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Annex A (informative): Cross-reference for abstract syntaxes of MAP 853

Annex B (informative): Fully expanded ASN.1 sources for abstract syntaxes of MAP 998

B.1 Fully Expanded ASN.1 Source of MAP-Protocol/TCAPMessages 998

B.2 Fully Expanded ASN.1 Source of MAP-DialogueInformation 1049

Annex C (informative): Formal protocol incompatibilities between versions 1 & 2 of MAP 1053

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Foreword

This Technical Specification (TS) has been produced by the Special Mobile Group (SMG).

The present document specifies the Mobile Application Part (MAP), the requirements for the signalling system and procedures within the Digital cellular telecommunications system (Phase 2/Phase2+) at application level. The contents of the present document are subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document, it will be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 6.x.y

where:

- 6 indicates GSM Release 1997 of Phase 2+,
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

It is necessary to transfer between entities of a Public Land Mobile Network (PLMN) information specific to the PLMN in order to deal with the specific behaviour of roaming Mobile Stations (MS)s. The Signalling System No. 7 specified by CCITT is used to transfer this information.

The present document describes the requirements for the signalling system and the procedures needed at the application level in order to fulfil these signalling needs.

Clauses 1 to 6 are related to general aspects such as terminology, mobile network configuration and other protocols required by MAP.

MAP consists of a set of MAP services which are provided to MAP service-users by a MAP service-provider.

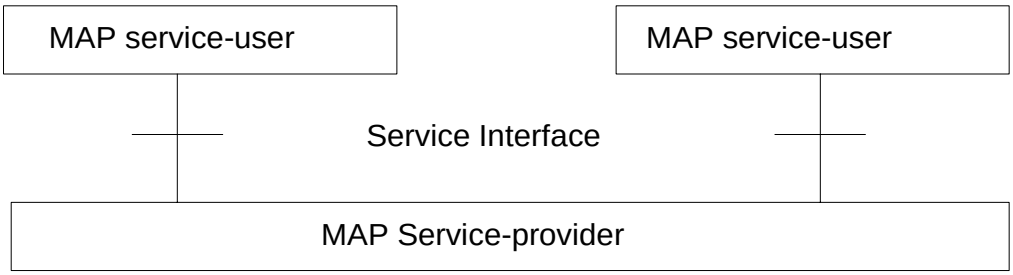

Figure 1.1/1: Modelling principles

Clauses 7 to 12 of the present document describe the MAP services.

Clauses 14 to 17 define the MAP protocol specification and the behaviour of service provider (protocol elements to be used to provide MAP services, mapping on to TC service primitives, abstract syntaxes, etc.).

Clauses 18 to 25 describe the MAP user procedures which make use of MAP services.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1997 document, references to GSM documents are for Release 1997 versions (version 6.x.y).

[1] GSM 01.04 : "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.01: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 02.02: "Digital cellular telecommunications system (Phase 2+); Bearer Services (BS) Supported by a GSM Public Land Mobile Network (PLMN)".

[4] GSM 02.03: "Digital cellular telecommunications system (Phase 2+); Teleservices Supported by a GSM Public Land Mobile Network (PLMN)".

[5] GSM 02.04: "Digital cellular telecommunications system (Phase 2+); General on supplementary services".

[6] GSM 02.09: "Digital cellular telecommunications system (Phase 2+); Security aspects".

[7] GSM 02.16: "Digital cellular telecommunications system (Phase 2+); International Mobile station Equipment Identities (IMEI)".

[8] GSM 02.41: "Digital cellular telecommunications system (Phase 2+); Operator determined barring".

[9] GSM 02.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 1".

[10] GSM 02.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 1".

[11] GSM 02.83 : "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

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

[13] GSM 02.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 1".

[14] GSM 02.86: "Digital cellular telecommunications system (Phase 2+); Advice of charge (AoC) supplementary services - Stage 1".

[15] GSM 02.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 1".

[16] GSM 02.90: "Digital cellular telecommunication system (Phase 2+); Unstructured supplementary services operation - Stage 1".

[17] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".

[18] GSM 03.04: "Digital cellular telecommunications system (Phase 2+); Signalling requirements relating to routeing of calls to mobile subscribers".

[19] GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration procedures".

[20] GSM 03.08: "Digital cellular telecommunications system (Phase 2+); Organisation of subscriber data".

[21] GSM 03.09: "Digital cellular telecommunications system (Phase 2+; Handover procedures".

[22] GSM 03.11: "Digital cellular telecommunications system (Phase 2+); Technical realization of supplementary services".

[23] GSM 03.12: "Digital cellular telecommunications system (Phase 2+); Location registration procedures".

[24] GSM 03.20: "Digital cellular telecommunications system (Phase 2+); Security related network functions".

[25] GSM 03.38: "Digital cellular telecommunications system (Phase 2+); Alphabets and language specific information for GSM".

[26] GSM 03.40: "Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS) Point to Point (PP)".

[27] GSM 03.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 2".

[28] GSM 03.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 2".

[29] GSM 03.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".

[30] GSM 03.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 2".

[31] GSM 03.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 2".

[32] GSM 03.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 2".

[33] GSM 03.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 2".

[34] GSM 03.90: "Digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 2".

[35] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[36] GSM 04.10: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 Supplementary services specification General aspects".

[37] GSM 04.11: "Digital cellular telecommunications system (Phase 2+); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[38] GSM 04.80: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 supplementary services specification Formats and coding".

[39] GSM 04.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 3".

[40] GSM 04.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 3".

[41] GSM 04.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 3".

[42] GSM 04.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 3".

[43] GSM 04.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 3".

[44] GSM 04.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 3".

[45] GSM 04.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 3".

[46] GSM 04.90: "Digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 3".

[47] GSM 08.02: "Digital cellular telecommunications system (Phase 2+); Base Station System - Mobile-services Switching Centre (BSS - MSC) interface Interface principles".

[48] GSM 08.06: "Digital cellular telecommunications system (Phase 2+); Signalling transport mechanism specification for the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[49] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".

[50] GSM 09.01: "Digital cellular telecommunications system (Phase 2+); General network interworking scenarios".

[51] GSM 09.02: "Digital cellular telecommunications system (Phase 1); Mobile Application Part (MAP) specification".

[52] GSM 09.03: "Digital cellular telecommunications system (Phase 2+); Signalling requirements on interworking between the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) and the Public Land Mobile Network (PLMN)".

[53] GSM 09.04: "Digital cellular telecommunications system (Phase 2+); Interworking between the Public Land Mobile Network (PLMN) and the Circuit Switched Public Data Network (CSPDN)".

[54] GSM 09.05: "Digital cellular telecommunications system (Phase 2+); Interworking between the Public Land Mobile Network (PLMN) and the Packet Switched Public Data Network (PSPDN) for Packet Assembly/Disassembly facility (PAD) access".

[55] GSM 09.06: "Digital cellular telecommunications system (Phase 2+); Interworking between a Public Land Mobile Network (PLMN) and a Packet Switched Public Data Network/Integrated Services Digital Network (PSPDN/ISDN) for the support of packet switched data transmission services".

[56] GSM 09.07: "Digital cellular telecommunications system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[57] GSM 09.08: "Digital cellular telecommunications system (Phase 2+); Application of the Base Station System Application Part (BSSAP) on the E-interface".

[58] GSM 09.10: "Digital cellular telecommunications system (Phase 2+); Information element mapping between Mobile Station - Base Station System and BSS - Mobile-services Switching Centre (MS - BSS - MSC) Signalling procedures and the Mobile Application Part (MAP)".

[59] GSM 09.11: "Digital cellular telecommunications system (Phase 2+); Signalling interworking for supplementary services".

[60] GSM 09.90: "Digital cellular telecommunications system (Phase 2+); Interworking between Phase 1 infrastructure and Phase 2 Mobile Stations (MS)".

[61] GSM 12.08: "Digital cellular telecommunications system (Phase 2); Subscriber and Equipment Trace".

[62] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3 specifications for basic call control".

[63] ETS 300 136 (1992): "Integrated Services Digital Network (ISDN); Closed User Group (CUG) supplementary service description".

[64] ETS 300 138 (1992): "Integrated Services Digital Network (ISDN); Closed User Group (CUG) supplementary service Digital Subscriber Signalling System No.one (DSS1) protocol".

[65] ETS 300 287: "Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2".

[66] ETR 060: "Signalling Protocols and Switching (SPS); Guide-lines for using Abstract Syntax Notation One (ASN.1) in telecommunication application protocols".

[67] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

[68] CCITT Recommendation E.212: "Identification plan for land mobile stations".

[69] CCITT Recommendation E.213: "Telephone and ISDN numbering plan for land mobile stations".

[70] CCITT Recommendation E.214: "Structuring of the land mobile global title for the signalling connection control part".

[71] CCITT Recommendation Q.669: "Interworking between the Digital Subscriber Signalling System Layer 3 protocol and the Signalling System No.7 ISDN User part".

[72] CCITT Recommendation Q.711: "Specifications of Signalling System No.7; Functional description of the signalling connection control part".

[73] CCITT Recommendation Q.712: "Definition and function of SCCP messages".

[74] CCITT Recommendation Q.713: "Specifications of Signalling System No.7; SCCP formats and codes".

[75] CCITT Recommendation Q.714: "Specifications of Signalling System No.7; Signalling connection control part procedures".

[76] CCITT Recommendation Q.716: "Specifications of Signalling System No.7; Signalling connection control part (SCCP) performances".

[77] CCITT Recommendation Q.721 (1988): "Specifications of Signalling System No.7; Functional description of the Signalling System No.7 Telephone user part".

[78] CCITT Recommendation Q.722 (1988): "Specifications of Signalling System No.7; General function of Telephone messages and signals".

[79] CCITT Recommendation Q.723 (1988): "Specifications of Signalling System No.7; Formats and codes".

[80] CCITT Recommendation Q.724 (1988): "Specifications of Signalling System No.7; Signalling procedures".

[81] CCITT Recommendation Q.725 (1988): "Specifications of Signalling System No.7; Signalling performance in the telephone application".

[82] CCITT Recommendation Q.761 (1988): "Specifications of Signalling System No.7; Functional description of the ISDN user part of Signalling System No.7".

[83] CCITT Recommendation Q.762 (1988): "Specifications of Signalling System No.7; General function of messages and signals".

[84] CCITT Recommendation Q.763 (1988): "Specifications of Signalling System No.7; Formats and codes".

[85] CCITT Recommendation Q.764 (1988): "Specifications of Signalling System No.7; Signalling procedures".

[86] CCITT Recommendation Q.767: "Specifications of Signalling System No.7; Application of the ISDN user part of CCITT signalling System No.7 for international ISDN interconnections".

[87] CCITT Recommendation Q.771: "Specifications of Signalling System No.7; Functional description of transaction capabilities".

[88] CCITT Recommendation Q.772: "Specifications of Signalling System No.7; Transaction capabilities information element definitions".

[89] CCITT Recommendation Q.773: "Specifications of Signalling System No.7; Transaction capabilities formats and encoding".

[90] CCITT Recommendation Q.774: "Specifications of Signalling System No.7; Transaction capabilities procedures".

[91] CCITT Recommendation Q.775: "Specifications of Signalling System No.7; Guide-lines for using transaction capabilities".

[92] CCITT Recommendation X.200: "Reference Model of Open systems interconnection for CCITT Applications".

[93] CCITT Recommendation X.208 (1988): "Specification of Abstract Syntax Notation One (ASN.1)".

[94] CCITT Recommendation X.209 (1988): "Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".

[95] CCITT Recommendation X.210: "Open systems interconnection layer service definition conventions".

[96] GSM 09.02: "Digital cellular telecommunications system (Phase 2); Mobile Application Part (MAP) specification".

[97] GSM 03.18: "Digital cellular telecommunications system (Phase 2+); Basic Call Handling".

[98] GSM 03.78: "Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL) - Stage 2".

[99] GSM 03.79: "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routeing (SOR) - Stage 2".

[100] GSM 03.68: "Digital cellular telecommunications system (Phase 2+); - Stage 2".

[101] GSM 03.69: "Digital cellular telecommunications system (Phase 2+); - Stage 2".

[102] ANSI T1.113: "Signaling System No. 7 (SS7) - ISDN User Part".

[103] GSM 03.54 "Digital cellular telecommunications system (Phase 2+); Stage 2 Description for the use of a Shared Inter Working Function (SIWF) in a GSM PLMN".

[104] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS) Description; Stage 2".

[105] GSM 09.60: "Digital cellular telecommunications system (Phase 2+), General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".

[106] GSM 09.18: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR); Gs interface layer 3 specification".

[107] GSM 03.93: "Digital cellular telecommunications system (Phase 2+); Technical Realization of Completion of Calls to Busy Subscriber (CCBS); Stage 2".

3 Abbreviations

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

4 Configuration of the mobile network

4.1 The entities of the mobile system

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

4.1.1 The Home Location Register (HLR)

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

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

- IMSI;
- MSISDN.

The data base contains other information such as:

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

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

4.1.2 The Visitor Location Register (VLR)

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

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

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

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

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

4.1.3 The Mobile-services Switching Centre (MSC)

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

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

4.1.4 The Base Station System (BSS)

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

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

4.1.5 The Gateway MSC (GMSC)

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

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

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

See also GSM 03.04.

4.1.6 The SMS Gateway MSC

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

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

4.1.7 The SMS Interworking MSC

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

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

4.1.8 The VBS/VGCS Anchor MSC

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

4.1.9 The Equipment Identity Register (EIR)

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

4.1.10 The GSM Service Control Function (gsmSCF)

This functional entity contains the CAMEL service logic to implement OSS. It interfaces with the gsmSSF and the HLR; see also TS GSM 03.78.

4.1.11 The VBS/VGCS Relay MSC

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

4.1.12 The Group Call Register (GCR)

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

4.1.13 The Shared InterWorking Function Server (SIWFS)

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

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

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

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

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

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

4.1.14 The Serving GPRS Support Node (SGSN)

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

4.1.15 The Gateway GPRS Support Node (GGSN)

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

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

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

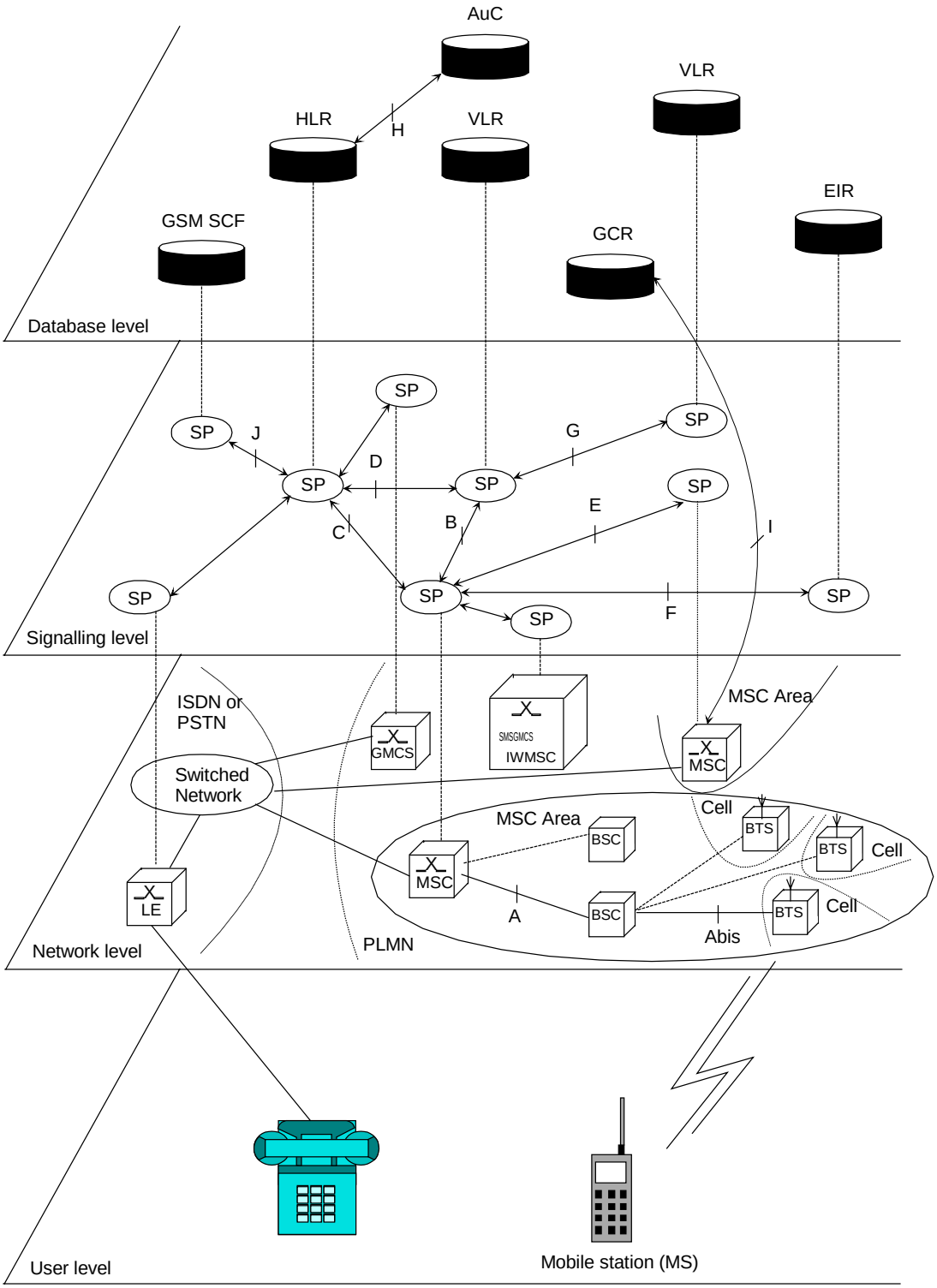

Figure 4.2/1: Configuration of a PLMN

4.3 Interconnection between PLMNs

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

4.4 The interfaces within the mobile service

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

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

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

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

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

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

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

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

4.4.4 Interface between VLRs (G-interface)

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

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

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

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

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

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

4.4.7 Interface between MSCs (E-interface)

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

This interface is also used to forward short messages.

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

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

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

The BSS-MSC interface carries information concerning:

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

4.4.9 Interface between MSC and EIR (F-interface)

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

4.4.10 Interface between VBS/VGCS Anchor MSC and GCR (I-interface)

This is an internal interface.

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

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

4.4.12 Interface between SGSN and HLR (Gr-interface)

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

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

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

4.4.14 Interface between GGSN and HLR (Gc-interface)

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

4.4.15 Interface between SGSN and EIR (Gf-interface)

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

4.4.16 Interface between SGSN and BSC (Gb-interface)

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

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

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

4.5 Splitting of the data storage

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

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

5 Overload and compatibility overview

5.1 Overload control

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

5.1.1 Overload control for MSC (outside MAP)

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

- ISDN
  CCITT Recommendation Q.764 (Automatic Congestion Control), applicable to reduce the mobile terminating traffic;

- BSSAP
  GSM 08.08 (A-interface Flow Control), applicable to reduce the mobile originating traffic.

5.1.2 Overload control for MAP entities

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5.1.3 Congestion control for Signalling System No. 7

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

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

5.2 Compatibility

5.2.1 General

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

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

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

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

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

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

5.2.2 Strategy for selecting the Application Context (AC) version

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

5.2.2.1 Proposed method

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

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

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

a) the version shown in table 1 is "version n-1", where 'n' is the highest version existing in this specification; table 2 is not used;

b) the version shown in table 1 is "unknown"; table 2 is used, and maintained as described in subclause 5.2.2.2;

c) when the PLMN operator declares that an entity (single node or entire PLMN) has been upgraded to support all the MAP version n ACs defined for the relevant interface, the version shown in table 1 is set to "version n" by administrative action; table 2 is no longer used, and the storage space may be recovered.

5.2.2.2 Managing the version look-up table

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

IF the entity number is known

THEN

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

ELSE

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

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

IF the destination address is known and not timed-out

THEN

It retrieves the appropriate AC-name and uses it

IF the dialogue is accepted by the peer

THEN

It does not modify the version control table

ELSE (this should never occur)

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

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

ELSE

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

IF the dialogue is accepted by the peer

THEN

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

ELSE

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

IF the destination node was not known

THEN

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

ELSE

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

5.2.2.3 Optimizing the method

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

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

  for HLR:

  - Subscriber data modification (stand alone);

  for VLR:

  - Data Restoration.

6 Requirements concerning the use of SCCP and TC

6.1 Use of SCCP

The Mobile Application Part makes use of the services offered by the Signalling Connection Control Part of signalling System No. 7. CCITT Blue Book or ITU-T (03/93) Recommendations Q.711 to Q.716 should be consulted for the full specification of SCCP.

6.1.1 SCCP Class

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

6.1.2 Sub-System Number (SSN)

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

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

6.1.3 SCCP addressing

6.1.3.1 Introduction

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

Only the entities which should be addressed are described below. The format and coding of address parameters carried by the SCCP for that purpose shall comply with CCITT Recommendation Q.713 with the following restrictions:

1) Intra-PLMN addressing

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

2) Inter-PLMN addressing

a) Called Party Address

- SSN indicator = 1 (MAP SSN always included);
- Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
- the translation type field will be coded "00000000" (Not used);
- Routing indicator = 0 (Routing on global title);

b) Calling Party Address

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

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

- E.212 numbering plan

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

- E.214 and E.164 numbering plans

  Only address information belonging to either E.214 or E.164 numbering plan is allowed to be included as Global Title in the Called and Calling Party Address.

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

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

  When receiving an N-UNITDATA-REQUEST primitive from TC, SCCP shall accept an E.164 number or an E.214 number in the Called Address and in the Calling Address.

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

- the Mobile-services Switching Centre (MSC);
- the Home location Register (HLR);
- the Visitor Location Register (VLR);

- the Gateway Mobile-services Switching Centre (GMSC);
- the GSM Service Control Function (gsmSCF);
- the Interworking Mobile-services Switching Centre (IWMSC);
- the Shared Inter Working Function (SIWF);
- the Serving GPRS Support Node (SGSN);
- the Gateway GPRS Support Node (GGSN).

6.1.3.2 The Mobile-services Switching Centre (MSC)

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

6.1.3.2.1 MSC interaction during handover

The address is derived from the target Cellid.

6.1.3.2.2 MSC for short message routing

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

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

6.1.3.3 The Home Location Register (HLR)

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

6.1.3.3.1 During call set-up

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

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

6.1.3.3.2 Before location updating completion

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

- on an E.214 Mobile Global Title originally derived by the VLR from the IMSI; or
- on an E.164 HLR address; or
- in the case of intra-PLMN signalling, on an SPC.

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

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

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

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

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

6.1.3.3.3 After location updating completion

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

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

6.1.3.3.4 VLR restoration

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

6.1.3.3.5 During Network-Requested PDP Context Activation

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

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

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

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

6.1.3.3.6 Before GPRS location updating completion

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

- on an E.214 Mobile Global Title originally derived by the SGSN from the IMSI; or
- on an E.164 HLR address; or
- in the case of intra-PLMN signalling, on an SPC.

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

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

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

6.1.3.3.7 After GPRS location updating completion

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

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

6.1.3.4 The Visitor Location Register (VLR)

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

6.1.3.4.1 Inter-VLR information retrieval

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

6.1.3.4.2 HLR request

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

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

6.1.3.5 The Interworking MSC (IWMSC) for Short Message Service

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

6.1.3.6 The Equipment Identity Register (EIR)

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

6.1.3.7 The Shared Inter Working Function (SIWF)

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

6.1.3.8 The Serving GPRS Support Node (SGSN)

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

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

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

6.1.3.9 The Gateway GPRS Support Node (GGSN)

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

6.1.3.10 The Gateway MSC (GMSC) for Short Message Service

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

6.1.3.11 Summary table

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

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

Table 6.1/1

to from	fixed net work	HLR	VLR	MSC	EIR	gsmSCF	SIWF	SGSN	GGSN
fixed network	---	E:GT T:MSISDN	---	---	---	---	---	---	---
home location register	---	---	I:SPC/GT E:GT T:VLR NUMBER	---	---	I:SPC/GT E:GT T:gsmSCF NUMBER	---	I:SPC/GT E:GT T:SGSN NUMBER	I:SPC/GT E:GT T:GGSN NUMBER
visitor location register	---	I:SPC/GT E:GT T:MGT/MSISDN/HLR NUMBER (note)	I:SPC/GT E:GT T:VLR NUMBER	---	---	---	---	---	---
mobile-services switching centre	---	I:SPC/GT E:GT T:MSISDN	I:SPC/GT E:GT T:VLR NUMBER	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	I:SPC/GT E:GT T:gsmSCF NUMBER	I:SPC/GT E:GT T:SIWF NUMBER	I:SPC/GT E:GT T:SGSN NUMBER	---
gsm Service Control Function	---	I:SPC/GT E:GT T:MSISDN	---	---	---	---	---	---	---
Shared Inter Working Function	---	---	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---
Serving GPRS Support Node	---	I:SPC/GT E:GT T:MGT/MSISDN/HLR NUMBER	---	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	---	---	---	---
Gateway GPRS Support Node	---	I:SPC/GT E:GT T:MGT	---	---	---	---	---	---	---

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

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

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

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

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

6.2 Use of TC

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

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

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

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

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

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

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

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

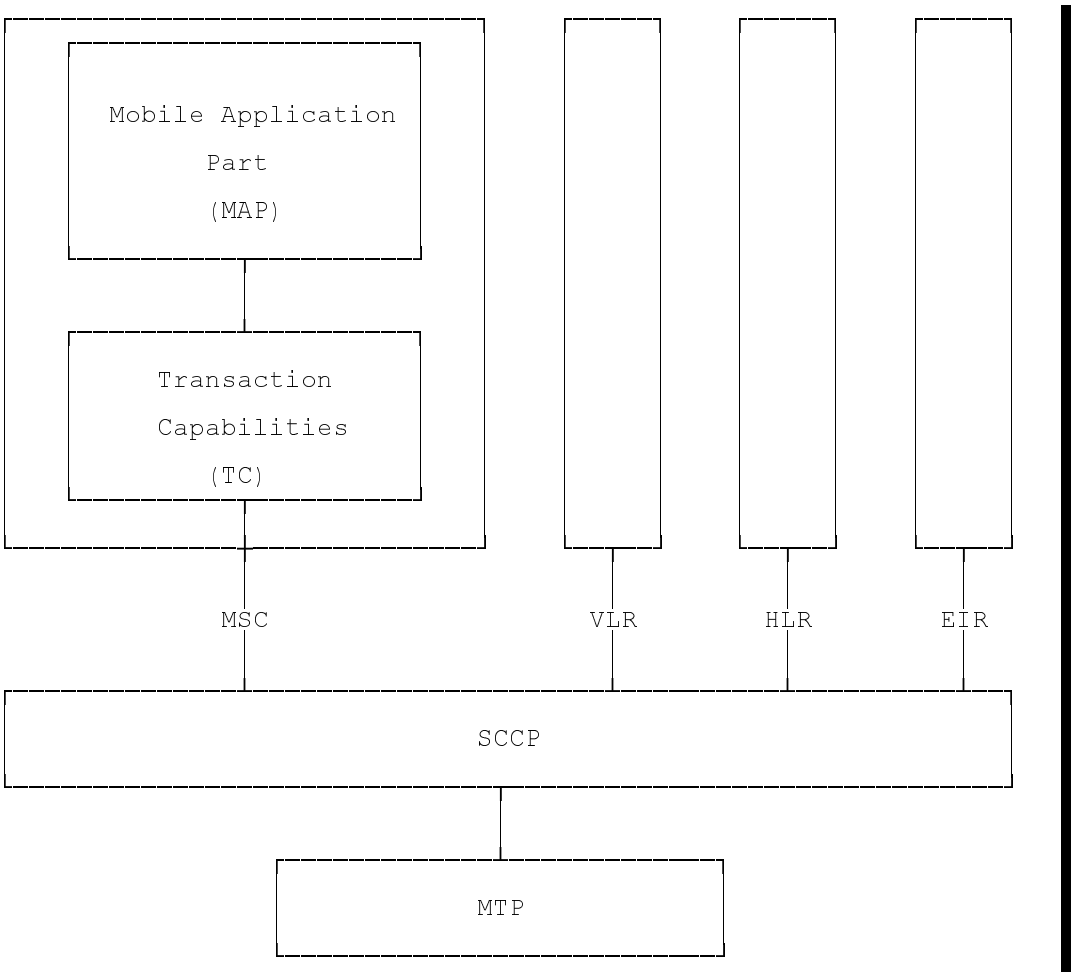

Figure 6.2/1: Facilities for supporting the Mobile Application Part in Signalling System No.7

7 General on MAP services

7.1 Terminology and definitions

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

7.2 Modelling principles

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

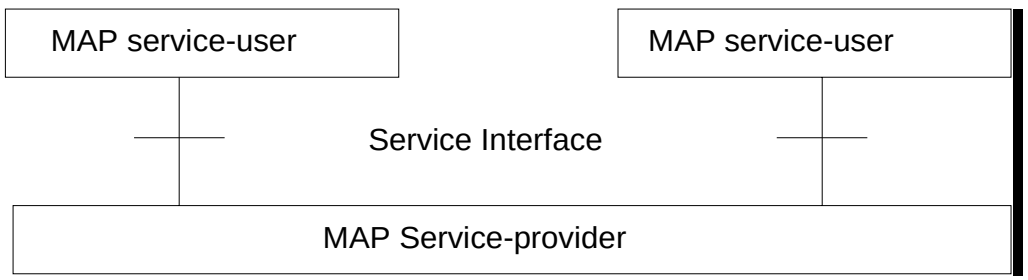

Figure 7.2/1: Modelling principles

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

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

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

MAP-ServicePrimitiveName **type**

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

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

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

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

7.3 Common MAP services

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

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

For these purposes the following common services are defined:

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

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

M the inclusion of the parameter is mandatory. The M category can be used for any primitive type and specifies that the corresponding parameter must be present in the indicated primitive type;

O the inclusion of the parameter is a service-provider option. The O category can be used in indication and confirm type primitives and is used for parameters that may optionally be included by the service-provider;

U the inclusion of the parameter is a service-user option. The U category can be used in request and response type primitives. The inclusion of the corresponding parameter is the choice of the service-user;

C the inclusion of the parameter is conditional. The C category can be used for the following purposes:

- to indicate that if the parameter is received from another entity it must be included for the service being considered;
- to indicate that the service user must decide whether to include the parameter, based on the context on which the service is used;
- to indicate that one of a number of mutually exclusive parameters must be included (e.g. parameters indicating a positive result versus parameters indicating a negative result);
- to indicate that a service user optional parameter (marked "U") or a conditional parameter (marked "C") presented by the service user in a request or response type primitive is to be presented to the service user in the corresponding indication or confirm type primitive;

(=) when appended to one of the above, this symbol means that the parameter takes the same value as the parameter appearing immediately to its left;

blank the parameter is not present.

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

7.3.1 MAP-OPEN service

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

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

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

Application context name:

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

Destination address:

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

Destination-reference:

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

Table 7.3/2: Use of the destination reference

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

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

Originating address:

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

Originating-reference:

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

Table 7.3/3: Use of the originating reference

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

Specific information:

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

Responding address:

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

Result:

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

Refuse reason:

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

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

7.3.2 MAP-CLOSE service

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

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

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

Release method:

This parameter can take the following two values:

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

Specific information:

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

7.3.3 MAP-DELIMITER service

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

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

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

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

Parameters	Request	Indication

7.3.4 MAP-U-ABORT service

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

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

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

User reason:

This parameter can take the following values:

- resource limitation (congestion);

  the requested user resource is unavailable due to congestion;

- resource unavailable;

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

- application procedure cancellation;

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

- procedure error;

  processing of the procedure is terminated for procedural reasons.

Diagnostic information:

This parameter may be used to give additional information for some of the values of the user-reason parameter:

Table 7.3/7: User reason and diagnostic information

User reason	Diagnostic information
Resource limitation (congestion)	-
Resource unavailable	Short term/long term problem
Application procedure cancellation	Handover cancellation/ Radio Channel release/ Network path release/ Call release/ Associated procedure failure/ Tandem dialogue released/ Remote operations failure
Procedure error	-

Specific information:

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

7.3.5 MAP-P-ABORT service

This service enables the MAP service-provider to abort a MAP dialogue. The service is a provider-initiated service with service-primitive as shown in table 7.3/8.

Table 7.3/8: Service-primitive for the MAP-P-ABORT service

Parameters	Indication
Provider reason	M
Source	M

Provider reason:

This parameter indicates the reason for aborting the MAP dialogue:

- provider malfunction;
- supporting dialogue/transaction released;
- resource limitation;
- maintenance activity;
- version incompatibility;
- abnormal MAP dialogue.

Source:

This parameter indicates the source of the abort. For Transaction Capabilities (TC) applications the parameter may take the following values:

- MAP problem;
- TC problem;
- network service problem.

Table 7.3/9: Values of provider reason and source parameters and examples of corresponding events

Provider reason	Source	Corresponding event
Provider malfunction	MAP	Malfunction at MAP level at peer entity
	TC	"Unrecognised message type" or "Badly formatted transaction portion" or "Incorrect transaction portion" received in TC-P-ABORT "Abnormal dialogue"
	Network service	Malfunction at network service level at peer entity
Supporting dialogue/ transaction released	TC	"Unrecognised transaction ID" received in TC-ABORT
Resource limitation	MAP	Congestion towards MAP peer service-user
	TC	"Resource limitation" received in TC-P-ABORT
Maintenance activity	MAP	Maintenance at MAP peer service-user
	Network service	Maintenance at network peer service level
Abnormal MAP dialogue	MAP	MAP dialogue is not in accordance with specified application context
Version incompatibility	TC	A Provider Abort indicating "No common dialogue portion" is received in the dialogue initiated state

7.3.6 MAP-NOTICE service

This service is used to notify the MAP service-user about protocol problems related to a MAP dialogue not affecting the state of the protocol machines.

The service is a provider-initiated service with service-primitive as shown in table 7.3/10.

Table 7.3/10: Service-primitive for the MAP-NOTICE service

Parameters	Indication
Problem diagnostic	M

Problem diagnostic:

This parameter can take one of the following values:

- abnormal event detected by the peer;
- response rejected by the peer;
- abnormal event received from the peer
- message cannot be delivered to the peer.

7.4 Sequencing of services

The sequencing of services is shown in figure 7.4/1 and is as follows:

Opening:

The MAP-OPEN service is invoked before any user specific service-primitive is accepted. The sequence may contain none, one or several user specific service-primitives. If no user specific service-primitive is contained between the MAP-OPEN and the MAP-DELIMITER primitives, then this will correspond to sending an empty Begin message in TC. If more than one user specific service-primitive is included, all are to be sent in the same Begin message. The sequence ends with a MAP-DELIMITER primitive.

Continuing:

This sequence may not be present in some MAP dialogues. If it is present, it ends with a MAP-DELIMITER primitive. If more than one user specific service-primitive is included, all are to be included in the same Continue message.

Closing:

The sequence can only appear after an opening sequence or a continuing sequence. The sequence may contain none, one or several user specific service-primitives if the MAP-CLOSE primitive specifies normal release. If no user specific service-primitive is included, then this will correspond to sending an empty End message in TC. If more than one user specific service-primitive is included, all are to be sent in the same End message. If prearranged end is specified, the sequence cannot contain any user specific service-primitive. The MAP-CLOSE primitive must be sent after all user specific service-primitives have been delivered to the MAP service-provider.

Aborting:

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

The MAP service-provider may issue at any time a MAP-P-ABORT primitive towards a MAP service-user for which a MAP dialogue exists.

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

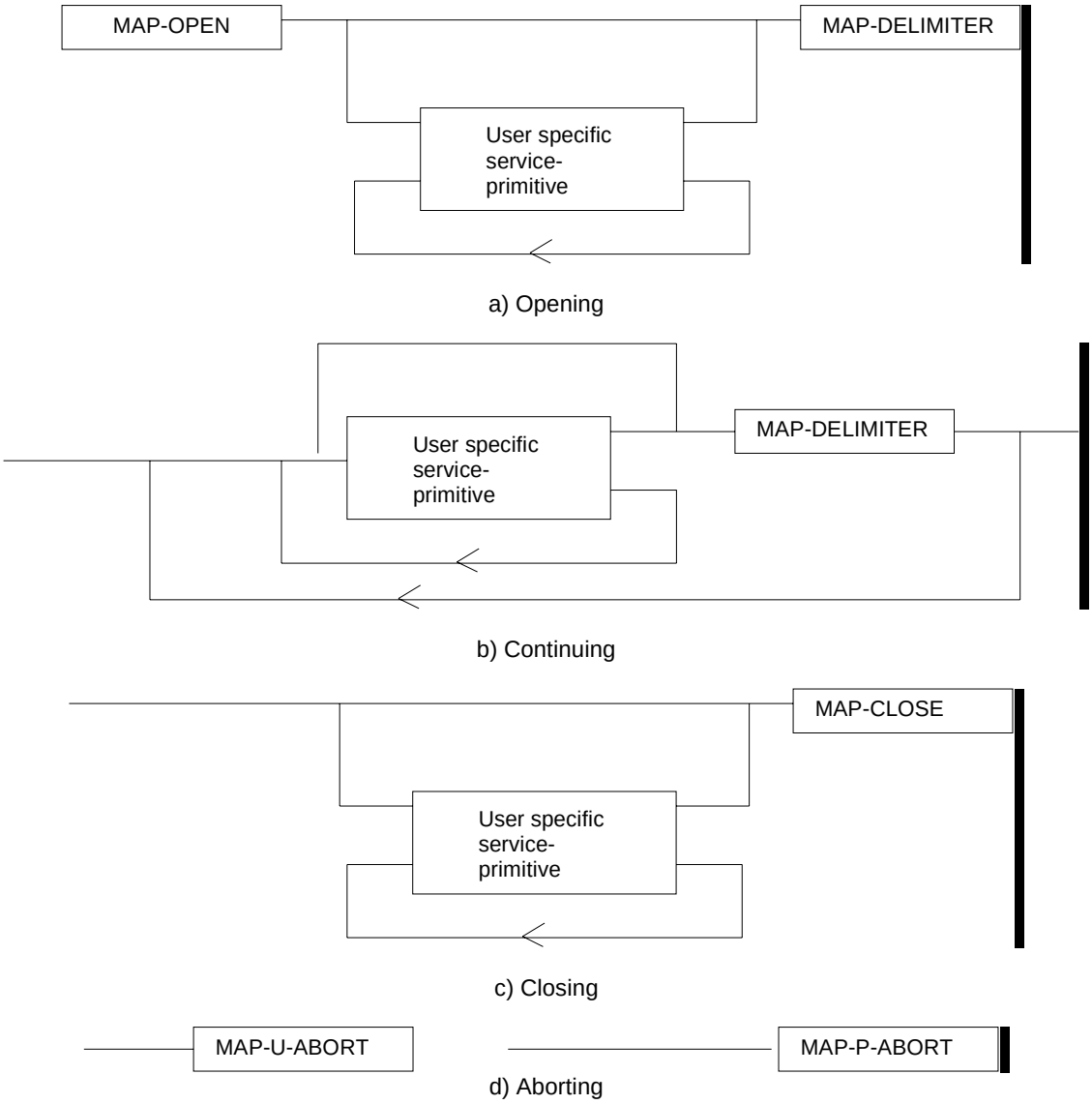

Figure 7.4/1: Sequencing of services

If the reason "resource unavailable (short term problem)" is indicated in the MAP-U-ABORT indication primitive, the MAP service-user may decide to attempt a new MAP dialogue establishment immediately.

Sequencing of user specific service-primitives is done by the MAP service-user and based on rules applicable for each MAP service-user instance.

A MAP-NOTICE indication primitive may be received at any time during the active period of a MAP dialogue.

7.5 General rules for mapping of services onto TC

7.5.1 Mapping of common services

Table 7.5/1 gives an overview of the mapping rules for mapping of common services onto TC-services. Table 7.5/2 gives the mapping rules for mapping of TC-services onto common services.

Protocol machine description is given in clauses 14 to 17.

Table 7.5/1: Mapping of common services on to TC services

MAP service-primitive	TC service-primitive
MAP-OPEN request (+ any user specific service primitives) + MAP-DELIMITER request	TC-BEGIN request (+ component handling primitives)
MAP-OPEN response (+ any user specific service primitives) + MAP-DELIMITER request	TC-CONTINUE request (note) (+ component handling primitives)
(any user specific service primitives) + MAP-DELIMITER request	TC-CONTINUE request (+ component handling primitives)
(any user specific service primitives) + MAP-CLOSE request	TC-END request (+ component handling primitives)
MAP-U-ABORT request	TC-U-ABORT request

NOTE: or TC-END if the MAP-CLOSE request has been received before the MAP-DELIMITER request.

Table 7.5/2: Mapping of TC services on to common service

TC service-primitive	MAP service-primitive
TC-BEGIN indication (+ component handling primitives)	MAP-OPEN indication (+ user specific service primitives) + MAP-DELIMITER indication (note 1)
TC-CONTINUE indication (+ component handling primitives)	First time: MAP-OPEN confirm (+ user specific service primitives) + MAP-DELIMITER indication (note 1) Subsequent times: (user specific service primitives) + MAP-DELIMITER indication (note 1)
TC-END indication (+ component handling primitives)	MAP-OPEN confirm (note 6) (user specific service primitives) + MAP-CLOSE indication
TC-U-ABORT indication	MAP-U-ABORT indication or MAP-P-ABORT indication (note 2) MAP-OPEN confirmation (note 3)
TC-P-ABORT indication	MAP-P-ABORT indication (note 4) MAP-OPEN confirmation (note 5)

NOTE 1: It may not be necessary to present this primitive to the user for MAP version 2 applications.

NOTE 2: The mapping depends on whether the TC-U-ABORT indication primitive contains a MAP-abort-PDU from the remote MAP service-provider or a MAP-user-abort-PDU from the remote MAP service-user.

NOTE 3: Only if the opening sequence is pending and if the "Abort Reason" in the TC-U-ABORT indication is set to "Application Context Not Supported".

NOTE 4: If the "Abort Reason" in the TC-P-ABORT indication is set to a value different from "Incorrect Transaction Portion".

NOTE 5: Only if the opening sequence is pending and if the "Abort Reason" in the TC-P-ABORT indication is set to "Incorrect Transaction Portion".

NOTE 6: Only if opening sequence is pending.

7.5.2 Mapping of user specific services

Table 7.5/3 gives the general mapping rules which apply to mapping of MAP user specific services onto TC services and table 7.5/4 gives the similar rules for mapping of TC services onto MAP user specific services. Detailed mapping is given in clauses 14 to 17.

Table 7.5/3: Mapping of MAP user specific services onto TC services

MAP service-primitive	TC-service-primitive
MAP-xx request	TC-INVOKE request
MAP-xx response (note 1)	TC-RESULT-L request TC-U-ERROR request TC-U-REJECT request TC-INVOKE request (note 2)

Table 7.5/4: Mapping of TC services onto MAP user specific services

TC-service-primitive	MAP service-primitive
TC-INVOKE indication	MAP-xx indication
TC-RESULT-L indication (note 4) TC-U-ERROR indication TC-INVOKE indication (note 2) TC-L-CANCEL indication	MAP-xx confirm
TC-U-REJECT indication TC-L-REJECT indication TC-R-REJECT indication	MAP-xx confirm or MAP-NOTICE indication (note 3)

Notes to tables 7.5/3 and 7.5/4:

NOTE 1: The mapping is determined by parameters contained in the MAP-xx response primitive.

NOTE 2: This applies only to TC class 4 operations where the operation is used to pass a result of another class 2 or class 4 operation.

NOTE 3: The detailed mapping rules are given in clause 16.

NOTE 4: If RESULT-NL components are present they are mapped on to the same MAP-xx confirm.

7.6 Definition of parameters

Following is an alphabetic list of parameters used in the common MAP-services in subclause 7.3:

Application context name	7.3.1	Refuse reason	7.3.1
Destination address	7.3.1	Release method	7.3.2
Destination reference	7.3.1	Responding address	7.3.1
Diagnostic information	7.3.4	Result	7.3.1
Originating address	7.3.1	Source	7.3.5
Originating reference	7.3.1	Specific information	7.3.1/7.3.2/7.3.4
Problem diagnostic	7.3.6	User reason	7.3.4
Provider reason	7.3.5		

Following is an alphabetic list of parameters contained in this clause:

Absent Subscriber Diagnostic SM	7.6.8.9	Invoke Id	7.6.1.1
Access connection status	7.6.9.3	ISDN Bearer Capability	7.6.3.41
Access signalling information	7.6.9.5	Kc	7.6.7.4
Additional Absent Subscriber Diagnostic SM	7.6.8.12	Linked Id	7.6.1.2
Additional number	7.6.2.46	LMSI	7.6.2.16
Additional SM Delivery Outcome	7.6.8.11	Location Information	7.6.2.30
Alert Reason	7.6.8.8	Location update type	7.6.9.6
Alert Reason Indicator	7.6.8.10	Lower Layer Compatibility	7.6.3.42
Alerting Pattern	7.6.3.44	Mobile Not Reachable Reason	7.6.3.51
All GPRS Data	7.6.3.53	More Messages To Send	7.6.8.7
APN	7.6.2.42	MS ISDN	7.6.2.17
Authentication set list	7.6.7.1	MSC number	7.6.2.11
B-subscriber Address	7.6.2.36	MSIsdn-Alert	7.6.2.29
B subscriber Number	7.6.2.48	MWD status	7.6.8.3
B subscriber subaddress	7.6.2.49	Network Access Mode	7.6.3.50
Basic Service Group	7.6.4.40	Network node number	7.6.2.43
Bearer service	7.6.4.38	Network resources	7.6.10.1
BSS-apdu	7.6.9.1	Network signal information	7.6.9.8
Call barring feature	7.6.4.19	New password	7.6.4.20
Call barring information	7.6.4.18	No reply condition timer	7.6.4.7
Call Direction	7.6.5.8	North American Equal Access preferred Carrier Id	7.6.2.34
Call Info	7.6.9.9	ODB General Data	7.6.3.9
Call reference	7.6.5.1	ODB HPLMN Specific Data	7.6.3.10
Called number	7.6.2.24	OMC Id	7.6.2.18
Calling number	7.6.2.25	Originally dialled number	7.6.2.26
CAMEL Subscription Info Withdraw	7.6.3.38		
Cancellation Type	7.6.3.52	Originating entity number	7.6.2.10
Category	7.6.3.1	Override Category	7.6.4.4
CCBS Feature	7.6.5.8	P-TMSI	7.6.2.47
Channel Type	7.6.5.9	PDP-Address	7.6.2.45
Chosen Channel	7.6.5.10	PDP-Context identifier	7.6.3.55
Ciphering mode	7.6.7.7	PDP-Type	7.6.2.44
Cksn	7.6.7.5	Previous location area Id	7.6.2.4
CLI Restriction	7.6.4.5	Protocol Id	7.6.9.7
CM service type	7.6.9.2	Provider error	7.6.1.3
Complete Data List Included	7.6.3.54		
CUG feature	7.6.3.26	QoS-Subscribed	7.6.3.47
CUG index	7.6.3.25	Rand	7.6.7.2
CUG info	7.6.3.22	Regional Subscription Data	7.6.3.11
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7.6.1 Common parameters

The following set of parameters are used in several MAP service-primitives:

7.6.1.1 Invoke Id

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

7.6.1.2 Linked Id

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

7.6.1.3 Provider error

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

- duplicated invoke Id;
- not supported service;
- mistyped parameter;
- resource limitation;
- initiating release, i.e. the peer has already initiated release of the dialogue and the service has to be released;
- unexpected response from the peer;
- service completion failure;
- no response from the peer;
- invalid response received.

7.6.1.4 User error

This parameter can take values as follows:

NOTE: The values are grouped in order to improve readability; the grouping has no other significance.

a) Generic error:

- system failure, i.e. a task cannot be performed because of a problem in another entity. The type of entity or network resource may be indicated by use of the network resource parameter;
- data missing, i.e. an optional parameter required by the context is missing;
- unexpected data value, i.e. the data type is formally correct but its value or presence is unexpected in the current context;
- resource limitation;
- initiating release, i.e. the receiving entity has started the release procedure;
- facility not supported, i.e. the requested facility is not supported by the PLMN;
- incompatible terminal, i.e. the requested facility is not supported by the terminal.

b) Identification or numbering problem:

- unknown subscriber, i.e. no such subscription exists;
- number changed, i.e. the subscription does not exist for that number any more;
- unknown MSC;
- unidentified subscriber, i.e. if the subscriber is not contained in the database and it has not or cannot be established whether or not a subscription exists;
- unallocated roaming number;
- unknown equipment;
- unknown location area.

c) Subscription problem:

- roaming not allowed, i.e. a location updating attempt is made in an area not covered by the subscription;
- illegal subscriber, i.e. illegality of the access has been established by use of authentication procedure;
- bearer service not provisioned;
- teleservice not provisioned;
- illegal equipment, i.e. the IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

d) Handover problem:

- no handover number available;
- subsequent handover failure, i.e. handover to a third MSC failed for some reason.

e) Operation and maintenance problem:

- tracing buffer full, i.e. tracing cannot be performed because the tracing capacity is exceeded.

f) Call set-up problem:

- no roaming number available, i.e. a roaming number cannot be allocated because all available numbers are in use;
- absent subscriber, i.e. the subscriber has activated the detach service or the system detects the absence condition. This error may be qualified to indicate whether the subscriber was IMSI detached, in a restricted area or did not respond to paging;
- busy subscriber. This error may be qualified to indicate that the subscriber was busy due to CCBS and that CCBS is possible;
- no subscriber reply;
- forwarding violation, i.e. the call has already been forwarded the maximum number of times that is allowed;
- CUG reject, i.e. the call does not pass a CUG check; additional information may also be given in order to indicate rejection due to e.g. incoming call barred or non-CUG membership.
- call barred. Optionally, additional information may be included for indicating either that the call meets a barring condition set by the subscriber or that the call is barred for operator reasons. In case of barring of Mobil Terminating Short Message, the additional information may indicate a barring condition due to « unauthorised Message Originator».
- optimal routeing not allowed, i.e. the entity which sends the error does not support optimal routeing, or the HLR will not accept an optimal routeing interrogation from the GMSC, or the call cannot be optimally routed because it would contravene optimal routeing constraints.
- forwarding failed, i.e. the GMSC interrogated the HLR for forwarding information but the HLR returned an error.

g) Supplementary services problem:

- call barred;
- illegal SS operation;
- SS error status;
- SS not available;
- SS subscription violation;
- SS incompatibility;
- negative password check;
- password registration failure;
- Number of Password Attempts;
- USSD Busy;
- Unknown Alphabet.
- short term denial;
- long term denial.

For definition of these errors see GSM 04.80.

h) Short message problem:

- SM delivery failure with detailed reason as follows:
  - memory capacity exceeded;
  - MS protocol error;
  - MS not equipped;
  - unknown service centre (SC);
  - SC congestion;
  - invalid SME address;
  - subscriber is not an SC subscriber;
  - and possibly detailed diagnostic information, coded as specified in TS GSM 03.40, under SMS-SUBMIT-REPORT and SMS-DELIVERY-REPORT. If the SM entity which returns the SM Delivery Failure error includes detailed diagnostic information, it shall be forwarded in the MAP_MO_FORWARD_SHORT_MESSAGE and in the MAP_MT_FORWARD_SHORT_MESSAGE response.
- message waiting list full, i.e. no further SC address can be added to the message waiting list;
- Subscriber busy for MT SMS, i.e. the mobile terminated short message transfer cannot be completed because:
  - another mobile terminated short message transfer is going on and the delivery node does not support message buffering; or
  - another mobile terminated short message transfer is going on and it is not possible to buffer the message for later delivery; or
  - the message was buffered but it is not possible to deliver the message before the expiry of the buffering time defined in GSM 03.40;
- Absent Subscriber SM, i.e. the mobile terminated short message transfer cannot be completed because the network cannot contact the subscriber. Diagnostic information regarding the reason for the subscriber's absence may be included with this error.

7.6.2 Numbering and identification parameter

7.6.2.1 IMSI

This parameter is the International Mobile Subscriber Identity defined in GSM 03.03.

7.6.2.2 TMSI

This parameter is the Temporary Mobile Subscriber Identity defined in GSM 03.03.

7.6.2.3 IMEI

This parameter is the International Mobile Equipment Identity defined in GSM 03.03.

7.6.2.4 Previous location area Id

This parameter refers to the identity of the location area from which the subscriber has roamed.

7.6.2.5 Stored location area Id

This parameter refers to the location area where the subscriber is assumed to be located.

7.6.2.6 Current location area Id

This parameter is used to indicate the location area in which the subscriber is currently located.

7.6.2.7 Target location area Id

This parameter refers to the location area into which the subscriber intends to roam.

7.6.2.8 Target cell Id

This parameter refers to the identity of the cell to which a call has to be handed over.

7.6.2.9 Void

7.6.2.10 Originating entity number

This parameter refers to an application layer identification of a system component in terms of its associated ISDN number.

7.6.2.11 MSC number

This parameter refers to the ISDN number of an MSC.

7.6.2.12 Target MSC number

This parameter refers to the ISDN number of an MSC to which a call has to be handed over.

7.6.2.13 HLR number

This parameter refers to the ISDN number of an HLR.

7.6.2.14 VLR number

This parameter refers to the ISDN number of a VLR.

7.6.2.15 HLR Id

This parameter refers to the identity of an HLR derived from the IMSI defined in CCITT Recommendation E.212.

7.6.2.16 LMSI

This parameter refers to a local identity allocated by the VLR to a given subscriber for internal management of data in the VLR. LMSI shall not be sent to the SGSN.

7.6.2.17 MS ISDN

This parameter refers to one of the ISDN numbers assigned to a mobile subscriber in accordance with CCITT Recommendation E.213.

7.6.2.18 OMC Id

This parameter refers to the identity of an operation and maintenance centre.

7.6.2.19 Roaming number

This parameter refers to the roaming number as defined in CCITT Recommendation E.213.

7.6.2.20 Void

7.6.2.21 Handover number

This parameter refers to the number used for routing a call between MSCs during handover.

7.6.2.22 Forwarded-to number

This parameter refers to the address to which a call is to be forwarded. This may include a subaddress. For subscribers having an originating CAMEL Phase 2 subscription this address need not be in non-E.164 international format.

7.6.2.23 Forwarded-to subaddress

This parameter refers to the sub-address attached to the address to which a call is to be forwarded.

7.6.2.24 Called number

This parameter refers to a called party number as defined in CCITT Recommendation Q.767.

7.6.2.25 Calling number

This parameter refers to a calling party number as defined in CCITT Recommendation Q.767.

7.6.2.26 Originally dialled number

This parameter refers to the number dialled by the calling party in order to reach a mobile subscriber.

7.6.2.27 Service centre address

This parameter represents the address of a Short Message Service Centre.

7.6.2.28 Zone Code

This parameter is used to define location areas into which the subscriber is allowed or not allowed to roam (regional subscription). With a complete list of Zone Codes the VLR or the SGSN is able to determine for all its location areas whether roaming is allowed or not.

7.6.2.29 MSIsdn-Alert

This parameter refers to the MSISDN stored in a Message Waiting Data File in the HLR. It is used to alert the Service Centre when the MS is again attainable.

7.6.2.30 Location Information

This parameter indicates the location of the served subscriber as defined in GSM 03.18.

7.6.2.31 GMSC Address

This parameter refers to the E.164 address of a GMSC.

7.6.2.32 VMSC Address

This parameter refers to the E.164 address of a VMSC.

7.6.2.33 Group Id

This parameter is used to describe groups a subscriber can be member of. A subscriber can partake in all group calls (VBS/VGCS) where he subscribed to the respective groups.

7.6.2.34 North American Equal Access preferred Carrier Id

This parameter refers to the carrier identity preferred by the subscriber for calls requiring routing via an interexchange carrier. This identity is used at:

- outgoing calls: when the subscriber does not specify at call setup a carrier identity;
- forwarded calls: when a call is forwarded by the subscriber;
- incoming calls: applicable to the roaming leg of the call.

7.6.2.35 SIWFS Number

This parameter refers to the number used for routing a call between the MSC and the SIWFS (used by ISUP).

7.6.2.36 B-subscriber address

This parameter refers to the address used by the SIWFS to route the outgoing call from the SIWFS to either the B-subscriber in case the non-loop method or back to the VMSC in case of the loop method.

7.6.2.37 Serving cell Id

This parameter indicates the cell currently being used by the served subscriber.

7.6.2.38 SGSN number

This parameter refers to the ISDN number of a SGSN.

7.6.2.39 SGSN address

This parameter refers to the IP-address of a SGSN. This parameter is defined in GSM 03.03.

7.6.2.40 GGSN address

This parameter refers to the IP-address of a GGSN. This parameter is defined in GSM 03.03.

7.6.2.41 GGSN number

This parameter refers to the ISDN number of a GGSN or the ISDN number of the protocol-converter if a protocol-converting GSN is used between the GGSN and the HLR..

7.6.2.42 APN

This parameter refers to the DNS name of a GGSN. This parameter is defined in GSM 03.60.

7.6.2.43 Network Node number

This parameter refers either to the ISDN number of SGSN or to the ISDN number of MSC.

7.6.2.44 PDP-Type

This parameter indicates which type of protocol is used by the MS as defined in GSM 03.60.

7.6.2.45 PDP-Address

This parameter indicates the address of the data protocol as defined in GSM 03.60.

7.6.2.46 Additional number

This parameter can refer either to the SGSN number or to the MSC number.

7.6.2.47 P-TMSI

This parameter is the Packet Temporary Mobile Subscriber Identity defined in GSM 03.03.

7.6.2.48 B-subscriber number

This parameter refers to the number of the destination B dialled by the A user. This may include a subaddress.

7.6.2.49 B-subscriber subaddress

This parameter refers to the sub-address attached to the destination B dialled by the A user.

7.6.3 Subscriber management parameters

7.6.3.1 Category

This parameter refers to the calling party category as defined in CCITT Recommendation Q.767.

7.6.3.2 Equipment status

This parameter refers to the status of the mobile equipment as defined in GSM 02.16.

7.6.3.3 Extensible Bearer service

This parameter may refer to a single bearer service, a set of bearer services or to all bearer services as defined in TS GSM 02.02. This parameter is used only for subscriber profile management. Extensible Bearer service values include all values defined for a Bearer service parameter (7.6.4.38).

7.6.3.4 Extensible Teleservice

This parameter may refer to a single teleservice, a set of teleservices or to all teleservices as defined in TS GSM 02.03. This parameter is used only for subscriber profile management. Extensible Teleservice values include all values defined for a Teleservice parameter (7.6.4.39).

7.6.3.5 Extensible Basic Service Group

This parameter refers to the Basic Service Group either as an extensible bearer service (see subclause 7.6.3.3) or an extensible teleservice (see subclause 7.6.3.4). This parameter is used only for subscriber profile management. The null value (i.e. neither extensible bearer service nor extensible teleservice) is used to denote the group containing all extensible bearer services and all extensible teleservices.

7.6.3.6 GSM bearer capability

This parameter refers to the GSM bearer capability information element defined in GSM 04.08.

7.6.3.7 Subscriber Status

This parameter refers to the barring status of the subscriber:

- service granted;
- Operator Determined Barring.

7.6.3.8 CUG Outgoing Access indicator

This parameter represents the Outgoing Access as defined in ETS 300 136.

7.6.3.9 Operator Determined Barring General Data

This parameter refers to the set of subscribers features that the network operator or the service provider can regulate. This set only includes those limitations that can be controlled in the VLR or in the SGSN:

- All outgoing calls barred; (*)
- International outgoing calls barred; (*)
- International outgoing calls except those to the home PLMN country barred; (*)
- Interzonal outgoing calls barred; (*)
- Interzonal outgoing calls except those to the home PLMN country barred; (*)
- Interzonal outgoing calls AND intenational outgoing calls except those directed to the home PLMN country barred; (*)
- Premium rate (information) outgoing calls barred;
- Premium rate (entertainment) outgoing calls barred;
- Supplementary service access barred;
- Invocation of call transfer barred;
- Invocation of chargeable call transfer barred;
- Invocation of internationally chargeable call transfer barred;
- Invocation of interzonally chargeable call transfer barred;
- Invocation of call transfer where both legs are chargeable barred.

(*) Only these ODBs are supported by the SGSN. The SGSN applies them only for short message transfer.

7.6.3.10 ODB HPLMN Specific Data

This parameter refers to the set of subscribers features that the network operator or the service provider can regulate only when the subscriber is registered in the HPLMN. This set only includes those limitations that can be controlled in the VLR or in the SGSN:

- Operator Determined Barring Type 1;
- Operator Determined Barring Type 2;
- Operator Determined Barring Type 3;
- Operator Determined Barring Type 4.

7.6.3.11 Regional Subscription Data

This parameter defines the regional subscription area in which the subscriber is allowed to roam. It consists of a list of Zone Codes (see subclause 7.6.2.28).

7.6.3.12 Regional Subscription Response

This parameter indicates either that the regional subscription data cannot be handled or that the current MSC or SGSN area is entirely restricted because of regional subscription.

7.6.3.13 Roaming Restriction Due To Unsupported Feature

This parameter defines that a subscriber is not allowed to roam in the current MSC area. It may be used by the HLR if a feature or service is indicated as unsupported by the VLR.

7.6.3.14 Extensible SS-Info

This parameter refers to all the information related to a supplementary service and is a choice between:

- extensible forwarding information (see subclause 7.6.3.15);
- extensible call barring information (see subclause 7.6.3.20);
- CUG info (see subclause 7.6.3.22);
- extensible SS-Data (see subclause 7.6.3.29).

7.6.3.15 Extensible Forwarding information

This parameter represents the information related to each call forwarding service:

- the SS-Code of the relevant call forwarding service (see subclause 7.6.4.1);
- if required, a list of extensible forwarding feature parameters (see subclause 7.6.3.16).

  The list may contain one item per Basic Service Group.

7.6.3.16 Extensible Forwarding feature

This parameter applies to each combination of call forwarding service and Basic Service Group and contains the following information, as required:

- extensible Basic Service Group (see subclause 7.6.3.5);
- extensible SS-Status (see subclause 7.6.3.17);
- forwarded-to number (see subclause 7.6.2.22);
- forwarded-to subaddress (see subclause 7.6.2.23);
- extensible forwarding options (see subclause 7.6.3.18);
- extensible no reply condition timer (see subclause 7.6.4.19).

7.6.3.17 Extensible SS-Status

This parameter refers to the state information of individual supplementary services as defined in TS GSM 03.11.

7.6.3.18 Extensible Forwarding Options

This parameter refers to a set of forwarding options attached to a supplementary service. It contains the following informations:

- notification to forwarding party (see TS GSM 02.82 for the meaning of this parameter);
- notification to calling party (see TS GSM 02.82 for the meaning of this parameter);
- Forwarding reason (see TS GSM 02.82 for the meaning of this parameter).

7.6.3.19 Extensible No reply condition timer

This parameter refers to the extensible no reply condition timer for call forwarding on no reply.

7.6.3.20 Extensible Call barring information

This parameter contains for each call barring service:

- SS-Code (see subclause 7.6.4.1);
- a list of extensible call barring feature parameters (see subclause 7.6.3.21).

  The list may contain one item per Basic Service Group.

7.6.3.21 Extensible Call barring feature

This parameter gives the status of call barring services as applicable to each Basic Service Group. The parameter contains the following information:

- Extensible Basic Service Group (see subclause 7.6.3.5);
- provisioned SS-Status (see subclause 7.6.3.17).

7.6.3.22 CUG info

This parameter refers to the overall information required for operation for each CUG:

- CUG subscriptionList;
- CUG featureList.

7.6.3.23 CUG subscription

This parameter refers to the set of basic information for each CUG defined in that subscription. The following information is stored:

- CUG index;
- CUG interlock;
- Intra CUG restrictions;
- Basic Service Group List.

7.6.3.24 CUG interlock

This parameter represents the CUG interlock code defined in ETS 300 138.

7.6.3.25 CUG index

This parameter represents the CUG index defined in ETS 300 138.

7.6.3.26 CUG feature

This parameter contains two parameters which are associated with the Basic Service Group. If the Basic Service Group Code is not present the feature applies to all Basic Services. The following parameters are included:

- Preferential CUG indicator:

  indicates which CUG index is to be used at outgoing call set-up using the associated Basic Service Group;

- Inter CUG Option:

  describes whether it for the associated Basic Service Group is allowed to make calls outside the CUG and whether incoming calls are allowed;

- Basic Service Group.

See TS GSM 02.85 for meaning of this parameter.

7.6.3.27 Inter CUG options

This parameter indicates the subscribers ability to make and receive calls outside a specific closed user group. It takes any of the following values:

- CUG only facility (only calls within CUG are allowed);
- CUG with outgoing access (calls outside CUG allowed);
- CUG with incoming access (calls from outside CUG into CUG allowed);
- CUG with both incoming and outgoing access (all calls allowed).

7.6.3.28 Intra CUG restrictions

This parameter describes whether or not the subscriber is allowed to originate calls to or to receive calls from within the CUG. It can take any of the following values:

- no CUG restrictions;
- CUG incoming calls barred;
- CUG outgoing calls barred.

7.6.3.29 Extensible SS-Data

This parameter refers to the necessary set of information required in order to characterise one supplementary service:

- SS-Code (see subclause 7.6.4.1);
- Extensible SS-Status (if applicable) (see subclause 7.6.3.17);
- Extensible Override subscription option (if applicable) (see subclause 7.6.3.30);
- Extensible CLI Restriction (if applicable) (see subclause 7.6.3.31);
- Extensible Basic Service Group Code (see subclause 7.6.3.5).

7.6.3.30 Subscriber State

This parameter indicates the state of the MS as defined in GSM 03.18.

7.6.3.31 Requested Info

This parameter indicates the subscriber information being requested as defined in GSM 03.18.

7.6.3.32 Suppression of Announcement

This parameter indicates if the announcement or tones shall be suppressed as defined in GSM 03.78.

7.6.3.33 Suppress T-CSI

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

7.6.3.34 GMSC CAMEL Subscription Info

This parameter contains CAMEL subscription information, i.e.O-CSI and/or T-CSI, which indicates to the GMSC that originating and/or terminating CAMEL services shall be invoked for the incoming call.

7.6.3.35 VLR CAMEL Subscription Info

This parameter identifies the subscriber as having CAMEL services which are invoked in the MSC.

7.6.3.36 Supported CAMEL Phases

This parameter indicates which phases of CAMEL are supported.

7.6.3.37 CUG Subscription Flag

This parameter indicates a that a subscriber with a T-CSI also has a CUG subscription. It is defined in TS GSM 03.78.

7.6.3.38 CAMEL Subscription Info Withdraw

This parameter indicates that CAMEL Subscription Info shall be deleted from the VLR.

7.6.3.39 Voice Group Call Service (VGCS) Data

This parameter refers to one or more groups a subscriber may be member of for voice group calls.

7.6.3.40 Voice Broadcast Service (VBS) Data

This parameter refers to one or more groups a subscriber may be member of for the voice broadcast service. Per group it is further indicated whether the subscriber is only allowed to listen to respective group calls or whether he is in addition entitled to initiate respective voice broadcast calls.

7.6.3.41 ISDN bearer capability

This parameter refers to the ISDN bearer capability information element defined in GSM 09.07.

7.6.3.42 Lower layer Compatibility

This parameter refers to the lower layer compatibility information element defined in GSM 04.08.

7.6.3.43 High Layer Compatibility

This parameter refers to the high layer compatibility information element defined in GSM 04.08.

7.6.3.44 Alerting Pattern

This parameter is an indication that can be used by the MS to alert the user in a specific manner in case of mobile terminating traffic (switched call or USSD). That indication can be an alerting level or an alerting category.

7.6.3.45 GPRS Subscription Data Withdraw

This parameter indicates that GPRS Subscription Data shall be deleted from the SGSN.

7.6.3.46 GPRS Subscription Data

This parameter refers to the list of PDP-Contexts that subscriber has subscribed to.

7.6.3.47 QoS-Subscribed

This parameter indicates the quality of service subscribed for a certain service. It is defined in GSM 03.60.

7.6.3.48 VPLMN address allowed

This parameter specifies whether the MS is allowed to used a dynamic address allocated in the VPLMN. It is defined in GSM 03.60.

7.6.3.49 Roaming Restricted In SGSN Due To Unsupported Feature

This parameter defines that a subscriber is not allowed to roam in the current SGSN area. It may be used by the HLR if a feature or service is indicated as unsupported by the SGSN.

7.6.3.50 Network Access Mode

This parameter is defined in GSM 03.08.

7.6.3.51 Mobile Not Reachable Reason

This parameter stores the reason for the MS being absent when an attempt to deliver a short message to an MS fails at the MSC, SGSN or both. It is defined in TS GSM 03.40.

7.6.3.52 Cancellation Type

This parameter indicates the reason of location cancellation. It is defined in TS GSM 03.60.

7.6.3.53 All GPRS Data

This parameter indicates to the SGSN that all GPRS Subscription Data shall be deleted for the subscriber.

7.6.3.54 Complete Data List Included

This parameter indicates to the SGSN that the complete GPRS Subscription Data stored for the Subscriber shall be replaced with the GPRS Subscription Data received.

7.6.3.55 PDP Context Identifier

This parameter is used to identify a PDP context for the subscriber.

7.6.4 Supplementary services parameters

7.6.4.1 SS-Code

This parameter may refer to one supplementary service or a set of supplementary services as defined in TS GSM 02.04. For MAP Release '97 this includes:

- Calling Line Identification Presentation service (CLIP);
- Calling Line Identification Restriction service (CLIR);

- Connected Line Identification Presentation service (COLP);
- Connected Line Identification Restriction service (COLR);
- Calling Name Presentation (CNAP)
- All Call Forwarding services;
- Call Waiting (CW);
- Call Hold (HOLD);
- Multi-Party service (MPTY);
- Closed User Group (CUG);
- All Charging services;
- All Call Restriction services;
- Explicit Call Transfer service (ECT);
- enhanced Multi-Level Precedence and Pre-emption service (eMLPP);
- Completion of Calls to Busy Subscriber, originating side (CCBS-A);
- Completion of Calls to Busy Subscriber, destination side (CCBS-B).

7.6.4.2 SS-Status

This parameter refers to the state information of individual supplementary services as defined in GSM 03.11.

7.6.4.3 SS-Data

This parameter refers to the necessary set of information required in order to characterise one supplementary service:

- SS-Code (see subclause 7.6.4.1);
- SS-Status (if applicable) (see subclause 7.6.4.2);
- Override subscription option (see subclause 7.6.4.4);
- CLI Restriction (see subclause 7.6.4.5);
- Basic Service Group Code (see subclause 7.6.4.40).

7.6.4.4 Override Category

This parameter refers to the subscription option Override Category attached to a supplementary service. It can take the following two values:

- Enabled;
- Disabled.

7.6.4.5 CLI Restriction Option

This parameter refers to the subscription option Restriction mode attached to the CLIR supplementary service. It can take the following three values:

- Permanent;
- Temporary (Default Restricted);
- Temporary (Default Allowed).

7.6.4.6 Forwarding Options

This parameter refers to a forwarding option attached to a supplementary service. It can take one of the following values:

- notification to forwarding party (see GSM 02.82 for the meaning of this parameter);
- notification to calling party (see GSM 02.82 for the meaning of this parameter);
- Forwarding reason (see GSM 02.82 for the meaning of this parameter).

