3GPP TSG CN Plenary Meeting #15 **NP-020063**
6th – 8th March 2002. Jeju, Korea.

Source: TSG CN WG4

Title: CRs on Rel-5 Camel4

Agenda item: 9.5

Document for: APPROVAL

Introduction:

This document contains 7 CRs on Rel-5 Work Item ”Camel4”, that have been agreed by TSG CN WG4, and are forwarded to TSG CN Plenary meeting #15 for approval.

Spec	CR	Re	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
23.018	100	1	N4-020288	Rel-5	Transferring the MS classmark & IMEI to the gsmSCF	C	5.2.0
23.079	016		N4-020008	Rel-5	Introduction of CAMEL Phase 4	B	4.0.0
23.083	009	1	N4-020009	Rel-5	Introduction of CAMEL Phase 4	B	4.3.0
23.018	082	2	N4-020260	Rel-5	Introduction of CAMEL Phase 4	B	5.2.0
23.008	039	1	N4-020243	Rel-5	Collective CRs against 23.008 for CAMEL phase4	F	4.1.0
23.016	021		N4-020014	Rel-5	Collective CRs against 23.016 for CAMEL phase4	B	4.0.0
29.002	368	4	N4-020300	Rel-5	Collective CRs against 29.002 for CAMEL phase4	B	5.0.0

3GPP TSG CN WG4 Meeting #12
Sophia Antipolis, France,
28th January – 2nd February 2002

N4-020243

CR-Form-v4

CHANGE REQUEST

⌘ **23.008** **CR** **039** ⌘ ev **1** ⌘ Current version: **4.1.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Collective CRs against 23.008 for CAMEL phase4
Source:	⌘	CN4
Work item code:	⌘	CAMEL phase 4
Date:	⌘	30/01/02
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Collective CAMEL phase 4 CR
Summary of change:	⌘	1. N2-010945 endorsed during CN2 Cancun meeting 2. Editorials - bullets alignement 3. N2-020147 endorsed during CN2 Sophia meeting
Consequences if not approved:	⌘	Missing CAMEL phase 4 functionalities

Clauses affected:	⌘	2.14.1.8/2.14.1.9/2.14.1.x (addition of MG-CSI) 2.14.2.1/2.14.3.5/2.14.3.6/2.14.4.1/2.14.4.2/2.14.4.4(addition of MG-CSI) Table1/Table2
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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

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:

- A TDP list. The TDP list is a list of TDP descriptions. Each TDP description contains the following elements:

  1. DP Value. The DP value identifies the DP in the MO State Model where service triggering may take place. For O-CSI, the allowed DP value are *DP Collected_info, DP Route_Select_Failure.*

  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. DP criteria is associated to each TDP.

TDP	**Triggering Criteria (*)**	**ServiceKey**	**gsmSCF address**	**Default Call Handling**
DP Collected_ Info	No Criterion Number criteria Basic service code criteria Call type criteria	One ServiceKey	One E164 gsmSCF address	One Default call handling
DP Route_Select_ Failure	No criterion Cause value criteria	One ServiceKey	One E164 gsmSCF address	One Default call handling

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

- CAMEL capability handling. It gives the CAMEL phase associated to the O-CSI (CAMEL phase1, phase2, or phase3).
- The CSI state. The CSI state indicates whether the O-CSI is active or not.
- The notification flag, the notification flag indicates whether changes of the O-CSI shall trigger Notification on Change of Subscriber Data.

~~TDP~~	~~Triggering Criteria (*)~~	~~ServiceKey~~	~~gsmSCF address~~	~~Default Call Handling~~
~~DP Collected_ Info~~	~~No Criterion Number criteria Basic service code criteria Call type criteria~~	~~One ServiceKey~~	~~One E164 gsmSCF address~~	~~One Default call handling~~
~~DP Route_Select_ Failure~~	~~No criterion Cause value criteria~~	~~One ServiceKey~~	~~One E164 gsmSCF address~~	~~One Default call handling~~

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

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:

- A TDP list. DP The TDP list is a list of TDP descriptions. Each TDP description contains the following elements:

  1. DP Value. The DP value identifies the DP in the MT State Model where service triggering may take place. For T-CSI, the allowed DP value are DP Terminating_Attempt_Authorised, DP T_Busy, DP T_No_Answer.

  2. A gsmSCF address. It is the gsmSCF address (E.164 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. DP criteria is associated to each TDP.

TDP	**Triggering Criteria (*)**	**ServiceKey**	**gsmSCF address**	**Default Call Handling**
DP Collected_ Info	No Criterion Number criteria Basic service code criteria Call type criteria	One ServiceKey	One E164 gsmSCF address	One Default call handling
DP Route_Select_ Failure	No criterion Cause value criteria	One ServiceKey	One E164 gsmSCF address	One Default call handling

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

- CAMEL capability handling. It gives the CAMEL phase associated to the T-CSI/VT-CSI (CAMEL phase1, or phase2, or phase3).
- The CSI state 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.

~~TDP~~	~~Triggering Criteria (*)~~	~~ServiceKey~~	~~gsmSCF address~~	~~Default Call Handling~~
~~DP Terminating_ Attempt_Authorised~~	~~No Criterion Basic service criteria~~	~~One serviceKey~~	~~One E164 gsmSCF address~~	~~One Default call handling~~
~~DP T_Busy~~	~~No criterion Cause value criteria~~	~~One serviceKey~~	~~One E164 gsmSCF address~~	~~One Default call handling~~
~~DP T_No_Answer~~	~~No criterion Cause value criteria~~	~~One service Key~~	~~One E164 gsmSCF address~~	~~One Default call handling~~

~~(*) One or more DP criteria shall be applicable. All applicable triggering 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 a MT call.

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:

- a service code. The service code defines a specific application in the gsmSCF;
- a gsmSCFaddress. It is the gsmSCF address (E.164 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 criterion, which may be a list of Supplementary Service(s). The possible Supplementary Services are: ECT, CD or MPTY, CCBS;
- a gsmSCFaddress: it is the gsmSCF address (E.164 number) where the notification of the Supplementary Service invocation is treated for this subscriber;
- CSI state, 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.

2.14.1.6 Translation Information flag (TIF-CSI)

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

2.14.1.7 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. The gsmSCF address is 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 Management's events shall be reported to the gsmSCF. The mobility management's 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 indicates whether the M-CSI is active or not.
- Notification flag. The notification flag indicates whether the change of M-CSI shall trigger Notification on Change of Subscriber data.

2.14.1.8 Mobile Originated Short Message Service CAMEL Subscription Information (MO-SMS-CSI)

This data defines the contents of the MO SMS CAMEL subscription information. The MO 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.

MO-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:
  1. DP Value. The DP value identifies the DP in the MO SMS State Model where service triggering may take place. For MO-SMS-CSI, the only allowed DP value is *SMS_Collected_Info*.
  2. 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.
  3. Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.
  4. 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 MO-SMS-CSI shall have the value CAMEL phase 3.
- CSI state: indicates whether the MO-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.

2.14.1.9 Mobile Terminating Short Message Service CAMEL Subscription Information (MT-SMS-CSI)

This data defines the contents of the mobile terminating short message service CAMEL subscription information. The MT-SMS-CSI CAMEL Subscription Information is used for the following interworking:

- Interworking between gsmSCF and gsmSSF, for CAMEL control of circuit switched MT SMS;
- Interworking between gsmSCF and gprsSSF, for CAMEL control of packet switched MT SMS.

MT-SMS-CSI consists of the following data items:

- TDP List. The TDP list is a list of MT SMS TDP descriptions. Each TDP description contains the following elements:

  1. DP Value. The DP value identifies the DP in the MT SMS State Model where service triggering may take place. For MT-SMS-CSI, the only allowed DP value is DP SMS-Delivery-Request

  2. gsmSCF Address. The gsmSCF address is the address (E164 number) of the gsmSCF where the MT SMS CAMEL Service associated with this TDP, is located for this subscriber.

  3. Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.

  4. Default SMS handling. The default SMS handling indicates whether the MT SMS delivery 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~~;~~.

  5. DP criterion. The DP criterion indicates on which criterion the gsmSSF shall access the gsmSCF. A DP criterion is associated with each TDP. For MT-SMS the DP criterion is the TDPU type. The criterion may be absent.

TDP	**Triggering Criterion**	**ServiceKey**	**gsmSCF address**	**Default SMS Handling**
DP SMS-Delivery Request	TDPU type	One serviceKey	One E164 gsmSCF address	One Default SMS handling

- CAMEL Capability Handling. CAMEL Capability Handling indicates the CAMEL Phase that is required for the MT SMS service. The CAMEL Capability Handling for MT-SMS-CSI shall have the value CAMEL phase 4.
- CSI state: indicates whether the MT-SMS-CSI is active or not.
- Notification flag indicates whether the change of the MT-SMS-CSI shall trigger Notification on change of subscriber Data or not.

2.14.1.~~9~~10 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:~~

~~I~~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:

  1. DP Value. The DP value identifies the DP in the GPRS State Model where service triggering may take place.

  2. 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.

  3. Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.

  4. 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 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.~~10~~11 Dialled service CAMEL Subscription Information (D-CSI)

This data defines the contents of the dialled 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. Each entry shall contain the following items:

  1. DP Criterion. It indicates when the gsmSSF shall request gsmSCF for instructions. It is a destination number.

  2. A gsmSCF address. It is the gsmSCF address (E164 number) where this Subscribed Dialled CAMEL service is treated for the subscriber. A gsmSCF address is associated to each DP Criterion.

  3. A serviceKey. The serviceKey identifies to the gsmSCF the service logic. A serviceKey is associated to each DP Criterion.

  4. 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).

     - CSI state: indicates whether the D-CSI is active or not.

     - Notification Flag. It indicates whether the change of the D-CSI shall trigger the Notification on Change of Subscriber Data.

2.14.1.x Mobility Management for GPRS event notification (MG-CSI)

This data indicates which Mobility Management for GPRS subscriber 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 is 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 management triggers may contain one or any combination of the following elements:

  - GPRS Routeing area update of MS to a different SGSN service area;

  - GPRS Routeing area update of MS within the same SGSN service area;

  - Attach of MS for GPRS subscriber (e.g. MS switched on, successful routeing area update after network initiated detach);

  - MS-initiated GPRS detach (e.g. MS switched off);

  - Network-initiated GPRS detach.

  ~~Editor's note: Network-initiated GPRS detach is to be included in the stage 1.~~

- The CSI state indicates whether the MG-CSI is active or not.

- Notification flag. The notification flag indicates whether the change of MG-CSI shall trigger Notification on Change of Subscriber data.

2.14.2 Other Data stored in the 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 the given CSI has not been downloaded to the VLR or SGSN.

The following table shows the *negotiated CAMEL Capability Handling* variables.

Variable name	Associated CSI	CSI stored in	Allowable values for negotiated CCH
O-CSI Negotiated CAMEL Capability Handling	O-CSI	VLR	NULL, 1, 2, 3, 4
D-CSI Negotiated CAMEL Capability Handling	D-CSI	VLR	NULL, 3, 4
SS-CSI Negotiated CAMEL Capability Handling	SS-CSI	VLR	NULL, 2, 3, 4
VT-CSI Negotiated CAMEL Capability Handling	VT-CSI	VLR	NULL, 3, 4
MO-SMS-CSI VLR Negotiated CAMEL Capability Handling	MO-SMS-CSI	VLR	NULL, 3
MT-SMS-CSI VLR Negotiated CAMEL Capability Handling	MT-SMS-CSI	VLR	NULL, 4
M-CSI Negotiated CAMEL Capability Handling	M-CSI	VLR	NULL, 3, 4
MG-CSI Negotiated CAMEL Capability Handling	MG-CSI	SGSN	NULL, 4
MO-SMS-CSI SGSN Negotiated CAMEL Capability Handling	MO-SMS-CSI	SGSN	NULL, 3
MT-SMS-CSI SGSN Negotiated CAMEL Capability Handling	MT-SMS-CSI	SGSN	NULL, 4
GPRS-CSI Negotiated CAMEL Capability Handling	GPRS-CSI	SGSN	NULL, 3

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 in 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 (E.164 number) where the USSD application is treated for this subscriber.

2.14.2.4 gsmSCF address for CSI

This information element contains the list of gsmSCF address(E164 address) to which Notification on Change of Subscriber Data is to be sent.

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) is 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 calls. It consists of:

- A TDP list: The TDP list is a list of TDP descriptions. Each TDP description contains the following elements:

  1. DP Value. The DP value identifies the DP in the MO State Model where service triggering may take place. For O-CSI, the allowed DP value is *DP Collected_info, DP Route_Select_Failure.*

  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 indicate on which criteria the gsmSSF shall access the gsmSCF. DP criteria are associated to each TDP.

- 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 a MT call. It consists of:

- A TDP list. The TDP list is a list of TDP descriptions. Each TDP description contains the following elements:

  1. DP Value. The DP value identifies the DP in the MT State Model where service triggering may take place. For VT-CSI, the allowed DP value is *DP Terminating Attempt Authorised, DP T_Busy, and 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 indicate on which criteria the gsmSSF shall access the gsmSCF.

- CAMEL capability handling. It gives the CAMEL phase associated to the VT-CSI. It is 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 criterion, 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.

2.14.3.4 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. 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 Management's events shall be reported to the gsmSCF. The mobility management's 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).

2.14.3.5 Mobile Originating Short Message Service CAMEL Subscription Information (MO-SMS-CSI)

This data defines the contents of the MO SMS CAMEL subscription information used for the interworking between gsmSCF and gsmSSF, for CAMEL control of circuit switched MO SMS.

MO-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:
  1. DP Value. The DP value identifies the DP in the MO SMS State Model where service triggering may take place. For MO SMS-CSI, the only allowed DP value is *SMS_Collected_Info*.
  2. 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.~~
  3. Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.
  4. 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 MO-SMS-CSI shall have the value CAMEL phase 3.

2.14.3.6 Mobile Terminating Short Message Service CAMEL Subscription Information (MT-SMS-CSI)

This data defines the contents of the mobile terminating short message service CAMEL subscription information. The MT-SMS-CSI CAMEL Subscription Information is used for interworking between gsmSCF and gsmSSF, for CAMEL control of circuit switched MT SMS.

MT-SMS-CSI consists of the following data items:

- TDP List. The TDP list is a list of MT SMS TDP descriptions. Each TDP description contains the following elements:
  1. DP Value. The DP value identifies the DP in the MT SMS State Model where service triggering may take place. For MT-SMS-CSI, the only allowed DP value is SMS-Delivery-Request

2. gsmSCF Address. The gsmSCF address is the address (E164 number) of the gsmSCF where the MT SMS CAMEL Service associated with this TDP, is located for this subscriber.

3. Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.

4. Default SMS handling. The default SMS handling indicates whether the MT SMS delivery 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~~;~~

5. . DP criterion. The DP criterion indicates on which criterion the gsmSSF shall access the gsmSCF. A DP criterion is associated with each TDP. For MT-SMS the DP criterion is the TDPU type. The criterion may be absent.

TDP	Triggering Criterion	ServiceKey	gsmSCF address	Default SMS Handling
DP SMS-Delivery Request	TDPU type	One serviceKey	One E164 gsmSCF address	One Default SMS handling

- CAMEL Capability Handling. CAMEL Capability Handling indicates the CAMEL Phase that is required for the MT SMS service. The CAMEL Capability Handling for MT-SMS-CSI shall have the value CAMEL phase 4.

2.14.3.~~6~~7 Dialled service CAMEL Subscription Information (D-CSI)

This data defines the contents of the dialled 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 Criterion: It indicates when the gsmSSF shall request gsmSCF for instructions.

  1. A gsmSCF address. It is the gsmSCF address (E164 number) where this Subscribed Dialled CAMEL service is treated for the subscriber. A gsmSCF address is associated to each DP Criterion.

  2. A serviceKey. The serviceKey identifies to the gsmSCF the service logic. A serviceKey is associated to each DP Criterion.

  3. 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.~~7~~8 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 (DTN).

2.14.4 Data stored in SGSN

2.14.4.1 Mobile Originating Short Message Service CAMEL Subscription Information (MO-SMS-CSI)

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

MO-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:

1. DP Value. The DP value identifies the DP in the MO SMS State Model where service triggering may take place. For MO-SMS-CSI, the only allowed DP value is *SMS_Collected_Info*.

2. gsmSCF Address. The gsmSCF address is the address (E.164 number) of the gsmSCF where the MO SMS CAMEL Service associated with this TDP, is located for this subscriber.

3. Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.

4. 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 MO-SMS-CSI in SGSN shall have the value CAMEL phase 3.

2.14.4.2. Mobile Terminating Short Message Service CAMEL Subscription Information (MT-SMS-CSI)

This data defines the contents of the mobile terminating short message service CAMEL subscription information. The MT-SMS-CSI CAMEL Subscription Information is used for the Interworking between gsmSCF and gprsSSF, for CAMEL control of packet switched MT SMS.

MT-SMS-CSI consists of the following data items:

- TDP List. The TDP list is a list of MT SMS TDP descriptions. Each TDP description contains the following elements:

  1. DP Value. The DP value identifies the DP in the MT SMS State Model where service triggering may take place. For MT-SMS-CSI, the only allowed DP value is SMS-Delivery-Request

  2. gsmSCF Address. The gsmSCF address is the address (E164 number) of the gsmSCF where the MT SMS CAMEL Service associated with this TDP, is located for this subscriber.

  3. Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.

  4. Default SMS handling. The default SMS handling indicates whether the MT SMS delivery request shall be rejected or continued in the case of error in the dialogue between the gprsSSF and gsmSCF~~:~~.

  5. DP criterion. The DP criterion indicates on which criterion the gsmSSF shall access the gsmSCF. A DP criterion is associated with each TDP. For MT-SMS the DP criterion is the TDPU type. The criterion may be absent.

TDP	**Triggering Criterion**	**ServiceKey**	**gsmSCF address**	**Default SMS Handling**
DP SMS-Delivery Request	TDPU type	One serviceKey	One E164 gsmSCF address	One Default SMS handling

- CAMEL Capability Handling. CAMEL Capability Handling indicates the CAMEL Phase that is required for the MT SMS service. The CAMEL Capability Handling for MT-SMS-CSI shall have the value CAMEL phase 4.

2.14.4.~~2~~3 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 interworking between gsmSCF and gprsSSF, for CAMEL control of packet switch call.

The 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:

  1. DP Value. The DP value identifies the DP in the GPRS State Model where service triggering may take place.

2. 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.

3. Service Key. The service key identifies to the gsmSCF the service logic that shall be applied.

4. 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.

2.14.4.4 Mobility Management for GPRS event notification (MG-CSI)

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

- gsmSCF address : This is the address of the gsmSCF where the Mobility Management for GPRS 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 Management events shall be reported to the gsmSCF. The mobility management triggers may contain one or any combination of the following elements:

  - GPRS Routeing area update of MS to a different SGSN service area;

  - GPRS Routeing area update of MS within the same SGSN service area;

  - Attach of MS for GPRS subscriber (e.g. MS switched on, successful routeing area update after network initiated detach);

  - MS-initiated GPRS detach (e.g. MS switched off);

  - Network-initiated GPRS detach.

  ~~Editor's note: Network-initiated GPRS detach is to be included in the stage 1.~~

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

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

PARAMETER	SUBCLAUSE	HLR	VLR	TYPE
IMSI	2.1.1.1	M	M	P
Network Access Mode	2.1.1.2	M	-	P
International MS ISDN number	2.1.2	M	M	P
multinumbering MSISDNs	2.1.3	C	-	P
Basic MSISDN indicator	2.1.3.1	C	-	P
MSISDN-Alert indicator	2.1.3.2	C	-	P
TMSI	2.1.4	-	C	T
LMSI	2.1.8	C	C	T
Mobile Station Category	2.2.1	M	M	P
LMU Identifier	2.2.2	C	C	P
RAND, SRES and Kc	2.3.1		C	T
RAND, XRES, CK, IK and AUTN	2.3.2	M	C	T
Ciphering Key Sequence Number	2.3.3	-	M	T
Key Set Identifier (KSI)	2.3.4	-	M	T
MSRN	2.4.1	-	C	T
Location Area Identity	2.4.2	-	M	T
VLR number	2.4.5	M	-	T
MSC number	2.4.6	M	C	T
HLR number	2.4.7	-	C	T
Subscription restriction	2.4.10	C	-	P
RSZI lists	2.4.11.1	C	-	P
Zone Code List	2.4.11.2	-	C	P
MSC area restricted flag	2.4.12	M	-	T
LA not allowed flag	2.4.13	-	M	T
ODB-induced barring data	2.4.15.1	C	-	T
Roaming restriction due to unsupported feature	2.4.15.2	M	M	T
Cell Global ID or Service Area ID	2.4.16	-	C	T
LSA Identity	2.4.17.1	C	C	P
LSA Priority	2.4.17.2	C	C	P
LSA Preferential Access Indicator	2.4.17.2A	C	C	P
LSA Active Mode Support Indicator	2.4.17.2B	C	C	P
LSA Only Access Indicator	2.4.17.3	C	C	P
LSA Active Mode Indicator	2.4.17.4	C	C	P
VPLMN Identifier	2.4.17.5	C	-	P
Provision of bearer service	2.5.1	M	M	P
Provision of teleservice	2.5.2	M	M	P
BC allocation	2.5.3	C	C	P
IMSI detached flag	2.7.1	-	C	T
Confirmed by Radio Contact indicator	2.7.4.1	-	M	T
Subscriber Data Confirmed by HLR indicator	2.7.4.2	-	M	T
Location Information Confirmed in HLR indicator	2.7.4.3	-	M	T
Check SS indicator	2.7.4.4	M	-	T
MS purged for non-GPRS flag	2.7.5	M	-	T
MNRR	2.7.7	C	-	T
Subscriber status	2.8.1	C	C	P
Barring of outgoing calls	2.8.2.1	C	C	P
Barring of incoming calls	2.8.2.2	C	-	P
Barring of roaming	2.8.2.3	C	-	P
Barring of premium rate calls	2.8.2.4	C	C	P
Barring of supplementary service management	2.8.2.5	C	C	P
Barring of registration of call forwarding	2.8.2.6	C	-	P
Barring of invocation of call transfer	2.8.2.7	C	C	P
Operator determined barring PLMN-specific data	2.8.3	C	C	P
Notification to CSE flag for ODB	2.8.4	C	-	T
gsmSCF address list for ODB	2.8.5	C	-	P
Handover Number	2.9.1	-	C	T
Messages Waiting Data	2.10.1	C	-	T
Mobile Station Not Reachable Flag	2.10.2	C	M	T
Memory Capacity Exceeded Flag	2.10.3	C	-	T
Trace Reference	2.11.1	C	C	P
Trace Type	2.11.2	C	C	P
Operations Systems Identity	2.11.3	C	C	P
HLR Trace Type	2.11.4	C	-	P
MAP Error On Trace	2.11.5	C	-	T
Trace Activated in VLR	2.11.6	C	C	T

PARAMETER	SUBCLAUSE	HLR	VLR	TYPE
Foreign Subscriber Registered in VLR	2.11.7	-	C	P
VGCS Group Membership List	2.12.1	C	C	P
VBS Group Membership List	2.12.2	C	C	P
Broadcast Call Initiation Allowed List	2.12.2.1	C	C	P
Originating CAMEL Subscription Information (O-CSI)	2.14.1.1/3.1	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)	2.14.1.5/3.2	C	C	P
Translation information flag(TIF-CSI)	2.14.1.6/3.6	C	C	P
Dialled service CAMEL Subscription Information (D-CSI)	2.14.1.~~10~~11/3.~~6~~ 7	C	C	P
USSD General CAMEL service information (UG-CSI)	2.14.2	C	-	P
O-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C		T
SS-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C		T
VT-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C		T
~~Short Message Service CAMEL Subscription Information(SMS-CSI)~~	~~**Erreur! Source du renvoi introuvable./Erreur! Source du renvoi introuvable.**~~	~~C~~	~~C~~	~~P~~
Short Message Service CAMEL Subscription Information(MO-SMS-CSI)	2.14.1.8/2.14.3.5	C	C	P
Short Message Service CAMEL Subscription Information(MT-SMS-CSI)	2.14.1.9/2.14.3.6	C	C	P
MO-SMS-CSI VLR Negotiated CAMEL Capability Handling	2.14.2.1	C		T
MT-SMS-CSI VLR Negotiated CAMEL Capability Handling	2.14.2.1	C		P
M-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C		T
VLR Supported CAMEL Phases	2.14.2.3	C		T
GsmSCF address for CSI	2.14.2.4	C		P
IST Alert Timer	2.15.1	C	C	P
Privacy Exception List	2.16.1.1	C	C	P
GMLC Numbers	2.16.1.2	C	C	P
MO-LR List	2.16.1.3	C	C	P
Age Indicator	2.17.1	C	C	T
CS Allocation/Retention priority	2.18.1	C	C	P

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

PARAMETER	Subclause	HLR	VLR	SGSN	GGSN	TYPE
IMSI	2.1.1.1	M	M	M	M	P
Network Access Mode	2.1.1.2	M	-	C note1	-	P
International MS ISDN number	2.1.2	M	M	M	-	T
multinumbering MSISDNs	2.1.3	C	-	-	-	T
Basic MSISDN indicator	2.1.3.1	C	-	-	-	T .
MSISDN-Alert indicator	2.1.3.2	C	-	-	-	T
P-TMSI	2.1.5	-	-	C	-	T
TLLI	2.1.6	-	-	C	-	T
Random TLLI	2.1.7	-	-	C	-	T
IMEI	2.1.9	-	-	C	-	T
RAND/SRES and Kc	2.3.1		-	C	-	T
RAND, XRES, CK, IK, AUTN	2.3.2	M	-	C	-	T
Ciphering Key Sequence Number	2.3.3	-	-	M	-	T
Key Set Identifier (KSI)	2.3.4	-	-	M	-	T
Selected Ciphering Algorithm	2.3.5	-	-	M	-	T
Current Kc	2.3.6	-	-	M	-	T
P-TMSI Signature	2.3.7	-	-	C	-	T
Routing Area Identity	2.4.3	-	-	M	-	T
VLR Number	2.4.5	M	-	C note2	-	T
SGSN Number	2.4.8.1	M	C note2	-	-	T
GGSN Number	2.4.8.2	M	-	-	-	P
RSZI Lists	2.4.11.1	C	-	-	-	P
Zone Code List	2.4.11.2	-	-	C	-	P
LA not allowed flag	2.4.13	-	-	M	-	T
SGSN area restricted flag	2.4.14	M	-	-	-	T
Roaming Restriction in the SGSN ..	2.4.15.2	M	-	M	-	T
Cell Global ID or Service Area ID	2.4.16	-	-	C	-	T
LSA Identity	2.4.17.1	C	C	C	-	P
LSA Priority	2.4.17.2	C	C	C	-	P
LSA Preferential Access Indicator	2.4.17.2A	C	C	C		P
LSA Active Mode Support Indicator	2.4.17.2B	C	C	C		P
LSA Only Access Indicator	2.4.17.3	C	C	C	-	P
LSA Active Mode Indicator	2.4.17.4	C	C	C	-	P
VPLMN Identifier	2.4.17.5	C	-	-	-	P
Provision of teleservice	2.5.2	C	-	C	-	P
Transfer of SM option	2.5.4	M	-	-	-	P
MNRG	2.7.2	M	-	M	M	T
MM State	2.7.3	-	-	M	-	T
Subscriber Data Confirmed by HLR Indicator	2.7.4.2	-	-	M	-	T
Location Info Confirmed by HLR Indicator	2.7.4.3	-	-	M	-	T
MS purged for GPRS flag	2.7.6	M	-	-	-	T
MNRR	2.7.7	C	-	-	-	T
Subscriber Status	2.8.1	C	-	C	-	P
Barring of outgoing calls	2.8.2.1	C	-		-	P
Barring of roaming	2.8.2.3	C	-	C	-	P
Barring of Packet Oriented Services	2.8.2.8	C	-	C	-	P
ODB PLMN-specific data	2.8.3	C	-	C	-	P
Notification to CSE flag for ODB	2.8.4	C	-	-	-	T
gsmSCF address list for ODB	2.8.5	C	-	-	-	P
Trace Activated in SGSN	2.11.7	C	-	C	-	P
PDP Type	2.13.1	C	-	C	M	P
PDP Address	2.13.2	C	-	C	M	P
NSAPI	2.13.3	-	-	C	C	T
PDP State	2.13.4	-	-	C	-	T
New SGSN Address	2.13.5	-	-	C	-	T
Access Point Name	2.13.6	C	-	C	C	P/T
GGSN Address in Use	2.13.7	-	-	C	-	T
VPLMN Address Allowed	2.13.8	C	-	C	-	P
Dynamic Address	2.13.9	-	-	-	C	T
SGSN Address	2.13.10	-	-	-	M	T
GGSN-list	2.13.11	M	-	-	-	T
Quality of Service Subscribed	2.13.12	C	-	C	-	P
Quality of Service Requested	2.13.13	-	-	C	-	T
Quality of Service Negotiated	2.13.14	-	-	C	M	T
SND	2.13.15	-	-	C	C	T

PARAMETER	Subclause	HLR	VLR	SGSN	GGSN	TYPE
SNU	2.13.16	-	-	C	C	T
DRX Parameters	2.13.17	-	-	M	-	T
Compression	2.13.18	-	-	C	-	T
NGAF	2.13.19	-	-	C note2	-	T
Classmark	2.13.20	-	-	M	-	T
TID	2.13.21	-	-	C	C	T
Radio Priority	2.13.22	-	-	C	-	T
Radio Priority SMS	2.13.23	-	-	C	-	T
PDP Context Identifier	2.13.24	C	-	C	-	T
PDP Context Charging Characteristics	2.13.25	C	-	C	C	P
GPRS CAMEL Subscription Information (GPRS-CSI)	2.14.1.10/2.14.4.4	C	-	C	-	C
MO Short Message Service CAMEL Subscription Information(MO-SMS-CSI)	2.14.1.8/2.14.4.1	C	-	C	-	C
MT Short Message Service CAMEL Subscription Information(MT-SMS-CSI)	2.14.1.9/2.14.4.2.	C	-	C	-	C
MO-SMS-CSI SGSN Negotiated CAMEL Capability Handling	2.14.2.1	C	-	-	-	P
MT-SMS-CSI SGSN Negotiated CAMEL Capability Handling	2.14.2.1	C	-	-	-	P
~~Short Message Service CAMEL Subscription Information (SMS-CSI)~~	~~2.14.4.1/1.8~~	~~C~~	~~-~~	~~C~~	~~-~~	~~P~~
~~GPRS CAMEL Subscription Information (GPRS-CSI)~~	~~2.14.4.2/1.9~~	~~C~~	~~-~~	~~C~~	~~-~~	~~C~~
~~SMS-CSI SGSN Negotiated CAMEL Capability Handling~~	~~2.14.2.1~~	~~C~~	~~-~~	~~-~~	~~-~~	~~T~~
Mobility Management for GPRS event notification (MG-CSI)	2.14.1.12/2.14.4.4	C	-	C	-	C
MG-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C	-	-	-	P
GPRS-CSI Negotiated CAMEL Capability Handling	2.14.2.1	C	-	-	-	T
SGSN Supported CAMEL Phases	2.14.2.3	C	-	-	-	T
GsmSCF address for CSI	2.14.2.4	C	-	-	-	P
Age Indicator	2.16.1	C	-	C	-	T
Subscribed Charging Characteristics	2.19.1	C	-	C	C	P
Privacy Exception List	2.16.1.1	C	-	C	-	P
GMLC Numbers	2.16.1.2	C	-	C	-	P
MO-LR List	2.16.1.3	C	-	C	-	P

The HLR column indicates only GPRS related use, i.e. if the HLR uses a parameter in non-GPRS Network Access Mode but not in GPRS Network Access Mode, it is not mentioned in this table 2.

Note 1: This parameter is relevant in the SGSN only when the Gs interface is installed.

Note 2: The VLR column is applicable if Gs interface is installed. It only indicates GPRS related data to be stored and is only relevant to GPRS subscribers registered in VLR.

For special condition of storage see in clause 2. See clause 3 for explanation of M, C, T and P in table 2.

3GPP TSG CN WG2 Meeting #22 **N4-020300**
Sophia Antipolis, France, 28th January – 2nd February 2002

CHANGE REQUEST

⌘ **29.002** **CR** **368** ⌘ **rev** **4** ⌘ Current version: **4.5.0** ⌘

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Collective CAMEL Phase 4 CR
Source:	⌘	CN4

Work item code: ⌘	CAMEL4	***Date:*** ⌘	25 February 2002

Category: ⌘	B	***Release:*** ⌘	Rel-5
	Use one of the following categories:	*Use one of the following releases:*	
	F *(correction)*	*2*	*(GSM Phase 2)*
	A *(corresponds to a correction in an earlier release)*	*R96*	*(Release 1996)*
	B *(addition of feature),*	*R97*	*(Release 1997)*
	C *(functional modification of feature)*	*R98*	*(Release 1998)*
	D *(editorial modification)*	*R99*	*(Release 1999)*
		REL-4	*(Release 4)*
		REL-5	*(Release 5)*

Reason for change: ⌘	The present contribution is the collective CAMEL 4 CR on Ts 29.002. It includes the following approved CRs: - N2-010005, "Introduction of CAMEL4 MT SMS to MAP";

	- N2-010226, "Triggering criteria for MT-SMS"; - N2-010436, "Correction to MT-SMS Trigger Criterion"; - N2-010604, "Use of SRI operation by gsmSCF"; - N2-010620, "Mobility management for GPRS subscriber"; - N2-011023, "Enhancements to subscriber information reporting in the PS domain"; - N2-020148, "Correction on MT SMS SDL"; - N2-020200, "Inclusion of ODB data in ATM"; - N2-020204, "Enhancements to subscriber information reporting in the PS domain".
Summary of change: ⌘	Introduction of CAMEL Phase 4 CRs

Consequences if not approved:	⌘	CAMEL Phase 4 will not work in Rel-5.

Clauses affected:	⌘			
Other specs Affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘	I have placed a few "CR Editor's notes" in the CR. In addition, note the following: General: the words "gsmSCF" and "CSE" are used rather inconsistently. It would be better		

	of the term "gsmSCF" be used consistently. N2-020148 • the wording of the (**) notes underneath figures 23.3/1 and 23.3/2 has been improved. • Missing underscore of the message "MAP CONTINUE_CAMEL_SMS_HANDLING" underneath figures 23.3/1 and 23.3/2 has been added. • In section 23.3.1, "GMSC" has been replaced by "SMS-GMSC". • In section 23.3.1, the wording "the MSC sends" has been replaced by the wording "the MSC shall send". • New wording in section 23.3.2 has been refined.

	N2-020200 • section 7.6.3.xx, "Modification Request for ODB data" is not entirely correct. The wording should read " This parameter indicates the operator determined barring data to be inserted by CSE.". But, the incorrect wording is used rathe consistently, so the newly added wording shall be kept as is.

3GPP TS 29.002 V4.5.0 (2001-09)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Core Network;
Mobile Application Part (MAP) specification;
(Release 4)

CAMEL Phase 4 CRs – for 3GPP-CN2/CN4 only
2002-02-25

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*** First Modification ***

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
  3GPP TS 48.008 [49] (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 that might be changed due to network operator/implementation matters.

If secure transport is used, the encapsulated application context for the requested dialogue determines the priority for discarding the received MAP operation.

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

	Responder = HLR	**Initiating Entity**
Priority high		
	Mobility Management	
	networkLocUp (updateLocation), (restoreData/v2), (sendParameters/v1)	VLR
	gprsLocationUpdate (updateGPRSLocation/v3),	SGSN
	infoRetrieval (sendAuthenticationInfo/v2/v3), (sendParameters/v1)	VLR/SGSN
	istAlerting (istAlert/v3)	MSC msPurging VLR
	msPurging (purgeMS/v2/v3)	SGSN
	msPurging (purgeMS/v3)	SGSN
	Short Message Service	
	shortMsgGateway (sendRoutingInfoforSM), (reportSM-DeliveryStatus)	GMSC
	mwdMngt (readyForSM/v2/v3), (noteSubscriberPresent/v1)	VLR/SGSN
	Mobile Terminating Traffic	
	locInfoRetrieval (sendRoutingInfo)	GMSC
	anyTimeEnquiry (anyTimeInterrogation/v3)	gsmSCF
	reporting (statusReport)	VLR
	Location Services	
	locationSvcGateway (sendRoutingInfoforLCS/v3)	GMLC
	Subscriber Controlled Inputs (Supplementary Services)	
	networkFunctionalSs (registerSS), (eraseSS), (activateSS), (deactivateSS), (interrogateSS), (registerPassword), (processUnstructuredSS-Data/v1), (beginSubscriberActivity/v1)	VLR
	callCompletion (registerCCEntry), (eraseCCEntry)	VLR
	networkUnstructuredSs (processUnstructuredSS-Request/v2)	VLR
	imsiRetrieval (sendIMSI/v2)	VLR
	gprsLocationInfoRetrieval (sendRoutingInfoForGprs/v3/v4)	GGSN/SGSN
	failureReport (failureReport/v3)	GGSN/SGSN
	authenticationFailureReport (authenticationFailureReport/v3)	VLR/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	
Mobility and Location Register Management	
locationCancel (cancelLocation v3)	HLR
reset (reset)	HLR
subscriberDataMngt (insertSubscriberData v3), (deleteSubscriberData v3)	HLR
tracing (activateTraceMode), (deactivateTraceMode)	HLR
Short Message Service	
shortMsgMT-Relay (MT-ForwardSM v3), [CR editor's note: above comma has been added on the initiative of the CR editor. To be confirmed by rapporteur.] (forwardSM v1/v2)	MSC
Network-Requested PDP context activation	
gprsNotify (noteMsPresentForGprs v3),	HLR
(Subscriber Location & State retrieval)	
subscriberInfoEnquiry (provideSubscriberInformation/v3)	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.

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

Responder = MSC/VLR	Initiating Entity
Priority high	
Handover	
handoverControl (prepareHandover/v2/v3), (performHandover/v1)	MSC
Group call and Broadcast call	
groupCallControl (prepareGroupCall/v3)	MSC
Mobility and Location Register Management	
locationCancel (cancelLocation)	HLR
reset (reset)	HLR
immediateTermination (istCommand/v3)	HLR
interVlrInfoRetrieval (sendIdentification/v2/v3), (sendParameters/v1)	VLR
subscriberDataMngt (insertSubscriberData), (deleteSubscriberData)	HLR
tracing (activateTraceMode), (deactivateTraceMode)	HLR
Short Message Service	
shortMsgMO-Relay (MO-ForwardSM v3), [CR editor's note: above comma has been added on the initiative of the CR editor. To be confirmed by rapporteur.] (forwardSM v1/v2)	MSC/SGSN
shortMsgMT-Relay (MT-ForwardSM v3), [CR editor's note: above comma has been added on the initiative of the CR editor. To be confirmed by rapporteur.] (forwardSM v1/v2)	MSC
shortMsgAlert (alertServiceCentre/v2), (alertServiceCentreWithoutResult/v1)	HLR
Mobile Terminating Traffic	
roamingNbEnquiry (provideRoamingNumber)	HLR
callControlTransfer (resumeCallHandling)	MSC
subscriberInfoEnquiry (provideSubscriberInformation/v3)	HLR
reporting (remoteUserFree), [CR editor's note: above comma has been added on the initiative of the CR editor. To be confirmed by rapporteur.] (SetReportingState)	HLR
Location Services	
locationSvcEnquiry (provideSubscriberLocation-/v3)	GMLC
Network-Initiated USSD	
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.

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 that could be applied to achieve the required traffic reductions are described in clauses 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 functionality (if possible).

When a signalling procedure can be supported by several application contexts that differ by their version number, the MAP-User needs to select a name. It can either select the name that 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 is minimised.

5.2.2 Strategy for selecting the Application Context (AC) version

A method should be used to minimise 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 that 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 that 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 clause 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 clause 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 ind 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 replaces the old AC-name by the new one in the list of associated highest AC supported.

ELSE

It uses the AC-name that 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 Optimising 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.

*** Next Modification ***

6 Requirements concerning the use of SCCP and TC

6.1 Use of SCCP

The Mobile Application Part (MAP) makes use of the services offered by the Signalling Connection Control Part (SCCP).

MAP supports the following SCCP versions:

- Signalling Connection Control Part, Signalling System no. 7 CCITT ('Blue Book SCCP');
- Signalling Connection Control Part, Signalling System no. 7 ITU-T Recommendation (07/96) Q.711 to Q.716 ('White Book SCCP'). Support of White Book SCCP at the receiving side shall be mandated from 00:01hrs, 1st July 2002(UTC). However, for signalling over the MAP E-interface to support inter-MSC handover/relocation, the support of White Book SCCP shall be mandated with immediate effect.

A White Book SCCP message will fail if any signalling point used in the transfer of the message does not support White Book SCCP. Therefore it is recommended that the originator of the White Book SCCP message supports a drop back mechanism or route capability determination mechanism to interwork with signalling points that are beyond the control of GSM/UMTS network operators.

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.

The SCCP is identified as an MTP3-user and the transport of SCCP messages between two entities shall be accomplished according to the 3GPP TS 29.202 [121].

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 SSNs for MAP are specified in 3GPP TS 23.003 [17].

When the SGSN emulates MSC behaviour for processing messages (MAP-MO-FORWARD-SHORT-MESSAGE, MAP_CHECK_IMEI, MAP_SUBSCRIBER_LOCATION_REPORT) towards entities which do not support interworking to SGSNs, it shall use the MSC SSN in the calling party address instead of the SGSN SSN.

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 that 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 3GPP TS 23.066 [108]) 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 routeing 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 routeing 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, i.e. 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 clauses 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 Gateway Mobile Location Centre (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 or relocation

The address is derived from the target Cell id or from the target RNC id.

6.1.3.2.2 MSC for short message routing

When a short message has to be routed to an MS, the GMSC addresses the VMSC by an MSC identity received from the HLR that 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 that has MAP capabilities, e.g. local exchange, outgoing International Switching Centre (ISC), etc.

6.1.3.3.2 Before location updating completion

When an 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 routeing 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
- an E.164 HLR address; or
- in the case of intra-PLMN signalling, 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 routeing 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 routeing 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 routeing 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 an MS registers for the first time in an 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 routeing 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
- an E.164 HLR address; or
- in the case of intra-PLMN signalling, 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 routeing 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 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 routeing 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 cannot 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 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 routeing information used by the HLR is derived form 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 3GPP TS 23.003 [17]) shall be included in the called party address. The routeing 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 on E.164 address known in the HLR, SGSN or MSC.

6.1.3.10A Void

6.1.3.10A.1 Void

6.1.3.10A.2 Void

6.1.3.10B The Gateway Mobile Location Centre (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 summarise 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/HLR 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--	---	---	---
Gateway GPRS Support Node	---	I:SPC/GT E:GT T:MGT	---	---	---	---	---	---	---
Gateway Mobile Location Centre	---	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 routeing 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).

Table 6.1/2

to **from**		**GMLC**
fixed network		---
Home Location Register		---
Visitor Location Register		---
Mobile-services Switching Centre		---
gsm Service Control Function		I:SPC/GT E:GT T:MSISDN
Shared Inter Working Function		---
Serving GPRS Support Node		---
Gateway GPRS Support Node		---
Gateway Mobile Location Centre		

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

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 initialisation 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).

*** Next Modification ***

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.

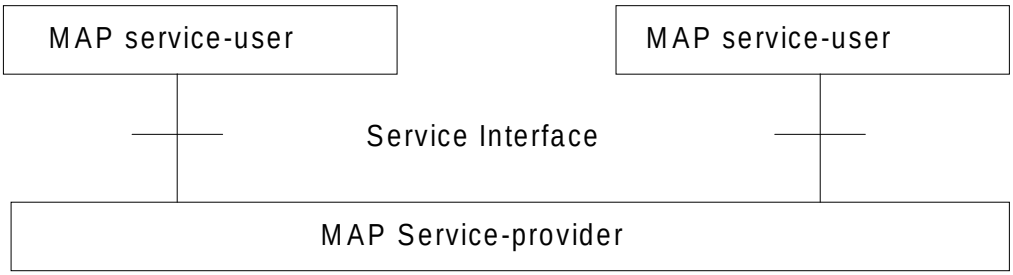


Figure 7.2/1: Modelling principles

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 that 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;
- MAP-SECURE-TRANSPORT-CLASS-1 service;
- MAP-SECURE-TRANSPORT-CLASS-2 service;
- MAP-SECURE-TRANSPORT-CLASS-3 service;
- MAP-SECURE-TRANSPORT-CLASS-4 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 that 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 (note 1)	Subscriber identity
MAP-UNSTRUCTURED-SS-REQUEST	IMSI (note 2)	Subscriber identity
MAP-UNSTRUCTURED-SS-NOTIFY	IMSI (note 2)	Subscriber identity
MAP-FORWARD-SHORT-MESSAGE	IMSI (note 3)	Subscriber identity
MAP-REGISTER-CC-ENTRY	IMSI	Subscriber identity
MAP-ERASE-CC-ENTRY	IMSI	Subscriber identity

NOTE 1: On the HLR - HLR interface and on the HLR - gsmSCF interface the Destination reference shall be either IMSI or MSISDN.

NOTE 2: On the gsmSCF - HLR interface and on the HLR - HLR interface the Destination reference shall be either IMSI or MSISDN.

NOTE 3: 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 that 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. Furthermore the receiving entity may be able to use the value of the Originating-reference to screen the service indication.

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-UNSTRUCTURED-SS-REQUEST	ISDN-Address-String (note)	Originated entity address
MAP-UNSTRUCTURED-SS-NOTIFY	ISDN-Address-String (note)	Originated entity address
MAP-REGISTER-CC-ENTRY	ISDN-Address-String	Originated entity address
MAP-ERASE-CC-ENTRY	ISDN-Address-String	Originated entity address

NOTE: The Originating reference may be omitted.

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 peer accepts the dialogue.

Refuse reason:

This parameter is present only 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;

- Secured transport not possible;
- Transport protection not adequate.

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 clause 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 reasons 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	Short term/long term problem
Application procedure cancellation	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-primitives as shown in table 7.3/8.

Table 7.3/8: Service-primitives 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	MAP	Malfunction at MAP level at peer entity
malfunction	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	MAP	Congestion towards MAP peer service-user
limitation	TC	"Resource limitation" received in TC-P-ABORT
Maintenance	MAP	Maintenance at MAP peer service-user
activity	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.

7.3.7 MAP-SECURE-TRANSPORT-CLASS-1 service

This service is used for secure transport of a specific confirmed MAP service which is mapped on to a TCAP class 1 operation (i.e. one which can return a result or an error). The service is a confirmed service with service primitives as shown in table 7.3/11.

Table 7.3/11: Service-primitives for the MAP-SECURE-TRANSPORT-CLASS-1 service

Parameters	Request	Indication	Response	Confirm
Security header	M	M(=)	M	M(=)
Protected payload	C	C(=)	U	C(=)
User error			U	C(=)
Provider error				O

Security header:

This parameter carries the security header information required for secure transport of MAP messages. The details of this parameter are given in clause 7.6.12.

Protected payload:

This parameter represents in protected mode the complete Request, Indication, Response or Confirm primitive of the service which makes use of the MAP-SECURE-TRANSPORT-CLASS-1 service.

User error:

If the application at the responding entity returns an error to be carried in the secure transport envelope, this parameter contains the Secure transport error defined in clause 7.6.1.

Provider error

For the definition of provider errors see clause 7.6.1.

7.3.8 MAP-SECURE-TRANSPORT-CLASS-2 service

This service is used for secure transport of a specific confirmed MAP service which is mapped on to a TCAP class 2 operation (i.e. one which can return an error but no result). The service is a confirmed service with service primitives as shown in table 7.3/12.

Table 7.3/12: Service-primitives for the MAP-SECURE-TRANSPORT-CLASS-2 service

Parameters	Request	Indication	Response	Confirm
Security header	M	M(=)	M	M(=)
Protected payload	C	C(=)		
User error			U	C(=)
Provider error				O

Security header:

This parameter carries the security header information required for secure transport of MAP messages. The details of this parameter are given in clause 7.6.12.

Protected payload:

This parameter represents in protected mode the complete Request, Indication, Response or Confirm primitive of the service which makes use of the MAP-SECURE-TRANSPORT-CLASS-2 service.

User error:

If the application at the responding entity returns an error to be carried in the secure transport envelope, this parameter contains the Secure transport error defined in clause 7.6.1.

Provider error

For the definition of provider errors see clause 7.6.1.

7.3.9 MAP-SECURE-TRANSPORT-CLASS-3 service

This service is used for secure transport of a specific confirmed MAP service which is mapped on to a TCAP class 3 operation (i.e. one which can return a result but no error). The service is a confirmed service with service primitives as shown in table 7.3/13.

Table 7.3/13: Service-primitives for the MAP-SECURE-TRANSPORT-CLASS-3 service

Parameters	Request	Indication	Response	Confirm
Security header	M	M(=)	M	M(=)
Protected payload	C	C(=)	U	C(=)
Provider error				O

Security header:

This parameter carries the security header information required for secure transport of MAP messages. The details of this parameter are given in clause 7.6.12.

Protected payload:

This parameter represents in protected mode the complete Request, Indication, Response or Confirm primitive of the service which makes use of the MAP-SECURE-TRANSPORT-CLASS-3 service.

Provider error

For the definition of provider errors see clause 7.6.1.

7.3.10 MAP-SECURE-TRANSPORT-CLASS-4 service

This service is used for secure transport of a specific unconfirmed MAP service which is mapped on to a TCAP class 4 operation (i.e. one which can return neither a result nor an error). The service is an unconfirmed service with service primitives as shown in table 7.3/14.

Table 7.3/14: Service-primitives for the MAP-SECURE-TRANSPORT-CLASS-4 service

Parameters	Request	Indication
Security header	M	M(=)
Protected payload	C	C(=)

Security header:

This parameter carries the security header information required for secure transport of MAP messages. The details of this parameter are given in clause 7.6.12.

Protected payload:

This parameter represents in protected mode the complete Request or Indication primitive of the service which makes use of the MAP-SECURE-TRANSPORT-CLASS-4 service.

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:

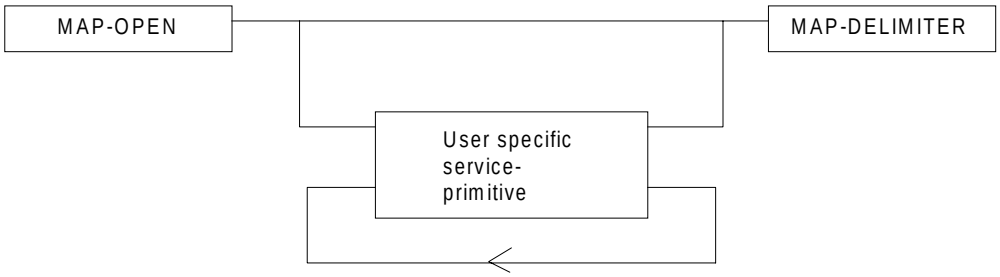
The sequence can only appear after an opening sequence or a continuing sequence. The sequence may contain none, one or several user specific service-primitives if the MAP-CLOSE primitive specifies normal release. If no user specific service-primitive is included, then this will correspond to sending 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:

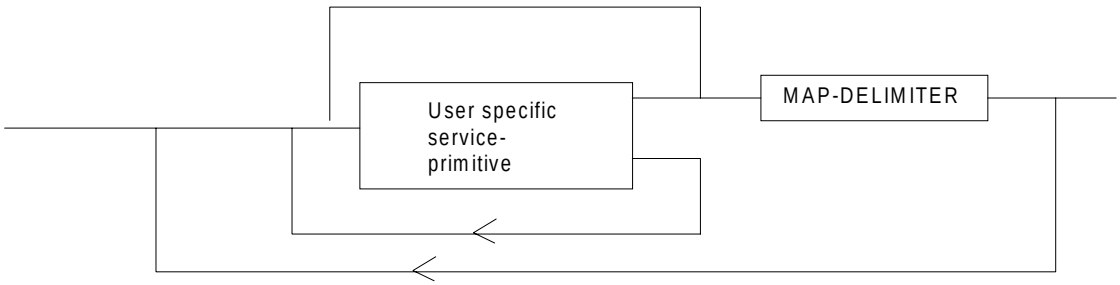
A MAP service-user can issue a MAP-U-ABORT primitive at any time after the MAP dialogue has been opened or as a response to an attempt to open a MAP dialogue.

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.

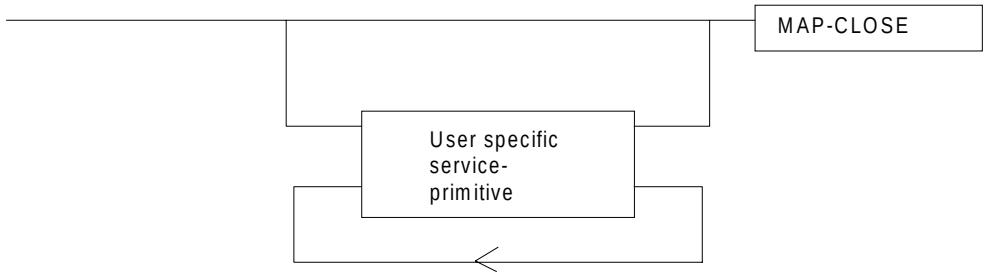
MAP-U-ABORT primitives and MAP-P-ABORT primitives terminate the MAP dialogue.



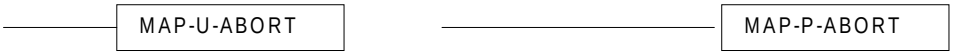
a) Opening



b) Continuing



c) Closing



d) Aborting

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 onto 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 onto 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 onto the same MAP-xx confirm.

7.6 Definition of parameters

Following is an alphabetic list of parameters used in the common MAP-services in clause 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 Location Estimate	7.6.11.21	LMSI	7.6.2.16
Additional number	7.6.2.46	Location Information	7.6.2.30
		Location Information for GPRS	7.6.2.30a
Additional signal info	7.6.9.10	Location update type	7.6.9.6
Additional SM Delivery Outcome	7.6.8.11	Long Forwarded-to Number	7.6.2.22A
		Long FTN Supported	7.6.2.22B
Age Indicator	7.6.3.72	Lower Layer Compatibility	7.6.3.42
		LSA Information	7.6.3.56
		LSA Information Withdraw	7.6.3.58
Alert Reason	7.6.8.8	MC Information	7.6.4.48
Alert Reason Indicator	7.6.8.10	MC Subscription Data	7.6.4.47
Alerting Pattern	7.6.3.44	Mobile Not Reachable Reason	7.6.3.51
All GPRS Data	7.6.3.53	Modification request for CSI	7.6.3.81
All Information Sent	7.6.1.5	Modification request for SS Information	7.6.3.82
AN-apdu	7.6.9.1	More Messages To Send	7.6.8.7
APN	7.6.2.42	MS ISDN	7.6.2.17
Authentication set list	7.6.7.1	MSC number	7.6.2.11
B-subscriber Address	7.6.2.36	MSIsdn-Alert	7.6.2.29
B subscriber Number	7.6.2.48	Multicall Bearer Information	7.6.2.52
B subscriber subaddress	7.6.2.49	Multiple Bearer Requested	7.6.2.53
Basic Service Group	7.6.4.40	Multiple Bearer Not Supported	7.6.2.54
Bearer service	7.6.4.38	MWD status	7.6.8.3
Call Barring Data	7.6.3.83	NbrUser	7.6.4.45
Call barring feature	7.6.4.19	Network Access Mode	7.6.3.50
Call barring information	7.6.4.18	Network node number	7.6.2.43
Call Direction	7.6.5.8	Network resources	7.6.10.1
Call Forwarding Data	7.6.3.84	Network signal information	7.6.9.8
Call Info	7.6.9.9	New password	7.6.4.20
Call reference	7.6.5.1	No reply condition timer	7.6.4.7
Call Termination Indicator	7.6.3.67		
Called number	7.6.2.24	North American Equal Access preferred Carrier Id	7.6.2.34
Calling number	7.6.2.25	Number Portability Status	7.6.5.14
CAMEL Subscription Info	7.6.3.78	ODB Data	7.6.3.85
CAMEL Subscription Info Withdraw	7.6.3.38	ODB General Data	7.6.3.9
Cancellation Type	7.6.3.52	ODB HPLMN Specific Data	7.6.3.10

Category	7.6.3.1
CCBS Feature	7.6.5.8
CCBS Request State	7.6.4.49
Channel Type	7.6.5.9
Chosen Channel	7.6.5.10
Chosen Radio Resource Information	7.6.6.10B
Ciphering mode	7.6.7.7
Cksn	7.6.7.5
CLI Restriction	7.6.4.5
CM service type	7.6.9.2
Complete Data List Included	7.6.3.54
CS Allocation Retention priority	7.6.3.87
CUG feature	7.6.3.26
CUG index	7.6.3.25
CUG info	7.6.3.22
CUG interlock	7.6.3.24
CUG Outgoing Access indicator	7.6.3.8
CUG subscription	7.6.3.23
CUG Subscription Flag	7.6.3.37
Current location area Id	7.6.2.6
Current password	7.6.4.21
Deferred MT-LR Data	7.6.11.3
Deferred MT-LR Response Indicator	7.6.11.2
eMLPP Information	7.6.4.41
Encryption Information	7.6.6.9
Equipment status	7.6.3.2
Extensible Basic Service Group	7.6.3.5
Extensible Bearer service	7.6.3.3
Extensible Call barring feature	7.6.3.21
Extensible Call barring information	7.6.3.20
Extensible Call barring information for CSE	7.6.3.79
Extensible Forwarding feature	7.6.3.16
Extensible Forwarding info	7.6.3.15
Extensible Forwarding information for CSE	7.6.3.80
Extensible Forwarding Options	7.6.3.18
Extensible No reply condition timer	7.6.3.19
Extensible QoS-Subscribed	7.6.3.74
Extensible SS-Data	7.6.3.29
Extensible SS-Info	7.6.3.14
Extensible SS-Status	7.6.3.17
Extensible Teleservice	7.6.3.4
External Signal Information	7.6.9.4
Failure Cause	7.6.7.9
Forwarded-to number	7.6.2.22
Forwarded-to subaddress	7.6.2.23
Forwarding feature	7.6.4.16
Forwarding information	7.6.4.15
Forwarding Options	7.6.4.6
GGSN address	7.6.2.40
GGSN number	7.6.2.41
GMSC CAMEL Subscription Info	7.6.3.34
GPRS enhancements support indicator	7.6.3.73
GPRS Node Indicator	7.6.8.14
GPRS Subscription Data	7.6.3.46
GPRS Subscription Data Withdraw	7.6.3.45
GPRS Support Indicator	7.6.8.15
Group Id	7.6.2.33
GSM bearer capability	7.6.3.6
OMC Id	7.6.2.18
Originally dialled number	7.6.2.26
Originating entity number	7.6.2.10
Override Category	7.6.4.4
P-TMSI	7.6.2.47
PDP-Address	7.6.2.45
PDP-Context identifier	7.6.3.55
PDP-Type	7.6.2.44
Pre-paging supported	7.6.5.15
Previous location area Id	7.6.2.4
Protocol Id	7.6.9.7
Provider error	7.6.1.3
QoS-Subscribed	7.6.3.47
Radio Resource Information	7.6.6.10
Radio Resource List	7.6.6.10A
Rand	7.6.7.2
Regional Subscription Data	7.6.3.11
Regional Subscription Response	7.6.3.12
Relocation Number List	7.6.2.19A
Requested Info	7.6.3.31
Requested Subscription Info	7.6.3.86
Roaming number	7.6.2.19
Roaming Restricted In SGSN Due To Unsupported Feature	7.6.3.49
Roaming Restriction Due To Unsupported Feature	7.6.3.13
Current Security Context	7.6.7.8
Selected RAB ID	7.6.2.56
Service centre address	7.6.2.27
Serving Cell Id	7.6.2.37
SGSN address	7.6.2.39
SGSN CAMEL Subscription Info	7.6.3.75
SGSN number	7.6.2.38
SIWF Number	7.6.2.35
SoLSA Support Indicator	7.6.3.57
SM Delivery Outcome	7.6.8.6
SM-RP-DA	7.6.8.1
SM-RP-MTI	7.6.8.16
SM-RP-OA	7.6.8.2
SM-RP-PRI	7.6.8.5
SM-RP-SMEA	7.6.8.17
SM-RP-UI	7.6.8.4
Sres	7.6.7.3
SS-Code	7.6.4.1
SS-Data	7.6.4.3
SS-Event	7.6.4.42
SS-Event-Data	7.6.4.43
SS-Info	7.6.4.24
SS-Status	7.6.4.2
Stored location area Id	7.6.2.5
Subscriber State	7.6.3.30
Subscriber Status	7.6.3.7
Super-Charger Supported in HLR	7.6.3.70
Super-Charger Supported in Serving Network Entity	7.6.3.71
Supported CAMEL Phases in VLR	7.6.3.36
Supported CAMEL Phases in SGSN	7.6.3.36A
Supported GAD Shapes	7.6.11.20
Supported LCS Capability Sets	7.6.11.17
Suppress Incoming Call Barring	7.6.3.b
Suppress T-CSI	7.6.3.33
Suppress VT-CSI	7.6.3.a
Suppression of Announcement	7.6.3.32
Target cell Id	7.6.2.8
Target location area Id	7.6.2.7
Target RNC Id	7.6.2.8A

gsmSCF Initiated Call	7.6.3.c
Guidance information	7.6.4.22
Handover number	7.6.2.21
High Layer Compatibility	7.6.3.43
HLR Id	7.6.2.15
HLR number	7.6.2.13
HO-Number Not Required	7.6.6.7
IMEI	7.6.2.3
IMSI	7.6.2.1
Integrity Protection Information	7.6.6.8
Inter CUG options	7.6.3.27
Intra CUG restrictions	7.6.3.28
Target MSC number	7.6.2.12
Teleservice	7.6.4.39
TMSI	7.6.2.2
Trace reference	7.6.10.2
Trace type	7.6.10.3
User error	7.6.1.4
USSD Data Coding Scheme	7.6.4.36
USSD String	7.6.4.37
UU Data	7.6.5.12
UUS CF Interaction	7.6.5.13
VBS Data	7.6.3.40
VGCS Data	7.6.3.39
VLR CAMEL Subscription Info	7.6.3.35
VLR number	7.6.2.14
VPLMN address allowed	7.6.3.48
Zone Code	7.6.2.28

7.6.1 Common parameters

The following set of parameters is used in several MAP service-primitives.

7.6.1.1 Invoke Id

This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.

7.6.1.2 Linked Id

This parameter is used for linked services and it takes the value of the invoke Id of the service linked to.

7.6.1.3 Provider error

This parameter is used to indicate a protocol related type of error:

- duplicated invoke Id;
- not supported service;
- 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, i.e. the VLR cannot allocate a number for handover or cannot allocate the required amount of numbers for relocation;
- subsequent handover failure, i.e. handover to a third MSC failed for some reason;
- target cell outside group call area.

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 the case of barring of Mobile 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 3GPP TS 24.080 [38].

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 3GPP TS 23.140, under SMS-SUBMIT-REPORT and SMS-DELIVERY-REPORT. If the SM entity that 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 3GPP TS 23.140;
- 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:

- Unauthorised Requesting Network
- Unauthorised LCS Client with detailed reasons as follows:
  - Unauthorised Privacy Class
  - Unauthorised Call Unrelated External Client
  - Unauthorised Call Related External Client
- Privacy override not applicable
- Position method failure with detailed reasons as follows:
  - Congestion
  - Insufficient resources
  - Insufficient Measurement Data
  - Inconsistent Measurement Data
  - Location procedure not completed
  - QoS not attainable
  - Position Method Not Available in Network
  - Position Method Not Available in Location Area
  - Unknown or unreachable LCS Client.

j) Problem detected by an application using secure transport:

- Secure transport error. This error indicates that the application using secure transport returned an error. The parameter of the error indicates:
  - The protected payload, which carries the result of applying the protection function specified in 3G TS 33.200 to the encoding of the parameter of the original error.

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 parameters

7.6.2.1 IMSI

This parameter is the International Mobile Subscriber Identity defined in 3GPP TS 23.003 [17].

7.6.2.2 TMSI

This parameter is the Temporary Mobile Subscriber Identity defined in 3GPP TS 23.003 [17].

7.6.2.3 IMEI

This parameter is the International Mobile Equipment Identity defined in 3GPP TS 23.003 [17].

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.

7.6.2.8A Target RNC Id

This parameter refers to the identity of the RNC to which a call has to be relocated.

7.6.2.9 Void

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.

7.6.2.19A Relocation Number List

This parameter refers to the number(s) used for routing one call or several calls between MSCs during relocation.

7.6.2.20 Void

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. A subaddress may be appended. For subscribers having an originating CAMEL Phase 2 or higher subscription, this address need not be in E.164 international format.

7.6.2.22A Long forwarded-to number

This parameter refers to the address to which a call is to be forwarded. A subaddress may be appended. For subscribers having an originating CAMEL Phase 2 or higher subscription this address need not be in international format.

7.6.2.22B Long FTN Supported

This parameter indicates that the sending entity supports Long Forwarded-to Numbers.

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 3GPP TS 23.018 [97].

7.6.2.30a Location Information for GPRS

This parameter indicates the location of the served subscriber as defined in 3GPP TS 23.078 [98].

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 a 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 inter-exchange carrier. This identity is used at:

- outgoing calls: when the subscriber does not specify at call set-up 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 of 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 3GPP TS 23.003 [17].

7.6.2.40 GGSN address

This parameter refers to the IP-address of a GGSN. This parameter is defined in 3GPP TS 23.003 [17].

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 3GPP TS 23.060 [104].

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 3GPP TS 23.060 [104].

7.6.2.45 PDP-Address

This parameter indicates the address of the data protocol as defined in 3GPP TS 23.060 [104].

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 3GPP TS 23.003 [17].

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.

7.6.2.52 Multicall Bearer Information

This parameter refers to the number of simultaneous bearers supported per user by the serving network.

7.6.2.53 Multiple Bearer Requested

This parameter indicates whether multiple bearers are requested for a relocation.

7.6.2.54 Multiple Bearer Not Supported

This parameter indicates whether multiple bearers are supported.

7.6.2.55 PDP-Charging Characteristics

This parameter indicates the charging characteristics associated with a specific PDP context as defined in 3G TS 32.015.

7.6.2.56 Selected RAB ID

The selected radio access bearer to be kept at subsequent inter-MSC handover from UMTS to GSM.

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 3GPP TS 22.016 [7].

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 3GPP TS 22.002 [3]. 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 3GPP TS 22.003 [4]. 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 clause 7.6.3.3) or an extensible teleservice (see clause 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 3GPP TS 24.008 [35].

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 subscriber 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 subscriber 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 clause 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 clause 7.6.3.15);
- extensible call barring information (see clause 7.6.3.20);
- CUG info (see clause 7.6.3.22);
- extensible SS-Data (see clause 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 clause 7.6.4.1);
- if required, a list of extensible forwarding feature parameters (see clause 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 clause 7.6.3.5);
- extensible SS-Status (see clause 7.6.3.17);
- forwarded-to number (see clause 7.6.2.22);
- forwarded-to subaddress (see clause 7.6.2.23);
- extensible forwarding options (see clause 7.6.3.18);
- extensible no reply condition timer (see clause 7.6.4.19);
- long forwarded-to number (see clause 7.6.2.22A).

If a number is required to define the forwarded-to destination then:

- If the VLR supports Long Forwarded-to Numbers then the long forwarded-to number shall be present and the forwarded-to number shall be absent;
- If the VLR does not support Long Forwarded-to Numbers then the forwarded-to number shall be present and the long forwarded-to number shall be absent.

7.6.3.17 Extensible SS-Status

This parameter refers to the state information of individual supplementary services as defined in 3GPP TS 23.011 [22].

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 information:

- notification to forwarding party (see 3GPP TS 22.082 [10] for the meaning of this parameter);
- redirection notification to the forwarded-to party (see 3GPP TS 22.082 [10] for the meaning of this parameter);
- notification to calling party (see 3GPP TS 22.082 [10] for the meaning of this parameter);
- redirecting presentation (see 3GPP TS 22.082 [10] for the meaning of this parameter);
- forwarding reason (see 3GPP TS 22.082 [10] 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 clause 7.6.4.1);
- a list of extensible call barring feature parameters (see clause 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 clause 7.6.3.5);
- provisioned SS-Status (see clause 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 that 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 3GPP TS 22.085 [13] 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 clause 7.6.4.1);
- Extensible SS-Status (if applicable) (see clause 7.6.3.17);
- Extensible Override subscription option (if applicable) (see clause 7.6.3.30);
- Extensible CLI Restriction (if applicable) (see clause 7.6.3.31);
- Extensible Basic Service Group Code (see clause 7.6.3.5).

7.6.3.30 Subscriber State

This parameter indicates the state of the MS as defined in 3GPP TS 23.018 [97].

7.6.3.31 Requested Info

This parameter indicates the subscriber information being requested as defined in 3GPP TS 23.018 [97].

7.6.3.32 Suppression of Announcement

This parameter indicates if the announcement or tones shall be suppressed as defined in 3GPP 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 that are invoked in the MSC or VLR.

7.6.3.36 Supported CAMEL Phases in the VLR

This parameter indicates which phases of CAMEL are supported in the VLR.

7.6.3.36A 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 3GPP 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 a 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 a 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 3GPP TS 29.007 [56].

7.6.3.42 Lower layer Compatibility

This parameter refers to the lower layer compatibility information element defined in 3GPP TS 24.008 [35].

7.6.3.43 High Layer Compatibility

This parameter refers to the high layer compatibility information element defined in 3GPP TS 24.008 [35].

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 3GPP TS 23.060 [104].

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 3GPP TS 23.060 [104].

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 3GPP TS 23.108.

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 3GPP TS 23.140.

7.6.3.52 Cancellation Type

This parameter indicates the reason of location cancellation. It is defined in 3GPP TS 23.060 [104].

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, the preferential access indicator, the active mode support indicator and active mode indication 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:

- GMLC List (see clause 7.6.3.61).
- LCS Privacy Exception List (see clause 7.6.3.62).
- MO-LR List (see clause 7.6.3.65A).

7.6.3.61 GMLC List

This parameter contains the addresses of all GMLCs that are permitted to issue a non-call related or call related MT-LR location request for this MS. Usage of this parameter is defined in 3G TS 23.271.

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 clause 7.6.4.1);
- a list of LCS privacy exception parameters (see clause 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 clause 7.6.3.17);
- privacy notification to MS user (see clause 7.6.3.65B);
- external client List (see clause 7.6.3.64);
- internal client List (see clause 7.6.3.65).

7.6.3.64 External Client List

This parameter is only applicable to the non-call related privacy class and call related privacy class, and gives the identities of the external clients that are allowed to locate a target MS for a MT-LR. Each identity is an international (e.g.E.164) address. For each identified external client, GMLC restrictions may be defined. It may also be indicated if the MS shall be notified of a non-restricted MT-LR from each identified LCS client and, if so, whether notification only or notification with privacy verification shall apply. Usage of this parameter is defined in 3G TS 23.271.

7.6.3.65 Internal Client List

This parameter is only applicable to the PLMN operator privacy class and 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 3G TS 23.271.

7.6.3.65A MO-LR List

This parameter defines the classes of MO-LR for which a subscription exists for a particular MS. For each class, the following information is provided:

- SS-Code (see clause 7.6.4.1).

7.6.3.65B Privacy Notification to MS User

This parameter is applicable to the non-call related privacy class and call related privacy class. For non-call/call related privacy class it indicates whether the MS user shall be notified for a non-call/call related MT-LR from any value added LCS client when the MT-LR is restricted and be enabled to accept or override the restriction. Usage of this parameter is defined in 3G TS 23.271.

7.6.3.65C GMLC List Withdraw

This parameter indicates whether the subscriber's LCS GMLC list shall be deleted from the VLR or SGSN.

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 Super-Charger Supported In HLR

This parameter is used by the HLR to indicate support of the Super-Charger functionality and an indication of the age of the subscription data stored in the HLR.

7.6.3.71 Super-Charger Supported In Serving Network Entity

This parameter is used to indicate support of the Super-Charger functionality by the originating entity and to indicate either that subscription data is required or the date and time of the last know subscriber data modification.

7.6.3.72 Age Indicator

This parameter is used by the HLR to determine the validity of the subscription data retained by the serving network entity in a Super-Charged network.

7.6.3.73 GPRS enhancements support indicator

This parameter indicates to the HLR that the SGSN supports GPRS enhancements.

7.6.3.74 Extensible QoS-Subscribed

This parameter indicates the enhanced QoS subscribed for a certain service. It is defined in 3G TS 23.060. This parameter is an extension to QoS-Subscribed.

7.6.3.75 SGSN ~~Camel~~CAMEL Subscription Info

This parameter identifies the subscriber as having CAMEL services that are invoked in the SGSN.

7.6.3.76 MO-SMS-CSI

~~This parameter identifies the subscriber as having SMS CAMEL services as defined in 3G TS 23.078.~~ This parameter identifies the subscriber as having mobile originating SMS CAMEL services as defined in 3GPP TS 23.078. For the CAMEL phase 3 the MO-SMS-CSI is the same as the SMS-CSI.

7.6.3.xx MT-SMS-CSI

This parameter identifies the subscriber as having mobile terminating SMS CAMEL services as defined in 3GPP TS 23.078.

7.6.3.77 GPRS-CSI

This parameter identifies the subscriber as having GPRS CAMEL services as defined in 3GPP TS 23.078.

7.6.3.78 CAMEL subscription info

This parameter indicates the CSI that can be controlled by CSE.

7.6.3.79 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.

7.6.3.80 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.

7.6.3.81 Modification Request for CSI

This parameter indicates the CAMEL subscription information to be modified by CSE.

7.6.3.xx Modification Request for ODB data

This parameter indicates the operator determined barring data to be modified by CSE.

7.6.3.82 Modification Request for SS Information

This parameter indicates the call forwarding and call barring supplementary service data to be modified by CSE.

7.6.3.83 Call Barring Data

This parameter contains the extensible call barring feature list (see clause 7.6.3.21) and Notification to CSE flag.

7.6.3.84 Call Forwarding Data

This parameter contains the extensible call forwarding feature list (see clause 7.6.3.16) and Notification to CSE flag.

7.6.3.85 ODB Data

This parameter contains the ODB general data, ODB HPLMN specific data and Notification to CSE flag.

7.6.3.86 Requested Subscription Info

This parameter indicates the subscription information being requested.

7.6.3.87 CS Allocation/Retention priority

This parameter indicates the allocation/retention priority for Circuit Switched (CS). It corresponds to the allocation/retention priority that is defined in 3G TS 23.107.

7.6.3.a Suppress VT-CSI

This parameter is used to suppress the invocation of terminating CAMEL services at the VMSC.

7.6.3.b Suppress Incoming Call Barring

This parameter is used to suppress the invocation of Incoming Call Barrings.

7.6.3.c gsmSCF Initiated Call

This parameter is used to indicate that the call was initiated by the gsmSCF.

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 3G TS 22.004. For MAP Release '99 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 clause 7.6.4.44);
- Mobile Originating Location Request (MO-LR) (see clause 7.6.4.44A);
- Multicall (MC).

7.6.4.2 SS-Status

This parameter refers to the state information of individual supplementary services as defined in 3G TS 23.011.

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 clause 7.6.4.1);
- SS-Status (if applicable) (see clause 7.6.4.2);
- Override subscription option (see clause 7.6.4.4);
- CLI Restriction (see clause 7.6.4.5);
- Basic Service Group Code (see clause 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 3GPP TS 22.082 [10] for the meaning of this parameter);
- notification to calling party (see 3GPP TS 22.082 [10] for the meaning of this parameter);
- redirecting presentation (see 3GPP TS 22.082 [10] for the meaning of this parameter);
- Forwarding reason (see 3GPP TS 22.082 [10] 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 Void

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 clause 7.6.4.1);
- if required, a list of forwarding feature parameters (see clause 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 clause 7.6.4.40);
- SS-Status (see clause 7.6.4.2);
- forwarded-to number (see clause 7.6.2.22);
- forwarded-to subaddress (see clause 7.6.2.23);
- forwarding options (see clause 7.6.4.6);
- no reply condition timer (see clause 7.6.4.7);
- long forwarded-to number (see clause 7.6.2.22A).

If a number is required to define the forwarded-to destination then:

- If the VLR supports Long Forwarded-to Numbers then the long forwarded-to number shall be present and the forwarded-to number shall be absent.
- If the VLR does not support Long Forwarded-to Numbers then the forwarded-to number shall be present and the long forwarded-to number shall be absent.

7.6.4.17 Void

7.6.4.18 Call barring information

This parameter contains for each call barring service:

- SS-Code (see clause 7.6.4.1);
- a list of call barring feature parameters (see clause 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 clause 7.6.4.40);
- SS-Status (see clause 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 Void

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 clause 7.6.4.15);
- call barring information (see clause 7.6.4.18);
- CUG info (see clause 7.6.4.8);
- SS-Data (see clause 7.6.4.3).
- eMLPP information (see clause 7.6.4.41).

7.6.4.25 - 7.6.4.35 Void

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 3GPP TS 23.038 [25].

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 3GPP TS 22.090 [16].

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 3GPP TS 22.002 [3]. 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 3GPP TS 22.003 [4]. 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 clause 7.6.4.38) or a teleservice (see clause 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.

CD The 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.

7.6.4.45 Mobile Originating Location Request (MO-LR)

Distinct SS codes are assigned to the following classes of MO-LR:

- Basic Self Location;
- Autonomous Self Location;
- Transfer to Third Party.

7.6.4.46 NbrUser

This parameter indicates the maximum number of parallel bearers that may be used as defined by the user at registration of the MC SS.

7.6.4.47 MC Subscription Data

This parameter contains two parameters which are associated with the MC service. The following two parameters are included:

- NbrUser:

  indicates the maximum number of parallel bearers that may be used as defined by the user at registration of the MC SS

- NbrSB:

  indicates the maximum number of parallel bearers that may be used as defined by the user's subscription.

7.6.4.48 MC Information

This parameter contains three parameters which are associated with the MC service. The following parameters are included:

- NbrSB;
- NbrUser;
- NbrSN.

Definitions of these parameters are provided in 3G TS 23.135.

7.6.4.49 CCBS Request State

This parameter indicates the current state of the CCBS request. It can take one of seven values:

- request;
- recall;
- active;
- completed;
- suspended;
- frozen;
- deleted.

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 routeing 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 3GPP TS 23.078.

7.6.5.7A D-CSI

This parameter identifies the subscriber as having originating CAMEL dialled services as defined in 3GPP TS 23.078.

7.6.5.7B T-CSI

This parameter identifies the subscriber as having terminating CAMEL services in the GMSC, as defined in ~~TS~~ 3GPP TS 23.078.

7.6.5.7C VT-CSI

This parameter identifies the subscriber as having terminating CAMEL services in the VMSC, as defined in 3GPP 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 TS 61/62. 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 3GPP TS 48.008 [49].

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 3GPP TS 48.008 [49].

7.6.5.11 CCBS Feature

This parameter corresponds to the 'CCBS Description' parameter in 3G TS 23.093. 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 3G TS 23.093 for the use of this parameter);
- B-subscriber number (see clause 7.6.2.48);
- B-subscriber subaddress (see clause 7.6.2.49);
- Basic Service Group Code (see clause 7.6.4.40).

7.6.5.12 UU Data

This parameter includes User-To-User Data. It is defined in 3GPP TS 23.087.

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 3GPP TS 23.087.

7.6.5.14 Number Portability Status

This parameter indicates the number portability status of subscriber. See 3GPP TS 23.066 [108].

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 Void

7.6.6.7 HO-Number Not Required

This parameter indicates that no handover or relocation number allocation is necessary.

7.6.6.8 Integrity Protection Information

This parameter refers to the Integrity Protection Information element defined in 3G TS 25.413.

7.6.6.9 Encryption Information

This parameter refers to the Encryption Information element defined in 3G TS 25.413.

7.6.6.10 Radio Resource Information

This parameter refers to the Channel Type information element defined in 3GPP TS 48.008 [49].

7.6.6.10A Radio Resource List

This parameter refers to list of RAB-id's and their associated Channel Type information elements defined in 3G TS 48.008.

7.6.6.10B Chosen Radio Resource Information

This parameter refers to the Chosen Channel and Speech Version information elements defined in 3G TS 48.008.

7.6.6.11 Key Status

This parameter refers to the Key Status element defined in 3G TS 25.413.

7.6.6.12 Selected UMTS Algorithms

This parameters identifies the UMTS integrity and optionally encryption algorithms selected by MSC-B. Coding of this parameter is defined in 3G TS 25.413.

7.6.6.13 Allowed GSM Algorithms

This parameters identifies the allowed GSM algorithms in MSC-B. Coding of this parameter is defined in 3G TS 48.008.

7.6.6.14 Allowed UMTS Algorithms

This parameters identifies the allowed UMTS algorithms in MSC-B. Coding of this parameter is defined in 3G TS 25.413.

7.6.6.15 Selected GSM Algorithm

This parameter identifies the GSM algorithm selected by GSM BSC controlled by MSC-B. Coding of this parameter is defined in 3G TS 48.008.

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.

The list either contains Authentication Triplets (Rand, Sres, Kc) or Authentication Quintuplets (Rand, Xres, Ck, Ik, Autn). If the list contains Authentication Quintuplets, the order of sequence in this list is chronological, the first quintuplet in the list is the oldest one.

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 Xres

This parameter represents the response to an UMTS authentication request.

7.6.7.5A Ck

This parameter refers to a key used for UMTS ciphering purposes.

7.6.7.5B Ik

This parameter refers to the Integrity Key.

7.6.7.5C Autn

This parameter refers to the Authentication Token.

7.6.7.6 Cksn

This parameter refers to a ciphering key sequence number.

7.6.7.6A Ksi

This parameter refers to a key set identifier.

7.6.7.6B Auts

This parameter refers to the resynchronisation token.

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.

7.6.7.8 Current Security Context

This parameter represents a list of security context parameters for a given subscriber.

The list either contains GSM Security Context data (Kc, Cksn) or UMTS Security Context Data (Ck, Ik, Ksi).

7.6.7.9 Failure cause

This parameter refers to an authentication failure which has occurred. It may take values as follows:

- wrong user response;
- wrong network signature.

7.6.7.10 Re-attempt

It indicates whether the failure ocurred in a normal authentication attempt or in an authentication reattempt (there was a previous unsuccessful authentication).

7.6.7.11 Access Type

It indicates whether the authentication procedure was initiated due to a call, an emergency call, a location updating, a supplementary service procedure, a short message transfer, a GPRS attach procedure, a routing area updating, a service request, a PDP context activation or a PDP context deactivation procedure.

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 clause 7.6.2.1);
- LMSI (see clause 7.6.2.16);
- MS-ISDN (see clause 7.6.2.17);
- roaming number (see clause 7.6.2.19);
- service centre address (see clause 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 clause 7.6.2.17);
- service centre address (see clause 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 3GPP TS 23.140.

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 3GPP TS 23.140.

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 3GPP TS 23.140.

7.6.9 Access and signalling system related parameters

7.6.9.1 AN-apdu

This parameter includes one or two concatenated complete 3G TS 25.413 or 3GPP TS 48.006 [48] messages, as described in 3G TS 23.009 and 3G TS 29.010. The access network protocol ID indicates that the message or messages are according to either 3GPP TS 48.006 [48] or 3G TS 25.413. For the coding of the messages see 3G TS 25.413, 3GPP TS 48.006 [48] and 3GPP TS 48.008 [49].

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 set-up;
- Voice broadcast set-up.

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 3GPP TS 24.008 [35].

7.6.9.6 Location update type

This parameter refers to the location update type (normal, periodic or IMSI attach) contained in the 3GPP TS 24.008 [35] 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 3GPP TS 29.007 [56]:

- ISDN BC; the tag and length are defined by ETS 300 102-1.

  For the content, see 3GPP TS 29.007 [56].

- HLC; the tag and length are defined by ETS 300 102-1.

  For the content, see 3GPP TS 29.007 [56].

- LLC; the tag and length are defined by ETS 300 102-1.

  For the content, see 3GPP TS 29.007 [56].

They are contained in the Signal Information parameter according to figure 7.6/1 (irrespective of the order):

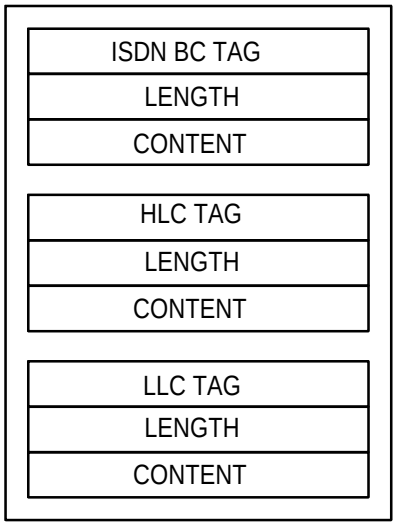


Figure 7.6/1: Network signal information parameter

7.6.9.9 Call Info

This parameter is transported as external signal information. The protocol ID shall be set to "3GPP TS 24.008 [35]".

The Call Info includes the set of information elements from the original SETUP message and is imported from 3GPP TS 24.008 [35].

7.6.9.10 Additional signal info

This parameter is transported as 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):

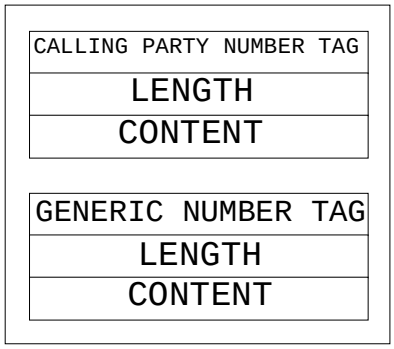


Figure 7.6/2: Additional signal information parameter

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 Deferred MT-LR Response Indicator

This parameter shows that this is a response to a deferred mt-lr request.

7.6.11.3 Deferred MT-LR Data

This parameter is used to report the deferred location event type, the location information and reason why the serving node aborted monitoring the event to the GMLC. The termination cause mt-lrRestart shall be used to trigger the GMLC

to restart the location procedure in all the cases where the sending node detects that the location procedure cannot be successfully performed anymore (as for example when. Cancel Location or Send Identification has been received, Implicit Detach has been performed, …). The location information shall be included only if the termination cause is mt-lrRestart. The network node number contained in the location information refers to the node where the MS/UE has moved to and shall be included if available, like in case Send Identification has been received.

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 Void

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 – “low delay” or “delay tolerant”.

2) Horizontal Accuracy

   Indicates the required horizontal accuracy of the location estimate.

3) Vertical Coordinate

   Indicates if a vertical coordinate is required (in addition to horizontal coordinates).

4) Vertical Accuracy

   Indicates the required vertical accuracy of the location estimate (inclusion is optional).

7.6.11.9 Void

7.6.11.10 Void

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. The estimate is expressed in terms of the geographical shapes defined by 3G TS 23.032. and is composed of the type of shape plus the encoding of the shape itself. Any type of shape defined in 3G TS 23.032 can be filled in in the Location Estimate parameter, but only the encoding of the following shapes shall be carried by Location Estimate:

- Ellipsoid point with uncertainty circle

- Ellipsoid point with uncertainty ellipse

- Ellipsoid point with altitude and uncertainty ellipsoid

- Ellipsoid arc

- Ellipsoid point

The encoding for the remaining types of shape, defined in the 3G TS 23.032, shall be filled in in the Additional Location Estimate parameter.

7.6.11.12 Location Type

This parameter indicates the type of location estimate required by the LCS client. Possible location estimate types include:

- current location;
- current or last known location;
- initial location for an emergency services call;
- deferred location event type.

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 Void

7.6.11.16 Privacy Override

This parameter indicates if MS privacy is overridden by the LCS client when the GMLC and VMSC/SGSN for an MT-LR are in the same country.

7.6.11.17 Supported LCS Capability Sets

This parameter indicates which capability sets of LCS are supported in the VLR or SGSN.

7.6.11.18 Void

7.6.11.19 Void

7.6.11.20 Supported GAD Shapes

This parameter indicates which of the shapes defined in 3G TS 23.032 are supported. If the parameter is not provided then the receiving node shall assume that the sending entity supports the following shapes:

- Ellipsoid point with uncertainty circle
- Ellipsoid point with uncertainty ellipse
- Ellipsoid point with altitude and uncertainty ellipsoid
- Ellipsoid arc
- Ellipsoid point

7.6.11.21 Additional Location Estimate

This parameter gives an estimate of the location of an MS/UE in universal coordinates and the accuracy of the estimate. This parameter allows the location estimate to be expressed in any of the geographical shapes defined in 3G TS 23.032

7.6.12 Secure Transport Parameters

7.6.12.1 Security Header

This parameter carries the security header information which is required by a receiving entity in order to extract the protected information from a securely transported MAP message. The components of the security header are shown in table 7.6.12/1.

See 3GPP TS 33.200 for the use of these parameters.

Table 7.6.12/1: Components of the Security Header

Component name	Presence requirement	Description
Initialisation vector	M	An initialisation vector for the message protection function. The TVP part of the IV is mandatory. The other parts shall be present if required for the current Protection Mode.
Sending PLMN identity	M	The Mobile Country Code and the Mobile Network Code of the PLMN which sent the secure MAP message.
Security Parameters Index	M	Identifies the Security Association for the component.
Original component identifier	M	Identifies the type of component to be securely transported – one of: - Operation, identified by the operation code; - Error, defined by the error code; - User information.

7.7 Representation of a list of a basic parameter in service-primitives

In some service-primitives several instances of a basic parameter of clause 7.6 are required. In the service descriptions such cases will be represented as

ParameterNameLIST

in the tables where ParameterName refers to one of the parameters defined in clause 7.6. This corresponds to the following construction rule:

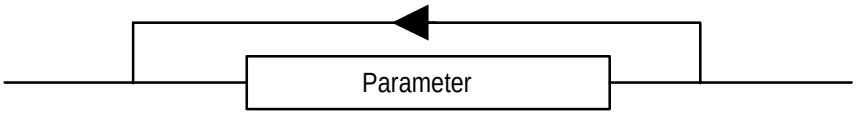


Figure 7.7/1: Construction of Lists

*** Next Modification ***

8 Mobility services

8.1 Location management services

8.1.1 Void

8.1.1.1 Void

8.1.1.2 Void

8.1.1.3 Void

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 8.1/2.

8.1.2.2 Service primitives

Table 8.1/2: MAP_UPDATE_LOCATION

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(=)		
Super-Charger Supported in Serving Network Entity	C	C(=)		
Long FTN Supported	C	C(=)		
Supported LCS Capability Sets	C	C(=)		
Inform Previous Network Entity	C	C(=)		
HLR number			C	C(=)
User error			C	C(=)
Provider error				O

8.1.2.3 Parameter definitions and use

Invoke Id

See definition in clause 7.6.1.

IMSI

See definition in clause 7.6.2.

MSC Address

See definition for MSC number in clause 7.6.2. 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 clause 7.6.2.

LMSI

See definition in clause 7.6.2. 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 clause 7.6.2. 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.

Long FTN Supported

This parameter indicates that the VLR supports Long Forwarded-to Numbers.

Super-Charger Supported in Serving Network Entity

This parameter is used by the VLR to indicate to the HLR that the VLR supports the Super-Charger functionality and whether subscription data has been retained by the VLR. If subscription data has been retained by the VLR the age indicator shall be included. Otherwise the VLR shall indicate that subscriber data is required.

If this parameter is absent then the VLR does not support the Super-Charger functionality.

Supported LCS Capability Sets

This parameter indicates, if present, the capability sets of LCS which are supported. If the parameter is sent but no capability set is marked as supported then the VLR does not support LCS at all.

If this parameter is absent then the VLR may support at most LCS capability set 1, that is LCS Release98 or Release99 version.

Inform Previous Network Entity

This parameter is used by the VLR to ask the HLR to inform the previous network entity about the update. It is used in case Super-Charger is supported in the network and the serving network entity has not been able to inform itself the previous network entity that MS has moved, that is if it has not sent Send Identification to the previous serving entity.

User error

In case of unsuccessful updating, an error cause shall be returned by the HLR. The following error causes defined in clause 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 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 clause 7.6.1.

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 clause 7.6.1.

IMSI

See definition in clause 7.6.2.

LMSI

See definition in clause 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 clause 7.6.3. 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. One of the following error causes defined in clause 7.6.1 shall be used:

- unexpected data value;
- data missing.

Provider error

For definition of provider errors see clause 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 data 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(=)		
Number of requested vectors	M	M(=)		
Segmentation prohibited indicator	C	C (=)		
IMSI			C	C(=)
Authentication set			U	C(=)
Current Security Context			U	C(=)
User error			C	C(=)
Provider error				O

8.1.4.3 Parameter definitions and use

Invoke Id

See definition in clause 7.6.1.

TMSI

See definition in clause 7.6.2.

Number of requested vectors

A number indicating how many authentication vectors the new VLR is prepared to receive. The previous VLR shall not return more vectors than indicated by this parameter.

Segmentation prohibited indicator

This parameter indicates if the new VLR or SGSN allows message segmentation.

IMSI

See definition in clause 7.6.2. The IMSI is to be returned if the service succeeds.

Authentication set

See definition in clause 7.6.7. If the service succeeds a list of up to five authentication sets is returned, if there are any available.

Current Security Context

See definition in clause 7.6.7. If the service succeeds, a list of either GSM or UMTS Security Context parameters can be returned.

User error

This parameter is mandatory if the service fails. The following error cause defined in clause 7.6.1 may be used, depending on the nature of the fault:

- unidentified subscriber.

Provider error

For definition of provider errors see clause 7.6.1.

8.1.5 Void

8.1.5.1 Void

8.1.5.2 Void

8.1.5.3 Void

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. This service shall not be used if both the VLR and HLR support the Super-Charger functionality.

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. This service shall not be used if both the SGSN and HLR support the Super-Charger functionality.

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 clause 7.6.1.

IMSI

See definition in clause 7.6.2.

VLR number

Shall be present if the sender is VLR. See definition in clause 7.6.2.

SGSN number

Shall be present if the sender is SGSN. See definition in clause 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;
- Unknown Subscriber.

Provider error

See definition of provider errors in clause 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(=)		
Super-Charger Supported in Serving Network Entity	C	C(=)		
GPRS enhancements support indicator	C	C(=)		
Supported LCS Capability Sets	C	C(=)		
Inform Previous Network Entity	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 clause 7.6.1.

IMSI

See definition in clause 7.6.2.

SGSN number

See definition in clause 7.6.2.

SGSN address

See definition in clause 7.6.2.

Supported CAMEL Phases

This parameter indicates which phases of CAMEL are supported. The SGSN can only support CAMEL phase 3 or greater.

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.

Super-Charger Supported in Serving Network Entity

This parameter is used by the SGSN to indicate to the HLR that the SGSN supports the Super-Charger functionality and whether subscription data has been retained by the SGSN. If subscription data has been retained by the SGSN the age indicator shall be included. Otherwise the SGSN shall indicate that subscriber data is required.

If this parameter is absent then the SGSN does not support the Super-Charger functionality.

GPRS enhancements support indicator

This parameter is used by the SGSN to indicate to the HLR in the Update GPRS Location indication that GPRS enhancements are supported. If this parameter is included in the Update GPRS Location indication the HLR may send the extensible QoS in the PDP contexts to the SGSN.

HLR number

See definition in clause 7.6.2. The presence of this parameter is mandatory in case of successful HLR updating.

Supported LCS Capability Sets

This parameter indicates, if present, the capability sets of LCS which are supported. If the parameter is sent but no capability set is marked as supported then the SGSN does not support LCS at all.

The SGSN is not allowed to indicate support for LCS capability set 1.

If this parameter is absent then the SGSN does not support LCS at all.

Inform Previous Network Entity

This parameter is used by the SGSN to ask the HLR to inform the previous network entity about the update. It is used in case Super-Charger is supported in the network and the serving network entity has not been able to inform itself the previous network entity that MS has moved, that is if it has not sent SGSN Context Request to the previous serving entity.

User error

In case of unsuccessful updating, an error cause shall be returned by the HLR. The following error causes defined in clause 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 clause 7.6.1.

8.1.8 MAP-NOTE-MM-EVENT

8.1.8.1 Definition

This service is used between the VLR ~~or SGSN~~ and the gsmSCF or between the SGSN and the gsmSCF when ~~for a subscriber~~ a mobility management event for a subscriber has been processed successfully, that subscriber is provisioned with M-CSI or MG-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(=)		
Location Information for GPRS	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 for a mobility management event reported by the VLR:

- 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).

It shall have one of the following values for a mobility management event reported by the SGSN:

- Routeing area update in the same SGSN service area;
- Routeing area update to another SGSN service area;
- GPRS attach;
- MS initiated GPRS detach;
- Network initiated GPRS detach;
- Network initiated transfer to the "not reachable for paging" state.

Service Key

See clause 7.6.x.

IMSI

See clause 7.6.x.

Basic MSISDN

See clause 7.6.x.

Location Information

See clause ~~7.6.x~~7.6.2.30. This information shall be sent when the event is reported by a VLR, if available.

Location Information for GPRS

See clause 7.6.2.30a. This information shall be sent when the event is reported by an SGSN, if available.

LSA Identity

See clause 7.6.x. This information shall be sent, if available.

Supported CAMEL Phases

See clause 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 clause 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 clause 7.6.1.

IMSI

See definition in clause 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 clause 7.6.2.

TMSI

See definition in clause 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 clause 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 clause 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 clause 7.6.1.

IMSI

See definition in clause 7.6.2. The IMSI is used to identify the subscriber when paging on the radio path.

Current location area Id

See definition in clause 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 clause 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 clause 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 clause 7.6.1.

CM service type

See definition in clause 7.6.9.

Access connection status

See definition in clause 7.6.9.

Current Location Area Id

See definition in clause 7.6.2. This parameter is used to update the VLR in case of previous VLR failure.

Serving cell Id

See definition in clause 7.6.2.

TMSI

See definition in clause 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 clause 7.6.7. In case of access with TMSI, the Cksn shall be present.

IMSI

See definition in clause 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 clause 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 clause 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 clause 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 clause 7.6.1.

8.4 Handover services

It should be noted that the handover services used on the B-interface have not been updated for Release 99. The B-interface is not fully operational specified. It is strongly recommended not to implement the B-interface as an external interface.

8.4.1 MAP_PREPARE_HANDOVER 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 or relocated from MSC-A to MSC-B.

The MAP_PREPARE_HANDOVER 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_HANDOVER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target Cell Id	C	C(=)		
Target RNC Id	C	C(=)		
HO-NumberNotRequired	C	C(=)		
IMSI	C	C(=)		
Integrity Protection Information	C	C(=)		
Encryption Information	C	C(=)		
Radio Resource Information	C	C(=)		
AN-APDU	C	C(=)	C	C(=)
Allowed GSM Algorithms	C	C(=)		
Allowed UMTS Algorithms	C	C(=)		
Radio Resource List	C	C(=)		
Handover Number			C	C(=)
Relocation Number List			C	C(=)
Multicall Bearer Information			C	C(=)
Multiple Bearer Requested	C	C(=)		
Multiple Bearer Not Supported			C	C(=)
Selected UMTS Algorithms			C	C(=)
Chosen Radio Resource Information			C	C(=)
User error			C	C(=)
Provider error				O

8.4.1.3 Parameter use

Invoke Id

For definition of this parameter see clause 7.6.1.

Target Cell Id

For definition of this parameter see clause 7.6.2. This parameter is only included if the service is not in an ongoing transaction. This parameter shall also be excluded if the service is a part of the Inter-MSC SRNS Relocation procedure or the inter-system handover GSM to UMTS procedure described in 3G TS 23.009.

Target RNC Id

For definition of this parameter see clause 7.6.2. This parameter shall be included if the service is a part of the Inter-MSC SRNS Relocation procedure or the inter-system handover GSM to UMTS procedure described in 3G TS 23.009.

HO-Number Not Required

For definition of this parameter see clause 7.6.6.

IMSI

For definition of this parameter see clause 7.6.2. This UMTS parameter shall be included if:

- available and
- if the access network protocol is BSSAP and
- there is an indication that the MS also supports UMTS.

Integrity Protection Information

For definition of this parameter see clause 7.6.6. This UMTS parameter shall be included if available and if the access network protocol is BSSAP.

Encryption Information

For definition of this parameter see clause 7.6.6. This UMTS parameter shall be included if available and if the access network protocol is BSSAP.

Radio Resource Information

For definition of this parameter see clause 7.6.6. This GSM parameter shall be included if the access network protocol is RANAP and there is an indication that the UE also supports GSM. If the parameter Radio Resource List is sent , the parameter Radio Resource Information shall not be sent.

AN-APDU

For definition of this parameter see clause 7.6.9.

Allowed GSM Algorithms

For definition of this parameter see clause 7.6.6. This parameters includes allowed GSM algorithms. This GSM parameter shall be included if:

- the service is a part of the Inter-MSC SRNS Relocation procedure and
- Ciphering or Security Mode Setting procedure has been performed.and
- there is an indication that the MS also supports UMTS.

Allowed UMTS Algorithms

For definition of this parameter see clause 7.6.6. This UMTS parameter shall be included if all of the following conditions apply:

- access network protocol is BSSAP and
- Integrity Protection Information and Encryption Information are not available and

Ciphering or Security Mode Setting procedure has been performed.

Radio Resource List

For definition of this parameter see clause 7.6.6. This parameter shall be included if the access network protocol is RANAP and there is an indication that the UE also supports GSM. This parameter shall be sent when MSC-A requests multiple bearers to MSC-B. If the parameter Radio Resource Information is sent , the parameter Radio Resource List shall not be sent.

Handover Number

For definition of this parameter see clause 7.6.2. This parameter shall be returned at handover, unless the parameter HO-NumberNotRequired is sent. If the parameter Handover Number is returned, the parameter Relocation Number List shall not be returned.

Relocation Number List

For definition of this parameter see clause 7.6.2. This parameter shall be returned at relocation, unless the parameter HO-NumberNotRequired is sent. If the parameter Relocation Number List is returned, the parameter Handover Number shall not be returned.

Multicall Bearer Information

For a definition of this parameter see clause 7.6.2. This parameter shall be returned at relocation in the case that MSC-B supports multiple bearers.

Multiple Bearer Requested

For a definition of this parameter see clause 7.6.2. This parameter shall be sent when MSC-A requests multiple bearers to MSC-B.

Multiple Bearer Not Supported

For a definition of this parameter see clause 7.6.2. This parameter shall be returned at relocation when MSC-B receives Multiple Bearer Requested parameter and MSC-B does not support multiple bearers.

Selected UMTS Algorithms

For definition of this parameter see clause 7.6.6. This parameters includes the UMTS integrity and optionally encryption algorithms selected by RNC under the control of MSC-B. This UMTS parameter shall be included if the service is a part of the inter MSC inter system handover from GSM to UMTS.

Chosen Radio Resource Information

For definition of this parameter see clause 7.6.6. This parameter shall be returned at relocation if the encapsulated PDU is RANAP RAB Assignment Response and MS is in GSM access.

User error

For definition of this parameter see clause 7.6.1. The following errors defined in clause 7.6.1 may be used, depending on the nature of the fault:

- No handover number available.
- Target cell outside group call area;
- System failure.
- Unexpected data value.
- Data Missing.

Provider error

See definition of provider errors in clause 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 or relocated 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(=)
AN-APDU	M	M(=)		
Provider error				O

8.4.2.3 Parameter use

Invoke Id

For definition of this parameter see clause 7.6.1.

AN-APDU

For definition of this parameter see clause 7.6.9.

Provider error

For definition of this parameter see clause 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 or Iu-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(=)
AN-APDU	M	M(=)
Selected GSM Algorithm	C	C(=)
Selected UMTS Algorithms	C	C(=)
Chosen Radio Resource Information	C	C(=)
Selected RAB id	C	C(=)

8.4.3.3 Parameter use

Invoke Id

For definition of this parameter see clause 7.6.1.

AN-APDU

For definition of this parameter see clause 7.6.9.

Selected GSM algorithm

For definition of this parameter see clause 7.6.6. This parameter shall be present if the encapsulated PDU is Security Mode Complete and MS is in GSM access.

Selected UMTS Algorithms

For definition of this parameter see clause 7.6.6. This parameters includes the UMTS integrity and optionally encryption algorithms selected by RNC under the control of MSC-B. This UMTS parameter shall be included if the

encapsulated PDU is BSSMAP Cipher Mode Complete and the MS is in UMTS, or an interystem handover to UMTS is performed in MSC-B, or in the case of intra MSC-B intra UMTS relocation.

Chosen Radio Resource Information

For definition of this parameter see clause 7.6.6. This parameter shall be sent if the encapsulated PDU is RANAP RAB Assignment Response and MS is in GSM access.

Selected RAB ID

The selected radio access bearer that was kept at subsequent intra-MSC handover from UMTS to GSM after multiple bearers were used.

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 or Iu-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(=)
Integrity Protection Information	C	C(=)
Encryption Information	C	C(=)
Key Status	C	C(=)
AN-APDU	M	M(=)
Allowed GSM Algorithms	C	C(=)
Allowed UMTS Algorithms	C	C(=)
Radio Resource Information	C	C(=)

8.4.4.3 Parameter use

For the definition and use of all parameters and errors, see clause 7.6.1.

Invoke Id

For definition of this parameter see clause 7.6.1.

Integrity Protection Information

For definition of this parameter see clause 7.6.6. This UMTS parameter shall be included if available and if the encapsulated PDU is BSSMAP Cipher Mode Command.

Encryption Information

For definition of this parameter see clause 7.6.6. This UMTS parameter shall be included if available and if the encapsulated PDU is BSSMAP Cipher Mode Command.

Key Status

For definition of this parameter see clause 7.6.6. This UMTS parameter shall be included if available and if the encapsulated PDU is BSSMAP Cipher Mode Command.

AN-APDU

For definition of this parameter see clause 7.6.9.

Allowed GSM Algorithms

This parameters includes allowed GSM algorithms. This GSM parameter shall be included if the encapsulated PDU is RANAP Security Mode Command and there is an indication that the UE also supports GSM.

Allowed UMTS Algorithms

For definition of this parameter see clause 7.6.6. This UMTS parameter shall be included if Integrity Protection Information and Encryption Information are not available and the encapsulated PDU is BSSMAP Cipher Mode Command.

Radio Resource Information

For definition of this parameter see clause 7.6.6. This parameter shall be sent if the encapsulated PDU is RANAP RAB Assignment Request.

8.4.5 MAP_PREPARE_SUBSEQUENT_HANDOVER 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 or relocation to either MSC-A or a third MSC (MSC-B') is required.

The MAP_PREPARE_SUBSEQUENT_HANDOVER 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_HANDOVER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target Cell Id	C	C(=)		
Target RNC Id	C	C(=)		
Target MSC Number	M	M(=)		
Selected RAB ID	C	C(=)		
AN-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 clause 7.6.1.

Target Cell Id

For definition of this parameter see clause 7.6.2. This parameter shall be excluded if the service is a part of the Inter-MSC SRNS Relocation procedure or the inter-system handover GSM to UMTS procedure described in 3G TS 23.009.

Target RNC Id

For definition of this parameter see clause 7.6.2. This parameter shall be included if the service is a part of the Inter-MSC SRNS Relocation procedure or the inter-system handover GSM to UMTS procedure described in 3G TS 23.009.

Target MSC Number

For definition of this parameter see clause 7.6.2.

Selected RAB ID

For definition of this parameter see clause 7.6.2.

AN-APDU

For definition of this parameter see clause 7.6.9.

User error

For definition of this parameter see clause 7.6.1. The following error causes defined in clause 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 clause 7.6.1.

8.4.6 MAP_ALLOCATE_HANDOVER_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_HANDOVER_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_HANDOVER_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 clause 7.6.1.

User error

For definition of this parameter see clause 7.6.1. The following errors defined in clause 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 clause 7.6.1.

8.4.7 MAP_SEND_HANDOVER_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_HANDOVER_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_HANDOVER_REPORT

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Handover Number	M	M(=)		
Linked Id	M	M(=)		
Provider error				O

8.4.7.3 Parameter use

Invoke Id

For definition of this parameter see clause 7.6.1.

Handover Number

For definition of this parameter see clause 7.6.2.

Linked Id

For definition of this parameter see clause 7.6.1. This service is linked with MAP_ALLOCATE_HANDOVER_NUMBER.

Provider error

For definition of this parameter see clause 7.6.1.

8.5 Authentication management services

8.5.1 MAP_AUTHENTICATE service

The MAP_AUTHENTICATE service is used on the MAP B interface. This interface is not fully operational specified. It is strongly recommended not to implement the B-interface as an external interface.

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 clause 7.6.1 for the use of this parameter.

RAND

See clause 7.6.7 for the use of this parameter.

CKSN

See clause 7.6.7 for the use of this parameter.

SRES

See clause 7.6.7 for the use of this parameter.

Provider error

See clause 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 up to five authentication 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 up to five authentication vectors.

If the user is a UMTS subscriber, the HLR shall return authentication quintuplets. If the user is a GSM subscriber, the HLR shall return authentication triplets.

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 3GPP TS 43.020 [24].

If the HLR cannot provide the VLR or the SGSN with quintuplets, an empty response is returned. The VLR or the SGSN shall not re-use old authentication quintuplets.

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 3GPP TS 43.020 [24] and 3G TS 33.200.

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_INFO parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
Number of requested vectors	C	C(=)		
Requesting node type	C	C(=)		
Re-synchronisation Info	C	C(=)		

Segmentation prohibited indicator	C	C (=)		
Immediate response preferred indicator	U	C (=)		
AuthenticationSetList			C	C(=)
User error			C	C(=)
Provider error				O

8.5.2.3 Parameter use

Invoke id

See clause 7.6.1 for the use of this parameter.

IMSI

See clause 7.6.2 for the use of this parameter.

If segmentation is used this parameter shall not be present in subsequent segments.

Number of requested vectors

A number indicating how many authentication vectors the VLR or SGSN is prepared to receive. The HLR shall not return more vectors than indicated by this parameter.

If segmentation is used this parameter shall not be present in subsequent segments.

Requesting node type

The type of the requesting node (SGSN or VLR).

This parameter shall be present in the first (or only) request of the dialogue. If segmentation is used this parameter shall not be present in subsequent segments.

Re-synchronisation Info

For definition and use of this parameter see 3G TS 33.200.

If segmentation is used this parameter shall not be present in subsequent segments.

Segmentation prohibited indicator

This parameter indicates if the VLR or SGSN allows message segmentation.

If segmentation is used this parameter shall not be present in subsequent segments.

Immediate response preferred indicator

This parameter indicates that one of the requested authentication vectors is requested for immediate use in the VLR or SGSN. It may be used by the HLR together with the number of requested vectors and the number of vectors stored in the HLR to determine the number of vectors to be obtained from the AuC. It shall be ignored if the number of available vectors is greater than the number of requested vectors.

If segmentation is used this parameter shall not be present in subsequent segments.

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 clause 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 clause 7.6.1 for the use of this parameter.

8.5.3 MAP_AUTHENTICATION_FAILURE_REPORT service

8.5.3.1 Definition

This service is used between the VLR and the HLR or between the SGSN or HLR for reporting of authentication failures.

8.5.3.2 Service primitives

The service primitives are shown in table 8.5/3.

Table 8.5/3: MAP_AUTHENTICATION_FAILURE_REPORT parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Failure cause	M	M(=)		
Re-attempt	M	M(=)		
Access Type	M	M(=)		
Rand	M	M(=)		
VLR number	C	C(=)		
SGSN number	C	C(=)		
User error			C	C(=)
Provider error				O

8.5.3.3 Parameter use

Invoke id

See clause 7.6.1 for the use of this parameter.

IMSI

See clause 7.6.2 for the use of this parameter.

Failure Cause

See clause 7.6.7 for use of this parameter.

Re-attempt

See clause 7.6.7 for use of this parameter.

Access Type

See clause 7.6.7 for use of this parameter.

Rand

This parameter identifies the specific AV that failed authentication.

See clause 7.6.7 for use of this parameter.

VLR number

Shall be present if the sender is VLR. See definition in clause 7.6.2.

SGSN number

Shall be present if the sender is SGSN. See definition in clause 7.6.2.

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 clause 7.6.1:

- Unknown Subscriber;
- System Failure;
- Unexpected Data Value.

Provider error

These are defined in clause 7.6.

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 clause 7.6.1 for the use of this parameter.

Ciphering mode

See clause 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 clause 7.6.1 for the use of this parameter.

IMEI

See clause 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 clause 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 clause 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 clause 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 clause 7.6.1 for the use of this parameter.

IMEI

See clause 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 clause 7.6.1) to the MSC.

Provider error

See clause 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. If the Super-Charger

functionality is supported the HLR may not need to provide the VLR with subscriber parameters at location updating of a subscriber. See TS 23.116.

Also this service is used by an HLR to update an 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 subscriber has changed data concerning one or more supplementary services by using a subscriber procedure;
- the HLR provides the SGSN with subscriber parameters at GPRS location updating of a subscriber. If the Super-Charger functionality is supported the HLR may not need to provide the SGSN with subscriber parameters. See 3G TS 23.116.

It is a confirmed service and consists of the primitives shown in table 8.8/1.

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(=)		
MC-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~~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(=)		
CS Allocation/Retention priority	C	C(=)		
Super-Charger Supported In HLR	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

All parameters are described in clause 7.6. The following clarifications are applicable:

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. This parameter shall always be sent to the SGSN as part of the GPRS subscriber data at GPRS location updating. It shall be sent to the SGSN if it is changed as a result of administrative action.

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 clause 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 clause 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 clause 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 clause 7.6).

The Extensible Forwarding Feature may include an Extensible Basic Service Group. This shall be interpreted according to the rules in clause 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 number to define the forwarded-to destination 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 clause 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 clause 7.6).

The Extensible Call Barring Feature may include an Extensible Basic Service Group. This shall be interpreted according to the rules in clause 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 clause 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 clause 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 clause 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 by the SGSN only for LCS. If the SGSN receives an Indication containing any supplementary service codes (either LCS related or not) which it does not support/allocate then it discards them.

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 clause 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.

MC Subscription Data

If included in the Insert Subscriber Data request, this parameter provides the MC Subscription Data as defined in clause 7.6.

If the VLR does not support the MC 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).

MC subscription data that have been stored previously in a subscriber data record in the VLR are completely replaced by the new MC 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 clause 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 clause 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-data 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 clause 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, the preferential access indicator, the active mode support indicator and active mode indication of each localised service area; see clause 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. This parameter is used only by the VLR and shall be ignored if received by an SGSN.

LCS Information

This parameter provides the following LCS related information for an MS subscriber:

- list of GMLCs in the HPLMN;
- privacy exception list;
- MO-LR list.

At restoration and location updating, the HLR shall include the complete LCS data of the subscriber.

When there is a change in LCS subscriber data the HLR shall include at least the new and/or modified LCS data. LCS data that is not modified need not be included.

The VLR/SGSN shall keep any previously stored LCS Information that is not included in an Insert Subscriber Data operation.

If the VLR/SGSN detects that there is overlapping in the LCS information received within a dialogue, it shall send the error Unexpected Data Value.

Super-Charger Supported In HLR

This parameter is used by the HLR to indicate support for the Super-Charger functionality. If this parameter is present it shall include an indication of the age of the subscription data stored in the HLR.

If this parameter is absent then the HLR does not support the Super-Charger functionality.

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 clause 7.6). The list can only include individual SS-Codes that were sent in the service request. This parameter is used by only 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 O-CSI, SS-CSI and TIF-CSI. In CAMEL Phase 2 and onwards, TDP-Criteria for O-CSI may be associated with O-CSI.
- In CAMEL Phase 3, this parameter may contain O-CSI, D-CSI, SS-CSI, VT-CSI, MO-SMS-CSI, M-CSI and TIF-CSI. ~~In CAMEL Phase 2 TDP-Criteria for O-CSI may be associated with O-CSI.~~ In CAMEL Phase 3 and onwards, ~~additionally,~~ TDP-Criteria for VT-CSI may be associated with VT-CSI.~~.~~
- In CAMEL Phase 4, this parameter may contain O-CSI, D-CSI, SS-CSI, VT-CSI, MO-SMS-CSI, MT-SMS-CSI, M-CSI and TIF-CSI. In CAMEL Phase 4, TDP-Criteria for MT-SMS-CSI may be associated with MT-SMS-CSI.

~~-~~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.

At location updating, the complete set of VLR CAMEL Subscription Info is sent in one dialogue.

When CAMEL Subscription Information is changed in the HLR and changed data have to be sent to the VLR, then:

- for CAMEL Phase 1 and CAMEL Phase 2, the complete set of VLR CAMEL Subscription Info is sent in one dialogue;
- for CAMEL Phase 3 or higher, one or more specific elements of VLR CAMEL Subscription Info are sent in one dialogue.

When the VLR receives a specific element of VLR CAMEL Subscription Info, it shall overwrite the corresponding specific element of VLR CAMEL Subscription Info (if any) which it has stored for that subscriber.

The specific elements of VLR CAMEL Subscription Info which may be sent are:

- VLR CAMEL Subscription Info which is applicable for CAMEL Phase 1 and CAMEL Phase 2, which consists of any one or more of:
  - O-CSI;
  - TDP-Criteria for O-CSI;
  - SS-CSI;
  - TIF-CSI.
- D-CSI;
- VT-CSI;
- TDP-Criteria for VT-CSI;
- MO-SMS-CSI;
- MT-SMS-CSI;
- TDP-Criteria for MT-SMS-CSI;
- M-CSI.

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~~higher. 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 3GPP 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 clause 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 one or both of GPRS-CSI and MO-SMS-CSI.
- In CAMEL Phase 4, this parameter may contain GPRS-CSI, MO-SMS-CSI and MT-SMS-CSI and TDP-Criteria for MT-SMS-CSI.

At GPRS location updating the complete set of SGSN CAMEL Subscription Info is sent.

When CAMEL Subscription Information is changed in the HLR and changed data have to be sent to the SGSN, then one or more specific elements of SGSN CAMEL Subscription Info are sent in one dialogue.

When the SGSN receives a specific element of SGSN CAMEL Subscription Info, it shall overwrite the corresponding specific element of SGSN CAMEL Subscription Info (if any) which it has stored for that subscriber.

The specific elements of SGSN CAMEL Subscription Info which may be sent are:

- MO-SMS-CSI;
- MT-SMS-CSI;
- TDP-Criteria for MT-SMS-CSI;
- GPRS-CSI;
- MC-CSI.

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.

CS Allocation/Retention priority

The CS Allocation/Retention priority is used only for Circuit Switched (CS). This parameter specifies relative importance to compare with other bearers about allocation and retention of bearer. This parameter is used only by the VLR and if the SGSN 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 clause explains how this information is to be interpreted. Supplementary service parameters to which this clause is applicable only apply to the basic service groups described in this clause, 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(=)		
Specific CSI 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(=)
GMLC List Withdraw	C	C(=)		
User error			C	C(=)
Provider error				O

8.8.2.3 Parameter use

All parameters are described in clause 7.6. The following clarifications are applicable:

Basic service List

A list of Extensible Basic service parameters (Extensible Basic service is defined in clause 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 clause 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 by the VLR and SGSN for LCS. Otherwise, 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. This parameter should not be sent in the same message as the Specific CSI Withdraw parameter.

Specific CSI Withdraw

This parameter is used to indicate that one or more specific elements of CAMEL Subscription Info shall be deleted from the VLR or from the SGSN.

The specific elements of CAMEL Subscription Info which may be withdrawn are:

- O-CSI with TDP criteria for O-CSI;
- SS-CSI;
- TIF-CSI;
- D-CSI;
- VT-CSI with TDP criteria for VT-CSI;

- MO-SMS-CSI;
- MT-SMS-CSI with TDP-Criteria for MT-SMS-CSI;
- M-CSI;
- MG-CSI;
- GPRS-CSI.

This parameter is used by the VLR and by the SGSN. It shall not be sent to VLRs that do not support CAMEL phase 3 or higher. This parameter should not be sent in the same message as the CAMEL Subscription Info Withdraw parameter.

Regional Subscription Identifier

Contains one single Zone Code (as defined in clause 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 Ids 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 contexts 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 3GPP TS 43.035 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.

GMLC List Withdraw

This parameter indicates that the subscriber's LCS GMLC List shall be deleted from the VLR or 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 clause 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(=)		
Provider error				O

8.9.2.3 Parameter use

The parameter TMSI is described in clause 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 clause 7.6.1.

HLR number

See definition in clause 7.6.2.

HLR Id LIST

The HLR Id List is a list of HLR Ids. 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 clause 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 8.10/3.

8.10.3.2 Service primitives

Table 8.10/3: MAP_RESTORE_DATA

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

8.10.3.3 Parameter definitions and use

Invoke Id

See definition in clause 7.6.1.

IMSI

See definition in clause 7.6.2.

LMSI

See definition in clause 7.6.2. 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 clause 7.6.2. The presence of this parameter is mandatory in case of successful outcome of the service.

MS Not Reachable Flag

See definition in clause 7.6.8. 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 clause 7.6.1 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 clause 7.6.1.

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.

The MAP-ANY-TIME-INTERROGATION service is a confirmed service using the service primitives defined in table 8.11/1.

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(=)
Location Information for GPRS			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 clause 7.6. The use of these parameters and the requirements for their presence are specified in 3GPP TS 23.018 [97] and 3GPP TS 23.078 [98].

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 3GPP 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 clause 7.6.1.

8.11.2 MAP-PROVIDE-SUBSCRIBER-~~Info~~INFO service

8.11.2.1 Definition

This service is used to request information (e.g. subscriber state and location) from the VLR or SGSN at any time.

The MAP-PROVIDE-SUBSCRIBER-~~Info~~INFO service is a confirmed service using the primitives defined in table 8.11/2.

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(=)
Location Information for GPRS			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 clause 7.6. The use of these parameters and the requirements for their presence are specified in 3GPP TS 23.018 [97] and 3GPP TS 23.078 [98].

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 clause 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(=)		
Long FTN Supported	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 clause 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 3GPP 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 clause 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 ODB data	C	C(=)		
Modification request for SS information	C	C(=)		
Modification request for CSI	C	C(=)		
Long FTN Supported	C	C(=)		
Ext Forwarding information-for-CSE			C	C(=)
Ext Call barring information-for-CSE			C	C(=)
ODB Info			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 clause 7.6.

The HLR may be able to use the value of the parameter gsmSCF-address to screen a MAP_Any_Time_Modification indication.

The use of these parameters and the requirements for their presence are specified in 3GPP 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 clause 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(=)		
Ext Forwarding information-for-CSE	C	C(=)		
Ext Call barring information-for-CSE	C	C(=)		
ODB data	C	C(=)		

Parameter name	Request	Indication	Response	Confirm
CAMEL subscription info	C	C(=)		
All Information Sent	C	C(=)		
User error			C	C(=)
Provider error				O

8.11.5.3 Parameter definition and use

Invoke id

See clause 7.6.1 for the use of this parameter.

IMSI

See clause 7.6.2 for the use of this parameter.

MSISDN

See clause 7.6.2 for the use of this parameter.

Ext Forwarding information-for-CSE

See clause 7.6.2 for the use of this parameter. The use of this parameter and the requirements for their presence are specified in 3GPP TS 23.078.

Ext Call barring information-for-CSE

See clause 7.6.2 for the use of this parameter. The use of this parameter and the requirements for their presence are specified in 3GPP TS 23.078.

ODB data

See clause 7.6.2 for the use of this parameter. The use of this parameter and the requirements for their presence are specified in 3GPP TS 23.078.

CAMEL subscription info

See clause 7.6.2 for the use of this parameter. The use of this parameter and the requirements for their presence are specified in 3GPP TS 23.078.

All Information Sent

This parameter is set when the HLR has sent all information to gsmSCF.

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

These are defined in clause 7.6.1.

The use of the parameters and the requirements for their presence are specified in 3GPP TS 23.078.

*** Next Modification ***

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 and between the gsmSCF and the HLR.

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 or gsmSCF 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(=)	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(=)		
Long FTN Supported	C	C(=)		
Suppress VT-CSI	C	C(=)		
Suppress Incoming Call Barring	C	C(=)		
gsmSCF Initiated Call	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 Carrier Id			U	C(=)
User error			C	C(=)
SS-List			U	C(=)

Parameter name	Request	Indication	Response	Confirm
CCBS Target			C	C(=)
Keep CCBS Call Indicator			C	C(=)
IST Alert Timer			C	C(=)
Number Portability Status			U	C(=)
Supported CAMEL Phases			C	
Provider error				O

10.1.3 Parameter use

See clause 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 3GPP TS 23.078 shall be absent if the sending entity does not support CAMEL;
- a conditional parameter whose use is defined only in 3GPP TS 23.079 [99] shall be absent if the sending entity does not support optimal routeing;
- a conditional parameter whose use is defined only in 3GPP TS 23.078 & 3GPP TS 23.079 [99] shall be absent if the sending entity supports neither CAMEL nor optimal routeing.

Interrogation Type

See 3GPP TS 23.079 [99] for the use of this parameter.

GMSC or gsmSCF address

The E.164 address of the GMSC, or the gsmSCF. This parameter contains the a gsmSCF address if the gsmSCF iniated call parameter is present, otherwise it is the GMSC address.

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 3GPP TS 23.066 [108] for the use of this parameter and the conditions for its presence in the response.

OR Interrogation

See 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

OR Capability

See 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

CUG Interlock

See 3GPP TS 23.018 [97] for the use of this parameter and the conditions for its presence.

CUG Outgoing Access

See 3GPP TS 23.018 [97] for the use of this parameter and the conditions for its presence.

Number of Forwarding

See 3GPP TS 23.018 [97] for the use of this parameter and the conditions for its presence.

Network Signal Info

See 3GPP TS 23.018 [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 3GPP TS 23.078.

T-CSI Suppression

The use of this parameter and the requirements for its presence are specified in 3GPP TS 23.078.

Suppression Of Announcement

The use of this parameter and the requirements for its presence are specified in 3GPP TS 23.078.

Call Reference Number

The use of this parameter and the conditions for its presence are specified in 3GPP TS 23.078 [98] and 3GPP TS 23.079 [99].

Forwarding Reason

See 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

Basic Service Group

See 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

Alerting Pattern

See 3GPP TS 23.018 [97] for the use of this parameter and the conditions for its presence.

CCBS Call

See 3G TS 23.093 [107] for the use of this parameter and the conditions for its presence.

Supported CCBS Phase

This parameter indicates by its presence that CCBS is supported and the phase of CCBS which is supported.

Additional Signal Info

See 3G TS 23.081 [27] for the conditions for the presence of the components of this parameter.

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 TS 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 3GPP TS 23.018 [97] and 3GPP TS 23.066 [108] for the use of this parameter and the conditions for its presence.

MSRN

See 3GPP TS 23.018 [97], 3GPP TS 23.066 [108] and 3GPP TS 23.079 [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 a number to define the forwarded-to destination, the forwarding reason and the forwarding options Notification to calling party and Redirecting presentation, and can include the forwarded-to subaddress. See 3GPP TS 23.018 [97] and 3GPP TS 23.079 [99] for the conditions for the presence of its components.

Forwarding Interrogation Required

See 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

Long FTN Supported

This parameter indicates that the GMSC supports Long Forwarded-to Numbers.

Suppress VT-CSI

The use of this parameter and the requirements for its presence are specified in 3GPP TS 23.078.

Suppress Incoming Call Barring

The use of this parameter and the requirements for its presence are specified in 3GPP TS 23.078.

gsmSCF Initiated Call

The use of this parameter and the requirements for its presence are specified in 3GPP TS 23.078.

VMSC address

See 3GPP TS 23.079 [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 3GPP TS 23.078.

Location Information

The use of this parameter and the requirements for its presence are specified in 3GPP TS 23.078.

Subscriber State

The use of this parameter and the requirements for its presence are specified in 3GPP TS 23.078.

CUG Subscription Flag

The use of this parameter and the requirements for its presence are specified in 3GPP TS 23.078.

North American Equal Access preferred Carrier Id

This parameter is returned to indicate the preferred carrier identity to be used to set-up 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 3GPP 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 3GPP TS 23.093 [107] for the use of this parameter and the conditions for its presence.

Keep CCBS Call Indicator

See 3GPP TS 23.093 [107] 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 SRIack 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;

  The diagnostic for the Unknown Subscriber error may indicate “NPDB Mismatch”.

- 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 3GPP TS 22.041 [8] 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 clause 7.6 for a definition of these errors.

Provider error

These are defined in clause 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(=)		
Long FTN Supported	C	C(=)		
Suppress VT-CSI	C	C(=)		
Roaming Number			C	C(=)
User error			C	C(=)
Provider error				O

10.2.3 Parameter use

See clause 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 3GPP TS 23.078 [98] shall be absent if the sending entity does not support CAMEL;
- a conditional parameter whose use is defined only in 3GPP TS 23.079 [99] shall be absent if the sending entity does not support optimal routeing;
- a conditional parameter whose use is defined only in 3GPP TS 23.078 [98] & 3GPP TS 23.079 [99] shall be absent if the sending entity supports neither CAMEL nor optimal routeing.

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 3GPP TS 23.018 [97] for the use of this parameter and the conditions for its presence.

LMSI

See 3GPP TS 23.018 [97] for the use of this parameter and the conditions for its presence.

GSM Bearer Capability

See 3GPP TS 23.018 [97] for the use of this parameter and the conditions for its presence.

This information is passed according to the rules specified in TS 3GPP TS 29.007 [56].

There may be two GSM Bearer Capabilities supplied.

Network Signal Info

See 3GPP TS 23.018 [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 3GPP TS 23.078 [98].

Call Reference Number

The use of this parameter and the conditions for its presence are specified in 3GPP TS 23.078 [98] and 3GPP TS 23.079 [99].

GMSC Address

The use of this parameter and the conditions for its presence are specified in 3GPP TS 23.078 [98] and 3GPP TS 23.079 [99].

OR Interrogation

See 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

OR Not Supported in GMSC

See 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

Supported CAMEL Phases in GMSC

See 3GPP TS 23.078 [98] for the use of this parameter and the conditions for its presence.

Alerting Pattern

See 3GPP TS 23.078 [98] for the use of this parameter and the conditions for its presence.

CCBS Call

See 3G TS 23.093 [107] for the use of this parameter and the conditions for its presence.

Additional Signal Info

See 3GPP TS 23.081 [27] for the conditions for the presence of the components of this parameter.

Pre-paging supported

See 3G TS 23.018 for the use of this parameter and the conditions for its presence.

Long FTN supported

See 3G TS 23.082 for the use of this parameter and the conditions for its presence.

Suppress VT-CSI

See 3GPP TS 23.078 for the use of this parameter and the conditions for its presence.

Roaming Number

See 3GPP TS 23.018 [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 routeing.

- Facility Not Supported;

- System Failure;

- Data Missing;

- Unexpected Data Value.

See clause 7.6 for a definition of these reasons.

Provider error

These are defined in clause 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 clause 7.6 for a definition of the parameters used, in addition to the following.

Call Reference Number

See 3GPP TS 23.079 [99] for the use of this parameter. This parameter shall be present in a first segment of the dialogue.

Basic Service Group

See 3GPP TS 23.079 [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 a number to define the forwarded-to destination, the forwarding reason and the forwarding options Notification to calling party and Redirecting presentation, and can include the forwarded-to subaddress. See 3GPP TS 23.079 [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 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

CUG Outgoing Access

See 3GPP TS 23.079 [99] for the use of this parameter and the conditions for its presence.

O-CSI

See 3GPP TS 23.079 [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.

D-CSI

The Dialled Services-CSI.

See 3GPP TS 23.078 for the use of this parameter and the conditions for its presence.

CCBS Target

See 3GPP TS 23.093 [107] for the use of this parameter and the conditions for its presence.

UU Data

See 3GPP TS 23.087 for the use of this parameter and the conditions for its presence.

UUS CF Interaction

See 3GPP TS 23.087 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 clause 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 set-up.

The MAP_PREPARE_GROUP_CALL service is a confirmed service using the service primitives given in table 10.4/1.

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 clause 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 clause 7.6.1 The following errors defined in clause 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 clause 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 10.5/1.

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 clause 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 10.6/1.

10.6.2 Service primitives

Table 10.6/1: MAP_FORWARD_GROUP_CALL_SIGNALLING service

Parameter name	Request	Indication
Invoke Id	M	M(=)
IMSI	C	C(=)
Uplink Request	C	C(=)

Acknowledgement		
Uplink Release Indication	C	C(=)
Uplink Reject Command	C	C(=)
Uplink Seized Command	C	C(=)
Uplink Release Command	C	C(=)
State Attributes	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 clause 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.

State Attributes

This information element is used to allow service logic running in an Anchor MSC to mute a VGCS talker even when the talker is served on a Relay MSC. The IE is used to build a GCC message that provides a mechanism to induce the VGCS talker terminal to mute/unmute the downlink at the Anchor MSC, as defined in 3GPP TS 44.068.

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 the Relay MSC that all resources for the call can be released in the 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 10.7/1.

10.7.2 Service primitives

Table 10.7/1: 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 clause 7.6.1

Provider Error

See definition of provider error in clause 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 10.8/1.

10.8.2 Service primitive

Table 10.8/1: 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 clause 7.6 for a definition of the parameters 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 3GPP TS 29.007 [56]. 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 3GPP TS 48.008 [49].

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 3GPP TS 29.007 [56]. This parameter is defined in 3GPP TS 24.008 [35].

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 3GPP TS 29.007 [56]. This parameter is defined in 3GPP TS 24.008 [35].

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 clause 7.6 for a definition of these reasons.

Provider error

These are defined in clause 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 10.9/1.

10.9.2 Service primitive

Table 10.9/1: 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 clause 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 3GPP TS 48.008 [49].

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 3GPP TS 48.008 [49].

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 clause 7.6 for a definition of these reasons.

Provider error

These are defined in clause 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

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 clause 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 3GPP TS 23.093 [107]; if it indicates that monitoring shall be stopped this service corresponds to the message 'Stop Reporting' in 3GPP TS 23.093 [107].

CCBS Subscriber Status

See 3GPP TS 23.093 [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 clause 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 clause 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

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 clause 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 3GPP TS 23.093 [107]. See 3GPP TS 23.093 [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 3GPP TS 23.093 [107]. See 3GPP TS 23.093 [107] for the use of this parameter and the conditions for its presence.

Call Outcome

See 3GPP TS 23.093 [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 clause 7.6.1:

- Unknown Subscriber;
- System Failure;
- Unexpected Data Value;
- Data Missing.

Provider error

These are defined in clause 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

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 clause 7.6 for a definition of the parameters used, in addition to the following.

Call Info

See 3GPP TS 23.093 [107] for the use of this parameter.

CCBS Feature

See 3GPP TS 23.093 [107] for the conditions for the presence of the parameters included in the CCBS feature.

Translated B Number

See 3GPP TS 23.093 [107] for the use of this parameter.

Replace B Number

See 3GPP TS 23.093 [107] for the use of this parameter and the conditions for its presence.

Alerting Pattern

See 3GPP TS 23.093 [107] for the use of this parameter and the conditions for its presence.

RUF Outcome

See 3GPP TS 23.093 [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 clause 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 3GPP TS 24.008 [35];
- Absent Subscriber (IMSI Detach; Restricted Area; No Page Response);
- System Failure;
- Busy Subscriber (CCBS Busy).

Provider error

These are defined in clause 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

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 clause 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

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 clause 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.

*** Next Modification ***

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 uses the service primitives shown in table 11.1./1.

11.1.2 Service primitives

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(=)
Long FTN Supported	C	C(=)		
NbrUser	C	C(=)	C	C(=)
Forwarding information			C	C(=)
User error			C	C(=)
Provider error				O

11.1.3 Parameter use

Invoke id

See clause 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.

Long FTN Supported

This parameter indicates that the mobile station supports Long Forwarded-to Numbers.

NbrUser

This parameter is sent by the initiator to register the MC maximum number of user defined circuit switched bearers to be used.

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 clause 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 clause 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 uses the service primitives shown in table 11.2/1.

11.2.2 Service primitives

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 clause 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 clause 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 clause 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 uses the service primitives shown in table 11.3/1.

11.3.2 Service primitives

Table 11.3/1: MAP_ACTIVATE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Long FTN Supported	C	C(=)		
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 clause 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.

Long FTN Supported

This parameter indicates that the mobile station supports Long Forwarded-to Numbers.

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 clause 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 clause 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 uses the service primitives shown in table 11.4/1.

11.4.2 Service primitives

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 clause 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 clause 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 clause 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(=)		
Long FTN Supported	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(=)
MC Information			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 clause 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.

Long FTN Supported

This parameter indicates that the mobile station supports Long Forwarded-to Numbers.

Forwarding feature LIST

The forwarding feature parameter is described in clause 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.

MC Information

The MC information (NbrSB, NbrUser and NbrSN) is returned by the responder if the interrogation request applies to the MC supplementary service. For a definition of these 3 components, refer to 3G TS 23.135 and 3G TS 24.135.

CCBS Feature LIST

The CCBS feature parameter is described in clause 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 3GPP TS 23.093 [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 clause 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 clause 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 clause 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 clause 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 clause 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 clause 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 clause 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 clause 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 uses the service primitives shown in table 11.8/1.

11.8.2 Service primitives

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 clause 7.6.1 for the use of this parameter.

Linked Id

See clause 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 clause 7.6.4 for the use of this parameter.

Current password

See clause 7.6.4 for the use of this parameter.

Provider error

See clause 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, between the HLR and gsmSCF and between the HLR and HLR 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 clause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme

See clause 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 clause 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 clause 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 clause 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 clause 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

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 clause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme

See clause 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 clause 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 clause 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 clause 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 clause 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

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 clause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme:

See clause 7.6.4 for the use of this parameter.

USSD String:

See clause 7.6.1 for the use of this parameter.

Alerting Pattern

See clause 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 clause 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 clause 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(=)		
B-subscriber Number	C	C(=)		
CCBS Request State	C	C(=)		
User error			C	C(=)
Provider error				O

11.12.3 Parameter use

All parameters are described in clause 7.6. The use of these parameters and the requirements for their presence are specified in 3GPP 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 clause 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

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 clause 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 3GPP TS 23.093 [107] for the conditions for the presence of the parameters included in the CCBS feature.

Translated B Number

See 3GPP TS 23.093 [107] 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 3GPP TS 23.093 [107]. It indicates which services have been invoked for the original call (e.g. CLIR, CAMEL). See 3GPP TS 23.093 [107] for the use of this parameter and the conditions for its presence.

Call Info

See 3GPP TS 23.093 [107] for the use of this parameter and the conditions for its presence.

Network Signal Info

See 3GPP TS 23.093 [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 clause 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 clause 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

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 clause 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 3GPP TS 23.093 [107] 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 clause 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 clause 7.6.1 for the use of this parameter.

*** Next Modification ***

17 Abstract syntax of the MAP protocol

17.1 General

This clause 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 clause 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 clause 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 clause 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 comments. 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 clause 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 clause 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 recommendations/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 clause 17.1.1 apply to every element of the whole Transfer Syntax especially to the ASN.1 type EXTERNAL.

The extension container "privateExtensionList" is defined in this specification in order to carry extensions which are defined outside this specification. Private extensions can be defined by, for example, network operators, manufacturers, and regional standardisation bodies.

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 RegisterCCEntry and EraseCCEntry 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 capitalised, e.g. "no reply condition time" is mapped to "noReplyConditionTime"). Additionally some words may be abbreviated as follows:

bs basic service

ch call handling

cug closed user group

ho handover

ic incoming call

id identity

info information

mm mobility management

lcs location services

ms mobile service

oc outgoing call

om operation & maintenance

pw Password

sm short message service

ss supplementary service

st secure transport

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. 3GPP TS 24.080 [38]). 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;
12. MAP-SecureTransportOperations.

The module containing all error type definitions for MAP is:

13. MAP-Errors.

Modules containing all data type definitions for MAP are:

14. MAP-MS-DataTypes;
15. MAP-OM-DataTypes;
16. MAP-CH-DataTypes;
17. MAP-SS-DataTypes;
18. MAP-SS-Code;
19. MAP-SM-DataTypes;
20. MAP-ER-DataTypes;
21. MAP-CommonDataTypes;
22. MAP-TS-Code;
23. MAP-BS-Code;
24. MAP-ExtensionDataTypes;
25. MAP-GR-DataTypes;
26. MAP-LCS-DataTypes;
27. MAP-ST-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 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	v3	sendAuthenticationInfo	
interVlrInfoRetrievalContext	v3	sendIdentification	
handoverControlContext	v3	prepareHandover forwardAccessSignalling sendEndSignal processAccessSignalling prepareSubsequentHandover	the syntax of this operation has been extended in comparison with release 98 version
mwdMngtContext	v3	readyForSM	
msPurgingContext	v3	purgeMS	
shortMsgAlertContext	v2	alertServiceCentre	
resetContext	v2	reset	
networkUnstructuredSsContext	v2	processUnstructuredSS-Request unstructuredSS-Request unstructuredSS-Notify	
tracingContext	v3	activateTraceMode deactivateTraceMode	

AC Name	AC Version	Operations Used	Comments
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	v4	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	
locationSvcEnquiryContext	v3	provideSubscriberLocation subscriberLocationReport	
locationSvcGatewayContext	v3	sendRoutingInfoForLCS	
mm-EventReportingContext	v3	noteMM-Event	
subscriberDataModificationNotificationContext	v3	noteSubscriberDataModified	
authenticationFailureReportContext	v3	authenticationFailureReport	
secureTransportHandlingContext	v3	secureTransportClass1 secureTransportClass2 secureTransportClass3 secureTransportClass4	

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 clause describes the operation-packages which are used to build the application-contexts defined in clause 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 terms 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 terms of Application Service Elements.

The following ASN.1 MACRO is used to describe operation-packages in this clause:

```
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 clause 17.3 use only an informal description technique, only the type notation is used in the following clauses to define operation-packages.

The following definitions are used throughout this clause (n>=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>=2.

For each operation package which is not vn-only (n>=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 clauses, 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 clause 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 clause 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 clause 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-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     -- Supplier is HLR if Consumer is SGSN
     CONSUMER INVOKES {
          sendAuthenticationInfo}
```

The v2-equivalent package is defined as follows:

```
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-v3 ::= OPERATION-PACKAGE
     -- Supplier is VLR if Consumer is VLR
     CONSUMER INVOKES {
          sendIdentification}
```

The v2-equivalent package is defined as follows:

```
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 clause 17.2.1.

17.2.2.8 Secure transport

This operation package includes the operations required for the secure transport of MAP messages between any MAP entities.

```
SecureTransportHandlingPackage-v3 ::= OPERATION-PACKAGE
     CONSUMER INVOKES {
          SecureTransportClass1,          -- to be used if the original operation is a
                                          -- TCAP class 1 operation
          SecureTransportClass2,          -- to be used if the original operation is a
                                          -- TCAP class 2 operation
          SecureTransportClass3,          -- to be used if the original operation is a
                                          -- TCAP class 3 operation
          SecureTransportClass4}          -- to be used if the original operation is a
                                          -- TCAP class 4 operation
```

This package is v3 only.

17.2.2.9 Void

17.2.2.10 Interrogation

This operation package includes the operations required for interrogation procedures between MSC and HLR or NPLR or between HLR and gsmSCF.

```
InterrogationPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR or NPLR if Consumer is MSC
     -- Supplier is HLR if Consumer is gsmSCF
     CONSUMER INVOKES {
          sendRoutingInfo}
```

The v1-equivalent and v2-equivalent packages can be determined according to the rules described in clause 17.2.1.

17.2.2.11 Void

17.2.2.12 Handover Control

This operation package includes the operations required for handover procedures between MSCs.

```
HandoverControlPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is MSCB if Consumer is MSCA
     CONSUMER INVOKES {
          prepareHandover,
          forwardAccessSignalling}
     SUPPLIER INVOKES {
          sendEndSignal,
          processAccessSignalling,
          prepareSubsequentHandover}
```

The v2-equivalent package can be determined according to the rules described in clause 17.2.1.

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 clause 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 clause 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 clause 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 clause 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 clause 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 clause 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 clause 17.2.1.

17.2.2.20 Binding

This operation package includes the operation required to initialise 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, between the HLR and the gsmSCF, and between HLR and HLR.

```
UnstructuredSsPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     -- Supplier is gsmSCF or HLR 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 clause 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 clause 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 Void

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 clause 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 clause 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 clause 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 or between HLR and SGSN.

```
SubscriberInformationEnquiryPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is VLR or SGSN 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 between gsmSCF and 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-v4 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is GGSN
     CONSUMER INVOKES {
          sendRoutingInfoForGprs}
```

The v3-equivalent package is defined as follows.

```
GprsInterrogationPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is GGSN
     CONSUMER INVOKES {
          sendRoutingInfoForGprs}
```

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}
```

This package is v3 only.

17.2.2.45A Location service reporting

This operation package includes the operations required for the location service enquiry procedures between MSC and GMLC.

```
LocationSvcReportingPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is GMLC if Consumer is MSC
     CONSUMER INVOKES {
          subscriberLocationReport}
```

17.2.2.46 Void

17.2.2.47 Void

17.2.2.48 Void

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.

17.2.2.54 Authentication Failure Report

This operation package includes the operation required for procedures between VLR and HLR or the SGSN and the HLR for reporting of authentication failures.

```
AuthenticationFailureReportPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is HLR if Consumer is VLR
    -- Supplier is HLR if Consumer is SGSN
    CONSUMER INVOKES {
        authenticationFailureReport}
```

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 clauses:

```
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 clause:

- 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 clause 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 clause 17.4.

17.3.2 Application context definitions

17.3.2.1 Void

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 Void

17.3.2.6 Location Information Retrieval

This application-context is used between GMSC and HLR or between GMSC and NPLR or between gsmSCF and HLR 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
     -- Responder is HLR if Initiator is gsmSCF
     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 Secure transport

This application context is used for the secure transport of MAP messages between any MAP entities.

```
SecureTransportHandlingContext-v3 APPLICATION-CONTEXT
     INITIATOR CONSUMER OF {
          SecureTransportHandlingPackage-v3}
::= {map-ac secureTransportHandling(40) version3(3)}
```

This application-context is v3 only.

17.3.2.9 - 17.3.2.10 Void

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-v3 APPLICATION-CONTEXT
     -- Responder is MSCB if Initiator is MSCA
     INITIATOR CONSUMER OF {
          HandoverControlPackage-v3}
::= {map-ac handoverControl(11) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
{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 and version 3 of this application context are applicable.

```
infoRetrievalContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     -- Responder is HLR if Initiator is SGSN
     INITIATOR CONSUMER OF {
          InfoRetrievalPackage-v3}
::= {map-ac infoRetrieval(14) version3(3)}
```

The following application-context-name is assigned to the v2-equivalent application-context:

```
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:

```
{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-v3 APPLICATION-CONTEXT
     -- Responder is VLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          InterVlrInfoRetrievalPackage-v3}
::= {map-ac interVlrInfoRetrieval(15) version3(3)}
```

The v2-equivalent application-context is:

```
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:

```
{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, between the HLR and gsmSCF, and between HLR and HLR.

```
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
     -- Responder is HLR, Initiator is HLR
     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 Void

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 or between HLR and SGSN for subscriber information enquiry procedures.

```
subscriberInfoEnquiryContext-v3 APPLICATION-CONTEXT
     -- Responder is VLR or SGSN 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 between gsmSCF and 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 Initiater 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 Retreival

This application context is used between HLR and GGSN when retrieving gprs location information.

```
gprsLocationInfoRetrievalContext-v4 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is GGSN
     INITIATOR CONSUMER OF {
          GprsInterrogationPackage-v4}
::= {map-ac gprsLocationInfoRetrieval(33) version4(4)}
```

The following application-context-name is assigned to the v3-equivalent application-context:

```
{map-ac gprsLocationInfoRetrieval(33) version3(3)}
```

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
     -- Responder is GMLC if Initiator is MSC
     INITIATOR CONSUMER OF {
          locationSvcEnquiryPackage-v3,
          locationSvcReportingPackage-v3}
::= {map-ac locationSvcEnquiry(38) version3 (3)}
```

17.3.2.41 Void

17.3.2.42 Void

17.3.2.43 Void

17.3.2.44 IST Alerting

This application context is used between MSC (Visited MSC or Gateway MSC) and HLR 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.

17.3.2.49 Authentication Failure Report

This application context is used between VLR and HLR or SGSN and HLR for reporting of authentication failures.

```
authenticationFailureReportContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     -- Responder is HLR if Initiator is SGSN
     INITIATOR CONSUMER OF {
          AuthenticationFailureReportPackage-v3 }
::= {map-ac authenticationFailureReport(39) version3(3)}
```

This application-context is v3 only.

17.3.3 ASN.1 Module for application-context-names

The following ASN.1 module summarises the application-context-name assigned to MAP application-contexts.

```
MAP-ApplicationContexts {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ApplicationContexts (2) version7 (7)}

DEFINITIONS

::=

BEGIN


-- EXPORTS everything


IMPORTS
   gsm-NetworkId,
   ac-Id
FROM MobileDomainDefinitions {
   ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
   mobileDomainDefinitions (0) version1 (1)}
;

-- application-context-names

map-ac  OBJECT IDENTIFIER ::= {gsm-NetworkId ac-Id}
```

```
networkLocUpContext-v3  OBJECT IDENTIFIER ::=
     {map-ac networkLocUp(1) version3(3)}

locationCancellationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationCancel(2) version3(3)}

roamingNumberEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac roamingNbEnquiry(3) version3(3)}

authenticationFailureReportContext-v3  OBJECT IDENTIFIER ::=
     {map-ac authenticationFailureReport(39) version3(3)}

locationInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locInfoRetrieval(5) version3(3)}

resetContext-v2  OBJECT IDENTIFIER ::=
     {map-ac reset(10) version2(2)}

handoverControlContext-v3  OBJECT IDENTIFIER ::=
     {map-ac handoverControl(11) version3(3)}

equipmentMngtContext-v2  OBJECT IDENTIFIER ::=
     {map-ac equipmentMngt(13) version2(2)}

infoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac infoRetrieval(14) version3(3)}

interVlrInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac interVlrInfoRetrieval(15) version3(3)}

subscriberDataMngtContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberDataMngt(16) version3(3)}

tracingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac tracing(17) version3(3)}

networkFunctionalSsContext-v2  OBJECT IDENTIFIER ::=
     {map-ac networkFunctionalSs(18) version2(2)}

networkUnstructuredSsContext-v2  OBJECT IDENTIFIER ::=
     {map-ac networkUnstructuredSs(19) version2(2)}

shortMsgGatewayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgGateway(20) version3(3)}

shortMsgMO-RelayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgMO-Relay(21) version3(3)}

shortMsgAlertContext-v2  OBJECT IDENTIFIER ::=
     {map-ac shortMsgAlert(23) version2(2)}

mwdMngtContext-v3  OBJECT IDENTIFIER ::=
     {map-ac mwdMngt(24) version3(3)}

shortMsgMT-RelayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgMT-Relay(25) version3(3)}

imsiRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac imsiRetrieval(26) version2(2)}

msPurgingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac msPurging(27) version3(3)}

subscriberInfoEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberInfoEnquiry(28) version3(3)}

anyTimeInfoEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac anyTimeInfoEnquiry(29) version3(3)}

callControlTransferContext-v4  OBJECT IDENTIFIER ::=
     {map-ac callControlTransfer(6) version4(4)}

ss-InvocationNotificationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac ss-InvocationNotification(36) version3(3)}
```

```
sIWFSAllocationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac sIWFSAllocation(12) version3(3)}

groupCallControlContext-v3  OBJECT IDENTIFIER ::=
     {map-ac groupCallControl(31) version3(3)}

gprsLocationUpdateContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsLocationUpdate(32) version3(3)}

gprsLocationInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsLocationInfoRetrieval(33) version3(3)}

failureReportContext-v3  OBJECT IDENTIFIER ::=
     {map-ac failureReport(34) version3(3)}

gprsNotifyContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsNotify(35) version3(3)}

reportingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac reporting(7) version3(3)}

callCompletionContext-v3  OBJECT IDENTIFIER ::=
     {map-ac callCompletion(8) version3(3)}

istAlertingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac istAlerting(4) version3(3)}

serviceTerminationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac immediateTermination(9) version3(3)}

locationSvcGatewayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcGateway(37) version3(3)}

locationSvcEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcEnquiry(38) version3(3)}


mm-EventReportingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac mm-EventReporting(42) version3(3)}

anyTimeInfoHandlingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac anyTimeInfoHandling(43) version3(3)}

subscriberDataModificationNotificationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberDataModificationNotification(22) version3(3)}

secureTransportHandlingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac secureTransportHandling(40) version3(3)}

-- The following Object Identifiers are reserved for application-
-- contexts existing in previous versions of the protocol
```

-- AC Name & Version	Object Identifier	
--		
-- networkLocUpContext-v1	map-ac networkLocUp (1)	version1 (1)
-- networkLocUpContext-v2	map-ac networkLocUp (1)	version2 (2)
-- locationCancellationContext-v1	map-ac locationCancellation (2)	version1 (1)
-- locationCancellationContext-v2	map-ac locationCancellation (2)	version2 (2)
-- roamingNumberEnquiryContext-v1	map-ac roamingNumberEnquiry (3)	version1 (1)
-- roamingNumberEnquiryContext-v2	map-ac roamingNumberEnquiry (3)	version2 (2)
-- locationInfoRetrievalContext-v1	map-ac locationInfoRetrieval (5)	version1 (1)
-- locationInfoRetrievalContext-v2	map-ac locationInfoRetrieval (5)	version2 (2)
-- resetContext-v1	map-ac reset (10)	version1 (1)
-- handoverControlContext-v1	map-ac handoverControl (11)	version1 (1)
-- handoverControlContext-v2	map-ac handoverControl (11)	version2 (2)
-- equipmentMngtContext-v1	map-ac equipmentMngt (13)	version1 (1)
-- infoRetrievalContext-v1	map-ac infoRetrieval (14)	version1 (1)
-- infoRetrievalContext-v2	map-ac infoRetrieval (14)	version2 (2)
-- interVlrInfoRetrievalContext-v2	map-ac interVlrInfoRetrieval (15)	version2 (2)
-- subscriberDataMngtContext-v1	map-ac subscriberDataMngt (16)	version1 (1)
-- subscriberDataMngtContext-v2	map-ac subscriberDataMngt (16)	version2 (2)
-- tracingContext-v1	map-ac tracing (17)	version1 (1)
-- tracingContext-v2	map-ac tracing (17)	version2 (2)
-- networkFunctionalSsContext-v1	*map-ac networkFunctionalSs (18)*	*version1 (1)*
-- shortMsgGatewayContext-v1	map-ac shortMsgGateway (20)	version1 (1)
-- shortMsgGatewayContext-v2	map-ac shortMsgGateway (20)	version2 (2)
-- shortMsgRelayContext-v1	map-ac shortMsgRelay (21)	version1 (1)
-- shortMsgAlertContext-v1	map-ac shortMsgAlert (23)	version1 (1)
-- mwdMngtContext-v1	*map-ac mwdMngt (24)*	*version1 (1)*
-- mwdMngtContext-v2	map-ac mwdMngt (24)	version2 (2)
-- shortMsgMT-RelayContext-v2	map-ac shortMsgMT-Relay (25)	version2 (2)
-- msPurgingContext-v2	map-ac msPurging (27)	version2 (2)
-- callControlTransferContext-v3	map-ac callControlTransferContext (6)	version3 (3)

```
END
```

17.4 MAP Dialogue Information

```
MAP-DialogueInformation {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-DialogueInformation (3) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   map-DialogueAS,
   MAP-DialoguePDU,
   map-ProtectedDialogueAS,
   MAP-ProtectedDialoguePDU

;

IMPORTS
   gsm-NetworkId,
   as-Id
FROM MobileDomainDefinitions {
   ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
   mobileDomainDefinitions (0) version1 (1)}

   AddressString
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network(1) modules (3) map-CommonDataTypes (18) version7 (7)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}

   SecurityHeader,
   ProtectedPayload
FROM MAP-ST-DataTypes {
```

```
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ST-DataTypes (27) version7 (7)}

;


-- abstract syntax name for MAP-DialoguePDU

map-DialogueAS  OBJECT IDENTIFIER ::=
     {gsm-NetworkId as-Id map-DialoguePDU (1) version1 (1)}

MAP-DialoguePDU ::= CHOICE {
     map-open                          [0] MAP-OpenInfo,
     map-accept                        [1] MAP-AcceptInfo,
     map-close                         [2] MAP-CloseInfo,
     map-refuse                        [3] MAP-RefuseInfo,
     map-userAbort                     [4] MAP-UserAbortInfo,
     map-providerAbort                 [5] MAP-ProviderAbortInfo}

MAP-OpenInfo ::= SEQUENCE {
     destinationReference              [0] AddressString               OPTIONAL,
     originationReference              [1] AddressString               OPTIONAL,
     ...,
     extensionContainer                ExtensionContainer              OPTIONAL
     -- extensionContainer must not be used in version 2
     }

MAP-AcceptInfo ::= SEQUENCE {
     ...,
     extensionContainer                ExtensionContainer              OPTIONAL
     -- extensionContainer must not be used in version 2
     }

MAP-CloseInfo ::= SEQUENCE {
     ...,
     extensionContainer                ExtensionContainer              OPTIONAL
     -- extensionContainer must not be used in version 2
     }

MAP-RefuseInfo ::= SEQUENCE {
     reason    Reason,
     ...,
     extensionContainer                ExtensionContainer              OPTIONAL,
     -- extensionContainer must not be used in version 2
     alternativeApplicationContext     OBJECT IDENTIFIER               OPTIONAL
     -- alternativeApplicationContext must not be used in version 2
     }

Reason ::= ENUMERATED {
     noReasonGiven                     (0),
     invalidDestinationReference       (1),
     invalidOriginatingReference       (2),
     encapsulatedAC-NotSupported       (3) ,
     transportProtectionNotAdequate    (4)}
     -- encapsulatedAC-NotSupported and transportProtectionNotAdequate must not be used in
     -- dialogues with an AC different from secureTransportHandling

MAP-UserAbortInfo ::= SEQUENCE {
     map-UserAbortChoice               MAP-UserAbortChoice,
     ...,
     extensionContainer                ExtensionContainer              OPTIONAL
     -- extensionContainer must not be used in version 2
     }

MAP-UserAbortChoice ::= CHOICE {
     userSpecificReason                [0] NULL,
     userResourceLimitation            [1] NULL,
     resourceUnavailable               [2] ResourceUnavailableReason,
     applicationProcedureCancellation  [3] ProcedureCancellationReason}

ResourceUnavailableReason ::= ENUMERATED {
     shortTermResourceLimitation  (0),
     longTermResourceLimitation  (1)}
```

```
ProcedureCancellationReason ::= ENUMERATED {
     handoverCancellation  (0),
     radioChannelRelease  (1),
     networkPathRelease  (2),
     callRelease  (3),
     associatedProcedureFailure  (4),
     tandemDialogueRelease  (5),
     remoteOperationsFailure  (6)}
```

```
MAP-ProviderAbortInfo ::= SEQUENCE {
     map-ProviderAbortReason             MAP-ProviderAbortReason,
     ...,
     extensionContainer                  ExtensionContainer                OPTIONAL
     -- extensionContainer must not be used in version 2
     }
```

```
MAP-ProviderAbortReason ::= ENUMERATED {
     abnormalDialogue  (0),
     invalidPDU  (1)}
```

```
-- abstract syntax name for MAP-ProtectedDialoguePDU
```

```
map-ProtectedDialogueAS  OBJECT IDENTIFIER ::=
     {gsm-NetworkId as-Id map-ProtectedDialoguePDU (3) version1 (1)}
```

```
MAP-ProtectedDialoguePDU ::= SEQUENCE {
     encapsulatedAC                      OBJECT IDENTIFIER,
     securityHeader                      SecurityHeader                    OPTIONAL,
     protectedPayload                    ProtectedPayload                  OPTIONAL,
     ...}
     -- The protectedPayload carries the result of applying the security function
     -- defined in 3G TS 33.200 to the encoding of the securely transported
     -- MAP-DialoguePDU
```

```
END
```

17.5 MAP operation and error codes

```
MAP-Protocol {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Protocol (4) version7 (7)}

DEFINITIONS

::=

BEGIN

IMPORTS
   UpdateLocation,
   CancelLocation,
   PurgeMS,
   SendIdentification,
   UpdateGprsLocation,
   PrepareHandover,
   SendEndSignal,
   ProcessAccessSignalling,
   ForwardAccessSignalling,
   PrepareSubsequentHandover,
   SendAuthenticationInfo,
   AuthenticationFailureReport,
   CheckIMEI,
   InsertSubscriberData,
   DeleteSubscriberData,
   Reset,
   ForwardCheckSS-Indication,
   RestoreData,
   ProvideSubscriberInfo,
   AnyTimeInterrogation,
   AnyTimeSubscriptionInterrogation,
   AnyTimeModification,
   SendRoutingInfoForGprs,
   FailureReport,
   NoteMsPresentForGprs,
   NoteMM-Event,
   NoteSubscriberDataModified
```

```
FROM MAP-MobileServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MobileServiceOperations (5)
   version7 (7)}

   ActivateTraceMode,
   DeactivateTraceMode,
   SendIMSI
FROM MAP-OperationAndMaintenanceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
   version7 (7)}

   SendRoutingInfo,
   ProvideRoamingNumber,
   ResumeCallHandling,
   ProvideSIWFSNumber,
   SIWFSSignallingModify,
   SetReportingState,
   StatusReport,
   RemoteUserFree,
   IST-Alert,
   IST-Command
FROM MAP-CallHandlingOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CallHandlingOperations (7)
   version7 (7)}

   RegisterSS,
   EraseSS,
   ActivateSS,
   DeactivateSS,
   InterrogateSS,
   ProcessUnstructuredSS-Request,
   UnstructuredSS-Request,
   UnstructuredSS-Notify,
   RegisterPassword,
   GetPassword,
   SS-InvocationNotification,
   RegisterCC-Entry,
   EraseCC-Entry
FROM MAP-SupplementaryServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SupplementaryServiceOperations (8)
   version7 (7)}

   SendRoutingInfoForSM,
   MO-ForwardSM,
   MT-ForwardSM,
   ReportSM-DeliveryStatus,
   AlertServiceCentre,
   InformServiceCentre,
   ReadyForSM
FROM MAP-ShortMessageServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ShortMessageServiceOperations (9)
   version7 (7)}

   PrepareGroupCall,
   ProcessGroupCallSignalling,
   ForwardGroupCallSignalling,
   SendGroupCallEndSignal
FROM MAP-Group-Call-Operations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Group-Call-Operations (22)
   version7 (7)}

   ProvideSubscriberLocation,
   SendRoutingInfoForLCS,
   SubscriberLocationReport
FROM MAP-LocationServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LocationServiceOperations (24)
   version7 (7)}

SecureTransportClass1,
SecureTransportClass2,
SecureTransportClass3,
```

```
SecureTransportClass4

FROM MAP-SecureTransportOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SecureTransportOperations (26)
   version7 (7)}

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   NumberChanged,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,
   RoamingNotAllowed,
   IllegalSubscriber,
   IllegalEquipment,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,
   TracingBufferFull,
   OR-NotAllowed,
   NoRoamingNumberAvailable,
   AbsentSubscriber,
   BusySubscriber,
   NoSubscriberReply,
   CallBarred,
   ForwardingViolation,
   ForwardingFailed,
   CUG-Reject,
   ATI-NotAllowed,
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-SubscriptionViolation,
   SS-Incompatibility,
   UnknownAlphabet,
   USSD-Busy,
   PW-RegistrationFailure,
   NegativePW-Check,
   NumberOfPW-AttemptsViolation,
   SubscriberBusyForMT-SMS,
   SM-DeliveryFailure,
   MessageWaitingListFull,
   AbsentSubscriberSM,
   ResourceLimitation,
   NoGroupCallNumberAvailable,
   ShortTermDenial,
   LongTermDenial,
   IncompatibleTerminal,
   UnauthorizedRequestingNetwork,
   UnauthorizedLCSClient,
   PositionMethodFailure,
   UnknownOrUnreachableLCSClient,
   ATSI-NotAllowed,
   ATM-NotAllowed,
   InformationNotAvailable,
   MM-EventNotSupported,
   TargetCellOutsideGroupCallArea,
   SecureTransportError



FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}
;


-- location registration operation codes
```

```
updateLocation  UpdateLocation ::= localValue 2
cancelLocation  CancelLocation ::= localValue 3
purgeMS  PurgeMS ::= localValue 67
sendIdentification  SendIdentification ::= localValue 55
```

-- handover operation codes

```
prepareHandover  PrepareHandover ::= localValue 68
sendEndSignal  SendEndSignal ::= localValue 29
processAccessSignalling  ProcessAccessSignalling ::= localValue 33
forwardAccessSignalling  ForwardAccessSignalling ::= localValue 34
prepareSubsequentHandover  PrepareSubsequentHandover ::=
     localValue 69
```

-- authentication operation codes

```
sendAuthenticationInfo  SendAuthenticationInfo ::= localValue 56
authenticationFailureReport  AuthenticationFailureReport ::= localValue 15
```

-- IMEI MANAGEMENT operation codes

```
checkIMEI  CheckIMEI ::= localValue 43
```

-- subscriber management operation codes

```
insertSubscriberData  InsertSubscriberData ::= localValue 7
deleteSubscriberData  DeleteSubscriberData ::= localValue 8
```

-- fault recovery operation codes

```
reset  Reset ::= localValue 37
forwardCheckSS-Indication  ForwardCheckSS-Indication ::=
     localValue 38
restoreData  RestoreData ::= localValue 57
```

-- operation and maintenance operation codes

```
activateTraceMode  ActivateTraceMode ::= localValue 50
deactivateTraceMode  DeactivateTraceMode ::= localValue 51
sendIMSI  SendIMSI ::= localValue 58
```

-- call handling operation codes

```
sendRoutingInfo  SendRoutingInfo ::= localValue 22
provideRoamingNumber  ProvideRoamingNumber ::= localValue 4
resumeCallHandling  ResumeCallHandling ::= localValue 6
provideSIWFSNumber  ProvideSIWFSNumber ::= localValue 31
sIWFSSignallingModify  SIWFSSignallingModify ::= localValue 32
setReportingState  SetReportingState ::= localValue 73
statusReport StatusReport ::= localValue 74
remoteUserFree RemoteUserFree ::= localValue 75
istAlert IST-Alert ::= localValue 87
istCommand IST-Command ::= localValue 88
```

-- supplementary service handling operation codes

```
registerSS  RegisterSS ::= localValue 10
eraseSS  EraseSS ::= localValue 11
activateSS  ActivateSS ::= localValue 12
deactivateSS  DeactivateSS ::= localValue 13
interrogateSS  InterrogateSS ::= localValue 14
processUnstructuredSS-Request  ProcessUnstructuredSS-Request ::=
     localValue 59
unstructuredSS-Request  UnstructuredSS-Request ::= localValue 60
unstructuredSS-Notify  UnstructuredSS-Notify ::= localValue 61
registerPassword  RegisterPassword ::= localValue 17
getPassword  GetPassword ::= localValue 18
registerCC-Entry  RegisterCC-Entry ::= localValue 76
eraseCC-Entry  EraseCC-Entry ::= localValue 77
```

-- short message service operation codes

```
sendRoutingInfoForSM  SendRoutingInfoForSM ::= localValue 45
mo-forwardSM  MO-ForwardSM ::= localValue 46
mt-forwardSM  MT-ForwardSM ::= localValue 44
reportSM-DeliveryStatus  ReportSM-DeliveryStatus ::= localValue 47
informServiceCentre  InformServiceCentre ::= localValue 63
alertServiceCentre  AlertServiceCentre ::= localValue 64
readyForSM  ReadyForSM ::= localValue 66
```

-- provide subscriber info operation codes

```
provideSubscriberInfo  ProvideSubscriberInfo ::= localValue 70
```

-- any time interrogation operation codes

```
anyTimeInterrogation  AnyTimeInterrogation ::= localValue 71
```

-- any time information handling operation codes

```
anyTimeSubscriptionInterrogation  AnyTimeSubscriptionInterrogation ::= localValue 62
anyTimeModification  AnyTimeModification ::= localValue 65
```

-- subscriber data modification notification operation codes

```
noteSubscriberDataModified  NoteSubscriberDataModified ::= localValue 5
```

-- supplementary service invocation notification operation codes

```
ss-InvocationNotification  SS-InvocationNotification ::= localValue 72
```

--Group Call operation codes

```
prepareGroupCall  PrepareGroupCall ::= localValue 39
sendGroupCallEndSignal  SendGroupCallEndSignal ::= localValue 40
processGroupCallSignalling  ProcessGroupCallSignalling ::= localValue 41
forwardGroupCallSignalling  ForwardGroupCallSignalling ::= localValue 42
```

-- gprs location updating operation codes

```
updateGprsLocation  UpdateGprsLocation ::= localValue 23
```

-- gprs location information retrieval operation codes

```
sendRoutingInfoForGprs  SendRoutingInfoForGprs ::= localValue 24
```

-- failure reporting operation codes

```
failureReport  FailureReport ::= localValue 25
```

-- GPRS notification operation codes

```
noteMsPresentForGprs  NoteMsPresentForGprs ::= localValue 26
```

```
-- Location service operation codes

provideSubscriberLocation  ProvideSubscriberLocation ::= localValue 83
sendRoutingInfoForLCS  SendRoutingInfoForLCS ::= localValue 85
subscriberLocationReport  SubscriberLocationReport ::= localValue 86

-- Mobility Management operation codes

noteMM-Event  NoteMM-Event ::= localValue 89

-- Secure transport operation codes

secureTransportClass1 SecureTransportClass1 ::= localValue 78
secureTransportClass2 SecureTransportClass2 ::= localValue 79
secureTransportClass3 SecureTransportClass3 ::= localValue 80
secureTransportClass4 SecureTransportClass4 ::= localValue 81

-- generic error codes

systemFailure  SystemFailure ::= localValue 34
dataMissing  DataMissing ::= localValue 35
unexpectedDataValue  UnexpectedDataValue ::= localValue 36
facilityNotSupported  FacilityNotSupported ::= localValue 21
incompatibleTerminal  IncompatibleTerminal ::= localValue 28
resourceLimitation  ResourceLimitation ::= localValue 51

-- identification and numbering error codes

unknownSubscriber  UnknownSubscriber ::= localValue 1
numberChanged  NumberChanged ::= localValue 44
unknownMSC  UnknownMSC ::= localValue 3
unidentifiedSubscriber  UnidentifiedSubscriber ::= localValue 5
unknownEquipment  UnknownEquipment ::= localValue 7

-- subscription error codes

roamingNotAllowed  RoamingNotAllowed ::= localValue 8
illegalSubscriber  IllegalSubscriber ::= localValue 9
illegalEquipment  IllegalEquipment ::= localValue 12
bearerServiceNotProvisioned  BearerServiceNotProvisioned ::=
     localValue 10
teleserviceNotProvisioned  TeleserviceNotProvisioned ::=
     localValue 11

-- handover error codes

noHandoverNumberAvailable  NoHandoverNumberAvailable ::=
     localValue 25
subsequentHandoverFailure  SubsequentHandoverFailure ::=
     localValue 26
targetCellOutsideGroupCallArea  TargetCellOutsideGroupCallArea ::=
     localValue 42

-- operation and maintenance error codes

tracingBufferFull  TracingBufferFull ::= localValue 40

-- call handling error codes

noRoamingNumberAvailable  NoRoamingNumberAvailable ::= localValue 39
absentSubscriber  AbsentSubscriber ::= localValue 27
busySubscriber  BusySubscriber ::= localValue 45
noSubscriberReply  NoSubscriberReply ::= localValue 46
callBarred  CallBarred ::= localValue 13
forwardingFailed  ForwardingFailed ::= localValue 47
or-NotAllowed  OR-NotAllowed ::= localValue 48
forwardingViolation  ForwardingViolation ::= localValue 14
cug-Reject  CUG-Reject ::= localValue 15
```

```
-- any time interrogation error codes

ati-NotAllowed  ATI-NotAllowed ::= localValue 49

-- any time information handling error codes
atsi-NotAllowed  ATSI-NotAllowed ::= localValue 60
atm-NotAllowed  ATM-NotAllowed ::= localValue 61
informationNotAvailable  InformationNotAvailable ::= localValue 62

-- Group Call error codes
noGroupCallNumberAvailable  NoGroupCallNumberAvailable ::= localValue 50

-- supplementary service error codes

illegalSS-Operation  IllegalSS-Operation ::= localValue 16
ss-ErrorStatus  SS-ErrorStatus ::= localValue 17
ss-NotAvailable  SS-NotAvailable ::= localValue 18
ss-SubscriptionViolation  SS-SubscriptionViolation ::= localValue 19
ss-Incompatibility  SS-Incompatibility ::= localValue 20
unknownAlphabet  UnknownAlphabet ::= localValue 71
ussd-Busy  USSD-Busy ::= localValue 72
pw-RegistrationFailure  PW-RegistrationFailure ::= localValue 37
negativePW-Check  NegativePW-Check ::= localValue 38
numberOfPW-AttemptsViolation  NumberOfPW-AttemptsViolation ::=
     localValue 43
shortTermDenial  ShortTermDenial ::= localValue 29
longTermDenial  LongTermDenial ::= localValue 30

-- short message service error codes

subscriberBusyForMT-SMS  SubscriberBusyForMT-SMS ::= localValue 31
sm-DeliveryFailure  SM-DeliveryFailure ::= localValue 32
messageWaitingListFull  MessageWaitingListFull ::= localValue 33
absentsubscriberSM  AbsentSubscriberSM ::= localValue 6

-- location service error codes

unauthorizedRequestingNetwork  UnauthorizedRequestingNetwork::= localValue 52
unauthorizedLCSClient  UnauthorizedLCSClient ::= localValue 53
positionMethodFailure  PositionMethodFailure ::= localValue 54
unknownOrUnreachableLCSClient  UnknownOrUnreachableLCSClient ::= localValue 58

-- Mobility Management error codes
mm-EventNotSupported  MM-EventNotSupported ::= localValue 59

-- Secure transport error codes

secureTransportError SecureTransportError ::= localValue 4

-- The following operation codes are reserved for operations
-- existing in previous versions of the protocol

-- Operation Name                  AC used                                          Oper. Code
--
-- sendParameters                  map-ac infoRetrieval (14) version1 (1)           localValue 9
-- processUnstructuredSS-Data      map-ac networkFunctionalSs (18) version1 (1)     localValue 19
-- performHandover                 map-ac handoverControl (11) version1 (1)         localValue 28
-- performSubsequentHandover       map-ac handoverControl (11) version1 (1)         localValue 30
-- noteInternalHandover            map-ac handoverControl (11) version1 (1)         localValue 35
-- noteSubscriberPresent           map-ac mwdMngt (24) version1 (1)                 localValue 48
-- alertServiceCentreWithoutResult map-ac shortMsgAlert (23) version1 (1)           localValue 49
-- traceSubscriberActivity         map-ac handoverControl (11) version1 (1)         localValue 52
-- beginSubscriberActivity         map-ac networkFunctionalSs (18) version1 (1)     localValue 54

-- The following error codes are reserved for errors
-- existing in previous versions of the protocol
```

-- Error Name	AC used	Error Code
--		
-- unknownBaseStation	map-ac handoverControl (11) version1 (1)	localValue 2
-- invalidTargetBaseStation	map-ac handoverControl (11) version1 (1)	localValue 23
-- noRadioResourceAvailable	map-ac handoverControl (11) version1 (1)	localValue 24

```
END
```

17.6 MAP operation and error types

17.6.1 Mobile Service Operations

```
MAP-MobileServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MobileServiceOperations (5)
   version7 (7)}

DEFINITIONS

::=

BEGIN

EXPORTS

   -- location registration operations
   UpdateLocation,
   CancelLocation,
   PurgeMS,
   SendIdentification,

   -- gprs location registration operations
   UpdateGprsLocation,

   -- subscriber information enquiry operations
   ProvideSubscriberInfo,

   -- any time information enquiry operations
   AnyTimeInterrogation,

   -- any time information handling operations
   AnyTimeSubscriptionInterrogation,
   AnyTimeModification,

   -- subscriber data modification notification operations
   NoteSubscriberDataModified,


   -- handover operations
   PrepareHandover,
   SendEndSignal,
   ProcessAccessSignalling,
   ForwardAccessSignalling,
   PrepareSubsequentHandover,

   -- authentication management operations
   SendAuthenticationInfo,
   AuthenticationFailureReport,

   -- IMEI management operations
   CheckIMEI,

   -- subscriber management operations
   InsertSubscriberData,
   DeleteSubscriberData,

   -- fault recovery operations
   Reset,
   ForwardCheckSS-Indication,
   RestoreData,

-- gprs location information retrieval operations
   SendRoutingInfoForGprs,
```

```
   -- failure reporting operations
   FailureReport,

   -- gprs notification operations
   NoteMsPresentForGprs,

   -- Mobility Management operations
   NoteMM-Event




;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   UnknownSubscriber,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,
   RoamingNotAllowed,
   ATI-NotAllowed,
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,
   AbsentSubscriber,
   MM-EventNotSupported,
   ATSI-NotAllowed,
   ATM-NotAllowed,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   CallBarred,
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-Incompatibility,
   SS-SubscriptionViolation,
   InformationNotAvailable,
   TargetCellOutsideGroupCallArea


FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}

   UpdateLocationArg,
   UpdateLocationRes,
   CancelLocationArg,
   CancelLocationRes,
   PurgeMS-Arg,
   PurgeMS-Res,
   SendIdentificationArg,
   SendIdentificationRes,
   UpdateGprsLocationArg,
   UpdateGprsLocationRes,
   PrepareHO-Arg,
   PrepareHO-Res,
   ForwardAccessSignalling-Arg,
   ProcessAccessSignalling-Arg,
   SendEndSignal-Arg,
   SendEndSignal-Res,
   PrepareSubsequentHO-Res,
   PrepareSubsequentHO-Arg,
   SendAuthenticationInfoArg,
   SendAuthenticationInfoRes,
   AuthenticationFailureReportArg,
   AuthenticationFailureReportRes,
   EquipmentStatus,
   InsertSubscriberDataArg,
   InsertSubscriberDataRes,
   DeleteSubscriberDataArg,
   DeleteSubscriberDataRes,
   ResetArg,
   RestoreDataArg,
```

```
   RestoreDataRes,
   ProvideSubscriberInfoArg,
   ProvideSubscriberInfoRes,
   AnyTimeSubscriptionInterrogationArg,
   AnyTimeSubscriptionInterrogationRes,
   AnyTimeModificationArg,
   AnyTimeModificationRes,
   NoteSubscriberDataModifiedArg,
   NoteSubscriberDataModifiedRes,
   AnyTimeInterrogationArg,
   AnyTimeInterrogationRes,
   SendRoutingInfoForGprsArg,
   SendRoutingInfoForGprsRes,
   FailureReportArg,
   FailureReportRes,
   NoteMsPresentForGprsArg,
   NoteMsPresentForGprsRes,
   NoteMM-EventArg,
   NoteMM-EventRes


FROM MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version7 (7)}

   IMEI
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}
;


-- location registration operations

UpdateLocation ::= OPERATION                                          --Timer m
     ARGUMENT
          updateLocationArg              UpdateLocationArg
     RESULT
          updateLocationRes              UpdateLocationRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber,
          RoamingNotAllowed}

CancelLocation ::= OPERATION                                          --Timer m
     ARGUMENT
          cancelLocationArg              CancelLocationArg
     RESULT
          cancelLocationRes              CancelLocationRes
               -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue}

PurgeMS ::= OPERATION                                                 --Timer m
     ARGUMENT
          purgeMS-Arg                    PurgeMS-Arg
     RESULT
          purgeMS-Res                    PurgeMS-Res
               -- optional
     ERRORS{
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
SendIdentification ::= OPERATION                                    --Timer s
     ARGUMENT
          sendIdentificationArg               SendIdentificationArg
     RESULT
          sendIdentificationRes          SendIdentificationRes
     ERRORS {
          DataMissing,
          UnidentifiedSubscriber}
```

-- gprs location registration operations

```
UpdateGprsLocation ::= OPERATION                                    --Timer m
     ARGUMENT
          updateGprsLocationArg          UpdateGprsLocationArg
     RESULT
          updateGprsLocationRes          UpdateGprsLocationRes
     ERRORS {
          SystemFailure,
          UnexpectedDataValue,
          UnknownSubscriber,
          RoamingNotAllowed}
```

-- subscriber information enquiry operations

```
ProvideSubscriberInfo ::= OPERATION                                 --Timer m
     ARGUMENT
          provideSubscriberInfoArg       ProvideSubscriberInfoArg
     RESULT
          provideSubscriberInfoRes       ProvideSubscriberInfoRes
     ERRORS {
          DataMissing,
          UnexpectedDataValue}
```

-- any time information enquiry operations

```
AnyTimeInterrogation ::= OPERATION                                  --Timer m
     ARGUMENT
          anyTimeInterrogationArg        AnyTimeInterrogationArg
     RESULT
          anyTimeInterrogationRes        AnyTimeInterrogationRes
     ERRORS {
          SystemFailure,
          ATI-NotAllowed,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- any time information handling operations

```
AnyTimeSubscriptionInterrogation ::= OPERATION                       --Timer m
     ARGUMENT
          anyTimeSubscriptionInterrogationArg  AnyTimeSubscriptionInterrogationArg
     RESULT
          anyTimeSubscriptionInterrogationRes  AnyTimeSubscriptionInterrogationRes
     ERRORS {
          ATSI-NotAllowed,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-NotAvailable,
          InformationNotAvailable}
```

```
AnyTimeModification ::= OPERATION                                    --Timer m
     ARGUMENT
          anyTimeModificationArg          AnyTimeModificationArg
     RESULT
          anyTimeModificationRes          AnyTimeModificationRes
     ERRORS {
          ATM-NotAllowed,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-SubscriptionViolation,
          SS-ErrorStatus,
          SS-Incompatibility,
          InformationNotAvailable}
```

-- subscriber data modification notification operations

```
NoteSubscriberDataModified ::= OPERATION                             --Timer m
     ARGUMENT
          noteSubscriberDataModifiedArg   NoteSubscriberDataModifiedArg
     RESULT
          noteSubscriberDataModifiedRes   NoteSubscriberDataModifiedRes
               -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- handover operations

```
PrepareHandover ::= OPERATION                                        --Timer m
     ARGUMENT
          prepareHO-Arg                   PrepareHO-Arg
     RESULT
          prepareHO-Res                   PrepareHO-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          NoHandoverNumberAvailable,
          TargetCellOutsideGroupCallArea }
```

```
SendEndSignal ::= OPERATION                                          --Timer l
     ARGUMENT
          sendEndSignal-Arg               SendEndSignal-Arg
     RESULT
          sendEndSignal-Res               SendEndSignal-Res
```

```
ProcessAccessSignalling ::= OPERATION                                --Timer s
     ARGUMENT
          processAccessSignalling-Arg     ProcessAccessSignalling-Arg
```

```
ForwardAccessSignalling ::= OPERATION                                --Timer s
     ARGUMENT
          forwardAccessSignalling-Arg     ForwardAccessSignalling-Arg
```

```
PrepareSubsequentHandover ::= OPERATION                              --Timer m
     ARGUMENT
          prepareSubsequentHO-Arg         PrepareSubsequentHO-Arg
     RESULT
          prepareSubsequentHO-Res         PrepareSubsequentHO-Res
     ERRORS {
          UnexpectedDataValue,
          DataMissing,
          UnknownMSC,
          SubsequentHandoverFailure}
```

-- authentication management operations

```
SendAuthenticationInfo ::= OPERATION                                    --Timer m
     ARGUMENT
          sendAuthenticationInfoArg       SendAuthenticationInfoArg
          -- optional
          -- if segmentation is used, sendAuthenticationInfoArg shall be present in the first
          -- segment and shall not be present in subsequent segments.  If received in
          -- subsequent segments it shall be discarded.

     RESULT
          sendAuthenticationInfoRes       SendAuthenticationInfoRes
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
AuthenticationFailureReport ::= OPERATION          --Timer m
     ARGUMENT
          authenticationFailureReportArg  AuthenticationFailureReportArg
     RESULT
          authenticationFailureReportRes  AuthenticationFailureReportRes
          -- optional
     ERRORS {
          SystemFailure,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- IMEI management operations

```
CheckIMEI ::= OPERATION                                                 --Timer m
     ARGUMENT
          imei                            IMEI
     RESULT
          equipmentStatus                 EquipmentStatus
     ERRORS {
          SystemFailure,
          DataMissing,
          UnknownEquipment}
```

-- subscriber management operations

```
InsertSubscriberData ::= OPERATION                                      --Timer m
     ARGUMENT
          insertSubscriberDataArg         InsertSubscriberDataArg
     RESULT
          insertSubscriberDataRes         InsertSubscriberDataRes
          -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnidentifiedSubscriber}
```

```
DeleteSubscriberData ::= OPERATION                                      --Timer m
     ARGUMENT
          deleteSubscriberDataArg         DeleteSubscriberDataArg
     RESULT
          deleteSubscriberDataRes         DeleteSubscriberDataRes
          -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnidentifiedSubscriber}
```

-- fault recovery operations

```
Reset ::= OPERATION                                                     --Timer m
     ARGUMENT
          resetArg                        ResetArg
```

```
ForwardCheckSS-Indication ::= OPERATION            --Timer s
```

```
RestoreData ::= OPERATION                                                --Timer m
     ARGUMENT
          restoreDataArg                  RestoreDataArg
     RESULT
          restoreDataRes                  RestoreDataRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- gprs location information retrieval operations

```
SendRoutingInfoForGprs ::= OPERATION                                     --Timer m
     ARGUMENT
          sendRoutingInfoForGprsArg       SendRoutingInfoForGprsArg
     RESULT
          sendRoutingInfoForGprsRes       SendRoutingInfoForGprsRes
     ERRORS {
          AbsentSubscriber,
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber,
          CallBarred }
```

-- failure reporting operations

```
FailureReport ::= OPERATION                                              --Timer m
     ARGUMENT
          failureReportArg                FailureReportArg
     RESULT
          failureReportRes                FailureReportRes
               -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- gprs notification operations

```
NoteMsPresentForGprs ::= OPERATION                                       --Timer m
     ARGUMENT
          noteMsPresentForGprsArg         NoteMsPresentForGprsArg
     RESULT
          noteMsPresentForGprsRes         NoteMsPresentForGprsRes
               -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
NoteMM-Event ::= OPERATION                                               --Timer m
     ARGUMENT
          noteMM-EventArg                 NoteMM-EventArg
     RESULT
          noteMM-EventRes                 NoteMM-EventRes
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber,
          MM-EventNotSupported}
```

```
END
```

17.6.2 Operation and Maintenance Operations

```
MAP-OperationAndMaintenanceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
   version7 (7)}

DEFINITIONS
```

```
::=

BEGIN

EXPORTS
   ActivateTraceMode,
   DeactivateTraceMode,
   SendIMSI
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   UnidentifiedSubscriber,
   TracingBufferFull
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}

   ActivateTraceModeArg,
   ActivateTraceModeRes,
   DeactivateTraceModeArg,
   DeactivateTraceModeRes
FROM MAP-OM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OM-DataTypes (12) version7 (7)}

   ISDN-AddressString,
   IMSI
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}
;
```

```
ActivateTraceMode ::= OPERATION                                    --Timer m
     ARGUMENT
          activateTraceModeArg           ActivateTraceModeArg
     RESULT
          activateTraceModeRes           ActivateTraceModeRes
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnidentifiedSubscriber,
          TracingBufferFull}
```

```
DeactivateTraceMode ::= OPERATION                                  --Timer m
     ARGUMENT
          deactivateTraceModeArg         DeactivateTraceModeArg
     RESULT
          deactivateTraceModeRes         DeactivateTraceModeRes
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnidentifiedSubscriber}
```

```
SendIMSI ::= OPERATION                                                    --Timer m
     ARGUMENT
          msisdn                         ISDN-AddressString
     RESULT
          imsi                           IMSI
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
END
```

17.6.3 Call Handling Operations

```
MAP-CallHandlingOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CallHandlingOperations (7)
   version7 (7)}

DEFINITIONS

::=

BEGIN

EXPORTS
   SendRoutingInfo,
   ProvideRoamingNumber,
   ResumeCallHandling,
   ProvideSIWFSNumber,
   SIWFSSignallingModify,
   SetReportingState,
   StatusReport,
   RemoteUserFree,
   IST-Alert,
   IST-Command
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   OR-NotAllowed,
   UnknownSubscriber,
   NumberChanged,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   NoRoamingNumberAvailable,
   AbsentSubscriber,
   BusySubscriber,
   NoSubscriberReply,
   CallBarred,
   ForwardingViolation,
   ForwardingFailed,
   CUG-Reject,
   ResourceLimitation,
   IncompatibleTerminal,
   UnidentifiedSubscriber

FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}
   SendRoutingInfoArg,
   SendRoutingInfoRes,
   ProvideRoamingNumberArg,
   ProvideRoamingNumberRes,
   ResumeCallHandlingArg,
   ResumeCallHandlingRes,
   ProvideSIWFSNumberArg,
   ProvideSIWFSNumberRes,
   SIWFSSignallingModifyArg,
   SIWFSSignallingModifyRes,
   SetReportingStateArg,
```

```
   SetReportingStateRes,
   StatusReportArg,
   StatusReportRes,
   RemoteUserFreeArg,
   RemoteUserFreeRes,
   IST-AlertArg,
   IST-AlertRes,
   IST-CommandArg,
IST-CommandRes
FROM MAP-CH-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CH-DataTypes (13) version7 (7)}

;
```

```
SendRoutingInfo ::= OPERATION                                          --Timer m
-- The timer is set to the upper limit of the range if the GMSC supports pre-paging.
     ARGUMENT
          sendRoutingInfoArg              SendRoutingInfoArg
     RESULT
          sendRoutingInfoRes              SendRoutingInfoRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          OR-NotAllowed,
          UnknownSubscriber,
          NumberChanged,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          AbsentSubscriber,
          BusySubscriber,
          NoSubscriberReply,
          CallBarred,
          CUG-Reject,
          ForwardingViolation}
```

```
ProvideRoamingNumber ::= OPERATION                                     --Timer m
-- The timer is set to the upper limit of the range if the HLR supports pre-paging.
     ARGUMENT
          provideRoamingNumberArg         ProvideRoamingNumberArg
     RESULT
          provideRoamingNumberRes         ProvideRoamingNumberRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          OR-NotAllowed,
          AbsentSubscriber,
          NoRoamingNumberAvailable}
```

```
ResumeCallHandling ::= OPERATION                                       --Timer m
     ARGUMENT
          resumeCallHandlingArg           ResumeCallHandlingArg
     RESULT
          resumeCallHandlingRes           ResumeCallHandlingRes
          -- optional
     ERRORS {
          ForwardingFailed,
          OR-NotAllowed,
          UnexpectedDataValue,
          DataMissing }
```

```
ProvideSIWFSNumber ::= OPERATION                                       --Timer m
     ARGUMENT
          provideSIWFSNumberArg           ProvideSIWFSNumberArg
     RESULT
          provideSIWFSNumberRes           ProvideSIWFSNumberRes
     ERRORS {
          ResourceLimitation,
          DataMissing,
          UnexpectedDataValue,
          SystemFailure}
```

```
SIWFSSignallingModify ::= OPERATION                                    --Timer m
     ARGUMENT
          sIWFSSignallingModifyArg        SIWFSSignallingModifyArg
     RESULT
          sIWFSSignallingModifyRes        SIWFSSignallingModifyRes
          -- optional
     ERRORS {
          ResourceLimitation,
          DataMissing,
          UnexpectedDataValue,
          SystemFailure}
```

```
SetReportingState ::= OPERATION                                        --Timer m
     ARGUMENT
          setReportingStateArg            SetReportingStateArg
     RESULT
          setReportingStateRes            SetReportingStateRes
          -- optional
     ERRORS {
          SystemFailure,
          UnidentifiedSubscriber,
          UnexpectedDataValue,
          DataMissing,
          ResourceLimitation,
          FacilityNotSupported}
```

```
StatusReport ::= OPERATION                                             --Timer m
     ARGUMENT
          statusReportArg                 StatusReportArg
     RESULT
          statusReportRes                 StatusReportRes
          -- optional
     ERRORS {
          UnknownSubscriber,
          SystemFailure,
          UnexpectedDataValue,
          DataMissing}
```

```
RemoteUserFree ::= OPERATION                                           --Timer ml
     ARGUMENT
          remoteUserFreeArg               RemoteUserFreeArg
     RESULT
          remoteUserFreeRes               RemoteUserFreeRes
     ERRORS {
          UnexpectedDataValue,
          DataMissing,
          IncompatibleTerminal,
          AbsentSubscriber,
          SystemFailure,
          BusySubscriber}
```

```
IST-Alert ::= OPERATION                                                --Timer m
     ARGUMENT
          istAlertArg                     IST-AlertArg
     RESULT
          istAlertRes                     IST-AlertRes
          -- optional
     ERRORS {
          UnexpectedDataValue,
          ResourceLimitation,
          UnknownSubscriber,
          SystemFailure,
          FacilityNotSupported}
```

```
IST-Command ::= OPERATION                                              --Timer m
     ARGUMENT
          istCommandArg                   IST-CommandArg
     RESULT
          istCommandRes                   IST-CommandRes
          -- optional
     ERRORS {
          UnexpectedDataValue,
          ResourceLimitation,
          UnknownSubscriber,
          SystemFailure,
          FacilityNotSupported}
```

```
END
```

17.6.4 Supplementary service operations

```
MAP-SupplementaryServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SupplementaryServiceOperations (8)
   version7 (7)}

DEFINITIONS

::=

BEGIN

EXPORTS
   RegisterSS,
   EraseSS,
   ActivateSS,
   DeactivateSS,
   InterrogateSS,
   ProcessUnstructuredSS-Request,
   UnstructuredSS-Request,
   UnstructuredSS-Notify,
   RegisterPassword,
   GetPassword,
   SS-InvocationNotification,
   RegisterCC-Entry,
   EraseCC-Entry
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   UnknownSubscriber,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   CallBarred,
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-SubscriptionViolation,
   SS-Incompatibility,
   PW-RegistrationFailure,
   NegativePW-Check,
   NumberOfPW-AttemptsViolation,
   UnknownAlphabet,
   USSD-Busy,
   AbsentSubscriber,
   IllegalSubscriber,
   IllegalEquipment,
   ShortTermDenial,
   LongTermDenial,
   FacilityNotSupported
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}

   RegisterSS-Arg,
   SS-Info,
   SS-ForBS-Code,
   InterrogateSS-Res,
   USSD-Arg,
   USSD-Res,
   Password,
   GuidanceInfo,
   SS-InvocationNotificationArg,
   SS-InvocationNotificationRes,
   RegisterCC-EntryArg,
   RegisterCC-EntryRes,
   EraseCC-EntryArg,
   EraseCC-EntryRes
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
```

```
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version7 (7)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version7 (7)}
;


-- supplementary service handling operations
```

```
RegisterSS ::= OPERATION                                        --Timer m
     ARGUMENT
          registerSS-Arg                 RegisterSS-Arg
     RESULT
          ss-Info                        SS-Info
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus,
          SS-Incompatibility}
```

```
EraseSS ::= OPERATION                                           --Timer m
     ARGUMENT
          ss-ForBS                       SS-ForBS-Code
     RESULT
          ss-Info                        SS-Info
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus
          }
```

```
ActivateSS ::= OPERATION                                        --Timer m
     ARGUMENT
          ss-ForBS                       SS-ForBS-Code
     RESULT
          ss-Info                        SS-Info
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus,
          SS-SubscriptionViolation,
          SS-Incompatibility,
          NegativePW-Check,
          NumberOfPW-AttemptsViolation}
```

```
DeactivateSS ::= OPERATION                                          --Timer m
     ARGUMENT
          ss-ForBS                        SS-ForBS-Code
     RESULT
          ss-Info                         SS-Info
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus,
          SS-SubscriptionViolation,
          NegativePW-Check,
          NumberOfPW-AttemptsViolation}
```

```
InterrogateSS ::= OPERATION                                         --Timer m
     ARGUMENT
          ss-ForBS                        SS-ForBS-Code
     RESULT
          interrogateSS-Res               InterrogateSS-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-NotAvailable}
```

```
ProcessUnstructuredSS-Request ::= OPERATION              --Timer 10 minutes
     ARGUMENT
          ussd-Arg                        USSD-Arg
     RESULT
          ussd-Res                        USSD-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownAlphabet,
          CallBarred}
```

```
UnstructuredSS-Request ::= OPERATION                                --Timer ml
     ARGUMENT
          ussd-Arg                        USSD-Arg
     RESULT
          ussd-Res                        USSD-Res
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          AbsentSubscriber,
          IllegalSubscriber,
          IllegalEquipment,
          UnknownAlphabet,
          USSD-Busy}
```

```
UnstructuredSS-Notify ::= OPERATION                                 --Timer ml
     ARGUMENT
          ussd-Arg                        USSD-Arg
     RESULT
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          AbsentSubscriber,
          IllegalSubscriber,
          IllegalEquipment,
          UnknownAlphabet,
          USSD-Busy}
```

```
RegisterPassword ::= OPERATION                                          --Timer ml
     ARGUMENT
          ss-Code                         SS-Code
     RESULT
          newPassword                     Password
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          CallBarred,
          SS-SubscriptionViolation,
          PW-RegistrationFailure,
          NegativePW-Check,
          NumberOfPW-AttemptsViolation}
     LINKED {
          GetPassword}
```

```
GetPassword ::= OPERATION                                               --Timer m
     ARGUMENT
          guidanceInfo                    GuidanceInfo
     RESULT
          currentPassword                 Password
```

```
SS-InvocationNotification ::= OPERATION                                 --Timer m
     ARGUMENT
          ss-InvocationNotificationArg         SS-InvocationNotificationArg
     RESULT
          ss-InvocationNotificationRes         SS-InvocationNotificationRes
          -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
RegisterCC-Entry ::= OPERATION                                          --Timer m
     ARGUMENT
          registerCC-EntryArg             RegisterCC-EntryArg
     RESULT
          registerCC-EntryRes             RegisterCC-EntryRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus,
          SS-Incompatibility,
          ShortTermDenial,
          LongTermDenial,
          FacilityNotSupported}
```

```
EraseCC-Entry ::= OPERATION                                             --Timer m
     ARGUMENT
          eraseCC-EntryArg                EraseCC-EntryArg
     RESULT
          eraseCC-EntryRes                EraseCC-EntryRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus}
```

```
END
```

17.6.5 Short message service operations

```
MAP-ShortMessageServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ShortMessageServiceOperations (9)
   version7 (7)}

DEFINITIONS

::=
```

```
BEGIN

EXPORTS
   SendRoutingInfoForSM,
   MO-ForwardSM,
   MT-ForwardSM,
   ReportSM-DeliveryStatus,
   AlertServiceCentre,
   InformServiceCentre,
   ReadyForSM
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   UnidentifiedSubscriber,
   IllegalSubscriber,
   IllegalEquipment,
   TeleserviceNotProvisioned,
   CallBarred,
   SubscriberBusyForMT-SMS,
   SM-DeliveryFailure,
   MessageWaitingListFull,
   AbsentSubscriberSM
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}

   RoutingInfoForSM-Arg,
   RoutingInfoForSM-Res,
   MO-ForwardSM-Arg,
   MO-ForwardSM-Res,
   MT-ForwardSM-Arg,
   MT-ForwardSM-Res,
   ReportSM-DeliveryStatusArg,
   ReportSM-DeliveryStatusRes,
   AlertServiceCentreArg,
   InformServiceCentreArg,
   ReadyForSM-Arg,
   ReadyForSM-Res
FROM MAP-SM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SM-DataTypes (16) version7 (7)}



;
```

```
SendRoutingInfoForSM ::= OPERATION                                    --Timer m
     ARGUMENT
          routingInfoForSM-Arg           RoutingInfoForSM-Arg
     RESULT
          routingInfoForSM-Res           RoutingInfoForSM-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnknownSubscriber,
          TeleserviceNotProvisioned,
          CallBarred,
          AbsentSubscriberSM}
```

```
MO-ForwardSM ::= OPERATION                                          --Timer ml
     ARGUMENT
          mo-forwardSM-Arg               MO-ForwardSM-Arg
     RESULT
          mo-forwardSM-Res               MO-ForwardSM-Res
          -- optional
     ERRORS {
          SystemFailure,
          UnexpectedDataValue,
          FacilityNotSupported,
          SM-DeliveryFailure}
```

```
MT-ForwardSM ::= OPERATION                                          --Timer ml
     ARGUMENT
          mt-forwardSM-Arg               MT-ForwardSM-Arg
     RESULT
          mt-forwardSM-Res               MT-ForwardSM-Res
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnidentifiedSubscriber,
          IllegalSubscriber,
          IllegalEquipment,
          SubscriberBusyForMT-SMS,
          SM-DeliveryFailure,
          AbsentSubscriberSM}
```

```
ReportSM-DeliveryStatus ::= OPERATION              --Timer s
     ARGUMENT
          reportSM-DeliveryStatusArg     ReportSM-DeliveryStatusArg
     RESULT
          reportSM-DeliveryStatusRes     ReportSM-DeliveryStatusRes
          -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber,
          MessageWaitingListFull}
```

```
AlertServiceCentre ::= OPERATION                                    --Timer s
     ARGUMENT
          alertServiceCentreArg          AlertServiceCentreArg
     RESULT
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue}
```

```
InformServiceCentre ::= OPERATION                                   --Timer s
     ARGUMENT
          informServiceCentreArg         InformServiceCentreArg
```

```
ReadyForSM ::= OPERATION                                            --Timer m
     ARGUMENT
          readyForSM-Arg                 ReadyForSM-Arg
     RESULT
          readyForSM-Res                 ReadyForSM-Res
          -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnknownSubscriber}
```

```
END
```

17.6.6 Errors

```
MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}

DEFINITIONS

::=

BEGIN

EXPORTS

   -- generic errors
   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   IncompatibleTerminal,
   ResourceLimitation,

   -- identification and numbering errors
   UnknownSubscriber,
   NumberChanged,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,

   -- subscription errors
   RoamingNotAllowed,
   IllegalSubscriber,
   IllegalEquipment,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,

   -- handover errors
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,
   TargetCellOutsideGroupCallArea,

   -- operation and maintenance errors
   TracingBufferFull,

   -- call handling errors
   OR-NotAllowed,
   NoRoamingNumberAvailable,
   BusySubscriber,
   NoSubscriberReply,
   AbsentSubscriber,
   CallBarred,
   ForwardingViolation,
   ForwardingFailed,
   CUG-Reject,

   -- any time interrogation errors
   ATI-NotAllowed,

   -- any time information handling errors
   ATSI-NotAllowed,
   ATM-NotAllowed,
   InformationNotAvailable,

   -- supplementary service errors
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-SubscriptionViolation,
   SS-Incompatibility,
   UnknownAlphabet,
   USSD-Busy,
   PW-RegistrationFailure,
   NegativePW-Check,
   NumberOfPW-AttemptsViolation,
   ShortTermDenial,
   LongTermDenial,

   -- short message service errors
   SubscriberBusyForMT-SMS,
   SM-DeliveryFailure,
   MessageWaitingListFull,
```

```
   AbsentSubscriberSM,

   -- Group Call errors
   NoGroupCallNumberAvailable,

   -- location service errors
   UnauthorizedRequestingNetwork,
   UnauthorizedLCSClient,
   PositionMethodFailure,
   UnknownOrUnreachableLCSClient,

   -- Mobility Management errors
   MM-EventNotSupported,

   -- Secure transport errors
   SecureTransportError


;

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

   SS-Status
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version7 (7)}

   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   RoamingNotAllowedParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   OR-NotAllowedParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   CallBarredParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   CUG-RejectParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam,
   UnauthorizedRequestingNetwork-Param,
   UnauthorizedLCSClient-Param,
   PositionMethodFailure-Param,
   UnknownOrUnreachableLCSClient-Param,
   MM-EventNotSupported-Param,
   ATSI-NotAllowedParam,
   ATM-NotAllowedParam,
   IllegalSS-OperationParam,
   SS-NotAvailableParam,
   SS-SubscriptionViolationParam,
   InformationNotAvailableParam,
   TargetCellOutsideGCA-Param,
   SecureTransportErrorParam
```

```
FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version7 (7)}
;


-- generic errors

SystemFailure ::= ERROR
     PARAMETER
          systemFailureParam              SystemFailureParam
          -- optional

DataMissing ::= ERROR
     PARAMETER
          dataMissingParam                DataMissingParam
          -- optional
          -- dataMissingParam must not be used in version <3

UnexpectedDataValue ::= ERROR
     PARAMETER
          unexpectedDataParam             UnexpectedDataParam
          -- optional
          -- unexpectedDataParam must not be used in version <3

FacilityNotSupported ::= ERROR
     PARAMETER
          facilityNotSupParam             FacilityNotSupParam
          -- optional
          -- facilityNotSupParam must not be used in version <3

IncompatibleTerminal ::= ERROR
     PARAMETER
          incompatibleTerminalParam       IncompatibleTerminalParam
          -- optional

ResourceLimitation ::= ERROR
     PARAMETER
          resourceLimitationParam         ResourceLimitationParam
          -- optional

-- identification and numbering errors

UnknownSubscriber ::= ERROR
     PARAMETER
          unknownSubscriberParam          UnknownSubscriberParam
          -- optional
          -- unknownSubscriberParam must not be used in version <3

NumberChanged ::= ERROR
     PARAMETER
          numberChangedParam              NumberChangedParam
          -- optional

UnknownMSC ::= ERROR

UnidentifiedSubscriber ::= ERROR
     PARAMETER
          unidentifiedSubParam            UnidentifiedSubParam
          -- optional
          -- unidentifiedSubParam must not be used in version <3

UnknownEquipment ::= ERROR


-- subscription errors

RoamingNotAllowed ::= ERROR
     PARAMETER
          roamingNotAllowedParam          RoamingNotAllowedParam

IllegalSubscriber ::= ERROR
     PARAMETER
          illegalSubscriberParam          IllegalSubscriberParam
```

```
        -- optional
        -- illegalSubscriberParam must not be used in version <3
```

```
IllegalEquipment ::= ERROR
    PARAMETER
        illegalEquipmentParam           IllegalEquipmentParam
        -- optional
        -- illegalEquipmentParam must not be used in version <3
```

```
BearerServiceNotProvisioned ::= ERROR
    PARAMETER
        bearerServNotProvParam          BearerServNotProvParam
        -- optional
        -- bearerServNotProvParam must not be used in version <3
```

```
TeleserviceNotProvisioned ::= ERROR
    PARAMETER
        teleservNotProvParam            TeleservNotProvParam
        -- optional
        -- teleservNotProvParam must not be used in version <3
```

```
-- handover errors
```

```
NoHandoverNumberAvailable ::= ERROR
```

```
SubsequentHandoverFailure ::= ERROR
```

```
TargetCellOutsideGroupCallArea ::= ERROR
    PARAMETER
        targetCellOutsideGCA-Param      TargetCellOutsideGCA-Param
        -- optional
```

```
-- operation and maintenance errors
```

```
TracingBufferFull ::= ERROR
    PARAMETER
        tracingBufferFullParam          TracingBufferFullParam
        -- optional
```

```
-- call handling errors
```

```
NoRoamingNumberAvailable ::= ERROR
    PARAMETER
        noRoamingNbParam                NoRoamingNbParam
        -- optional
```

```
AbsentSubscriber ::= ERROR
    PARAMETER
        absentSubscriberParam           AbsentSubscriberParam
        -- optional
        -- absentSubscriberParam must not be used in version <3
```

```
BusySubscriber ::= ERROR
    PARAMETER
        busySubscriberParam             BusySubscriberParam
        -- optional
```

```
NoSubscriberReply ::= ERROR
    PARAMETER
        noSubscriberReplyParam          NoSubscriberReplyParam
        -- optional
```

```
CallBarred ::= ERROR
    PARAMETER
        callBarredParam                 CallBarredParam
        -- optional
```

```
ForwardingViolation ::= ERROR
    PARAMETER
        forwardingViolationParam        ForwardingViolationParam
        -- optional
```

```
ForwardingFailed ::= ERROR
     PARAMETER
          forwardingFailedParam          ForwardingFailedParam
          -- optional
```

```
CUG-Reject ::= ERROR
     PARAMETER
          cug-RejectParam                CUG-RejectParam
          -- optional
```

```
OR-NotAllowed ::= ERROR
     PARAMETER
          or-NotAllowedParam             OR-NotAllowedParam
          -- optional
```

```
-- any time interrogation errors
ATI-NotAllowed ::= ERROR
     PARAMETER
          ati-NotAllowedParam            ATI-NotAllowedParam
          -- optional
```

```
-- any time information handling errors
ATSI-NotAllowed ::= ERROR
     PARAMETER
          atsi-NotAllowedParam           ATSI-NotAllowedParam
          -- optional
```

```
ATM-NotAllowed ::= ERROR
     PARAMETER
          atm-NotAllowedParam            ATM-NotAllowedParam
          -- optional
```

```
InformationNotAvailable ::= ERROR
     PARAMETER
          informationNotAvailableParam   InformationNotAvailableParam
          -- optional
```

```
-- supplementary service errors
```

```
IllegalSS-Operation ::= ERROR
     PARAMETER
          illegalSS-OperationParam       IllegalSS-OperationParam
          -- optional
          -- illegalSS-OperationParam must not be used in version <3
```

```
SS-ErrorStatus ::= ERROR
     PARAMETER
          ss-Status                      SS-Status
          -- optional
```

```
SS-NotAvailable ::= ERROR
     PARAMETER
          ss-NotAvailableParam           SS-NotAvailableParam
          -- optional
          -- ss-NotAvailableParam must not be used in version <3
```

```
SS-SubscriptionViolation ::= ERROR
     PARAMETER
          ss-SubscriptionViolationParam  SS-SubscriptionViolationParam
          -- optional
          -- ss-NotAvailableParam must not be used in version <3
```

```
SS-Incompatibility ::= ERROR
     PARAMETER
          ss-IncompatibilityCause        SS-IncompatibilityCause
          -- optional
```

```
UnknownAlphabet ::= ERROR
```

```
USSD-Busy ::= ERROR
```

```
PW-RegistrationFailure ::= ERROR
     PARAMETER
          pw-RegistrationFailureCause     PW-RegistrationFailureCause
```

```
NegativePW-Check ::= ERROR
```

```
NumberOfPW-AttemptsViolation ::= ERROR
```

```
ShortTermDenial ::= ERROR
     PARAMETER
          shortTermDenialParam                ShortTermDenialParam
          -- optional
```

```
LongTermDenial ::= ERROR
     PARAMETER
          longTermDenialParam                 LongTermDenialParam
          -- optional
```

-- short message service errors

```
SubscriberBusyForMT-SMS ::= ERROR
     PARAMETER
          subBusyForMT-SMS-Param          SubBusyForMT-SMS-Param
          -- optional
```

```
SM-DeliveryFailure ::= ERROR
     PARAMETER
          sm-DeliveryFailureCause         SM-DeliveryFailureCause
```

```
MessageWaitingListFull ::= ERROR
     PARAMETER
          messageWaitListFullParam        MessageWaitListFullParam
          -- optional
```

```
AbsentSubscriberSM ::= ERROR
     PARAMETER
          absentSubscriberSM-Param        AbsentSubscriberSM-Param
          -- optional
```

-- Group Call errors

```
NoGroupCallNumberAvailable ::= ERROR
     PARAMETER
          noGroupCallNbParam              NoGroupCallNbParam
          -- optional
```

-- location service errors

```
UnauthorizedRequestingNetwork ::= ERROR
     PARAMETER
          unauthorizedRequestingNetwork-Param  UnauthorizedRequestingNetwork-Param
          -- optional
```

```
UnauthorizedLCSClient ::= ERROR
     PARAMETER
          unauthorizedLCSClient-Param     UnauthorizedLCSClient-Param
          -- optional
```

```
PositionMethodFailure ::= ERROR
     PARAMETER
          positionMethodFailure-Param     PositionMethodFailure-Param
          -- optional
```

```
UnknownOrUnreachableLCSClient ::= ERROR
     PARAMETER
          unknownOrUnreachableLCSClient-Param   UnknownOrUnreachableLCSClient-Param
          -- optional
```

```
MM-EventNotSupported ::= ERROR
     PARAMETER
          mm-EventNotSupported-Param      MM-EventNotSupported-Param
          -- optional
```

-- Secure transport errors

```
SecureTransportError ::= ERROR
    PARAMETER
        secureTransportErrorParam       SecureTransportErrorParam
```

```
END
```

17.6.7 Group Call operations

```
MAP-Group-Call-Operations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Group-Call-Operations (22)
   version7 (7)}

DEFINITIONS

::=

BEGIN

EXPORTS
   PrepareGroupCall,
   SendGroupCallEndSignal,
   ForwardGroupCallSignalling,
   ProcessGroupCallSignalling
;

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

   SystemFailure,
   UnexpectedDataValue,
   NoGroupCallNumberAvailable
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}

   PrepareGroupCallArg,
   PrepareGroupCallRes,
   SendGroupCallEndSignalArg,
   SendGroupCallEndSignalRes,
   ForwardGroupCallSignallingArg,
   ProcessGroupCallSignallingArg
FROM MAP-GR-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-GR-DataTypes (23) version7 (7)}



;
```

```
PrepareGroupCall ::= OPERATION                                          --Timer m
    ARGUMENT
        prepareGroupCallArg             PrepareGroupCallArg
    RESULT
        prepareGroupCallRes             PrepareGroupCallRes
    ERRORS {
        SystemFailure,
        NoGroupCallNumberAvailable,
        UnexpectedDataValue}
```

```
SendGroupCallEndSignal ::= OPERATION                                    --Timer l
    ARGUMENT
        sendGroupCallEndSignalArg       SendGroupCallEndSignalArg
    RESULT
        sendGroupCallEndSignalRes       SendGroupCallEndSignalRes
```

```
ProcessGroupCallSignalling ::= OPERATION                                --Timer s
    ARGUMENT
        processGroupCallSignallingArg   ProcessGroupCallSignallingArg
```

```
ForwardGroupCallSignalling ::= OPERATION                                    --Timer s
    ARGUMENT
        forwardGroupCallSignallingArg   ForwardGroupCallSignallingArg

END
```

17.6.8 Location service operations

```
MAP-LocationServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LocationServiceOperations (24)
   version7 (7)}

DEFINITIONS

::=

BEGIN

EXPORTS
   ProvideSubscriberLocation,
   SendRoutingInfoForLCS,
   SubscriberLocationReport
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   AbsentSubscriber,
   UnauthorizedRequestingNetwork,
   UnauthorizedLCSClient,
   PositionMethodFailure,
   ResourceLimitation,
   UnknownOrUnreachableLCSClient,
   UnidentifiedSubscriber,
   IllegalEquipment,
   IllegalSubscriber
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}

   RoutingInfoForLCS-Arg,
   RoutingInfoForLCS-Res,
   ProvideSubscriberLocation-Arg,
   ProvideSubscriberLocation-Res,
   SubscriberLocationReport-Arg,
   SubscriberLocationReport-Res
FROM MAP-LCS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LCS-DataTypes (25) version7 (7)}
;

SendRoutingInfoForLCS ::= OPERATION                                         --Timer m
    ARGUMENT
        routingInfoForLCS-Arg           RoutingInfoForLCS-Arg
    RESULT
        routingInfoForLCS-Res           RoutingInfoForLCS-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        FacilityNotSupported,
        UnknownSubscriber,
        AbsentSubscriber,
        UnauthorizedRequestingNetwork }

```

```
ProvideSubscriberLocation ::= OPERATION                                    --Timer ml
     ARGUMENT
          provideSubscriberLocation-Arg   ProvideSubscriberLocation-Arg
     RESULT
          provideSubscriberLocation-Res   ProvideSubscriberLocation-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnidentifiedSubscriber,
          IllegalSubscriber,
          IllegalEquipment,
          AbsentSubscriber,
          UnauthorizedRequestingNetwork,
          UnauthorizedLCSClient,
          PositionMethodFailure }

SubscriberLocationReport ::= OPERATION                                     --Timer m
     ARGUMENT
          subscriberLocationReport-Arg    SubscriberLocationReport-Arg
     RESULT
          subscriberLocationReport-Res    SubscriberLocationReport-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          ResourceLimitation,
          UnexpectedDataValue,
          UnknownSubscriber,
          UnauthorizedRequestingNetwork,
          UnknownOrUnreachableLCSClient}


END
```

17.6.9 Secure transport operations

```
MAP-SecureTransportOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SecureTransportOperations (26)
   version7 (7)}

DEFINITIONS

::=

BEGIN

EXPORTS
   SecureTransportClass1,
   SecureTransportClass2,
   SecureTransportClass3,
   SecureTransportClass4
;

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

   DataMissing,
   SecureTransportError,
   UnexpectedDataValue

FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version7 (7)}

   SecureTransportArg,
   SecureTransportRes

FROM MAP-ST-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ST-DataTypes (27) version7 (7)}
;
```

```
SecureTransportClass1 ::= OPERATION                --Timer shall be the same as for the
                                                   --securely transported operation
    ARGUMENT
         secureTransportArg             SecureTransportArg
    RESULT
         secureTransportRes             SecureTransportRes
    ERRORS {
         SecureTransportError,
         DataMissing,
         UnexpectedDataValue}
```

```
SecureTransportClass2 ::= OPERATION                --Timer shall be the same as for the
                                                   --securely transported operation
    ARGUMENT
         secureTransportArg             SecureTransportArg
    ERRORS {
         SecureTransportError,
         DataMissing,
         UnexpectedDataValue}
```

```
SecureTransportClass3 ::= OPERATION                --Timer shall be the same as for the
                                                   --securely transported operation
    ARGUMENT
         secureTransportArg             SecureTransportArg
    RESULT
         secureTransportRes             SecureTransportRes
```

```
SecureTransportClass4 ::= OPERATION                --Timer shall be the same as for the
                                                   --securely transported operation
    ARGUMENT
         secureTransportArg             SecureTransportArg
```

```
END
```

17.7 MAP constants and data types

17.7.1 Mobile Service data types

```
MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- location registration types
   UpdateLocationArg,
   UpdateLocationRes,
   CancelLocationArg,
   CancelLocationRes,
   PurgeMS-Arg,
   PurgeMS-Res,
   SendIdentificationArg,
   SendIdentificationRes,
   UpdateGprsLocationArg,
   UpdateGprsLocationRes,
   IST-SupportIndicator,
   SupportedLCS-CapabilitySets,

   -- gprs location registration types
   GSN-Address,

   -- handover types
   ForwardAccessSignalling-Arg,
   PrepareHO-Arg,
```

```
    PrepareHO-Res,
    PrepareSubsequentHO-Arg,
    PrepareSubsequentHO-Res,
    ProcessAccessSignalling-Arg,
    SendEndSignal-Arg,
    SendEndSignal-Res,


    -- authentication management types
    SendAuthenticationInfoArg,
    SendAuthenticationInfoRes,
    AuthenticationFailureReportArg,
    AuthenticationFailureReportRes,

    -- security management types
    EquipmentStatus,
    Kc,

    -- subscriber management types
    InsertSubscriberDataArg,
    InsertSubscriberDataRes,
    LSAIdentity,
    DeleteSubscriberDataArg,
    DeleteSubscriberDataRes,
    Ext-QoS-Subscribed,
    SubscriberData,
    ODB-Data,
    SubscriberStatus,
    ZoneCodeList,
    maxNumOfZoneCodes,
    O-CSI,
    D-CSI,
    O-BcsmCamelTDPCriteriaList,
    T-BCSM-CAMEL-TDP-CriteriaList,
    SS-CSI,
    ServiceKey,
    DefaultCallHandling,
    CamelCapabilityHandling,
    BasicServiceCriteria,
    SupportedCamelPhases,
    maxNumOfCamelTDPData,
    CUG-Index,
    CUG-Interlock,
    InterCUG-Restrictions,
    IntraCUG-Options,
    NotificationToMSUser,
    QoS-Subscribed,
    IST-AlertTimerValue,
    T-CSI,
    T-BcsmTriggerDetectionPoint,
    APN,

    -- fault recovery types
    ResetArg,
    RestoreDataArg,
    RestoreDataRes,

-- provide subscriber info types
    GeographicalInformation,


    -- subscriber information enquiry types
    ProvideSubscriberInfoArg,
    ProvideSubscriberInfoRes,
    SubscriberInfo,
    LocationInformation,
    LocationInformationGPRS,
    RAIdentity,
    SubscriberState,
    GPRSChargingID,

    -- any time information enquiry types
    AnyTimeInterrogationArg,
    AnyTimeInterrogationRes,

    -- any time information handling types
    AnyTimeSubscriptionInterrogationArg,
    AnyTimeSubscriptionInterrogationRes,
    AnyTimeModificationArg,
```

```
   AnyTimeModificationRes,

   -- subscriber data modification notification types
   NoteSubscriberDataModifiedArg,
   NoteSubscriberDataModifiedRes,

   -- gprs location information retrieval types
   SendRoutingInfoForGprsArg,
   SendRoutingInfoForGprsRes,

   -- failure reporting types
   FailureReportArg,
   FailureReportRes,

   -- gprs notification types
   NoteMsPresentForGprsArg,
   NoteMsPresentForGprsRes,

   -- Mobility Management types
   NoteMM-EventArg,
   NoteMM-EventRes



;

IMPORTS
   maxNumOfSS,
   SS-SubscriptionOption,
   SS-List,
   SS-ForBS-Code,
   Password
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version7 (7)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version7 (7)}

   Ext-BearerServiceCode
FROM MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version7 (7)}

   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version7 (7)}


   AddressString,
   ISDN-AddressString,
   ISDN-SubaddressString,
   FTN-AddressString,
   AccessNetworkSignalInfo,
   IMSI,
   TMSI,
   HLR-List,
   LMSI,
   Identity,
   GlobalCellId,
   CellGlobalIdOrServiceAreaIdOrLAI,
   Ext-BasicServiceCode,
   NAEA-PreferredCI,
   EMLPP-Info,
   MC-SS-Info,
   SubscriberIdentity,
   AgeOfLocationInformation,
   LCSClientExternalID,
   LCSClientInternalID,
   Ext-SS-Status



FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}
```

```
   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}

   AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version7 (7)}


;


-- location registration types

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,
     informPreviousNetworkEntity       [11] NULL                         OPTIONAL }

VLR-Capability ::= SEQUENCE{
     supportedCamelPhases              [0] SupportedCamelPhases          OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ... ,
     solsaSupportIndicator             [2] NULL                          OPTIONAL,
     istSupportIndicator               [1] IST-SupportIndicator          OPTIONAL,
     superChargerSupportedInServingNetworkEntity   [3] SuperChargerInfo  OPTIONAL,
     longFTN-Supported                 [4]  NULL                         OPTIONAL,
     supportedLCS-CapabilitySets       [5]  SupportedLCS-CapabilitySets  OPTIONAL }

SuperChargerInfo ::= CHOICE {
     sendSubscriberData                [0] NULL,
     subscriberDataStored              [1] AgeIndicator }

AgeIndicator ::= OCTET STRING (SIZE (1..6))
     -- The internal structure of this parameter is implementation specific.


IST-SupportIndicator ::=  ENUMERATED {
     basicISTSupported                 (0),
     istCommandSupported               (1),
     ...}
-- exception handling:
-- reception of values > 1 shall be mapped to ' istCommandSupported '

SupportedLCS-CapabilitySets ::= BIT STRING {
     lcsCapabilitySet1 (0),
     lcsCapabilitySet2 (1) } (SIZE (2..16))
-- Core network signalling capability set1 indicates LCS Release98 or Release99 version.
-- Core network signalling capability set2 indicates LCS Release4 or later version.
-- A node shall mark in the BIT STRING all LCS capability sets it supports.
-- If no bit is set then the sending node does not support LCS.
-- If the parameter is not sent by an VLR then the VLR may support at most capability set1.
-- If the parameter is not sent by an SGSN then no support for LCS is assumed.
-- An SGSN is not allowed to indicate support of capability set1.
-- Other bits than listed above shall be discarded.

