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Agenda Item: **The Gateway Location Register**

Source: **NTT COMMUNICATIONWARE**

Title: **GLR stage3 specification for MAP (version 1.1.0)**

Document for: Approval

Date: **09/02/00**

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Introduction

This is the MAP part of GLR stage3 specification (version 1.1.0).

According to N2B000074, the specifcation is modified to introduce the Super-Charger functionality to GLR.

Proposal

It is proposed that TSG N2 approve the specification and send it to TSG CN plenary #7 for approval.

3G TS 29.120 V2.0.0 (2000-02)

Technical Specification

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

(3G TS 29.120 version 2.0.0)

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Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

This TS specifies the signalling requirements and procedures used at network elements related to the Gateway Location Register (GLR) for Mobile Application Part (MAP) within the 3GPP system. (i.e. This TS specifies the delta against TS 29.002.)

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

Version 3.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 Indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

This Technical Specification (TS) describes the signalling requirements and procedures used at network elements related to the GLR for MAP within the 3GPP system at the application level.

This TS gives the description of the systems needed only in the network utilising GLR as the delta document against TS 29.002.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] TS 23.003: "Numbering, addressing and identification".

[2] TS 23.007: "Restoration procedures".

[3] TS 23.012: "Location registration procedures".

[4] TS 23.040: "Technical realization of the Short Message Service (SMS) Point to Point (PP)".

[5] TS 29.002: "Mobile Application Part (MAP) specification".

[6] TS 23.119: "Gateway Location Register(GLR) - stage2".

3 Abbreviations

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

CCBS   Completion of Call to Busy Subscriber
GLR   Gateway Location Register
GPRS   General Packet Radio Service
IM_GSN   Intermediate GSN
IM_MSC   Intermediate MSC
SGSN   Serving GPRS support node
GGSN   Gateway GPRS support node

4 The entities and interfaces whithin the mobile network utilizing the GLR

4.1 The eintities of the mobile system

The functional entities related to the GLR are described below. The description of each eintity is detailed in TS 23.119 (GLR stage2 specification). The other functional entities described in this TS (e.g. MSC, VLR, and HLR) are specified in TS 29.002.

- The Gateway location Regisnter (GLR);

- The Intermediate MSC (IM-MSC);

- The Intermediate GSN (IM-GSN).

4.2 The Interfaces within the mobile services

The Interfaces related to the GLR are described below. The description of each interface is detailed in TS 23.119 (GLR stage2 specification).

- Interfcace between the HLR and the GLR;

- Interfcace between the VLR and the GLR;

- Interfcace between the MSC and the IM_MSC;

- Interfcace between the SGSN and the GLR;

- Interfcace between the MSC and the GLR;

- Interfcace between the GLR and the IM_GSN.

5 Overload and compatibility overview

5.1 Overload control for MAP entities

The VLR and SGSN see the GLR as an HLR, and the HLR sees the GLR as a VLR or a SGSN. Therefore the GLR shall behave like mobile entity as which the GLR is regarded. If overload of the GLR is detected, requests for certain MAP operations (see tables 5.1/1, 5.1/2 and 5.1/3 in TS 29.002) 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.

5.2 Compatibility

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. The description of the version negotiation mechanism is detailed in TS 29.002.

6   Requirements concerning the use of SCCP and TC

6.1   Use of SCCP

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

6.1.1   SCCP Class

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

6.1.2   Sub-System Number (SSN)

The Application Entities (AEs) defined for MAP consist of several Application Service Elements (ASEs) and are addressed by sub-system numbers (SSNs). The SSN for MAP are specified in TS 23.003 [1]. The specific SSN is not needed for the GLR, IM_MSC, IM_GSN.

6.1.3   SCCP addressing

6.1.3.1   Introduction

The format and coding of address parameters carried by SCCP are detailed in TS 29.002.

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

-    the Gateway location Register (GLR);

-    the Intermediate Mobile-services Switching Centre (IM_MSC);

-    the Intermediate GPRS Support Node (IM_GSN).

6.1.3.2   The Gateway Location Register (GLR)

6.1.3.2.1   Addressed by the VLR

In the network utilizing the GLR, when a MS which belongs to other PLMN registers in a VLR/SGSN, the VLR/SGSN sees the GLR as the MS's HLR. When initiating the update location dialogues, the VLR is able to address the GLR based on the SPC of the GLR because of intra-PLMN signalling. And the VLR can address the GLR 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). When answering with Global Title to the VLR, the GLR shall insert its E.164 address in the Calling Party Address of the SCCP message containing the first responding CONTINUE message. After that, the VLR can address the GLR based on an E.164 GLR address.

6.1.3.2.2   Addressed by the HLR

When a location updating dialogue initiated by a GLR has been successfully completed, the HLR sees the GLR as the VLR. When initiating dialogues towards the VLR, 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, but in reality the HLR addresses the GLR using the VLR number.

6.1.3.2.3 Addressed by the GMSC

In the case that the MS is served by the SGSN in the network utilizing the GLR, the GMSC sees the GLR as the SGSN. When the GMSC initiates dialogues towards the SGSN the SGSN (MAP) SSN (See TS 23.003) 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. But in reality the GMSC addresses the GLR using the SGSN number.

6.1.3.2.4 Addressed by the IM-GSN

In the network utilizing the GLR, the IM-GSN initiates the gprs location information retrieval to the GLR. The IM-GSN must have the value of the GLR address beforehand.

6.1.3.3 The Intermediate MSC (IM_MSC)

6.1.3.3.1 Addressed by the GMSC

When a short message for CS has to be routed to a MS, the GMSC addresses the MSC by an MSC identity received from the HLR which complies with E.164 rules. But in reality the GMSC addresses the IM-MSC in the network utilizing the GLR.

6.1.3.3.2 Addressed by the GMLC

When a location request for a particular MS needs to be sent to the MS's VMSC, the GMLC addresses the MSC using an E.164 address received from the MS's HLR. But in reality the GMLC addresses the IM-MSC in the network utilizing the GLR.

6.1.3.4 The Intermediate GSN (IM_GSN)

The IM-GSN provides routing of the Network-Requested PDP Context activation. If a Network-Requested PDP Context activation fails, the GLR will alert the IM-GSN when the subscriber becomes reachable. The GLR will use the E.164 IM-GSN number received as parameter of the MAP message reporting the failure.

6.1.3.5 Summary table

The following table summarizes 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 Adress. 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 6.1.3/1

to from	fixed net work	HLR	VLR	MSC	SGSN	GGSN	GLR	IM-MSC	IM-GSN
fixed network									
home location register							I:SPC/GT E:GT T:VLR NUMBER		
visitor location register							I:SPC/GT E:GT T:MGT (outside World Zone 1)/MSISDN (World Zone 1/)HLR NUMBER (note)		
mobile-services switching centre							E:GT T:SGSN NUMBER	I:SPC/GT E:GT T:MSC NUMBER	
Serving GPRS Support Node							I:SPC/GT T:MGT/MS ISDN/HLR NUMBER		
Gateway GPRS Support Node						Note1			
Gateway Location register	---	E:GT T:MGT (outside World Zone1)/M SISDN(World Zone1/) HLR NUMBE R (note)	I:SPC/G T T:VLR NUMBE R	---	I:SPC/GT T:SGSN NUMBER				
Intermediate-MSC	---			I:SPC/G T T:MSC NUMBE R					
Intermediate-GSN	---						I:SPC/GT T:HLR 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.

From VLR in, GLR as for T (address type) only HLR Number is used. VLR and HLR are because only the thing that is belonging to same PLMN is thought.NOTE1:   The hatching part is the same part of TS29.002.

6.2   Use of TC

Refer to the corresponding section in TS 29.002.

7   Genaral on MAP services

Refer to the corresponding section in TS 29.002 with the exceptions described below.

7.1   Common MAP services

Replace the MAP-U-ABORT service as follows.

7.1.1   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 7.1/1. MAP service-user in the GLR may set "application context not supported" as user reason.

Table 7.1/1: Service-primitives for the MAP-U-ABORT service

Parameters	Request	Indication
User reason	M	M(=)
Diagnostic information	U	C(=)
Specific information	U	C(=)

User reason:

This parameter can take the following values:

-    resource limitation (congestion);

     the requested user resource is unavailable due to congestion;

-    resource unavailable;

     the requested user resource is unavailable for reasons other than congestion;

-    application procedure cancellation;

     the procedure is cancelled for reason detailed in the diagnostic information parameter;

-    application context not supported;

     the requested application context is not supported;

-    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 7.1/2: User reason and diagnostic information

User reason	Diagnostic information
Resource limitation (congestion) Resource unavailable Application procedure cancellation	- Short term/long term problem Handover cancellation/ Radio Channel release/ Network path release/ Call release/ Associated procedure failure/ Tandem dialogue released/ Remote operations failure
Application context not supported	-
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.

8 Mobility services

8.1 General

Regarding definition of each service, only the interval for adoptation shall be considered for the GLR introduction. The interval for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in TS 29.002.

8.2 Location Management services

Services	interval for adoption
MAP_UPDATE_LOCATION	VLR – GLR
	GLR – HLR
MAP_CANCEL _LOCATION	HLR – GLR
	GLR – VLR
	GLR – SGSN
MAP_PURGE_MS	VLR – GLR
	SGSN – GLR
	GLR – HLR
MAP_UPDATE_GPRS_LOCATION	SGSN – GLR
	GLR – HLR

Figure 8.2 /1

8.3 Authentication Management services

Services	Interval for adoption
MAP_SEND_AUTHENTICATION_INFO	VLR – GLR
	SGSN – GLR
	GLR – HLR

Figure 8.3/1

8.4 Subscriber management services

Services	Interval for adoption
MAP_ INSERT-SUBSCRIBER-DATA	HLR – GLR
	GLR – VLR
	GLR – SGSN
MAP-DELETE-SUBSCRIBER-DATA	HLR – GLR
	GLR – VLR
	GLR – SGSN

Figure 8.4/1

8.5 Fault recovery services

Services	Interval for adoption
MAP_RESET	HLR – GLR
	GLR – VLR
	GLR – SGSN
MAP_FORWARD_CHECK_SS_INDICATION	HLR – GLR
	GLR – VLR
MAP_RESTORE_DATA	VLR – GLR

Figure 8.5/1

8.6 Subscriber Information services

Services	Interval for adoption
MAP-PROVIDE-SUBSCRIBER-Info	VLR – GLR
	GLR – HLR

Figure 8.6/1

9   Operation and mentenance services

9.1   General

Regarding definition of each service, only the interval for adoptation shall be considered for the GLR introduction. The interval for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in TS 29.002.

9.2   MAP_SEND_IMSI service

Services	Interval for adoption
MAP_ SEND_IMSI	HLR – GLR
	GLR – VLR

Figure 9.2/1

10   Call handling services

10.1   General

Regarding definition of each service, only the interval for adoptation shall be considered for the GLR introduction. The interval for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in TS 29.002.

10.2   MAP_PROVIDE_ROAMING_NUMBER service

Services	Interval for adoption
MAP_ PROVIDE_ROAMING_NUMBER	HLR – GLR
	GLR – VLR

Figure 10.2/1

10.3   MAP_SET_REPORTING_STATE service

Services	Interval for adoption
MAP_ SET_REPORTING_STATE	HLR – GLR
	GLR – VLR

Figure 10.3/1

10.4   MAP_STATUS_REPORT service

Services	Interval for adoption
MAP_ STATUS_REPORT	VLR – GLR
	GLR – HLR

Figure 10.4/1

10.5   MAP_REMOTE_USER_FREE service

Services	Interval for adoption
MAP_REMOTE_USER_FREE	VLR – GLR
	GLR – HLR

Figure 10.5/1

11   Supplementary services related services

11.1   General

Regarding definition of each service, only the interval for adoptation shall be considered for the GLR introduction. The interval for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in TS 29.002.

11.2   MAP_REGISTER_SS service

Services	Interval for adoption
MAP_ REGISTER_SS	VLR – GLR
	GLR – HLR

Figure 11.2/1

11.3   MAP_ERASE_SS service

Services	Interval for adoption
MAP_ ERASE_SS	VLR – GLR
	GLR – HLR

Figure 11.3/1

11.4   MAP_ACTIVATE_SS service

Services	interval for adoption
MAP_ ACTIVATE_SS	VLR – GLR
	GLR – HLR

Figure 11.4/1

11.5   MAP_DEACTIVATE_SS service

Services	Interval for adoption
MAP_ DEACTIVATE_SS	VLR – GLR
	GLR – HLR

Figure 11.5/1

11.6   MAP_ INTERROGATE _SS service

Services	Interval for adoption
MAP_ INTERROGATE_SS	VLR – GLR
	GLR – HLR

Figure 11.6/1

11.7   MAP_ REGISTER_PASSWORD service

Services	Interval for adoption
MAP_ REGISTER_PASSWORD	VLR – GLR
	GLR – HLR

Figure 11.7/1

11.8   MAP_ GET_PASSWORD service

Services	Interval for adoption
MAP_ GET_PASSWORD	HLR – GLR
	GLR – VLR

Figure 11.8/1

11.9 MAP_ PROCESS_UNSTRUCTURED_SS_REQUEST service

Services	Interval for adoption
MAP_ PROCESS_UNSTRUCTURED_SS_REQUEST	VLR – GLR
	GLR – HLR

Figure 11.9/1

11.10 MAP_ UNSTRUCTURED_SS_REQUEST service

Services	Interval for adoption
MAP_ UNSTRUCTURED_SS_REQUEST	HLR – GLR
	GLR – VLR

Figure 11.10/1

11.11 MAP_UNSTRUCTURED_SS_NOTIFY service

Services	Interval for adoption
MAP_ UNSTRUCTURED_SS_NOTIFY	HLR – GLR
	GLR – VLR

Figure 11.11/1

11.12 MAP_REGISTER_CC_ENTRY service

Services	Interval for adoption
MAP_ UNSTRUCTURED_SS_NOTIFY	VLR – GLR
	GLR – HLR

Figure 11.12/1

11.13 MAP_ERASE_CC_ENTRY service

Services	Interval for adoption
MAP_ ERASE_CC_NOTIFY	VLR – GLR
	GLR – HLR

Figure 11.13/1

12 Short message service management services

12.1 General

Regarding definition of each service, only the interval for adoptation shall be considered for the GLR introduction. The interval for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in TS 29.002.

12.2 MAP-READY-FOR-SM service

Services	interval for adoption
MAP-READY-FOR-SM	VLR – GLR
	SGSN – GLR
	GLR – HLR

Figure 12.2/1

12.3 MAP-MT-FORWARD-SHORT-MESSAGE service

Services	interval for adoption
MAP_MT_FORWARD_SHORT_MESSAGE	SMS-GMSC – IM-MSC
	IM-MSC – MSC
	SMS-GMSC – GLR
	GLR – SGSN

Figure 12.3/1

13 Network-Requested PDP Context Activation services

13.1 General

Regarding definition of each service, only the interval for adoptation shall be considered for the GLR introduction. The interval for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in TS 29.002.

13.2 MAP_SEND_ROUTING_INFO_FOR_GPRS service

Services	Interval for adoption
MAP_SEND_ROUTING_INFO_FOR_GPRS	IM-GSN – GLR

Figure 13.2/1

13.3   MAP_FAILURE_REPORT service

Services	Interval for adoption
MAP_ FAILURE_REPORT	IM-GSN – GLR

Figure 13.3/1

14   [spare]

15   Element of procedure

The elements of procedures for the MAP protocol are referred to the corresponding section in TS 29.002.

16 Mapping onto TC services

Dialogue control, Servise specific procedures and SDL decriptions are referred to the corresponding section in TS 29.002 with the exccptoins described below.

16.1 SDL descriptions

Replace the corresponding part of MAP_DSM as figure 16.1/1.
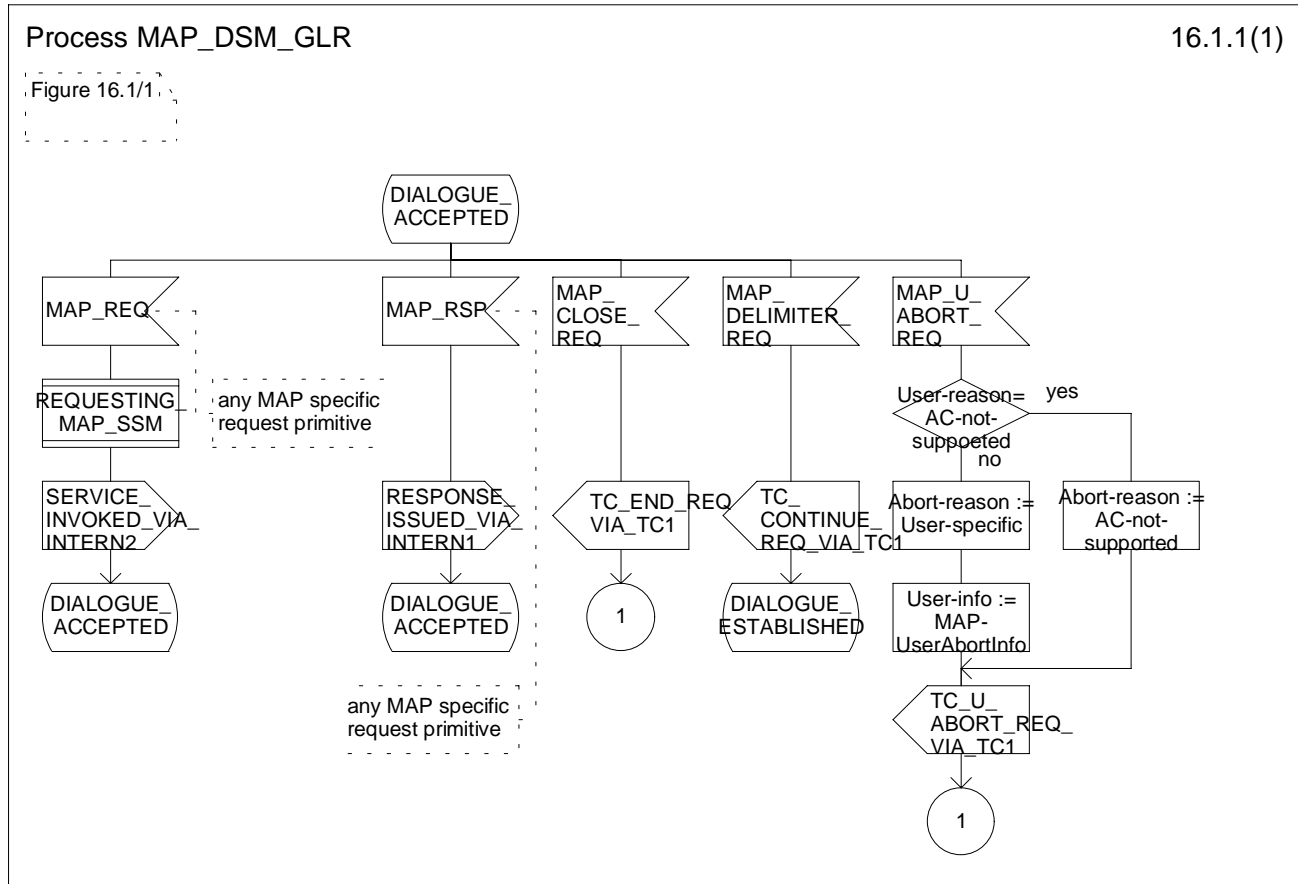
Figure 16.1/1: Process MAP_DSM_GLR

17 Abstract syntax of the MAP protocol

17.1 General

Refer to the corresponding section in TS 29.002 except Packages specifications and Application contexts.

Regarding the operations which are initiated by the VLR or SGSN toward HLR via GLR, the timer value used in the operations should be configured enough long to guarantee the GLR specific fallback mechanism.

17.2 Packages specifications

Regarding Packages specifications, only the supplier and consumer definition shall be considered for the GLR introduction. The supplier and consumer definition for the GLR specification are derived Table 17.2/1. For the other definitions of the package specifications are as in TS 29.002.

Table 17.2/1 supplier and consumer definition

Operation Package	supplier	consumer
LocationUpdatingPackage-v3	HLR	GLR
	GLR	VLR
LocationCancellationPackage-v3	VLR or SGSN	GLR
	GLR	HLR
RoamingNumberEnquiryPackage-v3	VLR	GLR
	GLR	HLR
InfoRetrievalPackage-v2	HLR	GLR
	GLR	VLR
	GLR	SGSN
InfoRetrievalPackage-v1	HLR	GLR
	GLR	VLR
	GLR	SGSN
IMSIRetrievalPackage-v2	HLR	GLR
	GLR	VLR
SubscriberDataMngtStandAlonePackage-v3	VLR or SGSN	GLR
	GLR	HLR
SubscriberDataMngtPackage-v3	VLR or SGSN	GLR
	GLR	HLR
ResetPackage-v2	VLR or SGSN	GLR
	GLR	HLR
FunctionalSsPackage-v2	HLR	GLR
	GLR	HLR
BindingPackage-v1	HLR	GLR
	GLR	VLR
UnstructuredSsPackage-v2	HLR	GLR
	GLR	VLR
UnstructuredSsPackage-v1	HLR	GLR
	GLR	VLR
MTShortMsgRelayPackage-v3	IM-MSC or GLR	GMSC
	MSC	IM-MSC
	SGSN	GLR
MwdMngtPackage-v3	HLR	GLR
	GLR	SGSN
	GLR	VLR
MwdMngtPackage-v1	HLR	GLR
	GLR	VLR
DataRestorationPackage-v3	GLR	VLR
PurgingPackage-v3	HLR	GLR
	GLR	VLR
	GLR	SGSN
SubscriberInformationEnquiryPackage-v3	VLR	GLR
	GLR	HLR
GprsLocationUpdatingPackage-v3	HLR	GLR
	GLR	SGSN
FailureReportingPackage-v3	GLR	IM-GSN
SetReportingStatePackage-v3	VLR	GLR
	GLR	HLR
StatusReportPackage-v3	HLR	GLR
	GLR	VLR
RemoteUserFreePackage-v3	VLR	GLR
	GLR	HLR
CallCompletionPackage-v3	HLR	GLR
	GLR	VLR

17.3   Application contexts

Regarding Application contexts specifications, only the responder and initiator definition shall be considered for the GLR introduction. The responder and initiator definition for the GLR specification are derived Table 17.3/1. For the other definitions of the package specifications are as in TS 29.002.

Table 17.3/1 supplier and consumer definition

Application Context	version	initiator	Responder
locationCancellationContext	v3	HLR	GLR
		GLR	VLR or SGSN
imsiRetrievalContext	v2	VLR	GLR
		GLR	HLR
infoRetrievalContext	v2	VLR or SGSN	GLR
		GLR	HLR
mwdMngtContext	v3	VLR or SGSN	GLR
		GLR	HLR
msPurgingContext	v3	VLR or SGSN	GLR
		GLR	HLR
resetContext	v2	HLR	GLR
		GLR	VLR or SGSN
networkUnstructuredSsContext	v2	VLR	GLR
		GLR	HLR
		HLR	GLR
		GLR	VLR
networkFunctionalSsContext	v2	VLR	GLR
		GLR	HLR
shortMsgMT-RelayContext	v3	MSC	IM-MSC or GLR
		IM-MSC	MSC
		GLR	SGSN
networkLocUpContext	v3	VLR	GLR
		GLR	HLR
gprsLocationUpdateContext	v3	SGSN	GLR
		GLR	HLR
subscriberDataMngtContext	v3	HLR	GLR
		GLR	VLR or SGSN
roamingNumberEnquiryContext	v3	HLR	GLR
		GLR	VLR
gprsLocationInfoRetrievalContext	v3	IM-GSN	GLR
failureReportContext	v3	IM-GSN	GLR
subscriberInfoEnquiryContext	v3	HLR	GLR
		GLR	VLR
reportingContext	v3	VLR	GLR
		GLR	HLR
		HLR	GLR
		GLR	VLR
callCompletionComtext	v3	VLR	GLR
		GLR	HLR

18   General on MAP user procedure

Refer to TS 29.002 for general matters for procedure description such as notation convention, version handling at dialogue establishment and interaction between MAP provider and MAP users.

19   Mobility procedures

19.1   Location management Procedures

For non-GPRS subscribers, this subclause comprises a number of processes to handle the mobile nature of the subscriber. The processes will be addressed by SCCP SSN (VLR or HLR) and the Application Context. The processes in the GLR interact with the processes in the VLR or HLR defined in 29.002. The followings show the relations between the protocol processes in the GLR and the processes in the other node.

Process Update Location (VLR-GLR):

Initiator: Update_Location_Area_VLR or Update_Location_HLR;

Responder: Update_Location_GLR;

Process Update Location (GLR-HLR):

Initiator: GLR_Update_Location_HLR;

Responder: Update_Location_HLR;

Process Cancel Location (VLR-GLR):

Initiator: GLR_Cancel_Location_VLR;

Responder: Cancel_Location_VLR;

Process Cancel Location (GLR-HLR):

Initiator: Cancel_Location_HLR;

Responder: Cancel_Location_GLR;

Process Purge MS (VLR-GLR):

Initiator: Purge_MS_VLR;

Responder: Purge_MS_GLR;

Process Purge MS (GLR-HLR):

Initiator: GLR_Purge_MS_HLR;

Responder: Purge_MS_HLR;

A Location Management Coordinator in the GLR coordinates the two protocol processes "Update_Location_GLR" (subclause 19.1.2) and "RESTORE_DATA_GLR" (subclause 19.2) that are addressed by the same application context.

On receipt of a dialogue request for the Location Management Application Context, the location Management_Coordinator_GLR will:

- Terminate the process in case of parameter problems; or

- Revert to MAP version Vr protocol if the VLR requests version Vr protocol; or

- Continue as described in the following, if the dialogue is accepted.

The protocol process is created depending on the first primitive received from the MAP service provider within this dialogue:

- Update_Location_GLR if the primitive is a MAP_UPDATE_LOCATION indication;

- RESTORE_DATA_GLR if the primitive is a MAP_RESTORE_DATA indication.

If a MAP_NOTICE indication is received instead, the dialogue towards the VLR is terminated and the process returns to idle state.

After creation of the protocol process the service primitive received from the MAP service-provider is passed to the protocol 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.
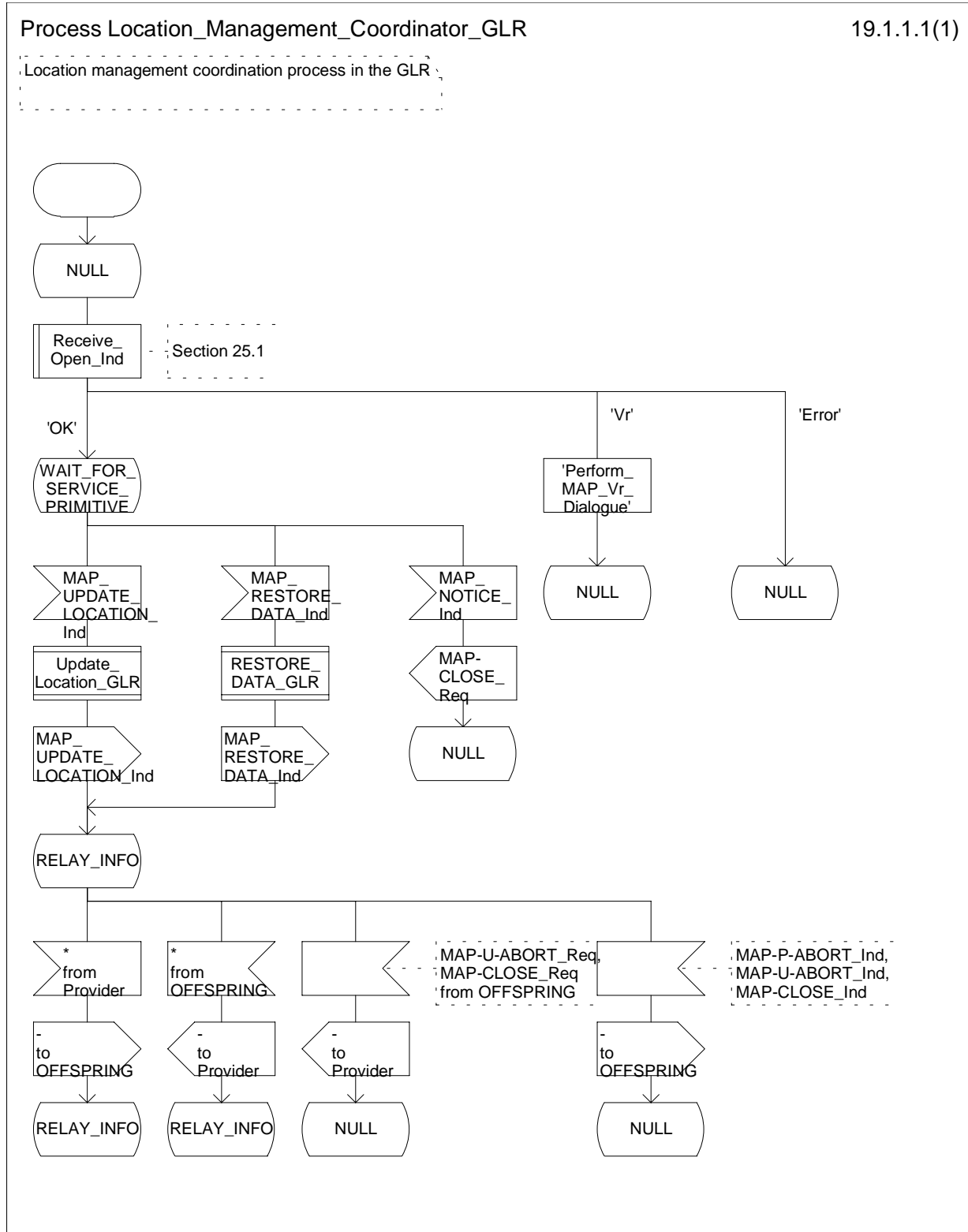
Figure 19.1.1/1: Process Location_Management_Coordinater_GLR

For GPRS subscribers, this subclause comprises a number of other processes to handle the mobile nature of the subscriber. The processes will be addressed by SCCP Sub-System Number (SGSN or HLR) and the Application Context. The processes in the GLR interact with the processes in the VLR, SGSN or HLR defined in 29.002. The followings show the relations between the processes in the GLR and the processes in the other node.

Process GPRS Update Location (VLR or SGSN-GLR):

Initiator: GPRS_Update_Location_Area_VLR, or SGSN_Update_HLR,

Responder: Update_GPRS_Location_GLR;

Process GPRS Update Location (GLR-HLR):

Initiator: GLR_Update_GPRS_Location_HLR,

Responder: Update_GPRS_Location_HLR;

Process Cancel Location (SGSN-GLR):

Initiator: GLR_Cancel_Location_SGSN;

Responder: Cancel_Location_SGSN;

Process Cancel Location (GLR-HLR):

Initiator: Cancel_GPRS_Location_HLR;

Responder: Cancel_GPRS_Location_GLR;

Process Purge MS (SGSN-GLR):

Initiator: Purge_MS_SGSN;

Responder: Purge_MS_GLR_for_GPRS.

Process Purge MS (GLR-HLR):

Initiator: GLR_Purge_MS_HLR_for_GPRS;

Responder: Purge_MS_HLR;

19.1.2   Location updating

19.1.2.1   General

This location updating procedure is used to update the location information held in the network.

If GLR is located between the VLR and the HLR, the MAP_UPDATE_LOCATION service is invoked towards the GLR whose identity is contained in the VLR table. When the GLR receives a MAP_UPDATE_LOCATION indication, it determines whether it invokes the MAP_UPDATE_LOCATION service towards the HLR, and invokes it if nessesary.

If GLR is located between the SGSN and the HLR, the MAP_UPDATE_GPRS_LOCATION service is invoked towards the GLR whose identity is contained in the SGSN table. When the GLR receives a MAP_UPDATE_GPRS_LOCATION indication, it determines whether it invokes the MAP_UPDATE_GPRS_LOCATION service towards the HLR, and invokes it if nessesary.

```
+----+                   +----+                   +----+                   +-----+
•VLR/•                   |    |                   •    •                   •PGLR/•
•SGSN+-----+----------•GLR •-------+---------•HLR +-------+---------•PVLR/•
•    •                   |    |                   •    •                   •PSGSN•
+----+                   +----+                   +----+                   +-----+
  •                        •                        •                        •
  • MAP UPDATE_LOCATION  •                        •                        •
  •-------------------->•                        •                        •
  • or MAP UPDATE GPRS  •  MAP UPDATE_LOCATION  •    MAP_CANCEL_        •
  •  LOCATION             •  -------------------->• -------------------->•
  •                        •or MAP UPDATE GPRS   •    LOCATION           •
  •                        •    LOCATION           •                        •
  •                        •                        •                        •
  •                        •                        •  MAP_CANCEL_LOCATION  •
  •                        •                        •<--------------------  •
  •                        •                        •         ack           •
  •MAP INSERT SUBSCRIBER•MAP INSERT SUBSCRIBER •                        •
  •       DATA            •       DATA            •                        •
  •<-------------------•<--------------------•                        •
  •                        •                        •                        •
  •                        •                        •                        •
  •MAP INSERT SUBSCRIBER•MAP INSERT SUBSCRIBER •                        •
  •       DATA            •       DATA            •                        •
  •-------------------->•-------------------->  •                        •
  •       ack             •       ack             •                        •
  •                        •                        •                        •
  •                        •                        •                        •
  •MAP CHECK SS          •MAP CHECK SS          •                        •
  •       INDICATION     •       INDICATION     •                        •
  •<-------------------•<--------------------•                        •
  •                        •                        •                        •
  •                        •                        •                        •
  •MAP UPDATE_LOCATION  •MAP UPDATE_LOCATION  •                        •
  •or MAP UPDATE_GPRS   •or MAP UPDATE_GPRS   •                        •
  •       LOCATION        •       LOCATION        •                        •
  •<-------------------•<--------------------  •                        •
  •       ack             •       ack             •                        •
  •                        •                        •                        •
```

Figure 19.1.2/1: Interface and services for Location updating

19.1.2.2   Detailed procedure in the GLR

Figure 19.1.2/2 shows the Process Update_Location_GLR. This process is a GLR MAP prorocol machine handling location updating and is a responder to the VLR.

Process Update_Location_GLR 19.1.2.2_1(3)

GLR MAP protocol machine handling location updating and interfaceing with VLR MAP protocol machine

Left to VLR
Right to GLR
application

WAIT_FOR_
SERVICE_
PRIMITIVE

MAP_Update_
Location_ind

Update
Location

2

WAIT_FOR_
APPLICATION_
RESPONSE

Update Location Ack	Update Location Negative Response	Insert_ Subscriber Data	Forward check SS indication	Abort

Set result

Set Error

1

WAIT_FOR_
APPLICATION_
RESPONSE

MAP_U_
ABORT_req

MAP_UPDATE_
LOCATION_Rsp.
MAP_CLOSE_Req.

MAP_UPDATE_
LOCATION_Rsp.
MAP_CLOSE_Req.

MAP_FORWARD_
CHECK_SS_INDICATION_req
MAP_DELIMITER_req

Figure 19.1.2/2 (sheet 1 of 3): Process Update_Location_GLR

Process Update_Location_GLR 19.1.2.2_2(3)

GLR MAP protocol machine
handling location updating and
interfaceing with VLR MAP
protocol machine

(1)

MAP_Insert_Subscriber_Data_Req
MAP_Delimiter_Req

WAIT_FOR_ISD_Cnf_
WAIT_FOR_SUBSEQUENT_
APPLICATION_RESPONSE

Left to VLR
Right to GLR
application

MAP_Insert_Subscriber_
Data_Cnf

MAP_U_ABORT_Ind
MAP_P_ABORT_Ind
MAP_CLOSE_Ind

MAP_NOTICE_
Ind

Abort

Set Negative
Result
System Failure

ISD
Negative Response

(2)

Check
Confirmation

Section 25.2

OK

Provider error
Data error

User error

Insert_Subscriber_
Data_Cnf

Set Negative
Response
System Failure

MAP User Error
to Negative
Response

(2)

ISD
Negative Response

(2)

Figure 19.1.2/2 (sheet 2 of 3): Process Update_Location_GLR

Process Update_Location_GLR 19.1.2.2_3(3)

GLR MAP protocol machine
handling location updating and
interfaceing with VLR MAP
protocol machine

Left to VLR
Right to GLR
application

WAIT_FOR_ISD_Cnf_
WAIT_FOR_SUBSEQUENT_
APPLICATION_RESPONSE

Update Location Ack	Update Location Negative Response	Insert Subscriber Data	Abort
Set result	Set Error	(1)	MAP_U_ ABORT_Req.

MAP_UPDATE_
LOCATION_Rsp.
MAP_CLOSE_Req.
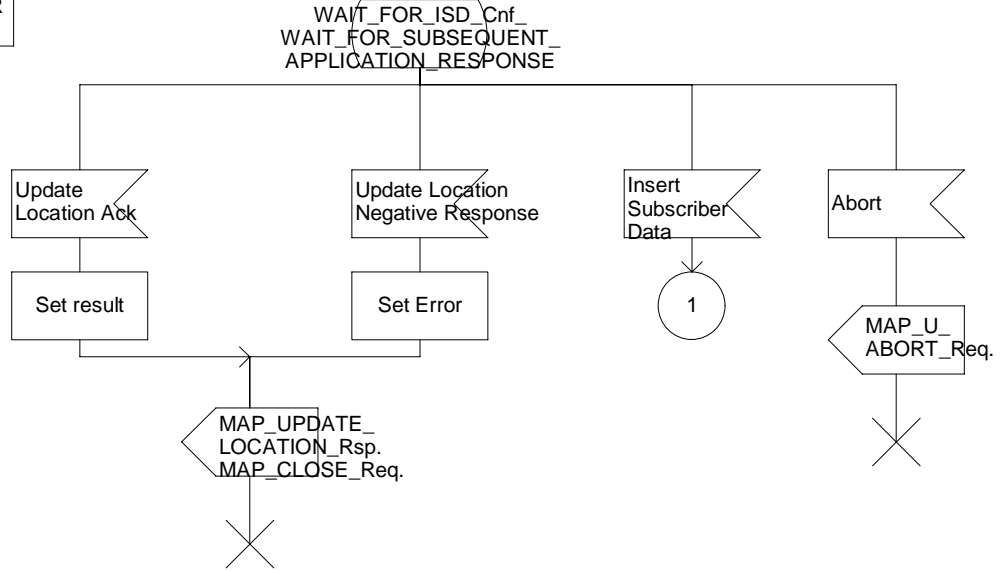
Figure 19.1.2/2 (sheet 3 of 3): Process Update_Location_GLR

Figure 19.1.2/3 shows the Process GLR_Update_Location_HLR. This process is a GLR MAP prorocol machine handling location updating and is an initiateor to the HLR.

Sheet 1: If the Macro Open_Receive_Cnf results Vr, the process rquests to perform MAP Vr. It causes a request for sending an abort message to Process Update_Location_GLR.
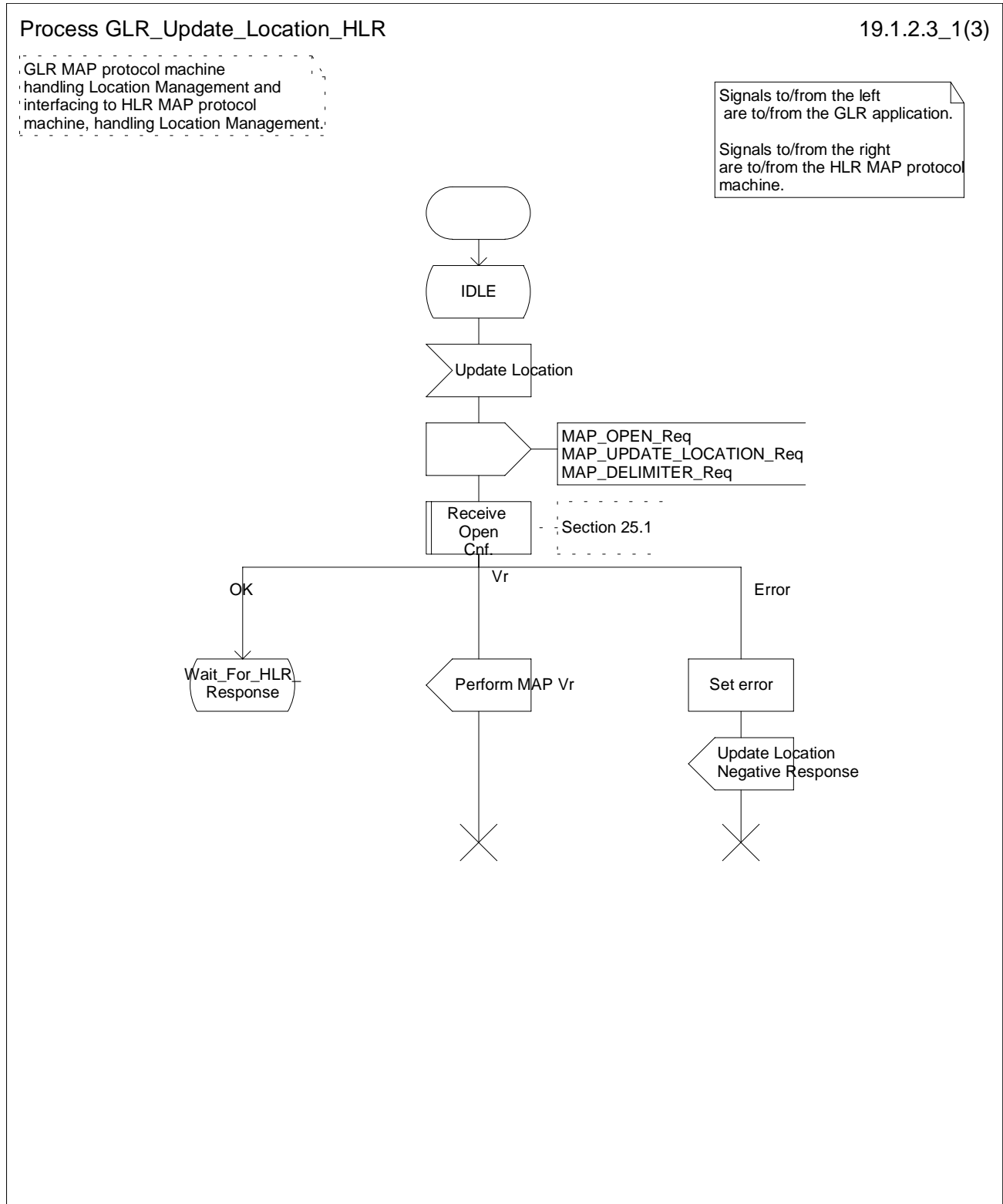
Figure 19.1.2/3 (Sheet 1 of 3): Process GLR_Update_Location_HLR

Process GLR_Update_Location_HLR 19.1.2.3_2(3)

GLR MAP protocol machine
handling Location Management and
interfacing to HLR MAP protocol
machine, handling Location Management.

Signals to/from the left
are to/from the GLR application.

Signals to/from the right
are to/from the HLR MAP protocol
machine.
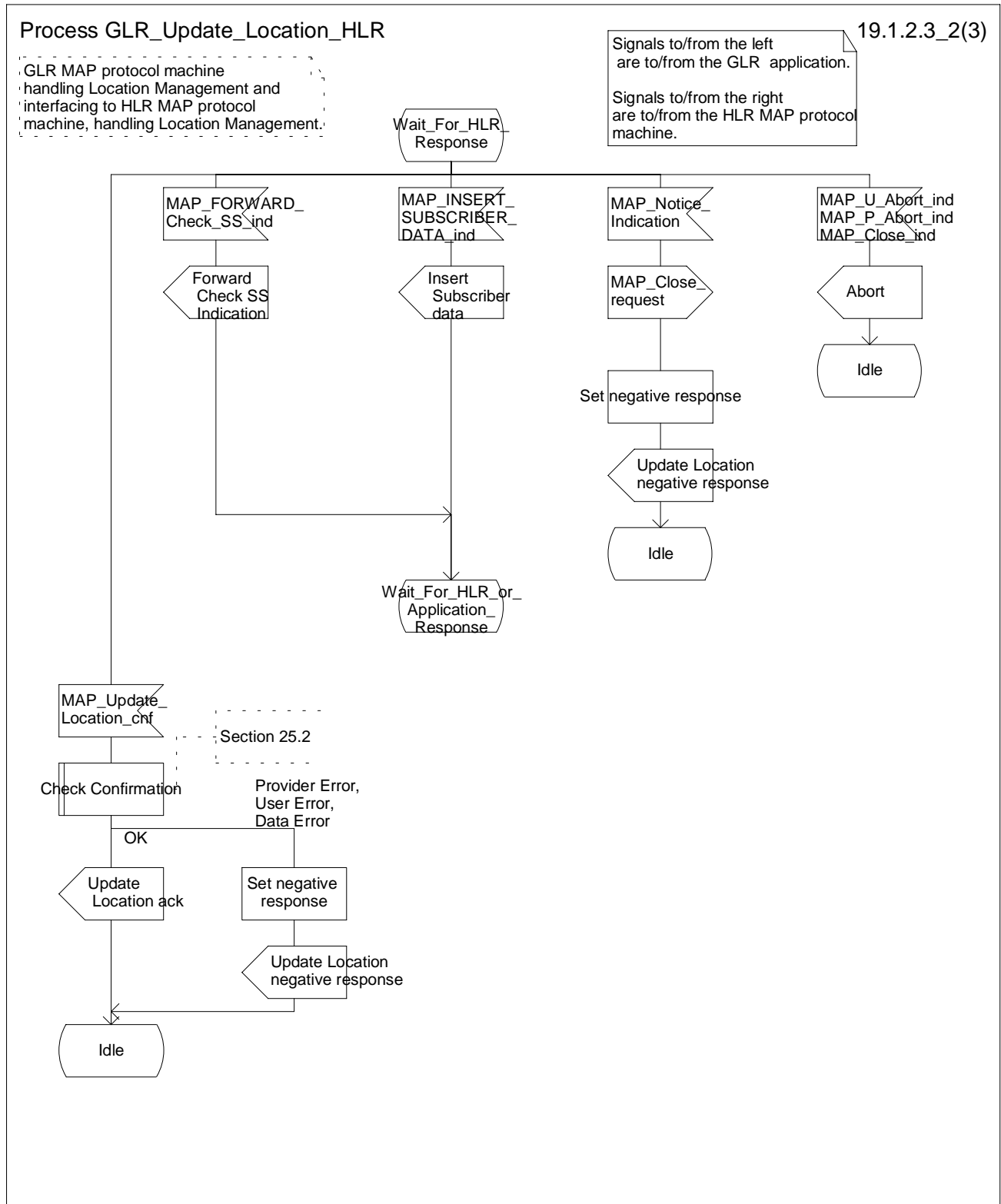
Figure 19.1.2/3 (Sheet 2 of 3): Process GLR_Update_Location_HLR
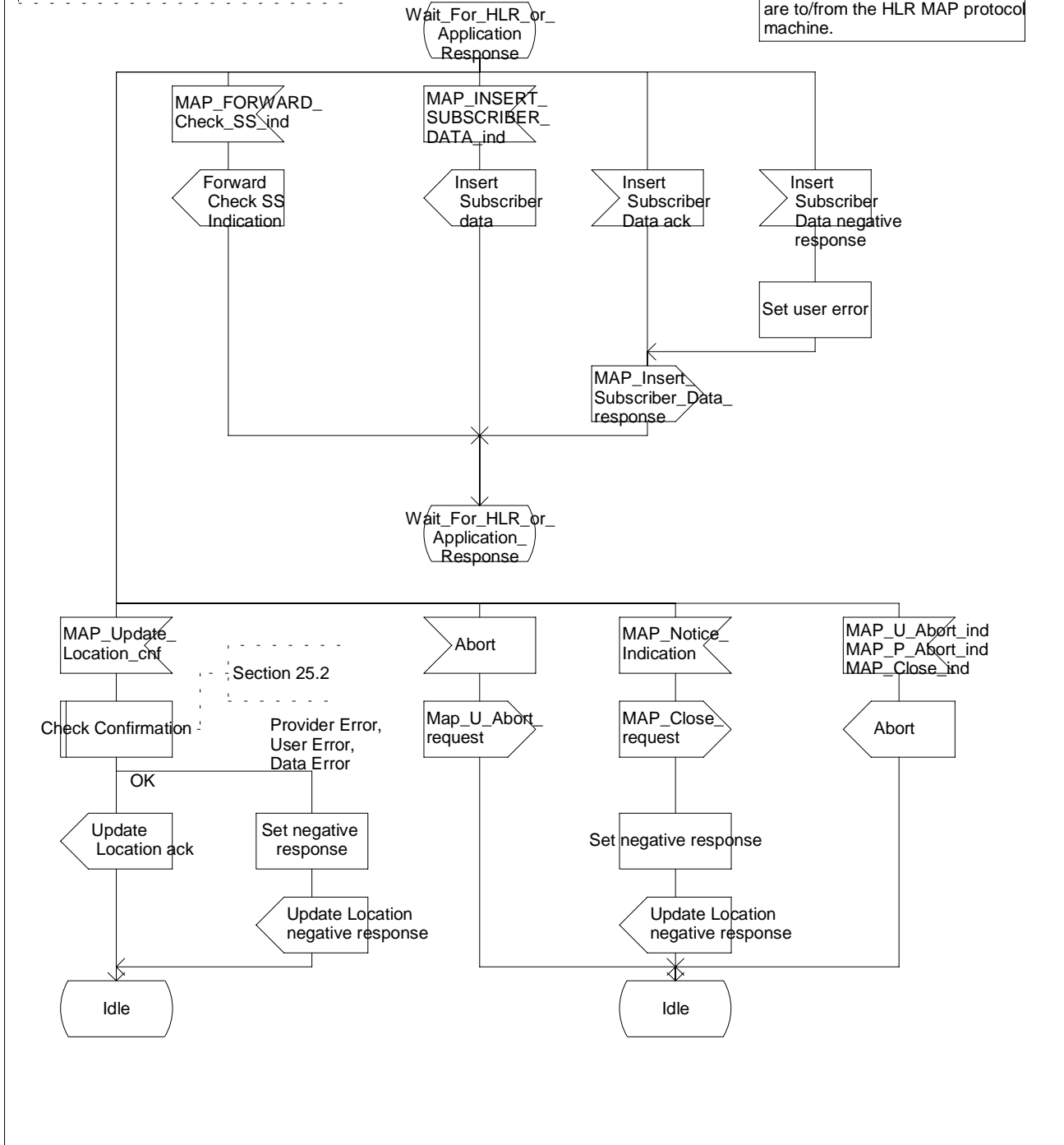
Figure 19.1.2/3 (Sheet 3 of 3): Process GLR_Update_Location_HLR

Figure 19.1.2/4 shows the Process Update_GPRS_Location_GLR. This process is a GLR MAP prorocol machine handling location updating and is a responder to the SGSN.
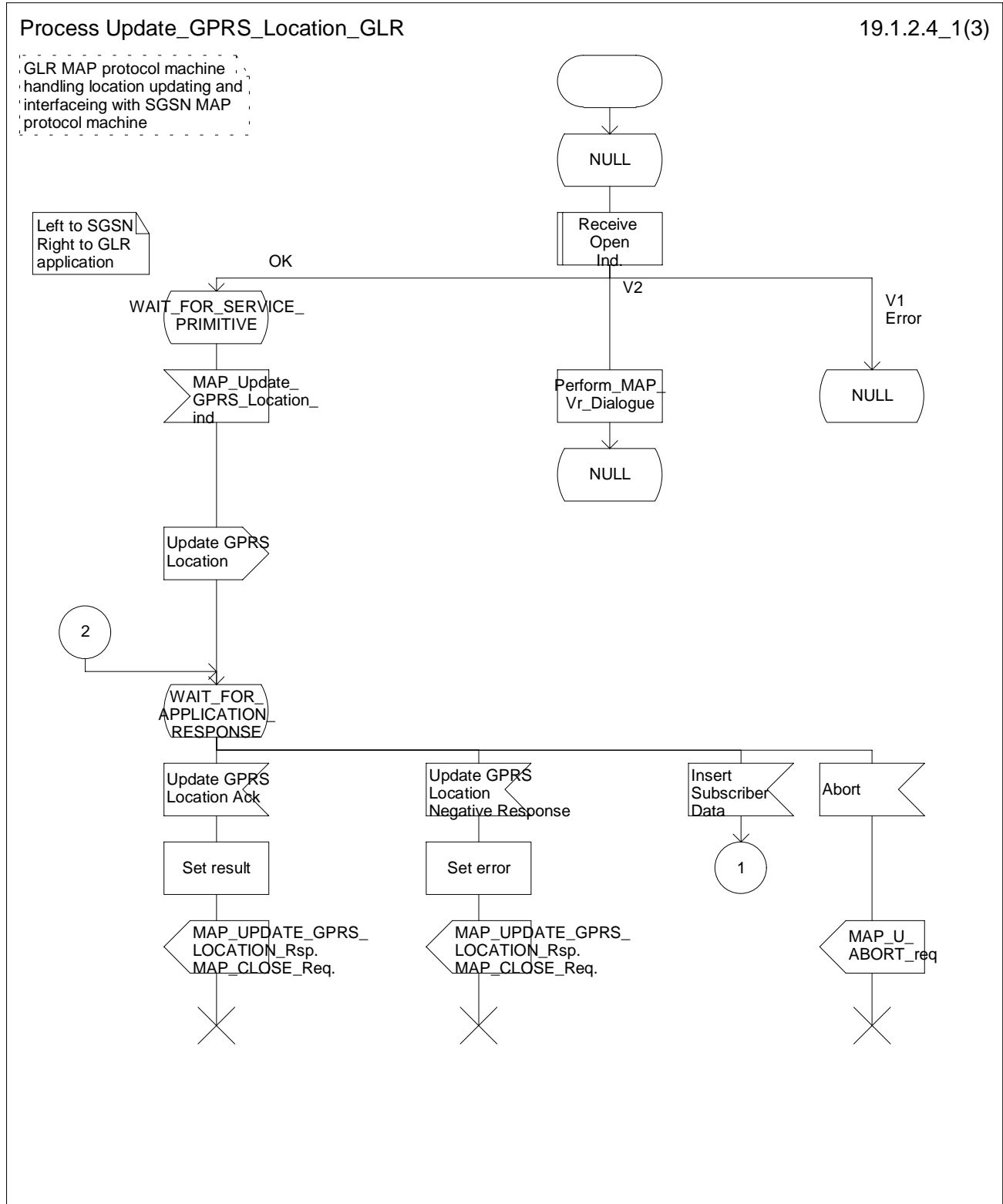
Figure 19.1.2/4 (sheet 1 of 3): Process Update_GPRS_Location_GLR

Process Update_GPRS_Location_GLR 19.1.2.4_2(3)

GLR MAP protocol machine
handling location updating and
interfaceing with SGSN MAP
protocol machine

1

Left to SGSN
Right to GLR
application

3

MAP_Insert_Subscriber_Data_Req
MAP_Delimiter_Req

WAIT_FOR_ISD_Cnf_
WAIT_FOR_SUBSEQUENT_
APPLICATION_RESPONSE

MAP_Insert_Subscriber_
Data_Cnf

MAP_U_ABORT_Ind
MAP_P_ABORT_Ind
MAP_CLOSE_Ind

MAP_NOTICE_
Ind

Abort

Set Negative
Result
System Failure

ISD
Negative Response

3

Check
Confirmation

Section 25.2

OK

Provider error
Data error

User error

Insert_Subscriber_
Data_Cnf

Set Negative
Response
System Failure

MAP User Error
to Negative
Response

2

ISD
Negative Response

2

Figure 19.1.2/4 (sheet 2 of 3): Process Update_GPRS_Location_GLR

Process Update_GPRS_Location_GLR 19.1.2.4_3(3)

GLR MAP protocol machine
handling location updating and
interfaceing with SGSN MAP
protocol machine

Left to SGSN
Right to GLR
application

WAIT_FOR_ISD_Cnf_
WAIT_FOR_SUBSEQUENT_
APPLICATION_RESPONSE

Update
Location Ack

Update GPRS Location
Negative Response

Insert
Subscriber
Data

Abort

Set result

Set Error

(1)

MAP_U_
ABORT_req

MAP_UPDATE_
LOCATION_Rsp.
MAP_CLOSE_Req.
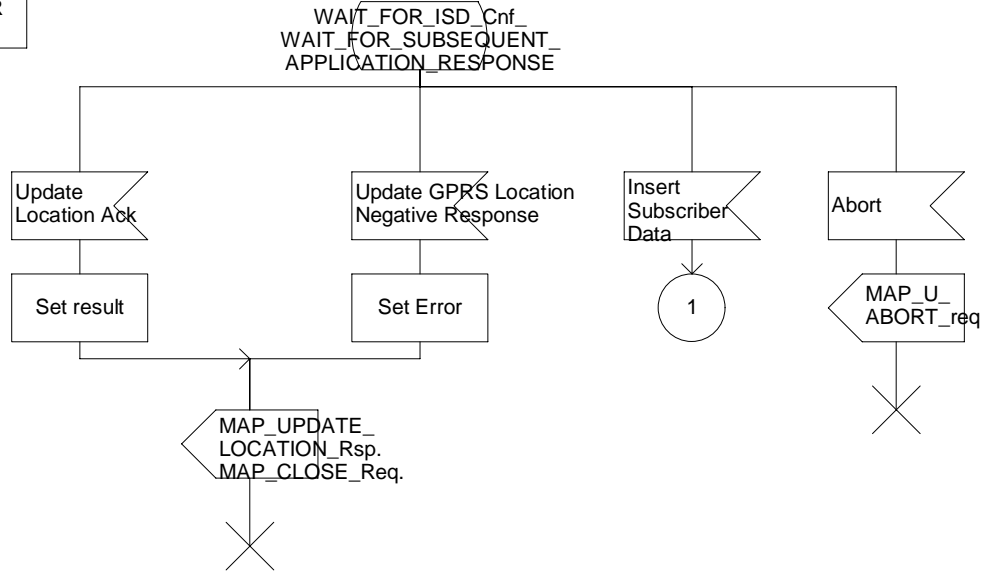
Figure 19.1.2/4 (sheet 3 of 3): Process Update_GPRS_Location_GLR

Figure 19.1.2/5 shows the Process GLR_Update_GPRS_Location_HLR. This process is a GLR MAP prorocol machine handling location updating and is an initiateor to the HLR.

