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Technical Specification

3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Mobile Application Part (MAP) specification for Gateway Location Register (GLR) (Release 11)



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Foreword

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

The present document 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. the present document specifies the delta against 3GPP 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 the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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- x the first digit:
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1 Scope

The present document describes the signalling requirements and procedures used at network elements related to the GLR for MAP within the 3GPP system at the application level.

The present document gives the description of the systems needed only in the network utilising GLR as the delta document against 3GPP 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.

[1] 3GPP TS 23.003: "Numbering, addressing and identification".

[2] 3GPP TS 23.007: "Restoration procedures".

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

[4] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS) Point to Point (PP)".

[5] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[6] 3GPP 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 within the mobile network utilising the GLR

4.1 The entities of the mobile system

The functional entities related to the GLR are described below. The description of each entity is detailed in 3GPP TS 23.119 (GLR stage2 specification). The other functional entities described in the present document (e.g. MSC, VLR, and HLR) are specified in 3GPP TS 29.002.

- The Gateway location Register (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 3GPP TS 23.119 (GLR stage2 specification).

- Interface between the HLR and the GLR.
- Interface between the VLR and the GLR.
- Interface between the MSC and the IM_MSC.
- Interface between the SGSN and the GLR.
- Interface between the MSC and the GLR.
- Interface 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, the responder may ignore requests for certain MAP operations (see tables 5.1/1, 5.1/2 and 5.1/3 in 3GPP TS 29.002). 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 3GPP 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 3GPP TS 23.003 [1]. The specific SSN is not needed for the GLR, IM_MSC, and 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 3GPP 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 utilising the GLR, when an MS that 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 routing information used by the HLR is derived from the E.164 VLR number received as a parameter of the MAP message initiating the update location dialogue, 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 utilising the GLR, the GMSC sees the GLR as the SGSN. When the GMSC initiates dialogues towards the SGSN the SGSN (MAP) SSN (See 3GPP TS 23.003) shall be included in the called party address. The routing information used by the GMSC is derived from the E.164 SGSN number received as a parameter of the MAP message initiating the forward short message procedure. 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 utilising 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 an MS, the GMSC addresses the MSC by an MSC identity received from the HLR that complies with E.164 rules. But in reality the GMSC addresses the IM-MSC in the network utilising 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 utilising 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 summarises 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 message is used as SCCP Called Party Address. For extra-PLMN addressing the own E.164 entity address is used as SCCP Calling Party Address; for intra-PLMN addressing an SPC derived from the entity number may be used instead. When using an SPC, the SPC may be taken directly from MTP.

Table 6.1.3/1

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/MSISDN/HLR NUMBER		
Gateway GPRS Support Node						Note1			
Gateway Location register	---	E:GT T:MGT (outside World Zone1)/MSISDN(World Zone1/) HLR NUMBER (note)	I:SPC/GT T:VLR NUMBER	---	I:SPC/GT T:SGSN NUMBER				
Intermedi- ate- MSC	---			I:SPC/GT T:MSC NUMBER					
Intermedi- ate- 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 0: For initiating the location updating procedure and an authentication information retrieval from the HLR preceding it, the VLR has to derive the HLR address from the IMSI of the MS. The result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1). When continuing the established update location dialogue (as with any other dialogue) the VLR must derive the routing information towards the HLR from the Calling Party Address received with the first responding CONTINUE message until the dialogue terminating message is received.

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

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

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 3GPP TS29.002.

6.2 Use of TC

Refer to the corresponding section in 3GPP TS 29.002.

7 General on MAP services

Refer to the corresponding section in 3GPP TS 29.002 with the exceptions described below.

7.1 Common MAP services

The following common services are used:

- MAP-OPEN service;
- MAP-CLOSE service;
- MAP-DELIMITER service;
- MAP-U-ABORT service;
- MAP-P-ABORT service;
- MAP-NOTICE service;
- MAP-SECURE-TRANSPORT-CLASS-1 service;
- MAP-SECURE-TRANSPORT-CLASS-2 service;
- MAP-SECURE-TRANSPORT-CLASS-3 service;
- MAP-SECURE-TRANSPORT-CLASS-4 service.

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	Short term/long term problem
Application procedure cancellation	Handover cancellation/ Radio Channel release/ Network path release/ Call release/ Associated procedure failure/ Tandem dialogue released/ Remote operations failure
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 adoption shall be considered for the GLR introduction. The interval for adoption for the GLR specification is described below. Service primitives and parameter definitions are as in 3GPP 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_INFORMATION	VLR – GLR
	SGSN – GLR
	GLR – HLR
MAP_AUTHENTICATION_FAILURE_REPORT	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 maintenance services

9.1 General

Regarding definition of each service, only the interval for adoption shall be considered for the GLR introduction. The intervals for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in 3GPP 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 adoption shall be considered for the GLR introduction. The intervals for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in 3GPP 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 adoption shall be considered for the GLR introduction. The intervals for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in 3GPP 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 adoption shall be considered for the GLR introduction. The intervals for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in 3GPP 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 adoption shall be considered for the GLR introduction. The intervals for adoption for the GLR specification are described below. Service primitives and parameter definitions are as in 3GPP 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 Void

15 Element of procedure

The elements of procedures for the MAP protocol are referred to the corresponding section in 3GPP TS 29.002 with the exceptions described below.

15.1 SDL descriptions

Replace the corresponding part of Process Secure_MAP_DSM as figure 15.1/1.

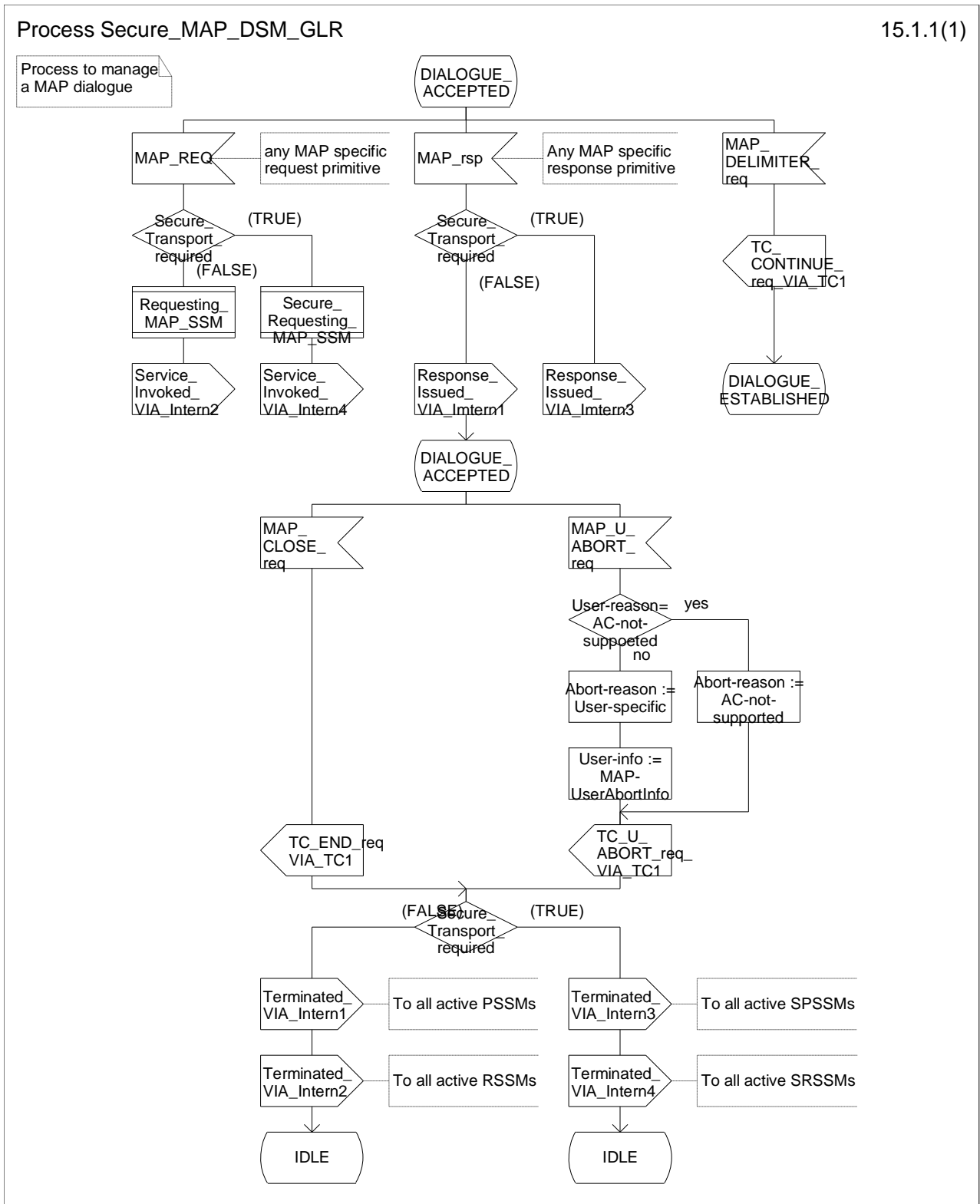


Figure 15.1/1: Process Secure_MAP_DSM_GLR

16 Mapping onto TC services

Dialogue control, Service specific procedures and SDL descriptions are referred to the corresponding section in 3GPP TS 29.002.

17 Abstract syntax of the MAP protocol

17.1 General

Refer to the corresponding section in 3GPP 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 3GPP 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

Operation Package	supplier	consumer
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
AuthenticationFailureReportPackage-v3	HLR	GLR
	GLR	VLR
	GLR	SGSN
SecureTransportHandlingPackage-v3	This operation package includes the operations required for the secure transport of MAP messages between any MAP entities.	

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 3GPP 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
callCompletionContext	v3	VLR	GLR
		GLR	HLR
authenticationFailureReportContext	v3	VLR or SGSN	GLR
		GLR	HLR
SecureTransportHandlingContext	v3	This application context is used for the secure transport of MAP messages between any MAP entities.	

18 General on MAP user procedure

Refer to 3GPP 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 Co-ordinator in the GLR co-ordinates 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 co-ordinator 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 Co-ordinator process returns to idle state.

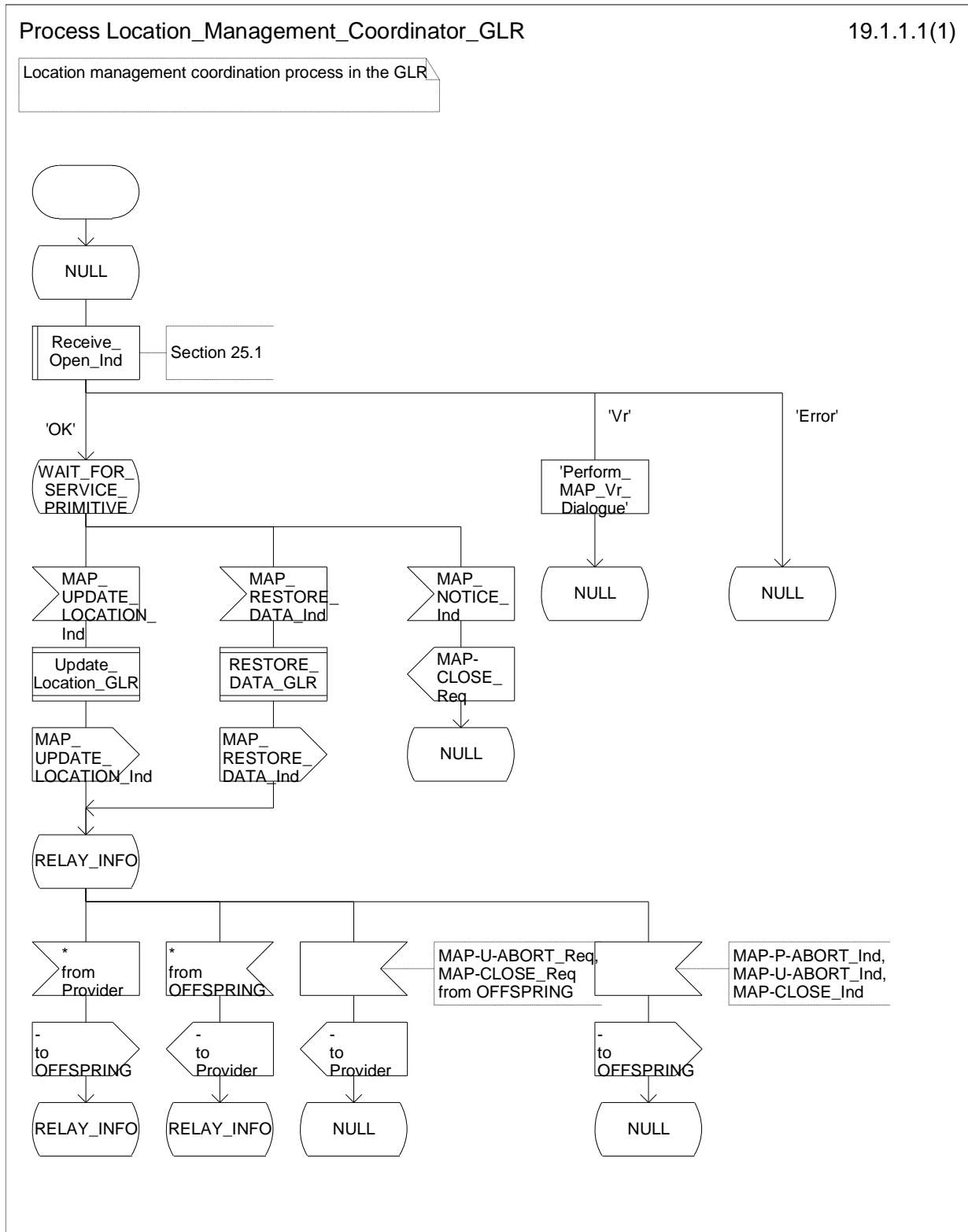


Figure 19.1.1/1: Process Location_Management_Coordinator_GLR

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.

19.1.1 Location updating

19.1.1.1 General

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

If the 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 necessary.

If the 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 necessary.

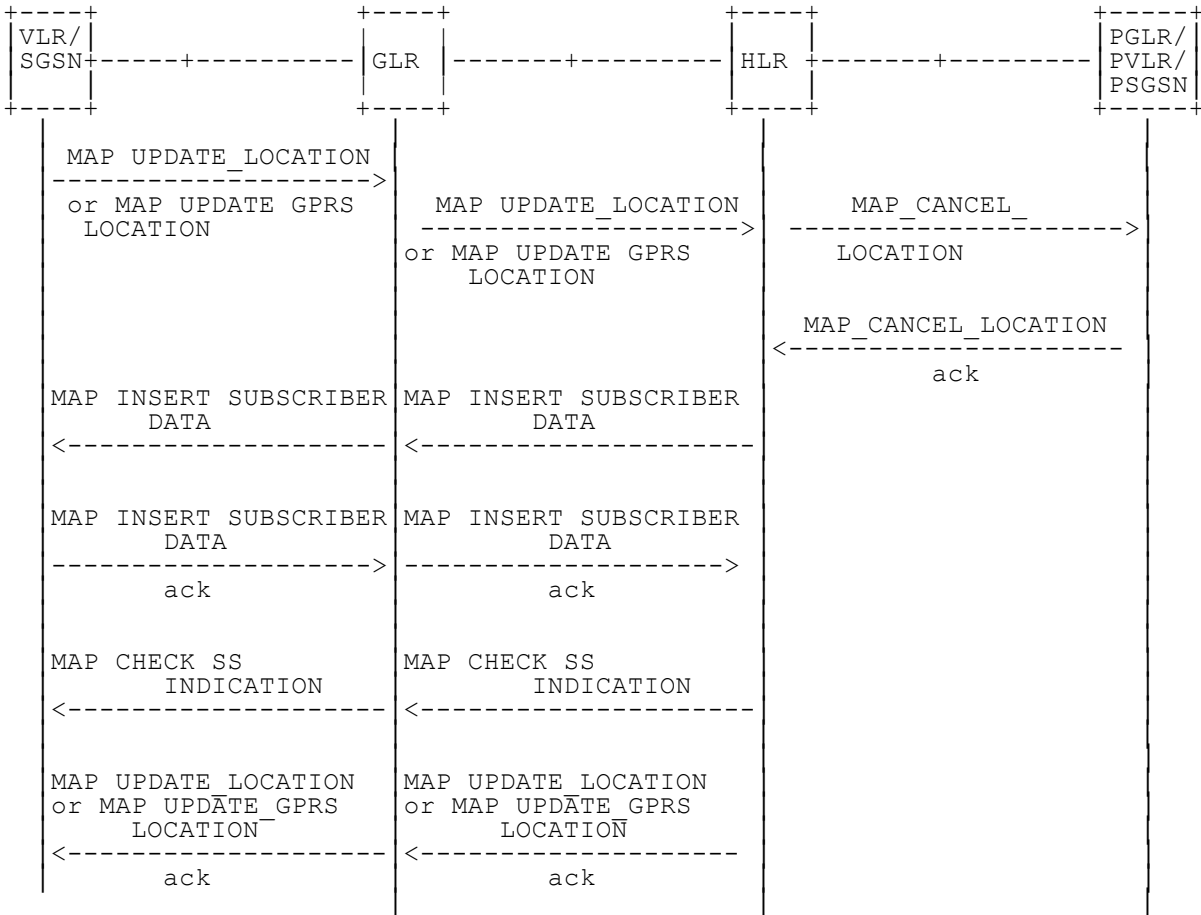


Figure 19.1.2/1: Interface and services for Location updating

19.1.1.2 Detailed procedure in the GLR

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

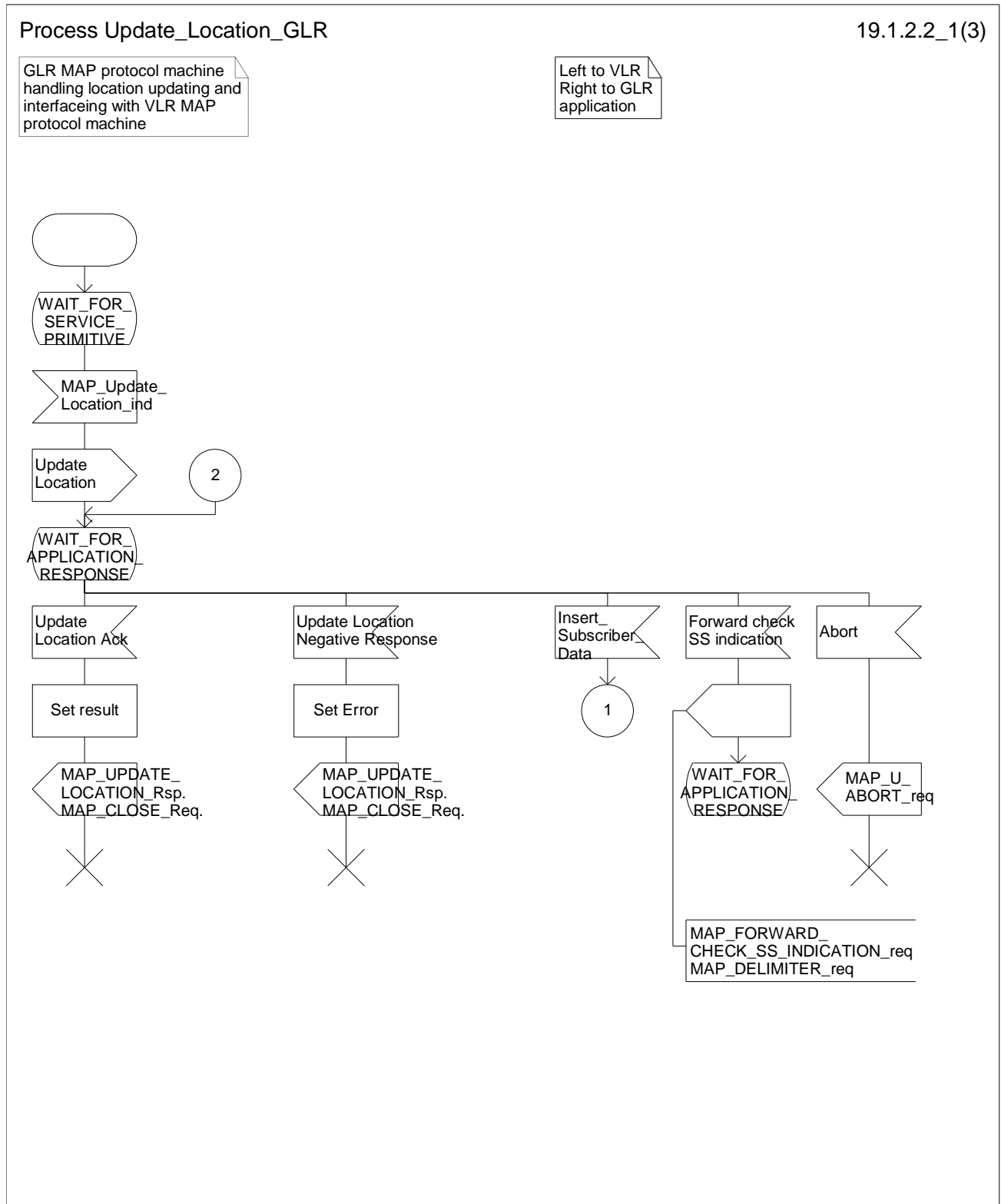


Figure 19.1.2/2 (sheet 1 of 3): Process Update_Location_GLR

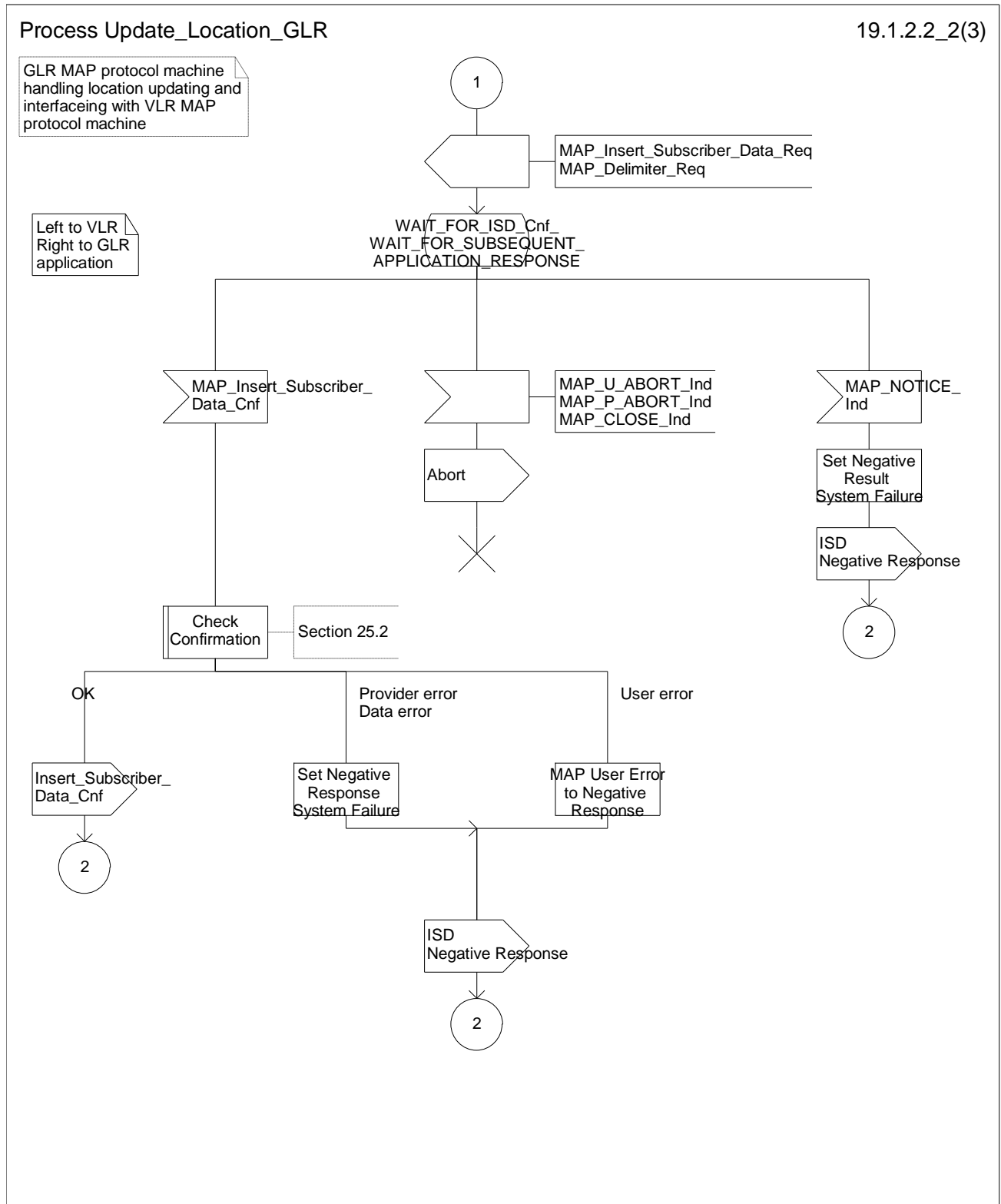


Figure 19.1.2/2 (sheet 2 of 3): Process Update_Location_GLR

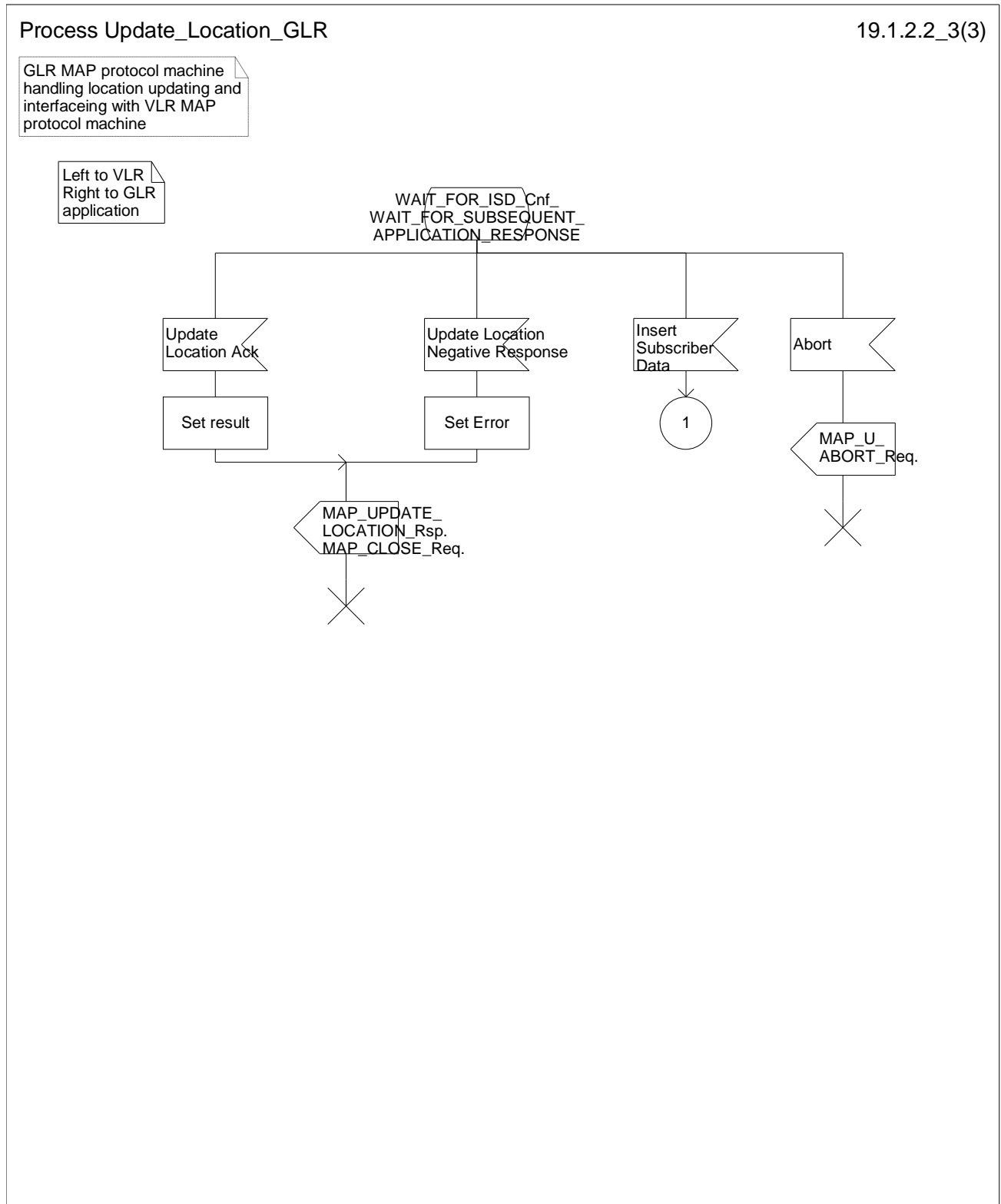


Figure 19.1.2/2 (sheet 3 of 3): Process Update_Location_GLR

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

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

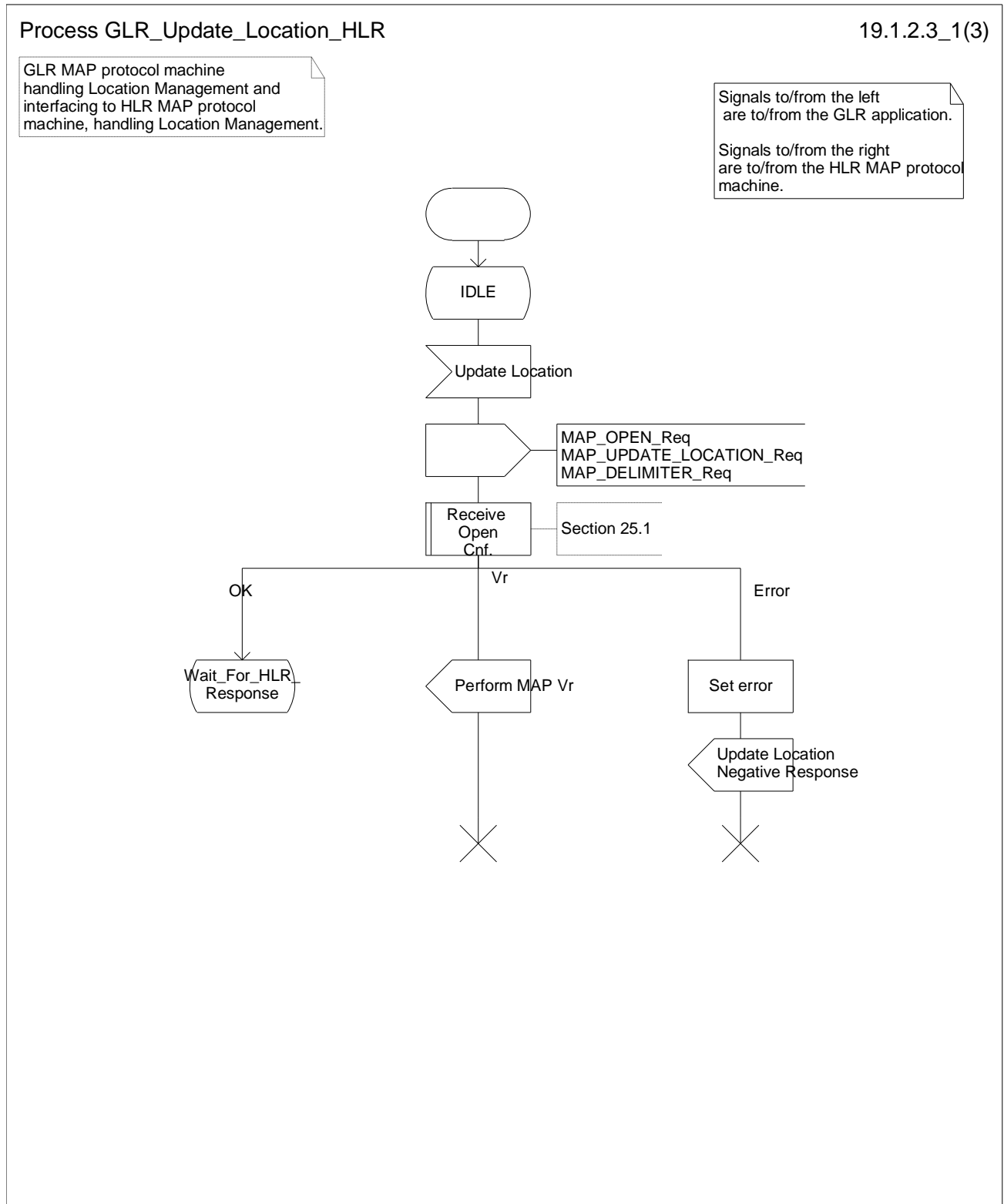


Figure 19.1.2/3 (Sheet 1 of 3): Process GLR_Update_Location_HLR

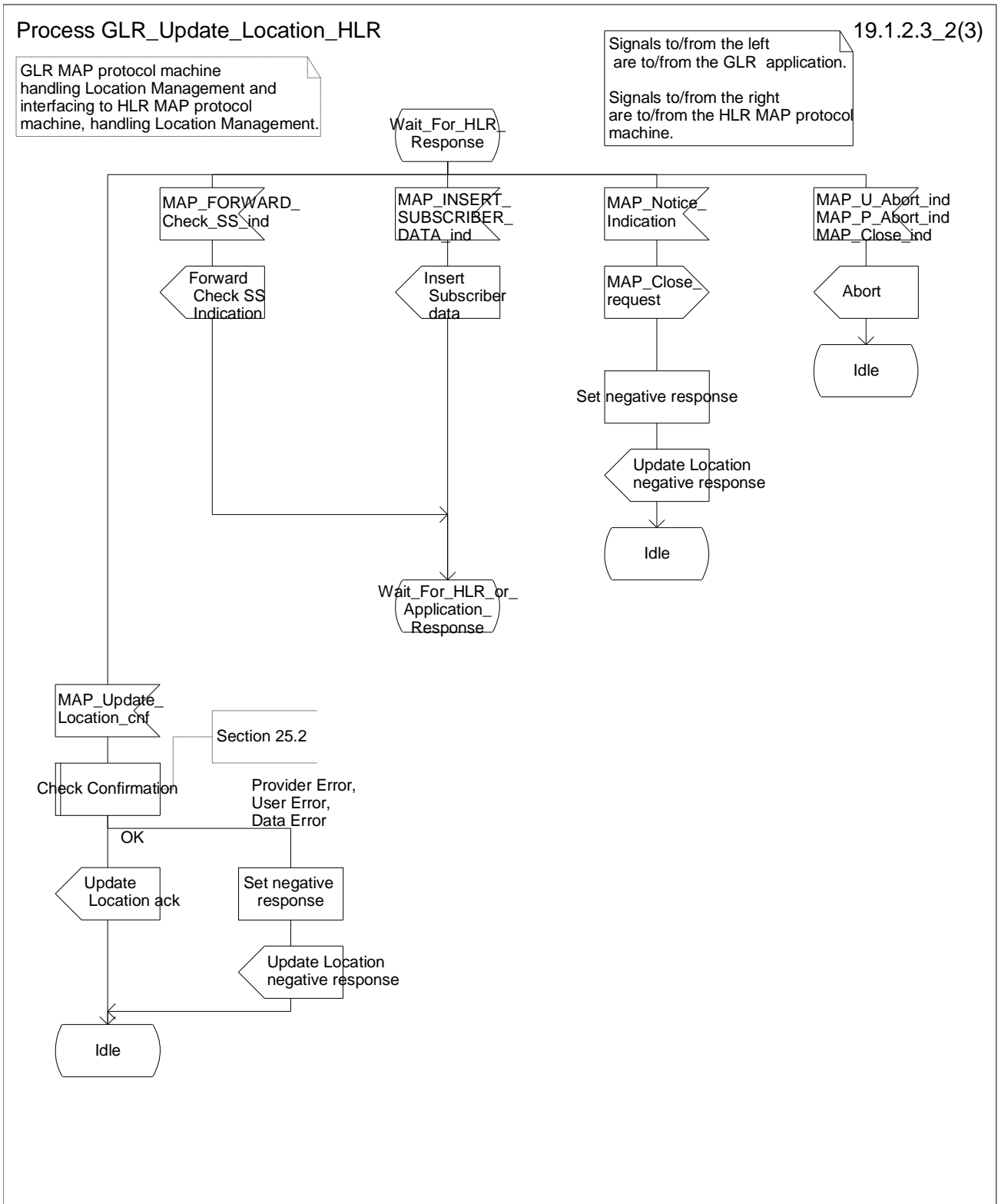


Figure 19.1.2/3 (Sheet 2 of 3): Process GLR_Update_Location_HLR

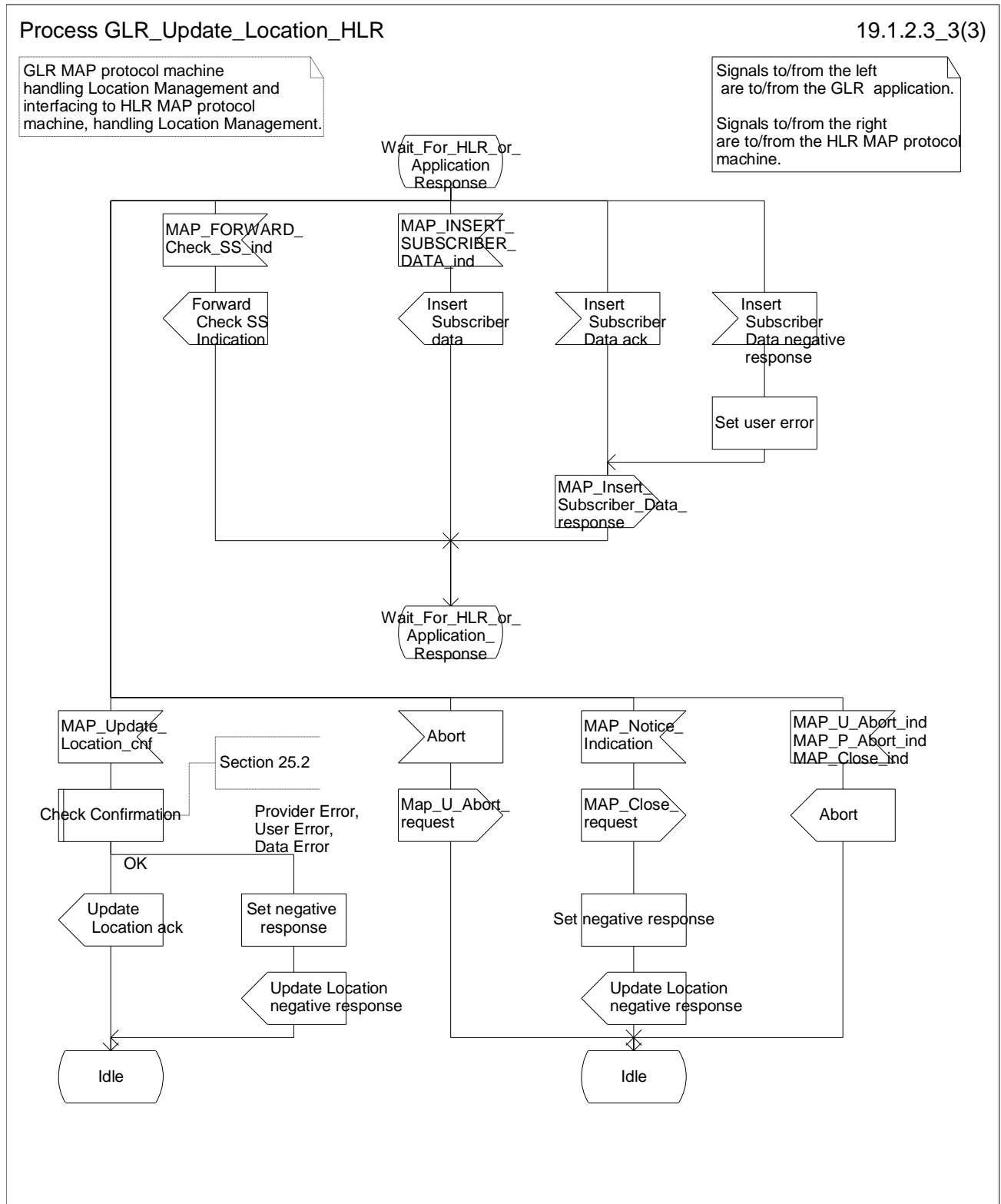


Figure 19.1.2/3 (Sheet 3 of 3): Process GLR_Update_Location_HLR

Figure 19.1.2/4 shows the Process Update_GPRS_Location_GLR. This process is a GLR MAP protocol machine handling location updating and is a responder to the SGSN.