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
```

```
CancelLocationRes ::= SEQUENCE {
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}
```

```
PurgeMS-Arg ::= [3] SEQUENCE {
     imsi                               IMSI,
     vlr-Number                         [0] ISDN-AddressString          OPTIONAL,
     sgsn-Number                        [1]  ISDN-AddressString         OPTIONAL,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}
```

```
PurgeMS-Res ::= SEQUENCE {
     freezeTMSI                         [0]  NULL                       OPTIONAL,
     freezeP-TMSI                       [1]  NULL                       OPTIONAL,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}
```

```
SendIdentificationArg ::= SEQUENCE {
     tmsi                               TMSI,
     numberOfRequestedVectors           NumberOfRequestedVectors        OPTIONAL,
     -- if segmentation is used, numberOfRequestedVectors shall be present in
     -- the first segment and shall not be present in subsequent segments. If received
     -- in a subsequent segment it shall be discarded.
     segmentationProhibited             NULL                            OPTIONAL,
     -- if segmentation is prohibited the previous VLR shall not send the result
     -- within a TC-CONTINUE message.
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}
```

```
SendIdentificationRes ::= [3] SEQUENCE {
     imsi                               IMSI                            OPTIONAL,
     -- IMSI must be present if SendIdentificationRes is not segmented.
     -- If the TC-Continue segmentation option is taken the IMSI must be
     -- present in one segmented transmission of SendIdentificationRes.
     authenticationSetList              AuthenticationSetList           OPTIONAL,
     currentSecurityContext             [2]CurrentSecurityContext       OPTIONAL,
     extensionContainer                 [3] ExtensionContainer          OPTIONAL,
     ...}
```

```
-- authentication management types
```

```
AuthenticationSetList ::= CHOICE {
     tripletList                        [0] TripletList,
     quintupletList                     [1] QuintupletList }
```

```
TripletList ::= SEQUENCE SIZE (1..5) OF
                                        AuthenticationTriplet
```

```
QuintupletList ::= SEQUENCE SIZE (1..5) OF
                                        AuthenticationQuintuplet
```

```
AuthenticationTriplet ::= SEQUENCE {
     rand                               RAND,
     sres                               SRES,
     kc                                 Kc,
     ...}
```

```
AuthenticationQuintuplet ::= SEQUENCE {
     rand                               RAND,
     xres                               XRES,
     ck                                 CK,
     ik                                 IK,
     autn                               AUTN,
     ...}
```

```
CurrentSecurityContext ::= CHOICE {
     gsm-SecurityContextData            [0] GSM-SecurityContextData,
     umts-SecurityContextData           [1] UMTS-SecurityContextData }
```

```
GSM-SecurityContextData ::= SEQUENCE {
     kc                                  Kc,
     cksn                                Cksn,
     ... }
```

```
UMTS-SecurityContextData ::= SEQUENCE {
     ck                                  CK,
     ik                                  IK,
     ksi                                 KSI,
     ... }
```

```
RAND ::= OCTET STRING (SIZE (16))
```

```
SRES ::= OCTET STRING (SIZE (4))
```

```
Kc ::= OCTET STRING (SIZE (8))
```

```
XRES ::= OCTET STRING (SIZE (4..16))
```

```
CK ::= OCTET STRING (SIZE (16))
```

```
IK ::= OCTET STRING (SIZE (16))
```

```
AUTN ::= OCTET STRING (SIZE (16))
```

```
AUTS ::= OCTET STRING (SIZE (14))
```

```
Cksn ::= OCTET STRING (SIZE (1))
     -- The internal structure is defined in 3G TS 24.008
```

```
KSI ::= OCTET STRING (SIZE (1))
     -- The internal structure is defined in 3G TS 24.008
```

```
AuthenticationFailureReportArg ::= SEQUENCE {
     imsi                                IMSI,
     failureCause                        FailureCause,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ... ,
     re-attempt                          BOOLEAN                         OPTIONAL,
     accessType                          AccessType                      OPTIONAL,
     rand                                RAND                            OPTIONAL,
     vlr-Number                          [0] ISDN-AddressString          OPTIONAL,
     sgsn-Number                         [1] ISDN-AddressString          OPTIONAL }
```

```
AccessType ::= ENUMERATED {
     call (0),
     emergencyCall (1),
     locationUpdating (2),
     supplementaryService (3),
     shortMessage (4),
     gprsAttach (5),
     routingAreaUpdating (6),
     serviceRequest (7),
     pdpContextActivation (8),
     pdpContextDeactivation (9),
     ...}
     -- exception handling:
     -- received values greater than 9 shall be ignored.
```

```
AuthenticationFailureReportRes ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
FailureCause ::= ENUMERATED {
     wrongUserResponse  (0),
     wrongNetworkSignature  (1)}
```

```
-- gprs location registration types
```

```
UpdateGprsLocationArg ::= SEQUENCE {
     imsi                                IMSI,
     sgsn-Number                         ISDN-AddressString,
     sgsn-Address                        GSN-Address,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ... ,
     sgsn-Capability                     [0] SGSN-Capability               OPTIONAL,
     informPreviousNetworkEntity         [1]  NULL                         OPTIONAL }
```

```
SGSN-Capability ::= SEQUENCE{
     solsaSupportIndicator               NULL                              OPTIONAL,
     extensionContainer                  [1] ExtensionContainer            OPTIONAL,
     ... ,
     superChargerSupportedInServingNetworkEntity   [2] SuperChargerInfo    OPTIONAL ,
     gprsEnhancementsSupportIndicator    [3] NULL                          OPTIONAL,
     supportedCamelPhases                [4] SupportedCamelPhases          OPTIONAL,
     supportedLCS-CapabilitySets         [5]  SupportedLCS-CapabilitySets  OPTIONAL }
```

```
GSN-Address ::= OCTET STRING (SIZE (5..17))
     -- Octets are coded according to TS 3GPP TS 23.003 [17]
```

```
UpdateGprsLocationRes ::= SEQUENCE {
     hlr-Number                          ISDN-AddressString,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

-- handover types

```
ForwardAccessSignalling-Arg ::= [3] SEQUENCE {
     an-APDU                             AccessNetworkSignalInfo,
     integrityProtectionInfo             [0] IntegrityProtectionInformation  OPTIONAL,
     encryptionInfo                      [1] EncryptionInformation           OPTIONAL,
     keyStatus                           [2]  KeyStatus                    OPTIONAL,
     allowedGSM-Algorithms               [4]  AllowedGSM-Algorithms        OPTIONAL,
     allowedUMTS-Algorithms              [5]  AllowedUMTS-Algorithms       OPTIONAL,
     radioResourceInformation            [6] RadioResourceInformation      OPTIONAL,
     extensionContainer                  [3]  ExtensionContainer           OPTIONAL,
     ...}
```

```
AllowedGSM-Algorithms ::= OCTET STRING (SIZE (1))
     -- internal structure is coded as Algorithm identifier octet from
     -- Permitted Algorithms defined in 3G TS 48.008
     -- A node shall mark all GSM algorithms that are allowed in MSC-B
```

```
AllowedUMTS-Algorithms ::= SEQUENCE {
     integrityProtectionAlgorithms       [0]  PermittedIntegrityProtectionAlgorithms
     OPTIONAL,
     encryptionAlgorithms                [1]  PermittedEncryptionAlgorithms  OPTIONAL,
     extensionContainer                  [2]  ExtensionContainer           OPTIONAL,
     ...}
```

```
PermittedIntegrityProtectionAlgorithms ::=
          OCTET STRING (SIZE (1..maxPermittedIntegrityProtectionAlgorithmsLength))
     -- Octets are coded according to Permitted Integrity Protection Algorithms in Integrity
     -- Protection Information information element in 3G TS 25.413
```

```
maxPermittedIntegrityProtectionAlgorithmsLength INTEGER ::= 9
```

```
PermittedEncryptionAlgorithms ::=
          OCTET STRING (SIZE (1..maxPermittedEncryptionAlgorithmsLength))
     -- Octets are coded according to Permitted Encryption Algorithms in Encryption
     -- Information information element in 3G TS 25.413
```

```
maxPermittedEncryptionAlgorithmsLength INTEGER ::= 9
```

```
KeyStatus ::= ENUMERATED {
     old  (0),
     new  (1),
     ...}
     -- exception handling:
     -- received values in range 2-31 shall be treated as "old"
     -- received values greater than 31 shall be treated as "new"
```

```
PrepareHO-Arg ::= [3] SEQUENCE {
     targetCellId                        [0] GlobalCellId                    OPTIONAL,
     ho-NumberNotRequired                NULL                                OPTIONAL,
     targetRNCId                         [1] RNCId                           OPTIONAL,
     an-APDU                             [2] AccessNetworkSignalInfo         OPTIONAL,
     multipleBearerRequested             [3] NULL                            OPTIONAL,
     imsi                                [4] IMSI                            OPTIONAL,
     integrityProtectionInfo             [5] IntegrityProtectionInformation  OPTIONAL,
     encryptionInfo                      [6] EncryptionInformation           OPTIONAL,
     radioResourceInformation            [7] RadioResourceInformation        OPTIONAL,
     allowedGSM-Algorithms               [9]  AllowedGSM-Algorithms          OPTIONAL,
     allowedUMTS-Algorithms              [10] AllowedUMTS-Algorithms         OPTIONAL,
     radioResourceList                   [11] RadioResourceList              OPTIONAL,
     extensionContainer                  [8] ExtensionContainer              OPTIONAL,
     ...}
```

```
RadioResourceList ::= SEQUENCE SIZE (2.. maxNumOfRadioResources) OF
                                         RadioResource
```

```
RadioResource ::= SEQUENCE {
     radioResourceInformation            RadioResourceInformation,
     rab-Id                              RAB-Id,
     -- RAB Identity is needed to relate the radio resources with the radio access bearers.
     ...}
```

```
maxNumOfRadioResources  INTEGER ::= 7
```

```
PrepareHO-Res ::= [3] SEQUENCE {
     handoverNumber                      [0] ISDN-AddressString              OPTIONAL,
     relocationNumberList                [1]  RelocationNumberList           OPTIONAL,
     an-APDU                             [2]  AccessNetworkSignalInfo        OPTIONAL,
     multicallBearerInfo                 [3]  MulticallBearerInfo            OPTIONAL,
     multipleBearerNotSupported          NULL                                OPTIONAL,
     selectedUMTS-Algorithms             [5]  SelectedUMTS-Algorithms        OPTIONAL,
     chosenRadioResourceInformation      [6] ChosenRadioResourceInformation OPTIONAL,
     extensionContainer                  [4]  ExtensionContainer             OPTIONAL,
     ...}
```

```
SelectedUMTS-Algorithms ::= SEQUENCE {
     integrityProtectionAlgorithm        [0]  ChosenIntegrityProtectionAlgorithm   OPTIONAL,
     encryptionAlgorithm                 [1]  ChosenEncryptionAlgorithm      OPTIONAL,
     extensionContainer                  [2]  ExtensionContainer             OPTIONAL,
     ...}
```

```
ChosenIntegrityProtectionAlgorithm ::= OCTET STRING (SIZE (1))
     -- Octet is coded according to 3G TS 25.413
```

```
ChosenEncryptionAlgorithm ::= OCTET STRING (SIZE (1))
     -- Octet is coded according to 3G TS 25.413
```

```
ChosenRadioResourceInformation ::= SEQUENCE {
     chosenChannelInfo                   [0] ChosenChannelInfo               OPTIONAL,
     chosenSpeechVersion                 [1] ChosenSpeechVersion             OPTIONAL,
     ...}
```

```
ChosenChannelInfo ::= OCTET STRING (SIZE (2))
     -- Octets are coded according the Chosen Channel information element in 3G TS 48.008
```

```
ChosenSpeechVersion ::= OCTET STRING (SIZE (2))
     -- Octets are coded according the Speech Version (chosen) information element in 3G TS
     -- 48.008
```

```
PrepareSubsequentHO-Arg ::= [3] SEQUENCE {
     targetCellId                        [0] GlobalCellId                    OPTIONAL,
     targetMSC-Number                    [1] ISDN-AddressString,
     targetRNCId                         [2] RNCId                           OPTIONAL,
     an-APDU                             [3]  AccessNetworkSignalInfo        OPTIONAL,
     selectedRab-Id                      [4]  RAB-Id                         OPTIONAL,
     extensionContainer                  [5]  ExtensionContainer             OPTIONAL,
     ...}
```

```
PrepareSubsequentHO-Res ::= [3] SEQUENCE {
    an-APDU                          AccessNetworkSignalInfo,
    extensionContainer               [0]  ExtensionContainer          OPTIONAL,
    ...}
```

```
ProcessAccessSignalling-Arg ::= [3] SEQUENCE {
    an-APDU                          AccessNetworkSignalInfo,
    selectedUMTS-Algorithms          [1]  SelectedUMTS-Algorithms     OPTIONAL,
    selectedGSM-Algorithm            [2]  SelectedGSM-Algorithm       OPTIONAL,
    chosenRadioResourceInformation   [3] ChosenRadioResourceInformation OPTIONAL,
    selectedRab-Id                   [4] RAB-Id                       OPTIONAL,
    extensionContainer               [0]  ExtensionContainer          OPTIONAL,
    ...}
```

```
SelectedGSM-Algorithm ::= OCTET STRING (SIZE (1))
    -- internal structure is coded as Algorithm identifier octet from Chosen Encryption
    -- Algorithm defined in 3G TS 48.008
    -- A node shall mark only the selected GSM algorithm
```

```
SendEndSignal-Arg ::= [3] SEQUENCE {
    an-APDU                          AccessNetworkSignalInfo,
    extensionContainer               [0]  ExtensionContainer          OPTIONAL,
    ...}
```

```
SendEndSignal-Res ::= SEQUENCE {
    extensionContainer               [0]  ExtensionContainer          OPTIONAL,
    ...}
```

```
RNCId ::= OCTET STRING (SIZE (7))
    -- Refers to the Target RNC-ID in the Target ID in 3G TS 25.413.
    -- The internal structure is defined as follows:
    -- PLMN-ID   3 octets
    -- LAC       2 octets
    -- RNC-ID    2 octets
```

```
RelocationNumberList ::= SEQUENCE SIZE (1..maxNumOfRelocationNumber) OF
                         RelocationNumber
```

```
MulticallBearerInfo ::= INTEGER (1..maxNumOfRelocationNumber)
```

```
RelocationNumber ::= SEQUENCE {
    handoverNumber                   ISDN-AddressString,
    rab-Id                           RAB-Id,
    -- RAB Identity is needed to relate the calls with the radio access bearers.
    ...}
```

```
RAB-Id ::= INTEGER (1..maxNrOfRABs)
```

```
maxNrOfRABs INTEGER ::= 255
```

```
maxNumOfRelocationNumber  INTEGER ::= 7
```

```
RadioResourceInformation ::= OCTET STRING (SIZE (5..15))
    -- Octets are coded according the Channel Type information element in 3G TS 48.008
```

```
IntegrityProtectionInformation ::= OCTET STRING (SIZE (18..maxNumOfIntegrityInfo))
    -- Octets are coded according to 3G TS 25.413
```

```
maxNumOfIntegrityInfo INTEGER ::= 100
```

```
EncryptionInformation ::= OCTET STRING (SIZE (18..maxNumOfEncryptionInfo))
    -- Octets are coded according to 3G TS 25.413
```

```
maxNumOfEncryptionInfo INTEGER ::= 100
```

```
-- authentication management types
```

```
SendAuthenticationInfoArg ::= SEQUENCE {
    imsi                                [0] IMSI,
    numberOfRequestedVectors            NumberOfRequestedVectors,
    segmentationProhibited              NULL                                OPTIONAL,
    -- if segmentation is prohibited the HLR shall not send the result within
    -- a TC-CONTINUE message.
    immediateResponsePreferred          [1] NULL                             OPTIONAL,
    -- if present, the HLR may send an immediate response with the available authentication
    -- vectors (see § 8.5.2 for more information).
    re-synchronisationInfo              Re-synchronisationInfo              OPTIONAL,
    extensionContainer                  [2] ExtensionContainer              OPTIONAL,
    ...,
    requestingNodeType                  [3] RequestingNodeType              OPTIONAL}
```

```
NumberOfRequestedVectors ::= INTEGER (1..5)
```

```
Re-synchronisationInfo ::= SEQUENCE {
    rand                                RAND,
    auts                                AUTS,
    ...}
```

```
SendAuthenticationInfoRes ::= [3] SEQUENCE {
    authenticationSetList               AuthenticationSetList               OPTIONAL,
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}
```

```
RequestingNodeType ::= ENUMERATED {
    vlr  (0),
    sgsn  (1),
    ...}
    -- exception handling:
    -- received values in the range 2-15 shall be treated as "vlr"
    -- received values greater than 15 shall be treated as "sgsn"
```

-- security management types

```
EquipmentStatus ::= ENUMERATED {
    whiteListed  (0),
    blackListed  (1),
    greyListed  (2)}
```

-- subscriber management types

```
InsertSubscriberDataArg ::= SEQUENCE {
    imsi                                [0] IMSI                            OPTIONAL,
    COMPONENTS OF                       SubscriberData,
    extensionContainer                  [14] ExtensionContainer             OPTIONAL,
    ... ,
    naea-PreferredCI                    [15] NAEA-PreferredCI               OPTIONAL,
    -- naea-PreferredCI is included at the discretion of the HLR operator.
    gprsSubscriptionData                [16] GPRSSubscriptionData           OPTIONAL,
    roamingRestrictedInSgsnDueToUnsupportedFeature [23]                     NULL
                                                                            OPTIONAL,
    networkAccessMode                   [24] NetworkAccessMode              OPTIONAL,
    lsaInformation                      [25] LSAInformation                 OPTIONAL,
    lmu-Indicator                       [21] NULL                           OPTIONAL,
    lcsInformation                      [22] LCSInformation                 OPTIONAL,
        istAlertTimer                   [26] IST-AlertTimerValue            OPTIONAL,
        superChargerSupportedInHLR      [27] AgeIndicator                   OPTIONAL,
        mc-SS-Info                      [28] MC-SS-Info                     OPTIONAL,
    cs-AllocationRetentionPriority      [29] CS-AllocationRetentionPriority   OPTIONAL,
    sgsn-CAMEL-SubscriptionInfo         [17] SGSN-CAMEL-SubscriptionInfo    OPTIONAL,
    chargingCharacteristics             [18] ChargingCharacteristics        OPTIONAL
 }
    -- If the Network Access Mode parameter is sent, it shall be present only in
    -- the first sequence if seqmentation is used
```

```
CS-AllocationRetentionPriority ::= OCTET STRING (SIZE (1))
    -- This data type encodes each priority level defined in TS 23.107 as the binary value
    -- of the priority level.
```

```
IST-AlertTimerValue ::= INTEGER (15..255)
```

```
LCSInformation ::= SEQUENCE {
    gmlc-List [0]                       GMLC-List OPTIONAL,
    lcs-PrivacyExceptionList            [1]  LCS-PrivacyExceptionList     OPTIONAL,
    molr-List                           [2]  MOLR-List                    OPTIONAL,
    ...}
```

```
GMLC-List ::= SEQUENCE SIZE (1..maxNumOfGMLC) OF
                                        ISDN-AddressString
    -- if segmentation is used, the complete GMLC-List shall be sent in one segment
```

```
maxNumOfGMLC  INTEGER ::= 5
```

```
NetworkAccessMode ::= ENUMERATED {
    bothMSCAndSGSN                      (0),
    onlyMSC                             (1),
    onlySGSN                            (2),
    ...}
    -- if unknown values are received in NetworkAccessMode
    -- they shall be discarded.
```

```
GPRSDataList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                        PDP-Context
```

```
maxNumOfPDP-Contexts  INTEGER ::= 50
```

```
PDP-Context ::= SEQUENCE {
    pdp-ContextId                       ContextId,
    pdp-Type                            [16] PDP-Type,
    pdp-Address                         [17] PDP-Address                  OPTIONAL,
    qos-Subscribed                      [18] QoS-Subscribed,
    vplmnAddressAllowed                 [19] NULL OPTIONAL,
    apn                                 [20] APN,
    extensionContainer                  [21] ExtensionContainer           OPTIONAL,
    ... ,
    ext-QoS-Subscribed                  [0] Ext-QoS-Subscribed            OPTIONAL,
    pdp-ChargingCharacteristics         [1] ChargingCharacteristics       OPTIONAL }
    -- qos-Subscribed shall be discarded if ext-QoS-Subscribed is received and supported
```

```
ContextId ::= INTEGER (1..maxNumOfPDP-Contexts)
```

```
GPRSSubscriptionData ::= SEQUENCE {
    completeDataListIncluded            NULL                              OPTIONAL,

        -- If segmentation is used, completeDataListIncluded may only be present in the
        -- first segment.
    gprsDataList                        [1]  GPRSDataList,
    extensionContainer                  [2] ExtensionContainer            OPTIONAL,
    ... }
```

```
SGSN-CAMEL-SubscriptionInfo ::= SEQUENCE {
    gprs-CSI                            [0]  GPRS-CSI                     OPTIONAL,
    mo-sms-CSI                          [1]  SMS-CSI                      OPTIONAL,
    extensionContainer                  [2]  ExtensionContainer           OPTIONAL,
    ...,
    mt-sms-CSI                          [3]  SMS-CSI                      OPTIONAL,
    mt-smsCAMELTDP-CriteriaList         [4]  MT-smsCAMELTDP-CriteriaList  OPTIONAL,
    mg-csi                              [5]  MG-CSI                       OPTIONAL
    }
```

```
GPRS-CSI ::= SEQUENCE {
    gprs-CamelTDPDataList               [0] GPRS-CamelTDPDataList         OPTIONAL,
    camelCapabilityHandling             [1] CamelCapabilityHandling       OPTIONAL,
    extensionContainer                  [2] ExtensionContainer            OPTIONAL,
    notificationToCSE                   [3]  NULL                         OPTIONAL,
    csi-Active                          [4]  NULL                         OPTIONAL,
    ...}
--   notificationToCSE and csi-Active shall not be present when GPRS-CSI is sent to SGSN.
--   They may only be included in ATSI/ATM ack/NSDC message.
--   GPRS-CamelTDPData and  camelCapabilityHandling shall be present in
--   the GPRS-CSI sequence.
--   If GPRS-CSI is segmented, gprs-CamelTDPDataList and camelCapabilityHandling shall be
--   present in the first segment
```

```
GPRS-CamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     GPRS-CamelTDPData
--   GPRS-CamelTDPDataList shall not contain more than one instance of
--   GPRS-CamelTDPData containing the same value for gprs-TriggerDetectionPoint.
```

```
GPRS-CamelTDPData ::= SEQUENCE {
     gprs-TriggerDetectionPoint          [0] GPRS-TriggerDetectionPoint,
     serviceKey                          [1] ServiceKey,
     gsmSCF-Address                      [2] ISDN-AddressString,
     defaultSessionHandling              [3] DefaultGPRS-Handling,
     extensionContainer                  [4] ExtensionContainer           OPTIONAL,
     ...
     }
```

```
DefaultGPRS-Handling ::= ENUMERATED {
     continueTransaction (0) ,
     releaseTransaction (1) ,
     ...}
-- exception handling:
-- reception of values in range 2-31 shall be treated as "continueTransaction"
-- reception of values greater than 31 shall be treated as "releaseTransaction"
```

```
GPRS-TriggerDetectionPoint ::= ENUMERATED {
     attach                                (1),
     attachChangeOfPosition                (2),
     pdp-ContextEstablishment              (11),
     pdp-ContextEstablishmentAcknowledgement  (12),
     pdp-ContextChangeOfPosition           (14),
     ... }
-- exception handling:
-- For GPRS-CamelTDPData sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- GPRS-CamelTDPDatasequence.
```

```
APN ::=  OCTET STRING (SIZE (2..63))
     -- Octets are coded according to TS 3GPP TS 23.003 [17]
```

```
PDP-Type ::= OCTET STRING (SIZE (2))
     -- Octets are coded according to TS 3GPP TS 29.060 [105]
```

```
PDP-Address ::= OCTET STRING (SIZE (1..16))
     -- Octets are coded according to TS 3GPP TS 29.060 [105]

     -- The possible size values are:
     -- 1-7 octets  X.25 address type
     --  4  octets  IPv4 address type
     -- 16  octets  Ipv6 address type
```

```
QoS-Subscribed ::= OCTET STRING (SIZE (3))
     -- Octets are coded according to TS 3GPP TS 24.008 [35].
```

```
Ext-QoS-Subscribed ::= OCTET STRING (SIZE (1..9))
     -- OCTET 1:
     --  Allocation/Retention Priority (This octet encodes each priority level defined in
     --     23.107 as the binary value of the priority level, declaration in 29.060)
     -- Octets 2-9 are coded according to 3G TS 24.008 Quality of Service Octets
     -- 6-13.
```

```
ChargingCharacteristics ::= OCTET STRING (SIZE (2))
     -- Octets are coded according to 3G TS 32.015.
```

```
LSAOnlyAccessIndicator ::= ENUMERATED {
     accessOutsideLSAsAllowed  (0),
     accessOutsideLSAsRestricted (1)}
```

```
LSADataList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
                                        LSAData
```

```
maxNumOfLSAs  INTEGER ::= 20
```

```
LSAData ::= SEQUENCE {
     lsaIdentity                         [0] LSAIdentity,
     lsaAttributes                       [1] LSAAttributes,
     lsaActiveModeIndicator              [2] NULL                          OPTIONAL,
     extensionContainer                  [3] ExtensionContainer            OPTIONAL,
     ...}
```

```
LSAInformation ::= SEQUENCE {
     completeDataListIncluded            NULL                              OPTIONAL,

          -- If segmentation is used, completeDataListIncluded may only be present in the
          -- first segment.
     lsaOnlyAccessIndicator              [1]  LSAOnlyAccessIndicator       OPTIONAL,
     lsaDataList                         [2]  LSADataList                  OPTIONAL,
     extensionContainer                  [3] ExtensionContainer            OPTIONAL,
     ...}
```

```
LSAIdentity ::= OCTET STRING (SIZE (3))
     -- Octets are coded according to TS 3GPP TS 23.003 [17]
```

```
LSAAttributes ::= OCTET STRING (SIZE (1))
     -- Octets are coded according to TS 3GPP TS 48.008 [49]
```

```
SubscriberData ::= SEQUENCE {
     msisdn                              [1] ISDN-AddressString            OPTIONAL,
     category                            [2] Category                      OPTIONAL,
     subscriberStatus                    [3] SubscriberStatus              OPTIONAL,
     bearerServiceList                   [4] BearerServiceList             OPTIONAL,
     -- The exception handling for reception of unsupported / not allocated
     -- bearerServiceCodes is defined in section 8.8.1
     teleserviceList                     [6] TeleserviceList               OPTIONAL,
     -- The exception handling for reception of unsupported / not allocated
     -- teleserviceCodes is defined in section 8.8.1
     provisionedSS                       [7] Ext-SS-InfoList               OPTIONAL,
     odb-Data                            [8] ODB-Data                      OPTIONAL,
     roamingRestrictionDueToUnsupportedFeature  [9] NULL                   OPTIONAL,
     regionalSubscriptionData            [10] ZoneCodeList                 OPTIONAL,
     vbsSubscriptionData                 [11] VBSDataList                  OPTIONAL,
     vgcsSubscriptionData                [12] VGCSDataList                 OPTIONAL,
     vlrCamelSubscriptionInfo            [13] VlrCamelSubscriptionInfo     OPTIONAL
     }
```

```
Category ::= OCTET STRING (SIZE (1))
     -- The internal structure is defined in CCITT Rec Q.763.
```

```
SubscriberStatus ::= ENUMERATED {
     serviceGranted  (0),
     operatorDeterminedBarring  (1)}
```

```
BearerServiceList ::= SEQUENCE SIZE (1..maxNumOfBearerServices) OF
                                     Ext-BearerServiceCode
```

```
maxNumOfBearerServices  INTEGER ::= 50
```

```
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),
     premiumRateEntertainementOGCallsBarred  (4),
     ss-AccessBarred  (5),
     allECT-Barred (9),
     chargeableECT-Barred (10),
     internationalECT-Barred (11),
     interzonalECT-Barred (12),
     doublyChargeableECT-Barred (13),
     multipleECT-Barred (14),
     allPacketOrientedServicesBarred (15),
     roamerAccessToHPLMN-AP-Barred  (16),
     roamerAccessToVPLMN-AP-Barred  (17)} (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,
     ...,
     longForwardedToNumber          [10] FTN-AddressString          OPTIONAL }
```

```
Ext-ForwOptions ::= OCTET STRING (SIZE (1..5))

    -- OCTET 1:

    --  bit 8: notification to forwarding party
    --   0  no notification
    --   1  notification

    --  bit 7: redirecting presentation
    --   0 no presentation
    --   1  presentation

    --  bit 6: notification to calling party
    --   0  no notification
    --   1  notification

    --  bit 5: 0 (unused)

    --  bits 43: forwarding reason
    --   00  ms not reachable
    --   01  ms busy
    --   10  no reply
    --   11  unconditional

    -- bits 21: 00 (unused)

    -- OCTETS 2-5: reserved for future use. They shall be discarded if
    -- received and not understood.
```

```
Ext-NoRepCondTime ::= INTEGER (1..100)
    -- Only values 5-30 are used.
    -- Values in the ranges 1-4 and 31-100 are reserved for future use
    -- If received:
    --       values 1-4 shall be mapped on to value 5
    --       values 31-100 shall be mapped on to value 30
```

```
Ext-CallBarInfo ::= SEQUENCE {
    ss-Code                         SS-Code,
    callBarringFeatureList          Ext-CallBarFeatureList,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
Ext-CallBarFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                    Ext-CallBarringFeature
```

```
Ext-CallBarringFeature ::= SEQUENCE {
    basicService                    Ext-BasicServiceCode            OPTIONAL,
    ss-Status                       [4] Ext-SS-Status,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
CUG-Info ::= SEQUENCE {
    cug-SubscriptionList            CUG-SubscriptionList,
    cug-FeatureList                 CUG-FeatureList                 OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
CUG-SubscriptionList ::= SEQUENCE SIZE (0..maxNumOfCUG) OF
                                    CUG-Subscription
```

```
CUG-Subscription ::= SEQUENCE {
    cug-Index CUG-Index,
    cug-Interlock                   CUG-Interlock,
    intraCUG-Options                IntraCUG-Options,
    basicServiceGroupList           Ext-BasicServiceGroupList       OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
CUG-Index ::= INTEGER (0..32767)
    -- The internal structure is defined in ETS 300 138.
```

```
CUG-Interlock ::= OCTET STRING (SIZE (4))
```

```
IntraCUG-Options ::= ENUMERATED {
     noCUG-Restrictions  (0),
     cugIC-CallBarred  (1),
     cugOG-CallBarred  (2)}
```

```
maxNumOfCUG  INTEGER ::= 10
```

```
CUG-FeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                        CUG-Feature
```

```
Ext-BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                        Ext-BasicServiceCode
```

```
maxNumOfExt-BasicServiceGroups  INTEGER ::= 32
```

```
CUG-Feature ::= SEQUENCE {
     basicService                       Ext-BasicServiceCode             OPTIONAL,
     preferentialCUG-Indicator          CUG-Index OPTIONAL,
     interCUG-Restrictions              InterCUG-Restrictions,
     extensionContainer                 ExtensionContainer               OPTIONAL,
     ...}
```

```
InterCUG-Restrictions ::= OCTET STRING (SIZE (1))

     -- bits 876543: 000000 (unused)
     -- Exception handling:
     -- bits 876543 shall be ignored if received and not understood

     -- bits 21
     --   00  CUG only facilities
     --   01  CUG with outgoing access
     --   10  CUG with incoming access
     --   11  CUG with both outgoing and incoming access
```

```
Ext-SS-Data ::= SEQUENCE {
     ss-Code                            SS-Code,
     ss-Status [4] Ext-SS-Status,
     ss-SubscriptionOption              SS-SubscriptionOption            OPTIONAL,
     basicServiceGroupList              Ext-BasicServiceGroupList        OPTIONAL,
     extensionContainer                 [5] ExtensionContainer           OPTIONAL,
     ...}
```

```
LCS-PrivacyExceptionList ::= SEQUENCE SIZE (1..maxNumOfPrivacyClass) OF
                                        LCS-PrivacyClass
```

```
maxNumOfPrivacyClass  INTEGER ::= 4
```

```
LCS-PrivacyClass ::= SEQUENCE {
     ss-Code                            SS-Code,
     ss-Status                          Ext-SS-Status,
     notificationToMSUser               [0] NotificationToMSUser         OPTIONAL,
     -- notificationToMSUser  is expected only for
     -- SS-code = callunrelated or SS-code = callrelated
     externalClientList                 [1] ExternalClientList           OPTIONAL,
     -- externalClientList and ext-externalClientList are expected only for
     -- SS-code = callunrelated or SS-code = callrelated
     plmnClientList                     [2] PLMNClientList               OPTIONAL,
     -- plmnClientList is expected only for SS-code = plmn operator
     extensionContainer                 [3] ExtensionContainer           OPTIONAL,
     ...,
     ext-externalClientList             [4] Ext-ExternalClientList  OPTIONAL
     -- Ext-externalClientList is present when the visited node supports LCS Release 4 or
     -- later versions, user specifies more than 5 clients and White Book SCCP is used.
     -- if segmentation is used, the complete LCS-PrivacyClass shall be sent in one segment
}
```

```
ExternalClientList ::= SEQUENCE SIZE (0..maxNumOfExternalClient) OF
                                        ExternalClient
```

```
maxNumOfExternalClient  INTEGER ::= 5
```

```
PLMNClientList ::= SEQUENCE SIZE (1..maxNumOfPLMNClient) OF
                                        LCSClientInternalID
```

```
maxNumOfPLMNClient  INTEGER ::= 5
```

```
Ext-ExternalClientList ::= SEQUENCE SIZE (1..maxNumOfExt-ExternalClient) OF
                                        ExternalClient
```

```
maxNumOfExt-ExternalClient  INTEGER ::= 35
```

```
ExternalClient ::= SEQUENCE {
     clientIdentity                     LCSClientExternalID,
     gmlc-Restriction                   [0] GMLC-Restriction              OPTIONAL,
     notificationToMSUser               [1] NotificationToMSUser          OPTIONAL,
     extensionContainer                 [2] ExtensionContainer            OPTIONAL,
     ... }
```

```
GMLC-Restriction ::= ENUMERATED {
     gmlc-List                          (0),
     home-Country                       (1) ,
     ... }
-- exception handling:
-- At reception of any other value than the ones listed the receiver shall ignore
-- GMLC-Restriction.
```

```
NotificationToMSUser ::= ENUMERATED {
     notifyLocationAllowed              (0),
     notifyAndVerify-LocationAllowedIfNoResponse   (1),
     notifyAndVerify-LocationNotAllowedIfNoResponse(2),
     ...,
     locationNotAllowed (3) }
-- exception handling:
-- At reception of any other value than the ones listed the receiver shall ignore
-- NotificationToMSUser.
```

```
MOLR-List ::= SEQUENCE SIZE (1..maxNumOfMOLR-Class) OF
                                        MOLR-Class
```

```
maxNumOfMOLR-Class  INTEGER ::= 3
```

```
MOLR-Class ::= SEQUENCE {
     ss-Code                            SS-Code,
     ss-Status                          Ext-SS-Status,
     extensionContainer                 [0] ExtensionContainer            OPTIONAL,
     ...}
```

```
ZoneCodeList ::= SEQUENCE SIZE (1..maxNumOfZoneCodes)
                                        OF ZoneCode
```

```
ZoneCode ::= OCTET STRING (SIZE (2))
     -- internal structure is defined in TS 3GPP TS 23.003 [17]
```

```
maxNumOfZoneCodes  INTEGER ::= 10
```

```
InsertSubscriberDataRes ::= SEQUENCE {
     teleserviceList                    [1] TeleserviceList               OPTIONAL,
     bearerServiceList                  [2] BearerServiceList             OPTIONAL,
     ss-List                            [3] SS-List                       OPTIONAL,
     odb-GeneralData                    [4] ODB-GeneralData               OPTIONAL,
     regionalSubscriptionResponse       [5] RegionalSubscriptionResponse   OPTIONAL,
     supportedCamelPhases               [6] SupportedCamelPhases          OPTIONAL,
     extensionContainer                 [7] ExtensionContainer            OPTIONAL,
     ...}
```

```
RegionalSubscriptionResponse ::= ENUMERATED {
     networkNode-AreaRestricted         (0),
     tooManyZoneCodes                   (1),
     zoneCodesConflict                  (2),
     regionalSubscNotSupported          (3)}
```

```
DeleteSubscriberDataArg ::= SEQUENCE {
     imsi                                [0] IMSI,
     basicServiceList                    [1] BasicServiceList              OPTIONAL,
     -- The exception handling for reception of unsupported/not allocated
     -- basicServiceCodes is defined in section 6.8.2
     ss-List                             [2] SS-List                       OPTIONAL,
     roamingRestrictionDueToUnsupportedFeature [4] NULL                    OPTIONAL,
     regionalSubscriptionIdentifier      [5] ZoneCode                      OPTIONAL,
     vbsGroupIndication                  [7] NULL                          OPTIONAL,
     vgcsGroupIndication                 [8] NULL   OPTIONAL,
     camelSubscriptionInfoWithdraw       [9] NULL   OPTIONAL,
     extensionContainer                  [6] ExtensionContainer OPTIONAL,
     ...,
     gprsSubscriptionDataWithdraw        [10] GPRSSubscriptionDataWithdraw OPTIONAL,
     roamingRestrictedInSgsnDueToUnsuppportedFeature [11] NULL             OPTIONAL,
     lsaInformationWithdraw              [12] LSAInformationWithdraw       OPTIONAL,
     gmlc-ListWithdraw                   [13] NULL                         OPTIONAL,
     istInformationWithdraw              [14] NULL                         OPTIONAL,
     specificCSI-Withdraw                [15] SpecificCSI-Withdraw         OPTIONAL }
```

```
SpecificCSI-Withdraw ::= BIT STRING {
     o-csi (0),
     ss-csi (1),
     tif-csi (2),
     d-csi (3),
     vt-csi (4),
     mo-sms-csi (5),
     m-csi (6),
     gprs-csi (7),
     mt-sms-csi (8),
     mg-csi(9)} (SIZE(8..32))
-- exception handling:
-- bits 810 to 31 shall be ignored if received
```

```
GPRSSubscriptionDataWithdraw ::= CHOICE {
     allGPRSData                         NULL,
     contextIdList                       ContextIdList}
```

```
ContextIdList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                         ContextId
```

```
LSAInformationWithdraw ::= CHOICE {
     allLSAData                          NULL,
     lsaIdentityList                     LSAIdentityList }
```

```
LSAIdentityList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
                                         LSAIdentity
```

```
BasicServiceList ::= SEQUENCE SIZE (1..maxNumOfBasicServices) OF
                                         Ext-BasicServiceCode
```

```
maxNumOfBasicServices  INTEGER ::= 70
```

```
DeleteSubscriberDataRes ::= SEQUENCE {
     regionalSubscriptionResponse        [0] RegionalSubscriptionResponse  OPTIONAL,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
VlrCamelSubscriptionInfo ::= SEQUENCE {
     o-CSI                               [0] O-CSI                         OPTIONAL,
     extensionContainer                  [1] ExtensionContainer            OPTIONAL,
     ...,
     ss-CSI                              [2] SS-CSI                        OPTIONAL,
     o-BcsmCamelTDP-CriteriaList         [4] O-BcsmCamelTDPCriteriaList    OPTIONAL,
     tif-CSI                             [3] NULL                          OPTIONAL,
     m-CSI                               [5] M-CSI                         OPTIONAL,
     mo-sms-CSI                          [6] SMS-CSI                       OPTIONAL,
     vt-CSI                              [7] T-CSI                         OPTIONAL,
     t-BCSM-CAMEL-TDP-CriteriaList       [8] T-BCSM-CAMEL-TDP-CriteriaList OPTIONAL,
     d-CSI                               [9] D-CSI                         OPTIONAL,
     mt-sms-CSI                          [10] SMS-CSI                      OPTIONAL,
     mt-smsCAMELTDP-CriteriaList         [11] MT-smsCAMELTDP-CriteriaList  OPTIONAL
     }
```

```
MT-smsCAMELTDP-CriteriaList ::= SEQUENCE SIZE (1.. maxNumOfCamelTDPData) OF
     MT-smsCAMELTDP-Criteria
```

```
MT-smsCAMELTDP-Criteria ::= SEQUENCE {
     sms-TriggerDetectionPoint          SMS-TriggerDetectionPoint,
     tpdu-TypeCriterion                 [0]  TPDU-TypeCriterion          OPTIONAL,
     ... }
```

```
TPDU-TypeCriterion ::= SEQUENCE SIZE (1..maxNumOfTPDUTypes) OF
     MT-SMS-TPDU-Type
```

```
maxNumOfTPDUTypes INTEGER ::= 5
```

```
MT-SMS-TPDU-Type ::= ENUMERATED {
     SMSsms-DELIVER                     (0),
     SMSsms-SUBMIT-REPORT               (1),
     SMSsms-STATUS-REPORT               (2),
     ... }

--   exception handling:
--   For TPDU-TypeCriterion sequences containing this parameter with any
--   other value than the ones listed above the receiver shall ignore
--   the whole TPDU-TypeCriterion sequence.
--   In CAMEL phase 4, SMSsms-SUBMIT-REPORT shall not be used.
```

```
D-CSI ::= SEQUENCE {
     dp-AnalysedInfoCriteriaList        [0] DP-AnalysedInfoCriteriaList   OPTIONAL,
     camelCapabilityHandling            [1] CamelCapabilityHandling       OPTIONAL,
     extensionContainer                 [2] ExtensionContainer            OPTIONAL,
     notificationToCSE                  [3]  NULL                         OPTIONAL,
     csi-Active                         [4]  NULL                         OPTIONAL,
     ...}
--   notificationToCSE and csi-Active shall not be present when D-CSI is sent to VLR/GMSC.
--   They may only be included in ATSI/ATM ack/NSDC message.
--   DP-AnalysedInfoCriteria and  camelCapabilityHandling shall be present in
--   the D-CSI sequence.
--   If D-CSI is segmented, dp-AnalysedInfoCriteriaList and camelCapabilityHandling shall be
--   present in the first segment
```

```
DP-AnalysedInfoCriteriaList  ::= SEQUENCE SIZE (1..maxNumOfDP-AnalysedInfoCriteria) OF
                                 DP-AnalysedInfoCriterium
```

```
maxNumOfDP-AnalysedInfoCriteria INTEGER ::= 10
```

```
DP-AnalysedInfoCriterium ::= SEQUENCE {
     dialledNumber                      ISDN-AddressString,
     serviceKey                         ServiceKey,
     gsmSCF-Address                     ISDN-AddressString,
     defaultCallHandling                DefaultCallHandling,
     extensionContainer                 ExtensionContainer                OPTIONAL,
     ...}
```

```
SS-CSI ::= SEQUENCE {
     ss-CamelData                       SS-CamelData,
     extensionContainer                 ExtensionContainer                OPTIONAL,
     ...,
     notificationToCSE                  [0]  NULL                         OPTIONAL,
     csi-Active                         [1]  NULL                         OPTIONAL
--   notificationToCSE and csi-Active shall not be present when SS-CSI is sent to VLR.
--   They may only be included in ATSI/ATM ack/NSDC message.
}
```

```
SS-CamelData  ::= SEQUENCE {
     ss-EventList                       SS-EventList,
     gsmSCF-Address                     ISDN-AddressString,
     extensionContainer                 [0] ExtensionContainer            OPTIONAL,
     ...}
```

```
SS-EventList  ::= SEQUENCE SIZE (1..maxNumOfCamelSSEvents) OF SS-Code
     -- Actions for the following SS-Code values are defined in CAMEL Phase 3:
     -- ect                              SS-Code ::= '00110001'B
     -- multiPTY                         SS-Code ::= '01010001'B
     -- cd                               SS-Code ::= '00100100'B
     -- ccbs                             SS-Code ::= '01000100'B
     -- all other SS codes shall be ignored
     -- When SS-CSI is sent to the VLR, it shall not contain a marking for ccbs.
     -- If the VLR receives SS-CSI containing a marking for ccbs, the VLR shall discard the
     -- ccbs marking in SS-CSI.
```

```
maxNumOfCamelSSEvents INTEGER ::= 10
```

```
O-CSI ::= SEQUENCE {
     o-BcsmCamelTDPDataList              O-BcsmCamelTDPDataList,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     camelCapabilityHandling             [0] CamelCapabilityHandling       OPTIONAL,
     notificationToCSE                   [1]  NULL                         OPTIONAL,
     csiActive                           [2]  NULL                         OPTIONAL}
--   notificationtoCSE and csiActive shall not be present when O-CSI is sent to VLR/GMSC.
--   They may only be included in ATSI/ATM ack/NSDC message.
```

```
O-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDPData
     -- O-BcsmCamelTDPDataList shall not contain more than one instance of
     -- O-BcsmCamelTDPData containing the same value for o-BcsmTriggerDetectionPoint.
     -- For CAMEL Phase 2, this means that only one instance of O-BcsmCamelTDPData is allowed
     -- with o-BcsmTriggerDetectionPoint being equal to DP2.
```

```
maxNumOfCamelTDPData  INTEGER ::= 10
```

```
O-BcsmCamelTDPData ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint         O-BcsmTriggerDetectionPoint,
     serviceKey                          ServiceKey,
     gsmSCF-Address                      [0] ISDN-AddressString,
     defaultCallHandling                 [1] DefaultCallHandling,
     extensionContainer                  [2] ExtensionContainer            OPTIONAL,
     ...
     }
```

```
ServiceKey ::= INTEGER (0..2147483647)
```

```
O-BcsmTriggerDetectionPoint ::= ENUMERATED {
     collectedInfo (2),
     ...,
     routeSelectFailure (4) }
     -- exception handling:
     -- For O-BcsmCamelTDPData sequences containing this parameter with any
     -- other value than the ones listed the receiver shall ignore the whole
     -- O-BcsmCamelTDPDatasequence.
     -- For O-BcsmCamelTDP-Criteria sequences containing this parameter with any
     -- other value than the ones listed the receiver shall ignore the whole
     -- O-BcsmCamelTDP-Criteria sequence.
```

```
O-BcsmCamelTDPCriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDP-Criteria
```

```
T-BCSM-CAMEL-TDP-CriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     T-BCSM-CAMEL-TDP-Criteria
```

```
O-BcsmCamelTDP-Criteria ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint         O-BcsmTriggerDetectionPoint,
     destinationNumberCriteria           [0] DestinationNumberCriteria     OPTIONAL,
     basicServiceCriteria                [1] BasicServiceCriteria          OPTIONAL,
     callTypeCriteria                    [2] CallTypeCriteria              OPTIONAL,
     ...,
     o-CauseValueCriteria                [3] O-CauseValueCriteria          OPTIONAL,
     extensionContainer                  [4] ExtensionContainer            OPTIONAL }
```

```
T-BCSM-CAMEL-TDP-Criteria ::= SEQUENCE {
     t-BCSM-TriggerDetectionPoint        T-BcsmTriggerDetectionPoint,
     basicServiceCriteria                [0] BasicServiceCriteria          OPTIONAL,
     t-CauseValueCriteria                [1] T-CauseValueCriteria          OPTIONAL,
     ... }
```

```
DestinationNumberCriteria  ::= SEQUENCE {
    matchType                          [0] MatchType,
    destinationNumberList              [1] DestinationNumberList         OPTIONAL,
    destinationNumberLengthList        [2] DestinationNumberLengthList   OPTIONAL,
    -- one or both of destinationNumberList and destinationNumberLengthList
    -- shall be present
    ...}
```

```
DestinationNumberList  ::= SEQUENCE SIZE   (1..maxNumOfCamelDestinationNumbers) OF
                                    ISDN-AddressString
    -- The receiving entity shall not check the format of a number in
    -- the dialled number list
```

```
DestinationNumberLengthList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumberLengths)
OF
                                          INTEGER(1..maxNumOfISDN-AddressDigits)
```

```
BasicServiceCriteria  ::= SEQUENCE SIZE(1..maxNumOfCamelBasicServiceCriteria) OF
    Ext-BasicServiceCode
```

```
maxNumOfISDN-AddressDigits  INTEGER ::= 15
```

```
maxNumOfCamelDestinationNumbers  INTEGER ::= 10
```

```
maxNumOfCamelDestinationNumberLengths  INTEGER ::= 3
```

```
maxNumOfCamelBasicServiceCriteria  INTEGER ::= 5
```

```
CallTypeCriteria       ::= ENUMERATED {
    forwarded                          (0),
    notForwarded                       (1)}
```

```
MatchType       ::= ENUMERATED {
    inhibiting                         (0),
    enabling                           (1)}
```

```
O-CauseValueCriteria  ::= SEQUENCE SIZE(1..maxNumOfCAMEL-O-CauseValueCriteria) OF
    CauseValue
```

```
T-CauseValueCriteria  ::= SEQUENCE SIZE(1..maxNumOfCAMEL-T-CauseValueCriteria) OF
    CauseValue
```

```
maxNumOfCAMEL-O-CauseValueCriteria  INTEGER ::= 5
```

```
maxNumOfCAMEL-T-CauseValueCriteria  INTEGER ::= 5
```

```
CauseValue ::= OCTET STRING (SIZE(1))
-- Type extracted from Cause parameter in ITU-T Recommendation Q.763.
-- For the use of cause value refer to ITU-T Recommendation Q.850.
```

```
DefaultCallHandling ::= ENUMERATED {
    continueCall (0) ,
    releaseCall (1) ,
    ...}
    -- exception handling:
    -- reception of values in range 2-31 shall be treated as "continueCall"
    -- reception of values greater than 31 shall be treated as "releaseCall"
```

```
CamelCapabilityHandling ::= INTEGER(1..16)
    -- value 1 = CAMEL phase 1,
    -- value 2 = CAMEL phase 2,
    -- value 3 = CAMEL Phase 3,
    -- value 4 = CAMEL phase 4:
    -- reception of values greater than 34 shall be treated as CAMEL phase 34.
```

```
SupportedCamelPhases ::= BIT STRING {
    phase1 (0),
    phase2 (1),
    phase3 (2),
    phase4 (3)} (SIZE (1..16))
-- A node shall mark in the BIT STRING all CAMEL Phases it supports.
-- Other values than listed above shall be discarded.
```

```
SMS-CSI ::= SEQUENCE {
     sms-CAMEL-TDP-DataList              [0] SMS-CAMEL-TDP-DataList        OPTIONAL,
     camelCapabilityHandling             [1] CamelCapabilityHandling       OPTIONAL,
     extensionContainer                  [2] ExtensionContainer            OPTIONAL,
     notificationToCSE                   [3] NULL                          OPTIONAL,
     csi-Active                          [4] NULL                          OPTIONAL,
     ...}
--   notificationToCSE and csi-Active shall not be present
--   when MO-SMS-CSI or MT-SMS-CSI is sent to VLR/ or SGSN.
--   They may only be included in ATSI/ATM ack/NSDC message.
--   SMS-CAMEL-TDP-Data and  camelCapabilityHandling shall be present in
--   the SMS-CSI sequence.
--   If SMS-CSI is segmented, sms-CAMEL-TDP-DataList and camelCapabilityHandling shall be
--   present in the first segment
```

```
SMS-CAMEL-TDP-DataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     SMS-CAMEL-TDP-Data
--   SMS-CAMEL-TDP-DataList shall not contain more than one instance of
--   SMS-CAMEL-TDP-Data containing the same value for sms-TriggerDetectionPoint.
```

```
SMS-CAMEL-TDP-Data ::= SEQUENCE {
     sms-TriggerDetectionPoint           [0] SMS-TriggerDetectionPoint,
     serviceKey                          [1] ServiceKey,
     gsmSCF-Address                      [2] ISDN-AddressString,
     defaultSMS-Handling                 [3] DefaultSMS-Handling,
     extensionContainer                  [4] ExtensionContainer            OPTIONAL,
     ...
     }
```

```
SMS-TriggerDetectionPoint ::= ENUMERATED {
     sms-CollectedInfo (1),
     .../
     sms-DeliveryRequest (2)
     }
--   exception handling:
--   For SMS-CAMEL-TDP-Data sequences containing this parameter with any
--   other value than the ones listed the receiver shall ignore the whole
--   SMS-CAMEL-TDP-Data sequence.
```

```
DefaultSMS-Handling ::= ENUMERATED {
     continueTransaction (0) ,
     releaseTransaction (1) ,
     ...}
--   exception handling:
--   reception of values in range 2-31 shall be treated as "continueTransaction"
--   reception of values greater than 31 shall be treated as "releaseTransaction"
```

```
M-CSI ::= SEQUENCE {
     mobilityTriggers                    MobilityTriggers,
     serviceKey                          ServiceKey,
     gsmSCF-Address                      [0]  ISDN-AddressString,
     extensionContainer                  [1]  ExtensionContainer           OPTIONAL,
     notificationToCSE                   [2] NULL                          OPTIONAL,
     csi-Active                          [3] NULL                          OPTIONAL,
     ...}
--   notificationToCSE and csi-Active shall not be present when M-CSI is sent to VLR.
--   They may only be included in ATSI/ATM ack/NSDC message.
```

```
MG-CSI ::= SEQUENCE {
     mobilityTriggers                    MobilityTriggers,
     serviceKey                          ServiceKey,
     gsmSCF-Address                      [0]  ISDN-AddressString,
     extensionContainer                  [1]  ExtensionContainer           OPTIONAL,
     notificationToCSE                   [2] NULL                          OPTIONAL,
     csi-Active                          [3] NULL                          OPTIONAL,
     ...}
--   notificationToCSE and csi-Active shall not be present when MG-CSI is sent to SGSN.
--   They may only be included in ATSI/ATM ack/NSDC message.
```

```
MobilityTriggers  ::= SEQUENCE SIZE (1..maxNumOfMobilityTriggers) OF
     MM-Code
```

```
maxNumOfMobilityTriggers INTEGER ::= 10
```

```
MM-Code ::= OCTET STRING (SIZE (1))
--   This type is used to indicate a Mobility Management event.
--   Actions for the following MM-Code values are defined in CAMEL Phases 3 and 4:
--
--   MSC-related Mobility Management codesCS domain MM events:
--   Location-update-in-same-VLR          MM-Code ::= '00000000'B
--   Location-update-to-other-VLR         MM-Code ::= '00000001'B
--   IMSI-Attach                          MM-Code ::= '00000010'B
--   MS-initiated-IMSI-Detach             MM-Code ::= '00000011'B
--   Network-initiated-IMSI-Detach        MM-Code ::= '00000100'B
--
--   SGSN-related Mobility Management codesPS domain MM events:
--   Routeing-Area-update-in-same-SGSN    MM-Code ::= '01000010000'B
--   Routeing-Area-update-to-other-SGSN   MM-Code ::= '01000010001'B
--   MS-Attach-GPRSGPRS-Attach            MM-Code ::= '01000010010'B
--   MS-initiated-GPRS-Detach-GPRS        MM-Code ::= '01000010011'B
--   Network-initiated-GPRS-Detach-GPRS   MM-Code ::= '01000010100'B
--   Network-initiated-transfer-to-MS-not-reachable-for-paging
--                                        MM-Code ::= '00000101'B
--
--   If the MSC receives any other MM-code than the ones listed above for the
--   MSCCS domain, then the MSC shall ignore that MM-code.
--   If the SGSN receives any other MM-code than the ones listed above for the
--   SGSNPS domain, then the SGSN shall ignore that MM-code.
--
--   If any other MM-code is received in M-CSI, then that MM-code shall be
--   ignored.
```

```
T-CSI ::= SEQUENCE {
     t-BcsmCamelTDPDataList              T-BcsmCamelTDPDataList,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     camelCapabilityHandling             [0] CamelCapabilityHandling       OPTIONAL,
     notificationToCSE                   [1] NULL                          OPTIONAL,
     csi-Active                          [2] NULL                          OPTIONAL}
--   notificationToCSE and csi-Active shall not be present when VT-CSI/T-CSI is sent
--   to VLR/GMSC.
--   They may only be included in ATSI/ATM ack/NSDC message.
```

```
T-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     T-BcsmCamelTDPData
     --- T-BcsmCamelTDPDataList shall not contain more than one instance of
     --- T-BcsmCamelTDPData containing the same value for t-BcsmTriggerDetectionPoint.
     --- For CAMEL Phase 2, this means that only one instance of T-BcsmCamelTDPData is
allowed
     --- with t-BcsmTriggerDetectionPoint being equal to DP12.
     --- For CAMEL Phase 3, more TDP's are allowed.
```

```
T-BcsmCamelTDPData ::= SEQUENCE {
     t-BcsmTriggerDetectionPoint         T-BcsmTriggerDetectionPoint,
     serviceKey                          ServiceKey,
     gsmSCF-Address                      [0] ISDN-AddressString,
     defaultCallHandling                 [1] DefaultCallHandling,
     extensionContainer                  [2] ExtensionContainer            OPTIONAL,
     ...}
```

```
T-BcsmTriggerDetectionPoint ::= ENUMERATED {
     termAttemptAuthorized (12),
     ... ,
     tBusy (13),
     tNoAnswer (14)}
     -- exception handling:
     -- For T-BcsmCamelTDPData sequences containing this parameter with any other
     -- value than the ones listed above, the receiver shall ignore the whole
     -- T-BcsmCamelTDPData sequence.
```

```
-- gprs location information retrieval types
```

```
SendRoutingInfoForGprsArg ::= SEQUENCE {
     imsi                                [0] IMSI,
     ggsn-Address                        [1] GSN-Address                   OPTIONAL,
     ggsn-Number                         [2]  ISDN-AddressString,
     extensionContainer                  [3] ExtensionContainer            OPTIONAL,
     ...}
```

```
SendRoutingInfoForGprsRes ::= SEQUENCE {
    sgsn-Address                        [0] GSN-Address,
    ggsn-Address                        [1]  GSN-Address              OPTIONAL,
    mobileNotReachableReason            [2]  AbsentSubscriberDiagnosticSM    OPTIONAL,
    extensionContainer                  [3] ExtensionContainer        OPTIONAL,
    ...}
```

-- failure report types

```
FailureReportArg ::= SEQUENCE {
    imsi                                [0] IMSI,
    ggsn-Number                         [1] ISDN-AddressString        ,
    ggsn-Address                        [2] GSN-Address               OPTIONAL,
    extensionContainer                  [3] ExtensionContainer        OPTIONAL,
    ...}
```

```
FailureReportRes ::= SEQUENCE {
    ggsn-Address                        [0] GSN-Address               OPTIONAL,
    extensionContainer                  [1] ExtensionContainer        OPTIONAL,
    ...}
```

-- gprs notification types

```
NoteMsPresentForGprsArg ::= SEQUENCE {
    imsi                                [0] IMSI,
    sgsn-Address                        [1] GSN-Address,
    ggsn-Address                        [2] GSN-Address               OPTIONAL,
    extensionContainer                  [3] ExtensionContainer        OPTIONAL,
    ...}
```

```
NoteMsPresentForGprsRes ::= SEQUENCE {
    extensionContainer                  [0] ExtensionContainer        OPTIONAL,
    ...}
```

-- fault recovery types

```
ResetArg ::= SEQUENCE {
    hlr-Number                          ISDN-AddressString,
    hlr-List                            HLR-List                      OPTIONAL,
    ...}
```

```
RestoreDataArg ::= SEQUENCE {
    imsi                                IMSI,
    lmsi                                LMSI                          OPTIONAL,
    extensionContainer                  ExtensionContainer            OPTIONAL,
    ... ,
    vlr-Capability                      [6] VLR-Capability            OPTIONAL }
```

```
RestoreDataRes ::= SEQUENCE {
    hlr-Number                          ISDN-AddressString,
    msNotReachable                      NULL                          OPTIONAL,
    extensionContainer                  ExtensionContainer            OPTIONAL,
    ...}
```

-- VBS/VGCS types

```
VBSDataList ::= SEQUENCE SIZE (1..maxNumOfVBSGroupIds) OF
                                        VoiceBroadcastData
```

```
VGCSDataList ::= SEQUENCE SIZE (1..maxNumOfVGCSGroupIds) OF
                                        VoiceGroupCallData
```

```
maxNumOfVBSGroupIds  INTEGER ::= 50
```

```
maxNumOfVGCSGroupIds  INTEGER ::= 50
```

```
VoiceGroupCallData  ::= SEQUENCE {
    groupId                             GroupId,
    extensionContainer                  ExtensionContainer            OPTIONAL,
    ...}
```

```
VoiceBroadcastData ::= SEQUENCE {
     groupid                          GroupId,
     broadcastInitEntitlement         NULL                          OPTIONAL,
     extensionContainer               ExtensionContainer            OPTIONAL,
     ...}
```

```
GroupId  ::= OCTET STRING (SIZE (3))
     -- Refers to the Group Identification as specified in GSM TS 03.03
     -- and 03.68/ 03.69
```

-- provide subscriber info types

```
ProvideSubscriberInfoArg ::= SEQUENCE {
     imsi      [0] IMSI,
     lmsi      [1] LMSI                 OPTIONAL,
     requestedInfo                      [2] RequestedInfo,
     extensionContainer                 [3] ExtensionContainer        OPTIONAL,
     ...}
```

```
ProvideSubscriberInfoRes ::= SEQUENCE {
     subscriberInfo                     SubscriberInfo,
     extensionContainer                 ExtensionContainer            OPTIONAL,
     ...}
```

```
SubscriberInfo ::= SEQUENCE {
     locationInformation                [0] LocationInformation       OPTIONAL,
     subscriberState                    [1] SubscriberState           OPTIONAL,
     extensionContainer                 [2] ExtensionContainer        OPTIONAL,
     ...,
     locationInformationGPRS            [3] LocationInformationGPRS   OPTIONAL,
     ps-SubscriberState                 [34] PS-SubscriberState       OPTIONAL}

--   locationInformation shall be present only in a response to a request for
--   information from the CS domain.
--   locationInformationGPRS shall be present only in a response to a request
--   for information from the PS domain.
--   subscriberState shall be present only in a response to a request for
--   information from the CS domain.
--   ps-Subscriber state shall be present only in a response to a request
--   for information from the PS domain.
```

```
RequestedInfo ::= SEQUENCE {
     locationInformation                [0] NULL                      OPTIONAL,
     subscriberState                    [1] NULL                      OPTIONAL,
     extensionContainer                 [2] ExtensionContainer        OPTIONAL,
     ...,
     currentLocation                    [3] NULL                      OPTIONAL }
-- currentLocation shall not be present if locationInformation
-- is not present in the RequestedInfo parameter
```

```
LocationInformation ::= SEQUENCE {
     ageOfLocationInformation           AgeOfLocationInformation      OPTIONAL,
     geographicalInformation            [0] GeographicalInformation   OPTIONAL,
     vlr-number                         [1] ISDN-AddressString        OPTIONAL,
     locationNumber                     [2] LocationNumber            OPTIONAL,
     cellGlobalIdOrServiceAreaIdOrLAI   [3] CellGlobalIdOrServiceAreaIdOrLAI  OPTIONAL,
     extensionContainer                 [4] ExtensionContainer        OPTIONAL,
     ... ,
     selectedLSA-Id                     [5] LSAIdentity               OPTIONAL,
     msc-Number                         [6] ISDN-AddressString        OPTIONAL,
     geodeticInformation                [7] GeodeticInformation       OPTIONAL,
     currentLocationRetrieved           [8] NULL                      OPTIONAL,
     sai-Present                        [9] NULL                      OPTIONAL,
     sgsn-Number                        [10] ISDN-AddressString       OPTIONAL }
-- sai-Present indicates that the cellGlobalIdOrServiceAreaIdOrLAI parameter contains
-- a Service Area Identity.
-- currentLocationRetrieved shall be present
-- if the location information were retrieved after a successfull paging.

-- sai-Present indicates that the cellGlobalIdOrServiceAreaIdOrLAI parameter contains
-- a Service Area Identity.
-- currentLocationRetrieved shall be present if the location information
-- was retrieved after successful paging.
-- vlr-number and msc-number shall be absent if LocationInformation is sent by an SGSN.
-- sgsn-number shall be absent if LocationInformation is sent by a VLR.
```

```
LocationInformationGPRS ::= SEQUENCE {
    cellGlobalIdOrServiceAreaIdOrLAI    [0] OCTET STRING (SIZE(5..7))       OPTIONAL,
    cellGlobalIdOrServiceAreaIdOrLAI    [0] CellGlobalIdOrServiceAreaIdOrLAI OPTIONAL,
    routeingAreaIdentity                [1] RAIdentity                      OPTIONAL,
    geographicalInformation             [2] GeographicalInformation         OPTIONAL,
    sgsn-Number                         [3] ISDN-AddressString              OPTIONAL,
    selectedLSAIdentity                 [4] LSAIdentity                     OPTIONAL,
    extensionContainer                  [5] ExtensionContainer              OPTIONAL,
    ...,
    sai-Present                         [6] NULL                            OPTIONAL,
    geodeticInformation                 [7] GeodeticInformation             OPTIONAL,
    currentLocationRetrieved            [8] NULL                            OPTIONAL,
    ageOfLocationInformation            [9] AgeOfLocationInformation        OPTIONAL }
-- sai-Present indicates that the cellGlobalIdOrServiceAreaIdOrLAI parameter contains
-- a Service Area Identity.
-- currentLocationRetrieved shall be present if the location information
-- was retrieved after successful paging.
```

```
RAIdentity ::= OCTET STRING (SIZE (6))
-- Routing Area Identity is coded in accordance with 3GPP TS 29.060 [105].
-- It shall contain the value part defined in 3GPP TS 29.060 only. I.e. the 3GPP TS 29.060
-- type identifier octet shall not be included.
```

```
GeographicalInformation ::= OCTET STRING (SIZE (8))
--   Refers to geographical Information defined in 3GPP TS 23.032.
--   Only the description of an ellipsoid point with uncertainty circle
--   as specified in 3GPP TS 23.032 is allowed to be used
--   The internal structure according to 3GPP TS 23.032 is as follows:
--        Type of shape (ellipsoid point with uncertainty circle)          1 octet
--        Degrees of Latitude                                              3 octets
--        Degrees of Longitude                                             3 octets
--        Uncertainty code                                                 1 octet
```

```
GeodeticInformation ::= OCTET STRING (SIZE (10))
--   Refers to Calling Geodetic Location defined in Q.763 (1999).
--   Only the description of an ellipsoid point with uncertainty circle
--   as specified in Q.763 (1999) is allowed to be used
--   The internal structure according to Q.763 (1999) is as follows:
--        Screening and presentation indicators                            1 octet
--        Type of shape (ellipsoid point with uncertainty circle)          1 octet
--        Degrees of Latitude                                              3 octets
--        Degrees of Longitude                                             3 octets
--        Uncertainty code                                                 1 octet
--        Confidence                                                       1 octet
```

```
LocationNumber ::= OCTET STRING (SIZE (2..10))
    -- the internal structure is defined in CCITT Rec Q.763
```

```
SubscriberState ::= CHOICE {
    assumedIdle                 [0] NULL,
    camelBusy                   [1] NULL,
    netDetNotReachable          NotReachableReason,
    notProvidedFromVLR          [2] NULL}
```

```
PS-SubscriberState ::= CHOICE {
    notProvidedFromSGSN                 [0] NULL,
    ps-Detached                         [1] NULL,
    ps-AttachedNotReachableForPaging    [2] NULL,
    ps-AttachedReachableForPaging       [3] NULL,
    ps-ConnectedNotReachableForPaging   [4] PDP-ContextInfoList,
    ps-ConnectedReachableForPaging      [5] PDP-ContextInfoList}
```

```
PDP-ContextInfoList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                        PDP-ContextInfo
```

```
PDP-ContextInfo ::= SEQUENCE {
    pdp-ContextIdentifier           [0] ContextId,
    pdp-ContextActive               [1] NULL                    OPTIONAL,
    pdp-Type                        [2] PDP-Type,
    pdp-Address                     [3] PDP-Address             OPTIONAL,
    apn-Subscribed                  [4] APN                     OPTIONAL,
    apn-InUse                       [5] APN                     OPTIONAL,
    nsapi                           [6] NSAPI                   OPTIONAL,
    transactionId                   [7] TransactionId           OPTIONAL,
    teid-ForGnAndGp                 [8] TEID                    OPTIONAL,
    teid-ForIu                      [9] TEID                    OPTIONAL,
    ggsn-Address                    [10] GSN-Address            OPTIONAL,
    qos-Subscribed                  [11] Ext-QoS-Subscribed     OPTIONAL,
    qos-Requested                   [12] Ext-QoS-Subscribed     OPTIONAL,
    qos-Negotiated                  [13] Ext-QoS-Subscribed     OPTIONAL,
    chargingId                      [14] GPRSChargingID         OPTIONAL,
    chargingCharacteristics         [15] ChargingCharacteristics OPTIONAL,
    rnc-Address                     [16] GSN-Address            OPTIONAL,
    extensionContainer              [17] ExtensionContainer     OPTIONAL,
    ...}
```

```
NSAPI ::= INTEGER (0..15)
--   This type is used to indicate the Network layer Service Access Point
```

```
TransactionId ::= OCTET STRING (SIZE (1..2))
--   This type carries the value part of the transaction identifier which is used in the
--   session management messages on the access interface. The encoding is defined in
--   3GPP TS 24.008
```

```
TEID ::= OCTET STRING (SIZE (4))
--   This type carries the value part of the Tunnel Endpoint Identifier which is used to
--   distinguish between different tunnels between the same pair of entities which communicate
--   using the GPRS Tunnelling Protocol The encoding is defined in 3GPP TS 29.060.
```

```
GPRSChargingID ::= OCTET STRING (SIZE (4))
--   The Charging ID is a unique four octet value generated by the GGSN when
--   a PDP Context is activated. A Charging ID is generated for each activated context.
--   The encoding is defined in 3GPP TS 29.060.
```

```
NotReachableReason ::= ENUMERATED {
    msPurged (0),
    imsiDetached (1),
    restrictedArea (2),
    notRegistered (3)}
```

-- any time interrogation info types

```
AnyTimeInterrogationArg ::= SEQUENCE {
    subscriberIdentity              [0] SubscriberIdentity,
    requestedInfo                   [1] RequestedInfo,
    gsmSCF-Address                  [3] ISDN-AddressString,
    extensionContainer              [2] ExtensionContainer      OPTIONAL,
    ...}
```

```
AnyTimeInterrogationRes ::= SEQUENCE {
    subscriberInfo                  SubscriberInfo,
    extensionContainer              ExtensionContainer          OPTIONAL,
    ...}
```

-- any time information handling types

```
AnyTimeSubscriptionInterrogationArg ::= SEQUENCE {
    subscriberIdentity              [0] SubscriberIdentity,
    requestedSubscriptionInfo       [1] RequestedSubscriptionInfo,
    gsmSCF-Address                  [2] ISDN-AddressString,
    extensionContainer              [3] ExtensionContainer      OPTIONAL,
    longFTN-Supported               [4]  NULL                   OPTIONAL,
    ...}
```

```
AnyTimeSubscriptionInterrogationRes ::= SEQUENCE {
    callForwardingData              [1] CallForwardingData          OPTIONAL,
    callBarringData                 [2] CallBarringData             OPTIONAL,
    odb-Info                        [3] ODB-Info                    OPTIONAL,
    camel-SubscriptionInfo          [4] CAMEL-SubscriptionInfo      OPTIONAL,
    supportedVLR-CAMEL-Phases       [5] SupportedCamelPhases        OPTIONAL,
    supportedSGSN-CAMEL-Phases      [6] SupportedCamelPhases        OPTIONAL,
    extensionContainer              [7] ExtensionContainer          OPTIONAL,
    ...}
```

```
RequestedSubscriptionInfo ::= SEQUENCE {
    requestedSS-Info                [1] SS-ForBS-Code               OPTIONAL,
    odb                             [2] NULL                        OPTIONAL,
    requestedCAMEL-SubscriptionInfo [3] RequestedCAMEL-SubscriptionInfo   OPTIONAL,
    supportedVLR-CAMEL-Phases       [4] NULL                        OPTIONAL,
    supportedSGSN-CAMEL-Phases      [5] NULL                        OPTIONAL,
    extensionContainer              [6] ExtensionContainer          OPTIONAL,
    ...,
    additionalRequestedCAMEL-SubscriptionInfo
                                    [7] AdditionalRequestedCAMEL-SubscriptionInfo
                                                                    OPTIONAL}
```

```
RequestedCAMEL-SubscriptionInfo ::= ENUMERATED {
    o-CSI                           (0),
    t-CSI                           (1),
    vt-CSI                          (2),
    tif-CSI                         (3),
    gprs-CSI                        (4),
    mo-sms-CSI                      (5),
    ss-CSI                          (6),
    m-CSI                           (7),
    d-csi                           (8)}
```

```
AdditionalRequestedCAMEL-SubscriptionInfo ::= ENUMERATED {
    mt-sms-CSI                      (0),
    mg-csi                          (1),
    ...}
--  exception handling: unknown values shall be discarded by the receiver.
```

```
CallForwardingData ::= SEQUENCE {
    forwardingFeatureList           Ext-ForwFeatureList,
    notificationToCSE               NULL                            OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
CallBarringData ::= SEQUENCE {
    callBarringFeatureList          Ext-CallBarFeatureList,
    password                        Password,
    wrongPasswordAttemptsCounter    WrongPasswordAttemptsCounter,
    notificationToCSE               NULL                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
WrongPasswordAttemptsCounter ::= INTEGER (0..4)
```

```
ODB-Info ::= SEQUENCE {
    odb-Data                        ODB-Data,
    notificationToCSE               NULL                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
CAMEL-SubscriptionInfo ::= SEQUENCE {
     o-CSI                                [0]  O-CSI                                OPTIONAL,
     o-BcsmCamelTDP-CriteriaList          [1]  O-BcsmCamelTDPCriteriaList           OPTIONAL,
     d-CSI                                [2]  D-CSI                                OPTIONAL,
     t-CSI                                [3]  T-CSI                                OPTIONAL,
     t-BCSM-CAMEL-TDP-CriteriaList        [4]  T-BCSM-CAMEL-TDP-CriteriaList        OPTIONAL,
     vt-CSI                               [5]  T-CSI                                OPTIONAL,
     vt-BCSM-CAMEL-TDP-CriteriaList       [6]  T-BCSM-CAMEL-TDP-CriteriaList        OPTIONAL,
     tif-CSI                              [7]  NULL                                 OPTIONAL,
     tif-CSI-NotificationToCSE            [8]  NULL                                 OPTIONAL,
     gprs-CSI                             [9]  GPRS-CSI                             OPTIONAL,
     mo-sms-CSI                           [10] SMS-CSI                              OPTIONAL,
     ss-CSI                               [11] SS-CSI                               OPTIONAL,
     m-CSI                                [12] M-CSI                                OPTIONAL,
     extensionContainer                   [13] ExtensionContainer                   OPTIONAL,
     ...,
     mt-sms-CSI                           [14] SMS-CSI                              OPTIONAL,
     mt-smsCAMELTDP-CriteriaList          [15] MT-smsCAMELTDP-CriteriaList          OPTIONAL,
     mg-csi                               [16] MG-CSI                               OPTIONAL
     }

AnyTimeModificationArg ::= SEQUENCE {
     subscriberIdentity                   [0]  SubscriberIdentity,
     gsmSCF-Address                       [1]  ISDN-AddressString,
     modificationRequestFor-CF-Info       [2]  ModificationRequestFor-CF-Info OPTIONAL,
     modificationRequestFor-CB-Info       [3]  ModificationRequestFor-CB-Info OPTIONAL,
     modificationRequestFor-CSI           [4]  ModificationRequestFor-CSI      OPTIONAL,
     extensionContainer                   [5]  ExtensionContainer              OPTIONAL,
     longFTN-Supported                    [6]  NULL                            OPTIONAL,
     ...,
     modificationRequestFor-ODB-data      [7]  ModificationRequestFor-ODB-data OPTIONAL}

AnyTimeModificationRes ::= SEQUENCE {
     ss-InfoFor-CSE                       [0]  Ext-SS-InfoFor-CSE              OPTIONAL,
     camel-SubscriptionInfo               [1]  CAMEL-SubscriptionInfo          OPTIONAL,
     extensionContainer                   [2]  ExtensionContainer              OPTIONAL,
     ...,
     odb-Info                             [3]  ODB-Info                        OPTIONAL}

ModificationRequestFor-CF-Info ::= SEQUENCE {
     ss-Code                              [0]  SS-Code,
     basicService                         [1]  Ext-BasicServiceCode            OPTIONAL,
     ss-Status                            [2]  Ext-SS-Status                   OPTIONAL,
     forwardedToNumber                    [3]  AddressString                   OPTIONAL,
     forwardedToSubaddress                [4]  ISDN-SubaddressString           OPTIONAL,
     noReplyConditionTime                 [5]  Ext-NoRepCondTime               OPTIONAL,
     modifyNotificationToCSE              [6]  ModificationInstruction         OPTIONAL,
     extensionContainer                   [7]  ExtensionContainer              OPTIONAL,
     ...}

ModificationRequestFor-CB-Info ::= SEQUENCE {
     ss-Code                              [0]  SS-Code,
     basicService                         [1]  Ext-BasicServiceCode            OPTIONAL,
     ss-Status                            [2]  Ext-SS-Status                   OPTIONAL,
     password                             [3]  Password                        OPTIONAL,
     wrongPasswordAttemptsCounter         [4]  WrongPasswordAttemptsCounter    OPTIONAL,
     modifyNotificationToCSE              [5]  ModificationInstruction         OPTIONAL,
     extensionContainer                   [6]  ExtensionContainer              OPTIONAL,
     ...}

ModificationRequestFor-ODB-data ::= SEQUENCE {
     odb-data                             [0]  ODB-Data                        OPTIONAL,
     modifyNotificationToCSE              [1]  ModificationInstruction         OPTIONAL,
     extensionContainer                   [2]  ExtensionContainer              OPTIONAL,
     ...}

ModificationRequestFor-CSI ::= SEQUENCE {
     requestedCamel-SubscriptionInfo      [0]  RequestedCAMEL-SubscriptionInfo,
     modifyNotificationToCSE              [1]  ModificationInstruction         OPTIONAL,
     modifyCSI-State                      [2]  ModificationInstruction         OPTIONAL,
     extensionContainer                   [3]  ExtensionContainer              OPTIONAL,
     ...,
     additionalRequestedCAMEL-SubscriptionInfo
                                          [4] AdditionalRequestedCAMEL-SubscriptionInfo
                                                                               OPTIONAL}
```

```
ModificationInstruction ::= ENUMERATED {
     deactivate                          (0),
     activate                            (1)}
```

-- subscriber data modification notification types

```
NoteSubscriberDataModifiedArg ::= SEQUENCE {
     imsi                                IMSI,
     msisdn                              ISDN-AddressString,
     forwardingInfoFor-CSE               [0] Ext-ForwardingInfoFor-CSE     OPTIONAL,
     callBarringInfoFor-CSE              [1] Ext-CallBarringInfoFor-CSE    OPTIONAL,
     odb-Info                            [2] ODB-Info                      OPTIONAL,
     camel-SubscriptionInfo              [3] CAMEL-SubscriptionInfo        OPTIONAL,
     allInformationSent                  [4] NULL                          OPTIONAL,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
NoteSubscriberDataModifiedRes ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

-- mobility management event notificatioon info types

```
NoteMM-EventArg::= SEQUENCE {
     serviceKey                          ServiceKey,
     eventMet                            [0]  MM-Code,
     imsi                                [1]  IMSI,
     msisdn                              [2]  ISDN-AddressString,
     locationInformation                 [3]  LocationInformation          OPTIONAL,
     supportedCAMELPhases                [5]  SupportedCamelPhases         OPTIONAL,
     extensionContainer                  [6]  ExtensionContainer           OPTIONAL,
     ...}
```

```
NoteMM-EventRes ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
Ext-SS-InfoFor-CSE ::= CHOICE {
     forwardingInfoFor-CSE               [0] Ext-ForwardingInfoFor-CSE,
     callBarringInfoFor-CSE              [1] Ext-CallBarringInfoFor-CSE
     }
```

```
Ext-ForwardingInfoFor-CSE ::= SEQUENCE {
     ss-Code                             [0]  SS-Code,
     forwardingFeatureList               [1]  Ext-ForwFeatureList,
     notificationToCSE                   [2]  NULL,
     extensionContainer                  [3]  ExtensionContainer           OPTIONAL,
     ...}
```

```
Ext-CallBarringInfoFor-CSE ::= SEQUENCE {
     ss-Code                             [0]  SS-Code,
     callBarringFeatureList              [1]  Ext-CallBarFeatureList,
     password                            [2]  Password,
     wrongPasswordAttemptsCounter        [3]  WrongPasswordAttemptsCounter,
     notificationToCSE                   [4]  NULL,
     extensionContainer                  [5]  ExtensionContainer           OPTIONAL,
     ...}
```

```
END
```

17.7.2 Operation and maintenance data types

```
MAP-OM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OM-DataTypes (12) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   ActivateTraceModeArg,
```

```
   ActivateTraceModeRes,
   DeactivateTraceModeArg,
   DeactivateTraceModeRes
;

IMPORTS
   AddressString,
   IMSI
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}


;
```

```
ActivateTraceModeArg ::= SEQUENCE {
     imsi                              [0] IMSI                          OPTIONAL,
     traceReference                    [1] TraceReference,
     traceType                         [2] TraceType,
     omc-Id                            [3] AddressString                 OPTIONAL,
     extensionContainer                [4] ExtensionContainer            OPTIONAL,
     ...}
```

```
TraceReference ::= OCTET STRING (SIZE (1..2))
```

```
TraceType ::= INTEGER
     (0..255)
     -- Trace types are fully defined in TS GSM 12.08.
```

```
ActivateTraceModeRes ::= SEQUENCE {
     extensionContainer                [0] ExtensionContainer            OPTIONAL,
     ...}
```

```
DeactivateTraceModeArg ::= SEQUENCE {
     imsi                              [0] IMSI                          OPTIONAL,
     traceReference                    [1] TraceReference,
     extensionContainer                [2] ExtensionContainer            OPTIONAL,
     ...}
```

```
DeactivateTraceModeRes ::= SEQUENCE {
     extensionContainer                [0] ExtensionContainer            OPTIONAL,
     ...}
```

```
END
```

17.7.3 Call handling data types

```
MAP-CH-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CH-DataTypes (13) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   SendRoutingInfoArg,
   SendRoutingInfoRes,
   ProvideRoamingNumberArg,
   ProvideRoamingNumberRes,
   ResumeCallHandlingArg,
   ResumeCallHandlingRes,
   NumberOfForwarding,
   SuppressionOfAnnouncement,
   CallReferenceNumber,
   ProvideSIWFSNumberArg,
   ProvideSIWFSNumberRes,
```

```
   SIWFSSignallingModifyArg,
   SIWFSSignallingModifyRes,
   SetReportingStateArg,
   SetReportingStateRes,
   StatusReportArg,
   StatusReportRes,
   RemoteUserFreeArg,
   RemoteUserFreeRes,
   IST-AlertArg,
   IST-AlertRes,
   IST-CommandArg,
   IST-CommandRes
;

IMPORTS
   SubscriberInfo,
   SupportedCamelPhases,
   CUG-Interlock,
   O-CSI,
   D-CSI,
   O-BcsmCamelTDPCriteriaList,
   T-BCSM-CAMEL-TDP-CriteriaList,
   IST-SupportIndicator,
   IST-AlertTimerValue,
   T-CSI


FROM MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version7 (7)}

   ForwardingOptions,
   SS-List,
   CCBS-Feature
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version7 (7)}

   ISDN-AddressString,
   ISDN-SubaddressString,
   FTN-AddressString,
   ExternalSignalInfo,
   Ext-ExternalSignalInfo,
   IMSI,
   LMSI,
   Ext-BasicServiceCode,
   AlertingPattern,
   NAEA-PreferredCI


FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}
;
```

```
CUG-CheckInfo ::= SEQUENCE {
     cug-Interlock                  CUG-Interlock,
     cug-OutgoingAccess             NULL                          OPTIONAL,
     extensionContainer             ExtensionContainer            OPTIONAL,
     ...}
```

```
NumberOfForwarding ::= INTEGER (1..5)
```

```
SendRoutingInfoArg ::= SEQUENCE {
     msisdn                              [0] ISDN-AddressString,
     cug-CheckInfo                       [1] CUG-CheckInfo                  OPTIONAL,
     numberOfForwarding                  [2] NumberOfForwarding             OPTIONAL,
     interrogationType                   [3] InterrogationType,
     or-Interrogation                    [4] NULL                           OPTIONAL,
     or-Capability                       [5] OR-Phase                       OPTIONAL,
     gmsc-OrGsmSCF-Address               [6] ISDN-AddressString,
     callReferenceNumber                 [7] CallReferenceNumber            OPTIONAL,
     forwardingReason                    [8] ForwardingReason               OPTIONAL,
     basicServiceGroup                   [9] Ext-BasicServiceCode           OPTIONAL,
     networkSignalInfo                  [10] ExternalSignalInfo             OPTIONAL,
     camelInfo                          [11] CamelInfo                      OPTIONAL,
     suppressionOfAnnouncement          [12] SuppressionOfAnnouncement      OPTIONAL,
     extensionContainer                 [13] ExtensionContainer             OPTIONAL,
     ...,
     alertingPattern                    [14] AlertingPattern                OPTIONAL,
     ccbs-Call                          [15] NULL                            OPTIONAL,
     supportedCCBS-Phase                [16]  SupportedCCBS-Phase           OPTIONAL,
     additionalSignalInfo               [17] Ext-ExternalSignalInfo         OPTIONAL,
     istSupportIndicator                [18] IST-SupportIndicator           OPTIONAL,
     pre-pagingSupported                [19] NULL                           OPTIONAL,
     callDiversionTreatmentIndicator    [20] CallDiversionTreatmentIndicator   OPTIONAL,
     longFTN-Supported                  [21] NULL                           OPTIONAL,
     suppress-VT-CSI                    [22] NULL                           OPTIONAL,
     suppressIncomingCallBarring        [23] NULL                           OPTIONAL,
     gsmSCF-InitiatedCall               [24] NULL                           OPTIONAL
     }
```

```
SuppressionOfAnnouncement ::= NULL
```

```
InterrogationType ::= ENUMERATED {
     basicCall  (0),
     forwarding  (1)}
```

```
OR-Phase ::= INTEGER (1..127)
```

```
CallReferenceNumber ::= OCTET STRING (SIZE (1..8))
```

```
ForwardingReason ::= ENUMERATED {
     notReachable  (0),
     busy  (1),
     noReply  (2)}
```

```
SupportedCCBS-Phase ::= INTEGER (1..127)
-- exception handling:
-- Only value 1 is used.
-- Values in the ranges 2-127 are reserved for future use.
-- If received values 2-127 shall be mapped on to value 1.
```

```
CallDiversionTreatmentIndicator ::= OCTET STRING (SIZE(1))
--   callDiversionAllowed (xxxx xx01)
--   callDiversionNotAllowed (xxxx xx10)
--   network default is call diversion allowed
```

```
SendRoutingInfoRes ::= [3] SEQUENCE {
    imsi                                [9] IMSI                                OPTIONAL,
    -- IMSI must be present if SendRoutingInfoRes is not segmented.
    -- If the TC-Result-NL segmentation option is taken the IMSI must be
    -- present in one segmented transmission of SendRoutingInfoRes.
    extendedRoutingInfo                 ExtendedRoutingInfo                 OPTIONAL,
    cug-CheckInfo                       [3] CUG-CheckInfo                   OPTIONAL,
    cugSubscriptionFlag                 [6] NULL                            OPTIONAL,
    subscriberInfo                      [7] SubscriberInfo                  OPTIONAL,
    ss-List                             [1] SS-List                         OPTIONAL,
    basicService                        [5] Ext-BasicServiceCode            OPTIONAL,
    forwardingInterrogationRequired     [4] NULL                            OPTIONAL,
    vmsc-Address                        [2] ISDN-AddressString              OPTIONAL,
    extensionContainer                  [0] ExtensionContainer              OPTIONAL,
    ... ,
    naea-PreferredCI                    [10] NAEA-PreferredCI               OPTIONAL,
    -- naea-PreferredCI is included at the discretion of the HLR operator.
    ccbs-Indicators                     [11] CCBS-Indicators                OPTIONAL,
    msisdn                              [12] ISDN-AddressString             OPTIONAL,
    numberPortabilityStatus             [13] NumberPortabilityStatus        OPTIONAL,
    istAlertTimer                       [14] IST-AlertTimerValue            OPTIONAL,
    supportedCamelPhases                [15] SupportedCamelPhases           OPTIONAL
    }
```

```
NumberPortabilityStatus ::= ENUMERATED {
    notKnownToBePorted                  (0),
    ownNumberPortedOut                  (1),
    foreignNumberPortedToForeignNetwork (2),
    ...}
    --   exception handling:
    --  reception of other values than the ones listed the receiver shall ignore the
    --  whole NumberPortabilityStatus
```

```
CCBS-Indicators ::= SEQUENCE {
    ccbs-Possible                       [0]  NULL                           OPTIONAL,
    keepCCBS-CallIndicator              [1]  NULL                           OPTIONAL,
    extensionContainer                  [2]  ExtensionContainer             OPTIONAL,
    ...}
```

```
RoutingInfo ::= CHOICE {
    roamingNumber                       ISDN-AddressString,
    forwardingData                      ForwardingData}
```

```
ForwardingData ::= SEQUENCE {
    forwardedToNumber                   [5] ISDN-AddressString              OPTIONAL,
    -- When this datatype is sent from an HLR which supports CAMEL Phase 2
    -- to a GMSC which supports CAMEL Phase 2 the GMSC shall not check the
    -- format of the number
    forwardedToSubaddress               [4] ISDN-SubaddressString           OPTIONAL,
    forwardingOptions                   [6] ForwardingOptions               OPTIONAL,
    extensionContainer                  [7] ExtensionContainer              OPTIONAL,
    ...,
    longForwardedToNumber               [8] FTN-AddressString               OPTIONAL}
```

```
ProvideRoamingNumberArg ::= SEQUENCE {
    imsi                                [0] IMSI,
    msc-Number                          [1] ISDN-AddressString,
    msisdn                              [2] ISDN-AddressString              OPTIONAL,
    lmsi                                [4] LMSI                            OPTIONAL,
    gsm-BearerCapability                [5] ExternalSignalInfo              OPTIONAL,
    networkSignalInfo                   [6] ExternalSignalInfo              OPTIONAL,
    suppressionOfAnnouncement           [7] SuppressionOfAnnouncement       OPTIONAL,
    gmsc-Address                        [8] ISDN-AddressString              OPTIONAL,
    callReferenceNumber                 [9] CallReferenceNumber             OPTIONAL,
    or-Interrogation                    [10] NULL                           OPTIONAL,
    extensionContainer                  [11] ExtensionContainer             OPTIONAL,
    ... ,
    alertingPattern                     [12] AlertingPattern                OPTIONAL,
    ccbs-Call                           [13] NULL                           OPTIONAL,
    supportedCamelPhasesInGMSC          [15] SupportedCamelPhases           OPTIONAL,
    additionalSignalInfo                [14] Ext-ExternalSignalInfo         OPTIONAL,
    orNotSupportedInGMSC                [16] NULL                           OPTIONAL,
    pre-pagingSupported                 [17] NULL                           OPTIONAL,
    longFTN-Supported                   [18] NULL                           OPTIONAL,
    suppress-VT-CSI                     [19] NULL                           OPTIONAL
    }
```

```
ProvideRoamingNumberRes ::= SEQUENCE {
     roamingNumber                    ISDN-AddressString,
     extensionContainer               ExtensionContainer              OPTIONAL,
     ...}
```

```
ResumeCallHandlingArg ::= SEQUENCE {
     callReferenceNumber              [0] CallReferenceNumber         OPTIONAL,
     basicServiceGroup                [1] Ext-BasicServiceCode        OPTIONAL,
     forwardingData                   [2] ForwardingData              OPTIONAL,
     imsi                             [3] IMSI                        OPTIONAL,
     cug-CheckInfo                    [4] CUG-CheckInfo               OPTIONAL,
     o-CSI                            [5] O-CSI                       OPTIONAL,
     extensionContainer               [7] ExtensionContainer          OPTIONAL,
     ccbs-Possible                    [8]  NULL                       OPTIONAL,
     msisdn                           [9]  ISDN-AddressString         OPTIONAL,
     uu-Data                          [10] UU-Data                    OPTIONAL,
     allInformationSent               [11] NULL                       OPTIONAL,
     ...,
     d-csi                            [12] D-CSI                      OPTIONAL}
```

```
UU-Data ::= SEQUENCE {
     uuIndicator                      [0] UUIndicator                 OPTIONAL,
     uui                              [1] UUI                         OPTIONAL,
     uusCFInteraction                 [2] NULL                        OPTIONAL,
     extensionContainer               [3] ExtensionContainer          OPTIONAL,
     ...}
```

```
UUIndicator ::= OCTET STRING (SIZE (1))
     -- Octets are coded according to ETS 300 356
```

```
UUI  ::= OCTET STRING (SIZE (1..131))
     -- Octets are coded according to ETS 300 356
```

```
ResumeCallHandlingRes ::= SEQUENCE {
     extensionContainer               ExtensionContainer              OPTIONAL,
     ...}
```

```
CamelInfo ::= SEQUENCE {
     supportedCamelPhases             SupportedCamelPhases,
     suppress-T-CSI                   NULL                            OPTIONAL,
     extensionContainer               ExtensionContainer              OPTIONAL,
     ...}
```

```
ExtendedRoutingInfo ::= CHOICE {
     routingInfo                      RoutingInfo,
     camelRoutingInfo                 [8] CamelRoutingInfo}
```

```
CamelRoutingInfo ::= SEQUENCE {
     forwardingData                   ForwardingData                  OPTIONAL,
     gmscCamelSubscriptionInfo        [0] GmscCamelSubscriptionInfo,
     extensionContainer               [1] ExtensionContainer          OPTIONAL,
     ...}
```

```
GmscCamelSubscriptionInfo ::= SEQUENCE {
     t-CSI                            [0] T-CSI OPTIONAL,
     o-CSI                            [1] O-CSI OPTIONAL,
     extensionContainer               [2] ExtensionContainer          OPTIONAL,
     ...,
     o-BcsmCamelTDP-CriteriaList      [3] O-BcsmCamelTDPCriteriaList  OPTIONAL,
     t-BCSM-CAMEL-TDP-CriteriaList    [4]  T-BCSM-CAMEL-TDP-CriteriaList OPTIONAL,
     d-csi                            [5]  D-CSI                      OPTIONAL}
```

```
ProvideSIWFSNumberArg ::= SEQUENCE {
     gsm-BearerCapability             [0] ExternalSignalInfo,
     isdn-BearerCapability            [1] ExternalSignalInfo,
     call-Direction                   [2] CallDirection,
     b-Subscriber-Address             [3] ISDN-AddressString,
     chosenChannel                    [4] ExternalSignalInfo,
     lowerLayerCompatibility          [5] ExternalSignalInfo          OPTIONAL,
     highLayerCompatibility           [6] ExternalSignalInfo          OPTIONAL,
     extensionContainer               [7] ExtensionContainer          OPTIONAL,
     ...}
```

```
CallDirection ::= OCTET STRING (SIZE (1))
     -- OCTET 1

     -- bit 1 (direction of call)
     -- 0  Mobile Originated Call (MOC)
     -- 1  Mobile Terminated Call (MTC)
```

```
ProvideSIWFSNumberRes ::= SEQUENCE {
     sIWFSNumber                    [0] ISDN-AddressString,
     extensionContainer             [1] ExtensionContainer          OPTIONAL,
     ...}
```

```
SIWFSSignallingModifyArg ::= SEQUENCE {
     channelType                    [0] ExternalSignalInfo          OPTIONAL,
     chosenChannel                  [1] ExternalSignalInfo          OPTIONAL,
     extensionContainer             [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
SIWFSSignallingModifyRes ::= SEQUENCE {
     chosenChannel                  [0] ExternalSignalInfo          OPTIONAL,
     extensionContainer             [1] ExtensionContainer          OPTIONAL,
     ...}
```

```
SetReportingStateArg ::= SEQUENCE {
     imsi                           [0]  IMSI                       OPTIONAL,
     lmsi                           [1]  LMSI                       OPTIONAL,
     ccbs-Monitoring                [2]  ReportingState             OPTIONAL,
     extensionContainer             [3]  ExtensionContainer         OPTIONAL,
     ...}
```

```
ReportingState ::= ENUMERATED {
     stopMonitoring                 (0),
     startMonitoring                (1),
     ...}
     -- exception handling:
     -- reception of values 2-10 shall be mapped to 'stopMonitoring'
     -- reception of values > 10 shall be mapped to 'startMonitoring'
```

```
SetReportingStateRes ::= SEQUENCE{
     ccbs-SubscriberStatus          [0]  CCBS-SubscriberStatus      OPTIONAL,
     extensionContainer             [1]  ExtensionContainer         OPTIONAL,
     ...}
```

```
CCBS-SubscriberStatus ::= ENUMERATED {
     ccbsNotIdle                    (0),
     ccbsIdle                       (1),
     ccbsNotReachable               (2),
     ...}
     --  exception handling:
     --  reception of values 3-10 shall be mapped to 'ccbsNotIdle'
     --  reception of values 11-20 shall be mapped to 'ccbsIdle'
     --  reception of values > 20 shall be mapped to 'ccbsNotReachable'
```

```
StatusReportArg ::= SEQUENCE{
     imsi                           [0]  IMSI,
     eventReportData                [1]  EventReportData            OPTIONAL,
     callReportdata                 [2]  CallReportData             OPTIONAL,
     extensionContainer             [3]  ExtensionContainer         OPTIONAL,
     ...}
```

```
EventReportData ::= SEQUENCE{
     ccbs-SubscriberStatus          [0]  CCBS-SubscriberStatus      OPTIONAL,
     extensionContainer             [1]  ExtensionContainer         OPTIONAL,
     ...}
```

```
CallReportData ::= SEQUENCE{
     monitoringMode                 [0]  MonitoringMode             OPTIONAL,
     callOutcome                    [1]  CallOutcome                OPTIONAL,
     extensionContainer             [2]  ExtensionContainer         OPTIONAL,
     ...}
```

```
MonitoringMode ::= ENUMERATED {
     a-side                              (0),
     b-side                              (1),
     ...}
     --   exception handling:
     --  reception of values 2-10 shall be mapped 'a-side'
     --  reception of values > 10 shall be mapped to 'b-side'
```

```
CallOutcome ::= ENUMERATED {
     success                             (0),
     failure                             (1),
     busy                                (2),
     ...}
     --   exception handling:
     --  reception of values 3-10 shall be mapped to 'success'
     --  reception of values 11-20 shall be mapped to 'failure'
     --  reception of values > 20 shall be mapped to 'busy'
```

```
StatusReportRes ::= SEQUENCE {
     extensionContainer                  [0]  ExtensionContainer           OPTIONAL,
     ...}
```

```
RemoteUserFreeArg ::= SEQUENCE{
     imsi                                [0]  IMSI,
     callInfo                            [1]  ExternalSignalInfo,
     ccbs-Feature                        [2]  CCBS-Feature,
     translatedB-Number                  [3]  ISDN-AddressString,
     replaceB-Number                     [4]  NULL                         OPTIONAL,
     alertingPattern                     [5]  AlertingPattern              OPTIONAL,
     extensionContainer                  [6]  ExtensionContainer           OPTIONAL,
     ...}
```

```
RemoteUserFreeRes ::= SEQUENCE{
     ruf-Outcome                         [0]  RUF-Outcome,
     extensionContainer                  [1]  ExtensionContainer           OPTIONAL,
     ...}
```

```
RUF-Outcome ::= ENUMERATED{
     accepted (0),
     rejected (1),
     noResponseFromFreeMS (2), -- T4 Expiry
     noResponseFromBusyMS (3), -- T10 Expiry
     udubFromFreeMS (4),
     udubFromBusyMS (5),
     ...}
     -- exception handling:
     -- reception of values 6-20 shall be mapped to 'accepted'
     -- reception of values 21-30 shall be mapped to 'rejected'
     -- reception of values 31-40 shall be mapped to 'noResponseFromFreeMS'
     -- reception of values 41-50 shall be mapped to 'noResponseFromBusyMS'
     -- reception of values 51-60 shall be mapped to 'udubFromFreeMS'
     -- reception of values > 60 shall be mapped to 'udubFromBusyMS'
```

```
IST-AlertArg ::= SEQUENCE{
     imsi                                [0]  IMSI,
     extensionContainer                  [1]  ExtensionContainer           OPTIONAL,
     ...}
```

```
IST-AlertRes ::= SEQUENCE{
     istAlertTimer                       [0]  IST-AlertTimerValue          OPTIONAL,
     istInformationWithdraw              [1]  NULL                         OPTIONAL,
     callTerminationIndicator            [2]  CallTerminationIndicator     OPTIONAL,
     extensionContainer                  [3]  ExtensionContainer           OPTIONAL,
     ...}
```

```
IST-CommandArg ::= SEQUENCE{
     imsi                                [0]  IMSI,
     extensionContainer                  [1]  ExtensionContainer           OPTIONAL,
     ...}
```

```
IST-CommandRes ::= SEQUENCE{
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
CallTerminationIndicator ::= ENUMERATED {
     terminateCallActivityReferred       (0),
     terminateAllCallActivities          (1),
     ...}
     -- exception handling:
     -- reception of values 2-10 shall be mapped to ' terminateCallActivityReferred '
     -- reception of values > 10 shall be mapped to ' terminateAllCallActivities '

     -- In MSCs not supporting linkage of all call activities, any value received shall
     -- be interpreted as ' terminateCallActivityReferred '
```

```
END
```

17.7.4 Supplementary service data types

```
MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RegisterSS-Arg,
   SS-Info,
   SS-Status,
   SS-SubscriptionOption,
   SS-ForBS-Code,
   InterrogateSS-Res,
   USSD-Arg,
   USSD-Res,
   USSD-DataCodingScheme,
   USSD-String,
   Password,
   GuidanceInfo,
   SS-List,
   SS-InfoList,
   OverrideCategory,
   CliRestrictionOption,
   NoReplyConditionTime,
   ForwardingOptions,
   maxNumOfSS,
   SS-Data,
   SS-InvocationNotificationArg,
   SS-InvocationNotificationRes,
   CCBS-Feature,
   RegisterCC-EntryArg,
   RegisterCC-EntryRes,
   EraseCC-EntryArg,
   EraseCC-EntryRes
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   ISDN-SubaddressString,
   FTN-AddressString,
   IMSI,
   BasicServiceCode,
   AlertingPattern,
   EMLPP-Priority,
   MaxMC-Bearers,
   MC-Bearers,
   ExternalSignalInfo

FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}
```

```
   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version7 (7)}
;
```

```
RegisterSS-Arg ::= SEQUENCE {
     ss-Code                          SS-Code,
     basicService                     BasicServiceCode                 OPTIONAL,
     forwardedToNumber                [4] AddressString                OPTIONAL,
     forwardedToSubaddress            [6] ISDN-SubaddressString        OPTIONAL,
     noReplyConditionTime             [5] NoReplyConditionTime         OPTIONAL,
     ...,
     defaultPriority                  [7] EMLPP-Priority               OPTIONAL,
     nbrUser                          [8] MC-Bearers                   OPTIONAL,
     longFTN-Supported                [9]  NULL                        OPTIONAL }
```

```
NoReplyConditionTime ::= INTEGER (5..30)
```

```
SS-Info ::= CHOICE {
     forwardingInfo                   [0] ForwardingInfo,
     callBarringInfo                  [1] CallBarringInfo,
     ss-Data                          [3] SS-Data}
```

```
ForwardingInfo ::= SEQUENCE {
     ss-Code                          SS-Code                          OPTIONAL,
     forwardingFeatureList            ForwardingFeatureList,
     ...}
```

```
ForwardingFeatureList ::=
     SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
                                      ForwardingFeature
```

```
ForwardingFeature ::= SEQUENCE {
     basicService                     BasicServiceCode                 OPTIONAL,
     ss-Status                        [4] SS-Status                    OPTIONAL,
     forwardedToNumber                [5] ISDN-AddressString           OPTIONAL,
     forwardedToSubaddress            [8] ISDN-SubaddressString        OPTIONAL,
     forwardingOptions                [6] ForwardingOptions            OPTIONAL,
     noReplyConditionTime             [7] NoReplyConditionTime         OPTIONAL,
     ...,
     longForwardedToNumber            [9] FTN-AddressString            OPTIONAL }
```

```
SS-Status ::= OCTET STRING (SIZE (1))

     -- bits 8765: 0000 (unused)
     -- bits 4321: Used to convey the "P bit","R bit","A bit" and "Q bit",
     --            representing supplementary service state information
     --            as defined in TS 3GPP TS 23.011 [22]

     -- bit 4: "Q bit"

     -- bit 3: "P bit"

     -- bit 2: "R bit"

     -- bit 1: "A bit"
```

```
ForwardingOptions ::= OCTET STRING (SIZE (1))

     -- bit 8: notification to forwarding party
     --   0  no notification
     --   1  notification

     -- bit 7: redirecting presentation
     --   0 no presentation
     --   1  presentation

     -- bit 6: notification to calling party
     --   0  no notification
     --   1  notification

     -- bit 5: 0 (unused)

     -- bits 43: forwarding reason
     --   00  ms not reachable
     --   01  ms busy
     --   10  no reply
     --   11  unconditional when used in a SRI Result,
     --       or call deflection when used in a RCH Argument
     -- bits 21: 00 (unused)
```

```
CallBarringInfo ::= SEQUENCE {
     ss-Code                          SS-Code                          OPTIONAL,
     callBarringFeatureList           CallBarringFeatureList,
     ...}
```

```
CallBarringFeatureList ::= SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
                                      CallBarringFeature
```

```
CallBarringFeature ::= SEQUENCE {
     basicService                     BasicServiceCode                 OPTIONAL,
     ss-Status [4] SS-Status          OPTIONAL,
     ...}
```

```
SS-Data ::= SEQUENCE {
     ss-Code                          SS-Code                          OPTIONAL,
     ss-Status                        [4] SS-Status                    OPTIONAL,
     ss-SubscriptionOption            SS-SubscriptionOption            OPTIONAL,
     basicServiceGroupList            BasicServiceGroupList            OPTIONAL,
     ...,
     defaultPriority                  EMLPP-Priority                   OPTIONAL,
     nbrUser                          [5] MC-Bearers                   OPTIONAL
     }
```

```
SS-SubscriptionOption ::= CHOICE {
     cliRestrictionOption             [2] CliRestrictionOption,
     overrideCategory                 [1] OverrideCategory}
```

```
CliRestrictionOption ::= ENUMERATED {
     permanent  (0),
     temporaryDefaultRestricted  (1),
     temporaryDefaultAllowed  (2)}
```

```
OverrideCategory ::= ENUMERATED {
     overrideEnabled  (0),
     overrideDisabled  (1)}
```

```
SS-ForBS-Code ::= SEQUENCE {
     ss-Code                          SS-Code,
     basicService                     BasicServiceCode                 OPTIONAL,
     ...,
     longFTN-Supported                [4]  NULL                        OPTIONAL }
```

```
GenericServiceInfo ::= SEQUENCE {
     ss-Status SS-Status,
     cliRestrictionOption             CliRestrictionOption             OPTIONAL,
     ...,
     maximumEntitledPriority          [0] EMLPP-Priority               OPTIONAL,
     defaultPriority                  [1] EMLPP-Priority               OPTIONAL,
     ccbs-FeatureList                 [2] CCBS-FeatureList             OPTIONAL,
     nbrSB                            [3] MaxMC-Bearers                OPTIONAL,
     nbrUser                          [4] MC-Bearers                   OPTIONAL,
     nbrSN                            [5] MC-Bearers                   OPTIONAL }
```

```
CCBS-FeatureList ::= SEQUENCE SIZE (1..maxNumOfCCBS-Requests) OF
                                        CCBS-Feature
```

```
maxNumOfCCBS-Requests  INTEGER ::= 5
```

```
CCBS-Feature ::= SEQUENCE {
     ccbs-Index                         [0] CCBS-Index                    OPTIONAL,
     b-subscriberNumber                 [1] ISDN-AddressString            OPTIONAL,
     b-subscriberSubaddress             [2] ISDN-SubaddressString         OPTIONAL,
     basicServiceGroup                  [3] BasicServiceCode              OPTIONAL,
     ...}
```

```
CCBS-Index  ::= INTEGER (1..maxNumOfCCBS-Requests)
```

```
InterrogateSS-Res ::= CHOICE {
     ss-Status                          [0] SS-Status,
     basicServiceGroupList              [2] BasicServiceGroupList,
     forwardingFeatureList              [3] ForwardingFeatureList,
     genericServiceInfo                 [4]  GenericServiceInfo }
```

```
USSD-Arg ::= SEQUENCE {
     ussd-DataCodingScheme              USSD-DataCodingScheme,
     ussd-String                        USSD-String,
     ... ,
     alertingPattern                    AlertingPattern                   OPTIONAL,
     msisdn                             [0] ISDN-AddressString            OPTIONAL }
```

```
USSD-Res ::= SEQUENCE {
     ussd-DataCodingScheme              USSD-DataCodingScheme,
     ussd-String                        USSD-String,
     ...}
```

```
USSD-DataCodingScheme ::= OCTET STRING (SIZE (1))
     -- The structure of the USSD-DataCodingScheme is defined by
     -- the Cell Broadcast Data Coding Scheme as described in
     -- TS 3GPP TS 23.038 [25]
```

```
USSD-String ::= OCTET STRING (SIZE (1..maxUSSD-StringLength))
     -- The structure of the contents of the USSD-String is dependent
     -- on the USSD-DataCodingScheme as described in TS 3GPP TS 23.038 [25].
```

```
maxUSSD-StringLength  INTEGER ::= 160
```

```
Password ::= NumericString
     (FROM ("0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9"))
     (SIZE (4))
```

```
GuidanceInfo ::= ENUMERATED {
     enterPW  (0),
     enterNewPW  (1),
     enterNewPW-Again  (2)}
     -- How this information is really delivered to the subscriber
     -- (display, announcement, ...) is not part of this
     -- specification.
```

```
SS-List ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                                        SS-Code
```

```
maxNumOfSS  INTEGER ::= 30
```

```
SS-InfoList ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                                        SS-Info
```

```
BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
                                        BasicServiceCode
```

```
maxNumOfBasicServiceGroups  INTEGER ::= 13
```

```
SS-InvocationNotificationArg ::= SEQUENCE {
     imsi                                [0] IMSI,
     msisdn                              [1] ISDN-AddressString,
     ss-Event                            [2] SS-Code,
     -- The following SS-Code values are allowed :
     -- ect                              SS-Code ::= '00110001'B
     -- multiPTY                         SS-Code ::= '01010001'B
     -- cd                               SS-Code ::= '00100100'B
     -- ccbs                             SS-Code ::= '01000100'B
     ss-EventSpecification               [3] SS-EventSpecification         OPTIONAL,
     extensionContainer                  [4] ExtensionContainer            OPTIONAL,
     ...,
     b-subscriberNumber                  [5]  ISDN-AddressString           OPTIONAL,
     ccbs-RequestState                   [6]  CCBS-RequestState            OPTIONAL
     }
```

```
CCBS-RequestState ::= ENUMERATED {
     request   (0),
     recall    (1),
     active    (2),
     completed (3),
     suspended (4),
     frozen    (5),
     deleted   (6)
     }
```

```
SS-InvocationNotificationRes ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...
     }
```

```
SS-EventSpecification ::= SEQUENCE SIZE (1..maxEventSpecification) OF
                                         AddressString
```

```
maxEventSpecification  INTEGER ::= 2
```

```
RegisterCC-EntryArg ::= SEQUENCE {
     ss-Code                             [0]  SS-Code,
     ccbs-Data                           [1]  CCBS-Data                    OPTIONAL,
     ...}
```

```
CCBS-Data ::= SEQUENCE {
     ccbs-Feature                        [0]  CCBS-Feature,
     translatedB-Number                  [1]  ISDN-AddressString,
     serviceIndicator                    [2]  ServiceIndicator             OPTIONAL,
     callInfo                            [3]  ExternalSignalInfo,
     networkSignalInfo                   [4]  ExternalSignalInfo,
     ...}
```

```
ServiceIndicator ::= BIT STRING {
     clir-invoked (0),
     camel-invoked (1)} (SIZE(2..32))
     -- exception handling:
     -- bits 2 to 31 shall be ignored if received and not understood
```

```
RegisterCC-EntryRes ::= SEQUENCE {
     ccbs-Feature                        [0] CCBS-Feature                  OPTIONAL,
     ...}
```

```
EraseCC-EntryArg ::= SEQUENCE {
     ss-Code                             [0]  SS-Code,
     ccbs-Index                          [1]  CCBS-Index                   OPTIONAL,
     ...}
```

```
EraseCC-EntryRes ::= SEQUENCE {
     ss-Code                             [0]  SS-Code,
     ss-Status                           [1] SS-Status                     OPTIONAL,
     ...}
```

```
END
```

17.7.5 Supplementary service codes

```
MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version7 (7)}
```

```
DEFINITIONS

::=

BEGIN
```

```
SS-Code ::= OCTET STRING (SIZE (1))
     -- This type is used to represent the code identifying a single
     -- supplementary service, a group of supplementary services, or
     -- all supplementary services. The services and abbreviations
     -- used are defined in TS 3GPP TS 22.004 [5]. The internal structure is
     -- defined as follows:
     --
     -- bits 87654321: group (bits 8765), and specific service
     -- (bits 4321)
```

```
allSS                                   SS-Code ::= '00000000'B
     -- reserved for possible future use
     -- all SS
```

```
allLineIdentificationSS                 SS-Code ::= '00010000'B
     -- reserved for possible future use
     -- all line identification SS
clip                                    SS-Code ::= '00010001'B
     -- calling line identification presentation
clir                                    SS-Code ::= '00010010'B
     -- calling line identification restriction
colp                                    SS-Code ::= '00010011'B
     -- connected line identification presentation
colr                                    SS-Code ::= '00010100'B
     -- connected line identification restriction
mci                                     SS-Code ::= '00010101'B
     -- reserved for possible future use
     -- malicious call identification

allNameIdentificationSS                 SS-Code ::= '00011000'B
     -- all name identification SS
cnap                                    SS-Code ::= '00011001'B
     -- calling name presentation

     -- SS-Codes '00011010'B to '00011111'B are reserved for future
     -- NameIdentification Supplementary Service use.
```

```
allForwardingSS                         SS-Code ::= '00100000'B
     -- all forwarding SS
cfu                                     SS-Code ::= '00100001'B
     -- call forwarding unconditional
allCondForwardingSS                     SS-Code ::= '00101000'B
     -- all conditional forwarding SS
cfb                                     SS-Code ::= '00101001'B
     -- call forwarding on mobile subscriber busy
cfnry                                   SS-Code ::= '00101010'B
     -- call forwarding on no reply
cfnrc                                   SS-Code ::= '00101011'B
     -- call forwarding on mobile subscriber not reachable
cd                                      SS-Code ::= '00100100'B
     -- call deflection
```

```
allCallOfferingSS                       SS-Code ::= '00110000'B
     -- reserved for possible future use
     -- all call offering SS includes also all forwarding SS
ect                                     SS-Code ::= '00110001'B
          -- explicit call transfer
mah                                     SS-Code ::= '00110010'B
     -- reserved for possible future use
     -- mobile access hunting
```

```
allCallCompletionSS                     SS-Code ::= '01000000'B
     -- reserved for possible future use
     -- all Call completion SS
cw                                      SS-Code ::= '01000001'B
     -- call waiting
hold                                    SS-Code ::= '01000010'B
     -- call hold
ccbs-A                                  SS-Code ::= '01000011'B
     -- completion of call to busy subscribers, originating side
ccbs-B                                  SS-Code ::= '01000100'B
     -- completion of call to busy subscribers, destination side
     -- this SS-Code is used only in InsertSubscriberData and DeleteSubscriberData
mc                                      SS-Code ::= '01000101'B
     -- multicall
```

```
allMultiPartySS                         SS-Code ::= '01010000'B
     -- reserved for possible future use
     -- all multiparty SS
multiPTY                                SS-Code ::= '01010001'B
     -- multiparty
```

```
allCommunityOfInterest-SS               SS-Code ::= '01100000'B
     -- reserved for possible future use
     -- all community of interest SS
cug                                     SS-Code ::= '01100001'B
     -- closed user group
```

```
allChargingSS                           SS-Code ::= '01110000'B
     -- reserved for possible future use
     -- all charging SS
aoci                                    SS-Code ::= '01110001'B
     -- advice of charge information
aocc                                    SS-Code ::= '01110010'B
     -- advice of charge charging
```

```
allAdditionalInfoTransferSS             SS-Code ::= '10000000'B
     -- reserved for possible future use
     -- all additional information transfer SS
uus1                                    SS-Code ::= '10000001'B
     -- UUS1 user-to-user signalling
uus2                                    SS-Code ::= '10000010'B
     -- UUS2 user-to-user signalling
uus3                                    SS-Code ::= '10000011'B
     -- UUS3 user-to-user signalling
```

```
allBarringSS                            SS-Code ::= '10010000'B
     -- all barring SS
barringOfOutgoingCalls                  SS-Code ::= '10010001'B
     -- barring of outgoing calls
baoc                                    SS-Code ::= '10010010'B
     -- barring of all outgoing calls
boic                                    SS-Code ::= '10010011'B
     -- barring of outgoing international calls
boicExHC                                SS-Code ::= '10010100'B
     -- barring of outgoing international calls except those directed
     -- to the home PLMN
barringOfIncomingCalls                  SS-Code ::= '10011001'B
     -- barring of incoming calls
baic                                    SS-Code ::= '10011010'B
     -- barring of all incoming calls
bicRoam                                 SS-Code ::= '10011011'B
     -- barring of incoming calls when roaming outside home PLMN
     -- Country
```

```
allPLMN-specificSS                      SS-Code ::= '11110000'B
plmn-specificSS-1                       SS-Code ::= '11110001'B
plmn-specificSS-2                       SS-Code ::= '11110010'B
plmn-specificSS-3                       SS-Code ::= '11110011'B
plmn-specificSS-4                       SS-Code ::= '11110100'B
plmn-specificSS-5                       SS-Code ::= '11110101'B
plmn-specificSS-6                       SS-Code ::= '11110110'B
plmn-specificSS-7                       SS-Code ::= '11110111'B
plmn-specificSS-8                       SS-Code ::= '11111000'B
plmn-specificSS-9                       SS-Code ::= '11111001'B
plmn-specificSS-A                       SS-Code ::= '11111010'B
plmn-specificSS-B                       SS-Code ::= '11111011'B
plmn-specificSS-C                       SS-Code ::= '11111100'B
plmn-specificSS-D                       SS-Code ::= '11111101'B
plmn-specificSS-E                       SS-Code ::= '11111110'B
plmn-specificSS-F                       SS-Code ::= '11111111'B
```

```
allCallPrioritySS                       SS-Code ::= '10100000'B
     -- reserved for possible future use
     -- all call priority SS
emlpp                                   SS-Code ::= '10100001'B
     -- enhanced Multilevel Precedence Pre-emption (EMLPP) service
```

```
allLCSPrivacyException                  SS-Code ::= '10110000'B
     -- all LCS Privacy Exception Classes
universal                               SS-Code ::= '10110001'B
     -- allow location by any LCS client
callrelated                             SS-Code ::= '10110010'B
     -- allow location by any value added LCS client to which a call
     -- is established from the target MS
callunrelated                           SS-Code ::= '10110011'B
     -- allow location by designated external value added LCS clients
plmnoperator                            SS-Code ::= '10110100'B
     -- allow location by designated PLMN operator LCS clients
```

```
allMOLR-SS                              SS-Code ::= '11000000'B
     -- all Mobile Originating Location Request Classes
basicSelfLocation                       SS-Code ::= '11000001'B
     -- allow an MS to request its own location
autonomousSelfLocation                  SS-Code ::= '11000010'B
     -- allow an MS to perform self location without interaction
     -- with the PLMN for a predetermined period of time
transferToThirdParty                    SS-Code ::= '11000011'B
     -- allow an MS to request transfer of its location to another LCS client
```

```
END
```

17.7.6 Short message data types

```
MAP-SM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SM-DataTypes (16) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoutingInfoForSM-Arg,
   RoutingInfoForSM-Res,
   MO-ForwardSM-Arg,
   MO-ForwardSM-Res,
   MT-ForwardSM-Arg,
   MT-ForwardSM-Res,
   ReportSM-DeliveryStatusArg,
   ReportSM-DeliveryStatusRes,
   AlertServiceCentreArg,
   InformServiceCentreArg,
   ReadyForSM-Arg,
   ReadyForSM-Res,
   SM-DeliveryOutcome,
   AlertReason,
   Additional-Number
```

```
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   SignalInfo,
   IMSI,
   LMSI
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}

   AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version7 (7)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}
;
```

```
RoutingInfoForSM-Arg ::= SEQUENCE {
     msisdn                              [0] ISDN-AddressString,
     sm-RP-PRI                           [1] BOOLEAN,
     serviceCentreAddress                [2] AddressString,
     extensionContainer                  [6] ExtensionContainer          OPTIONAL,
     ... ,
     gprsSupportIndicator                [7]  NULL                       OPTIONAL,
     -- gprsSupportIndicator is set only if the SMS-GMSC supports
     -- receiving of two numbers from the HLR
     sm-RP-MTI                           [8] SM-RP-MTI                   OPTIONAL,
     sm-RP-SMEA                          [9] SM-RP-SMEA                  OPTIONAL }
```

```
SM-RP-MTI ::= INTEGER (0..10)
     -- 0 SMS Deliver
     -- 1 SMS Status Report
     -- other values are reserved for future use and shall be discarded if
     -- received
```

```
SM-RP-SMEA ::= OCTET STRING (SIZE (1..12))
     -- this parameter contains an address field which is encoded
     -- as defined in 3GPP TS 23.140. An address field contains 3 elements :
     --       address-length
     --       type-of-address
     --       address-value
```

```
RoutingInfoForSM-Res ::= SEQUENCE {
     imsi                                IMSI,
     locationInfoWithLMSI                [0] LocationInfoWithLMSI,
     extensionContainer                  [4] ExtensionContainer          OPTIONAL,
     ...}
```

```
LocationInfoWithLMSI ::= SEQUENCE {
     networkNode-Number                  [1] ISDN-AddressString,
     lmsi                                LMSI                            OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...,
     gprsNodeIndicator                   [5]  NULL                       OPTIONAL,
     -- gprsNodeIndicator is set only if the SGSN number is sent as the
     -- Network Node Number
     additional-Number                   [6] Additional-Number           OPTIONAL
     -- NetworkNode-number can be either msc-number or sgsn-number
     }
```

```
Additional-Number ::= CHOICE {
     msc-Number                          [0] ISDN-AddressString,
     sgsn-Number                         [1] ISDN-AddressString}
     -- additional-number can be either msc-number or sgsn-number
     -- if received networkNode-number is msc-number then the
     -- additional number is sgsn-number
     -- if received networkNode-number is sgsn-number then the
     -- additional number is msc-number
```

```
MO-ForwardSM-Arg ::= SEQUENCE {
     sm-RP-DA                          SM-RP-DA,
     sm-RP-OA                          SM-RP-OA,
     sm-RP-UI                          SignalInfo,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ... ,
     imsi                              IMSI                              OPTIONAL }
```

```
MO-ForwardSM-Res ::= SEQUENCE {
     sm-RP-UI                          SignalInfo                        OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}
```

```
MT-ForwardSM-Arg ::= SEQUENCE {
     sm-RP-DA                          SM-RP-DA,
     sm-RP-OA                          SM-RP-OA,
     sm-RP-UI                          SignalInfo,
     moreMessagesToSend                NULL                              OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}
```

```
MT-ForwardSM-Res ::= SEQUENCE {
     sm-RP-UI                          SignalInfo                        OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}
```

```
SM-RP-DA ::= CHOICE {
     imsi                              [0] IMSI,
     lmsi                              [1] LMSI,
     serviceCentreAddressDA            [4] AddressString,
     noSM-RP-DA                        [5] NULL}
```

```
SM-RP-OA ::= CHOICE {
     msisdn                            [2] ISDN-AddressString,
     serviceCentreAddressOA            [4] AddressString,
     noSM-RP-OA                        [5] NULL}
```

```
ReportSM-DeliveryStatusArg ::= SEQUENCE {
     msisdn                            ISDN-AddressString,
     serviceCentreAddress              AddressString,
     sm-DeliveryOutcome                SM-DeliveryOutcome,
     absentSubscriberDiagnosticSM      [0] AbsentSubscriberDiagnosticSM
                                                                         OPTIONAL,
     extensionContainer                [1] ExtensionContainer            OPTIONAL,
     ...,
     gprsSupportIndicator              [2]  NULL                         OPTIONAL,
     -- gprsSupportIndicator is set only if the SMS-GMSC supports
     -- handling of two delivery outcomes
     deliveryOutcomeIndicator          [3]  NULL                         OPTIONAL,
     -- DeliveryOutcomeIndicator is set when the SM-DeliveryOutcome
     -- is for GPRS
     additionalSM-DeliveryOutcome      [4]  SM-DeliveryOutcome           OPTIONAL,
     -- If received, additionalSM-DeliveryOutcome is for GPRS
     -- If DeliveryOutcomeIndicator is set, then AdditionalSM-DeliveryOutcome shall be absent
     additionalAbsentSubscriberDiagnosticSM   [5]  AbsentSubscriberDiagnosticSM OPTIONAL
     -- If received additionalAbsentSubscriberDiagnosticSM is for GPRS
     -- If DeliveryOutcomeIndicator is set, then AdditionalAbsentSubscriberDiagnosticSM
     -- shall be absent
     }
```

```
SM-DeliveryOutcome ::= ENUMERATED {
     memoryCapacityExceeded  (0),
     absentSubscriber  (1),
     successfulTransfer  (2)}
```

```
ReportSM-DeliveryStatusRes ::= SEQUENCE {
     storedMSISDN                      ISDN-AddressString                OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}
```

```
AlertServiceCentreArg ::= SEQUENCE {
     msisdn                            ISDN-AddressString,
     serviceCentreAddress              AddressString,
     ...}
```

```
InformServiceCentreArg ::= SEQUENCE {
     storedMSISDN                         ISDN-AddressString              OPTIONAL,
     mw-Status MW-Status                  OPTIONAL,
     extensionContainer                   ExtensionContainer              OPTIONAL,
     ...}
```

```
MW-Status ::= BIT STRING {
     sc-AddressNotIncluded  (0),
     mnrf-Set  (1),
     mcef-Set  (2) ,
     mnrg-Set   (3)} (SIZE (6..16))
     -- exception handling:
     -- bits 4 to 15 shall be ignored if received and not understood
```

```
ReadyForSM-Arg ::= SEQUENCE {
     imsi                                 [0] IMSI,
     alertReason                          AlertReason,
     alertReasonIndicator                 NULL                            OPTIONAL,
     -- alertReasonIndicator is set only when the alertReason
     -- sent to HLR is for GPRS
     extensionContainer                   ExtensionContainer              OPTIONAL,
     ...}
```

```
ReadyForSM-Res ::= SEQUENCE {
     extensionContainer                   ExtensionContainer              OPTIONAL,
     ...}
```

```
AlertReason ::= ENUMERATED {
     ms-Present  (0),
     memoryAvailable  (1)}
```

```
END
```

17.7.7 Error data types

```
MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoamingNotAllowedParam,
   CallBarredParam,
   CUG-RejectParam,
   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   OR-NotAllowedParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
```

```
   AbsentSubscriberSM-Param,
   AbsentSubscriberDiagnosticSM,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam,
   UnauthorizedRequestingNetwork-Param,
   UnauthorizedLCSClient-Param,
   PositionMethodFailure-Param,
   UnknownOrUnreachableLCSClient-Param,
   MM-EventNotSupported-Param,
   SecureTransportErrorParam,
   ATSI-NotAllowedParam,
   ATM-NotAllowedParam,
   IllegalSS-OperationParam,
   SS-NotAvailableParam,
   SS-SubscriptionViolationParam,
   InformationNotAvailableParam,
   TargetCellOutsideGCA-Param



;

IMPORTS
   SS-Status
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version7 (7)}

   SignalInfo,
   BasicServiceCode,
   NetworkResource
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}

   SecurityHeader,
   ProtectedPayload
FROM MAP-ST-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ST-DataTypes (27) version7 (7)}


   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version7 (7)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}
;
```

```
RoamingNotAllowedParam ::= SEQUENCE {
     roamingNotAllowedCause              RoamingNotAllowedCause,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
RoamingNotAllowedCause ::= ENUMERATED {
     plmnRoamingNotAllowed  (0),
     operatorDeterminedBarring  (3)}
```

```
CallBarredParam ::= CHOICE {
     callBarringCause                    CallBarringCause,
     -- call BarringCause must not be used in version 3 and higher
     extensibleCallBarredParam           ExtensibleCallBarredParam
     -- extensibleCallBarredParam must not be used in version <3
     }
```

```
CallBarringCause ::= ENUMERATED {
     barringServiceActive  (0),
     operatorBarring  (1)}
```

```
ExtensibleCallBarredParam ::= SEQUENCE {
     callBarringCause                    CallBarringCause                OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ... ,
     unauthorisedMessageOriginator       [1] NULL                        OPTIONAL }
```

```
CUG-RejectParam ::= SEQUENCE {
     cug-RejectCause                     CUG-RejectCause                 OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
CUG-RejectCause ::= ENUMERATED {
     incomingCallsBarredWithinCUG  (0),
     subscriberNotMemberOfCUG  (1),
     requestedBasicServiceViolatesCUG-Constraints  (5),
     calledPartySS-InteractionViolation  (7)}
```

```
SS-IncompatibilityCause ::= SEQUENCE {
     ss-Code                             [1] SS-Code                     OPTIONAL,
     basicService                        BasicServiceCode                OPTIONAL,
     ss-Status                           [4] SS-Status                   OPTIONAL,
     ...}
```

```
PW-RegistrationFailureCause ::= ENUMERATED {
     undetermined  (0),
     invalidFormat  (1),
     newPasswordsMismatch  (2)}
```

```
SM-EnumeratedDeliveryFailureCause ::= ENUMERATED {
     memoryCapacityExceeded  (0),
     equipmentProtocolError  (1),
     equipmentNotSM-Equipped  (2),
     unknownServiceCentre  (3),
     sc-Congestion  (4),
     invalidSME-Address  (5),
     subscriberNotSC-Subscriber  (6)}
```

```
SM-DeliveryFailureCause ::= SEQUENCE {
     sm-EnumeratedDeliveryFailureCause   SM-EnumeratedDeliveryFailureCause,
     diagnosticInfo                      SignalInfo                      OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
AbsentSubscriberSM-Param ::= SEQUENCE {
     absentSubscriberDiagnosticSM        AbsentSubscriberDiagnosticSM    OPTIONAL,
     -- AbsentSubscriberDiagnosticSM can be either for non-GPRS
     -- or for GPRS
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...,
     additionalAbsentSubscriberDiagnosticSM   [0]  AbsentSubscriberDiagnosticSM OPTIONAL }
     -- if received, additionalAbsentSubscriberDiagnosticSM
     -- is for GPRS and absentSubscriberDiagnosticSM is
     -- for non-GPRS
```

```
AbsentSubscriberDiagnosticSM ::= INTEGER (0..255)
     -- AbsentSubscriberDiagnosticSM values are defined in ETS 300 536 (3GPP TS 23.140)
```

```
SystemFailureParam ::= CHOICE {
     networkResource                     NetworkResource,
     -- networkResource must not be used in version 3
     extensibleSystemFailureParam        ExtensibleSystemFailureParam
     -- extensibleSystemFailureParam must not be used in version <3
     }
```

```
ExtensibleSystemFailureParam ::= SEQUENCE {
     networkResource                     NetworkResource                 OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
DataMissingParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
UnexpectedDataParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
FacilityNotSupParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
OR-NotAllowedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
UnknownSubscriberParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     unknownSubscriberDiagnostic         UnknownSubscriberDiagnostic       OPTIONAL}
```

```
UnknownSubscriberDiagnostic ::= ENUMERATED {
     imsiUnknown  (0),
     gprsSubscriptionUnknown  (1),
     ...,
     npdbMismatch  (2)}
     -- if unknown values are received in
     -- unknownSubscriberDiagnostic they shall be discarded
```

```
NumberChangedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
UnidentifiedSubParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
IllegalSubscriberParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
IllegalEquipmentParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
BearerServNotProvParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
TeleservNotProvParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
TracingBufferFullParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
NoRoamingNbParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
AbsentSubscriberParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     absentSubscriberReason              [0] AbsentSubscriberReason        OPTIONAL}
```

```
AbsentSubscriberReason ::= ENUMERATED {
     imsiDetach (0),
     restrictedArea (1),
     noPageResponse (2),
     ... ,
     purgedMS (3)}
-- exception handling: at reception of other values than the ones listed the
-- AbsentSubscriberReason shall be ignored.
-- The AbsentSubscriberReason: purgedMS is defined for the Super-Charger feature
-- (see TS 23.116). If this value is received in a Provide Roaming Number response
-- it shall be mapped to the AbsentSubscriberReason: imsiDetach in the Send Routeing
-- Information response
```

```
BusySubscriberParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...,
     ccbs-Possible                       [0] NULL                        OPTIONAL,
     ccbs-Busy                           [1] NULL                        OPTIONAL}
```

```
NoSubscriberReplyParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
ForwardingViolationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
ForwardingFailedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
ATI-NotAllowedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
ATSI-NotAllowedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
ATM-NotAllowedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
IllegalSS-OperationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
SS-NotAvailableParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
SS-SubscriptionViolationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
InformationNotAvailableParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
SubBusyForMT-SMS-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ... ,
     gprsConnectionSuspended             NULL                            OPTIONAL }
     -- If GprsConnectionSuspended is not understood it shall
     -- be discarded
```

```
MessageWaitListFullParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
ResourceLimitationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
NoGroupCallNbParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
IncompatibleTerminalParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ShortTermDenialParam ::= SEQUENCE {
     ...}
```

```
LongTermDenialParam ::= SEQUENCE {
     ...}
```

```
UnauthorizedRequestingNetwork-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
UnauthorizedLCSClient-Param ::= SEQUENCE {
     unauthorizedLCSClient-Diagnostic    [0] UnauthorizedLCSClient-Diagnostic   OPTIONAL,
     extensionContainer                  [1] ExtensionContainer                 OPTIONAL,
     ... }
```

```
UnauthorizedLCSClient-Diagnostic ::= ENUMERATED {
     noAdditionalInformation (0),
     clientNotInMSPrivacyExceptionList (1),
     callToClientNotSetup (2),
     privacyOverrideNotApplicable (3),
     disallowedByLocalRegulatoryRequirements (4),
     ... }
--   exception handling:
--   any unrecognized value shall be ignored
```

```
PositionMethodFailure-Param ::= SEQUENCE {
     positionMethodFailure-Diagnostic    [0] PositionMethodFailure-Diagnostic   OPTIONAL,
     extensionContainer                  [1] ExtensionContainer                 OPTIONAL,
     ... }
```

```
PositionMethodFailure-Diagnostic ::= ENUMERATED {
     congestion  (0),
     insufficientResources  (1),
     insufficientMeasurementData  (2),
     inconsistentMeasurementData  (3),
     locationProcedureNotCompleted  (4),
     locationProcedureNotSupportedByTargetMS  (5),
     qoSNotAttainable  (6),
     positionMethodNotAvailableInNetwork  (7),
     positionMethodNotAvailableInLocationArea (8),
     ... }
--   exception handling:
--   any unrecognized value shall be ignored
```

```
UnknownOrUnreachableLCSClient-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
MM-EventNotSupported-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
TargetCellOutsideGCA-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
SecureTransportErrorParam ::= SEQUENCE {
     securityHeader                      SecurityHeader,
     protectedPayload                    ProtectedPayload                  OPTIONAL
     }
     -- The protectedPayload carries the result of applying the security function
     -- defined in 3G TS 33.200 to the encoding of the securely transported error
     -- parameter
```

```
END
```

17.7.8 Common data types

```
MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- general data types and values
   AddressString,
   ISDN-AddressString,
   maxISDN-AddressLength,
   FTN-AddressString,
   ISDN-SubaddressString,
   ExternalSignalInfo,
   Ext-ExternalSignalInfo,
   AccessNetworkSignalInfo,
   SignalInfo,
   maxSignalInfoLength,
   AlertingPattern,

   -- data types for numbering and identification
   IMSI,
   TMSI,
   Identity,
   SubscriberId,
   IMEI,
   HLR-List,
   LMSI,
   GlobalCellId,
   NetworkResource,
   NAEA-PreferredCI,
   NAEA-CIC,
   ASCI-CallReference,
   SubscriberIdentity,
   PLMN-Id,

   -- data types for CAMEL
   CellGlobalIdOrServiceAreaIdOrLAI,

   -- data types for subscriber management
   BasicServiceCode,
   Ext-BasicServiceCode,
   EMLPP-Info,
   EMLPP-Priority,
   MC-SS-Info,
   MaxMC-Bearers,
   MC-Bearers,
   Ext-SS-Status,

   -- data types for geographic location
   AgeOfLocationInformation,
   LCSClientExternalID,
   LCSClientInternalID
;

IMPORTS
   TeleserviceCode,
   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version7 (7)}

   BearerServiceCode,
   Ext-BearerServiceCode
FROM MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version7 (7)}
```

```
   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version7 (7)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}
;


-- general data types

TBCD-STRING ::= OCTET STRING
     -- This type (Telephony Binary Coded Decimal String) is used to
     -- represent several digits from 0 through 9, *, #, a, b, c, two
     -- digits per octet, each digit encoded 0000 to 1001 (0 to 9),
     -- 1010 (*), 1011 (#), 1100 (a), 1101 (b) or 1110 (c); 1111 used
     -- as filler when there is an odd number of digits.

     -- bits 8765 of octet n encoding digit 2n
     -- bits 4321 of octet n encoding digit 2(n-1) +1

AddressString ::= OCTET STRING (SIZE (1..maxAddressLength))
     -- This type is used to represent a number for addressing
     -- purposes. It is composed of
     --   a)   one octet for nature of address, and numbering plan
     --        indicator.
     --   b)   digits of an address encoded as TBCD-String.

     -- a)    The first octet includes a one bit extension indicator, a
     --       3 bits nature of address indicator and a 4 bits numbering
     --       plan indicator, encoded as follows:

     -- bit 8: 1  (no extension)

     -- bits 765: nature of address indicator
     --   000  unknown
     --   001  international number
     --   010  national significant number
     --   011  network specific number
     --   100  subscriber number
     --   101  reserved
     --   110  abbreviated number
     --   111  reserved for extension

     -- bits 4321: numbering plan indicator
     --   0000  unknown
     --   0001  ISDN/Telephony Numbering Plan (Rec CCITT E.164)
     --   0010  spare
     --   0011  data numbering plan (CCITT Rec X.121)
     --   0100  telex numbering plan (CCITT Rec F.69)
     --   0101  spare
     --   0110  land mobile numbering plan (CCITT Rec E.212)
     --   0111  spare
     --   1000  national numbering plan
     --   1001  private numbering plan
     --   1111  reserved for extension

     --   all other values are reserved.

     -- b)    The following octets representing digits of an address
     --       encoded as a TBCD-STRING.

maxAddressLength  INTEGER ::= 20

ISDN-AddressString ::=
              AddressString (SIZE (1..maxISDN-AddressLength))
     -- This type is used to represent ISDN numbers.

maxISDN-AddressLength  INTEGER ::= 9
```

```
FTN-AddressString ::=
             AddressString (SIZE (1..maxFTN-AddressLength))
    -- This type is used to represent forwarded-to numbers.
    -- For long forwarded-to numbers (longer than 15 digits) NPI shall be unknown;
    -- if NAI = international the first digits represent the country code (CC) as for E.164.
```

```
maxFTN-AddressLength  INTEGER ::= 15
```

```
ISDN-SubaddressString ::=
             OCTET STRING (SIZE (1..maxISDN-SubaddressLength))
    -- This type is used to represent ISDN subaddresses.
    -- It is composed of
    --   a)   one octet for type of subaddress and odd/even indicator.
    --   b)   20 octets for subaddress information.

    --   a)   The first octet includes a one bit extension indicator, a
    --        3 bits type of subaddress and a one bit odd/even indicator,
    --        encoded as follows:

    --   bit 8: 1  (no extension)

    --   bits 765: type of subaddress
    --        000  NSAP (X.213/ISO 8348 AD2)
    --        010  User Specified
    --        All other values are reserved

    --   bit 4: odd/even indicator
    --        0  even number of address signals
    --        1  odd number of address signals
    --        The odd/even indicator is used when the type of subaddress
    --        is "user specified" and the coding is BCD.

    --   bits 321: 000 (unused)

    --   b) Subaddress information.
    --   The NSAP X.213/ISO8348AD2 address shall be formatted as specified
    --   by octet 4 which contains the Authority and Format Identifier
    --   (AFI). The encoding is made according to the "preferred binary
    --   encoding" as defined in X.213/ISO834AD2. For the definition
    --   of this type of subaddress, see CCITT Rec I.334.

    --   For User-specific subaddress, this field is encoded according
    --   to the user specification, subject to a maximum length of 20
    --   octets. When interworking with X.25 networks BCD coding should
    --   be applied.
```

```
maxISDN-SubaddressLength  INTEGER ::= 21
```

```
ExternalSignalInfo ::= SEQUENCE {
    protocolId                      ProtocolId,
    signalInfo                      SignalInfo,
    -- Information about the internal structure is given in
    -- clause 7.6.9.
    extensionContainer              ExtensionContainer              OPTIONAL,
    -- extensionContainer must not be used in version 2
    ...}
```

```
SignalInfo ::= OCTET STRING (SIZE (1..maxSignalInfoLength))
```

```
maxSignalInfoLength  INTEGER ::= 200
    -- This NamedValue represents the theoretical maximum number of octets which is
    -- available to carry a single instance of the SignalInfo data type,
    -- without requiring segmentation to cope with the network layer service.
    -- However, the actual maximum size available for an instance of the data
    -- type may be lower, especially when other information elements
    -- have to be included in the same component.
```

```
ProtocolId ::= ENUMERATED {
    gsm-0408  (1),
    gsm-0806  (2),
    gsm-BSSMAP  (3),
    -- Value 3 is reserved and must not be used
    ets-300102-1  (4)}
```

```
Ext-ExternalSignalInfo ::= SEQUENCE {
     ext-ProtocolId                      Ext-ProtocolId,
     signalInfo                          SignalInfo,
     -- Information about the internal structure is given in
     -- clause 7.6.9.10
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
Ext-ProtocolId ::= ENUMERATED {
     ets-300356  (1),
     ...
      }
-- exception handling:
-- For Ext-ExternalSignalInfo sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- Ext-ExternalSignalInfo sequence.
```

```
AccessNetworkSignalInfo ::= SEQUENCE {
     accessNetworkProtocolId             AccessNetworkProtocolId,
     signalInfo                          LongSignalInfo,
     -- Information about the internal structure is given in clause 7.6.9.1

     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
LongSignalInfo ::= OCTET STRING (SIZE (1..maxLongSignalInfoLength))
```

```
maxLongSignalInfoLength  INTEGER ::= 2560
     -- This Named Value represents the maximum number of octets which is available
     -- to carry a single instance of the LongSignalInfo data type using
     -- White Book SCCP with the maximum number of segments.
     -- It takes account of the octets used by the lower layers of the protocol, and
     -- other information elements which may be included in the same component.
```

```
AccessNetworkProtocolId ::= ENUMERATED {
     gsm-0806   (1),
     ts3G-25413 (2),
     ...}
     -- exception handling:
     -- For AccessNetworkSignalInfo sequences containing this parameter with any
     -- other value than the ones listed the receiver shall ignore the whole
     -- AccessNetworkSignalInfo sequence.
```

```
AlertingPattern ::= OCTET STRING (SIZE (1) )
     -- This type is used to represent Alerting Pattern

     --   bits 8765 : 0000 (unused)

     --   bits 43 : type of Pattern
     --        00 level
     --        01 category
     --        10 category
     --        all other values are reserved.

     --   bits 21 : type of alerting

alertingLevel-0   AlertingPattern ::= '00000000'B
alertingLevel-1   AlertingPattern ::= '00000001'B
alertingLevel-2   AlertingPattern ::= '00000010'B
     -- all other values of Alerting level are reserved
     -- Alerting Levels are defined in GSM 02.07

alertingCategory-1   AlertingPattern ::= '00000100'B
alertingCategory-2   AlertingPattern ::= '00000101'B
alertingCategory-3   AlertingPattern ::= '00000110'B
alertingCategory-4   AlertingPattern ::= '00000111'B
alertingCategory-5   AlertingPattern ::= '00001000'B
     -- all other values of Alerting Category are reserved
     -- Alerting categories are defined in GSM 02.07
```

-- data types for numbering and identification

```
IMSI ::= TBCD-STRING (SIZE (3..8))
     -- digits of MCC, MNC, MSIN are concatenated in this order.
```

```
Identity ::= CHOICE {
     imsi                                IMSI,
     imsi-WithLMSI                       IMSI-WithLMSI}
```

```
IMSI-WithLMSI ::= SEQUENCE {
     imsi                                IMSI,
     lmsi                                LMSI,
     -- a special value 00000000 indicates that the LMSI is not in use
     ...}
```

```
ASCI-CallReference ::= TBCD-STRING (SIZE (1..8))
     -- digits of VGCS/VBC-area,Group-ID are concatenated in this order.
```

```
TMSI ::= OCTET STRING (SIZE (1..4))
```

```
SubscriberId ::= CHOICE {
     imsi                                [0] IMSI,
     tmsi                                [1] TMSI}
```

```
IMEI ::= TBCD-STRING (SIZE (8))
     --   Refers to International Mobile Station Equipment Identity
     --   and Software Version Number (SVN) defined in TS 3GPP TS 23.003 [17].
     --   If the SVN is not present the last octet shall contain the
     --   digit 0 and a filler.
     --   If present the SVN shall be included in the last octet.
```

```
HLR-Id ::= IMSI
     -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
     -- MSIN) forming HLR Id defined in TS 3GPP TS 23.003 [17].
```

```
HLR-List ::= SEQUENCE SIZE (1..maxNumOfHLR-Id) OF
                                         HLR-Id
```

```
maxNumOfHLR-Id  INTEGER ::= 50
```

```
LMSI ::= OCTET STRING (SIZE (4))
```

```
GlobalCellId ::= OCTET STRING (SIZE (5..7))
     -- Refers to Cell Global Identification defined in TS 3GPP TS 23.003 [17].
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS 3GPP TS 24.008
[35]
     -- octets 6 and 7                   Cell Identity (CI) according to TS 3GPP TS 24.008
[35]
```

```
NetworkResource ::= ENUMERATED {
     plmn  (0),
     hlr  (1),
     vlr  (2),
     pvlr  (3),
     controllingMSC  (4),
     vmsc  (5),
     eir  (6),
     rss  (7)}
```

```
NAEA-PreferredCI ::= SEQUENCE {
     naea-PreferredCIC                   [0] NAEA-CIC,
     extensionContainer                  [1] ExtensionContainer            OPTIONAL,
     ...}
```

```
NAEA-CIC ::= OCTET STRING (SIZE (3))
     -- The internal structure is defined by the Carrier Identification
     -- parameter in ANSI T1.113.3. Carrier codes between “000” and “999” may
     -- be encoded as 3 digits using “000” to “999” or as 4 digits using
     -- “0000” to “0999”. Carrier codes between “1000” and “9999” are encoded
     -- using 4 digits.
```

```
SubscriberIdentity ::= CHOICE {
     imsi                                [0] IMSI,
     msisdn                              [1] ISDN-AddressString
     }
```

```
LCSClientExternalID ::= SEQUENCE {
     externalAddress                     [0] AddressString               OPTIONAL,
     extensionContainer                  [1] ExtensionContainer          OPTIONAL,
     ... }
```

```
LCSClientInternalID ::= ENUMERATED {
     broadcastService                    (0),
     o-andM-HPLMN                        (1),
     o-andM-VPLMN                        (2),
     anonymousLocation                   (3),
     targetMSsubscribedService           (4),
     ... }
-- for a CAMEL phase 3 PLMN operator client, the value targetMSsubscribedService shall be used
```

```
PLMN-Id ::= TBCD-STRING (SIZE (3))
     -- digits of MCC, MNC, are concatenated in this order.
```

-- data types for CAMEL

```
CellGlobalIdOrServiceAreaIdOrLAI ::= CHOICE {
     cellGlobalIdOrServiceAreaIdFixedLength   [0] CellGlobalIdOrServiceAreaIdFixedLength,
     laiFixedLength                      [1] LAIFixedLength}
```

```
CellGlobalIdOrServiceAreaIdFixedLength ::= OCTET STRING (SIZE (7))
     -- Refers to Cell Global Identification or Service Are Identification
     -- defined in 3G TS 23.003.
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to 3G TS 24.008
     -- octets 6 and 7                   Cell Identity (CI) value or
     --                                  Service Area Code (SAC) value
     --                                  according to 3G TS 23.003
```

```
LAIFixedLength ::= OCTET STRING (SIZE (5))
     -- Refers to Location Area Identification defined in TS 3GPP TS 23.003 [17].
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS 3GPP TS 24.008
[35]
```

-- data types for subscriber management

```
BasicServiceCode ::= CHOICE {
     bearerService                       [2] BearerServiceCode,
     teleservice                         [3] TeleserviceCode}
```

```
Ext-BasicServiceCode ::= CHOICE {
     ext-BearerService                   [2] Ext-BearerServiceCode,
     ext-Teleservice                     [3] Ext-TeleserviceCode}
```

```
EMLPP-Info ::= SEQUENCE {
     maximumentitledPriority             EMLPP-Priority,
     defaultPriority                     EMLPP-Priority,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
EMLPP-Priority ::= INTEGER (0..15)
     -- The mapping from the values A,B,0,1,2,3,4 to the integer-value is
     -- specified as follows where A is the highest and 4 is the lowest
     -- priority level
     -- the integer values 7-15 are spare and shall be mapped to value 4
```

```
priorityLevelA                          EMLPP-Priority ::= 6
priorityLevelB                          EMLPP-Priority ::= 5
priorityLevel0                          EMLPP-Priority ::= 0
priorityLevel1                          EMLPP-Priority ::= 1
priorityLevel2                          EMLPP-Priority ::= 2
priorityLevel3                          EMLPP-Priority ::= 3
priorityLevel4                          EMLPP-Priority ::= 4
```

```
MC-SS-Info ::= SEQUENCE {
     ss-Code                            [0] SS-Code,
     ss-Status                          [1] Ext-SS-Status,
     nbrSB                              [2] MaxMC-Bearers,
     nbrUser                            [3] MC-Bearers,
     extensionContainer                 [4] ExtensionContainer          OPTIONAL,
     ...}
```

```
MaxMC-Bearers ::= INTEGER (2..maxNumOfMC-Bearers)
```

```
MC-Bearers ::= INTEGER (1..maxNumOfMC-Bearers)
```

```
maxNumOfMC-Bearers  INTEGER ::= 7
```

```
Ext-SS-Status ::= OCTET STRING (SIZE (1..5))

     -- OCTET 1:
     --
     -- bits 8765: 0000 (unused)
     -- bits 4321: Used to convey the "P bit","R bit","A bit" and "Q bit",
     --            representing supplementary service state information
     --            as defined in TS 3GPP TS 23.011 [22]

     -- bit 4: "Q bit"

     -- bit 3: "P bit"

     -- bit 2: "R bit"

     -- bit 1: "A bit"

     -- OCTETS 2-5: reserved for future use. They shall be discarded if
     -- received and not understood.
```

```
   -- data types for geographic location

AgeOfLocationInformation ::= INTEGER (0..32767)
-- the value represents the elapsed time in minutes since the last
-- network contact of the mobile station (i.e. the actuality of the
-- location information).
-- value “0” indicates that the MS is currently in contact with the
--           network
-- value “32767” indicates that the location information is at least
--               32767 minutes old

END
```

17.7.9 Teleservice Codes

```
MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version7 (7)}

DEFINITIONS

::=

BEGIN
```

```
TeleserviceCode ::= OCTET STRING (SIZE (1))
     -- This type is used to represent the code identifying a single
     -- teleservice, a group of teleservices, or all teleservices. The
     -- services are defined in TS GSM 22.003 [4].
     -- The internal structure is defined as follows:

     -- bits 87654321: group (bits 8765) and specific service
     -- (bits 4321)
```

```
Ext-TeleserviceCode ::= OCTET STRING (SIZE (1..5))
     -- This type is used to represent the code identifying a single
     -- teleservice, a group of teleservices, or all teleservices. The
     -- services are defined in TS GSM 22.003 [4].
     -- The internal structure is defined as follows:

     -- OCTET 1:
     -- bits 87654321: group (bits 8765) and specific service
     -- (bits 4321)

     -- OCTETS 2-5: reserved for future use. If received the
    -- Ext-TeleserviceCode shall be
     -- treated according to the exception handling defined for the
     -- operation that uses this type.

     -- Ext-TeleserviceCode includes all values defined for TeleserviceCode.
```

```
allTeleservices                         TeleserviceCode ::= '00000000'B
```

```
allSpeechTransmissionServices           TeleserviceCode ::= '00010000'B
telephony                               TeleserviceCode ::= '00010001'B
emergencyCalls                          TeleserviceCode ::= '00010010'B
```

```
allShortMessageServices                 TeleserviceCode ::= '00100000'B
shortMessageMT-PP                       TeleserviceCode ::= '00100001'B
shortMessageMO-PP                       TeleserviceCode ::= '00100010'B
```

```
allFacsimileTransmissionServices        TeleserviceCode ::= '01100000'B
facsimileGroup3AndAlterSpeech           TeleserviceCode ::= '01100001'B
automaticFacsimileGroup3                TeleserviceCode ::= '01100010'B
facsimileGroup4                         TeleserviceCode ::= '01100011'B
```

```
-- The following non-hierarchical Compound Teleservice Groups
-- are defined in TS 3GPP TS 22.030:
allDataTeleservices                     TeleserviceCode ::= '01110000'B
     -- covers Teleservice Groups 'allFacsimileTransmissionServices'
     -- and 'allShortMessageServices'
allTeleservices-ExeptSMS                TeleserviceCode ::= '10000000'B
     -- covers Teleservice Groups 'allSpeechTransmissionServices' and
     -- 'allFacsimileTransmissionServices'
--
-- Compound Teleservice Group Codes are only used in call
-- independent supplementary service operations, i.e. they
-- are not used in InsertSubscriberData or in
-- DeleteSubscriberData messages.
```

```
allVoiceGroupCallServices               TeleserviceCode ::= '10010000'B
voiceGroupCall                          TeleserviceCode ::= '10010001'B
voiceBroadcastCall                      TeleserviceCode ::= '10010010'B
```

```
allPLMN-specificTS                      TeleserviceCode ::= '11010000'B
plmn-specificTS-1                       TeleserviceCode ::= '11010001'B
plmn-specificTS-2                       TeleserviceCode ::= '11010010'B
plmn-specificTS-3                       TeleserviceCode ::= '11010011'B
plmn-specificTS-4                       TeleserviceCode ::= '11010100'B
plmn-specificTS-5                       TeleserviceCode ::= '11010101'B
plmn-specificTS-6                       TeleserviceCode ::= '11010110'B
plmn-specificTS-7                       TeleserviceCode ::= '11010111'B
plmn-specificTS-8                       TeleserviceCode ::= '11011000'B
plmn-specificTS-9                       TeleserviceCode ::= '11011001'B
plmn-specificTS-A                       TeleserviceCode ::= '11011010'B
plmn-specificTS-B                       TeleserviceCode ::= '11011011'B
plmn-specificTS-C                       TeleserviceCode ::= '11011100'B
plmn-specificTS-D                       TeleserviceCode ::= '11011101'B
plmn-specificTS-E                       TeleserviceCode ::= '11011110'B
plmn-specificTS-F                       TeleserviceCode ::= '11011111'B
```

```
END
```

17.7.10 Bearer Service Codes

```
MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version7 (7)}

DEFINITIONS

::=

BEGIN
```

```
BearerServiceCode ::= OCTET STRING (SIZE (1))
     -- This type is used to represent the code identifying a single
     -- bearer service, a group of bearer services, or all bearer
     -- services. The services are defined in TS 3GPP TS 22.002 [3].
     -- The internal structure is defined as follows:
     --
     -- plmn-specific bearer services:
     -- bits 87654321: defined by the HPLMN operator

     -- rest of bearer services:
     -- bit 8: 0 (unused)
     -- bits 7654321: group (bits 7654), and rate, if applicable
     -- (bits 321)
```

```
Ext-BearerServiceCode ::= OCTET STRING (SIZE (1..5))
     -- This type is used to represent the code identifying a single
     -- bearer service, a group of bearer services, or all bearer
     -- services. The services are defined in TS 3GPP TS 22.002 [3].
     -- The internal structure is defined as follows:
     --
     -- OCTET 1:
     -- plmn-specific bearer services:
     -- bits 87654321: defined by the HPLMN operator
     --
     -- rest of bearer services:
     -- bit 8: 0 (unused)
     -- bits 7654321: group (bits 7654), and rate, if applicable
     -- (bits 321)

     -- OCTETS 2-5: reserved for future use. If received the
    -- Ext-TeleserviceCode shall be
     -- treated according to the exception handling defined for the
     -- operation that uses this type.


     -- Ext-BearerServiceCode includes all values defined for BearerServiceCode.
```

```
allBearerServices                    BearerServiceCode ::= '00000000'B
```

```
allDataCDA-Services                  BearerServiceCode ::= '00010000'B
dataCDA-300bps                       BearerServiceCode ::= '00010001'B
dataCDA-1200bps                      BearerServiceCode ::= '00010010'B
dataCDA-1200-75bps                   BearerServiceCode ::= '00010011'B
dataCDA-2400bps                      BearerServiceCode ::= '00010100'B
dataCDA-4800bps                      BearerServiceCode ::= '00010101'B
dataCDA-9600bps                      BearerServiceCode ::= '00010110'B
general-dataCDA                      BearerServiceCode ::= '00010111'B
```

```
allDataCDS-Services                  BearerServiceCode ::= '00011000'B
dataCDS-1200bps                      BearerServiceCode ::= '00011010'B
dataCDS-2400bps                      BearerServiceCode ::= '00011100'B
dataCDS-4800bps                      BearerServiceCode ::= '00011101'B
dataCDS-9600bps                      BearerServiceCode ::= '00011110'B
general-dataCDS                      BearerServiceCode ::= '00011111'B
```

```
allPadAccessCA-Services                 BearerServiceCode ::= '00100000'B
padAccessCA-300bps                      BearerServiceCode ::= '00100001'B
padAccessCA-1200bps                     BearerServiceCode ::= '00100010'B
padAccessCA-1200-75bps                  BearerServiceCode ::= '00100011'B
padAccessCA-2400bps                     BearerServiceCode ::= '00100100'B
padAccessCA-4800bps                     BearerServiceCode ::= '00100101'B
padAccessCA-9600bps                     BearerServiceCode ::= '00100110'B
general-padAccessCA                     BearerServiceCode ::= '00100111'B
```

```
allDataPDS-Services                     BearerServiceCode ::= '00101000'B
dataPDS-2400bps                         BearerServiceCode ::= '00101100'B
dataPDS-4800bps                         BearerServiceCode ::= '00101101'B
dataPDS-9600bps                         BearerServiceCode ::= '00101110'B
general-dataPDS                         BearerServiceCode ::= '00101111'B
```

```
allAlternateSpeech-DataCDA              BearerServiceCode ::= '00110000'B
```

```
allAlternateSpeech-DataCDS              BearerServiceCode ::= '00111000'B
```

```
allSpeechFollowedByDataCDA              BearerServiceCode ::= '01000000'B
```

```
allSpeechFollowedByDataCDS              BearerServiceCode ::= '01001000'B
```

```
-- The following non-hierarchical Compound Bearer Service
-- Groups are defined in TS 3GPP TS 22.030:
allDataCircuitAsynchronous              BearerServiceCode ::= '01010000'B
     -- covers "allDataCDA-Services", "allAlternateSpeech-DataCDA" and
     -- "allSpeechFollowedByDataCDA"
allAsynchronousServices                 BearerServiceCode ::= '01100000'B
     -- covers "allDataCDA-Services", "allAlternateSpeech-DataCDA",
     -- "allSpeechFollowedByDataCDA" and "allPadAccessCDA-Services"
allDataCircuitSynchronous               BearerServiceCode ::= '01011000'B
     -- covers "allDataCDS-Services", "allAlternateSpeech-DataCDS" and
     -- "allSpeechFollowedByDataCDS"
allSynchronousServices                  BearerServiceCode ::= '01101000'B
     -- covers "allDataCDS-Services", "allAlternateSpeech-DataCDS",
     -- "allSpeechFollowedByDataCDS" and "allDataPDS-Services"
--
-- Compound Bearer Service Group Codes are only used in call
-- independent supplementary service operations, i.e. they
-- are not used in InsertSubscriberData or in
-- DeleteSubscriberData messages.
```

```
allPLMN-specificBS                      BearerServiceCode ::= '11010000'B
plmn-specificBS-1                       BearerServiceCode ::= '11010001'B
plmn-specificBS-2                       BearerServiceCode ::= '11010010'B
plmn-specificBS-3                       BearerServiceCode ::= '11010011'B
plmn-specificBS-4                       BearerServiceCode ::= '11010100'B
plmn-specificBS-5                       BearerServiceCode ::= '11010101'B
plmn-specificBS-6                       BearerServiceCode ::= '11010110'B
plmn-specificBS-7                       BearerServiceCode ::= '11010111'B
plmn-specificBS-8                       BearerServiceCode ::= '11011000'B
plmn-specificBS-9                       BearerServiceCode ::= '11011001'B
plmn-specificBS-A                       BearerServiceCode ::= '11011010'B
plmn-specificBS-B                       BearerServiceCode ::= '11011011'B
plmn-specificBS-C                       BearerServiceCode ::= '11011100'B
plmn-specificBS-D                       BearerServiceCode ::= '11011101'B
plmn-specificBS-E                       BearerServiceCode ::= '11011110'B
plmn-specificBS-F                       BearerServiceCode ::= '11011111'B
```

```
END
```

17.7.11 Extension data types

```
MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
```

```
   PrivateExtension,
   ExtensionContainer;


-- IOC for private MAP extensions

MAP-EXTENSION  ::= CLASS {
    &ExtensionType                                              OPTIONAL,
    &extensionId                    OBJECT IDENTIFIER }
    -- The length of the Object Identifier shall not exceed 16 octets and the
    -- number of components of the Object Identifier shall not exceed 16


-- data types

ExtensionContainer ::= SEQUENCE {
    privateExtensionList            [0]PrivateExtensionList         OPTIONAL,
    pcs-Extensions                  [1]PCS-Extensions               OPTIONAL,
    ...}

PrivateExtensionList ::= SEQUENCE SIZE (1..maxNumOfPrivateExtensions) OF
                                    PrivateExtension

PrivateExtension ::= SEQUENCE {
    extId                           MAP-EXTENSION.&extensionId
                                    ({ExtensionSet}),
    extType                         MAP-EXTENSION.&ExtensionType
                                    ({ExtensionSet}{@extId})        OPTIONAL}

maxNumOfPrivateExtensions  INTEGER ::= 10

ExtensionSet                        MAP-EXTENSION ::=
        {...
         -- ExtensionSet is the set of all defined private extensions
    }

    -- Unsupported private extensions shall be discarded if received.

PCS-Extensions ::= SEQUENCE {
    ...}

END
```

17.7.12 Group Call data types

```
MAP-GR-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-GR-DataTypes (23) version7 (7)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   PrepareGroupCallArg,
   PrepareGroupCallRes,
   SendGroupCallEndSignalArg,
   SendGroupCallEndSignalRes,
   ForwardGroupCallSignallingArg,
   ProcessGroupCallSignallingArg
;

IMPORTS
   ISDN-AddressString,
   IMSI,
   EMLPP-Priority,
   ASCI-CallReference
FROM MAP-CommonDataTypes {
```

```
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}

   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version7 (7)}

   Kc
FROM MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version7 (7)}


   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}
;
```

```
PrepareGroupCallArg ::= SEQUENCE {
     teleservice                    Ext-TeleserviceCode,
     asciCallReference              ASCI-CallReference,
     codec-Info                     CODEC-Info,
     cipheringAlgorithm             CipheringAlgorithm,
     groupKeyNumber                 [0]GroupKeyNumber           OPTIONAL,
     groupKey                       [1]Kc                       OPTIONAL,
     priority                       [2]EMLPP-Priority           OPTIONAL,
     uplinkFree                     [3] NULL                    OPTIONAL,
     extensionContainer             [4] ExtensionContainer      OPTIONAL,
     ...}
```

```
PrepareGroupCallRes ::= SEQUENCE {
     groupCallNumber                ISDN-AddressString,
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...}
```

```
SendGroupCallEndSignalArg ::= SEQUENCE {
     imsi                           IMSI                        OPTIONAL,
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...}
```

```
SendGroupCallEndSignalRes ::= SEQUENCE {
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...}
```

```
ForwardGroupCallSignallingArg ::= SEQUENCE {
     imsi                           IMSI                        OPTIONAL,
     uplinkRequestAck               [0] NULL                    OPTIONAL,
     uplinkReleaseIndication        [1] NULL                    OPTIONAL,
     uplinkRejectCommand            [2] NULL                    OPTIONAL,
     uplinkSeizedCommand            [3] NULL                    OPTIONAL,
     uplinkReleaseCommand           [4] NULL                    OPTIONAL,
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...,
     stateAttributes                [5] StateAttributes         OPTIONAL }
```

```
ProcessGroupCallSignallingArg ::= SEQUENCE {
     uplinkRequest                  [0] NULL                    OPTIONAL,
     uplinkReleaseIndication        [1] NULL                    OPTIONAL,
     releaseGroupCall               [2] NULL                    OPTIONAL,
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...}
```

```
GroupKeyNumber ::= INTEGER (0..15)
```

```
CODEC-Info ::= OCTET STRING (SIZE (5..10))
     -- Refers to channel type
     -- coded according to 3GPP TS 48.008 [49]
```

```
CipheringAlgorithm ::= OCTET STRING (SIZE (1))
     -- Refers to 'permitted algorithms' in 'encryption information'
     -- coded according to 3GPP TS 48.008 [49]:

     -- Bits 8-1
     -- 8765 4321
     -- 0000 0001                        No encryption
     -- 0000 0010                        GSM A5/1
     -- 0000 0100                        GSM A5/2
     -- 0000 1000                        GSM A5/3
     -- 0001 0000                        GSM A5/4
     -- 0010 0000                        GSM A5/5
     -- 0100 0000                        GSM A5/6
     -- 1000 0000                        GSM A5/7
```

```
StateAttributes ::= SEQUENCE {
     downlinkAttached                          [5] NULL                 OPTIONAL,
     uplinkAttached                            [6] NULL                 OPTIONAL,
     dualCommunication                         [7] NULL                 OPTIONAL,
     callOriginator                            [8] NULL                 OPTIONAL }

     -- Refers to 3GPP TS 44.068 for definitions of StateAttributes fields.
```

```
END
```

17.7.13 Location service data types

```
MAP-LCS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LCS-DataTypes (25) version7 (7)}

DEFINITIONS
IMPLICIT TAGS
::=
BEGIN

EXPORTS
   RoutingInfoForLCS-Arg,
   RoutingInfoForLCS-Res,
   ProvideSubscriberLocation-Arg,
   ProvideSubscriberLocation-Res,
   SubscriberLocationReport-Arg,
   SubscriberLocationReport-Res,
   LocationType,
   LCSClientName,
   LCS-QoS,
   Horizontal-Accuracy,
   ResponseTime,
   Ext-GeographicalInformation,
   SupportedGADShapes,
   Add-GeographicalInformation
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   IMEI,
   IMSI,
   LMSI,
   SubscriberIdentity,
   AgeOfLocationInformation,
   LCSClientExternalID,
      LCSClientInternalID
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}

```

```
   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version7 (7)}

   USSD-DataCodingScheme,
   USSD-String
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
   map-SS-DataTypes (14) version7 (7)}

   APN
FROM MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version7 (7)}

   Additional-Number
FROM MAP-SM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SM-DataTypes (16) version7 (7)}
;
```

```
RoutingInfoForLCS-Arg ::= SEQUENCE {
     mlcNumber                          [0] ISDN-AddressString,
     targetMS                           [1] SubscriberIdentity,
     extensionContainer                 [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
RoutingInfoForLCS-Res ::= SEQUENCE {
     targetMS                           [0] SubscriberIdentity,
     lcsLocationInfo                    [1] LCSLocationInfo,
     extensionContainer                 [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
LCSLocationInfo ::= SEQUENCE {
     networkNode-Number                 ISDN-AddressString,
     -- NetworkNode-number can be either msc-number or sgsn-number
     lmsi                               [0] LMSI                        OPTIONAL,
     extensionContainer                 [1] ExtensionContainer          OPTIONAL,
     ... ,
     gprsNodeIndicator                  [2] NULL                        OPTIONAL,
     -- gprsNodeIndicator is set only if the SGSN number is sent as the Network Node Number
     additional-Number                  [3] Additional-Number           OPTIONAL
     }
```

```
ProvideSubscriberLocation-Arg ::= SEQUENCE {
     locationType                       LocationType,
     mlc-Number                         ISDN-AddressString,
     lcs-ClientID                       [0] LCS-ClientID                OPTIONAL,
     privacyOverride                    [1] NULL                        OPTIONAL,
     imsi                               [2] IMSI                        OPTIONAL,
     msisdn                             [3] ISDN-AddressString          OPTIONAL,
     lmsi                               [4] LMSI                        OPTIONAL,
     imei                               [5] IMEI                        OPTIONAL,
     lcs-Priority                       [6] LCS-Priority                OPTIONAL,
     lcs-QoS                            [7] LCS-QoS                     OPTIONAL,
     extensionContainer                 [8] ExtensionContainer          OPTIONAL,
     ... ,
     supportedGADShapes                 [9]  SupportedGADShapes         OPTIONAL}

     -- one of imsi or msisdn is mandatory
```

```
LocationType ::= SEQUENCE {
     locationEstimateType               [0] LocationEstimateType,
     ...,
     deferredLocationEventType          [1] DeferredLocationEventType   OPTIONAL }
```

```
LocationEstimateType ::= ENUMERATED {
     currentLocation                    (0),
     currentOrLastKnownLocation         (1),
     initialLocation                    (2),
     ...,
     activateDeferredLocation           (3),
     cancelDeferredLocation             (4) }
--   exception handling:
--   a ProvideSubscriberLocation-Arg containing an unrecognized LocationEstimateType
--   shall be rejected by the receiver with a return error cause of unexpected data value
```

```
DeferredLocationEventType ::= BIT STRING {
     msAvailable                        (0) } (SIZE (1..16))
-- exception handling
-- a ProvideSubscriberLocation-Arg containing other values than listed above in
-- DeferredLocationEventType shall be rejected by the receiver with a return error cause of
-- unexpected data value.
```

```
LCS-ClientID ::= SEQUENCE {
     lcsClientType                      [0] LCSClientType,
     lcsClientExternalID                [1] LCSClientExternalID          OPTIONAL,
     lcsClientDialedByMS                [2] AddressString                OPTIONAL,
     lcsClientInternalID                [3] LCSClientInternalID          OPTIONAL,
     lcsClientName                      [4] LCSClientName                OPTIONAL,
     ...,
     lcsAPN                             [5] APN                          OPTIONAL }
```

```
LCSClientType ::= ENUMERATED {
     emergencyServices                  (0),
     valueAddedServices                 (1),
     plmnOperatorServices               (2),
     lawfulInterceptServices            (3),
     ... }
     --   exception handling:
     --   unrecognized values may be ignored if the LCS client uses the privacy override
     --   otherwise, an unrecognized value shall be treated as unexpected data by a receiver
     --   a return error shall then be returned if received in a MAP invoke
```

```
LCSClientName ::= SEQUENCE {
     dataCodingScheme                   [0] USSD-DataCodingScheme,
     nameString                         [2] NameString,
     ...}

-- The USSD-DataCodingScheme shall indicate use of the default alphabet through the
-- following encoding
--   bit  7 6 5 4 3 2 1 0
--        0 0 0 0 1 1 1 1
```

```
NameString ::= USSD-String (SIZE (1..maxNameStringLength))
```

```
maxNameStringLength  INTEGER ::= 63
```

```
LCS-Priority ::= OCTET STRING (SIZE (1))
     -- 0 = highest priority
     -- 1 = normal priority
     -- all other values treated as 1
```

```
LCS-QoS ::= SEQUENCE {
     horizontal-accuracy                [0] Horizontal-Accuracy          OPTIONAL,
     verticalCoordinateRequest          [1] NULL                         OPTIONAL,
     vertical-accuracy                  [2] Vertical-Accuracy            OPTIONAL,
     responseTime                       [3] ResponseTime                 OPTIONAL,
     extensionContainer                 [4] ExtensionContainer           OPTIONAL,
     ...}
```

```
Horizontal-Accuracy ::= OCTET STRING (SIZE (1))
     -- bit 8 = 0
     -- bits 7-1 = 7 bit Uncertainty Code defined in 3G TS 23.032. The horizontal location
     -- error should be less than the error indicated by the uncertainty code with 67%
     -- confidence.
```

```
Vertical-Accuracy ::= OCTET STRING (SIZE (1))
     -- bit 8 = 0
     -- bits 7-1 = 7 bit Vertical Uncertainty Code defined in 3G TS 23.032.
     -- The vertical location error should be less than the error indicated
     -- by the uncertainty code with 67% confidence.
```

```
ResponseTime ::= SEQUENCE {
     responseTimeCategory                ResponseTimeCategory,
     ...}
--   note: an expandable SEQUENCE simplifies later addition of a numeric response time.
```

```
ResponseTimeCategory ::= ENUMERATED {
     lowdelay  (0),
     delaytolerant  (1),
     ... }
--   exception handling:
--   an unrecognized value shall be treated the same as value 1 (delaytolerant)
```

```
SupportedGADShapes ::= BIT STRING {
     ellipsoidPoint  (0),
     ellipsoidPointWithUncertaintyCircle (1),
     ellipsoidPointWithUncertaintyEllipse (2),
     polygon (3),
     ellipsoidPointWithAltitude (4),
     ellipsoidPointWithAltitudeAndUncertaintyElipsoid (5),
     ellipsoidArc  (6) } (SIZE (7..16))
-- A node shall mark in the BIT STRING all Shapes defined in 3G TS 23.032 it supports.
-- exception handling: bits 7 to 15 shall be ignored if received.
```

```
ProvideSubscriberLocation-Res ::= SEQUENCE {
     locationEstimate                    Ext-GeographicalInformation,
     ageOfLocationEstimate               [0] AgeOfLocationInformation      OPTIONAL,
     extensionContainer                  [1] ExtensionContainer            OPTIONAL,
     ... ,
     add-LocationEstimate                [2] Add-GeographicalInformation   OPTIONAL,
     deferredmt-lrResponseIndicator      [3] NULL                          OPTIONAL }

--   if deferredmt-lrResponseIndicator is set, locationEstimate is ignored.

-- the add-LocationEstimate parameter shall not be sent to a node that did not indicate the
 -- geographic shapes supported in the ProvideSubscriberLocation-Arg
```

```
Ext-GeographicalInformation ::= OCTET STRING (SIZE (1..maxExt-GeographicalInformation))
    -- Refers to geographical Information defined in 3G TS 23.032.
    -- This is composed of 1 or more octets with an internal structure according to
    -- 3G TS 23.032
    -- Octet 1: Type of shape, only the following shapes in 3G TS 23.032 are allowed:
    --       (a) Ellipsoid point with uncertainty circle
    --       (b) Ellipsoid point with uncertainty ellipse
    --       (c) Ellipsoid point with altitude and uncertainty ellipsoid
    --       (d) Ellipsoid Arc
    --       (e) Ellipsoid Point
    -- Any other value in octet 1 shall be treated as invalid
    -- Octets 2 to 8 for case (a) – Ellipsoid point with uncertainty circle
    --       Degrees of Latitude                                        3 octets
    --       Degrees of Longitude                                       3 octets
    --       Uncertainty code                                           1 octet
    -- Octets 2 to 11 for case (b) – Ellipsoid point with uncertainty ellipse:
    --       Degrees of Latitude                                        3 octets
    --       Degrees of Longitude                                       3 octets
    --       Uncertainty semi-major axis                                1 octet
    --       Uncertainty semi-minor axis                                1 octet
    --       Angle of major axis                                        1 octet
    --       Confidence                                                 1 octet
    -- Octets 2 to 14 for case (c) – Ellipsoid point with altitude and uncertainty ellipsoid
    --       Degrees of Latitude                                        3 octets
    --       Degrees of Longitude                                       3 octets
    --       Altitude                                                   2 octets
    --       Uncertainty semi-major axis                                1 octet
    --       Uncertainty semi-minor axis                                1 octet
    --       Angle of major axis                                        1 octet
    --       Uncertainty altitude                                       1 octet
    --       Confidence                                                 1 octet
    -- Octets 2 to 13 for case (d) – Ellipsoid Arc
    --       Degrees of Latitude                                        3 octets
    --       Degrees of Longitude                                       3 octets
    --       Inner radius                                               2 octets
    --       Uncertainty radius                                         1 octet
    --       Offset angle                                               1 octet
    --       Included angle                                             1 octet
    --       Confidence                                                 1 octet
    -- Octets 2 to 7 for case (e) – Ellipsoid Point
    --       Degrees of Latitude                                        3 octets
    --       Degrees of Longitude                                       3 octets

    --
    -- An Ext-GeographicalInformation parameter comprising more than one octet and
    -- containing any other shape or an incorrect number of octets or coding according
    -- to 3G TS 23.032 shall be treated as invalid data by a receiver.
    --
    -- An Ext-GeographicalInformation parameter comprising one octet shall be discarded
    -- by the receiver if an Add-GeographicalInformation parameter is received
    -- in the same message.
    --
    -- An Ext-GeographicalInformation parameter comprising one octet shall be treated as
    -- invalid data by the receiver if an Add-GeographicalInformation parameter is not
    -- received in the same message.

maxExt-GeographicalInformation  INTEGER ::= 20
    -- the maximum length allows for further shapes in 3G TS 23.032 to be included in later
    -- versions of 3G TS 29.002

Add-GeographicalInformation ::= OCTET STRING (SIZE (1..maxAdd-GeographicalInformation))
    -- Refers to geographical Information defined in 3G TS 23.032.
    -- This is composed of 1 or more octets with an internal structure according to
    -- 3G TS 23.032
    -- Octet 1: Type of shape, all the shapes defined in 3G TS 23.032 are allowed:
    -- Octets 2 to n (where n is the total number of octets necessary to encode the shape
    -- according to 3G TS 23.032) are used to encode the shape itself in accordance with the
    -- encoding defined in 3G TS 23.032
    --
    -- An Add-GeographicalInformation parameter, whether valid or invalid, received
    -- together with a valid Ext-GeographicalInformation parameter in the same message
    -- shall be discarded.
    --
    -- An Add-GeographicalInformation parameter containing any shape not defined in
    -- 3G TS 23.032 or an incorrect number of octets or coding according to
    -- 3G TS 23.032 shall be treated as invalid data by a receiver if not received
    -- together with a valid Ext-GeographicalInformation parameter in the same message.
```

```
maxAdd-GeographicalInformation  INTEGER ::= 90
     -- the maximum length allows support for all the shapes currently defined in 3G TS 23.032

SubscriberLocationReport-Arg ::= SEQUENCE {
     lcs-Event                          LCS-Event,
     lcs-ClientID                       LCS-ClientID,
     lcsLocationInfo                    LCSLocationInfo,
     msisdn                             [0] ISDN-AddressString            OPTIONAL,
     imsi                               [1] IMSI                          OPTIONAL,
     imei                               [2] IMEI                          OPTIONAL,
     na-ESRD                            [3] ISDN-AddressString            OPTIONAL,
     na-ESRK                            [4] ISDN-AddressString            OPTIONAL,
     locationEstimate                   [5] Ext-GeographicalInformation   OPTIONAL,
     ageOfLocationEstimate              [6] AgeOfLocationInformation      OPTIONAL,
     extensionContainer                 [7] ExtensionContainer            OPTIONAL,
     ... ,
     add-LocationEstimate               [8] Add-GeographicalInformation   OPTIONAL,
     deferredmt-lrData                  [9] Deferredmt-lrData             OPTIONAL }

     -- one of msisdn or imsi is mandatory
     -- a location estimate that is valid for the locationEstimate parameter should
     -- be transferred in this parameter in preference to the add-LocationEstimate.
     -- the deferredmt-lrData parameter shall be included if and only if the lcs-Event
     -- indicates a deferredmt-lrResponse.

Deferredmt-lrData ::= SEQUENCE {
     deferredLocationEventType          DeferredLocationEventType,
     terminationCause                   [0] TerminationCause              OPTIONAL,
     lcsLocationInfo                    [1] LCSLocationInfo               OPTIONAL,
     ...}
     -- lcsLocationInfo may be included only if a terminationCause is present
     -- indicating mt-lrRestart.

LCS-Event ::= ENUMERATED {
     emergencyCallOrigination  (0),
     emergencyCallRelease  (1),
     mo-lr  (2),
     ...,
     deferredmt-lrResponse  (3) }
     --   exception handling:
     --   a SubscriberLocationReport-Arg containing an unrecognized LCS-Event
     --   shall be rejected by a receiver with a return error cause of unexpected data value

TerminationCause ::= ENUMERATED {
     normal  (0),
     errorundefined  (1),
     internalTimeout  (2),
     congestion  (3),
     mt-lrRestart  (4),
     privacyViolation  (5),
     ... }
-- mt-lrRestart shall be used to trigger the GMLC to restart the location procedure,
-- either because the sending node knows that the terminal has moved under coverage
-- of another MSC or SGSN (e.g. Send Identification received), or because the subscriber
-- has been autonomously deregistered by the serving node (e.g implicit detach).
--
-- exception handling
-- an unrecognized value shall be treated the same as value 1 (errorundefined)

SubscriberLocationReport-Res ::= SEQUENCE {
     extensionContainer                 ExtensionContainer                OPTIONAL,
     ...}



END
```

17.7.14 Secure transport data types

```
MAP-ST-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ST-DataTypes (27) version7 (7)}

DEFINITIONS
IMPLICIT TAGS
::=
BEGIN

EXPORTS
   SecureTransportArg,
   SecureTransportRes,
   SecurityHeader,
   ProtectedPayload
;

IMPORTS
   IMSI,
   PLMN-Id

FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version7 (7)}
;
```

```
SecureTransportArg ::= SEQUENCE {
     securityHeader                          SecurityHeader,
     protectedPayload                        ProtectedPayload            OPTIONAL
     }
     -- The protectedPayload carries the result of applying the security function
     -- defined in 3G TS 33.200 to the encoding of the argument of the securely
     -- transported operation
```

```
SecureTransportRes ::= SEQUENCE {
     securityHeader                          SecurityHeader,
     protectedPayload                        ProtectedPayload            OPTIONAL
     }
     -- The protectedPayload carries the result of applying the security function
     -- defined in 3G TS 33.200 to the encoding of the result of the securely
     -- transported operation
```

```
SecurityHeader ::= SEQUENCE {
     initialisationVector                InitialisationVector,
     sendingPLMN-Id                      PLMN-Id,
     securityParametersIndex             SecurityParametersIndex,
     originalComponentIdentifier         OriginalComponentIdentifier,
     ...}
```

```
ProtectedPayload ::= OCTET STRING(SIZE(1.. 3438))
     -- In protection mode 0 (noProtection) the ProtectedPayload carries the transfer
          -- syntax value of the component parameter identified by the
          -- originalComponentIdentifier.
     -- In protection mode 1 (integrityAuthenticity) the protectedPayload carries
          --  the transfer syntax value of the component
          -- parameter identified by the originalComponentIdentifier, followed by
          -- the 32 bit integrity check value.
          -- The integrity check value is the result of applying the hash algorithm
          -- to the concatenation of the transfer syntax value of the SecurityHeader,
          -- and the transfer syntax value of the component parameter.
     -- In protection mode 2 (confidentialityIntegrityAuthenticity) the protected
          -- payload carries the encrypted transfer syntax
          -- value of the component parameter identified by the
          -- originalComponentIdentifier, followed by the 32 bit integrity check value.
          -- The integrity check value is the result of applying the hash algorithm
          -- to the concatenation of the transfer syntax value of the SecurityHeader,
          -- and the encrypted transfer syntax value of the component parameter.
     -- See 33.200.
     -- The length of the protectedPayload is adjusted according to the capabilities of
     -- the lower protocol layers
```

```
SecurityParametersIndex ::= OCTET STRING (SIZE(4))
```

```
InitialisationVector ::= OCTET STRING (SIZE(4..14))
     -- the internal structure is defined as follows:
     -- Octets 1 to 4 : TVP. The TVP is a 32 bit time stamp. Its value is binary coded
     --                 and indicates the number of intervals of 100 milliseconds
     --                 elapsed since 1st January 2002, 0:00:00 UTC
     -- Octets 5 to 10: NE-Id. The NE-Id uniquely identifies the sending network entity
     --                 within the PLMN. It is the entity's E.164 number without CC and
     --                 NDC. It is TBCD-coded, padded with zeros.
     -- Octets 11 to 14: PROP. This 32 bit value is used to make the
     --                 InitialisationVector unique within the same TVP period.
     --                 The content is not standardized.
```

```
OriginalComponentIdentifier ::= CHOICE {
     operationCode                          [0] OperationCode,
     errorCode                              [1] ErrorCode,
     userInfo                               [2] NULL}
```

```
OperationCode ::= CHOICE {
     localValue                             INTEGER,
     globalValue                            OBJECT IDENTIFIER}
```

```
ErrorCode ::= CHOICE {
     localValue                             INTEGER,
     globalValue                            OBJECT IDENTIFIER}
```