Sheet 1: If the Macro Open_Receive_Cnf results Vr, the process rquests to perform MAP Vr. It causes a request for sending an abort message to Process Update_GPRS_Location_GLR.

Figure 19.1.2/5 (Sheet 1 of 3): Process GLR_Update_GPRS_Location_HLR

Process GLR_Update_GPRS_Location_HLR 19.1.2.5_2(3)

GLR MAP protocol machine
handling Location Management and
interfacing to HLR MAP protocol
machine, handling Location Management.

Signals to/from the left
are to/from the GLR application.

Signals to/from the right
are to/from the HLR MAP protocol
machine.

Wait_For_HLR_
Response

MAP_Update_GPRS_
Location_cnf

MAP_INSERT_
SUBSCRIBER_
DATA_ind

MAP_Notice_
Indication

MAP_U_Abort_ind
MAP_P_Abort_ind
MAP_Close_ind

Check Confirmation | Section 25.2

Insert
Subscriber
Data

MAP_Close_
request

Abort

OK

Provider Error,
User Error,
Data Error

Set negative response

Update GPRS
Location ack

Set negative
response

Wait_For_HLR_or_
Application_
Response

Update GPRS Location
negative response

Idle

Update GPRS Location
negative response

Idle

Figure 19.1.2/5 (Sheet 2 of 3): Process GLR_Update_GPRS_Location_HLR

Process GLR_Update_GPRS_Location_HLR 19.1.2.5_3(3)

GLR MAP protocol machine handling Location Management and interfacing to HLR MAP protocol machine, handling Location Management.

Signals to/from the left are to/from the GLR application.

Signals to/from the right are to/from the HLR MAP protocol machine.

Wait_For_HLR_or_ Application Response

MAP_INSERT_ SUBSCRIBER_ DATA_ind

Insert Subscriber Data

Insert Subscriber Data ack

Insert Subscriber Data negative response

Set user error

MAP_Insert Subscriber_Data_ response

Wait_For_HLR_or_ Application_ Response

MAP_Update_GPRS_ Location_cnf

Section 25.2

Abort

MAP_Notice_ Indication

MAP_U_Abort_ind MAP_P_Abort_ind MAP_Close_ind

Check Confirmation

Provider Error, User Error, Data Error

Map_U_Abort_ request

MAP_Close_ request

Abort

OK

Update GPRS Location ack

Set negative response

Set negative response

Update GPRS Location negative response

Update GPRS Location negative response

Idle

Idle

Figure 19.1.2/5 (Sheet 3 of 3): Process GLR_Update_GPRS_Location_HLR

19.1.3 Location Cancellation

19.1.3.1 General

The purpose of this process is to delete a subscriber's record from a previous GLR/VLR/SGSN after she has registered with a new GLR/VLR/SGSN. The procedure may also be used if the subscriber's record is to be deleted for other operator determined purposes. 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).

If GLR is located between the VLR or the SGSN and the HLR, the MAP_CANCEL_LOCATION service is invoked towards the GLR whose identity is contained in the HLR table.

```
+----+                      +----+                      +----+                      +----+
•VLR/•      D              |    |          D            •    •         D            •    •
•GLR +-----+----------•HLR •-------+---------•PGLR+-------+---------•PVLR•
+----+                      +----+                      +----+                      +----+
   •                           •                           •                           •
   •  MAP UPDATE_LOCATION       •                           •                           •
   •-------------------->•                           •                           •
   •                           •        MAP_CANCEL_         •        MAP_CANCEL_         •
   •                           • ------------------->•  ------------------->•
   •                           •        LOCATION            •        LOCATION            •
   •                           •                           •                           •
   •                           •                           •                           •
   •                           •  MAP_CANCEL_LOCATION       •  MAP_CANCEL_LOCATION       •
   •                           •<------------------- •<------------------- •
   •                           •            ack            •            ack            •
   •                           •                           •                           •
```

NOTE: The service shown in dotted lines indicates the trigger provided by other MAP signalling.

Figure 19.1.3/1: Interface and services for Location Cancellation
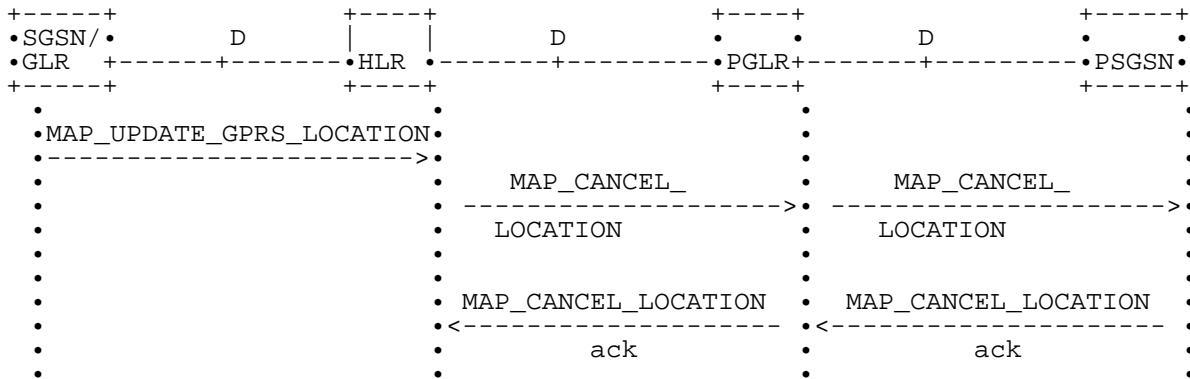
```
+-----+                     +----+                      +----+                      +-----+
•SGSN/•      D             |    |          D           •    •         D            •     •
•GLR   +------+-------•HLR •-------+---------•PGLR+-------+---------•PSGSN•
+-----+                     +----+                      +----+                      +-----+
   •                           •                           •                           •
   •MAP_UPDATE_GPRS_LOCATION•                           •                           •
   •----------------------->•                           •                           •
   •                           •        MAP_CANCEL_         •        MAP_CANCEL_         •
   •                           • ------------------->•  -------------------->•
   •                           •        LOCATION            •        LOCATION            •
   •                           •                           •                           •
   •                           •                           •                           •
   •                           •  MAP_CANCEL_LOCATION       •  MAP_CANCEL_LOCATION       •
   •                           •<------------------- •<------------------- •
   •                           •            ack            •            ack            •
   •                           •                           •                           •
```
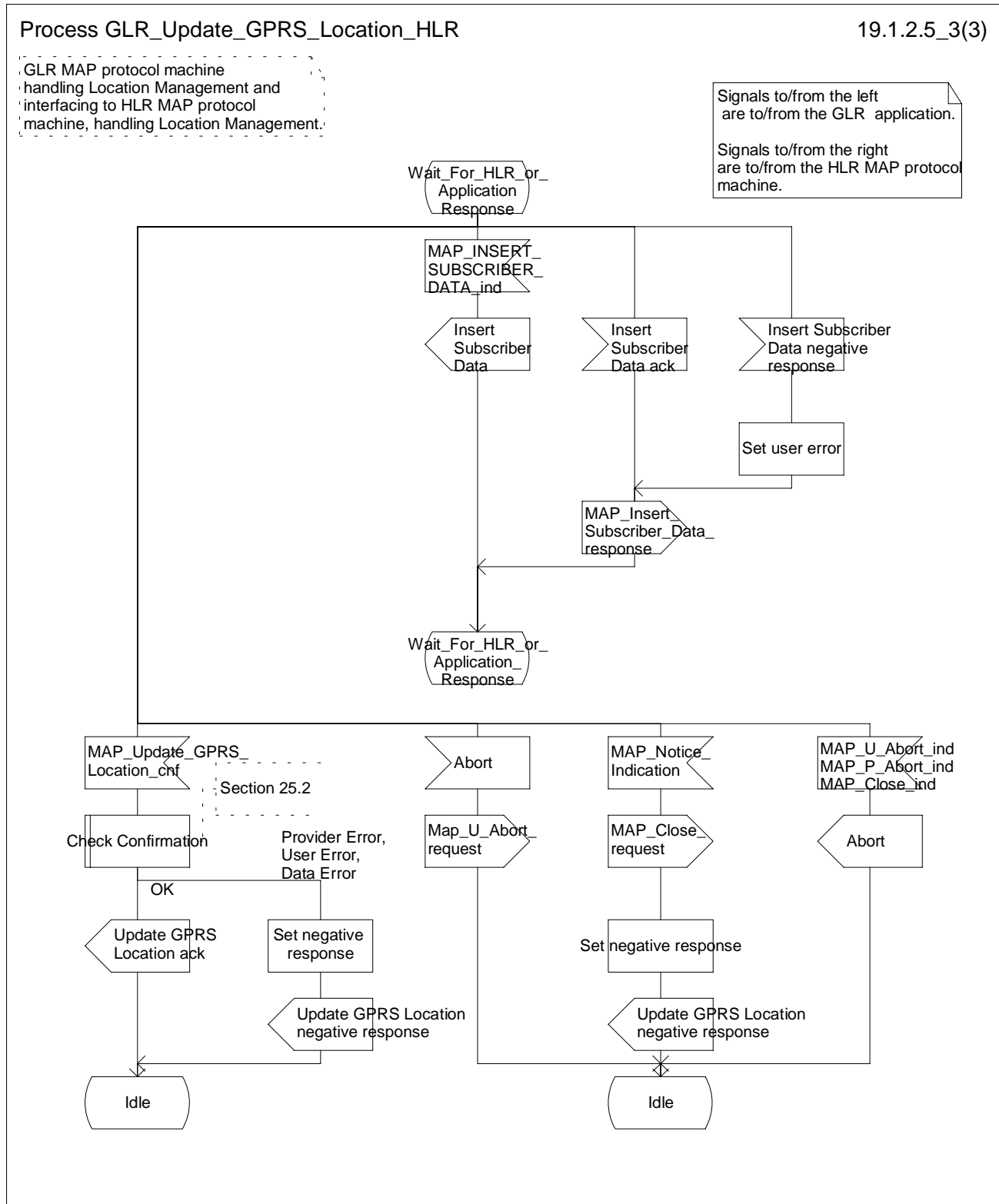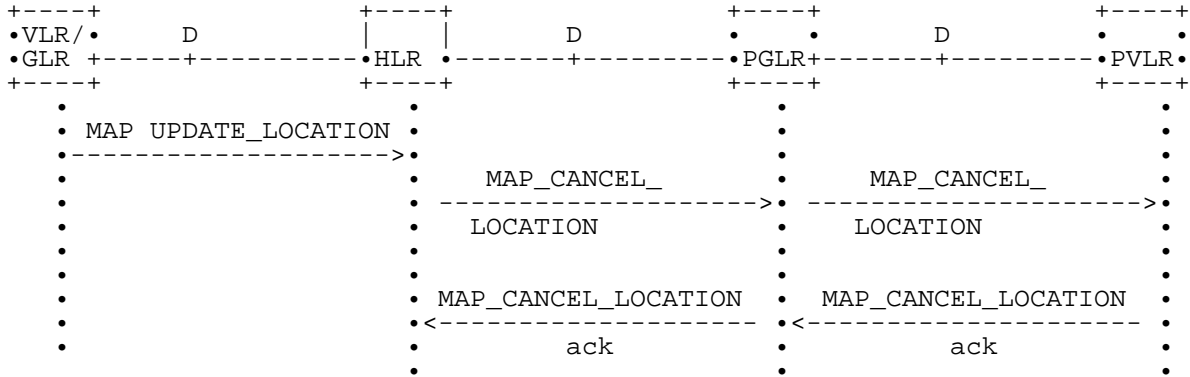
NOTE: The service shown in dotted lines indicates the trigger provided by other MAP signalling.

Figure 19.1.3/2: Interface and services for Location Cancellation in GPRS

Additionally, The MAP_CANCEL_LOCATION service is invoked when the GLR that stores the subscriber's record 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 GLR that stores the subscriber's record a MAP_UPDATE_GPRS_LOCATION indication from a SGSN other than stored in its table for this subscriber. The MAP_CANCEL_LOCATION service is in any case invoked towards the VLR or the SGSN whose identity is contained in the HLR table.

```
+----+           D           +----+      D            +-----+
•VLR/+-----------+-----------+GLR +-------+--------+PVLR/•
•SGSN|                       •    •                •PSGSN•
+----+                       +----+                +-----+
   •    MAP_UPDATE_LOCATION or  •                     •
   •    MAP_UPDATE_GPRS_LOCATION •                     •
   •----------------------------->•                     •
   •                            •     MAP_CANCEL_       •
   •                            • --------------------->•
   •                            •     LOCATION          •
   •                            •                       •
   •                            •                       •
   •                            •   MAP_CANCEL_LOCATION  •
   •                            •<--------------------  •
   •                            •           ack         •
   •                            •                       •
```
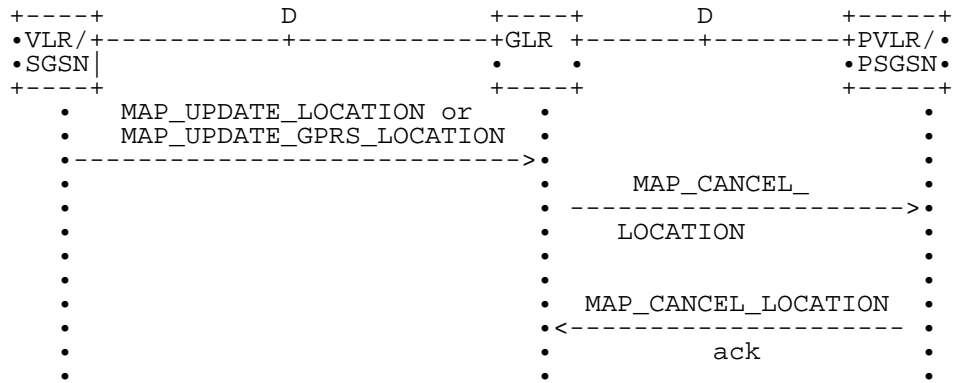
Figure 19.1.3/4: Interface and services for Location Cancellation in case that the GLR stores the subscriber's record

19.1.3.2   Detailed procedure in the GLR

Figure 19.1.3/5 shows the Process Cancel_Location_GLR. This process is a GLR MAP prorocol machine handling location cancellation and is a responder to the HLR.

Process Cancel_Location_GLR 19.1.3.5(1)

GLR MAP protocol machine handling Location cancelation and interfacing to HLR MAP protocol machine, handling Location Cancelation.

Signals to/from the left are to/from the GLR Location cancellation application.

Signals to/from the right are to/from the HLR MAP protocol machine, handling Location Cancellation.

NULL

Receive Open Ind.

OK

WAIT_FOR_SERVICE_ PRIMITIVE

V2

V1 Error

MAP_CANCEL_ LOCATION_ind

MAP_NOTICE_ind

Perform_MAP_ Vr_Dialogue

NULL

MAP_CLOSE_req

NULL

Cancel Location

NULL

NULL

WAIT_FOR_ APPLICATION_ RESPONSE

Cancel Location Ack

Cancel Location Negative response

Abort

MAP_CANCEL_LOCATION_Rsp. MAP_CLOSE_Req.

MAP_U_ABORT_req

NULL

NULL

Figure 19.1.3/5: Process Cancel_Location_GLR

Figure 19.1.3/6 shows the Process GLR_Cancel_Location_VLR. This process is a GLR MAP prorocol machine handling location cancellation and is an initiateor to the VLR.

Sheet 1: If the Macro Open_Receive_Cnf results Vr, the process rquests to perform MAP Vr. It causes a request for sending an abort message to Process Cancel_Location_GLR.

Figure 19.1.3/6: Process GLR_Cancel_Location_VLR

Figure 19.1.3/7 shows the Process Cancel_GPRS_Location_GLR. This process is a GLR MAP prorocol machine handling location cancellation and is a responder to the HLR.
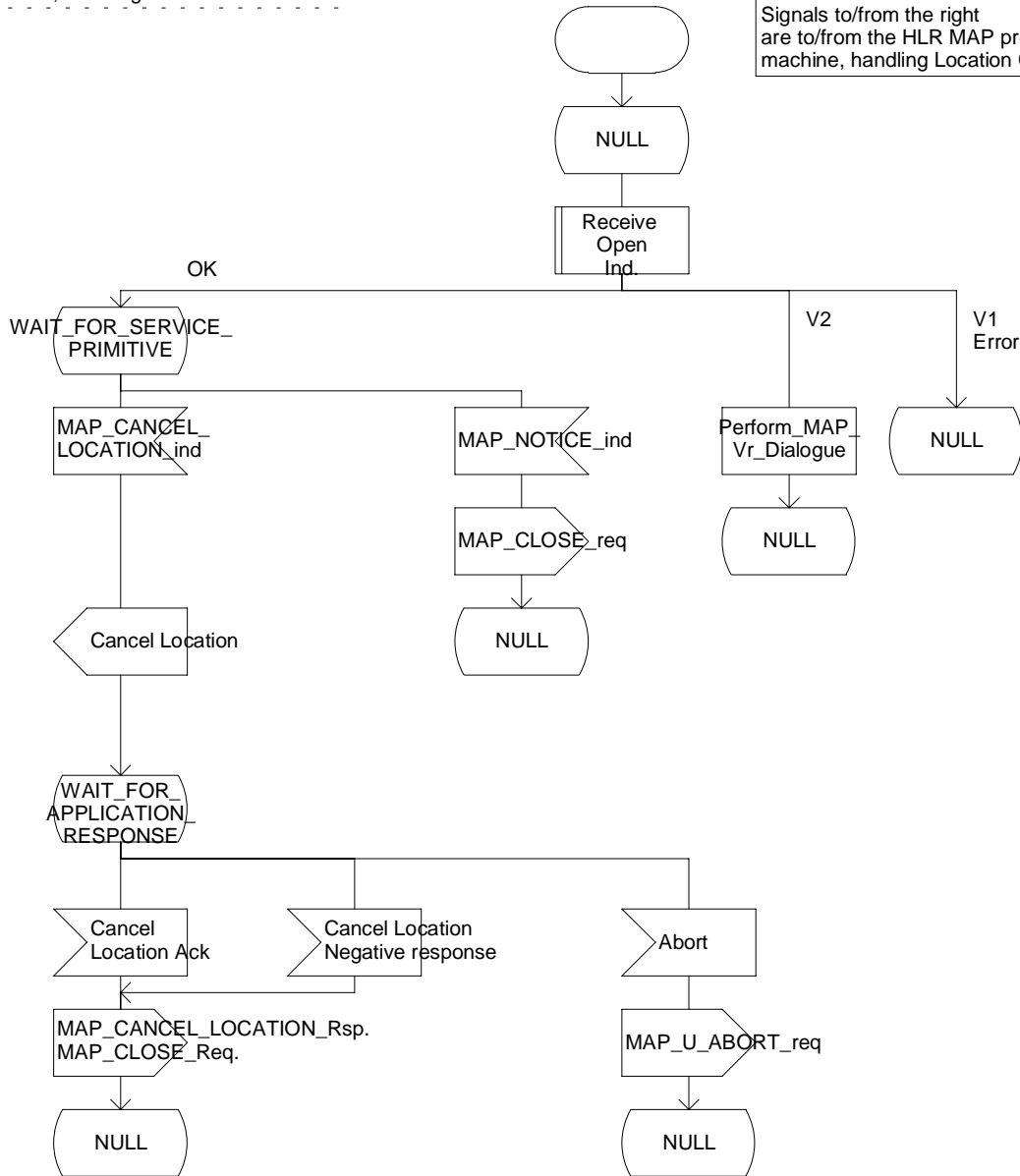

Figure 19.1.3/7: Process Cancel_GPRS_Location_GLR

Figure 19.1.3/8 shows the Process GLR_Cancel_Location_SGSN. This process is a GLR MAP prorocol machine handling location cancellation and is an initiateor to the SGSN.

Sheet 1: If the Macro Open_Receive_Cnf results Vr, the process rquests to perform MAP Vr. It causes a request for sending an abort message to Process Cancel_GPRS_Location_GLR.
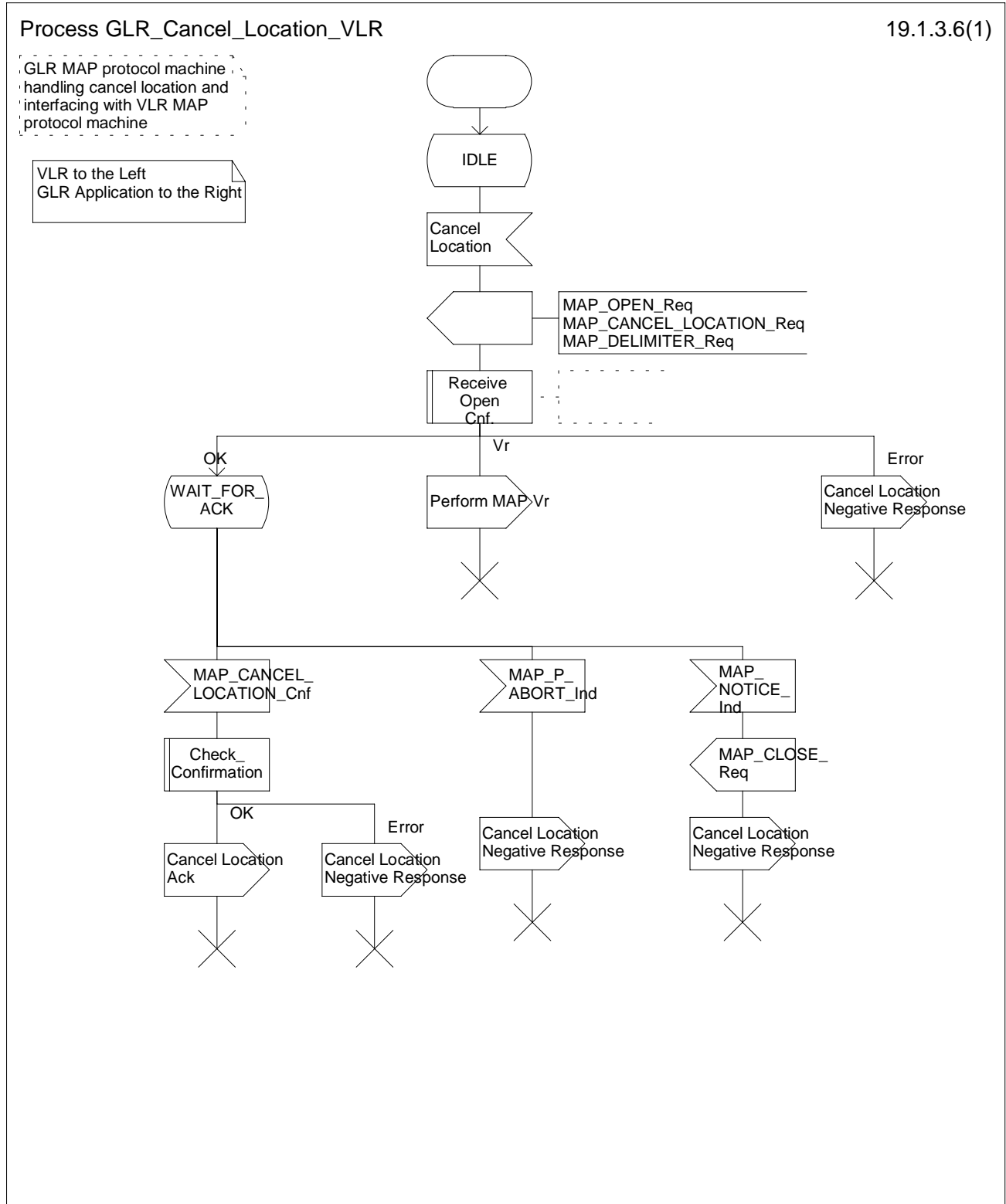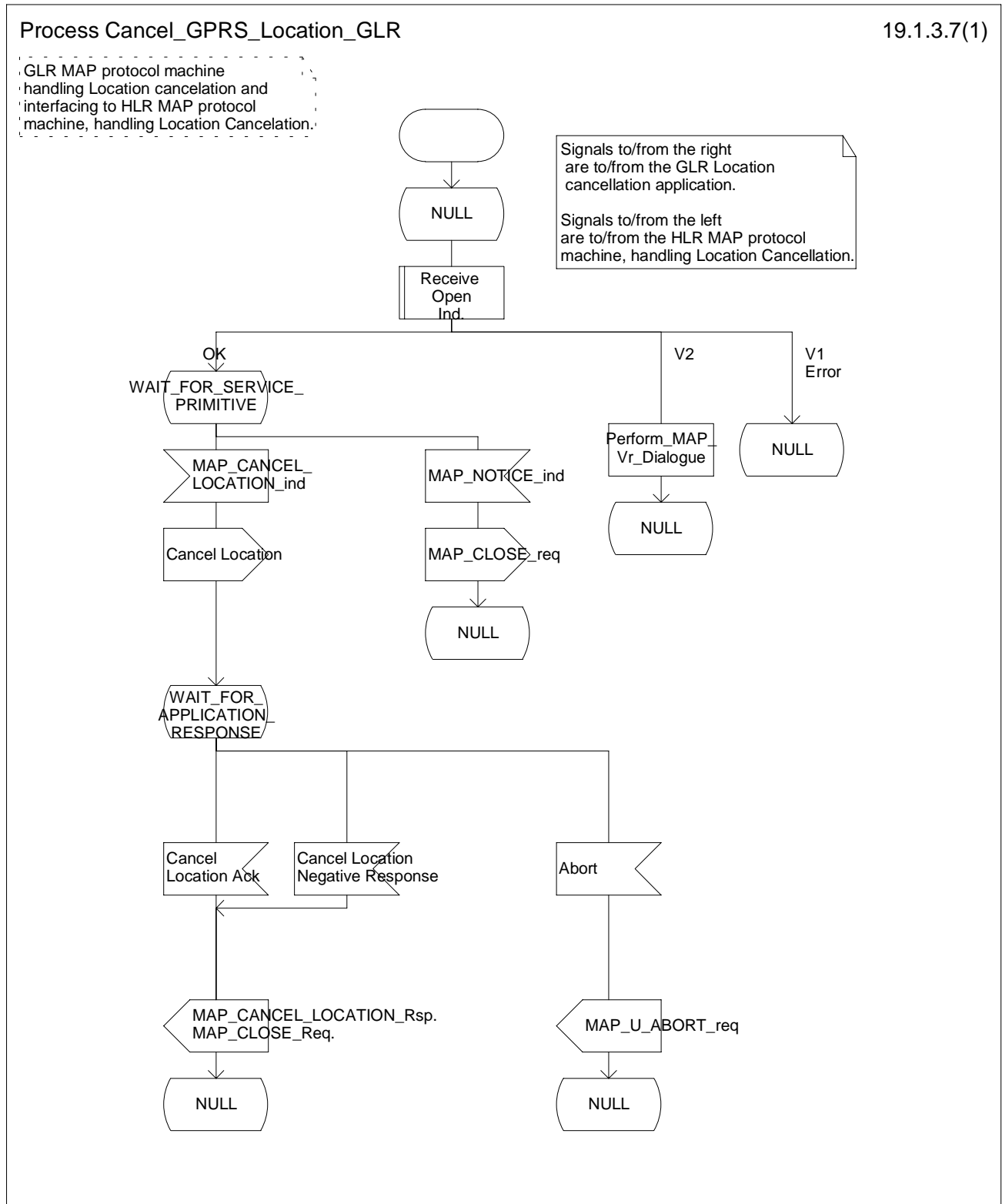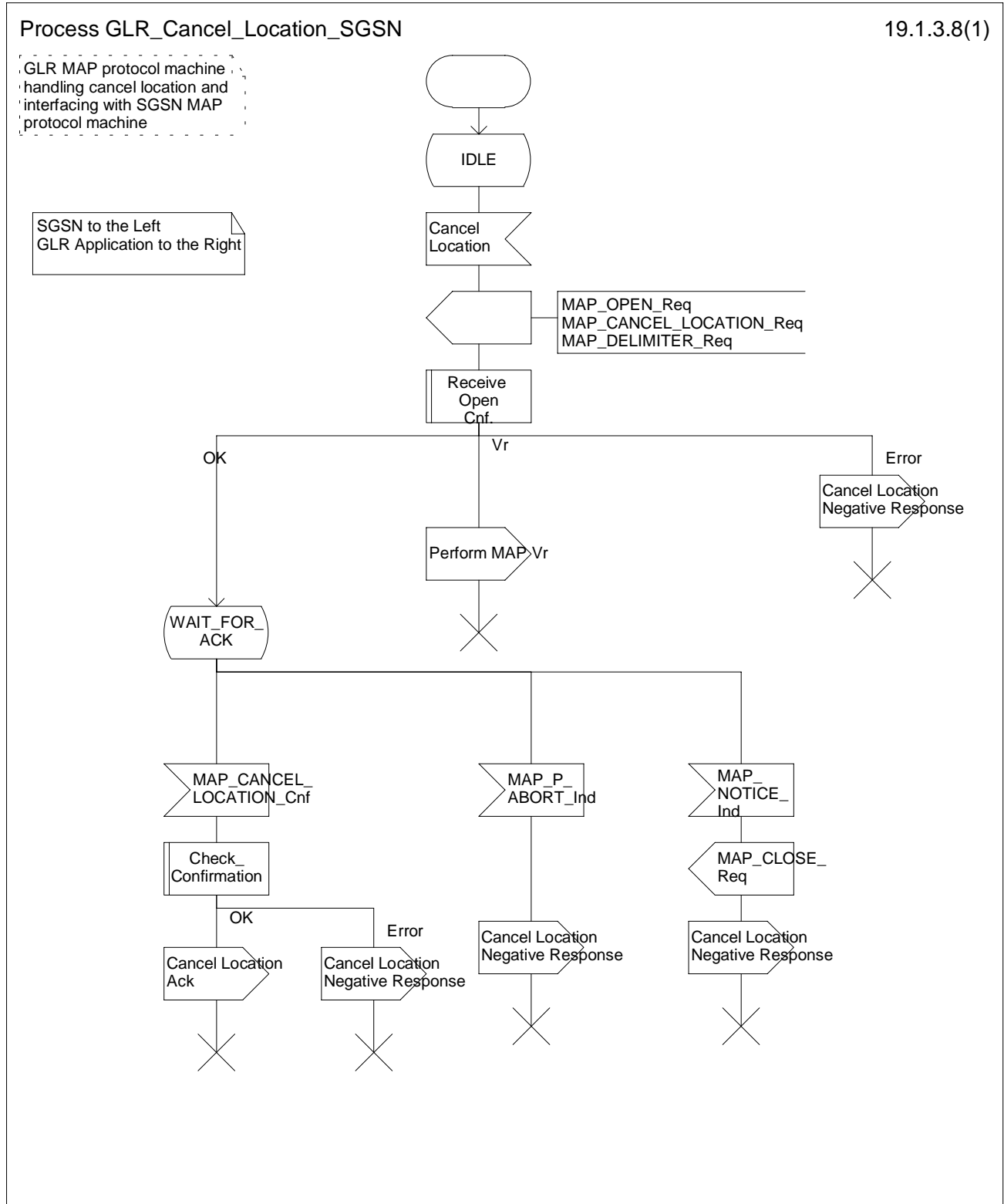

Figure 19.1.3/8: Process GLR_Cancel_Location_SGSN

19.1.4   Purge MS

19.1.4.1   General

This Purge MS procedure is used to treat any request for routing information for a mobile terminated call or a mobile terminated short message as if the MS is not reachable.

If GLR is located between the VLR or the SGSN and the HLR, the MAP_PURGE_MS service is invoked towards the GLR whose identity is contained in the VLR table or the SGSN table.

When the GLR receives a MAP_PURGE_MS indication, the GLR determines whether it invokes the MAP_PURGE_MS service towards the HLR.

```
+----+                     +----+                        +----+
•VLR/•                     |    |                        •    •
•SGSN+-----+----------+GLR +--------+--------• HLR•
+----+                     +----+                        +----+
    •                         •                              •
    •  MAP PURGE_MS           •                              •
    •------------------->•                              •
    •                         •  MAP PURGE_MS                •
    •                         • ------------------->•
    •                         •                              •
    •                         •                              •
    •                         •                              •
    •                         •     MAP PURGE_MS ack         •
    •   MAP_PURGE_MS ack      •<--------------------•
    •<-------------------•                              •
    •                         •                              •
```
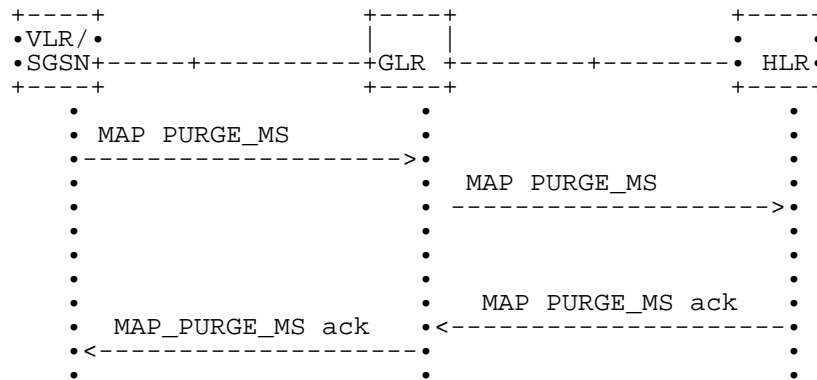**Figure 19.1.4/1: Interface and services for Purge MS**

19.1.4.2   Detailed procedure in GLR

Figure 19.1.4/2 shows the Process Purge_MS_GLR. This process is a GLR MAP prorocol machine handling purge MS and is a responder to the VLR.

Process Purge_MS_GLR   19.1.4.2(1)

GLR MAP protocol machine
handling purge MS

NULL

VLR to the Left
GLR Application to the Right

Receive
Open Ind.

OK

V1
Error

V2

WAIT_FOR_SERVICE_
PRIMITIVE

Perform_MAP_
Vr_Dialogue

NULL

NULL

MAP_NOTICE_
Ind

MAP_PURGE_
MS_Ind

MAP_CLOSE_
Req

Purge MS

WAIT_FOR_
APPLICATION_
RESPONSE

Purge MS
Ack

Purge MS
Negative Response

Abort

MAP_PURGE_MS_Rsp
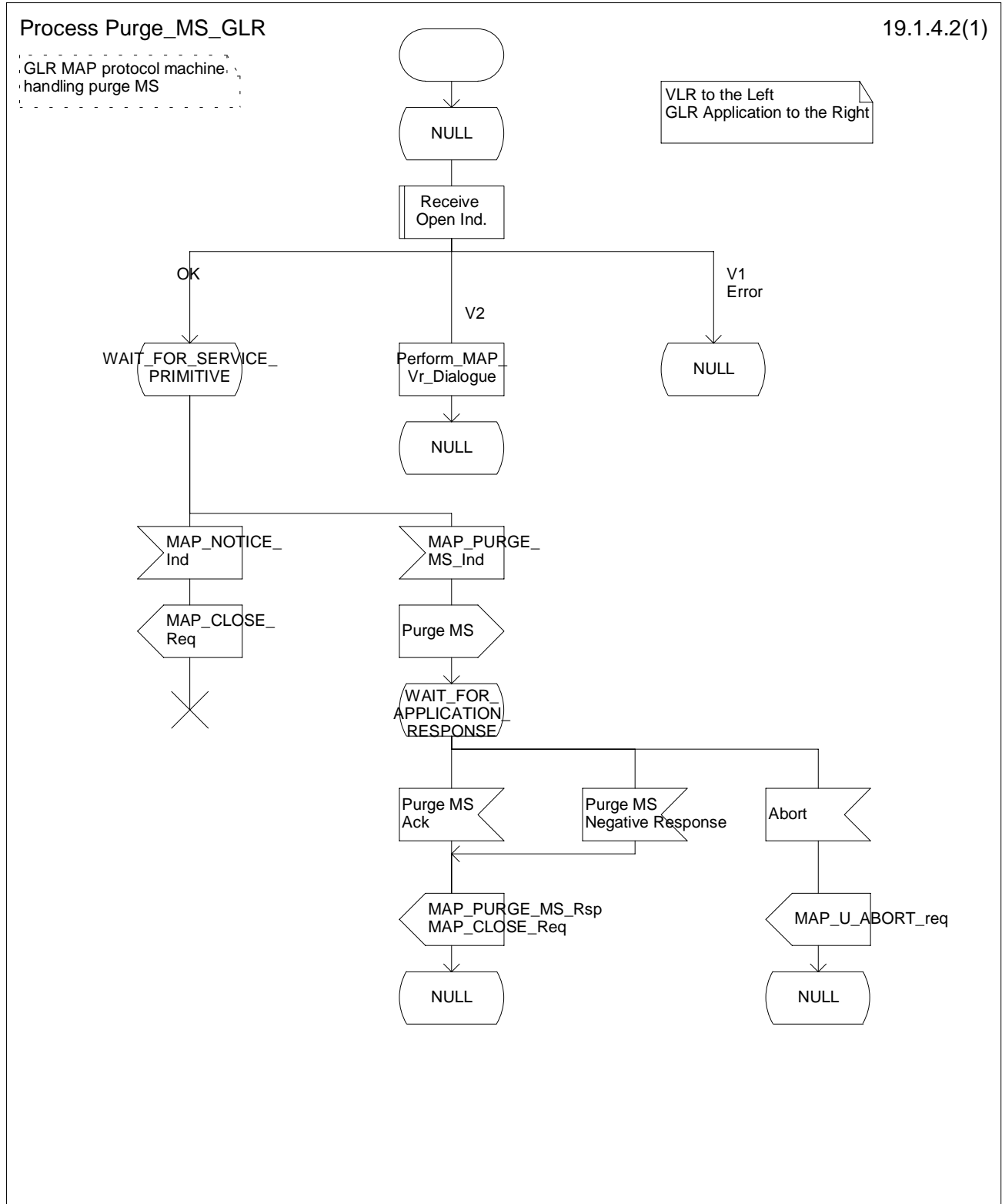MAP_CLOSE_Req

MAP_U_ABORT_req

NULL

NULL

Figure 19.1.4/2: Process Purge_MS_GLR

Figure 19.1.4/3 shows the Process GLR_Purege_MS_HLR. This process is a GLR MAP prorocol machine handling purge MS and is an initiator to the HLR.

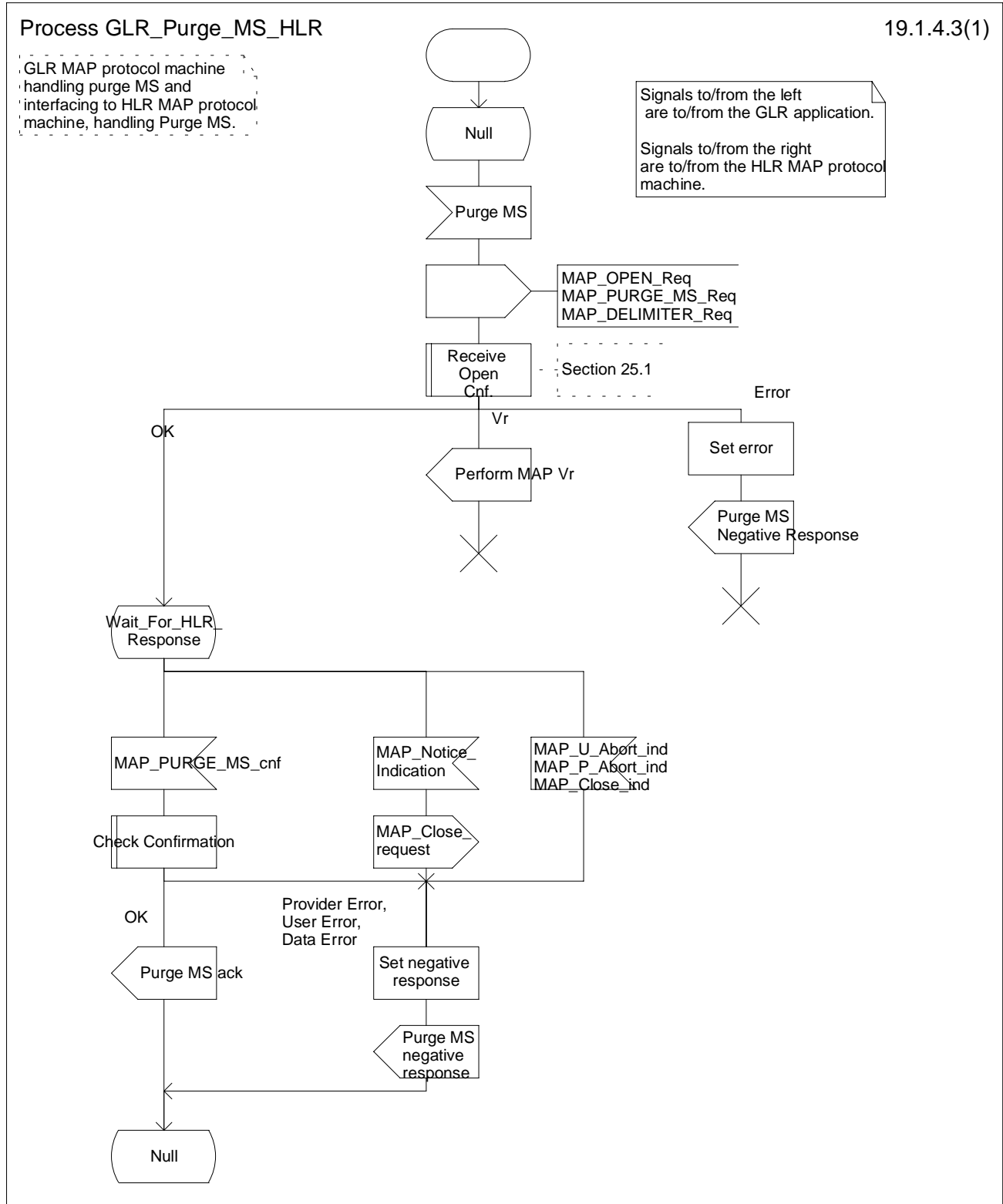**Figure 19.1.4/3: Process GLR_PURGE_MS_HLR**

Figure 19.1.4/4 shows the Process Purge_MS_GLR_for_GPRS. This process is a GLR MAP prorocol machine handling purge MS and is a responder to the SGSN.

Sheet 1: If the Macro Open_Receive_Cnf results Vr, the process rquests to perform MAP Vr. It causes a request for sending an abort message to Process PURGE_MS_GLR.

Figure 19.1.4/4: Process Purge_MS_GLR_for_GPRS

Figure 19.1.4/5 shows the Process GLR_Purge_MS_HLR_for_GPRS. This process is a GLR MAP prorocol machine handling purge MS and is an initiateor to the HLR.

Sheet 1: If the Macro Open_Receive_Cnf results Vr, the process rquests to perform MAP Vr. It causes a request for sending an abort message to Process PURGE_MS_GLR_for_GPRS.
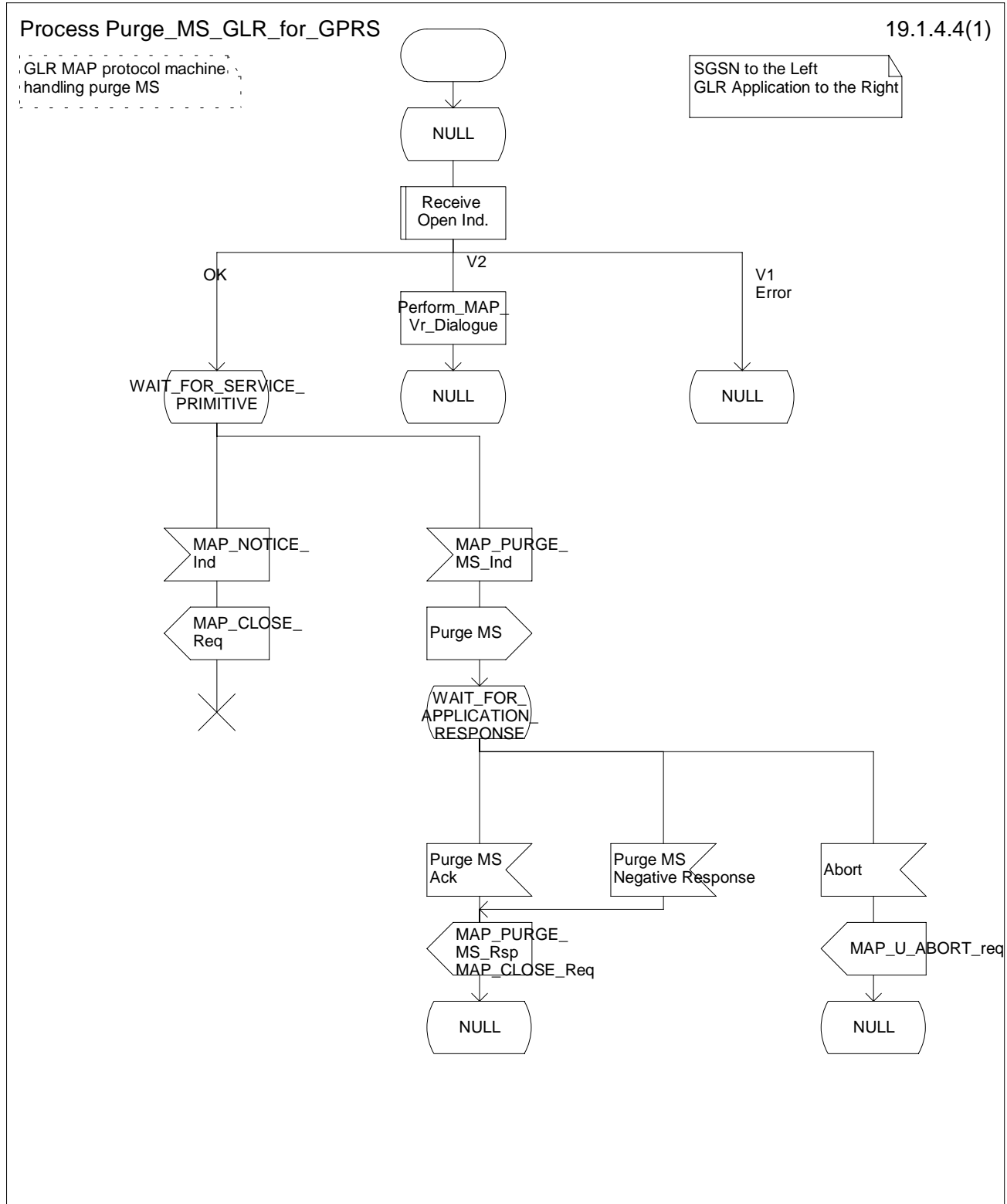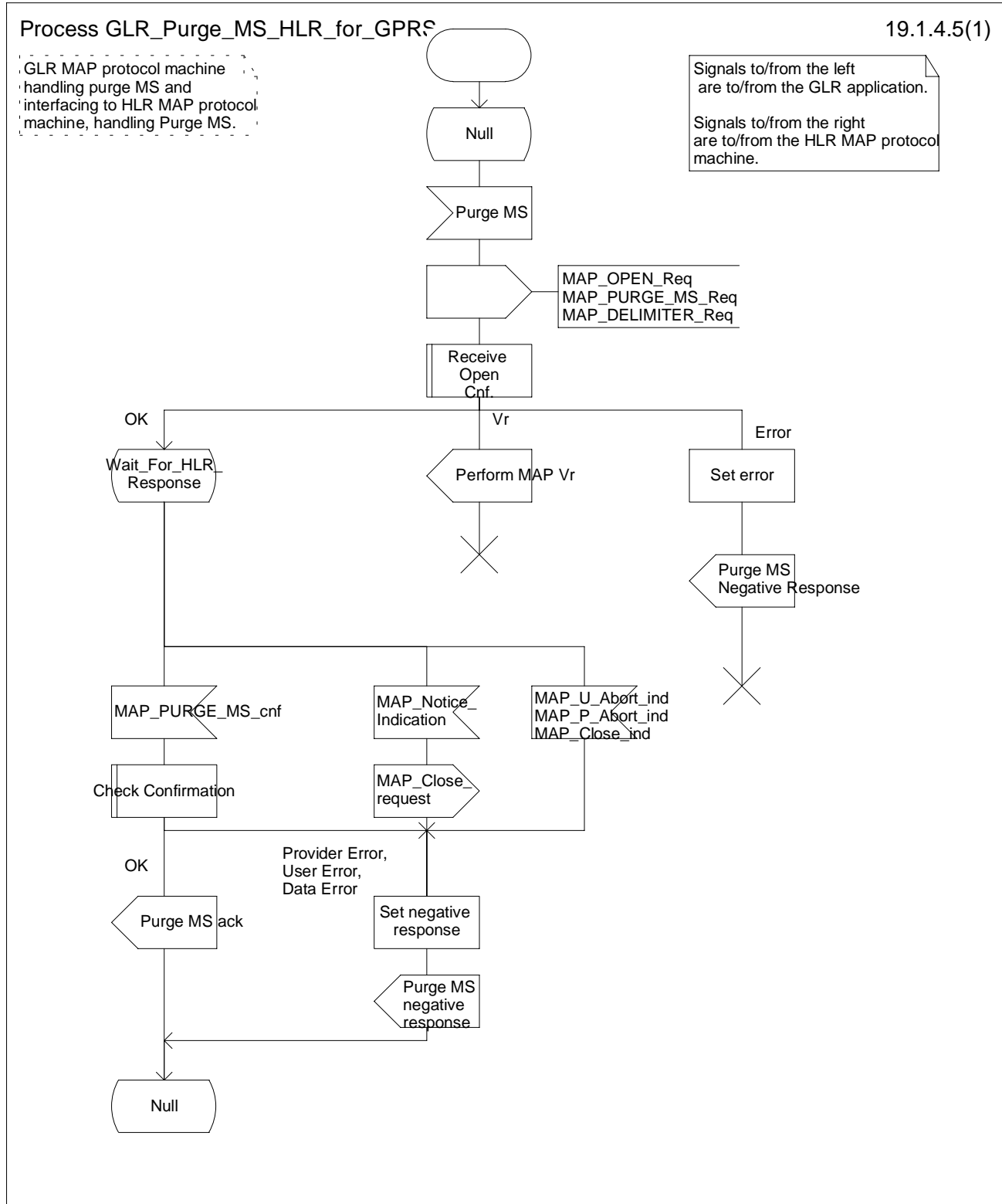

Figure 19.1.4/5: Process GLR_Purge_MS_HLR_for_GPRS

19.2 Fault recovery procedures

19.2.1 RESET procedure

This procedure is used to notify VLR, SGSN and GLR of the failure of the node for restoration of the subscriber data.