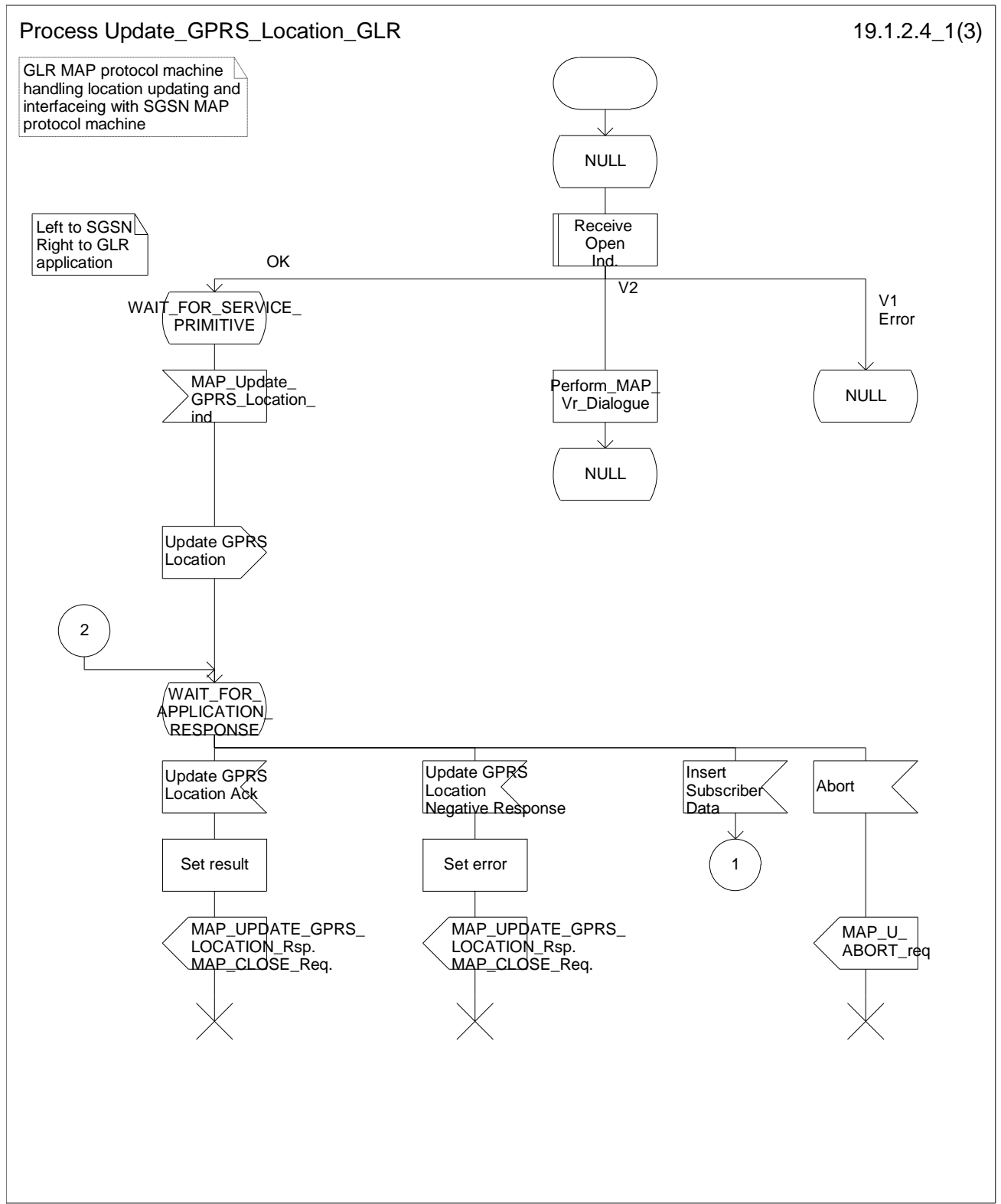


Figure 19.1.2/4 (sheet 1 of 3): Process Update_GPRS_Location_GLR

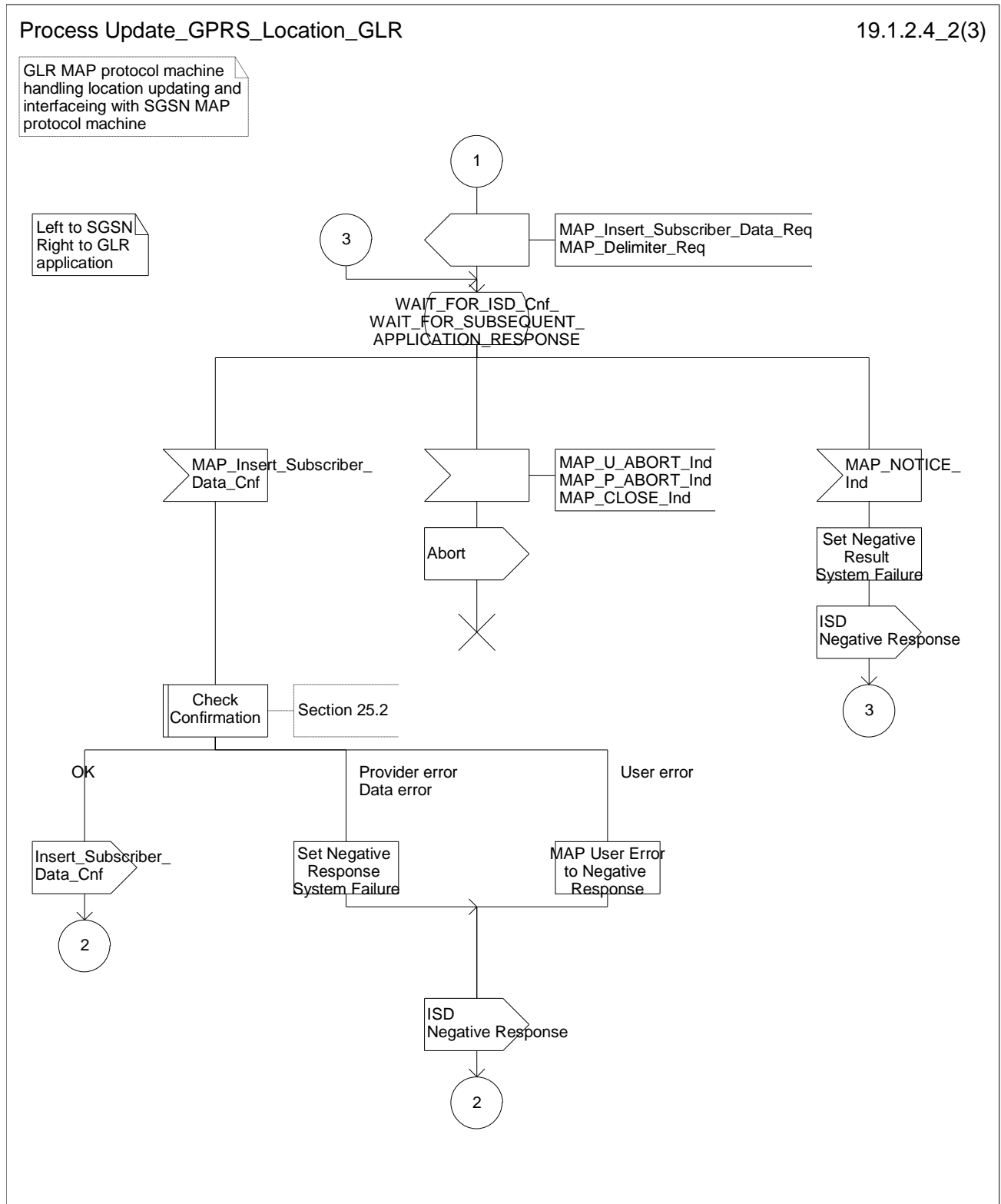


Figure 19.1.2/4 (sheet 2 of 3): Process Update_GPRS_Location_GLR

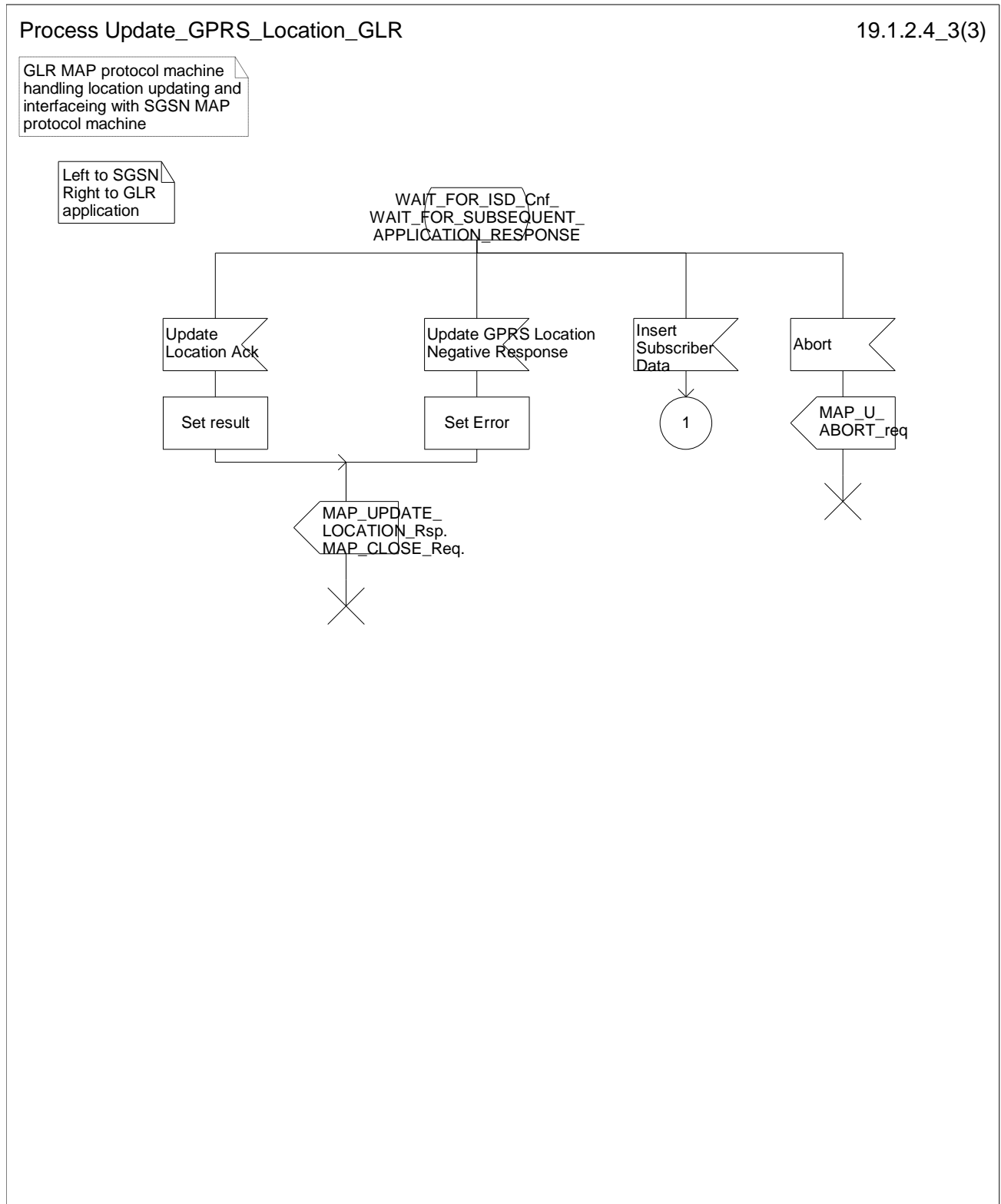


Figure 19.1.2/4 (sheet 3 of 3): Process Update_GPRS_Location_GLR

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

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

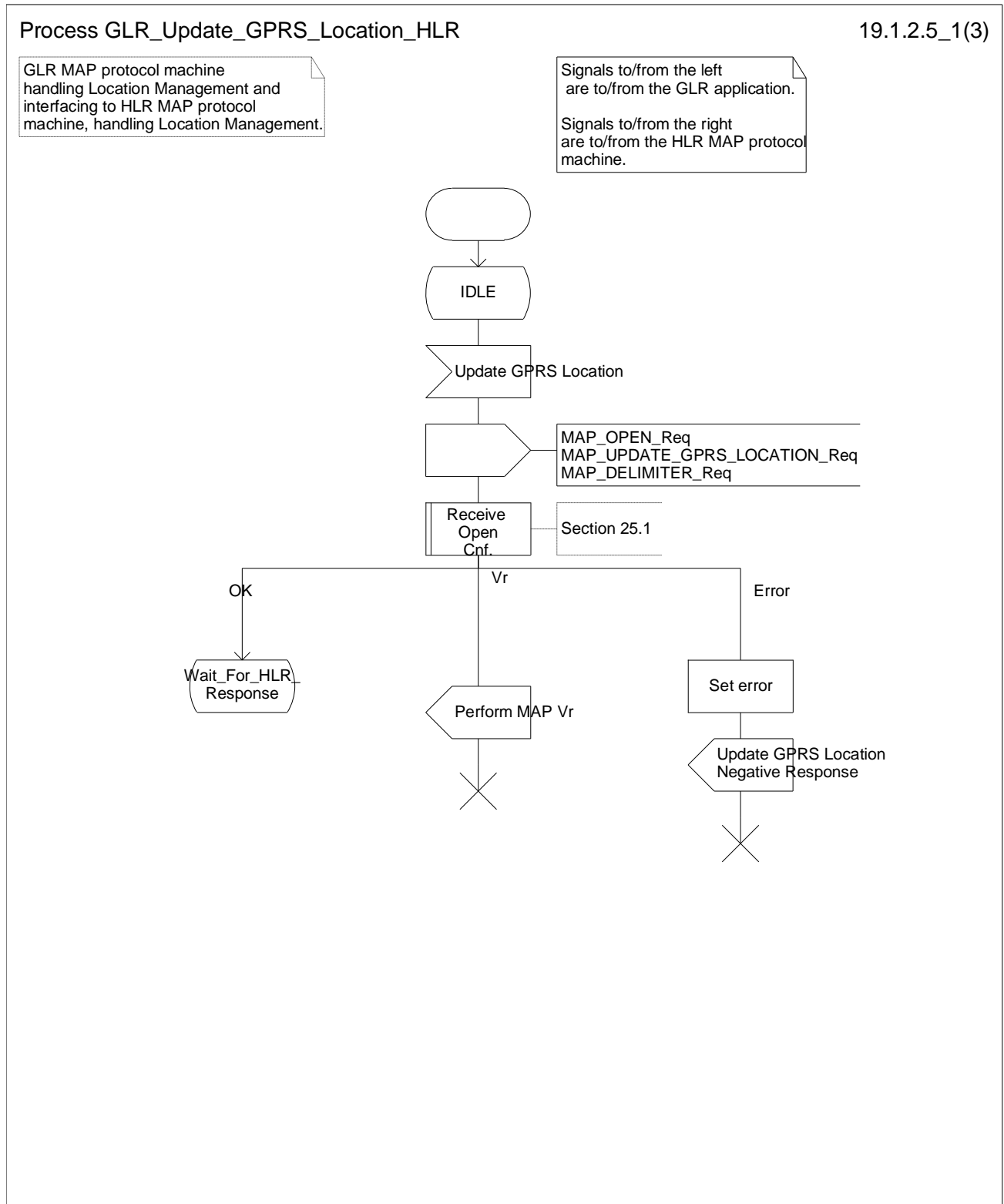


Figure 19.1.2/5 (Sheet 1 of 3): Process GLR_Update_GPRS_Location_HLR

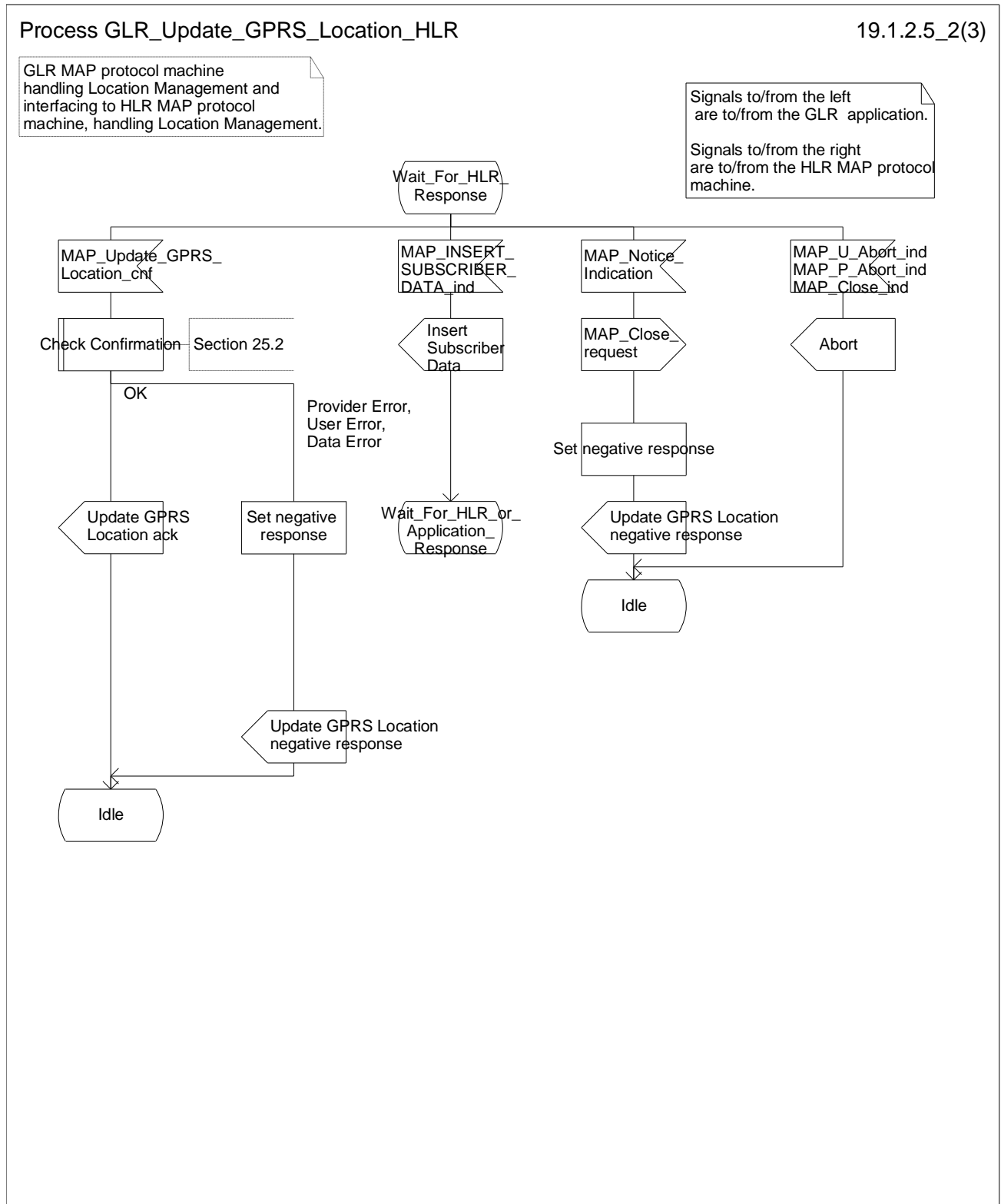
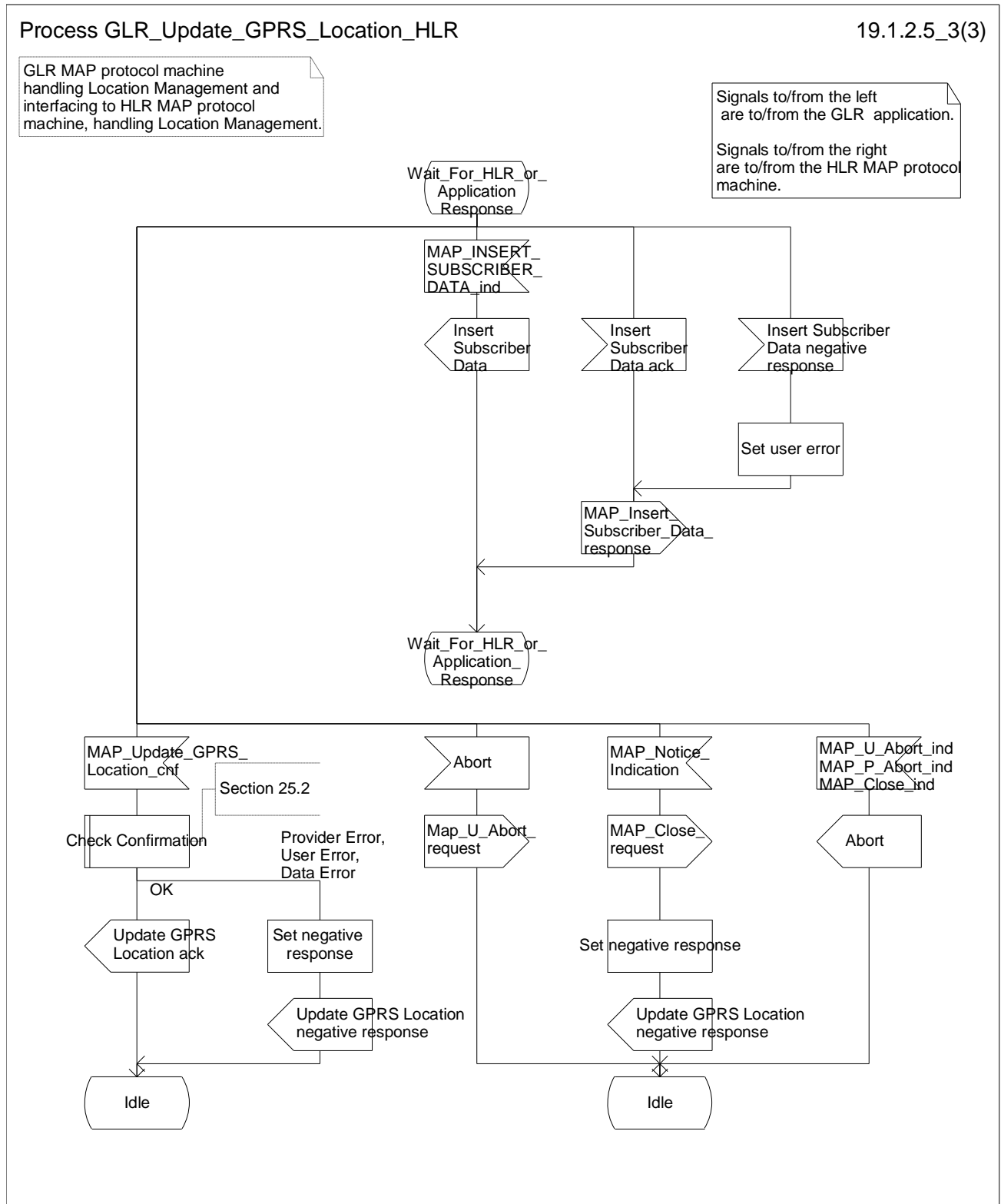


Figure 19.1.2/5 (Sheet 2 of 3): Process GLR_Update_GPRS_Location_HLR



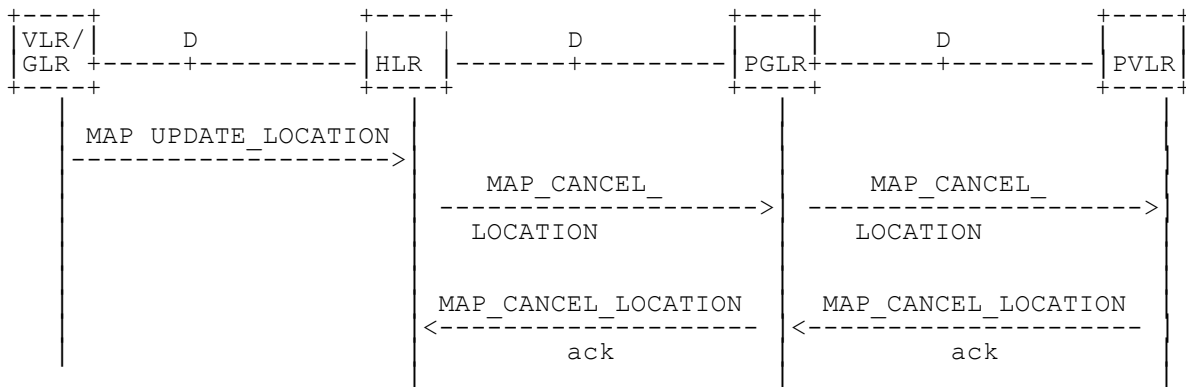
19.1.2 Location Cancellation

19.1.2.1 General

The purpose of this process is to delete a subscriber's record from a previous 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.

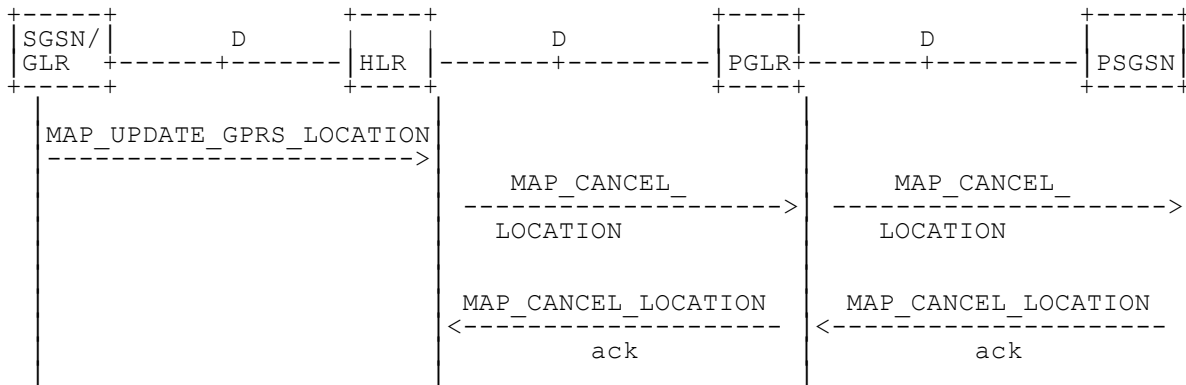
In all cases, the process is performed independently of the invoking process (e.g. Location Updating).

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.



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



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.

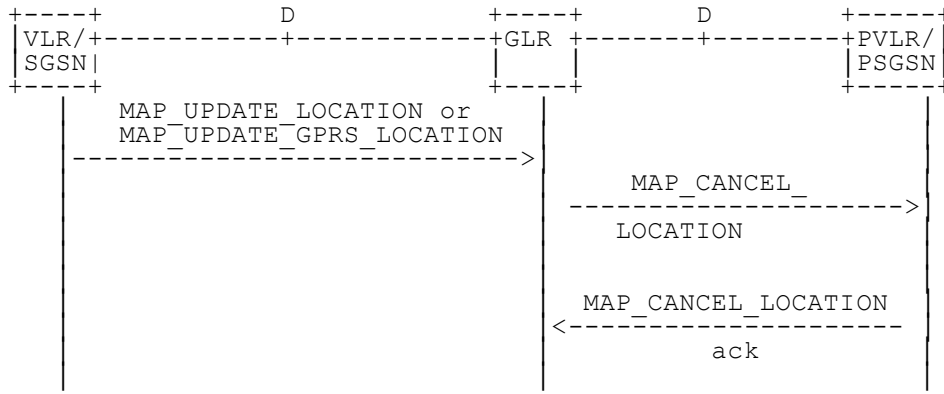


Figure 19.1.3/4: Interface and services for Location Cancellation in case that the GLR stores the subscriber's record

19.1.2.2 Detailed procedure in the GLR

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

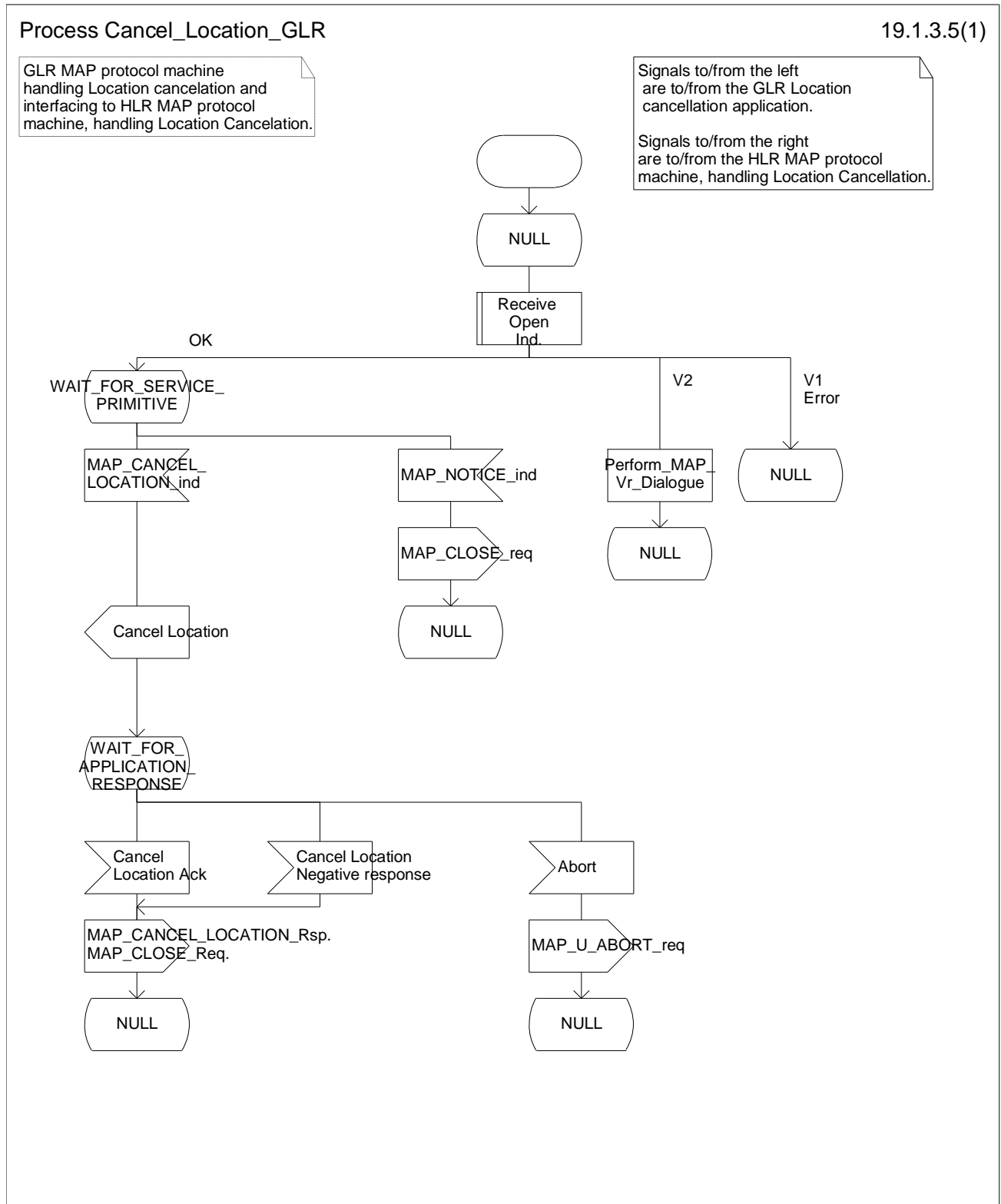


Figure 19.1.3/5: Process Cancel_Location_GLR

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

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

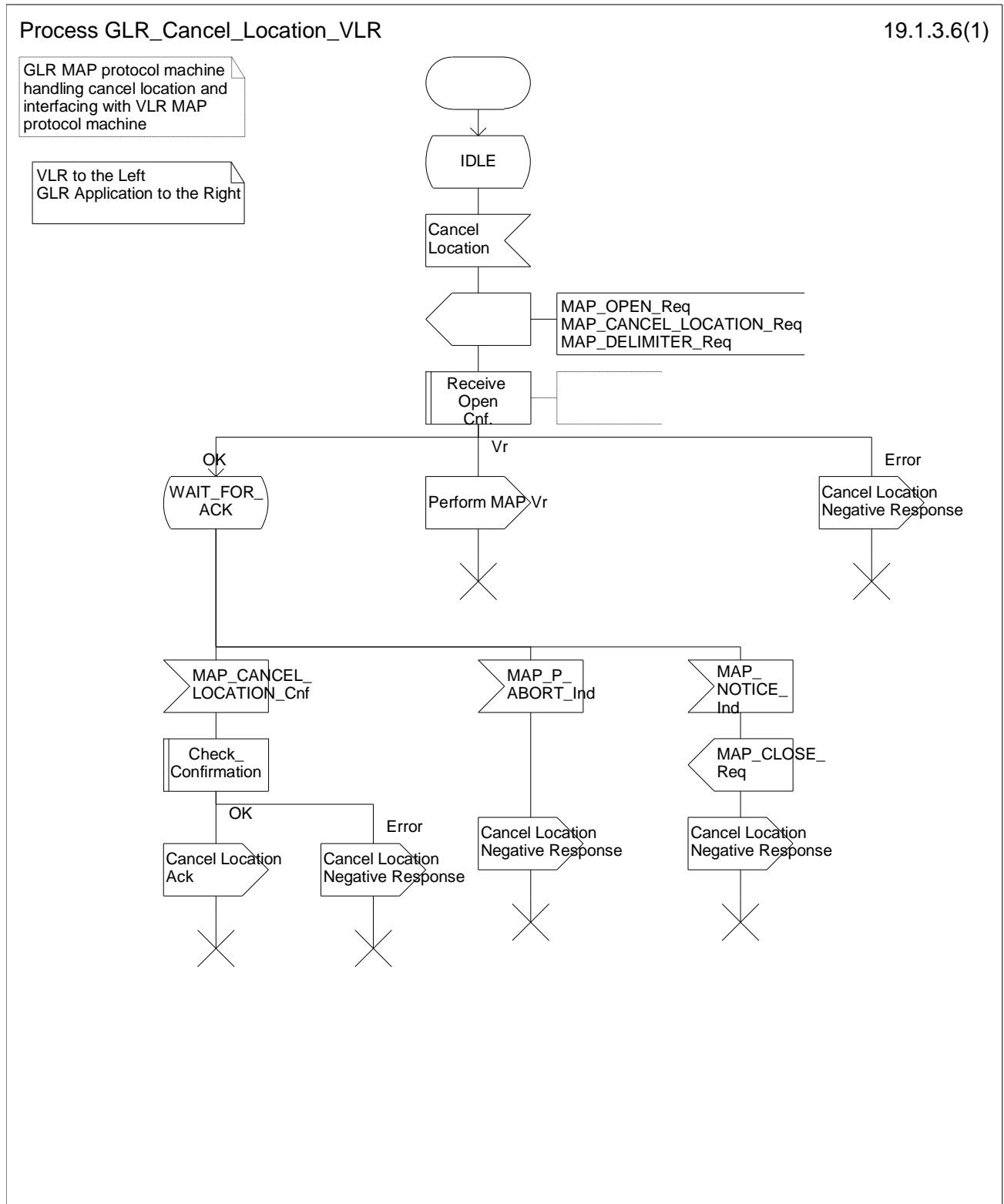


Figure 19.1.3/6: Process GLR_Cancel_Location_VLR

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

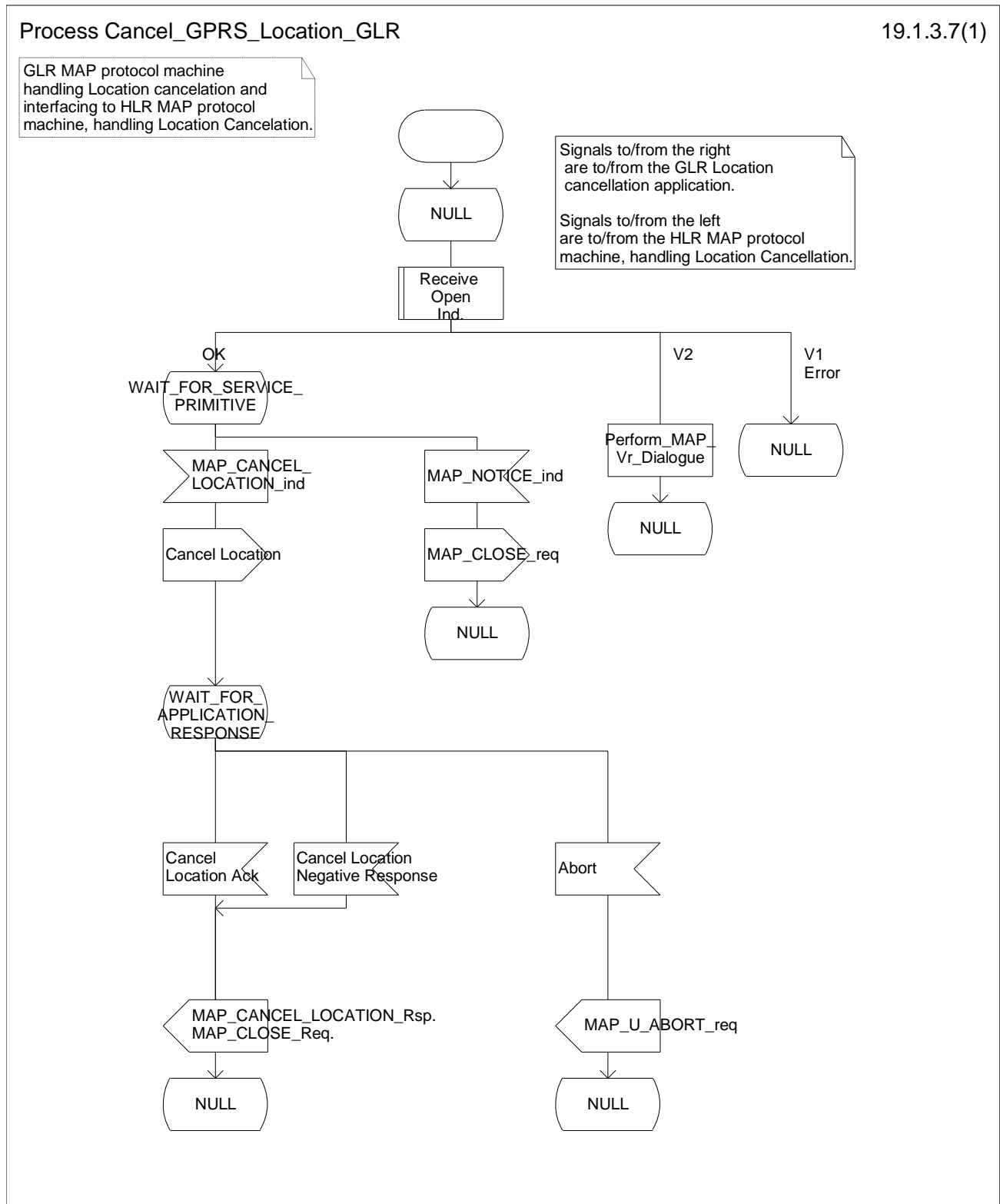


Figure 19.1.3/7: Process Cancel_GPRS_Location_GLR

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

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

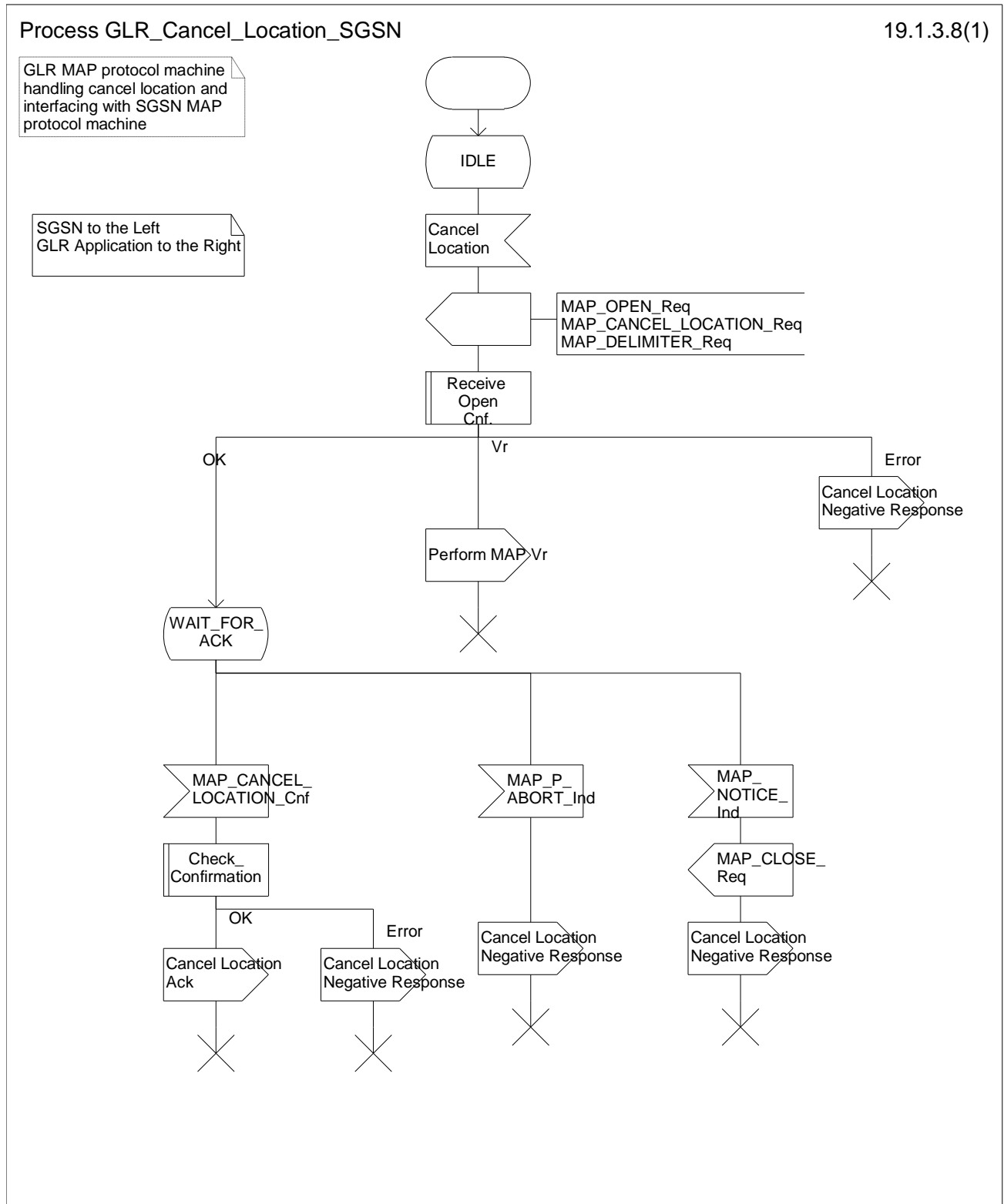


Figure 19.1.3/8: Process GLR_Cancel_Location_SGSN

19.1.3 Purge MS

19.1.3.1 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.