7.6.4.7 No reply condition timer

This parameter refers to the no reply condition timer for call forwarding on no reply.

7.6.4.8 - 7.6.4.14 Void

7.6.4.15 Forwarding information

This parameter represents the information related to each call forwarding service:

- the SS-Code of the relevant call forwarding service (see subclause 7.6.4.1);
- if required, a list of forwarding feature parameters (see subclause 7.6.4.16).

  The list may contain one item per Basic Service Group.

7.6.4.16 Forwarding feature

This parameter applies to each combination of call forwarding service and Basic Service Group and contains the following information, as required:

- Basic Service Group (see subclause 7.6.4.40);
- SS-Status (see subclause 7.6.4.2);
- forwarded-to number (see subclause 7.6.2.22);
- forwarded-to subaddress (see subclause 7.6.2.23);
- forwarding options (see subclause 7.6.4.6);
- no reply condition timer (see subclause 7.6.4.7).

7.6.4.17 Void

7.6.4.18 Call barring information

This parameter contains for each call barring service:

- SS-Code (see subclause 7.6.4.1);
- a list of call barring feature parameters (see subclause 7.6.4.19).

  The list may contain one item per Basic Service Group.

7.6.4.19 Call barring feature

This parameter gives the status of call barring services as applicable to each Basic Service Group. The parameter contains the following information:

- Basic Service Group (see subclause 7.6.4.40);

- SS-Status (see subclause 7.6.4.2).

7.6.4.20 New password

This parameter refers to the password which the subscriber just registered in the network.

This parameter refers to a password used by the subscriber for supplementary service control.

7.6.4.21 Current password

This parameter refers to a password used by the subscriber for supplementary service control.

7.6.4.22 Guidance information

This parameter refers to guidance information given to a subscriber who is requested to provide a password. One of the following information may be given:

- "enter password";

  This information is used for checking of the old password.

- "enter new password";

  This information is used during password registration for the request of the first new password.

- "enter new password again";

  This information is used during password registration for the request of the new password again for verification.

7.6.4.23 Void

7.6.4.24 SS-Info

This parameter refers to all the information related to a supplementary service and is a choice between:

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

7.6.4.25 ÷ 7.6.4.35 Void

7.6.4.36 USSD Data Coding Scheme

This parameter contains the information of the alphabet and the language used for the unstructured information in an Unstructured Supplementary Service Data operation. The coding of this parameter is according to the Cell Broadcast Data Coding Scheme as specified in GSM 03.38.

7.6.4.37 USSD String

This parameter contains a string of unstructured information in an Unstructured Supplementary Service Data operation. The string is sent either by the mobile user or the network. The contents of a string sent by the MS are interpreted by the network as specified in GSM 02.90.

7.6.4.38 Bearer service

This parameter may refer to a single bearer service, a set of bearer services or to all bearer services as defined in TS GSM 02.02. This parameter is used only for supplementary service management.

7.6.4.39 Teleservice

This parameter may refer to a single teleservice, a set of teleservices or to all teleservices as defined in TS GSM 02.03. This parameter is used only for supplementary service management.

7.6.4.40 Basic Service Group

This parameter refers to the Basic Service Group either as a bearer service (see subclause 7.6.4.38) or a teleservice (see subclause 7.6.4.39). This parameter is used only for supplementary service management. The null value (i.e. neither bearer service nor teleservice) is used to denote the group containing all bearer services and all teleservices.

7.6.4.41 eMLPP information

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

- maximum entitled priority:

  indicates the highest priority level the subscriber is allowed to apply for an outgoing call set-up;

- default priority:

  defines the priority level which shall be assigned to a call if no explicit priority is indicated during call set-up.

7.6.4.42 SS-event

This parameter indicates the Supplementary Service for which an invocation notification is sent towards the gsmSCF. It can indicate one of the following services:

- Explicit Call Transfer (ECT)
- Call Deflection (CD)
- Multi-Party call (MPTY)

7.6.4.43 SS-event data

This parameter contains additional information related to Supplementary Service invocation. Depending on the service invoked it can contain the following information:

ECT A list with all Called Party Numbers involved.

CDThe called Party number involved.

7.6.5 Call parameters

7.6.5.1 Call reference number

This parameter refers to a call reference number allocated by a call control MSC.

7.6.5.2 Interrogation type

This parameter refers to the type of interrogation for routing information which is sent from a GMSC to an HLR. It can take either of two values:

- basic call (for information to route a call before the call has been extended to the VMSC of the called party);

- forwarding (for information to route the call to the forwarded-to destination after the VMSC of the forwarding party has requested the GMSC to resume handling of the call.

7.6.5.3 OR interrogation

This parameter indicates that the GMSC which interrogated the HLR for routeing information is not in the same PLMN as the HLR, and therefore that the call will potentially be optimally routed.

7.6.5.4 OR capability

This parameter indicates the phase of OR which the GMSC supports.

7.6.5.5 Forwarding reason

This parameter indicates the reason for which the call is to be forwarded. It can take one of three values:

- busy subscriber;
- mobile subscriber not reachable;
- no subscriber reply.

7.6.5.6 Forwarding interrogation required

This parameter indicates that if the VMSC of the forwarding subscriber requests the GMSC to resume handling of the call the GMSC shall interrogate the HLR for forwarding information.

7.6.5.7 O-CSI

This parameter identifies the subscriber as having originating CAMEL services as defined in TS GSM 03.78

7.6.5.8 Call Direction

This parameter is used to indicate the direction of the call.

7.6.5.9 Channel Type

This parameter is the result of a Channel Mode Modification for TS61/62. It contains the changed Air Interface User Rate. The information is sent from the SIWFS to the MSC to assign the correct radio resource. This parameter is defined in GSM 08.08.

7.6.5.10 Chosen Channel

This parameter is sent from the MSC to the SIWFS to adjust the interworking unit to the assigned radio resources. This parameter is defined in GSM 08.08.

7.6.5.11 CCBS Feature

This parameter corresponds to the 'CCBS Description' parameter in GSM 03.93. It refers to the necessary set of information required in order to characterise a certain CCBS request. The parameter may contain the following information:

- CCBS Index (see GSM 03.93 for the use of this parameter);
- B-subscriber number (see subclause 7.6.2.48);
- B-subscriber subaddress (see subclause 7.6.2.49);
- Basic Service Group Code (see subclause 7.6.4.40).

7.6.6 Radio parameters

7.6.6.1 ÷ 7.6.6.6 Void

7.6.6.7 HO-Number Not Required

This parameter indicates that no handover number allocation is necessary.

7.6.7 Authentication parameters

7.6.7.1 Authentication set list

This parameter represents a list of sets of authentication parameters for a given subscriber:

- Rand;
- Sres;
- Kc.

7.6.7.2 Rand

This parameter represents a random number used for authentication.

7.6.7.3 Sres

This parameter represents the response to an authentication request.

7.6.7.4 Kc

This parameter refers to a key used for ciphering purposes.

7.6.7.5 Void

7.6.7.6 Cksn

This parameter refers to a ciphering key sequence number.

7.6.7.7 Ciphering mode

This parameter refers to the ciphering mode which is associated with a radio channel. It may take values as follows:

- no encryption;
- identification of specific ciphering algorithm.

7.6.8 Short message parameters

7.6.8.1 SM-RP-DA

This parameter represents the destination address used by the short message service relay sub-layer protocol. It can be either of the following:

- IMSI (see subclause 7.6.2.1);
- LMSI (see subclause 7.6.2.16);
- MS-ISDN (see subclause 7.6.2.17);

- roaming number (see subclause 7.6.2.19);
- service centre address (see subclause 7.6.2.27).

7.6.8.2 SM-RP-OA

This parameter refers to the originating address used by the short message service relay sub-layer protocol. It can be either of the following:

- MS-ISDN (see subclause 7.6.2.17);
- service centre address (see subclause 7.6.2.27).

7.6.8.3 MWD status

This parameter indicates whether or not the address of the originator service centre is already contained in the Message Waiting Data file. In addition, it contains the status of the Memory Capacity Exceeded Flag (MCEF), the status of the Mobile subscriber Not Reachable Flag (MNRF) and the status of the Mobile station Not Reachable for GPRS flag (MNRG).

7.6.8.4 SM-RP-UI

This parameter represents the user data field carried by the short message service relay sub-layer protocol.

7.6.8.5 SM-RP-PRI

This parameter is used to indicate whether or not delivery of the short message shall be attempted when a service centre address is already contained in the Message Waiting Data file.

7.6.8.6 SM Delivery Outcome

This parameter indicates the cause for setting the message waiting data. It can take one of the following values:

- Absent subscriber;
- MS memory capacity exceeded;
- Successful transfer.

7.6.8.7 More Messages To Send

This parameter is used to indicate whether or not the service centre has more short messages to send.

7.6.8.8 Alert Reason

This parameter is used to indicate the reason why the service centre is alerted. It can take one of the following values:

- MS present;
- Memory Available.

7.6.8.9 Absent Subscriber Diagnostic SM

This parameter is used to indicate the reason why the subscriber is absent. For the values for this parameter see TS GSM 03.40.

7.6.8.10 Alert Reason Indicator

This parameter indicates that the alert reason is sent to the HLR due to GPRS activity.

7.6.8.11 Additional SM Delivery Outcome

This parameter is used to indicate the GPRS delivery outcome in case a combination between delivery outcome for GPRS and non-GPRS are sent to the HLR.

7.6.8.12 Additional Absent Subscriber Diagnostic SM

This parameter indicates the reason of the additional SM Delivery Outcome.

7.6.8.13 Delivery Outcome Indicator

This parameter indicates that the delivery outcome sent to the HLR is for GPRS.

7.6.8.14 GPRS Node Indicator

This parameter indicates that the Network Node Number sent by the HLR is the SGSN number.

7.6.8.15 GPRS Support Indicator

This parameter indicates that the SMS-GMSC supports GPRS specific procedure of combine delivery of Short Message via MSC and/or via the SGSN.

7.6.8.16 SM-RP-MTI

This parameter represents the RP-Message Type Indicator of the Short Message. It is used to distinguish a SM sent to the mobile station in order to acknowledge an MO-SM initiated by the mobile from a normal MT-SM. This parameter is formatted according to the formatting rules of address fields as described in GSM 03.40.

7.6.8.17 SM-RP-SMEA

This parameter represents the RP-Originating SME-address of the Short Message Entity that has originated the SM. This parameter is used by the short message service relay sub-layer protocol and is formatted according to the formatting rules of address fields as described in GSM 03.40.

7.6.9 Access and signalling system related parameters

7.6.9.1 BSS-apdu

This parameter includes one or two concatenated complete 08.06 messages, as described in GSM 03.09 and GSM 09.10. The Protocol ID indicates that the message or messages are according to GSM 08.06. For the coding of the messages see GSM 08.06 and GSM 08.08.

7.6.9.2 CM service type

This parameter identifies the service category being requested by the subscriber:

- mobile originating call;
- emergency call establishment;
- short message service;
- mobile originating call re-establishment;
- mobile terminating call;
- SS request;
- Voice group call setup;

- Voice broadcast setup.

7.6.9.3 Access connection status

This parameter represents the following access connection status information:

- RR-connection status (established/not established);
- ciphering mode (on/off);
- authentication status (authenticated/not authenticated).

7.6.9.4 External Signal Information

This parameter contains concatenated information elements (including tag and length) which are defined by a common protocol version, preceded by the associated protocol ID. It is used to transport information of the indicated protocol via MAP interfaces.

7.6.9.5 Access signalling information

This parameter refers to any set of information elements imported from GSM 04.08.

7.6.9.6 Location update type

This parameter refers to the location update type (normal, periodic or IMSI attach) contained in the GSM 04.08 LOCATION REGISTRATION REQUEST message.

7.6.9.7 Protocol ID

This parameter refers to the protocol to which the coding of the content of the associated External Signal Information conforms.

The following values are defined:

- 04.08;
- 08.06;
- ETS 300 102-1.

  This value indicates the protocol defined by ETS 300 102-1 (EDSS1).

7.6.9.8 Network signal information

This parameter is transported as external signal information. The protocol ID shall be set to "ETS 300 102-1".

The network signal information may include the following information elements as defined in GSM 09.07:

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

  For the content, see GSM 09.07.

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

  For the content, see GSM 09.07.

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

  For the content, see GSM 09.07.

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

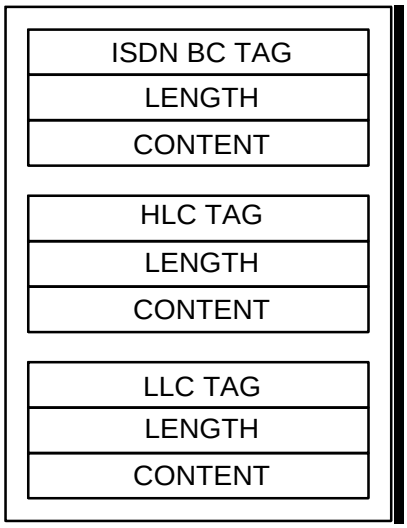

Figure 7.6/1: Network signal information parameter

7.6.9.9 Call Info

This parameter is transported as external signal information. The protocol ID shall be set to "GSM 04.08".

The Call Info includes the set of information elements from the original SETUP message and is imported from GSM 04.08.

7.6.10 System operations parameters

7.6.10.1 Network resources

This parameter refers to a class or type of network resource:

- PLMN;
- HLR;
- VLR (current or previous);
- MSC (controlling or current);
- EIR;
- radio sub-system.

7.6.10.2 Trace reference

This parameter represents a reference associated with a tracing request. The parameter is managed by OMC.

7.6.10.3 Trace type

This parameter identifies the type of trace. Trace types are fully defined in GSM 12.08.

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

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

ParameterNameLIST

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

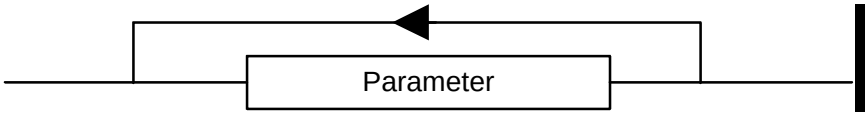

Figure 7.7/1: Construction of Lists

8 Mobility services

8.1 Location management services

8.1.1 MAP_UPDATE_LOCATION_AREA service

8.1.1.1 Definition

This service is used between MSC and VLR to update location information in the network. It is initiated by an MS when changing the location area or at first registration. The detailed conditions are given in GSM 03.12.

The MAP_UPDATE_LOCATION_AREA service is a confirmed service using the primitives from table 8.1/1.

8.1.1.2 Service primitives

Table 8.1/1: MAP_UPDATE_LOCATION_AREA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target location area Id	M	M(=)		
Serving cell Id	M	M(=)		
Location update type	M	M(=)		
IMSI	C	C(=)		
TMSI	C	C(=)		
Previous location area Id	C	C(=)		
CKSN	C	C(=)		
User error			C	C(=)
Provider error				O

8.1.1.3 parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

Target location area Id

See definition in subclause 7.6.2.

Serving cell Id

See definition in subclause 7.6.2.

Location update type

See definition in subclause 7.6.9.

IMSI

See definition in subclause 7.6.2. It is up to the MS to provide either IMSI or TMSI, but one shall be present.

TMSI

See definition in subclause 7.6.2. It is up to the MS to provide either IMSI or TMSI, but one shall be present.

Previous location area Id

See definition in subclause 7.6.2. This parameter is provided if the updating is not a first registration.

CKSN

See definition in subclause 7.6.7. The CKSN is given if TMSI is used.

User error

One of the following error causes defined in subclause 7.6.1 is sent by the user in case of location area updating failures, depending on the failure reason:

- unknown subscriber;

  This cause is used if the subscriber is not known in the VLR and even a correlated request to the subscriber's HLR gives a negative result (i.e. the IMSI is not allocated to a subscriber).

- unknown location area;

  This cause is used if the target location area identity given is not known in the VLR.

- roaming not allowed;

  This cause is used if the MS is not allowed to roam into the target location area indicated in the MAP_UPDATE_LOCATION_AREA Req. The cause will be qualified according to the roaming restriction reason, i.e. one of "National Roaming Not Allowed", "PLMN Not Allowed", "Location Area Not Allowed", or "Operator Determined Barring".

- illegal subscriber;

  This error is sent if a correlated authentication procedure has not authenticated the subscriber.

- illegal equipment;

  This error is sent if an IMEI check failed, i.e. the IMEI is blacklisted or not white-listed.

- system failure;

- unexpected data value.

Provider error

For definition of provider errors see subclause 7.6.1.

8.1.2 MAP_UPDATE_LOCATION service

8.1.2.1 Definition

This service is used by the VLR to update the location information stored in the HLR.

The MAP_UPDATE_LOCATION service is a confirmed service using the service primitives given in table 6.1/2.

8.1.2.2 Service primitives

Table 8.1/2: MAP_UPDATE_LOCATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
MSC Address	M	M(=)		
VLR number	M	M(=)		
LMSI	U	C(=)		
Supported CAMEL Phases	C	C(=)		
HLR number			C	C(=)
User error			C	C(=)
Provider error				O

8.1.2.3 Parameter definitions and use

Invoke Id

See definition in subclause 5.6.1.

IMSI

See definition in subclause 5.6.2.

MSC Address

See definition in subclause 5.6.2. The MSC address is used for short message delivery only and for each incoming call set-up attempt the MSRN will be requested from the VLR.

VLR number

See definition in subclause 5.6.2.

LMSI

See definition in subclause 5.6.2. It is an operator option to provide the LMSI from the VLR; it is mandatory for the HLR to support the LMSI handling procedures.

Supported CAMEL Phases

This parameter indicates which phases of CAMEL are supported. Must be present if a CAMEL phase different from phase 1 is supported. Otherwise may be absent.

HLR number

See definition in subclause 5.6.2. The presence of this parameter is mandatory in case of successful HLR updating.

User error

In case of unsuccessful updating, an error cause shall be returned by the HLR. The following error causes defined in subclause 5.6.1 may be used, depending on the nature of the fault:

- unknown subscriber;
- roaming not allowed;

  This cause will be sent if the MS is not allowed to roam into the PLMN indicated by the VLR number. The cause is qualified by the roaming restriction reason "PLMN Not Allowed" or "Operator Determined Barring". If no qualification is received (HLR with MAP Version 1), "PLMN Not Allowed" is taken as default.

- system failure;

- unexpected data value.

Provider error

For definition of provider errors see subclause 5.6.1.

8.1.3 MAP_CANCEL_LOCATION service

8.1.3.1 Definition

This service is used between HLR and VLR to delete a subscriber record from the VLR. It may be invoked automatically when an MS moves from one VLR area to another, to remove the subscriber record from the old VLR, or by the HLR operator to enforce a location updating from the VLR to the HLR, e.g. on withdrawal of a subscription.

Also this service is used between HLR and SGSN to delete a subscriber record from the SGSN. It may be invoked automatically when an MS moves from one SGSN area to another, to remove the subscriber record from the old SGSN, or by the HLR operator to enforce a location updating from the SGSN to the HLR.

The MAP_CANCEL_LOCATION service is a confirmed service using the primitives defined in table 8.1/3.

8.1.3.2 Service primitives

Table 8.1/3: MAP_CANCEL_LOCATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	C	C(=)		
Cancellation Type	C	C(=)		
User error			C	C(=)
Provider error				O

8.1.3.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

LMSI

See definition in subclause 7.6.2. The LMSI shall be included if it has been received from VLR. LMSI is not applicable between SGSN and HLR.

Value 0000 0000 can be used to indicate that the LMSI is not in use.

Cancellation Type

See definition in subclause 5.6.3. The presence of this parameter is mandatory when the Cancel Location is sent to the SGSN. If the VLR receives this parameter and do not understand it the VLR shall ignore it.

User error

If the cancellation fails, an error cause is to be returned by the VLR or by the SGSN. The one of the following error causes defined in subclause 5.6.1 shall be used:

- unexpected data value;
- data missing.

Provider error

For definition of provider errors see subclause 7.6.1.

8.1.4 MAP_SEND_IDENTIFICATION service

8.1.4.1 Definition

The MAP_SEND_IDENTIFICATION service is used between a VLR and a previous VLR to retrieve IMSI and authentication sets for a subscriber registering afresh in that VLR.

The MAP_SEND_IDENTIFICATION service is a confirmed service using the service primitives defined in table 8.1/4.

8.1.4.2 Service primitives

Table 8.1/4: MAP_SEND_IDENTIFICATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
TMSI	M	M(=)		
IMSI			C	C(=)
Authentication set			U	C(=)
User error			C	C(=)
Provider error				O

8.1.4.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

TMSI

See definition in subclause 7.6.2.

IMSI

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

Authentication set

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

User error

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

- unidentified subscriber.

Provider error

For definition of provider errors see subclause 7.6.1.

8.1.5 MAP_DETACH_IMSI service

8.1.5.1 Definition

The MAP_DETACH_IMSI service is used by the MSC to indicate to the VLR that an MS is no longer reachable. The network needs this information e.g. to reject an incoming call without initiating paging on the radio path.

The MAP_DETACH_IMSI service is a non-confirmed service using the service primitives defined in table 8.1/5.

8.1.5.2 Service primitives

Table 8.1/5: MAP_DETACH_IMSI

Parameter name	Request	Indication
Invoke Id	M	M(=)
Serving cell id	M	M(=)
IMSI	C	C(=)
TMSI	C	C(=)

8.1.5.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

Serving cell id

See definition in subclause 7.6.2.

IMSI

See definition in subclause 7.6.2. It is up to the MS to provide either IMSI or TMSI as subscriber identity, but one shall be present.

TMSI

See definition in subclause 7.6.2. It is up to the MS to provide either IMSI or TMSI as subscriber identity, but one shall be present.

8.1.6 MAP_PURGE_MS service

8.1.6.1 Definition

This service is used between the VLR and the HLR to cause the HLR to mark its data for an MS so that any request for routing information for a mobile terminated call or a mobile terminated short message will be treated as if the MS is not reachable. It is invoked when the subscriber record for the MS is to be deleted in the VLR, either by MMI interaction or automatically, e.g. because the MS has been inactive for several days.

Also this service is used between the SGSN and the HLR to cause the HLR to mark its data for an MS so that any request for routing information for a mobile terminated short message or a network requested PDP-context activation will be treated as if the MS is not reachable. It is invoked when the subscriber record for the MS is to be deleted in the SGSN, either by MMI interaction or automatically, e.g. because the MS has been inactive for several days.

The MAP_PURGE_MS service is a confirmed service using the primitives defined in table 8.1/6.

8.1.6.2 Service primitives

Table 8.1/6: MAP_PURGE_MS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
VLR number	C	C(=)		
Freeze TMSI			C	C(=)
Freeze P-TMSI			C	C(=)
SGSN number	C	C(=)		
User error			C	C(=)
Provider error				O

8.1.6.3 Parameter definitions and use

Invoke ID

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

VLR number

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

SGSN number

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

Freeze TMSI

This parameter is sent to the VLR to indicate that the TMSI has to be frozen. It shall be present if the received VLR number matches the stored VLR number.

Freeze P-TMSI

This parameter is sent to the SGSN to indicate that the P-TMSI has to be frozen. It shall be present if the received SGSN number matches the stored SGSN number.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Data Missing;
- Unexpected Data Value;
- UnknownSubscriber.

Provider error

See definition of provider errors in subclause 7.6.1.

8.1.7 MAP_UPDATE_GPRS_LOCATION service

8.1.7.1 Definition

This service is used by the SGSN to update the location information stored in the HLR.

The MAP_UPDATE_GPRS_LOCATION service is a confirmed service using the service primitives given in table 8.1/7.

8.1.7.2 Service primitives

Table 8.1/7: MAP_UPDATE_GPRS_LOCATION

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
SGSN number	M	M(=)		
SGSN address	M	M(=)		
HLR number			C	C(=)
User error			C	C(=)
Provider error				O

8.1.7.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

SGSN number

See definition in subclause 7.6.2.

SGSN address

See definition in subclause 7.6.2.

HLR number

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

User error

In case of unsuccessful updating, an error cause shall be returned by the HLR. The following error causes defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- unknown subscriber;
- roaming not allowed;

  This cause will be sent if the MS is not allowed to roam into the PLMN indicated by the SGSN number. The cause is qualified by the roaming restriction reason "PLMN Not Allowed" or "Operator Determined Barring".

- system failure;
- unexpected data value.

The diagnostic in the Unknown Subscriber may indicate “Imsi Unknown” or “Gprs Subscription Unknown”.

Provider error

For definition of provider errors see subclause 7.6.1.

8.2 Paging and search

8.2.1 MAP_PAGE service

8.2.1.1 Definition

This service is used between VLR and MSC to initiate paging of an MS for mobile terminated call set-up, mobile terminated short message or unstructured SS notification.

The MAP_PAGE service is a confirmed service using the primitives from table 8.2/1.

8.2.1.2 Service primitives

Table 8.2/1: MAP_PAGE

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Stored location area Id	M	M(=)		
TMSI	U	C(=)		
User error			C	C(=)
Provider error				O

8.2.1.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The IMSI is used to define the paging subgroup. If the TMSI is not supplied, paging on the radio path uses the IMSI as an identifier.

Stored location area Id

See definition in subclause 7.6.2.

TMSI

See definition in subclause 7.6.2. The TMSI is included if paging on the radio channel is to use the TMSI as an identifier.

User error

The following error causes defined in subclause 7.6.1 may be sent by the user in case of a paging error, depending on the failure reason:

- absent subscriber;
- unknown location area;
- busy subscriber;
- system failure;

  This corresponds to the case where there is no call associated with the MAP_PAGE service, i.e. if the call has been released but the dialogue to the VLR has not been aborted.

- unexpected data value.

Provider error

See definition in subclause 7.6.1.

8.2.2 MAP_SEARCH_FOR_MS service

8.2.2.1 Definition

This service is used between VLR and MSC to initiate paging of an MS in all location areas of that VLR. It is used if the VLR does not hold location area information confirmed by radio contact.

The MAP_SEARCH_FOR_MS service is a confirmed service using the primitives from table 8.2/2.

8.2.2.2 Service primitives

Table 8.2/2: MAP_SEARCH_FOR_MS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Current location area Id			C	C(=)
User error			C	C(=)
Provider error				O

8.2.2.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

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

Current location area Id

See definition in subclause 7.6.2. In case of successful outcome of the service, i.e. if the MS responds to paging, the Location Area Id of the area in which the MS responded is given in the response.

User error

The following error causes defined in subclause 7.6.1 shall be sent by the user if the search procedure fails, depending on the failure reason:

- absent subscriber;

  This error cause is returned by the MSC if the MS does not respond to the paging request.

- system failure;

  This corresponds to the case where there is no call associated with the MAP_SEARCH_FOR_MS service, i.e. if the call has been released but the dialogue to the VLR has not been aborted.

- busy subscriber;

- unexpected data value.

Provider error

See definition in subclause 7.6.1.

8.3 Access management services

8.3.1 MAP_PROCESS_ACCESS_REQUEST service

8.3.1.1 Definition

This service is used between MSC and VLR to initiate processing of an MS access to the network, e.g. in case of mobile originated call set-up or after being paged by the network.

The MAP_PROCESS_ACCESS_REQUEST service is a confirmed service using the primitives from table 8.3/1.

8.3.1.2 Service primitives

Table 8.3/1: MAP_PROCESS_ACCESS_REQUEST

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
CM service type	M	M(=)		
Access connection status	M	M(=)		
Current Location Area Id	M	M(=)		
Serving cell id	M	M(=)		
TMSI	C	C(=)		
Cksn	C	C(=)		
IMSI	C	C(=)	C	C(=)
IMEI	C	C(=)	C	C(=)
MSISDN			U	C(=)
User error			C	C(=)
Provider error				O

8.3.1.3 Parameter definitions and use

Invoke Id

See definition in subclause 7.6.1.

CM service type

See definition in subclause 7.6.9.

Access connection status

See definition in subclause 7.6.9.

Current Location Area Id

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

Serving cell id

See definition in subclause 7.6.2.

TMSI

See definition in subclause 7.6.2. Either TMSI or IMSI as received from the MS are included in the Request/Indication, but one shall be present. In case of CM Service Type "Emergency Call Establishment", the IMEI may replace IMSI/TMSI.

Cksn

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

IMSI

See definition in subclause 7.6.2. Either TMSI or IMSI as received from the MS are included in the Request/Indication, but one shall be present. In case of CM Service Type "Emergency Call Establishment", the IMEI may replace IMSI/TMSI.

In the Response/Confirmation, the IMSI is to be sent in case of successful outcome of the service. In case of CM Service Type "Emergency Call Establishment", IMEI may replace IMSI.

IMEI

See definition in subclause 7.6.2. The IMEI may replace IMSI/TMSI in the Request/Indication and IMSI in the Response/Confirmation only in case the CM Service Type indicates "Emergency Call Establishment".

MSISDN

See definition in subclause 7.6.2. The MSISDN is included in case of successful outcome of the service as an operator option, e.g. if it is needed at the MSC for charging purposes in case of call forwarding.

User error

One of the following error causes defined in subclause 7.6.1 shall be sent by the user if the access request fails, depending on the failure reason:

- unidentified subscriber;
- illegal subscriber;

  This error is sent if a correlated authentication procedure has not authenticated the subscriber.

- illegal equipment;

  This error is sent if an IMEI check failed, i.e. the IMEI is blacklisted or not white-listed.

- roaming not allowed;

  This cause is used after VLR restart if the subscriber has no subscription for the current location area, e.g. due to regional subscription. The cause will be qualified by "location area not allowed" or "national roaming not allowed", respectively.

- unknown location area;
- system failure;
- unexpected data value.

Provider error

For definition of provider errors see subclause 7.6.1.

8.4 Handover services

8.4.1 MAP_PREPARE_HANDOVER service

8.4.1.1 Definition

This service is used between MSC-A and MSC-B (E-interface) when a call is to be handed over from MSC-A to MSC-B.

The MAP_PREPARE_HANDOVER service is a confirmed service using the primitives from table 8.4/1.

8.4.1.2 Service primitives

Table 8.4/1: MAP_PREPARE_HANDOVER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target Cell Id	C	C(=)		
HO-NumberNotRequired	C	C(=)		
BSS-APDU	C	C(=)	C	C(=)
Handover Number			C	C(=)
User error			C	C(=)
Provider error				O

8.4.1.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

Target Cell Id

For definition of this parameter see subclause 7.6.2. This parameter is only included if the service is not in an ongoing transaction.

HO-Number Not Required

For definition of this parameter see subclause 7.6.6.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

Handover Number

For definition of this parameter see subclause 7.6.2. This parameter shall be returned, unless the parameter HO-NumberNotRequired is sent.

User error

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

- No handover number available;
- System failure;
- Unexpected data value;
- DataMissing.

Provider error

See definition of provider errors in subclause 7.6.1.

8.4.2 MAP_SEND_END_SIGNAL service

8.4.2.1 Definition

This service is used between MSC-B and MSC-A (E-interface) indicating that the radio path has been established by MSC-B to the MS. MSC-A retains then the main control of the call until it clears.

The response is used by MSC-A to inform MSC-B that all resources for the call can be released in MSC-B, either because the call has been released in MSC-A or because the call has been successfully handed over from MSC-B to another MSC.

The MAP_SEND_END_SIGNAL service is a confirmed service using the primitives from table 8.4/2.

8.4.2.2 Service primitives

Table 8.4/2: MAP_SEND_END_SIGNAL

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
BSS-APDU	M	M(=)		
Provider error				O

8.4.2.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

Provider error

For definition of this parameter see subclause 7.6.1.

8.4.3 MAP_PROCESS_ACCESS_SIGNALLING service

8.4.3.1 Definition

This service is used between MSC-B and MSC-A (E-interface) to pass information received on the A-interface in MSC-B to MSC-A.

The MAP_PROCESS_ACCESS_SIGNALLING service is a non-confirmed service using the primitives from table 8.4/3.

8.4.3.2 Service primitives

Table 8.4/3: MAP_PROCESS_ACCESS_SIGNALLING

Parameter name	Request	Indication
Invoke Id	M	M(=)
BSS-APDU	M	M(=)

8.4.3.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

8.4.4 MAP_FORWARD_ACCESS_SIGNALLING service

8.4.4.1 Definition

This service is used between MSC-A and MSC-B (E-interface) to pass information to be forwarded to the A-interface of MSC-B.

The MAP_FORWARD_ACCESS_SIGNALLING service is a non-confirmed service using the primitives from table 8.4/4.

8.4.4.2 Service primitives

Table 8.4/4: MAP_FORWARD_ACCESS_SIGNALLING

Parameter name	Request	Indication
Invoke Id	M	M(=)
BSS-APDU	M	M(=)

8.4.4.3 Parameter use

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

Invoke Id

For definition of this parameter see subclause 7.6.1.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

8.4.5 MAP_PREPARE_SUBSEQUENT_HANDOVER service

8.4.5.1 Definition

This service is used between MSC-B and MSC-A (E-interface) to inform MSC-A that it has been decided that a handover to either MSC-A or a third MSC (MSC-B') is required.

The MAP_PREPARE_SUBSEQUENT_HANDOVER service is a confirmed service using the primitives from table 8.4/5.

8.4.5.2 Service primitives

Table 8.4/5: MAP_PREPARE_SUBSEQUENT_HANDOVER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Target Cell Id	M	M(=)		
Target MSC Number	M	M(=)		
BSS-APDU	M	M(=)	C	C(=)
User error			C	C(=)
Provider error				O

8.4.5.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

Target Cell Id

For definition of this parameter see subclause 7.6.2.

Target MSC Number

For definition of this parameter see subclause 7.6.2.

BSS-APDU

For definition of this parameter see subclause 7.6.9.

User error

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

- Unknown MSC;
- Subsequent handover failure;
- Unexpected data value;
- Data Missing.

Provider error

For definition of this parameter see subclause 7.6.1.

8.4.6 MAP_ALLOCATE_HANDOVER_NUMBER service

8.4.6.1 Definition

This service is used between MSC and VLR (B-interface) to request a handover number.

The MAP_ALLOCATE_HANDOVER_NUMBER service is a confirmed service using the primitives from table 8.4/6.

8.4.6.2 Service primitives

Table 8.4/6: MAP_ALLOCATE_HANDOVER_NUMBER

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
User error			C	C(=)
Provider error				O

8.4.6.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

User error

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

- No handover number available.

Provider error

For definition of this parameter see subclause 7.6.1.

8.4.7 MAP_SEND_HANDOVER_REPORT service

8.4.7.1 Definition

This service is used between VLR and MSC-B (B-interface) to transfer the handover number to be forwarded to and used by MSC-A.

The MAP_SEND_HANDOVER_REPORT service is a confirmed service using the primitives from table 8.4/7.

8.4.7.2 Service primitives

Table 8.4/7: MAP_SEND_HANDOVER_REPORT

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

8.4.7.3 Parameter use

Invoke Id

For definition of this parameter see subclause 7.6.1.

Handover Number

For definition of this parameter see subclause 7.6.2.

Linked Id

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

Provider error

For definition of this parameter see subclause 7.6.1.

8.5 Authentication management services

8.5.1 MAP_AUTHENTICATE service

8.5.1.1 Definition

This service is used between the VLR and the MSC when the VLR receives a MAP service indication from the MSC concerning a location registration, call set-up, operation on a supplementary service or a request from the MSC to initiate authentication.

The service is a confirmed service and consists of four service primitives.

8.5.1.2 Service primitives

The service primitives are shown in table 8.5/1

Table 8.5/1: MAP_AUTHENTICATE parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
RAND	M	M(=)		
CKSN	M	M(=)		
SRES			M	M(=)
Provider error				O

8.5.1.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

RAND

See subclause 7.6.7 for the use of this parameter.

CKSN

See subclause 7.6.7 for the use of this parameter.

SRES

See subclause 7.6.7 for the use of this parameter.

Provider error

See subclause 7.6.1 for the use of this parameter.

8.5.2 MAP_SEND_AUTHENTICATION_INFO service

8.5.2.1 Definition

This service is used between the VLR and the HLR for the VLR to retrieve authentication information from the HLR. The VLR requests some sets of RAND/SRES/Kc vectors.

Also this service is used between the SGSN and the HLR for the SGSN to retrieve authentication information from the HLR. The SGSN requests some sets of RAND/SRES/Kc vectors.

If the HLR cannot provide the VLR or the SGSN with triplets, an empty response is returned. The VLR or the SGSN may then re-use old authentication triplets, except where this is forbidden under the conditions specified in GSM 03.20 [24].

If the VLR or SGSN receives a MAP-Send_AUTHENTICATION_INFO response containing a User Error parameter as part of the handling of an authentication procedure, the authentication procedure in the VLR or SGSN shall fail.

Security related network functions are further described in GSM 03.20.

The service is a confirmed service and consists of four service primitives.

8.5.2.2 Service primitives

The service primitives are shown in table 8.5/2.

Table 8.5/2: MAP_SEND_AUTHENTICATION_PARAMETERS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
AuthenticationSetList			C	C(=)
User error			C	C(=)
Provider error				O

8.5.2.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

IMSI

See subclause 7.6.2 for the use of this parameter.

AuthenticationSetList

A set of one to five authentication vectors are transferred from the HLR to the VLR or from the HLR to the SGSN, if the outcome of the service was successful.

User error

One of the following error causes defined in subclause 7.6.1 shall be sent by the user in case of unsuccessful outcome of the service, depending on the respective failure reason:

- unknown subscriber;
- unexpected data value;
- system failure;
- data missing.

Provider error

See subclause 7.6.1 for the use of this parameter.

8.6 Security management services

8.6.1 MAP_SET_CIPHERING_MODE service

8.6.1.1 Definitions

This service is used between the VLR and the MSC to set the ciphering mode and to start ciphering if applicable. It is called when another service requires that information is to be sent on the radio path in encrypted form.

The service is a non-confirmed service and consists of two service primitives.

8.6.1.2 Service primitives

The service primitives are shown in table 8.6/1

Table 8.6/1: MAP_SET_CIPHERING_MODE parameters

Parameter name	Request	Indication
Invoke id	M	M(=)
Ciphering mode	M	M(=)
Kc	C	C(=)

8.6.1.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

Ciphering mode

See subclause 7.6.7 for the use of this parameter.

Kc

The Kc parameter should be included when the ciphering mode parameter indicates that ciphering must be performed.

8.7 International mobile equipment identities management services

8.7.1 MAP_CHECK_IMEI service

8.7.1.1 Definition

This service is used between the VLR and the MSC and between the MSC and the EIR and between the SGSN and EIR to request check of IMEI. If the IMEI is not available in the MSC or in the SGSN, it is requested from the MS and transferred to the EIR in the service request.

The service is a confirmed service and consists of four service primitives.

8.7.1.2 Service primitives

The service primitives are shown in table 8.7/1.

Table 8.7/1: MAP_CHECK_IMEI parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMEI	C	C(=)	C	C(=)
Equipment status			C	C(=)
User error			C	C(=)
Provider error				O

8.7.1.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

IMEI

See subclause 7.6.2 for the use of this parameter. The parameter shall not be included in the service request between the VLR and the MSC, but is mandatory in the service request from the MSC to the EIR and from the SGSN to the EIR. It

is not included in the service response from the EIR to the MSC or to the SGSN, but is mandatory in the service response from the MSC to the VLR on successful outcome.

Equipment status

See subclause 7.6.4 for the use of this parameter. This parameter is sent by the responder in case of successful outcome of the service.

User error

One of the following error causes defined in subclause 7.6.1 shall be sent by the user in case of unsuccessful outcome of the service, depending on the respective failure reason:

- unknown equipment;

  This error is returned by the responder when the IMEI is not known in the EIR.

- system failure;

- unexpected data value.

Provider error

See subclause 7.6.1 for the use of this parameter.

8.7.2 MAP_OBTAIN_IMEI service

8.7.2.1 Definition

This service is used between the VLR and the MSC to request the IMEI. If the IMEI is not available in the MSC, it is requested from the MS.

The service is a confirmed service and consists of four service primitives.

8.7.2.2 Service primitives

The service primitives are shown in table 8.7/2.

Table 8.7/2: MAP_OBTAIN_IMEI parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMEI			C	C(=)
User error			C	C(=)
Provider error				O

8.7.2.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

IMEI

See subclause 7.6.2 for the use of this parameter. The parameter IS included in the service response from the MSC to the VLR on successful outcome of the service.

User error

If the service fails, the VLR sends the user error System Failure (see subclause 7.6.1) to the MSC.

Provider error

See subclause 7.6.1 for the use of this parameter.

8.8 Subscriber management services

8.8.1 MAP-INSERT-SUBSCRIBER-DATA service

8.8.1.1 Definition

This service is used by an HLR to update a VLR with certain subscriber data in the following occasions:

- the operator has changed the subscription of one or more supplementary services, basic services or data of a subscriber. Note that in case of withdrawal of a Basic or Supplementary service this primitive shall not be used;
- the operator has applied, changed or removed Operator Determined Barring;
- the subscriber has changed data concerning one or more supplementary services by using a subscriber procedure;
- the HLR provides the VLR with subscriber parameters at location updating of a subscriber or at restoration. In this case, this service is used to indicate explicitly that a supplementary service is not provisioned, if the supplementary service specification requires it. The only supplementary services which have this requirement are the CLIR and COLR services. Network access mode is provided only in restoration.

Also this service is used by an HLR to update a SGSN with certain subscriber data in the following occasions:

- if the GPRS subscription has changed;
- if the network access mode is changed;
- the operator has applied, changed or removed Operator Determined Barring;
- the HLR provides the SGSN with subscriber parameters at GPRS location updating of a subscriber.

It is a confirmed service and consists of the primitives shown in table 6.8/1.

8.8.1.2 Service primitives

Table 8.8/1: MAP-INSERT-SUBSCRIBER-DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
MSISDN	C	C(=)		
Category	C	C(=)		
Subscriber Status	C	C(=)		
Bearer service List	C	C(=)	C	C(=)
Teleservice List	C	C(=)	C	C(=)
Forwarding information List	C	C(=)		
Call barring information List	C	C(=)		
CUG information List	C	C(=)		
SS-Data List	C	C(=)		
eMLPP Subscription Data	C	C(=)		
Operator Determined Barring General data	C	C(=)	C	C(=)
Operator Determined Barring HPLMN data	C	C(=)		
Roaming Restriction Due To Unsupported Feature	C	C(=)		
Regional Subscription Data	C	C(=)		
VLR CAMEL Subscription Info	C	C(=)		
Voice Broadcast Data	C	C(=)		
Voice Group Call Data	C	C(=)		
Network access mode	C	C(=)		
GPRS Subscription Data	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
North American Equal Access preferred Carrier Id	U	C(=)		
SS-Code List			C	C(=)
Regional Subscription Response			C	C(=)
Supported CAMEL Phases			C	C (=)
User error			U	C(=)
Provider error				O

8.8.1.3 Parameter use

Network access mode

This parameter defines if the subscriber has access to MSC/VLR and/or to SGSN. This parameter is used by SGSN and MSC/VLR. In VLR, the parameter is used only as part of Restore Data Procedure and the parameter is not stored in the VLR.

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

IMSI

It is only included if the service is not used in an ongoing transaction (e.g. location updating). This parameter is used by the VLR and the SGSN.

MSISDN

It is included either at location updating or when it is changed. The MSISDN sent shall be the basic MSISDN. This parameter is used by the VLR and the SGSN.

Category

It is included either at location updating or when it is changed. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Subscriber Status

It is included either at location updating or when it is changed.

To apply, remove or update Operator Determined Barring Categories the Subscriber Status is set to Operator Determined Barring. In this case ODB General Data shall also be present. If the Operator Determined Barring applies and the subscriber is registered in the HPLMN and HPLMN specific Operator Determined Barring applies then ODB HPLMN Specific Data shall also be present.

To remove all Operator Determined Barring Categories the Subscriber Status shall be set to "Service Granted". This parameter is used by the VLR and the SGSN.

Bearer service List

A list of Extensible Bearer service parameters (Extensible Bearer service is defined in subclause 7.6). An Extensible Bearer service parameter must be the code for an individual Bearer service, except in the cases described below.

The codes for the Bearer service groups "allAlternateSpeech-DataCDA" and "allAlternateSpeech-DataCDS" shall, if applicable, be sent from the HLR to the VLR as a pair. The codes for the Bearer service groups "allSpeechFollowedByDataCDA" and "allSpeechFollowedByDataCDS" shall, if applicable, be sent from the HLR to the VLR as a pair.

If it is included in the Request/Indication, it includes either all Extensible Bearer services subscribed (at location updating or at restoration) or only the ones added (at subscriber data modification).

If the VLR receives an Indication containing any Extensible Bearer service parameters which it does not support/allocate it returns them in the response to the HLR and discards the unsupported Extensible Bearer services (no error is sent back), except in the cases described below.

If the VLR receives the codes for the Bearer service groups "allSpeechFollowedByDataCDA" and "allSpeechFollowedByDataCDS" and supports one or more of the circuit-switched synchronous or asynchronous data rates specified for simple data bearer services, it shall accept the bearer service codes, and not return them in the response to the HLR. If the VLR does not support any of the circuit-switched synchronous or asynchronous data rates specified for simple data bearer services, and receives the pair of codes for "allAlternateSpeech-DataCDA" and "allAlternateSpeech-DataCDS" or the pair of codes for "allSpeechFollowedByDataCDA" and "allSpeechFollowedByDataCDS", it shall reject the pair of codes by returning them in the response to the HLR. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Teleservice List

A list of Extensible Teleservice parameters (Extensible Teleservice is defined in subclause 7.6). An Extensible Teleservice parameter must be the code for an individual Teleservice.

If it is included in the Request/Indication, it contains either all Extensible Teleservices subscribed (at location updating or at restoration) or the ones added (at subscriber data modification). Only the Extensible Teleservices that are relevant to the node at which the message is received should be included in the Teleservice List.

If the VLR or the SGSN receives an Indication containing any Extensible Teleservice parameters which it does not support/allocate it returns them in the response to the HLR and discards the unsupported Extensible Teleservices (no error is sent back). This parameter is used by the VLR and the SGSN.

Forwarding information List

A list of Extensible Forwarding information parameters (Extensible Forwarding information is defined in subclause 7.6). It includes Call Forwarding services either at location updating or at restoration or when they are changed. Each Extensible Forwarding information parameter shall be treated independently of all other parameters in the primitive.

The Extensible Forwarding information shall include the SS-Code for an individual call forwarding supplementary service. The Extensible Forwarding information shall contain one or more Extensible Forwarding Features (Extensible Forwarding Feature is defined in subclause 7.6).

The Extensible Forwarding Feature may include an Extensible Basic Service Group. This shall be interpreted according to the rules in subclause 8.8.1.4.

The Extensible Forwarding Feature shall contain an Extensible SS-Status parameter.

If the Extensible SS-Status indicates that call forwarding is registered then (except for call forwarding unconditional) the Extensible Forwarding Feature shall contain a forwarded-to number and, if available, the forwarded-to subaddress. In

other states the forwarded-to number and, if applicable, the forwarded-to subaddress shall not be included. For call forwarding unconditional the forwarded-to number and, if applicable, the forwarded-to subaddress shall not be included. If the VLR does not receive a forwarded-to subaddress then it shall assume that a forwarded-to subaddress has not been registered.

The Extensible Forwarding Feature shall contain the extensible forwarding options (except for call forwarding unconditional where the extensible forwarding options shall not be included). Bits 3 and 4 of the extensible forwarding options shall be ignored by the VLR, and may be set to any value by the HLR.

For call forwarding on no reply: If the extensible SS-Status indicates that call forwarding is registered then the Extensible Forwarding Feature shall contain an extensible no reply condition timer. In other states the no reply condition timer shall not be included.

For call forwarding services other than call forwarding on no reply: The Extensible Forwarding Feature shall not contain a no reply condition timer.

If the VLR receives an Indication containing any Call Forwarding service codes which it does not support/allocate it returns them to the HLR in the parameter SS-Code List and discards the unsupported Call Forwarding service codes (no error is sent back). This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Call barring information List

A list of Extensible Call barring information parameters (Extensible Call barring information is defined in subclause 7.6). It includes Call Barring services either at location updating or at restoration or when they are changed. Each Extensible Call barring information parameter shall be treated independently of all other parameters in the primitive.

The Extensible Call barring information shall include the SS-Code for an individual call barring supplementary service. The Extensible Call barring information shall contain one or more Extensible Call Barring Features (Extensible Call Barring Feature is defined in subclause 7.6).

The Extensible Call Barring Feature may include an Extensible Basic Service Group. This shall be interpreted according to the rules in subclause 8.8.1.4.

The Extensible Call Barring Feature shall contain an extensible SS-Status parameter.

If the VLR receives an Indication containing any Extensible Call Barring service codes which it does not support/allocate it returns them to the HLR in the parameter SS-Code List and discards the unsupported Extensible Call Barring service codes (no error is sent back). This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

CUG information List

A list of CUG information list parameters (CUG information is defined in subclause 7.6). It includes CUG information either at location updating or at restoration or when it is changed.

At location updating, restoration or when there is a change in CUG data, the HLR shall include the complete CUG-SubscriptionList and, if there are options per basic group, it shall also include the complete CUG-FeatureList. If there are not options per extensible basic service group the CUG-FeatureList shall not be included.

In any dialogue, the first insertSubscriberData message which contains CUG information shall include a non-empty CUG-SubscriptionList.

When the VLR receives CUG data it shall replace the stored CUG data with the received data set.

If CUG-FeatureList is omitted in the Insert Subscriber Data operation VLR shall interpret that no options per extensible basic service group exist, and then it shall apply the default values i.e. no outgoing access, no incoming access, no preferential CUG exists.

If CUG-Feature is received without preferential CUG, the VLR shall interpret that no preferential CUG applies.

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

Note that data consistency between CUG subscription data and CUG feature data is the responsibility of the HLR.

If the VLR does not support the CUG service it returns its code to the HLR in the parameter SS-Code List and discards the received information (no error is sent back). This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

SS-Data List

A list of Extensible SS-Data parameters (Extensible SS-Data is defined in subclause 7.6). It is sent for any other supplementary service than Call Forwarding, Call Barring, CUG and eMLPP either at location updating or at restoration or when they are changed. Each SS-Data parameter shall be treated independently of all other parameters in the primitive.

The Extensible SS-Data shall include the SS-Code for an individual supplementary service.

The Extensible SS-Data shall contain an Extensible SS-Status parameter and any subscription options that are applicable to the service defined by the SS-Code.

The SS-Data may include a Basic Service Group List. This shall be interpreted according to the rules in subclause 8.8.1.4.

If the VLR receives an Indication containing any supplementary service codes which it does not support/allocate it returns them to the HLR in the parameter SS-Code List and therefore discards the unsupported service codes received (no error is sent back). This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Operator Determined Barring General data

If it is included in a Request/Indication, it includes all the Operator Determined Barring categories that may be applied to a subscriber registered in any PLMN. This parameter is only included in a Request/Indication when the parameter Subscriber Status is set to the value Operator Determined Barring. Note that all General Operator Determined Barring Categories shall be set to their actual status.

If the VLR or the SGSN receives an Indication containing Operator Determined Barring General Data which shows that the subscriber is subject to barring not supported / not allocated by the VLR or by the SGSN, it returns Operator Determined Barring General Data in the response to the HLR to show the barring categories which are not supported / not allocated by the VLR or by the SGSN. This parameter is used by the VLR and the SGSN.

Operator Determined Barring HPLMN data

It includes all the Operator Determined Barring categories that may be applied only to a subscriber registered in the HPLMN. Therefore, it shall only be transferred to the VLR or to the SGSN when the subscriber is roaming into the HPLMN and when the parameter Subscriber Status is set to the value Operator Determined Barring. Note that all HPLMN Operator Determined Barring Categories shall be set to their actual status.

If Subscriber Status is set to the value Operator Determined Barring and no Operator Determined Barring HPLMN data is present then the VLR or the SGSN shall not apply any HPLMN specific ODB services to the subscriber. This parameter is used by the VLR and the SGSN.

eMLPP Subscription Data

If included in the Insert Subscriber Data request this parameter defines the priorities the subscriber might apply for a call (as defined in subclause 7.6). It contains both subparameters of eMLPP.

If the VLR does not support the eMLPP service it returns its code to the HLR in the parameter SS-Code List and therefore discards the received information (no error is sent back).

eMLPP subscription data that have been stored previously in a subscriber data record in the VLR are completely replaced by the new eMLPP subscription data received in a MAP_INSERT_SUBSCRIBER_DATA during either an Update Location or Restore Data procedure or a stand alone Insert Subscriber data procedure. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Roaming Restriction Due To Unsupported Feature

The HLR may decide to include this parameter in the request if certain services or features are indicated as not supported by the MSC/VLR (e.g. Advice of Charge Charging Level).

If this parameter is sent to the VLR the MSC area is restricted by the HLR and the VLR. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Regional Subscription Data

If included in the Insert Subscriber Data request this parameter defines the subscriber's subscription area for the addressed VLR or for the addressed SGSN (as defined in subclause 7.6). It contains the complete list of up to 10 Zone Codes that apply to a subscriber in the currently visited PLMN. The HLR shall send only those Zone Codes which are stored against the CC and NDC of the VLR or the CC and NDC of the SGSN to be updated.

NOTE: Support of this parameter is a network operator option and it will not be sent to networks which do not support Regional Subscription.

Regional subscription data that have been stored previously in a subscriber data record in the VLR or in the SGSN are completely replaced by the regional subscription data received in an Insert Subscriber Data indication during either an Update Location or Restore Data procedure or a stand alone Insert Subscriber data procedure.

After the regional subscription data are inserted the VLR or the SGSN shall derive whether its location areas are allowed or not. If the whole MSC or SGSN area is restricted it will be reported to HLR by returning the Regional Subscription Response.

The VLR or the SGSN returns a Regional Subscription Response indicating that a problem with the Zone Code has been detected in one of the following cases:

- Too Many Zone Codes: more than 10 Zone Codes are to be stored in the VLR or in the SGSN;
- Regional Subscription Not Supported by the VLR or the SGSN;
- Zone Codes Conflict: the VLR or the SGSN detects that the zone codes indicate conflicting service permission for a location area.

Zone codes which have no mapping to location areas shall be ignored.

If a sequence of MAP_INSERT_SUBSCRIBER_DATA services is used during a dialogue, Regional Subscription Data shall be accepted only in one service. Regional Subscription Data received in a subsequent service shall be rejected with the error Unexpected Data Value.

If Regional Subscription Data are not included in any MAP_INSERT_SUBSCRIBER_DATA service, there is no restriction of roaming due to Regional Subscription. This parameter is used by the VLR and the SGSN.

Voice Broadcast Data

This parameter contains a list of group id's a user might have subscribed to; (VBS-Data is defined in subclause 7.6). It includes VBS information either at location updating or at restoration or when it is changed.

At location updating, restoration or when there is a change in VBS data, the HLR shall include the complete VBS-Data.

When the VLR receives VBS-Data within a dialogue it shall replace the stored VBS-data with the received data set. All subsequent VBS-dta received within this dialogue shall be interpreted as add-on data.

If VBS-data is omitted in the Insert Subscriber Data operation the VLR shall keep the previously stored VBS data.

If the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. . This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Voice Group Call Data

This parameter contains a list of group id's a user might have subscribed to; see subclause 7.6.

At location updating, restoration or when there is a change in VGCS data, the HLR shall include the complete VGCS-Data.

When the VLR receives VGCS-Data within a dialogue it shall replace the stored VGCS-Data with the received data set. All VGCS-Data received within this dialogue shall be interpreted as add-on data.

If VBCS-Data is omitted in the Insert Subsciber Data operation the VLR shall keep the previously stored VGCS-Data.

If the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

North American Equal Access preferred Carrier Id

The preferred carrier identity that is subscribed to.

When the VLR receives this parameter from the HLR, it shall replace the previously stored preferred carrier identity with the received one.

SS-Code List

The list of SS-Code parameters that are provided to a subscriber but are not supported/allocated by the VLR (SS-Code is defined in subclause 7.6). The list can only include individual SS-Codes that were sent in the service request. This parameter is used only by the VLR.

Regional Subscription Response

If included in the response this parameter indicates one of:

- MSC Area Restricted entirely because of regional subscription;
- SGSN Area Restricted entirely because of regional subscription;
- Too Many Zone Codes to be inserted;
- Zone Codes Conflict;
- Regional Subscription not Supported by the VLR or by the SGSN.

If the VLR determines after insertion of Regional Subscription Data that the entire MSC area is restricted, the VLR shall respond with a Regional Subscription Response indicating MSC Area Restricted. Otherwise MSC Area Restricted is not sent. The HLR shall check whether the current MSC area is no longer restricted.

If the SGSN determines after insertion of Regional Subscription Data that the entire SGSN area is restricted, the SGSN shall respond with a Regional Subscription Response indicating SGSN Area Restricted. Otherwise SGSN Area Restricted is not sent. The HLR shall check whether the current SGSN area is no longer restricted. This parameter is used by the VLR and by the SGSN.

VLR CAMEL Subscription Info

This parameter is sent for subscribers who have CAMEL services which are invoked in the MSC. In CAMEL phase 1 this parameter contains only the O-CSI. In CAMEL Phase 2 this parameter contains the SS-CSI and/or the O-CSI. If an O-CSI is contained, TDP-Criteria may also be present in CAMEL Phase 2. The VLR CAMEL Subscription Info is sent at location updating or when any information in the applicable CAMEL Subscription Info in the HLR has been changed. The entire set of CAMEL Subscription Info is sent within one dialogue. If a set of CAMEL Subscription Info is already stored in the VLR, i.e received within a previous dialogue, it is replaced by the received data. If the VLR CAMEL Subscription Info is omitted in the Insert Subscriber Data operation the VLR shall keep the previously stored VLR CAMEL Subscription Info. Within one dialogue subsequent received data are interpreted as add-on data. If the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value.This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Supported CAMEL Phases

The use of this parameter and the requirements for its presence are specified in GSM 03.78. This parameter is used only by the VLR.
A VLR not supporting any CAMEL Phase may omit this parameter.

GPRS Subscription Data

This parameter contains a list of PDP-contexts a user has subscribed to; see subclause 7.6.

At GPRS location updating the HLR shall include the complete GPRS Subscription Data.

When there is a change in GPRS subscriber data the HLR shall include only the new and/or modified PDP contexts.

When the SGSN receives GPRS Subscription Data within a dialogue it shall check if the received data has to be considered as the entire GPRS subscription data. If so, it shall replace the stored GPRS Subscription Data with the received data set, otherwise it shall replace the data only for the modified PDP contexts (if any) and add the new PDP contexts (if any) to the stored GPRS Subscription Data.

If GPRS Subscription Data is omitted in the Insert Subscriber Data operation the SGSN shall keep the previously stored GPRS Subscription Data.

If the SGSN detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

Roaming Restricted In SGSN Due To Unsupported Feature

The HLR may decide to include this parameter in the request if certain services or features are indicated as not supported by the SGSN. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

User error

Only one of the following values is applicable:

- Unidentified subscriber;
- Data missing;
- Unexpected data value.

8.8.1.4 Basic service information related to supplementary services

A number of parameters that relate to supplementary services can be qualified by a Basic Service Group (or a Basic Service Group List). This subclause explains how this information is to be interpreted. Supplementary service parameters to which this subclause is applicable only apply to the basic service groups described in this subclause, and only those basic service groups shall be overwritten at the VLR.

The Basic Service Group (or Basic Service Group List) is optional.

If present the Basic Service Group (or the elements of the Basic Service Group List) shall be one of:

- an Elementary Basic Service Group for which the supplementary service is applicable to at least one basic service in the group; and to which the subscriber has a subscription to at least one basic service in the group;
- the group "All Teleservices" provided that the service is applicable to at least one teleservice and that the subscriber has a subscription to at least one teleservice that is in the same Elementary Basic Service Group as a teleservice to which the service is applicable;
- the group "All Bearer Services" provided that the service is applicable to at least one bearer service and that the subscriber has a subscription to at least one bearer service that is in the same Elementary Basic Service Group as a basic service to which the service is applicable.

If the Basic Service Group (or Basic Service Group List) is not present then the parameter shall apply to all Basic Service Groups.

If the basic service information is not a single Elementary Basic Service Group then the parameter shall be taken as applying individually to all the Elementary Basic Service Groups for which:

- the supplementary service is applicable to at least one basic service in the Basic Service Group; and
- the subscriber has a subscription to at least one basic service in the Basic Service Group.

The VLR is not required to store supplementary services data for Basic Service Groups that are not supported at the VLR.

8.8.2 MAP-DELETE-SUBSCRIBER-DATA service

8.8.2.1 Definition

This service is used by an HLR to remove certain subscriber data from a VLR if the subscription of one or more supplementary services or basic services is withdrawn. Note that this service is not used in case of erasure or deactivation of supplementary services.

Also this service is used by an HLR to remove GPRS subscription data from a SGSN.

It is a confirmed service and consists of the primitives shown in table 8.8/2.

8.8.2.2 Service primitives

Table 8.8/2: MAP-DELETE-SUBSCRIBER-DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Basic service List	C	C(=)		
SS-Code List	C	C(=)		
Roaming Restriction Due To Unsupported Feature	C	C(=)		
Camel Subscription Info Withdraw	C	C(=)		
Regional Subscription Data	C	C(=)		
VBS Group Indication	C	C(=)		
VGCS Group Indication	C	C(=)		
GPRS Subscription Data Withdraw	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
Regional Subscription Response			C	C(=)
User error			C	C(=)
Provider error				O

8.8.2.3 Parameter use

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

Basic service List

A list of Extensible Basic service parameters (Extensible Basic service is defined in subclause 7.6). It is used when one, several or all basic services are to be withdrawn from the subscriber. If the VLR or the SGSN receives a value for an Extensible Basic Service which it does not support, it shall ignore that value. This parameter is used by the VLR and by the SGSN.

SS-Code List

A list of SS-Code parameters (SS-Code is defined in subclause 7.6). It is used when several or all supplementary services are to be withdrawn from the subscriber.

There are three possible options:

- deletion of basic service(s);

  The parameter Basic service List is only included.

- deletion of supplementary service(s);

  The parameter SS-Code List is only included.

- deletion of basic and supplementary services;

  Both Basic service List and SS-Code List are included.

This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Roaming Restriction Due To Unsupported Feature

This parameter is used if Roaming Restriction Due To Unsupported Feature is deleted from the subscriber data. This may occur if unsupported features or services are removed from the subscriber data in the HLR.

If this parameter is sent the VLR shall check if the current Location Area is possibly allowed now. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

CAMEL Subscription Info Withdraw

This parameter is used to indicate that CAMEL Subscription Info shall be deleted from the VLR. All CAMEL Subscription Info for the subscriber shall be deleted. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Regional Subscription Identifier

Contains one single Zone Code (as defined subclause 7.6) and is used if all Zone Codes shall be deleted from the subscriber data. When all the Zone Codes are deleted, the VLR or the SGSN shall check for its location areas whether they are allowed or not. If the whole MSC area is restricted, VLR will report it to HLR by returning the Regional Subscription Response "MSC Area Restricted". If the whole SGSN area is restricted, SGSN will report it to HLR by returning the Regional Subscription Response "SGSN Area Restricted".

The binary coding of the Zone Code value received in a Delete Subscriber Data request shall not be checked by the VLR or by the SGSN.

Note that support of this parameter is a network operator option and it shall not be sent to networks which do not support Regional Subscription.

If Regional Subscription is not supported by the VLR or by the SGSN, the request for deletion of Zone Codes is refused by sending the Regional Subscription Response "Regional Subscription Not Supported" to the HLR.

If no Zone Codes are stored in the respective subscriber data record, the request for deleting all Zone Code information shall be ignored and no Regional Subscription Response shall be returned. This parameter is used by the VLR and by the SGSN.

VBS Group Indication

Contains an indication (flag) which is used if all Group Id's shall be deleted from the subscriber data for the Voice Broadcast teleservice.

If VBS is not supported in the VLR or no Group Ids are stored for VBS in the respective subscriber record, the request for deletion of all Group Ids shall be ignored. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

VGCS Group Indication

Contains an indication (flag) which is used if all Group Id's shall be deleted from the subscriber data for the Voice Group Call teleservice. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

If VGCS is not supported in the VLR or no Group Ids are stored for VGCS in the respective subscriber record, the request for deletion of all Group Ids shall be ignored.

GPRS Subscription Data Withdraw

This parameter is used to indicate whether all GPRS Subscription Data for the subscriber shall be deleted or if only a subset of the stored GPRS Subscription Data for the subscriber shall be deleted. In the latter case only those PDP context whose identifiers are included in the subsequent identifier list will be deleted. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

Roaming Restricted In SGSN Due To Unsupported Feature

This parameter is used if Roaming Restricted In SGSN Due To Unsupported Feature is deleted from the GPRS subscriber data. This may occur if unsupported features or services are removed from the GPRS subscriber data in the HLR.

If this parameter is sent the SGSN shall check if the current Location Area is possibly allowed now. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

Regional Subscription Response

If included in the Delete Subscriber Data response this parameter indicates one of:

- MSC Area Restricted
- SGSN Area Restricted;
- Regional Subscription Not Supported.

This parameter is used by the VLR and by the SGSN.

User error

Only one of the following values is applicable:

- Unidentified subscriber;
- Data missing;
- Unexpected data value.

8.9 Identity management services

8.9.1 MAP-PROVIDE-IMSI service

8.9.1.1 Definition

This service is used by a VLR in order to get, via the MSC, the IMSI of a subscriber (e.g. when a subscriber has identified itself with a TMSI not allocated to any subscriber in the VLR).

It is a confirmed service and consists of the primitives shown in table 8.9/1.

8.9.1.2 Service primitives

Table 8.9/1: MAP-PROVIDE-IMSI

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI			C	C(=)
User error			C	C(=)
Provider error				O

8.9.1.3 Parameter use

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

IMSI

This parameter is received when the request is successfully carried out. It contains the requested IMSI.

User error

Only one of the following values is applicable:

- Absent subscriber.

8.9.2 MAP-FORWARD-NEW-TMSI service

8.9.2.1 Definition

This service is used by a VLR to allocate, via MSC, a new TMSI to a subscriber during an ongoing transaction (e.g. call set-up, location updating or supplementary services operation).

It is a confirmed service and consists of the primitives shown in table 8.9/2.

8.9.2.2 Service primitives

Table 8.9/2: MAP-FORWARD-NEW-TMSI

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
TMSI	M	M(=) O	Provider error	

8.9.2.3 Parameter use

The parameter TMSI is described in subclause 7.6.

8.10 Fault recovery services

8.10.1 MAP_RESET service

8.10.1.1 Definition

This service is used by the HLR, after a restart, to indicate to a list of VLRs or SGSNs that a failure occurred.

The MAP_RESET service is a non-confirmed service using the service primitives defined in table 8.10/1

8.10.1.2 Service primitives

Table 8.10/1: MAP_RESET

Parameter name	Request	Indication
Invoke Id	M	M(=)
HLR number	M	M(=)
HLR Id LIST	U	C(=)

8.10.1.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

HLR number

See definition in subclause 7.6.2.

HLR Id LIST

The HLR Id List is a list of HLR Id. If the parameter is present in the indication, the VLR or SGSN may base the retrieval of subscribers to be restored on their IMSI: the subscribers affected by the reset are those whose IMSI leading digits are equal to one of these numbers. If the parameter is absent, subscribers to be restored are those for which the OriginatingEntityNumber received at location updating time matches the equivalent parameter of the Reset Indication.

8.10.2 MAP_FORWARD_CHECK_SS_INDICATION service

8.10.2.1 Definition

This service may be used by an HLR as an implementation option, to indicate to a mobile subscriber that supplementary services parameters may have been altered, e.g. due to a restart. If received from the HLR, the VLR shall forward this indication to the MSC, which in turn forwards it to the MS. The HLR only sends this indication after successful completion of the subscriber data retrieval from HLR to VLR that ran embedded in a MAP_UPDATE_LOCATION procedure.

The MAP_FORWARD_CHECK_SS_INDICATION service is a non-confirmed service using the service primitives defined in table 8.10/2.

8.10.2.2 Service primitives

Table 8.10/2: MAP_FORWARD_CHECK_SS_INDICATION

Parameter name	Request	Indication
Invoke Id	M	M(=)

8.10.2.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

8.10.3 MAP_RESTORE_DATA service

8.10.3.1 Definition

This service is invoked by the VLR on receipt of a MAP_PROVIDE_ROAMING_NUMBER indication for an unknown IMSI, or for a known IMSI with the indicator "Confirmed by HLR" set to "Not confirmed". The service is used to update the LMSI in the HLR, if provided, and to request the HLR to send all data to the VLR that are to be stored in the subscriber's IMSI record.

The MAP_RESTORE_DATA service is a confirmed service using the service primitives defined in table 6.10/3.

8.10.3.2 Service primitives

Table 8.10/3: MAP_RESTORE_DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	U	C(=)		
Supported CAMEL phases	C	C(=)		
HLR number			C	C(=)
MS Not Reachable Flag			C	C(=)
User error			C	C(=)
Provider error				O

8.10.3.3 Parameter definitions and use

Invoke Id

See definition in subclause 5.6.1.

IMSI

See definition in subclause 5.6.2.

LMSI

See definition in subclause 5.6.2. It is an operator option to provide the LMSI from the VLR; it is mandatory for the HLR to support the LMSI handling procedures.

Supported CAMEL Phases

This parameter indicates which phases of CAMEL are supported. Must be present if a CAMEL phase different from phase 1 is supported. Otherwise may be absent.

HLR number

See definition in subclause 5.6.2. The presence of this parameter is mandatory in case of successful outcome of the service.

MS Not Reachable Flag

See definition in subclause 5.6.8. This parameter shall be present in case of successful outcome of the service, if the "MS Not Reachable flag" was set in the HLR.

User error

In case of unsuccessful outcome of the service, an error cause shall be returned by the HLR. The following error causes defined in subclause 5.6.1 may be used, depending on the nature of the fault:

- unknown subscriber;
- system failure;
- unexpected data value;
- data missing.

Provider error

For definition of provider errors see subclause 5.6.1.

8.11 Subscriber Information services

8.11.1 MAP-ANY-TIME-INTERROGATION service

8.11.1.1 Definition

This service is used by the gsmSCF, to request information (e.g. subscriber state and location) from the HLR at any time.

8.11.1.2 Service primitives

Table 8.11/1: Any_Time_Interrogation

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Requested Info	M	M(=)		
gsmSCF-Address	M	M(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
Location Information			C	C(=)
Subscriber State			C	C(=)
User error			C	C(=)
Provider error				O

8.11.1.3 Parameter definition and use

All parameters are described in subclause 7.6.

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

The use of the parameters and the requirements for their presence are specified in GSM 03.78.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- System Failure;
- Any Time Interrogation Not Allowed;
- Data Missing;
- Unexpected Data Value;
- Unknown Subscriber.

Provider error

These are defined in subclause 7.6.1.

8.11.2 MAP-PROVIDE-SUBSCRIBER-Info service

8.11.2.1 Definition

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

8.11.2.2 Service primitives

Table 8.11/2: Provide_Subscriber_Information

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Requested Info	M	M(=)		
IMSI	M	M(=)		
LMSI	U	O		
Location Information			C	C(=)
Subscriber State			C	C(=)
User error			C	C(=)
Provider error				O

8.11.2.3 Parameter definition and use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.18

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Data Missing;
- Unexpected Data Value.

Provider error

These are defined in subclause 7.6.1.