19.2.1.1 HLR failure case

In the case of HLR failure, the HLR invokes MAP_RESET service towards the affectd GLR, if GLR is located between the VLR and the HLR or between the SGSN and the HLR. When a GLR receives MAP_RESET indication, it sends a MAP_RESET message to the affected VLR and/or SGSN.

19.2.1.2 GLR failure case

In the case of GLR failure, the GLR invokes MAP_RESET service towards the affected VLR and/or SGSN.

19.2.1.3 Detailed procedure in GLR

Figure 19.2.1/1 shows the Process RECEIVE_RESET_IN_GLR. This process is a GLR MAP prorocol machine handling reset message from HLR.
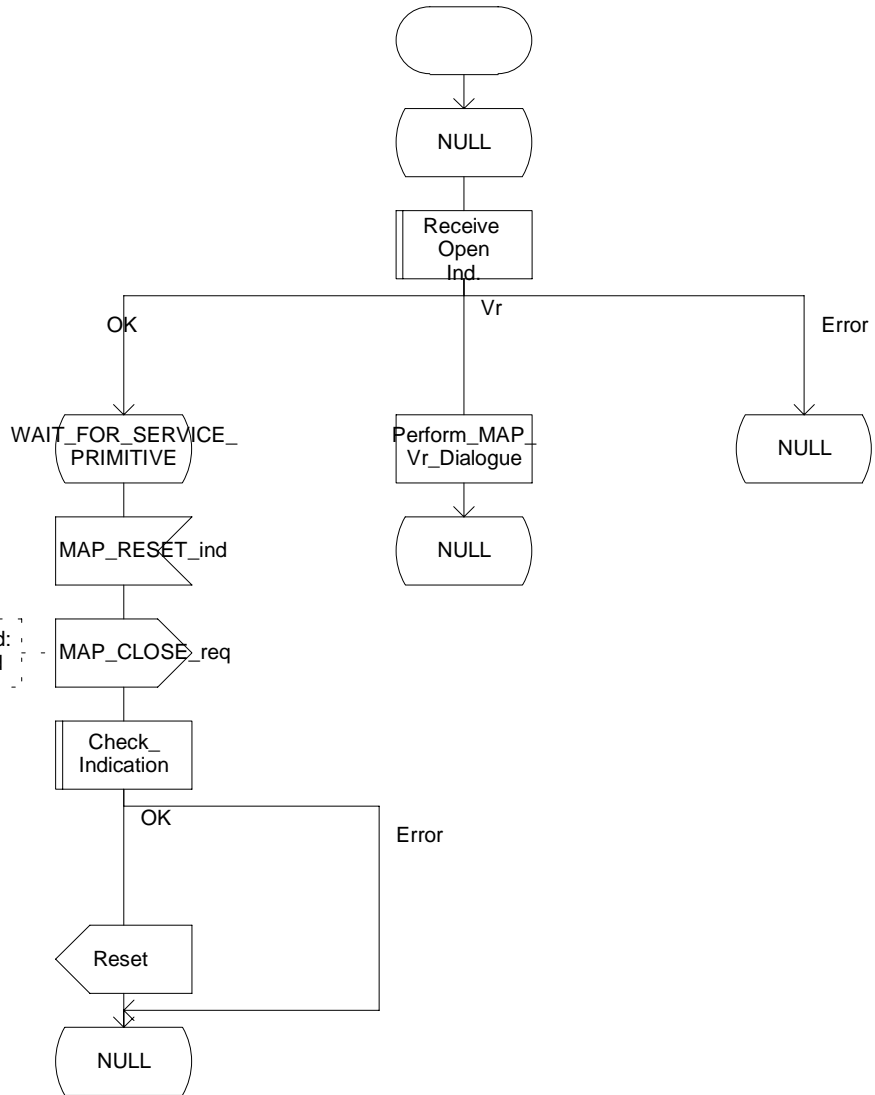
Figure 19.2.1/1: Process RECEIVE_RESET_IN_GLR

Figure 19.2.1/2 shows the Process SEND_RESET_TO_VLR. This process is a GLR MAP prorocol machine handling reset message to VLR.
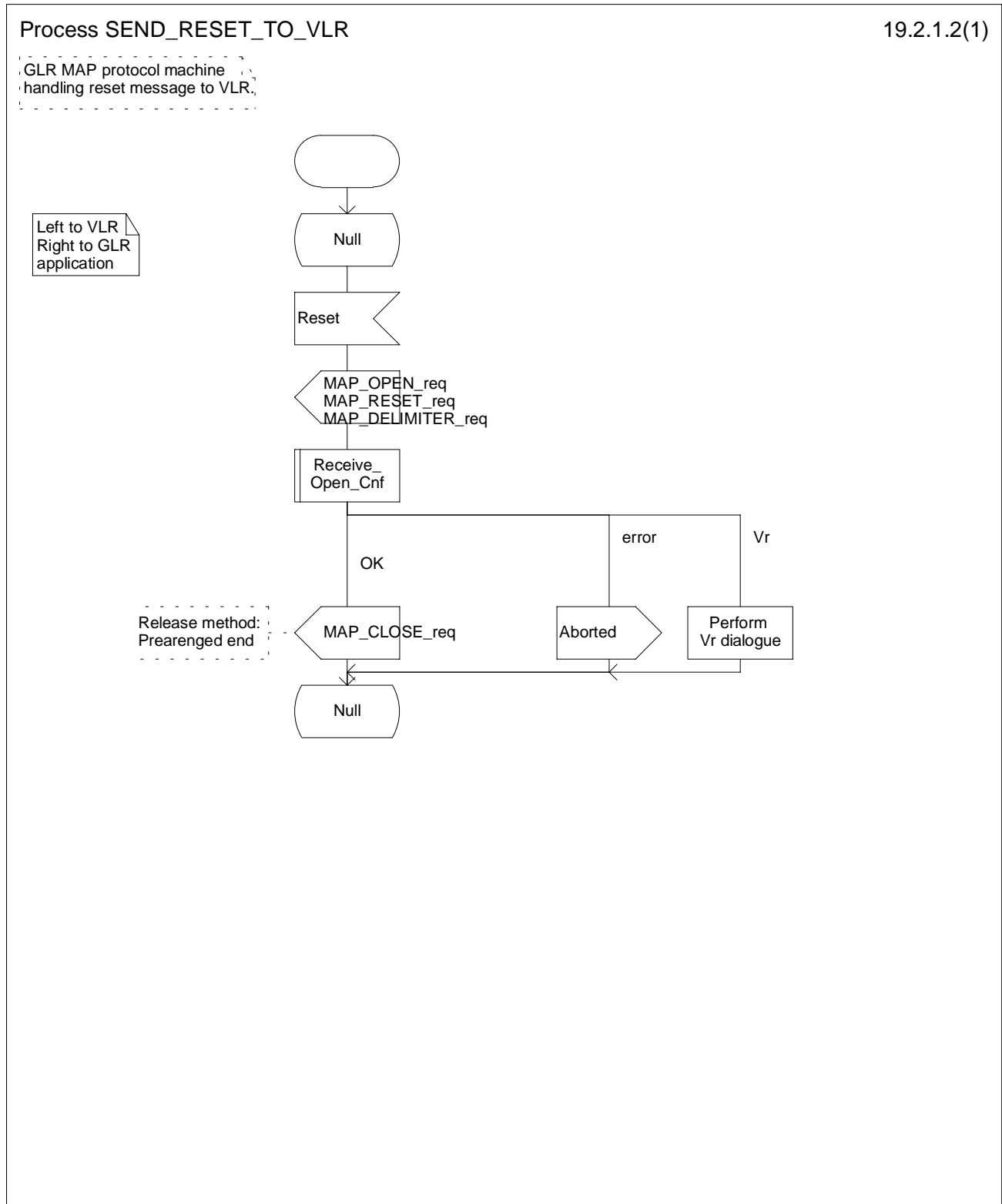
Figure 19.2.1/2: Process SEND_RESET_TO_VLR

Figure 19.2.1/3 shows the Process SEND_RESET_TO_SGSN. This process is a GLR MAP prorocol machine handling reset message to SGSN.
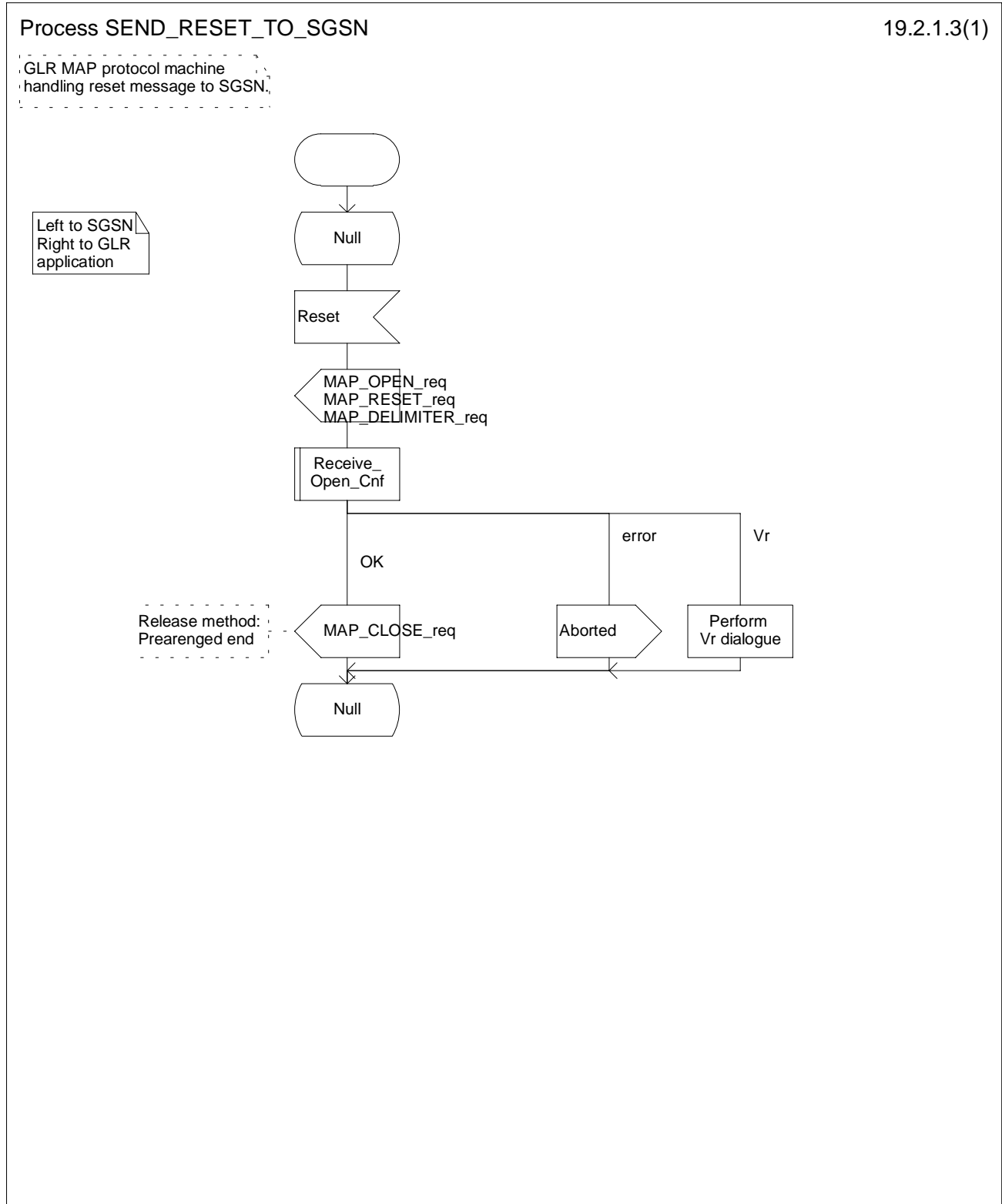
Figure 19.2.1/3: Process SEND_RESET_TO_SGSN

19.2.2   VLR restoration: the restore data procedure in the GLR

19.2.2.1   General

This procedure is used to restore the subscriber data 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" in VLR.

If GLR is located between the VLR and the HLR, the MAP_RESTORE_DATA service is invoked towards the GLR whose identity is contained in the VLR table. When the GLR receives a MAP_RESTORE_DATA indication, it determines whether it invokes the MAP_RESTORE_DATA service towards the HLR, and invokes it if nessesary.

19.2.2.2   Detailed procedure in GLR

Figure 19.2.2/1 shows the Process RESTORE_DATA_GLR. This process is a GLR MAP prorocol machine handling VLR restoration and is a responder to the VLR.

Process RESTORE_DATA_GLR 19.2.2.1_1(3)

GLR MAP protocol machine
handling VLR restoration and
interfaceing with VLR MAP
protocol machine

Left to VLR
Right to GLR
application

WAIT_FOR_SERVICE_
PRIMITIVE

MAP_RESTORE_DATA_ind

Restore data   (2)

WAIT_FOR_
APPLICATION_
RESPONSE

Restore data Ack	Restore data Negative Response	Insert_ Subscriber Data	Abort
Set result	Set error	(1)	
MAP_RESTORE_DATA_Rsp. MAP_CLOSE_Req.	MAP_RESTORE_DATA_Rsp. MAP_CLOSE_Req.		MAP_U_ ABORT_req

Figure 19.2.2/1 (Sheet 1 of 3): Process RESTORE_DATA_GLR

Process RESTORE_DATA_GLR   19.2.2.1_2(3)

GLR MAP protocol machine
handling VLR restoration and
interfaceing with VLR MAP
protocol machine

Figure 19.2.2/1 (Sheet 2 of 3): Process RESTORE_DATA_GLR

Process RESTORE_DATA_GLR   19.2.2.1_3(3)

GLR MAP protocol machine
handling VLR restoration and
interfaceing with VLR MAP
protocol machine

Left to VLR
Right to GLR
application

WAIT_FOR_ISD_Cnf_
WAIT_FOR_SUBSEQUENT_
APPLICATION_RESPONSE

Restore_Data_Ack	Restore_Data_ Negative_Response	Insert_ Subscriber_ Data	Abort
Set result	Set Error	1	MAP_U_ ABORT_req

MAP_RESTORE_DATA_Rsp.
MAP_CLOSE_Req.
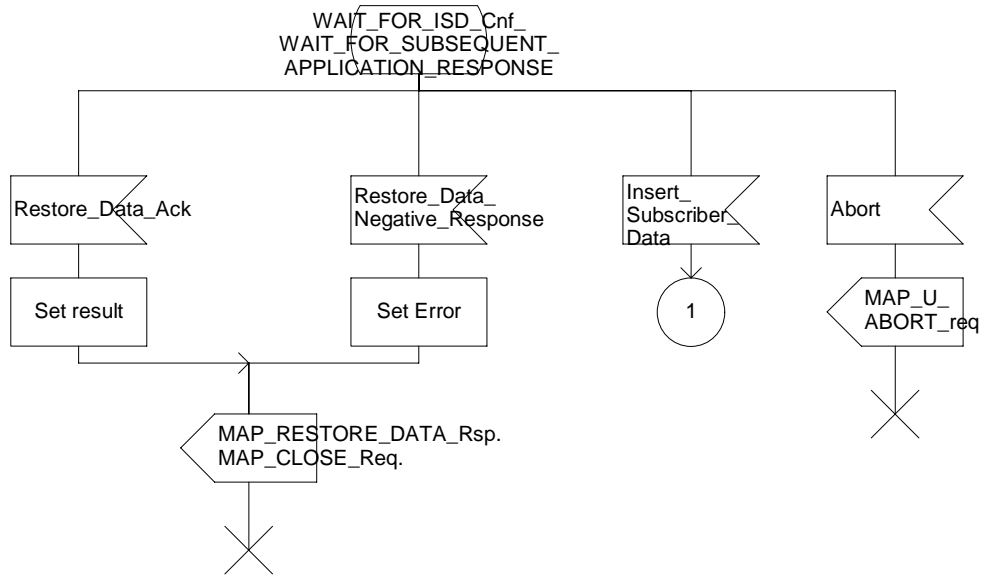
Figure 19.2.2/1 (Sheet 3 of 3): Process RESTORE_DATA_GLR

Figure 19.2.2/2 shows the Process GLR_RESTORE_DATA_HLR. This process is a GLR MAP prorocol machine handling VLR restoration and is an initiator to the HLR.

Sheet 1: If the Macro Open_Receive_Cnf results Vr, the process rquests to perform MAP Vr. It causes a request for sending an abort message to Process RESTORE_DATA_GLR.
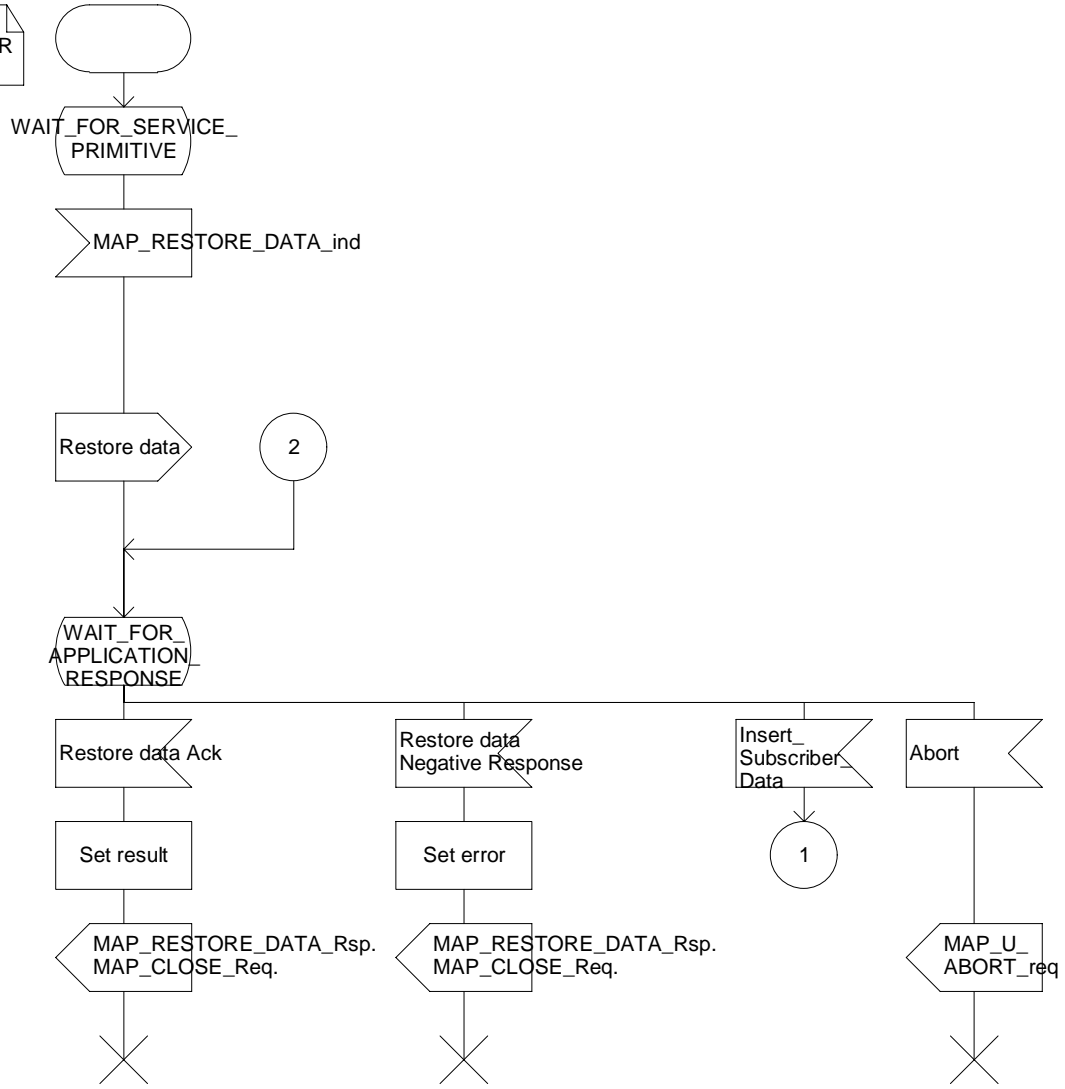

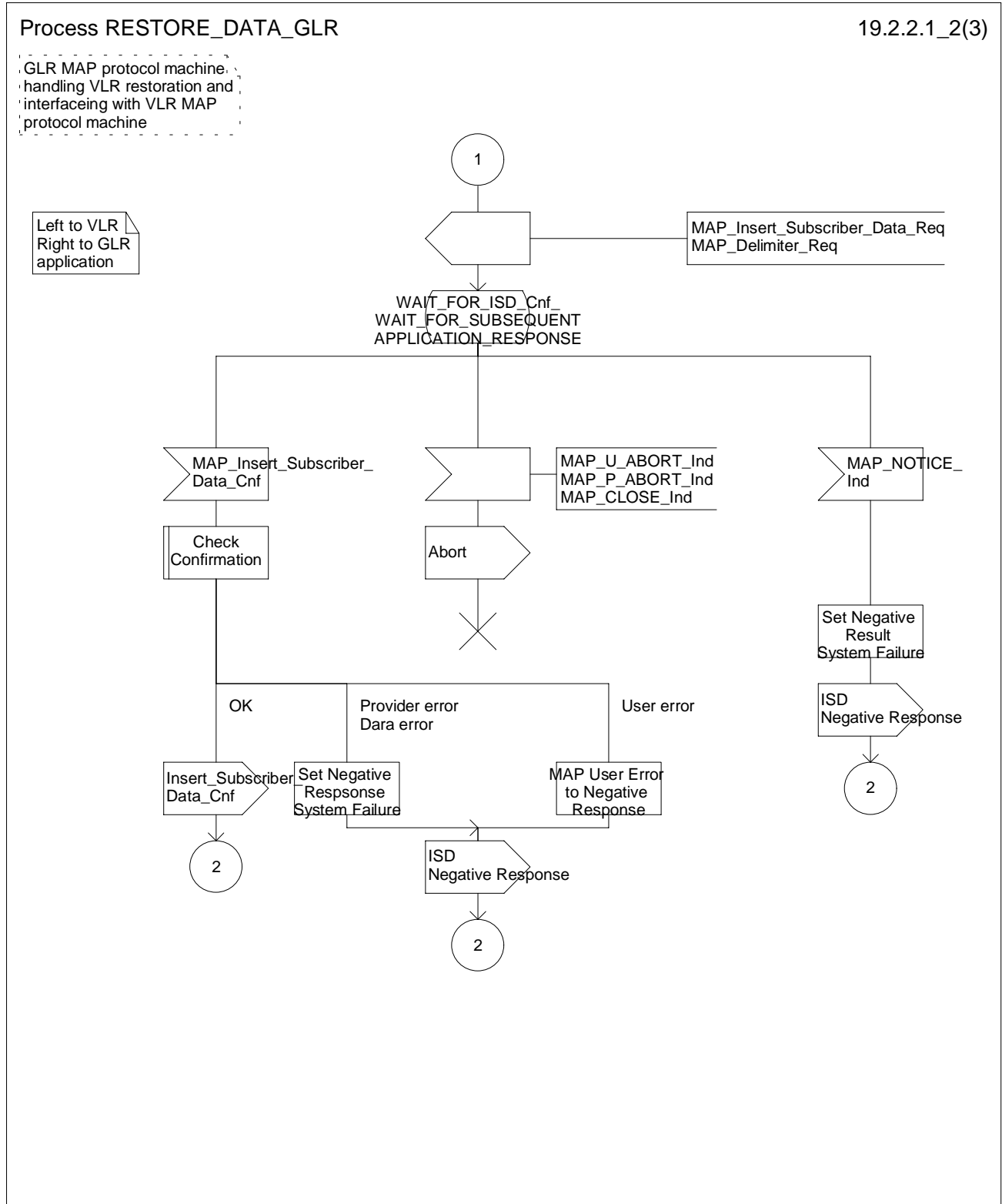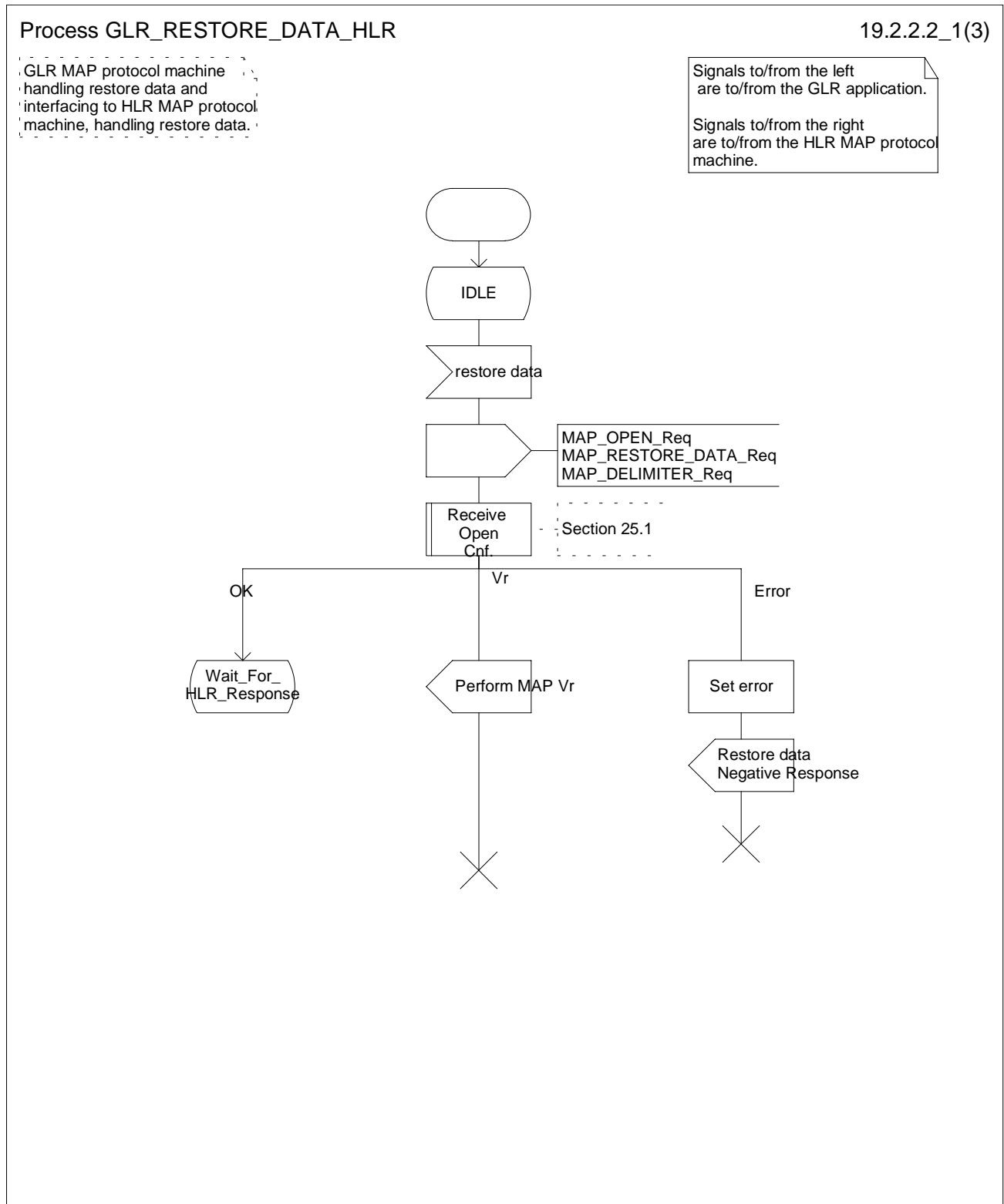**Figure 19.2.2/2 (Sheet 1 of 3): Process GLR_RESTORE_DATA_HLR**

Process GLR_RESTORE_DATA_HLR   19.2.2.2_2(3)

GLR MAP protocol machine
handling restore data and
interfacing to HLR MAP protocol
machine, handling restore data.

Signals to/from the left
are to/from the GLR application.

Signals to/from the right
are to/from the HLR MAP protocol
machine.

Wait_For_
HLR_Response

MAP_RESTORE_	MAP_INSERT_	MAP_Notice_	MAP_U_Abort_ind
DATA_cnf	SUBSCRIBER_	Indication	MAP_P_Abort_ind
	DATA_ind		MAP_Close_ind

Check Confirmation · · · Section 25.2

Insert
Subscriber
data

MAP_Close_
request

Abort

OK   Provider Error,
            User Error,
            Data Error

Wait_For_HLR_or_
Application_
Response

Set negative response

Idle

Restore
data ack

Set negative
response

Restore data
negative response

Restore data
negative response

Idle

Idle
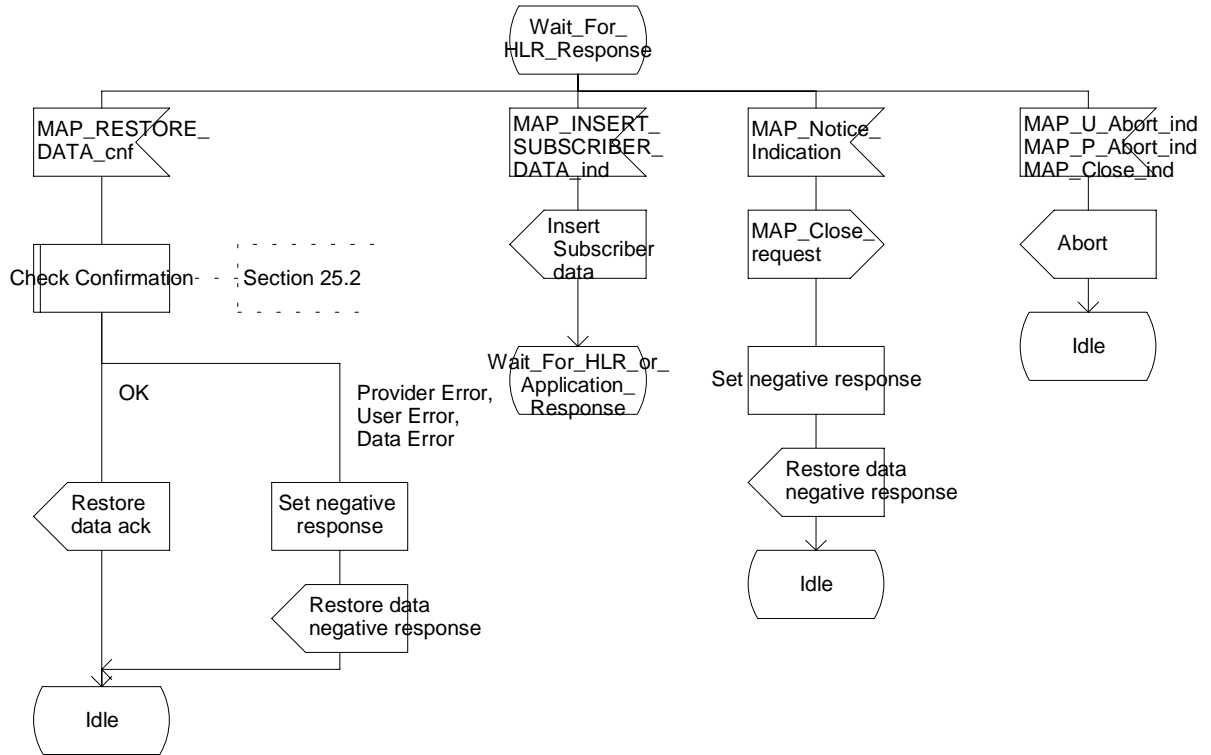
Figure 19.2.2/2 (Sheet 2 of 3): Process GLR_RESTORE_DATA_HLR
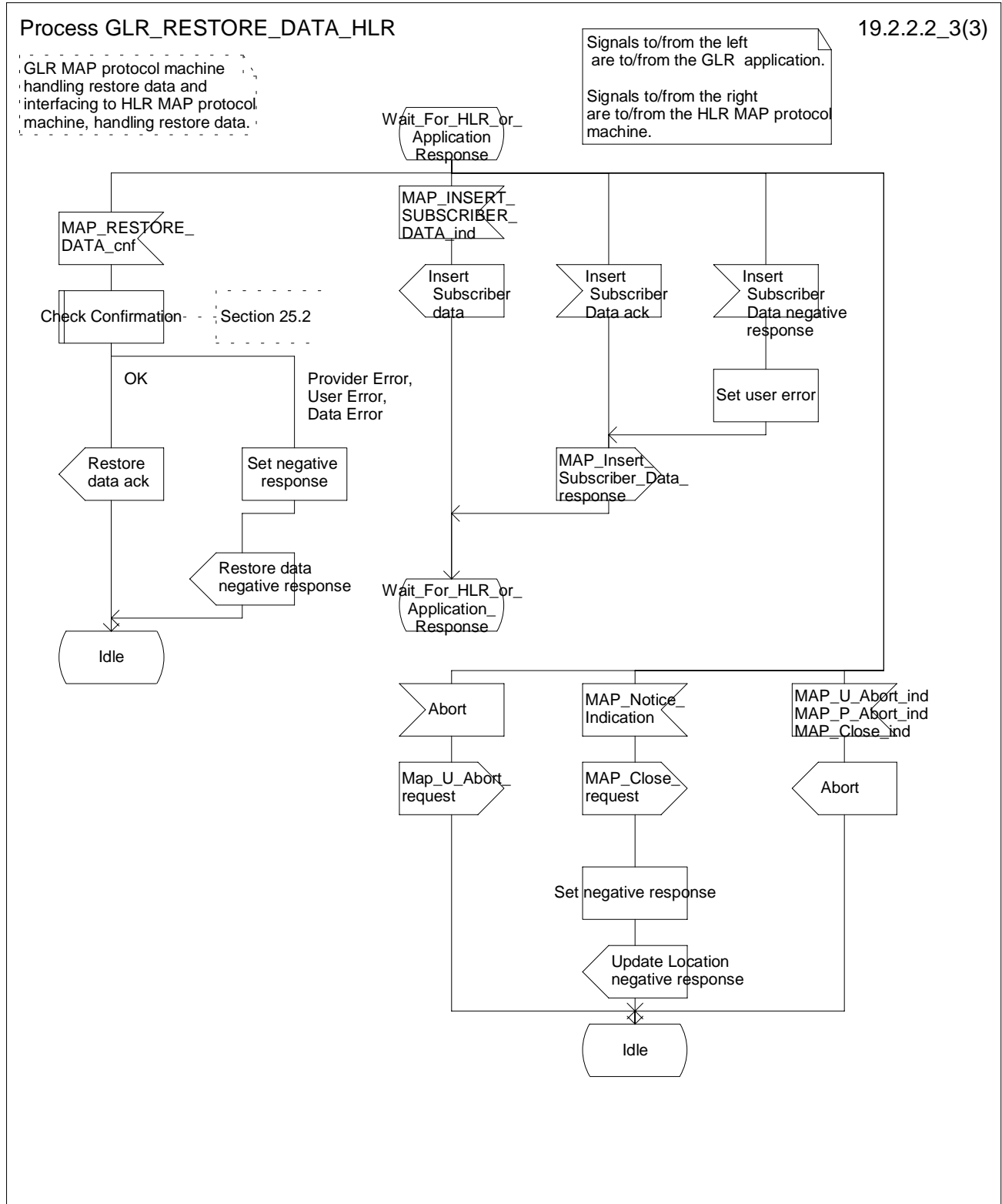
Figure 19.2.2/2 (Sheet 3 of 3): Process GLR_RESTORE_DATA_HLR

20   Operation and maintenance procedures

20.1   General

The Operation and Maintenance procedures are needed for operating and maintaining the UMTS PLMN network.

The following procedures exist for operation and maintenance purposes:

    i)   Tracing procedures;

    ii)   Subscriber Data Management procedures;

    iii) Subscriber Identity procedures.

The following application contexts refer to complex MAP Users consisting of several processes:

    -   subscriberDataManagementContext;

    -   tracingContext.

These two application contexts need a co-ordinating process in the VLR or in the SGSN. Refer to the TS 29.002 for detail procedures.

The Subscriber Data Management procedures are only procedures that impact to the GLR. The following subclause describes the Subscriber Identity procedures in the GLR.

20.2   Subscriber data management procedures

20.2.1   General

Two types of subscriber data management procedures exist in the Mobile Application Part

    i)   Subscriber Deletion;

    ii)   Subscriber Data Modification.

No requirements have been identified for the Subscriber creation and subscriber data interrogation procedures.

The subscriber deletion and subscriber data modification procedures are initiated by the OMC (see figures 20.2.1/1, 20.2.1/2, 20.2.1/3 and 20.2.1/4).

```
+-----+              +-----+              +------+              +-------+
•  VLR  •              •  GLR  •              •  HLR  •              •   OMC   •
+-----+              +-----+              +------+              +-------+
   •                    •                    •1.                   •
   •                    •2.                   +< - - - - - - - •
   •2.                   +<--------------•                    •
   +<--------------•                    •                    •
   •                  3.•                    •                    •
   +-------------->•                    3.•                    •
   •                    +-------------->•                    4.•
   •                    •                    + - - - - - - - >•
   •                    •                    •                    •
```
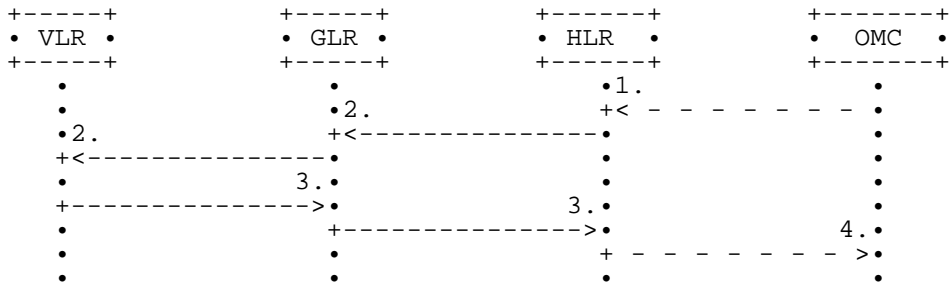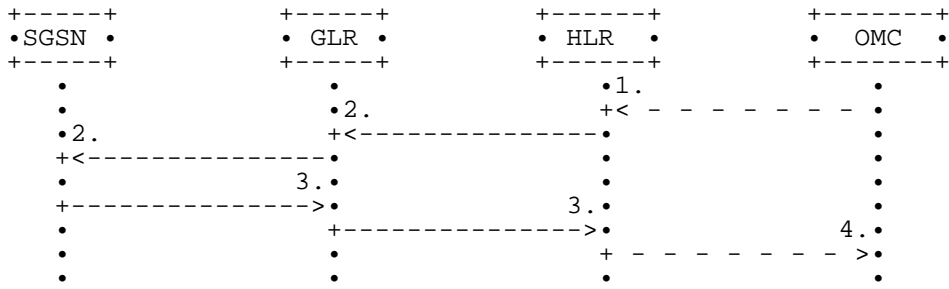
1) Delete Subscriber

2) MAP_CANCEL_LOCATION

3) MAP_CANCEL_LOCATION_ACK

4) Subscriber Deleted

Figure 20.2.1/1: Subscriber deletion procedure

In the subscriber deletion procedure the subscriber data should be removed from the VLR and from the HLR. The HLR uses the MAP_CANCEL_LOCATION service.

```
+-----+              +-----+              +------+              +-------+
•SGSN  •              •  GLR  •              •  HLR  •              •   OMC   •
+-----+              +-----+              +------+              +-------+
   •                    •                    •1.                   •
   •                    •2.                   +< - - - - - - - •
   •2.                   +<--------------•                    •
   +<--------------•                    •                    •
   •                  3.•                    •                    •
   +-------------->•                    3.•                    •
   •                    +-------------->•                    4.•
   •                    •                    + - - - - - - - >•
   •                    •                    •                    •
```

1) Delete GPRS Subscriber

2) MAP_CANCEL_LOCATION

3) MAP_CANCEL_LOCATION_ACK

4) GPRS Subscriber Deleted

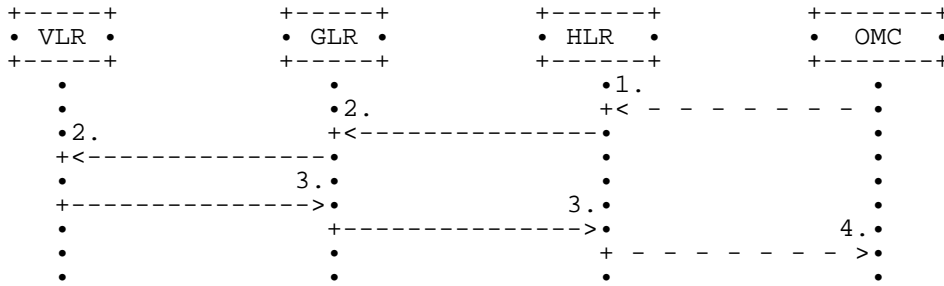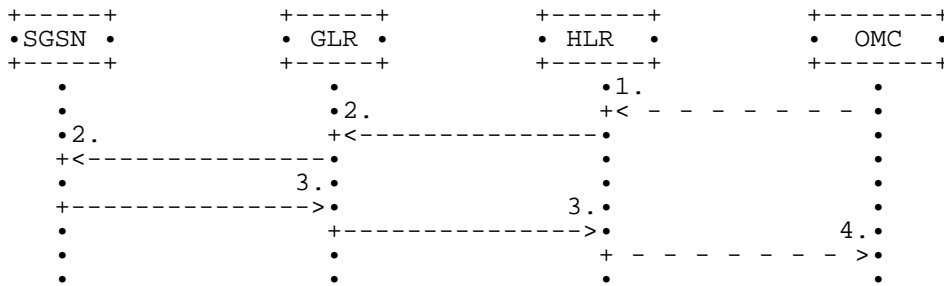**Figure 20.2.1/2: Subscriber deletion procedure for GPRS**

In the subscriber deletion procedure the subscriber data should be removed from the SGSN and from the HLR. The HLR uses the MAP_CANCEL_LOCATION service.

```
+-----+           +-----+           +------+           +-------+
• VLR •           • GLR •           • HLR  •           •  OMC  •
+-----+           +-----+           +------+           +-------+
   •                 •                 •1.                 •
   •                 •2.               +< - - - - - - - •
   •2.               +<--------------•                   •
   +<--------------•                   •                   •
   •              3.•                   •                   •
   +-------------->•                   •                   •
   •                 •              3.•                   •
   •                 +-------------->•                 4.•
   •                 •                 + - - - - - - - >•
   •                 •                 •                   •
   •                 •                 •                   •
```

1) Modify Subscriber Data

2) MAP_CANCEL_LOCATION, MAP_INSERT_SUBSCRIBER_DATA or MAP_DELETE_SUBSCRIBER_DATA

3) MAP_CANCEL_LOCATION_ACK, MAP_INSERT_SUBSCRIBER_DATA_ACK or MAP_DELETE_SUBSCRIBER_DATA_ACK

4) Subscriber Data Modified

Figure 20.2.1/3: Subscriber data modification procedure

```
+-----+           +-----+           +------+           +-------+
•SGSN •           • GLR •           • HLR  •           •  OMC  •
+-----+           +-----+           +------+           +-------+
   •                 •                 •1.                 •
   •                 •2.               +< - - - - - - - •
   •2.               +<--------------•                   •
   +<--------------•                   •                   •
   •              3.•                   •                   •
   +-------------->•                   •                   •
   •                 •              3.•                   •
   •                 +-------------->•                 4.•
   •                 •                 + - - - - - - - >•
   •                 •                 •                   •
   •                 •                 •                   •
```

1) Modify Subscriber Data

2) MAP_CANCEL_LOCATION, MAP_INSERT_SUBSCRIBER_DATA or MAP_DELETE_SUBSCRIBER_DATA

3) MAP_CANCEL_LOCATION_ACK, MAP_INSERT_SUBSCRIBER_DATA_ACK or MAP_DELETE_SUBSCRIBER_DATA_ACK

4) Subscriber Data Modified

Figure 20.2.1/4: Subscriber data modification procedure for GPRS

In the subscriber data modification procedure the subscriber data is modified in the HLR and when necessary also in the VLR or in the SGSN. The HLR initiates either the MAP_INSERT_SUBSCRIBER_DATA,MAP_DELETE_SUBSCRIBER_DATA or MAP_CANCEL_LOCATION service depending on the modified data.

20.2.2   Procedures in the GLR

20.2.2.1   Subscriber deletion procedure

The subscriber deletion procedure in the GLR is described in the subclause 19.

20.2.2.2   Subscriber data modification procedure

When receiving either the MAP_INSERT_SUBSCRIBER_DATA indication or the MAP_DELETE_SUBSCRIBER_DATA indication, the GLR checks the parameters and data in the primitive. Data errors are reported as an unexpected data value error or a data missing error depending on the nature of the error.

After receiving the first MAP_INSERT_SUBSCRIBER_DATA indication, the GLR will check the IMSI that is included in the primitive. If the IMSI is unknown, the error "Unidentified subscriber" is returned.

If the GLR does not support received basic or supplementary services or the network feature Operator Determined Barring, or there is a problem with Regional Subscription Data then this is reported to the HLR.

If the entire MSC area that covered the VLR wherein the subscriber is registered is restricted due to regional subscription, this is reported to the HLR.

If the updating of the subscriber data is not possible, the GLR will initiate the MAP_U_ABORT request primitive.

If the updating is successful in the GLR, the GLR will initiate the MAP_INSERT_SUBSCRIBER_DATA request or the MAP_DELETE_SUBSCRIBER_DATA request to the VLR or to the SGSN wherein the subscriber is registered.

The subscriber data modification procedure in the GLR is shown in the figures 20.2.2.2/1, 20.2.2.2/2, 20.2.2.2/3, 20.2.2.2/4, 20.2.2.2/5 and 20.2.2.2/6.