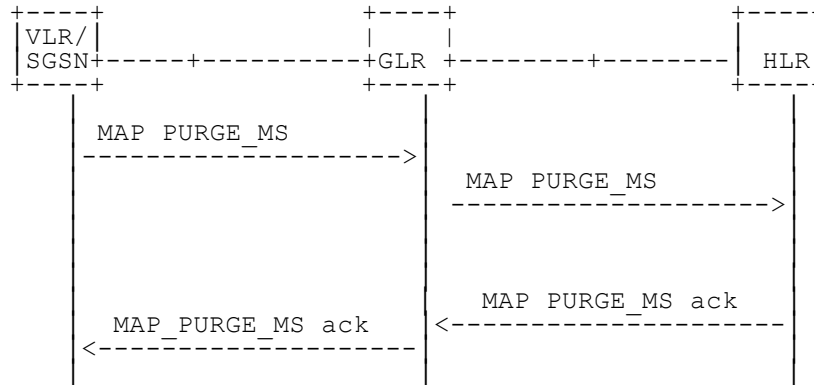


Figure 19.1.4/1: Interface and services for Purge MS

19.1.3.2 Detailed procedure in GLR

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

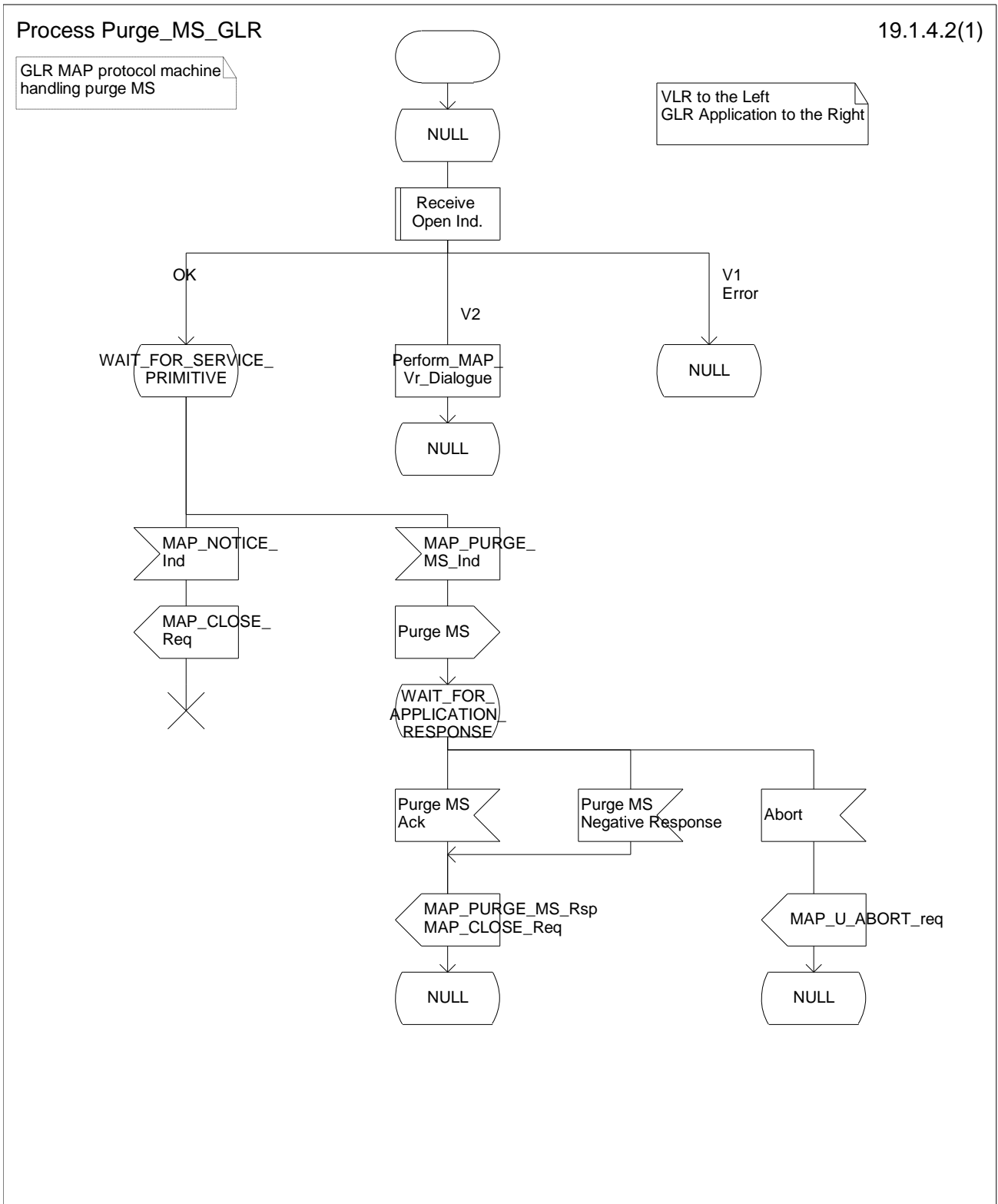


Figure 19.1.4/2: Process Purge_MS_GLR

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

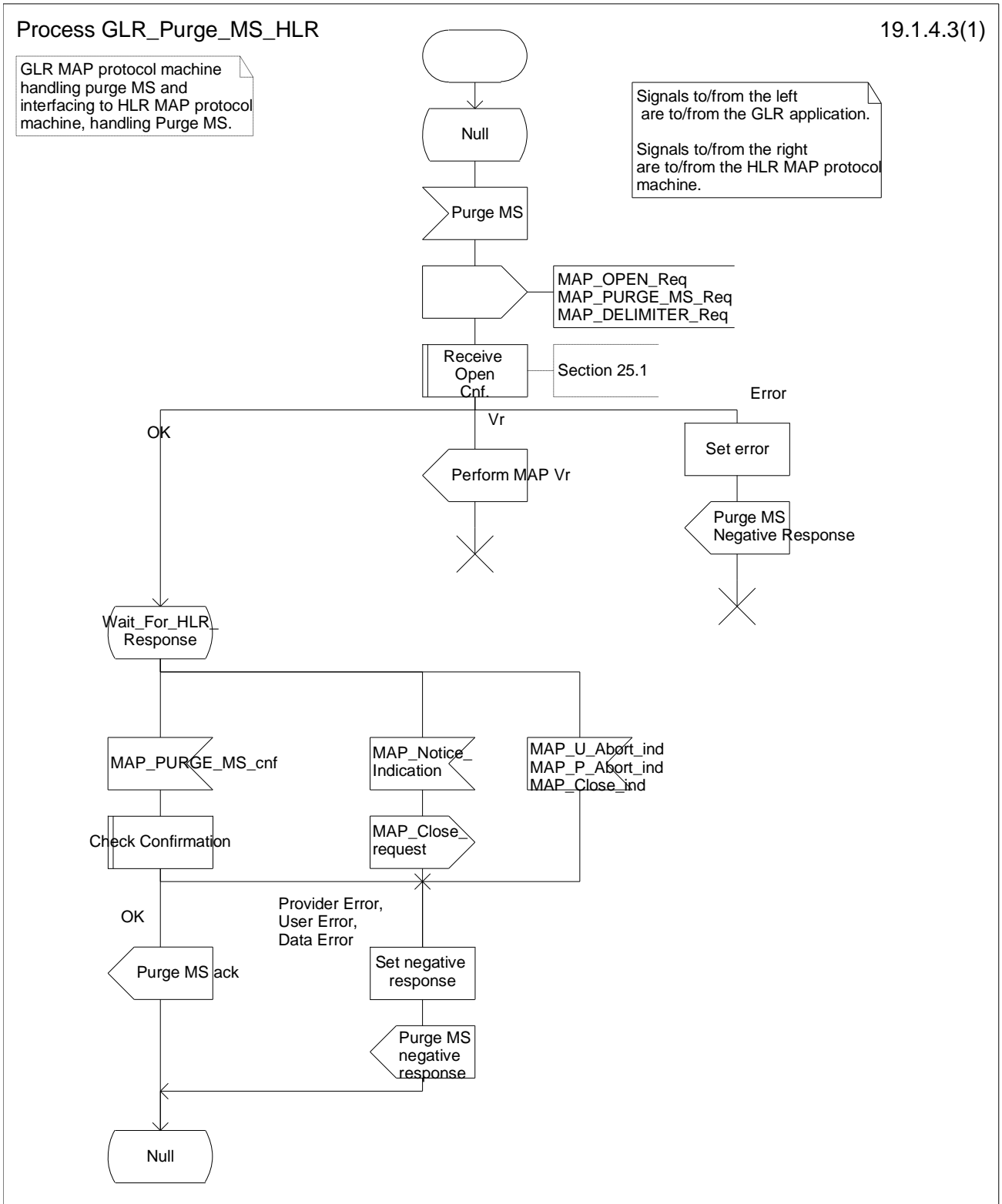


Figure 19.1.4/3: Process GLR_PURGE_MS_HLR

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

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

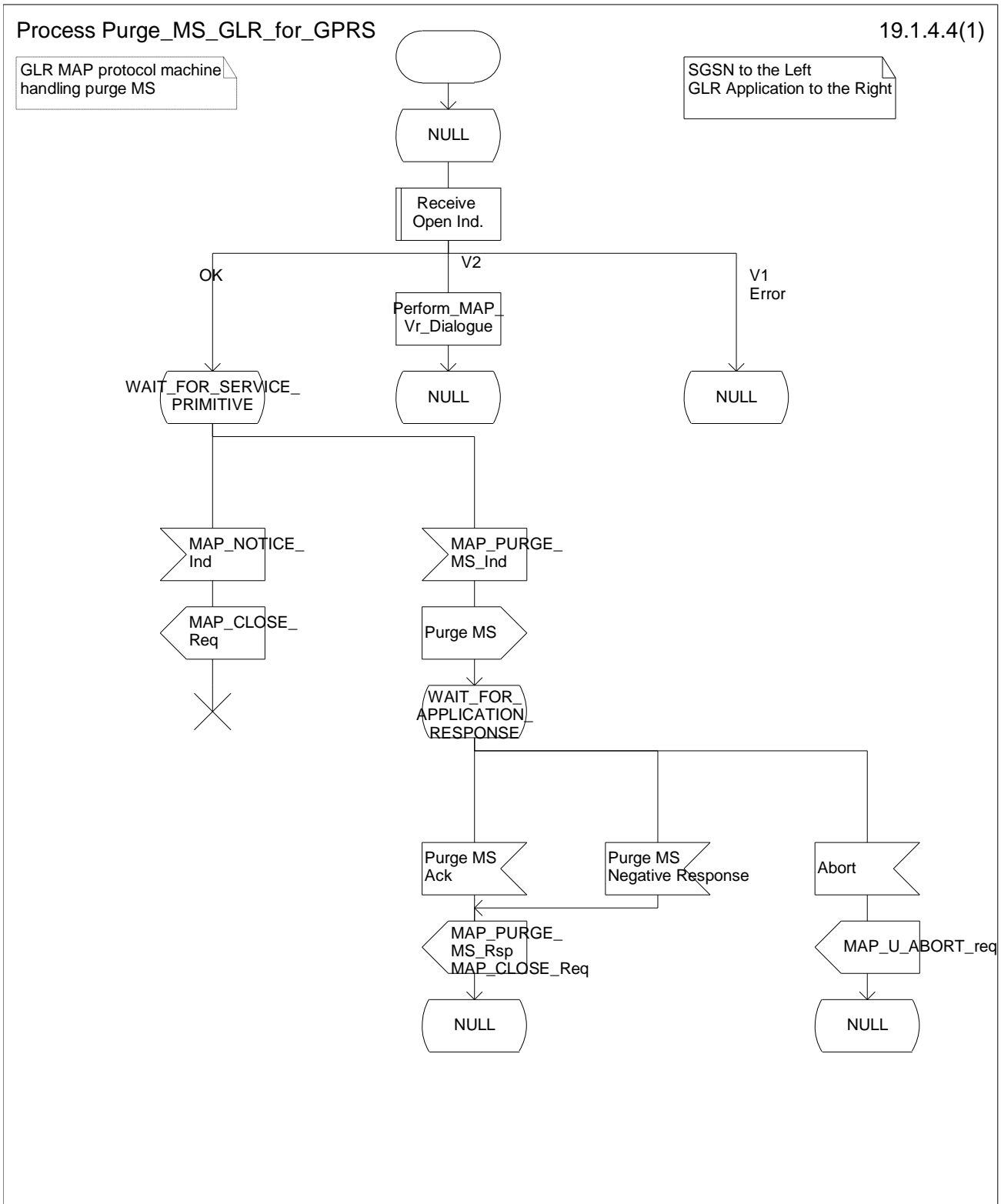


Figure 19.1.4/4: Process Purge_MS_GLR_for_GPRS

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

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

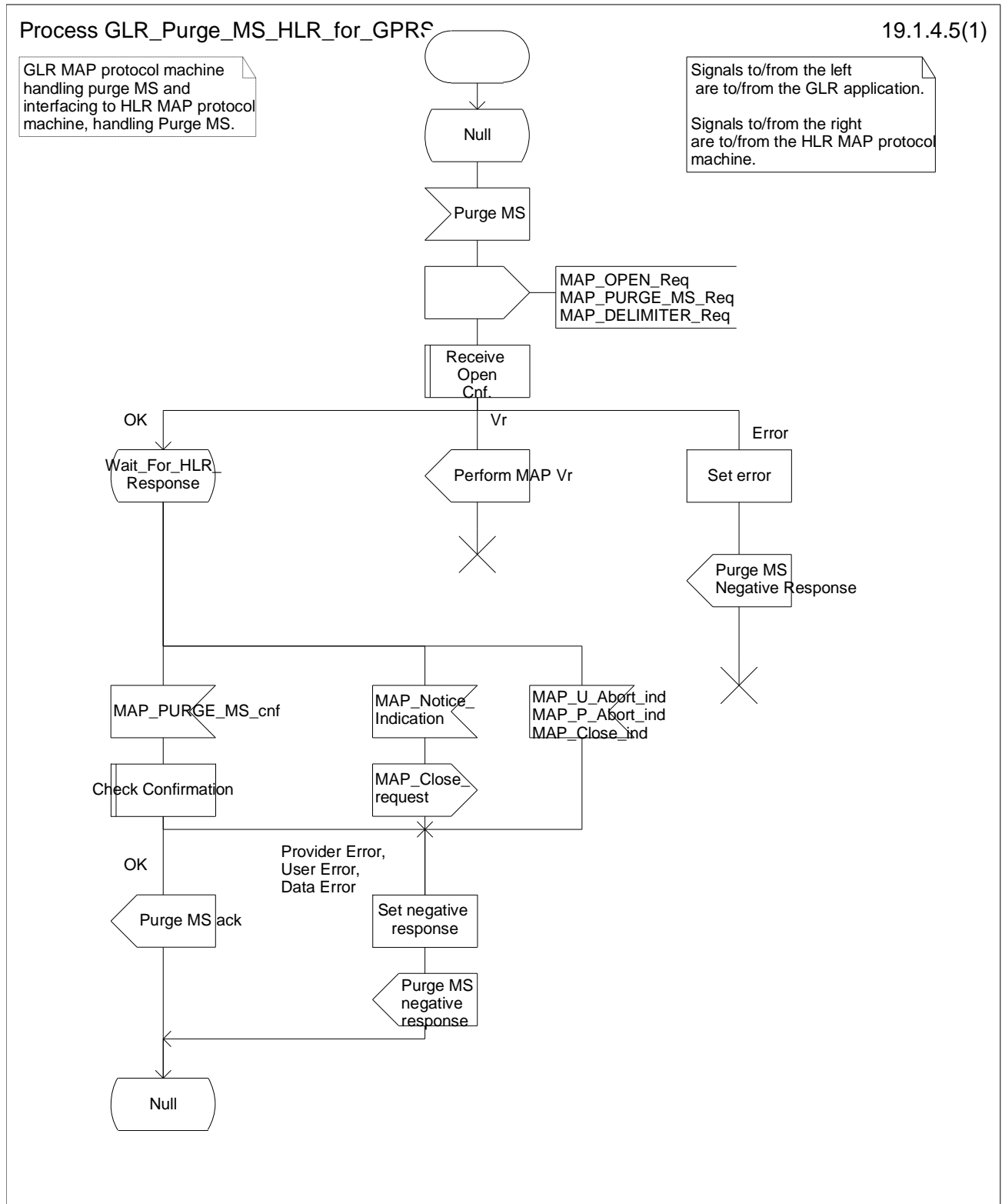


Figure 19.1.4/5: Process GLR_Purge_MS_HLR_for_GPRS

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 affected 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 protocol machine handling reset message from HLR.

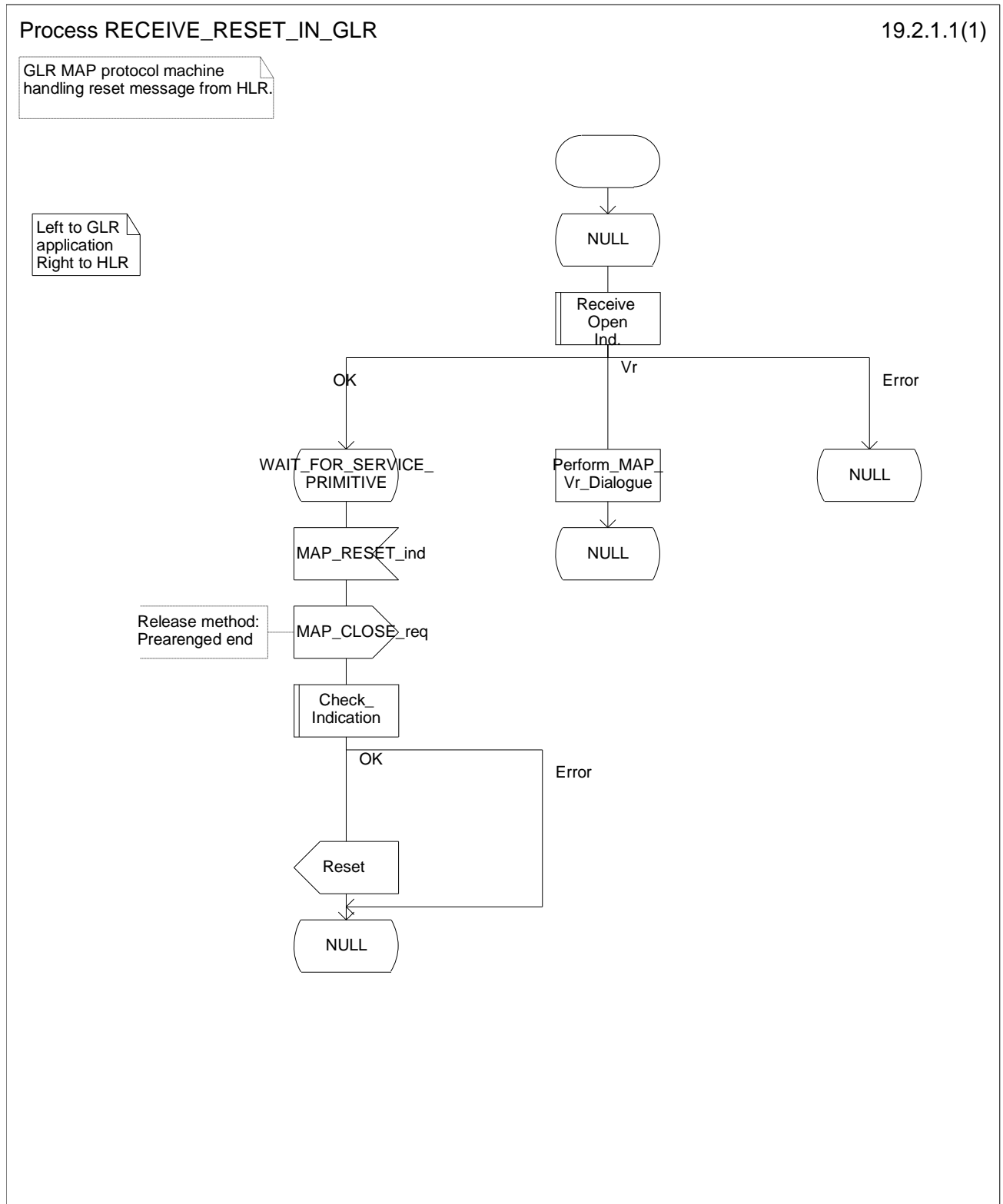


Figure 19.2.1/1: Process RECEIVE_RESET_IN_GLR

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

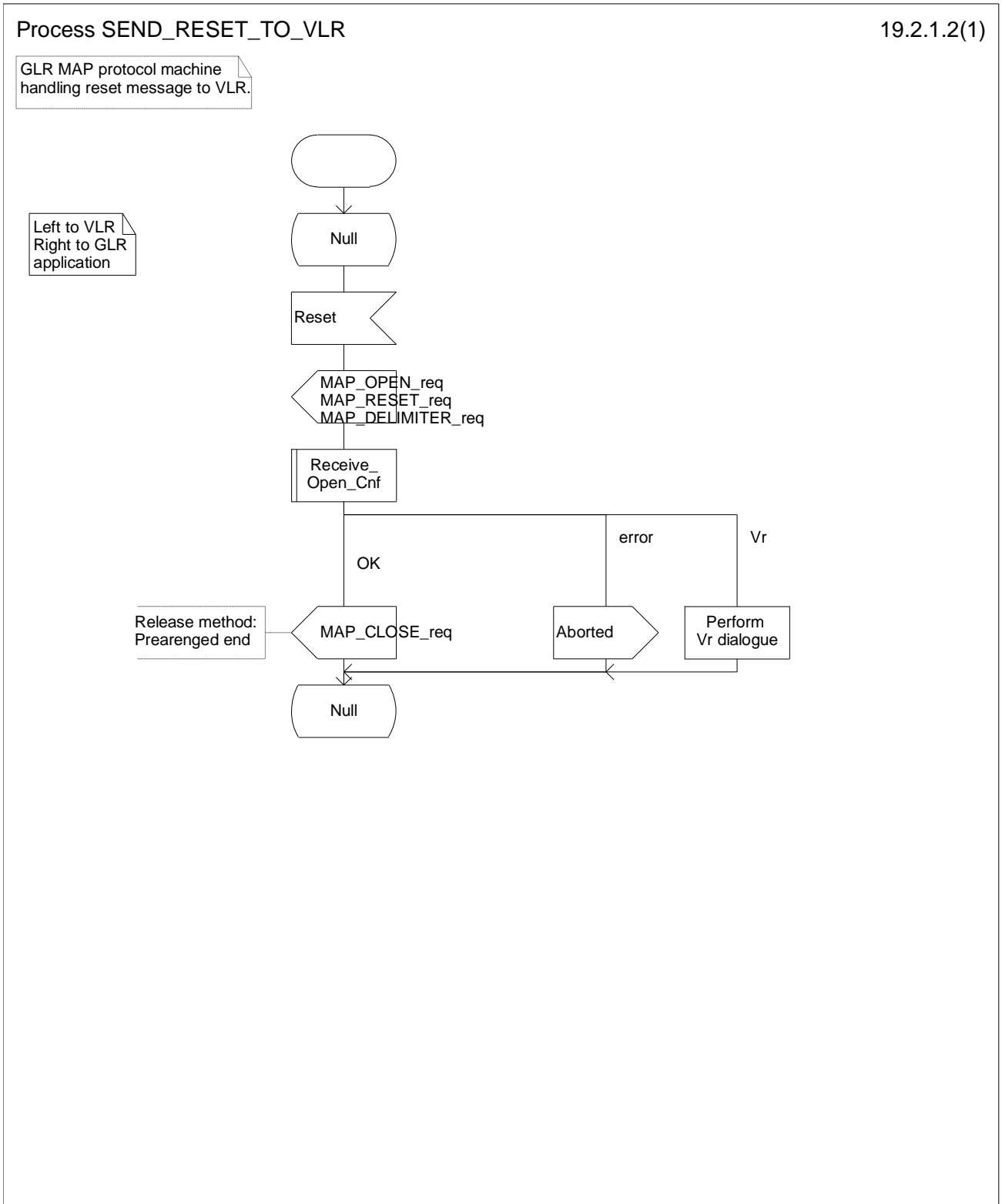


Figure 19.2.1/2: Process SEND_RESET_TO_VLR

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

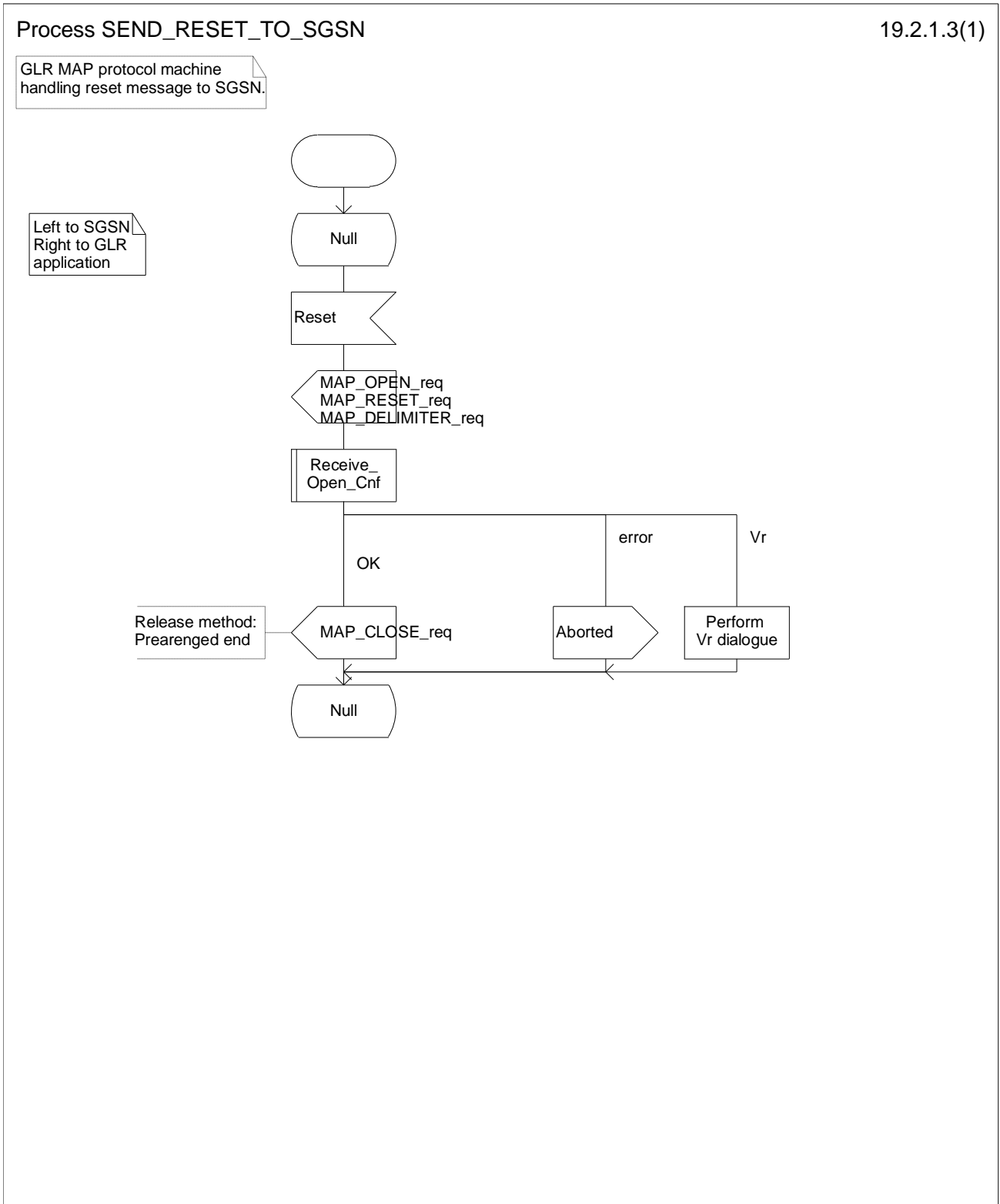


Figure 19.2.1/3: Process SEND_RESET_TO_SGSN

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 necessary.

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 protocol machine handling VLR restoration and is a responder to the VLR.

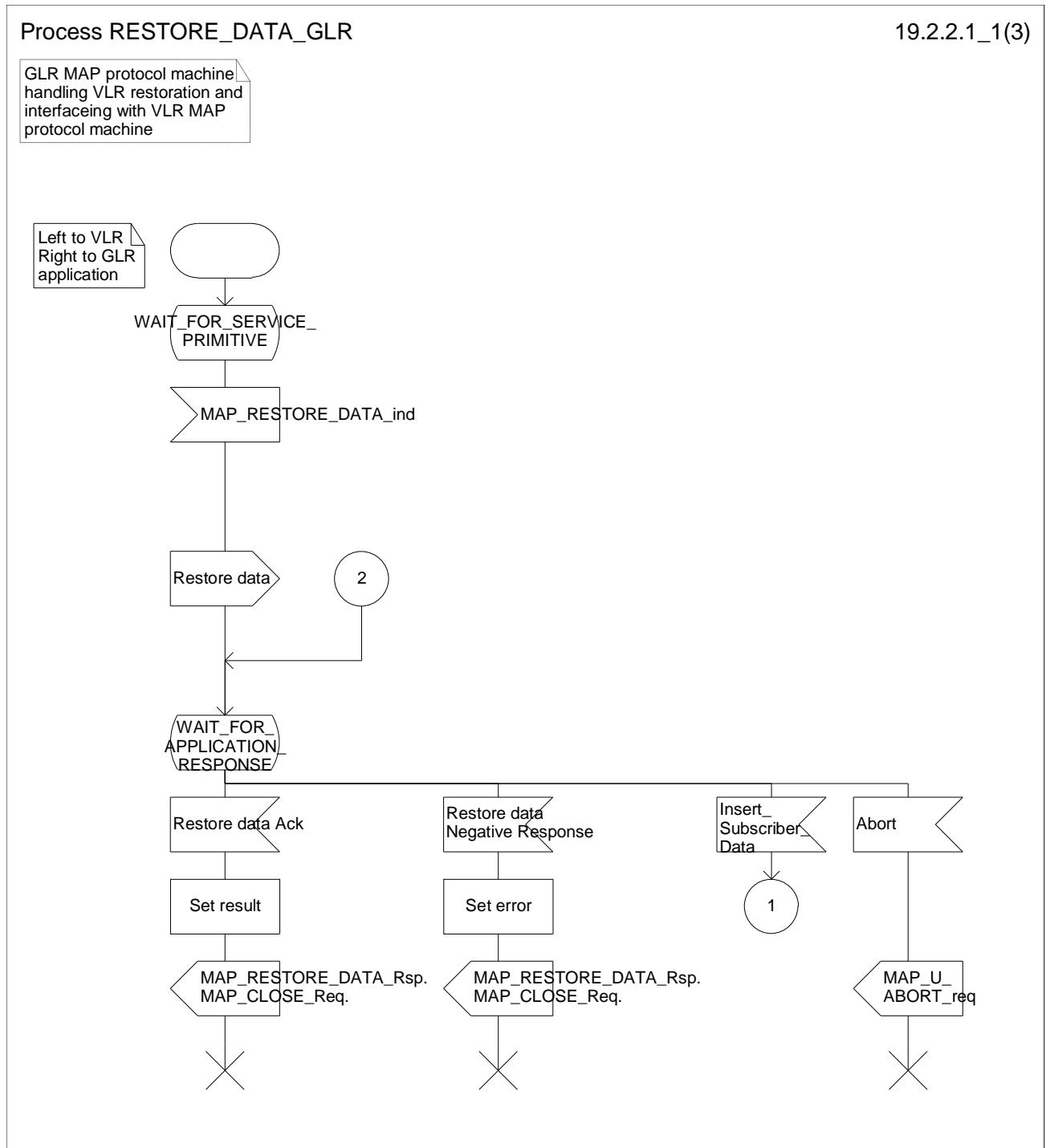


Figure 19.2.2/1 (Sheet 1 of 3): Process RESTORE_DATA_GLR

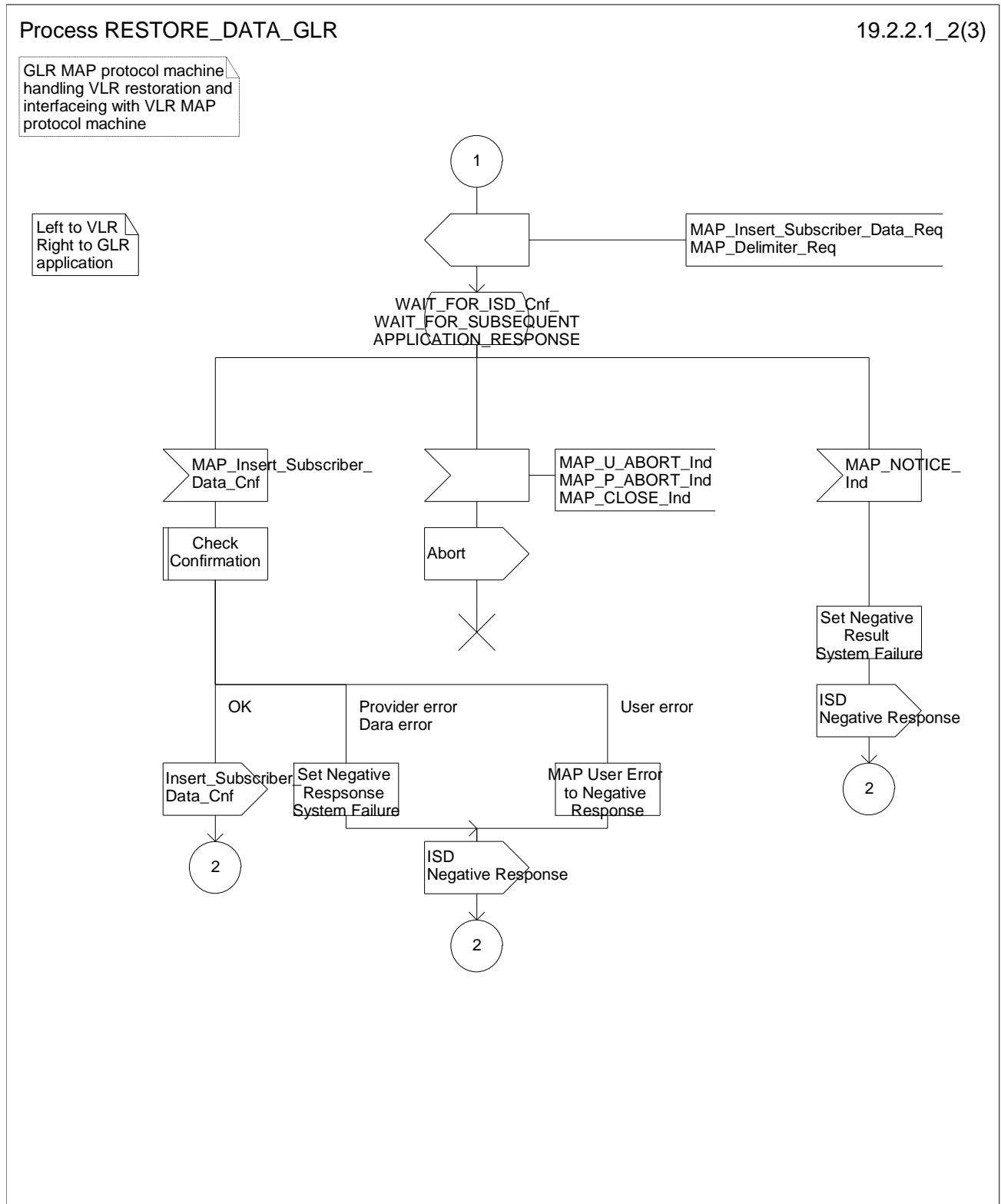


Figure 19.2.2/1 (Sheet 2 of 3): Process RESTORE_DATA_GLR

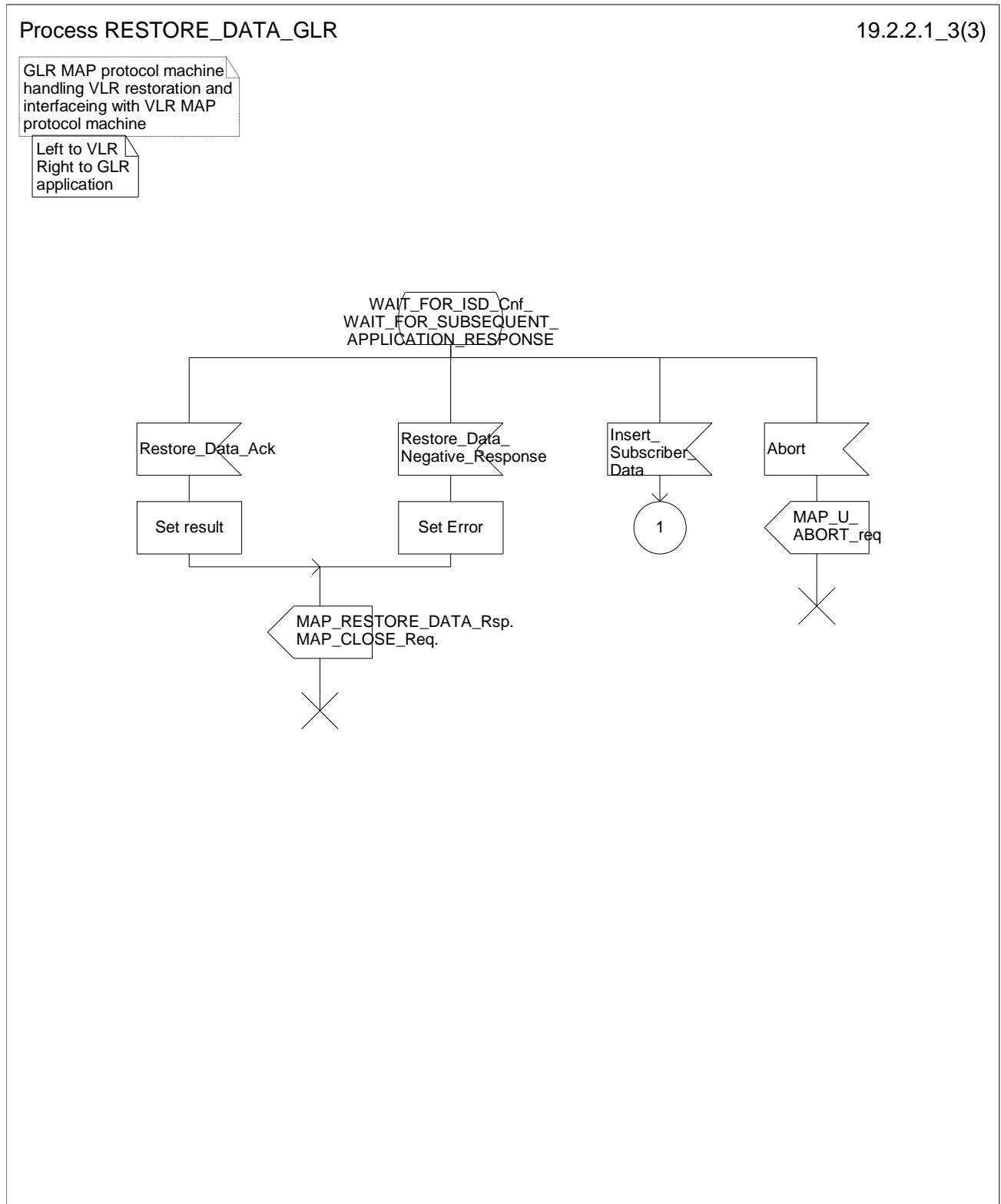


Figure 19.2.2/1 (Sheet 3 of 3): Process RESTORE_DATA_GLR

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

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

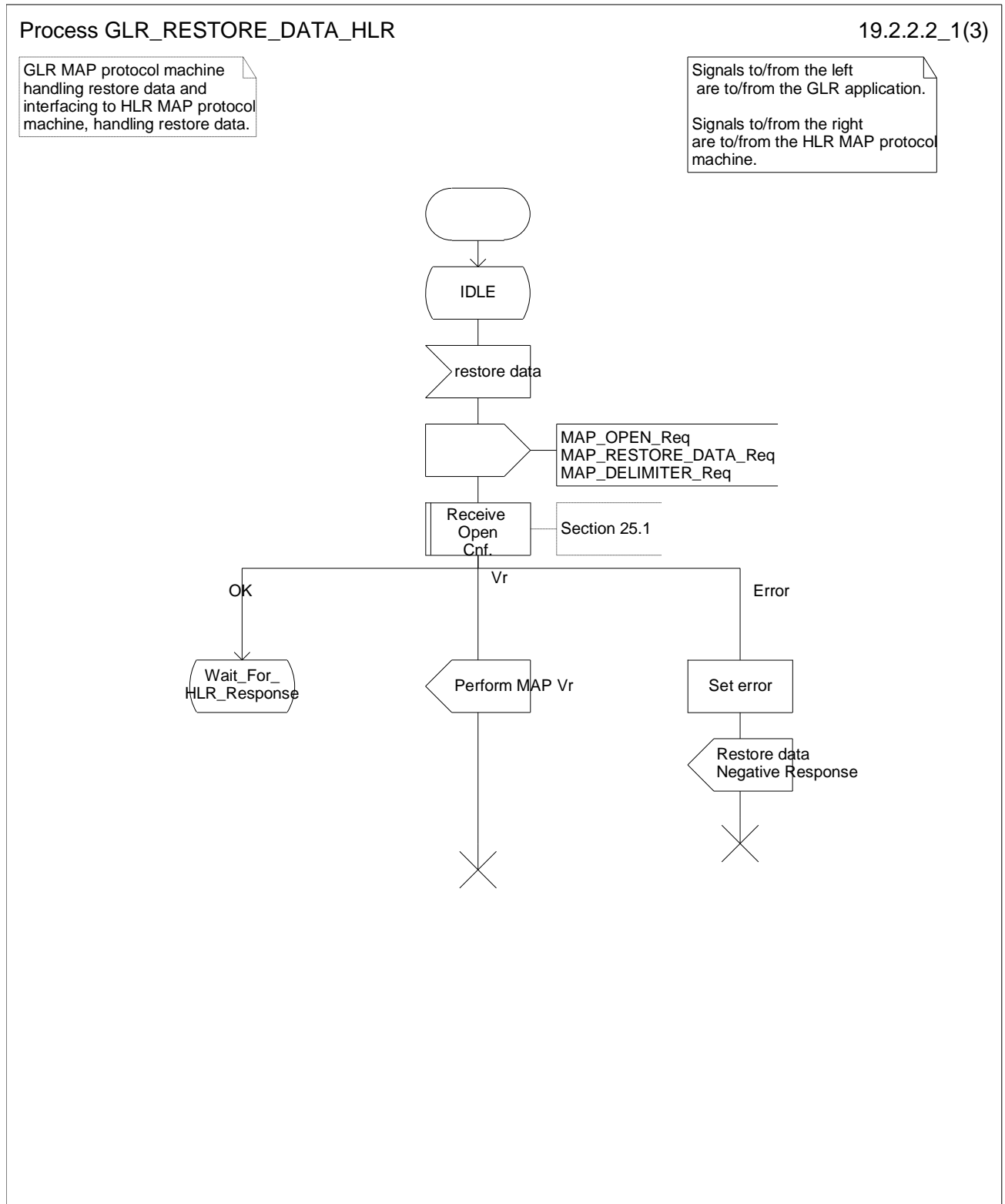


Figure 19.2.2/2 (Sheet 1 of 3): Process GLR_RESTORE_DATA_HLR

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.

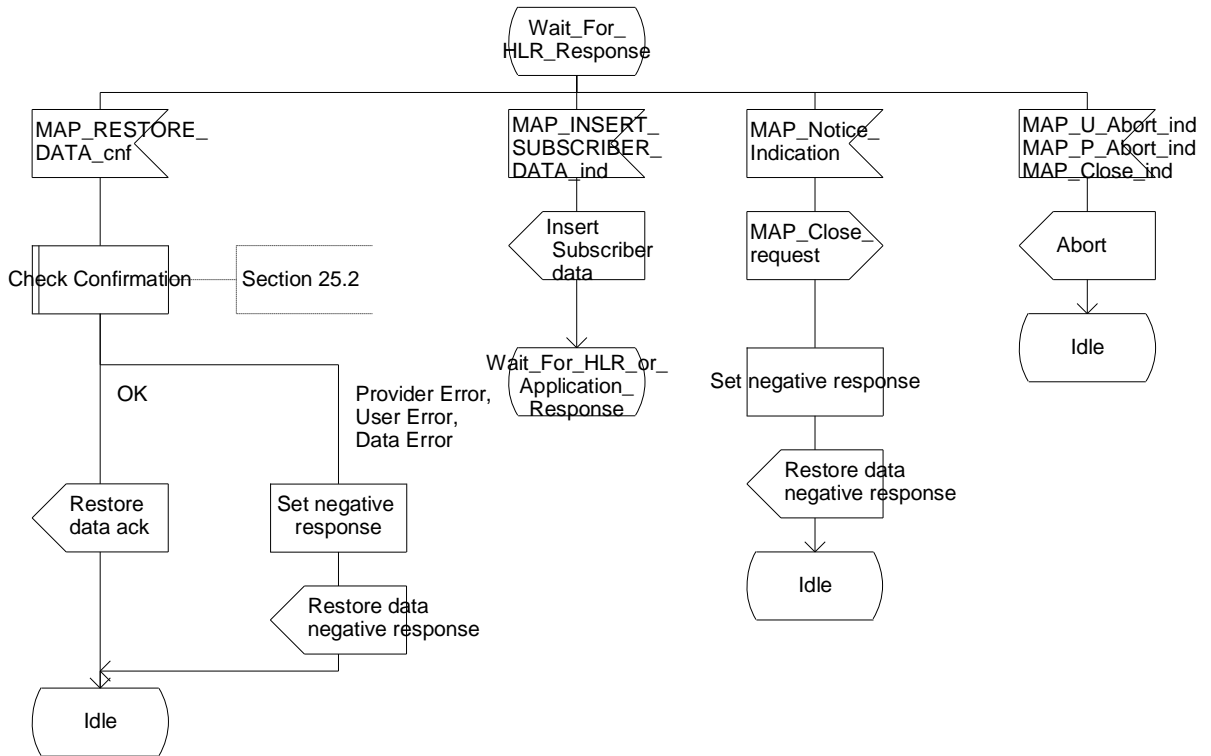


Figure 19.2.2/2 (Sheet 2 of 3): Process GLR_RESTORE_DATA_HLR

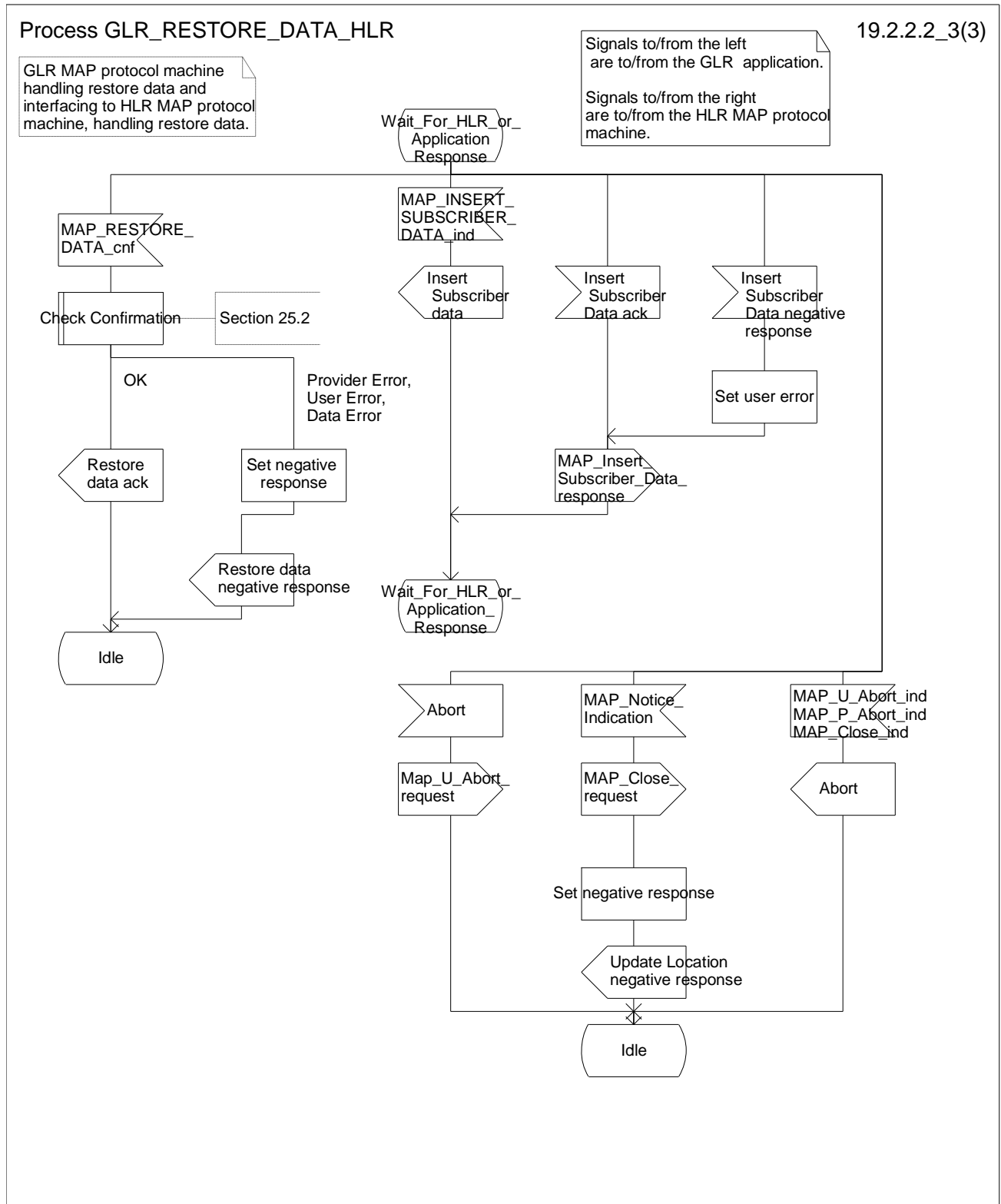


Figure 19.2/2 (Sheet 3 of 3): Process GLR_RESTORE_DATA_HLR

20 Operations and maintenance procedures

20.1 General

The Operations 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 3GPP 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).

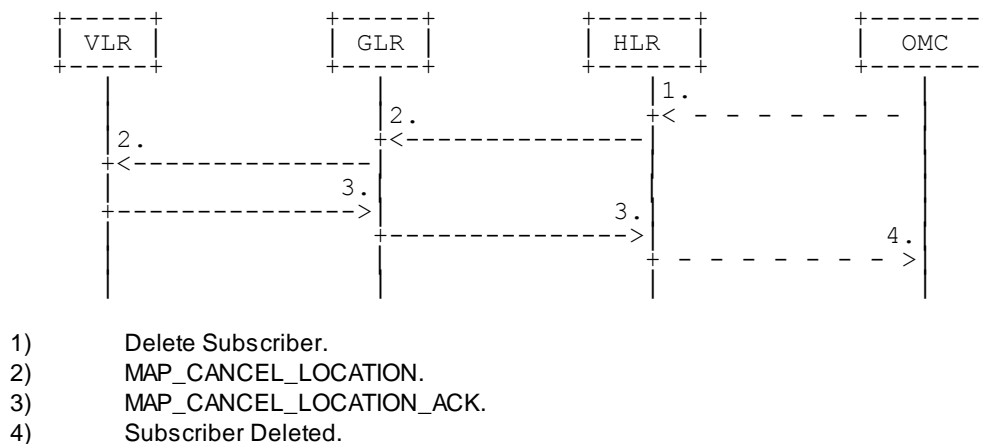
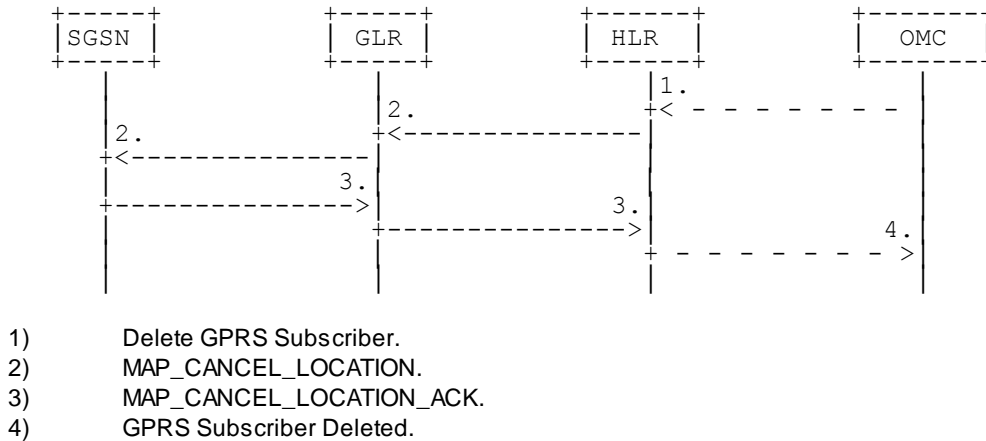


Figure 20.2.1/1: Subscriber deletion procedure

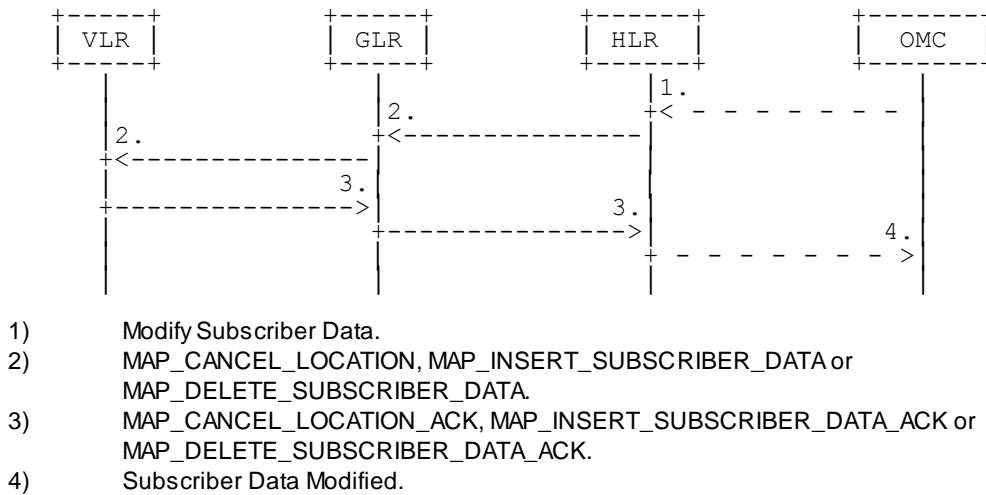
In the subscriber deletion procedure the subscriber data should be removed from the VLR and from the HLR. The HLR uses the MAP_CANCEL_LOCATION service.



- 1) Delete GPRS Subscriber.
- 2) MAP_CANCEL_LOCATION.
- 3) MAP_CANCEL_LOCATION_ACK.
- 4) GPRS Subscriber Deleted.