9 Operation and maintenance services

9.1 Subscriber tracing services

9.1.1 MAP-ACTIVATE-TRACE-MODE service

9.1.1.1 Definition

This service is used between the HLR and the VLR to activate subscriber tracing in the VLR.

Also this service is used between the HLR and the SGSN to activate subscriber tracing in the SGSN.

The MAP-ACTIVATE-TRACE-MODE service is a confirmed service using the primitives from table 9.1/1.

9.1.1.2 Service primitives

Table 9.1/1: MAP-ACTIVATE-TRACE-MODE

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
Trace reference	M	M(=)		
Trace type	M	M(=)		
OMC Id	U	C(=)		
User error			C	C(=)
Provider error				O

9.1.1.3 Parameter use

Invoke id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The IMSI is a mandatory parameter in a stand-alone operation.

Trace reference

See definition in subclause 7.6.10.

Trace type

See definition in subclause 7.6.10.

OMC Id

See definition in subclause 7.6.2. The use of this parameter is an operator option.

User error

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unidentified Subscriber;
- Facility Not Supported;
- Tracing Buffer Full;
- System Failure;
- Unexpected Data Value;
- Data missing**.**

Provider error

For definition of provider errors see subclause 7.6.1.

9.1.2 MAP-DEACTIVATE-TRACE-MODE service

9.1.2.1 Definition

This service is used between the VLR and the HLR for deactivating subscriber tracing in the VLR.

Also this service is used between the SGSN and the HLR for deactivating subscriber tracing in the SGSN.

The MAP-DEACTIVATE-TRACE-MODE service is a confirmed service using the primitives from table 9.1/2.

9.1.2.2 Service primitives

Table 9.1/2: MAP-DEACTIVATE-TRACE-MODE

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
Trace reference	M	M(=)		
User error			C	C(=)
Provider error				O

9.1.2.3 Parameter use

Invoke id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The IMSI is a mandatory parameter in a stand-alone operation.

Trace reference

See definition in subclause 7.6.10.

User error

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unidentified Subscriber;
- Facility Not Supported;
- System Failure;
- Unexpected Data Value;
- Data missing.

Provider error

For definition of provider errors see subclause 7.6.1.

9.1.3 MAP-TRACE-SUBSCRIBER-ACTIVITY service

9.1.3.1 Definition

This service is used between the VLR and the MSC to activate the subscriber tracing in the MSC.

The MAP-TRACE-SUBSCRIBER-ACTIVITY service is a non-confirmed service using the primitives from table 9.1/3.

9.1.3.2 Service primitives

Table 9.1/3: MAP-TRACE-SUBSCRIBER-ACTIVITY

Parameter name	Request	Indication
Invoke id	M	M(=)
IMSI	C	C(=)
Trace reference	M	M(=)
Trace type	M	M(=)
OMC Id	U	C(=)

9.1.3.3 Parameter use

Invoke id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2. The controlling MSC shall provide either the IMSI or the IMEI to the servicing MSC.

Trace reference

See definition in subclause 7.6.10.

Trace type

See definition in subclause 7.6.10.

OMC Id

See definition in subclause 7.6.2. The use of this parameter is an operator option.

9.2 Other operation and maintenance services

9.2.1 MAP-SEND-IMSI service

9.2.1.1 Definition

This service is used by a VLR in order to fetch the IMSI of a subscriber in case of some Operation & Maintenance procedure where subscriber data are needed in the Visited PLMN and MSISDN is the only subscriber's identity known.

It is a confirmed service and consists of the primitive shown in figure 9.2/1.

9.2.1.2 Service primitives

Table 9.2/1: MAP-SEND-IMSI

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSISDN	M	M(=)		
IMSI			C	C(=)
User error			C	C(=)
Provider error				O

9.2.1.3 Parameter use

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

User error

Only one of the following values is applicable:

- Unknown subscriber;
- Unexpected data value;
- Data missing.

10 Call handling services

10.1 MAP_SEND_ROUTING_INFORMATION service

10.1.1 Definition

This service is used between the Gateway MSC and the HLR. The service is invoked by the Gateway MSC to perform the interrogation of the HLR in order to route a call towards the called MS.

This is a confirmed service using the primitives listed in table 10.1/1.

10.1.2 Service primitives

Table 10.1/1: MAP_SEND_ROUTING_INFORMATION parameters

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Interrogation Type	M	M(=)		
GMSC Address	M	M(=)		
MSISDN	M	M(=)		
OR Interrogation	C	C(=)		
OR Capability	C	C(=)		
CUG Interlock	C	C(=)	C	C(=)
CUG Outgoing Access	C	C(=)	C	C(=)
Number of Forwarding	C	C(=)		
Network Signal Info	C	C(=)		
Supported CAMEL Phases	C	C(=)		
Suppress T-CSI	C	C(=)		
Suppression of Announcement	C	C(=)		
Call Reference Number	C	C(=)		
Forwarding Reason	C	C(=)		
Basic Service Group	C	C(=)		
Alerting Pattern	C	C(=)		
CCBS Call	C	C(=)		
Supported CCBS Phase	C	C(=)		
IMSI			C	C(=)
MSRN			C	C(=)
Forwarding Data			C	C(=)
Forwarding Interrogation Required			C	C(=)
VMSC address			C	C(=)
GMSC Camel Subscription Info			C	C(=)
Location Information			C	C(=)
Subscriber State			C	C(=)
Basic Service Code			C	C(=)
CUG Subscription Flag			C	C(=)
North American Equal Access preferred Carrier Id			U	C(=)
User error			C	C(=)
SS-List			U	C(=)
CCBS Target			C	C(=)
Keep CCBS Call Indicator			C	C(=)
Provider error				O

10.1.3 Parameter use

See subclause 7.6 for a definition of the parameters used in addition to the following. Note that:

- a conditional parameter whose use is defined only in GSM 03.78 shall be absent if the sending entity does not support CAMEL;
- a conditional parameter whose use is defined only in GSM 03.79 shall be absent if the sending entity does not support optimal routeing;
- a conditional parameter whose use is defined only in GSM 03.78 & GSM 03.79 shall be absent if the sending entity supports neither CAMEL nor optimal routeing.

Interrogation Type

See GSM 03.79 [99] for the use of this parameter.

GMSC address

The E.164 address of the GMSC.

MSISDN

This is the Mobile Subscriber ISDN number assigned to the called subscriber.

OR Interrogation

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

OR Capability

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

CUG Interlock

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

CUG Outgoing Access

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

Number of Forwarding

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

Network Signal Info

See GSM 03.18 [97] for the conditions for the presence of the components of this parameter.

Supported CAMEL Phases

The use of this parameter and the requirements for its presence are specified in GSM 03.78

T-CSI Suppression

The use of this parameter and the requirements for its presence are specified in GSM 03.78

Suppression Of Announcement

The use of this parameter and the requirements for its presence are specified in GSM 03.78

Call Reference Number

The use of this parameter and the conditions for its presence are specified in GSM 03.78 [98] and GSM 03.79 [99].

Forwarding Reason

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

Basic Service Group

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

Alerting Pattern

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

CCBS Call

See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

Supported CCBS Phase

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

IMSI

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

MSRN

See GSM 03.18 [97] and GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

Forwarding Data

This parameter includes the forwarded-to number, the forwarding option Notification to calling party and the forwarding reason, and can include the forwarded-to subaddress. See GSM 03.18 [97] and GSM 03.79 [99] for the conditions for the presence of its components.

Forwarding Interrogation Required

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

VMSC address

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

GMSC CAMEL Subscription Info

The use of this parameter and the requirements for its presence are specified in GSM 03.78

Location Information

The use of this parameter and the requirements for its presence are specified in GSM 03.78

Subscriber State

The use of this parameter and the requirements for its presence are specified in GSM 03.78

CUG Subscription Flag

The use of this parameter and the requirements for its presence are specified in GSM 03.78.

North American Equal Access preferred Carrier Id

This parameter is returned to indicate the preferred carrier identity to be used to setup the call (i.e. forwarding the call or establishing the roaming leg).

SS-List

This parameter includes SS-codes and will be returned as an operator option. The HLR shall not send PLMN-specific SS-codes across PLMN boundaries. However if the GMSC receives PLMN-specific SS-codes from a foreign PLMN's HLR the GMSC may ignore it. If the GMSC attempts to process the PLMN specific SS codes, this may lead to unpredictable behaviour but the GMSC shall continue call processing.

Basic Service Code

The use of this parameter and the requirements for its presence are specified in GSM 03.78.

If the CAMEL service is not involved, this parameter includes the basic service code and will be returned as an operator option. The HLR shall not send a PLMN-specific Basic Service Code across PLMN boundaries. However if the GMSC receives a PLMN-specific Basic Service Code from a foreign PLMN's HLR the GMSC may ignore it. If the GMSC attempts to process the PLMN specific Basic Service codes, this may lead to unpredictable behaviour but the GMSC shall continue call processing.

CCBS Target

See GSM 03.93 for the use of this parameter and the conditions for its presence.

Keep CCBS Call Indicator

See GSM 03.93 for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Unknown Subscriber;
- Number changed;
- Call Barred;

  This error will indicate that either incoming calls are barred for this MS or that calls are barred due to Operator Determined Barring (see GSM 02.41 for a definition of this network feature).

- CUG Reject;

  The value of this error cause will indicate the reason for CUG Reject.

- Bearer Service Not Provisioned;
- Teleservice Not Provisioned;

  A subscription check has been performed and the call has not passed the check due to incompatibility with regard to the requested service. Depending on the nature of the incompatibility, either of these messages will be returned.

- Facility Not Supported;
- Absent Subscriber;

  This indicates that the location of the MS is not known (either the station is not registered and there is no location information available or the Provide Roaming Number procedure fails due to IMSI detached flag being set), or the GMSC requested forwarding information with a forwarding reason of not reachable, and the call forwarding on MS not reachable service is not active.

- Busy Subscriber;

  This indicates that Call Forwarding on Busy was not active for the specified basic service group when the GMSC requested forwarding information with a forwarding reason of busy.

  The error may also indicate that the subscriber is busy due to an outstanding CCBS recall. In the error data it may then be specified that CCBS is possible for the busy encountered call.

- No Subscriber Reply;

  This indicates that Call Forwarding on No Reply was not active for the specified basic service group when the GMSC requested forwarding information with a forwarding reason of no reply.

- OR Not Allowed;

  This indicates that the HLR is not prepared to accept an OR interrogation from the GMSC, or that calls to the specified subscriber are not allowed to be optimally routed.

- Forwarding Violation;

- System Failure;

- Data Missing;

- Unexpected Data Value.

See subclause 7.6 for a definition of these errors.

Provider error

These are defined in subclause 7.6.

10.2 MAP_PROVIDE_ROAMING_NUMBER service

10.2.1 Definition

This service is used between the HLR and VLR. The service is invoked by the HLR to request a VLR to send back a roaming number to enable the HLR to instruct the GMSC to route an incoming call to the called MS.

This is a confirmed service which uses the Primitives described in table 10.2/1.

10.2.2 Service primitives

Table 10.2/1: MAP_PROVIDE_ROAMING_NUMBER parameters

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
MSC Number	M	M(=)		
MSISDN	U	C(=)		
LMSI	C	C(=)		
GSM Bearer Capability	C	C(=)		
Network Signal Info	C	C(=)		
Suppression Of Announcement	C	C(=)		
Call Reference Number	C	C(=)		
GMSC Address	C	C(=)		
OR Interrogation	C	C(=)		
Alerting Pattern	C	C(=)		
CCBS Call	C	C(=)		
Supported CAMEL Phases in GMSC	C	C(=)		
Roaming Number			C	C(=)
User error			C	C(=)
Provider error				O

10.2.3 Parameter use

See subclause 7.6 for a definition of the parameters used, in addition to the following. Note that:

- a conditional parameter whose use is defined only in GSM 03.78 shall be absent if the sending entity does not support CAMEL;
- a conditional parameter whose use is defined only in GSM 03.79 shall be absent if the sending entity does not support optimal routeing;
- a conditional parameter whose use is defined only in GSM 03.78 & GSM 03.79 shall be absent if the sending entity supports neither CAMEL nor optimal routeing.

IMSI

This is the IMSI of the called Subscriber.

MSC Number

This is the ISDN number assigned to the MSC currently serving the MS. The MSC number will have been stored in the HLR as provided at location updating.

MSISDN

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

LMSI

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

GSM Bearer Capability

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

This information is passed according to the rules specified in TS GSM 09.07.

There may be two GSM Bearer Capabilities supplied.

Network Signal Info

See GSM 03.18 [97] for the conditions for the presence of the components of this parameter.

Suppression Of Announcement

The use of this parameter and the requirements for its presence are specified in GSM 03.78.

Call Reference Number

The use of this parameter and the conditions for its presence are specified in GSM 03.78 [98] and GSM 03.79 [99].

GMSC Address

The use of this parameter and the conditions for its presence are specified in GSM 03.78 [98] and GSM 03.79 [99].

OR Interrogation

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

Supported CAMEL Phases in GMSC

See GSM 03.78 [98] for the use of this parameter and the conditions for its presence.

Alerting Pattern

See GSM 03.78 [98] for the use of this parameter and the conditions for its presence.

CCBS Call

See GSM 03.93 [xx] for the use of this parameter and the conditions for its presence.

Roaming Number

See GSM 03.18 [97] for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Absent Subscriber;

  This error will be returned if the IMSI detach flag is set.

- No Roaming Number Available;

- OR Not Allowed;

  This indicates that the MAP_PROVIDE_ROAMING_NUMBER indication included the OR interrogation indicator, but the VLR does not support optimal routeing.

- Facility Not Supported;

- System Failure;

- Data Missing;

- Unexpected Data Value.

See subclause 7.6 for a definition of these reasons.

Provider error

These are defined in subclause 7.6.

10.3 MAP_RESUME_CALL_HANDLING service

10.3.1 Definition

This service is used between the terminating VMSC and the GMSC. The service is invoked by the terminating VMSC to request the GMSC to resume handling the call and forward it to the specified destination.

This is a confirmed service which uses the Primitives listed in table 10.3/1.

10.3.2 Service primitives

Table 10.3/1: MAP_RESUME_CALL_HANDLING parameters

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Call Reference Number	M	M(=)		
Basic Service Group	M	M(=)		
IMSI	M	M(=)		
Forwarding Data	M	M(=)		
CUG Interlock	C	C(=)		
CUG Outgoing Access	C	C(=)		
O-CSI	C	C(=)		
CCBS Target	C	C(=)		
User error			C	C(=)
Provider error				O

10.3.3 Parameter use

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

Call Reference Number

See GSM 03.79 [99] for the use of this parameter.

Basic Service Group

See GSM 03.79 [99] for the use of this parameter.

IMSI

This is the IMSI of the forwarding Subscriber.

Forwarding Data

Includes the forwarded-to number, the forwarding reason, an indication of whether the calling party is to be notified that the call has been forwarded and possibly a forwarded-to subaddress.

CUG Interlock

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

CUG Outgoing Access

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

O-CSI

See GSM 03.79 [99] for the use of this parameter and the conditions for its presence.

For CAMEL phases 1 & 2, the O-CSI shall contain only one set of O-BCSM TDP data.

CCBS Target

See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Optimal Routeing not allowed;
- Forwarding failed.

Provider error

These are defined in subclause 7.6.

10.4 MAP_PREPARE_GROUP_CALL service

10.4.1 Definition

This service is used by the Anchor_MSC to inform the Relay_MSC about a group call setup.

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

10.4.2 Service primitives

Table 10.4/1: MAP_PREPARE_GROUP_CALL service

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Teleservice	M	M(=)		
ASCI Call Reference	M	M(=)		
Ciphering Algorithm	M	M(=)		
Group Key Number	C	C(=)		
Group Key	C	C(=)		
Priority	C	C(=)		
CODEC-Information	M	M(=)		
Uplink Free Indicator	M	M(=)		
Group Call Number			M	M(=)
User Error			C	C(=)
Provider Error				O

10.4.3 Parameter definitions and use

Invoke Id

See definition in section 7.6.1

Teleservice

Voice Broadcast Service or Voice Group Call Service

ASCI Call Reference

Broadcast call reference or group call reference. This item is used to access the VBS-GCR or VGCS-GCR within the Relay_MSC.

Ciphering Algorithm

The ciphering algorithm to be used for the group call.

Group Key Number

This number has to be broadcasted and is used by the mobile station to select the chosen group key.

Shall be present if the ciphering applies.

Group Key

This key is used for ciphering on the radio interface.

Shall be present if the ciphering applies.

Priority

Default priority level related to the call if eMLPP applies.

CODEC-Information

Information on the codecs allowed for this call.

Uplink Free Indicator

A flag indicating whether the call is initiated from a dispatcher.

Group Call Number

This temporary allocated E.164 number is used for routing the call from the Anchor MSC to the Relay MSC.

User Error

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

- No Group Call Number available

- System Failure

- Unexpected Data Value

Provider Error

See definition of provider error in section 7.6.1.

10.5 MAP_PROCESS_GROUP CALL_SIGNALLING service

10.5.1 Definitions

This service is used between Relay MSC and Anchor MSC for transmission of Group Call notifications.

The MAP_PROCESS_GROUP_CALL_SIGNALLING service is a non-confirmed service using the service primitives given in table 10.5

10.5.2 Service primitives

Table 10.5/1: MAP_PROCESS_GROUP_CALL_SIGNALLING service

Parameter name	Request	Indication
Invoke Id	M	M(=)
Uplink Request	C	C(=)
Uplink Release Indication	C	C(=)
Release Group Call	C	C(=)

10.5.3 Parameter definitions and use

Invoke Id

See definition in section 7.6.1

Uplink Request

This information element indicates to the anchor MSC that a service subscriber roaming in the relay MSC area requests access to the uplink.

Uplink Release Indication

This information element if included by the Relay MSC indicates to the Anchor MSC that the uplink has become free.

Release Group Call

This information element if included by the Relay MSC indicates to the Anchor MSC that the service subscriber who has initiated the call and who currently has access to the uplink terminates the call.

10.6 MAP_FORWARD_GROUP_CALL_SIGNALLING service

10.6.1 Definitions

This service is used between Anchor MSC and Relay MSC for transmission of Group Call notifications.

The MAP_FORWARD_GROUP_CALL_SIGNALLING service is a non-confirmed service using the service primitives given in table 10.6

10.6.2 Service primitives

Table 10.6: MAP_FORWARD_GROUP_CALL_SIGNALLING service

Parameter name	Request	Indication
Invoke Id	M	M(=)
IMSI	C	C(=)
Uplink Request Acknowledgement	C	C(=)
Uplink Release Indication	C	C(=)
Uplink Reject Command	C	C(=)
Uplink Seized Command	C	C(=)
Uplink Release Command	C	C(=)

10.6.3 Parameter definitions and use

IMSI

Identity of the service subscriber who has established the call and who is allowed to terminate the call.

Invoke Id

See definition in section 7.6.1

Uplink Request Acknowledgement

This information element is used for positive acknowledgement of an uplink request

Uplink Release Indication

This information element if included by the Anchor MSC indicates to the Relay MSC that the uplink has become free.

Uplink Reject Command

This information element is used for negative acknowledgement of an uplink request

Uplink Seized Command

This information element if included by the Anchor MSC indicates to the Relay MSC that the uplink is no longer free.

Uplink Release Command

This information element if included by the Anchor MSC indicates to the Relay MSC that the uplink which is granted to a MS in the relay MSC area shall be released.

10.7 MAP_SEND_GROUP_CALL_END_SIGNAL service

10.7.1 Definitions

This service is used between the Relay MSC and the Anchor MSC indicating that VGCS / VBS channels have been established in the Relay MSC area. The response is used by the Anchor MSC to inform Relay MSC that all resources for the call can be released in Relay MSC because the call has been released in the Anchor MSC.

The MAP_SEND_GROUP_CALL_END_SIGNAL service is a confirmed service using the service primitives given in table 10.7

10.7.2 Service primitives

Table 10.7: MAP_SEND_GROUP_CALL_END_SIGNAL service

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
Provider Error				O

10.7.3 Parameter definitions and use

IMSI

Identity of the service subscriber who has established the call and who is allowed to terminate the call.

Shall be present if the call was established by a service subscriber roaming in the relay MSC area.

Invoke Id

See definition in section 7.6.1

Provider Error

See definition of provider error in section 7.6.1.

10.8 MAP_Provide_SIWFS_Number

10.8.1 Definition

This service is used between an MSC and SIWFS. It is invoked by an MSC receiving an incoming call (call to or from MS) to request the SIWFS to allocate IWU resources. The service is defined in GSM 03.54.

This is a confirmed service using the primitives described in table 10.8.

10.8.2 Service primitive

Table 10.8: MAP_Provide_SIWFS_Number service

Parameter name	Request	Indication	Response	Confirm
Invoke ID	M	M(=)	M(=)	M(=)
GSM Bearer Capability	M	M(=)		
ISDN Bearer Capability	M	M(=)		
Call Direction	M	M(=)		
B-subscriber address	M	M(=)		
Chosen Channel	M	M(=)		
Lower Layer Compatibility	C	C(=)		
High Layer Compatibility	C	C(=)		
SIWFS number			C	C(=)
User error			C	C(=)
Provider error				O

10.8.3 Parameter use

See subclause 7.6 for a definition of the parameter used, in addition to the following.

GSM Bearer Capability

This information is the result from the negotiation with the mobile station. The information is sent from the MSC to the SIWFS to allocate the correct IWU.

ISDN Bearer Capability

This parameter refers to the ISDN Bearer Capability information element. For the MTC this parameter is received in the ISUP User Service Information parameter. For the MOC call this parameter is mapped from the GSM BC parameter according to GSM 09.07. The parameter is used by the SIWFS to route the call and to allocate the outgoing circuit.

Call Direction

This parameter indicates the direction of the call (mobile originated or mobile terminated) at call set-up.

B-subscriber address

This parameter is sent from the MSC to the SIWFS to inform the SIWFS where to route the call i.e. where to send the IAM. If the loop method is used this parameter will indicate the address to the VMSC. This address is allocated by the VMSC in the same way as a MSRN and is used to correlate the incoming IAM to the corresponding MAP dialogue. If the non-loop method is used this parameter will indicate the address to the B-subscriber.

Chosen Channel

This parameter is sent from the MSC to the SIWFS to adjust the interworking unit to the assigned radio resources. This parameter is defined in GSM 08.08.

Lower Layer Compatibility

This parameter is sent from the MSC to the SIWF to allow the interworking unit to perform a compatibility check. This parameter is handled as specified in GSM 09.07. This parameter is defined in GSM 04.08.

High Layer Compatibility

This parameter is sent from the MSC to the SIWF to allow the interworking unit to perform a compatibility check. This parameter is handled as specified in GSM 09.07. This parameter is defined in GSM 04.08.

SIWFS number

This parameter is sent from the SIWFS to the MSC. This address is used by the visited MSC to route the call, i.e. the IAM to the SIWFS (similar to MSRN) and will be used by the SIWFS to correlate the incoming IAM to the corresponding MAP message. This parameter must always be sent from the SIWFS when a successful allocation of SIWFS resources has been made.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Resource limitation;
- Facility Not Supported;
- Unexpected Data Value;
- System Failure.

See subclause 7.6 for a definition of these reasons.

Provider error

These are defined in subclause 7.6.

10.9 MAP_SIWFS_Signalling_Modify

10.9.1 Definition

This service is used to transport signalling information between an MSC and an SIWFS in the case of a request to modify the configuration (e.g. HSCSD). It is invoked either by an MSC or by the SIWFS. The service is defined in GSM 03.54.

This is a confirmed service using the primitives described in table 10.9.

10.9.2 Service primitive

Table 10.9: MAP_SIWFS_Signalling_Modify service

Parameter name	Request	Indication	Response	Confirm
Invoke ID	M	M(=)	M(=)	M(=)
Channel Type	C	C(=)		
Chosen Channel	C	C(=)	C(=)	C(=)
User error			C	C(=)
Provider error				O

10.9.3 Parameter use

See subclause 7.6 for a definition of the parameter used, in addition to the following.

Channel Type

This parameter is the result of a Channel Mode Modification for TS61/62. It contains the changed Air Interface User Rate. The information is sent from the SIWFS to the MSC to assign the correct radio resource. This parameter is defined in GSM 08.08.

Chosen Channel

This parameter is sent from the MSC to the SIWFS to adjust the interworking unit to the assigned radio resources. This parameter is defined in GSM 08.08.

User error

This parameter is sent by the responder when an error is detected and if present , takes one of the following values:

- Resource limitation;
- Facility Not Supported;
- Data Missing;
- Unexpected Data Value;
- System Failure.

See subclause 7.6 for a definition of these reasons.

Provider error

These are defined in subclause 7.6.

10.10 MAP_SET_REPORTING_STATE service

10.10.1 Definition

This service is used between the HLR and the VLR to set the reporting state for a requested service. It is a confirmed service using the service primitives shown in table 10.10/1.

10.10.2 Service primitives

The service primitives are shown in table 10.10/1.

Table 10.10/1: MAP_SET_REPORTING_STATE parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
LMSI	C	C(=)		
CCBS Monitoring	C	C(=)		
CCBS Subscriber Status			C	C(=)
User error			C	C(=)
Provider error				O

10.10.3 Parameter use

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

IMSI

The IMSI is a mandatory parameter if the service is used as the only one in a dialogue.

CCBS Monitoring

This parameter indicates whether monitoring for CCBS shall be started or stopped. If it indicates that monitoring shall be started this service corresponds to the message 'Start Reporting' in GSM 03.93; if it indicates that monitoring shall be stopped this service corresponds to the message 'Stop Reporting' in GSM 03.93.

CCBS Subscriber Status

See GSM 03.93 for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System Failure;
- Unidentified Subscriber;
- Unexpected Data Value;
- Data Missing;
- Resource Limitation;
- Facility Not Supported.

NOTE: This error is reserved for future use.

Provider error

These are defined in subclause 7.6.

10.11 MAP_STATUS_REPORT service

10.11.1 Definition

This service is used by the VLR to report an event or call outcome to the HLR.It is a confirmed service using the service primitives shown in table 10.11/1.

10.11.2 Service primitives

The service primitives are shown in table 10.11/1.

Table 10.11/1: MAP_STATUS_REPORT parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
CCBS Subscriber Status	C	C(=)		
Monitoring Mode	C	C(=)		
Call Outcome	C	C(=)		
User error			C	C(=)
Provider error				O

10.11.3 Parameter use

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

CCBS Subscriber Status

If this parameter is present without Monitoring Mode and Call Outcome this service corresponds to the message 'Event Report' in GSM 03.93 [107]. See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

Monitoring Mode

If this parameter is present with CCBS Call Outcome this service corresponds to the message 'CCBS Call Report' in GSM 03.93. See GSM 03.93 for the use of this parameter and the conditions for its presence.

Call Outcome

See GSM 03.93 for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

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

Provider error

These are defined in subclause 7.6.

10.12 MAP_REMOTE_USER_FREE service

10.12.1 Definition

This service is used between the HLR and the VLR to report that the B subscriber is now idle and that the A subscriber can be notified. It is a confirmed service using the service primitives shown in table 10.12/1.

10.12.2 Service primitives

The service primitives are shown in table 10.12/1.

Table 10.12/1: MAP_REMOTE_USER_FREE parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Call Info	M	M(=)		
CCBS Feature	M	M(=)		
Translated B Number	M	M(=)		
Replace B Number	C	C(=)		
Alerting Pattern	C	C(=)		
RUF Outcome			C	C(=)
User error			C	C(=)
Provider error				O

10.12.3 Parameter use

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

Call Info

See GSM 03.93 for the use of this parameter.

CCBS Feature

See GSM 03.93 for the conditions for the presence of the parameters included in the CCBS feature.

Translated B Number

See GSM 03.93 for the use of this parameter.

Replace B Number

See GSM 03.93 for the use of this parameter and the conditions for its presence.

Alerting Pattern

See GSM 03.93 for the use of this parameter and the conditions for its presence.

RUF Outcome

See GSM 03.93 for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- Unexpected Data Value;
- Data Missing;
- Incompatible Terminal;

  This error is returned by the responder when the terminal used for CCBS activation is not compatible with the terminal used for the CCBS recall. For details refer to GSM 04.08.

- Absent Subscriber (IMSI Detach; Restricted Area; No Page Response);
- System Failure;
- Busy Subscriber (CCBS Busy).

Provider error

These are defined in subclause 7.6.

11 Supplementary services related services

11.1 MAP_REGISTER_SS service

11.1.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to register data related to a supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.1.2 Service primitives

The service primitives are shown in table 11.1/1.

Table 11.1/1: MAP_REGISTER_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
Forwarded-to number with subaddress	C	C(=)		
No reply condition time	C	C(=)		
EMLPP default priority	C	C(=)	C	C(=)
Forwarding information			C	C(=)
User error			C	C(=)
Provider error				O

11.1.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates the supplementary service which the mobile subscriber wants to register.

Basic service

This parameter indicates for which basic service group the supplementary service is to be registered. If it is not included, the registration request applies to all basic services.

Forwarded-to number with subaddress

This parameter is obligatory if the registration applies to one or more call forwarding supplementary services. It can optionally include a sub-address.

No reply condition time

This parameter is included if the registration applies to the Call Forwarding on No Reply supplementary service (or a superset of this service) and the mobile subscriber supplies a value for this time.

EMLPP default priority

This parameter is sent by the initiator to register the eMLPP default priority level and is returned by the responder at successful outcome of the service.

Forwarding information

This parameter is returned by the responder at successful outcome of the service, if the registration request concerned one or a group of Call Forwarding supplementary services.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;
- Call Barred;
- Bearer service not provisioned;

  This error is returned only if not even a subset of the requested bearer service group has been subscribed to.

- Teleservice not provisioned;

  This error is returned only if not even a subset of the requested teleservice group has been subscribed to.

- Illegal SS operation;
- SS error status;
- SS incompatibility.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.2 MAP_ERASE_SS service

11.2.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to erase data related to a supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.2.2 Service primitives

The service primitives are shown in table 11.2/1.

Table 11.2/1: MAP_ERASE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
Forwarding information			C	C(=)
User error			C	C(=)
Provider error				O

11.2.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates the supplementary service which the mobile subscriber wants to erase.

Basic service

This parameter indicates for which basic service group the supplementary service should be erased. If it is not included, the erasure request applies to all basic services.

Forwarding information

This parameter is returned by the responder at successful outcome of the service, if the erasure request concerned one or a group of Call Forwarding supplementary services.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Bearer service not provisioned;

  This error is returned only if not even a subset of the requested bearer service group has been subscribed to.
- Teleservice not provisioned;

  This error is returned only if not even a subset of the requested teleservice group has been subscribed to.
- Call Barred;
- Illegal SS operation;
- SS error status.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.3 MAP_ACTIVATE_SS service

11.3.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to activate a supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.3.2 Service primitives

The service primitives are shown in table 11.3/1.

Table 11.3/1: MAP_ACTIVATE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
Forwarding information			C	C(=)
Call barring information			C	C(=)
SS-Data			C	C(=)
User error			C	C(=)
Provider error				O

11.3.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates the supplementary service which the mobile subscriber wants to activate.

Basic service

This parameter indicates for which basic service groups the requested supplementary service(s) should be activated. If it is not included, the activation request applies to all basic services.

Forwarding information

This parameter is returned by the responder at successful outcome of the service, if the activation request concerned Call Forwarding.

Call barring information

This parameter is returned by the responder at successful outcome of the service, if the activation request concerned Call Barring.

SS-Data

This parameter is returned by the responder at successful outcome of the service, if the activation request concerned for example Call Waiting.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Bearer service not provisioned;

  This error is returned only if not even a subset of the requested bearer service group has been subscribed to.

- Teleservice not provisioned;

  This error is returned only if not even a subset of the requested teleservice group has been subscribed to.

- Call Barred;
- Illegal SS operation;
- SS error status;
- SS subscription violation;
- SS incompatibility;
- Negative PW check;
- Number Of PW Attempts Violation.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.4 MAP_DEACTIVATE_SS service

11.4.1 Definitions

This service is used between the MSC and the VLR and between the VLR and the HLR to deactivate a supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.4.2 Service primitives

The service primitives are shown in table 11.4/1.

Table 11.4/1: MAP_DEACTIVATE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
Forwarding information			C	C(=)
Call barring information			C	C(=)
SS-Data			C	C(=)
User error			C	C(=)
Provider error				**O**

11.4.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates the supplementary service which the mobile subscriber wants to deactivate.

Basic service

This parameter indicates for which basic service group the requested supplementary service(s) should be deactivated. If it is not included the deactivation request applies to all basic services.

Forwarding information

This parameter is returned by the responder at successful outcome of the service, if the deactivation request concerned one or a group of Call Forwarding supplementary services.

Call barring information

This parameter is returned by the responder at successful outcome of the service, if the activation request concerned one or a group of Call Barring supplementary services.

SS-Data

This parameter is returned by the responder at successful outcome of the service, for example if the deactivation request concerned the Call Waiting supplementary service.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Bearer service not provisioned;

  This error is returned only if not even a subset of the requested bearer service group has been subscribed to.
- Teleservice not provisioned;

  This error is returned only if not even a subset of the requested teleservice group has been subscribed to.
- Call Barred;
- Illegal SS operation;
- SS error status;
- SS subscription violation;
- Negative PW check;
- Number Of PW Attempts Violation.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.5 MAP_INTERROGATE_SS service

11.5.1 Definitions

This service is used between the MSC and the VLR and between the VLR and the HLR to retrieve information related to a supplementary service. The VLR will relay the message to the HLR if necessary.

The service is a confirmed service and consists of four service primitives.

11.5.2 Service primitives

The service primitives are shown in table 11.5/1.

Table 11.5/1: MAP_INTERROGATE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
SS-Status			C	C(=)
Basic service Group LIST			C	C(=)
Forwarding feature LIST			C	C(=)
CLI restriction Info			C	C(=)
EMLPP Info			C	C(=)
CCBS Feature LIST			C	C(=)
User error			C	C(=)
Provider error				O

11.5.3 Parameter use

For additional information on parameter use refer to the GSM 04.8x and 04.9x-series of technical specifications.

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

The mobile subscriber can only interrogate a single supplementary service per service request.

Basic service

This parameter indicates for which basic service group the given supplementary service is interrogated. If it is not included, the interrogation request applies to all basic services.

SS-Status

This parameter is included by the responder if:

- the interrogated supplementary service can only be subscribed for all applicable basic services simultaneously; or
- the interrogated supplementary service is not active for any of the interrogated basic services, or
- the interrogation was for the CCBS supplementary service and no CCBS request is active or the service is not provisioned.

Basic service group LIST

This parameter LIST is used to include one or a series of basic service groups for which the interrogated supplementary service is active. If the interrogated supplementary service is not active for any of the interrogated (and provisioned) basic service groups, the SS-Status parameter is returned.

Forwarding feature LIST

The forwarding feature parameter is described in subclause 7.6.4. A list of one or more forwarding features is returned by the responder when the interrogation request applied to Call Forwarding supplementary service.

If no basic service code parameter is provided within this sequence, the forwarding feature parameter applies to all provisioned basic services.

CLI restriction Info

The CLI-RestrictionInfo parameter is returned by the responder when the interrogation request applies to the CLIR supplementary service.

EMLPP Info

The eMLPP info (maximum entitled priority and default priority) is returned by the responder if the interrogation request applies to the eMLPP supplementary service.

CCBS Feature LIST

The CCBS feature parameter is described in subclause 7.6. A list of one or more CCBS features is returned by the responder when the interrogation request applied to the CCBS supplementary service. See GSM 03.93 [107] for the conditions for the presence of the parameters included in the CCBS feature.

User error

This error is sent by the responder upon unsuccessful outcome of the interrogation service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Bearer Service not provisioned;

  This error is returned only if not even a subset of the interrogated bearer services are provided.

- Teleservice not provisioned;

  This error is returned only if not even a subset of the interrogated teleservices are provided.

- Call Barred;
- Illegal SS operation;
- SS not available.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.6 MAP_INVOKE_SS service

11.6.1 Definitions

This service is used between the MSC and the VLR to check the subscriber's subscription to a given supplementary service in the VLR, in connection with in-call invocation of that supplementary service, i.e. after the call set-up phase is finished. For supplementary service invocation during call set-up phase, please refer to the call handling descriptions.

The service is a confirmed service and consists of four service primitives.

11.6.2 Service primitives

The service primitives are shown in table 11.6/1.

Table 11.6/1: MAP_INVOKE_SS parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
Basic service	C	C(=)		
User error			C	C(=)
Provider error				O

11.6.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This SS-Code can only refer to a single supplementary service, e.g. the Call Hold or Multi Party supplementary services.

Basic service

This parameter indicates for which basic service the supplementary service invocation is required.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values:

- System Failure;
- Data Missing;
- Unexpected data value;
- Call Barred;
- Illegal SS operation;
- SS error status;
- SS not available.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.7 MAP_REGISTER_PASSWORD service

11.7.1 Definitions

This service is used between the MSC and the VLR and between the VLR and the HLR if the mobile subscriber requests to register a new password. The VLR will relay the message to the HLR.

The service is a confirmed service and consists of four service primitives.

11.7.2 Service primitives

The service primitives are shown in table 11.7/1.

Table 11.7/1: MAP_REGISTER_PASSWORD parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)		
New password			C	C(=)
User error			C	C(=)
Provider error				O

11.7.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

SS-Code

This parameter indicates for which supplementary service(s) the password should be registered.

New Password

See subclause 7.6.4 for the use of this parameter.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Call Barred;
- SS subscription violation;
- Password registration failure;
- Negative PW check;
- Number Of PW Attempts Violation.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.8 MAP_GET_PASSWORD service

11.8.1 Definitions

This service is used between the HLR and the VLR and between the VLR and the MSC when the HLR receives a request from the mobile subscriber for an operation on a supplementary service which requires a password from the subscriber. The VLR will relay the message to the MSC.

The service is a confirmed service and consists of four service primitives.

11.8.2 Service primitives

The service primitives are shown in table 11.8/1.

Table 11.8/1: MAP_GET_PASSWORD parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Linked id	C	C(=)		
Guidance info	M	M(=)		
Current password			M	M(=)
Provider error				O

11.8.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

Linked Id

See subclause 7.6.1 for the use of this parameter. If the MAP GET PASSWORD service is used in conjunction with the MAP REGISTER PASSWORD service, this parameter must be present; otherwise it must be absent.

Guidance info

See subclause 7.6.4 for the use of this parameter.

Current password

See subclause 7.6.4 for the use of this parameter.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.9 MAP_PROCESS_UNSTRUCTURED_SS_REQUEST service

11.9.1 Definitions

This service is used between the MSC and the VLR, between the VLR and the HLR and between the HLR and gsmSCF to relay information in order to allow unstructured supplementary service operation.

The MAP_PROCESS_UNSTRUCTURED_SS_REQUEST service is a confirmed service using the primitives from table 11.9/1.

11.9.2 Service primitives

Table 11.9/1: MAP_PROCESS_UNSTRUCTURED_SS_REQUEST parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
USSD Data Coding Scheme	M	M(=)	C	C(=)
USSD String	M	M(=)	C	C(=)
MSISDN	U	C(=)		
User error			C	C(=)
Provider error				O

11.9.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme:

See subclause 7.6.4 for the use of this parameter. The presence of the parameter in the response is dependent on the unstructured supplementary service application. If this parameter is present, then the USSD String parameter has to be present.

USSD String:

See subclause 7.6.1 for the use of this parameter. The presence of the parameter in the response is dependent on the unstructured supplementary service application. If this parameter is present, then the USSD Data Coding Scheme parameter has to be present.

MSISDN:

The subscriber's basic MSISDN.
See definition in subclause 7.6.2. The MSISDN is included as an operator option, e.g. to allow addressing the subscriber's data in the gsmSCF with the MSISDN.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;

  This error is returned by the responder if it is not able to deal with the contents of the USSD string.
- Call Barred;
- Unknown Alphabet.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.10 MAP_UNSTRUCTURED_SS_REQUEST service

11.10.1 Definitions

This service is used between the gsmSCF and the HLR, the HLR and the VLR and between the VLR and the MSC when the invoking entity requires information from the mobile user, in connection with unstructured supplementary service handling.

The MAP_UNSTRUCTURED_SS_REQUEST service is a confirmed service using the primitives from table 11.10/1.

11.10.2 Service primitives

The service primitives are shown in table 11.10/1.

Table 11.10/1: MAP_UNSTRUCTURED_SS_REQUEST parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
USSD Data Coding Scheme	M	M(=)	C	C(=)
USSD String	M	M(=)	C	C(=)
Alerting Pattern	C	C(=)		
User error			C	C(=)
Provider error				O

11.10.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme:

See subclause 7.6.4 for the use of this parameter. The presence of the parameter in the response is dependent on the mobile user's MMI input. If this parameter is present, then the USSD String parameter has to be present.

USSD String:

See subclause 7.6.1 for the use of this parameter. The presence of the parameter in the response is dependent on the mobile user's MMI input. If this parameter is present, then the USSD Data Coding Scheme parameter has to be present.

Alerting Pattern

See subclause 7.6.3 for the use of this parameter.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;

  This error is returned by the responder if it is not able to deal with the contents of the USSD string.

- Absent Subscriber;
- Illegal Subscriber;

  This error indicates that delivery of the unstructured supplementary service data failed because the MS failed authentication.

- Illegal Equipment;
- USSD Busy;
- Unknown Alphabet.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.11 MAP_UNSTRUCTURED_SS_NOTIFY service

11.11.1 Definitions

This service is used between the gsmSCF and the HLR, the HLR and the VLR and between the VLR and the MSC when the invoking entity requires a notification to be sent to the mobile user, in connection with unstructured supplementary services handling.

The MAP_UNSTRUCTURED_SS_NOTIFY service is a confirmed service using the primitives from table 11.11/1.

11.11.2 Service primitives

The service primitives are shown in table 11.11/1.

Table 11.11/1: MAP_UNSTRUCTURED_SS_NOTIFY parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
USSD Data Coding Scheme	M	M(=)		
USSD String	M	M(=)		
Alerting Pattern	C	C(=)		
User error			C	C(=)
Provider error				O

11.11.3 Parameter use

Invoke id

See subclause 7.6.1 for the use of this parameter.

USSD Data Coding Scheme:

See subclause 7.6.4 for the use of this parameter.

USSD String:

See subclause 7.6.1 for the use of this parameter.

Alerting Pattern

See subclause 7.6.3 for the use of this parameter.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;

  This error is returned by the responder if it is not able to deal with the contents of the USSD string.

- Absent Subscriber;
- Illegal Subscriber;

  This error indicates that delivery of the unstructured supplementary service data failed because the MS failed authentication.

- Illegal Equipment;
- USSD Busy;
- Unknown Alphabet.

Provider error

See subclause 7.6.1 for the use of this parameter.

11.12 MAP_SS_INVOCATION_NOTIFY

11.12.1 Definition

This service is used between the MSC and the gsmSCF when the subscriber invokes one of the following supplementary services; CD, ECT or MPTY.

11.12.2 Service primitives

The service primitives are shown in table 11.12/1.

Table 11.12/1: SS_INVOCATION_NOTIFY parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
MSISDN	M	M(=)		
IMSI	M	M(=)		
SS- event	M	M(=)		
SS- event data	C	C(=)		
User error			C	C(=)
Provider error				O

11.12.3 Parameter use

All parameters are described in subclause 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.78.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

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

Provider error

This is defined in subclause 7.6.1.

11.13 MAP_REGISTER_CC_ENTRY service

11.13.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to register data for a requested call completion supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and uses the service primitives shown in table 11.13/1.

11.13.2 Service primitives

The service primitives are shown in table 11.13/1.

Table 11.13/1: MAP_REGISTER_CC_ENTRY parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS Code	M	M(=)		
CCBS Feature	C	C(=)	C	C(=)
Translated B number	C	C(=)		
Service Indicator	C	C(=)		
Call Info	C	C(=)		
Network Signal Info	C	C(=)		
User error			C	C(=)
Provider error				O

11.13.3 Parameter use

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

SS-Code

This parameter indicates the call completion supplementary service for which the mobile subscriber wants to register an entry.

CCBS Feature

See GSM 03.93 for the conditions for the presence of the parameters included in the CCBS feature.

Translated B Number

See GSM 03.93 for the use of this parameter and the conditions for its presence.

Service Indicator

This parameter corresponds to the parameters 'Presentation Indicator' and 'CAMEL Invoked' in GSM 03.93 [107]. It indicates which services have been invoked for the original call (e.g. CLIR, Camel). See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

Call Info

See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

Network Signal Info

See GSM 03.93 [107] for the use of this parameter and the conditions for its presence.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data missing;
- Unexpected data value;
- Call Barred;
- Illegal SS operation;
- SS error status;
- SS incompatibility.
- Short Term Denial;
- Long Term Denial;
- Facililty Not Supported;

  Note: This error is reserved for future use.

Private Extensions shall not be sent with these user errors for this operation.

Provider error

See subclause 7.6.1 for the use of this parameter**.**

11.14 MAP_ERASE_CC_ENTRY service

11.14.1 Definition

This service is used between the MSC and the VLR and between the VLR and the HLR to erase data related to a call completion supplementary service. The VLR will relay the message to the HLR.

The service is a confirmed service and uses the service primitives shown in table 11.14/1.

11.14.2 Service primitives

The service primitives are shown in table 11.14/1.

Table 11.14/1: MAP_ERASE_CC_ENTRY parameters

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
SS-Code	M	M(=)	C(=)	C(=)
CCBS Index	C	C(=)		
SS-Status			C	C(=)
User error			C	C(=)
Provider error				O

11.14.3 Parameter use

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

SS-Code

This parameter indicates the call completion supplementary service for which the mobile subscriber wants to erase an entry/entries.

CCBS Index

See GSM 03.93 for the use of this parameter and the condition for its presence.

SS-Status

Depending on the outcome of the service request this parameter may indicate either provisioned and active or not provisioned.

User error

This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values, defined in subclause 7.6.1:

- System failure;
- Data Missing;
- Unexpected data value;
- Call Barred;
- Illegal SS operation;
- SS error status.

Private Extensions shall not be sent with these user errors for this operation.

Provider error

See subclause 7.6.1 for the use of this parameter.

12 Short message service management services

12.1 MAP-SEND-ROUTING-INFO-FOR-SM service

12.1.1 Definition

This service is used between the gateway MSC and the HLR to retrieve the routing information needed for routing the short message to the servicing MSC.

The MAP-SEND-ROUTING-INFO-FOR-SM is a confirmed service using the primitives from table 12.1/1.

12.1.2 Service primitives

The service primitives are shown in table 12.1/1.

Table 12.1/1: MAP-SEND-ROUTING-INFO-FOR-SM

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSISDN	M	M(=)		
SM-RP-PRI	M	M(=)		
Service Centre Address	M	M(=)		
SM-RP-MTI	C	C(=)		
SM-RP-SMEA	C	C(=)		
GPRS Support Indicator	C	C(=)		
IMSI			C	C(=)
Network Node Number			C	C(=)
LMSI			C	C(=)
GPRS Node Indicator			C	C(=)
Additional Number			C	C(=)
User error			C	C(=)
Provider error				O

12.1.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

MSISDN:

See definition in subclause 7.6.2.

SM-RP-PRI:

See definition in subclause 7.6.8.

Service Centre Address:

See definition in subclause 7.6.2.

SM-RP-MTI :

See definition in subclause 7.6.8. This parameter shall be present when the feature « SM filtering by the HPLMN » is supported by the SMS-GMSC and when the equivalent parameter is received from the short message service relay sub-layer protocol.

SM-RP-SMEA:

See definition in subclause 7.6.8. This parameter shall be present when the feature « SM filtering by the HPLMN » is supported by the SMS-GMSC and when the equivalent parameter is received from the the short message service relay sub-layer protocol.

GPRS Support Indicator:

See definition in subclause 7.6.8. The presence of this parameter is mandatory if the SMS-GMSC supports receiving of the two numbers from the HLR.

IMSI:

See definition in subclause 7.6.2. The presence of this parameter is mandatory in a successful case.

Network Node Number:

See definition in subclause 7.6.2. This parameter is provided in a successful response.

LMSI:

See definition in subclause 7.6.2. It is an operator option to provide this parameter from the VLR; it is mandatory for the HLR to include the LMSI in a successful response, if the VLR has used the LMSI.

GPRS Node Indicator:

See definition in subclause 7.6.8. The presence of this parameter is mandatory if only the SGSN number is sent in the Network Node Number.

Additional Number:

See definition in subclause 7.6.2. This parameter is provided in a successful response.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Call Barred;
- Teleservice Not Provisioned;
- Absent Subscriber_SM;
- Facility Not Supported;
- System failure;
- Unexpected Data Value;
- Data missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.2 MAP-MO-FORWARD-SHORT-MESSAGE service

12.2.1 Definition

This service is used between the serving MSC or the SGSN and the gateway MSC to forward mobile originated short messages.

The MAP-MO-FORWARD-SHORT-MESSAGE service is a confirmed service using the service primitives given in table 12.2/1.

12.2.2 Service primitives

The service primitives are shown in table 12.2/1.

Table 12.2/1: MAP-MO-FORWARD-SHORT-MESSAGE

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
SM RP DA	M	M(=)		
SM RP OA	M	M(=)		
SM RP UI	M	M(=)	C	C(=)
User error			C	C(=)
Provider error				O

12.2.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

SM RP DA:

See definition in subclause 7.6.8.

In the mobile originated SM transfer this parameter contains the Service Centre address received from the mobile station.

SM RP OA:

See definition in subclause 7.6.8.

The MSISDN received from the VLR or from the SGSN is inserted in this parameter in the mobile originated SM transfer.

SM RP UI:

See definition in subclause 7.6.8. The short message transfer protocol data unit received from the Service Centre is inserted in this parameter.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Facility Not Supported;
- System Failure;
- SM Delivery Failure;
    - The reason of the SM Delivery Failure can be one of the following in the mobile originated SM:
        - unknown Service Centre address;
        - Service Centre congestion;
        - invalid Short Message Entity address;
        - subscriber not Service Centre subscriber;
        - protocol error.
- Unexpected Data Value

Provider error:

For definition of provider errors see subclause 7.6.1.

12.3 MAP-REPORT-SM-DELIVERY-STATUS service

12.3.1 Definition

This service is used between the gateway MSC and the HLR. The MAP-REPORT-SM-DELIVERY-STATUS service is used to set the Message Waiting Data into the HLR or to inform the HLR of successful SM transfer after polling. This service is invoked by the gateway MSC.

The MAP-REPORT-SM-DELIVERY-STATUS service is a confirmed service using the service primitives given in table 12.3/1.

12.3.2 Service primitives

The service primitives are shown in table 12.3/1.

Table 12.3/1: MAP-REPORT-SM-DELIVERY-STATUS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSISDN	M	M(=)		
Service Centre Address	M	M(=)		
SM Delivery Outcome	M	M(=)		
Absent Subscriber Diagnostic SM	C	C(=)		
GPRS Support Indicator	C	C(=)		
Delivery Outcome Indicator	C	C(=)		
Additional SM Delivery Outcome	C	C(=)		
Additional Absent Subscriber Diagnostic SM	C	C(=)		
MSIsdn-Alert			C	C(=)
User error			C	C(=)
Provider error				O

12.3.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

MSISDN:

See definition in subclause 7.6.2.

Service Centre Address:

See definition in subclause 7.6.2.

SM Delivery Outcome:

See definition in subclause 7.6.8. This parameter indicates the status of the mobile terminated SM delivery.

Absent Subscriber Diagnostic SM:

See definition in subclause 7.6.8.

GPRS Support Indicator:

See definition in subclause 7.6.8. The presence of this parameter is mandatory if the SMS-GMSC supports handling of two delivery outcomes.

Delivery Outcome Indicator:

See definition in subclause 7.6.8.

Additional SM Delivery Outcome:

See definition in subclause 7.6.8.

Additional Absent Subscriber Diagnostic SM:

See definition in subclause 7.6.8.

MSIsdn-Alert:

See definition in subclause 7.6.2. This parameter shall be present in case of unsuccessful delivery, when the MSISDN received in the operation is different from the stored MSIsdn-Alert; the stored MSIsdn-Alert is the value that is returned to the gateway MSC.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown Subscriber;
- Message Waiting List Full;
- Unexpected Data Value;
- Data missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.4 MAP-READY-FOR-SM service

12.4.1 Definition

This service is used between the MSC and VLR and as well between the VLR and the HLR. The MSC initiates this service if a subscriber indicates memory available situation. The VLR uses the service to indicate this to the HLR.

The VLR initiates this service if a subscriber, whose message waiting flag is active in the VLR, has radio contact in the MSC.

Also this service is used between the SGSN and the HLR. The SGSN initiates this service if a subscriber indicates memory available situation. The SGSN uses the service to indicate this to the HLR.

The SGSN initiates this service if a subscriber, whose message waiting flag is active in the SGSN, has radio contact in the GPRS.

The MAP-READY-FOR-SM service is a confirmed service using the primitives from table 12.4/1.

12.4.2 Service primitives

The service primitives are shown in table 12.4/1.

Table 12.4/1: MAP-READY-FOR-SM

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
TMSI	C	C(=)		
Alert Reason	M	M(=)		
Alert Reason Indicator	C	C(=)		
User error			C	C(=)
Provider error				O

12.4.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

See definition in subclause 7.6.2. The IMSI is used always between the VLR and the HLR and between the SGSN and the HLR. Between the MSC and the VLR the identification can be either IMSI or TMSI.

TMSI:

See definition in subclause 7.6.2. The identification can be either IMSI or TMSI between MSC and VLR.

Alert Reason:

See definition in subclause 7.6.8. This parameter indicates if the mobile subscriber is present or the MS has memory available.

Alert Reason Indicator:

See definition in subclause 7.6.8.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown Subscriber;
- Facility Not Supported:
- System Failure;
- Unexpected Data Value;
- Data missing;

Provider error:

For definition of provider errors see subclause 7.6.1.

12.5 MAP-ALERT-SERVICE-CENTRE service

12.5.1 Definition

This service is used between the HLR and the interworking MSC. The HLR initiates this service, if the HLR detects that a subscriber, whose MSISDN is in the Message Waiting Data file, is active or the MS has memory available.

The MAP-ALERT-SERVICE-CENTRE service is a confirmed service using the primitives from table 12.5/1.

12.5.2 Service primitives

The service primitives are shown in table 12.5/1.

Table 12.5/1: MAP-ALERT-SERVICE-CENTRE

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MSIsdn-Alert	M	M(=)		
Service Centre Address	M	M(=)		
User error			C	C(=)
Provider error				O

12.5.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

MSIsdn-Alert:

See definition in subclause 7.6.2. The provided MSISDN shall be the one which is stored in the Message Waiting Data file.

Service Centre Address:

See definition in subclause 7.6.2.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- System Failure;
- Unexpected Data Value;
- Data missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.6 MAP-INFORM-SERVICE-CENTRE service

12.6.1 Definition

This service is used between the HLR and the gateway MSC to inform the Service Centre which MSISDN number is stored in the Message Waiting Data file. If the stored MSISDN number is not the same than the one received from the gateway MSC in the MAP-SEND-ROUTING-INFO-FOR-SM service primitive the stored MSISDN number is included in the message.

Additionally the status of MCEF, MNRF and MNRG flags and the inclusion of the particular Service Centre address in the Message Waiting Data list is informed to the gateway MSC when appropriate.

The MAP-INFORM-SERVICE-CENTRE service is a non-confirmed service using the primitives from table 12.6/1.

12.6.2 Service primitives

The service primitives are shown in table 12.6/1.

Table 12.6/1: MAP-INFORM-SERVICE-CENTRE

Parameter name	Request	Indication
Invoke Id	M	M(=)
MSIsdn-Alert	C	C(=)
MWD Status	C	C(=)

12.6.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

MSIsdn-Alert:

See definition in subclause 7.6.2 This parameter refers to the MSISDN stored in a Message Waiting Data file in the HLR.

MWD Status:

See definition in subclause 7.6.8. This parameter indicates the status of the MCEF, MNRF and MNRG flags and the status of the particular SC address presence in the Message Waiting Data list.

12.7 MAP-SEND-INFO-FOR-MT-SMS service

12.7.1 Definition

This service is used between the MSC and the VLR. The service is invoked by the MSC receiving an mobile terminated short message to request subscriber related information from the VLR.

The MAP-SEND-INFO-FOR-MT-SMS service is a confirmed service using the primitives from table 12.7/1.

12.7.2 Service primitives

The service primitives are shown in table 12.7/1.

Table 12.7/1: MAP-SEND-INFO-FOR-MT-SMS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
SM RP DA	M	M(=)		
MSISDN			C	C(=)
User error			C	C(=)
Provider error				O

12.7.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

SM RP DA:

See definition in subclause 7.6.8. This parameter shall contain either an IMSI or a LMSI.

MSISDN:

See definition in subclause 7.6.2.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Unidentified Subscriber;
- Absent subscriber;
- Unexpected Data Value;
- Data Missing;
- Illegal subscriber;
- Illegal equipment;
- Subscriber busy for MT SMS;
- System Failure.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.8 MAP-SEND-INFO-FOR-MO-SMS service

12.8.1 Definition

This service is used between the MSC and the VLR. The service is invoked by the MSC which has to handle a mobile originated short message request to request the subscriber related information from the VLR.

The MAP-SEND-INFO-FOR-MO-SMS service is a confirmed service using the primitives from table 12.8/1.

12.8.2 Service primitives

The service primitives are shown in table 12.8/1.

Table 12.8/1: MAP-SEND-INFO-FOR-MO-SMS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
Service Centre Address	M	M(=)		
MSISDN			C	C(=)
User error			C	C(=)
Provider error				O

12.8.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

Service Centre Address:

See definition in subclause 7.6.2.

MSISDN:

See definition in subclause 7.6.2.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Teleservice Not Provisioned;
- Call Barred;
- Unexpected Data Value;
- Data Missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

12.9 MAP-MT-FORWARD-SHORT-MESSAGE service

12.9.1 Definition

This service is used between the gateway MSC and the servicing MSC or the SGSN to forward mobile mobile terminated short messages.

The MAP-MT-FORWARD-SHORT-MESSAGE service is a confirmed service using the service primitives given in table 12.9/1.

12.9.2 Service primitives

The service primitives are shown in table 12.9/1.

Table 12.9/1: MAP-MT-FORWARD-SHORT-MESSAGE

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
SM RP DA	M	M(=)		
SM RP OA	M	M(=)		
SM RP UI	M	M(=)	C	C(=)
More Messages To Send	C	C(=)		
User error			C	C(=)
Provider error				O

12.9.3 Parameter use

Invoke id:

See definition in subclause 7.6.1.

SM RP DA:

See definition in subclause 7.6.8. This parameter can contain either an IMSI or a LMSI. The use of the LMSI is an operator option. The LMSI can be provided if it is received from the HLR. The IMSI is used if the use of the LMSI is not available.

This parameter is omitted in the mobile terminated subsequent SM transfers.

SM RP OA:

See definition in subclause 7.6.8. The Service Centre address received from the originating Service Centre is inserted in this parameter .

This parameter is omitted in the mobile terminated subsequent SM transfers.

SM RP UI:

See definition in subclause 7.6.8. The short message transfer protocol data unit received from the Service Centre is inserted in this parameter. A short message transfer protocol data unit may also be inserted in this parameter in the message delivery acknowlegment from the MSC or from the SGSN to the Service Centre.

More Messages To Send:

See definition in subclause 7.6.8. The information from the MMS indication received from the Service Centre is inserted in this parameter.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unidentified subscriber;
- Absent Subscriber_SM;
- Subscriber busy for MT SMS;
- Facility Not Supported;
- Illegal Subscriber indicates that delivery of the mobile terminated short message failed because the mobile station failed authentication;
- Illegal equipment indicates that delivery of the mobile terminated short message failed because an IMEI check failed, i.e. the IMEI was blacklisted or not white-listed;
- System Failure;
- SM Delivery Failure;
    - The reason of the SM Delivery Failure can be one of the following in the mobile terminated SM:
        - memory capacity exceeded in the mobile equipment;
        - protocol error;
        - mobile equipment does not support the mobile terminated short message service.
- Unexpected Data Value;
- Data Missing.

Provider error:

For definition of provider errors see subclause 7.6.1.

13 Network-Requested PDP Context Activation services

13.1 MAP_SEND_ROUTING_INFO_FOR_GPRS service

13.1.1 Definition

This service is used by the GGSN to request GPRS routing information from the HLR.

13.1.2 Service primitives

Table 13.1/1: MAP_SEND_ROUTING_INFO_FOR_GPRS

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
GGSN address	C	C(=)	C	C(=)
GGSN number	M	M(=)		
SGSN address			C	C(=)
Mobile Not Reachable Reason			C	C(=)
User error			C	C(=)
Provider error				O

13.1.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

GGSN address

This parameter shall be present if the protocol-converting GSN is used between the GGSN and the HLR.

GGSN number

See definition in subclause 7.6.2.

SGSN address

This parameter shall be present if the outcome of the Send Routing Info For GPRS request to the GPRS application process in the HLR is positive.

Mobile Not Reachable Reason

This parameter shall be present if the outcome of the Send Routing Info For GPRS request to the GPRS application process in the HLR is positive and the MNRG flag in the HLR is set. See definition in subclause 7.6.3.51.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- Absent Subscriber;
- System Failure;
- Data Missing;
- Unexpected Data Value;
- UnknownSubscriber.

The diagnostic in the Unknown Subscriber may indicate “Imsi Unknown” or “Gprs Subscription Unknown”.

Provider error

These are defined in subclause 7.6.1.

13.2 MAP_FAILURE_REPORT service

13.2.1 Definition

This service is used by the GGSN to inform the HLR that network requested PDP-context activation has failed.

13.2.2 Service primitives

Table 13.2/1: MAP_FAILURE_REPORT

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
GGSN address	C	C(=)		
GGSN number	M	M(=)		
User error			C	C(=)
Provider error				O

13.2.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

GGSN address

This parameter shall be present if the protocol-converting GSN is used between the GGSN and the HLR.

GGSN number

See definition in subclause 7.6.2.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- System Failure;
- Data Missing;
- Unexpected Data Value;
- UnknownSubscriber.

Provider error

These are defined in subclause 7.6.1.

13.3 MAP_NOTE_MS_PRESENT_FOR_GPRS service

13.3.1 Definition

This service is used by the HLR to inform the GGSN that the MS is present for GPRS again.

13.3.2 Service primitives

Table 13.3/1: MAP_NOTE_MS_PRESENT_FOR_GPRS

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
GGSN address	C	C(=)		
SGSN address	M	M(=)		
User error			C	C(=)
Provider error				O

13.3.3 Parameter definition and use

Invoke Id

See definition in subclause 7.6.1.

IMSI

See definition in subclause 7.6.2.

GGSN address

This parameter shall be present if the protocol-converting GSN is used between the GGSN and the HLR.

SGSN address

See definition in subclause 7.6.2.

User error

This parameter is sent by the responder when an error is detected and if present, takes one of the following values:

- System Failure;
- Data Missing;
- Unexpected Data Value;
- UnknownSubscriber.

Provider error

These are defined in subclause 7.6.1.

14 General

14.1 Overview

Clause 14 to 17 specify the protocol elements to be used to provide the MAP services described in clause 7.

Clause 15 specifies the elements of procedures for the MAP protocol. Clause 16 specifies the mapping on to TC service primitives. Clause 17 specifies the application contexts, operation packages and abstract syntaxes for the MAP protocol as well as the encoding rules to be applied.

14.2 Underlying services

The MAP protocol relies on the services provided by the Transaction Capabilities (TC) of signalling system number 7, as referenced in clause 6.

14.3 Model

The MAP Protocol Machine (MAP PM) can be modelled as a collection of service state machines (SSMs) - one per MAP specific service invoked - coordinated by a MAP dialogue control function with its one state machine: MAP dialogue state machine (DSM). There are two types of Service State Machines: Requesting Service State Machines (RSM) and Performing Service State Machines (PSM).

A new invocation of a MAP PM is employed on the receipt of a MAP-OPEN request primitive or a TC-BEGIN indication primitive. Each invocation controls exactly one MAP dialogue. For each MAP specific service invoked during a dialogue, a MAP RSM is created at the requestor's side and a MAP PSM is created at the performer's side.

This modelling is used only to facilitate understanding and the MAP behaviour descriptions and is not intended to suggest any implementation. SDL descriptions are organized according to this model.

How the MAP-service-user and the MAP refer to a MAP dialogue (i.e. a MAP PM invocation) is a local implementation matter.

How TC dialogue identifiers are assigned to a MAP PM invocation is also a local implementation matter.

14.4 Conventions

The behaviour of the MAP PM depends on the application-context-name associated with the dialogue. One major difference is that the MAP requests the transfer of the application-context-name by TC only for those contexts which do not belong to the so-called "version one context set".

The "version one context set" is a set of application-contexts which model the behaviour of a MAP V1 implementation according to the latest phase 1 version of GSM 09.02. This set is defined in clause 15.

The procedures described in clause 15 are used when the application-context-name does not refer to a dialogue between an MSC and its VLR. When the application-context-name refers to a dialogue between an MSC and its VLR the MAP PM procedures are a local implementation matter.

15 Elements of procedure

15.1 Dialogue establishment

The establishment of a MAP dialogue involves two MAP-service-users, one that is the dialogue-initiator and one that is the dialogue-responder.

This procedure is driven by the following signals:

- a MAP-OPEN request primitive from the dialogue-initiator;
- a TC-BEGIN indication primitive occurring at the responding side;
- a MAP-OPEN response primitive from the dialogue-responder;
- the first TC-CONTINUE indication primitive occurring at the initiating side;

and under specific conditions:

- a TC-END indication primitive occurring at the initiating side;
- a TC-U-ABORT indication primitive occurring at the initiating side;

- a TC-P-ABORT indication primitive occurring at the initiating side.

15.1.1 Handling of unknown operations

Unknown operations (i.e. a standard operation introduced in a later version of 09.02 or a private operation) can be introduced in MAP in a backwards compatible way. This means, that the receiver of an unknown operation shall, if the dialogue state allows it, send a TC-REJECT component to the sender of the operation indicating 'unrecognised operation' and continue with the processing of further components or messages exchanged within the dialogue as if the unknown operation had not been received.

The standardised structure of a MAP dialogue shall not be affected by the invocation of unknown operations, i.e. if a dialogue uses only a TC-BEGIN message which is acknowledged by a TC-END message, a TC-CONTINUE message shall not be used to invoke an unknown operation. However the standardised structure of a MAP dialogue may be affected by the rejection of unknown operations, i.e. if a dialogue uses only a TC-BEGIN message which is acknowledged by a TC-END message, a TC-CONTINUE message followed by a TC-END message may be used to carry the rejection of an unknown operation and the response to the standardised operation. The entity which initiated a dialogue whose standardised structure is a TC-BEGIN message which is acknowledged by a TC-END message shall not send any messages in that dialogue after the TC-BEGIN.

Note that if the dialogue structure is affected as described in this paragraph the TC-CONTINUE shall include the dialogue portion required to confirm the acceptance of the dialogue.

Unknown operations can be invoked in the following types of messages (there is no restriction as to how many unknown operations can be invoked in a message):

- TC-BEGIN the component to invoke the unknown operation shall follow the component of the standard operation that is included in this message.

- TC-CONTINUE: the component to invoke the unknown operation may be transported as the only component in a stand-alone message or can be grouped with existing operations. In the latter case a specific sequencing of components is not required.

- TC-END: if the component to invoke the unknown operation is grouped with an existing operation a specific sequencing of components is not required

The TC-REJECT component may be sent in the following messages:

- TC-CONTINUE or TC-END: either as the only component of the message or grouped with an existing component. The choice is up to the MAP-Service User.

  If the received message contains only unknown operations the MAP-Service User shall send the TC-REJECT components in a TC-CONTINUE message to the peer entity, if the dialogue state allows it.

  If the received message contains unknown operations and standard operations and the standardised structure of the dialogue requires the response to the standard operation to be sent within a TC-END message, then the MAP-Service User may send the response to the standard operations and the TC-REJECT components for the unknown operations in a TC-CONTINUE message followed by a TC-END message. A specific distribution of the components to the TC messages or a specific sequencing of components is not required.

Note that SDLs of chapters 19 - 25 do not show the report to the MAP-Service User about the reception of the unknown operation. This has been done for the sake of simplicity of description; the MAP PM may inform the MAP-Service User.

The sender of the unknown operation shall ensure that there is enough room in the used message for the unknown operation.

15.1.2 Receipt of a MAP-OPEN request primitive

On receipt of a MAP-OPEN request primitive the behaviour of the MAP PM shall be as follows:

The MAP PM shall accept zero, one or several user request primitives until a MAP-DELIMITER request primitive is received.

For each user request primitive, the MAP PM shall request the invocation of the associated operation using the TC-INVOKE service. See subclause 15.6 for a description of the associated SSMs.

On receipt of the MAP-DELIMITER request primitive the MAP PM shall issue a TC-BEGIN request primitive. The application-context-name as well as the user information parameter (if any) shall be mapped to the corresponding TC-BEGIN parameters.

The requesting MAP PM waits for a TC indication primitive and does not accept any other primitive from its user, except a MAP-U-ABORT request or a MAP-CLOSE request.

15.1.3 Receipt of a TC-BEGIN indication

On receipt of a TC-BEGIN indication primitive, the MAP PM shall:

- if no application-context-name is included in the primitive and if the "Components present" indicator indicates "no components", issue a TC-U-ABORT request primitive (note 2). The local MAP-User is not informed.

- if no application-context-name is included in the primitive and if presence of components is indicated, wait for the first TC-INVOKE primitive, and derive a version 1 application-context-name from the operation code according to table 15.1/1 (note 1).

NOTE 1: In some cases, it may be necessary to analyse the operation argument.

Then:

a) if no application-context-name can be derived (i.e. the operation code does not exist in MAP V1 specifications), the MAP PM shall issue a TC-U-ABORT request primitive (note 2). The local MAP-User is not informed.

b) if an application-context-name can be derived and if it is acceptable from a load control point of view, the MAP PM shall:

i) if this primitive requests the beginSubscriberActivity operation, the MAP PM shall check whether more components have been received associated with this operation. If more components are present, the MAP PM shall issue a MAP-OPEN indication primitive with the version 1 application-context-name "networkFunctionalSsContext-v1". The Destination-reference shall include the IMSI taken from the argument of the beginSubscriberActivity operation; the Originating-reference shall cover the originatingEntityNumber.

A beginSubscriberActivity operation that is not associated with any other Component shall be rejected by the MAP PM by issuing a TC-U-ABORT request primitive (note 2). The local MAP-User shall not be informed.

ii) otherwise, the MAP PM shall issue a MAP-OPEN indication primitive with the version 1 application-context-name set according to table 15.1/1. DestinationReference and OriginatingReference must not be included in the MAP-OPEN indication primitive.

Then the MAP PM shall function in a way that the dialogue responding MAP behaves as specified in the GSM phase 1 protocol (latest version of TS GSM 09.02 phase 1).

NOTE 2: If no AARQ apdu was included in the BEGIN message, TC (Component Sub-layer) will not include an AARE apdu or an ABRT apdu in a TR-U-ABORT request primitive that is to be issued on receipt of a TC-U-ABORT request primitive from the local MAP service provider.

c) if an application-context-name can be derived but if it is not acceptable from a load control point of view, the MAP PM shall ignore this dialogue request and not inform the MAP-user;

- if a version 1 application-context-name is included, the MAP PM shall issue a TC-U-ABORT request primitive with abort-reason "User-specific" and user-information "MAP-ProviderAbortInfo" indicating "abnormalDialogue". The local MAP-user shall not be informed.