```
END
```

*** Next Modification ***

19 Mobility procedures

19.1 Location management Procedures

For non-GPRS subscribers, this clause 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 clause:

Process Update Location Area:

Update_Location_Area_VLR, clause 19.1.1.3;

Process Update Location:

Initiator: Update_Location_Area_VLR, clause 19.1.1.3;

Responder: Update_Location_HLR, clause 19.1.1.4;

Process Send Identification:

Initiator: Send_Identification_VLR, clause 19.1.1.x;

Responder: Send_Identification_PVLR, clause 19.1.1.5;

Process Cancel Location:

Initiator: Cancel_Location_HLR, clause 19.1.2.2;

Responder: Cancel_Location_VLR, clause 19.1.2.3;

Process Purge MS:

Initiator: Purge_MS_VLR, clause 19.1.4.2;

Responder: Purge_MS_HLR, clause 19.1.4.3.

For GPRS subscribers, this clause 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 clause:

Process GPRS Update Location:

Initiator: GPRS_Update_Location_Area_VLR, clause 19.1.1.3, or

SGSN_Update_HLR, clause 19.1.1.8,

Responder: Update_GPRS_Location_HLR, clause 19.1.1.4;

Process Cancel Location:

Initiator: Cancel_GPRS_Location_HLR, clause 19.1.2.2;

Responder: Cancel_Location_SGSN, clause 19.1.2.4;

Process Purge MS:

Initiator: Purge_MS_SGSN, clause 19.1.4.4;

Responder: Purge_MS_HLR, clause 19.1.4.3.

The following existing process is also used for GPRS subscribers :

Process Subscriber Present HLR:

Initiator: Subscriber_Present_HLR, clause 19.1.1.7;

Responder: Short_Message_Alert_IWMSC, clause 23.4.3;

Location Management Coordinator HLR

Sheet 1: 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.

Process Location_Management_Coordinator_HLR

'Figure 19.1/3
'Location management coordination process in the HLR

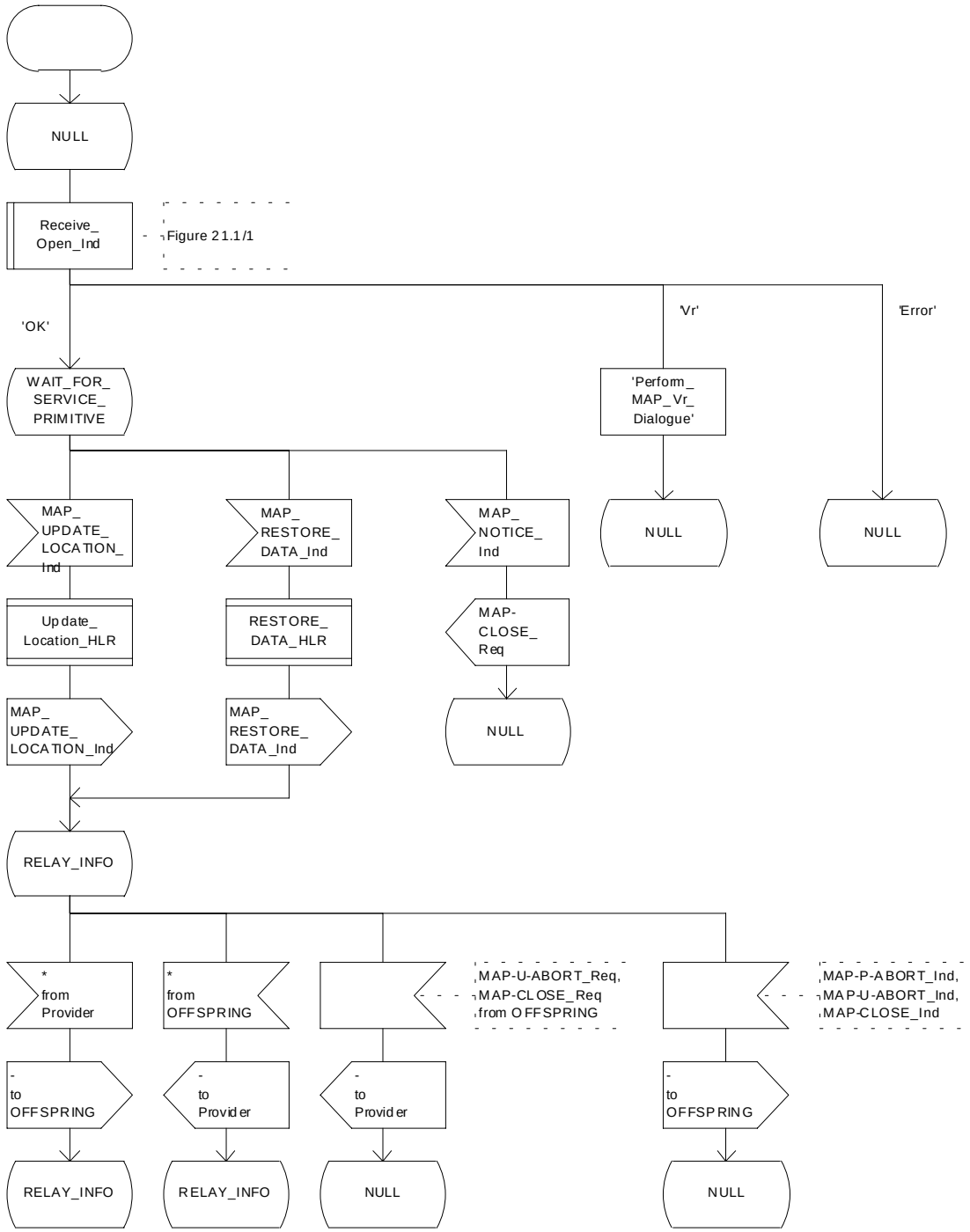


Figure 19.1/3: Process Location_Management_Coordinator_HLR

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 3GPP TS 23.012 [23] and 3GPP TS 23.060 [104]). The use of the IMSI Detach / Attach feature is optional for the network operator.

To minimise 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 3GPP TS 23.060 [104]. 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 clause 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 clause 8.1);(**)
MAP_UPDATE_LOCATION	(see clause 8.1);(**)
MAP_UPDATE_GPRS_LOCATION	(see clause 8.1) (*);
MAP_CANCEL_LOCATION	(see clause 8.1);
MAP_INSERT_SUBSCRIBER_DATA	(see clause 8.8);
MAP_SEND_IDENTIFICATION	(see clause 8.1) (**);
MAP_PROVIDE_IMSI	(see clause 8.9) (**);
MAP_AUTHENTICATE	(see clause 8.5) (**);
MAP_SET_CIPHERING_MODE	(see clause 8.6) (**);

MAP_FORWARD_NEW_TMSI (see clause 8.9) (**);

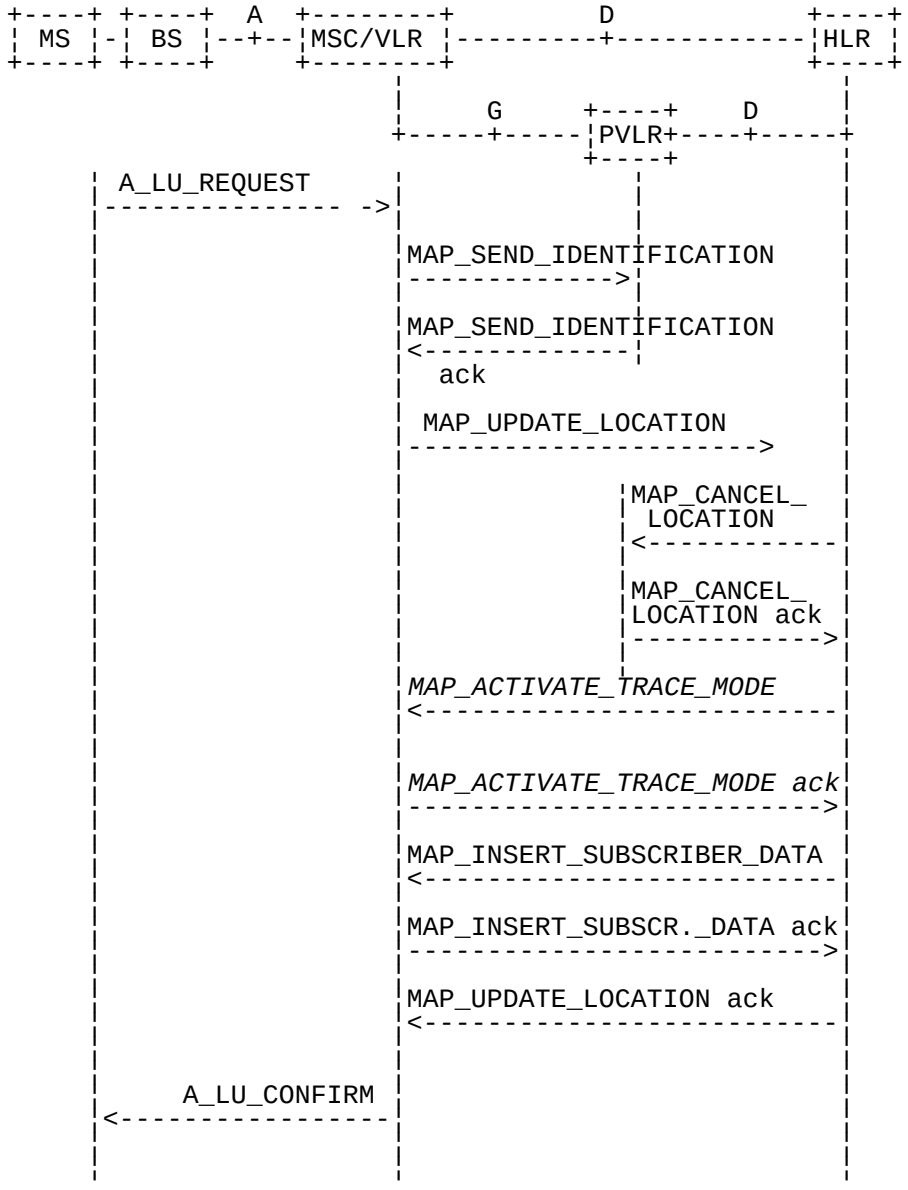
MAP_CHECK_IMEI (see clause 8.7) (**);

MAP_ACTIVATE_TRACE_MODE (see clause 9.2);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see clause 9.2) (**).

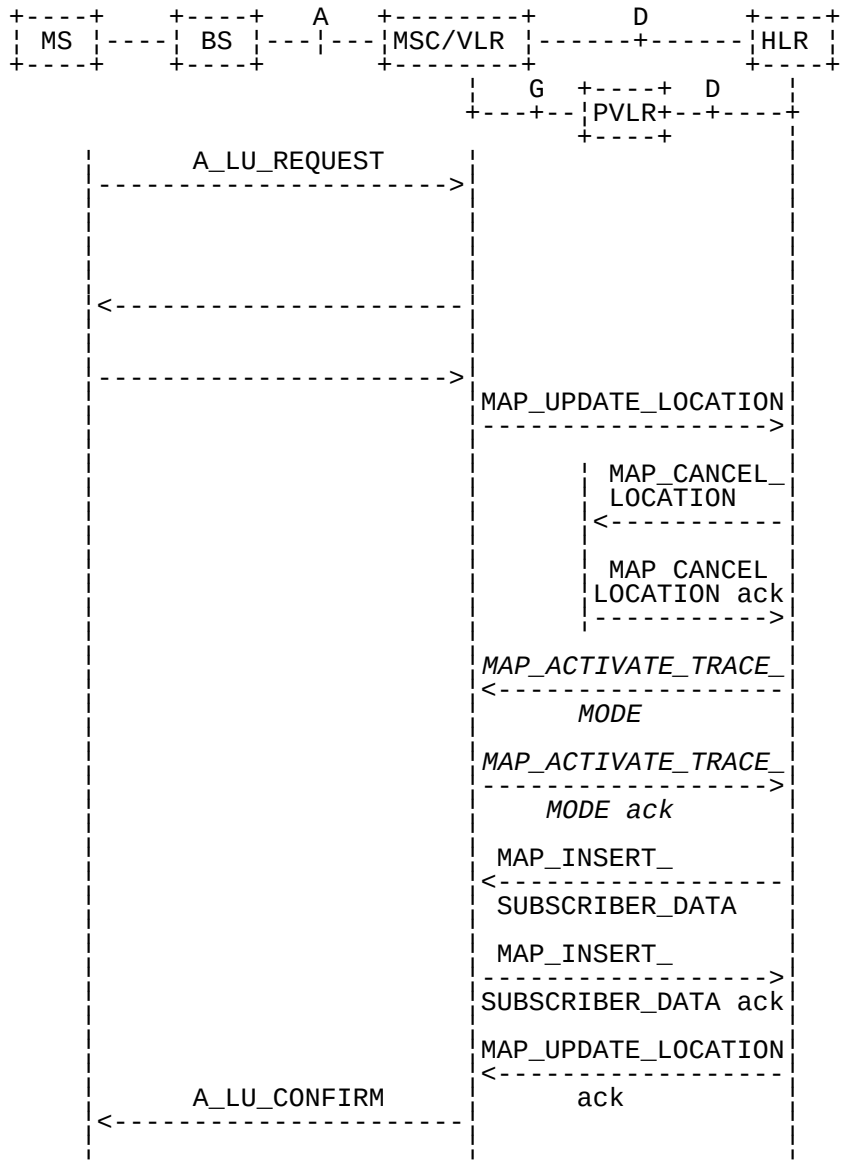
(*): only used in SGSN and HLR for GPRS

(**): not used in SGSN



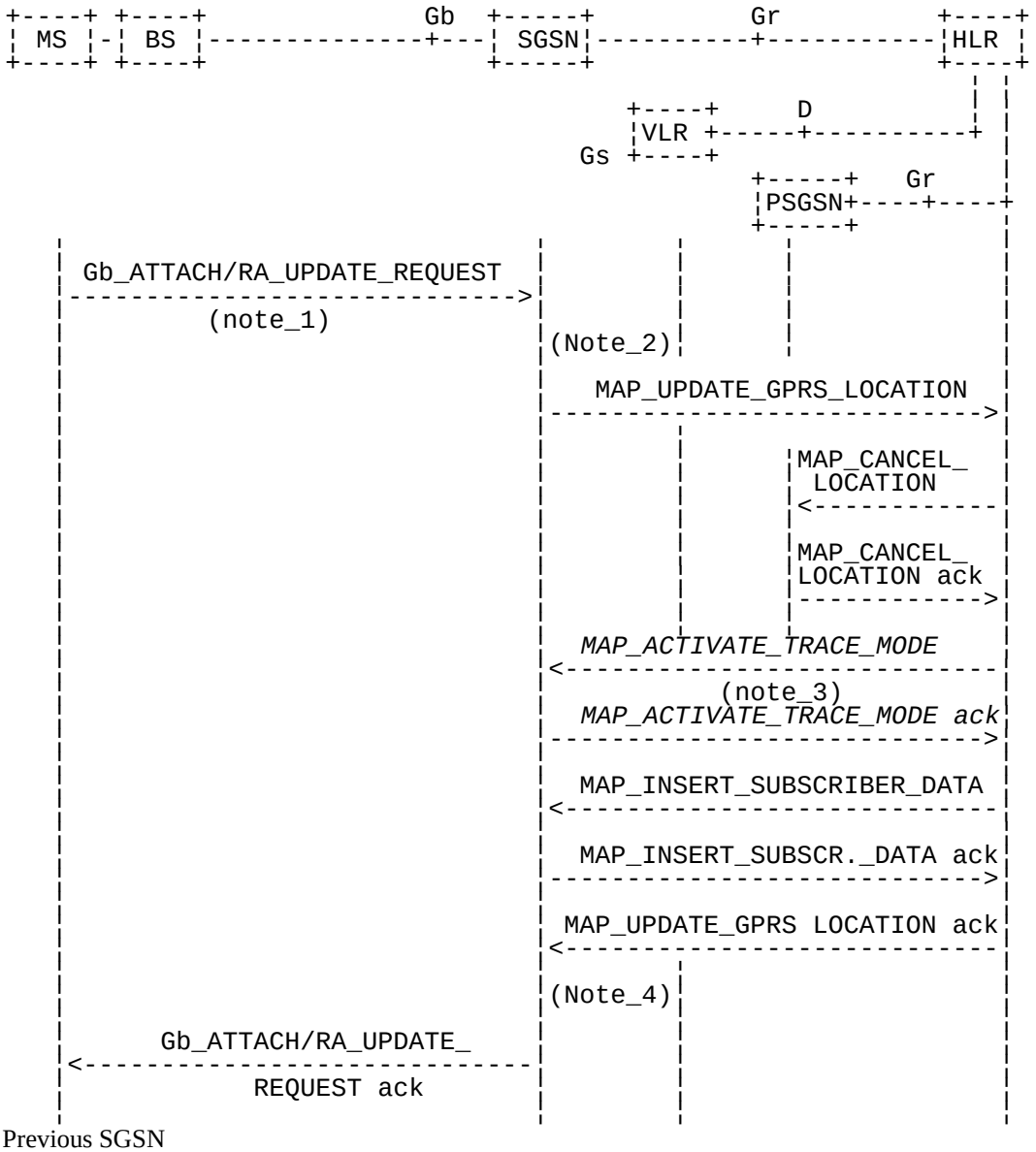
NOTE: Procedures shown in italics are optional.

Figure 19.1.1/2: Interface and services for location updating when changing the VLR area



NOTE: Procedures shown in italics are optional.

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

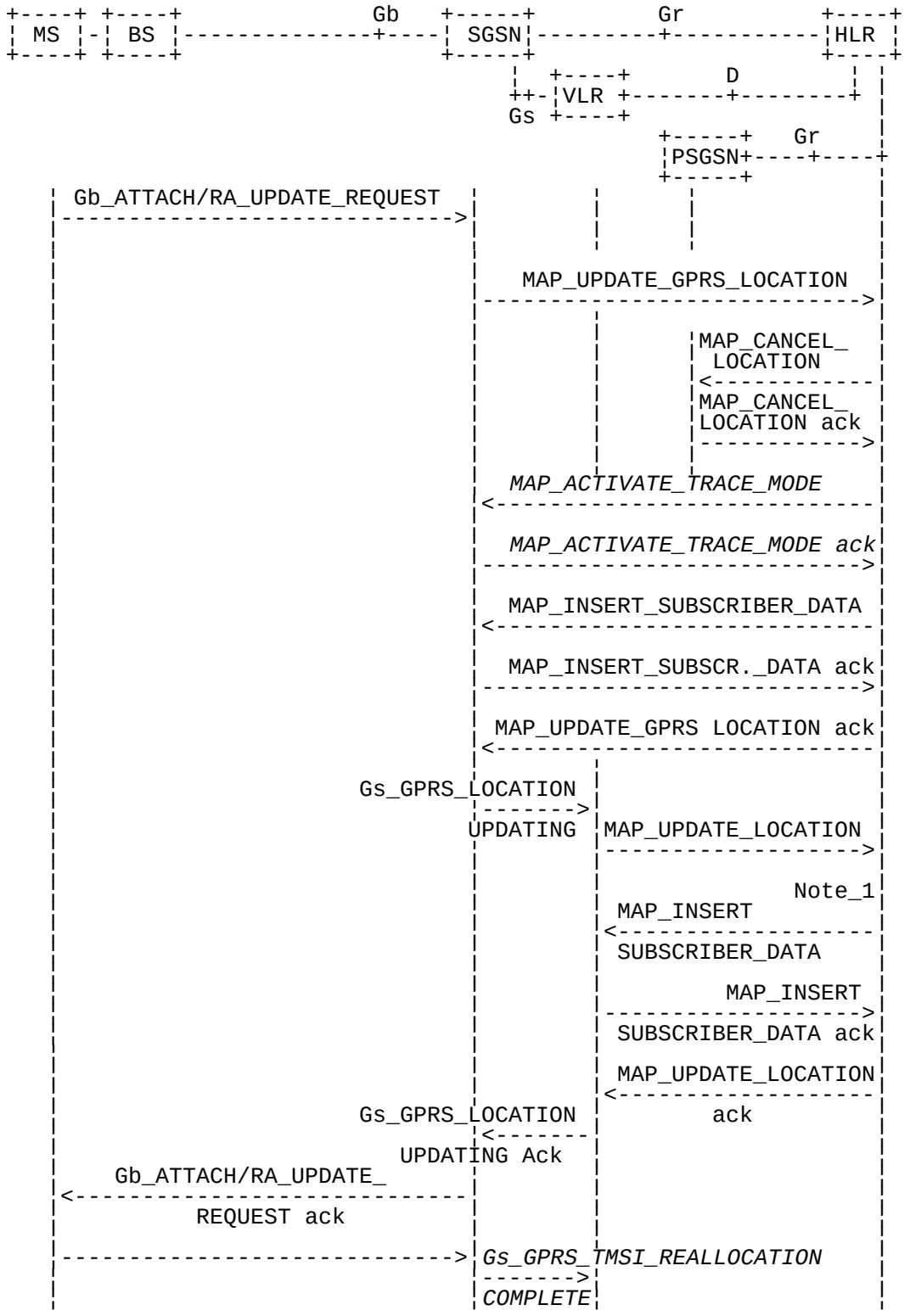
NOTE 1: For details of the procedure on the radio path, see 3GPP TS 48.018. The services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For security functions (authentication, ciphering, IMEI check) triggering refer to 3GPP TS 23.060 [104]. MAP processes invoked for those procedures are described in section 25.

NOTE 3: Optional services are printed in *italics*.

NOTE 4: Refer to 3GPP TS 23.060 [104] for termination of the procedure and triggering of the signalling on the Gb interface.

Figure 19.1.1/4: Interface and services for GPRS location updating (Gs-interface not installed)



NOTE 1: The optional procedures in figure 19.1.1/14 apply here respectively. For details of the procedure on the Gs-interface, see 3GPP TS 29.018 [106].

NOTE 2: Location Cancellation procedure toward the old VLR and optional tracing activation toward the new VLR are not represented on this figure.

Figure 19.1.1/5: Interface and services for GPRS location updating (Gs-interface installed)

19.1.1.3 Detailed procedure in the VLR

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 3GPP TS 23.060 [104] 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 exits 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 3GPP TS 29.018 [106]) 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 3GPP TS 29.018 [106]) 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 3GPP TS 29.018 [106]) 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 3GPP TS 29.018 [106]) 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 3GPP TS 29.018 [106]) 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 3GPP TS 29.018 [106]) 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 clause 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 3GPP TS 23.060 [104]). 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 clause 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 clause 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 clause 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.

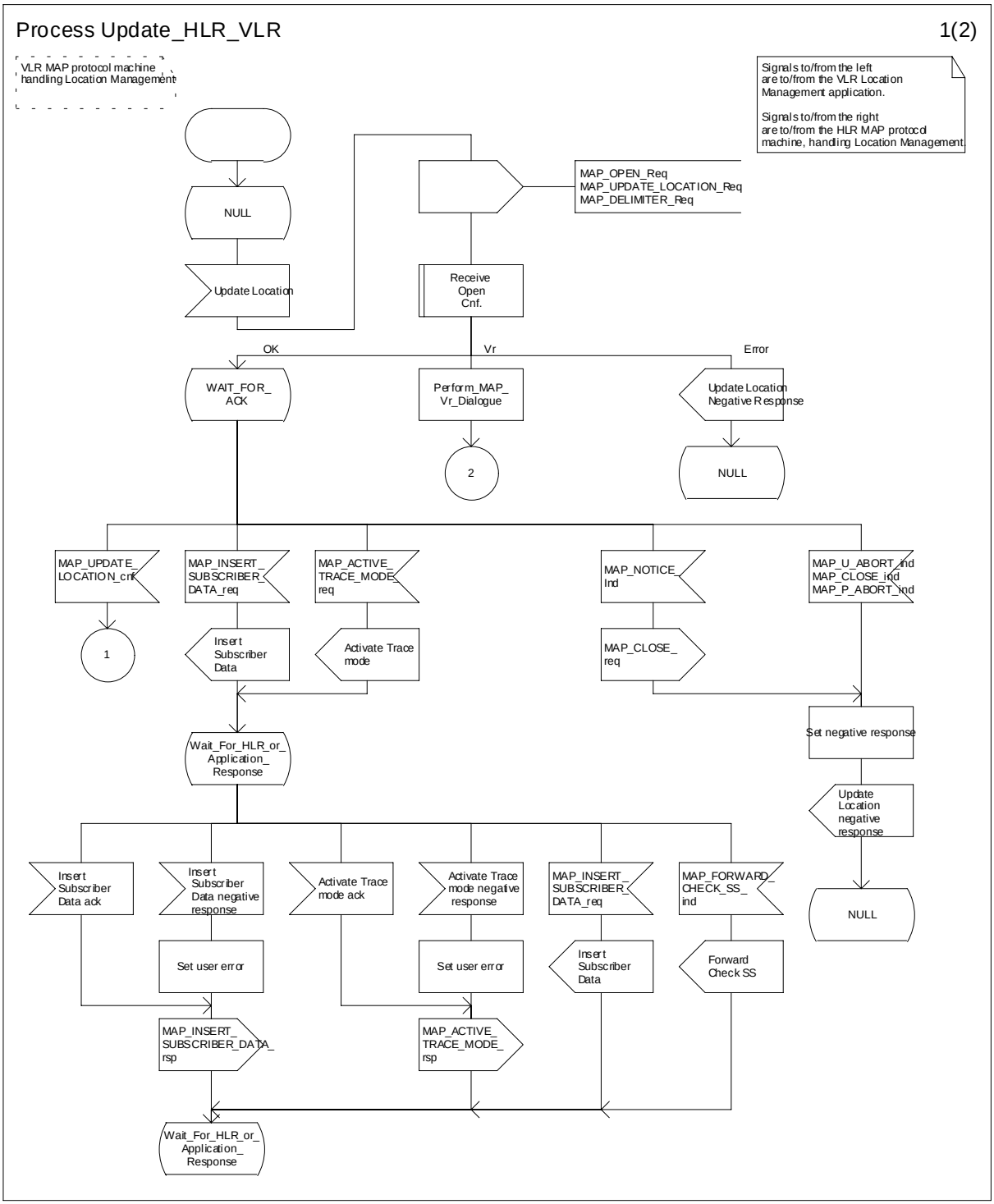


Figure 19.1.1/6 (sheet 1 of 2): Process Update_HLR_VLR

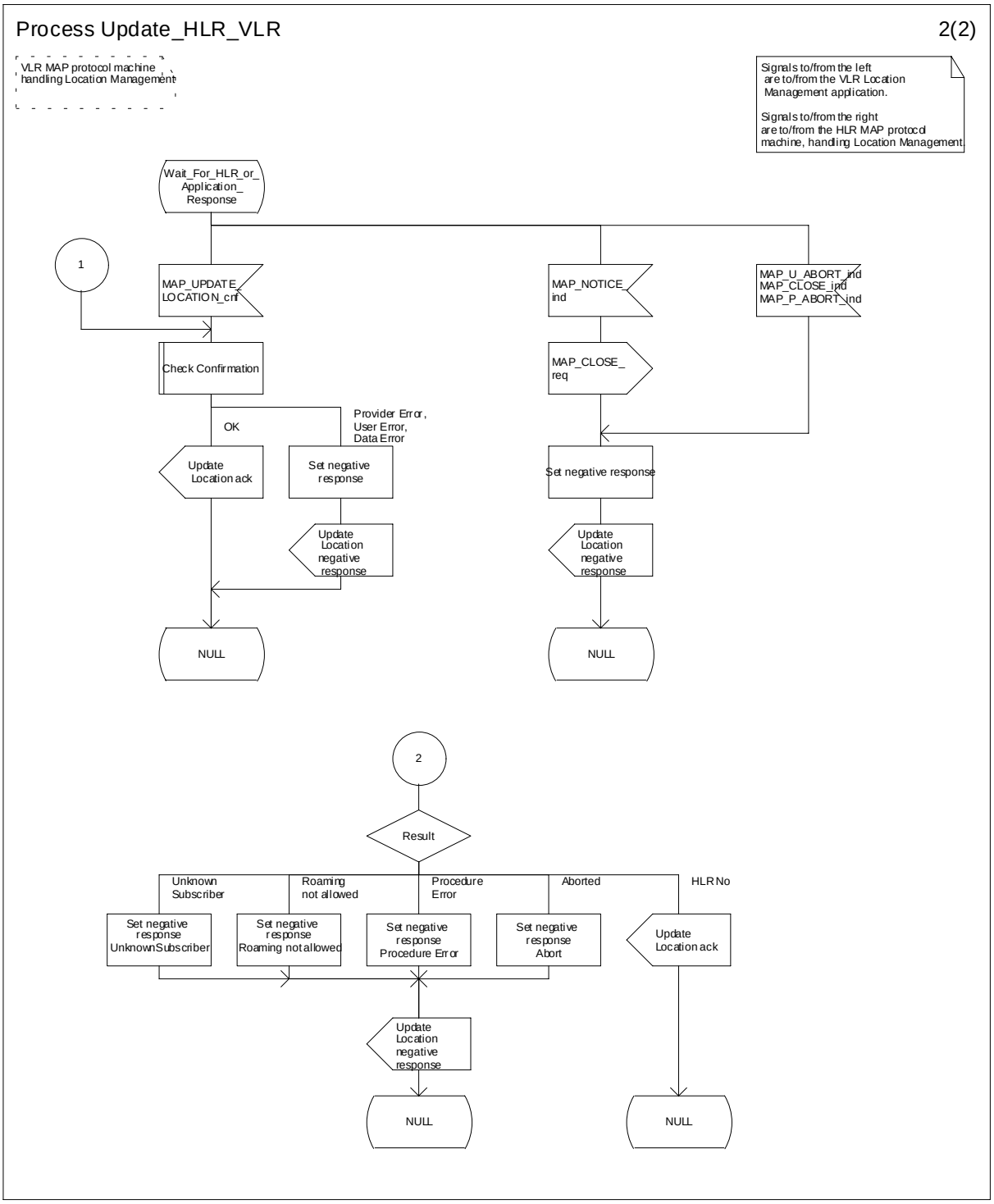


Figure 19.1.1/6 (sheet 2 of 2): Process Update_HLR_VLR

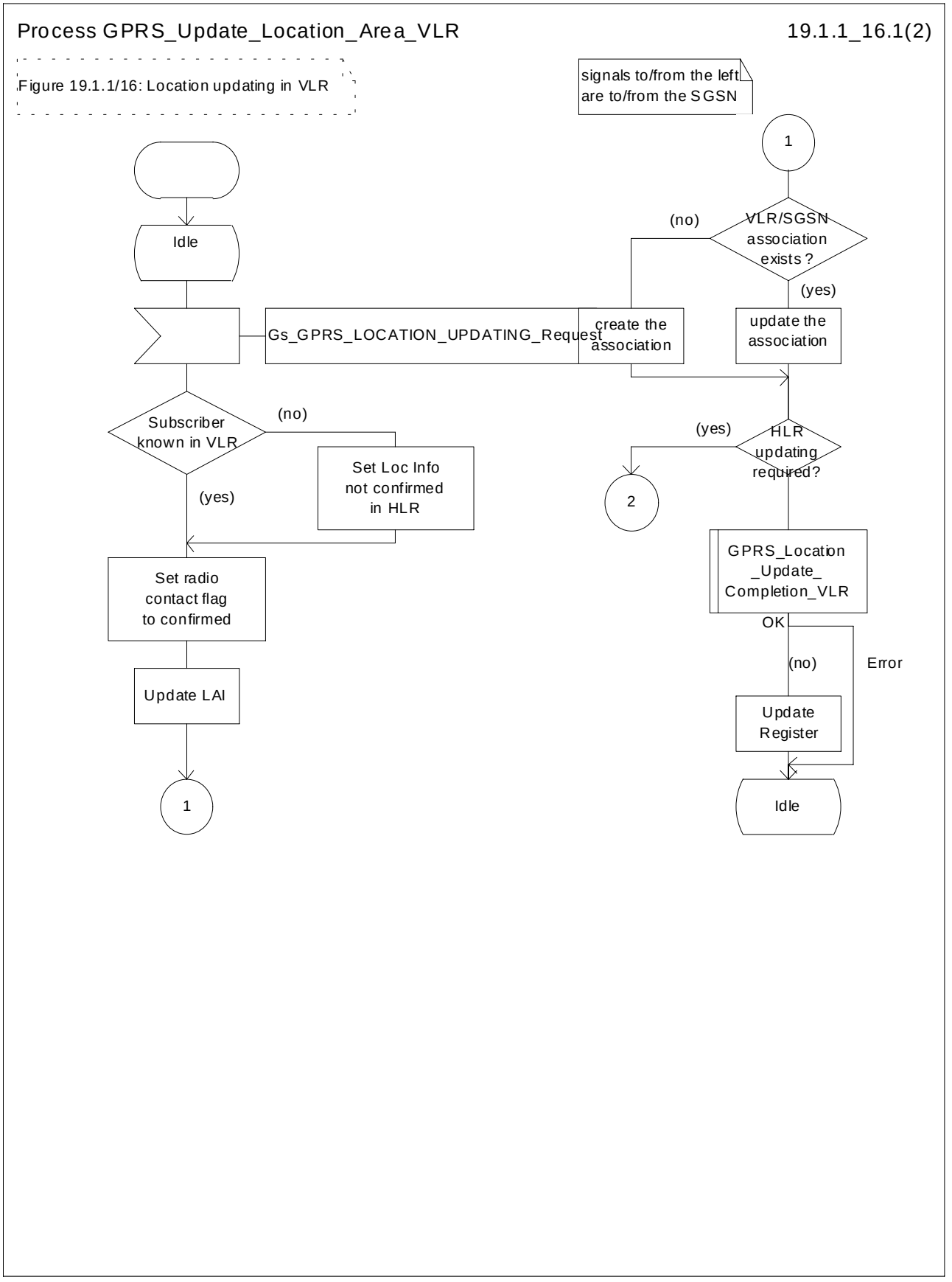


Figure 19.1.1/16 (sheet 1 of 2): Process GPRS_Update_Location_Area_VLR

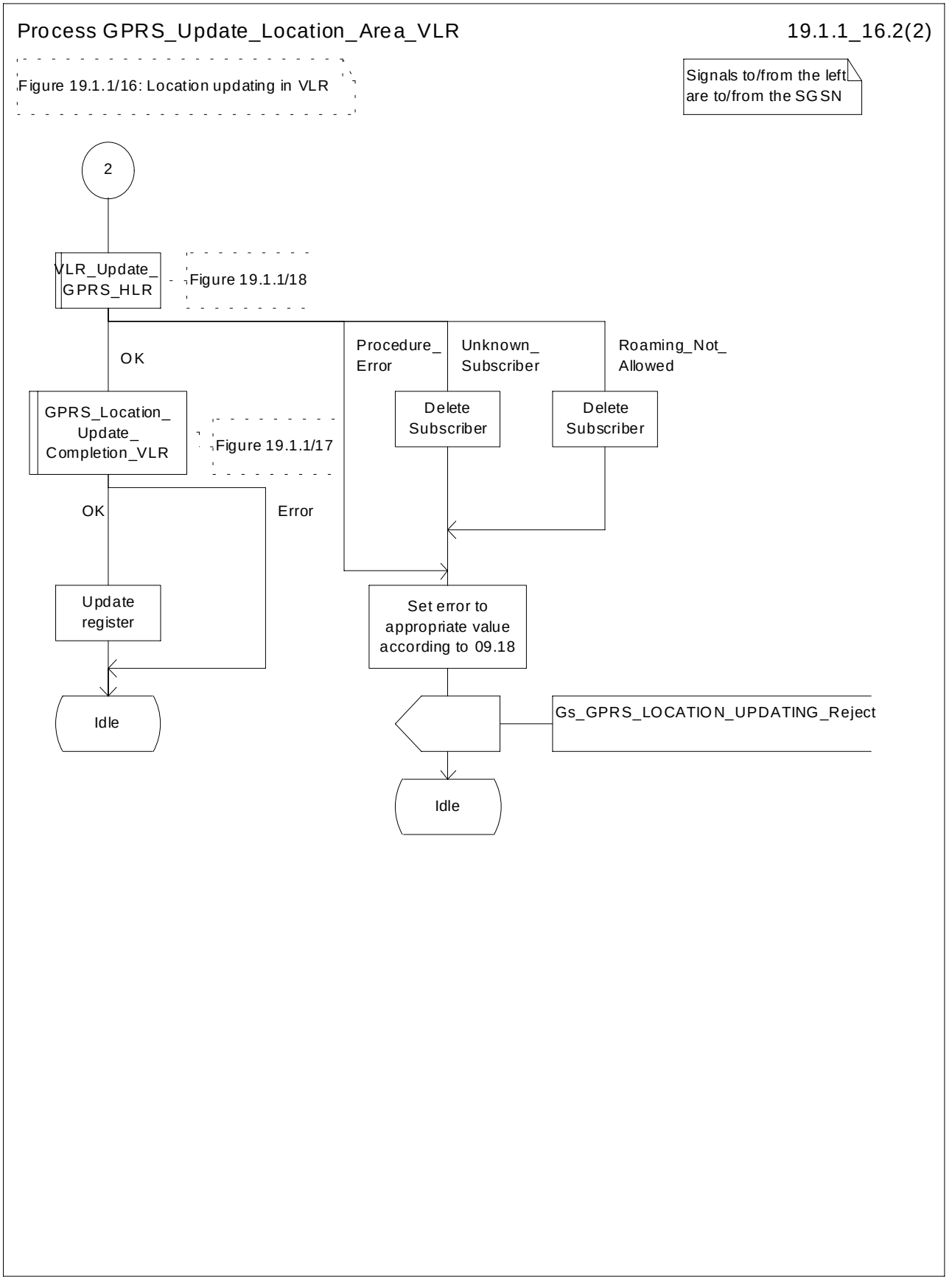


Figure 19.1.1/16 (sheet 2 of 2): Process GPRS_Update_Location_Area_VLR

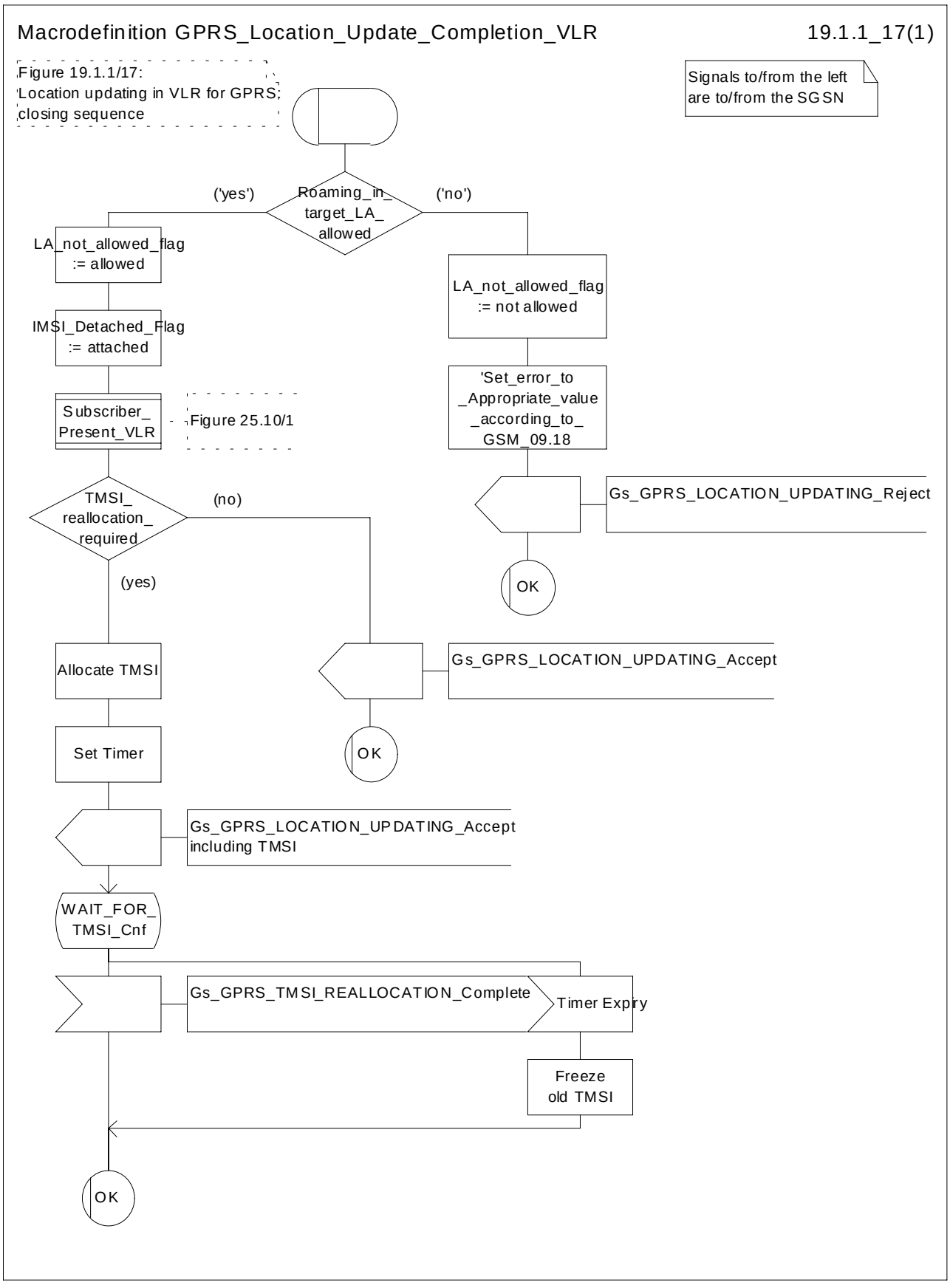


Figure 19.1.1/17: Macro GPRS_Location_Update_Completion_VLR

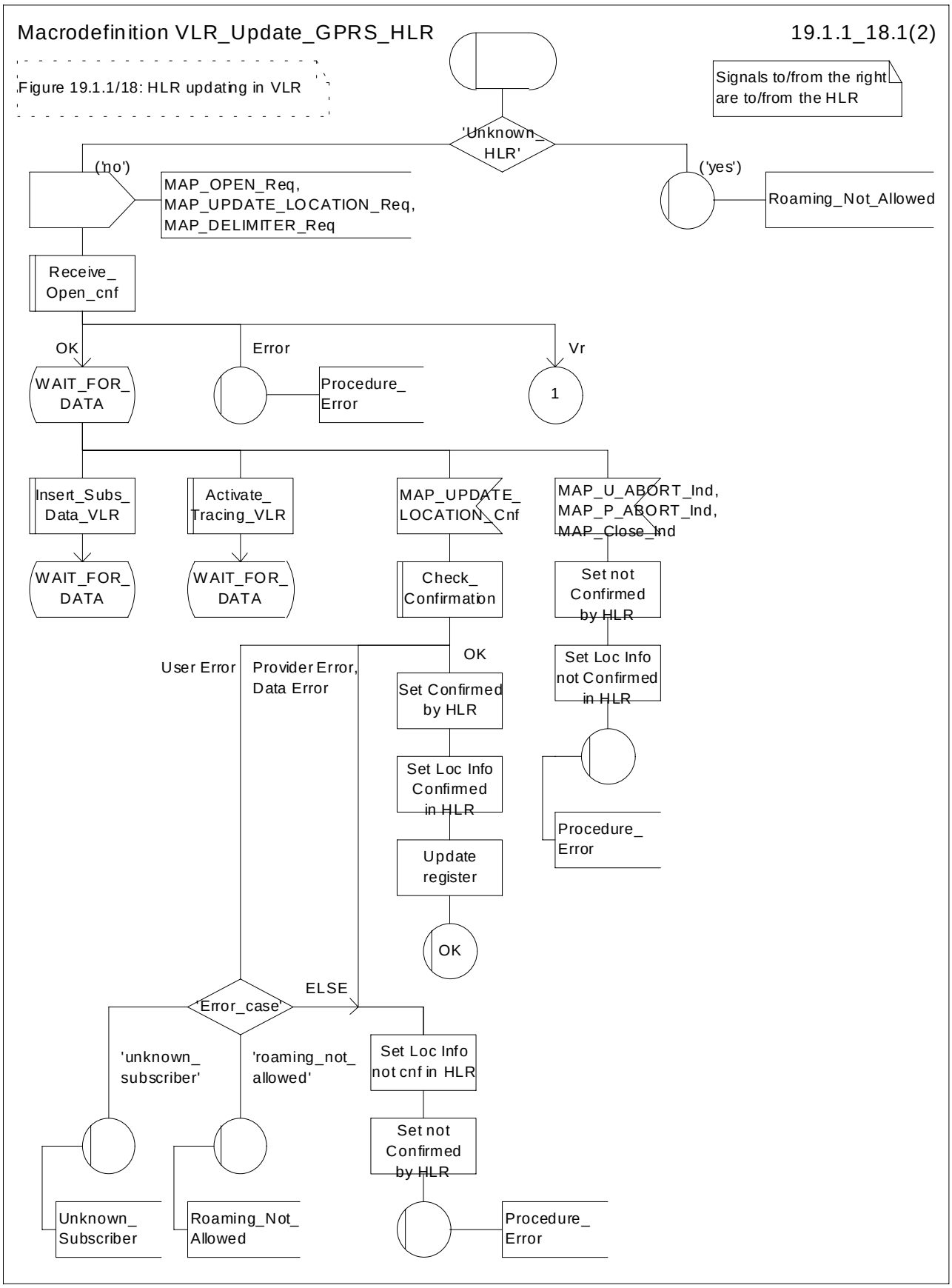


Figure 19.1.1/18 (sheet 1 of 2): Macro VLR_Update_GPRS_HLR

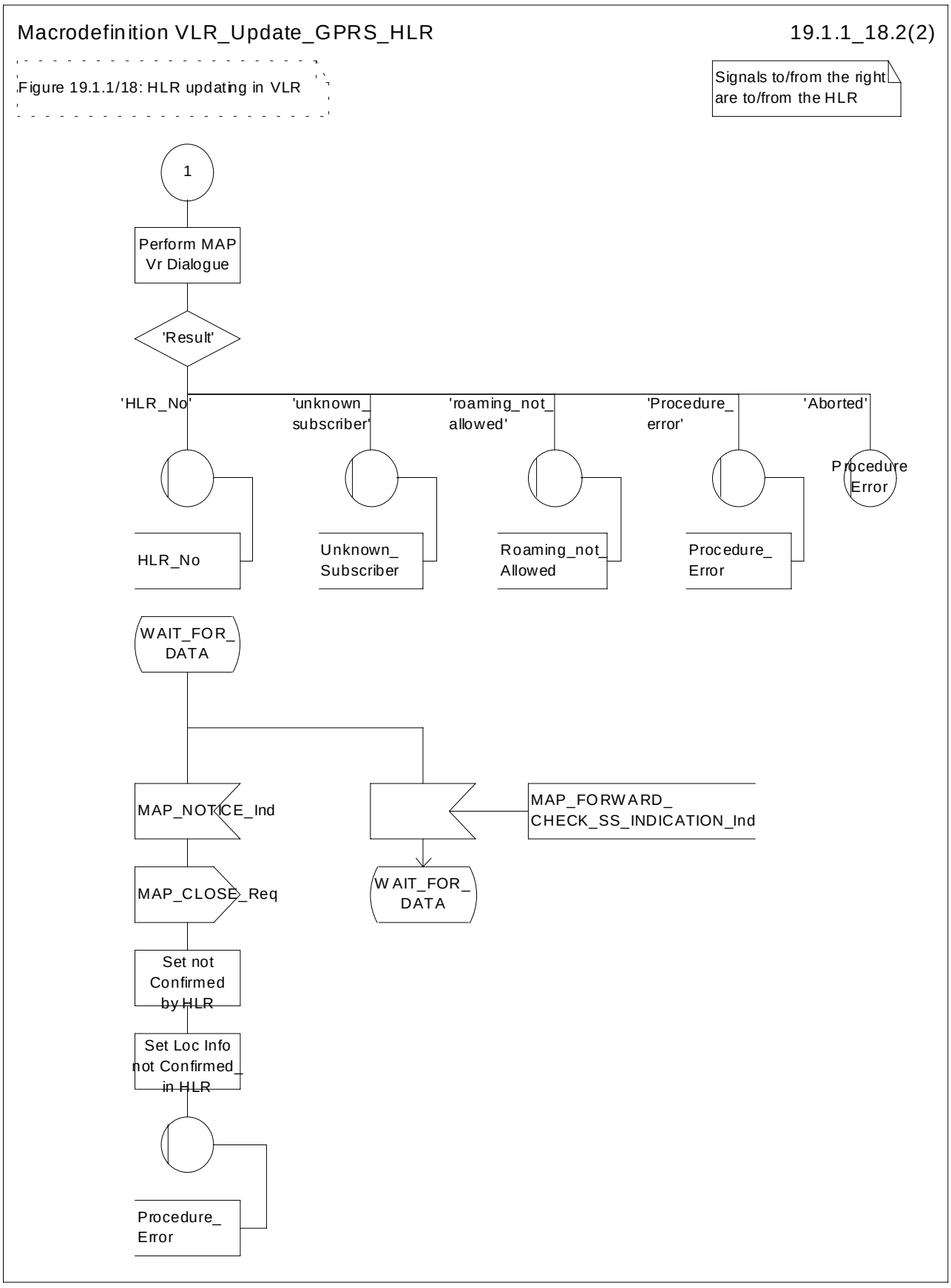


Figure 19.1.1/18 (sheet 2 of 2): Macro VLR_Update_GPRS_HLR

19.1.1.4 Detailed procedure in the HLR

Sheet 1: The procedure Super_Charged_Cancel_Location_HLR is specific to Super-Charger; it is specified in TS 23.116 [110]. If the previous SGSN and the originating HLR support the Super-Charger functionality, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 2: The procedure Super_Charged_Location_Updating_HLR is specific to Super-Charger; it is specified in TS 23.116 [110]. If subscription data needs to be sent to the SGSN, processing continues from the "No" exit of the test "Result=Pass?".

When addressed by the SGSN, the following macros are used by the process Update_GPRS_Location_HLR:

- Receive_Open_indication, defined in clause 25.1;
- Check_indication, defined in clause 25.2;
- Insert_Subs_Data_In_SGSN_Framed_HLR, described in clause 19.4;
- Control_Tracing_HLR_with_SGSN, described in clause 25.9;

and the processes Cancel_Location_HLR (see clause 19.1.2) and Subscriber_Present_HLR (see clause 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 clause 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 deactive 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 clause 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 clause 25.9.

Thereafter, the macro Insert_Subs_Data_In_SGSN_Framed_HLR described in clause 19.4 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 clause 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.

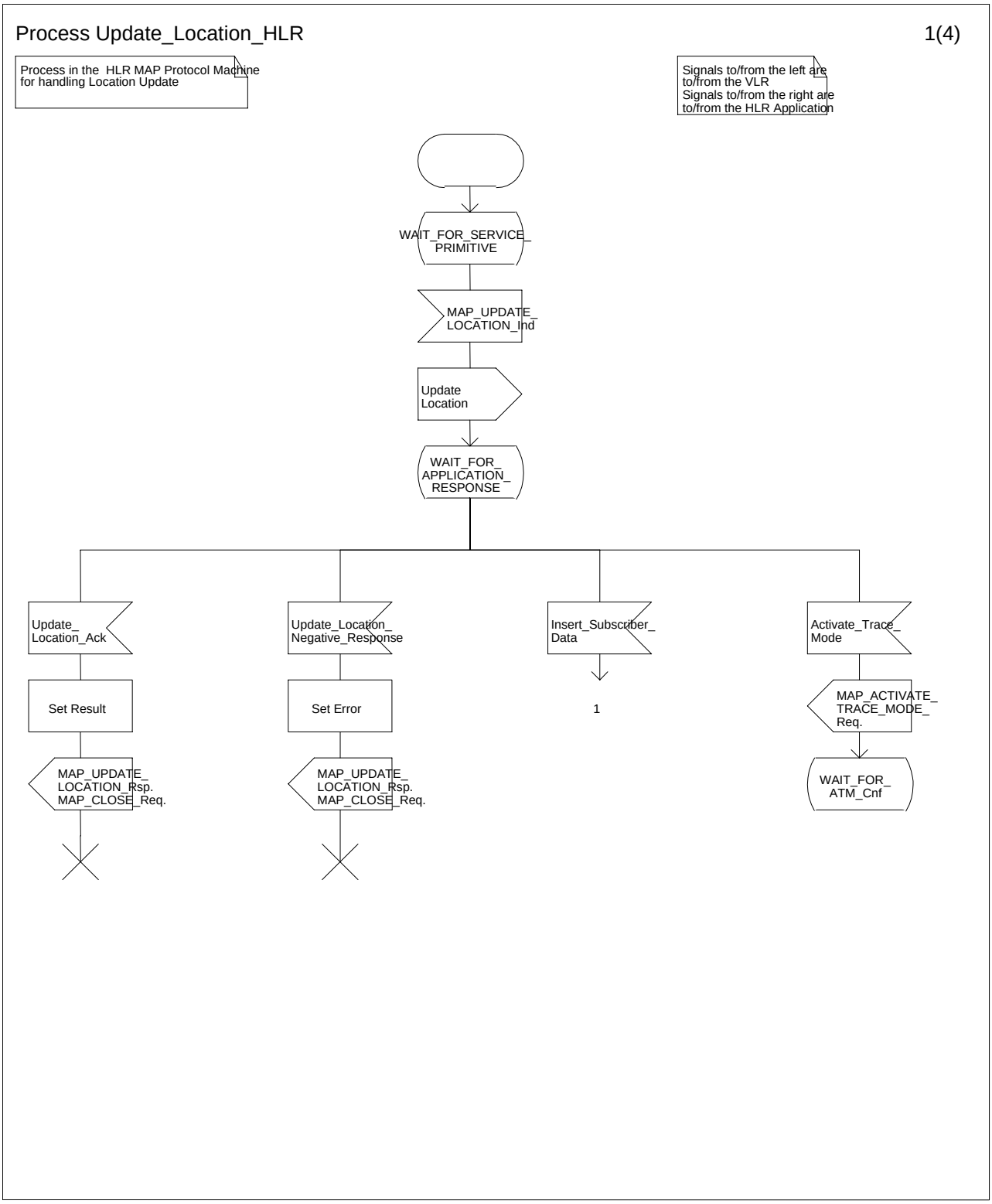


Figure 19.1.1/9 (sheet 1 of 4): Process Update_Location_HLR

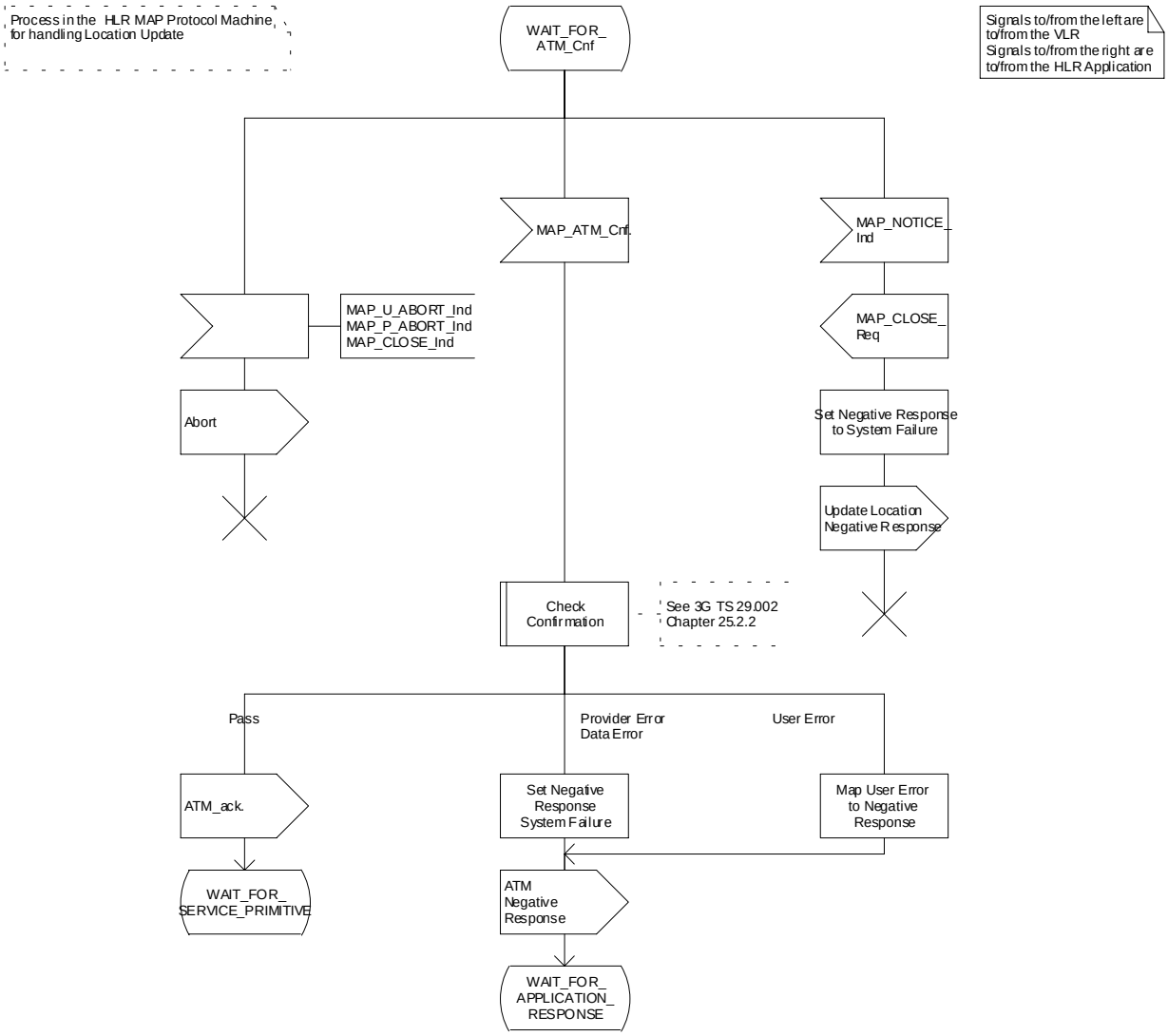


Figure 19.1.1/9 (sheet 2 of 4): Process Update_Location_HLR

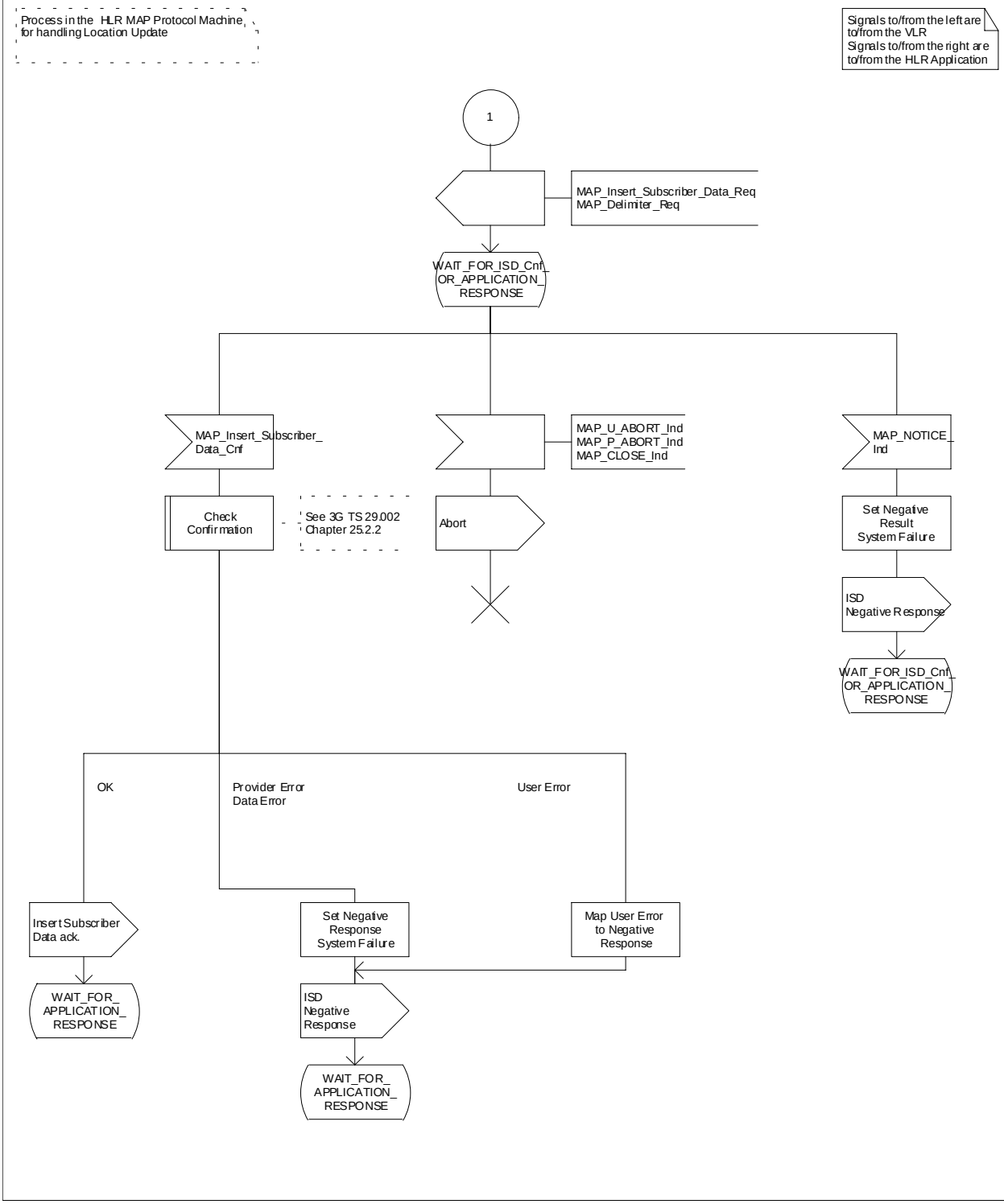


Figure 19.1.1/9 (sheet 3 of 4): Process Update_Location_HLR

Process in the HLR MAP Protocol Machine for handling Location Update

Signals to/from the left are to/from the VLR
Signals to/from the right are to/from the HLR Application

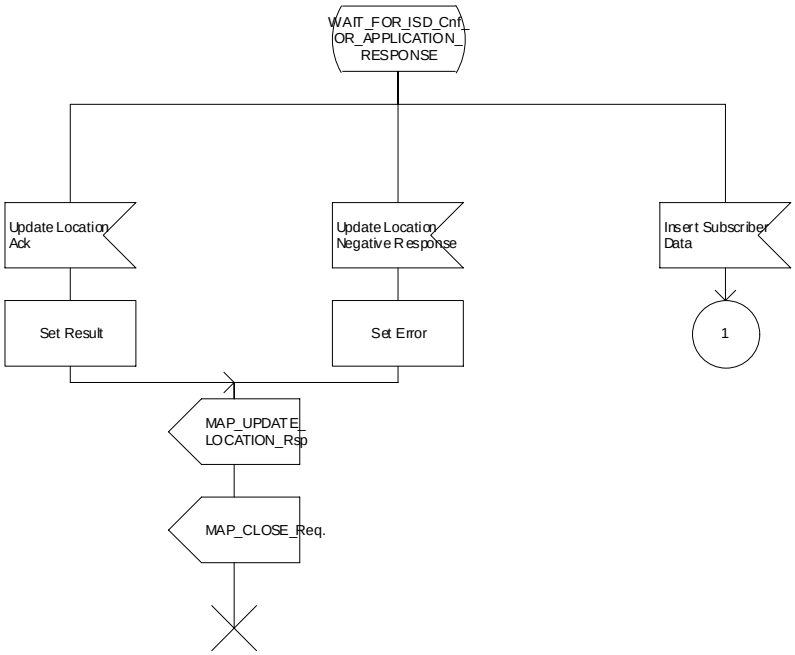


Figure 19.1.1/9 (sheet 4 of 4): Process Update_Location_HLR

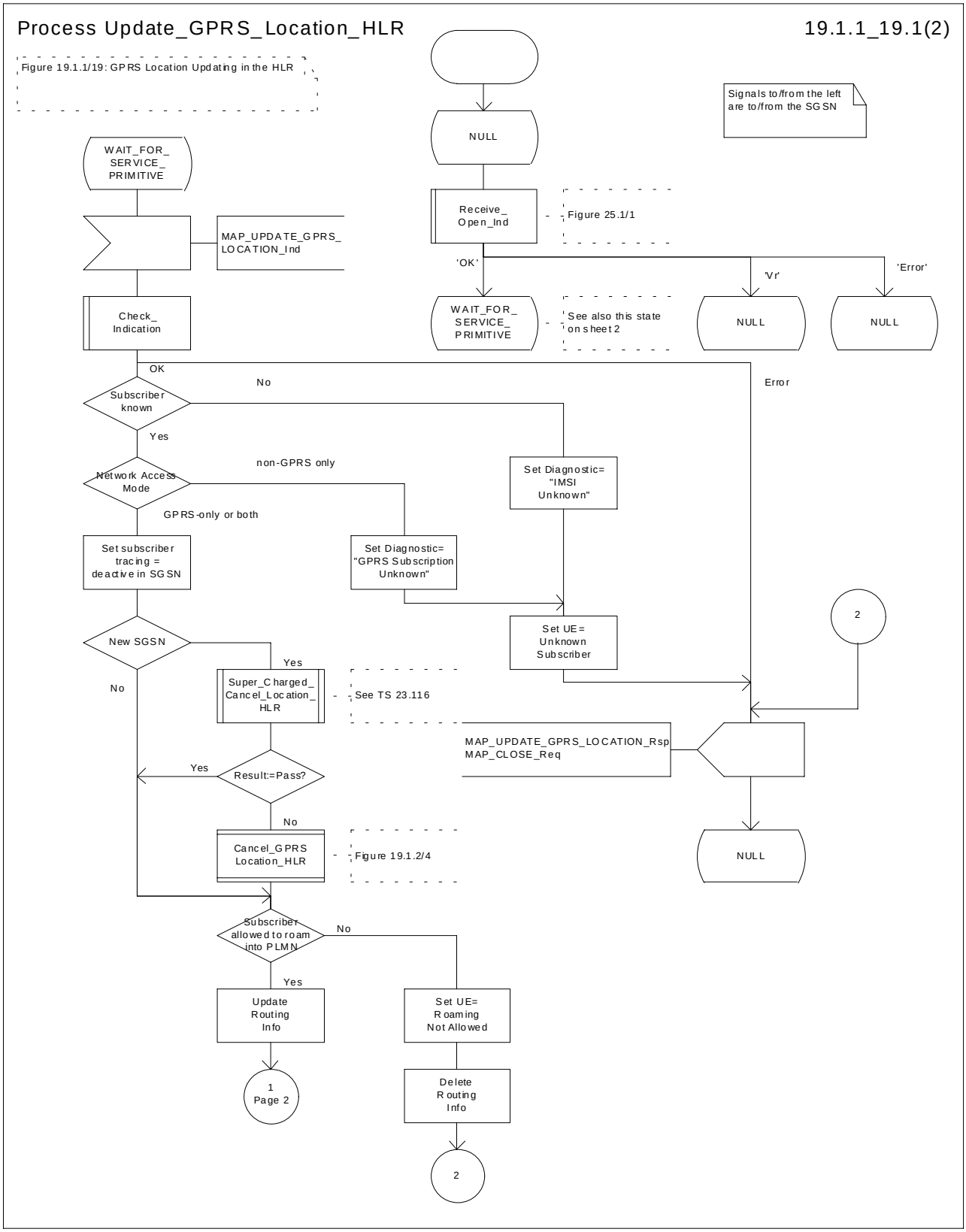


Figure 19.1.1/19 (sheet 1 of 2): Process Update_GPRS_Location_HLR

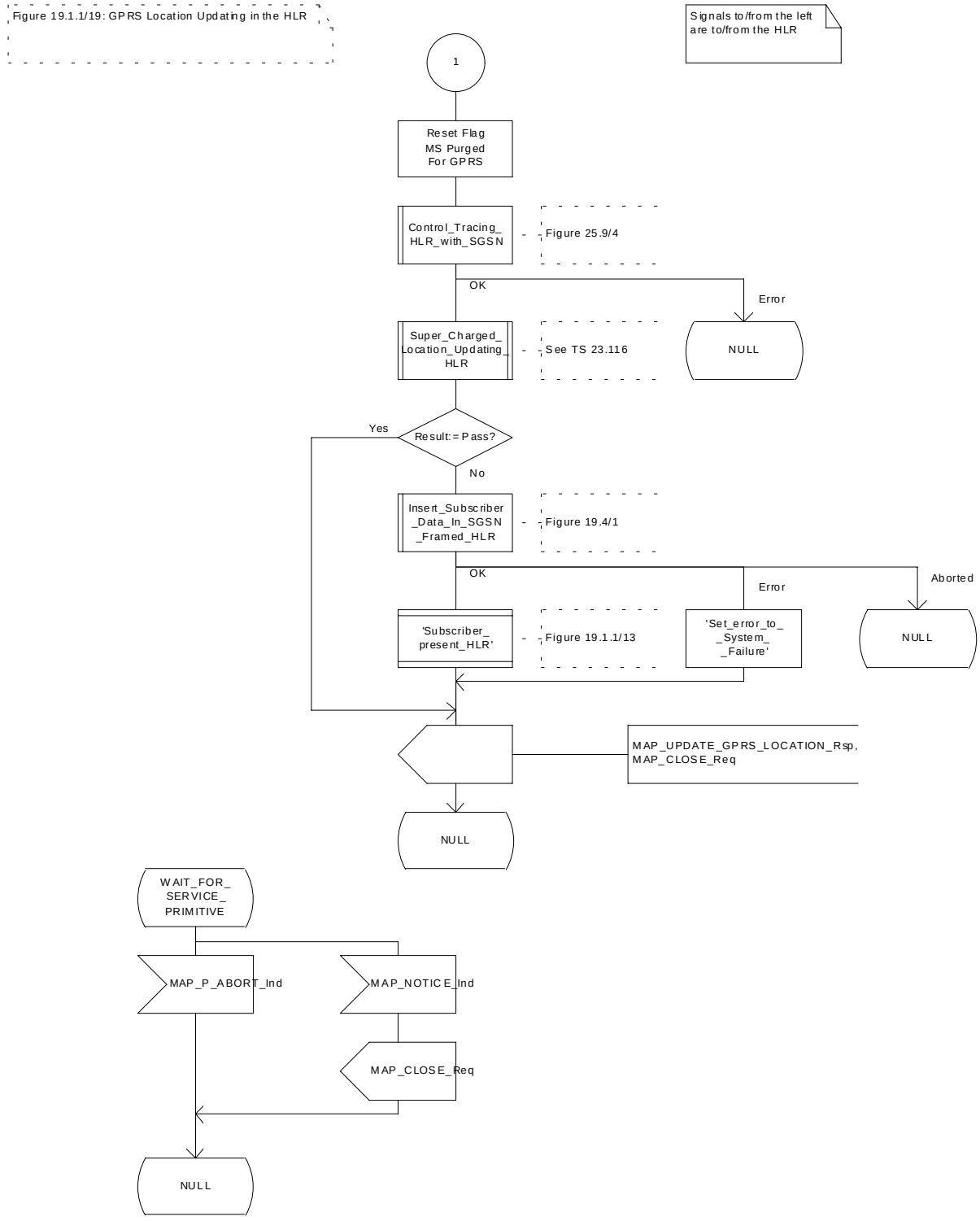


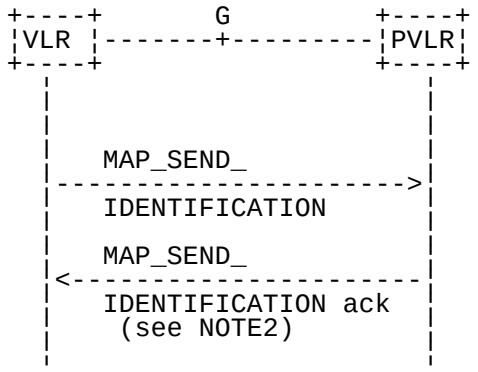
Figure 19.1.1/19 (sheet 2 of 2): Process Update_GPRS_Location_HLR

19.1.1.5 Send Identification

19.1.1.5.1 General

This service is invoked by the VLR when it receives Update location from the MSC 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 clause 19.1.1.3), using the service described in clause 8.1.4.

If the version negotiation between R99 VLR and pre-R99 PVLR leads to the MAP version 1 or 2, the VLR shall request authentication sets from the HLR.



NOTE1: The service shown in dotted lines indicates the trigger provided by other MAP signalling.
NOTE2: Several MAP_SEND_IDENTIFICATION request/response may be used if message segmentation is required.

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 clause 19.1.1.X.

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 clause 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.

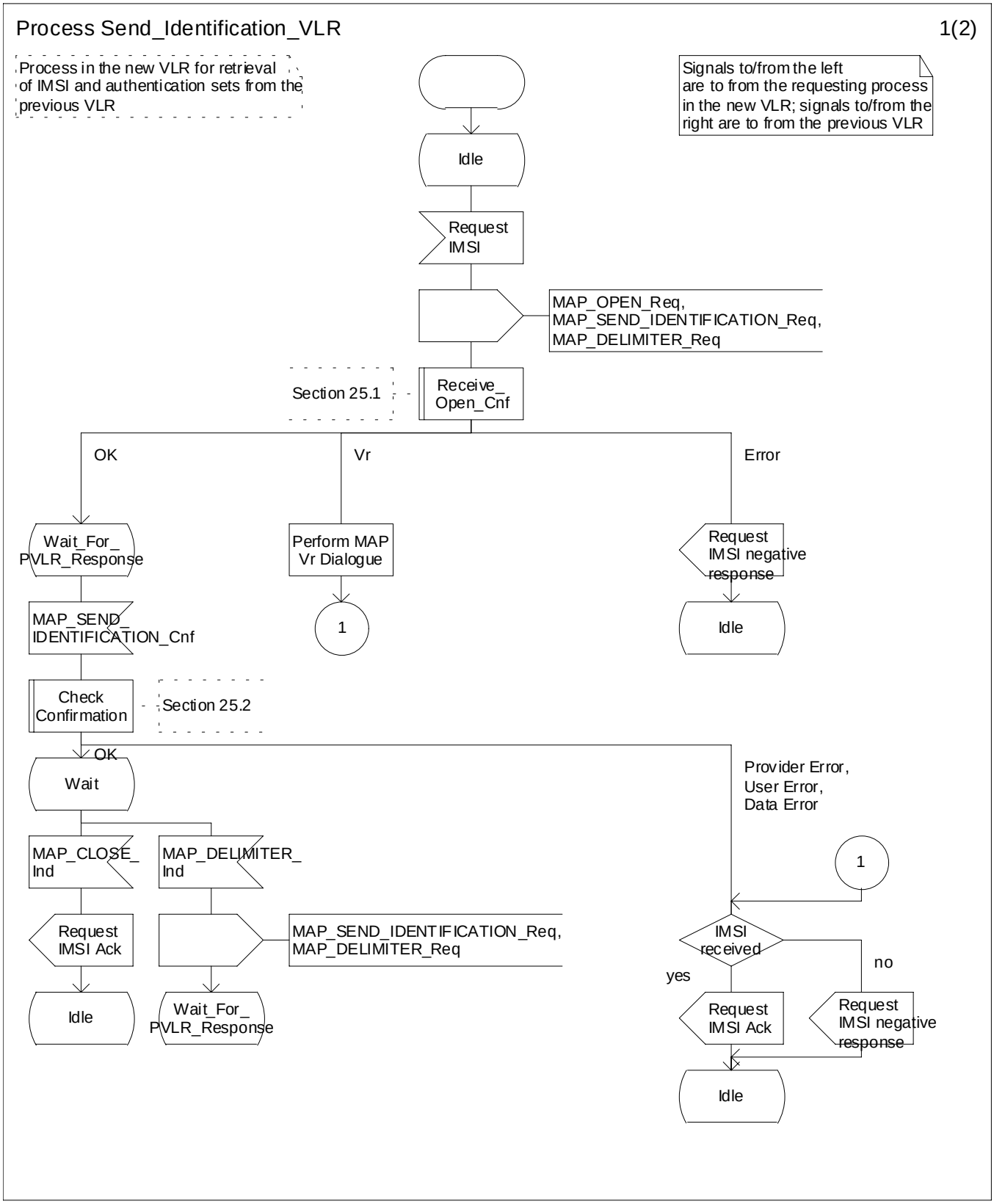


Figure 19.1.1/XX (sheet 1 of 2): Process Send_Identification_VLR

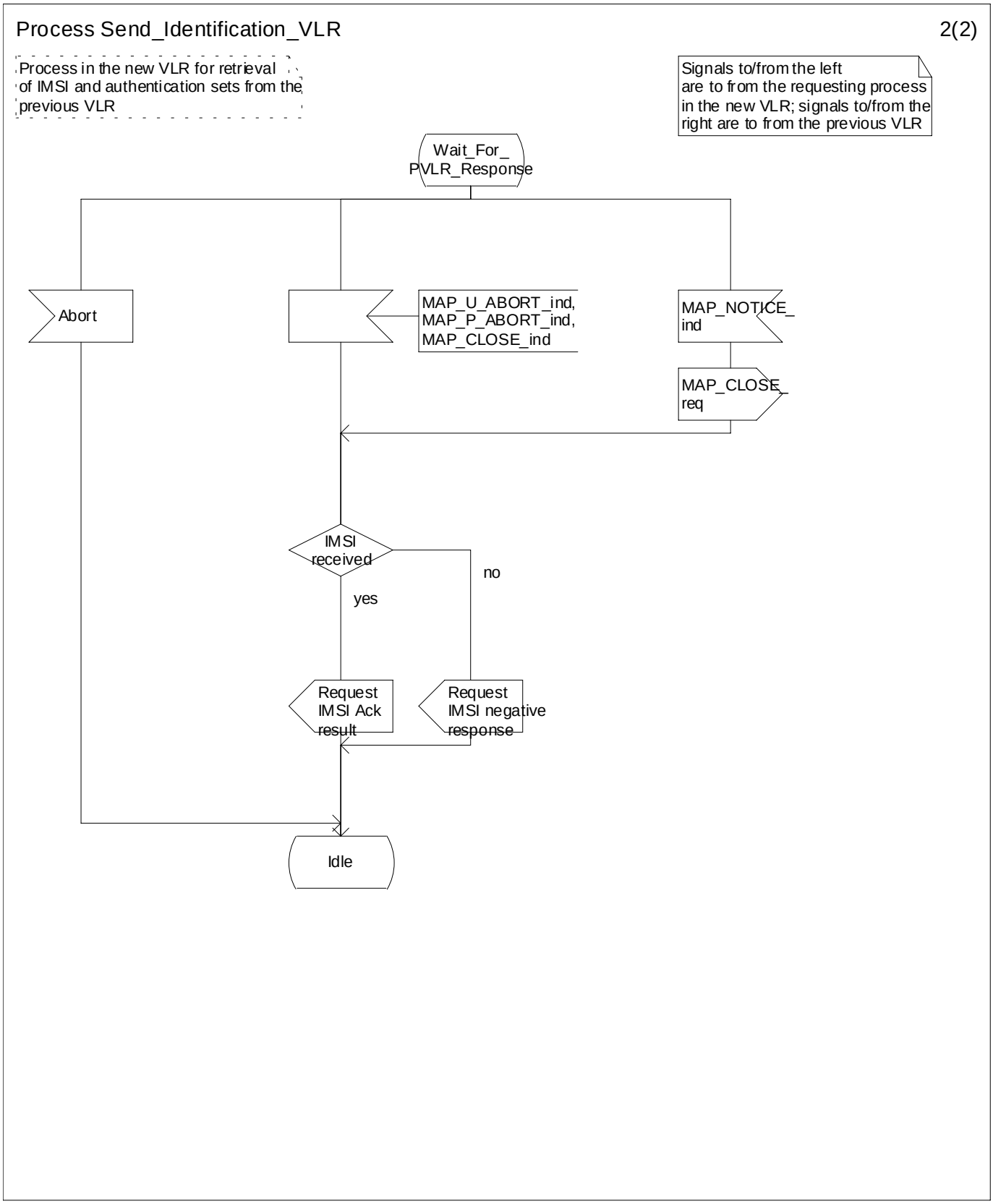


Figure 19.1.1/XX (sheet 2 of 2): Process Send_Identification_VLR

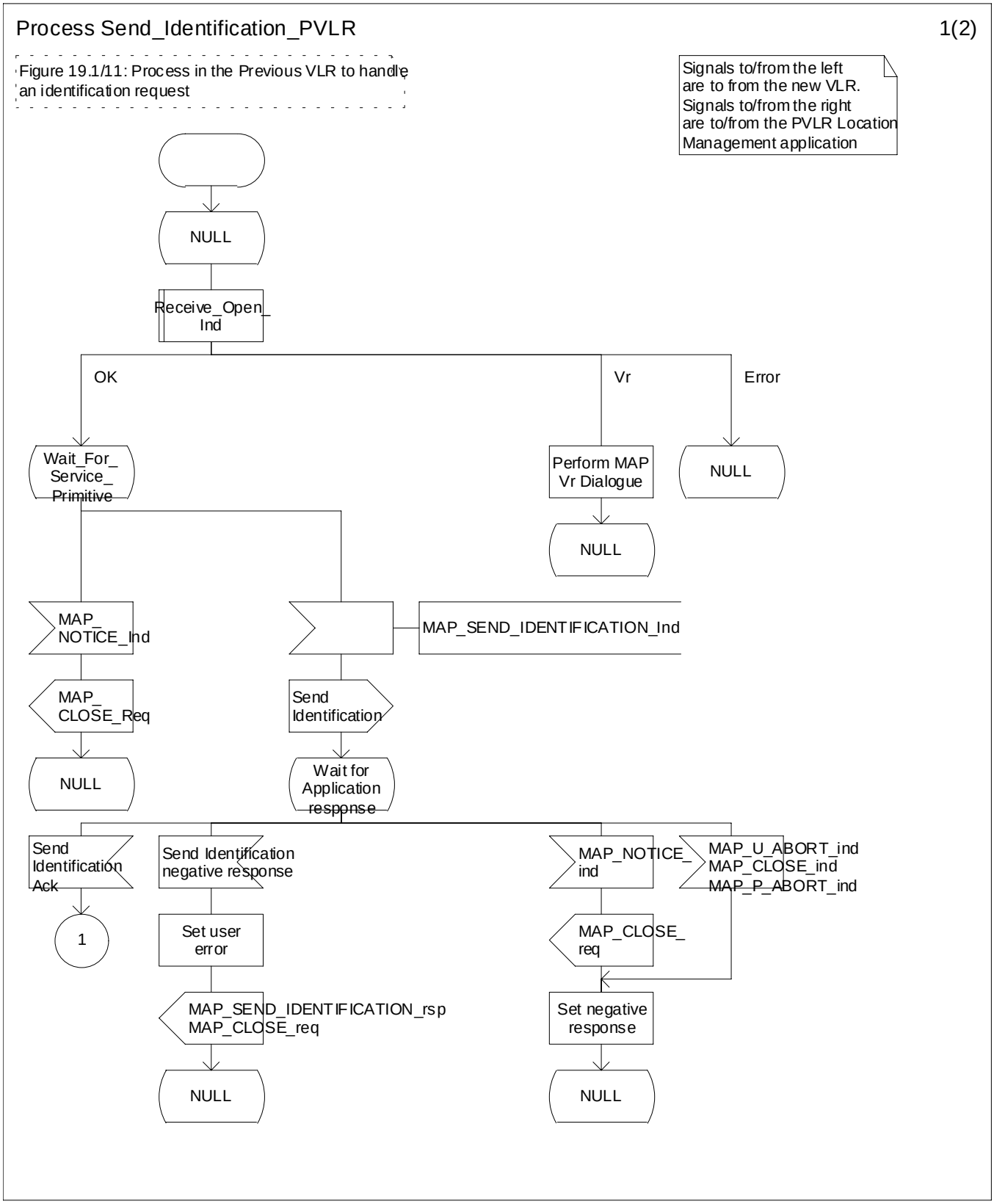


Figure 19.1.1/XX (sheet 1 of 2): Process Send_Identification_PVLR

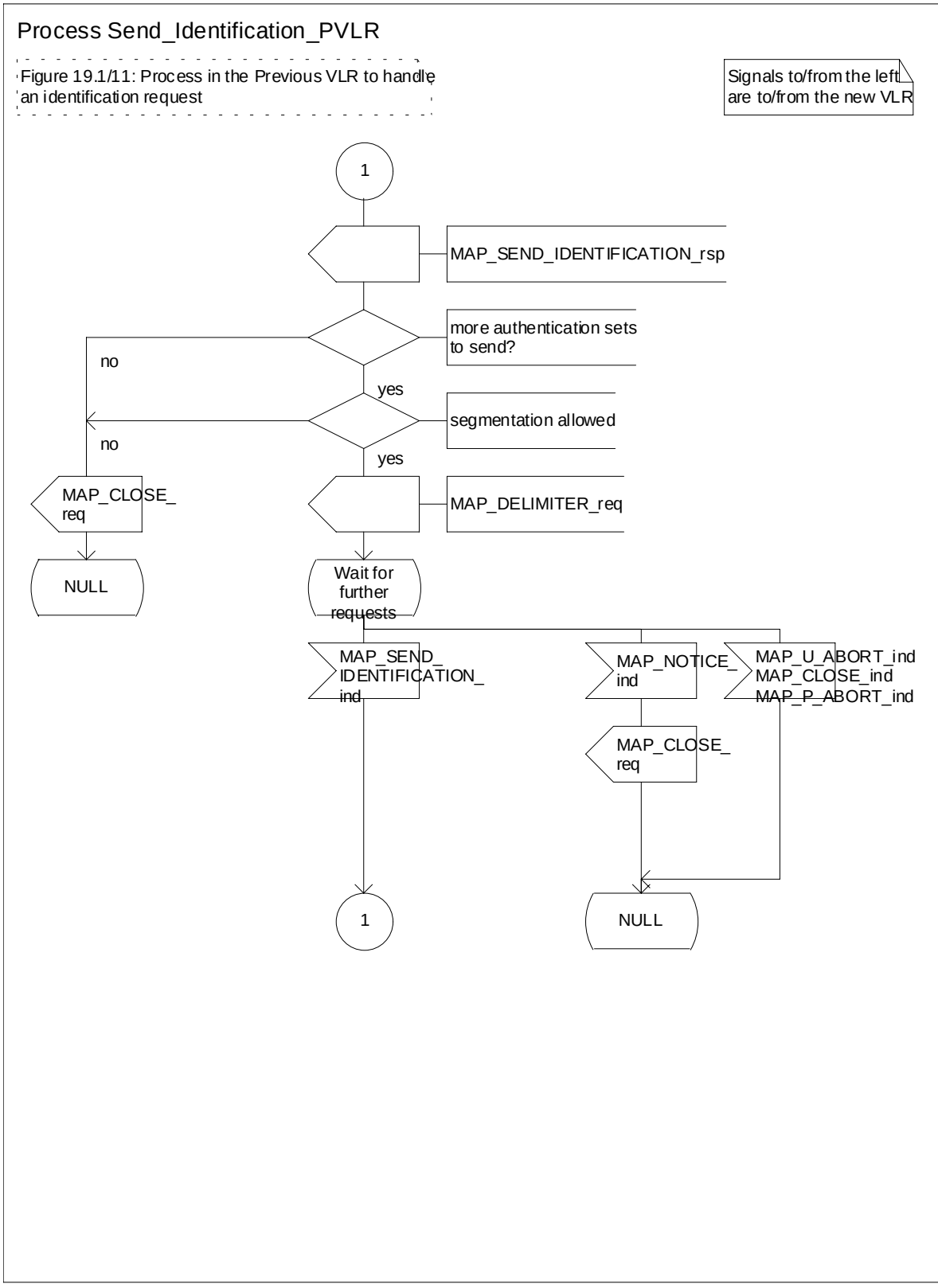


Figure 19.1.1/XX (sheet 2 of 2): Process Send_Identification_PVLR

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 clause 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 1: This process will be performed independent from the calling process, no coordination is required.

NOTE 2: The procedure Notify_gsmSCF is specified in 3GPP TS 23.078.

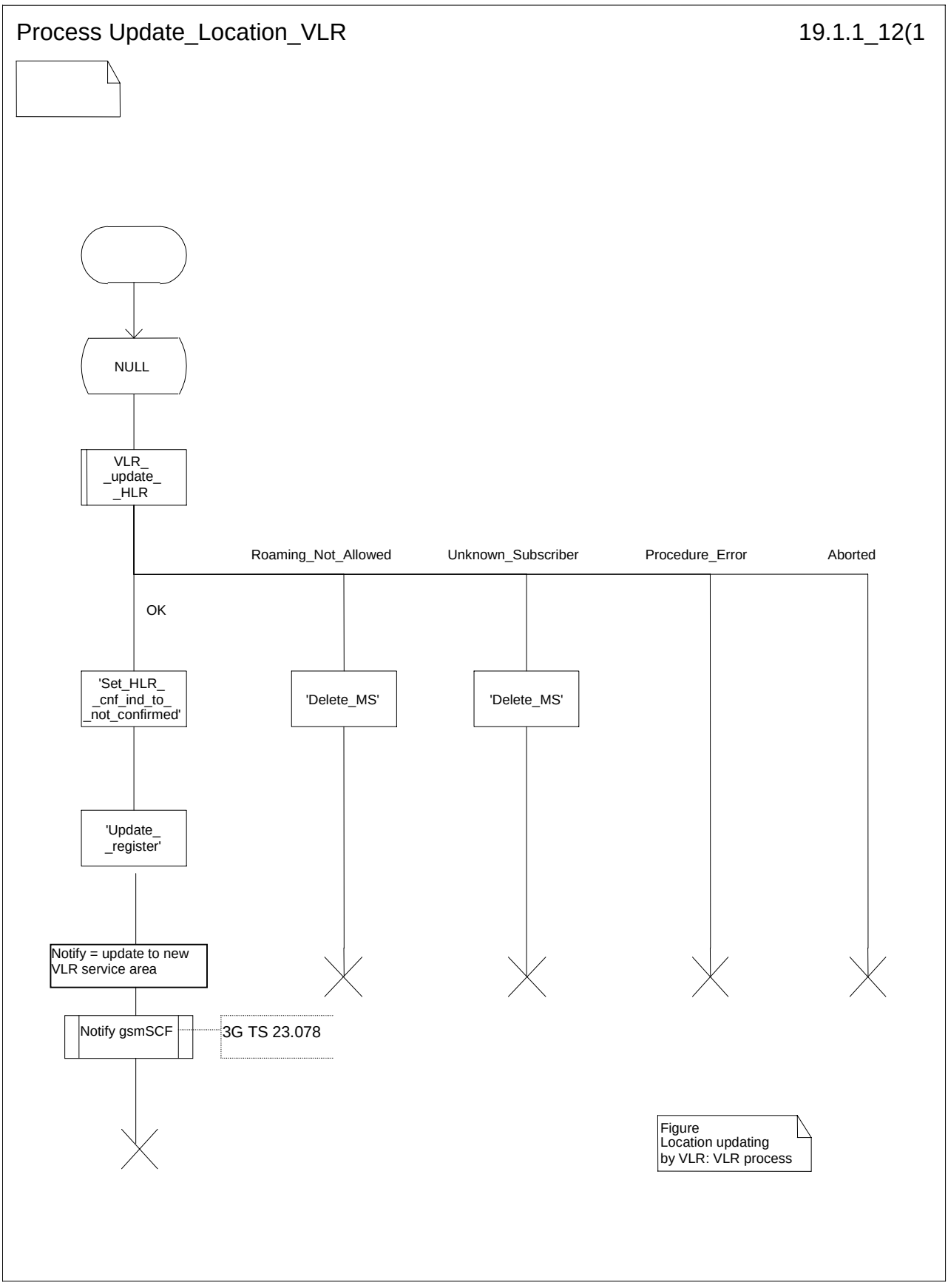


Figure 19.1.1/12: Process UL_VLR

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	clause 25.1;
Insert_Subscriber_Data_SGSN	clause 25.7;
Activate_Tracing_SGSN	clause 25.9;

Sheet 2: The procedure Check_User_Error_In_Serving_Network_Entity is specific to Super-Charger; it is specified in 3G TS 23.116 [110].

The location updating process

The MAP process receives an « Update HLR request » from the relevant process in the SGSN (see 3GPP TS 23.060 [104]) 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 Unknown HLR 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 clause 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_Subs_Data_SGSN defined in clause 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 clause 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 3GPP TS 23.060 [104]).
  - 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.

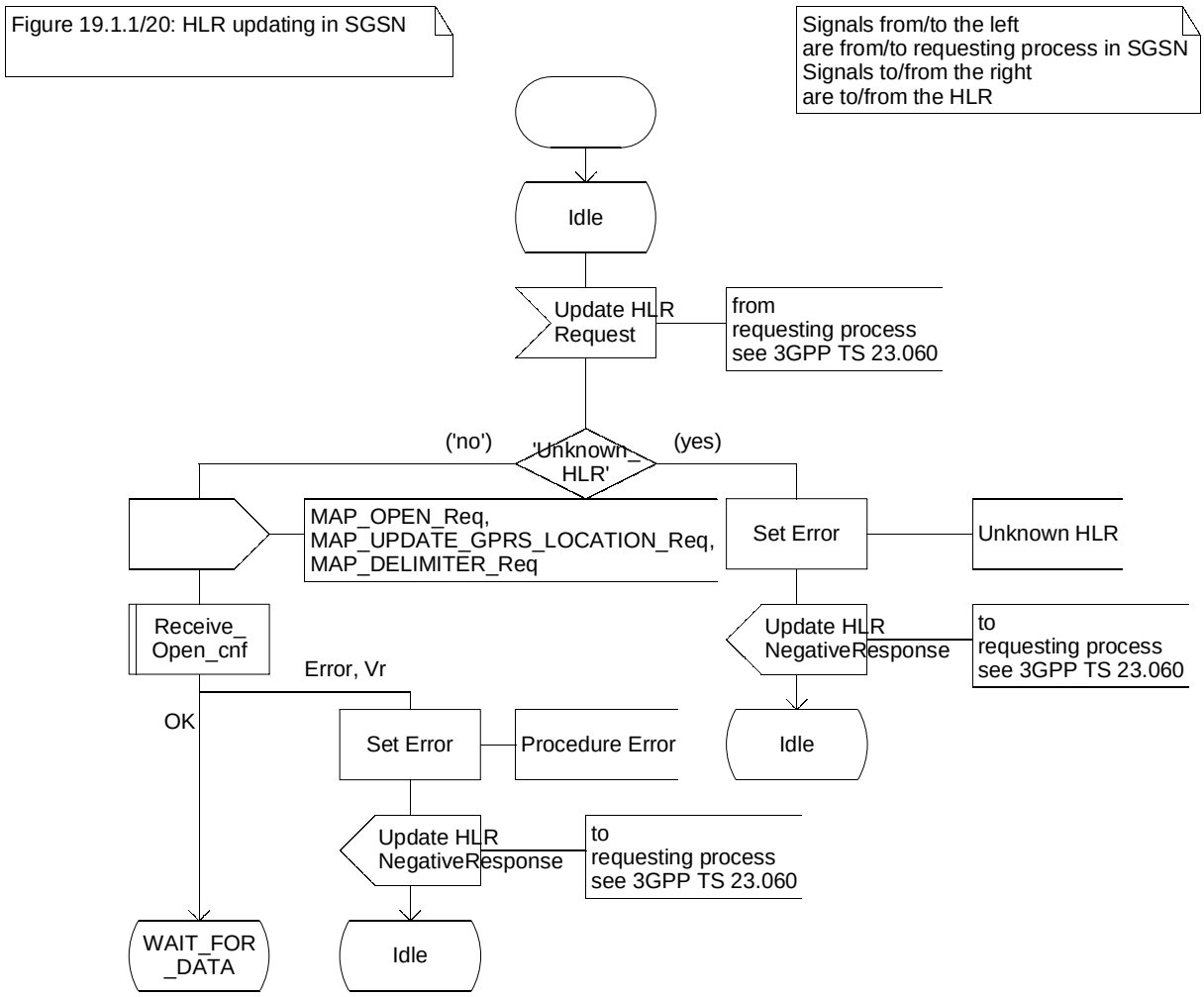


Figure 19.1.1/20 (sheet 1 of 2): Process SGSN_Update_HLR

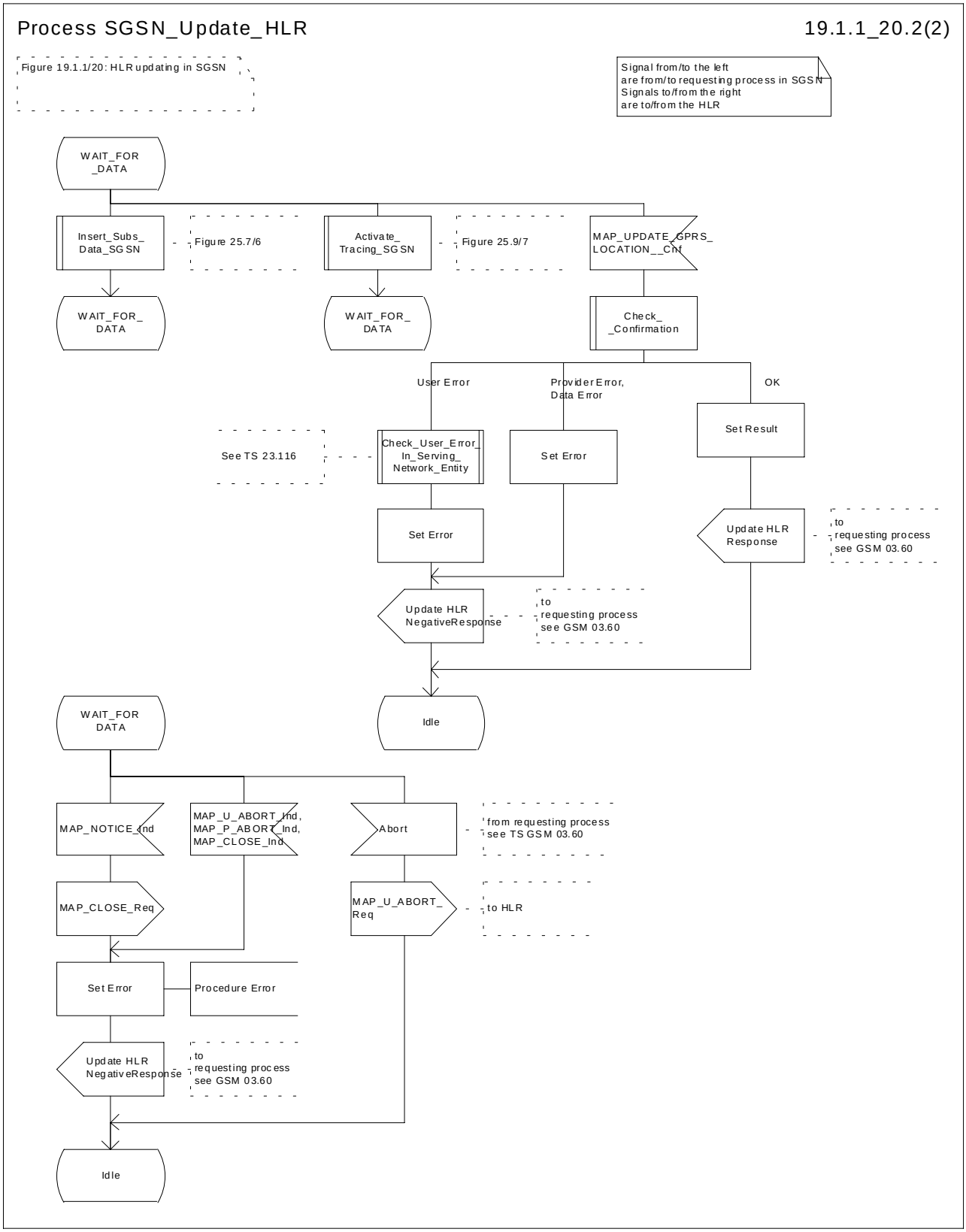


Figure 19.1.1/20 (sheet 2 of 2): Process SGSN_Update_HLR

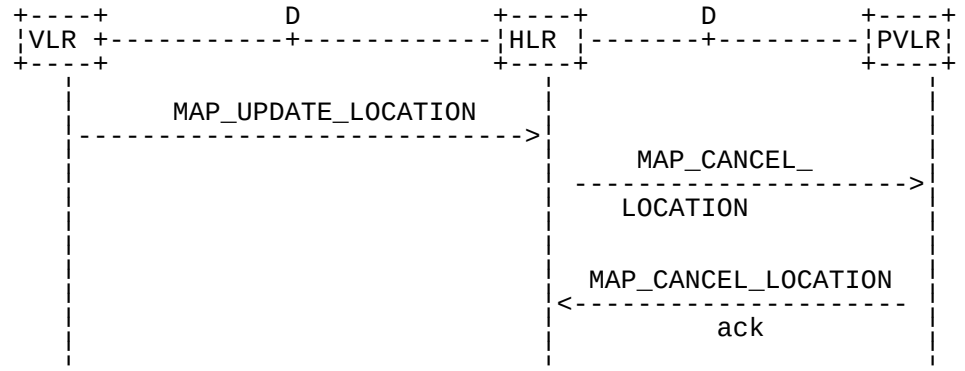
19.1.2 Location Cancellation

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 clause 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

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 19.1.2/2 and 19.1.2/4), 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 does not understand it, this parameter shall be ignored.

19.1.2.3 Detailed procedure in the VLR

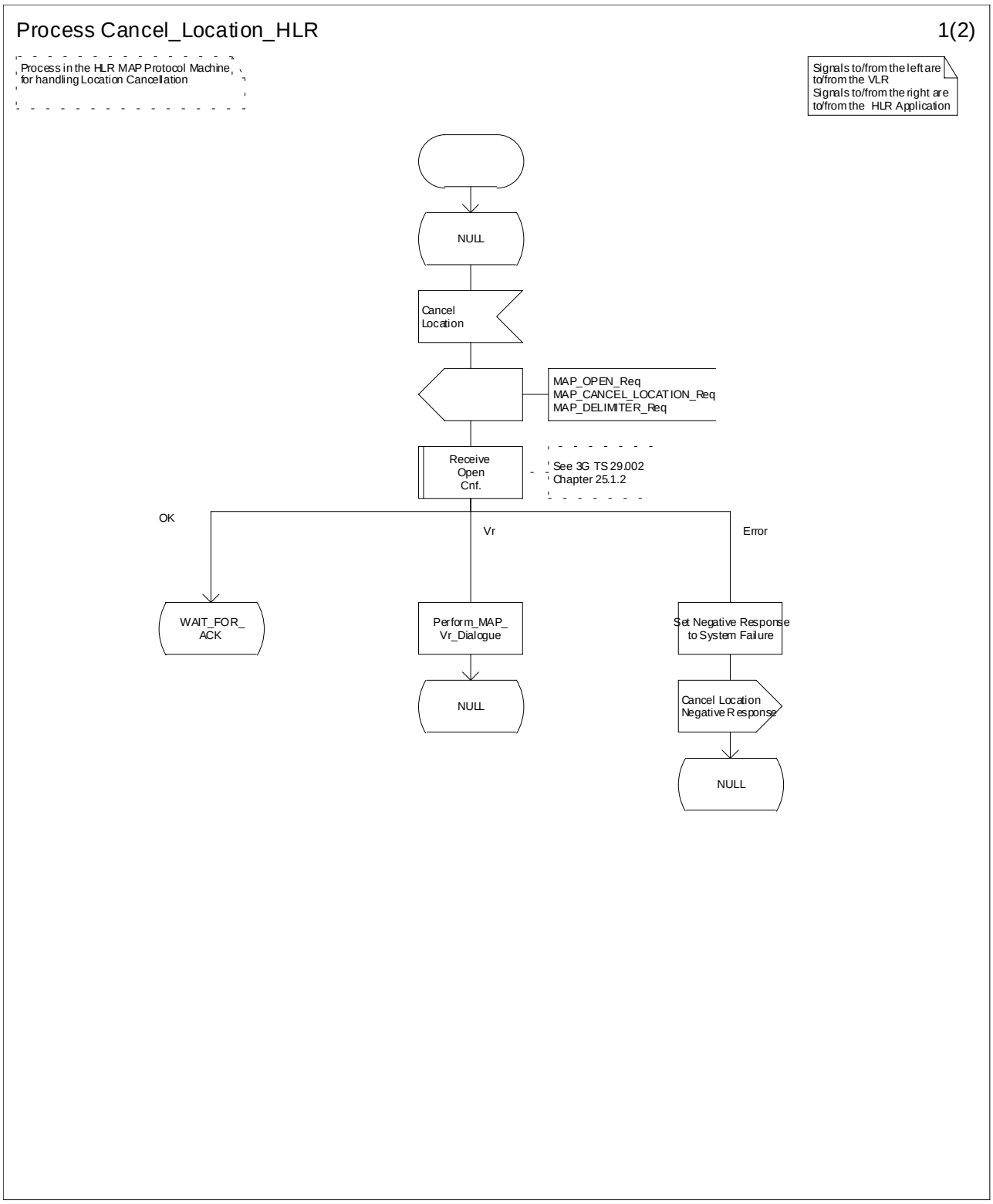


Figure 19.1.2/2 (Sheet 1 of 2): Process Cancel_Location_HLR

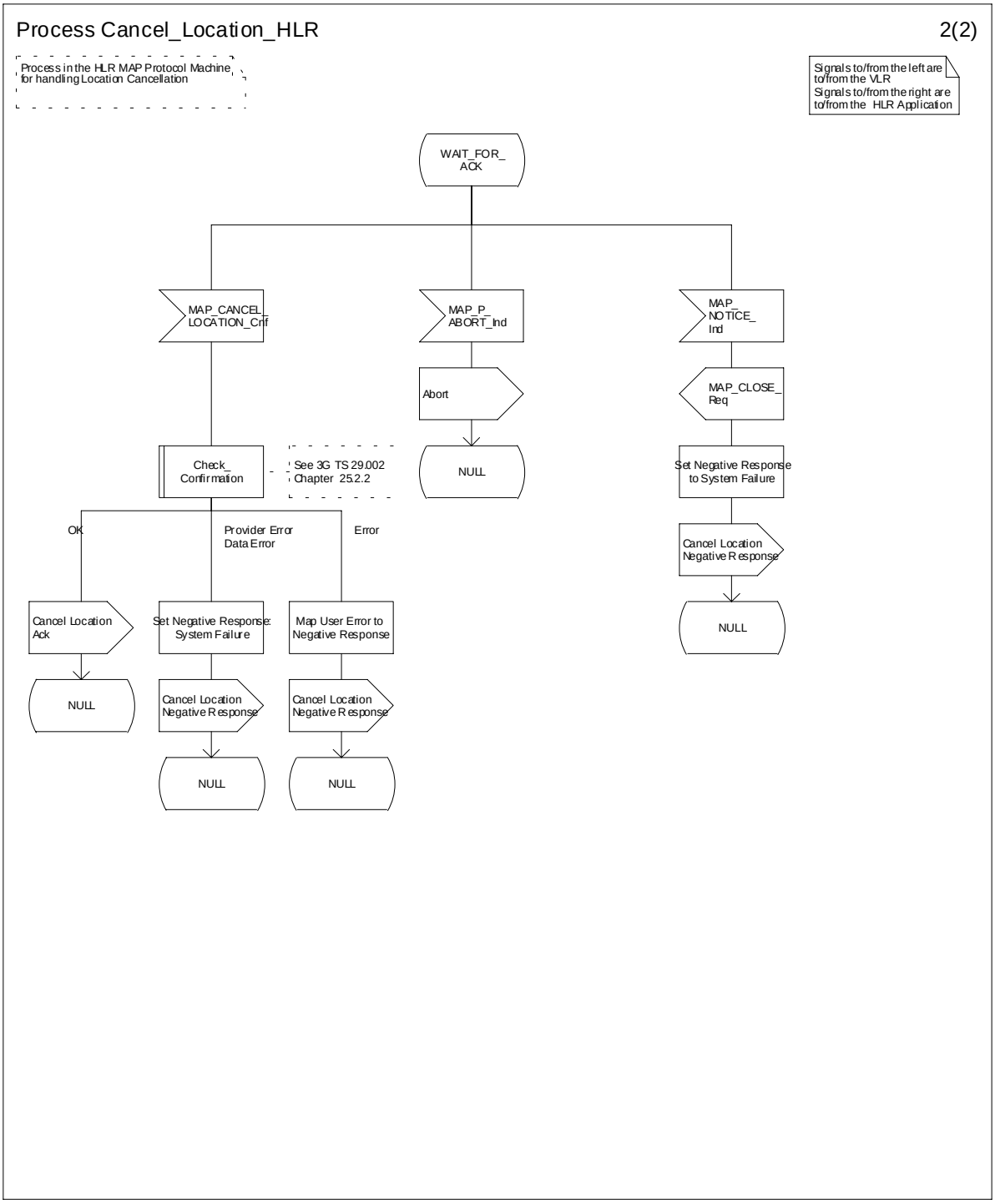


Figure 19.1.2/2 (Sheet 2 of 2): Process Cancel_Location_HLR

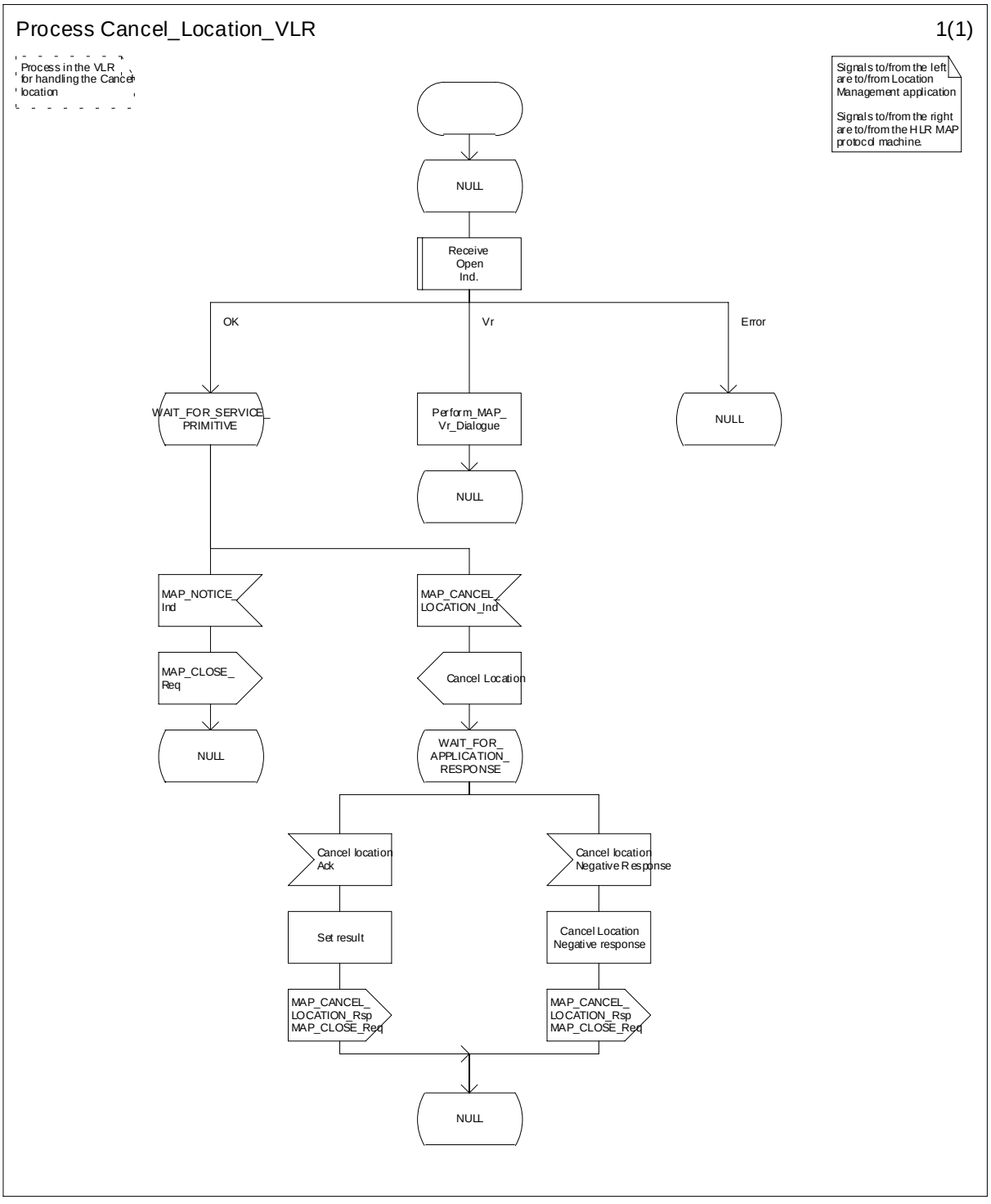


Figure 19.1.2/3: Process Cancel_Location_VLR

19.1.2.4 Detailed procedure in the SGSN

Opening of the dialogue is described in the macro Receive_Open_Ind in clause 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 clause 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.

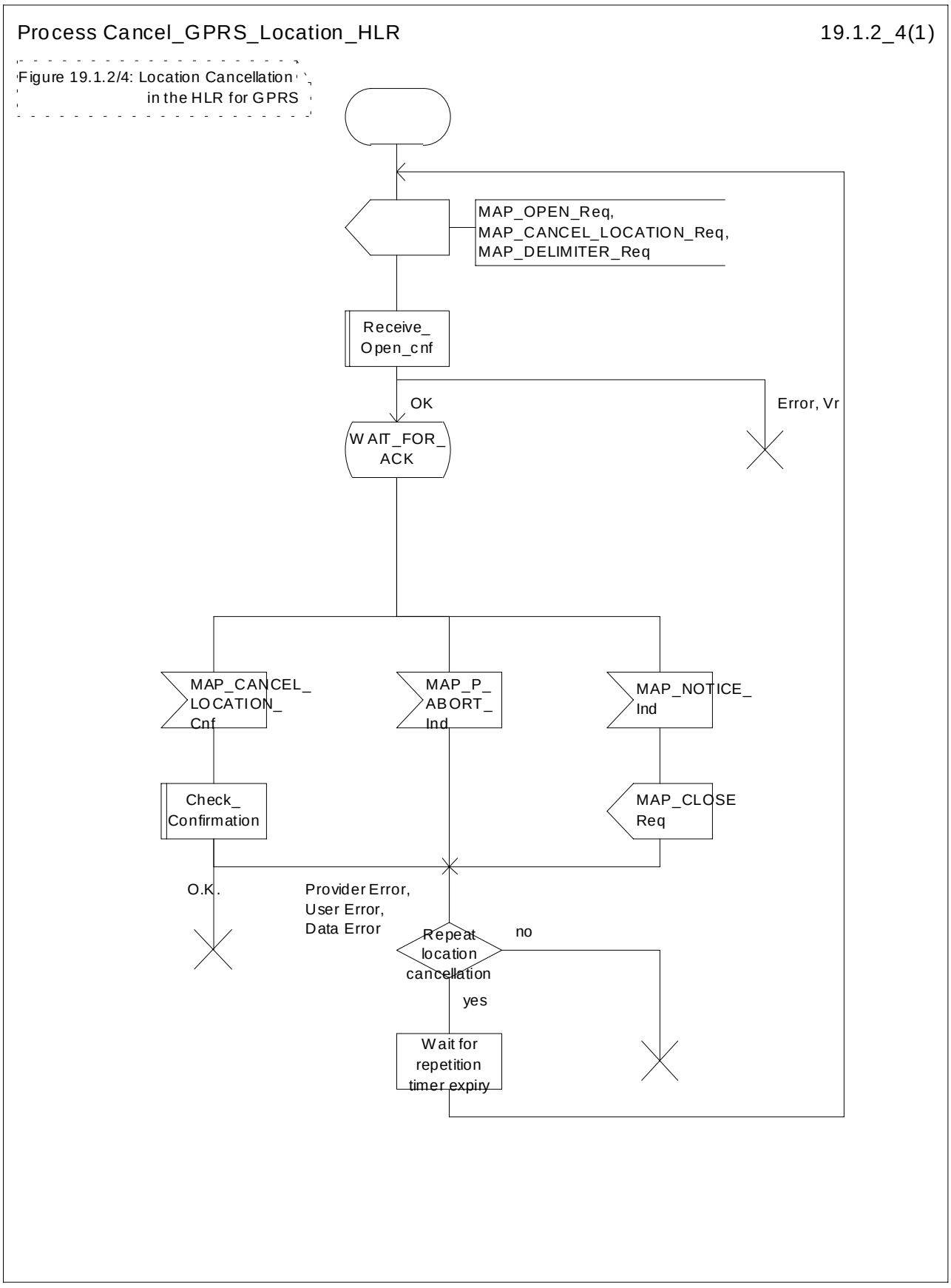


Figure 19.1.2/4: Process Cancel_GPRS_Location_HLR

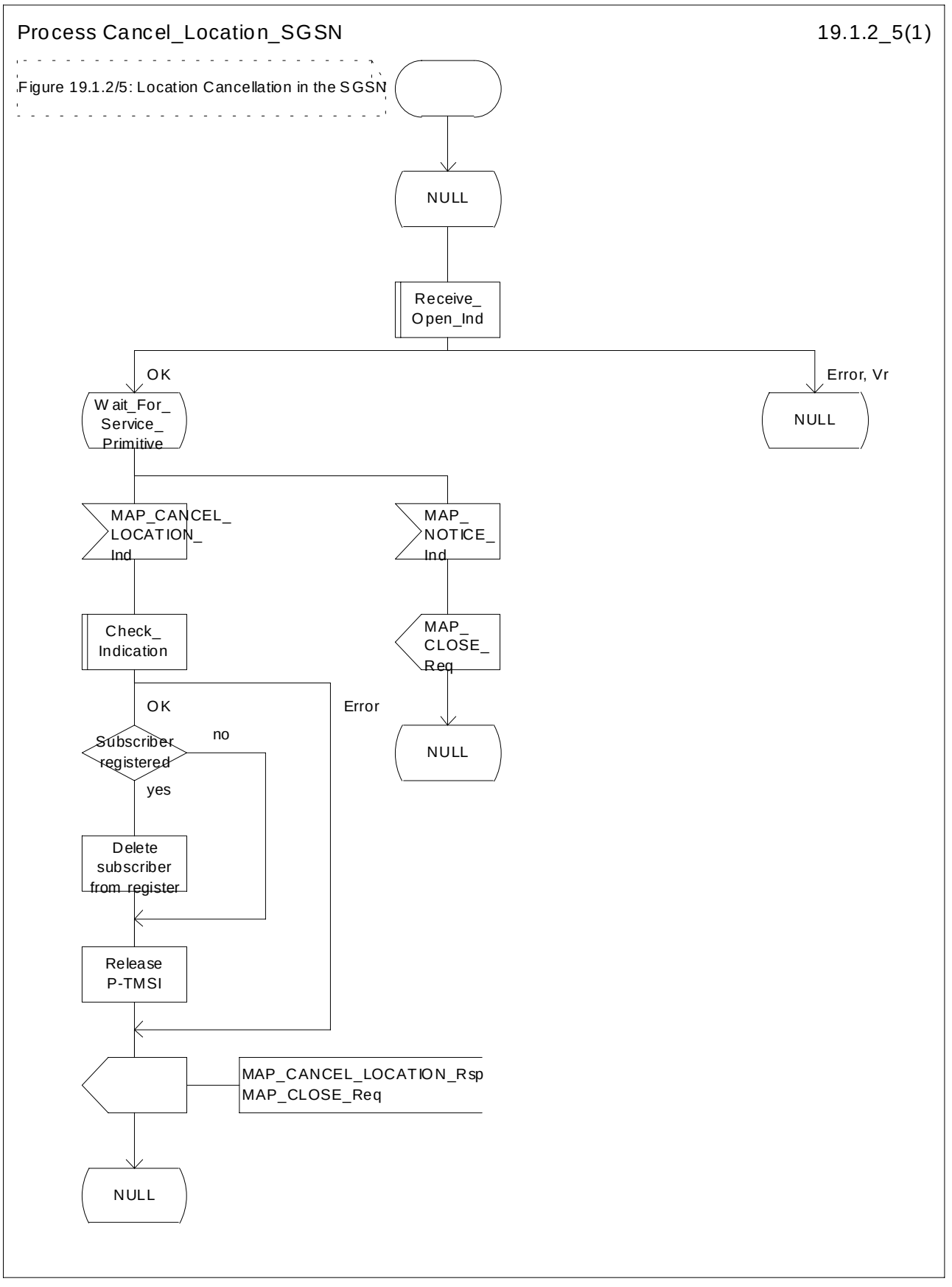


Figure 19.1.2/5: Process Cancel_Location_SGSN

19.1.3 Void

19.1.3.1 Void

19.1.3.2 Void

19.1.3.3 Void

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 clause 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 19.1.4/1and 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.

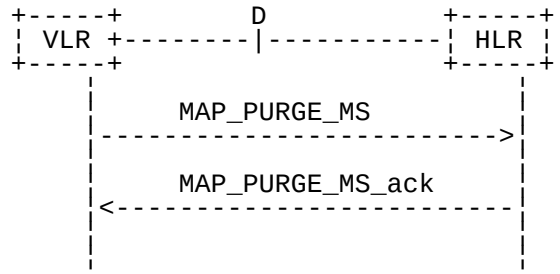


Figure 19.1.4/1: MAP-D Interface and services for MAP_PURGE_MS

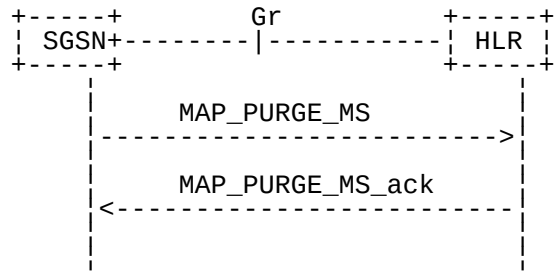


Figure 19.1.4/5: Gr Interface and services for MAP_PURGE_MS

19.1.4.2 Void

19.1.4.3 Void

19.1.4.4 Detailed procedure in the SGSN

Figure 19.1.4/4 shows the MAP process in the SGSN to notify the HLR that an MS record has been purged. The following general macro is used:

Receive_Open_Cnf clause 25.1;

Sheet 1: The procedure Purge_MS_In_Serving_Network_Entity is specific to Super-Charger; it is specified in 3G TS 23.116 [110]. If the SGSN and the originating HLR support the Super-Charger functionality, processing continues from the "Yes" exit of the test "Result=Pass?".

When the SGSN receives an indication from O&M that an MS record is to be purged, it invokes the MAP_PURGE_MS service.

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 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.

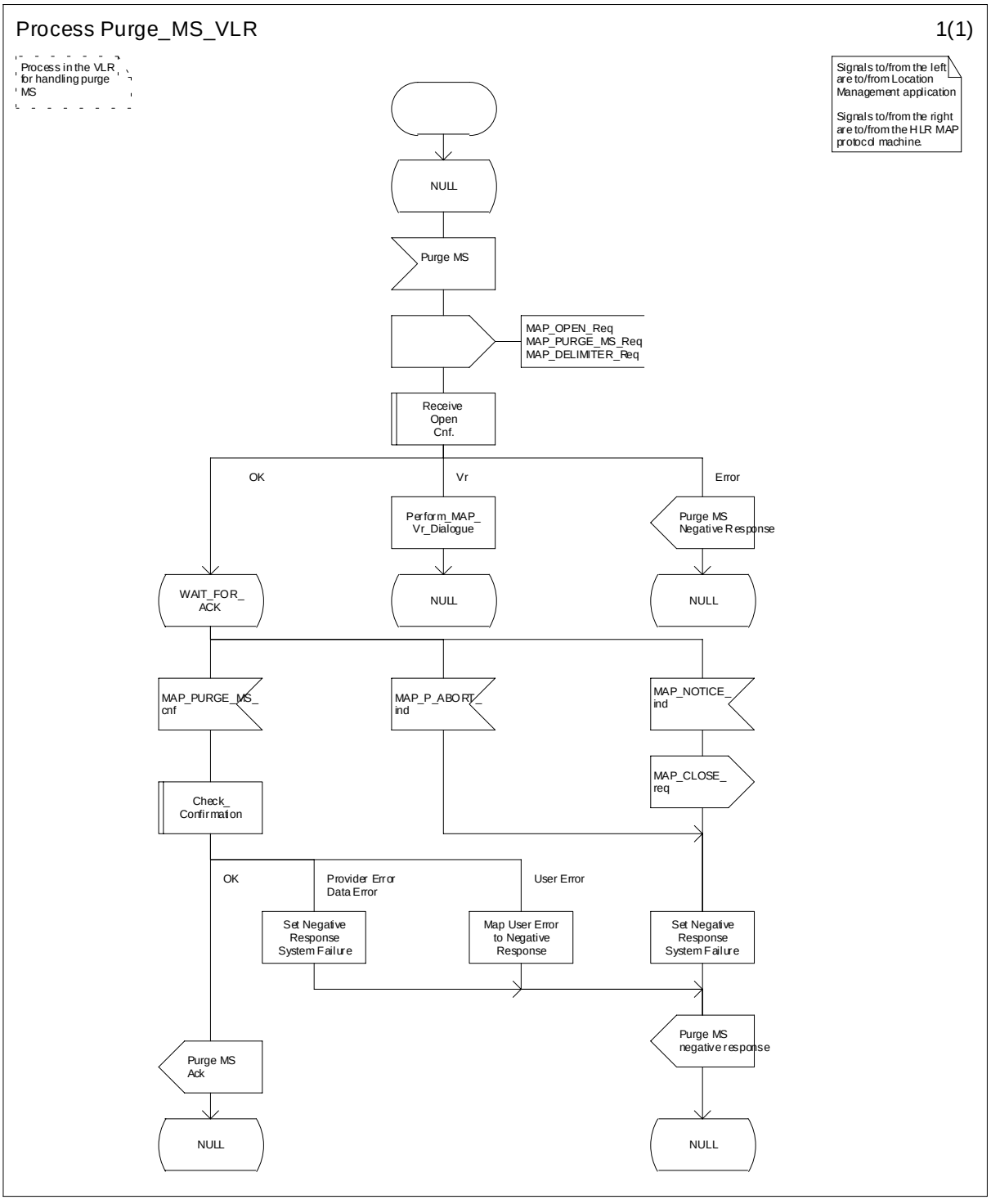


Figure 19.1.4/2: Process Purge_MS_VLR

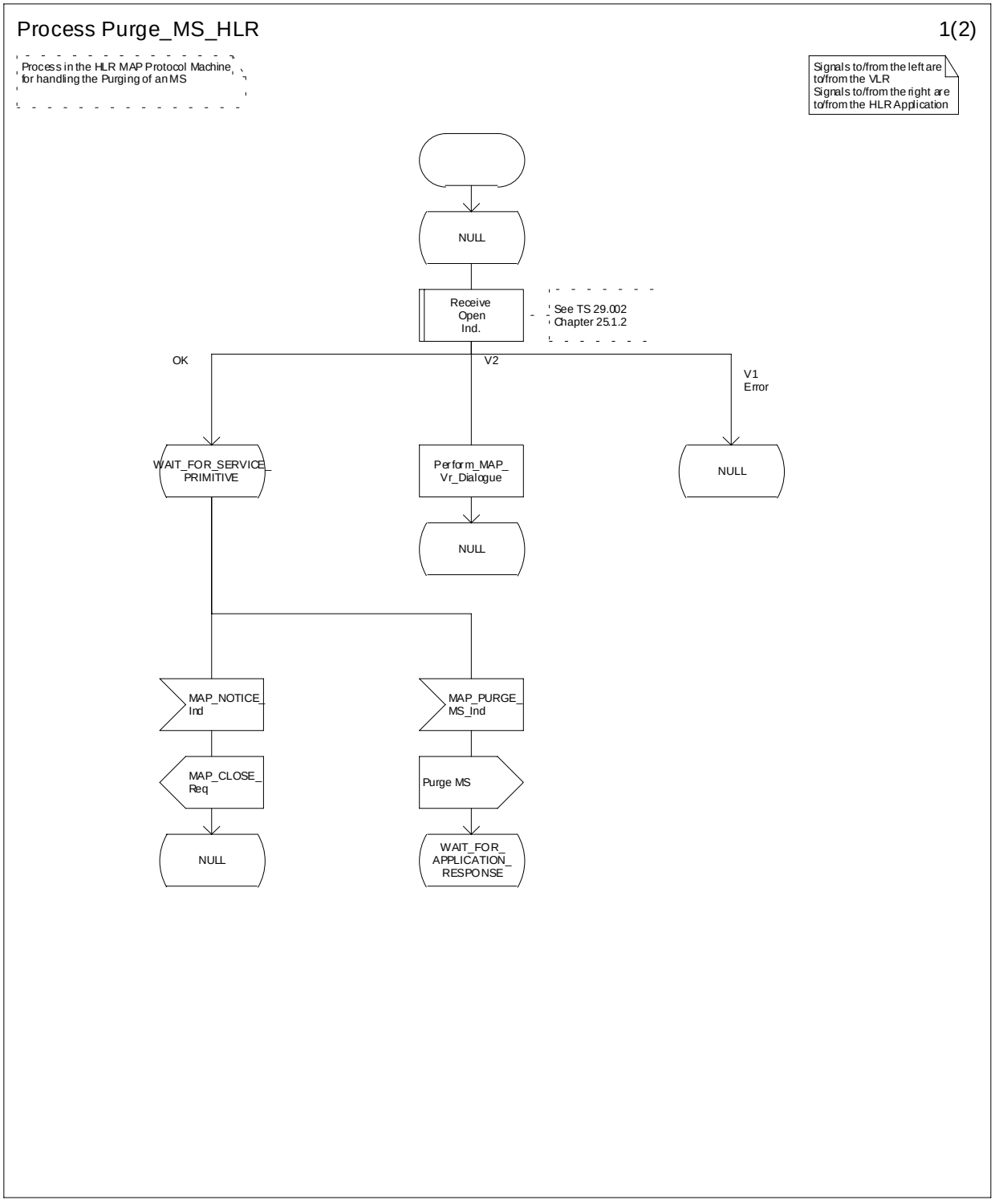


Figure 19.1.4/3 (Sheet 1 of 2): Process Purge_MS_HLR

Process Purge_MS_HLR

Process in the HLR MAP Protocol Machine for handling the Purging of an MS

Signals to/from the left are to/from the VLR
Signals to/from the right are to/from the HLR Application

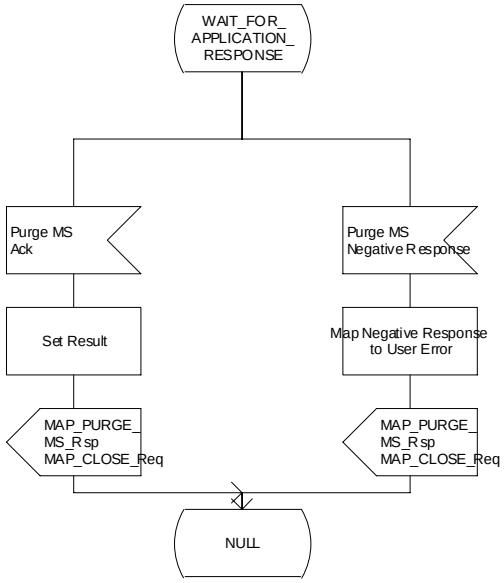


Figure 19.1.4/3 (Sheet 2 of 2): Process Purge_MS_HLR

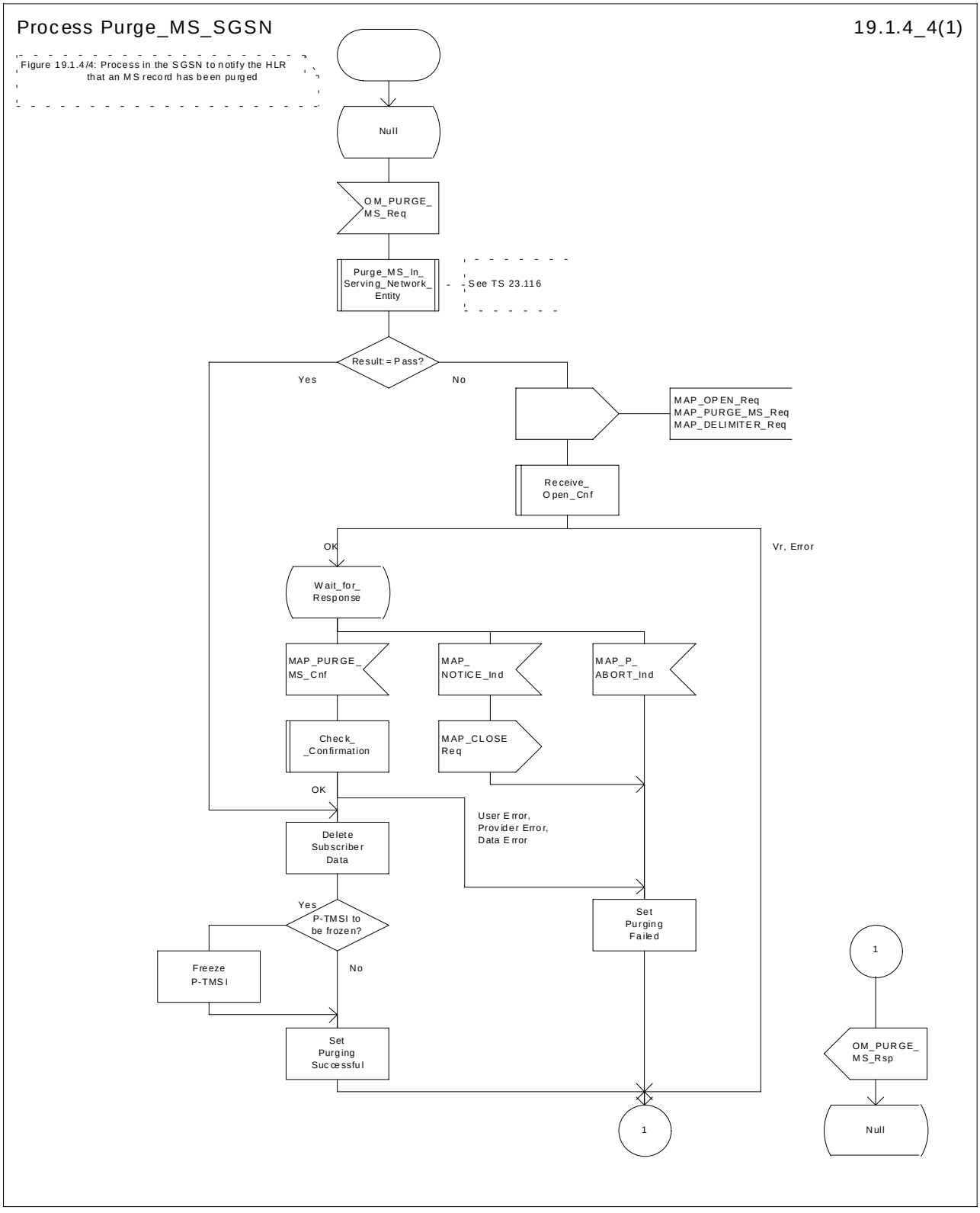


Figure 19.1.4/4: Process Purge_MS_SGSN

19.2 Handover procedure

It should be noted that procedures related to the B-interface have not been updated for Release 99. The B-interface is not fully operational specified. It is strongly recommended not to implement the B-interface as an external interface.

19.2.1 General

The handover or relocation 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:

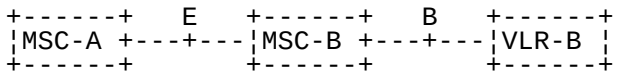
   The call is handed over from the controlling MSC, called MSC-A to another MSC, called MSC-B (figure 19.2/1a).

   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.

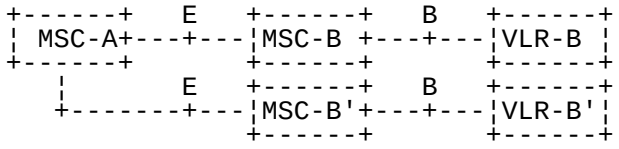
2) Subsequent Inter-MSC handover:

   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 or one or several relocation numbers and to transport BSSAP or RANAP messages.

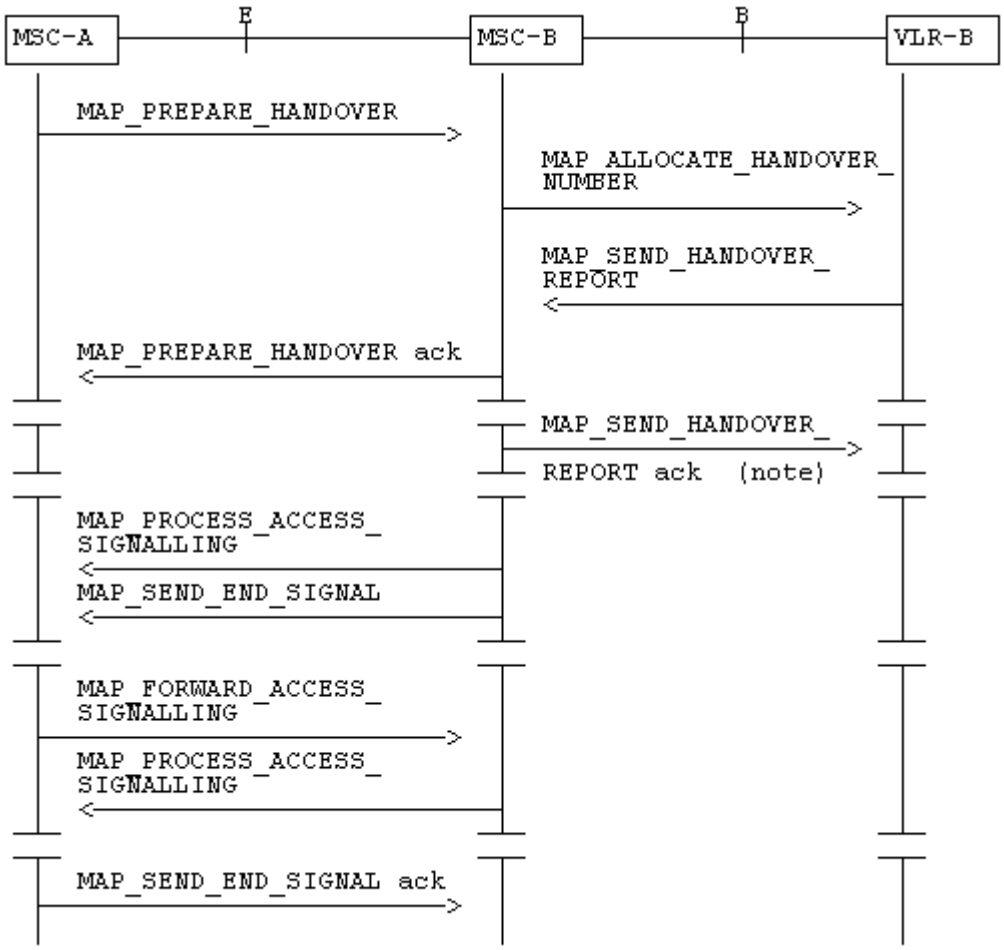
Minimum applicable MAP AC for intersystem MSC GSM BSS to UTRAN handover shall be MAP handover AC version 3.

Minimum applicable MAP AC for intersystem MSC UTRAN to GSM BSS handover shall be MAP handover AC version 2.

Note: If MAP AC version 2 is used, subsequent handover to MSC UTRAN is not possible.

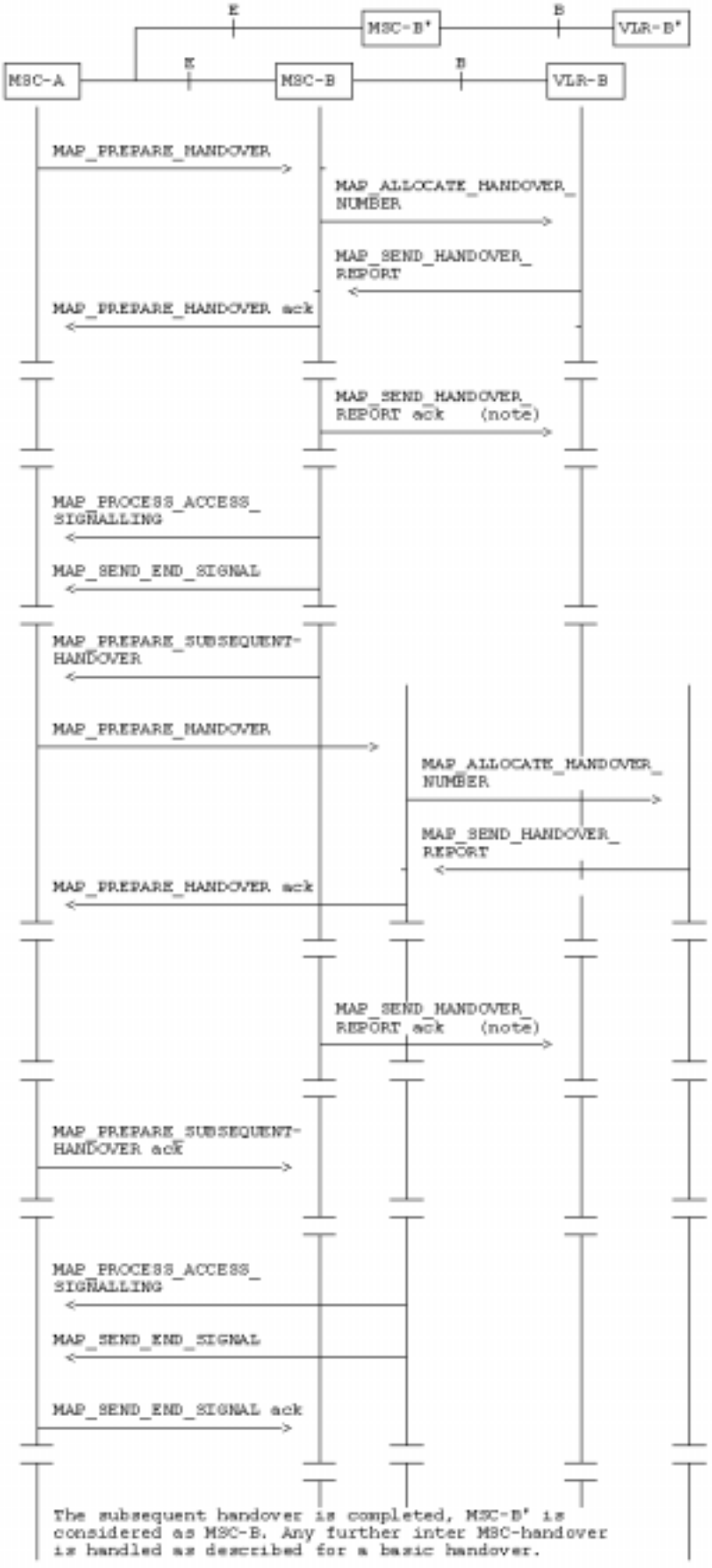
The transported BSSAP or RANAP messages are controlled and handled by the Handover Control Application in the MSCs. This information will be transparent to the MAP protocol. If the MSC receives via the MAP protocol BSSAP or RANAP messages, this information will be forwarded to the Handover Control Application (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 or RANAP messages via the MAP protocol.

For detailed interworking between the A-interface and MAP procedures or the Iu-interface and MAP procedures, see 3G TS 23.009 and 3G TS 29.010.



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 clause describes the handover or relocation procedure in MSC-A, including the request for a basic handover or relocation to another MSC (MSC-B), subsequent handover or relocation 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 or relocated to MSC-B, the Handover Control Application in MSC-A requests the MAP application to initiate the MAP_PREPARE_HANDOVER 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_HANDOVER request. This request shall contain all the information required by MSC-B to allocate the necessary radio resources. In addition, it may optionally contain:

- an indication that a handover number allocation is not required;
- the targetCellId, for compatibility reasons in the case of handover or inter-system handover to GSM ;
- the targetRNCId, in case of SRNS relocation or inter-system handover from GSM to UMTS;
- the IMSI;
- UMTS encryption information and UMTS integrity protection information, which are necessary parameters for inter-system handover from GSM to UMTS;
- GSM radio resource information (channel type) shall be included at inter-MSC relocation to prepare for a possible subsequent intra-MSC handover from UMTS to GSM in MSC-B.

The conditions when these parameters shall be included and the processing of them in MSC-B (3G_MSC-B) are described in detail in 3G TS 29.010 and 23.009.

If MSC-B accepts the dialogue, it returns a MAP_PREPARE_HANDOVER confirmation containing a handover number or one or several relocation numbers, unless the request has included the HO-NumberNotRequired parameter, and BSSAP or RANAP information which is forwarded to and handled by the Handover Control Application in MSC-A.

Optionally MSC-A can receive, after a MAP_PREPARE_HANDOVER confirmation, a MAP_PROCESS_ACCESS_SIGNALLING indication containing BSSAP or RANAP 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 or relocation 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 or the Iu-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 or the Iu-interface for call control and mobility management information. Any response received in MSC-B from the A-interface or the Iu-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 or relocation, a number of procedures between MSC-A and BSS-B or RNS-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_HANDOVER request, it will start the procedure of handing or relocating the call over to a third MSC (MSC-B'), or back to the controlling MSC (MSC-A). If the new handover or relocation 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 clause.

The services used are defined in clause 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 or relocation procedure, see 3G TS 23.009.

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.

Figure 19.2 2/1: HO in MSC-A

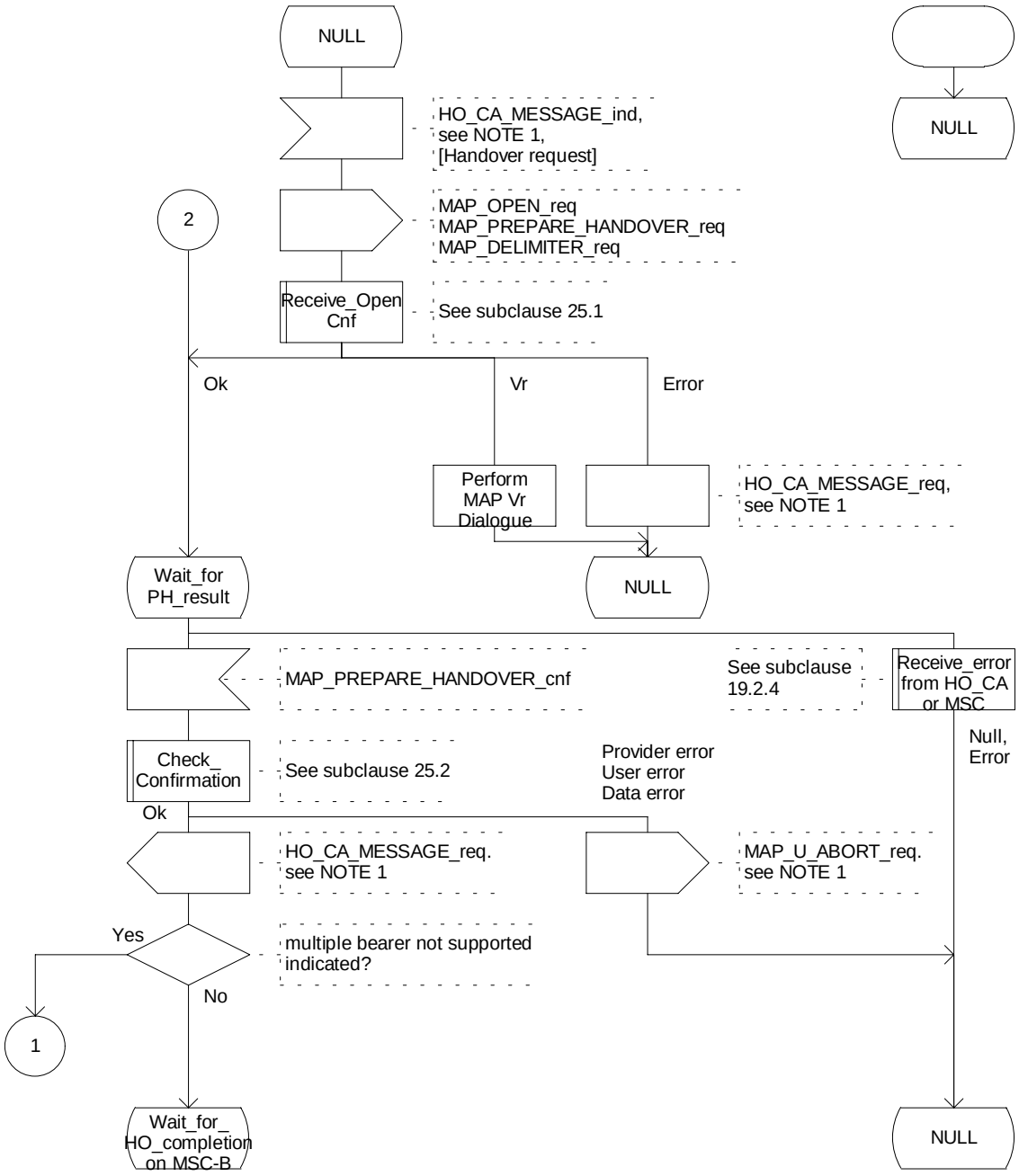


Figure 19.2.2/1 (sheet 1 of 13): Process MSC_A_HO

Figure 19.2 2/1: HO in MSC-A

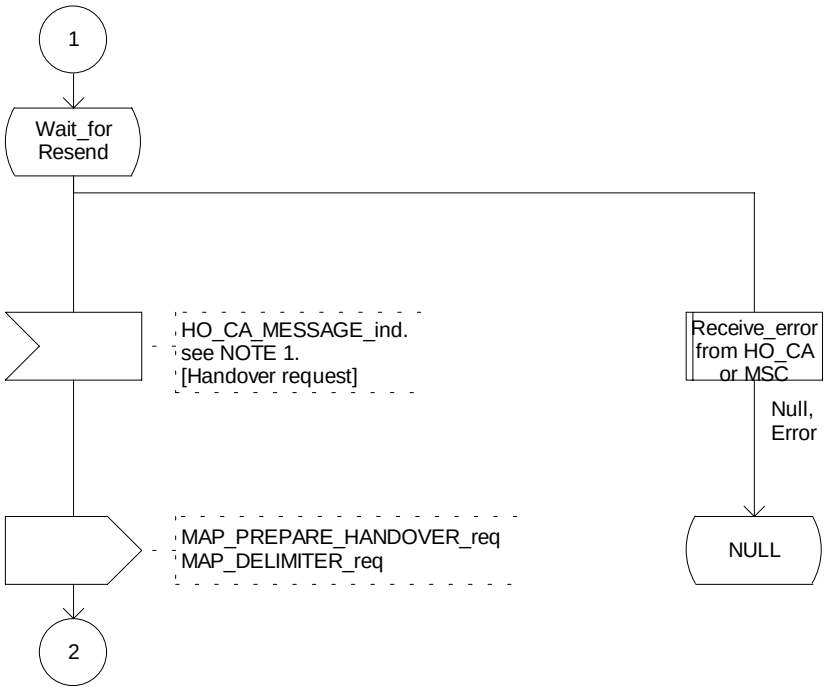


Figure 19.2.2/1 (sheet 2 of 13): Process MSC_A_HO

Figure 19.2 2/1: HO in MSC-A

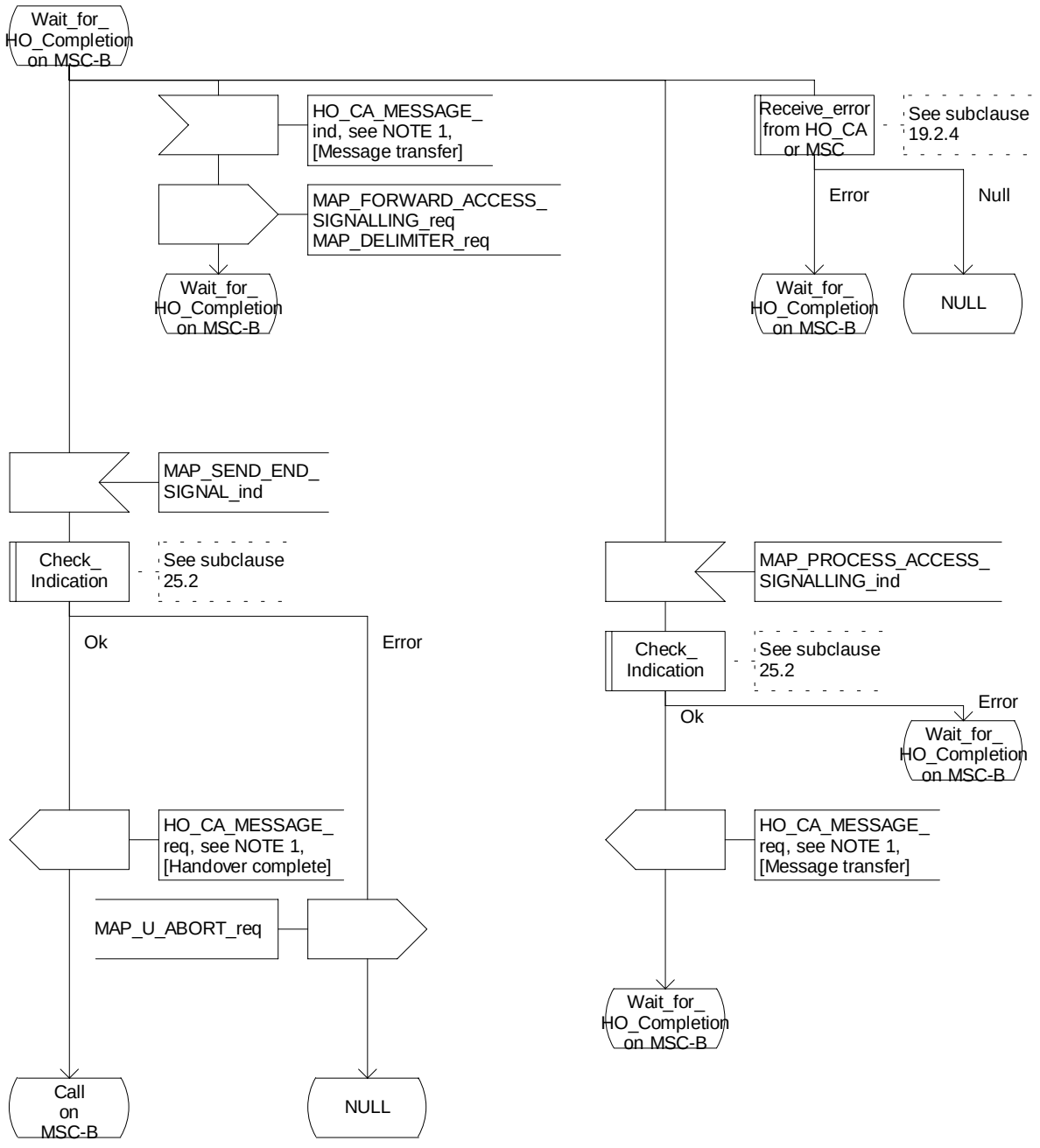


Figure 19.2.2/1 (sheet 3 of 13): Process MSC_A_HO

Figure 19.2 2/1: HO in MSC-A

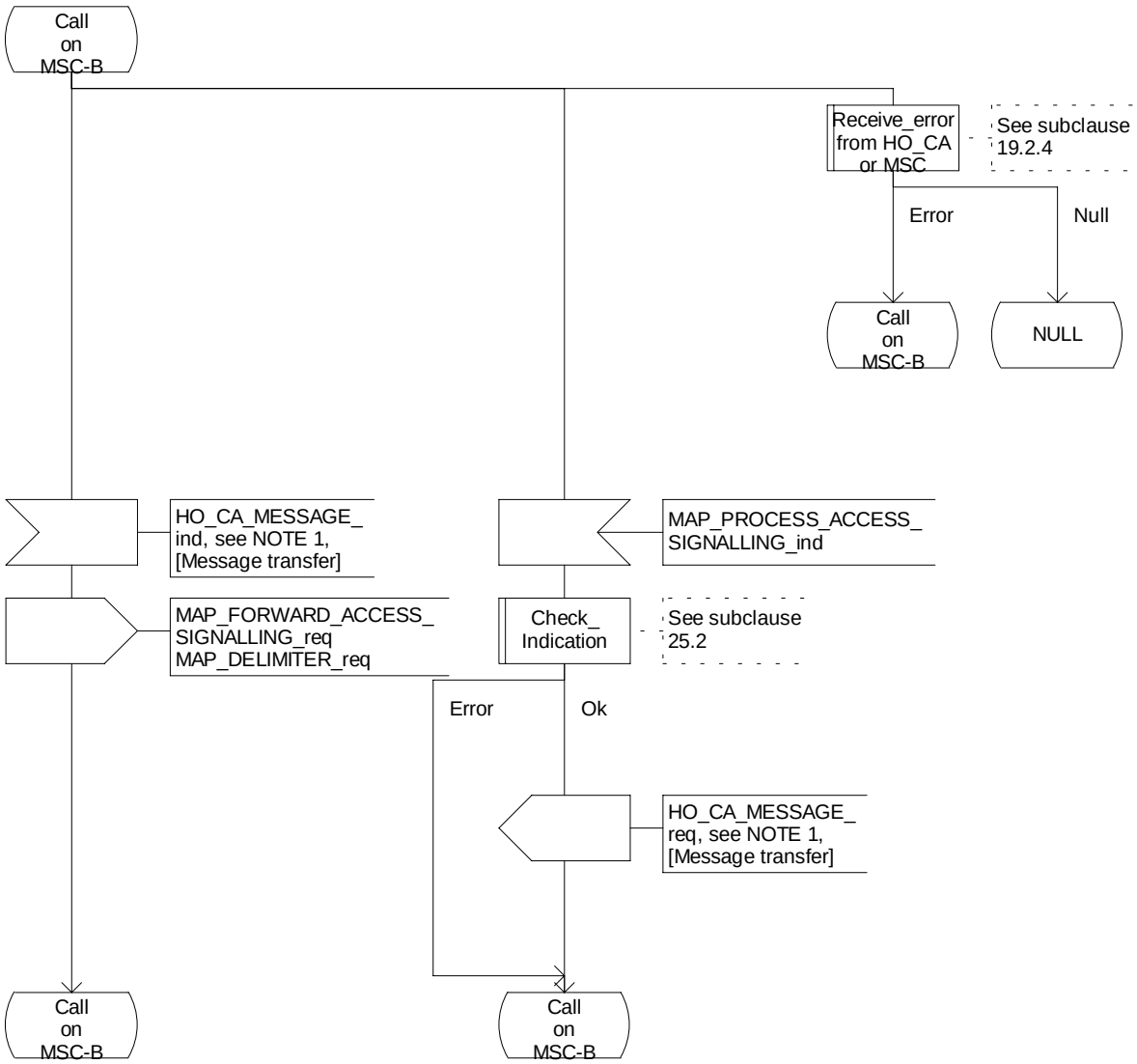


Figure 19.2.2/1 (sheet 4 of 13): Process MSC_A_HO

Figure 19.2 2/1: HO in MSC-A

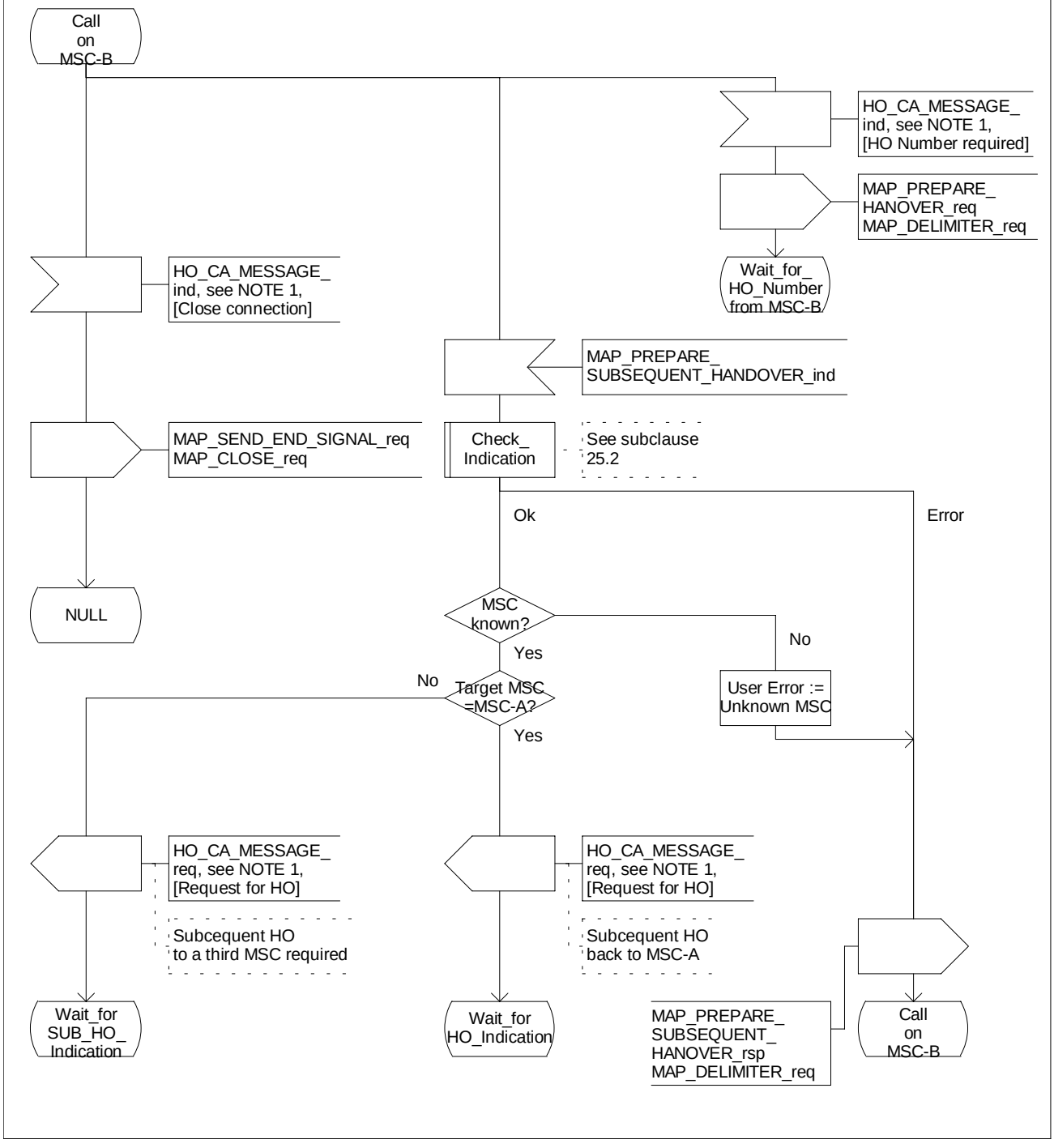


Figure 19.2.2/1 (sheet 5 of 13): Process MSC_A_HO

Figure 19.2 2/1: HO in MSC-A

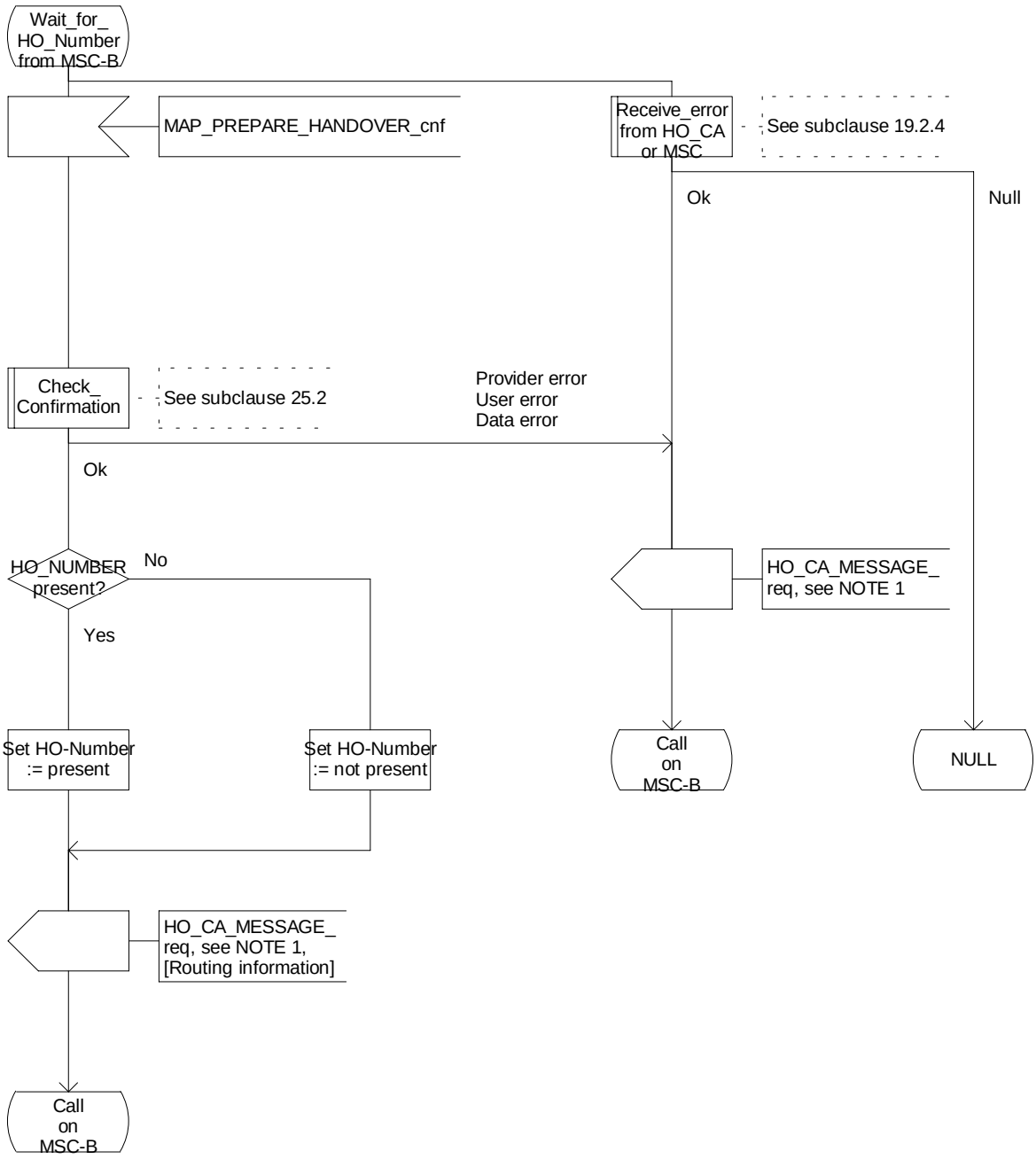


Figure 19.2.2/1 (sheet 6 of 13): Process MSC_A_HO

Figure 19.2 2/1: HO in MSC-A

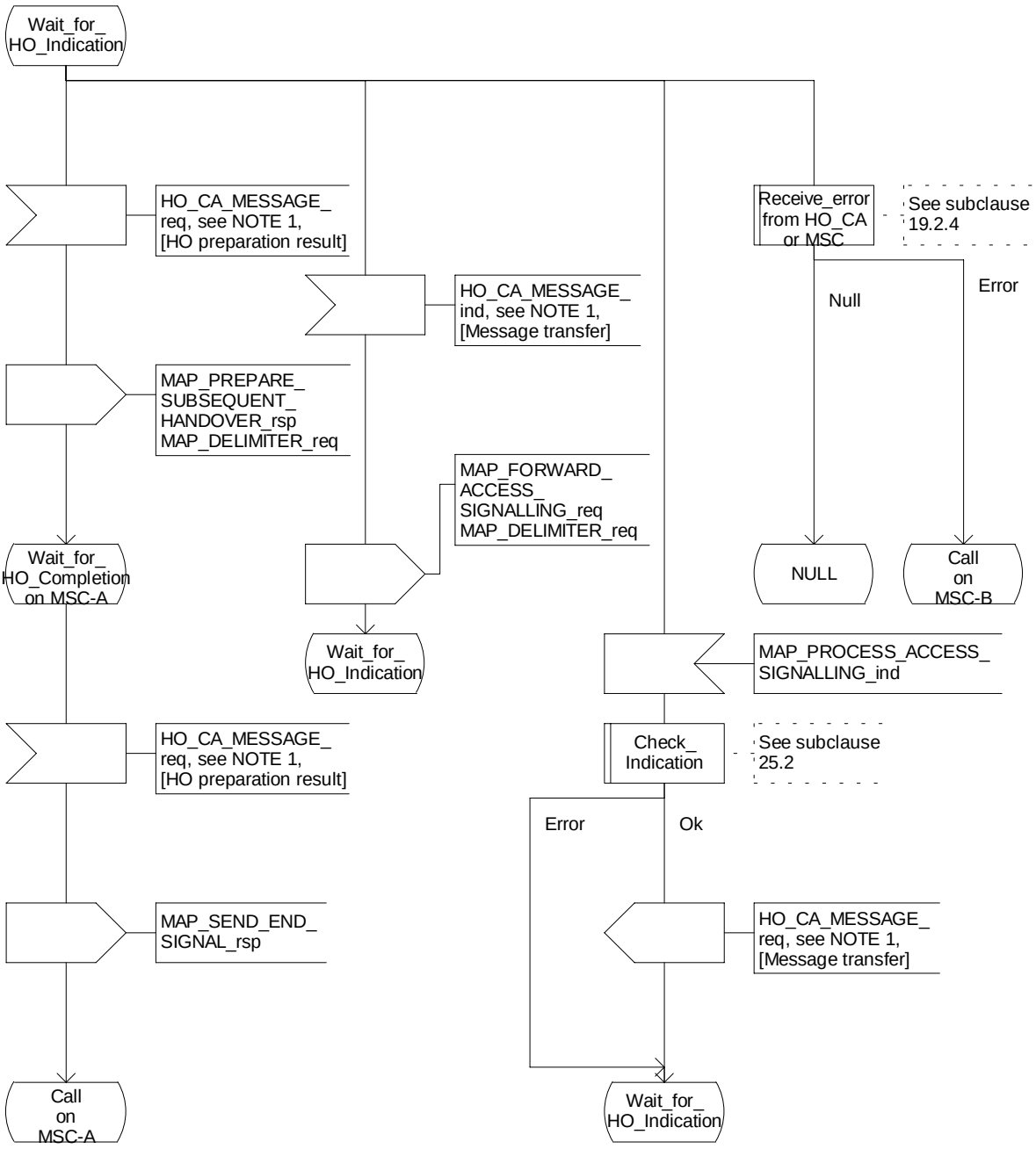


Figure 19.2.2/1 (sheet 7 of 13): Process MSC_A_HO

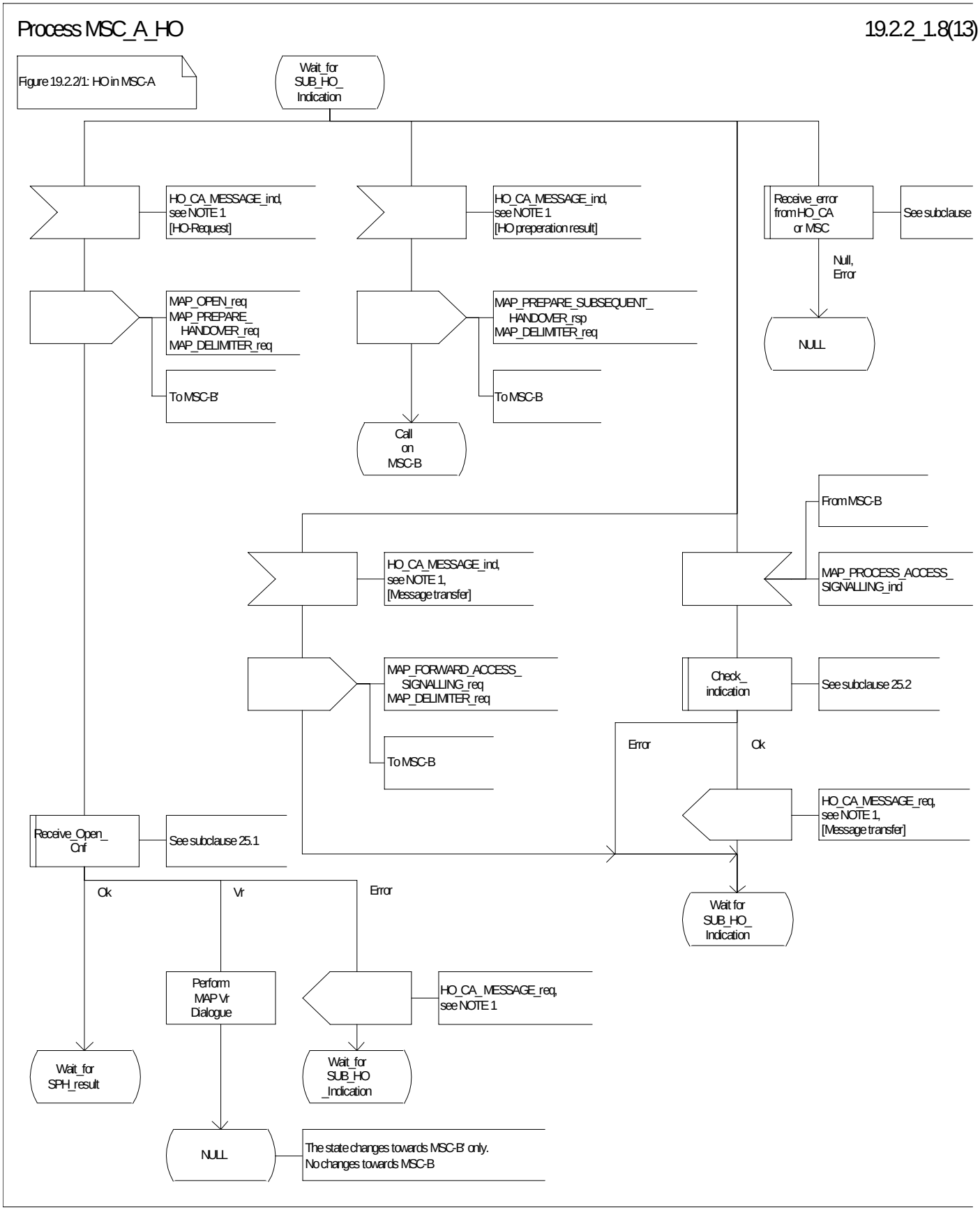


Figure 19.2.2/1 (sheet 8 of 13): Process MSC_A_HO

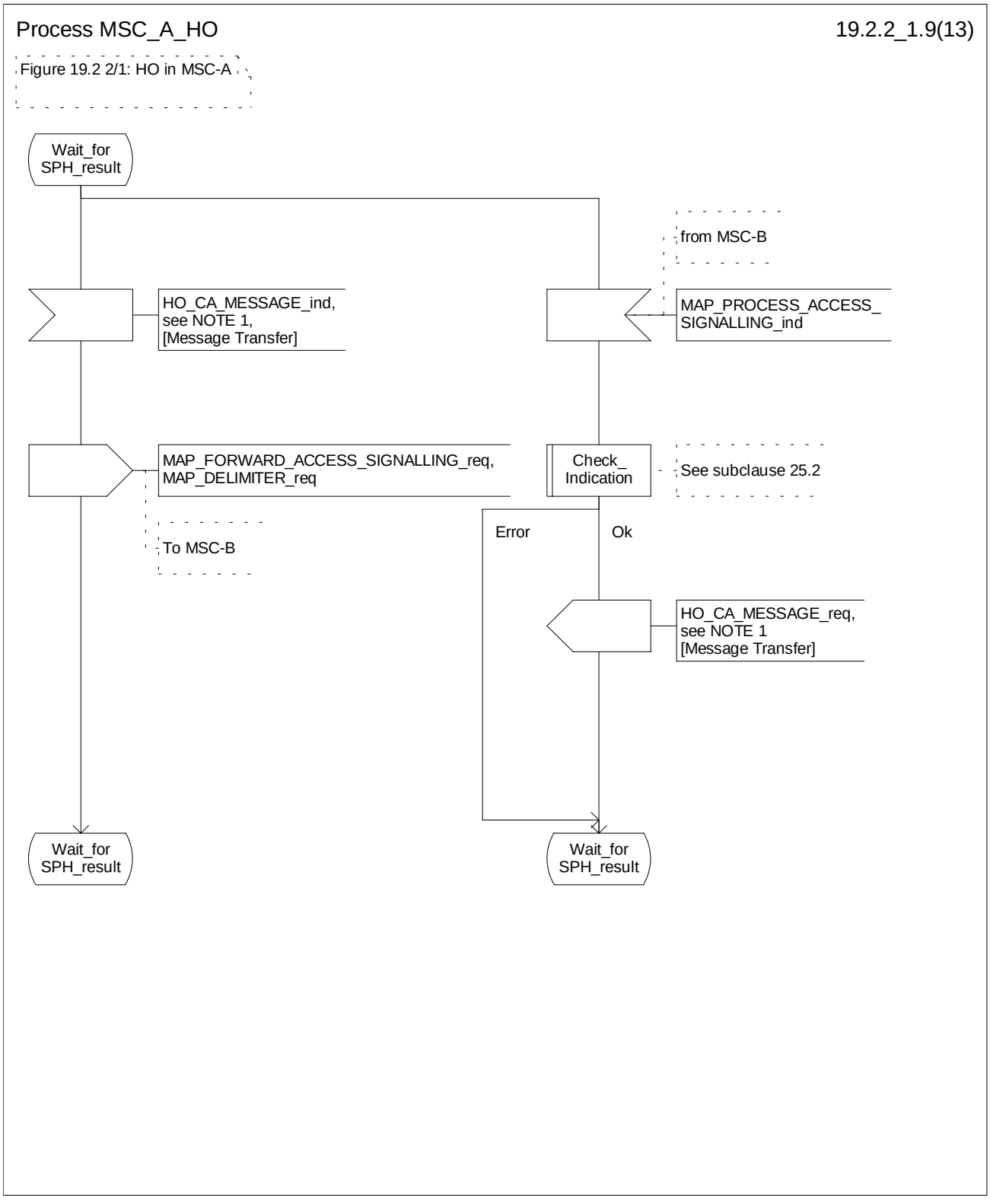


Figure 19.2.2/1 (sheet 9 of 13): Process MSC_A_HO

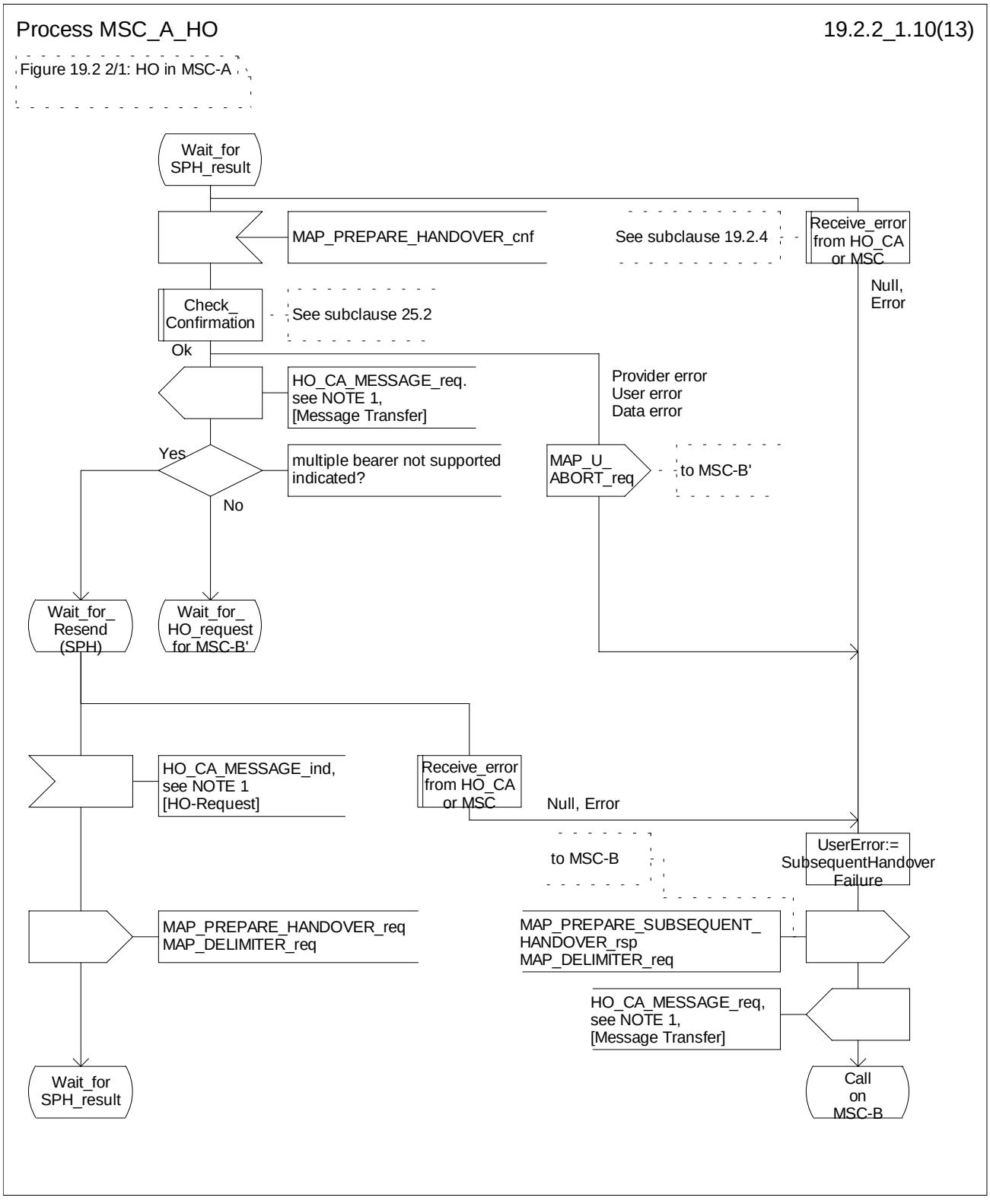


Figure 19.2.2/1 (sheet 10 of 13): Process MSC_A_HO

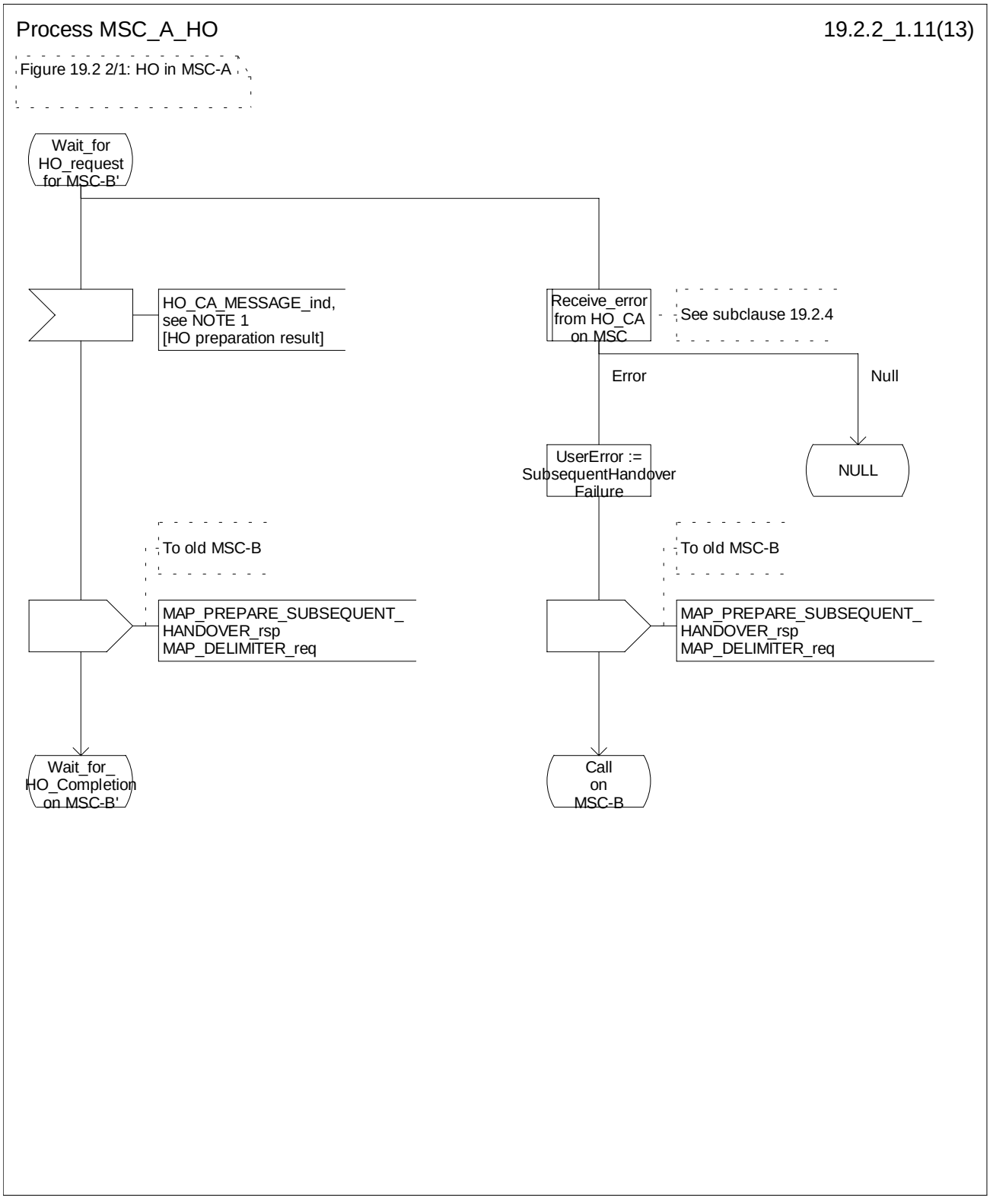


Figure 19.2.2/1 (sheet 11 of 13): Process MSC_A_HO

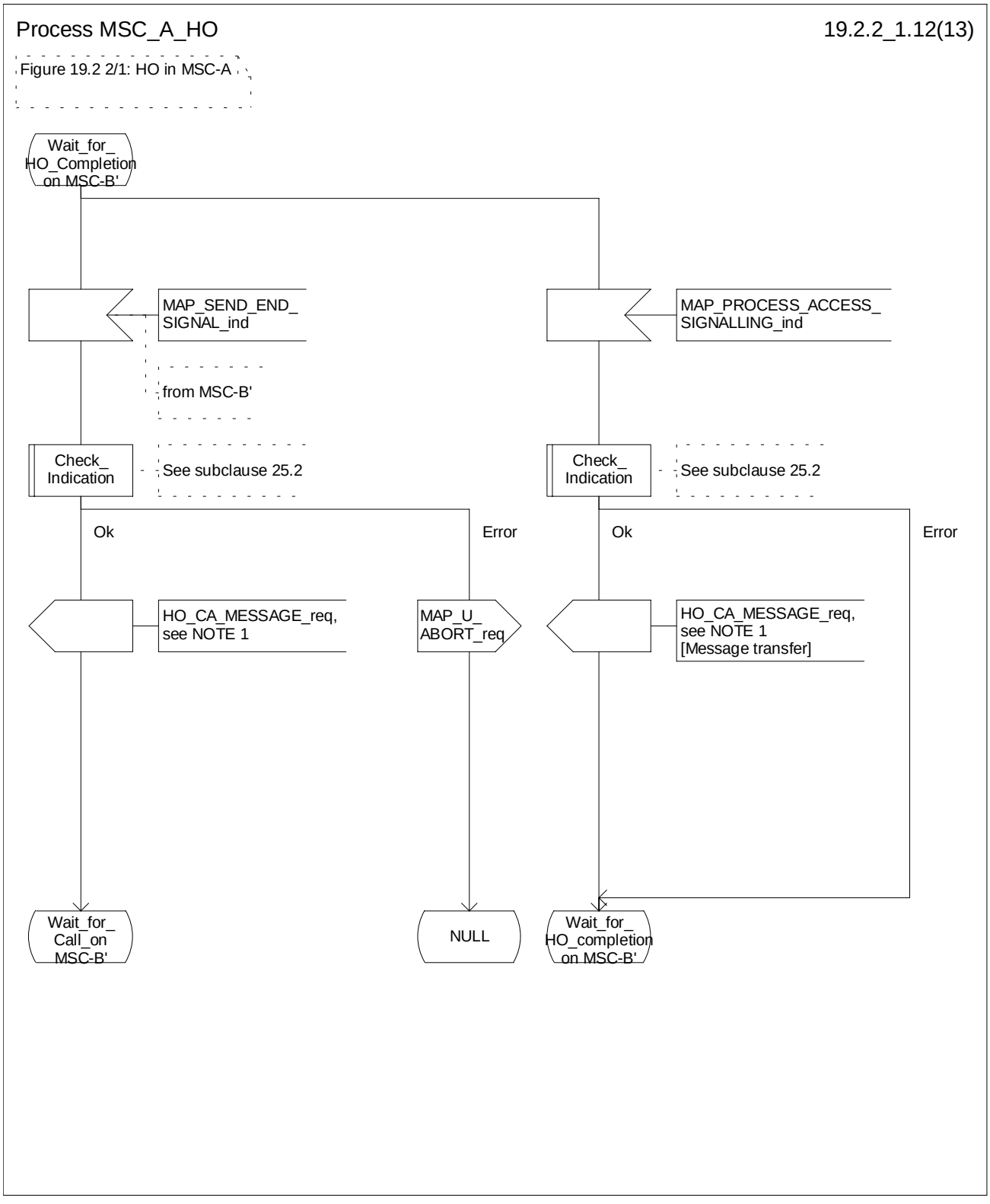


Figure 19.2.2/1 (sheet 12 of 13): Process MSC_A_HO

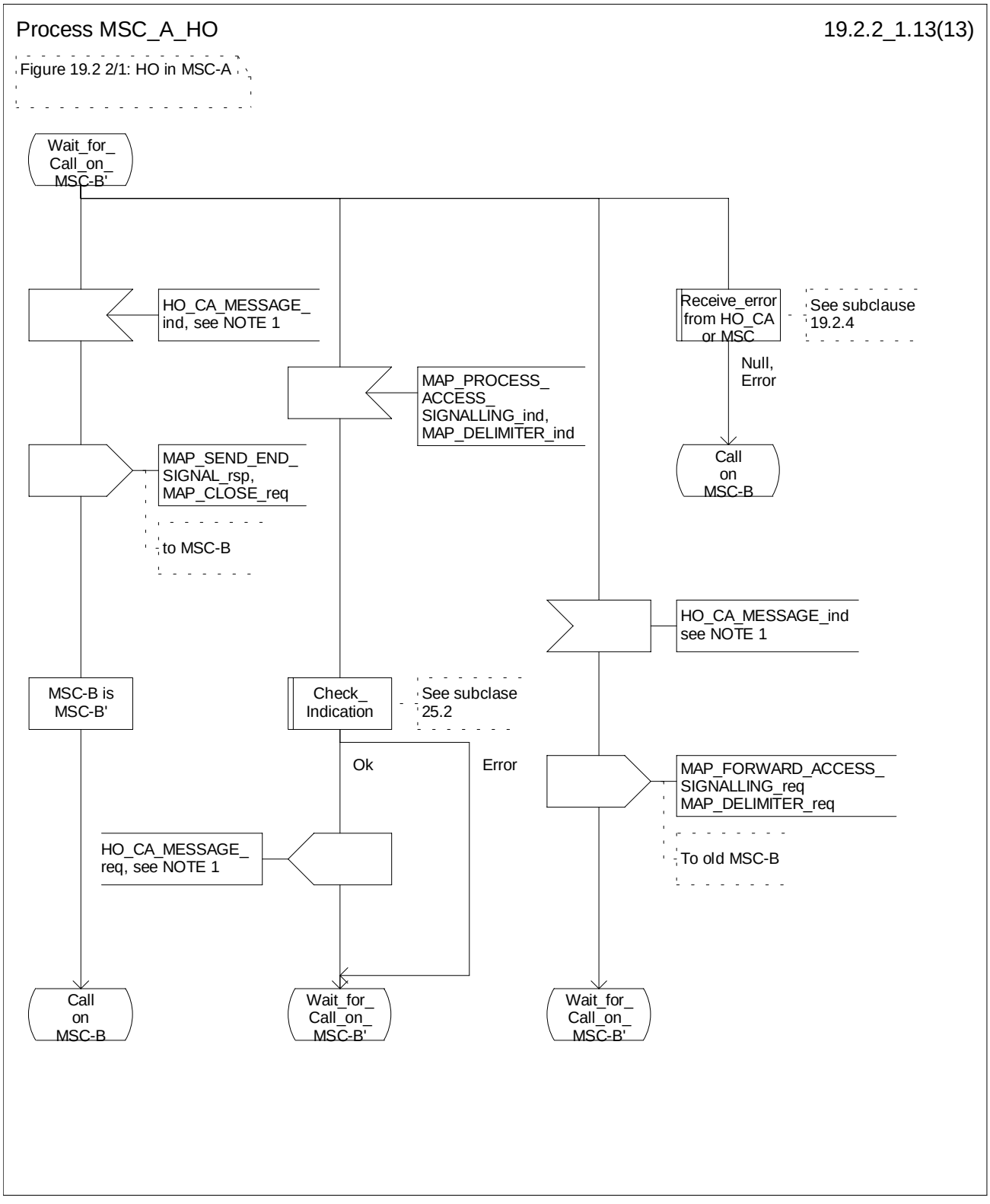


Figure 19.2.2/1 (sheet 13 of 13): Process MSC_A_HO

19.2.3 Handover procedure in MSC-B

This clause describes the handover or relocation procedure in MSC-B, including the request for a handover or relocation from another MSC (MSC-A), subsequent handover or relocation 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 clause 25.1.

When MSC-B process receives a MAP_PREPARE_HANDOVER 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_HANDOVER_NUMBER request will be sent to the VLR. The handover number is received in the MAP_SEND_HANDOVER_REPORT request, and will be included in the MAP_PREPARE_HANDOVER response to MSC-A.

When relocation numbers are required, one or several MAP_ALLOCATE_HANDOVER_NUMBER requests will be sent to the VLR. Each relocation number is received in a MAP_SEND_HANDOVER_REPORT request, and the collected relocation numbers will be included in the MAP_PREPARE_HANDOVER 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_HANDOVER_REPORT response.

As soon as a call from MSC-A using a relocation number arrives in MSC-B, MSC-B shall release the relocation number in the VLR using the MAP_SEND_HANDOVER_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 or the Iu-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 or relocation, a number of procedures between MSC-A and BSS-B or RNS-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 or relocated to another MSC (either back to the controlling MSC (MSC-A) or to a third MSC (MSC-B')).

After the MAP_PREPARE_SUBSEQUENT_HANDOVER 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_HANDOVER_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 clause.

The services used are defined in clause 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 3G TS 23.009.

NOTE 2: The order in the SDL diagrams to allocate first the handover number and then the radio resources is not binding.

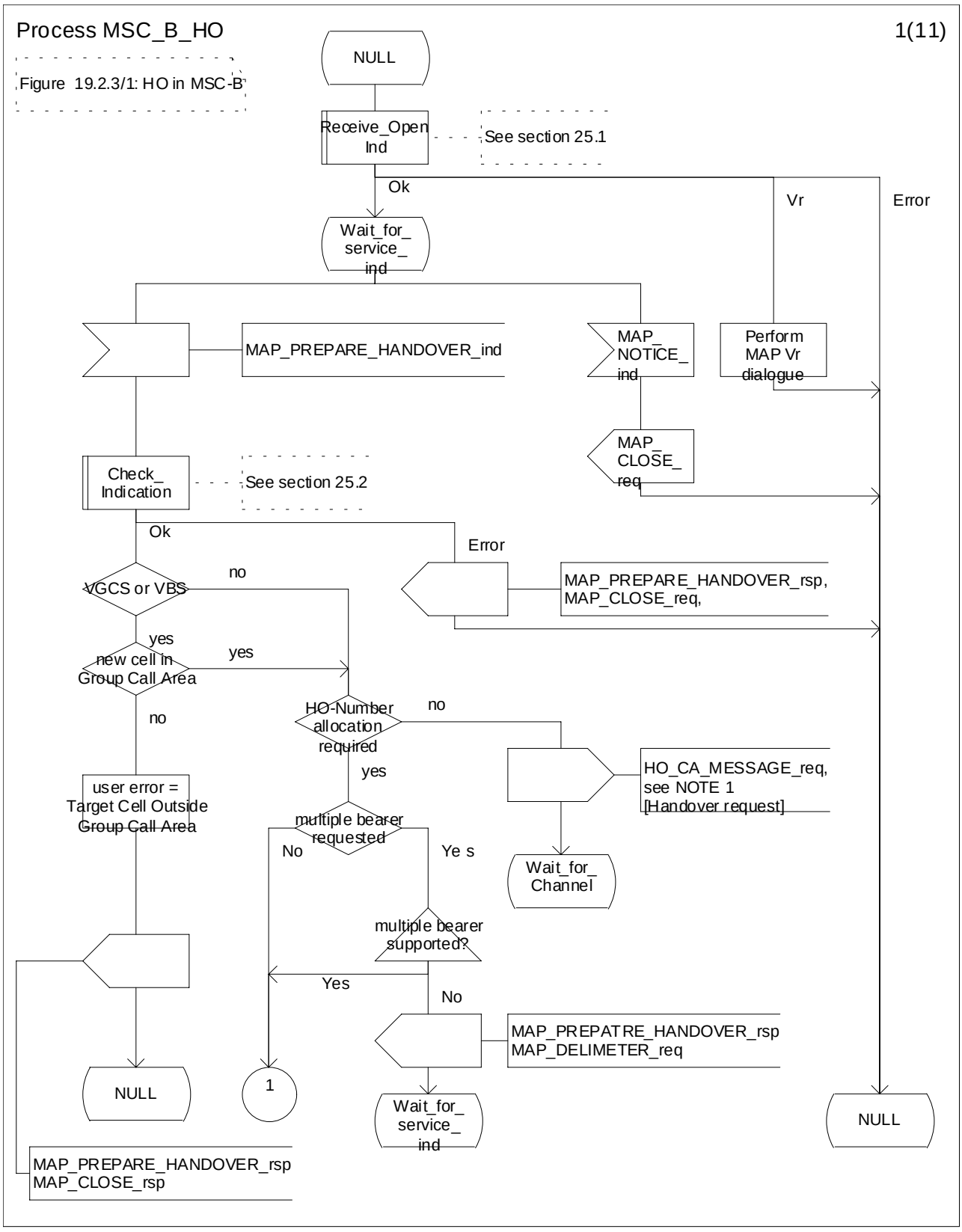


Figure 19.2.3/1 (sheet 1 of 11): Process MSC_B_HO

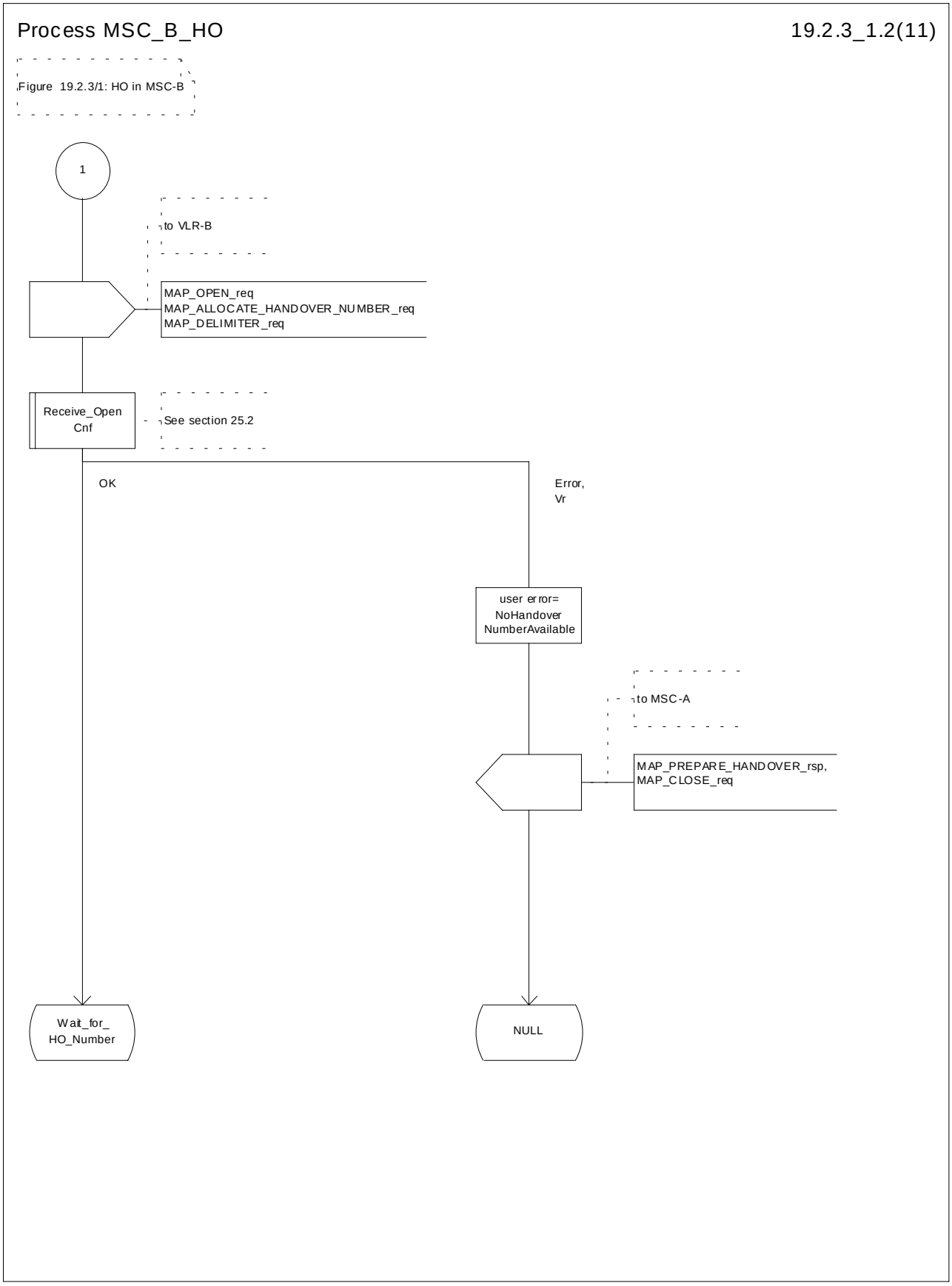


Figure 19.2.3/1 (sheet 2 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

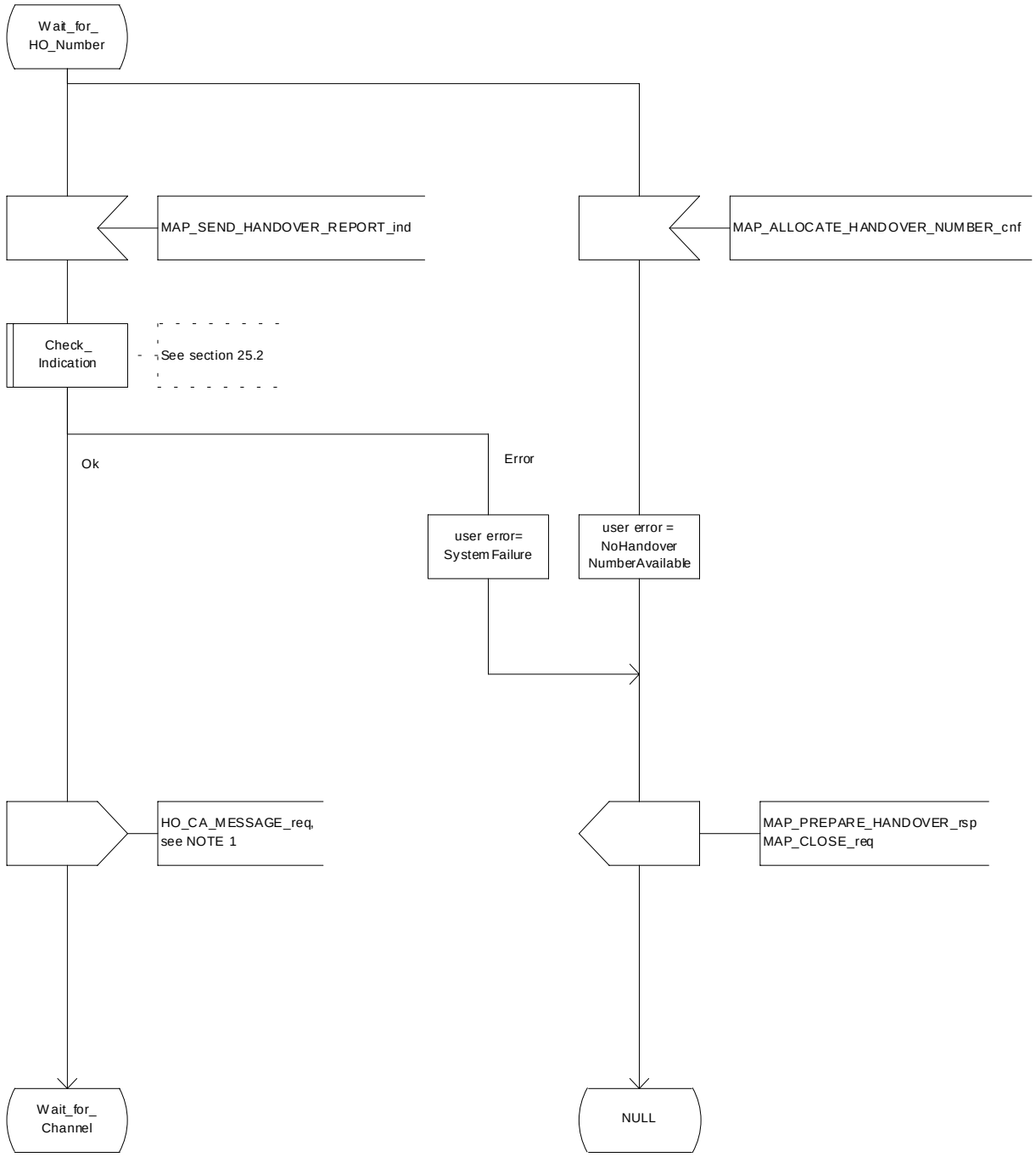


Figure 19.2.3/1 (sheet 3 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

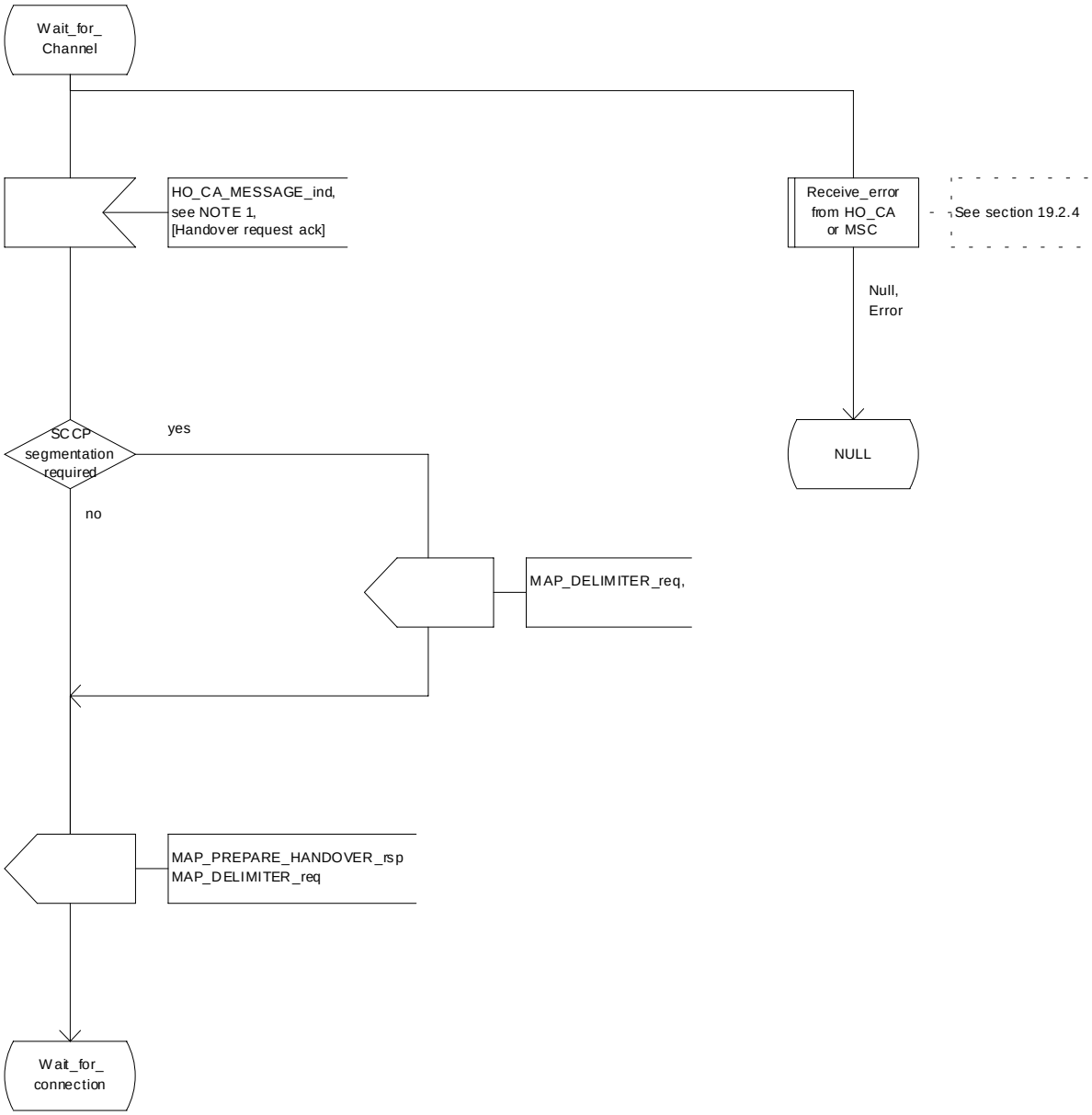


Figure 19.2.3/1 (sheet 4 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

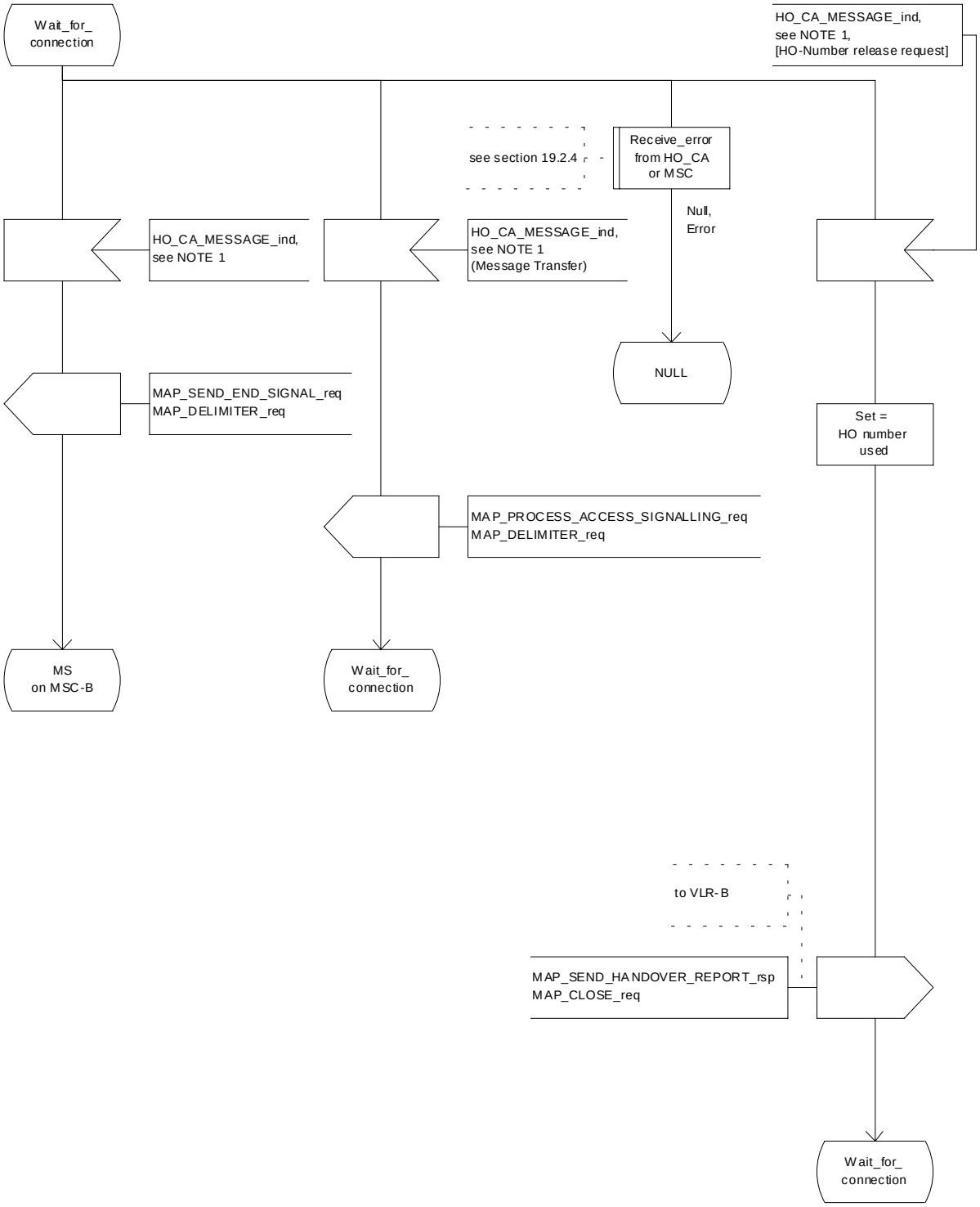


Figure 19.2.3/1 (sheet 5 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

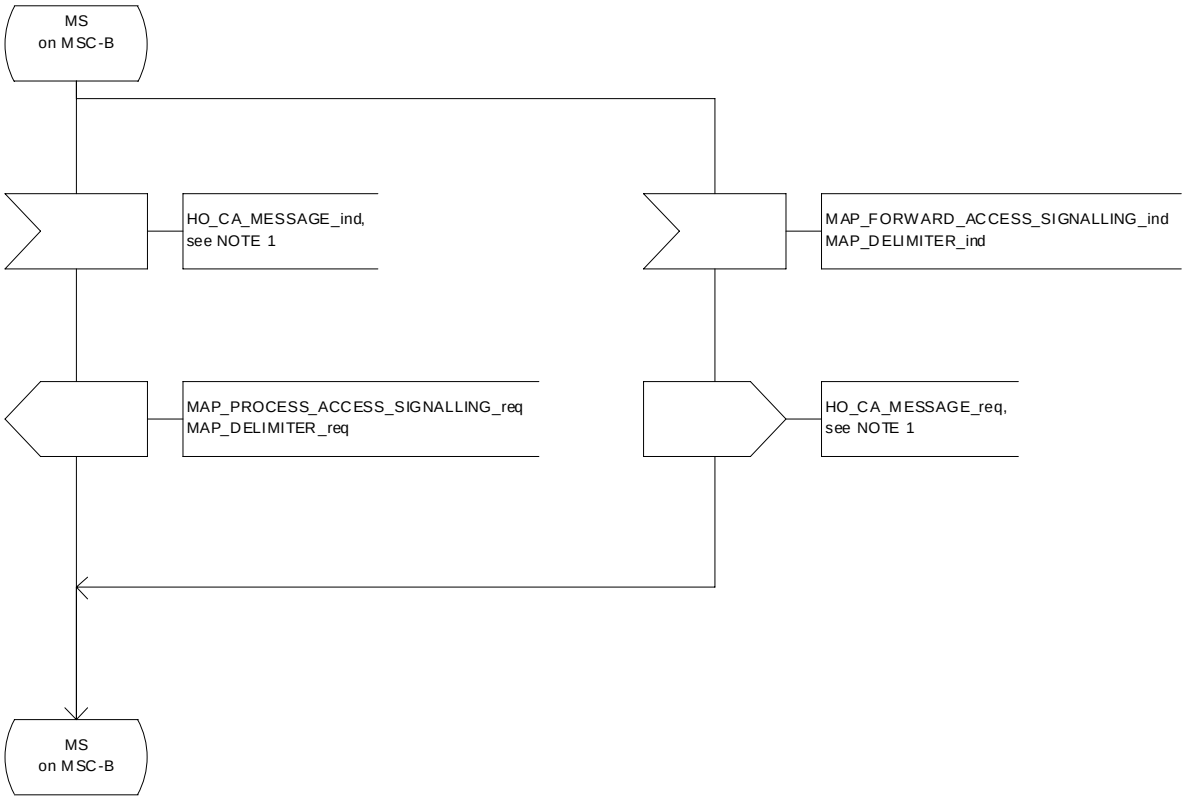


Figure 19.2.3/1 (sheet 6 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

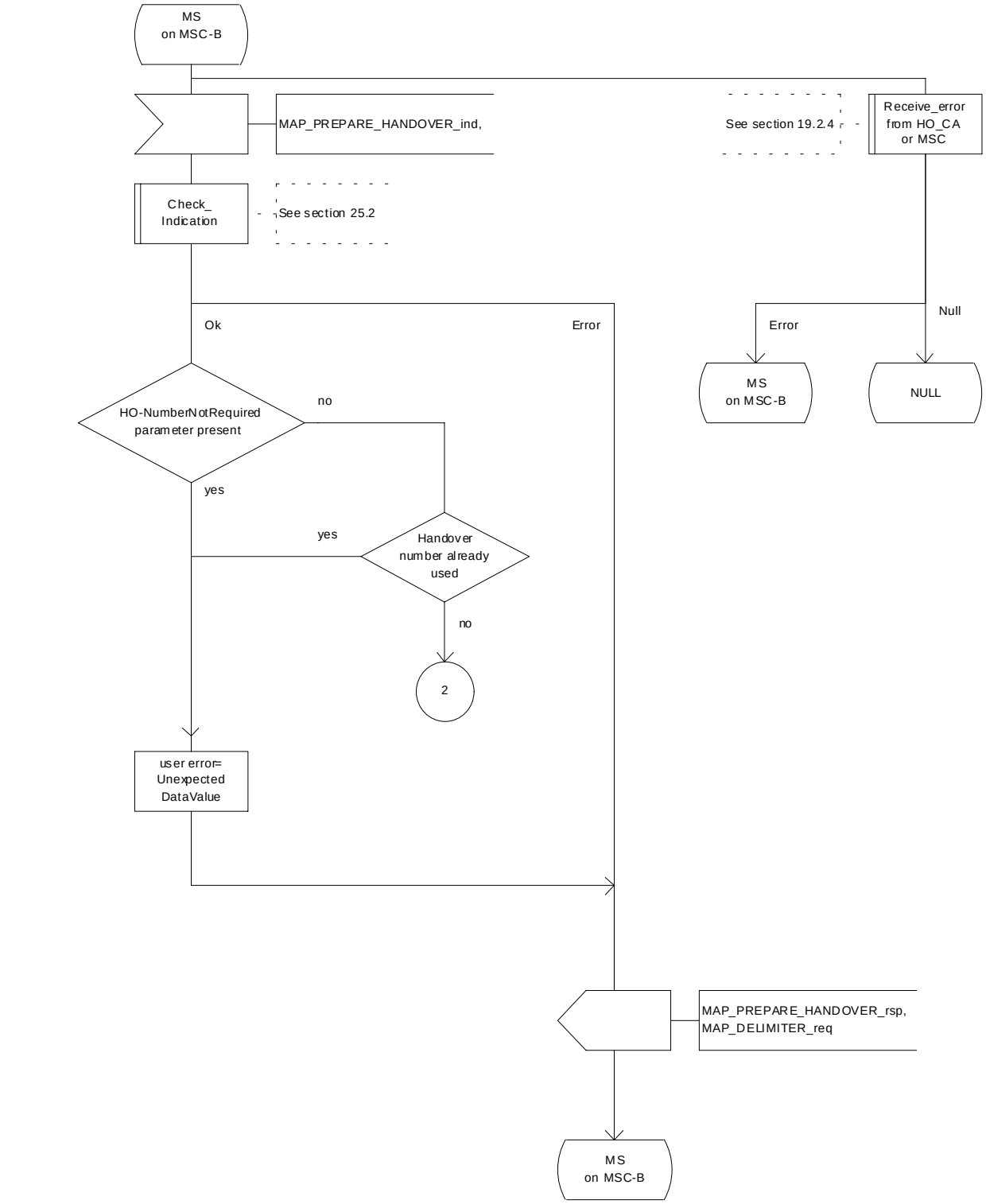


Figure 19.2.3/1 (sheet 7 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

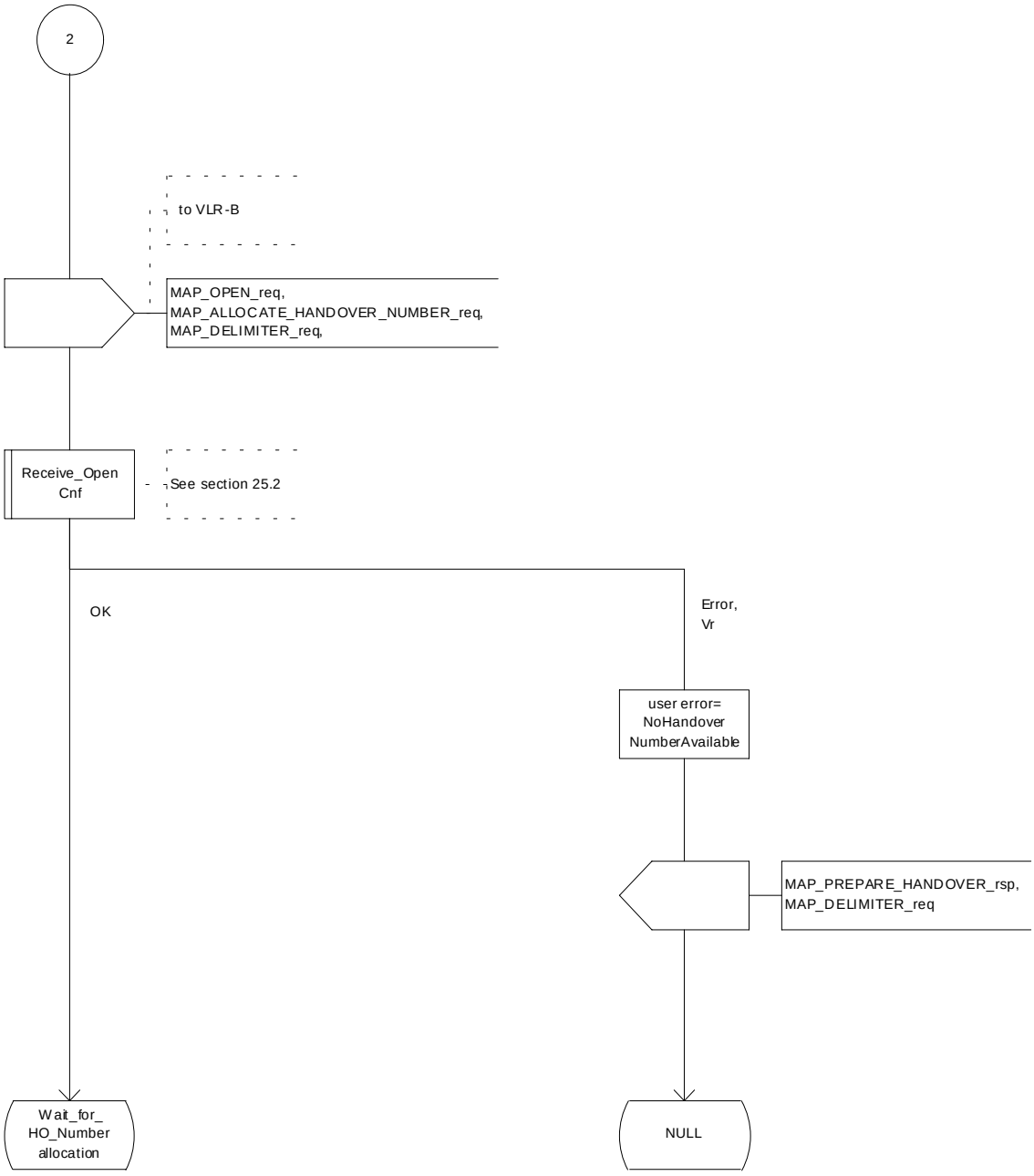


Figure 19.2.3/1 (sheet 8 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

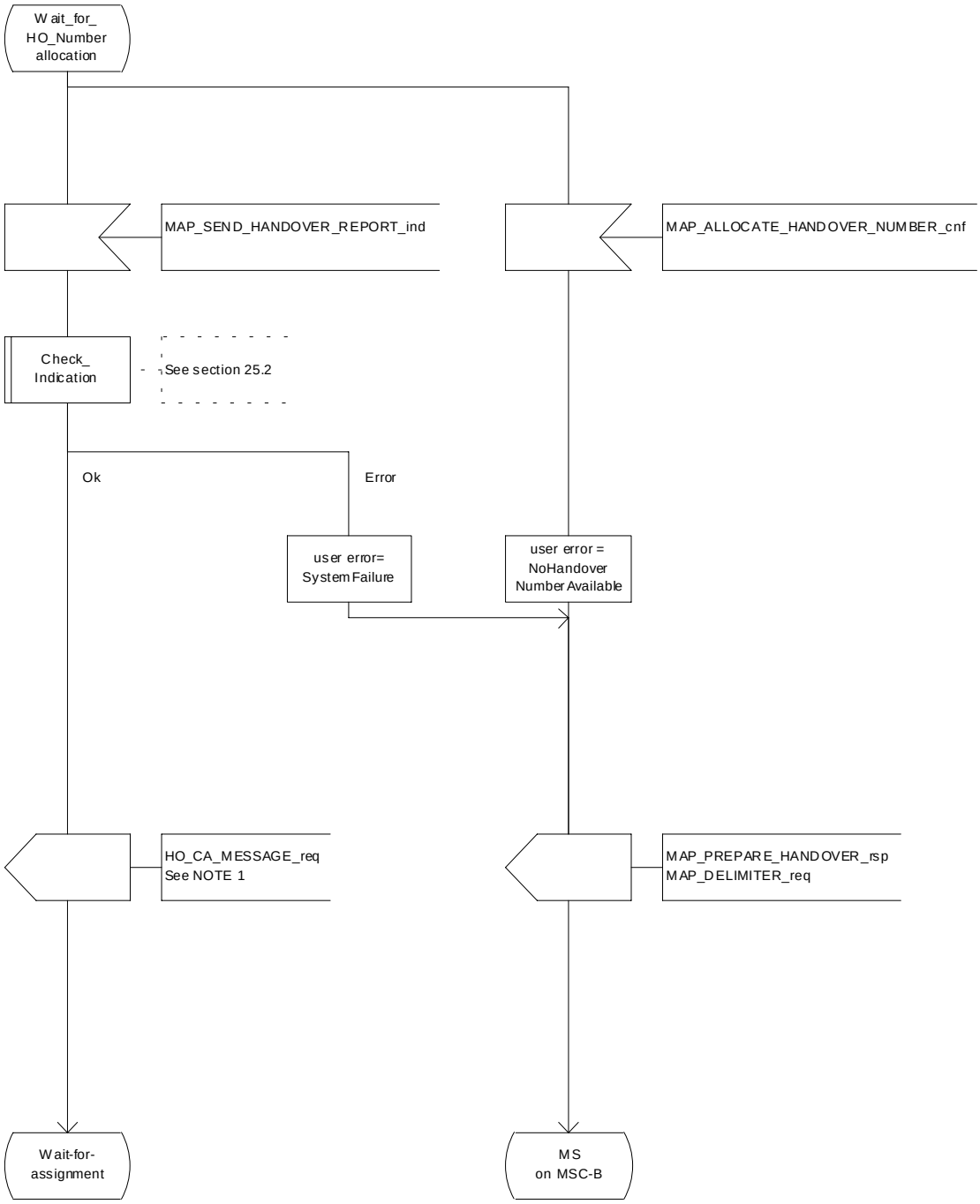


Figure 19.2.3/1 (sheet 9 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

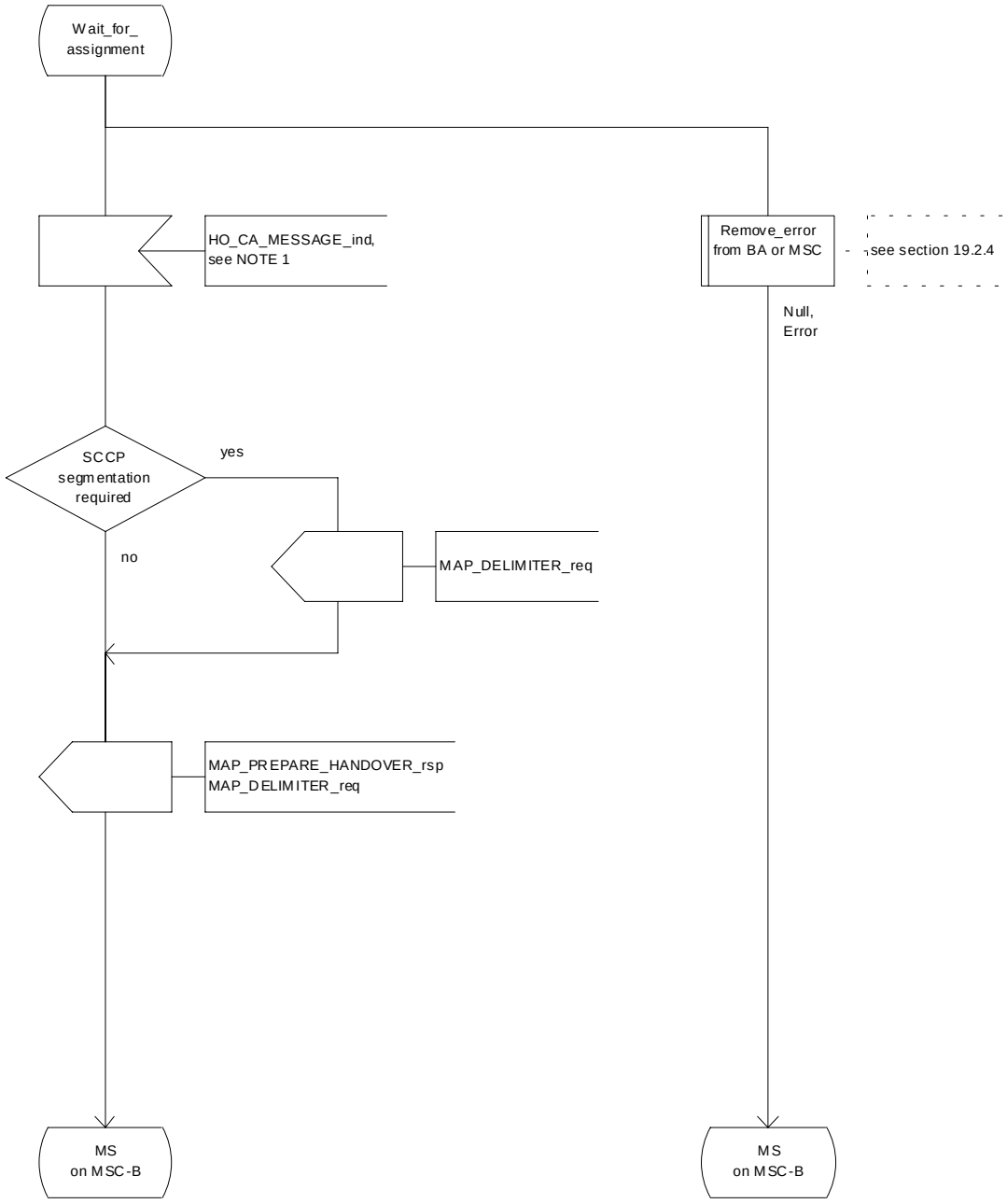


Figure 19.2.3/1 (sheet 10 of 11): Process MSC_B_HO

Figure 19.2.3/1: HO in MSC-B

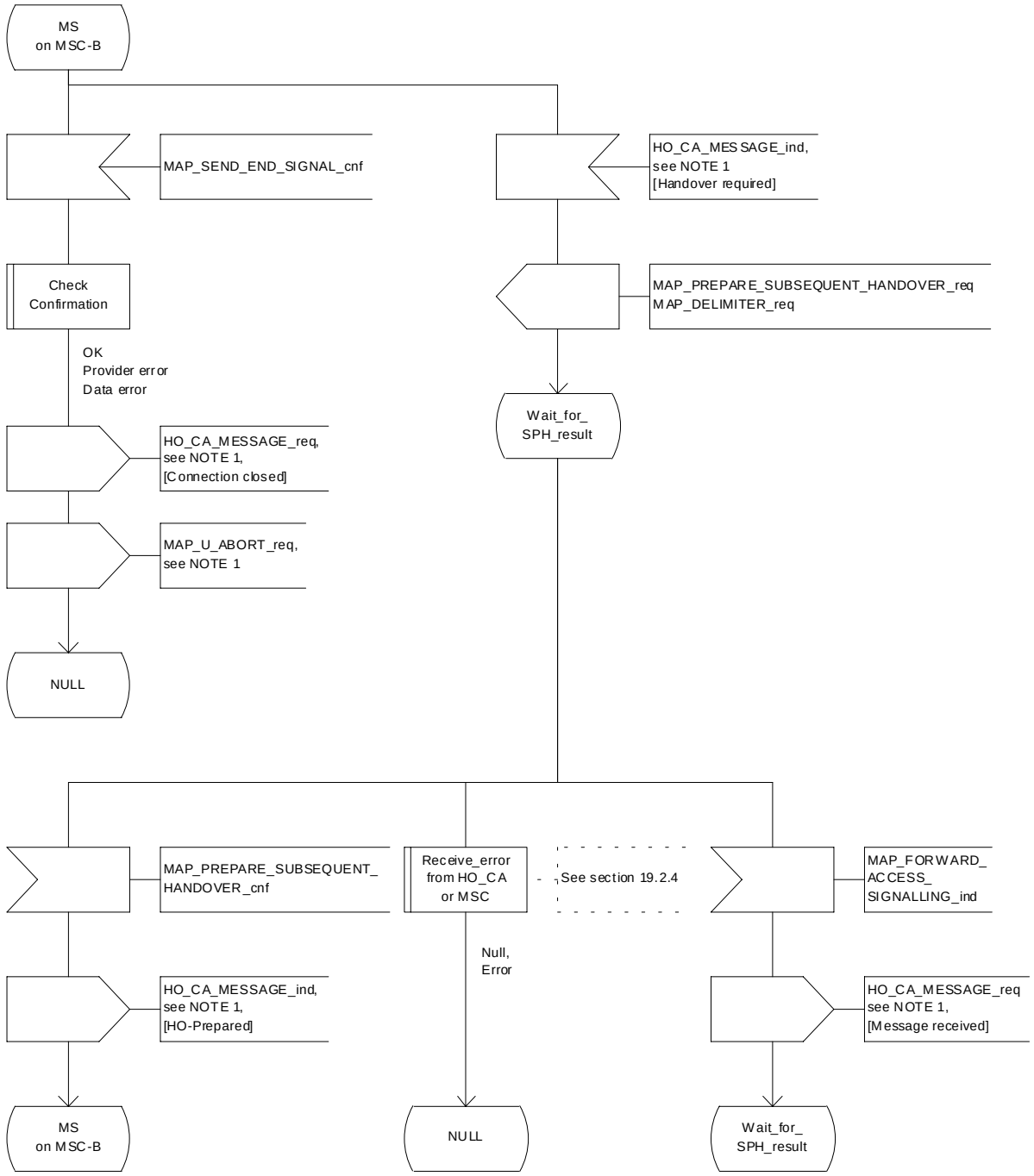


Figure 19.2.3/1 (sheet 11 of 11): Process MSC_B_HO

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 or relocation process should continue. In all other cases the MSC is returned to a "NULL" state.

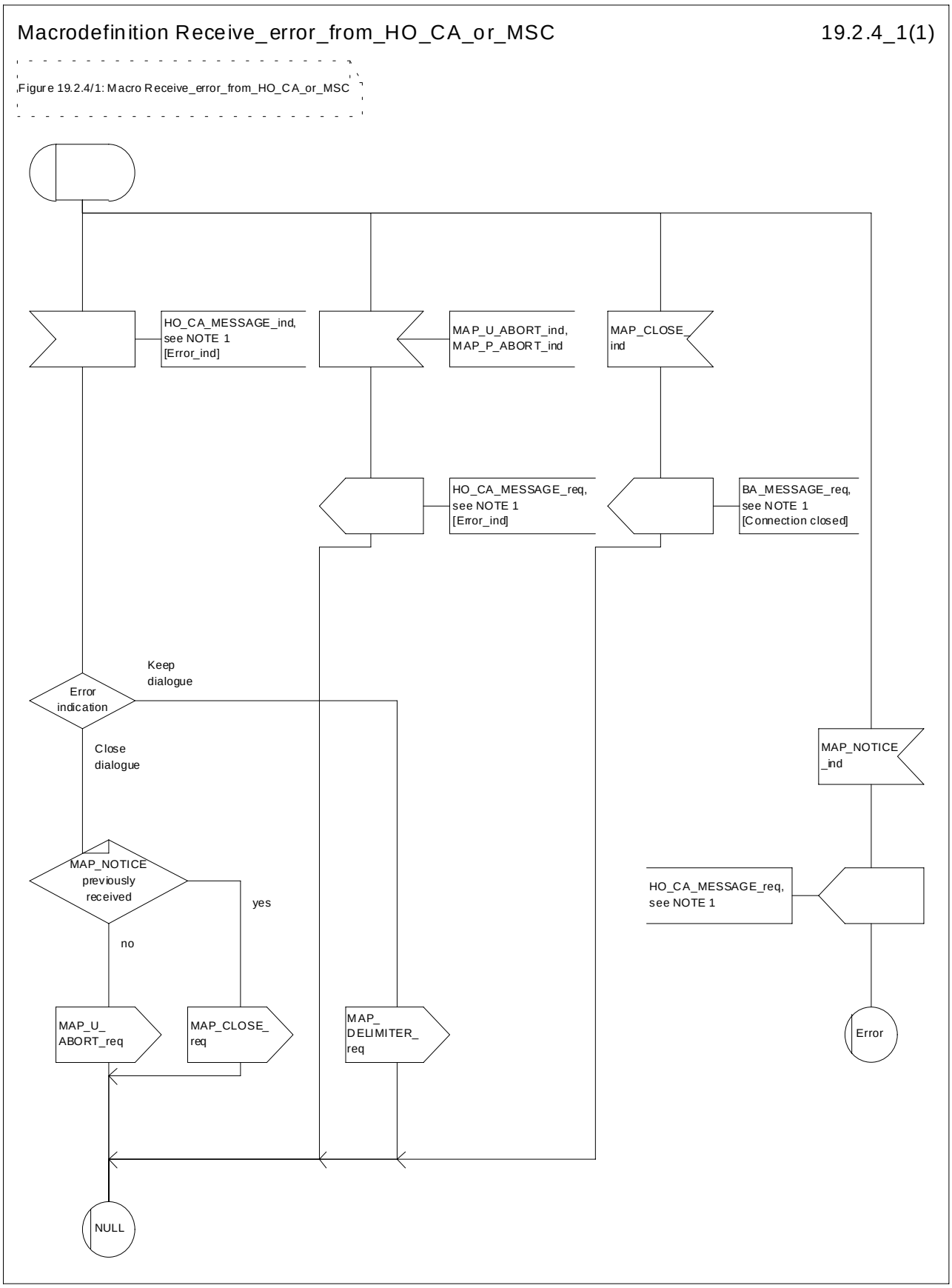


Figure 19.2.4/1: Macro Receive_error_from_HO_CA_or_MSC

19.2.5 Handover procedure in VLR

19.2.5.1 Allocation of handover number

When receiving the MAP_ALLOCATE_HANDOVER_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_HANDOVER_NUMBER response with the appropriate error.

The handover number allocated will otherwise be returned to MSC-B in the MAP_SEND_HANDOVER_REPORT request.

The handover number will be reserved until a MAP_SEND_HANDOVER_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 clause.

The services used are defined in clause 8.4.

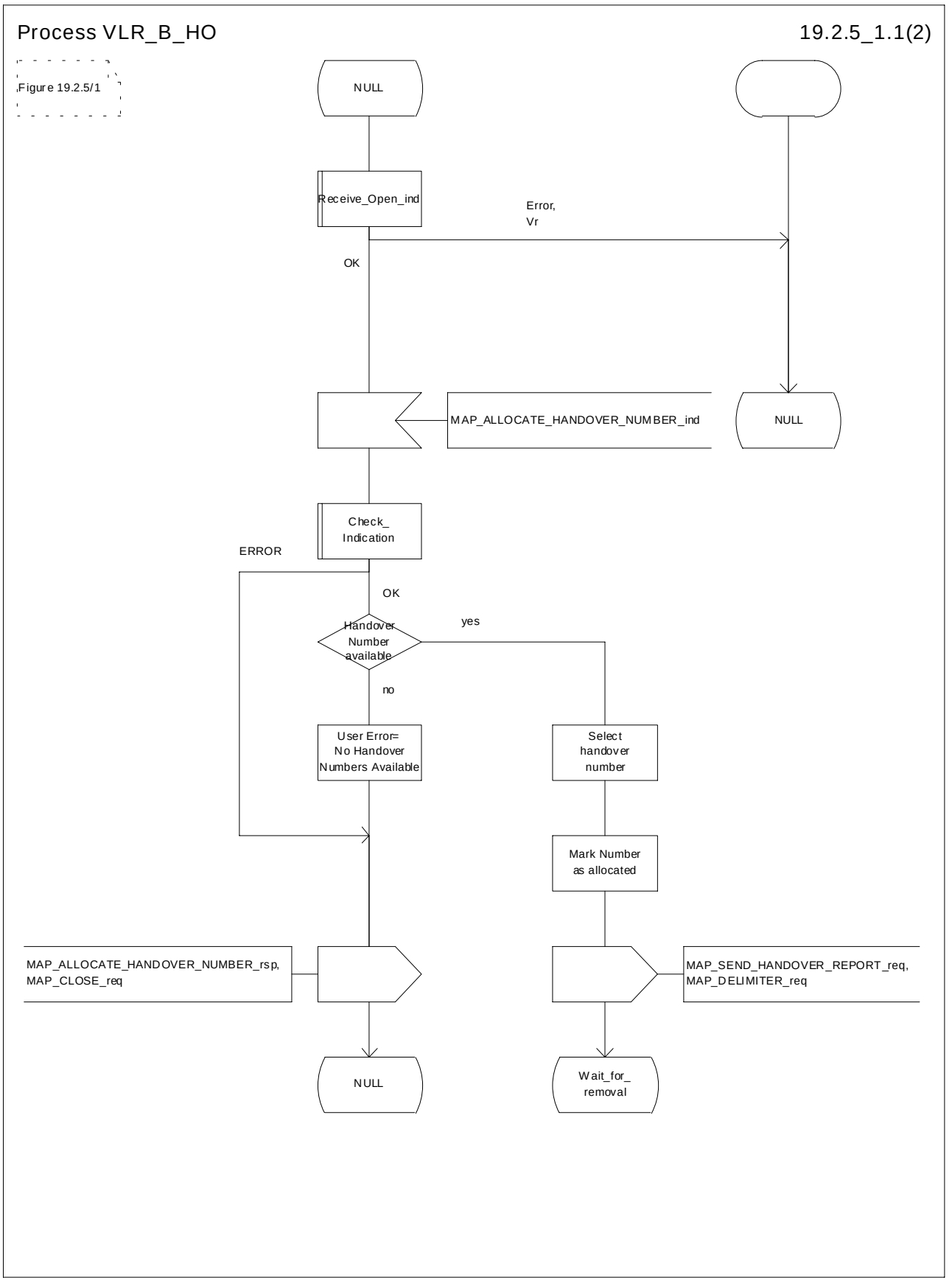


Figure 19.2.5/1 (sheet 1 of 2): Process VLR_B_HO

Figure 19.2.5/1

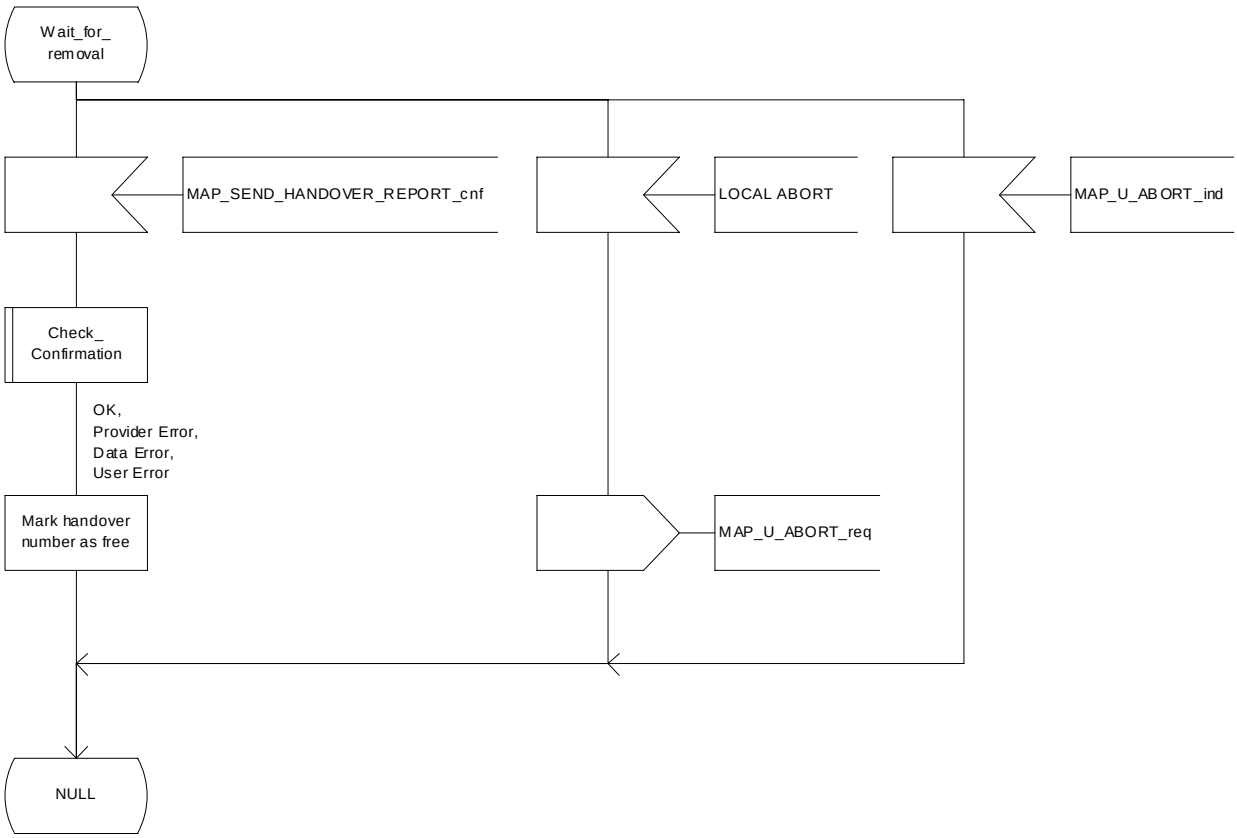


Figure 19.2.5/1 (sheet 2 of 2): Process VLR_B_HO

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 3GPP TS 23.007 [19].

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 clause 19.1.1.3;

  Update_Location_HLR clause 19.1.1.4.

- In case of a mobile terminated call:

  PRN_VLR clause 21.2.4;

  RESTORE_DATA_VLR clause 21.2.4;

  RESTORE_DATA_HLR clause 19.3.3;

  ICS_VLR clause 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 3GPP TS 23.007 [19]); and

- not confirmed by HLR by the indicator "Confirmed by HLR" (The function of this indicator is described in 3GPP TS 23.007 [19]).

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 3GPP TS 23.007 [19]).

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 clause 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 clause 21.2.4.

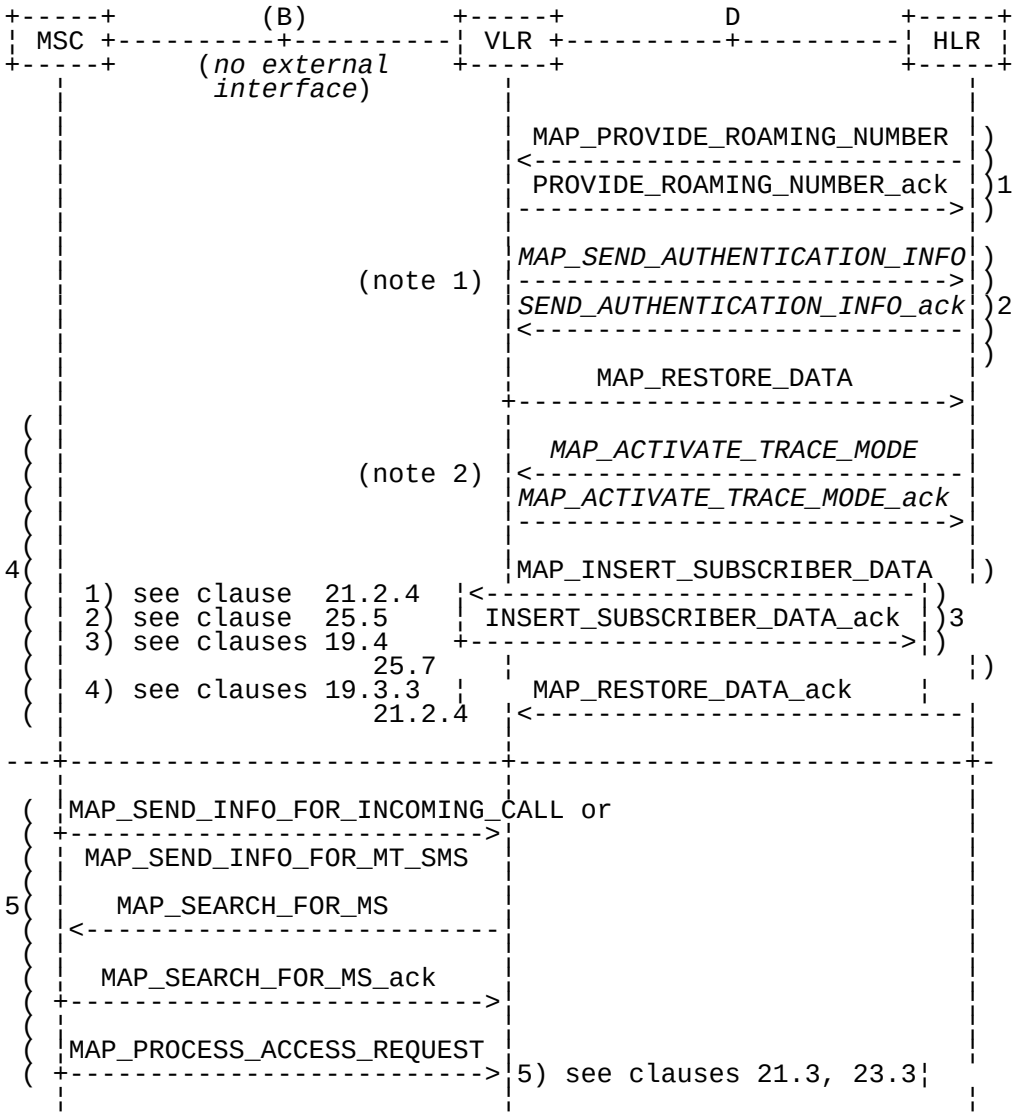
The MAP_RESTORE_DATA process in the HLR is described in clause 19.3.3.

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 clause 19.3.2;
- REC_RESET_IN_VLR clause 19.3.2;
- REC_RESET_IN_SGSN clause 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 clause 19.1.1.3;
- Update_Location_HLR clause 19.1.1.4;
- Update_GPRS_Location_HLR clause 19.1.1.4;
- GPRS_Update_Location_Area_VLR clause 19.1.1.3;

- SGSN_Update_HLR clause 19.1.1.8.

In the case of a mobile originated service request, the

- Macro Process_Access_Request_VLR clause 25.4.2; and the
- Process Update_Location_HLR clause 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 clause 19.1.

After receipt of the MAP_UPDATE_LOCATION or the MAP_UPDATE_GPRS_LOCATION acknowledgement 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.

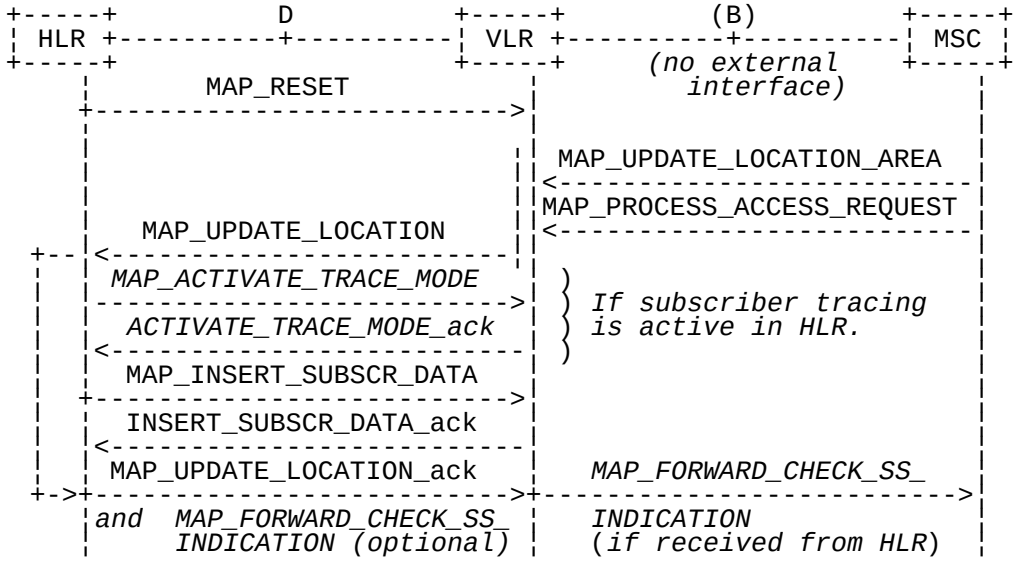


Figure 19.3/2: Procedures related to restoration of HLR

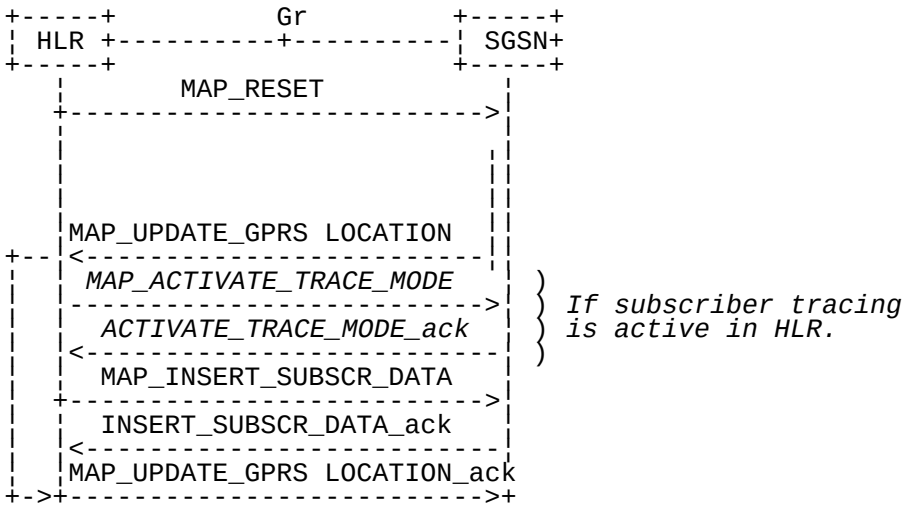


Figure 19.3/9: Procedures related to restoration of HLR for GPRS

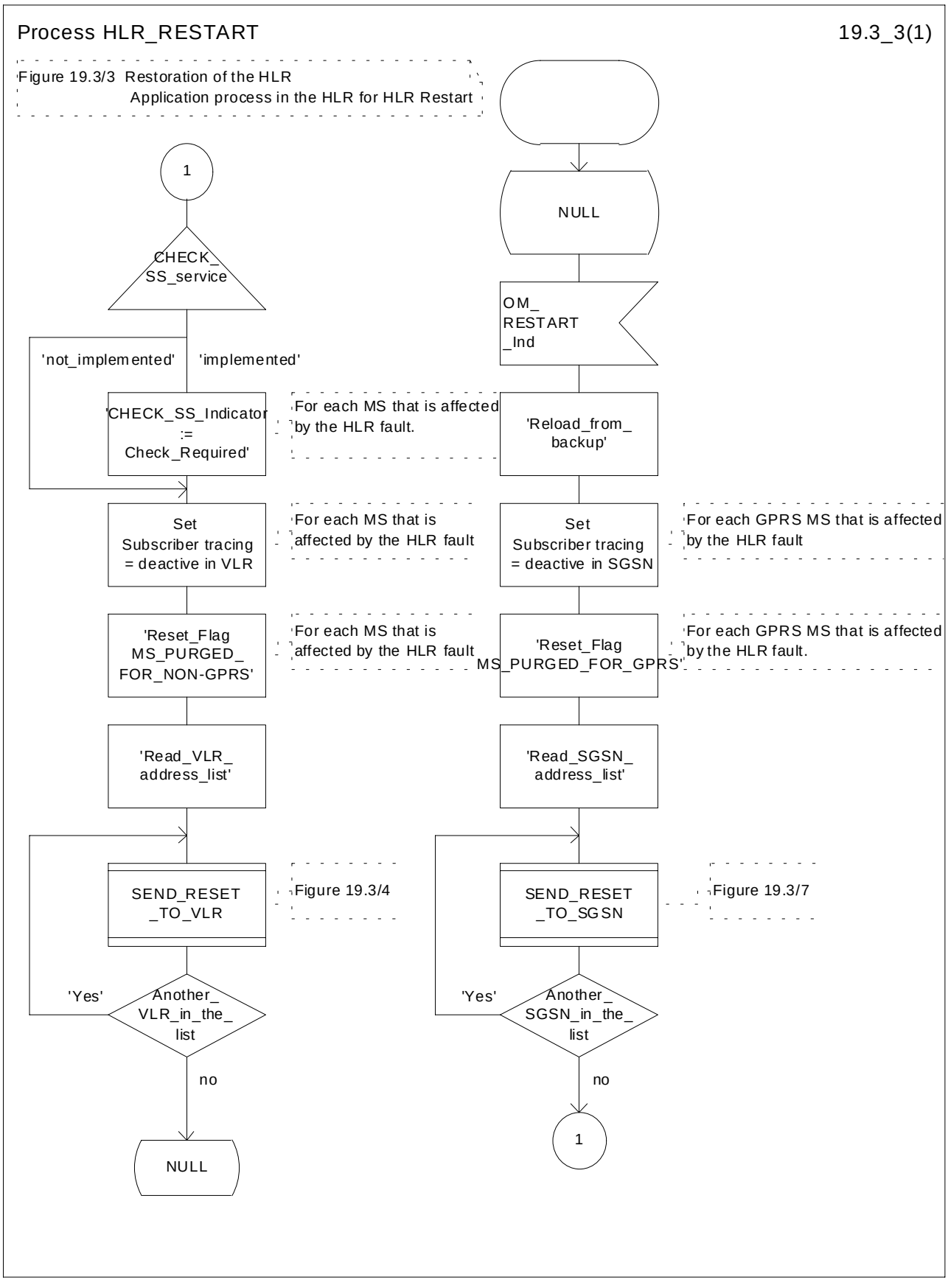


Figure 19.3/3: Process HLR_RESTART

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

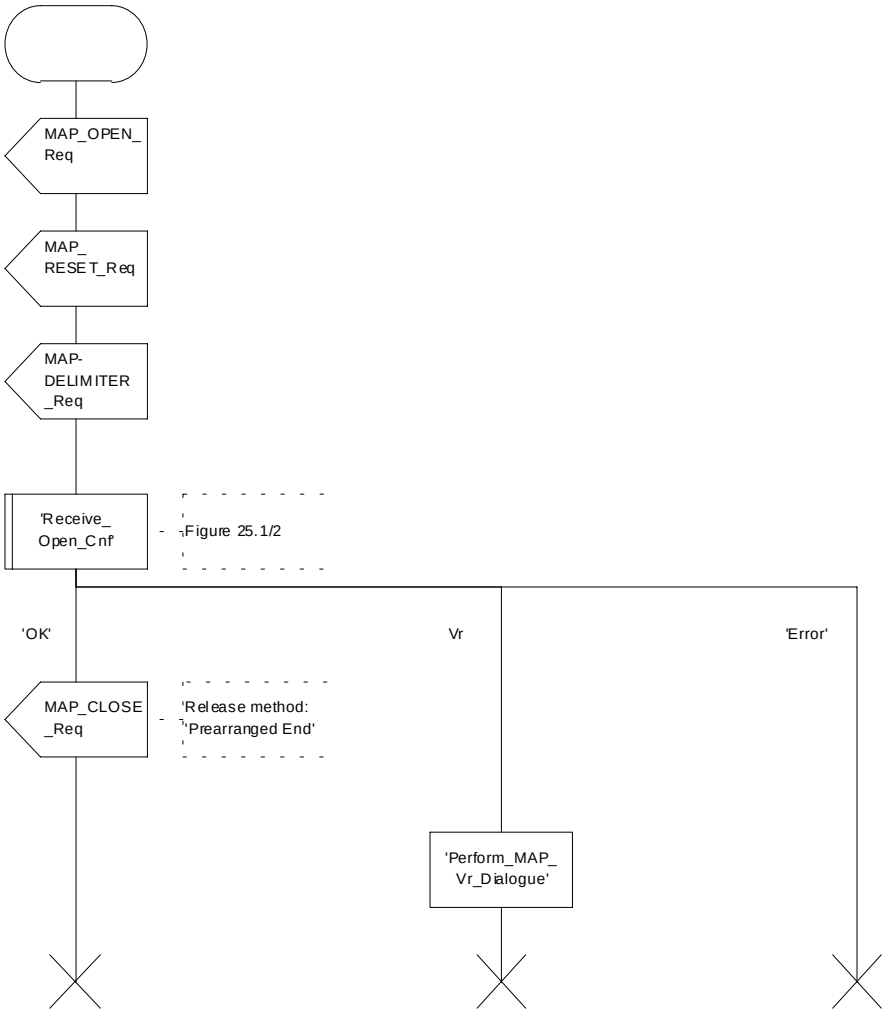


Figure 19.3/4: Process SEND_RESET_TO_VLR

Process REC_RESET_IN_VLR

'Figure 19.3/5 Restoration of the HLR - Application process in the VLR for reception of the RESET message from HLR'

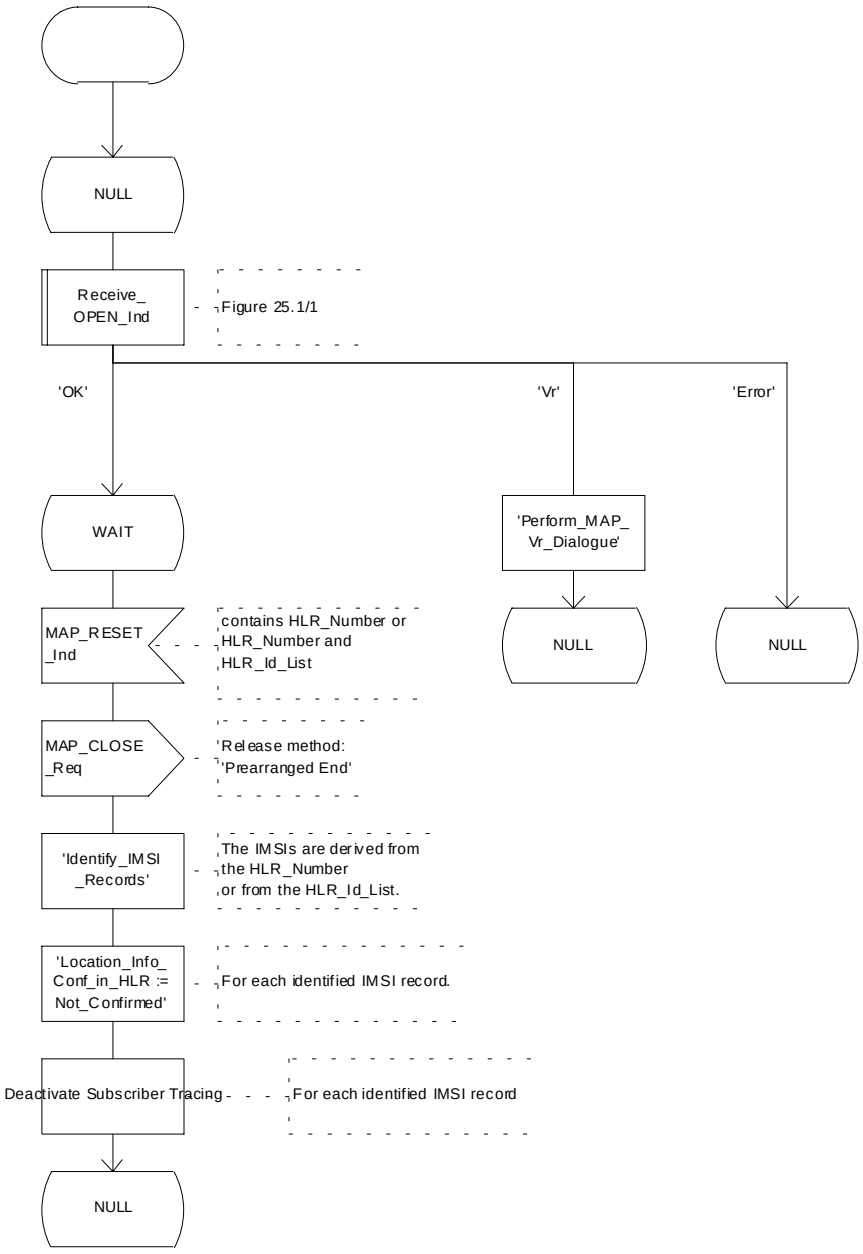


Figure 19.3/5: Process REC_RESET_IN_VLR

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

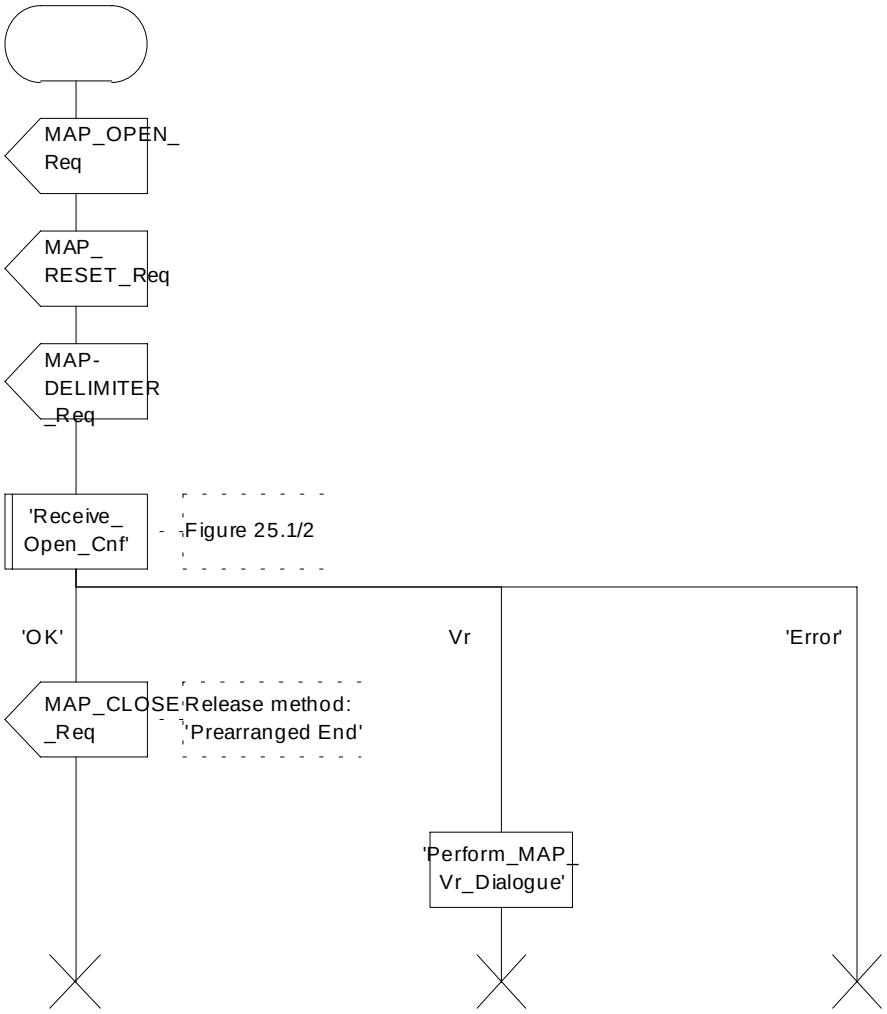


Figure 19.3/7: Process SEND_RESET_TO_SGSN

Figure 19.3/8: Restoration of the HLR - Application process in the SGSN for reception of the RESET message from HLR

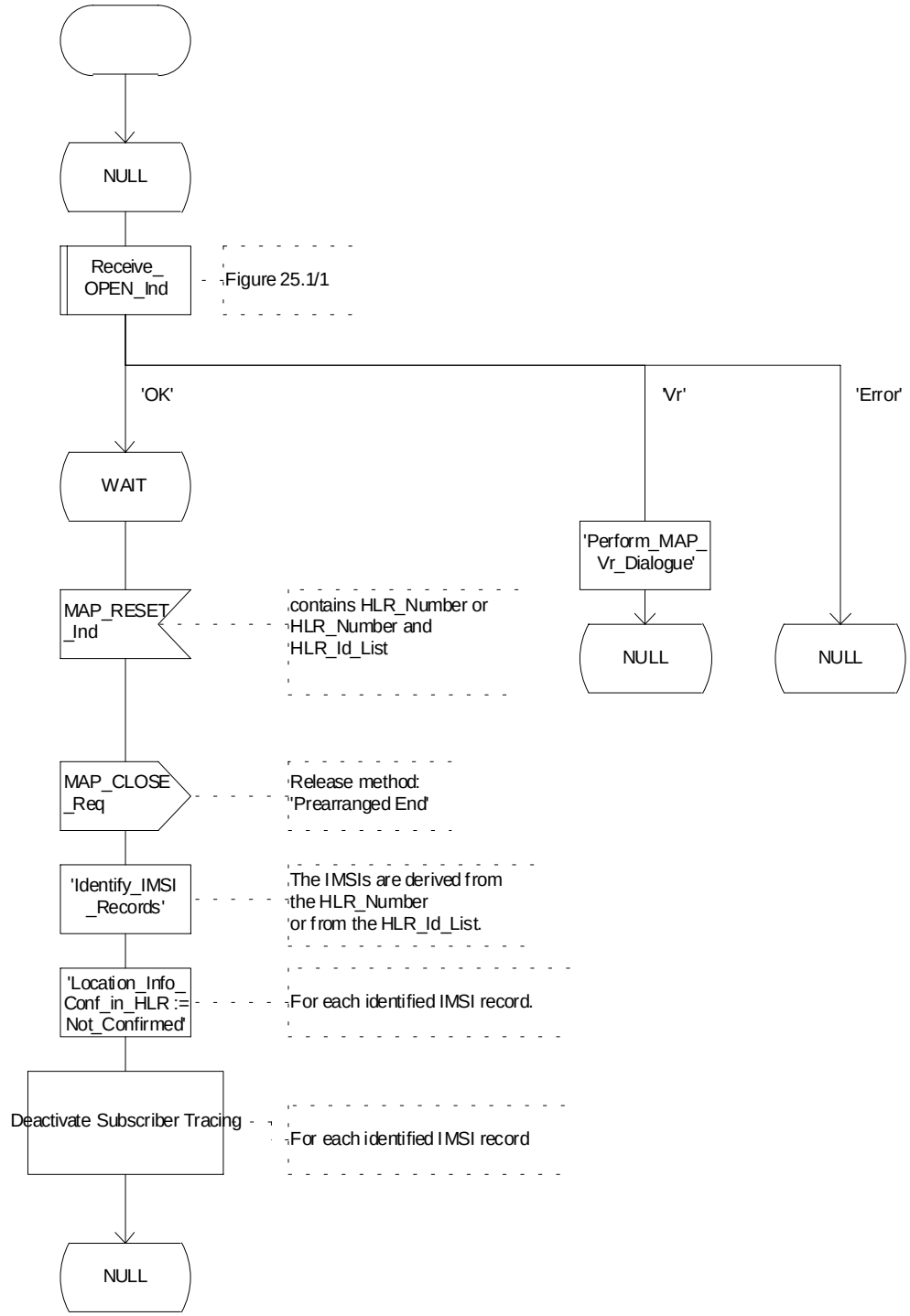


Figure 19.3/8: Process REC_RESET_IN_SGSN

19.3.3 VLR restoration: the restore data procedure in the HLR

The MAP_RESTORE_DATA procedure in the HLR (Process RESTORE_DATA_HLR) is described in this clause; the corresponding procedure in the VLR (RESTORE_DATA_VLR) is described in clause 21.2.4.

The process RESTORE_DATA_HLR makes use of the following macros:

- Receive_Open_Ind clause 25.1.1;
- Check_Indication clause 25.2.1;
- Insert_Subs_Data_Framed_HLR clause 19.4.

The MAP_RESTORE_DATA service is invoked by the VLR after provision of a roaming number in response to a MAP_PROVIDE_ROAMING_NUMBER indication for an unidentified MS (i.e. IMSI unknown in VLR), or for a known MS whose IMSI record is marked as "Not Confirmed" by the indicator "Confirmed by HLR" (see 4 in figure 19.3/1). The process RESTORE_DATA_VLR is shown in figure 21.2/6.

The restore data process in the HLR is activated by receipt of a MAP_RESTORE_DATA indication from the VLR (see figure 19.3/6). If there is a parameter problem in the indication, either of the errors "Unexpected Data Value" or "Data Missing" is returned in the MAP_RESTORE_DATA response; if the subscriber is not known in the HLR, the error "Unknown Subscriber" is returned in the MAP_RESTORE_DATA response. In all of these cases the process in the HLR terminates.

If the MAP_RESTORE_DATA indication is accepted and if the LMSI is received, the HLR updates the LMSI for the IMSI received in the MAP_RESTORE_DATA indication. For this IMSI the HLR sets "subscriber-tracing-not-active-in-VLR" and checks whether tracing is required. This check is handled by the macro "Control_Tracing_HLR" that is described in clause 25.9. Thereafter, the macro "Insert_Subs_Data_Framed_HLR" that is described in clause 19.4 is invoked. The outcome of the macro Insert_Subs_Data_Framed_HLR is one of:

- abort, in which case the process terminates;
- error, in which case the HLR returns the error "System Failure" in the MAP_RESTORE_DATA response, and the process terminates;
- OK, indicating successful outcome of downloading the subscriber data to the VLR.

After successful completion of the framed MAP_INSERT_SUBSCRIBER_DATA procedure, the HLR Number and, if applicable, the "MS Not Reachable Flag" which is used for SMS, are provided in the MAP_RESTORE_DATA response.

Upon receipt of the MAP_RESTORE_DATA confirmation, the VLR behaves as described in clause 21.2.4, figure 21.2/6.

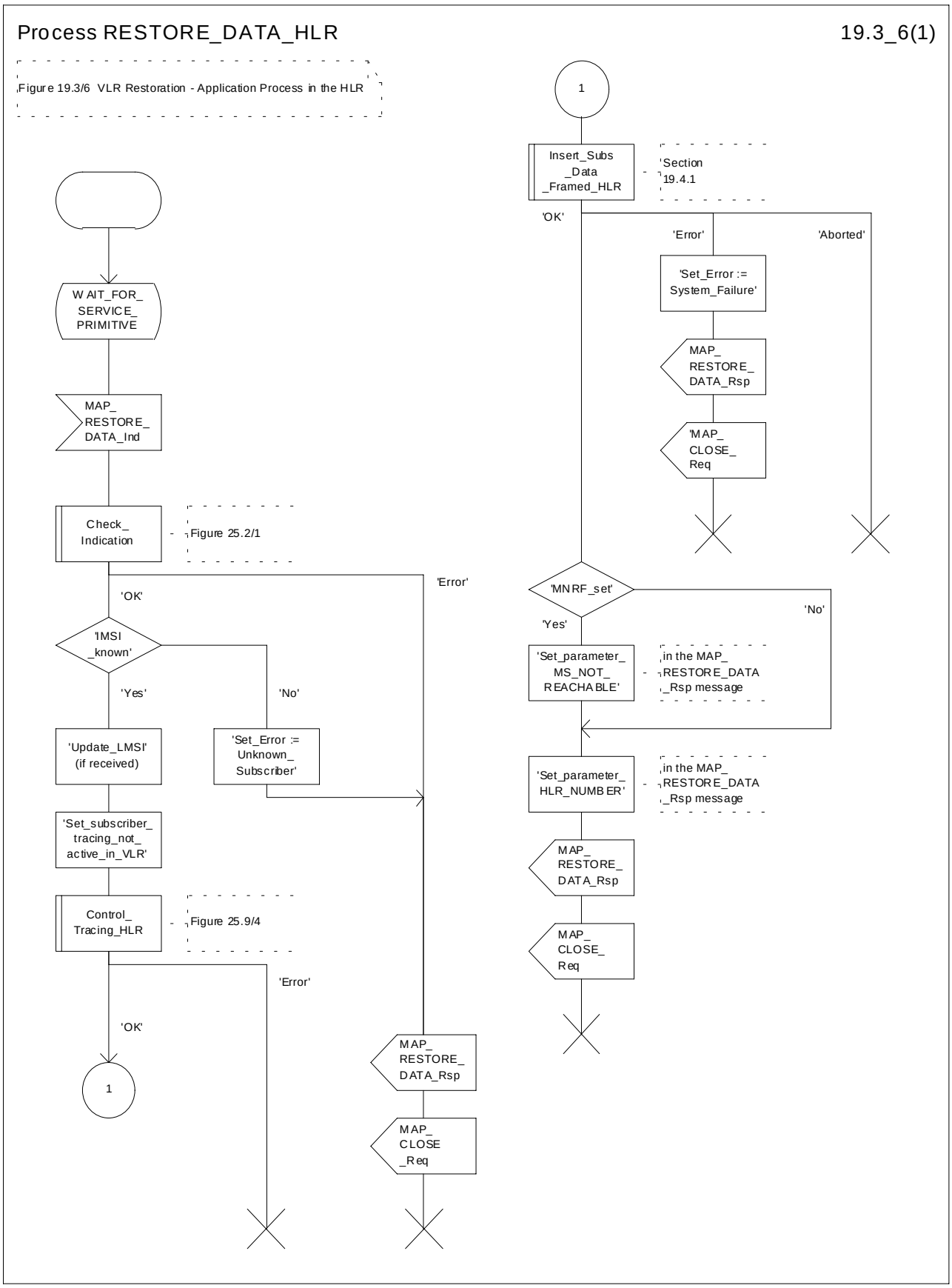


Figure 19.3/6: Process RESTORE_DATA_HLR

19.4 Macro Insert_Subs_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_Subs_Data" (see clause 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 clause 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 3GPP 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.

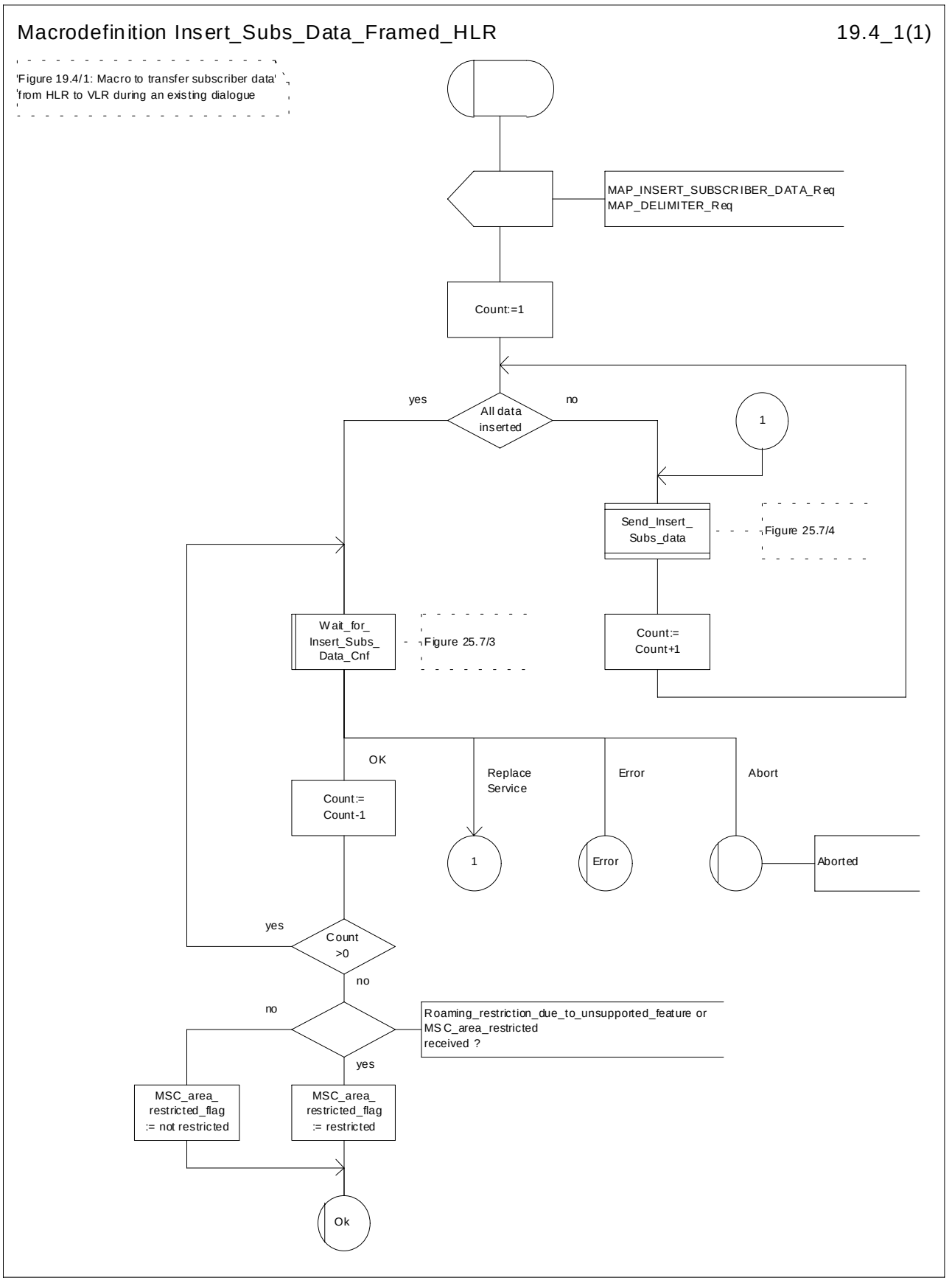


Figure 19.4/1: Macro Insert_Subs_Data_Framed_HLR

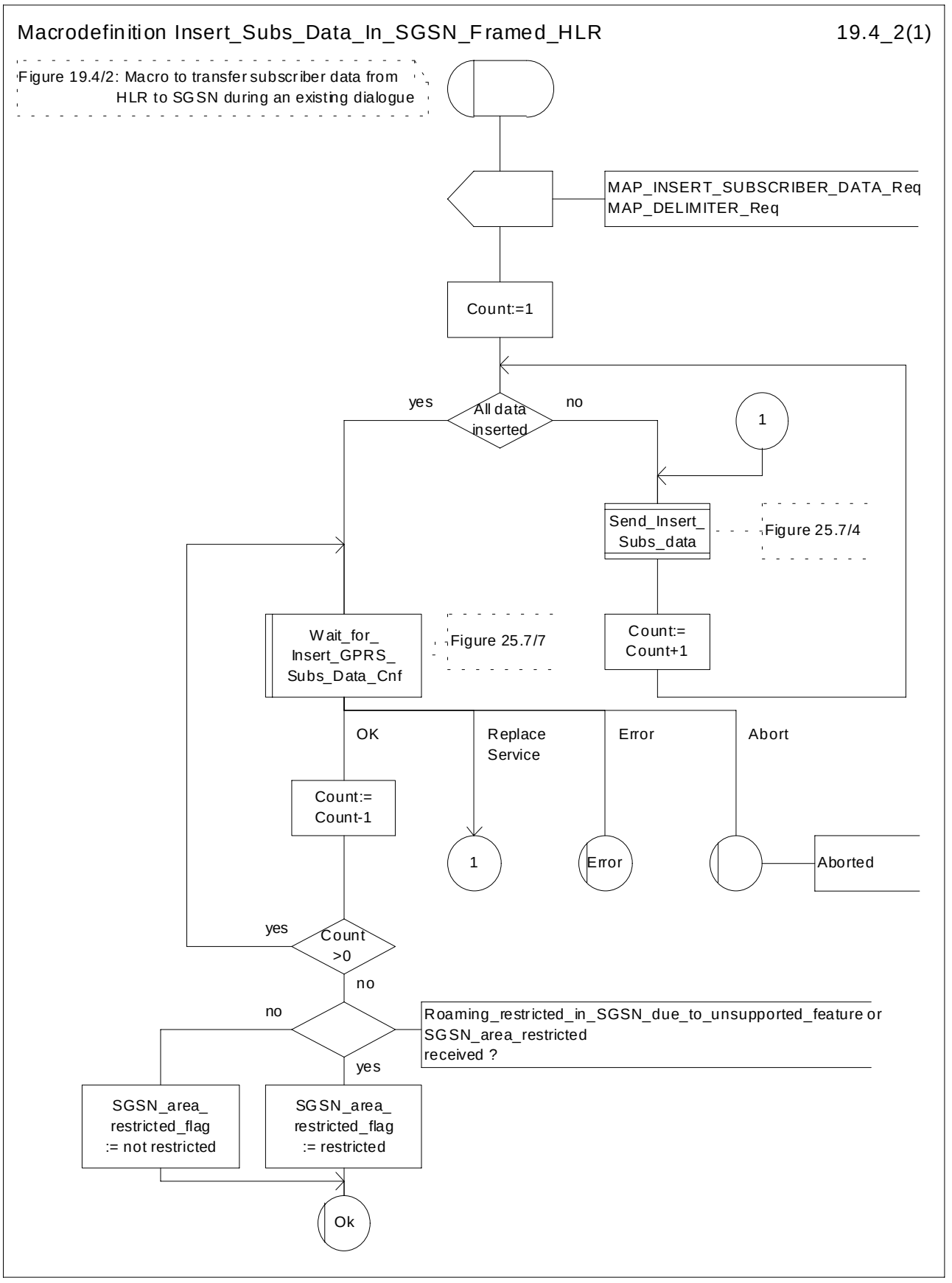


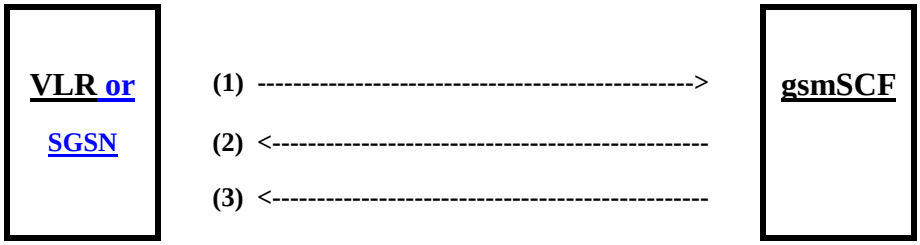
Figure 19.4/2: Macro Insert_Subs_Data_In_SGSN_Framed_HLR

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 or SGSN to gsmSCF).
(2) Report Mobility Management Event Result (gsmSCF to VLR or SGSN).
(3) Report Mobility Management Event Error (gsmSCF to VLR or SGSN).

Figure 19.5/1: Interfaces and MAP Messages for Mobility Management Event notifications

19.5.2 Process in the VLR/SGSN

The Mobility Management event notification procedure in the VLR/SGSN is triggered when the following conditions are fulfilled:

1. the VLR/SGSN 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/SGSN 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/SGSN 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/SGSN has received the RESULT or ERROR, the relationship between the VLR/SGSN and the gsmSCF is terminated. The relationship, if existing, is also terminated when the VLR/SGSN sends a TCAP P-ABORT primitive to the calling procedure or when the VLR/SGSN 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.

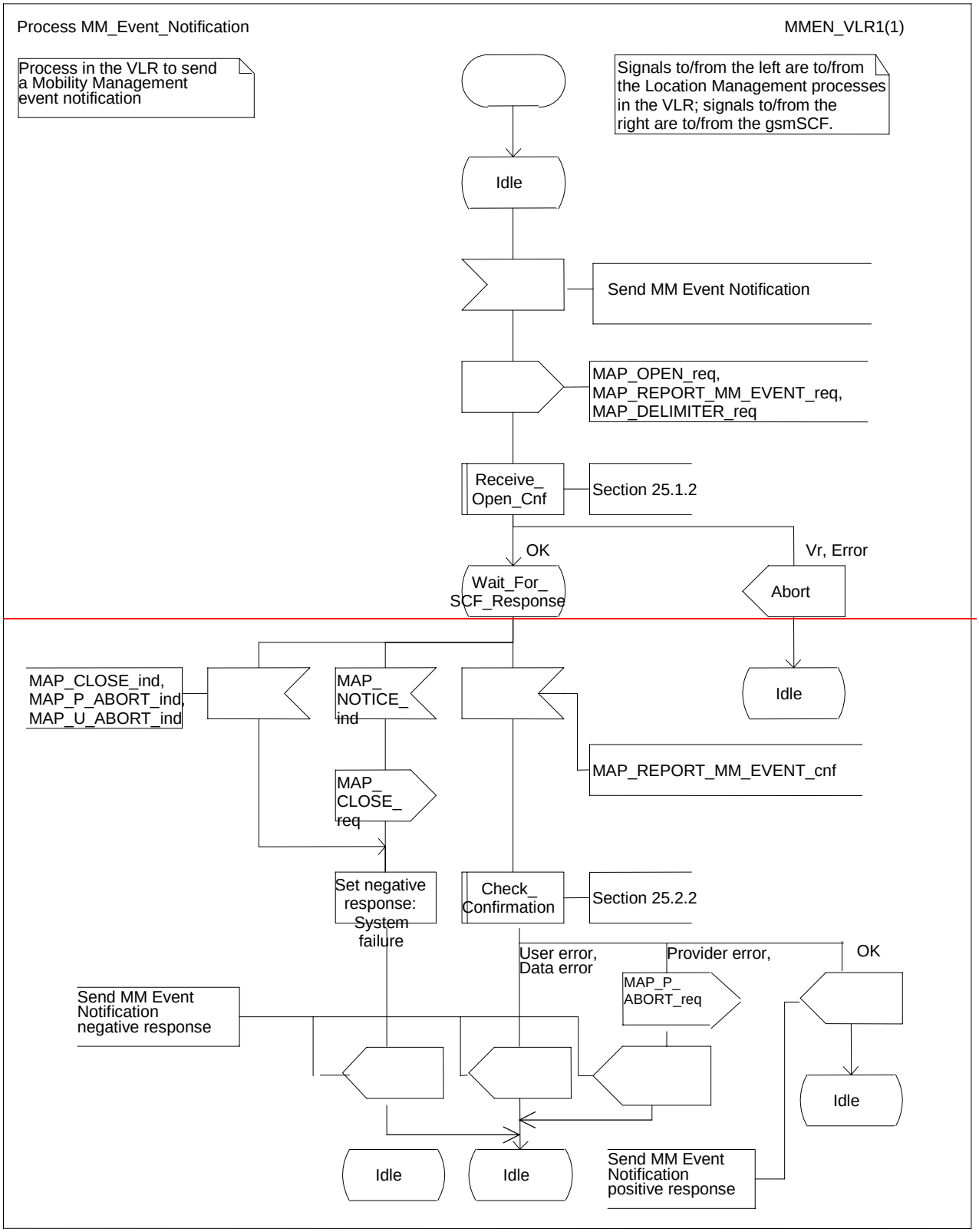


Figure 19.5/2: Process MM_Event_Notification_VLR (sheet 1 of 1)

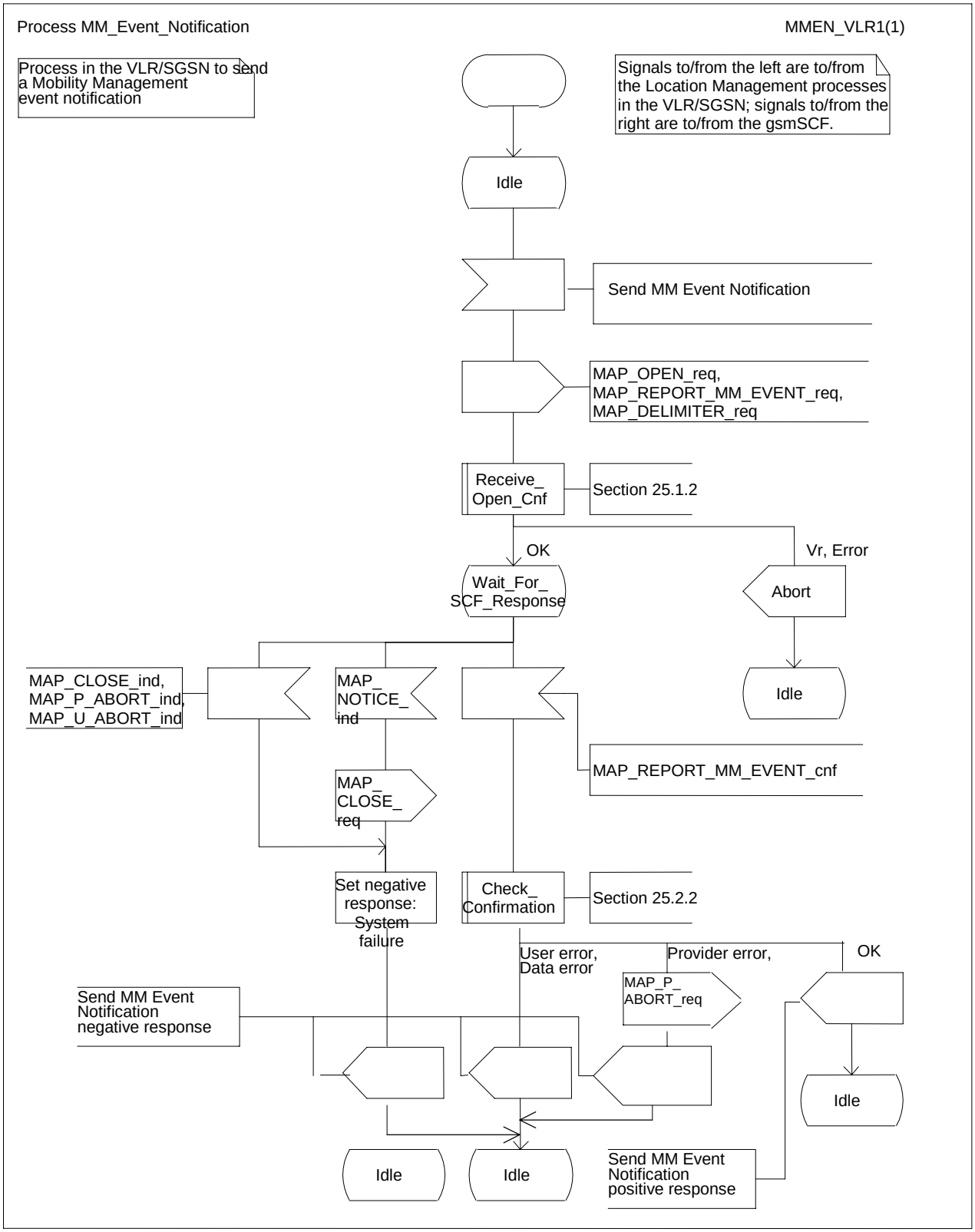


Figure 19.5/2: Process MM_Event_Notification_VLR (sheet 1 of 1)

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/SGSN.

If a negative response is received from the Service Logic, then a REPORT_MM_EVENT_ERROR is sent to the VLR/SGSN.

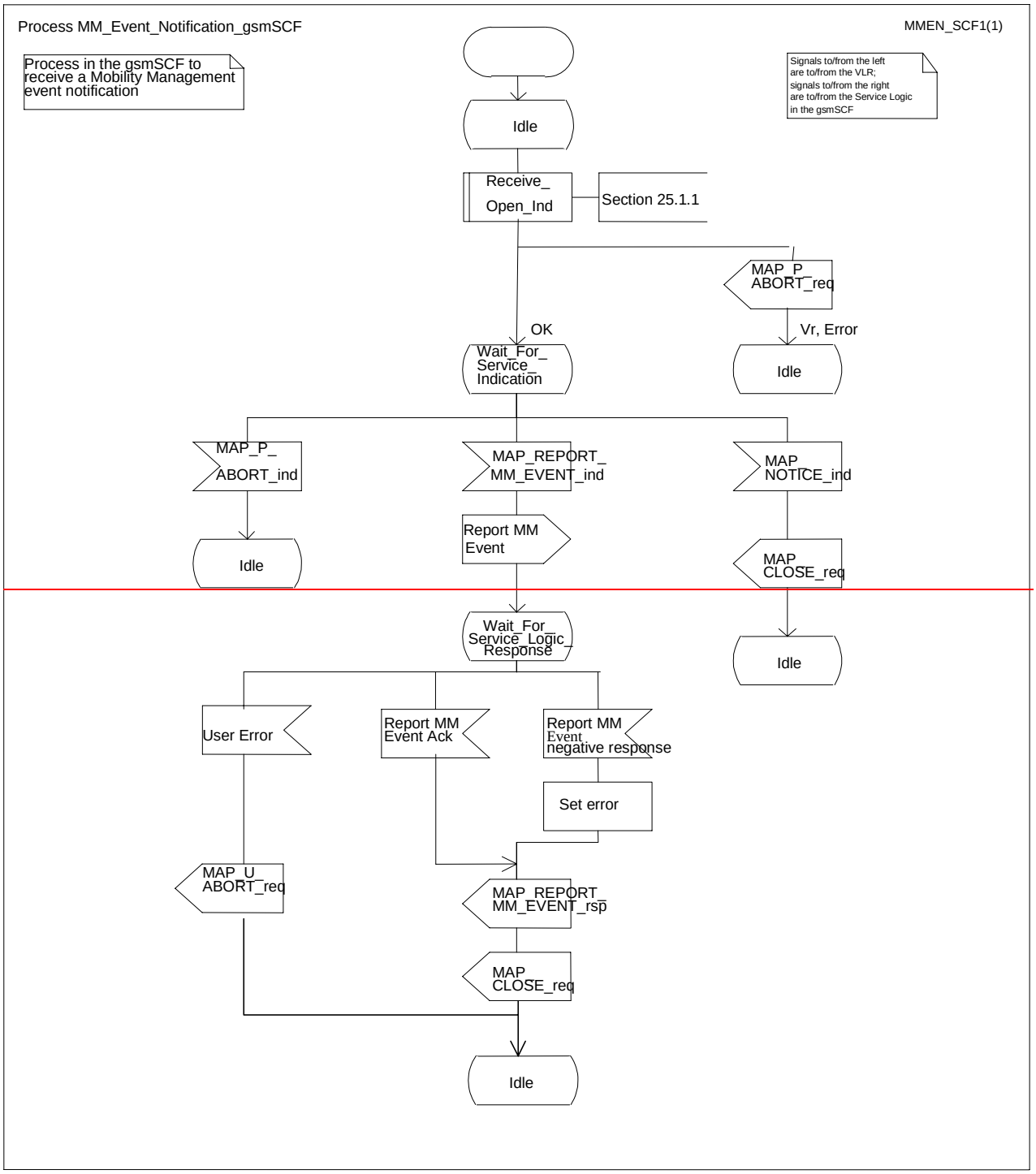
Both RESULT and ERROR are sent in a TCAP TC-END primitive. The Basic End procedure is used.

If the Service Logic returns a User Error, then a MAP U-ABORT primitive is sent to the VLR/SGSN.

The gsmSCF TCAP service may choose to abort the relationship with the VLR/SGSN by sending a TCAP P-ABORT primitive to the VLR/SGSN.

When the gsmSCF receives a TCAP P-ABORT primitive from the VLR/SGSN, 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)~~

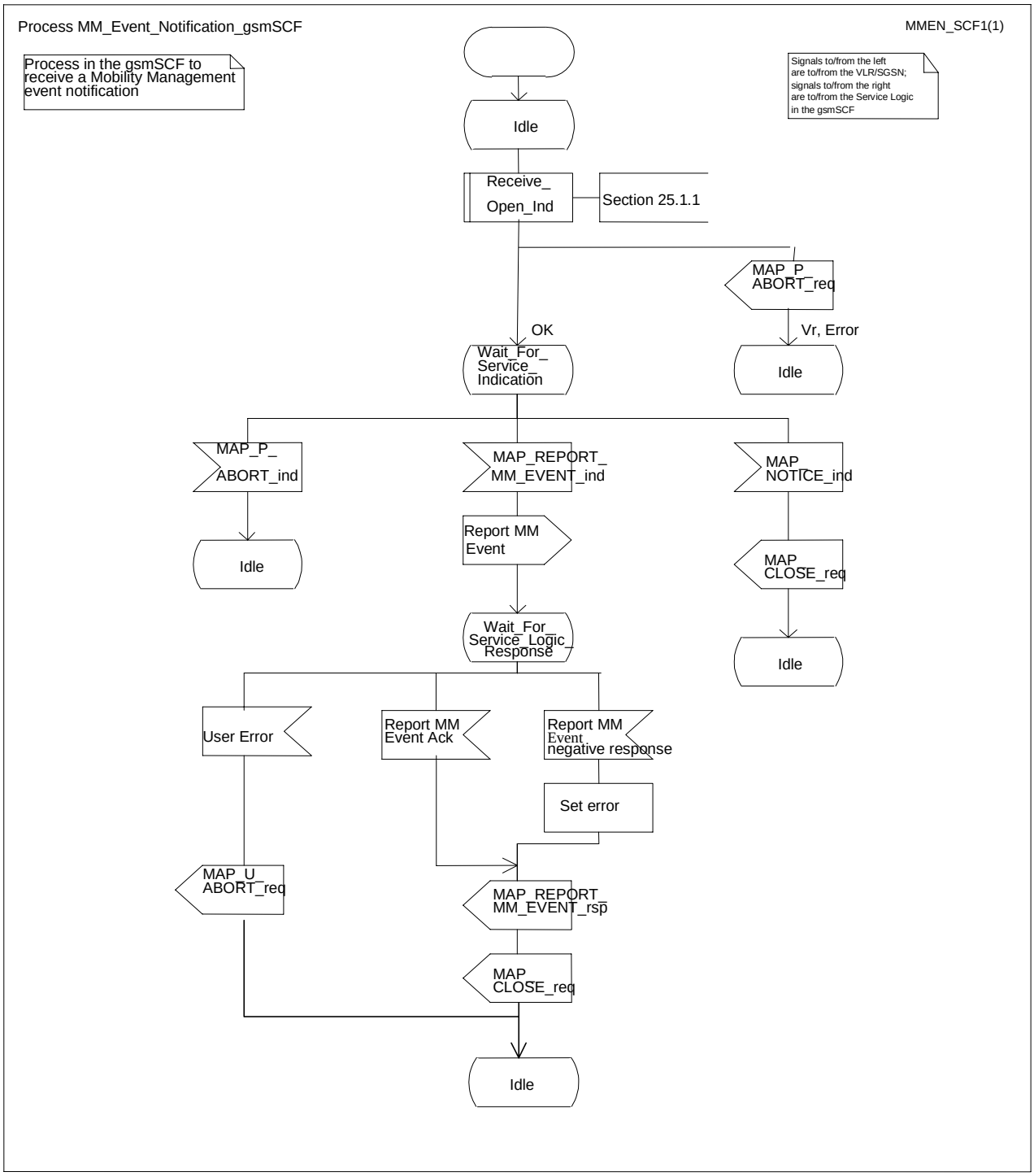


Figure 19.5/3: Process MM_Event_Notification_gsmSCF (sheet 1 of 1)

*** Next Modification ***

21 Call handling procedures

21.1 General

The MAP call handling procedures are used:

- to retrieve routeing 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 3GPP TS 23.018 [97].

The stage 2 specification for the retrieval of routeing information to handle a mobile terminating call is in 3GPP TS 23.018 [97]; modifications to this procedure for CAMEL are specified in 3GPP TS 23.078 [98], for optimal routeing of a basic mobile-to-mobile call in 3GPP TS 23.079 [99] and for CCBS in 3GPP TS 23.093 [107]. 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 3GPP TS 23.079 [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 3GPP TS 43.068 [100] and 3GPP TS 43.069 [101]. 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.