Figure 20.2.2.2/1 (Sheet 1 of 3): Process INS_SUBS_DATA_GLR

Process INS_SUBS_DATA_GLR 20.2.2.2.1_2(3)

Figure 20.2.2.2/1: The insert subscriber data process in the GLR
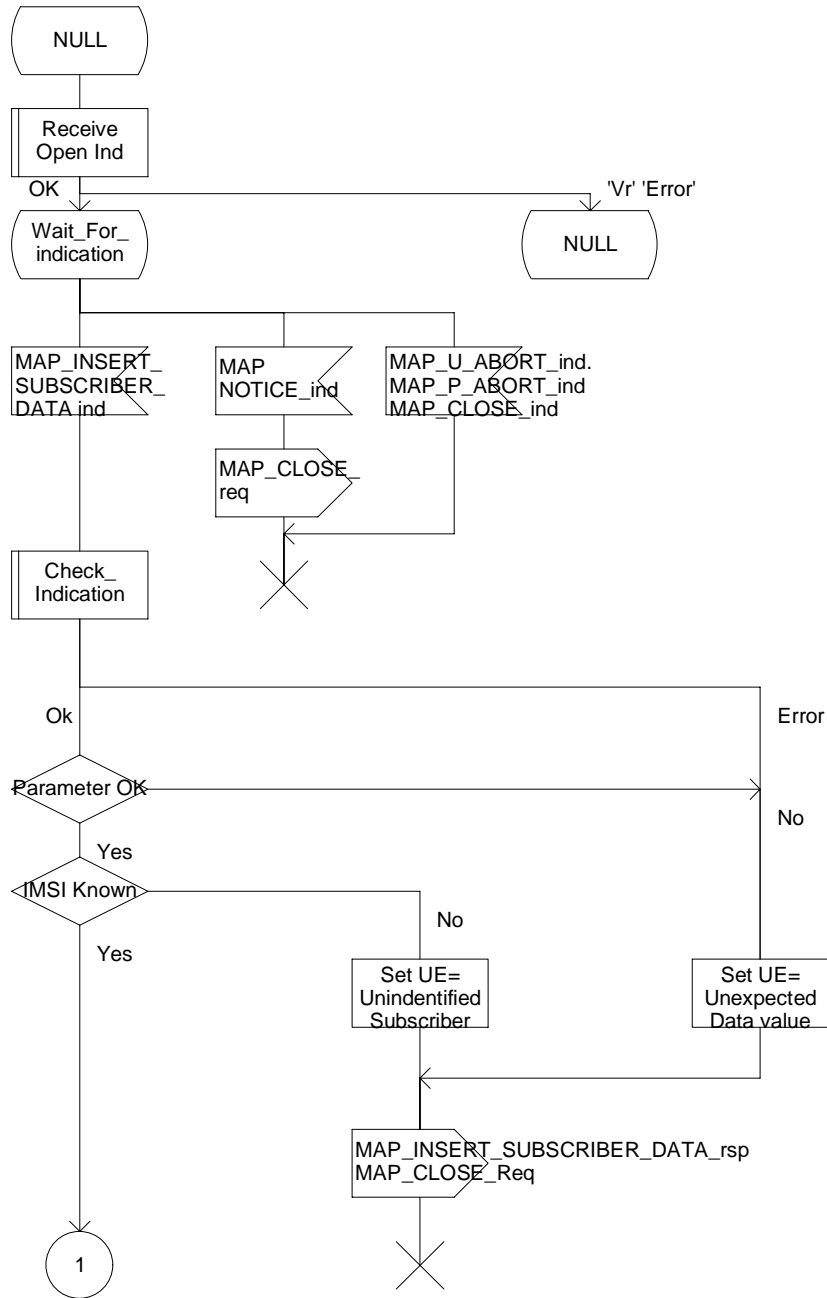
Arrows to left are to VLR
Arrows to right are to HLR

Figure 20.2.2.2/1 (Sheet 2 of 3): Process INS_SUBS_DATA_GLR

Process INS_SUBS_DATA_GLR 20.2.2.2.1_3(3)

Figure 20.2.2.2/1: The insert subscriber data process in the GLR

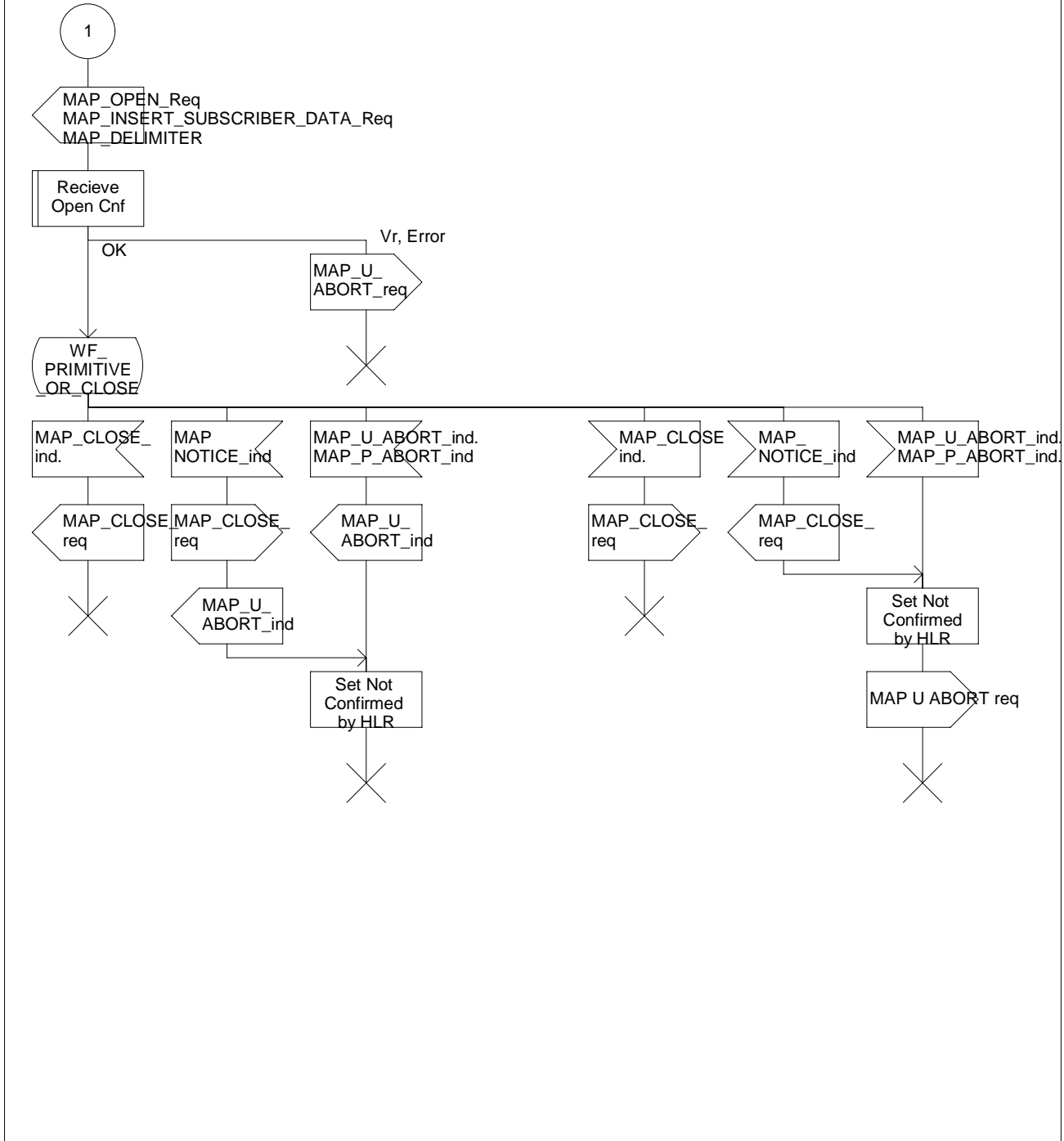Arrows to left are to VLR
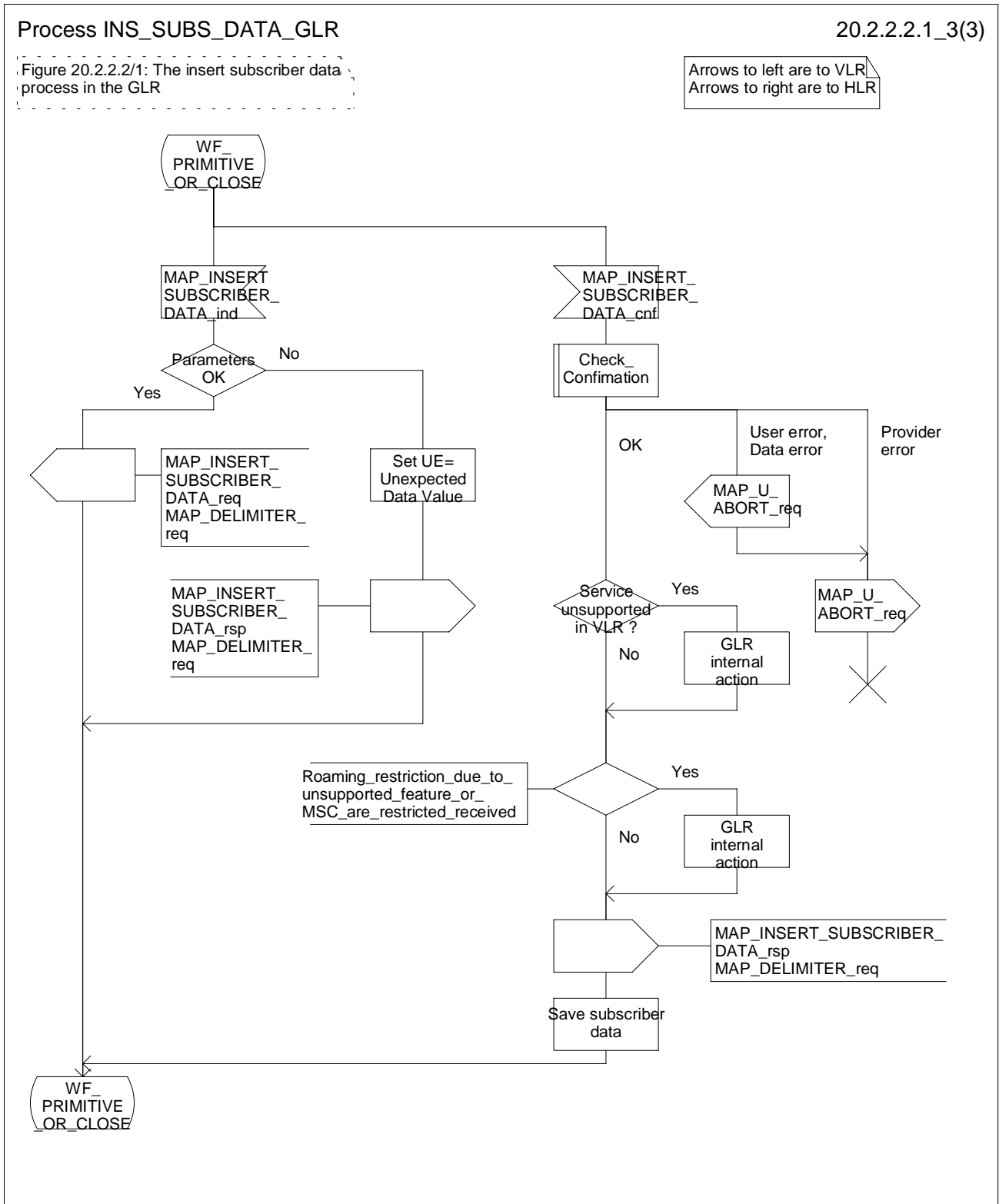Arrows to right are to HLR

Figure 20.2.2.2/1 (Sheet 3 of 3): Process INS_SUBS_DATA_GLR

Process INS_GPRS_SUBS_DATA_GLR 20.2.2.2.2_1(3)

Figure 20.2.2.2/2: The insert subscriber data process in the GLR

Arrows to left are to SGSN
Arrows to right are to HLR

NULL

Receive
Open Ind

OK 'Vr' 'Error'

Wait_For_
indication

NULL

MAP_INSET_
SUBSCRIBER_
DATA ind

MAP_
NOTICE_ind

MAP_U_ABORT_ind.
MAP_P_ABORT_ind
MAP_CLOSE_ind

MAP_CLOSE_
req

Check_
Indication

OK Error

Parameter OK

Yes No

IMSI Known

Yes No

Set UE=
Unindentified
Subscriber

Set UE=
Unexpected
Data value

MAP_INSERT_SUBSCRIBER_DATA_rsp
MAP_CLOSE_req

1

Figure 20.2.2.2/2 (Sheet 1 of 3): Process INS_GPRS_SUBS_DATA_GLR

Process INS_GPRS_SUBS_DATA_GLR 20.2.2.2.2_2(3)

Figure 20.2.2.2/2: The insert subscriber data process in the GLR

Arrows to left are to SGSN
Arrows to right are to HLR

Figure 20.2.2.2/2 (Sheet 2 of 3): Process INS_GPRS_SUBS_DATA_GLR

Process INS_GPRS_SUBS_DATA_GLR 20.2.2.2.2_3(3)

Figure 20.2.2.2/2: The insert subscriber data process in the GLR
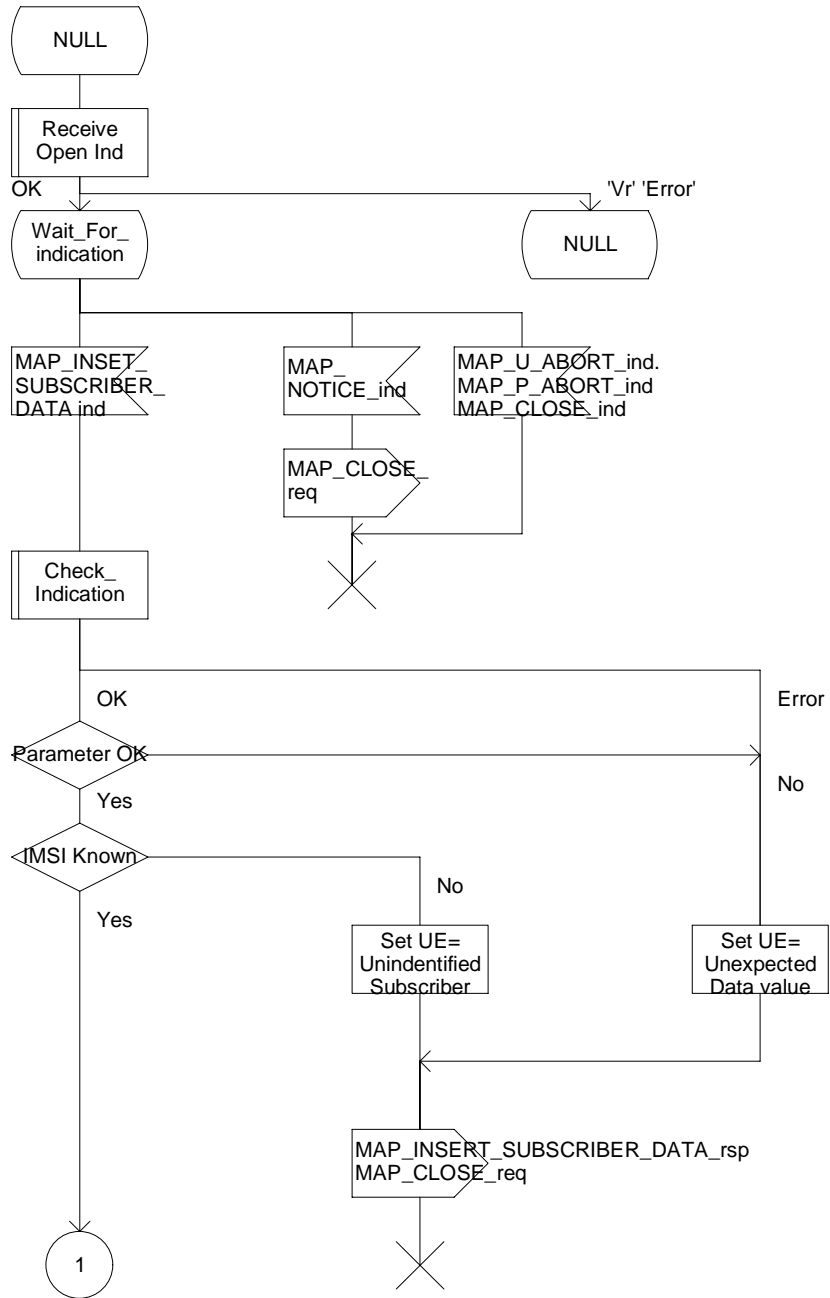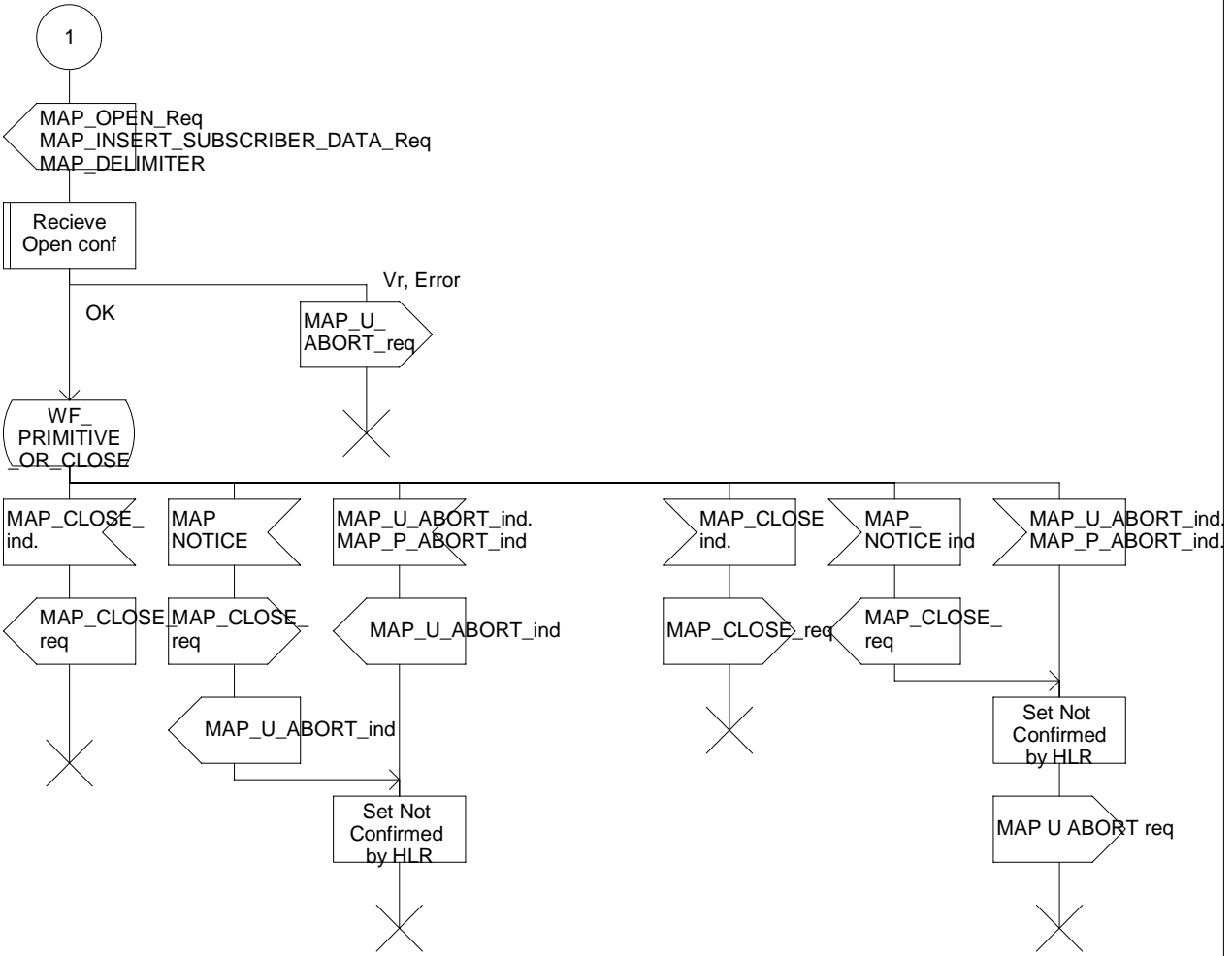
Arrows to left are to SGSN
Arrows to right are to HLR

Figure 20.2.2.2/2 (Sheet 3 of 3): Process INS_GPRS_SUBS_DATA_GLR

Process Delete_Subscriber_Data_GLR 20.2.2.2.3(1)

Figure 20.2.2.2/3: The delete subscriber data process in the GLR

Arrows to left are to VLR
Arrows to right are to HLR

NULL

Receive Open Ind

OK 'Vr' 'Error'

Wait_For_ indication

NULL

MAP_DELETE_ SUBSCRIBER_ DATA ind

Check_ Indication

Subscriber Know

Error

No

Yes

Services registered in a GLR

Set UE= Unindentified Subscriber

Set Not Confirmed by HLR

Yes

Delete_ Subs_ Data_GLR

No

Figure 20.2.2.2/5

OK

Delete Subscriber Data in the GLR

Error

MAP_DELETE_SUBSCRIBER_DATA_rsp MAP_CLOSE_req

Figure 20.2.2.2/3: Process Delete_Subscriber_Data_GLR

Process Delete_GPRS_Subscriber_Data_GLR 20.2.2.2.4(1)

Figure 20.2.2.2/4: The delete subscriber data process in the GLR
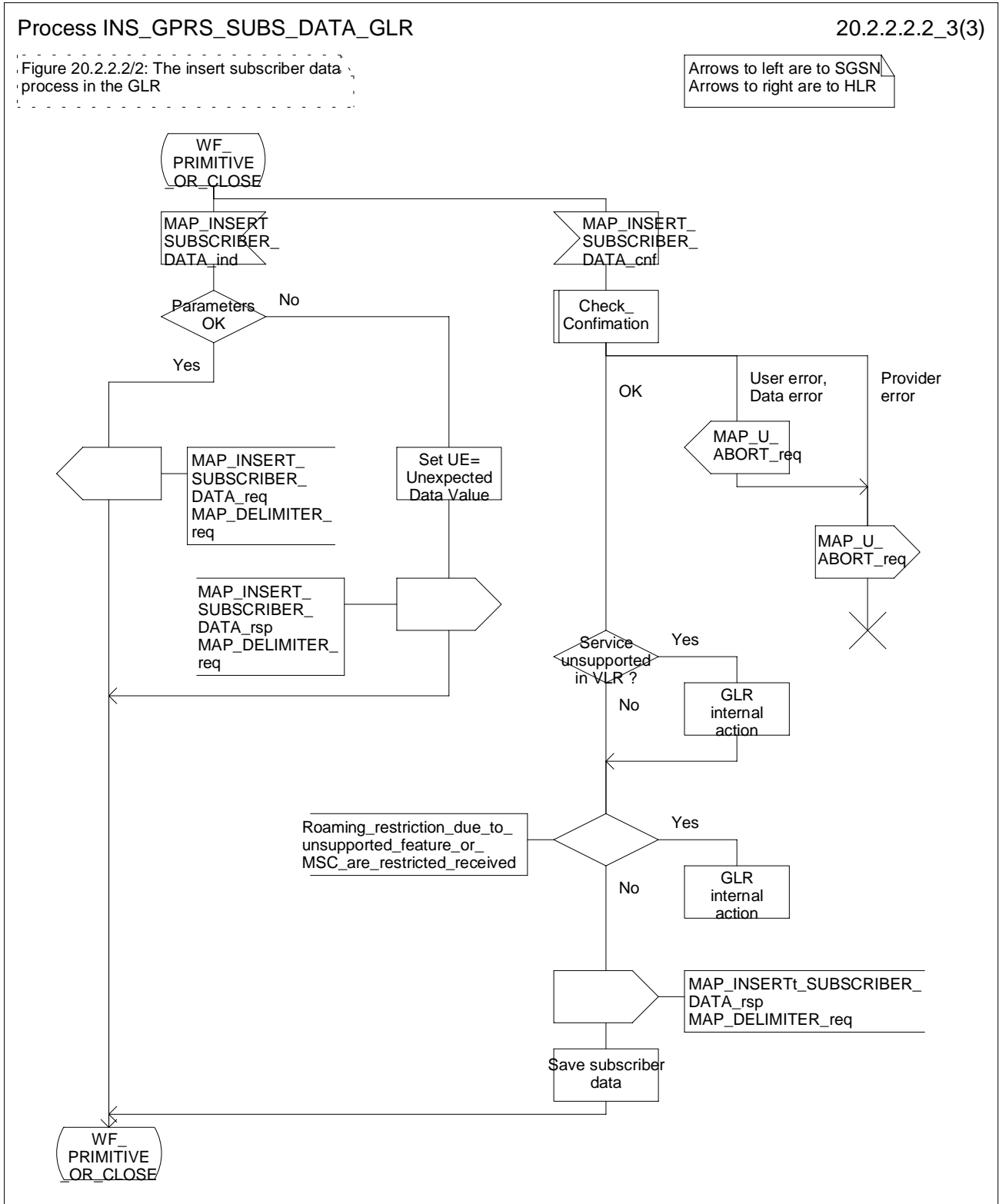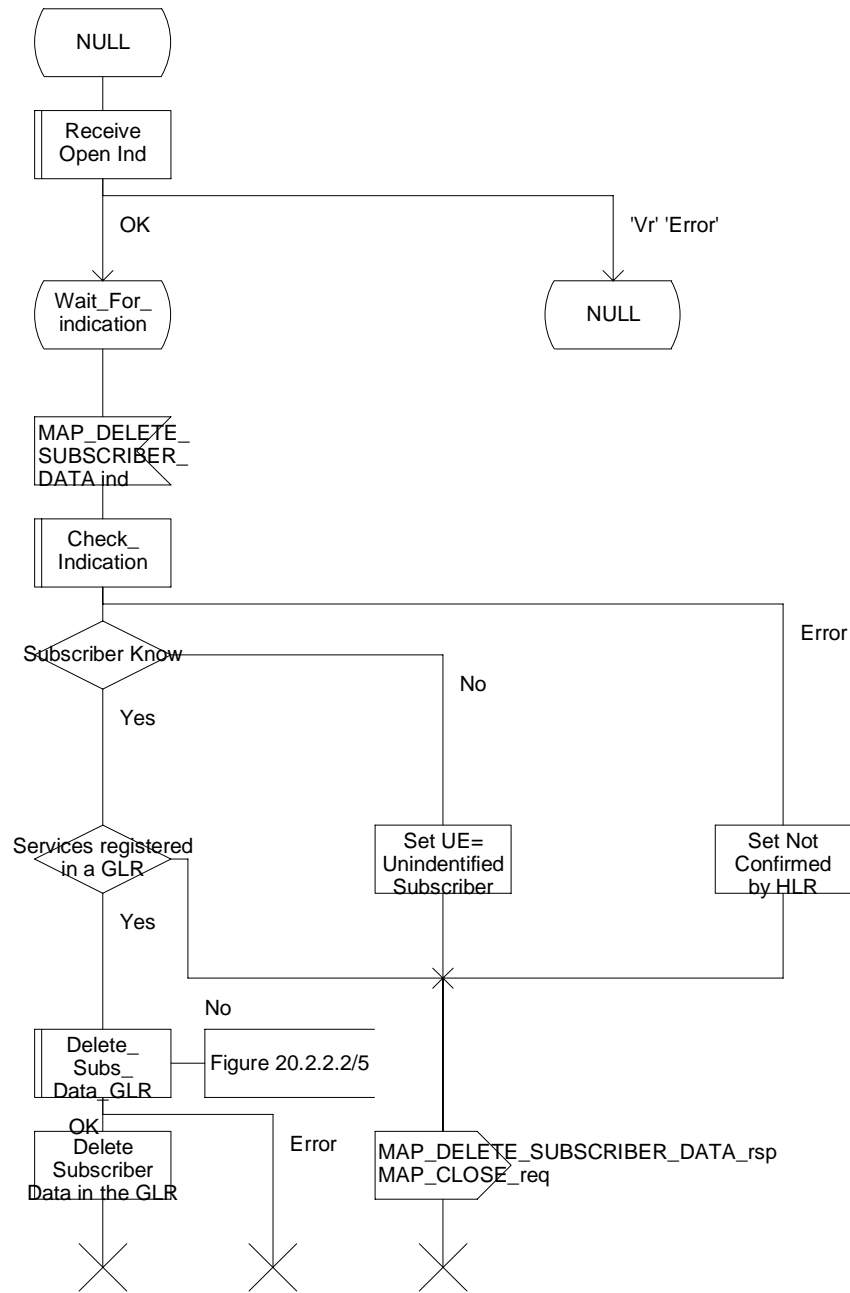
Arrows to left are to SGSN
Arrows to right are to HLR

NULL

Receive
Open Ind

OK 'Vr' 'Error'

Wait_For_
indication

NULL

MAP_DELETE_
SUBSCRIBER_
DATA ind

Check_
Indication

Error

Subscriber Know

No

Yes

Services registered
in a GLR

Set UE=
Unindentified
Subscriber

Set Not
Confirmed
by HLR

Yes

No

Delete_
GPRS_Subs_
Data_GLR

Figure 20.2.2.2/6

OK Error

Delete
Subscriber
Data in the GLR

MAP_DELETE_SUBSCRIBER_DATA_rsp
MAP_CLOSE_req
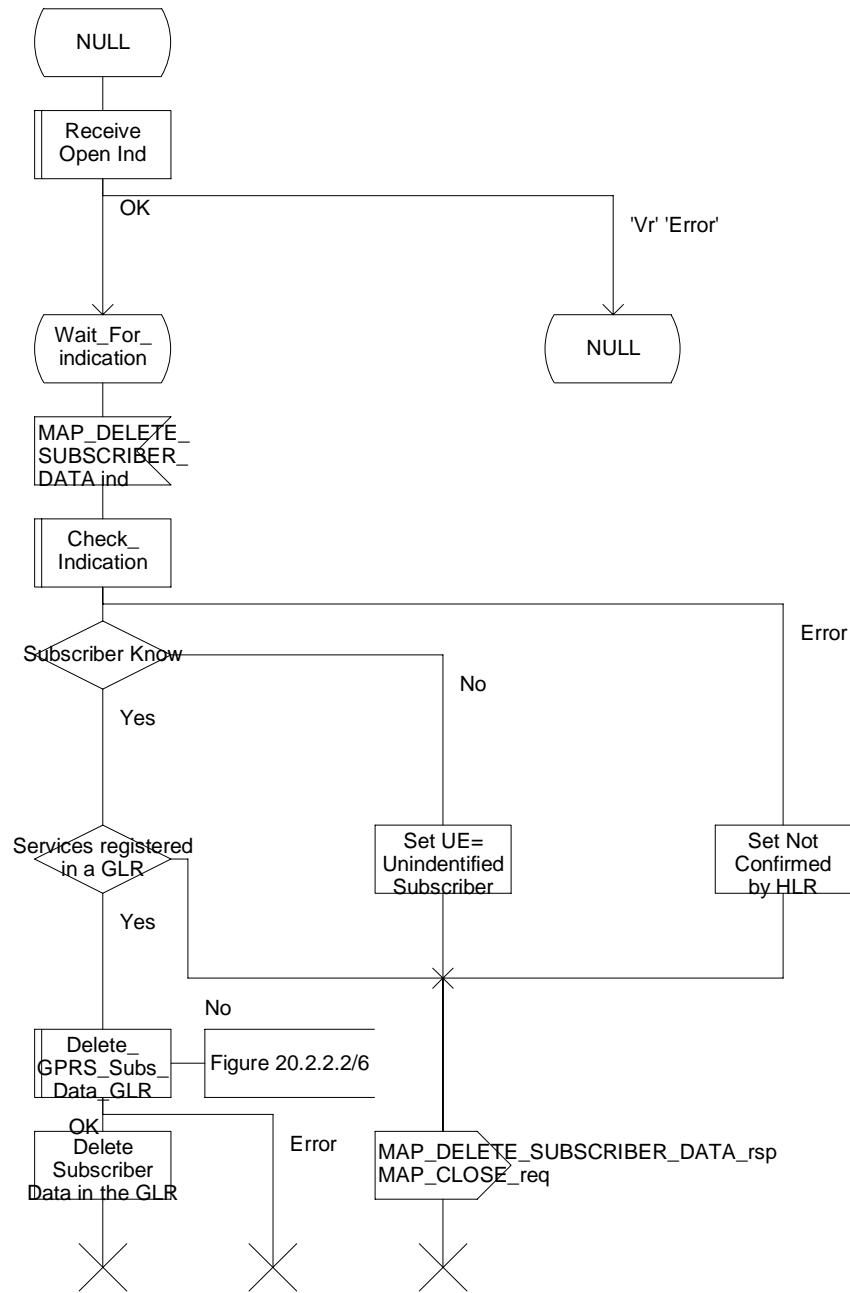
Figure 20.2.2.2/4: Process Delete_GPRS_Subscriber_Data_GLR

Macrodefinition Delete_Subs_Data_GLR   20.2.2.2.5(1)

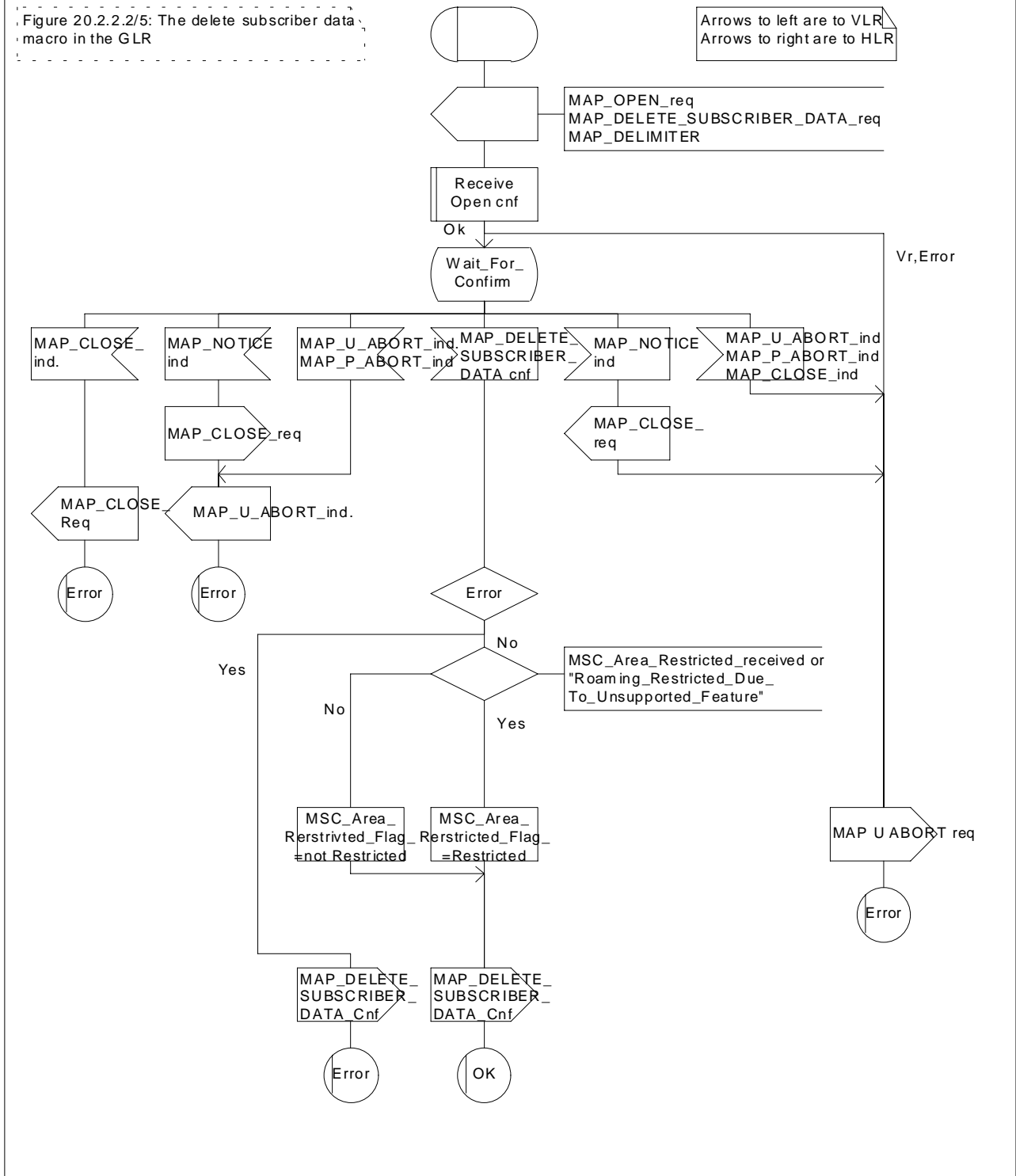Figure 20.2.2.2/5: The delete subscriber data
macro in the GLR

Arrows to left are to VLR
Arrows to right are to HLR

MAP_OPEN_req
MAP_DELETE_SUBSCRIBER_DATA_req
MAP_DELIMITER

Receive
Open cnf

Ok

Vr,Error

Wait_For_
Confirm

MAP_CLOSE_
ind.

MAP_NOTICE
ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_DELETE_
SUBSCRIBER_
DATA cnf

MAP_NOTICE
ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

MAP_CLOSE_req

MAP_CLOSE_
req

MAP_CLOSE_
Req

MAP_U_ABORT_ind.

Error

Error

Error

No

MSC_Area_Restricted_received or
"Roaming_Restricted_Due_
To_Unsupported_Feature"

Yes

No

Yes

MSC_Area_
Rerstrivted_Flag_
=not Restricted

MSC_Area_
Rerstricted_Flag_
=Restricted

MAP U ABORT req

Error

MAP_DELETE_
SUBSCRIBER_
DATA_Cnf

MAP_DELETE_
SUBSCRIBER_
DATA_Cnf

Error

OK

Figure 20.2.2.2/5: Macro Delete_Subs_Data_GLR

Macrodefinition Delete_GPRS_Subs_Data_GLR 20.2.2.2.6(1)

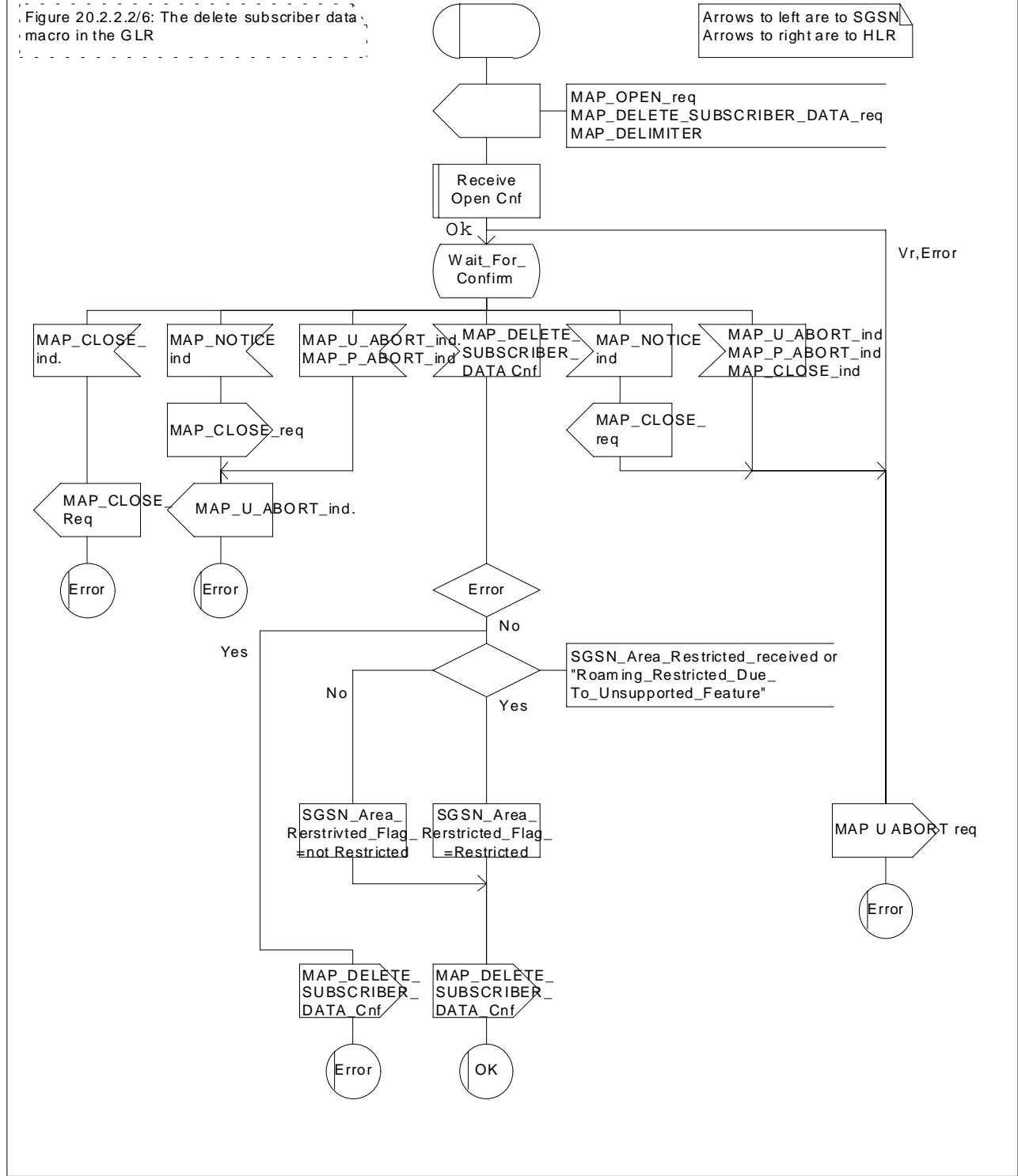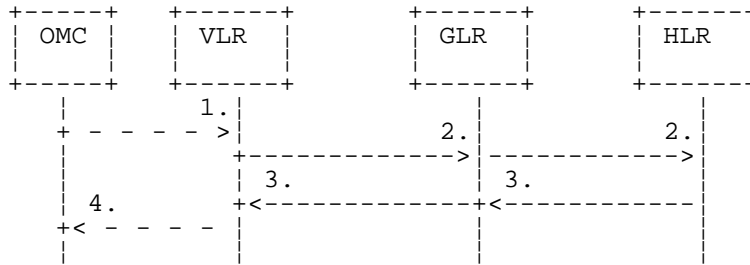Figure 20.2.2.2/6: The delete subscriber data macro in the GLR

Arrows to left are to SGSN
Arrows to right are to HLR

MAP_OPEN_req
MAP_DELETE_SUBSCRIBER_DATA_req
MAP_DELIMITER

Receive Open Cnf

Ok

Vr,Error

Wait_For_ Confirm

MAP_CLOSE_ ind.

MAP_NOTICE ind

MAP_U_ABORT_ind.
MAP_P_ABORT_ind

MAP_DELETE_ SUBSCRIBER_ DATA Cnf

MAP_NOTICE ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

MAP_CLOSE_req

MAP_CLOSE_ req

MAP_CLOSE Req

MAP_U_ABORT_ind.

Error

Error

Error

No

Yes

SGSN_Area_Restricted_received or "Roaming_Restricted_Due_ To_Unsupported_Feature"

No

Yes

SGSN_Area_ Rerstrivted_Flag_ =not Restricted

SGSN_Area_ Rerstricted_Flag_ =Restricted

MAP U ABORT req

Error

MAP_DELETE_ SUBSCRIBER_ DATA_Cnf

MAP_DELETE_ SUBSCRIBER_ DATA_Cnf

Error

OK

Figure 20.2.2.2/6: Macro Delete_GPRS_Subs_Data_GLR

20.3 Subscriber Identity procedure

In the subscriber identity procedure the IMSI of the subscriber is retrieved from the HLR. The procedure is shown in figure 20.3/1.

```
+-----+      +------+          +------+          +------+
| OMC |      | VLR  |          | GLR  |          | HLR  |
|     |      |      |          |      |          |      |
+-----+      +------+          +------+          +------+
   |         1.|                   |                 |
   + - - - - >|               2.|                 2.|
   |          +---------------->|--------------->|
   |          |  3.               |  3.             |
   |    4.    +<----------------+<---------------|
   +< - - - - |                   |                 |
   |          |                   |                 |
```

1) Identity request

2) MAP_SEND_IMSI

3) MAP_SEND_IMSI_ACK

4) Identity confirm

Figure 20.3/1: The subscriber identity procedure

20.3.1 Subscriber identity procedure in the GLR

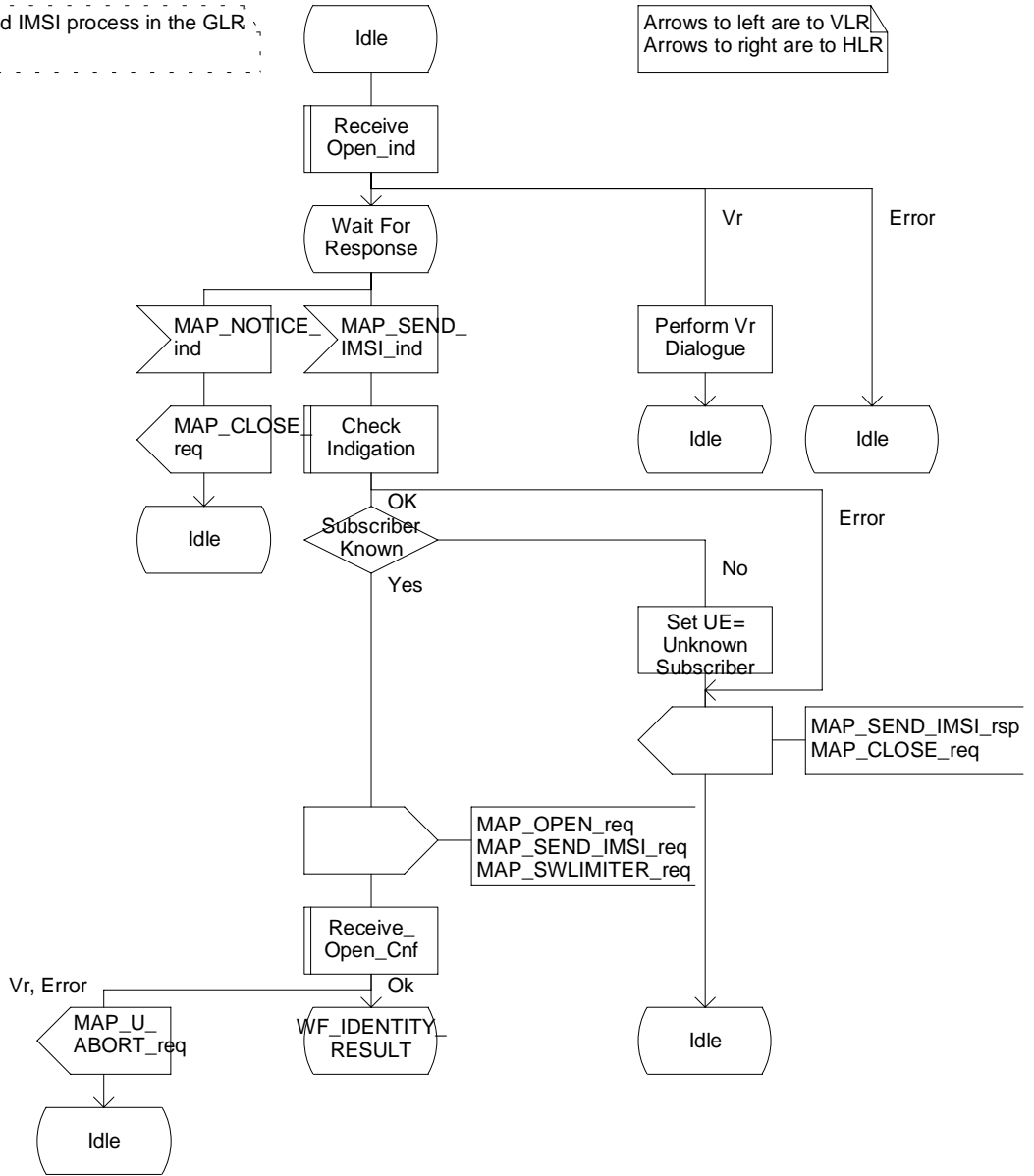The subscriber identity procedure in the GLR is shown in figure 20.3/2.

Figure 20.3/2(Sheet 1 of 2) : Process Send_IMSI_GLR

Process Send_IMSI_GLR 20.3.2_2(2)

Figure 20.3/2: The send IMSI process in the GLR

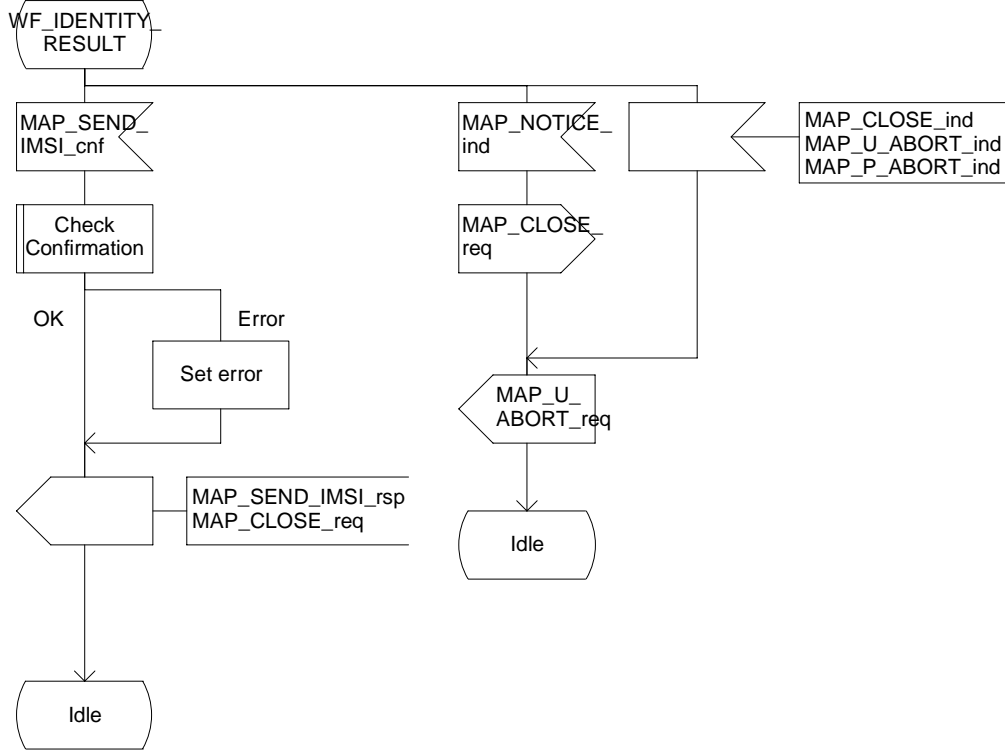Arrows to left are to VLR
Arrows to right are to HLR

WF_IDENTITY_
RESULT

MAP_SEND_
IMSI_cnf

MAP_NOTICE_
ind

MAP_CLOSE_ind
MAP_U_ABORT_ind
MAP_P_ABORT_ind

Check
Confirmation

MAP_CLOSE_
req

OK   Error

Set error

MAP_U_
ABORT_req

MAP_SEND_IMSI_rsp
MAP_CLOSE_req

Idle

Idle

Figure 20.3/2(Sheet 2 of 2) : Process Send_IMSI_GLR

21 Call handling procedures

21.1 General

The MAP call handling procedures are used:

1. to retrieve routeing information to handle a mobile terminating call;

2. to transfer control of a call back to the GMSC if the call is to be forwarded;

3. to retrieve and transfer information between anchor MSC and relay MSC for inter MSC group calls / broadcast calls;

4. to allocate resources in an SIWFS;

5. to handle the reporting of MS status for call completion services;

6. to handle the notification of remote user free for CCBS.

The item 1, 5 and 6 are only procedures that have impact to the GLR. The following subclause describes the function of the GLR related to these procedures.

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 21.2.1/1 (mobile terminating call which has not been optimally routed) and 21.2.1/2 (mobile-to-mobile call which has been optimally routed).
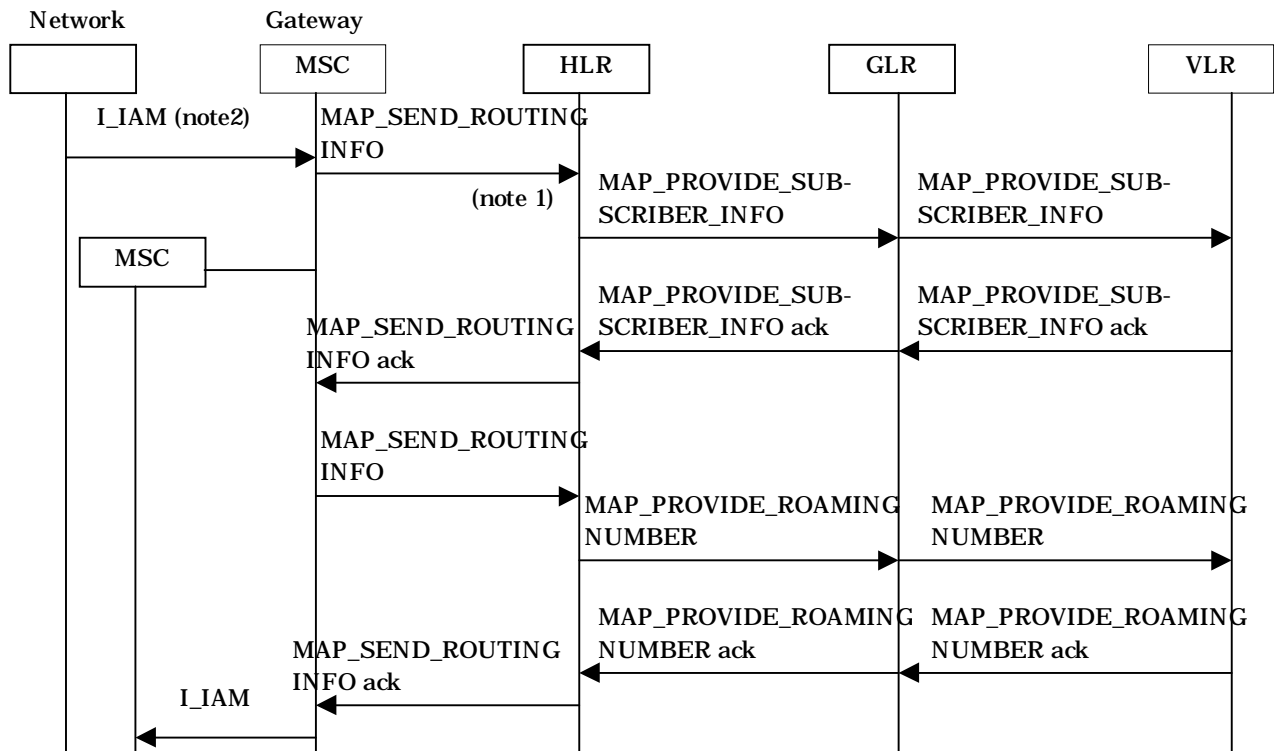
Notes:

xxx = Optional Procedure

NOTE 1: This service may also be used by an ISDN exchange for obtaining routing information from the HLR.
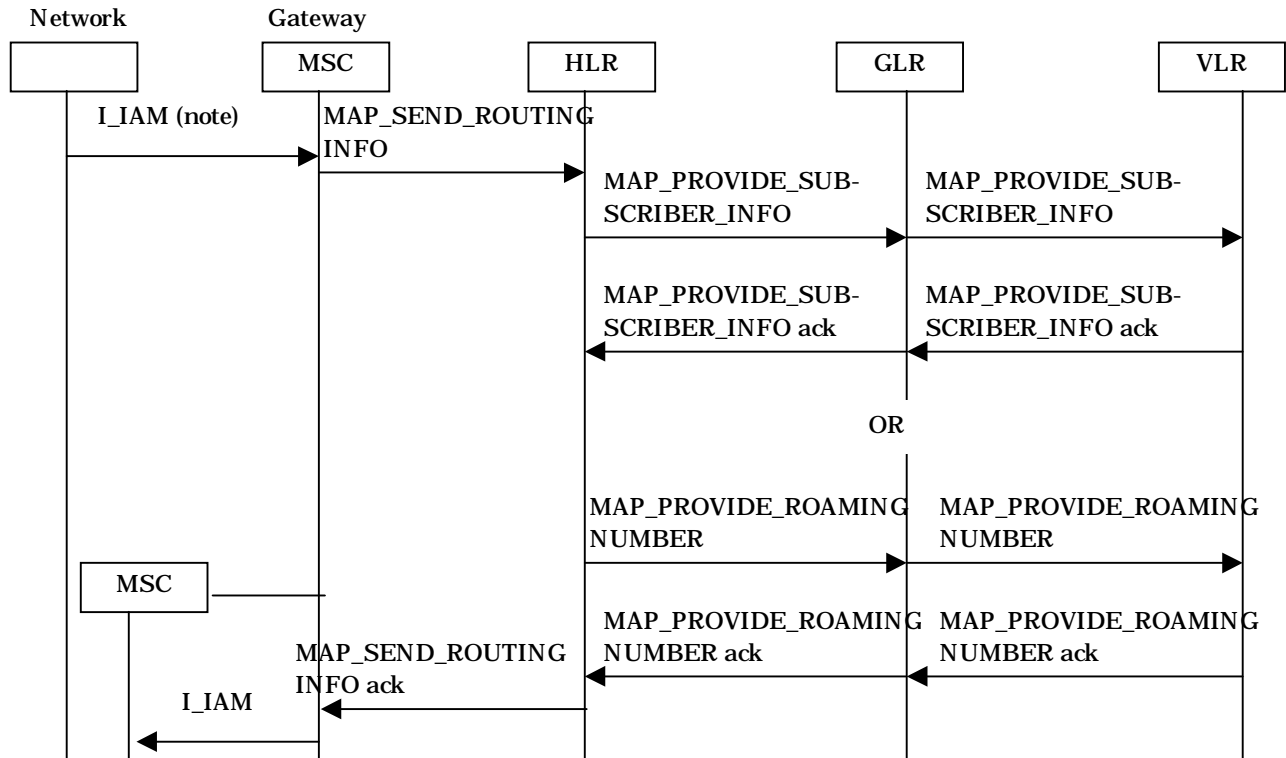
NOTE 2: TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. For further details on the TUP and ISUP procedures refer to the following ITU-T Recommendations and ETSI specification:

Q.721-725 - Telephone User Part (TUP);

ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

NOTE 3: As a network operator option, the HLR sends MAP_PROVIDE_SUBSCRIBER_INFORMATION to the VLR. For further details on the CAMEL procedures refer to GSM TS 03.78;

Figure 21.2.1/1: Message flow for retrieval of routeing information (non-optimally routed call)

Notes:

xxx = Optional Procedure

For Optimal Routeing phase 1, only one of the information flows for Provide Subscriber Info and Provide Roaming Number is used. For later phases of Optimal Routeing, the HLR may return a MAP_SEND_ROUTEING_INFORMATION ack after the Provide Subscriber Info information flow, and the GMSC may send a second MAP_SEND_ ROUTEING_INFORMATION, which will trigger the Provide Roaming Number information flow.

TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification:

Q.721-725 - Telephone User Part (TUP);

ETS 300 356-1 - Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 2 for the international interface; Part 1: Basic services.