- if an application-context-name different from version 1 is included in the primitive and if User-information is present, the User-information must constitute a syntactically correct MAP-OPEN dialogue PDU. Otherwise a TC-U-ABORT request primitive with abort-reason "User-specific" and user-information "MAP-

ProviderAbortInfo" indicating "abnormalDialogue" shall be issued and the local MAP-user shall not be informed.

- if no User-information is present it is checked whether presence of User Information in the TC-BEGIN indication primitive is required for the received application-context-name. If User Information is required but not present, a TC-U-ABORT request primitive with abort-reason "User-specific" and user-information "MAP-ProviderAbortInfo" indicating "abnormalDialogue" shall be issued. The local MAP-user shall not be informed.

- if an application-context-name different from version 1 is received in a syntactically correct TC-BEGIN indication primitive but is not acceptable from a load control point of view, the MAP PM shall ignore this dialogue request. The MAP-user is not informed.

- if an application-context-name different from version 1 is received in a syntactically correct TC-BEGIN indication primitive and if it is acceptable from a load control point of view, the MAP PM shall check whether the application-context-name is supported.

NOTE 3: Unknown application-context-names are treated like unsupported ones.

If it is, the MAP PM shall issue a MAP-OPEN indication primitive with all parameters (application-context-name included) set according to the value of the corresponding parameter of the TC-BEGIN indication primitive.

The MAP PM shall then process any other indication primitives received from TC as described in subclause 15.6. Once all the received components have been processed, the MAP PM shall inform the local MAP service user by a MAP-DELIMITER indication primitive.

If the TC-BEGIN indication primitive is not associated with any component, the MAP PM shall inform the MAP User by a MAP-DELIMITER indication primitive.

Once all the received primitives have been processed, the MAP PM does not accept any primitive from the provider and waits for a MAP-OPEN response primitive from its user.

- if an application-context-name different from version 1 is received in a syntactically correct TC-BEGIN indication primitive and if it is acceptable from a load control point of view but the application-context-name is not supported, the MAP PM shall issue a TC-U-ABORT request primitive with abort-reason indicating "application-context-not-supported". If an alternative application-context-name cannot be offered, the received application-context-name shall be returned in the TC-U-ABORT Req primitive.

In the following cases an alternative application-context can be offered and its name included in the TC-U-ABORT Req primitive:

a) if an application-context of version 2 or higher is requested, but only version 1 application-context supported, then the v1 application context shall be returned;

b) if an application-context of version 3 or higher is requested, but only version 2 application-context supported, then the v2 application context shall be returned.

c) if an application-context of version 4 or higher is requested, but only version 3 application-context supported, then the v3 application context shall be returned.

Table 15.1/1: Mapping of V1 operation codes on to application-context-names

Operation	Application-context-name (note 1)
updateLocation	networkLocUpContext-v1
cancelLocation	locationCancellationContext-v1
provideRoamingNumber	roamingNumberEnquiryContext-v1
insertSubscriberData	subscriberDataMngtContext-v1
deleteSubscriberData	subscriberDataMngtContext-v1
sendParameters	infoRetrievalContext-v1
	networkLocUpContext-v1 (note 2)
beginSubscriberActivity	networkFunctionalSsContext-v1
sendRoutingInfo	locationInfoRetrievalContext-v1
performHandover	handoverControlContext-v1
reset	resetContext-v1
activateTraceMode	tracingContext-v1
deactivateTraceMode	tracingContext-v1
sendRoutingInfoForSM	shortMsgGatewayContext-v1
forwardSM	shortMsgRelayContext-v1
reportSM-deliveryStatus	shortMsgGatewayContext-v1
noteSubscriberPresent	mwdMngtContext-v1
alertServiceCentreWithoutResult	shortMsgAlertContext-v1
checkIMEI	EquipmentMngtContext-v1

NOTE 1: These symbolic names refer to the object identifier value defined in clause 17 and allocated to each application-context used for the MAP.

NOTE 2: The choice between the application contexts is based on the parameters received in the operation.

15.1.4 Receipt of a MAP-OPEN response

On receipt of a MAP-OPEN response primitive indicating that the dialogue is accepted, the MAP PM shall build a MAP-Accept PDU if the user-information parameter is included in the response primitive and accept any MAP specific service request or service response until a MAP-DELIMITER request or a MAP-CLOSE request is received from the MAP user. The MAP PM shall process the MAP specific primitives as described in subclause 15.6. The MAP PM shall then issue a TC-CONTINUE request primitive after it receives the MAP-DELIMITER request primitive if no MAP-CLOSE request primitive has been received, otherwise it shall issue a TC-END request primitive. In both cases the MAP-Accept PDU (if any) is included in the user-information parameter of the TC primitive.

If the dialogue is not associated with a version 1 application context, the MAP PM shall include the application-context-name in the TC primitive.

If no MAP-CLOSE request has been received, the MAP PM waits for a request primitive from its user or an indication primitive from TC.

On receipt of a MAP-OPEN response primitive indicating that the dialogue is not accepted, the MAP PM shall build a MAP-Refuse PDU and request its transfer using the TC-U-ABORT req primitive (abort reason = user specific).

15.1.5 Receipt of the first TC-CONTINUE ind

On receipt of the first TC-CONTINUE indication primitive for a dialogue, the MAP PM shall check the value of the application-context-name parameter. If this value matches the one used in the MAP-OPEN request primitive, the MAP PM shall issue a MAP-OPEN confirm primitive with the result parameter indicating "accepted", then process the following TC component handling indication primitives as described in subclause 15.6, and then waits for a request primitive from its user or an indication primitive from TC, otherwise it shall issue a TC-U-ABORT request primitive with a MAP-providerAbort PDU indicating "abnormal dialogue" and a MAP-P-ABORT indication primitive with the "provider-reason" parameter indicating "abnormal dialogue".

15.1.6 Receipt of a TC-END ind

On receipt of a TC-END indication primitive in the dialogue initiated state, the MAP PM shall check the value of the application-context-name parameter. If this value does not match the one used in the MAP-OPEN request primitive, the

MAP PM shall discard any following component handling primitive and shall issue a MAP-P-ABORT indication primitive with the "provider-reason" parameter indicating "abnormal dialogue".

Otherwise it shall issue a MAP-OPEN confirm primitive with the result parameter set to "accepted" and process the following TC component handling indication primitives as described in subclause 15.6; then it shall issue a MAP-CLOSE indication primitive and return to idle all state machines associated with the dialogue.

15.1.7 Receipt of a TC-U-ABORT ind

On receipt of a TC-U-ABORT indication primitive in the "Dialogue Initiated" state with an abort-reason parameter indicating "ApplicationContextNotSupported", the MAP PM shall issue a MAP-OPEN confirm primitive with the result parameter indicating "Dialogue Refused" and the refuse-reason parameter indicating "ApplicationContextNotSupported".

On receipt of a TC-U-ABORT indication primitive in the "Dialogue Initiated" state with an abort-reason parameter indicating "User Specific" and without user information, the MAP PM shall issue a MAP-OPEN confirm primitive with the result parameter indicating "Dialogue Refused" and the refuse-reason parameter indicating "Potential Version Incompatibility".

On receipt of a TC-U-ABORT indication primitive in the "Dialogue Initiated" state with an abort-reason parameter indicating "User Specific" and a MAP-Refuse PDU included as user information, the MAP PM shall issue a MAP-OPEN confirm primitive with the result set to refused and the refuse reason set as received in the MAP Refuse PDU.

Receipt of a TC-U-ABORT indication primitive with abort-reason "User Specific" and with user information is described as part of abnormal termination (see subclause 15.4.2).

15.1.8 Receipt of a TC-P-ABORT ind

On receipt of a TC-P-ABORT indication primitive in the "Dialogue Initiated" state with a P-abort parameter indicating "Incorrect Transaction Portion", the MAP PM shall issue a MAP-OPEN confirm primitive with the result parameter indicating "Dialogue Refused" and the refuse reason parameter indicating "Potential Version Incompatibility".

On receipt of a TC-P-ABORT indication primitive in the "Dialogue Initiated" state with a P-abort parameter indicating "No Common Dialogue Portion", the MAP PM shall issue a MAP-P-ABORT indication primitive with the provider reason parameter indicating "Version Incompatibility".

Receipt of a TC-P-ABORT indication primitive with another P-abort parameter value is described as part of abnormal termination (see subclause 15.5.2).

15.2 Dialogue continuation

Once established the dialogue is said to be in a continuation phase.

Both MAP users can request the transfer of MAP APDUs until one of them requests the termination of the dialogue.

15.2.1 Sending entity

The MAP PM shall accept any MAP specific service request or response primitives and process them as described in subclause 15.6.

On receipt of a MAP-DELIMITER request primitive, the MAP PM shall issue a TC-CONTINUE request primitive.

15.2.2 Receiving entity

On receipt of a TC-CONTINUE indication primitive the MAP PM shall accept zero, one or several TC component handling indication primitives and process them as described in subclause 15.6.

15.3 Dialogue termination

Both the dialogue-initiator and the dialogue-responder have the ability to request the termination of a dialogue after it has been established.

The dialogue termination procedure is driven by the following events:

- a MAP-CLOSE request primitive;
- a TC-END indication primitive.

15.3.1 Receipt of a MAP-CLOSE request

On receipt of a MAP-CLOSE request primitive, the MAP PM shall issue a TC-END request primitive and, if applicable, return to idle the associated active SSMs. Note that if the release method parameter of the MAP-CLOSE request indicates "normal" the TC-END request primitive will trigger the transmission of components associated with any user specific request or response primitives which may have been issued after the last MAP-DELIMITER request.

15.3.2 Receipt of a TC-END indication

On receipt of a TC-END indication primitive, the MAP shall accept any component handling indication primitives and process them as described in subclause 15.6.

Once all the received primitives have been processed, the MAP PM shall return to idle the associated SSMs and issue a MAP-CLOSE indication primitive.

15.4 User Abort

Both the dialogue-initiator and the dialogue-responder have the ability to abort a dialogue at any time.

The user abort procedure is driven by one of the following events:

- a MAP-U-ABORT request primitive;
- a TC-U-ABORT indication primitive carrying a MAP-user-abort PDU.

15.4.1 MAP-U-ABORT request

On receipt of a MAP-U-ABORT request the MAP PM shall construct a MAP-user-abort PDU from the user-reason and diagnostic parameters and issue a TC-U-ABORT request primitive. All state machines associated with the dialogue are returned to idle.

15.4.2 TC-U-ABORT ind

On receipt of a TC-U-ABORT indication carrying a MAP-user-abort PDU, the MAP PM shall issue a MAP-U-ABORT indication primitive. The user-reason and diagnostic information elements are mapped to the corresponding parameters of the MAP-U-ABORT indication primitive.

All state machines associated with the dialogue are returned to idle.

15.5 Provider Abort

The MAP has the ability to abort a dialogue at both the dialogue-initiator side and the dialogue-responder side.

The provider abort procedure is driven by one of the following events:

- a MAP PM error situation;
- a TC-P-ABORT indication primitive;

- a TC-U-ABORT indication primitive carrying a MAP-abort PDU.

15.5.1 MAP PM error situation

In the case of an abnormal situation detected at the MAP level during an established dialogue, the MAP PM shall:

- issue a MAP-P-ABORT indication primitive with the appropriate value of the provider-reason parameter;
- construct a MAP-abort PDU from the value of these parameters and request its transfer using a TC-U-ABORT request primitive.

15.5.2 TC-P-ABORT ind

On receipt of a TC-P-ABORT indication, the MAP PM shall issue a MAP-P-ABORT indication primitive.

All state machines associated with the dialogue are returned to idle.

15.5.3 TC-U-ABORT ind

On receipt of a TC-U-ABORT indication carrying a MAP-abort PDU, the MAP PM shall issue a MAP-P-ABORT indication primitive, with the appropriate value of the provider-reason parameter. The source parameter shall indicate "MAP-provider".

All state machines associated with the dialogue are returned to idle.

15.6 Procedures for MAP specific services

This subclause describes the MAP procedures for MAP specific services.

These procedures are driven by the following types of events:

- a MAP specific request or a MAP specific MAP response primitive;
- a component handling primitive from TC.

A Service State Machine is activated on receipt of one of the following signals:

- a MAP request primitive, which activates a requesting SSM;
- a TC-INVOKE indication primitive without linked identifier, which activates a responding SSM.

For component handling primitives there are two types of events:

- events which activate a Service State Machine or which can be related to an existing one;

  The procedure elements driven by these events are described in subclauses 15.6.1 to 15.6.4.

- events which cannot be related to a Service State Machine.

  The procedure elements driven by these events are described in subclause 15.6.5.

15.6.1 Service invocation

The MAP specific procedures are initiated by the MAP request primitives.

On receipt of a MAP request primitive, the MAP PM shall build an operation argument from the parameters received in the request primitive and request the invocation of the associated operation using the TC-INVOKE procedure. If a linked ID parameter is inserted in the primitive this indicates a child service and implies that the operation on which the service is mapped is linked to the operation on which the parent service is mapped.

The mapping of MAP specific services on to remote operations is given in table 16.2/1.

15.6.2 Service invocation receipt

On receipt of a TC-INVOKE indication primitive, the MAP PM shall:

- if the invoke ID is already in use by an active service, request the transfer of a reject component using the TC-U-REJECT request primitive with the appropriate problem code (duplicated invokeID) and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event received from the peer";

- if the operation code does not correspond to an operation supported by the application-context, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (unrecognized operation), and -if the dialogue version is lower than 3- issue a MAP-NOTICE indication primitive with a diagnostic parameter set to „abnormal event received from the peer“;

- if a linked ID is included, perform the following checks: If the operation referred to by the linked ID does not allow linked operations or if the operation code does not correspond to a permitted linked operation, issue a TC-U-REJECT request primitive with the appropriate problem code (linked response unexpected or unexpected linked operation);

- if the type of the argument is not the one defined for the operation, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter), and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event from the peer";

- if the type of the argument is correct but the values of the information elements it contains do not permit the type of MAP service being invoked to be determined, request the transfer of an error component using the TC-U-ERROR request primitive with an error code set to "unexpected data value" and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event from the peer";

NOTE 1: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

- if the type of the argument is correct but information elements required for the service being invoked are missing, request the transfer of an error component using the TC-U-ERROR request primitive with an error code set to "data missing" and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event from the peer";

NOTE 2: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

- if the type of the argument is correct but contains information elements which are not relevant for the type of MAP service being invoked, request the transfer of an error component using the TC-U-ERROR request primitive with an error code set to "unexpected data value" and issue a MAP-NOTICE indication primitive with a diagnostic parameter set to "abnormal event from the peer";

NOTE 3: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

- Otherwise, issue the relevant MAP indication primitive to the MAP-service-user. If the service is to be user confirmed, the MAP PM waits for the corresponding response primitive.

15.6.3 Service response

For user confirmed services, the MAP PM shall accept a MAP response primitive and shall:

- if no error indication is included in the primitive and the service maps on to a class 1 or 3 operation, construct a result information element from the parameters received and request its transfer using the TC-RESULT-L service and optionally the TC-RESULT-NL service.

The TC-RESULT-NL services shall be used when the user specific parameters of the response primitives cannot be transferred in a single signalling frame and no segmenting mechanism is available from the underlying layers. The MAP PM shall issue one or several TC-RESULT-NL request primitives followed by a TC-RESULT-L primitive. The user parameters shall be split so that each portion contains sufficient information to construct a value compatible with the type defined for the result of the associated operation.

- if no error indication is included in the primitive and the service response maps on to a class 4 linked operation, construct an operation argument from the parameters received and request its transfer using the TC-INVOKE service for this class 4 linked operation. The operation to be invoked is deduced from the value of the result parameter of the service primitive;

- if an error indication is included in the primitive and the service maps on to a class 1 or 2 operation, either issue a TC-U-REJECT request primitive if the user error parameter indicates "resource limitation" or "initiating release", or construct an error parameter from the parameters received and request its transfer using the TC-U-ERROR request primitive. The error code should be the one associated with the value of the user error parameter of the response primitive.

NOTE: The only user errors that a MAP user can generate in addition to the list of errors attached to the operation which is associated with the service are: resource limitation and initiating release. Any other abnormal situation is detected either by the TC entity or by the MAP entity.

- if an error indication is received and the operation maps on to a class 3 operation, or if no error indication is received but the service maps on to a class 2 operation which has no class 4 linked operation, return the local service state machine to idle without requesting any service from TC.

15.6.4 Receipt of a response

A component handling indication primitive is considered as driving a response for a confirmed service if the invoke ID parameter value matches the one stored for the service, or if the linked ID parameter value matches the one stored for the service and the operation invoked is a class 4 operation. On receipt of a response (except a TC-L-CANCEL indication) for an unconfirmed service the MAP PM shall issue a MAP-NOTICE indication primitive with the appropriate provider error (return result unexpected or return error unexpected).

15.6.4.1 Receipt of a TC-RESULT-NL indication

If the type of the partial result parameter is not compatible with the one defined for the complete result of this operation, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter) and issue a confirm primitive with the provider error parameter set to "invalid response received". The MAP PM shall also issue a TC-U-CANCEL request primitive so that all subsequent result components for this operation are discarded by TC.

Otherwise, store the value of the partial result parameter and wait for subsequent TC-RESULT-NL indication primitives until a TC-RESULT-L indication primitive is received.

15.6.4.2 Receipt of a TC-RESULT-L indication

If the type of the result parameter is not the one defined for the result of this operation, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter), and issue a confirm primitive with the provider error parameter set to "invalid response received".

If the type of the result parameter is correct but does not contain all the information elements required by the service associated with the invocation, issue a confirm primitive with the provider error parameter set to "invalid response received".

NOTE 1: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

If the type of the result parameter is correct but contains information elements which are not relevant for the service associated with the invocation are missing, issue a confirm primitive with the provider error parameter set to "invalid response received".

NOTE 2: These checks are only relevant when there is not a one-to-one mapping between a service and an operation.

Otherwise, issue a MAP confirm primitive to the MAP-service-user mapping the result parameter of the TC-RESULT-L primitive on to the MAP specific parameters.

If partial results have been previously received, the value of the partial result parameters shall also be taken into account before performing the three previous checks.

15.6.4.3 Receipt of a TC-U-ERROR indication

If the error code is not defined for the MAP or is not one associated with the operation referred to by the invoke identifier, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (unrecognized error or unexpected error), and issue a confirm primitive with the provider error parameter set to "invalid response received".

If the type of the error parameter is not the one defined for this error, request the transfer of a reject component using the TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter), and issue a confirm primitive with the provider error parameter set to "invalid response received".

If the type of the error parameter is correct but does not contain all the information elements required by the service associated with the invocation, issue a confirm primitive with the provider error parameter set to "invalid response received".

NOTE 1: In some cases, it may be necessary to analyse the operation argument.

If the type of the error parameter is correct but its value includes information elements which are not relevant for the service associated with the invocation, issue a confirm primitive with the provider error parameter set to "invalid response received".

NOTE 2: In some cases, it may be necessary to analyse the operation argument.

Otherwise, issue a MAP confirm primitive to the MAP-service-user with the user error parameter set according to the received error code. If applicable the error parameter is mapped to the diagnostic parameter.

15.6.4.4 Receipt of a TC-INVOKE indication

A TC-INVOKE indication primitive is considered as carrying a possible response to a specific service if the linked ID refers to an active specific service and the associated operation is a class 4 operation. Note that the presence of a linked ID parameter in a TC-INVOKE primitive requesting a non class 4 operation indicates a child service whose procedures are the same as the procedures for the parent service.

On receipt of a TC-INVOKE indication confirming an active service, the MAP PM shall:

- if the operation code is not defined for MAP and the dialogue version is at least 3, issue a TC-U-REJECT request primitive with the appropriate problem code (unrecognized operation).

- if the operation code is not defined for MAP and the dialogue version is lower than 3, or if the operation referred to by the linked ID does not allow linked operations or if the operation code does not correspond to an allowed linked operation, issue a TC-U-REJECT request primitive with the appropriate problem code (unrecognized operation, linked response unexpected or unexpected linked operation). If the service is confirmed, the MAP shall also issue a Confirm primitive with provider error indication "unexpected response from the peer", otherwise it may issue a MAP-NOTICE indication primitive with an appropriate diagnostic "abnormal event received from the peer".

- otherwise issue a confirm primitive mapping the operation argument parameter to the user specific parameters and setting the result parameter according to the operation code of the linked operation.

15.6.4.5 Receipt of a TC-U-REJECT indication

On receipt of a TC-U-REJECT indication primitive which affects a pending service, the MAP PM shall issue a MAP confirm primitive to the MAP-service-user with the appropriate value of the provider error or user error parameter.

The mapping of TC invoke problem codes on to MAP Provider Error and MAP User Error parameter values is described in clause 16.

15.6.4.6 Receipt of a TC-L-REJECT indication

This event occurs when the local TC detects a protocol error in an incoming component which affects an active specific service.

On receipt of a TC-L-REJECT indicating "return result problem, unexpected return result", the MAP shall issue a confirm primitive with the parameter provider error indicating "unexpected response from the peer".

On receipt of a TC-L-REJECT indicating "return error problem, unexpected error result", the MAP shall issue a confirm primitive with the parameter provider error indicating "unexpected response from the peer".

Note that when the problem code indicates a general problem, it is considered that the event cannot be related to an existing SSM even if the invoke Id is provided by TC. This is because whether the invoke Id refers to a local or remote invocation is ambiguous. The behaviour of the MAP PM in such a case is described in subclause 15.6.5.3.

15.6.4.7 Receipt of a TC-L-CANCEL indication

On receipt of a TC-L-CANCEL indication, the MAP PM shall:

- if the associated operation is a class 1 operation, issue a confirm primitive with the provider error cause indicating "no response from the peer";
- if the associated operation is a class 2 operation and no linked operations are defined for this operation, issue a confirm primitive without parameter (i.e. indicating implicitly the successful completion of the service);
- if the associated operation is a class 2 operation and has linked operations but none of them has been invoked, issue a confirm primitive with the provider error parameter indicating "service completion failure";
- if the associated operation is a class 2 operation and a linked operation invocation has already been received in response to this operation, ignore the primitive;
- if the associated operation is a class 3 operation, issue a confirm primitive with the provider error cause indicating "service completion failure";
- if the associated operation is a class 4 operation, ignore the primitive.

NOTE: When a TC-L-CANCEL ind primitive is received before the dialogue has been confirmed (i.e. no backward message is received by the dialogue initiator node), the MAP PM shall first issue a MAP-OPEN Cnf primitive with the result parameter indicating "accepted" (which means that the dialogue is considered as being implicitly accepted). Then, as indicated above, the TC-L-CANCEL Indication is interpreted according to the class of the operation to which it refers.

15.6.4.8 Receipt of a TC-NOTICE indication

If a TC-NOTICE indication primitive is received before the dialogue has been confirmed (i.e. no backward message is received by the dialogue initiator node), the MAP PM shall issue a MAP-OPEN Cnf primitive with the result parameter indicating Refused and a refuse reason Remote node not reachable”.

If a TC-NOTICE indication primitive is received after the dialogue has been confirmed, the MAP PM shall issue a MAP-NOTICE indication to the user, with a problem diagnostic indicating "message cannot be delivered to the peer".

15.6.5 Other events

This subclause describes the behaviour of the MAP PM on receipt of a component handling indication primitive which cannot be related to any service or which does not affect a pending one. The MAP user is only informed that an abnormal event occurred during the associated dialogue. It is up to the MAP user to abort, continue or terminate the dialogue.

15.6.5.1 Receipt of a TC-U-REJECT

On receipt of a TC-U-REJECT indication primitive which does not affect an active SSM (i.e. indicating a return result or return error problem), the MAP PM shall issue a MAP-NOTICE indication primitive with the diagnostic parameter set to "response rejected by the peer".

This is also applicable for invoke problems related to a class 4 linked operation.

15.6.5.2 Receipt of a TC-R-REJECT indication

On receipt of a TC-R-REJECT indication (i.e. when a protocol error has been detected by the peer TC entity) which does not affect an active SSM, the MAP PM shall either discard this indication or issue a MAP-NOTICE indication primitive with the provider error indicating "abnormal event detected by the peer".

In case of notification, it is up to the MAP user to continue, abort or terminate the dialogue. Note also that for MAP V1 the reject component is received in an END message and therefore the dialogue is terminated anyway.

15.6.5.3 Receipt of a TC-L-REJECT indication

On receipt of a TC-L-REJECT indication primitive (i.e. when a protocol error has been detected by the local TC entity) which cannot be related to an active SSM, the MAP PM shall either discard this indication or issue a MAP-NOTICE indication primitive with the provider error indicating "abnormal event received from the peer".

In case of notification, it is up to the MAP user to continue, or to terminate the dialogue and implicitly trigger the transmission of the reject component or to abort the dialogue.

15.6.6 Parameter checks

As described in the previous subclauses, the MAP PM performs a set of checks to ensure the correctness of the information elements received; these are:

- check if the syntax and encoding (note) of the operation argument, result or error parameter are correct.

NOTE: Depending on the implementation, encoding problems on the TC user portion may be detected at TC level or by the MAP user. In the second case the problem is reported in a similar manner to a syntactical problem.

  The syntax shall be considered incorrect if a mandatory information element is missing in any constructed element or if the value of an information element is out of the range defined for the type it is supposed to belong to;

- if there is not a one-to-one mapping between a service and an operation:

  i) check if the value of the information elements (generally a single one) permits the MAP PM to determine the service associated with the operation invocation;

  ii) check that there are no information elements which are irrelevant for the indication or a confirm primitive to be issued;

- check if all the information elements required to built an indication or a confirm primitive are available.

However some additional checks may have to be performed by the MAP user (see clause 18).

15.6.7 Returning state machines to idle

Unlike TC invocation state machines, service state machines exist at both requestor and performer side.

A service state machine at the requestor side is returned to idle when the MAP-specific confirm primitive is issued or when the dialogue terminates.

A service state machine at the performer side is returned to idle on receipt of a MAP-specific response primitive from the MAP user, when the dialogue terminates or at expiry of an implementation dependent watch-dog timer which is started when the state machine is created.

15.6.8 Load control

As stated in the previous subclauses, before issuing a MAP-OPEN indication primitive the MAP PM performs a check to verify if there are sufficient resources to open the dialogue taking into account possible overload conditions.

The decision is based on the priority allocated to the application-context whose name is explicitly included in the TC-BEGIN indication primitive or implied by the first operation invocation when V1 contexts are in use. How a V1 application-context-name is derived from an operation code is described in table 15.1/1.

The priority level allocated to each application-context is described in clause 3 tables 5.1/1 and 5.1/2.

16 Mapping on to TC services

16.1 Dialogue control

Dialogue control services are mapped to TC dialogue handling services. The TC-UNI service is not used by the MAP PM.

16.1.1 Directly mapped parameters

The following parameters of the MAP-OPEN request and indication primitives are directly mapped on to the corresponding parameters of the TC-BEGIN primitives:

- destination address;
- originating address.

16.1.2 Use of other parameters of dialogue handling primitives

16.1.2.1 Dialogue Id

The value of this parameter is associated with the MAP PM invocation in an implementation dependent manner.

16.1.2.2 Application-context-name

The application-context-name parameter of a MAP primitive is mapped to the application-context-name parameter of TC dialogue handling primitives according to the rules described in subclause 15.1.

16.1.2.3 User information

The user information parameter of TC dialogue primitives is used to carry the MAP dialogue APDUs.

16.1.2.4 Component present

This parameter is used by the MAP PM as described in CCITT Recommendation Q.771. It is not visible to the MAP user.

16.1.2.5 Termination

The value of this parameter of the TC-END request primitive is set by the MAP PM on the basis of the release method parameter of the MAP-CLOSE request primitive, except when the dialogue state machine is in the state DIALOGUE INITIATED, in which case the Termination parameter shall always indicate "pre-arranged end".

16.1.2.6 P-Abort-Cause

Values of the P-abort-cause parameter are mapped to the values of the provider-reason parameter of the MAP-P-ABORT indication primitive according to table 16.1/1, except in the dialogue initiated phase for the "incorrectTransactionPortion" and "noCommonDialoguePortion" values which are mapped to the "potential incompatibility problem" value of the refuse-reason parameter of the MAP-OPEN cnf primitive. The source parameter in the MAP-P-ABORT ind takes the value "TC problem".

16.1.2.7 Quality of service

The quality of service of TC request primitives is set by the MAP as shown below.

- Return option: "Return message on error" or "Discard message on error" as required by the network operator;
- Sequence control: "Sequence guaranteed" or "Sequence result not guaranteed" as required by the network operator;

  "Sequence guaranteed" shall be used when a segmented result is to be transferred (e.g. subscriber data in response to SendParameters). It may also be appropriate to use Sequence guaranteed when a series of InsertSubscriberData, ProcessAccessSignalling or ForwardAccessSignalling operations is used.

It is essential that the TC message which indicates acceptance of a dialogue opening request is received by the dialogue initiator before any subsequent message in that dialogue; otherwise the dialogue opening will fail. The dialogue responder shall ensure that this requirement is met by:

- Sending the dialogue acceptance message in a TC-END, if the dialogue structure requires it; or
- Using "Sequence guaranteed", if the dialogue acceptance message is sent in a TC-CONTINUE; or
- Waiting until the dialogue acceptance message has been acknowledged by the dialogue initiator before sending a subsequent message, if the dialogue acceptance message is sent in a TC-CONTINUE.

Table 16.1/1: Mapping of P-Abort cause in TC-P-ABORT indication on to provider-reason in MAP-P-ABORT indication

TC P-Abort cause	MAP provider-reason
unrecognized message type	provider malfunction
unrecognized transaction Id	supporting dialogue released
badlyFormattedTransactionPortion	provider malfunction
incorrectTransactionPortion	provider malfunction (note)
resourceLimitation	resource limitation
abnormalDialogue	provider malfunction
noCommonDialoguePortion	version incompatibility

NOTE: Or version incompatibility in the dialogue initiated phase.

16.2 Service specific procedures

Specific services are mapped to TC component handling services.

16.2.1 Directly mapped parameters

The Invoke Id parameter of the MAP request and indication primitive is directly mapped on to the Invoke Id parameter of the component handling primitives.

16.2.2 Use of other parameters of component handling primitives

16.2.2.1 Dialogue Id

The value of this parameter is associated with the MAP PM invocation in an implementation dependent manner.

16.2.2.2 Class

The value of this parameter is set by the MAP PM according to the type of the operation to be invoked.

16.2.2.3 Linked Id

When a service response is mapped to a class 4 operation, the value of this parameter is set by the MAP PM and corresponds to the value assigned by the user to the initial service request (i.e. the value of the invoke ID parameter of the request primitive). Otherwise if such a parameter is included in MAP request/indication primitives it is directly mapped to the linked ID parameter of the associated TC-INVOKE request/indication primitives.

16.2.2.4 Operation

When mapping a request primitive on to a Remote Operations PDU (invoke), the MAP PM shall set the operation code according to the mapping described in table 16.2/1.

When mapping a response primitive on to a Remote Operations service, the MAP PM shall set the operation code of the TC-RESULT-L/NL primitive (if required) to the same value as the one received at invocation time.

Table 16.2/1: Mapping of MAP specific services on to MAP operations

MAP-SERVICE	operation
MAP-ACTIVATE-SS	activateSS
MAP-ACTIVATE-TRACE-MODE	activateTraceMode
MAP-ALERT-SERVICE-CENTRE	alertServiceCentre
MAP-ANY-TIME-INTERROGATION	anyTimeInterrogaton
MAP-CANCEL-LOCATION	cancelLocation
MAP-CHECK-IMEI	checkIMEI
MAP-DEACTIVATE-SS	deactivateSS
MAP-DEACTIVATE-TRACE-MODE	deactivateTraceMode
MAP-DELETE-SUBSCRIBER-DATA	deleteSubscriberData
MAP-ERASE-CC-ENTRY	eraseCC-Entry
MAP-ERASE-SS	eraseSS
MAP-FAILURE-REPORT	failureReport
MAP-FORWARD-ACCESS-SIGNALLING	forwardAccessSignalling
MAP-FORWARD-CHECK-SS-INDICATION	forwardCheckSsIndication
MAP-FORWARD-GROUP-CALL-SIGNALLING	forwardGroupCallSignalling
MAP-MT-FORWARD-SHORT-MESSAGE	mt-forwardSM
MAP-MO-FORWARD-SHORT-MESSAGE	mo-forwardSM
MAP-GET-PASSWORD	getPassword
MAP-INFORM-SERVICE-CENTRE	informServiceCentre
MAP-INSERT-SUBSCRIBER-DATA	insertSubscriberData
MAP-INTERROGATE-SS	interrogateSs
MAP-NOTE-MS-PRESENT-FOR-GPRS	noteMsPresentForGprs
MAP-PREPARE-GROUP-CALL	prepareGroupCall
MAP-PREPARE-HANDOVER	prepareHandover
MAP-PREPARE-SUBSEQUENT-HANDOVER	prepareSubsequentHandover
MAP-PROCESS-ACCESS-SIGNALLING	processAccessSignalling
MAP-PROCESS-GROUP-CALL-SIGNALLING	processGroupCallSignalling
MAP-PROCESS-UNSTRUCTURED-SS-REQUEST	processUnstructuredSS-Request
MAP-PROVIDE-ROAMING-NUMBER	provideRoamingNumber
MAP-PROVIDE-SIWFS-NUMBER	provideSIWFSNumber
MAP-PROVIDE-SUBSCRIBER-INFO	provideSubscriberInfo
MAP-PURGE-MS	purgeMS
MAP-READY-FOR-SM	readyForSM
MAP-REGISTER-CC-ENTRY	registerCC-Entry
MAP-REGISTER-PASSWORD	registerPassword
MAP-REGISTER-SS	registerSS
MAP-REMOTE-USER-FREE	remoteUserFree
MAP-REPORT-SM-DELIVERY-STATUS	reportSmDeliveryStatus
MAP-RESET	reset
MAP-RESTORE-DATA	restoreData
MAP-SEND_GROUP-CALL_END_SIGNAL	sendGroupCallEndSignal
MAP-SEND-END-SIGNAL	sendEndSignal
MAP-SEND-AUTHENTICATION-INFO	sendAuthenticationInfo
MAP-SEND-IMSI	sendIMSI
MAP-SEND-IDENTIFICATION	sendIdentification
MAP-SEND-ROUTING-INFO-FOR-SM	sendRoutingInfoForSM
MAP-SEND-ROUTING-INFO-FOR-GPRS	sendRoutingInfoForGprs
MAP-SEND-ROUTING-INFORMATION	sendRoutingInfo
MAP-SET-REPORTING-STATE	setReportingState
MAP-SIWFS-SIGNALLING-MODIFY	SIWFSSignallingModify
MAP-STATUS-REPORT	statusReport
MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION	ss-Invocation-Notification
MAP-UNSTRUCTURED-SS-NOTIFY	unstructuredSS-Notify
MAP-UNSTRUCTURED-SS-REQUEST	unstructuredSS-Request
MAP-UPDATE-GPRS-LOCATION	updateGprsLocation
MAP-UPDATE-LOCATION	updateLocation

16.2.2.5 Error

The error parameter in a TC-U-ERROR indication primitive is mapped to the user error parameter in the MAP confirm primitive of the service associated with the operation to which the error is attached.

The user error parameter in MAP response primitives is mapped to the error parameter of the TC-U-ERROR request primitive, except for "initiating-release" and "resource-limitation" which are mapped to the problem code parameter of the TC-U-REJECT request primitive.

16.2.2.6 Parameters

The parameters of MAP specific request and indication primitives are mapped to the argument parameter of TC-INVOKE primitives.

The parameters of MAP specific response and confirm primitives are mapped to the result parameter of TC-RESULT-L primitives, the parameter of TC-U-ERROR primitives or the argument of TC-INVOKE primitives when mapping on linked class 4 operations is used.

16.2.2.7 Time out

The value of this parameter is set by the MAP PM according to the type of operation invoked.

16.2.2.8 Last component

This parameter is used by the MAP PM as described in CCITT Recommendation Q.711. It is not visible from the MAP user.

16.2.2.9 Problem code

16.2.2.9.1 Mapping to MAP User Error

The following values of the user error parameter are mapped as follows to values of the TC problem code parameter. These values are generated by the MAP user. This mapping is valid from the TC-U-REJECT indication primitive to the MAP confirm service primitive and from the MAP response service primitive to the TC-U-REJECT request primitive.

Table 16.2/2: Mapping of MAP User Error parameter on to TC problem code in TC-U-REJECT primitives

MAP User Error	TC problem code
resource limitation	resource limitation
initiating release	initiating release

16.2.2.9.2 Mapping to MAP Provider Error parameter

The following values of the TC problem code parameter of the TC-U-REJECT indication primitive are mapped as follows to values of the MAP Provider Error parameter of the MAP confirm primitive.

Table 16.2/3: Mapping of TC problem code in TC-U-REJECT on to MAP Provider Error parameter

TC problem code	MAP Provider Error
duplicated invoke Id	duplicated invoke id
unrecognized operation	service not supported
mistyped parameter	mistyped parameter

The following values of the problem code parameters of the TC-L-REJECT primitive are mapped to values of the provider error parameter of the MAP confirm primitive as follows:

Table 16.2/4: Mapping of TC problem code in TC-L-REJECT on to MAP Provider Error parameter

TC problem code	MAP Provider Error
return result unexpected	unexpected response from the peer
return error unexpected	unexpected response from the peer

16.2.2.9.3 Mapping to diagnostic parameter

The following values of the problem code parameter of the TC-R-REJECT and TC-U-REJECT primitive are mapped to values of the diagnostic parameter of the MAP-NOTICE indication primitive as follows:

Table 16.2/5: Mapping of TC problem code of TC-R-REJECT and TC-U-REJECT on to diagnostic parameter

TC problem code	MAP diagnostic
General problem	
abnormal event detected by the peer	
Invoke problem	
- unrecognized linked ID	- abnormal event detected by the peer
- linked response unexpected	- response rejected by the peer
- unexpected linked operation	- response rejected by the peer
Return result problem	
- unrecognized invoke ID	- response rejected by the peer
- return result unexpected	- response rejected by the peer
- mistyped parameter	- response rejected by the peer
Return error problem	
- unrecognized invoke ID	- response rejected by the peer
- return error unexpected	- response rejected by the peer
- unrecognized error	- response rejected by the peer
- unexpected error	- response rejected by the peer
- mistyped parameter	- response rejected by the peer

The following values of the problem code parameter of the TC-L-REJECT primitive are mapped to values of the diagnostic parameter of the MAP-NOTICE indication primitive as follows:

Table 16.2/6: Mapping of TC problem code of TC-L-REJECT on to diagnostic parameter

TC problem code	MAP diagnostic
General problems:	- abnormal event received from the peer
Invoke problem:	
- unrecognized linked ID	- abnormal event received from the peer
Return result problem:	
- unrecognized invoke ID	- abnormal event received from the peer
Return error problem:	
- unrecognized invoke ID	- abnormal event received from the peer

16.3 SDL descriptions

The following SDL specification describes a system which includes three blocks: MAP-user, MAP-provider and TC.

Such a system resides in each network component supporting MAP and communicates with its peers via the lower layers of the signalling network which are part of the environment.

Only the MAP-provider is fully described in this subclause. The various type of processes which form the MAP-User block and the TC block are described respectively in clauses 18 to 25 of the present document and in CCITT Recommendation Q.774.

The MAP-Provider block communicates with the MAP_USER via two channels U1 and U2. Via U1 the MAP-provider receives the MAP request and response primitives. Via U2 it sends the MAP indication and confirm primitives.

The MAP-Provider block communicates with TC via two channels P1 and P2. Via P1 the MAP-Provider sends all the TC request primitives. Via P2 it receives all the TC indication primitives.

The MAP-Provider block is composed of the four following types of processes:

a) MAP_DSM: This type of process handles a dialogue. There exists one process instance per MAP dialogue.

b) LOAD_CTRL: This type of process is in charge of load control. There is only one instance of this process in each system.

c) PERFORMING_MAP_SSM: This type of process handle a MAP service performed during a dialogue. An instance of this process is created by the instance of the MAP_DSM process for each MAP-service to be performed.

d) REQUESTING_MAP_SSM: This type of process handle a MAP service requested during a dialogue. An instance of this process is created by the instance of the MAP_DSM process for each requested MAP-service.

A process MAP_DSM exchanges external signals with other blocks as well as internal signals with the other processes of the MAP-Provider block. The external signals are either MAP service primitives or TC service primitives.

The signal routes used by the various processes are organized as follows:

a) A process MAP_DSM receives and sends events from/to the MAP_user via signal route User1/User2. These routes uses respectively channel U1 and U2.

b) A process MAP_DSM receives and sends events from/to the TC via signal route Tc1/Tc2. These routes uses respectively channel P1 and P2.

c) A process MAP_DSM receives and sends events from/to the LOAD_CTRL process via signal route Load1/Load2. These routes are internal.

d) A process MAP_DSM sends events to the PERFORMING_MAP_SSM processes via signal route Intern1. This route is internal.

e) A process MAP_DSM sends events to the REQUESTING_MAP_SSM processes via signal route Intern2. This route is internal.

f) A process MAP_PERFORMING_SSM sends events to the MAP_USER via signal route User4. This route uses channel U2.

g) A process MAP_PERFORMING_SSM sends events to TC via signal route Tc3. This route uses channel P1.

h) A process MAP_REQUESTING_SSM sends events to the MAP_USER via signal route User5. This route uses channel U2.

j) A process MAP_REQUESTING_SSM sends events to TC via signal route Tc4. This route uses channel P1.

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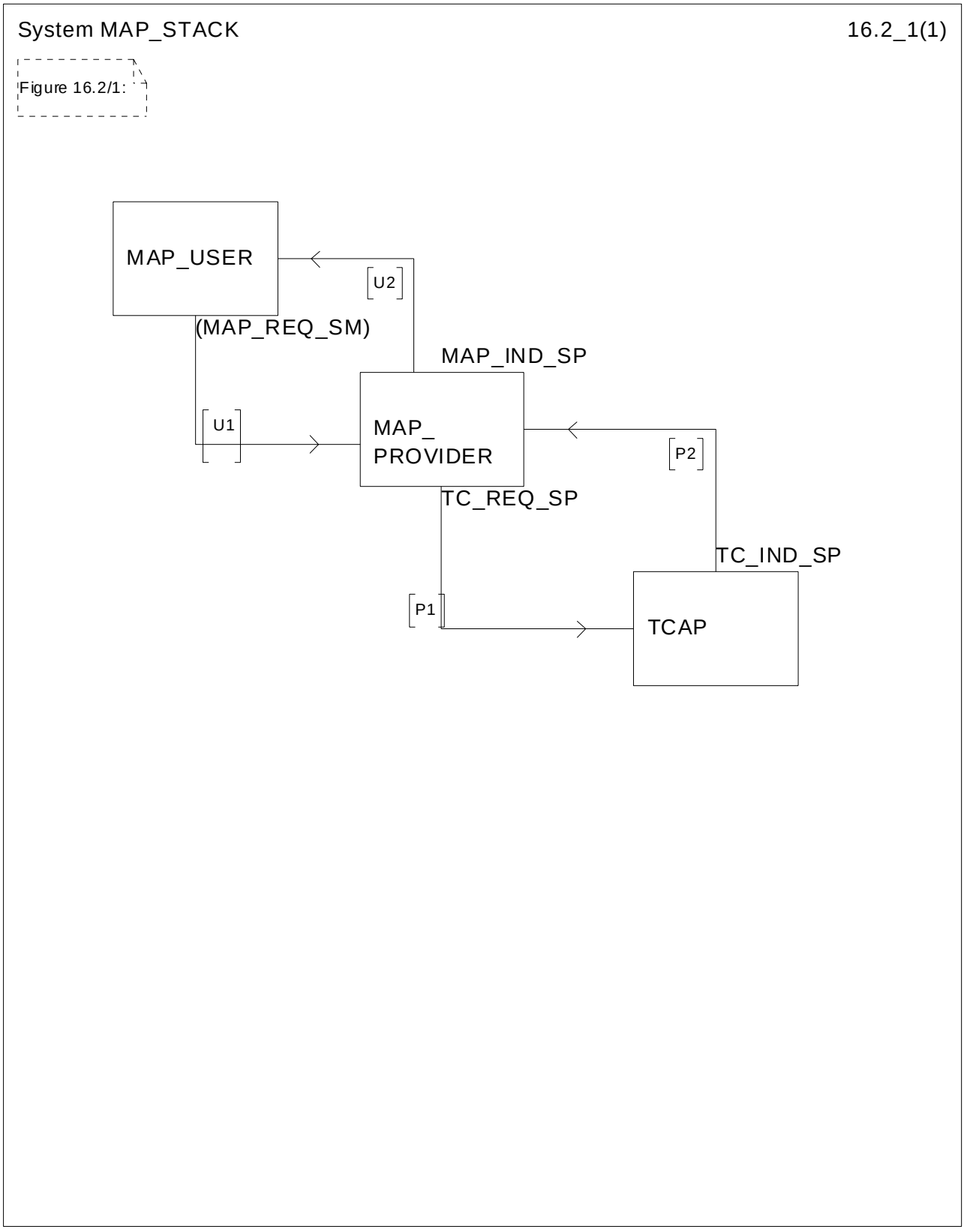