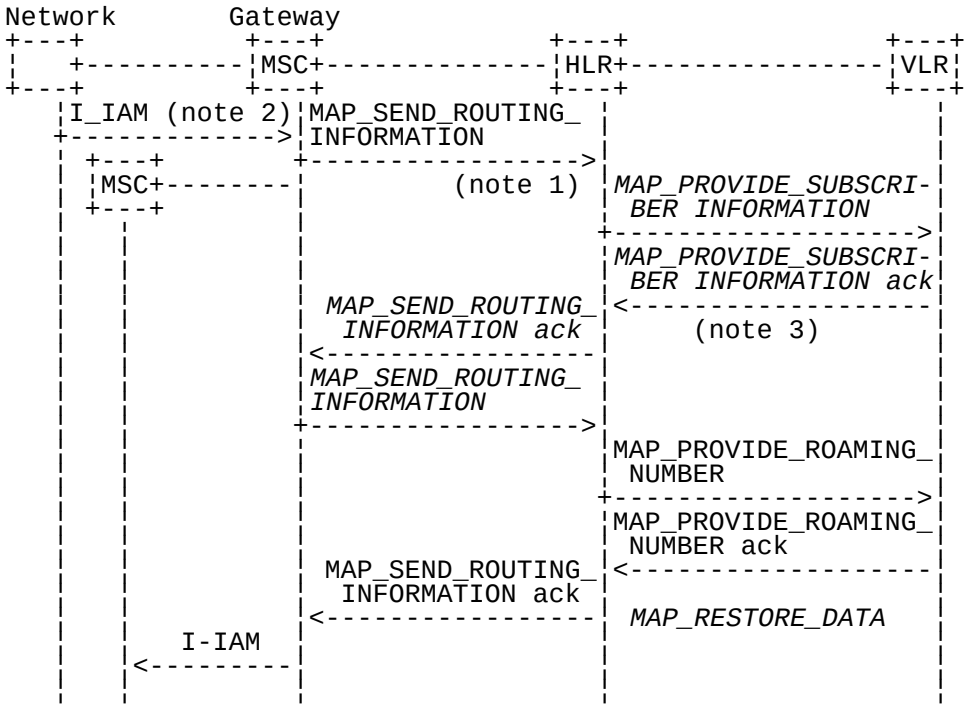
The interworking between the call handling procedures and signalling protocols other than MAP are shown in 3GPP TS 23.018, 3GPP TS 23.078 and 3GPP TS 23.079 [99].

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 3GPP TS 23.093 [107].

21.2 Retrieval of routing information

21.2.1 General

The message flows for successful retrieval of routeing 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). The message flow for successful retrieval of routeing information for a gsmSCF initiated call is shown in figure 21.2/x.



xxx = Optional Procedure

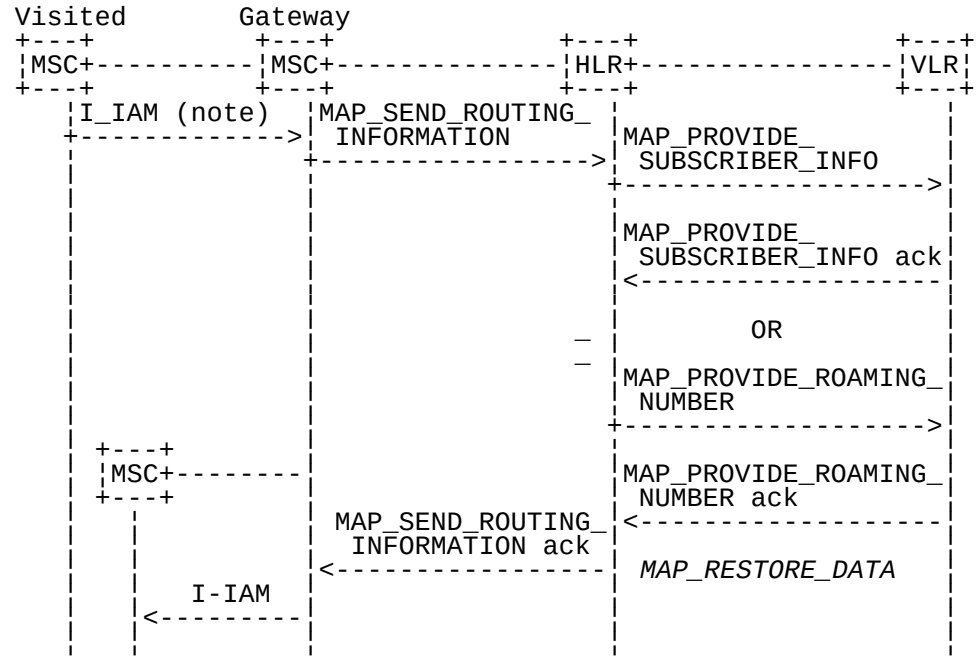
NOTE 1: This service may also be used by an ISDN exchange for obtaining routing information from the HLR.

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 3GPP TS 23.078 [98].

Figure 21.2/1: Message flow for retrieval of routeing information (non-optimally routed call)



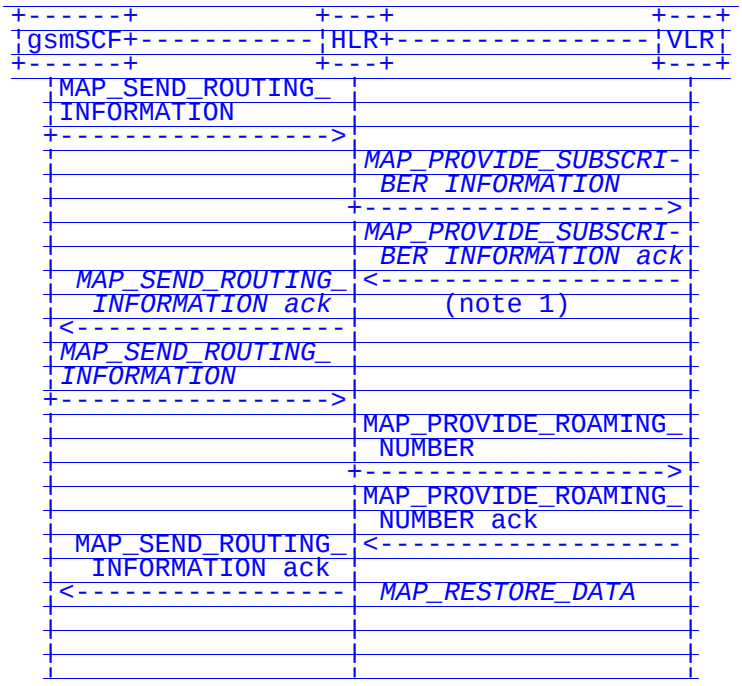
xxx = Optional Procedure

NOTE 1: 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.

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 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)



xxx = Optional Procedure

NOTE 1: 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 03.78~~3GPP TS 23.078 [98].

Figure 21.2/x: Message flow for retrieval of routeing information for a gsmSCF initiated call

The following MAP services are used to retrieve routing information:

MAP_SEND_ROUTING_INFORMATION	see clause 10.1;
MAP_PROVIDE_ROAMING_NUMBER	see clause 10.2;
MAP_PROVIDE_SUBSCRIBER_INFO	see clause 8.11.2;
MAP_RESTORE_DATA	see clause 8.10.3.

21.2.2 Process in the GMSC

The MAP process in the GMSC to retrieve routeing information for a mobile terminating call is shown in figure 21.2/3. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see clause 25.1.2;
Check_Confirmation	see clause 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 routeing 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 routeing 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] 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 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.

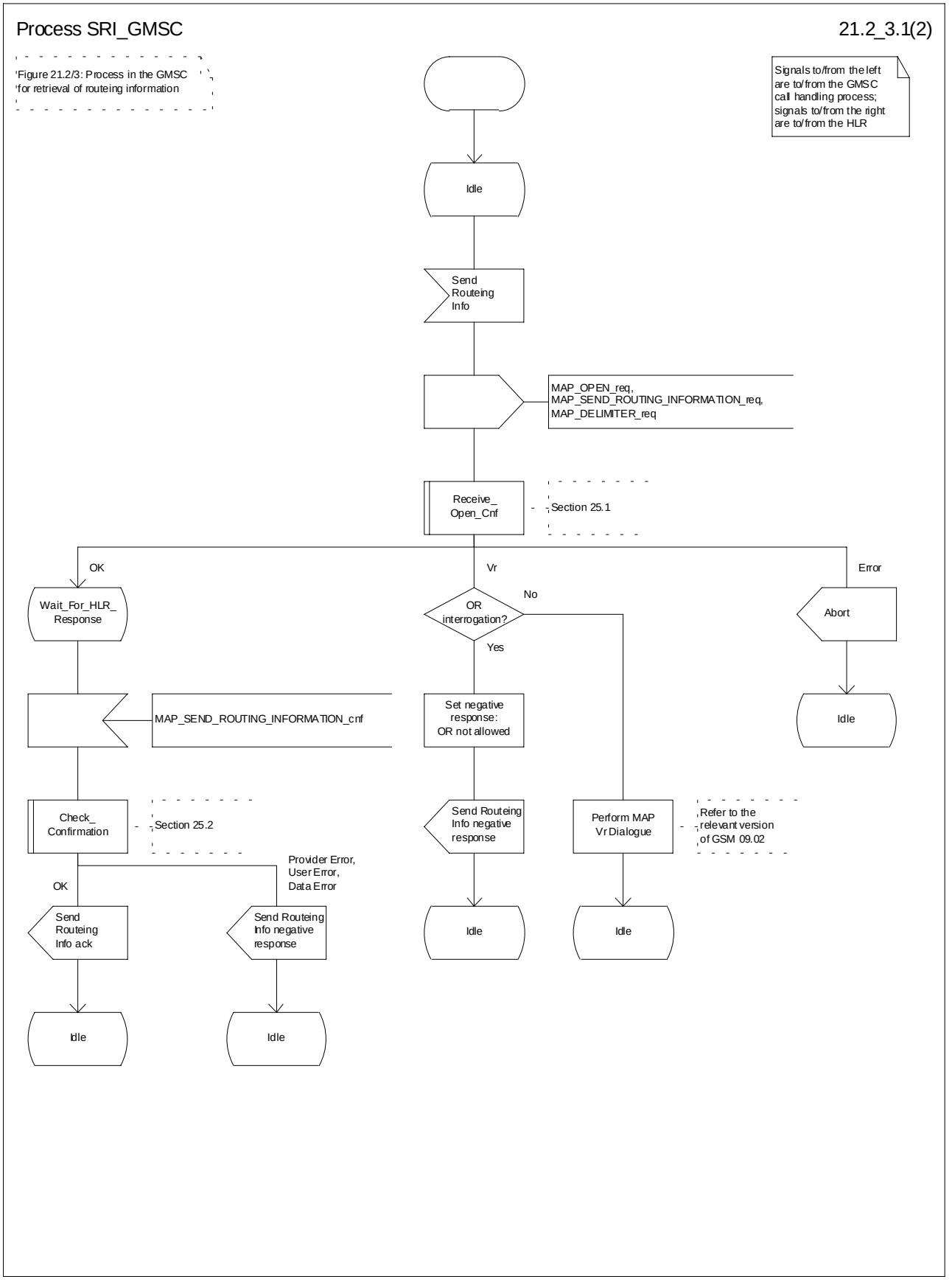


Figure 21.2/3 (sheet 1 of 2): Process SRI_GMSC

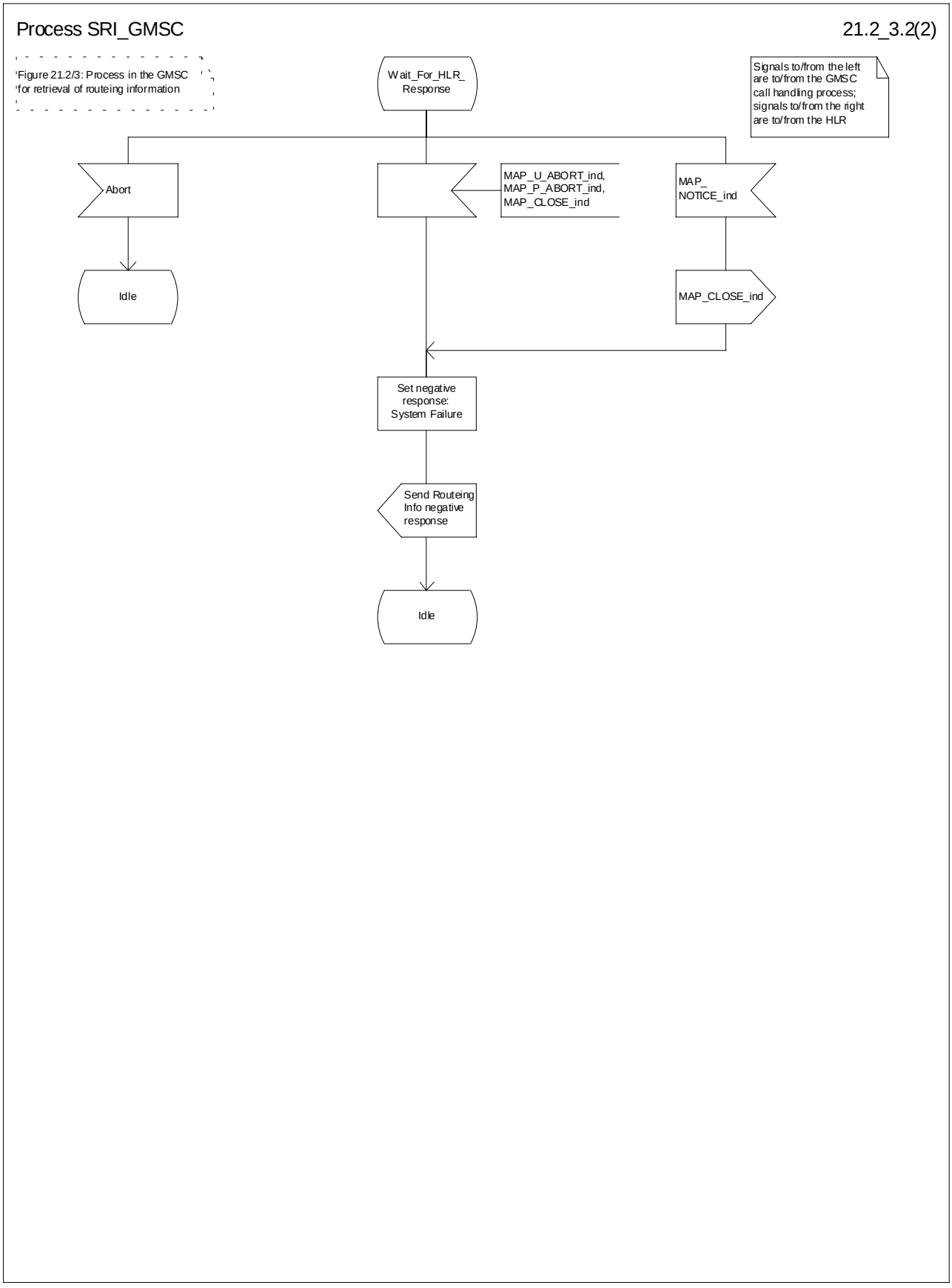


Figure 21.2/3 (sheet 2 of 2): Process SRI_GMSC

21.2.3 Procedures in the HLR

The MAP process in the HLR to retrieve routeing information for a mobile terminating call is shown in figure 21.2/4. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see clause 25.1.1;
Receive_Open_Cnf	see clause 25.1.2;
Check_Confirmation	see clause 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 Routeing Info request to the call handling process in the HLR, and waits for a response. The Send Routeing 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 Routeing Info ack, the MAP process constructs a MAP_SEND_ROUTING_INFORMATION service response containing the routeing information contained in the Send Routeing 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], 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 HLR performs the earlier version MAP dialogue as specified in [51] 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.

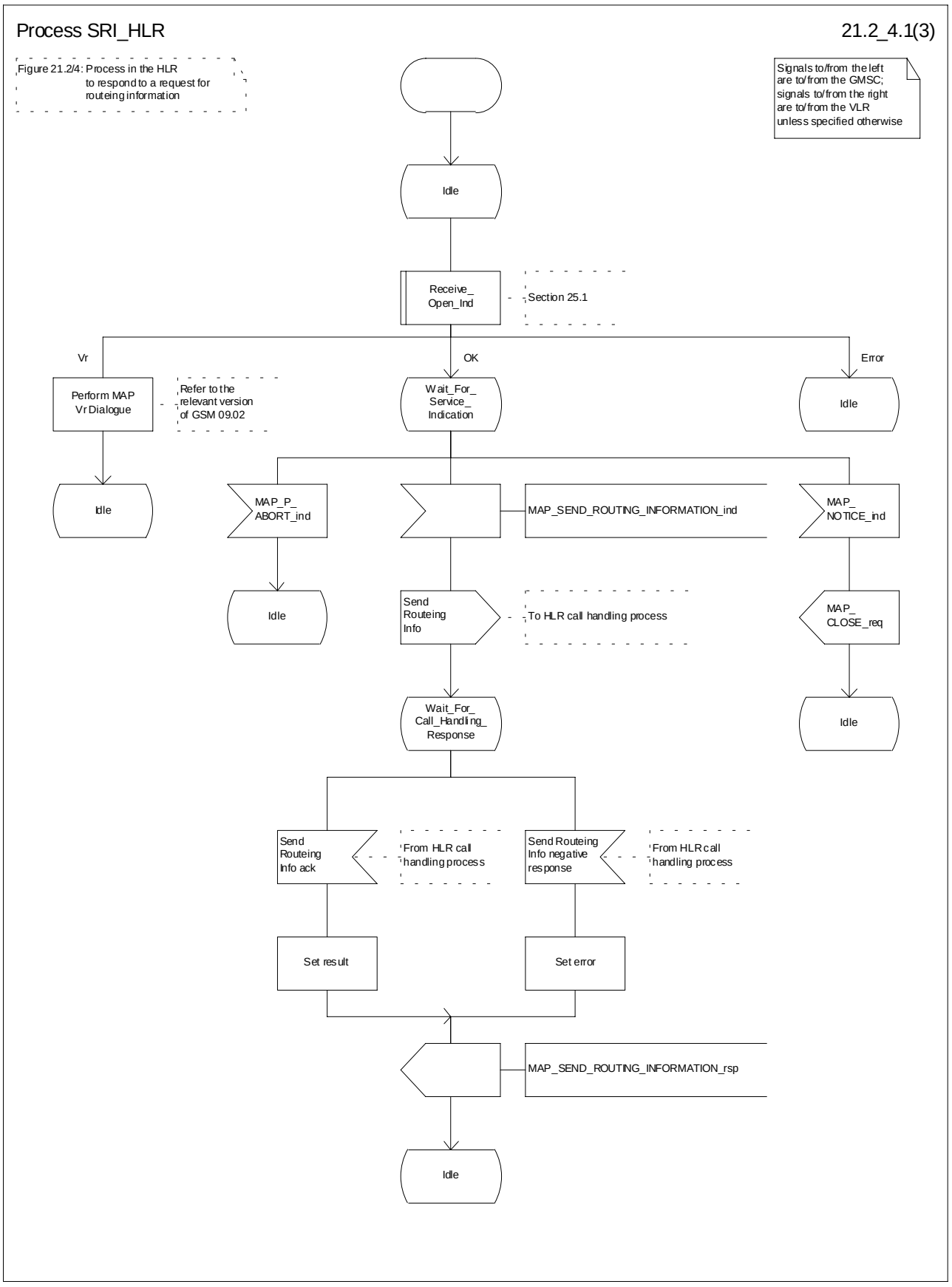


Figure 21.2/4 (sheet 1 of 3): Process SRI_HLR

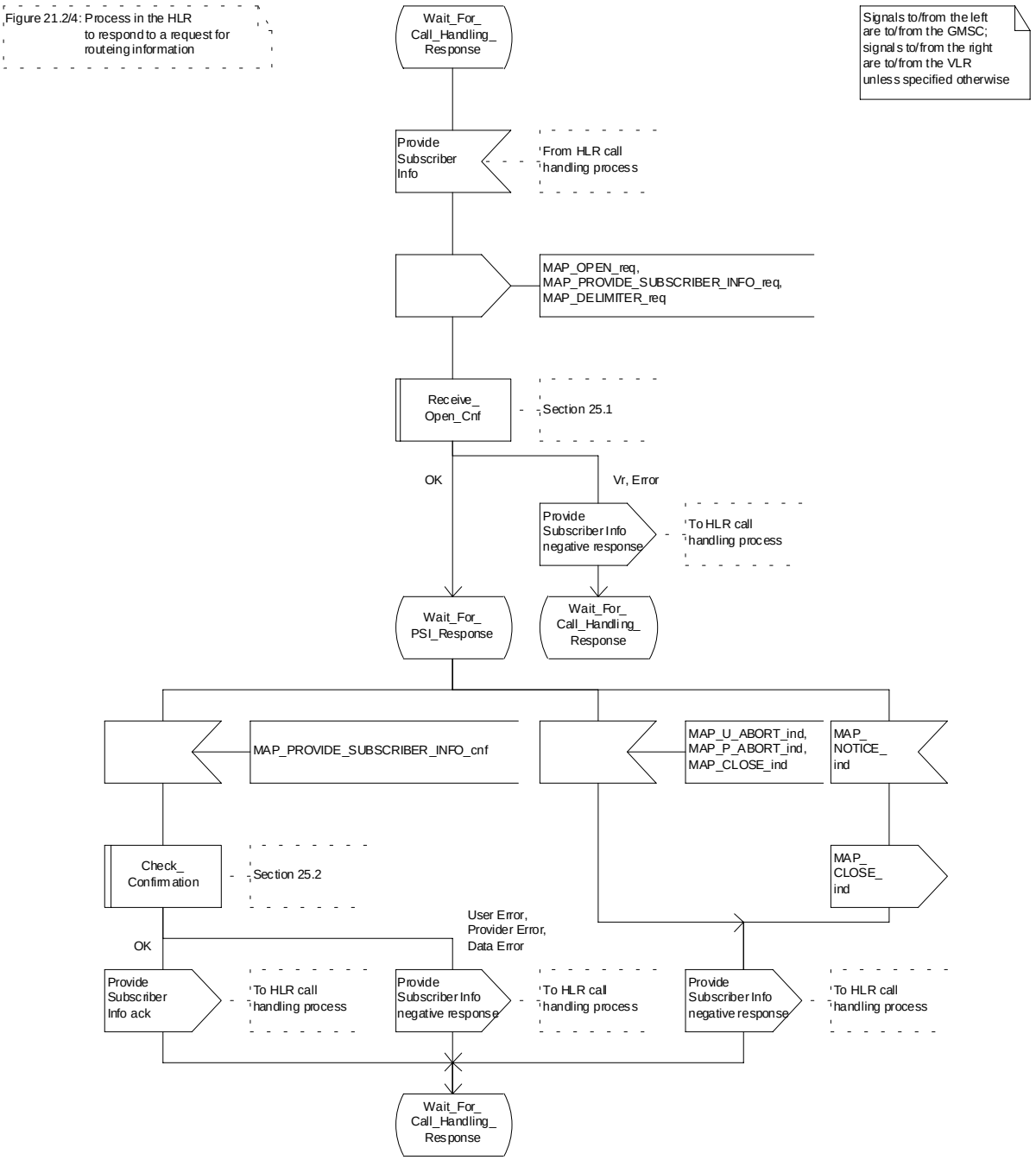


Figure 21.2/4 (sheet 2 of 3): Process SRI_HLR

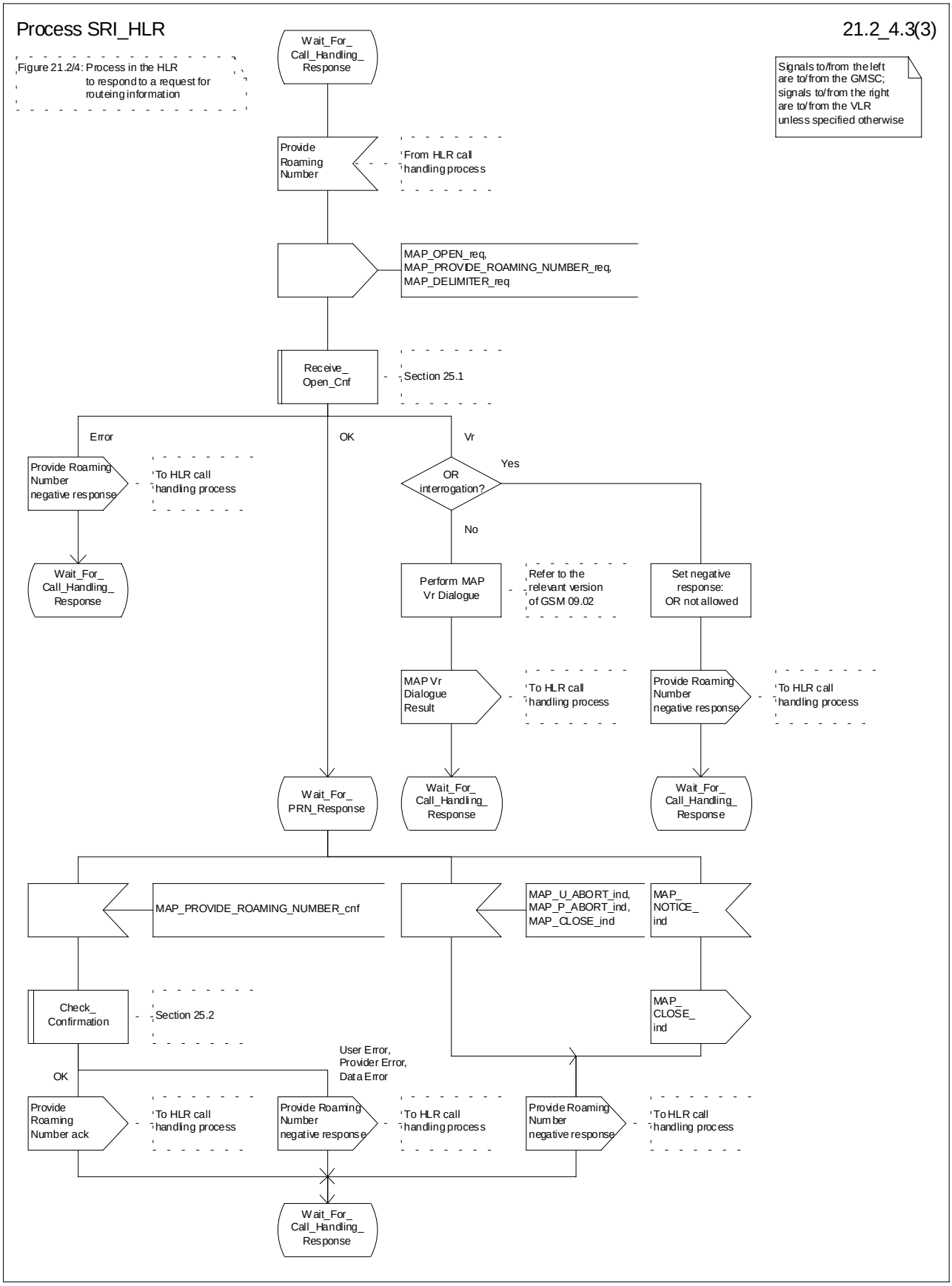


Figure 21.2/4 (sheet 3 of 3): Process SRI_HLR

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 clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 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 VLR performs the earlier version MAP dialogue as specified in [51] 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.

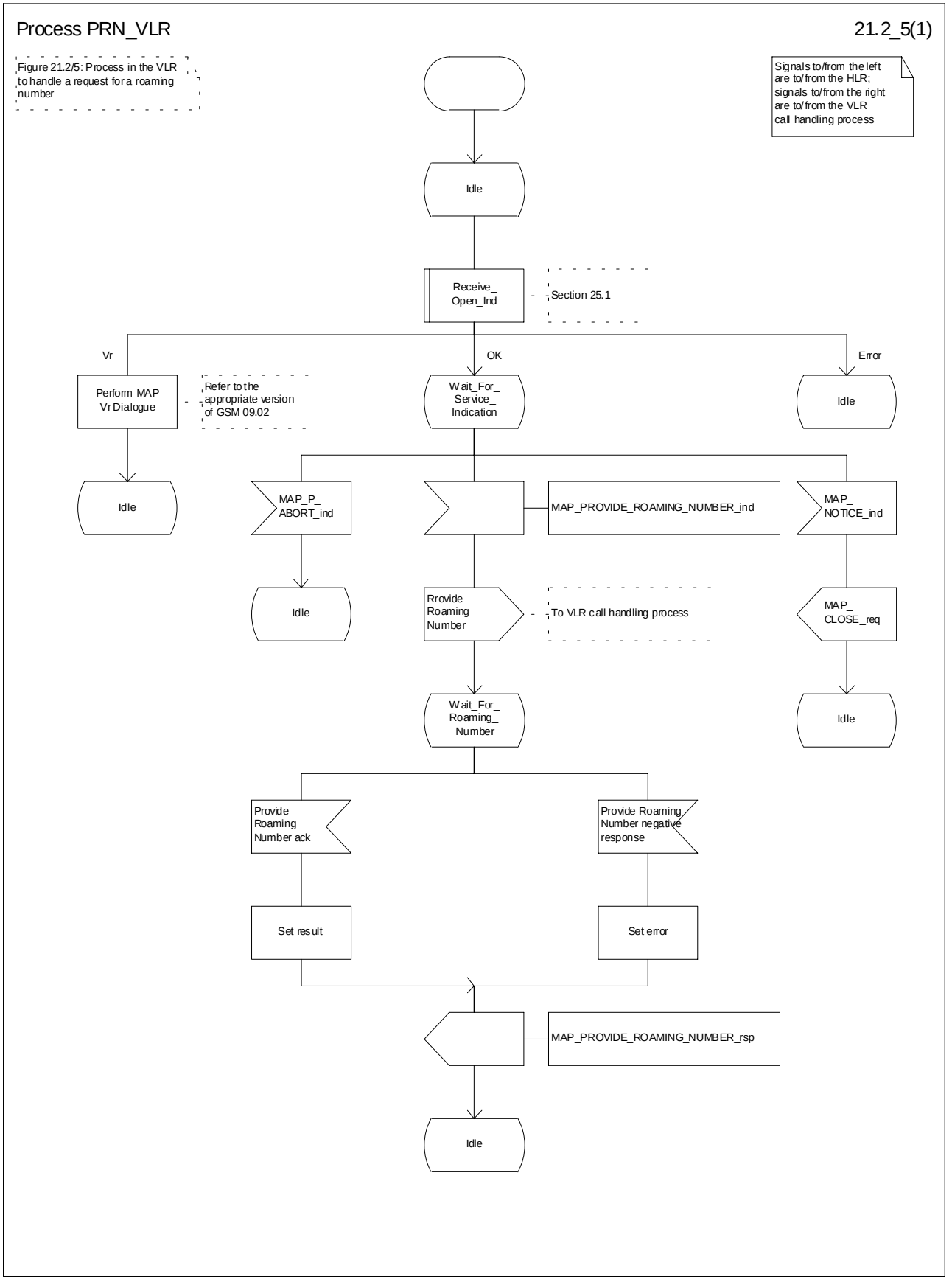


Figure 21.2/5: Process PRN_VLR

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see clause 25.1.2;
Check_Confirmation	see clause 25.2.2;
Insert_Subs_Data_VLR	see clause 25.7.1;
Activate_Tracing_VLR	see clause 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_Subs_Data_VLR as described in clause 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 clause 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] 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.

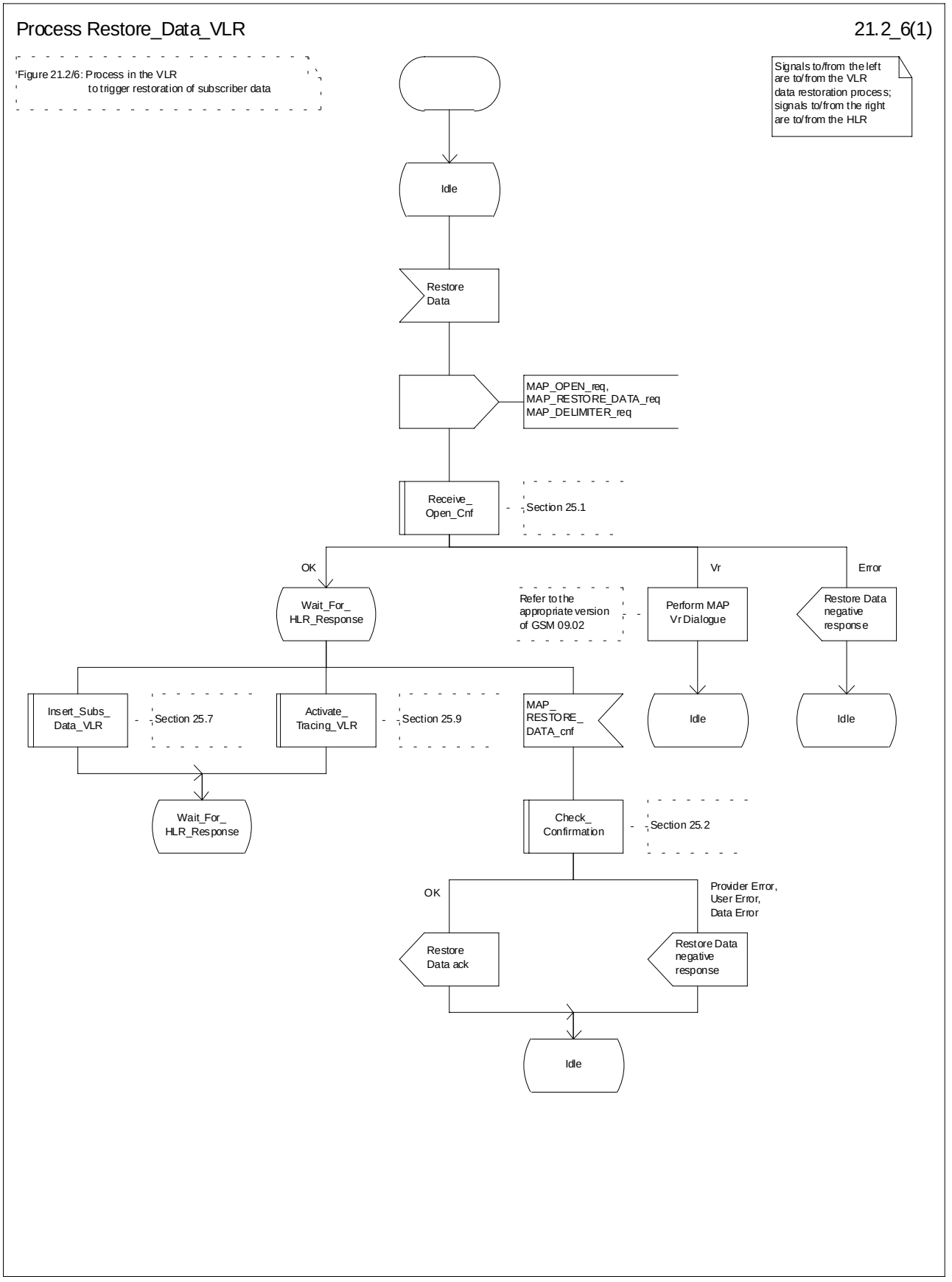


Figure 21.2/6: Process Restore_Data_VLR

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 clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 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.

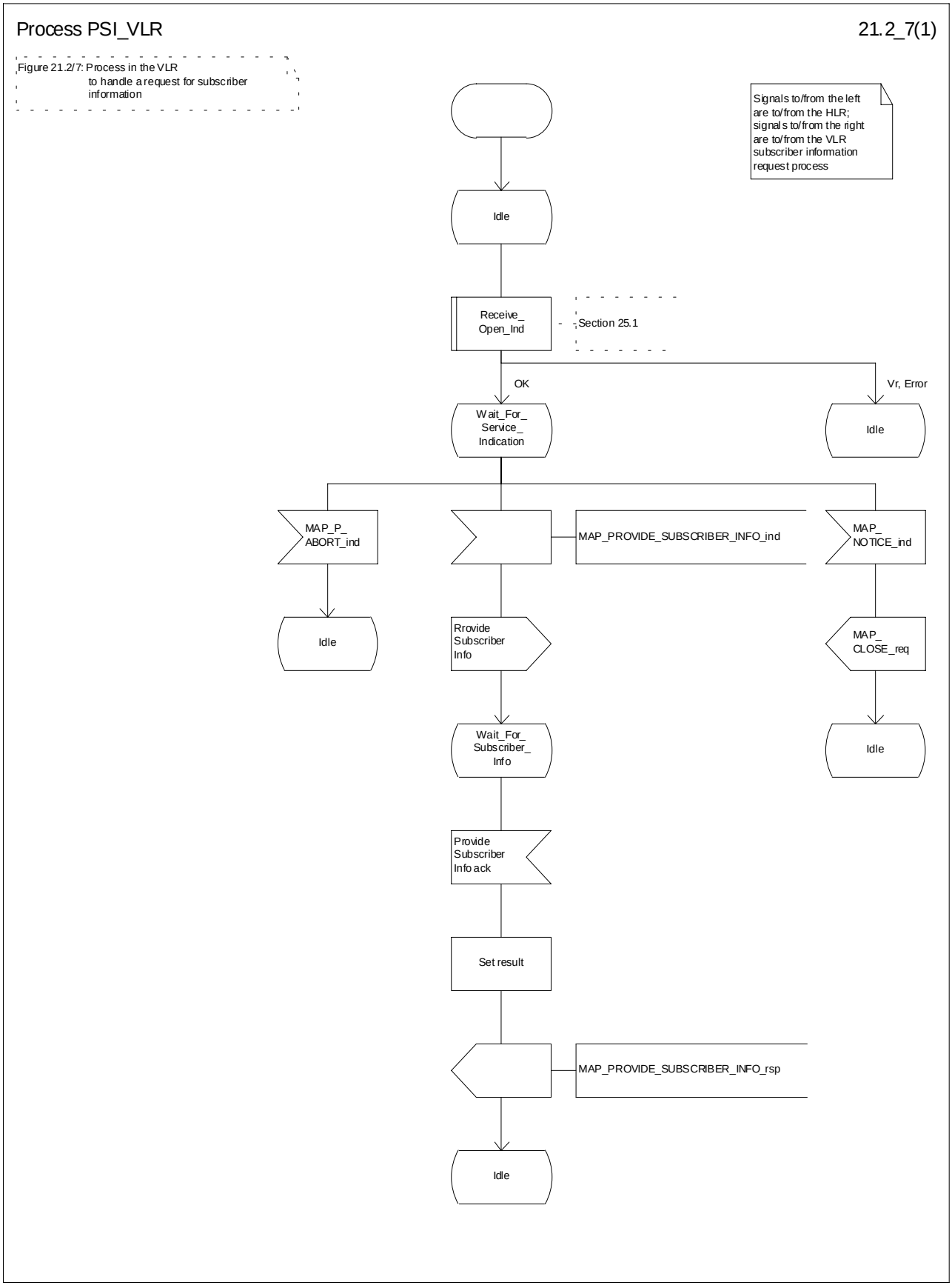


Figure 21.2/7: Process PSI_VLR

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.

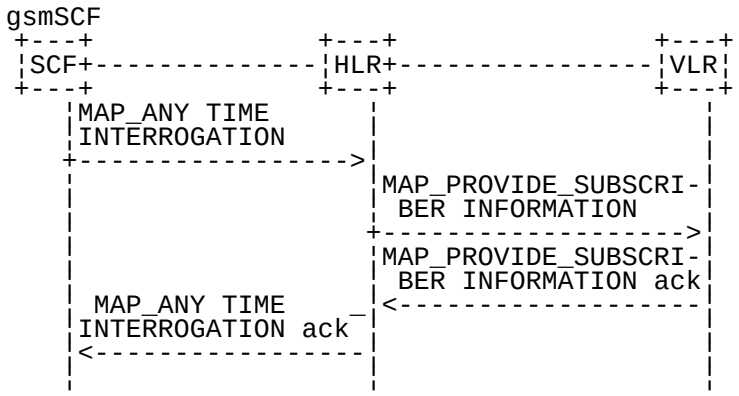


Figure 21.2/8: Message flow for any time interrogation

The following MAP services are used to retrieve routing information:

MAP_ANY_TIME_INTERROGATION see clause 8.11.1;

MAP_PROVIDE_SUBSCRIBER_INFO see clause 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 clause; the definitions of these macros can be found as follows:

Receive_Open_Ind see clause 25.1.1;

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 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 3GPP 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.

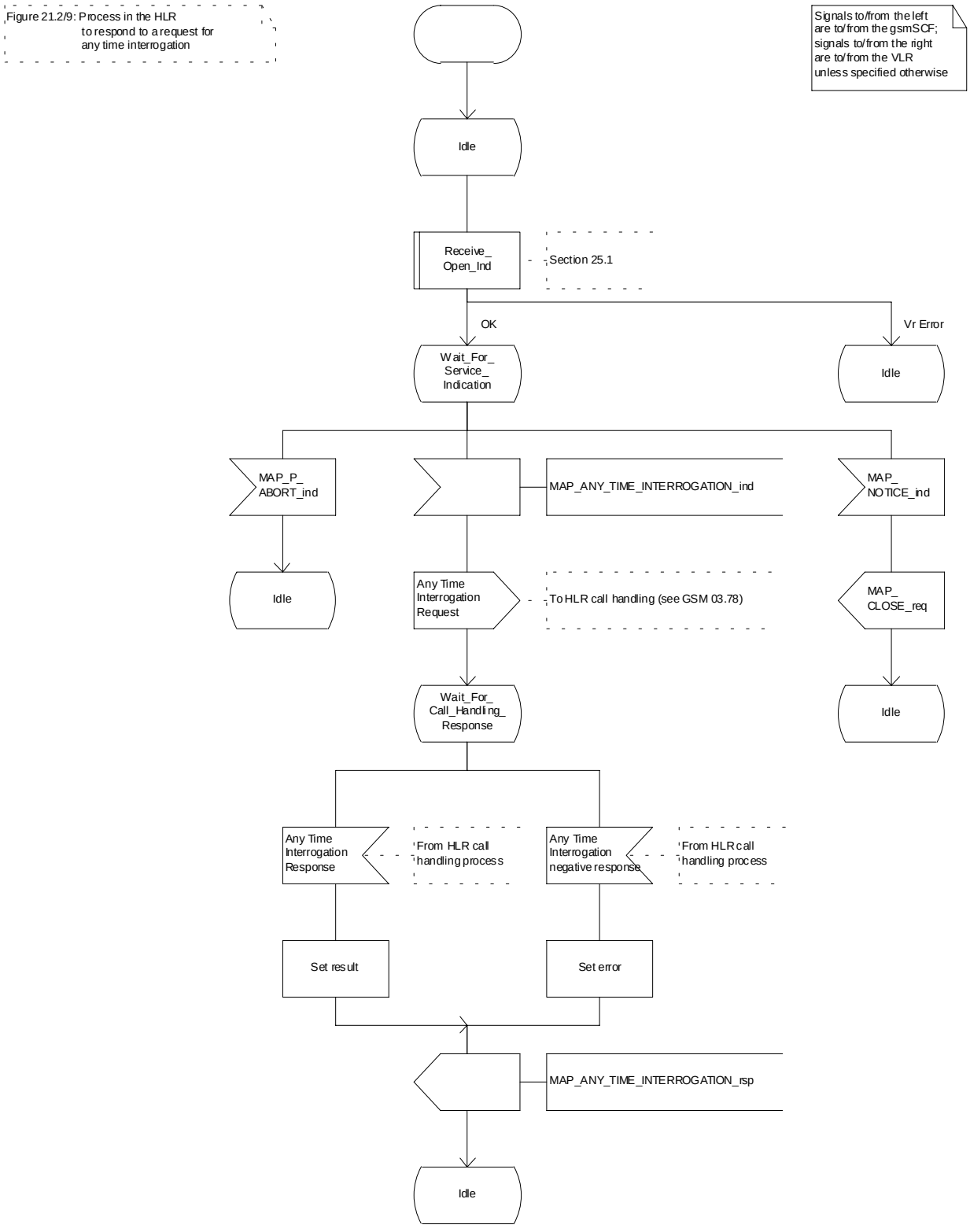


Figure 21.2/9 (sheet 1 of 2): Process ATI_HLR (New)

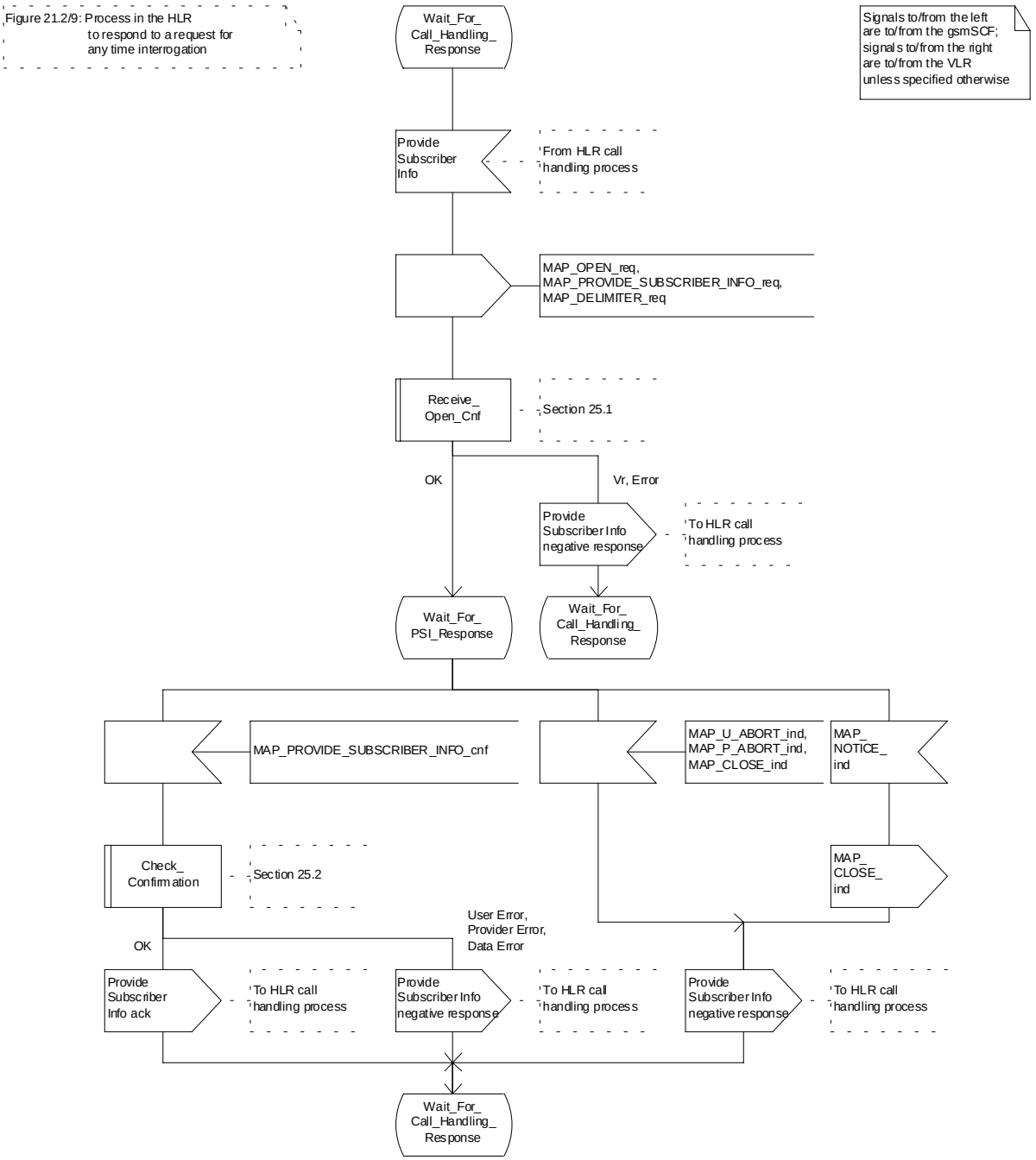
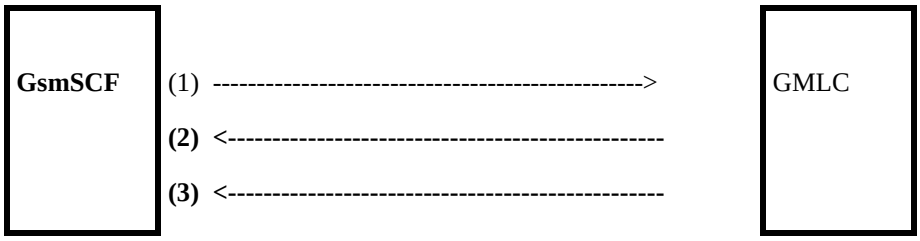


Figure 21.2/9 (sheet 2 of 2): Process ATI_HLR (New)

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 clause 8.11.1;

Figure 21.2.8/1

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.

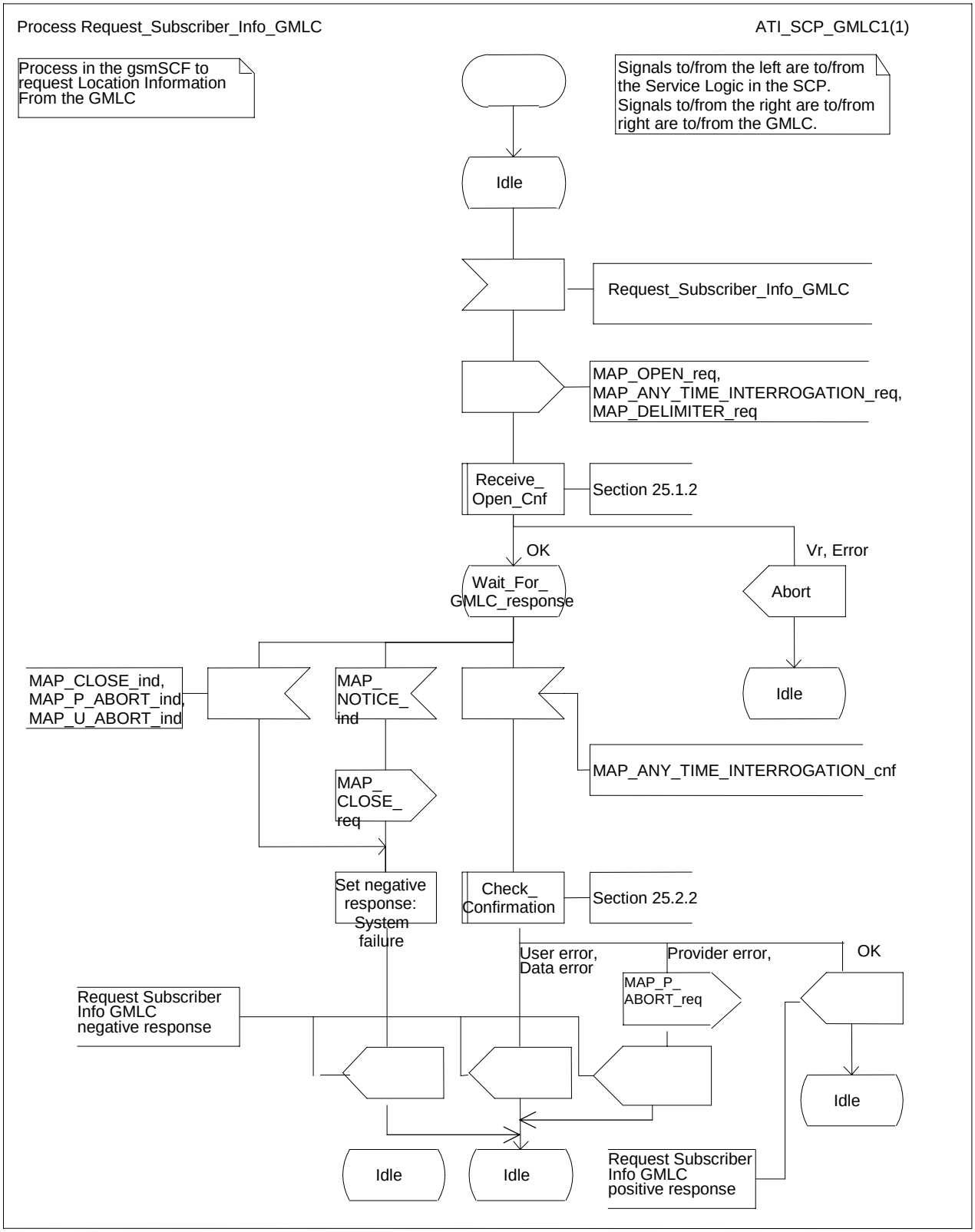


Figure 21.2.8/2: Process Request_Subscriber_Info_GMLC

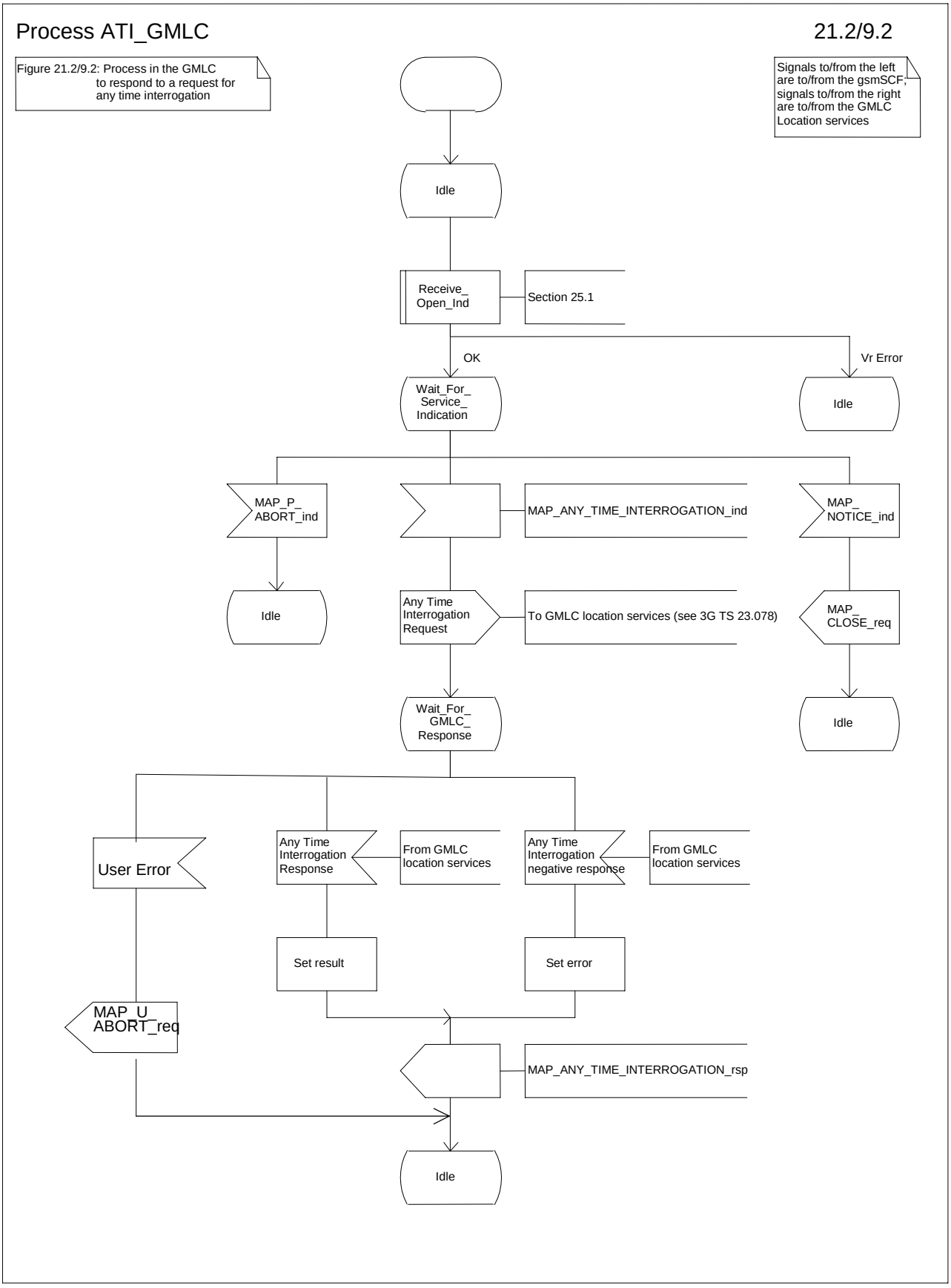


Figure 21.2.8/3: Process ATI_GMLC

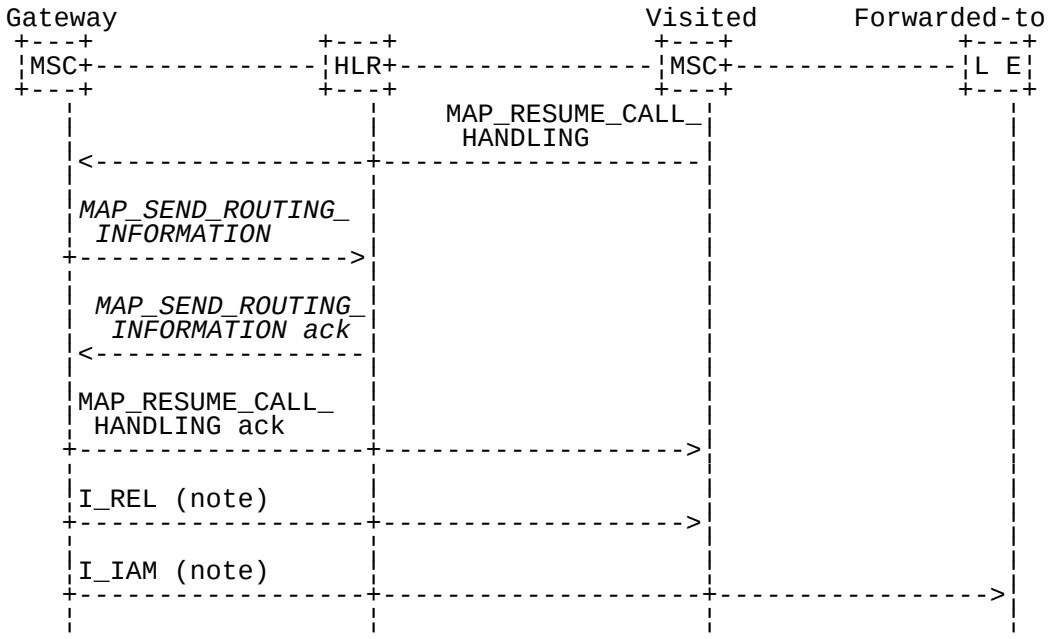
21.2.x Process in the gsmSCF

For the purposes of retrieving routeing information from the HLR, the gsmSCF takes the role of the GMSC and follows the process specified in subclause 21.2.2.

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.



xxx = Optional Procedure

NOTE: 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 routeing information that forwarding interrogation is required, the GMSC executes the Send Routeing 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 routeing information for a mobile terminating call is shown in figure 21.3/2. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 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 routeing 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 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.

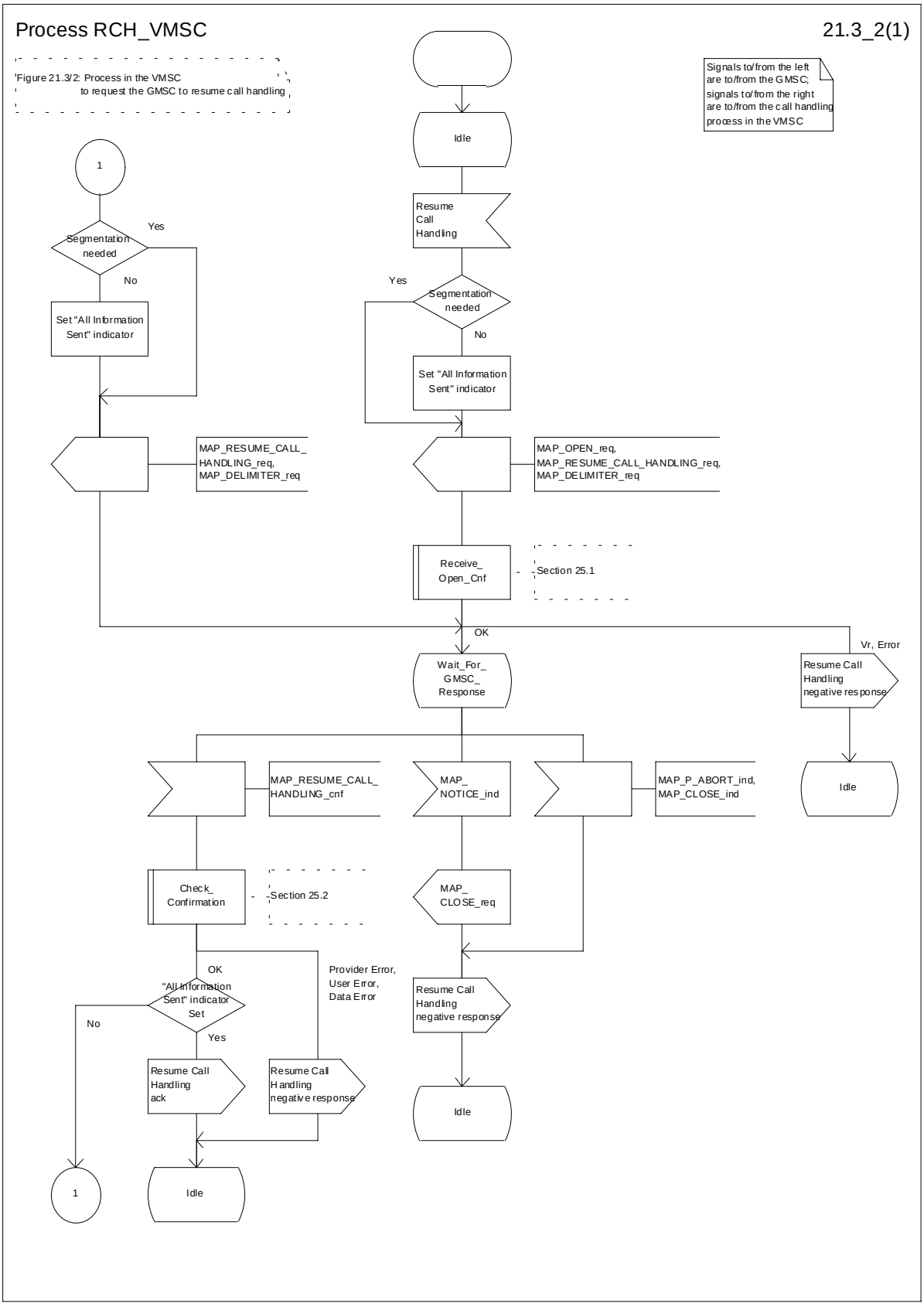


Figure 21.3/2: Process RCH_VMSC

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 clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 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.

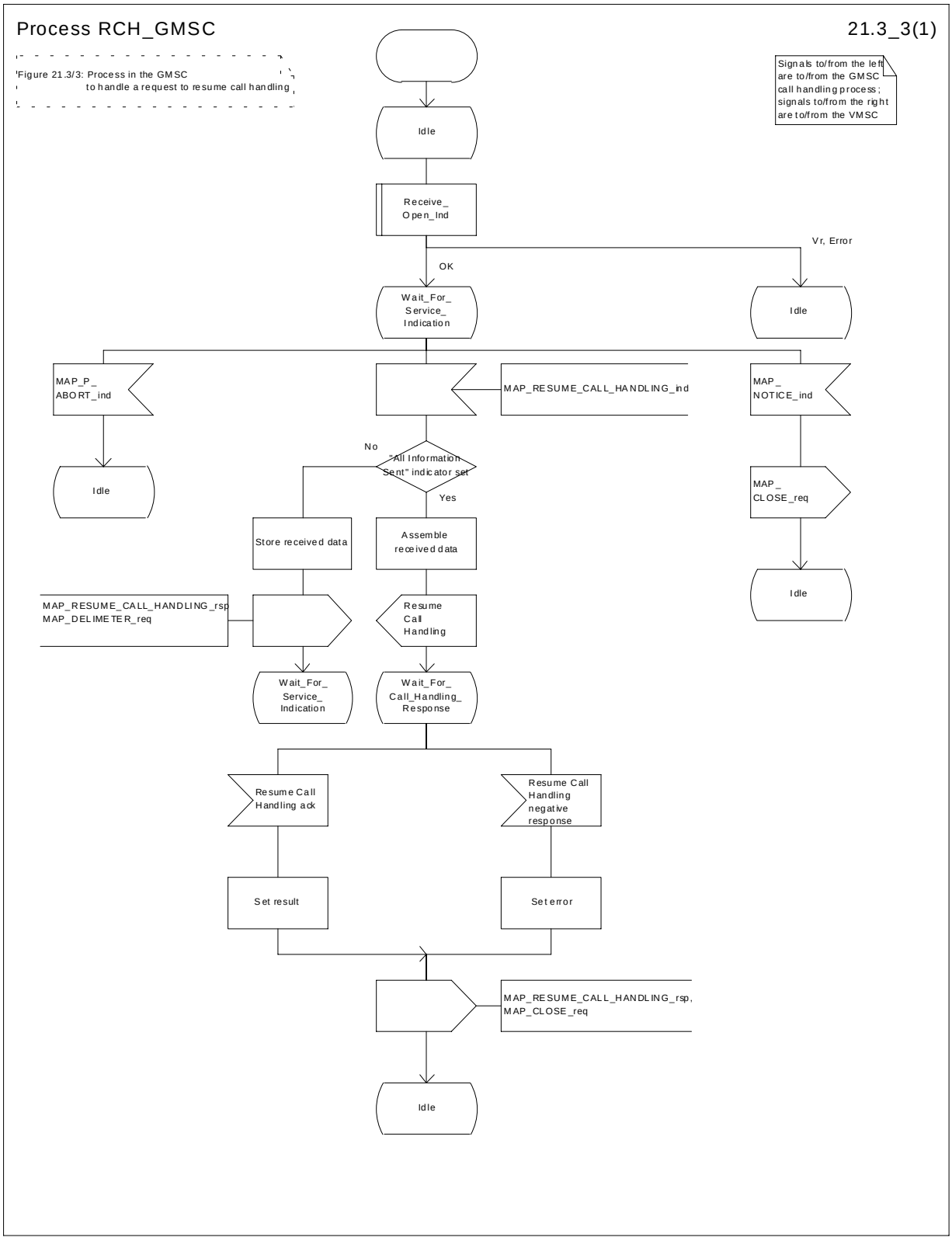
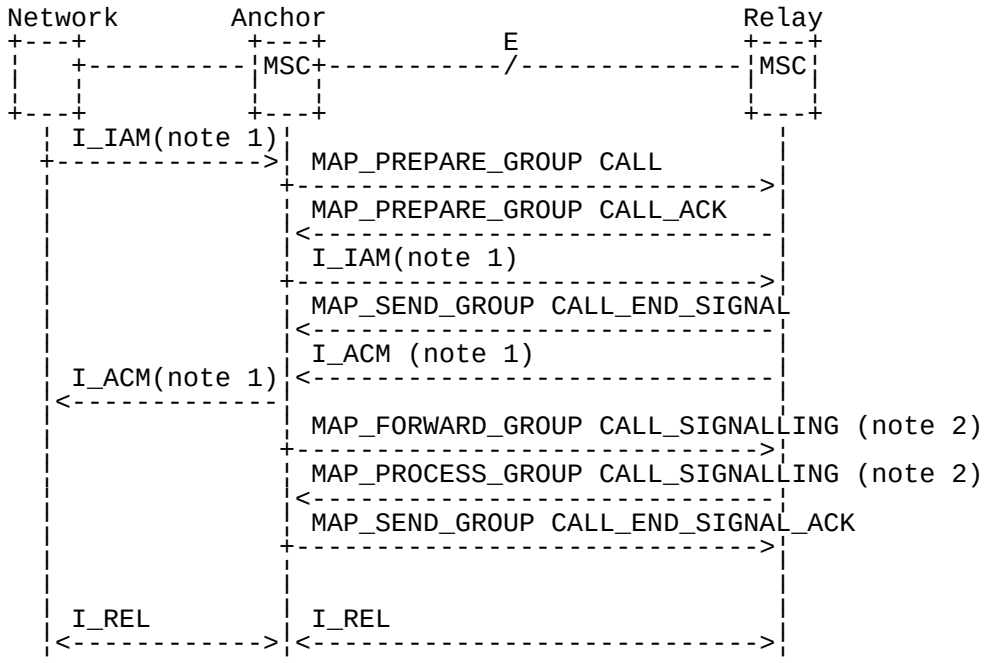


Figure 21.3/3: Process RCH_GMSC

21.4 Inter MSC Group Call Procedures

21.4.1 General

The message flows for successful inter MSC group call / broadcast call set-up 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 clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see clause 25.1.2;
Check_Indication	see clause 25.2.1;
Check_Confirmation	see clause 25.2.2.

Successful Outcome

When the MAP process receives a Prepare Group Call request from the ASCI 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 set-up 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.

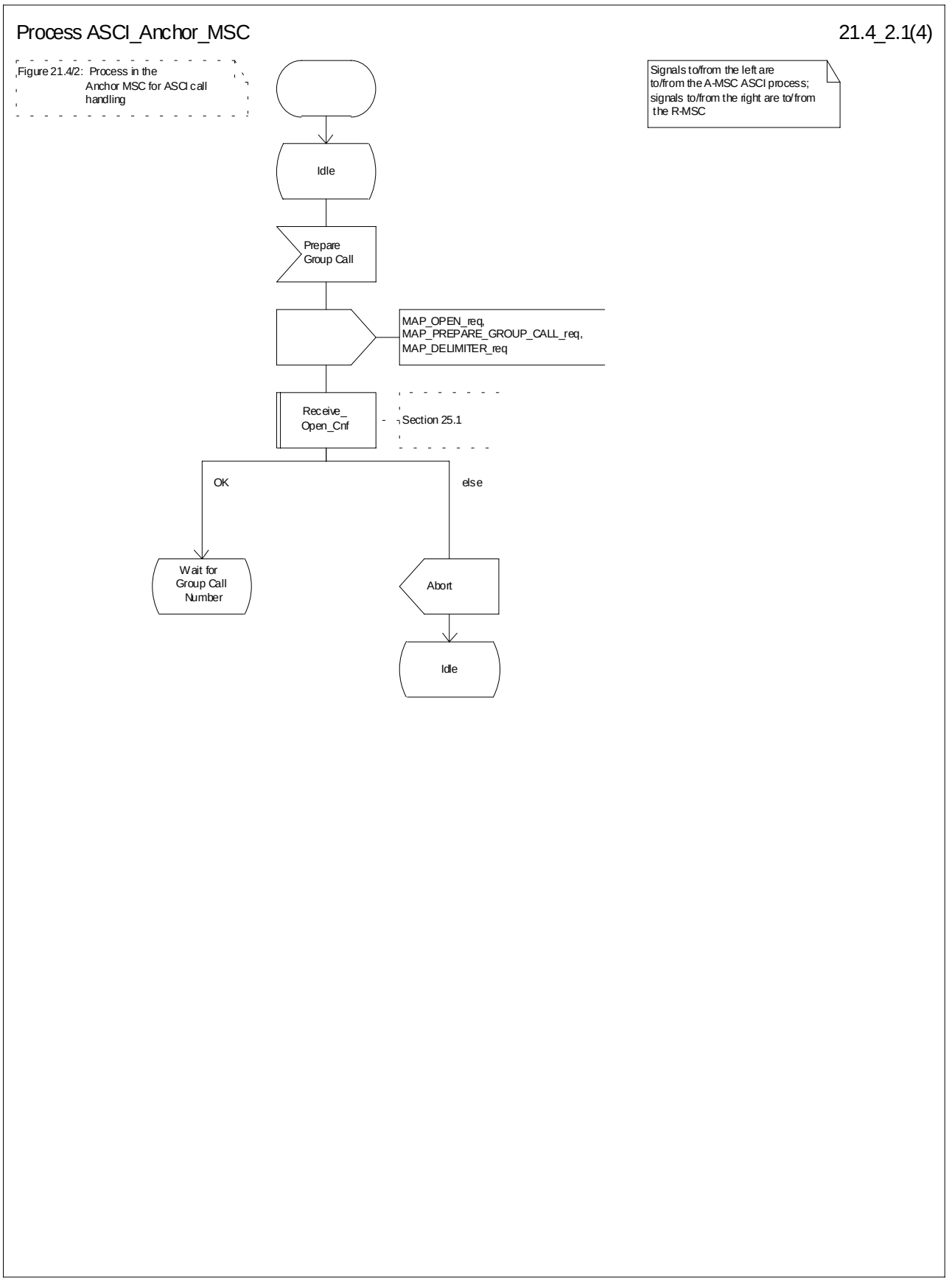


Figure 21.4/2 (sheet 1 of 4): Process ASCI_Anchor_MSC

Figure 21.4/2: Process in the Anchor MSC for ASCI call handling

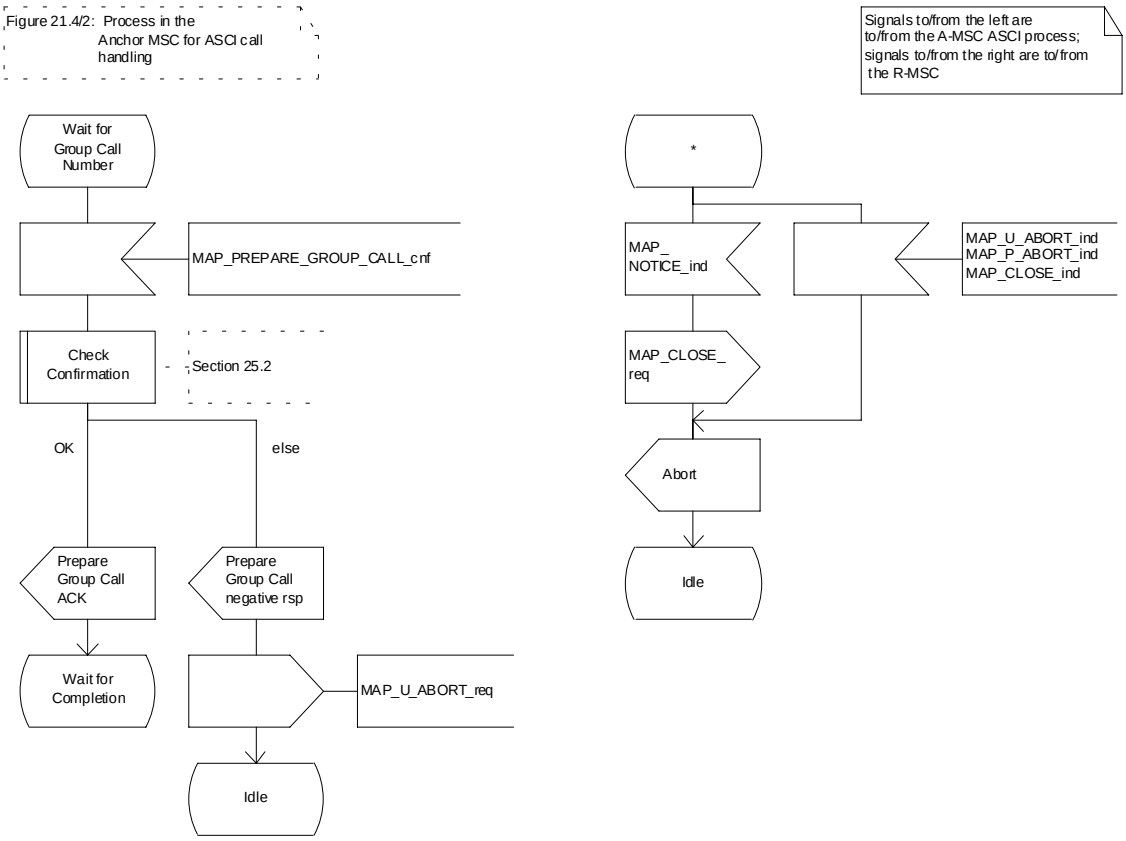


Figure 21.4/2 (sheet 2 of 4): Process ASCI_Anchor_MSC

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

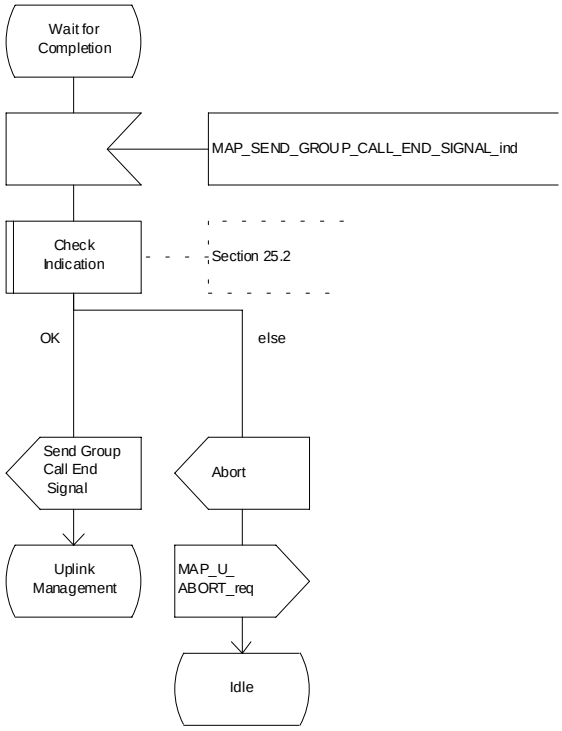


Figure 21.4/2 (sheet 3 of 4): Process ASCI_Anchor_MSC

Figure 21.4/2: Process in the Anchor MSC for ASCI call handling

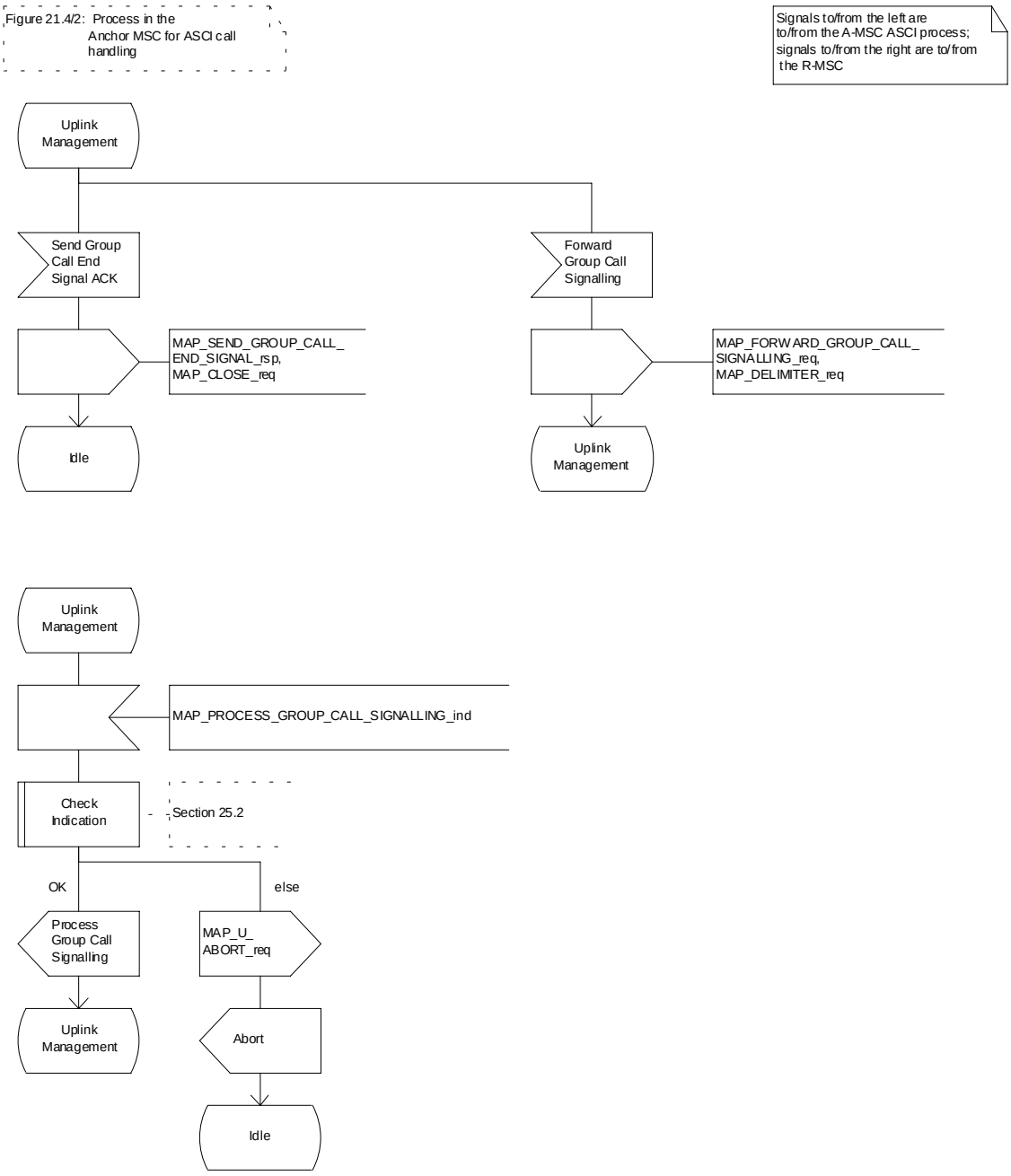


Figure 21.4/2 (sheet 4 of 4): Process ASCI_Anchor_MSC

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see clause 25.1.2;
Check_Indication	see clause 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 ind 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

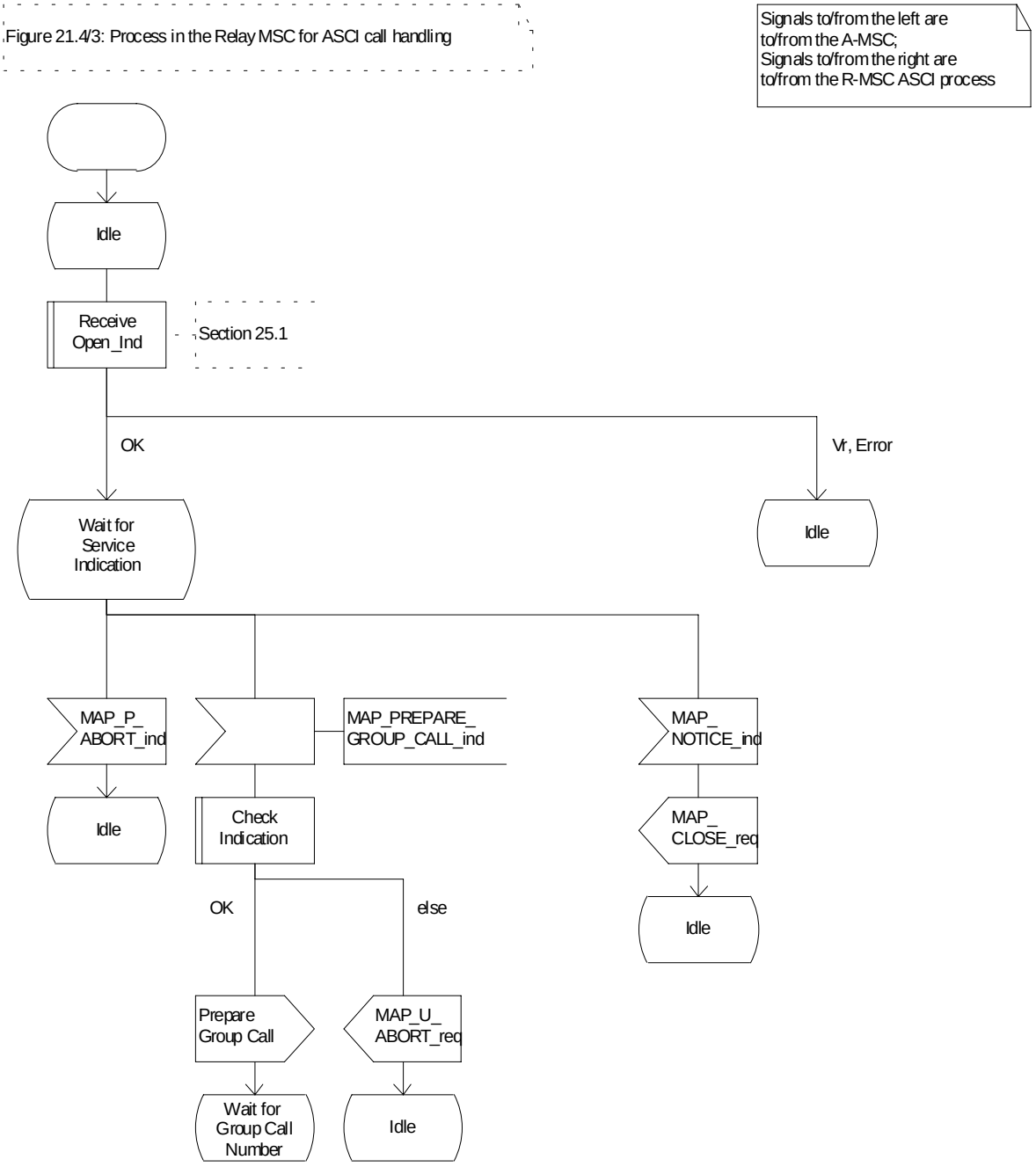


Figure 21.4/3 (sheet 1 of 3): Process ASCI_Relay_MSC

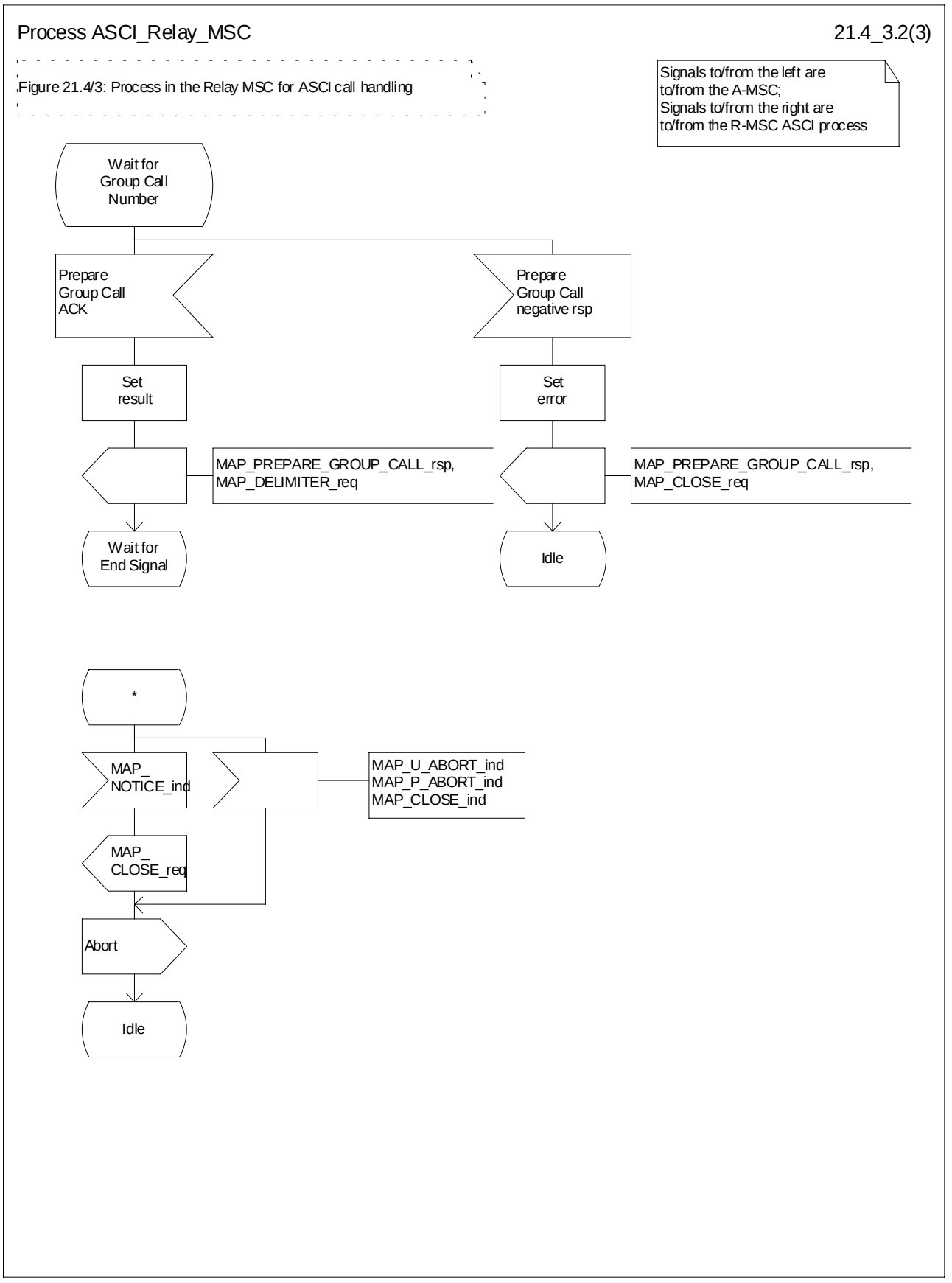


Figure 21.4/3 (sheet 2 of 3): Process ASCI_Relay_MSC

Figure 21.4/3: Process in the Relay MSC for ASCI call handling

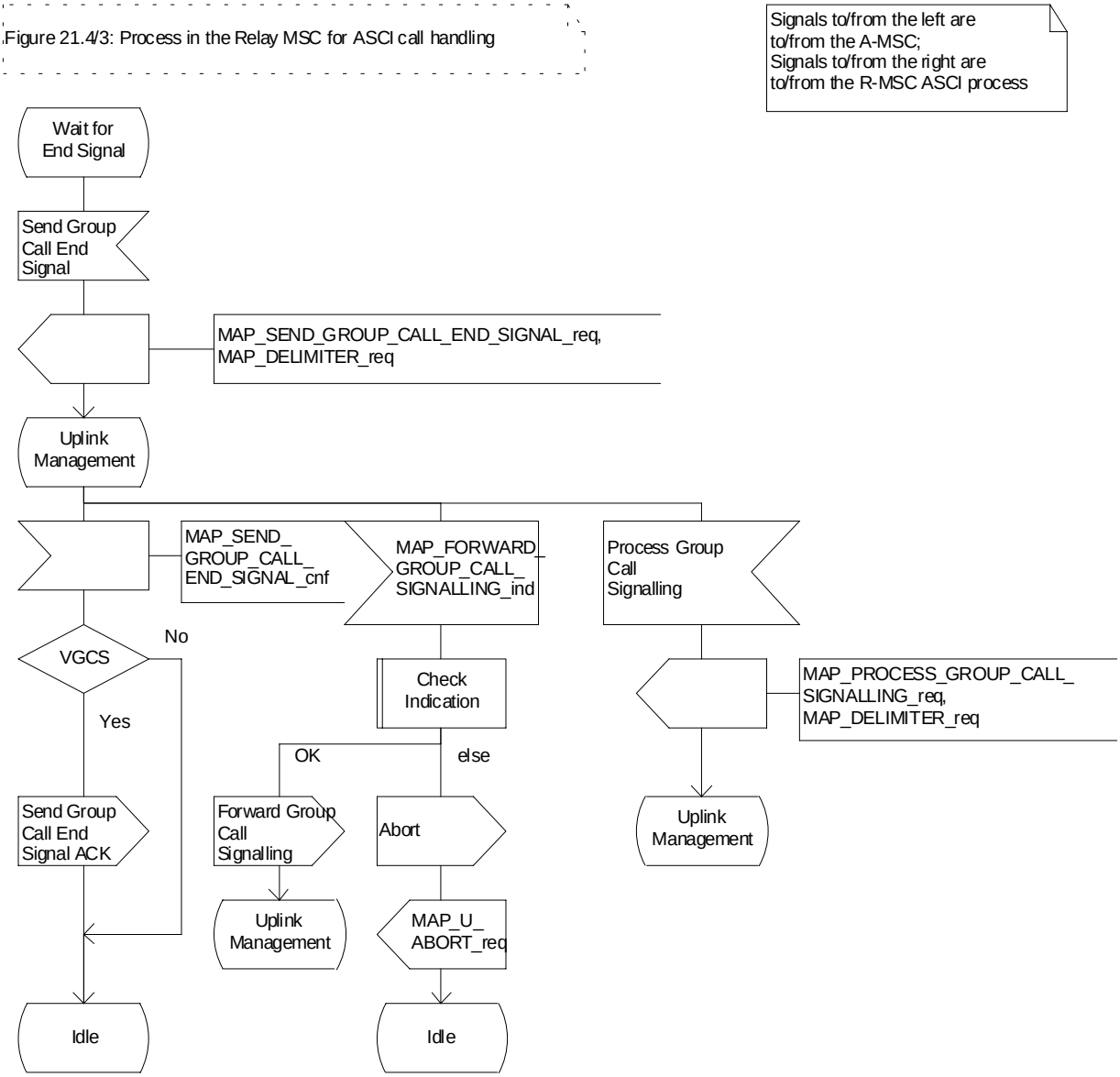
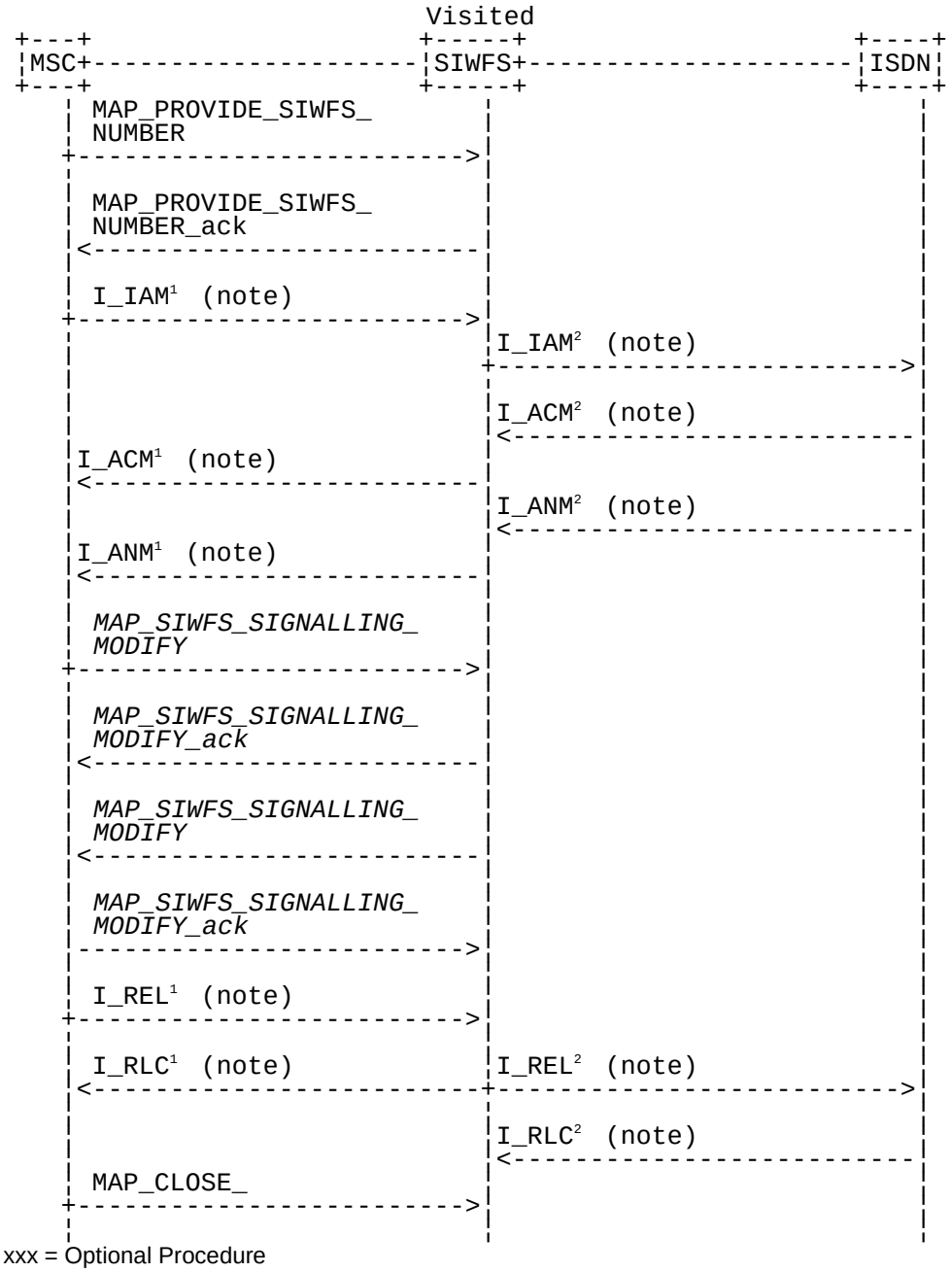


Figure 21.4/3 (sheet 3 of 3): Process ASCI_Relay_MSC

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).



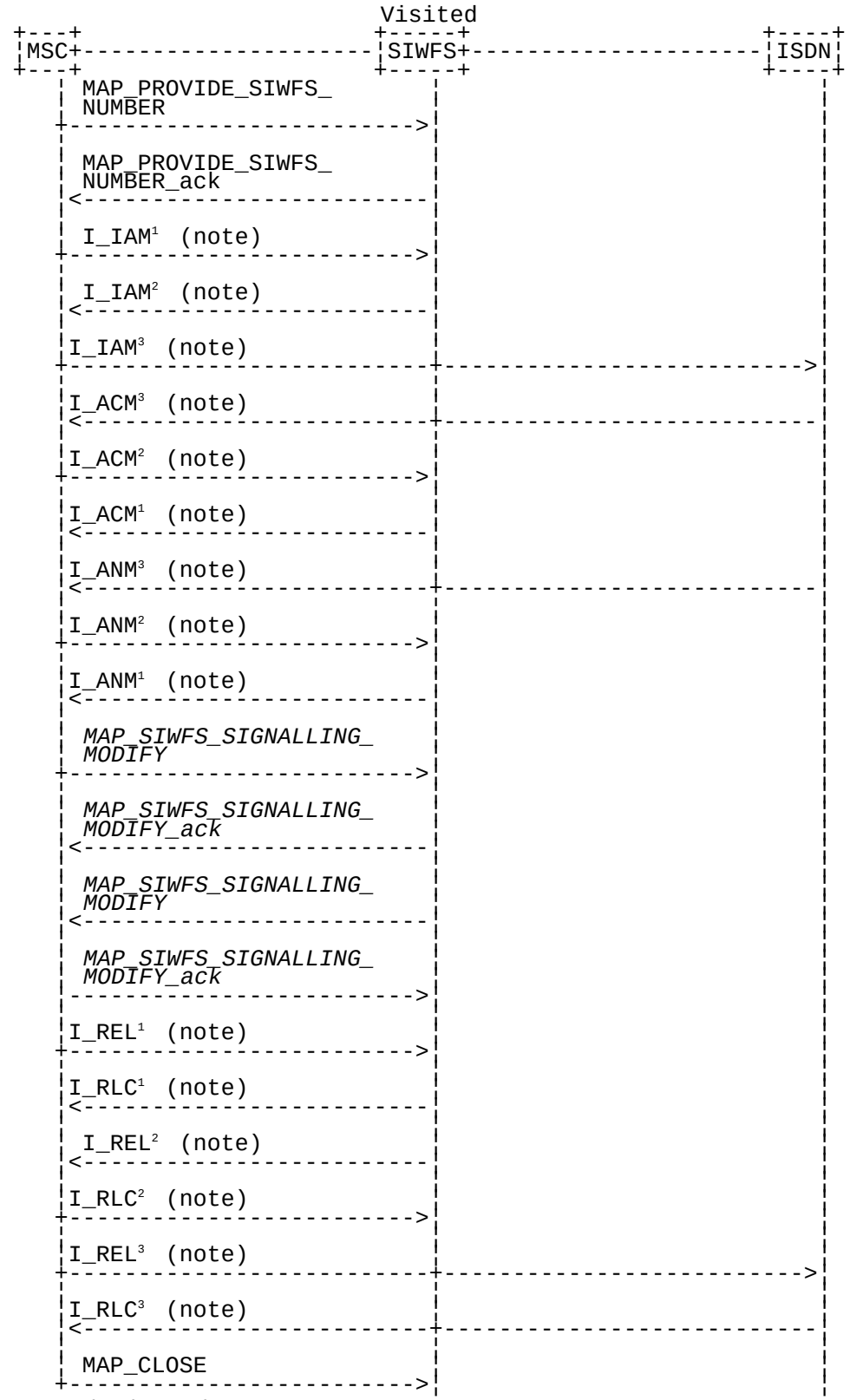
xxx = Optional Procedure

NOTE 1: 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.

NOTE 2: The number on the ISUP messages have been added to link the messages to respective signalling sequence.

NOTE 3: 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



xxx = Optional Procedure

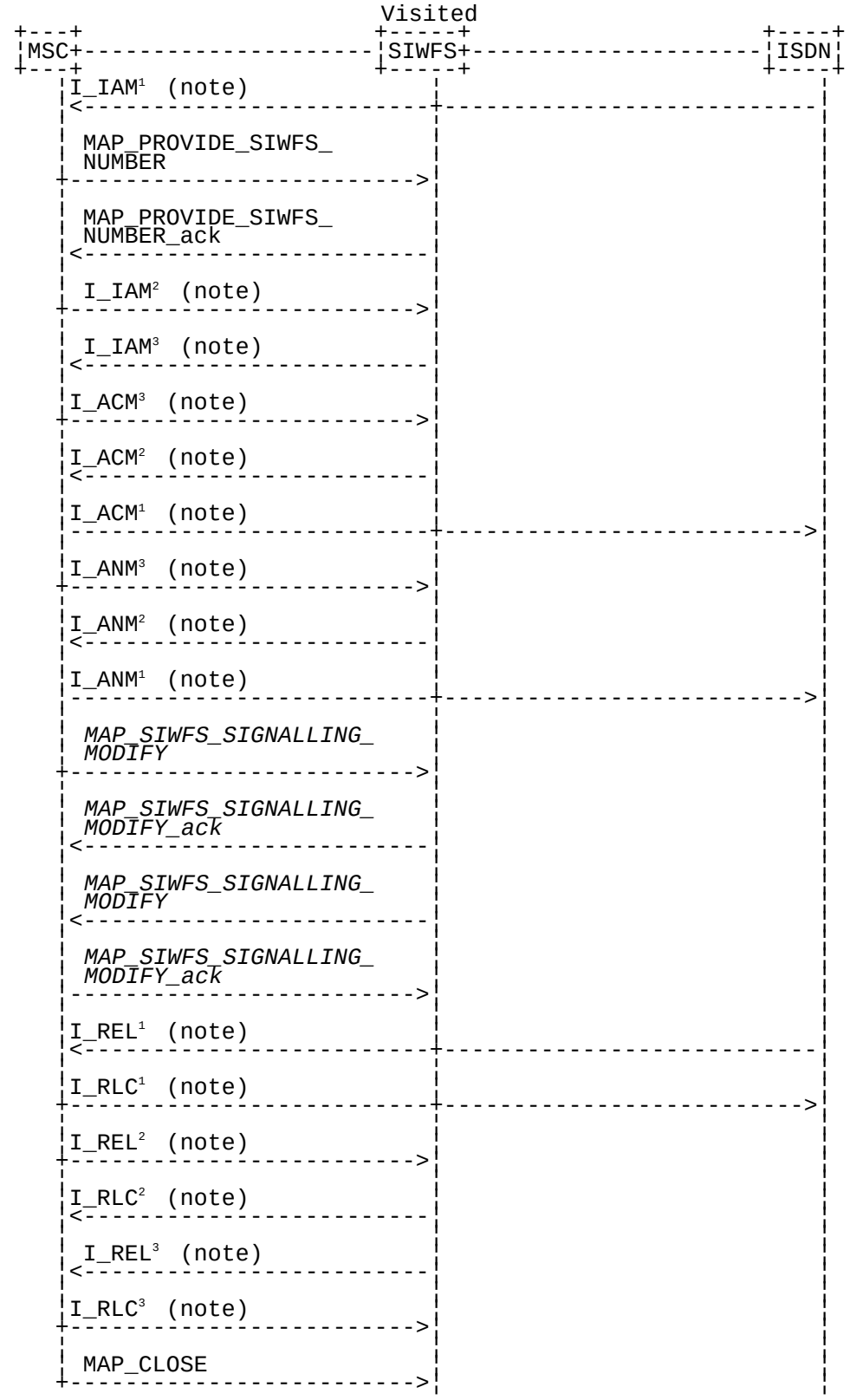
NOTE 1: TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. The Release message can be initiated either by calling or called subscriber. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification:

- 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.

NOTE 2: The number on the ISUP messages have been added to link the messages to respective signalling sequence.

NOTE 3: The modification of SIWF 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



xxx = Optional Procedure

NOTE 1: 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.

NOTE 2: The number on the ISUP messages have been added to link the messages to respective signalling sequence.

NOTE 3: 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 clause 10.8.

The following MAP services are used to modify resources in an SIWFS:

MAP_SIWFS_SIGNALLING_MODIFY see clause 10.9.

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 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.

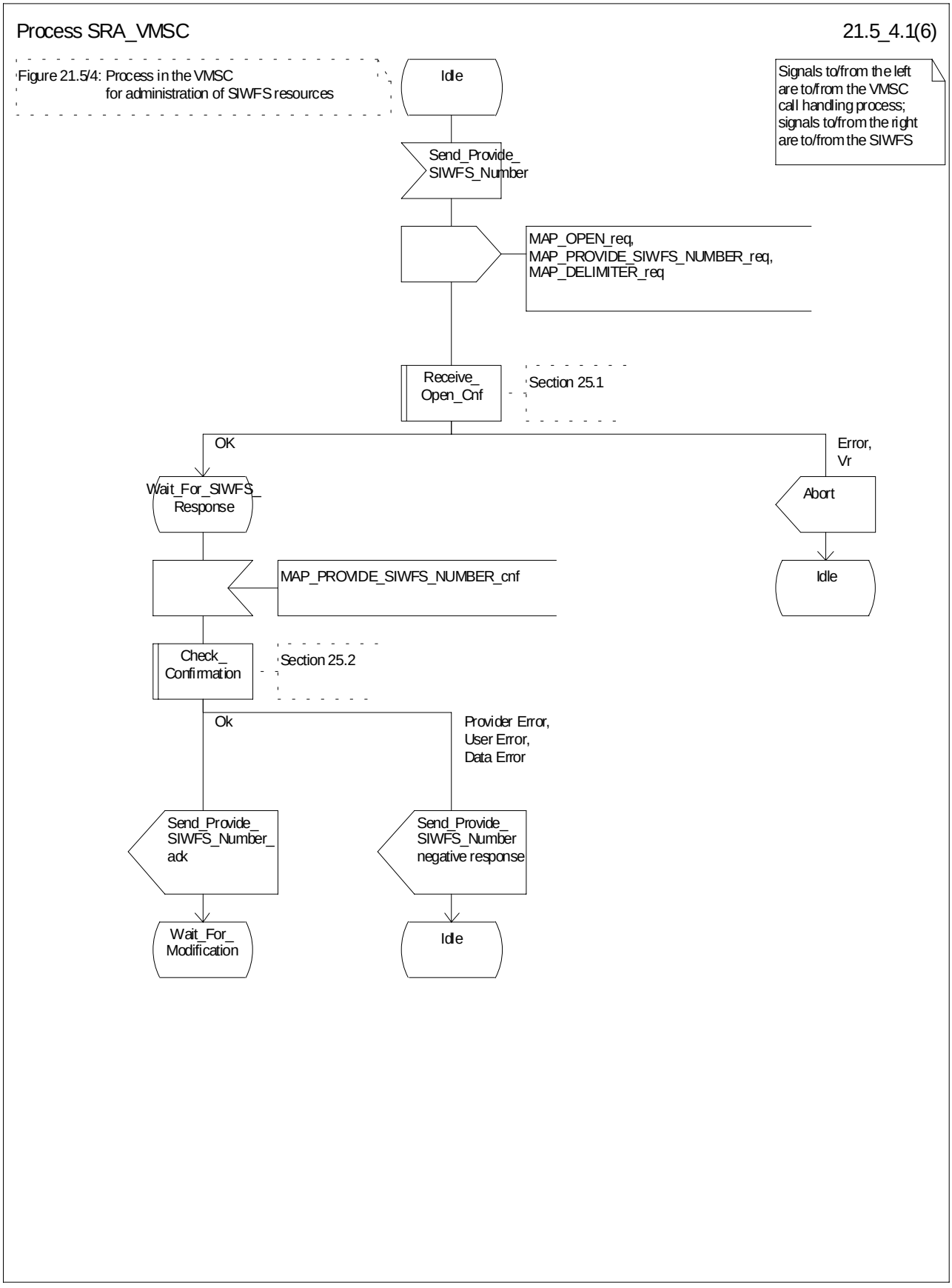


Figure 21.5/4 (sheet 1 of 6): Process SRA (SIWFS_RESOURCE_ADMINISTRATION)_VMSC

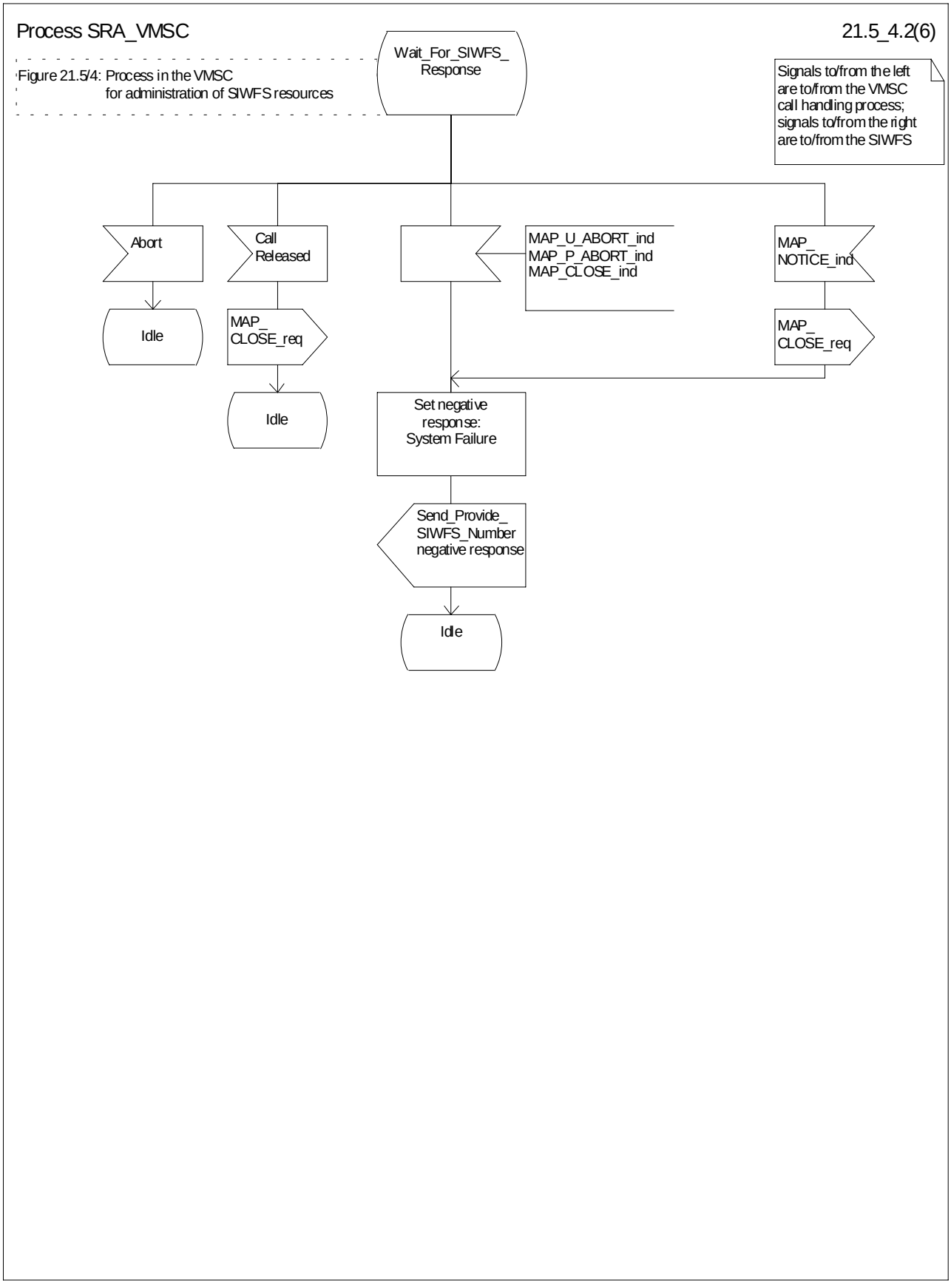


Figure 21.5/4 (sheet 2 of 6): Process SRA_VMSC

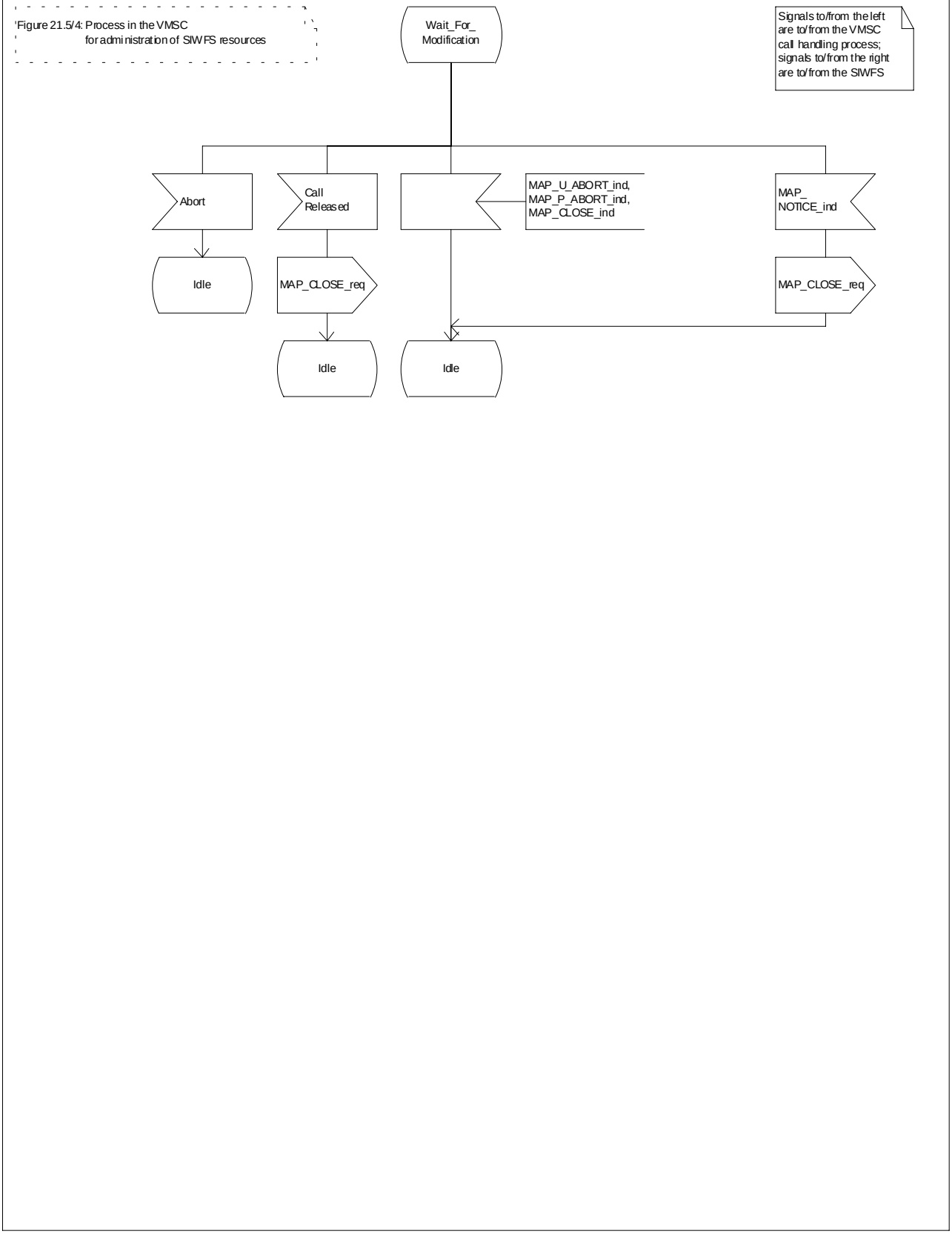


Figure 21.5/4 (sheet 3 of 6): Process SRA_VMSC

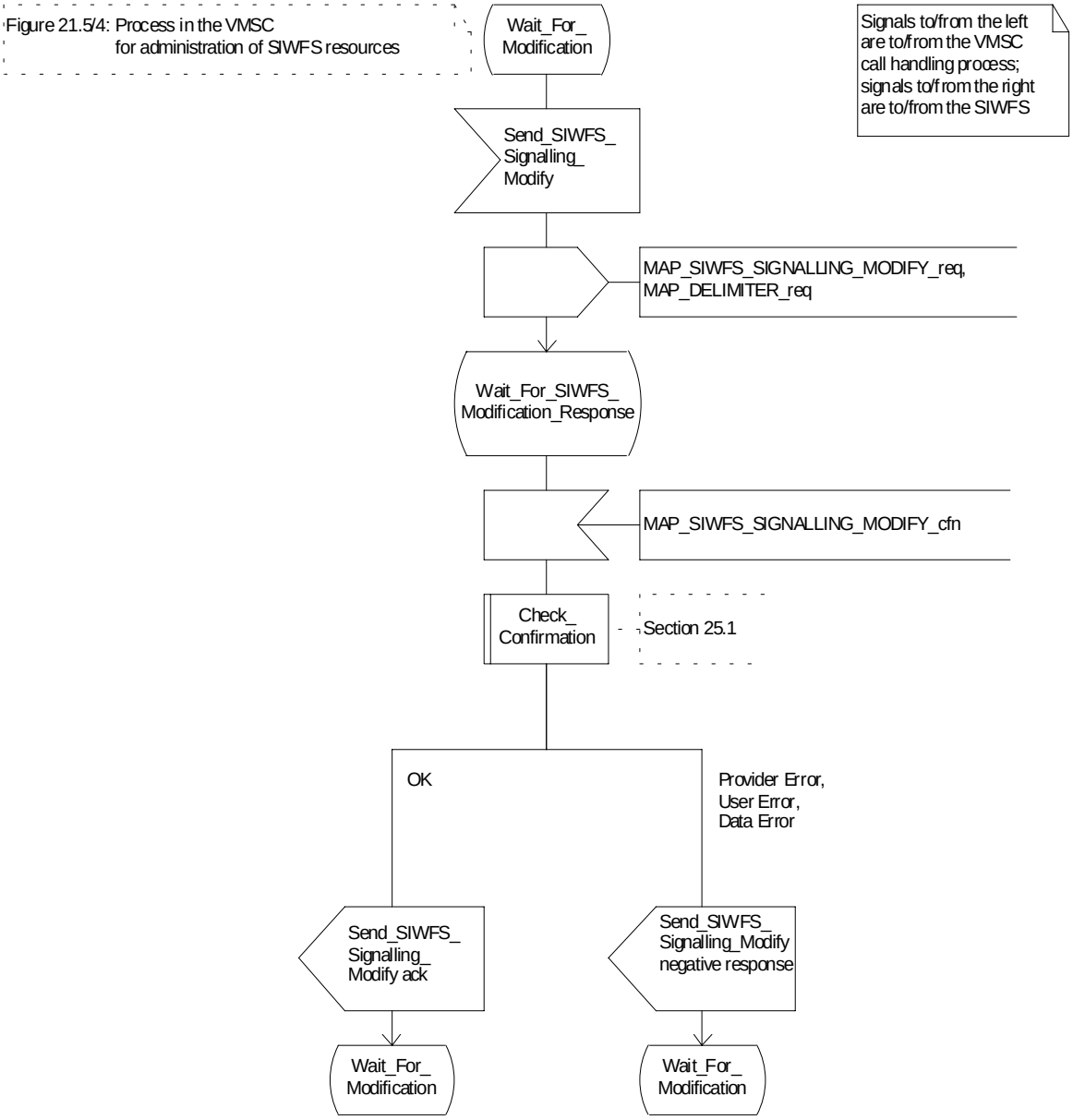


Figure 21.5/4 (sheet 4 of 6): Process SRA_VMSC

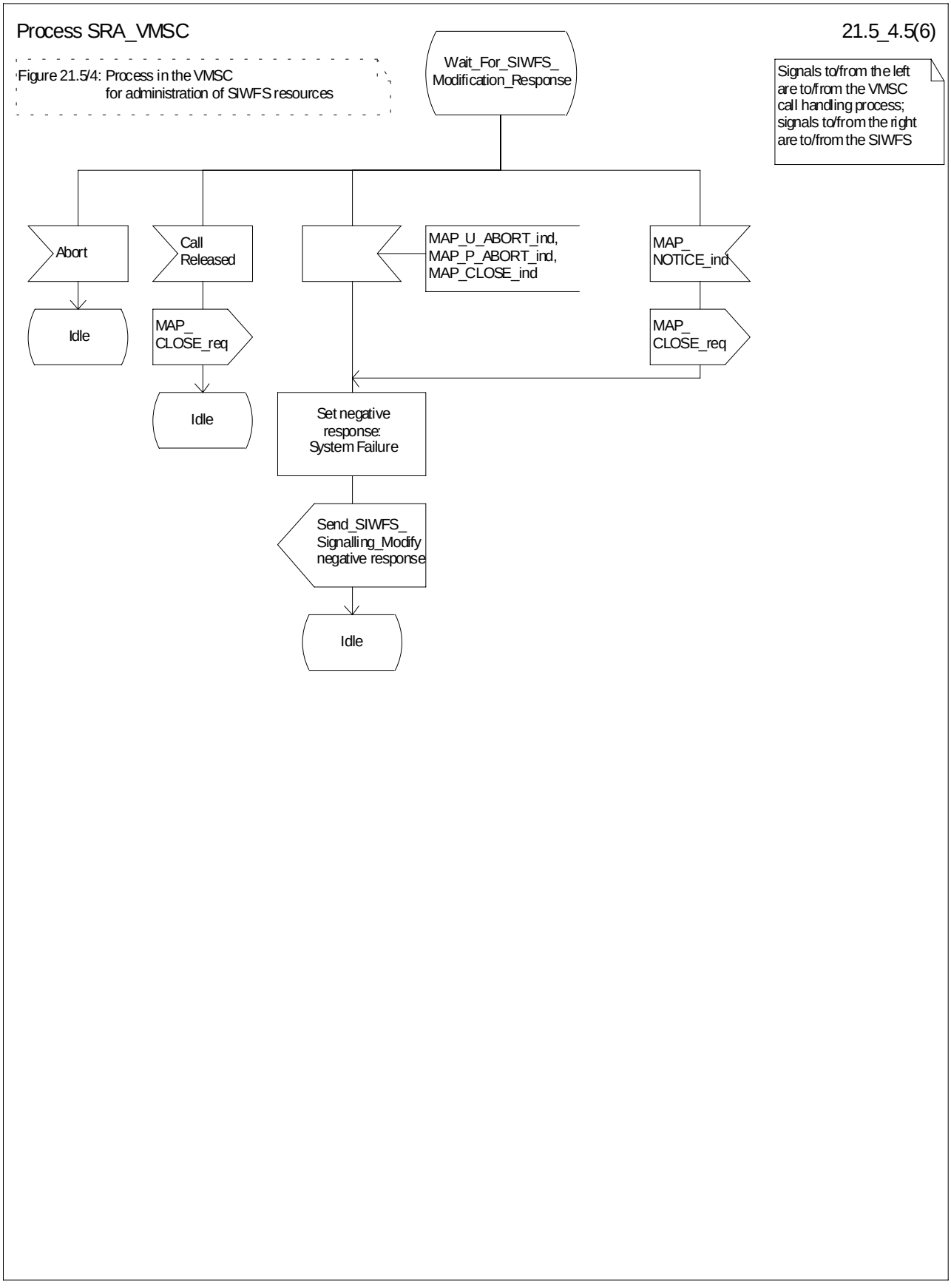


Figure 21.5/4 (sheet 5 of 6): Process SRA_VMSC

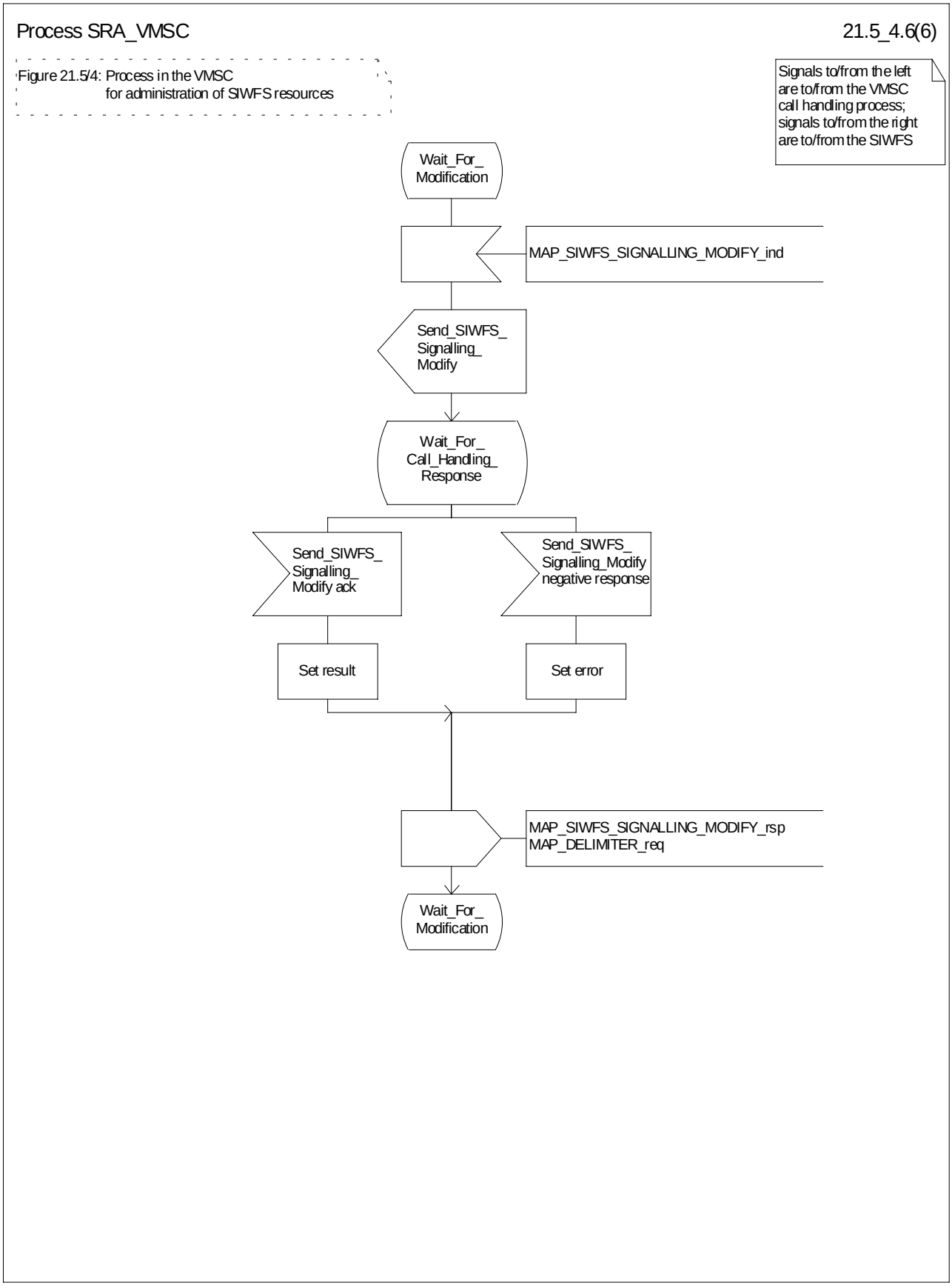


Figure 21.5/4 (sheet 6 of 6): Process SRA_VMSC

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see clause 25.1.1.
Check_Confirmation	see clause 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.

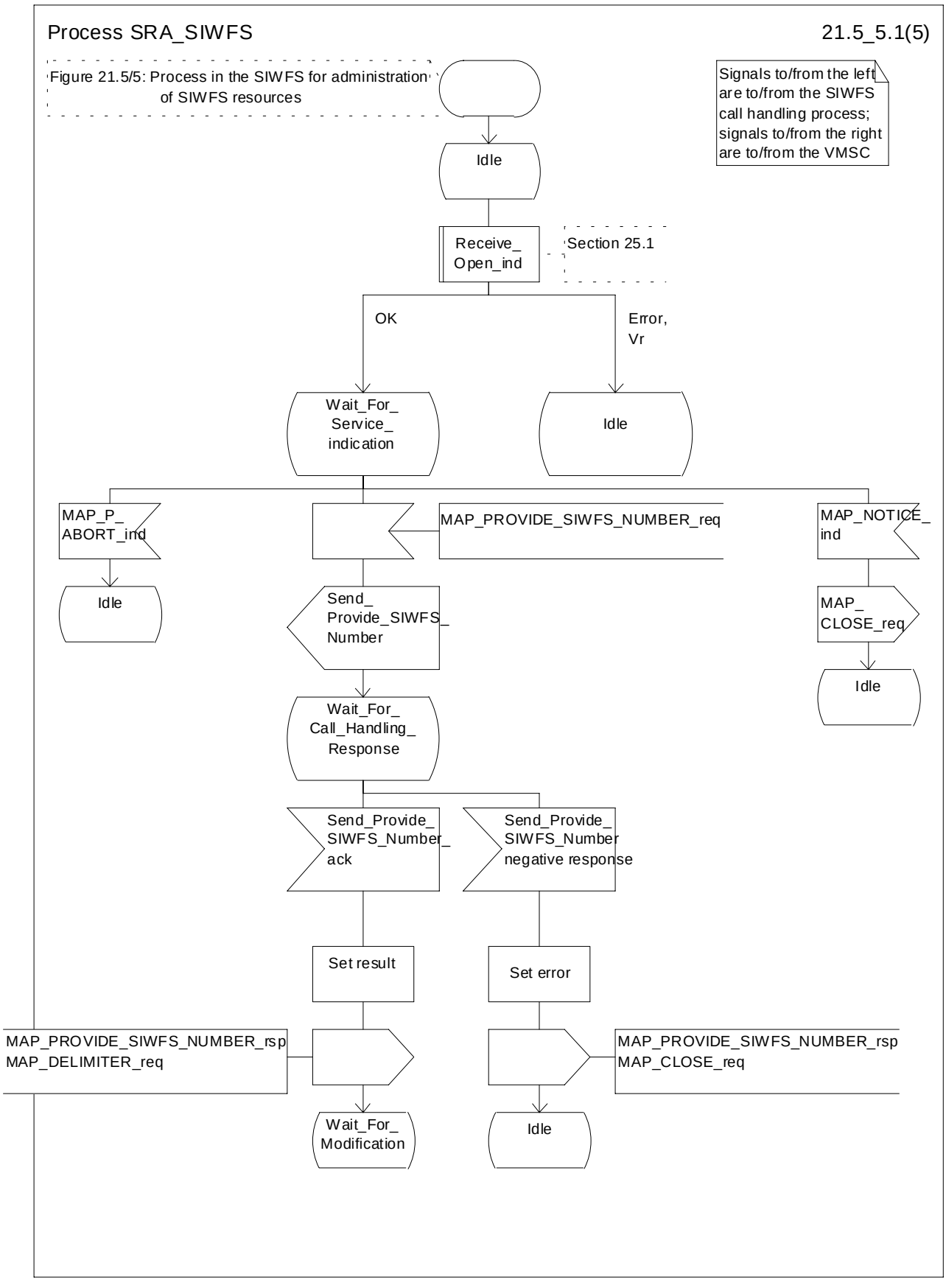


Figure 21.5/5 (sheet 1 of 5): Process SRA_SIWFS

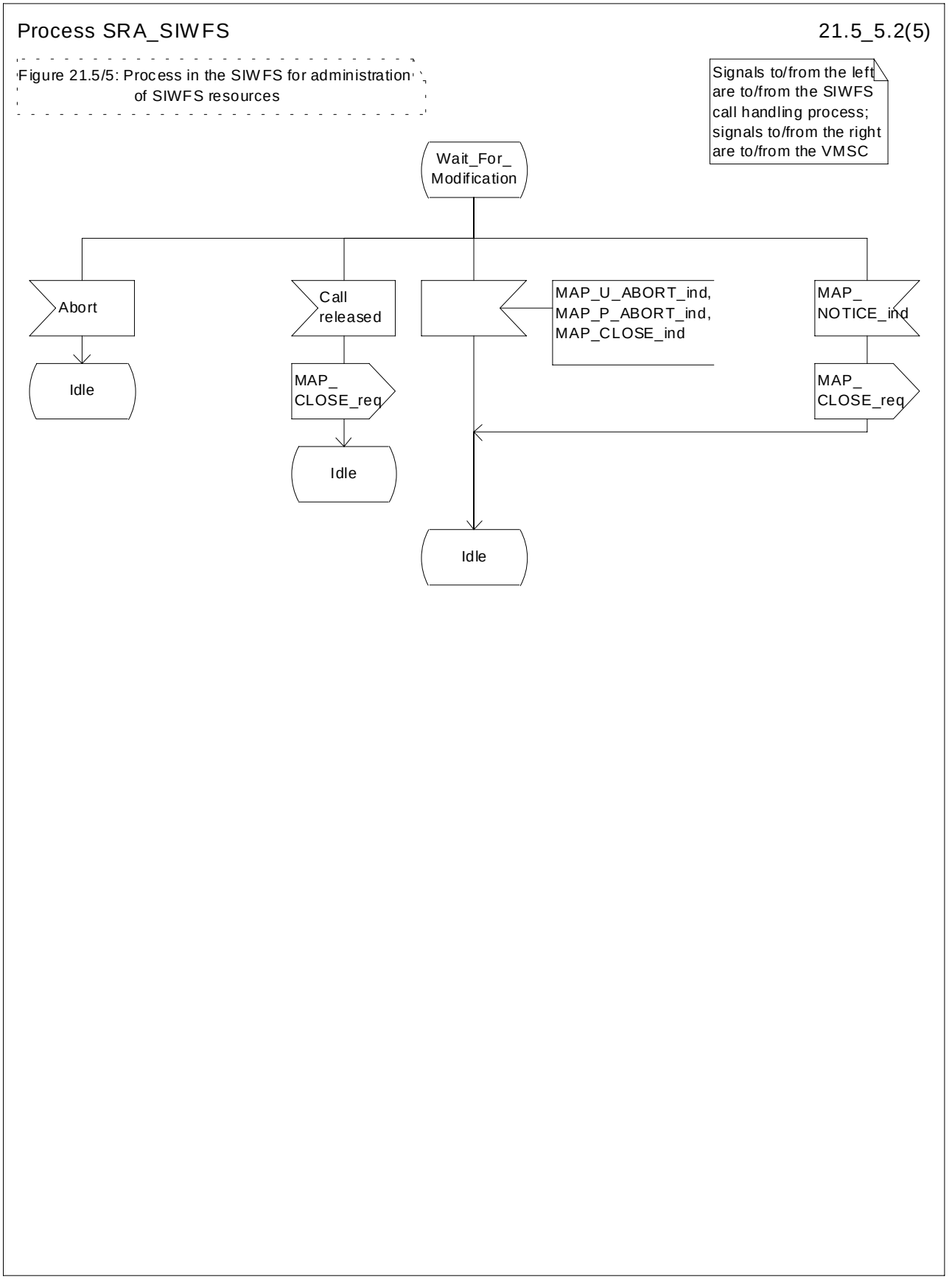


Figure 21.5/5 (sheet 2 of 5): Process SRA_SIWFS

Figure 21.5/5: Process in the SIWFS for administration of SIWFS resources

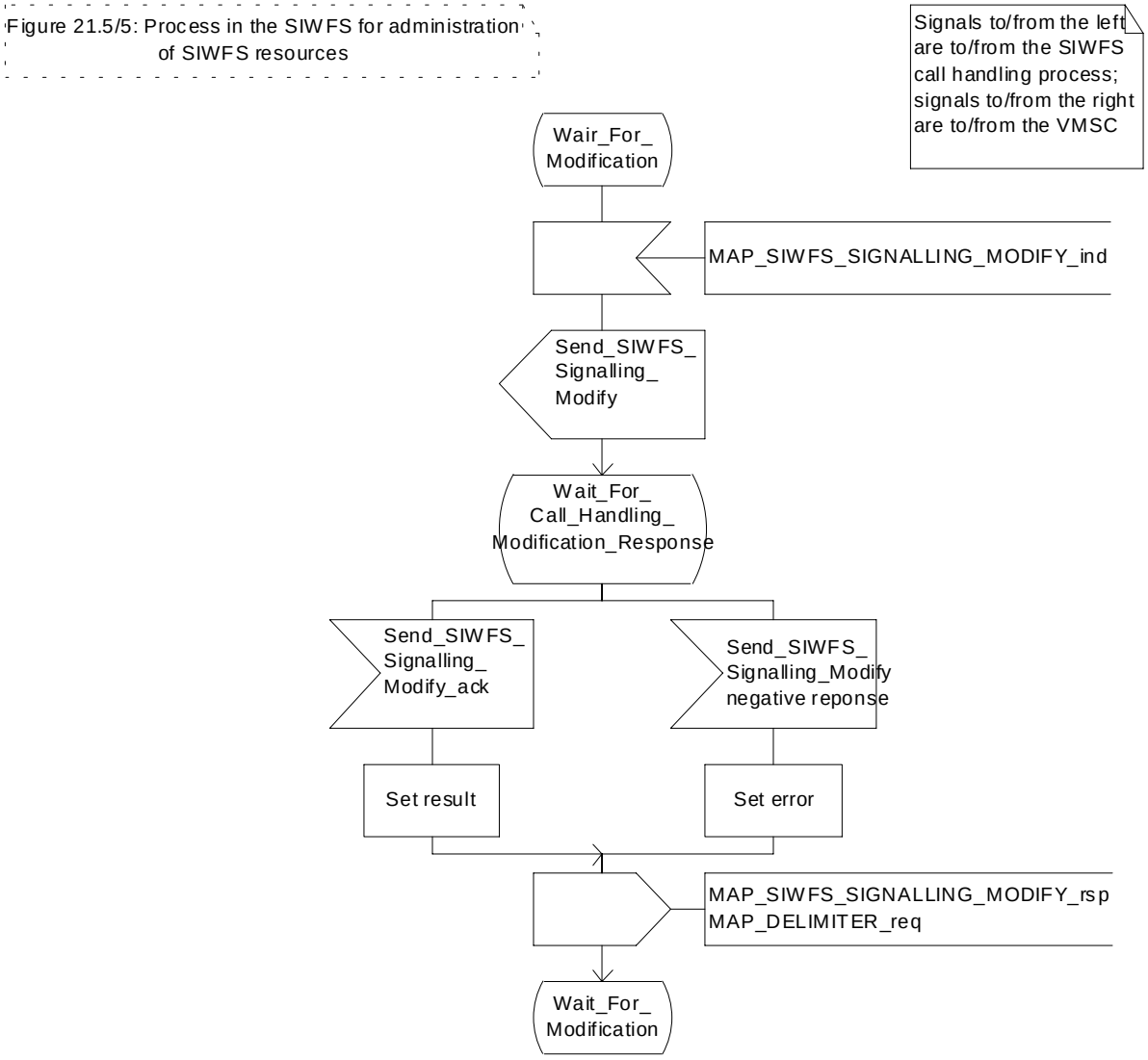


Figure 21.5/5 (sheet 3 of 5): Process SRA_SIWFS

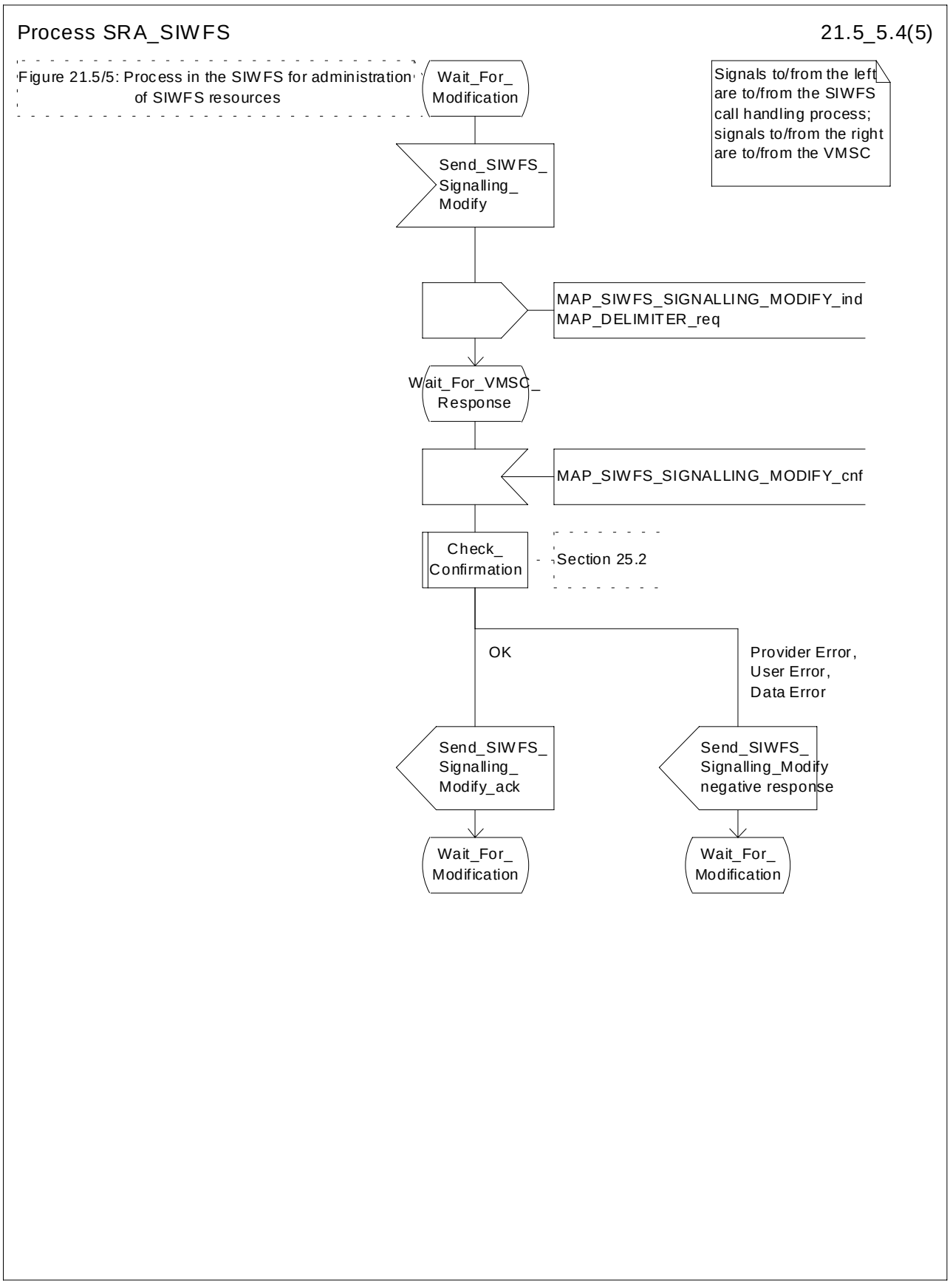


Figure 21.5/5 (sheet 4 of 5): Process SRA_SIWFS

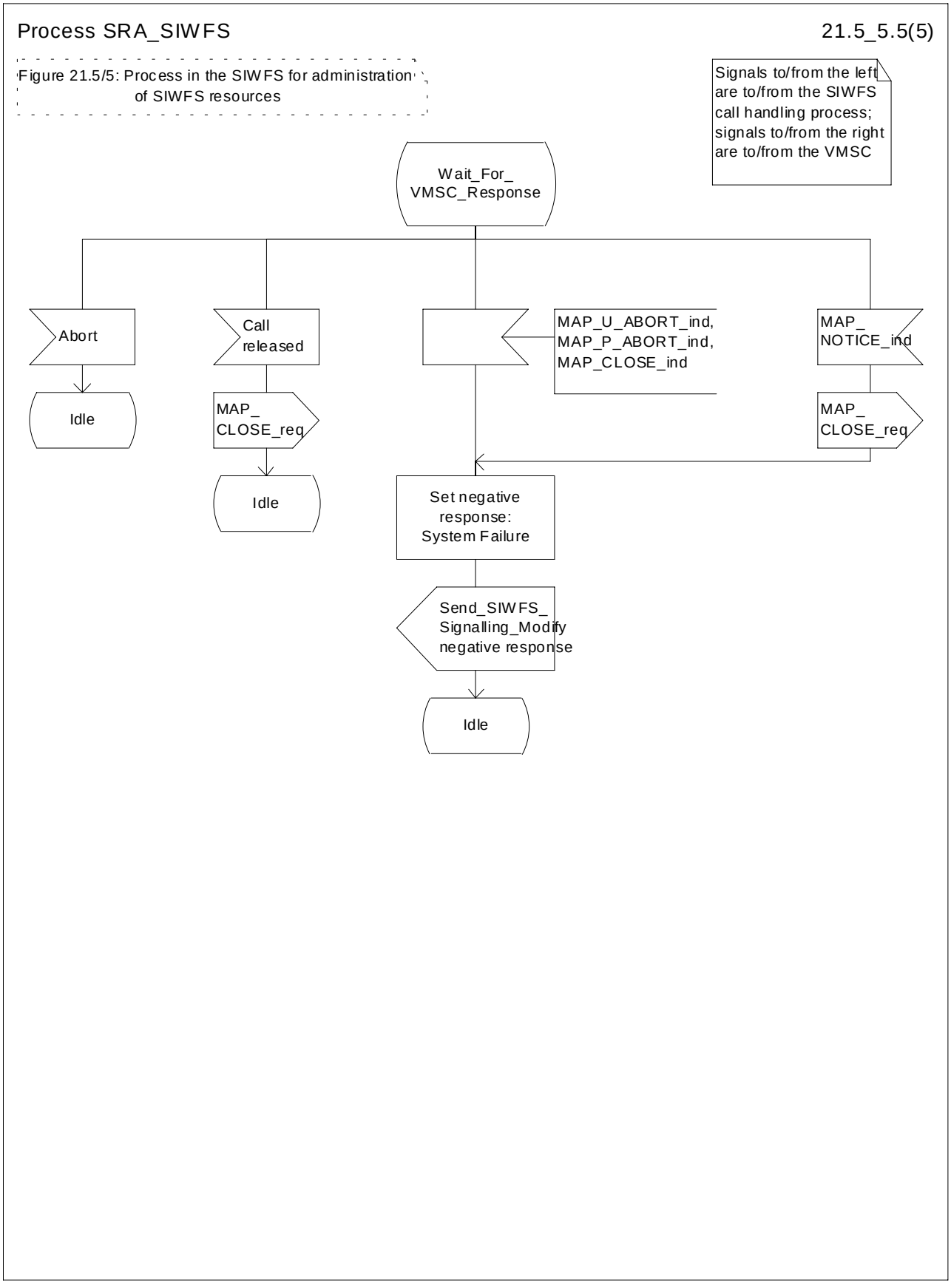


Figure 21.5/5 (sheet 5 of 5): Process SRA_SIWFS

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.

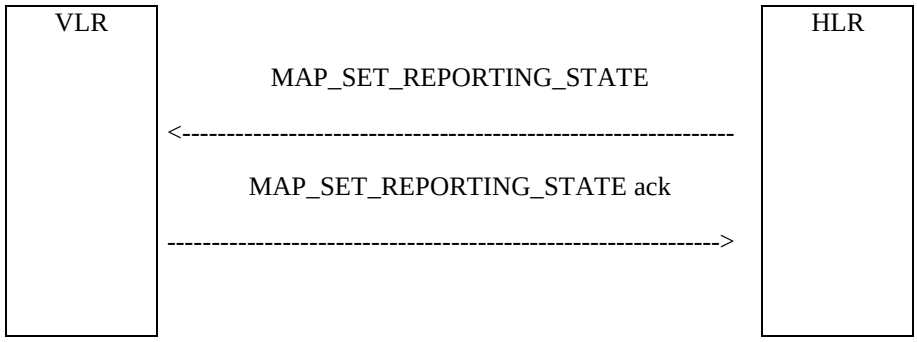


Figure 21.6/1: Message Flow for Setting the Reporting State

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 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.

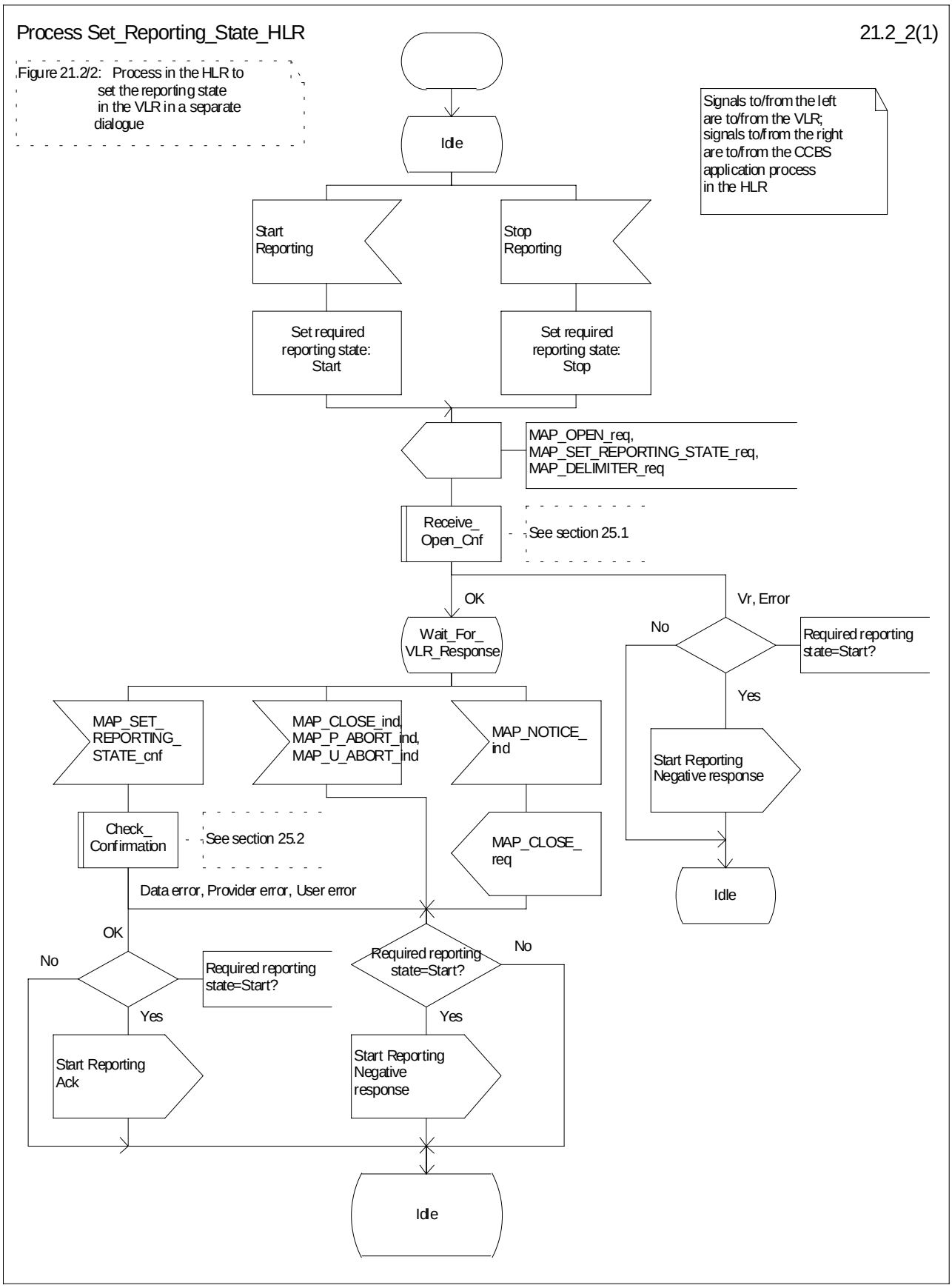


Figure 21.6/2: Process Set_Reporting_State_HLR

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 clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 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.

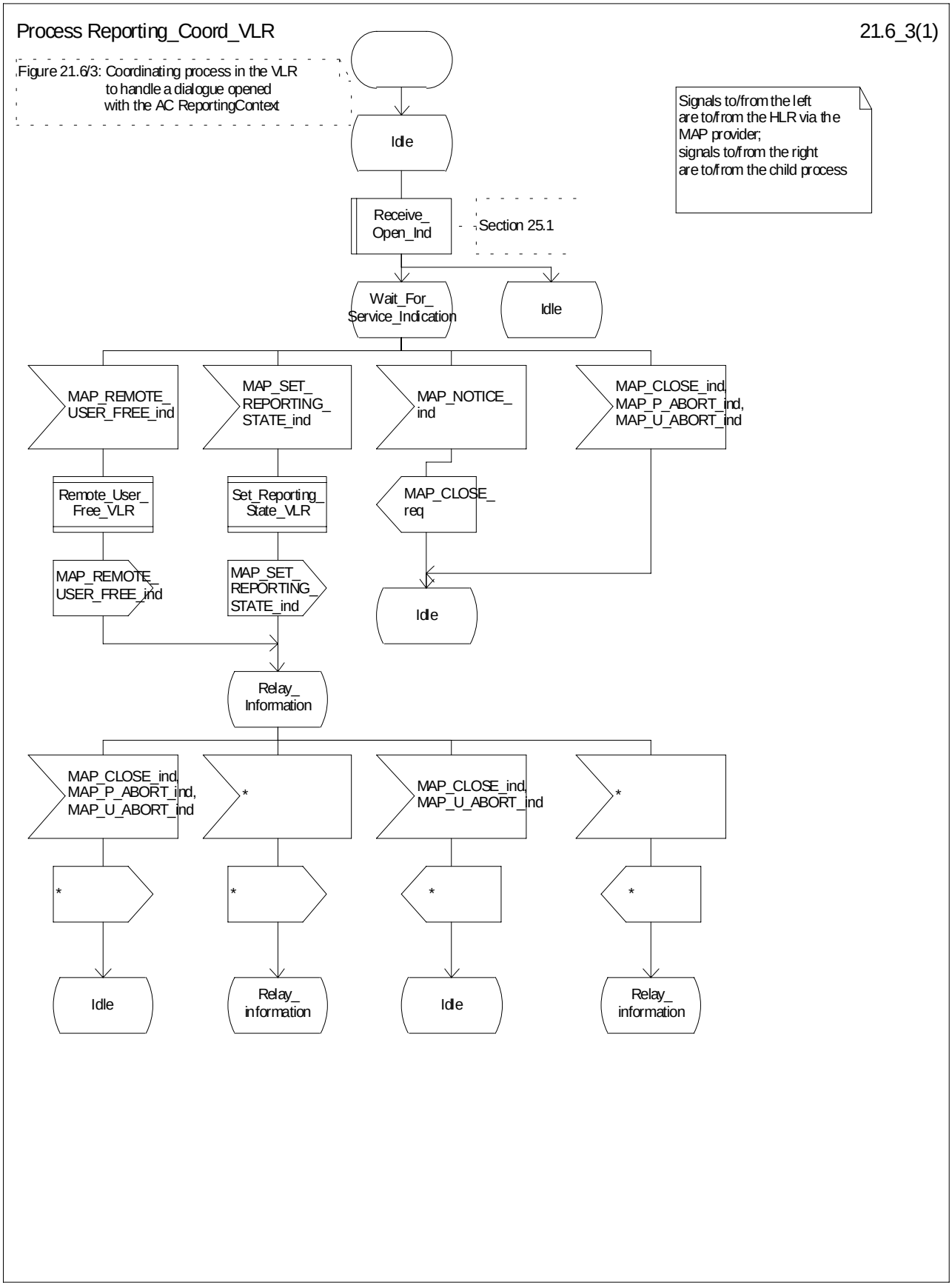


Figure 21.6/3: Process Reporting_Coord_VLR

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

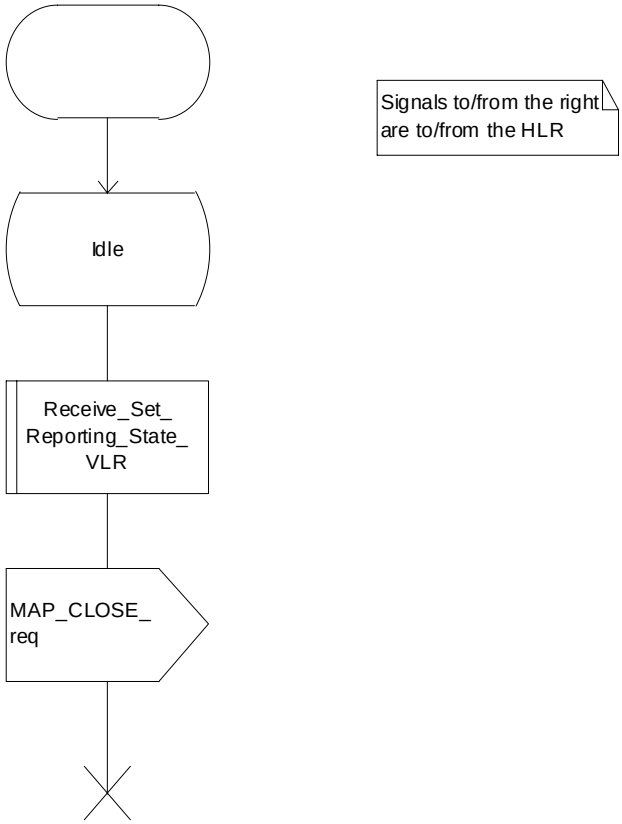
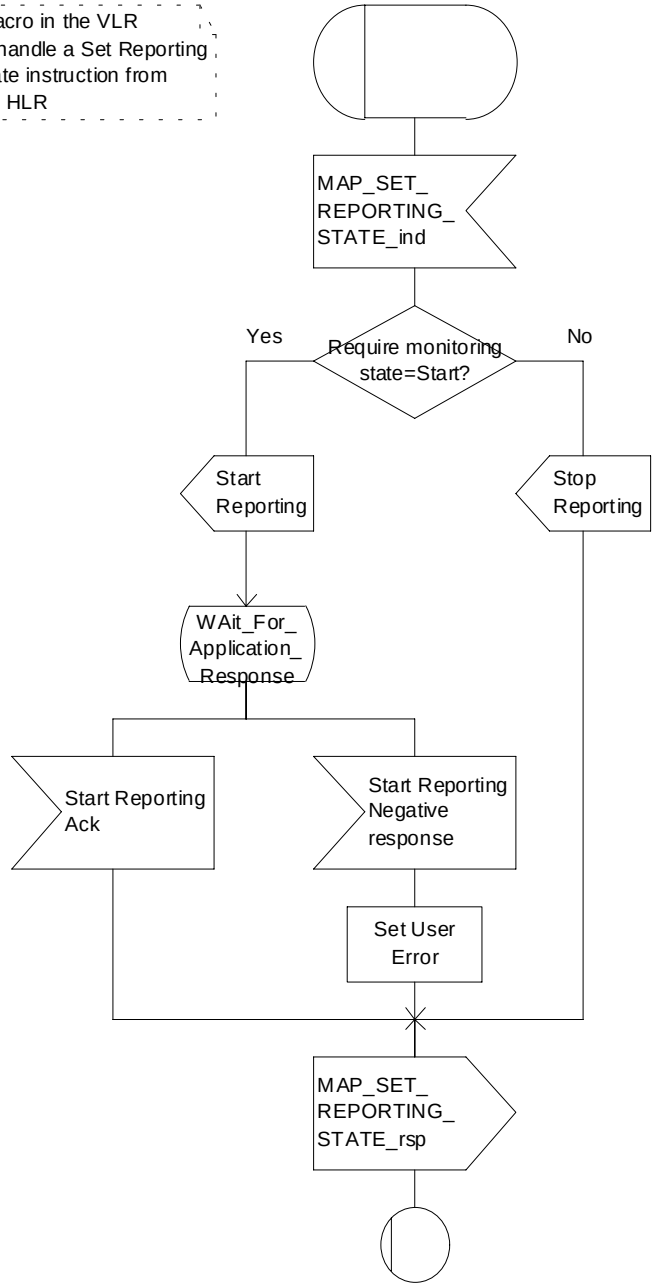


Figure 21.6/4: Process Set_Reporting_State_VLR

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.

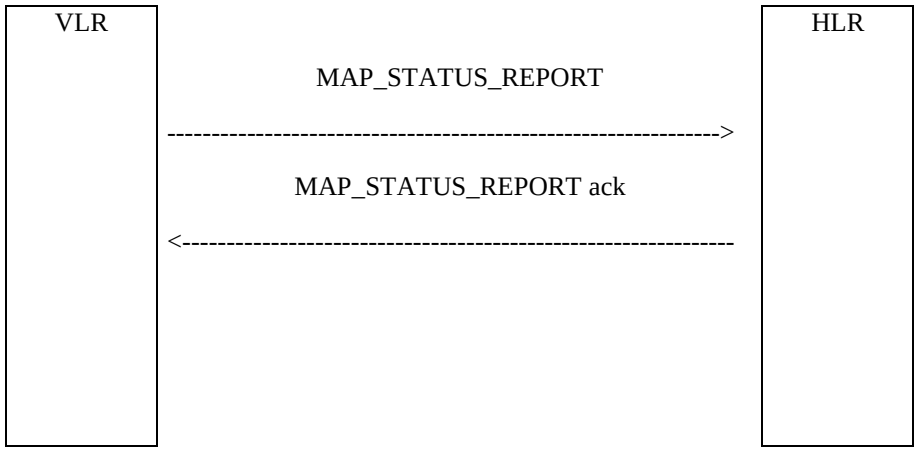


Figure 21.7/1: Status reporting, when monitoring continues in the VLR

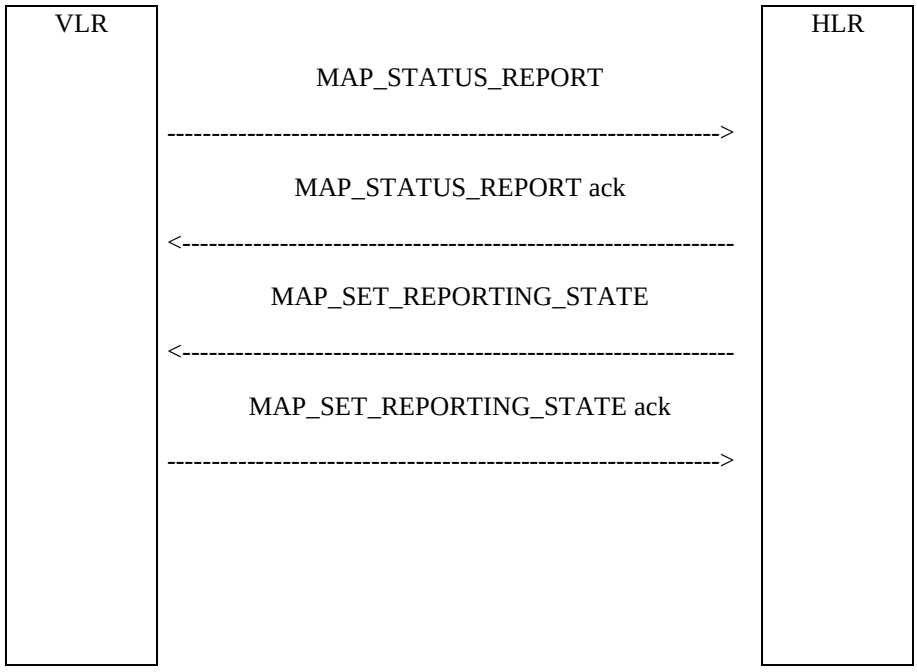


Figure 21.7/2: Status reporting, when monitoring stops

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 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.

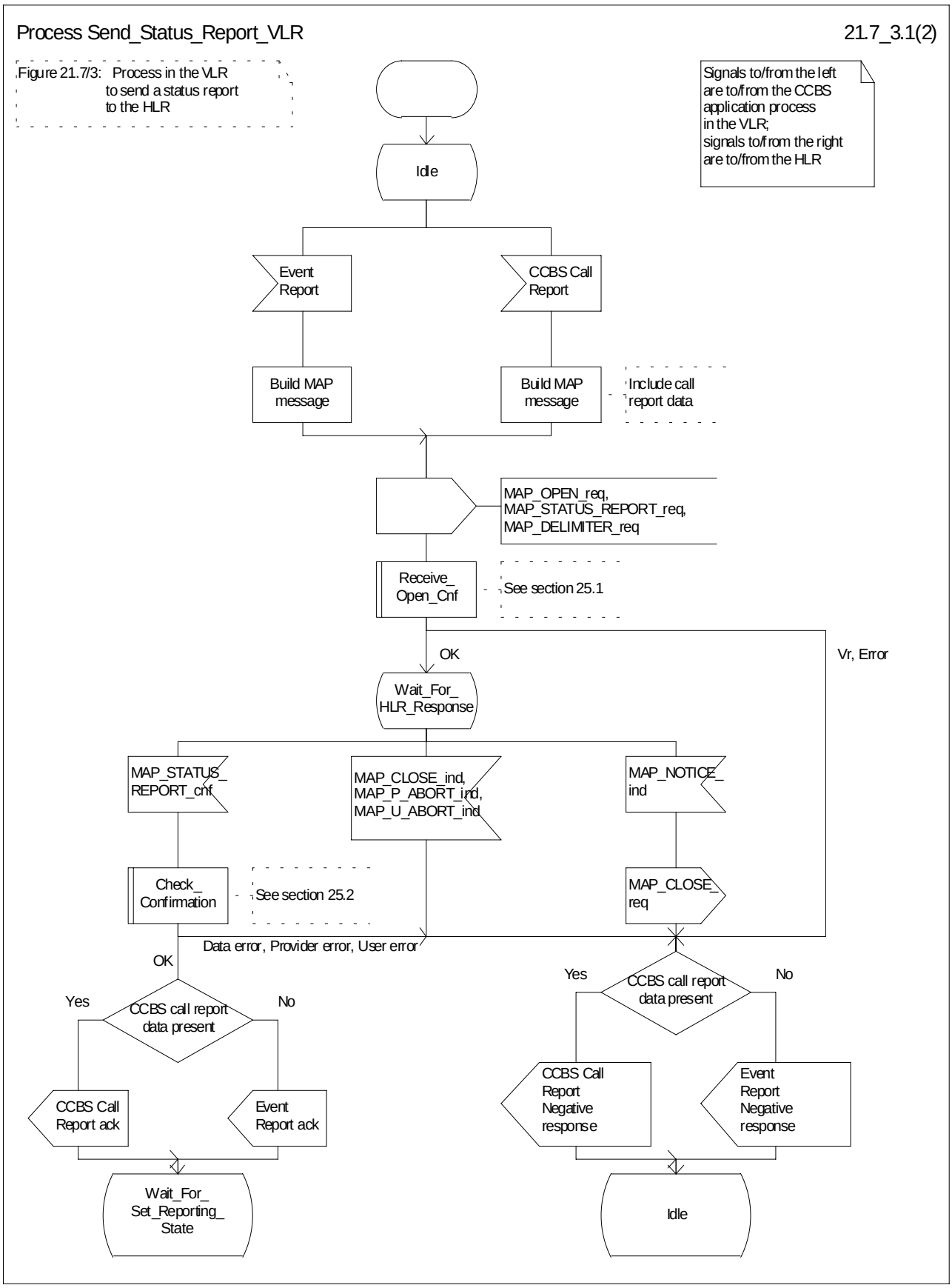


Figure 21.7/3 (sheet 1 of 2): Process Send_Status_Report_VLR

Figure 21.7/3: Process in the VLR to send a status report to the HLR

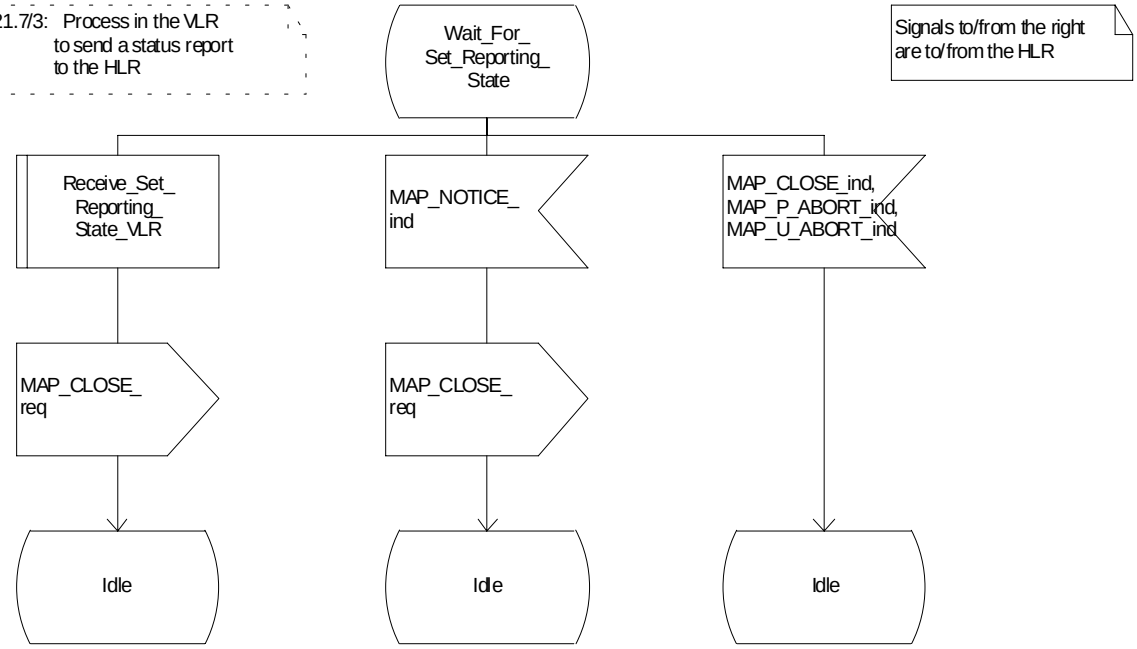


Figure 21.7/3 (sheet 2 of 2): Process Send_Status_Report_VLR

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see clause 25.1.1;
Check_Confirmation	see clause 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.

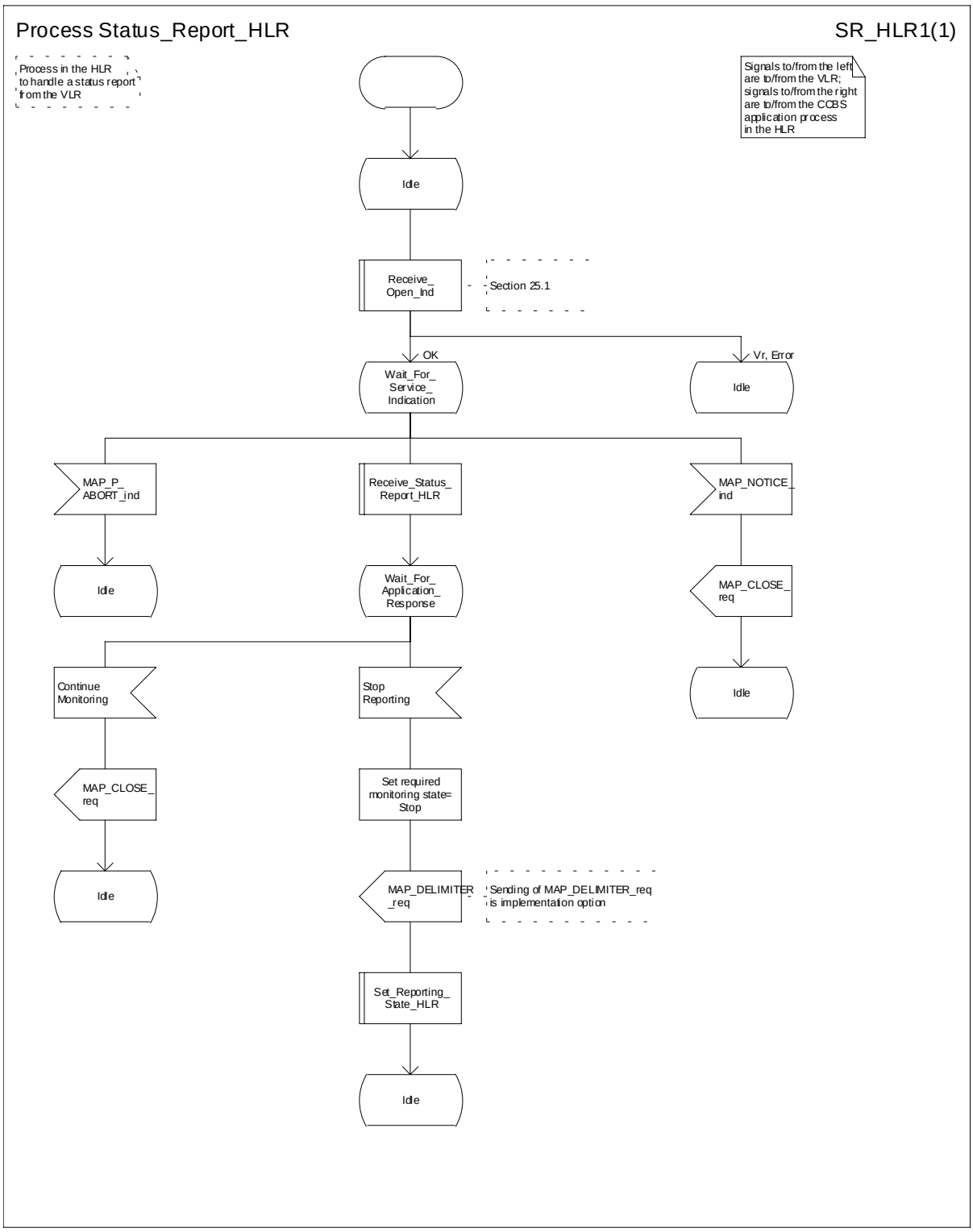


Figure 21.7/4: Process Status Report_HLR

Figure 21.7/5: Macro in the HLR to receive a status report from the VLR

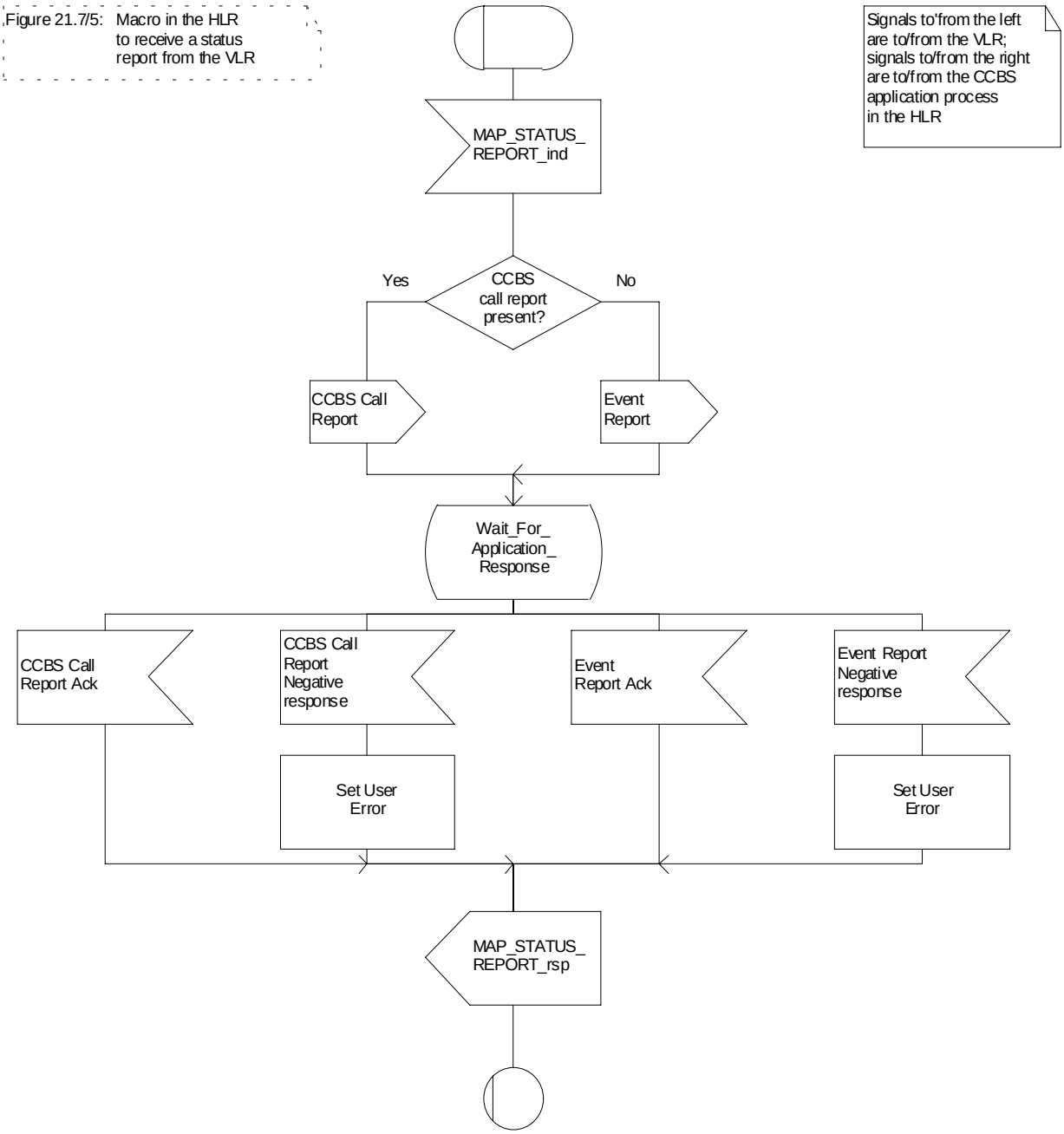


Figure 21.7/5: Macro Receive_Status_Report_HLR

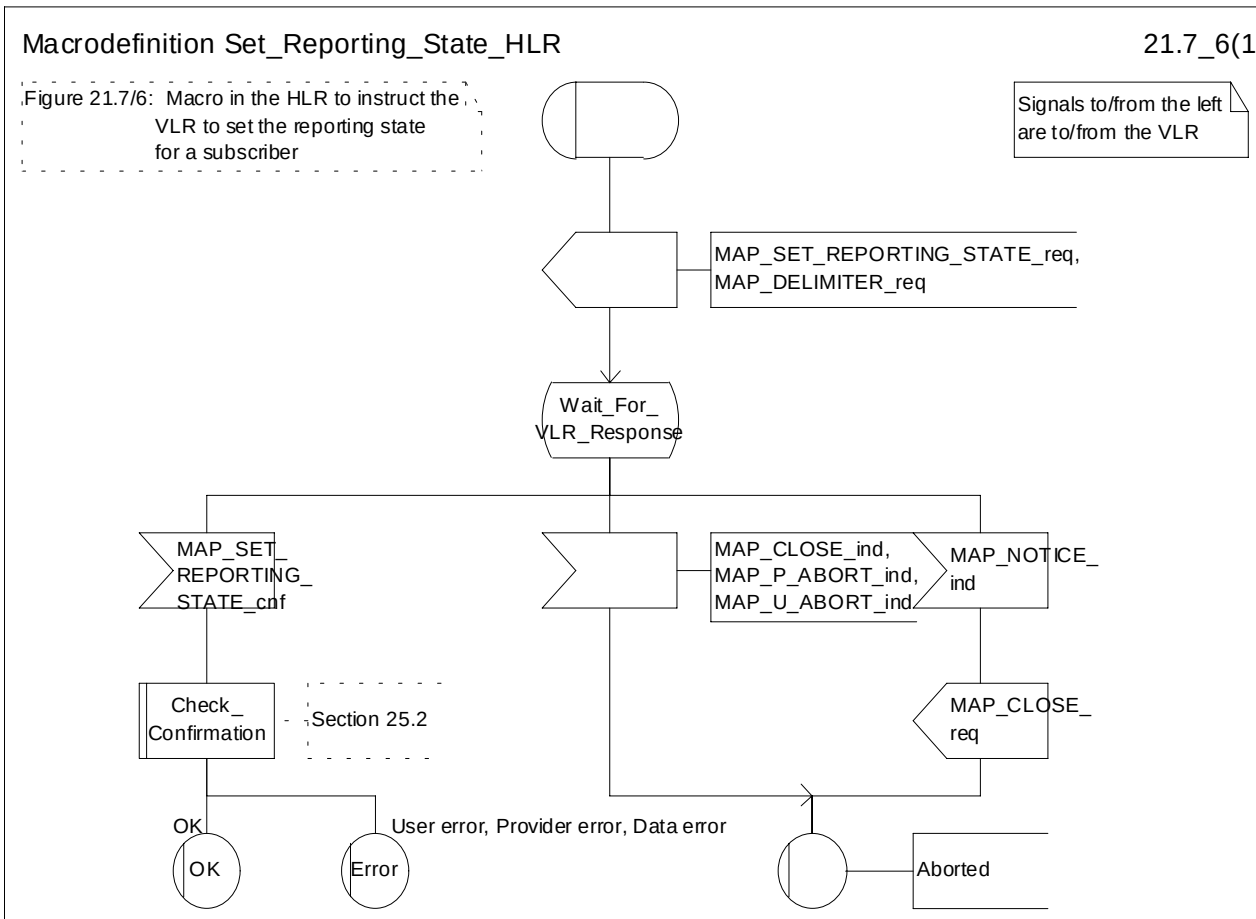


Figure 21.7/6: Macro Set_Reporting_State_HLR

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.

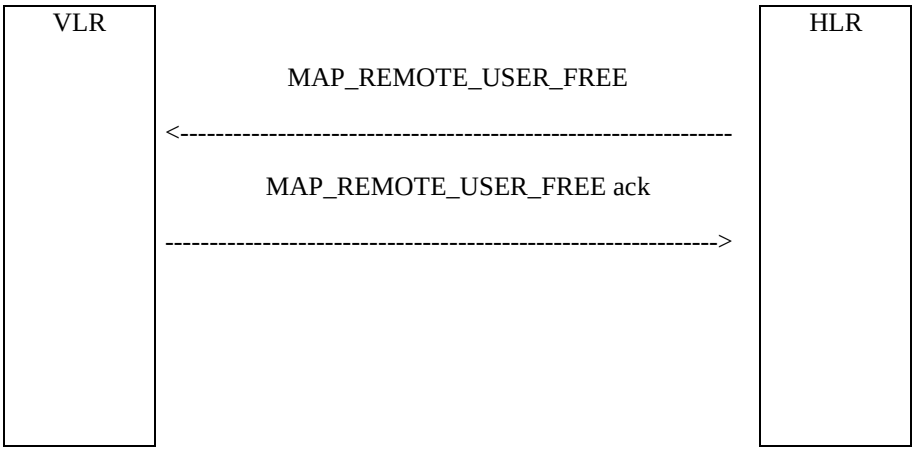


Figure 21.8/1: Remote User Free: recall not accepted

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 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 clause 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.

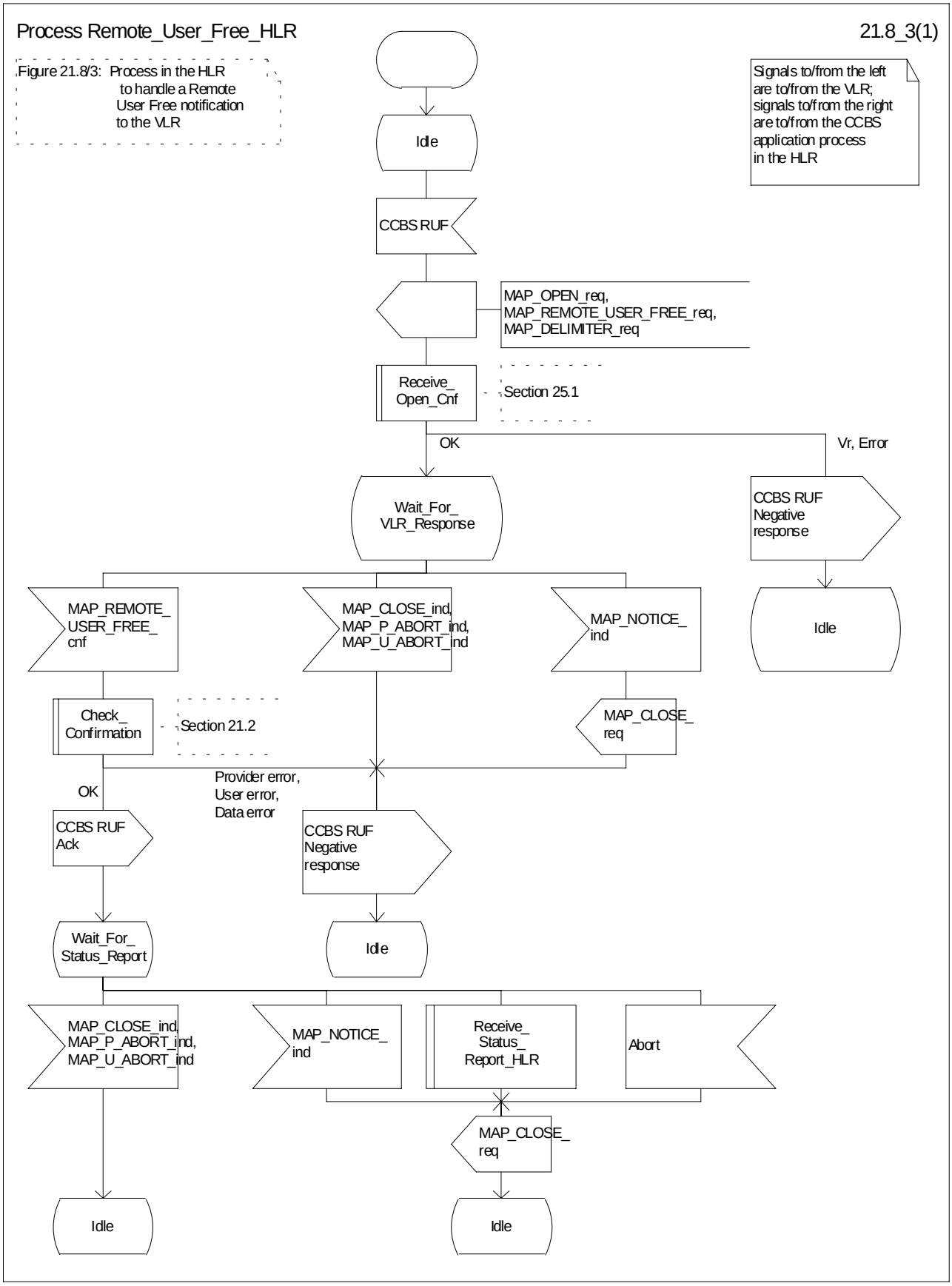


Figure 21.8/3: Process Remote_User_Free_HLR

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 clause; the definitions of this macro can be found as follows:

Check_Confirmation see clause 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.

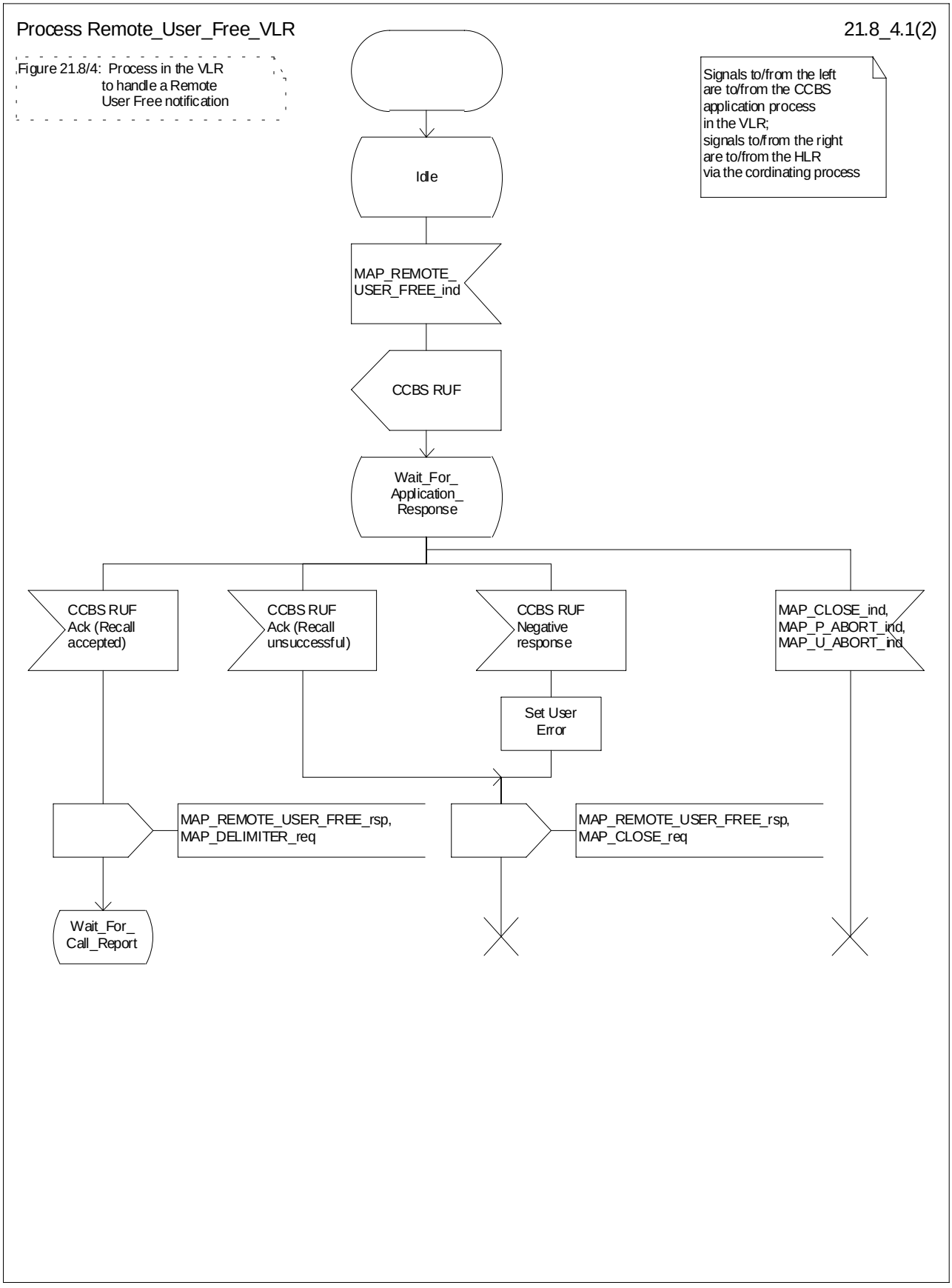


Figure 21.8/4 (sheet 1 of 2): Process Remote_User_Free_VLR

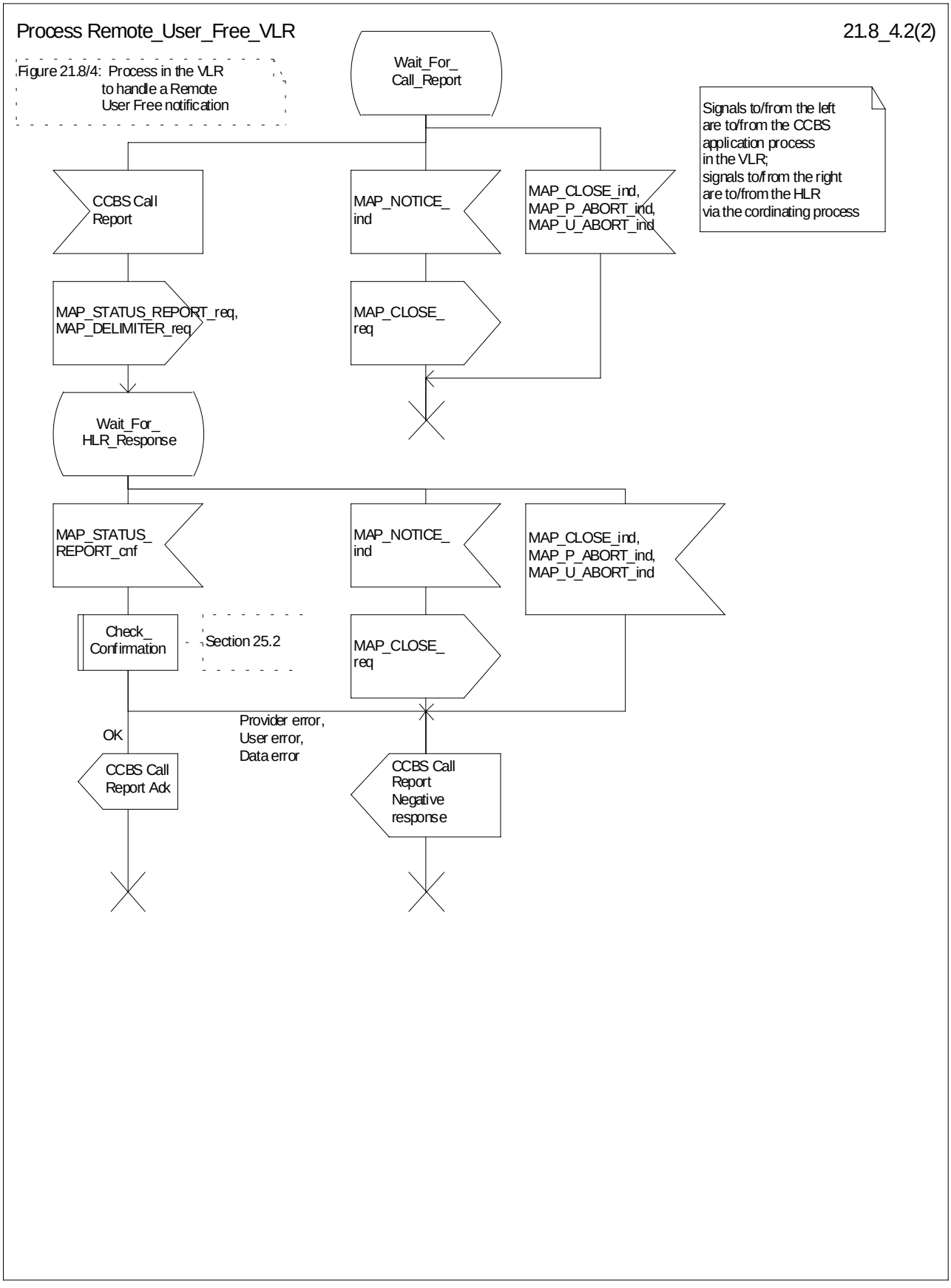


Figure 21.8/4 (sheet 2 of 2): Process Remote_User_Free_VLR

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.

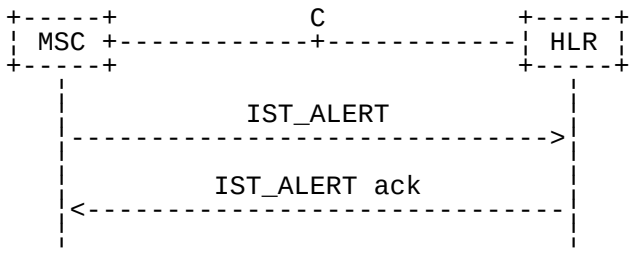


Figure 21.9/1: IST Alert

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see clause 25.1.2;
Check_Confirmation	see clause 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.

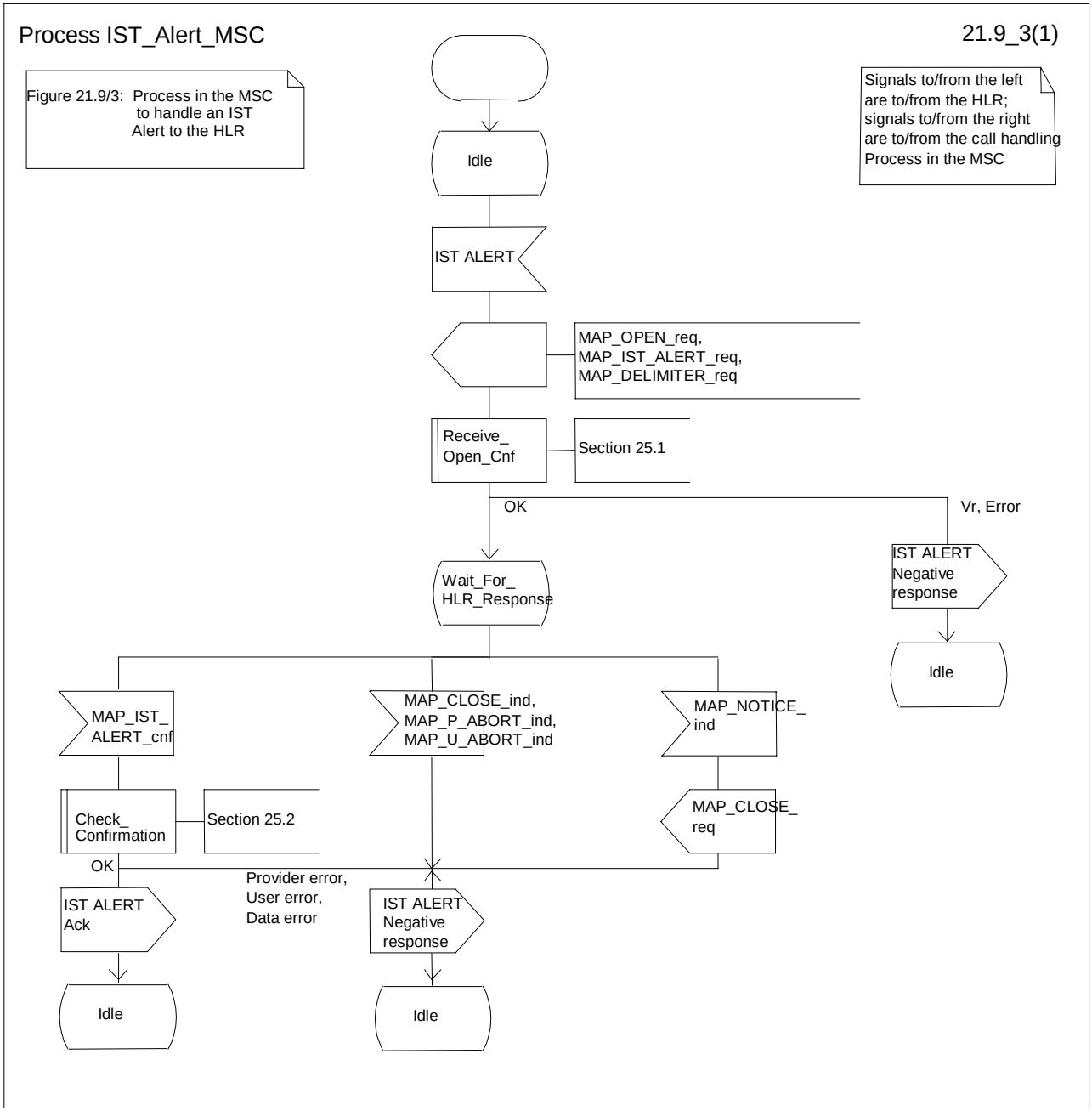


Figure 21.9/2: Process IST_Alert_MSC

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 clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 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 Reeive_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.

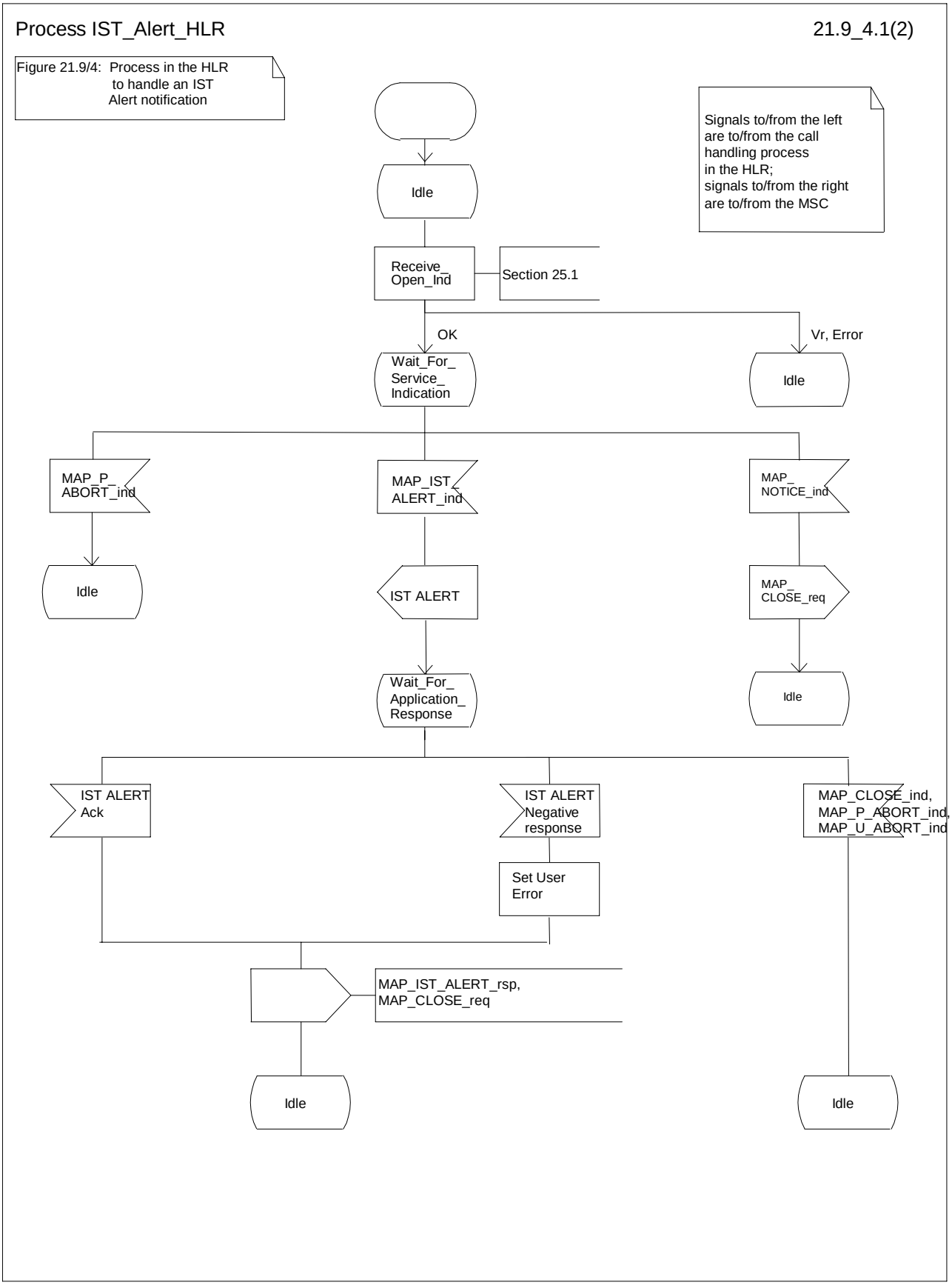


Figure 21.9/3: Process IST_Alert_HLR

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.

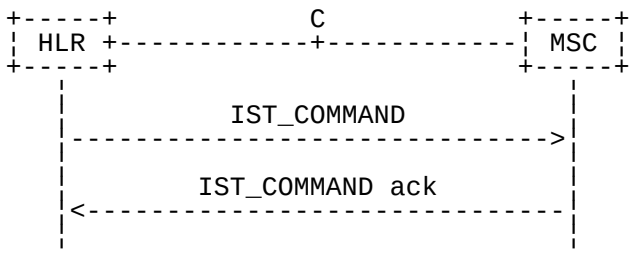


Figure 21.10/1: IST Command

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 clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 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.

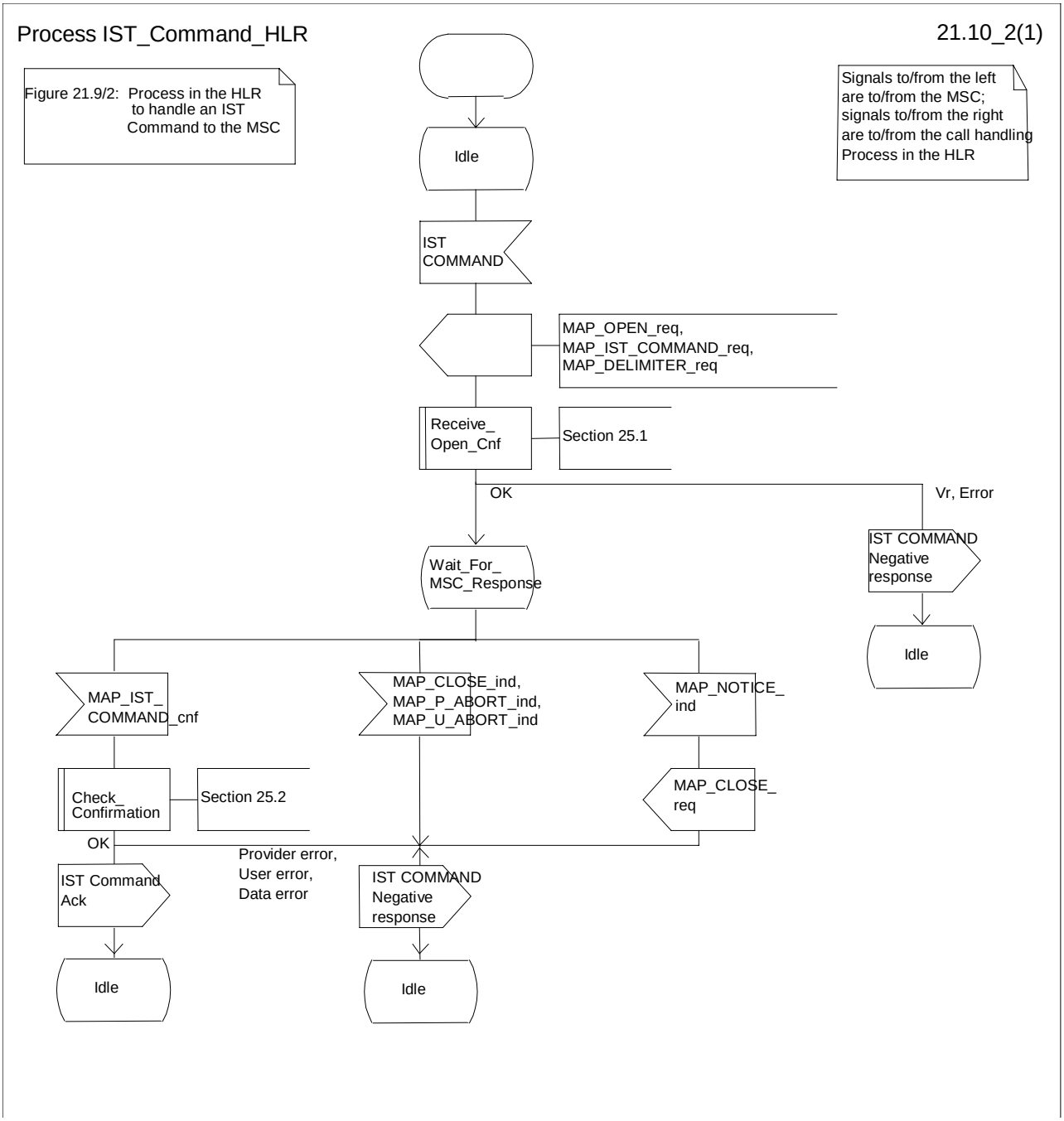


Figure 21.10/2: Process IST_Command_HLR

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 clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 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.

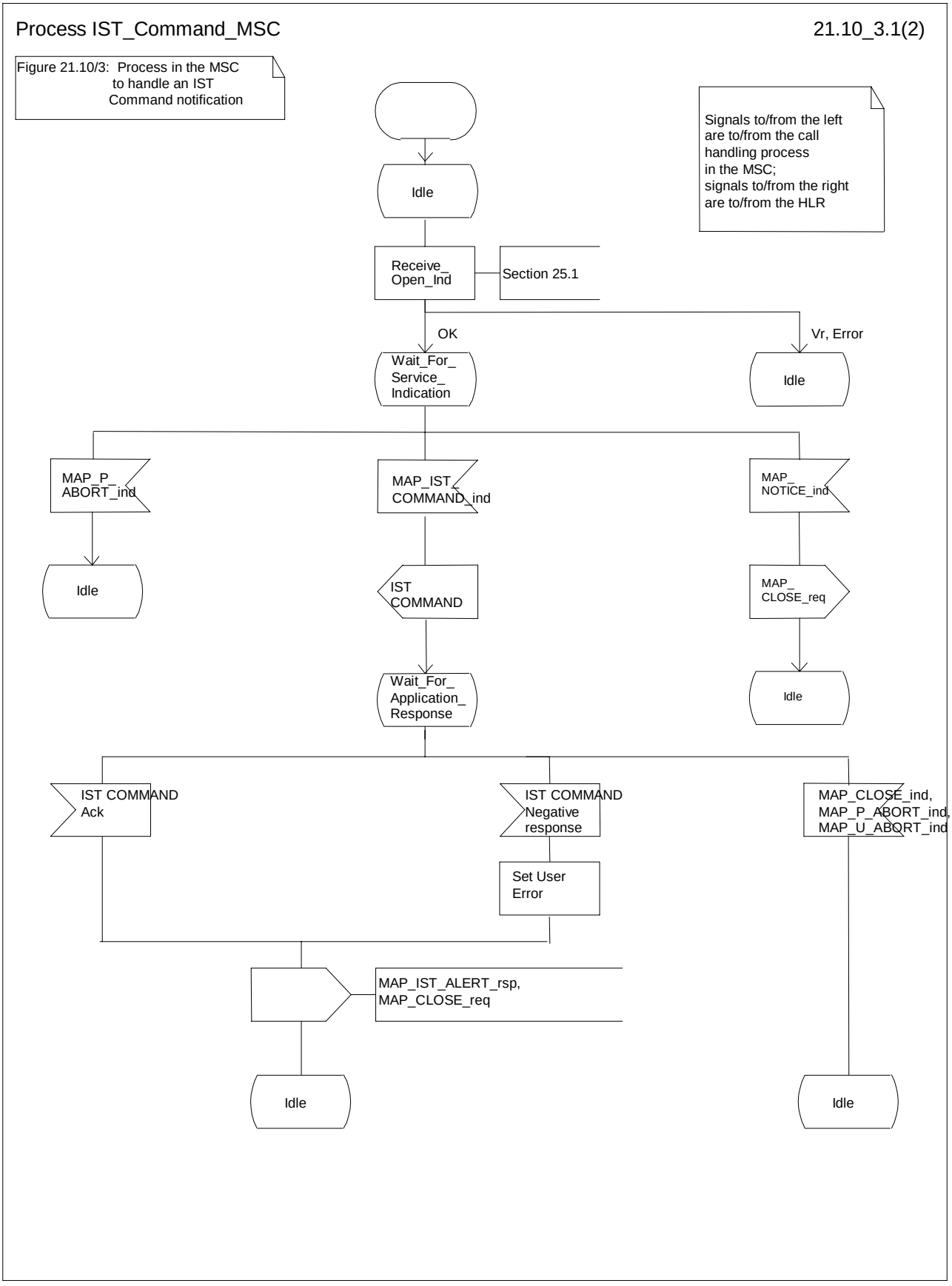


Figure 21.10/3: Process IST_Command_MSC

*** Next Modification ***

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 (3GPP TS 24.008 [35]) 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 clause 23.2.1);
- if the A_RP_SM_MEMORY_AVAILABLE indication is received, the process SC_Alert_MSC is initiated (see clause 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.

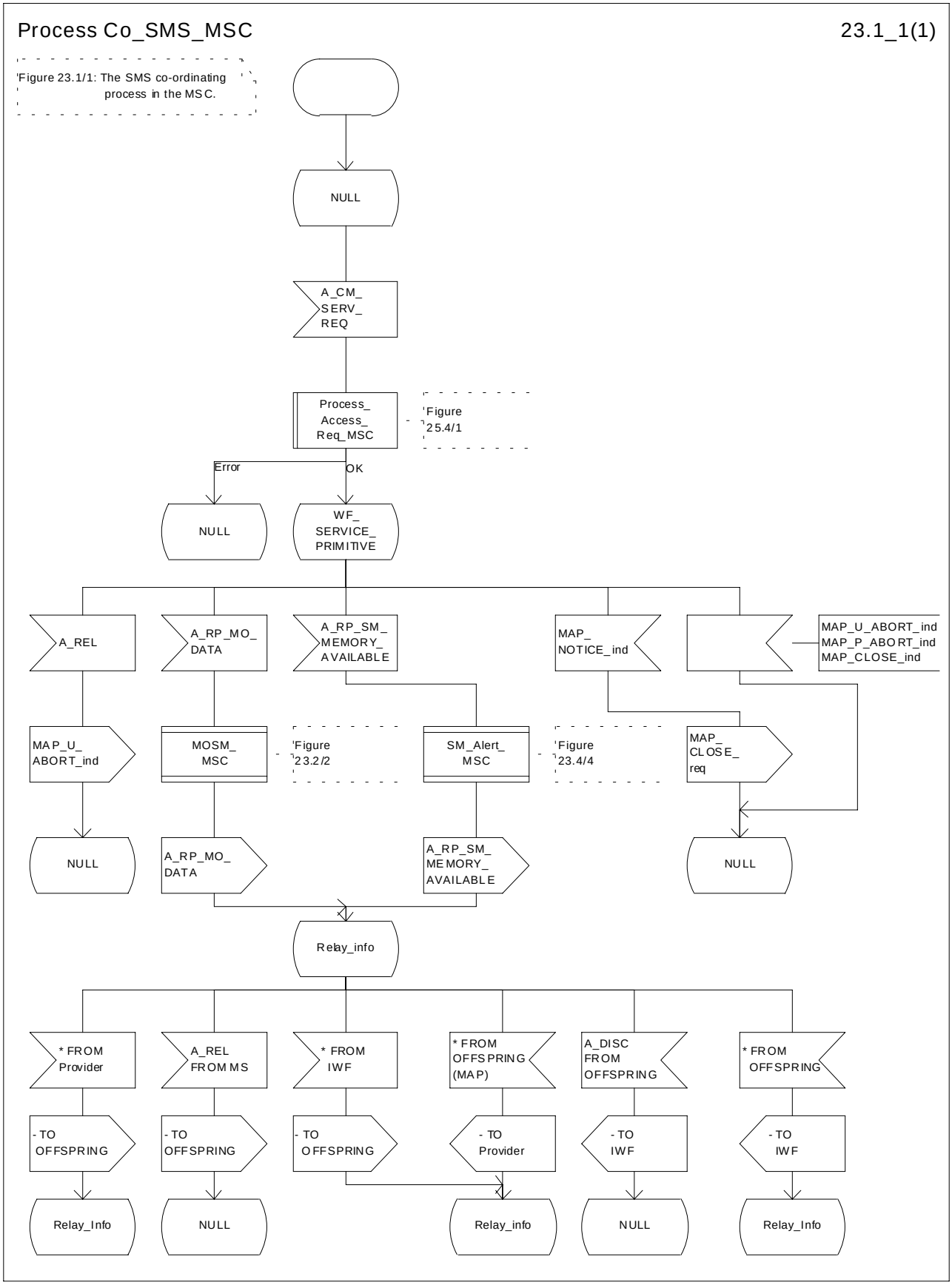


Figure 23.1/1: Process Co_SMS_MSC

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_SM_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.

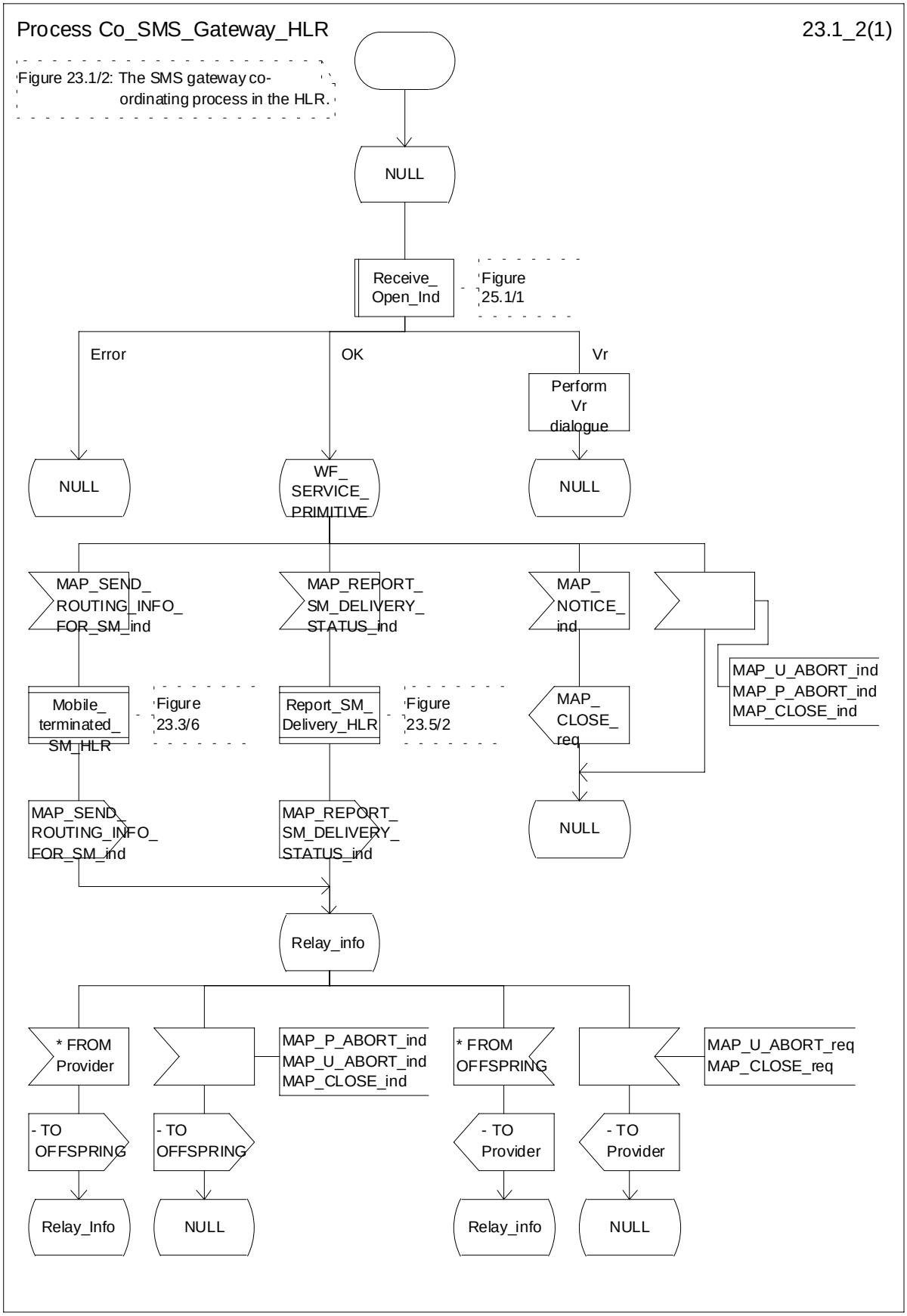


Figure 23.1/2: Process Co_SMS_Gateway_HLR

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 clause 23.2.4);
- if the A_RP_SM_MEMORY_AVAILABLE indication is received, the process SC_Alert_SGSN is initiated (see clause 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.

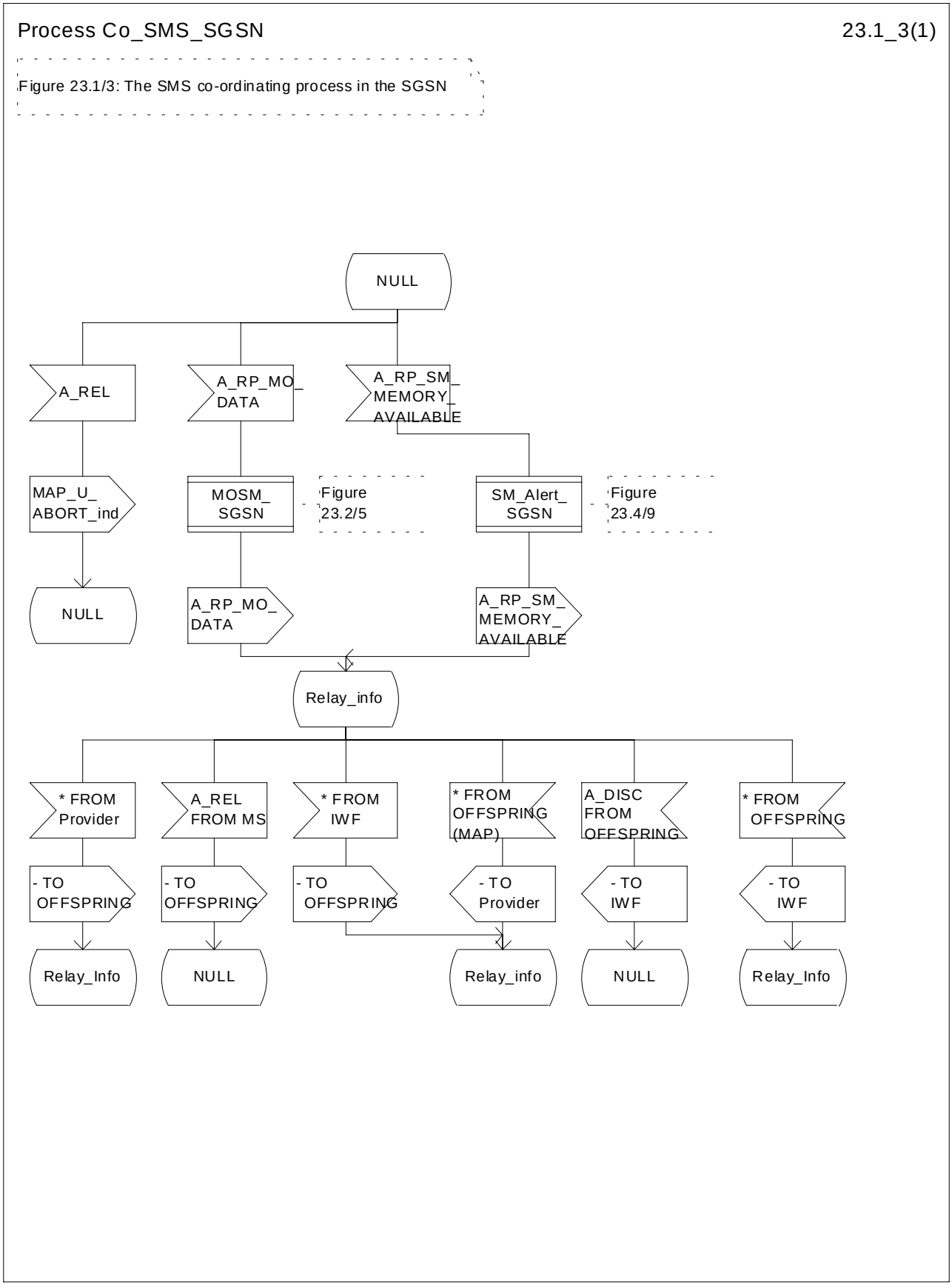
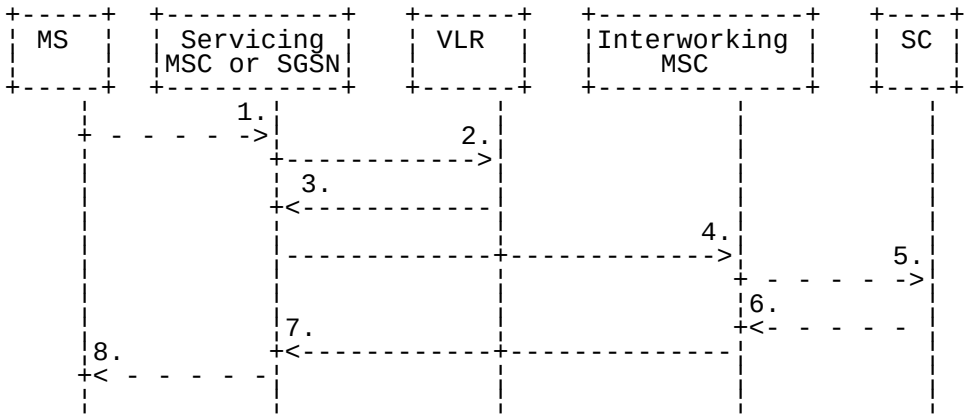


Figure 23.1/3: Process Co_SMS_SGSN

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 (3GPP TS 24.011 [37]).
2) MAP_SEND_INFO_FOR_MO_SMS (*).
3) MAP_SEND_INFO_FOR_MO_SMS_ACK (*).
4) MAP_MO_FORWARD_SHORT_MESSAGE.
5) Short message (3GPP TS 23.140).
6) Short message Acknowledgement (3GPP TS 23.140).
7) MAP_MO_FORWARD_SHORT_MESSAGE_ACK.
8) Short Message Acknowledgement (3GPP TS 24.011 [37]).
(*) 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 clause 8.3); (*)
MAP_AUTHENTICATE	(see clause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see clause 8.6); (*)
MAP_PROVIDE_IMSI	(see clause 8.9); (*)
MAP_CHECK_IMEI	(see clause 8.7);
MAP_FORWARD_NEW_TMSI	(see clause 8.9); (*)
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see clause 9.1); (*)
MAP_READY_FOR_SM	(see clause 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 clause 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 3GPP TS 23.140.

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 3GPP 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 3GPP 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 3GPP 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 3GPP 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 3GPP TS 23.140. The failure in the SM submission is reported to the CAMEL service as specified in 3GPP 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 acknowledgement message from the Service Centre is forwarded to the mobile station (3GPP TS 23.140, 3GPP TS 24.011 [37]).

The mobile originated short message service procedure is shown in figure 23.2/2.

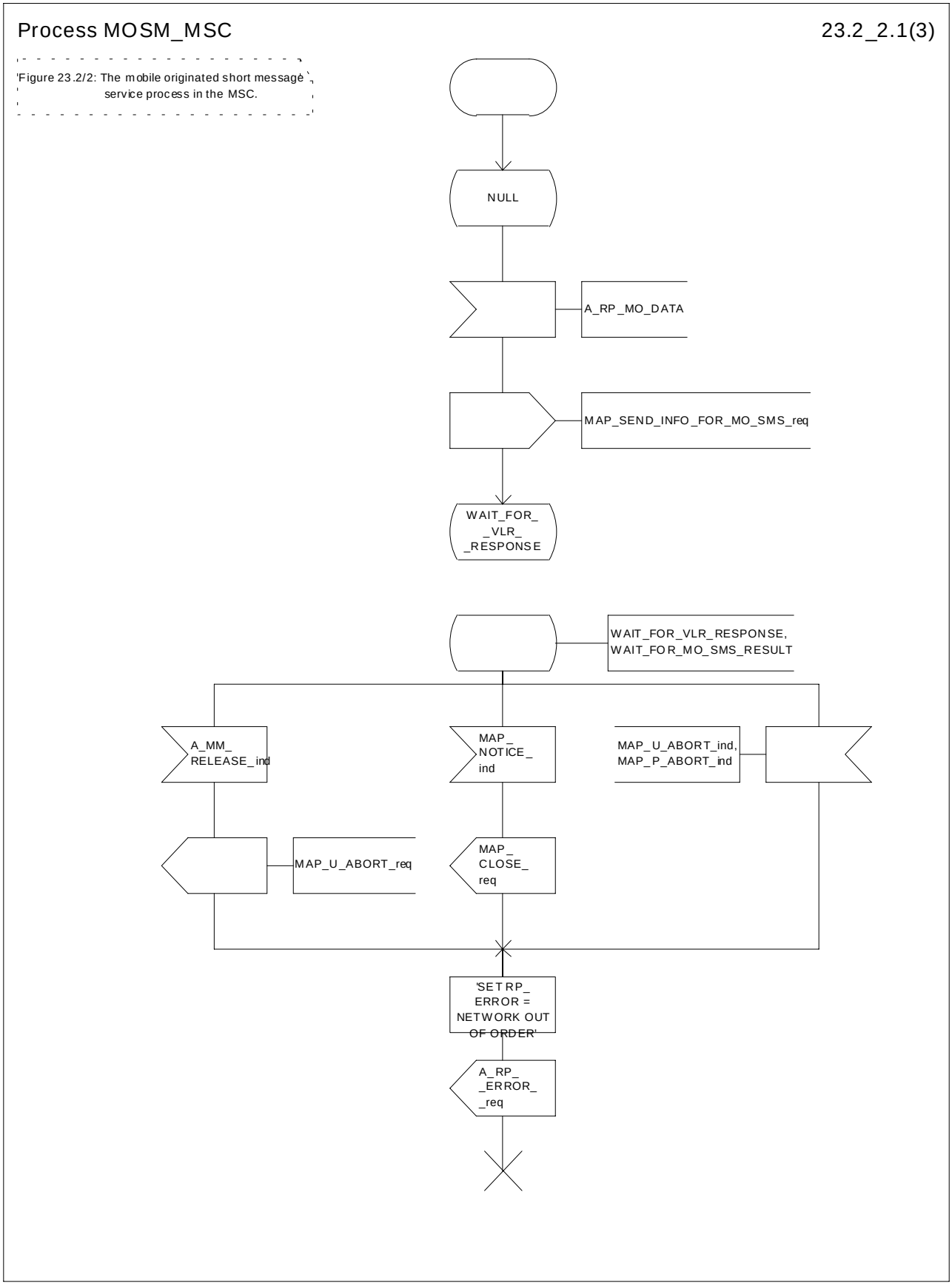


Figure 23.2/2 (sheet 1 of 4): Process MOSM_MSC

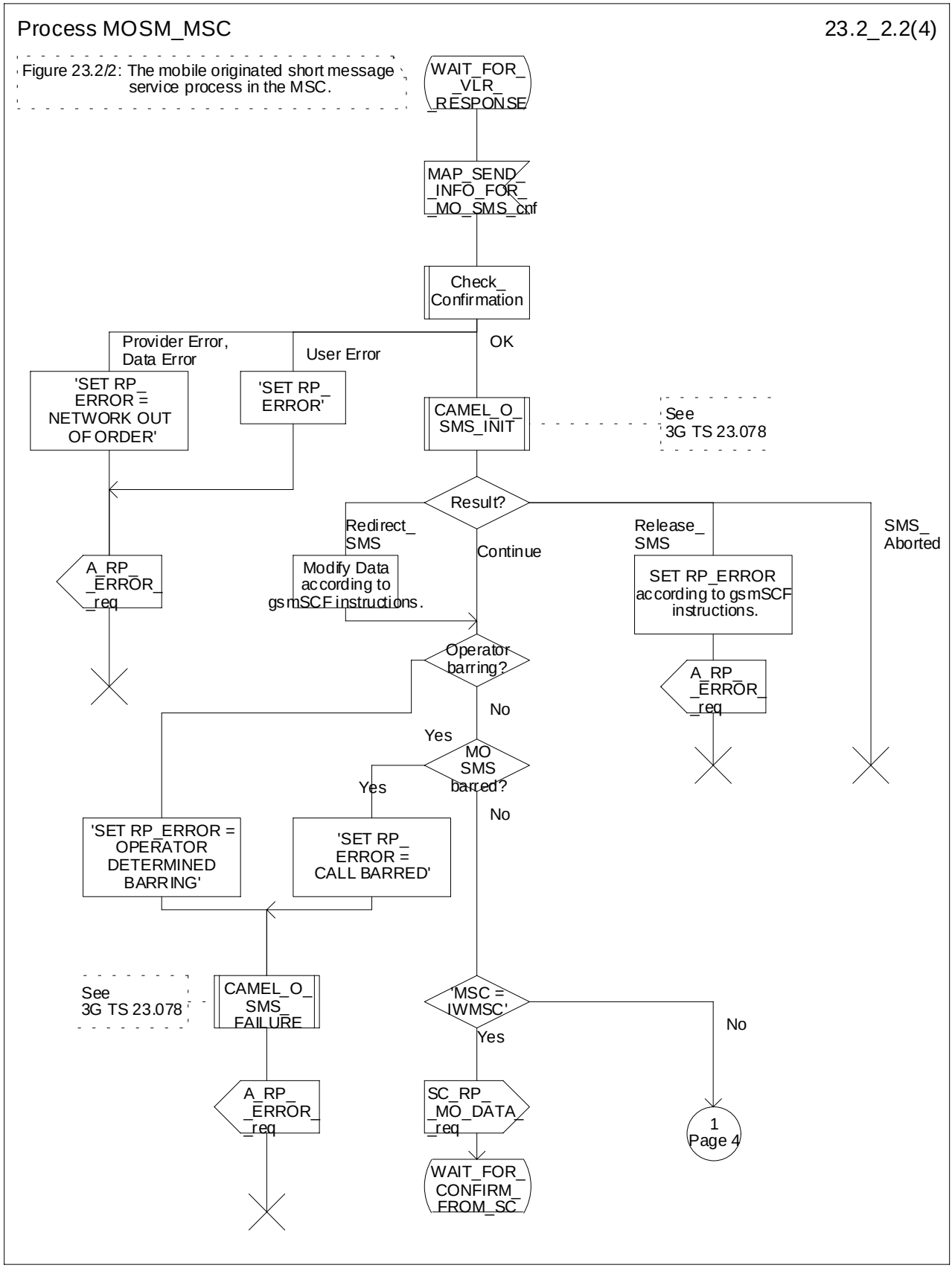


Figure 23.2/2 (sheet 2 of 4): Process MOSM_MSC

Process MOSM_MSC 23.2_2.new3(4)

Figure 23.2/2: The mobile originated short message service process in the MSC.

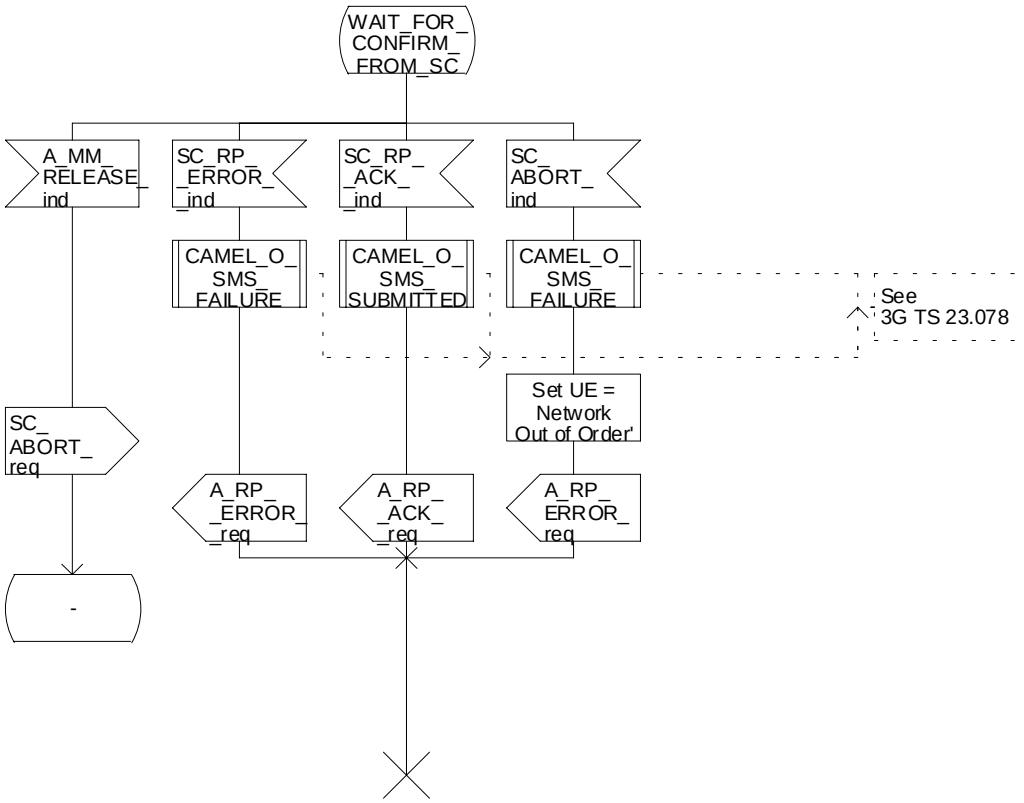


Figure 23.2/2 (sheet 3 of 4): Process MOSM_MSC

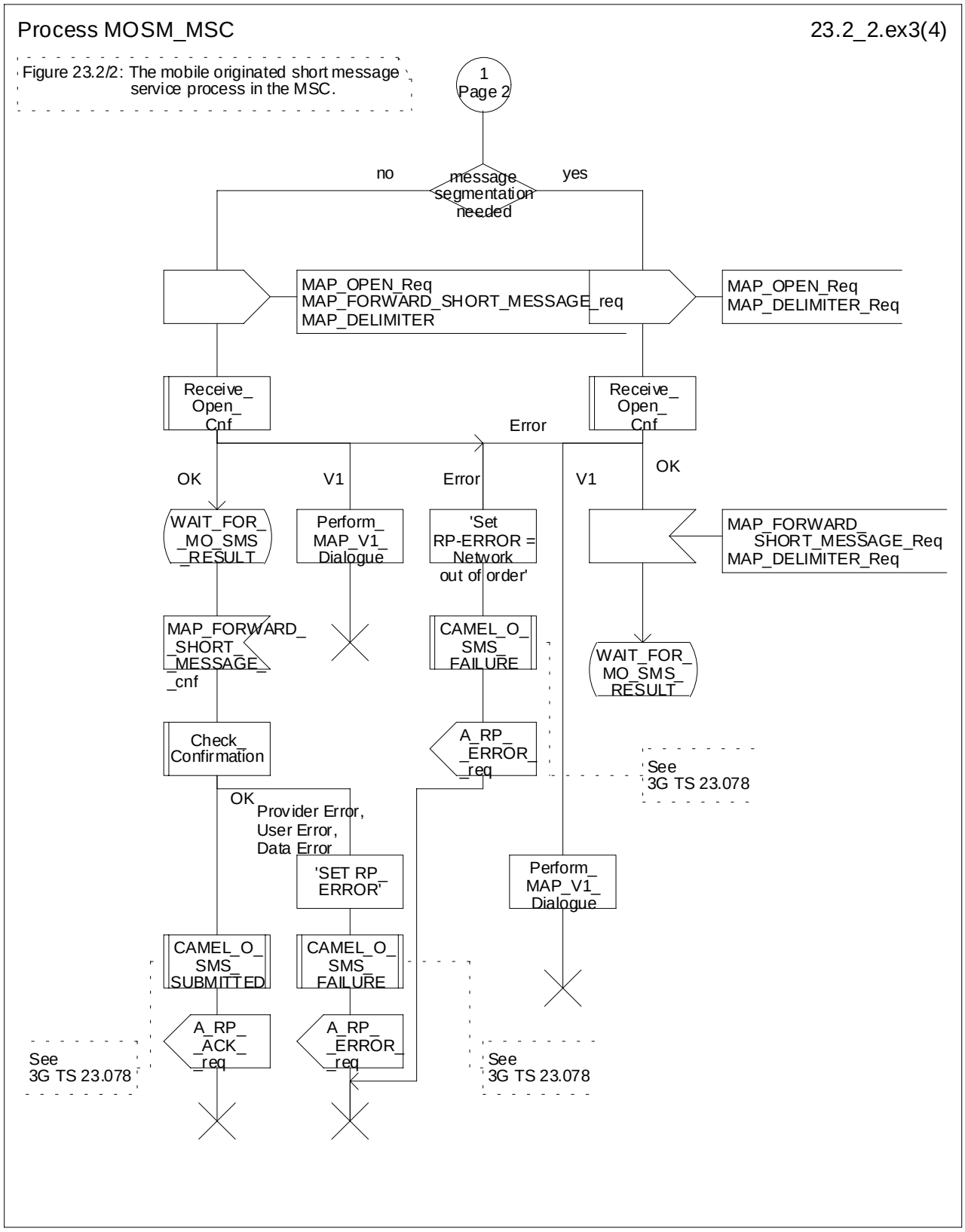


Figure 23.2/2 (sheet 4 of 4): Process MOSM_MSC

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.

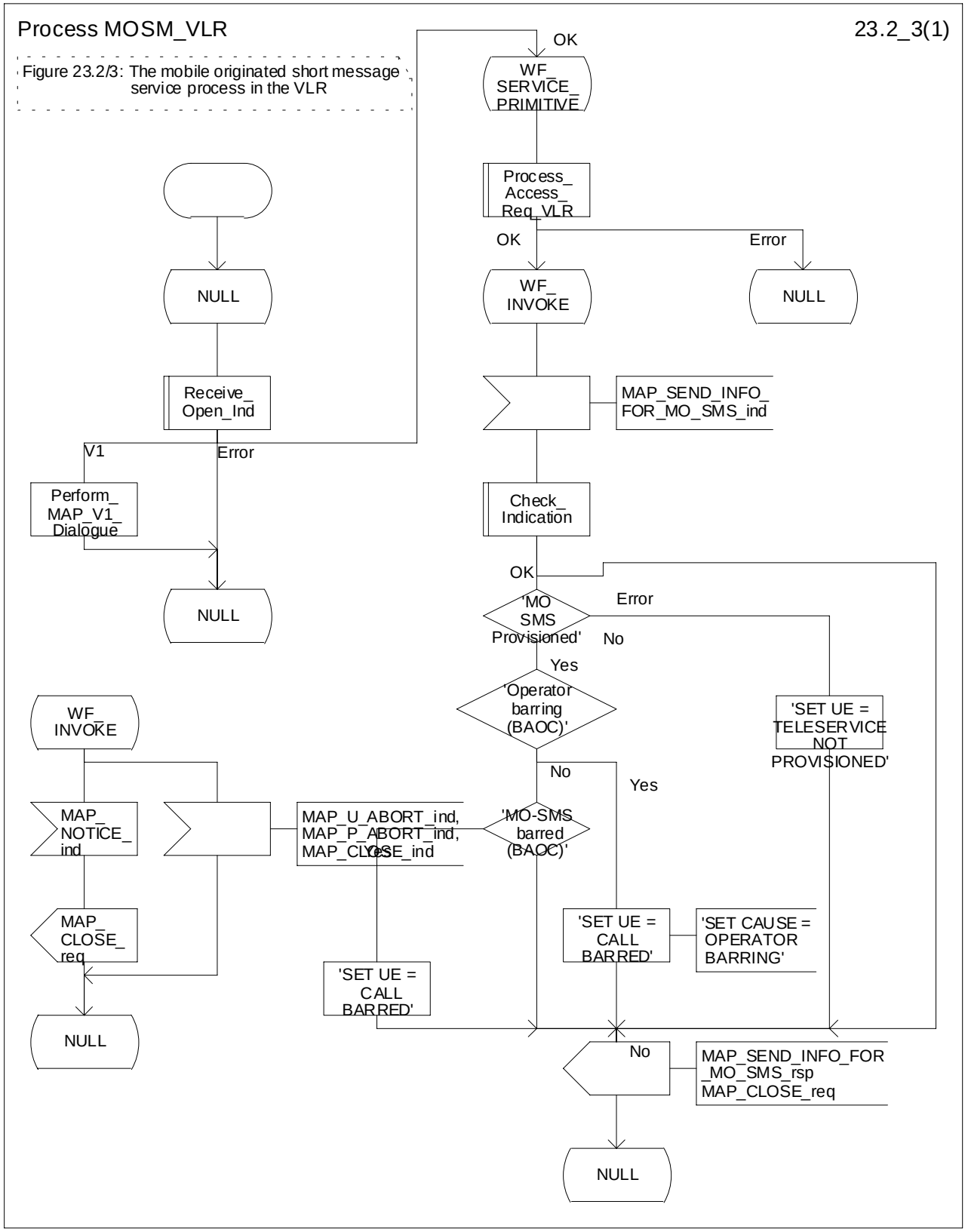


Figure 23.2/3: Process MOSM_VLR

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.

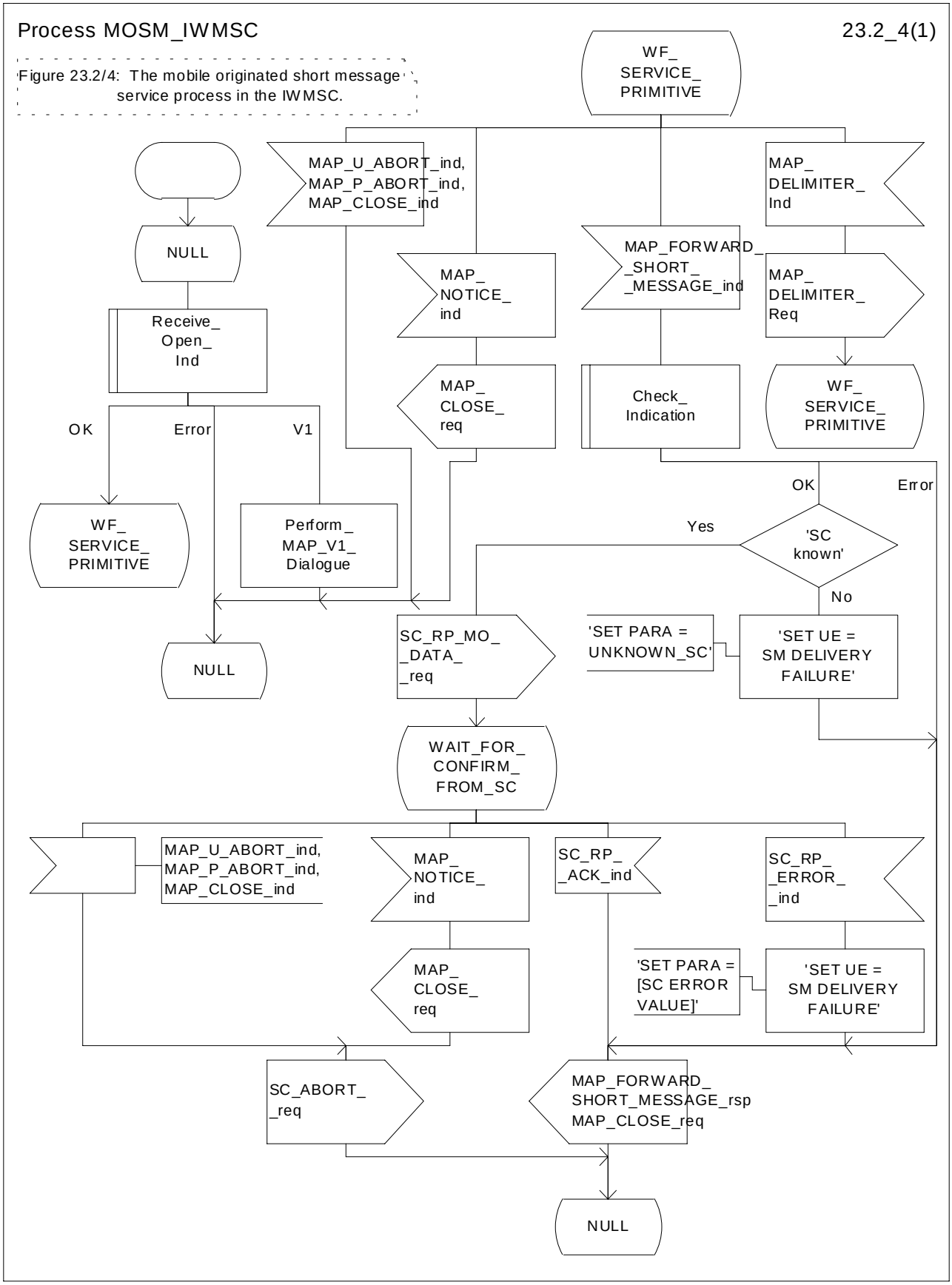


Figure 23.2/4: Process MOSM_IWMSC

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 3GPP 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 3GPP 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 3GPP TS 24.011 [37].

- 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 3GPP 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 3GPP TS 23.140. The failure in SM submission is reported to the CAMEL service as specified in 3GPP 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.

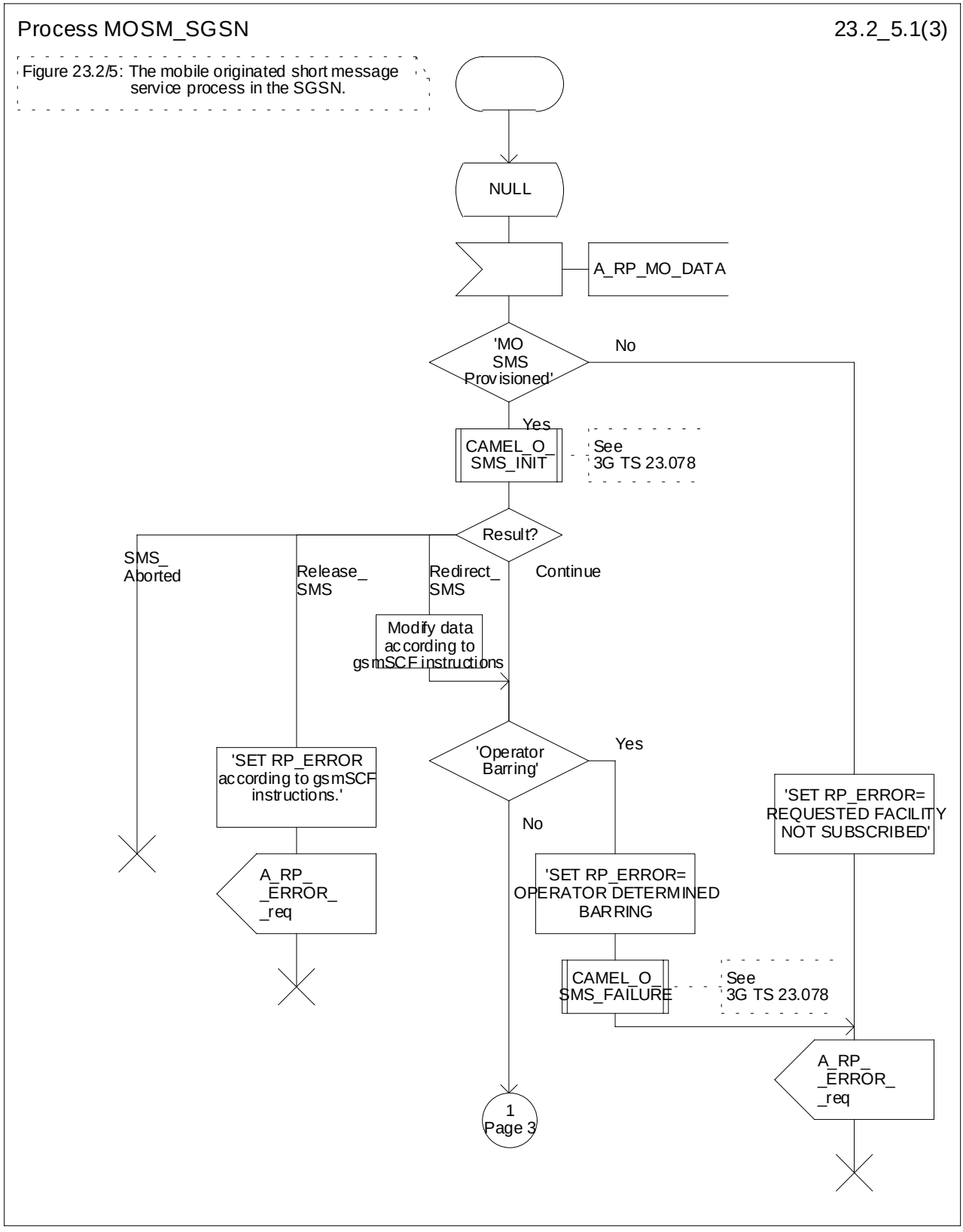


Figure 23.2/5 (sheet 1 of 3): Process MOSM_SGSN

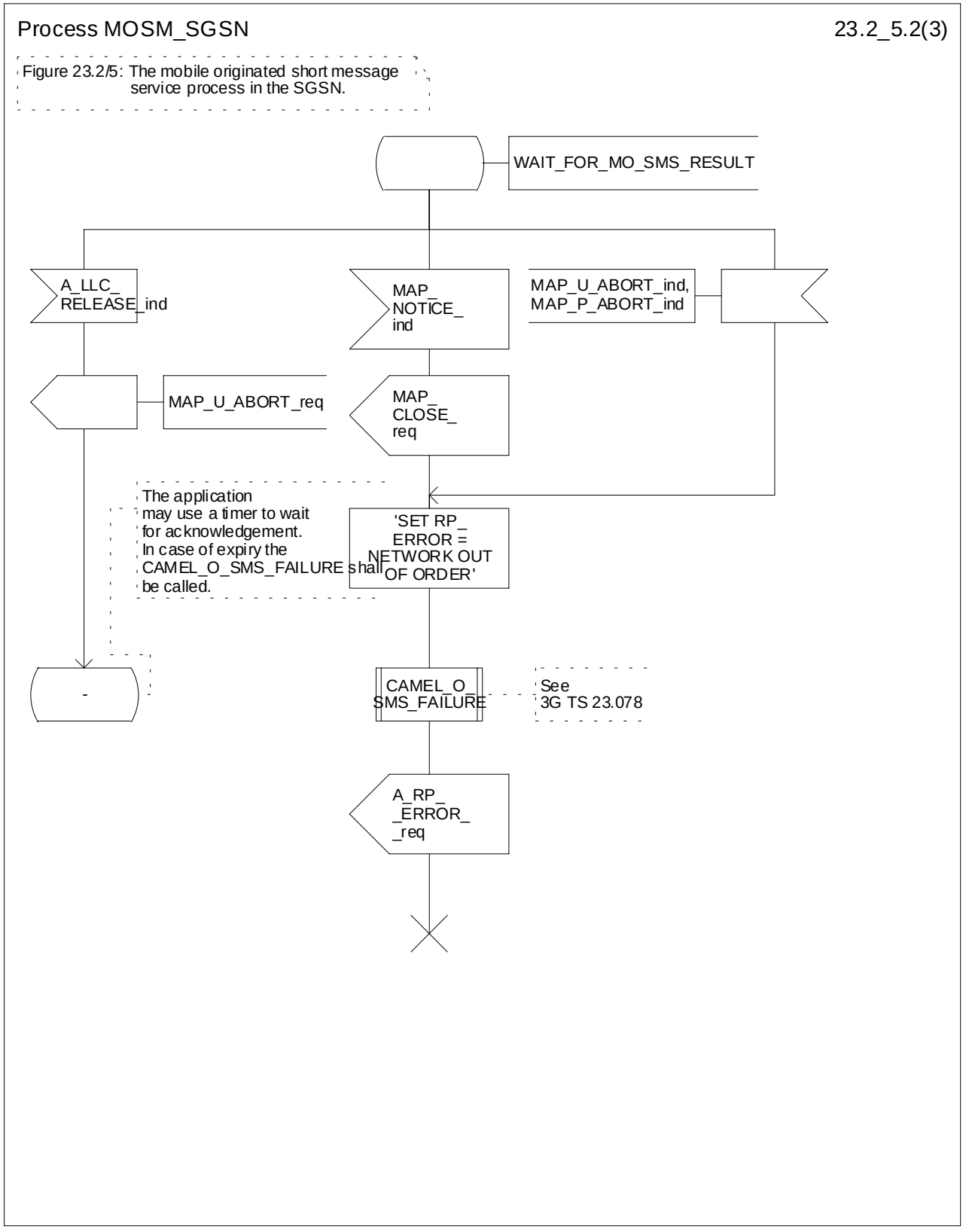


Figure 23.2/5 (sheet 2 of 3): Process MOSM_SGSN

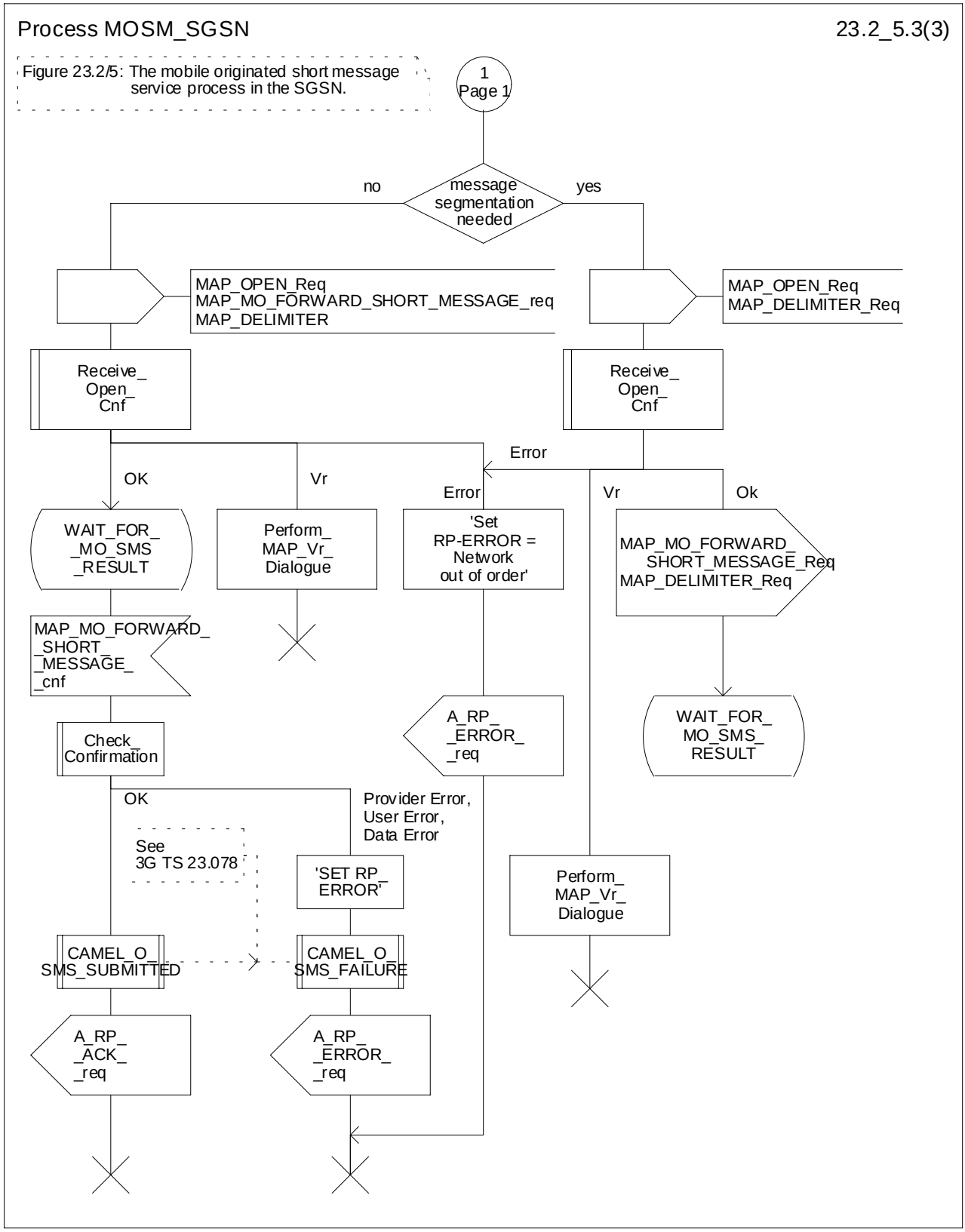
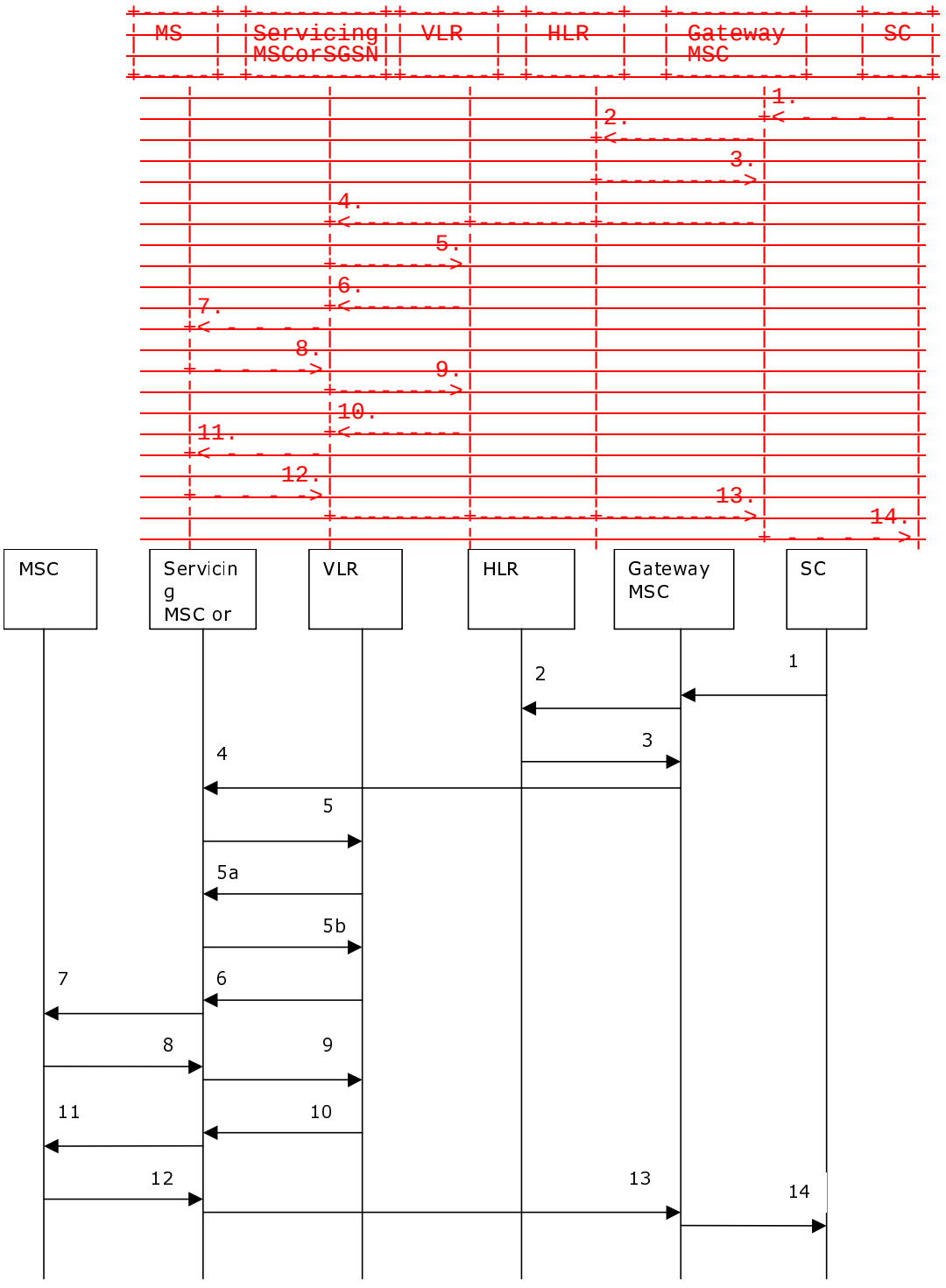


Figure 23.2/5 (sheet 3 of 3): Process MOSM_SGSN

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.



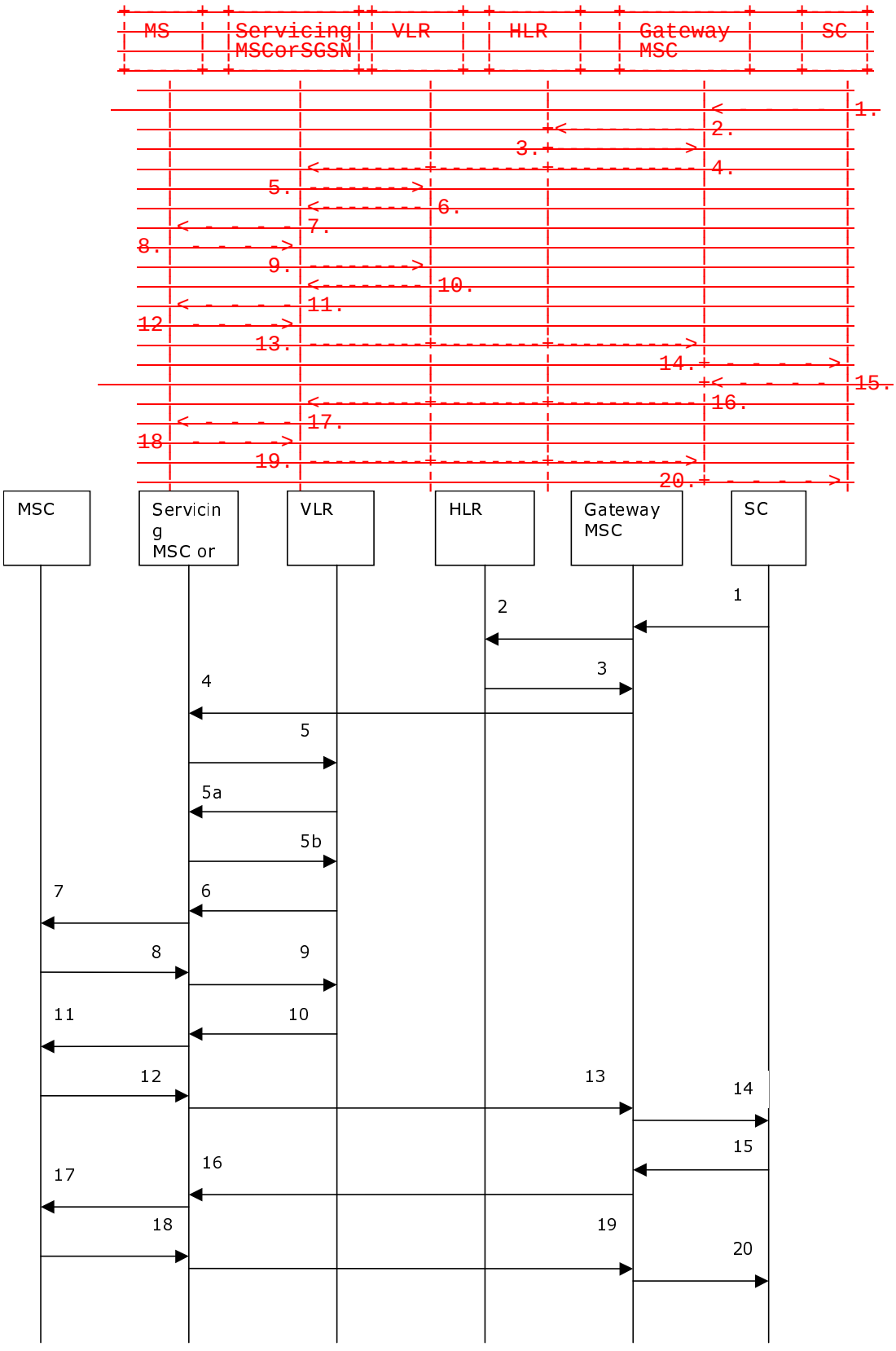
1) Short Message (3GPP TS 23.140).
2) MAP_SEND_ROUTING_INFO_FOR_SM.
3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK.
4) MAP_MT_FORWARD_SHORT_MESSAGE.
5) MAP_SEND_INFO_FOR_MT_SMS (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).

7) Page (3GPP TS 24.008 [35]).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.140).

(*) Messages 5), 5a), 5b), 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

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 (3GPP TS 23.140).
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 (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (*3GPP TS 48.008 [49]*).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.140).
15) Short Message (3GPP TS 23.140).
16) MAP_MT_FORWARD_SHORT_MESSAGE (note 2).
17) Short Message (3GPP TS 24.011 [37]).
18) Short Message Acknowledgement (3GPP TS 24.011 [37]).
19) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
20) Short Message Acknowledgement (3GPP TS 23.140).

(*) Messages 5), 5a), 5b) 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

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 clause 8.3); (*)
MAP_PAGE	(see clause 8.2); (*)
MAP_SEARCH_FOR_MS	(see clause 8.2); (*)
MAP_AUTHENTICATE	(see clause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see clause 8.6); (*)
MAP_CHECK_IMEI	(see clause 8.7);
MAP_FORWARD_NEW_TMSI	(see clause 8.9); (*)
MAP_REPORT_SM_DELIVERY_STATUS	(see clause 12.3);
MAP_INFORM_SERVICE_CENTRE	see clause 12.6);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see clause 9.1); (*)
MAP_READY_FOR_SM	(see clause 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 clause 25.3) reporting the successful outcome of the procedure;
- search procedure invocation (see clause 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 clause 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 opens a CAMEL dialogue as specified in 3GPP TS 23.078. If the CAMEL service bars the MT SM then the failure is reported to the GMSC, and the MT SM is not delivered to the MS; otherwise, T~~the MSC initiates forwarding of the short message to the MS.

The MSC may receive MAP_CONTINUE_CAMEL_SMS_HANDLING. The MSC then opens a CAMEL dialogue with the gsmSCF, as specified in 3GPP TS 23.078. If the CAMEL service bars the MT SM, then the failure is reported to the SMS-GMSC, and the MT SM is not delivered to the MS. Otherwise, the MSC shall send a second MAP_SEND_INFO_FOR_MT_SMS request to the VLR.

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 acknowledgement if the short message has been successfully delivered to the mobile subscriber. The successful MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;

- 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 clause 7.6.1.4) may also be carried. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;

- a system failure error if the delivery procedure is aborted. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078.

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,~~If the More Messages To Send flag was TRUE, then 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, then the unexpected data value error or data missing error is provided to the gateway MSC;

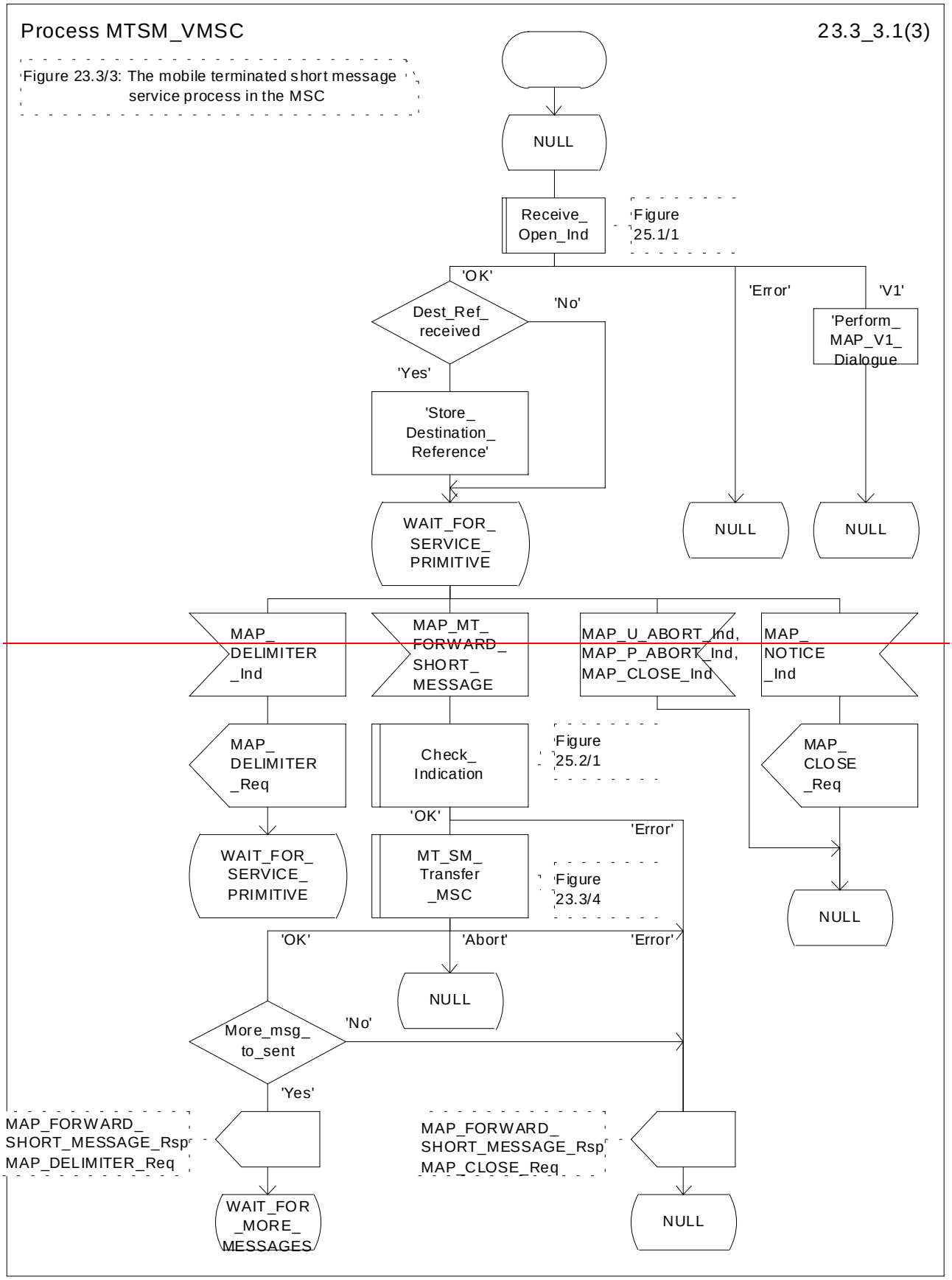
- The MSC opens a CAMEL dialogue as specified in 3GPP TS 23.078 for each SM. If the CAMEL service bars the MT SM, then the failure is reported to the GMSC, and the MT SM is not delivered to the MS.

- if the More Messages To Send flag is FALSE, then the serv~~ic~~ing MSC will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gsmSCF as specified in 3GPP TS 23.078 and to the gateway MSC and the transaction is terminated.

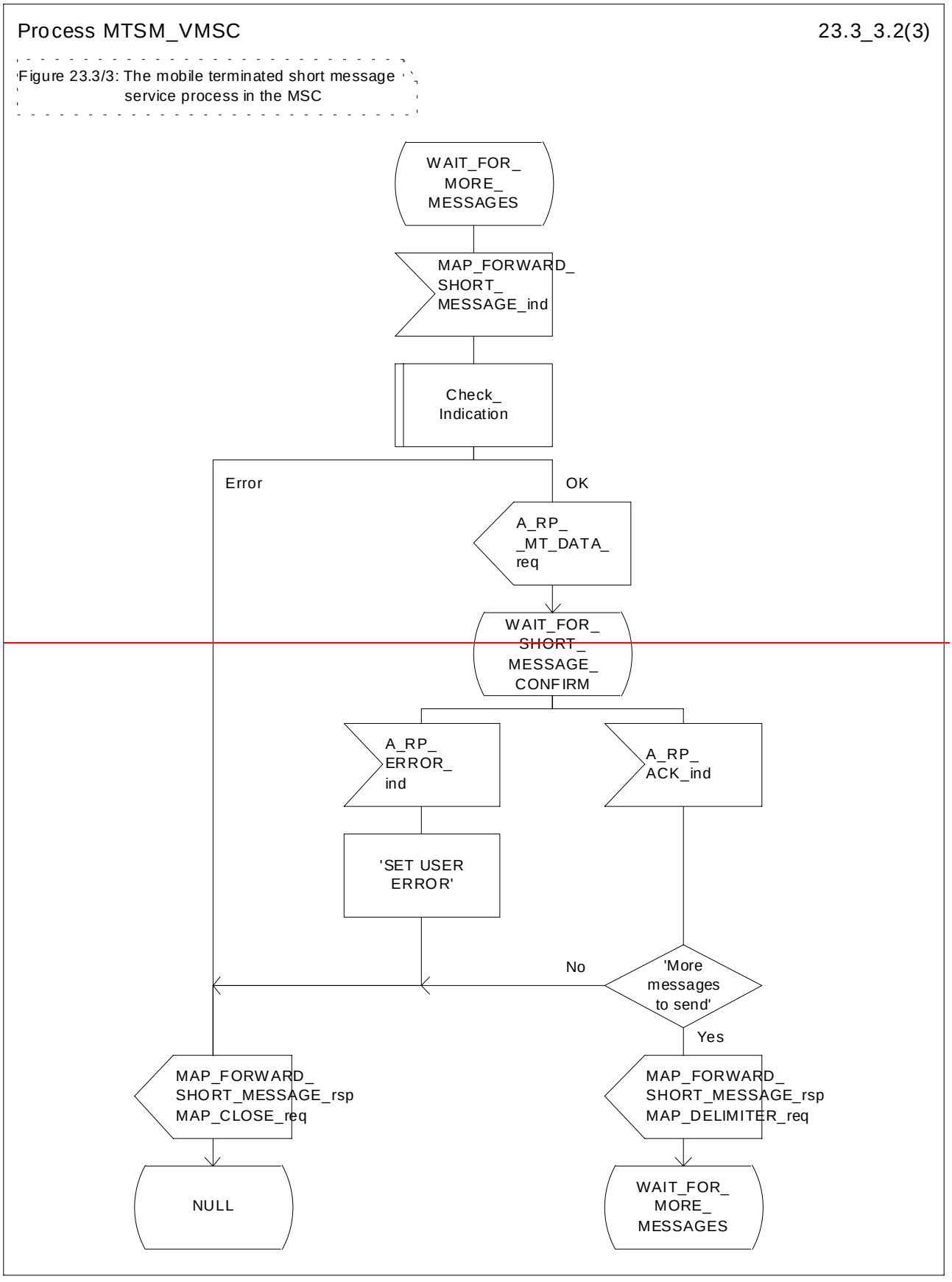
- if the More Messages To Send flag is TRUE, then the servi~~ci~~ng MSC will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, then the SM delivery failure is reported to the gsmSCF and the the reason is reported to the gateway MSC and the procedure is terminated. If the procedure is successful, then the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078, and 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.



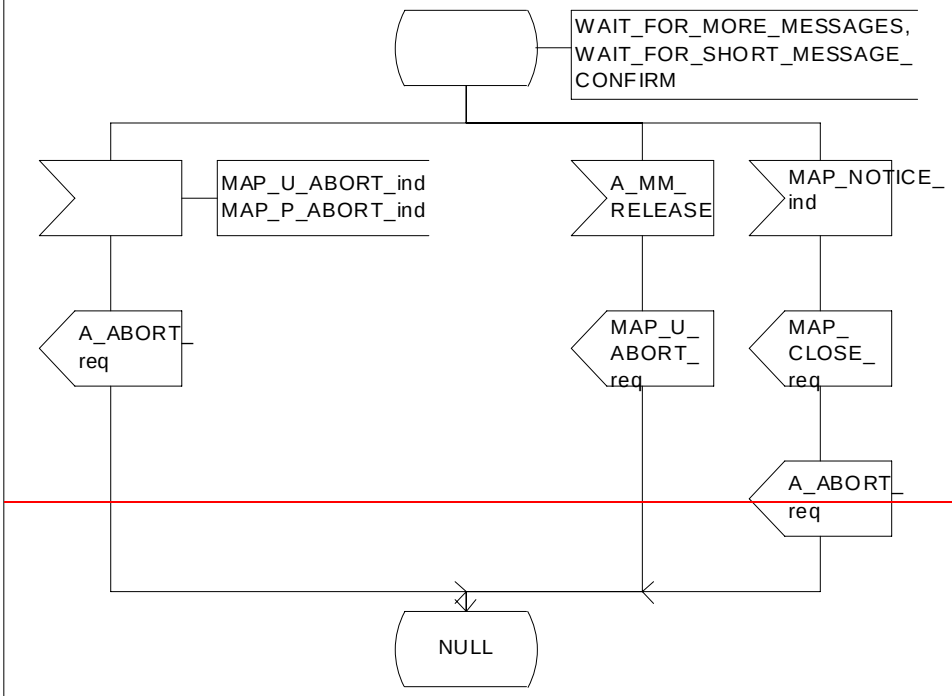
~~Figure 23.3/3 (sheet 1 of 3): Procedure MTSM_VMSC~~



~~Figure 23.3/3 (sheet 2 of 3): Procedure MTSM_VMSC~~

Process MTSM_VMSC 23.3_3.3(3)

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~~

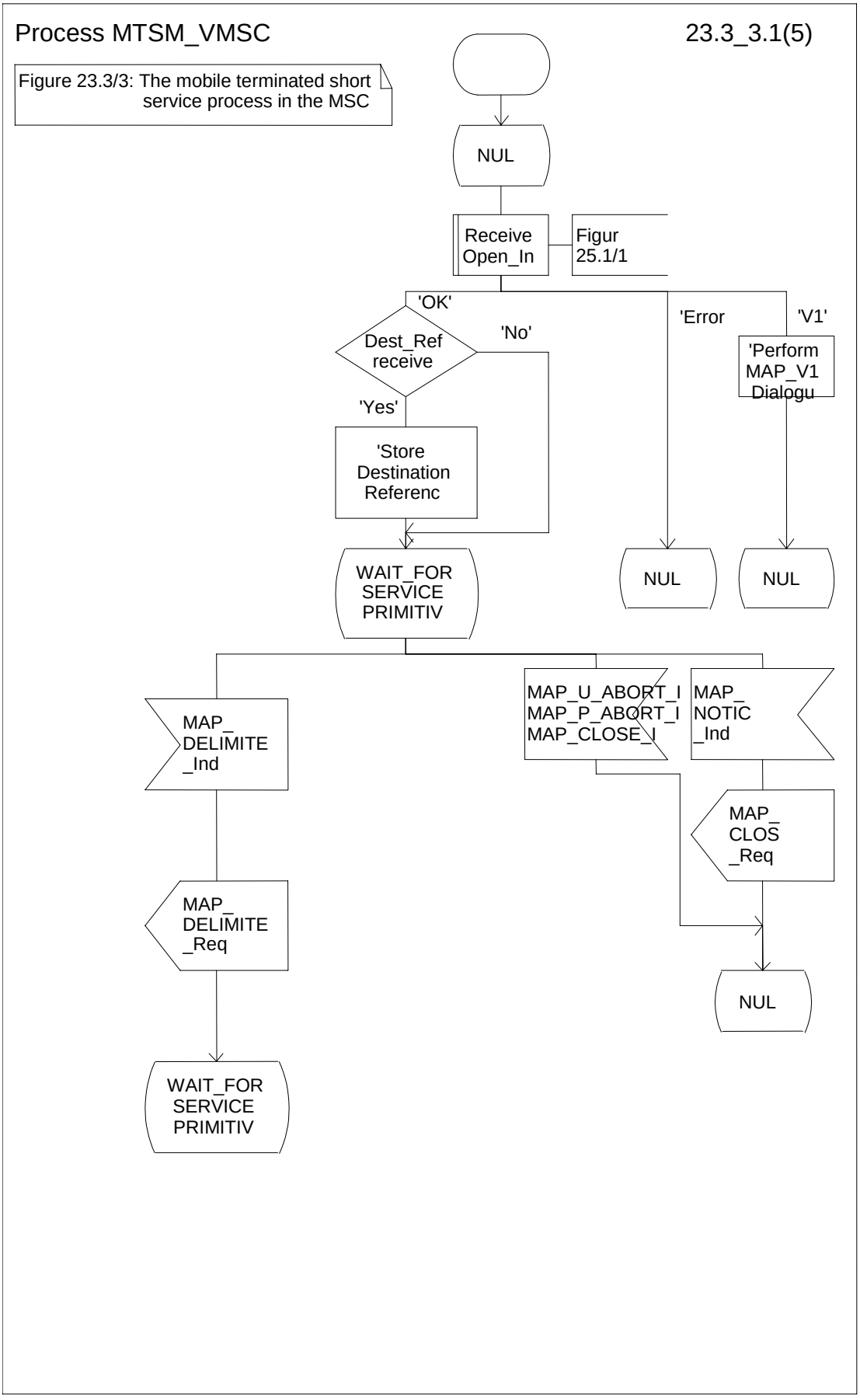


Figure 23.3/3 (sheet 1 of 5): Procedure MTSM_VMSC

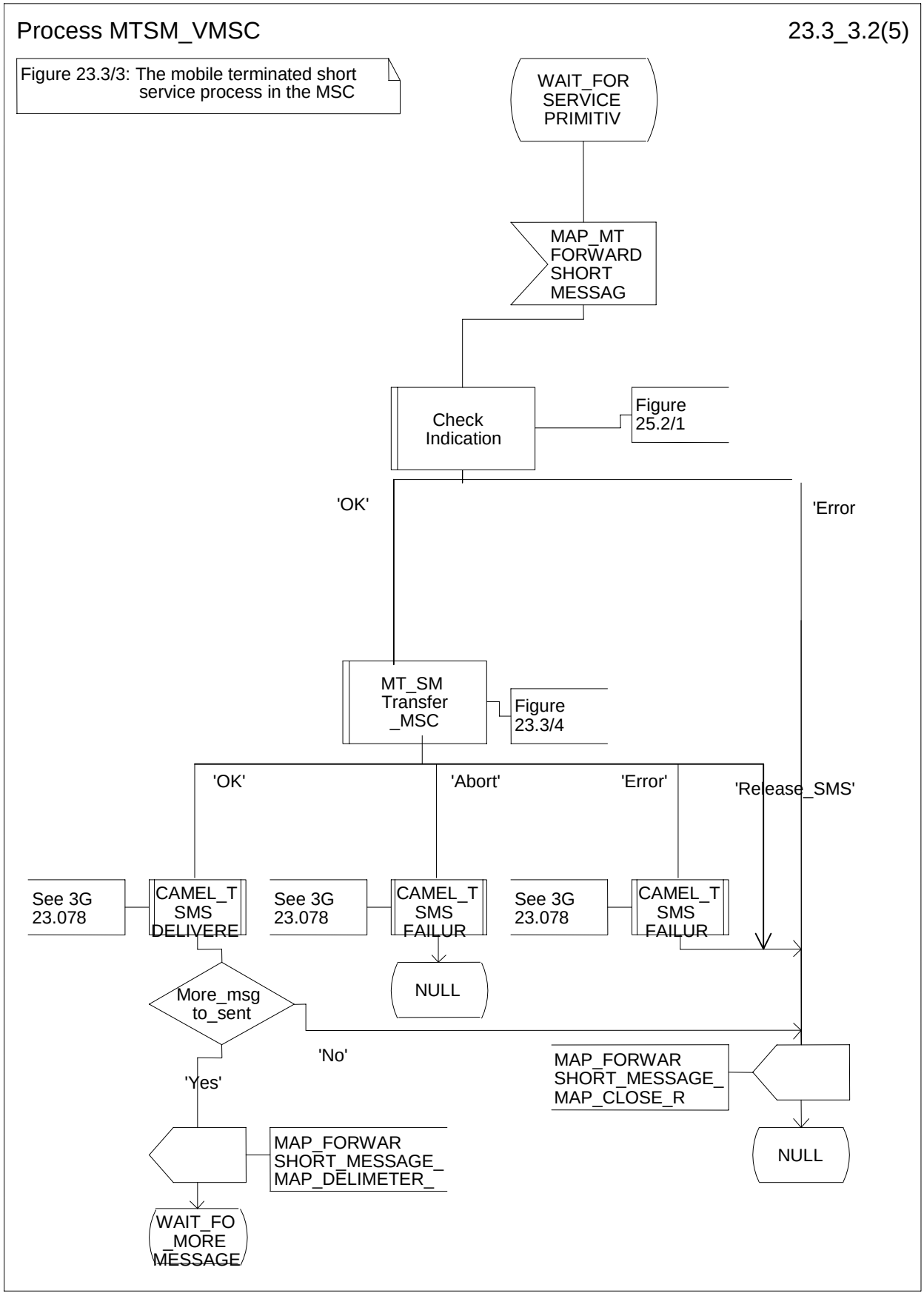


Figure 23.3/3 (sheet 2 of 5): Procedure MTSM_VMSC

Process MTSM_VMSC 23.3_3.3(5)

Figure 23.3/3: The mobile terminated short message service process in the MSC

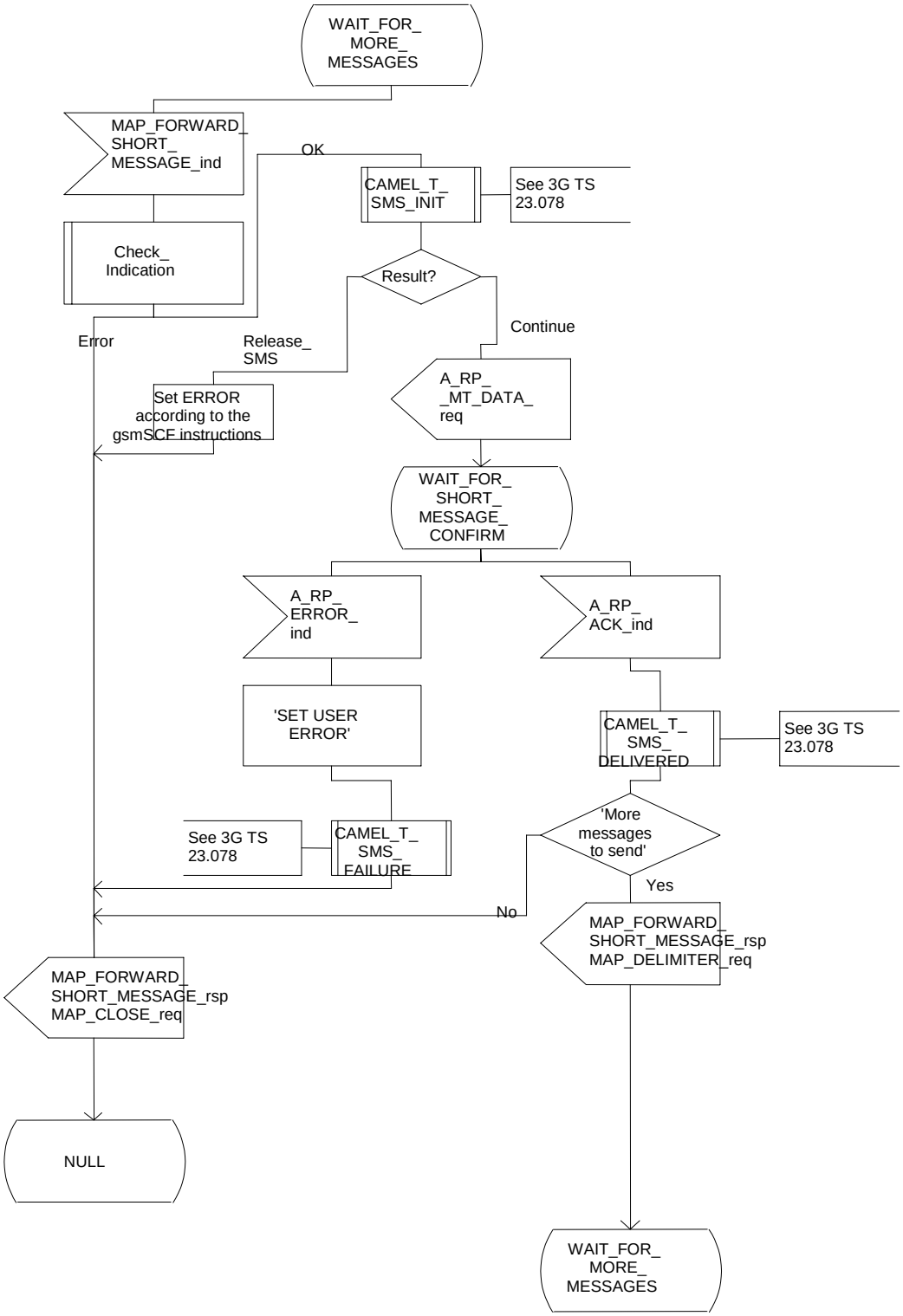


Figure 23.3/3 (sheet 3 of 5): Procedure MTSM_VMSC

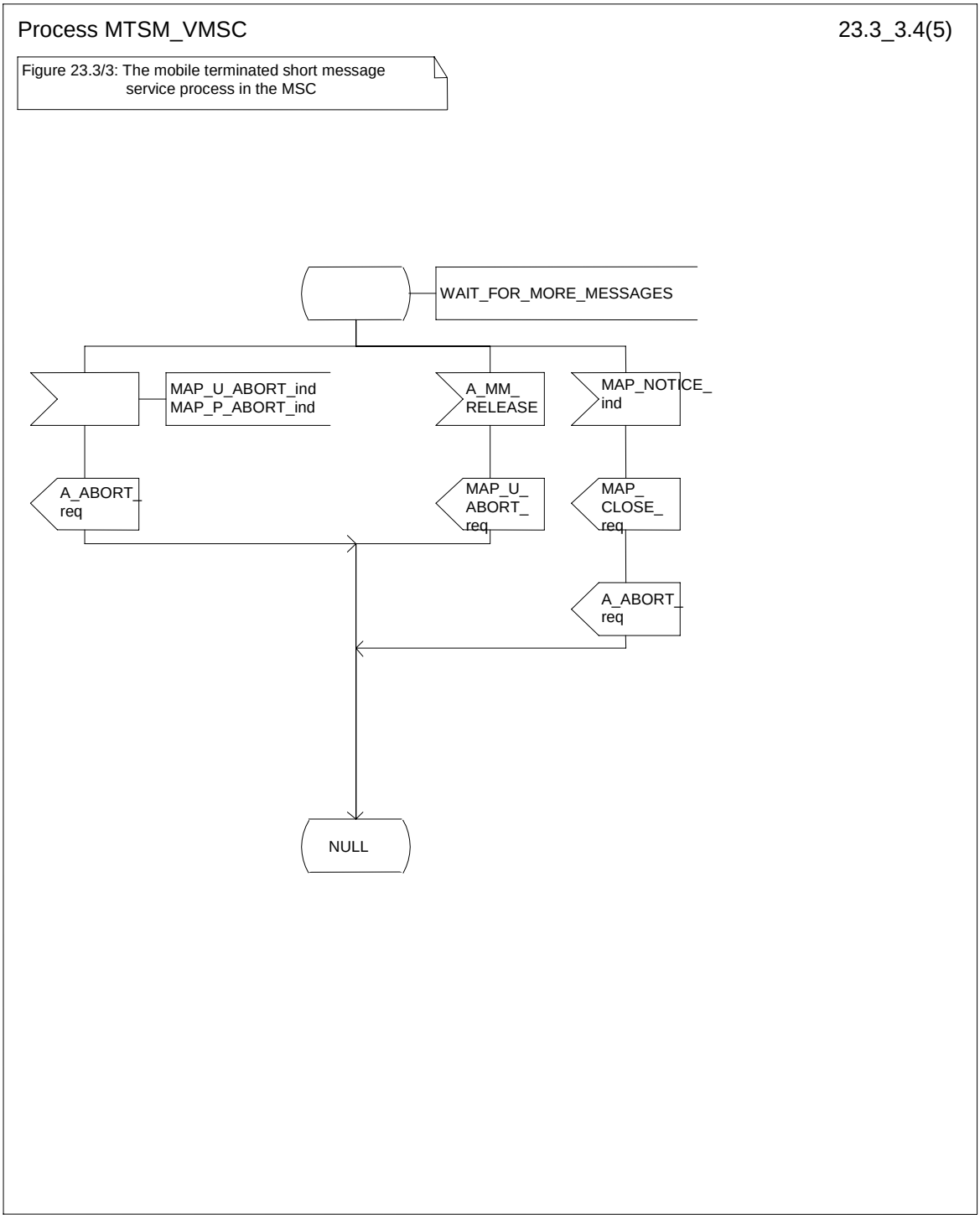


Figure 23.3/3 (sheet 4 of 5): Procedure MTSM_VMSC

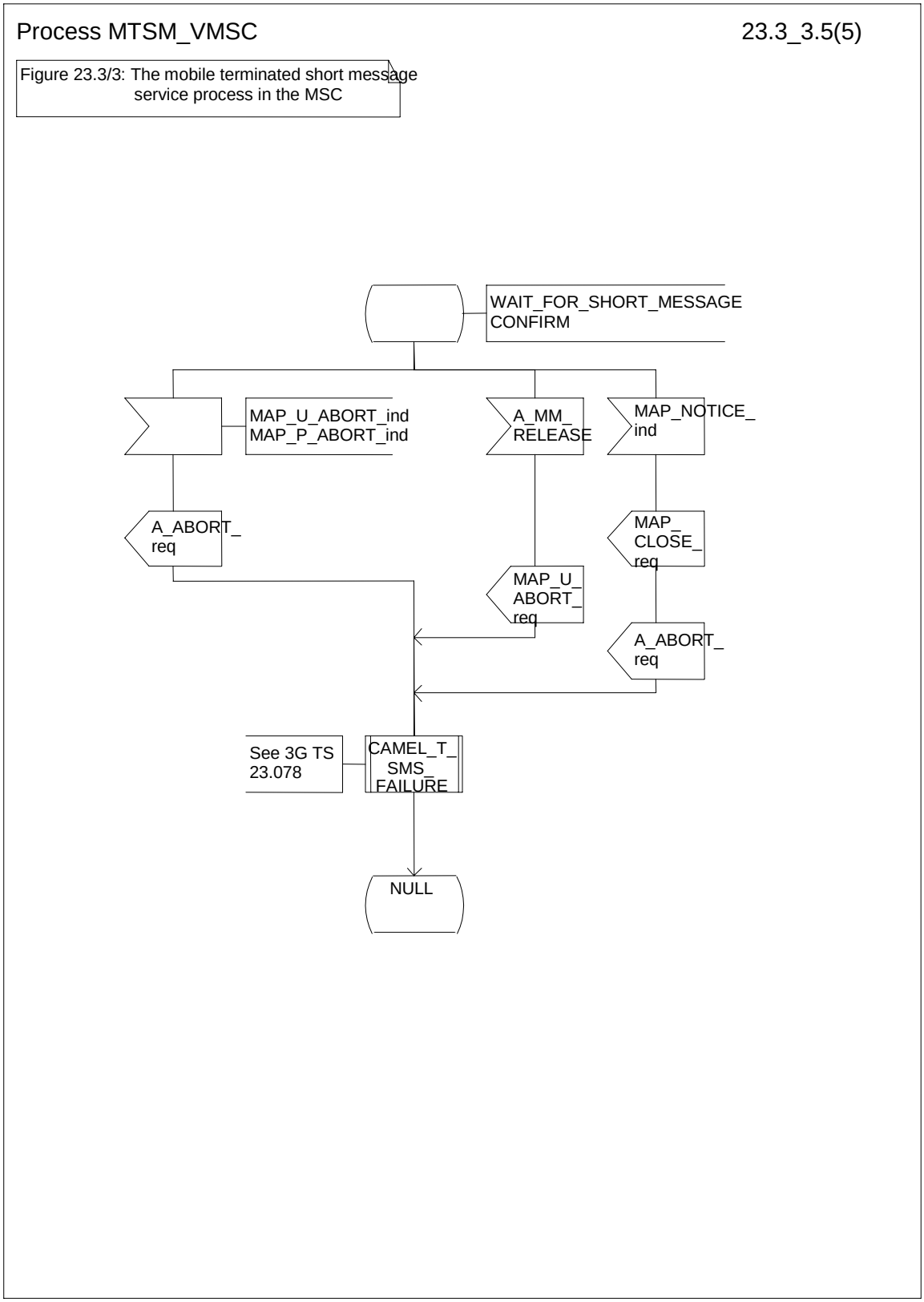
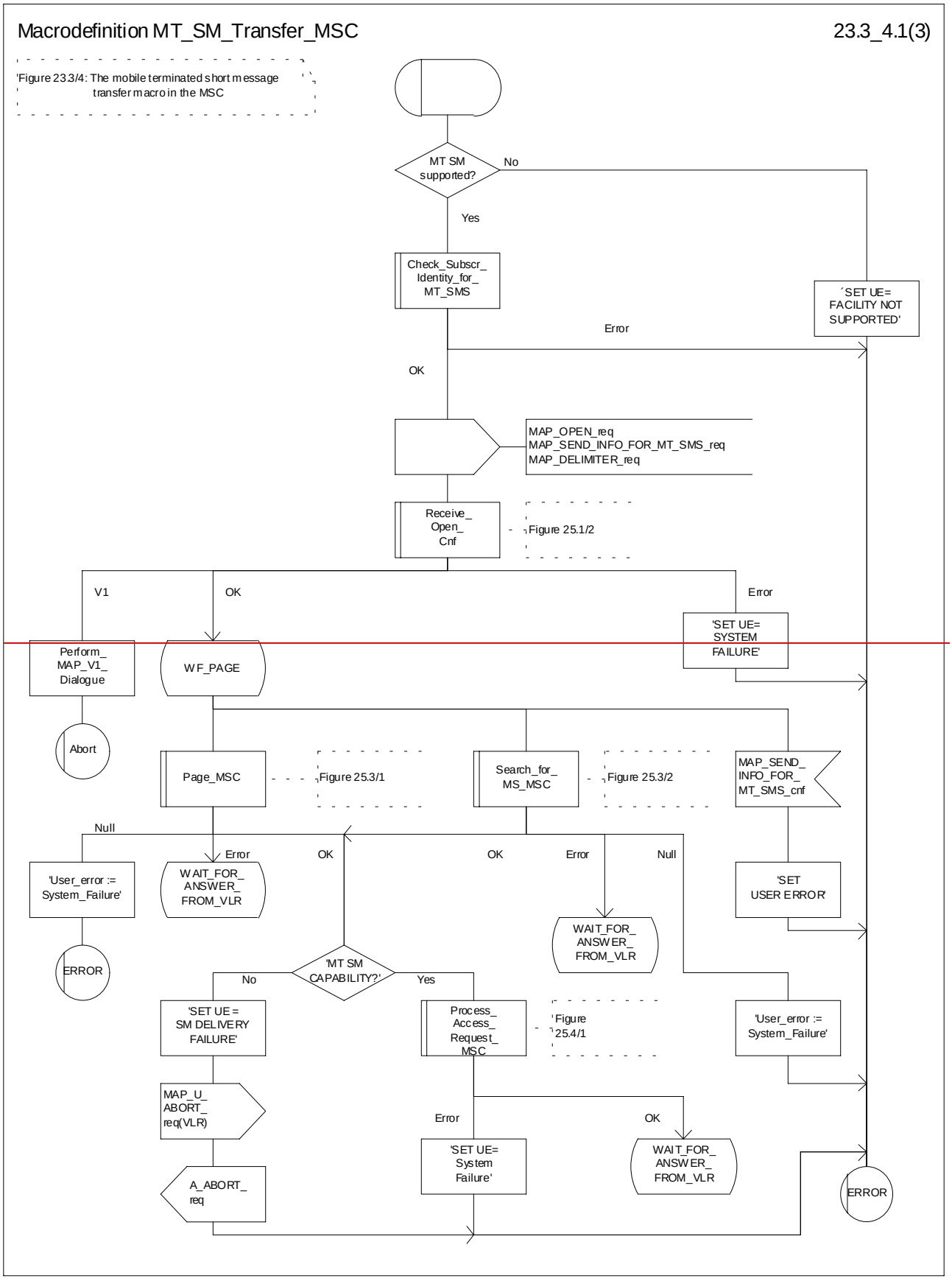
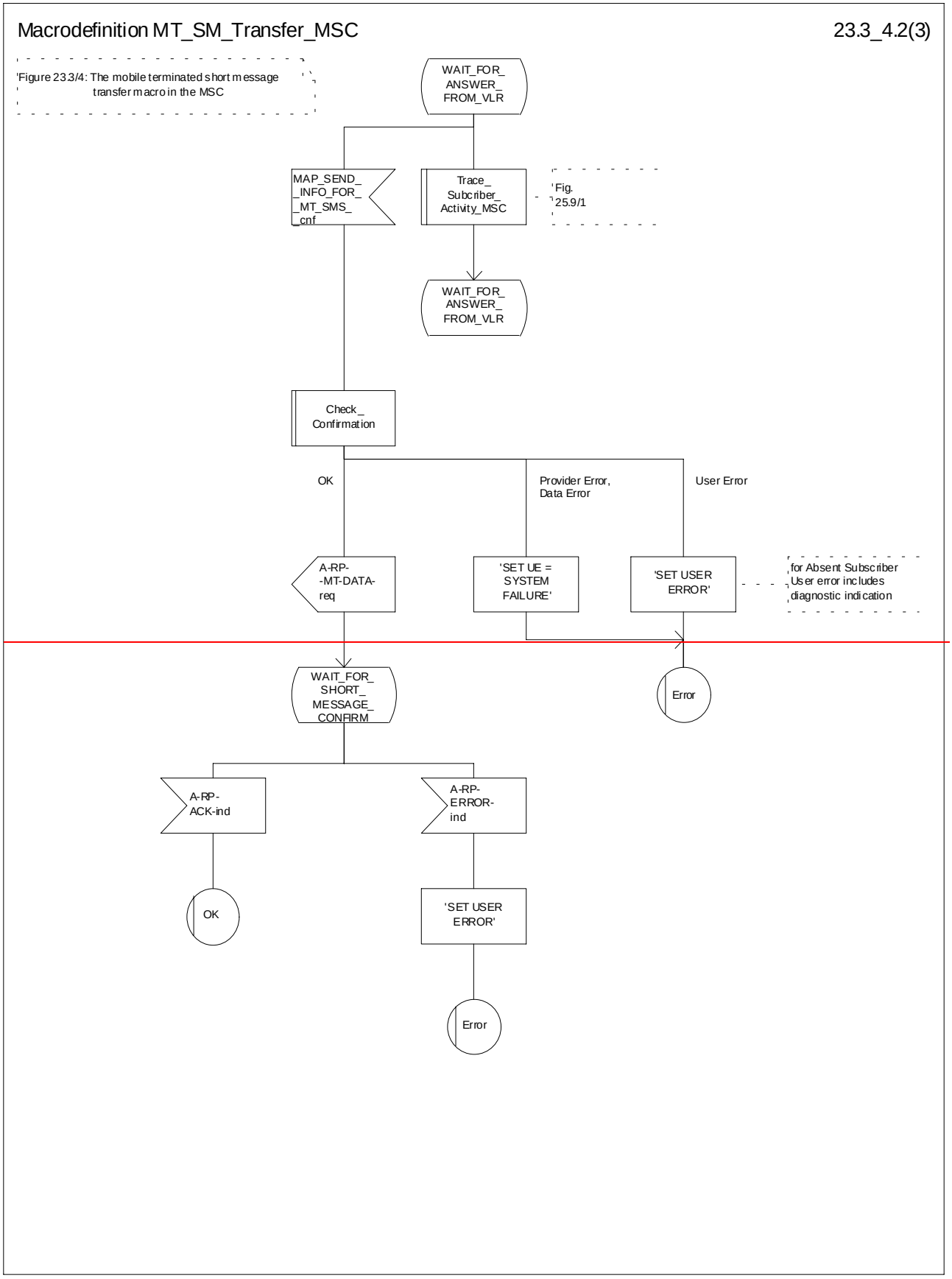


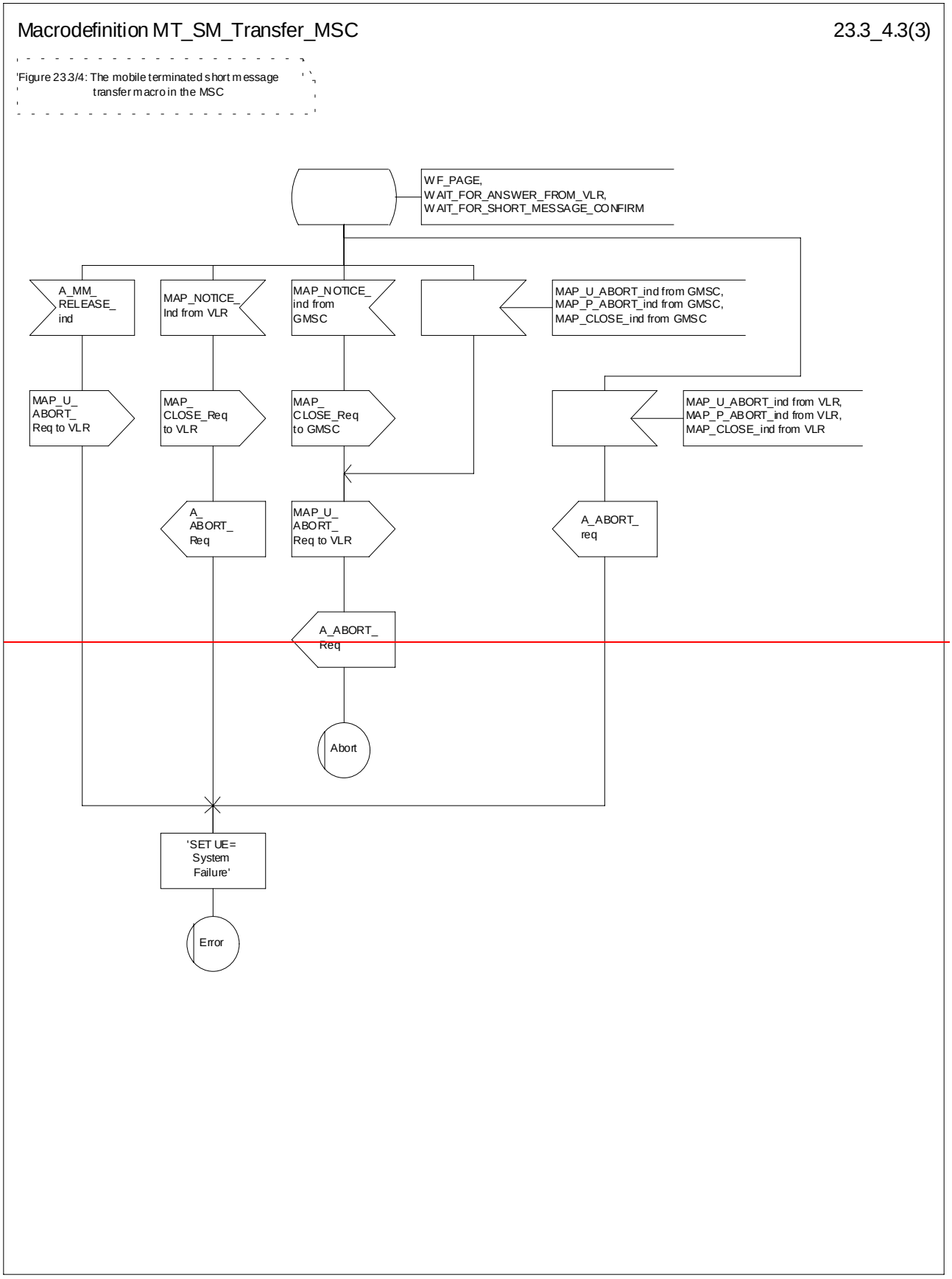
Figure 23.3/3 (sheet 5 of 5): Procedure MTSM_VMSC



~~Figure 23.3/4 (sheet 1 of 3): Macro MT_SM_Transfer_MSC~~



~~Figure 23.3/4 (sheet 2 of 3): Macro MT_SM_Transfer_MSC~~



~~Figure 23.3/4 (sheet 3 of 3): Macro MT_SM_Transfer_MSC~~

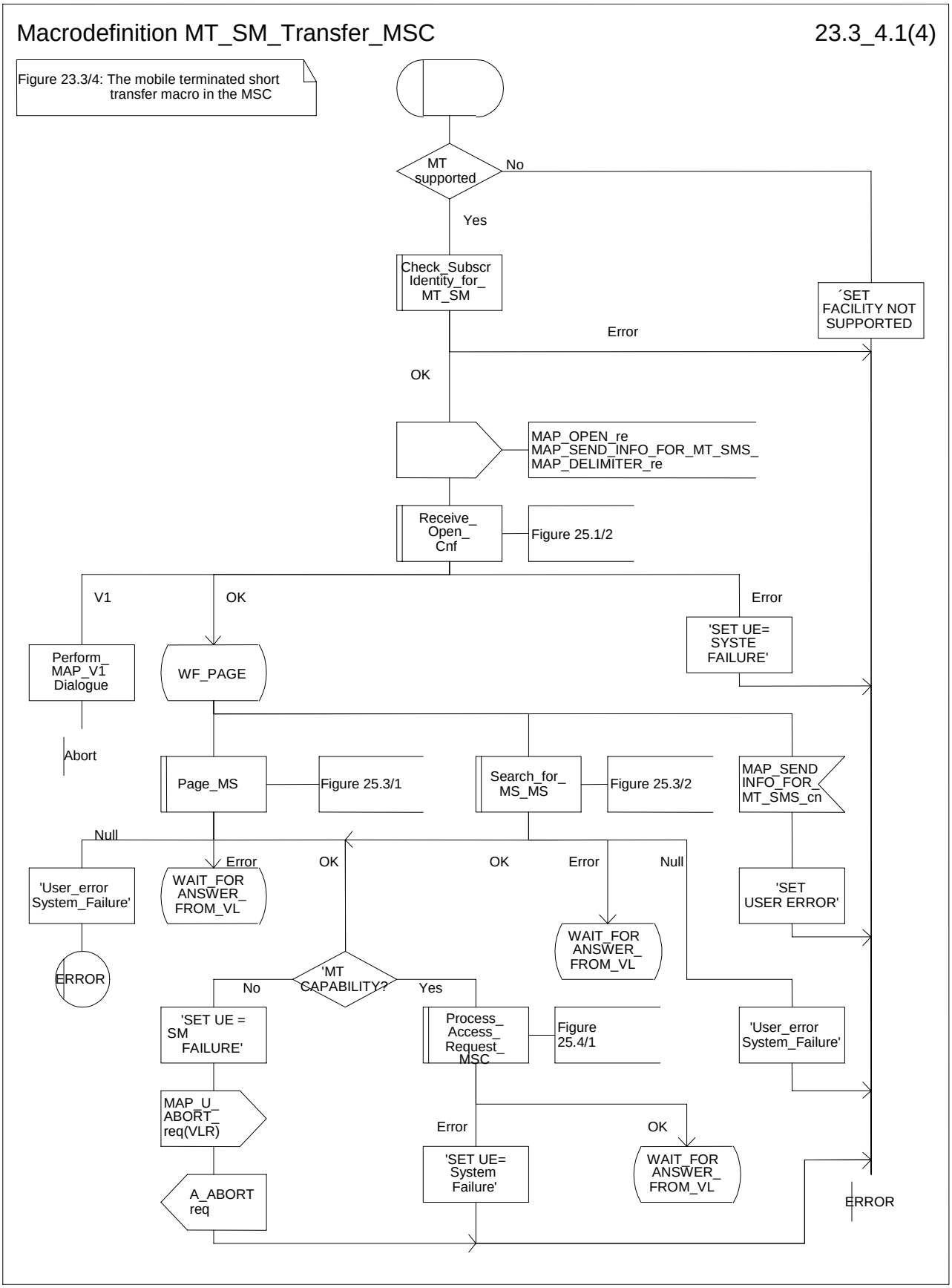


Figure 23.3/4 (sheet 1 of 4): Macro MT_SM_Transfer_MSC

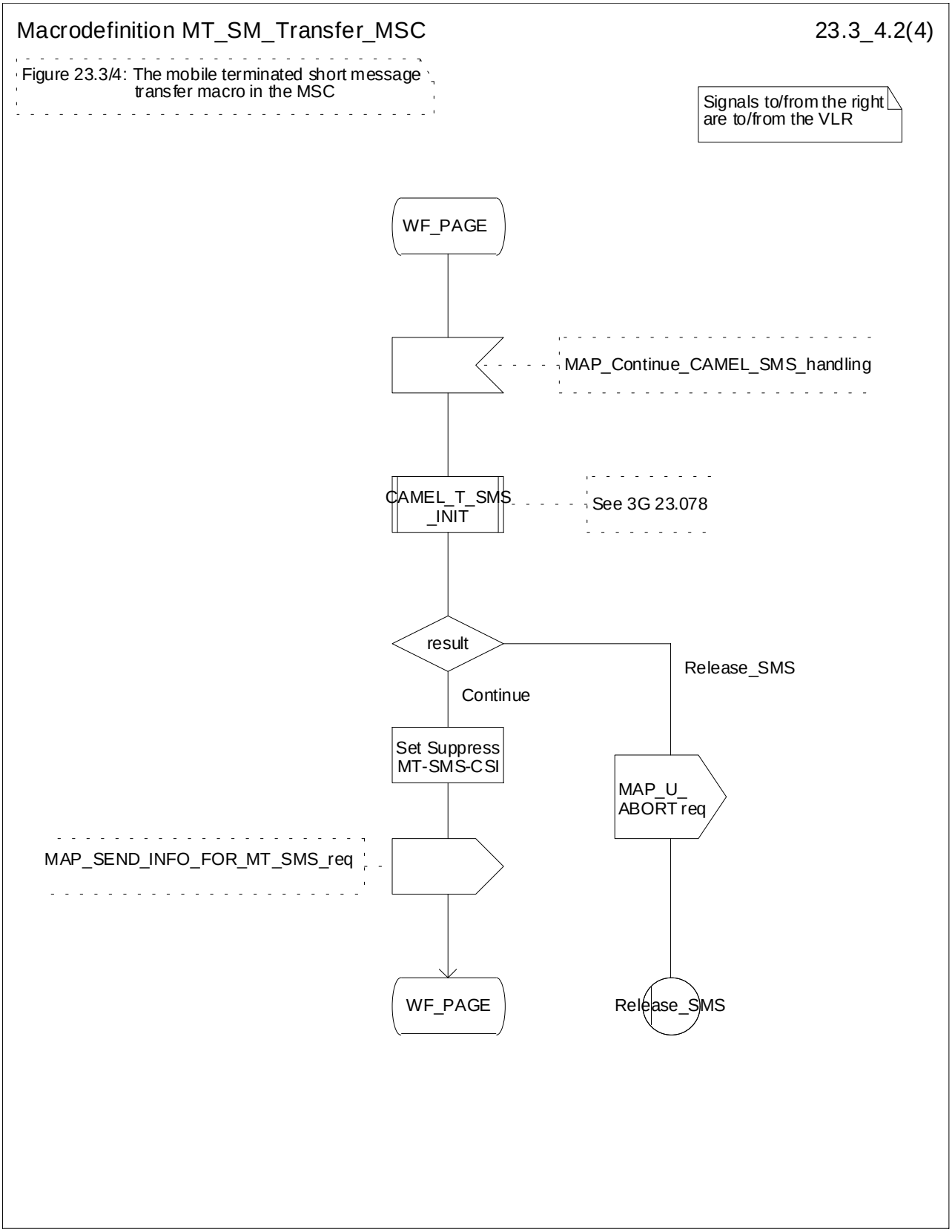


Figure 23.3/4 (sheet 2 of 4): Macro MT_SM_Transfer_MSC

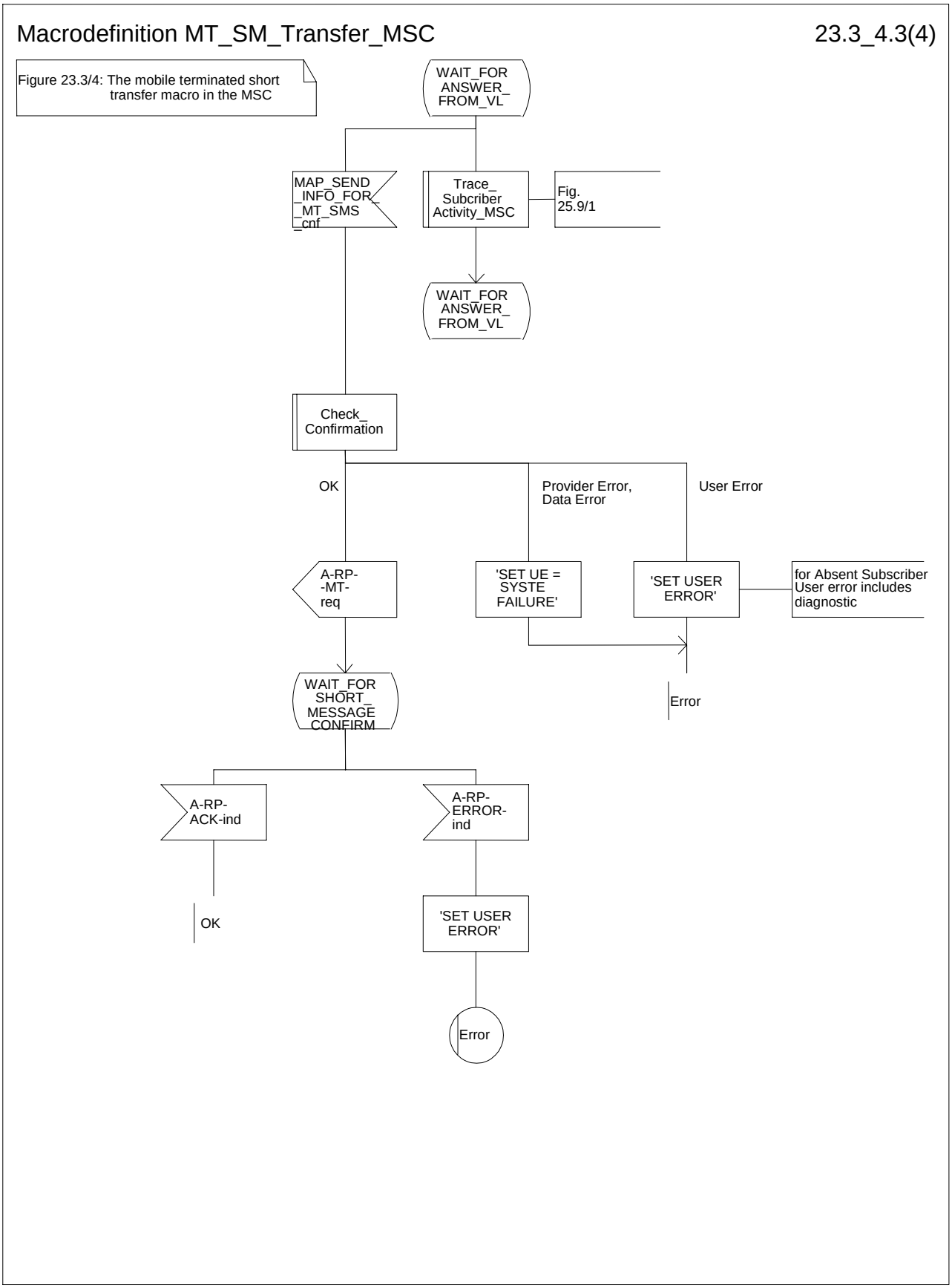


Figure 23.3/4 (sheet 3 of 4): Macro MT_SM_Transfer_MSC

Macrodefinition 23.3_4.4(4)

Figure 23.3/4: The mobile terminated short transfer macro in the MSC

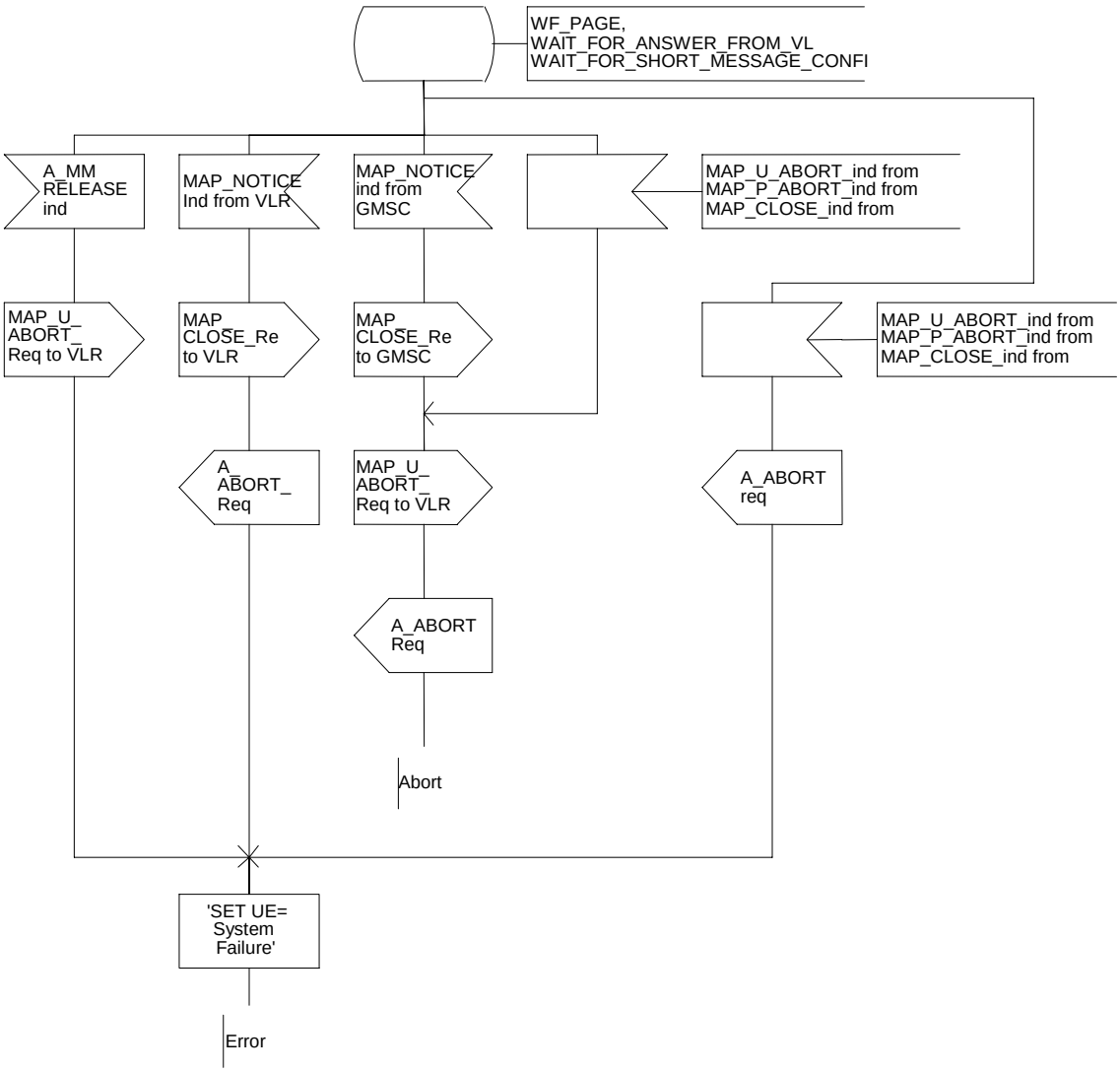


Figure 23.3/4 (sheet 4 of 4): Macro MT_SM_Transfer_MSC

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 the tests and the ~~MS has subscribed to MT-SMS controlled by CAMEL service~~ subscriber is provisioned with MT-SMS-CSI in the VLR, then the VLR ~~sends~~shall send ~~this information~~MT-SMS-CSI to the MSC in order to have the MSC initiate a CAMEL dialogue with the CSE.

- 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;

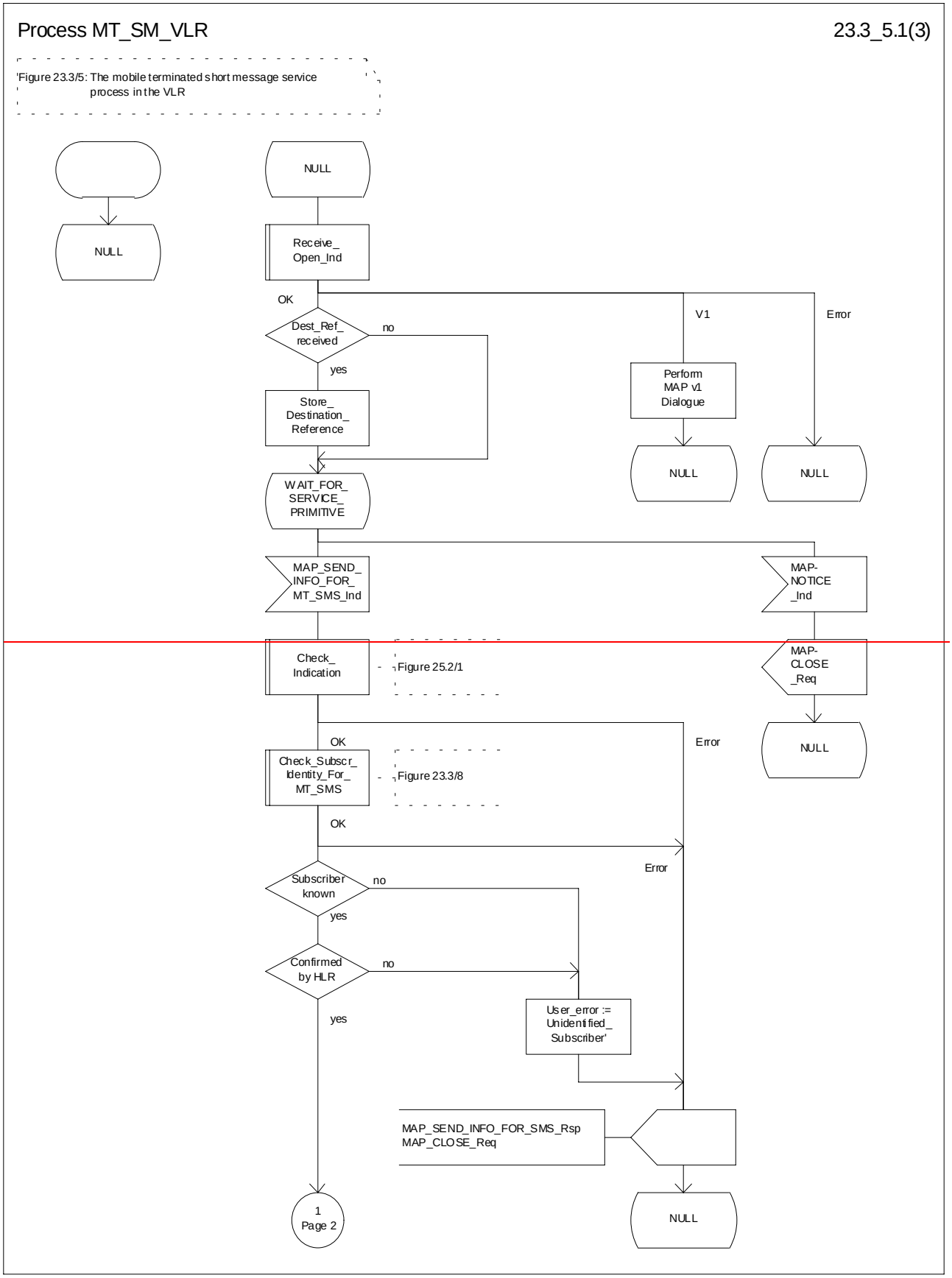
- the MAP_PAGE confirmation or MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating unsuccessful outcome. If an absent subscriber error is received, the MS not reachable flag (MNRF) is set in the VLR. The errors are forwarded to the MSC in the MAP_SEND_INFO_FOR_MT_SMS response, the absent subscriber 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 (sheet 1 of 3): Process MT_SM_VLR~~

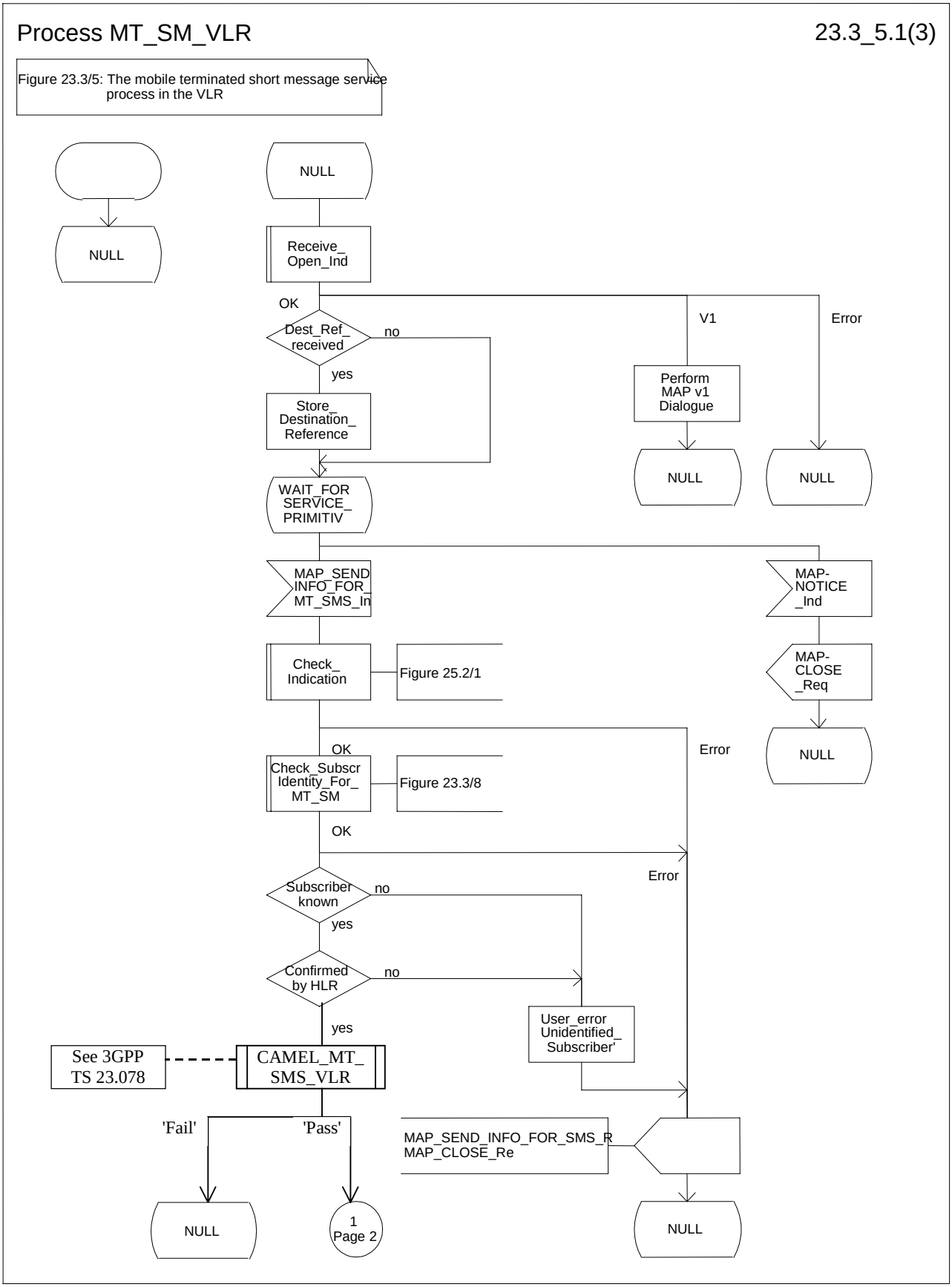


Figure 23.3/5 (sheet 1 of 3): Process MT_SM_VLR

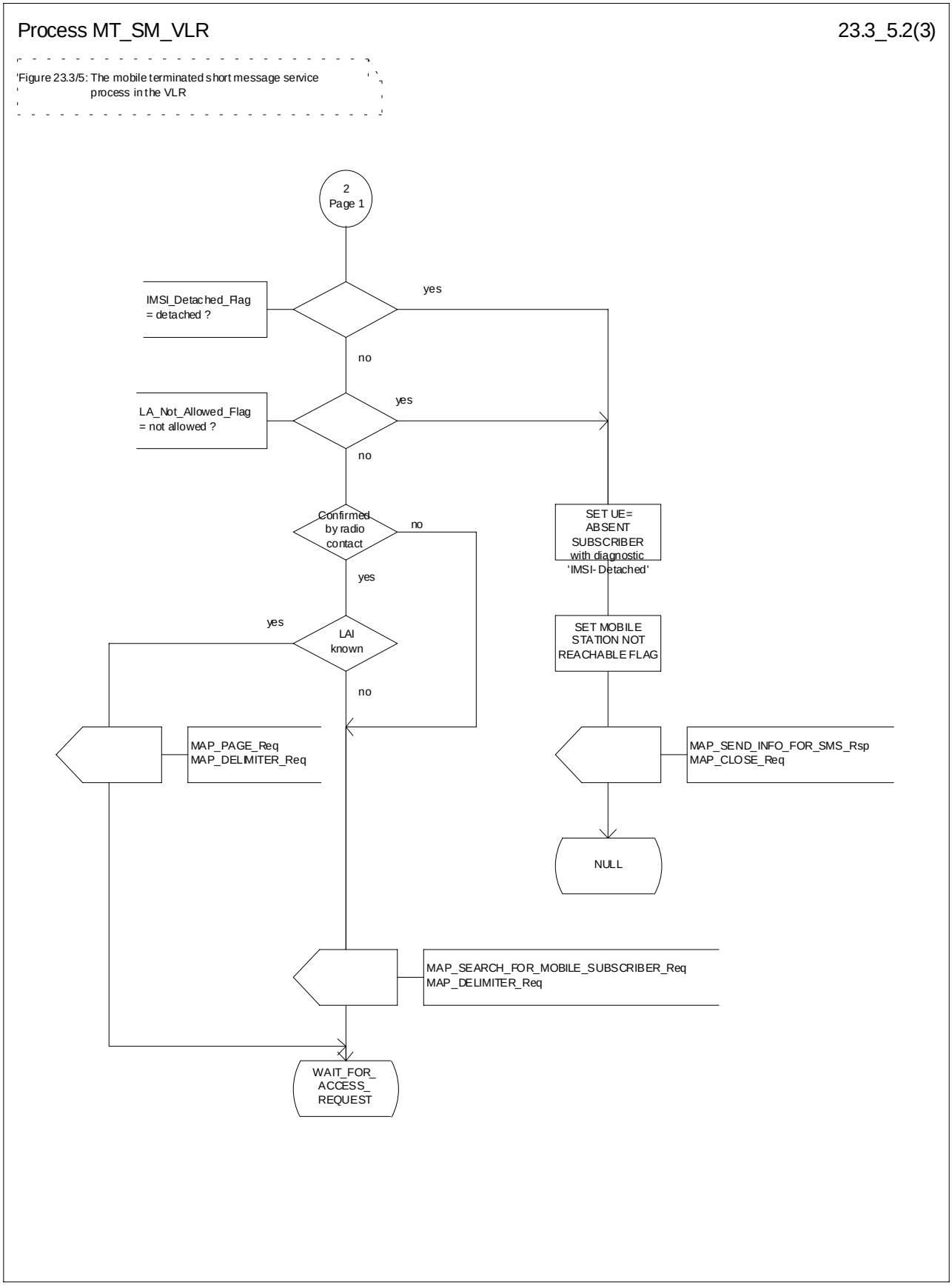


Figure 23.3/5 (sheet 2 of 3): Process MT_SM_VLR

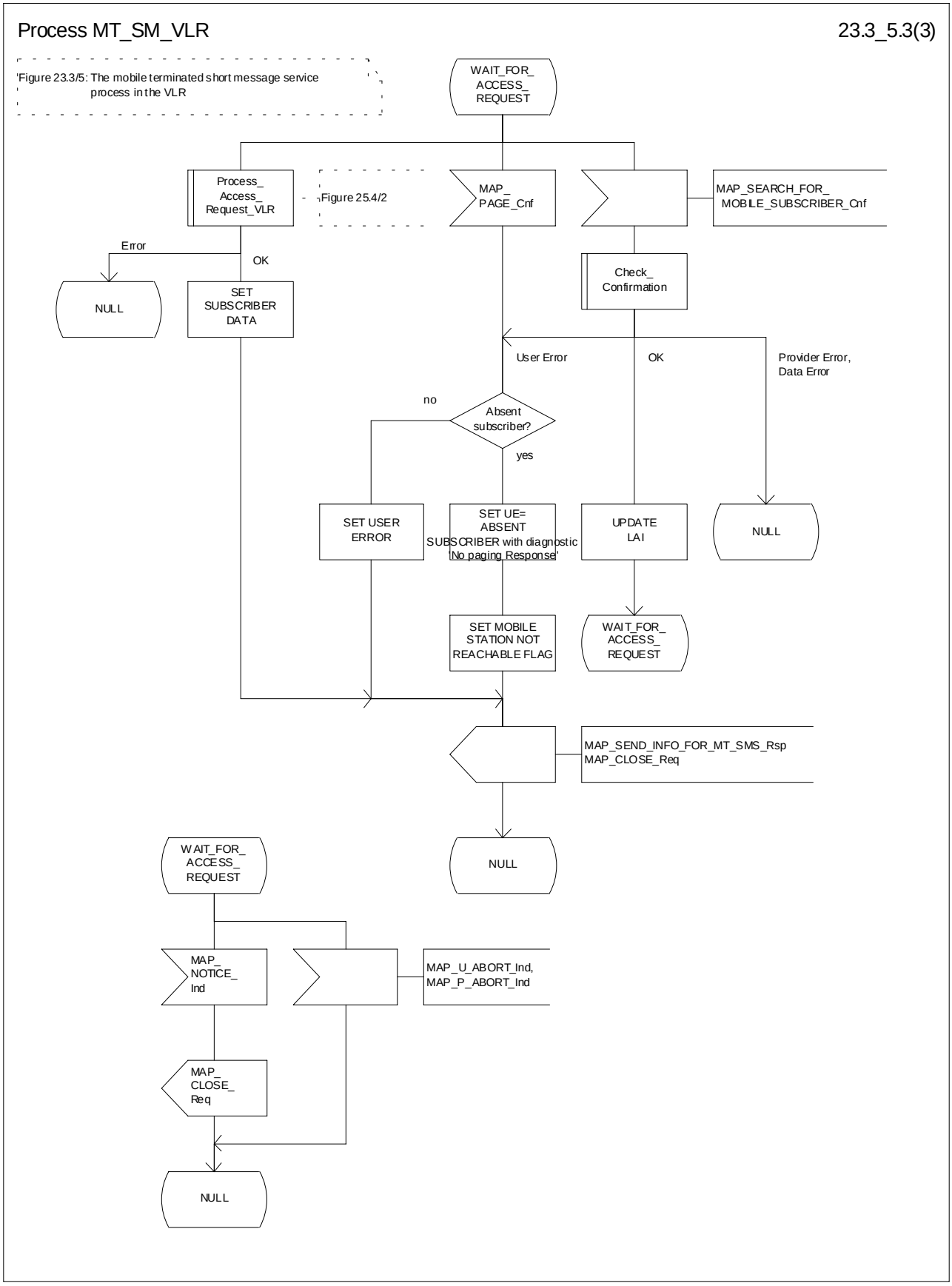


Figure 23.3/5 (sheet 3 to 3): Process MT_SM_VLR

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 routeing 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.

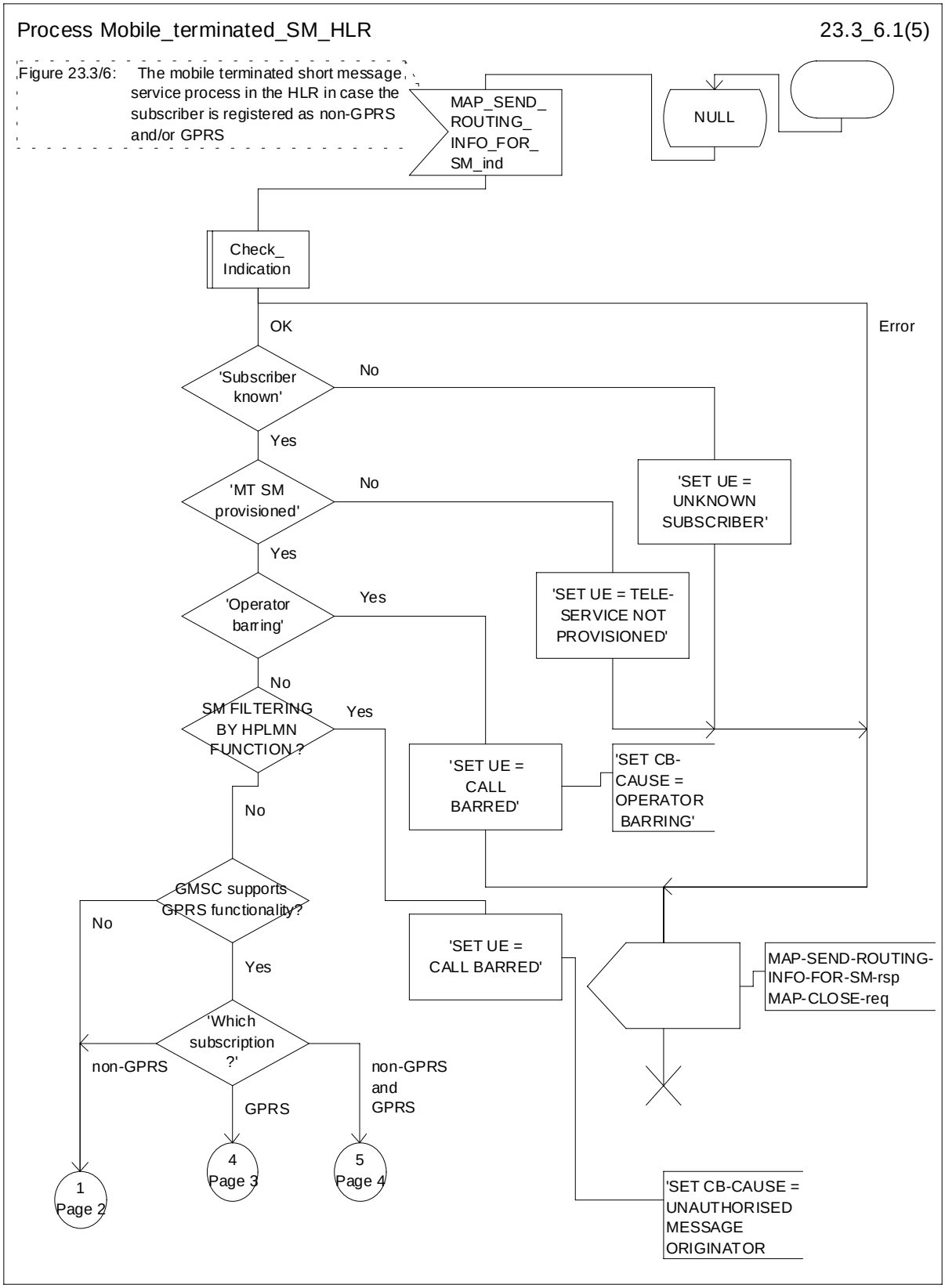


Figure 23.3/6 (sheet 1 of 5): Process Mobile_terminated_SM_HLR

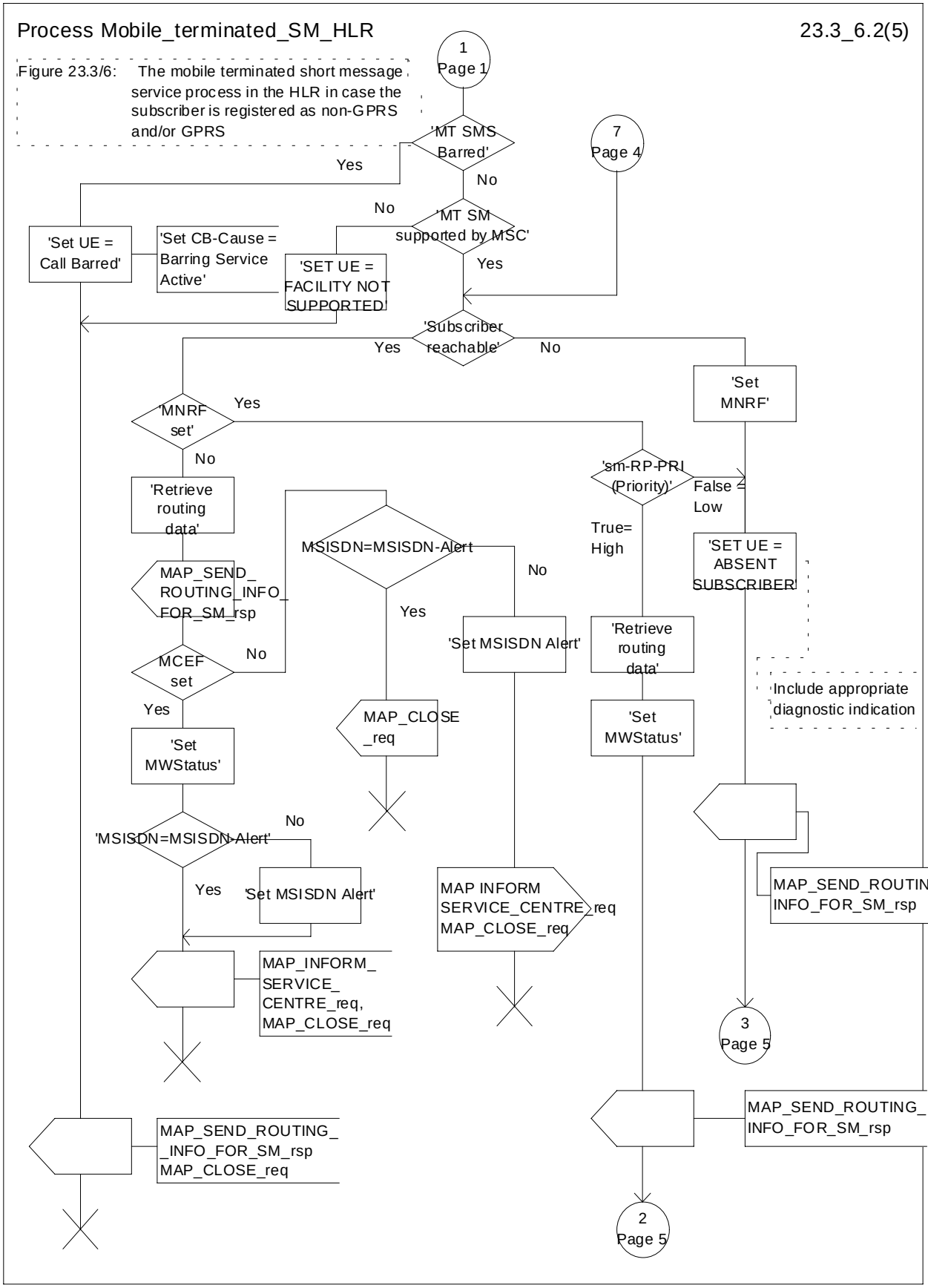


Figure 23.3/6 (sheet 2 of 5): Process Mobile_terminated_SM_HLR

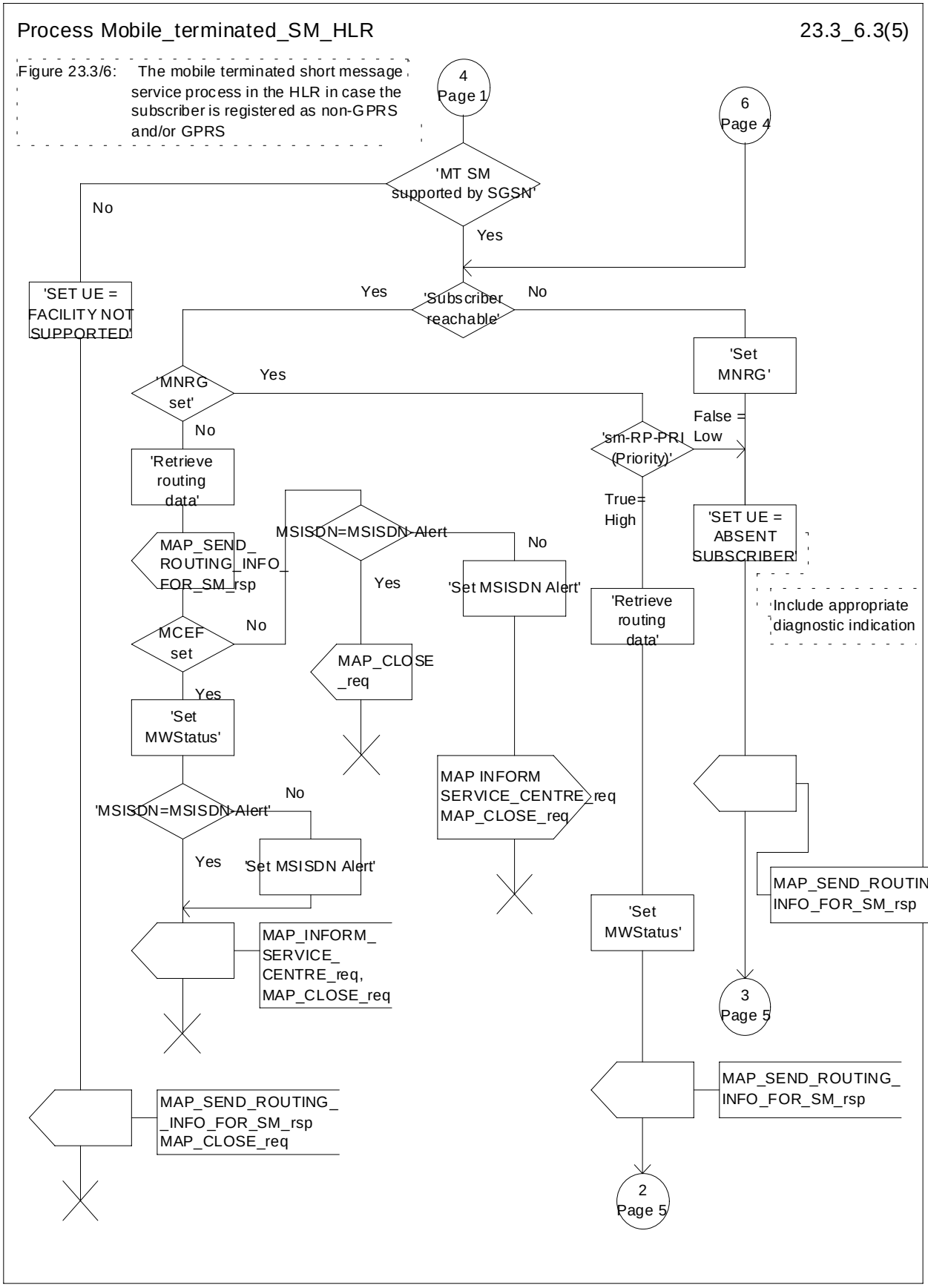


Figure 23.3/6 (sheet 3 of 5): Process Mobile_terminated_SM_HLR

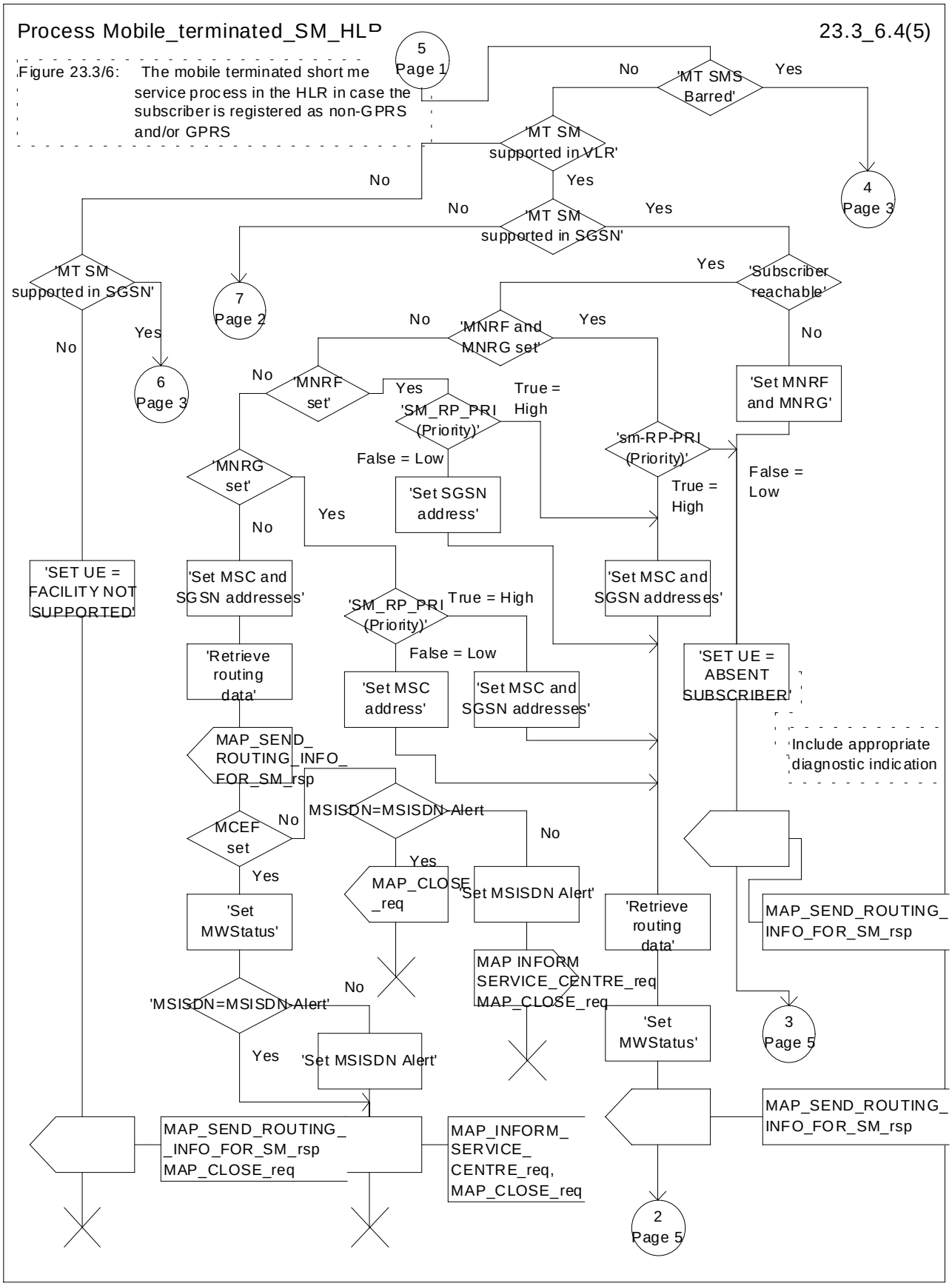


Figure 23.3/6 (sheet 4 of 5): Process Mobile_terminated_SM_HLR

Process Mobile_terminated_SM_HLR 23.3_6.5(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

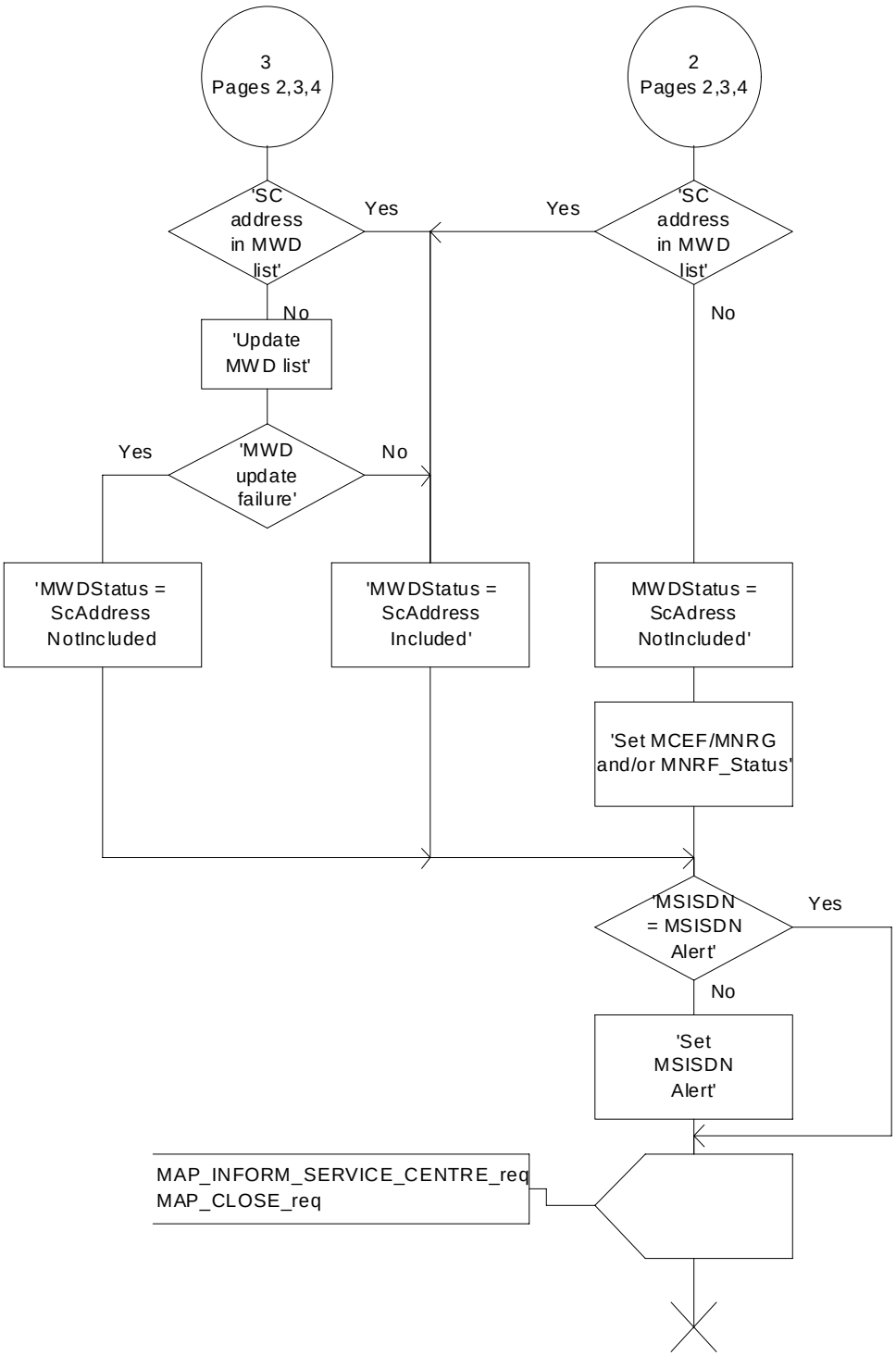


Figure 23.3/6 (sheet 5 of 5): Process Mobile_terminated_SM_HLR

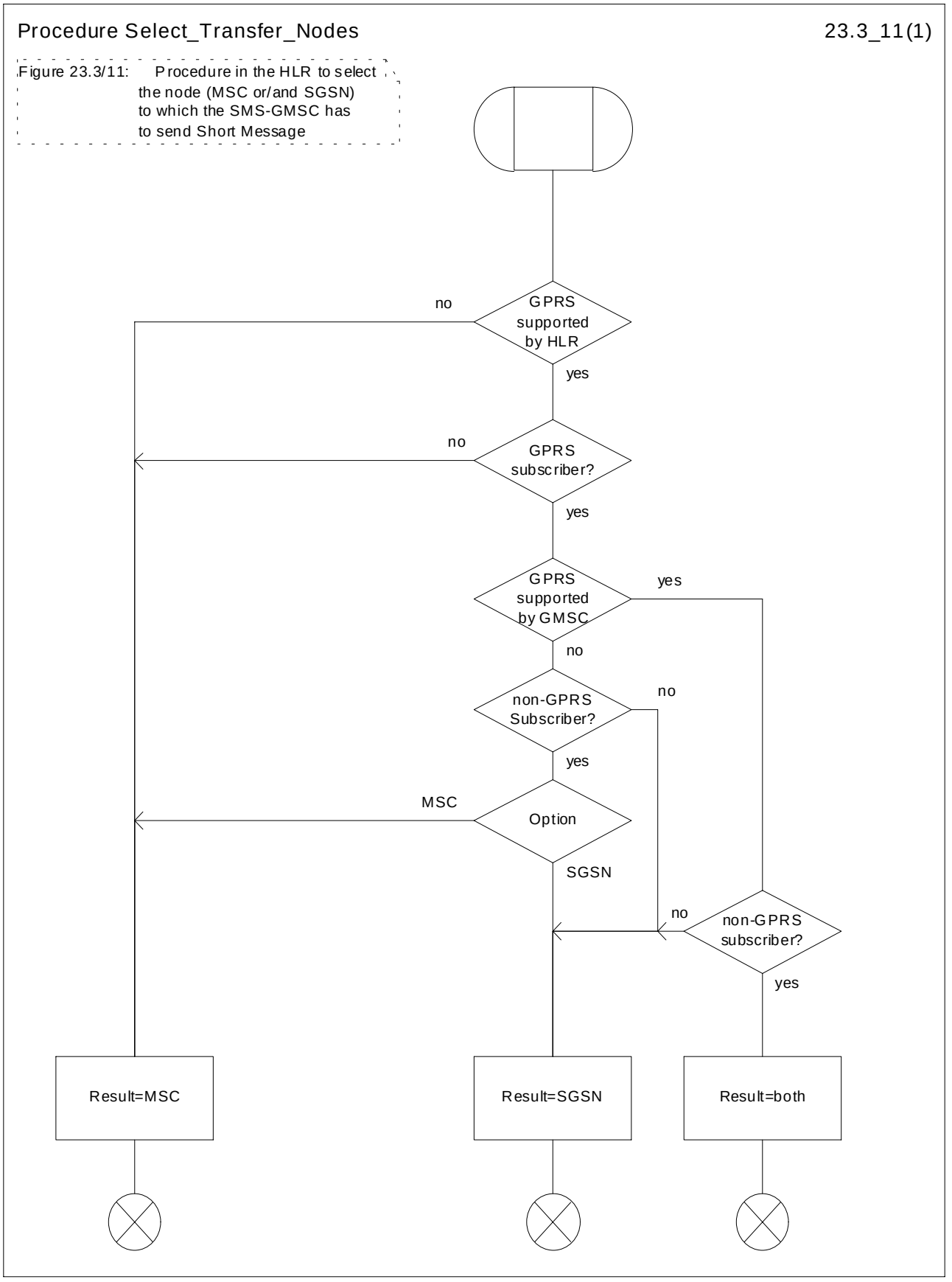


Figure 23.3/11: Procedure Select_Transfer_Nodes

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 3GPP TS 23.140.

- 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 clause 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 3GPP TS 23.140. 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 3GPP TS 23.140) 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 3GPP TS 23.140. 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 3GPP TS 23.140) 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 clause 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 3GPP TS 23.140 and 3GPP TS 24.011 [37].

The unidentified subscriber error is indicated to the SC as absent subscriber with diagnostic information set to 'Unidentified subscriber' as described in 3GPP TS 23.140.

Note that the indication, on which number belongs the SGSN and MSC, received from the HLR at routing information result (see clause 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 clause 23.3.1.

The mobile terminated short message transfer procedure in the gateway MSC is shown in figure 23.3/7.

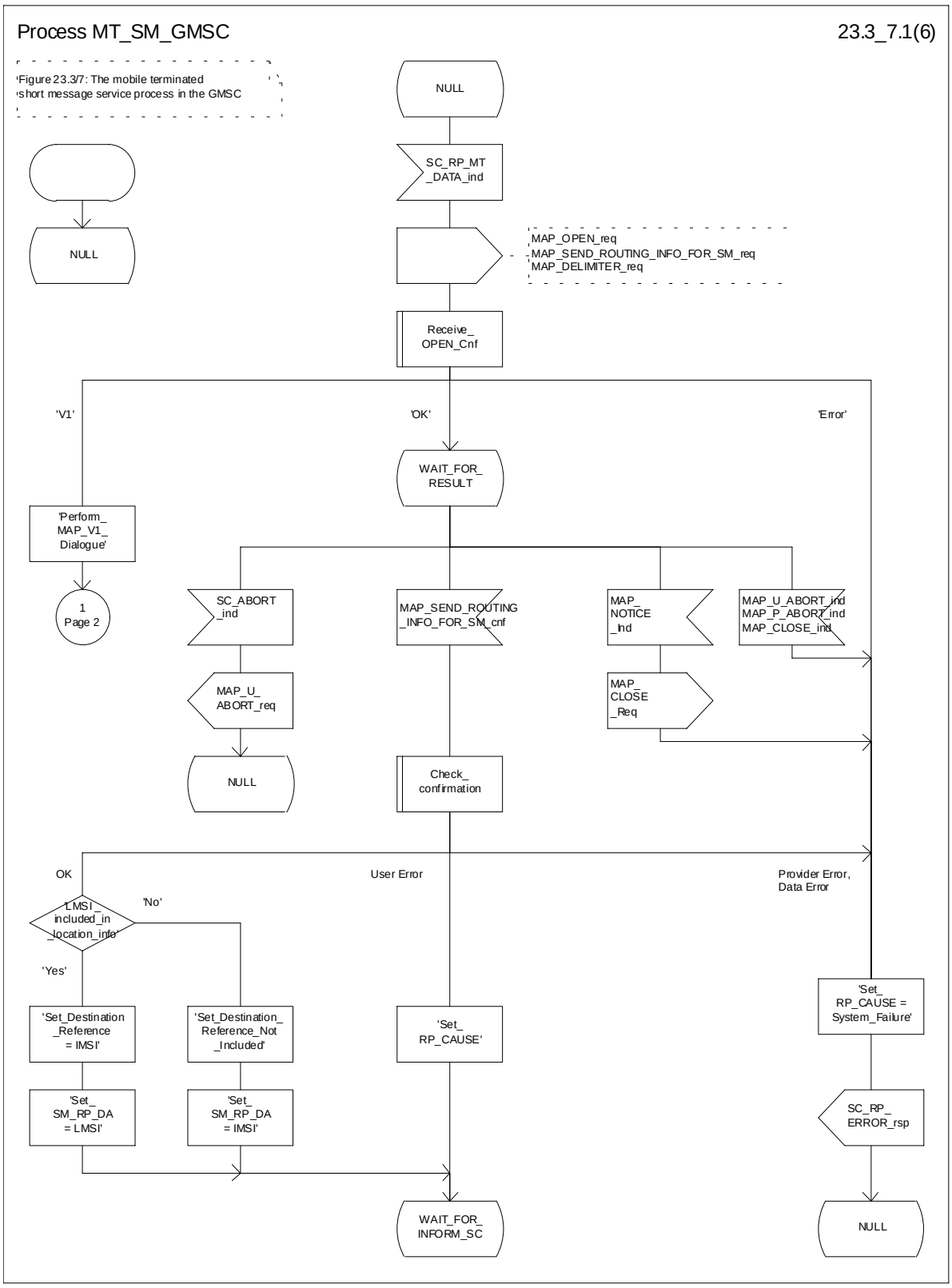


Figure 23.3/7 (sheet 1 of 6): Procedure MT_SM_GMSC

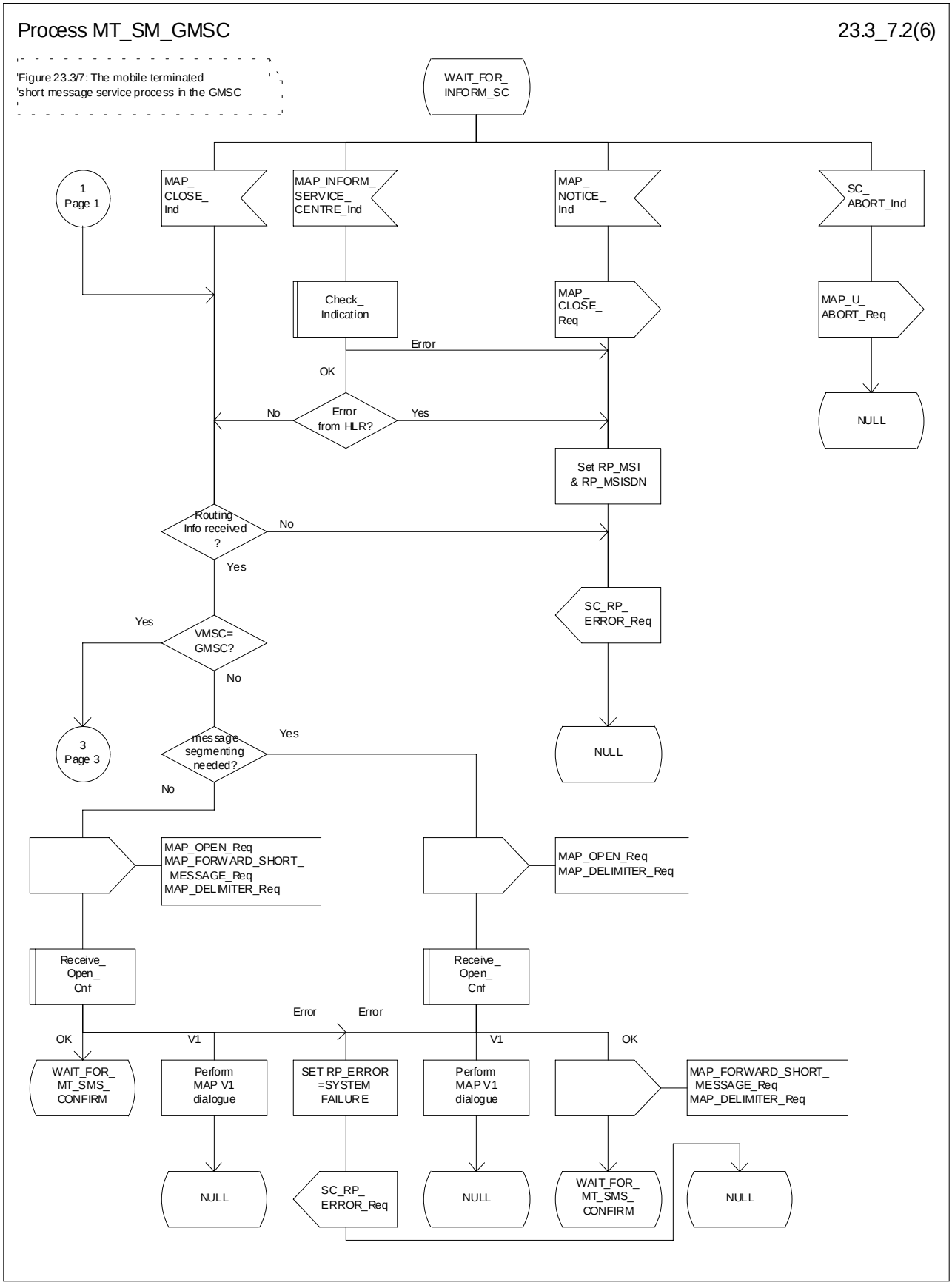


Figure 23.3/7 (sheet 2 to 6): Procedure MT_SM_GMSC

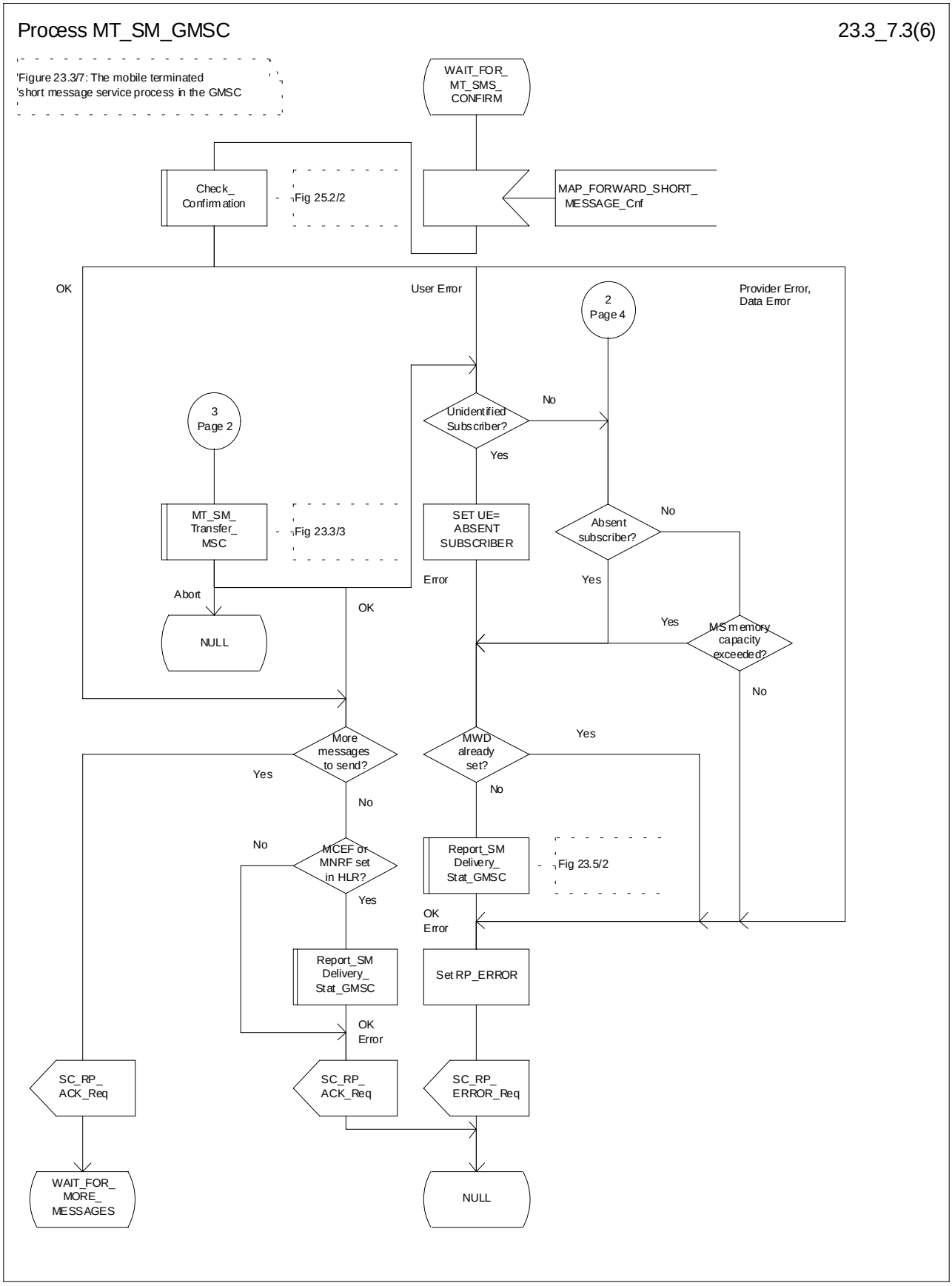


Figure 23.3/7 (sheet 3 of 6): Procedure MT_SM_GMSC

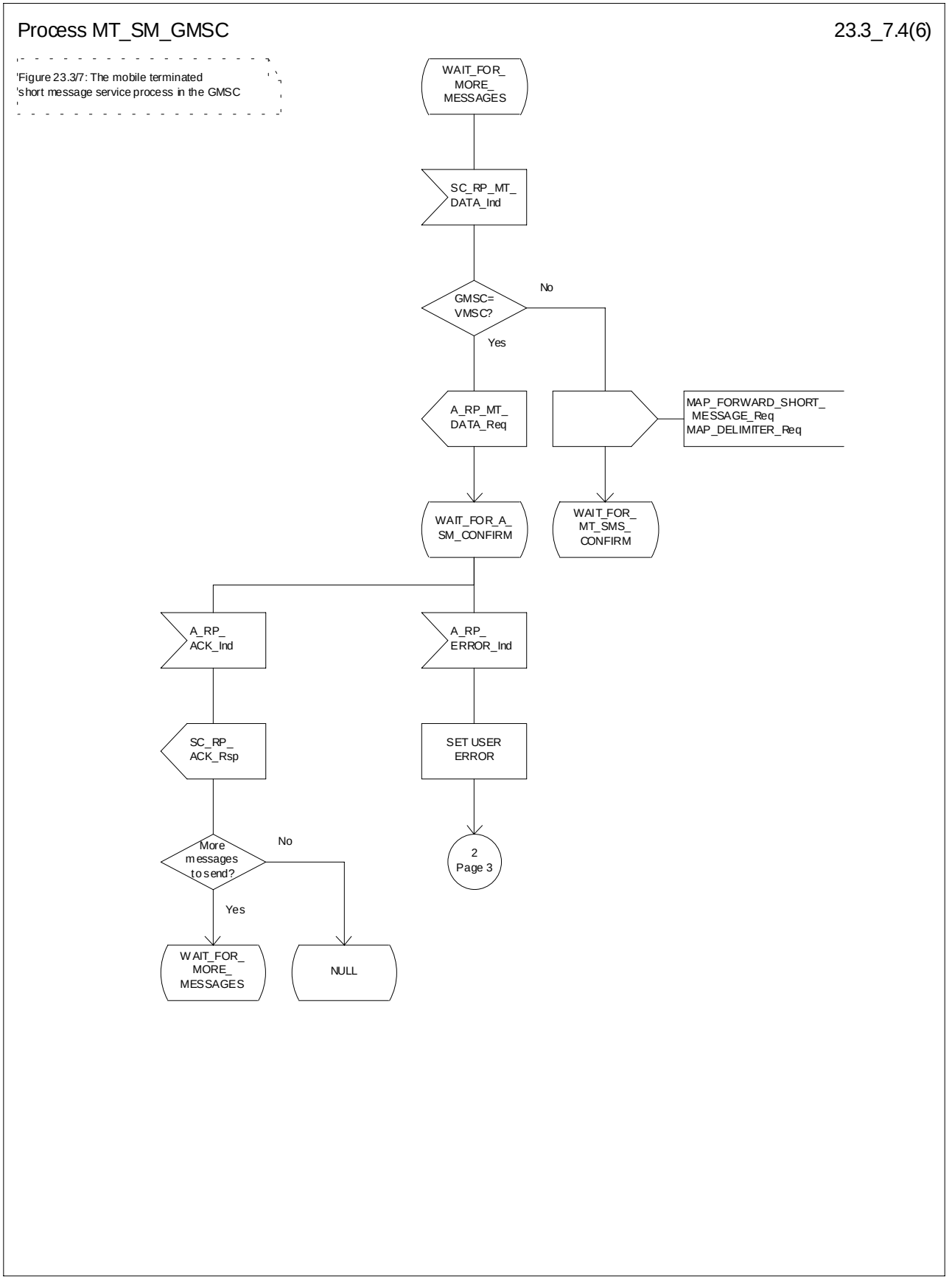


Figure 23.3/7 (sheet 4 of 6): Procedure_MT_SM_GMSC

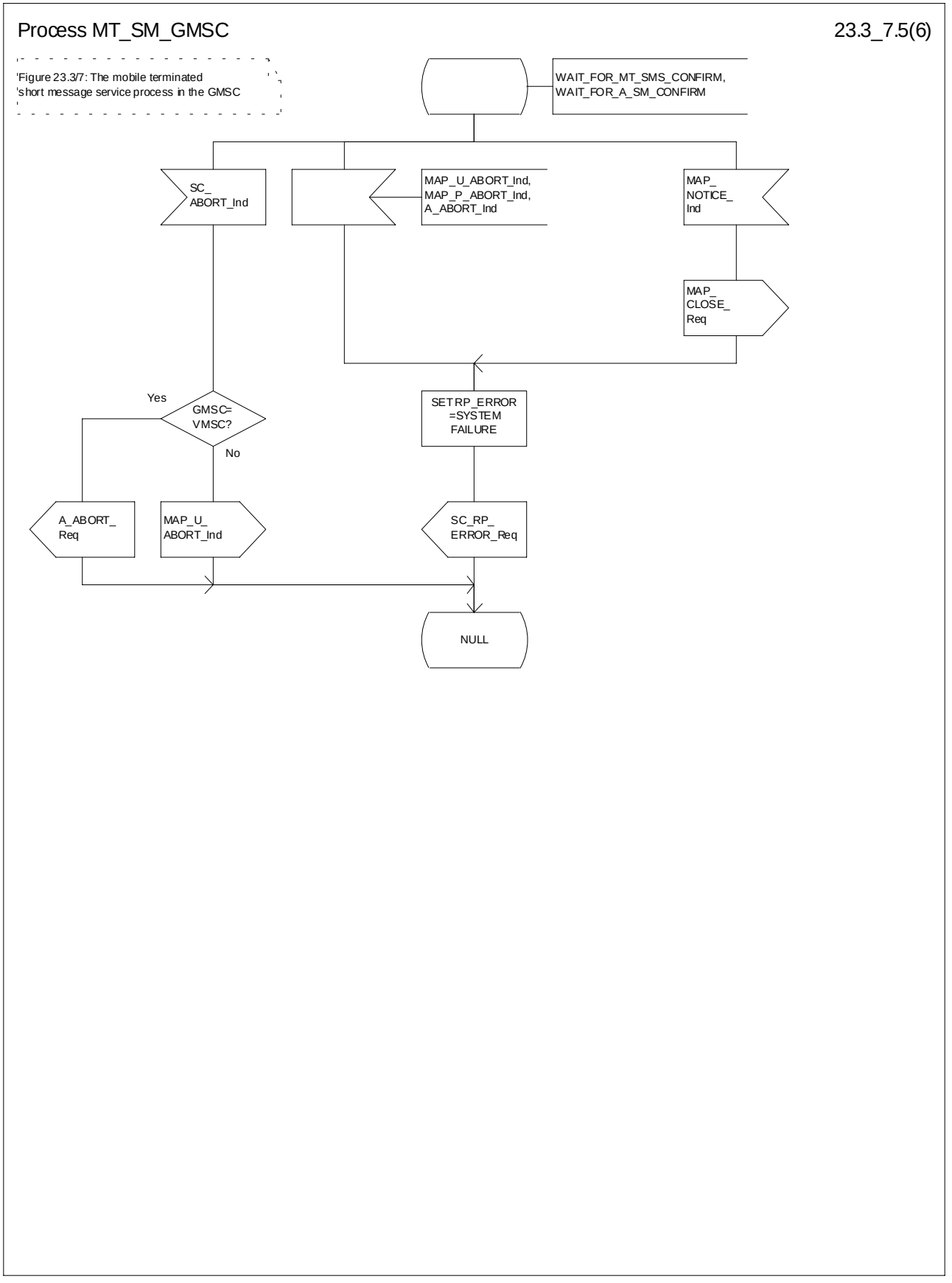


Figure 23.3/7 (sheet 5 to 6): Procedure MT_SM_GMSC

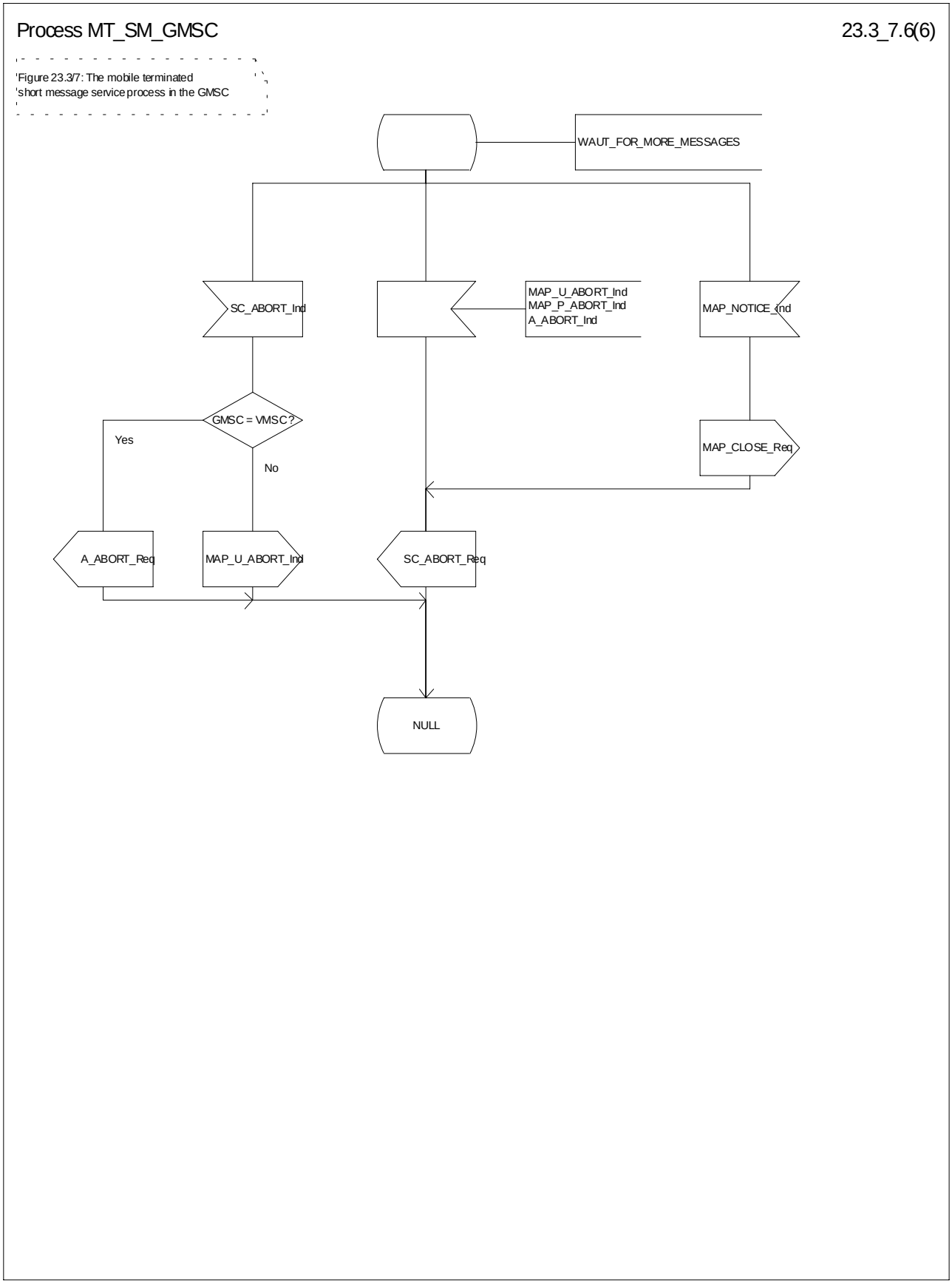


Figure 23.3/7 (sheet 6 of 6): Procedure MT_SM_GMSC

Macrodefinition Check_Subscr_Identity_For_MT_SMS 23.3_8(1)

Figure 23.3/8: Check of the subscriber identity for a mobile terminated short message in the servicing MSC and in the VLR

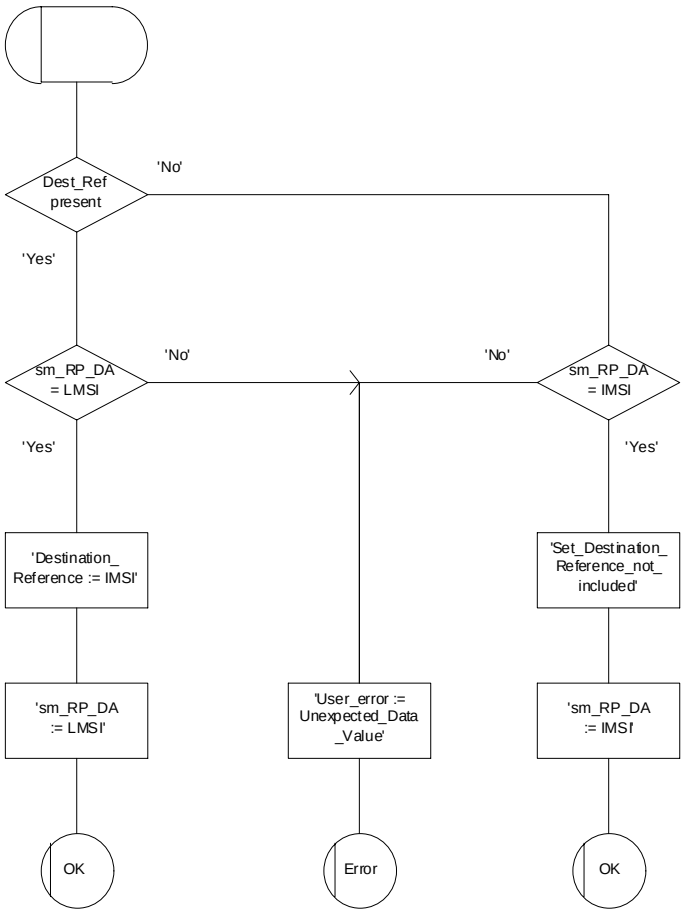


Figure 23.3/8: Macro Check_Subscr_Identity_For_MT_SMS

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 clause 25.3).Otherwise the search procedure is invoked (see clause 25.3).

After the subscriber data checks the SGSN opens a CAMEL dialogue as specified in 3GPP TS 23.078. If the CAMEL service bars the MT SM then the failure is reported to the GMSC, and the MT SM is not delivered to MS.

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 clauses 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 acknowledgement if the short message has been successfully delivered to the mobile subscriber. The successful MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;

- 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 clause 7.6.1.4) may also be carried. The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078;

- a system failure error if the delivery procedure is aborted. . The failure in the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078.

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,~~If the More Messages To Send flag was TRUE, then 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~~SGSN will act as follows:

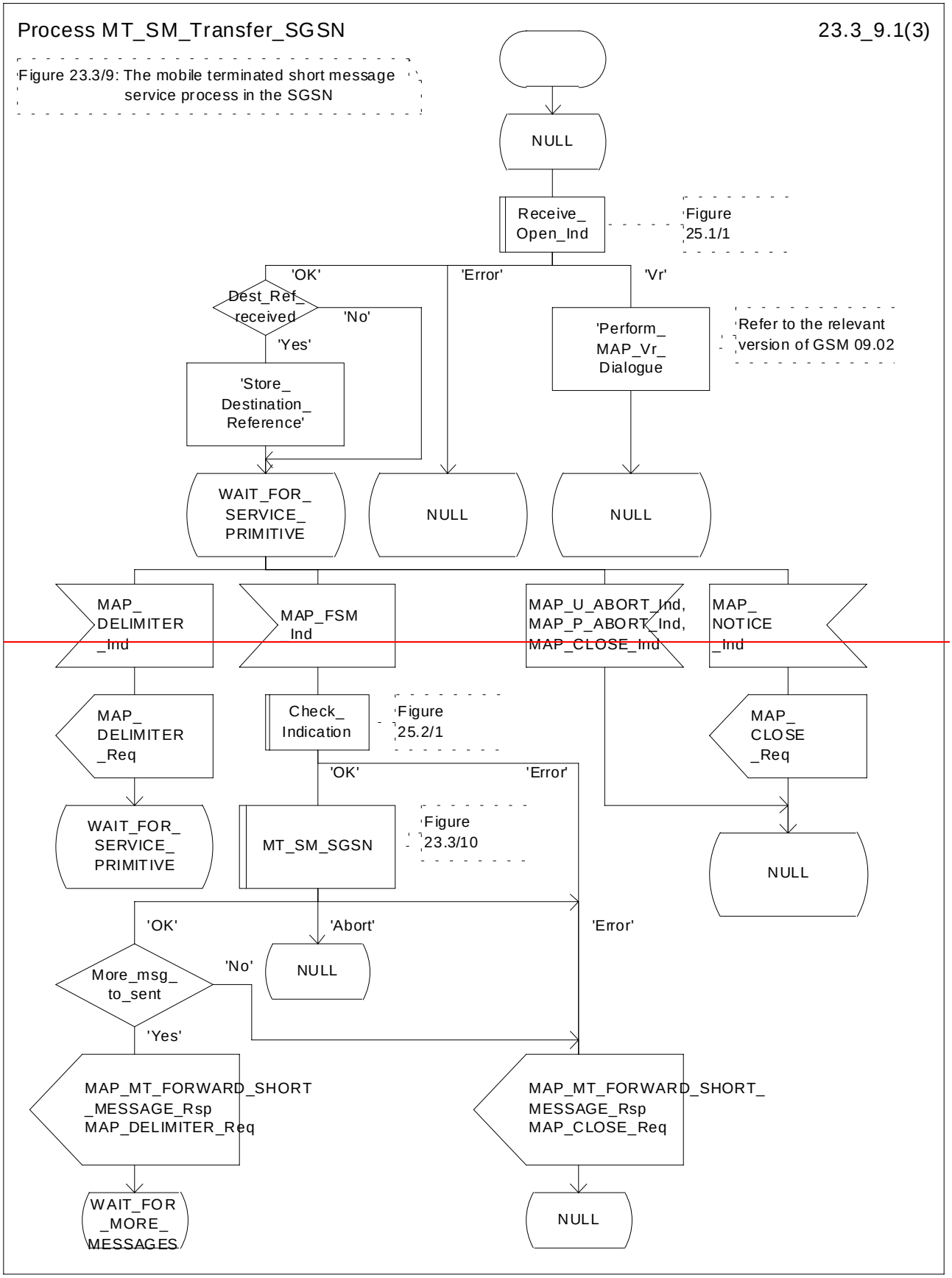
- if the received primitive contains errors, the unexpected data value error or data missing error is provided to the gateway MSC;

- The SGSN opens a CAMEL dialogue as specified in 3GPP TS 23.078 for each SM. If the CAMEL service bars the MT SM then the failure is reported to the GMSC, and the MT SM is not delivered to the MS.

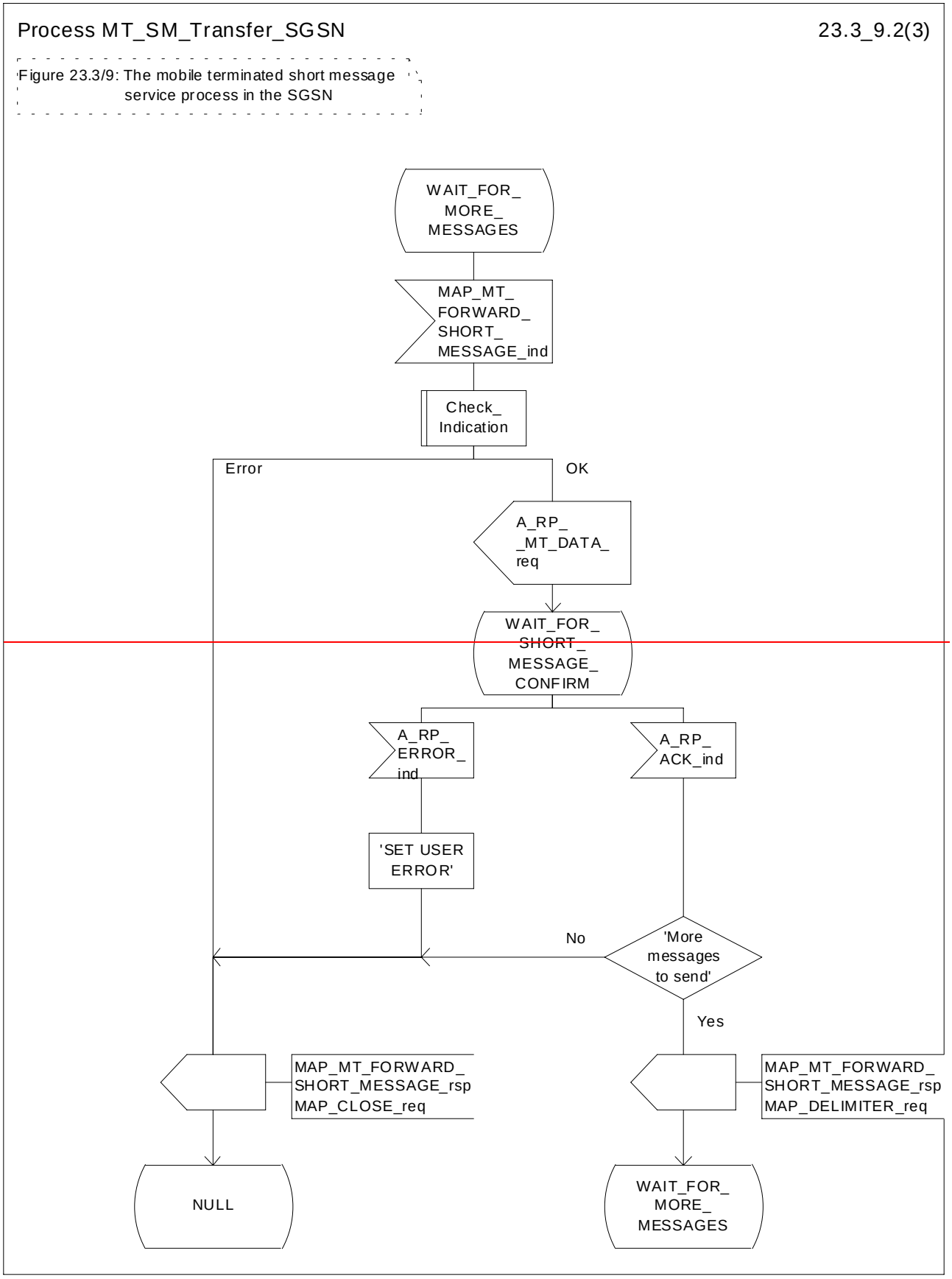
- if the More Messages To Send flag is FALSE, the servicing SGSN will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gsmSCF as specified in 3GPP TS 23.078 and gateway MSC, and the transaction is terminated.

- 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 SM delivery failure is reported to the gsmSCF and the reason is reported to the gateway MSC and the procedure is terminated. If the procedure is successful, then the MT SM delivery is reported to the gsmSCF as specified in 3GPP TS 23.078, and it is acknowledged to the gateway MSC and more short messages can be received.

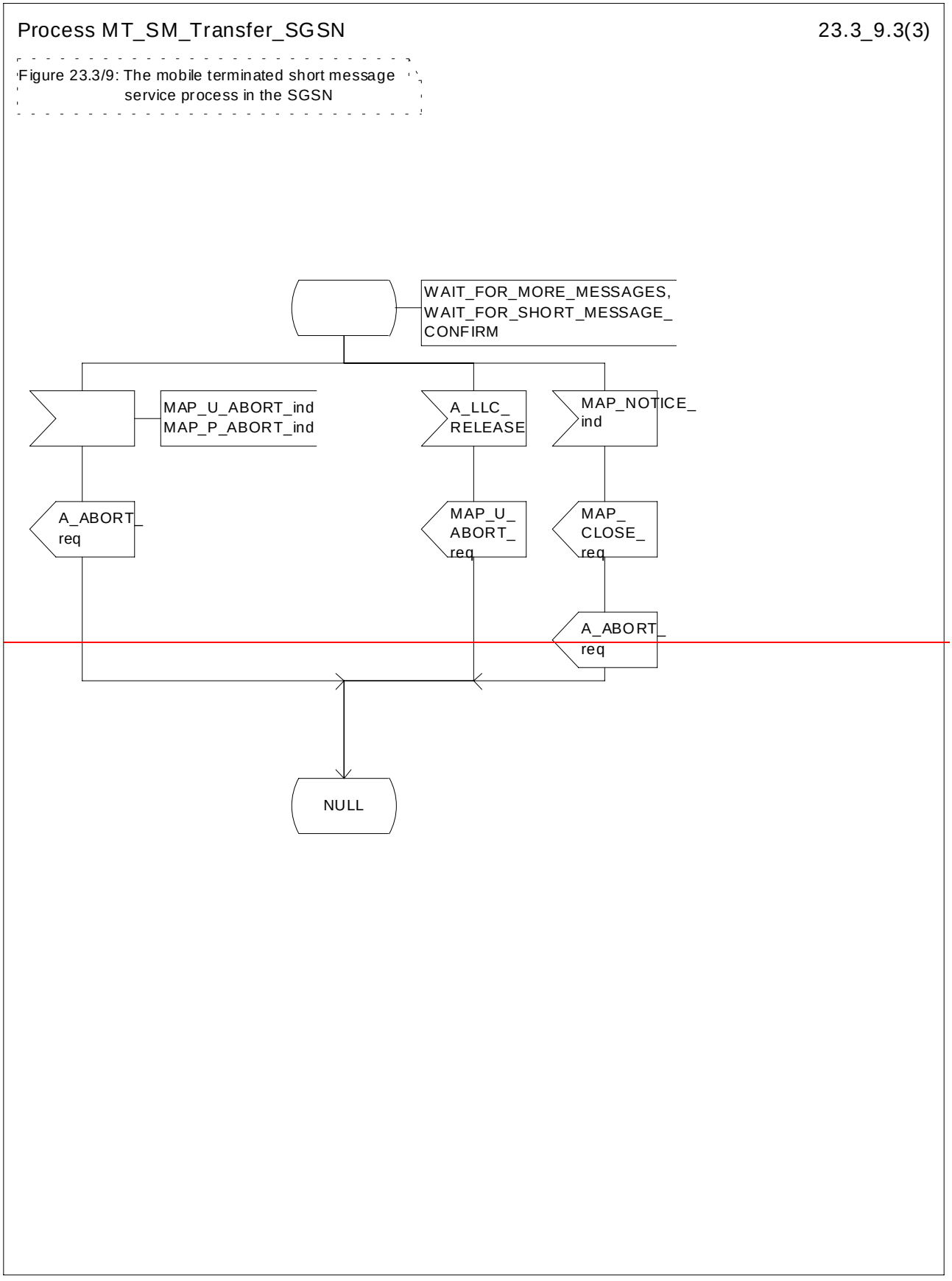
The mobile terminated short message transfer procedure in the servicing SGSN is shown in figures 23.3/9 and 23.3/10. The page and search procedures are shown in figure 25.3/1 and 25.3/2.



~~Figure 23.3/9 (sheet 1 of 3): Procedure MT_SM_Transfer_SGSN~~