Figure 21.2.1/2: Message flow for retrieval of routeing information (optimally routed call)

21.2.2   Process in the GLR to provide a roaming number

The MAP process in the GLR to provide a roaming number for a mobile terminating call is shown in figure 21.2.2/1 (Process PRN_Recieve_GLR) and figure 21.2.2/2 (Process PRN_Send_GLR). The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind   see section 25.1;

Receive_Open_Cnf   see section 25.1;
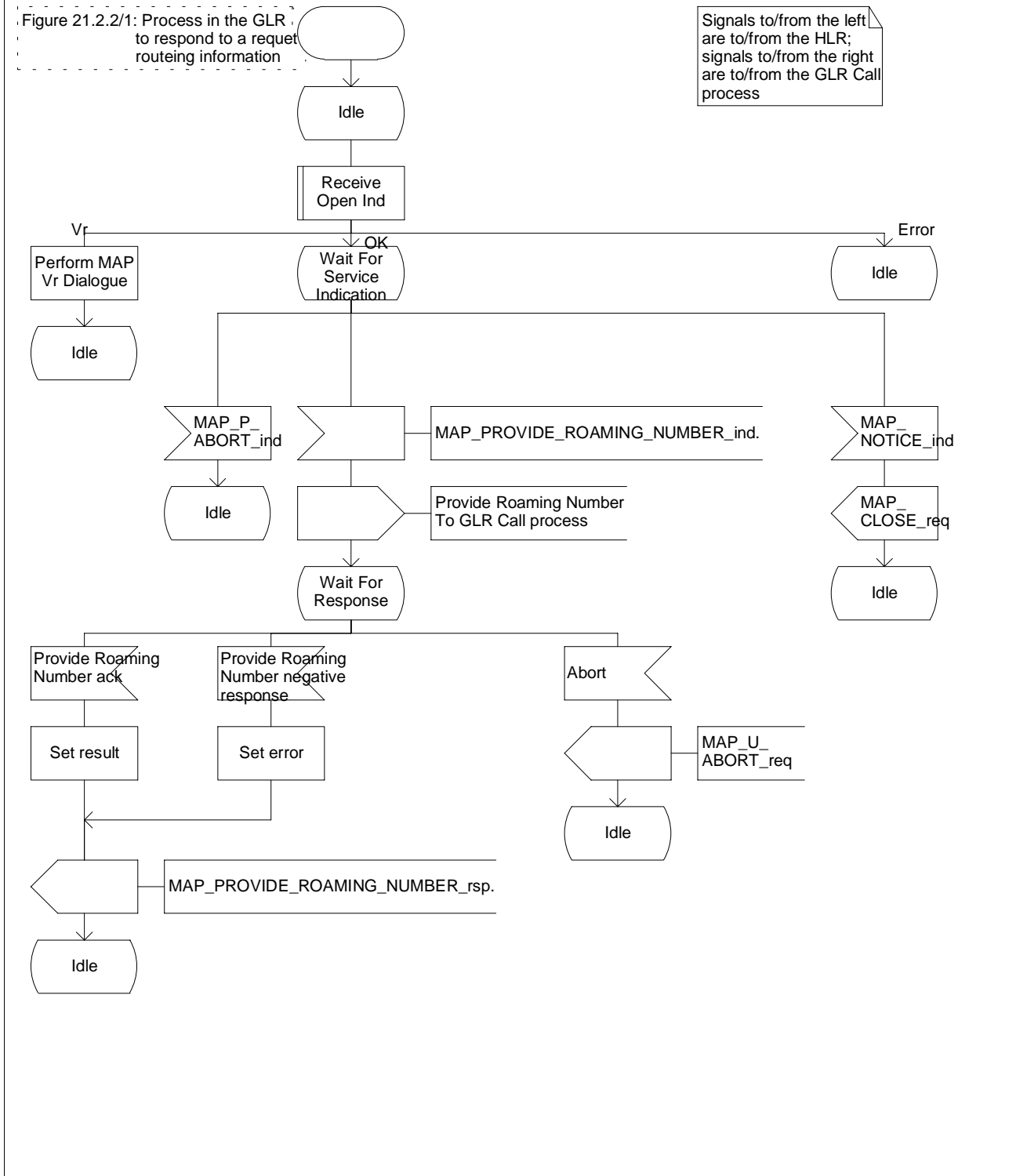
Check_Confirmation   see section 25.2.

Figure 21.2.2/1 : Process PRN_Receive_GLR

Process PRN_Send_GLR 21.2.2.2(1)

Figure 21.2.2/2: Process in the GLR to respond to a requet routeing information

Signals to/from the left are to/from the GLR Call; process signals to/from the right are to/from the VLR

Idle

Provide Roaming Number

MAP_Open_req
MAP_PROVIDE_ROAMING_NUMBER_req.
MAP_DELIMITER_req

Receive Open cnf

OK

Vr

Perform MAP Vr

Error

Provide Roaming Number negative response

Wait For Response

MAP_PROVIDE_ ROAMING_ NUMBER_ cnf

MAP_U_ABORT_ind.
MAP_P_ABORT_ind

MAP_NOTICE_ind.

Check Confrmation

MAP_CLOSE_req.

OK

Provide Roaming Number ack

Error

Provide Roaming Number negative response
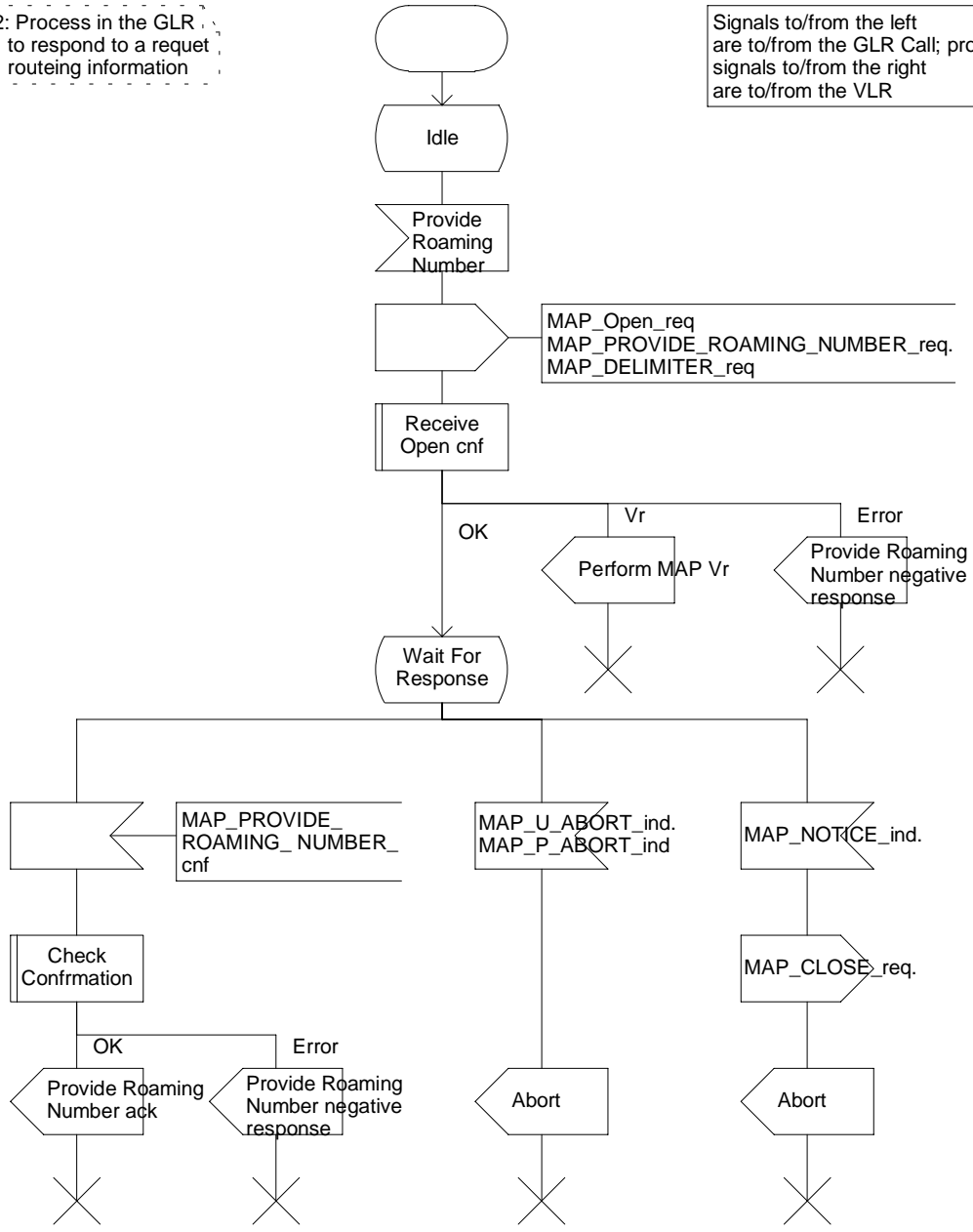
Abort

Abort

Figure 21.2.2/2: Process PRN_Send_GLR

21.2.3 Process in the GLR to provide subscriber information

The MAP process in the GLR to provide subscriber information for a mobile terminating call is shown in figure 21.2.3/1 (Process PSI Recieve_GLR) and figure 21.2.3/2 (Process PSI Send_GLR). The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind   see section 25.1;

Receive_Open_Cnf   see section 25.1;

Check_Confirmation   see section 25.2.

Process PSI_Receive_GLR 21.2.3.1(1)

Figure 21.2.3/1: Process in the GLR to respond to a requet routeing information

Signals to/from the left are to/from the HLR; signals to/from the right are to/from the GLR Call process
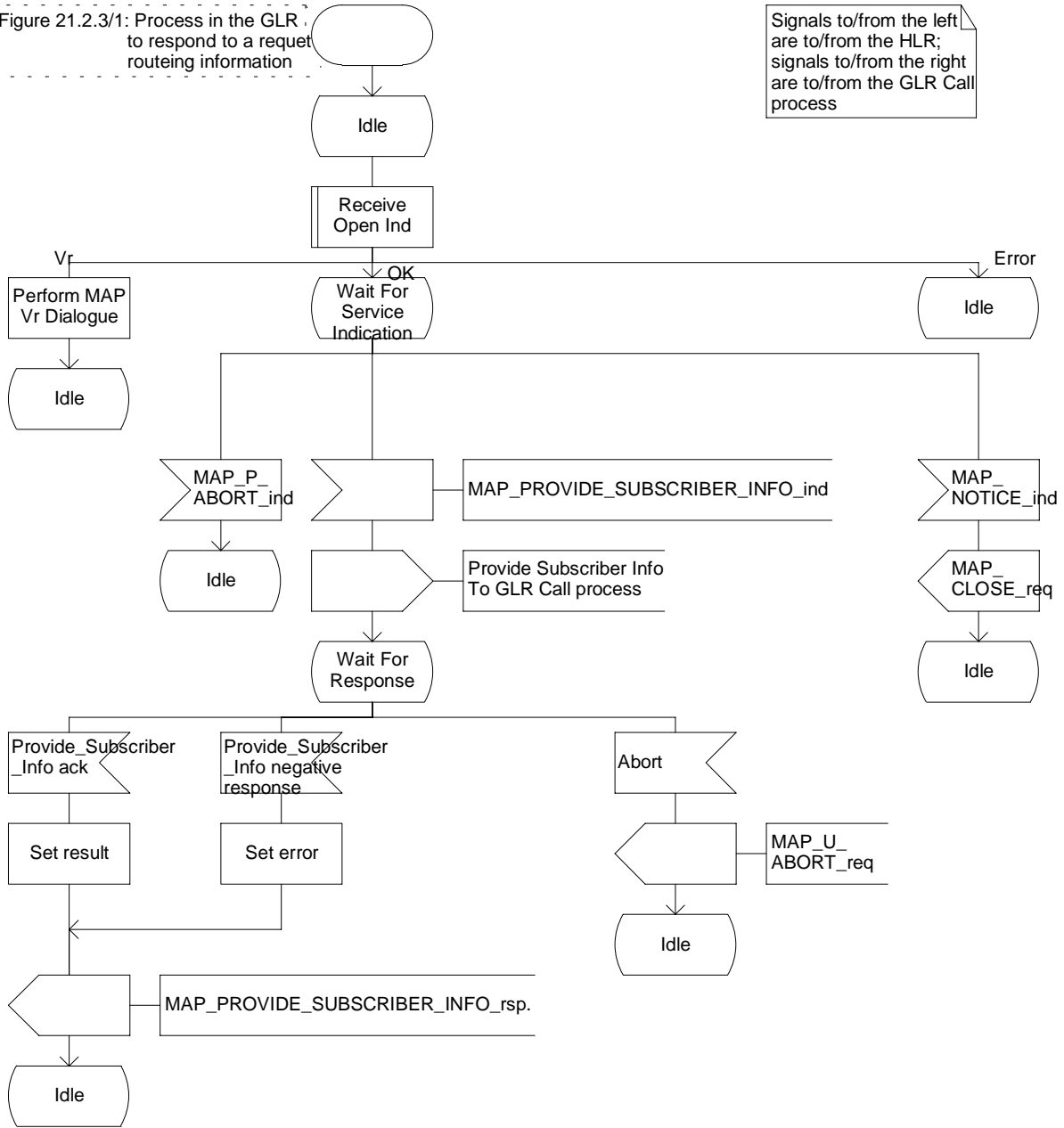
Idle

Receive Open Ind

Vr | OK | Error

Perform MAP Vr Dialogue

Wait For Service Indication

Idle

Idle

MAP_P_ABORT_ind | MAP_PROVIDE_SUBSCRIBER_INFO_ind | MAP_NOTICE_ind

Idle

Provide Subscriber Info To GLR Call process

MAP_CLOSE_req

Wait For Response

Idle

Provide_Subscriber_Info ack | Provide_Subscriber_Info negative response | Abort

Set result | Set error | MAP_U_ABORT_req

Idle

MAP_PROVIDE_SUBSCRIBER_INFO_rsp.

Idle

Figure 21.2.3/1 : Process PSI_Receive GLR

Process PSI_Send_GLR 21.2.3.2(1)

Figure 21.2.3/2: Process in the GLR to respond to a requet routeing information

Signals to/from the left are to/from the GLR Call; process signals to/from the right are to/from the VLR
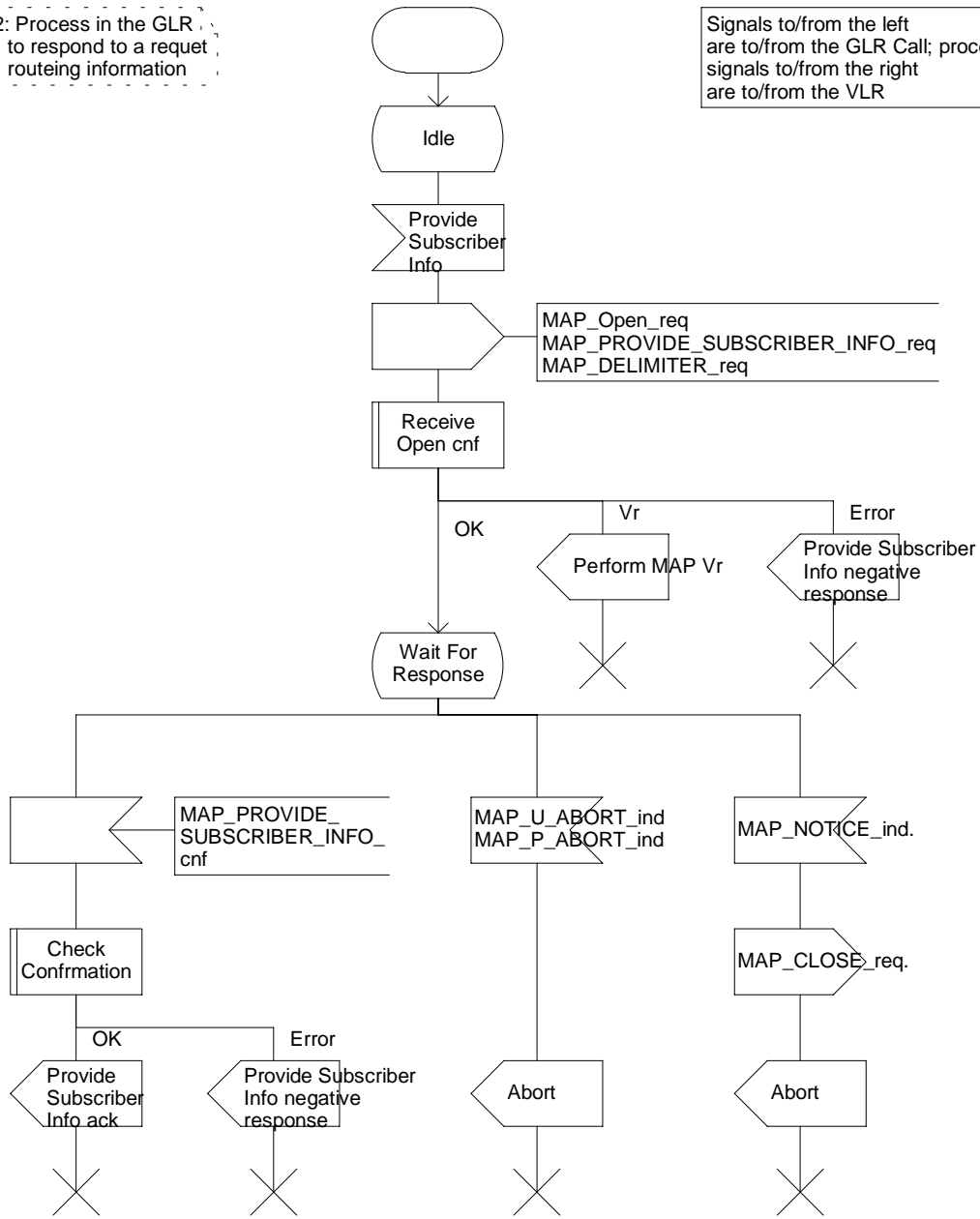
Idle

Provide Subscriber Info

MAP_Open_req
MAP_PROVIDE_SUBSCRIBER_INFO_req
MAP_DELIMITER_req

Receive Open cnf

OK | Vr | Error

Perform MAP Vr

Provide Subscriber Info negative response

Wait For Response

MAP_PROVIDE_ SUBSCRIBER_INFO_ cnf

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_NOTICE_ind.

Check Confrmation

MAP_CLOSE_req.

OK | Error

Provide Subscriber Info ack

Provide Subscriber Info negative response

Abort

Abort

Figure 21.2.3/2 : Process PSI_Send_GLR

21.3   Setting of Reporting State

21.3.1   General

In case that the HLR received the CCBS request message from the other HLR for CCSB monitoring, the message flow for setting the reporting state is shown in figure 21.3.1/1. The message flow shown in figure 21.3.1/1 shall also be applied in case for stop monitoring. The stage2 specification for the interaction with CCBS in a GLR is in TS 23.119.
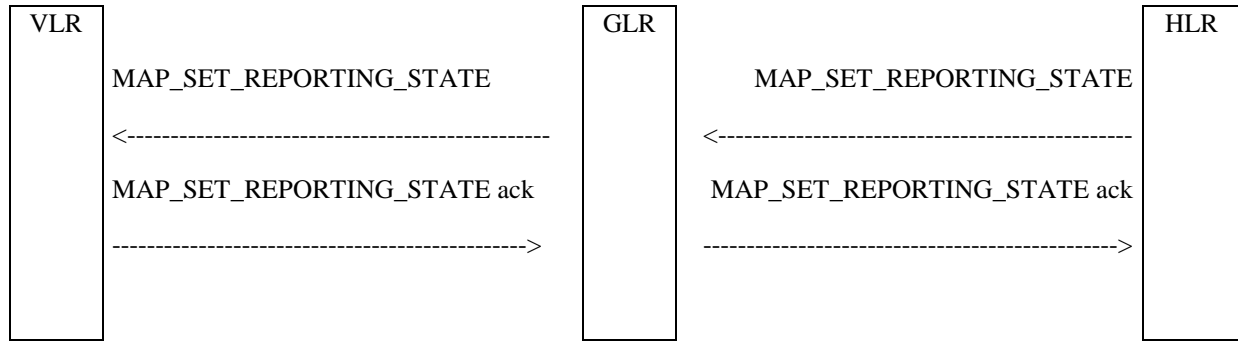
```
  VLR                                              GLR                                              HLR

         MAP_SET_REPORTING_STATE                          MAP_SET_REPORTING_STATE

  <----------------------------------------         <----------------------------------------

         MAP_SET_REPORTING_STATE ack                       MAP_SET_REPORTING_STATE ack

  ---------------------------------------->         ---------------------------------------->
```

Figure 21.3.1/1: Message Flow for Setting the Reporting State

21.3.2   Process in the GLR to set the reporting state

The MAP process in the GLR to set the reporting state is shown in figures 21.3.2/1 and 21.3.2/2. The MAP process invokes a macro not define in this subclause; the definition of this cacro can be found as follows:

Receive_Open_Ind   see section 25.1;

Receive_Open_Cnf   see section 25.1;

Check_Confirmation   see section 25.2.

Set the reporting state

When receiving the MAP_SET_REPORTING_STATE indication, the MAP user in the GLR transfers the information to the VLR in the MAP_ SET_REPORTING_STATE request.

The GLR then awaits the receipt of the MAP_ SET_REPORTING_STATE confirm from the VLR. The MAP user in the GLR shall transfer the information contained in this primitive to the HLR in the MAP_ SET_REPORTING_STATE response without checking its contents.

Figure 21.3.2/1: Process Repoting_State_Receive_GLR

Process Reporting_State_Send_GLR 21.3.2.2(1)

Figure 21.3.2/2: Process in the GLR to respond to a requet reporting state

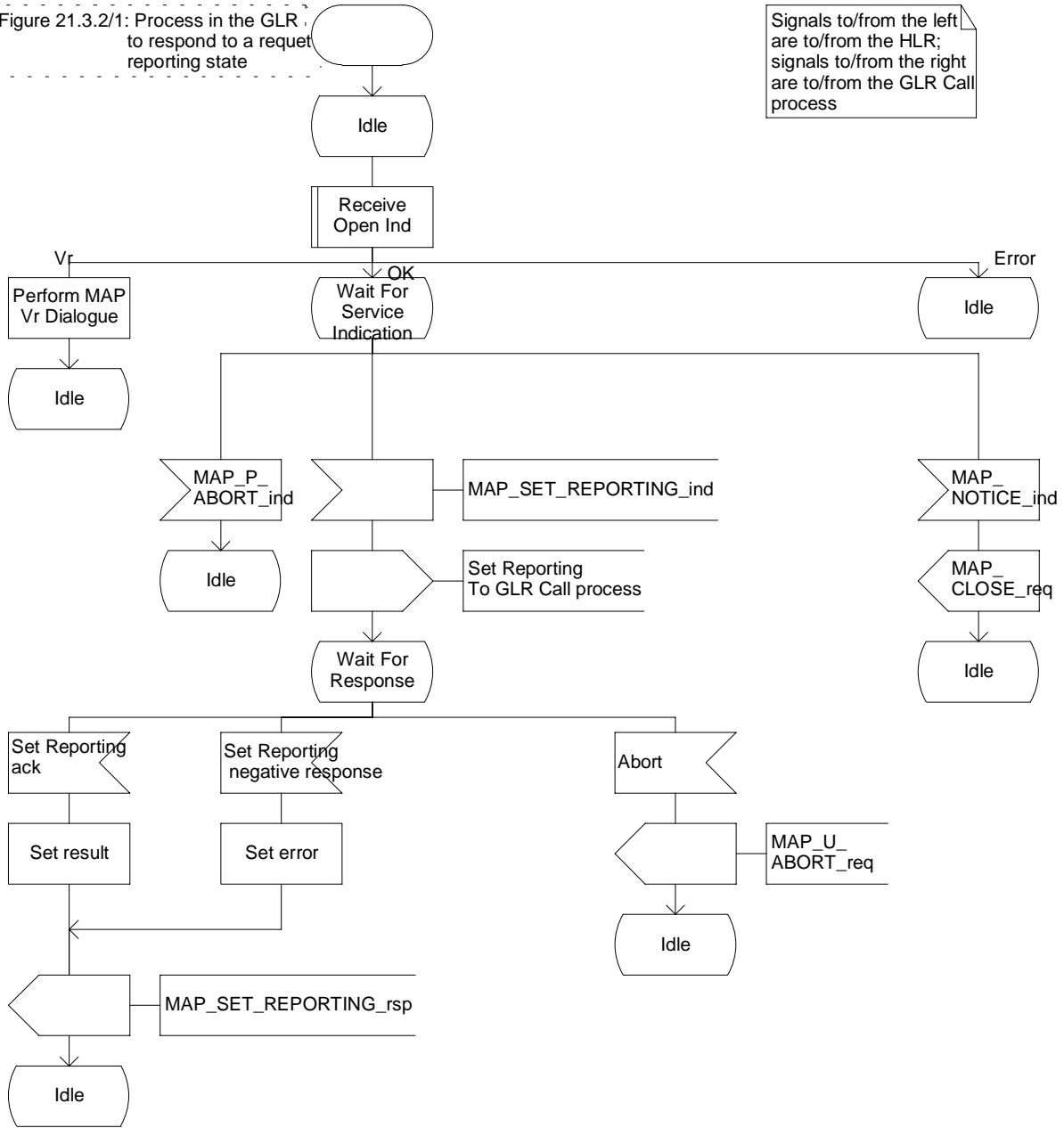Signals to/from the left are to/from the GLR Call; process signals to/from the right are to/from the VLR

Idle

Set Reporting

MAP_Open_req
MAP_SET_REPORTING_req
MAP_DELIMITER_req

Receive Open cnf

OK   Vr   Error

Perform MAP Vr   Set Reporting negative response

Wait For Response

MAP_SET_REPORTING_ cnf   MAP_U_ABORT_ind MAP_P_ABORT_ind   MAP_NOTICE_ind

Check Confrmation   MAP_CLOSE_req

OK   Error

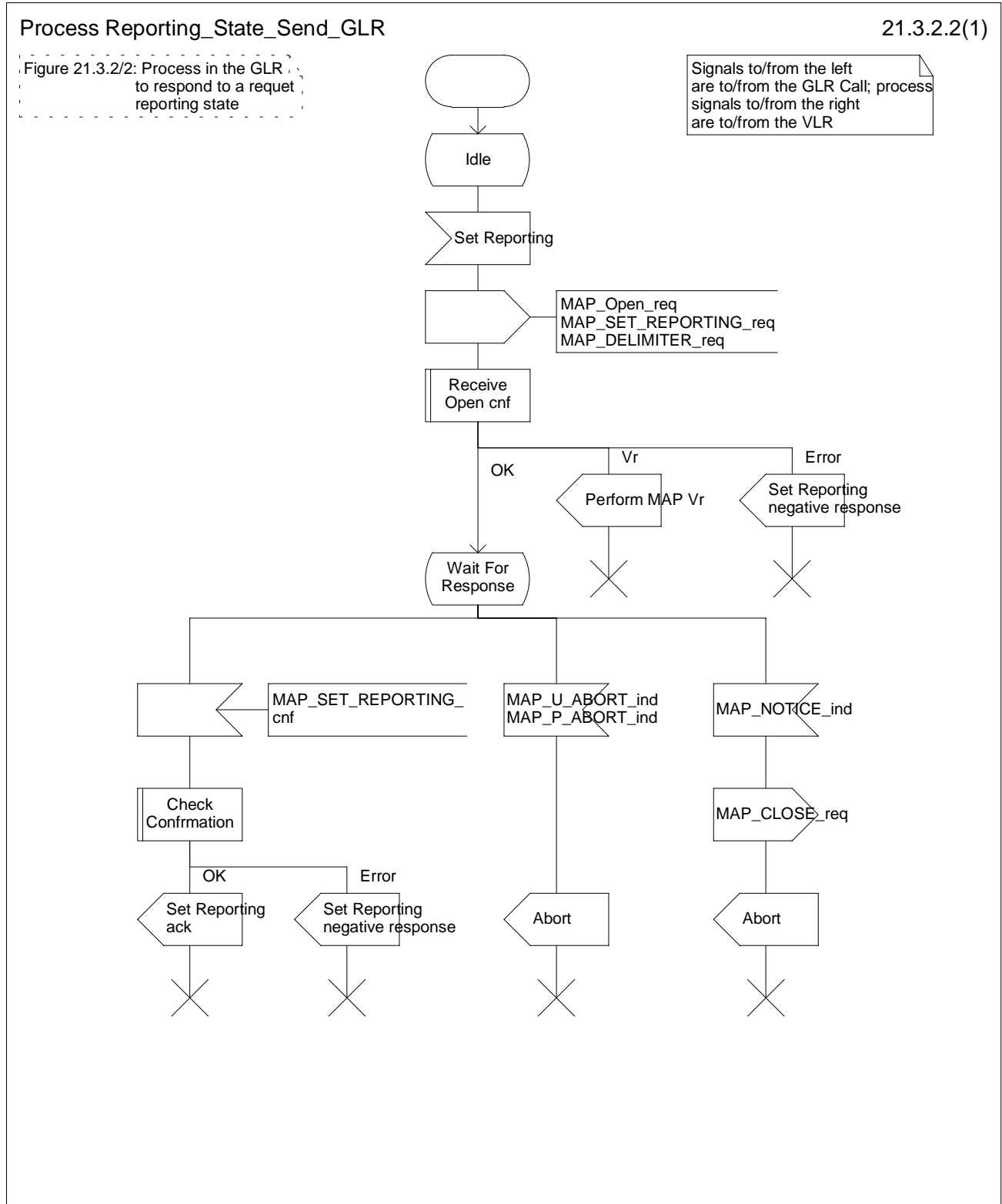Set Reporting ack   Set Reporting negative response   Abort   Abort

Figure 21.3.2/2: Process Repoting_State_Send_GLR

21.4 Status Reporting

21.4.1 General

In case that the monitored subscriber becomes to the idle state, the message flow for reporting subscriber's state to the HLR is shown in figure 21.4.1/1. The stage2 specification for the interaction with CCBS in a GLR is in TS 23.119.
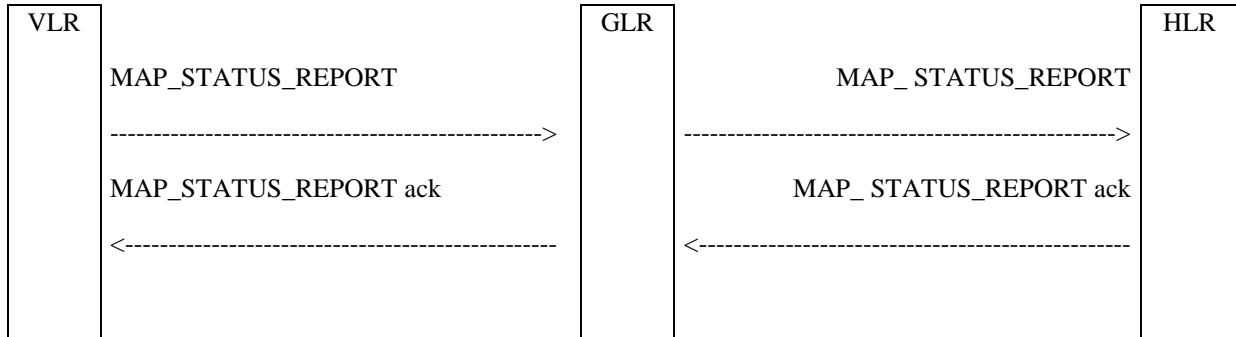
```
 ┌─────┐                                       ┌─────┐                                       ┌─────┐
 │ VLR │                                       │ GLR │                                       │ HLR │
 │     │   MAP_STATUS_REPORT                   │     │        MAP_ STATUS_REPORT             │     │
 │     │                                       │     │                                       │     │
 │     │ ------------------------------------> │     │ -----------------------------------> │     │
 │     │   MAP_STATUS_REPORT ack               │     │        MAP_ STATUS_REPORT ack         │     │
 │     │                                       │     │                                       │     │
 │     │ <------------------------------------ │     │ <----------------------------------- │     │
 │     │                                       │     │                                       │     │
 └─────┘                                       └─────┘                                       └─────┘
```

Figure 21.4.1/1: Message Flow for Status Reporting

21.4.2 Process in the GLR for Status Reporting

The MAP process in the GLR to send the status report to the HLR is shown in figures 21.4.1/1 and 21.4.2/2.

Send Status report

When receiving the MAP_STATUS_REPORT indication, the MAP user in the GLR transfers the information to the HLR in the MAP_ STATUS_REPORT request.

The GLR then awaits the receipt of the MAP_ STATUS_REPORT confirm from the HLR. The MAP user in the GLR shall transfer the information contained in this primitive to the VLR in the MAP_ STATUS_REPORT response without checking its contents.

Process Status_Report_Receive_GLR 21.4.2.1(1)

Figure 21.4.2/1: Process in the GLR to respond to a requet status report

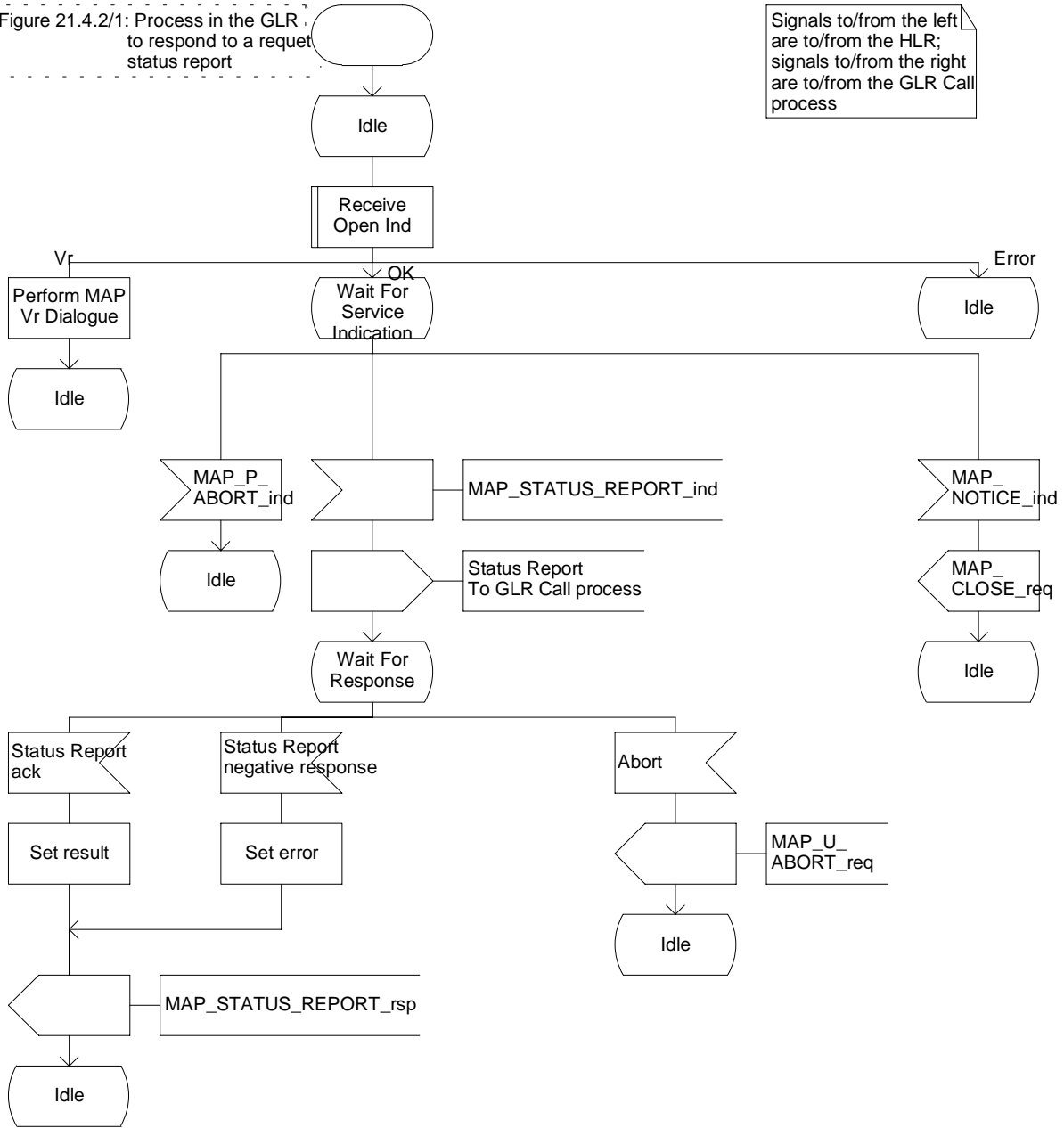Signals to/from the left are to/from the HLR; signals to/from the right are to/from the GLR Call process
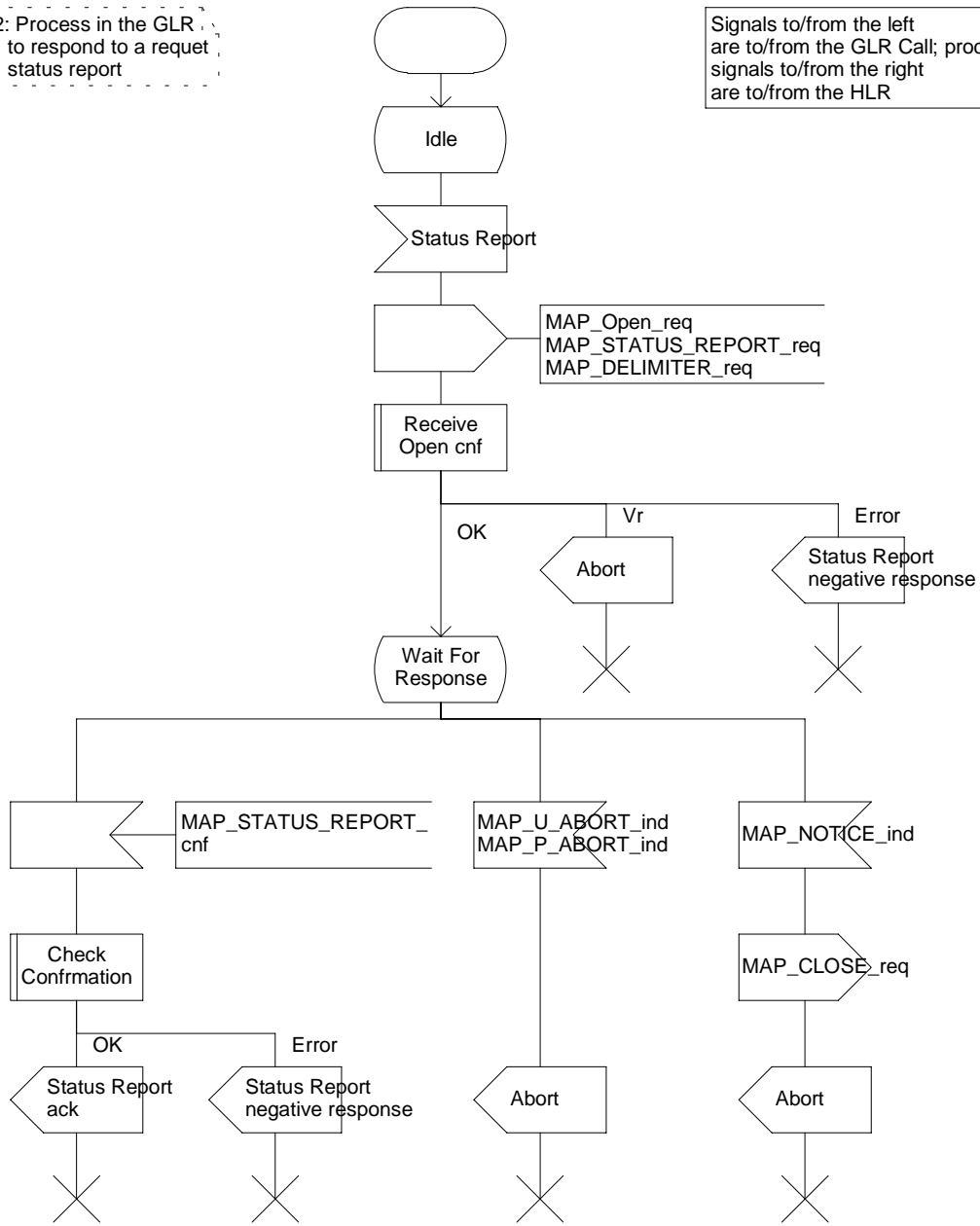
Idle

Receive Open Ind

Vr OK Error

Perform MAP Vr Dialogue

Wait For Service Indication

Idle

Idle

MAP_P_ ABORT_ind

MAP_STATUS_REPORT_ind

MAP_ NOTICE_ind

Idle

Status Report To GLR Call process

MAP_ CLOSE_req

Wait For Response

Idle

Status Report ack

Status Report negative response

Abort

Set result

Set error

MAP_U_ ABORT_req

Idle

MAP_STATUS_REPORT_rsp

Idle

Figure 21.4.2/1: Process Status_Report_Recieve_GLR

Process Status_Report_Send_GLR 21.4.2.2(1)

Figure 21.4.2/2: Process in the GLR to respond to a requet status report

Signals to/from the left are to/from the GLR Call; process signals to/from the right are to/from the HLR

Idle

Status Report

MAP_Open_req
MAP_STATUS_REPORT_req
MAP_DELIMITER_req

Receive Open cnf

OK

Vr

Error

Abort

Status Report negative response

Wait For Response

MAP_STATUS_REPORT_ cnf

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_NOTICE_ind

Check Confrmation

MAP_CLOSE_req

OK

Status Report ack

Error

Status Report negative response

Abort

Abort

Figure 21.4.2/2: Process Status_Report_Send_GLR

21.5 Remote User Free

21.5.1 General

The message flow for handling remote user free is shown in figure 21.5.1/1.

```
┌─────┐                                        ┌─────┐                                        ┌─────┐
│ VLR │                                        │ GLR │                                        │ HLR │
│     │    MAP_REMOTE_USER_FREE                │     │        MAP_ REMOTE_USER_FREE           │     │
│     │<---------------------------------------│     │<---------------------------------------│     │
│     │                                        │     │                                        │     │
│     │    MAP_ REMOTE_USER_FREE ack           │     │      MAP_ REMOTE_USER_FREE ack         │     │
│     │--------------------------------------->│     │--------------------------------------->│     │
│     │                                        │     │                                        │     │
└─────┘                                        └─────┘                                        └─────┘
```
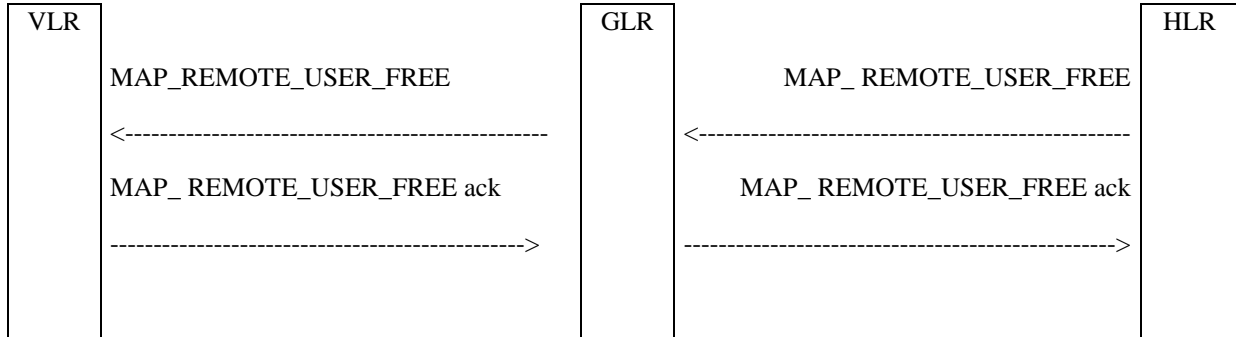
Figure 21.5.1/1: Message Flow for Remote User Free

21.5.2 Process in the GLR for Remote User Free

The MAP process in the GLR to handling Remote User Free is shown in figures 21.5.2/1 and 21.5.2/2.

Remote User Free

When receiving the MAP_REMOTE_USER_FREE indication, the MAP user in the GLR transfers the information to the VLR in the MAP_ REMOTE_USER_FREE request.

The GLR then awaits the receipt of the MAP_REMOTE_USER_FREE confirm from the VLR. The MAP user in the GLR shall transfer the information contained in this primitive to the HLR in the MAP_REMOTE_USER_FREE response without checking its contents.
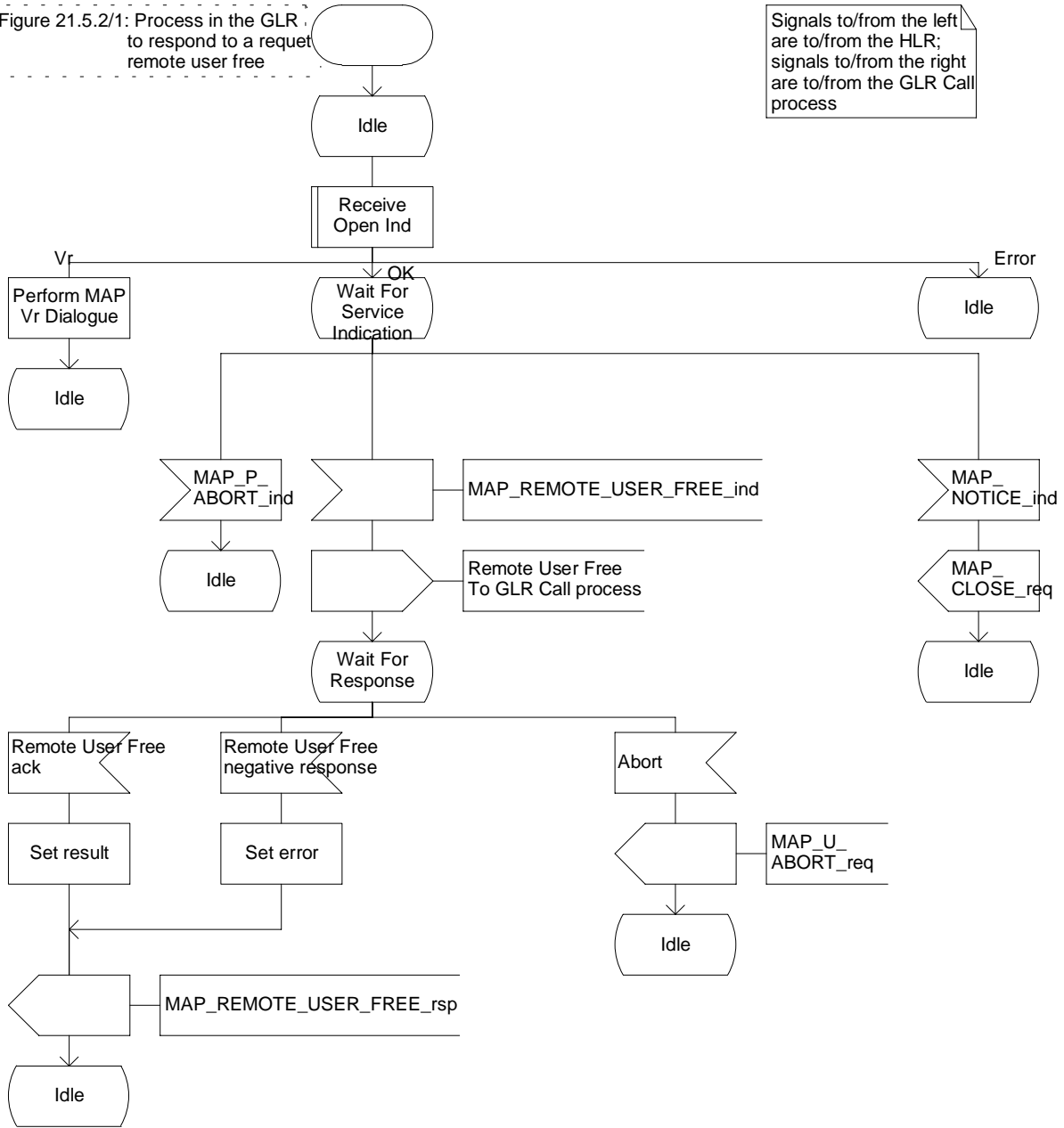
Figure 21.5.2/1: Process Remote_User_Free_Recieve_GLR

Process Remote_User_Free_Send_GLR 21.5.2.2(1)

Figure 21.5.2/2: Process in the GLR to respond to a requet remote user free

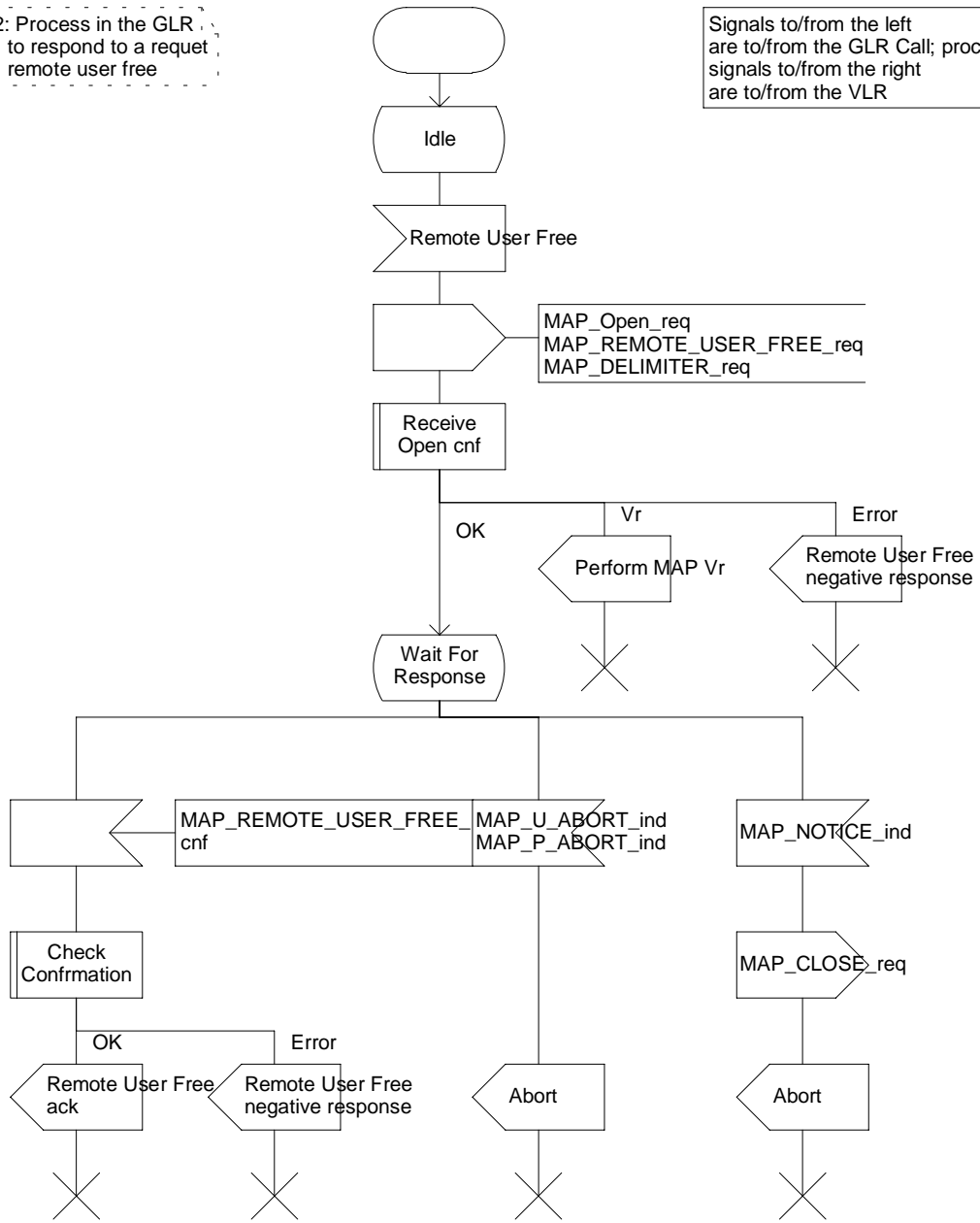Signals to/from the left are to/from the GLR Call; process signals to/from the right are to/from the VLR

Idle

Remote User Free

MAP_Open_req
MAP_REMOTE_USER_FREE_req
MAP_DELIMITER_req

Receive Open cnf

OK

Vr

Error

Perform MAP Vr

Remote User Free negative response

Wait For Response

MAP_REMOTE_USER_FREE_cnf

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_NOTICE_ind

Check Confrmation

MAP_CLOSE_req

OK

Error

Remote User Free ack

Remote User Free negative response

Abort

Abort

Figure 21.5.2/2: Process Remote_User_Free_Send_GLR

22 Supplementary services procedures

22.1 Functional supplementary service processes

22.1.1 Functional supplementary service process co-ordinator for GLR

Any functional SS process in the GLR starts by the GLR receiving a MAP-OPEN service indication. If that service is successful, the GLR can handle supplementary service indications from the VLR. Table 21.1/1 shows the co-ordinating process' reaction on receipt of specific SS service indications from the VLR. After the relevant process is invoked, the received service indication is sent to that process, and the co-ordinating process terminates.

Table 21.1/1: Relationship between received service indication and invoked process in the GLR.

Service indication received	Process invoked
MAP_REGISTER_SS_ind	REGISTER_SS_GLR
MAP_ERASE_SS_ind	ERASE_SS_GLR
MAP_ACTIVATE_SS_ind	ACTIVATE_SS_GLR
MAP_DEACTIVATE_SS_ind	DEACTIVATE_SS_GLR
MAP_INTERROGATE_SS_ind	INTERROGATE_SS_GLR
MAP_REGISTER_PASSWORD	REGISTER_PASSWORD_GLR

Figure 22.1/1 shows the co-ordinating process in the GLR.

Figure 22.1/1 (sheet 1 of 2): Process SS_Coordinator_GLR

Process SS_Coordinator_GLR 22.1.1_2(2)

Figure 22.1/1: Supplementary Service Coordination process in the GLR, to identity which functional supplementary service process be invoked.