Figure 16.2/1: System MAP_STACK

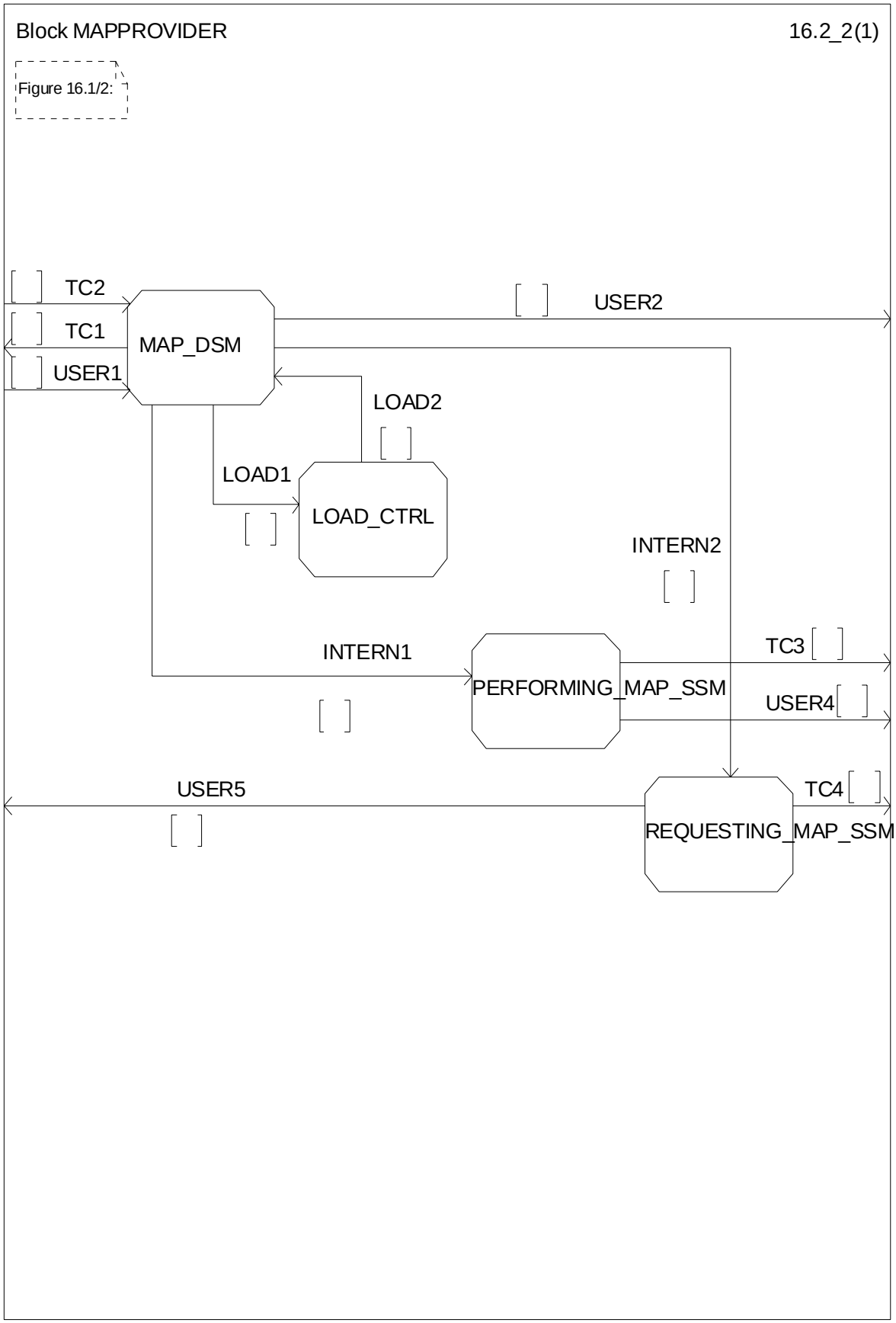


Figure 16.2/2: Block MAPPROVIDER

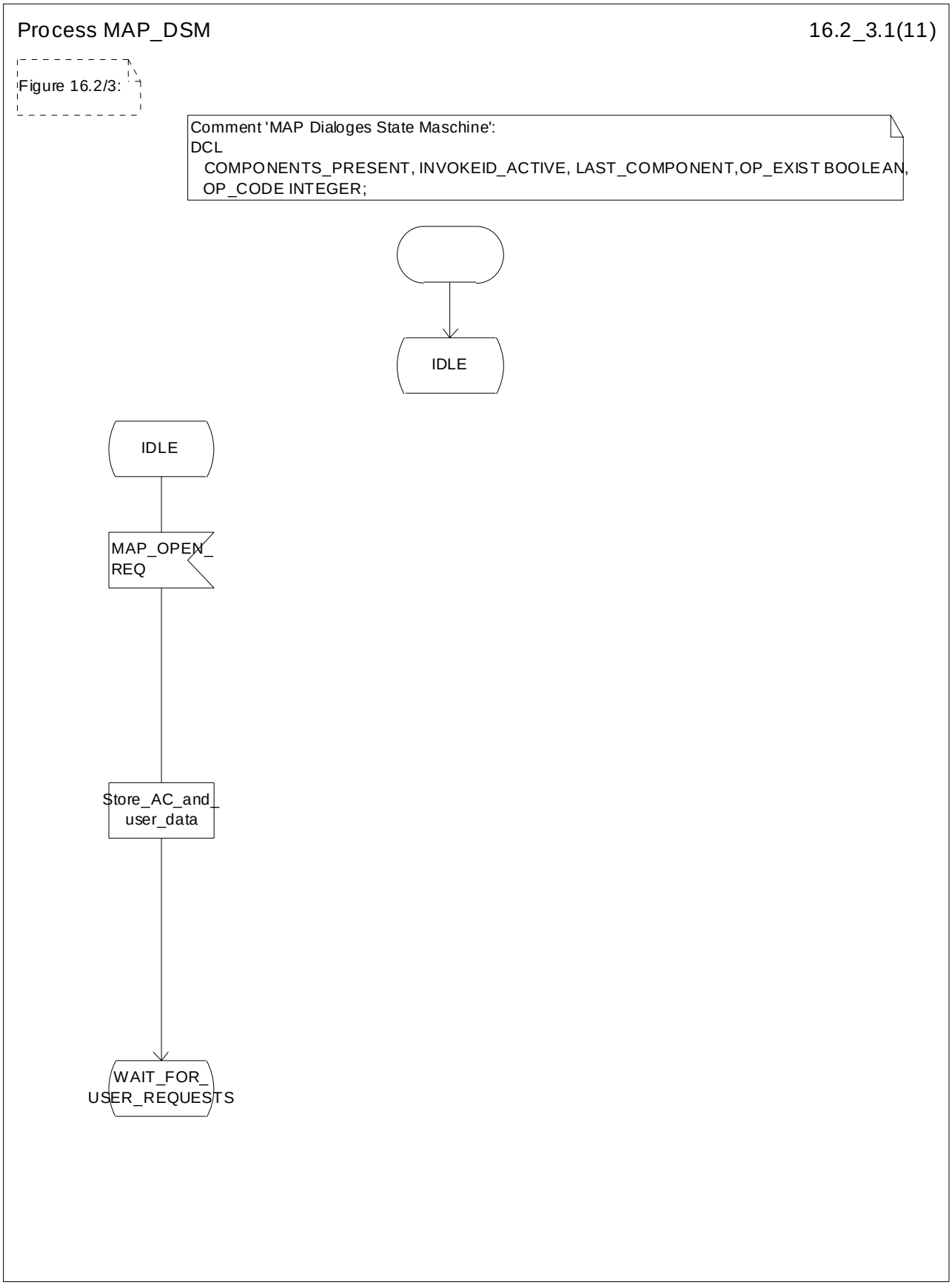


Figure 16.2/3 (sheet 1 of 11): Process MAP_DSM

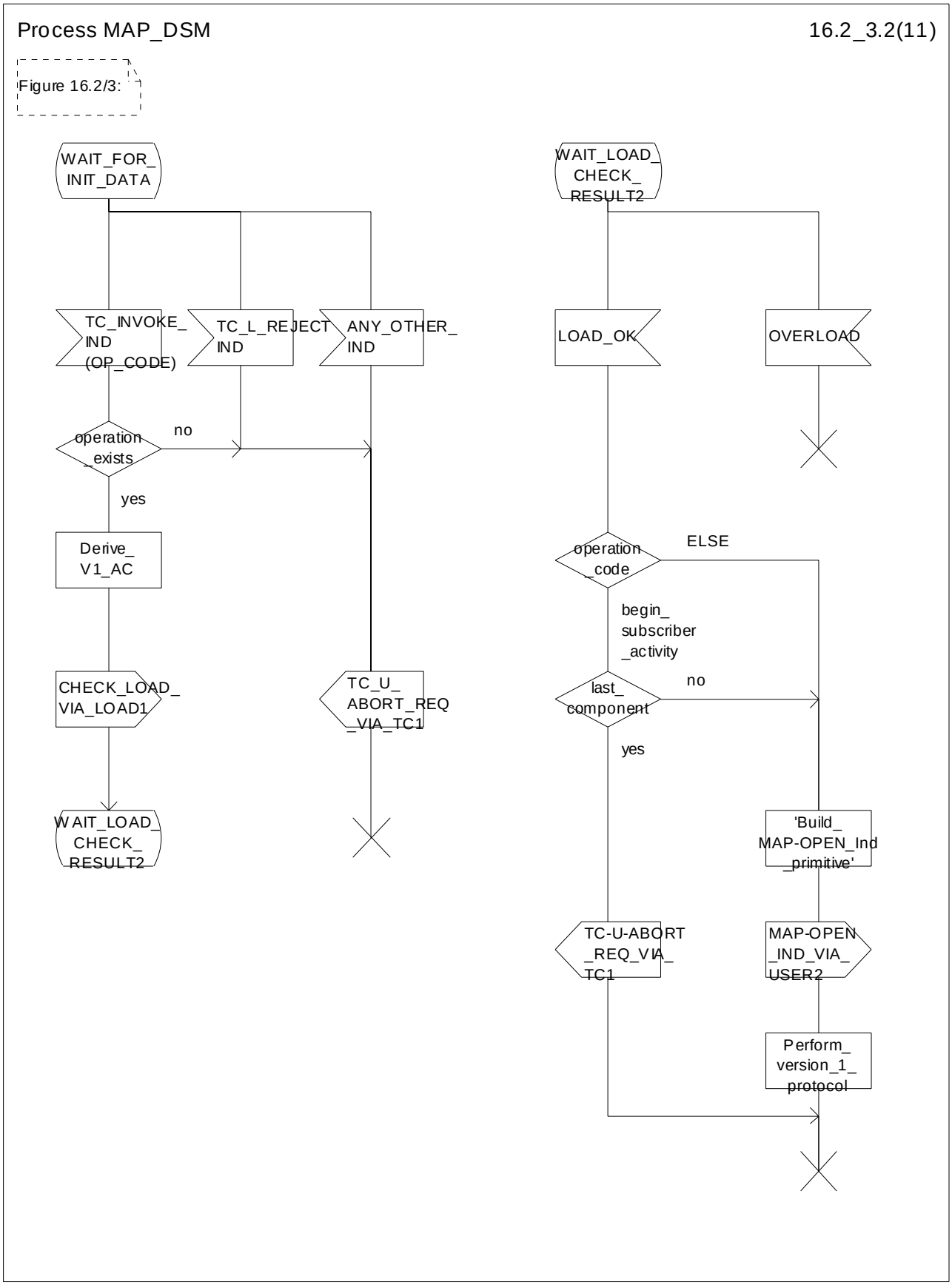


Figure 16.2/3 (sheet 2 of 11): Process MAP_DSM

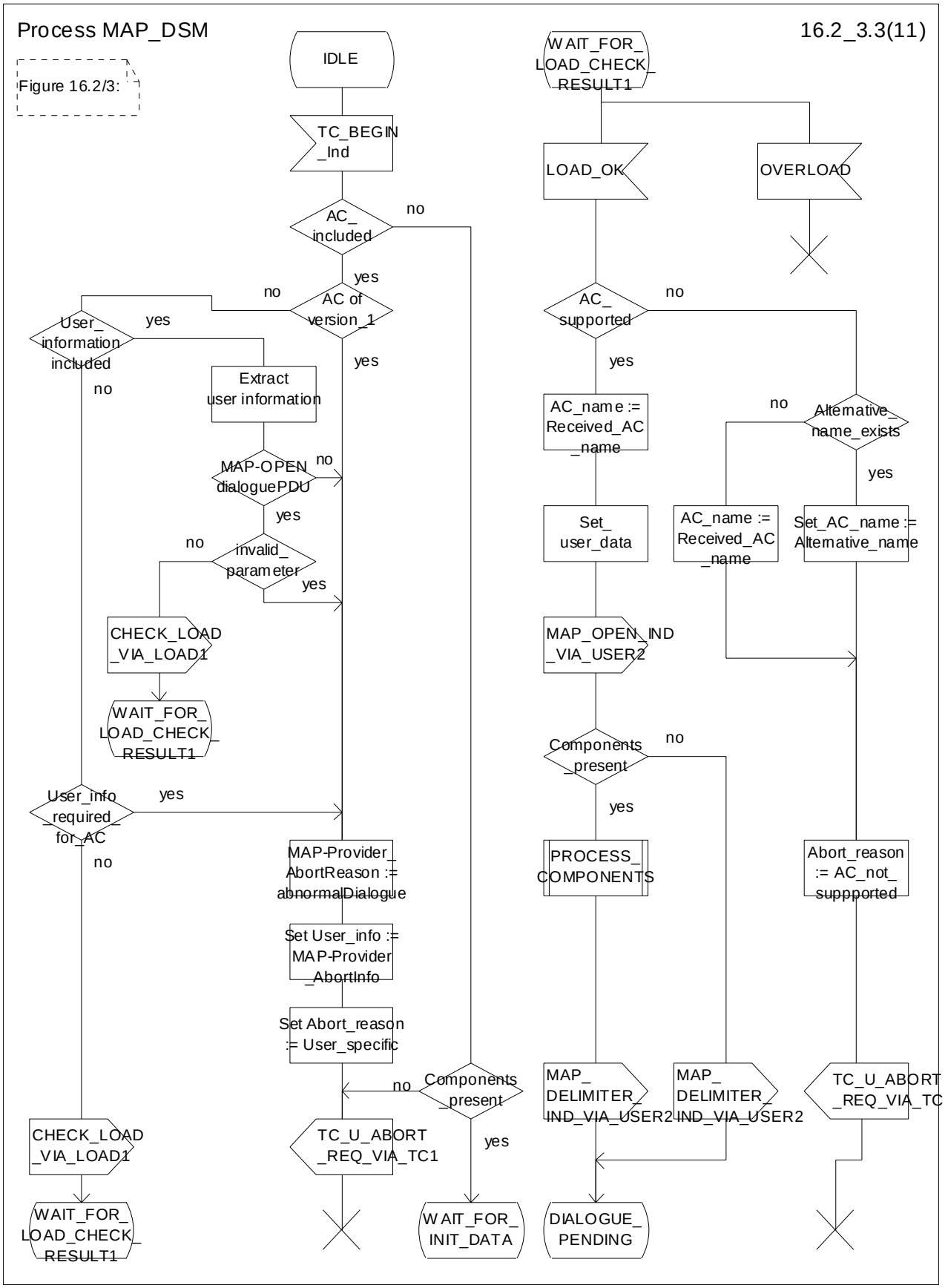


Figure 16.2/3 (sheet 3 of 11): Process MAP_DSM

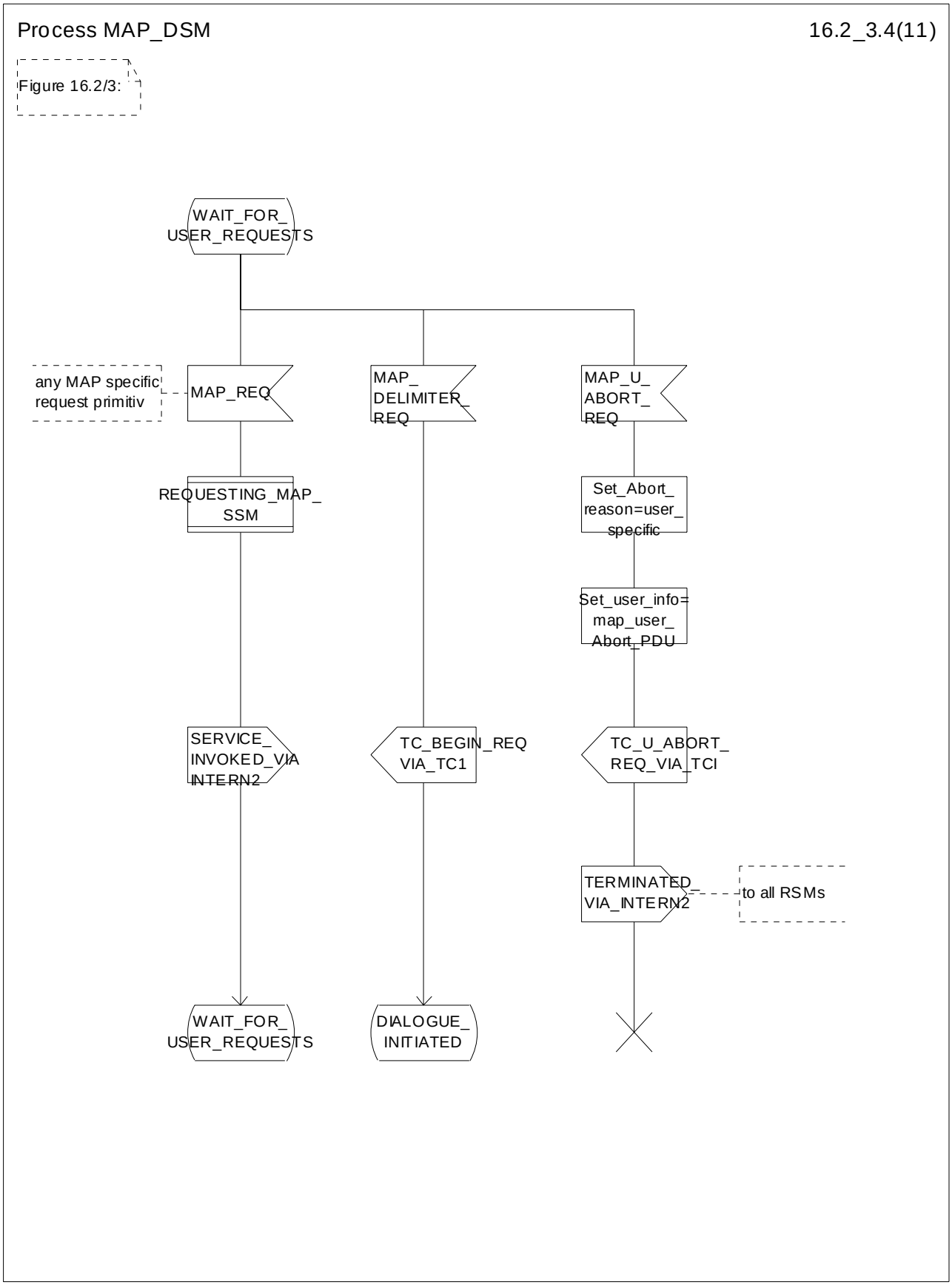


Figure 16.2/3 (sheet 4 of 11): Process MAP_DSM

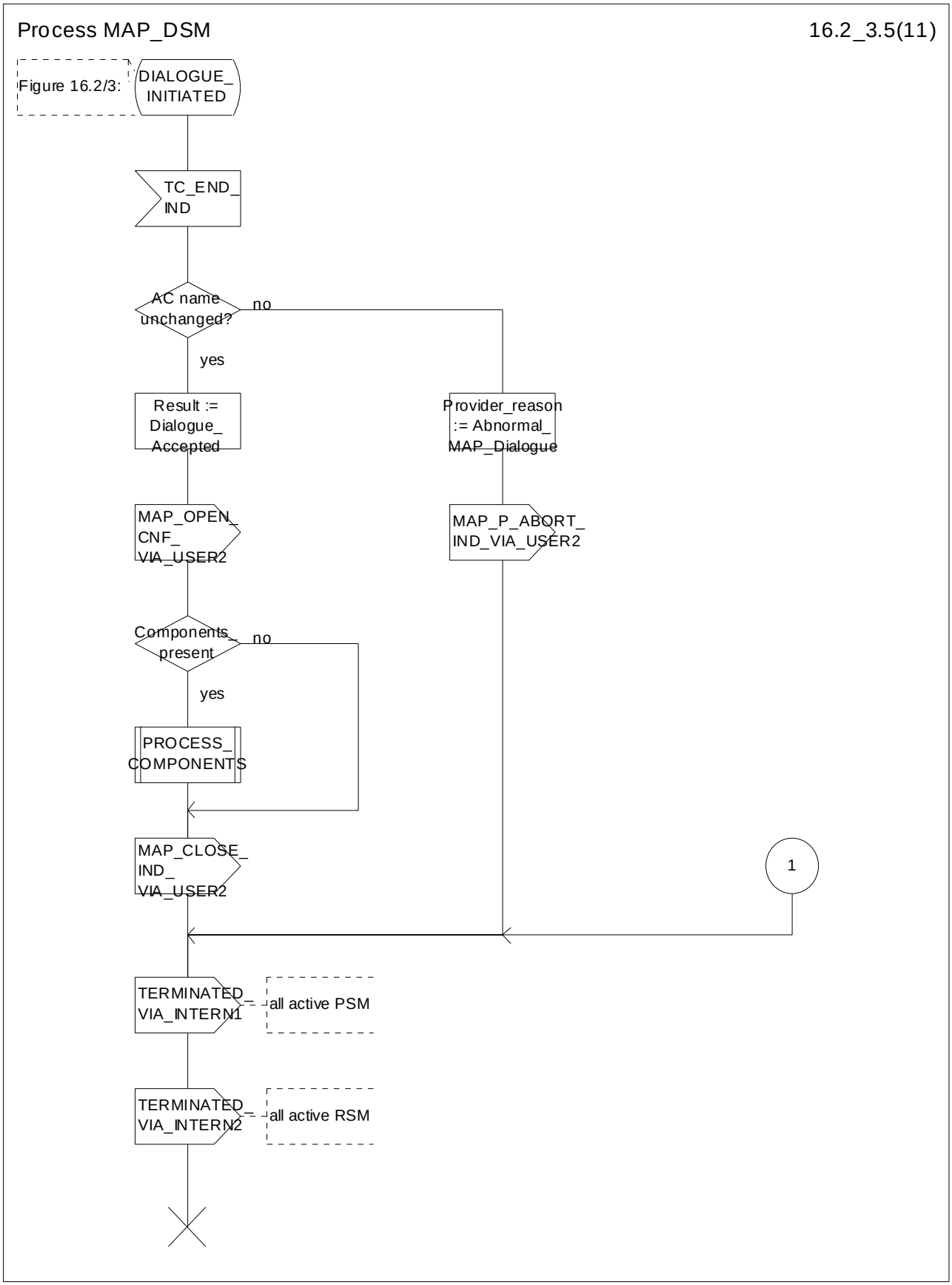


Figure 16.2/3 (sheet 5 of 11): Process MAP_DSM

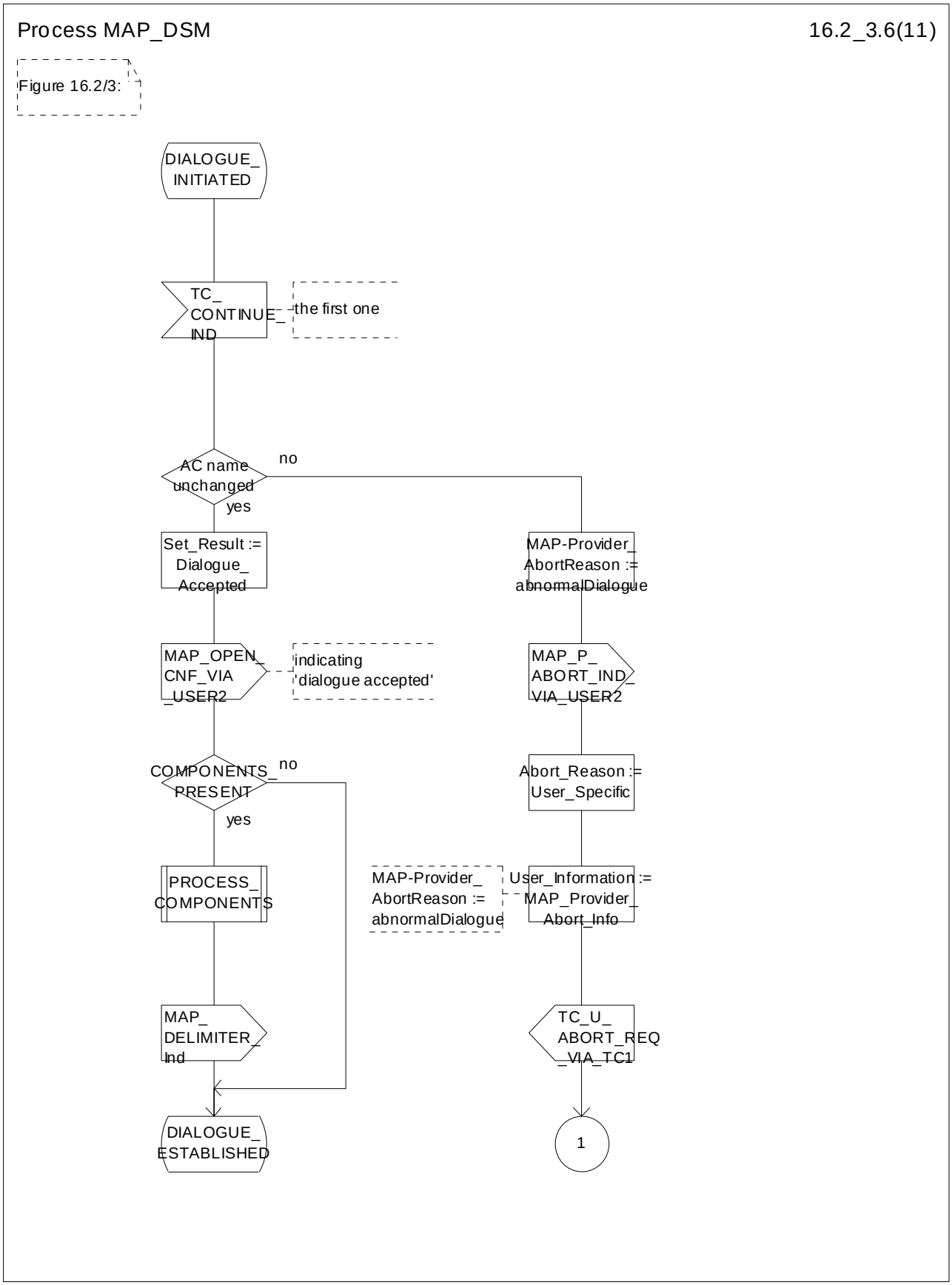


Figure 16.2/3 (sheet 6 of 11): Process MAP_DSM

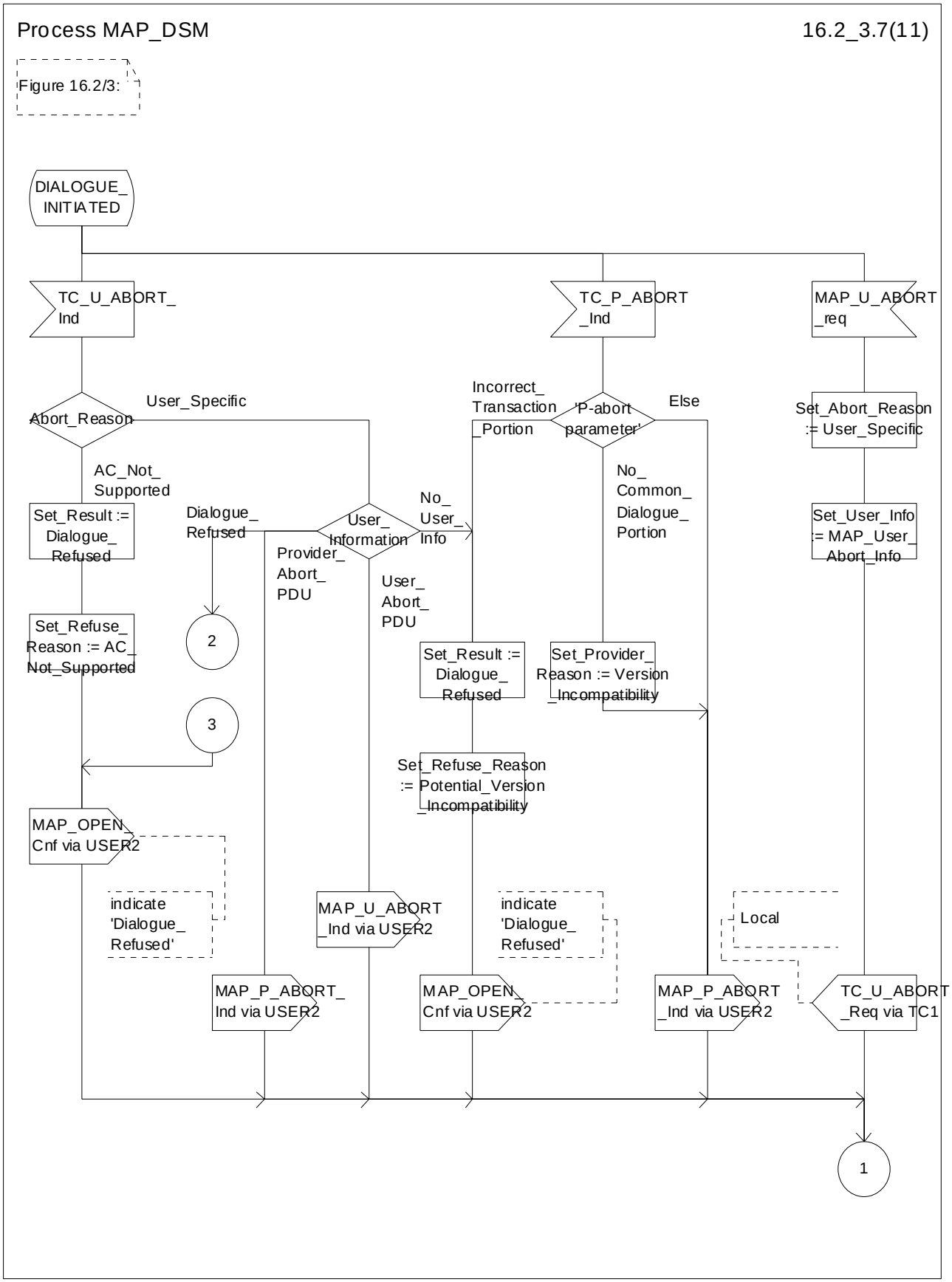


Figure 16.2/3 (sheet 7 of 11): Process MAP_DSM

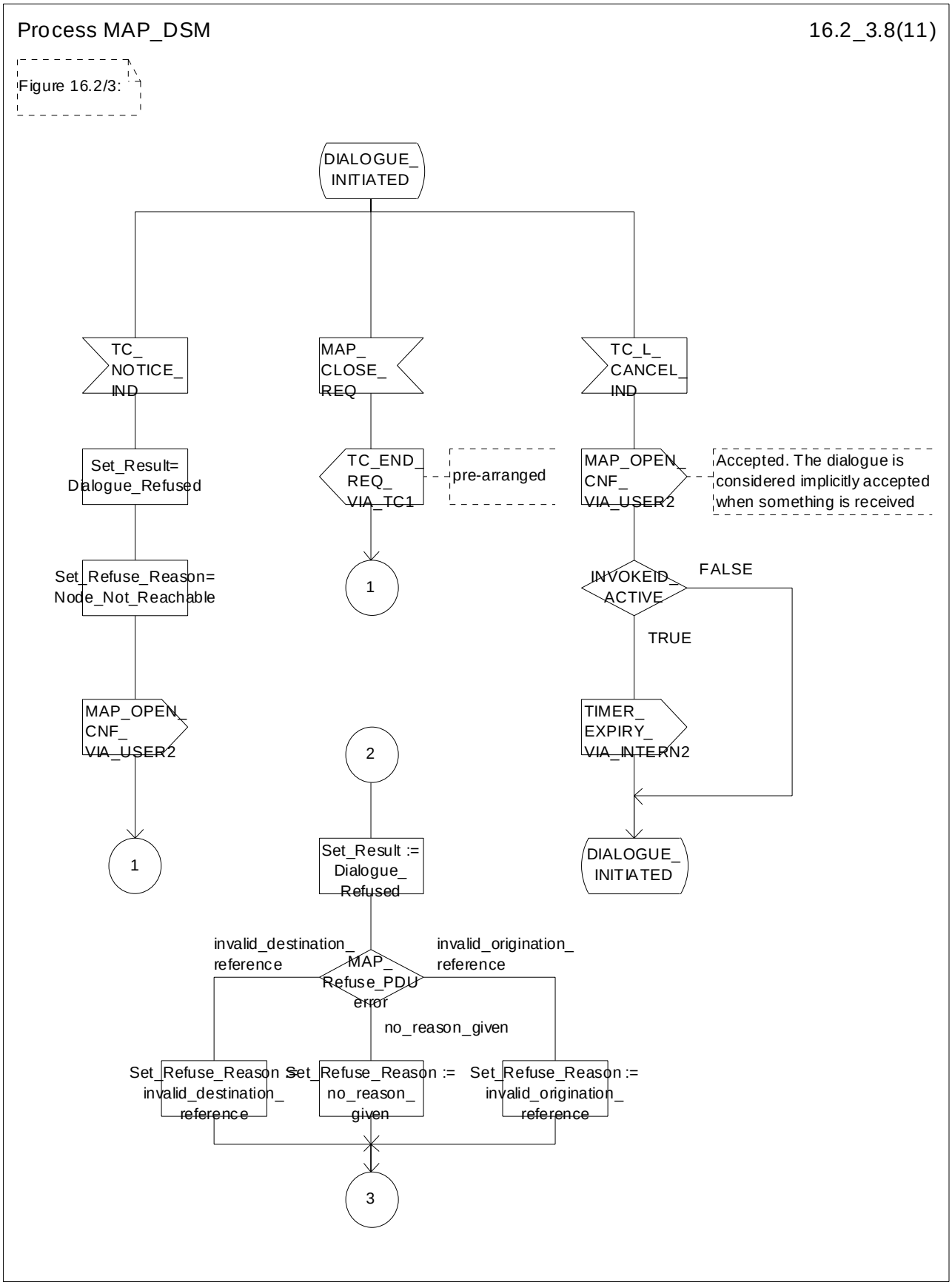


Figure 16.2/3 (sheet 8 of 11): Process MAP_DSM

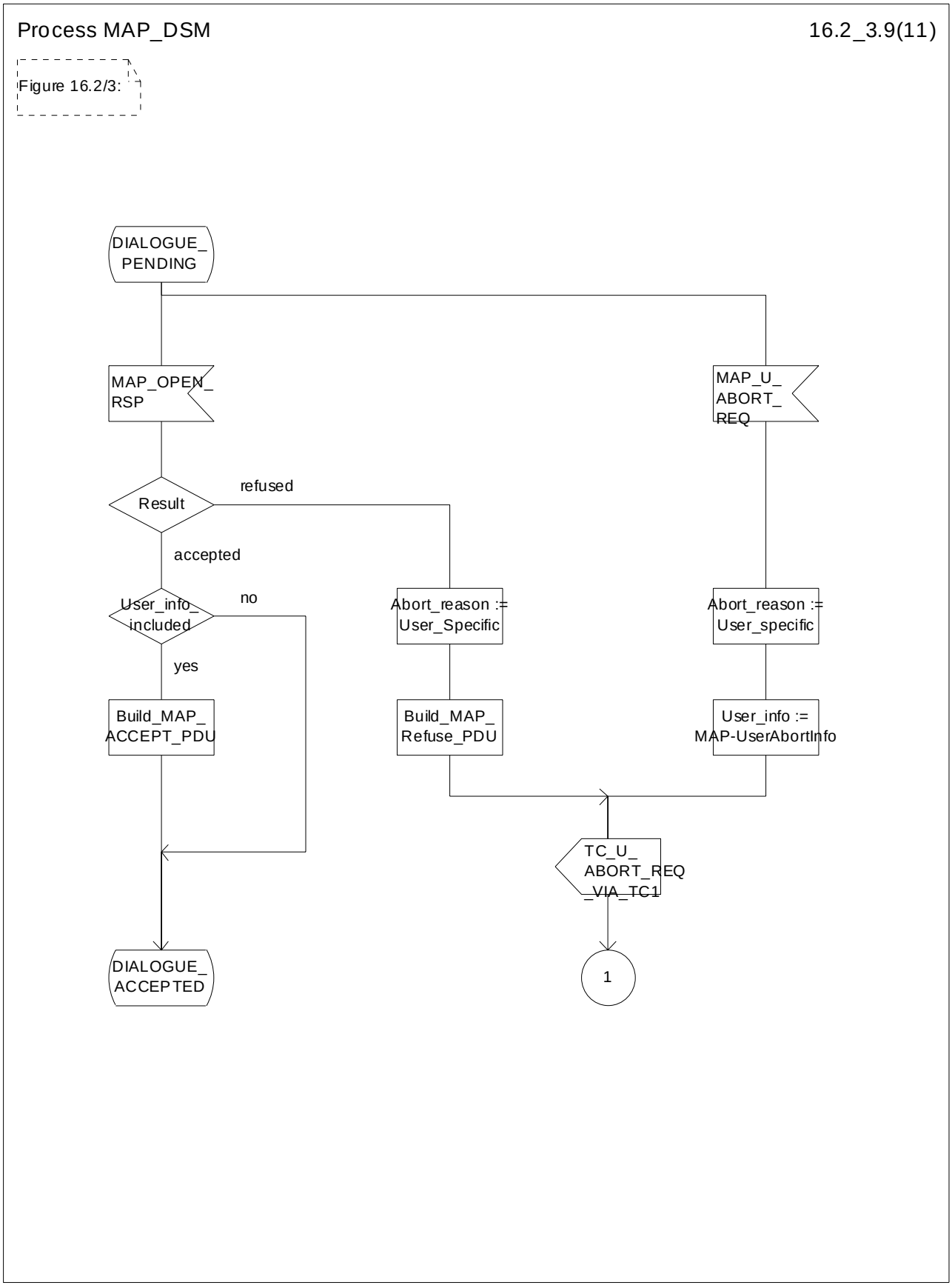


Figure 16.2/3 (sheet 9 of 11): Process MAP_DSM

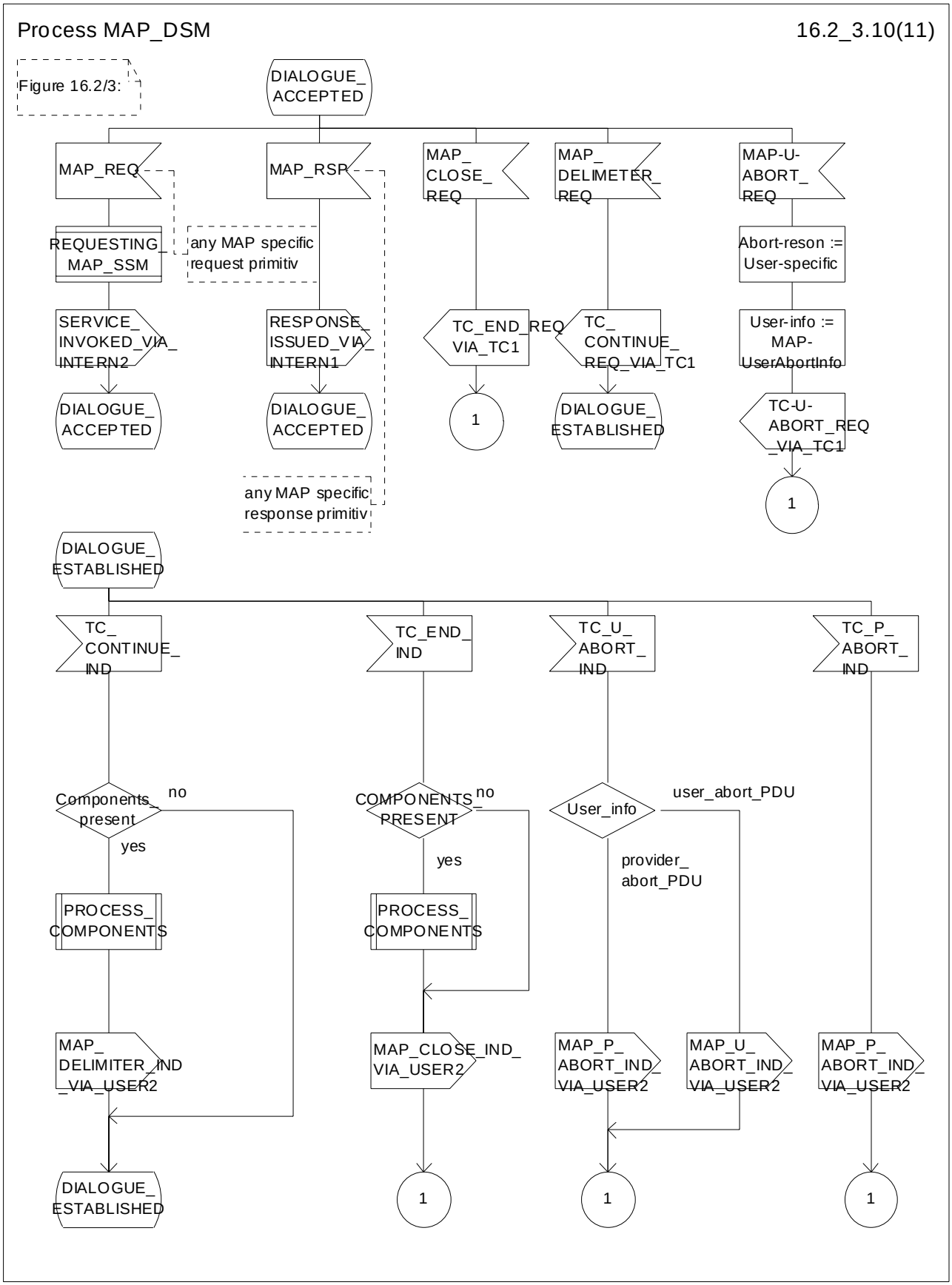


Figure 16.2/3 (sheet 10 of 11): Process MAP_DSM

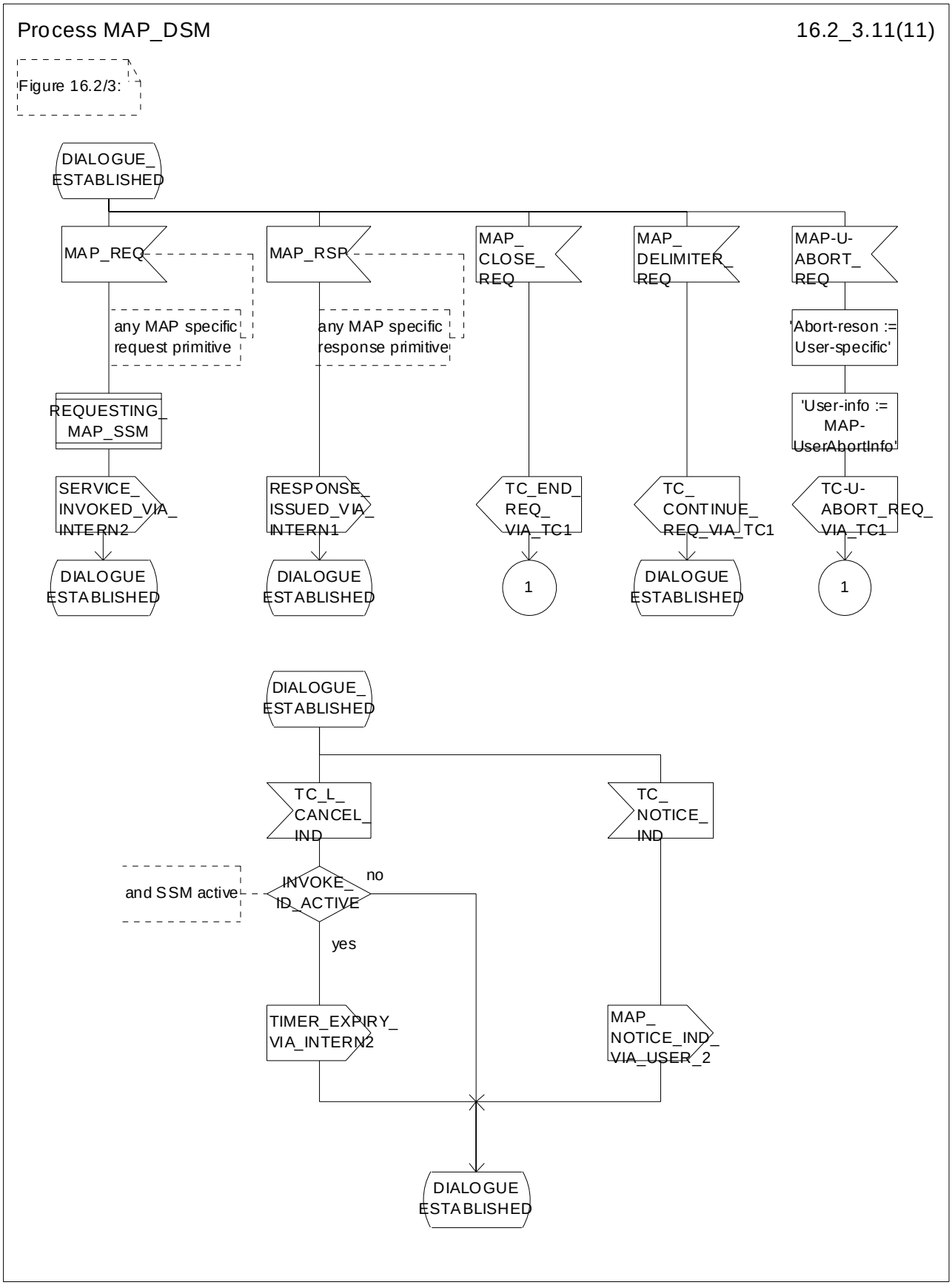


Figure 16.2/3 (sheet 11 of 11): Process MAP_DSM

Procedure PROCESS_COMPONENTS 16.2_4.1(4)

Figure 16.2/4:

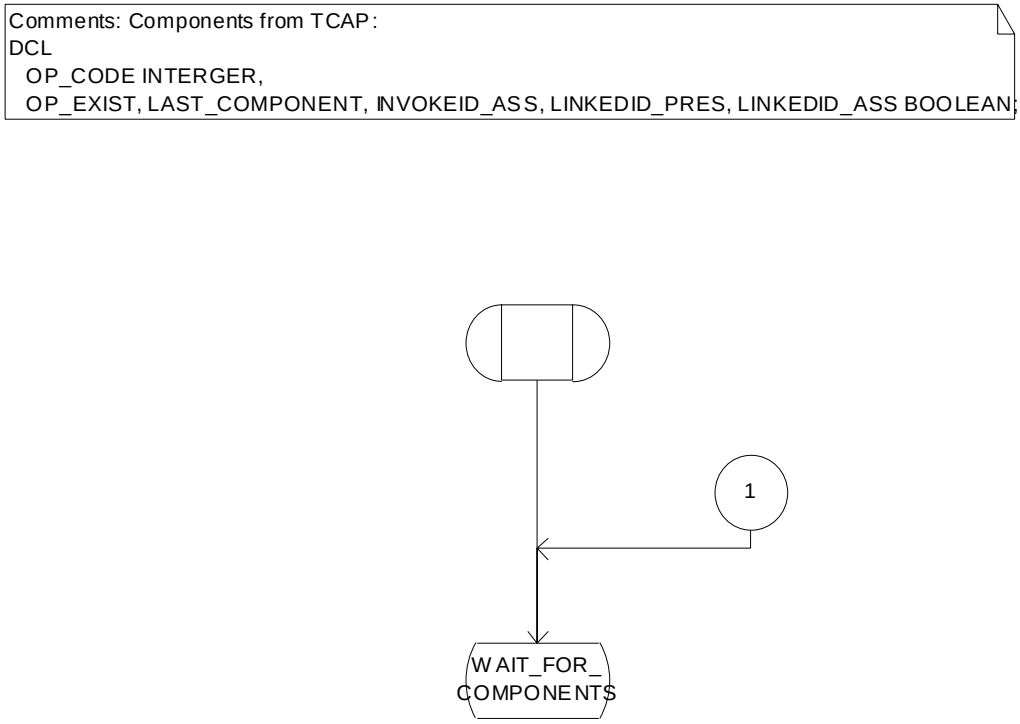


Figure 16.2/4 (sheet 1 of 4): Procedure PROCESS_COMPONENTS

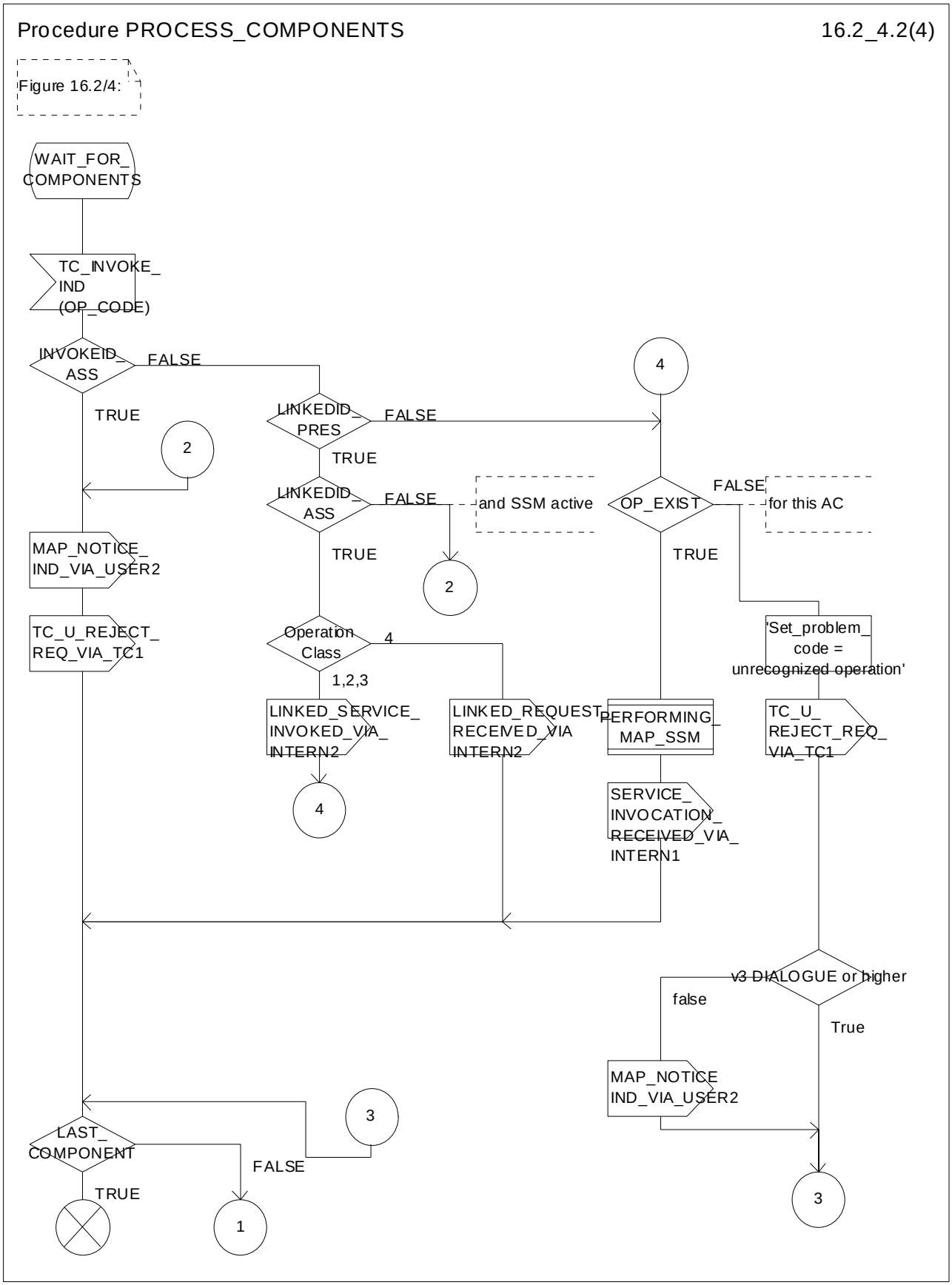


Figure 16.2/4 (sheet 2 of 4): Procedure PROCESS_COMPONENTS

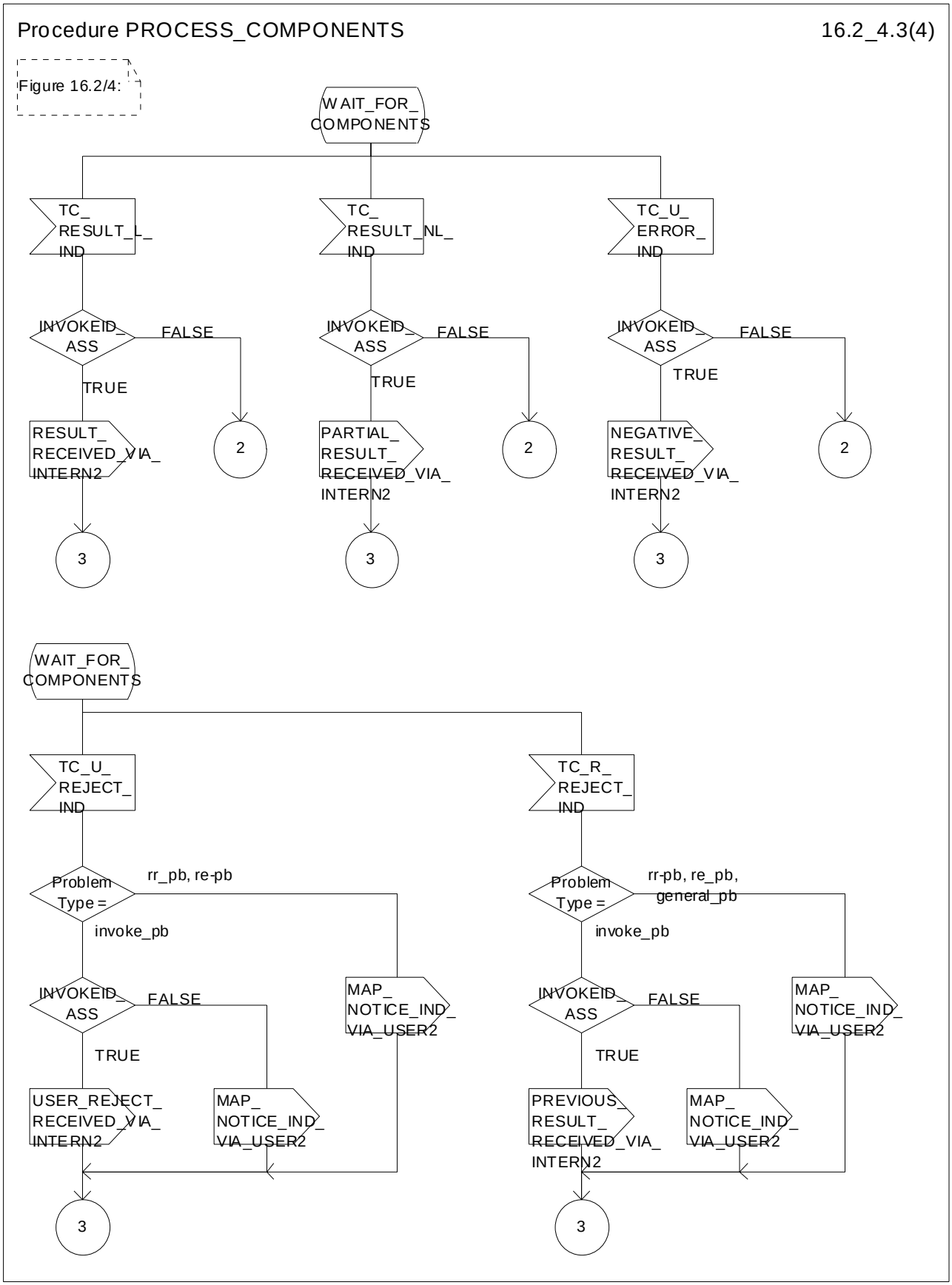


Figure 16.2/4 (sheet 3 of 4): Procedure PROCESS_COMPONENTS

Procedure PROCESS_COMPONENTS 16.2_4.4(4)

Figure 16.2/4:

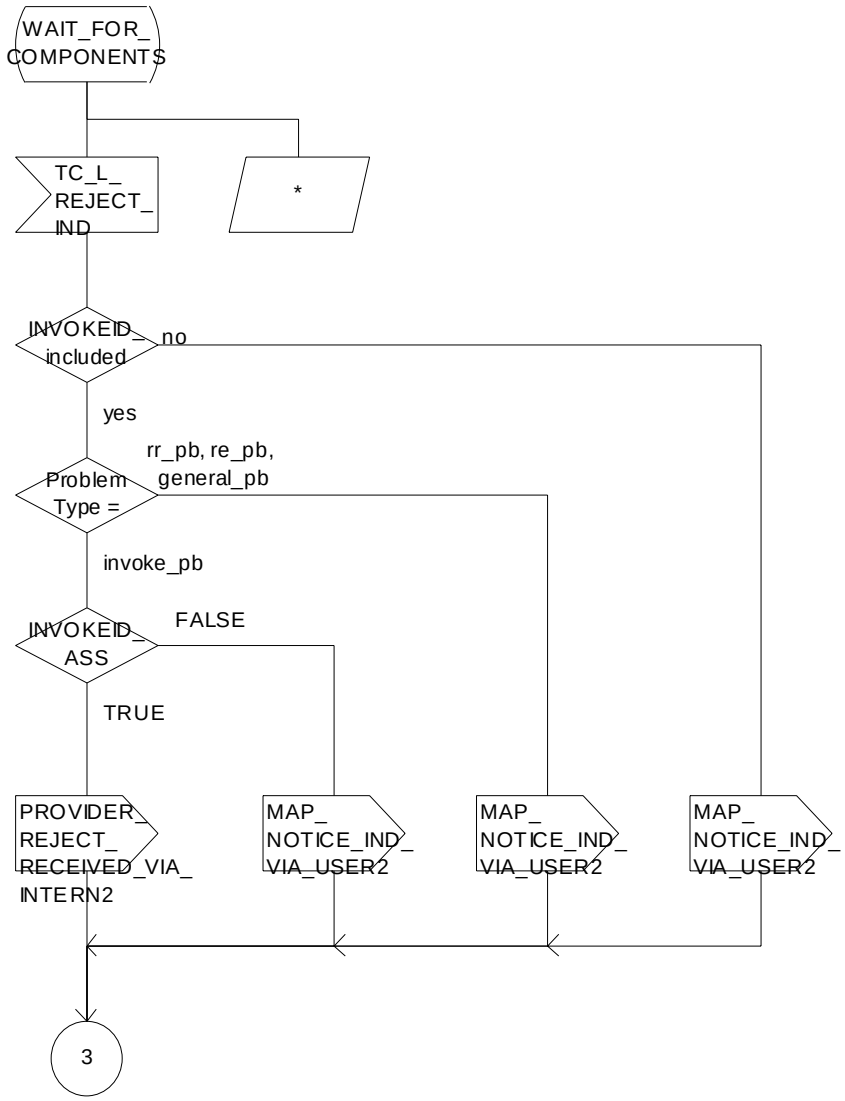


Figure 16.2/4 (sheet 4 of 4): Procedure PROCESS_COMPONENTS

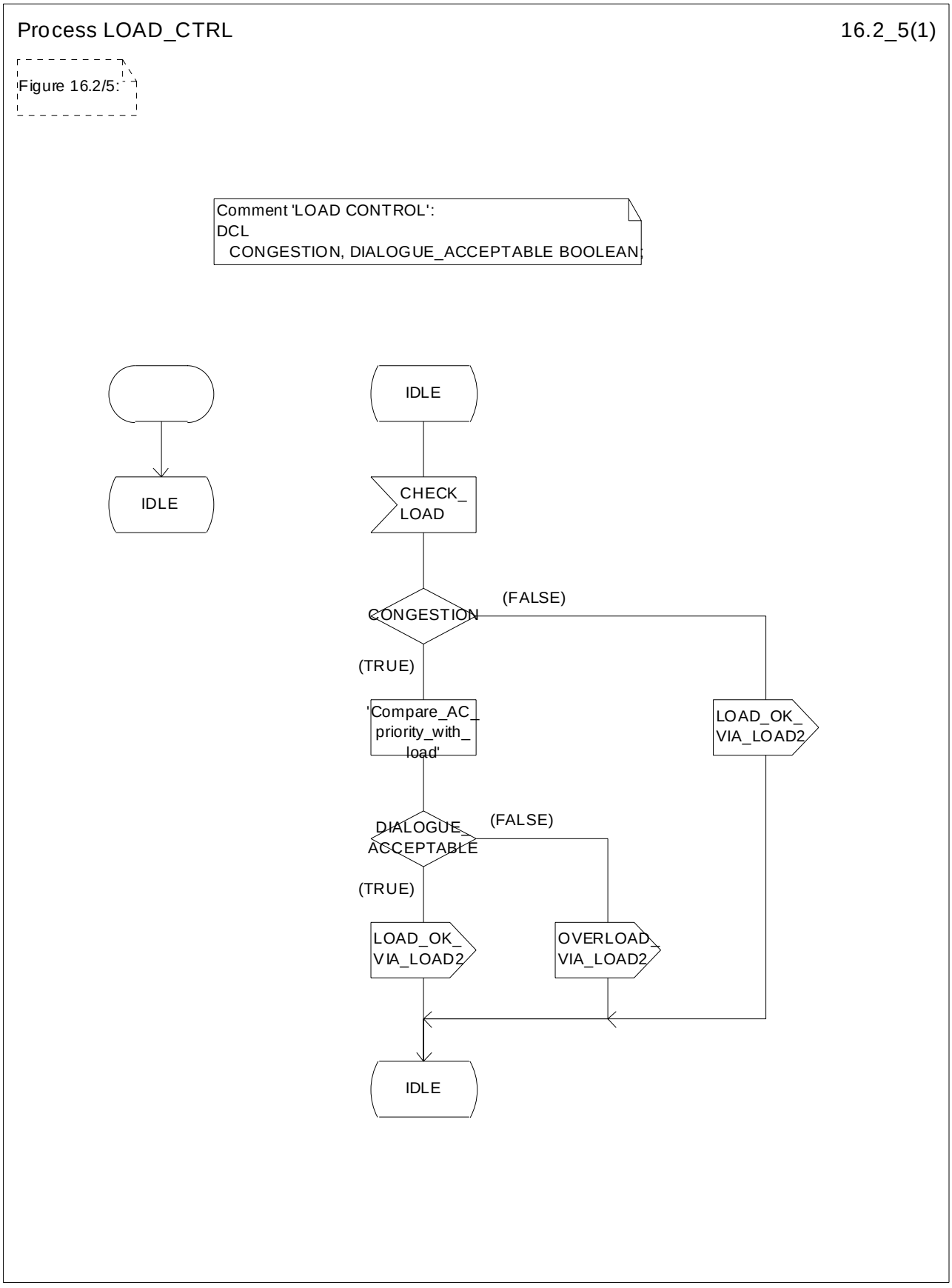


Figure 16.2/5: Process LOAD_CTRL

Process PERFORMING_MAP_SSM 16.2_6.1(3)

Figure 16.2/6:

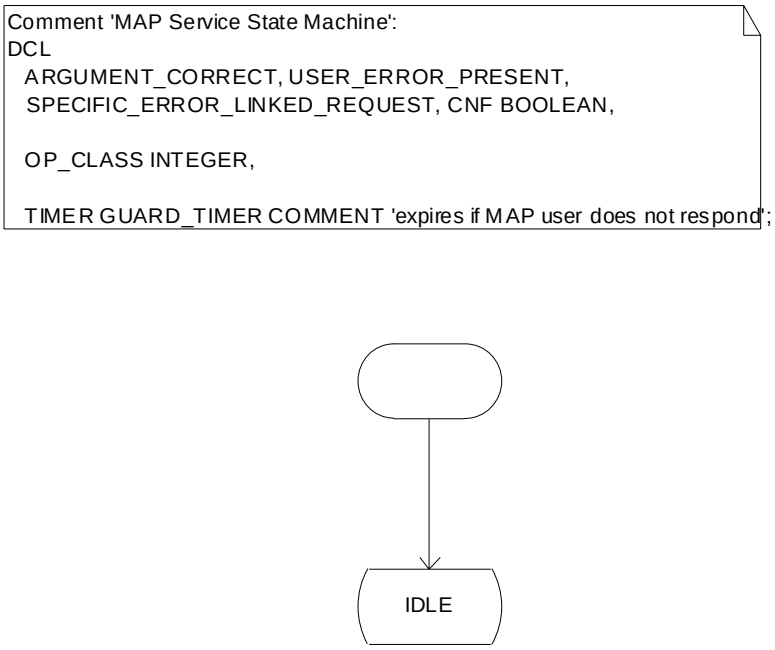


Figure 16.2/6 (sheet 1 of 3): Process PERFORMING_MAP_SSM

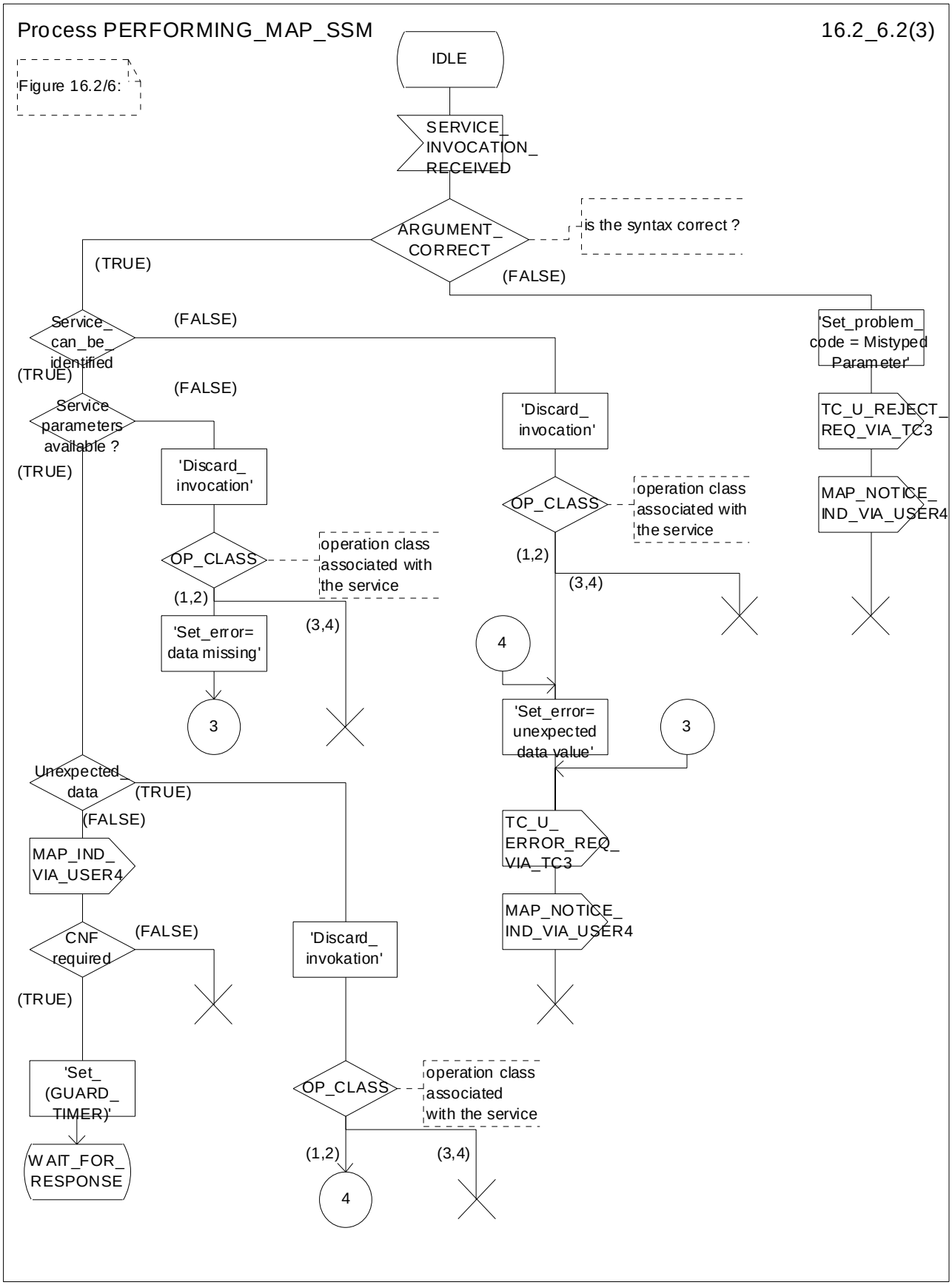


Figure 16.2/6 (sheet 2 of 3): Process PERFORMING_MAP_SSM

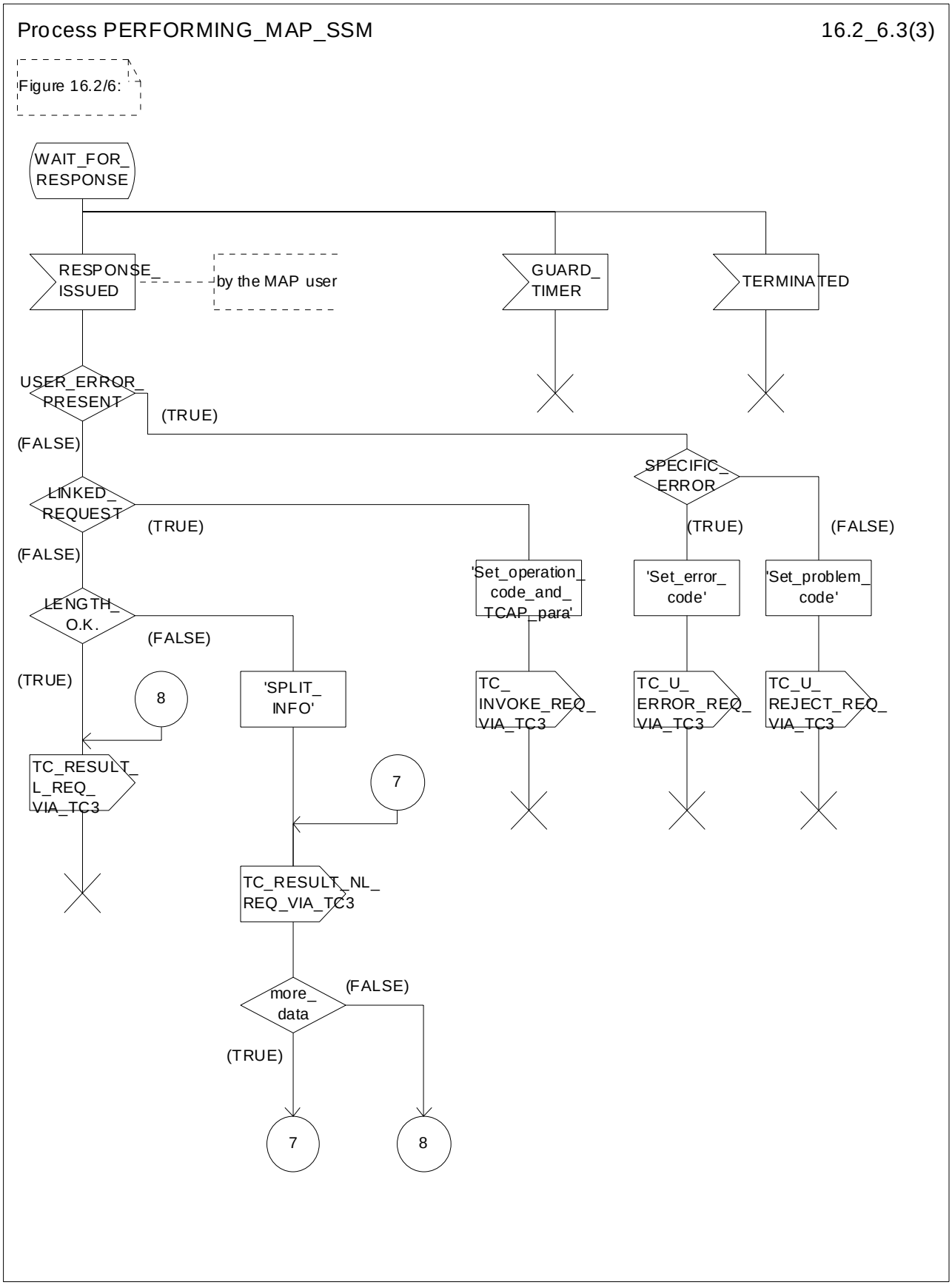


Figure 16.2/6 (sheet 3 of 3): Process PERFORMING_MAP_SSM

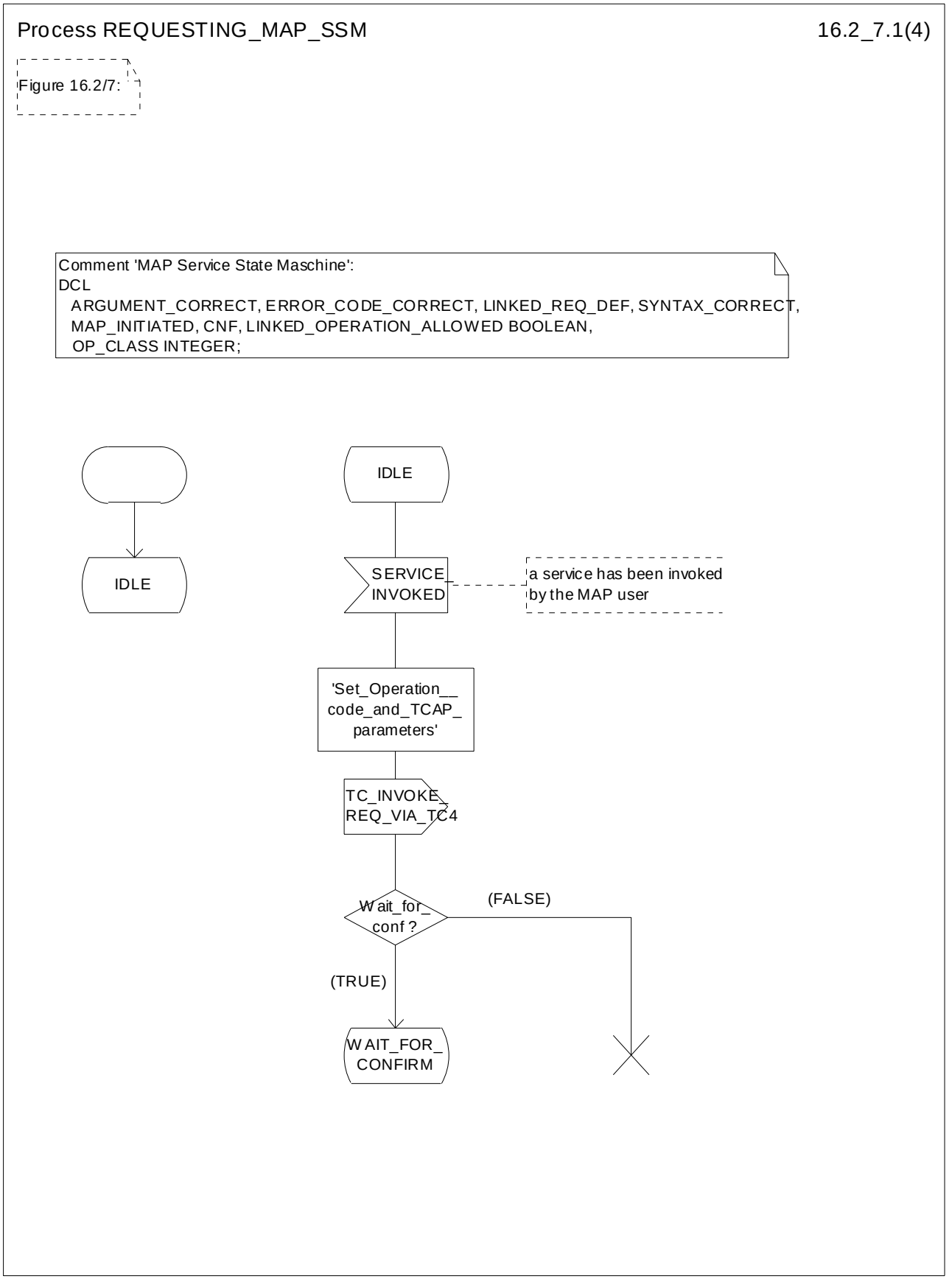


Figure 16.2/7 (sheet 1 of 4): Process REQUESTING_MAP_SSM

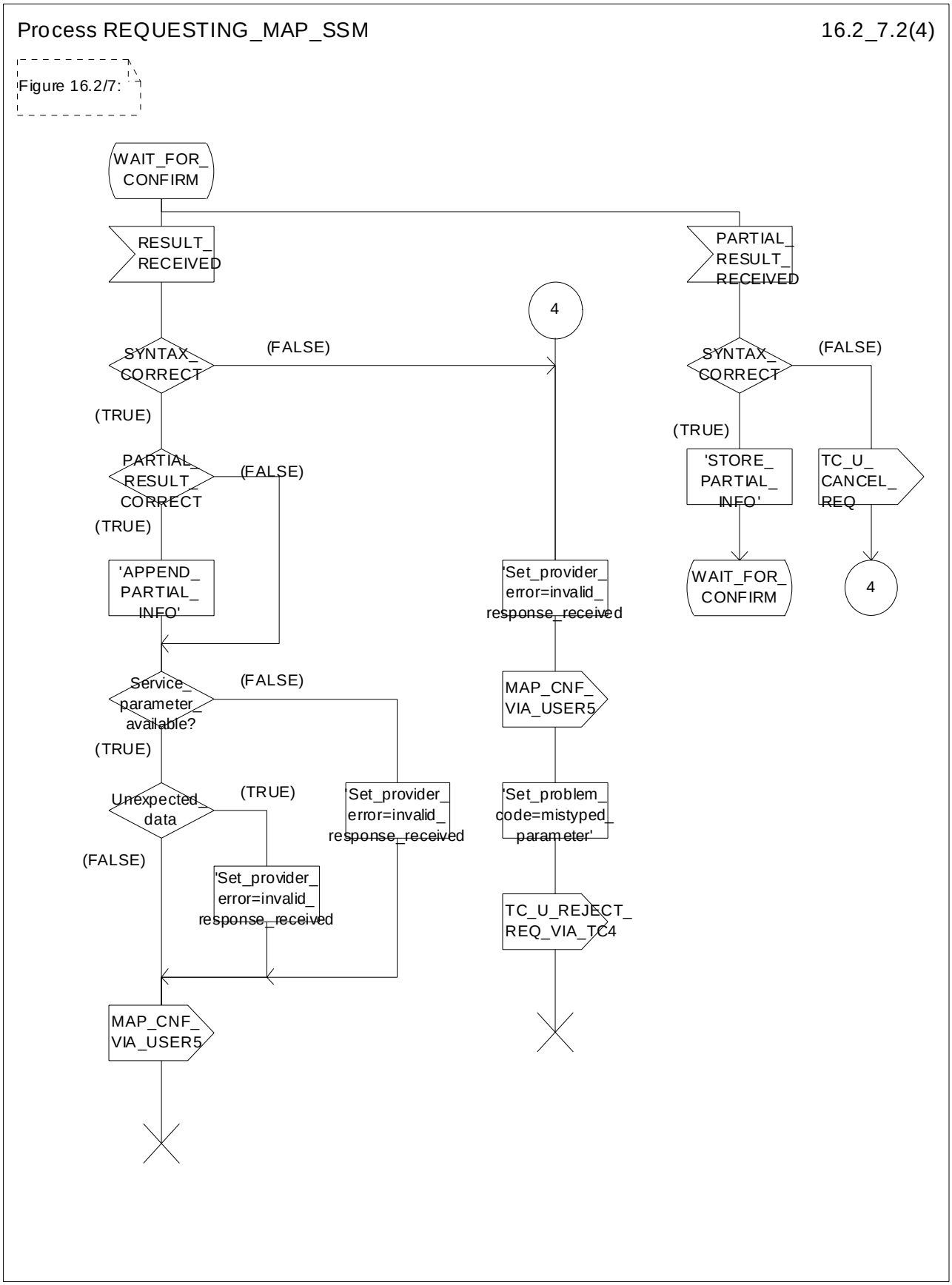


Figure 16.2/7 (sheet 2 of 4): Process REQUESTING_MAP_SSM

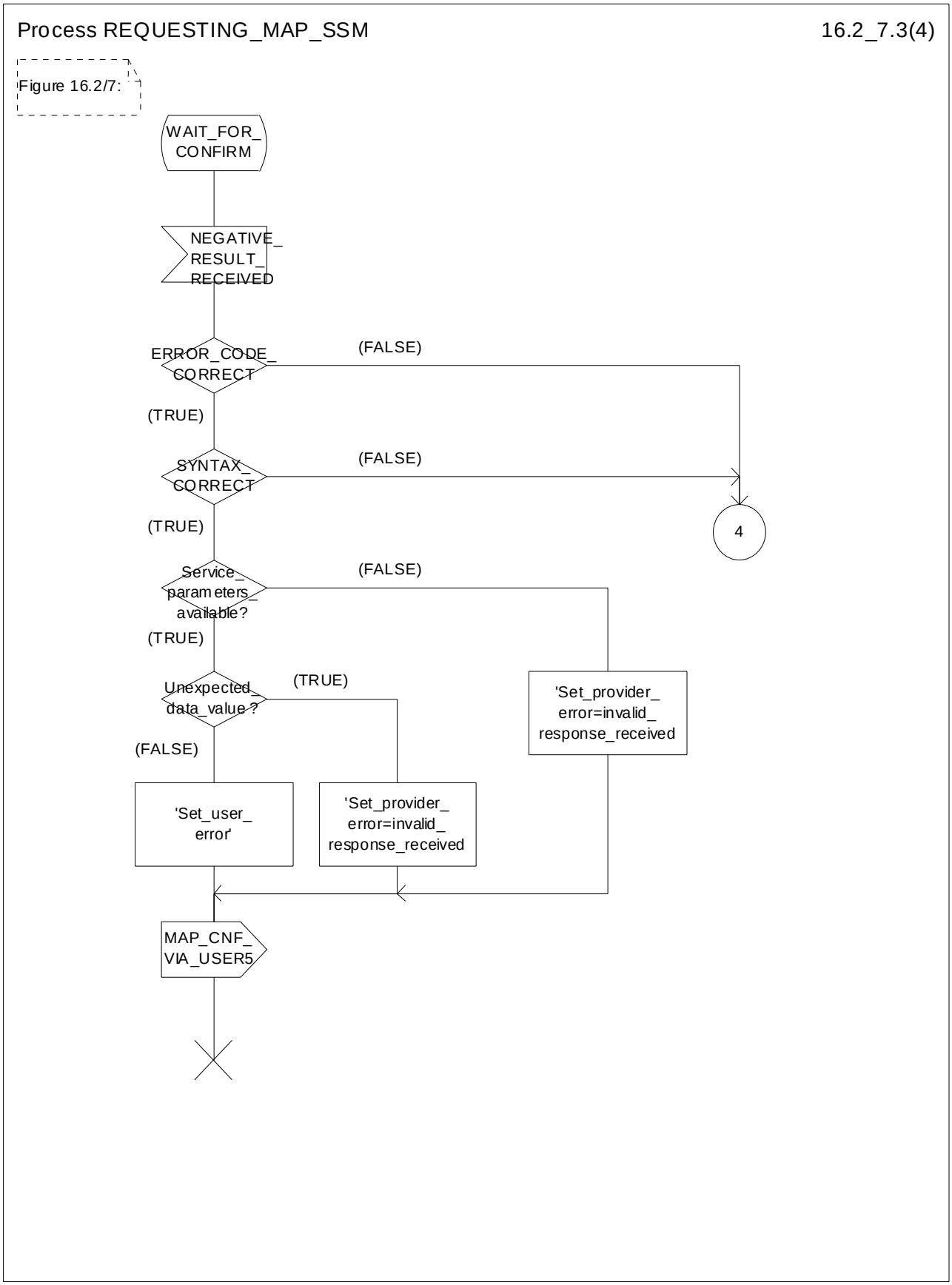


Figure 16.2/7 (sheet 3 of 4): Process REQUESTING_MAP_SSM

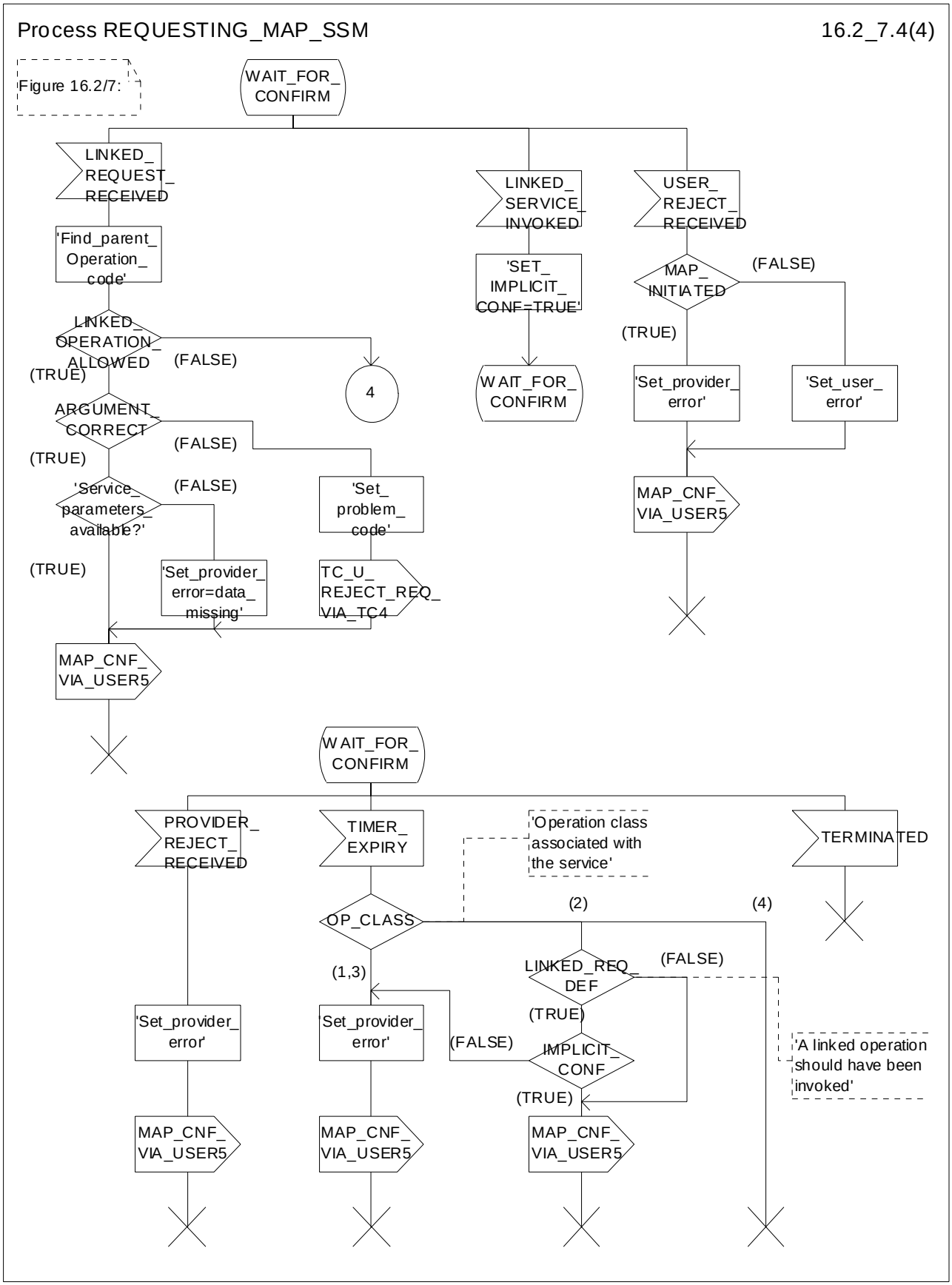


Figure 16.2/7 (sheet 4 of 4): Process REQUESTING_MAP_SSM

17 Abstract syntax of the MAP protocol

17.1 General

This subclause specifies the Abstract Syntaxes for the Mobile Application Part as well as the associated set of Operations and Errors, using the Abstract Syntax Notation One (ASN.1), defined in CCITT Recommendation X.208 (1988) or X.680 (1994) with additions as defined in subclause 17.1.4 on Compatibility Considerations and the OPERATION and ERROR external MACROs, defined in CCITT Recommendation Q.773.

The Abstract Syntax is defined for all interfaces specified in subclause 4.4 except for the A- and B-interfaces.

The Mobile Application Part protocol is defined by two Abstract Syntaxes:

- one Abstract Syntax which encompass all Operations; and
- Errors identified by the various MAP subsystem numbers.

This Abstract Syntax represents the set of values each of which is a value of the ASN.1 type TCAPMessages. MessageType as defined in CCITT Recommendation Q.773 with the ANY DEFINED BY sections resolved by the operation and error codes included in the ASN.1 module MAP-Protocol. However, only the subset of this abstract syntax which is required by the procedures defined for an entity needs to be supported:

- one Abstract Syntax identified by the OBJECT IDENTIFIER value MAP-DialogueInformation.map-DialogueAS.

This Abstract Syntax represents the set of values each of which is a value of the ASN.1 type MAP-DialogueInformation.MAP-DialoguePDU. Such a value of the ASN.1 single-ASN.1-type element is contained within the user-information element of the TCAPMessages.DialoguePortion ASN.1 type. This Abstract Syntax name is to be used as a direct reference.

17.1.1 Encoding rules

The encoding rules which are applicable to the defined Abstract Syntaxes are the Basic Encoding Rules for Abstract Syntax Notation One, defined in CCITT Recommendation X.690 with the same exceptions as in CCITT Recommendation Q.773 section 4 Message Representation.

When the definite form is used for length encoding, a data value of length less than 128 octets must have the length encoded in the short form.

When the long form is employed to code a length, the minimum number of octets shall be used to code the length field.

OCTET STRING values and BIT STRING values must be encoded in a primitive form.

There is no restriction to the use of empty constructors (e.g. an empty SEQUENCE type). That is, the encoding of the content of any data value shall consist of zero, one ore more octets.

17.1.2 Use of TC

The mapping of OPERATION and ERROR to TC components is defined in ETS 300 287 (version 2) which is based on CCITT Recommendation Q.773 (1992).

NOTE 1: The class of an operation is not stated explicitly but is specified as well in the ASN.1 operation type definition.

Class 1: RESULT and ERROR appear in ASN.1 operation type definition.

Class 2: only ERROR appears in ASN.1 operation type definition.

Class 3: only RESULT appears in ASN.1 operation type definition.

Class 4: both RESULT and ERROR do not appear in ASN.1 operation type definition.

The ASN.1 data type which follows the keywords "ARGUMENT", "PARAMETER" or "RESULT" (for OPERATION and ERROR) is always optional from a syntactic point of view. However, except when specifically mentioned with the ASN.1 comment «-- optional» , the «parameter» part of a component has to be considered as mandatory from a semantic point of view.

When an optional element is missing in an invoke component or in an inner data structure while it is required by the context, an error component is returned if specified in the operation type; the associated type of error is DataMissing. This holds also when the entire parameter of an invoke component is missing while it is required by the context.

NOTE 2: When a mandatory element is missing in the parameter or inner data structure of any component, a reject component is returned (if the dialogue still exists). The problem code to be used is "Mistyped parameter".

The Timer Values used in the operation type definitions are indicated as ASN.1 comment. The Timer Value Ranges are:

s = from 3 seconds to 10 seconds;

m = from 15 seconds to 30 seconds;

ml = from 1 minute to 10 minutes;

l = from 28 hours to 38 hours.

17.1.2.1 Use of Global Operation and Error codes defined outside MAP

An entity supporting an application context greater than 2 shall be capable of receiving an operation or error code, within an application context defined in GSM 09.02, encoded as either an Object Identifier (as defined in CCITT Recommendation X.690 (1994)) or an integer value (as defined in section 17.5). Related restrictions regarding the use of Object Identiers are as follows:

- The length of the Object Identifier shall not exceed 16 octets and the number of components of the Object Identifier shall not exceed 16.
- Object Identifiers shall be used only for operations or errors defined outside of GSM 09.02.
- Global error codes may be sent only in response to a global operation. If a standard operation is received then a global error code shall not be sent in response.

Handling of an unknown operation codes by the receiving entity is defined in section 15.1.1

17.1.3 Use of information elements defined outside MAP

An information element or a set of information elements (messages) transparently carried in the Mobile Application Part but defined in other recommendation/technical specifications are handled in one of the following ways:

i) The contents of each information element (without the octets encoding the identifier and the length in the recommendation/technical specification where it is defined) is carried as the value of an ASN.1 NamedType derived from the OCTET STRING data type. Additionally, the internal structure may be explained by means of comments. In case of misalignment the referred to recommendation/technical specification takes precedence.

ii) The complete information element (including the octets encoding the identifier and the length in the recommendation/technical specification where it is defined) or set of information elements and the identity of the associated protocol are carried as the value of the ExternalSignalInfo data type defined in the present document. Where more than one information element is carried, the information elements are sent contiguously with no filler octets between them.

17.1.4 Compatibility considerations

The following ASN.1 modules conform to CCITT Recommendation X.208 (1988) or X.680 (1994) (the only module which makes use of X.680 is MAP-ExtensionDataTypes), but in addition Ellipsis Notation ("..." - notation) is used as described in ITU-T Recommendation X.680 Amendment 1 (1995) wherever future protocol extensions are foreseen.

The "..." construct applies only to SEQUENCE and ENUMERATED data types. An entity supporting a version greater than 1 shall not reject an unsupported extension following "..." of that SEQUENCE or ENUMERATED data type. The Encoding Rules from subclause 17.1.1 apply to every element of the whole Transfer Syntax especially to the ASN.1 type EXTERNAL.

Private extensions shall:

1) if included in operations of an AC of V2, follow the extension marker and be tagged using PRIVATE tags up to and including 29.

NOTE: This type of extension is in most cases used only within a PLMN.

2) if included in operations of an AC of V3 or higher: be included only in the Private Extension Container that is defined in the specification.

NOTE: This type of extension can be used between PLMNs.

Private extensions shall not be included in v2 supplementary service operations.

Private extensions shall not be included within user error for RegisterCCEntry and EraseCCEntry operations.

PCS extensions shall be included in the PCS Extension Container that is defined in this specification.

In order to improve extensibility, a few error parameters have been defined as a CHOICE between the version 2 description and a SEQUENCE including the version 2 description and an extension container. Operations used in a v2-application-context must consider only the first alternative while operations used in a vn-application-context (n>2) must consider only the second alternative.

17.1.5 Structure of the Abstract Syntax of MAP

For each MAP parameter which has to be transferred by a MAP Protocol Data Unit (MAP message), there is a PDU field (an ASN.1 NamedType) whose ASN.1 identifier has the same name as the corresponding parameter, except for the differences required by the ASN.1 notation (blanks between words are removed or replaced by hyphen, the first letter of the first word is lower-case and the first letter of the following words are capitalized, e.g. "no reply condition time" is mapped to "noReplyConditionTime"). Additionally some words may be abbreviated as follows:

bs basic service

ch call handling

cug closed user group

ho handover

ic incoming call

id identity

info information

ms mobile service

oc outgoing call

om operation & maintenance

pw Password

sm short message service

ss supplementary service

The MAP protocol is composed of several ASN.1 modules dealing with either operations, errors, data types, and, if applicable, split into those dealing with mobile services, call handling services, supplementary services and short message services. For operations and errors no values are assigned, but only the operation and error types in order to allow use of the defined types also by other protocols (e.g. TS GSM 04.80). The values (operation codes and error codes) are defined in a separate module. The ASN.1 source lines are preceded by line-numbers at the left margin in order to enable the usage of the cross-reference in annex A.

The module containing the definition of the operation packages for MAP is:

1. MAP-OperationPackages.

The module containing the definition of the application contexts for MAP is:

2. MAP-ApplicationContexts.

The module containing the data types for the Abstract Syntax to be used for TCAPMessages.DialoguePortion for MAP is:

3. MAP-DialogueInformation.

The module containing the operation codes and error codes for MAP is:

4. MAP-Protocol.

The modules containing all operation type definitions for MAP are:

5. MAP-MobileServiceOperations;
6. MAP-OperationAndMaintenanceOperations;
7. MAP-CallHandlingOperations;
8. MAP-SupplementaryServiceOperations;
9. MAP-ShortMessageServiceOperations;
10. MAP-Group-Call-Operations.

The module containing all error type definitions for MAP is:

11. MAP-Errors.

Modules containing all data type definitions for MAP are:

12. MAP-MS-DataTypes;
13. MAP-OM-DataTypes;
14. MAP-CH-DataTypes;
15. MAP-SS-DataTypes;
16. MAP-SS-Code;
17. MAP-SM-DataTypes;
18. MAP-ER-DataTypes;
19. MAP-CommonDataTypes;
20. MAP-TS-Code;
21. MAP-BS-Code;
22. MAP-ExtensionDataTypes;
23. MAP-GR-DataTypes.