~~Figure 23.3/9 (sheet 2 of 3): Procedure MT_SM_Transfer_SGSN~~



~~Figure 23.3/9 (sheet 3 of 3): Procedure MT_SM_Transfer_SGSN~~

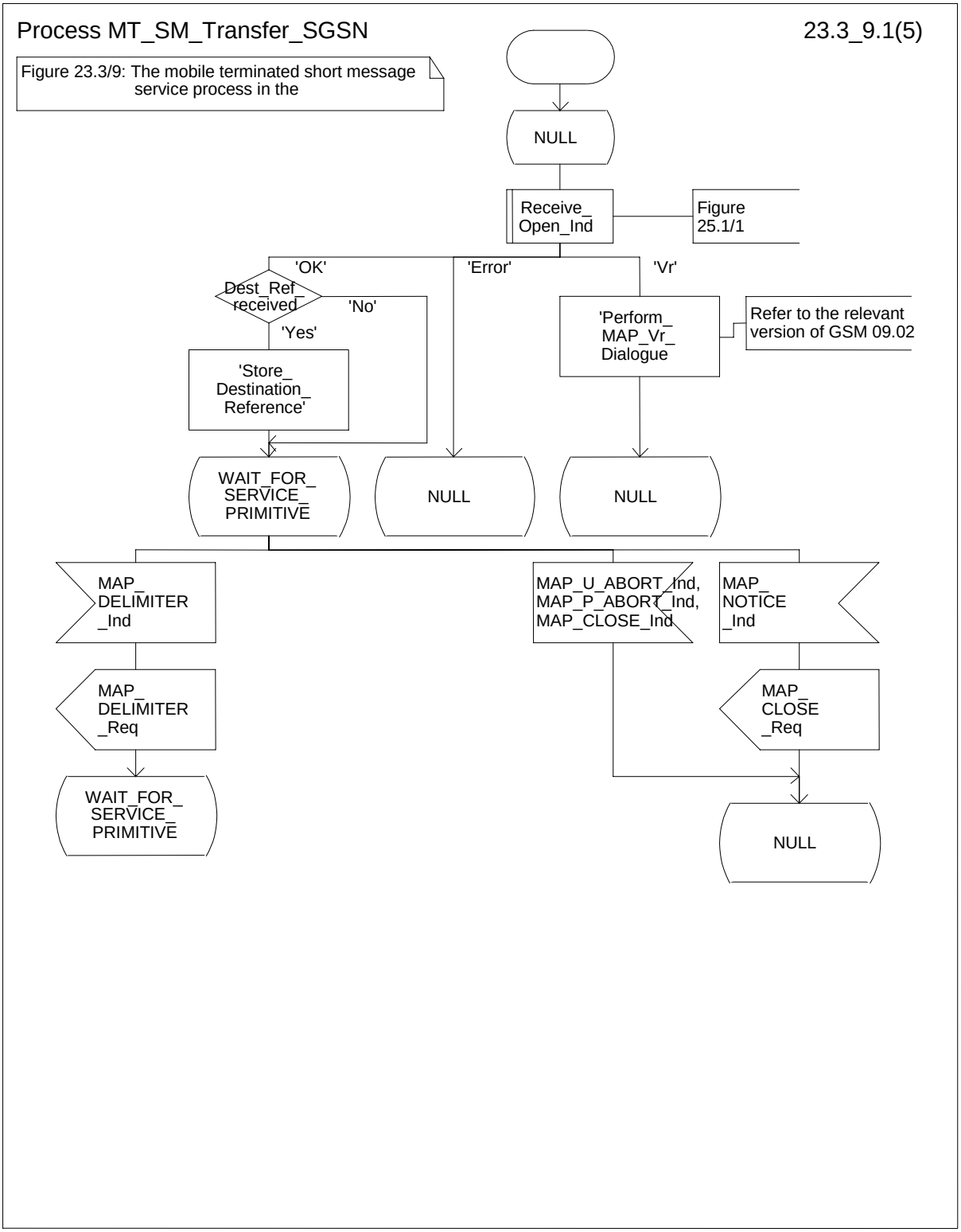


Figure 23.3/9 (sheet 1 of 5): Procedure MT_SM_Transfer_SGSN

Process 23.3_9.2(5)

Figure 23.3/9: The mobile terminated short message service process in the SGSN

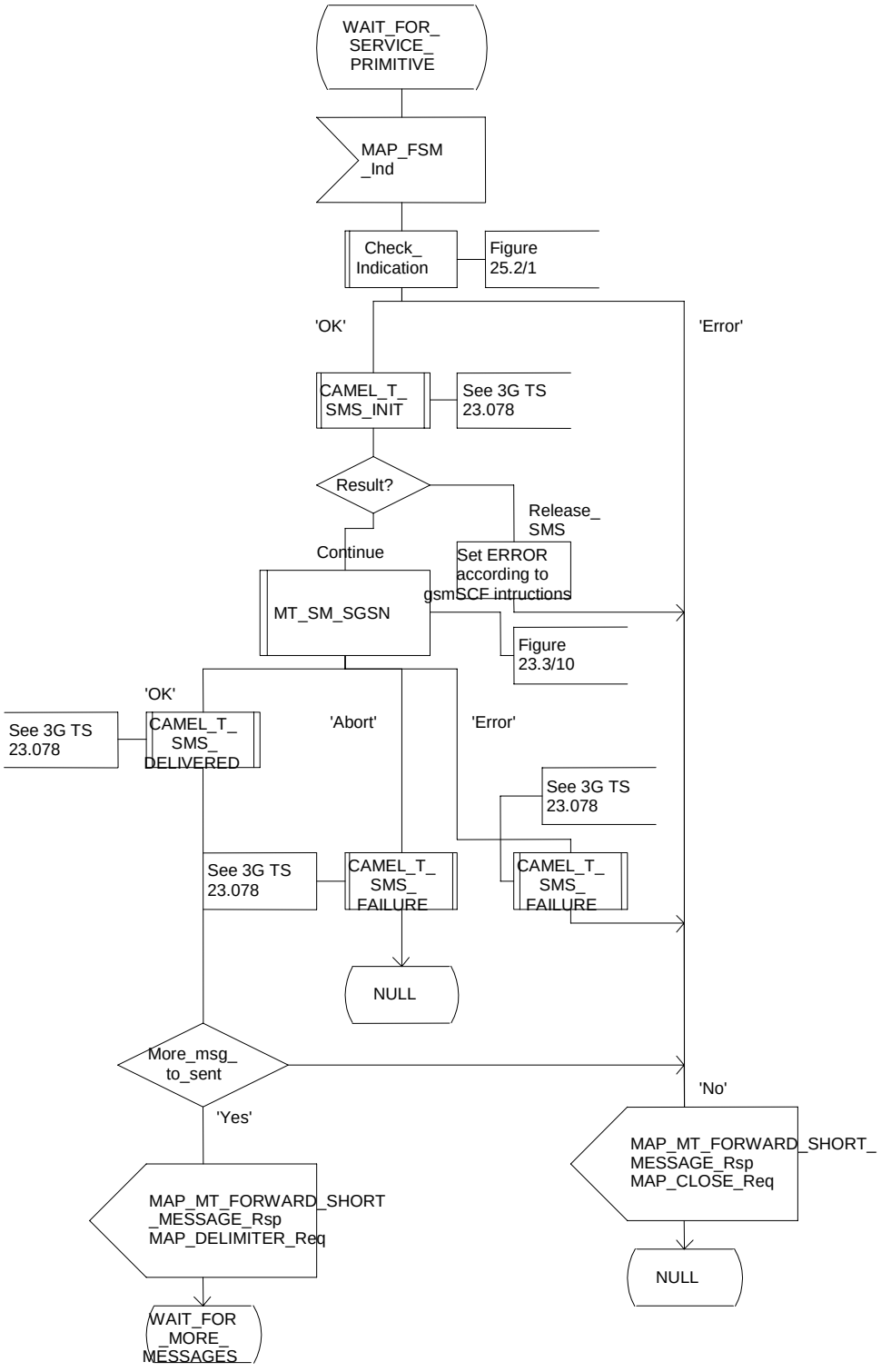


Figure 23.3/9 (sheet 2 of 5): Procedure MT_SM_Transfer_SGSN

Process MT_SM_Transfer_SGSN 23.3_9.3(5)

Figure 23.3/9: The mobile terminated short service process in the

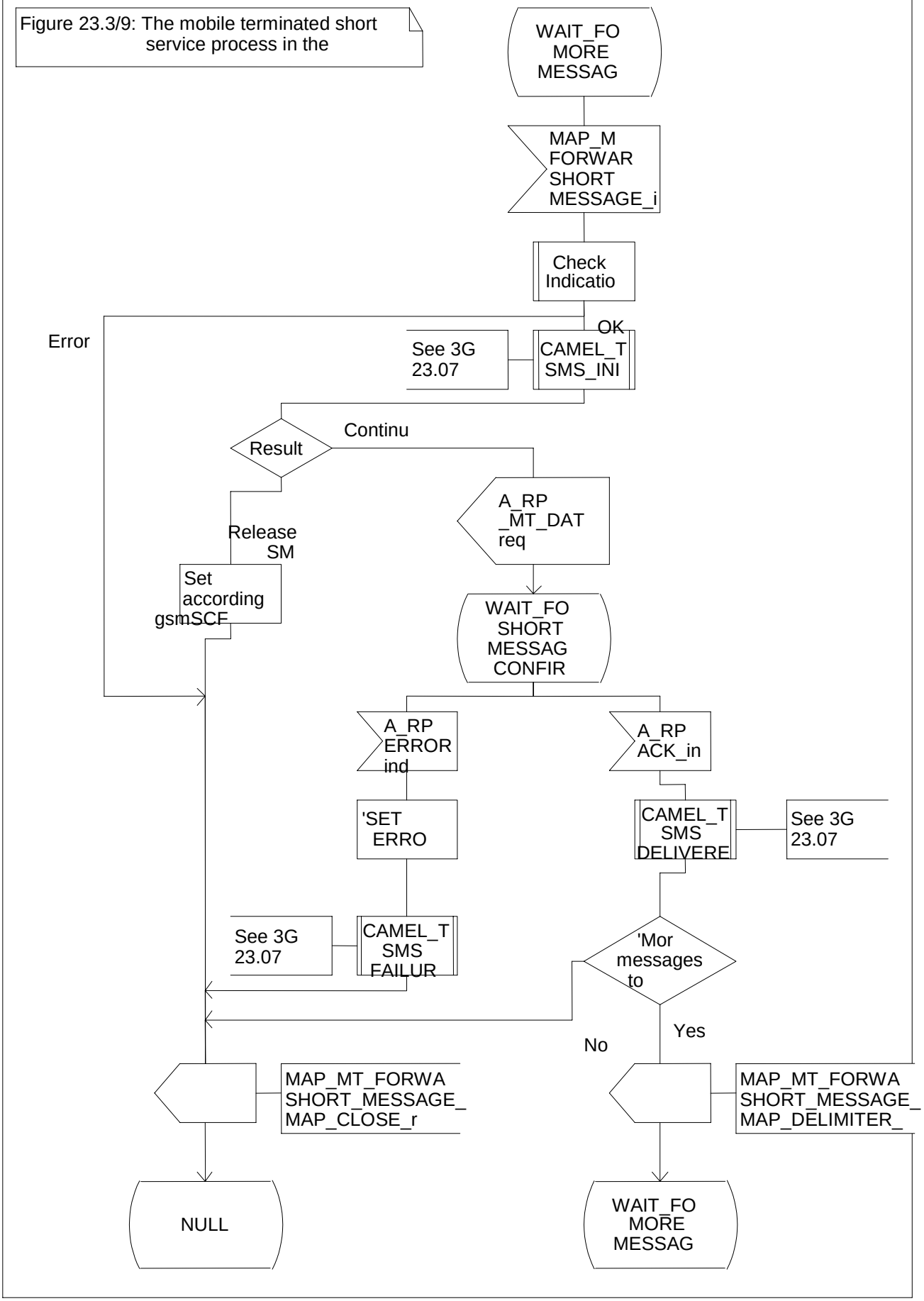


Figure 23.3/9 (sheet 3 of 5): Procedure MT_SM_Transfer_SGSN

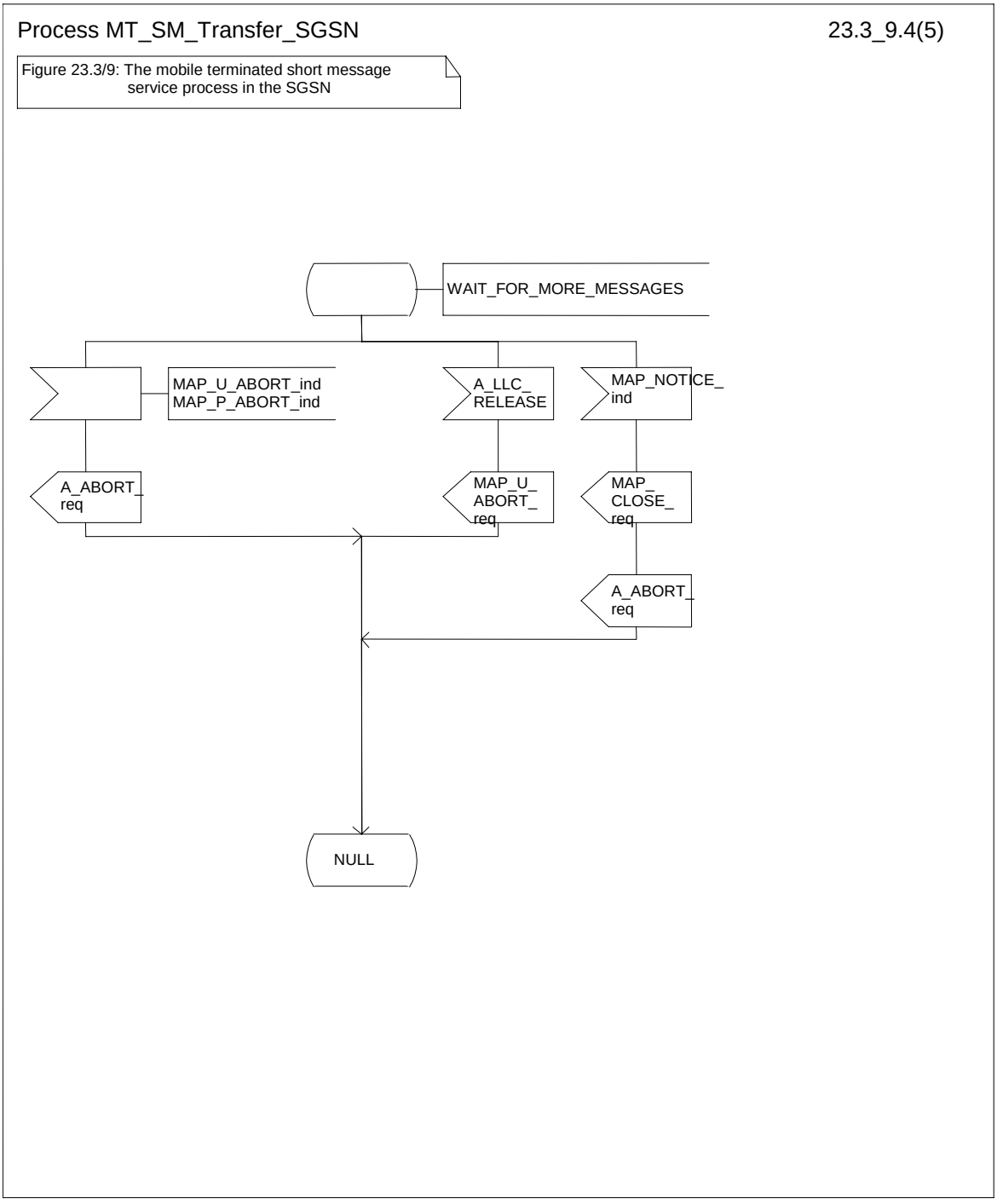


Figure 23.3/9 (sheet 4 of 5): Procedure MT_SM_Transfer_SGSN

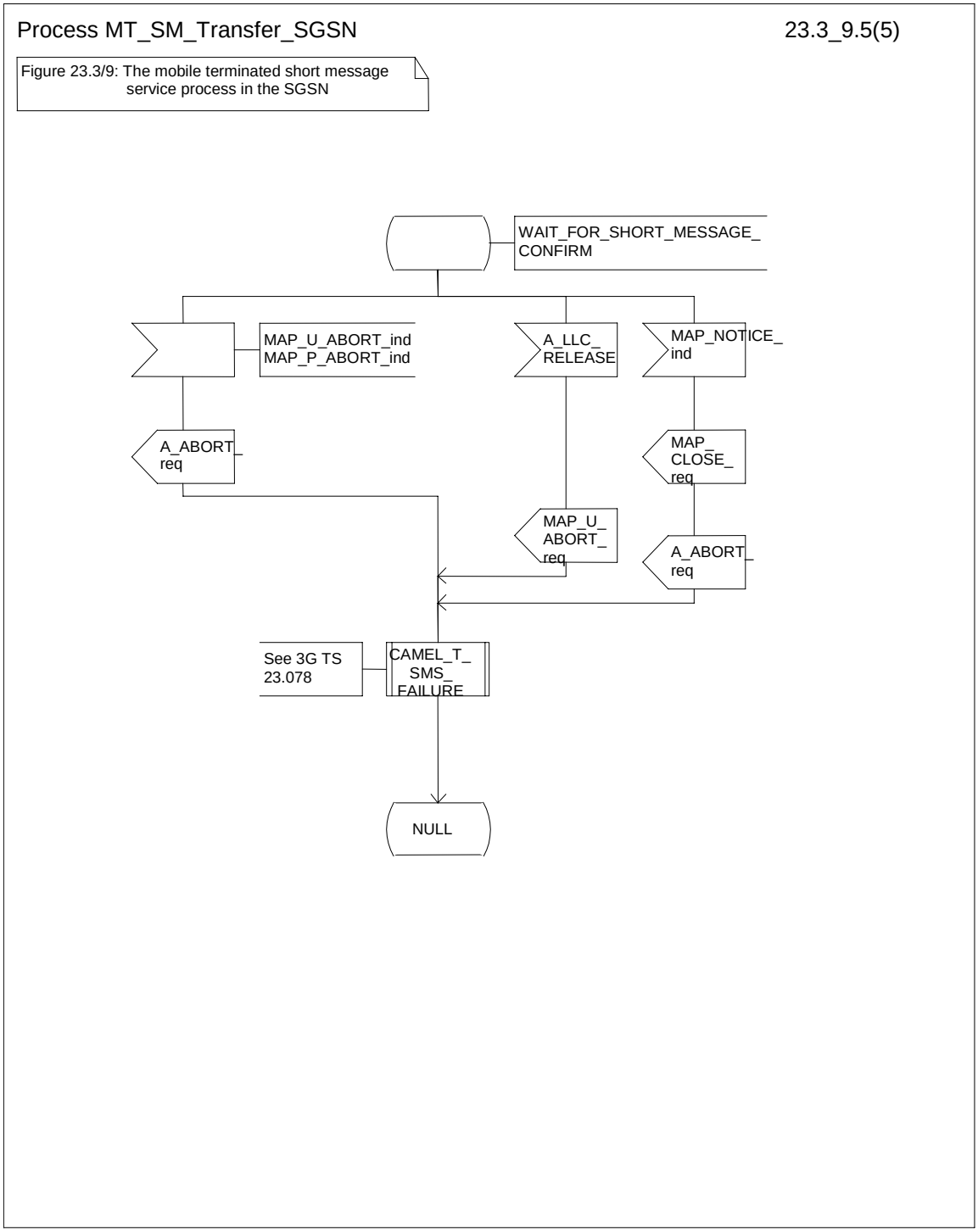


Figure 23.3/9 (sheet 5 of 5): Procedure MT_SM_Transfer_SGSN

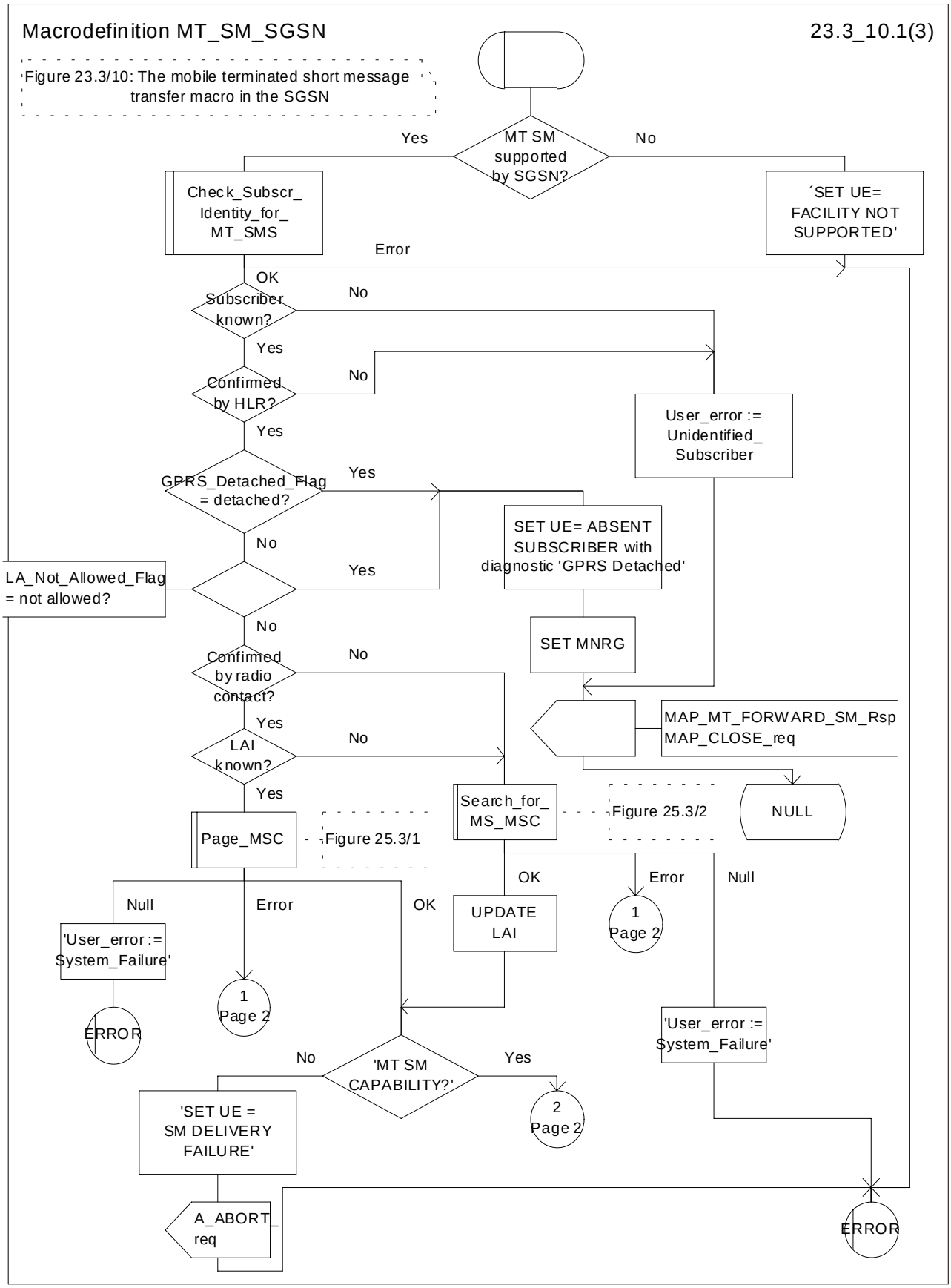


Figure 23.3/10 (sheet 1 of 3): Macro MT_SM_SGSN

Macrodefinition MT_SM_SGSN 23.3_10.2(3)

Figure 23.3/10: The mobile terminated short message transfer macro in the SGSN

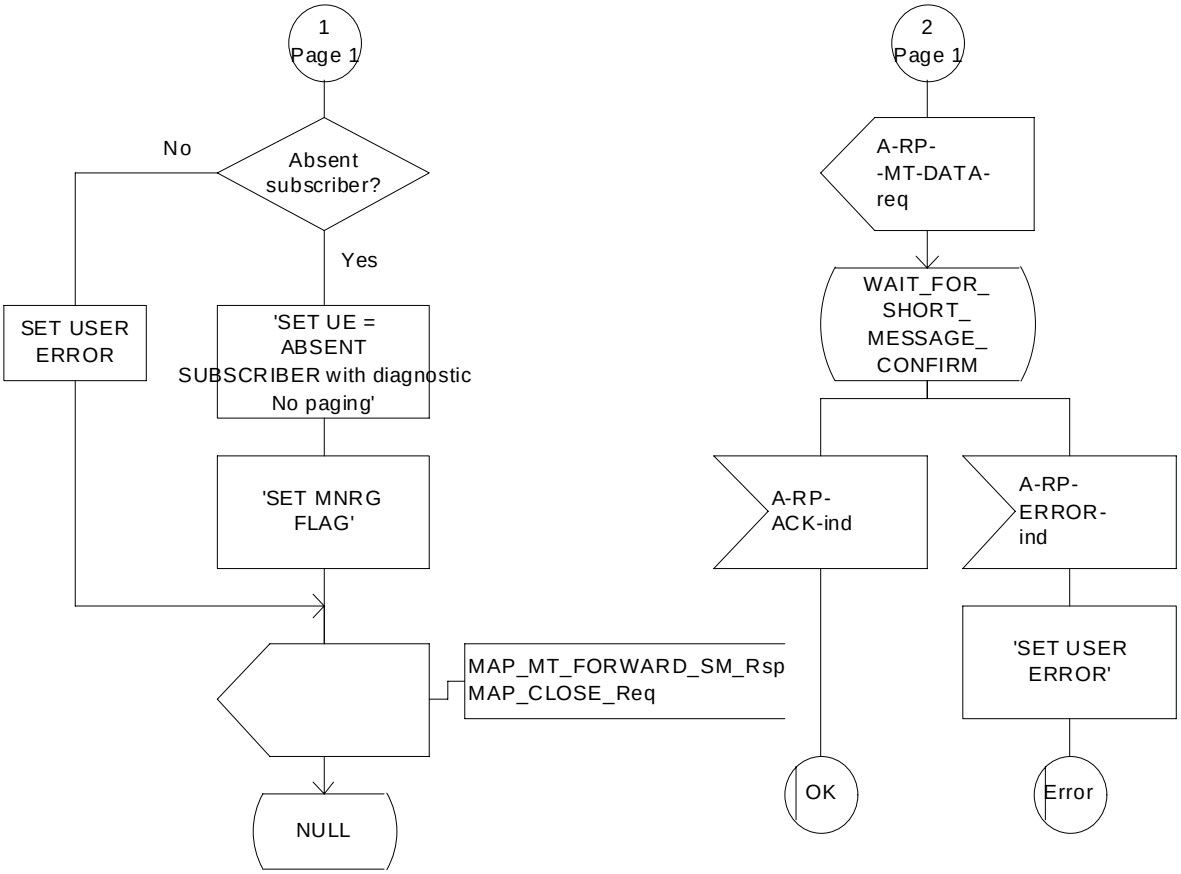


Figure 23.3/10 (sheet 2 of 3): Macro MT_SM_SGSN

Macrodefinition MT_SM_SGSN 23.3_10.3(3)

Figure 23.3/10: The mobile terminated short message transfer macro in the SGSN

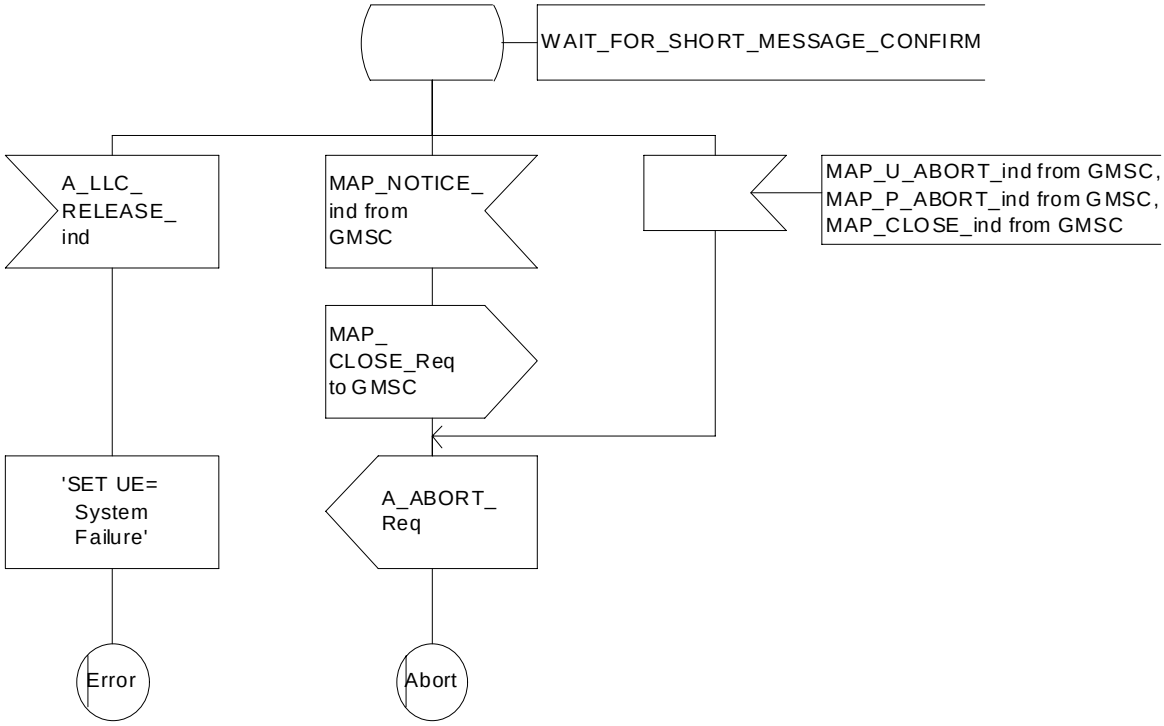
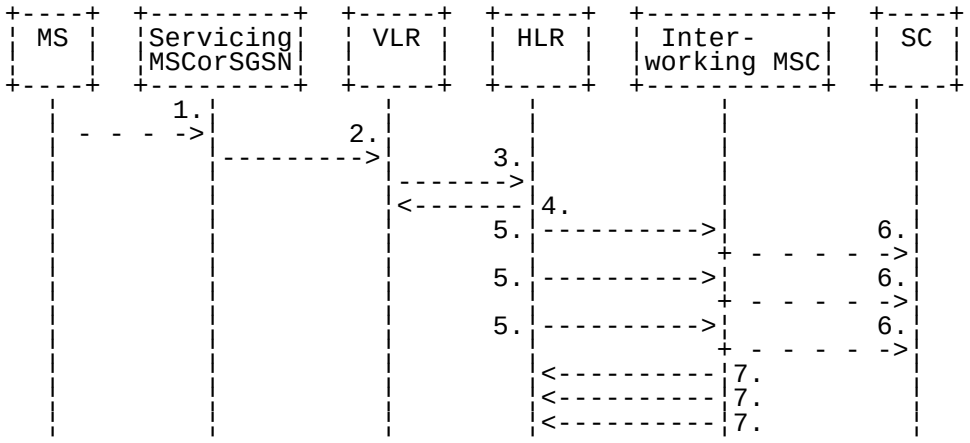


Figure 23.3/10 (sheet 3 of 3): Macro MT_SM_SGSN

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.

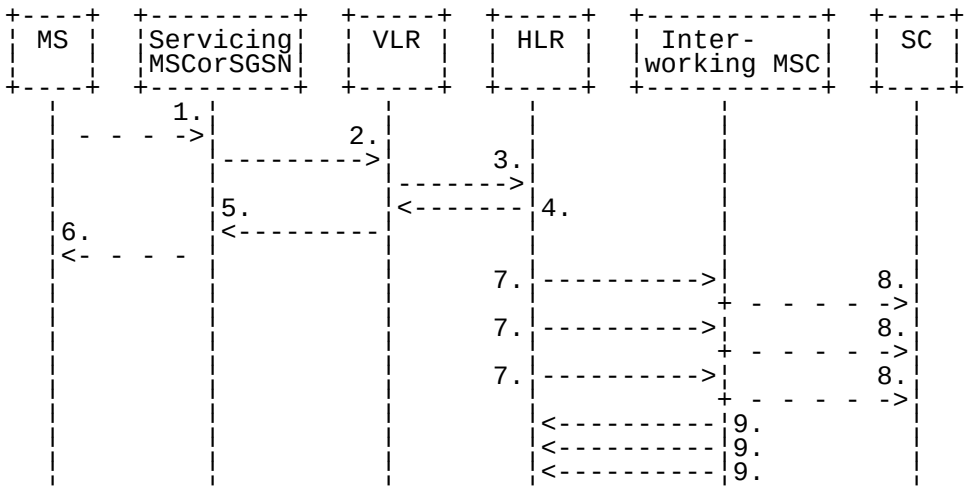


1) CM Service Request (**), Page response or Location Updating (3GPP TS 24.008 [35]).
2) MAP_PROCESS_ACCESS_REQUEST / MAP_UPDATE_LOCATION_AREA (**).
3) MAP_READY_FOR_SM (Mobile Present) / MAP_UPDATE_LOCATION / Supplementary Service Control Request (*).
4) MAP_READY_FOR_SM_ACK (*).
5) MAP_ALERT_SERVICE_CENTRE (notes 1 and 2).
6) Alert Service Centre (3GPP TS 23.140).
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 (3GPP TS 24.011 [37]).
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) (3GPP TS 24.011 [37]).
7) MAP_ALERT_SERVICE_CENTRE (note).
8) Alert Service Centre (3GPP TS 23.140).
9) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE: 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 clause 8.3); (*)

MAP_AUTHENTICATE (see clause 8.5); (*)

MAP_SET_CIPHERING_MODE (see clause 8.6); (*)

MAP_PROVIDE_IMSI (see clause 8.9); (*)

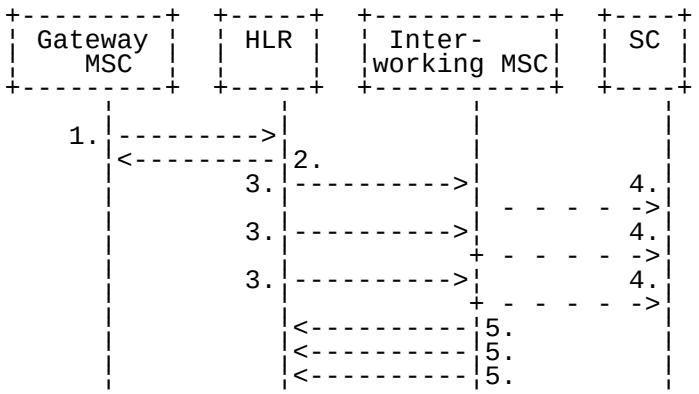
MAP_CHECK_IMEI (see clause 8.7);

MAP_FORWARD_NEW_TMSI (see clause 8.9); (*)

MAP_TRACE_SUBSCRIBER_ACTIVITY (see clause 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 (3GPP TS 23.140).
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 clause 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 acknowledgement. The MSC sends the corresponding message to the MS;
- negative acknowledgement, 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.

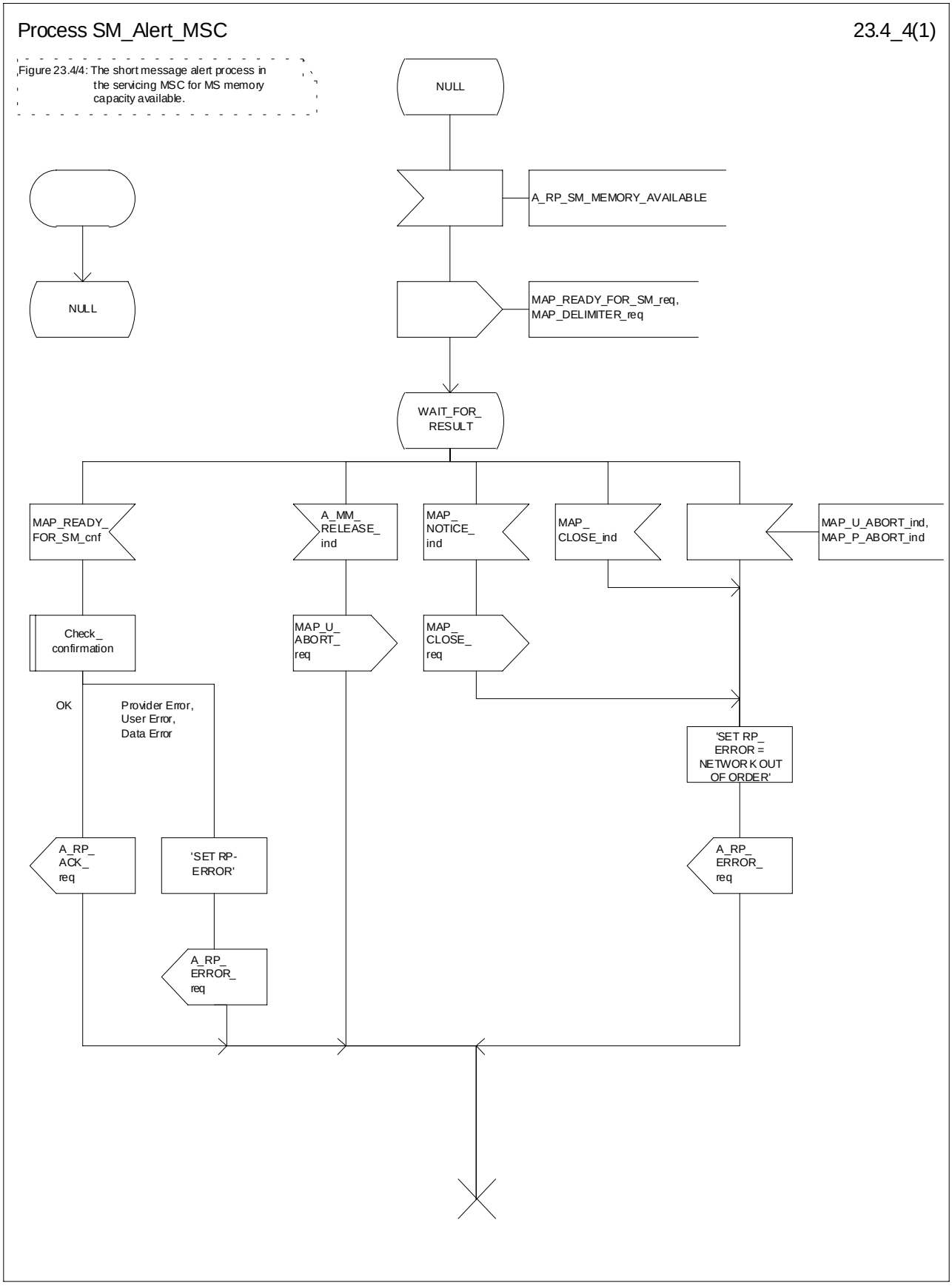


Figure 23.4/4: Procedure SM_Alert_MSC

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 clause 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 acknowledgement.

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 acknowledgement 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.

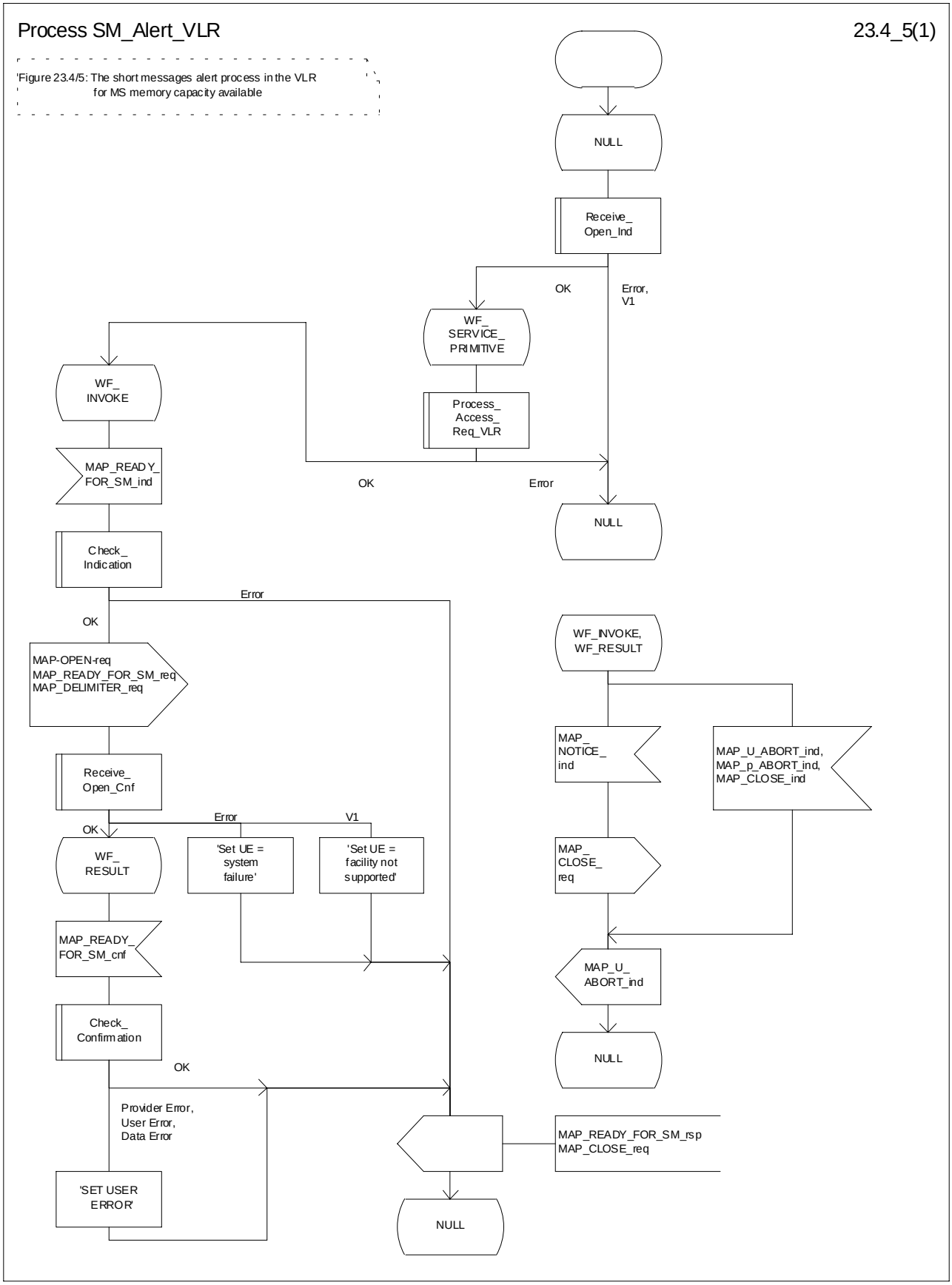


Figure 23.4/5: Procedure SM_Alert_VLR

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 clause 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 GPRS location 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 clause 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 clause 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.

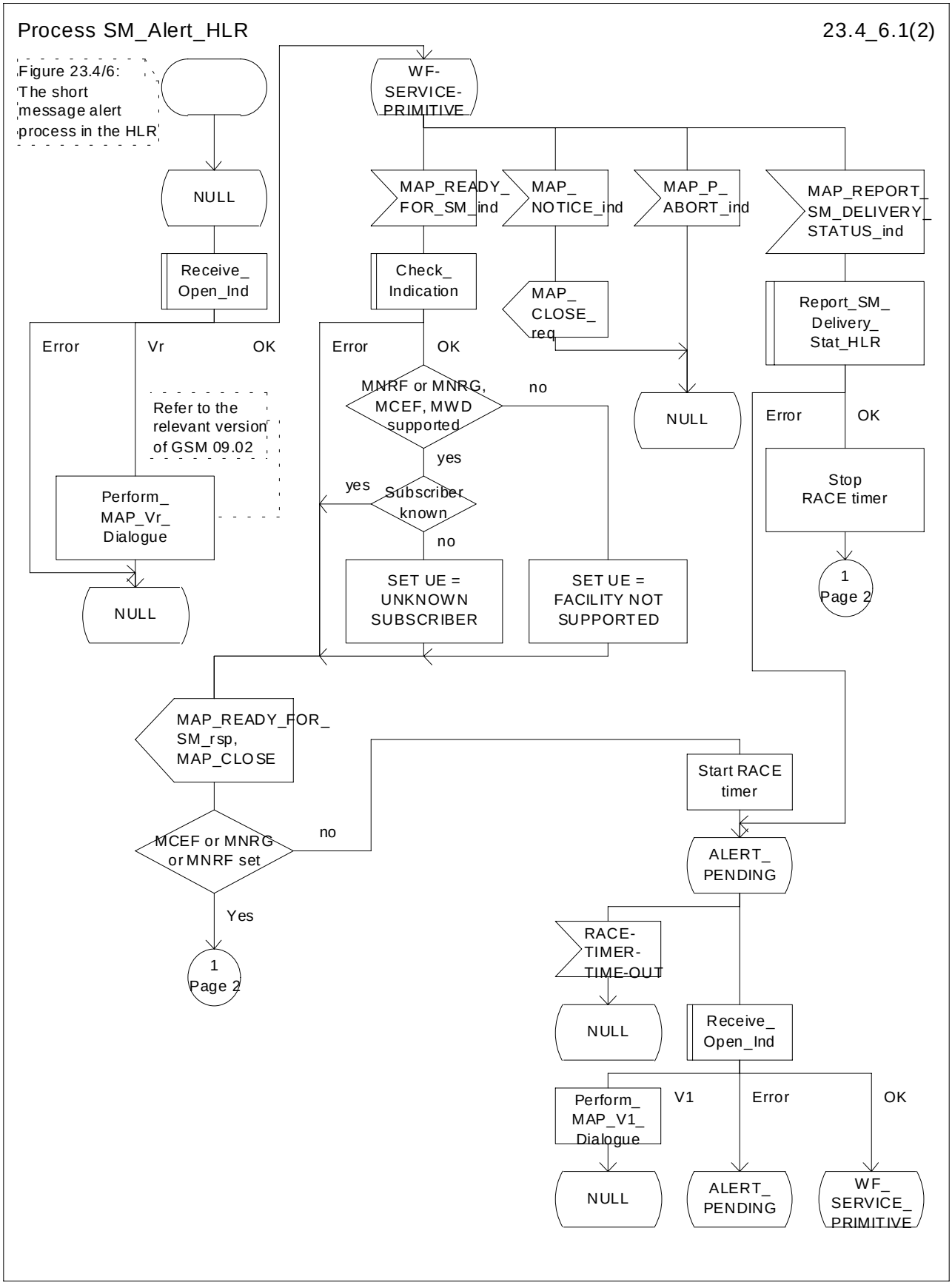


Figure 23.4/6 (sheet 1 of 2): Process SM_Alert_HLR

Process SM_Alert_HLR 23.4_6.2(2)

Figure 23.4/6: The short message alert process in the HLR

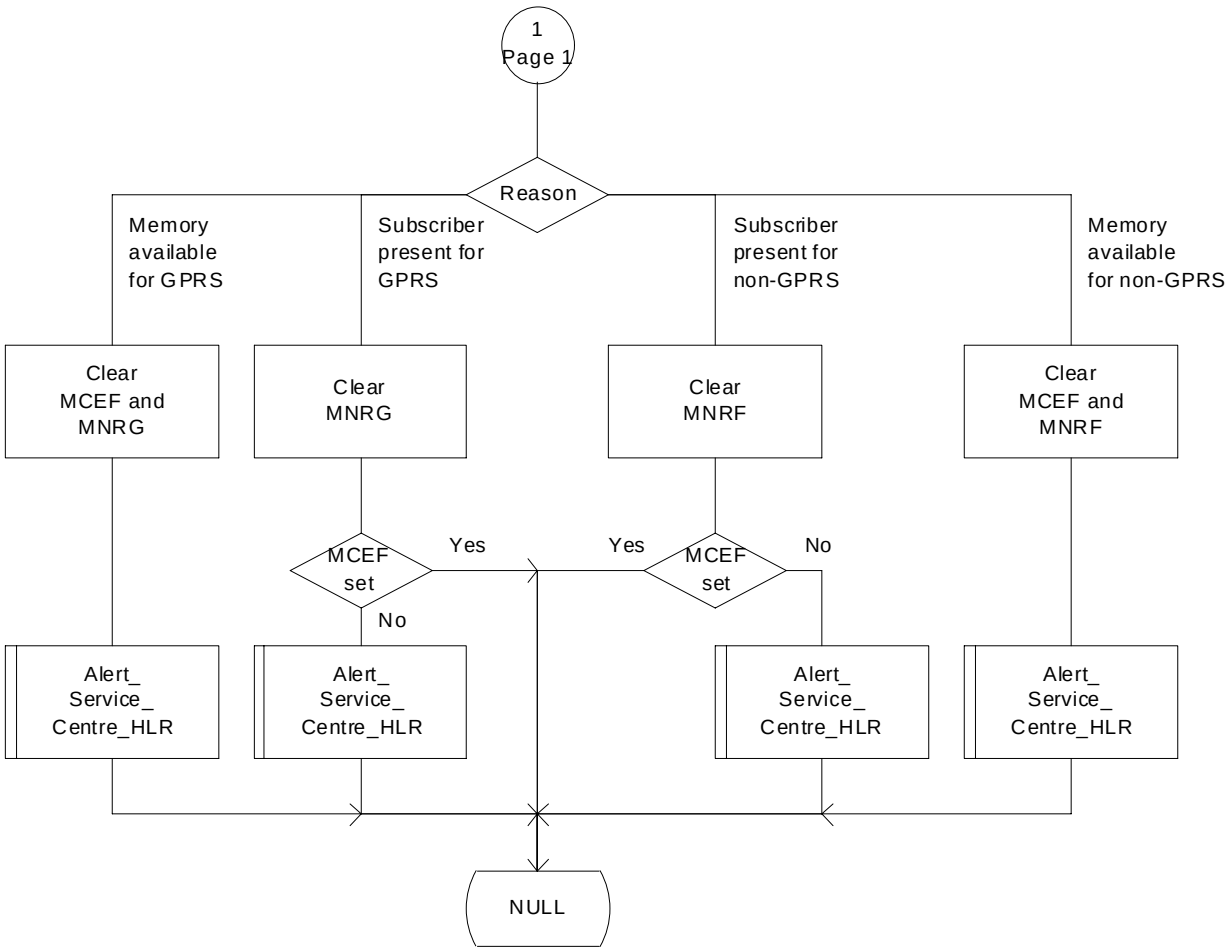


Figure 23.4/6 (sheet 2 of 2): Process SM_Alert_HLR

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.

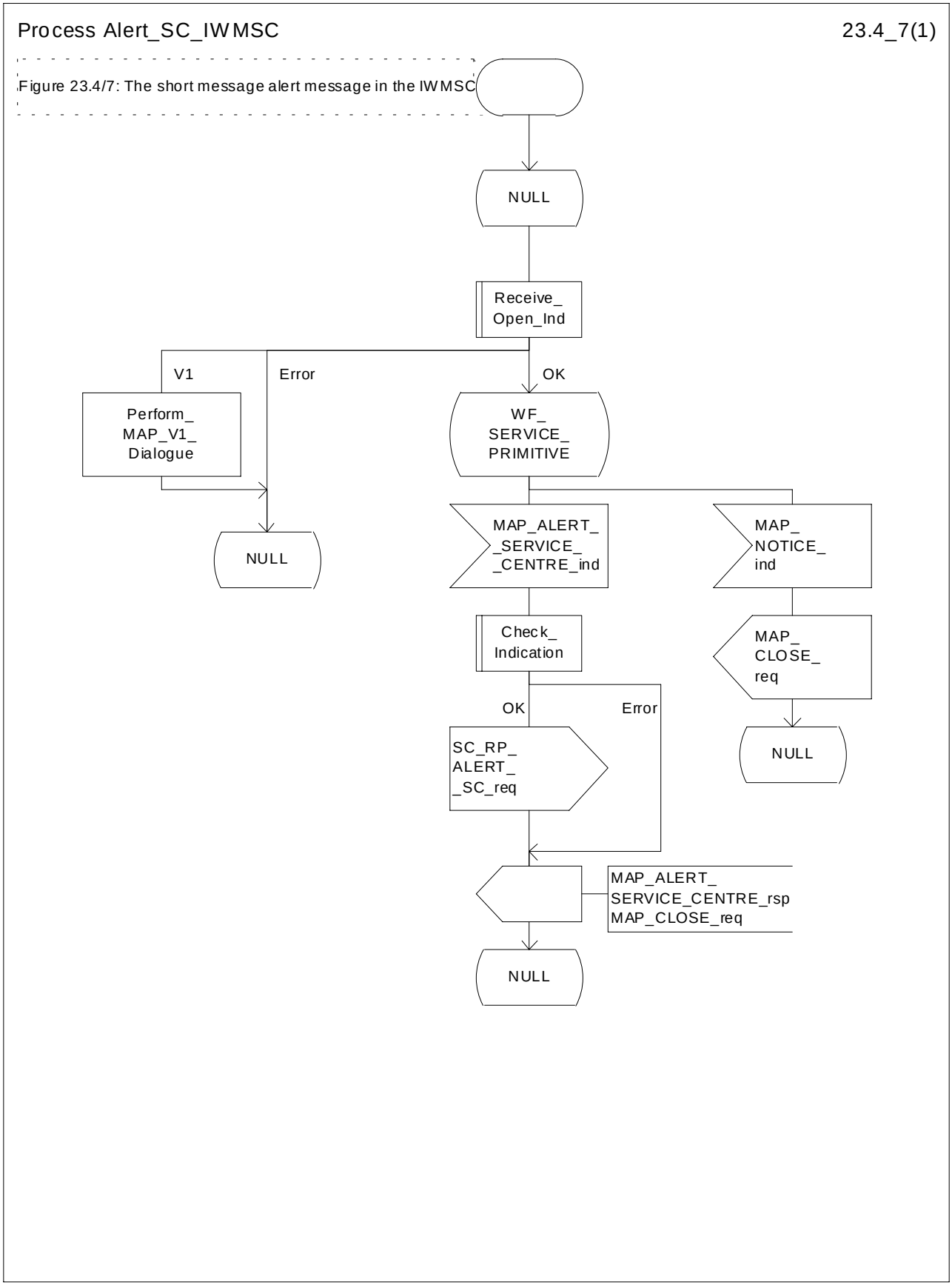


Figure 23.4/7: Process Alert_SC_IWMSC

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 (3GPP TS 24.008 [35]), 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 clause 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 acknowledgement. The SGSN sends the corresponding message to the MS;
- negative acknowledgement, 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.

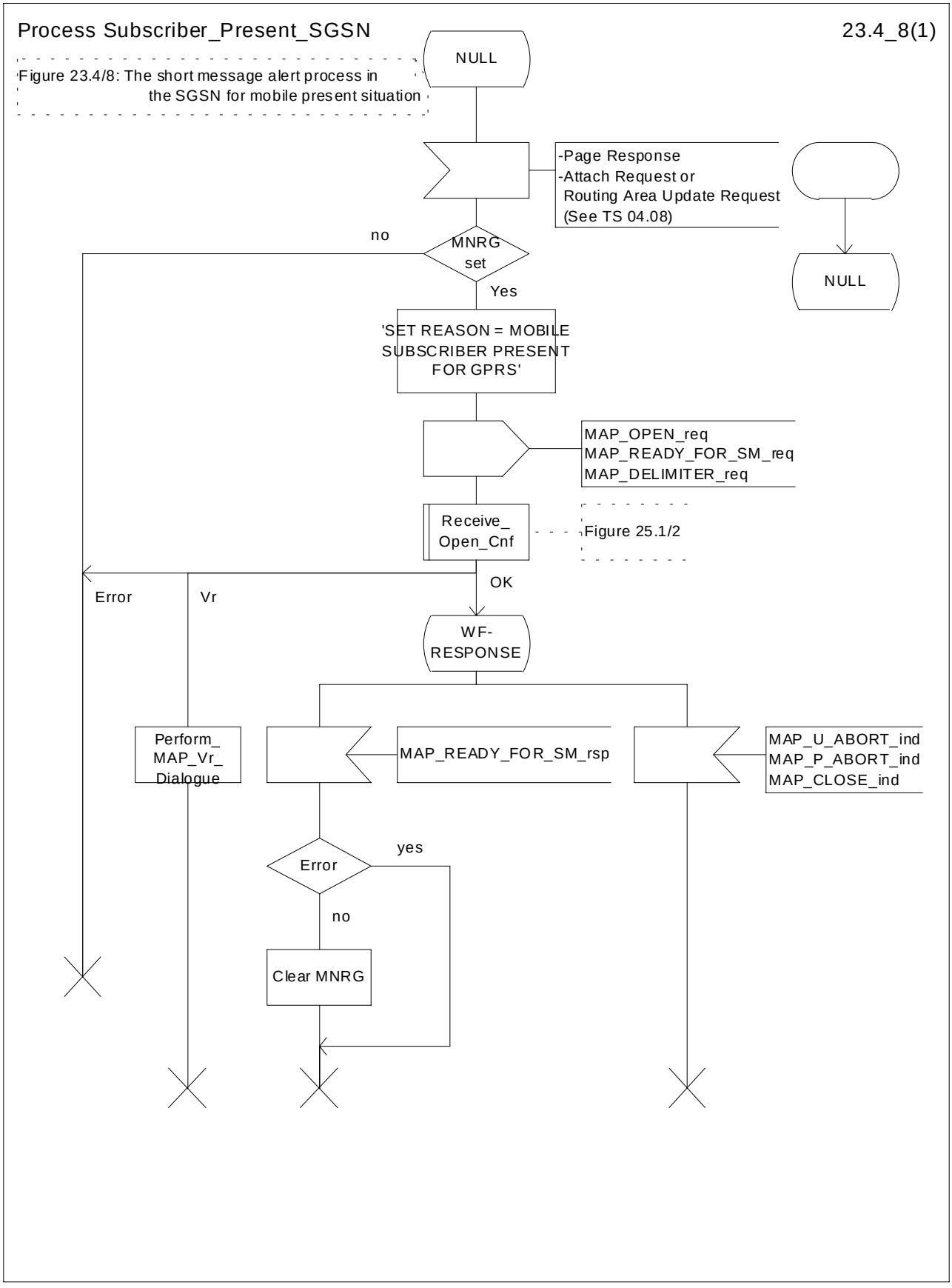


Figure 23.4/8: Process Subscriber_Present_SGSN

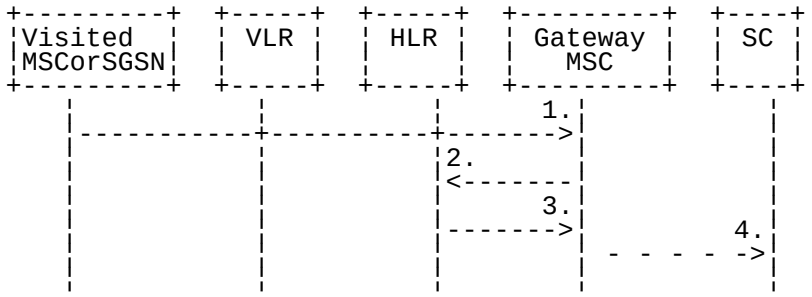
23.5 The SM delivery status report procedure

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 clause 23.4.

The SM delivery status report procedure is shown in figure 23.5/1.



1) MAP_MT_FORWARD_SHORT_MESSAGE_ACK/_NACK (Absent subscriber_SM, unidentified subscriber or memory capacity exceeded).
2) MAP_REPORT_SM_DELIVERY_STATUS.
3) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
4) Short Message Negative Acknowledgement (3GPP TS 23.140).

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 clause 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.

Process SM_Delivery_Status_Report_HLR 23.5_2(1)

Figure 23.5/2: The report SM delivery process in the HLR

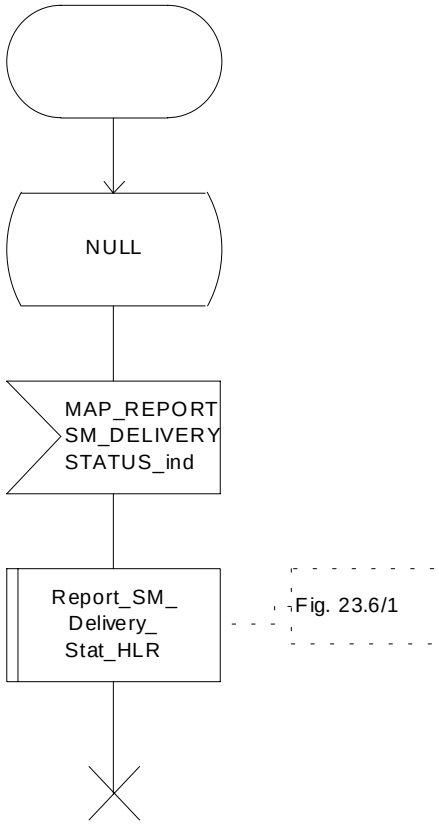


Figure 23.5/2: Process SM_Delivery_Status_Report_HLR

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 clause 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.

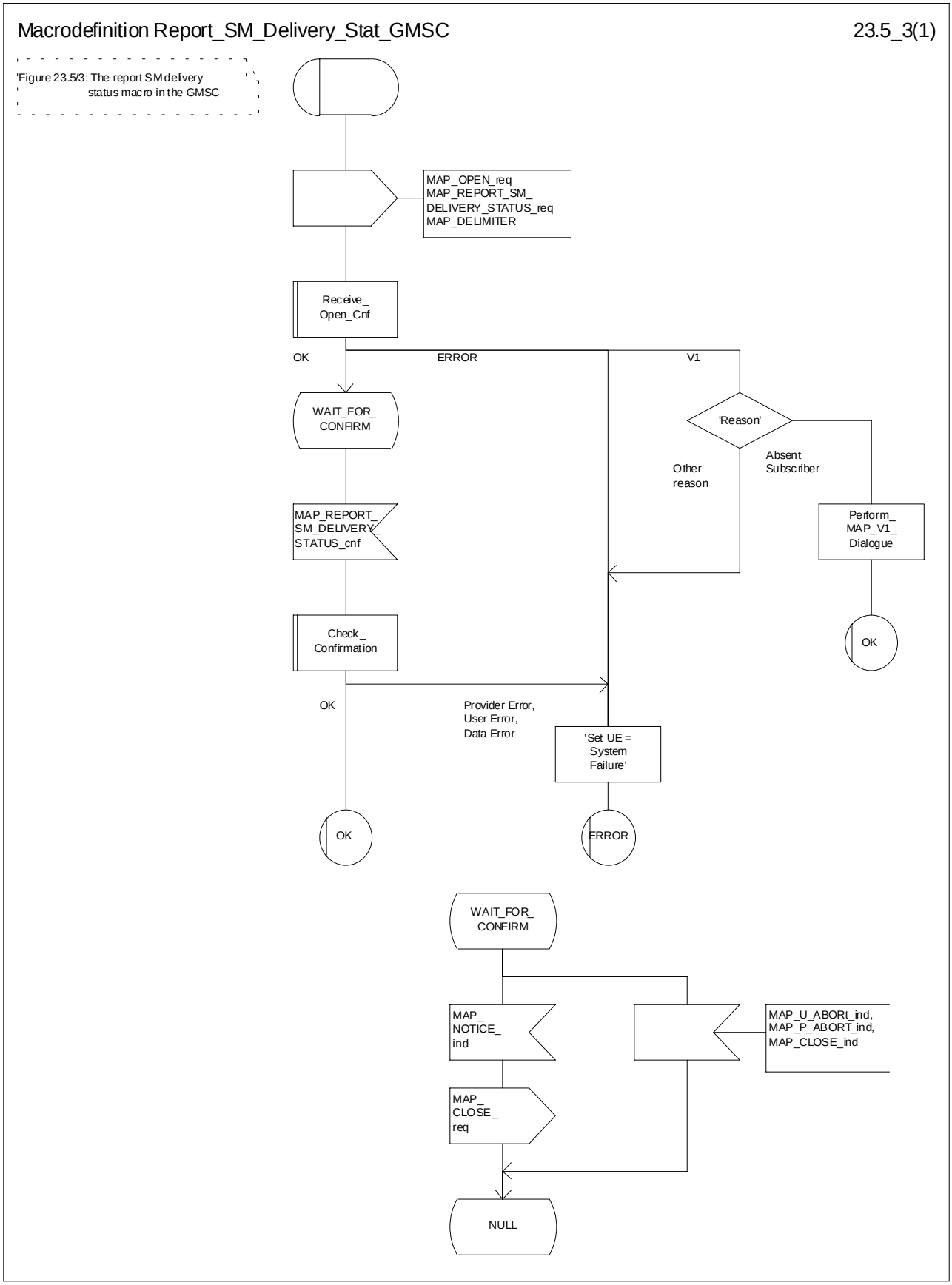


Figure 23.5/3: Macro Report_SM_Delivery_Stat_GMSC

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 responses 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 recognised 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 clause 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.

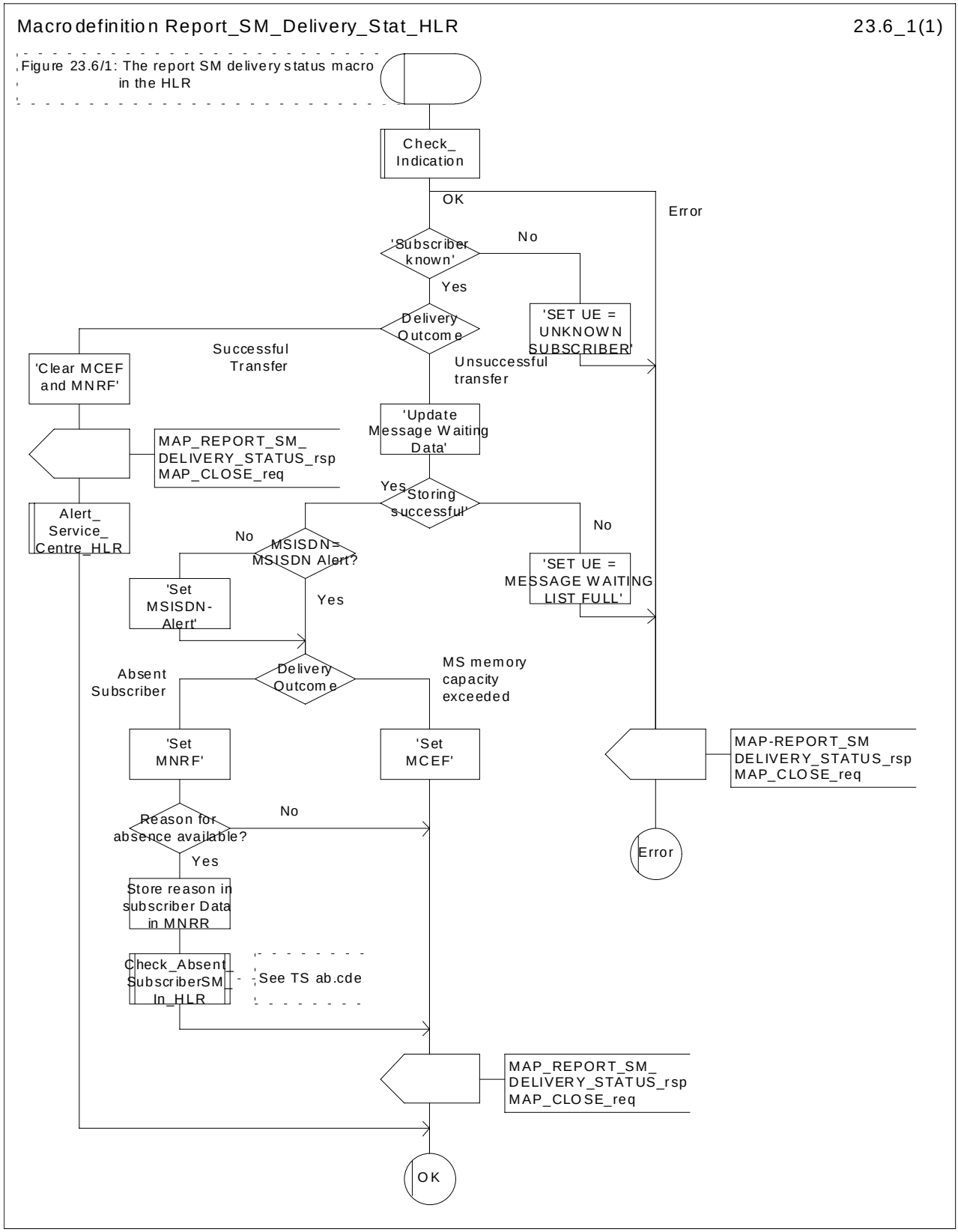


Figure 23.6/1: Macro Report_SM_Delivery_Stat_HLR

*** Next Modification ***

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 3GPP TS 23.060 [104] [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 macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see clause 25.1.1;

Check_Indication see clause 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 waits 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.

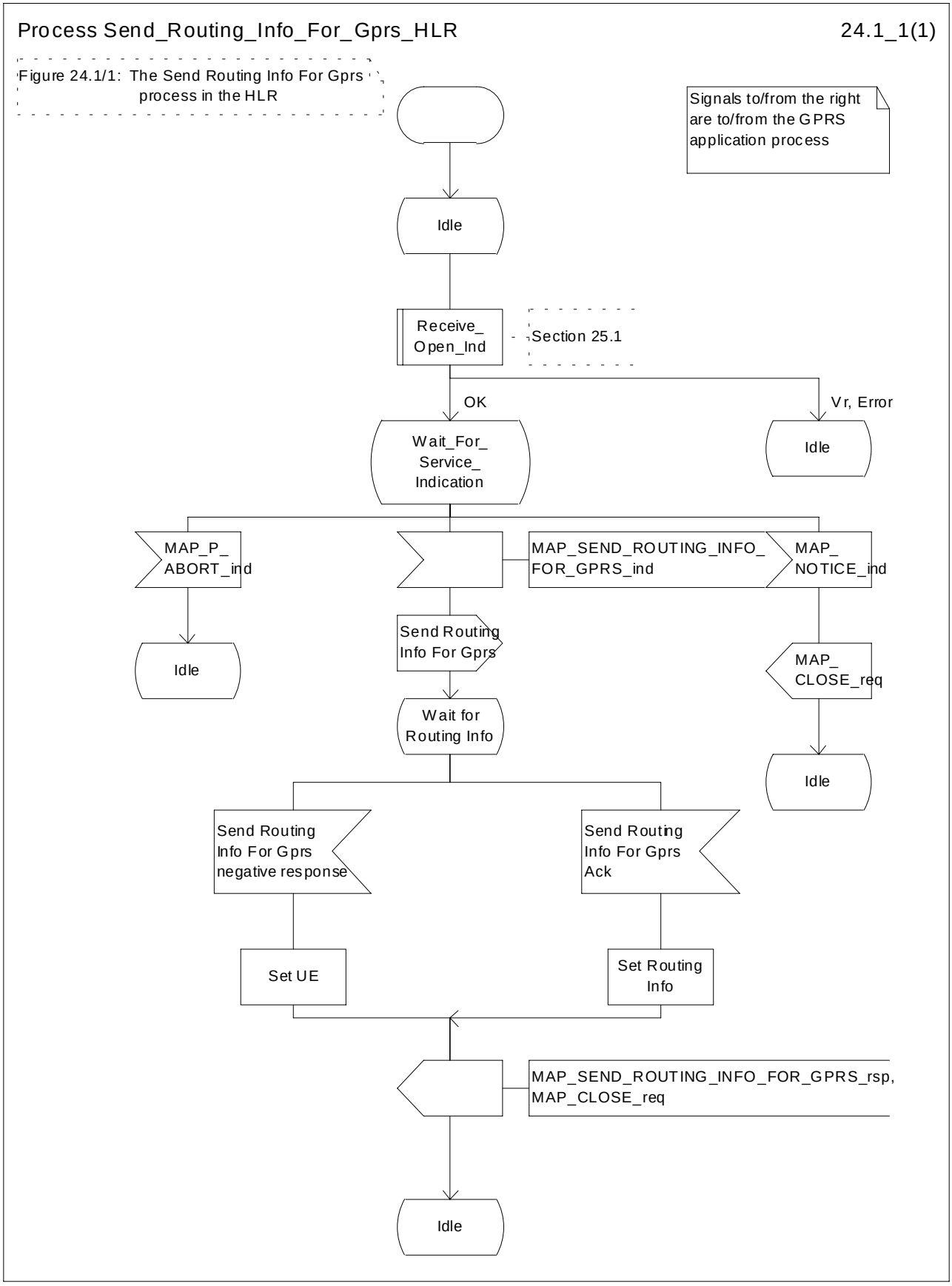


Figure 24.1/1: Process Send Routing Info For Gprs_HLR

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 routeing 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.

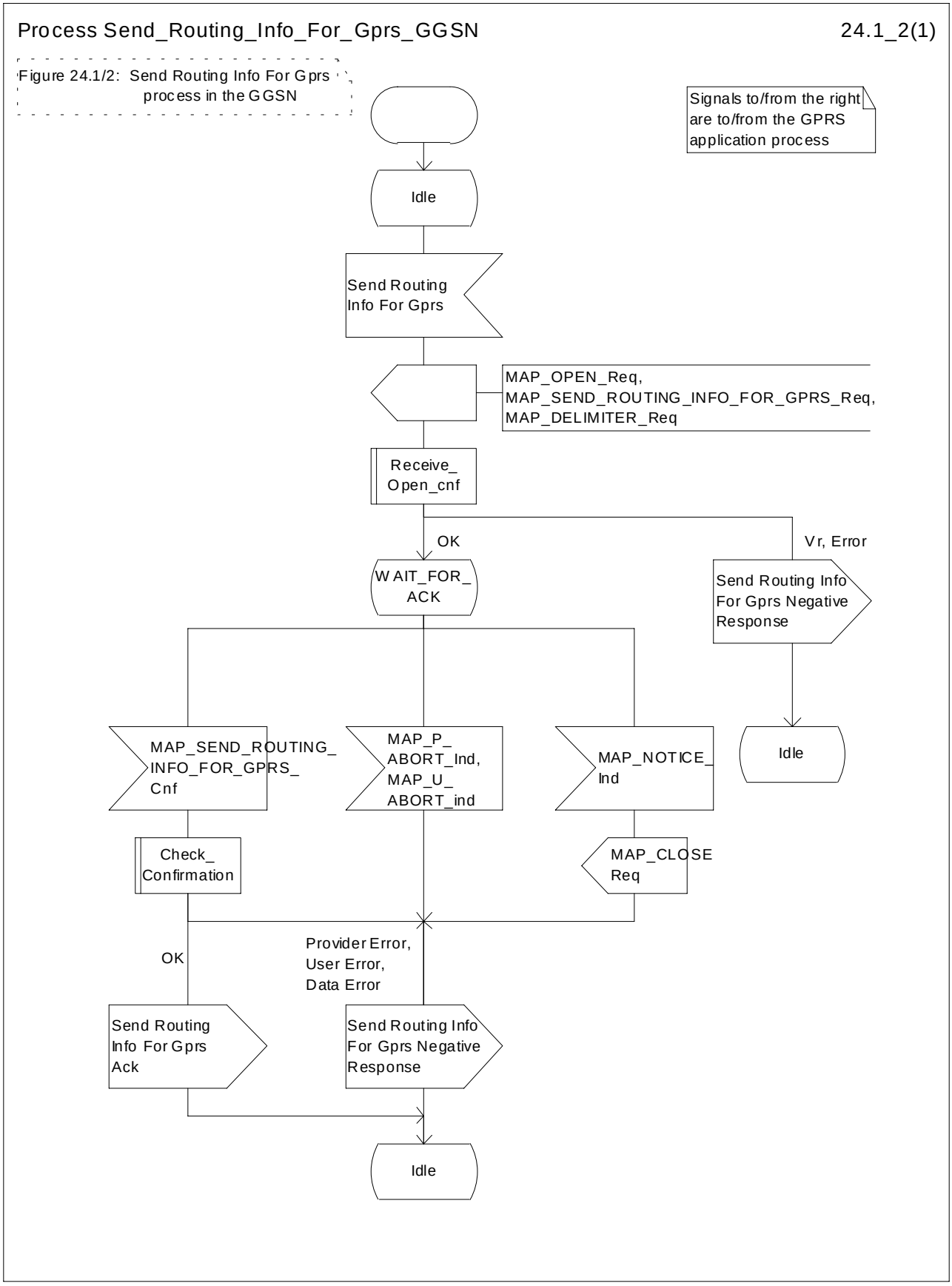


Figure 24.1/2: Process Send_Routing_Info_For_Gprs_GGSN

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 macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind	see clause 25.1.1;
Check Indication	see clause 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 waits 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.

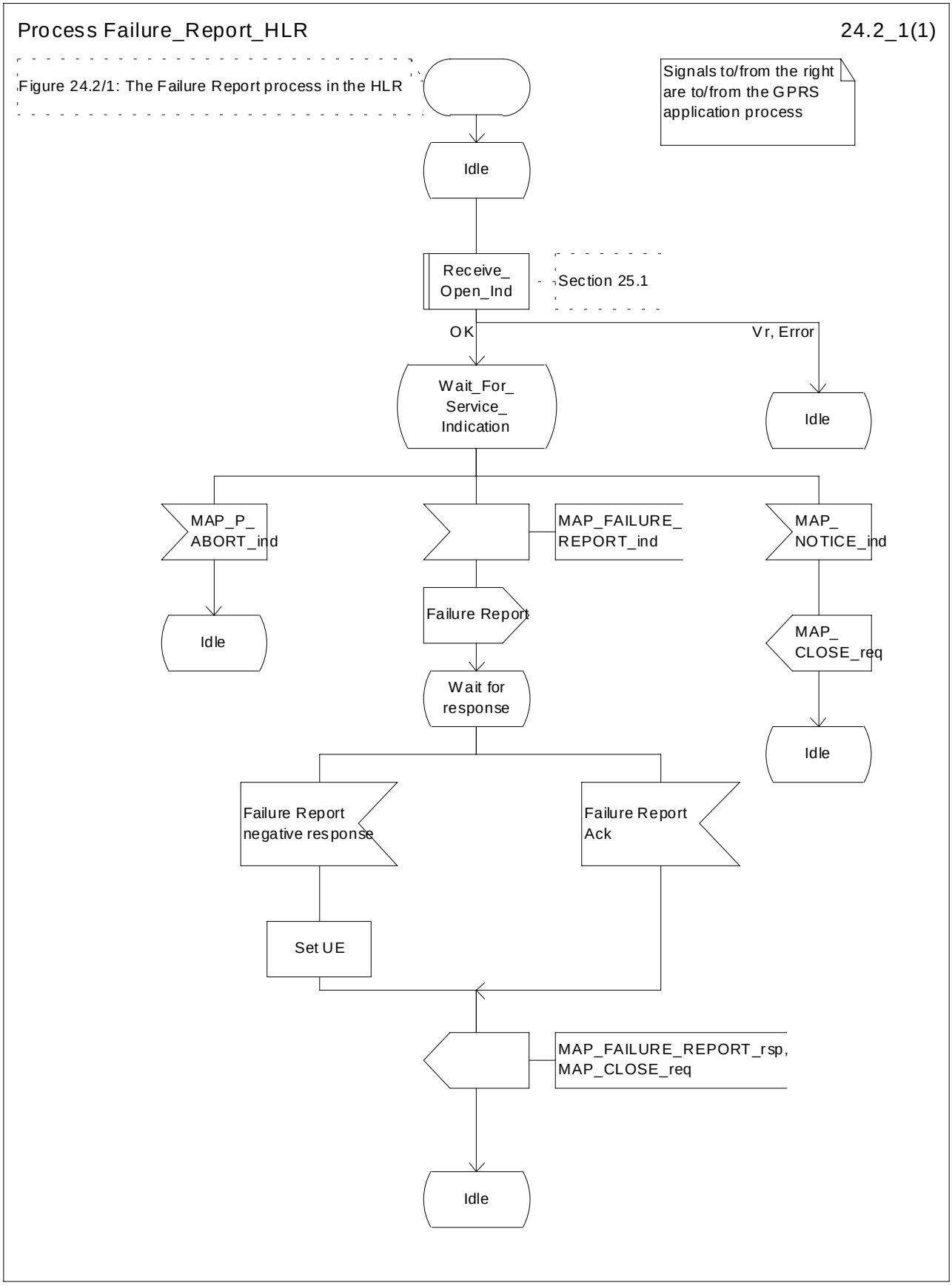


Figure 24.2/1: Process Failure_Report_HLR

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.

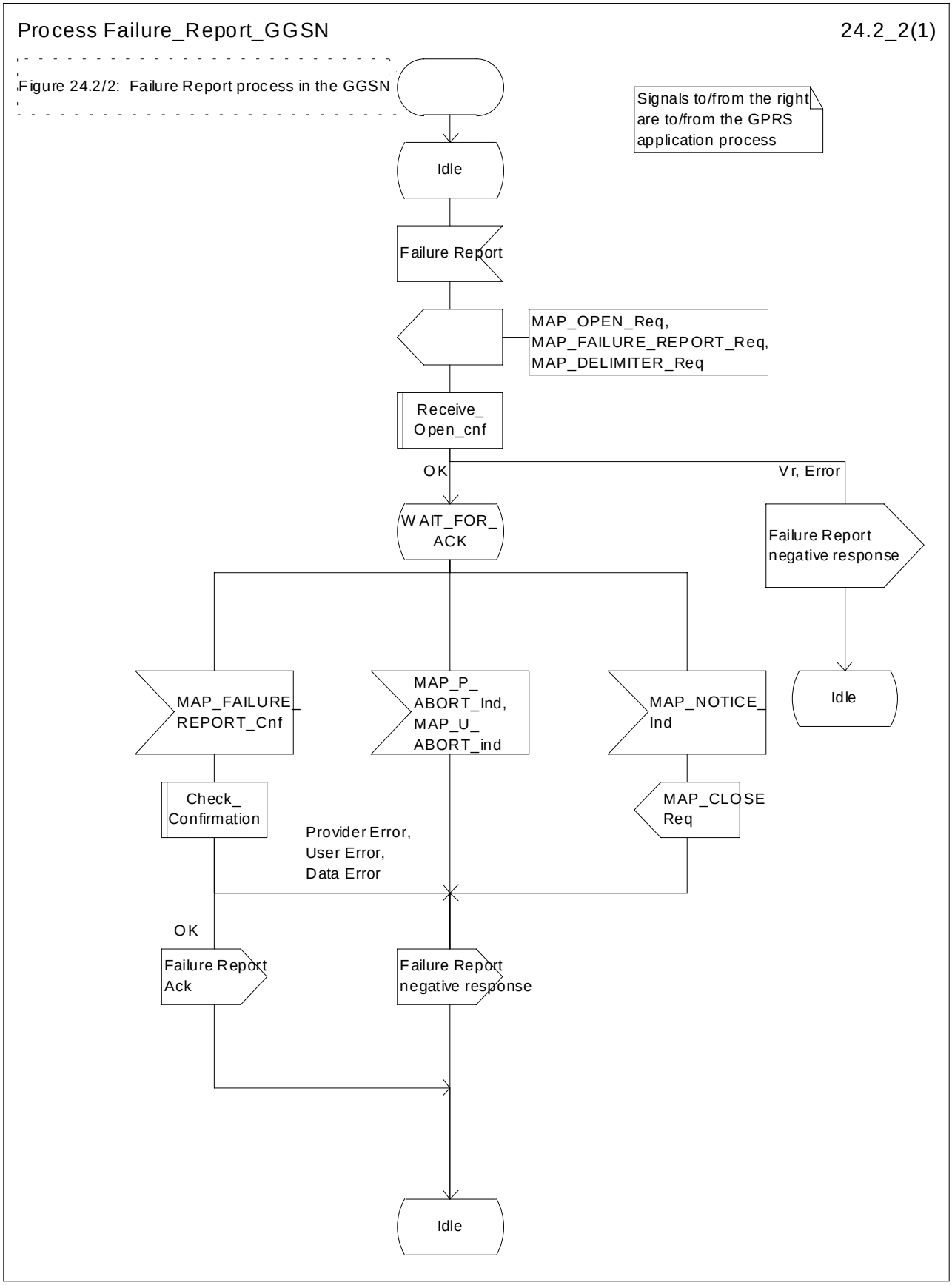


Figure 24.2/2: Process Failure_Report_GGSN

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 macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind	see clause 25.1.1;
Check_Indication	see clause 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 waits 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.

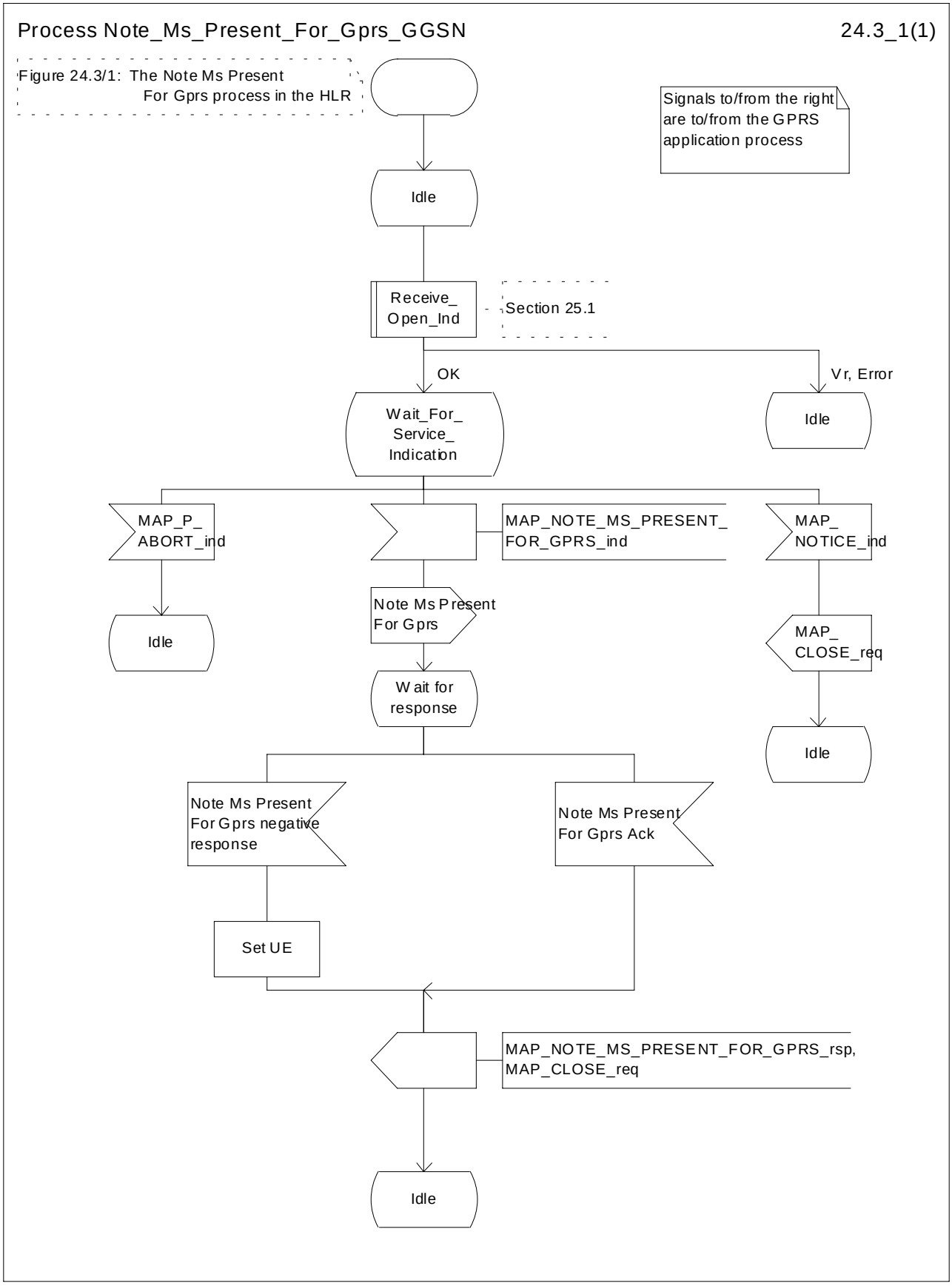


Figure 24.3/1: Process Note_Ms_Present_For_Gprs_GGSN

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.

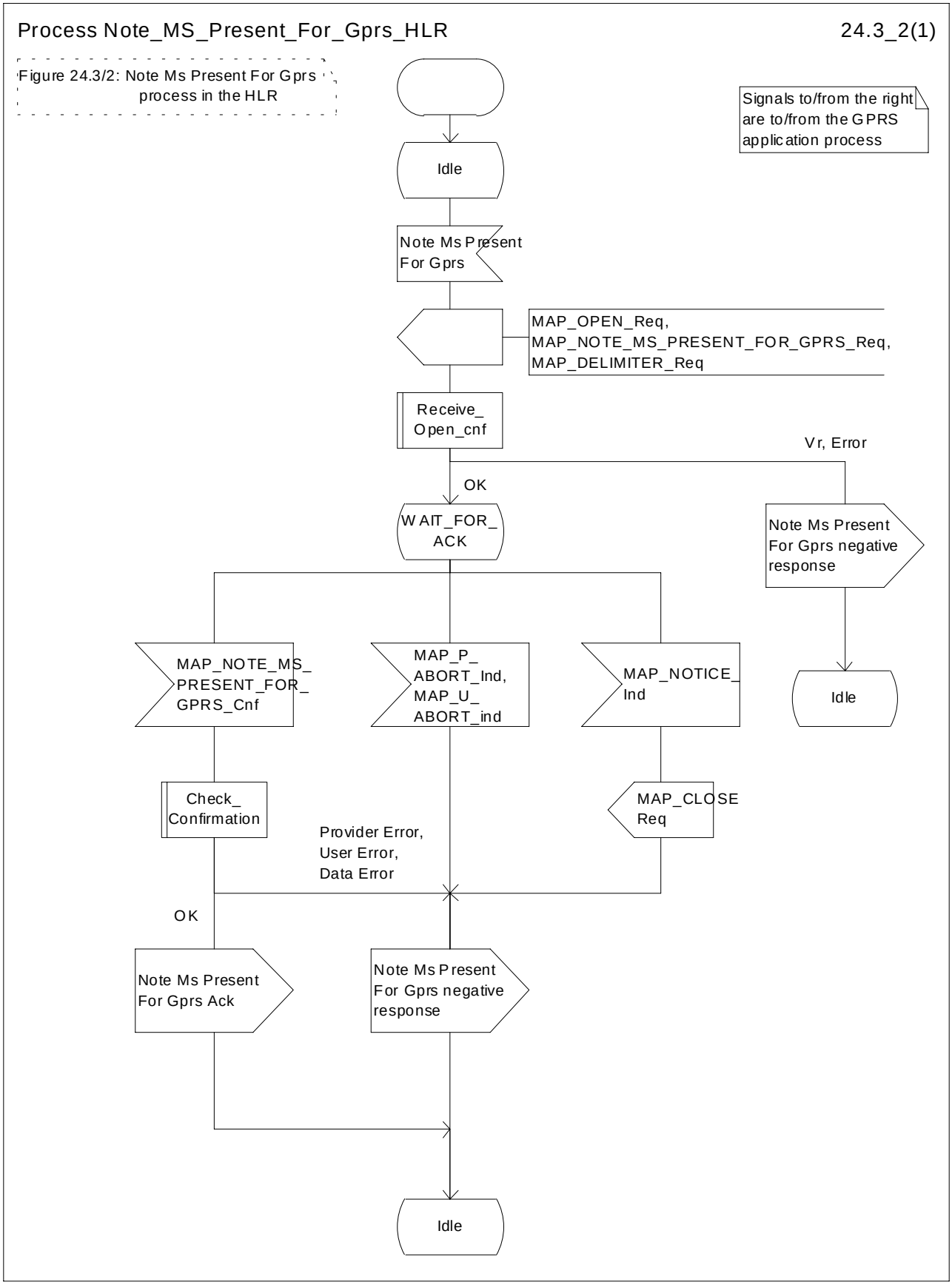


Figure 24.3/2: Process Note_Ms_Present_For_Gprs_HLR

*** Next Modification ***

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.

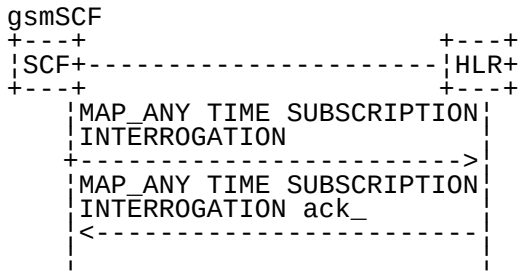


Figure 24A.1/1: Message flow for any time subscription interrogation

The following MAP services are used to retrieve requested information:

MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION see clause 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 clause; the definitions of these macros can be found as follows:

Receive_Open_Ind see clause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context anyTimeInformationHandlng, 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 3GPP 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.

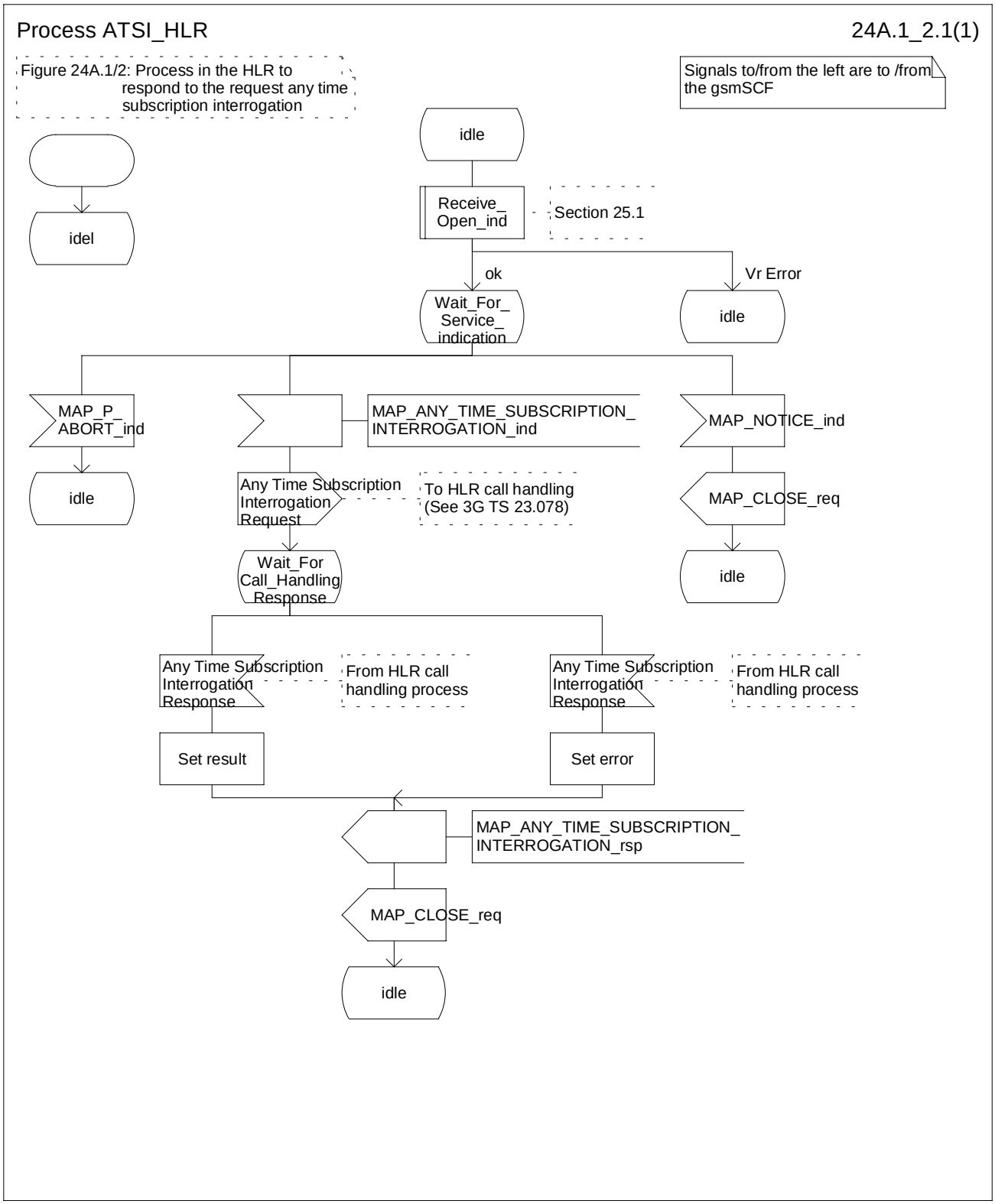


Figure 24A.1/2: Process ATSI_HLR

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

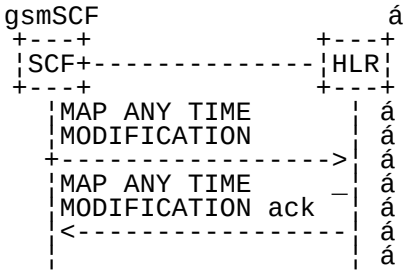


Figure 24A.2/1: Message flow for any time modification

The following MAP services are used to modify subscription information:

MAP_ANY_TIME_MODIFICATIONsee clause 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 clause; the definitions of these macros can be found as follows:

Receive_Open_Ind see clause 25.1.1;

Insert_Subs_Data_Stand_Alone_HLR see clause 25.7.2;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context anyTimeInfromationHandling, 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 3GPP 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.

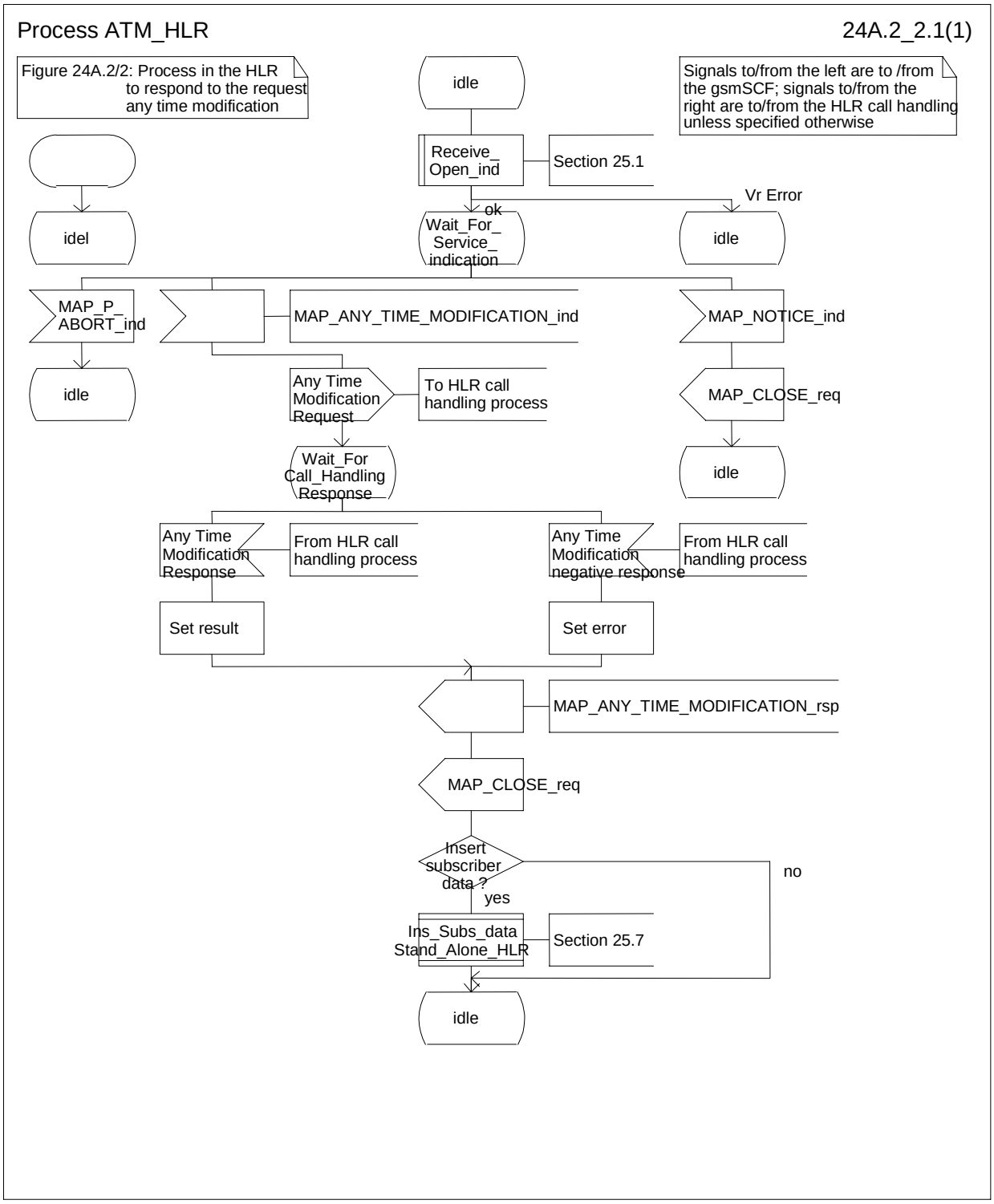


Figure 24A.2/2: Process ATM_HLR

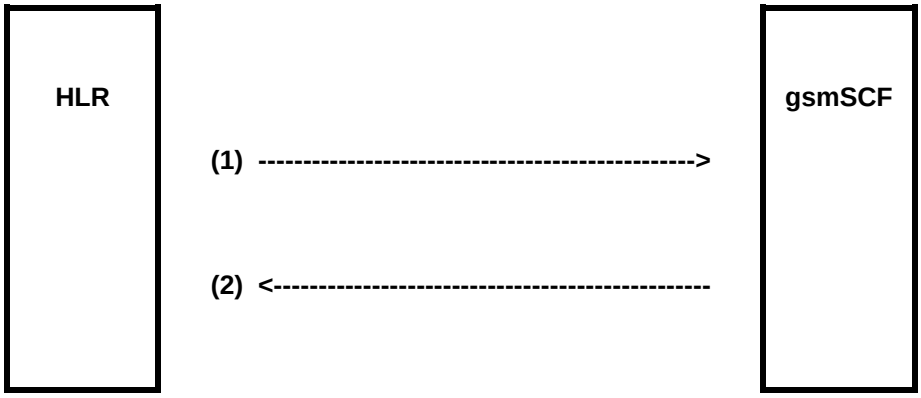
24A.3 Subscriber Data Modification Notification procedure

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 3GPP 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

The MAP process in the HLR to send modified data to the gsmSCF is shown in figure 24A.3/2. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see clause 25.1.2;
Check_Confirmation	see clause 25.2.2.

Successful Outcome

When the MAP process receives a Notify Subscriber Data Change request from the process in the HLR, it requests a dialogue with the gsmSCF whose identity is contained in the Note Subscriber Data Modified request by sending a MAP_OPEN service request, notifies modified subscriber data to the gsmSCF using a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED 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 gsmSCF.

If the HLR notices after receiving a Notify Subscriber Data Change request that the segmentation is needed the HLR does not set the “All Information Sent” indicator. Otherwise the indicator is set and the process returns to the Wait for SCF response state.

If the MAP process receives a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service confirm from the gsmSCF, 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 Notify Subscriber Data Modified ack to the process in the HLR 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 HLR does not set the indicator and sends MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request to the gsmSCF. Otherwise the indicator is set and the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request is sent to the gsmSCF.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the gsmSCF could not be opened or that the dialogue can be opened only at an earlier version, the MAP process sends a Notify Subscriber Data Modified negative response indicating system failure to the process in the HLR and returns to the idle state.

Error in MAP_NOTE_SUBSCRIBER_DATA_MODIFIED confirm

If the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service confirm contains a user error or a provider error, the MAP process sends a Notify Subscriber Data Change negative response to the process in the HLR and returns to the idle state.

Abort of gsmSCF dialogue

After the dialogue with the gsmSCF has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the gsmSCF may send a MAP_CLOSE indication. In either of these cases, the MAP process sends a Notify Subscriber Data Change negative response to the 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 gsmSCF, sends a Notify Subscriber Data Change negative response indicating system failure to the process in the HLR and returns to the idle state.

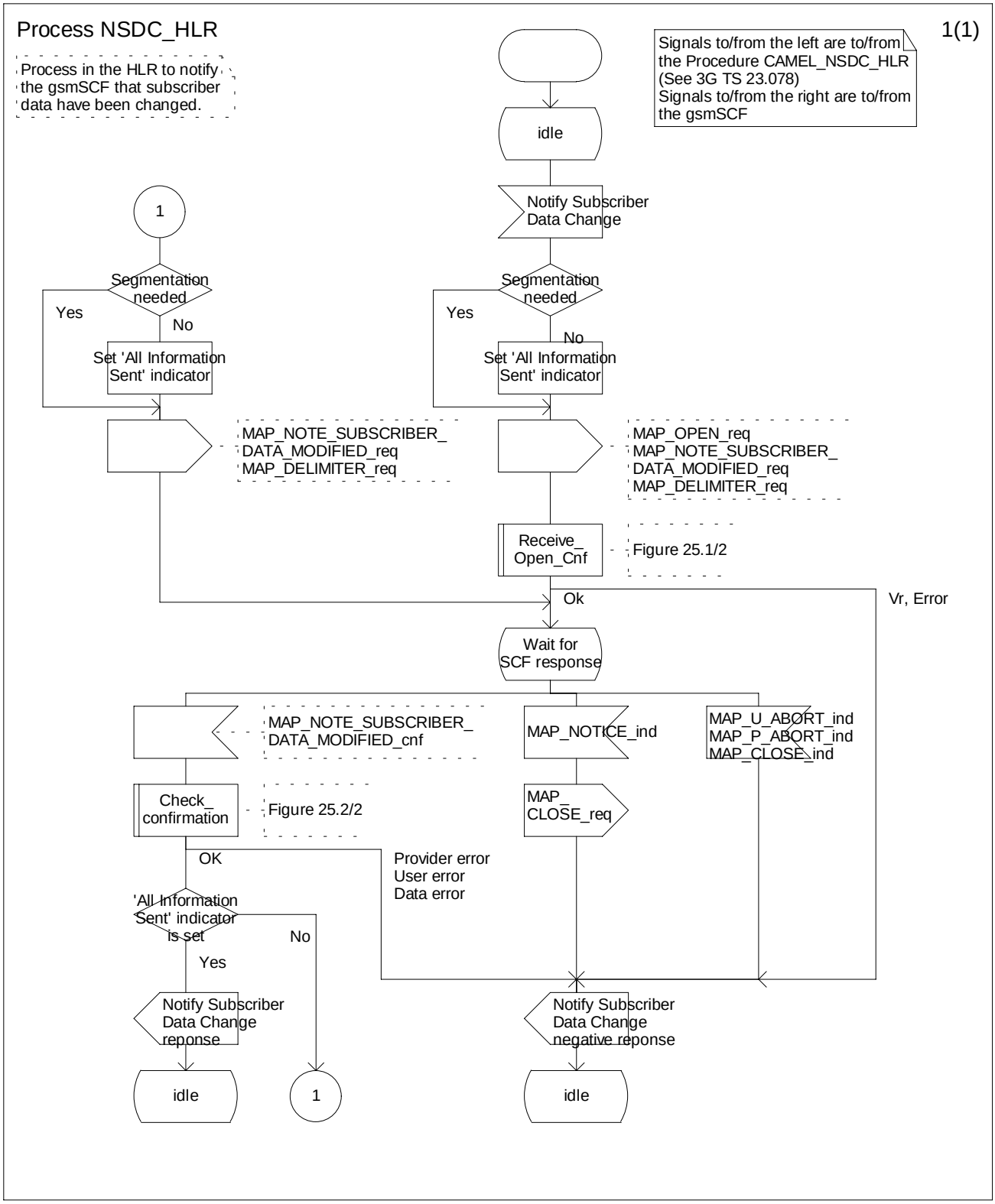


Figure 24A.3/2 Process Subscriber_Data_Modification_Notification_HLR (sheet 1 of 1)

24A.3.2.2 Process in the gsmSCF

The MAP process in the gsmSCF to handle a notification to the gsmSCF of change of subscriber data resume is shown in figure 24A.3/3. The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context noteSubscriberDataModified, 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_SUBSCRIBER_DATA_MODIFIED service indication is received, the MAP process checks if the "All Information Sent" indicator is set and if so it sends a Subscriber Data Changed request including all the stored data to the process in the gsmSCF, and waits for a response. The Subscriber Data Changed request contains the parameters received in the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication. If the "All Information Sent" indicator is not set, the received data is stored and the MAP process constructs an empty MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service response, sends it to the HLR and returns to the Wait for response state.

If the process in the gsmSCF returns a negative response, the MAP process constructs a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service response, 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.

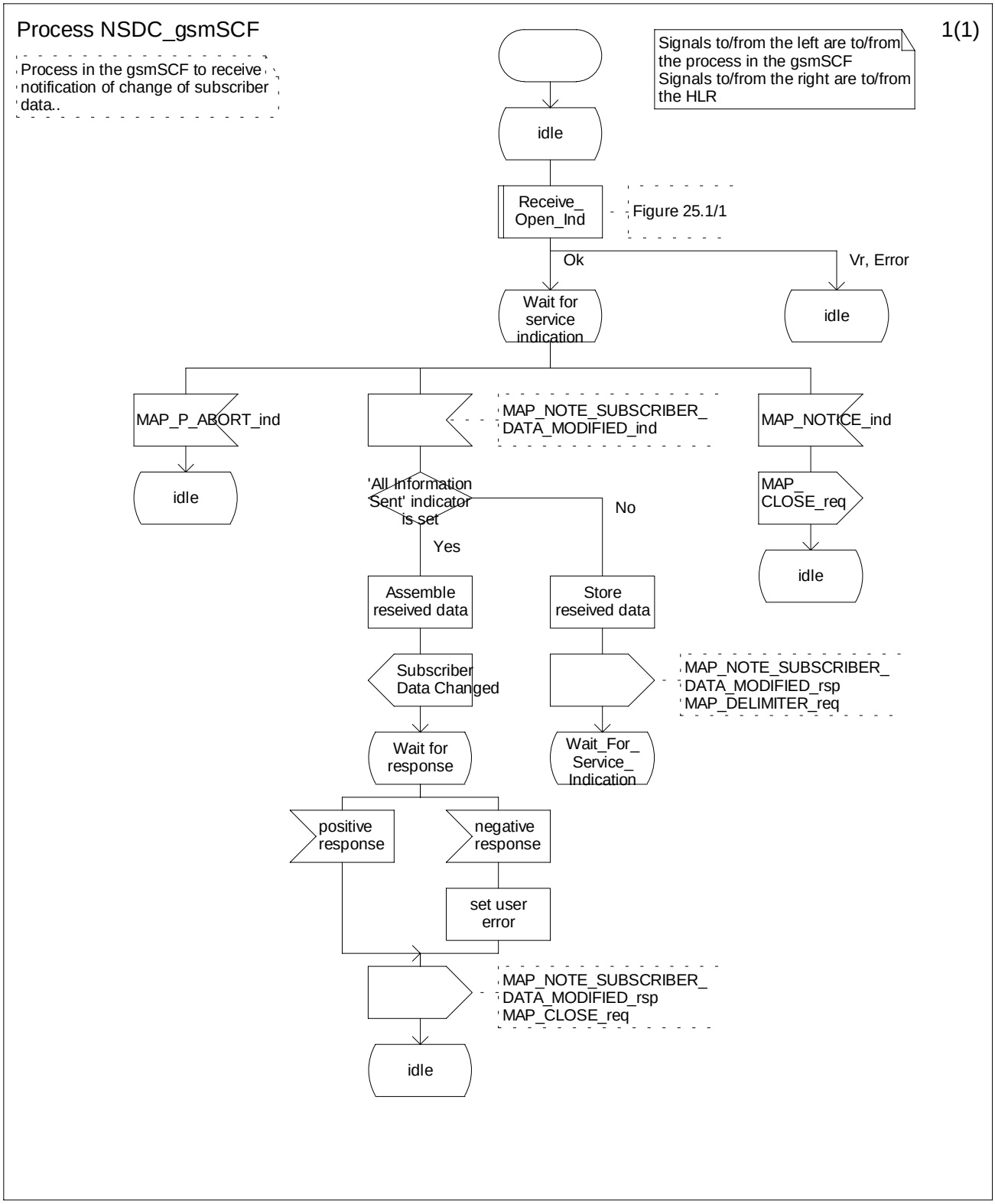


Figure 24A.3/3: Process Subscriber_Data_Modification_Notification_gsmSCF (sheet 1 of 1)

*** Next Modification ***

24B Location Service process description

24B.1 Routeing information retrieval procedure for LCS

24B.1.1 General

The message flows for successful retrieval of routeing information related to location services are shown in figure 24B.1/1.

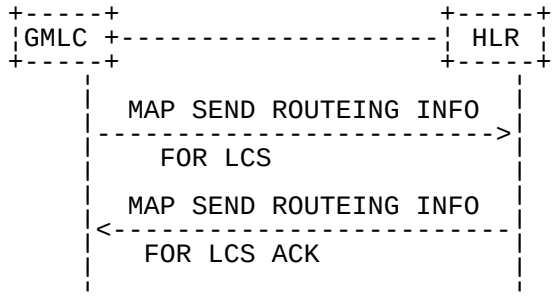


Figure 24B.1/1: Message flow for retrieval of routeing information for LCS

The following MAP services are used to retrieve requested information:

MAP_SEND_ROUTING_INFO_FOR_LCS see clause 13A.1.

24B.1.2 Process in the GMLC

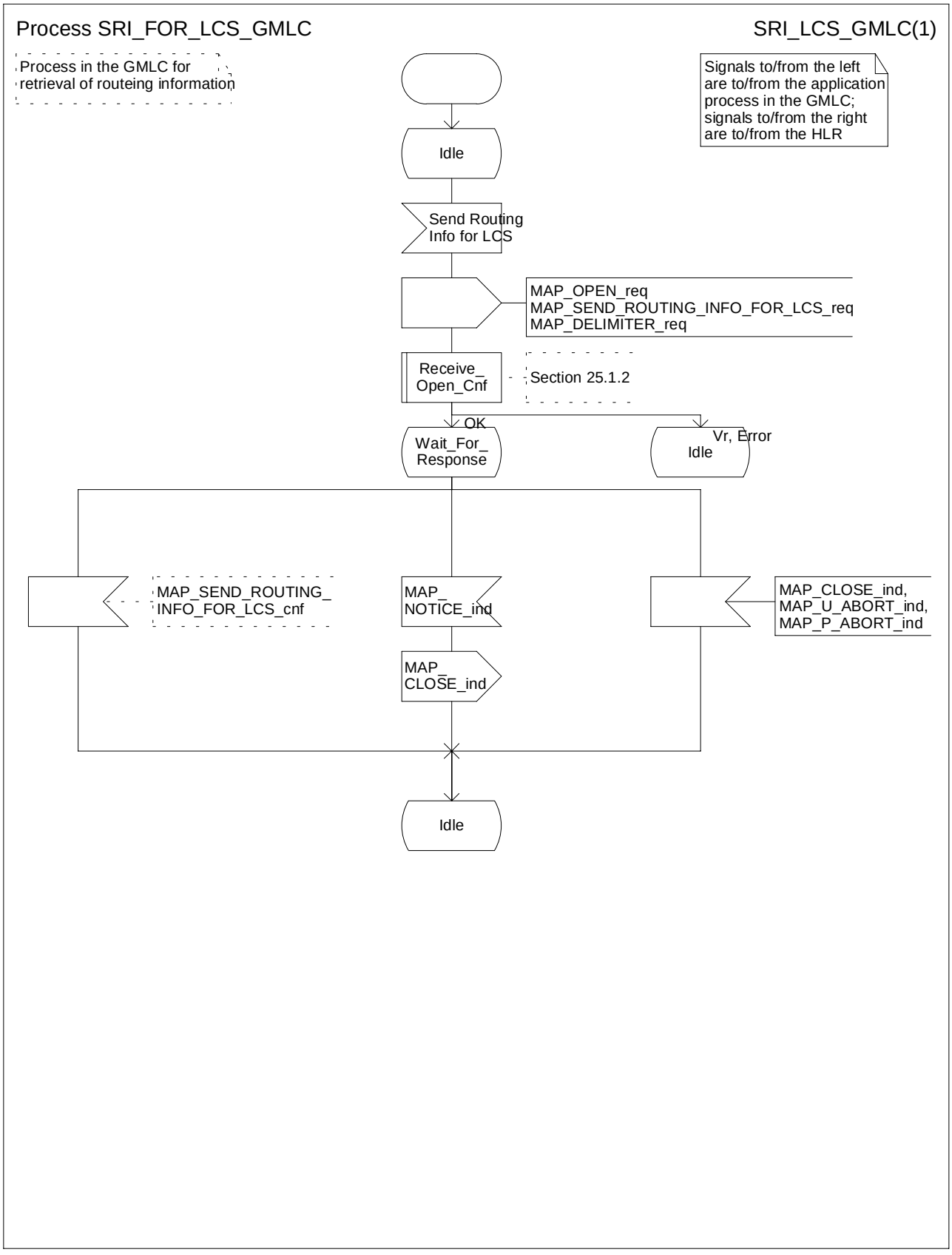


Figure 24B.1/2: Process SRI_FOR_LCS_GMLC

24B.1.3 Process in the HLR

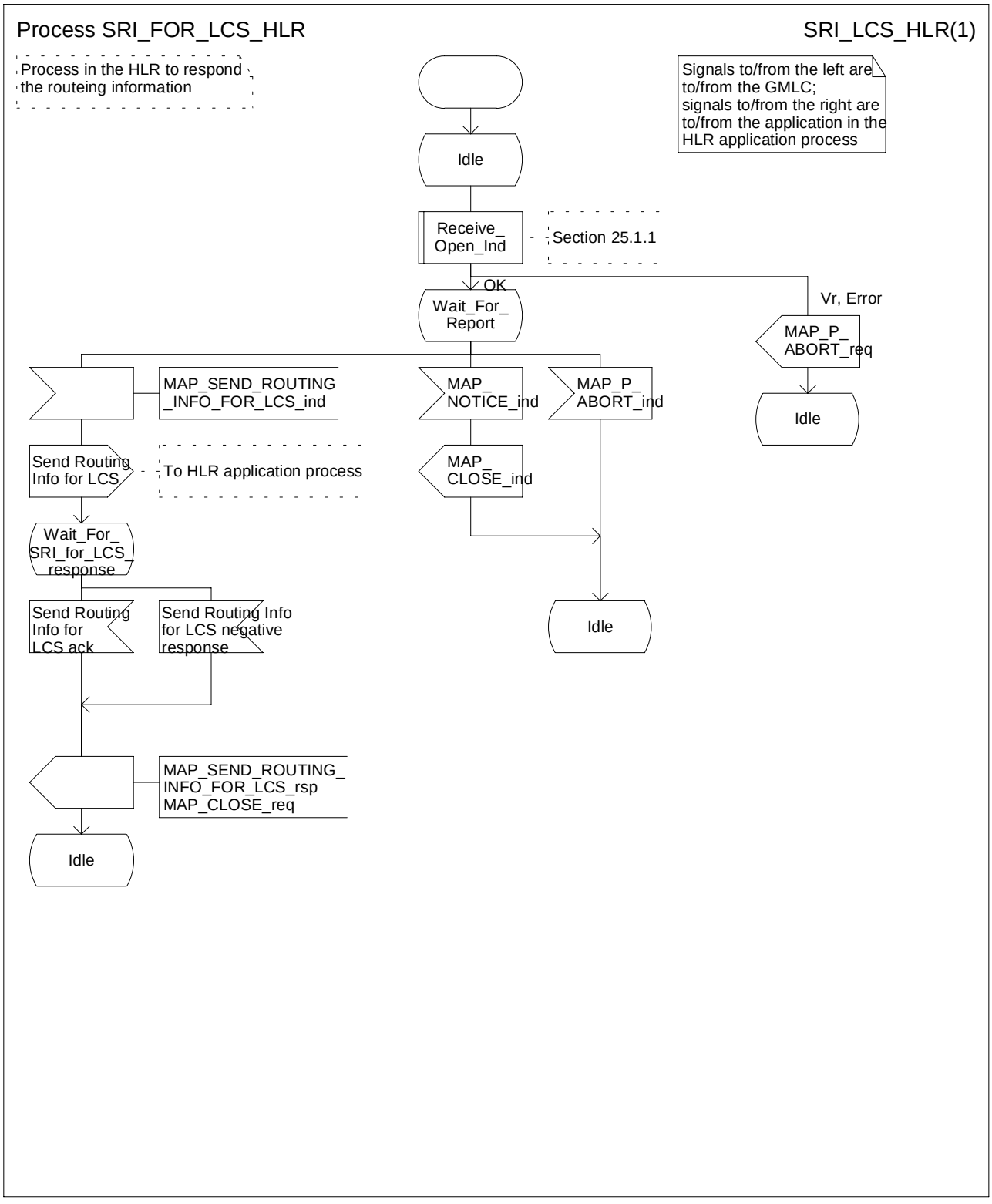


Figure 24B.1/3: Process SRI_FOR_LCS_HLR

24B.2 Provide Subscriber Location procedure

24B.2.1 General

The message flows for successful retrieval of the location information of a target MS related to location services are shown in figure 24B.1/1.

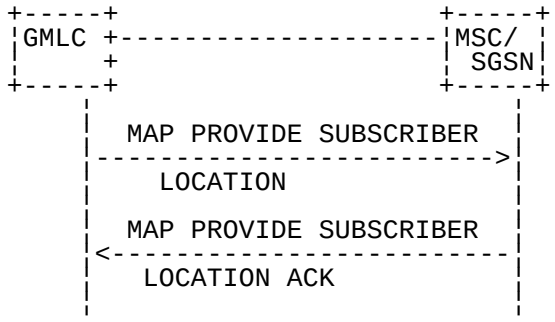


Figure 24B.2/1: Message flow for request of the location information

The following MAP services are used to retrieve requested information:

MAP_PROVIDE_SUBSCRIBER_LOCATION see clause 13A.2.

24B.2.2 Process in the GMLC

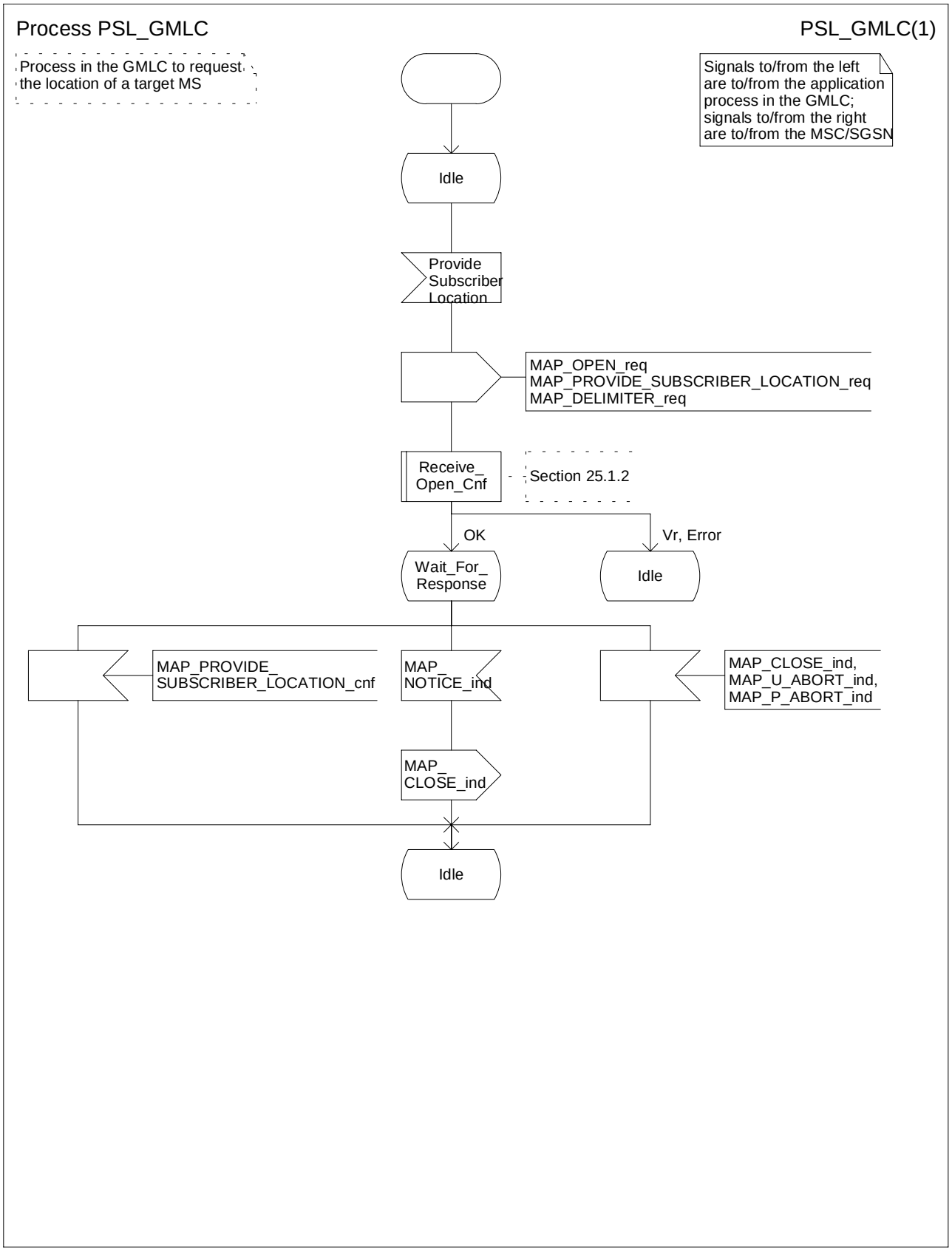


Figure 24B.2/2: Process PSL_GMLC

24B.2.3 Process in the MSC

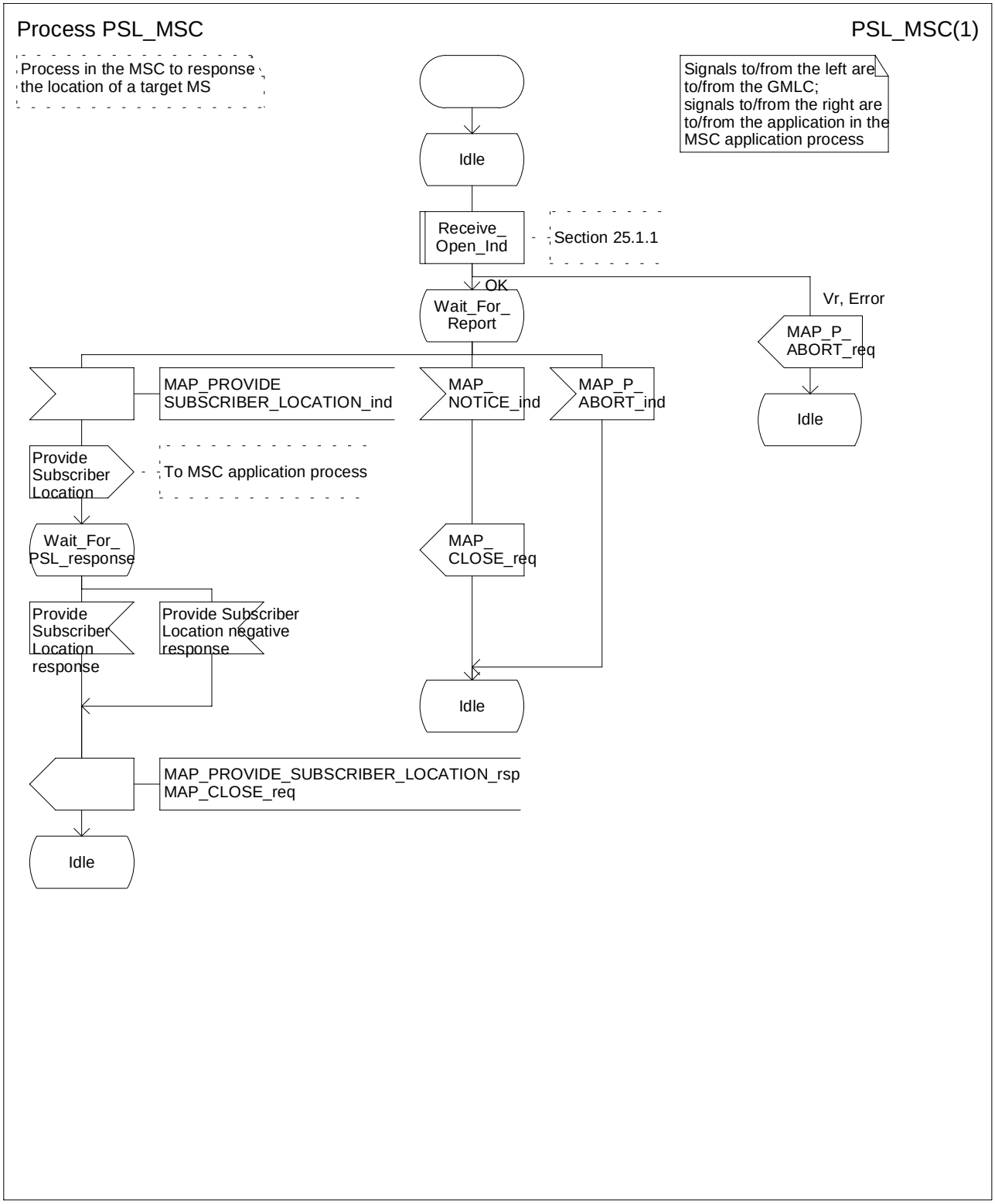


Figure 24B.2/3: Process PSL_MSC

24B.2.4 Process in the SGSN

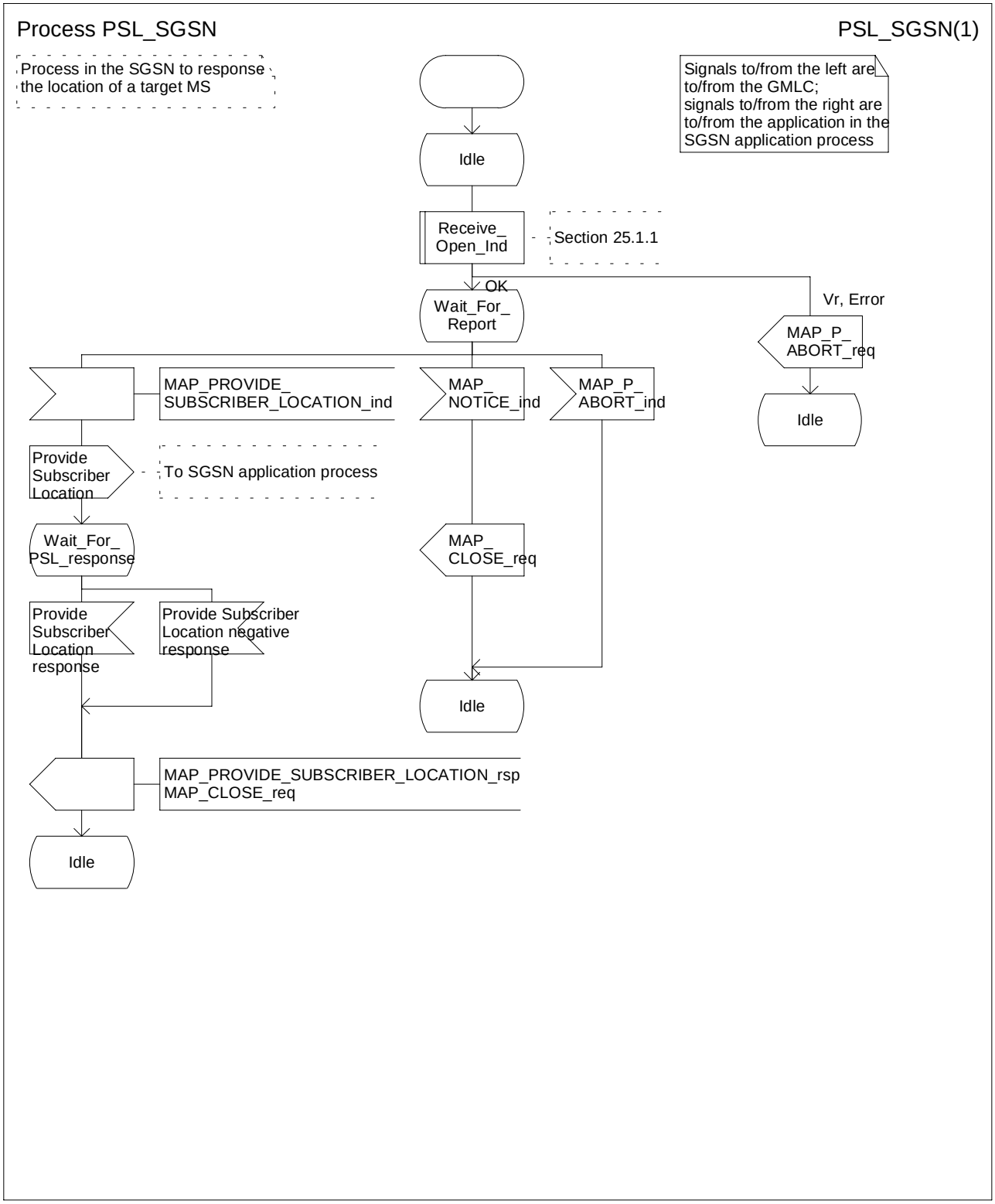


Figure 24B.2/4: Process PSL_SGSN

24B.3 Subscriber Location Report procedure

24B.3.1 General

The message flows for successful report of the location information of a target MS related to location services are shown in figure 24B.3/1.

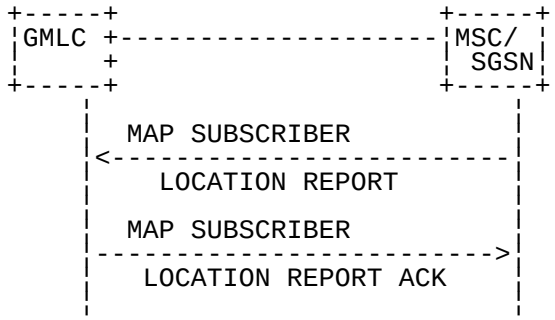


Figure 24B.3/1: Message flow for report of the location information

The following MAP services are used to retrieve requested information:

MAP_SUBSCRIBER_LOCATION_REPORT see clause 13A.3.

24B.3.2 Process in the GMLC

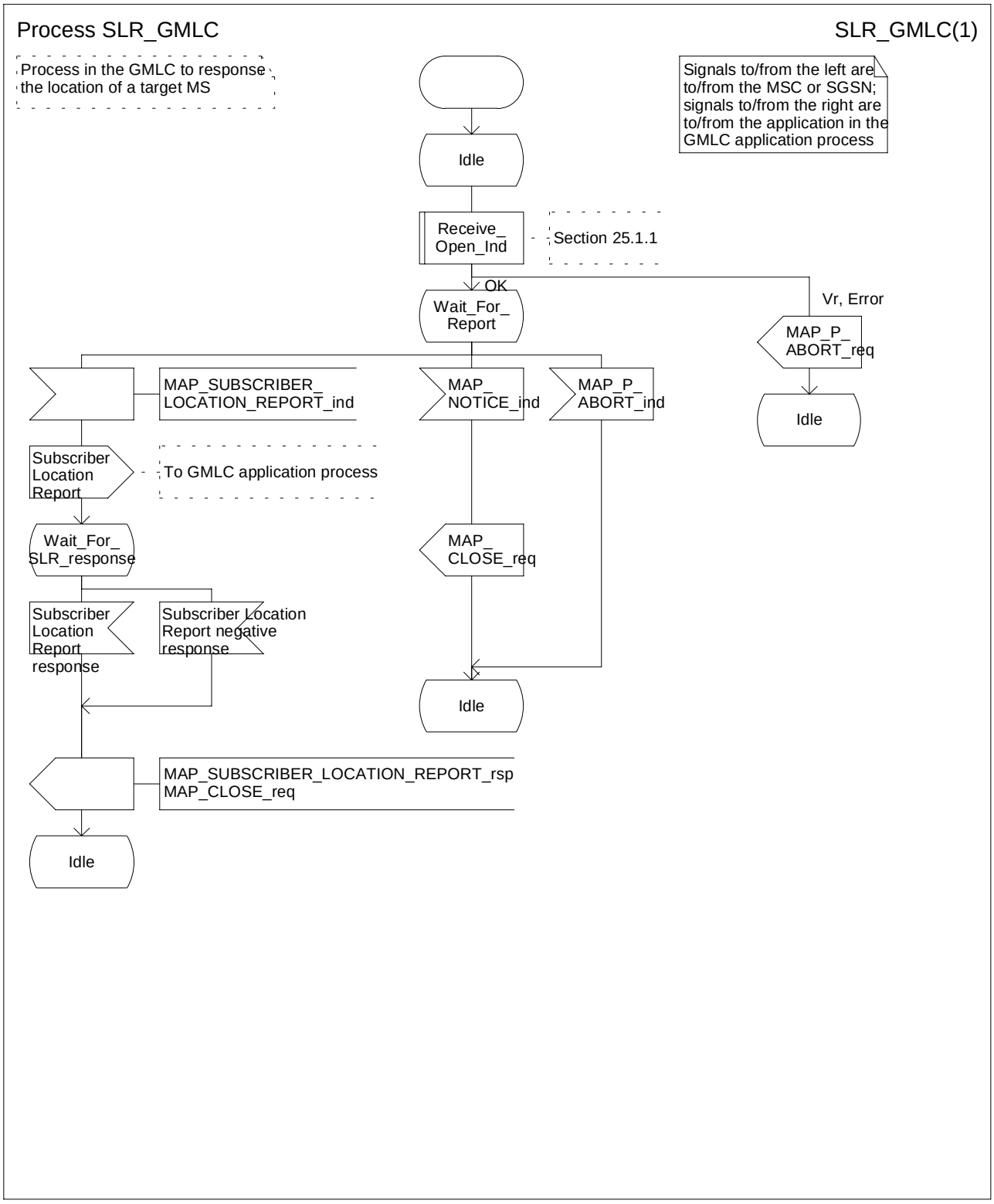


Figure 24B.3/2 Process SLR_GMLC

24B.3.3 Process in the MSC

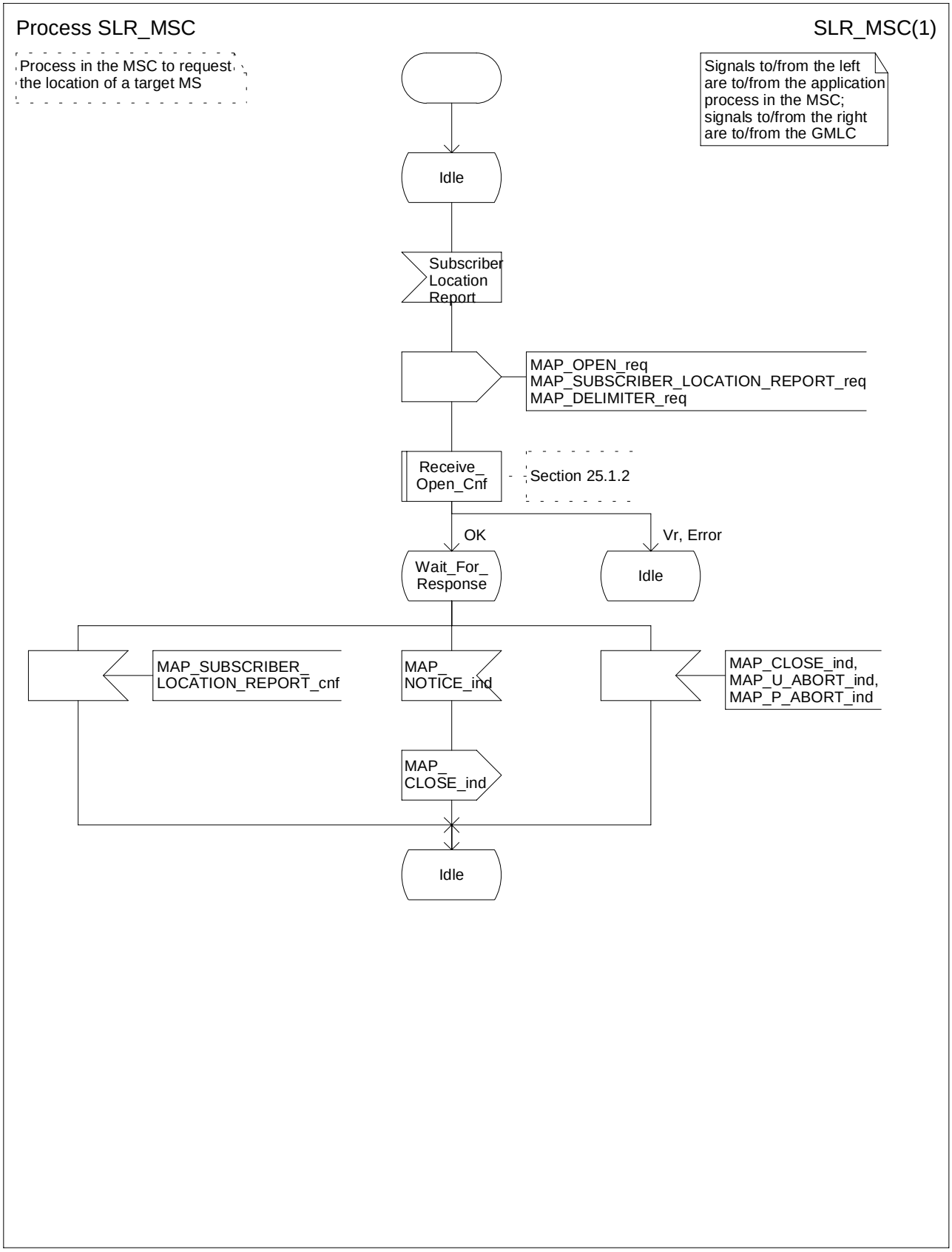


Figure 24B.3/3 Process SLR_MSC

24B.3.4 Process in the SGSN

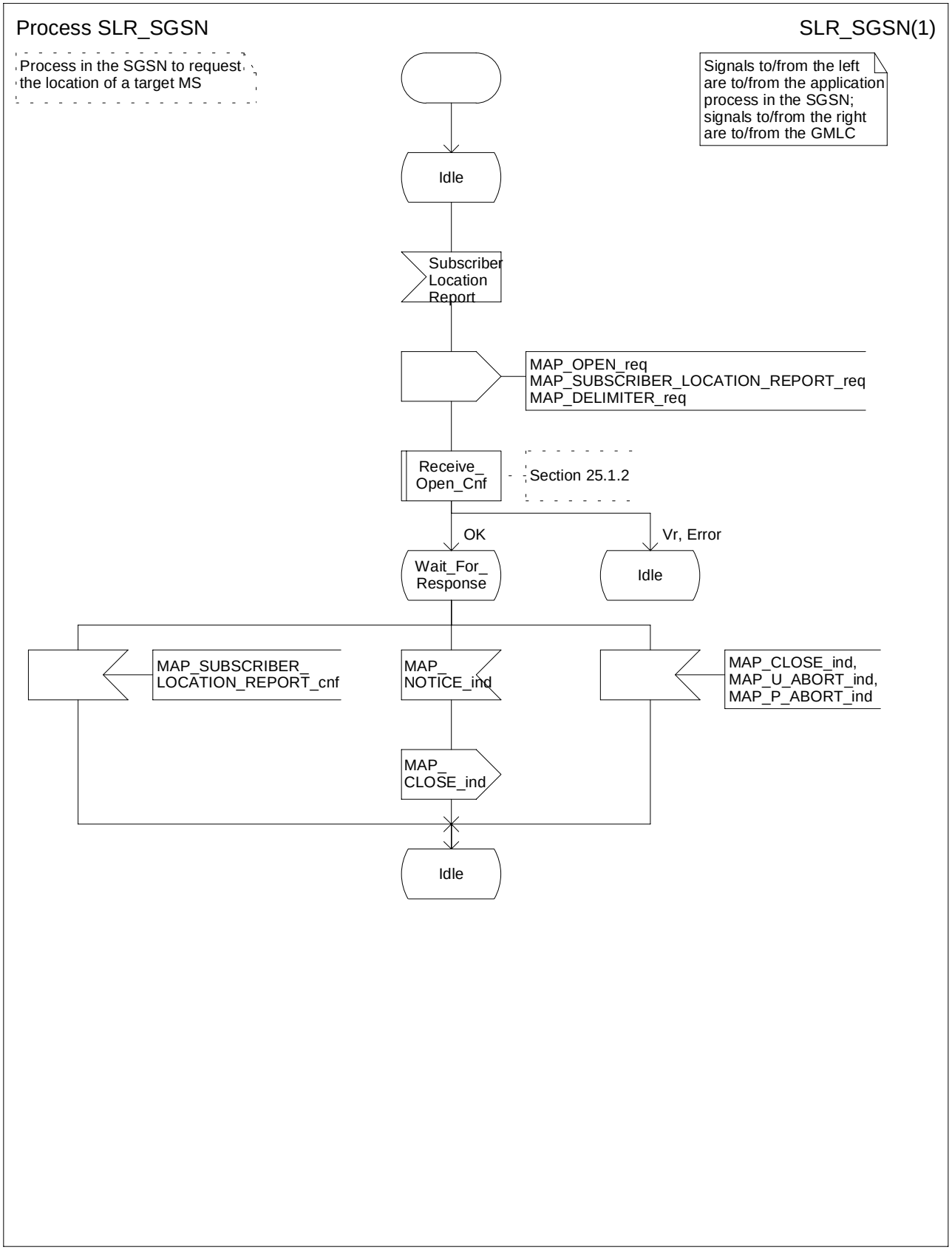


Figure 24B.3/4 Process SLR_SGSN

*** Next Modification ***

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. If the outcome of this check is an error, the MAP_OPEN responds 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 Vr" (Vr < Vn), the macro terminates in a way that causes restart of the dialogue by using the version Vr 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.

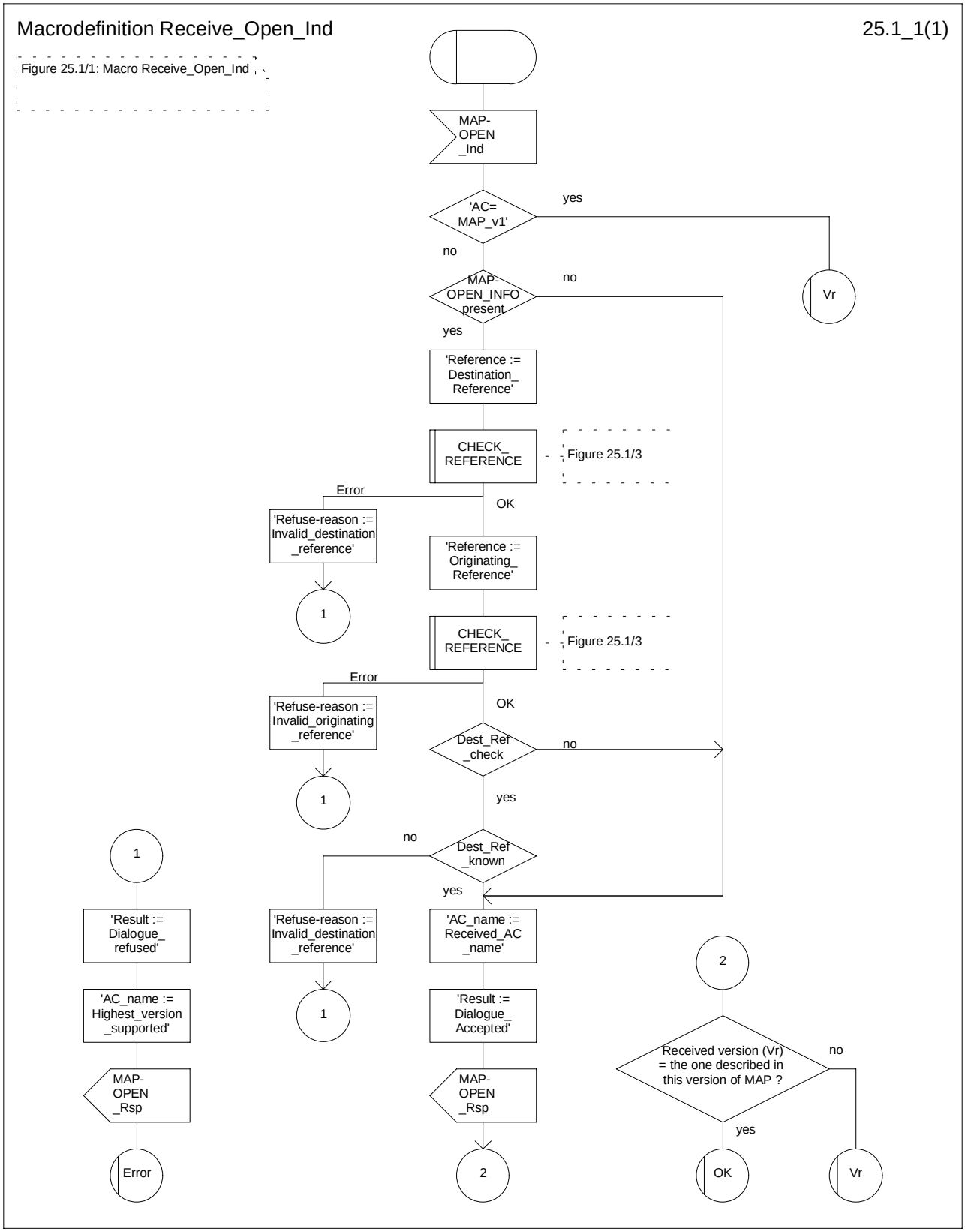


Figure 25.1/1: Macro Receive_Open_Ind

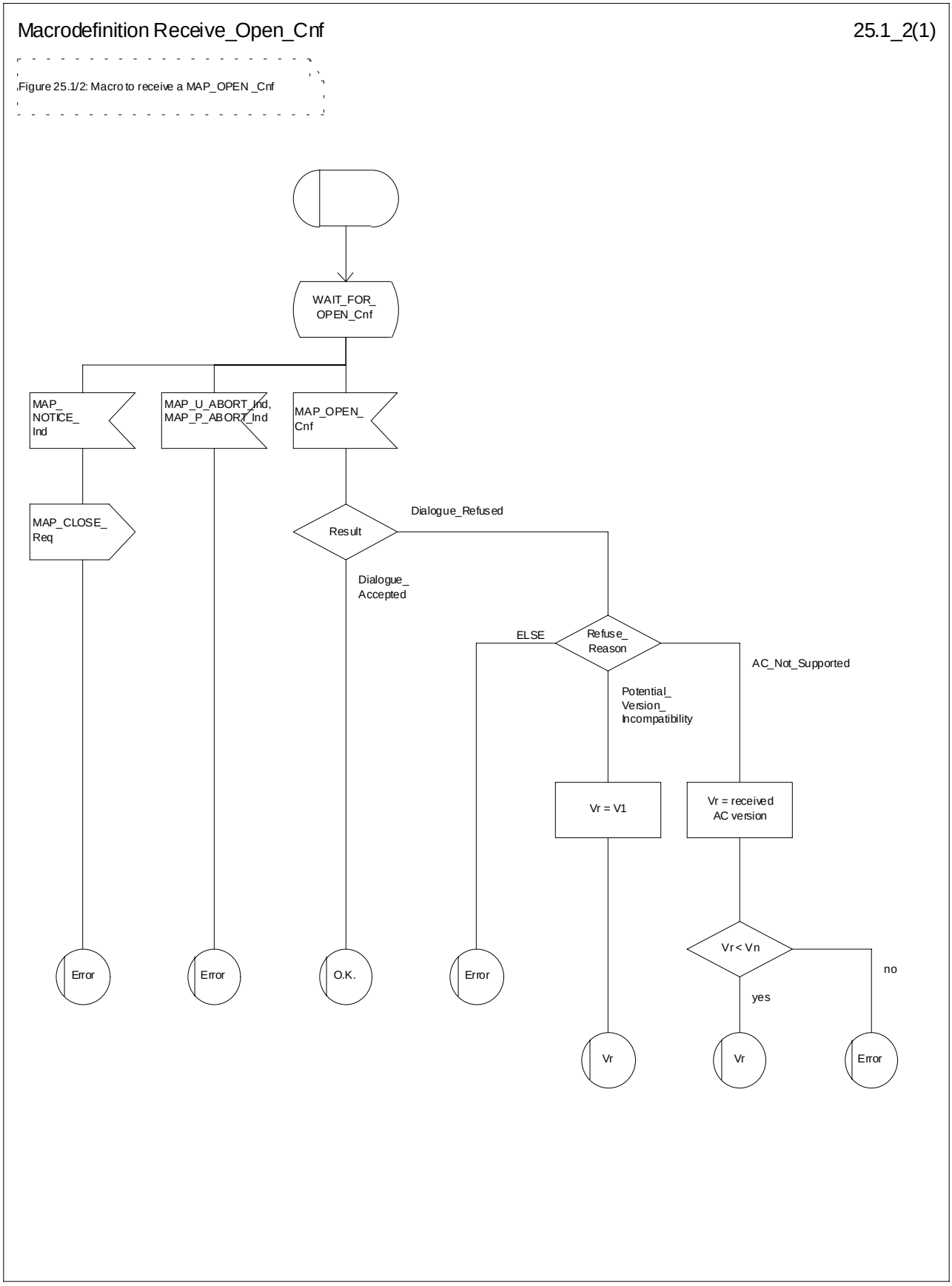


Figure 25.1/2: Macro Receive_Open_Cnf

Macrodefinition CHECK_REFERENCE 25.1_3(1)

Figure 25.1/3: Check of Destination Reference and Originating Reference received in a MAP-OPEN indication primitive

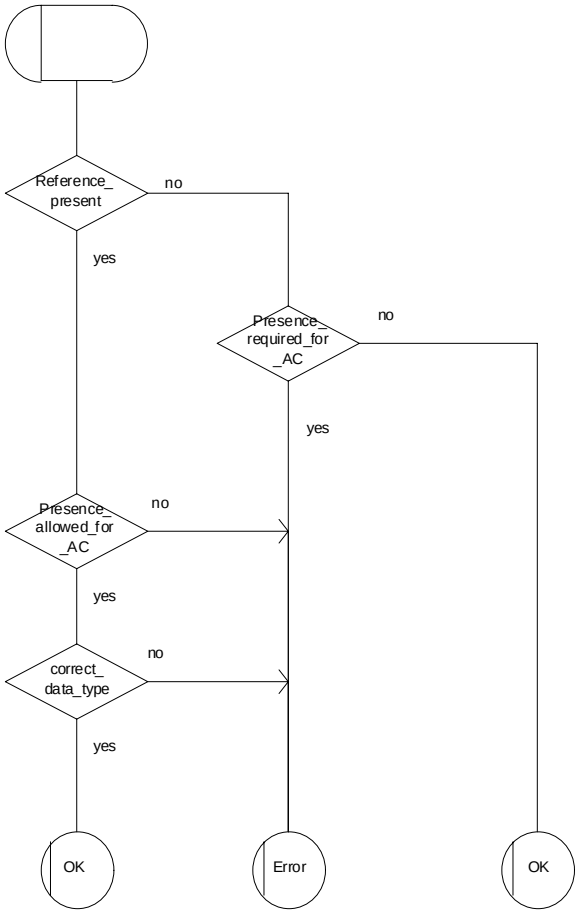


Figure 25.1/3: Macro CHECK_REFERENCE

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.

Macrodefinition Check_Indication 25.2_1(1)

Figure 25.2/1: Macro to check the parameters of an indication primitive

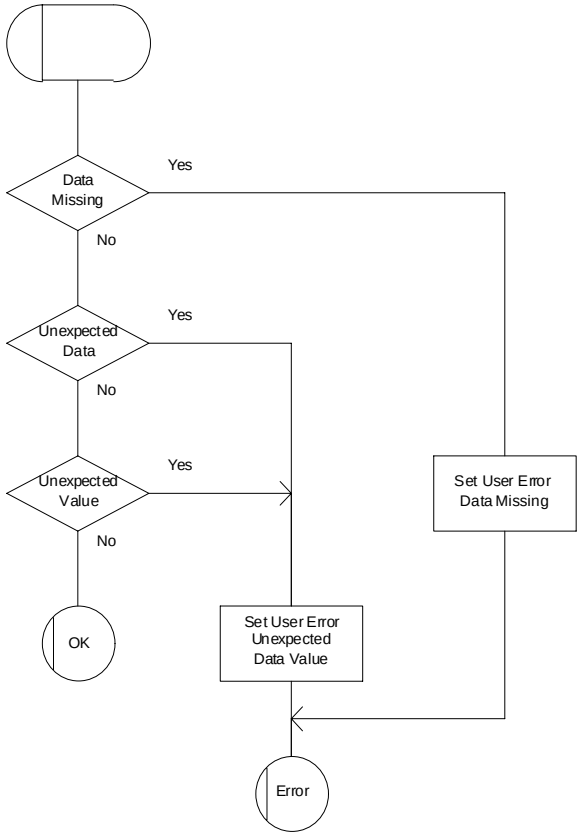


Figure 25.2/1: Macro Check_Indication

Macrodefinition Check_Confirmation 25.2_2(1)

Figure 25.2/2: Macro to check the parameters of a confirmation primitive

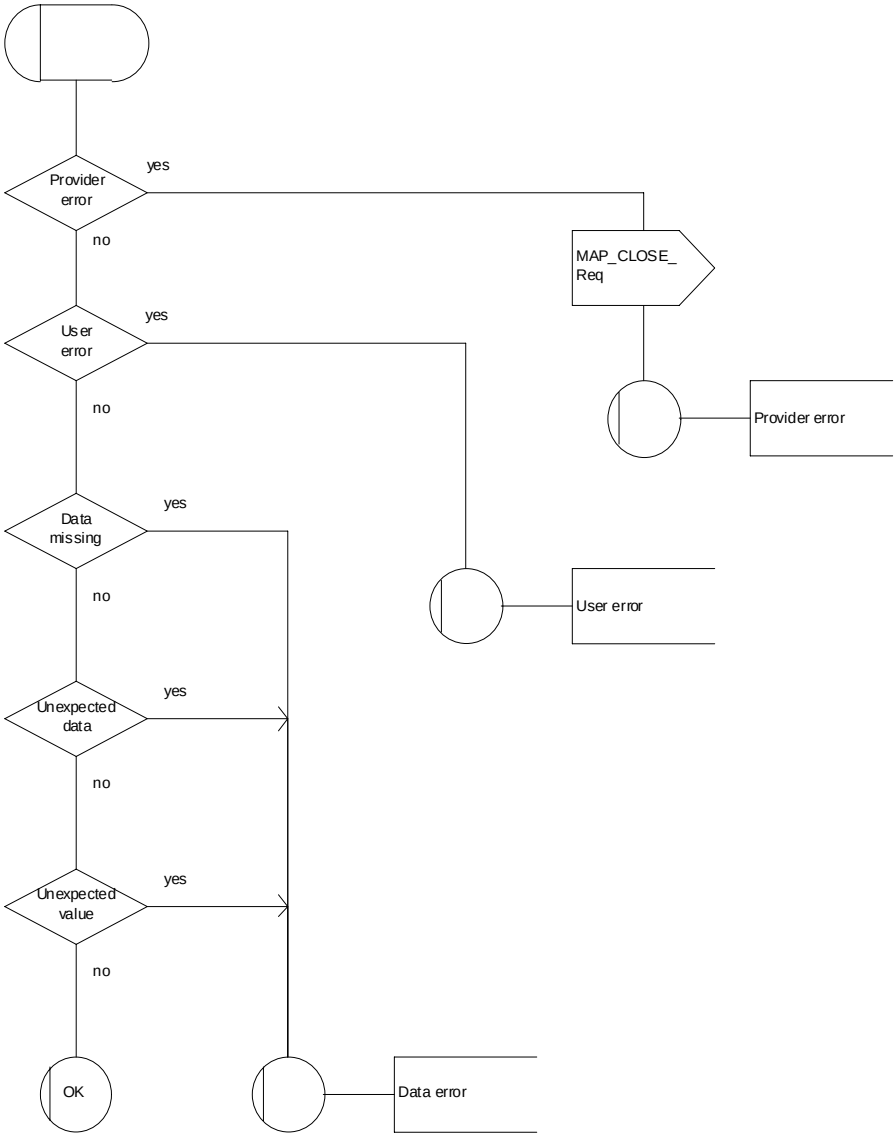


Figure 25.2/2: Macro Check_Confirmation

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 clause 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 3GPP TS 22.001 [2] 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 3GPP TS 24.008 [35]). 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 clause 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 3GPP TS 22.001 [2] 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 3GPP TS 24.008 [35]). 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.

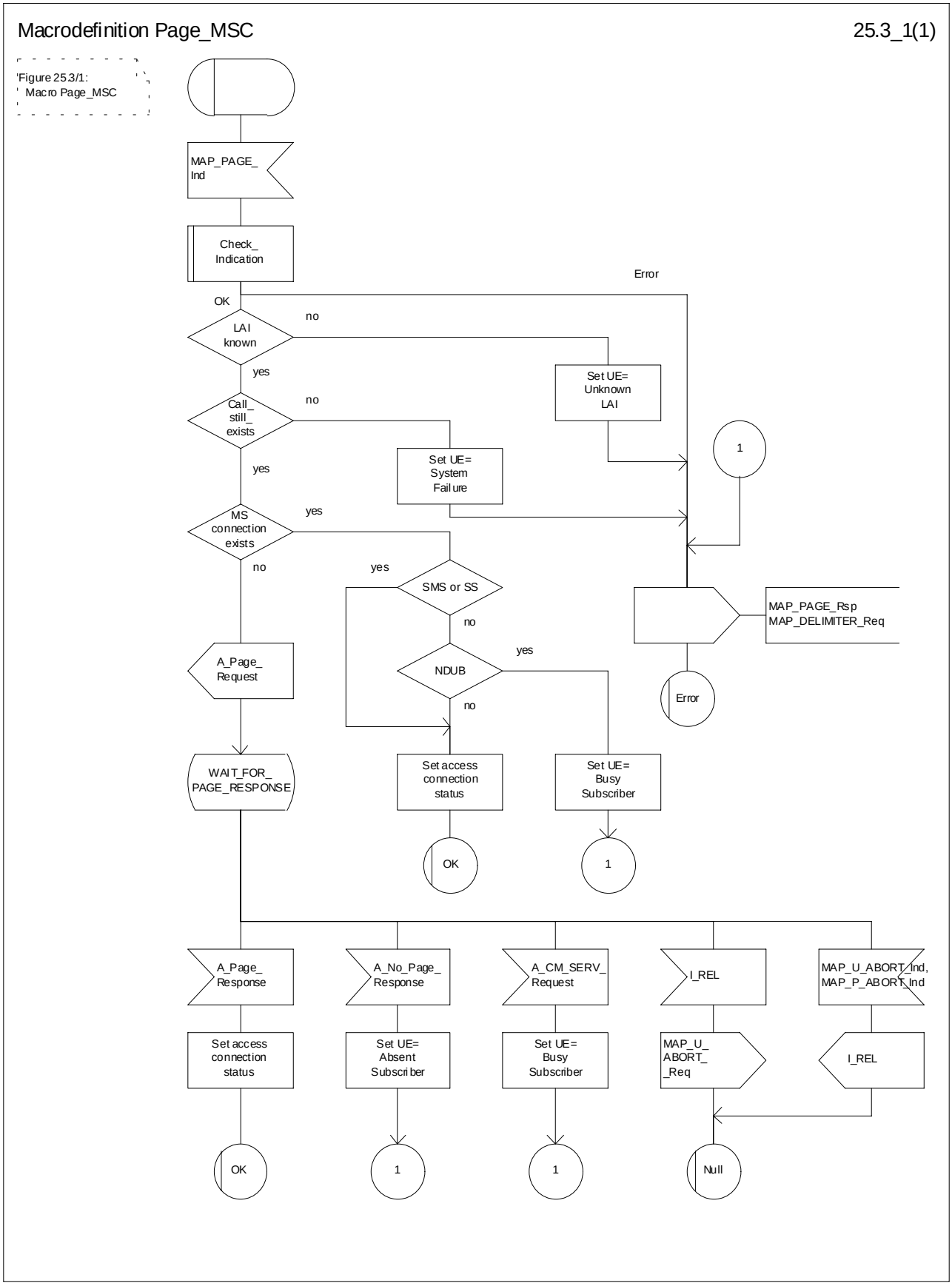


Figure 25.3/1: Macro Page_MSC

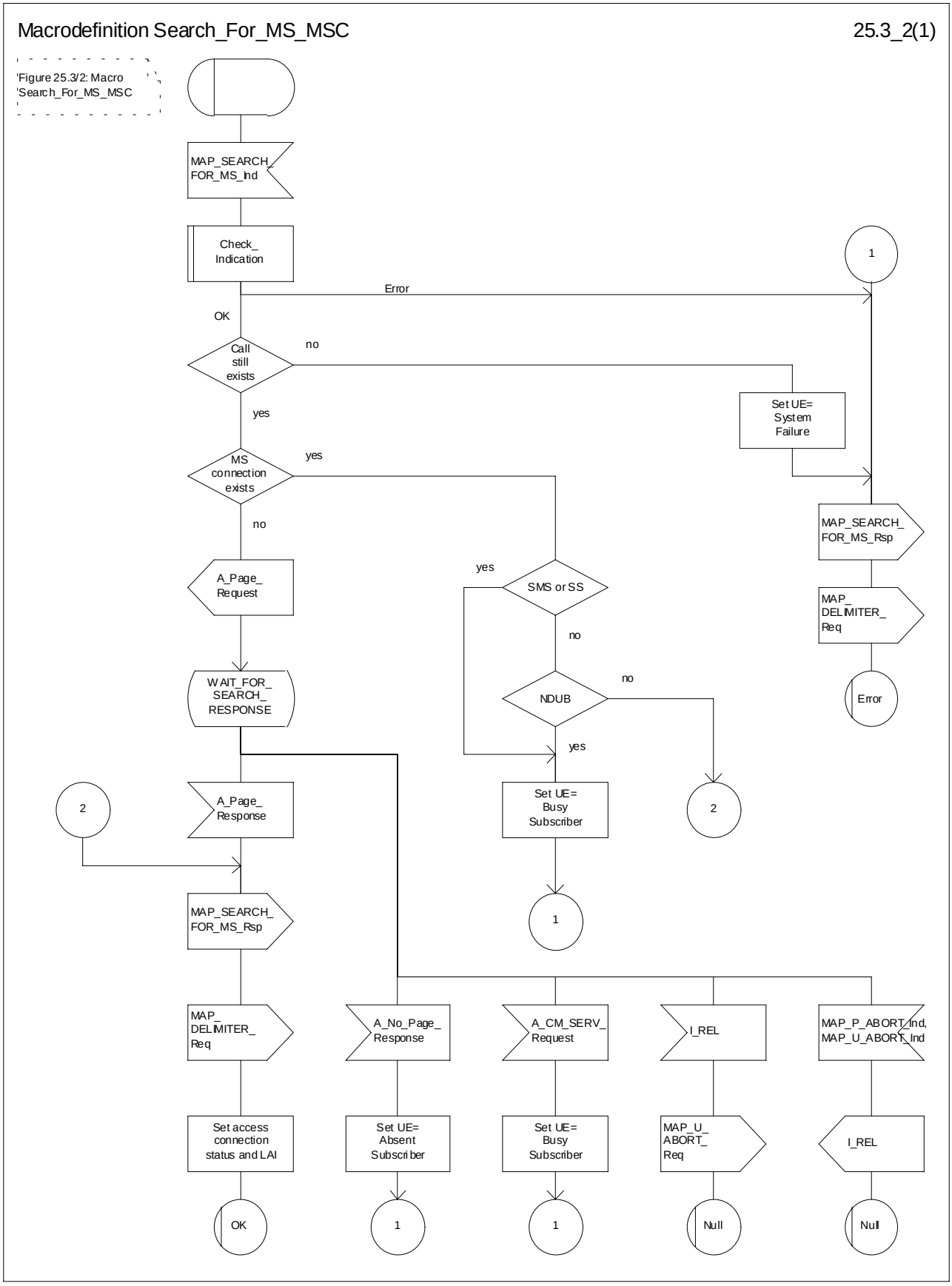


Figure 25.3/2: Macro Search_for_MS_MSC

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 3GPP TS 42.009 [6]).

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, clause 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 clause 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 clause 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 clause 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 clause 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 clause 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 3GPP TS 29.010 [58]);

- 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 3GPP TS 29.010 [58]), 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 3GPP TS 29.010 [58]), 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 3GPP TS 29.010 [58]);

- 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 3GPP TS 29.010 [58]), 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 3GPP TS 29.010 [58]).

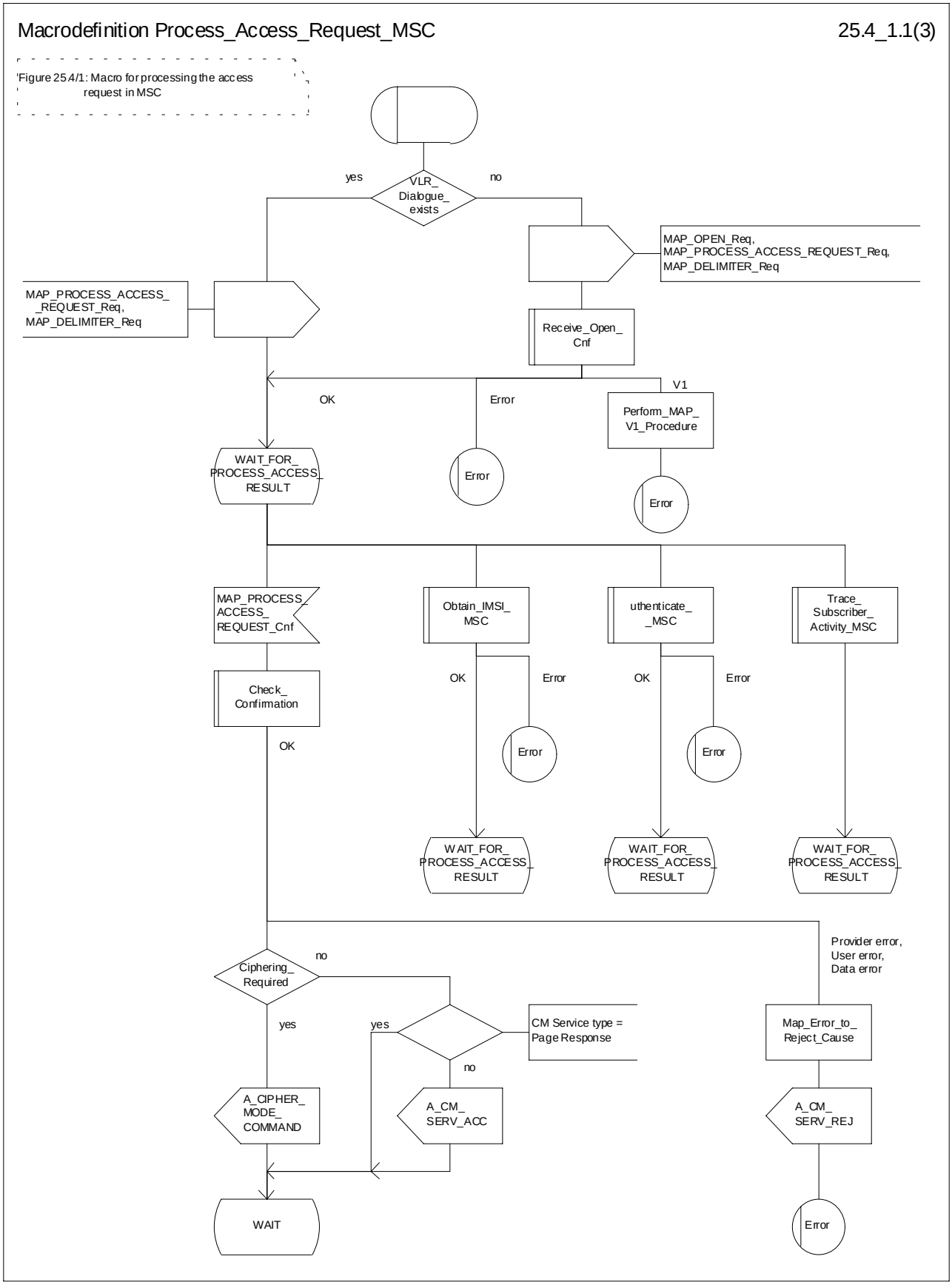


Figure 25.4/1 (sheet 1 of 3): Macro Process_Access_Request_MSC

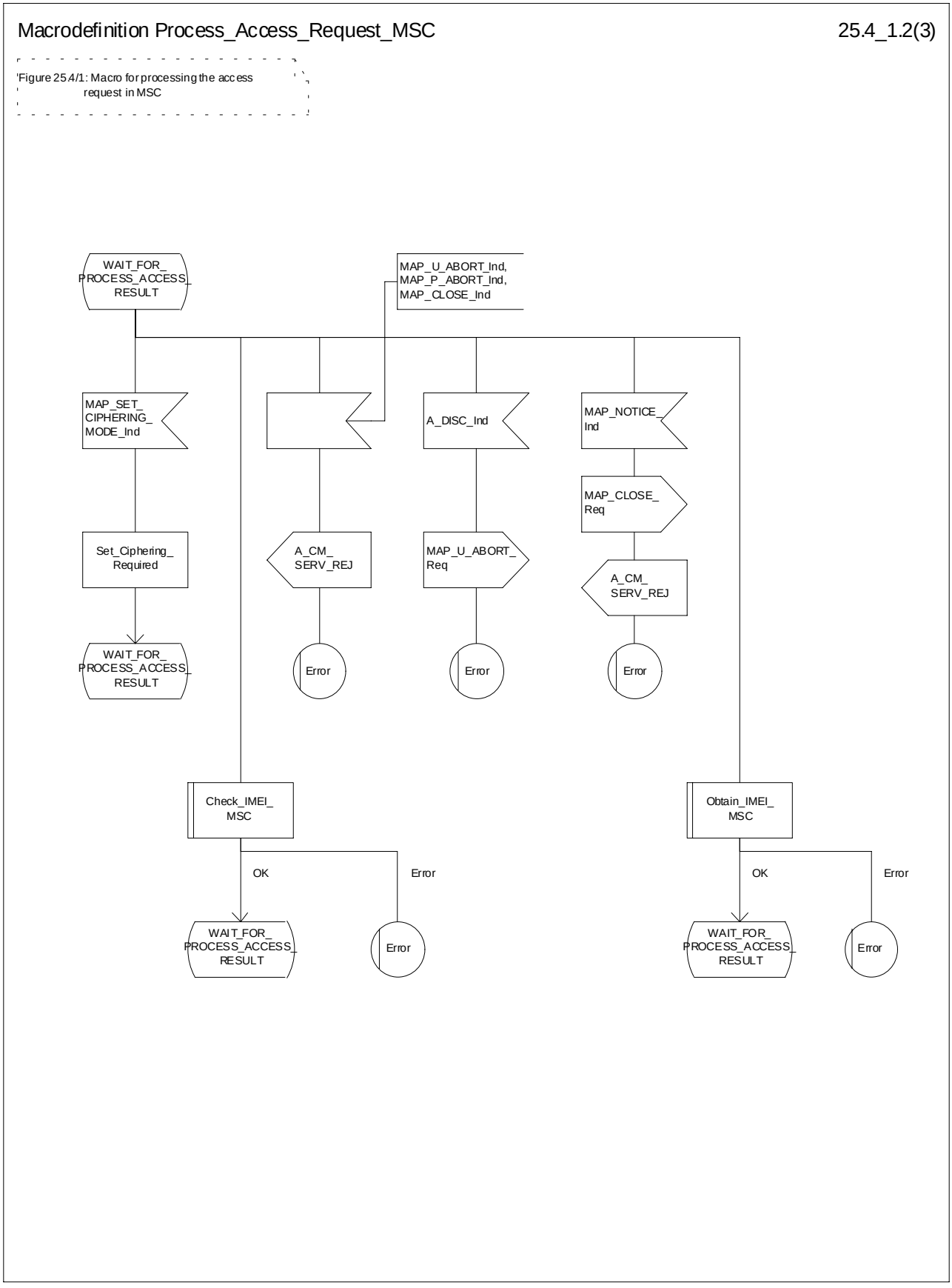


Figure 25.4/1 (sheet 2 of 3): Macro Process_Access_Request_MSC

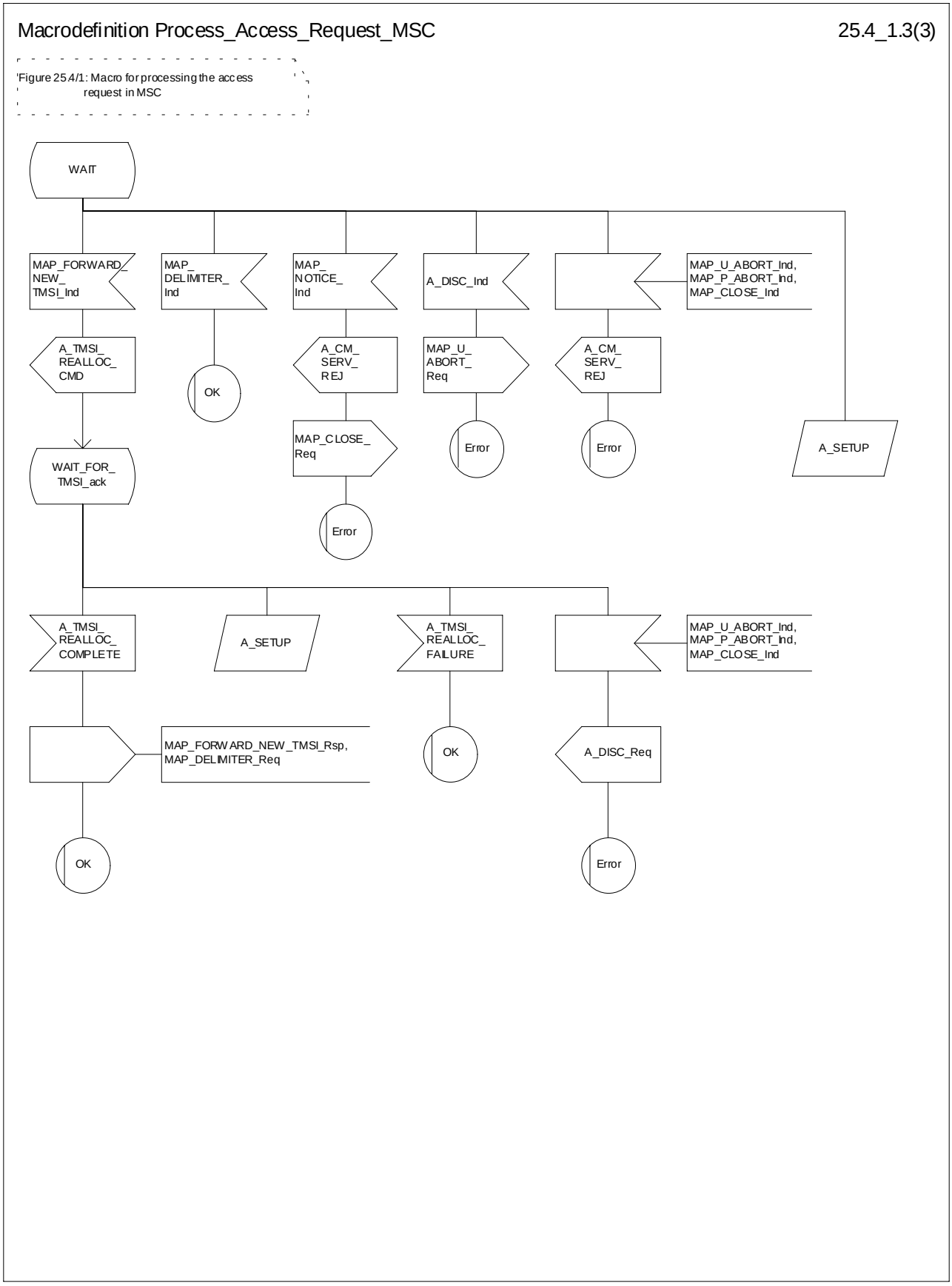


Figure 25.4/1 (sheet 3 of 3): Macro Process_Access_Request_MSC

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 clause 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 recognise 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, clause 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 clause 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 clause 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 clause 25.10).

At next, tracing is invoked if required by the operator (macro Trace_Subscriber_Activity_VLR, see clause 25.9). Thereafter,

if ciphering is not required, IMEI checking is invoked if required by the operator (see macro Check_IMEI_VLR defined in clause 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 clause 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 clause 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.

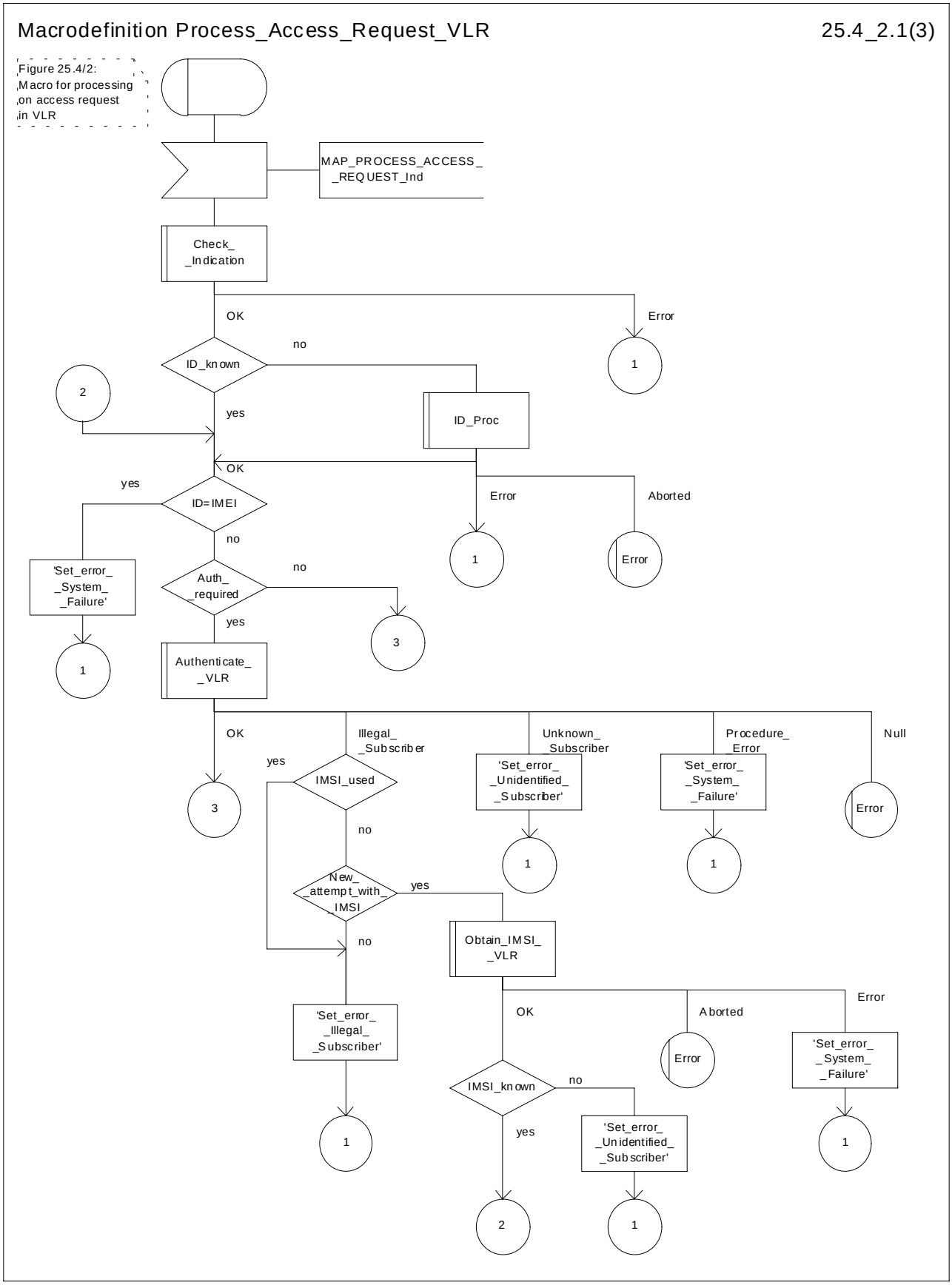


Figure 25.4/2 (sheet 1 of 3): Macro Process_Access_Request_VLR

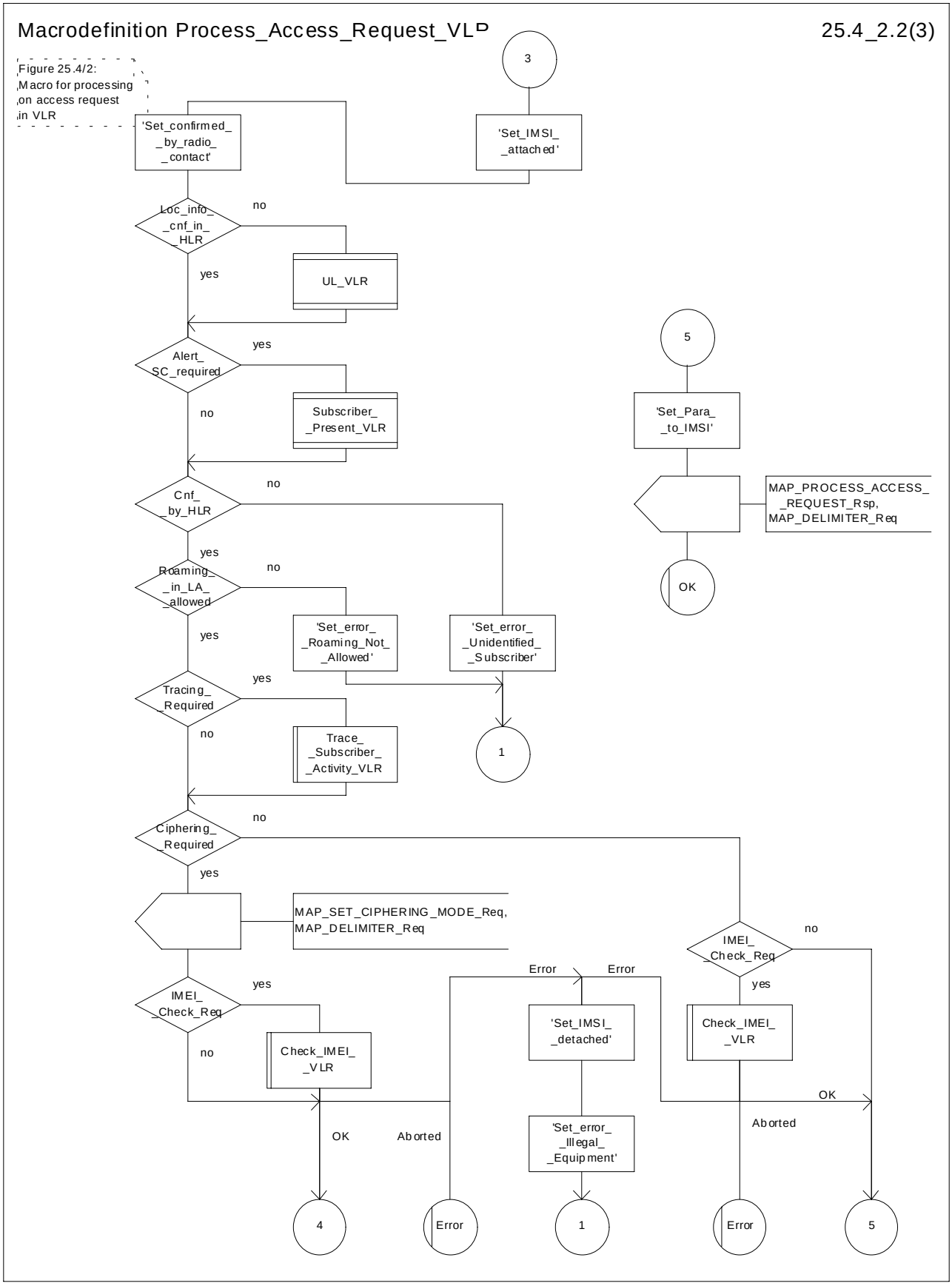


Figure 25.4/2 (sheet 2 of 3): Macro Process_Access_Request_VLR

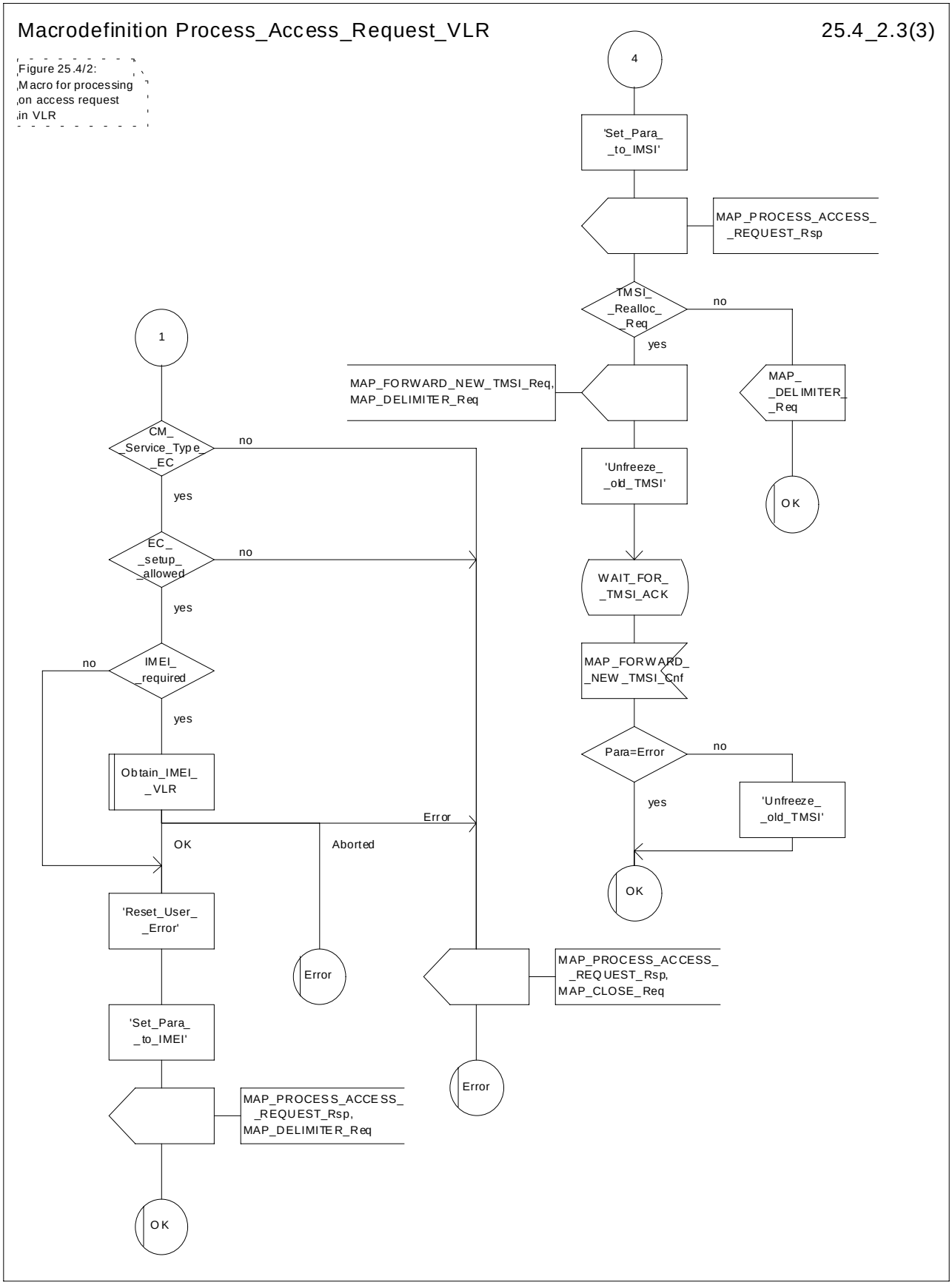


Figure 25.4/2 (sheet 3 of 3): Macro Process_Access_Request_VLR

Macrodefinition ID_Proc_VLR 25.4_3(1)

Figure 25.4/3

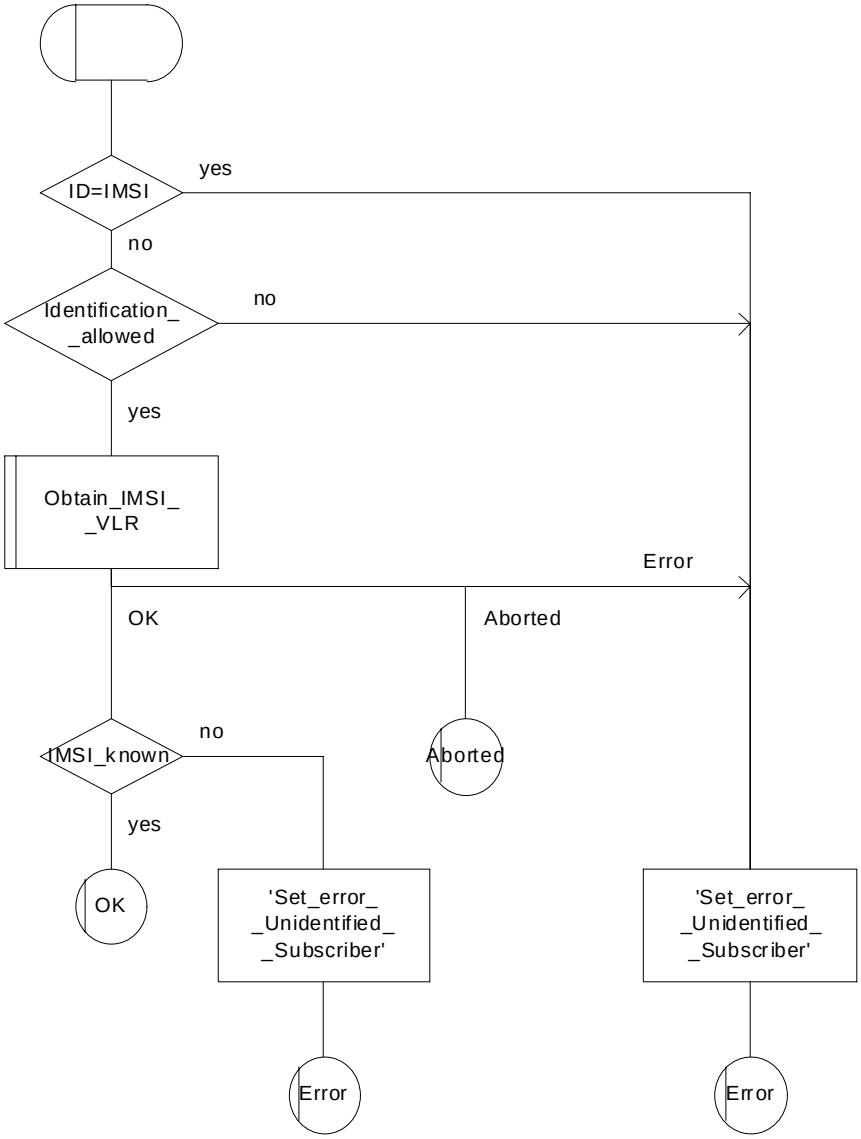


Figure 25.4/3: Macro ID_Proc_VLR

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 vectors 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 vectors 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, CKSN or KSI, and possibly AUTN 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 3GPP TS 43.020 [24]), or whether the received RES is identical to the stored XRES. If this is not the case, the "Illegal Subscriber" exit is used. If the SRES values or RES and XRES 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 authentication vectors 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 vectors 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 or 2 dialogue is to be used, the VLR performs the equivalent MAP version 1 or 2 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 returned by the MAP version 1 or 2 dialogue, then the "Unknown Subscriber" exit is used.

In a MAP version 3 dialogue a (possibly empty) set of authentication vectors may be received from the HLR followed by a MAP_CLOSE_Indication or by a MAP_DELIMITER_Indication. If a MAP_DELIMITER_Indication is received, the VLR may request additional authentication vectors from the HLR by sending a new MAP_SEND_AUTHENTIFICATION_INFO_Request with no parameter part. If a MAP_CLOSE_Indication is received, and authentication vectors have been received during the dialogue, then the "OK" exit is used. If no authentication vectors have been received during the dialogue, the VLR checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

If in a MAP version 3 dialogue an "Unknown Subscriber" error is received, then the "Unknown Subscriber" exit is used. If other errors are received, the VLR checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

- 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 (GSM triplets) can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit; note that re-use of old UMTS Quintuplets is not allowed;

- 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 (GSM triplets) can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit; note that re-use of old UMTS Quintuplets is not allowed.

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 clause 25.1, with outcomes:

- reversion to version one or two procedure;

- procedure termination; or

- dialogue acceptance, with proceeding as below.

This process is used by the HLR to obtain authentication vectors 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 vectors are fetched from the AuC. Further details are found in 3GPP TS 43.020 [24];

- if errors are detected they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. Otherwise the authentication vectors are returned.

- if segmentation of the response message is required and allowed, a MAP_SEND_AUTHENTICATION_INFO_response, containing at least one authentication vector, followed by a MAP_DELIMITER_request is returned to the VLR or SGSN, the remaining authentication vectors are stored and the HLR waits for a new service indication from the VLR or SGSN.

The process is described in figure 25.5/5.

Macrodefinition Authenticate_MSC 25.5_1(1)

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

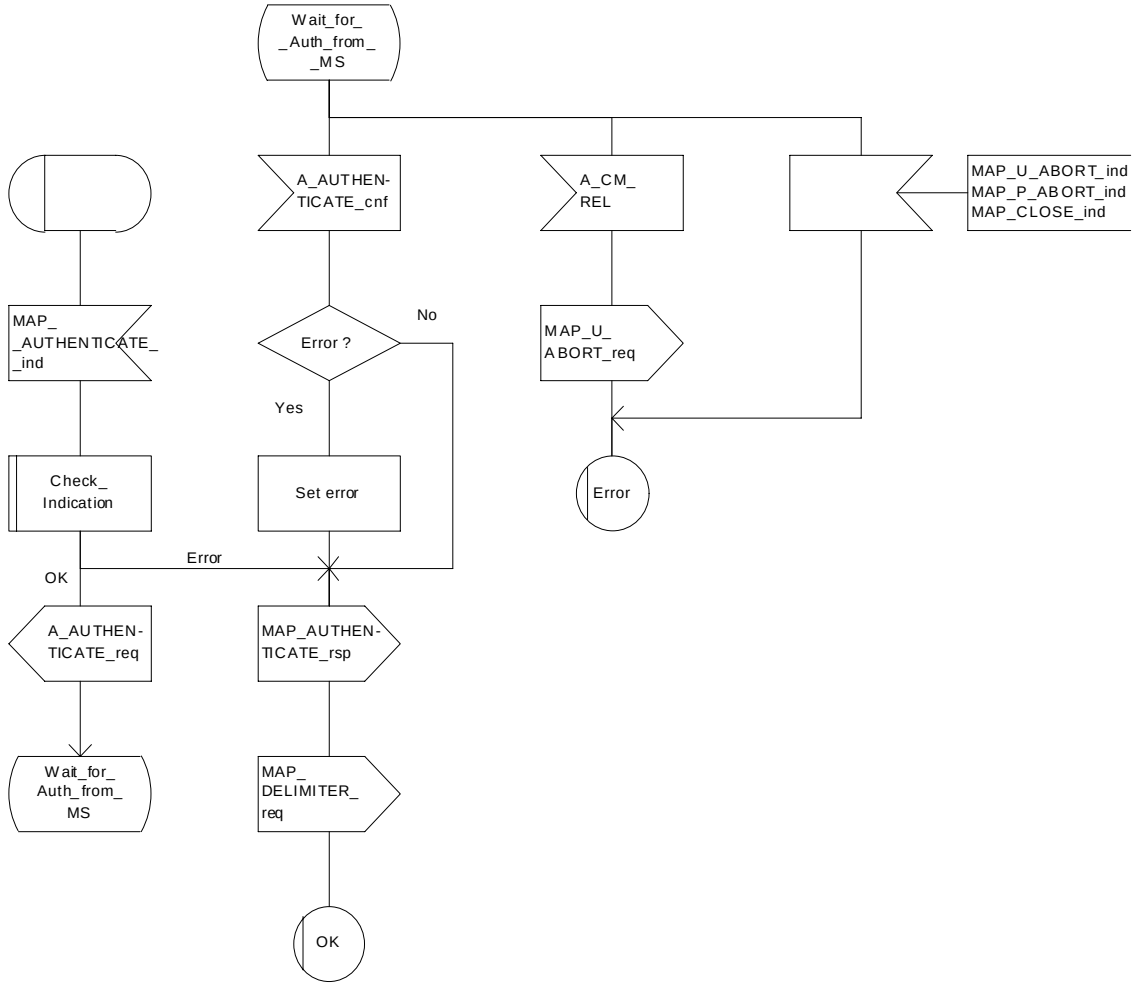


Figure 25.5/1: Macro Authenticate_MSC

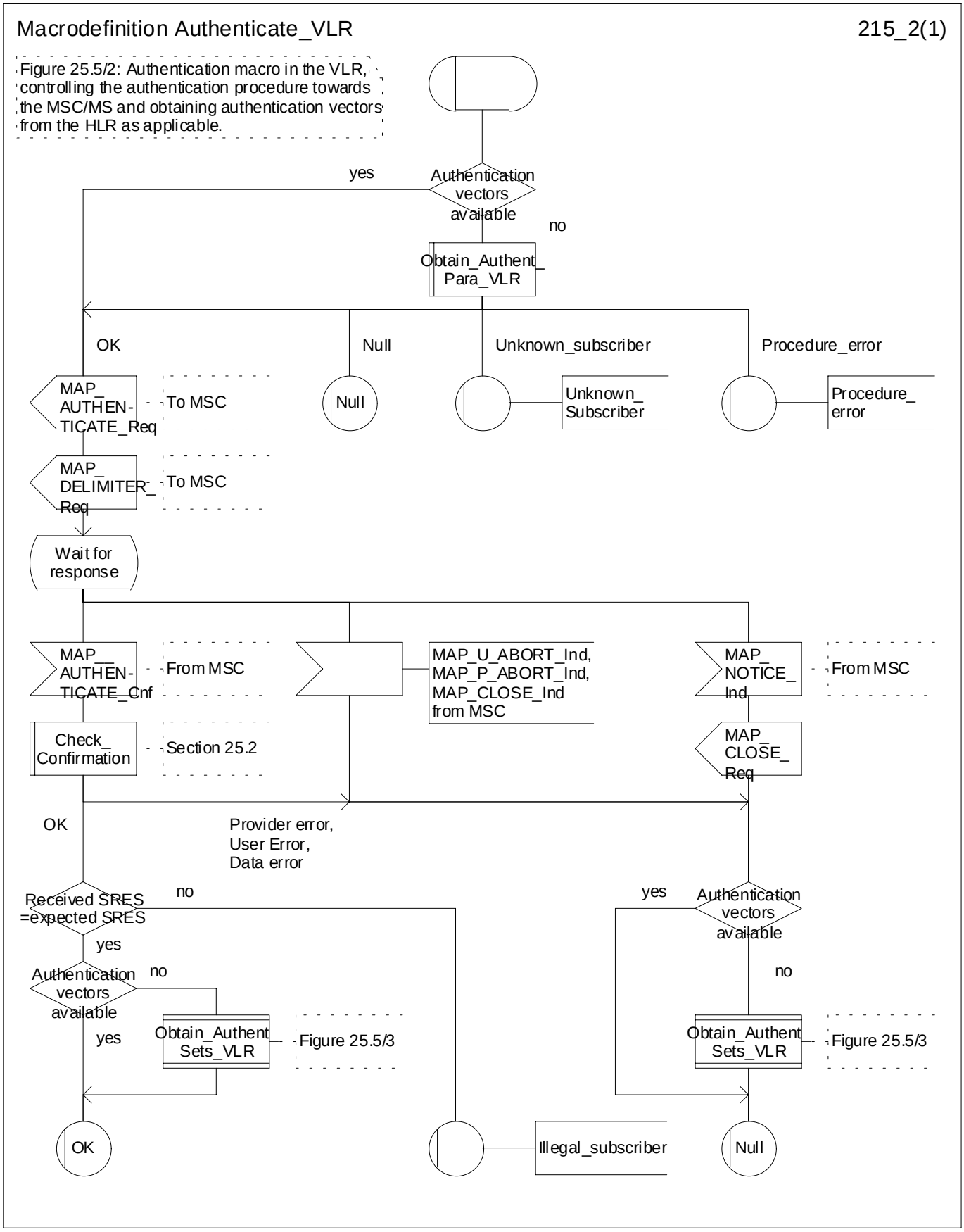


Figure 25.5/2: Macro Authenticate_VLR

Process Obtain_Authent_Sets_VLR 25.5_3(1)

Figure 25.5/3: Process to obtain authentication sets from the HLR to the VLR

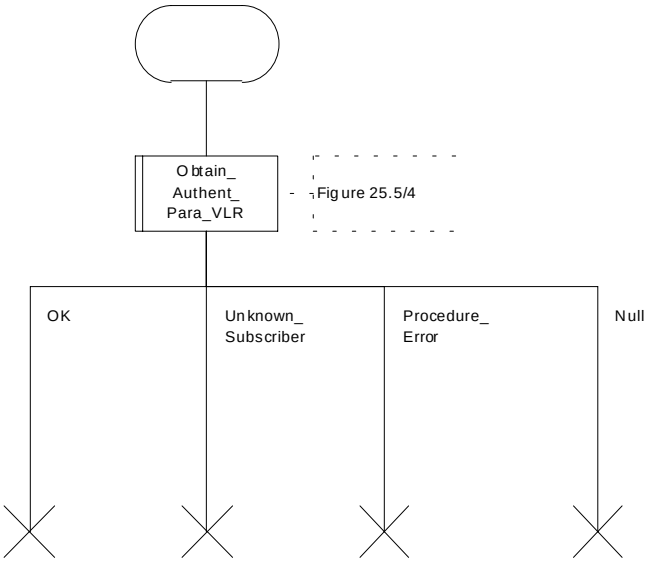


Figure 25.5/3: Process Obtain_Authentication_Sets_VLR

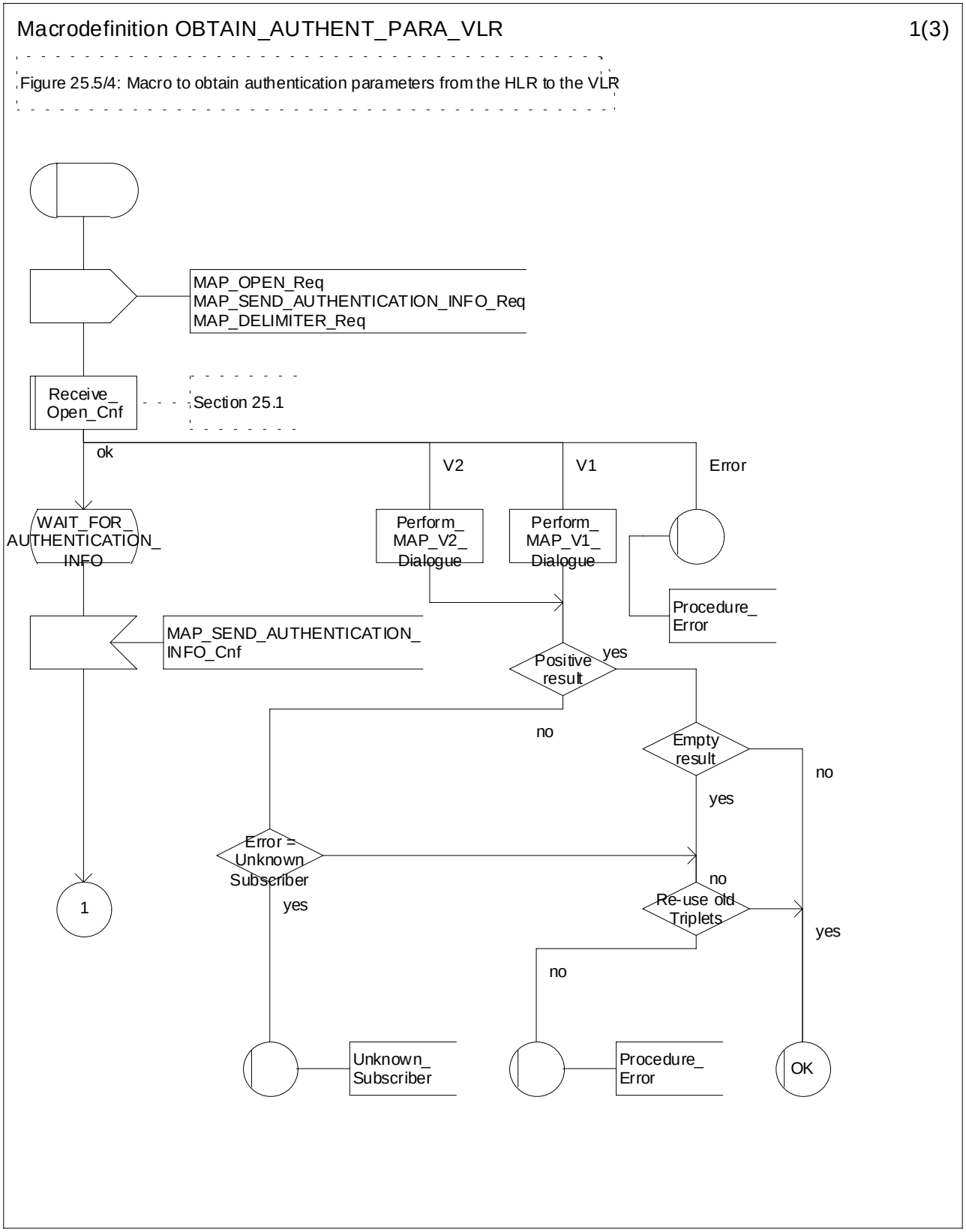


Figure 25.5/4 (sheet 1 of 3): Macro Obtain_Authent_Para_VLR

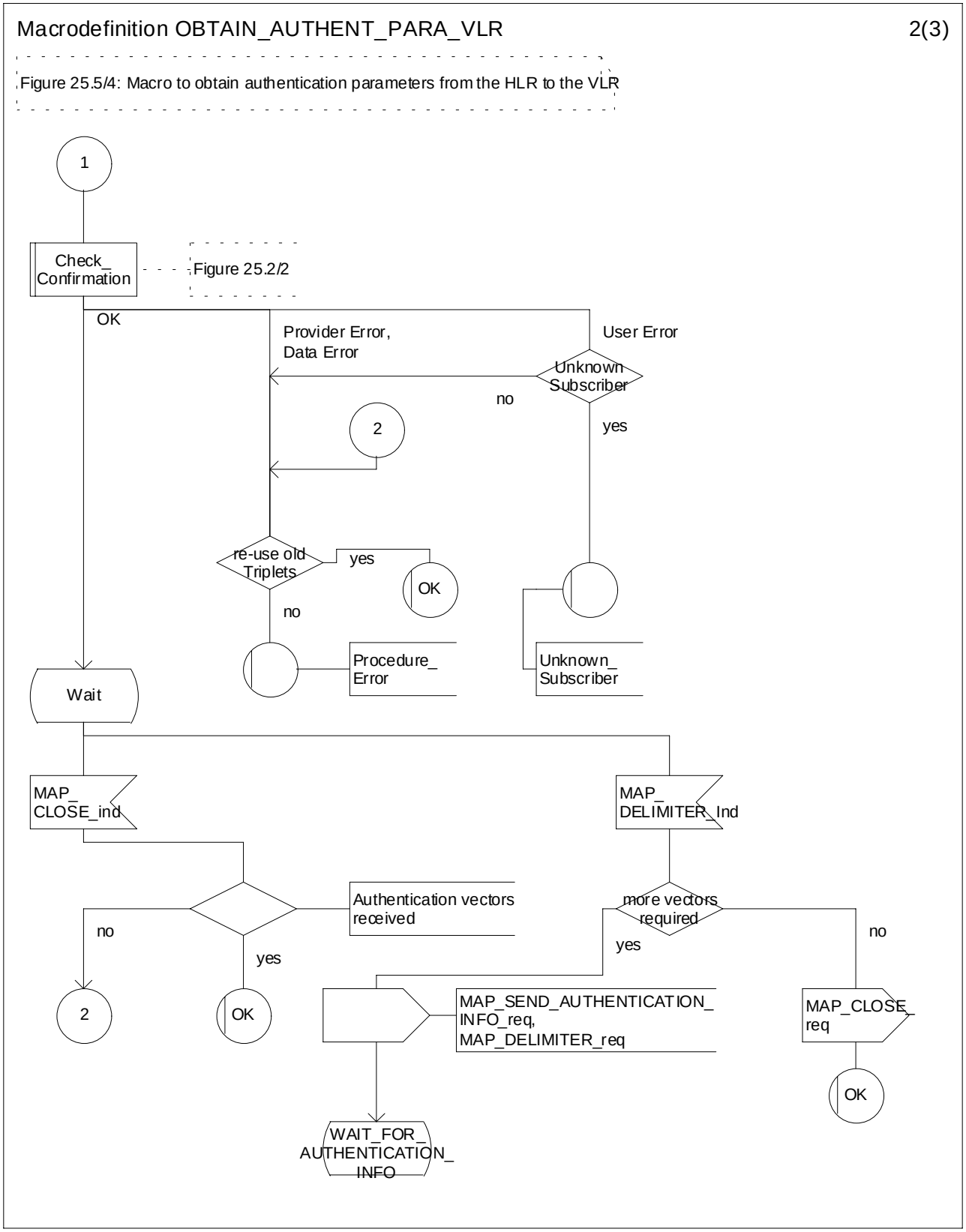


Figure 25.5/4 (sheet 2 of 3): Macro Obtain_Authent_Para_VLR

Macrodefinition OBTAIN_AUTHENT_PARA_VLR 3(3)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR

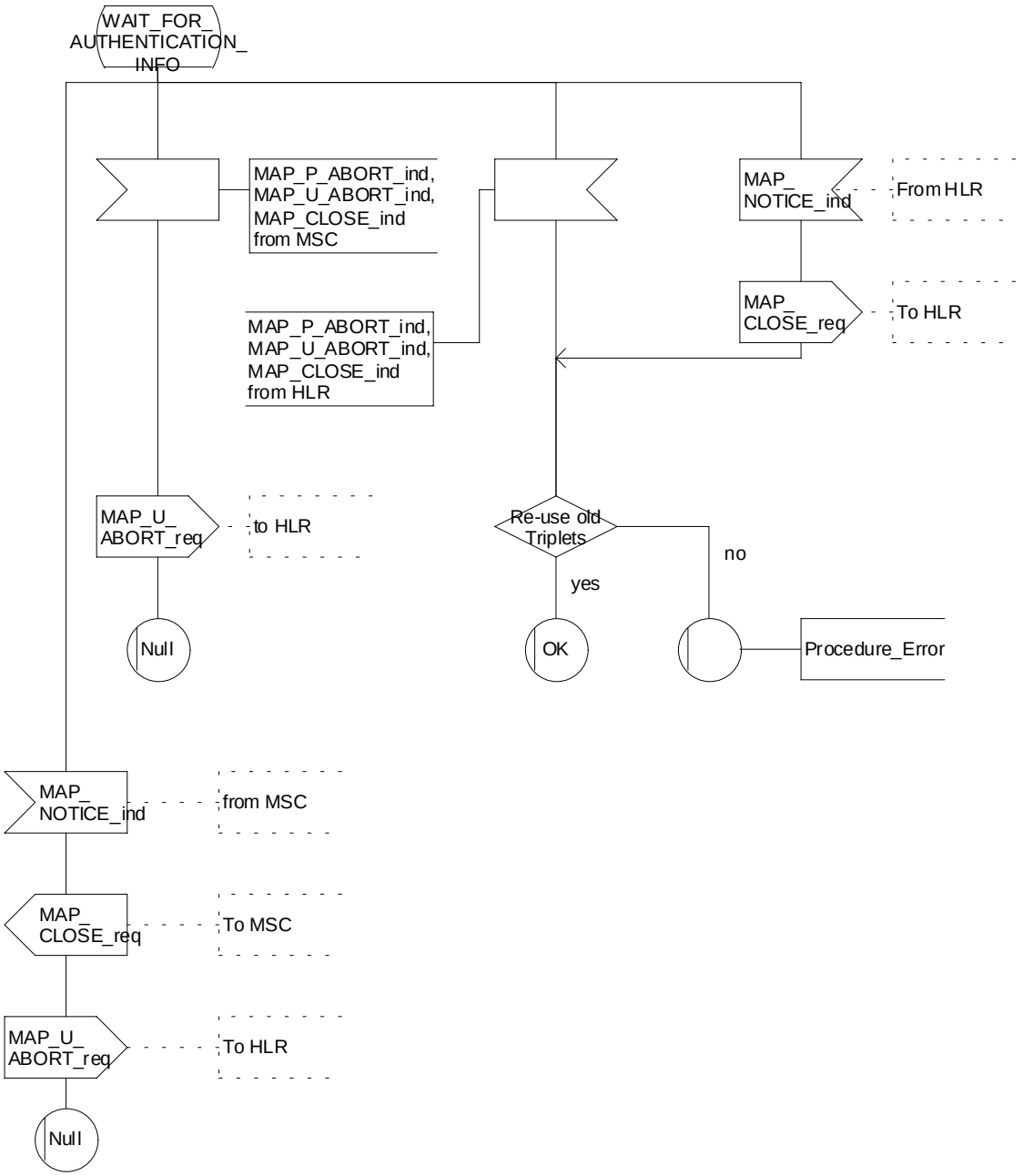


Figure 25.5/4 (sheet 3 of 3): Macro Obtain_Authent_Para_VLR

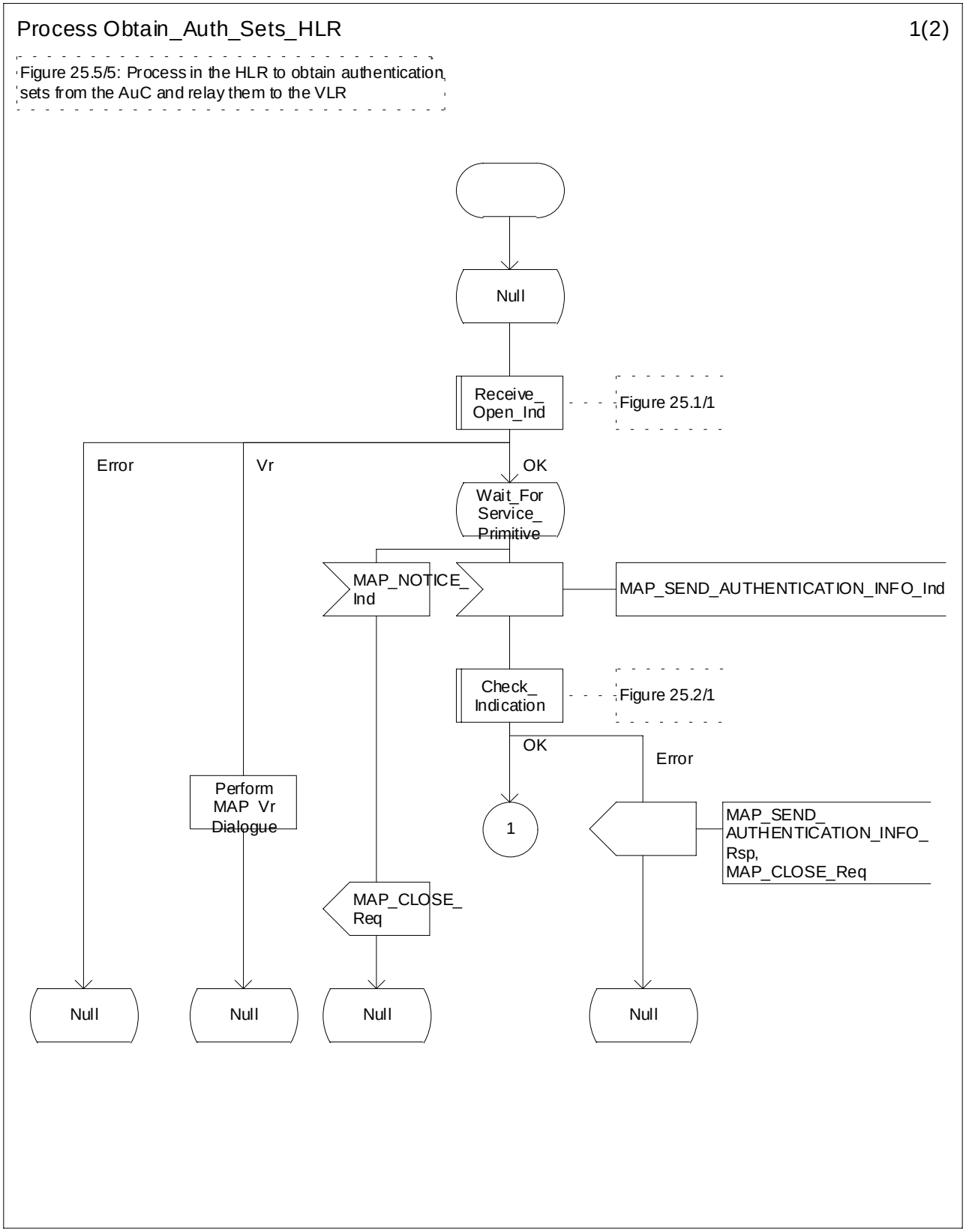


Figure 25.5/5 (sheet 1 of 2): Process Obtain_Auth_Sets_HLR

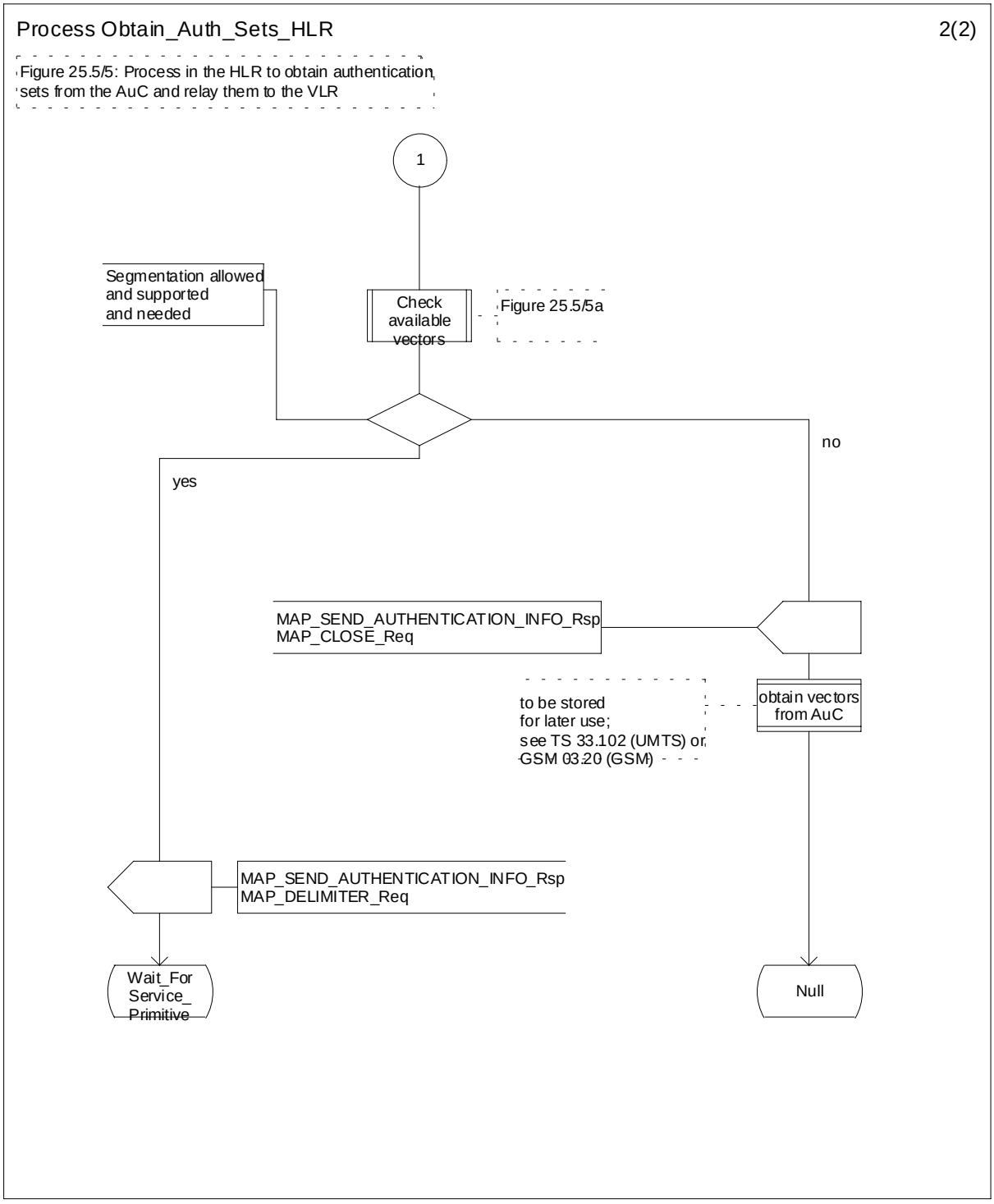


Figure 25.5/5 (sheet 2 of 2): Process Obtain_Auth_Sets_HLR

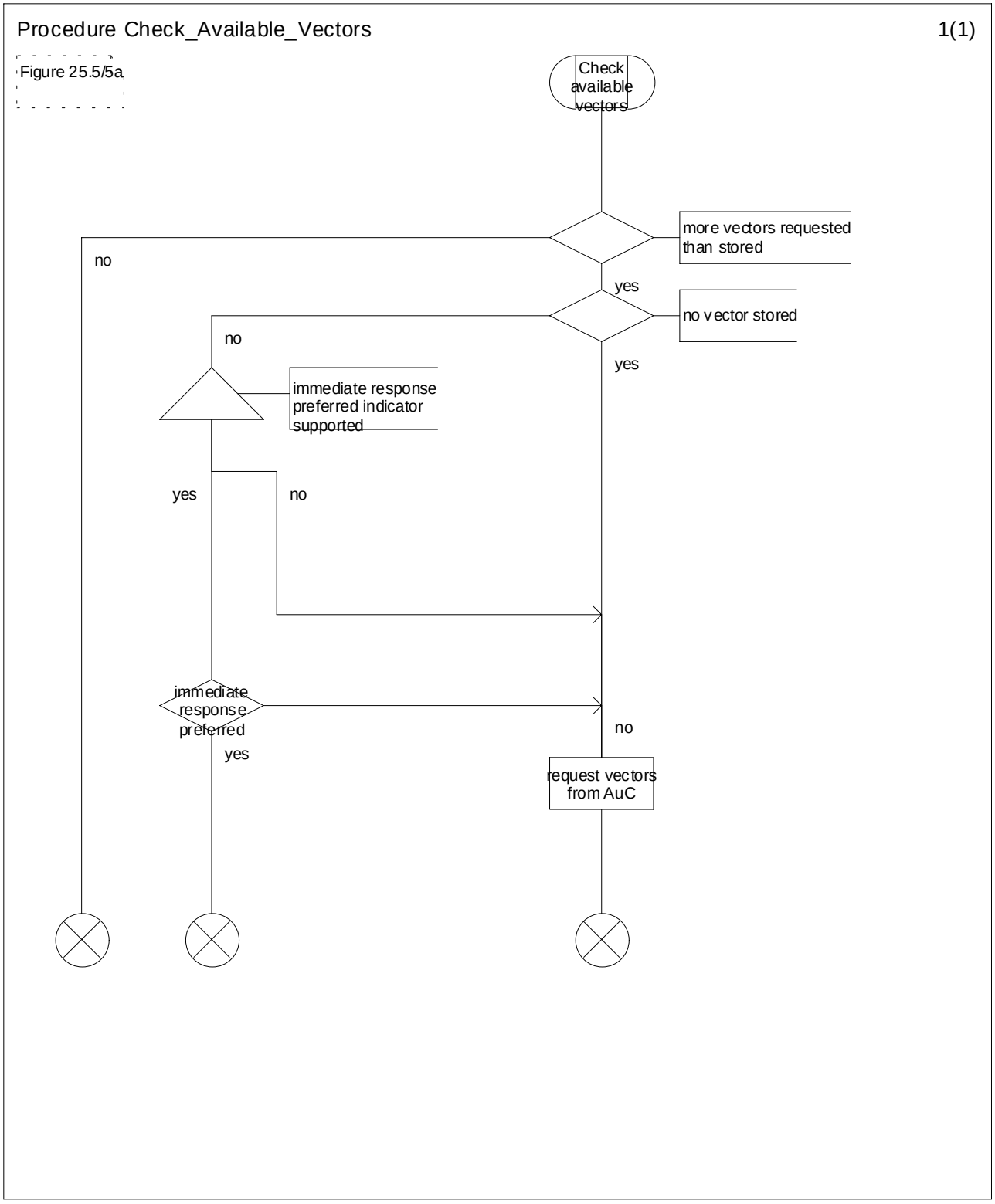


Figure 25.5/6: Procedure Check_Available_Vectors

25.5.6 Process Obtain_Authent_Para_SGSN

For authentication procedure description see 3GPP TS 23.060 [104] and 3GPP TS 24.008 [35].

This Process is used by the SGSN to request authentication vectors from the HLR.

If the SGSN does not know the subscriber's HLR address (e.g. no IMSI translation exists), the Authentication Parameter negative response with error “Unknown HLR” is returned to the requesting process.

Otherwise, 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 or 2dialogue is to be used, the SGSN performs the equivalent MAP version 1 or 2dialogue. 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 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

In a MAP version 3 dialogue a (possibly empty) set of authentication vectors may be received from the HLR followed by a MAP_CLOSE_Indication or by a MAP_DELIMITER_Indication. If a MAP_DELIMITER_Indication is received, the SGSN may request additional authentication vectors from the HLR by sending a new MAP_SEND_AUTHENTIFICATION_INFO_Request. If a MAP_CLOSE_Indication is received, and authentication vectors have been received during the dialogue, then the "OK" exit is used. If no authentication vectors have been received during the dialogue, the SGSN checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

If in a MAP version 3 dialogue an "Unknown Subscriber" error is received, then the "Unknown Subscriber" exit is used. If other errors are received, the SGSN checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

- 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.

Process Obtain_Authent_Para_SGSN 1(3)

Figure 25.5/6: Process to obtain authentication parameters from the HLR to the SGSN

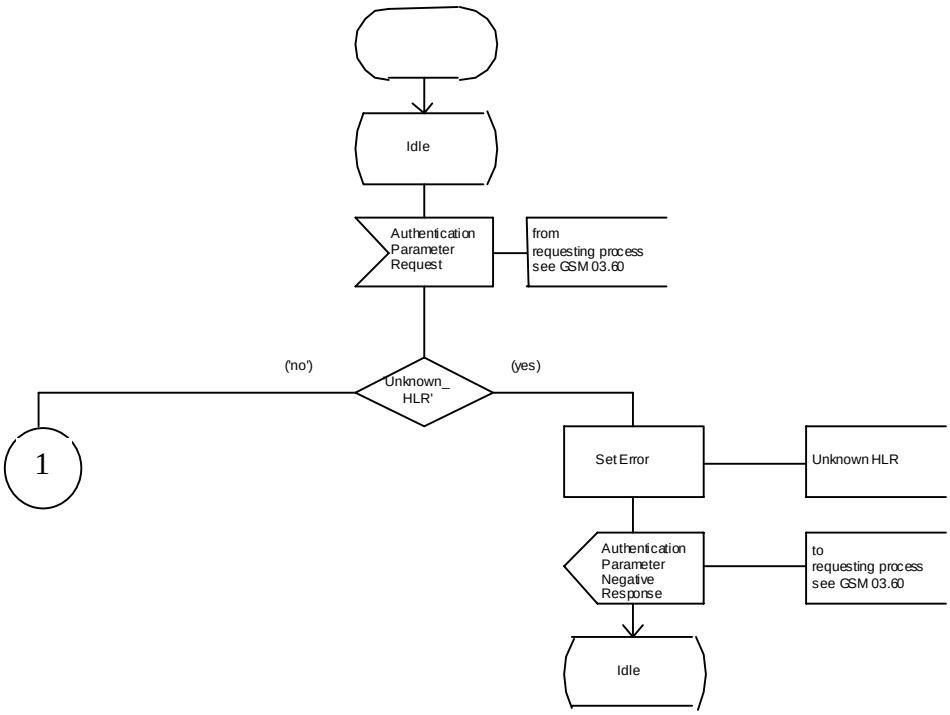


Figure 25.5/6 (sheet 1 of 3): Process Obtain_Authen_Para_SGSN

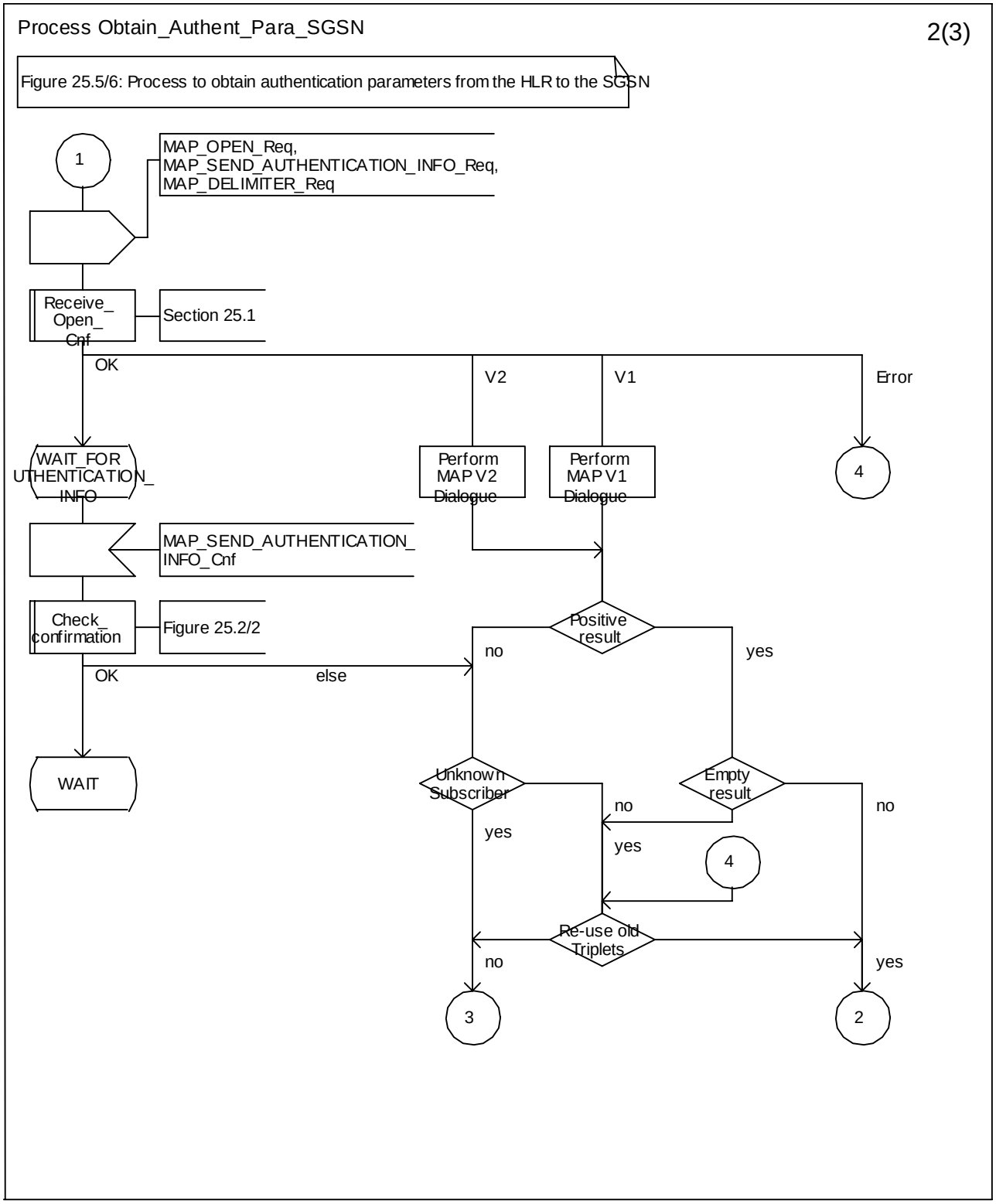


Figure 25.5/6 (sheet 2 of 3): Process Obtain_Authen_Para_SGSN

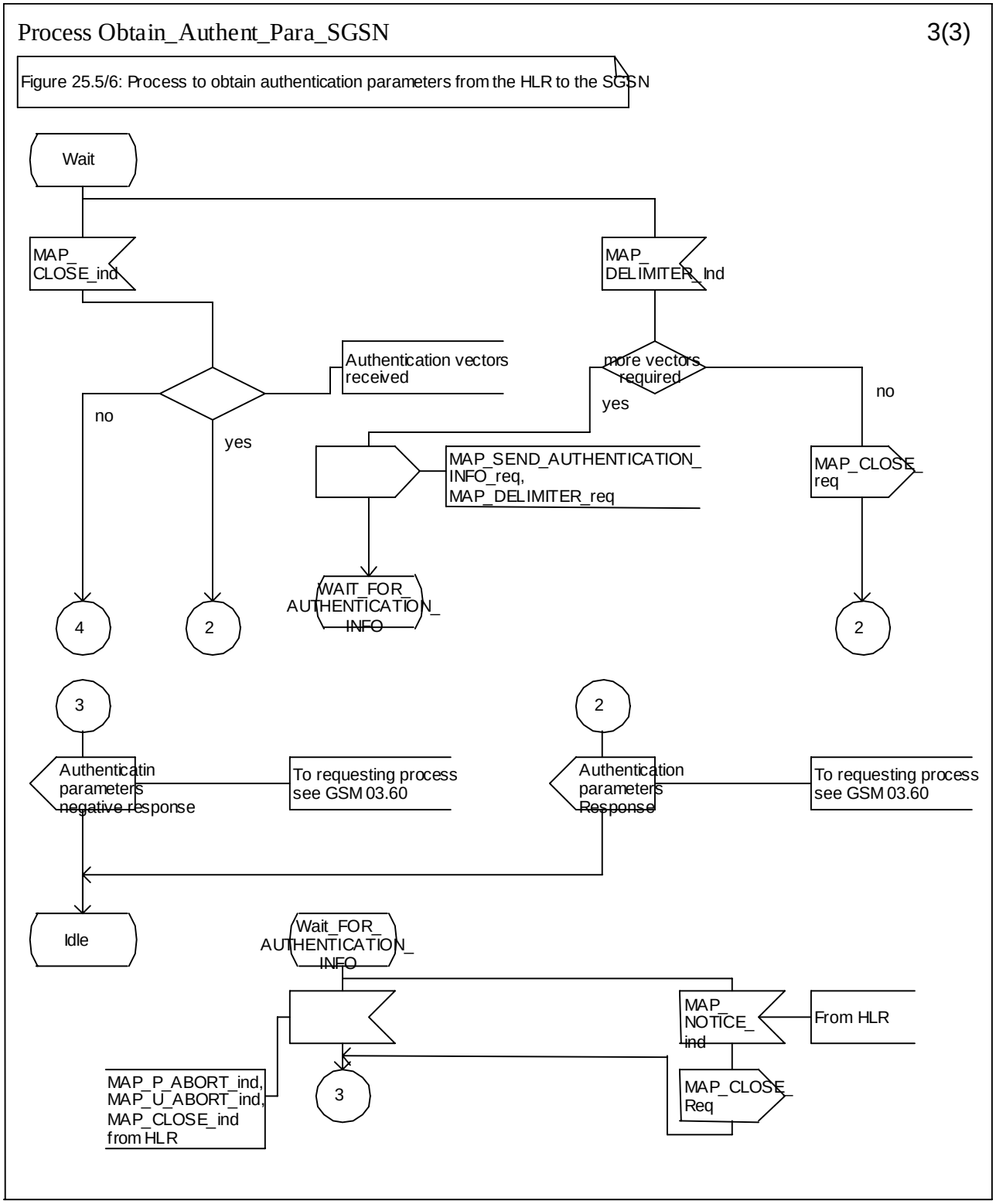


Figure 25.5/6 (sheet 3 of 3): Process Obtain_Authen_Para_SGSN

25.5.7 Process Authentication_Failure_Report

25.5.7.1 General

The Authentication Failure Report procedure is used to notify a HLR about the occurrence of an authentication failure in the SGSN or VLR.

The procedure is shown in figure 25.5/7.

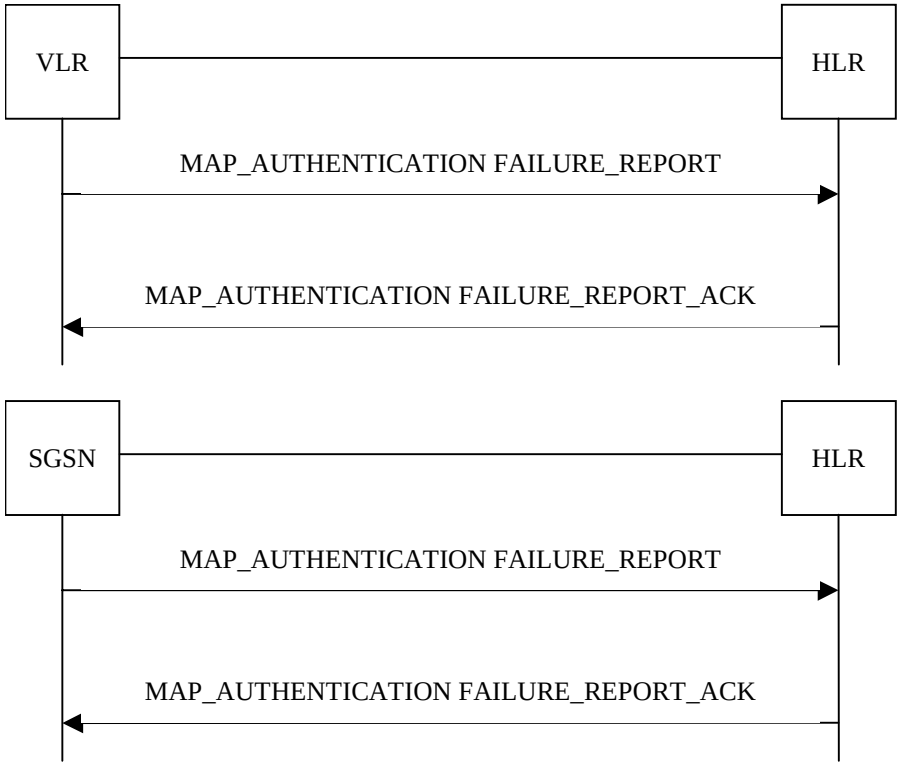


Figure 25.6/7: Message Flows to Authentication Failure Report

25.5.7.2 Process in the VLR

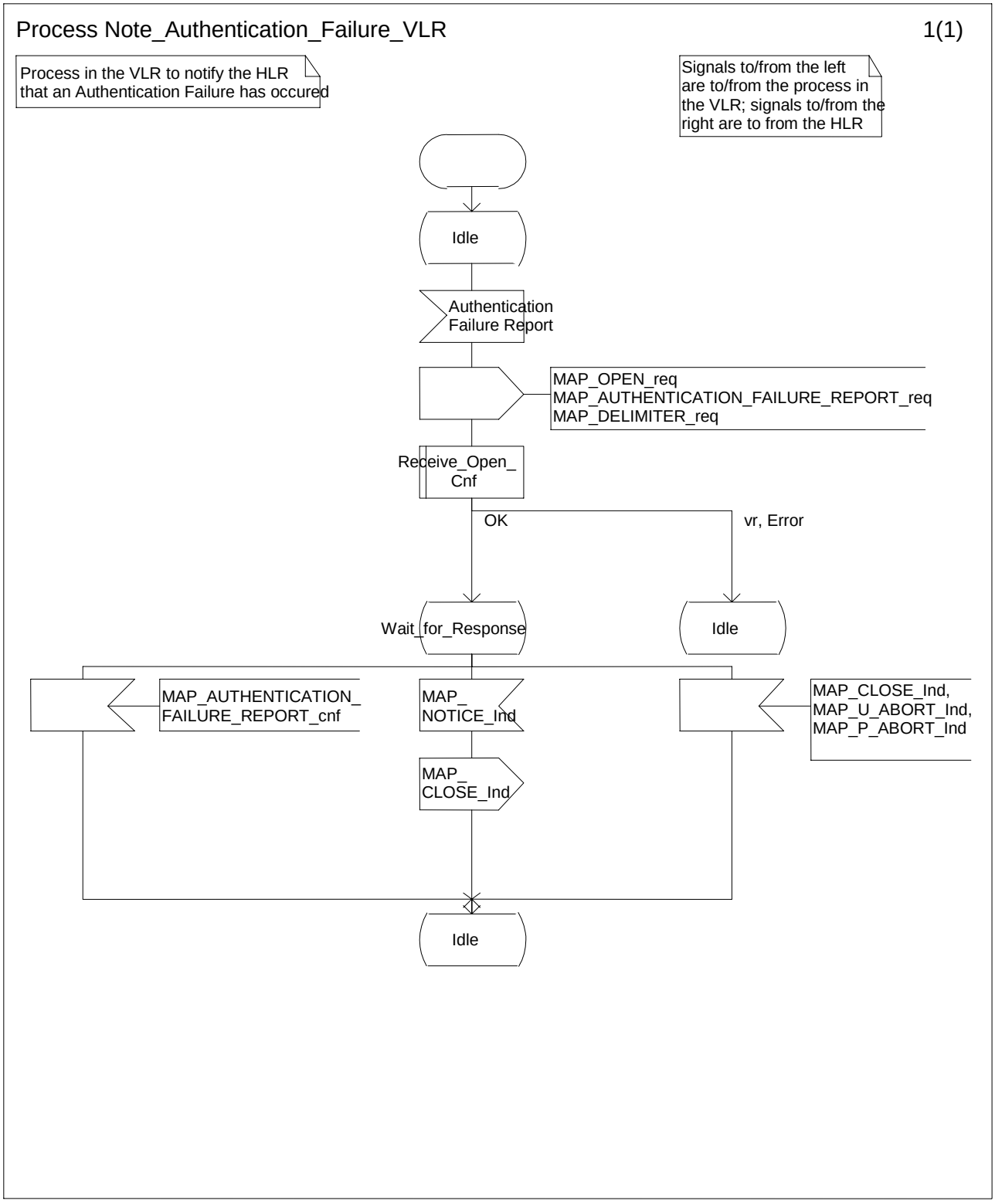


Figure 25.6/8: Process Note_Authentication_Failure_VLR

25.5.7.3 Process in the SGSN

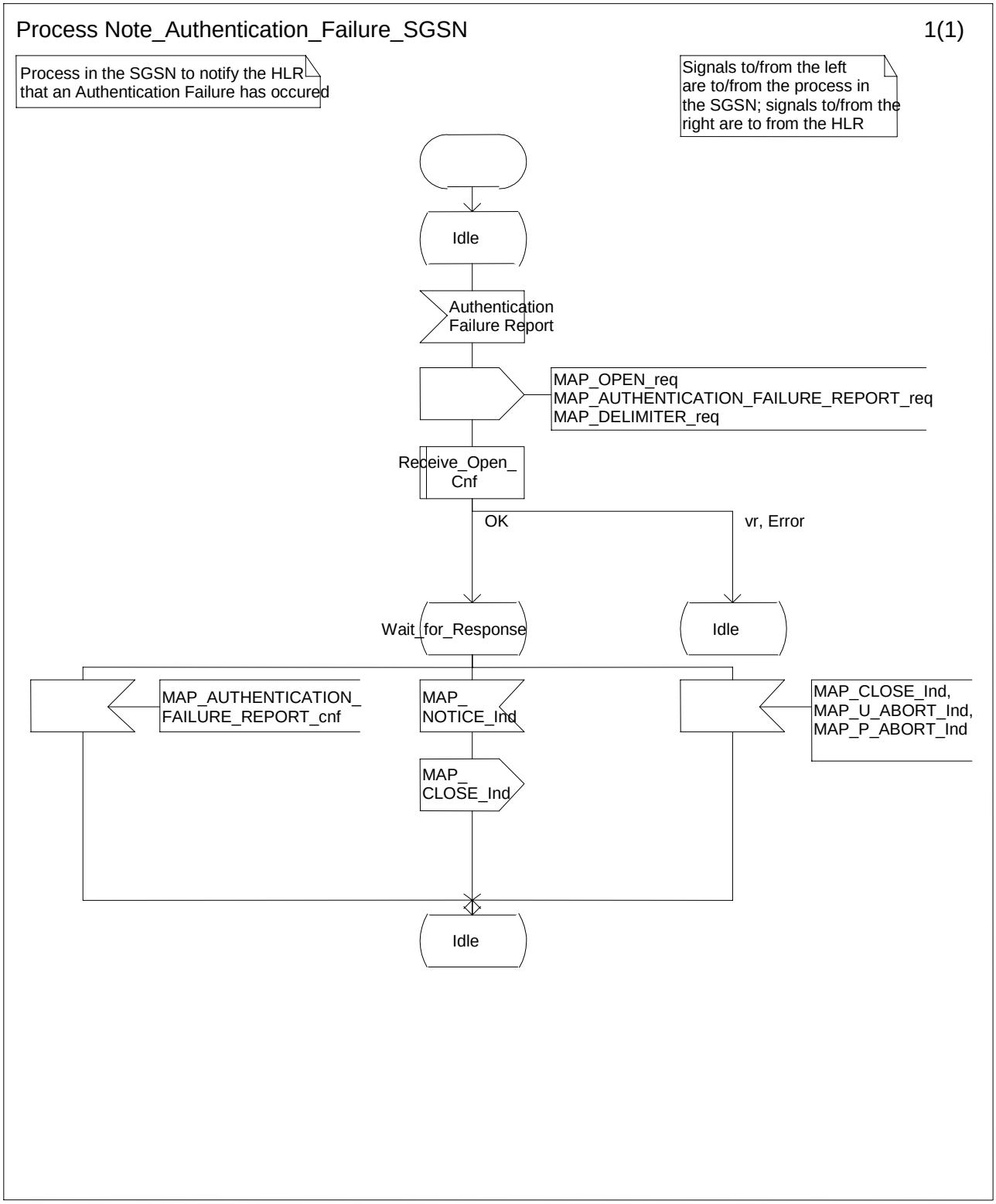


Figure 25.6/9: Process Note_Authentication_Failure_SGSN

25.5.7.4 Process in the HLR

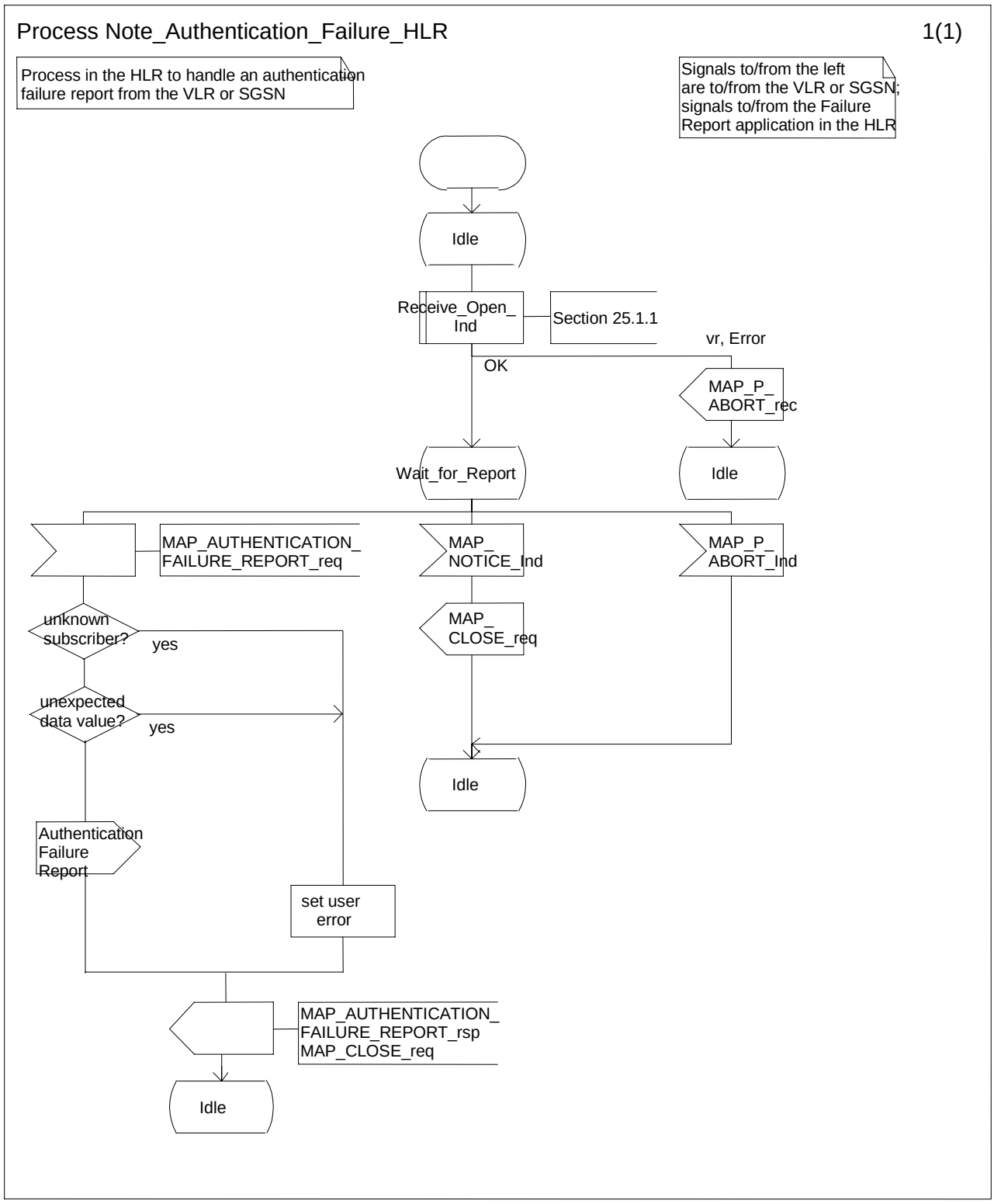


Figure 25.6/10: Process Note_Authentication_Failure_HLR

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, clause 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 3GPP TS 22.016 [7];

- 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.

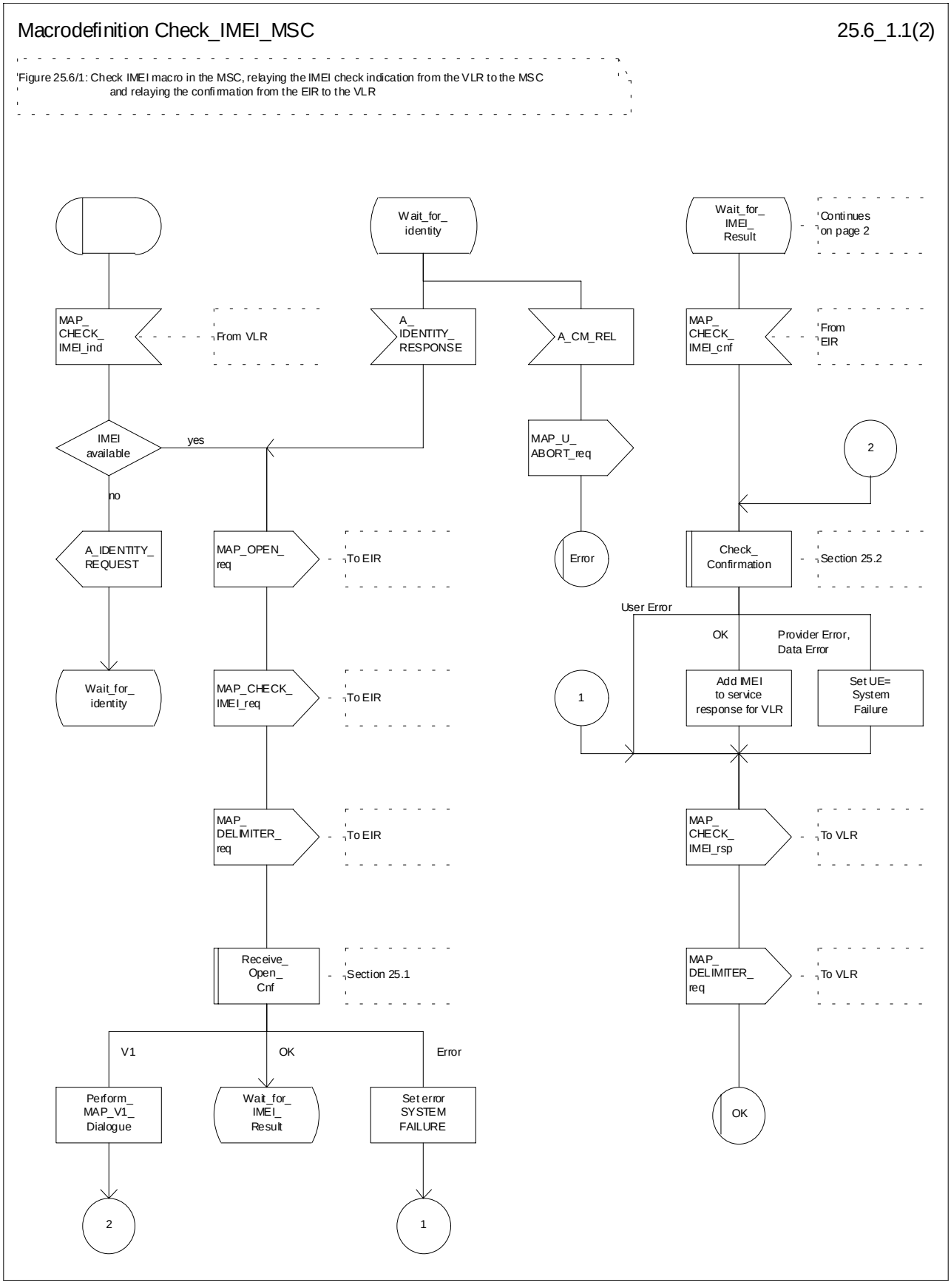


Figure 25.6/1 (sheet 1 of 2): Process Check_IMEI_MSC

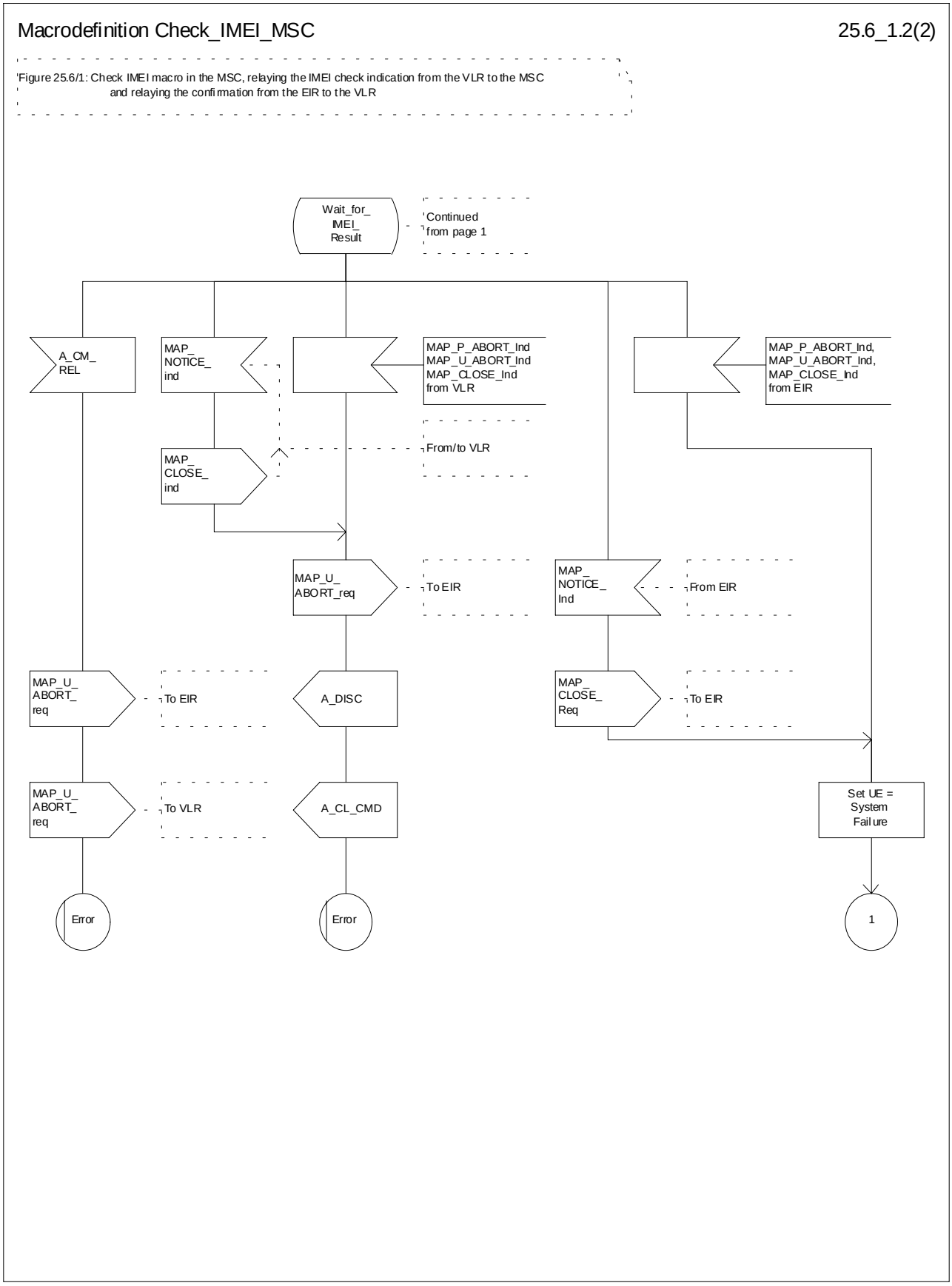


Figure 25.6/1 (sheet 2 of 2): Process Check_IMEI_MSC

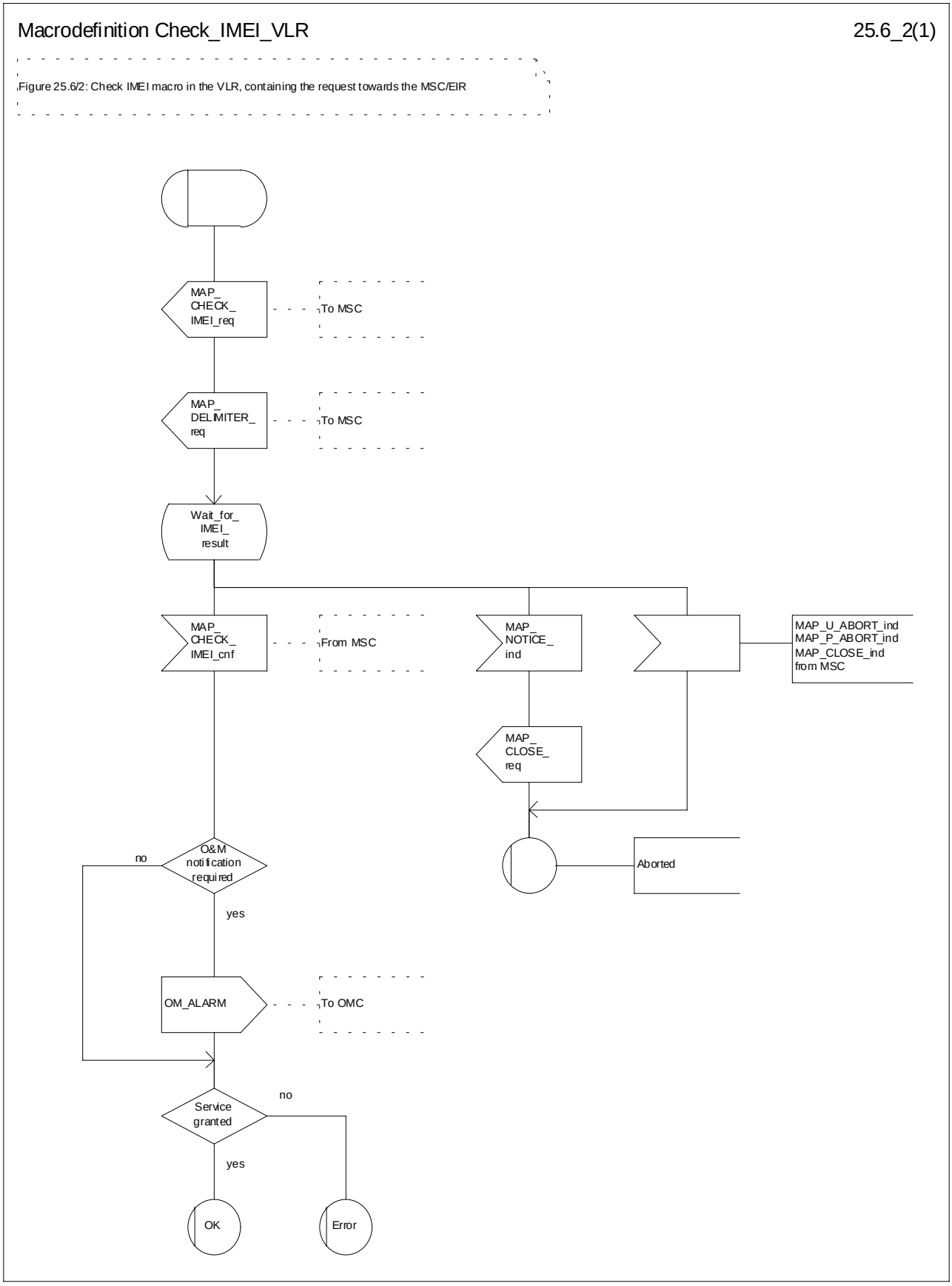


Figure 25.6/2: Process Check_IMEI_VLR

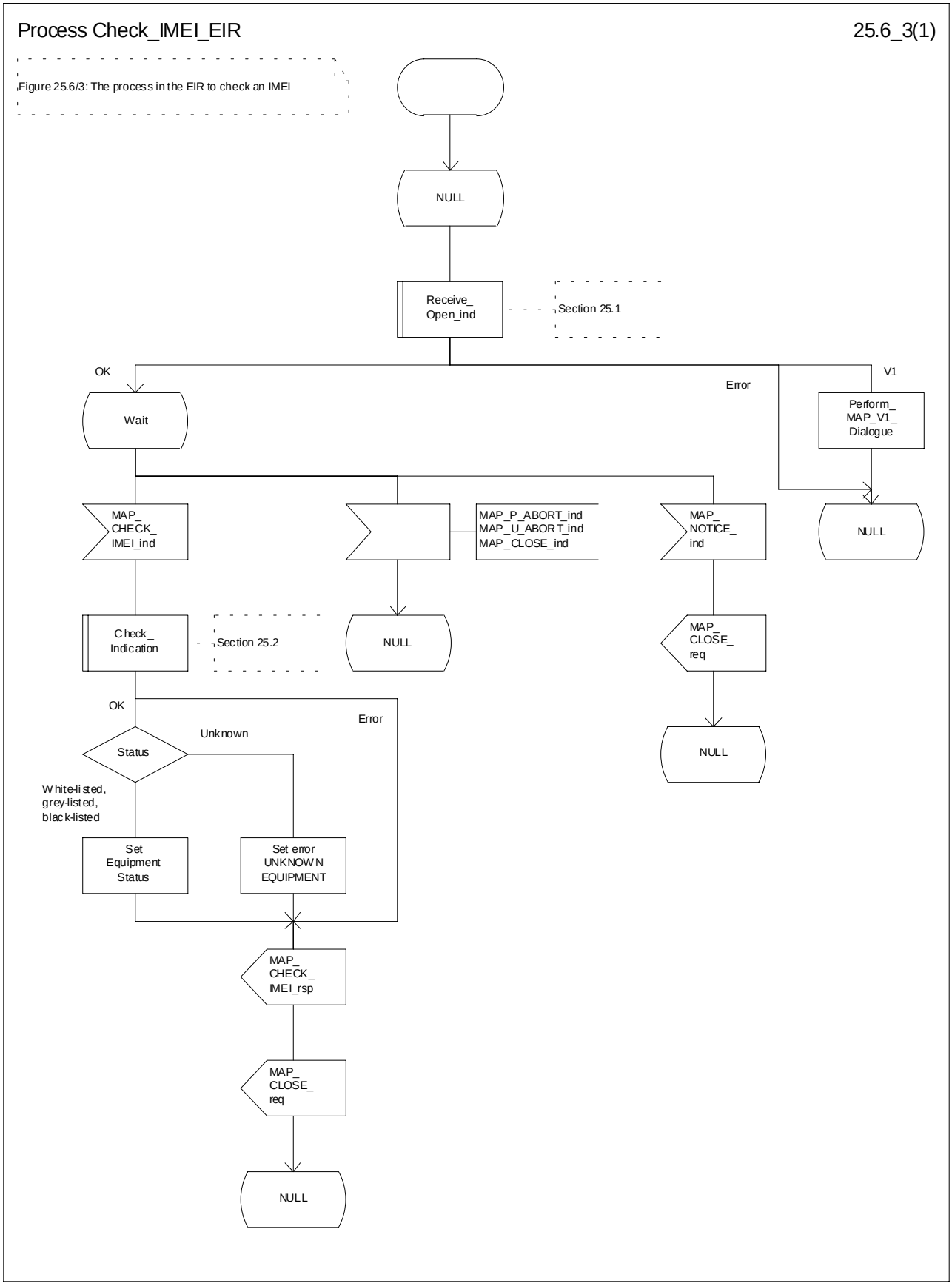


Figure 25.6/3: Process Check_IMEI_EIR

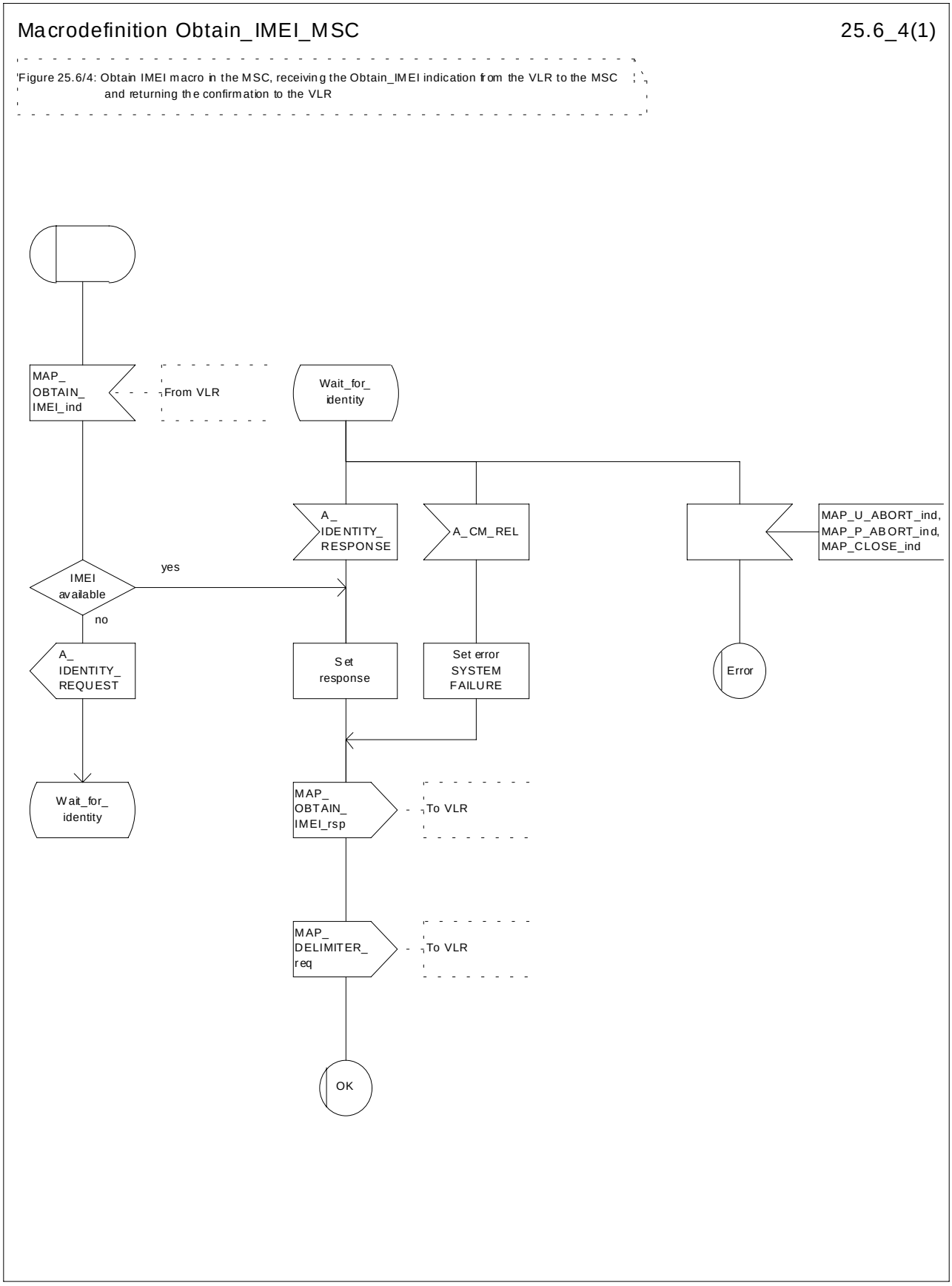


Figure 25.6/4: Process Obtain_IMEI_MSC

Macrodefinition Obtain_IMEI_VLR 25.6_5(1)

Figure 25.6/5: Obtain IMEI macro in the VLR, controlling the request towards the MSC

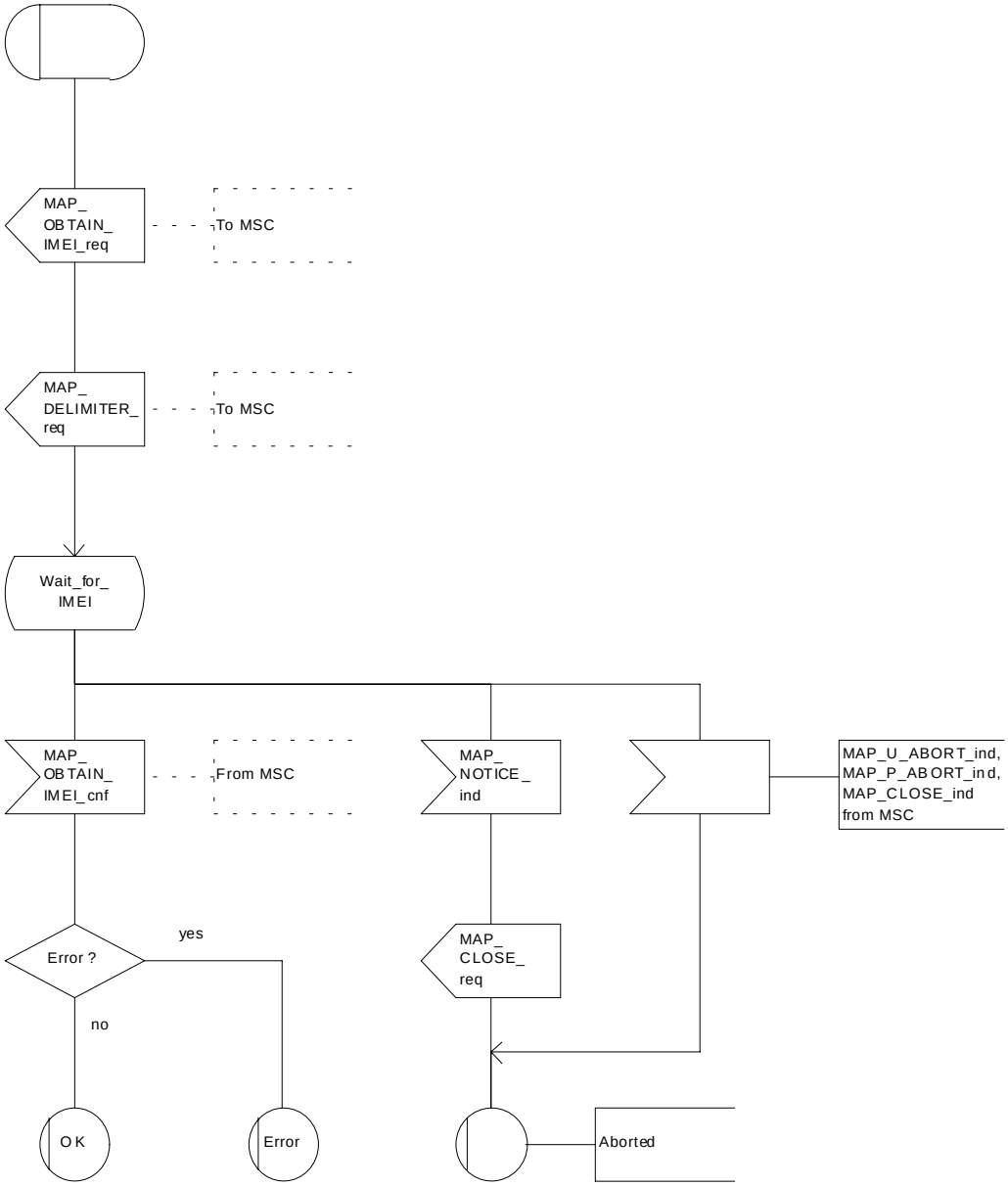


Figure 25.6/5: Process Obtain_IMEI_VLR

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.

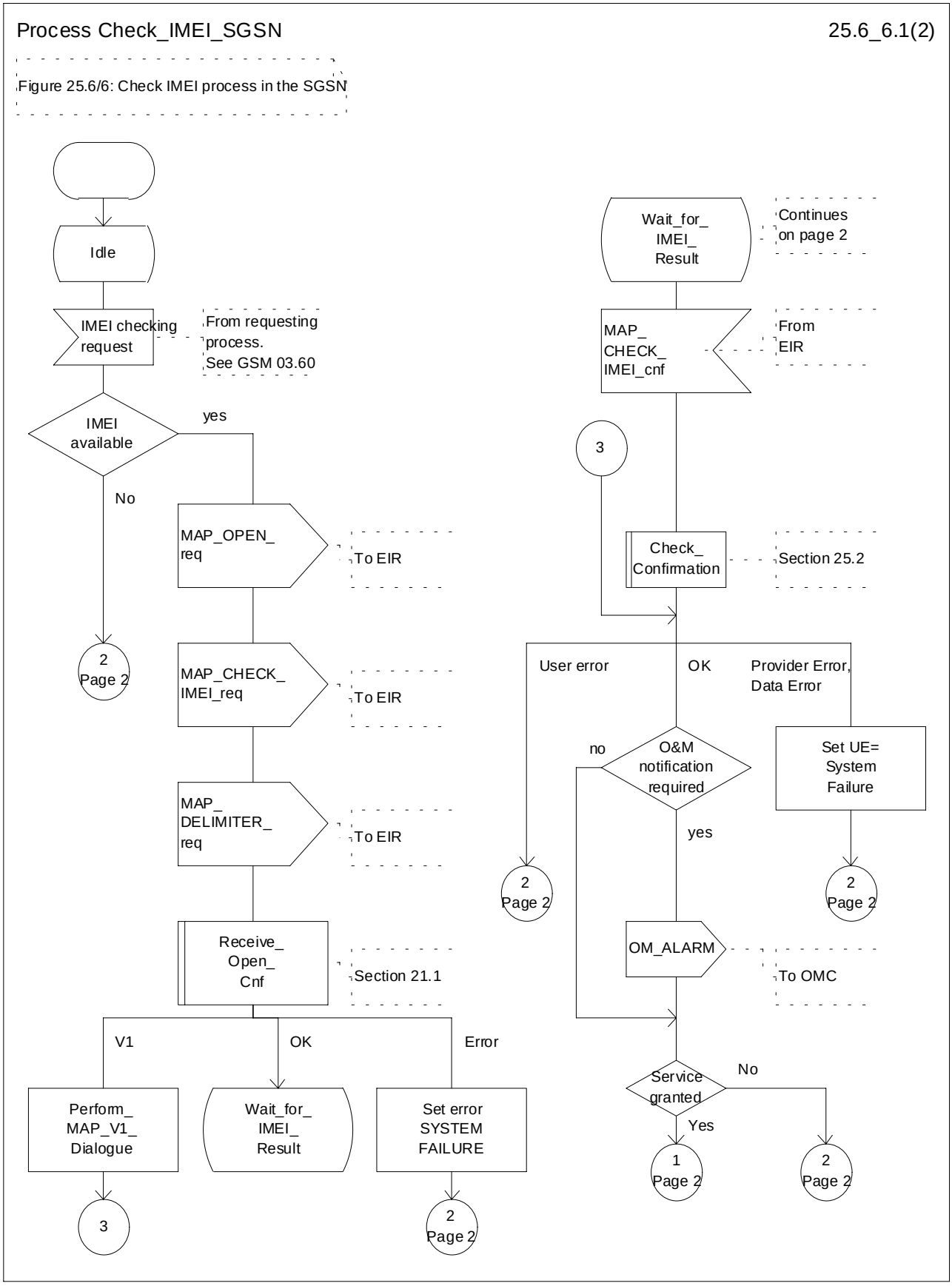


Figure 25.6/6 (sheet 1 of 2): Process Check_IMEI_SGSN

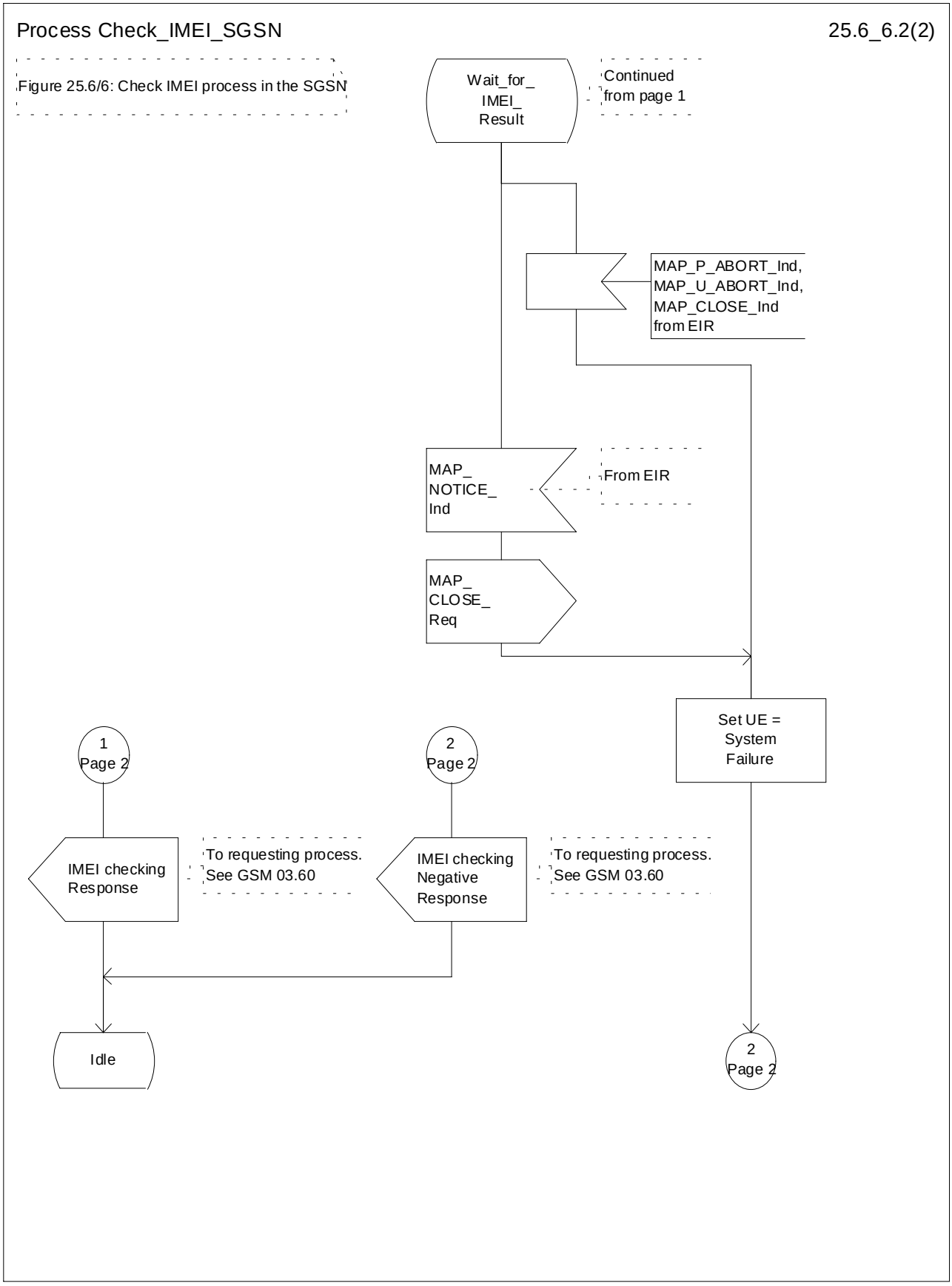


Figure 25.6/6 (sheet 2 of 2): Process Check_IMEI_SGSN

25.7 Insert Subscriber Data Macros

25.7.1 Macro Insert_Subs_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.

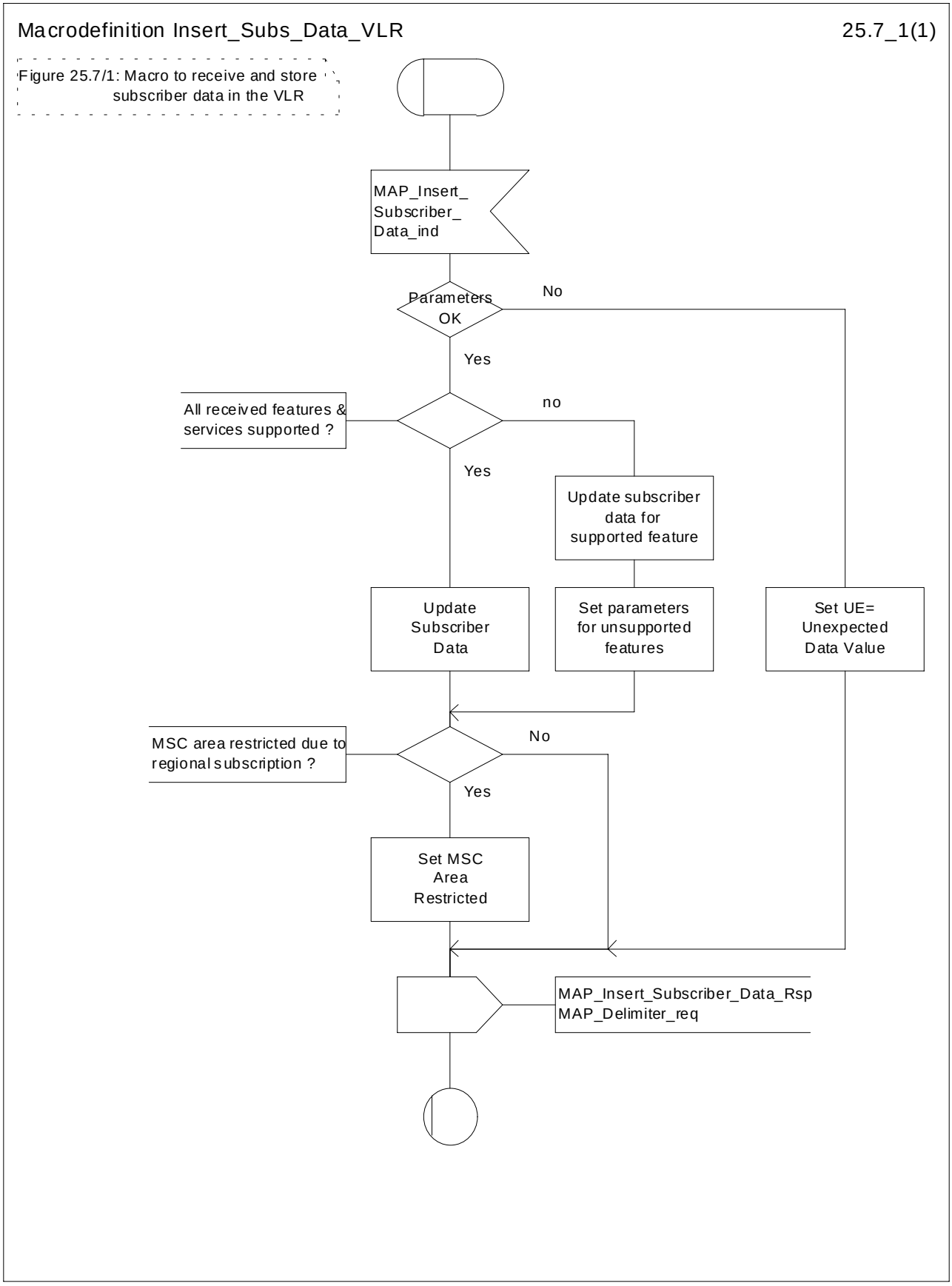


Figure 25.7/1: Macro Insert_Subs_Data_VLR

25.7.2 Process Insert_Subs_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_Subs_Data" (see clause 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_Subs_Data_Cnf" and “Wait_for_Insert_GPRS_Subs_Data_Cnf” (see clauses 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 3GPP 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.

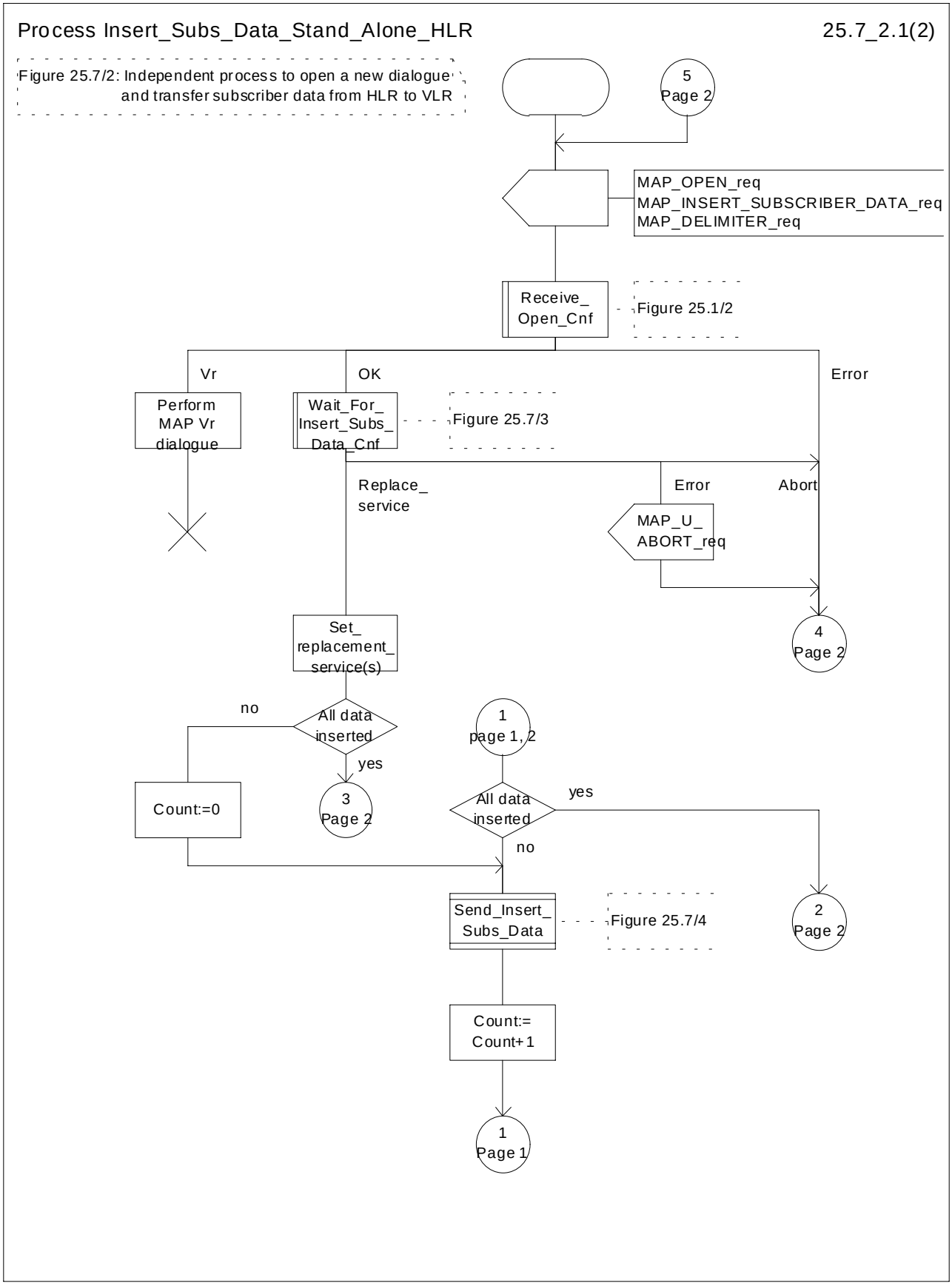


Figure 25.7/2 (sheet 1 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

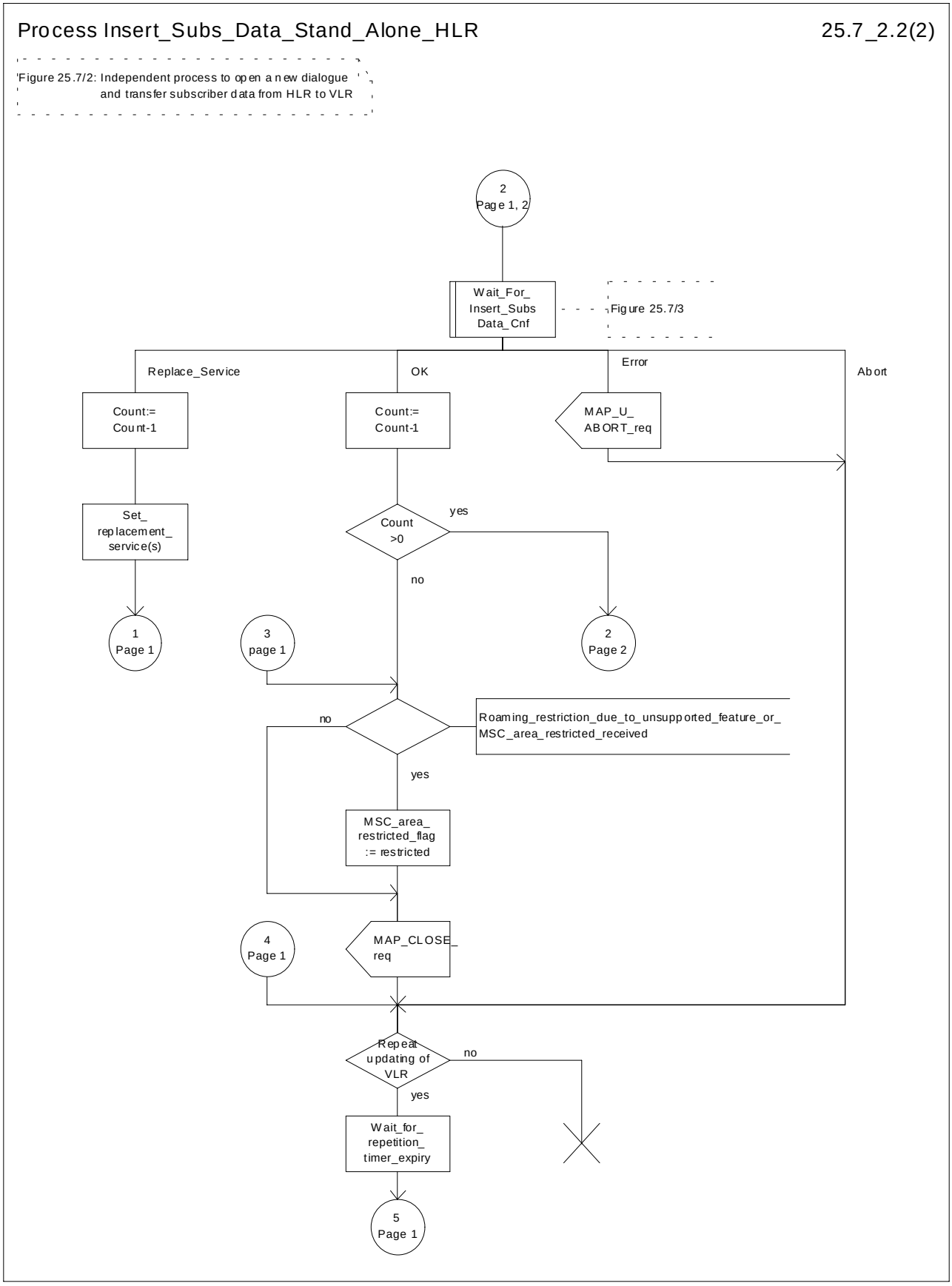


Figure 25.7/2 (sheet 2 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

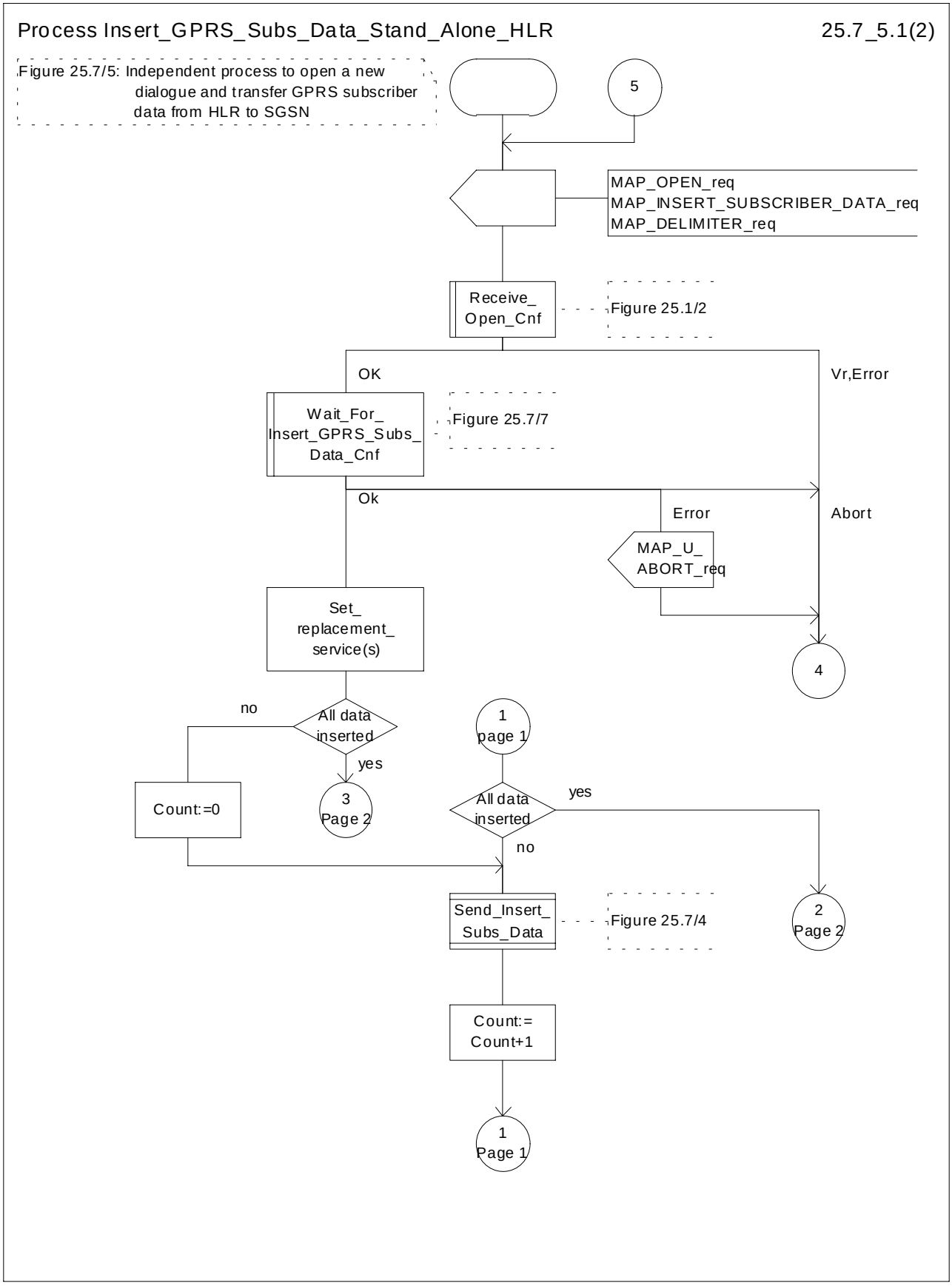


Figure 25.7/5 (sheet 1 of 2): Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

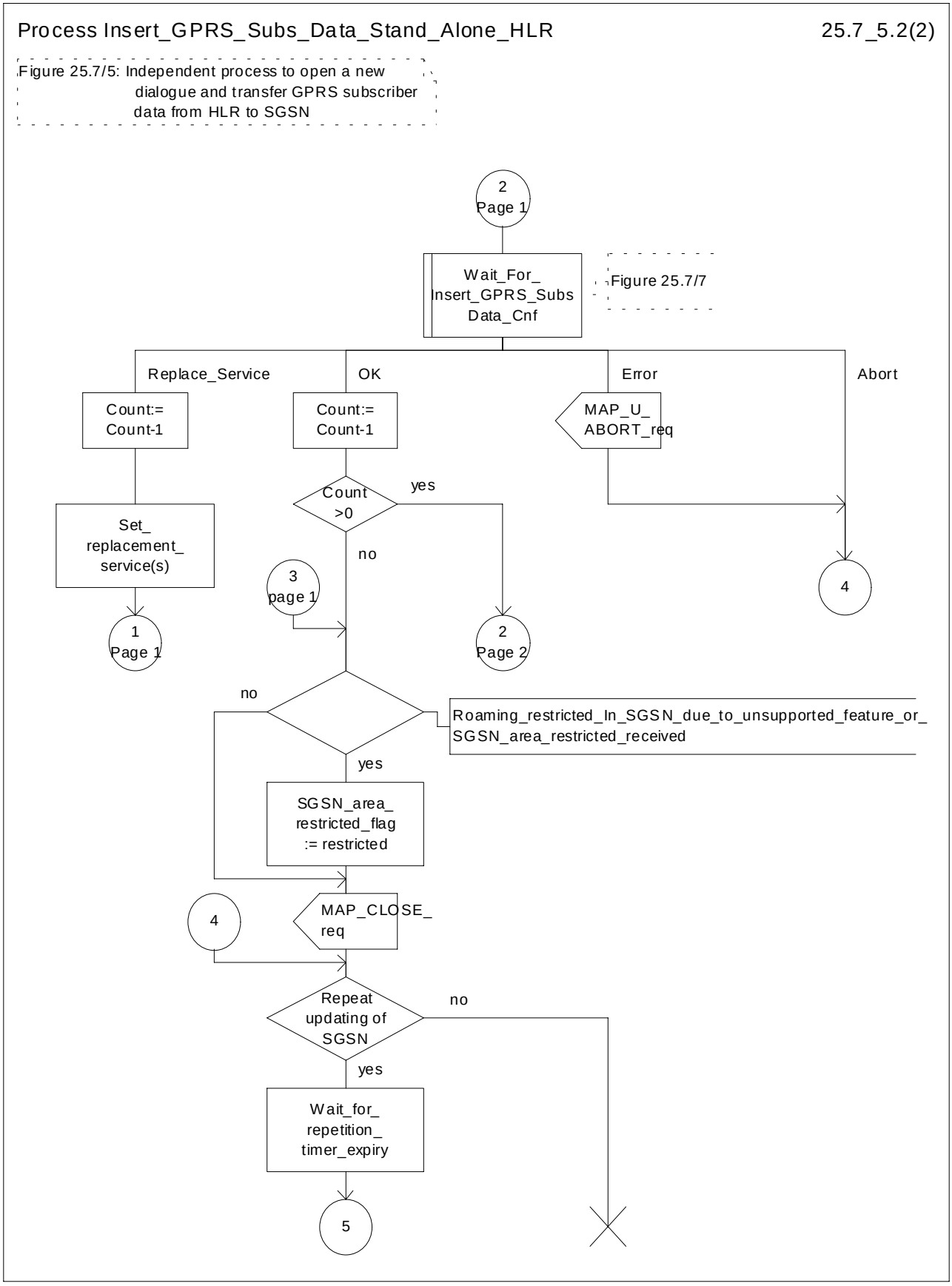


Figure 25.7/5 (sheet 2 of 2): Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

25.7.3 Macro Wait_for_Insert_Subs_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.

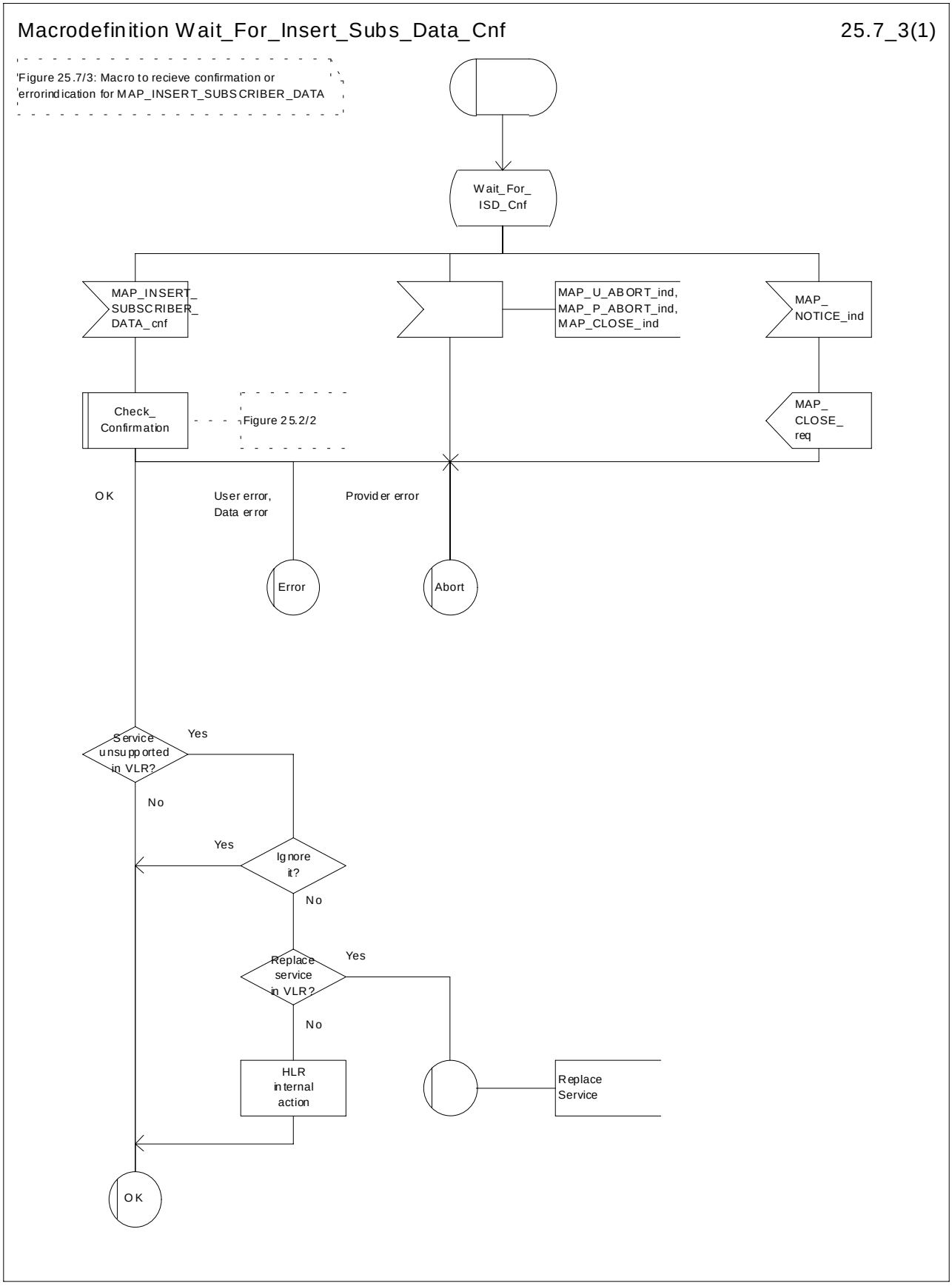


Figure 25.7/3: Macro Wait_for_Insert_Subs_Data_Cnf

25.7.4 Process Send_Insert_Subs_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.

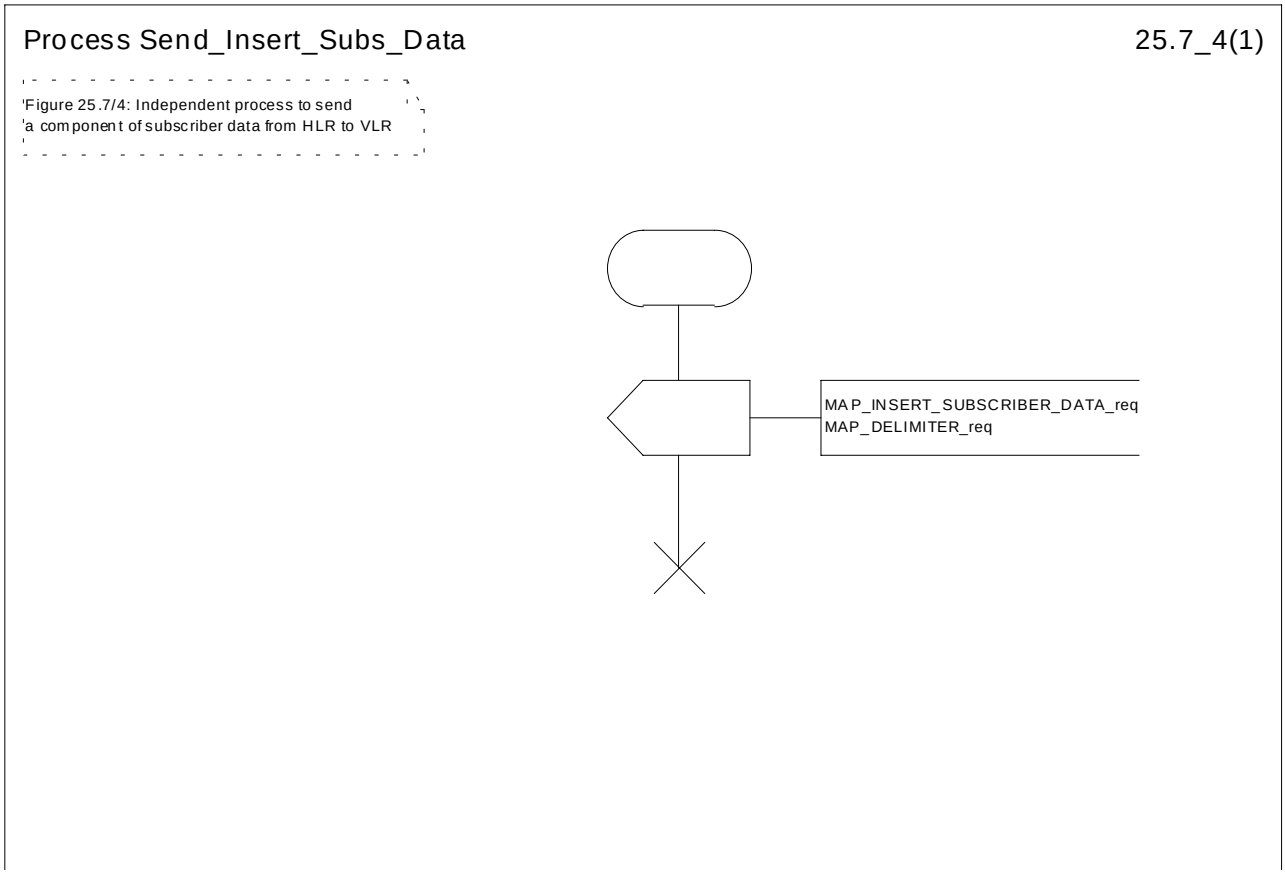


Figure 25.7/4: Process Send_Insert_Subs_Data

25.7.5 Macro Insert_Subs_Data_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.

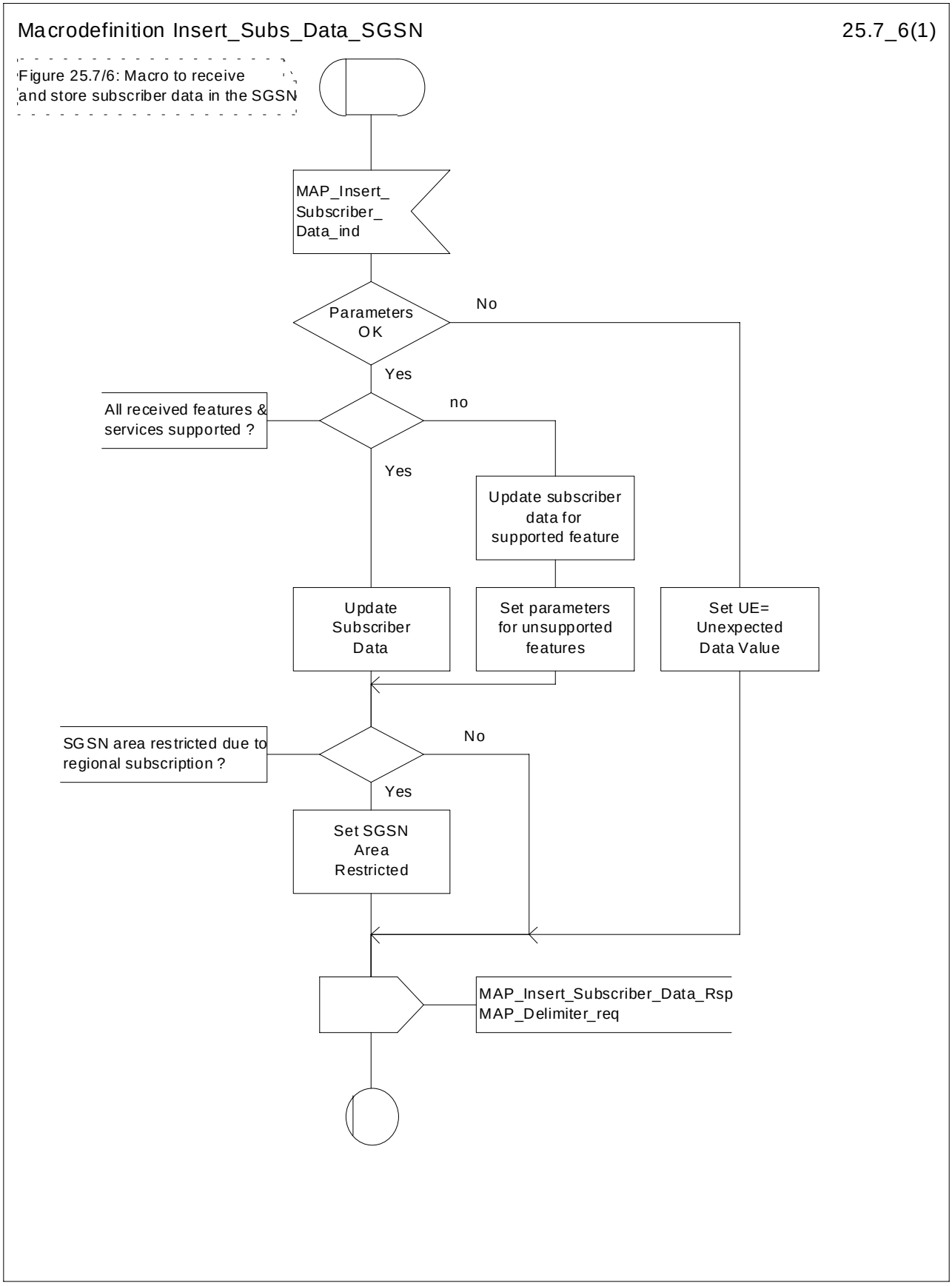


Figure 25.7/6: Macro Insert_Subs_Data_SGSN

25.7.6 Macro Wait_for_Insert_GPRS_Subs_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.

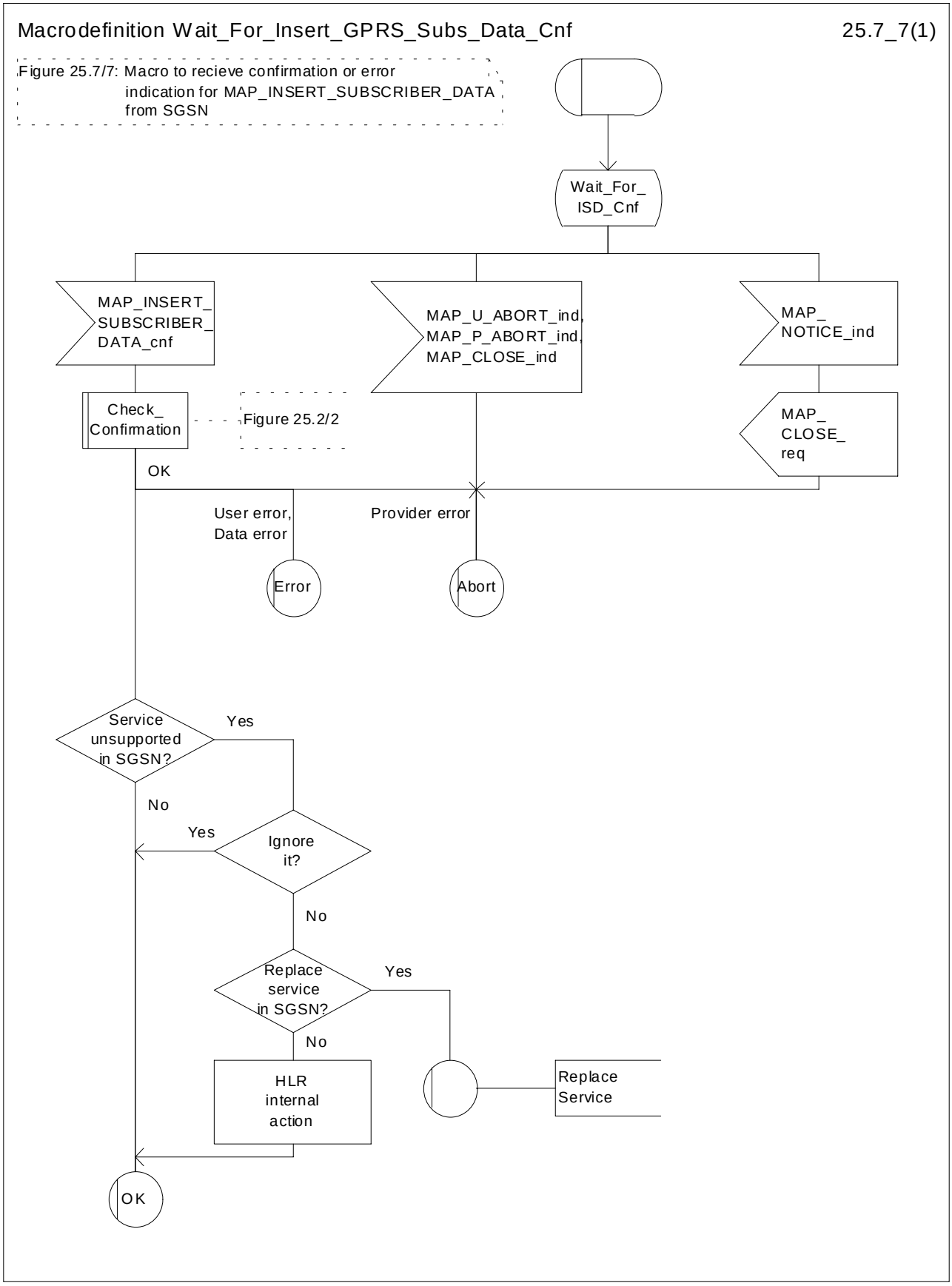


Figure 25.7/7: Macro Wait_for_Insert_GPRS_Subs_Data_Cnf

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.

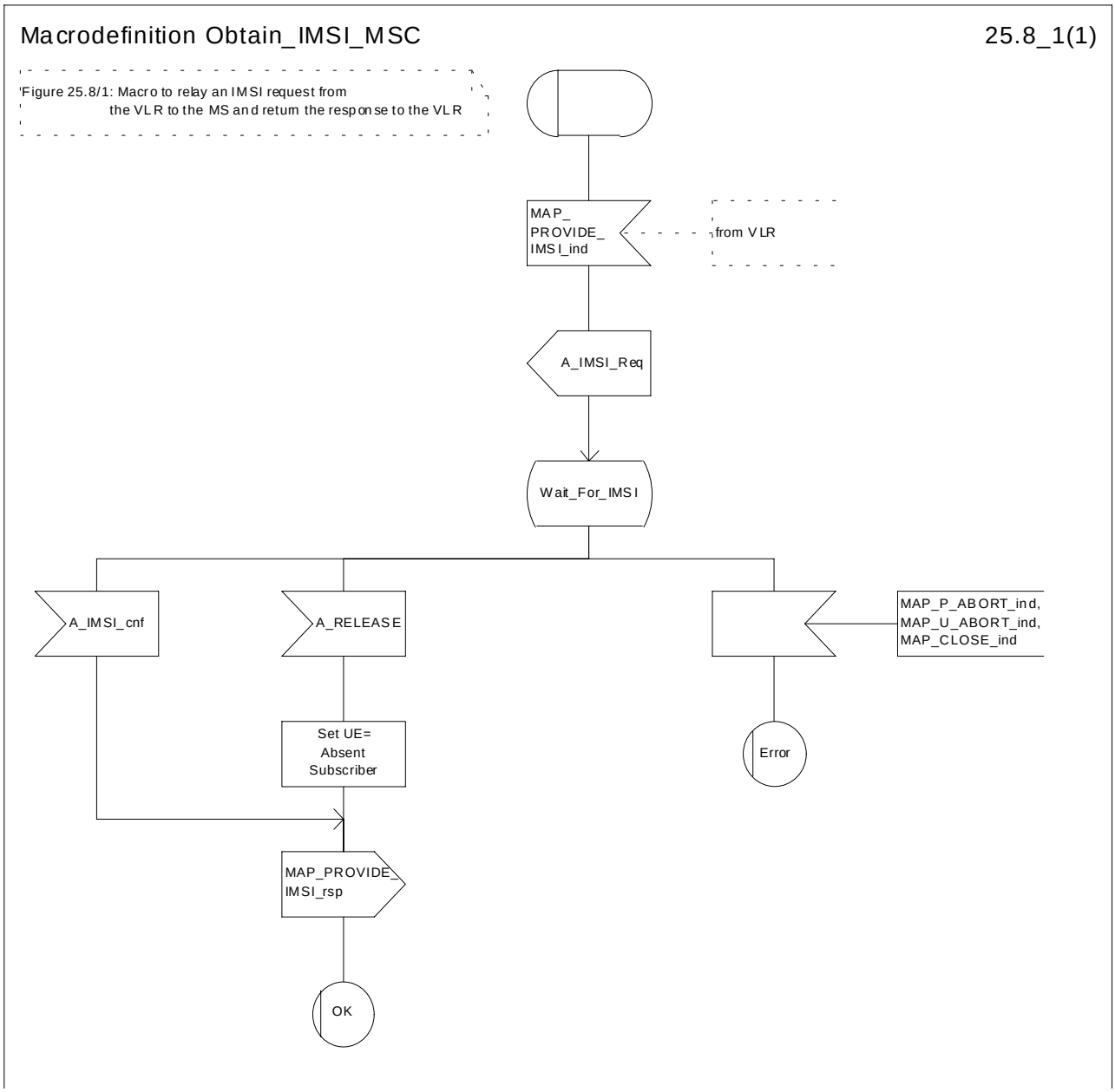


Figure 25.8/1: Macro Obtain_IMSI_MSC

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.

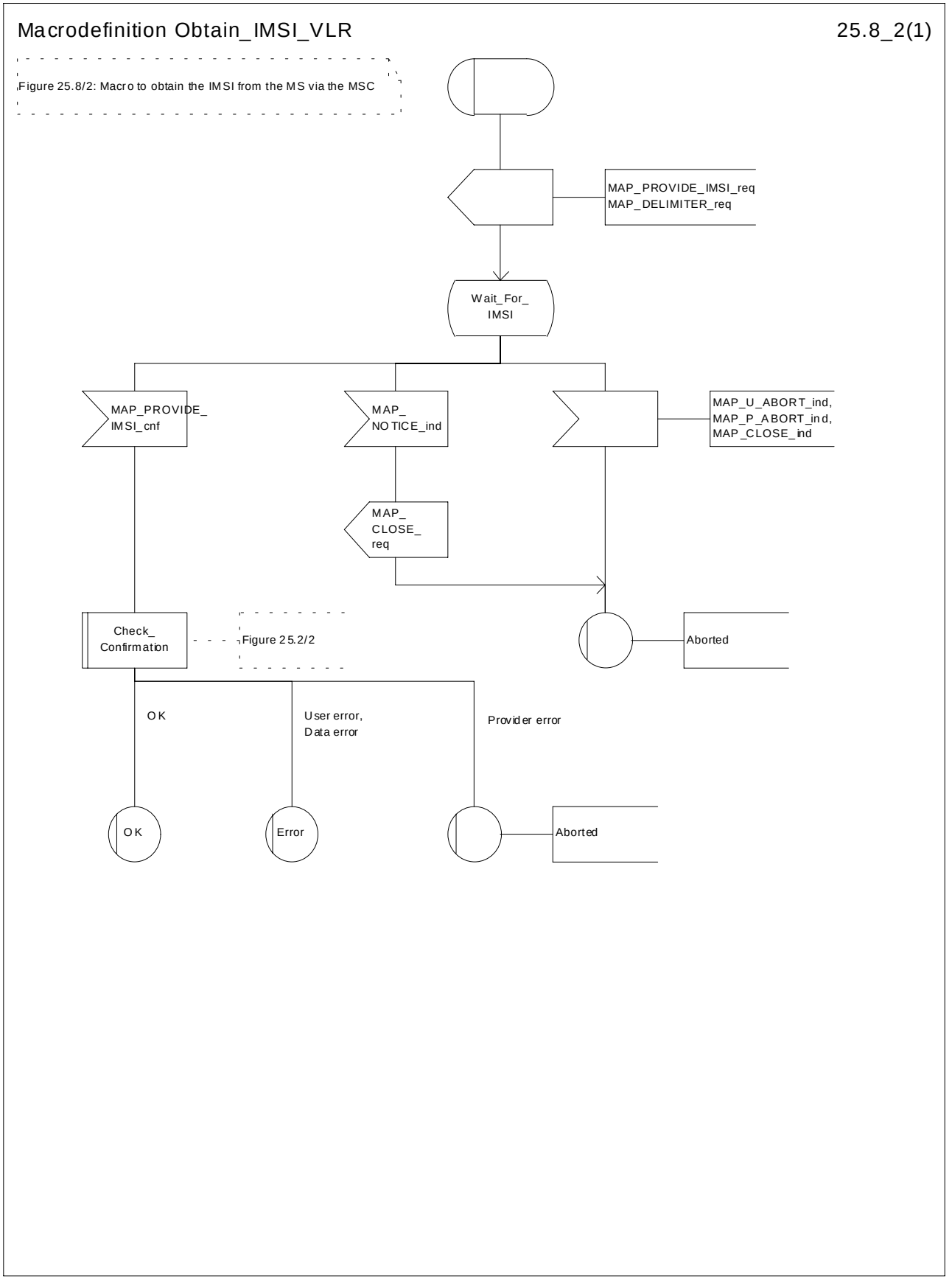


Figure 25.8/2: Macro Obtain_IMSI_VLR

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.

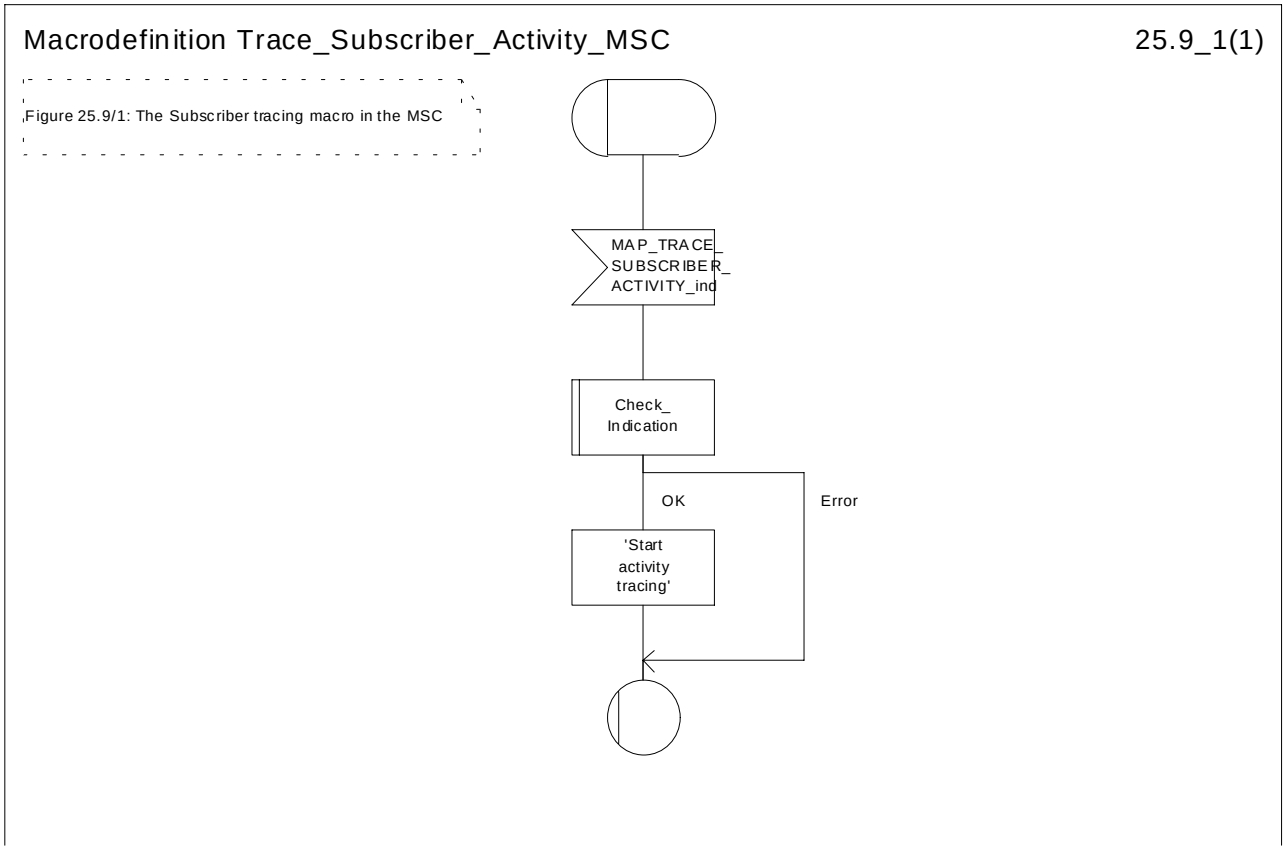


Figure 25.9/1: Macro Trace_Subscriber_Activity_MSC

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.

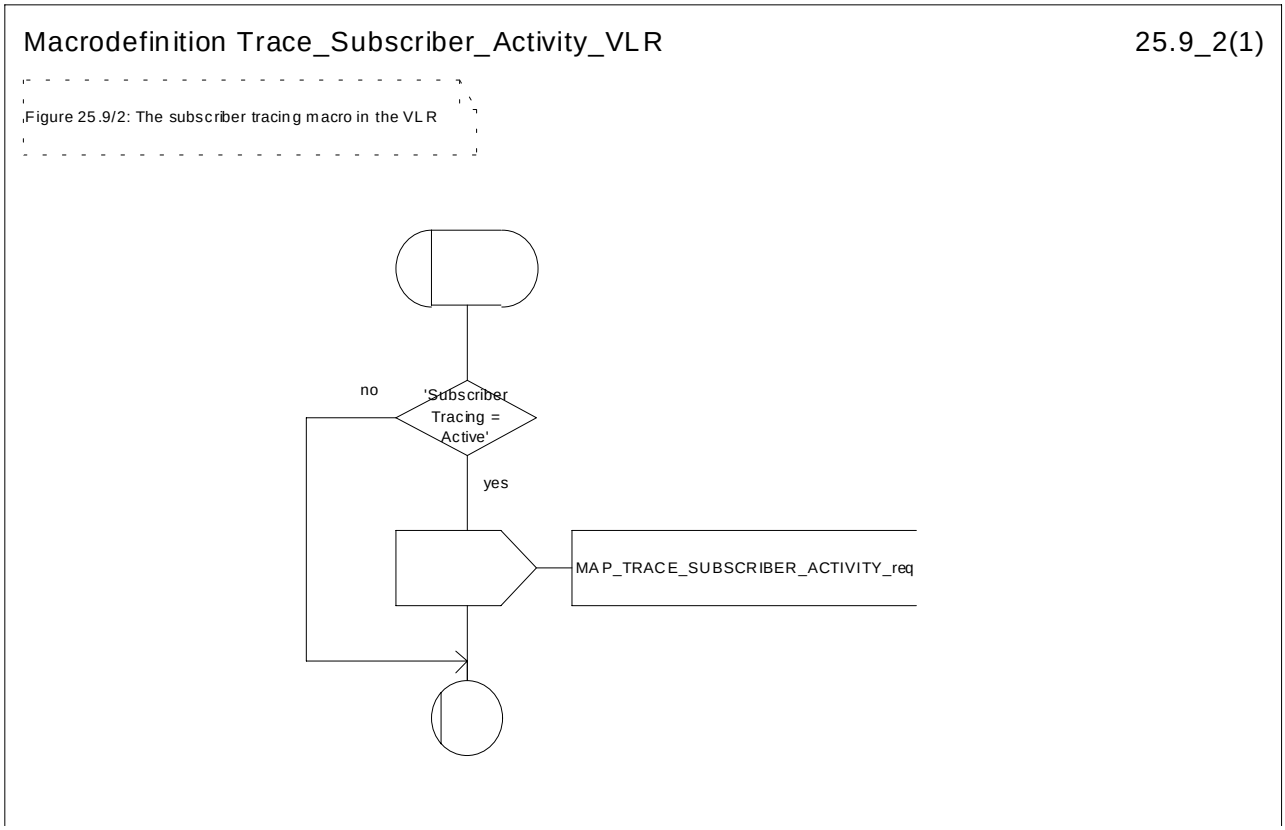


Figure 25.9/2: Macro Trace_Subscriber_Activity_VLR

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 are detected, the tracing is set active and a positive acknowledgement is returned to the HLR.

The Activate_Tracing_VLR macro is described in the figure 25.9/3.

Macrodefinition Activate_Tracing_VLR 25.9_3(1)

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

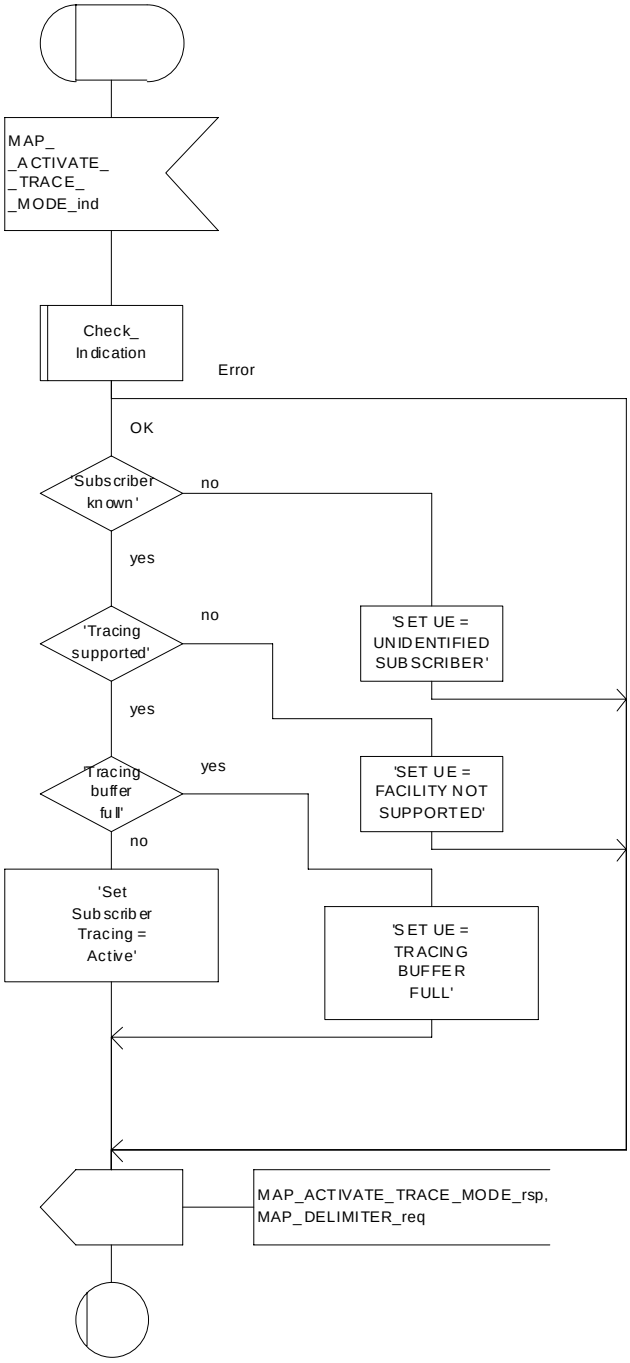


Figure 25.9/3: Macro Activate_Tracing_VLR

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 acknowledgement, 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 to 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.

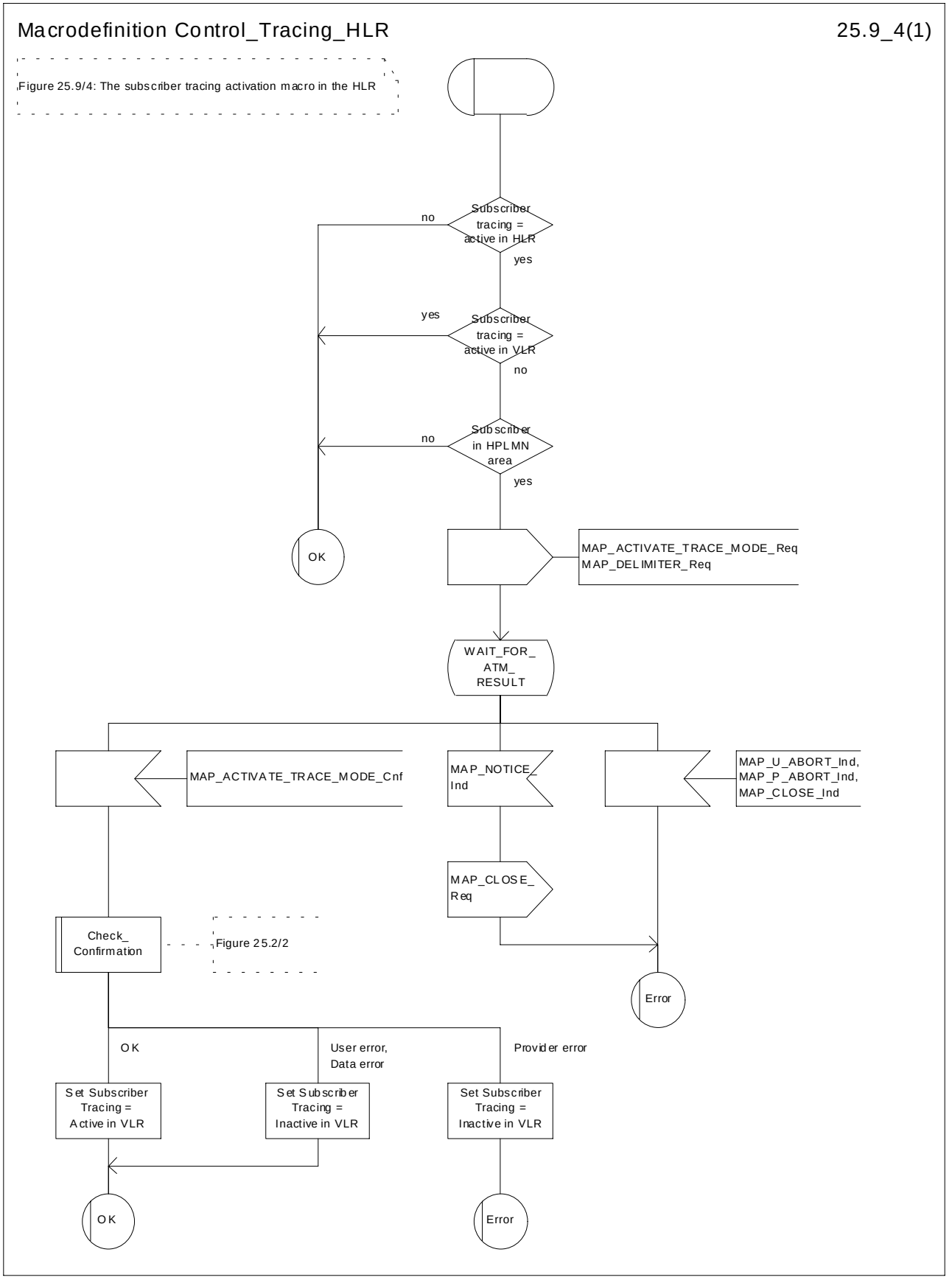


Figure 25.9/4: Macro Control_Tracing_HLR

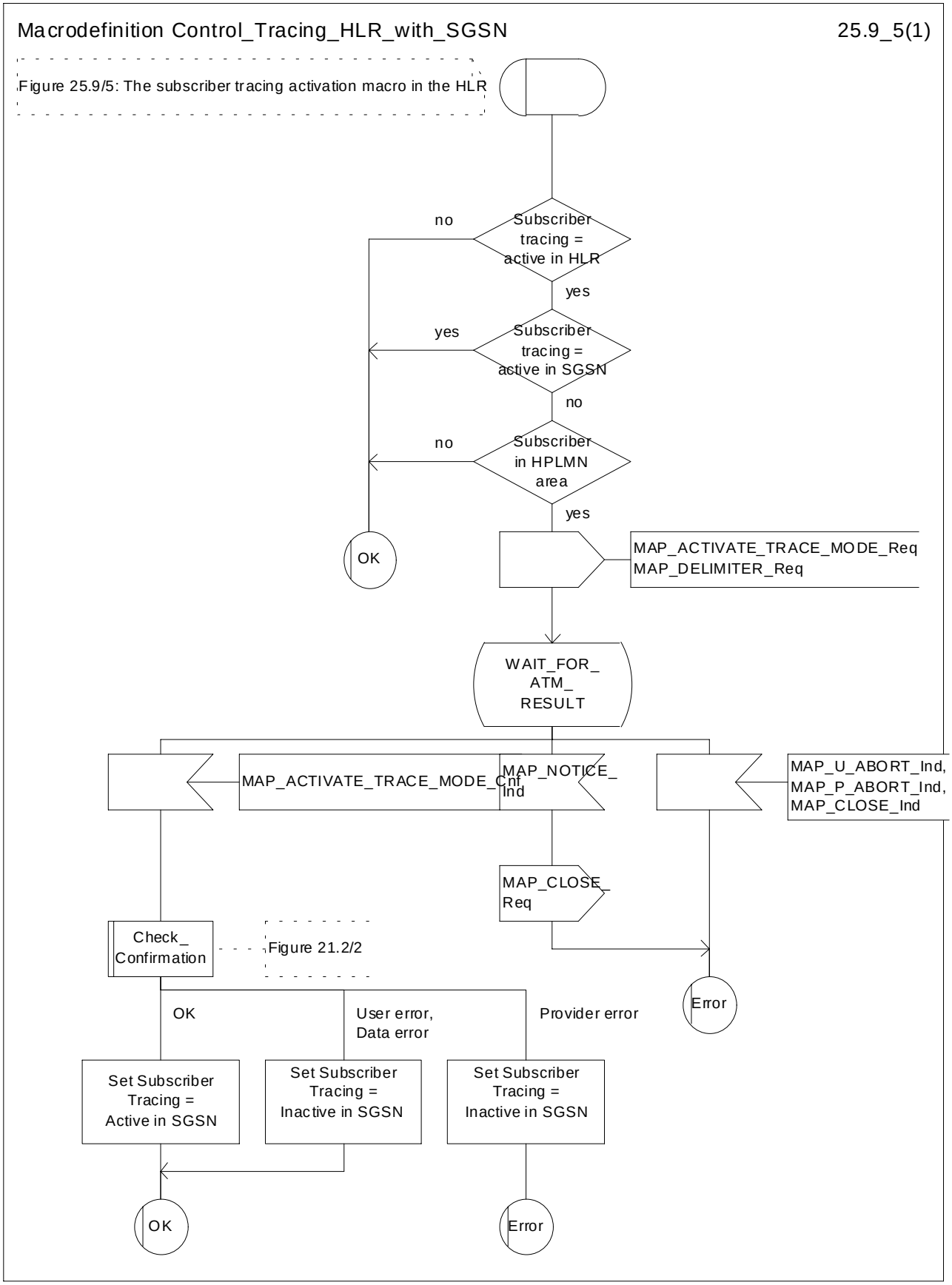


Figure 25.9/5: Macro Control_Tracing_HLR_with_SGSN

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.

Macrodefinition Trace_Subscriber_Activity_SGSN 25.9_6(1)

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

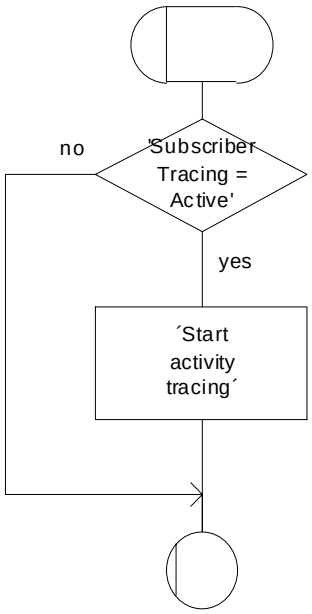


Figure 25.9/6: Macro Trace_Subscriber_Activity_SGSN

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 are detected, the tracing is set active and a positive acknowledgement is returned to the HLR.

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

Macrodefinition Activate_Tracing_SGSN 25.9_7(1)

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

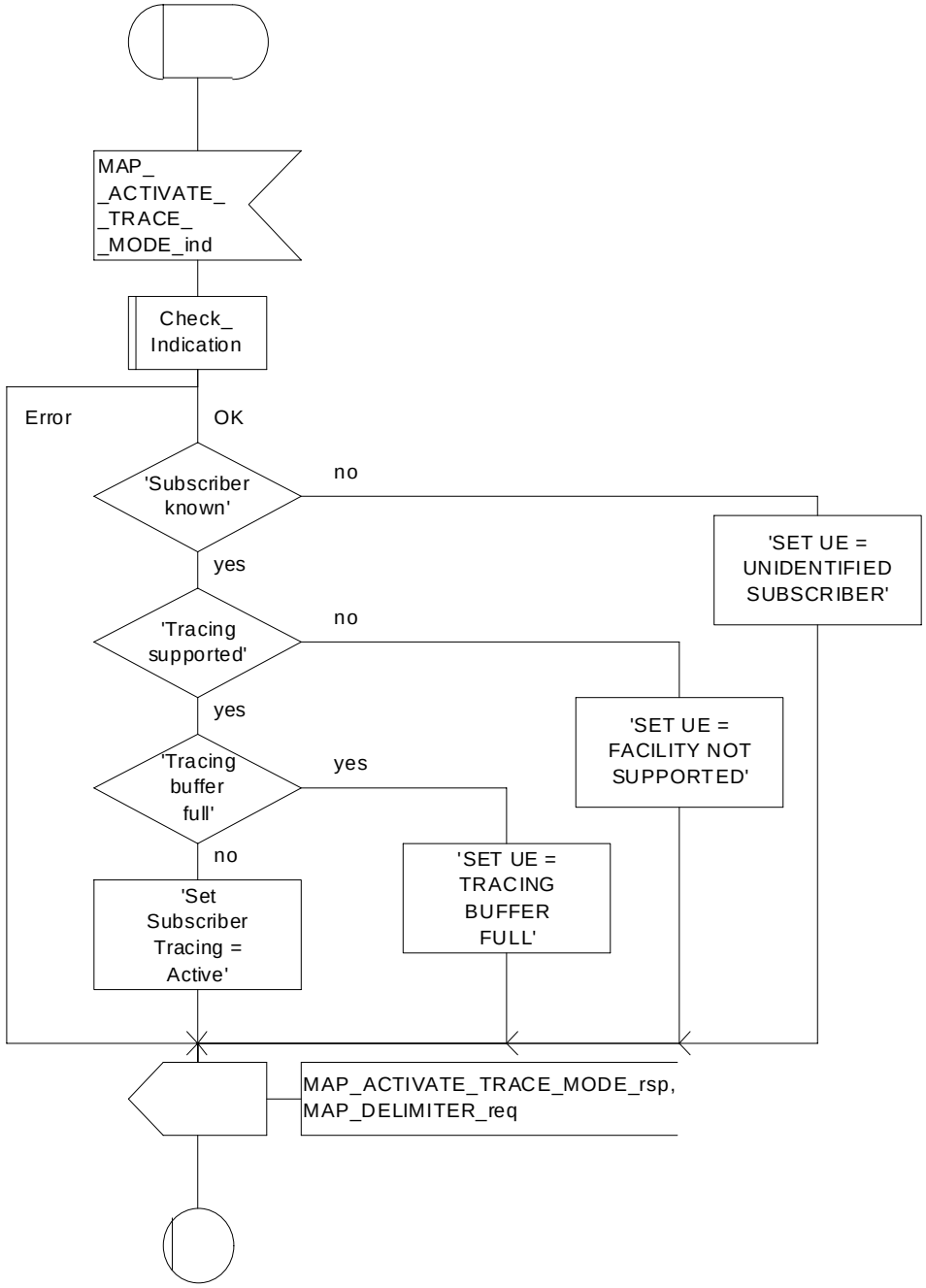


Figure 25.9/7: Macro Activate_Tracing_SGSN

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 clause 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.

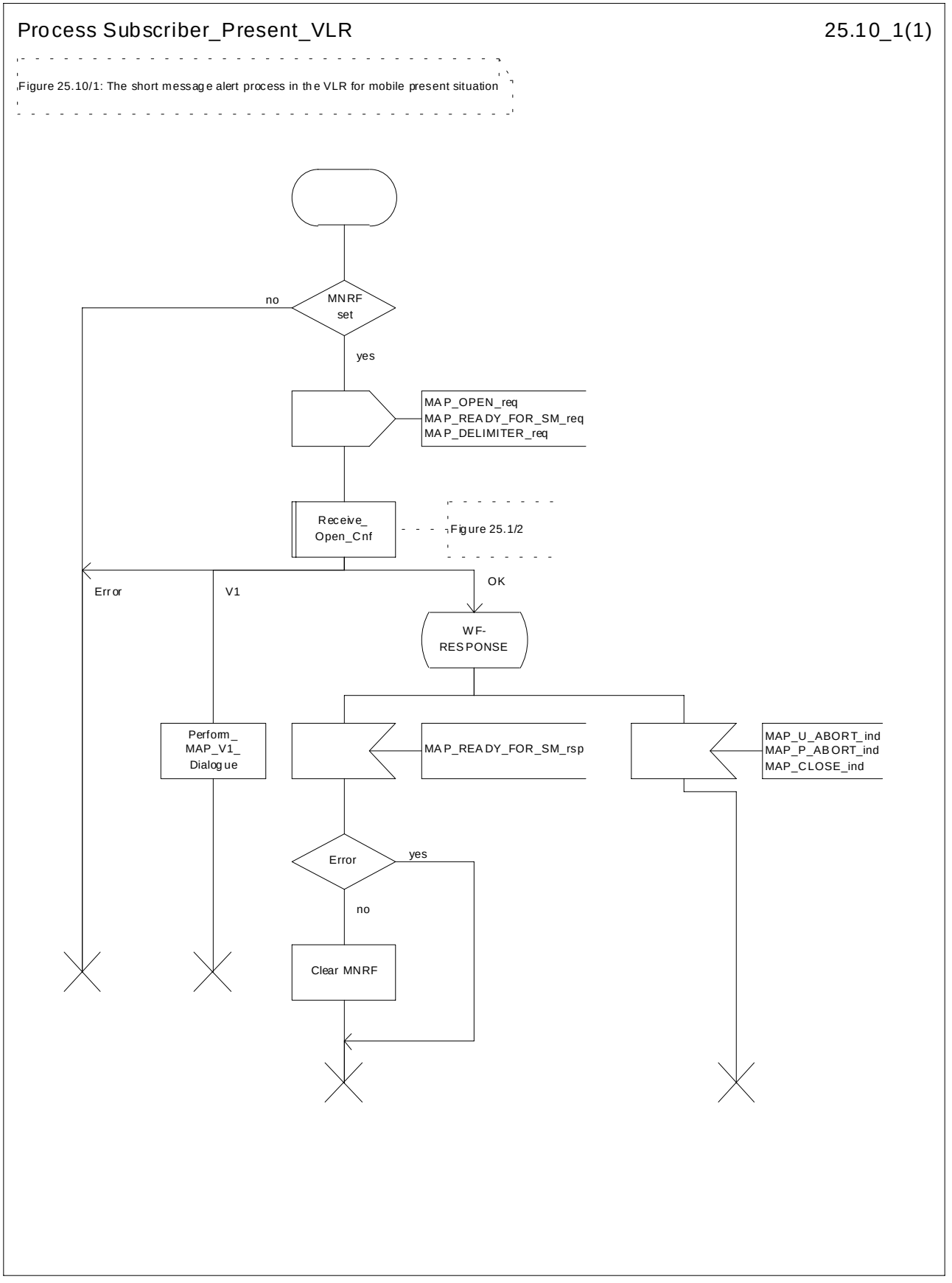


Figure 25.10/1: Process Subscriber_Present_VLR