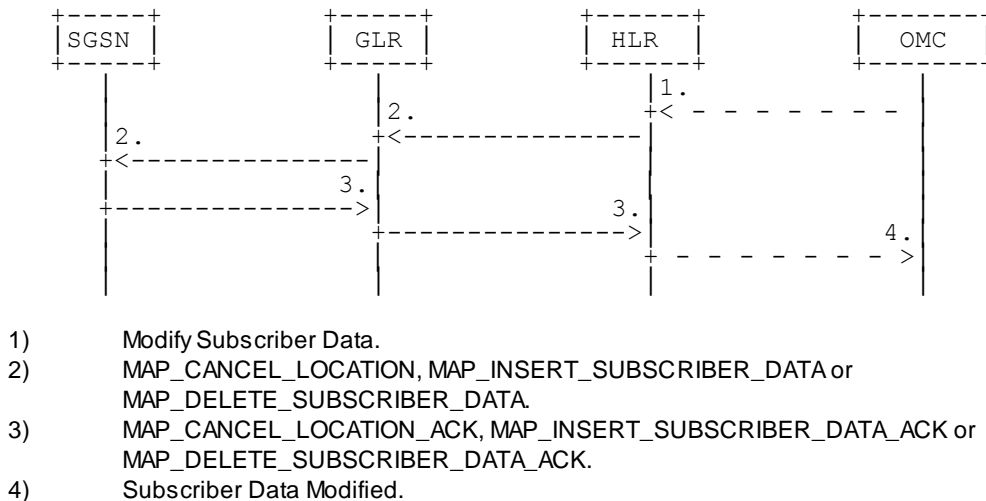
Figure 20.2.1/2: Subscriber deletion procedure for GPRS

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.



- 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



- 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.

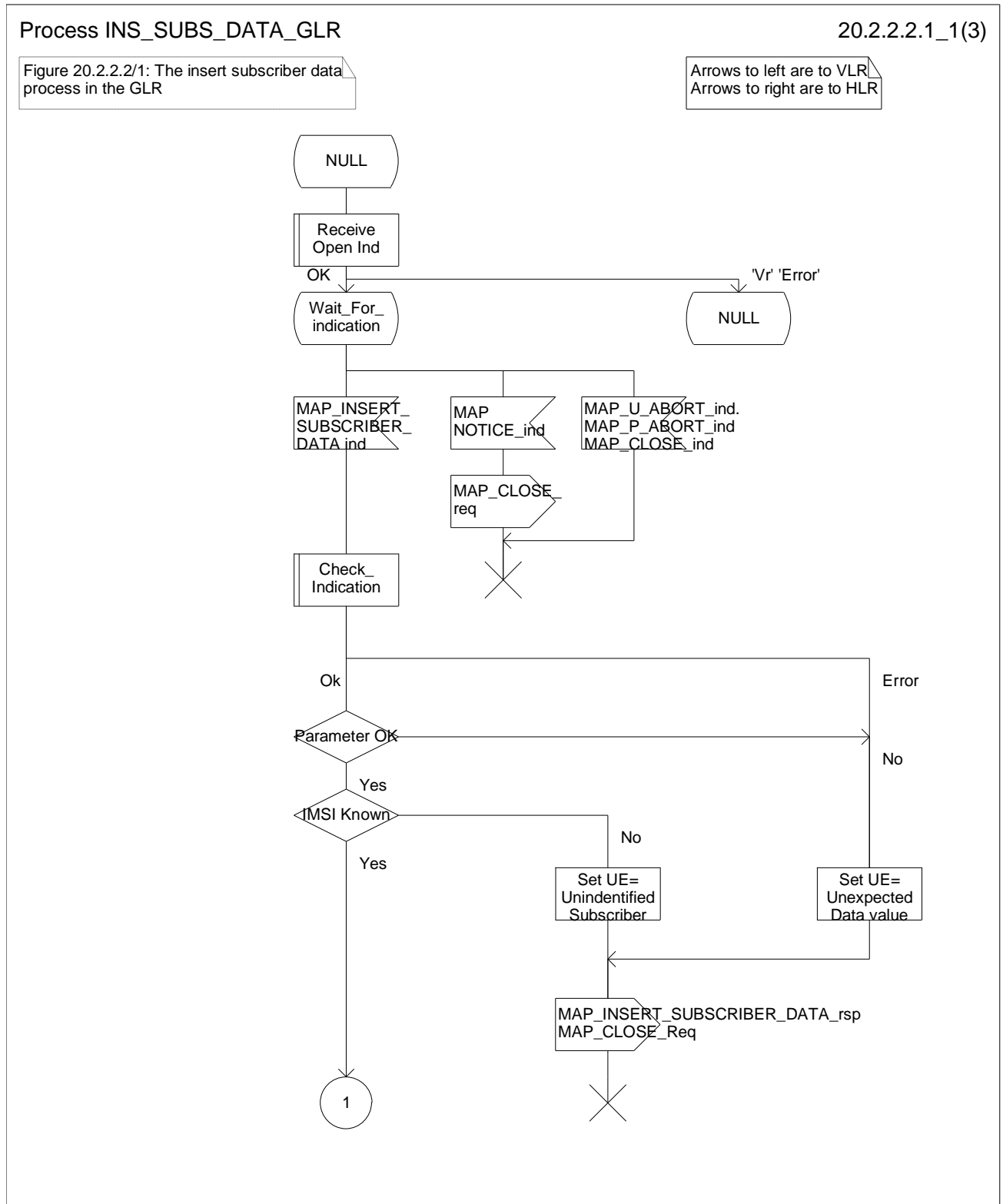


Figure 20.2.2.2/1 (Sheet 1 of 3): Process INS_SUBS_DATA_GLR

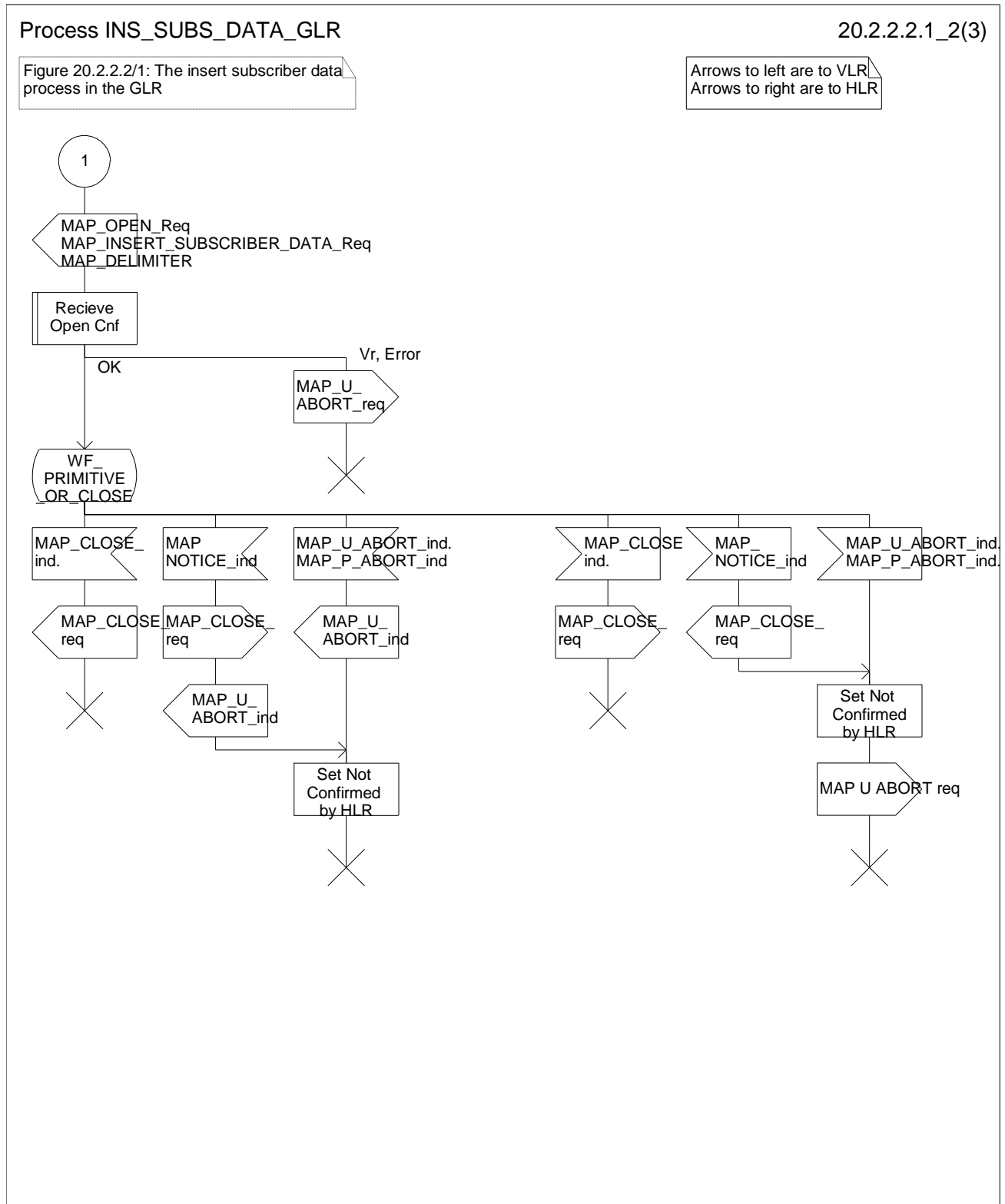


Figure 20.2.2.2/1 (Sheet 2 of 3): Process INS_SUBS_DATA_GLR

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

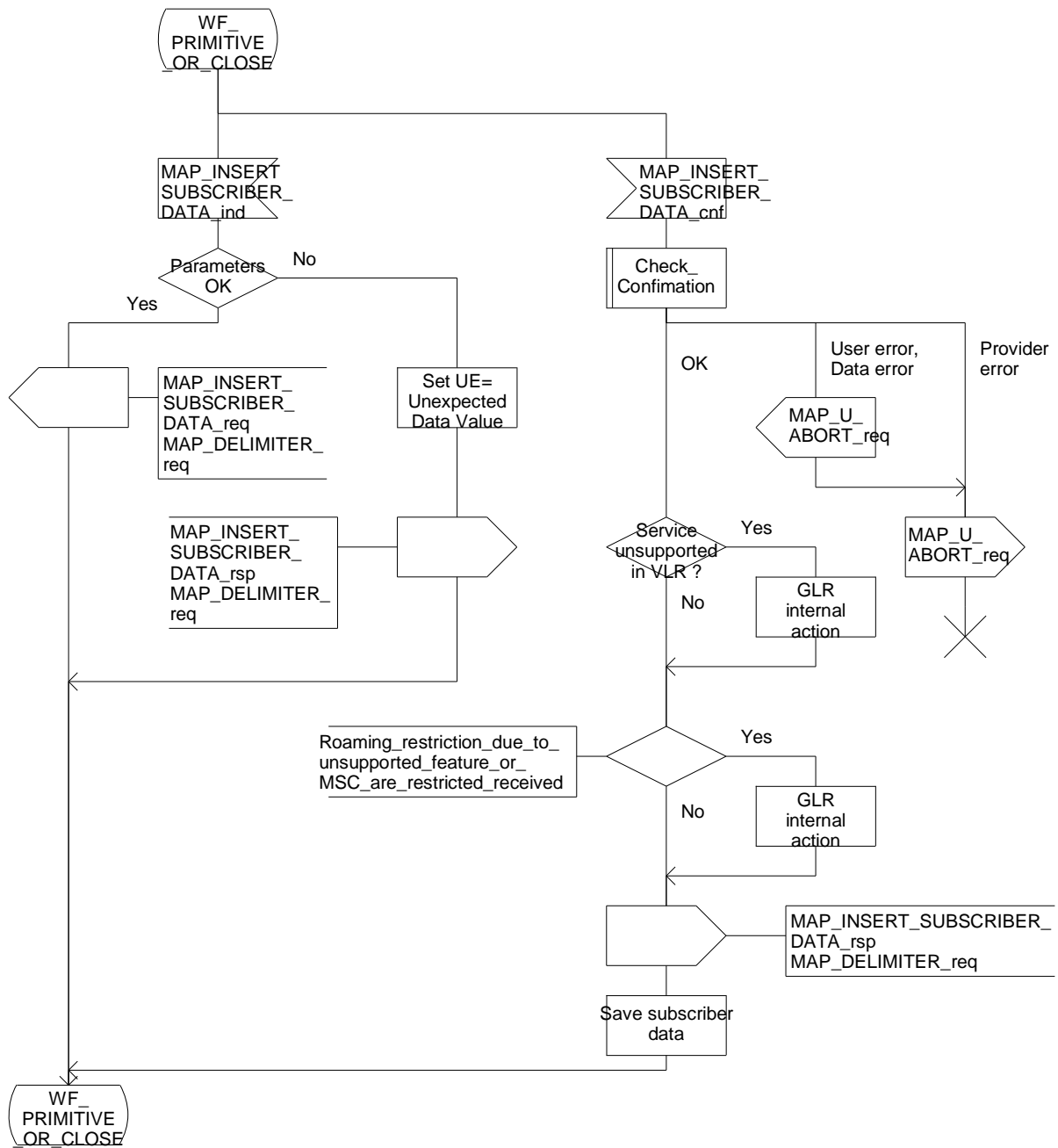


Figure 20.2.2.2/1 (Sheet 3 of 3): Process INS_SUBS_DATA_GLR

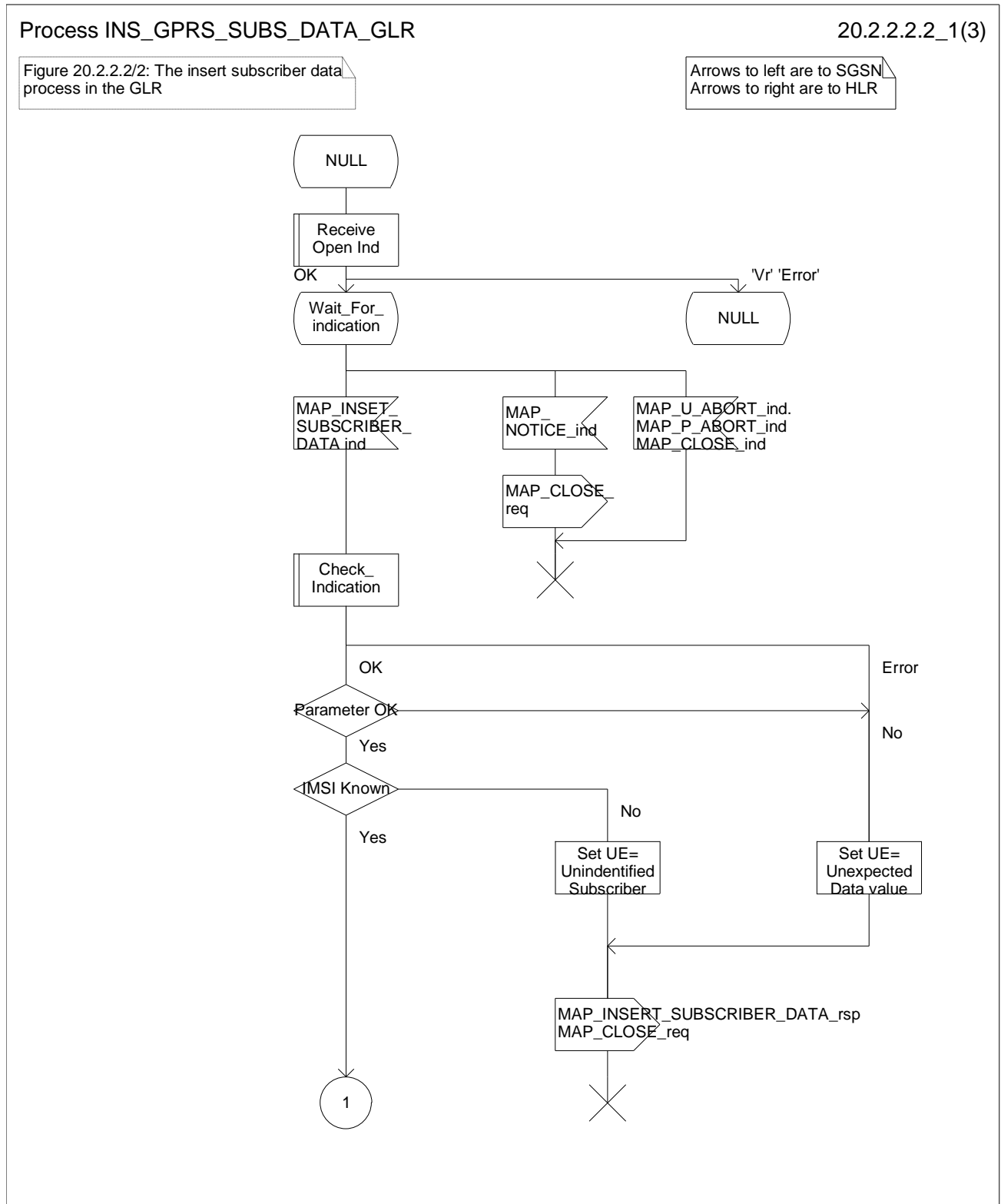


Figure 20.2.2.2/2 (Sheet 1 of 3): Process INS_GPRS_SUBS_DATA_GLR

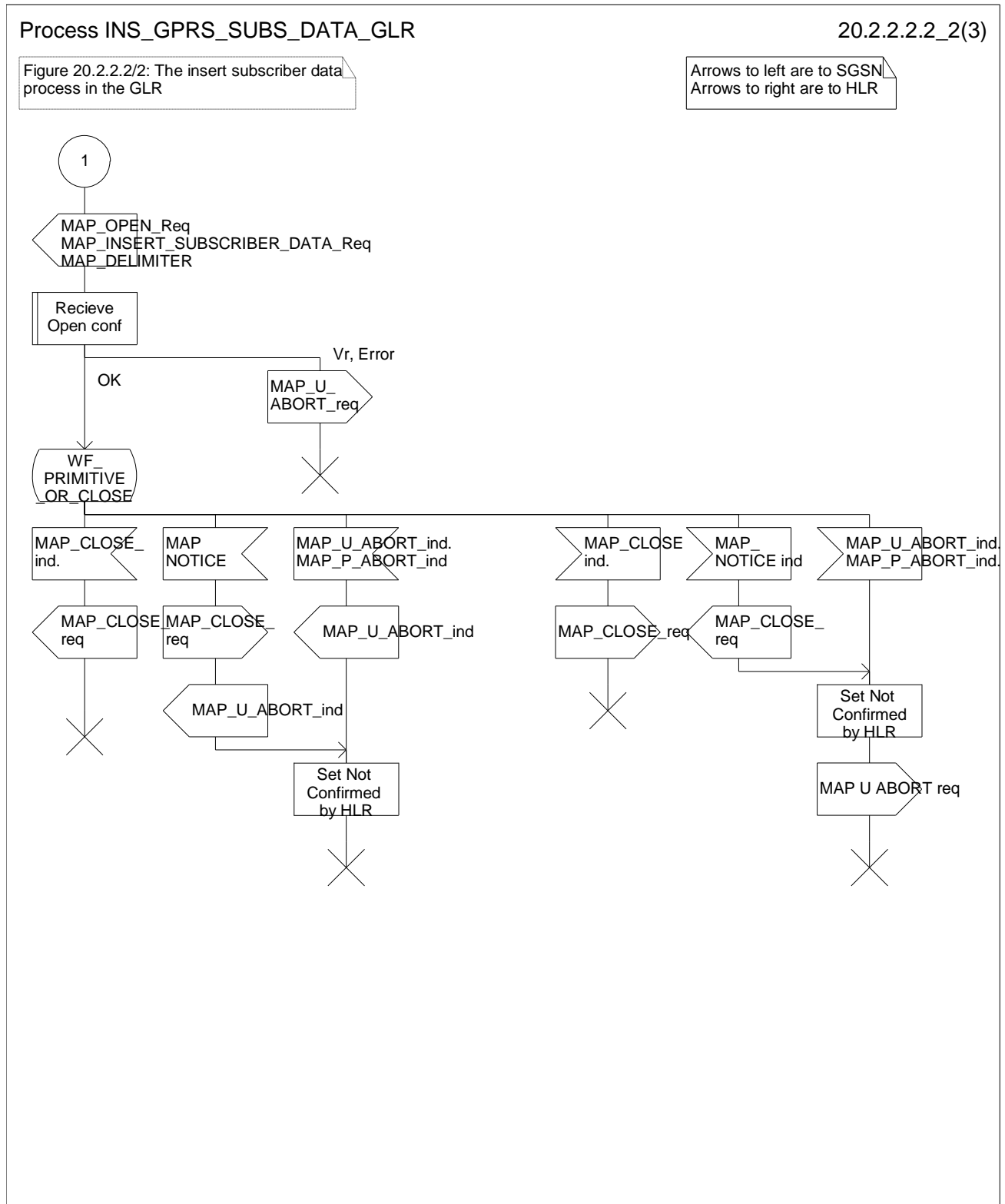


Figure 20.2.2.2/2 (Sheet 2 of 3): Process INS_GPRS_SUBS_DATA_GLR

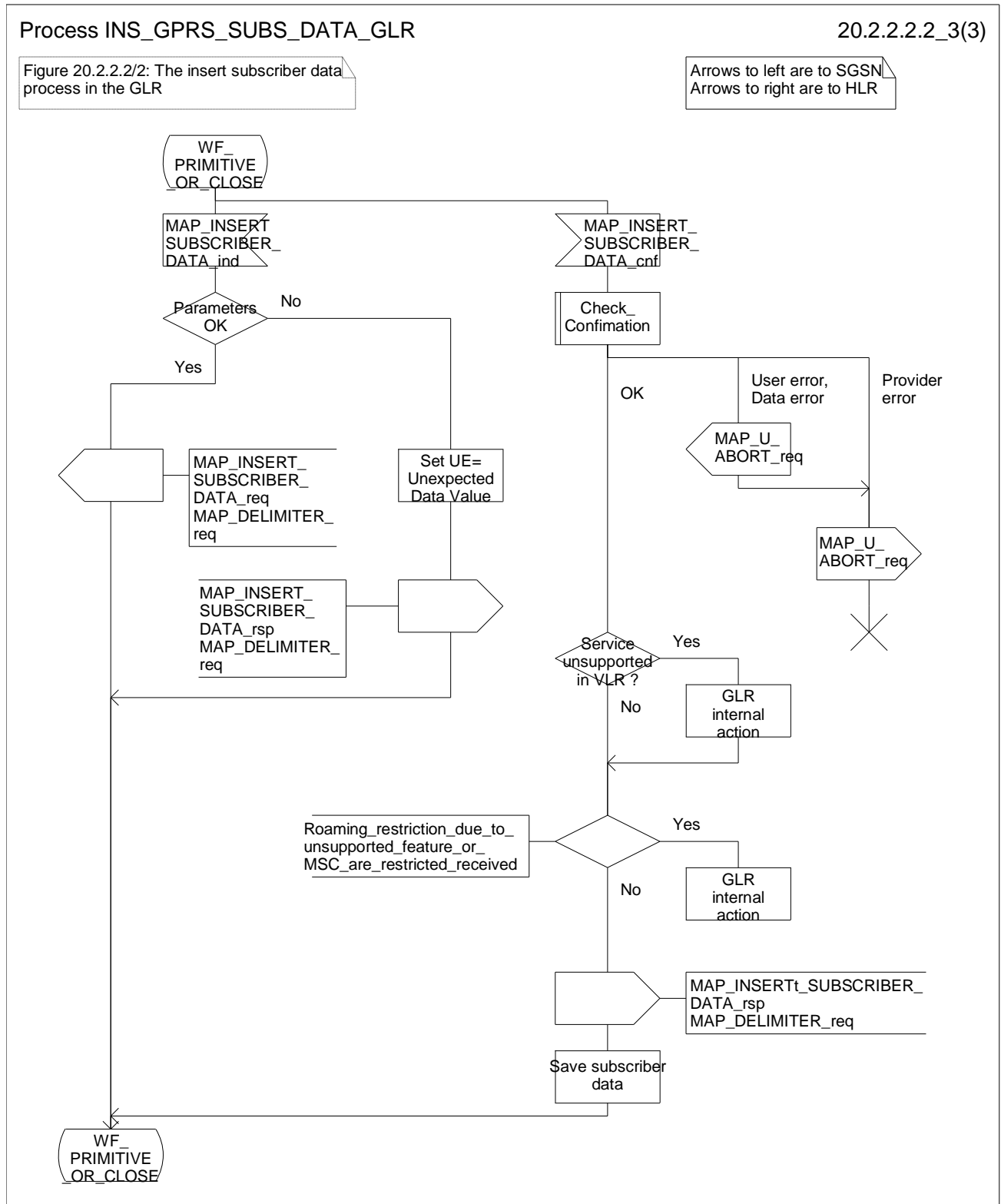


Figure 20.2.2.2/2 (Sheet 3 of 3): Process INS_GPRS_SUBS_DATA_GLR

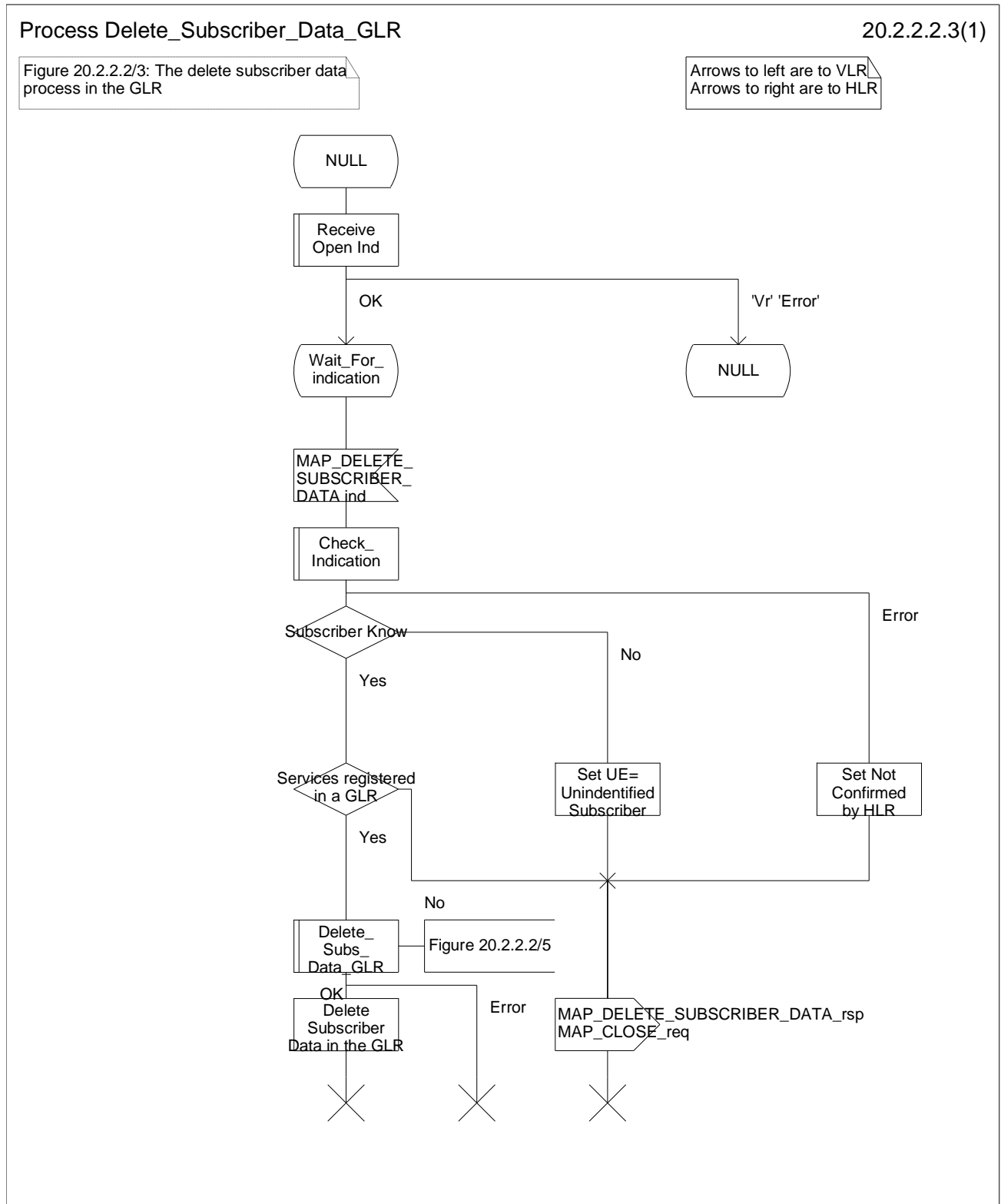


Figure 20.2.2/3: Process Delete_Subscriber_Data_GLR

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

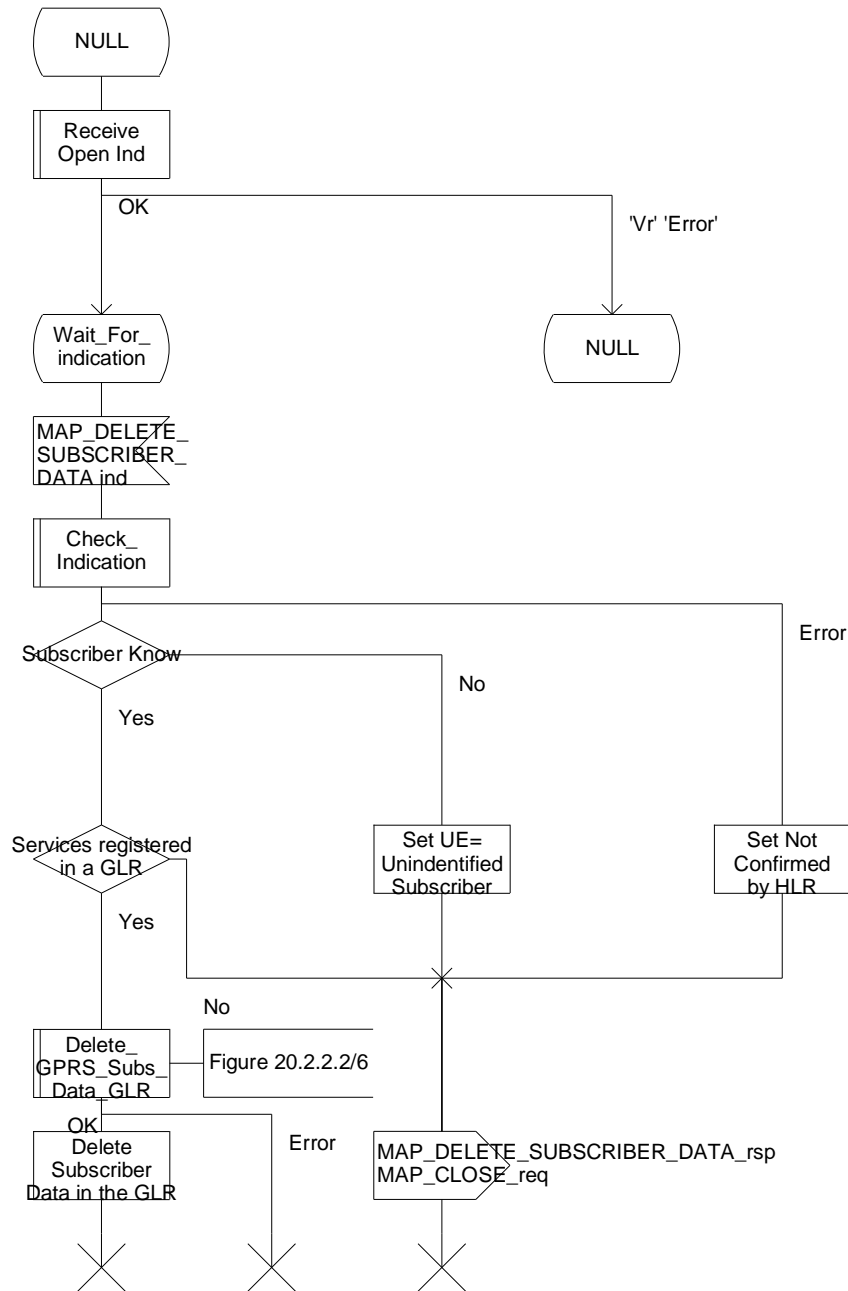


Figure 20.2.2/4: Process Delete_GPRS_Subscriber_Data_GLR

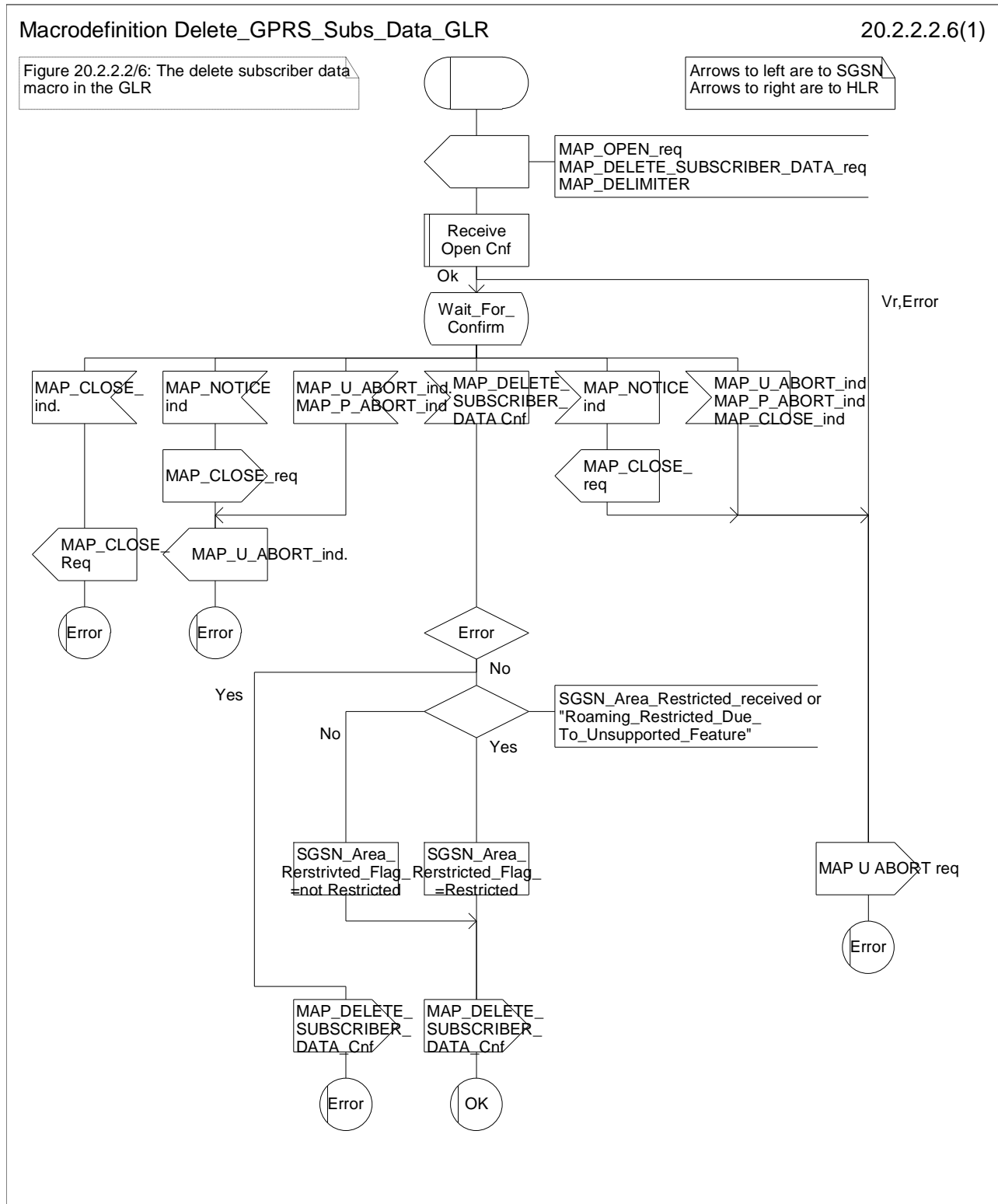
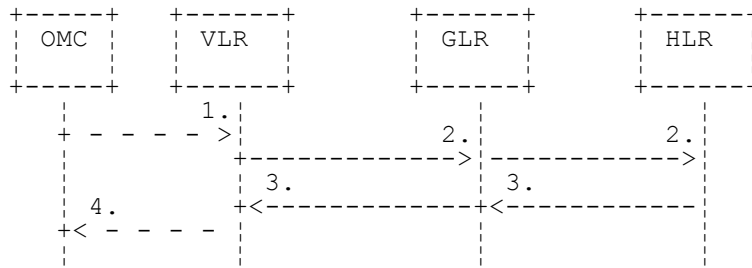


Figure 20.2.2.2/6: Macro Delete_GPRS_SubData_GLR

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.



- 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.

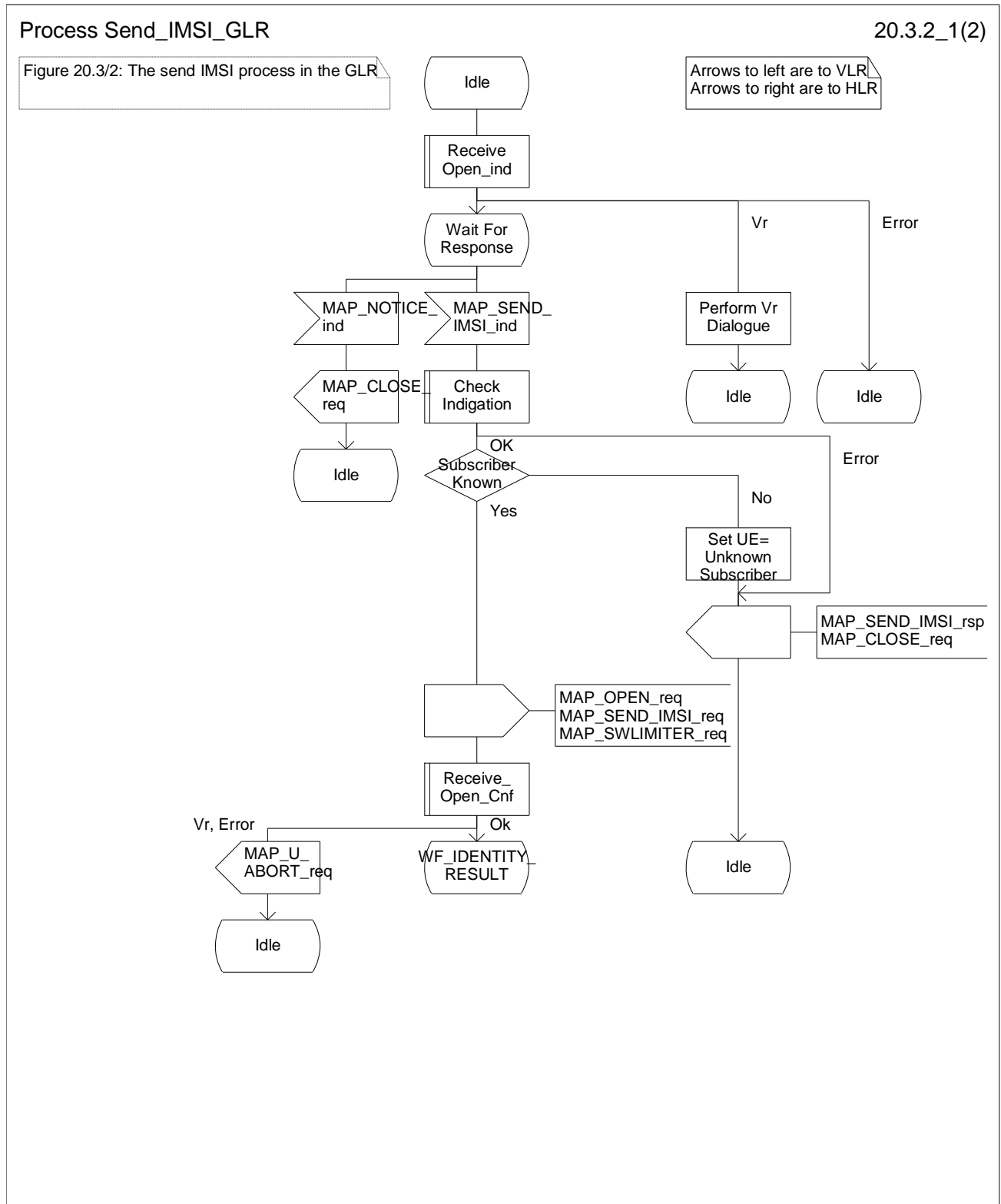


Figure 20.3/2 (Sheet 1 of 2): Process Send_IMSI_GLR

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

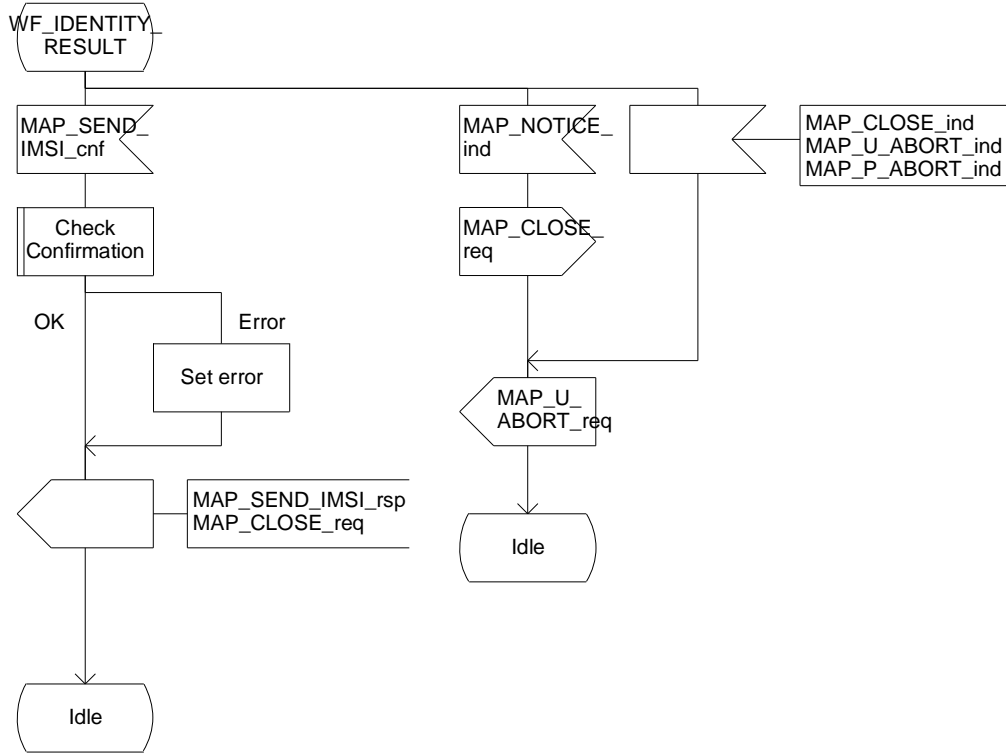


Figure 20.3/2 (Sheet 2 of 2): Process Send_IMSI_GLR

21 Call handling procedures

21.1 General

The MAP call handling procedures are used:

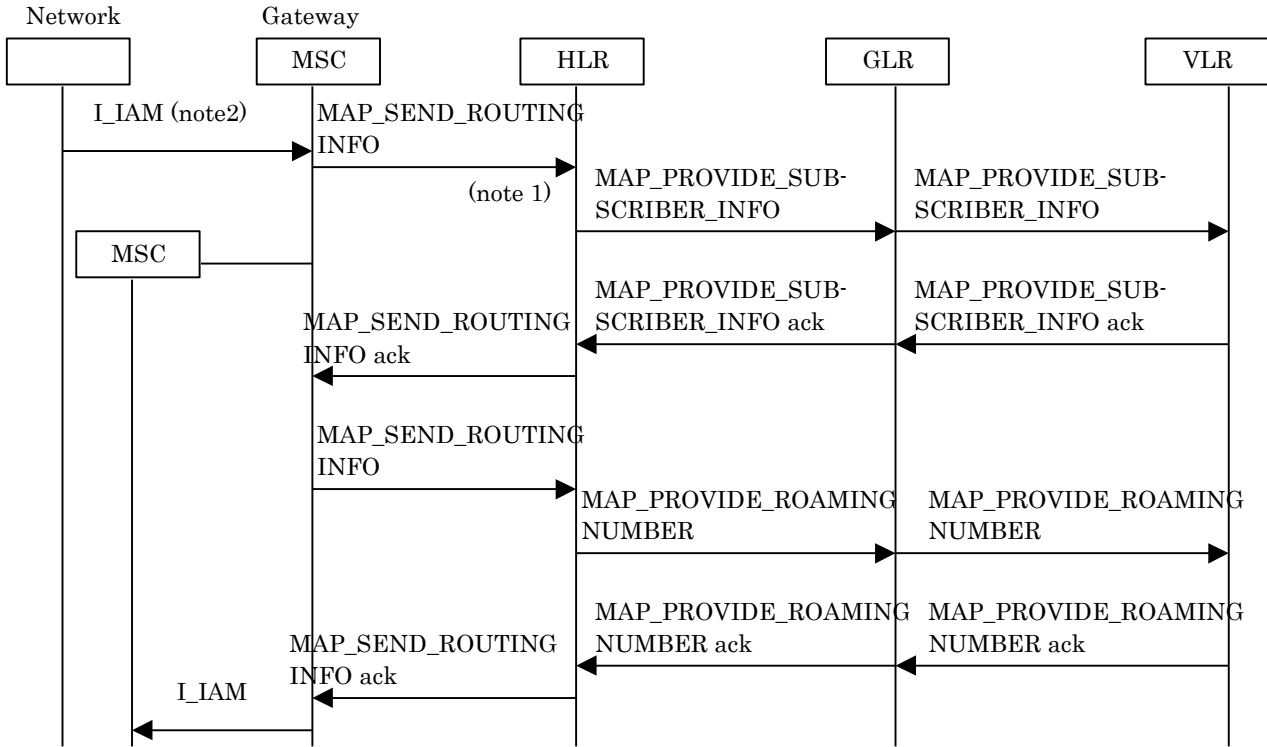
1. to retrieve routing information to handle a mobile terminating call;
2. to transfer control of a call back to the GMSC if the call is to be forwarded;
3. to retrieve and transfer information between anchor MSC and relay MSC for inter MSC group calls / broadcast calls;
4. to allocate resources in an SIWFS;
5. to handle the reporting of MS status for call completion services;
6. to handle the notification of remote user free for CCBS.

Items 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 routing 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 3GPP TS 03.78.