References are made also to modules defined outside of the present document. They are defined in the technical specification Mobile Services Domain and technical specification Transaction Capability respectively:

MobileDomainDefinitions;

TCAPMessages;

DialoguePDUs.

17.1.6 Application Contexts

The following informative table lists the latest versions of the Application Contexts used in this specification, with the operations used by them and, where applicable, whether or not the operation description is exactly the same as for previous versions. Information in sections 17.6 & 17.7 relates only to the ACs in this table.

AC Name	AC Version	Operations Used	Comments *
locationCancellationContext	v3	cancelLocation	
equipmentMngtContext	v2	checkIMEI	
imsiRetrievalContext	v2	sendIMSI	
infoRetrievalContext	v2	sendAuthenticationInfo	
interVlrInfoRetrievalContext	v2	sendIdentification	
handoverControlContext	v2	prepareHandover forwardAccessSignalling sendEndSignal processAccessSignalling prepareSubsequentHandover	
mwdMngtContext	v3	readyForSM	
msPurgingContext	v3	purgeMS	
shortMsgAlertContext	v2	alertServiceCentre	
resetContext	v2	reset	
networkUnstructuredSsContext	v2	processUnstructuredSS-Request unstructuredSS-Request unstructuredSS-Notify	
tracingContext	v3	activateTraceMode deactivateTraceMode	
networkFunctionalSsContext	v2	registerSS eraseSS activateSS deactivateSS registerPassword interrogateSS getPassword	
shortMsgMO-RelayContext	v3	mo-forwardSM	
shortMsgMT-RelayContext	v3	mt-forwardSM	
shortMsgGatewayContext	v3	sendRoutingInfoForSM reportSM-DeliveryStatus InformServiceCentre	the syntax of this operation has been extended in comparison with release 96 version
networkLocUpContext	v3	updateLocation forwardCheckSs-Indication restoreData insertSubscriberData activateTraceMode	the syntax is the same in v1 & v2
gprsLocationUpdateContext	v3	updateGprsLocation insertSubscriberData activateTraceMode	
subscriberDataMngtContext	v3	insertSubscriberData deleteSubscriberData	
roamingNumberEnquiryContext	v3	provideRoamingNumber	
locationInfoRetrievalContext	v3	sendRoutingInfo	

gprsNotifyContext	v3	noteMsPresentForGprs	
gprsLocationInfoRetrievalContext	v3	sendRoutingInfoForGprs	
failureReportContext	v3	failureReport	
callControlTransferContext	v3	resumeCallHandling	
subscriberInfoEnquiryContext	v3	provideSubscriberInfo	
anyTimeEnquiryContext	v3	anyTimeInterrogation	
ss-InvocationNotificationContext	v3	ss-InvocationNotification	
sIWFSAllocationContext	v3	provideSIWFSNumber sIWFSSignallingModify	
groupCallControlContext	v3	prepareGroupCall processGroupCallSignalling forwardGroupCallSignalling sendGroupCallEndSignal	
reportingContext	v3	setReportingState statusReport remoteUserFree	
callCompletionContext	v3	registerCC-Entry eraseCC-Entry	

NOTE (*): The syntax of the operations is not the same as in previous versions unless explicitly stated

17.2 Operation packages

17.2.1 General aspects

This subclause describes the operation-packages which are used to build the application-contexts defined in subclause 17.3.

Each operation-package is a specification of the roles of a pair of communicating objects (i.e. a pair of MAP-Providers), in term of operations which they can invoke of each other.

The grouping of operations into one or several packages does not necessarily imply any grouping in term of Application Service Elements.

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

```
OPERATION-PACKAGE MACRO ::=

BEGIN

TYPE NOTATION ::= Symmetric | ConsumerInvokes SupplierInvokes |
empty

VALUE NOTATION ::= value(VALUE OBJECT IDENTIFIER)
Symmetric ::= "OPERATIONS" "{" OperationList "}"
ConsumerInvokes ::= "CONSUMER INVOKES" "{" OperationList "}"
SupplierInvokes ::= "SUPPLIER INVOKES" "{" OperationList "}" | empty
OperationList ::= Operation | OperationList "," Operation
Operation ::= value(OPERATION)

END
```

Since the application-context definitions provided in subclause 17.3 use only an informal description technique, only the type notation is used in the following subclauses to define operation-packages.

The following definitions are used throughout this subclause (n>=2):

- v1-only operation: An operation which shall be used only in v1 application-contexts;
- vn-only operation: An operation which shall be used only in vn application-contexts;
- v(n-1)-operation: An operation whose specification has not been modified since the MAP v(n-1) specifications or if the modifications are considered as not affecting v(n-1) implementations;

- v(n-1)-equivalent operation: The version of an operation which excludes all the information elements and errors which have been added since the MAP v(n-1) specification;

- vn-only package: An operation package which contains only vn-only operations;

- v(n-1)-package: An operation package which contains only v(n-1)- operations.

The names of vn-packages are suffixed by "-vn" where n>=2.

For each operation package which is not vn-only (n>=2) and which does not include only v(n-1)-operations, there is a v(n-1)-equivalent package. Except when a definition is explicitly provided in the following subclauses, the v(n-1)-equivalent package includes the v(n-1)-equivalent operations of the operations which belong to this package.

17.2.2 Packages specifications

17.2.2.1 Location updating

This operation package includes the operations required for location management procedures between HLR and VLR.

```
LocationUpdatingPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     CONSUMER INVOKES {
          updateLocation}
     SUPPLIER INVOKES {
          forwardCheckSs-Indication}
```

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

17.2.2.2 Location cancellation

This operation package includes the operations required for location cancellation and MS purging procedures between HLR and VLR and between HLR and SGSN.

```
LocationCancellationPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is VLR or SGSN if Consumer is HLR
     CONSUMER INVOKES {
          cancelLocation}
```

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

17.2.2.3 Roaming number enquiry

This operation package includes the operations required for roaming number enquiry procedures between HLR and VLR.

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

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

17.2.2.4 Information retrieval

This operation package includes the operation required for the authentication information retrieval procedure between HLR and VLR and between HLR and SGSN.

```
InfoRetrievalPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     -- Supplier is HLR if Consumer is SGSN
     CONSUMER INVOKES {
          sendAuthenticationInfo}
```

The v1-equivalent package is defined as follows:

```
InfoRetrievalPackage-v1 ::= OPERATION-PACKAGE
     -- Supplier is HLR or VLR if Consumer is VLR
     -- Supplier is HLR if Consumer is SGSN
     CONSUMER INVOKES {
          sendParameters}
```

17.2.2.5 Inter-VLR information retrieval

This operation package includes the operations required for inter VLR information retrieval procedures.

```
InterVlrInfoRetrievalPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is VLR if Consumer is VLR
     CONSUMER INVOKES {
          sendIdentification}
```

The v1-equivalent package is : InfoRetrievalPackage-v1

17.2.2.6 IMSI retrieval

This operation package includes the operation required for the IMSI retrieval procedure between HLR and VLR.

```
IMSIRetrievalPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     CONSUMER INVOKES {
          sendIMSI}
```

This package is v2 only.

17.2.2.7 Call control transfer

This operation package includes the operation required for the call control transfer procedure between VMSC and GMSC.

```
CallControlTransferPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is GMSC if Consumer is VMSC
     CONSUMER INVOKES {
          resumeCallHandling}
```

This package is v3 only.

17.2.2.8 - 17.2.2.9 Void

17.2.2.10 Interrogation

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

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

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

17.2.2.11 Void

17.2.2.12 Handover Control

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

```
HandoverControlPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is MSCB if Consumer is MSCA
     CONSUMER INVOKES {
          prepareHandover,
          forwardAccessSignalling}
     SUPPLIER INVOKES {
          sendEndSignal,
          processAccessSignalling,
          prepareSubsequentHandover}
```

The v1-equivalent package is defined as follows.

```
HandoverControlPackage-v1 ::= OPERATION-PACKAGE
     -- Supplier is MSCB if Consumer is MSCA
     CONSUMER INVOKES {
          performHandover,
          forwardAccessSignalling,
          traceSubscriberActivity}
     SUPPLIER INVOKES {
          sendEndSignal,
          noteInternalHandover,
          processAccessSignalling,
          performSubsequentHandover}
```

17.2.2.13 Subscriber Data management stand alone

This operation package includes the operations required for stand alone subscriber data management procedures between HLR and VLR or between HLR and SGSN.

```
SubscriberDataMngtStandAlonePackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is VLR or SGSN if Consumer is HLR
     CONSUMER INVOKES {
          insertSubscriberData,
          deleteSubscriberData}
```

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

17.2.2.14 Equipment management

This operation package includes the operations required for equipment management procedures between EIR and MSC or between EIR and SGSN.

```
EquipmentMngtPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is EIR if Consumer is MSC
     -- Supplier is EIR if Consumer is SGSN
     CONSUMER INVOKES {
          checkIMEI}
```

The v1-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.15 Subscriber data management

This operation package includes the operations required for subscriber data management procedures between HLR and VLR or between HLR and SGSN.

```
SubscriberDataMngtPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is VLR or SGSN if Consumer is HLR
     CONSUMER INVOKES {
          insertSubscriberData}
```

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

17.2.2.16 Location register restart

This operation package includes the operations required for location register restart procedures between HLR and VLR or between HLR and SGSN.

```
ResetPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is VLR or SGSN if Consumer is HLR
     CONSUMER INVOKES {
          reset}
```

The v1-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.17 Tracing stand-alone

This operation package includes the operations required for stand alone tracing procedures between HLR and VLR or between HLR and SGSN.

```
TracingStandAlonePackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is VLR or SGSN if Consumer is HLR
     CONSUMER INVOKES {
          activateTraceMode,
          deactivateTraceMode}
```

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

17.2.2.18 Functional SS handling

This operation package includes the operations required for functional supplementary services procedures between VLR and HLR.

```
FunctionalSsPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     CONSUMER INVOKES {
          registerSS,
          eraseSS,
          activateSS,
          deactivateSS,
          registerPassword,
          interrogateSS}
     SUPPLIER INVOKES {
          getPassword}
```

The v1-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.19 Tracing

This operation package includes the operations required for tracing procedures between HLR and VLR or between HLR and SGSN.

```
TracingPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is VLR or SGSN if Consumer is HLR
     CONSUMER INVOKES {
          activateTraceMode}
```

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

17.2.2.20 Binding

This operation package includes the operation required to initialize a supplementary service procedure between VLR and HLR or between gsmSCF and HLR.

```
BindingPackage-v1 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     -- Supplier is gsmSCF if Consumer is HLR
     CONSUMER INVOKES {
          beginSubscriberActivity}
```

This package is v1 only.

17.2.2.21 Unstructured SS handling

This operation package includes the operations required for unstructured supplementary services procedures between VLR and HLR, and between the HLR and the gsmSCF.

```
UnstructuredSsPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     -- Supplier is gsmSCF if Consumer is HLR
     CONSUMER INVOKES {
          processUnstructuredSS-Request}
     SUPPLIER INVOKES {
          unstructuredSS-Request,
          unstructuredSS-Notify}
```

The v1-equivalent package is defined as follows:

```
UnstructuredSsPackage-v1 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     -- Supplier is gsmSCF if Consumer is HLR
     CONSUMER INVOKES {
          processUnstructuredSS-Data}
```

17.2.2.22 MO Short message relay services

This operation package includes the operations required for short message relay service procedures between IWMSC and VMSC or between GMSC and MSC or between SGSN and IWMSC.

```
MOShortMsgRelayPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is IWMSC if Consumer is MSC
     -- Supplier is IWMSC if Consumer is SGSN
     CONSUMER INVOKES {
          MO-forwardSM}
```

The v2-equivalent package is defined as follows:

```
ShortMsgRelayPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is IWMSC if Consumer is MSC
     -- Supplier is MSC or SGSN if Consumer is GMSC
     -- Supplier is IWMSC if Consumer is SGSN
     CONSUMER INVOKES {
          forwardSM}
```

The v1-equivalent package can be determined according to the rules described in subclause 17.2.1.

17.2.2.23 Short message gateway services

This operation package includes the operations required for short message service gateway procedures between MSC and HLR.

```
ShortMsgGatewayPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is GMSC
     CONSUMER INVOKES {
          sendRoutingInfoForSM,
          reportSM-DeliveryStatus}
     SUPPLIER INVOKES {
          informServiceCentre}
```

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

The v1-equivalent package is defined as follows:

```
ShortMsgGatewayPackage-v1 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is GMSC
     CONSUMER INVOKES {
          sendRoutingInfoForSM
          reportSMDeliveryStatus}
```

17.2.2.24 MT Short message relay services

This operation package includes the operations required for short message relay service procedures between GMSC and MSC or between GMSC and SGSN.

```
MTShortMsgRelayPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is MSC or SGSN if Consumer is GMSC
     CONSUMER INVOKES {
          MT-forwardSM}
```

The v2-equivalent package is: **ShortMsgRelayPackage-v2**

17.2.2.25 Void

17.2.2.26 Message waiting data management

This operation package includes the operations required for short message waiting data procedures between HLR and VLR, between HLR and SGSN.

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

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

The v1-equivalent package is defined as follows:

```
MwdMngtPackage-v1 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     CONSUMER INVOKES {
          noteSubscriberPresent}
```

17.2.2.27 Alerting

This operation package includes the operations required for alerting between HLR and IWMSC.

```
AlertingPackage-v2 ::= OPERATION-PACKAGE
     -- Supplier is IWMSC if Consumer is HLR
     CONSUMER INVOKES {
          alertServiceCentre}
```

The v1-equivalent package is defined as follows.

```
AlertingPackage-v1 ::= OPERATION-PACKAGE
     -- Supplier is IWMSC if Consumer is HLR
     CONSUMER INVOKES {
          alertServiceCentreWithoutResult}
```

17.2.2.28 Data restoration

This operation package includes the operations required for VLR data restoration between HLR and VLR.

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

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

The v1-equivalent package is: InfoRetrievalPackage-v1

17.2.2.29 Purging

This operation package includes the operations required for purging between HLR and VLR or between HLR and SGSN.

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

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

17.2.2.30 Subscriber information enquiry

This operation package includes the operations required for subscriber information enquiry procedures between HLR and VLR.

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

This package is v3 only.

17.2.2.31 Any time information enquiry

This operation package includes the operations required for any time information enquiry procedures between gsmSCF and HLR.

```
AnyTimeInformationEnquiryPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is gsmSCF
     CONSUMER INVOKES {
          anyTimeInterrogation}
```

This package is v3 only.

17.2.2.32 Group Call Control

This operation package includes the operations required for group call and broadcast call procedures between MSCs.

```
GroupCallControlPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is relay MSC if Consumer is anchor MSC
     CONSUMER INVOKES {
          prepareGroupCall,
          forwardGroupCallSignalling}
     SUPPLIER INVOKES {
          sendGroupCallEndSignal,
          processGroupCallSignalling}
```

This package is v3 only.

17.2.2.33 Provide SIWFS number

This operation package includes the operations required between VMSC and SIWF for requesting resources from an SIWF.

```
ProvideSIWFSNumberPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is SIWF if Consumer is VMSC
     CONSUMER INVOKES {
          provideSIWFSNumber}
```

This package is v3 only.

17.2.2.34 SIWFS Signalling Modify

This operation package includes the operations required for the modification of the resourses in an SIWF between the VMSC and SIWF.

```
SIWFSSignallingModifyPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is SIWF if Consumer is VMSC
     CONSUMER INVOKES {
          sIWFSSignallingModify}
```

This package is v3 only.

17.2.2.35 GPRS location updating

This operation package includes the operations required for the gprs location management procedures between HLR and SGSN.

```
GprsLocationUpdatingPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is SGSN
     CONSUMER INVOKES {
          updateGprsLocation}
```

This package is v3 only.

17.2.2.36 GPRS Interrogation

This operation package includes the operations required for interrogation procedures between HLR and GGSN.

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

This package is v3 only.

17.2.2.37 Failure reporting

This operation package includes the operations required for failure reporting between HLR and GGSN.

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

This package is v3 only.

17.2.2.38 GPRS notifying

This operation package includes the operations required for notifying that GPRS subscriber is present between HLR and GGSN.

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

This package is v3 only.

17.2.2.39 Supplementary Service invocation notification

This operation package includes the operations required for Supplementary Service invocation notification procedures between MSC and gsmSCF.

```
SS-InvocationNotificationPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is gsmSCF if Consumer is MSC
     CONSUMER INVOKES {
          ss-InvocationNotification}
```

This package is v3 only.

17.2.2.40 Set Reporting State

This operation package includes the operation required for procedures between HLR and VLR to set the reporting state.

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

This package is v3 only.

17.2.2.41 Status Report

This operation package includes the operation required for procedures between VLR and HLR to report call results and events.

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

This package is v3 only.

17.2.2.42 Remote User Free

This operation package includes the operation required by the HLR to indicate to the VLR that the remote user is free.

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

This package is v3 only.

17.2.2.43 Call Completion

This operation package includes the operations required for procedures between VLR and HLR for subscriber control of call completion services.

```
CallCompletionPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VLR
     CONSUMER INVOKES {
          registerCC-Entry,
          eraseCC-Entry}
```

This package is v3 only.

17.3 Application contexts

17.3.1 General aspects

An application-context is assigned for each dialogue established by a MAP-user. In the present document each application-context is assigned a name which is supplied in the MAP-OPEN Req primitive by the MAP-User and transmitted to the peer under certain circumstances.

The following ASN.1 MACRO is used to describe the main aspects of application-contexts in the following subclauses:

```
APPLICATION-CONTEXT MACRO ::=

BEGIN

TYPE NOTATION ::= Symmetric | InitiatorConsumerOf
ResponderConsumerOf | empty

VALUE NOTATION ::= value(VALUE OBJECT IDENTIFIER)

Symmetric ::= "OPERATIONS OF" "{" PackageList "}"

InitiatorConsumerOf ::= "INITIATOR CONSUMER OF" "{" PackageList "}"

ResponderConsumerOf ::= "RESPONDER CONSUMER OF" "{" PackageList "}"
          | empty

PackageList ::= Package | PackageList "," Package

Package ::= value(OPERATION-PACKAGE)
          | type -- shall reference a package type

END
```

The following definitions are used throughout this subclause:

- v1-application-context: An application-context which contains only v1-packages and uses only TC v1 facilities;
- v1 context set: the set of v1-application-contexts defined in the present document.
- vn-application-context (n>=2): An application-context which contains only vn-packages;

The names of v1-application-contexts are suffixed by "-v1" while other names are suffixed by "-vn" where n>=2.

Application-contexts which do not belong to the v1 context set use v2 TC facilities.

The last component of each application-context-name (i.e. the last component of the object identifier value) assigned to an application-context which belongs to the v1 context set indicates explicitly "version1".

For each application-context which does not belong to the "v1 context set" there is a v1-equivalent application context. This is a v1-application-context which includes the v1-equivalents of the packages included in the original context.

Each application-context uses the abstract-syntax associated with the operation-packages it includes and uses the transfer-syntax derived from it by applying the encoding rules defined in subclause 17.1.1.

ACs which do not belong to the v1 context set require the support of the abstract-syntax identified by the object identifier value: MAP-DialogueInformation.map-Dialogue-AS defined in subclause 17.4.

17.3.2 Application context definitions

17.3.2.1 Void

17.3.2.2 Location Updating

This application context is used between HLR and VLR for location updating procedures.

```
networkLocUpContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          LocationUpdatingPackage-v3,
          DataRestorationPackage-v3}
     RESPONDER CONSUMER OF {
          SubscriberDataMngtPackage-v3
          TracingPackage-v3}
::= {map-ac networkLocUp(1) version3(3)}
```

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

```
{map-ac networkLocUp(1) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac networkLocUp(1) version1(1)}
```

17.3.2.3 Location Cancellation

This application context is used between HLR and VLR or between HLR and SGSN for location cancellation procedures. For the HLR - SGSN interface only version 3 of this application context is applicable.

```
locationCancellationContext-v3 APPLICATION-CONTEXT
     -- Responder is VLR or SGSN if Initiator is HLR
     INITIATOR CONSUMER OF {
          LocationCancellationPackage-v3}
::= {map-ac locationCancel(2) version3(3)}
```

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

```
map-ac locationCancel(2) version2(2)
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
map-ac locationCancel(2) version1(1)
```

17.3.2.4 Roaming number enquiry

This application context is used between HLR and VLR for roaming number enquiry procedures.

```
roamingNumberEnquiryContext-v3 APPLICATION-CONTEXT
     -- Responder is VLR if Initiator is HLR
     INITIATOR CONSUMER OF {
          RoamingNumberEnquiryPackage-v3}
::= {map-ac roamingNbEnquiry(3) version3(3)}
```

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

```
{map-ac roamingNbEnquiry(3) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac roamingNbEnquiry(3) version1(1)}
```

17.3.2.5 Void

17.3.2.6 Location Information Retrieval

This application-context is used between GMSC and HLR when retrieving location information.

```
locationInfoRetrievalContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is GMSC
     INITIATOR CONSUMER OF {
          InterrogationPackage-v3}
::= {map-ac locInfoRetrieval(5) version3(3)}
```

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

```
{map-ac locInfoRetrieval(5) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac locInfoRetrieval(5) version1(1)}
```

17.3.2.7 Call control transfer

This application context is used for the call control transfer procedure between the VMSC and the GMSC.

```
callControlTransferContext-v3 APPLICATION-CONTEXT
     -- Responder is GMSC if Initiator is VMSC
     INITIATOR CONSUMER OF {
          CallControlTransferPackage-v3}
::= {map-ac callControlTransfer(6) version3(3)}
```

This application-context is v3 only.

17.3.2.8 - 17.3.2.10 Void

17.3.2.11 Location registers restart

This application context is used between HLR and VLR or between HLR and SGSN for location register restart procedures. For the HLR - SGSN interface version 1 and version 2 of this application context are applicable.

```
resetContext-v2 APPLICATION-CONTEXT
     -- Responder is VLR or SGSN if Initiator is HLR
     INITIATOR CONSUMER OF {
          ResetPackage-v2}
::= {map-ac reset(10) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac reset(10) version1(1)}
```

17.3.2.12 Handover control

This application context is used for handover procedures between MSCs.

```
handoverControlContext-v2 APPLICATION-CONTEXT
     -- Responder is MSCB if Initiator is MSCA
     INITIATOR CONSUMER OF {
          HandoverControlPackage-v2}
::= {map-ac handoverControl(11) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac handoverControl(11) version1(1)}
```

17.3.2.13 IMSI Retrieval

This application context is used for IMSI retrieval between HLR and VLR.

```
imsiRetrievalContext-v2 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          IMSIRetrievalPackage-v2}
::= {map-ac imsiRetrieval(26) version2(2)}
```

This application-context is v2 only.

17.3.2.14 Equipment Management

This application context is used for equipment checking between MSC and EIR or between SGSN and EIR. For the SGSN - EIR interface version 1 and version 2 of this application context are applicable:

```
equipmentMngtContext-v2 APPLICATION-CONTEXT
     -- Responder is EIR if Initiator is MSC
     -- Responder is EIR if Initiator is SGSN
     INITIATOR CONSUMER OF {
          EquipmentMngtPackage-v2}
::= {map-ac equipmentMngt(13) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac equipmentMngt(13) version1(1)}
```

17.3.2.15 Information retrieval

This application context is used for authentication information retrieval between HLR and VLR or between HLR and SGSN. For the HLR - SGSN interface version 1 and version 2 of this application context are applicable.

```
infoRetrievalContext-v2 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     -- Responder is HLR if Initiator is SGSN
     INITIATOR CONSUMER OF {
          InfoRetrievalPackage-v2}
::= {map-ac infoRetrieval(14) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
     -- Responder is HLR if Initiator is VLR
{map-ac infoRetrieval(14) version1(1)}
```

17.3.2.16 Inter-VLR information retrieval

This application context is used for information retrieval between VLRs.

```
interVlrInfoRetrievalContext-v2 APPLICATION-CONTEXT
     -- Responder is VLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          InterVlrInfoRetrievalPackage-v2}
::= {map-ac interVlrInfoRetrieval(15) version2(2)}
```

The v1-equivalent application-context is:

```
     -- Responder is VLR if Initiator is VLR
{map-ac infoRetrieval(14) version1(1)}
```

17.3.2.17 Stand Alone Subscriber Data Management

This application context is used for stand alone subscriber data management between HLR and VLR or between HLR and SGSN. For the HLR - SGSN interface only version 3 of this application context is applicable:

```
subscriberDataMngtContext-v3 APPLICATION-CONTEXT
     -- Responder is VLR or SGSN if Initiator is HLR
     INITIATOR CONSUMER OF {
          SubscriberDataMngtStandAlonePackage-v3}
::= {map-ac subscriberDataMngt(16) version3(3)}
```

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

```
{map-ac subscriberDataMngt(16) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac subscriberDataMngt(16) version1(1)}
```

17.3.2.18 Tracing

This application context is used between HLR and VLR or between HLR and SGSN for stand alone tracing control procedures: For the HLR - SGSN interface version 1, version 2 and version 3 of this application context are applicable.

```
tracingContext-v3 APPLICATION-CONTEXT
     -- Responder is VLR or SGSN if Initiator is HLR
     INITIATOR CONSUMER OF {
          TracingStandAlonePackage-v3}
::= {map-ac tracing(17) version3(3)}
```

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

```
{map-ac tracing(17) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac tracing(17) version1(1)}
```

17.3.2.19 Network functional SS handling

This application context is used for functional-like SS handling procedures between VLR and HLR.

```
networkFunctionalSsContext-v2 APPLICATION-CONTEXT
     -- Responder is HLR, Initiator is VLR
     INITIATOR CONSUMER OF {
          FunctionalSsPackage-v2}
::= {map-ac networkFunctionalSs(18) version2(2)}
```

The v1-equivalent application-context is defined as follows:

```
networkFunctionalSsContext-v1 APPLICATION-CONTEXT
     -- Responder is HLR, Initiator is VLR
     INITIATOR CONSUMER OF {
          FunctionalSsPackage-v1,
          UnstructuredSsPackage-v1,
          BindingPackage-v1}
::= {map-ac networkFunctionalSs(18) version1(1)}
```

17.3.2.20 Network unstructured SS handling

This application context is used for handling stimuli-like procedures between HLR and VLR, and between the HLR and gsmSCF.

```
networkUnstructuredSsContext-v2 APPLICATION-CONTEXT
     -- Responder is HLR, Initiator is VLR
     -- Responder is VLR, Initiator is HLR
     -- Responder is gsmSCF, Initiator is HLR
     -- Responder is HLR, Initiator is gsmSCF
     OPERATIONS OF {
          UnstructuredSsPackage-v2}
::= {map-ac networkUnstructuredSs(19) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac networkFunctionalSs(18) version1(1)}
```

17.3.2.21 Short Message Gateway

This application context is used for short message gateway procedures.

```
shortMsgGatewayContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is GMSC
     INITIATOR CONSUMER OF {
          ShortMsgGatewayPackage-v3}
::= {map-ac shortMsgGateway(20) version3(3)}
```

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

```
{map-ac shortMsgGateway(20) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac shortMsgGateway(20) version1(1)}
```

17.3.2.22 Mobile originating Short Message Relay

This application context is used between MSC and IWMSC or between SGSN and IWMSC for mobile originating short message relay procedures. For the SGSN - IWMSC interface version 1, version 2 and version 3 of this application context are applicable.

```
shortMsgMO-RelayContext-v3 APPLICATION-CONTEXT
     -- Responder is IWMSC if Initiator is MSC
     -- Responder is IWMSC if Initiator is SGSN
     INITIATOR CONSUMER OF {
          MOShortMsgRelayPackage-v3}
::= {map-ac shortMsgMO-Relay(21) version3(3)}
```

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

```
{map-ac shortMsgMO-Relay(21) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac shortMsg-Relay(21) version1(1)}
```

17.3.2.23 Void

17.3.2.24 Short message alert

This application context is used for short message alerting procedures.

```
shortMsgAlertContext-v2 APPLICATION-CONTEXT
     -- Responder is IWMSC if Initiator is HLR
     INITIATOR CONSUMER OF {
          AlertingPackage-v2}
::= {map-ac shortMsgAlert(23) version2(2)}
```

The following application-context-name is symbolically assigned to the v1-equivalent application-context:

```
{map-ac shortMsgAlert(23) version1(1)}
```

17.3.2.25 Short message waiting data management

This application context is used between VLR and HLR or between SGSN and HLR for short message waiting data management procedures. For the SGSN - HLR interface only version 3 of this application context is applicable.

```
mwdMngtContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is SGSN
     -- Responder is HLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          MwdMngtPackage-v3}
::= {map-ac mwdMngt(24) version3(3)}
```

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

```
{map-ac mwdMngt(24) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac mwdMngt(24) version1(1)}
```

17.3.2.26 Mobile terminating Short Message Relay

This application context is used between GMSC and MSC or between GMSC and SGSN for mobile terminating short message relay procedures. For the GMSC - SGSN interface version 2and version 3 of this application context and the equivalent version 1 application context are applicable.

```
shortMsgMT-RelayContext-v3 APPLICATION-CONTEXT
     -- Responder is MSC or SGSN if Initiator is GMSC
     INITIATOR CONSUMER OF {
          MTShortMsgRelayPackage-v3}
::= {map-ac shortMsgMT-Relay(25) version3(3)}
```

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

```
{map-ac shortMsgMT-Relay(25) version2(2)}
```

The following application-context-name is assigned to the v1-equivalent application-context:

```
{map-ac shortMsgMO-Relay(21) version1(1)}
```

17.3.2.27 MS purging

This application context is used between HLR and VLR or between HLR and SGSN for MS purging procedures. For the SGSN - HLR interface only version 3 of this application context is applicable.

```
msPurgingContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     -- Responder is HLR if Initiator is SGSN
     INITIATOR CONSUMER OF {
          purgingPackage-v3}
::= {map-ac msPurging(27) version3(3)}
```

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

```
{map-ac msPurging(27) version2(2)}
```

17.3.2.28 Subscriber information enquiry

This application context is used between HLR and VLR for subscriber information enquiry procedures.

```
subscriberInfoEnquiryContext-v3 APPLICATION-CONTEXT
     -- Responder is VLR if Initiator is HLR
     INITIATOR CONSUMER OF {
          SubscriberInformationEnquiryPackage-v3}
::= {map-ac subscriberInfoEnquiry(28) version3(3)}
```

This application-context is v3 only.

17.3.2.29 Any time information enquiry

This application context is used between gsmSCF and HLR for any time information enquiry procedures.

```
anyTimeInfoEnquiryContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is gsmSCF
     INITIATOR CONSUMER OF {
          AnyTimeInformationEnquiryPackage-v3}
::= {map-ac anyTimeInfoEnquiry(29) version3(3)}
```

This application-context is v3 only.

17.3.2.30 Group Call Control

This application context is used between anchor MSC and relay MSC for group call and broadcast call procedures.

```
groupCallControlContext-v3 APPLICATION-CONTEXT
     -- Responder is relay MSC if Initiator is anchor MSC
     INITIATOR CONSUMER OF {
          GroupCallControlPackage-v3}
::= {map-ac groupCallControl(31) version3(3)}
```

This application-context is v3 only.

17.3.2.31 Provide SIWFS Number

This application context is used for activation or modification of SIWF resources.

```
sIWFSAllocationContext-v3 APPLICATION-CONTEXT
     -- Responder is SIWF if Initiater is VMSC
     INITIATOR CONSUMER OF {
          ProvideSIWFSNumberPackage-v3,
          SIWFSSignallingModifyPackage-v3}
::= {map-ac sIWFSAllocation (12) version3(3)}
```

This application-context is v3 only.

17.3.2.32 Gprs Location Updating

This application context is used between HLR and SGSN for gprs location updating procedures.

```
gprsLocationUpdateContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is SGSN
     INITIATOR CONSUMER OF {
          GprsLocationUpdatingPackage-v3}
     RESPONDER CONSUMER OF {
          SubscriberDataMngtPackage-v3
          TracingPackage-v3}
::= {map-ac gprsLocationUpdate(32) version3(3)}
```

This application-context is v3 only.

17.3.2.33 Gprs Location Information Retreival

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

```
gprsLocationInfoRetrievalContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is GGSN
     INITIATOR CONSUMER OF {
          GprsInterrogationPackage-v3}
::= {map-ac gprsLocationInfoRetrieval(33) version3(3)}
```

This application-context is v3 only.

17.3.2.34 Failure Reporting

This application context is used between HLR and GGSN to inform that network requested PDP-context activation has failed.

```
failureReportContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is GGSN
     INITIATOR CONSUMER OF {
          FailureReportingPackage-v3}
::= {map-ac failureReport(34) version3(3)}
```

This application-context is v3 only.

17.3.2.35 GPRS Notifying

This application context is used between HLR and GGSN for notifying that GPRS subscriber is present again.

```
gprsNotifyContext-v3 APPLICATION-CONTEXT
     -- Responder is GGSN if Initiator is HLR
     INITIATOR CONSUMER OF {
          GprsNotifyingPackage-v3}
::= {map-ac gprsNotify(35) version3(3)}
```

This application-context is v3 only.

17.3.2.36 Supplementary Service invocation notification

This application context is used between MSC and gsmSCF for Supplementary Service invocation notification procedures.

```
ss-InvocationNotificationContext-v3 APPLICATION-CONTEXT
     -- Responder is gsmSCF, Initiator is MSC
     INITIATOR CONSUMER OF {
          SS-InvocationNotificationPackage-v3}
::= {map-ac ss-InvocationNotification(36) version3(3)}
```

This application-context is v3 only.

17.3.2.37 Reporting

This application context is used between HLR and VLR for reporting procedures.

```
reportingContext-v3 APPLICATION-CONTEXT
     -- Responder is VLR if Initiator is HLR
     -- Responder is HLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          SetReportingStatePackage-v3,
          StatusReportPackage-v3,
          RemoteUserFreePackage-v3}
     RESPONDER CONSUMER OF {
          SetReportingStatePackage-v3,
          StatusReportPackage-v3}
::= {map-ac reporting(7) version3(3)}
```

This application-context is v3 only.

17.3.2.38 Call Completion

This application context is used between VLR and the HLR for subscriber control of call completion services.

```
callCompletionContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          CallCompletionPackage-v3}
::= {map-ac callCompletion(8) version3(3)}
```

This application-context is v3 only.

17.3.3 ASN.1 Module for application-context-names

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

```
MAP-ApplicationContexts {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ApplicationContexts (2) version4 (4)}

DEFINITIONS

::=

BEGIN


-- EXPORTS everything


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

-- application-context-names
```

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

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

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

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

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

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

handoverControlContext-v2  OBJECT IDENTIFIER ::=
     {map-ac handoverControl(11) version2(2)}

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

infoRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac infoRetrieval(14) version2(2)}

interVlrInfoRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac interVlrInfoRetrieval(15) version2(2)}

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

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

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

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

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

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

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

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

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

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

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

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

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

callControlTransferContext-v3  OBJECT IDENTIFIER ::=
     {map-ac callControlTransfer(6) version3(3)}

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

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

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

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

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

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

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

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

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

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

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

```
END
```

17.4 MAP Dialogue Information

MAP-DialogueInformation {

```
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-DialogueInformation (3) version4 (4)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   map-DialogueAS,
   MAP-DialoguePDU
;

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

   AddressString
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network(1) modules (3) map-CommonDataTypes (18) version4 (4)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}

;


-- abstract syntax name for MAP-DialoguePDU
```

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

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

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

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

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

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

```
Reason ::= ENUMERATED {
     noReasonGiven  (0),
     invalidDestinationReference  (1),
     invalidOriginatingReference  (2)}
```

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

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

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

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

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

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

```
END
```

17.5 MAP operation and error codes

```
MAP-Protocol {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Protocol (4) version4 (4)}

DEFINITIONS

::=

BEGIN

IMPORTS
   UpdateLocation,
   CancelLocation,
   PurgeMS,
   SendIdentification,
   UpdateGprsLocation,
   PrepareHandover,
   SendEndSignal,
   ProcessAccessSignalling,
   ForwardAccessSignalling,
   PrepareSubsequentHandover,
   SendAuthenticationInfo,
   CheckIMEI,
   InsertSubscriberData,
```

```
   DeleteSubscriberData,
   Reset,
   ForwardCheckSS-Indication,
   RestoreData,
   ProvideSubscriberInfo,
   AnyTimeInterrogation,
   SendRoutingInfoForGprs,
   FailureReport,
   NoteMsPresentForGprs


FROM MAP-MobileServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MobileServiceOperations (5)
   version4 (4)}

   ActivateTraceMode,
   DeactivateTraceMode,
   SendIMSI
FROM MAP-OperationAndMaintenanceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
   version4 (4)}

   SendRoutingInfo,
   ProvideRoamingNumber,
   ResumeCallHandling,
   ProvideSIWFSNumber,
   SIWFSSignallingModify,
   SetReportingState,
   StatusReport,
   RemoteUserFree
FROM MAP-CallHandlingOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CallHandlingOperations (7)
   version4 (4)}

   RegisterSS,
   EraseSS,
   ActivateSS,
   DeactivateSS,
   InterrogateSS,
   ProcessUnstructuredSS-Request,
   UnstructuredSS-Request,
   UnstructuredSS-Notify,
   RegisterPassword,
   GetPassword,
   SS-InvocationNotification,
   RegisterCC-Entry,
   EraseCC-Entry
FROM MAP-SupplementaryServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SupplementaryServiceOperations (8)
   version4 (4)}

   SendRoutingInfoForSM,
   MO-ForwardSM,
   MT-ForwardSM,
   ReportSM-DeliveryStatus,
   AlertServiceCentre,
   InformServiceCentre,
   ReadyForSM
FROM MAP-ShortMessageServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ShortMessageServiceOperations (9)
   version4 (4)}

   PrepareGroupCall,
   ProcessGroupCallSignalling,
   ForwardGroupCallSignalling,
   SendGroupCallEndSignal
FROM MAP-Group-Call-Operations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Group-Call-Operations (22)
   version4 (4)}

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
```

```
   FacilityNotSupported,
   UnknownSubscriber,
   NumberChanged,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,
   RoamingNotAllowed,
   IllegalSubscriber,
   IllegalEquipment,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,
   TracingBufferFull,
   OR-NotAllowed,
   NoRoamingNumberAvailable,
   AbsentSubscriber,
   BusySubscriber,
   NoSubscriberReply,
   CallBarred,
   ForwardingViolation,
   ForwardingFailed,
   CUG-Reject,
   ATI-NotAllowed,
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-SubscriptionViolation,
   SS-Incompatibility,
   UnknownAlphabet,
   USSD-Busy,
   PW-RegistrationFailure,
   NegativePW-Check,
   NumberOfPW-AttemptsViolation,
   SubscriberBusyForMT-SMS,
   SM-DeliveryFailure,
   MessageWaitingListFull,
   AbsentSubscriberSM,
   ResourceLimitation,
   NoGroupCallNumberAvailable,
   ShortTermDenial,
   LongTermDenial,
   IncompatibleTerminal
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version4 (4)}
;


-- location registration operation codes

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


-- handover operation codes

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


-- authentication operation codes

sendAuthenticationInfo  SendAuthenticationInfo ::= localValue 56


-- IMEI MANAGEMENT operation codes

checkIMEI  CheckIMEI ::= localValue 43
```

```
-- subscriber management operation codes

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

-- fault recovery operation codes

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

-- operation and maintenance operation codes

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

-- call handling operation codes

sendRoutingInfo  SendRoutingInfo ::= localValue 22
provideRoamingNumber  ProvideRoamingNumber ::= localValue 4
resumeCallHandling  ResumeCallHandling ::= localValue 6
provideSIWFSNumber  ProvideSIWFSNumber ::= localValue 31
sIWFSSignallingModify  SIWFSSignallingModify ::= localValue 32
setReportingState  SetReportingState ::= localValue 73
statusReport StatusReport ::= localValue 74
remoteUserFree RemoteUserFree ::= localValue 75

-- supplementary service handling operation codes

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

-- short message service operation codes

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

-- provide subscriber info operation codes

provideSubscriberInfo  ProvideSubscriberInfo ::= localValue 70

-- any time interrogation operation codes

anyTimeInterrogation  AnyTimeInterrogation ::= localValue 71

-- supplementary service invocation notification operation codes

ss-InvocationNotification  SS-InvocationNotification ::= localValue 72

--Group Call operation codes
```

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

```
-- gprs location updating operation codes
```

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

```
-- gprs location information retrieval operation codes
```

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

```
-- failure reporting operation codes
```

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

```
-- GPRS notification operation codes
```

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

```
-- generic error codes
```

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

```
-- identification and numbering error codes
```

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

```
-- subscription error codes
```

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

```
-- handover error codes
```

```
noHandoverNumberAvailable  NoHandoverNumberAvailable ::=
     localValue 25
subsequentHandoverFailure  SubsequentHandoverFailure ::=
     localValue 26
```

```
-- operation and maintenance error codes
```

```
tracingBufferFull  TracingBufferFull ::= localValue 40
```

```
-- call handling error codes
```

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

```
-- any time interrogation error codes
ati-NotAllowed  ATI-NotAllowed ::= localValue 49
```

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

```
-- supplementary service error codes
```

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

```
-- short message service error codes
```

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

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

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

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

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

```
END
```

17.6 MAP operation and error types

17.6.1 Mobile Service Operations

```
MAP-MobileServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MobileServiceOperations (5)
   version4 (4)}

DEFINITIONS

::=

BEGIN

EXPORTS

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

   -- gprs location registration operations
   UpdateGprsLocation,

   -- subscriber information enquiry operations
   ProvideSubscriberInfo,

   -- any time information enquiry operations
   AnyTimeInterrogation,

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

   -- authentication management operations
   SendAuthenticationInfo,

   -- IMEI management operations
   CheckIMEI,

   -- subscriber management operations
   InsertSubscriberData,
   DeleteSubscriberData,

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

-- gprs location information retrieval operations
   SendRoutingInfoForGprs,

   -- failure reporting operations
   FailureReport,

   -- gprs notification operations
   NoteMsPresentForGprs



;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   UnknownSubscriber,
```

```
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,
   RoamingNotAllowed,
   ATI-NotAllowed,
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,
   AbsentSubscriber

FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version4 (4)}

   UpdateLocationArg,
   UpdateLocationRes,
   CancelLocationArg,
   CancelLocationRes,
   PurgeMS-Arg,
   PurgeMS-Res,
   SendIdentificationRes,
   UpdateGprsLocationArg,
   UpdateGprsLocationRes,
   PrepareHO-Arg,
   PrepareHO-Res,
   PrepareSubsequentHO-Arg,
   SendAuthenticationInfoArg,
   SendAuthenticationInfoRes,
   EquipmentStatus,
   InsertSubscriberDataArg,
   InsertSubscriberDataRes,
   DeleteSubscriberDataArg,
   DeleteSubscriberDataRes,
   ResetArg,
   RestoreDataArg,
   RestoreDataRes,
   ProvideSubscriberInfoArg,
   ProvideSubscriberInfoRes,
   AnyTimeInterrogationArg,
   AnyTimeInterrogationRes,
   SendRoutingInfoForGprsArg,
   SendRoutingInfoForGprsRes,
   FailureReportArg,
   FailureReportRes,
   NoteMsPresentForGprsArg,
   NoteMsPresentForGprsRes

FROM MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version4 (4)}

   ExternalSignalInfo,
   TMSI,
   IMEI
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}
;


-- location registration operations

UpdateLocation ::= OPERATION                                          --Timer m
    ARGUMENT
        updateLocationArg              UpdateLocationArg
    RESULT
        updateLocationRes              UpdateLocationRes
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        UnknownSubscriber,
        RoamingNotAllowed}
```

```
CancelLocation ::= OPERATION                                        --Timer m
     ARGUMENT
          cancelLocationArg              CancelLocationArg
     RESULT
          cancelLocationRes              CancelLocationRes
               -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue}
```

```
PurgeMS ::= OPERATION                                               --Timer m
     ARGUMENT
          purgeMS-Arg                    PurgeMS-Arg
     RESULT
          purgeMS-Res                    PurgeMS-Res
               -- optional
     ERRORS{
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
SendIdentification ::= OPERATION                                    --Timer s
     ARGUMENT
          tmsi                           TMSI
     RESULT
          sendIdentificationRes          SendIdentificationRes
     ERRORS {
          DataMissing,
          UnidentifiedSubscriber}
```

-- gprs location registration operations

```
UpdateGprsLocation ::= OPERATION                                    --Timer m
     ARGUMENT
          updateGprsLocationArg          UpdateGprsLocationArg
     RESULT
          updateGprsLocationRes          UpdateGprsLocationRes
     ERRORS {
          SystemFailure,
          UnexpectedDataValue,
          UnknownSubscriber,
          RoamingNotAllowed}
```

-- subscriber information enquiry operations

```
ProvideSubscriberInfo ::= OPERATION                                 --Timer m
     ARGUMENT
          provideSubscriberInfoArg       ProvideSubscriberInfoArg
     RESULT
          provideSubscriberInfoRes       ProvideSubscriberInfoRes
     ERRORS {
          DataMissing,
          UnexpectedDataValue}
```

-- any time information enquiry operations

```
AnyTimeInterrogation ::= OPERATION                                  --Timer m
     ARGUMENT
          anyTimeInterrogationArg        AnyTimeInterrogationArg
     RESULT
          anyTimeInterrogationRes        AnyTimeInterrogationRes
     ERRORS {
          SystemFailure,
          ATI-NotAllowed,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- handover operations

```
PrepareHandover ::= OPERATION                                          --Timer m
     ARGUMENT
          prepareHO-Arg                  PrepareHO-Arg
     RESULT
          prepareHO-Res                  PrepareHO-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          NoHandoverNumberAvailable}
```

```
SendEndSignal ::= OPERATION                                            --Timer l
     ARGUMENT
          bss-APDU                       ExternalSignalInfo
     RESULT
```

```
ProcessAccessSignalling ::= OPERATION              --Timer s
     ARGUMENT
          bss-APDU                       ExternalSignalInfo
```

```
ForwardAccessSignalling ::= OPERATION              --Timer s
     ARGUMENT
          bss-APDU                       ExternalSignalInfo
```

```
PrepareSubsequentHandover ::= OPERATION            --Timer m
     ARGUMENT
          prepareSubsequentHO-Arg        PrepareSubsequentHO-Arg
     RESULT
          bss-APDU                       ExternalSignalInfo
     ERRORS {
          UnexpectedDataValue,
          DataMissing,
          UnknownMSC,
          SubsequentHandoverFailure}
```

-- authentication management operations

```
SendAuthenticationInfo ::= OPERATION               --Timer m
     ARGUMENT
          sendAuthenticationInfoArg      SendAuthenticationInfoArg
     RESULT
          sendAuthenticationInfoRes      SendAuthenticationInfoRes
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- IMEI management operations

```
CheckIMEI ::= OPERATION                                                --Timer m
     ARGUMENT
          imei                           IMEI
     RESULT
          equipmentStatus                EquipmentStatus
     ERRORS {
          SystemFailure,
          DataMissing,
          UnknownEquipment}
```

-- subscriber management operations

```
InsertSubscriberData ::= OPERATION                                     --Timer m
     ARGUMENT
          insertSubscriberDataArg        InsertSubscriberDataArg
     RESULT
          insertSubscriberDataRes        InsertSubscriberDataRes
          -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnidentifiedSubscriber}
```

```
DeleteSubscriberData ::= OPERATION                                    --Timer m
     ARGUMENT
          deleteSubscriberDataArg         DeleteSubscriberDataArg
     RESULT
          deleteSubscriberDataRes         DeleteSubscriberDataRes
          -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnidentifiedSubscriber}
```

-- fault recovery operations

```
Reset ::= OPERATION                                                   --Timer m
     ARGUMENT
          resetArg                        ResetArg
```

```
ForwardCheckSS-Indication ::= OPERATION           --Timer s
```

```
RestoreData ::= OPERATION                                             --Timer m
     ARGUMENT
          restoreDataArg                  RestoreDataArg
     RESULT
          restoreDataRes                  RestoreDataRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- gprs location information retrieval operations

```
SendRoutingInfoForGprs ::= OPERATION                                  --Timer m
     ARGUMENT
          sendRoutingInfoForGprsArg       SendRoutingInfoForGprsArg
     RESULT
          sendRoutingInfoForGprsRes       SendRoutingInfoForGprsRes
     ERRORS {
          AbsentSubscriber,
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- failure reporting operations

```
FailureReport ::= OPERATION                                           --Timer m
     ARGUMENT
          failureReportArg                FailureReportArg
     RESULT
          failureReportRes                FailureReportRes
               -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

-- gprs notification operations

```
NoteMsPresentForGprs ::= OPERATION                                    --Timer m
     ARGUMENT
          noteMsPresentForGprsArg         NoteMsPresentForGprsArg
     RESULT
          noteMsPresentForGprsRes         NoteMsPresentForGprsRes
               -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
END
```

17.6.2 Operation and Maintenance Operations

```
MAP-OperationAndMaintenanceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
   version4 (4)}

DEFINITIONS

::=

BEGIN

EXPORTS
   ActivateTraceMode,
   DeactivateTraceMode,
   SendIMSI
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   UnidentifiedSubscriber,
   TracingBufferFull
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version4 (4)}

   ActivateTraceModeArg,
   ActivateTraceModeRes,
   DeactivateTraceModeArg,
   DeactivateTraceModeRes
FROM MAP-OM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OM-DataTypes (12) version4 (4)}

   ISDN-AddressString,
   IMSI
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}
;
```

```
ActivateTraceMode ::= OPERATION                                    --Timer m
     ARGUMENT
          activateTraceModeArg           ActivateTraceModeArg
     RESULT
          activateTraceModeRes           ActivateTraceModeRes
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnidentifiedSubscriber,
          TracingBufferFull}
```

```
DeactivateTraceMode ::= OPERATION                                  --Timer m
     ARGUMENT
          deactivateTraceModeArg         DeactivateTraceModeArg
     RESULT
          deactivateTraceModeRes         DeactivateTraceModeRes
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnidentifiedSubscriber}
```

```
SendIMSI ::= OPERATION                                                    --Timer m
     ARGUMENT
          msisdn                         ISDN-AddressString
     RESULT
          imsi                           IMSI
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
END
```

17.6.3 Call Handling Operations

```
MAP-CallHandlingOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CallHandlingOperations (7)
   version4 (4)}

DEFINITIONS

::=

BEGIN

EXPORTS
   SendRoutingInfo,
   ProvideRoamingNumber,
   ResumeCallHandling,
   ProvideSIWFSNumber,
   SIWFSSignallingModify,
   SetReportingState,
   StatusReport,
   RemoteUserFree
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   OR-NotAllowed,
   UnknownSubscriber,
   NumberChanged,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   NoRoamingNumberAvailable,
   AbsentSubscriber,
   BusySubscriber,
   NoSubscriberReply,
   CallBarred,
   ForwardingViolation,
   ForwardingFailed,
   CUG-Reject,
   ResourceLimitation,
   IncompatibleTerminal,
   UnidentifiedSubscriber

FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version4 (4)}
   SendRoutingInfoArg,
   SendRoutingInfoRes,
   ProvideRoamingNumberArg,
   ProvideRoamingNumberRes,
   ResumeCallHandlingArg,
   ResumeCallHandlingRes,
   ProvideSIWFSNumberArg,
   ProvideSIWFSNumberRes,
   SIWFSSignallingModifyArg,
   SIWFSSignallingModifyRes,
   SetReportingStateArg,
   SetReportingStateRes,
   StatusReportArg,
```

```
   StatusReportRes,
   RemoteUserFreeArg,
   RemoteUserFreeRes
FROM MAP-CH-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CH-DataTypes (13) version4 (4)}

;
```

```
SendRoutingInfo ::= OPERATION                                          --Timer m
     ARGUMENT
          sendRoutingInfoArg              SendRoutingInfoArg
     RESULT
          sendRoutingInfoRes              SendRoutingInfoRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          OR-NotAllowed,
          UnknownSubscriber,
          NumberChanged,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          AbsentSubscriber,
          BusySubscriber,
          NoSubscriberReply,
          CallBarred,
          CUG-Reject,
          ForwardingViolation}
```

```
ProvideRoamingNumber ::= OPERATION                                     --Timer m
     ARGUMENT
          provideRoamingNumberArg         ProvideRoamingNumberArg
     RESULT
          provideRoamingNumberRes         ProvideRoamingNumberRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          OR-NotAllowed,
          AbsentSubscriber,
          NoRoamingNumberAvailable}
```

```
ResumeCallHandling ::= OPERATION                                       --Timer m
     ARGUMENT
          resumeCallHandlingArg           ResumeCallHandlingArg
     RESULT
          resumeCallHandlingRes           ResumeCallHandlingRes
     ERRORS {
          ForwardingFailed,
          OR-NotAllowed,
          UnexpectedDataValue}
```

```
ProvideSIWFSNumber ::= OPERATION                                       --Timer m
     ARGUMENT
          provideSIWFSNumberArg           ProvideSIWFSNumberArg
     RESULT
          provideSIWFSNumberRes           ProvideSIWFSNumberRes
     ERRORS {
          ResourceLimitation,
          DataMissing,
          UnexpectedDataValue,
          SystemFailure}
```

```
SIWFSSignallingModify ::= OPERATION                                    --Timer m
     ARGUMENT
          sIWFSSignallingModifyArg        SIWFSSignallingModifyArg
     RESULT
          sIWFSSignallingModifyRes        SIWFSSignallingModifyRes
          -- optional
     ERRORS {
          ResourceLimitation,
          DataMissing,
          UnexpectedDataValue,
          SystemFailure}
```

```
SetReportingState ::= OPERATION                                          --Timer m
     ARGUMENT
          setReportingStateArg            SetReportingStateArg
     RESULT
          setReportingStateRes            SetReportingStateRes
          -- optional
     ERRORS {
          SystemFailure,
          UnidentifiedSubscriber,
          UnexpectedDataValue,
          DataMissing,
          ResourceLimitation,
          FacilityNotSupported}
```

```
StatusReport ::= OPERATION                                               --Timer m
     ARGUMENT
          statusReportArg                 StatusReportArg
     RESULT
          statusReportRes                 StatusReportRes
          -- optional
     ERRORS {
          UnknownSubscriber,
          SystemFailure,
          UnexpectedDataValue,
          DataMissing}
```

```
RemoteUserFree ::= OPERATION                                             --Timer ml
     ARGUMENT
          remoteUserFreeArg               RemoteUserFreeArg
     RESULT
          remoteUserFreeRes               RemoteUserFreeRes
     ERRORS {
          UnexpectedDataValue,
          DataMissing,
          IncompatibleTerminal,
          AbsentSubscriber,
          SystemFailure,
          BusySubscriber}
```

```
END
```

17.6.4 Supplementary service operations

```
MAP-SupplementaryServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SupplementaryServiceOperations (8)
   version4 (4)}

DEFINITIONS

::=

BEGIN

EXPORTS
   RegisterSS,
   EraseSS,
   ActivateSS,
   DeactivateSS,
   InterrogateSS,
   ProcessUnstructuredSS-Request,
   UnstructuredSS-Request,
   UnstructuredSS-Notify,
   RegisterPassword,
   GetPassword,
   SS-InvocationNotification,
   RegisterCC-Entry,
   EraseCC-Entry
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
```

```
   UnknownSubscriber,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   CallBarred,
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-SubscriptionViolation,
   SS-Incompatibility,
   PW-RegistrationFailure,
   NegativePW-Check,
   NumberOfPW-AttemptsViolation,
   UnknownAlphabet,
   USSD-Busy,
   AbsentSubscriber,
   IllegalSubscriber,
   IllegalEquipment,
   ShortTermDenial,
   LongTermDenial,
   FacilityNotSupported
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version4 (4)}

   RegisterSS-Arg,
   SS-Info,
   SS-ForBS-Code,
   InterrogateSS-Res,
   USSD-Arg,
   USSD-Res,
   Password,
   GuidanceInfo,
   SS-InvocationNotificationArg,
   SS-InvocationNotificationRes,
   RegisterCC-EntryArg,
   RegisterCC-EntryRes,
   EraseCC-EntryArg,
   EraseCC-EntryRes
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version4 (4)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version4 (4)}
;


-- supplementary service handling operations

RegisterSS ::= OPERATION                                        --Timer m
    ARGUMENT
        registerSS-Arg                  RegisterSS-Arg
    RESULT
        ss-Info                         SS-Info
        -- optional
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        BearerServiceNotProvisioned,
        TeleserviceNotProvisioned,
        CallBarred,
        IllegalSS-Operation,
        SS-ErrorStatus,
        SS-Incompatibility}
```

```
EraseSS ::= OPERATION                                                    --Timer m
     ARGUMENT
          ss-ForBS                        SS-ForBS-Code
     RESULT
          ss-Info                         SS-Info
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus
          }
```

```
ActivateSS ::= OPERATION                                                 --Timer m
     ARGUMENT
          ss-ForBS                        SS-ForBS-Code
     RESULT
          ss-Info                         SS-Info
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus,
          SS-SubscriptionViolation,
          SS-Incompatibility,
          NegativePW-Check,
          NumberOfPW-AttemptsViolation}
```

```
DeactivateSS ::= OPERATION                                               --Timer m
     ARGUMENT
          ss-ForBS                        SS-ForBS-Code
     RESULT
          ss-Info                         SS-Info
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus,
          SS-SubscriptionViolation,
          NegativePW-Check,
          NumberOfPW-AttemptsViolation}
```

```
InterrogateSS ::= OPERATION                                              --Timer m
     ARGUMENT
          ss-ForBS                        SS-ForBS-Code
     RESULT
          interrogateSS-Res               InterrogateSS-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          BearerServiceNotProvisioned,
          TeleserviceNotProvisioned,
          CallBarred,
          IllegalSS-Operation,
          SS-NotAvailable}
```

```
ProcessUnstructuredSS-Request ::= OPERATION              --Timer 10 minutes
     ARGUMENT
          ussd-Arg                          USSD-Arg
     RESULT
          ussd-Res                          USSD-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          UnknownAlphabet,
          CallBarred}
```

```
UnstructuredSS-Request ::= OPERATION              --Timer ml
     ARGUMENT
          ussd-Arg                          USSD-Arg
     RESULT
          ussd-Res                          USSD-Res
          -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          AbsentSubscriber,
          IllegalSubscriber,
          IllegalEquipment,
          UnknownAlphabet,
          USSD-Busy}
```

```
UnstructuredSS-Notify ::= OPERATION                                   --Timer ml
     ARGUMENT
          ussd-Arg                          USSD-Arg
     RESULT
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          AbsentSubscriber,
          IllegalSubscriber,
          IllegalEquipment,
          UnknownAlphabet,
          USSD-Busy}
```

```
RegisterPassword ::= OPERATION                                        --Timer ml
     ARGUMENT
          ss-Code                           SS-Code
     RESULT
          newPassword                       Password
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          CallBarred,
          SS-SubscriptionViolation,
          PW-RegistrationFailure,
          NegativePW-Check,
          NumberOfPW-AttemptsViolation}
     LINKED {
          GetPassword}
```

```
GetPassword ::= OPERATION                                             --Timer m
     ARGUMENT
          guidanceInfo                      GuidanceInfo
     RESULT
          currentPassword                   Password
```

```
SS-InvocationNotification ::= OPERATION           --Timer m
     ARGUMENT
          ss-InvocationNotificationArg        SS-InvocationNotificationArg
     RESULT
          ss-InvocationNotificationRes        SS-InvocationNotificationRes
          -- optional
     ERRORS {
          DataMissing,
          UnexpectedDataValue,
          UnknownSubscriber}
```

```
RegisterCC-Entry ::= OPERATION                                          --Timer m
     ARGUMENT
          registerCC-EntryArg             RegisterCC-EntryArg
     RESULT
          registerCC-EntryRes             RegisterCC-EntryRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus,
          SS-Incompatibility,
          ShortTermDenial,
          LongTermDenial,
          FacilityNotSupported}
```

```
EraseCC-Entry ::= OPERATION                                             --Timer m
     ARGUMENT
          eraseCC-EntryArg                EraseCC-EntryArg
     RESULT
          eraseCC-EntryRes                EraseCC-EntryRes
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          CallBarred,
          IllegalSS-Operation,
          SS-ErrorStatus}
```

```
END
```

17.6.5 Short message service operations

```
MAP-ShortMessageServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ShortMessageServiceOperations (9)
   version4 (4)}

DEFINITIONS

::=

BEGIN

EXPORTS
   SendRoutingInfoForSM,
   MO-ForwardSM,
   MT-ForwardSM,
   ReportSM-DeliveryStatus,
   AlertServiceCentre,
   InformServiceCentre,
   ReadyForSM
;

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

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   UnidentifiedSubscriber,
   IllegalSubscriber,
   IllegalEquipment,
   TeleserviceNotProvisioned,
   AbsentSubscriber,
   CallBarred,
   SubscriberBusyForMT-SMS,
   SM-DeliveryFailure,
   MessageWaitingListFull,
   AbsentSubscriberSM
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version4 (4)}
```

```
   RoutingInfoForSM-Arg,
   RoutingInfoForSM-Res,
   MO-ForwardSM-Arg,
   MO-ForwardSM-Res,
   MT-ForwardSM-Arg,
   MT-ForwardSM-Res,
   ReportSM-DeliveryStatusArg,
   ReportSM-DeliveryStatusRes,
   AlertServiceCentreArg,
   InformServiceCentreArg,
   ReadyForSM-Arg,
   ReadyForSM-Res
FROM MAP-SM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SM-DataTypes (16) version4 (4)}


;
```

```
SendRoutingInfoForSM ::= OPERATION                                    --Timer m
     ARGUMENT
          routingInfoForSM-Arg            RoutingInfoForSM-Arg
     RESULT
          routingInfoForSM-Res            RoutingInfoForSM-Res
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnknownSubscriber,
          TeleserviceNotProvisioned,
          CallBarred,
          AbsentSubscriberSM}
```

```
MO-ForwardSM ::= OPERATION                                            --Timer ml
     ARGUMENT
          mo-forwardSM-Arg                MO-ForwardSM-Arg
     RESULT
          mo-forwardSM-Res                MO-ForwardSM-Res
               -- optional
     ERRORS {
          SystemFailure,
          UnexpectedDataValue,
          FacilityNotSupported,
          SM-DeliveryFailure}
```

```
MT-ForwardSM ::= OPERATION                                            --Timer ml
     ARGUMENT
          mt-forwardSM-Arg                MT-ForwardSM-Arg
     RESULT
          mt-forwardSM-Res                MT-ForwardSM-Res
               -- optional
     ERRORS {
          SystemFailure,
          DataMissing,
          UnexpectedDataValue,
          FacilityNotSupported,
          UnidentifiedSubscriber,
          IllegalSubscriber,
          IllegalEquipment,
          SubscriberBusyForMT-SMS,
          SM-DeliveryFailure,
          AbsentSubscriberSM}
```

```
ReportSM-DeliveryStatus ::= OPERATION              --Timer s
    ARGUMENT
        reportSM-DeliveryStatusArg      ReportSM-DeliveryStatusArg
    RESULT
        reportSM-DeliveryStatusRes      ReportSM-DeliveryStatusRes
        -- optional
    ERRORS {
        DataMissing,
        UnexpectedDataValue,
        UnknownSubscriber,
        MessageWaitingListFull}
```

```
AlertServiceCentre ::= OPERATION                                    --Timer s
    ARGUMENT
        alertServiceCentreArg           AlertServiceCentreArg
    RESULT
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue}
```

```
InformServiceCentre ::= OPERATION                                   --Timer s
    ARGUMENT
        informServiceCentreArg          InformServiceCentreArg
```

```
ReadyForSM ::= OPERATION                                            --Timer m
    ARGUMENT
        readyForSM-Arg                  ReadyForSM-Arg
    RESULT
    readyForSM-Res                      ReadyForSM-Res
            -- optional
        ERRORS {
        DataMissing,
        UnexpectedDataValue,
        FacilityNotSupported,
        UnknownSubscriber}
```

```
END
```

17.6.6 Errors

```
MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version4 (4)}

DEFINITIONS

::=

BEGIN

EXPORTS

   -- generic errors
   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   IncompatibleTerminal,
   ResourceLimitation,

   -- identification and numbering errors
   UnknownSubscriber,
   NumberChanged,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,

   -- subscription errors
   RoamingNotAllowed,
   IllegalSubscriber,
   IllegalEquipment,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,

   -- handover errors
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,
```

```
   -- operation and maintenance errors
   TracingBufferFull,

   -- call handling errors
   OR-NotAllowed,
   NoRoamingNumberAvailable,
   BusySubscriber,
   NoSubscriberReply,
   AbsentSubscriber,
   CallBarred,
   ForwardingViolation,
   ForwardingFailed,
   CUG-Reject,

   -- any time interrogation errors
   ATI-NotAllowed,

   -- supplementary service errors
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-SubscriptionViolation,
   SS-Incompatibility,
   UnknownAlphabet,
   USSD-Busy,
   PW-RegistrationFailure,
   NegativePW-Check,
   NumberOfPW-AttemptsViolation,
   ShortTermDenial,
   LongTermDenial,

   -- short message service errors
   SubscriberBusyForMT-SMS,
   SM-DeliveryFailure,
   MessageWaitingListFull,
   AbsentSubscriberSM,

   -- Group Call errors
   NoGroupCallNumberAvailable

;

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

   SS-Status
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version4 (4)}

   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   RoamingNotAllowedParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   OR-NotAllowedParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   CallBarredParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   CUG-RejectParam,
   ATI-NotAllowedParam,
```

```
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam

FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version4 (4)}
;


-- generic errors

SystemFailure ::= ERROR
     PARAMETER
          systemFailureParam              SystemFailureParam
          -- optional

DataMissing ::= ERROR
     PARAMETER
          dataMissingParam                DataMissingParam
          -- optional
          -- dataMissingParam must not be used in version <3

UnexpectedDataValue ::= ERROR
     PARAMETER
          unexpectedDataParam             UnexpectedDataParam
          -- optional
          -- unexpectedDataParam must not be used in version <3

FacilityNotSupported ::= ERROR
     PARAMETER
          facilityNotSupParam             FacilityNotSupParam
          -- optional
          -- facilityNotSupParam must not be used in version <3

IncompatibleTerminal ::= ERROR
     PARAMETER
          incompatibleTerminalParam       IncompatibleTerminalParam
          -- optional

ResourceLimitation ::= ERROR
     PARAMETER
          resourceLimitationParam         ResourceLimitationParam
          -- optional

-- identification and numbering errors

UnknownSubscriber ::= ERROR
     PARAMETER
          unknownSubscriberParam          UnknownSubscriberParam
          -- optional
          -- unknownSubscriberParam must not be used in version <3

NumberChanged ::= ERROR
     PARAMETER
          numberChangedParam              NumberChangedParam
          -- optional

UnknownMSC ::= ERROR

UnidentifiedSubscriber ::= ERROR
     PARAMETER
          unidentifiedSubParam            UnidentifiedSubParam
          -- optional
          -- unidentifiedSubParam must not be used in version <3

UnknownEquipment ::= ERROR


-- subscription errors
```

```
RoamingNotAllowed ::= ERROR
     PARAMETER
          roamingNotAllowedParam          RoamingNotAllowedParam
```

```
IllegalSubscriber ::= ERROR
     PARAMETER
          illegalSubscriberParam          IllegalSubscriberParam
          -- optional
          -- illegalSubscriberParam must not be used in version <3
```

```
IllegalEquipment ::= ERROR
     PARAMETER
          illegalEquipmentParam           IllegalEquipmentParam
          -- optional
          -- illegalEquipmentParam must not be used in version <3
```

```
BearerServiceNotProvisioned ::= ERROR
     PARAMETER
          bearerServNotProvParam          BearerServNotProvParam
          -- optional
          -- bearerServNotProvParam must not be used in version <3
```

```
TeleserviceNotProvisioned ::= ERROR
     PARAMETER
          teleservNotProvParam            TeleservNotProvParam
          -- optional
          -- teleservNotProvParam must not be used in version <3
```

```
-- handover errors
```

```
NoHandoverNumberAvailable ::= ERROR
```

```
SubsequentHandoverFailure ::= ERROR
```

```
-- operation and maintenance errors
```

```
TracingBufferFull ::= ERROR
     PARAMETER
          tracingBufferFullParam          TracingBufferFullParam
          -- optional
```

```
-- call handling errors
```

```
NoRoamingNumberAvailable ::= ERROR
     PARAMETER
          noRoamingNbParam                NoRoamingNbParam
          -- optional
```

```
AbsentSubscriber ::= ERROR
     PARAMETER
          absentSubscriberParam           AbsentSubscriberParam
          -- optional
```

```
      -- absentSubscriberParam must not be used in version <3
```

```
BusySubscriber ::= ERROR
     PARAMETER
          busySubscriberParam             BusySubscriberParam
          -- optional
```

```
NoSubscriberReply ::= ERROR
     PARAMETER
          noSubscriberReplyParam          NoSubscriberReplyParam
          -- optional
```

```
CallBarred ::= ERROR
     PARAMETER
          callBarredParam                 CallBarredParam
          -- optional
```

```
ForwardingViolation ::= ERROR
     PARAMETER
          forwardingViolationParam        ForwardingViolationParam
          -- optional
```

```
ForwardingFailed ::= ERROR
     PARAMETER
          forwardingFailedParam          ForwardingFailedParam
          -- optional
```

```
CUG-Reject ::= ERROR
     PARAMETER
          cug-RejectParam                CUG-RejectParam
          -- optional
```

```
OR-NotAllowed ::= ERROR
     PARAMETER
          or-NotAllowedParam             OR-NotAllowedParam
          -- optional
```

```
-- any time interrogation errors
ATI-NotAllowed ::= ERROR
     PARAMETER
          ati-NotAllowedParam            ATI-NotAllowedParam
          -- optional
```

```
-- supplementary service errors
```

```
IllegalSS-Operation ::= ERROR
```

```
SS-ErrorStatus ::= ERROR
     PARAMETER
          ss-Status                      SS-Status
          -- optional
```

```
SS-NotAvailable ::= ERROR
```

```
SS-SubscriptionViolation ::= ERROR
```

```
SS-Incompatibility ::= ERROR
     PARAMETER
          ss-IncompatibilityCause        SS-IncompatibilityCause
          -- optional
```

```
UnknownAlphabet ::= ERROR
```

```
USSD-Busy ::= ERROR
```

```
PW-RegistrationFailure ::= ERROR
     PARAMETER
          pw-RegistrationFailureCause    PW-RegistrationFailureCause
```

```
NegativePW-Check ::= ERROR
```

```
NumberOfPW-AttemptsViolation ::= ERROR
```

```
ShortTermDenial ::= ERROR
     PARAMETER
          shortTermDenialParam                ShortTermDenialParam
          -- optional
```

```
LongTermDenial ::= ERROR
     PARAMETER
          longTermDenialParam                 LongTermDenialParam
          -- optional
```

```
-- short message service errors
```

```
SubscriberBusyForMT-SMS ::= ERROR
     PARAMETER
          subBusyForMT-SMS-Param         SubBusyForMT-SMS-Param
          -- optional
```

```
SM-DeliveryFailure ::= ERROR
     PARAMETER
          sm-DeliveryFailureCause        SM-DeliveryFailureCause
```

```
MessageWaitingListFull ::= ERROR
    PARAMETER
        messageWaitListFullParam        MessageWaitListFullParam
        -- optional
```

```
AbsentSubscriberSM ::= ERROR
    PARAMETER
        absentSubscriberSM-Param        AbsentSubscriberSM-Param
        -- optional
```

```
-- Group Call errors
```

```
NoGroupCallNumberAvailable ::= ERROR
    PARAMETER
        noGroupCallNbParam              NoGroupCallNbParam
        -- optional
```

```
END
```

17.6.7 Group Call operations

```
MAP-Group-Call-Operations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Group-Call-Operations (22)
   version4 (4)}

DEFINITIONS

::=

BEGIN

EXPORTS
   PrepareGroupCall,
   SendGroupCallEndSignal,
   ForwardGroupCallSignalling,
   ProcessGroupCallSignalling
;

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

   SystemFailure,
   UnexpectedDataValue,
   NoGroupCallNumberAvailable
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version4 (4)}

   PrepareGroupCallArg,
   PrepareGroupCallRes,
   SendGroupCallEndSignalArg,
   SendGroupCallEndSignalRes,
   ForwardGroupCallSignallingArg,
   ProcessGroupCallSignallingArg
FROM MAP-GR-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-GR-DataTypes (23) version4 (4)}



;
```

```
PrepareGroupCall ::= OPERATION                                          --Timer m
    ARGUMENT
        prepareGroupCallArg             PrepareGroupCallArg
    RESULT
        prepareGroupCallRes             PrepareGroupCallRes
    ERRORS {
        SystemFailure,
        NoGroupCallNumberAvailable,
        UnexpectedDataValue}
```

```
SendGroupCallEndSignal ::= OPERATION                                    --Timer l
    ARGUMENT
        sendGroupCallEndSignalArg       SendGroupCallEndSignalArg
    RESULT
        sendGroupCallEndSignalRes       SendGroupCallEndSignalRes
```

```
ProcessGroupCallSignalling ::= OPERATION          --Timer s
    ARGUMENT
        processGroupCallSignallingArg   ProcessGroupCallSignallingArg
```

```
ForwardGroupCallSignalling ::= OPERATION          --Timer s
    ARGUMENT
        forwardGroupCallSignallingArg   ForwardGroupCallSignallingArg
```

```
END
```

17.7 MAP constants and data types

17.7.1 Mobile Service data types

```
MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version4 (4)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- location registration types
   UpdateLocationArg,
   UpdateLocationRes,
   CancelLocationArg,
   CancelLocationRes,
   PurgeMS-Arg,
   PurgeMS-Res,
   SendIdentificationRes,
   UpdateGprsLocationArg,
   UpdateGprsLocationRes,



   -- handover types
   PrepareHO-Arg,
   PrepareHO-Res,
   PrepareSubsequentHO-Arg,

   -- authentication management types
   SendAuthenticationInfoArg,
   SendAuthenticationInfoRes,

   -- security management types
   EquipmentStatus,
   Kc,

   -- subscriber management types
   InsertSubscriberDataArg,
   InsertSubscriberDataRes,
   DeleteSubscriberDataArg,
   DeleteSubscriberDataRes,
   SubscriberData,
   ODB-Data,
   SubscriberStatus,
   ZoneCodeList,
   maxNumOfZoneCodes,
   O-CSI,
   O-BcsmCamelTDPCriteriaList,
   SS-CSI,
   ServiceKey,
   DefaultCallHandling,
```

```
   CamelCapabilityHandling,
   BasicServiceCriteria,
   SupportedCamelPhases,
   maxNumOfCamelTDPData,
   CUG-Index,
   CUG-Interlock,
   InterCUG-Restrictions,
   IntraCUG-Options,

   -- fault recovery types
   ResetArg,
   RestoreDataArg,
   RestoreDataRes,

   -- subscriber information enquiry types
   ProvideSubscriberInfoArg,
   ProvideSubscriberInfoRes,
   SubscriberInfo,
   LocationInformation,
   SubscriberState,

   -- any time information enquiry types
   AnyTimeInterrogationArg,
   AnyTimeInterrogationRes,

   -- gprs location information retrieval types
   SendRoutingInfoForGprsArg,
   SendRoutingInfoForGprsRes,

   -- failure reporting types
   FailureReportArg,
   FailureReportRes,

   -- gprs notification types
   NoteMsPresentForGprsArg,
   NoteMsPresentForGprsRes


;

IMPORTS
   maxNumOfSS,
   SS-SubscriptionOption,
   SS-List
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version4 (4)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version4 (4)}

   Ext-BearerServiceCode
FROM MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version4 (4)}

   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version4 (4)}


   ISDN-AddressString,
   maxISDN-AddressLength,
   ISDN-SubaddressString,
   ExternalSignalInfo,
   IMSI,
   HLR-List,
   LMSI,
   GlobalCellId,
   CellIdOrLAI,
   Ext-BasicServiceCode,
   NAEA-PreferredCI,
   EMLPP-Info


FROM MAP-CommonDataTypes {
```

```
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}

   AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version4 (4)}


;


-- location registration types
```

```
UpdateLocationArg ::= SEQUENCE {
    imsi                            IMSI,

    msc-Number                      [1] ISDN-AddressString,
    vlr-Number                      ISDN-AddressString,
    lmsi                            [10] LMSI OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ... ,
    vlr-Capability                  [6] VLR-Capability              OPTIONAL }
```

```
VLR-Capability ::= SEQUENCE{
    supportedCamelPhases            [0] SupportedCamelPhases        OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    … }
```

```
UpdateLocationRes ::= SEQUENCE {
    hlr-Number                      ISDN-AddressString,

    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
CancelLocationArg ::= [3] SEQUENCE {
    identity                        Identity,
    cancellationType                CancellationType                OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
Identity ::= CHOICE {
    imsi                            IMSI,
    imsi-WithLMSI                   IMSI-WithLMSI}
```

```
CancellationType ::= ENUMERATED {
    updateProcedure                 (0),
    subscriptionWithdraw            (1),
    ...}
    -- The HLR shall not send values other than listed above
```

```
CancelLocationRes ::= SEQUENCE {
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
PurgeMS-Arg ::= [3] SEQUENCE {
    imsi                            IMSI,
    vlr-Number                      [0] ISDN-AddressString          OPTIONAL,
    sgsn-Number                     [1]  ISDN-AddressString         OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
PurgeMS-Res ::= SEQUENCE {
    freezeTMSI                      [0]  NULL                       OPTIONAL,
    freezeP-TMSI                    [1]  NULL                       OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
IMSI-WithLMSI ::= SEQUENCE {
    imsi                                IMSI,
    lmsi                                LMSI,
    -- a special value 00000000 indicates that the LMSI is not in use
    ...}
```

```
SendIdentificationRes ::= SEQUENCE {
    imsi                                IMSI,
    authenticationSetList               AuthenticationSetList           OPTIONAL,
    ...}
```

```
AuthenticationSetList ::= SEQUENCE SIZE (1..5) OF
                                        AuthenticationSet
```

```
AuthenticationSet ::= SEQUENCE {
    rand                                RAND,
    sres                                SRES,
    kc                                  Kc,
    ...}
```

```
RAND ::= OCTET STRING (SIZE (16))
```

```
SRES ::= OCTET STRING (SIZE (4))
```

```
Kc ::= OCTET STRING (SIZE (8))
```

-- gprs location registration types

```
UpdateGprsLocationArg ::= SEQUENCE {
    imsi                                IMSI,
    sgsn-Number                         ISDN-AddressString,
    sgsn-Address                        GSN-Address,
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ...}
```

```
GSN-Address ::= OCTET STRING (SIZE (5..17))
    -- Octets are coded according to TS GSM 03.03
```

```
UpdateGprsLocationRes ::= SEQUENCE {
    hlr-Number                          ISDN-AddressString,
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ...}
```

-- handover types

```
PrepareHO-Arg ::= SEQUENCE {
    targetCellId                        GlobalCellId                    OPTIONAL,
    ho-NumberNotRequired                NULL                            OPTIONAL,
    bss-APDU                            ExternalSignalInfo              OPTIONAL,
    ...}
```

```
PrepareHO-Res ::= SEQUENCE {
    handoverNumber                      ISDN-AddressString              OPTIONAL,
    bss-APDU                            ExternalSignalInfo              OPTIONAL,
    ...}
```

```
PrepareSubsequentHO-Arg ::= SEQUENCE {
    targetCellId                        GlobalCellId,
    targetMSC-Number                    ISDN-AddressString,
    bss-APDU                            ExternalSignalInfo,
    ...}
```

-- authentication management types

```
SendAuthenticationInfoArg ::= IMSI
```

```
SendAuthenticationInfoRes ::= AuthenticationSetList
```

-- security management types

```
EquipmentStatus ::= ENUMERATED {
    whiteListed  (0),
    blackListed  (1),
    greyListed  (2)}
```

```
-- subscriber management types

InsertSubscriberDataArg ::= SEQUENCE {
     imsi                                [0] IMSI                                OPTIONAL,
     COMPONENTS OF                       SubscriberData,
     extensionContainer                  [14] ExtensionContainer                 OPTIONAL,
     ... ,
     naea-PreferredCI                    [15] NAEA-PreferredCI                   OPTIONAL,
     -- naea-PreferredCI is included at the discretion of the HLR operator.
     gprsSubscriptionData                [16] GPRSSubscriptionData               OPTIONAL,
     roamingRestrictedInSgsnDueToUnsupportedFeature [23]                         NULL
     OPTIONAL,
     networkAccessMode                   [24] NetworkAccessMode                  OPTIONAL
      }
     -- If the Network Access Mode parameter is sent, it shall be present only in
     -- the first sequence if the segmentation is used

NetworkAccessMode ::= ENUMERATED {
     bothMSCAndSGSN                      (0),
     onlyMSC                             (1),
     onlySGSN                            (2),
     ...}
     -- if unknown values are received in NetworkAccessMode
     -- they shall be discarded.