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 acknowledgement 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.

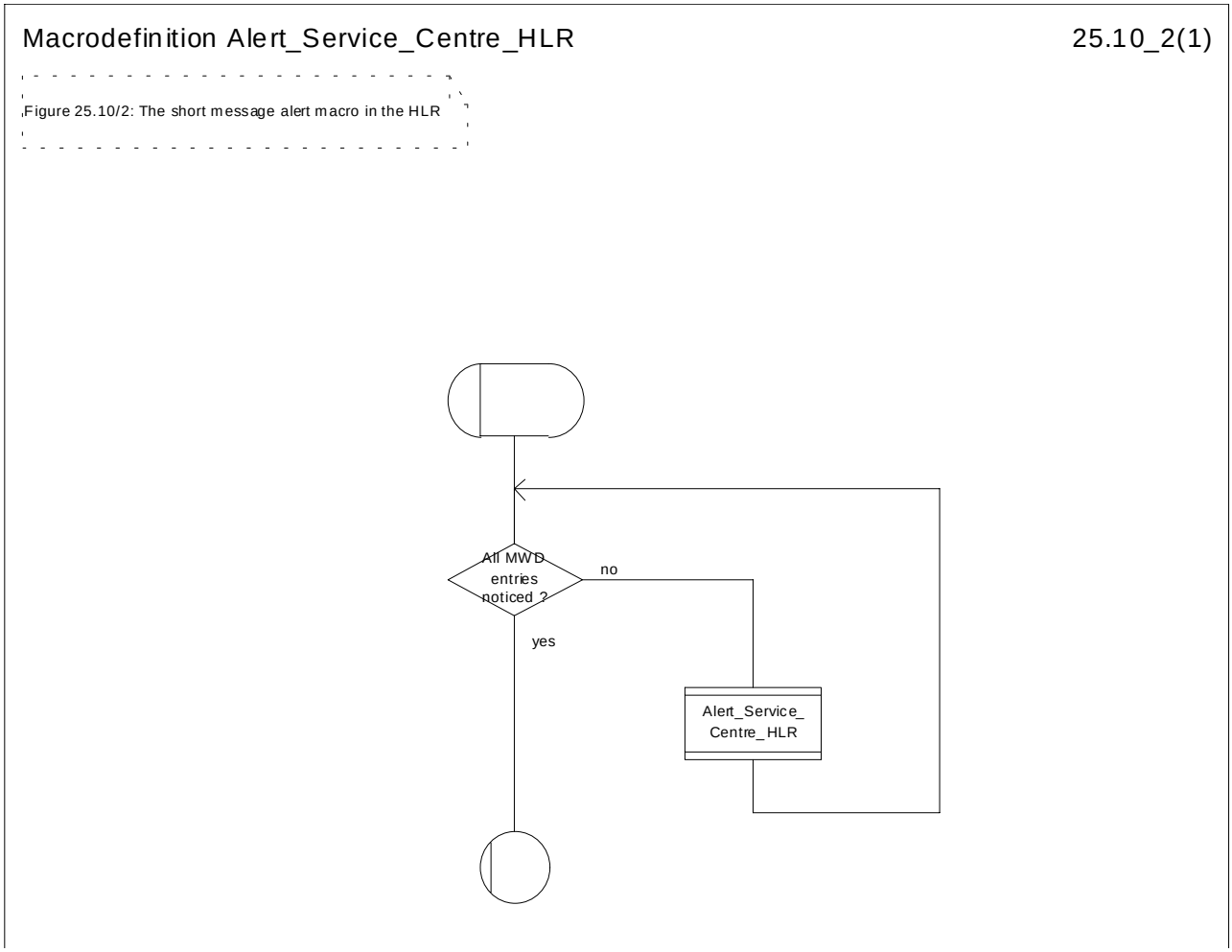


Figure 25.10/2: Macro Alert_Service_Centre_HLR

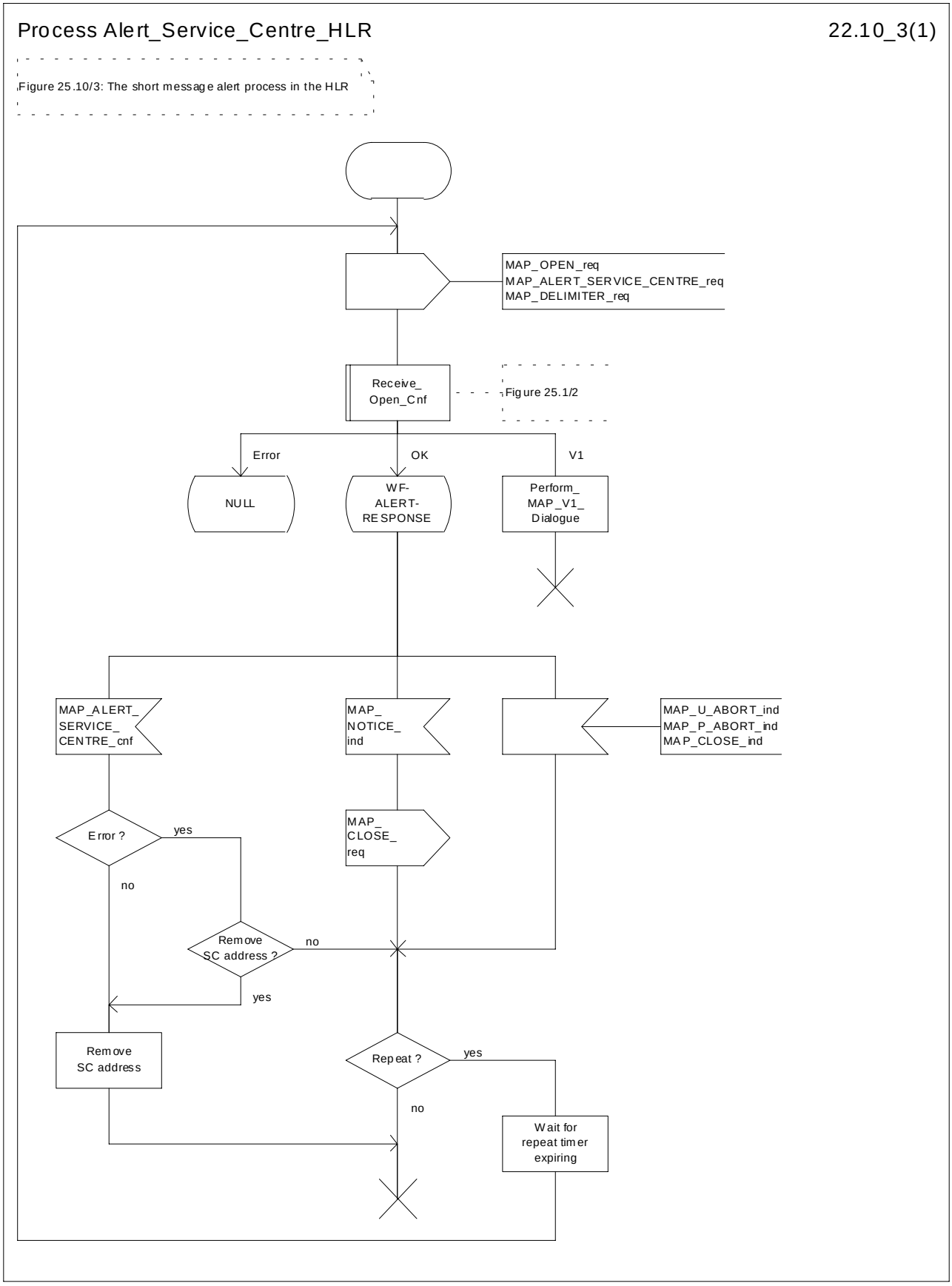


Figure 25.10/3: Process Alert_Service_Centre_HLR

25.10.3 The Mobile Subscriber is present

When receiving Page response, Attach request or Routing area update request messages (3GPP TS 24.008 [35]), 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.

Process Subscriber_Present_SGSN 25.10_4(1)

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

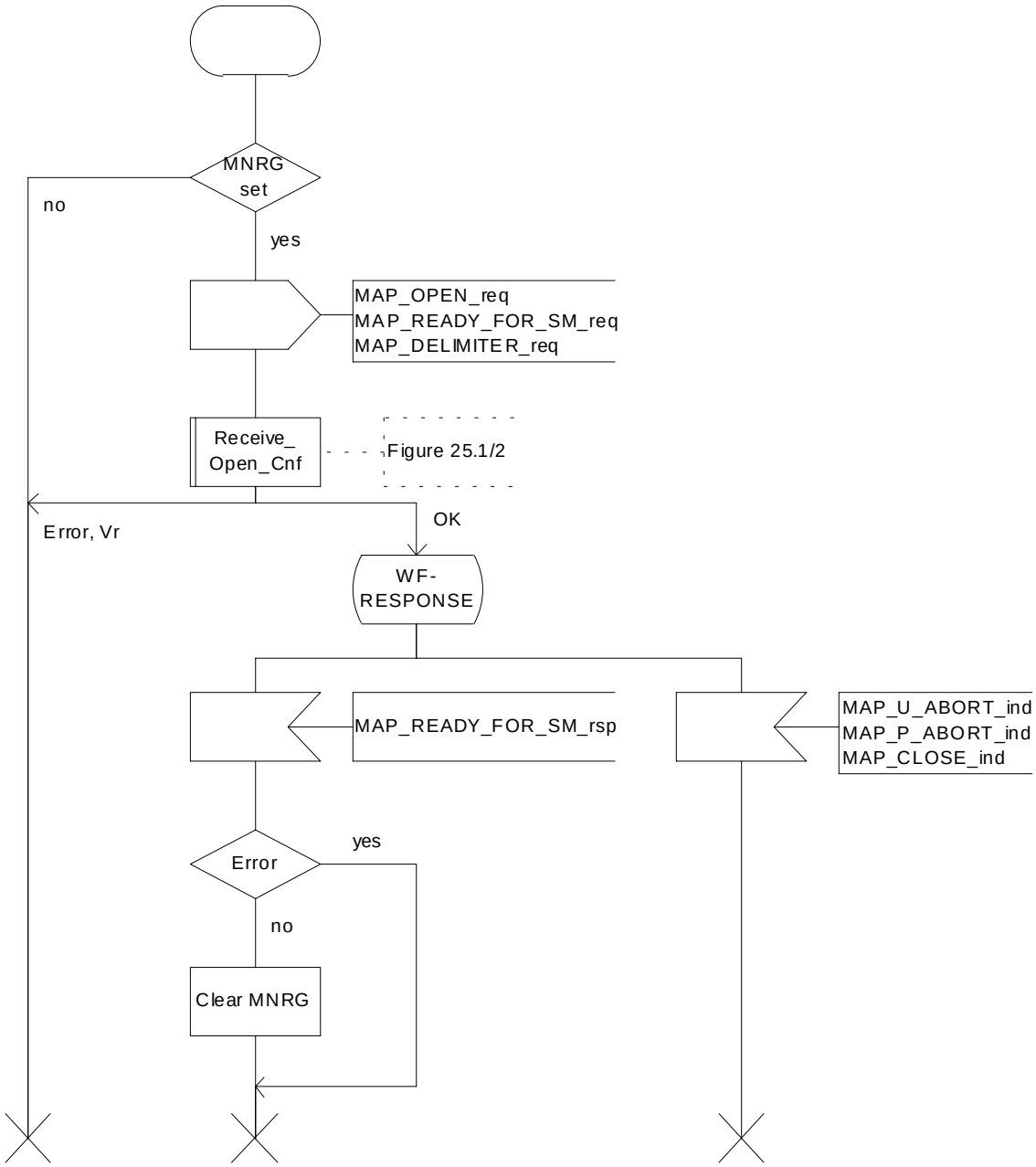


Figure 25.10/4: Process Subscriber_Present_SGSN

3GPP TSG CN WG4 Meeting #12
Sophia Antipolis, France,
28th January – 2nd February 2002

N4-020009
(Revision of N4-011249)

CR-Form-v5

CHANGE REQUEST

⌘ **23.083** **CR** **009** ⌘ **rev** **1** ⌘ Current version: 4.3.0 ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Introduction of CAMEL Phase 4
Source:	⌘	CN4
Work item code:	⌘	CAMEL4
Date:	⌘	11th January 2002
Category:	⌘	**B**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	This CR combines the CRs to 3GPP TS 23.083 that have been approved in TSG-CN2 under the CAMEL Phase 4 work item.
Summary of change:	⌘	This version introduces the changes to the Process_Call_Waiting procedure based on those proposed to the same procedure in N2-010234. In addition, the following CRs have been incorporated: • N2-010499: Handling of reconnect on leg 2 disconnect (MT and VT call cases)
Consequences if not approved:	⌘	CAMEL Phase 4 is incomplete.

Clauses affected:	⌘	1.2		
Other specs affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	23.018, 23.078, 23.079, etc.
Other comments:	⌘	Changes since the previous version (N2-010869, N4-011249): • Update of base version (4.2.0 -> 4.3.0)		

****** Modified Section ******

1.2 Functions and information flows

…

The procedure Process_Call _Waiting is shown in figure 1.5.

Sheet 1: the procedure Set_CLIP_Info_MSC is specific to CLIP; it is specified in 3GPP TS 23.018 [5].

Sheet 1: the procedure Derive_CS_BC_MSC is specified in 3GPP TS 23.018 [5].

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 Set-up and Call Confirmed messages.

Sheet 1: the Call Confirmed message indicates "busy" for the successful case.

Sheet 1: the procedure Establish_Terminating_TCH_Multicall1 is specific to Multicall; it is specified in 3GPP TS 23.135 [7]. If the VMSC does not support Multicall, processing continues from the “Yes” exit of the test “Result=Pass?”.

Sheet 1: the procedure UUS_ICH_UUS1_Implicit_Active is specific to UUS; it is specified in 3GPP TS 23.087 [8].

Sheet 1: the procedure CCBS_Report_Not_Idle is specific to CCBS; it is specified in 3GPP TS 23.093 [9].

Sheet 2, sheet 3, sheet 5: the procedure UUS_ICH_Check_Support is specific to UUS; it is specified in 3GPP TS 23.087 [8]. If the VMSC does not support UUS, processing 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 3GPP TS 23.093 [9].

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

Sheet 2: the procedure CAMEL_Start_TNRy is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [6].

Sheet 2: the procedure Send_ACM_If_Required is specified in 3GPP TS 23.018 [5].

Sheet 2: The procedure CAMEL_MT_MSC_ALERTING is specific to CAMEL phase 4 or later; it is specifed in 3GPP TS 23.078 [6]. If the VMSC does not support CAMEL phase 4 or later, processing continues from the "Pass" exit of the test "Result?".

Sheet 2, 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 2, sheet 8: the procedure Handling_CD_MSC is specific to Call Deflection; it is specified in 3GPP TS 23.072 [10].

Sheet 2, sheet 3, sheet 6, sheet 7: the procedure CAMEL_MT_GMSC_DISC4 is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [6]. If the VMSC does not support CAMEL phase 3 or later, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 2, sheet 3, sheet 4, sheet 8: the procedure CCBS_ICH_MSC_Report_Failure is specific to CCBS; it is specified in 3GPP TS 23.093 [9].

Sheet 3, sheet 7: the Release transaction (reject) message covers all unsuccessful cases not otherwise indicated.

Sheet 4, sheet 7: the procedure UUS_MSC_Check_UUS1_UUI is specific to UUS; it is specified in 3GPP TS 23.087 [8].

Sheet 4, sheet 8: the procedure CAMEL_MT_GMSC_DISC6 is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [6].

Sheet 5: the procedure CAMEL_Stop_TNRy is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [6].

Sheet 5: the procedure Establish_Terminating_TCH_If_Required is specified in 3GPP TS 23.018 [5].

Sheet 5: the procedure Establish_Terminating_TCH_Multicall is specific to Multicall; it is specified in 3GPP TS 23.135 [7].

Sheet 6: the procedure Handle_AoC_MT_MSC is specific to AoC; it is specified in 3GPP TS 23.018 [5]. If the VMSC does not support AoC, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 6: the procedure CAMEL_MT_GMSC_ANSWER is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [6]. If the VMSC does not support CAMEL phase 3 or later, processing continues from the "Pass~~Yes~~" exit of the test "Result~~=Pass~~?" on sheet 6.

Sheet 6: the procedure Set_COL_Presentation_Indicator_MSC is specific to COLP; it is specified in 3GPP TS 23.018 [5].

Sheet 6: the procedure Send_Answer_If_Required is specified in 3GPP TS 23.018 [5]

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

Sheet 7: the procedure CAMEL_MT_GMSC_DISC5 is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [6]. If the VMSC does not support CAMEL phase 3 or later, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 7, sheet 8: the procedure UUS_ICH_Check_Forwarding is specific to UUS; it is specified in 3GPP TS 23.087 [8]. If the VMSC does not support UUS, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 7, sheet 8, sheet 9: the procedure UUS_MSC_Check_UUS1_UUI is specificto UUS; it is specified in 3GPP TS 23.087 [8].

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 3GPP TS 23.087 [8].

Sheet 8: the procedure CD_UUS_Interaction is specific to Call Deflection; it is specified in GSM 23.072 [10].

Sheet 9: the procedure CCBS_ICH_MSC_Report_Failure is specific to CCBS; it is specified in 23.093 [9].

Sheet 9: the procedure CAMEL_MT_GMSC_DISC6 is specific to CAMEL; it is specified in 23.078 [6].

…

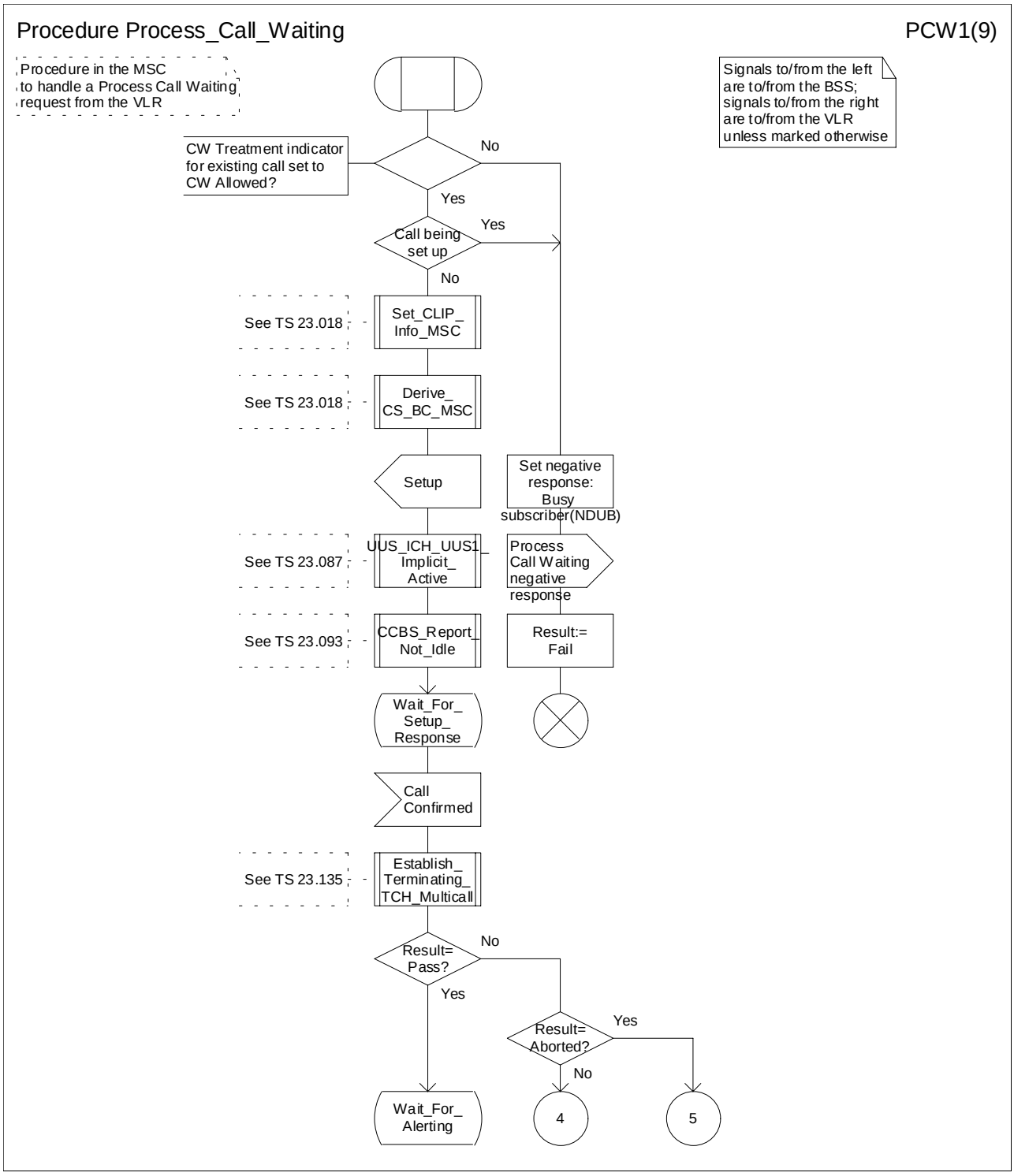
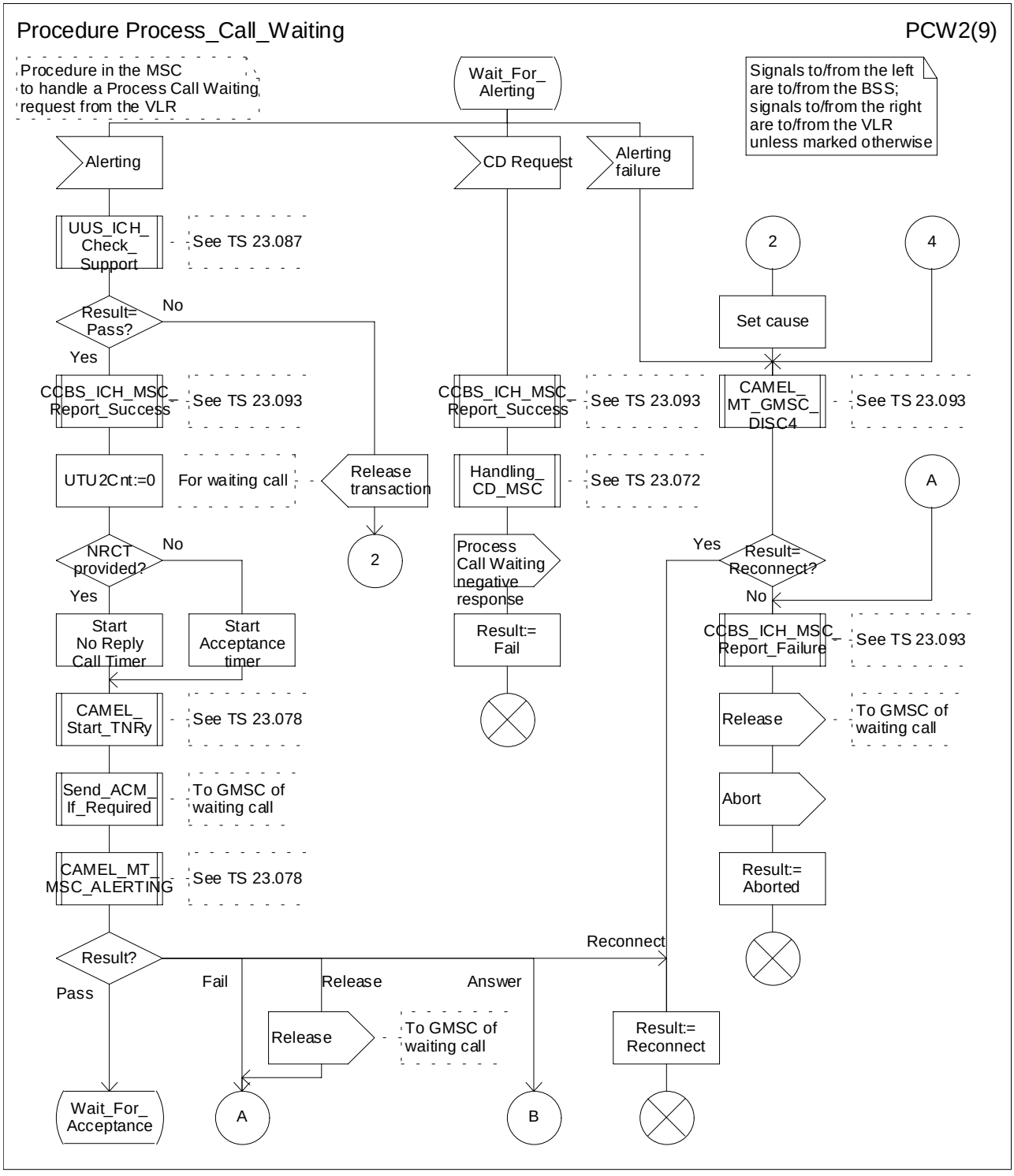


Figure 1.5 (sheet 1 of 9): Procedure Process_Call_Waiting


Procedure Process_Call_Waiting
PCW2(9)
Procedure in the MSC to handle a Process Call Waiting request from the VLR
Wait_For_ Alerting
Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise
Alerting
CD Request
Alerting failure
UUS_ICH_ Check_ Support
See TS 23.087
2
4
Result= Pass?
No
Yes
Set cause
CCBS_ICH_MSC_ Report_Success
See TS 23.093
CCBS_ICH_MSC_ Report_Success
See TS 23.093
CAMEL_ MT_GMSC_ DISC4
See TS 23.093
UTU2Cnt:=0
For waiting call
Release transaction
Handling_ CD_MSC
See TS 23.072
A
NRCT provided?
No
Yes
2
Process Call Waiting negative response
Yes
Result= Reconnect?
No
Start No Reply Call Timer
Start Acceptance timer
Result:= Fail
CCBS_ICH_MSC_ Report_Failure
See TS 23.093
CAMEL_ Start_TNRy
See TS 23.078
Release
To GMSC of waiting call
Send_ACM_ If_Required
To GMSC of waiting call
Abort
CAMEL_MT_ MSC_ALERTING
See TS 23.078
Result:= Aborted
Result?
Reconnect
Pass
Fail
Release
Answer
Release
To GMSC of waiting call
Result:= Reconnect
Wait_For_ Acceptance
A
B

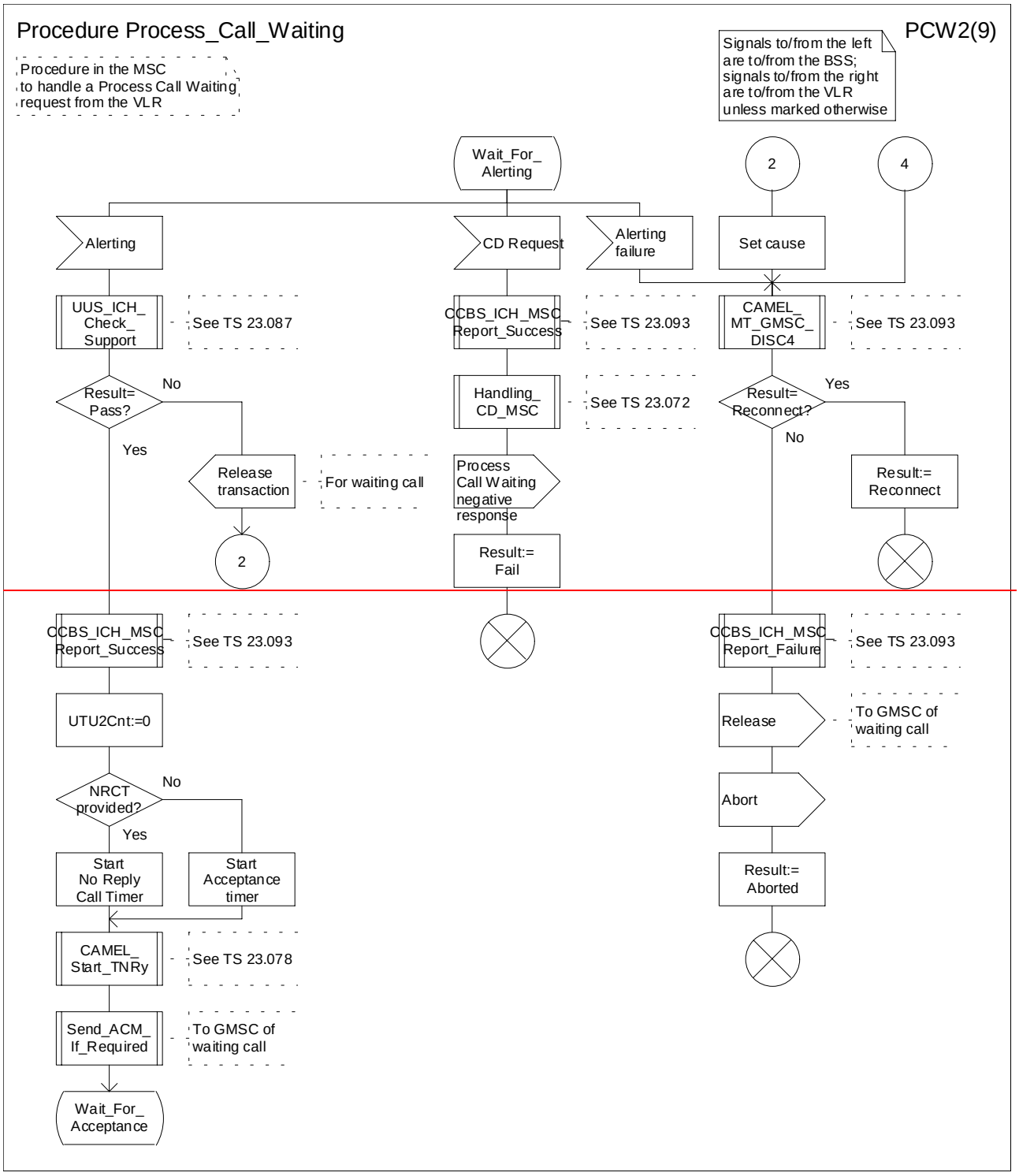


Figure 1.5 (sheet 2 of 9): Procedure Process_Call_Waiting

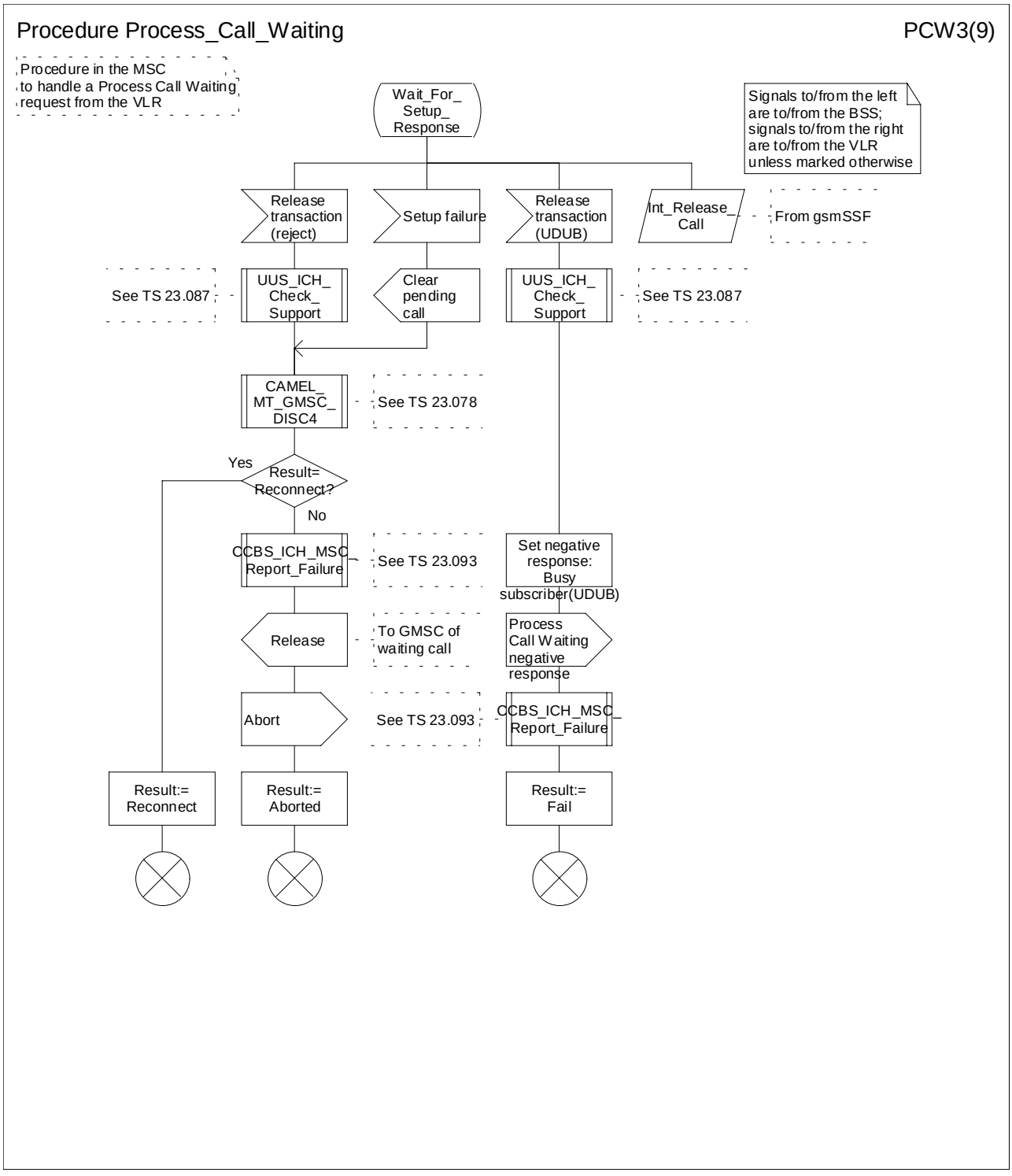


Figure 1.5 (sheet 3 of 9): Procedure Process_Call_Waiting

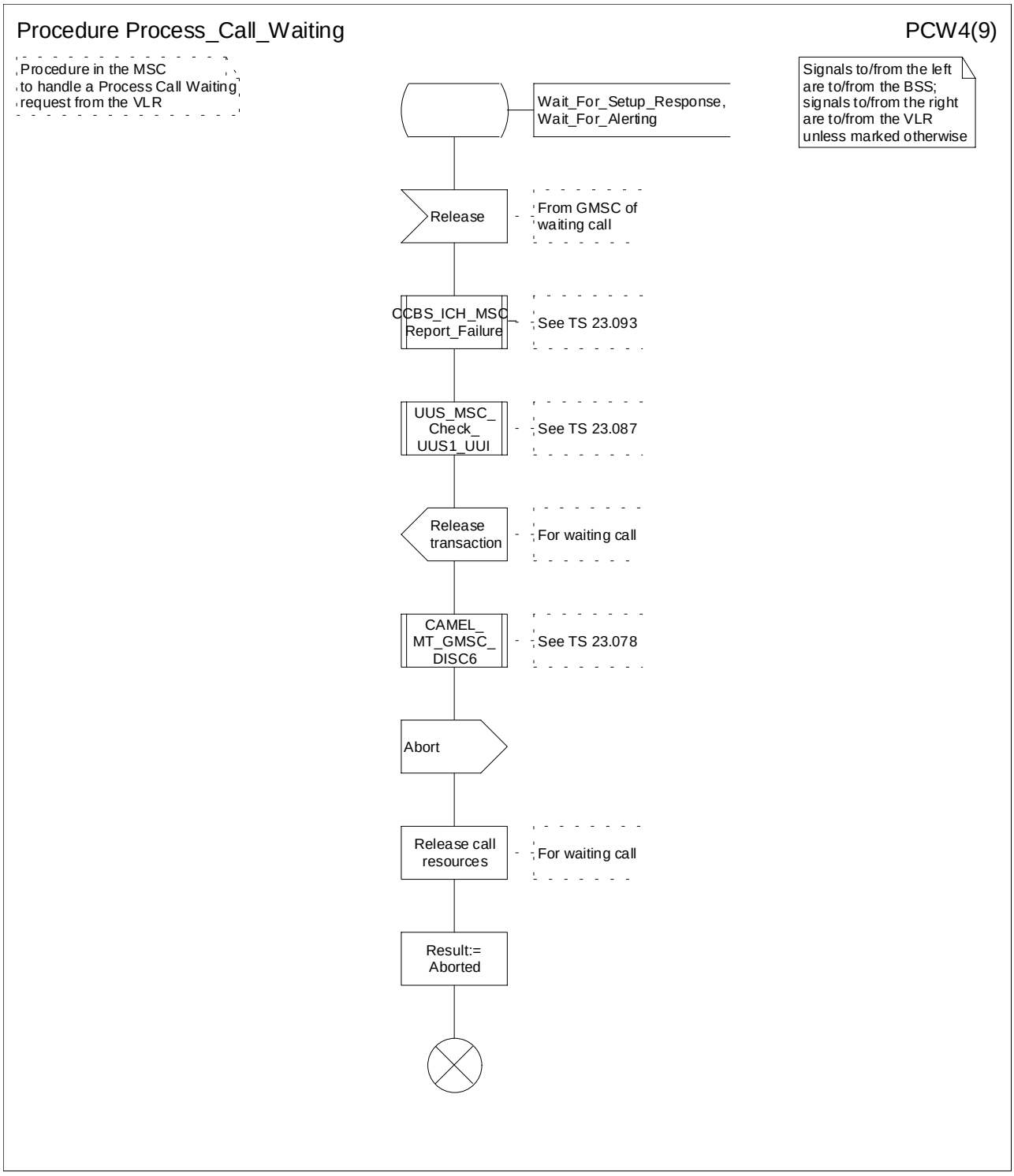
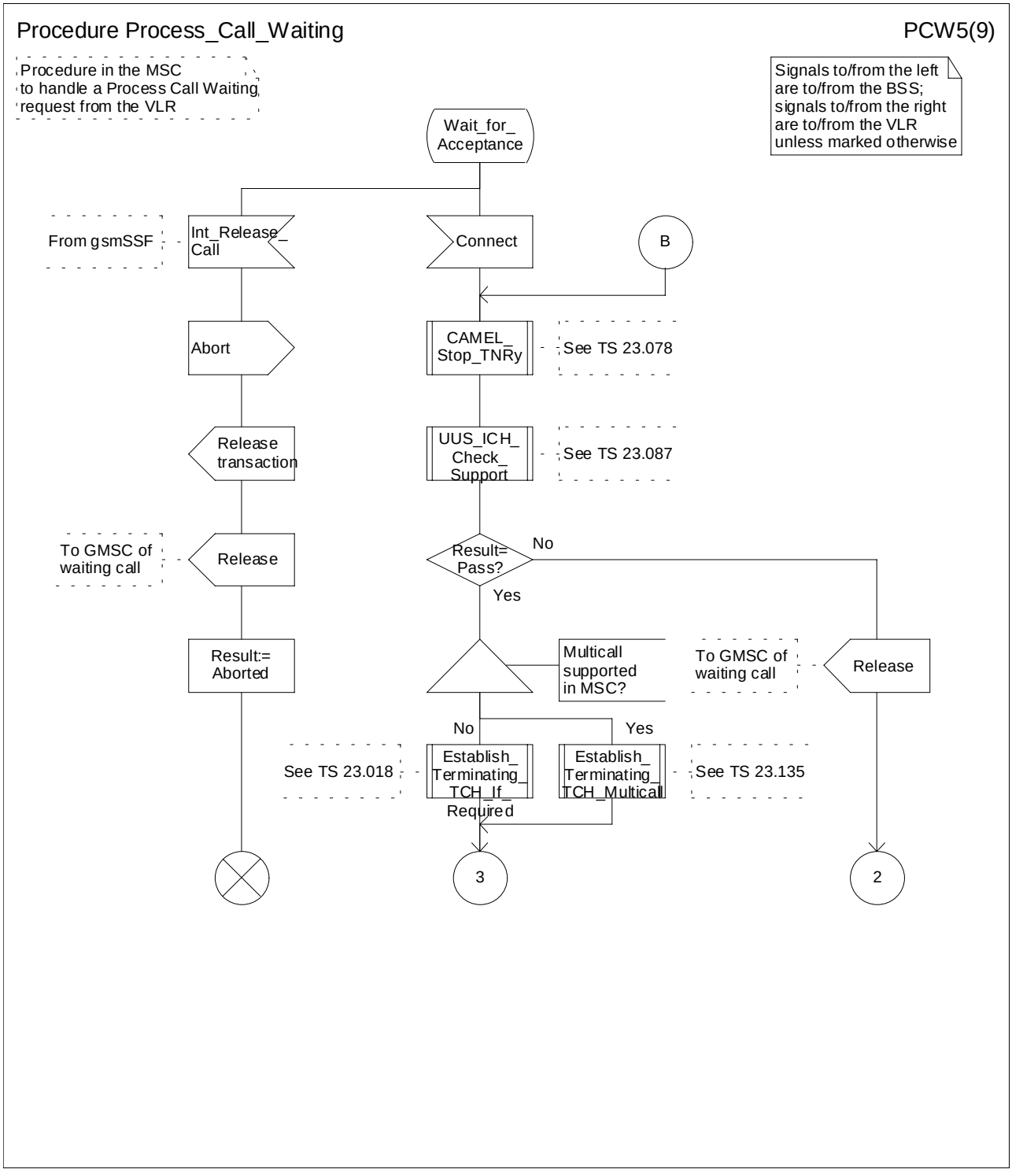


Figure 1.5 (sheet 4 of 9): Procedure Process_Call_Waiting


Procedure Process_Call_Waiting
PCW5(9)
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
Wait_for_ Acceptance
From gsmSSF
Int_Release_ Call
Connect
B
Abort
CAMEL_ Stop_TNRy
See TS 23.078
Release transaction
UUS_ICH_ Check_ Support
See TS 23.087
To GMSC of waiting call
Release
Result= Pass?
No
Yes
Result:= Aborted
Multicall supported in MSC?
To GMSC of waiting call
Release
No
Yes
See TS 23.018
Establish_ Terminating_ TCH_If_ Required
Establish_ Terminating_ TCH_Multicall
See TS 23.135
3
2

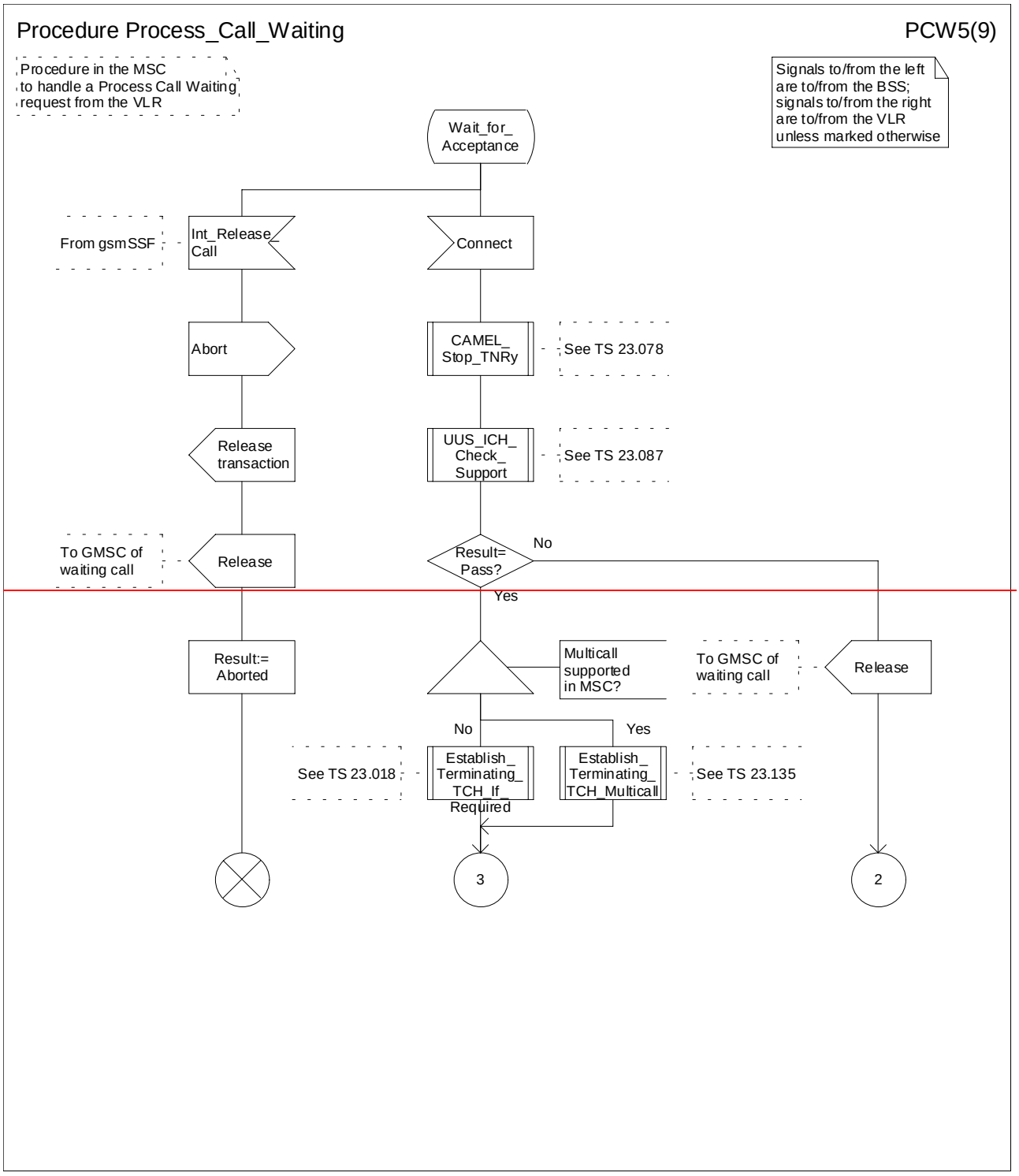
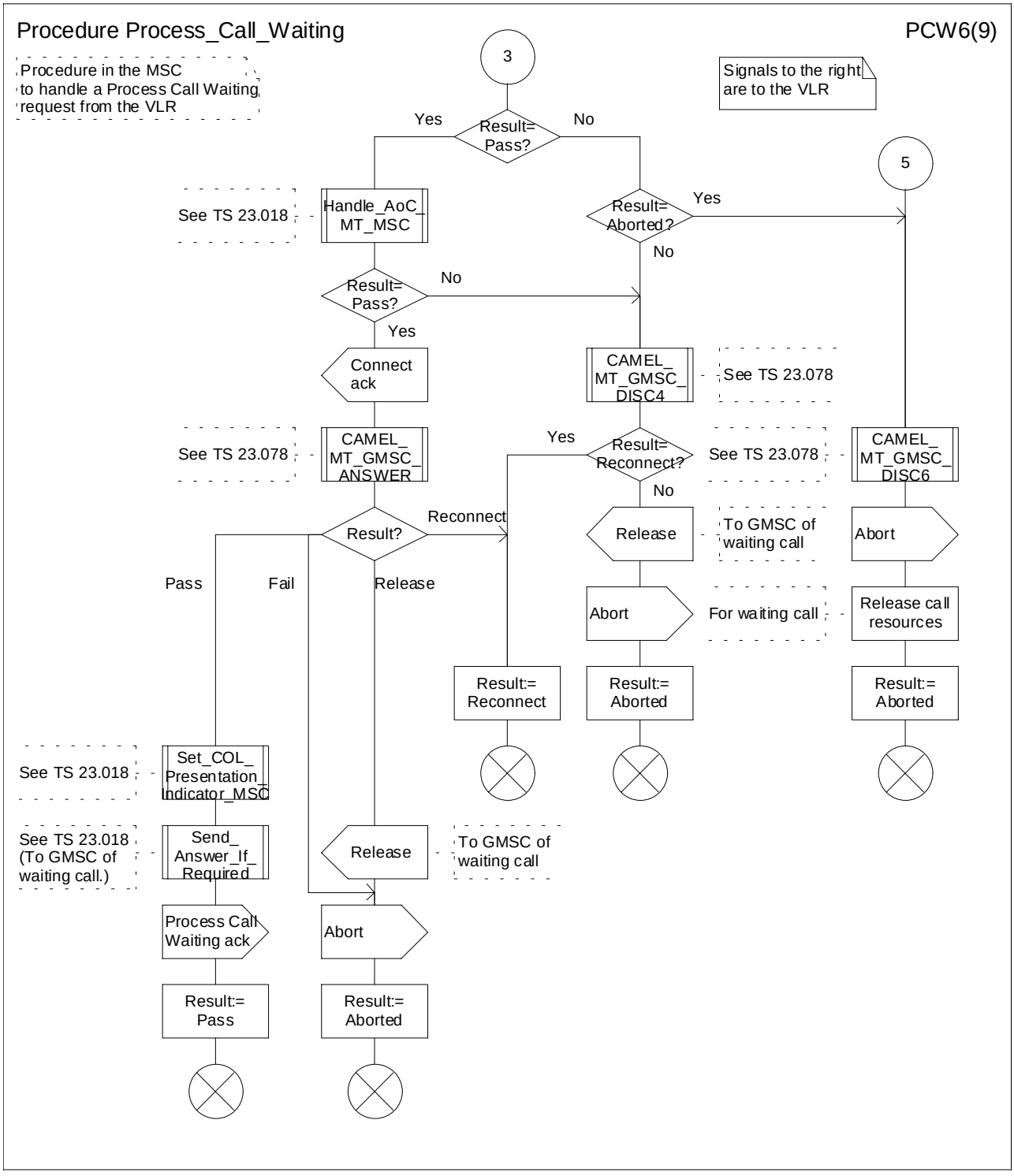


Figure 1.5 (sheet 5 of 9): Procedure Process_Call_Waiting


Procedure Process_Call_Waiting
PCW6(9)
Procedure in the MSC to handle a Process Call Waiting request from the VLR
Signals to the right are to the VLR
3
Result= Pass?
Yes
No
See TS 23.018
Handle_AoC_ MT_MSC
Result= Aborted?
Yes
No
5
Result= Pass?
No
Yes
Connect ack
CAMEL_ MT_GMSC_ DISC4
See TS 23.078
See TS 23.078
CAMEL_ MT_GMSC_ ANSWER
Result= Reconnect?
Yes
No
See TS 23.078
CAMEL_ MT_GMSC_ DISC6
Result?
Reconnect
Release
To GMSC of waiting call
Abort
Pass
Fail
Release
Abort
For waiting call
Release call resources
Result:= Reconnect
Result:= Aborted
Result:= Aborted
See TS 23.018
Set_COL_ Presentation_ Indicator_MSC
See TS 23.018 (To GMSC of waiting call.)
Send_ Answer_If_ Required
Release
To GMSC of waiting call
Process Call Waiting ack
Abort
Result:= Pass
Result:= Aborted

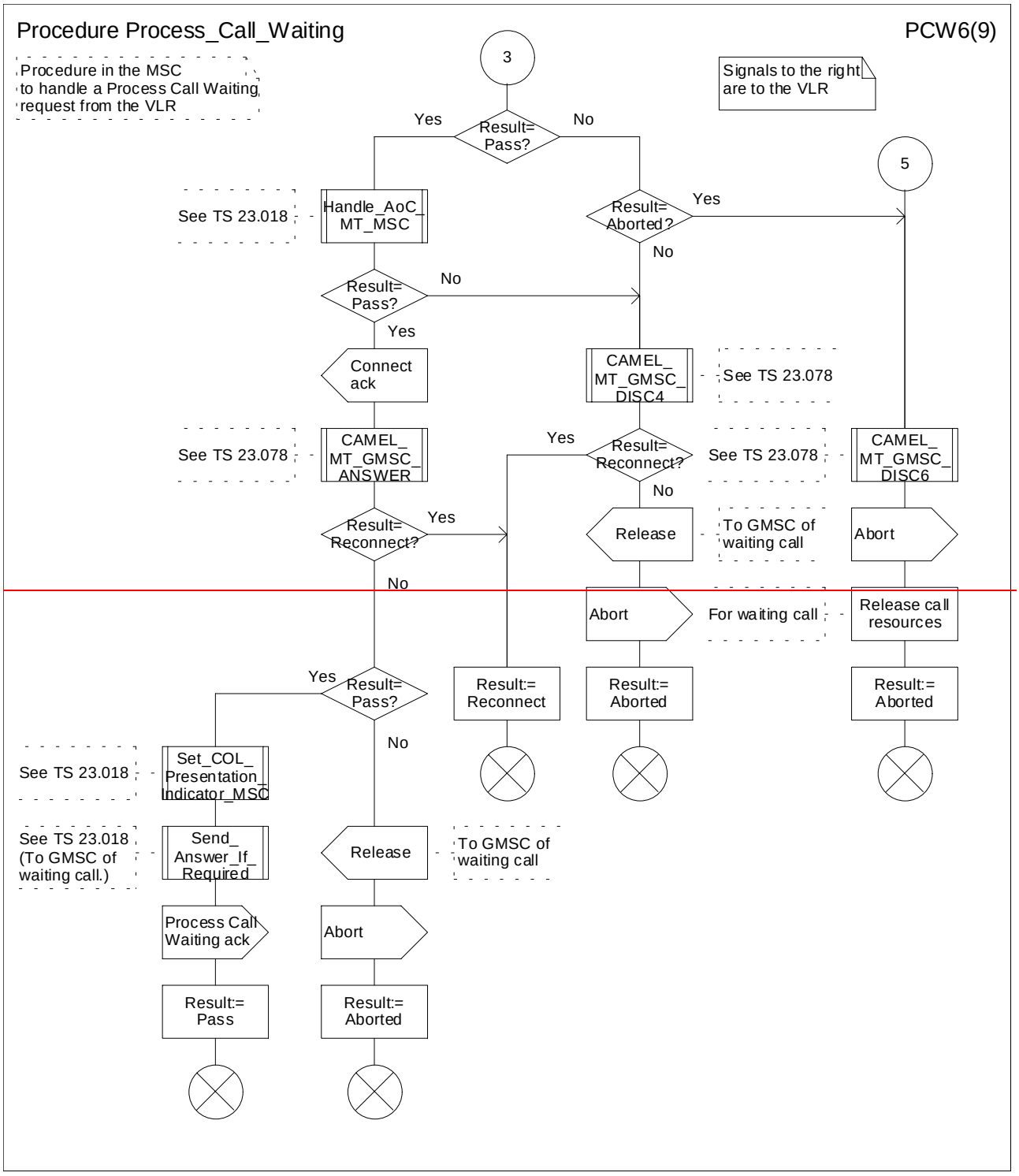


Figure 1.5 (sheet 6 of 9): Procedure Process_Call_Waiting

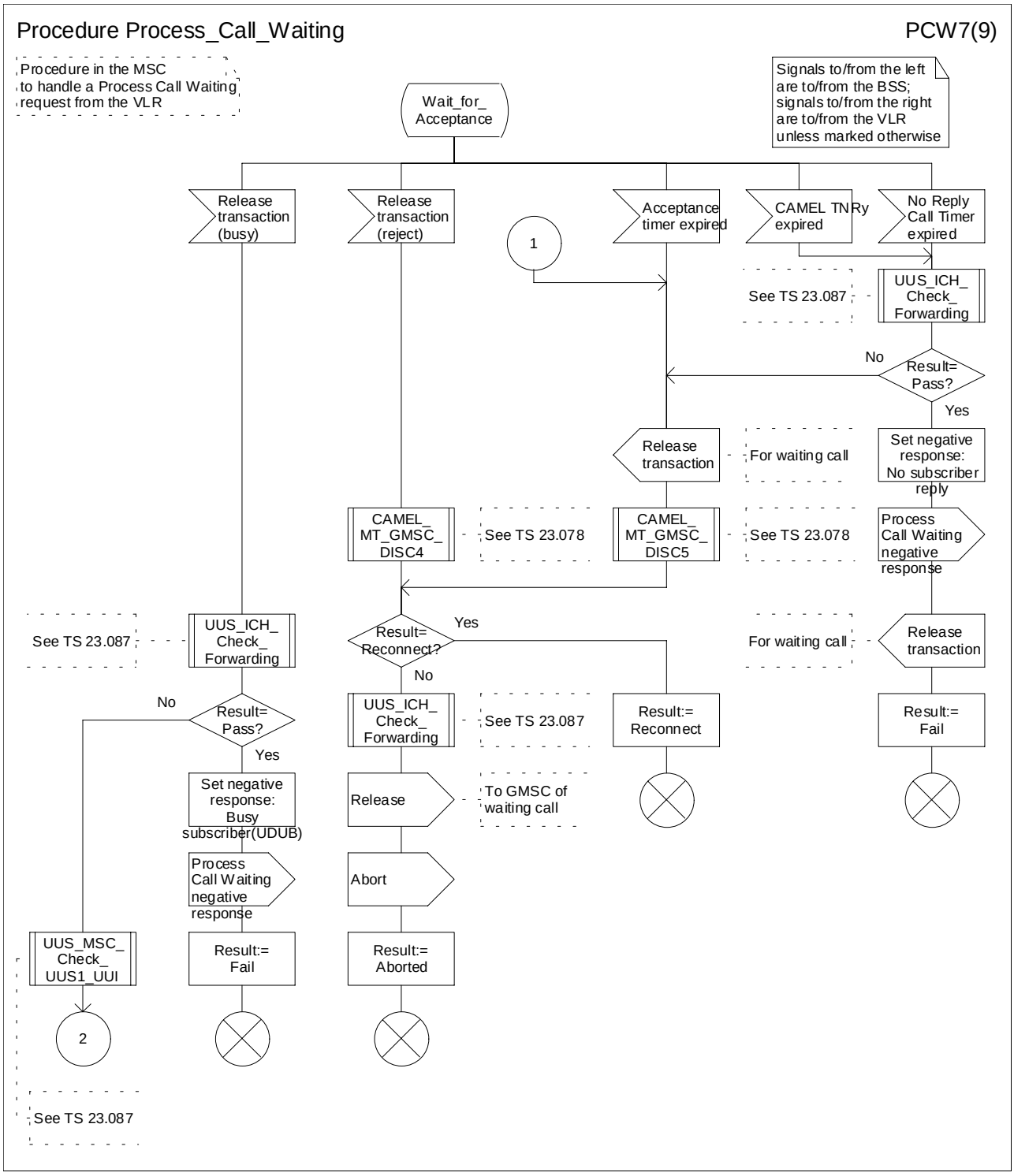


Figure 1.5 (sheet 7 of 9): Procedure Process_Call_Waiting

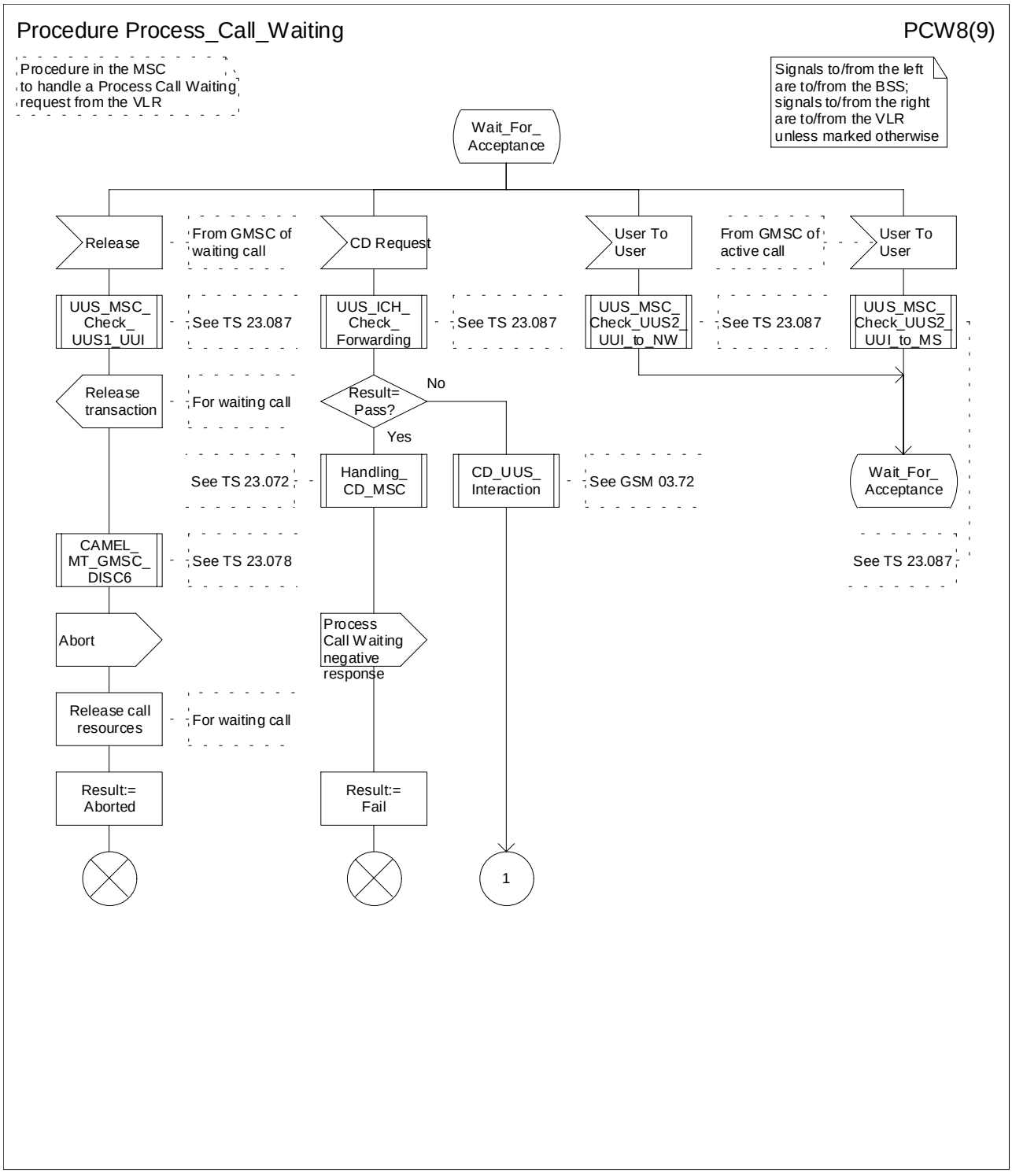


Figure 1.5 (sheet 8 of 9): Procedure Process_Call_Waiting

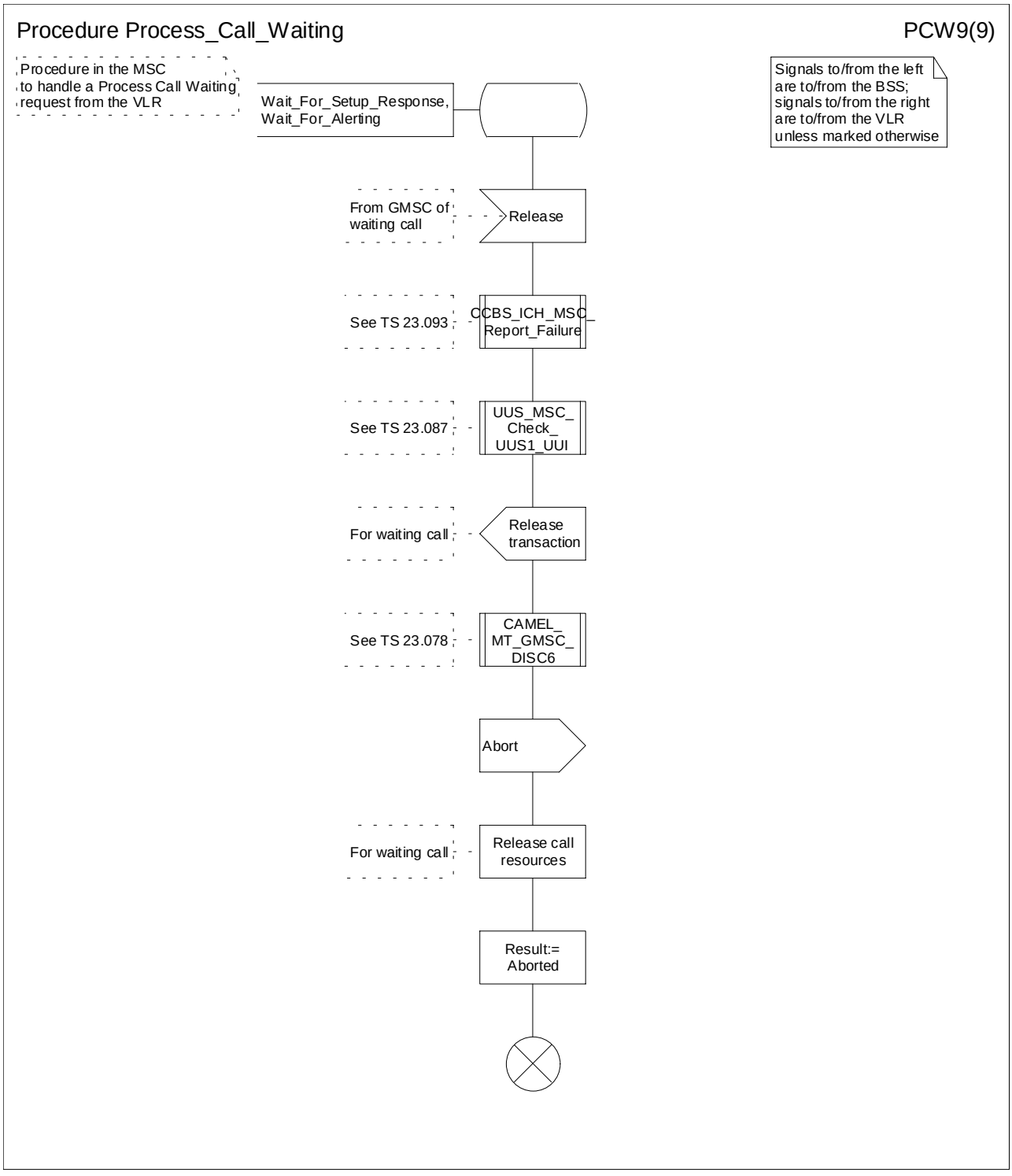


Figure 1.5 (sheet 9 of 9): Procedure Process_Call_Waiting

…

****** End of Document ******

3GPP TSG CN WG4 Meeting #12
Sophia Antipolis, France,
28th January – 2nd February 2002

N4-020008
(Resubmission of N4-011248)

CR-Form-v5

CHANGE REQUEST

⌘ **23.079** **CR** **016** ⌘ **rev** ⌘ Current version: 4.0.0 ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Introduction of CAMEL Phase 4
Source:	⌘	CN4
Work item code:	⌘	CAMEL4
Date:	⌘	9th October 2001
Category:	⌘	**B**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	This CR combines the CRs to 3GPP TS 23.079 that have been approved in TSG-CN2 under the CAMEL Phase 4 work item.
Summary of change:	⌘	The following CRs have been incorporated: • N2-010011: CAMEL Support for OR • N2-010498: Handling of reconnect on leg 2 disconnect (MT and VT call cases) • N2-010621: Change of name: "GMSC address" to "GMSC or gsmSCF address" in SRI • N2-010682: Possibility of BOR of a CF leg from the GMSC
Consequences if not approved:	⌘	CAMEL Phase 4 is incomplete

Clauses affected:	⌘	4.1, 5, 5.1, 5.2.1, 8.2, 9.2, 9.4, 9.4.2, 10.2.1 and Annex A		
Other specs affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	23.018, 23.078, 23.083 etc
Other comments:	⌘	This is the condensed version of N2-020009.		

****** First Modified Section ******

4.1 Optimal routeing for basic mobile-to-mobile calls

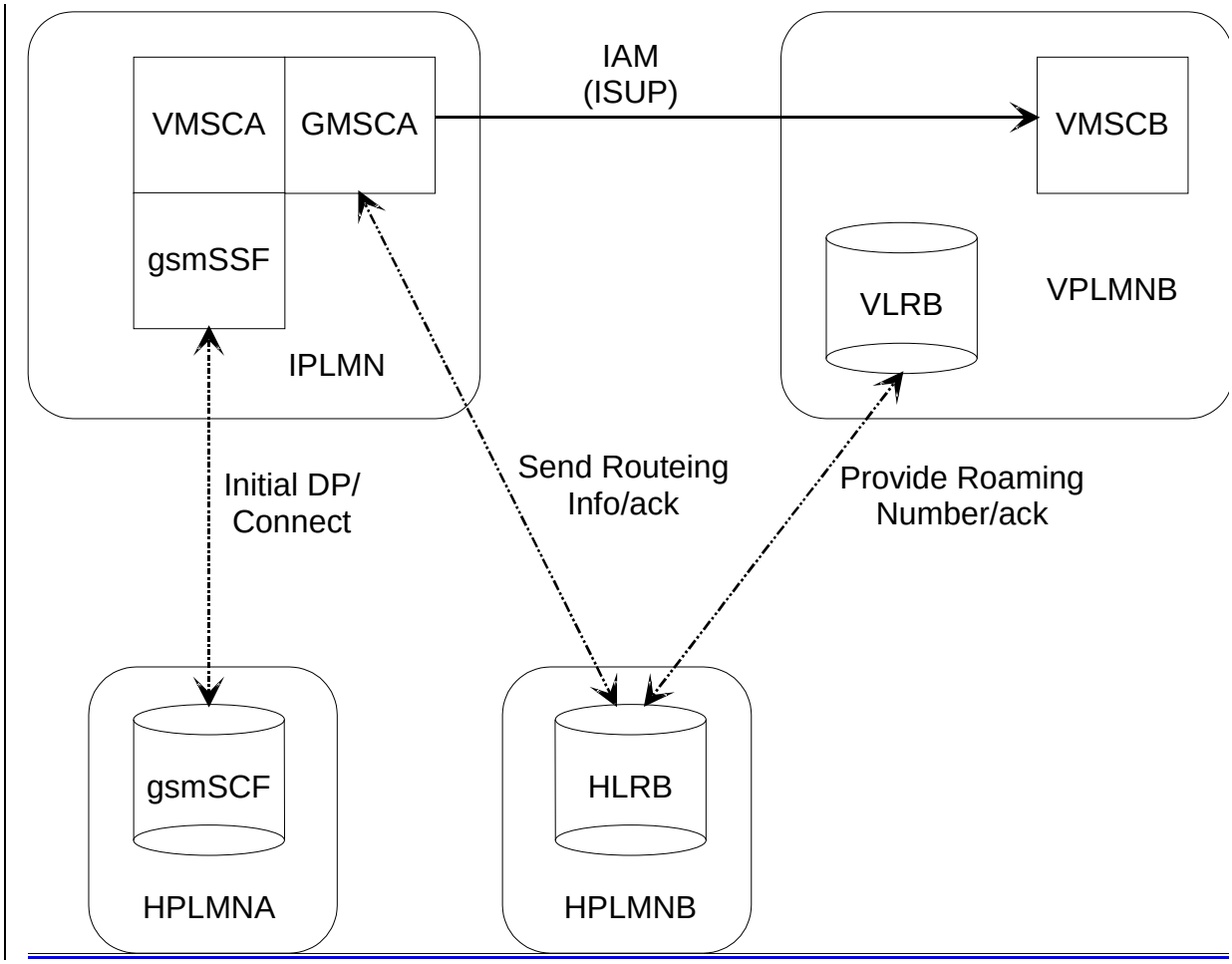
It is a network operator option whether to implement optimal routeing for basic mobile-to-mobile calls.

The existing UMTS and GSM architectures support the primary technical requirement of optimal routeing for mobile-to-mobile calls (basic OR): that a GMSC can interrogate an HLR in a different PLMN to obtain routeing information for a mobile terminated call (see GSM 03.04 [1]). Three logically distinct PLMNs are involved in the handling of an optimally routed mobile-to-mobile call:

- the IPLMN, which is also the VPLMN of the calling mobile subscriber;
- the HPLMN of the called mobile subscriber (HPLMNB);
- the VPLMN of the called mobile subscriber (VPLMNB).

Any two or all three of these PLMNs may be identical; in figure 1 they are shown as distinct.

Figure 1 shows the communication between the IPLMN, HPLMNB and VPLMNB for an optimally routed mobile-to-mobile call.


VMSCA
GMSCA
IAM
(ISUP)
VMSCB
gsmSSF
VLRB
VPLMNB
IPLMN
Initial DP/
Connect
Send Routeing
Info/ack
Provide Roaming
Number/ack
gsmSCF
HLRB
HPLMNA
HPLMNB

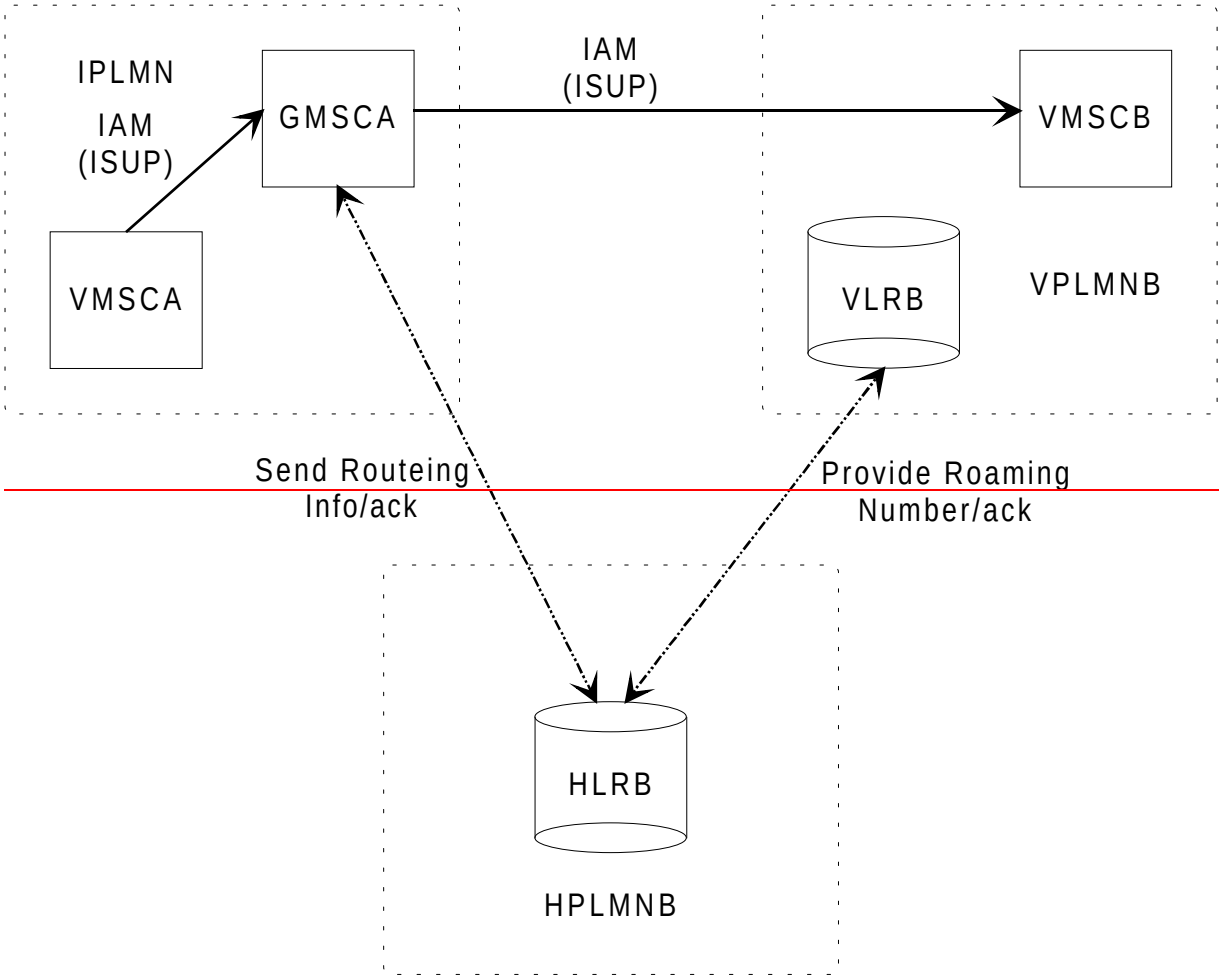


Figure 1: Architecture for optimal routeing of basic mobile-to-mobile call

In figure 1 and throughout the present document, the term ISUP is used to denote the telephony signalling system used between exchanges. ~~In a given network, any telephony signalling system may be used; the only additional requirement is that GMSCA must be able to signal to VMSCA the destination address which it has used to route the call.~~

~~If~~In this architecture the VMSC of the calling mobile subscriber (VMSCA) is ~~distinct from~~ integrated with the GMSC; communication between them is over an internal interface~~, it constructs an ISUP Initial Address Message (IAM) using the MSISDN of the called subscriber and sends it to the GMSC.~~ A gsmSSF is also associated with VMSCA, to support CAMEL functionality; this is required for the support of optimal routeing of mobile-to-mobile calls.

If the originating subscriber has a CAMEL subscription, then when VMSCA receives the setup message it sends an Initial DP message, containing the address digits received in the setup message, via the gsmSSF to the gsmSCF. If the gsmSCF determines that the destination defined by the address digits belongs to a GSM or UMTS PLMN, it responds to the Initial DP with a Connect or Continue With Argument message to VMSCA containing an indication that the call is eligible for optimal routeing. This causes VMSCA to route the call to the associated GMSC (GMSCA).

If the GMSC, which ~~may be distinct from the VMSC of the calling mobile subscriber but~~ is in the VPLMN of the calling mobile subscriber, is in a different PLMN from HLRB, it requests routeing information from HLRB using the MAP protocol. If HLRB determines that the call can be routed directly from the GMSC to VMSCB without contravening the charging requirements for optimal routeing given in subclause 9.1, it requests a roaming number from VLRB using the MAP protocol, and VLRB returns a roaming number in the Provide Roaming Number ack. HLRB returns the roaming number to the GMSC in the Send Routeing Info ack. The GMSC uses the roaming number to construct an ISUP IAM, which it sends to VMSCB. The call is then handled according to the procedures defined in 3GPP TS 23.018 [6], except that if the call is answered GMSCA ~~inserts in the ISUP Answer message~~ relays the answer event to VMSCA and includes ~~-~~the destination address which it used to route the call, to allow VMSCA to generate the correct charging record.

NOTE: If the GMSC ~~returns an ISUP Answer message~~ relays an answer event to VMSCA before it has received an Answer message from the final destination (e.g. because of an interaction with a Specialised Resource Function) an incorrect destination address (or no destination address) can be sent to VMSCA, even though the call is eventually optimally routed.

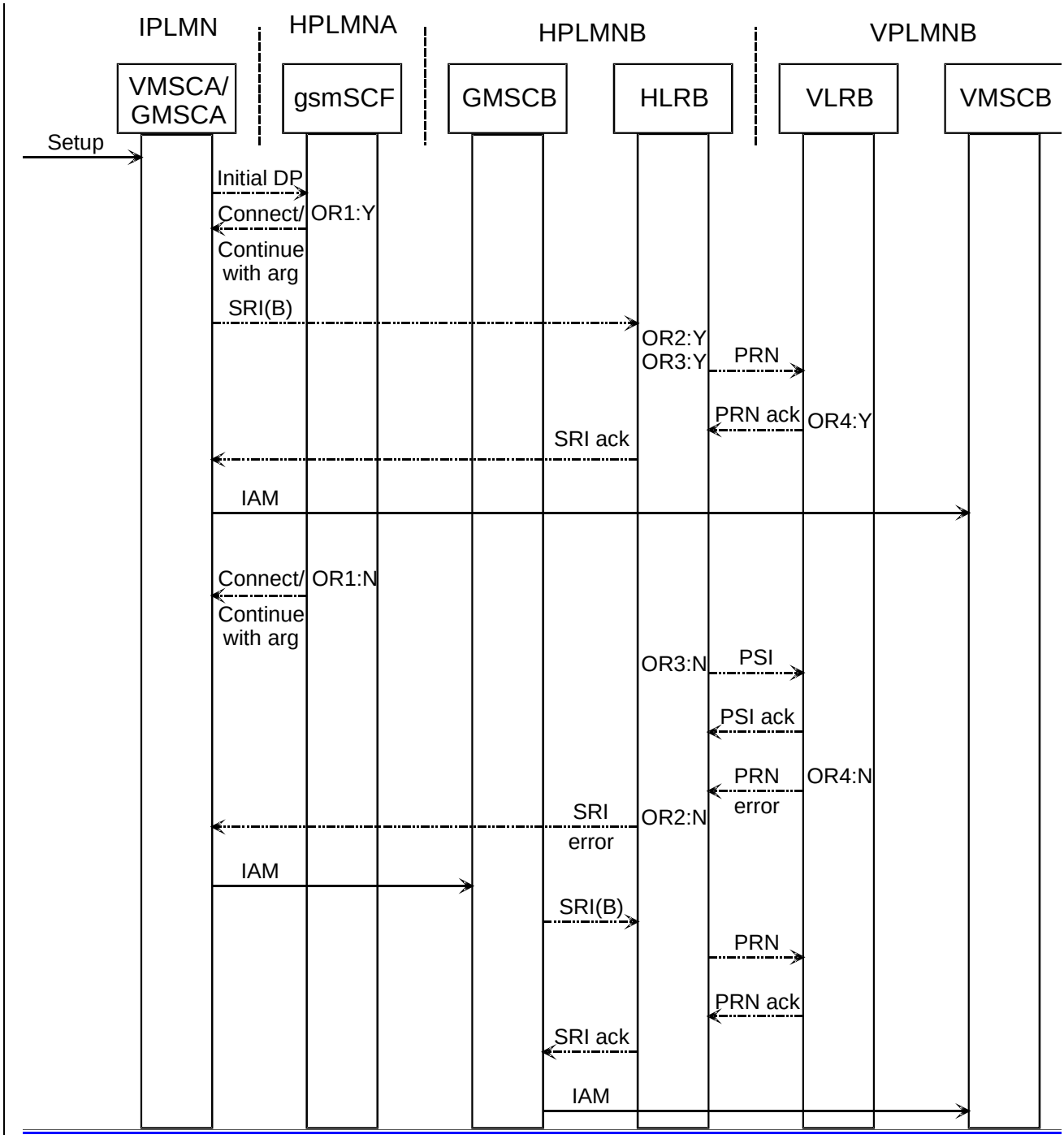
****** Next Modified Section ******

5 Optimal routeing for basic mobile-to-mobile calls: message flows

It is a network operator option whether to implement optimal routeing for basic mobile-to-mobile calls.

This clause does not consider the handling of calls to a fixed network B subscriber.

The message flow for an optimally routed call from one mobile subscriber to another mobile subscriber is shown in figure 3. For simplicity of description, it is assumed that forwarding of calls from the B subscriber is not required. Solid lines indicate circuit-associated signalling; dashed lines indicate connectionless signalling.


IPLMN
HPLMNA
HPLMNB
VPLMNB
VMSCA/ GMSCA
gsmSCF
GMSCB
HLRB
VLRB
VMSCB
Setup
Initial DP
Connect/ Continue with arg
OR1:Y
SRI(B)
OR2:Y
OR3:Y
PRN
PRN ack
OR4:Y
SRI ack
IAM
Connect/ Continue with arg
OR1:N
OR3:N
PSI
PSI ack
PRN error
OR4:N
SRI error
OR2:N
IAM
SRI(B)
PRN
PRN ack
SRI ack
IAM

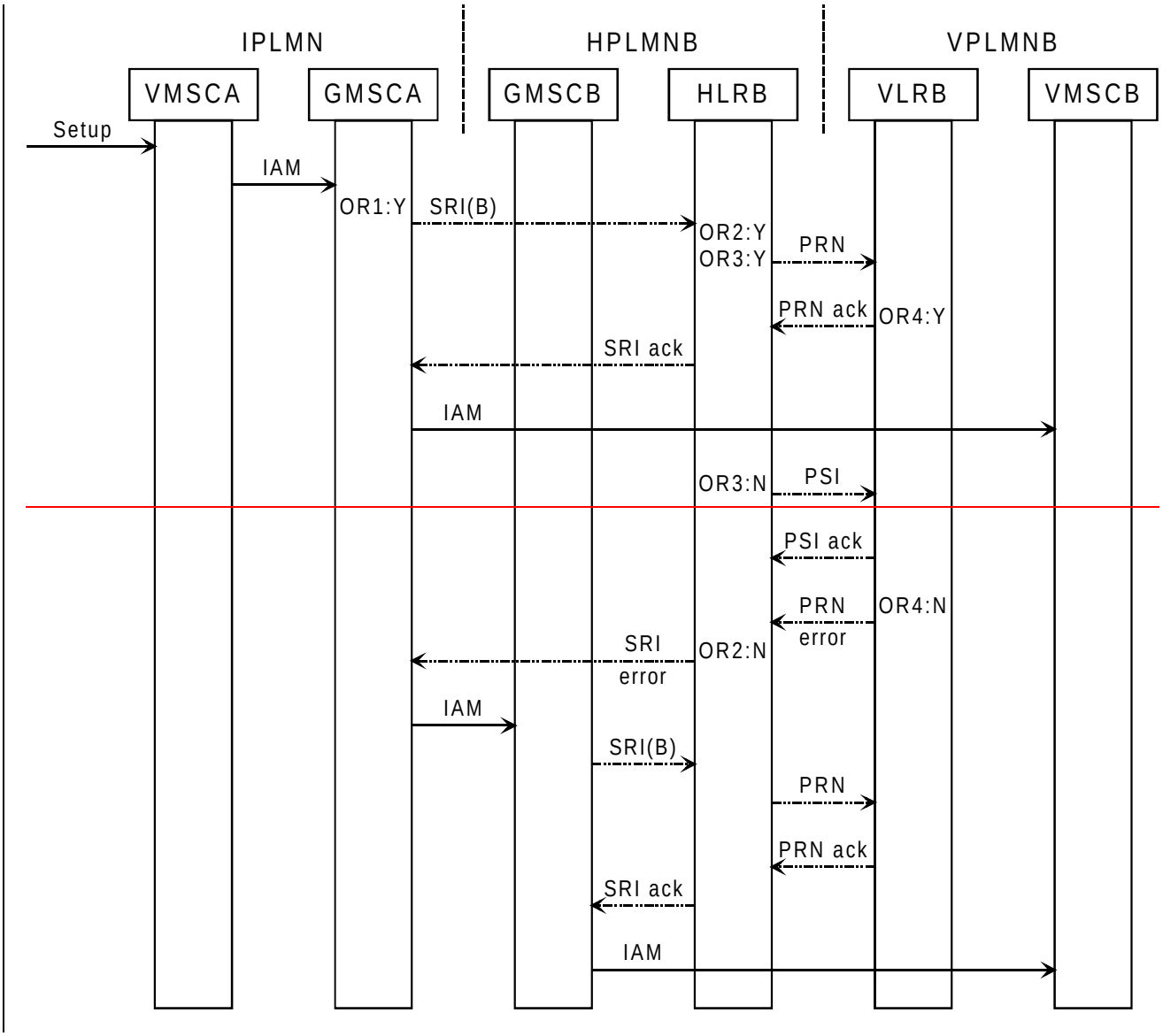


Figure 3: Message flow for optimal routeing of basic mobile-to-mobile call

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

5.1 Successful outcome

When VMSCA receives a Setup message from the MS, it sends a request for information to handle the outgoing call to VLRA, according to the procedures described in 3GPP TS 23.018 [6]. If VLRA determines that the MS is allowed service, it returns a positive acknowledgement, including an indication that the subscriber has a CAMEL subscription, so that VMSCA will request instructions via the gsmSSF (not shown in this diagram) from the gsmSCF. ~~When VMSCA receives the acknowledgement, it constructs an IAM using the B subscriber address and sends it to GMSCA.~~

If ~~GMSCA~~the gsmSCF recognises the B subscriber address as belonging to a UMTS or GSM PLMN (decision OR1:Y), it sends a Connect message or a Continue With Argument message, containing an indication that the call is eligible for optimal routeing, to VMSCA. This causes VMSCA to route the call to the associated GMSC function (GMSCA). GMSCA checks the identity of HPLMNB. If GMSCA is in a different PLMN from HLRB, it then sends a request for routeing information (SRI(B)) to HLRB; this request contains an indication that it is an optimal routeing enquiry for information to route a basic call. If HLRB is prepared to accept an optimal routeing enquiry from GMSCA (decision OR2:Y), it checks whether at least one of the three conditions:

- the GMSC is in the same country as VMSCB;
- the HLR is in the same country as VMSCB;
- the GMSC is in the same PLMN as the HLR;

is met. If it is (decision OR3:Y), HLRB sends a request for a roaming number (PRN) to VLRB; the request contains an indication that it is for an optimally routed call. If VLRB supports optimal routeing (decision OR4:Y), it returns the roaming number in the PRN ack, and HLRB relays the roaming number in the SRI ack to GMSCA. GMSCA constructs an ISUP IAM using the roaming number, and sends it to VMSCB, which processes the incoming IAM according to the procedures described in 3GPP TS 23.018 [6].

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

5.2.1 B subscriber address not recognised as belonging to a UMTS or GSM PLMN

If ~~GMSCA does not support optimal routeing for basic mobile-to-mobile calls, or~~the gsmSCF ~~-~~does not recognise the B subscriber address as belonging to a UMTS or GSM PLMN (decision OR1:N), it sends a Connect or Continue With Argument message, omitting the indication that the call is eligible for optimal routeing. VMSCA constructs an IAM using the B subscriber address and sends it to GMSCB in HPLMNB. GMSCB analyses the address received in the IAM, and sends a request for routeing information (SRI(B)) to HLRB; this request contains an indication that it is not an optimal routeing enquiry. Because GMSCB is in the same PLMN as HLRB, it will always be able to derive an HLR address. HLRB sends a request for a roaming number (PRN) to VLRB. VLRB returns the roaming number in the PRN ack, and HLRB relays the roaming number in the SRI ack to GMSCB. GMSCB constructs an ISUP IAM using the roaming number, and sends it to VMSCB, which processes the incoming IAM according to the procedures described in 3GPP TS 23.018 [6].

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

8.2 CAMEL

The principles for interactions between CAMEL services and optimal routeing are specified in this subclause. The interworking between CAMEL processing and optimal routeing in the GMSC and the terminating VMSC is specified in subclause 9.4 and 3GPP TS 23.018 [6].

If a mobile-originating CAMEL service modifies the number entered by the A subscriber, VMSCA treats the number returned by the ~~CAMEL server~~gsmSCF in the same way as a number received in the SETUP message, i.e.:

- If the gsmSCF indicated that the call is eligible for optimal routeing, VMSCA ~~it~~ sends ~~an IAM~~ a signal containing the modified number to the associated GMSC, which ~~analyses it to find if it is an MSISDN~~ sends a request for routeing information to the appropriate HLR;

- If the gsmSCF did not indicate that the call is eligible for optimal routeing, VMSCA sends an IAM containing the modified number to a GMSC in HPLMNB, which sends a request for routeing information to the appropriate HLR.

If a mobile-terminating CAMEL service modifies the number received by the GMSC, the GMSC treats the number returned by the CAMEL server in the same way as a forwarded-to number, i.e. it checks it against the optimal routeing criteria in subclause 9.1 but does not analyse it to find if it can derive an HLR address. If the number returned by the CAMEL server does not satisfy the optimal routeing criteria in subclause 9.1 and the GMSC is not in the same PLMN as HLRB, the GMSC will route the call to a GMSC in the same PLMN as HLRB. This will lead to a repetition of the mobile terminating CAMEL interaction.

If the call is to be forwarded at the GMSC (whether by a UMTS-standardised call forwarding service or by a CAMEL-based call forwarding service) and a mobile originating CAMEL service applies to the forwarding subscriber, the GMSC checks the number which results from the CAMEL service against the optimal routeing criteria in subclause 9.1. If the number returned by the CAMEL server does not satisfy the optimal routeing criteria in subclause 9.1, the GMSC will not route the call to the forwarded-to destination. For early call forwarding, the GMSC will route the call to a GMSC in the same PLMN as HLRB. This will lead to a repetition of the mobile originating CAMEL interaction. For optimal routeing of late call forwarding, the GMSC will return a Resume Call Handling negative response towards VMSCB, which will forward the call. This will lead to a repetition of the mobile originating CAMEL interaction.

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

9.2 Functional behaviour of VMSCA

The functional behaviour of VMSCA is specified in 3GPP TS 23.018 [6]. The only functions specific to optimal routeing ~~is~~are:

- Routeing the call to the associated GMSC function if the gsmSCF indicates that the call is eligible for optimal routeing;

- ~~t~~The transfer of the destination address, if it is received in the ~~ISUP Answer message~~ indication of the answer event, to the call data record, to allow the correct charge for the call to be made. This function is required only if VMSCA supports optimal routeing of mobile-to-mobile calls.

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

9.4 Functional behaviour of GMSC

~~It should be noted that if~~When a call is being forwarded the forwarding leg is controlled by a process MT_CF_MSC which runs in the forwarding MSC (VMSC or ~~from VMSCB rather than from the MSC which acted as~~ GMSC). ~~for the original call then VMSCB~~ If CAMEL processing of the forwarding leg indicates that Basic Optimal Routeing of the forwarding leg should be attempted, the forwarding MSC may use the services of an associated GMSC for the forwarding leg, i.e. the associated GMSC requests routeing information from HLRC. In this case, the forwarding leg is processed in the same way as a mobile-originated call from mobile subscriber B.

The functional behaviour of a GMSC is specified in 3GPP TS 23.018 [6]. The procedures specific to Support of Optimal Routeing are specified in this subclause.

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

9.4.2 Procedure OR_Handle_RCH

Sheet 2~~1~~: the procedure Activate_CF_Process is specified in 3GPP TS 23.018 [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~~2~~: the procedure CAMEL_MT_GMSC_Notify_CF is specific to CAMEL phase 2 or higher; it is specified in 3GPP TS 23.078 [7]. If the GMSC does not support CAMEL phase 2 or higher, 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 routeing of basic mobile-to-mobile calls.

Sheet 2: the process MT_CF_MSC is specified in 3GPP TS 23.018 [6].

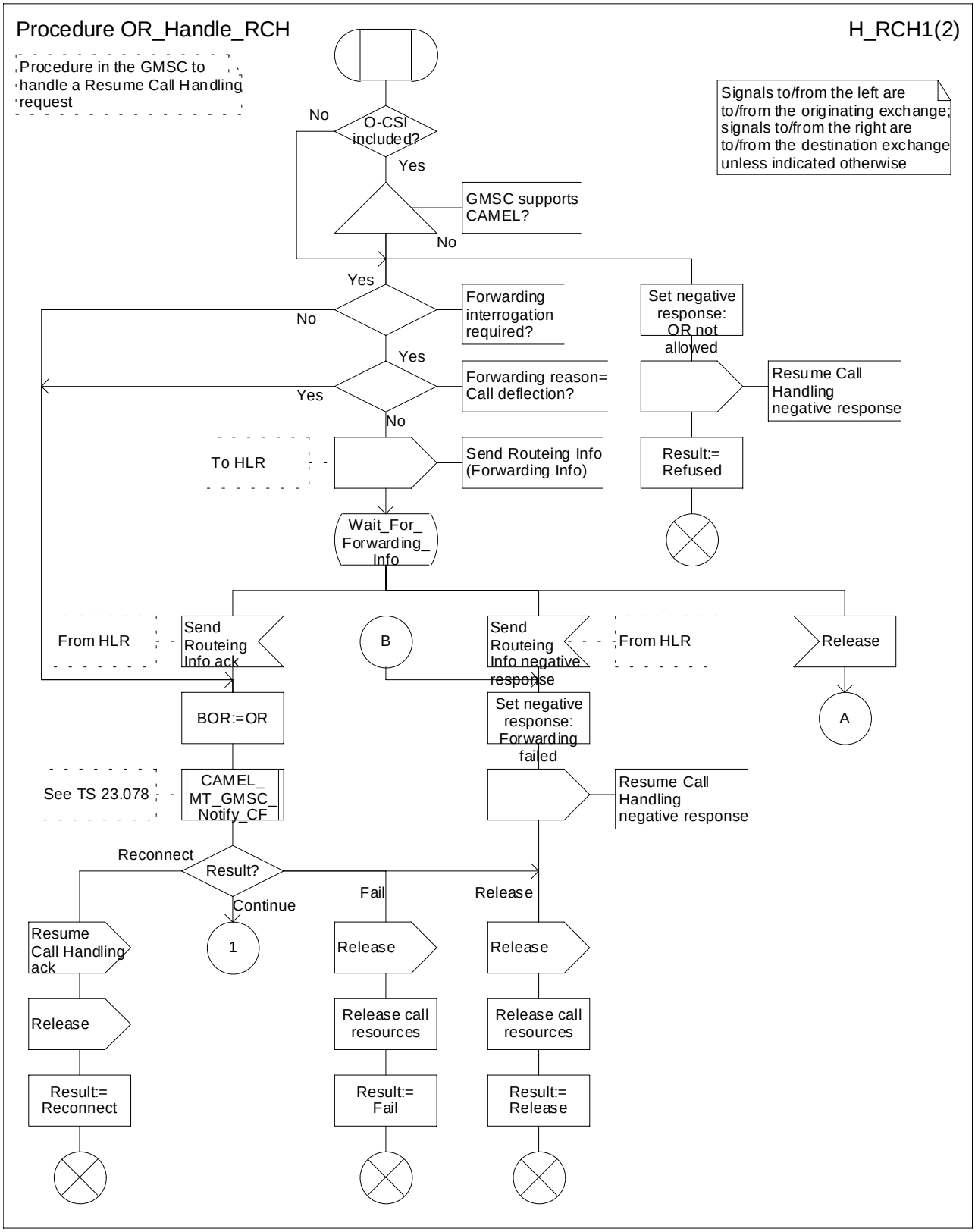
Sheet 2: the procedure UUS_GMSC_Check_Forwarding is specific to UUS; it is specified in 3GPP TS 23.087 [9].

Sheet 2: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3 or higher; it is specified in 3GPP TS 23.078 [7].

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.

**** Modified SDLs in section 9.4****

…


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
O-CSI included?
No
Yes
GMSC supports CAMEL?
No
Yes
Forwarding interrogation required?
No
Set negative response: OR not allowed
Yes
Forwarding reason= Call deflection?
Yes
Resume Call Handling negative response
No
To HLR
Send Routeing Info (Forwarding Info)
Result:= Refused
Wait_For_ Forwarding_ Info
From HLR
Send Routeing Info ack
B
Send Routeing Info negative response
From HLR
Release
A
BOR:=OR
Set negative response: Forwarding failed
See TS 23.078
CAMEL_ MT_GMSC_ Notify_CF
Resume Call Handling negative response
Reconnect
Result?
Continue
Fail
Release
Resume Call Handling ack
1
Release
Release
Release
Release call resources
Release call resources
Result:= Reconnect
Result:= Fail
Result:= Release

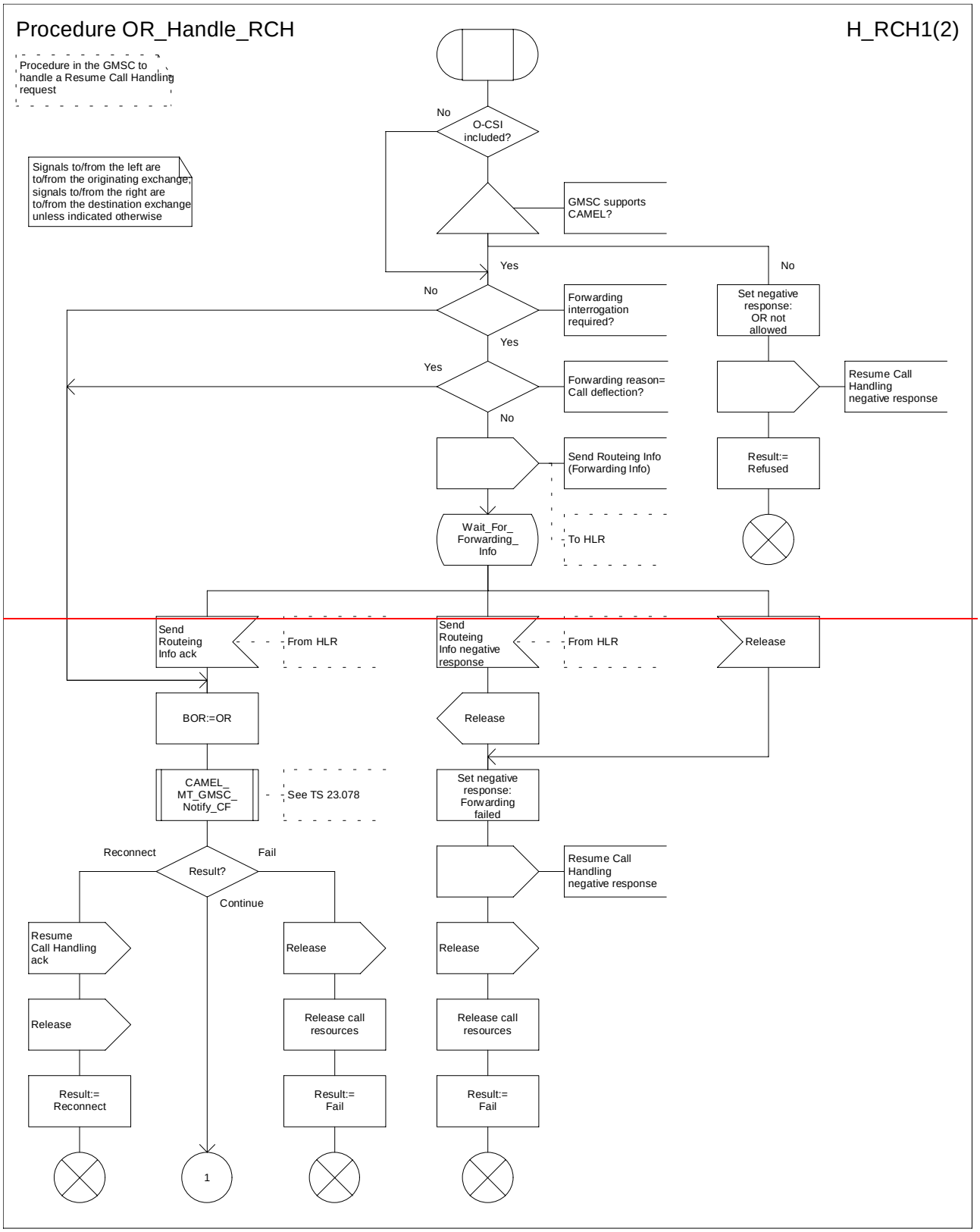
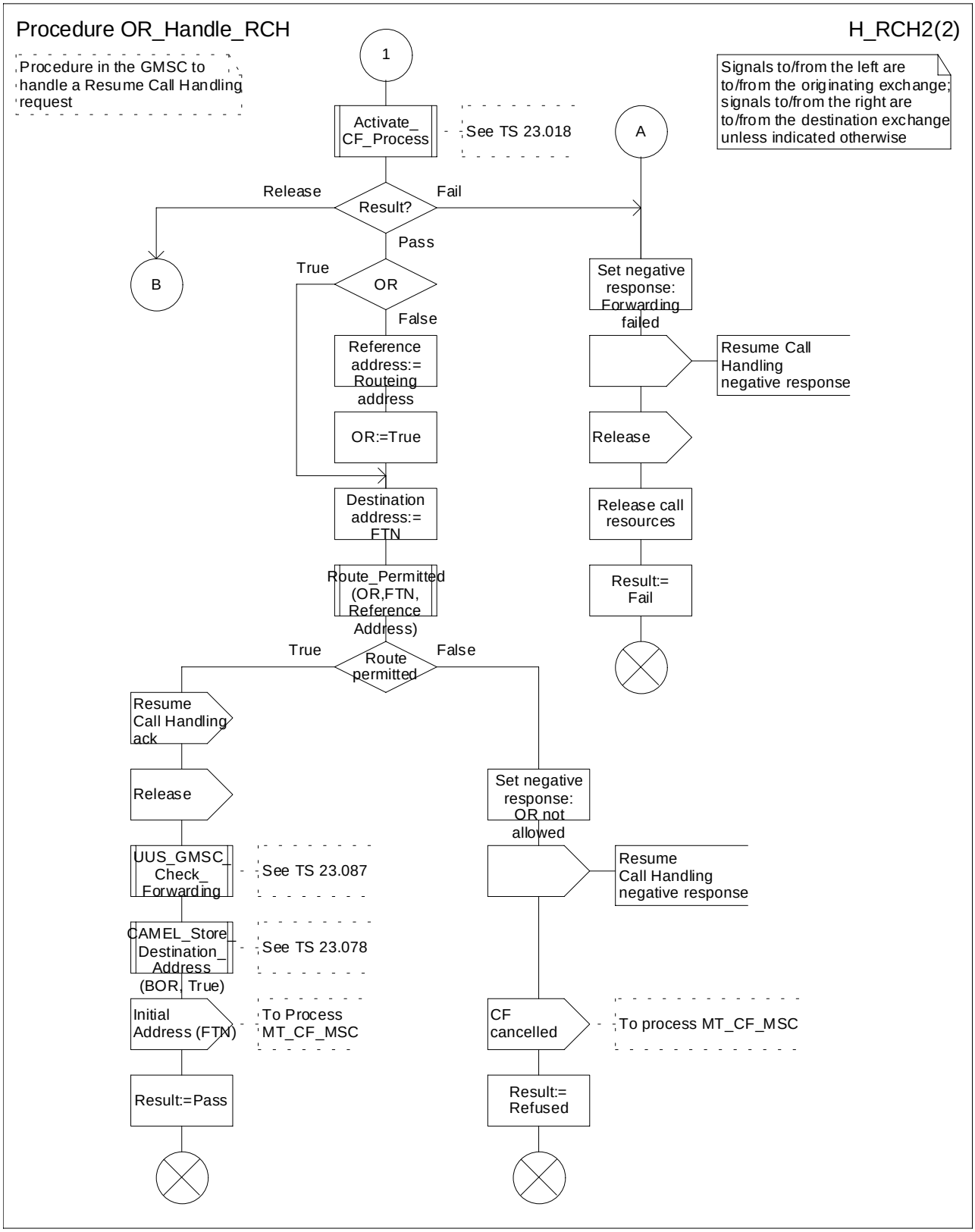


Figure 7a: Procedure OR_Handle_RCH (sheet 1)


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
1
Activate_ CF_Process
See TS 23.018
A
Release
Result?
Fail
Pass
B
True
OR
False
Set negative response: Forwarding failed
Reference address:= Routeing address
Resume Call Handling negative response
OR:=True
Release
Destination address:= FTN
Release call resources
Route_Permitted (OR,FTN, Reference Address)
Result:= Fail
True
Route permitted
False
Resume Call Handling ack
Release
Set negative response: OR not allowed
UUS_GMSC_ Check_ Forwarding
See TS 23.087
Resume Call Handling negative response
CAMEL_Store_ Destination_ Address (BOR, True)
See TS 23.078
Initial Address (FTN)
To Process MT_CF_MSC
CF cancelled
To process MT_CF_MSC
Result:=Pass
Result:= Refused

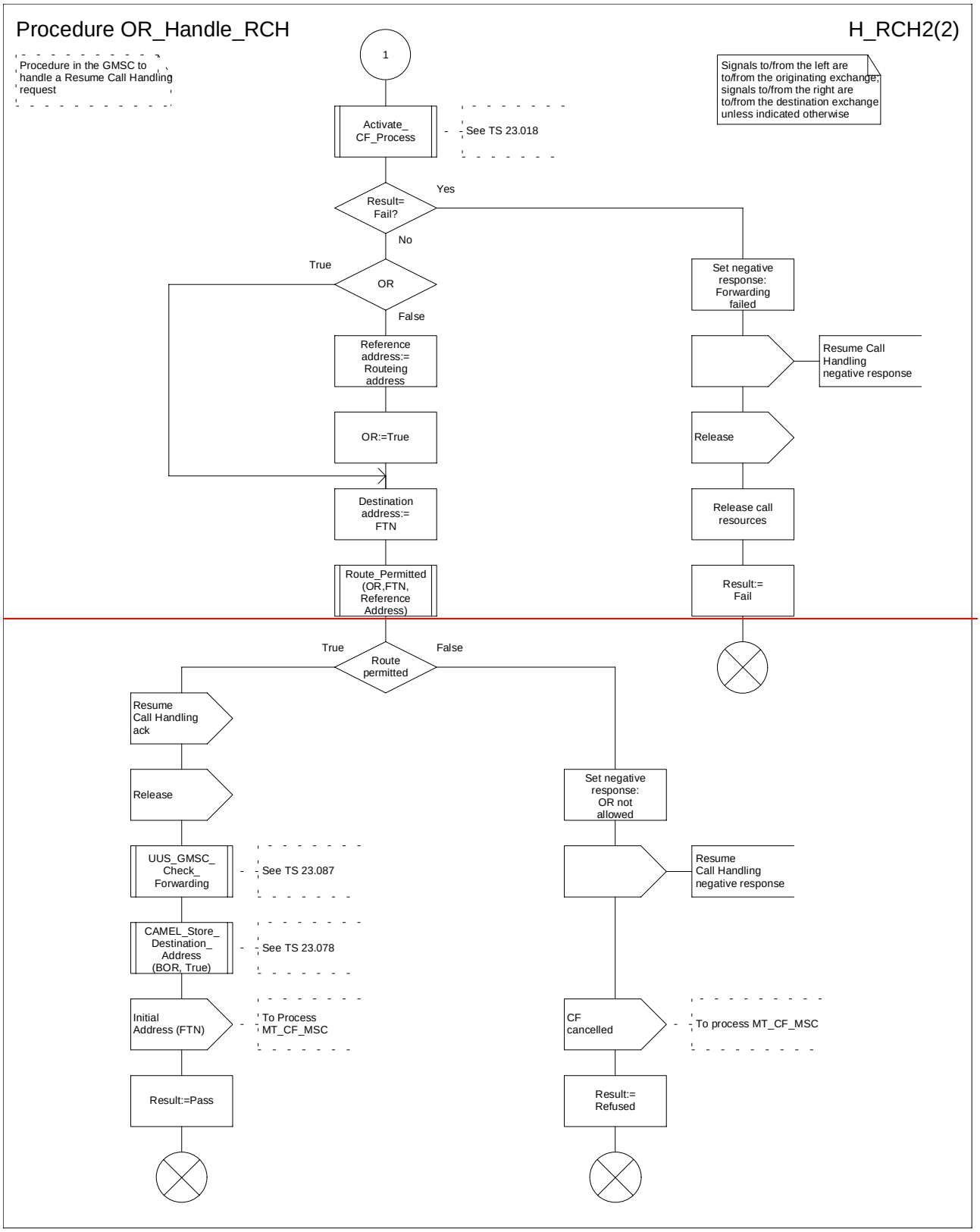


Figure 7b: Procedure OR_Handle_RCH (sheet 2)

…

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

10.2.1 Send Routeing Info

This message is specified in 3GPP TS 23.018 [6]. The following additional information elements are required:

Information element name	Required	Description
Interrogation type	M	Indicates the type of interrogation: basic(for routeing information for an MT call) or forwarding (when the GMSC has been asked to resume call handling for OR of late call forwarding).
OR interrogation indicator	C	Indicates that the interrogation is from a GMSC not in the same PLMN as the HLR. Shall be present if the interrogation is from a GMSC not in the same PLMN as the HLR, otherwise shall be absent.
OR capability	C	Indicates the phase of OR which the GMSC supports. Shall be present if the GMSC supports OR, otherwise shall be absent.
GMSC or gsmSCF address	M	E.164 address of the GMSC.
Call reference number	C	Call reference number used by the GMSC for this call. Shall be present if the interrogation type=basic call, otherwise shall be absent.
Forwarding reason	C	Indicates the reason for forwarding (on busy, on no subscriber reply, or on mobile subscriber not reachable). Shall be present if the Interrogation type=forwarding, otherwise shall be absent.
Basic service group	C	Basic service group which applies for this call. Shall be present if the Interrogation type=forwarding, otherwise shall be absent.

****** Last Modified Section ******

Annex A (informative): Handling of an IAM at an MSC

An MSC which receives an IAM from an originating exchange may react in three different ways:

- It acts as a transit exchange, i.e. it relays the IAM to a destination exchange determined by analysis of the called party address, and thereafter relays other ISUP signalling between the originating and destination exchange until the connection is released. This behaviour is not specific to UMTS or GSM.

- It acts as a terminating exchange, i.e. it attempts to connect the call to an MS currently registered in the service area of the MSC.

- It acts as a GMSC, i.e. it interrogates an HLR for information to route the call. If the HLR returns routeing information, the MSC uses the routeing information from the HLR to construct an IAM, which it sends to a destination exchange determined by analysis of the routeing information from the HLR.

The method which the MSC uses to determine how to handle the IAM is described in 3GPP TS 23.018 [6]. However, the number analysis required to derive the address of an HLR in a different PLMN from the MSC is much more extensive than that required to derive the address of an HLR in the same PLMN as the MSC - the MSC needs to be able to recognise the combination of country code and national destination code for every subscriber of every PLMN to which calls are to be optimally routed. In order to avoid the need to maintain the tables required to support this extensive number analysis, and the run-time processing load of performing the number analysis, optimal routeing of mobile-to-mobile calls is handled as a mobile originating CAMEL service; the gsmSCF analyses the destination address (after possible modification of the number by other MO CAMEL services) to determine whether the call is eligible for optimal routeing. If the call is eligible for optimal routeing, the gsmSCF indicates this to VMSCA, which routes the call to an associated GMSC function, which in turn sends a request for routeing information to the appropriate HLR.

~~A PLMN operator may decide to implement the ability to recognise a called party address as belonging to a UMTS or GSM PLMN which is not the PLMN of the MSC in only a subset of the MSCs in his PLMN. Other MSCs will route international calls to one of the MSCs which have the capability for extra number analysis.~~

When a GMSC has interrogated an HLR and received an MSRN, the GMSC may need to route the call to the HPLMN of the called subscriber. If the call is routed through an MSC which has the capability to analyse an address to derive an HLR address, a method must be provided to prevent the transit MSC from performing a further interrogation of the HLR, using the MSRN as an MSISDN. The method used to prevent this further interrogation is a matter for the PLMN operator.

****** End of Document******

3GPP TSG CN WG4 Meeting #12bis ***N4-020288***
Helsinki, FINLAND, 13th Feb. – 14th Feb. 2002

3GPP TSG-CN WG2 Meeting #22 ***Tdoc N2-020209***
Sophia Antipolis, France **(rev of *Tdoc N2-020068)***
28th January – 1st February 2002

CR-Form-v5

CHANGE REQUEST

⌘ **23.018** **CR** **100** ⌘ **rev** **1** ⌘ Current version: **5.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Transferring the MS classmark & IMEI to the gsmSCF
Source:	⌘	CN4
Work item code:	⌘	CAMEL4
Date:	⌘	21 January 2002
Category:	⌘	**C**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The MS classmark & IMEI (including the software version) of the ME allow the gsmSCF to determine information about the capabilities of the ME, which can be useful to service logic designers
Summary of change:	⌘	
Consequences if not approved:	⌘	CAMEL-based services will not be able to take account of the capabilities of the MS.

Clauses affected:	⌘	7.2.3.3; 7.2.3.4; 7.2.3.5; Figure 57a; Figure 57b; Figure 58; Figure 59 (replaced by Figures 59a & 59b); 7.2.4.5; 7.2.4.6; 7.2.4.7; 7.2.4.8 (new); Figure 65; Figure 66; Figure 66bis (new); 8.1.17; 8.1.18; 8.1.32; 8.1.33; 8.3.4; 8.3.5		
Other specs affected:	⌘	**X** Other core specifications	⌘	22.078 (Tdoc S1-020408); 23.078 (Tdoc N2-020063); 29.078 (Tdoc N2-020064)
		☐ Test specifications		
		☐ O&M Specifications		
Other comments:	⌘	The changes to the following figures are radical, so changes to individual symbols have not been identified: Figure 58; Figure 59; Figure 66 The parts of 23.018 which are affected by this CR have not been modified in the current version of the collective CAMEL phase 4 CR to 23.018		

**** First modified section ****

7.2.3.3 Process PSI_VLR