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

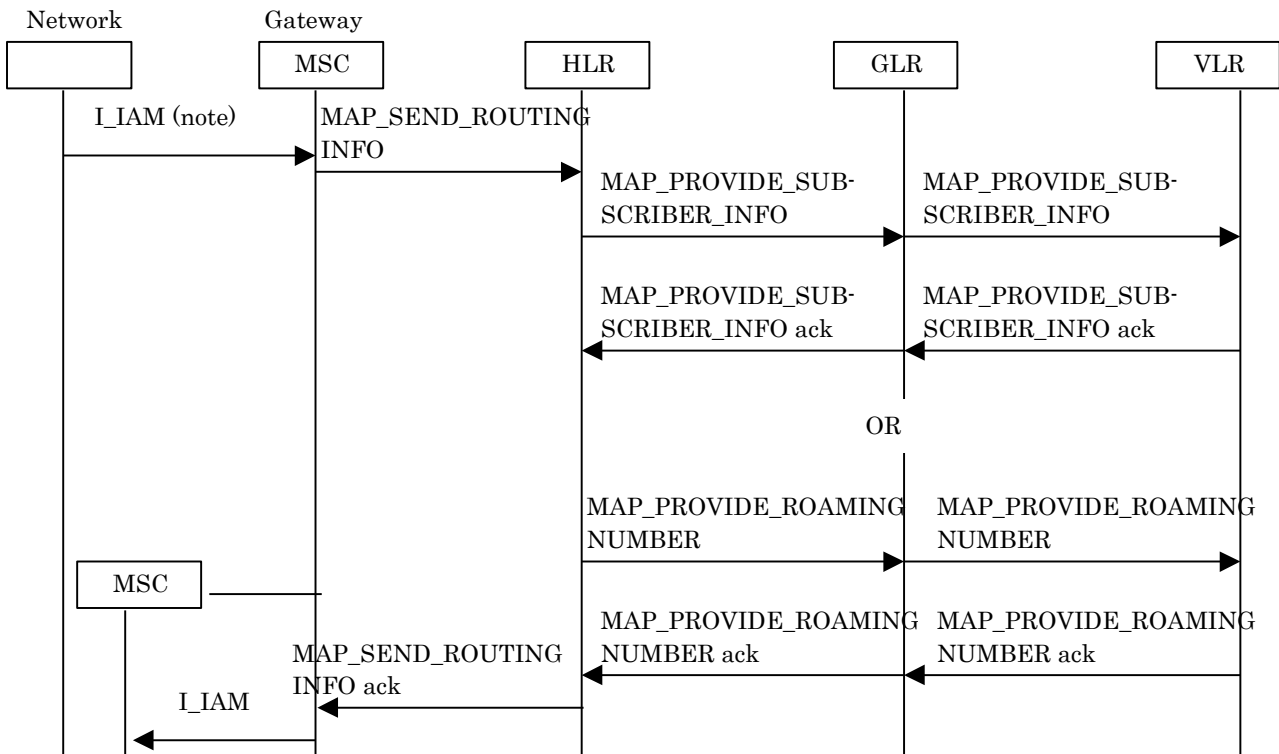


Figure 21.2.1/2: Message flow for retrieval of routing information (optimally routed call)

Notes:

xxx = Optional Procedure.

For Optimal Routing phase 1, only one of the information flows for Provide Subscriber Info and Provide Roaming Number is used. For later phases of Optimal Routing, 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.

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_Receive_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 subclause 25.1.
- Receive_Open_Cnf see subclause 25.1.
- Check_Confirmation see subclause 25.2.

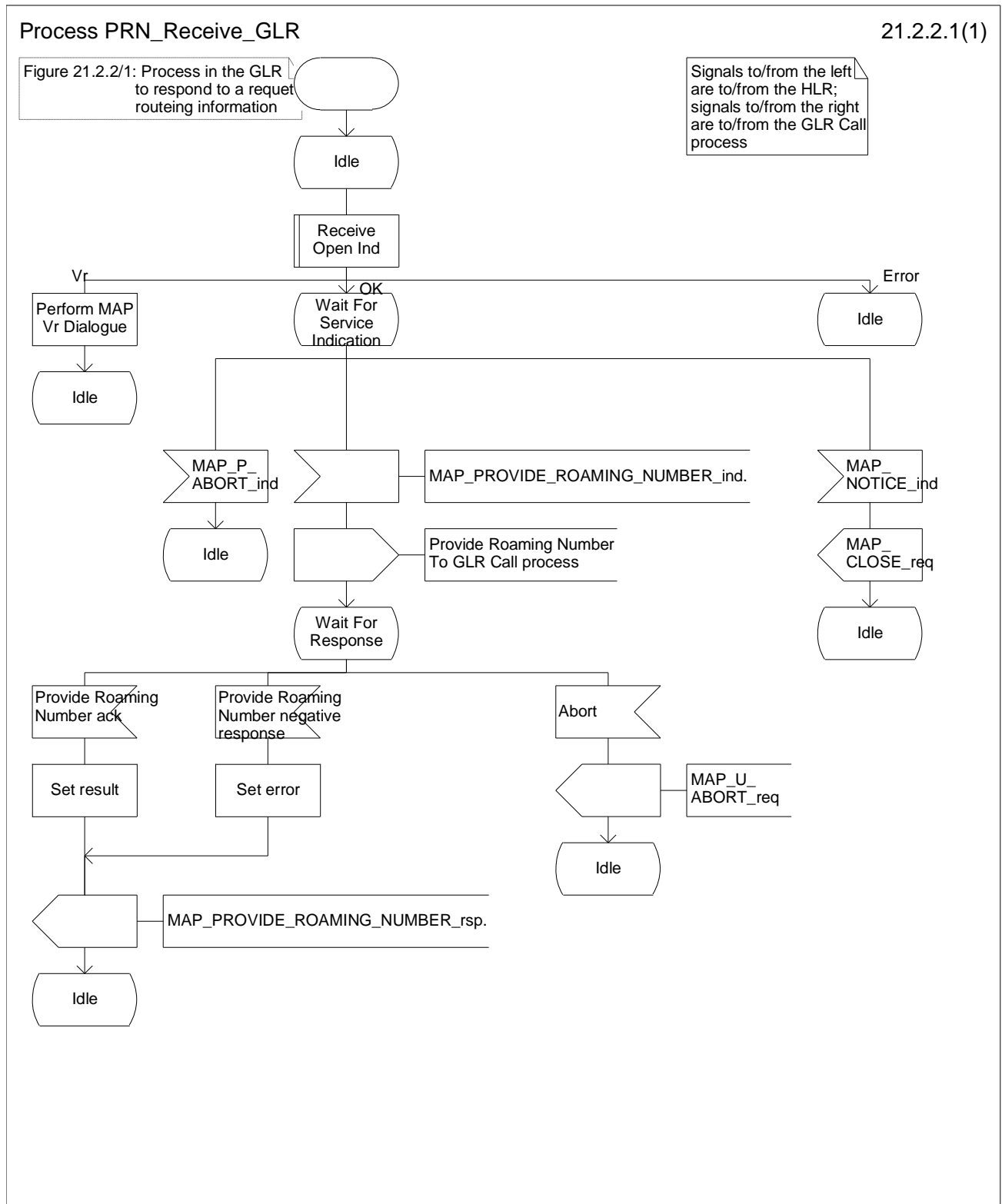


Figure 21.2.2/1: Process PRN_Receive_GLR

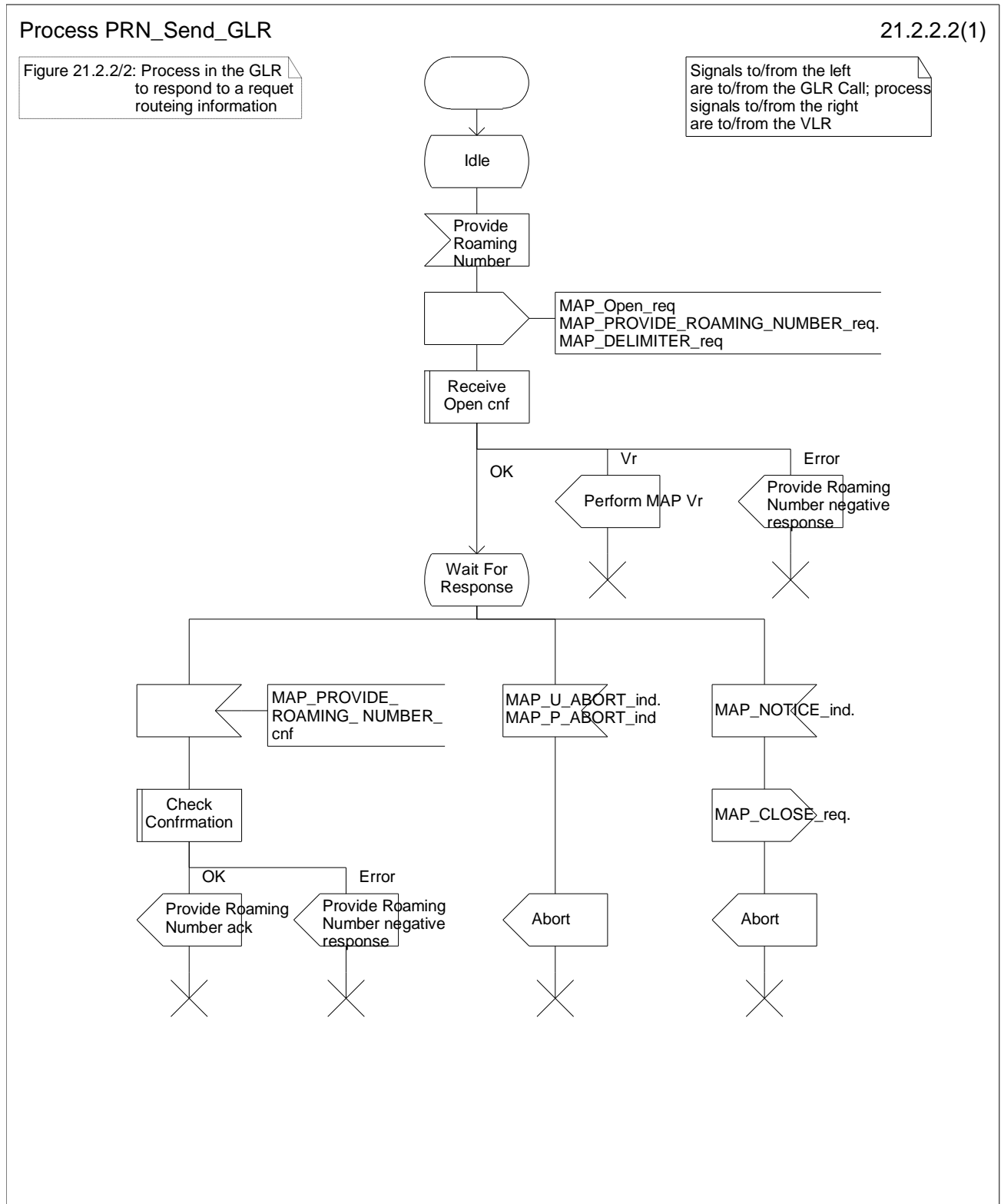


Figure 21.2.2/2: Process PRN_Send_GLR

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 Receive_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 subclause 25.1.
Receive_Open_Cnf	see subclause 25.1.
Check_Confirmation	see subclause 25.2.

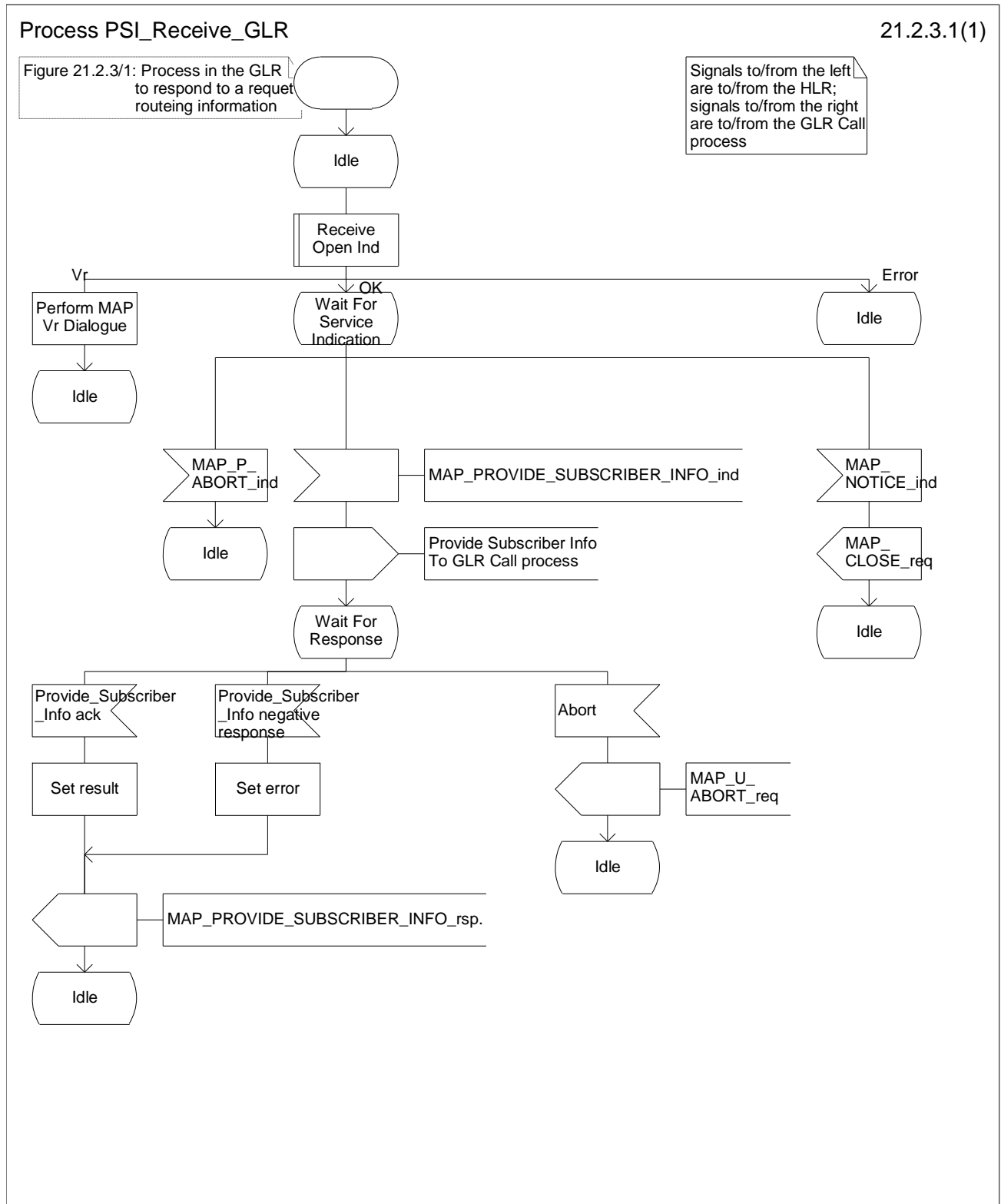


Figure 21.2.3/1 : Process PSI_Receive GLR

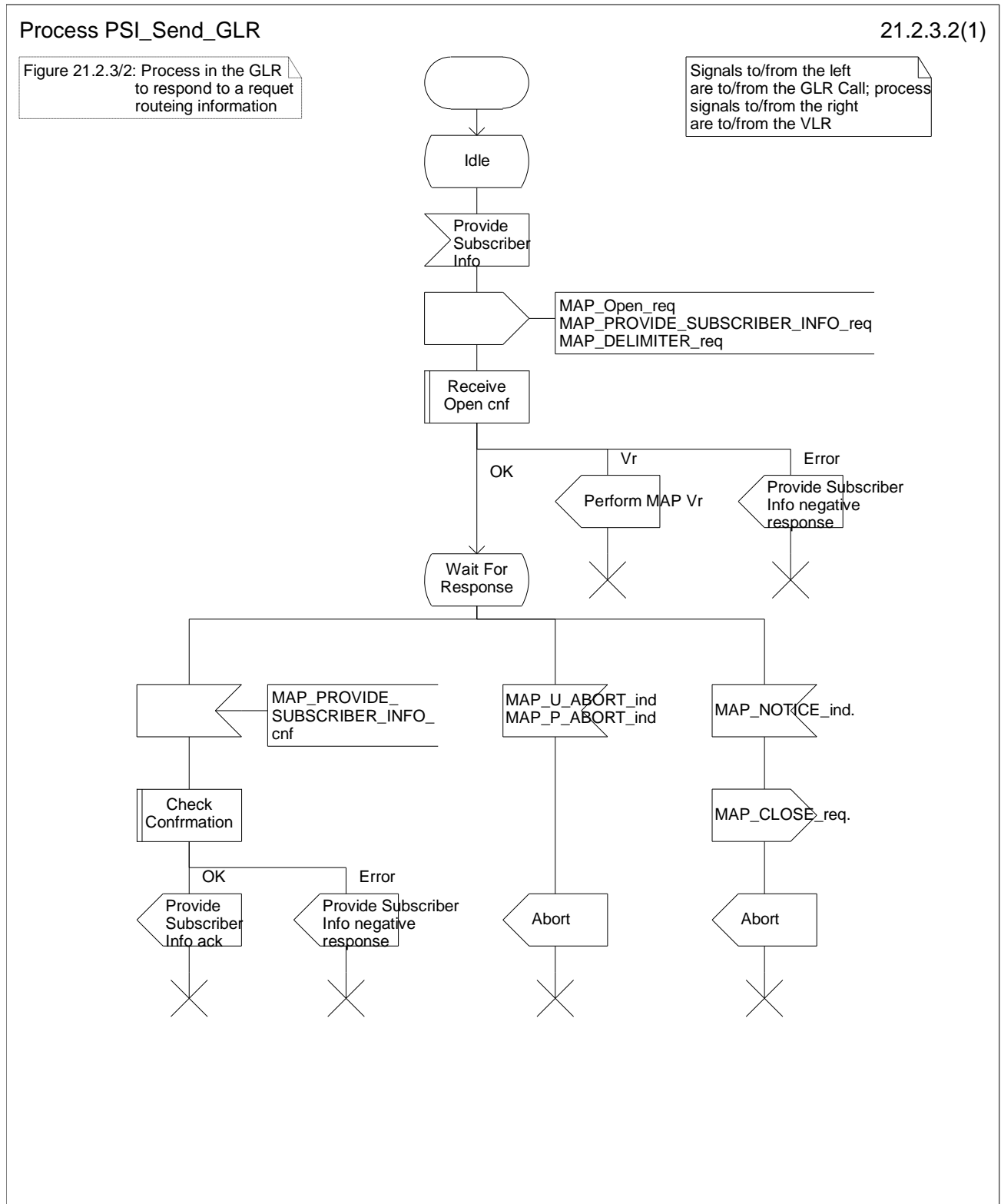


Figure 21.2.3/2 : Process PSI_Send_GLR

21.3 Setting of Reporting State

21.3.1 General

In case the HLR received the CCBS request message from the other HLR for CCBS 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 3GPP TS 23.119.

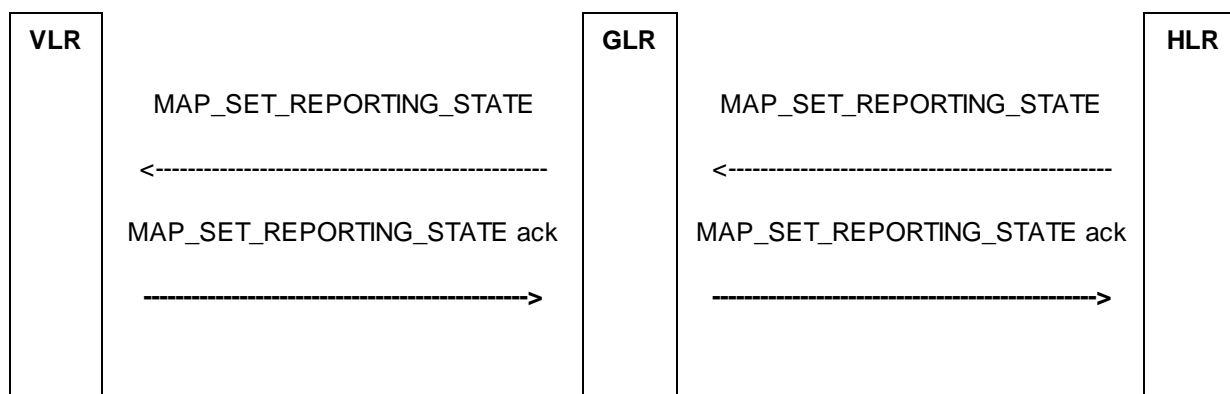


Figure 21.3.1/1: Message Flow for Setting the Reporting State

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 macro can be found as follows:

Receive_Open_Ind	see subclause 25.1.
Receive_Open_Cnf	see subclause 25.1.
Check_Confirmation	see subclause 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.

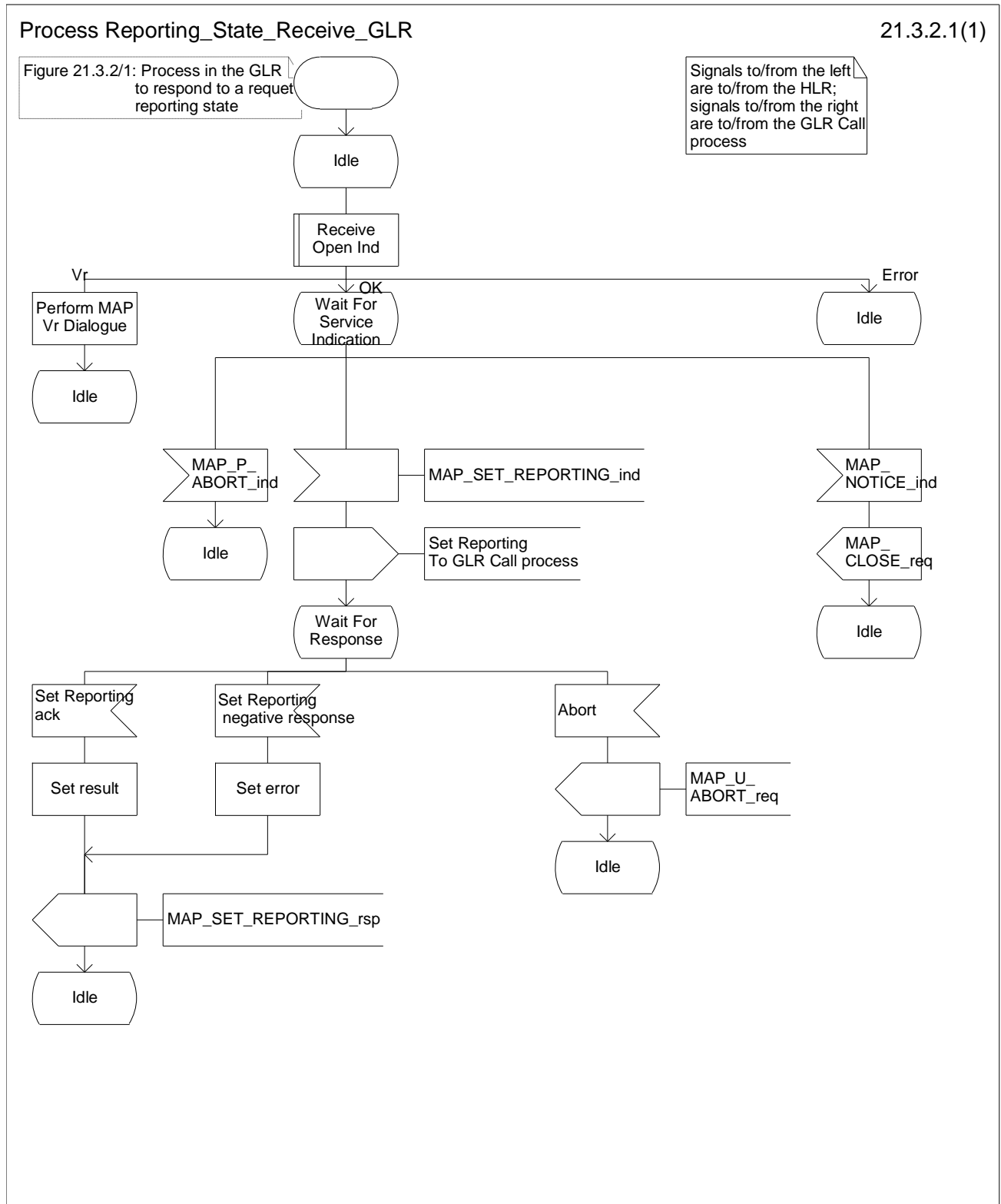


Figure 21.3.2/1: Process Reporting_State_Receive_GLR

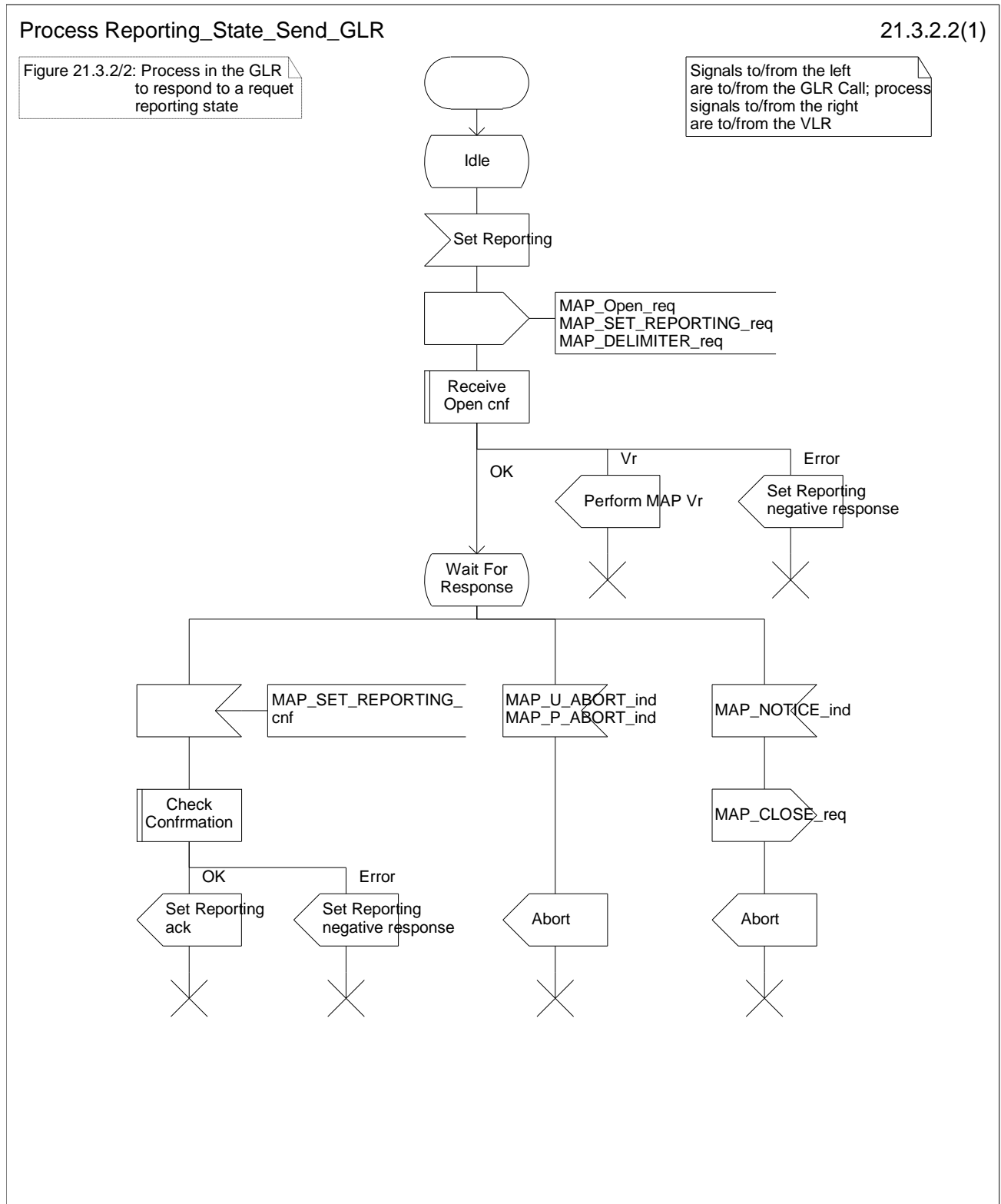


Figure 21.3.2/2: Process Reporting_State_Send_GLR

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 3GPP TS 23.119.

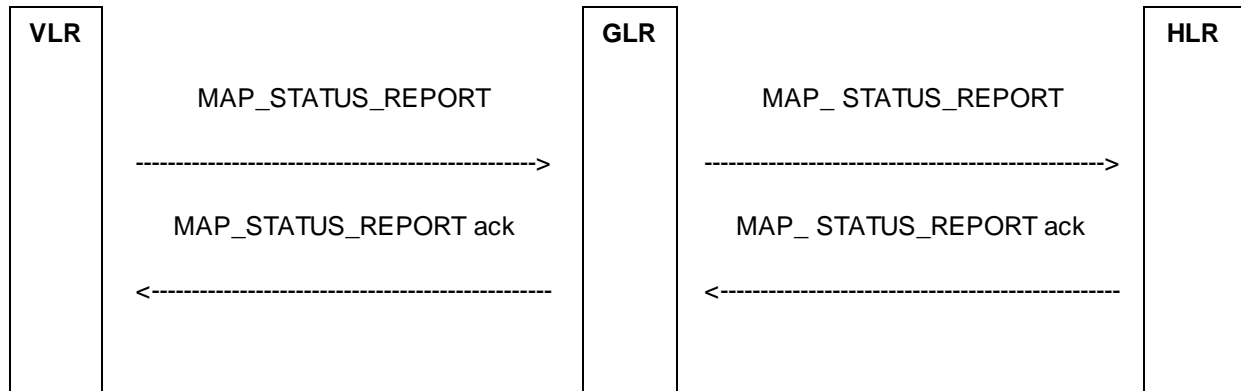


Figure 21.4.1/1: Message Flow for Status Reporting

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.

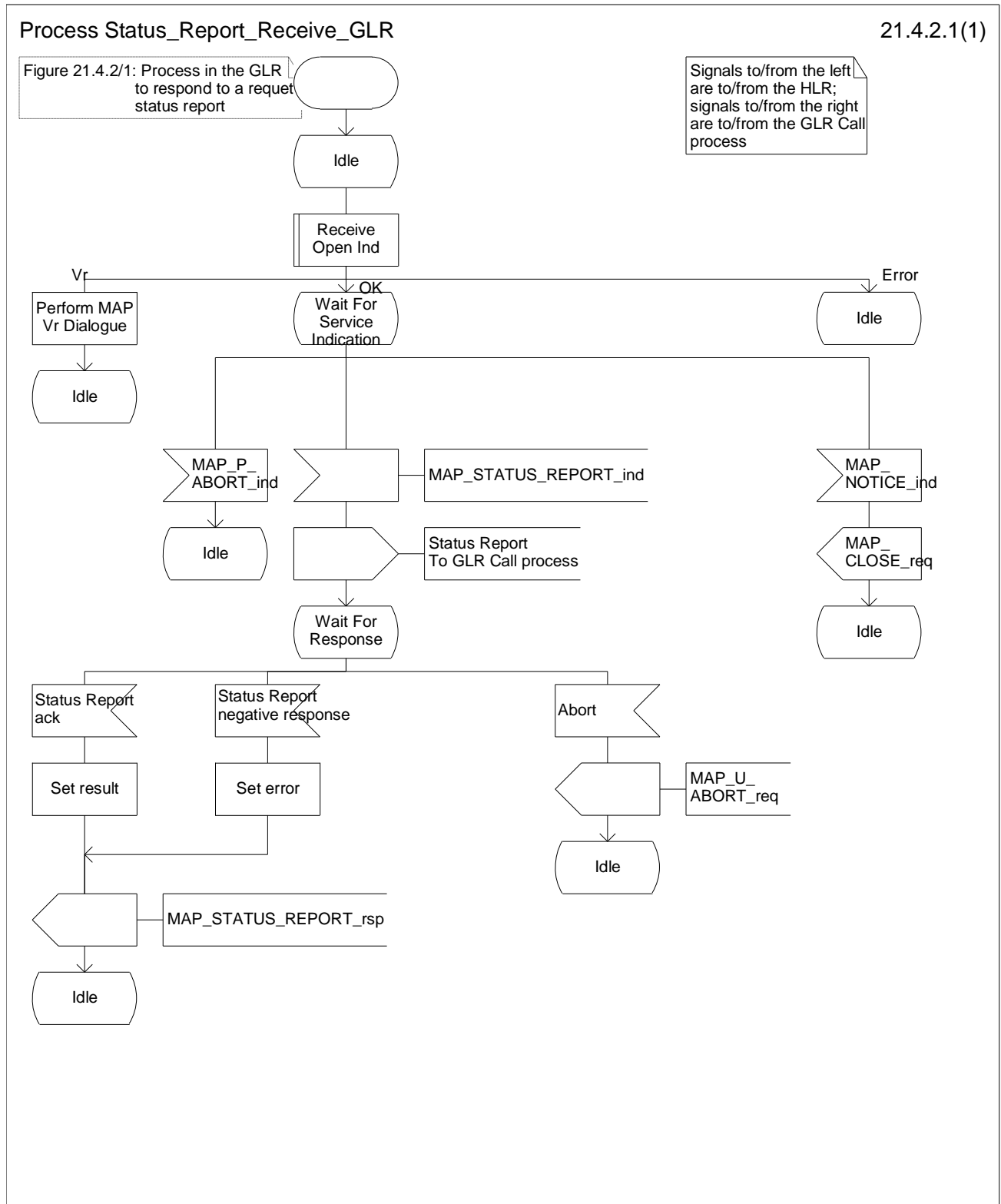


Figure 21.4.2/1: Process Status_Report_Receive_GLR

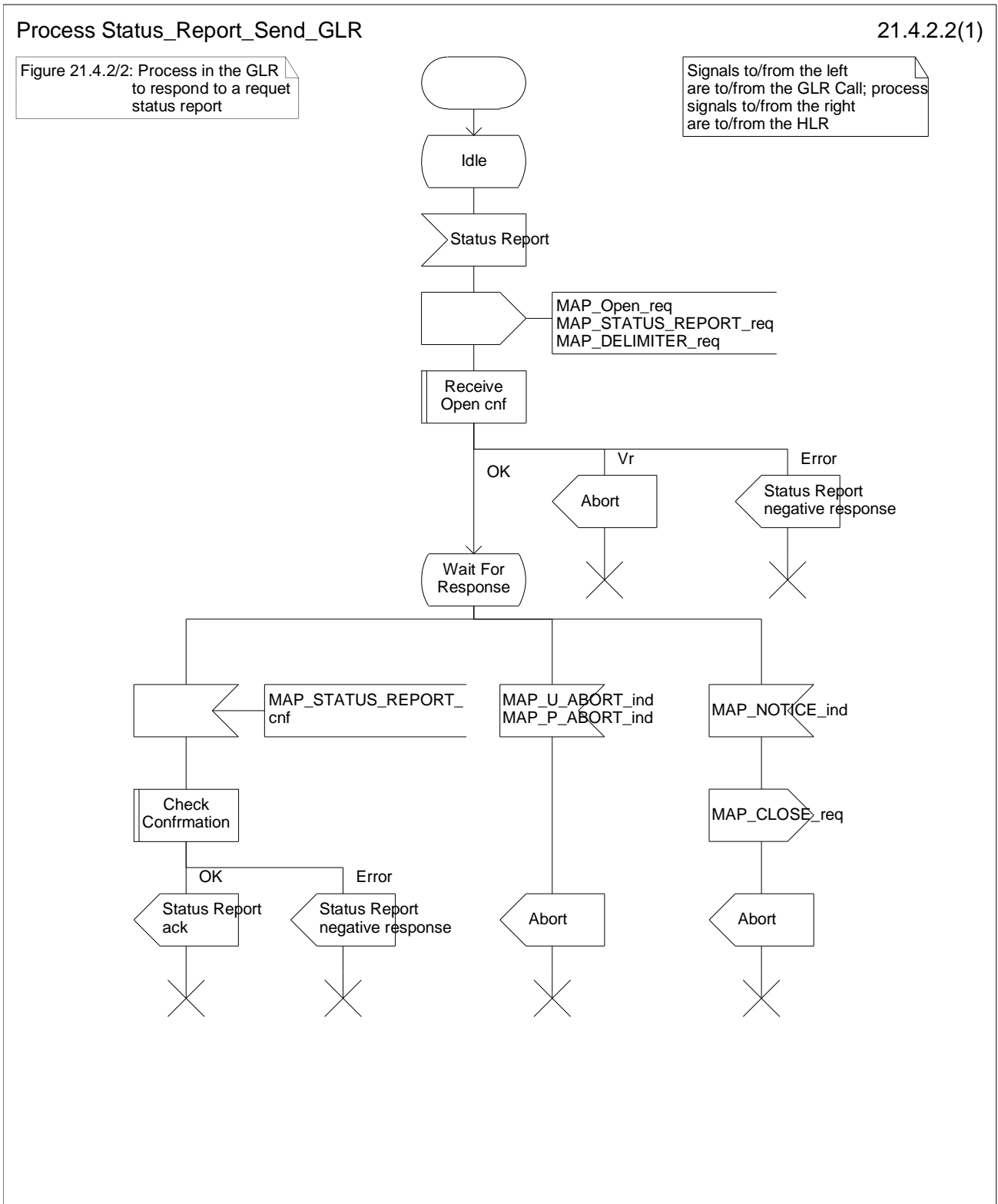


Figure 21.4.2/2: Process Status_Report_Send_GLR

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.

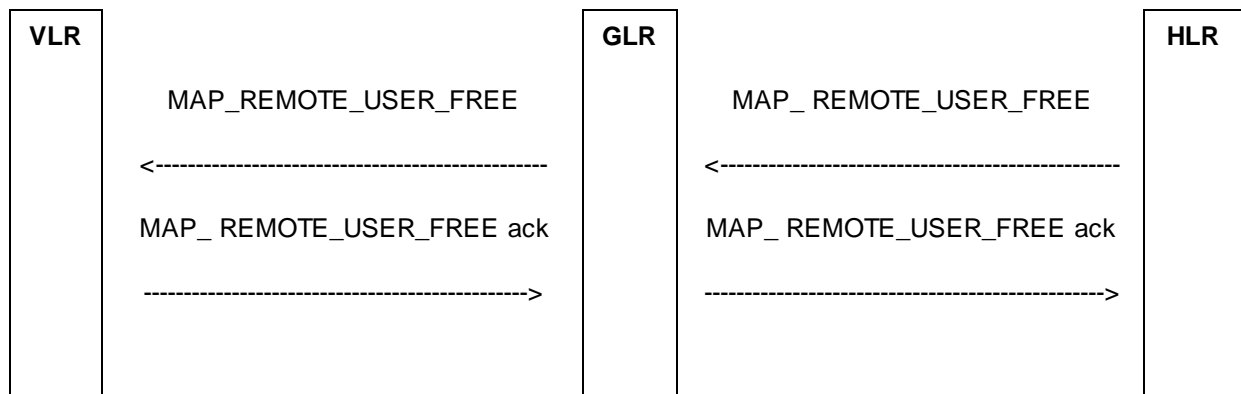


Figure 21.5.1/1: Message Flow for Remote User Free

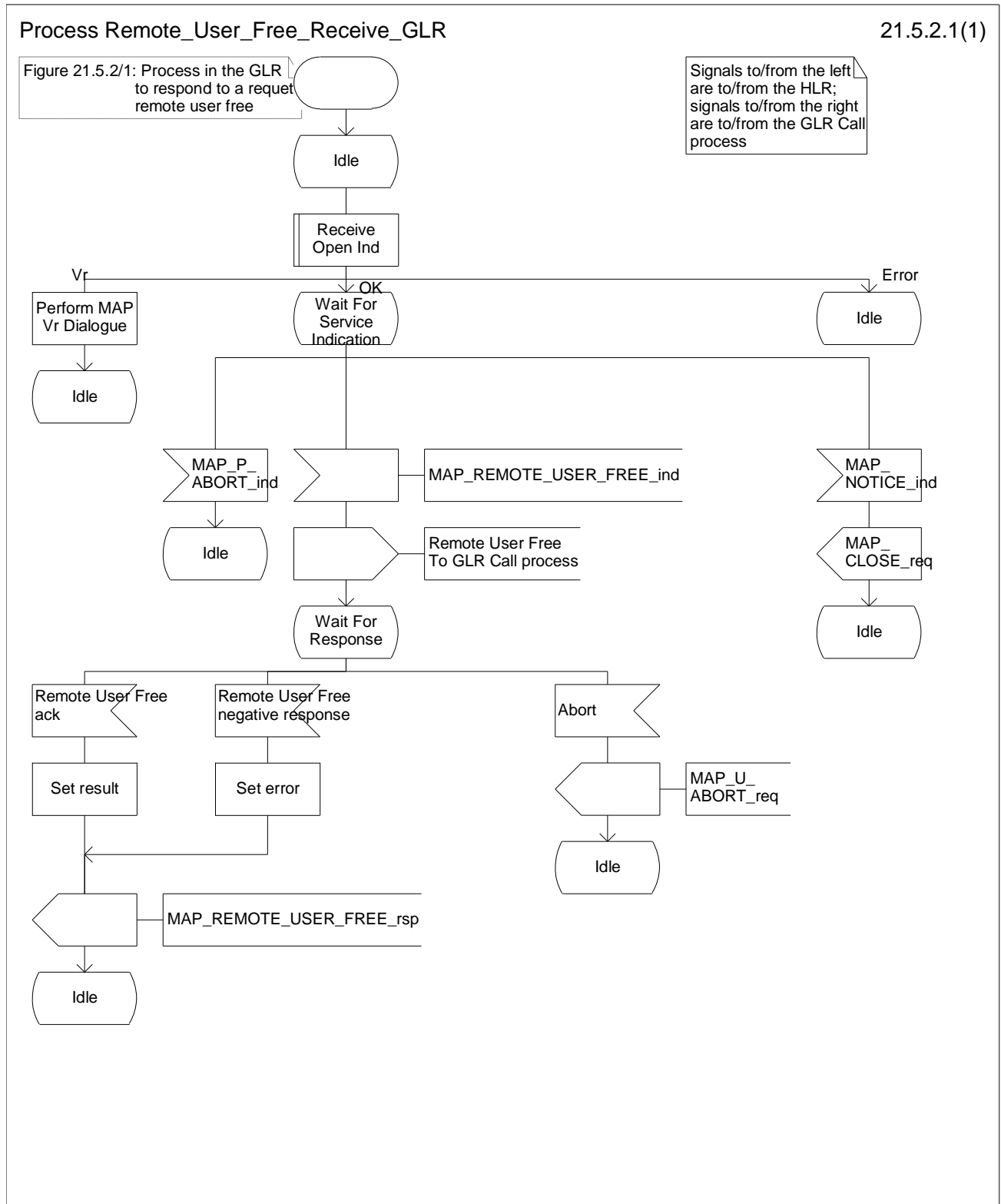
21.5.2 Process in the GLR for Remote User Free

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.



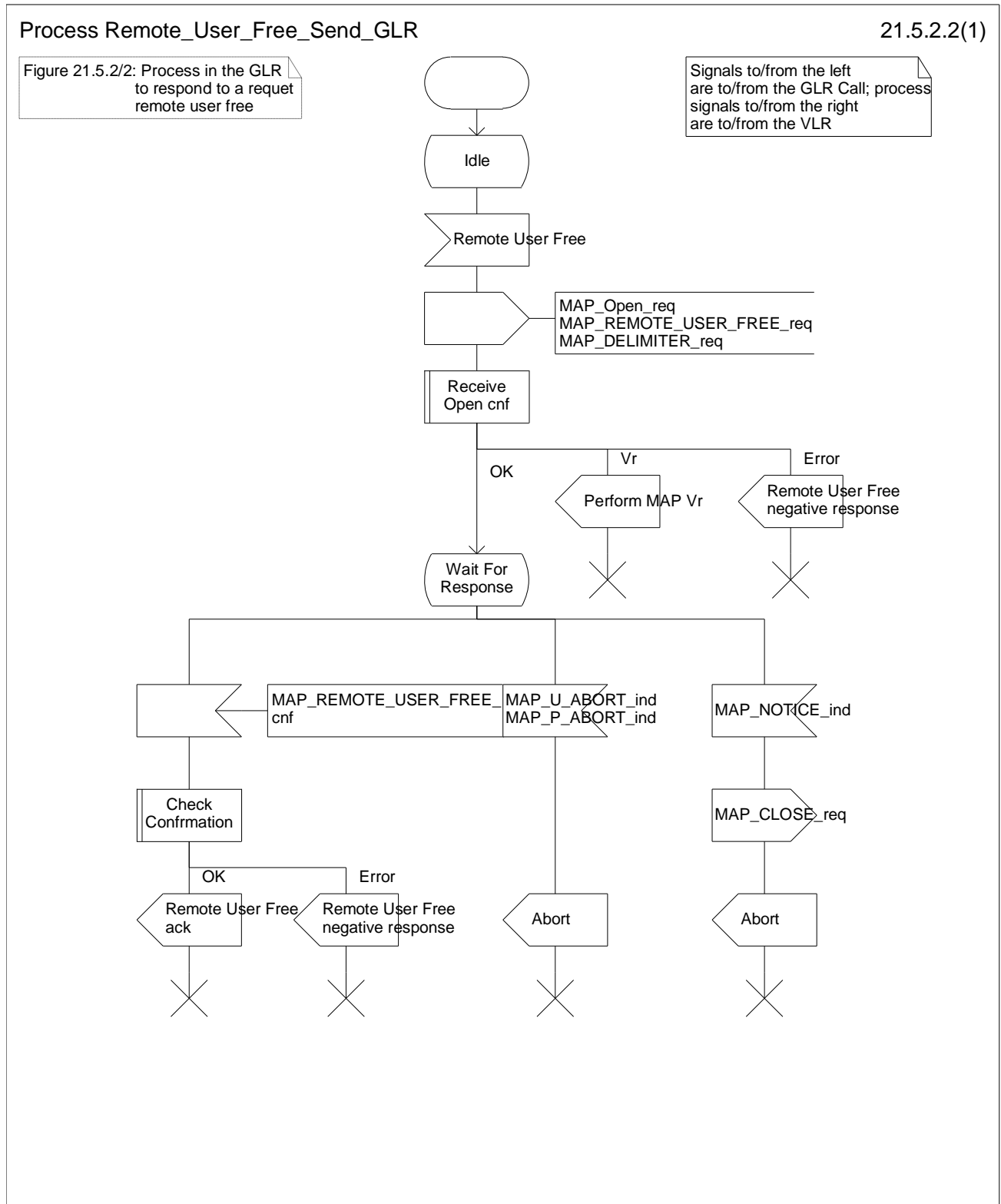


Figure 21.5.2/2: Process Remote_User_Free_Send_GLR

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.