GPRSDataList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                         PDP-Context

maxNumOfPDP-Contexts  INTEGER ::= 50

PDP-Context ::= SEQUENCE {
     pdp-ContextId                       ContextId,
     pdp-Type                            [16] PDP-Type,
     pdp-Address                         [17] PDP-Address                        OPTIONAL,
     qos-Subscribed                      [18] QoS-Subscribed,
     vplmnAddressAllowed                 [19] NULL OPTIONAL,
     apn                                 [20] APN  ,
     extensionContainer                  [21] ExtensionContainer                 OPTIONAL,
     ...}

ContextId ::= INTEGER (1..maxNumOfPDP-Contexts)

GPRSSubscriptionData ::= SEQUENCE {
     completeDataListIncluded            NULL                                    OPTIONAL,

          -- If segmentation is used, completeDataListIncluded may only be present in the
          -- first segment.
     gprsDataList                        [1]  GPRSDataList,
     extensionContainer                  [2] ExtensionContainer                  OPTIONAL,
     ...}

APN ::=  OCTET STRING (SIZE (2..63))
          -- Octets are coded according to TS GSM 03.03

PDP-Type ::= OCTET STRING (SIZE (2))
-- Octets are coded according to TS GSM 09.60

PDP-Address ::= OCTET STRING (SIZE (1..16))
-- Octets are coded according to TS GSM 09.60

-- The possible size values are:
-- 1-7 octets  X.25 address type
--  4  octets  IPv4 address type
-- 16  octets  Ipv6 address type

QoS-Subscribed ::= OCTET STRING (SIZE (3))
     -- Octets are coded according to TS GSM 04.08.
```

```
SubscriberData ::= SEQUENCE {
    msisdn                              [1] ISDN-AddressString            OPTIONAL,
    category                            [2] Category                      OPTIONAL,
    subscriberStatus                    [3] SubscriberStatus              OPTIONAL,
    bearerServiceList                   [4] BearerServiceList             OPTIONAL,
    -- The exception handling for reception of unsupported / not allocated
    -- bearerServiceCodes is defined in section 6.8.1
    teleserviceList                     [6] TeleserviceList               OPTIONAL,
    -- The exception handling for reception of unsupported / not allocated
    -- teleserviceCodes is defined in section 6.8.1
    provisionedSS                       [7] Ext-SS-InfoList               OPTIONAL,
    odb-Data                            [8] ODB-Data                      OPTIONAL,
    roamingRestrictionDueToUnsupportedFeature  [9] NULL                   OPTIONAL,
    regionalSubscriptionData            [10] ZoneCodeList                 OPTIONAL,
    vbsSubscriptionData                 [11] VBSDataList                  OPTIONAL,
    vgcsSubscriptionData                [12] VGCSDataList                 OPTIONAL,
    vlrCamelSubscriptionInfo            [13] VlrCamelSubscriptionInfo     OPTIONAL
    }
```

```
Category ::= OCTET STRING (SIZE (1))
    -- The internal structure is defined in CCITT Rec Q.763.
```

```
SubscriberStatus ::= ENUMERATED {
    serviceGranted  (0),
    operatorDeterminedBarring  (1)}
```

```
BearerServiceList ::= SEQUENCE SIZE (1..maxNumOfBearerServices) OF
                                    Ext-BearerServiceCode
```

```
maxNumOfBearerServices  INTEGER ::= 50
```

```
TeleserviceList ::= SEQUENCE SIZE (1..maxNumOfTeleservices) OF
                                    Ext-TeleserviceCode
```

```
maxNumOfTeleservices  INTEGER ::= 20
```

```
ODB-Data ::= SEQUENCE {
    odb-GeneralData                 ODB-GeneralData,
    odb-HPLMN-Data                  ODB-HPLMN-Data                  OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
ODB-GeneralData ::= BIT STRING {
    allOG-CallsBarred  (0),
    internationalOGCallsBarred  (1),
    internationalOGCallsNotToHPLMN-CountryBarred  (2),
    interzonalOGCallsBarred (6),
    interzonalOGCallsNotToHPLMN-CountryBarred (7),
    interzonalOGCallsAndInternationalOGCallsNotToHPLMN-CountryBarred (8),
    premiumRateInformationOGCallsBarred  (3),
    premiumRateEntertainementOGCallsBarred  (4),
    ss-AccessBarred  (5),
    allECT-Barred (9),
    chargeableECT-Barred (10),
    internationalECT-Barred (11),
    interzonalECT-Barred (12),
    doublyChargeableECT-Barred (13),
    multipleECT-Barred (14)} (SIZE (15..32))
    -- exception handling: reception of unknown bit assignments in the
    -- ODB-GeneralData type shall be treated like unsupported ODB-GeneralData
```

```
ODB-HPLMN-Data ::= BIT STRING {
    plmn-SpecificBarringType1  (0),
    plmn-SpecificBarringType2  (1),
    plmn-SpecificBarringType3  (2),
    plmn-SpecificBarringType4  (3)} (SIZE (4..32))
    -- exception handling: reception of unknown bit assignments in the
    -- ODB-HPLMN-Data type shall be treated like unsupported ODB-HPLMN-Data
```

```
Ext-SS-InfoList ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                                    Ext-SS-Info
```

```
Ext-SS-Info ::= CHOICE {
     forwardingInfo                    [0] Ext-ForwInfo,
     callBarringInfo                   [1] Ext-CallBarInfo,
     cug-Info                          [2] CUG-Info,
     ss-Data                           [3] Ext-SS-Data,
     emlpp-Info                        [4] EMLPP-Info}
```

```
Ext-ForwInfo ::= SEQUENCE {
     ss-Code                           SS-Code,
     forwardingFeatureList             Ext-ForwFeatureList,
     extensionContainer                [0] ExtensionContainer          OPTIONAL,
     ...}
```

```
Ext-ForwFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                       Ext-ForwFeature
```

```
Ext-ForwFeature ::= SEQUENCE {
     basicService                      Ext-BasicServiceCode            OPTIONAL,
     ss-Status [4] Ext-SS-Status,
     forwardedToNumber                 [5] ISDN-AddressString          OPTIONAL,
     -- When this data type is sent from an HLR which supports CAMEL Phase 2
     -- to a VLR that supports CAMEL Phase 2 the VLR shall not check the
     -- format of the number
     forwardedToSubaddress             [8] ISDN-SubaddressString       OPTIONAL,
     forwardingOptions                 [6] Ext-ForwOptions             OPTIONAL,
     noReplyConditionTime              [7] Ext-NoRepCondTime           OPTIONAL,
     extensionContainer                [9] ExtensionContainer          OPTIONAL,
     ...}
```

```
Ext-SS-Status ::= OCTET STRING (SIZE (1..5))

     -- OCTET 1:
     --
     -- bits 8765: 0000 (unused)
     -- bits 4321: Used to convey the "P bit","R bit","A bit" and "Q bit",
     --            representing supplementary service state information
     --            as defined in TS GSM 03.11

     -- bit 4: "Q bit"

     -- bit 3: "P bit"

     -- bit 2: "R bit"

     -- bit 1: "A bit"

     -- OCTETS 2-5: reserved for future use. They shall be discarded if
     -- received and not understood.
```

```
Ext-ForwOptions ::= OCTET STRING (SIZE (1..5))

     -- OCTET 1:

     --  bit 8: notification to forwarding party
     --   0  no notification
     --   1  notification

     --  bit 7: 0 (unused)

     --  bit 6: notification to calling party
     --   0  no notification
     --   1  notification

     --  bit 5: 0 (unused)

     --  bits 43: forwarding reason
     --   00  ms not reachable
     --   01  ms busy
     --   10  no reply
     --   11  unconditional

     -- bits 21: 00 (unused)

     -- OCTETS 2-5: reserved for future use. They shall be discarded if
     -- received and not understood.
```

```
Ext-NoRepCondTime ::= INTEGER (1..100)
    -- Only values 5-30 are used.
    -- Values in the ranges 1-4 and 31-100 are reserved for future use
    -- If received:
    --       values 1-4 shall be mapped on to value 5
    --       values 31-100 shall be mapped on to value 30
```

```
Ext-CallBarInfo ::= SEQUENCE {
    ss-Code                         SS-Code,
    callBarringFeatureList          Ext-CallBarFeatureList,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
Ext-CallBarFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                    Ext-CallBarringFeature
```

```
Ext-CallBarringFeature ::= SEQUENCE {
    basicService                    Ext-BasicServiceCode            OPTIONAL,
    ss-Status [4] Ext-SS-Status,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
CUG-Info ::= SEQUENCE {
    cug-SubscriptionList            CUG-SubscriptionList,
    cug-FeatureList                 CUG-FeatureList                 OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
CUG-SubscriptionList ::= SEQUENCE SIZE (0..maxNumOfCUG) OF
                                    CUG-Subscription
```

```
CUG-Subscription ::= SEQUENCE {
    cug-Index CUG-Index,
    cug-Interlock                   CUG-Interlock,
    intraCUG-Options                IntraCUG-Options,
    basicServiceGroupList           Ext-BasicServiceGroupList       OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
CUG-Index ::= INTEGER (0..32767)
    -- The internal structure is defined in ETS 300 138.
```

```
CUG-Interlock ::= OCTET STRING (SIZE (4))
```

```
IntraCUG-Options ::= ENUMERATED {
    noCUG-Restrictions  (0),
    cugIC-CallBarred  (1),
    cugOG-CallBarred  (2)}
```

```
maxNumOfCUG  INTEGER ::= 10
```

```
CUG-FeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                    CUG-Feature
```

```
Ext-BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups)          OF
                                    Ext-BasicServiceCode
```

```
maxNumOfExt-BasicServiceGroups  INTEGER ::= 32
```

```
CUG-Feature ::= SEQUENCE {
    basicService                    Ext-BasicServiceCode            OPTIONAL,
    preferentialCUG-Indicator       CUG-Index OPTIONAL,
    interCUG-Restrictions           InterCUG-Restrictions,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
InterCUG-Restrictions ::= OCTET STRING (SIZE (1))

     -- bits 876543: 000000 (unused)
     -- Exception handling:
     -- bits 876543 shall be ignored if received and not understood

     -- bits 21
     --   00  CUG only facilities
     --   01  CUG with outgoing access
     --   10  CUG with incoming access
     --   11  CUG with both outgoing and incoming access
```

```
Ext-SS-Data ::= SEQUENCE {
     ss-Code                         SS-Code,
     ss-Status [4] Ext-SS-Status,
     ss-SubscriptionOption           SS-SubscriptionOption           OPTIONAL,
     basicServiceGroupList           Ext-BasicServiceGroupList       OPTIONAL,
     extensionContainer              [5] ExtensionContainer          OPTIONAL,
     ...}
```

```
ZoneCodeList ::= SEQUENCE SIZE (1..maxNumOfZoneCodes)
                                     OF ZoneCode
```

```
ZoneCode ::= OCTET STRING (SIZE (2))
     -- internal structure is defined in TS GSM 03.03
```

```
maxNumOfZoneCodes  INTEGER ::= 10
```

```
InsertSubscriberDataRes ::= SEQUENCE {
     teleserviceList                 [1] TeleserviceList             OPTIONAL,
     bearerServiceList               [2] BearerServiceList           OPTIONAL,
     ss-List                         [3] SS-List                     OPTIONAL,
     odb-GeneralData                 [4] ODB-GeneralData             OPTIONAL,
     regionalSubscriptionResponse    [5]
               RegionalSubscriptionResponse       OPTIONAL,
     supportedCamelPhases            [6] SupportedCamelPhases        OPTIONAL,
     extensionContainer              [7] ExtensionContainer          OPTIONAL,
     ...}
```

```
RegionalSubscriptionResponse ::= ENUMERATED {
     networkNode-AreaRestricted      (0),
     tooManyZoneCodes                (1),
     zoneCodesConflict               (2),
     regionalSubscNotSupported       (3)}
```

```
DeleteSubscriberDataArg ::= SEQUENCE {
     imsi                            [0] IMSI,
     basicServiceList                [1] BasicServiceList            OPTIONAL,
     -- The exception handling for reception of unsupported/not allocated
     -- basicServiceCodes is defined in section 6.8.2
     ss-List                         [2] SS-List                     OPTIONAL,
     roamingRestrictionDueToUnsupportedFeature [4] NULL              OPTIONAL,
     regionalSubscriptionIdentifier  [5] ZoneCode                    OPTIONAL,
     vbsGroupIndication              [7] NULL                        OPTIONAL,
     vgcsGroupIndication             [8] NULL   OPTIONAL,
     camelSubscriptionInfoWithdraw   [9] NULL   OPTIONAL,
     extensionContainer              [6] ExtensionContainer OPTIONAL,
     ...,
     gprsSubscriptionDataWithdraw    [10] GPRSSubscriptionDataWithdraw OPTIONAL,
     roamingRestrictedInSgsnDueToUnsuppportedFeature [11] NULL       OPTIONAL}
```

```
GPRSSubscriptionDataWithdraw ::= CHOICE {
     allGPRSData                     NULL,
     contextIdList                   ContextIdList}
```

```
ContextIdList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                     ContextId
```

```
BasicServiceList ::= SEQUENCE SIZE (1..maxNumOfBasicServices) OF
                                     Ext-BasicServiceCode
```

```
maxNumOfBasicServices  INTEGER ::= 70
```

```
DeleteSubscriberDataRes ::= SEQUENCE {
     regionalSubscriptionResponse         [0]
                                          RegionalSubscriptionResponse      OPTIONAL,
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}
```

```
VlrCamelSubscriptionInfo ::= SEQUENCE {
     o-CSI                                [0] O-CSI OPTIONAL,
     extensionContainer                   [1] ExtensionContainer            OPTIONAL,
     ...,
     ss-CSI                               [2]  SS-CSI                       OPTIONAL,
     o-BcsmCamelTDP-CriteriaList          [4]  O-BcsmCamelTDPCriteriaList   OPTIONAL
     }
```

```
SS-CSI ::= SEQUENCE {
     ss-CamelData                         SS-CamelData,
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}
```

```
SS-CamelData  ::= SEQUENCE {
     ss-EventList                         SS-EventList,
     gsmSCF-Address                       ISDN-AddressString,
     extensionContainer                   [0] ExtensionContainer            OPTIONAL,
     ...
     }
```

```
SS-EventList  ::= SEQUENCE SIZE (1..maxNumOfCamelSSEvents) OF SS-Code
     -- Actions for the following SS-Code values are defined in CAMEL Phase 2:
     -- ect                               SS-Code ::= '00110001'B
     -- multiPTY                          SS-Code ::= '01010001'B
     -- cd                                SS-Code ::= '00100100'B
     -- all other SS codes shall be ignored
```

```
maxNumOfCamelSSEvents INTEGER ::= 10
```

```
O-CSI ::= SEQUENCE {
     o-BcsmCamelTDPDataList               O-BcsmCamelTDPDataList,
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...,
     camelCapabilityHandling              [0] CamelCapabilityHandling       OPTIONAL
     }
```

```
O-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDPData
--- O-BcsmCamelTDPDataList shall not contain more than one instance of O-BcsmCamelTDPData
--- containing the same value for o-BcsmTriggerDetectionPoint.
--- For CAMEL Phase 2, this means that only one instance of O-BcsmCamelTDPData is allowed
--- with o-BcsmTriggerDetectionPoint being equal to DP2.
```

```
maxNumOfCamelTDPData  INTEGER ::= 10
```

```
O-BcsmCamelTDPData ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint          O-BcsmTriggerDetectionPoint,
     serviceKey                           ServiceKey,
     gsmSCF-Address                       [0] ISDN-AddressString,
     defaultCallHandling                  [1] DefaultCallHandling,
     extensionContainer                   [2] ExtensionContainer            OPTIONAL,
     ...
     }
```

```
ServiceKey ::= INTEGER (0..2147483647)
```

```
O-BcsmTriggerDetectionPoint ::= ENUMERATED {
     collectedInfo (2),
     ... }
-- exception handling:
-- For O-BcsmCamelTDPData sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- O-BcsmCamelTDPData sequence.
-- For O-BcsmCamelTDP-Criteria sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- O-BcsmCamelTDP-Criteria sequence.
```

```
O-BcsmCamelTDPCriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDP-Criteria
```

```
O-BcsmCamelTDP-Criteria ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint          O-BcsmTriggerDetectionPoint,
     destinationNumberCriteria            [0] DestinationNumberCriteria     OPTIONAL,
     basicServiceCriteria                 [1] BasicServiceCriteria          OPTIONAL,
     callTypeCriteria                     [2] CallTypeCriteria              OPTIONAL,
     ... }
```

```
DestinationNumberCriteria  ::= SEQUENCE {
     matchType                            [0] MatchType,
     destinationNumberList                [1] DestinationNumberList         OPTIONAL,
     destinationNumberLengthList          [2] DestinationNumberLengthList   OPTIONAL,
     -- one or both of destinationNumberList and destinationNumberLengthList
     -- shall be present
     ... }
```

```
DestinationNumberList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumbers) OF
                                         ISDN-AddressString
-- The receiving entity shall not check the format of a number in
-- the dialled number list
```

```
DestinationNumberLengthList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumberLengths) OF
                                              INTEGER(1..maxNumOfISDN-AddressDigits)
```

```
BasicServiceCriteria   ::= SEQUENCE SIZE(1..maxNumOfCamelBasicServiceCriteria) OF
     Ext-BasicServiceCode
```

```
maxNumOfISDN-AddressDigits  INTEGER ::= 15
```

```
maxNumOfCamelDestinationNumbers  INTEGER ::= 10
```

```
maxNumOfCamelDestinationNumberLengths  INTEGER ::= 3
```

```
maxNumOfCamelBasicServiceCriteria  INTEGER ::= 5
```

```
CallTypeCriteria       ::= ENUMERATED {
     forwarded                            (0),
     notForwarded                         (1)}
```

```
MatchType       ::= ENUMERATED {
     inhibiting                           (0),
     enabling                             (1)}
```

```
DefaultCallHandling ::= ENUMERATED {
     continueCall (0) ,
     releaseCall (1) ,
     ...}
-- exception handling:
-- reception of values in range 2-31 shall be treated as "continueCall"
-- reception of values greater than 31 shall be treated as "releaseCall"
```

```
CamelCapabilityHandling ::= INTEGER(1..16)
-- value 1 = CAMEL phase 1,
-- value 2 = CAMEL phase 2:
-- reception of values greater than 2 shall be treated as CAMEL phase 2
```

```
SupportedCamelPhases ::= BIT STRING {
     phase1 (0),
     phase2 (1) } (SIZE (1..16))
```

-- gprs location information retrieval types

```
SendRoutingInfoForGprsArg ::= SEQUENCE {
     imsi                                 [0] IMSI,
     ggsn-Address                         [1] GSN-Address              OPTIONAL,
     ggsn-Number                          [2] ISDN-AddressString,
     extensionContainer                   [3] ExtensionContainer       OPTIONAL,
     ...}
```

```
SendRoutingInfoForGprsRes ::= SEQUENCE {
     sgsn-Address                          [0] GSN-Address,
     ggsn-Address                          [1]  GSN-Address              OPTIONAL,
     mobileNotReachableReason              [2]  AbsentSubscriberDiagnosticSM    OPTIONAL,
     extensionContainer                    [3] ExtensionContainer        OPTIONAL,
     ...}
```

-- failure report types

```
FailureReportArg ::= SEQUENCE {
     imsi                                  [0] IMSI,
     ggsn-Number                           [1] ISDN-AddressString        ,
     ggsn-Address                          [2] GSN-Address               OPTIONAL,
     extensionContainer                    [3] ExtensionContainer        OPTIONAL,
     ...}
```

```
FailureReportRes ::= SEQUENCE {
     ggsn-Address                          [0] GSN-Address               OPTIONAL,
     extensionContainer                    [1] ExtensionContainer        OPTIONAL,
     ...}
```

-- gprs notification types

```
NoteMsPresentForGprsArg ::= SEQUENCE {
     imsi                                  [0] IMSI,
     sgsn-Address                          [1] GSN-Address,
     ggsn-Address                          [2] GSN-Address               OPTIONAL,
     extensionContainer                    [3] ExtensionContainer        OPTIONAL,
     ...}
```

```
NoteMsPresentForGprsRes ::= SEQUENCE {
     extensionContainer                    [0] ExtensionContainer        OPTIONAL,
     ...}
```

-- fault recovery types

```
ResetArg ::= SEQUENCE {
     hlr-Number                            ISDN-AddressString,
     hlr-List                              HLR-List                      OPTIONAL,
     ...}
```

```
RestoreDataArg ::= SEQUENCE {
     imsi                                  IMSI,
     lmsi                                  LMSI                          OPTIONAL,
     extensionContainer                    ExtensionContainer            OPTIONAL,
     ... ,
     vlr-Capability                        [6] VLR-Capability            OPTIONAL }
```

```
RestoreDataRes ::= SEQUENCE {
     hlr-Number                            ISDN-AddressString,
     msNotReachable                        NULL                          OPTIONAL,
     extensionContainer                    ExtensionContainer            OPTIONAL,
     ...}
```

-- VBS/VGCS types

```
VBSDataList ::= SEQUENCE SIZE (1..maxNumOfVBSGroupIds) OF
                                           VoiceBroadcastData
```

```
VGCSDataList ::= SEQUENCE SIZE (1..maxNumOfVGCSGroupIds) OF
                                           VoiceGroupCallData
```

```
maxNumOfVBSGroupIds  INTEGER ::= 50
```

```
maxNumOfVGCSGroupIds  INTEGER ::= 50
```

```
VoiceGroupCallData  ::= SEQUENCE {
     groupId                               GroupId,
     extensionContainer                    ExtensionContainer            OPTIONAL,
     ...}
```

```
VoiceBroadcastData ::= SEQUENCE {
     groupid                               GroupId,
     broadcastInitEntitlement              NULL                          OPTIONAL,
     extensionContainer                    ExtensionContainer            OPTIONAL,
     ...}
```

```
GroupId  ::= OCTET STRING (SIZE (3))
     -- Refers to the Group Identification as specified in GSM TS 03.03
     -- and 03.68/ 03.69
```

-- provide subscriber info types

```
ProvideSubscriberInfoArg ::= SEQUENCE {
     imsi     [0] IMSI,
     lmsi     [1] LMSI                  OPTIONAL,
     requestedInfo                      [2] RequestedInfo,
     extensionContainer                 [3] ExtensionContainer          OPTIONAL,
     ...}
```

```
ProvideSubscriberInfoRes ::= SEQUENCE {
     subscriberInfo                     SubscriberInfo,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}
```

```
SubscriberInfo ::= SEQUENCE {
     locationInformation                [0] LocationInformation         OPTIONAL,
     subscriberState                    [1] SubscriberState             OPTIONAL,
     extensionContainer                 [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
RequestedInfo ::= SEQUENCE {
     locationInformation                [0] NULL                        OPTIONAL,
     subscriberState                    [1] NULL                        OPTIONAL,
     extensionContainer                 [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
LocationInformation ::= SEQUENCE {
     ageOfLocationInformation           AgeOfLocationInformation        OPTIONAL,
     geographicalInformation            [0] GeographicalInformation     OPTIONAL,
     vlr-number                         [1] ISDN-AddressString          OPTIONAL,
     locationNumber                     [2] LocationNumber              OPTIONAL,
     cellIdOrLAI                        [3] CellIdOrLAI                 OPTIONAL,
     extensionContainer                 [4] ExtensionContainer          OPTIONAL,
     ...}
```

```
AgeOfLocationInformation ::= INTEGER (0..32767)
-- the value represents the elapsed time in minutes since the last
-- network contact of the mobile station (i.e. the actuality of the
-- location information).
-- value “0” indicates that the MS is currently in contact with the
--           network
-- value “32767” indicates that the location information is at least
--               32767 minutes old
```

```
GeographicalInformation ::= OCTET STRING (SIZE (8))
-- Refers to geographical Information defined in GSM 03.32.
-- Only the description of an ellipsoid point with uncertainty circle
--as specified in GSM 03.32 is allowed to be used
-- The internal structure according to GSM 03.32 is as follows:
--       Type of shape (ellipsoid point with uncertainty circle)          1 octet
--       Degrees of Latitude                                              3 octets
--       Degrees of Longitude                                             3 octets
--       Uncertainty code                                                 1 octet
```

```
LocationNumber ::= OCTET STRING (SIZE (2..10))
     -- the internal structure is defined in CCITT Rec Q.763
```

```
SubscriberState ::= CHOICE {
     assumedIdle                        [0] NULL,
     camelBusy [1] NULL,
     netDetNotReachable                 NotReachableReason,
     notProvidedFromVLR                 [2] NULL}
```

```
NotReachableReason ::= ENUMERATED {
     msPurged (0),
     imsiDetached (1),
     restrictedArea (2),
     notRegistered (3)}
```

-- any time interrogation info types

```
AnyTimeInterrogationArg ::= SEQUENCE {
     subscriberIdentity                  [0] SubscriberIdentity,
     requestedInfo                       [1] RequestedInfo,
     gsmSCF-Address                      [3] ISDN-AddressString,
     extensionContainer                  [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
AnyTimeInterrogationRes ::= SEQUENCE {
     subscriberInfo                      SubscriberInfo,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
SubscriberIdentity ::= CHOICE {
     imsi      [0] IMSI,
     msisdn                              [1] ISDN-AddressString
     }
```

```
END
```

17.7.2 Operation and maintenance data types

```
MAP-OM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-OM-DataTypes (12) version4 (4)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   ActivateTraceModeArg,
   ActivateTraceModeRes,
   DeactivateTraceModeArg,
   DeactivateTraceModeRes
;

IMPORTS
   AddressString,
   IMSI
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}


;
```

```
ActivateTraceModeArg ::= SEQUENCE {
     imsi                                [0] IMSI                        OPTIONAL,
     traceReference                      [1] TraceReference,
     traceType [2] TraceType,
     omc-Id                              [3] AddressString               OPTIONAL,
     extensionContainer                  [4] ExtensionContainer          OPTIONAL,
     ...}
```

```
TraceReference ::= OCTET STRING (SIZE (1..2))
```

```
TraceType ::= INTEGER
     (0..255)
     -- Trace types are fully defined in TS GSM 12.08.
```

```
ActivateTraceModeRes ::= SEQUENCE {
     extensionContainer                  [0] ExtensionContainer          OPTIONAL,
     ...}
```

```
DeactivateTraceModeArg ::= SEQUENCE {
    imsi                              [0] IMSI                          OPTIONAL,
    traceReference                    [1] TraceReference,
    extensionContainer                [2] ExtensionContainer            OPTIONAL,
    ...}
```

```
DeactivateTraceModeRes ::= SEQUENCE {
    extensionContainer                [0] ExtensionContainer            OPTIONAL,
    ...}
```

```
END
```

17.7.3 Call handling data types

```
MAP-CH-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CH-DataTypes (13) version4 (4)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   SendRoutingInfoArg,
   SendRoutingInfoRes,
   ProvideRoamingNumberArg,
   ProvideRoamingNumberRes,
   ResumeCallHandlingArg,
   ResumeCallHandlingRes,
   NumberOfForwarding,
   SuppressionOfAnnouncement,
   CallReferenceNumber,
   ProvideSIWFSNumberArg,
   ProvideSIWFSNumberRes,
   SIWFSSignallingModifyArg,
   SIWFSSignallingModifyRes,
   SetReportingStateArg,
   SetReportingStateRes,
   StatusReportArg,
   StatusReportRes,
   RemoteUserFreeArg,
   RemoteUserFreeRes
;

IMPORTS
   maxNumOfCamelTDPData,
   SubscriberInfo,
   ServiceKey,
   DefaultCallHandling,
   SupportedCamelPhases,
   CamelCapabilityHandling,
   BasicServiceCriteria,
   CUG-Interlock,
   O-CSI,
   O-BcsmCamelTDPCriteriaList
FROM MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version4 (4)}

   ForwardingOptions,
   SS-List,
   CCBS-Feature
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version4 (4)}

   ISDN-AddressString,
   ISDN-SubaddressString,
   ExternalSignalInfo,
   IMSI,
   LMSI,
   Ext-BasicServiceCode,
   AlertingPattern,
   NAEA-PreferredCI
```

```
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}
;
```

```
CUG-CheckInfo ::= SEQUENCE {
     cug-Interlock                    CUG-Interlock,
     cug-OutgoingAccess               NULL                          OPTIONAL,
     extensionContainer               ExtensionContainer            OPTIONAL,
     ...}
```

```
NumberOfForwarding ::= INTEGER (1..5)
```

```
SendRoutingInfoArg ::= SEQUENCE {
     msisdn                           [0] ISDN-AddressString,
     cug-CheckInfo                    [1] CUG-CheckInfo             OPTIONAL,
     numberOfForwarding               [2] NumberOfForwarding        OPTIONAL,
     interrogationType                [3] InterrogationType,
     or-Interrogation                 [4] NULL                      OPTIONAL,
     or-Capability                    [5] OR-Phase                  OPTIONAL,
     gmsc-Address                     [6] ISDN-AddressString,
     callReferenceNumber              [7] CallReferenceNumber       OPTIONAL,
     forwardingReason                 [8] ForwardingReason          OPTIONAL,
     basicServiceGroup                [9] Ext-BasicServiceCode      OPTIONAL,
     networkSignalInfo                [10] ExternalSignalInfo       OPTIONAL,
     camelInfo [11] CamelInfo         OPTIONAL,
     suppressionOfAnnouncement        [12] SuppressionOfAnnouncement OPTIONAL,
     extensionContainer               [13] ExtensionContainer       OPTIONAL,
     ...,
     alertingPattern                  [14] AlertingPattern          OPTIONAL,
     ccbs-Call [15] NULL              OPTIONAL,
     supportedCCBS-Phase              [16]  SupportedCCBS-Phase     OPTIONAL }
```

```
SuppressionOfAnnouncement ::= NULL
```

```
InterrogationType ::= ENUMERATED {
     basicCall  (0),
     forwarding  (1)}
```

```
OR-Phase ::= INTEGER (1..127)
```

```
CallReferenceNumber ::= OCTET STRING (SIZE (1..8))
```

```
ForwardingReason ::= ENUMERATED {
     notReachable  (0),
     busy  (1),
     noReply  (2)}
```

```
SupportedCCBS-Phase ::= INTEGER (1..127)
-- exception handling:
-- Only value 1 is used.
-- Values in the ranges 2-127 are reserved for future use.
-- If received values 2-127 shall be mapped on to value 1.
```

```
SendRoutingInfoRes ::= [3] SEQUENCE {
    imsi                              [9] IMSI                          OPTIONAL,
    -- IMSI must be present if SendRoutingInfoRes is not segmented.
    -- If the TC-Result-NL segmentation option is taken the IMSI must be
    -- present in one segmented transmission of SendRoutingInfoRes.
    extendedRoutingInfo               ExtendedRoutingInfo               OPTIONAL,
    cug-CheckInfo                     [3] CUG-CheckInfo                 OPTIONAL,
    cugSubscriptionFlag               [6] NULL                          OPTIONAL,
    subscriberInfo                    [7] SubscriberInfo                OPTIONAL,
    ss-List                           [1] SS-List                       OPTIONAL,
    basicService                      [5] Ext-BasicServiceCode          OPTIONAL,
    forwardingInterrogationRequired   [4] NULL                          OPTIONAL,
    vmsc-Address                      [2] ISDN-AddressString            OPTIONAL,
    extensionContainer                [0] ExtensionContainer            OPTIONAL,
    ... ,
    naea-PreferredCI                  [10] NAEA-PreferredCI             OPTIONAL,
    -- naea-PreferredCI is included at the discretion of the HLR operator.
    ccbs-Indicators                   [11] CCBS-Indicators              OPTIONAL
    }
```

```
CCBS-Indicators ::= SEQUENCE {
    ccbs-Possible                     [0]  NULL                         OPTIONAL,
    keepCCBS-CallIndicator            [1]  NULL                         OPTIONAL,
    extensionContainer                [2]  ExtensionContainer           OPTIONAL,
    ...}
```

```
RoutingInfo ::= CHOICE {
    roamingNumber                     ISDN-AddressString,
    forwardingData                    ForwardingData}
```

```
ForwardingData ::= SEQUENCE {
    forwardedToNumber                 [5] ISDN-AddressString            OPTIONAL,
    -- When this datatype is sent from an HLR which supports CAMEL Phase 2
    -- to a GMSC which supports CAMEL Phase 2 the GMSC shall not check the
    -- format of the number
    forwardedToSubaddress             [4] ISDN-SubaddressString         OPTIONAL,
    forwardingOptions                 [6] ForwardingOptions             OPTIONAL,
    extensionContainer                [7] ExtensionContainer            OPTIONAL,
    ...}
```

```
ProvideRoamingNumberArg ::= SEQUENCE {
    imsi                              [0] IMSI,
    msc-Number                        [1] ISDN-AddressString,
    msisdn                            [2] ISDN-AddressString            OPTIONAL,
    lmsi                              [4] LMSI                          OPTIONAL,
    gsm-BearerCapability              [5] ExternalSignalInfo            OPTIONAL,
    networkSignalInfo                 [6] ExternalSignalInfo            OPTIONAL,
    suppressionOfAnnouncement         [7] SuppressionOfAnnouncement     OPTIONAL,
    gmsc-Address                      [8] ISDN-AddressString            OPTIONAL,
    callReferenceNumber               [9] CallReferenceNumber           OPTIONAL,
    or-Interrogation                  [10] NULL OPTIONAL,
    extensionContainer                [11] ExtensionContainer           OPTIONAL,
    ... ,
    alertingPattern                   [12] AlertingPattern              OPTIONAL,
    ccbs-Call                         [13] NULL                         OPTIONAL,
    supportedCamelPhasesInGMSC        [15] SupportedCamelPhases         OPTIONAL}
```

```
ProvideRoamingNumberRes ::= SEQUENCE {
    roamingNumber                     ISDN-AddressString,
    extensionContainer                ExtensionContainer                OPTIONAL,
    ...}
```

```
ResumeCallHandlingArg ::= SEQUENCE {
    callReferenceNumber               [0] CallReferenceNumber,
    basicServiceGroup                 [1] Ext-BasicServiceCode,
    forwardingData                    [2] ForwardingData,
    imsi                              [3] IMSI,
    cug-CheckInfo                     [4] CUG-CheckInfo                 OPTIONAL,
    o-CSI                             [5] O-CSI                         OPTIONAL,
    extensionContainer                [7] ExtensionContainer            OPTIONAL,
    ...,
    ccbs-Possible                     [8] NULL                          OPTIONAL}
```

```
ResumeCallHandlingRes ::= SEQUENCE {
    extensionContainer                ExtensionContainer                OPTIONAL,
    ...}
```

```
CamelInfo ::= SEQUENCE {
     supportedCamelPhases               SupportedCamelPhases,
     suppress-T-CSI                     NULL                              OPTIONAL,
     extensionContainer                 ExtensionContainer                OPTIONAL,
     ...}
```

```
ExtendedRoutingInfo ::= CHOICE {
     routingInfo                        RoutingInfo,
     camelRoutingInfo                   [8] CamelRoutingInfo}
```

```
CamelRoutingInfo ::= SEQUENCE {
     forwardingData                     ForwardingData                    OPTIONAL,
     gmscCamelSubscriptionInfo          [0] GmscCamelSubscriptionInfo,
     extensionContainer                 [1] ExtensionContainer            OPTIONAL,
     ...}
```

```
GmscCamelSubscriptionInfo ::= SEQUENCE {
     t-CSI                              [0] T-CSI OPTIONAL,
     o-CSI                              [1] O-CSI OPTIONAL,
     extensionContainer                 [2] ExtensionContainer            OPTIONAL,
     ...,
     o-BcsmCamelTDP-CriteriaList        [3] O-BcsmCamelTDPCriteriaList    OPTIONAL
}
```

```
T-CSI ::= SEQUENCE {
     t-BcsmCamelTDPDataList             T-BcsmCamelTDPDataList,
     extensionContainer                 ExtensionContainer                OPTIONAL,
     ...,
     camelCapabilityHandling            [0] CamelCapabilityHandling       OPTIONAL
     }
```

```
T-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     T-BcsmCamelTDPData
--- T-BcsmCamelTDPDataList shall not contain more than one instance of T-BcsmCamelTDPData
--- containing the same value for t-BcsmTriggerDetectionPoint.
--- For CAMEL Phase 2, this means that only one instance of T-BcsmCamelTDPData is allowed
--- with t-BcsmTriggerDetectionPoint being equal to DP12.
```

```
T-BcsmCamelTDPData ::= SEQUENCE {
     t-BcsmTriggerDetectionPoint        T-BcsmTriggerDetectionPoint,
     serviceKey                         ServiceKey,
     gsmSCF-Address                     [0] ISDN-AddressString,
     defaultCallHandling                [1] DefaultCallHandling,
     extensionContainer                 [2] ExtensionContainer            OPTIONAL,
     ...}
```

```
T-BcsmTriggerDetectionPoint ::= ENUMERATED {
     termAttemptAuthorized(12),
     ...}
-- exception handling:
-- For T-BcsmCamelTDPData sequences containing this parameter with any other
-- value thanthe ones listed the receiver shall ignore the whole
-- T-BcsmCamelTDPData sequence.
```

```
ProvideSIWFSNumberArg ::= SEQUENCE {
     gsm-BearerCapability               [0] ExternalSignalInfo,
     isdn-BearerCapability              [1] ExternalSignalInfo,
     call-Direction                     [2] CallDirection,
     b-Subscriber-Address               [3] ISDN-AddressString,
     chosenChannel                      [4] ExternalSignalInfo,
     lowerLayerCompatibility            [5] ExternalSignalInfo            OPTIONAL,
     highLayerCompatibility             [6] ExternalSignalInfo            OPTIONAL,
     extensionContainer                 [7] ExtensionContainer            OPTIONAL,
     ...}
```

```
CallDirection ::= OCTET STRING (SIZE (1))
     -- OCTET 1

     -- bit 1 (direction of call)
     -- 0  Mobile Originated Call (MOC)
     -- 1  Mobile Terminated Call (MTC)
```

```
ProvideSIWFSNumberRes ::= SEQUENCE {
     sIWFSNumber                    [0] ISDN-AddressString,
     extensionContainer             [1] ExtensionContainer          OPTIONAL,
     ...}
```

```
SIWFSSignallingModifyArg ::= SEQUENCE {
     channelType                    [0] ExternalSignalInfo          OPTIONAL,
     chosenChannel                  [1] ExternalSignalInfo          OPTIONAL,
     extensionContainer             [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
SIWFSSignallingModifyRes ::= SEQUENCE {
     chosenChannel                  [0] ExternalSignalInfo          OPTIONAL,
     extensionContainer             [1] ExtensionContainer          OPTIONAL,
     ...}
```

```
SetReportingStateArg ::= SEQUENCE {
     imsi                           [0]  IMSI                       OPTIONAL,
     lmsi                           [1]  LMSI                       OPTIONAL,
     ccbs-Monitoring                [2]  ReportingState             OPTIONAL,
     extensionContainer             [3]  ExtensionContainer         OPTIONAL,
     ...}
```

```
ReportingState ::= ENUMERATED {
     stopMonitoring                 (0),
     startMonitoring                (1),
     ...}
-- exception handling:
-- reception of values 2-10 shall be mapped to 'stopMonitoring'
-- reception of values > 10 shall be mapped to 'startMonitoring'
```

```
SetReportingStateRes ::= SEQUENCE{
     ccbs-SubscriberStatus          [0]  CCBS-SubscriberStatus      OPTIONAL,
     extensionContainer             [1]  ExtensionContainer         OPTIONAL,
     ...}
```

```
CCBS-SubscriberStatus ::= ENUMERATED {
     ccbsNotIdle                    (0),
     ccbsIdle (1),
     ccbsNotReachable               (2),
     ...}
--  exception handling:
--  reception of values 3-10 shall be mapped to 'ccbsNotIdle'
--  reception of values 11-20 shall be mapped to 'ccbsIdle'
--  reception of values > 20 shall be mapped to 'ccbsNotReachable'
```

```
StatusReportArg ::= SEQUENCE{
     imsi                           [0]  IMSI,
     eventReportData                [1]  EventReportData            OPTIONAL,
     callReportdata                 [2]  CallReportData             OPTIONAL,
     extensionContainer             [3]  ExtensionContainer         OPTIONAL,
     ...}
```

```
EventReportData ::= SEQUENCE{
     ccbs-SubscriberStatus          [0]  CCBS-SubscriberStatus      OPTIONAL,
     extensionContainer             [1]  ExtensionContainer         OPTIONAL,
     ...}
```

```
CallReportData ::= SEQUENCE{
     monitoringMode                 [0]  MonitoringMode             OPTIONAL,
     callOutcome                    [1]  CallOutcome                OPTIONAL,
     extensionContainer             [2]  ExtensionContainer         OPTIONAL,
     ...}
```

```
MonitoringMode ::= ENUMERATED {
     a-side                         (0),
     b-side                         (1),
     ...}
--   exception handling:
--  reception of values 2-10 shall be mapped 'a-side'
--  reception of values > 10 shall be mapped to 'b-side'
```

```
CallOutcome ::= ENUMERATED {
     success                          (0),
     failure                          (1),
     busy                             (2),
     ...}
--   exception handling:
--  reception of values 3-10 shall be mapped to 'success'
--  reception of values 11-20 shall be mapped to 'failure'
--  reception of values > 20 shall be mapped to 'busy'
```

```
StatusReportRes ::= SEQUENCE {
     extensionContainer               [0]  ExtensionContainer          OPTIONAL,
     ...}
```

```
RemoteUserFreeArg ::= SEQUENCE{
     imsi                             [0]  IMSI,
     callInfo                         [1]  ExternalSignalInfo,
     ccbs-Feature                     [2]  CCBS-Feature,
     translatedB-Number               [3]  ISDN-AddressString,
     replaceB-Number                  [4]  NULL                        OPTIONAL,
     alertingPattern                  [5]  AlertingPattern             OPTIONAL,
     extensionContainer               [6]  ExtensionContainer          OPTIONAL,
     ...}
```

```
RemoteUserFreeRes ::= SEQUENCE{
     ruf-Outcome                      [0]  RUF-Outcome,
     extensionContainer               [1]  ExtensionContainer          OPTIONAL,
     ...}
```

```
RUF-Outcome ::= ENUMERATED{
     accepted (0),
     rejected (1),
     noResponseFromFreeMS (2), -- T4 Expiry
     noResponseFromBusyMS (3), -- T10 Expiry
     ududFromFreeMS (4),
     ududFromBusyMS (5),
     ...}
-- exception handling:
-- reception of values 6-20 shall be mapped to 'accepted'
-- reception of values 21-30 shall be mapped to 'rejected'
-- reception of values 31-40 shall be mapped to 'noResponseFromFreeMS'
-- reception of values 41-50 shall be mapped to 'noResponseFromBusyMS'
-- reception of values 51-60 shall be mapped to 'ududFromFreeMS'
-- reception of values > 60 shall be mapped to 'ududFromBusyMS'
```

```
END
```

17.7.4 Supplementary service data types

```
MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version4 (4)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RegisterSS-Arg,
   SS-Info,
   SS-Status,
   SS-SubscriptionOption,
   SS-ForBS-Code,
   InterrogateSS-Res,
   USSD-Arg,
   USSD-Res,
   Password,
   GuidanceInfo,
   SS-List,
   SS-InfoList,
   OverrideCategory,
   CliRestrictionOption,
   NoReplyConditionTime,
   ForwardingOptions,
```

```
   maxNumOfSS,
   SS-Data,
   SS-InvocationNotificationArg,
   SS-InvocationNotificationRes,
   CCBS-Feature,
   RegisterCC-EntryArg,
   RegisterCC-EntryRes,
   EraseCC-EntryArg,
   EraseCC-EntryRes,
   USSD-DataCodingScheme,
   USSD-String
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   ISDN-SubaddressString,
   IMSI,
   BasicServiceCode,
   AlertingPattern,
   EMLPP-Priority,
   ExternalSignalInfo

FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version4 (4)}
;
```

```
RegisterSS-Arg ::= SEQUENCE{
     ss-Code                          SS-Code,
     basicService                     BasicServiceCode                 OPTIONAL,
     forwardedToNumber                [4] AddressString                OPTIONAL,
     forwardedToSubaddress            [6] ISDN-SubaddressString        OPTIONAL,
     noReplyConditionTime             [5] NoReplyConditionTime         OPTIONAL,
     ...,
     defaultPriority                  [7] EMLPP-Priority               OPTIONAL }
```

```
NoReplyConditionTime ::= INTEGER (5..30)
```

```
SS-Info ::= CHOICE {
     forwardingInfo                   [0] ForwardingInfo,
     callBarringInfo                  [1] CallBarringInfo,
     ss-Data                          [3] SS-Data}
```

```
ForwardingInfo ::= SEQUENCE {
     ss-Code                          SS-Code                          OPTIONAL,
     forwardingFeatureList            ForwardingFeatureList,
     ...}
```

```
ForwardingFeatureList ::=
     SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
                                      ForwardingFeature
```

```
ForwardingFeature ::= SEQUENCE {
     basicService                     BasicServiceCode                 OPTIONAL,
     ss-Status [4] SS-Status          OPTIONAL,
     forwardedToNumber                [5] ISDN-AddressString           OPTIONAL,
     forwardedToSubaddress            [8] ISDN-SubaddressString        OPTIONAL,
     forwardingOptions                [6] ForwardingOptions            OPTIONAL,
     noReplyConditionTime             [7] NoReplyConditionTime         OPTIONAL,
     ...}
```

```
SS-Status ::= OCTET STRING (SIZE (1))

     -- bits 8765: 0000 (unused)
     -- bits 4321: Used to convey the "P bit","R bit","A bit" and "Q bit",
     --            representing supplementary service state information
     --            as defined in TS GSM 03.11

     -- bit 4: "Q bit"

     -- bit 3: "P bit"

     -- bit 2: "R bit"

     -- bit 1: "A bit"
```

```
ForwardingOptions ::= OCTET STRING (SIZE (1))

     -- bit 8: notification to forwarding party
     --   0  no notification
     --   1  notification

     -- bit 7: 0 (unused)

     -- bit 6: notification to calling party
     --   0  no notification
     --   1  notification

     -- bit 5: 0 (unused)

     -- bits 43: forwarding reason
     --   00  ms not reachable
     --   01  ms busy
     --   10  no reply
     --   11  unconditional
     -- bits 21: 00 (unused)
```

```
CallBarringInfo ::= SEQUENCE {
     ss-Code                         SS-Code                         OPTIONAL,
     callBarringFeatureList          CallBarringFeatureList,
     ...}
```

```
CallBarringFeatureList ::= SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
                                     CallBarringFeature
```

```
CallBarringFeature ::= SEQUENCE {
     basicService                    BasicServiceCode                OPTIONAL,
     ss-Status [4] SS-Status         OPTIONAL,
     ...}
```

```
SS-Data ::= SEQUENCE {
     ss-Code                         SS-Code                         OPTIONAL,
     ss-Status [4] SS-Status         OPTIONAL,
     ss-SubscriptionOption           SS-SubscriptionOption           OPTIONAL,
     basicServiceGroupList           BasicServiceGroupList           OPTIONAL,
     ...,
     defaultPriority                 EMLPP-Priority                  OPTIONAL
     }
```

```
SS-SubscriptionOption ::= CHOICE {
     cliRestrictionOption            [2] CliRestrictionOption,
     overrideCategory                [1] OverrideCategory}
```

```
CliRestrictionOption ::= ENUMERATED {
     permanent  (0),
     temporaryDefaultRestricted  (1),
     temporaryDefaultAllowed  (2)}
```

```
OverrideCategory ::= ENUMERATED {
     overrideEnabled  (0),
     overrideDisabled  (1)}
```

```
SS-ForBS-Code ::= SEQUENCE {
     ss-Code                         SS-Code,
     basicService                    BasicServiceCode                OPTIONAL,
     ...}
```

```
GenericServiceInfo ::= SEQUENCE {
     ss-Status SS-Status,
     cliRestrictionOption                CliRestrictionOption              OPTIONAL,
     ...,
     maximumEntitledPriority             [0] EMLPP-Priority                OPTIONAL,
     defaultPriority                     [1] EMLPP-Priority                OPTIONAL,
     ccbs-FeatureList                    [2] CCBS-FeatureList              OPTIONAL }
```

```
CCBS-FeatureList ::= SEQUENCE SIZE (1..maxNumOfCCBS-Requests) OF
                                         CCBS-Feature
```

```
maxNumOfCCBS-Requests  INTEGER ::= 5
```

```
CCBS-Feature ::= SEQUENCE {
     ccbs-Index                          [0] CCBS-Index                    OPTIONAL,
     b-subscriberNumber                  [1] ISDN-AddressString            OPTIONAL,
     b-subscriberSubaddress              [2] ISDN-SubaddressString         OPTIONAL,
     basicServiceGroup                   [3] BasicServiceCode              OPTIONAL,
     ...}
```

```
CCBS-Index  ::= INTEGER (1..maxNumOfCCBS-Requests)
```

```
InterrogateSS-Res ::= CHOICE {
     ss-Status [0] SS-Status,
     basicServiceGroupList               [2] BasicServiceGroupList,
     forwardingFeatureList               [3] ForwardingFeatureList,
     genericServiceInfo                  [4]  GenericServiceInfo }
```

```
USSD-Arg ::= SEQUENCE {
     ussd-DataCodingScheme               USSD-DataCodingScheme,
     ussd-String                         USSD-String,
     ... ,
     alertingPattern                     AlertingPattern                   OPTIONAL,
     msisdn                              [0] ISDN-AddressString            OPTIONAL }
```

```
USSD-Res ::= SEQUENCE {
     ussd-DataCodingScheme               USSD-DataCodingScheme,
     ussd-String                         USSD-String,
     ...}
```

```
USSD-DataCodingScheme ::= OCTET STRING (SIZE (1))
     -- The structure of the USSD-DataCodingScheme is defined by
     -- the Cell Broadcast Data Coding Scheme as described in
     -- TS GSM 03.38
```

```
USSD-String ::= OCTET STRING (SIZE (1..maxUSSD-StringLength))
     -- The structure of the contents of the USSD-String is dependent
     -- on the USSD-DataCodingScheme as described in TS GSM 03.38.
```

```
maxUSSD-StringLength  INTEGER ::= 160
```

```
Password ::= NumericString
     (FROM ("0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9"))
     (SIZE (4))
```

```
GuidanceInfo ::= ENUMERATED {
     enterPW  (0),
     enterNewPW  (1),
     enterNewPW-Again  (2)}
     -- How this information is really delivered to the subscriber
     -- (display, announcement, ...) is not part of this
     -- specification.
```

```
SS-List ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                                         SS-Code
```

```
maxNumOfSS  INTEGER ::= 30
```

```
SS-InfoList ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                                         SS-Info
```

```
BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfBasicServiceGroups) OF
                                         BasicServiceCode
```

```
maxNumOfBasicServiceGroups  INTEGER ::= 13
```

```
SS-InvocationNotificationArg ::= SEQUENCE {
     imsi                                [0] IMSI,
     msisdn                              [1] ISDN-AddressString,
     ss-Event                            [2] SS-Code,
     -- The following SS-Code values are allowed :
     -- ect                              SS-Code ::= '00110001'B
     -- multiPTY                         SS-Code ::= '01010001'B
     -- cd                               SS-Code ::= '00100100'B
     ss-EventSpecification               [3] SS-EventSpecification         OPTIONAL,
     extensionContainer                  [4] ExtensionContainer            OPTIONAL,
     ...}
```

```
SS-InvocationNotificationRes ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...
     }
```

```
SS-EventSpecification ::= SEQUENCE SIZE (1..maxEventSpecification) OF
                                         AddressString
```

```
maxEventSpecification  INTEGER ::= 2
```

```
RegisterCC-EntryArg ::= SEQUENCE {
     ss-Code                             [0]  SS-Code,
     ccbs-Data [1]                       CCBS-Data OPTIONAL,
     ...}
```

```
CCBS-Data ::= SEQUENCE {
     ccbs-Feature                        [0]  CCBS-Feature,
     translatedB-Number                  [1]  ISDN-AddressString,
     serviceIndicator                    [2]  ServiceIndicator             OPTIONAL,
     callInfo                            [3]  ExternalSignalInfo,
     networkSignalInfo                   [4]  ExternalSignalInfo,
     ...}
```

```
ServiceIndicator ::= BIT STRING {
     clir-invoked (0),
     camel-invoked (1)} (SIZE(2..32))
-- exception handling:
-- bits 2 to 31 shall be ignored if received and not understood
```

```
RegisterCC-EntryRes ::= SEQUENCE {
     ccbs-Feature                        [0] CCBS-Feature                  OPTIONAL,
     ...}
```

```
EraseCC-EntryArg ::= SEQUENCE {
     ss-Code                             [0]  SS-Code,
     ccbs-Index                          [1]  CCBS-Index                   OPTIONAL,
     ...}
```

```
EraseCC-EntryRes ::= SEQUENCE {
     ss-Code                             [0]  SS-Code,
     ss-Status [1] SS-Status             OPTIONAL,
     ...}
```

```
END
```

17.7.5 Supplementary service codes

```
MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version4 (4)}

DEFINITIONS

::=

BEGIN
```

```
SS-Code ::= OCTET STRING (SIZE (1))
     -- This type is used to represent the code identifying a single
     -- supplementary service, a group of supplementary services, or
     -- all supplementary services. The services and abbreviations
     -- used are defined in TS GSM 02.04. The internal structure is
     -- defined as follows:
     --
     -- bits 87654321: group (bits 8765), and specific service
     -- (bits 4321)
```

```
allSS                                   SS-Code ::= '00000000'B
     -- reserved for possible future use
     -- all SS
```

```
allLineIdentificationSS                 SS-Code ::= '00010000'B
     -- reserved for possible future use
     -- all line identification SS
clip                                    SS-Code ::= '00010001'B
     -- calling line identification presentation
clir                                    SS-Code ::= '00010010'B
     -- calling line identification restriction
colp                                    SS-Code ::= '00010011'B
     -- connected line identification presentation
colr                                    SS-Code ::= '00010100'B
     -- connected line identification restriction
mci                                     SS-Code ::= '00010101'B
     -- reserved for possible future use
     -- malicious call identification

allNameIdentificationSS                 SS-Code ::= '00011000'B
     -- all name identification SS
cnap                                    SS-Code ::= '00011001'B
     -- calling name presentation

     -- SS-Codes '00011010'B to '00011111'B are reserved for future
     -- NameIdentification Supplementary Service use.
```

```
allForwardingSS                         SS-Code ::= '00100000'B
     -- all forwarding SS
cfu                                     SS-Code ::= '00100001'B
     -- call forwarding unconditional
allCondForwardingSS                     SS-Code ::= '00101000'B
     -- all conditional forwarding SS
cfb                                     SS-Code ::= '00101001'B
     -- call forwarding on mobile subscriber busy
cfnry                                   SS-Code ::= '00101010'B
     -- call forwarding on no reply
cfnrc                                   SS-Code ::= '00101011'B
     -- call forwarding on mobile subscriber not reachable
cd                                      SS-Code ::= '00100100'B
     -- call deflection
```

```
allCallOfferingSS                       SS-Code ::= '00110000'B
     -- reserved for possible future use
     -- all call offering SS includes also all forwarding SS
ect                                     SS-Code ::= '00110001'B
         -- explicit call transfer
mah                                     SS-Code ::= '00110010'B
     -- reserved for possible future use
     -- mobile access hunting
```

```
allCallCompletionSS                     SS-Code ::= '01000000'B
     -- reserved for possible future use
     -- all Call completion SS
cw                                      SS-Code ::= '01000001'B
     -- call waiting
hold                                    SS-Code ::= '01000010'B
     -- call hold
ccbs-A                                  SS-Code ::= '01000011'B
     -- completion of call to busy subscribers, originating side
ccbs-B                                  SS-Code ::= '01000100'B
     -- completion of call to busy subscribers, destination side
     -- this SS-Code is used only in InsertSubscriberData
```

```
allMultiPartySS                         SS-Code ::= '01010000'B
     -- reserved for possible future use
     -- all multiparty SS
multiPTY                                SS-Code ::= '01010001'B
     -- multiparty
```

```
allCommunityOfInterest-SS               SS-Code ::= '01100000'B
     -- reserved for possible future use
     -- all community of interest SS
cug                                     SS-Code ::= '01100001'B
     -- closed user group
```

```
allChargingSS                           SS-Code ::= '01110000'B
     -- reserved for possible future use
     -- all charging SS
aoci                                    SS-Code ::= '01110001'B
     -- advice of charge information
aocc                                    SS-Code ::= '01110010'B
     -- advice of charge charging
```

```
allAdditionalInfoTransferSS             SS-Code ::= '10000000'B
     -- reserved for possible future use
     -- all additional information transfer SS
uus                                     SS-Code ::= '10000001'B
     -- reserved for possible future use
     -- UUS user-to-user signalling
```

```
allBarringSS                            SS-Code ::= '10010000'B
     -- all barring SS
barringOfOutgoingCalls                  SS-Code ::= '10010001'B
     -- barring of outgoing calls
baoc                                    SS-Code ::= '10010010'B
     -- barring of all outgoing calls
boic                                    SS-Code ::= '10010011'B
     -- barring of outgoing international calls
boicExHC                                SS-Code ::= '10010100'B
     -- barring of outgoing international calls except those directed
     -- to the home PLMN
barringOfIncomingCalls                  SS-Code ::= '10011001'B
     -- barring of incoming calls
baic                                    SS-Code ::= '10011010'B
     -- barring of all incoming calls
bicRoam                                 SS-Code ::= '10011011'B
     -- barring of incoming calls when roaming outside home PLMN
     -- Country
```

```
allPLMN-specificSS                      SS-Code ::= '11110000'B
plmn-specificSS-1                       SS-Code ::= '11110001'B
plmn-specificSS-2                       SS-Code ::= '11110010'B
plmn-specificSS-3                       SS-Code ::= '11110011'B
plmn-specificSS-4                       SS-Code ::= '11110100'B
plmn-specificSS-5                       SS-Code ::= '11110101'B
plmn-specificSS-6                       SS-Code ::= '11110110'B
plmn-specificSS-7                       SS-Code ::= '11110111'B
plmn-specificSS-8                       SS-Code ::= '11111000'B
plmn-specificSS-9                       SS-Code ::= '11111001'B
plmn-specificSS-A                       SS-Code ::= '11111010'B
plmn-specificSS-B                       SS-Code ::= '11111011'B
plmn-specificSS-C                       SS-Code ::= '11111100'B
plmn-specificSS-D                       SS-Code ::= '11111101'B
plmn-specificSS-E                       SS-Code ::= '11111110'B
plmn-specificSS-F                       SS-Code ::= '11111111'B
```

```
allCallPrioritySS                       SS-Code ::= '10100000'B
     -- reserved for possible future use
     -- all call priority SS
emlpp                                   SS-Code ::= '10100001'B
     -- enhanced Multilevel Precedence Pre-emption (EMLPP) service
```

```
END
```

17.7.6 Short message data types

```
MAP-SM-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SM-DataTypes (16) version4 (4)}
```

```
DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoutingInfoForSM-Arg,
   RoutingInfoForSM-Res,
   MO-ForwardSM-Arg,
   MO-ForwardSM-Res,
   MT-ForwardSM-Arg,
   MT-ForwardSM-Res,
   ReportSM-DeliveryStatusArg,
   ReportSM-DeliveryStatusRes,
   AlertServiceCentreArg,
   InformServiceCentreArg,
   ReadyForSM-Arg,
   ReadyForSM-Res,
   SM-DeliveryOutcome,
   AlertReason
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   SignalInfo,
   IMSI,
   LMSI
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}

   AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version4 (4)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}
;
```

```
RoutingInfoForSM-Arg ::= SEQUENCE {
     msisdn                              [0] ISDN-AddressString,
     sm-RP-PRI [1] BOOLEAN,
     serviceCentreAddress                [2] AddressString,
     extensionContainer                  [6] ExtensionContainer          OPTIONAL,
     ... ,
     gprsSupportIndicator                [7]  NULL                       OPTIONAL,
     -- gprsSupportIndicator is set only if the SMS-GMSC supports
     -- receiving of two numbers from the HLR
     sm-RP-MTI [8] SM-RP-MTI             OPTIONAL,
     sm-RP-SMEA                          [9] SM-RP-SMEA                  OPTIONAL }
```

```
SM-RP-MTI ::= INTEGER (0..10)
     -- 0 SMS Deliver
     -- 1 SMS Status Report
     -- other values are reserved for future use and shall be discarded if
     -- received
```

```
SM-RP-SMEA ::= OCTET STRING (SIZE (1..12))
     -- this parameter contains an address field which is encoded
     -- as defined in GSM 03.40. An address field contains 3 elements :
     --       address-length
     --       type-of-address
     --       address-value
```

```
RoutingInfoForSM-Res ::= SEQUENCE {
    imsi                              IMSI,
    locationInfoWithLMSI              [0] LocationInfoWithLMSI,
    extensionContainer                [4] ExtensionContainer          OPTIONAL,
    ...}
```

```
LocationInfoWithLMSI ::= SEQUENCE {
    networkNode-Number                [1] ISDN-AddressString,
    lmsi                              LMSI                            OPTIONAL,
    extensionContainer                ExtensionContainer              OPTIONAL,
    ...,
    gprsNodeIndicator                 [5]  NULL                       OPTIONAL,
    -- gprsNodeIndicator is set only if the SGSN number is sent as the
    -- Network Node Number
    additional-Number                 [6] Additional-Number           OPTIONAL
    -- NetworkNode-number can be either msc-number or sgsn-number
    }
```

```
Additional-Number ::= CHOICE {
    msc-Number                        [0] ISDN-AddressString,
    sgsn-Number                       [1] ISDN-AddressString}
    -- additional-number can be either msc-number or sgsn-number
    -- if received networkNode-number is msc-number then the
    -- additional number is sgsn-number
    -- if received networkNode-number is sgsn-number then the
    -- additional number is msc-number
```