Sheet 1: the procedure Check_Parameters is specified in subclause 7.2.2.2. If the HLR requests ~~neither~~ none of location information, ~~nor~~ subscriber state, MS classmark and IMEI, the VLR treats this as a missing parameter.

Sheet 2: the test "Active retrieval required" takes the "Yes" exit if any one or more of current location, MS classmark or IMEI is indicated in the Provide Subscriber Info request.

7.2.3.4 Procedure Retrieve_Location_Info_VLR

~~The variable Current location retrieved is used to indicate that the location information was obtained by paging the MS.~~

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 service area ID (for UMTS) or cell ID (for GSM) of the cell in which the MS last established radio contact;
- the location number, geodetic information and geographical information derived from the service area ID or cell ID if the VLR is capable of doing so (the mapping from service area ID or cell ID to location number is network-specific and outside the scope of the UMTS and GSM standards);
- 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 received location information consists of:

- the service area ID (for UMTS) or cell ID(for GSM) received in the paging response message or in the Send MS Information ack;
- the location number, geodetic information and geographical information derived from the service area ID or 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 UMTS and GSM standards);
- 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 service area ID or cell ID is a VLR operator option (the mapping from service area ID or cell ID to location number is network-specific and outside the scope of the UMTS and GSM standards).

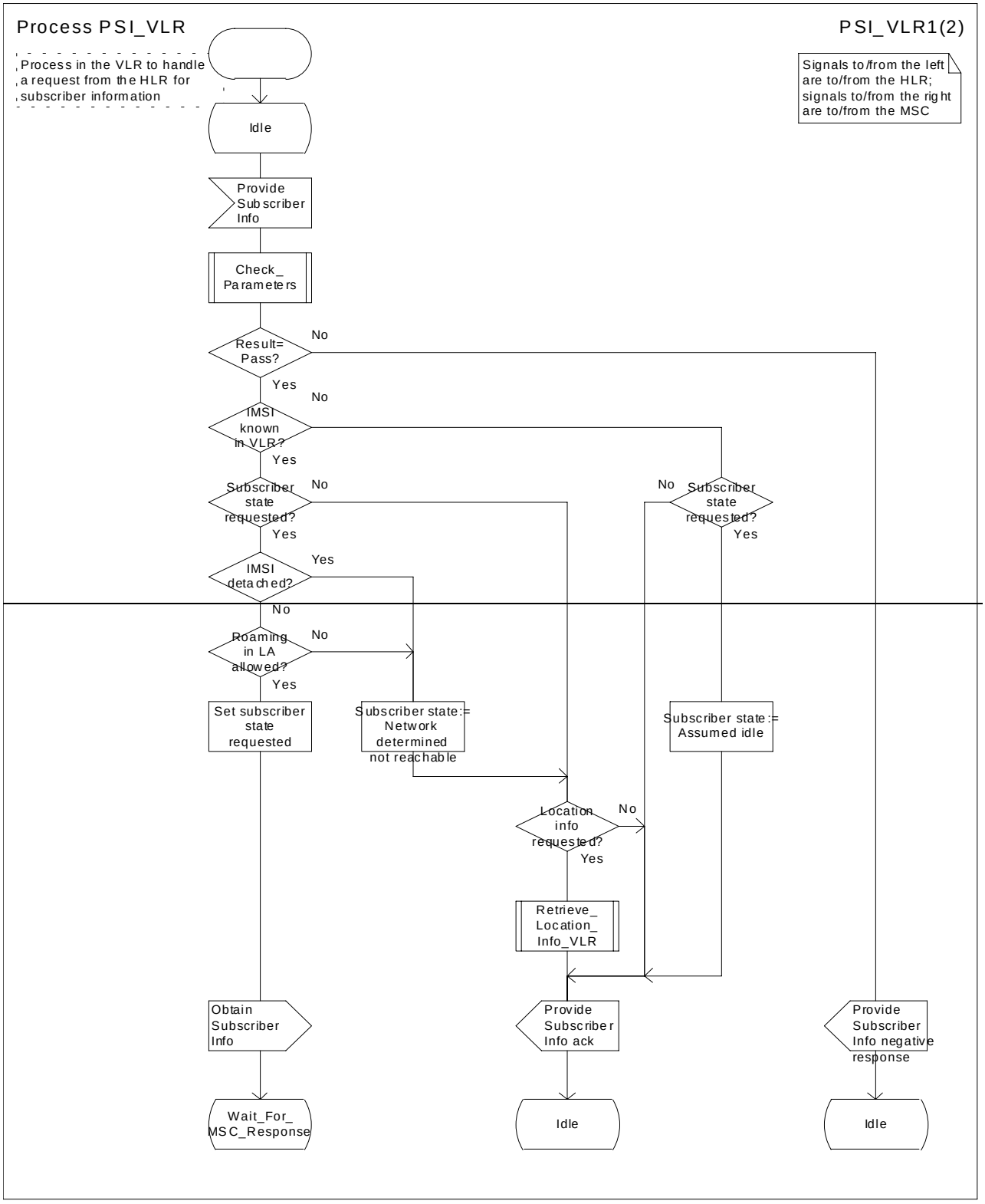
7.2.3.5 Procedure Active_Info_Retrieval~~e_Current_Location~~_VLR

Sheet 1: ~~T~~the test "Paging via SGSN possible" takes the "yes" exit if:

- the Gs interface is implemented; and
- the VLR configuration requires paging via the SGSN during VLR restoration.

Sheet 2: ~~T~~the output signal Page MS towards the SGSN includes or omits the Location area identity parameter depending on the availability of this information. If it is omitted, the signal Page MS is sent to every SGSN to which the VLR is connected.

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


Process PSI_VLR
PSI_VLR1(2)
Process in the VLR to handle a request from the HLR for subscriber information
Signals to/from the left are to/from the HLR; signals to/from the right are to/from the MSC
Idle
Provide Subscriber Info
Check_ Parameters
Result= Pass?
No
Yes
IMSI known in VLR?
No
Yes
Subscriber state requested?
No
Yes
IMSI detached?
Yes
No
Roaming in LA allowed?
No
Yes
Set subscriber state requested
Subscriber state:= Network determined not reachable
Subscriber state:= Assumed idle
Location info requested?
No
Yes
Retrieve_ Location_ Info_VLR
Obtain Subscriber Info
Provide Subscriber Info ack
Provide Subscriber Info negative response
Wait_For_ MSC_Response
Idle
Idle

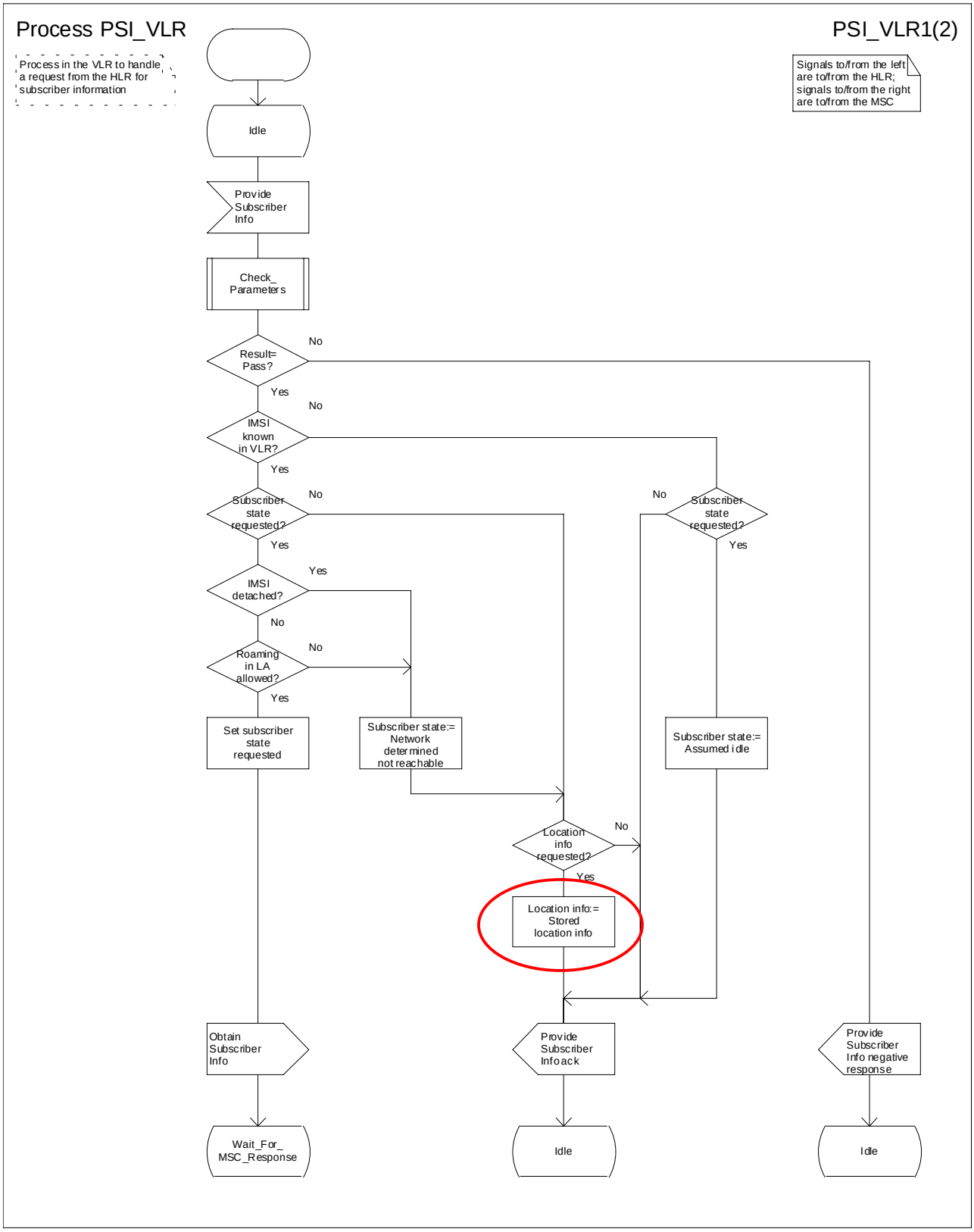
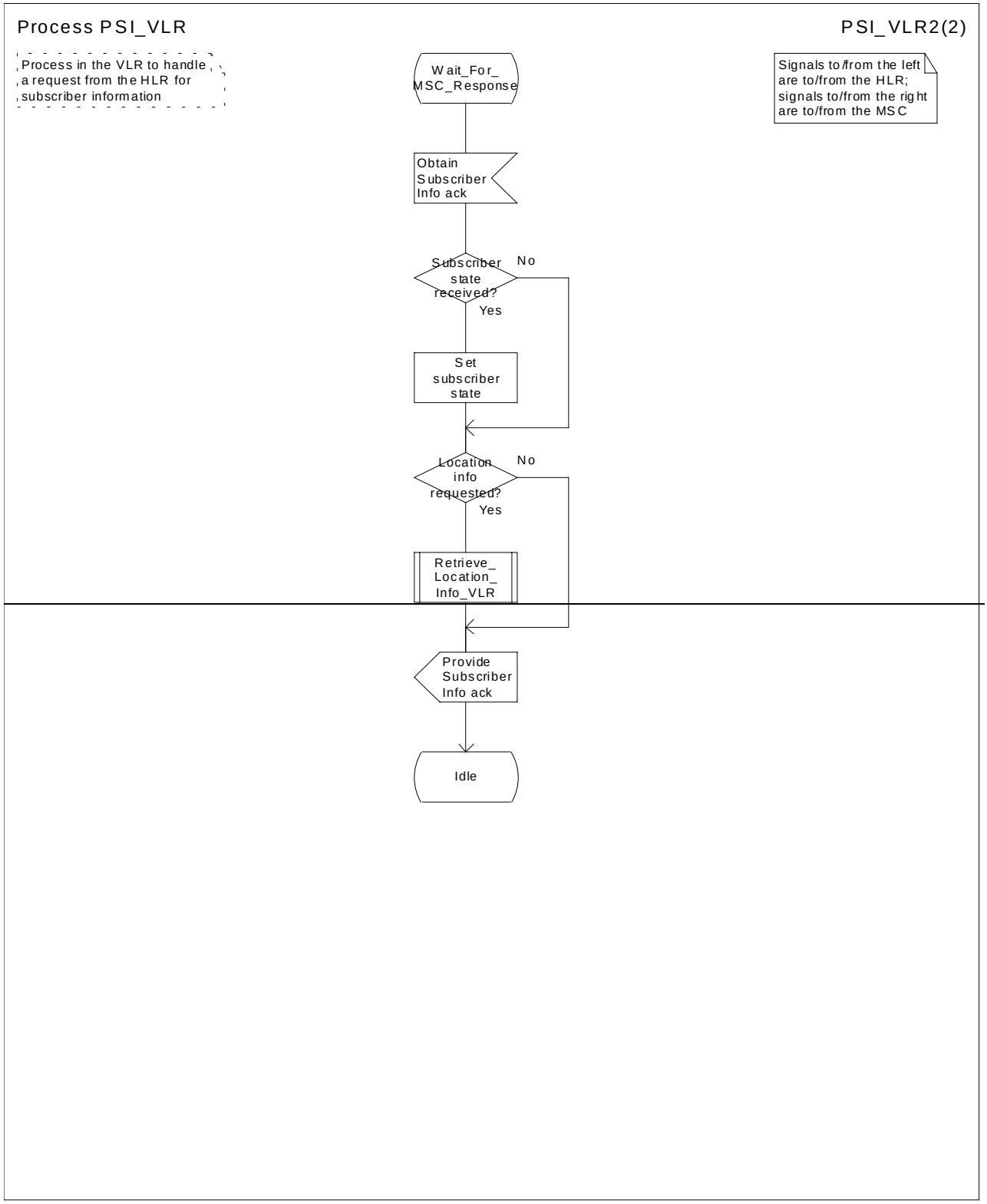


Figure 57a: Process PSI_VLR (sheet 1)


Process PSI_VLR
PSI_VLR2(2)
Process in the VLR to handle a request from the HLR for subscriber information
Signals to/from the left are to/from the HLR; signals to/from the right are to/from the MSC
Wait_For_ MSC_Response
Obtain Subscriber Info ack
Subscriber state received?
No
Yes
Set subscriber state
Location info requested?
No
Yes
Retrieve_ Location_ Info_VLR
Provide Subscriber Info ack
Idle

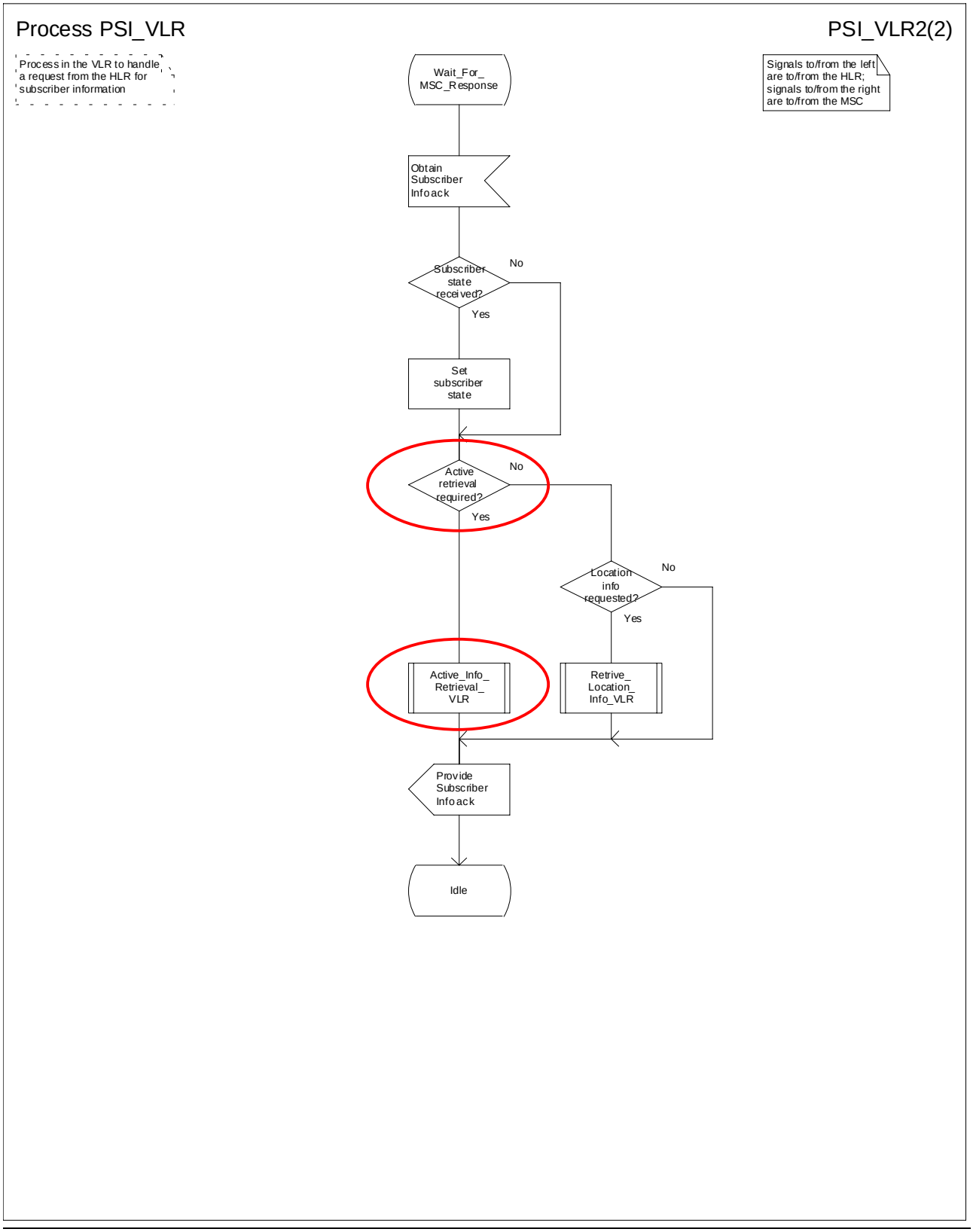
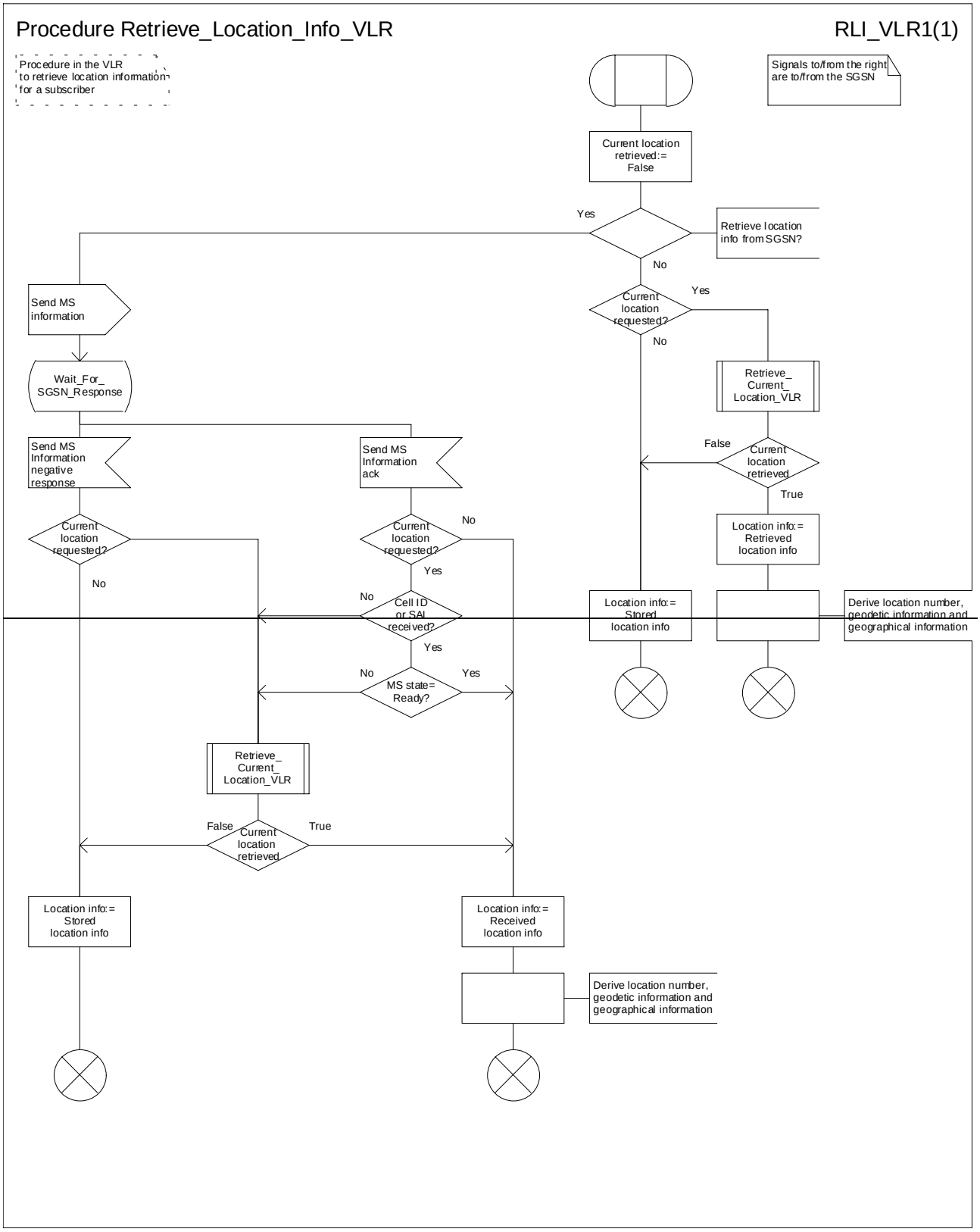


Figure 57b: Process PSI_VLR (sheet 2)


Procedure Retrieve_Location_Info_VLR
RLI_VLR1(1)
Procedure in the VLR to retrieve location information for a subscriber
Signals to/from the right are to/from the SGSN
Current location retrieved:= False
Yes
Retrieve location info from SGSN?
No
Current location requested?
Yes
No
Send MS information
Wait_For_ SGSN_Response
Retrieve_ Current_ Location_VLR
Send MS Information negative response
Send MS Information ack
False
Current location retrieved
True
Current location requested?
No
Location info:= Retrieved location info
Yes
No
Cell ID or SAI received?
Location info:= Stored location info
Derive location number, geodetic information and geographical information
Yes
No
MS state= Ready?
Yes
Retrieve_ Current_ Location_VLR
False
Current location retrieved
True
Location info:= Stored location info
Location info:= Received location info
Derive location number, geodetic information and geographical information

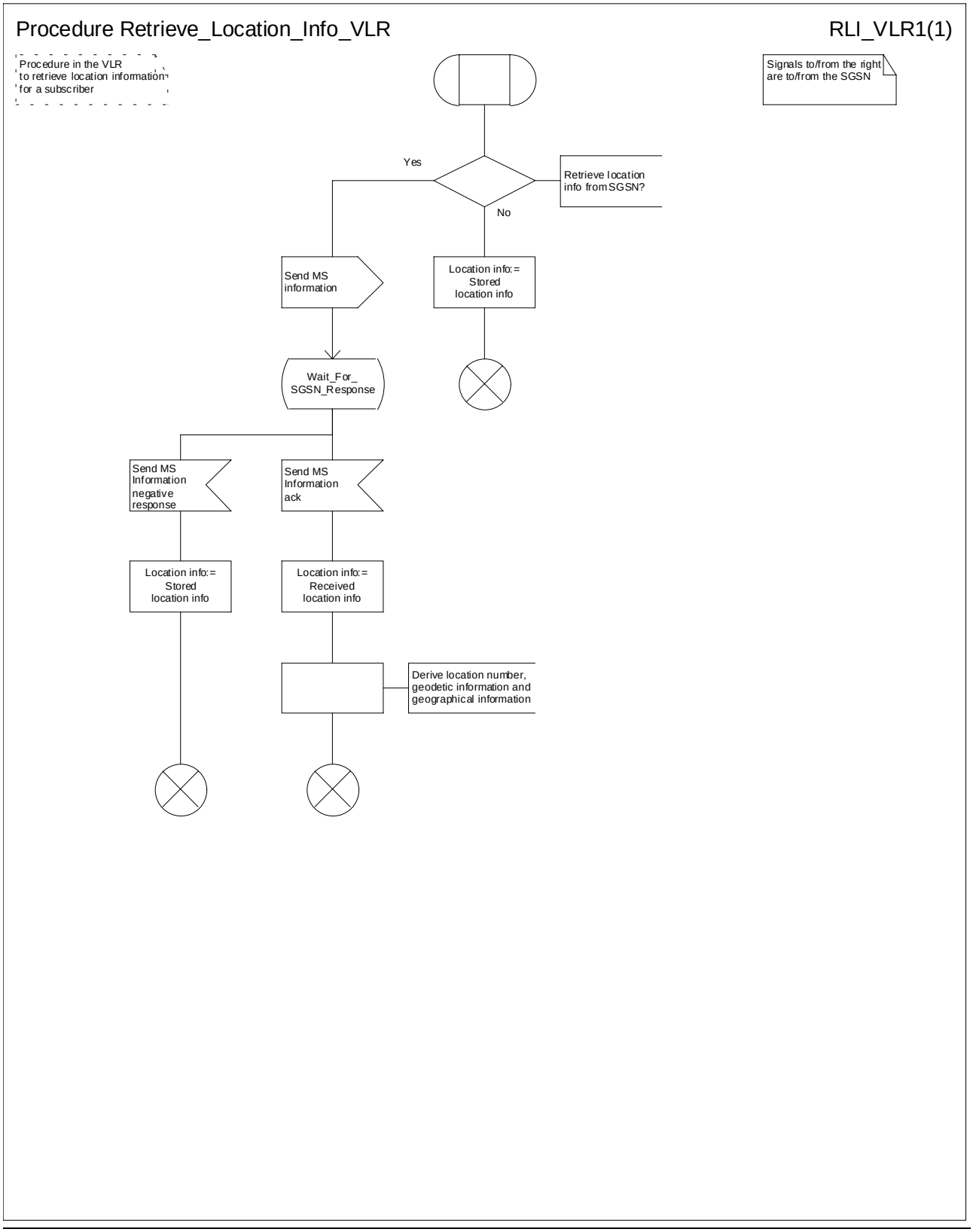
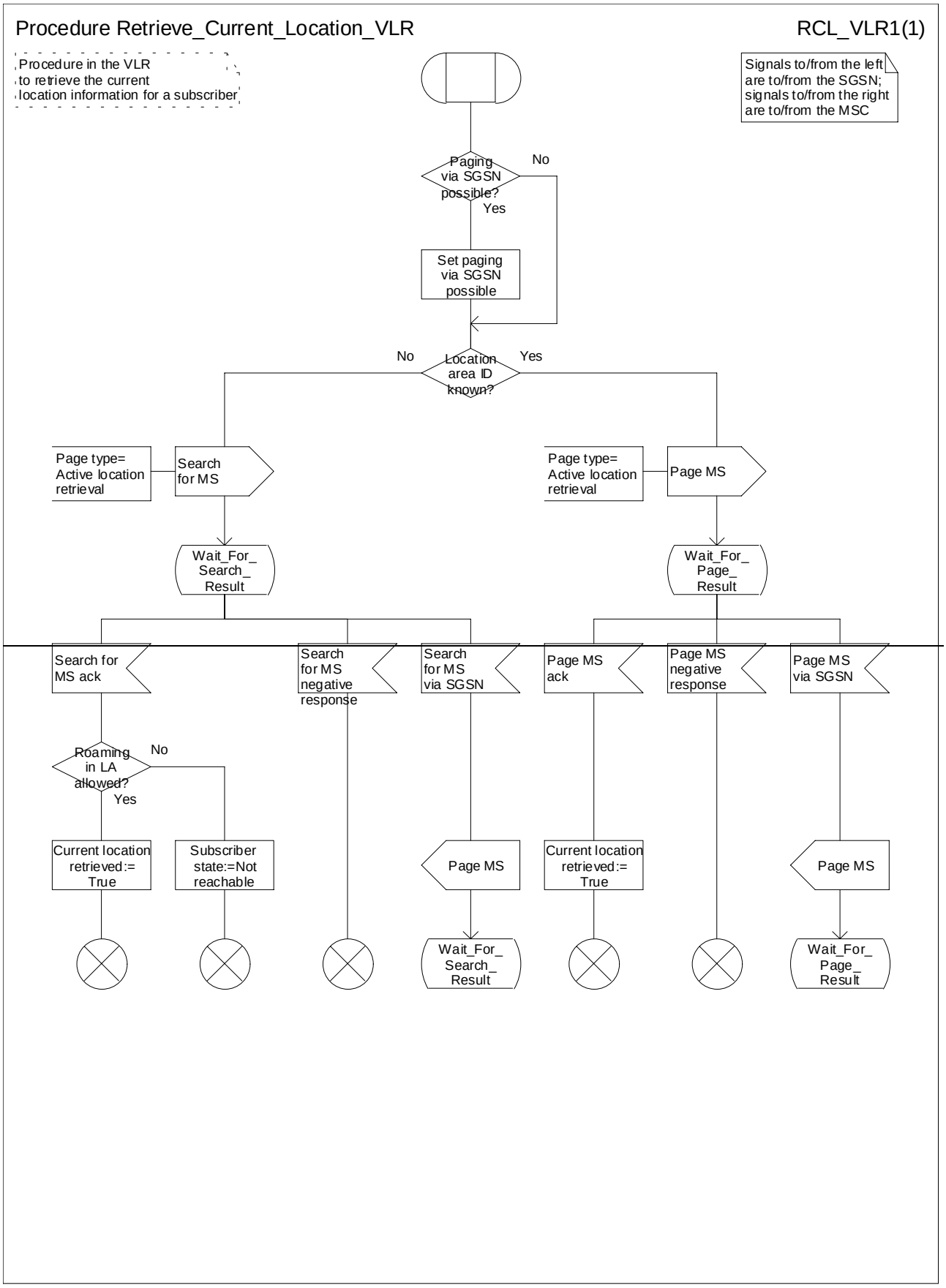


Figure 58: Procedure Retrieve_Location_Info_VLR


Procedure Retrieve_Current_Location_VLR
RCL_VLR1(1)
Procedure in the VLR to retrieve the current location information for a subscriber
Signals to/from the left are to/from the SGSN; signals to/from the right are to/from the MSC
Paging via SGSN possible?
No
Yes
Set paging via SGSN possible
No
Location area ID known?
Yes
Page type= Active location retrieval
Search for MS
Page type= Active location retrieval
Page MS
Wait_For_ Search_ Result
Wait_For_ Page_ Result
Search for MS ack
Search for MS negative response
Search for MS via SGSN
Page MS ack
Page MS negative response
Page MS via SGSN
Roaming in LA allowed?
No
Yes
Current location retrieved:= True
Subscriber state:=Not reachable
Page MS
Current location retrieved:= True
Page MS
Wait_For_ Search_ Result
Wait_For_ Page_ Result

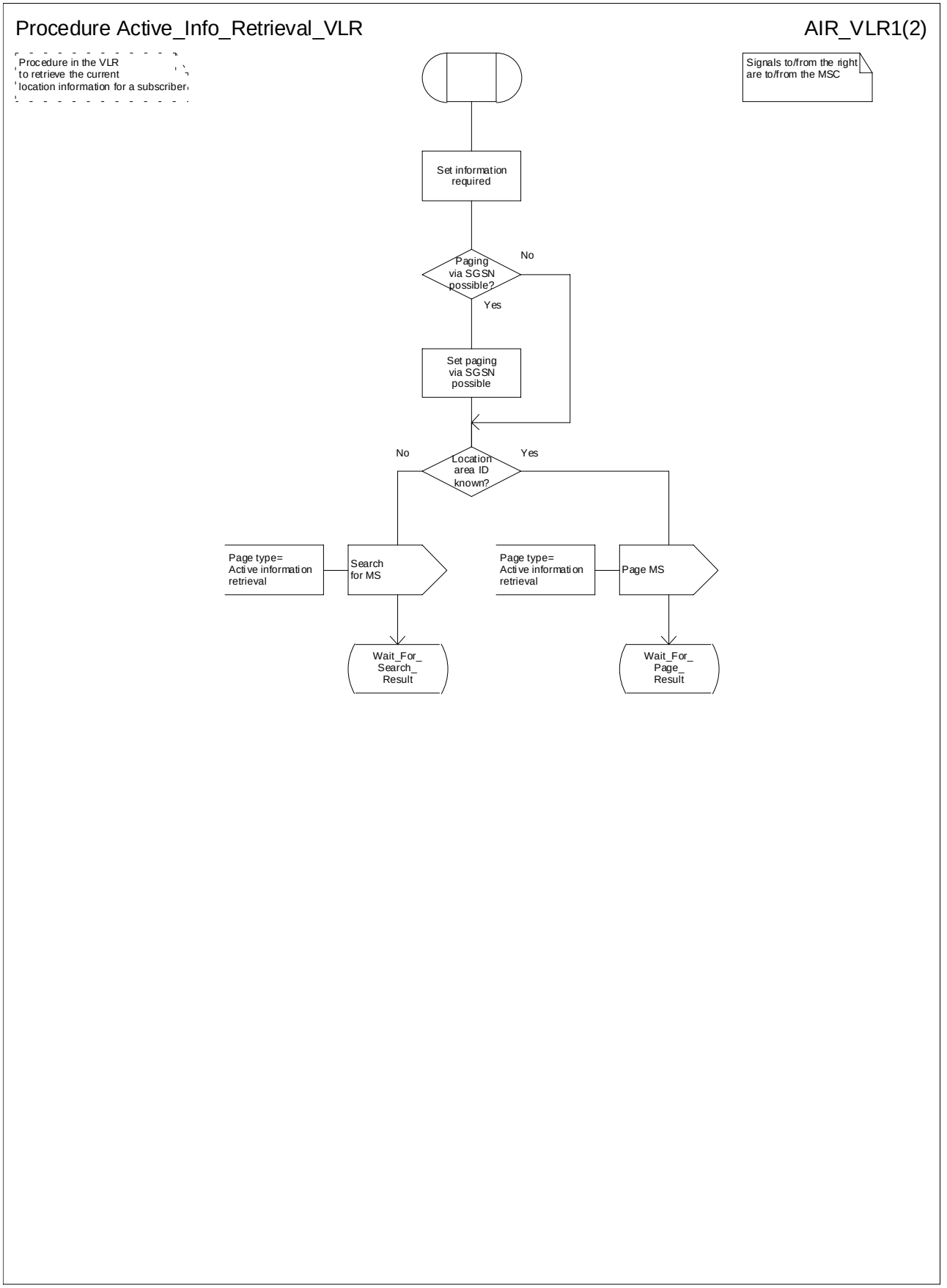


Figure 59a: Procedure Active_Info_Retrievale_Current_Location_VLR (sheet 1)

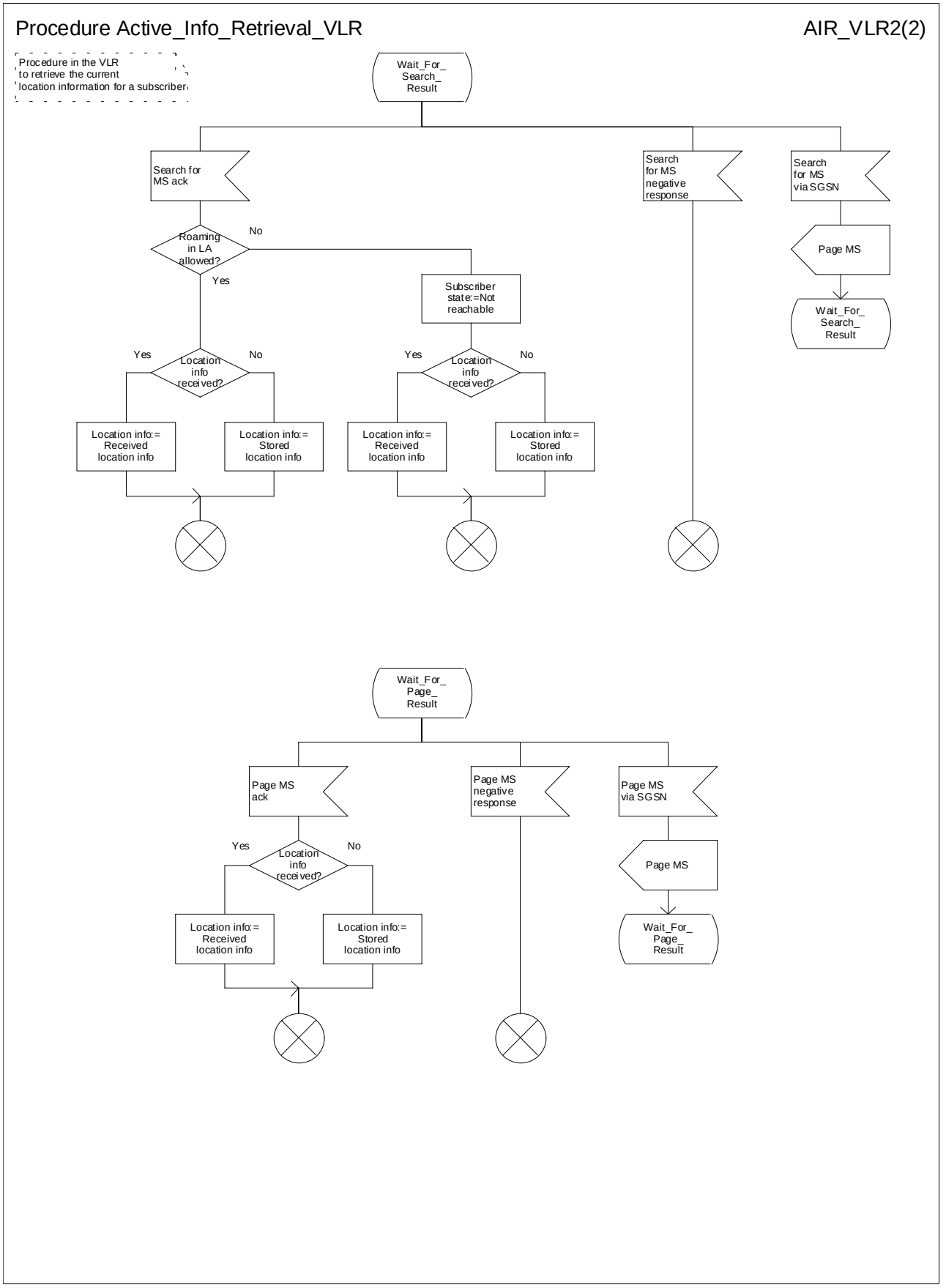


Figure 59b: Procedure Active_Info_Retrieval_VLR (sheet 2)

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

7.2.4.5 Process AIR~~CL~~_MSC

This process runs when the MSC receives a Page MS message or a Search for MS message with a Page type indicating Active Info Retrieval.

7.2.4.6 Procedure ~~Current_Location~~Active_Info_Retrieval_Page_MSC

The test "MS connection exists" takes the "Yes" exit if there is a radio connection established between the MS and the network.

The test "GSM Access" takes the "Yes" exit if the MS is using a GSM radio access to communicate with the network.

The test "Report on change of service area?" takes the "Yes" exit if the MSC has performed the Location Reporting Control procedure (see 3GPP TS 25.413 [27]) with the Request Type IE set to "Change of service area".

If the test "Report on change of service area?" takes the "No" exit the MSC shall perform a Location Reporting Control procedure with the Request Type IE set to "Direct".

7.2.4.7 Procedure ~~Current_Location~~Active_Info_Retrieval_Search_MSC

The test "MS connection exists" takes the "Yes" exit if there is a radio connection established between the MS and the network.

The test "GSM Access" takes the "Yes" exit if the MS is using a GSM radio access to communicate with the network.

The test "Report on change of service area?" takes the "Yes" exit if the MSC has performed the Location Reporting Control procedure (see 3GPP TS 25.413 [27]) with the Request Type IE set to "Change of service area".

If the test "Report on change of service area?" takes the "No" exit the MSC shall perform a Location Reporting Control procedure with the Request Type IE set to "Direct".

7.2.4.8 Procedure Retrieve_IMEI_If_Required

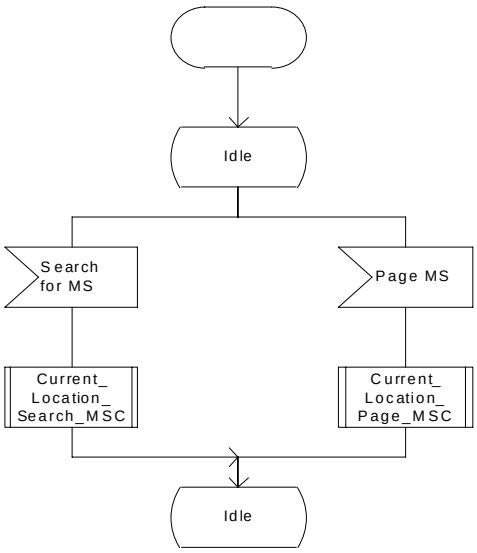
If the IMEI is retrieved using an existing connection between the MS and the network (as opposed to a connection which has been set up for active information retrieval), the Release transaction signal is relayed to the MSC process which is supervising the existing connection.

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

Process RCL_MSC RCL_MSC1(1)

Process in the MSC to retrieve the current location of a subscriber

Signals to/from the left are to/from the VLR



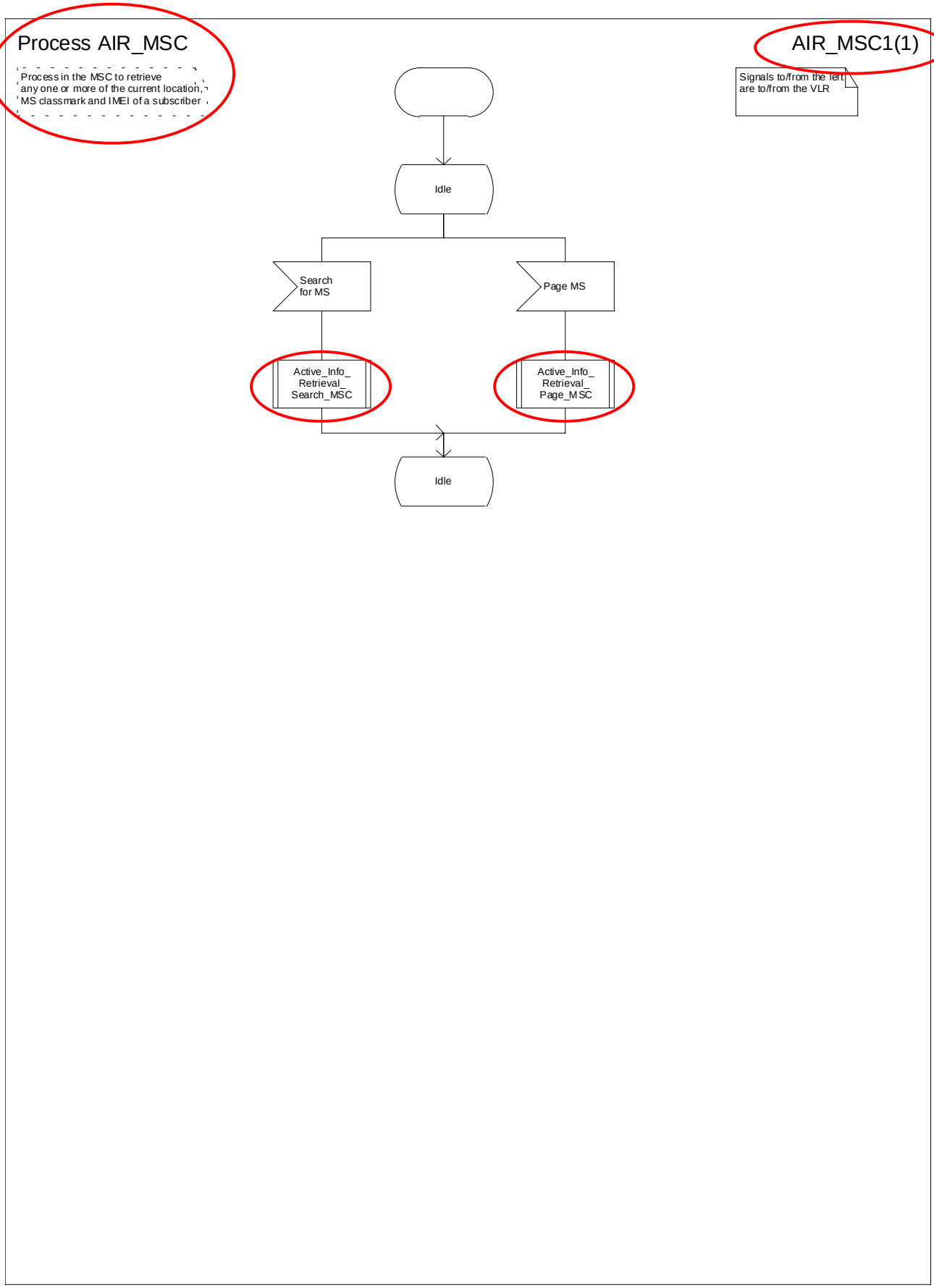
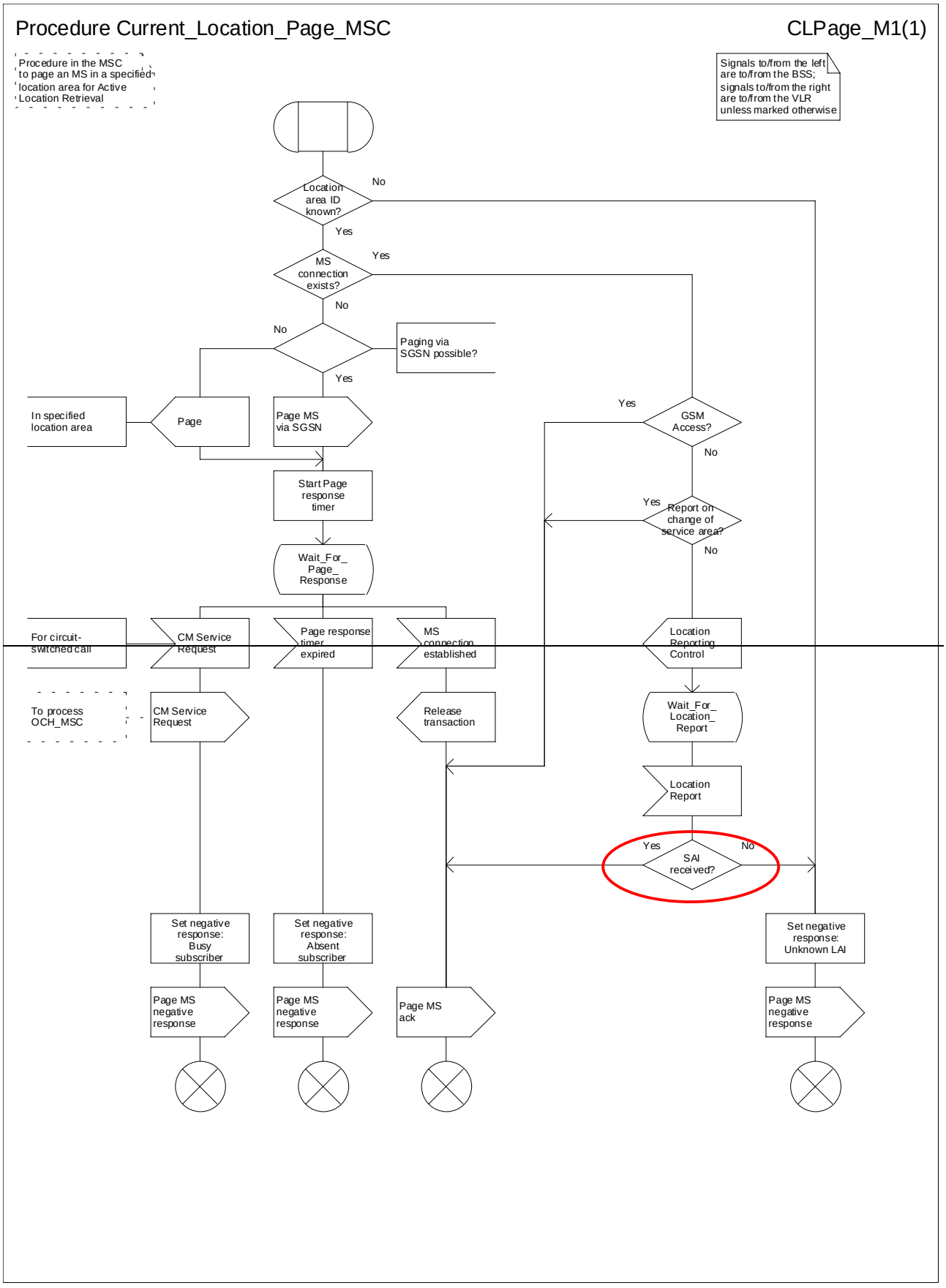


Figure 64: Process AIR~~CL~~_MSC


Procedure Current_Location_Page_MSC
CLPage_M1(1)
Procedure in the MSC to page an MS in a specified location area for Active Location Retrieval
Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise
Location area ID known?
No
Yes
MS connection exists?
Yes
No
No
Paging via SGSN possible?
Yes
In specified location area
Page
Page MS via SGSN
Yes
GSM Access?
No
Start Page response timer
Yes
Report on change of service area?
No
Wait_For_ Page_ Response
For circuit-switched call
CM Service Request
Page response timer expired
MS connection established
Location Reporting Control
To process OCH_MSC
CM Service Request
Release transaction
Wait_For_ Location_ Report
Location Report
Yes
SAI received?
No
Set negative response: Busy subscriber
Set negative response: Absent subscriber
Set negative response: Unknown LAI
Page MS negative response
Page MS negative response
Page MS ack
Page MS negative response

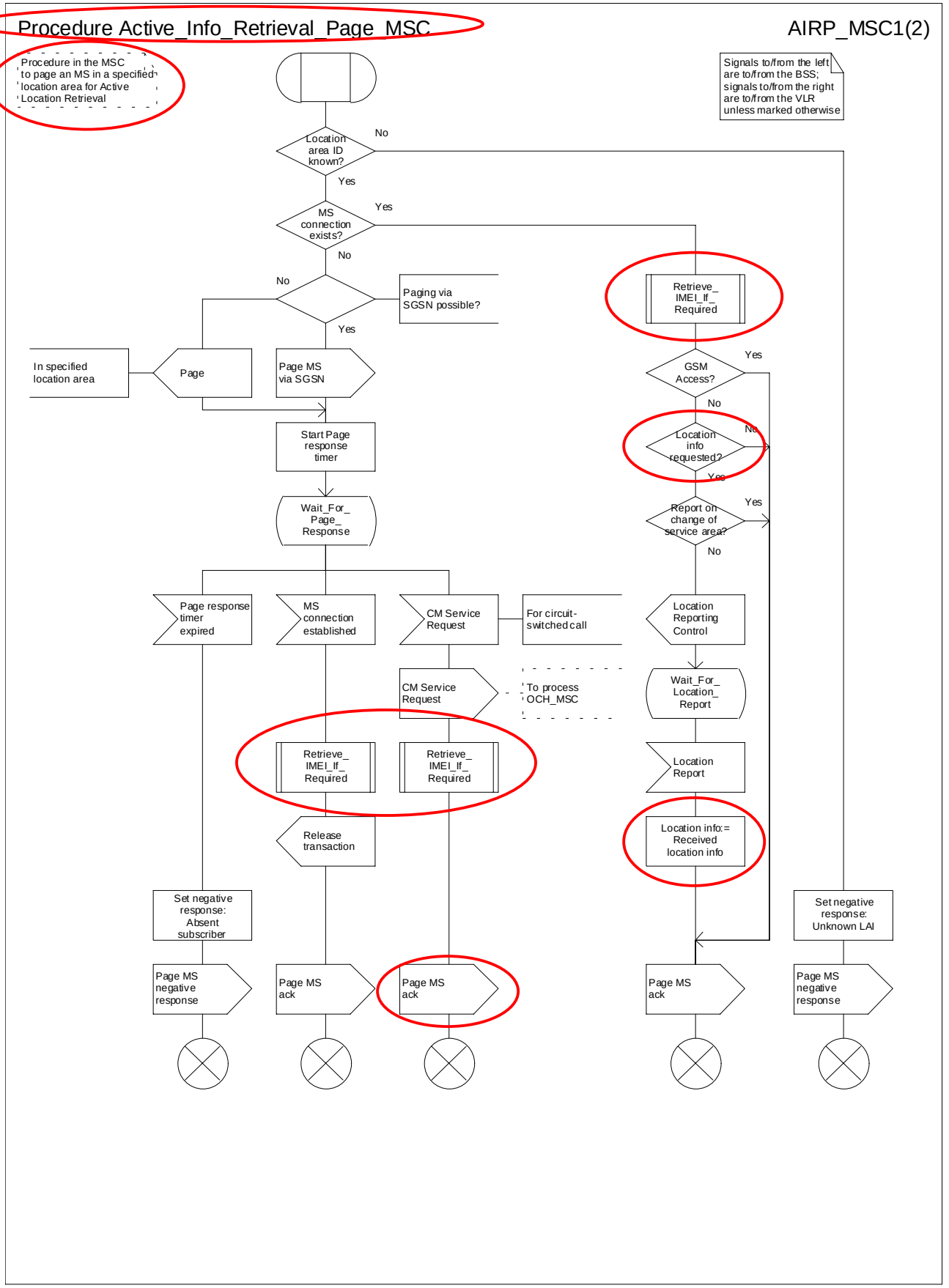
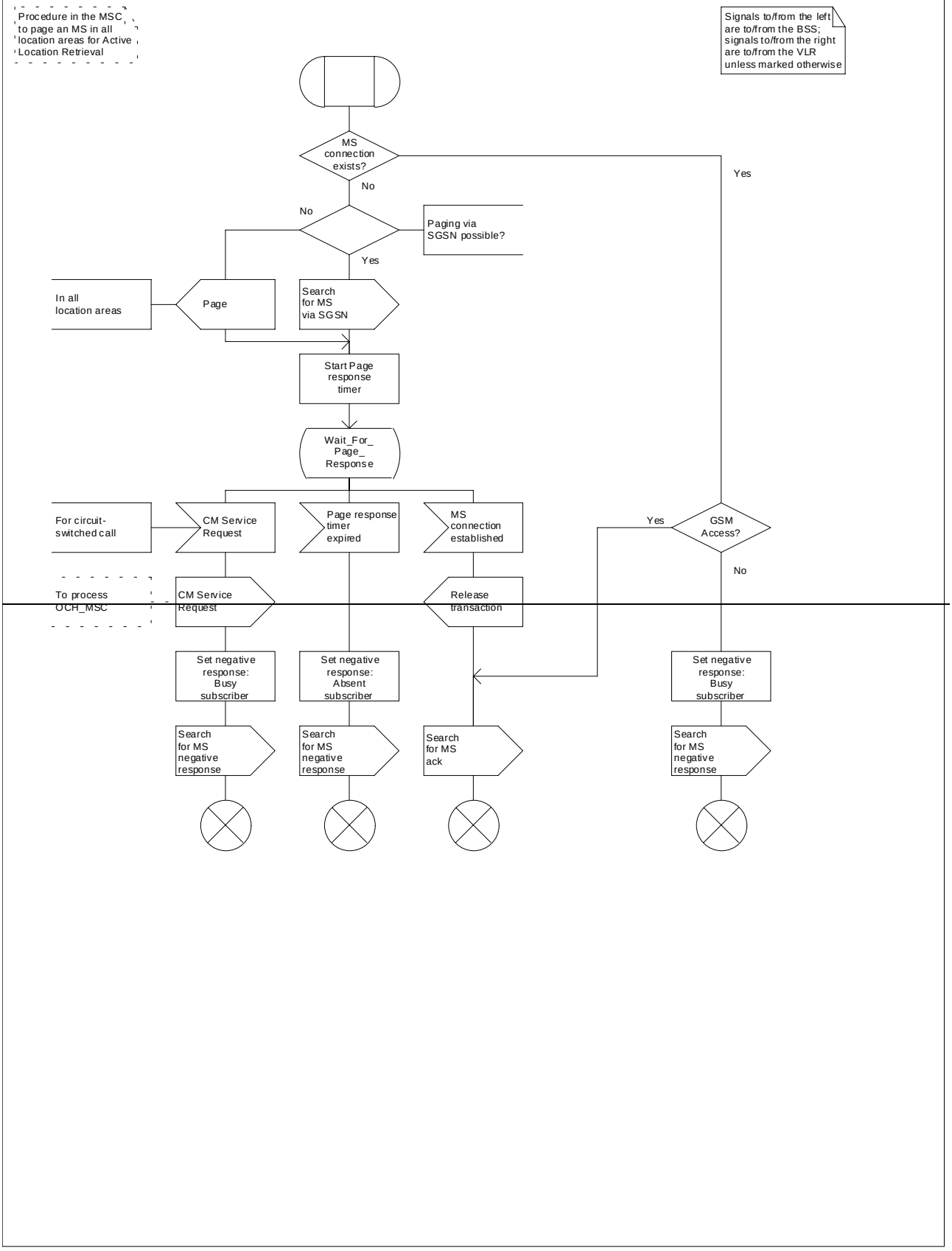


Figure 65: Procedure ~~Current_Location~~Active_Info_Retrieval_Page_MSC

Procedure Current_Location_Search_MSC CLS_MSC1(1)



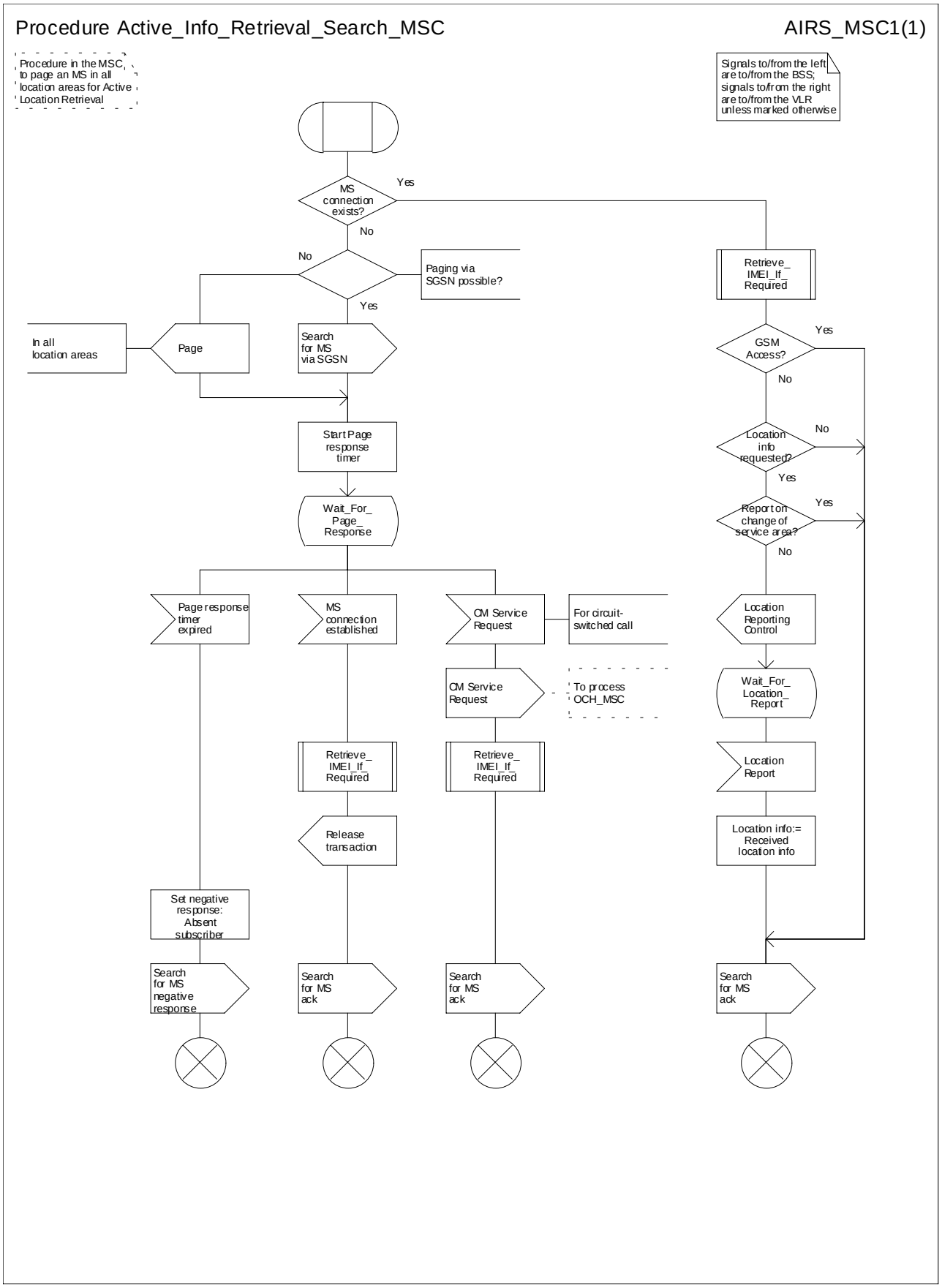


Figure 66: Procedure ~~Current_Location~~Active_Info_Retrieval_Search_MSC

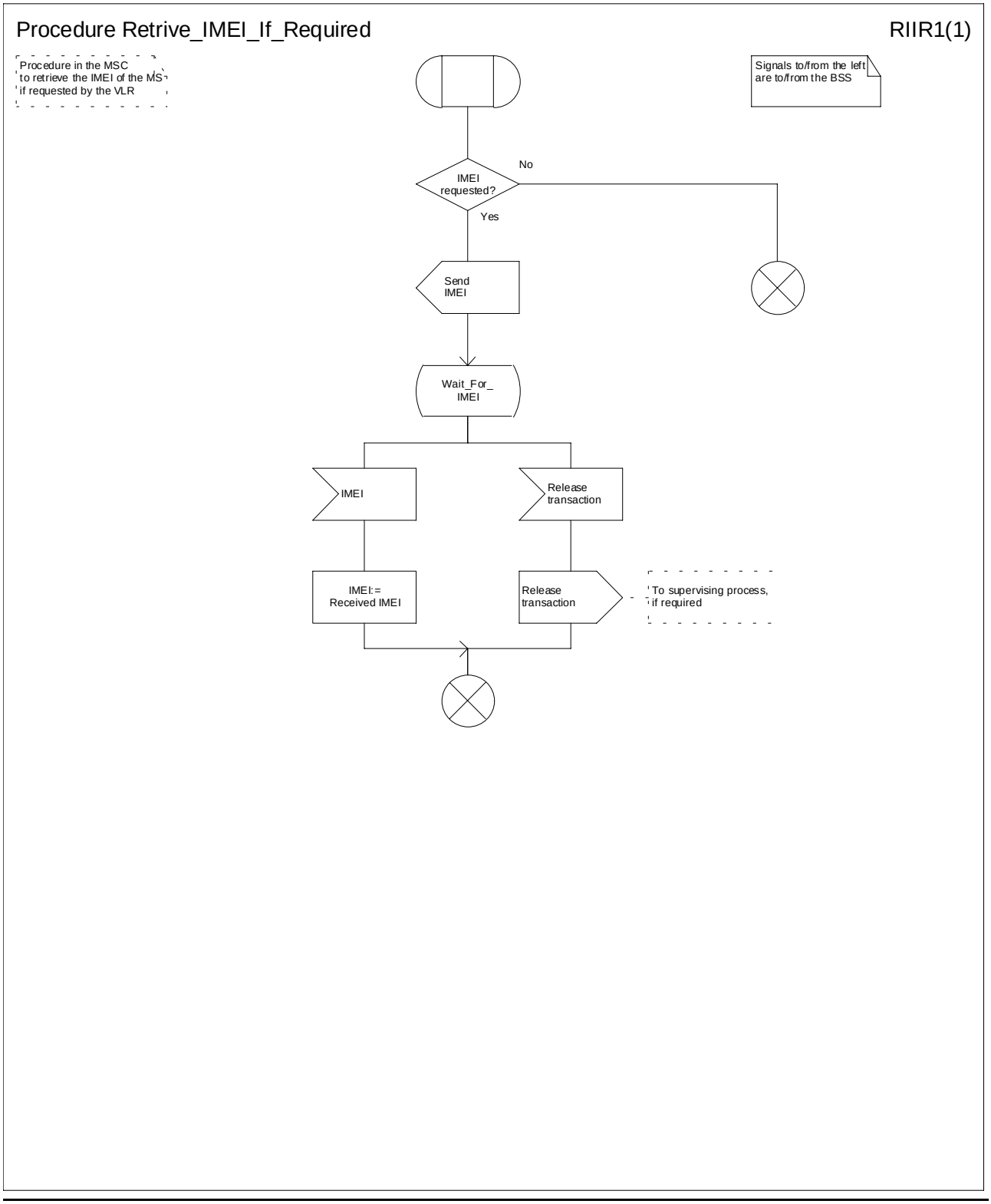


Figure 66bis: Procedure Retrieve_IMEI_If_Required

**** Next modified section ****

8.1.17 Page MS

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS to be paged.
Location area ID	M	Location area in which the MS is to be paged.
Page type	M	Indicates whether the paging is for a circuit-switched call, MT SMS delivery, SS activity or Active ~~Loc~~Information Retrieval.
Requested information	C	Indicates the information requested by the VLR – one or more of: - Location; - MS classmark; - IMEI. Shall be present if the Page type is Active Information Retrieval; otherwise shall be absent.
Paging via SGSN possible	C	Indicates that paging via the SGSN is possible. Shall be present if the VLR determines that the MS can be paged via the SGSN; otherwise shall be absent.
TMSI	O	TMSI to be broadcast to identify the MS.

8.1.18 Page MS ack

The following information elements are required :

Information element name	Required	Description
Location area ID	M	Location area in which the MS responded to the page.
Serving cell ID	~~M~~C	Identity of the cell in which the served subscriber is located. Shall be present if the MS uses GSM radio access; otherwise shall be absent.
Service area ID	C	Service area identity of the cell in which the served subscriber is located. Shall be present if the MS uses UMTS radio access; otherwise shall be absent.
MS classmark	M	MS classmark 2 as defined in 3GPP TS 24.008 [26].
IMEI (with software version)	C	IMEISV as defined in 3GPP TS 23.003 [5]. Shall be present if the IMEI was requested in the Page MS message and the MSC retrieved it from the MS; otherwise shall be absent.

**** Next modified section ****

8.1.32 Search For MS

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the MS to be paged in all location areas.
Page type	M	Indicates whether the paging is for a circuit-switched call, MT SMS delivery, SS activity or Active ~~Loc~~Information Retrieval.
Requested information	C	Indicates the information requested by the VLR – one or more of: - Location; - MS classmark; - IMEI. Shall be present if the Page type is Active Information Retrieval; otherwise shall be absent.
Paging via SGSN possible	C	Indicates that paging via the SGSN is possible. Shall be present if the VLR determines that the MS can be paged via the SGSN; otherwise shall be absent.
TMSI	O	TMSI to be broadcast to identify the MS.

8.1.33 Search For MS ack

The following information element is required:

Information element name	Required	Description
Location area ID	M	Location area in which the MS responded to the page.
Serving cell ID	C	Identity of the cell in which the served subscriber is located. Shall be present if the MS uses GSM radio access; otherwise shall be absent.
Service area ID	C	Service area identity of the cell in which the served subscriber is located. Shall be present if the MS uses UMTS radio access; otherwise shall be absent.
MS classmark	M	MS classmark 2 as defined in 3GPP TS 24.008 [26].
IMEI (with software version)	C	IMEISV as defined in 3GPP TS 23.003 [5]. Shall be present if the IMEI was requested in the Page MS message and the MSC retrieved it from the MS; otherwise shall be absent.

**** Next modified section ****

8.3.4 Provide Subscriber Info

The following information elements are required:

Information element name	Required	Description
IMSI	M	IMSI of the subscriber for whom information is requested (see 3GPP TS 23.003 [5]).
LMSI	C	Local Mobile Subscriber Identity. Shall be present if the LMSI was sent to the HLR at location updating.
Requested information	M	Indicates ~~whether~~ which of the following information the HLR requires: - location information;~~,~~ - subscriber state; - IMEI (with software version); - MS classmark.~~ or both location information and subscriber state.~~
Active location retrieval requested	C	Indicates that the HLR requires active location retrieval. Shall be absent if the requested information does not indicate that the HLR requires location information.

8.3.5 Provide Subscriber Info ack

The following information elements are required:

Information element name	Required	Description
Location information	C	Information to define the location of the MS: see definition in subclause 8.3.5.1. Shall be present if location information was requested and is available; otherwise shall be absent.
Subscriber state	C	Indicates whether the MS is busy (i.e. engaged on a circuit-switched call), network determined not reachable (IMSI detached or roaming in a prohibited location area) or assumed idle. Shall be present if subscriber state was requested; otherwise shall be absent.
IMEI (with software version)	C	IMEISV as defined in 3GPP TS 23.003 [5]. Shall be present if the IMEI was requested, otherwise shall be absent.
MS classmark	C	MS classmark 2 as defined in 3GPP TS 24.008 [26]. Shall be present if the MS classmark was requested, otherwise shall be absent.

****** End of document ******

3GPP TSG CN WG4 Meeting #12
Sophia Antipolis, France,
28th January – 2nd February 2002

N4-020260
(Revision of N4-020007)

CR-Form-v5

CHANGE REQUEST

⌘ **23.018** **CR** **082** ⌘ **rev** **2** ⌘ Current version: 5.2.0 ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Introduction of CAMEL Phase 4
Source:	⌘	CN4
Work item code:	⌘	CAMEL4
Date:	⌘	31st January 2002
Category:	⌘	**B**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	This CR combines the CRs to 3GPP TS 23.018 that have been approved in TSG-CN2 under the CAMEL Phase 4 work item.
Summary of change:	⌘	The following CRs have been incorporated: • N2-000306: Introduction of Alerting DP • N2-000564: Inclusion of Alerting DP as EDP-R • N2-000664: Introduction of Move Leg and Split Leg operations • N2-010123: Introduction of CPH operations • N2-010167: Correction of CAMEL Alerting procedures • N2-010243: Correction of CAMEL Alerting procedures • N2-010256: Correction to CPH procedures • N2-010349: Handling of reconnect after leg2 disconnects (MO case) • N2-010495: Handling of reconnect on leg2 disconnect (MF call case) • N2-010497: Handling of reconnect on leg2 disconnect (MT and VT call cases) • N2-010501: Use of SRI operation by gsmSCF • N2-010642: Handling of SRI from gsmSCF to HLR • N2-020012: Correction to CAMEL4 handling • N2-020154: Continue Without Leg2 at DP2 (for MO calls) • N2-020173: Continue Without Leg2 at DP2 for MF calls • N2-020175: Continue Without Leg2 at DP12 for MT and VT calls
Consequences if not approved:	⌘	CAMEL Phase 4 is incomplete

Clauses affected:	⌘	7.1.1, 7.2.1, 7.2.2 and 7.3.1		
Other specs affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	23.078, 23.079, 23.083 etc.

Other comments:	⌘	Changes since previous version: Inclusion of CRs agreed at CN2#22: • N2-020012: Correction to CAMEL4 handling • N2-020154: Continue Without Leg2 at DP2 (for MO calls) • N2-020173: Continue Without Leg2 at DP2 for MF calls • N2-020175: Continue Without Leg2 at DP12 for MT and VT calls

****** First Modified Section ******

7.1.1 Functional requirements of serving MSC

…

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 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 3GPP TS 23.087 [20].

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 3GPP TS 27.001 [28].

Sheet 1: the procedure CAMEL_N_CSI_CHECK_MSC is specific to CAMEL Phase 3 or later, it is specified in 3GPP TS 23.078 [12].

Sheet 1: the procedure Check_OG_Multicall_MSC is specific to Multicall; it is specified in 3GPP TS 23.135 [25]. If the VMSC does not support Multicall, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 1: the variable "On_Hold" is used only if the VMSC supports Call Hold.

Sheet 1, sheet 2, sheet 3, sheet 6: the procedure CCBS_OCH_Report_Failure is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 1, sheet 2, sheet 6, sheet 7, sheet 9: at any stage after the Set-up has been received, the MS may terminate the transaction with the network by sending a Release transaction request.

Sheet 2, sheet 3, sheet 4, sheet 5, sheet 6, sheet 7, sheet 8, sheet 9: signals are sent to and received from the process Subs_FSM as described in subclause 7.4.

Sheet 3: 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 3: the procedure CAMEL_OCH_MSC_INIT is specific to CAMEL; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 3: the procedure CAMEL_MO_Dialled_Services is specific to CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 3 or later, processing continues from the "~~Yes~~Pass" exit of the test "Result~~=Pass~~?".

Sheet 3: the procedure CCBS_Check_OG_Call is specific to CCBS; it is specified in 3GPP TS 23.093 [23]. If the VMSC does not support CCBS, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 3: the procedure MOBILE_NUMBER_PORTABILITY_IN_OQoD is specific to Mobile Number Portability; it is specified in 3GPP TS 23.066 [10].

Sheet 3: the procedure UUS_OCH_Set_Info_In_IAM is specific to UUS; it is specified in 3GPP TS 23.087 [20].

Sheet 3: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 3: the procedure CCBS_OCH_Report_Success is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 3, sheet 5: the procedure CAMEL_OCH_LEG1_MSC is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 4, sheet 7: the procedures CAMEL_Start_TNRy and CAMEL_Stop_TNRy are specific to CAMEL phase 2 or later; they are specified in 3GPP TS 23.078 [12].

Sheet 4: the task "UTU2Cnt := 0" is executed only if the VMSC supports UUS

Sheet 4: the procedure CAMEL_OCH_MSC_ALERTING is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 4 or later, processing continues from the "Pass" exit of the test "Result?".

Sheet 5: the procedure CAMEL_OCH_MSC_ANSWER is specific to CAMEL; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 5: the procedure Set_COLP_Info_MSC is specific to COLP.

Sheet 5: the procedure Handle_AoC_MO_MSC is specific to AoC.

Sheet 5: the task "Store CW treatment indicator for this call if received in SII2" is executed only if the VMSC supports CAMEL phase 3 or later.

Sheet 5: The process CAMEL_OCH_LEG2_MSC is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 6: the procedures CCBS_Check_If_CCBS_Possible and CCBS_Activation_MSC are specific to CCBS; they are specified in 3GPP TS 23.093 [23]. 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 6, sheet 7: the procedure CAMEL_OCH_MSC_DISC3 is specific to CAMEL Phase 1; it is specified in 3GPP TS 23.078 [12].

Sheet 6, sheet 7: the procedure CAMEL_OCH_MSC_DISC4 is specific to CAMEL Phase 2 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 6, sheet 6: the procedure CAMEL_OCH_MSC1 is specific to CAMEL phase 2 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 2 or later, processing continues from the "No" exit of the test "Result=Reconnect?"

Sheet 6, sheet 7, sheet 9: the processing in the branch beginning with the Int_Release_Call input will occur only if the MSC supports CAMEL.

Sheet 7, sheet 9: the procedure UUS_MSC_Check_UUS1_UUI is specific to UUS; it is specified in 3GPP TS 23.087 [20].

Sheet 8: the input signal TNRy expired and all the subsequent processing are specific to CAMEL phase 2 or later, and will occur only if the VMSC supports CAMEL phase 2 or later. The procedure CAMEL_OCH_MSC2 is specified in 3GPP TS 23.078 [12].

Sheet 8: the input signal User To User is specific to UUS; it is discarded if the VMSC does not support UUS.

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 3GPP TS 23.087 [20].

Sheet 9: the procedure CAMEL_OCH_MSC_DISC1 is specific to CAMEL; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL, processing continues from the "No" exit of the test "Result=CAMEL handling?".

Sheet 9: the procedure CAMEL_OCH_MSC_DISC2 is specific to CAMEL; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL, processing continues from the "No" exit of the test "Result=CAMEL handling?".

Sheet 10: the procedure Process_Hold_Request is specific to Call Hold; it is specified in 3GPP TS 23.083[16].

Sheet 10: the procedure Process_Retrieve_request is specific to Call Hold; it is specified in 3GPP TS 23.083[16].

****** Modified SDLs in Section 7.1.1 ******

…

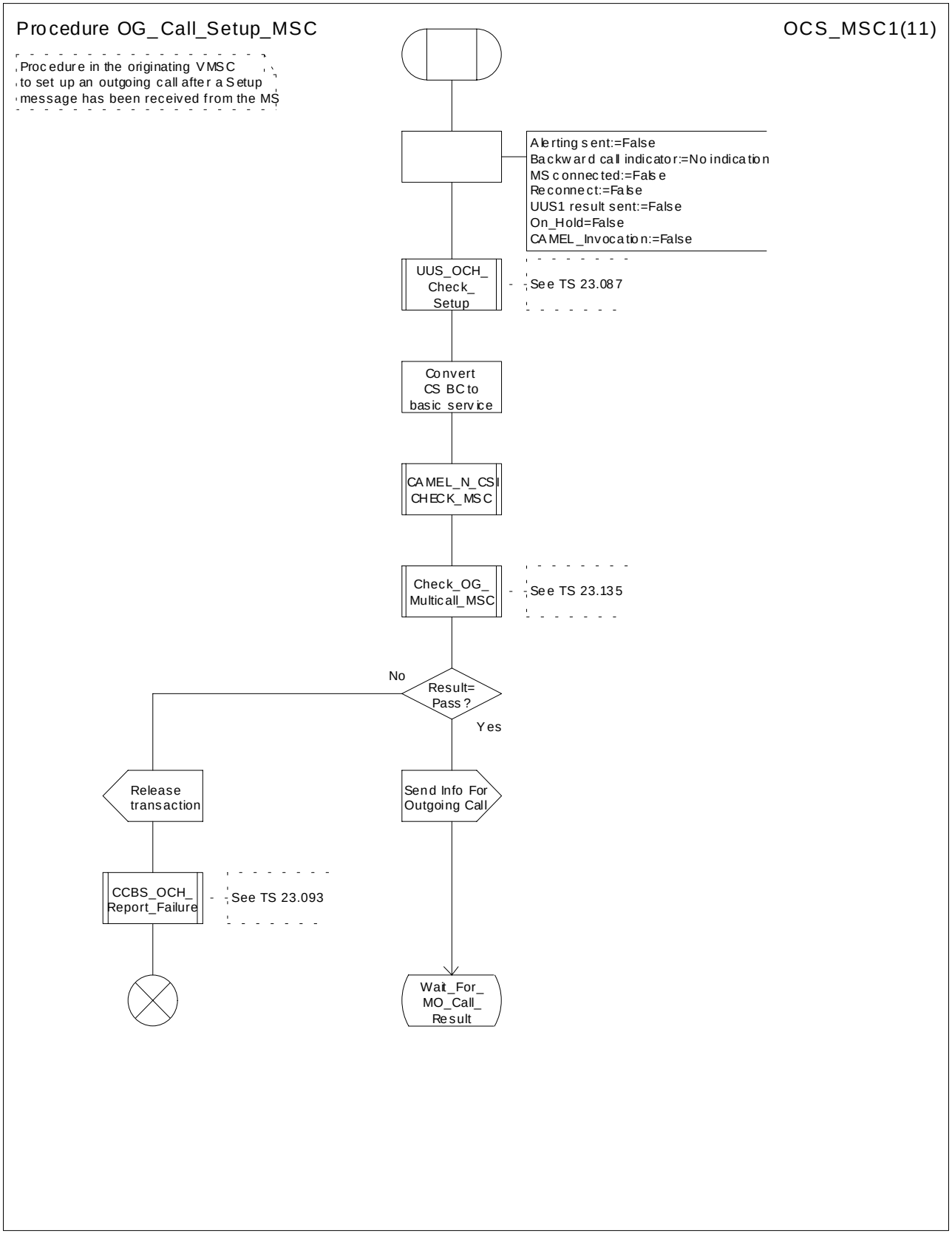


Figure 8a: Procedure OG_Call_Setup_MSC (sheet 1)

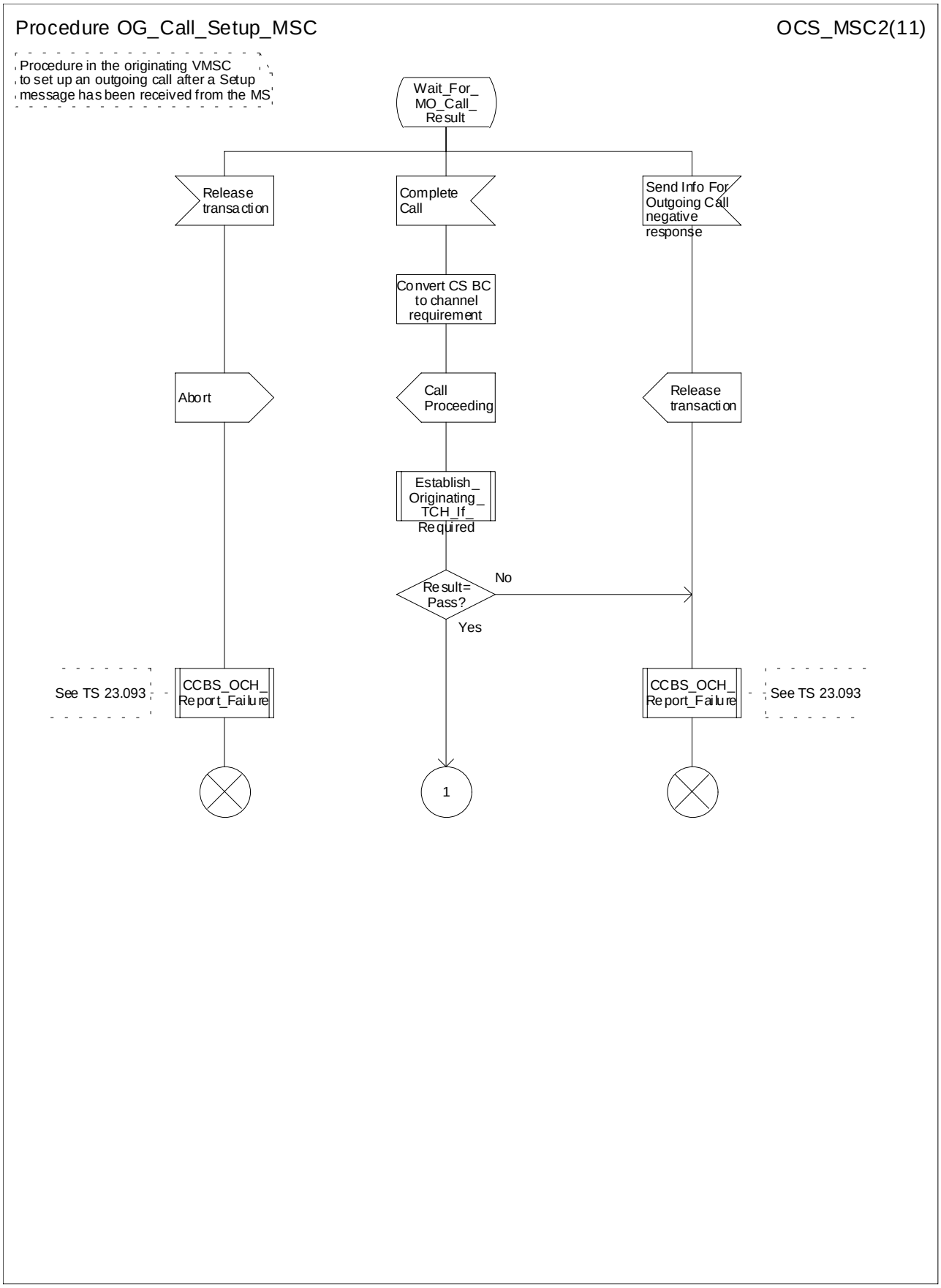
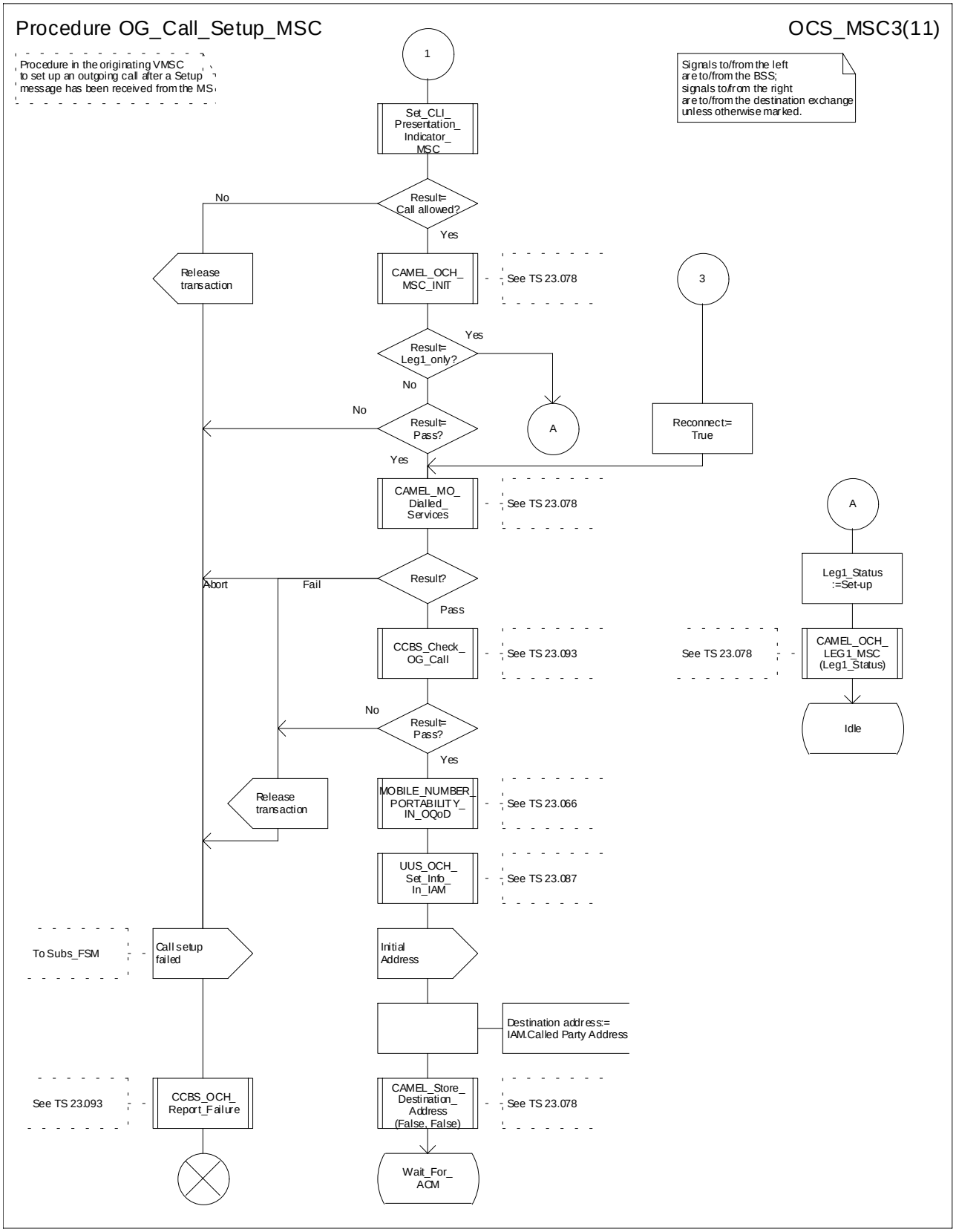


Figure 8b: Procedure OG_Call_Setup _MSC (sheet 2)


Procedure OG_Call_Setup_MSC
OCS_MSC3(11)
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 unless otherwise marked.
1
Set_CLI_Presentation_Indicator_MSC
Result= Call allowed?
No
Yes
Release transaction
CAMEL_OCH_MSC_INIT
See TS 23.078
3
Result= Leg1_only?
Yes
No
Result= Pass?
No
A
Reconnect:= True
Yes
CAMEL_MO_Dialled_Services
See TS 23.078
A
Leg1_Status :=Set-up
Result?
Abort
Fail
Pass
CCBS_Check_OG_Call
See TS 23.093
See TS 23.078
CAMEL_OCH_LEG1_MSC (Leg1_Status)
Idle
Result= Pass?
No
Yes
Release transaction
MOBILE_NUMBER_PORTABILITY_IN_OQoD
See TS 23.066
UUS_OCH_Set_Info_In_IAM
See TS 23.087
To Subs_FSM
Call setup failed
Initial Address
Destination address:= IAM.Called Party Address
See TS 23.093
CCBS_OCH_Report_Failure
CAMEL_Store_Destination_Address (False, False)
See TS 23.078
Wait_For_ACM

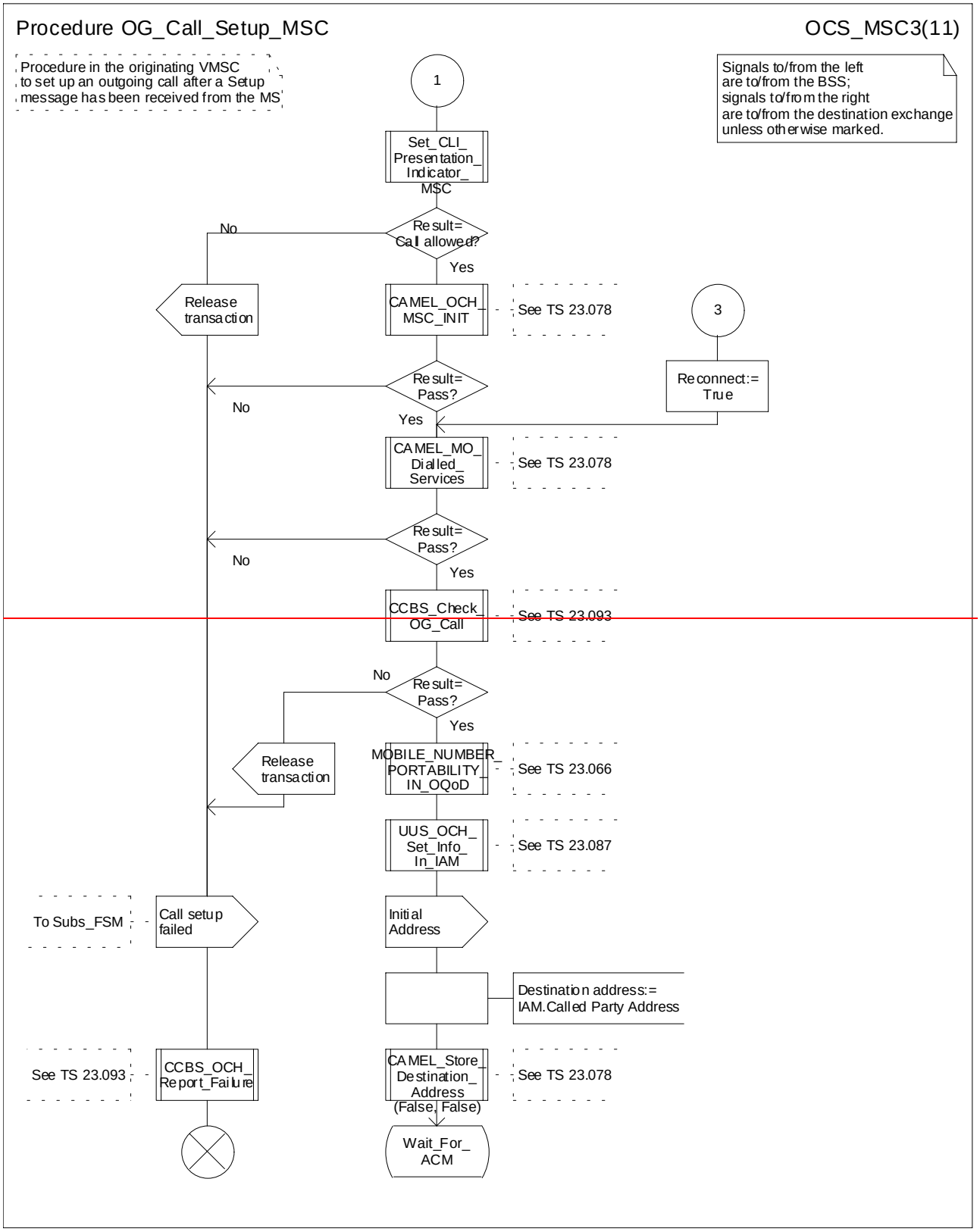
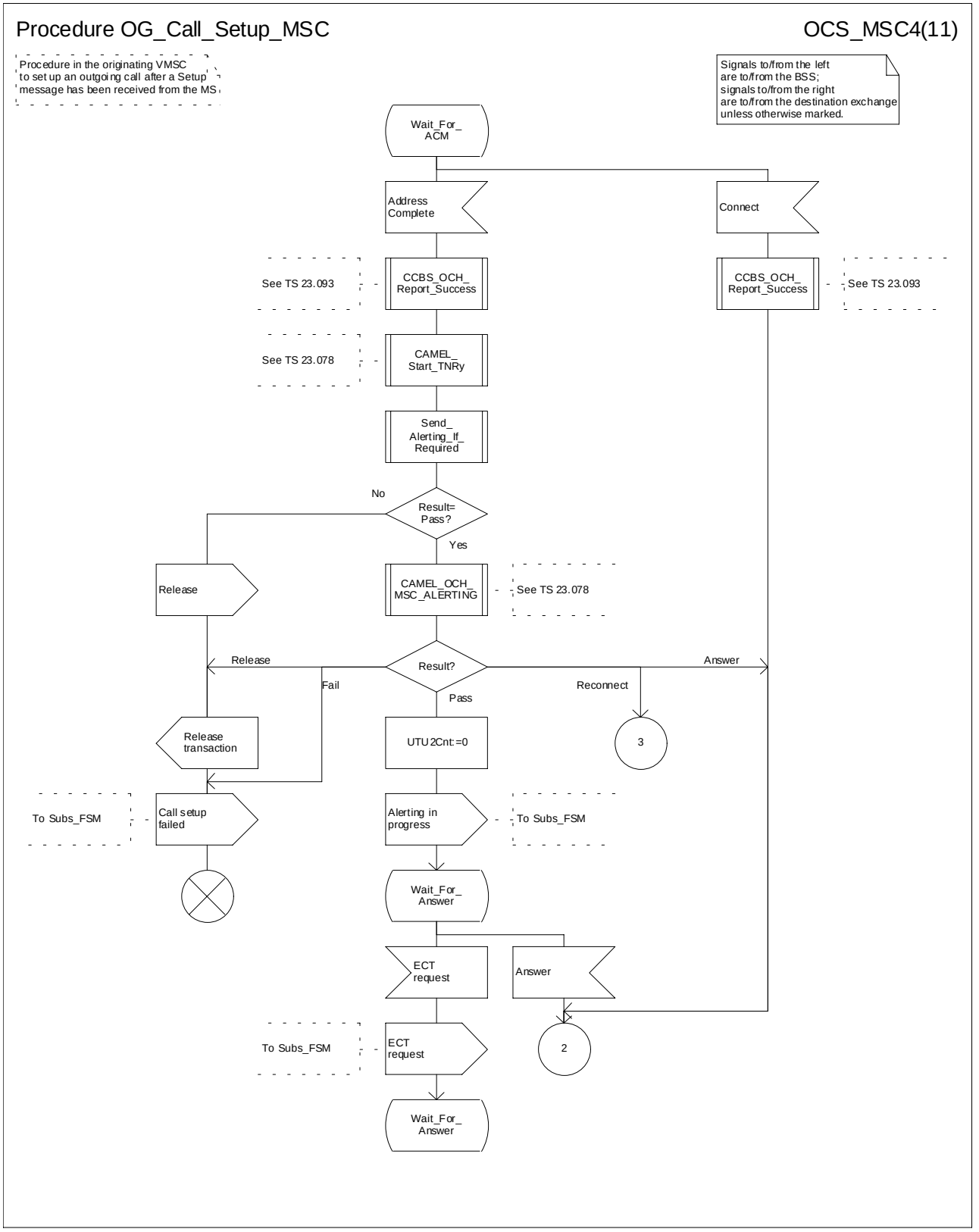


Figure 8c: Procedure OG_Call_Setup _MSC (sheet 3)


Procedure OG_Call_Setup_MSC
OCS_MSC4(11)
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 unless otherwise marked.
Wait_For_ ACM
Address Complete
Connect
See TS 23.093
CCBS_OCH_ Report_Success
CCBS_OCH_ Report_Success
See TS 23.093
See TS 23.078
CAMEL_ Start_TNRy
Send_ Alerting_If_ Required
No
Result= Pass?
Yes
Release
CAMEL_OCH_ MSC_ALERTING
See TS 23.078
Release
Result?
Answer
Fail
Reconnect
Pass
Release transaction
UTU2Cnt:=0
3
To Subs_FSM
Call setup failed
Alerting in progress
To Subs_FSM
Wait_For_ Answer
ECT request
Answer
To Subs_FSM
ECT request
2
Wait_For_ Answer

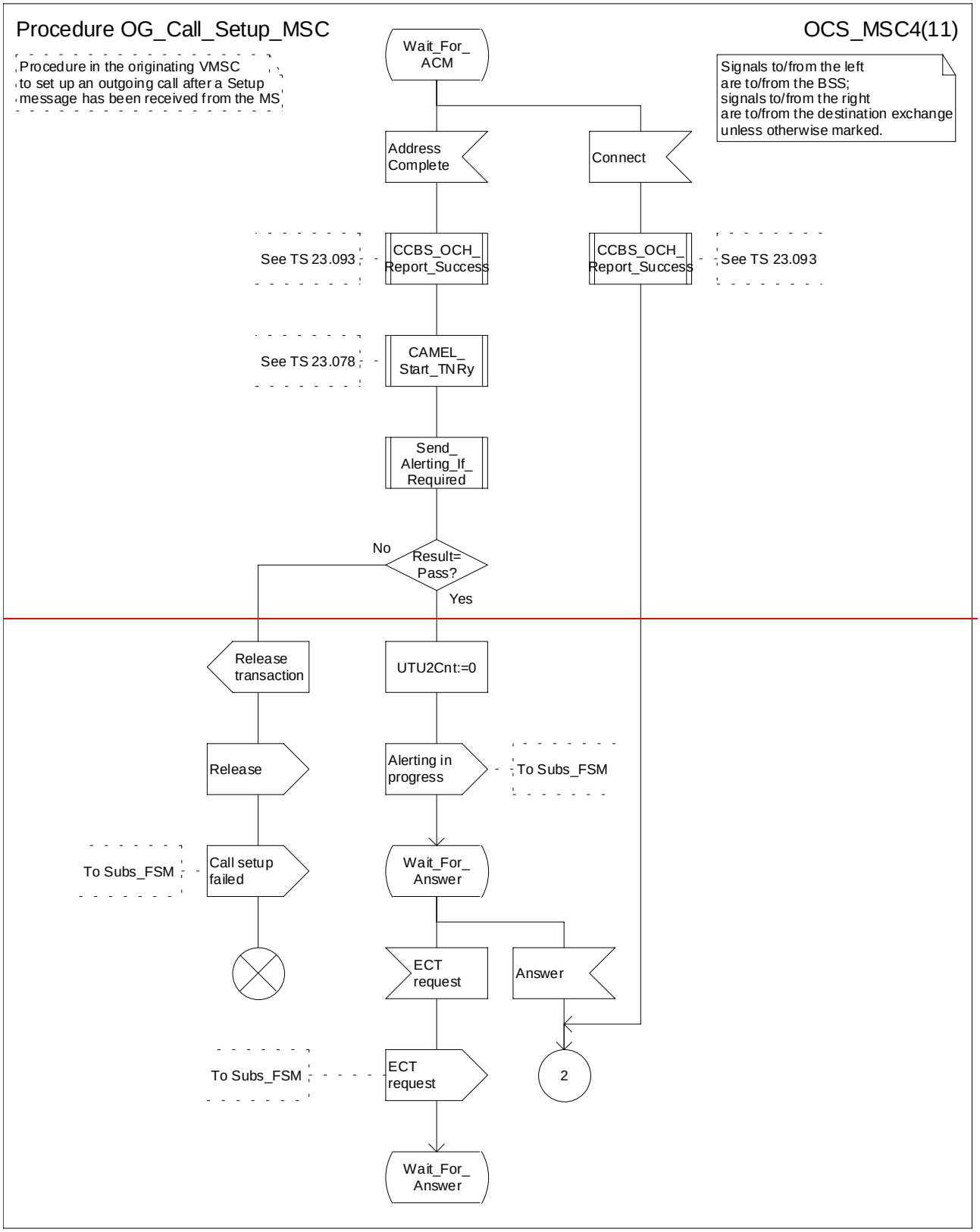
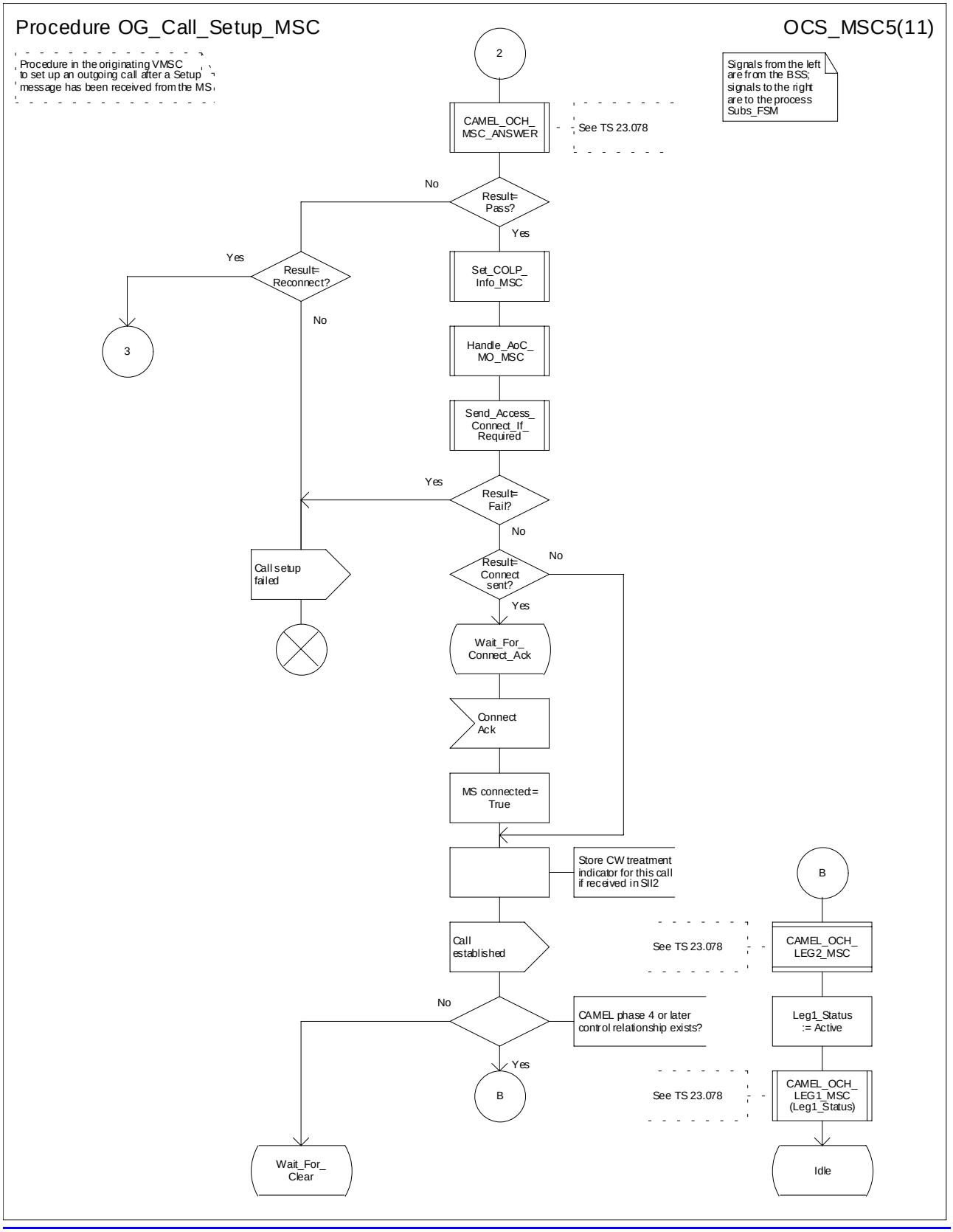


Figure 8d: Procedure OG_Call_Setup _MSC (sheet 4)


Procedure OG_Call_Setup_MSC
OCS_MSC5(11)
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; signals to the right are to the process Subs_FSM
2
CAMEL_OCH_ MSC_ANSWER
See TS 23.078
Result= Pass?
No
Yes
Result= Reconnect?
Yes
No
3
Set_COLP_ Info_MSC
Handle_AoC_ MO_MSC
Send_Access_ Connect_If_ Required
Result= Fail?
Yes
No
Call setup failed
Result= Connect sent?
No
Yes
Wait_For_ Connect_Ack
Connect Ack
MS connected:= True
Store CW treatment indicator for this call if received in SII2
B
Call established
See TS 23.078
CAMEL_OCH_ LEG2_MSC
No
CAMEL phase 4 or later control relationship exists?
Leg1_Status := Active
Yes
B
See TS 23.078
CAMEL_OCH_ LEG1_MSC (Leg1_Status)
Wait_For_ Clear
Idle

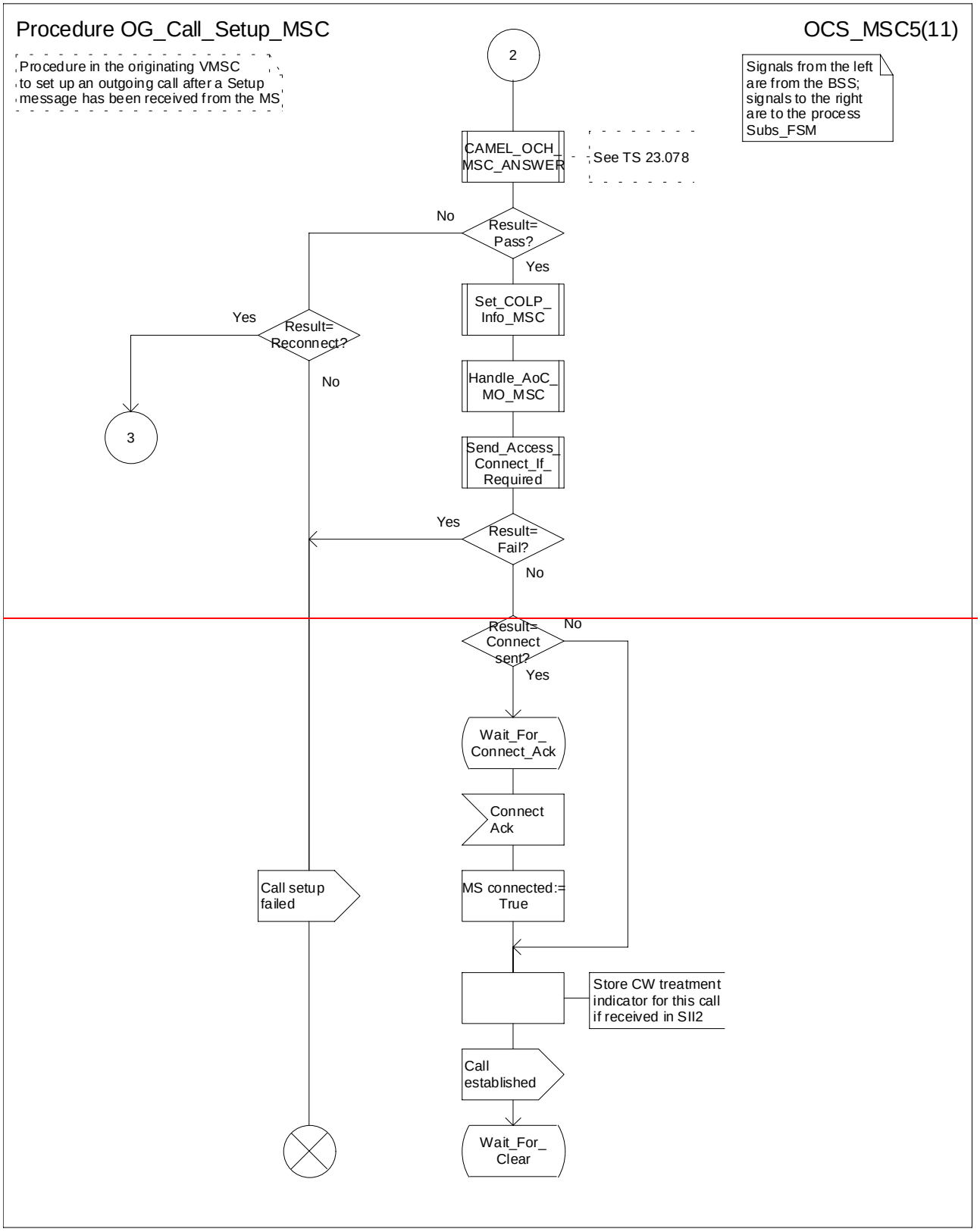


Figure 8e: Procedure OG_Call_Setup _MSC (sheet 5)

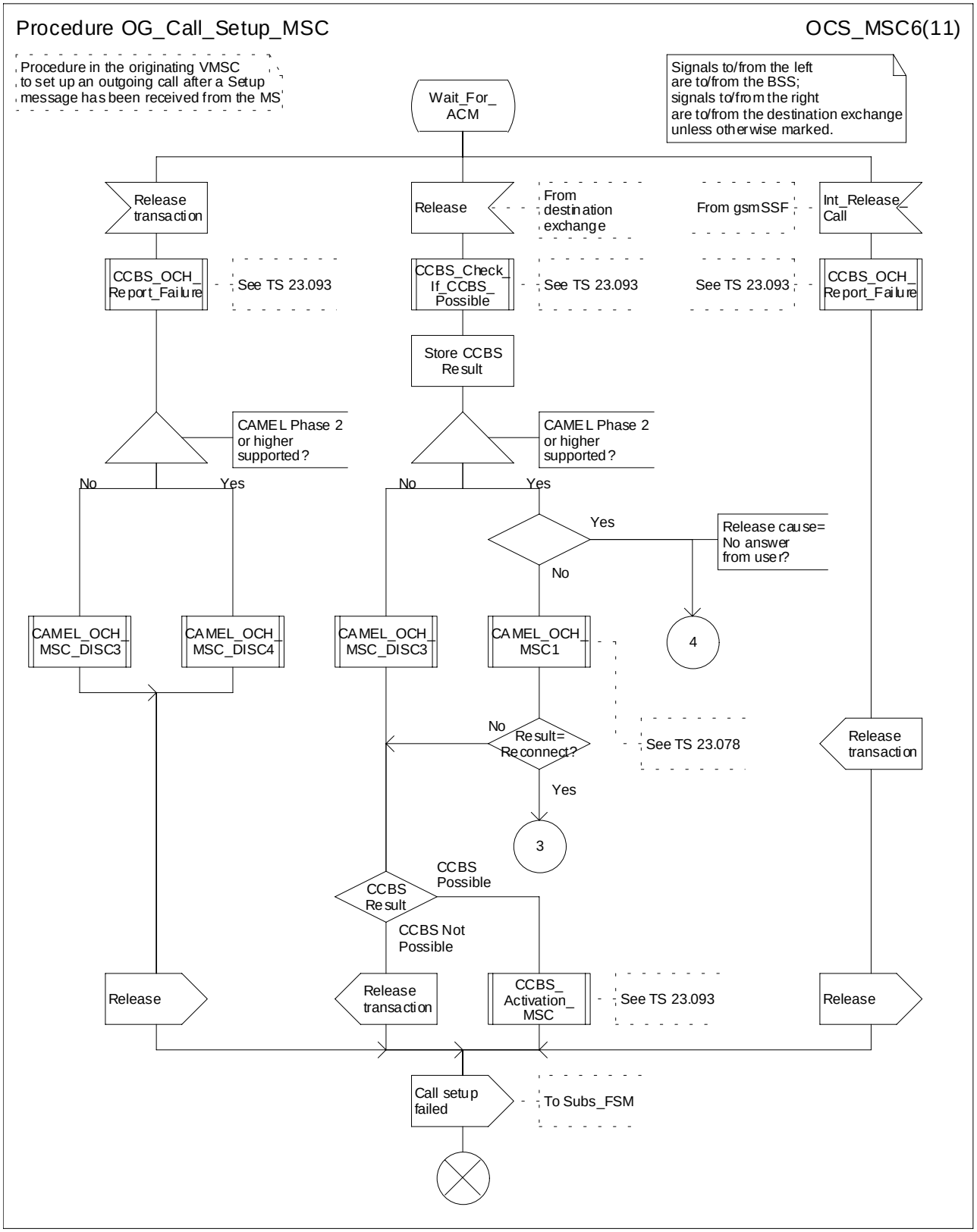


Figure 8f: Procedure OG_Call_Setup _MSC (sheet 6)

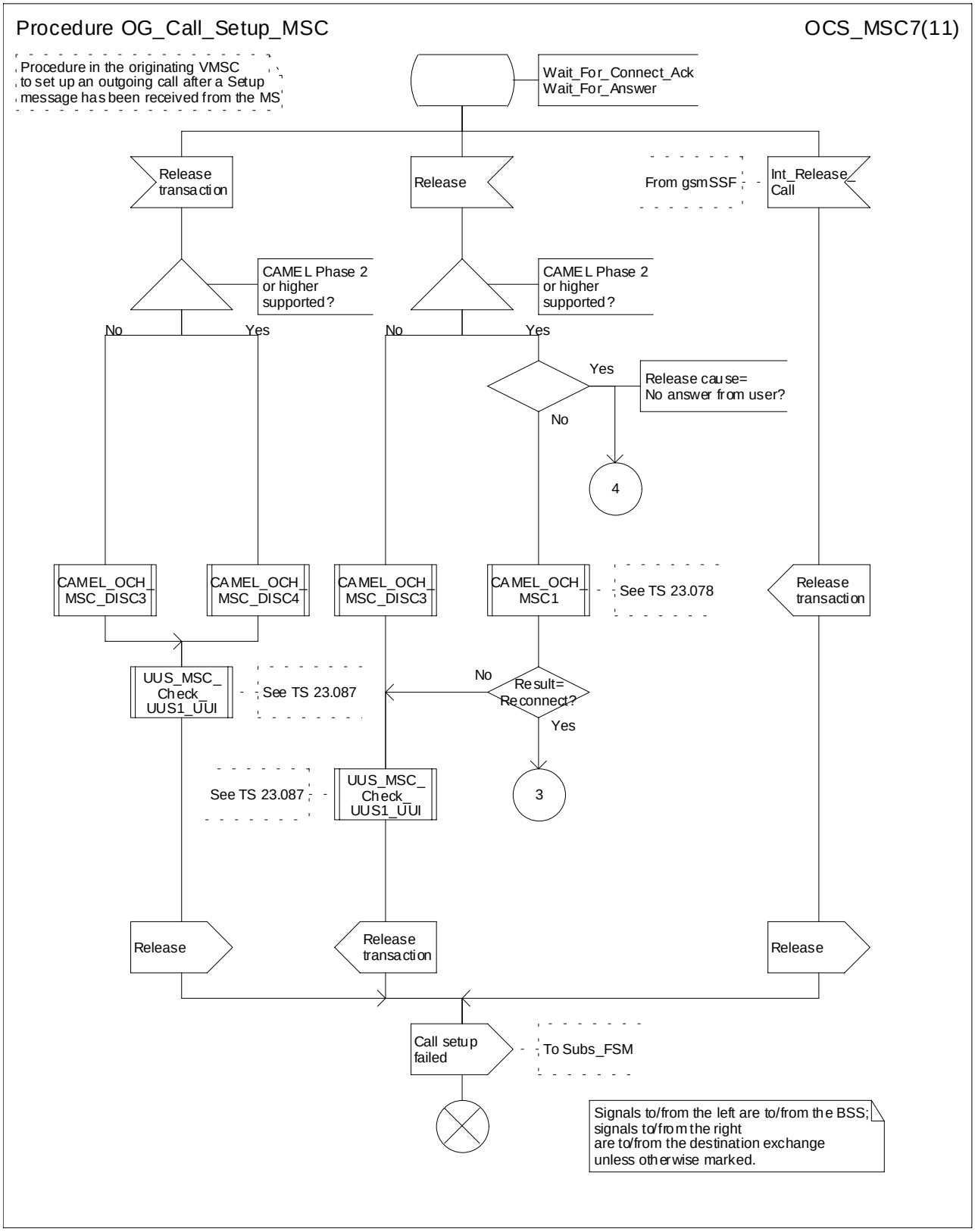


Figure 8g: Procedure OG_Call_Setup _MSC (sheet 7)

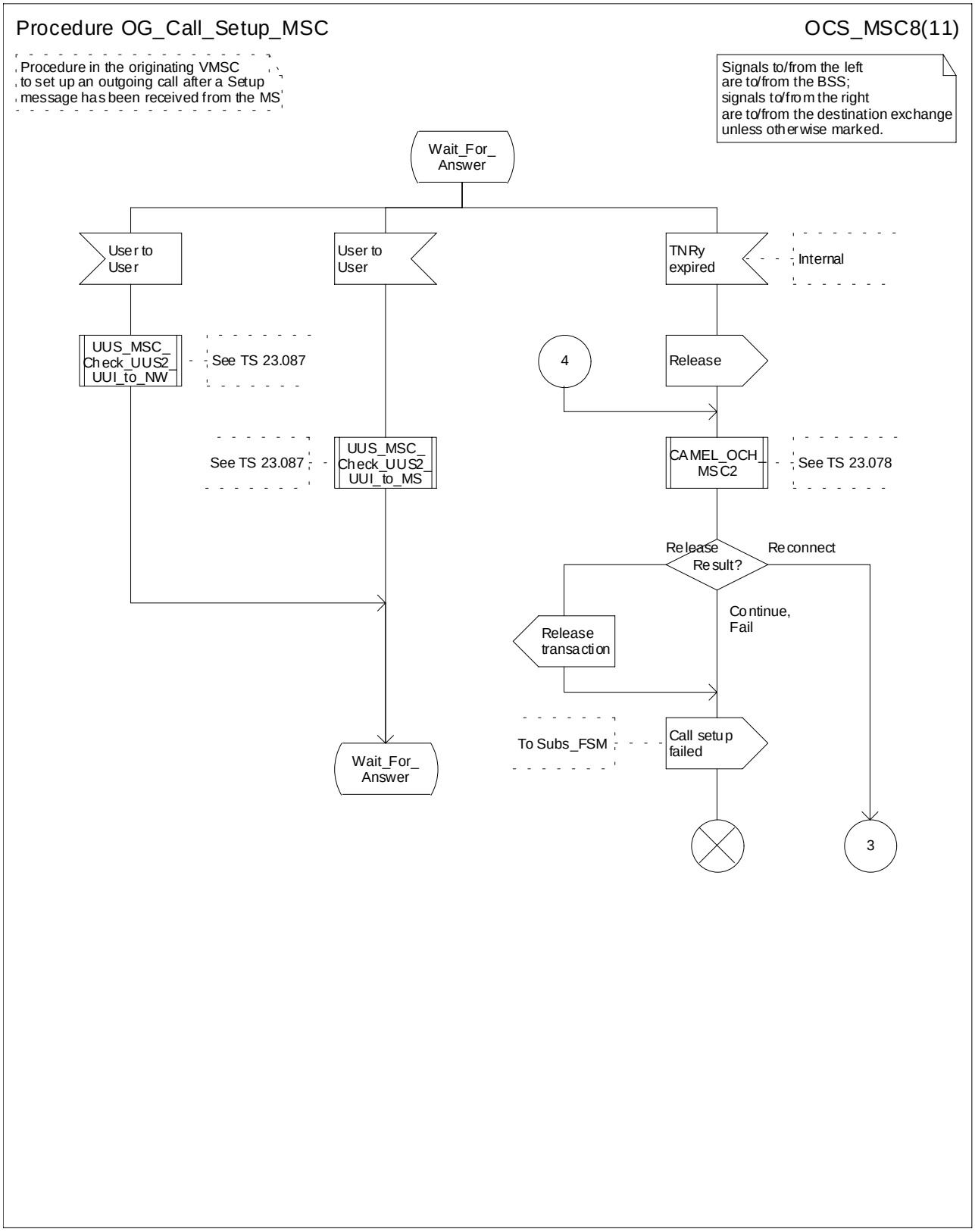


Figure 8h: Procedure OG_Call_Setup _MSC (sheet 8)

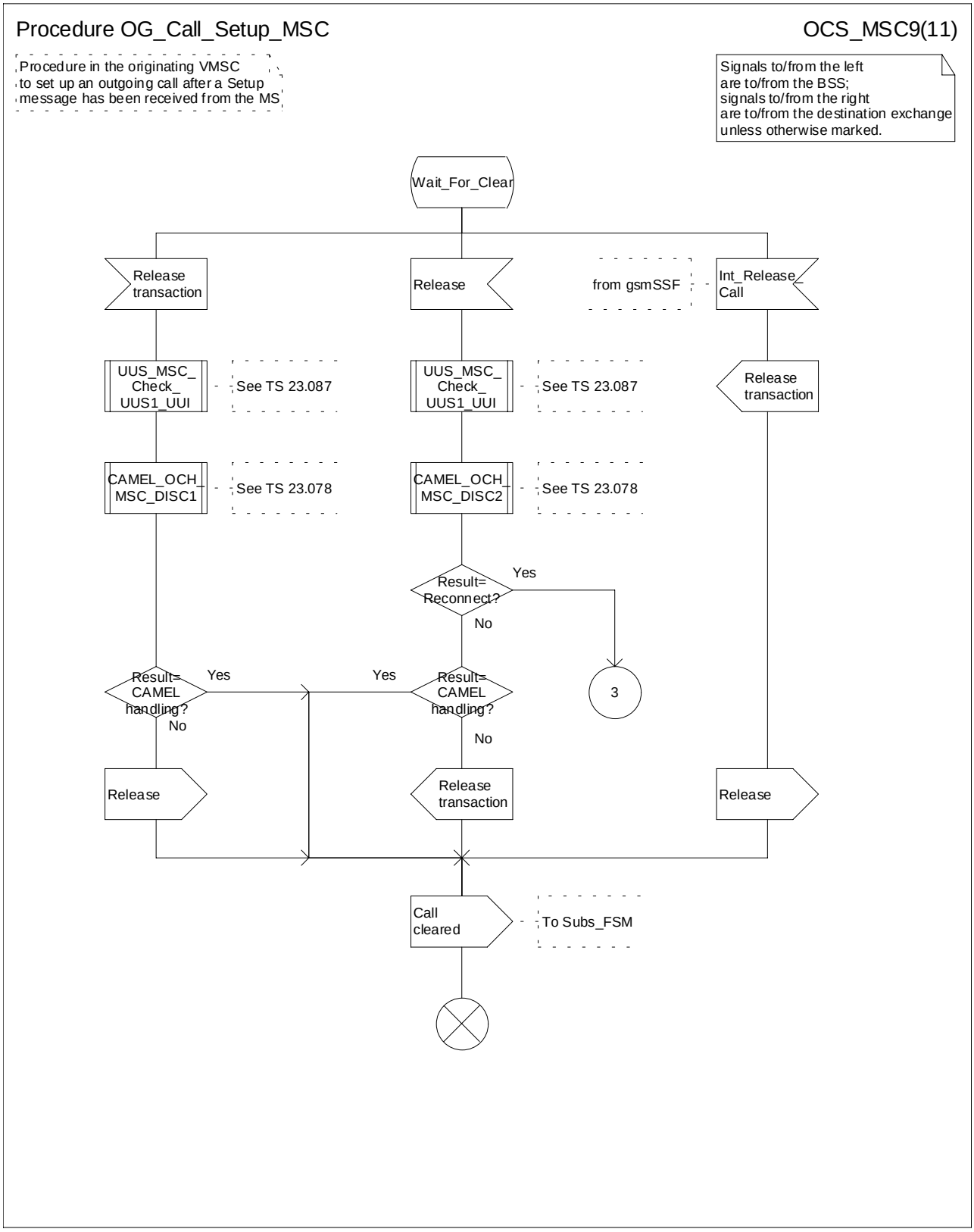


Figure 8i: Procedure OG_Call_Setup _MSC (sheet 9)

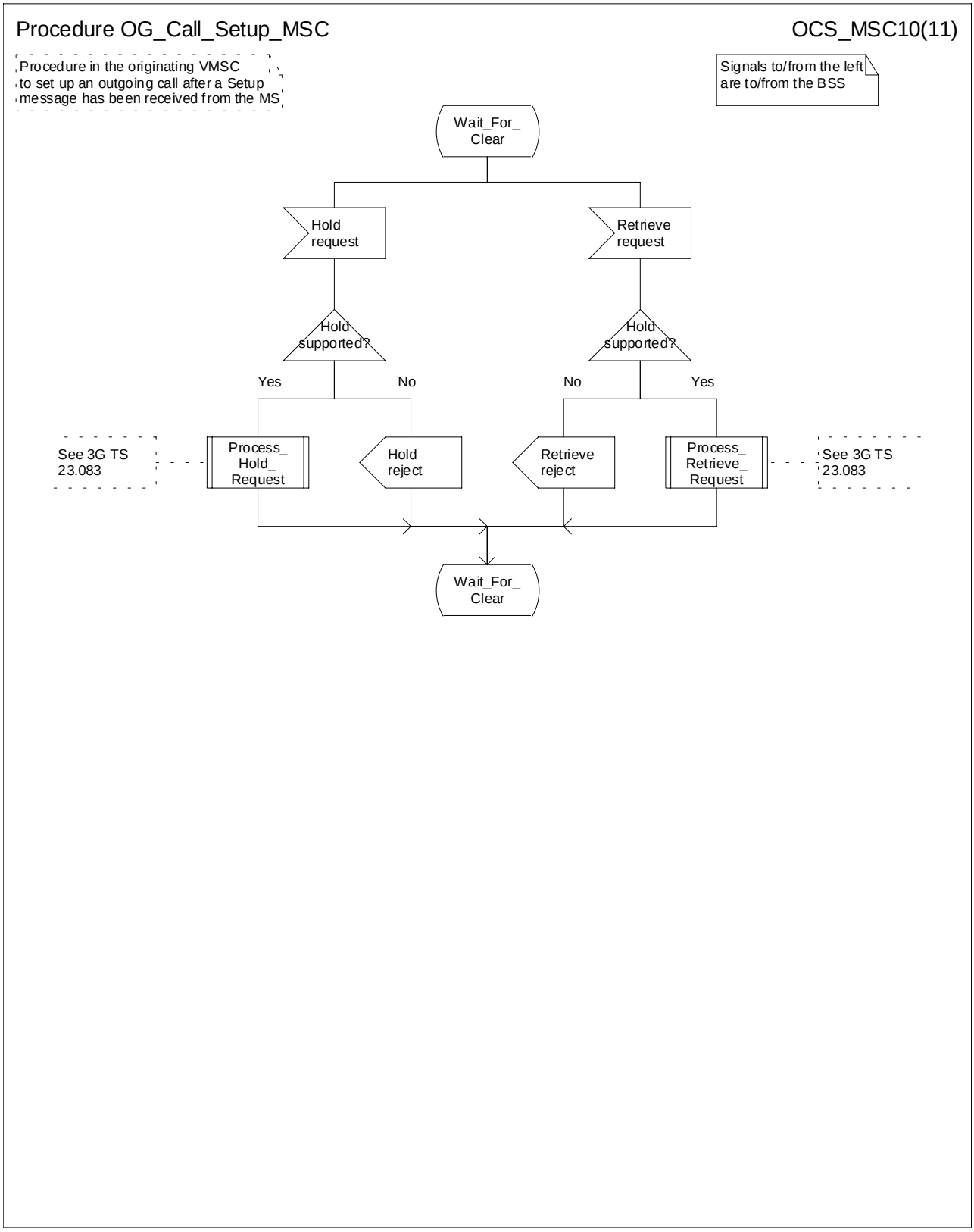


Figure 8j: Procedure OG_Call_Setup _MSC (sheet 10)

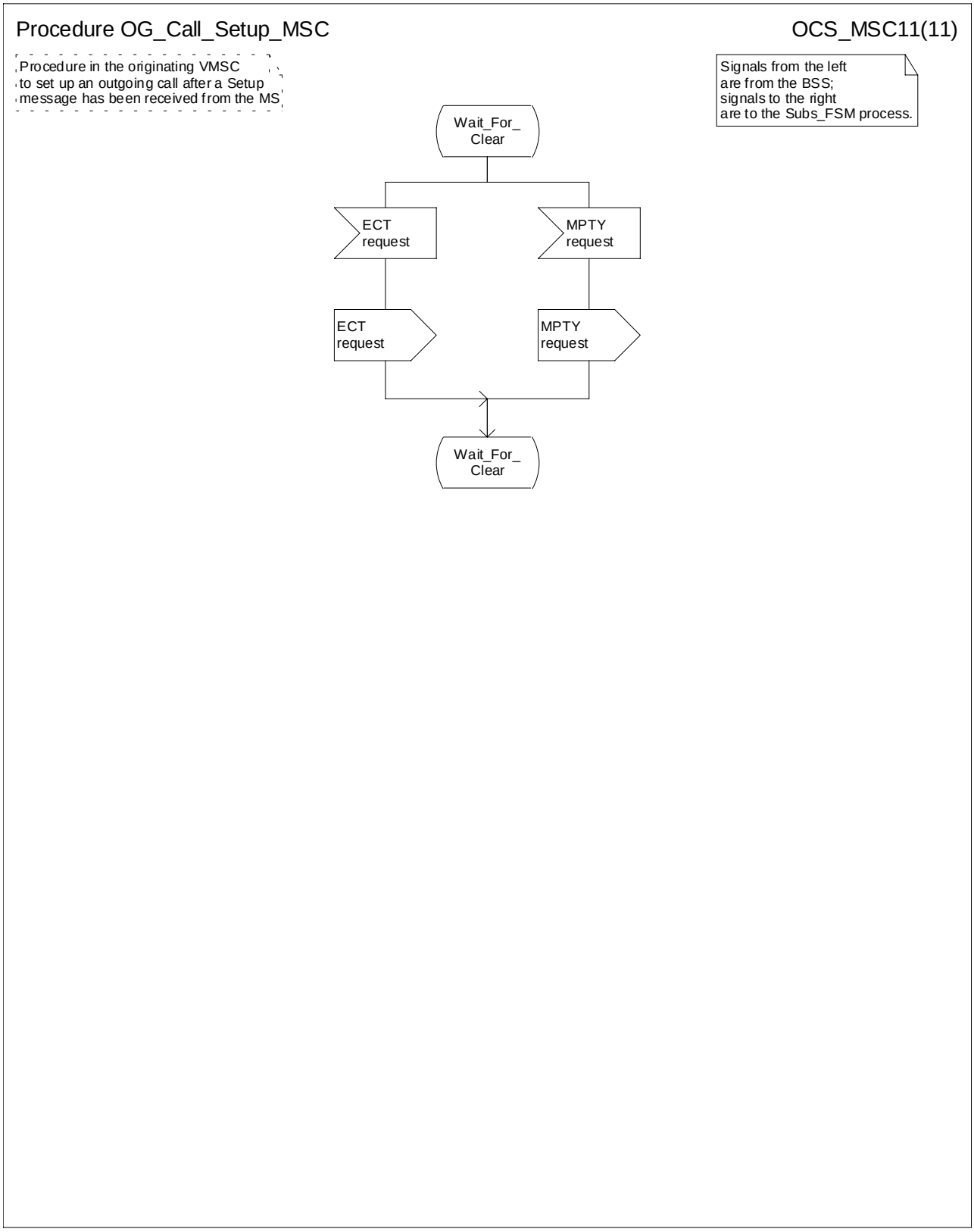


Figure 8k: Procedure OG_Call_Setup _MSC (sheet 11)

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

7.2.1 Functional requirements of GMSC

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 MNP_MT_GMSC_Set_MNP_Parameters is specific to Mobile Number Portability; it is specified in 3GPP TS 23.066 [10].

Sheet 1: the procedure OR_Set_ORA_Parameters is specific to Support of Optimal Routeing; it is specified in 3GPP TS 23.079 [13].

Sheet 1: the procedure CAMEL_Set_ORA_Parameters is specific to CAMEL; it is specified in 3GPP TS 23.078 [12].

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 [37]) 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 26	Unallocated (unassigned) number Misrouted call to a ported number (note)

NOTE: If the Diagnostic parameter indicates "NPDB mismatch", MNP can require a specific ISUP release cause value, according to National Coding Standard, to indicate "Misrouted call to a ported number", depending on national regulations. North American GSM Number Portability (NAGNP) requires the SRI negative response "unknown subscriber" to be treated differently under certain conditions. If the IAM received from the originating exchange contained the HPLMN routing number for NAGNP then the SRI negative response "unknown subscriber" shall be mapped to ISUP release cause number 26 "Misrouted call to a ported number"; under all other conditions the SRI negative response "unknown subscriber" shall be mapped to ISUP release cause number 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 or later; it is specified in 3GPP TS 23.078 [12].

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, sheet 8: the process CAMEL_MT_LEG1_GMSC is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 2: the procedures CAMEL_Start_TNRy and CAMEL_Stop_TNRy are specific to CAMEL phase 2 or later; they are specified in 3GPP TS 23.078 [12].

Sheet 2, sheet 3: the procedure CAMEL_MT_MSC_ALERTING is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12]. If the GMSC does not support CAMEL phase 4 or later, processing continues from the "Pass" exit of the test "Result?".

Sheet 2, sheet 3: the procedure CAMEL_MT_GMSC_ANSWER is specific to CAMEL; it is specified in 3GPP TS 23.078 [12]. 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 Routeing 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 Routeing, and will occur only if the GMSC supports Optimal Routeing. The procedure OR_Handle_RCH is specified in 3GPP TS 23.079 [13].

Sheet 4, sheet 6: the procedure CCBS_MT_GMSC_Check_CCBS_Possible is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 5: the input signal TNRy expired and all the subsequent processing are specific to CAMEL phase 2 or later, and will occur only if the GMSC supports CAMEL phase 2 or later. The procedure CAMEL_MT_GMSC_DISC5 is specified in 3GPP TS 23.078 [12].

Sheet 6: the procedure CAMEL_MT_GMSC_DISC3 is specific to CAMELphase 1; it is specified in 3GPP TS 23.078 [12].

Sheet 6: the procedures CAMEL_MT_GMSC_DISC4 and CAMEL_MT_GMSC_DISC6 are specific to CAMEL phase 2 or later, they are specified in 3GPP TS 23.078 [12].

Sheet 6: the procedure CCBS_Set_Diagnostic_For_Release is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 6, sheet 7: 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 3GPP TS 23.078 [12]. 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 3GPP TS 23.078 [12]. If the GMSC does not support CAMEL, processing continues from the "Normal handling" exit of the test "Result?".

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.

Sheet 8: the procedure CAMEL_MT_LEG2_GMSC is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12].

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****** 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 3GPP TS 23.078 [12]. 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 or later; it is specified in 3GPP TS 23.078 [12]. If the MSC does not support CAMEL phase 3 or later, 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 or later; it is specified in 3GPP TS 23.078 [12]. If the MSC does not support CAMEL phase 2 or later, 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 3GPP TS 23.066 [10].

Sheet 1: the procedure CAMEL_Store_Destination_Address is specific to CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 1, sheet 3: the procedure CAMEL_OCH_MSC_DISC3 is specific to CAMEL phase 1; it is specified in 3GPP TS 23.078 [12].

Sheet 1, sheet 3: the procedure CAMEL_OCH_MSC_DISC4 is specific to CAMEL Phase 2 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 1, sheet 6: the procedure CAMEL_MT_CF_LEG1_MSC is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 2: the procedures CAMEL_Start_TNRy and CAMEL_Stop TNRy are specific to CAMEL phase 2 or later; they are specified in 3GPP TS 23.078 [12].

Sheet 2: the procedure CAMEL_CF_MSC_ANSWER is specific to CAMEL; it is specified in 3GPP TS 23.078 [12]. If the MSC does not support CAMEL, processing continues from the "~~Yes~~Pass" exit of the test "Result~~=Pass~~?".

Sheet 2: the procedure UUS_MSC_Clear_UUS is specific to UUS; it is specified in 3GPP TS 23.087 [20].

Sheet 2: the procedure CAMEL_CF_MSC_ALERTING is specific to CAMEL phase 4 or later; it is specifed in 3GPP TS 23.078 [12]. If the GMSC does not support CAMEL phase 4 or later, processing continues from the "Pass" exit of the test "Result?".

Sheet 3: the procedure CAMEL_Stop_TNRy is specific to CAMEL phase 2 or later; it is specified in 3GPP TS 23.078 [12].

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 CAMEL phase 2 or later, and will occur only if the GMSC supports CAMEL phase 2 or later. The procedure CAMEL_OCH_MSC2 is specified in 3GPP TS 23.078 [12].

Sheet 5: the procedure CAMEL_OCH_MSC_DISC1 is specific to CAMEL; it is specified in 3GPP TS 23.078 [12]. If the MSC does not support CAMEL, processing continues from the "No" exit of the test "Result=CAMEL handling?".

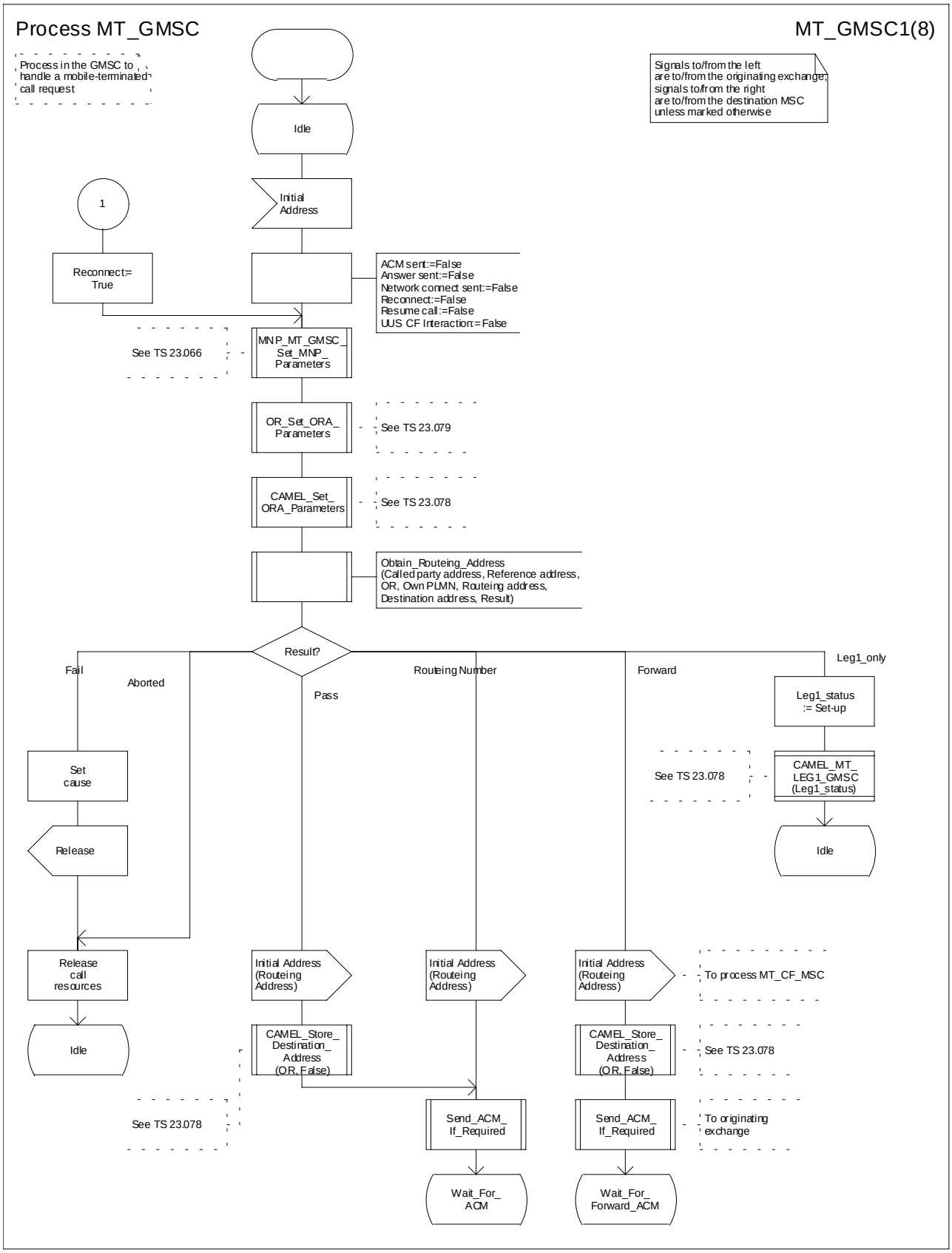
Sheet 5: the procedure CAMEL_OCH_MSC_DISC2 is specific to CAMEL; it is specified in 3GPP TS 23.078 [12]. If the MSC does not support CAMEL, processing continues from the "No" exit of the test "Result=Reconnect?" .

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.

Sheet 6: the process CAMEL_MT_CF_LEG2_MSC is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12].

**** Modified SDLs in Section 7.2.1 ****



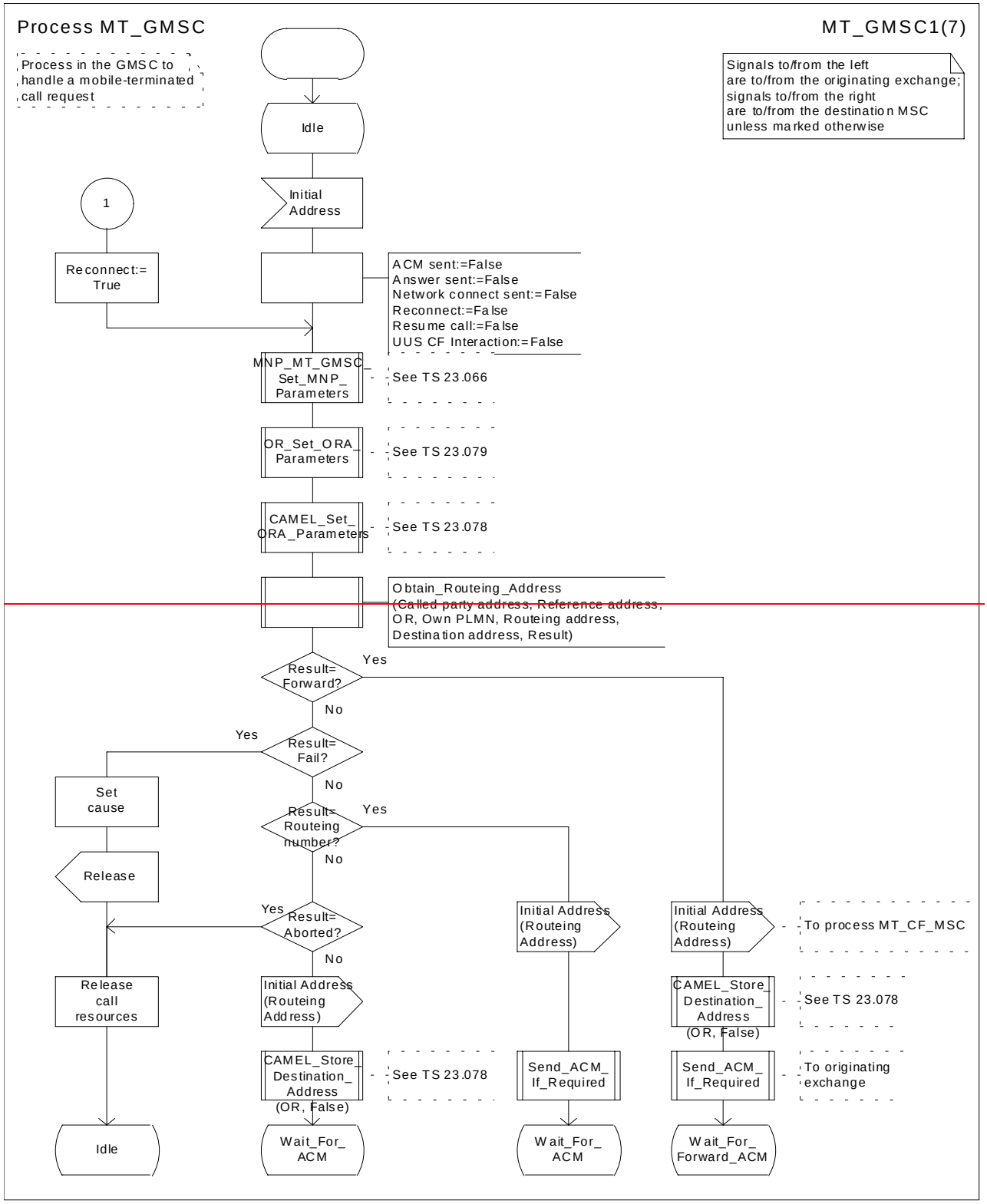
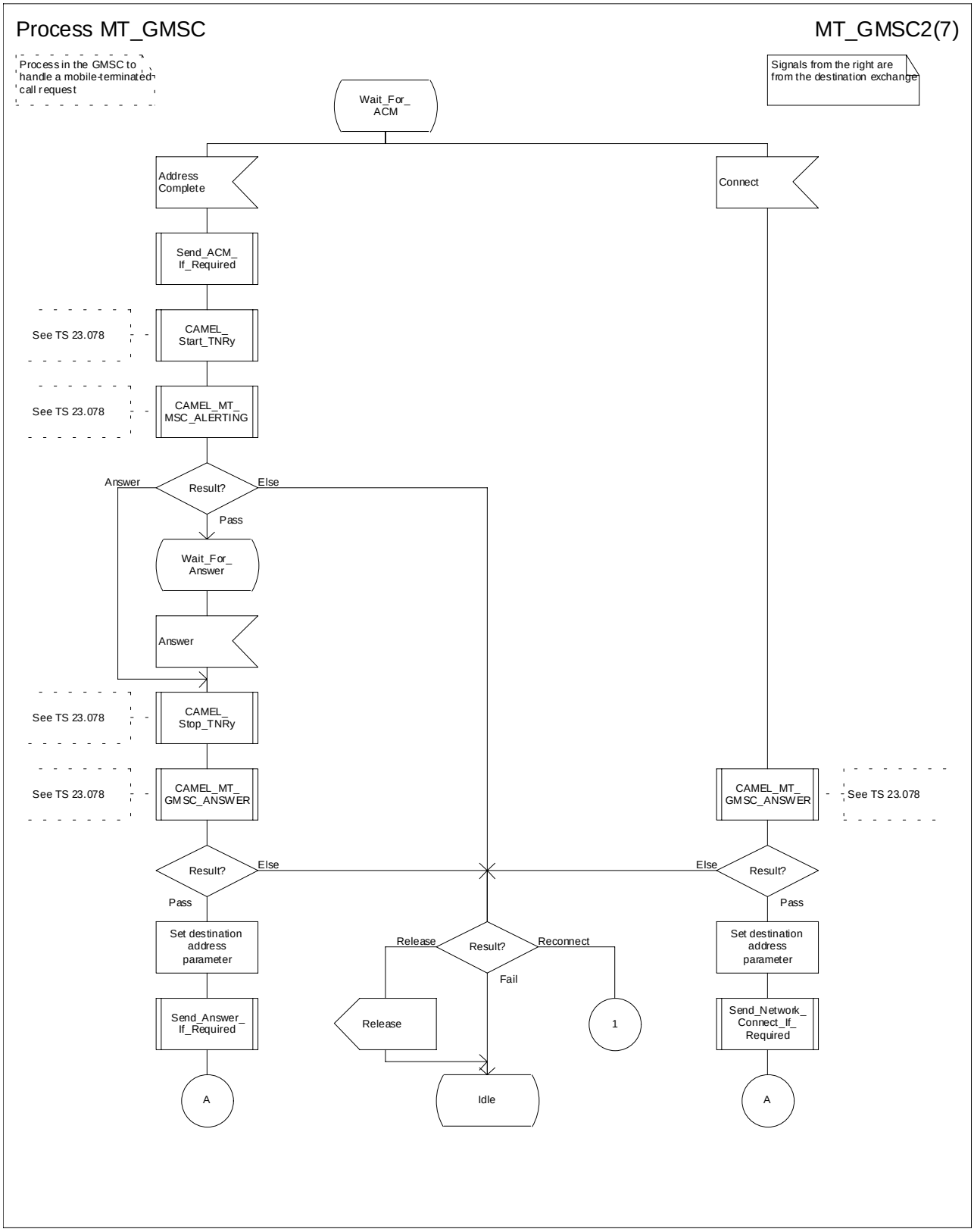


Figure 36a: Process MT_GMSC (sheet 1)


Process MT_GMSC
MT_GMSC2(7)
Process in the GMSC to handle a mobile-terminated call request
Signals from the right are from the destination exchange
Wait_For_ ACM
Address Complete
Connect
Send_ACM_ If_Required
See TS 23.078
CAMEL_ Start_TNRy
See TS 23.078
CAMEL_MT_ MSC_ALERTING
Answer
Result?
Else
Pass
Wait_For_ Answer
Answer
See TS 23.078
CAMEL_ Stop_TNRy
See TS 23.078
CAMEL_MT_ GMSC_ANSWER
CAMEL_MT_ GMSC_ANSWER
See TS 23.078
Result?
Else
Else
Result?
Pass
Pass
Set destination address parameter
Release
Result?
Reconnect
Fail
Set destination address parameter
Send_Answer_ If_Required
Release
1
Send_Network_ Connect_If_ Required
A
Idle
A

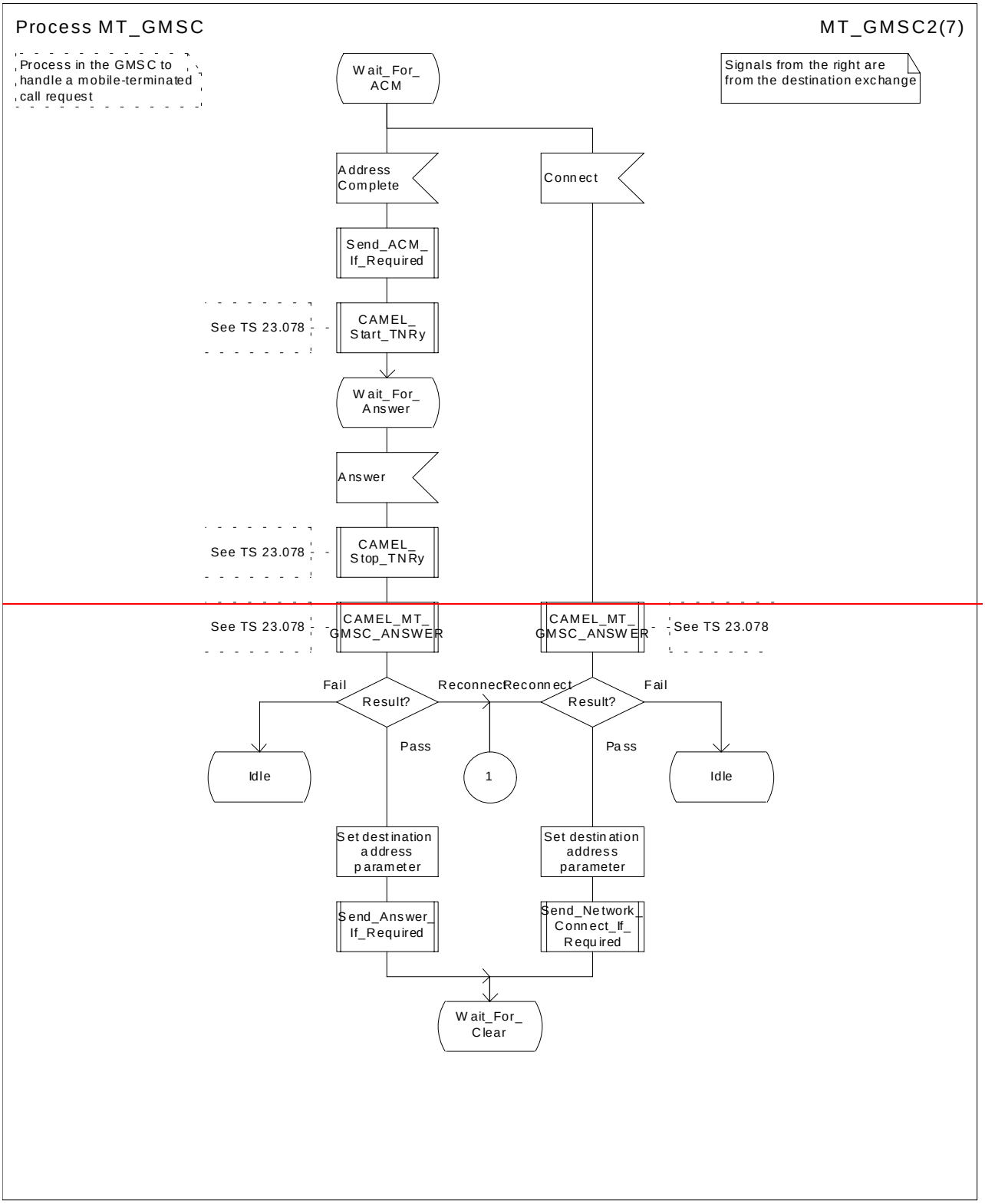
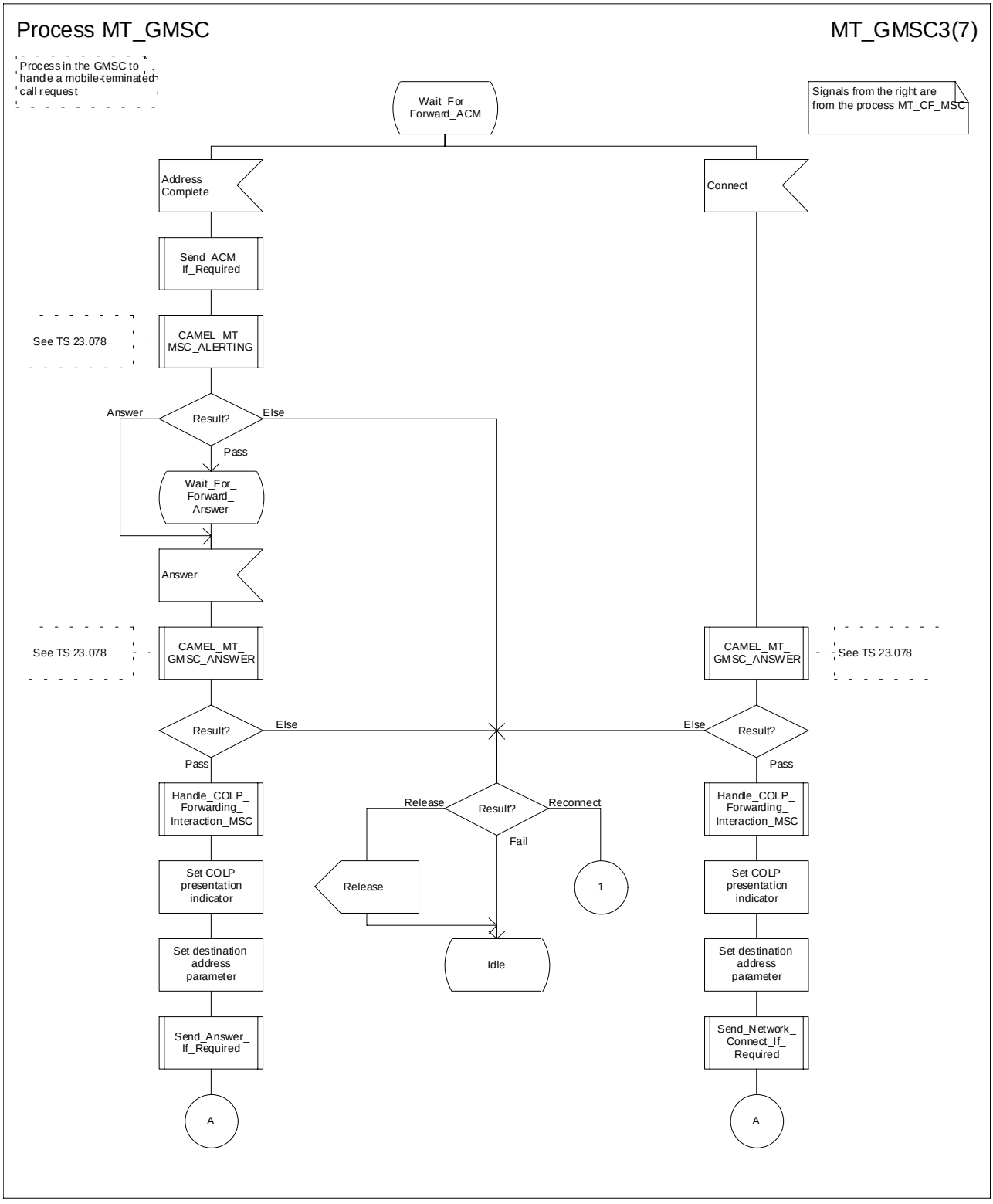


Figure 36b: Process MT_GMSC (sheet 2)


Process MT_GMSC
MT_GMSC3(7)
Process in the GMSC to handle a mobile-terminated call request