Process SS_Coordinator_GLR

22.1.1_1(2)

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

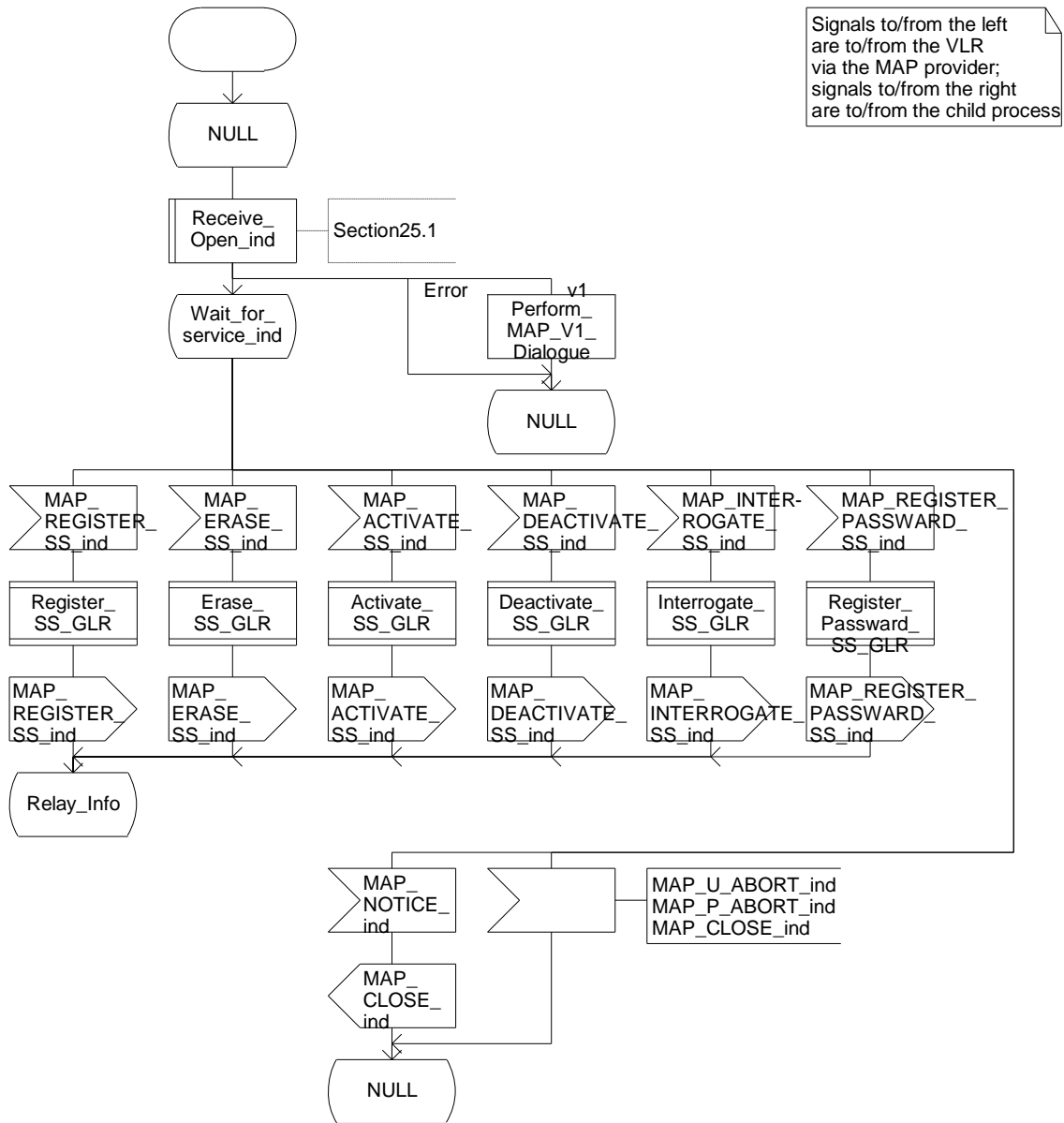


Figure 22.1/1 (sheet 1 of 2): Process SS_Coordinator_GLR

Process SS_Coordinator_GLR

22.1.1_2(2)

Figure 22.1/1: Supplementary Service Coordination process in the GLR, to identify 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

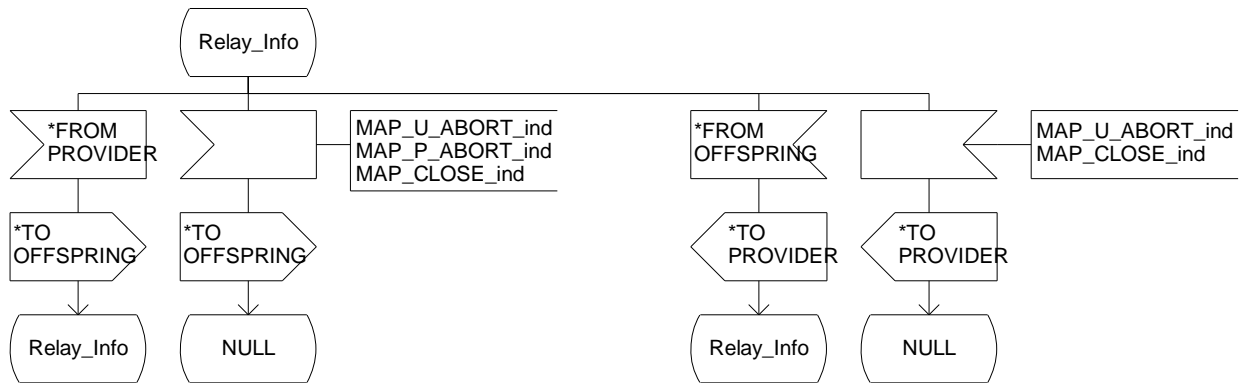


Figure 22.1/1 (sheet 2 of 2): Process SS_Coordinator_GLR

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.

Process CC_Coord_GLR

22.1.2(1)

Figure 22.1/2: Coordinating process in the GLR to handle dialogue opened with the AC Call Completion Context

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

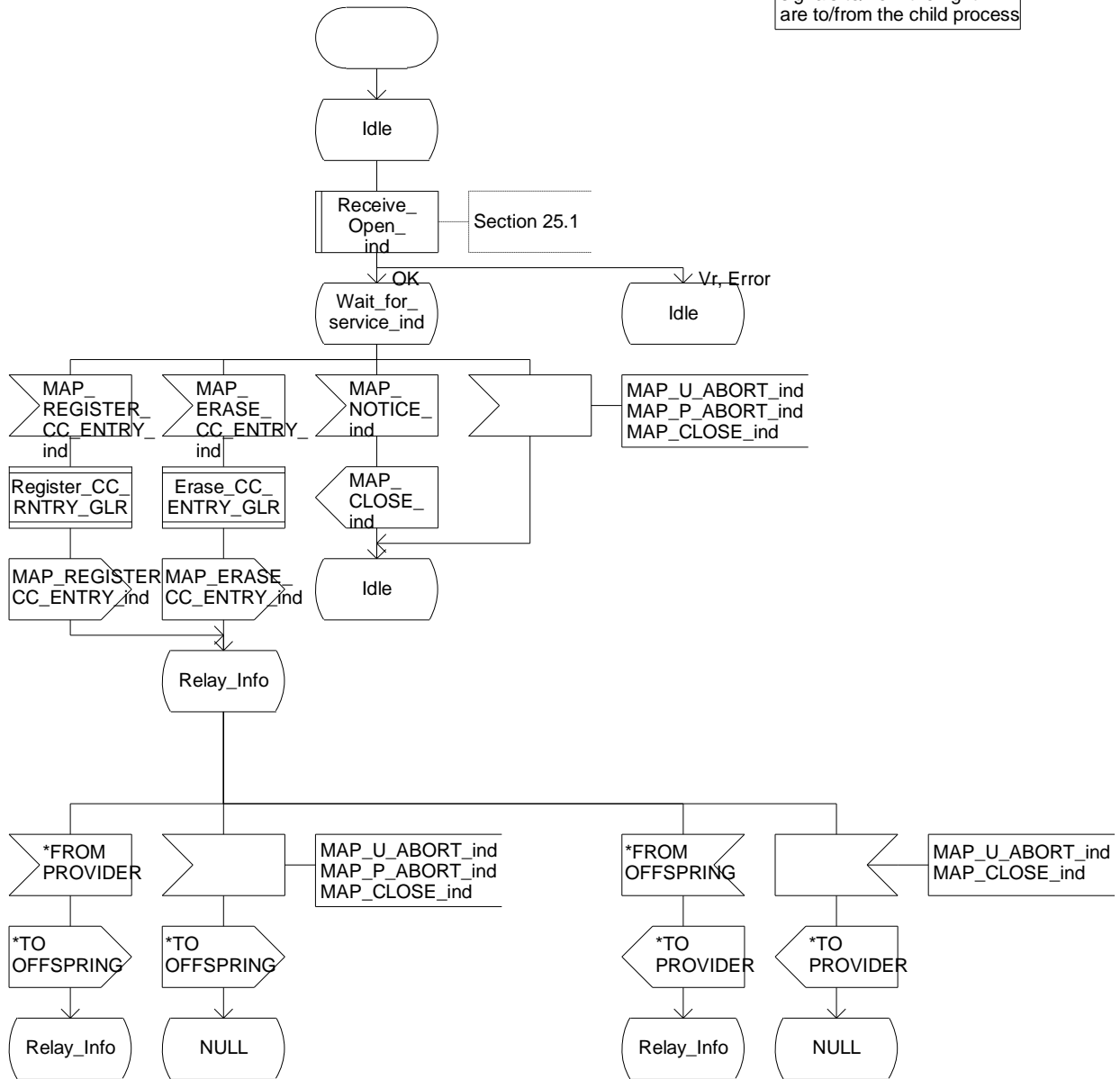


Figure 22.1/2: Process_CC_Coord_GLR

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.

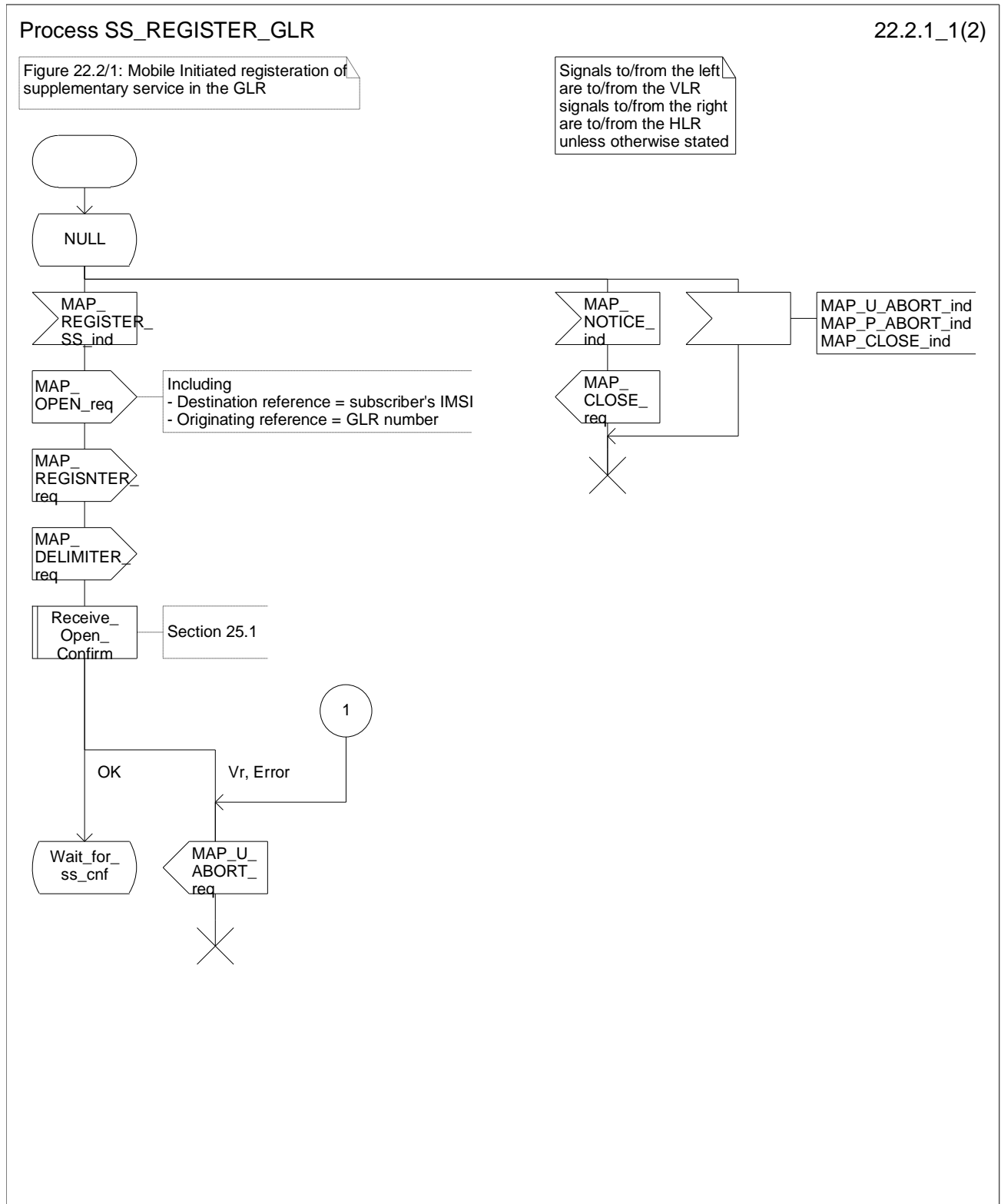


Figure 22.2/1 (sheet 1 of 2): Procedure SS_Register_GLR

Process SS_REGISTER_GLR

22.2.1_2(2)

Figure 22.2/1: Mobile Initiated registration 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

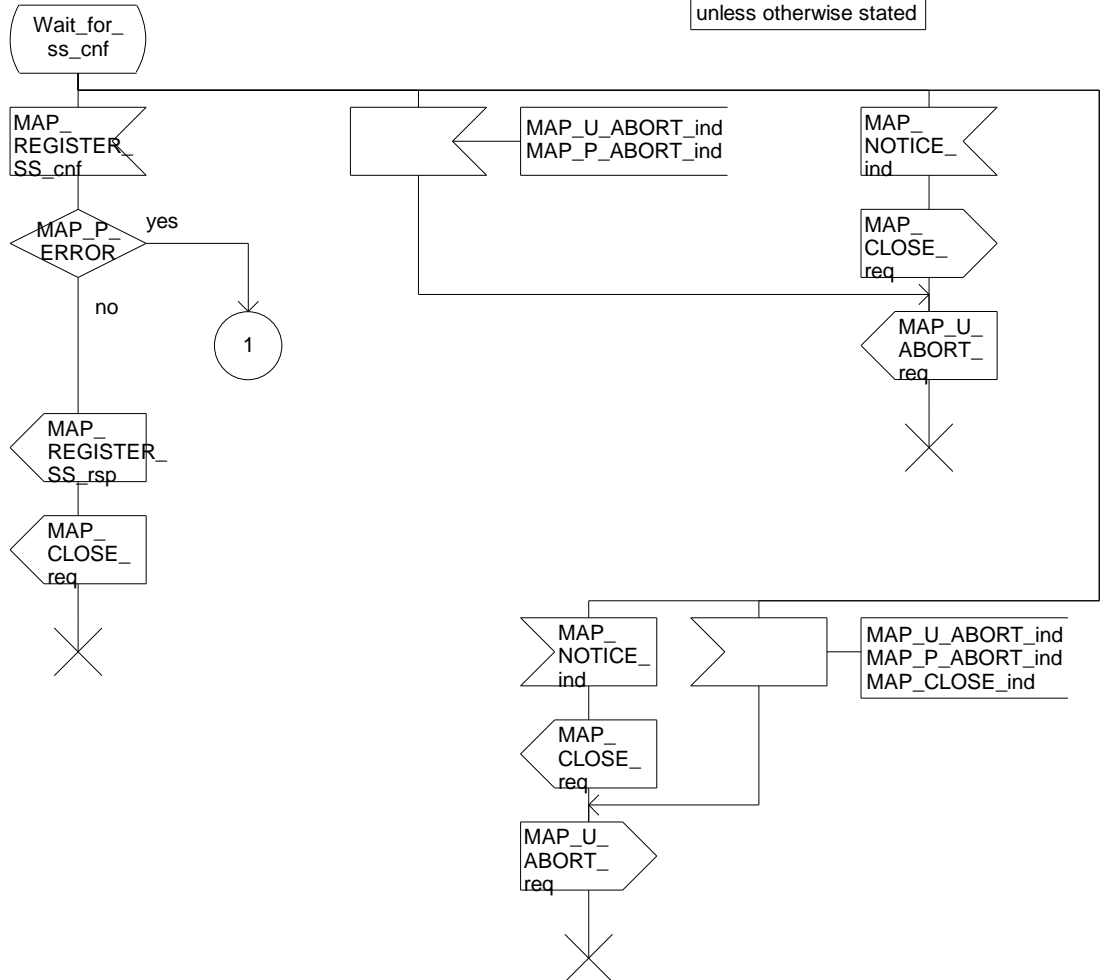


Figure 22.2/1 (sheet 2 of 2): Procedure SS_Register_GLR

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.

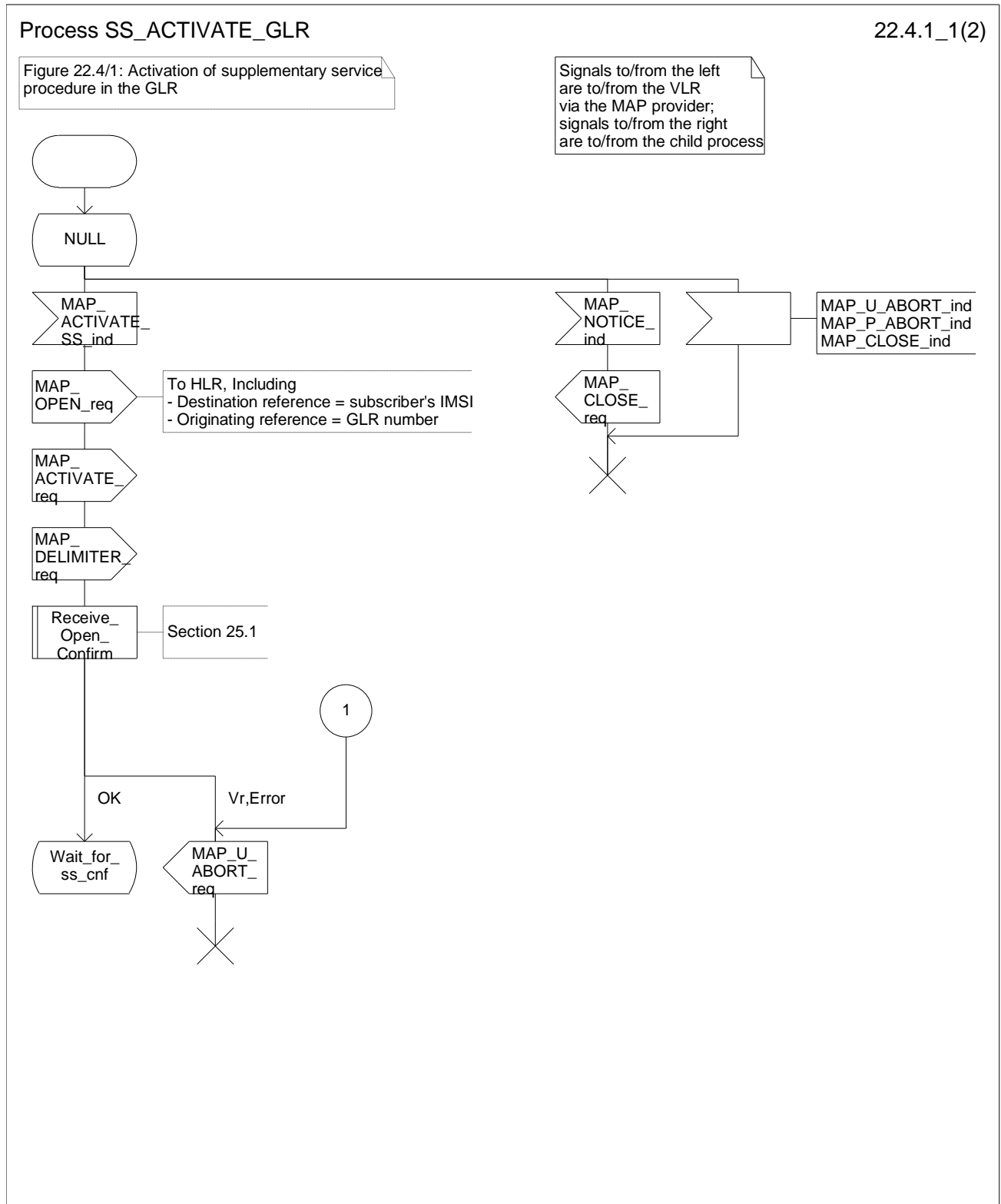


Figure 22.4/1 (sheet 1 of 2): Procedure Activate_SS_GLR

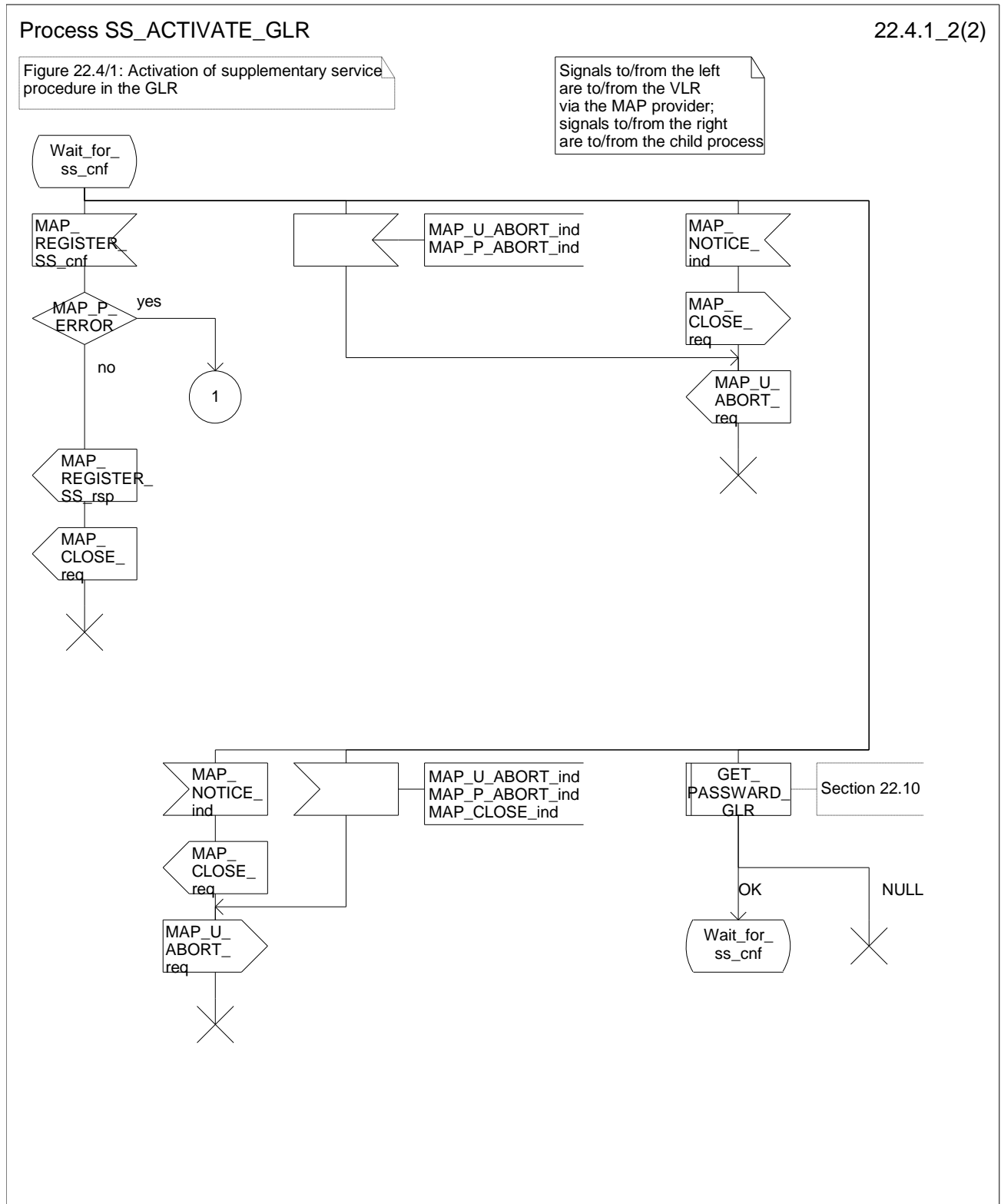


Figure 22.4/1 (sheet 2 of 2): Procedure SS_Activate_GLR

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

22.6.1 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.

22.6.2 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.

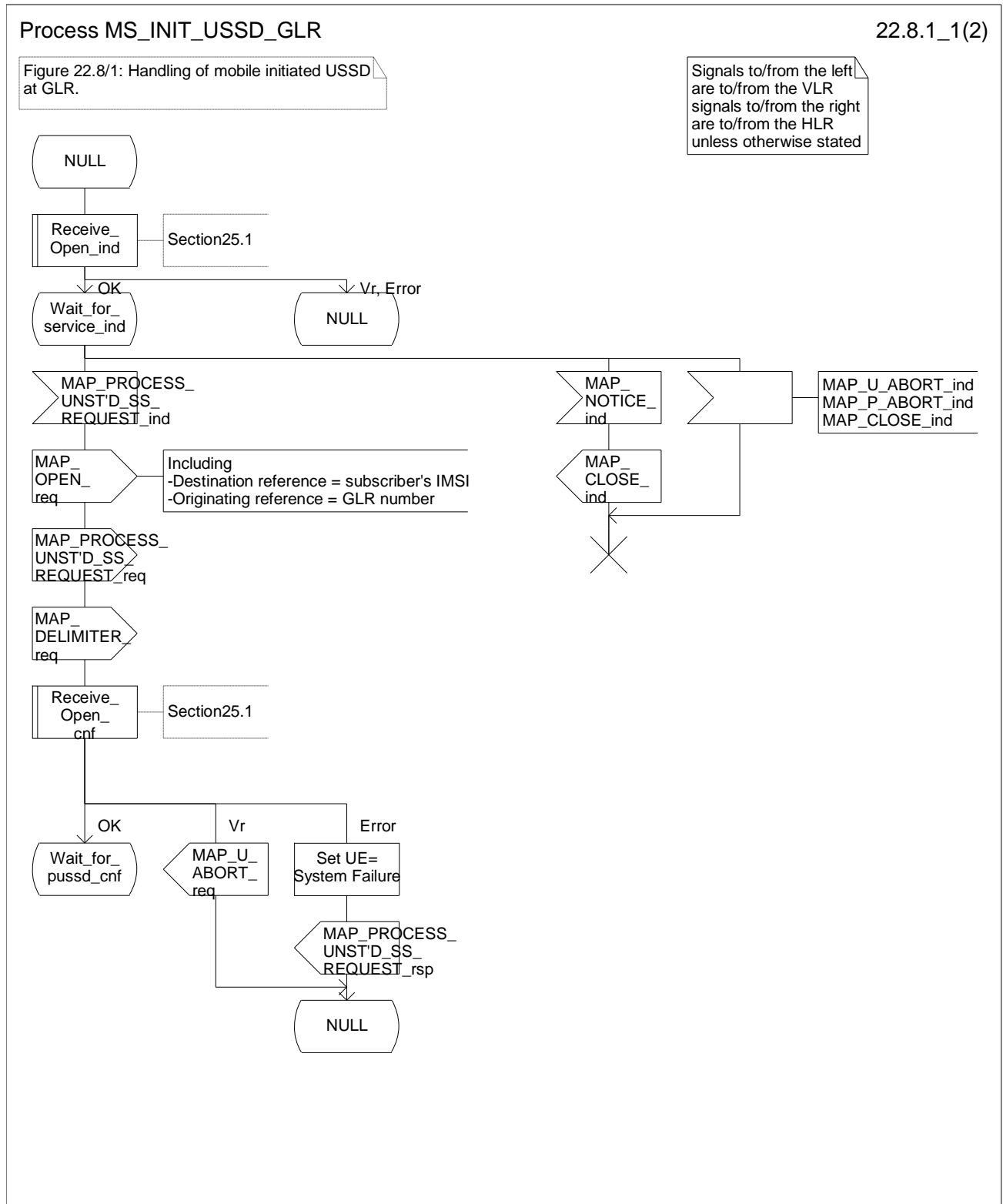


Figure 22.8/1 (sheet 1 of 2): Procedure MI_USSD_GLR

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

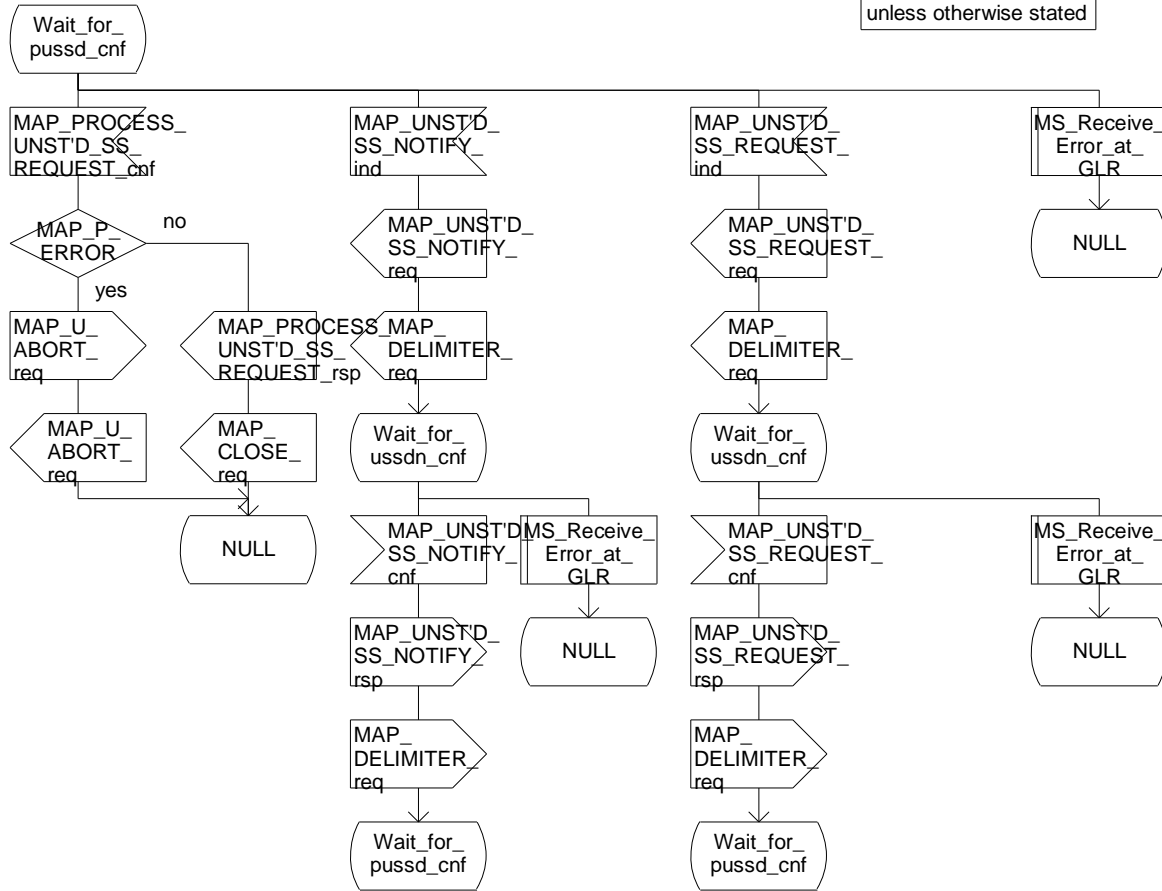


Figure 22.8/1 (sheet 2 of 2): Procedure MI_USSD_GLR

Macrodefinition MS_Receive_Error_at_GLR

22.8.2(1)

Figure 22.8/2: Handling of error at GLR for MS 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

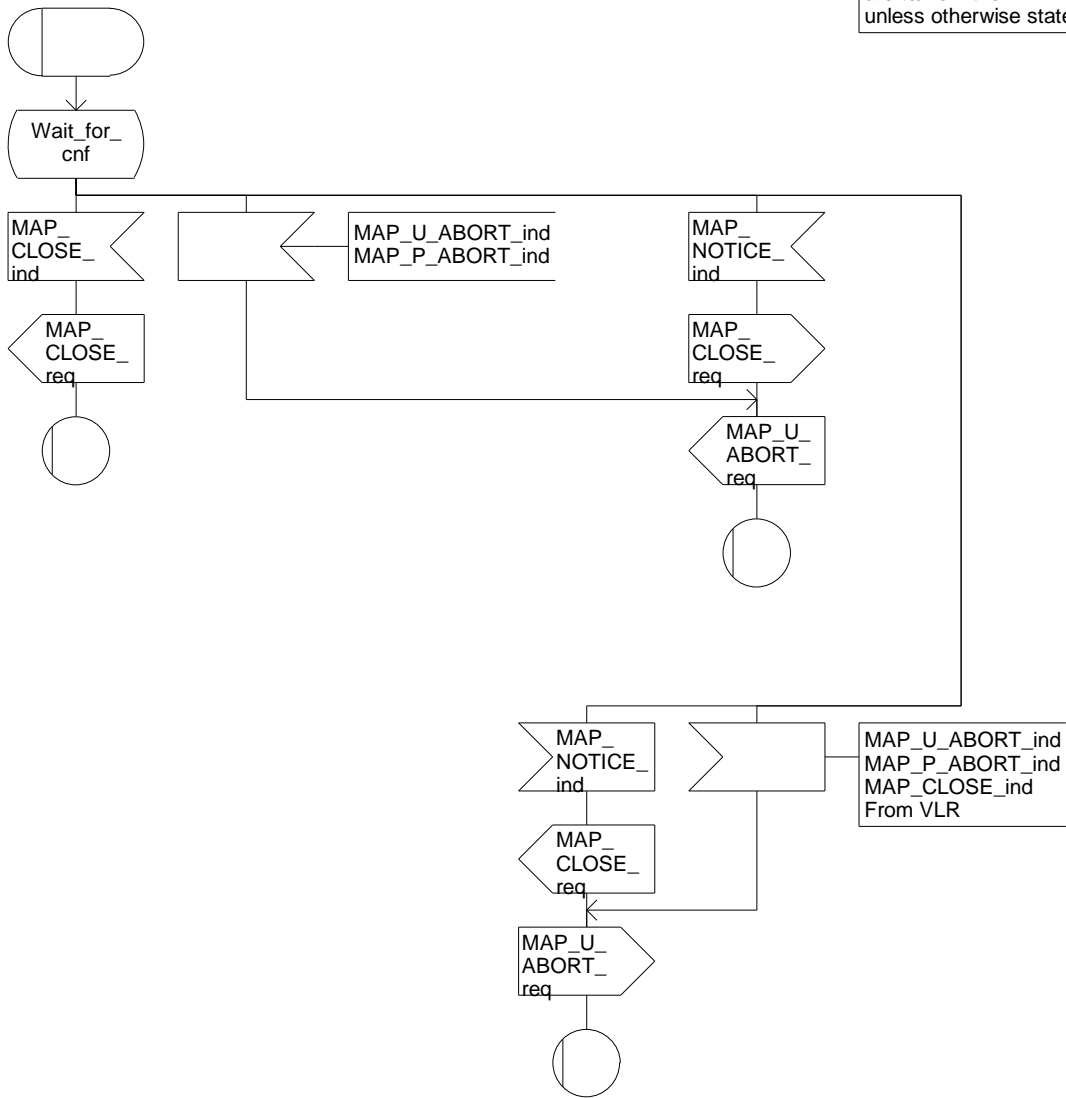


Figure 22.8/2: Macro MS_Receive_ERROR_at_GLR

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

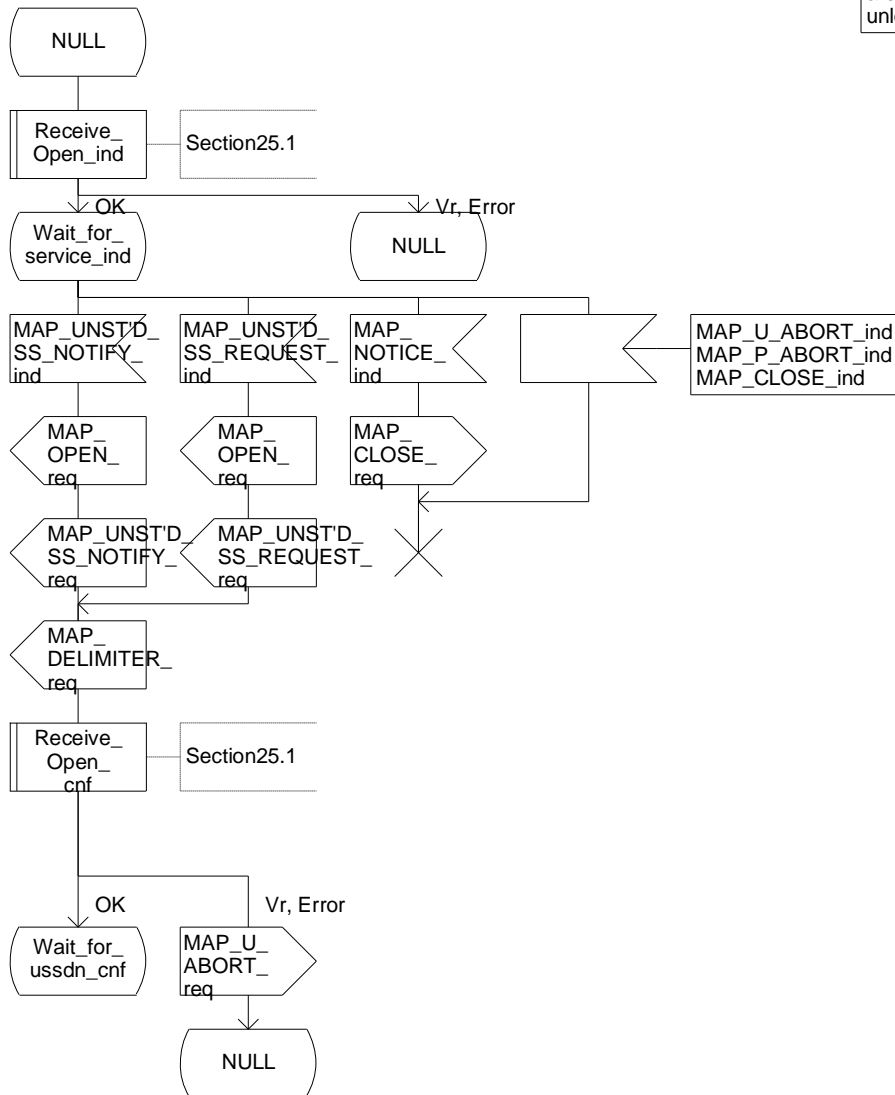


Figure 22.9/1 (sheet 1 of 2): Procedure NI_USSD_GLR

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

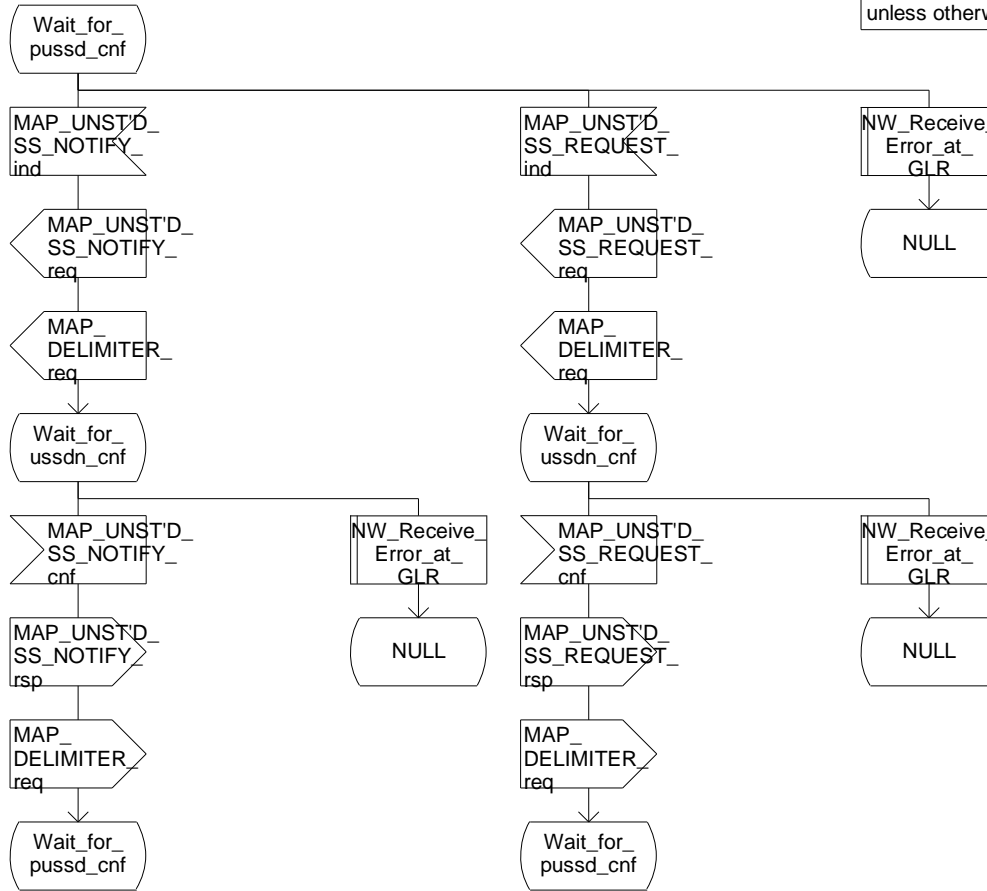


Figure 22.9/1 (sheet 2 of 2): Procedure NI_USSD_GLR

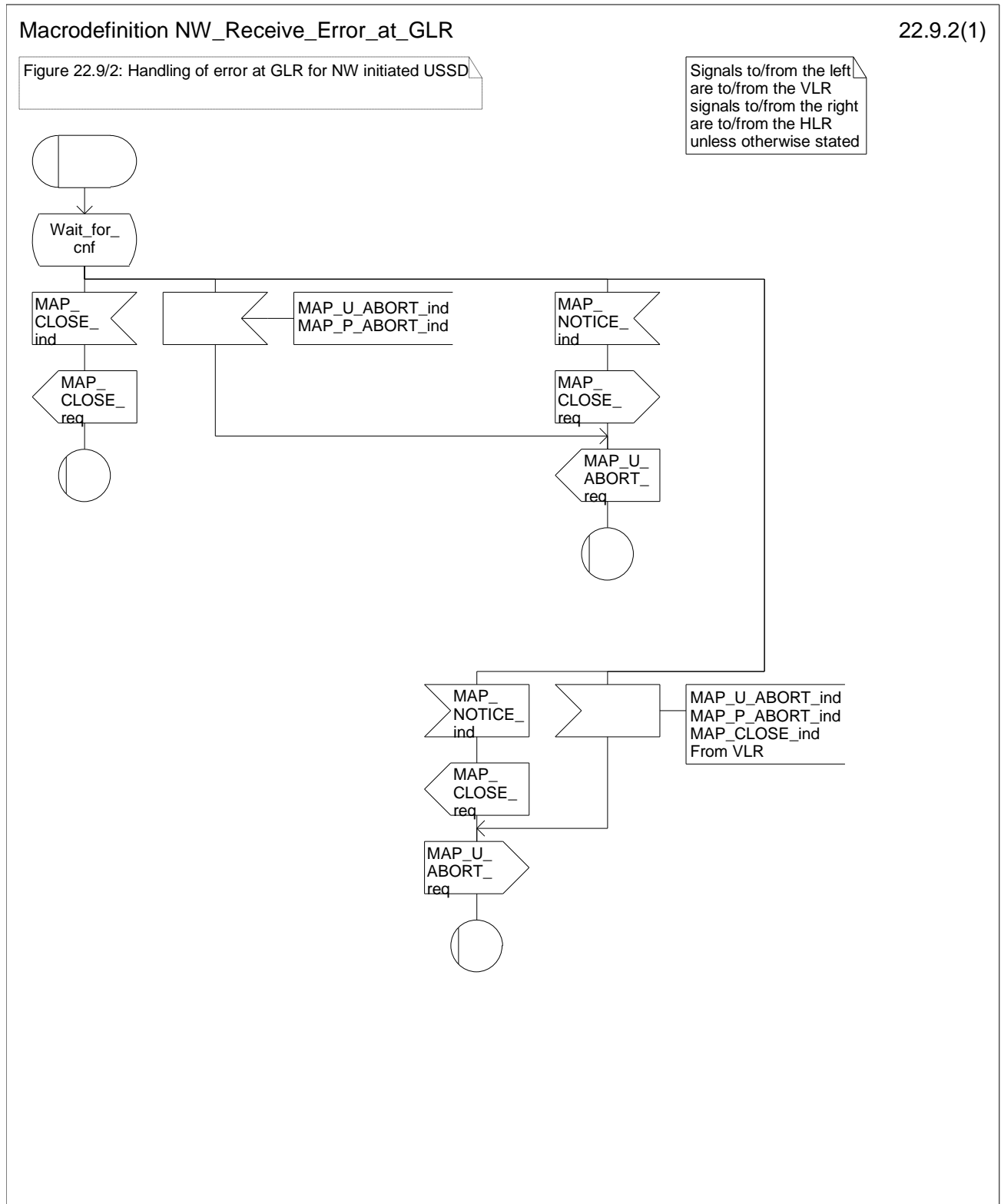


Figure 22.9/2: Marco NW_Receive_Rrror_at_GLR

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.