Signals to/from the left are to/from the VLR via the MAP provider; signals to/from the right are to/from the child process
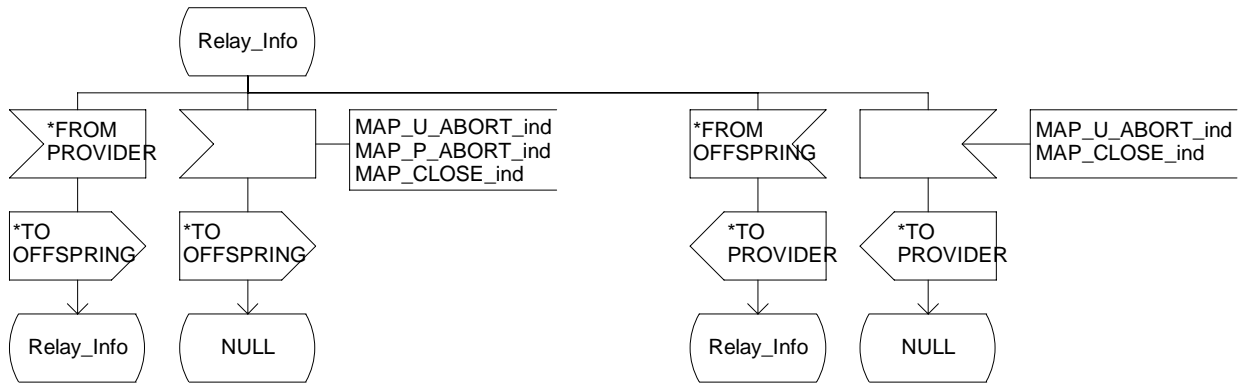
```
                           ┌──────────┐
                           │Relay_Info│
                           └────┬─────┘
          ┌─────────────────────┼─────────────────────────────────┬───────────────────────┐
     ┌────┴─────┐         ┌──────┴──┐  MAP_U_ABORT_ind    ┌────────┴┐              ┌────────┴┐  MAP_U_ABORT_ind
     │*FROM     │         │         │  MAP_P_ABORT_ind    │*FROM     │             │         │  MAP_CLOSE_ind
     │PROVIDER  │         │         │  MAP_CLOSE_ind      │OFFSPRING │             │         │
     └────┬─────┘         └────┬────┘                     └────┬─────┘             └────┬────┘
     ┌────┴─────┐         ┌────┴────┐                     ┌────┴─────┐             ┌────┴────┐
     │*TO       │         │*TO      │                     │*TO       │             │*TO      │
     │OFFSPRING │         │OFFSPRING│                     │PROVIDER  │             │PROVIDER │
     └────┬─────┘         └────┬────┘                     └────┬─────┘             └────┬────┘
     ┌────┴─────┐         ┌────┴────┐                     ┌────┴─────┐             ┌────┴────┐
     │Relay_Info│         │  NULL   │                     │Relay_Info│             │  NULL   │
     └──────────┘         └─────────┘                     └──────────┘             └─────────┘
```
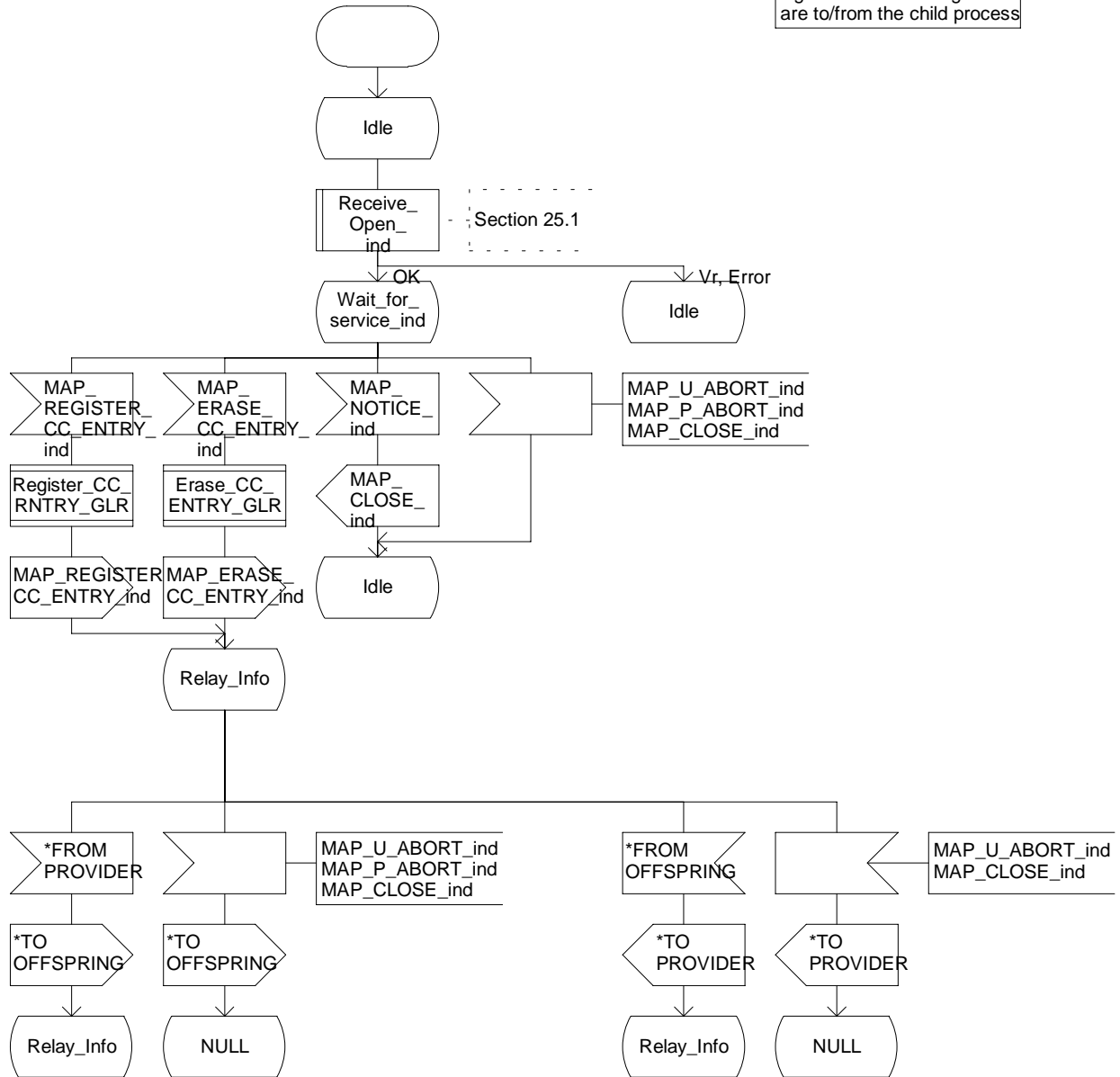
Figure 22.1/1 (sheet 2 of 2): Process SS_Coordinator_GLR

22.1.2 Call completion supplementary service process co-ordinator for GLR

The MAP co-ordinating process in the GLR to handle a dialogue opened with the call Completion application context is shown in figure 22.1/2. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind   see subclause 25.1.

Any call completion SS process in the GLR starts by the GLR receiving a MAP-OPEN service indication. If that service is successful, the GLR can handle call completion supplementary service indications from the VLR. Table 22.1/2 shows the co-ordinating process' reaction on receipt of specific call completion SS service indications from the VLR. After the relevant process is invoked, the received service indication is sent to that process.

Table 22.1/2: Relationship between received service indication and invoked process in the GLR.

Service indication received	Process invoked
MAP_REGISTER_CC_ENTRY_ind	REGISTER_CC_ENTRY_GLR
MAP_ERASE_CC_ENTRY_ind	ERASE_CC_ENTRY_GLR

After creation of the user process the Co-ordinator relays the messages between the MAP_PM and the invoked process until a request or an indication for dialogue termination is received.

The Call_Completion Co-ordinator is shown in figure 22.1/2.

Figure 22.1/2: Process_CC_Coord_GLR

22.2 Registration procedure

22.2.1 General

The registration procedure is used to register data related to a supplementary service in the HLR. The registration procedure is a fully transparent communication between the MS and the HLR.

22.2.2 Procedures in the GLR

Supplementary service registration

When receiving the MAP_REGISTER_SS indication from VLR, the MAP user in the GLR transfers the information to the HLR in the MAP_REGISTER_SS request without checking the contents of the service indication.

The GLR then awaits the receipt of the MAP_REGISTER_SS confirm from the HLR. The MAP user in the GLR shall transfer the information contained in this primitive to the VLR in the MAP_REGISTER_SS response without checking its contents.

Error handling

If at any time during this procedure a MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE or unexpected MAP_CLOSE indication is received from the VLR concerning the process, a MAP_U_ABORT request indicating application procedure cancellation is sent to the HLR (if a connection exists). If a MAP_NOTICE indication was received from the VLR, that dialogue must be closed by sending a MAP_CLOSE request towards the VLR. The process is terminated.

If a MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indication is received from the HLR, a MAP_U_ABORT request shall be sent to the VLR terminating the process. If a MAP_NOTICE indication was received from the HLR, that dialogue must be closed by sending a MAP_CLOSE request towards the HLR. The process terminates.

The registration procedure in the GLR is shown in figure 22.2/1.

Process SS_REGISTER_GLR 22.2.1_1(2)

Figure 22.2/1: Mobile Initiated registeration of supplementary service in the GLR

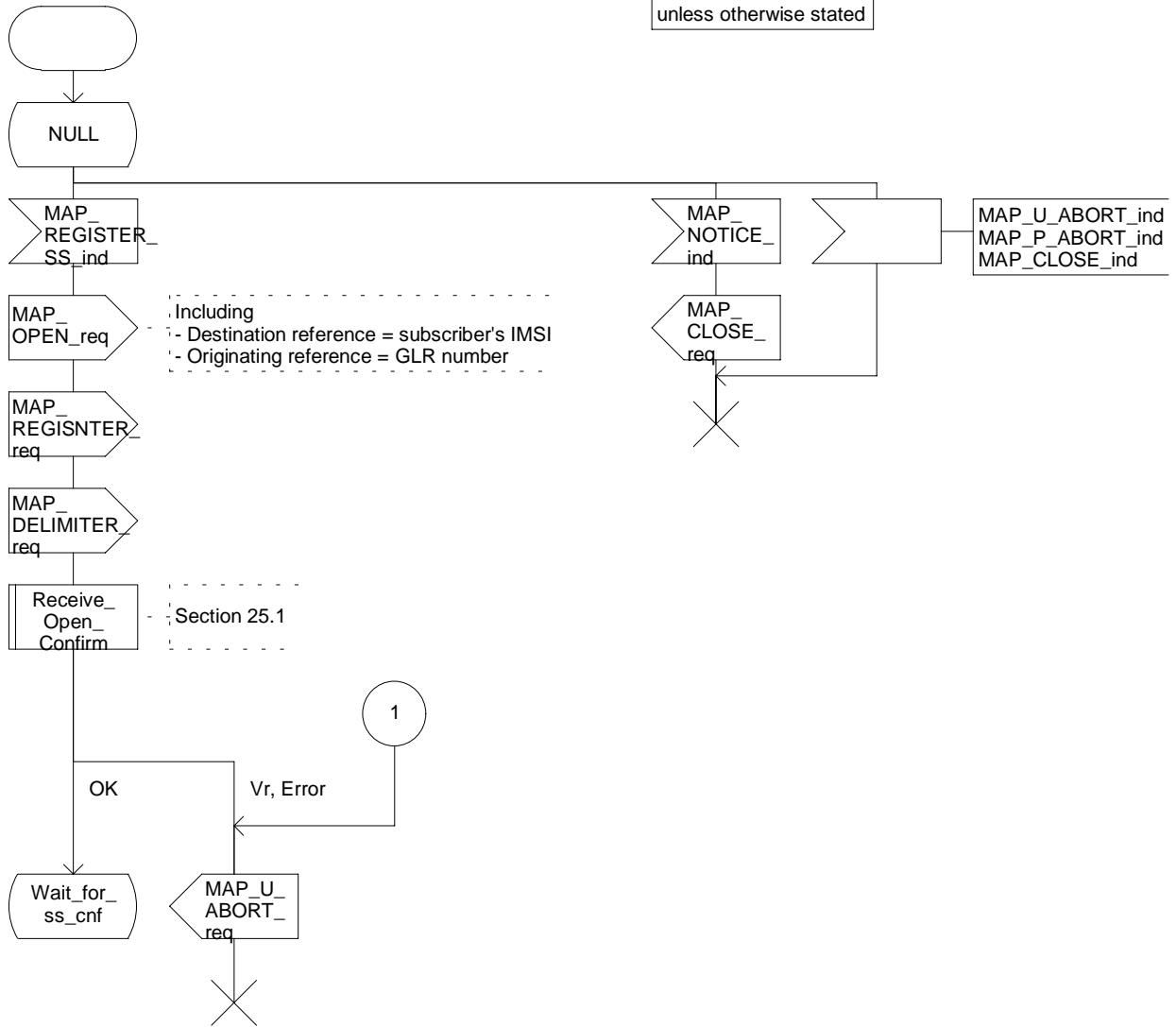Signals to/from the left are to/from the VLR signals to/from the right are to/from the HLR unless otherwise stated

NULL

MAP_ REGISTER_ SS_ind

MAP_ OPEN_req

Including
- Destination reference = subscriber's IMSI
- Originating reference = GLR number

MAP_ REGISNTER_ req

MAP_ DELIMITER_ req

Receive_ Open_ Confirm

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1

OK

Vr, Error

Wait_for_ ss_cnf

MAP_U_ ABORT_ req

MAP_ NOTICE_ ind

MAP_ CLOSE_ req

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

Figure 22.2/1 (sheet 1 of 2): Procedure SS_Register_GLR

Process SS_REGISTER_GLR   22.2.1_2(2)

Figure 22.2/1: Mobile Initiated registeration of
supplementary service in the GLR

Signals to/from the left
are to/from the VLR
signals to/from the right
are to/from the HLR
unless otherwise stated
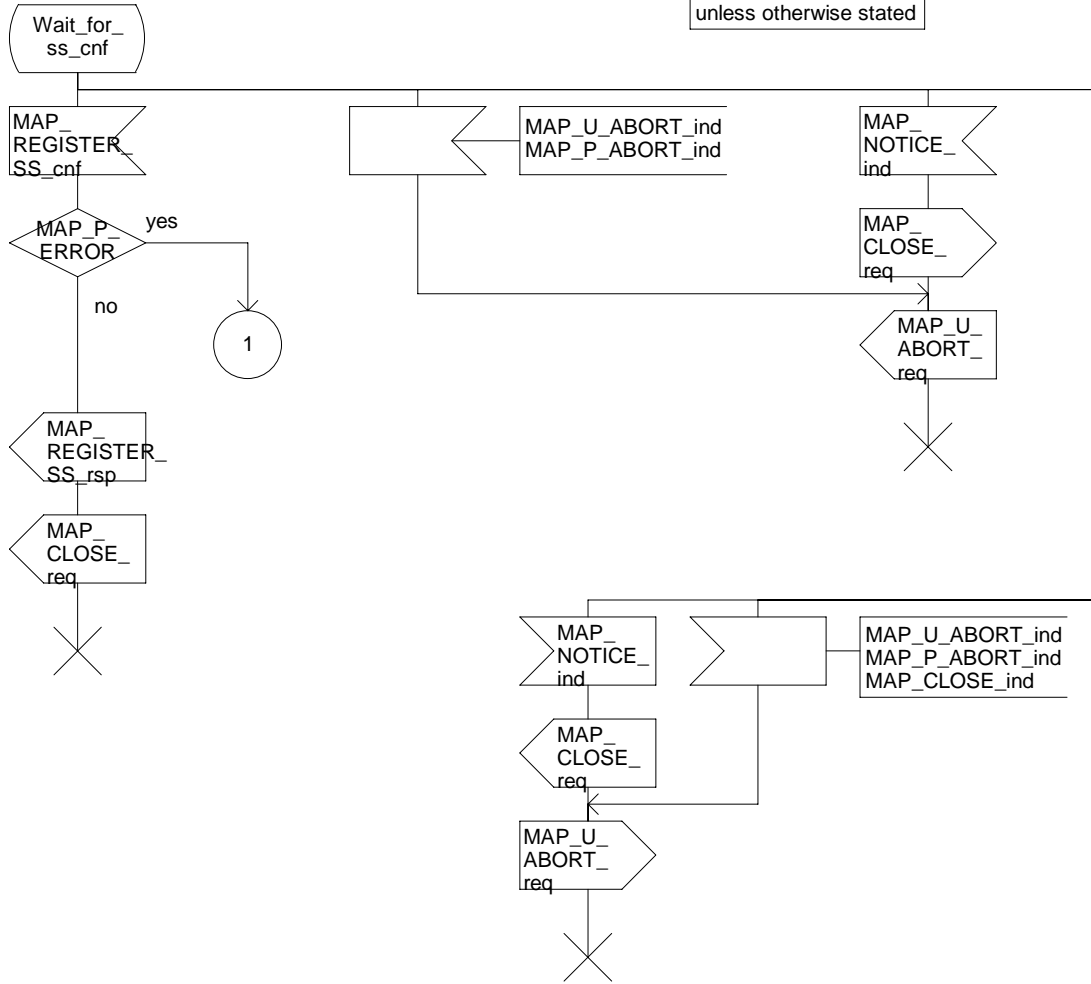
Figure 22.2/1 (sheet 2 of 2): Procedure SS_Register_GLR

22.3 Erasure procedure

22.3.1 General

The erasure procedure is used to erase data related to a supplementary service in the HLR. The erasure procedure is a fully transparent communication between the MS and the HLR.

22.3.2 Procedures in the GLR

The GLR procedures for erasure are identical to those specified for registration in subclause 22.2 The text and diagrams in subclause 22.2 apply with all references to registration changed to erasure.

22.4 Activation procedure

22.4.1 General

The activation procedure is used to activate a supplementary service in the HLR. The activation procedure is a fully transparent communication between the MS and the HLR.

22.4.2 Procedures in the GLR

Supplementary service activation

When receiving the MAP_ACTIVATE_SS indication, the MAP user in the GLR transfers the information to the HLR in the MAP_ACTIVATE_SS request without checking the contents of the service indication.

The GLR may then receive the MAP_GET_PASSWORD indication. This information is transferred to the VLR in the MAP_GET_PASSWORD request. If a MAP_GET_PASSWORD confirm primitive is received from the VLR, the VLR initiates the MAP_GET_PASSWORD response towards the HLR.

The GLR will receive the MAP_ACTIVATE_SS confirm from the HLR. The MAP user in the GLR shall transfer the information contained in this primitive to the VLR in the MAP_ACTIVATE_SS response without checking its contents.

Error handling

The handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE in this procedure is identical to the handling in the Registration procedure in the GLR, see subclause 22.2 of the present document.

The activation procedure in the GLR is shown in figure 22.4/1.

Figure 22.4/1 (sheet 1 of 2): Procedure Activate_SS_GLR

Process SS_ACTIVATE_GLR 22.4.1_2(2)

Figure 22.4/1: Activation of supplementary service procedure in the GLR

Signals to/from the left are to/from the VLR via the MAP provider; signals to/from the right are to/from the child process
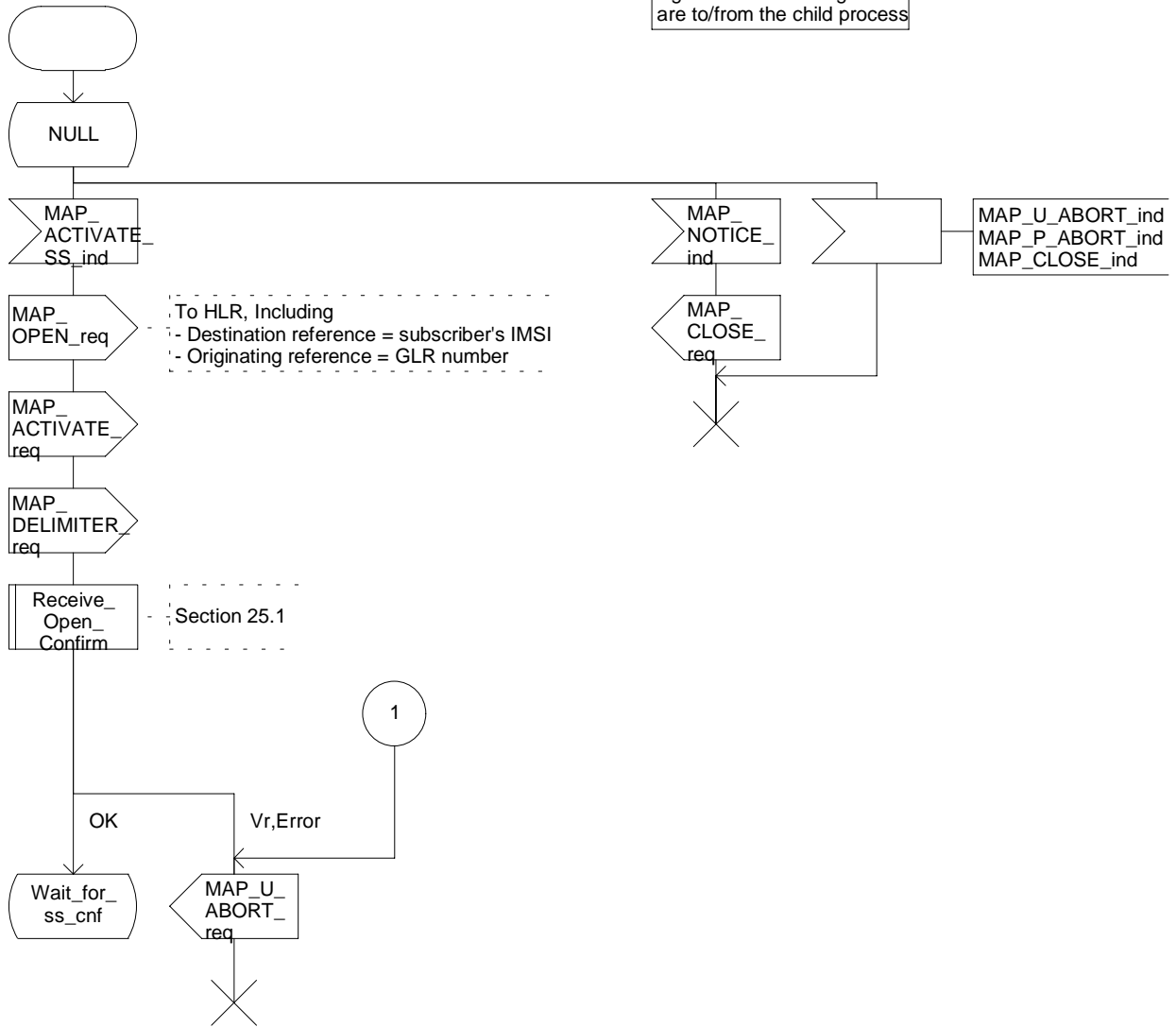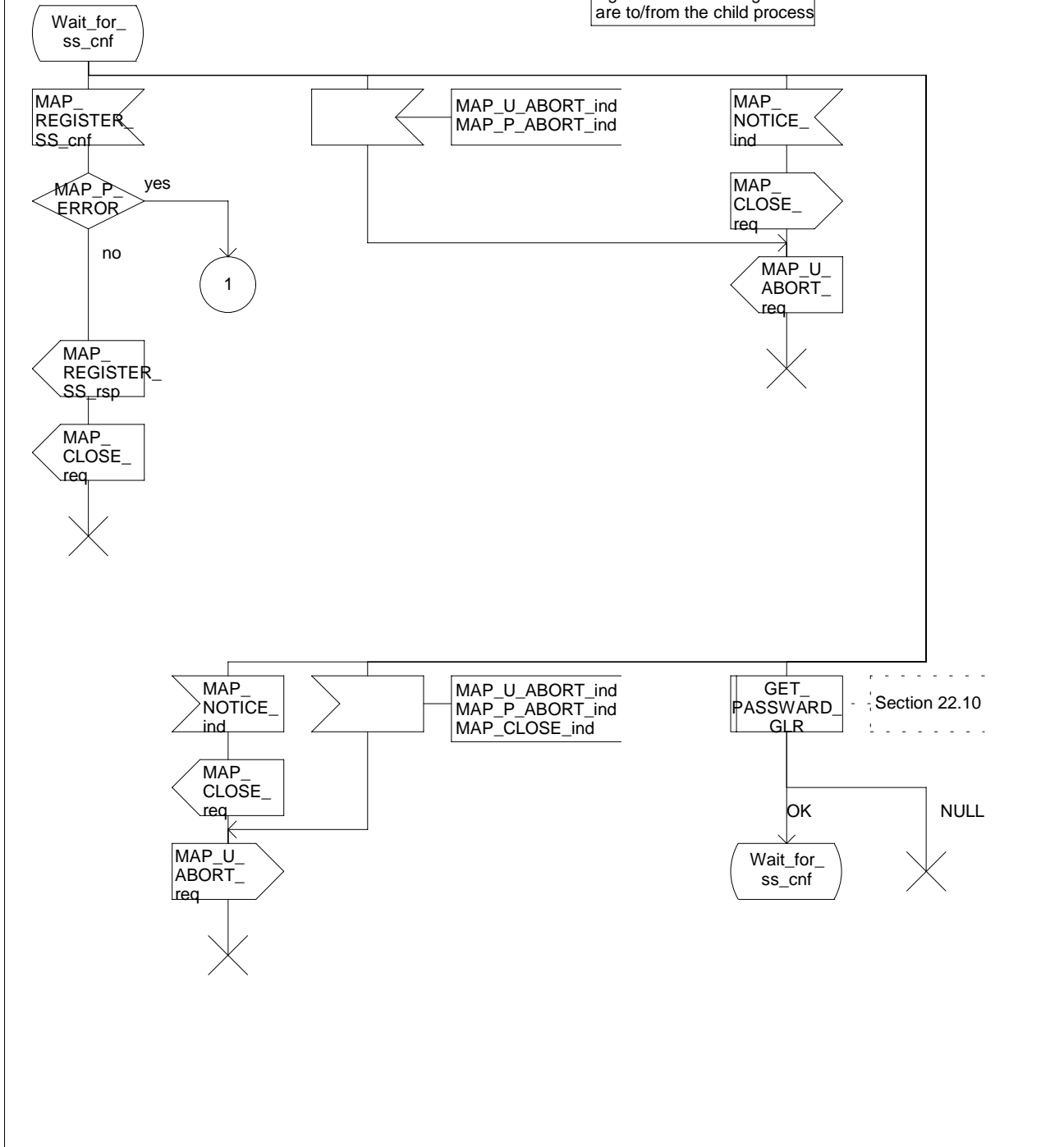
Wait_for_ss_cnf

MAP_REGISTER_SS_cnf

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_NOTICE_ind

MAP_P_ERROR   yes

MAP_CLOSE_req

no

MAP_U_ABORT_req

1

MAP_REGISTER_SS_rsp

MAP_CLOSE_req

MAP_NOTICE_ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

GET_PASSWARD_GLR

Section 22.10

MAP_CLOSE_req

OK   NULL

MAP_U_ABORT_req

Wait_for_ss_cnf

Figure 22.4/1 (sheet 2 of 2): Procedure SS_Activate_GLR

22.5 Deactivation procedure

22.5.1 General

The deactivation procedure is used to deactivate a supplementary service in the HLR. The deactivation procedure is a fully transparent communication between the MS and the HLR.

22.5.2 Procedures in the GLR

The GLR procedures for deactivation are identical to those specified for activation in subclause 22.4. The text and diagrams in subclause 22.4 apply with all references to activation changed to deactivation.

22.6 Interrogation procedure

22.7.1 General

The interrogation procedure is used to retrieve information related to a supplementary service from the VLR or the HLR. The interrogation procedure in the GLR is a fully transparent communication between the VLR and the HLR.

22.7.2 Procedures in the GLR

The GLR procedures for interrogation are identical to those specified for registration in subclause 22.2. The text and diagrams in subclause 22.2 apply with all references to registration changed to interrogation.

22.7 Password registration procedure

22.7.1 General

The password registration procedure is used to register a password in the HLR. The password registration procedure is a fully transparent communication between the MS and the HLR.

22.7.2 Procedures in the GLR

The password registration procedure in the GLR is identical to that for activation specified in subclause 22.4. All the text and diagrams in subclause 22.4 apply with all references to activation changed to password registration.

22.8 Mobile Initiated USSD procedure

22.8.1 Procedures in the GLR

The initiation of the process is shown in subclause 22.1.

In the case that a GLR is located between the VLR and the HLR, the Mobile Initiated USSD procedure in the GLR is a fully transparent communication between the VLR and the HLR.

When receiving the MAP_PROCESS_UNSTRUCTURED_SS_REQUEST indication from VLR, the MAP user in the GLR transfers the information to the HLR in the MAP_PROCESS_UNSTRUCTURED_SS_REQUEST request without checking the contents of the service indication.

The GLR may subsequently receive one or more MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications from the HLR. These shall be sent transparently to the VLR. When a confirmation is received from the VLR this shall be returned to the HLR.

When the GLR receives a MAP_PROCESS_UNSTRUCTURED_SS_REQUEST confirmation from the HLR then it shall pass this to the VLR and closes the MAP provider service.

Error Handling

Both the VLR and the HLR may initiate release of the MAP service at any time. This is handled as shown in the diagrams.

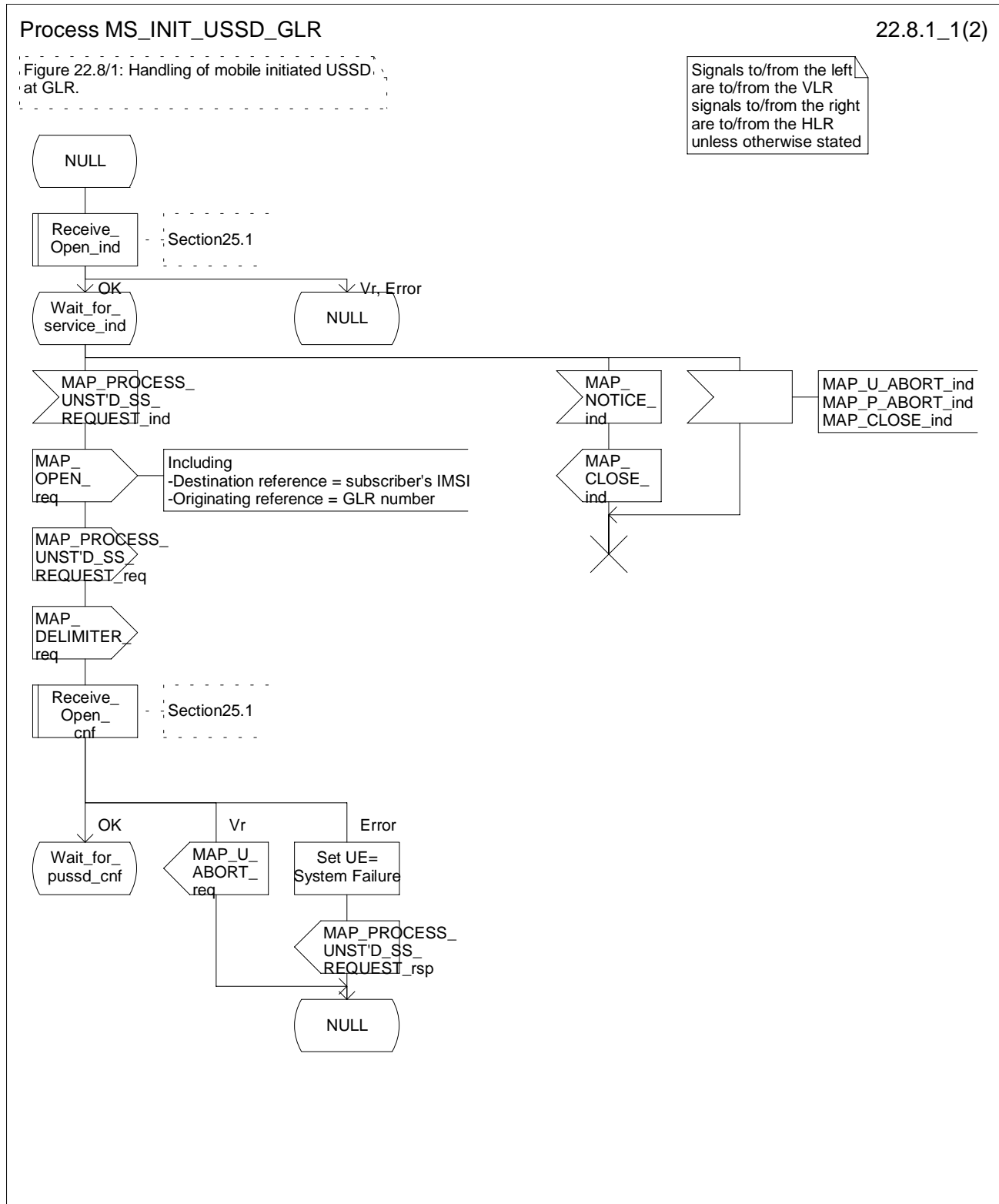The procedure in the HLR is shown in figure 22.8/1.

Figure 22.8/1 (sheet 1 of 2): Procedure MI_USSD_GLR

Process MS_INIT_USSD_GLR   22.8.1_2(2)

Figure 22.8/1: Handling of mobile initiated USSD at GLR.

Signals to/from the left are to/from the VLR signals to/from the right are to/from the HLR unless otherwise stated
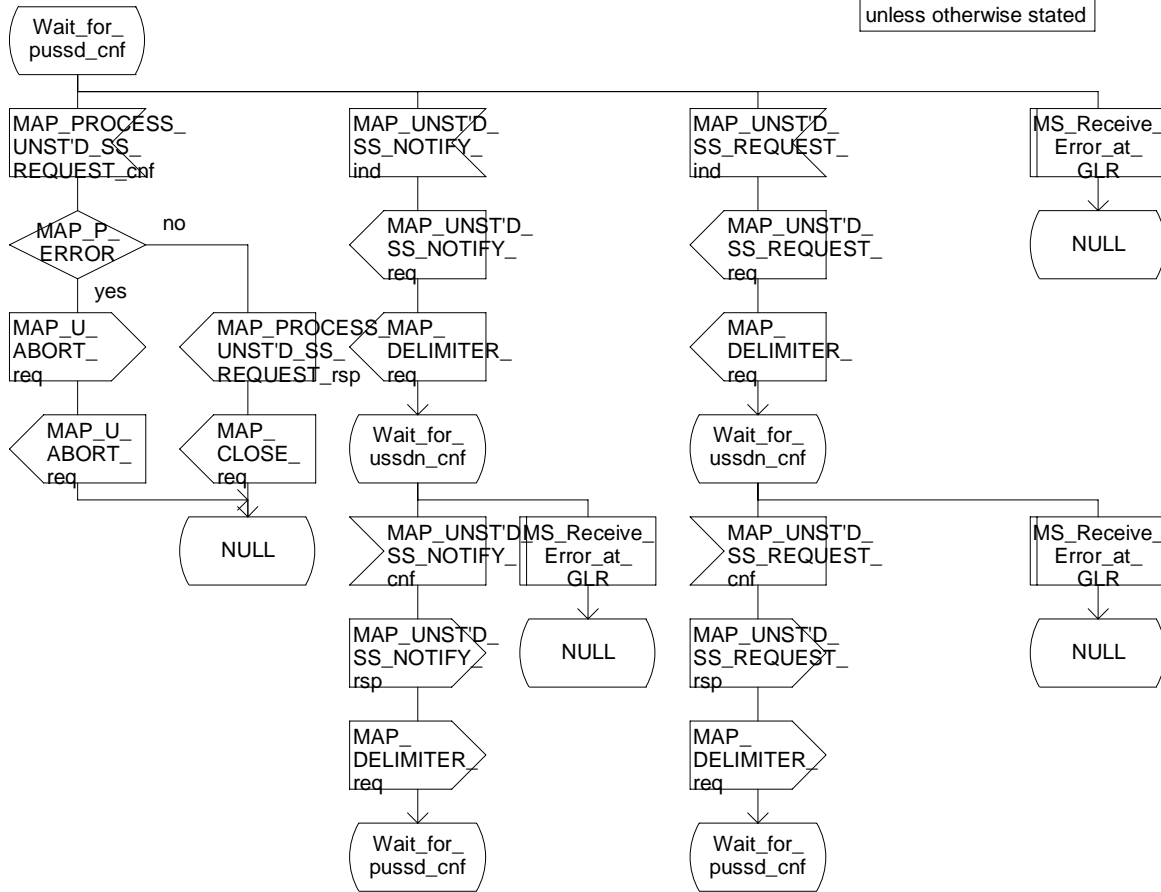

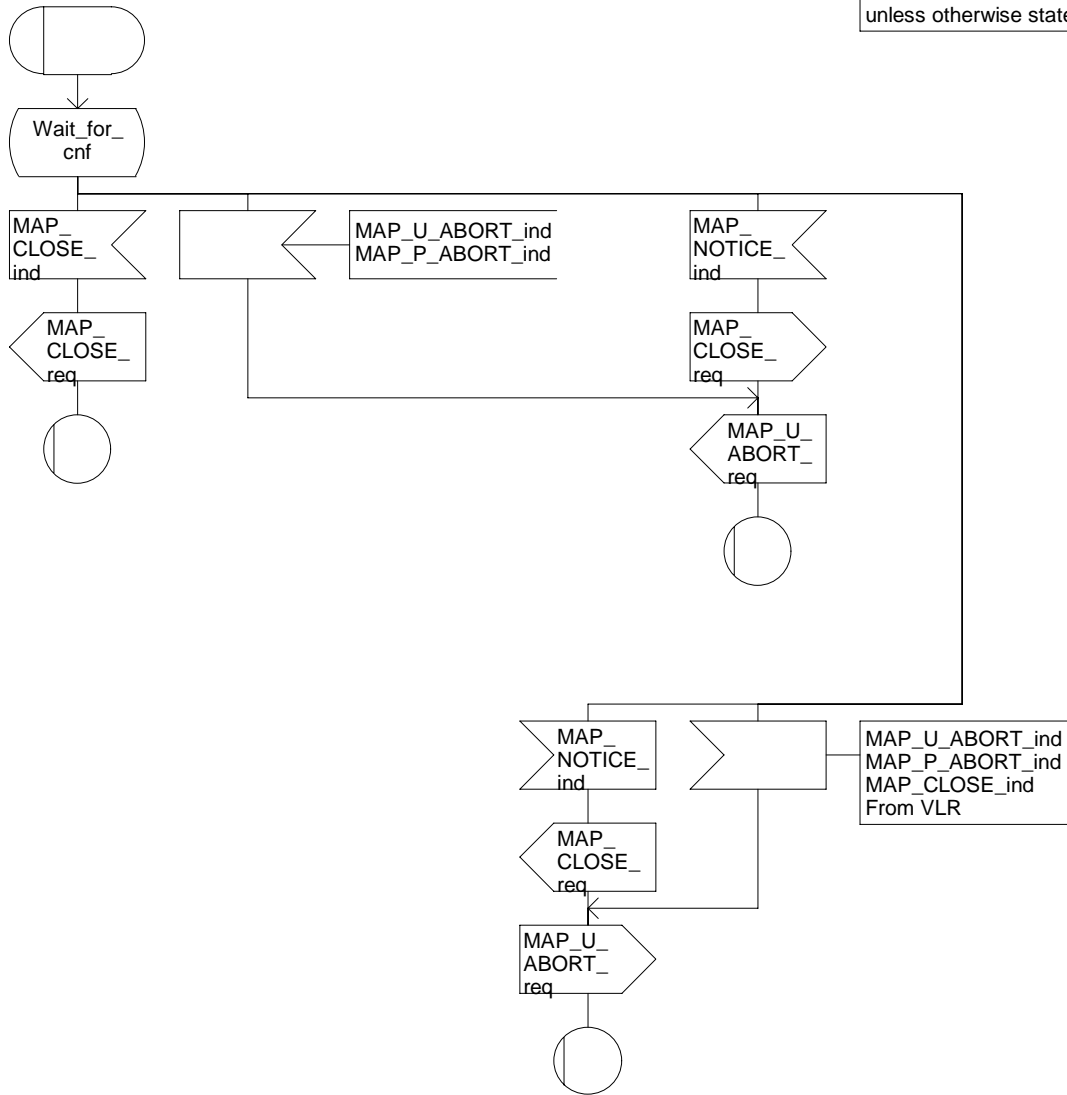**Figure 22.8/1 (sheet 2 of 2): Procedure MI_USSD_GLR**

Figure 22.8/2: Macro MS_Receive_ERROR_at_GLR

22.9 Network initiated USSD procedure

22.9.1 Procedure in the GLR

In the case that a GLR is located between the VLR and the HLR, the Network initiated USSD procedure in the GLR is a fully transparent communication between the VLR and the HLR.

The procedure may be invoked by the HLR. It may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.

The GLR may subsequently receive one or more MAP_UNSTRUCTURED_SS_REQUEST_ind or MAP_UNSTRUCTURED_SS_NOTIFY_ind indications from the VLR. These shall be sent transparently to the HLR. When a confirmation is received from the HLR this shall be returned to the VLR.

When the GLR receives a MAP_CLOSE_ind from the HLR then it shall pass this to the VLR and close the MAP dialogue.

Error Handling

Both the VLR and the HLR may initiate release of the MAP service at any time. This is handled as shown in the diagrams.

The Network initiated USSD procedure in the GLR is shown in figure 22.9/1.

Process NW_INIT_USSD_GLR 22.9.1_1(2)

Figure 22.9/1: Handling of network initiated USSD at GLR.

Signals to/from the left are to/from the VLR signals to/from the right are to/from the HLR unless otherwise stated

Figure 22.9/1 (sheet 1 of 2): Procedure NI_USSD_GLR

Process NW_INIT_USSD_GLR   22.9.1_2(2)

Figure 22.9/1: Handling of network initiated USSD
at GLR.

Signals to/from the left
are to/from the VLR
signals to/from the right
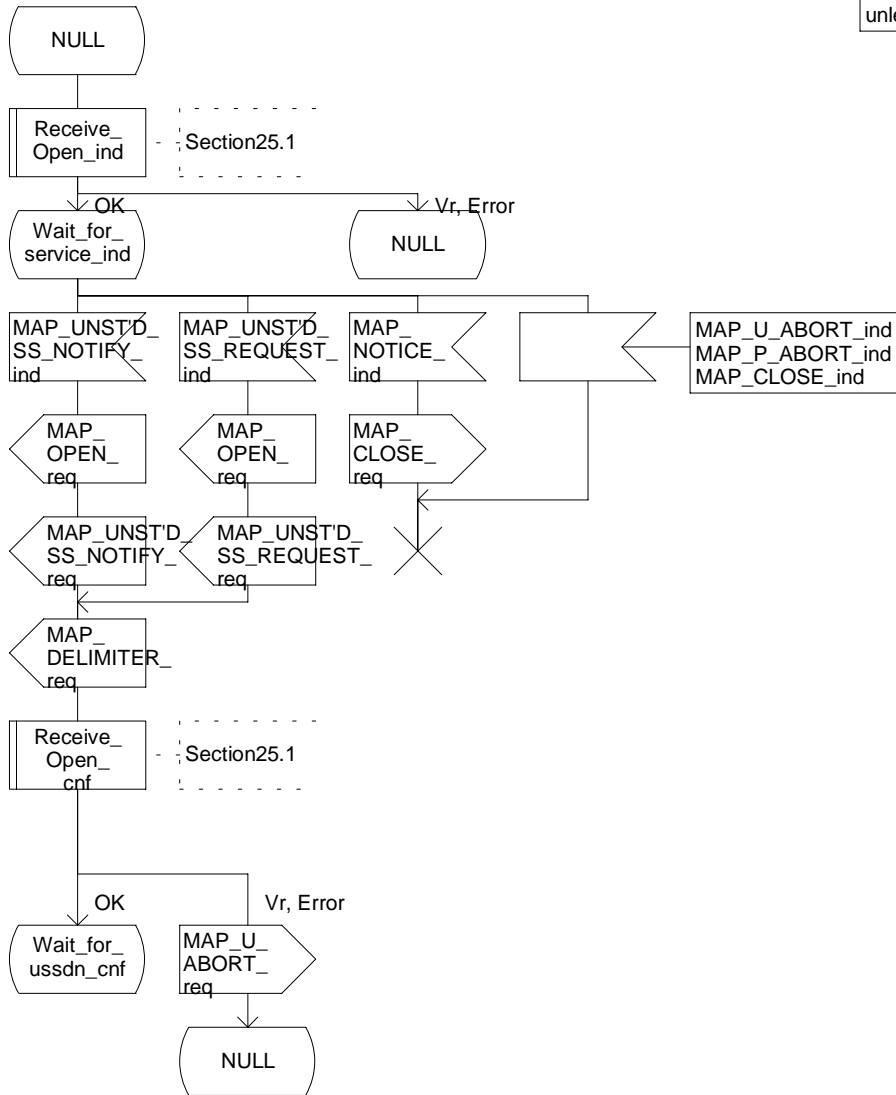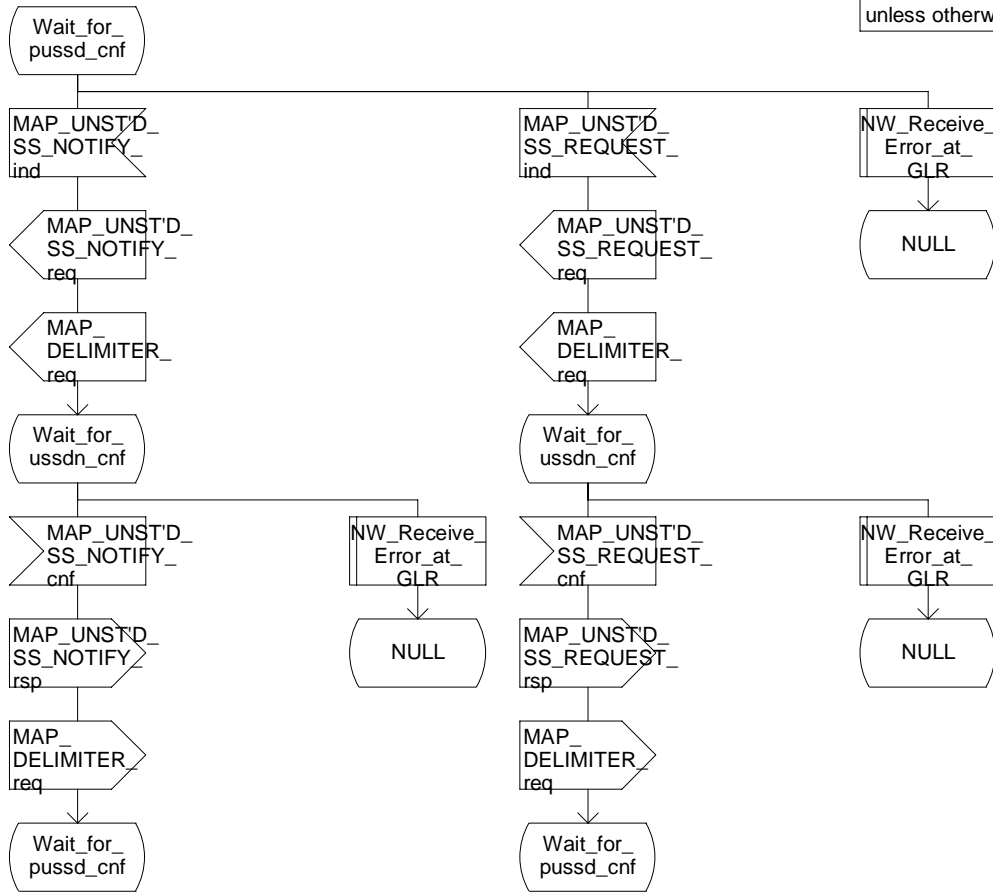are to/from the HLR
unless otherwise stated

Wait_for_
pussd_cnf

MAP_UNST'D_
SS_NOTIFY_
ind

MAP_UNST'D_
SS_REQUEST_
ind

NW_Receive_
Error_at_
GLR

MAP_UNST'D_
SS_NOTIFY_
req

MAP_UNST'D_
SS_REQUEST_
req

NULL

MAP_
DELIMITER_
req

MAP_
DELIMITER_
req

Wait_for_
ussdn_cnf

Wait_for_
ussdn_cnf

MAP_UNST'D_
SS_NOTIFY_
cnf

NW_Receive_
Error_at_
GLR

MAP_UNST'D_
SS_REQUEST_
cnf

NW_Receive_
Error_at_
GLR

MAP_UNST'D_
SS_NOTIFY_
rsp

NULL

MAP_UNST'D_
SS_REQUEST_
rsp

NULL

MAP_
DELIMITER_
req

MAP_
DELIMITER_
req

Wait_for_
pussd_cnf

Wait_for_
pussd_cnf

Figure 22.9/1 (sheet 2 of 2): Procedure NI_USSD_GLR

Macrodefinition NW_Receive_Error_at_GLR   22.9.2(1)

Figure 22.9/2: Handling of error at GLR for NW initiated USSD

Signals to/from the left
are to/from the VLR
signals to/from the right
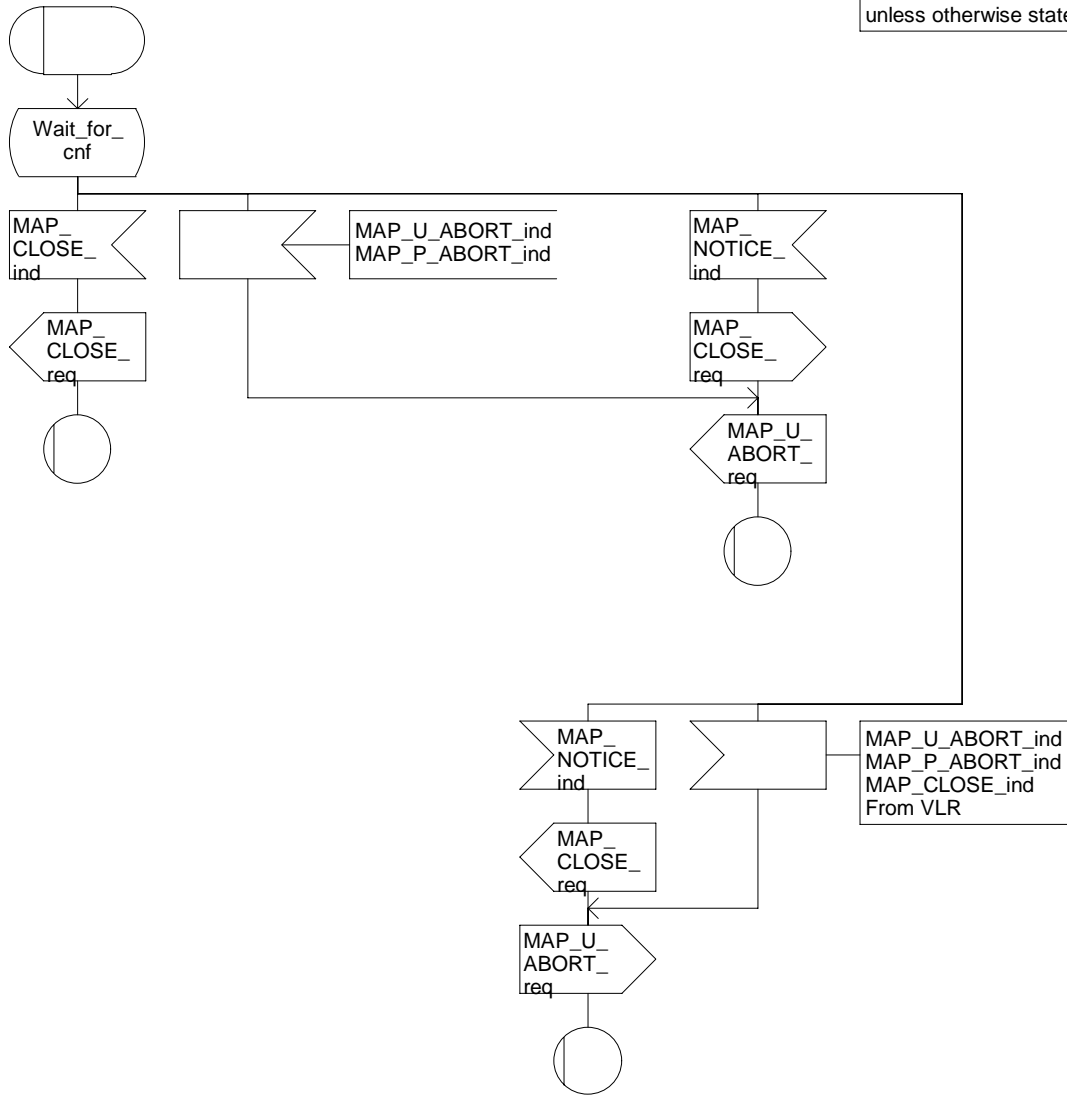are to/from the HLR
unless otherwise stated

Wait_for_
cnf

MAP_
CLOSE_
ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_
NOTICE_
ind

MAP_
CLOSE_
req

MAP_
CLOSE_
req

MAP_U_
ABORT_
req

MAP_
NOTICE_
ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
From VLR

MAP_
CLOSE_
req

MAP_U_
ABORT_
req

Figure 22.9/2: Marco NW_Receive_Rrror_at_GLR

22.10   Common macros for clause 22

22.10.1   SS Password handling macros

Macro Get_Password_GLR

This macro is used by the GLR to relay a request for password from the HLR to the VLR, and to relay a response from the VLR back to the HLR. The macro is described in figure 22.10/1

Macrodefinition GET_PASSWORD_GLR 22.10.1(1)

Figure 22.10/1: Macro which relay a GET Password request from the HLR to the VLR and relay a GET Password response from the VLR to the HLR

Signals to/from the left are to/from the VLR signals to/from the right are to/from the HLR unless otherwise stated
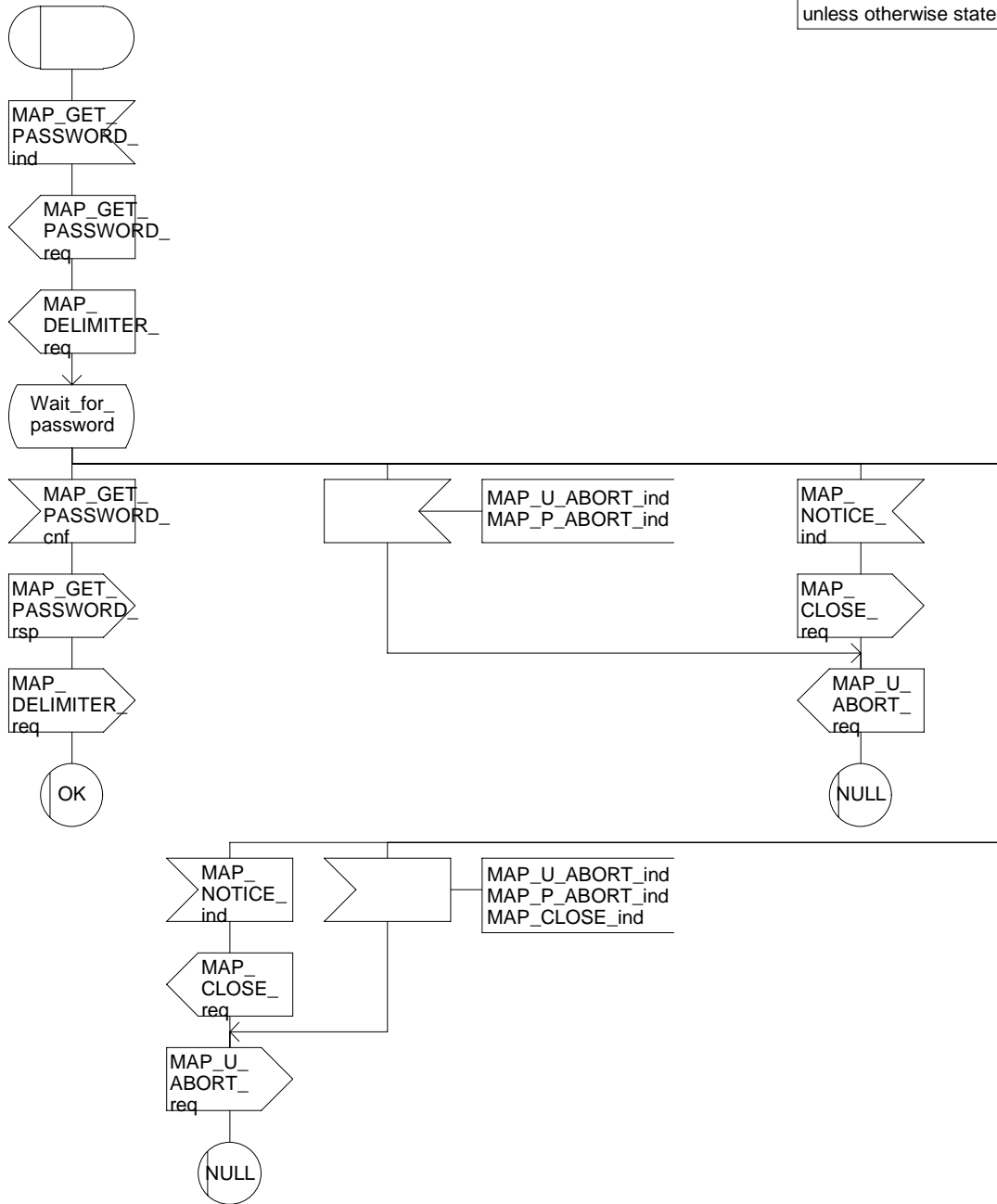
MAP_GET_PASSWORD_ind

MAP_GET_PASSWORD_req

MAP_DELIMITER_req

Wait_for_password

MAP_GET_PASSWORD_cnf

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_NOTICE_ind

MAP_GET_PASSWORD_rsp

MAP_CLOSE_req

MAP_DELIMITER_req

MAP_U_ABORT_req

OK

NULL

MAP_NOTICE_ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

MAP_CLOSE_req

MAP_U_ABORT_req

NULL

Figure 22.10/1: Macro Get_PW_GLR

22.11 Activation of a CCBS request

22.11.1 General

The Activation of a CCBS request procedure in the GLR is a fully transparent communication between the VLR and the HLR.