Wait_For_ Forward_ACM
Signals from the right are from the process MT_CF_MSC
Address Complete
Connect
Send_ACM_ If_Required
See TS 23.078
CAMEL_MT_ MSC_ALERTING
Answer
Result?
Else
Pass
Wait_For_ Forward_ Answer
Answer
See TS 23.078
CAMEL_MT_ GMSC_ANSWER
CAMEL_MT_ GMSC_ANSWER
See TS 23.078
Result?
Else
Else
Result?
Pass
Pass
Handle_COLP_ Forwarding_ Interaction_MSC
Release
Result?
Reconnect
Fail
Handle_COLP_ Forwarding_ Interaction_MSC
Set COLP presentation indicator
Release
1
Set COLP presentation indicator
Set destination address parameter
Idle
Set destination address parameter
Send_Answer_ If_Required
Send_Network_ Connect_If_ Required
A
A

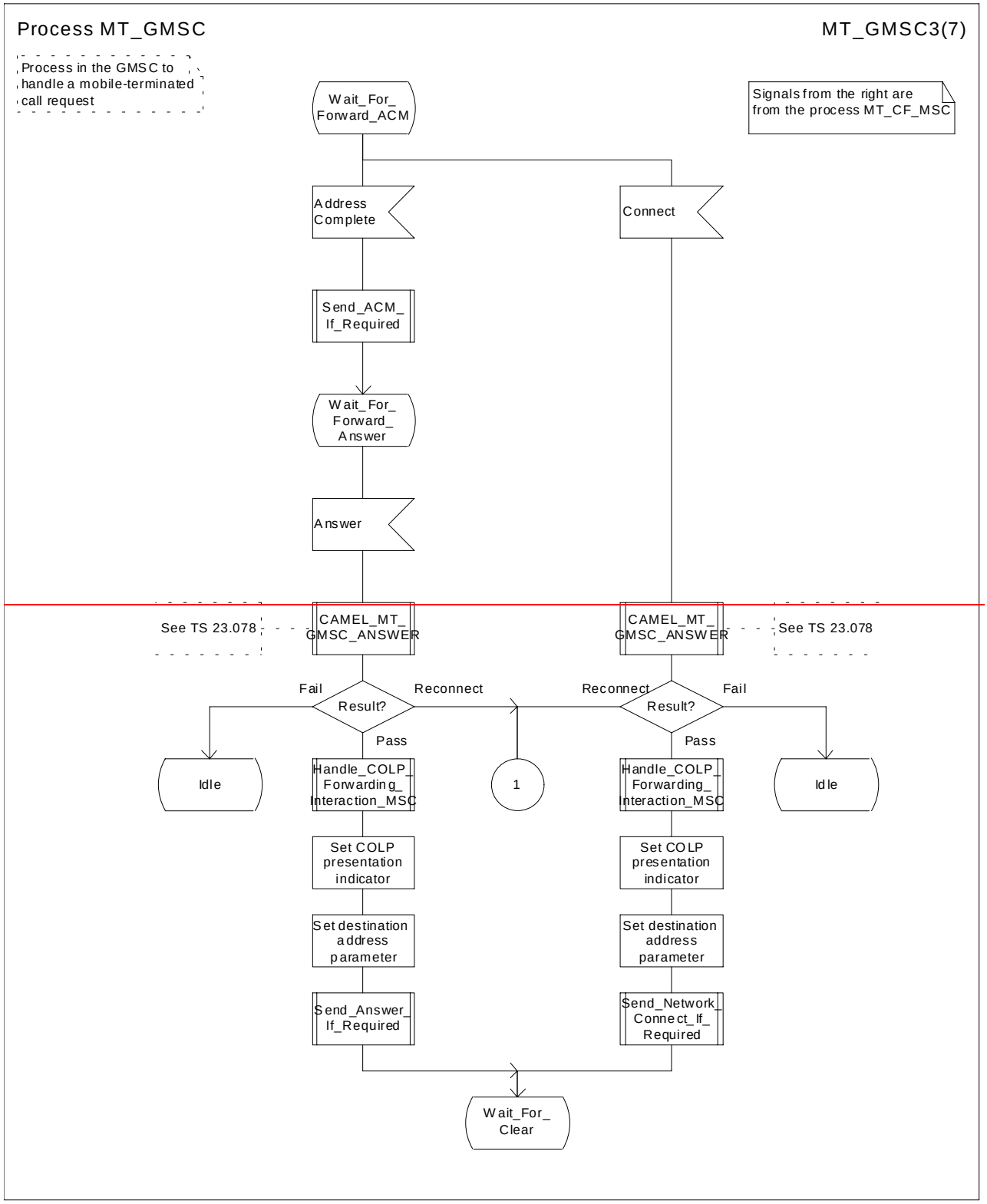
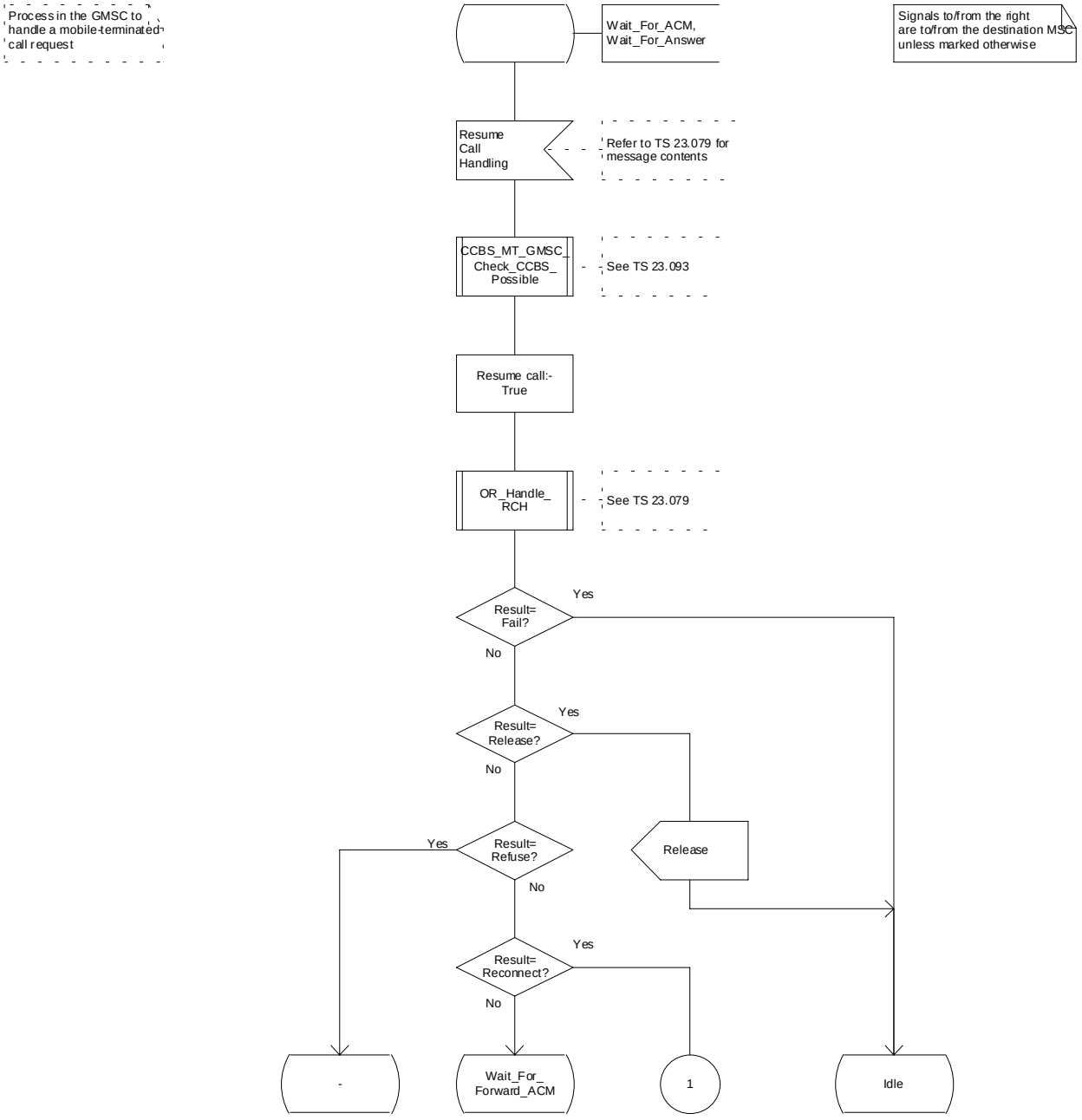


Figure 36c: Process MT_GMSC (sheet 3)

Process MT_GMSC

MT_GMSC4(7)



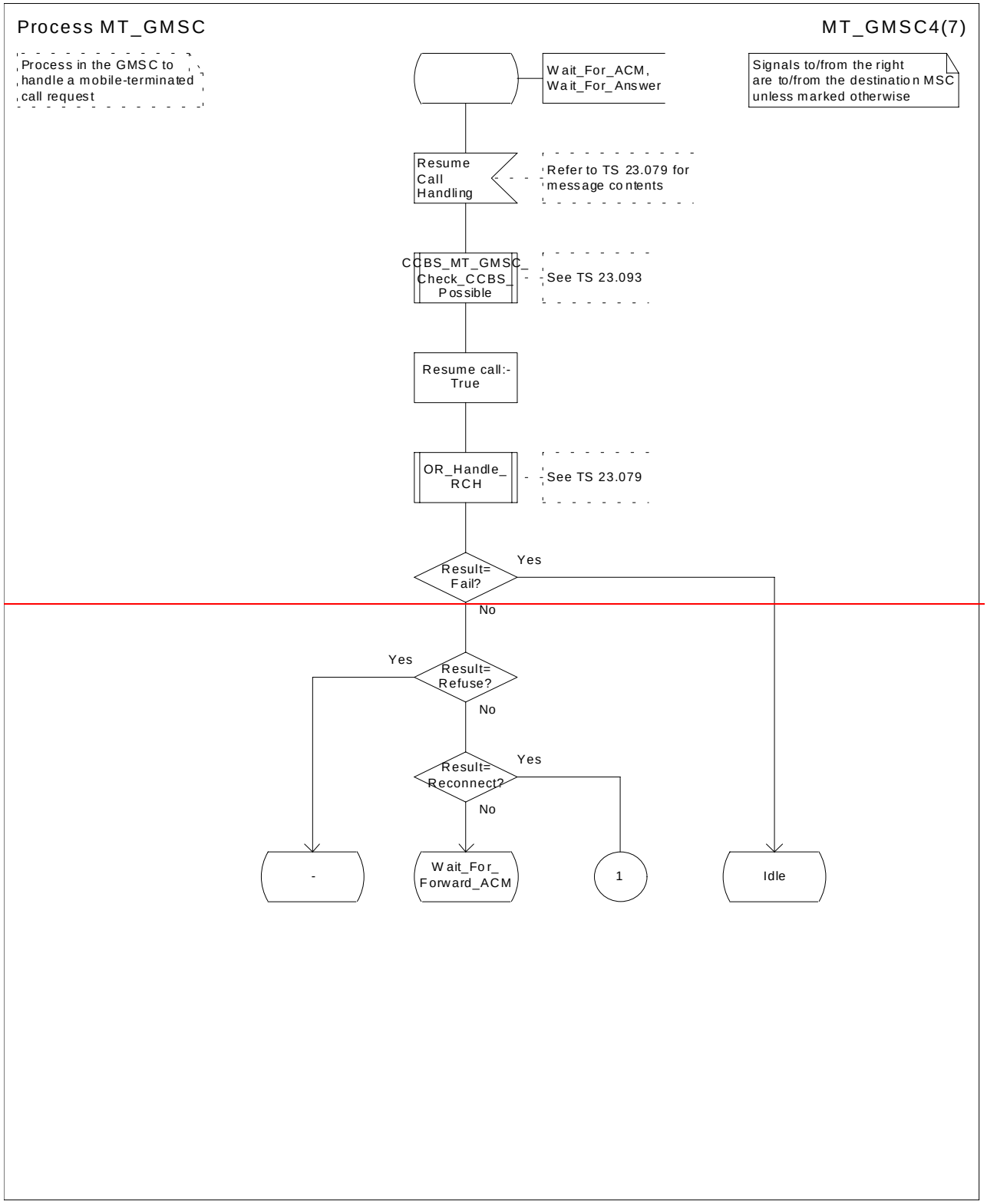


Figure 36d: Process MT_GMSC (sheet 4)

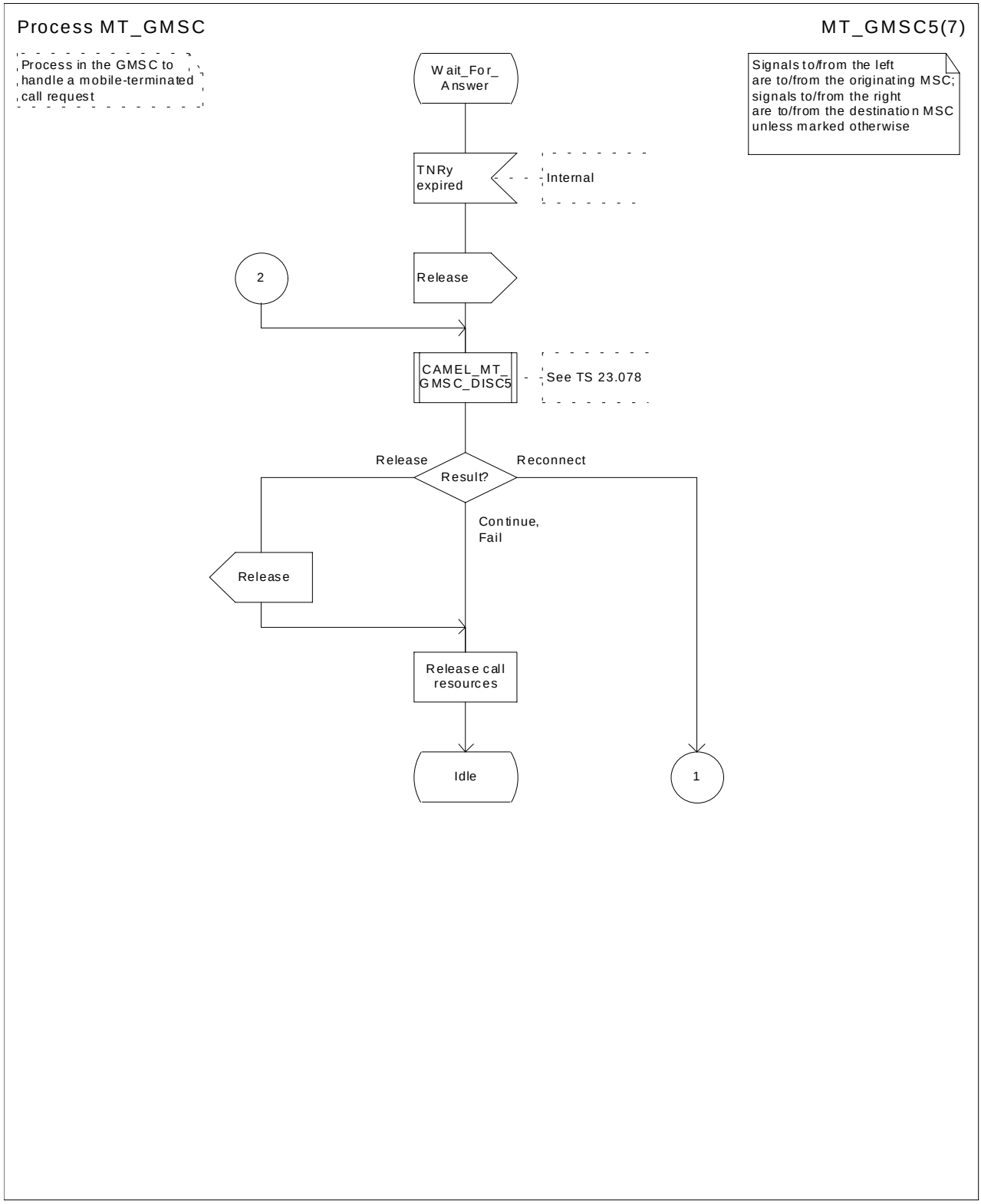


Figure 36e: Process MT_GMSC (sheet 5)

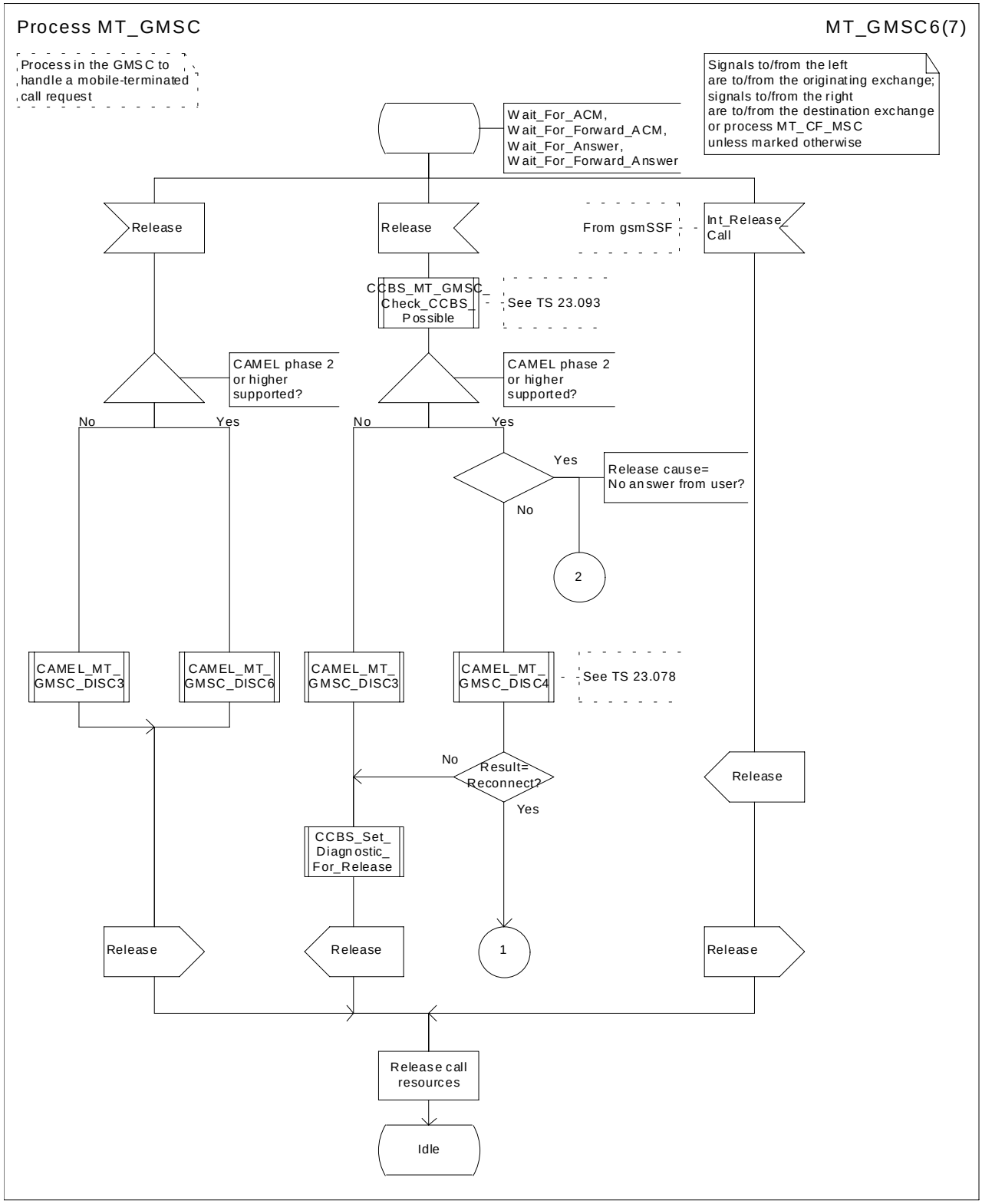


Figure 36f: Process MT_GMSC (sheet 6)

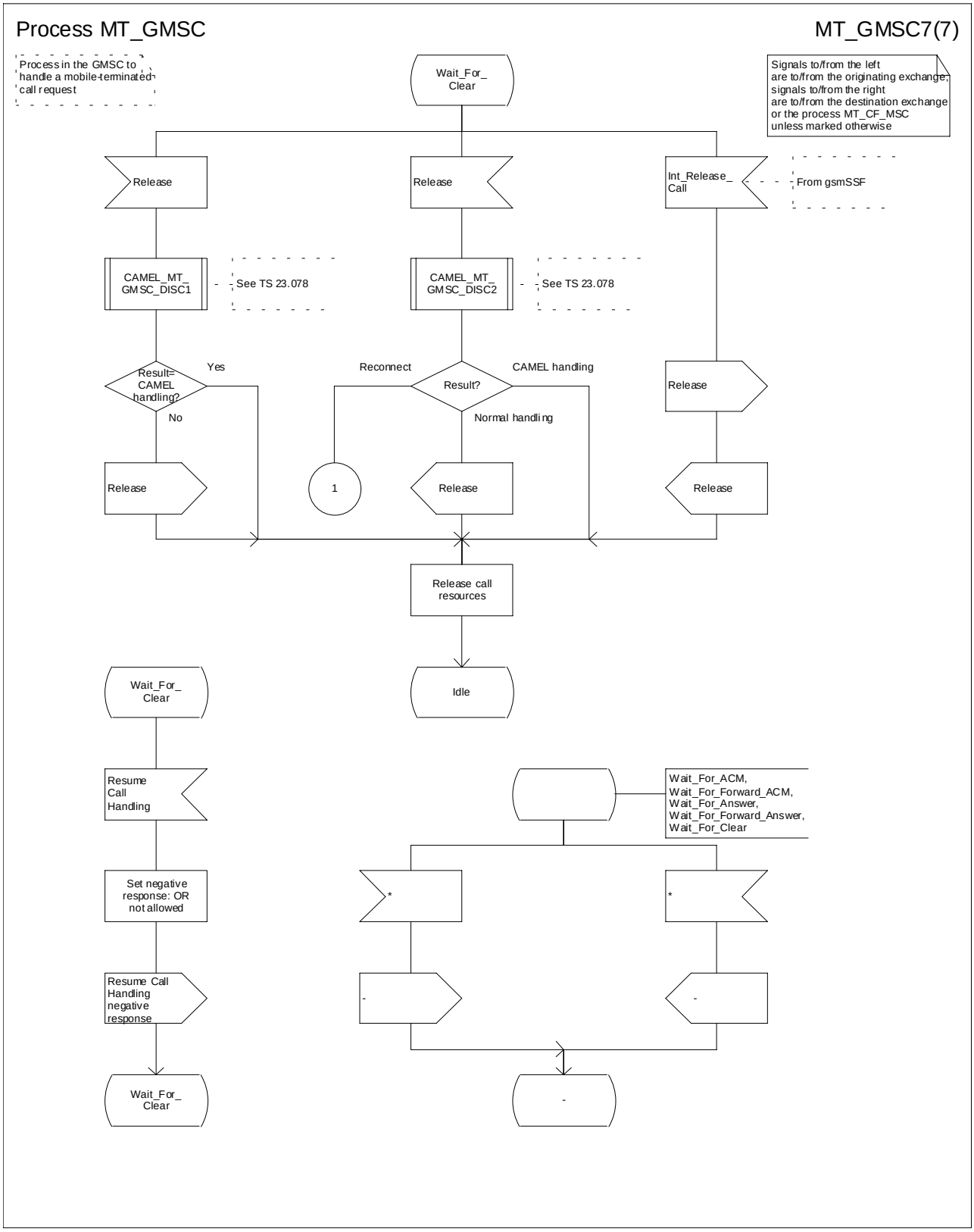


Figure 36g: Process MT_GMSC (sheet 7)

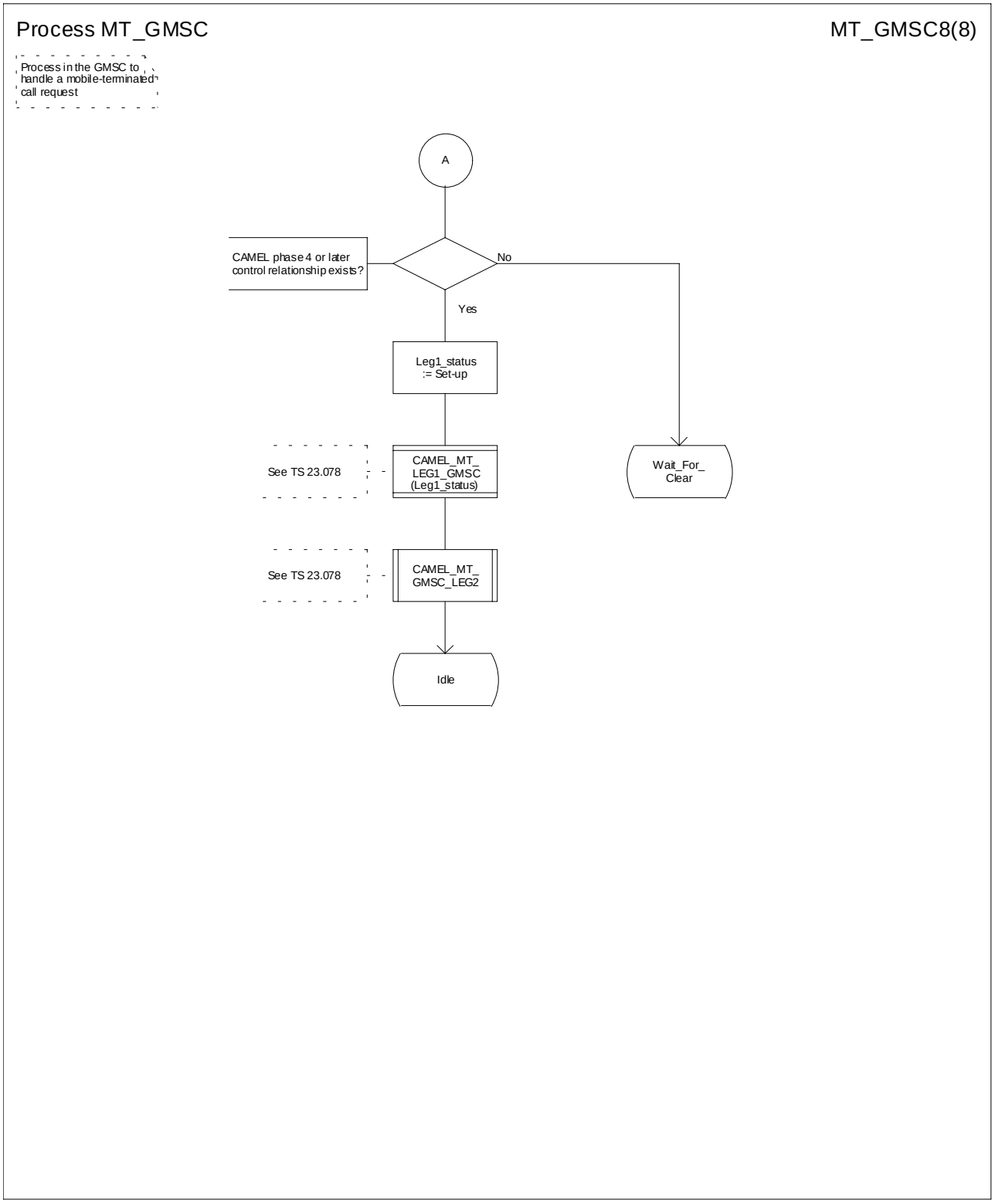


Figure 36h: Process MT_GMSC (sheet 8)

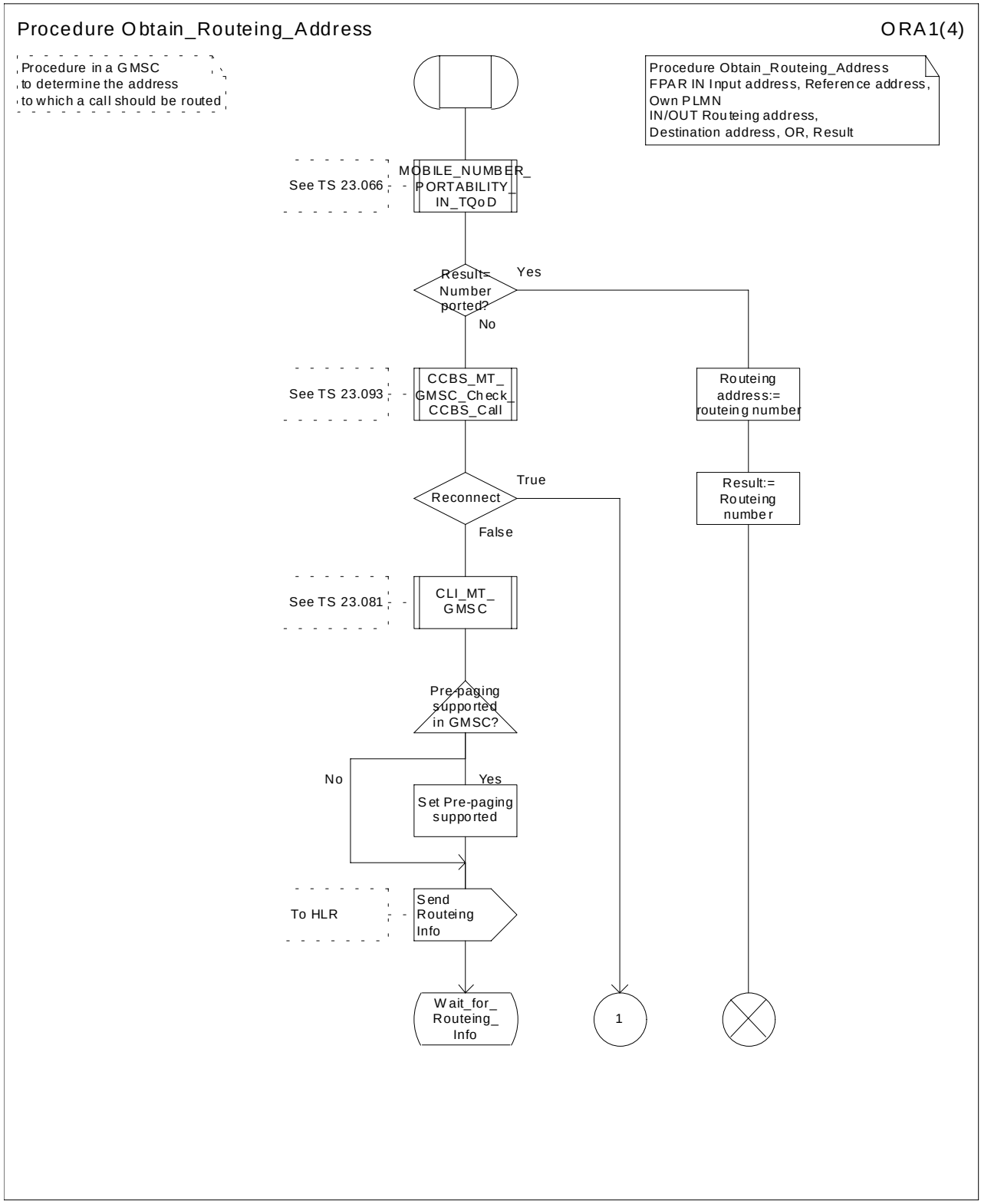


Figure 37a: Procedure Obtain_Routeing_Address (sheet 1)

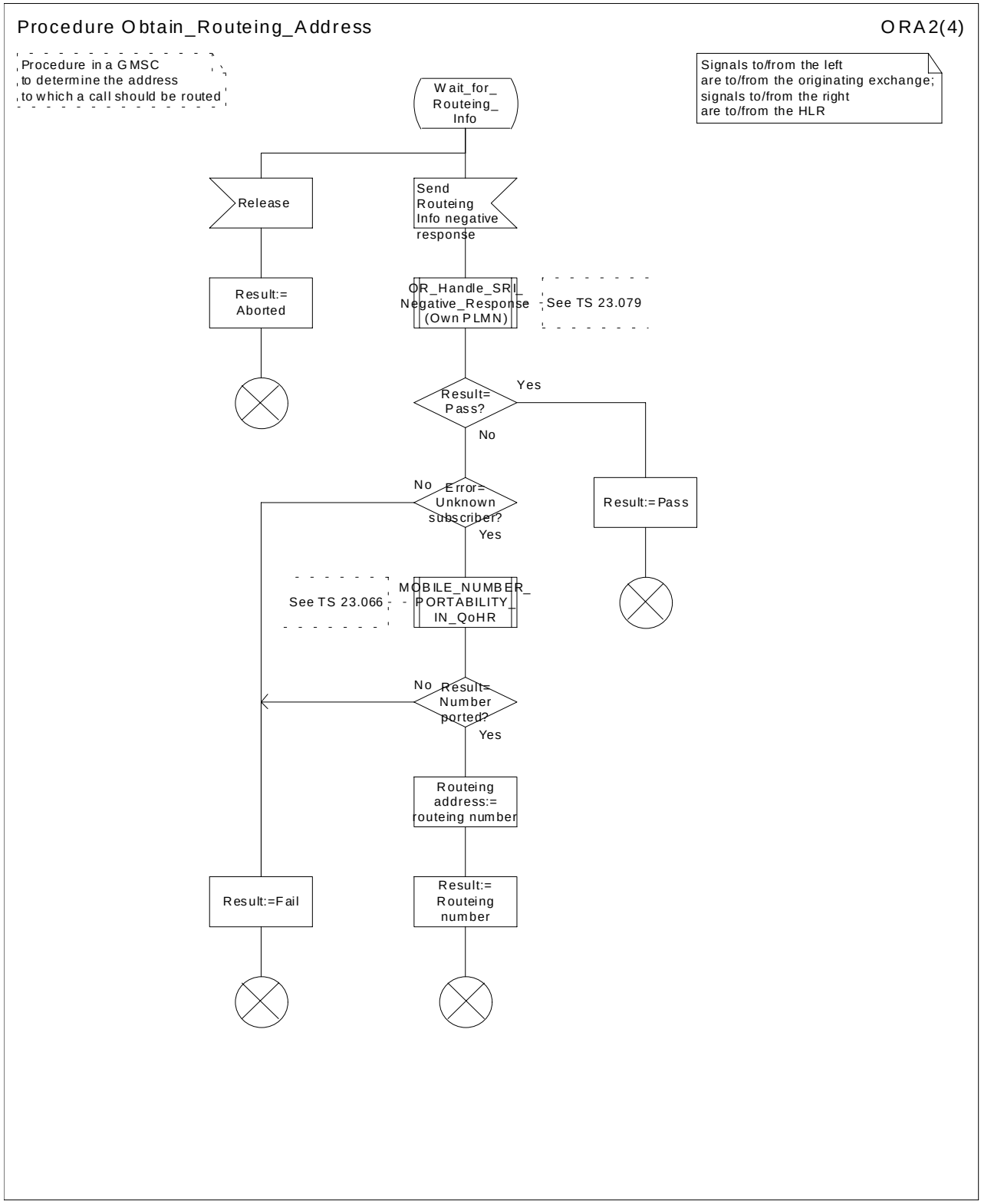
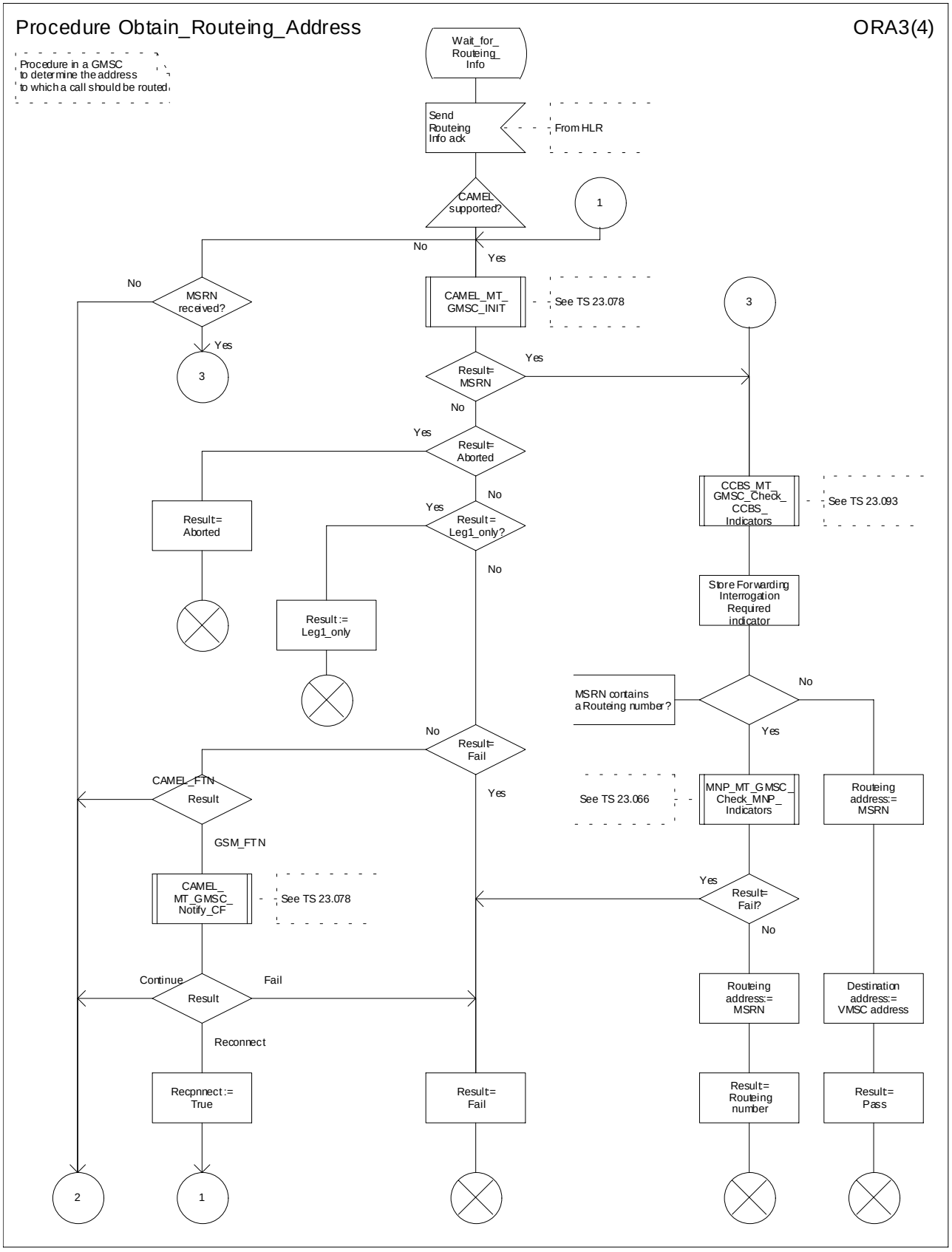


Figure 37b: Procedure Obtain_Routeing_Address (sheet 2)


Procedure Obtain_Routeing_Address
ORA3(4)
Procedure in a GMSC to determine the address to which a call should be routed.
Wait_for_ Routeing_ Info
Send Routeing Info ack
From HLR
CAMEL supported?
1
No
Yes
No
MSRN received?
Yes
3
CAMEL_MT_ GMSC_INIT
See TS 23.078
3
Result= MSRN
Yes
No
Yes
Result= Aborted
No
Result= Aborted
Yes
Result = Leg1_only?
No
Result := Leg1_only
CCBS_MT_ GMSC_Check_ CCBS_ Indicators
See TS 23.093
Store Forwarding Interrogation Required indicator
MSRN contains a Routeing number?
No
Yes
No
Result= Fail
Yes
CAMEL_FTN Result
GSM_FTN
CAMEL_ MT_GMSC_ Notify_CF
See TS 23.078
See TS 23.066
MNP_MT_GMSC_ Check_MNP_ Indicators
Routeing address:= MSRN
Yes
Result= Fail?
No
Continue
Result
Fail
Reconnect
Routeing address:= MSRN
Destination address:= VMSC address
Recpnnect := True
Result= Fail
Result= Routeing number
Result= Pass
2
1

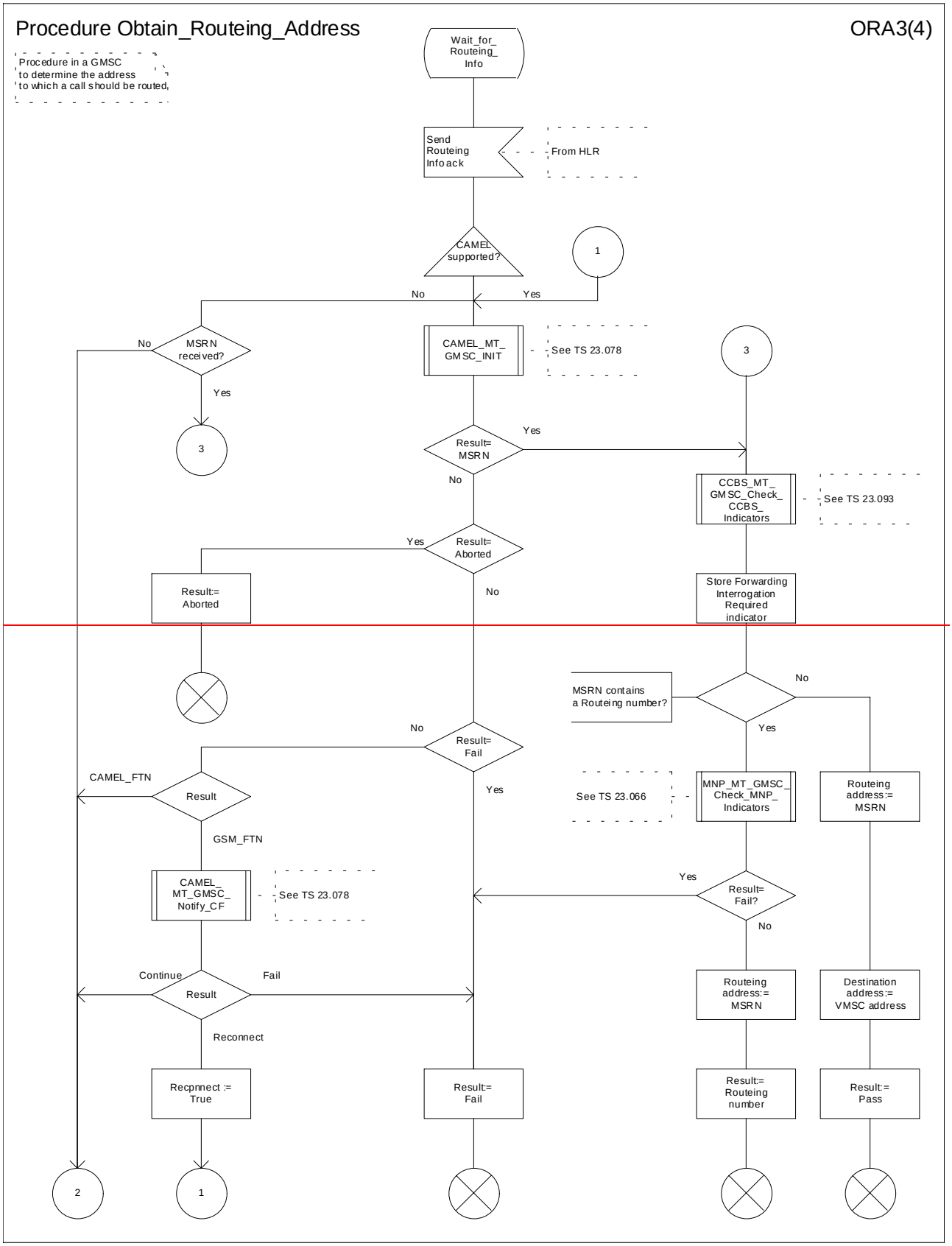
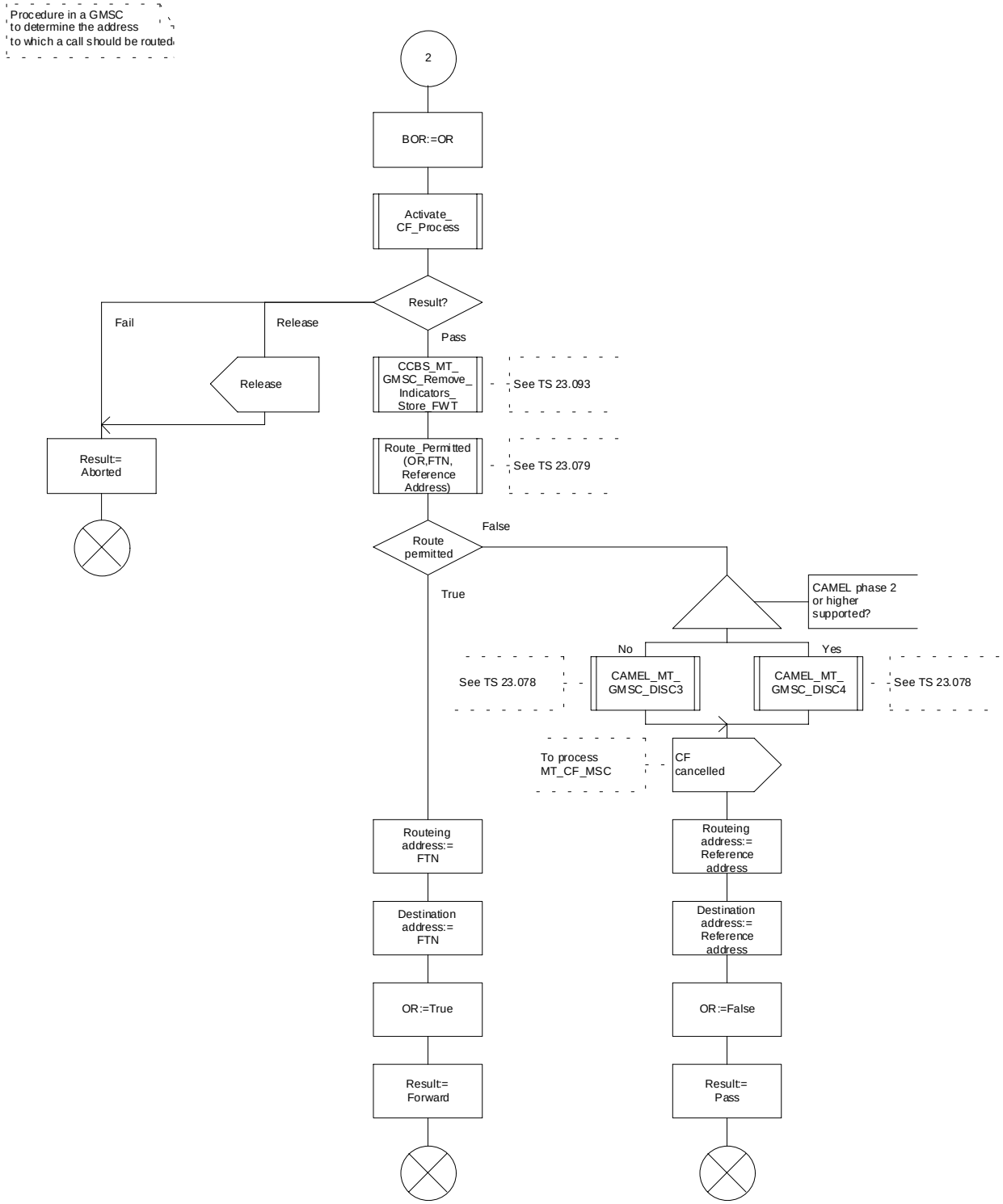


Figure 37c: Procedure Obtain_Routeing_Address (sheet 3)

Procedure Obtain_Routeing_Address ORA4(4)



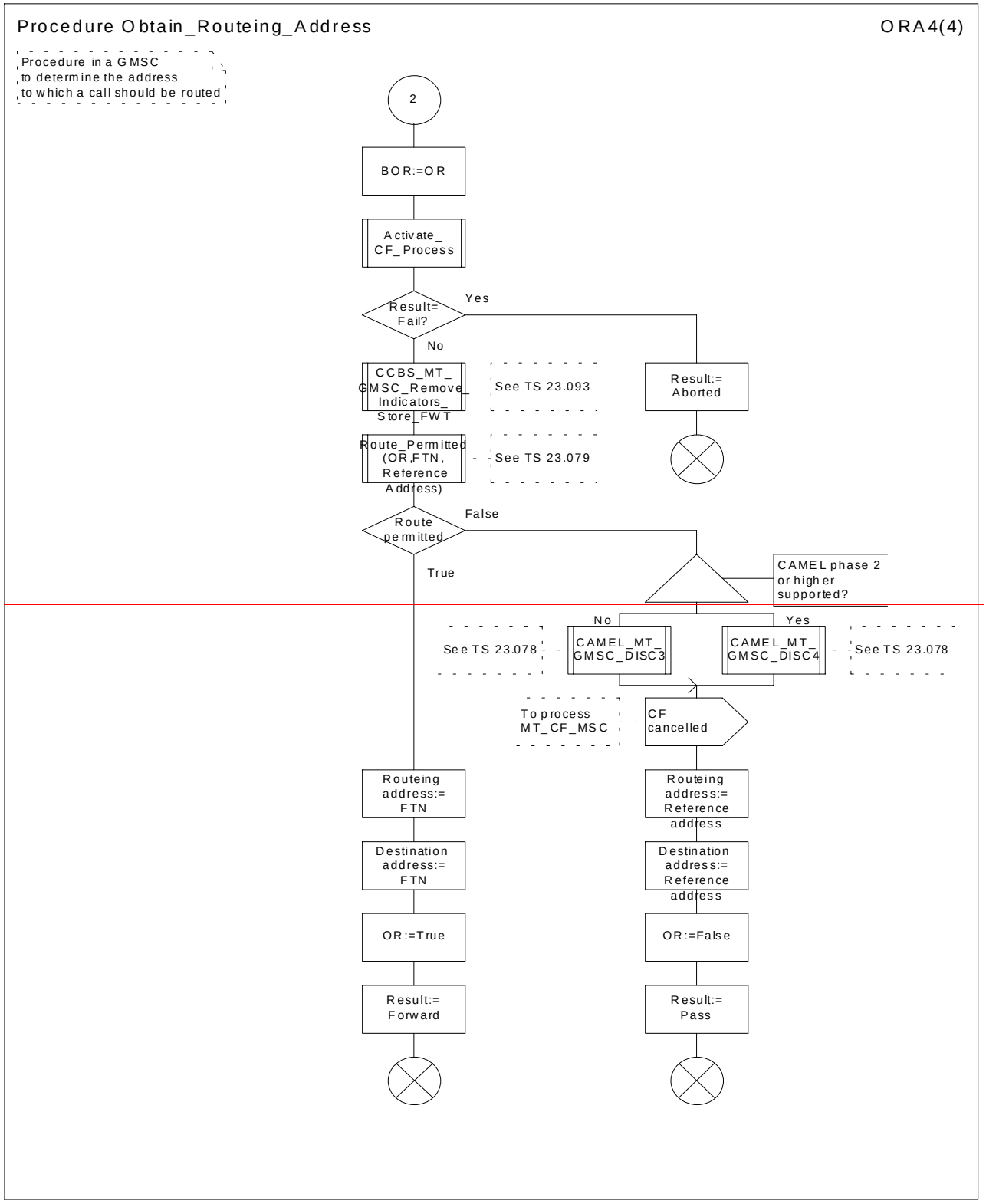
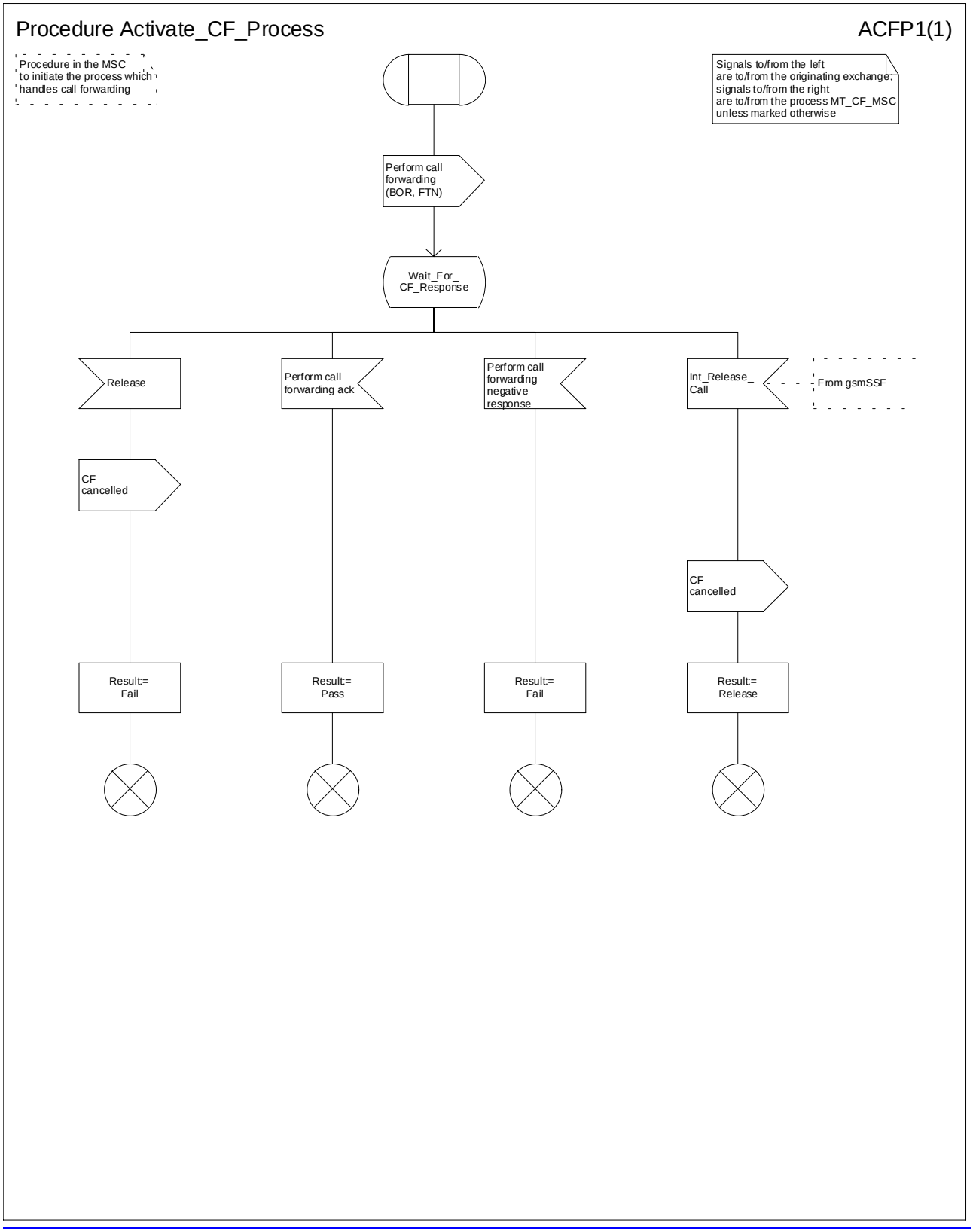


Figure 37d: Procedure Obtain_Routeing_Address (sheet 4)

…


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
Perform call
forwarding
(BOR, FTN)
Wait_For_
CF_Response
Release
Perform call
forwarding ack
Perform call
forwarding
negative
response
Int_Release_
Call
From gsmSSF
CF
cancelled
CF
cancelled
Result:=
Fail
Result:=
Pass
Result:=
Fail
Result:=
Release

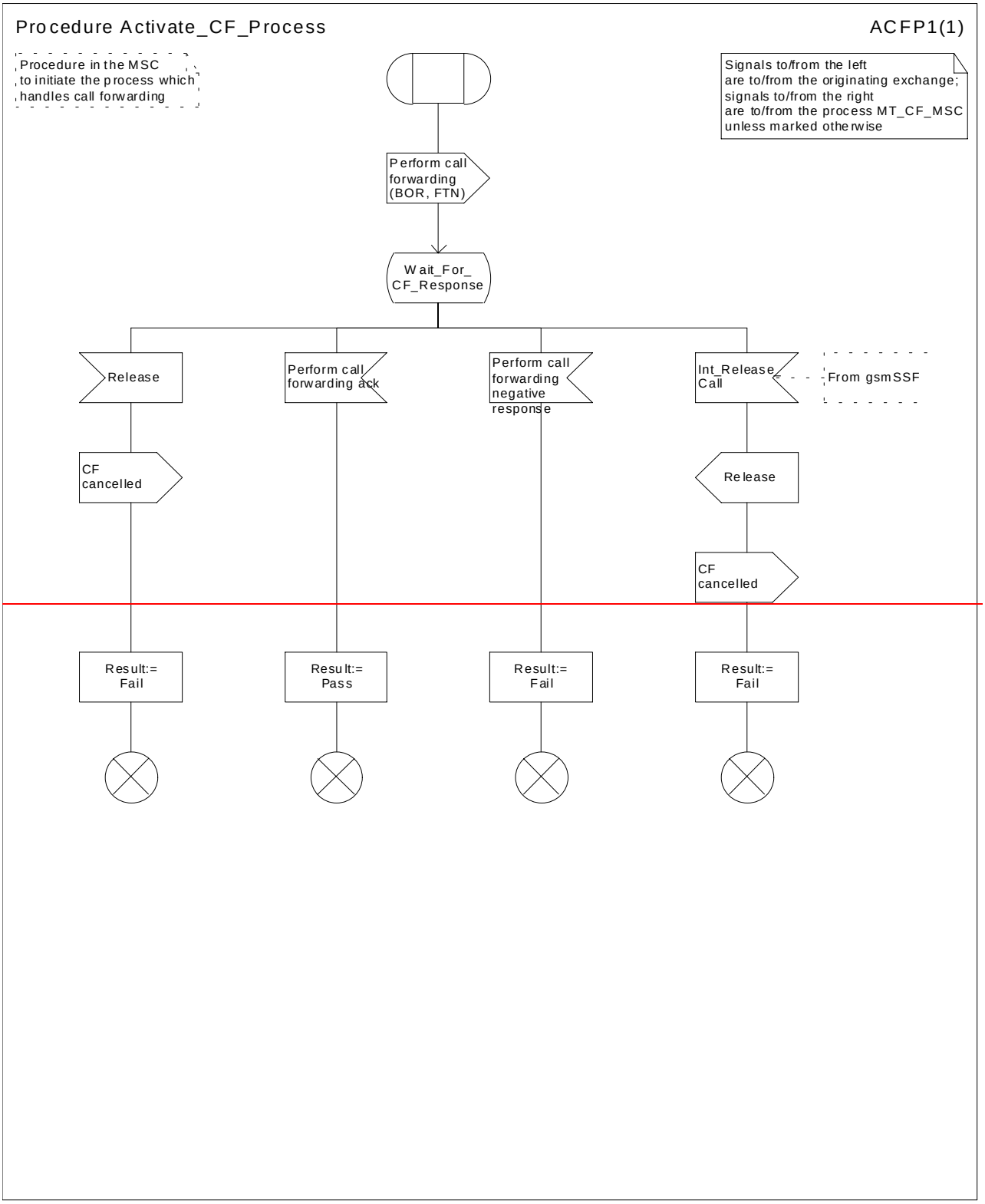
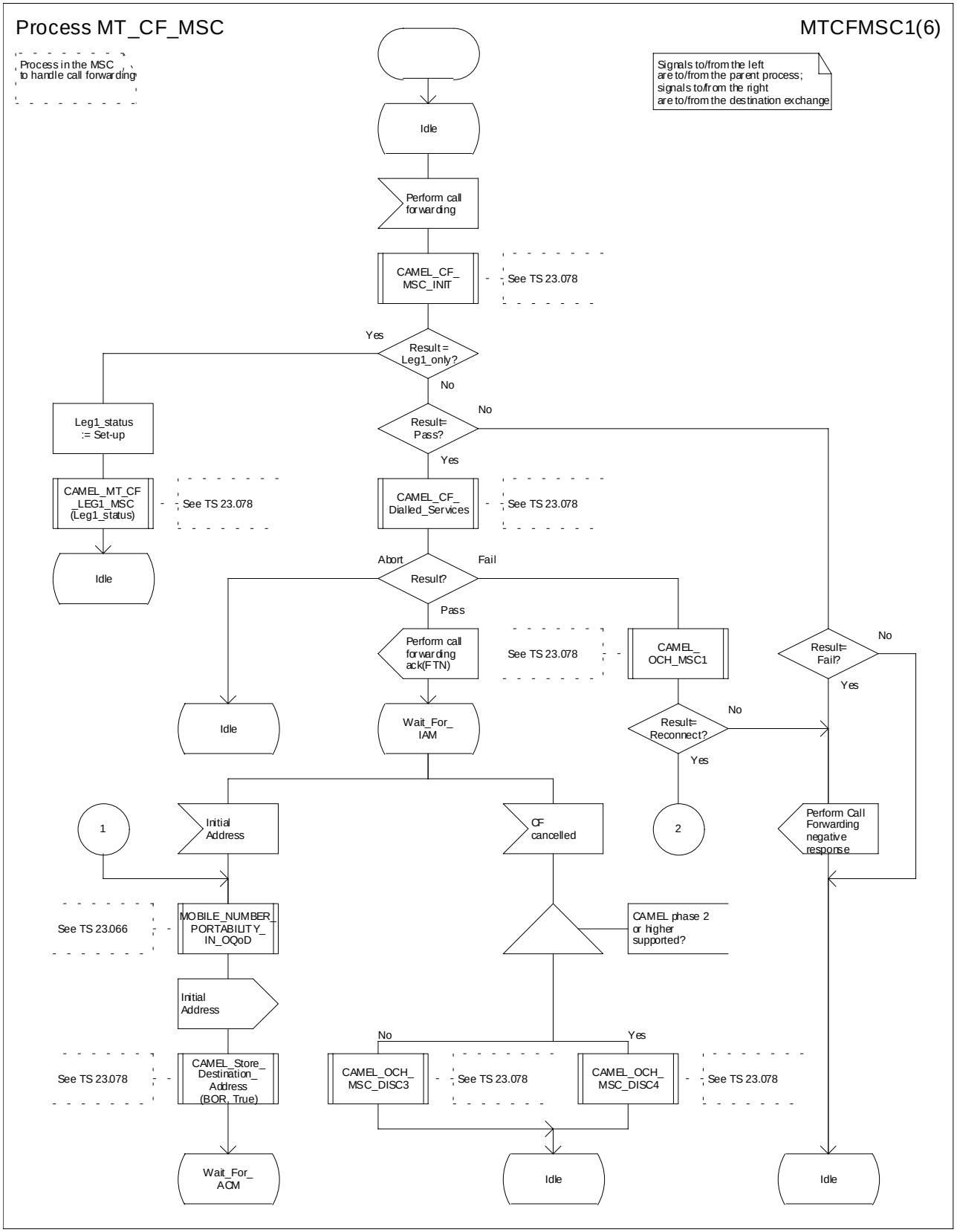


Figure 42: Procedure Activate_CF_Process


Process MT_CF_MSC
MTCFMSC1(6)
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
Idle
Perform call forwarding
CAMEL_CF_ MSC_INIT
See TS 23.078
Yes
Result = Leg1_only?
No
Leg1_status := Set-up
No
Result= Pass?
Yes
CAMEL_MT_CF _LEG1_MSC (Leg1_status)
See TS 23.078
CAMEL_CF_ Dialled_Services
See TS 23.078
Idle
Abort
Fail
Result?
Pass
Perform call forwarding ack(FTN)
See TS 23.078
CAMEL_ OCH_MSC1
Result= Fail?
No
Yes
Idle
Wait_For_ IAM
Result= Reconnect?
No
Yes
1
Initial Address
CF cancelled
2
Perform Call Forwarding negative response
See TS 23.066
MOBILE_NUMBER_ PORTABILITY_ IN_OQoD
CAMEL phase 2 or higher supported?
Initial Address
No
Yes
See TS 23.078
CAMEL_Store_ Destination_ Address (BOR, True)
CAMEL_OCH_ MSC_DISC3
See TS 23.078
CAMEL_OCH_ MSC_DISC4
See TS 23.078
Wait_For_ ACM
Idle
Idle

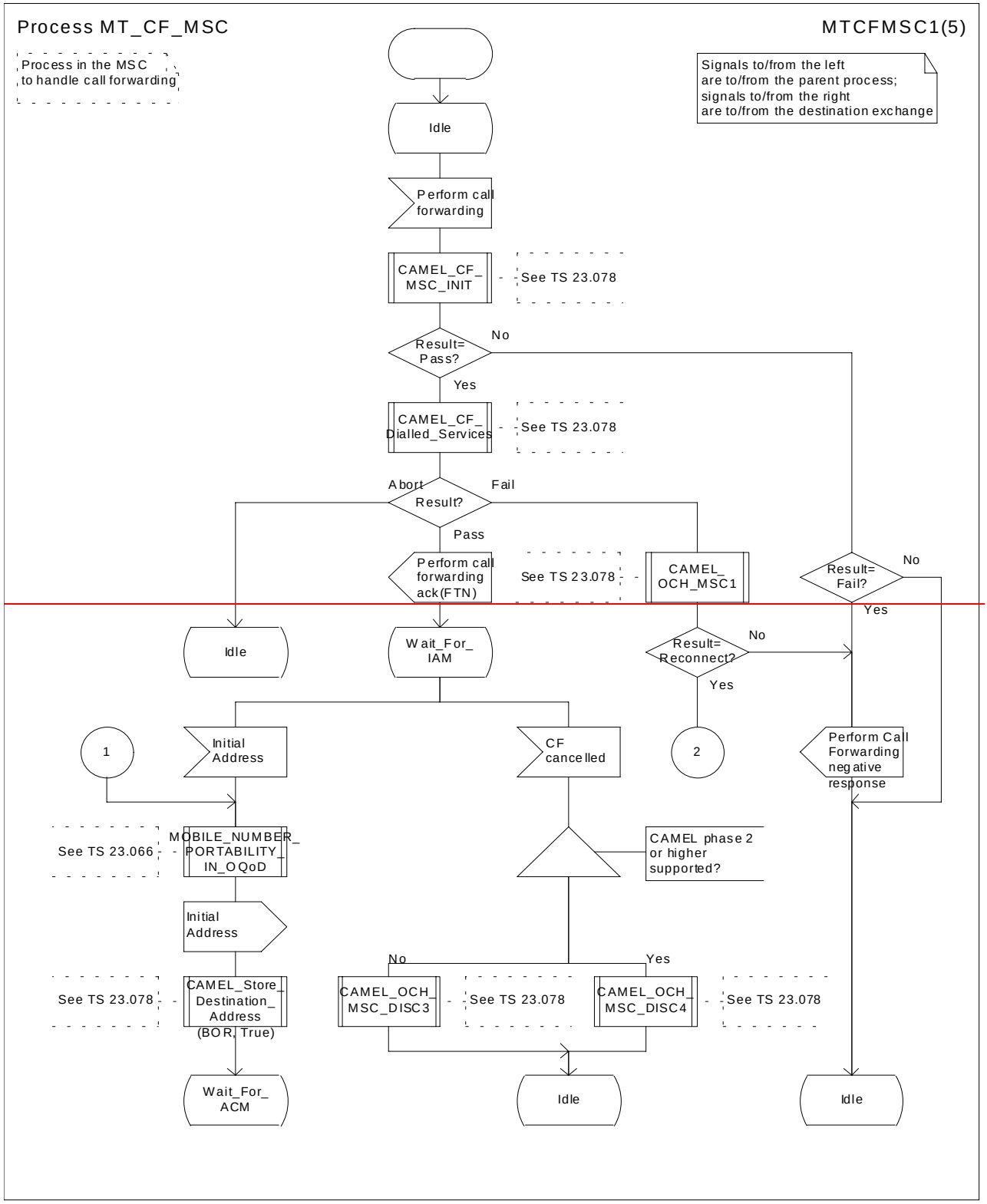
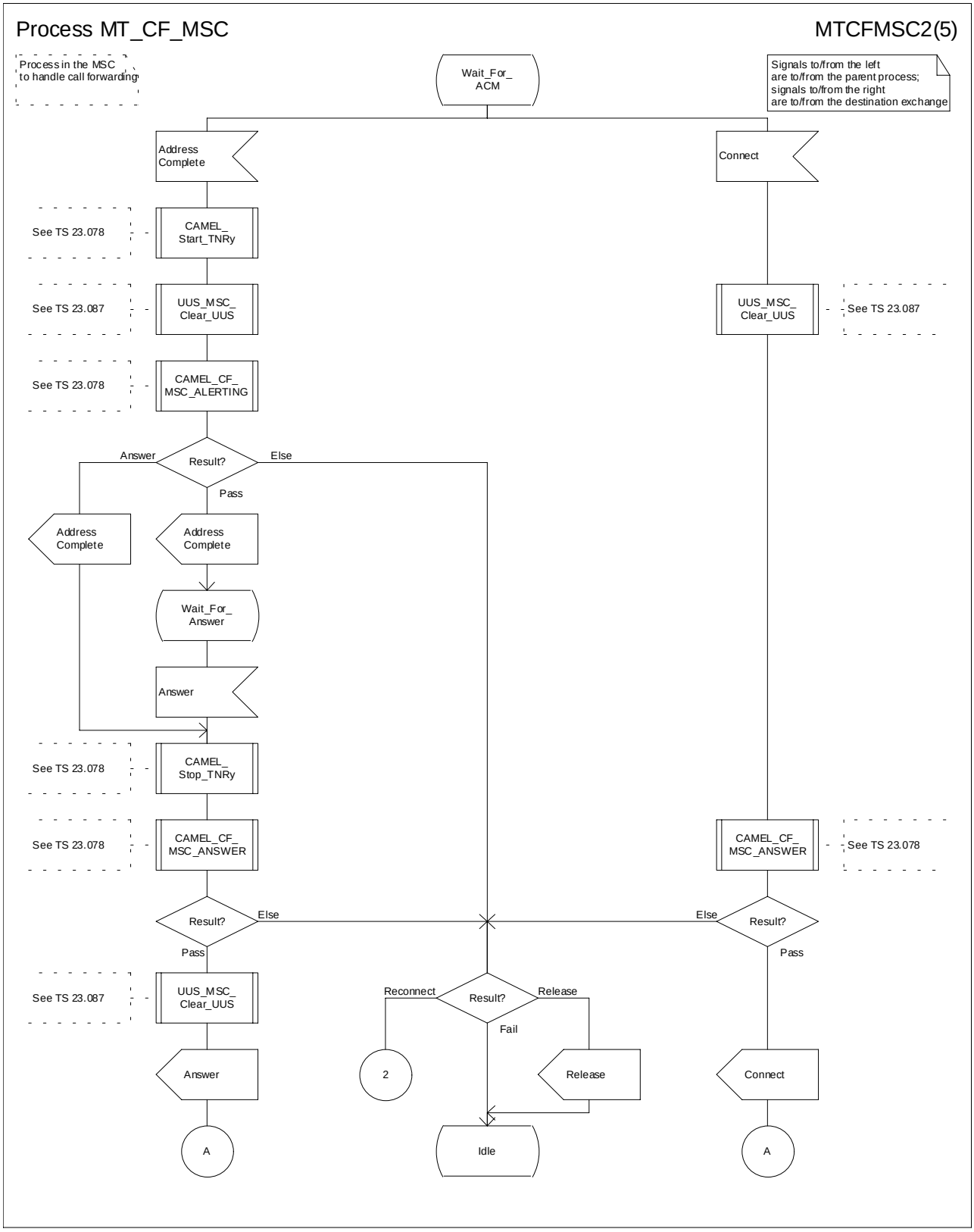


Figure 43a: Process MT_CF_MSC (sheet 1)


Process MT_CF_MSC
MTCFMSC2(5)
Process in the MSC to handle call forwarding
Wait_For_ ACM
Signals to/from the left are to/from the parent process; signals to/from the right are to/from the destination exchange
Address Complete
Connect
See TS 23.078
CAMEL_ Start_TNRy
See TS 23.087
UUS_MSC_ Clear_UUS
UUS_MSC_ Clear_UUS
See TS 23.087
See TS 23.078
CAMEL_CF_ MSC_ALERTING
Answer
Result?
Else
Pass
Address Complete
Address Complete
Wait_For_ Answer
Answer
See TS 23.078
CAMEL_ Stop_TNRy
See TS 23.078
CAMEL_CF_ MSC_ANSWER
CAMEL_CF_ MSC_ANSWER
See TS 23.078
Result?
Else
Else
Result?
Pass
Pass
See TS 23.087
UUS_MSC_ Clear_UUS
Reconnect
Result?
Release
Fail
Answer
2
Release
Connect
A
Idle
A

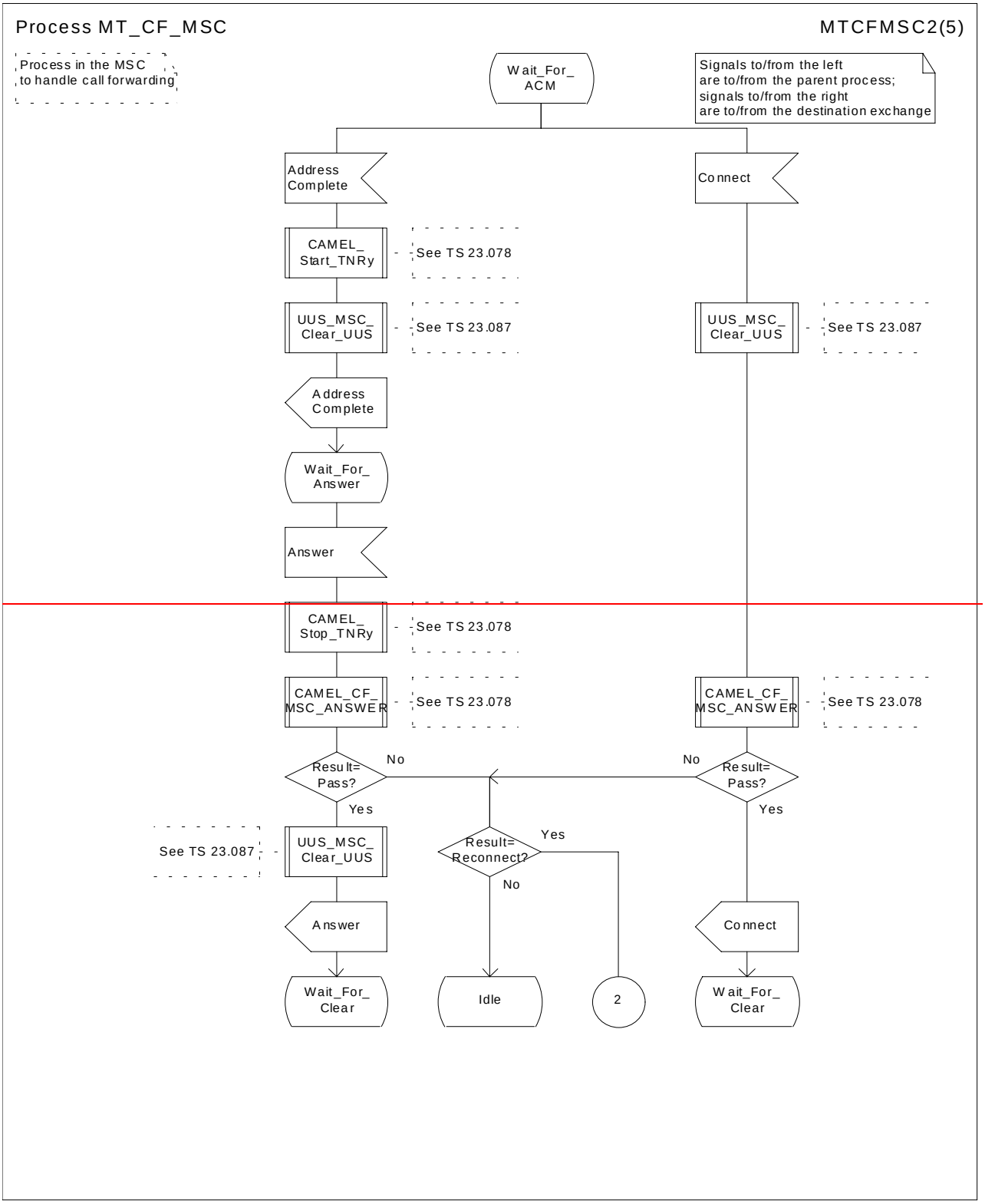


Figure 43b: Process MT_CF_MSC (sheet 2)

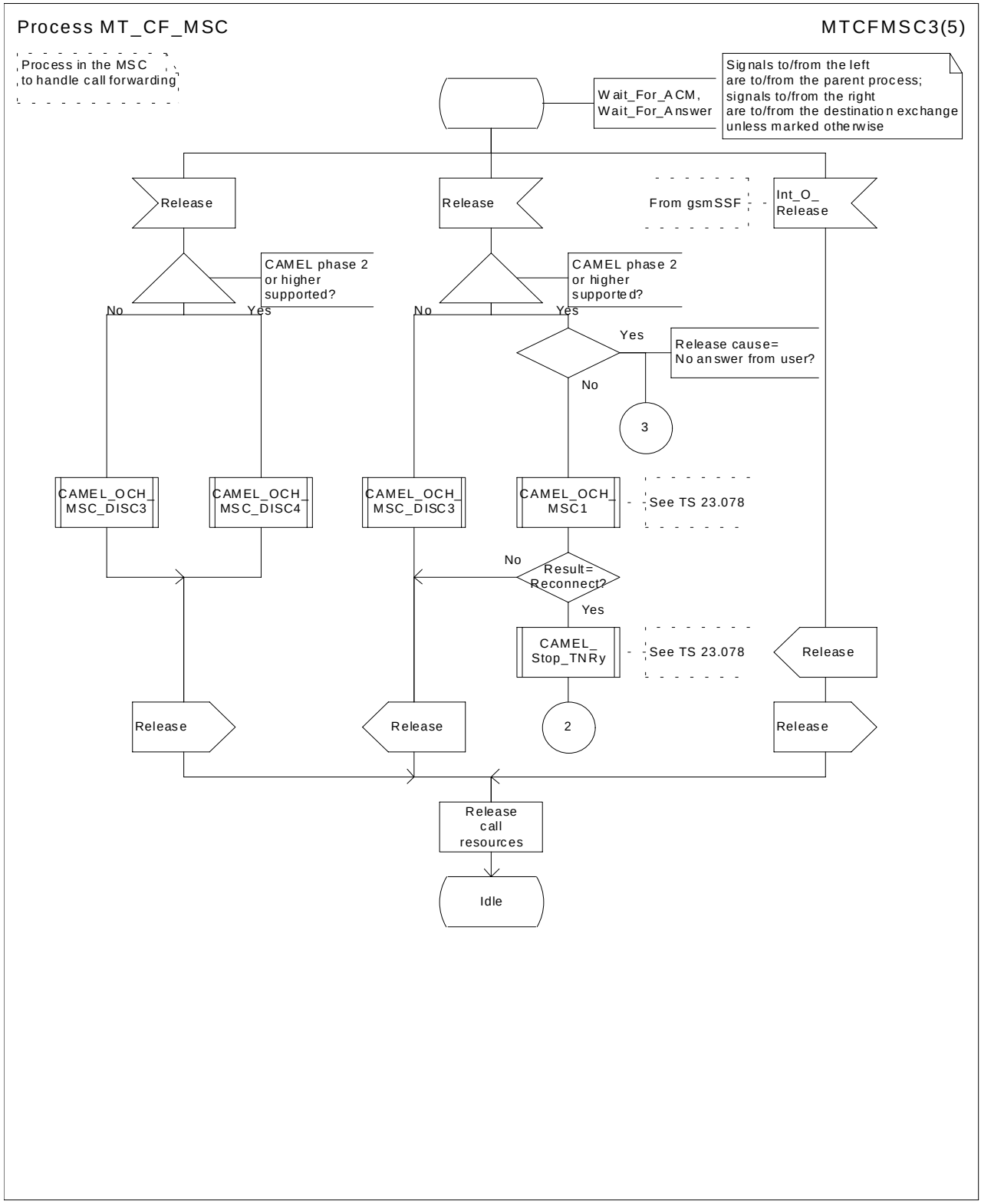


Figure 43c: Process MT_CF_MSC (sheet 3)

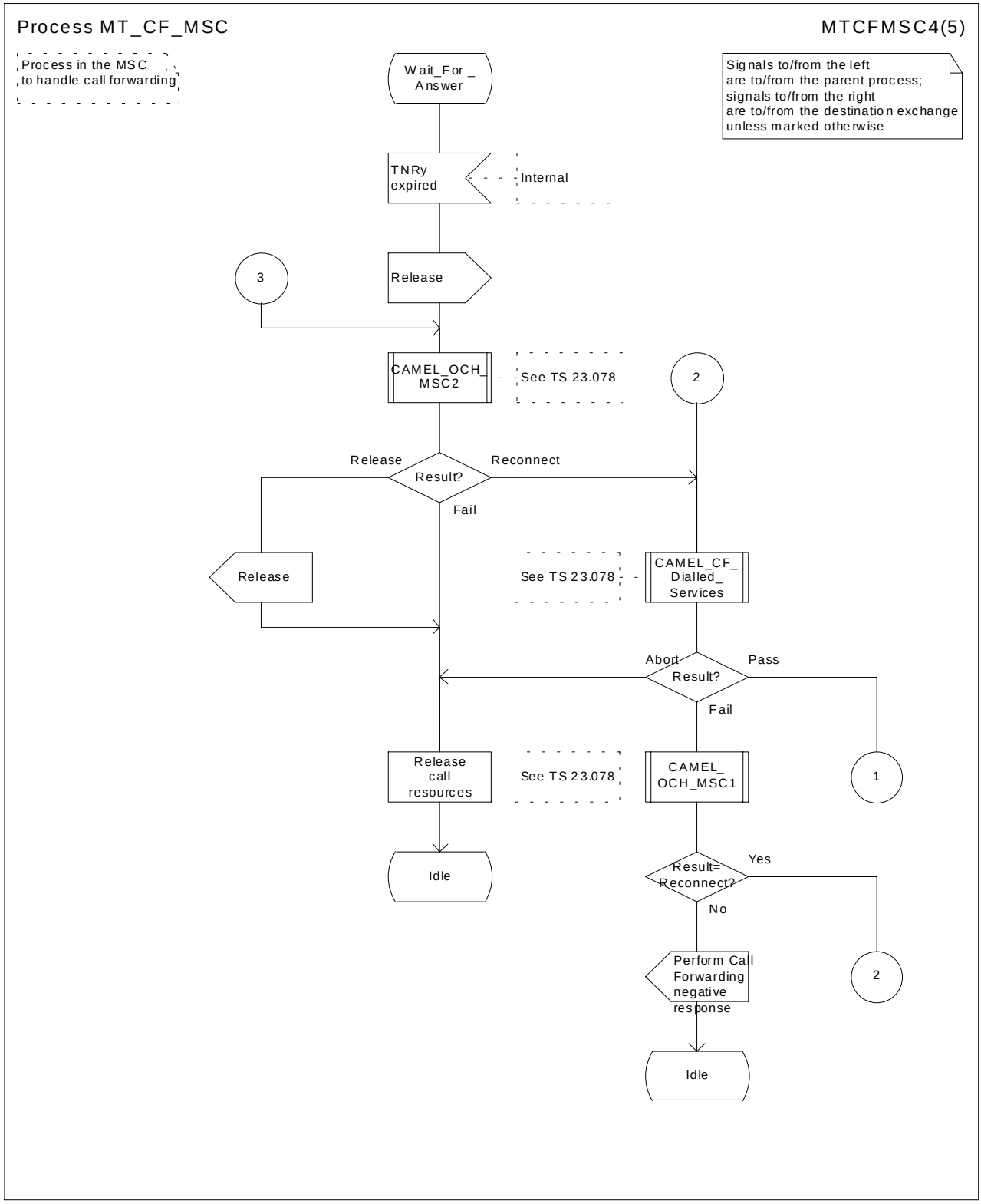


Figure 43d: Process MT_CF_MSC (sheet 4)

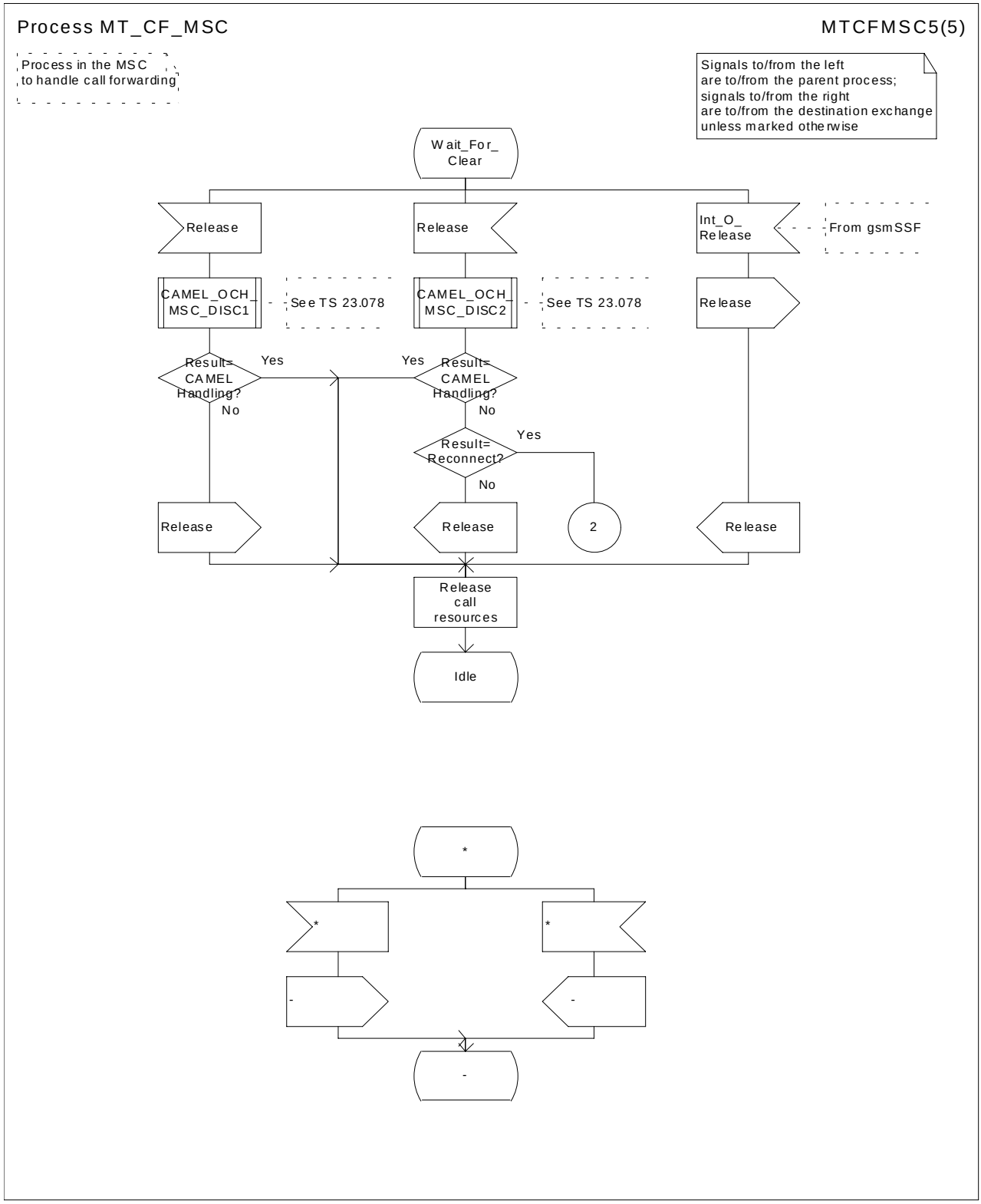


Figure 43e: Process MT_CF_MSC (sheet 5)

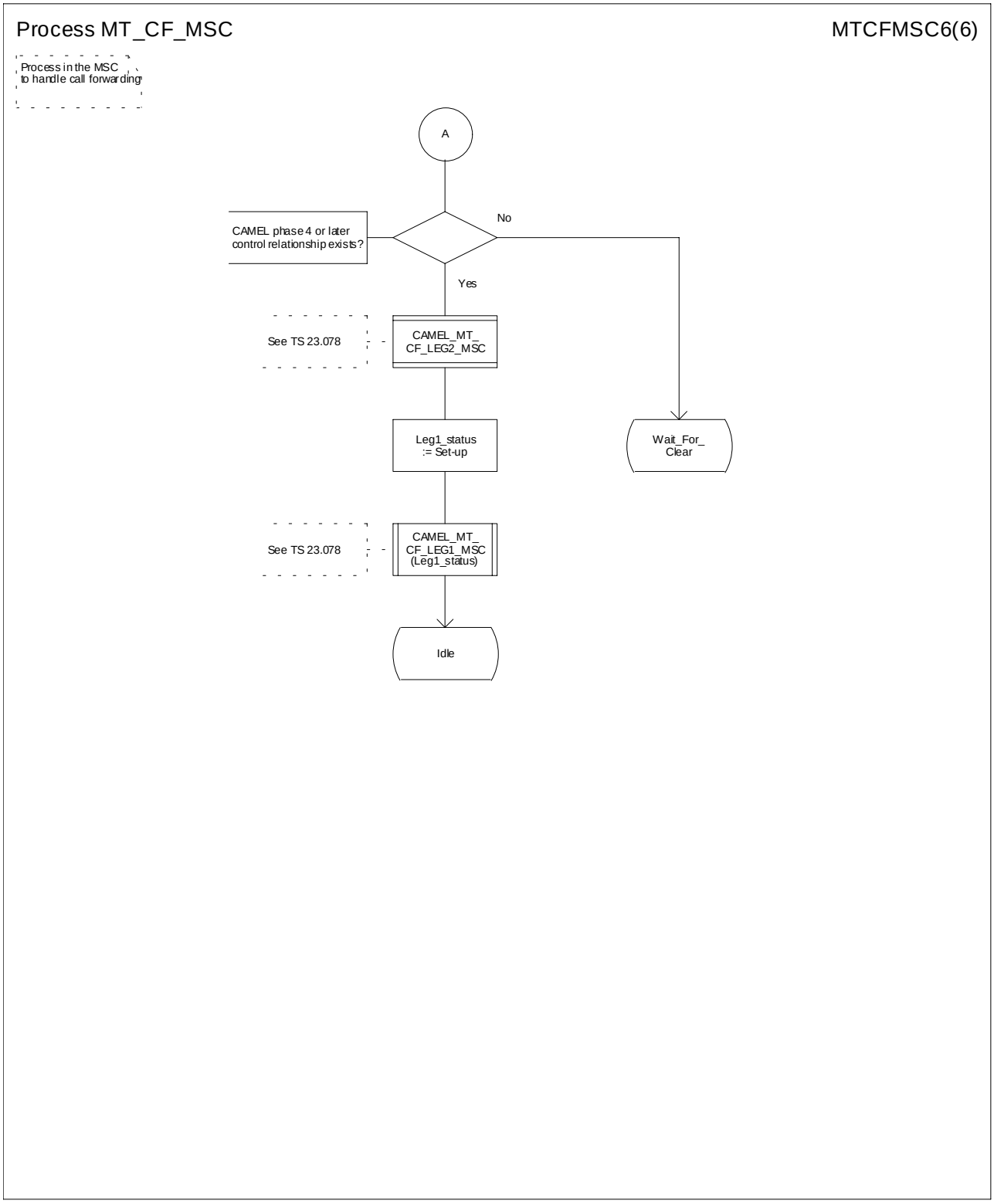


Figure 43f: Process MT_CF_MSC (sheet 6)

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

7.2.2 Functional requirements of HLR

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7.2.2.3 Procedure Subscription_Check_HLR

It is an implementation option to carry out the check for operator determined barring of incoming calls before the check on provisioning of the requested basic service.

The test "gsmSCF Initiated Call?" is specific to CAMEL phase 4 or later. If the HLR does not support CAMEL phase 4 or later, processing continues from the "No" exit.

The negative response "Call barred" indicates whether the reason is operator determined barring or supplementary service barring, according to the result returned by the procedure Check_IC_Barring.

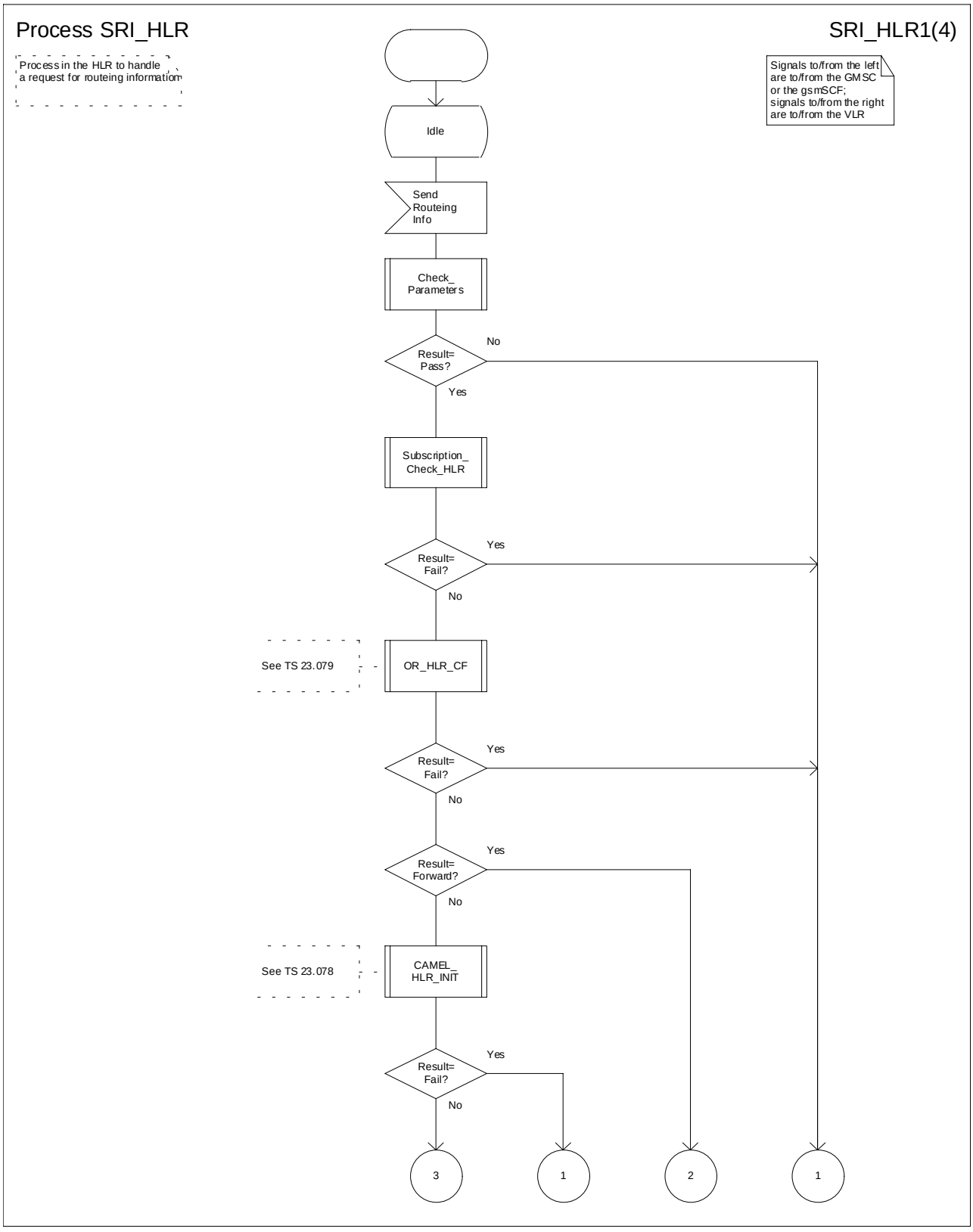
The procedure IC_CUG_Check is specific to CUG. If the HLR does not support GUG, processing continues from the "Yes" exit of the test "Result=Call allowed?".

The negative response "CUG reject" indicates whether the reason is:

- Incoming calls barred within CUG;
- Requested basic service violates CUG constraints;
- Subscriber not member of CUG;

according to the cause returned by the procedure IC_CUG_Check.

**** Modified SDLs in Section 7.2.2 ****



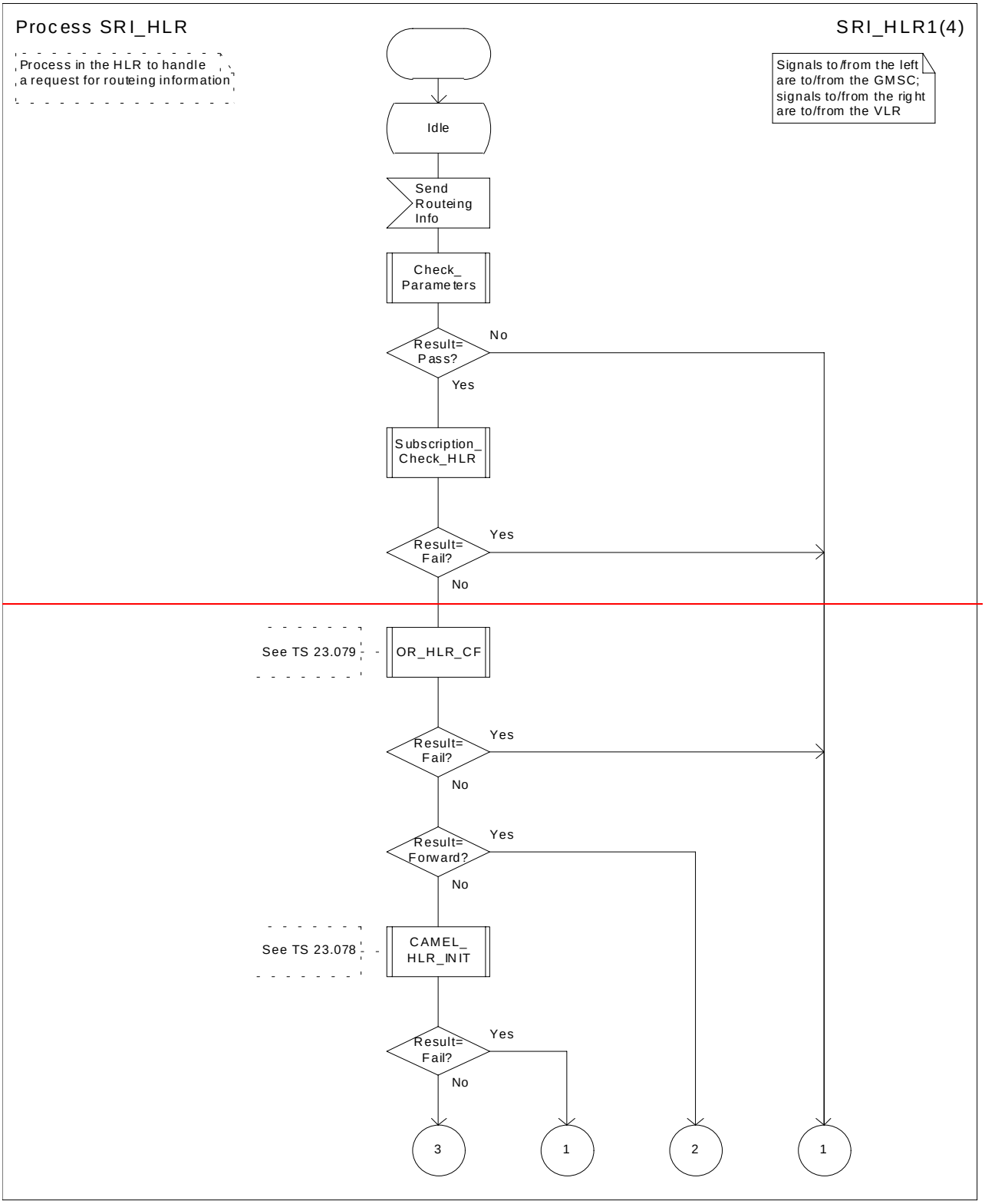
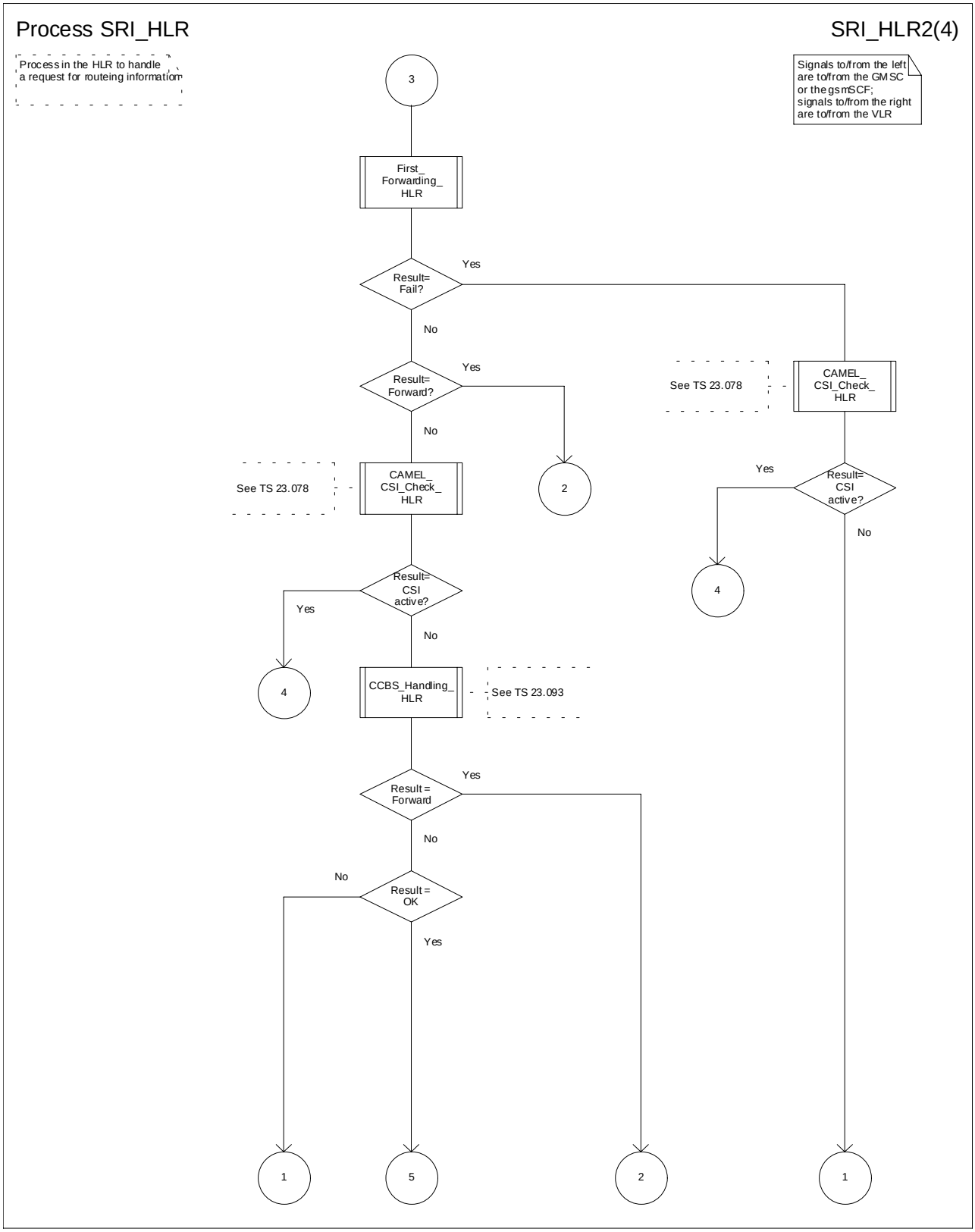


Figure 44a: Process SRI_HLR (sheet 1)


Process SRI_HLR
SRI_HLR2(4)
Process in the HLR to handle a request for routeing information
Signals to/from the left are to/from the GMSC or the gsmSCF; signals to/from the right are to/from the VLR
3
First_ Forwarding_ HLR
Result= Fail?
Yes
No
Result= Forward?
Yes
No
See TS 23.078
CAMEL_ CSI_Check_ HLR
2
See TS 23.078
CAMEL_ CSI_Check_ HLR
Yes
Result= CSI active?
No
4
Result= CSI active?
Yes
No
4
CCBS_Handling_ HLR
See TS 23.093
Result = Forward
Yes
No
No
Result = OK
Yes
1
5
2
1

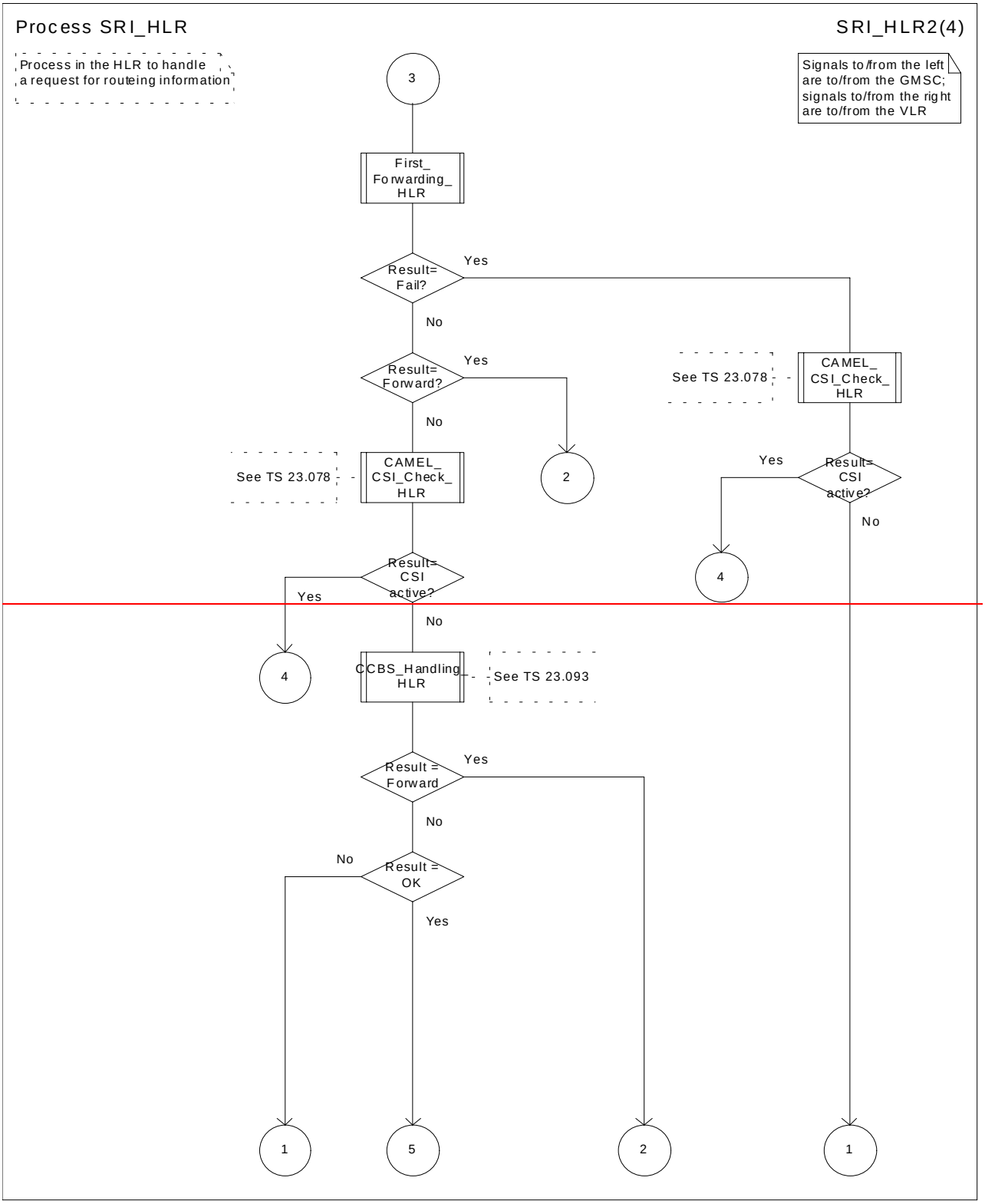
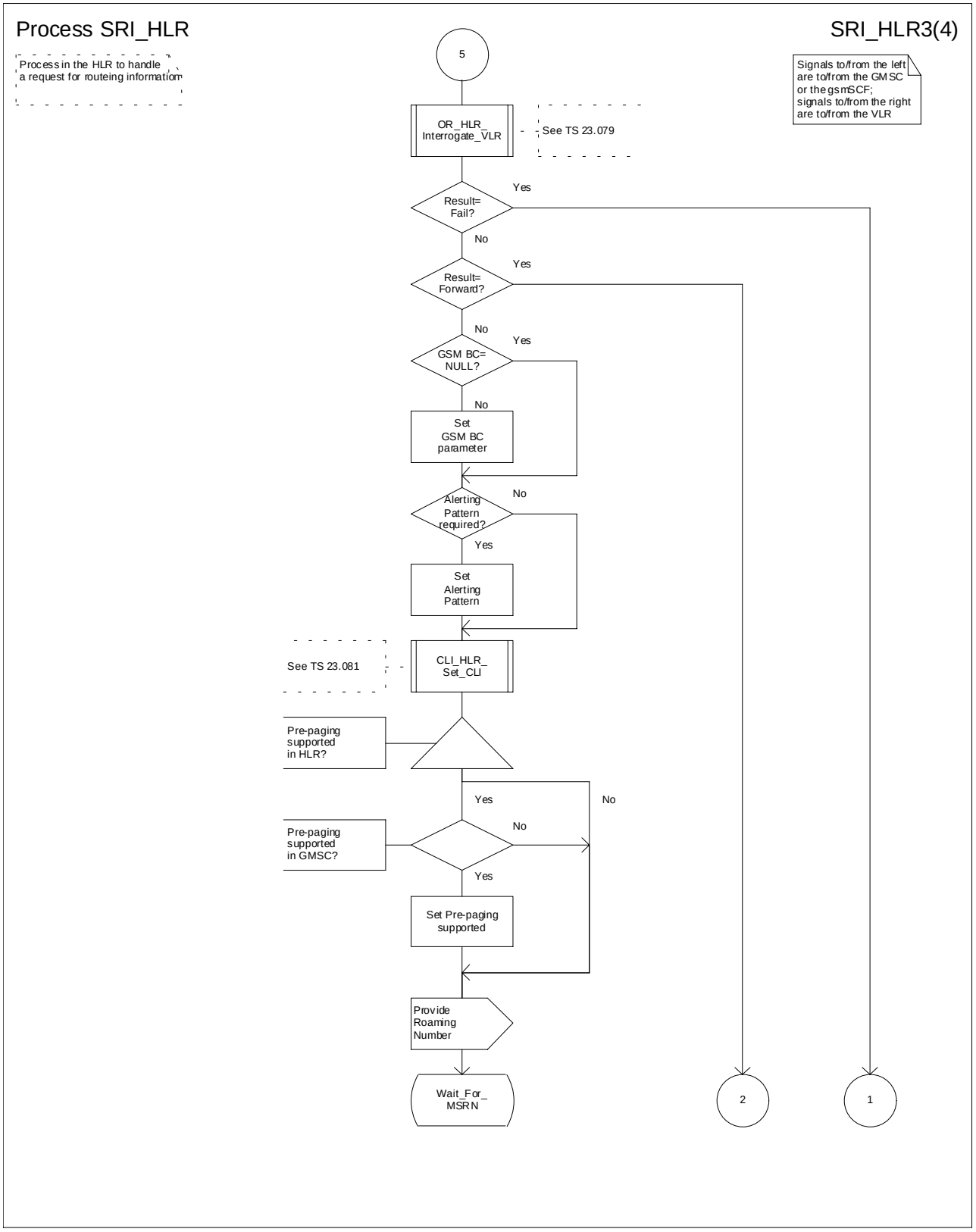


Figure 44b: Process SRI_HLR (sheet 2)


Process SRI_HLR
SRI_HLR3(4)
Process in the HLR to handle a request for routeing information
Signals to/from the left are to/from the GMSC or the gsmSCF; signals to/from the right are to/from the VLR
5
OR_HLR_ Interrogate_VLR
See TS 23.079
Result= Fail?
Yes
No
Result= Forward?
Yes
No
GSM BC= NULL?
Yes
No
Set GSM BC parameter
Alerting Pattern required?
No
Yes
Set Alerting Pattern
See TS 23.081
CLI_HLR_ Set_CLI
Pre-paging supported in HLR?
Yes
No
Pre-paging supported in GMSC?
No
Yes
Set Pre-paging supported
Provide Roaming Number
Wait_For_ MSRN
2
1

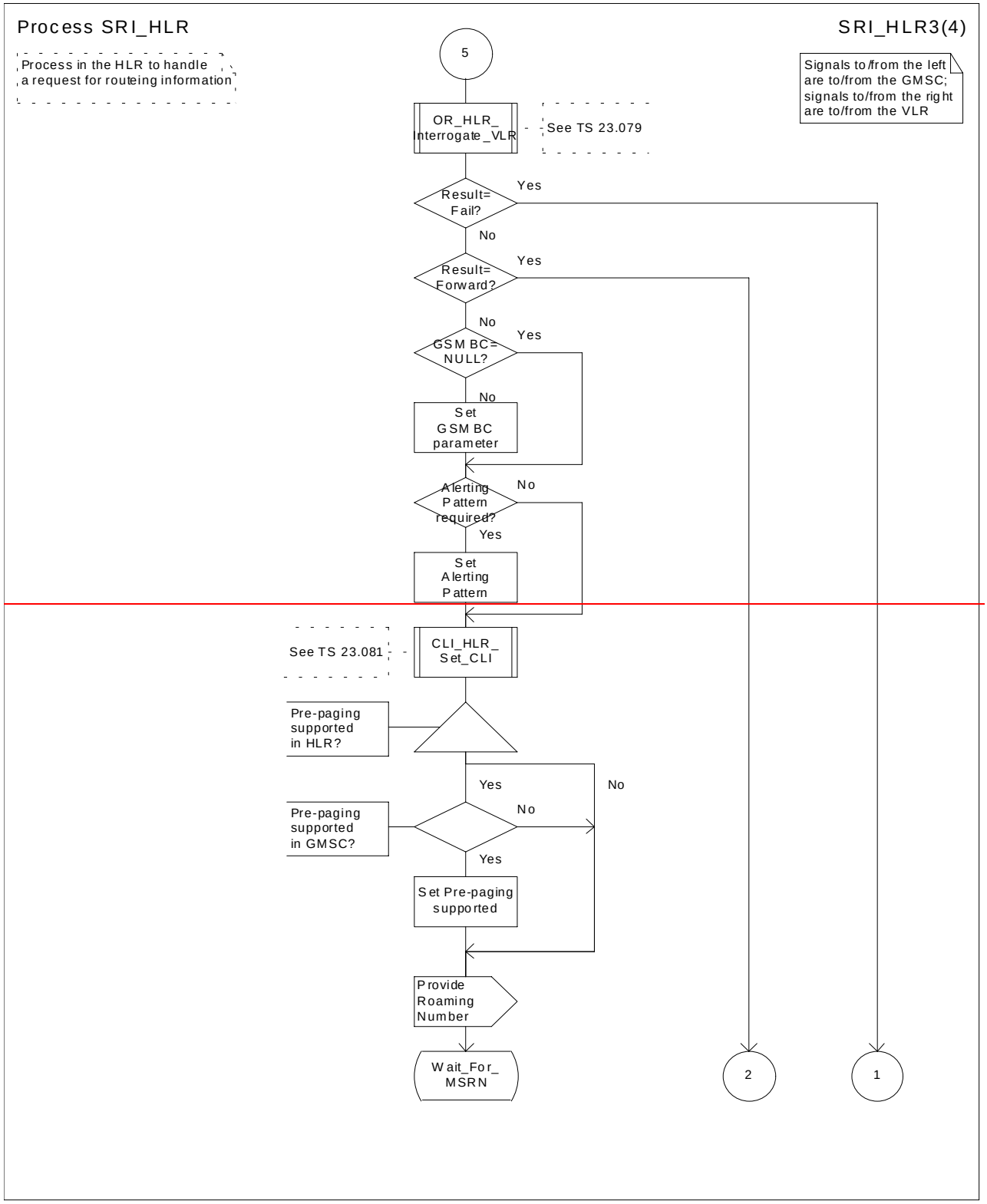
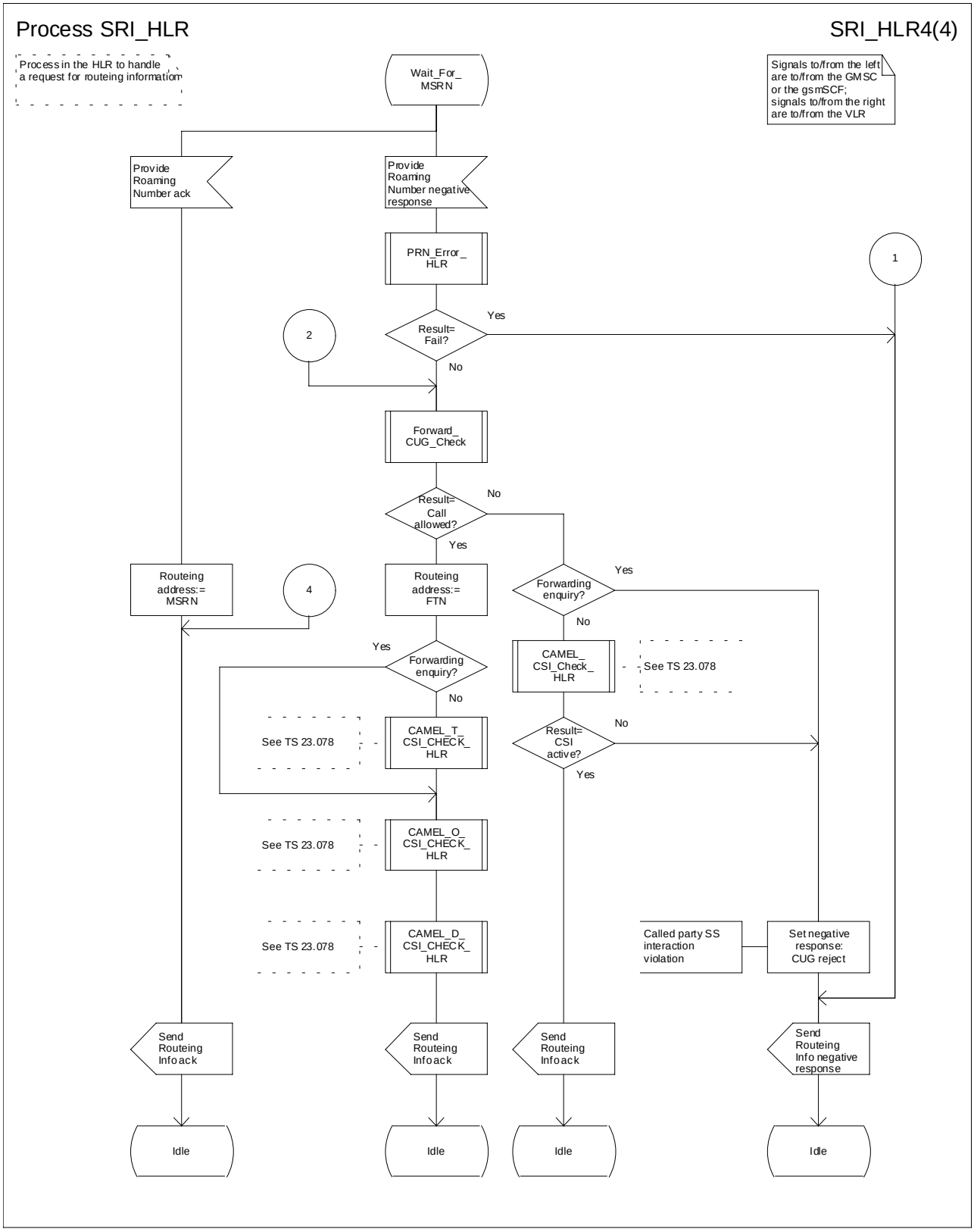


Figure 44c: Process SRI_HLR (sheet 3)


Process SRI_HLR
SRI_HLR4(4)
Process in the HLR to handle a request for routeing information
Wait_For_ MSRN
Signals to/from the left are to/from the GMSC or the gsmSCF; signals to/from the right are to/from the VLR
Provide Roaming Number ack
Provide Roaming Number negative response
PRN_Error_ HLR
1
2
Result= Fail?
Yes
No
Forward_ CUG_Check
Result= Call allowed?
No
Yes
Routeing address:= MSRN
4
Routeing address:= FTN
Forwarding enquiry?
Yes
No
CAMEL_ CSI_Check_ HLR
See TS 23.078
Forwarding enquiry?
Yes
No
See TS 23.078
CAMEL_T_ CSI_CHECK_ HLR
Result= CSI active?
No
Yes
See TS 23.078
CAMEL_O_ CSI_CHECK_ HLR
See TS 23.078
CAMEL_D_ CSI_CHECK_ HLR
Called party SS interaction violation
Set negative response: CUG reject
Send Routeing Info ack
Send Routeing Info ack
Send Routeing Info ack
Send Routeing Info negative response
Idle
Idle
Idle
Idle

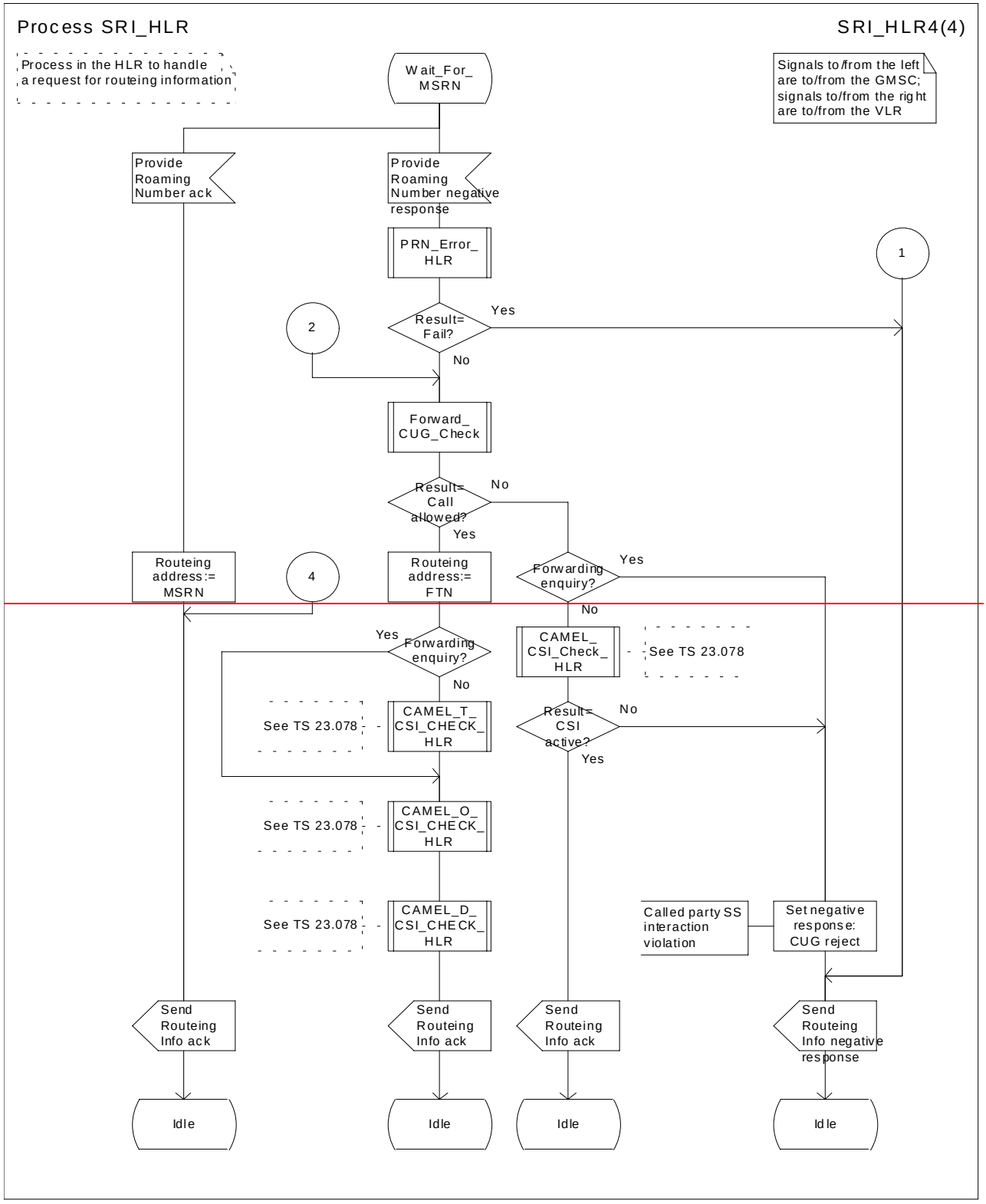


Figure 44d: Process SRI_HLR (sheet 4)

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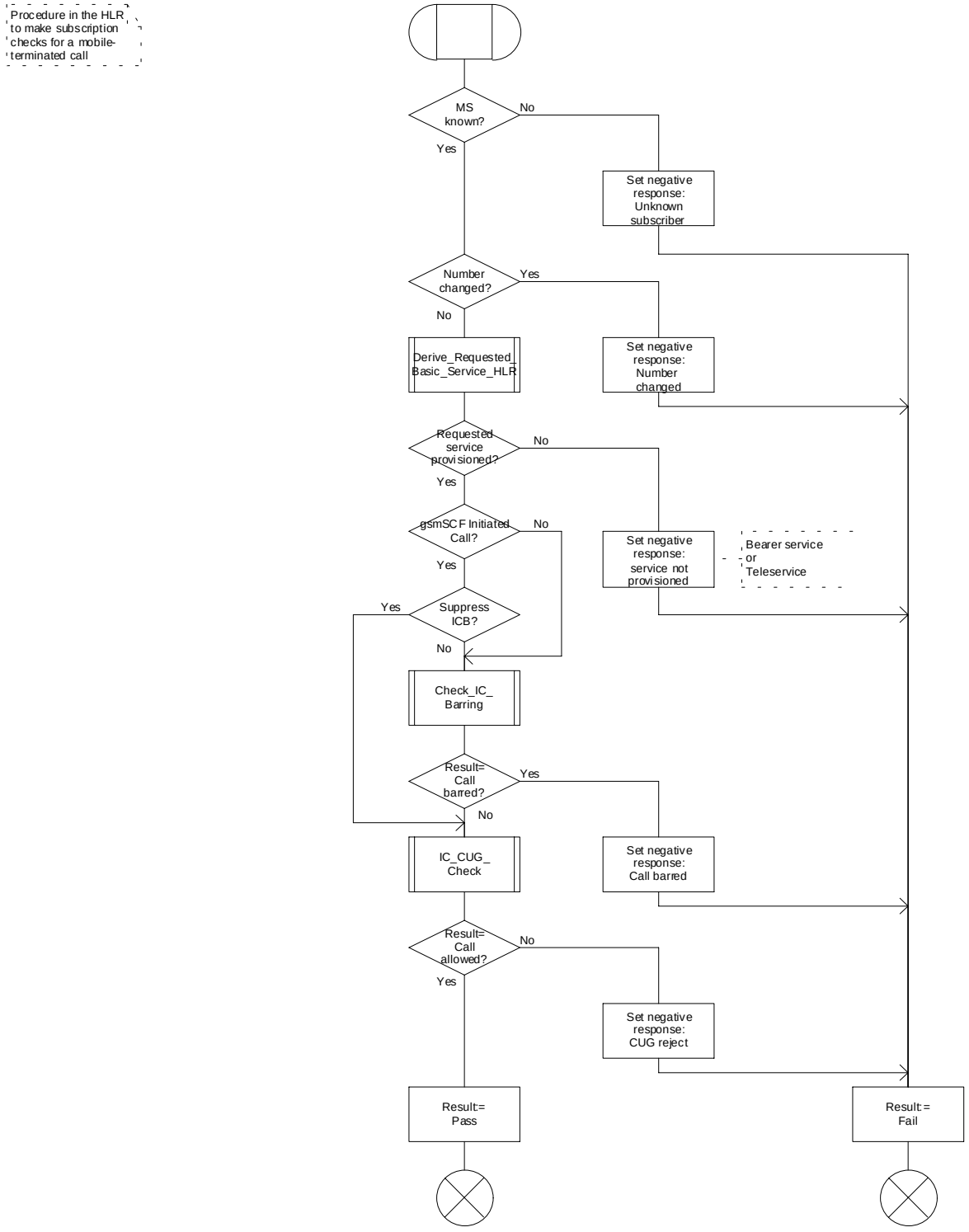
Procedure Subscription_Check_HLR SC_HLR1(1)



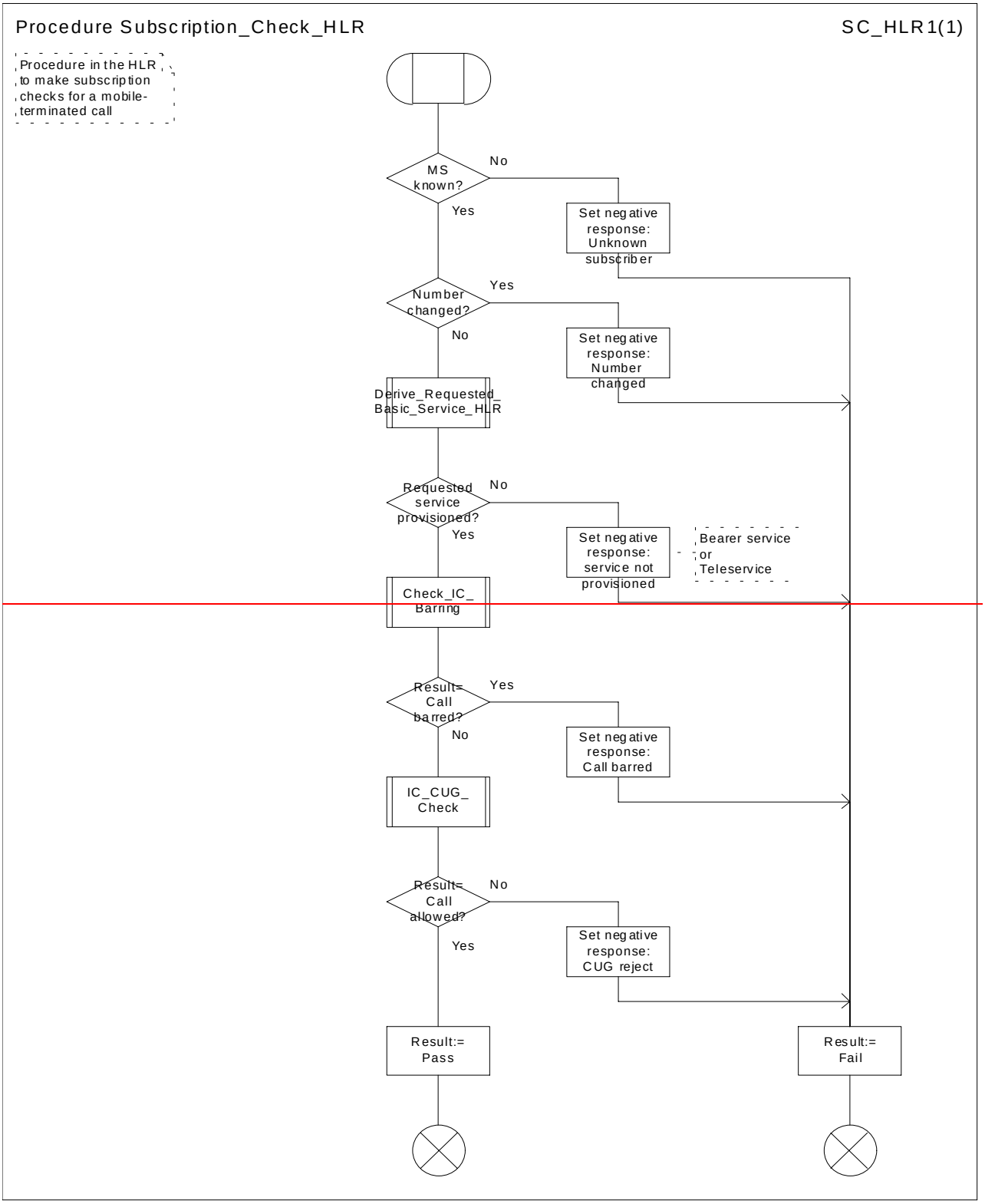


Figure 46: Procedure Subscription_Check_HLR

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

7.3.1 Functional requirements of serving MSC

7.3.1.1 Process ICH_MSC

Sheet 1: the rules for converting the ISDN BC/LLC/HLC to a bearer service or teleservice are specified in 3GPP TS 29.007 [30].

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 or later. If the VMSC does not support CAMEL phase 3 or later, this signal will not be received from the VLR.

Sheet 1: the procedure CAMEL_ICH_MSC_INIT is specific to CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 1: The variable "On_Hold" is used only if the VMSC supports Call Hold.

Sheet 1, sheet 15: the process CAMEL_ICH_LEG1_MSC is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12].

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 [37]) 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 called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 3 or later, 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 called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 3: the procedure CAMEL_MT_GMSC_DISC5 is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 3 or later, 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 or later.

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

Sheet 3: 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 3: the procedure Process_Call_Waiting is specific to Call Waiting; it is specified in 3GPP TS 23.083 [16].

Sheet 3, sheet 8, the procedure CD_Reject is specific to Call Deflection; it is specified in 3GPP TS 23.072 [11].

Sheet 3, sheet 8: the procedure CCBS_Set_Diagnostic_For_Release is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 3, sheet 4, sheet 10, sheet 11: the procedure CCBS_Check_Last_Call is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 3, sheet 11, sheet 13: signals are sent to and received from the process Subs_FSM; it is specified in subclause 7.4.

Sheet 4: the procedure UUS_ICH_Check_Support is specific to UUS; it is specified in 3GPP TS 23.087 [20].

Sheet 4: the procedure CAMEL_Check_ORLCF_VMSC is specific to CAMEL phase 2 or later; it is specified in 3GPP TS 23.078 [12].

- If the VLR does not support CAMEL or no CAMEL information is available for the subscriber, then ORLCF may take place (‘ORLCF’ result from CAMEL_Check_ORLCF_VMSC).

  If CAMEL information is available for the subscriber and the GMSC supports the required CAMEL phase, then ORLCF may take place. The Resume Call Handling request shall include the relevant CAMEL information (‘ORLCF’ result from CAMEL_Check_ORLCF_VMSC).

  If CAMEL information is available for the subscriber but the GMSC does not support the required CAMEL phase, then ORLCF shall not take place (‘VMSCCF’ result from CAMEL_Check_ORLCF_VMSC).

Sheet 4: the procedure Handle_ORLCF_VMSC is specific to Support of Optimal Routeing. It is specified in 3GPP TS 23.079 [13]. If the VMSC does not support Optimal Routeing, processing continues from the "Continue" exit of the test "ResultForwarding Failed?".

Sheet4, sheet 9: the procedures CD_Failure and CD_Success are specific to Call Deflection; they are specified in 3GPP TS 23.072 [11].

Sheet 5: the procedure CAMEL_MT_VMSC_Notify_CF is specific to CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

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

Sheet 5: The task "set redirection information" includes 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 5: 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 5, sheet 7: the procedure Send_ACM_If_Required is specified in subclause 7.2.1.3.

Sheet 5: the procedure Activate_CF_Process is specified in subclause 7.2.1.7.

Sheet 5: the procedure UUS_ICH_Set_Info_In_IAM is specific to UUS, it is specified in 3GPP TS 23.087 [20].

Sheet 5: 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 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 5; the procedure CD_Success is specific to Call Deflection; it is specified in 3GPP TS 23.0 72 [11].

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

Sheet 7: the procedure CAMEL_MT_GMSC_ANSWER is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 3 or later, processing continues from the "Pass~~No~~" exit of the test "Result~~=Reconnect~~?".

Sheet 7: the procedure Handle_COLP_Forwarding_Interaction is specified in subclause 7.2.1.6.

Sheet 7: the procedure Send_Answer_If_Required is specified in subclause 7.2.1.4.

Sheet 7: the procedure Send_Network_Connect_If_Required is specified in subclause 7.2.1.5.

Sheet 7: the procedure CAMEL_MT_MSC_ALERTING is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 4 or later, processing continues from the "Pass" exit of the test "Result?".

Sheet 8: the procedure CCBS_MT_MSC_Check_Forwarding is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 9: the processing on this sheet is specific to CAMEL phase 3 or later. If the VMSC does not support CAMEL phase 3 or later, the input signal Send Info For Reconnected Call ack will not be received.

Sheet 9: the procedure Handle_ORLCF_MSC is specific to OR; it is specified in 3GPP TS 23.079 [13]. If the VMSC does not support OR, processing continues from the "No" exit of the test "Result = Forwarding Failed?".

Sheet 11, sheet 12: the procedure CAMEL_MT_GMSC_DISC1 is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 11, sheet 12: the procedure CAMEL_MT_GMSC_ DISC2 is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 3 or later, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 11: the procedure UUS_MSC_Check_UUS1_UUI is specific to UUS; it is specified in 3GPP TS 23.087 [20].

Sheet 12: 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 or later. If the VMSC does not support CAMEL phase 3 or later, the input signal Int_Release Call will not be received.

Sheet 14: the procedure Process_Hold_Request is specific to Call Hold; it is specified in 3GPP TS 23.083[16].

Sheet 14: the procedure Process_Retrieve_request is specific to Call_Hold; it is specified in 3GPP TS 23.083[16].

Sheet 15: the procedures CAMEL_ICH_LEG2_MSC and CAMEL_ICH_LEG2_CF_MSC are specific to CAMEL phase 4 or later; they are specified in 3GPP TS 23.078 [12].

****** 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, 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 Set-up and Call Confirmed messages.

Sheet 1: the procedure UUS_ICH_UUS1_Implicit_Active is specific to UUS, it is specified in 3GPP TS 23.087 [20].

Sheet 1: the procedure CCBS_Report_Not_Idle is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 2: the procedure Establish_Terminating_TCH_Multicall is specific to Multicall; it is specified in 3GPP TS 23.135 [25].

Sheet 2: the test "Result=Rejected?" can take the "Yes" exit only if the procedure Establish_Terminating_TCH_Multicall was called.

Sheet 2, sheet 3, sheet 4, sheet 5, sheet 6, sheet 7: the procedure CAMEL_MT_GMSC_DISC4 is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 3 or later, processing continues from the "No" exit of the test "Result=Reconnect?".

Sheet 2, sheet 3, sheet 6, sheet 9, sheet 10: the procedure CAMEL_MT_GMSC_DISC6 is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 2, sheet 5, sheet 9: the procedure CCBS_ICH_MSC_Report_Failure is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 3, sheet 5: the procedure CCBS_ICH_MSC_Report_Success is specific to CCBS; it is specified in 3GPP TS 23.093 [23].

Sheet 3: the procedure CAMEL_Start_TNRy is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 3: the procedure CAMEL_MT_MSC_ALERTING is specific to CAMEL phase 4 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 4 or later, processing continues from the "Pass" exit of the test "Result?".

Sheet 3, sheet 6: the procedure UUS_ICH_Check_Support is specific to UUS, it is specified in 3GPP TS 23.087 [20]. If the VMSC does not support UUS, processing continues from the "Yes" exit of the test "Result=Pass?".

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

Sheet 3: the procedure Send_ACM_If_Required is specified in subclause 7.2.1.3.

Sheet 3, sheet 6: the procedure Establish_Terminating_TCH_Multicall is specific to Multicall; it is specified in 3GPP TS 23.135 [25]. If the VMSC does not support Multicall, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 4, sheet 7: 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 4, sheet 7: the procedure CAMEL_MT_GMSC_ANSWER is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12]. If the VMSC does not support CAMEL phase 3 or later, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 4, sheet 7: the procedure Set_COL_Presentation_Indicator_MSC is specific to COLP.

Sheet 4: the procedure Send_Network_Connect_If_Required is specified in subclause 7.2.1.5.

Sheet 5, sheet 11: 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 5, sheet 11: the procedure Handling_CD_MSC is specific to Call Deflection; it is specified in 3GPP TS 23.072 [11].

Sheet 6: the procedure CAMEL_Stop_TNRy is called if the VMSC supports CAMEL phase 3 or later; it is specified in 3GPP TS 23.078 [12].

Sheet 7: the procedure Send_Answer_If_Required is specified in subclause 7.2.1.4.

Sheet 8: the input signal "CAMEL TNRy expired" will be received only if the VMSC supports CAMEL phase 3 or later.

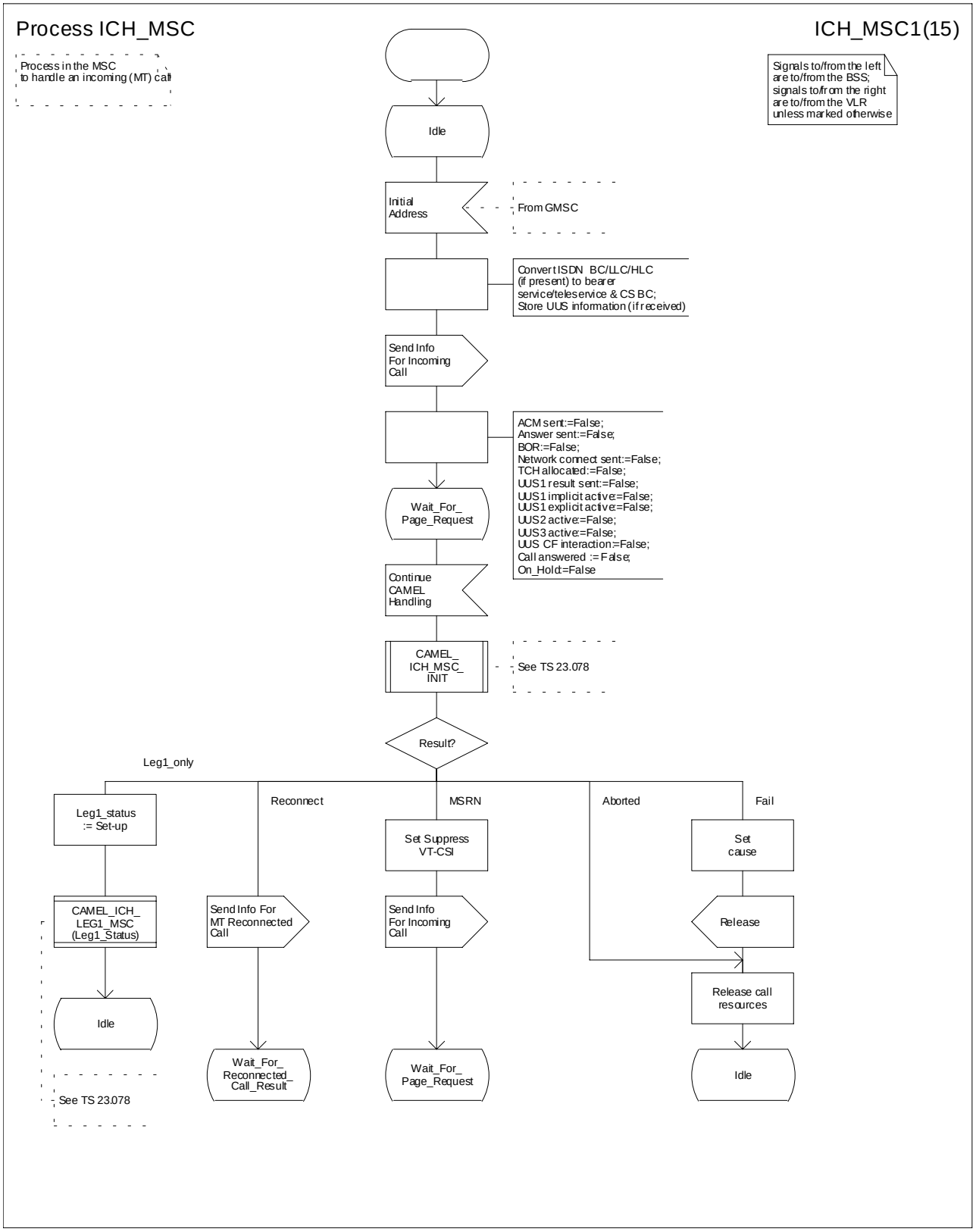
Sheet 8, sheet 11: the procedure UUS_ICH_Check_Forwarding is specific to UUS, it is specified in 3GPP TS 23.087 [20]. If the VMSC does not support UUS, processing continues from the "Yes" exit of the test "Result=Pass?".

Sheet 9, sheet 10: the procedure UUS_MSC_Check_UUS1_UUI is specific to UUS; it is specified in 3GPP TS 23.087 [20].

Sheet 11: 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 3GPP TS 23.087 [20].

Sheet 11: the procedure CD_UUS_Interaction is specific to Call Deflection; it is specified in 3GPP TS 23.072 [11].

****** Modified SDLs in Section 7.3.1 ******


Process ICH_MSC
ICH_MSC1(15)
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
Idle
Initial Address
From GMSC
Convert ISDN BC/LLC/HLC (if present) to bearer service/teleservice & CS BC; Store UUS information (if received)
Send Info For Incoming Call
ACM sent:=False; Answer sent:=False; BOR:=False; Network connect sent:=False; TCH allocated:=False; UUS1 result sent:=False; UUS1 implicit active:=False; UUS1 explicit active:=False; UUS2 active:=False; UUS3 active:=False; UUS CF interaction:=False; Call answered := False; On_Hold:=False
Wait_For_ Page_Request
Continue CAMEL Handling
CAMEL_ ICH_MSC_ INIT
See TS 23.078
Result?
Leg1_only
Reconnect
MSRN
Aborted
Fail
Leg1_status := Set-up
CAMEL_ICH_ LEG1_MSC (Leg1_Status)
Idle
See TS 23.078
Send Info For MT Reconnected Call
Wait_For_ Reconnected_ Call_Result
Set Suppress VT-CSI
Send Info For Incoming Call
Wait_For_ Page_Request
Set cause
Release
Release call resources
Idle

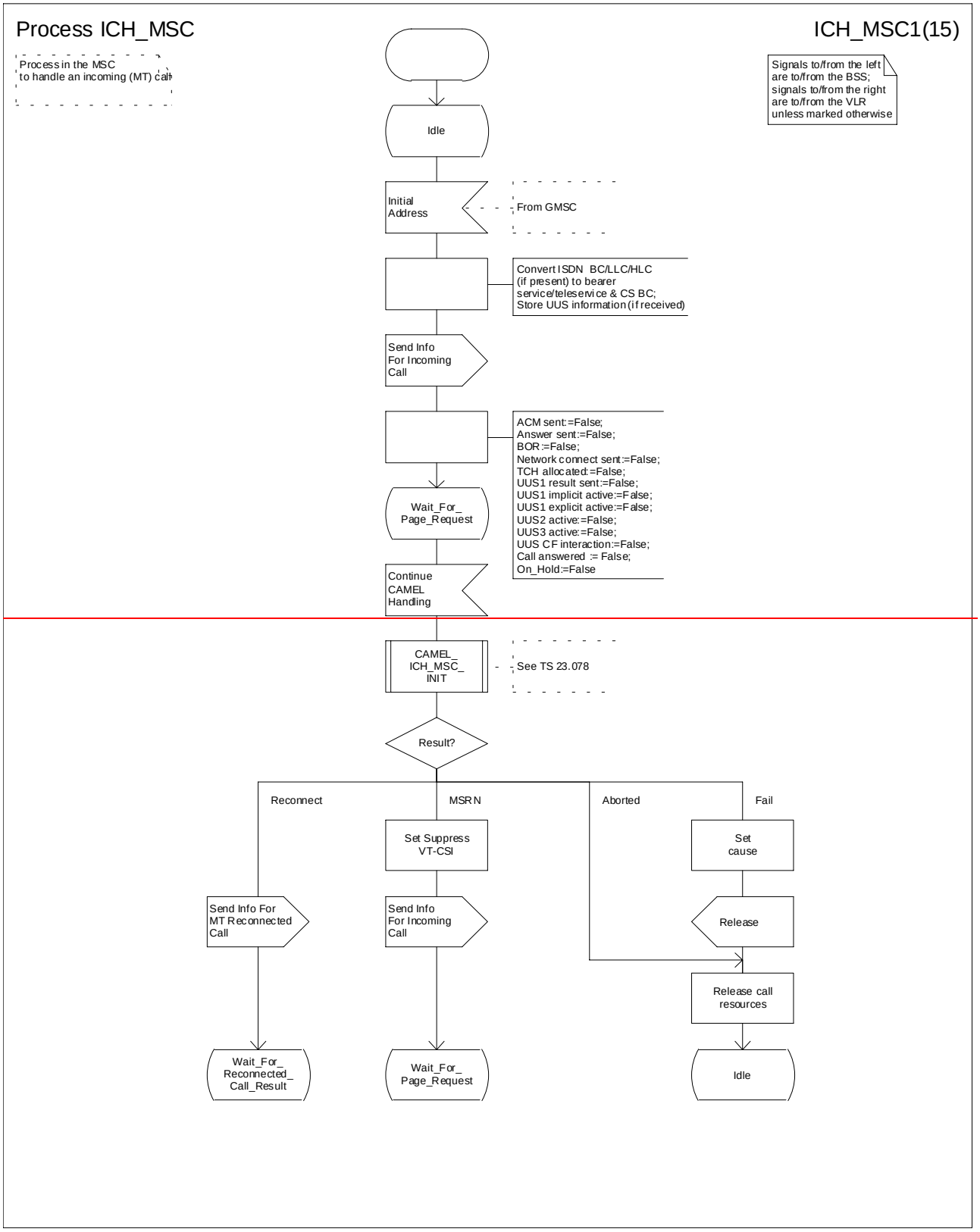


Figure 67a: Process ICH_MSC (sheet 1)

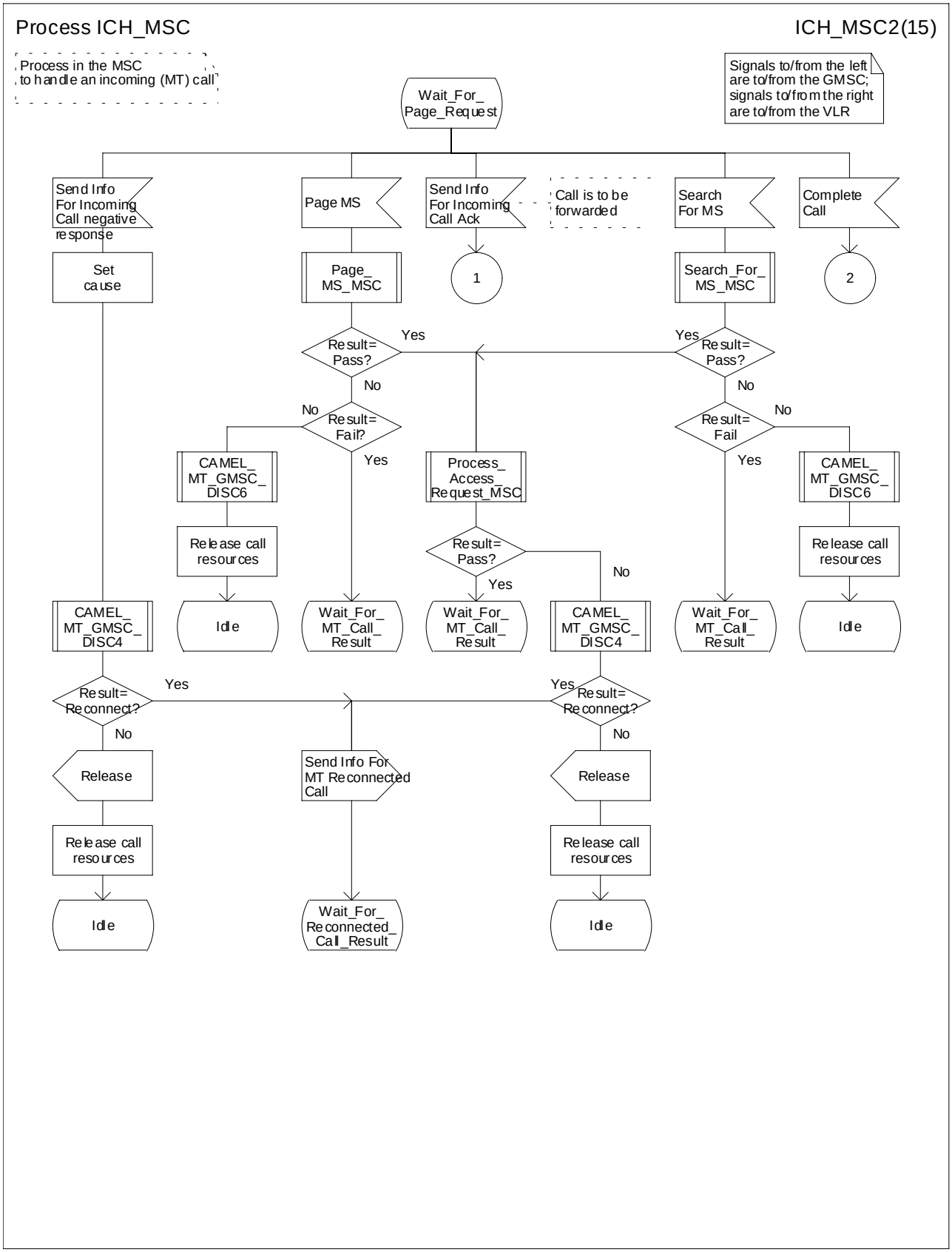
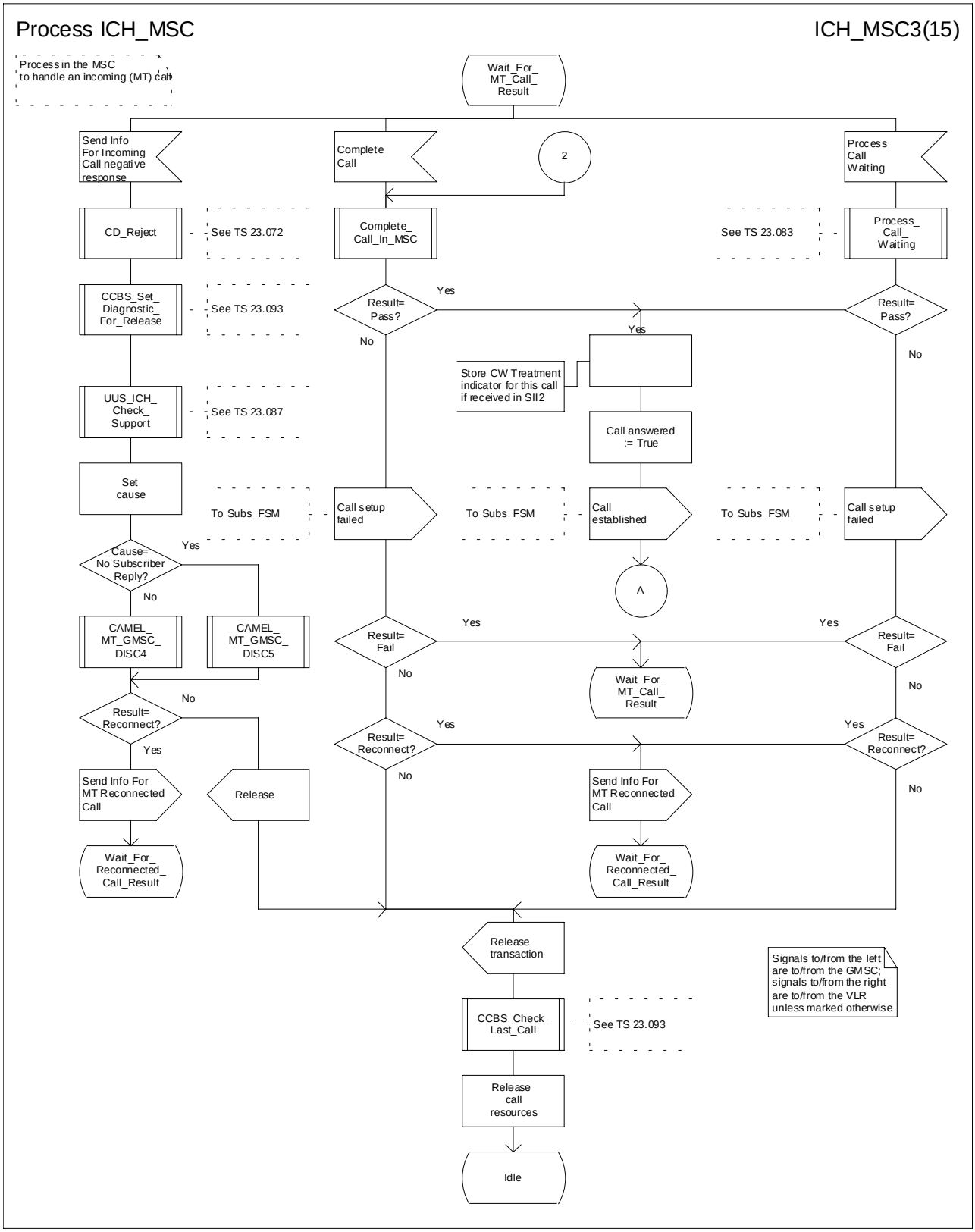


Figure 67b: Process ICH_MSC (sheet 2)


Process ICH_MSC
ICH_MSC3(15)
Process in the MSC to handle an incoming (MT) call
Wait_For_ MT_Call_ Result
Send Info For Incoming Call negative response
Complete Call
2
Process Call Waiting
CD_Reject
See TS 23.072
Complete_ Call_In_MSC
See TS 23.083
Process_ Call_ Waiting
CCBS_Set_ Diagnostic_ For_Release
See TS 23.093
Result= Pass?
Yes
No
Store CW Treatment indicator for this call if received in SII2
UUS_ICH_ Check_ Support
See TS 23.087
Call answered := True
Set cause
To Subs_FSM
Call setup failed
Call established
Cause= No Subscriber Reply?
A
CAMEL_ MT_GMSC_ DISC4
CAMEL_ MT_GMSC_ DISC5
Result= Fail
Wait_For_ MT_Call_ Result
Result= Reconnect?
Send Info For MT Reconnected Call
Release
Wait_For_ Reconnected_ Call_Result
Release transaction
CCBS_Check_ Last_Call
Release call resources
Idle
Signals to/from the left are to/from the GMSC; signals to/from the right are to/from the VLR unless marked otherwise

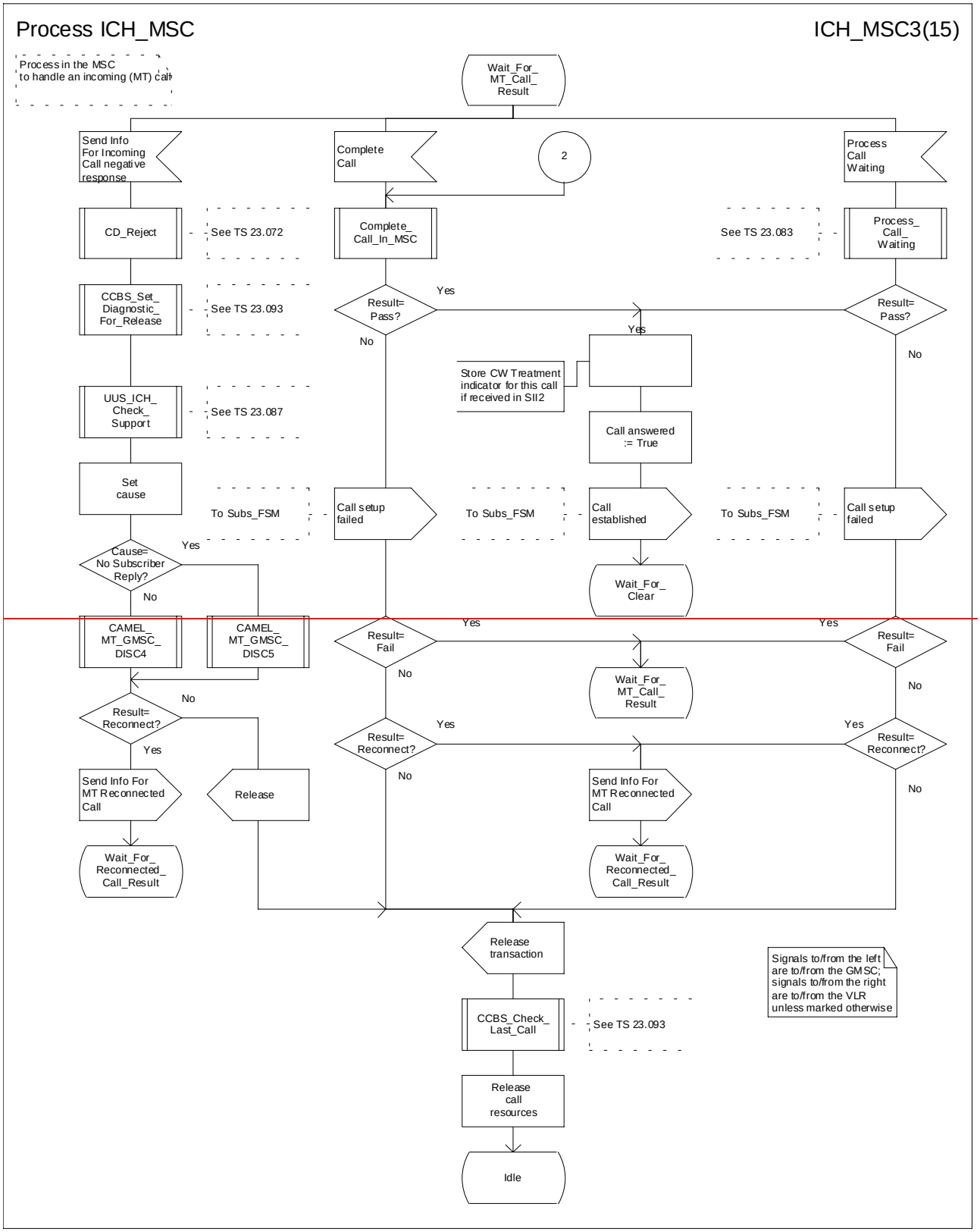


Figure 67c: Process ICH_MSC (sheet 3)

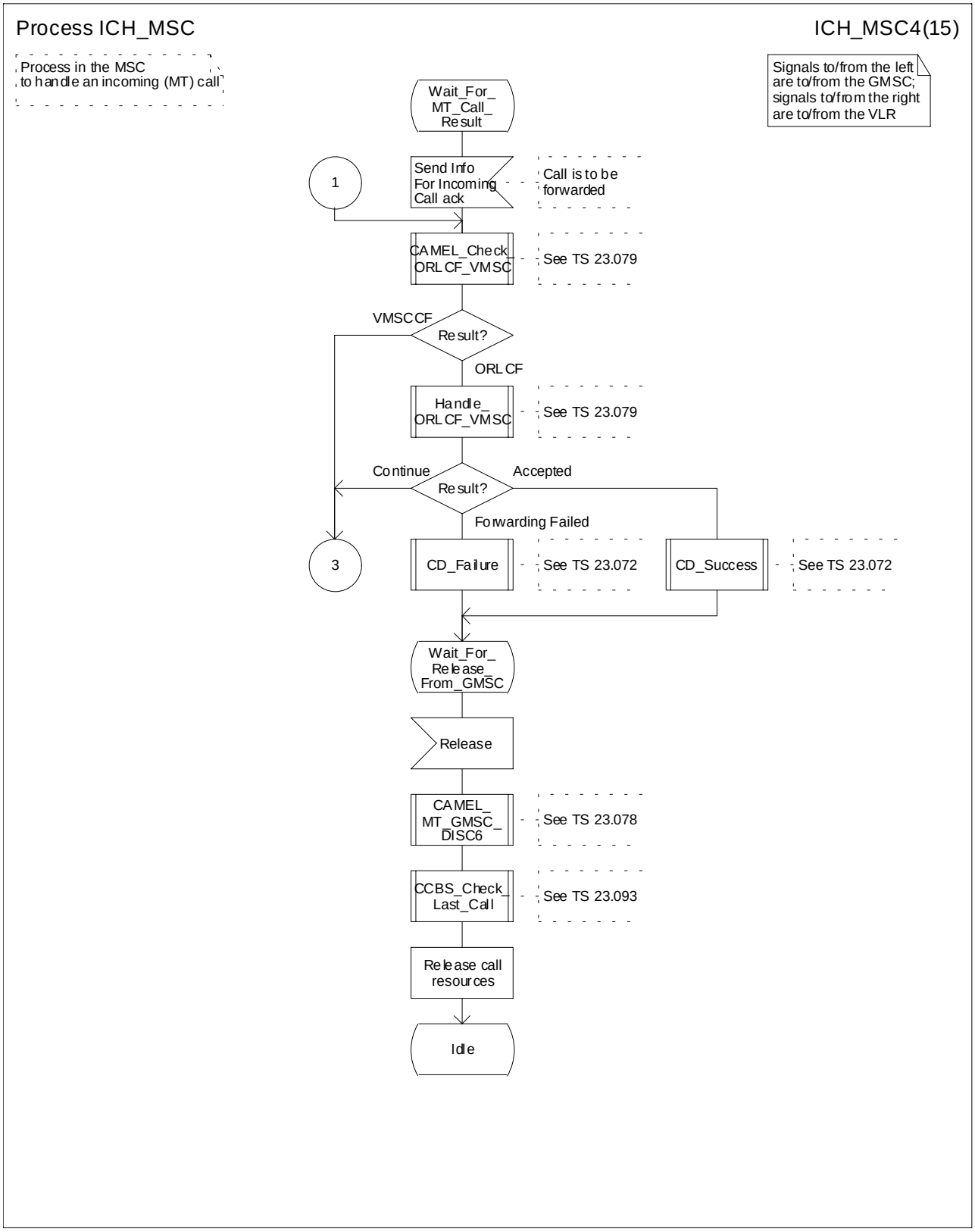
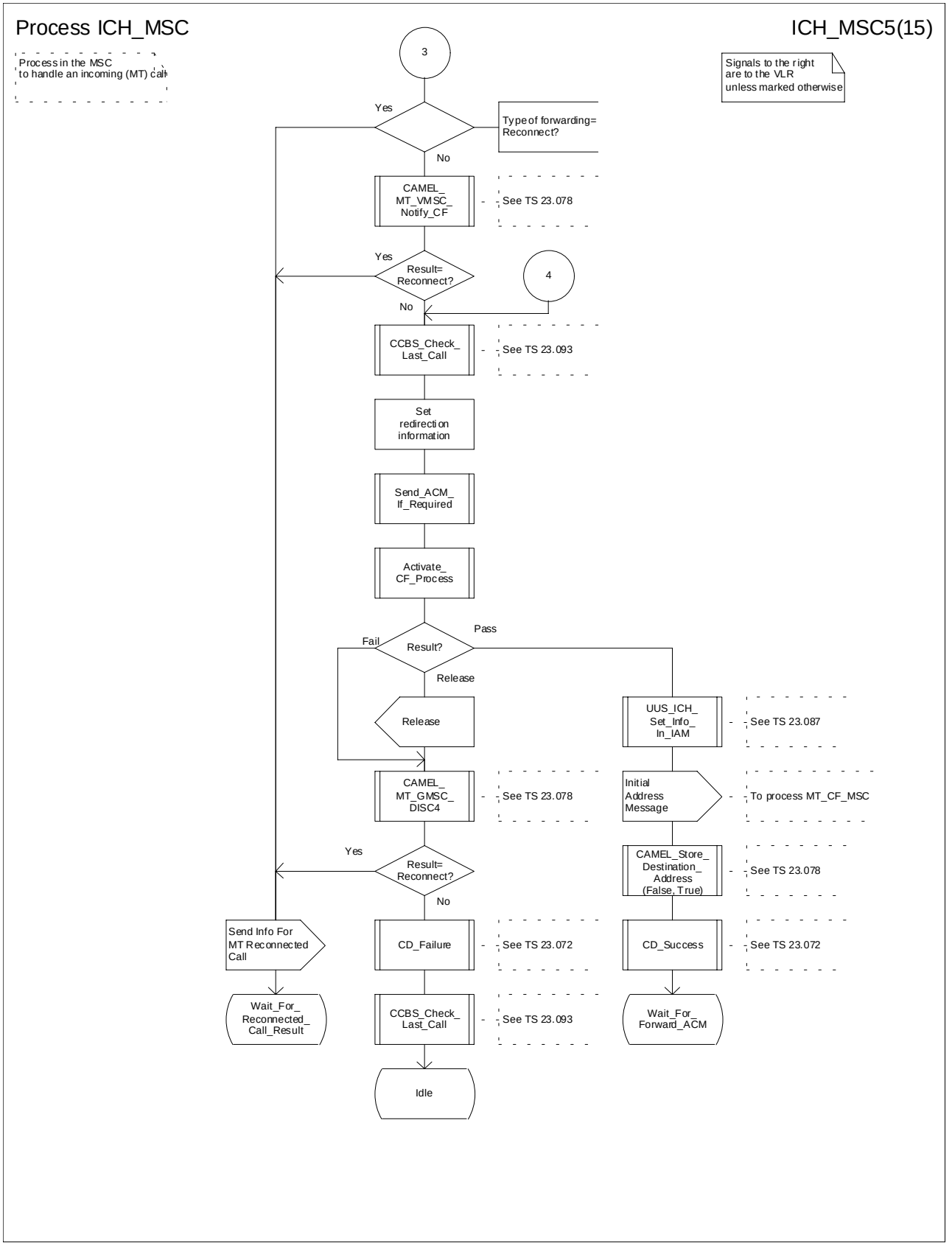


Figure 67d: Process ICH_MSC (sheet 4)


Process ICH_MSC
ICH_MSC5(15)
Process in the MSC to handle an incoming (MT) call
Signals to the right are to the VLR unless marked otherwise
3
Yes
Type of forwarding= Reconnect?
No
CAMEL_ MT_VMSC_ Notify_CF
See TS 23.078
Yes
Result= Reconnect?
4
No
CCBS_Check_ Last_Call
See TS 23.093
Set redirection information
Send_ACM_ If_Required
Activate_ CF_Process
Fail
Result?
Pass
Release
Release
UUS_ICH_ Set_Info_ In_IAM
See TS 23.087
CAMEL_ MT_GMSC_ DISC4
See TS 23.078
Initial Address Message
To process MT_CF_MSC
Yes
Result= Reconnect?
CAMEL_Store_ Destination_ Address (False, True)
See TS 23.078
No
Send Info For MT Reconnected Call
CD_Failure
See TS 23.072
CD_Success
See TS 23.072
Wait_For_ Reconnected_ Call_Result
CCBS_Check_ Last_Call
See TS 23.093
Wait_For_ Forward_ACM
Idle

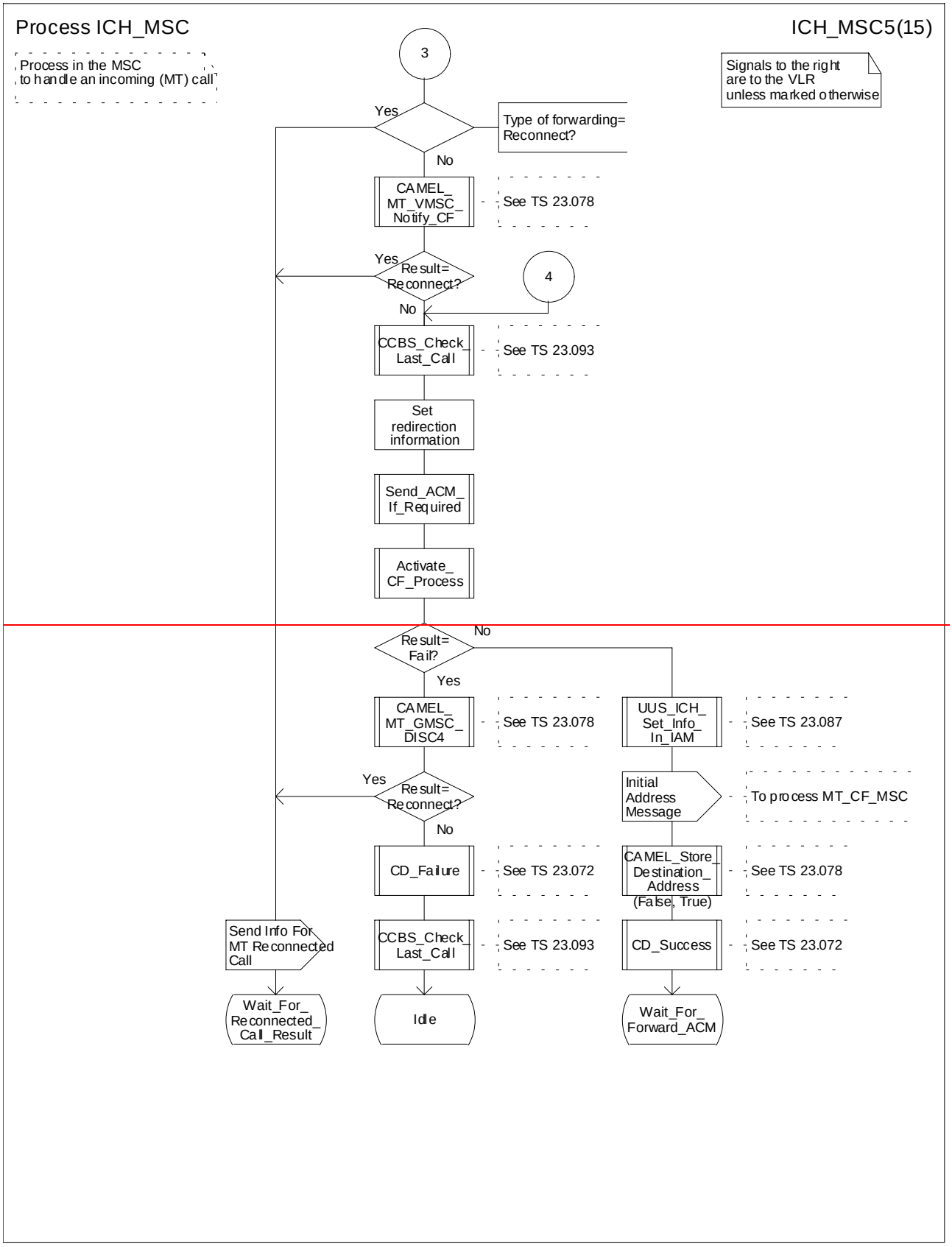


Figure 67e: Process ICH_MSC (sheet 5)

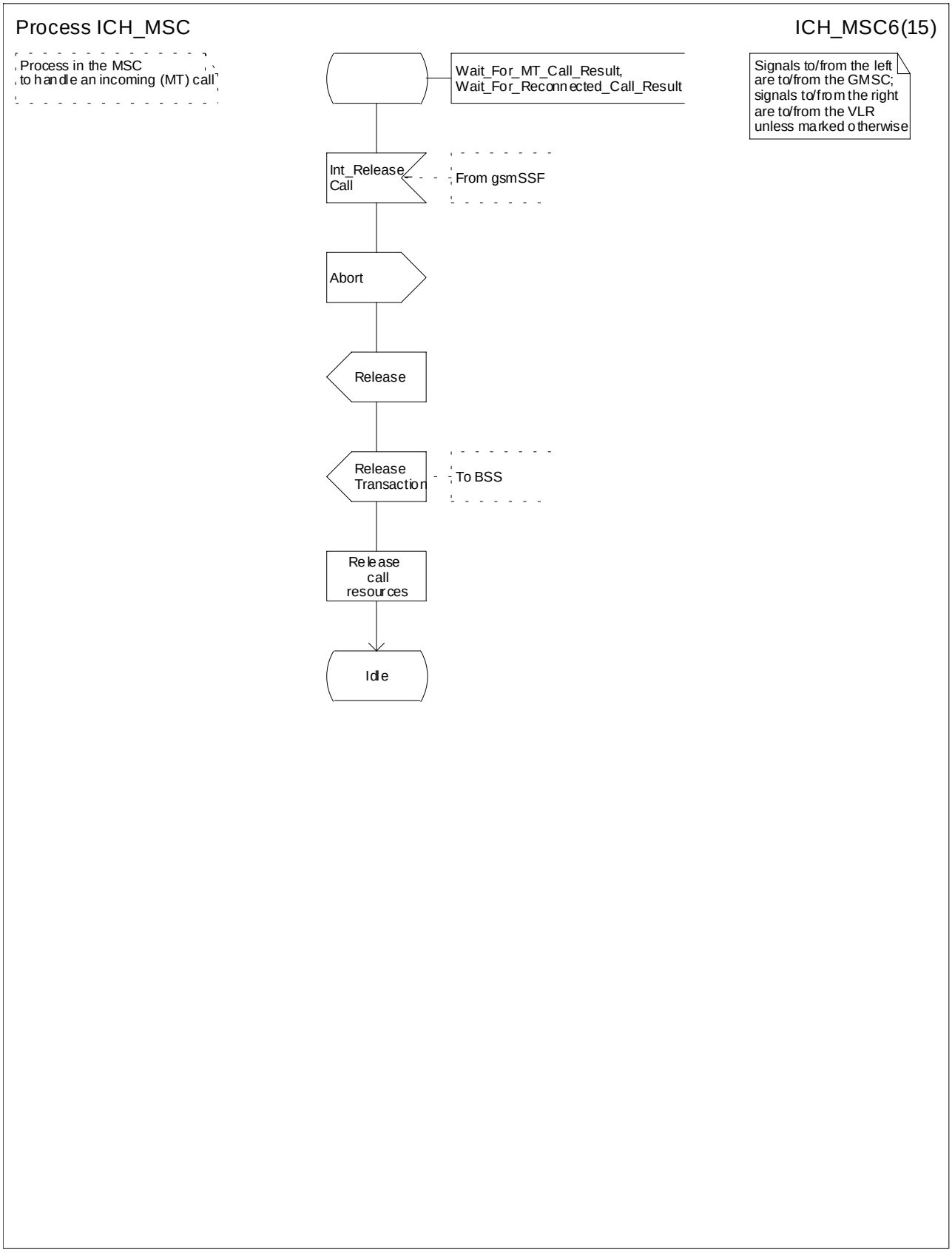
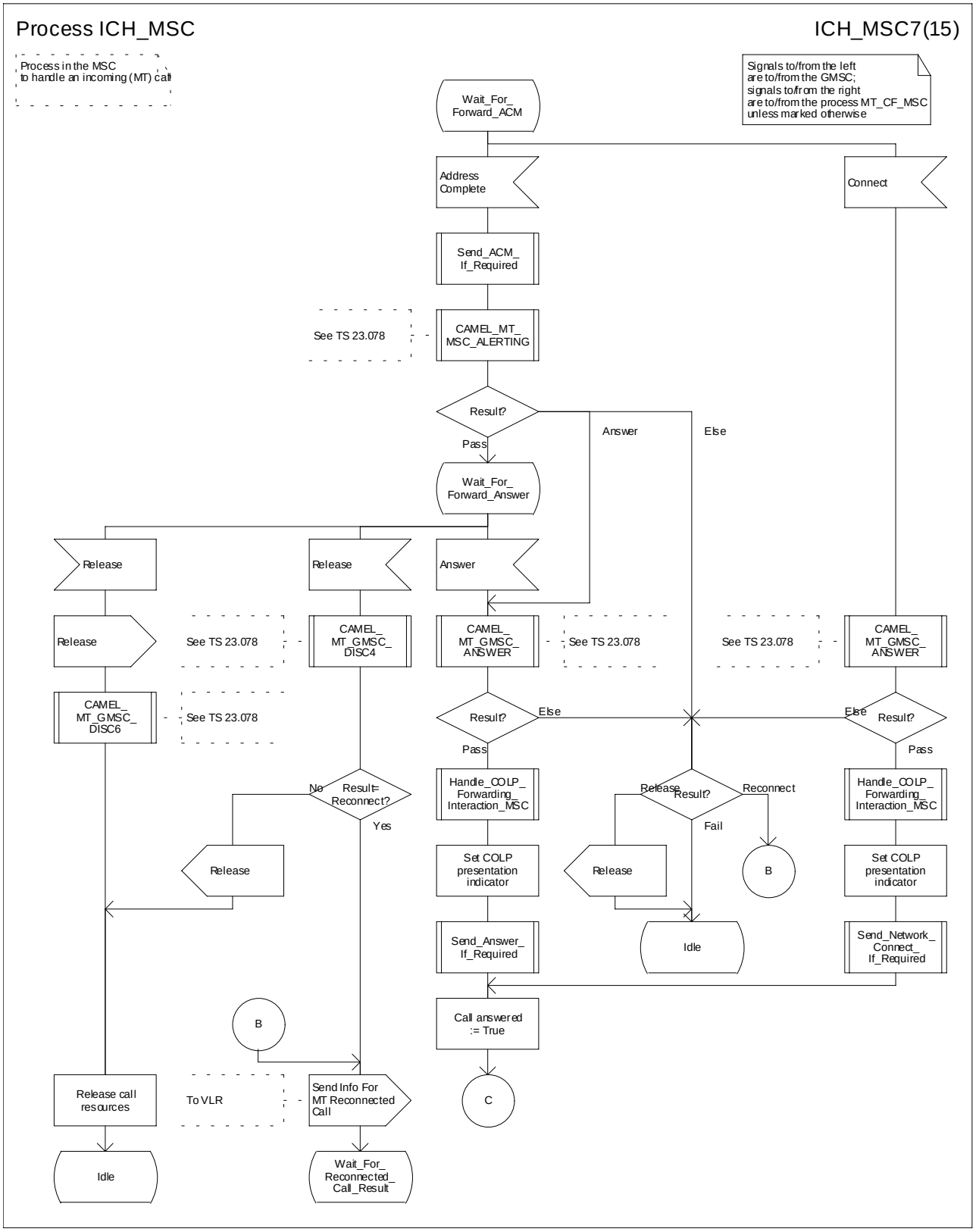


Figure 67f: Process ICH_MSC (sheet 6)


Process ICH_MSC
ICH_MSC7(15)
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
Wait_For_ Forward_ACM
Address Complete
Connect
Send_ACM_ If_Required
See TS 23.078
CAMEL_MT_ MSC_ALERTING
Result?
Answer
Else
Pass
Wait_For_ Forward_Answer
Release
Release
Answer
Release
See TS 23.078
CAMEL_ MT_GMSC_ DISC4
CAMEL_ MT_GMSC_ ANSWER
See TS 23.078
See TS 23.078
CAMEL_ MT_GMSC_ ANSWER
CAMEL_ MT_GMSC_ DISC6
See TS 23.078
Result?
Else
Else
Result?
Pass
Pass
No
Result= Reconnect?
Handle_COLP_ Forwarding_ Interaction_MSC
Release
Result?
Reconnect
Handle_COLP_ Forwarding_ Interaction_MSC
Yes
Fail
Release
Set COLP presentation indicator
Release
B
Set COLP presentation indicator
Send_Answer_ If_Required
Idle
Send_Network_ Connect_ If_Required
B
Call answered := True
Release call resources
To VLR
Send Info For MT Reconnected Call
C
Idle
Wait_For_ Reconnected_ Call_Result

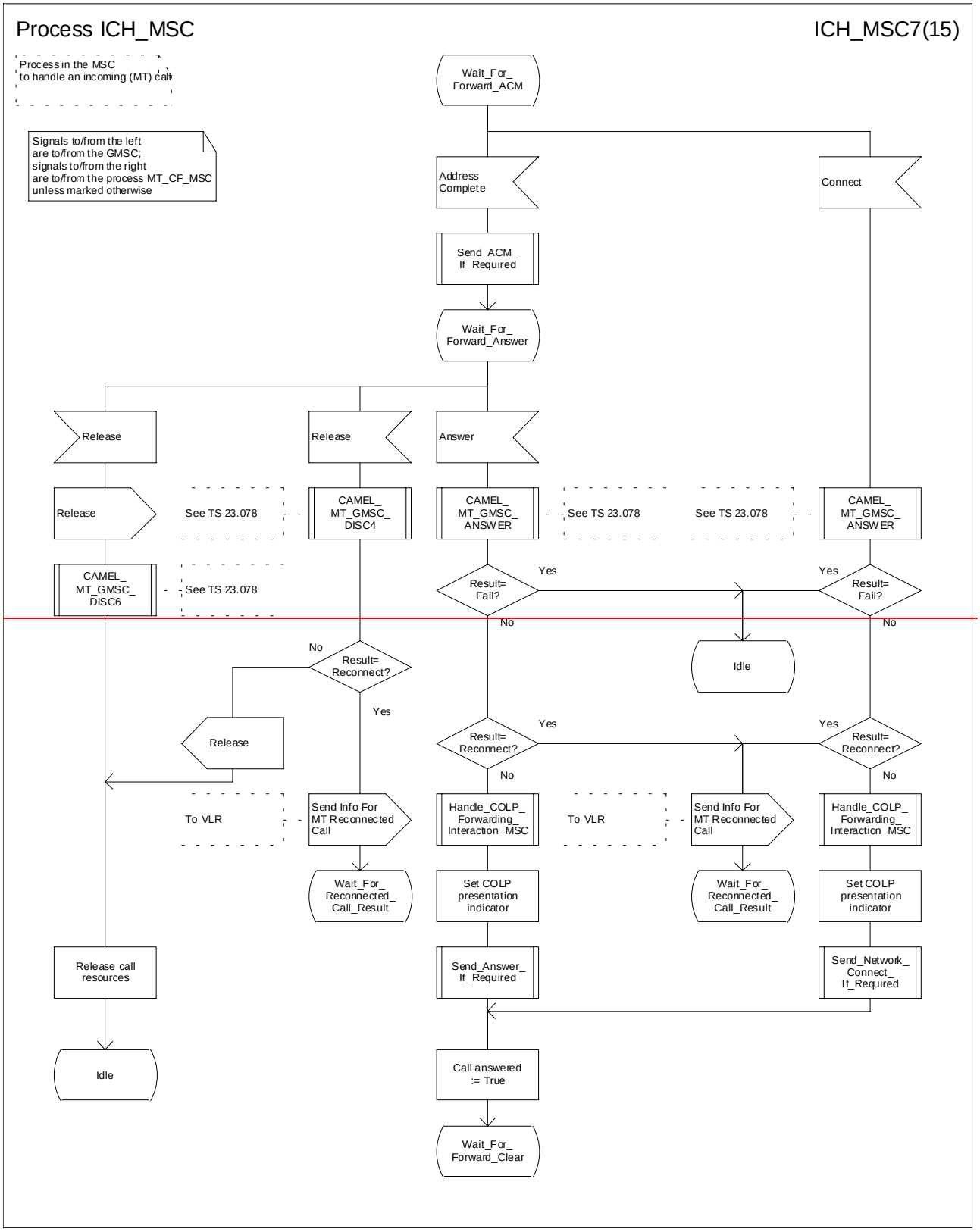


Figure 67g: Process ICH_MSC (sheet 7)

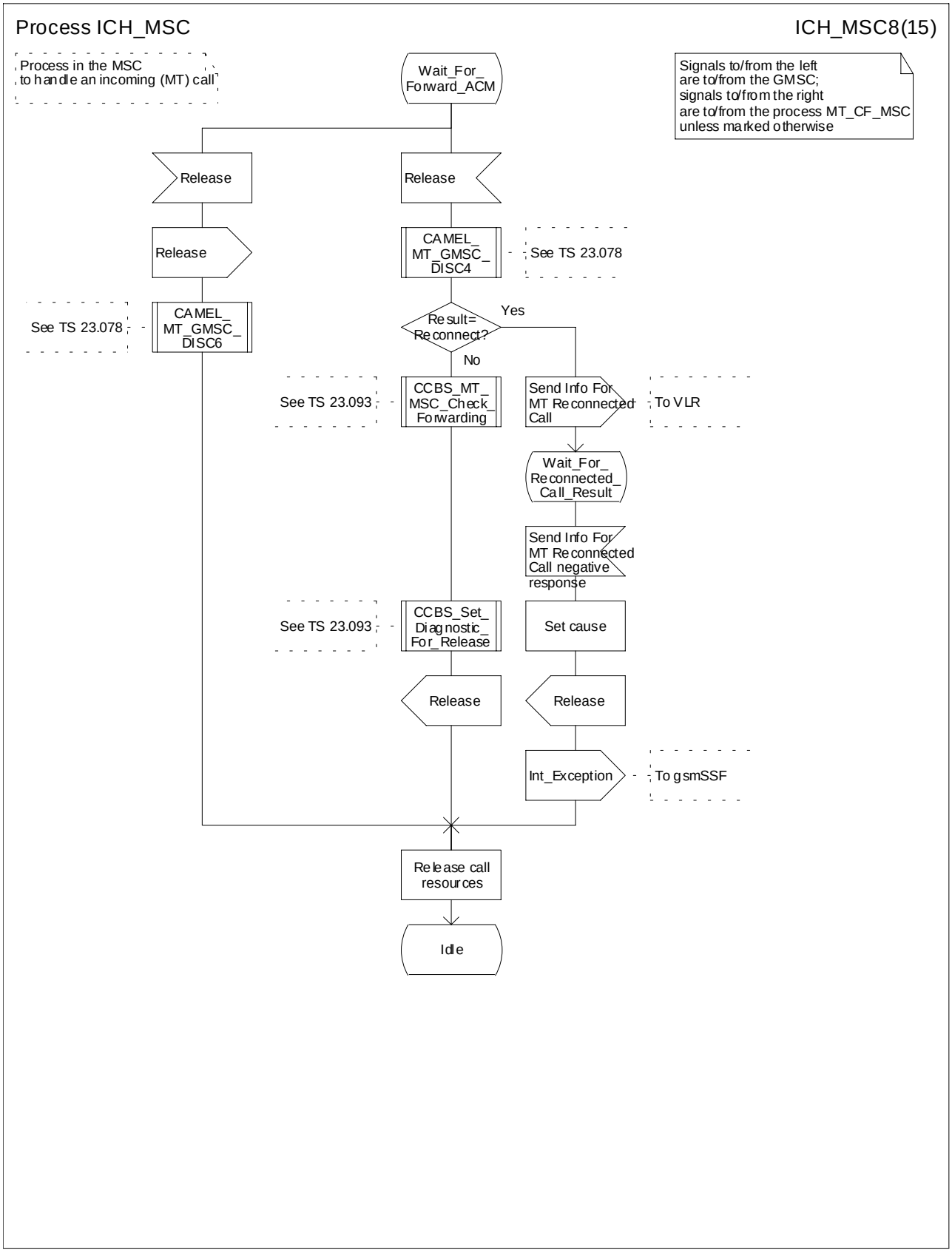


Figure 67h: Process ICH_MSC (sheet 8)

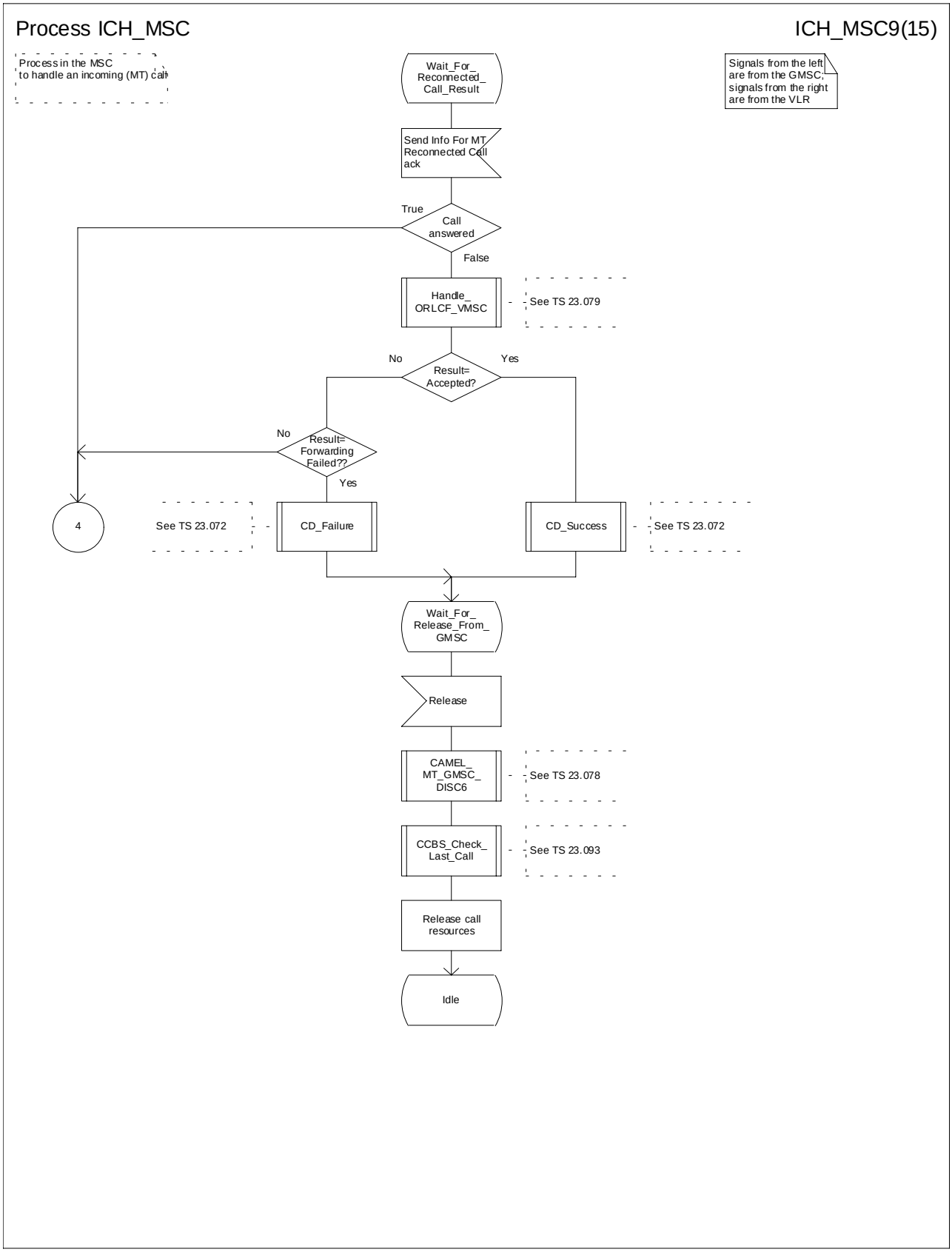


Figure 67i: Process ICH_MSC (sheet 9)

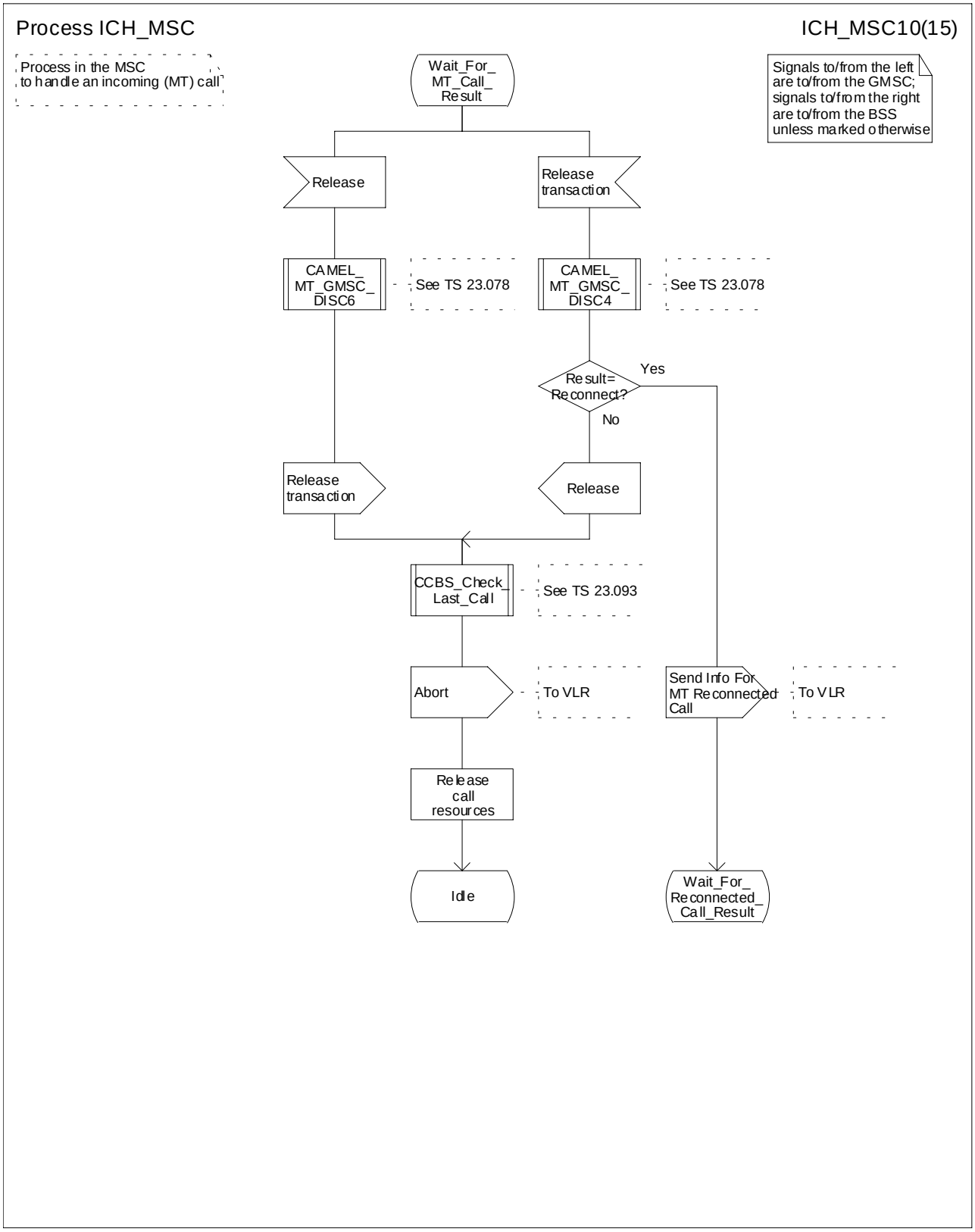


Figure 67j: Process ICH_MSC (sheet 10)

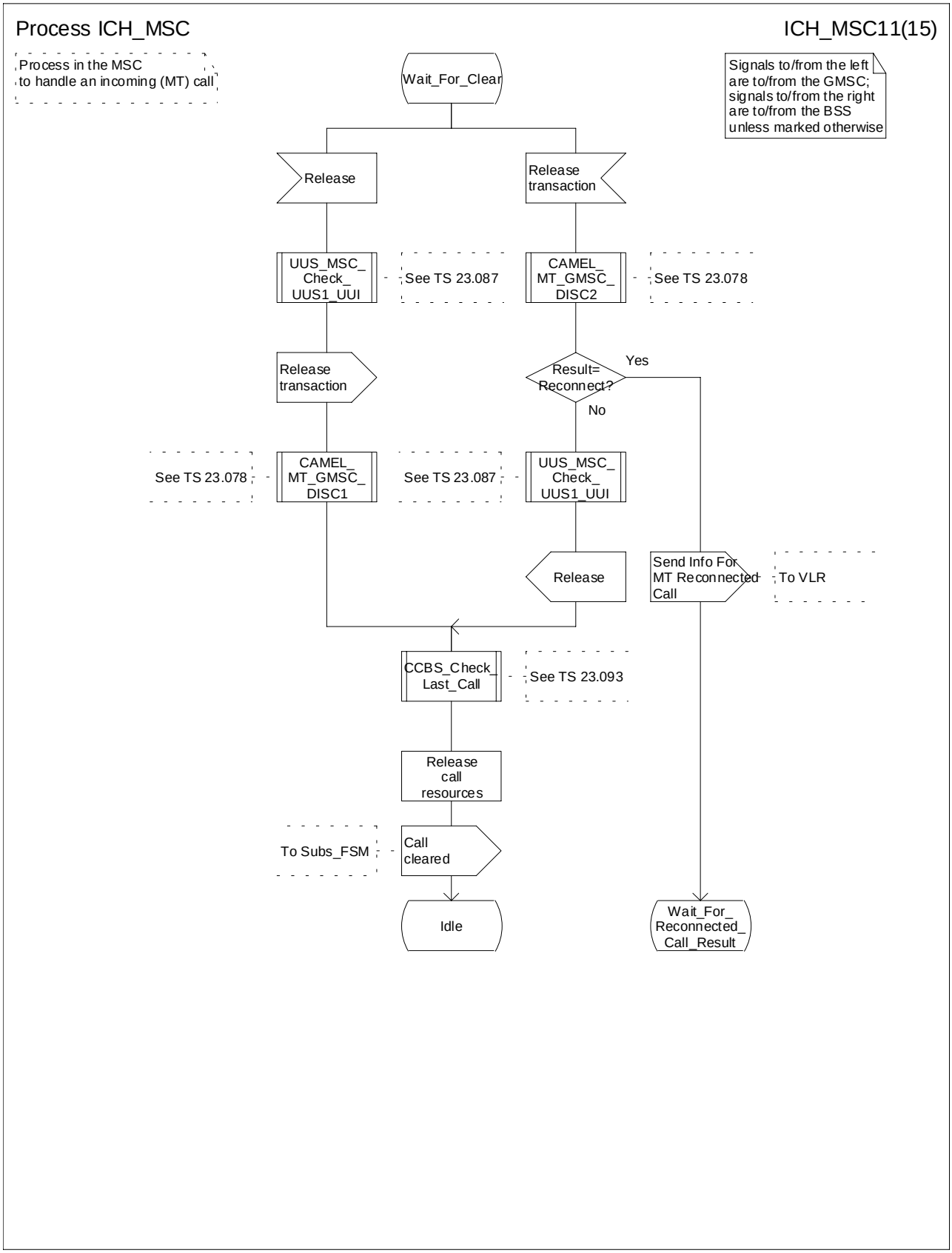


Figure 67k: Process ICH_MSC (sheet 11)

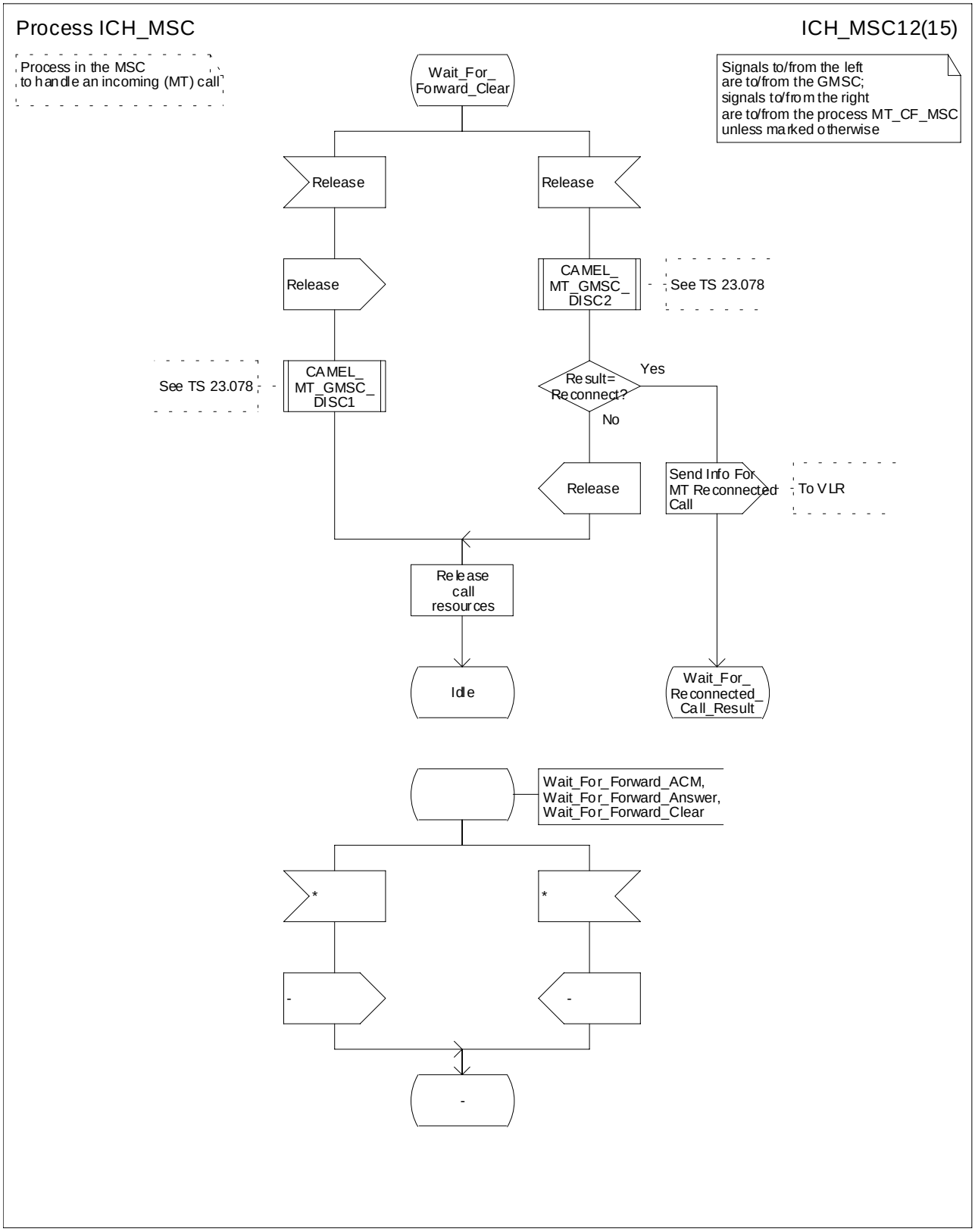


Figure 67l: Process ICH_MSC (sheet 12)

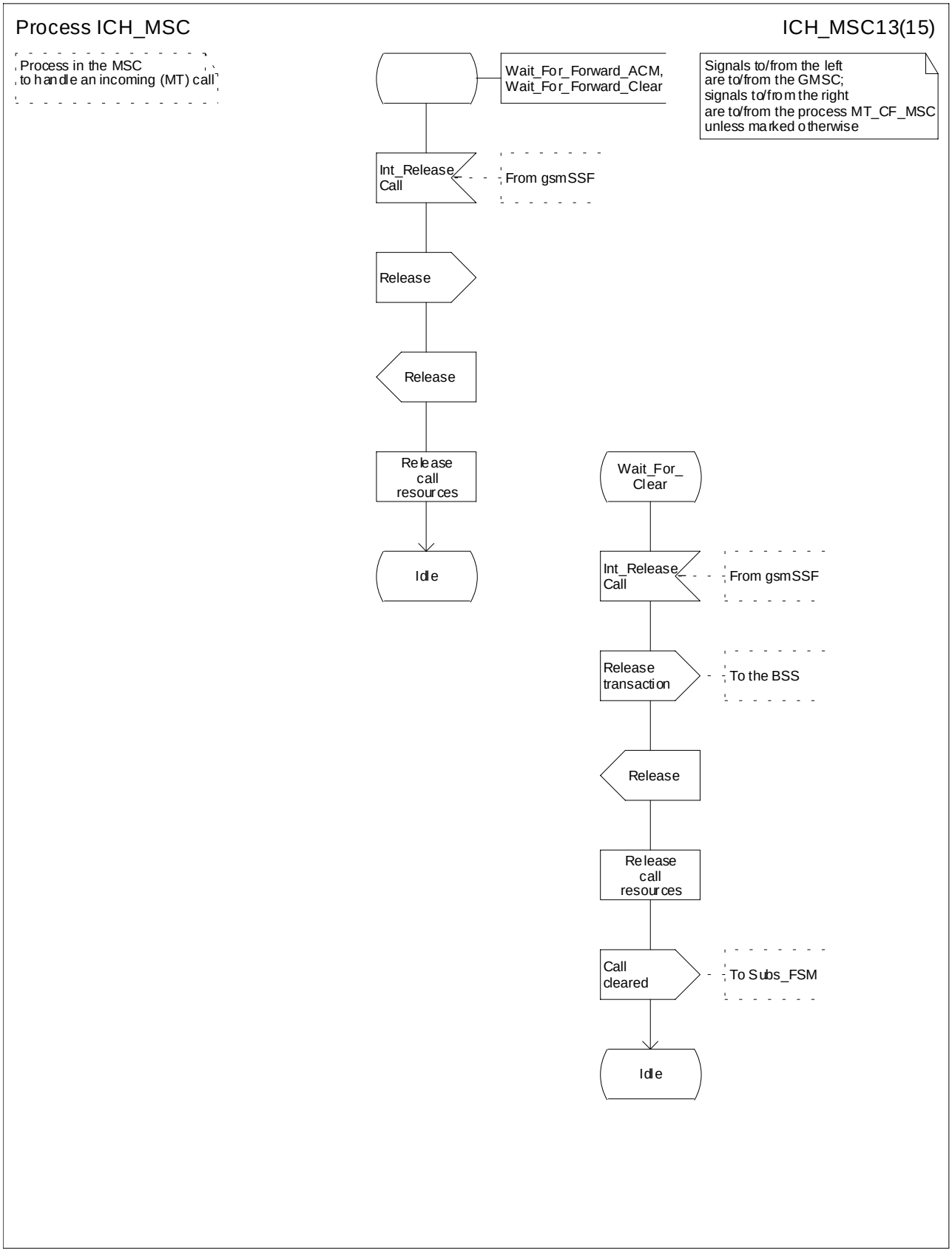


Figure 67m: Process ICH_MSC (sheet 13)

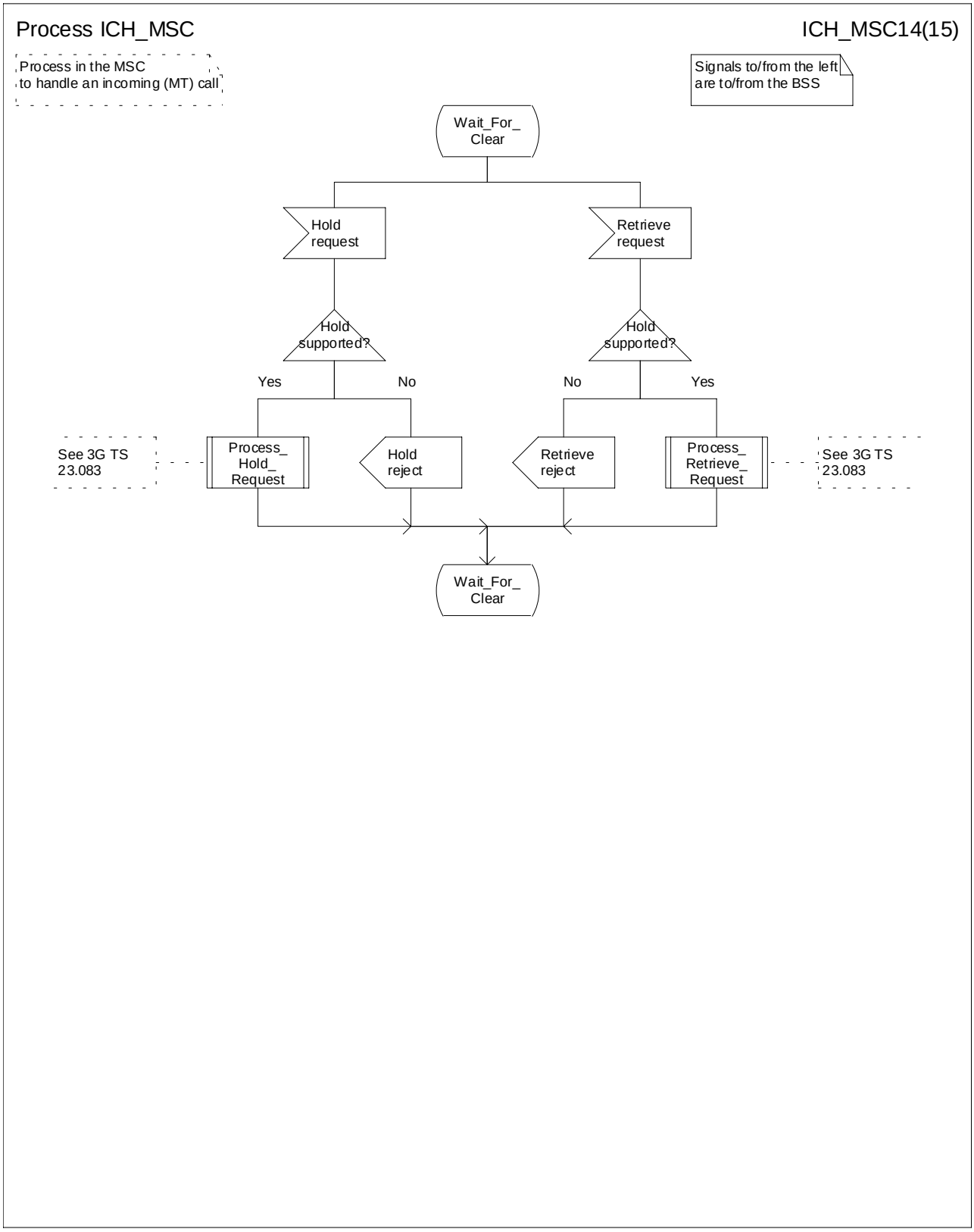
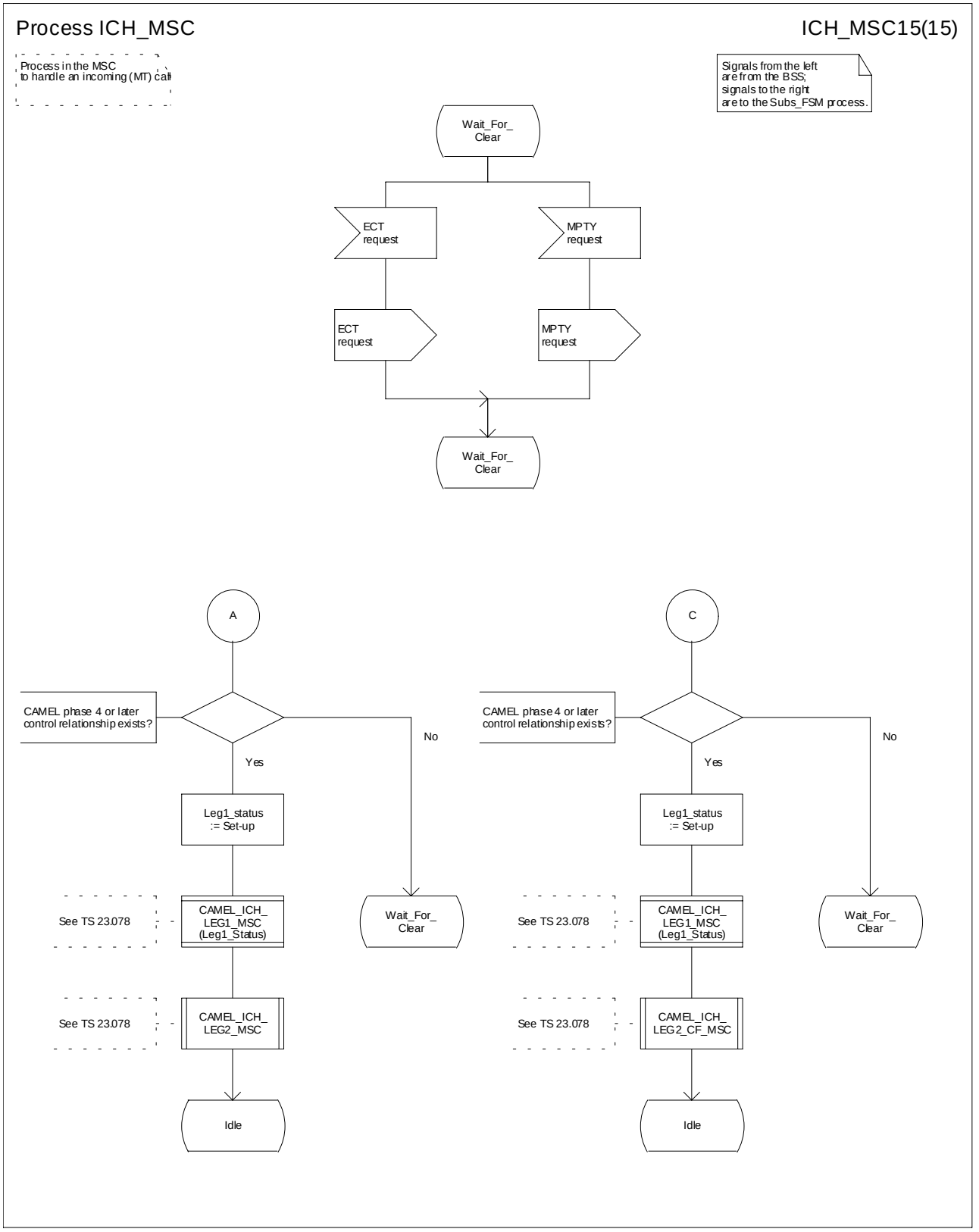


Figure 67n: Process ICH_MSC (sheet 14)


Process ICH_MSC
ICH_MSC15(15)
Process in the MSC to handle an incoming (MT) call
Signals from the left are from the BSS; signals to the right are to the Subs_FSM process.
Wait_For_ Clear
ECT request
MPTY request
ECT request
MPTY request
Wait_For_ Clear
A
CAMEL phase 4 or later control relationship exists?
No
Yes
Leg1_status := Set-up
See TS 23.078
CAMEL_ICH_ LEG1_MSC (Leg1_Status)
Wait_For_ Clear
See TS 23.078
CAMEL_ICH_ LEG2_MSC
Idle
C
CAMEL phase 4 or later control relationship exists?
No
Yes
Leg1_status := Set-up
See TS 23.078
CAMEL_ICH_ LEG1_MSC (Leg1_Status)
Wait_For_ Clear
See TS 23.078
CAMEL_ICH_ LEG2_CF_MSC
Idle

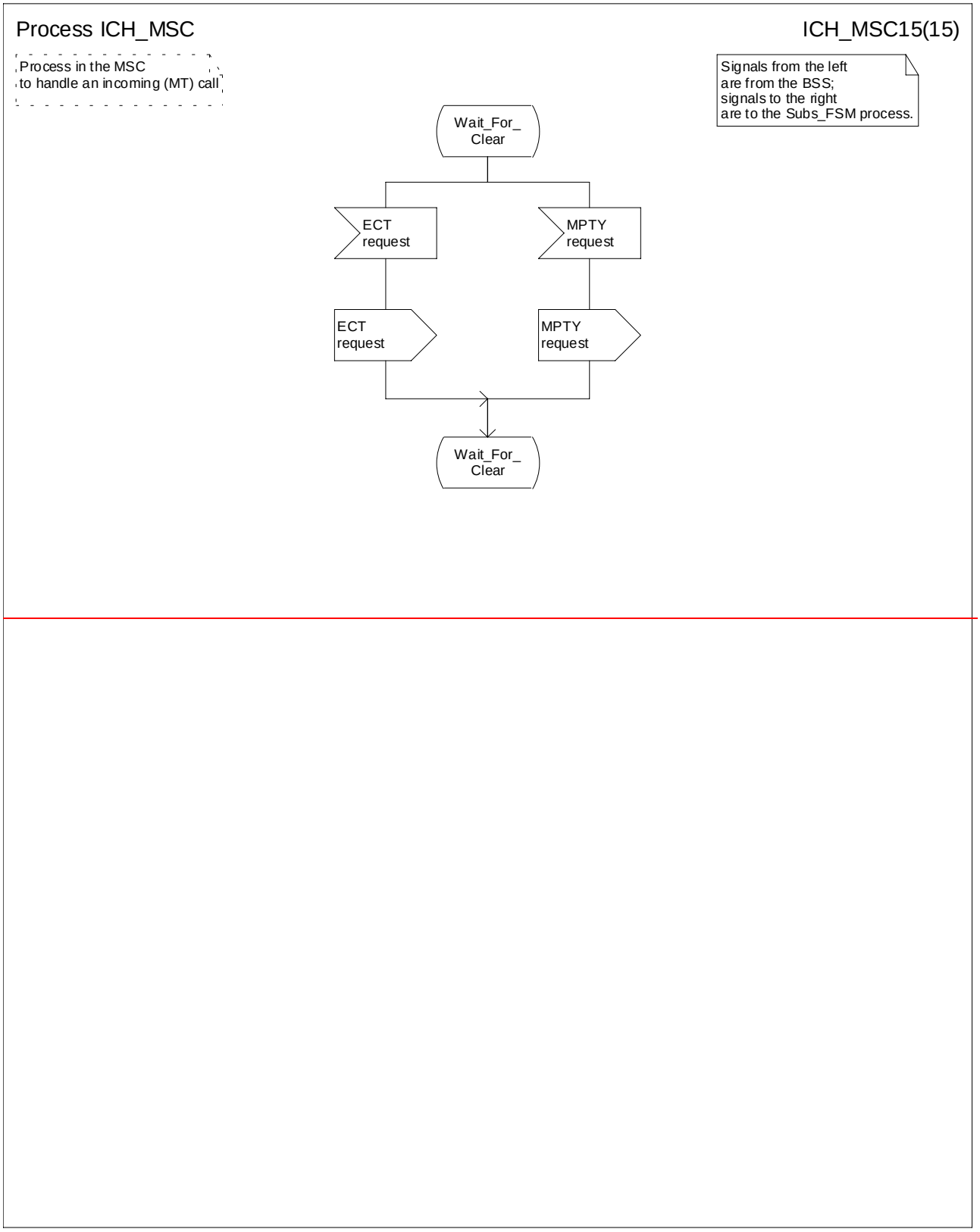


Figure 67o: Process ICH_MSC (sheet 15)

…

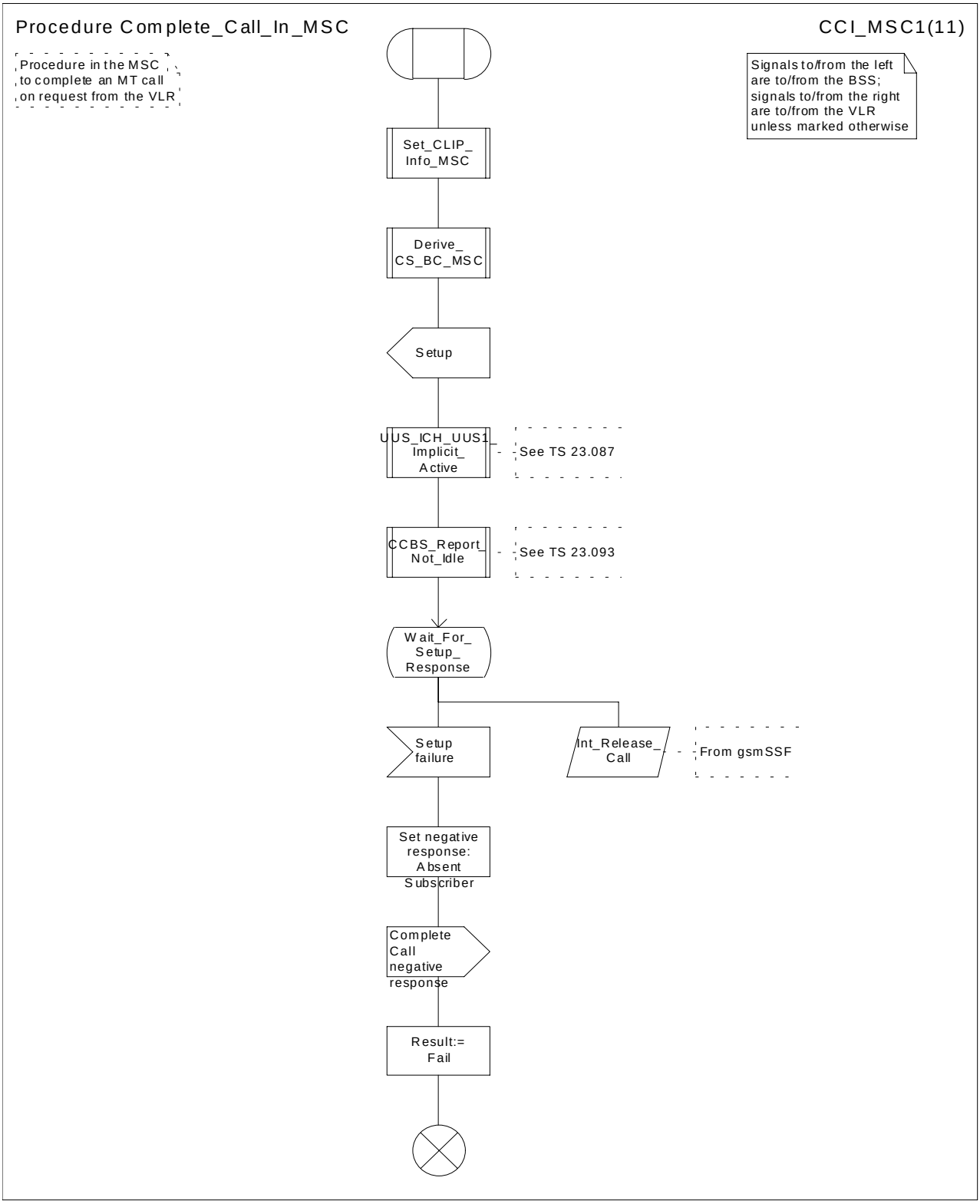


Figure 70a: Procedure Complete_Call_In_MSC (sheet 1)

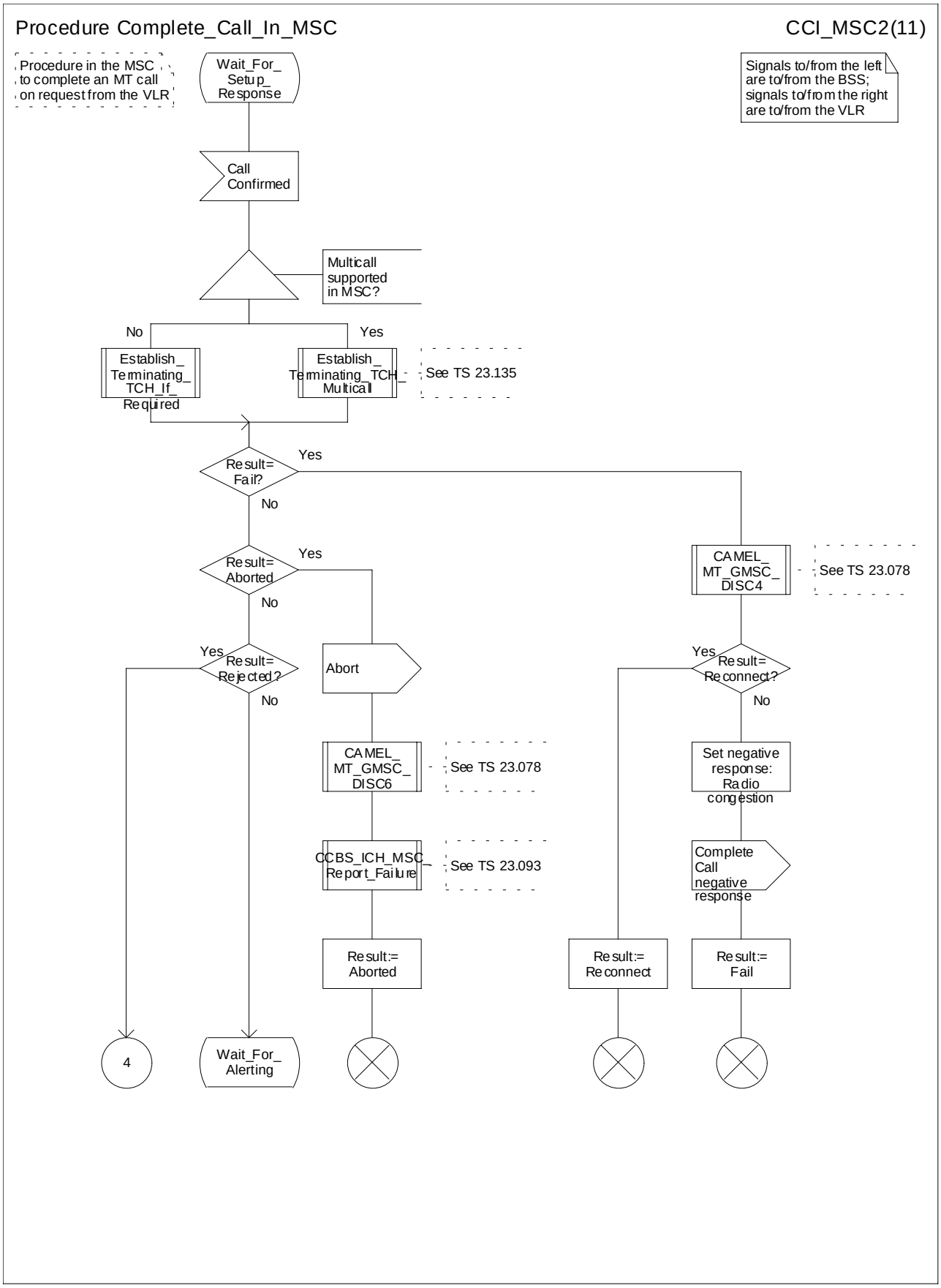
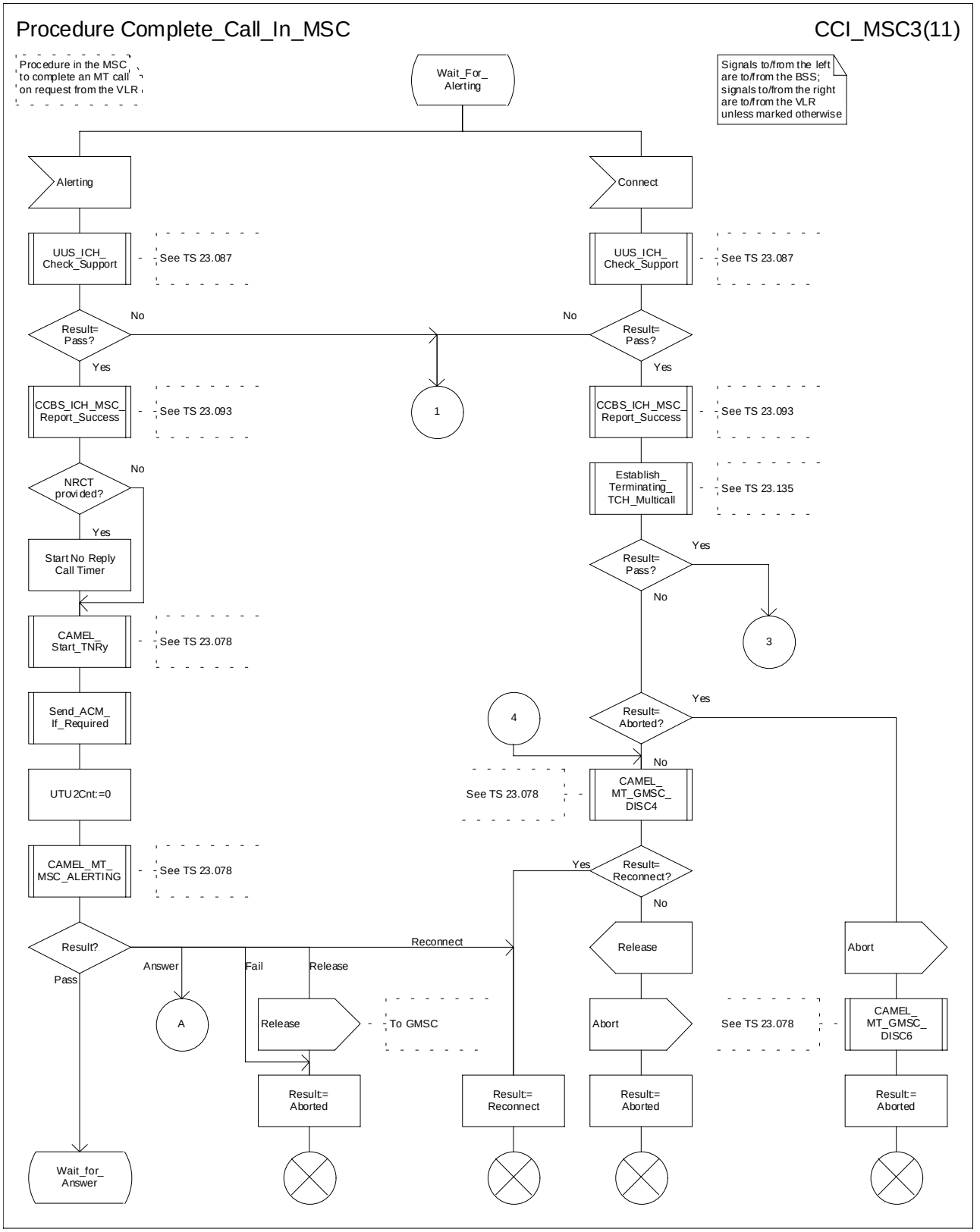


Figure 70b: Procedure Complete_Call_In_MSC (sheet 2)


Procedure Complete_Call_In_MSC
CCI_MSC3(11)
Procedure in the MSC to complete an MT call on request from the VLR
Wait_For_ Alerting
Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise
Alerting
Connect
UUS_ICH_ Check_Support
See TS 23.087
UUS_ICH_ Check_Support
See TS 23.087
Result= Pass?
No
Yes
Result= Pass?
No
Yes
CCBS_ICH_MSC_ Report_Success
See TS 23.093
1
CCBS_ICH_MSC_ Report_Success
See TS 23.093
NRCT provided?
No
Yes
Establish_ Terminating_ TCH_Multicall
See TS 23.135
Start No Reply Call Timer
Result= Pass?
Yes
No
3
CAMEL_ Start_TNRy
See TS 23.078
Send_ACM_ If_Required
4
Result= Aborted?
Yes
No
UTU2Cnt:=0
See TS 23.078
CAMEL_ MT_GMSC_ DISC4
CAMEL_MT_ MSC_ALERTING
See TS 23.078
Result= Reconnect?
Yes
No
Result?
Reconnect
Release
Abort
Pass
Answer
Fail
Release
A
Release
To GMSC
Abort
See TS 23.078
CAMEL_ MT_GMSC_ DISC6
Result:= Aborted
Result:= Reconnect
Result:= Aborted
Result:= Aborted
Wait_for_ Answer

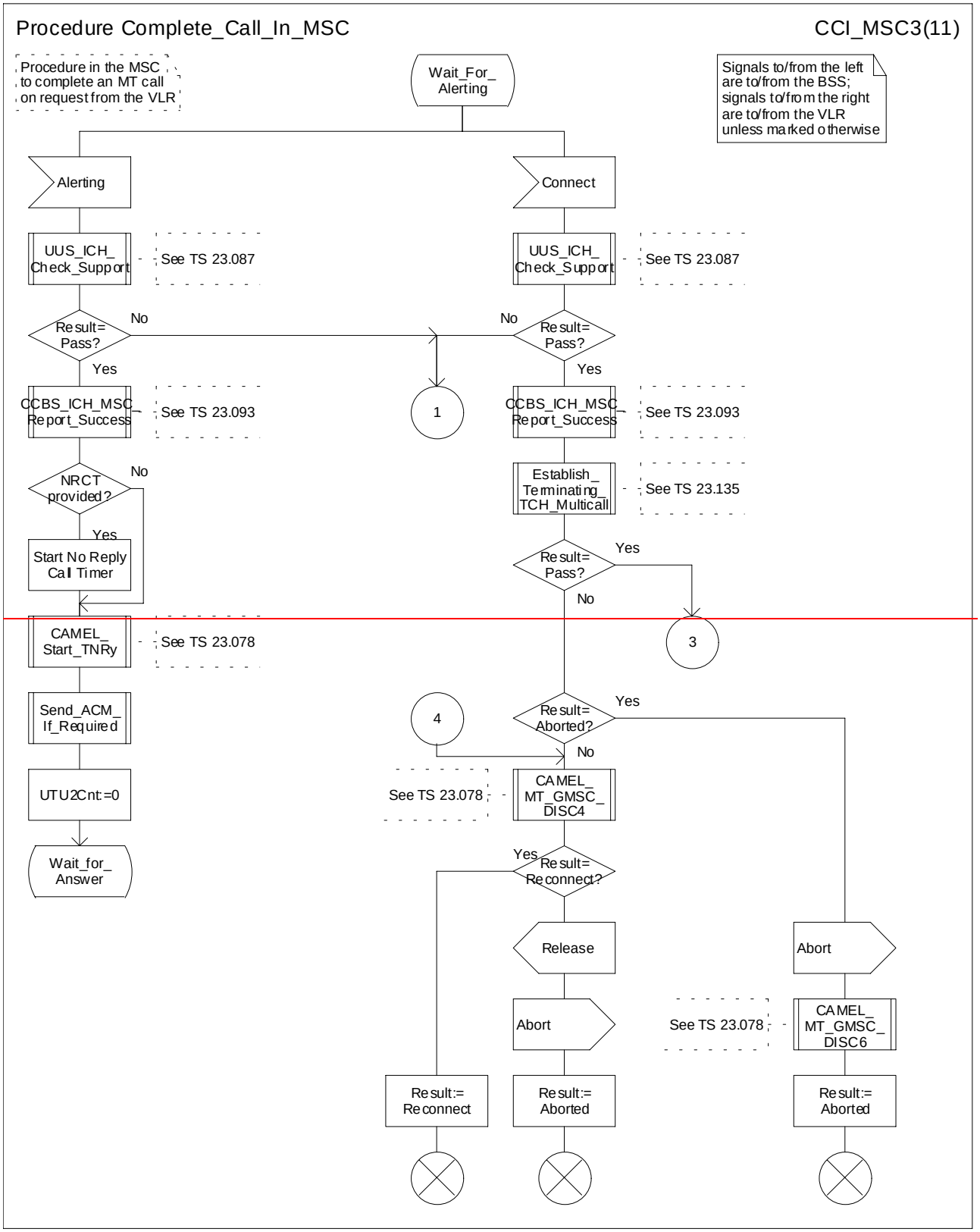
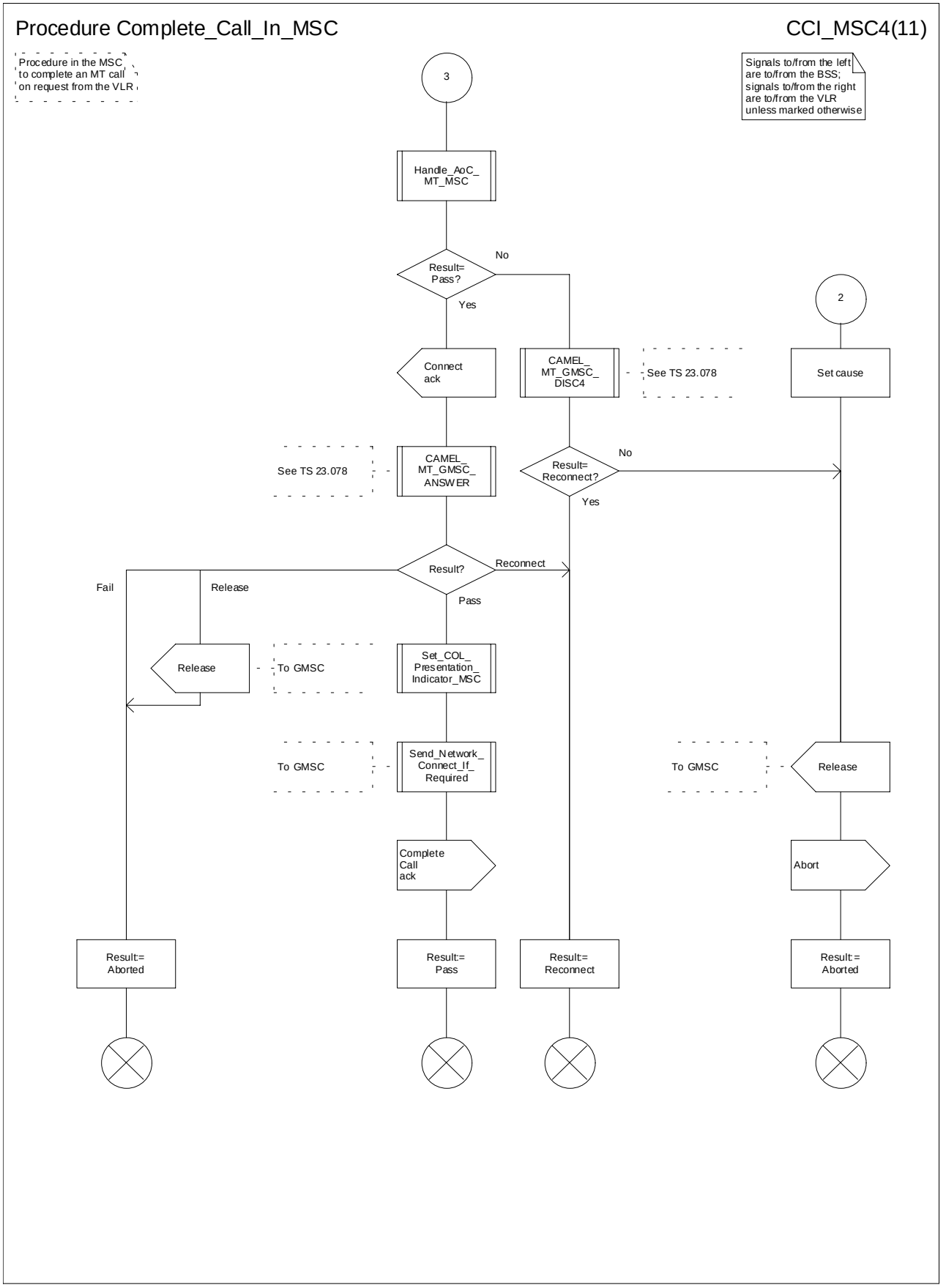


Figure 70c: Procedure Complete_Call_In_MSC (sheet 3)


Procedure Complete_Call_In_MSC
CCI_MSC4(11)
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
3
Handle_AoC_ MT_MSC
Result= Pass?
No
Yes
2
Connect ack
CAMEL_ MT_GMSC_ DISC4
See TS 23.078
Set cause
See TS 23.078
CAMEL_ MT_GMSC_ ANSWER
Result= Reconnect?
No
Yes
Result?
Reconnect
Fail
Release
Pass
Release
To GMSC
Set_COL_ Presentation_ Indicator_MSC
To GMSC
Send_Network_ Connect_If_ Required
To GMSC
Release
Complete Call ack
Abort
Result= Aborted
Result= Pass
Result= Reconnect
Result= Aborted

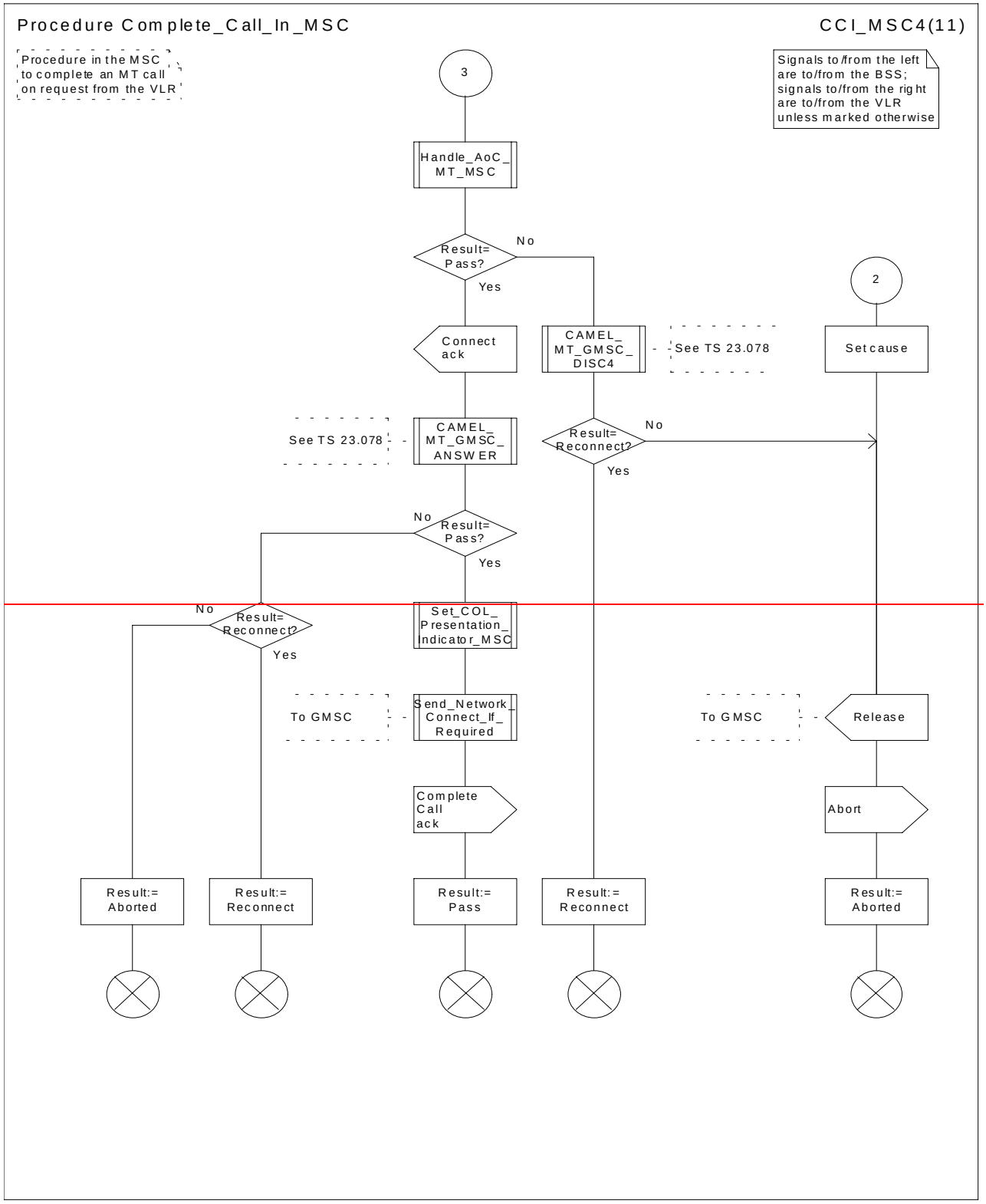


Figure 70d: Procedure Complete_Call_In_MSC (sheet 4)

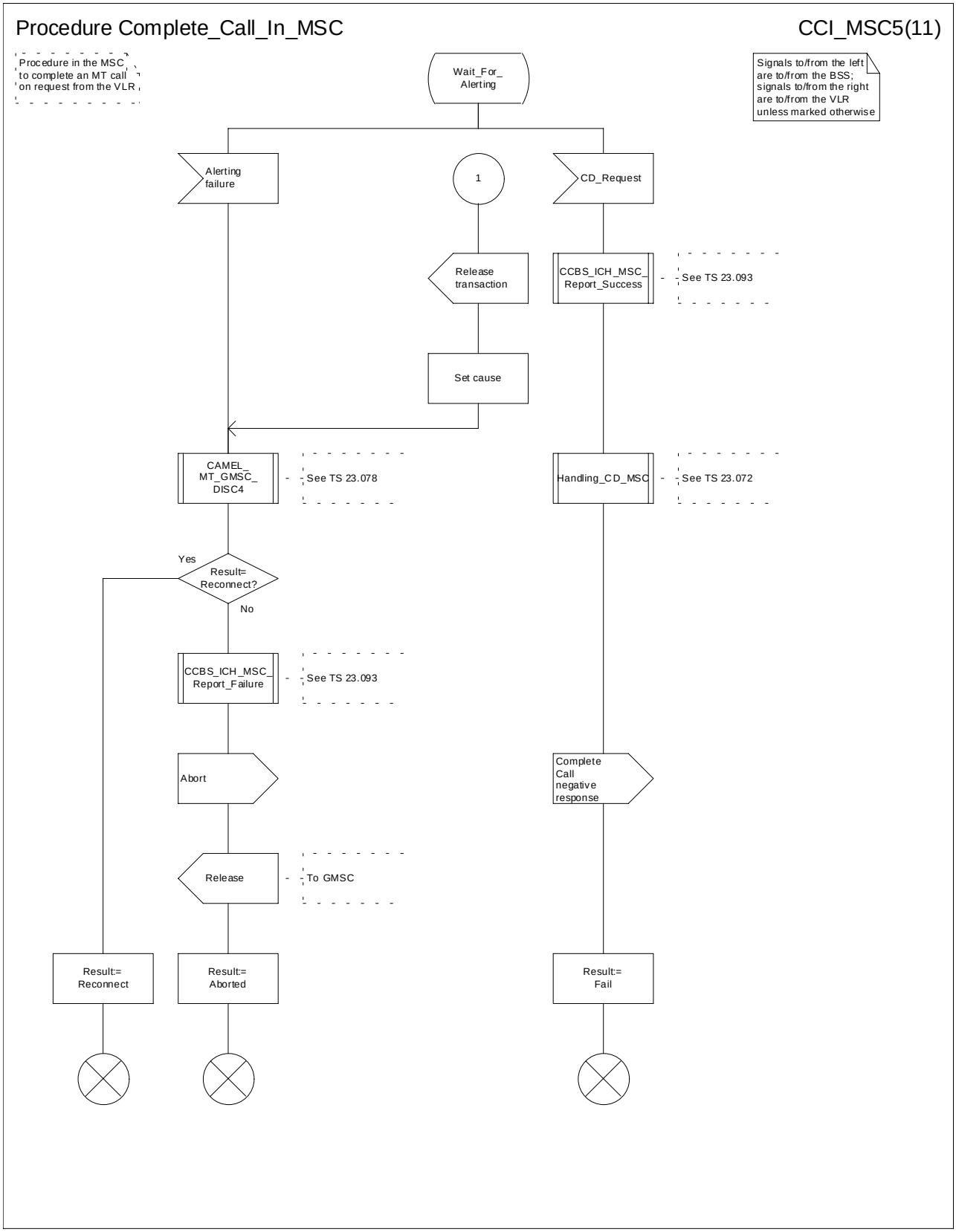
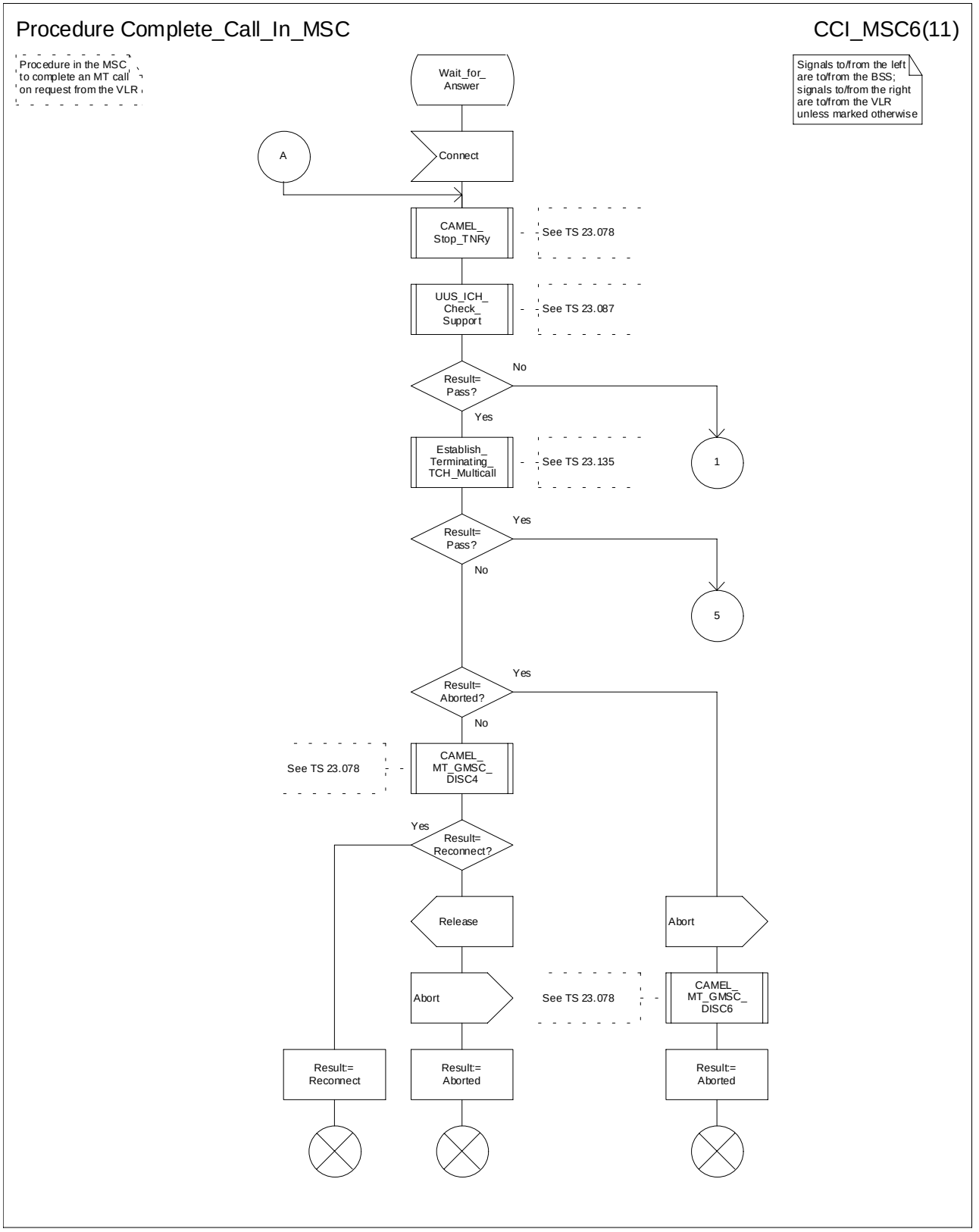


Figure 70e: Procedure Complete_Call_In_MSC (sheet 5)


Procedure Complete_Call_In_MSC
CCI_MSC6(11)
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
Wait_for_ Answer
A
Connect
CAMEL_ Stop_TNRy
See TS 23.078
UUS_ICH_ Check_ Support
See TS 23.087
Result= Pass?
No
Yes
Establish_ Terminating_ TCH_Multicall
See TS 23.135
1
Result= Pass?
Yes
No
5
Result= Aborted?
Yes
No
See TS 23.078
CAMEL_ MT_GMSC_ DISC4
Yes
Result= Reconnect?
Release
Abort
Abort
See TS 23.078
CAMEL_ MT_GMSC_ DISC6
Result:= Reconnect
Result:= Aborted
Result:= Aborted

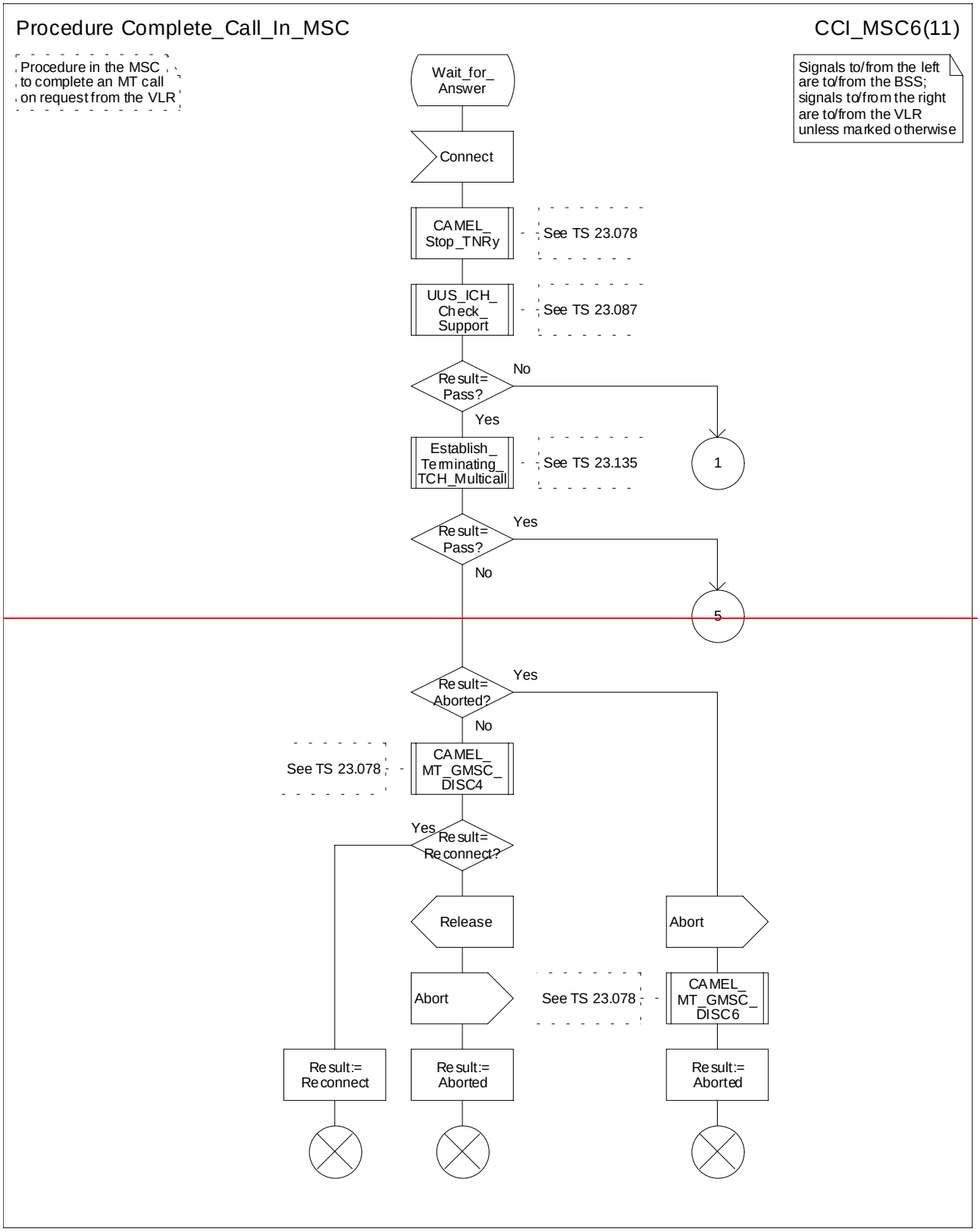
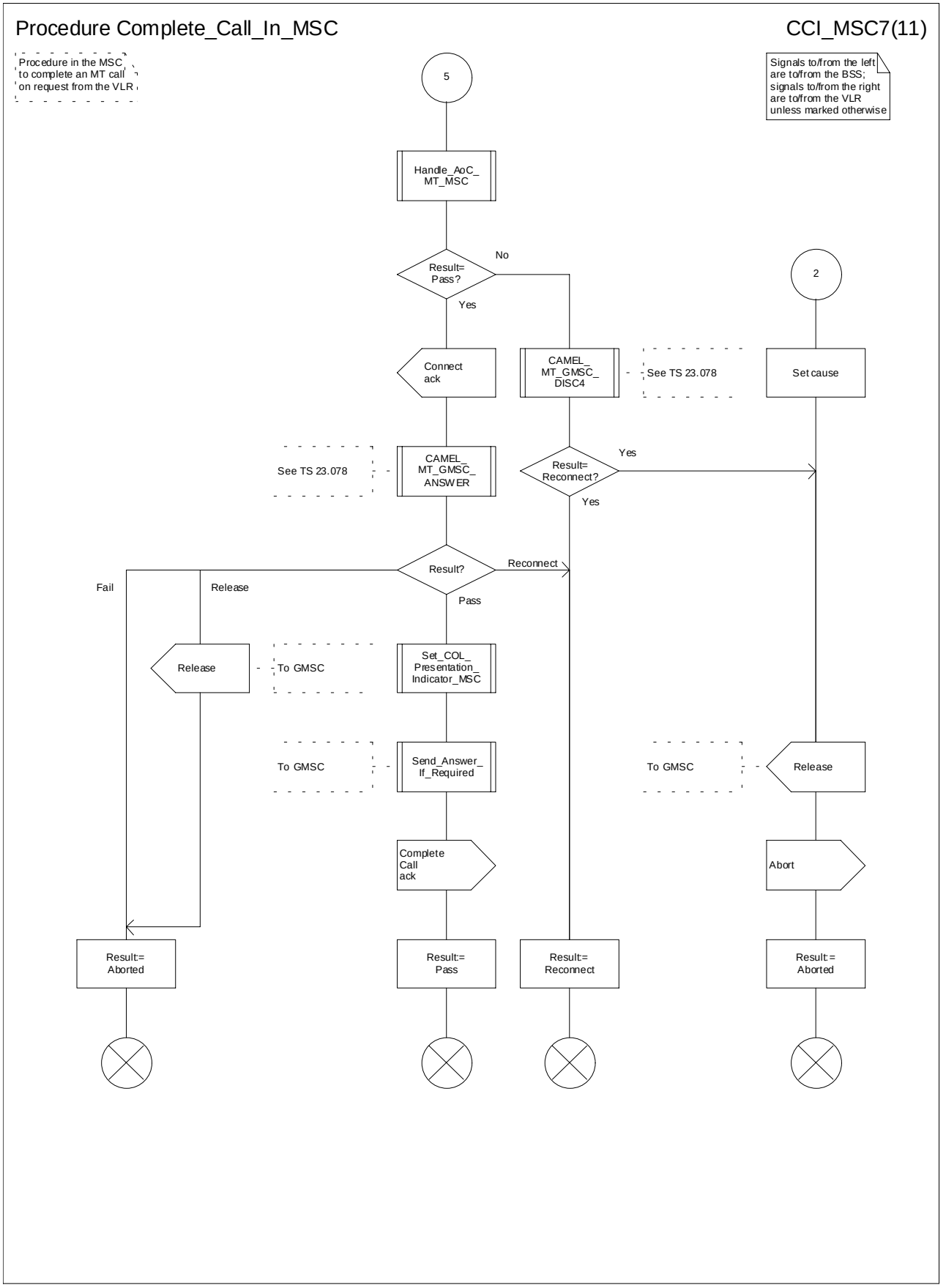


Figure 70f: Procedure Complete_Call_In_MSC (sheet 6)


Procedure Complete_Call_In_MSC
CCI_MSC7(11)
Procedure in the MSC to complete an MT call on request from the VLR
5
Signals to/from the left are to/from the BSS; signals to/from the right are to/from the VLR unless marked otherwise
Handle_AoC_ MT_MSC
Result= Pass?
No
Yes
2
Connect ack
CAMEL_ MT_GMSC_ DISC4
See TS 23.078
Set cause
See TS 23.078
CAMEL_ MT_GMSC_ ANSWER
Result= Reconnect?
Yes
Yes
Result?
Reconnect
Fail
Release
Pass
Release
To GMSC
Set_COL_ Presentation_ Indicator_MSC
To GMSC
Send_Answer_ If_Required
To GMSC
Release
Complete Call ack
Abort
Result= Aborted
Result= Pass
Result= Reconnect
Result= Aborted

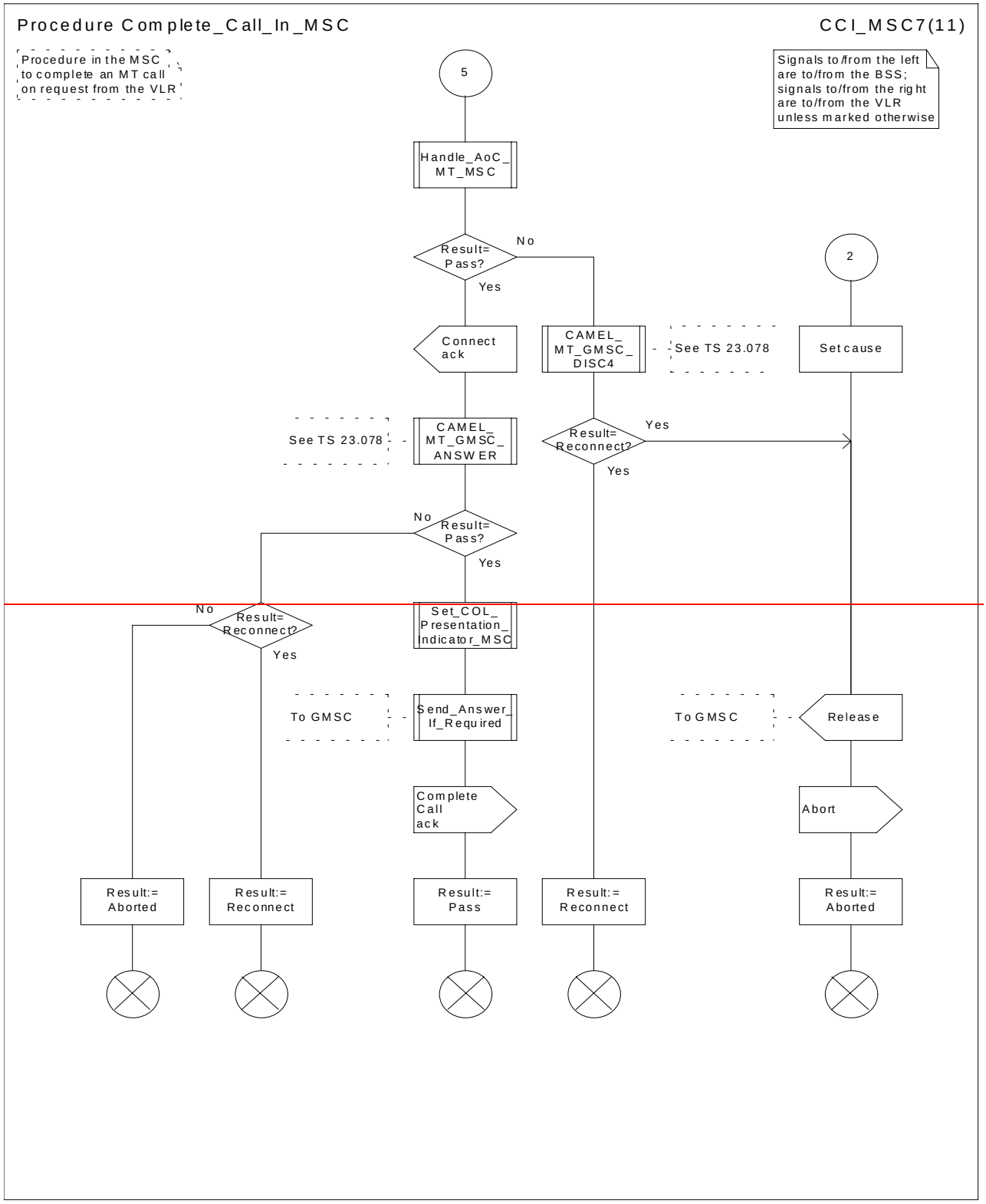


Figure 70g: Procedure Complete_Call_In_MSC (sheet 7)

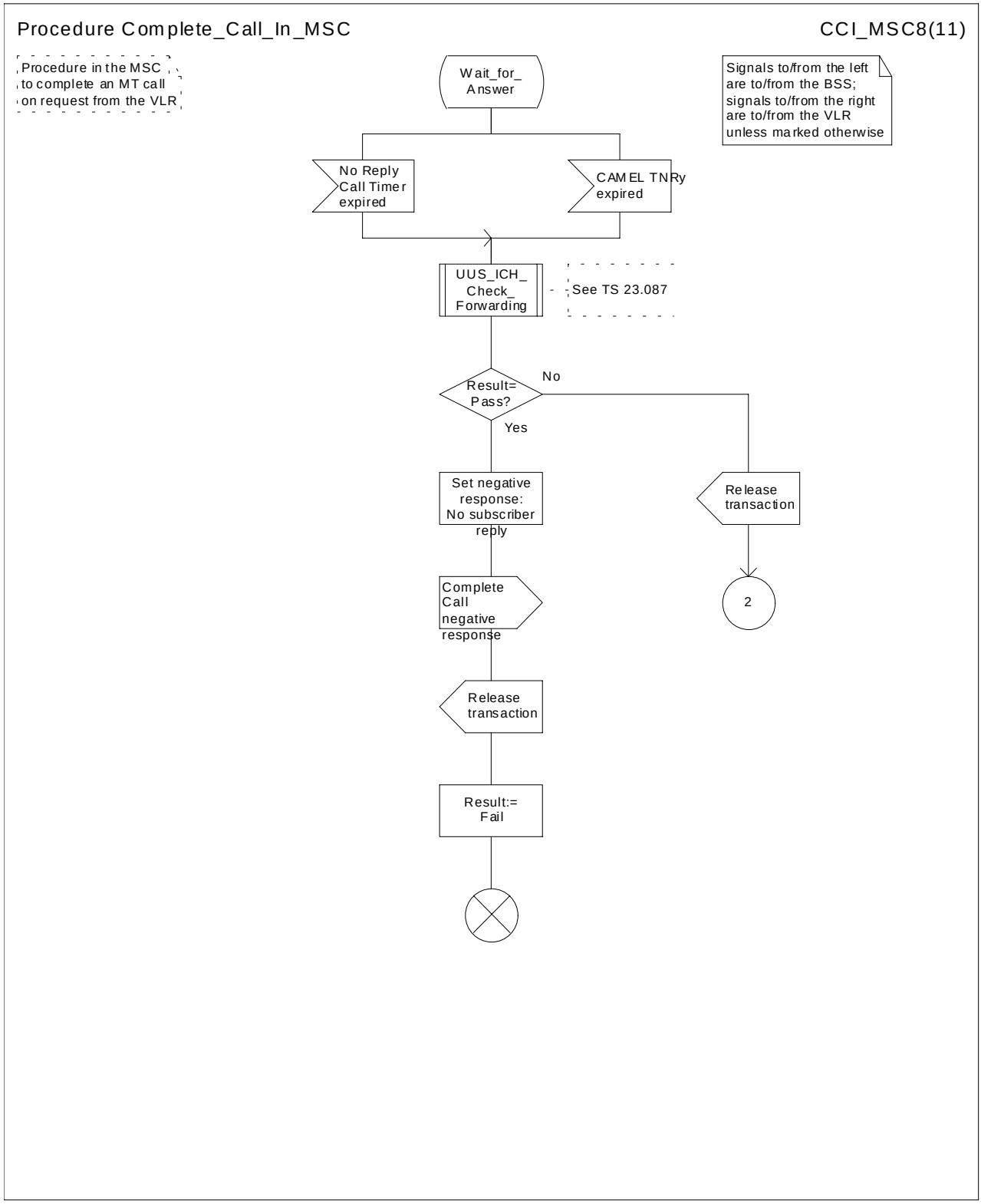


Figure 70h: Procedure Complete_Call_In_MSC (sheet 8)

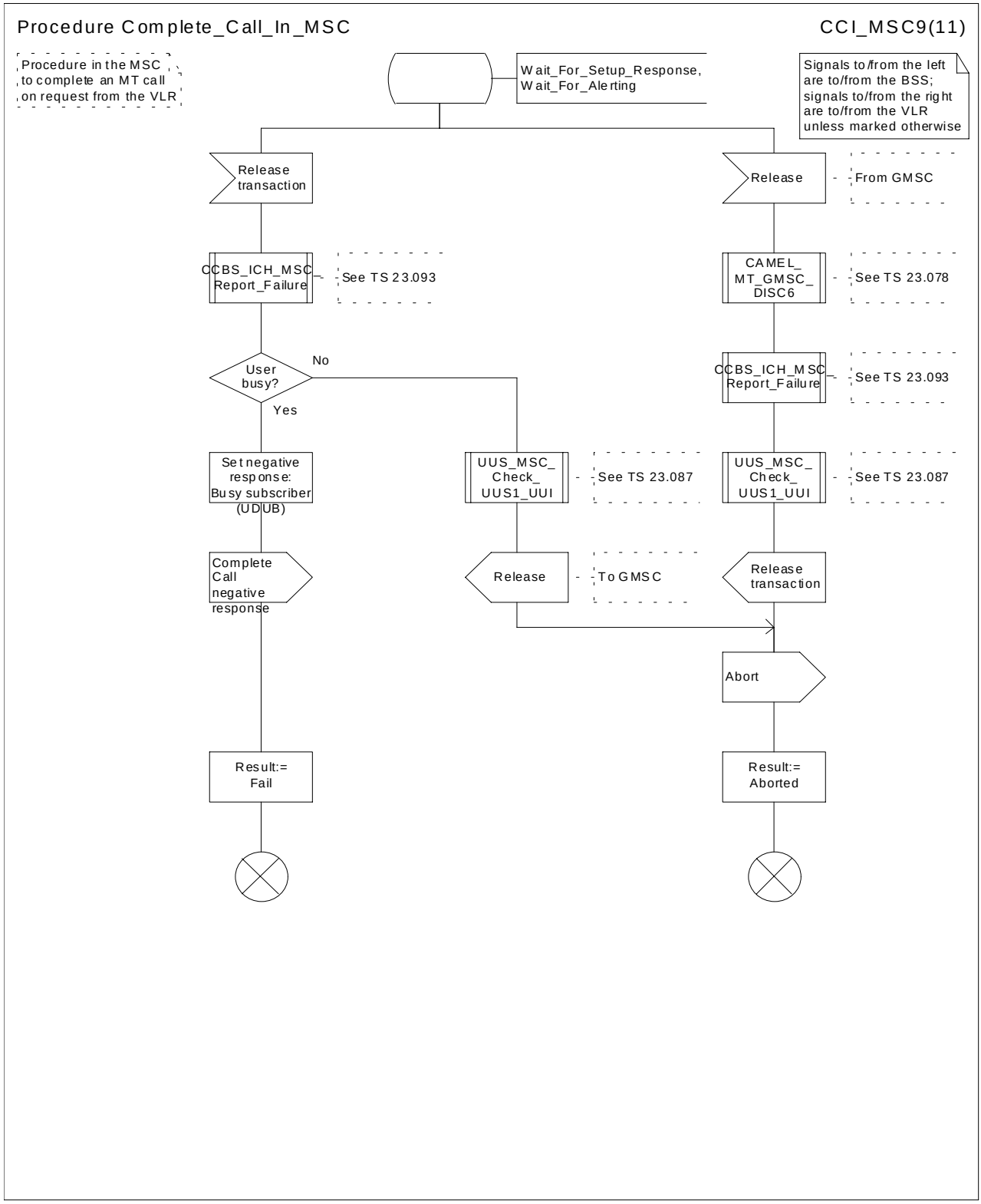


Figure 70i: Procedure Complete_Call_In_MSC (sheet 9)

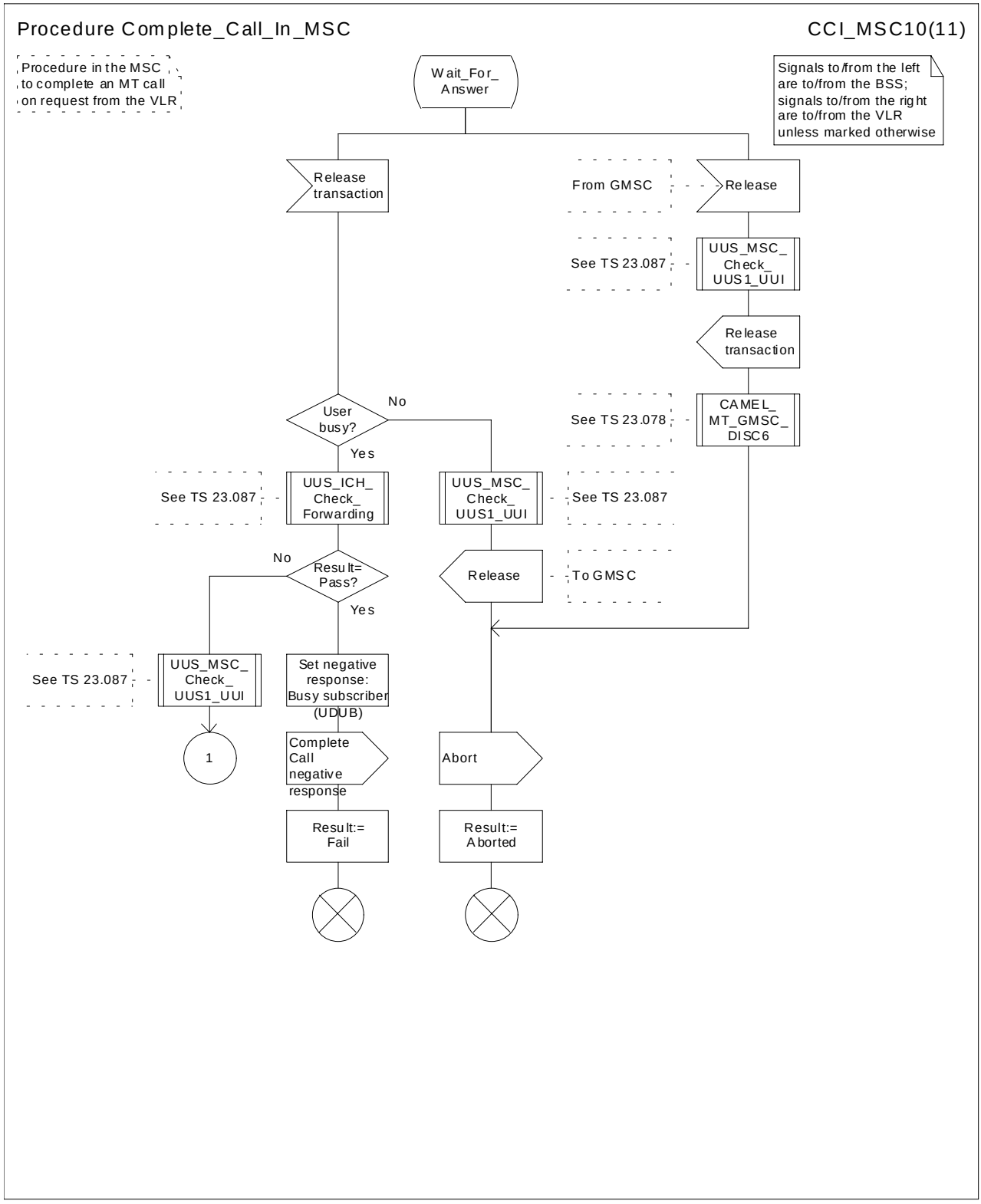


Figure 70j: Procedure Complete_Call_In_MSC (sheet 10)

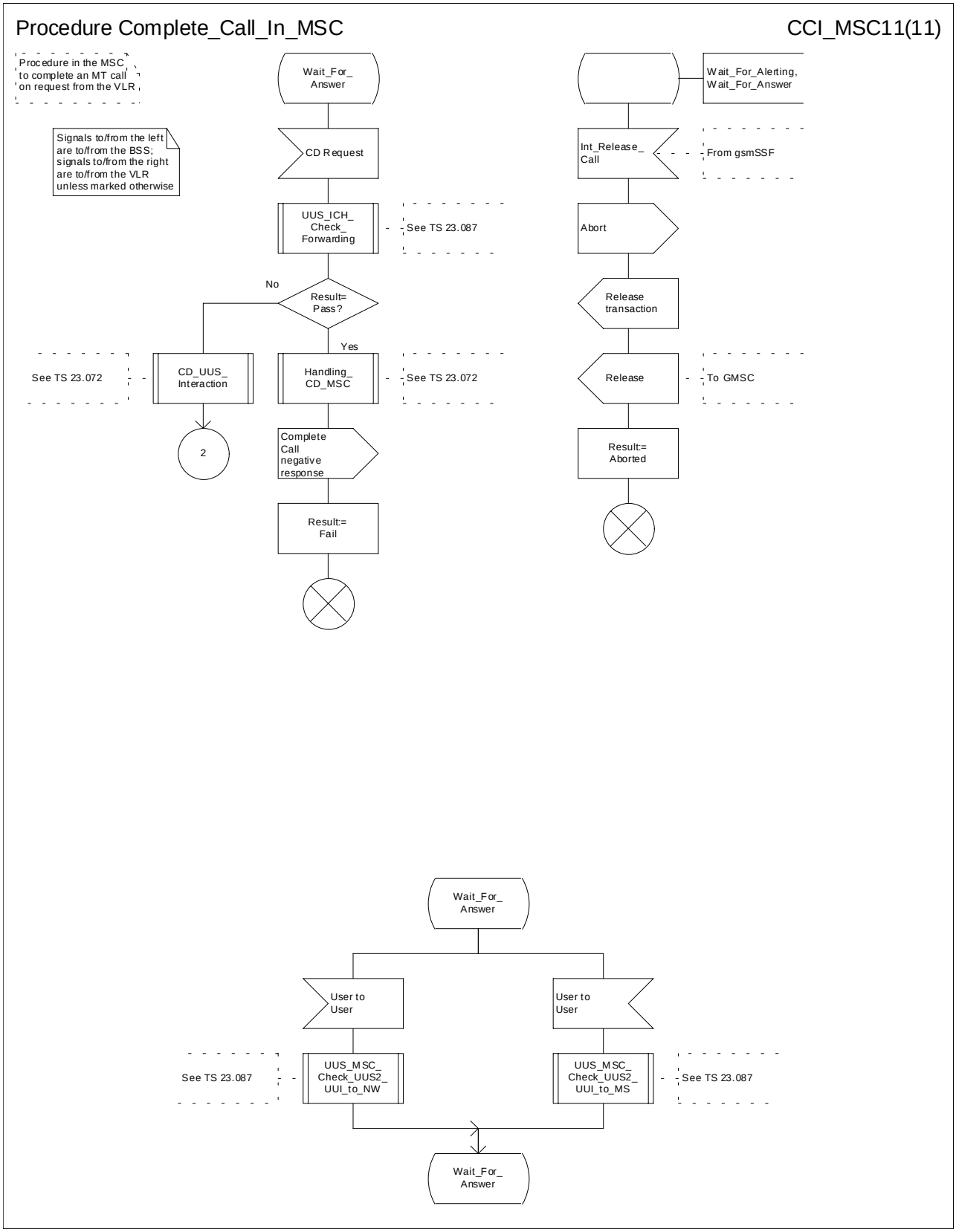


Figure 70k: Procedure Complete_Call_In_MSC (sheet 11)

…

****** End of Document**

3GPP TSG CN WG2 Meeting #22 **N2-020082**
3GPP TSG CN WG4 Meeting #12 **N4-020014**
Sophia Antipolis, France, 28th January – 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘ **23.016** **CR** **021** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Collective CR on 23.016
Source:	⌘	CN4
Work item code:	⌘	CAMEL4
Date:	⌘	18 January 2002
Category:	⌘	**B**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Newly introduced CSI in CAMEL4 (Rel-5) as follows • MT-SMS-CSI, which includes triggering criteria, • Naming change of SMS-CSI to MO-SMS-CSI, • MG-CSI
Summary of change:	⌘	New CSI (MT-SMS-CSI and MG-CSI), Naming change of SMS-CSI (in CAMEL Phase 3) to MO-SMS-CSI (CAMEL Phase 4).
Consequences if not approved:	⌘	

Clauses affected:	⌘	3.2, Figures 15, 22, 23a, 23b (renumbered)		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	23.008, 23.018, 23.078, 29.002, 29.078
Other comments:	⌘	This CR was submitted to CN4#11 meeting for information and comments, not for approval. If the latest version of this specification changes before the final approval, the CR will be changed as well. The contents of CR were noted by CN2#20 meeting in Brighton (N2-010778). After CN2 meeting, the coversheet was updated. Remark to CN2#22 and CN4#12: This document is submitted for comments, if any. Final CR will be created based on the latest specification (5.0.0).		

***** First modified part *****

3.2 Definitions

.....

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

.....

- CAMEL subscription information (Group H):
  - Originating CAMEL Subscription Information (O-CSI);
  - Dialled Service CAMEL Subscription Information (D-CSI);
  - VMSC Terminating CAMEL Subscription Information (VT-CSI);
  - Supplementary Service Invocation Notification CAMEL Subscription Information (SS-CSI);
  - Translation Information Flag CAMEL Subscription Information (TIF-CSI);
  - ~~SMS CAMEL Subscription Information (SMS-CSI);~~
  - Mobile Originating Short Message Service CAMEL Subscription Information (MO-SMS-CSI);
  - Mobile Terminating Short Message Service CAMEL Subscription Information (MT-SMS-CSI);
  - Mobility Management Event Notification CAMEL Subscription Information (M-CSI).
- LSA Information (Group I):
  - LSA data.
- Super-Charger (SC) Information (Group K):
  - Age Indicator;
- Location Services (LCS) information (Group X);
  - GMLC List;
  - LCS Privacy Exception List;
  - MO-LR List.
- IST Information (Group J):
  - IST data.
- Bearer Service Priority Information (Group L):
  - Bearer Service Priority Data.

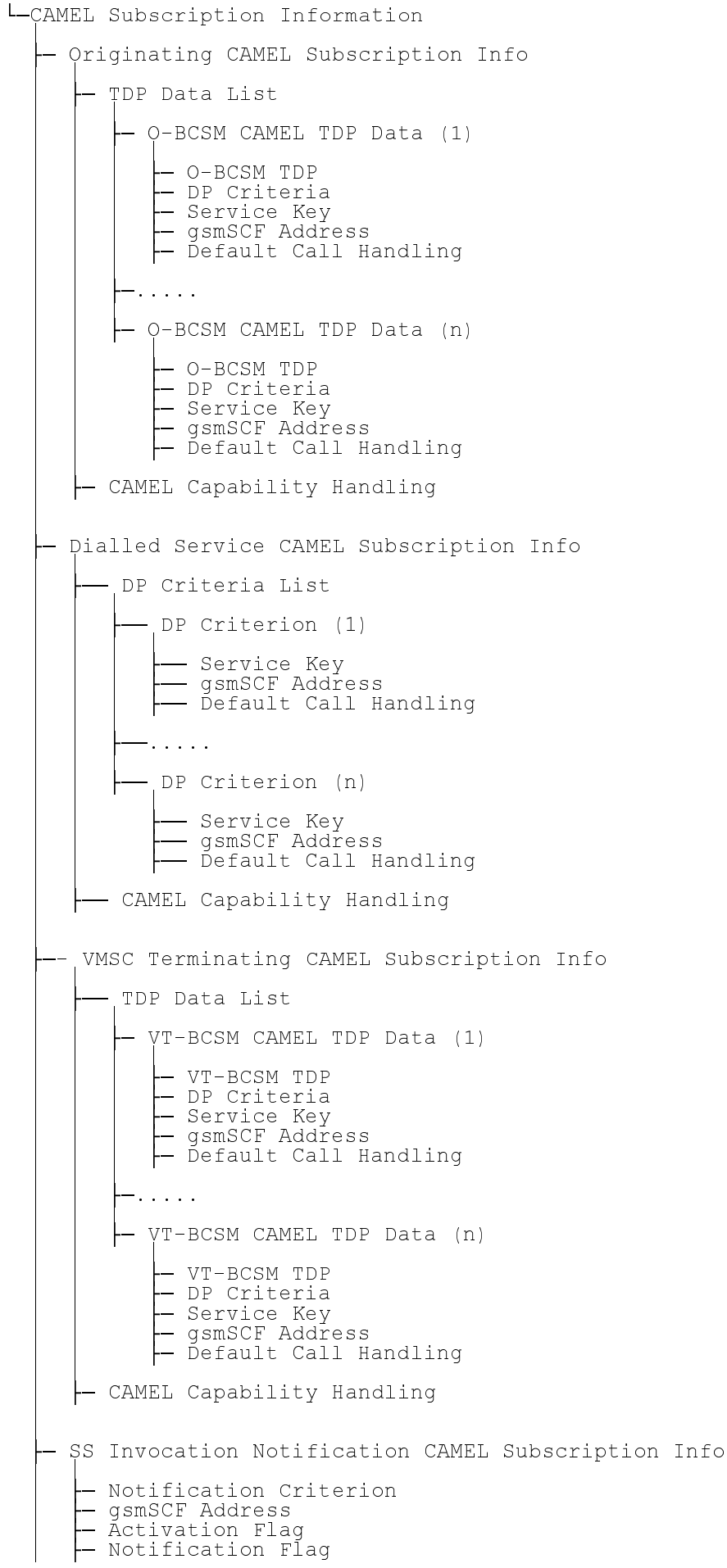
The following **groups of GPRS subscriber information** are defined:

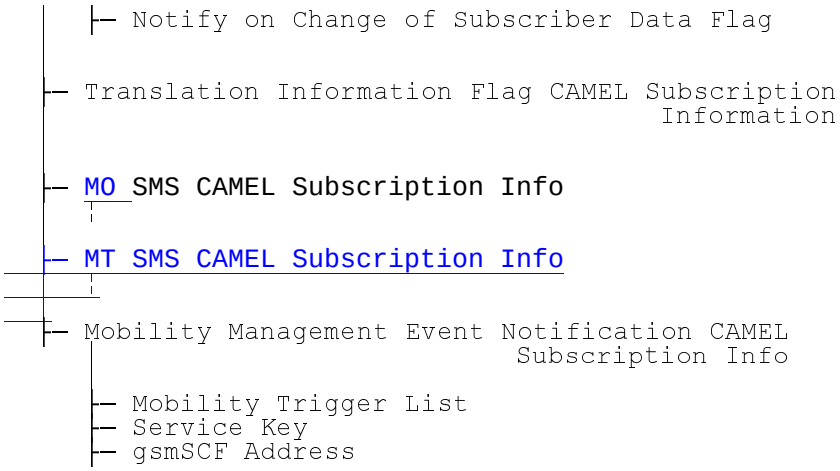
.....

- SGSN CAMEL subscription information (Group P7):
  - GPRS CAMEL subscription information;
  - ~~SMS CAMEL subscription information.~~
  - Mobile Originating Short Message Service CAMEL Subscription Information (MO-SMS-CSI);
  - Mobile Terminating Short Message Service CAMEL Subscription Information (MT-SMS-CSI);
  - Mobility Management Event for GPRS Notification CAMEL Subscription Information (MG-CSI).
- LSA Information (Group P8):
  - LSA data.
- Super-Charger (SC) Information (Group P9):
  - Age Indicator.
- Charging Information (Group P10):

  -Subscribed Charging Characteristics.
- Location Services (LCS) information (Group P11);
  - GMLC List;
  - LCS Privacy Exception List;
- - MO-LR List.

***** Next modified part *****


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

***** Next modified part *****

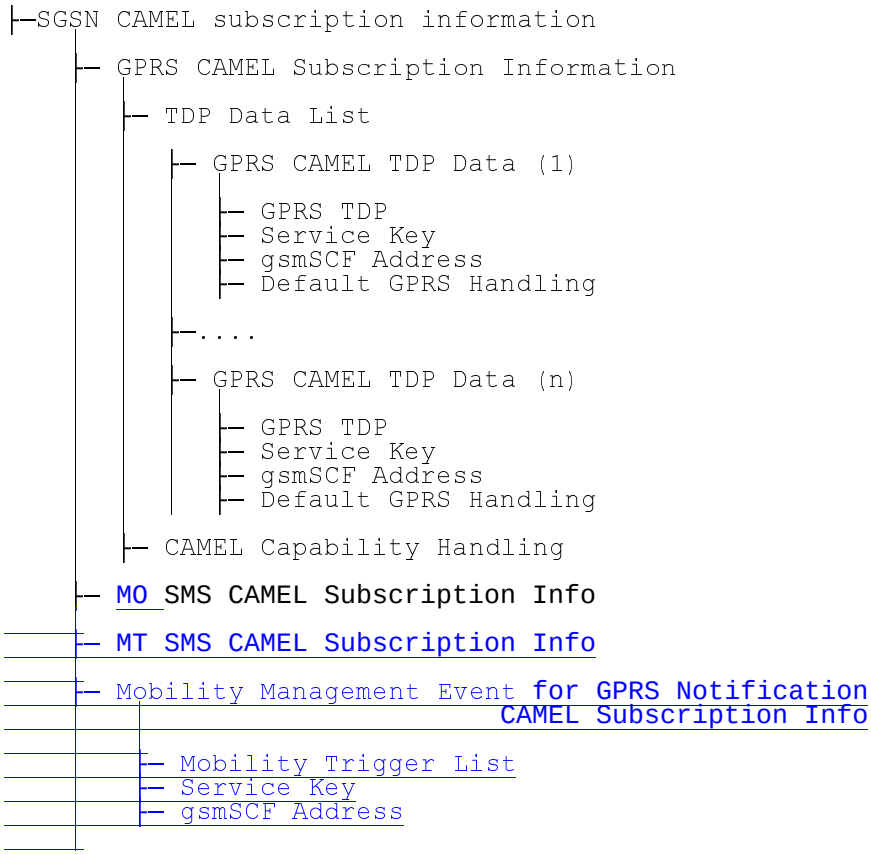


Figure 22: SGSN CAMEL subscription info ~~and GPRS CAMEL subscription info~~

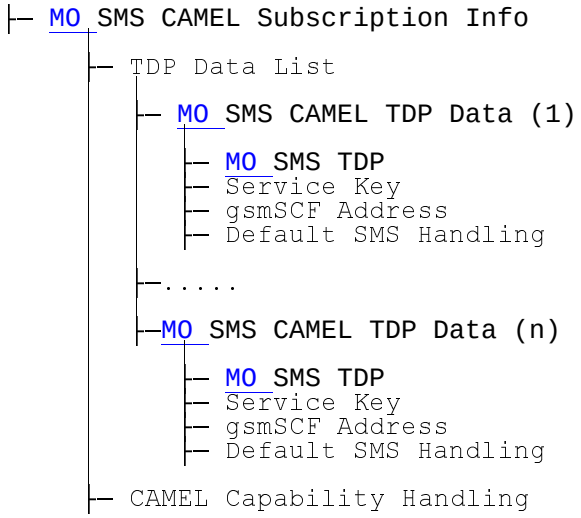


Figure 23a: MO SMS CAMEL Subscription Info

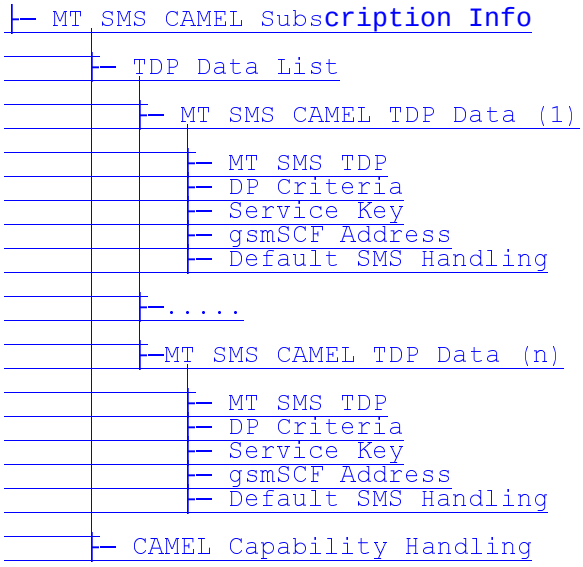


Figure 23b: MT SMS CAMEL Subscription Info