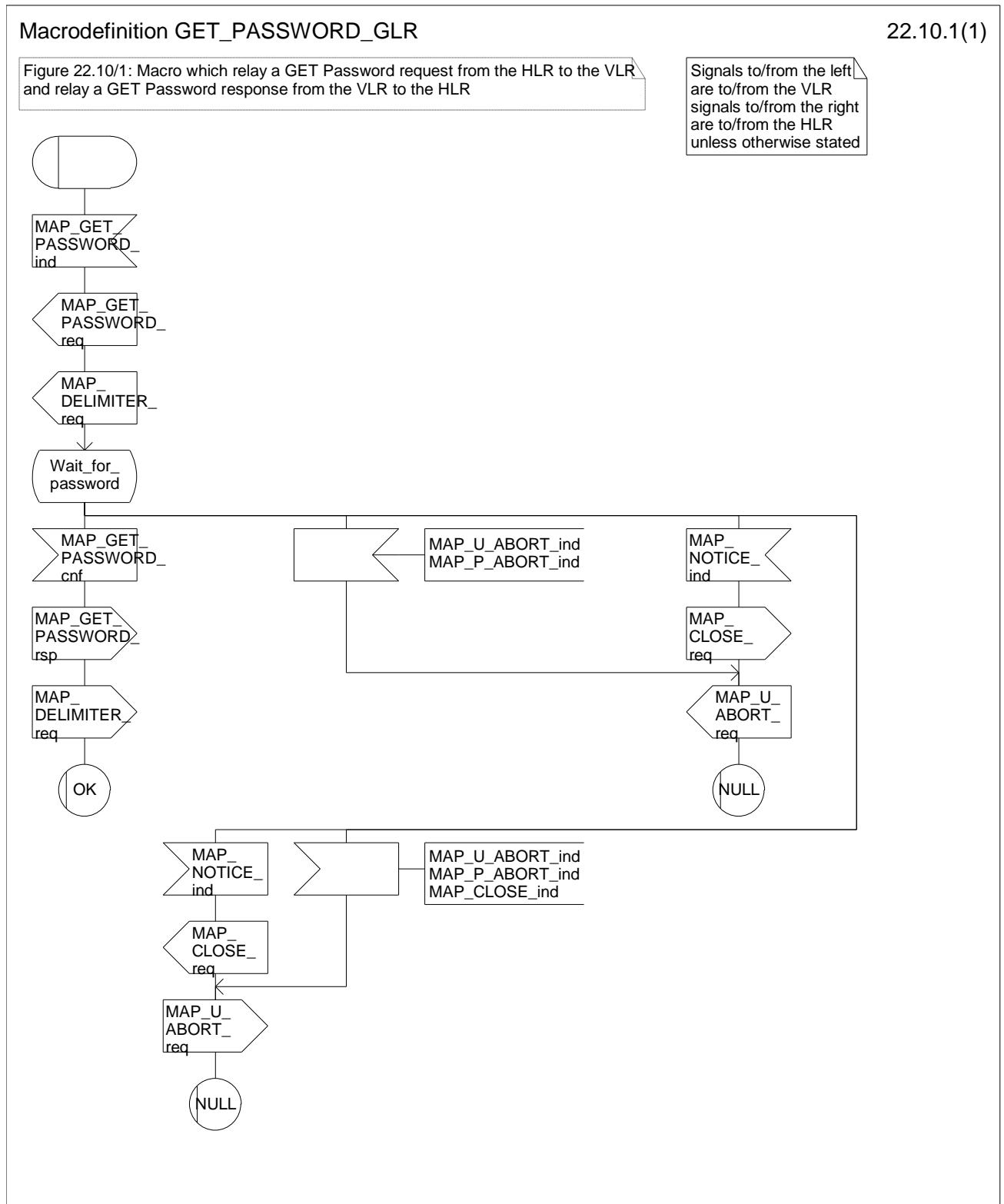


Figure 22.10/1: Macro Get_PW_GLR

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

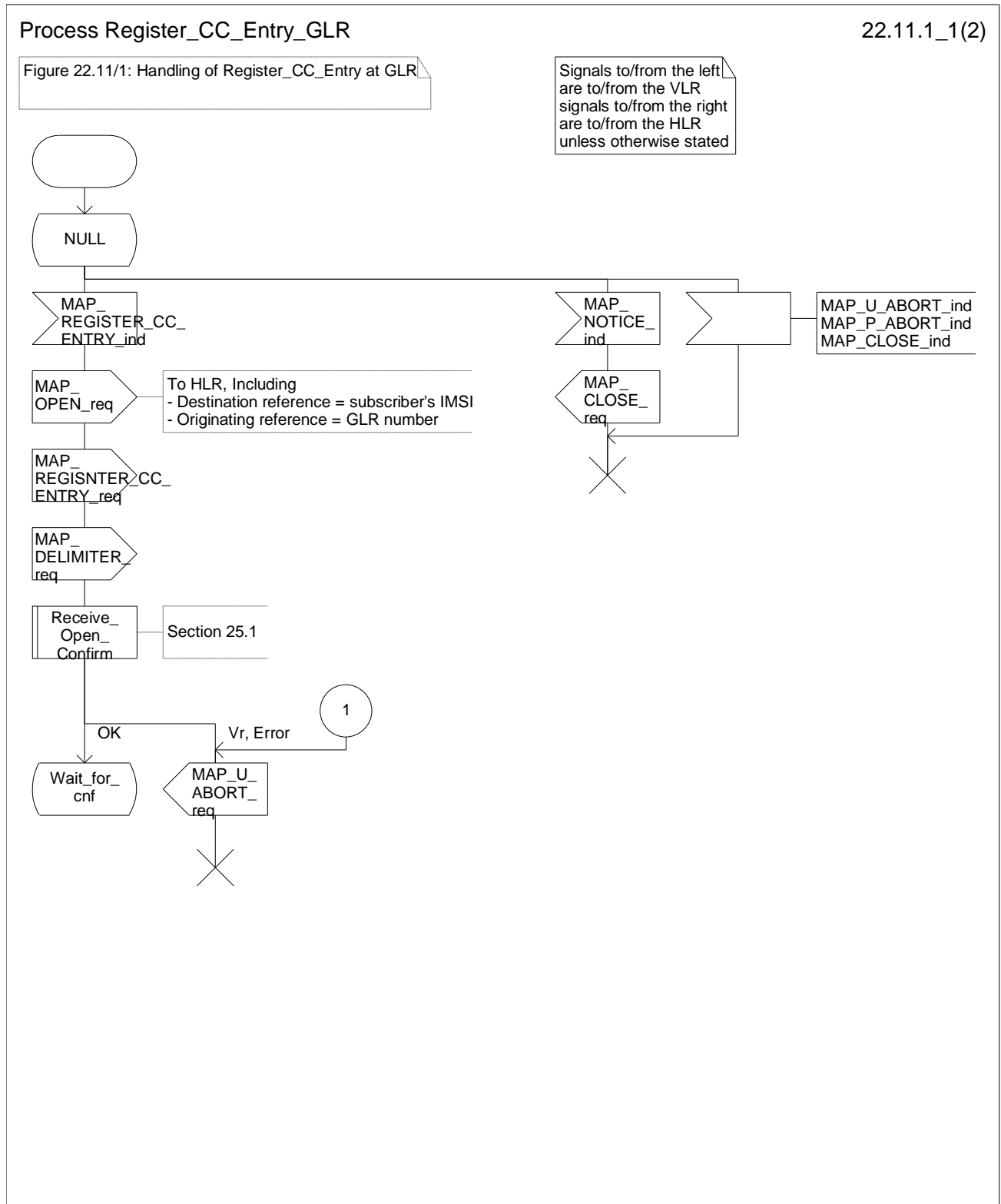


Figure 22.11/1 (sheet 1 of 2): Process Register_CC_Entry_GLR

22.12 Deactivation of a CCBS request

22.12.1 General

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

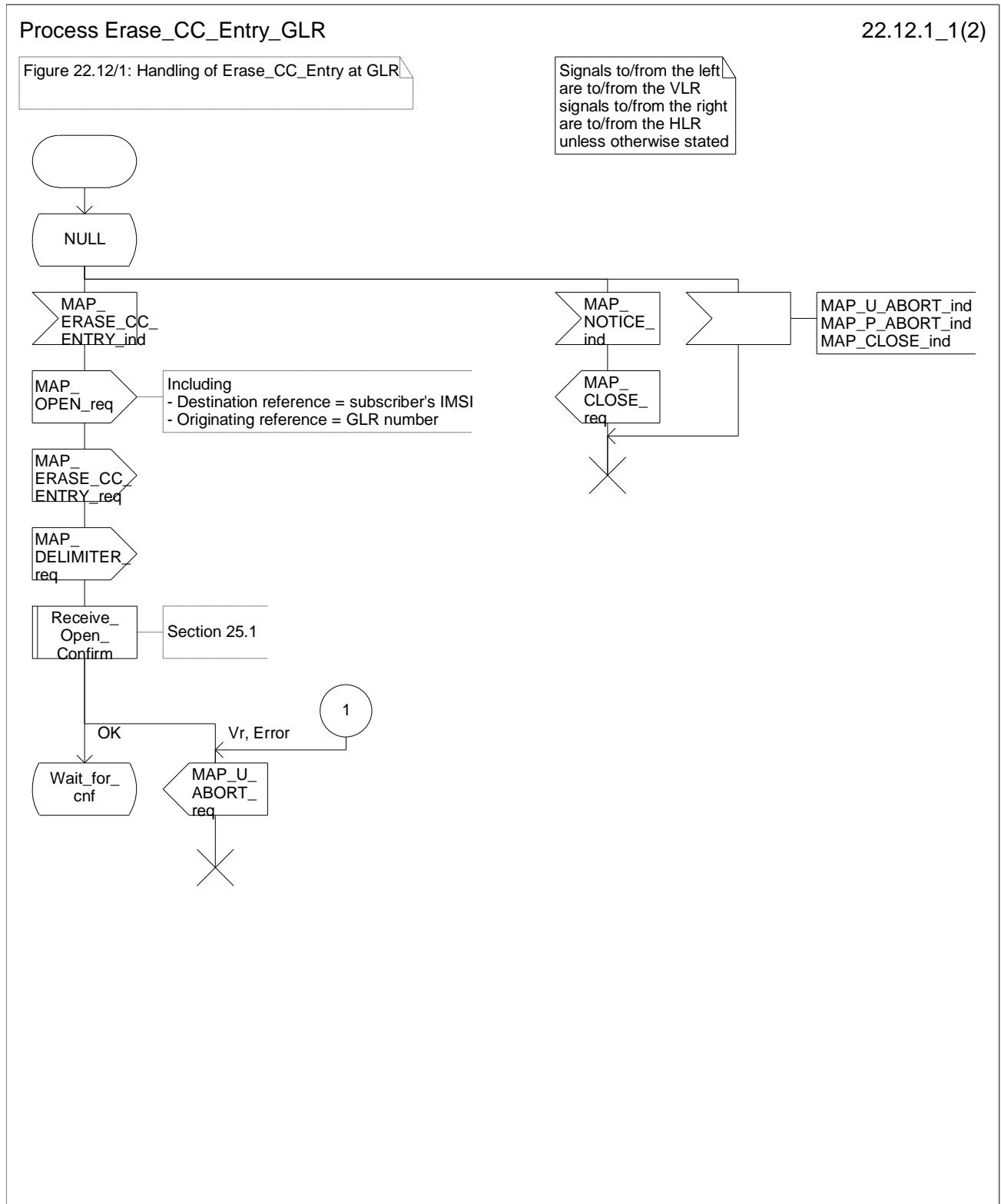


Figure 22.12/1 (sheet 1 of 2): Process Erase_CC_Entry_GLR

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

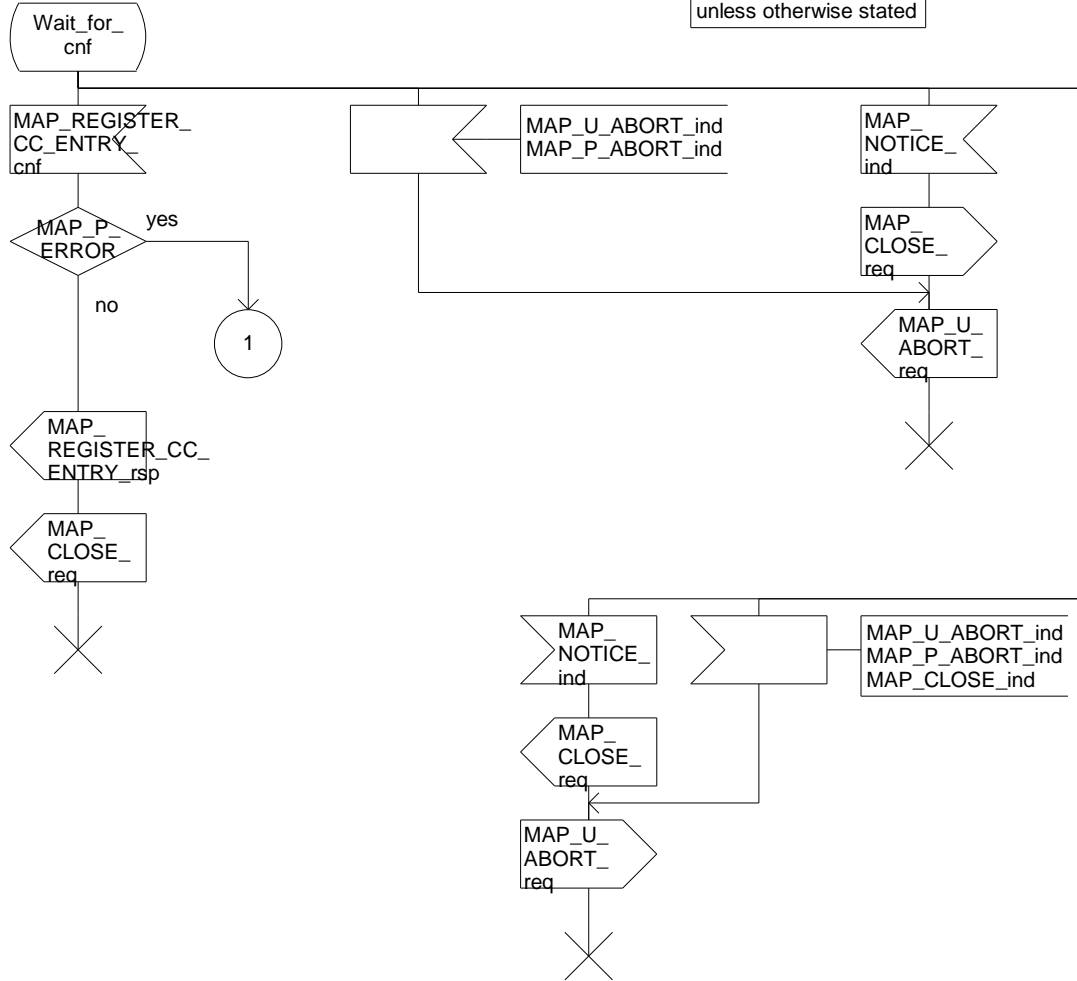


Figure 22.12/1 (sheet 2 of 2): Process Erase_CC_Entry_GLR

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

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 3GPP 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 3GPP 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.

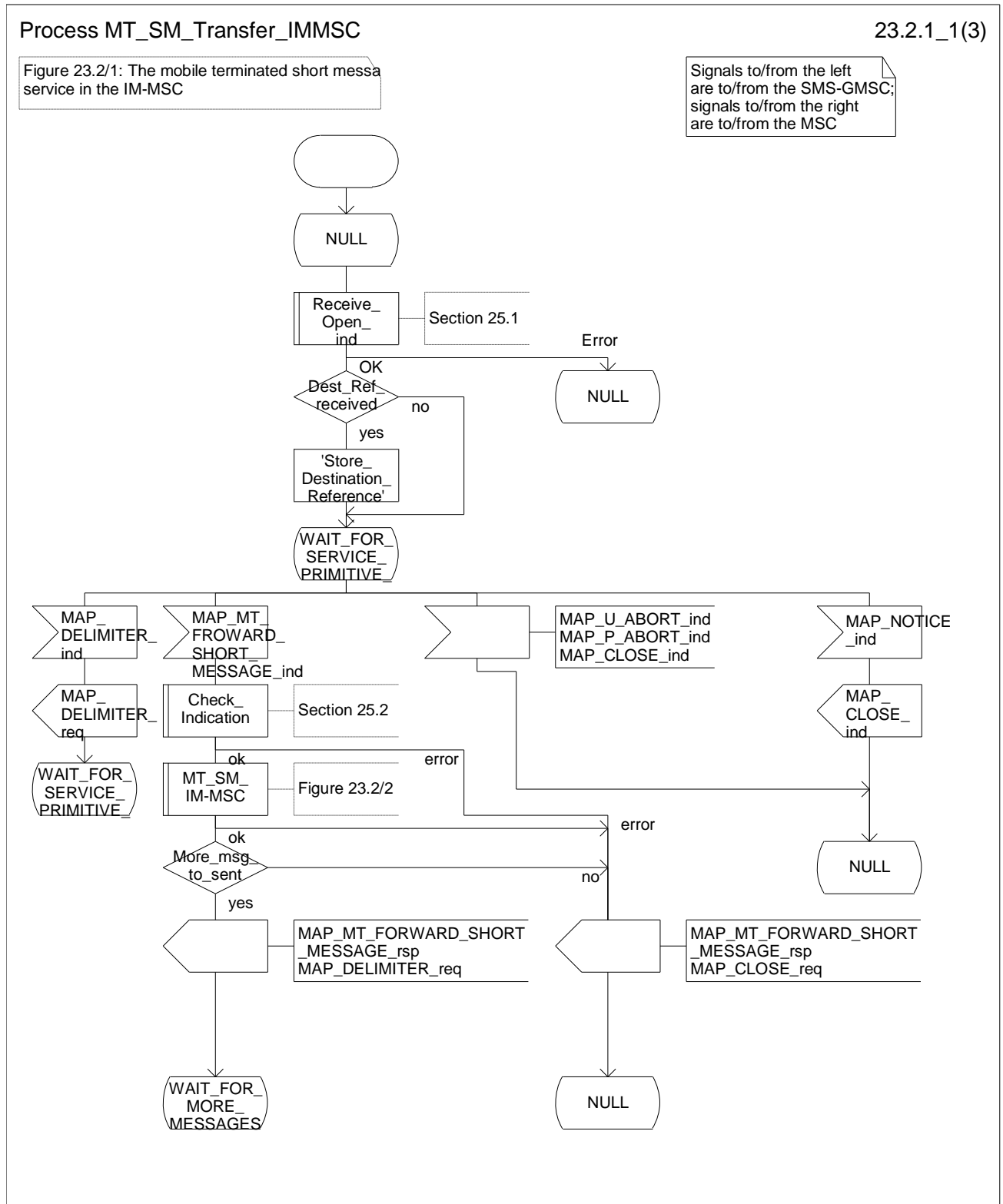


Figure 23.2/1 (sheet1 of 3): Procedure_MT_SM_Transfer_IM-MSC

Process MT_SM_Transfer_IMMSC

23.2.1_2(3)

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

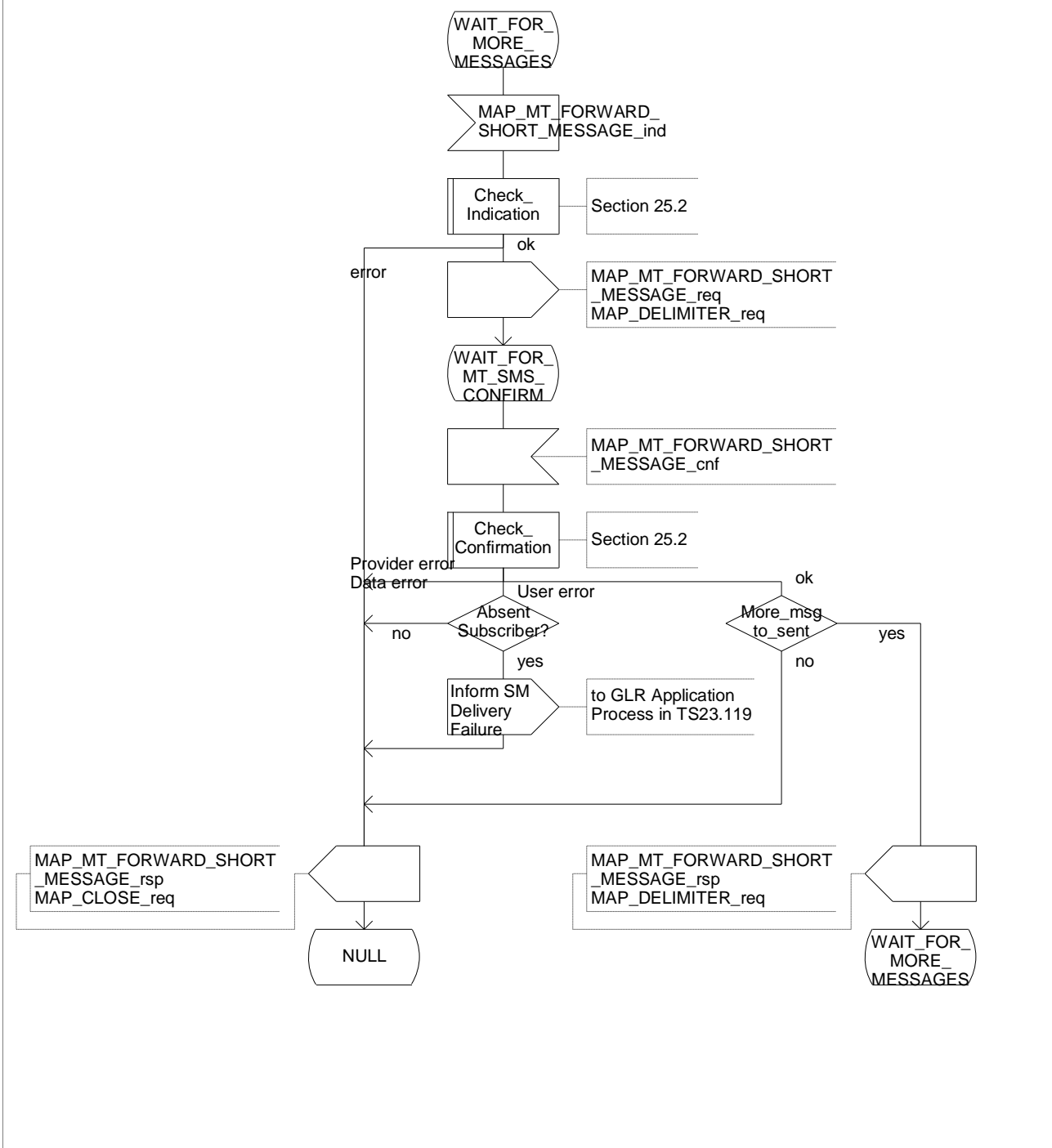


Figure 23.2/1 (sheet 2 of 3): Procedure MT_SM_Transfer_IMMSC

Process MT_SM_Transfer_IMMSC

23.2.1_3(3)

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

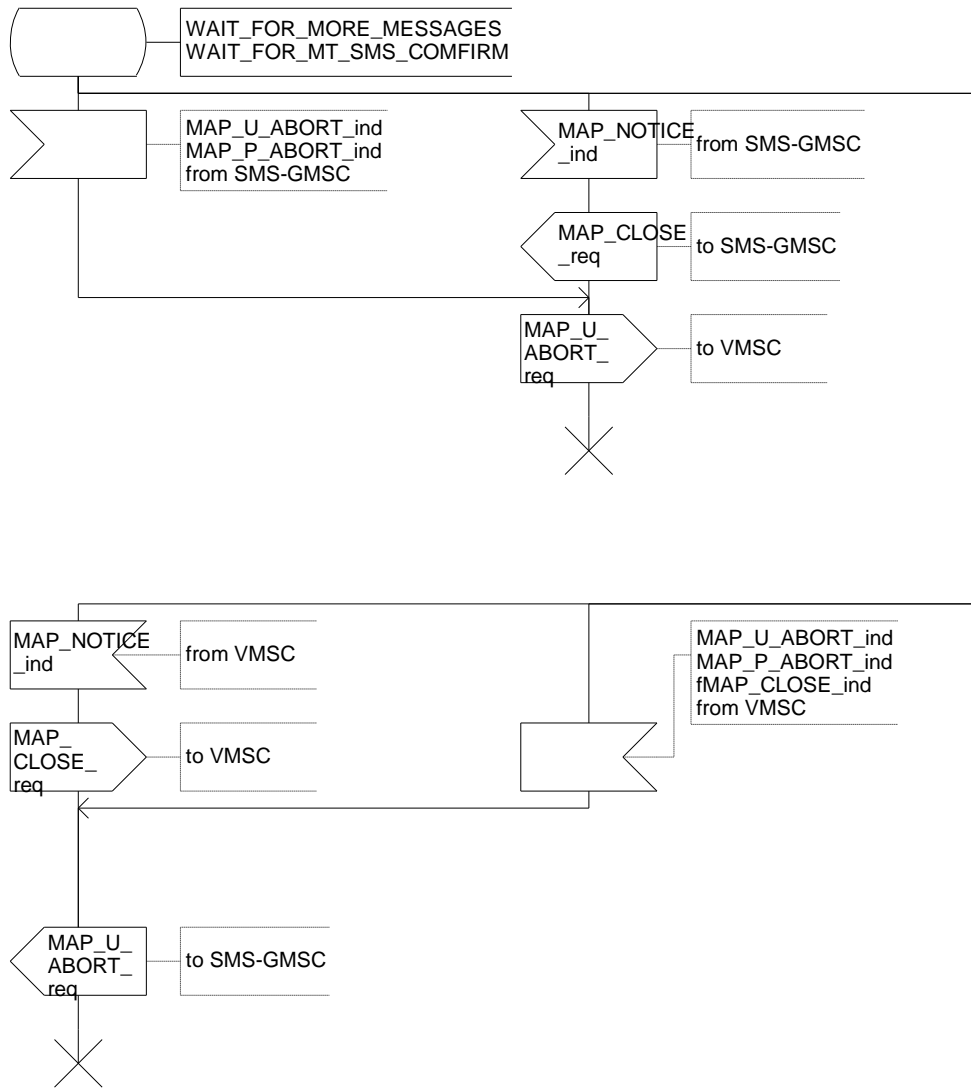


Figure 23.2/1 (sheet 3 of 3): Procedure MT_SM_Transfer_IM-MSC

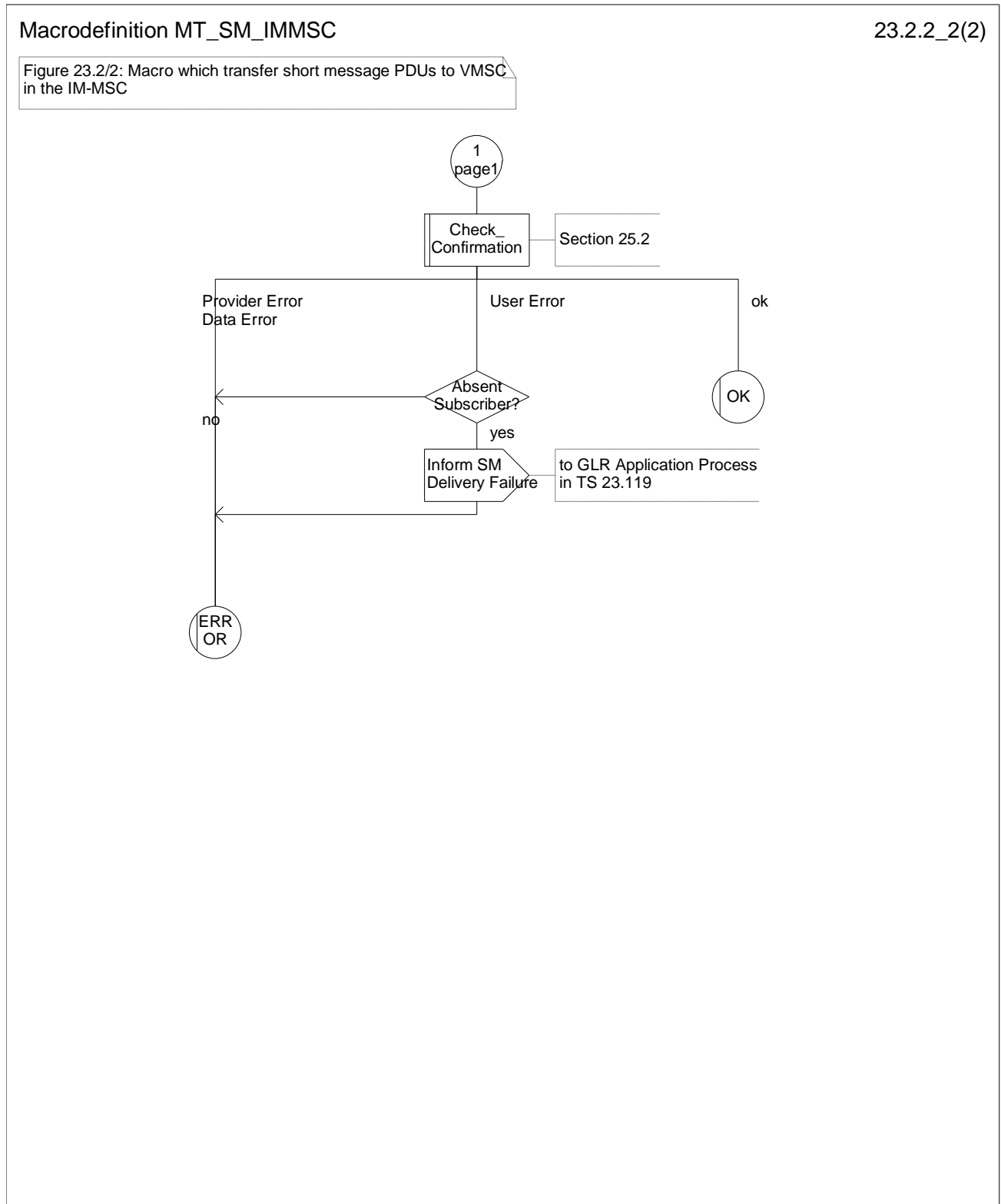


Figure 23.2/2 (sheet2 of 2): Macro MT_SM_IMMSC

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 is 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 retrieve 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.

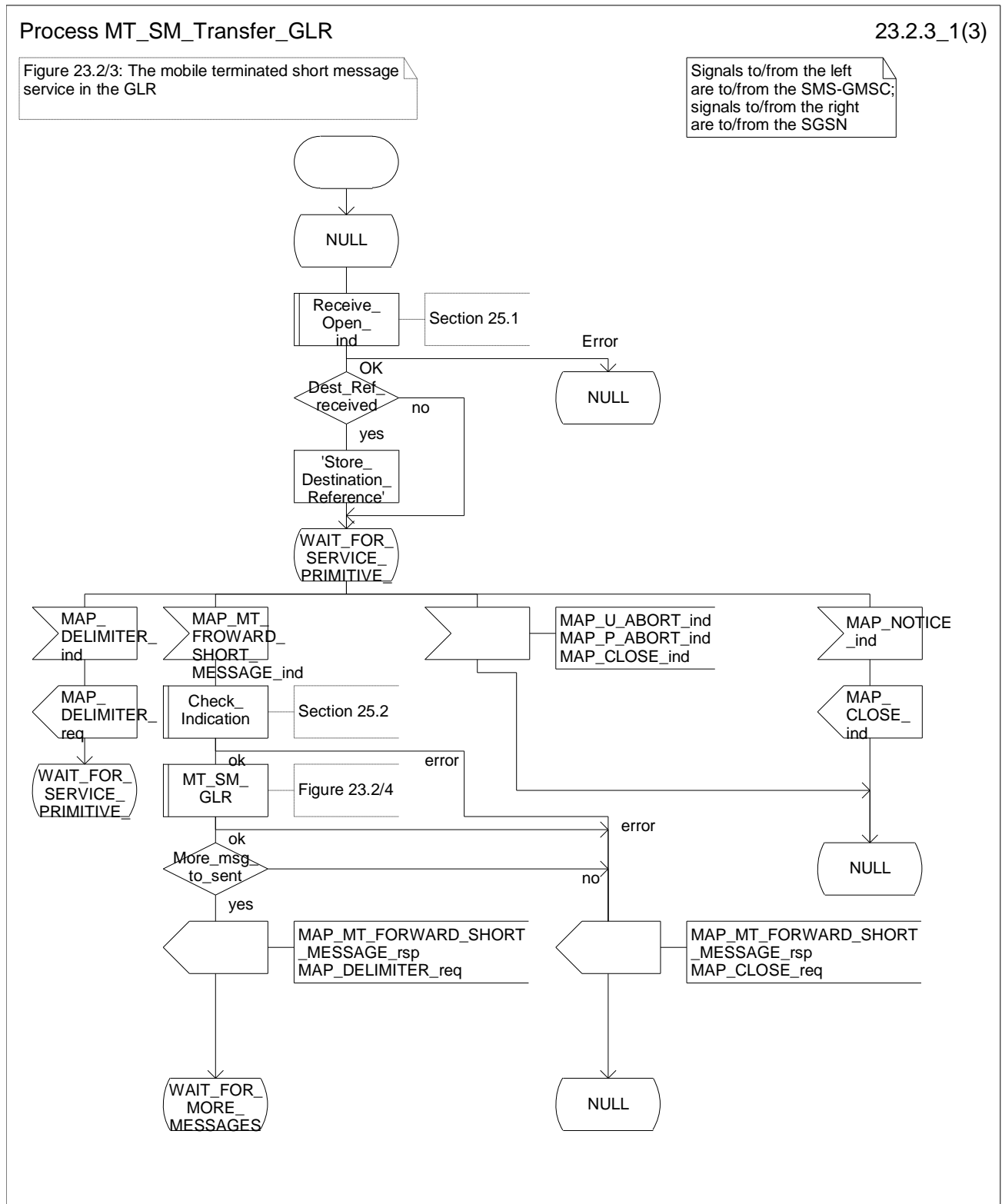


Figure 23.2/3 (sheet 1 of 3): Procedure MT_SM_Transfer_GLR

Process MT_SM_Transfer_GLR

23.2.3_2(3)

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

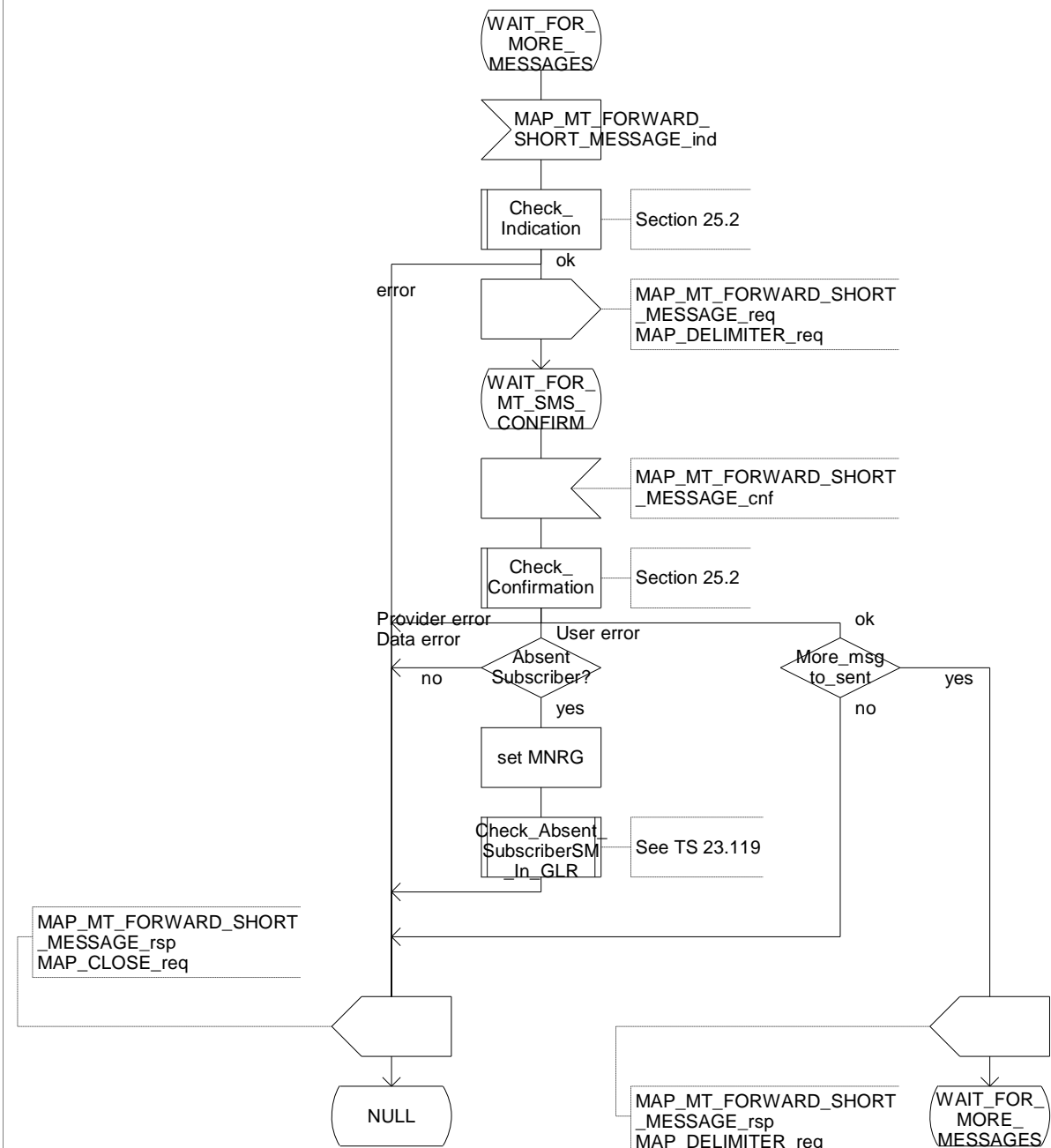


Figure 23.2/3 (sheet 2 of 3): Procedure MT_SM_Transfer_GLR

Process MT_SM_Transfer_GLR

23.2.3_3(3)

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

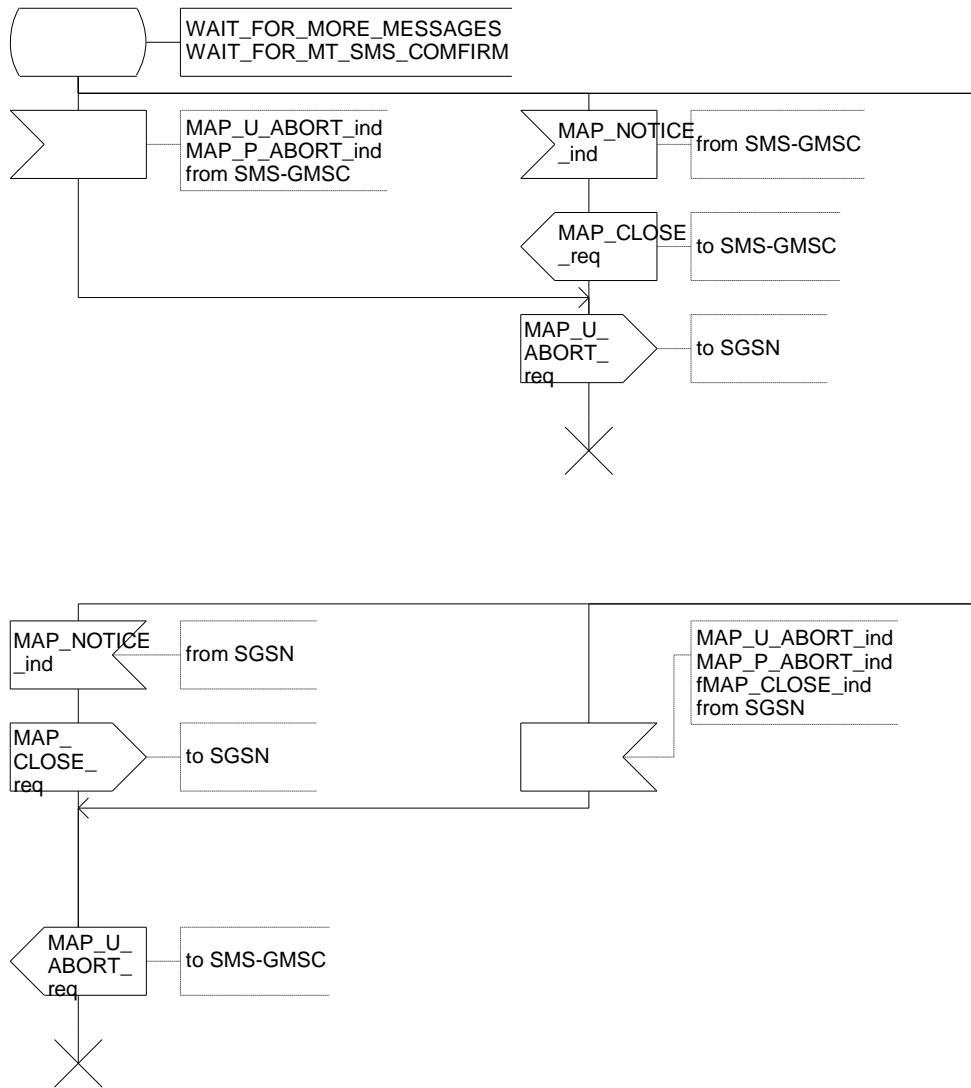


Figure 23.2/3 (sheet 3 of 3): Procedure MT_SM_Transfer_GLR

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

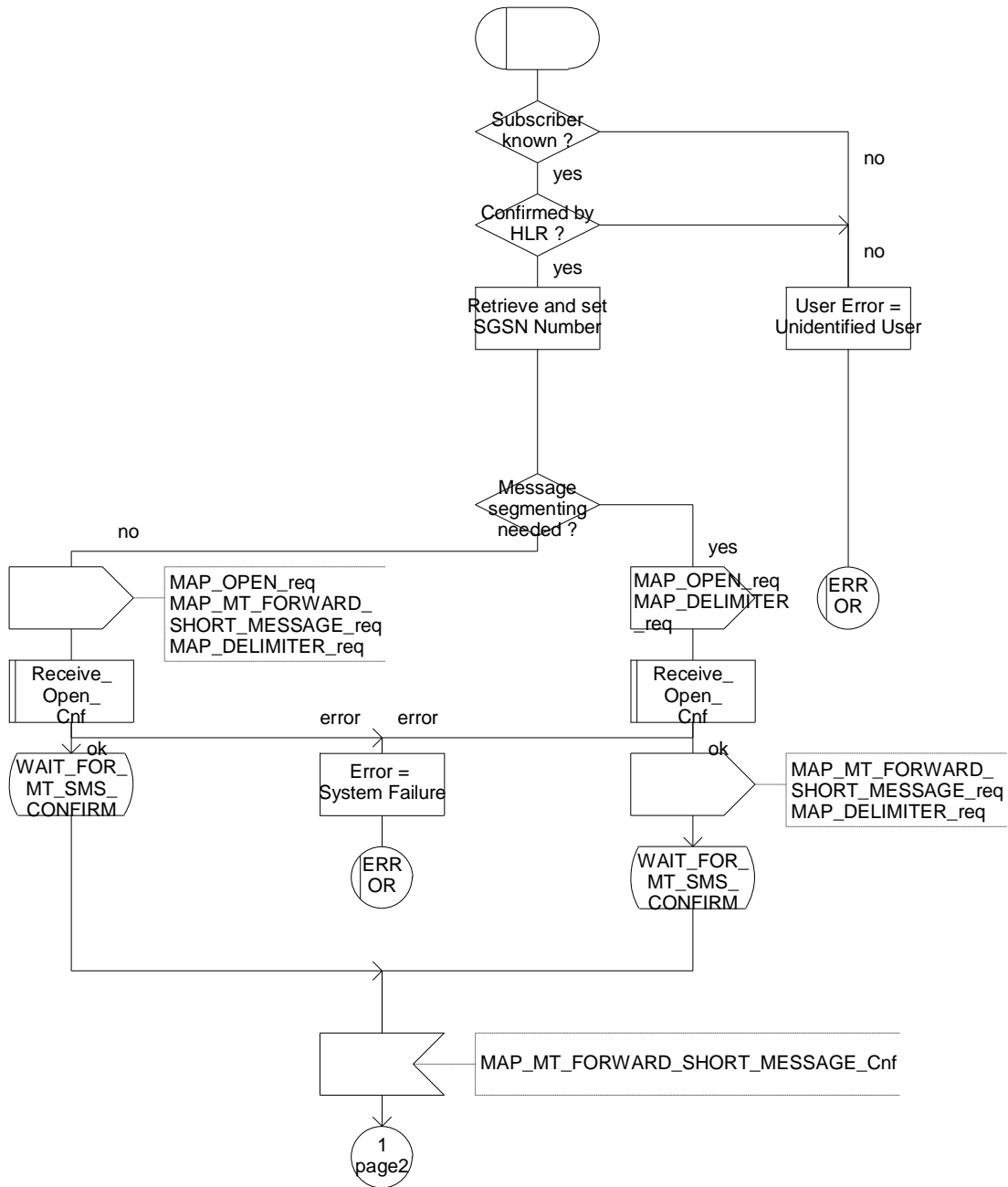


Figure 23.2/4 (sheet1 of 2): Macro MT_SM_GLR

Macrodefinition MT_SM_GLR

23.2.4_2(2)