22.11.2 Procedure in the GLR

When receiving the MAP_REGISTER_CC_ENTRY indication from VLR, the MAP user in the GLR transfers the information to the HLR in the MAP_REGISTER_CC_ENTRY request without checking the contents of the service indication.

When the GLR receives a MAP_REGISTER_CC_ENTRY confirmation from the HLR then it shall pass this to the VLR and closes the MAP provider service.

The activate of a CCBS request procedure in the GLR is shown in figure 22.11/1.

Process Register_CC_Entry_GLR   22.11.1_1(2)

Figure 22.11/1: Handling of Register_CC_Entry at GLR

Signals to/from the left
are to/from the VLR
signals to/from the right
are to/from the HLR
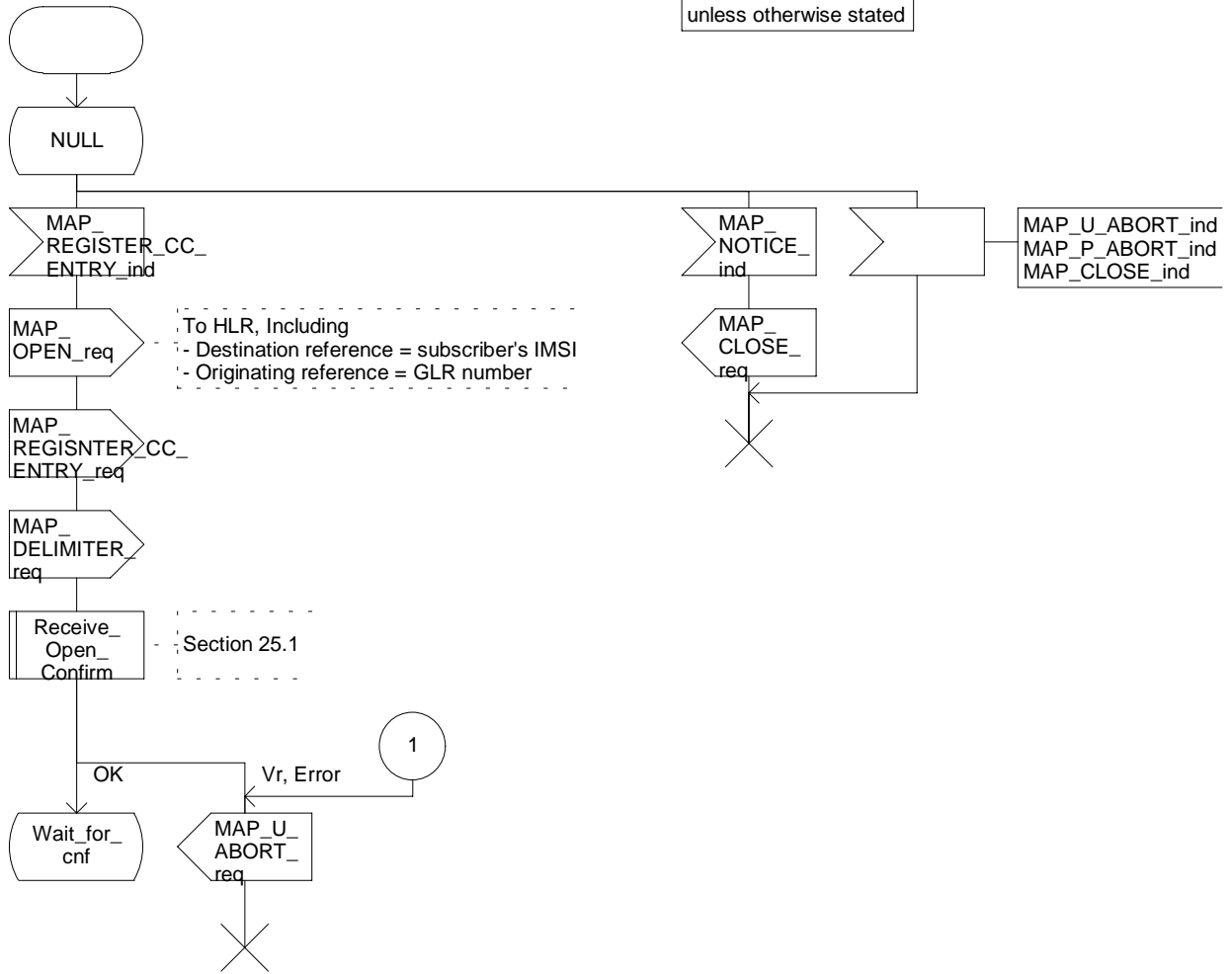unless otherwise stated

NULL

MAP_
REGISTER_CC_
ENTRY_ind

MAP_
NOTICE_
ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

MAP_
OPEN_req

To HLR, Including
- Destination reference = subscriber's IMSI
- Originating reference = GLR number

MAP_
CLOSE_
req

MAP_
REGISNTER_CC_
ENTRY_req

MAP_
DELIMITER_
req

Receive_
Open_
Confirm

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OK

Vr, Error

1

Wait_for_
cnf

MAP_U_
ABORT_
req

Figure 22.11/1 (sheet 1 of 2) : Process Register_CC_Entry_GLR

Process Register_CC_Entry_GLR   22.11.1_2(2)

Figure 22.11/1: Handling of Register_CC_Entry at GLR

Signals to/from the left
are to/from the VLR
signals to/from the right
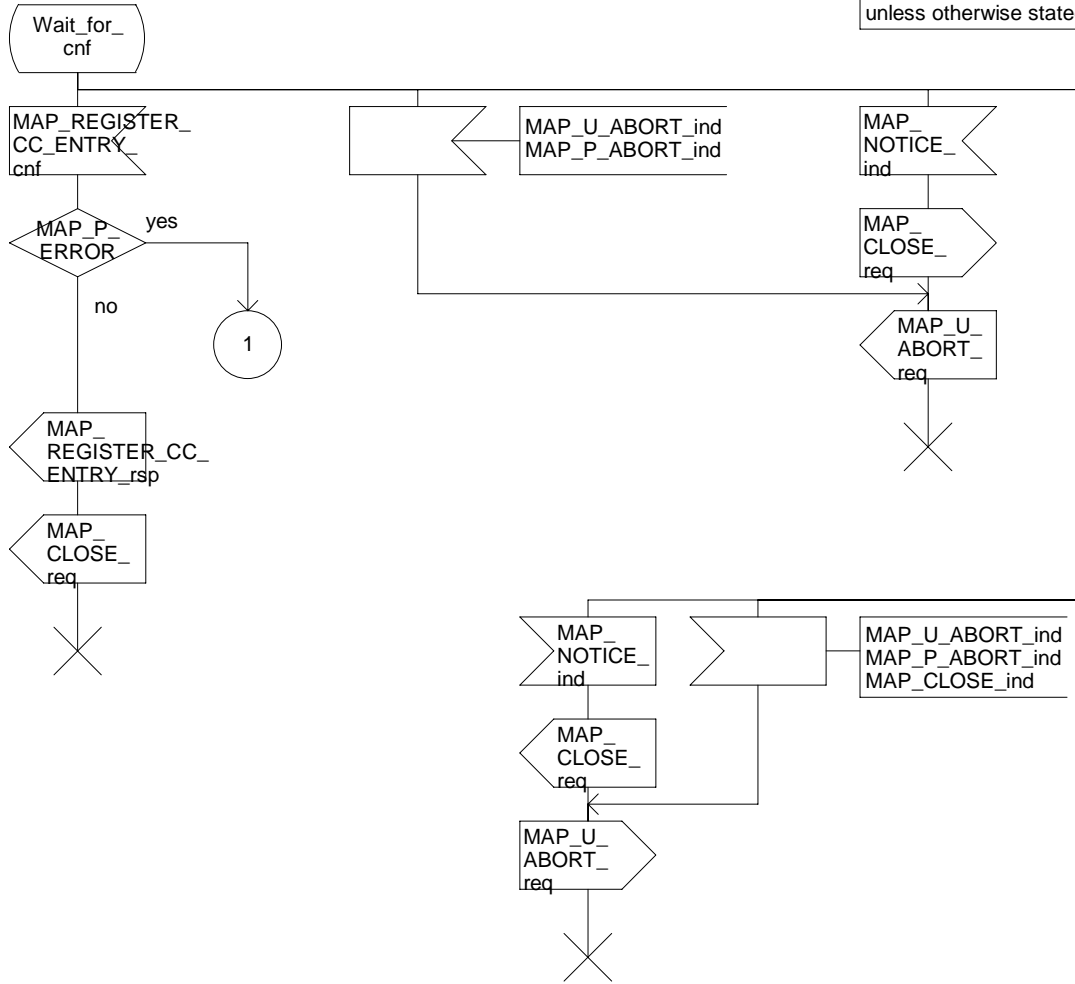are to/from the HLR
unless otherwise stated

Wait_for_
cnf

MAP_REGISTER_
CC_ENTRY_
cnf

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_
NOTICE_
ind

MAP_P_
ERROR   yes

MAP_
CLOSE_
req

no

MAP_U_
ABORT_
req

1

MAP_
REGISTER_CC_
ENTRY_rsp

MAP_
CLOSE_
req

MAP_
NOTICE_
ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

MAP_
CLOSE_
req

MAP_U_
ABORT_
req

Figure 22.11/1 (sheet 2 of 2) : Process Register_CC_Entry_GLR

22.12   Deactivation of a CCBS request

22.12.1 General

The Deactivation of a CCBS request precedure in the GLR is a fully transparent communication between the VLR and the HLR.

22.12.2 Procedure in the GLR

When receiving the MAP_ ERASE _CC_ENTRY indication from VLR, the MAP user in the GLR transfers the information to the HLR in the MAP_ ERASE _CC_ENTRY request without checking the contents of the service indication.

When the GLR receives a MAP_ ERASE _CC_ENTRY confirmation from the HLR then it shall pass this to the VLR and closes the MAP provider service.

The deactivate of a CCBS request procedure in the GLR is shown in figure 22.12/1.

Process Erase_CC_Entry_GLR 22.12.1_1(2)

Figure 22.12/1: Handling of Erase_CC_Entry at GLR

Signals to/from the left
are to/from the VLR
signals to/from the right
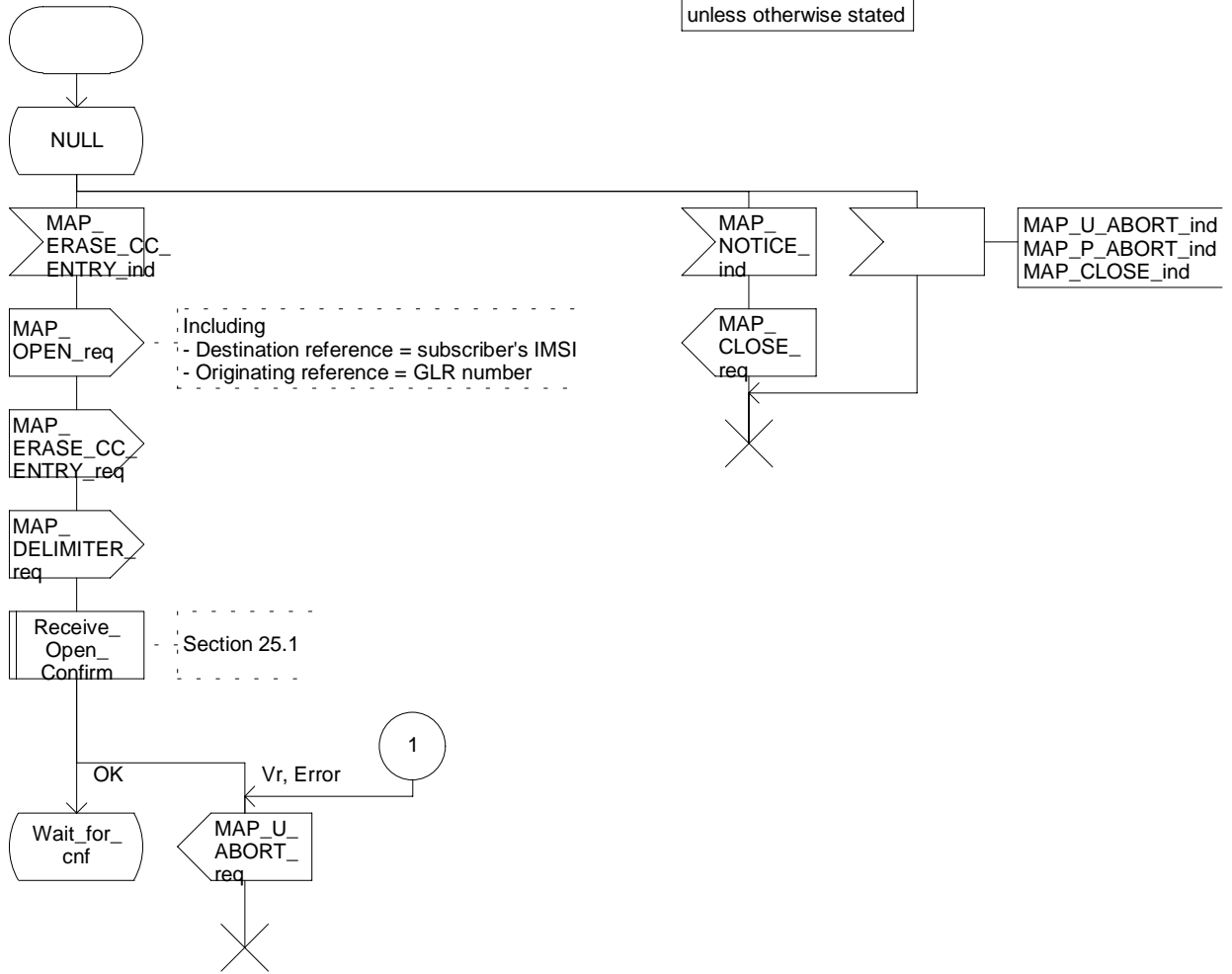are to/from the HLR
unless otherwise stated

NULL

MAP_
ERASE_CC_
ENTRY_ind

MAP_
OPEN_req

Including
- Destination reference = subscriber's IMSI
- Originating reference = GLR number

MAP_
ERASE_CC_
ENTRY_req

MAP_
DELIMITER_
req

Receive_
Open_
Confirm

Section 25.1

OK

Vr, Error

1

Wait_for_
cnf

MAP_U_
ABORT_
req

MAP_
NOTICE_
ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

MAP_
CLOSE_
req

Figure 22.12/1 (sheet 1 of 2) : Process Erase_CC_Entry_GLR

Process Erase_CC_Entry_GLR   22.12.1_2(2)

Figure 22.12/1: Handling of Erase_CC_Entry at GLR

Signals to/from the left
are to/from the VLR
signals to/from the right
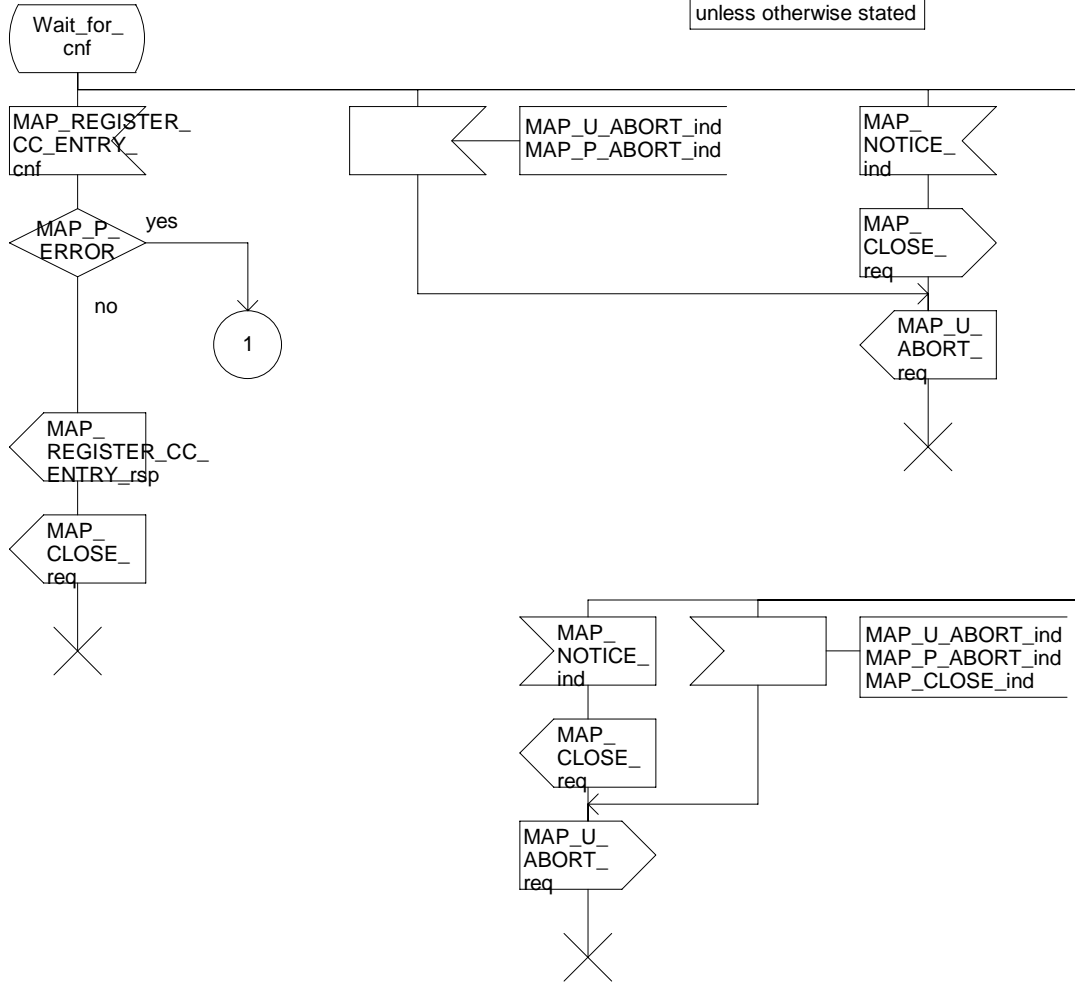are to/from the HLR
unless otherwise stated

Wait_for_
cnf

MAP_REGISTER_
CC_ENTRY_
cnf

MAP_U_ABORT_ind
MAP_P_ABORT_ind

MAP_
NOTICE_
ind

MAP_P_
ERROR   yes

MAP_
CLOSE_
req

no

1

MAP_U_
ABORT_
req

MAP_
REGISTER_CC_
ENTRY_rsp

MAP_
CLOSE_
req

MAP_
NOTICE_
ind

MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind

MAP_
CLOSE_
req

MAP_U_
ABORT_
req

Figure 22.12/1 (sheet 2 of 2) : Process Erase_CC_Entry_GLR

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 (see 29.002) but only the following two procedures are involved in the GLR and the IM-MSC:

- mobile terminated short message service transfer;

- short message alert procedure.

23.2 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. This subclause includes the description of the procedures in the IM-MSC and the GLR. The procedures in the other existing entities are entirely the same as in the network without the GLR and are described in 29.002.

23.2.1 Procedure in the Intermediate MSC

When initiating the dialogue with the IM-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 IM-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 IM- MSC retrieves the E.164 Number of the servicing MSC from the GLR if the MAP service primitive is accepted.

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.

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 key information for retrieving the MSC Number in the GLR.

Otherwise, if the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, it is used to retrieve the MSC Number in the GLR.

If a Destination Reference has been received in the IM-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 IM-MSC and the error "Unexpected Data Value" is returned to the SMS GMSC.

The interaction between the IM-MSC and the GLR for the MSC Number retrieval is described in TS 23.119 GLR-stage2.

If the IM-MSC is successfully retrieves the MSC Number it initiates the forward short message procedure to the servicing MSC. The presence of the Destination Reference in the MAP_OPEN request and the LMSI or IMSI in the first MAP_MT_FORWARD_SHORT_MESSAGE request follows the message received from the GMSC. The More Messages To Send flag is set to TRUE or FALSE depending on the information received from the GMSC.

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 IM-MSC will receive the MAP_MT_FORWARD_SHORT_MESSAGE confirmation indicating:

- a successful forwarding of the short message. This indication is passed to the GMSC;

- unsuccessful forwarding of the short message. This indication is passed to the GMSC.

The IM-MSC informs the delivery failure to the GLR, 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. That enables the GLR set the MNRF. The interaction between the IM-MSC and the GLR regarding the procedure is described in TS 23.119 GLR-stage2.

Unexpected data value, system failure errors and other errors are simply passed to the GMSC.

If the More Messages To Send flag was TRUE in the MAP_MT_FORWARD_SHORT_MESSAGE request and the previous short message transfer succeeded, then the IM-MSC awaits the next short message.

When receiving the next short message from the GMSC, the IM-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 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.

The mobile terminated short message transfer procedure in the IM-MSC is shown in figure 23.2/1 and 23.2/2

Figure 23.2/1 (sheet1 of 3): Procedure_MT_SM_Transfer_IM-MSC

Process MT_SM_Transfer_IMMSC 23.2.1_2(3)

Figure 23.2/1: The mobile terminated short message service in the IM-MSC

WAIT_FOR_
MORE_
MESSAGES

MAP_MT_FORWARD_
SHORT_MESSAGE_ind

Check_
Indication — Section 25.2

ok

error

MAP_MT_FORWARD_SHORT
_MESSAGE_req
MAP_DELIMITER_req

WAIT_FOR_
MT_SMS_
CONFIRM

MAP_MT_FORWARD_SHORT
_MESSAGE_cnf

Check_
Confirmation — Section 25.2

Provider error
Data error

User error

ok

Absent
Subscriber?

no

More_msg
to_sent

yes

yes

no

Inform SM
Delivery
Failure

to GLR Application
Process in TS23.119

MAP_MT_FORWARD_SHORT
_MESSAGE_rsp
MAP_CLOSE_req

MAP_MT_FORWARD_SHORT
_MESSAGE_rsp
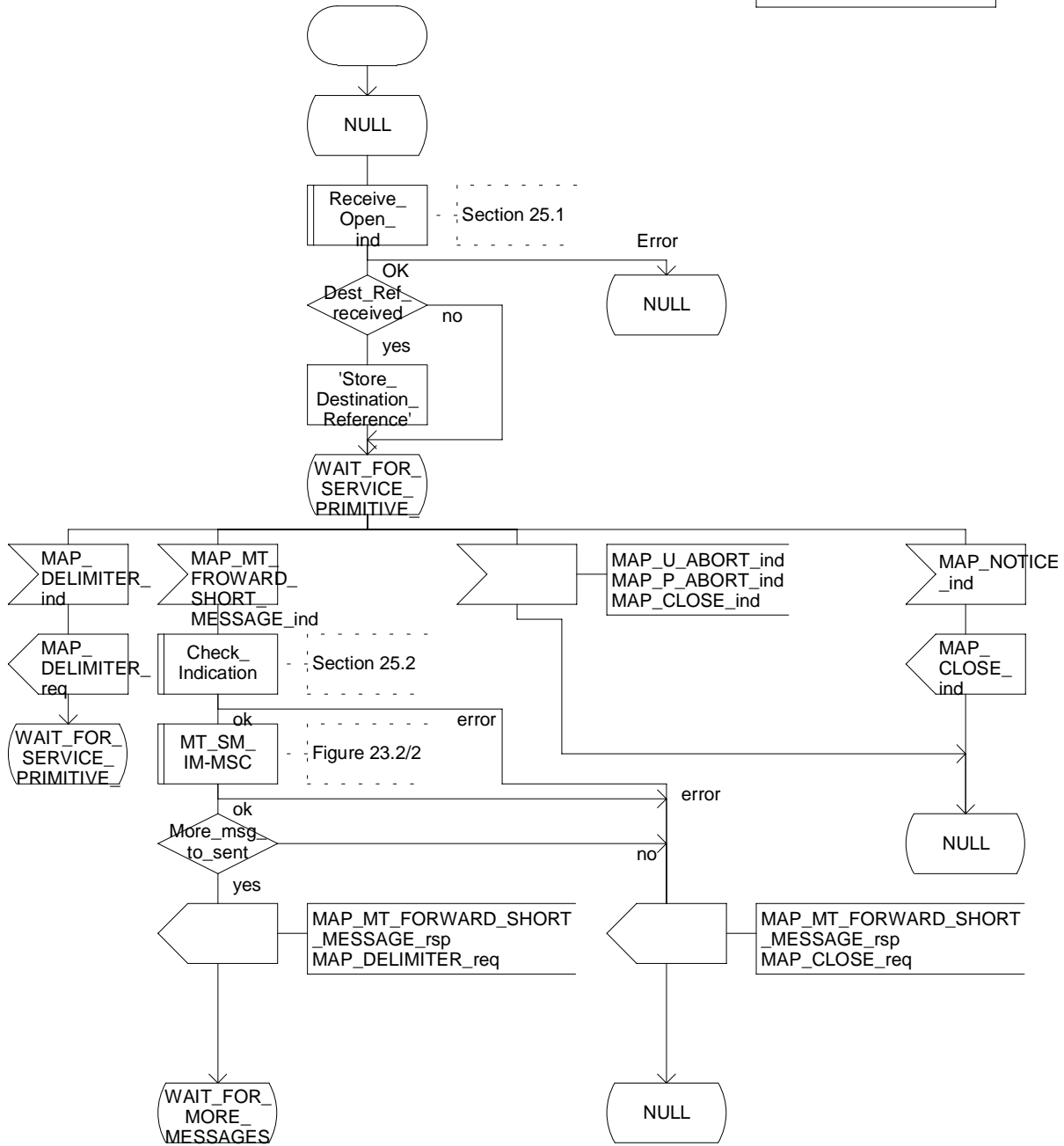MAP_DELIMITER_req

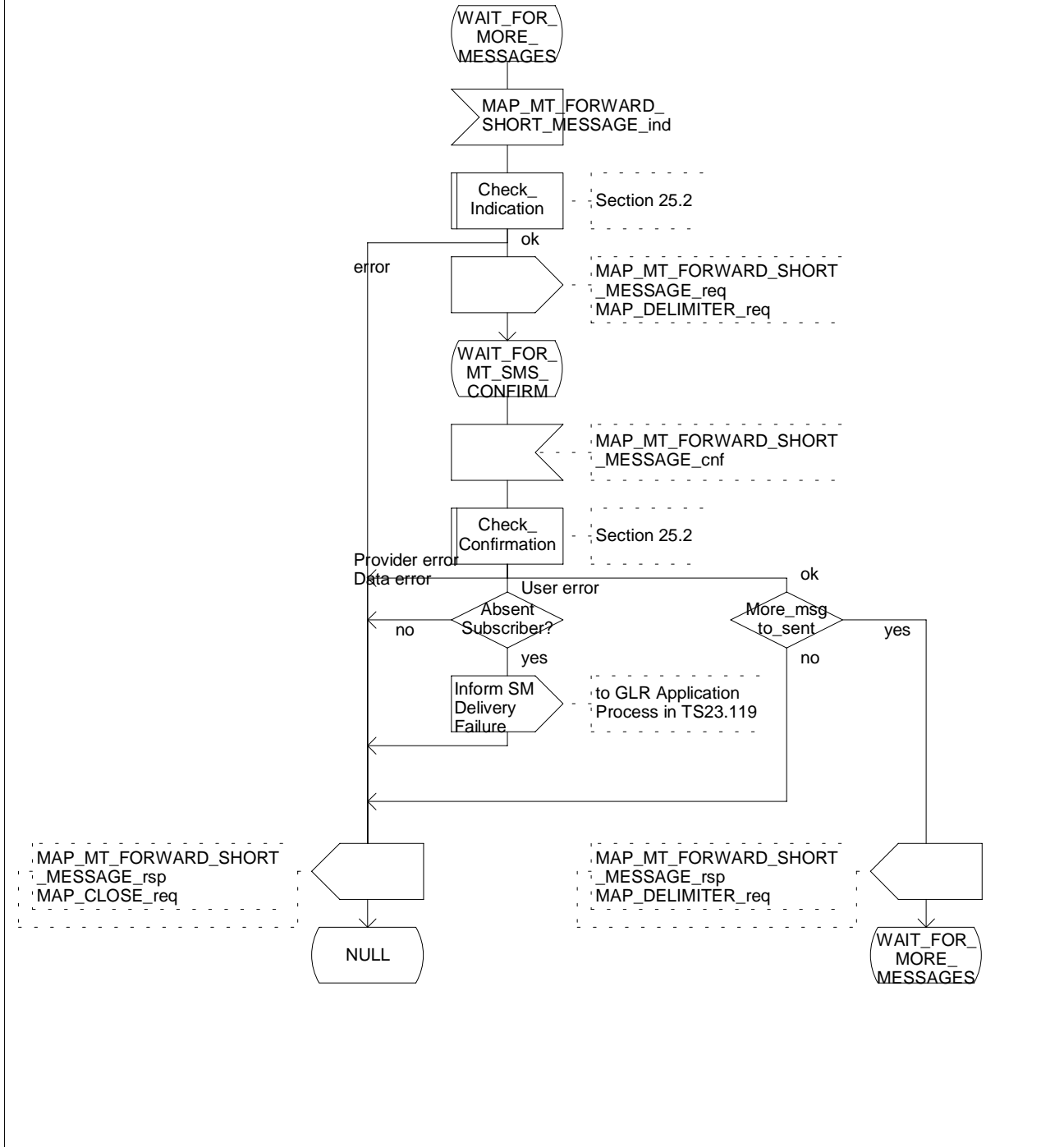NULL

WAIT_FOR_
MORE_
MESSAGES

Figure 23.2/1 (sheet 2 of 3): Procedure MT_SM_Transfer_IM-MSC

Process MT_SM_Transfer_IMMSC 23.2.1_3(3)

Figure 23.2/1: The mobile terminated short message service in the IM-MSC

WAIT_FOR_MORE_MESSAGES
WAIT_FOR_MT_SMS_COMFIRM

MAP_U_ABORT_ind
MAP_P_ABORT_ind
from SMS-GMSC

MAP_NOTICE _ind from SMS-GMSC

MAP_CLOSE _req to SMS-GMSC

MAP_U_ ABORT_ req to VMSC

MAP_NOTICE _ind from VMSC

MAP_ CLOSE_ req to VMSC

MAP_U_ABORT_ind
MAP_P_ABORT_ind
fMAP_CLOSE_ind
from VMSC

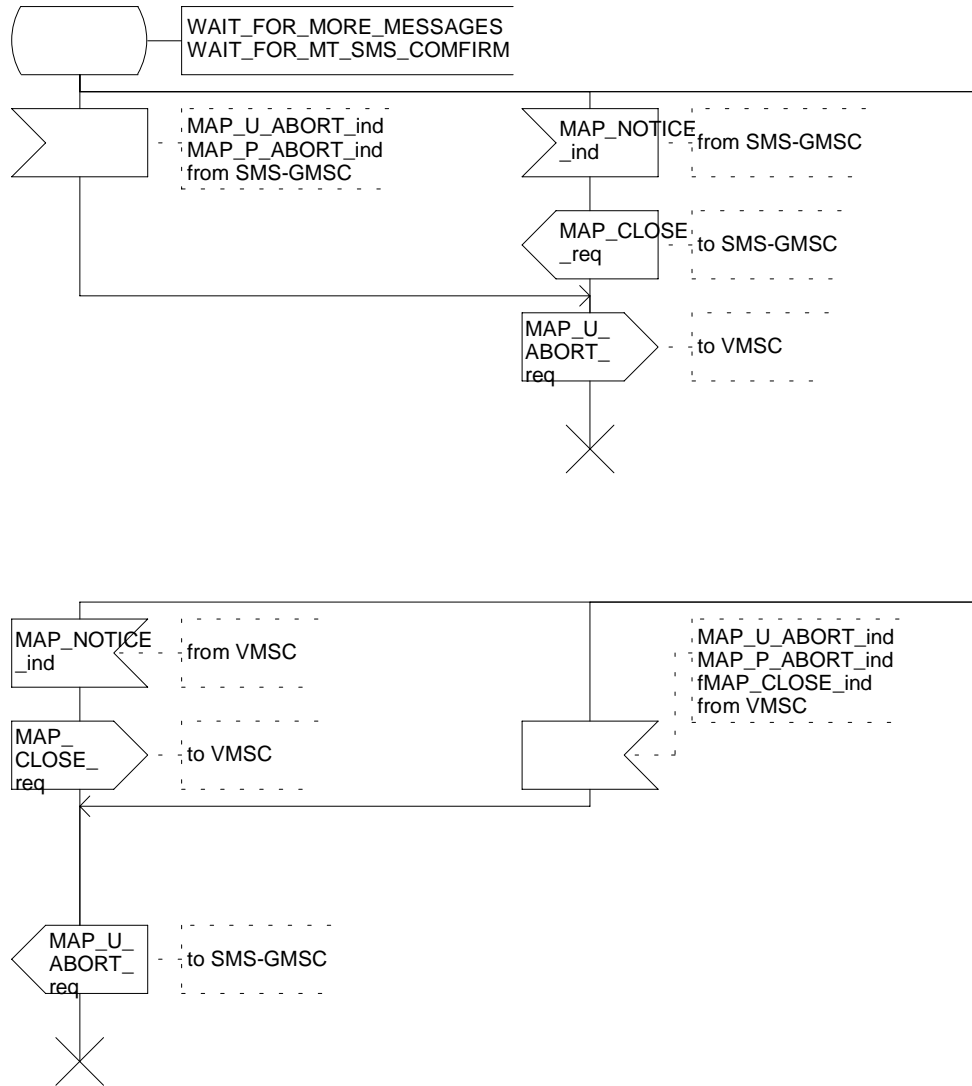MAP_U_ ABORT_ req to SMS-GMSC

Figure 23.2/1 (sheet 3 of 3): Procedure MT_SM_Transfer_IM-MSC

Macrodefinition MT_SM_IMMSC 23.2.2_1(2)

Figure 23.2/2: Macro which transfer short message PDUs to VMSC in the IM-MSC
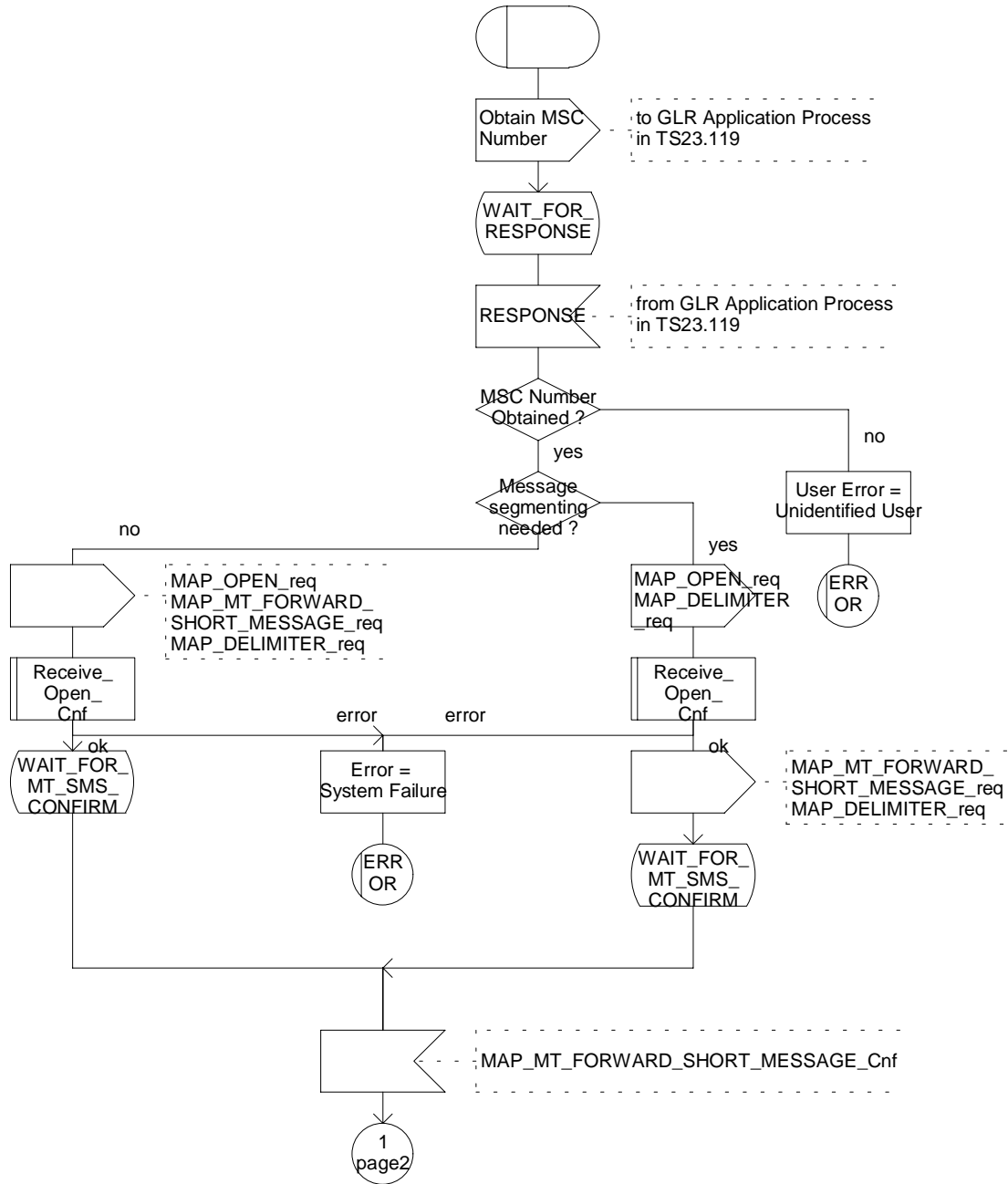
Signals to/from the right are to/from the MSC

Obtain MSC Number — to GLR Application Process in TS23.119

WAIT_FOR_ RESPONSE

RESPONSE — from GLR Application Process in TS23.119

MSC Number Obtained ?

yes / no

Message segmenting needed ?

no / yes

User Error = Unidentified User

ERROR

MAP_OPEN_req
MAP_MT_FORWARD_
SHORT_MESSAGE_req
MAP_DELIMITER_req

MAP_OPEN_req
MAP_DELIMITER_req

Receive_ Open_ Cnf

Receive_ Open_ Cnf

WAIT_FOR_ MT_SMS_ CONFIRM

ok

error   error

Error = System Failure

ERROR

ok

MAP_MT_FORWARD_
SHORT_MESSAGE_req
MAP_DELIMITER_req

WAIT_FOR_ MT_SMS_ CONFIRM

MAP_MT_FORWARD_SHORT_MESSAGE_Cnf

1 page2

Figure 23.2/2 (sheet1 of 2): Macro MT_SM_IM-MSC

Macrodefinition MT_SM_IMMSC 23.2.2_2(2)

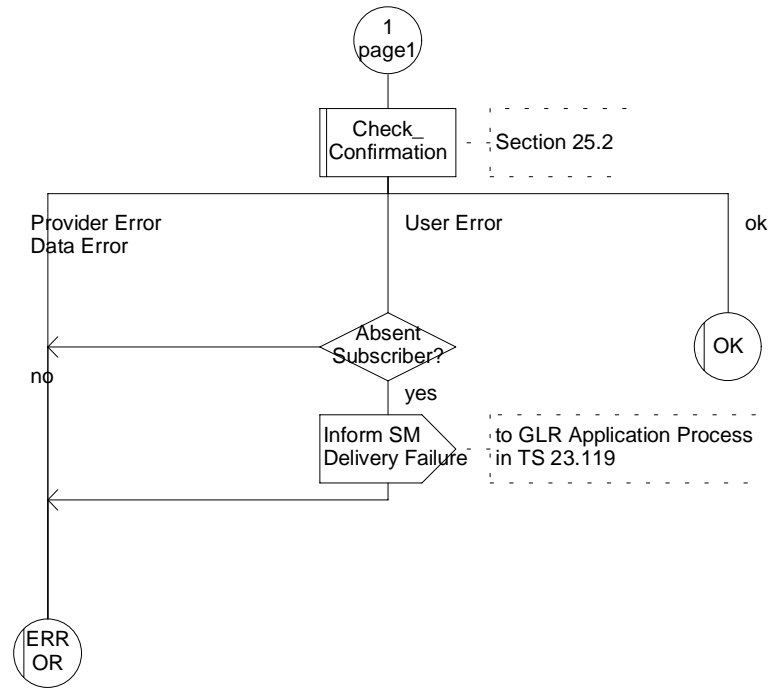Figure 23.2/2: Macro which transfer short message PDUs to VMSC
in the IM-MSC

Figure 23.2/2 (sheet2 of 2): Macro MT_SM_IM-MSC

23.2.2   Procedure in the GLR

When initiating the dialogue with the GLR, 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 GLR 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 GLR performs some subscriber data checks, if the MAP service primitive is accepted.

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.

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 GLR and the error "Unexpected Data Value" is returned to the GMSC.

The following outcomes from the subscriber data checks can occur in GLR:

- 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 mobile subscriber is known and "Confirmed by HLR" indicator is set to "Confirmed", the GLR shall successfully retrieves the SGSN Number.

If the GLR is successfully retrieves the SGSN Number it initiates the forward short message procedure to the SGSN. The IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE request. More Messages To Send flag is set to TRUE or FALSE depending on the information received from the GMSC.

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 GLR will receive the MAP_MT_FORWARD_SHORT_MESSAGE confirmation indicating:

- a successful forwarding of the short message. This indication is passed to the GMSC;

- unsuccessful forwarding of the short message. This indication is passed to the GMSC.

The GLR sets MNRG, if an absent subscriber_SM (except for the case that absent subscriber reason is PurgedMS), an unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded indication is received from the SGSN.

If the GLR receives an absent subscriber_SM and absent subscriber reason is PurgedMS, the GLR deletes the subscriber data for the user.

Unexpected data value, system failure errors and other errors are simply passed to the GMSC.

If the More Messages To Send flag was TRUE in the MAP_MT_FORWARD_SHORT_MESSAGE request and the previous short message transfer succeeded, then the GLR awaits the next short message.

When receiving the next short message from the GMSC, the GLR sets the More Messages To Send flag according to the information received and starts the service MAP_MT_FORWARD_SHORT_MESSAGE again.

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.

The mobile terminated short message transfer procedure in the GLR is shown in figure 23.2/3 and 23.2/4

Figure 23.2/3 (sheet 1 of 3): Procedure MT_SM_Transfer_GLR

Process MT_SM_Transfer_GLR 23.2.3_2(3)

Figure 23.2/3: The mobile terminated short message service in the GLR

WAIT_FOR_
MORE_
MESSAGES

MAP_MT_FORWARD_
SHORT_MESSAGE_ind

Check_
Indication — Section 25.2

ok

error

MAP_MT_FORWARD_SHORT
_MESSAGE_req
MAP_DELIMITER_req

WAIT_FOR_
MT_SMS_
CONFIRM

MAP_MT_FORWARD_SHORT
_MESSAGE_cnf

Check_
Confirmation — Section 25.2

Provider error
Data error   User error   ok

Absent   More_msg
Subscriber?   to_sent

no   yes

yes   no

set MNRG

Check_Absent_
SubscriberSM — See TS 23.119
_In_GLR

MAP_MT_FORWARD_SHORT
_MESSAGE_rsp
MAP_CLOSE_req

NULL

MAP_MT_FORWARD_SHORT
_MESSAGE_rsp
MAP_DELIMITER_req
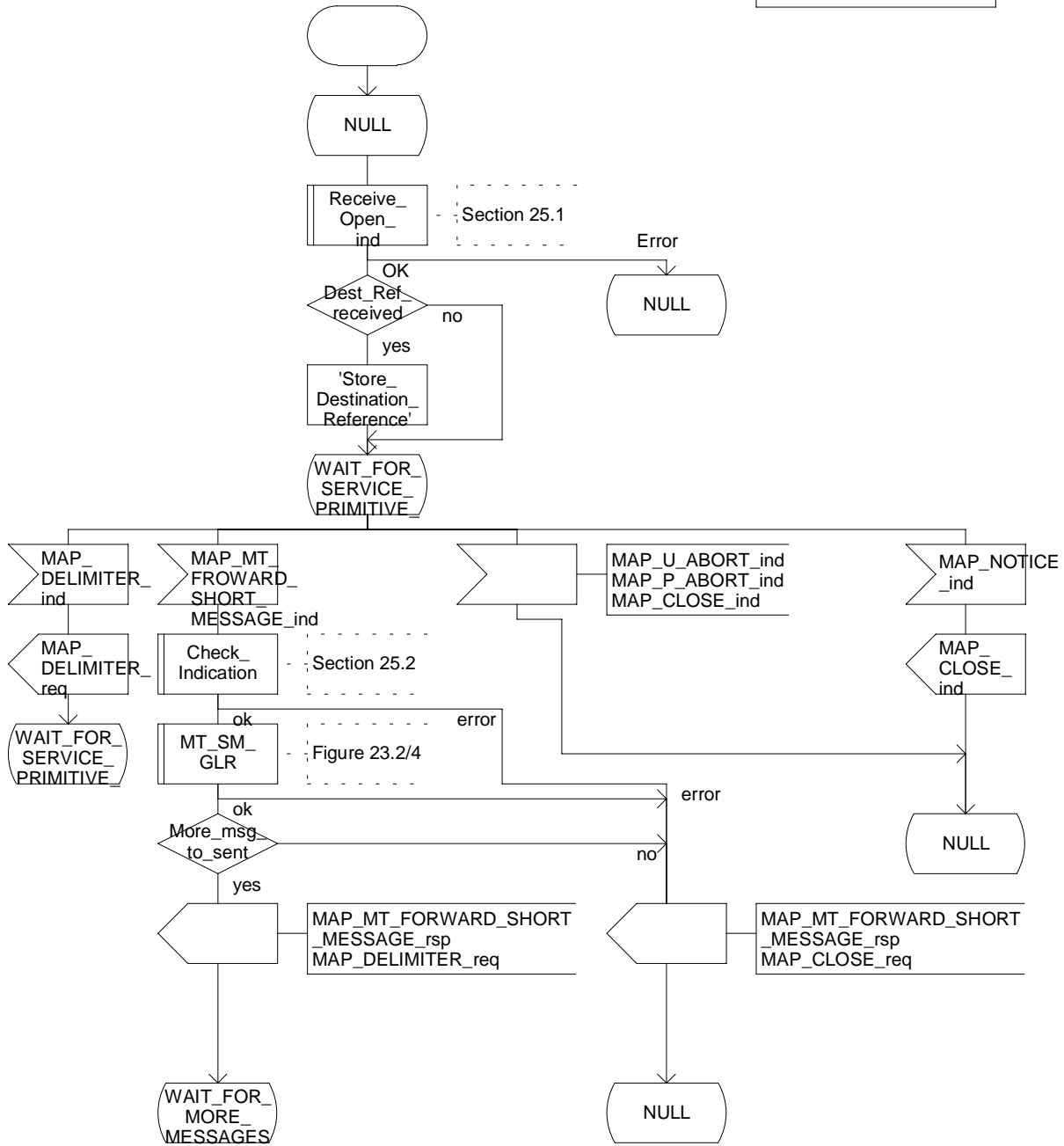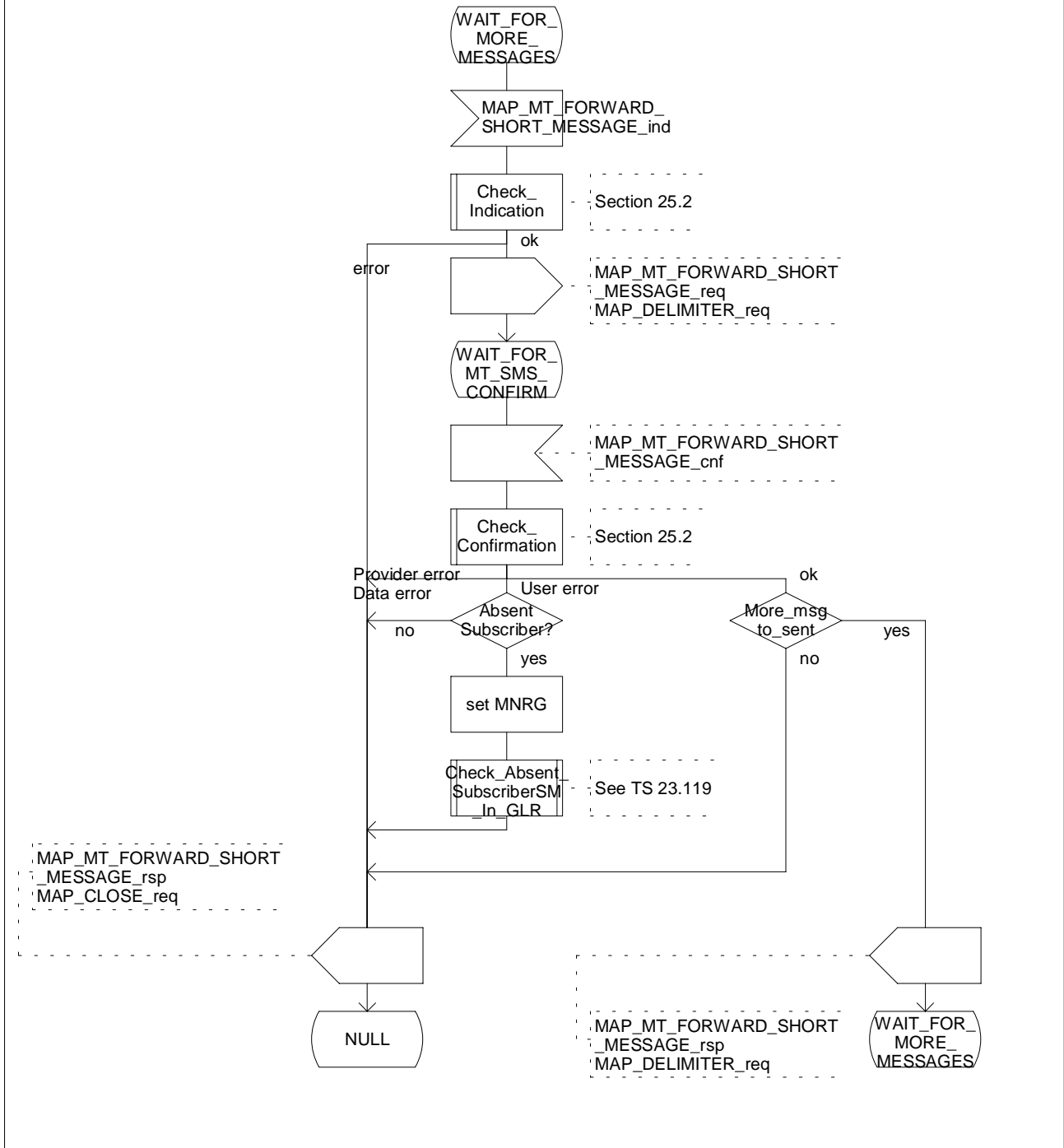
WAIT_FOR_
MORE_
MESSAGES

Figure 23.2/3 (sheet 2 of 3): Procedure MT_SM_Transfer_GLR

Process MT_SM_Transfer_GLR 23.2.3_3(3)

Figure 23.2/3: The mobile terminated short message
service in the GLR

WAIT_FOR_MORE_MESSAGES
WAIT_FOR_MT_SMS_COMFIRM

MAP_U_ABORT_ind
MAP_P_ABORT_ind
from SMS-GMSC

MAP_NOTICE
_ind from SMS-GMSC

MAP_CLOSE
_req to SMS-GMSC

MAP_U_
ABORT_
req to SGSN

MAP_NOTICE
_ind from SGSN

MAP_U_ABORT_ind
MAP_P_ABORT_ind
fMAP_CLOSE_ind
from SGSN

MAP_
CLOSE_
req to SGSN

MAP_U_
ABORT_
req to SMS-GMSC

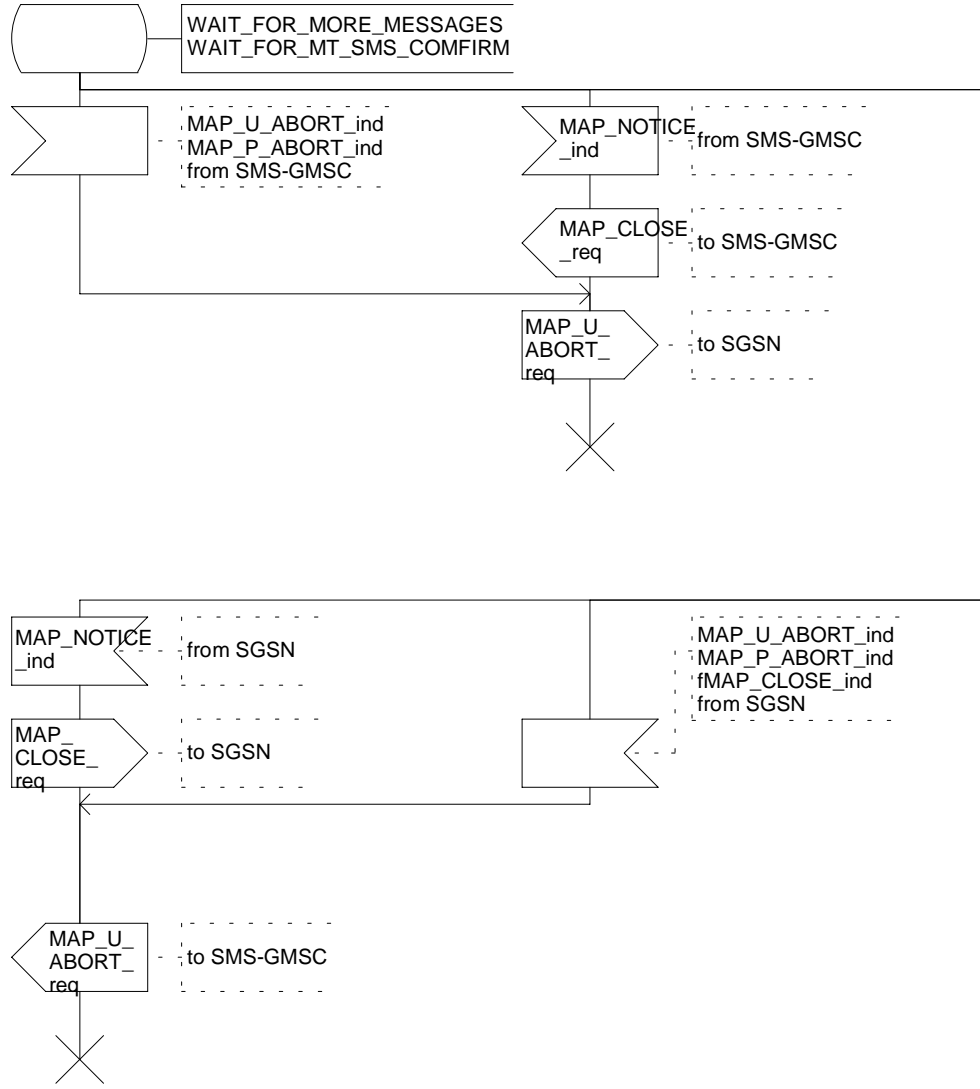**Figure 23.2/3 (sheet 3 of 3): Procedure MT_SM_Transfer_GLR**

Macrodefinition MT_SM_GLR   23.2.4_1(2)

Figure 23.2/4: Macro which transfer short message PDUs to SGSN in the GLR

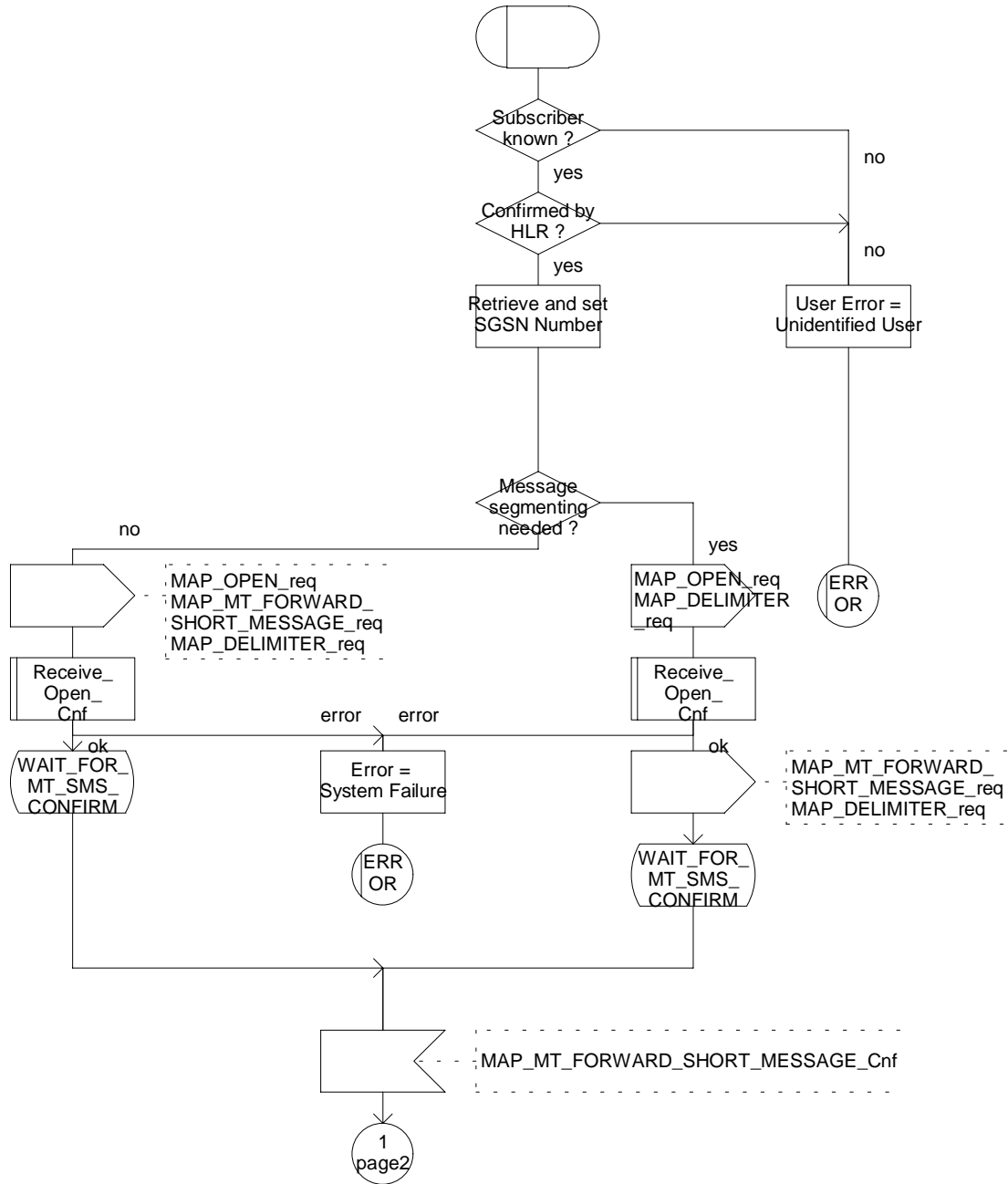Signals to/from the right are to/from the SGSN

Figure 23.2/4 (sheet1 of 2): Macro MT_SM_GLR

Macrodefinition MT_SM_GLR 23.2.4_2(2)

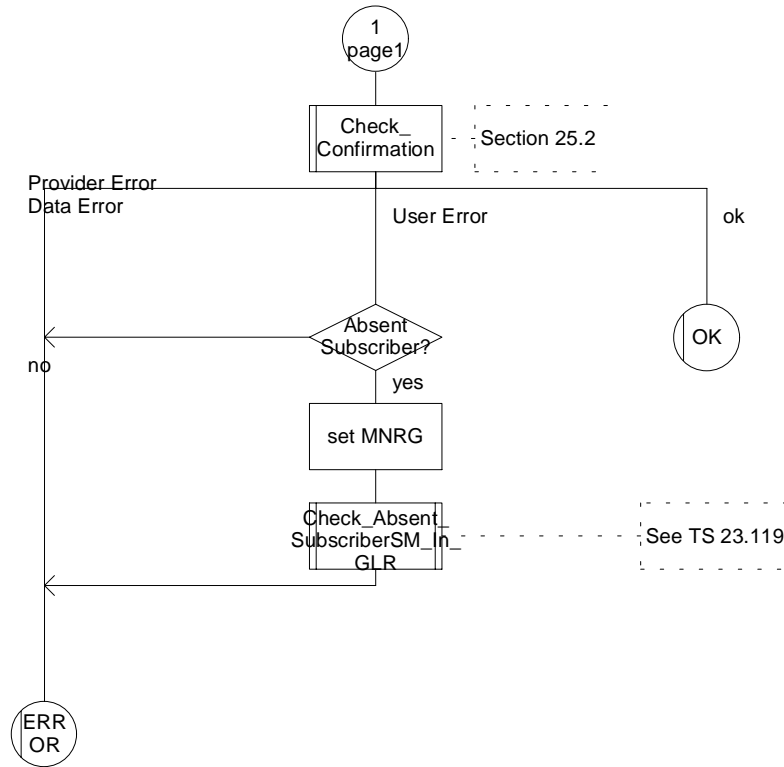Figure 23.2/4: Macro which transfer short message PDUs to SGSN
in the GLR

igure 23.2/4 (sheet2 of 2): Macro MT_SM_GLR

23.3 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.

23.3.1 Procedures in the GLR

When the GLR receives MAP_READY_FOR_SM indication from the VLR or the SGSN and it has MNRF or MNRG, it sends MAP_READY_FOR_SM request to the HLR.

If the outcome is successful, the MNRF or MNRG is cleared.

The short message alert procedure in the GLR is shown in figure 23.3/1.

Process SM_Alert_GLR 23.3.1_1(2)

Figure 23.3/1: The short message alert process in the GLR

Signals to/from the left are to/from the VLR/SGSN; signals to/from the right are to/from the HLR
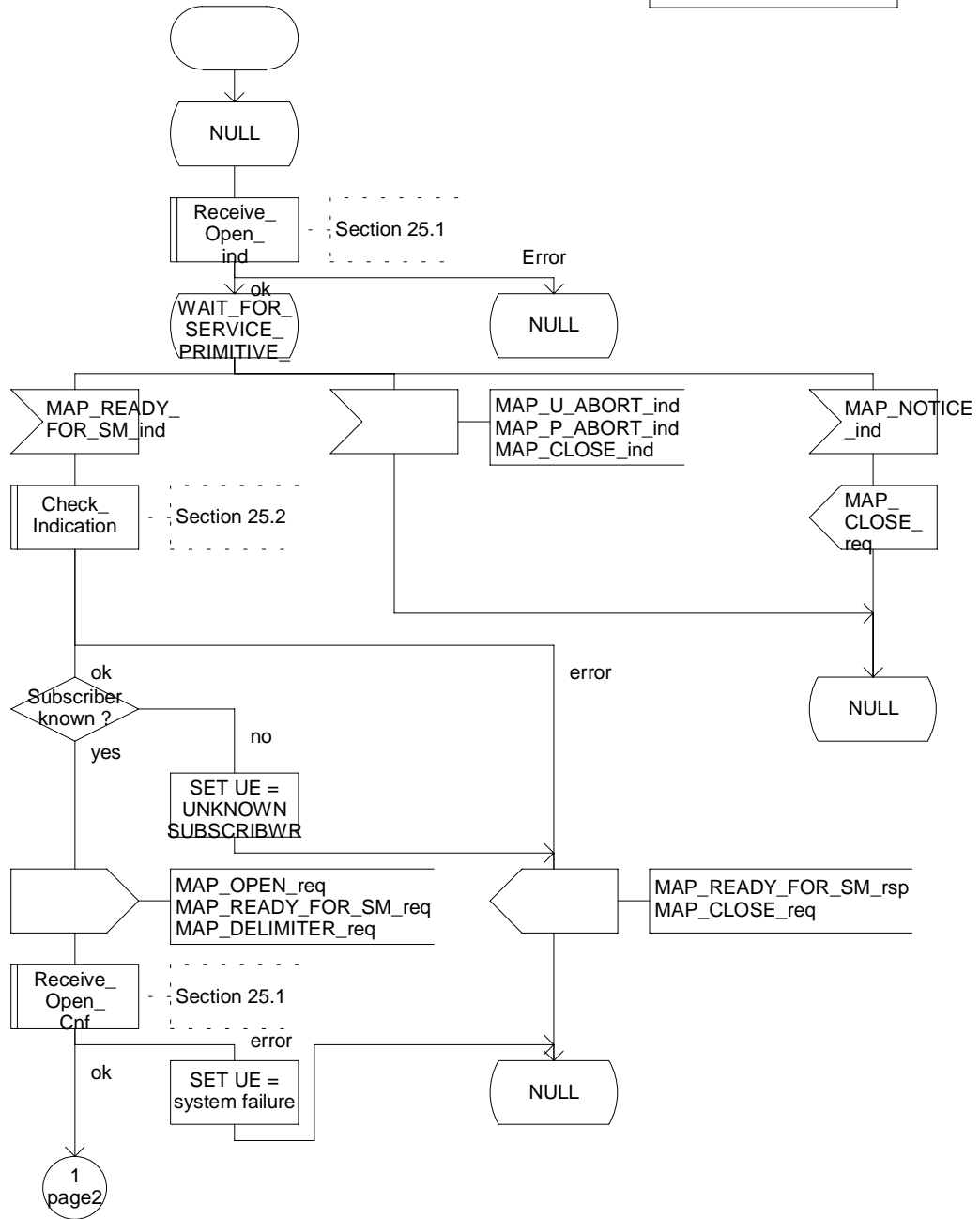

Figure 23.3/1 (sheet 1 of 2): Process SM_Alert_GLR

Process SM_Alert_GLR   23.3.1_2(2)

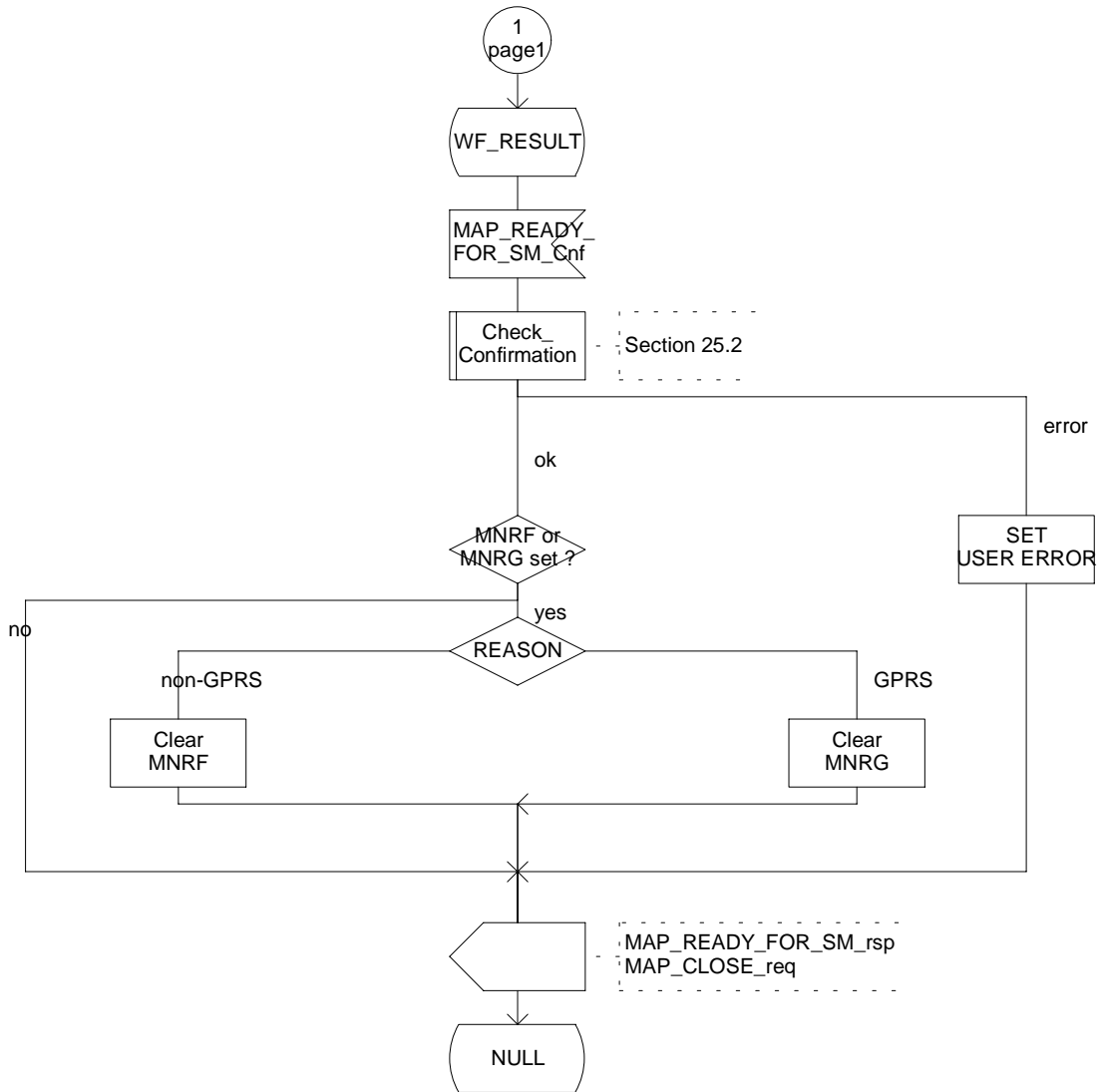Figure 23.3/1: The short message alert process
in the GLR

```
                                    ┌─────┐
                                    │  1  │
                                    │page1│
                                    └──┬──┘
                                       │
                                  ╱─────────╲
                                 │ WF_RESULT │
                                  ╲─────────╱
                                       │
                                 ┌───────────┐
                                 │MAP_READY_ ╱
                                 │FOR_SM_Cnf╱
                                 └─────────┘
                                       │
                                 ┌───────────┐     ┌ ─ ─ ─ ─ ─ ─
                                 │ Check_    │       Section 25.2
                                 │ Confirmation│    └ ─ ─ ─ ─ ─ ─
                                 └─────┬─────┘
                                       │                          error
                                       │ ok
                                  ╱─────────╲                ┌───────────┐
                                 ╱ MNRF or    ╲              │ SET       │
                                 ╲ MNRG set ?  ╱             │ USER ERROR│
                          no      ╲───────────╱              └───────────┘
                   ┌─────────────────┬─────────┐
                   │                 │ yes      │
                   │            ╱─────────╲      │
                   │           ╱  REASON   ╲─────┐
                   │   non-GPRS ╲───────────╱  GPRS
                   │       ┌───────┐   ┌───────┐
                   │       │ Clear │   │ Clear │
                   │       │ MNRF  │   │ MNRG  │
                   │       └───┬───┘   └───┬───┘
                   └───────────┴─────┬─────┴──────────┘
                                     ╳
                                     │
                                ╱─────────╲    ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─
                               ╱           ╲     MAP_READY_FOR_SM_rsp
                               ╲           ╱     MAP_CLOSE_req
                                ╲─────────╱     └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─
                                     │
                                ╱─────────╲
                               │   NULL    │
                                ╲─────────╱
```

Figure 23.3/1 (sheet 2 of 2): Process SM_Alert_GLR

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 Packet Switched Service involving GLR is in TS 23.119.

24.2 Send Routing Information procedure

24.2.1 Process in the GLR for Send Routing Information for GPRS

The MAP process in the GLR to provide routing information for a network-requested PDP context activation is shown in figure 24.2/1. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind   see subclause 25.1;

Check_Indication   see subclause 25.2.

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 GLR sends a Send Routing Info For Gprs request to the GPRS application process in the GLR, and wait for a response. The Send Routing Info For Gprs request contains the parameter received in the MAP_SEND_ROUTING_INFO_FOR_GPRS service indication

If the GPRS application process in the GLR 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 IM-GSN and returns to the idle state.

Negative response from GLR GPRS application process

If the GPRS application process in the GLR 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 IM-GSN and returns to the idle state.

Failure of dialogue opening with the IM-GSN

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process Send_Routing_Info_For_Gprs_GLR 24.2.1(1)

Figure 24.2/1: The Send Routing Info For Gprs process in the GLR

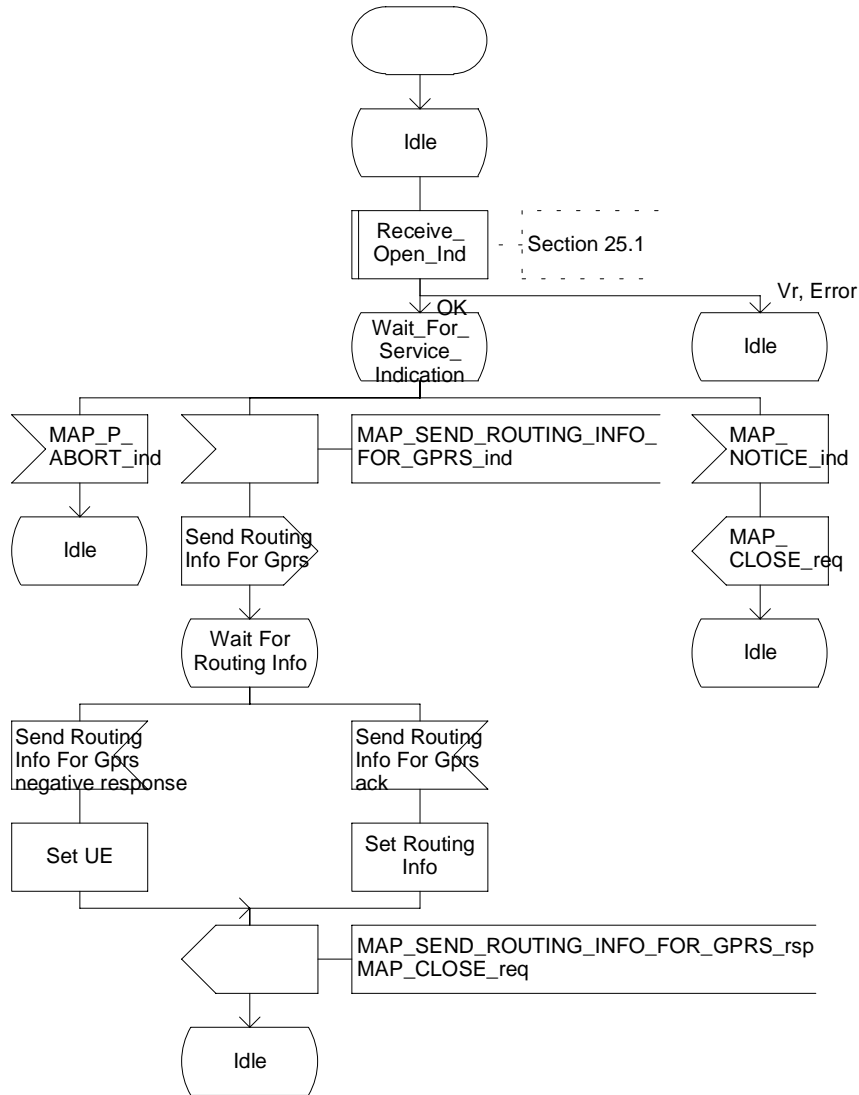Signals to/from the right are to/from the GPRS application process

Idle

Receive_ Open_Ind — Section 25.1

OK

Wait_For_ Service_ Indication

Vr, Error

Idle

MAP_P_ ABORT_ind

MAP_SEND_ROUTING_INFO_ FOR_GPRS_ind

MAP_ NOTICE_ind

Idle

Send Routing Info For Gprs

MAP_ CLOSE_req

Wait For Routing Info

Idle

Send Routing Info For Gprs negative response

Send Routing Info For Gprs ack

Set UE

Set Routing Info

MAP_SEND_ROUTING_INFO_FOR_GPRS_rsp MAP_CLOSE_req

Idle

Figure 24.2/1: Process Send Routing Info For Gprs_GLR

24.2.2 Process in the IM-GSN 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 IM-GSN, it requests a dialogue with the GLR 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 GLR.

If the MAP process receives a MAP_SEND_ROUTING_INFO_FOR_GPRS service confirm from the GLR, 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 GLR to the GPRS application process in the IM-GSN and returns to the idle state.

Failure of dialogue opening with the GLR

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 IM-GSN 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 IM-GSN and returns to the idle state.

Abort of GLRdialogue

After the dialogue with the GLR 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 IM-GSN 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 GLR, sends a Send Routing Info For Gprs negative response indicating system failure to the GPRS application process in the IM-GSN and returns to the idle state.

Process Send_Routing_Info_For_Gprs_IMGSN 24.2.2(1)

Figure 24.2/2: The Send Routing Info For Gprs process in the IMGSN

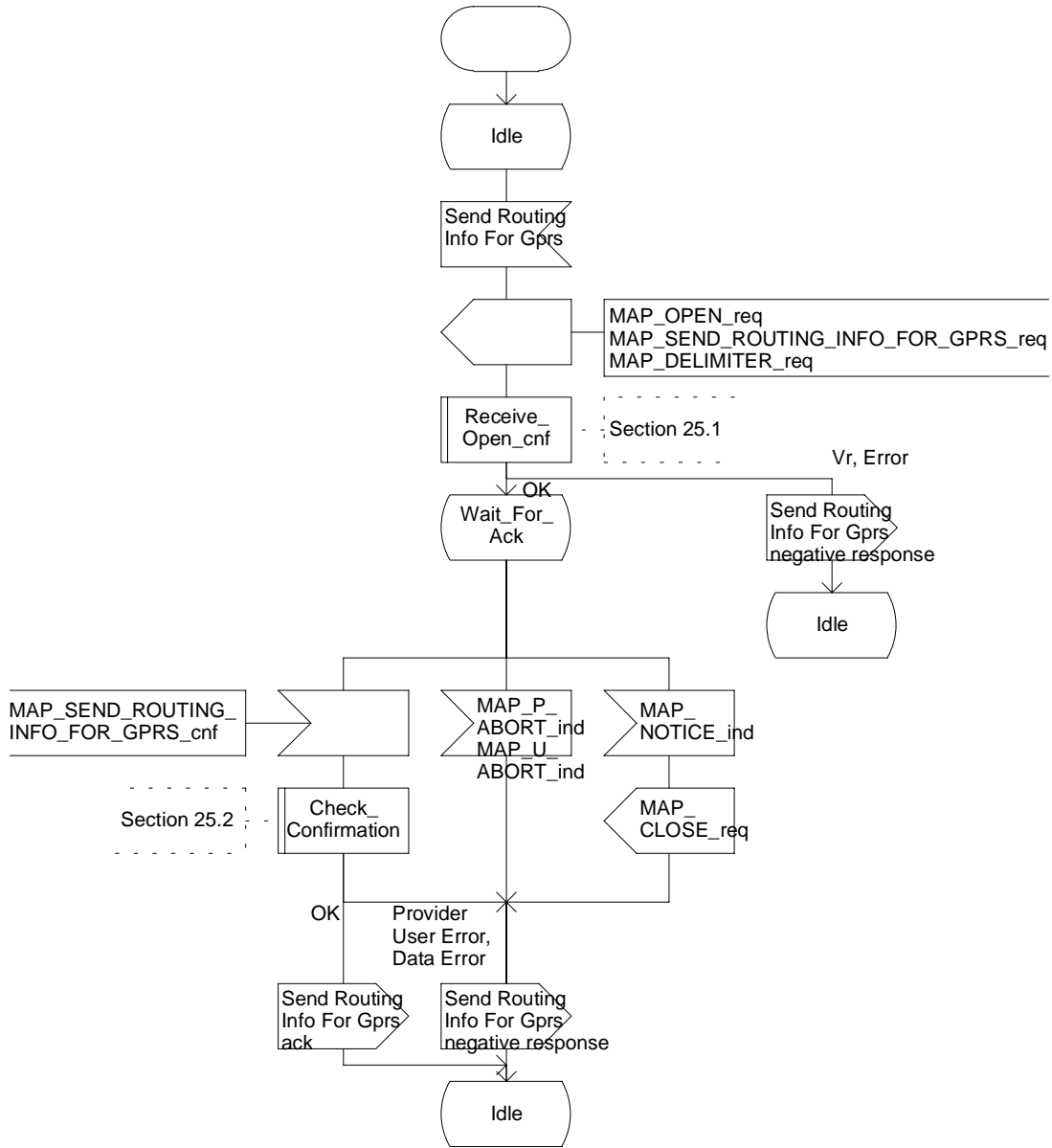Signals to/from the right are to/from the GPRS application process

Idle

Send Routing Info For Gprs

MAP_OPEN_req
MAP_SEND_ROUTING_INFO_FOR_GPRS_req
MAP_DELIMITER_req

Receive_ Open_cnf — Section 25.1

Vr, Error

OK

Wait_For_ Ack

Send Routing Info For Gprs negative response

Idle

MAP_SEND_ROUTING_ INFO_FOR_GPRS_cnf

MAP_P_ ABORT_ind MAP_U_ ABORT_ind

MAP_ NOTICE_ind

Section 25.2

Check_ Confirmation

MAP_ CLOSE_req

OK

Provider User Error, Data Error

Send Routing Info For Gprs ack

Send Routing Info For Gprs negative response

Idle

Figure 24.2/2: Process Send_Routing_Info_For_Gprs_IM-GSN

24.3 Failure Report procedure

24.3.1 Process in the GLR for Failure Report

The MAP process in the GLR to set the MNRG (Mobile station Not Reachable for GPRS) flag for the subcriber is shown in figure 24.3/1. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

> Receive_Open_Ind   see subclause 25.1;
>
> Check Indication   see subclause 25.2.

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 GLR sends a Failure Report request to the GPRS application process in the GLR, and wait for a response. The Failure Report request contains the parameter received in the MAP_FAILURE_REPORT service indication.

If a positive response is received, the MAP process constructs a MAP_FAILURE_REPORT service response, constructs a MAP_CLOSE service request, sends them to the IM-GSN and returns to the idle state.

Negative response from GLR GPRS application process

If the GPRS application process in the GLR 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 IM-GSN and returns to the idle state.

Failure of dialogue opening with the IM-GSN

If the macro Receive_Open_Ind takes the Vr exit or the Error exit, the MAP process returns to the idle state.

If the MAP provider sends a MAP_P_ABORT while the MAP process is waiting for a service indication, the MAP process returns to the idle state.

If the MAP provider sends a MAP_NOTICE while the MAP process is waiting for a service indication, the MAP process sends a MAP_CLOSE request to terminate the dialogue and returns to the idle state.

Process Failure_Report_GLR 24.3.1(1)

Figure 24.3/1: The Failure Report process in the GLR

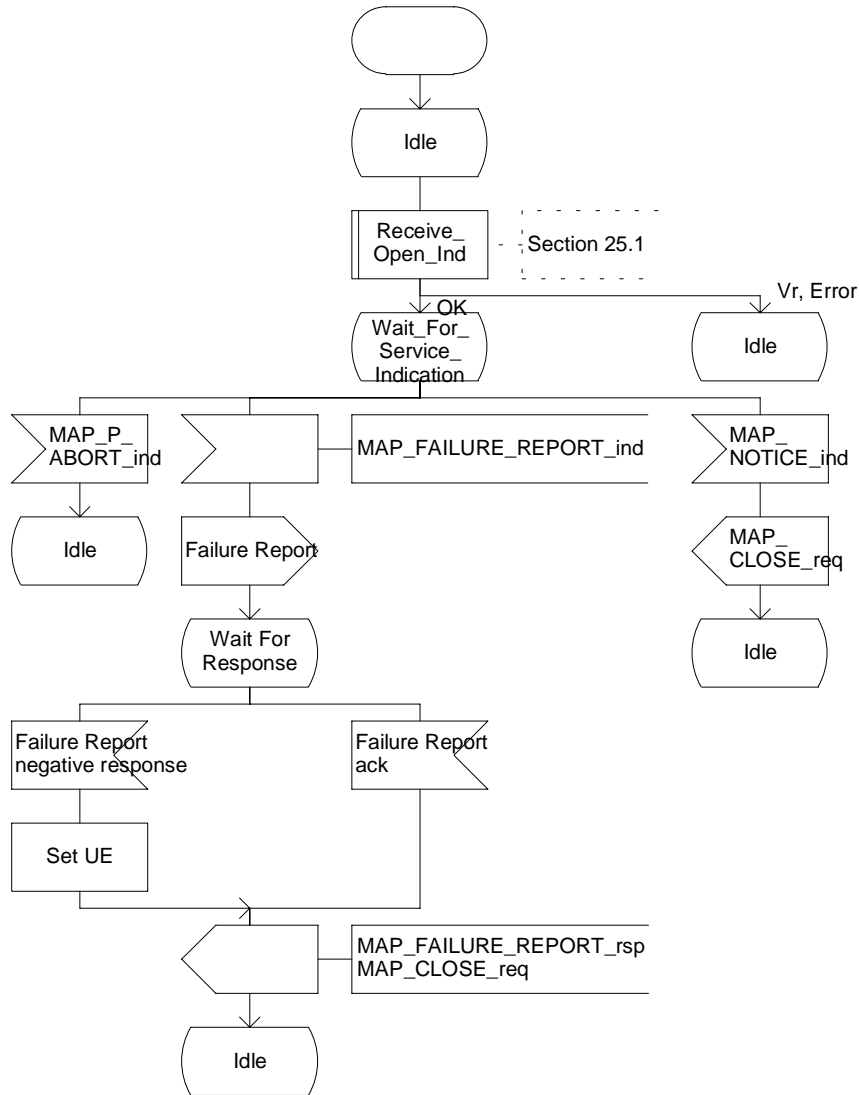Signals to/from the right are to/from the application process

Idle

Receive_ Open_Ind — Section 25.1

OK

Wait_For_ Service_ Indication

Vr, Error

Idle

MAP_P_ ABORT_ind

MAP_FAILURE_REPORT_ind

MAP_ NOTICE_ind

Idle

Failure Report

MAP_ CLOSE_req

Wait For Response

Idle

Failure Report negative response

Failure Report ack

Set UE

MAP_FAILURE_REPORT_rsp MAP_CLOSE_req

Idle

Figure 24.3/1: Process Failure_Report_GLR

24.3.2   Process in the IM-GSN for Failure Report

Successful Outcome

When the MAP process receives a Failure Report request from the GPRS application process in the IM-GSN, it requests a dialogue with the GLR 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 GLR.

If the MAP process receives a MAP_FAILURE_REPORT service confirm from the GLR, 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 GLR to the GPRS application process in the IM-GSN and returns to the idle state.

Failure of dialogue opening with the GLR

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 IM-GSN 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 IM-GSN and returns to the idle state.

Abort of GLR dialogue

After the dialogue with the GLR 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 IM-GSN 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 GLR, sends a Failure Report negative response indicating system failure to the GPRS application process in the IM-GSN and returns to the idle state.

Process Failure_Report_IMGSN 24.3.2(1)

Figure 24.3/2: The Failure Report process in the IMGSN

Signals to/from the right are to/from the GPRS application process
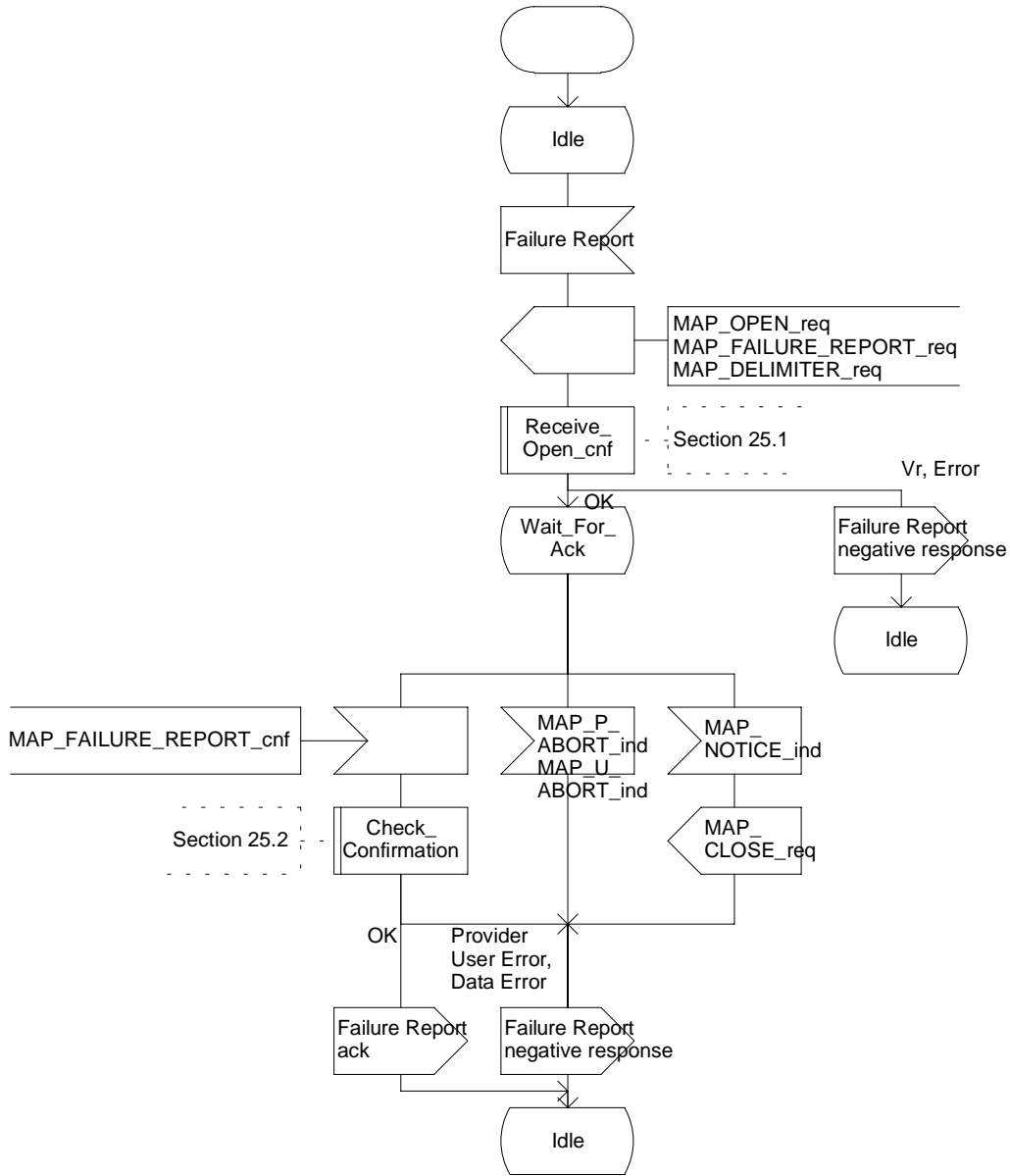
Idle

Failure Report

MAP_OPEN_req
MAP_FAILURE_REPORT_req
MAP_DELIMITER_req

Receive_
Open_cnf

Section 25.1

Vr, Error

OK

Wait_For_
Ack

Failure Report
negative response

Idle

MAP_FAILURE_REPORT_cnf

MAP_P_
ABORT_ind
MAP_U_
ABORT_ind

MAP_
NOTICE_ind

Section 25.2

Check_
Confirmation

MAP_
CLOSE_req

OK

Provider
User Error,
Data Error

Failure Report
ack

Failure Report
negative response

Idle

Figure 24.3/2: Process Failure_Report_IM-GSN

25 General macro description

25.1 MAP open macros

This subclause refers TS 29.002.

25.2 Macros to check the content of indication and confirmation primitives

This subclause refers TS 29.002.

25.3 Authentication processes

25.3.1 Process Obtain_Authentication_Sets_GLR

This process is initiated by the GLR to fetch authentication vectors from a subscriber's HLR to the VLR. The process is described in figure 25.3/1.

Figure 25.3.1/1 (sheet 1 of 2): Process Obtain_Authentication_Sets_GLR

Process Obtain_Authent_Sets_GLR 25.3.1_2(2)

Figure 25.3/1: The Process to obtain authetication
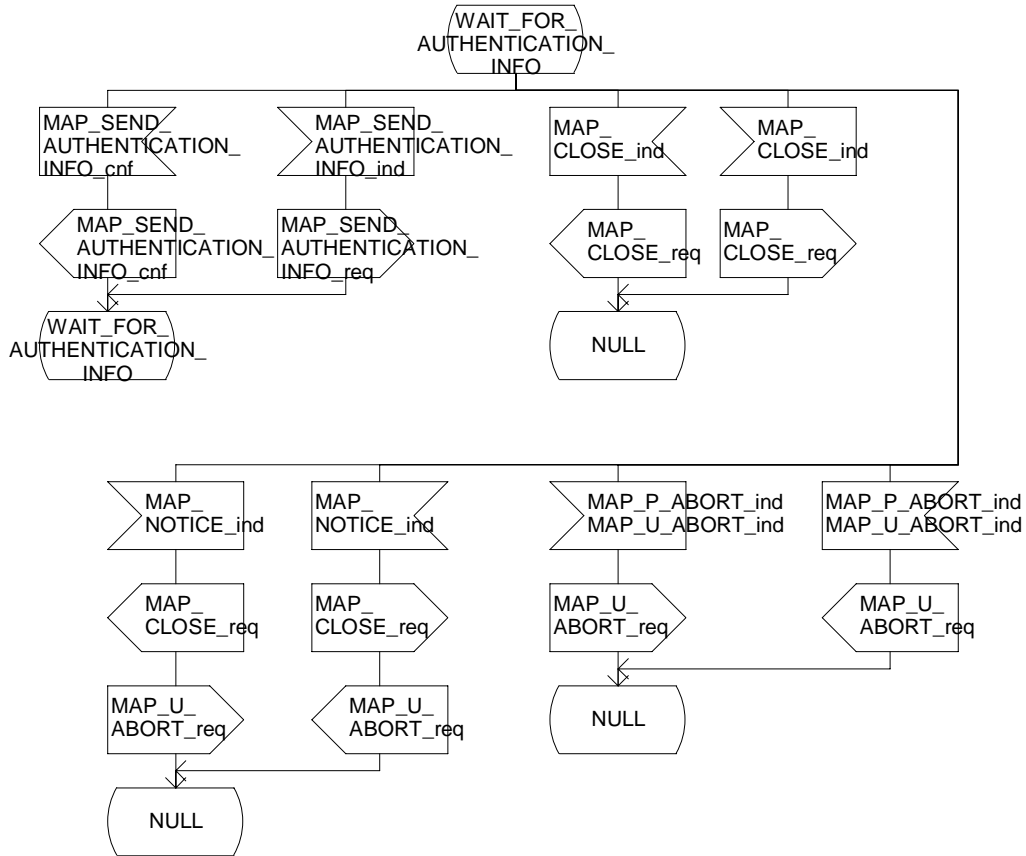sets from the HLR to the VLR via the GLR

Left from/to VLR
Right from/to HLR

WAIT_FOR_
AUTHENTICATION_
INFO

MAP_SEND_
AUTHENTICATION_
INFO_cnf

MAP_SEND_
AUTHENTICATION_
INFO_ind

MAP_
CLOSE_ind

MAP_
CLOSE_ind

MAP_SEND_
AUTHENTICATION_
INFO_cnf

MAP_SEND_
AUTHENTICATION_
INFO_req

MAP_
CLOSE_req

MAP_
CLOSE_req

WAIT_FOR_
AUTHENTICATION_
INFO

NULL

MAP_
NOTICE_ind

MAP_
NOTICE_ind

MAP_P_ABORT_ind
MAP_U_ABORT_ind

MAP_P_ABORT_ind
MAP_U_ABORT_ind

MAP_
CLOSE_req

MAP_
CLOSE_req

MAP_U_
ABORT_req

MAP_U_
ABORT_req

MAP_U_
ABORT_req

MAP_U_
ABORT_req

NULL

NULL

Figure 25.3.1/2 (sheet 2 of 2): Process Obtain_Authentication_Sets_GLR

25.4 Short Message Alert procedures

25.4.1 Subscriber_Present_GLR_AS_VLR process

The Subscriber_Present_GLR_AS_VLR process is invoked by the GLR, when GLR receives Update Location from VLR and the MNRF flag is set. The general description of the short message alert procedures is in the subclause 23.3.

The GLR sends the MAP_READY_FOR_SM request to the HLR and waits for the HLR to answer. When receiving the answer, the GLR 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_GLR_AS_VLR process is shown in the figure 25.4/1.

Process Subscriber_Present_GLR_AS_VLR   25.4.1(1)

Figure 25.4/1: The short message alert process
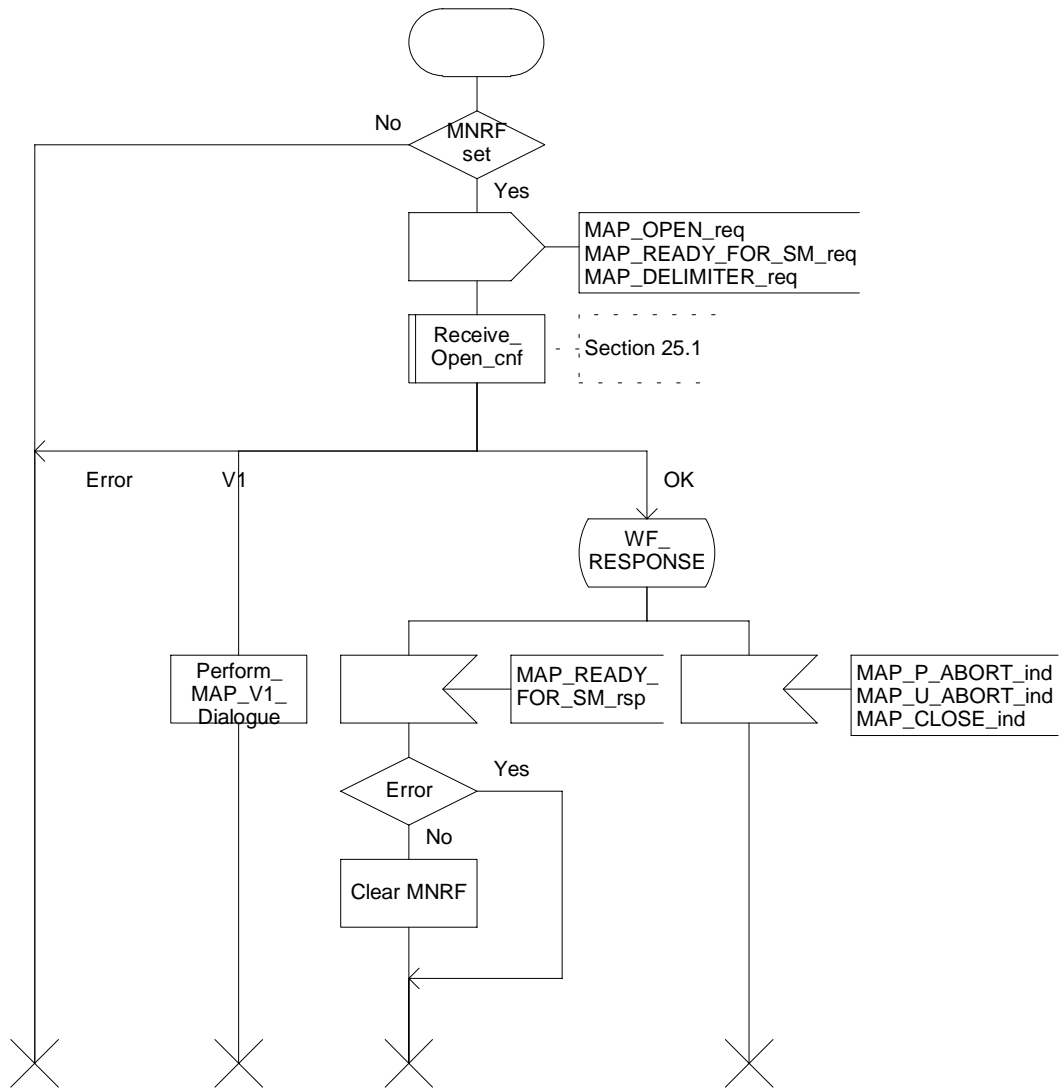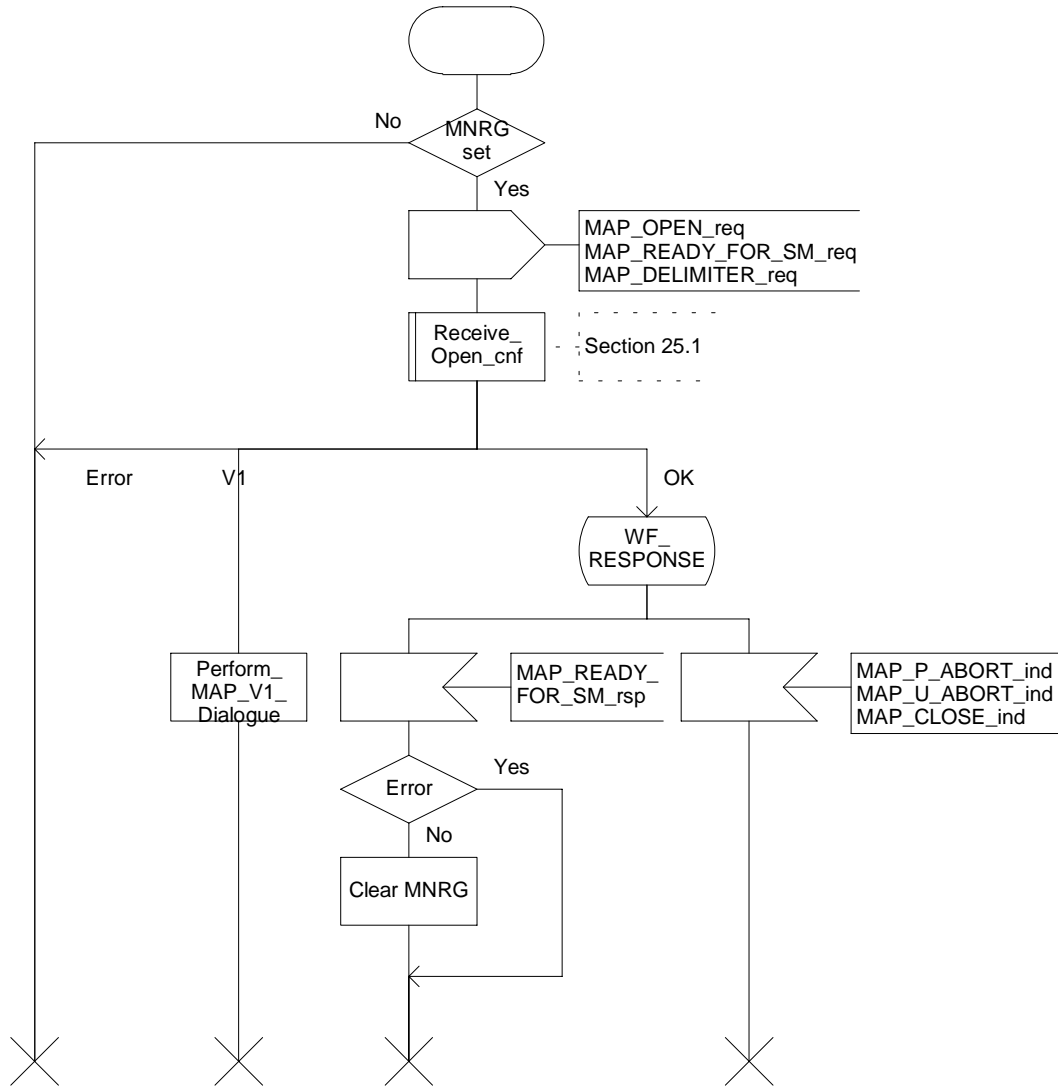in the GLR for mobile present situation

Figure 25.4/1: Process Subscriber_Present_GLR_AS_VLR

25.4.2   The Mobile Subscriber is present

When GLR recieves Update GPRS Location from SGSN, while the MS not reachable for GPRS (MNRG) flag is set, the GLR 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 GLR 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_GLR_AS_SGSN process is shown in the figure 25.4/2.

Figure 25.4/2: Process Subscriber_Present_GLR_AS_SGSN

History

Document history		
V0.0.1	Sep 1999	First draft by the editor
V0.0.2	Oct 1999	The GTP protocol issue is removed, and new specification related to GTP issue is generated.
V0.10.	Nov 1999	Modification related to the handling fallback via GLR - Add section 7.1.1: MAP-U-ABORT service - Add section 16.1: MAP_DSM SDL description - Procedures from section 19 to 25 are modified. Addition section 20.3: Subscriber Identity procedure Addition section 25.3: Authentication processes Deletion "Insert Subscriber Data Macros" and "Macro Insert_Subs_Data_Cnf" in sectoin 25. Subscriber data management procedures in section 20.2 are re-written without macrodifinitions.
V0.2.0	Nov 1999	Correction editolial mistakes with exceptions as follows. Regarding the GLR specific fallback mechanism, addition of description related to the timer value configuration in section 17.1, Modification of Subscriber data management procedures in section 20.2 - GLR doesn't have to count the number of "Insert Subscriber Data and ack messages". - GLR shall handle the regional restriction indication or unsupported service indication when receiving the "Insert Subscriber Data ack message".
V0.3.0	Nov 1999	In section 4.2, interfaces not related to MAP are removed, and Interfcace between the MSC and the GLR is added. For approval by N2
V 1.0.0	Dec 1999	For approval by CN#06
V 1.0.1	Jan 2000	Editorial corrections (in section 8.5, 12.2, 21.3.1 and 21.4.1) Modify the reference to the 3GPP Spec (in section 6.1.2 and 6.1.3.2.3)
V 1.1.0	Feb 2000	Modify to introduce the Super-Charger functionality to GLR (in section 23)
V2.0.0	Mar 2000	Submitted to CN#07 for approval