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

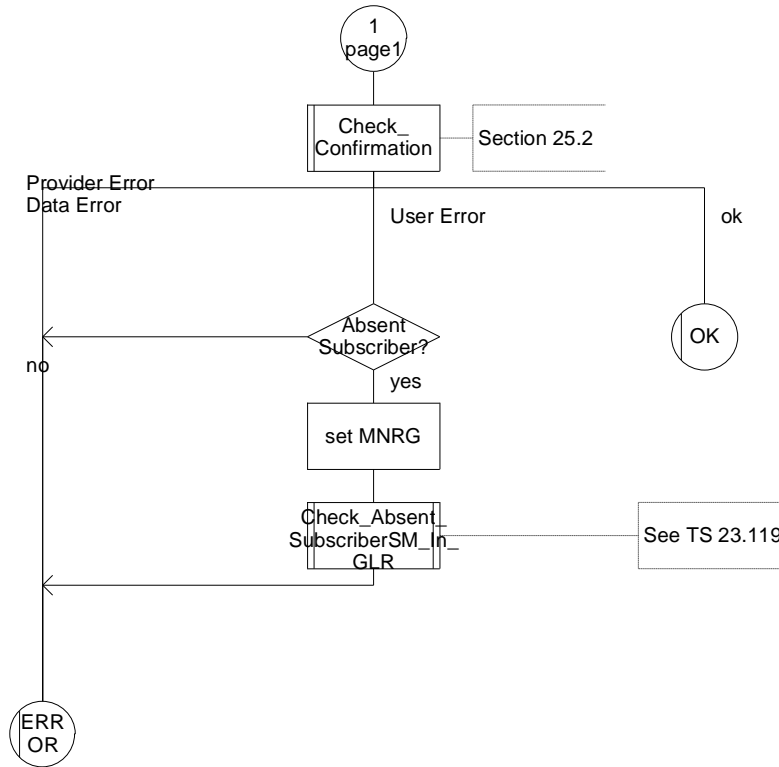


Figure 23.2/4 (sheet2 of 2): Macro MT_SM_GLR

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

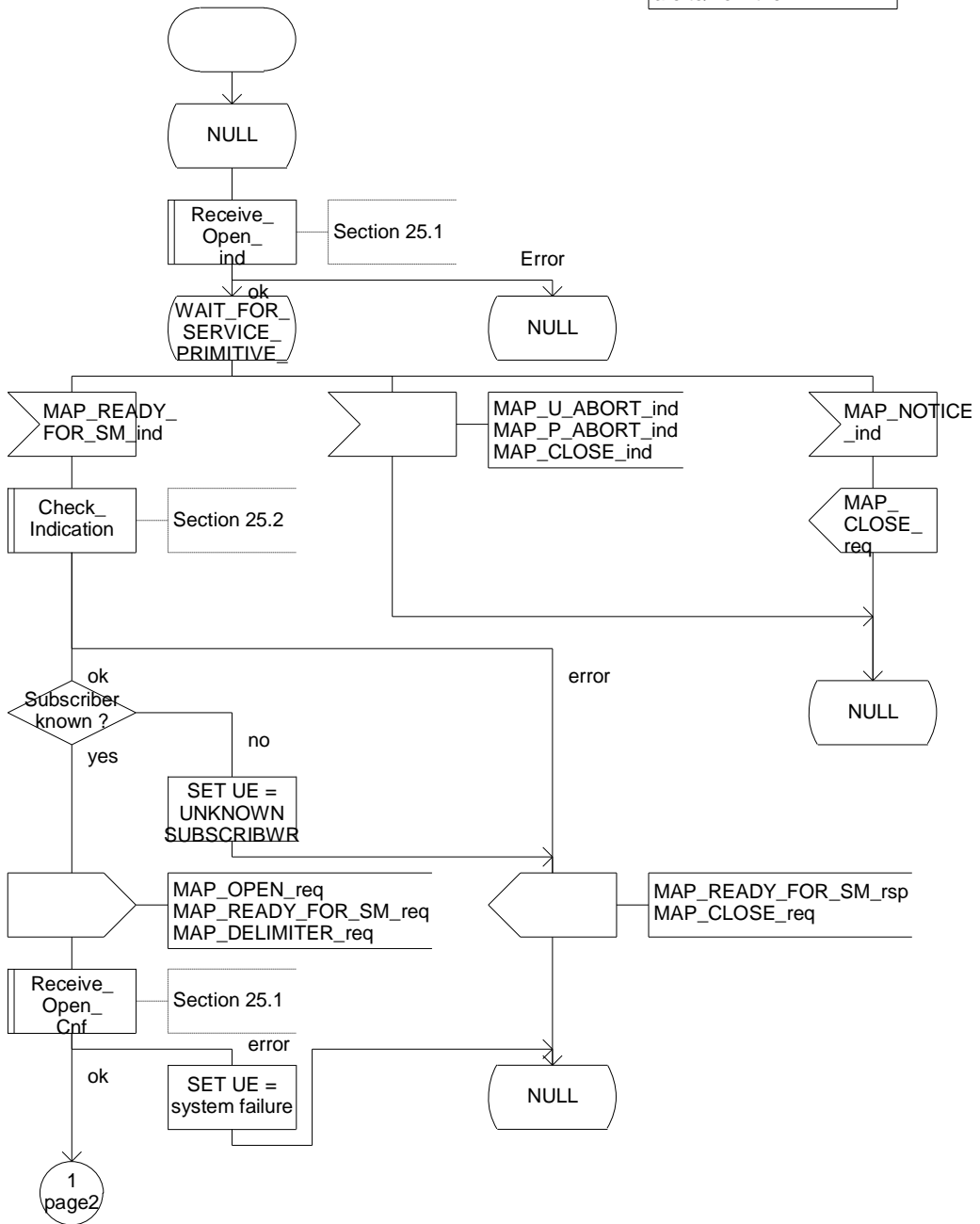


Figure 23.3/1 (sheet 1 of 2): Process SM_Alert_GLR

Process SM_Alert_GLR

23.3.1_2(2)

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

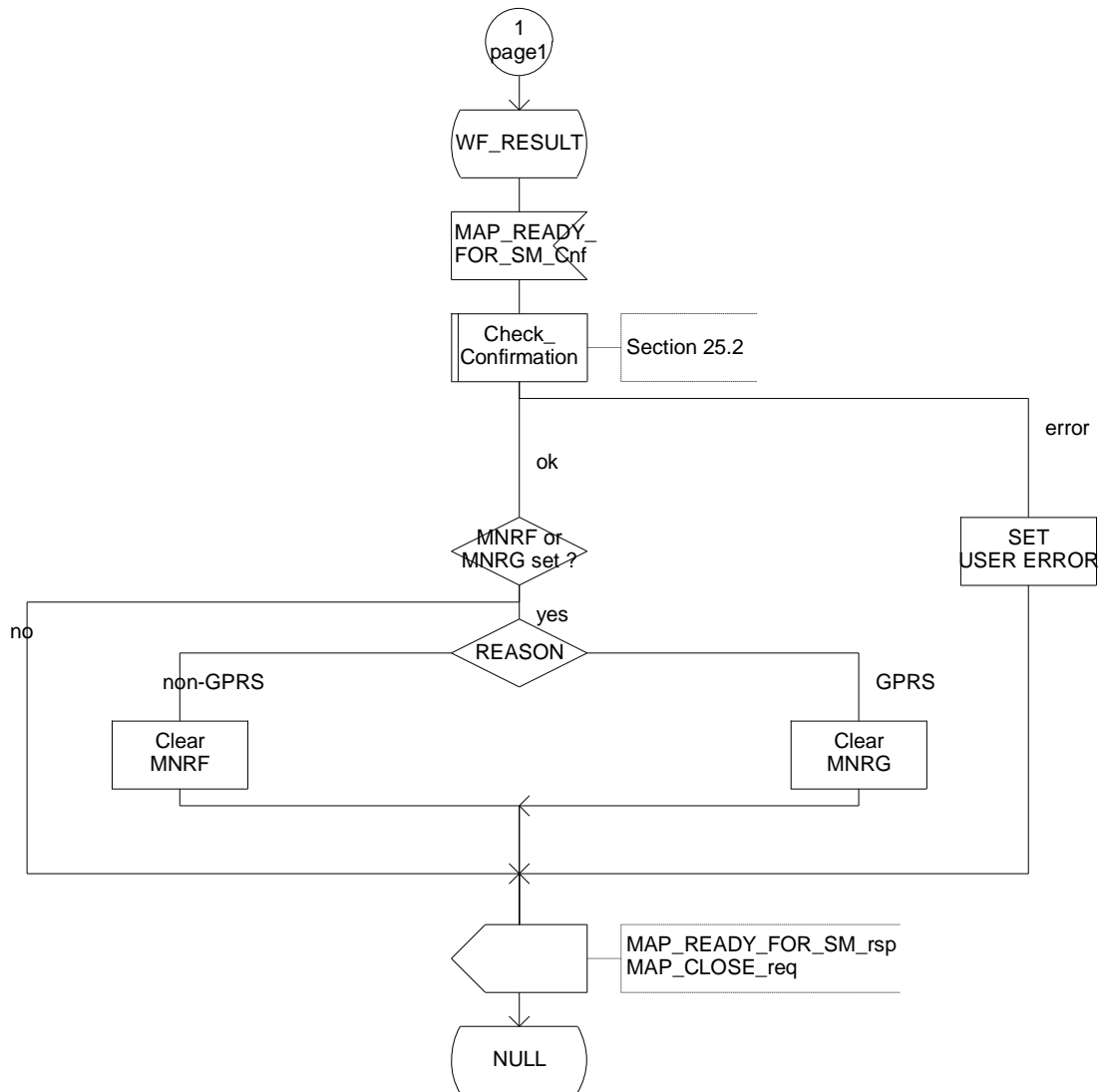


Figure 23.3/1 (sheet 2 of 2): Process SM_Alert_GLR

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 3GPP 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

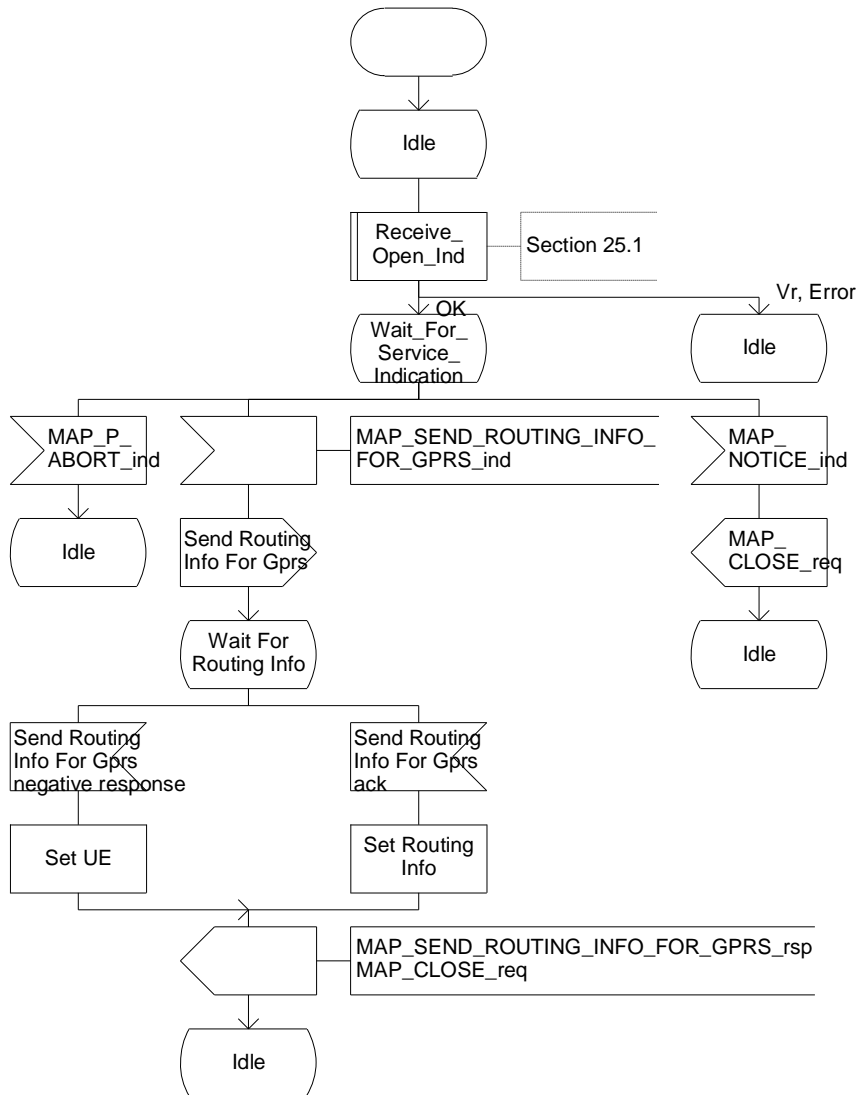


Figure 24.2/1: Process Send Routing Info For Gprs_GLR

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 routing information using a MAP_SEND_ROUTING_INFO_FOR_GPRS service request, and
- invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request.

If the dialogue opening is successful, the MAP process waits for a response from the 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 confirmation.

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 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 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

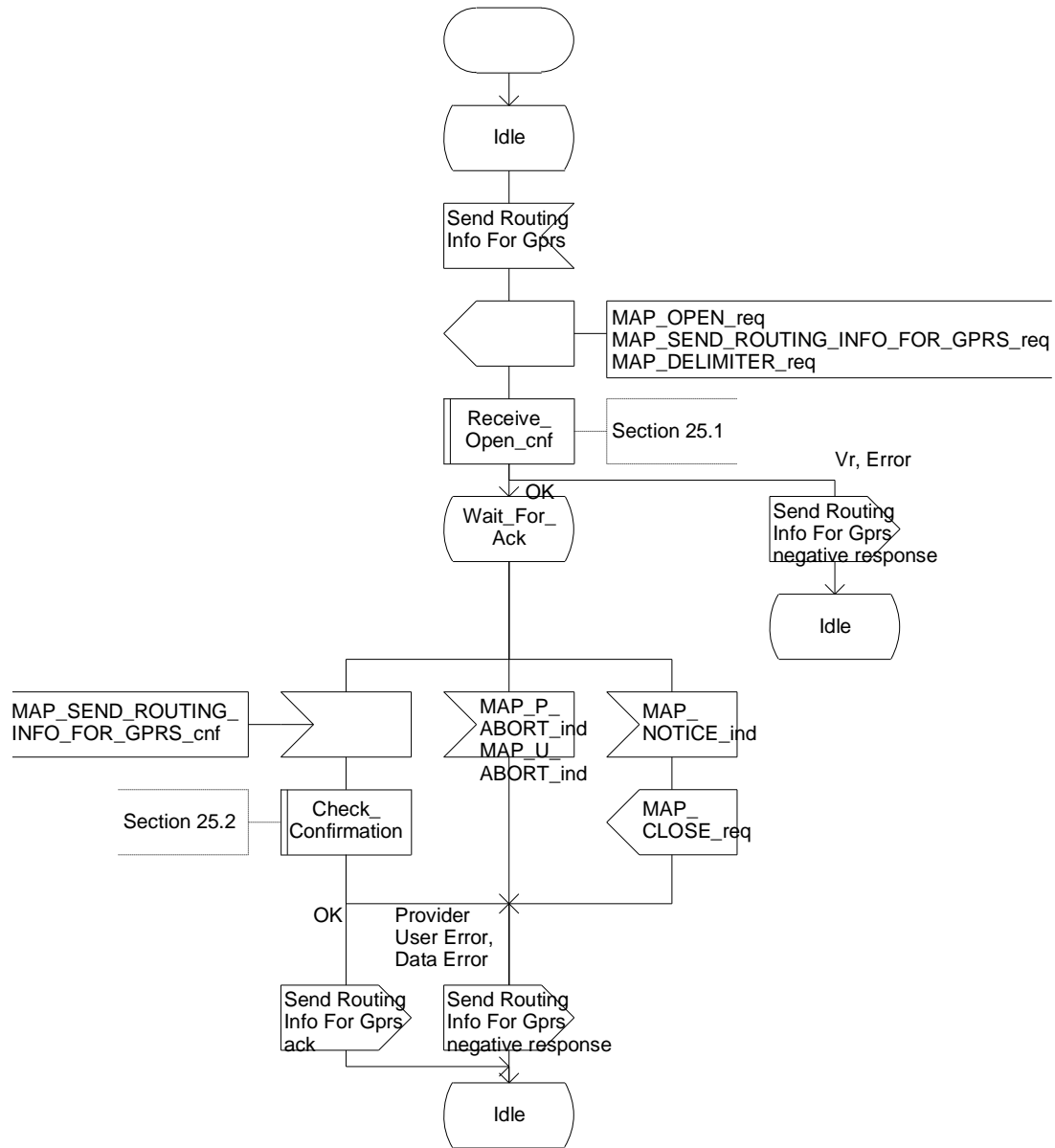


Figure 24.2/2: Process Send_Routing_Info_For_Gprs_IM-GSN

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 subscriber 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.

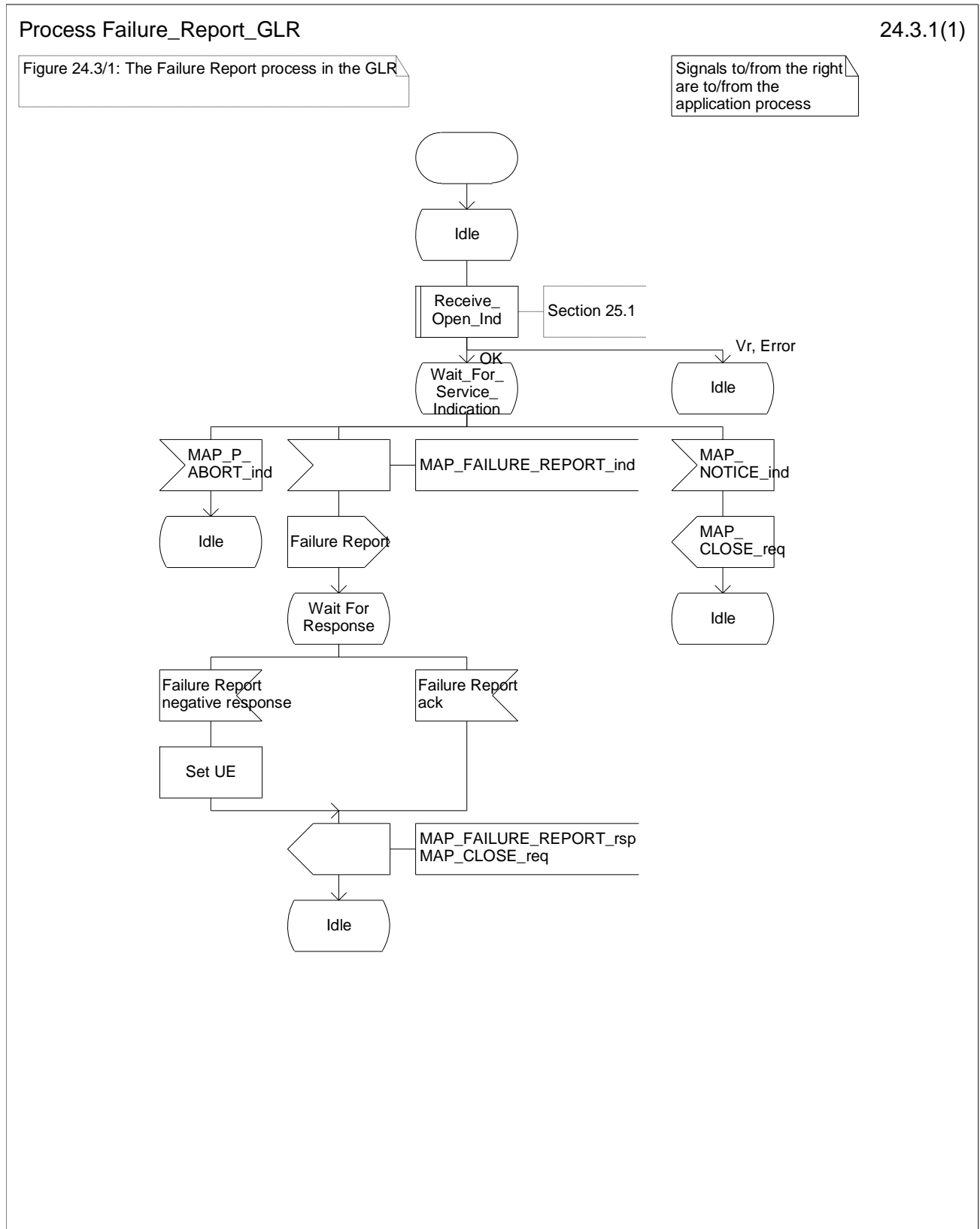


Figure 24.3/1: Process Failure_Report_GLR

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 confirmation.

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

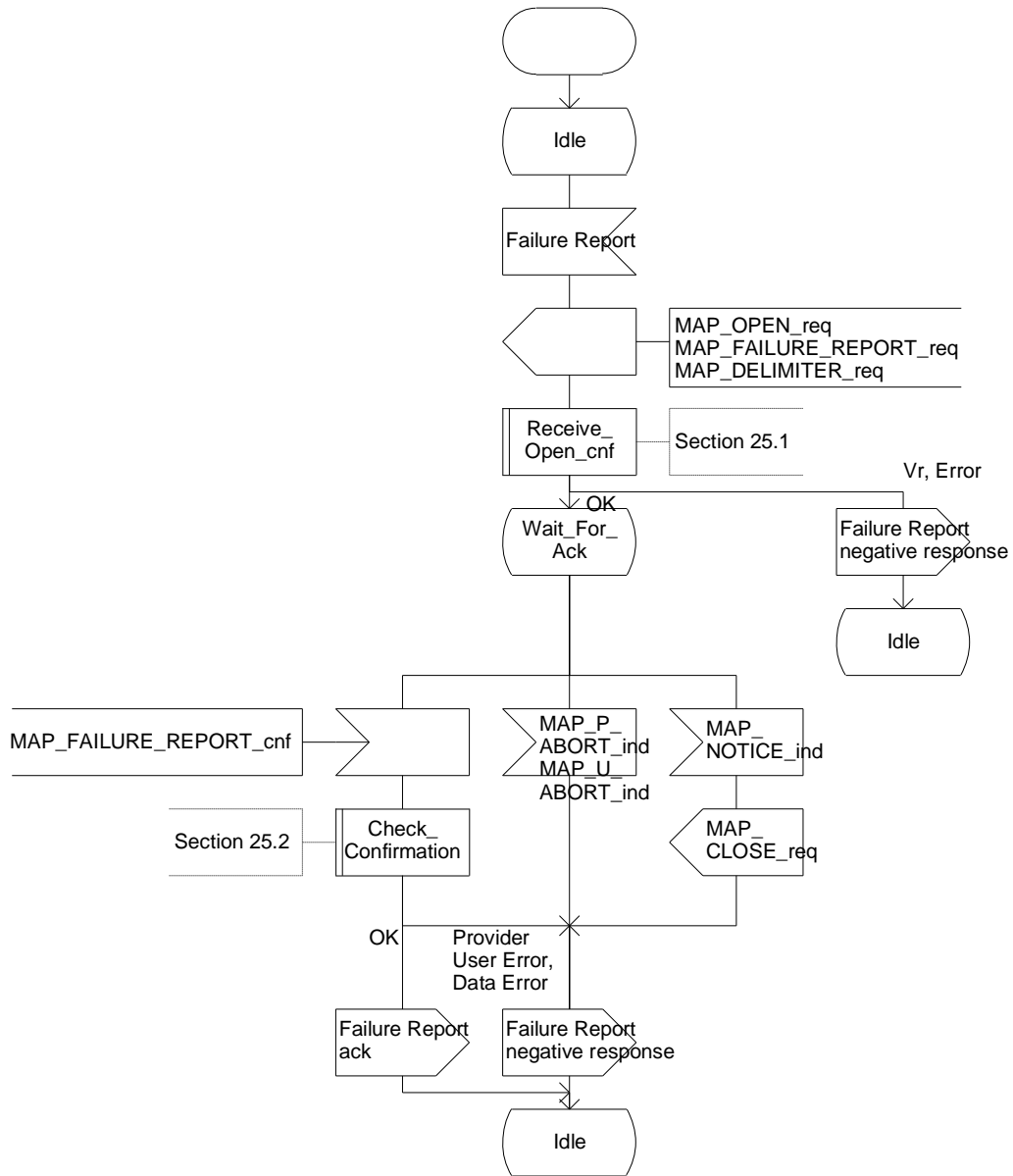


Figure 24.3/2: Process Failure_Report_IM-GSN

25 General macro description

25.1 MAP open macros

This subclause refers 3GPP TS 29.002.

25.2 Macros to check the content of indication and confirmation primitives

This subclause refers 3GPP 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.

Process Obtain_Authent_Sets_GLR

25.3.1_1(2)

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

Left from/to VLR
Right from/to HLR

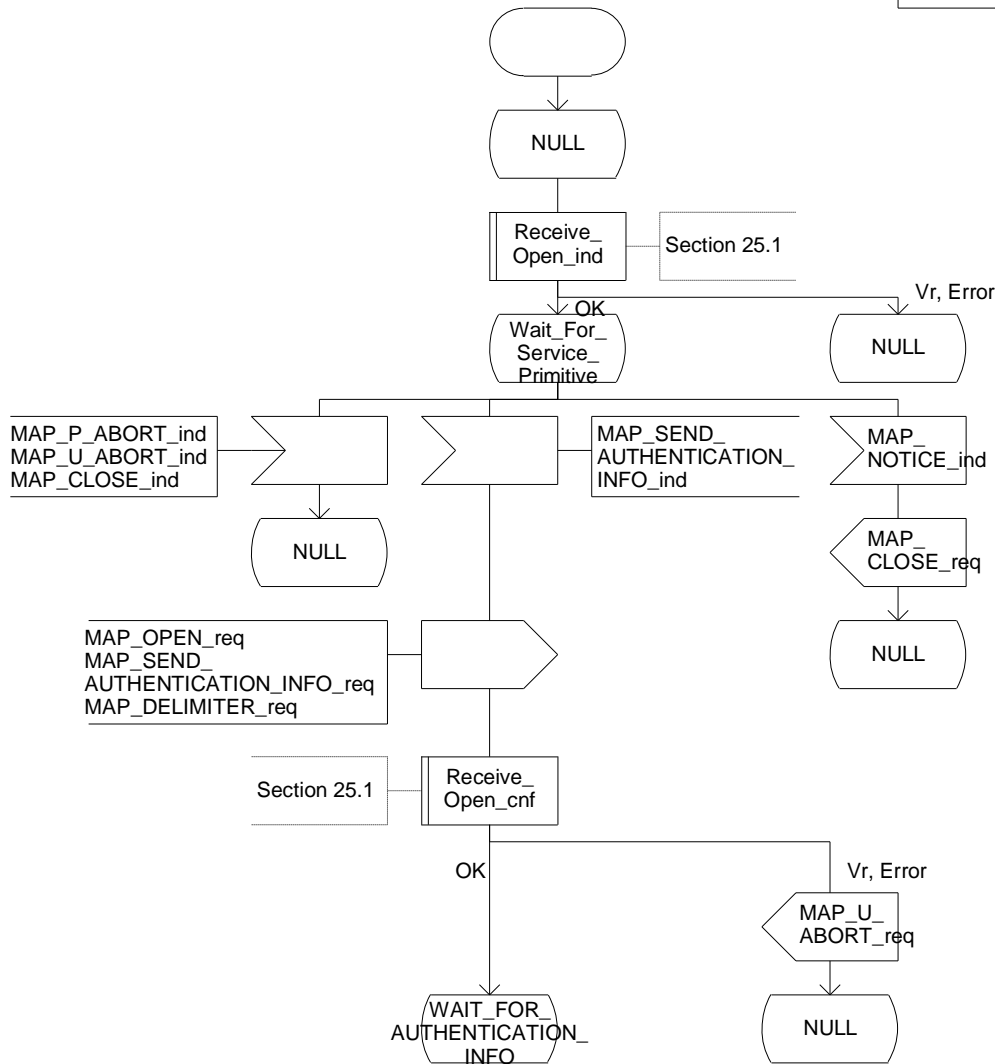


Figure 25.3.1/1 (sheet 1 of 2): Process Obtain_Authentication_Sets_GLR

Process Obtain_Authent_Sets_GLR

25.3.1_2(2)

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

Left from/to VLR
Right from/to HLR

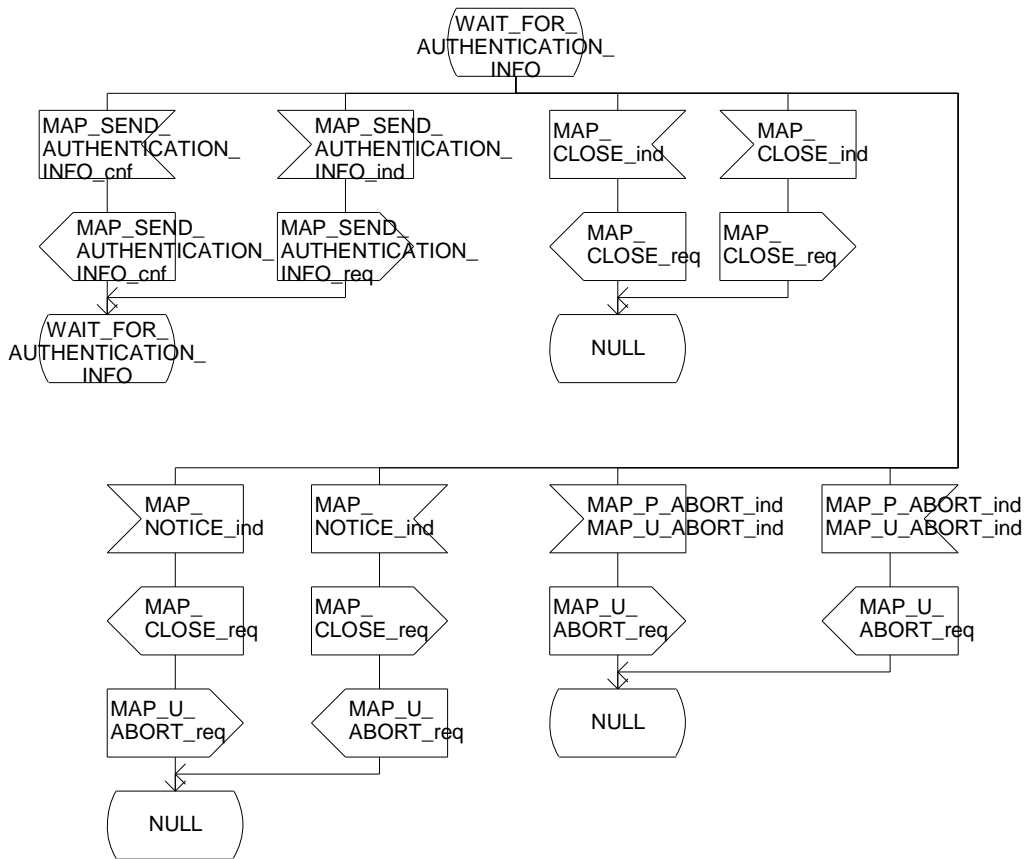


Figure 25.3.1/2 (sheet 2 of 2): Process Obtain_Authentication_Sets_GLR

25.3.2 Process Authentication_Failure_Report_GLR

This process is initiated by the GLR to notify a subscriber's HLR about the occurrence of an authentication failure in the VLR or SGSN. The process is described in figure 25.3/2.

Process Authentication_Failure_Report_GLR

25.3.2_1(2)

Figure 25.3.2/1: The Process to notify authentication failure report from the VLR/SGSN to the HLR via the GLR

Left from/to VLR or SGSN
Right from/to HLR

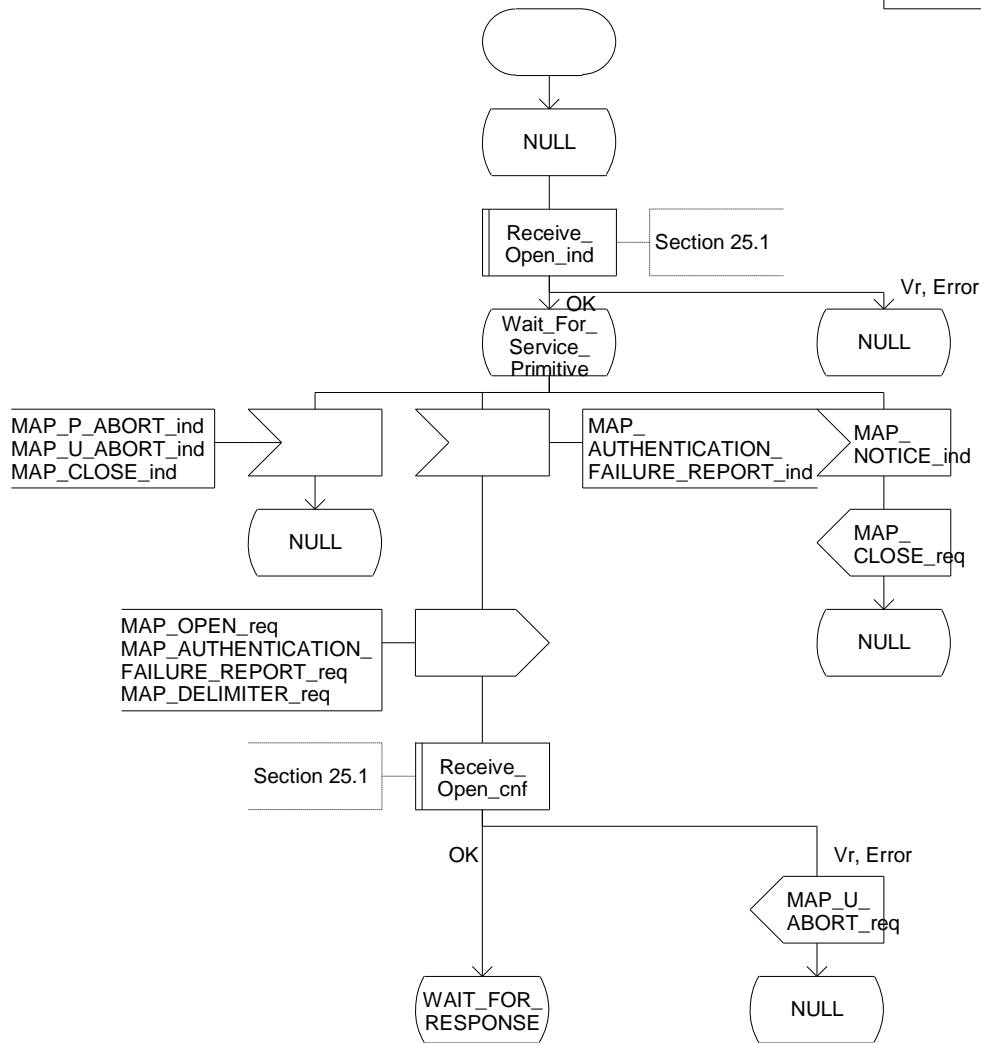


Figure 25.3.2/1 (sheet 1 of 2): Process Authentication_Failure_Report_GLR

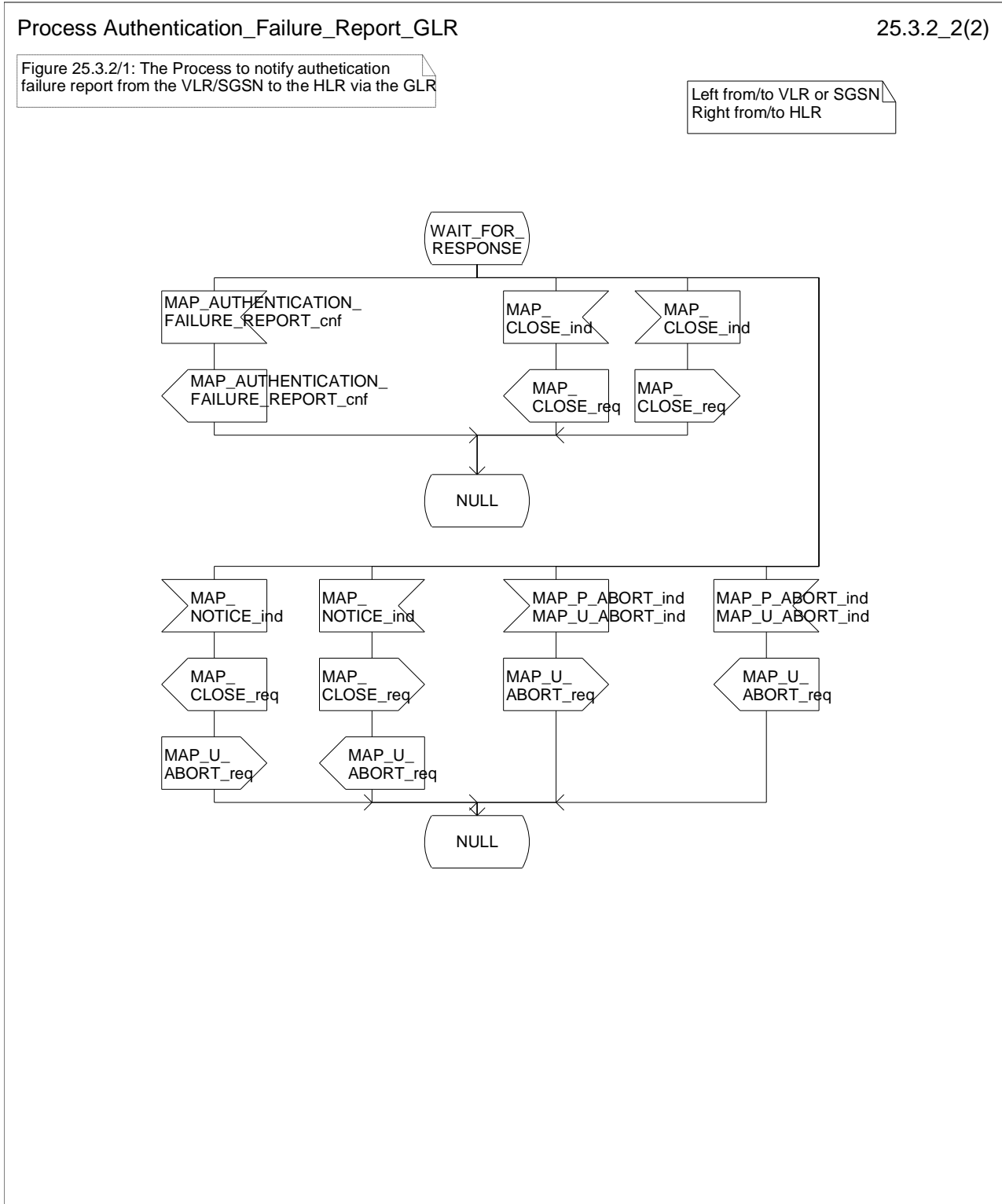


Figure 25.3.2/2 (sheet 2 of 2): Process Authentication_Failure_Report_GLR

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

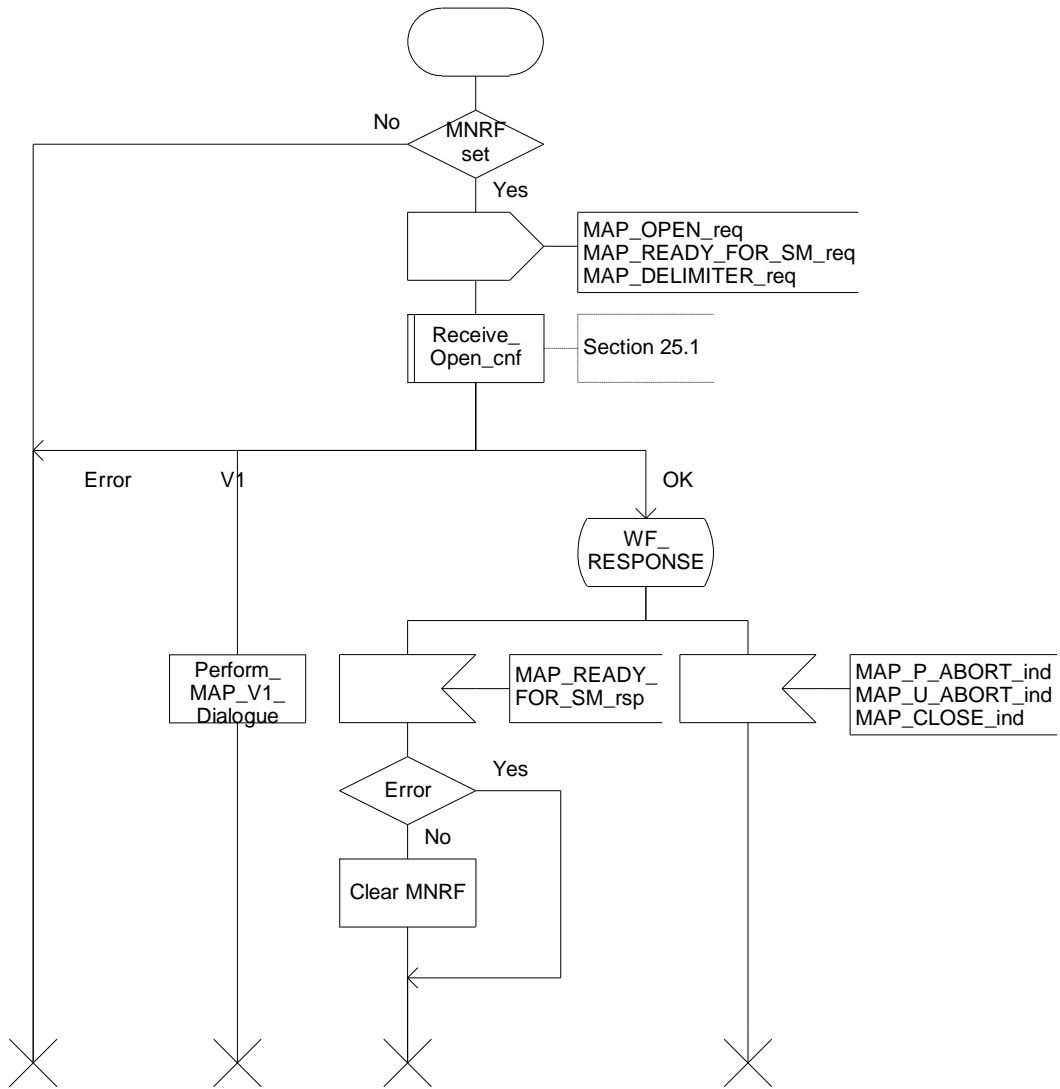


Figure 25.4/1: Process Subscriber_Present_GLR_AS_VLR

25.4.2 The Mobile Subscriber is present

When GLR receives 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.

Process Subscriber_Present_GLR_AS_SGSN

25.4.2(1)

Figure 25.4/2: The short message alert process in the GLR for mobile present situation

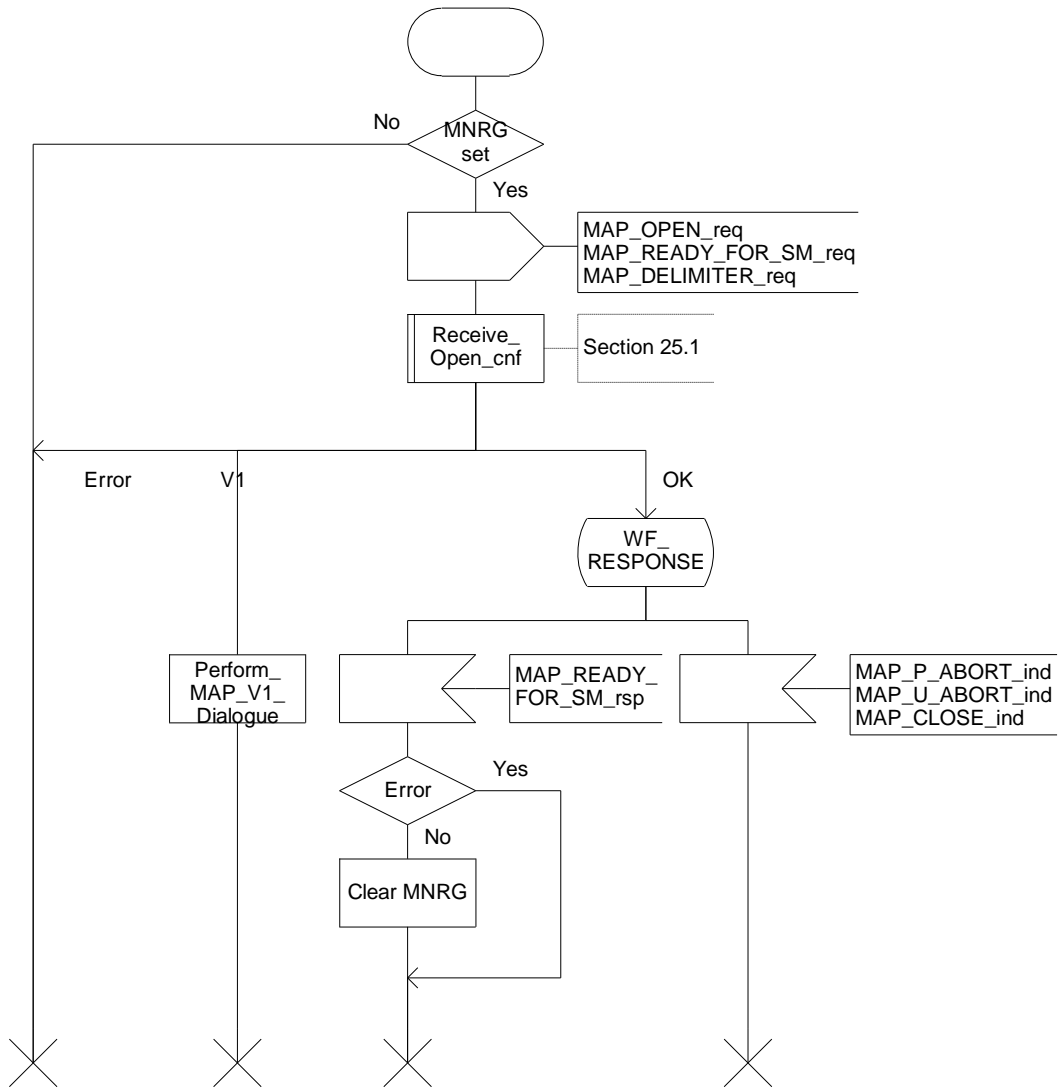


Figure 25.4/2: Process Subscriber_Present_GLR_AS_SGSN

Annex A (informative): Change history

Change history						
TSG CN#	Spec	Version	CR	<Phase>	New Version	Subject/Comment
CN#07	29.120	2.0.0		R99	3.0.0	Approved at TSGN#07
CN#09	29.120	3.0.0	001r1	R99	3.1.0	Changes to support Authentication Failure Report for GLR
CN#09	29.120	3.1.0	002	Rel-4	4.0.0	Changes to support secure transport MAP for GLR
CN#16	29.120	4.0.0		Rel-5	5.0.0	Rel-5 created after CN#16
CN#26	29.120	5.0.0		Rel-6	6.0.0	Rel-6 created after CN#26
CT#36	29.120	6.0.0		Rel-7	7.0.0	Upgraded unchanged from Rel-6
CT#42	29.120	7.0.0		Rel-8	8.0.0	Upgraded unchanged from Rel-7
2009-12	29.120	8.0.0	-	Rel-9	9.0.0	Update to Rel-9 version (MCC)
2011-03	29.120	9.0.0	-	Rel-10	10.0.0	Update to Rel-10 version (MCC)
2012-09	29.120	10.0.0	-	Rel-11	11.0.0	Update to Rel-11 version (MCC)