```
MO-ForwardSM-Arg ::= SEQUENCE {
    sm-RP-DA                          SM-RP-DA,
    sm-RP-OA                          SM-RP-OA,
    sm-RP-UI                          SignalInfo,
    extensionContainer                ExtensionContainer              OPTIONAL,
    ...}
```

```
MO-ForwardSM-Res ::= SEQUENCE {
    sm-RP-UI                          SignalInfo                      OPTIONAL,
    extensionContainer                ExtensionContainer              OPTIONAL,
    ...}
```

```
MT-ForwardSM-Arg ::= SEQUENCE {
    sm-RP-DA                          SM-RP-DA,
    sm-RP-OA                          SM-RP-OA,
    sm-RP-UI                          SignalInfo,
    moreMessagesToSend                NULL                            OPTIONAL,
    extensionContainer                ExtensionContainer              OPTIONAL,
    ...}
```

```
MT-ForwardSM-Res ::= SEQUENCE {
    sm-RP-UI                          SignalInfo                      OPTIONAL,
    extensionContainer                ExtensionContainer              OPTIONAL,
    ...}
```

```
SM-RP-DA ::= CHOICE {
    imsi                              [0] IMSI,
    lmsi                              [1] LMSI,
    serviceCentreAddressDA            [4] AddressString,
    noSM-RP-DA                        [5] NULL}
```

```
SM-RP-OA ::= CHOICE {
    msisdn                            [2] ISDN-AddressString,
    serviceCentreAddressOA            [4] AddressString,
    noSM-RP-OA                        [5] NULL}
```

```
ReportSM-DeliveryStatusArg ::= SEQUENCE {
     msisdn                              ISDN-AddressString,
     serviceCentreAddress                AddressString,
     sm-DeliveryOutcome                  SM-DeliveryOutcome,
     absentSubscriberDiagnosticSM        [0] AbsentSubscriberDiagnosticSM
                                                                    OPTIONAL,
     extensionContainer                  [1] ExtensionContainer     OPTIONAL,
     ...,
     gprsSupportIndicator                [2]  NULL                  OPTIONAL,
     -- gprsSupportIndicator is set only if the SMS-GMSC supports
     -- handling of two delivery outcomes
     deliveryOutcomeIndicator            [3]  NULL                  OPTIONAL,
     -- DeliveryOutcomeIndicator is set when the SM-DeliveryOutcome
     -- is for GPRS
     additionalSM-DeliveryOutcome        [4]  SM-DeliveryOutcome    OPTIONAL,
     -- If received, additionalSM-DeliveryOutcome is for GPRS
     additionalAbsentSubscriberDiagnosticSM   [5]  AbsentSubscriberDiagnosticSM OPTIONAL
     -- If received additionalAbsentSubscriberDiagnosticSM is for GPRS
     }
```

```
SM-DeliveryOutcome ::= ENUMERATED {
     memoryCapacityExceeded  (0),
     absentSubscriber  (1),
     successfulTransfer  (2)}
```

```
ReportSM-DeliveryStatusRes ::= SEQUENCE {
     storedMSISDN                        ISDN-AddressString         OPTIONAL,
     extensionContainer                  ExtensionContainer         OPTIONAL,
     ...}
```

```
AlertServiceCentreArg ::= SEQUENCE {
     msisdn                              ISDN-AddressString,
     serviceCentreAddress                AddressString,
     ...}
```

```
InformServiceCentreArg ::= SEQUENCE {
     storedMSISDN                        ISDN-AddressString         OPTIONAL,
     mw-Status MW-Status                 OPTIONAL,
     extensionContainer                  ExtensionContainer         OPTIONAL,
     ...}
```

```
MW-Status ::= BIT STRING {
     sc-AddressNotIncluded  (0),
     mnrf-Set  (1),
     mcef-Set  (2) ,
     mnrg-Set   (3)} (SIZE (6..16))
     -- exception handling:
     -- bits 4 to 15 shall be ignored if received and not understood
```

```
ReadyForSM-Arg ::= SEQUENCE {
     imsi                                [0] IMSI,
     alertReason                         AlertReason,
     alertReasonIndicator                NULL                       OPTIONAL,
     -- alertReasonIndicator is set only when the alertReason
     -- sent to HLR is for GPRS
     extensionContainer                  ExtensionContainer         OPTIONAL,
     ...}
```

```
ReadyForSM-Res ::= SEQUENCE {
     extensionContainer                  ExtensionContainer         OPTIONAL,
     ...}
```

```
AlertReason ::= ENUMERATED {
     ms-Present  (0),
     memoryAvailable  (1)}
```

```
END
```

17.7.7 Error data types

```
MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version4 (4)}

DEFINITIONS
```

```
IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoamingNotAllowedParam,
   CallBarredParam,
   CUG-RejectParam,
   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   OR-NotAllowedParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   AbsentSubscriberDiagnosticSM,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam

;

IMPORTS
   SS-Status
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version4 (4)}

   SignalInfo,
   BasicServiceCode,
   NetworkResource
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version4 (4)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}
;
```

```
RoamingNotAllowedParam ::= SEQUENCE {
     roamingNotAllowedCause              RoamingNotAllowedCause,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
RoamingNotAllowedCause ::= ENUMERATED {
     plmnRoamingNotAllowed  (0),
     operatorDeterminedBarring  (3)}
```

```
CallBarredParam ::= CHOICE {
     callBarringCause                    CallBarringCause,
     -- call BarringCause must not be used in version 3
     extensibleCallBarredParam           ExtensibleCallBarredParam
     -- extensibleCallBarredParam must not be used in version <3
     }
```

```
CallBarringCause ::= ENUMERATED {
     barringServiceActive  (0),
     operatorBarring  (1)}
```

```
ExtensibleCallBarredParam ::= SEQUENCE {
     callBarringCause                    CallBarringCause                  OPTIONAL,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ... ,
     unauthorisedMessageOriginator       [1] NULL                          OPTIONAL }
```

```
CUG-RejectParam ::= SEQUENCE {
     cug-RejectCause                     CUG-RejectCause                   OPTIONAL,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
CUG-RejectCause ::= ENUMERATED {
     incomingCallsBarredWithinCUG  (0),
     subscriberNotMemberOfCUG  (1),
     requestedBasicServiceViolatesCUG-Constraints  (5),
     calledPartySS-InteractionViolation  (7)}
```

```
SS-IncompatibilityCause ::= SEQUENCE {
     ss-Code                             [1] SS-Code                       OPTIONAL,
     basicService                        BasicServiceCode                  OPTIONAL,
     ss-Status [4] SS-Status             OPTIONAL,
     ...}
```

```
PW-RegistrationFailureCause ::= ENUMERATED {
     undetermined  (0),
     invalidFormat  (1),
     newPasswordsMismatch  (2)}
```

```
SM-EnumeratedDeliveryFailureCause ::= ENUMERATED {
     memoryCapacityExceeded  (0),
     equipmentProtocolError  (1),
     equipmentNotSM-Equipped  (2),
     unknownServiceCentre  (3),
     sc-Congestion  (4),
     invalidSME-Address  (5),
     subscriberNotSC-Subscriber  (6)}
```

```
SM-DeliveryFailureCause ::= SEQUENCE {
     sm-EnumeratedDeliveryFailureCause   SM-EnumeratedDeliveryFailureCause,
     diagnosticInfo                      SignalInfo                        OPTIONAL,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
AbsentSubscriberSM-Param ::= SEQUENCE {
     absentSubscriberDiagnosticSM        AbsentSubscriberDiagnosticSM      OPTIONAL,
     -- AbsentSubscriberDiagnosticSM can be either for non-GPRS
     -- or for GPRS
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     additionalAbsentSubscriberDiagnosticSM   [0]  AbsentSubscriberDiagnosticSM OPTIONAL }
     -- if received, additionalAbsentSubscriberDiagnosticSM
     -- is for GPRS and absentSubscriberDiagnosticSM is
     -- for non-GPRS
```

```
AbsentSubscriberDiagnosticSM ::= INTEGER (0..255)
     -- AbsentSubscriberDiagnosticSM values are defined in ETS 300 536 (GSM 03.40)
```

```
SystemFailureParam ::= CHOICE {
     networkResource                     NetworkResource,
     -- networkResource must not be used in version 3
     extensibleSystemFailureParam        ExtensibleSystemFailureParam
     -- extensibleSystemFailureParam must not be used in version <3
     }
```

```
ExtensibleSystemFailureParam ::= SEQUENCE {
     networkResource                  NetworkResource                  OPTIONAL,
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
DataMissingParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
UnexpectedDataParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
FacilityNotSupParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
OR-NotAllowedParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
UnknownSubscriberParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...,
     unknownSubscriberDiagnostic      UnknownSubscriberDiagnostic      OPTIONAL}
```

```
UnknownSubscriberDiagnostic ::= ENUMERATED {
     imsiUnknown  (0),
     gprsSubscriptionUnknown  (1),
     ...}
     -- if unknown values are received in
     -- unknownSubscriberDiagnostic they shall be discarded
```

```
NumberChangedParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
UnidentifiedSubParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
IllegalSubscriberParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
IllegalEquipmentParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
BearerServNotProvParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
TeleservNotProvParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
TracingBufferFullParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
NoRoamingNbParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...}
```

```
AbsentSubscriberParam ::= SEQUENCE {
     extensionContainer               ExtensionContainer               OPTIONAL,
     ...,
     absentSubscriberReason           [0] AbsentSubscriberReason       OPTIONAL}
```

```
AbsentSubscriberReason ::= ENUMERATED {
     imsiDetach (0),
     restrictedArea (1),
     noPageResponse (2),
     ...}
-- exception handling: at reception of other values than the ones listed the
-- AbsentSubscriberReason shall be ignored.
```

```
BusySubscriberParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     ccbs-Possible                       [0] NULL                          OPTIONAL,
     ccbs-Busy [1] NULL                       OPTIONAL}
```

```
NoSubscriberReplyParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ForwardingViolationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ForwardingFailedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ATI-NotAllowedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
SubBusyForMT-SMS-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ... ,
     gprsConnectionSuspended             NULL      OPTIONAL }
     -- If GprsConnectionSuspended is not understood it shall
     -- be discarded
```

```
MessageWaitListFullParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ResourceLimitationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
NoGroupCallNbParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
IncompatibleTerminalParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ShortTermDenialParam ::= SEQUENCE {
     ...}
```

```
LongTermDenialParam ::= SEQUENCE {
     ...}
```

```
END
```

17.7.8 Common data types

```
MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
```

```
   -- general data types and values
   AddressString,
   ISDN-AddressString,
   maxISDN-AddressLength,
   ISDN-SubaddressString,
   ExternalSignalInfo,
   SignalInfo,
   maxSignalInfoLength,
   AlertingPattern,

   -- data types for numbering and identification
   IMSI,
   TMSI,
   SubscriberId,
   IMEI,
   HLR-List,
   LMSI,
   GlobalCellId,
   NetworkResource,
   NAEA-PreferredCI,
   ASCI-CallReference,

   -- data types for CAMEL
   CellIdOrLAI,

   -- data types for subscriber management
   BasicServiceCode,
   Ext-BasicServiceCode,
   EMLPP-Info,
   EMLPP-Priority
;

IMPORTS
   TeleserviceCode,
   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version4 (4)}

   BearerServiceCode,
   Ext-BearerServiceCode
FROM MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version4 (4)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}
;


-- general data types

TBCD-STRING ::= OCTET STRING
     -- This type (Telephony Binary Coded Decimal String) is used to
     -- represent several digits from 0 through 9, *, #, a, b, c, two
     -- digits per octet, each digit encoded 0000 to 1001 (0 to 9),
     -- 1010 (*), 1011 (#), 1100 (a), 1101 (b) or 1110 (c); 1111 used
     -- as filler when there is an odd number of digits.

     -- bits 8765 of octet n encoding digit 2n
     -- bits 4321 of octet n encoding digit 2(n-1) +1
```

```
AddressString ::= OCTET STRING (SIZE (1..maxAddressLength))
    -- This type is used to represent a number for addressing
    -- purposes. It is composed of
    --   a)   one octet for nature of address, and numbering plan
    --        indicator.
    --   b)   digits of an address encoded as TBCD-String.

    -- a)     The first octet includes a one bit extension indicator, a
    --        3 bits nature of address indicator and a 4 bits numbering
    --        plan indicator, encoded as follows:

    -- bit 8: 1  (no extension)

    -- bits 765: nature of address indicator
    --   000  unknown
    --   001  international number
    --   010  national significant number
    --   011  network specific number
    --   100  subscriber number
    --   101  reserved
    --   110  abbreviated number
    --   111  reserved for extension

    -- bits 4321: numbering plan indicator
    --   0000  unknown
    --   0001  ISDN/Telephony Numbering Plan (Rec CCITT E.164)
    --   0010  spare
    --   0011  data numbering plan (CCITT Rec X.121)
    --   0100  telex numbering plan (CCITT Rec F.69)
    --   0101  spare
    --   0110  land mobile numbering plan (CCITT Rec E.212)
    --   0111  spare
    --   1000  national numbering plan
    --   1001  private numbering plan
    --   1111  reserved for extension

    --   all other values are reserved.

    -- b)     The following octets representing digits of an address
    --        encoded as a TBCD-STRING.
```

```
maxAddressLength  INTEGER ::= 20
```

```
ISDN-AddressString ::=
              AddressString (SIZE (1..maxISDN-AddressLength))
    -- This type is used to represent ISDN numbers.
```

```
maxISDN-AddressLength  INTEGER ::= 9
```

```
ISDN-SubaddressString ::=
            OCTET STRING (SIZE (1..maxISDN-SubaddressLength))
    -- This type is used to represent ISDN subaddresses.
    -- It is composed of
    --   a)   one octet for type of subaddress and odd/even indicator.
    --   b)   20 octets for subaddress information.

    --   a)   The first octet includes a one bit extension indicator, a
    --        3 bits type of subaddress and a one bit odd/even indicator,
    --        encoded as follows:

    --   bit 8: 1  (no extension)

    --   bits 765: type of subaddress
    --        000  NSAP (X.213/ISO 8348 AD2)
    --        010  User Specified
    --        All other values are reserved

    --   bit 4: odd/even indicator
    --        0  even number of address signals
    --        1  odd number of address signals
    --        The odd/even indicator is used when the type of subaddress
    --        is "user specified" and the coding is BCD.

    --   bits 321: 000 (unused)

    --   b) Subaddress information.
    --   The NSAP X.213/ISO8348AD2 address shall be formatted as specified
    --   by octet 4 which contains the Authority and Format Identifier
    --   (AFI). The encoding is made according to the "preferred binary
    --   encoding" as defined in X.213/ISO834AD2. For the definition
    --   of this type of subaddress, see CCITT Rec I.334.

    --   For User-specific subaddress, this field is encoded according
    --   to the user specification, subject to a maximum length of 20
    --   octets. When interworking with X.25 networks BCD coding should
    --   be applied.
```

```
maxISDN-SubaddressLength  INTEGER ::= 21
```

```
ExternalSignalInfo ::= SEQUENCE {
    protocolId                      ProtocolId,
    signalInfo                      SignalInfo,
    -- Information about the internal structure is given in
    -- subclause 7.6.9.
    extensionContainer              ExtensionContainer          OPTIONAL,
    -- extensionContainer must not be used in version 2
    ...}
```

```
SignalInfo ::= OCTET STRING (SIZE (1..maxSignalInfoLength))
```

```
maxSignalInfoLength  INTEGER ::= 200
    -- This NamedValue represents the theoretical maximum number of
    -- octets which are available to carry a single data type,
    -- without requiring segmentation to cope with the network layer
    -- service. However, the actual maximum size available for a data
    -- type may be lower, especially when other information elements
    -- have to be included in the same component.
```

```
ProtocolId ::= ENUMERATED {
    gsm-0408  (1),
    gsm-0806  (2),
    gsm-BSSMAP  (3),
    -- Value 3 is reserved and must not be used
    ets-300102-1  (4)}
```

```
AlertingPattern ::= OCTET STRING (SIZE (1) )
     -- This type is used to represent Alerting Pattern

     --   bits 8765 : 0000 (unused)

     --   bits 43 : type of Pattern
     --        00 level
     --        01 category
     --        10 category
     --        all other values are reserved.

     --   bits 21 : type of alerting

alertingLevel-0   AlertingPattern ::= '00000000'B
alertingLevel-1   AlertingPattern ::= '00000001'B
alertingLevel-2   AlertingPattern ::= '00000010'B
     -- all other values of Alerting level are reserved
     -- Alerting Levels are defined in GSM 02.07

alertingCategory-1   AlertingPattern ::= '00000100'B
alertingCategory-2   AlertingPattern ::= '00000101'B
alertingCategory-3   AlertingPattern ::= '00000110'B
alertingCategory-4   AlertingPattern ::= '00000111'B
alertingCategory-5   AlertingPattern ::= '00001000'B
     -- all other values of Alerting Category are reserved
     -- Alerting categories are defined in GSM 02.07
```

-- data types for numbering and identification

```
IMSI ::= TBCD-STRING (SIZE (3..8))
     -- digits of MCC, MNC, MSIN are concatenated in this order.
```

```
ASCI-CallReference ::= TBCD-STRING (SIZE (1..8))
     -- digits of VGCS/VBC-area,Group-ID are concatenated in this order.
```

```
TMSI ::= OCTET STRING (SIZE (1..4))
```

```
SubscriberId ::= CHOICE {
     imsi                                [0] IMSI,
     tmsi                                [1] TMSI}
```

```
IMEI ::= TBCD-STRING (SIZE (8))
     --   Refers to International Mobile Station Equipment Identity
     --   and Software Version Number (SVN) defined in TS GSM 03.03.
     --   If the SVN is not present the last octet shall contain the
     --   digit 0 and a filler.
     --   If present the SVN shall be included in the last octet.
```

```
HLR-Id ::= IMSI
     -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
     -- MSIN) forming HLR Id defined in TS GSM 03.03.
```

```
HLR-List ::= SEQUENCE SIZE (1..maxNumOfHLR-Id) OF
                                         HLR-Id
```

```
maxNumOfHLR-Id  INTEGER ::= 50
```

```
LMSI ::= OCTET STRING (SIZE (4))
```

```
GlobalCellId ::= OCTET STRING (SIZE (5..7))
     -- Refers to Cell Global Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     --   Mobile Country Code:           3 digits according to CCITT Rec E.212
     --                                  1 digit filler (1111)
     --   Mobile Network Code:           2 digits according to CCITT Rec E.212
     --   Location Area Code:            2 octets according to TS GSM 04.08
     --   Cell Identity:                 2 octets (CI) according to TS GSM 04.08
```

```
NetworkResource ::= ENUMERATED {
     plmn  (0),
     hlr  (1),
     vlr  (2),
     pvlr  (3),
     controllingMSC  (4),
     vmsc  (5),
     eir  (6),
     rss  (7)}
```

```
NAEA-PreferredCI ::= SEQUENCE {
     naea-PreferredCIC                  [0] NAEA-CIC,
     extensionContainer                 [1] ExtensionContainer          OPTIONAL,
     ...}
```

```
NAEA-CIC ::= OCTET STRING (SIZE (3))
     -- The internal structure is defined by the Carrier Identification
     -- parameter in ANSI T1.113.3. Carrier codes between “000” and “999” may
     -- be encoded as 3 digits using “000” to “999” or as 4 digits using
     -- “0000” to “0999”. Carrier codes between “1000” and “9999” are encoded
     -- using 4 digits.
```

-- data types for CAMEL

```
CellIdOrLAI ::= CHOICE {
     cellIdFixedLength                  [0] CellIdFixedLength,
     laiFixedLength                     [1] LAIFixedLength}
```

```
CellIdFixedLength ::= OCTET STRING (SIZE (7))
     -- Refers to Cell Global Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     --   Mobile Country Code:          3 digits according to CCITT Rec E.212
     --                                 1 digit filler (1111)
     --   Mobile Network Code:          2 digits according to CCITT Rec E.212
     --   Location Area Code:           2 octets according to TS GSM 04.08
     --   Cell Identity:                2 octets (CI) according to TS GSM 04.08
```

```
LAIFixedLength ::= OCTET STRING (SIZE (5))
     -- Refers to Location Area Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     --   Mobile Country Code:          3 digits according to CCITT Rec E.212
     --                                 1 digit filler (1111)
     --   Mobile Network Code:          2 digits according to CCITT Rec E.212
     --   Location Area Code:           2 octets according to TS GSM 04.08
```

-- data types for subscriber management

```
BasicServiceCode ::= CHOICE {
     bearerService                      [2] BearerServiceCode,
     teleservice                        [3] TeleserviceCode}
```

```
Ext-BasicServiceCode ::= CHOICE {
     ext-BearerService                  [2] Ext-BearerServiceCode,
     ext-Teleservice                    [3] Ext-TeleserviceCode}
```

```
EMLPP-Info ::= SEQUENCE {
     maximumentitledPriority            EMLPP-Priority,
     defaultPriority                    EMLPP-Priority,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}
```

```
EMLPP-Priority ::= INTEGER (0..15)
     -- The mapping from the values A,B,0,1,2,3,4 to the integer-value is
     -- specified as follows where A is the highest and 4 is the lowest
     -- priority level
     -- the integer values 7-15 are spare and shall be mapped to value 4
```

```
priorityLevelA                          EMLPP-Priority ::= 6
priorityLevelB                          EMLPP-Priority ::= 5
priorityLevel0                          EMLPP-Priority ::= 0
priorityLevel1                          EMLPP-Priority ::= 1
priorityLevel2                          EMLPP-Priority ::= 2
priorityLevel3                          EMLPP-Priority ::= 3
priorityLevel4                          EMLPP-Priority ::= 4
```

```
END
```

17.7.9 Teleservice Codes

```
MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version4 (4)}

DEFINITIONS

::=

BEGIN

TeleserviceCode ::= OCTET STRING (SIZE (1))
     -- This type is used to represent the code identifying a single
     -- teleservice, a group of teleservices, or all teleservices. The
     -- services are defined in TS GSM 02.03.
     -- The internal structure is defined as follows:

     -- bits 87654321: group (bits 8765) and specific service
     -- (bits 4321)

Ext-TeleserviceCode ::= OCTET STRING (SIZE (1..5))
     -- This type is used to represent the code identifying a single
     -- teleservice, a group of teleservices, or all teleservices. The
     -- services are defined in TS GSM 02.03.
     -- The internal structure is defined as follows:

     -- OCTET 1:
     -- bits 87654321: group (bits 8765) and specific service
     -- (bits 4321)

     -- OCTETS 2-5: reserved for future use. If received the
    -- Ext-TeleserviceCode shall be
     -- treated according to the exception handling defined for the
     -- operation that uses this type.

     -- Ext-TeleserviceCode includes all values defined for TeleserviceCode.

allTeleservices                         TeleserviceCode ::= '00000000'B

allSpeechTransmissionServices           TeleserviceCode ::= '00010000'B
telephony                               TeleserviceCode ::= '00010001'B
emergencyCalls                          TeleserviceCode ::= '00010010'B

allShortMessageServices                 TeleserviceCode ::= '00100000'B
shortMessageMT-PP                       TeleserviceCode ::= '00100001'B
shortMessageMO-PP                       TeleserviceCode ::= '00100010'B

allFacsimileTransmissionServices        TeleserviceCode ::= '01100000'B
facsimileGroup3AndAlterSpeech           TeleserviceCode ::= '01100001'B
automaticFacsimileGroup3                TeleserviceCode ::= '01100010'B
facsimileGroup4                         TeleserviceCode ::= '01100011'B

-- The following non-hierarchical Compound Teleservice Groups
-- are defined in TS GSM 02.30:
allDataTeleservices                     TeleserviceCode ::= '01110000'B
     -- covers Teleservice Groups 'allFacsimileTransmissionServices'
     -- and 'allShortMessageServices'
allTeleservices-ExeptSMS                TeleserviceCode ::= '10000000'B
     -- covers Teleservice Groups 'allSpeechTransmissionServices' and
     -- 'allFacsimileTransmissionServices'
--
-- Compound Teleservice Group Codes are only used in call
-- independent supplementary service operations, i.e. they
-- are not used in InsertSubscriberData or in
-- DeleteSubscriberData messages.

allVoiceGroupCallServices               TeleserviceCode ::= '10010000'B

voiceGroupCall                          TeleserviceCode ::= '10010001'B
voiceBroadcastCall                      TeleserviceCode ::= '10010010'B
```

```
allPLMN-specificTS                  TeleserviceCode ::= '11010000'B
plmn-specificTS-1                   TeleserviceCode ::= '11010001'B
plmn-specificTS-2                   TeleserviceCode ::= '11010010'B
plmn-specificTS-3                   TeleserviceCode ::= '11010011'B
plmn-specificTS-4                   TeleserviceCode ::= '11010100'B
plmn-specificTS-5                   TeleserviceCode ::= '11010101'B
plmn-specificTS-6                   TeleserviceCode ::= '11010110'B
plmn-specificTS-7                   TeleserviceCode ::= '11010111'B
plmn-specificTS-8                   TeleserviceCode ::= '11011000'B
plmn-specificTS-9                   TeleserviceCode ::= '11011001'B
plmn-specificTS-A                   TeleserviceCode ::= '11011010'B
plmn-specificTS-B                   TeleserviceCode ::= '11011011'B
plmn-specificTS-C                   TeleserviceCode ::= '11011100'B
plmn-specificTS-D                   TeleserviceCode ::= '11011101'B
plmn-specificTS-E                   TeleserviceCode ::= '11011110'B
plmn-specificTS-F                   TeleserviceCode ::= '11011111'B
```

```
END
```

17.7.10 Bearer Service Codes

```
MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version4 (4)}

DEFINITIONS

::=

BEGIN
```

```
BearerServiceCode ::= OCTET STRING (SIZE (1))
     -- This type is used to represent the code identifying a single
     -- bearer service, a group of bearer services, or all bearer
     -- services. The services are defined in TS GSM 02.02.
     -- The internal structure is defined as follows:
     --
     -- plmn-specific bearer services:
     -- bits 87654321: defined by the HPLMN operator

     -- rest of bearer services:
     -- bit 8: 0 (unused)
     -- bits 7654321: group (bits 7654), and rate, if applicable
     -- (bits 321)
```

```
Ext-BearerServiceCode ::= OCTET STRING (SIZE (1..5))
     -- This type is used to represent the code identifying a single
     -- bearer service, a group of bearer services, or all bearer
     -- services. The services are defined in TS GSM 02.02.
     -- The internal structure is defined as follows:
     --
     -- OCTET 1:
     -- plmn-specific bearer services:
     -- bits 87654321: defined by the HPLMN operator
     --
     -- rest of bearer services:
     -- bit 8: 0 (unused)
     -- bits 7654321: group (bits 7654), and rate, if applicable
     -- (bits 321)

     -- OCTETS 2-5: reserved for future use. If received the
    -- Ext-TeleserviceCode shall be
     -- treated according to the exception handling defined for the
     -- operation that uses this type.


     -- Ext-BearerServiceCode includes all values defined for BearerServiceCode.
```

```
allBearerServices                   BearerServiceCode ::= '00000000'B
```

```
allDataCDA-Services                     BearerServiceCode ::= '00010000'B
dataCDA-300bps                          BearerServiceCode ::= '00010001'B
dataCDA-1200bps                         BearerServiceCode ::= '00010010'B
dataCDA-1200-75bps                      BearerServiceCode ::= '00010011'B
dataCDA-2400bps                         BearerServiceCode ::= '00010100'B
dataCDA-4800bps                         BearerServiceCode ::= '00010101'B
dataCDA-9600bps                         BearerServiceCode ::= '00010110'B
general-dataCDA                         BearerServiceCode ::= '00010111'B
```

```
allDataCDS-Services                     BearerServiceCode ::= '00011000'B
dataCDS-1200bps                         BearerServiceCode ::= '00011010'B
dataCDS-2400bps                         BearerServiceCode ::= '00011100'B
dataCDS-4800bps                         BearerServiceCode ::= '00011101'B
dataCDS-9600bps                         BearerServiceCode ::= '00011110'B
general-dataCDS                         BearerServiceCode ::= '00011111'B
```

```
allPadAccessCA-Services                 BearerServiceCode ::= '00100000'B
padAccessCA-300bps                      BearerServiceCode ::= '00100001'B
padAccessCA-1200bps                     BearerServiceCode ::= '00100010'B
padAccessCA-1200-75bps                  BearerServiceCode ::= '00100011'B
padAccessCA-2400bps                     BearerServiceCode ::= '00100100'B
padAccessCA-4800bps                     BearerServiceCode ::= '00100101'B
padAccessCA-9600bps                     BearerServiceCode ::= '00100110'B
general-padAccessCA                     BearerServiceCode ::= '00100111'B
```

```
allDataPDS-Services                     BearerServiceCode ::= '00101000'B
dataPDS-2400bps                         BearerServiceCode ::= '00101100'B
dataPDS-4800bps                         BearerServiceCode ::= '00101101'B
dataPDS-9600bps                         BearerServiceCode ::= '00101110'B
general-dataPDS                         BearerServiceCode ::= '00101111'B
```

```
allAlternateSpeech-DataCDA              BearerServiceCode ::= '00110000'B
```

```
allAlternateSpeech-DataCDS              BearerServiceCode ::= '00111000'B
```

```
allSpeechFollowedByDataCDA              BearerServiceCode ::= '01000000'B
```

```
allSpeechFollowedByDataCDS              BearerServiceCode ::= '01001000'B
```

```
-- The following non-hierarchical Compound Bearer Service
-- Groups are defined in TS GSM 02.30:
allDataCircuitAsynchronous              BearerServiceCode ::= '01010000'B
     -- covers "allDataCDA-Services", "allAlternateSpeech-DataCDA" and
     -- "allSpeechFollowedByDataCDA"
allAsynchronousServices                 BearerServiceCode ::= '01100000'B
     -- covers "allDataCDA-Services", "allAlternateSpeech-DataCDA",
     -- "allSpeechFollowedByDataCDA" and "allPadAccessCDA-Services"
allDataCircuitSynchronous               BearerServiceCode ::= '01011000'B
     -- covers "allDataCDS-Services", "allAlternateSpeech-DataCDS" and
     -- "allSpeechFollowedByDataCDS"
allSynchronousServices                  BearerServiceCode ::= '01101000'B
     -- covers "allDataCDS-Services", "allAlternateSpeech-DataCDS",
     -- "allSpeechFollowedByDataCDS" and "allDataPDS-Services"
--
-- Compound Bearer Service Group Codes are only used in call
-- independent supplementary service operations, i.e. they
-- are not used in InsertSubscriberData or in
-- DeleteSubscriberData messages.
```

```
allPLMN-specificBS                      BearerServiceCode ::= '11010000'B
plmn-specificBS-1                       BearerServiceCode ::= '11010001'B
plmn-specificBS-2                       BearerServiceCode ::= '11010010'B
plmn-specificBS-3                       BearerServiceCode ::= '11010011'B
plmn-specificBS-4                       BearerServiceCode ::= '11010100'B
plmn-specificBS-5                       BearerServiceCode ::= '11010101'B
plmn-specificBS-6                       BearerServiceCode ::= '11010110'B
plmn-specificBS-7                       BearerServiceCode ::= '11010111'B
plmn-specificBS-8                       BearerServiceCode ::= '11011000'B
plmn-specificBS-9                       BearerServiceCode ::= '11011001'B
plmn-specificBS-A                       BearerServiceCode ::= '11011010'B
plmn-specificBS-B                       BearerServiceCode ::= '11011011'B
plmn-specificBS-C                       BearerServiceCode ::= '11011100'B
plmn-specificBS-D                       BearerServiceCode ::= '11011101'B
plmn-specificBS-E                       BearerServiceCode ::= '11011110'B
plmn-specificBS-F                       BearerServiceCode ::= '11011111'B
```

```
END
```

17.7.11 Extension data types

```
MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   PrivateExtension,
   ExtensionContainer;


-- IOC for private MAP extensions

MAP-EXTENSION  ::= CLASS {
     &ExtensionType                                                    OPTIONAL,
     &extensionId                        OBJECT IDENTIFIER }
     -- The length of the Object Identifier shall not exceed 16 octets and the
     -- number of components of the Object Identifier shall not exceed 16


-- data types

ExtensionContainer ::= SEQUENCE {
     privateExtensionList                [0]PrivateExtensionList           OPTIONAL,
     pcs-Extensions                      [1]PCS-Extensions                 OPTIONAL,
     ...}

PrivateExtensionList ::= SEQUENCE SIZE (1..maxNumOfPrivateExtensions) OF
                                         PrivateExtension

PrivateExtension ::= SEQUENCE {
     extId                               MAP-EXTENSION.&extensionId
                                         ({ExtensionSet}),
     extType                             MAP-EXTENSION.&ExtensionType
                                         ({ExtensionSet}{@extId})          OPTIONAL}

maxNumOfPrivateExtensions  INTEGER ::= 10

ExtensionSet                             MAP-EXTENSION ::=
          {...
           -- ExtensionSet is the set of all defined private extensions
     }

     -- Unsupported private extensions shall be discarded if received.


PCS-Extensions ::= SEQUENCE {
     ...}

END
```

17.7.12 Group Call data types

```
MAP-GR-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-GR-DataTypes (23) version4 (4)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN
```

```
EXPORTS
   PrepareGroupCallArg,
   PrepareGroupCallRes,
   SendGroupCallEndSignalArg,
   SendGroupCallEndSignalRes,
   ForwardGroupCallSignallingArg,
   ProcessGroupCallSignallingArg
;

IMPORTS
   ISDN-AddressString,
   IMSI,
   EMLPP-Priority,
   ASCI-CallReference
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version4 (4)}

   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version4 (4)}

   Kc
FROM MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version4 (4)}


   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}
;
```

```
PrepareGroupCallArg ::= SEQUENCE {
     teleservice                    Ext-TeleserviceCode,
     asciCallReference              ASCI-CallReference,
     codec-Info                     CODEC-Info,
     cipheringAlgorithm             CipheringAlgorithm,
     groupKeyNumber                 [0]GroupKeyNumber           OPTIONAL,
     groupKey                       [1]Kc                       OPTIONAL,
     priority                       [2]EMLPP-Priority           OPTIONAL,
     uplinkFree                     [3] NULL                    OPTIONAL,
     extensionContainer             [4] ExtensionContainer      OPTIONAL,
     ...}
```

```
PrepareGroupCallRes ::= SEQUENCE {
     groupCallNumber                ISDN-AddressString,
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...}
```

```
SendGroupCallEndSignalArg ::= SEQUENCE {
     imsi                           IMSI                        OPTIONAL,
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...}
```

```
SendGroupCallEndSignalRes ::= SEQUENCE {
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...}
```

```
ForwardGroupCallSignallingArg ::= SEQUENCE {
     imsi                           IMSI                        OPTIONAL,
     uplinkRequestAck               [0] NULL                    OPTIONAL,
     uplinkReleaseIndication        [1] NULL                    OPTIONAL,
     uplinkRejectCommand            [2] NULL                    OPTIONAL,
     uplinkSeizedCommand            [3] NULL                    OPTIONAL,
     uplinkReleaseCommand           [4] NULL                    OPTIONAL,
     extensionContainer             ExtensionContainer          OPTIONAL,
     ...}
```

```
ProcessGroupCallSignallingArg ::= SEQUENCE {
    uplinkRequest                   [0] NULL                    OPTIONAL,
    uplinkReleaseIndication         [1] NULL                    OPTIONAL,
    releaseGroupCall                [2] NULL                    OPTIONAL,
    extensionContainer              ExtensionContainer          OPTIONAL,
    ...}
```

```
GroupKeyNumber ::= INTEGER (0..15)
```

```
CODEC-Info ::= OCTET STRING (SIZE (5..10))
    -- Refers to channel type
    -- coded according to GSM 08.08
```

```
CipheringAlgorithm ::= OCTET STRING (SIZE (1))
    -- Refers to 'permitted algorithms' in 'encryption information'
    -- coded according to GSM 08.08:

    -- Bits 8-1
    -- 8765 4321
    -- 0000 0001                    No encryption
    -- 0000 0010                    GSM A5/1
    -- 0000 0100                    GSM A5/2
    -- 0000 1000                    GSM A5/3
    -- 0001 0000                    GSM A5/4
    -- 0010 0000                    GSM A5/5
    -- 0100 0000                    GSM A5/6
    -- 1000 0000                    GSM A5/7
```

```
END
```

18 General on MAP user procedures

18.1 Introduction

Clauses 18 to 25 describe the use of MAP services for GSM signalling procedures. GSM signalling procedures may involve one or several interfaces running one or several application protocols. The present document addresses only the signalling procedures which require at least the use of one MAP service.

When a signalling procedure takes place in the network, an application process invocation is created in each system component involved. Part of the application process invocation acts as a MAP user and handles one or several MAP dialogues. For each dialogue it employs an instance of the MAP service provider. It may also use other communication services to exchange information on other interfaces, but detailed description of these aspects is outside the scope of the present document.

18.2 Common aspects of user procedure descriptions

18.2.1 General conventions

For each signalling procedure the present document provides a brief textual overview accompanied by a flow diagram which represent the functional interactions between system components. Functional interactions are labelled using the MAP service name when the interaction results from a service request or by this service name followed by the symbol "ack" when this interaction results from a service response.

For each of the system components involved, the present document also provides a detailed textual description of the application process behaviour as well as an SDL diagram. SDL diagrams describe the sequence of events, as seen by the MAP-User, which occurs at MAP service provider boundaries as well as external events which occur at other interfaces and which impact on the previous sequence.

External events do not necessarily correspond to the messages of other protocols used in the system component. The MAP-user procedures are described as if a set of interworking functions (IWF) between the MAP-user and the other protocol entities was implemented (see figure 18.2/1). Such interworking functions are assumed to perform either an identity mapping or some processing or translation as required to eliminate information irrelevant to the MAP-user.

The mapping of service primitives on to protocol elements is described in clauses 14 to 17.

GSM signalling procedures are built from one or more sub-procedures (e.g. authentication, ciphering, ...). Sub-procedures from which signalling procedures are built are represented using SDL MACRO descriptions.

In case of any discrepancy between the textual descriptions and the SDL descriptions, the latter take precedence.

18.2.2 Naming conventions

Events related to MAP are represented by MAP service primitives. The signal names used in the SDL diagrams are derived from the service primitive names defined in clauses 7 to 12, with some lexical transformations for readability and parsability purposes (blanks between words are replaced by underscores, the first letter of each word is capitalized).

Events received and sent on other interfaces are named by appending the message or signal name to a symbol representing the interface type, with some lexical transformations for readability and parsability purposes (blanks between words are replaced by underscores, the first letter of each word is capitalized).

The following symbols are used to represent the interface types:

"I": For interfaces to the fixed network. "I" stands for ISUP interface.

"A": For interfaces to BSS (i.e. A-interfaces);

"OM": For network management interfaces (communication with OMC, MML interface, ...);

"SC": For interfaces to a Service Centre;

"HO_CA": For internal interfaces to the Handover Control Application.

"US": For a local USSD application.

These naming conventions can be summarized by the following BNF description:

<Event_Name> ::= <MAP_Primitive> | <External_Event>

<MAP_Primitive> ::= <MAP_Open> | <MAP_Close> | <MAP_U_Abort> | <MAP_P_Abort> |
<MAP_Specific> | <MAP_Notice>

<MAP_Open> ::= MAP_Open_Req | MAP_Open_Ind | MAP_Open_Rsp | MAP_Open_Cnf

<MAP_Close> ::= MAP_Close_Req | MAP_Close_Ind

<MAP_U_Abort> ::= MAP_U_Abort_Req | MAP_U_Abort_Ind

<MAP_P_Abort> ::= MAP_P_Abort_Ind

<MAP_Notice> ::= MAP_Notice_Ind

<MAP_Specific> ::= <MAP_Req> | <MAP_Ind> | <MAP_Rsp> | <MAP_Cnf>

<MAP_Req> ::= MAP_<Service_Name>_Req

<MAP_Ind> ::= MAP_<Service_Name>_Ind

<MAP_Rsp> ::= MAP_<Service_Name>_Rsp

<MAP_Cnf> ::= MAP_<Service_Name>_Cnf

<External_Event> ::= <Interface_Type>_<External_Signal>

<Interface_Type> ::= I | A | OM | SC | HO AC | US

<External_Signal> ::= <Lexical_Unit>

<Service_Name> ::= <Lexical_Unit>

<Lexical_Unit> ::= <Lexical_Component> | <Lexical_Unit>_ <Lexical_Component>

<Lexical_Component> ::= <Upper_Case_Letter><Letter_Or_Digit_List>

<Letter_Or_Digit_List> ::= <Letter_Or_Digit> | <Letter_Or_Digit_List><Letter_Or_Digit>

<Letter_Or_Digit> ::= <Letter> | <Digit>

<Letter> ::= <Lower_Case_Letter> | <Upper_Case_Letter>

<Upper_Case_Letter> ::= A|B|C|D|E|F|G|H|I|J|K|L|M|N|O|P|Q|R|S|T|U|V|W|X|Y|Z

<Lower_Case_Letter> ::= a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z

<Digit> ::= 1|2|3|4|5|6|7|8|9|0

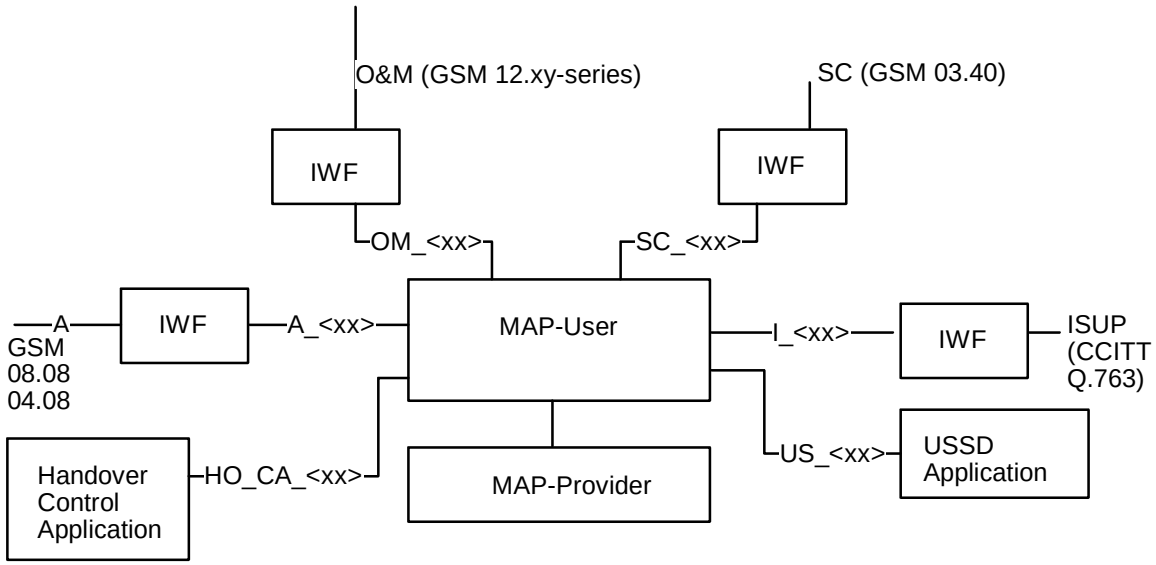


Figure 18.2/1: Interfaces applicable to the MAP-User

18.2.3 Convention on primitives parameters

18.2.3.1 Open service

When the originating and destination reference parameters shall be included in the MAP-OPEN request primitive, their value are indicated as a comment to the signal which represents this primitive.

18.2.3.2 Close service

When a pre-arranged released is requested, a comment is attached to the signal which represents the MAP-CLOSE request primitive. In the absence of comment, a normal release is assumed.

18.2.4 Version handling at dialogue establishment

Unless explicitly indicated in subsequent subclauses, the following principles regarding version handling procedures at dialogue establishment are applied by the MAP-user:

18.2.4.1 Behaviour at the initiating side

When a MAP user signalling procedure has to be executed, the MAP-user issues a MAP-OPEN request primitive with an appropriate application-context-name. If several names are supported (i.e. several versions) a suitable one is selected using the procedures described in clause 5.

If version 2 is selected and a MAP-CLOSE Confirm primitive in response to the MAP-OPEN request is received with a result parameter set to "refused" and a diagnostic parameter indicating "application-context-not-supported" or "potential incompatibility problem", the MAP-User issues a new MAP-OPEN request primitive with the equivalent version one context. This is informally represented in the SDL diagrams by a task symbol indicating "Perform Vr procedure".

If version 3 is selected and a MAP-CLOSE Confirm primitive in response to the MAP-OPEN request is received with a result parameter set to "refused" and a diagnostic parameter indicating "application-context-not-supported" or "potential incompatibility problem", the MAP-User issues a new MAP-OPEN request primitive with the equivalent version one or version two context. This is informally represented in the SDL diagrams by task symbols indicating "Perform Vr procedure" .

18.2.4.2 Behaviour at the responding side

On receipt of a MAP-OPEN indication primitive, the MAP-User analyses the application-context-name.

If it refers to a version one context, the associated V1 procedure is executed; if it refers to a version two context, the associated V2 procedure is executed, otherwise the associated V3 procedure is executed.

18.2.5 Abort Handling

Unless explicitly indicated in subsequent subclauses, the following principles are applied by the MAP-user regarding abort handling procedures:

On receipt of a MAP-P-ABORT indication or MAP-U-ABORT Indication primitive from any MAP-provider invocation, the MAP-User issues a MAP-U-ABORT Request primitive to each MAP-provider invocation associated with the same user procedure.

If applicable a decision is made to decide if the affected user procedure has to be retried or not.

18.2.6 SDL conventions

The MAP SDLs make use of a number of SDL concepts and conventions, where not all of them may be widely known. Therefore, this subclause outlines the use of a few concepts and conventions to improve understanding of the MAP SDLs.

The MAP User SDLs make use of SDL Processes, Procedures and Macros. Processes are independent from each other even if one process starts another one: The actions of both of them have no ordering in time. SDL Procedures and Macros are just used to ease writing of the specification: They contain parts of a behaviour used in several places, and the corresponding Procedure/Macro definition has to be expanded at the position of the Procedure/Macro call.

All Processes are started at system initialization and live forever, unless process creation/termination is indicated explicitly (i.e. a process is created by some other process).

The direction of Input/Output Signals in the SDL graphs is used to indicate the entity to which/from which communication is directed. If a process A communicates in parallel with processes B and C, all Inputs/Outputs to/from B are directed to one side, whereas communication with C is directed to the other side. However, there has been no formal convention used that communication to a certain entity (e.g. a HLR) will always be directed to a certain side (e.g. right).

In each state all those Input Signals are listed, which result in an action and/or state change. If an Input Signal is not listed in a state, receipt of this input should lead to an implicit consumption without any action or state change (according to the SDL rules). This implicit consumption is mainly used for receipt of the MAP DELIMITER indication and for receipt of a MAP CLOSE indication, except for a premature MAP CLOSE.

18.3 Interaction between MAP Provider and MAP Users

Each MAP User is defined by at least one SDL process. On the dialogue initiating side the MAP User will create a new instance of a MAP Provider implicit by issuing a MAP-OPEN request. This instance corresponds to a TC Dialogue and lives as long as the dialogue exists (see also subclause 14.3). There is a fix relation between MAP User and this Provider instance, i.e. all MAP service primitives from the MAP User for this dialogue are sent to this instance and all TC components received by this MAP Provider are mapped onto service primitives sent to this MAP User.

On the receiving side a MAP Provider instance is created implicit by receipt of a TC BEGIN indication. The corresponding MAP User is determined by the Application Context name included in this primitive, i.e. each Application Context is associated with one and only one MAP User. An instance of this User will be created implicit by receiving a MAP-OPEN indication. Note that in some cases there exist several SDL Processes for one MAP User (Application Context), e.g. the processes Register_SS_HLR, Erase_SS_HLR, Activate_SS_HLR, Deactivate_SS_HLR, Interrogate_SS_HLR, and Register_Password for the AC Network_Functional_SS_Handling. In these cases, a coordinator process is introduced acting as a MAP User, which in turn starts a sub-process depending on the first MAP service primitive received.

19 Mobility procedures

19.1 Location management Procedures

For non-GPRS subscribers, this subclause comprises a number of processes to handle the mobile nature of the subscriber. The processes will be addressed by SCCP Sub-System Number (MSC, VLR or HLR) and the Application Context. The following processes are defined in this subclause:

Process Update Location Area:

Initiator: Update_Location_Area_MSC, subclause 19.1.1.2;

Responder: Update_Location_Area_VLR, subclause 19.1.1.3;

Process Update Location:

Initiator: Update_Location_Area_VLR, subclause 19.1.1.3, or

Update_Location_VLR, subclause 19.1.1.6;

Responder: Update_Location_HLR, subclause 19.1.1.4;

Process Send Identification:

Initiator: Update_Location_Area_VLR, subclause 19.1.1.3;

Responder: Send_Identification_VLR, subclause 19.1.1.5;

Process Subscriber Present HLR:

Initiator: Subscriber_Present_HLR, subclause 19.1.1.7;

Responder: Short_Message_Alert_IWMSC, subclause 23.4.3;

Process Cancel Location:

Initiator: Cancel_Location_HLR, subclause 19.1.2.2;

Responder: Cancel_Location_VLR, subclause 19.1.2.3;

Process Detach IMSI:

Initiator: Detach_IMSI_MSC, subclause 19.1.3.2;

Responder: Detach_IMSI_VLR, subclause 19.1.3.3.

Process Purge MS:

Initiator: Purge_MS_VLR, subclause 19.1.4.2;

Responder: Purge_MS_HLR, subclause 19.1.4.3.

As both the Update Location Area and the Detach IMSI processes use the same application context name, the MAP Provider cannot distinguish between them. Therefore, a Location Management Coordinator Process will act as one user for this application context. This process (one in MSC, one in VLR) will create the Update Location Area or the Detach IMSI process, depending on the first service primitive received in the respective dialogue.

Additionally, a Location Management Coordinator process in the HLR coordinates the two application processes "Update Location HLR" (subclause 19.1.1.4) and "RESTORE_DATA_HLR" (subclause 19.3.3) that are addressed by the same application context.

Location Management Coordinator MSC

On receipt of a request for location updating from the A-interface, the Location Management Coordinator in the MSC will:

- create the process Update_Location_Area_MSC in case the updating type indicated in the A-interface primitive indicates normal updating, periodic updating or IMSI Attach;
- create the process Detach_IMSI_MSC in case the updating type indicated in the A-interface primitive indicates IMSI Detach.

The respective primitive is then forwarded to the created process. Henceforth, the coordinator will relay all service primitives from provider to the user and vice versa, until a request or indication for dialogue termination is received. This last primitive will be relayed, too, before the Coordinator process returns to idle state.

Location Management Coordinator VLR

On receipt of a dialogue request for the Location Management Application Context (see Receive_Open_Ind macro in subclause 25.1), the Location_Management_Coordinator will:

- terminate the procedure in case of parameter problems or if the MSC indicated version Vr protocol; or
- continue as below, if the dialogue is accepted.

Depending on the first service primitive received from the MAP Provider in this dialogue, the user process is created:

- Update_Location_Area_VLR in case the primitive is a MAP_UPDATE_LOCATION_AREA indication;
- Detach_IMSI_VLR in case the primitive is a MAP_DETACH IMSI indication.

In case a MAP_U_ABORT, MAP_P_ABORT or a premature MAP_CLOSE indication is received instead, the process returns to idle state. If a MAP_NOTICE indication is received, the dialogue towards the MSC is aborted and the process returns to idle state.

After creation of the user process the service primitive received from the provider is passed to the user process. Henceforth, the coordinator will relay all service primitives from provider to the user and vice versa, until a request or indication for dialogue termination is received. This last primitive will be relayed, too, before the Coordinator process returns to idle state.

Location Management Coordinator HLR

On receipt of a dialogue request for the Location Management Application Context (see Receive_Open_Ind macro in subclause 25.1), the Location_Management_Coordinator will:

- terminate the process in case of parameter problems; or
- revert to MAP version Vr protocol if the VLR requests version Vr protocol; or
- continue as described in the following, if the dialogue is accepted.

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

- Update_Location_HLR if the primitive is a MAP_UPDATE_LOCATION indication;
- RESTORE_DATA_HLR if the primitive is a MAP_RESTORE_DATA indication.

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

After creation of the user process the service primitive received from the MAP service-provider is passed to the user process. Henceforth, the coordinator will relay all service primitives from MAP service-provider to the MAP service-user and vice versa, until a request or indication for dialogue termination is received. This last primitive will be relayed, too, before the Coordinator process returns to idle state.

For GPRS subscribers, this subclause comprises a number of other processes to handle the mobile nature of the subscriber. The processes will be addressed by SCCP Sub-System Number (SGSN or HLR) and the Application Context. The following processes are defined in this subclause:

Process GPRS Update Location:

Initiator: GPRS_Update_Location_Area_VLR, subclause 19.1.1.3, or

SGSN_Update_HLR, subclause 19.1.1.8,

Responder: Update_GPRS_Location_HLR, subclause 19.1.1.4;

Process Cancel Location:

Initiator: Cancel_GPRS_Location_HLR, subclause 19.1.2.2;

Responder: Cancel_Location_SGSN, subclause 19.1.2.4;

Process Purge MS:

Initiator: Purge_MS_SGSN, subclause 19.1.4.4;

Responder: Purge_MS_HLR, subclause 19.1.4.3.

The following existing process is also used for GPRS subscribers :

Process Subscriber Present HLR:

Initiator: Subscriber_Present_HLR, subclause 19.1.1.7;

Responder: Short_Message_Alert_IWMSC, subclause 23.4.3;

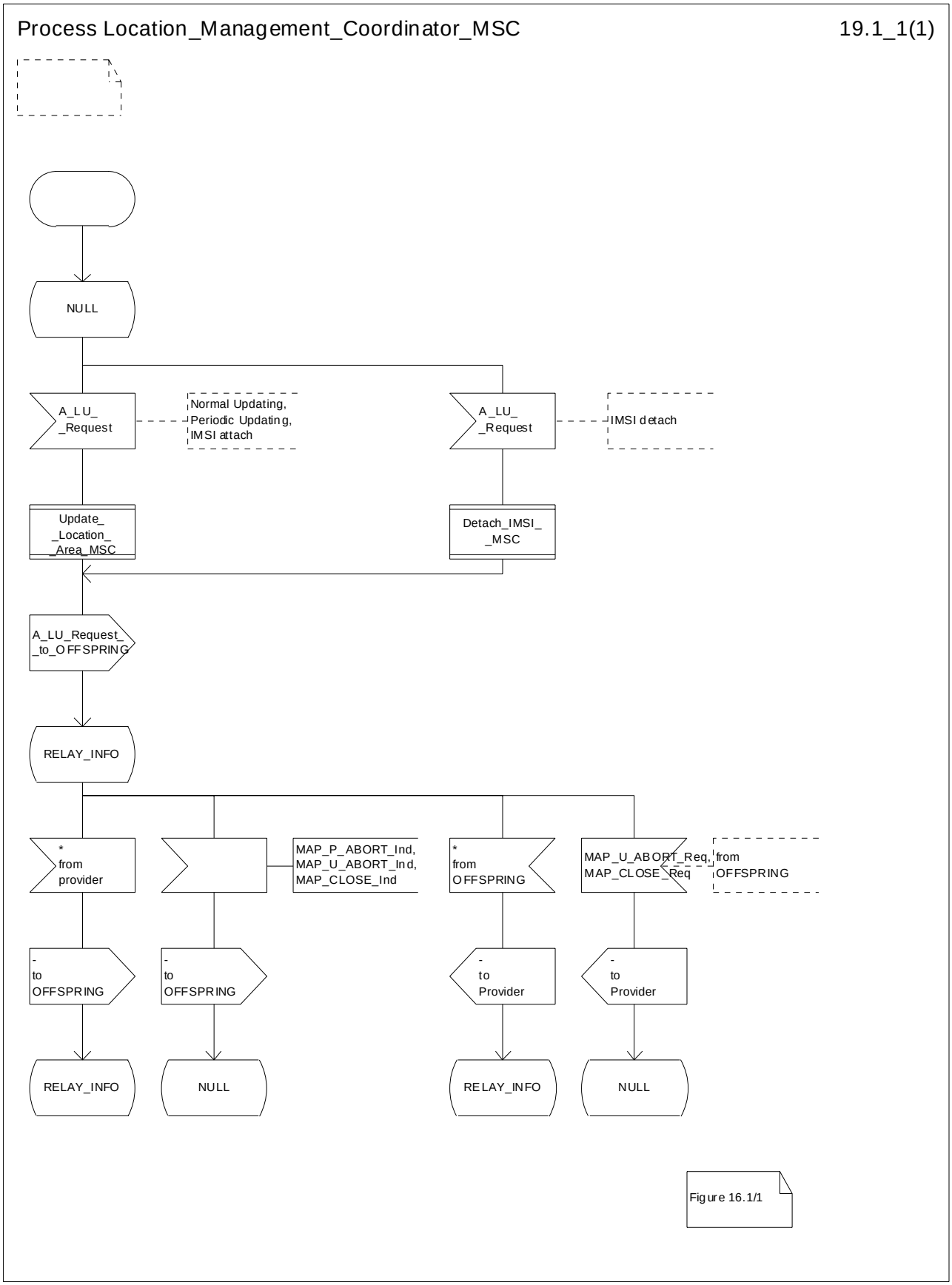


Figure 19.1/1: Process Location_Management_Coordinator_MSC

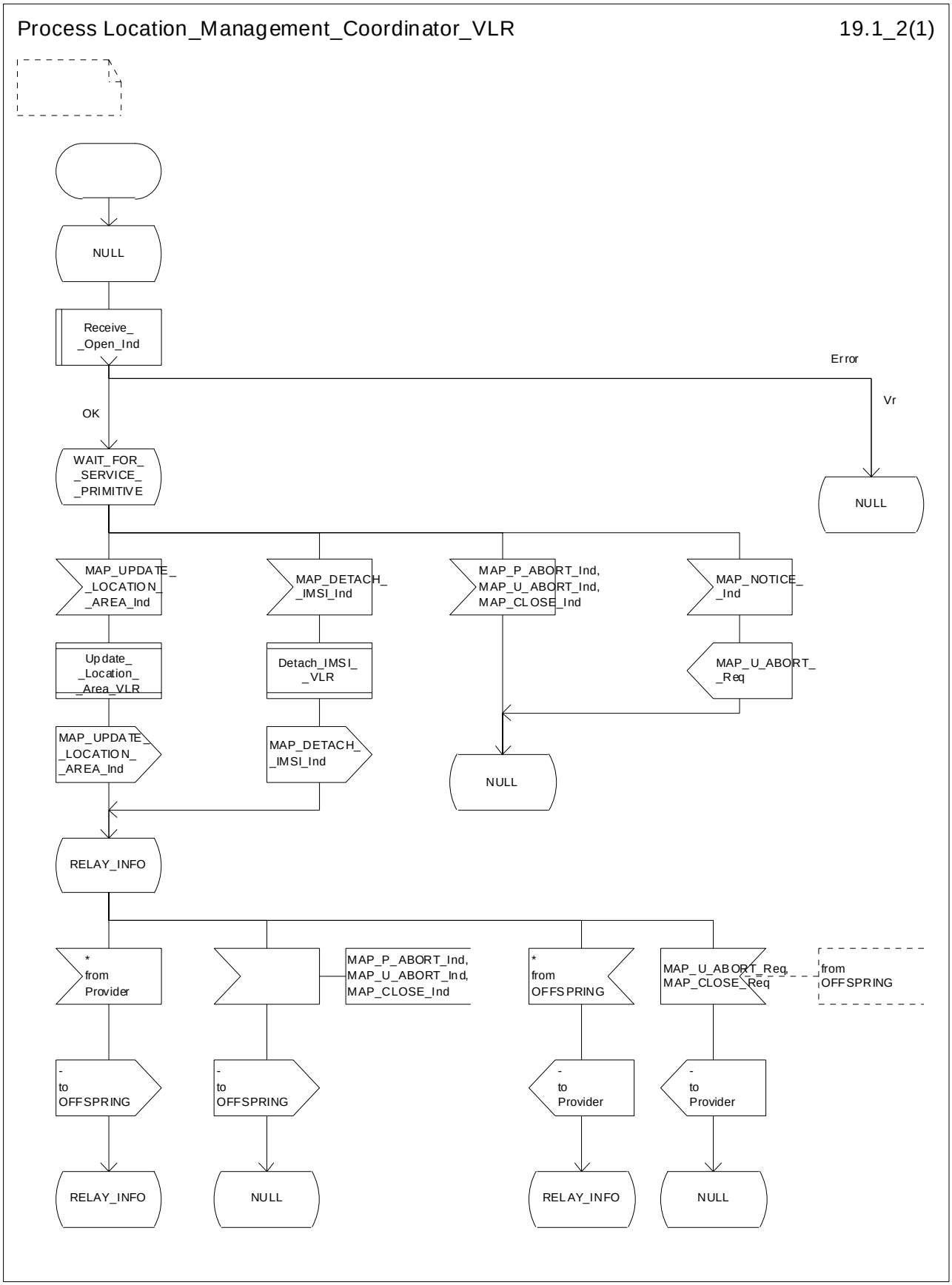


Figure 19.1/2: Process Location_Management_Coordinator_VLR

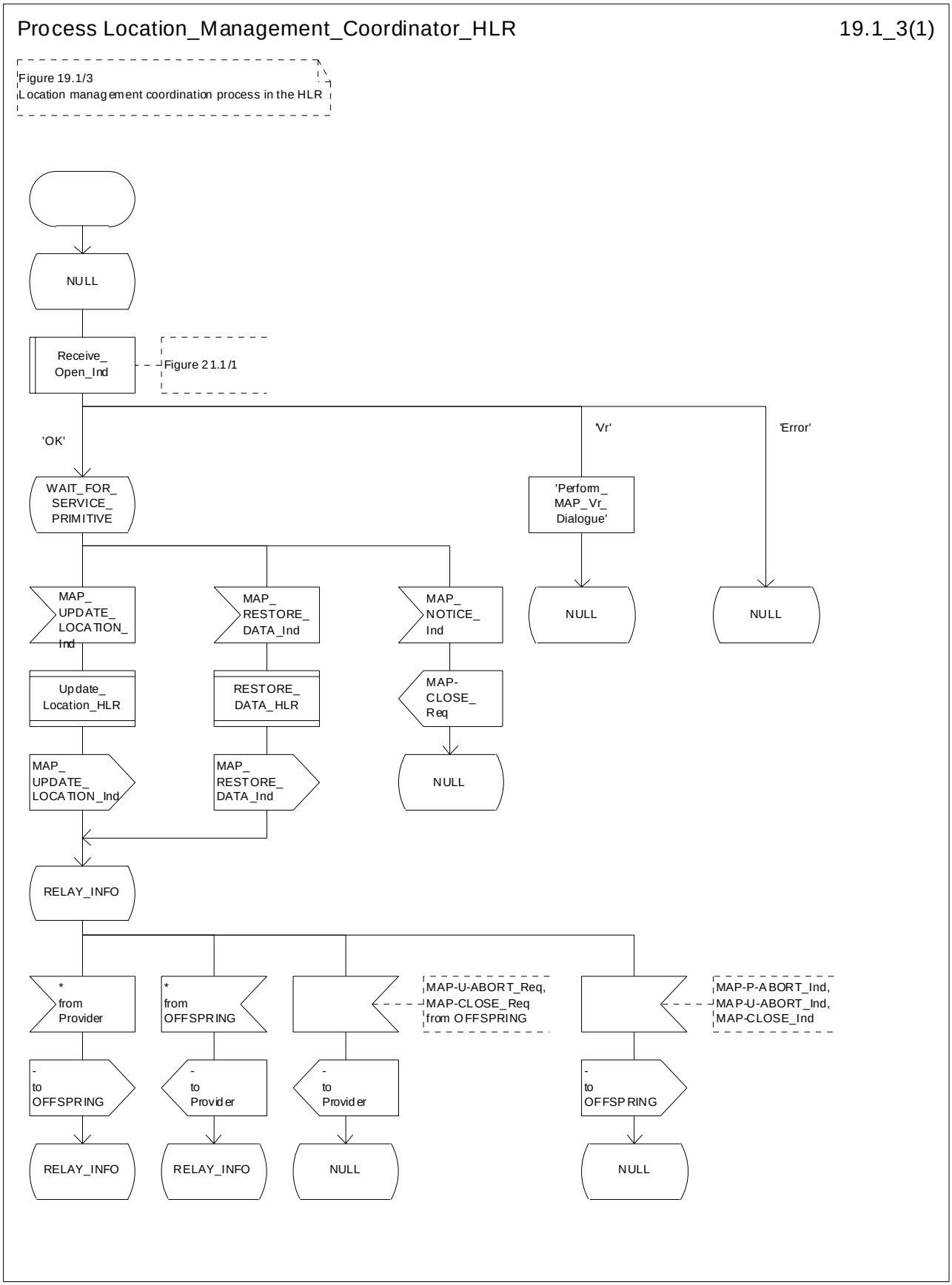


Figure 19.1/3: Process Location_Management_Coordinator_HLR

19.1.1 Location updating

19.1.1.1 General

The location updating procedure is used to update the location information held in the network. For GPRS subscribers, this procedure describes also updating of the SGSN and, if Gs interface is installed, updating of the VLR in combination with an attach/routing area updating in the SGSN. This location information is used to route incoming calls, packet data, short messages and unstructured supplementary service data to the roaming subscriber. Additionally, this procedure is used to provide the VLR and/or the SGSN with the information that a subscriber already registered, but being detached, is reachable again (IMSI Attach and/or GPRS Attach, see GSM 03.12 and GSM 03.60). The use of the IMSI Detach / Attach feature is optional for the network operator.

To minimize the updates of the subscriber's HLR, the HLR holds only information about the VLR and MSC the subscriber is attached to and, for GPRS subscribers, the SGSN the subscriber is attached to. The VLR and the SGSN contain more detailed location information, i.e. the location area the subscriber is actually roaming in (for the VLR) and the routing area (RA) where the GPRS subscriber is located (for SGSN). Therefore, the VLR needs to be updated at each location area change (see figure 19.1.1/1 for this procedure) and the SGSN needs to be updated at each routing area change.The HLR needs updating only in the following cases:

- when the subscriber registers in a new VLR or SGSN, i.e. the VLR or SGSN has no data for that subscriber;
- when the subscriber registers in a new location area of the same VLR and new routing information is to be provided to the HLR (change of MSC area);
- if the indicator "Confirmed by HLR" or the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" because of HLR, VLR or SGSN restoration, and the VLR or SGSN receives an indication that the subscriber is present.

If a mobile subscriber registers in a visitor location register (VLR) not holding any information about this subscriber and is identified by a temporary mobile subscriber identity (TMSI) allocated by a previous visitor location register (PVLR), if the PVLR identity can be derived from LAI the new VLR must obtain the IMSI from PVLR to identify the HLR to be updated (see figure 19.1.1/2). If the IMSI cannot be retrieved from PVLR, it is requested from the MS (see figure 19.1.1/3).

The stage 2 specification for GPRS is in GSM 03.60. The interworking between the MAP signalling procedures and the GPRS procedures in the SGSN is shown by the transfer of signals between these procedures (see subclause 19.1.1.8).

The message flow for successful GPRS Attach/ RA update procedure (with Gs interface not installed) is shown in figure 19.1.1/4.

The message flow for successful GPRS Attach/ RA update procedure combined with a successful VLR location updating (Gs interface installed) is shown in figure 19.1.1/5.

The following MAP services are invoked by the location update procedure:

MAP_UPDATE_LOCATION_AREA (see subclause 8.1);(**)

MAP_UPDATE_LOCATION (see subclause 8.1);(**)

MAP_UPDATE_GPRS_LOCATION (see subclause 8.1) (*);

MAP_CANCEL_LOCATION (see subclause 8.1);

MAP_INSERT_SUBSCRIBER_DATA (see subclause 8.8);

MAP_SEND_IDENTIFICATION (see subclause 8.1) (**);

MAP_PROVIDE_IMSI (see subclause 8.9) (**);

MAP_AUTHENTICATE (see subclause 8.5) (**);

MAP_SET_CIPHERING_MODE (see subclause 8.6) (**);

MAP_FORWARD_NEW_TMSI (see subclause 8.9) (**);

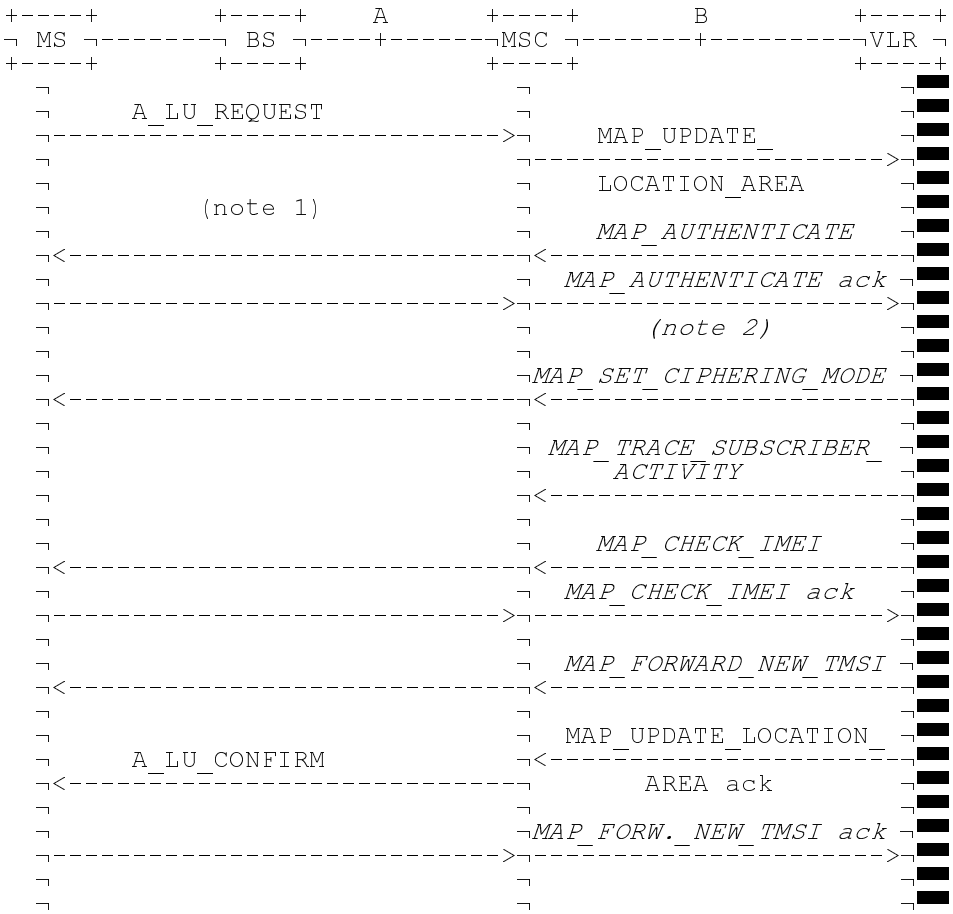
MAP_CHECK_IMEI (see subclause 8.7) (**);

MAP_ACTIVATE_TRACE_MODE (see subclause 9.2);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see subclause 9.2) (**).

(*): only used in SGSN and HLR for GPRS

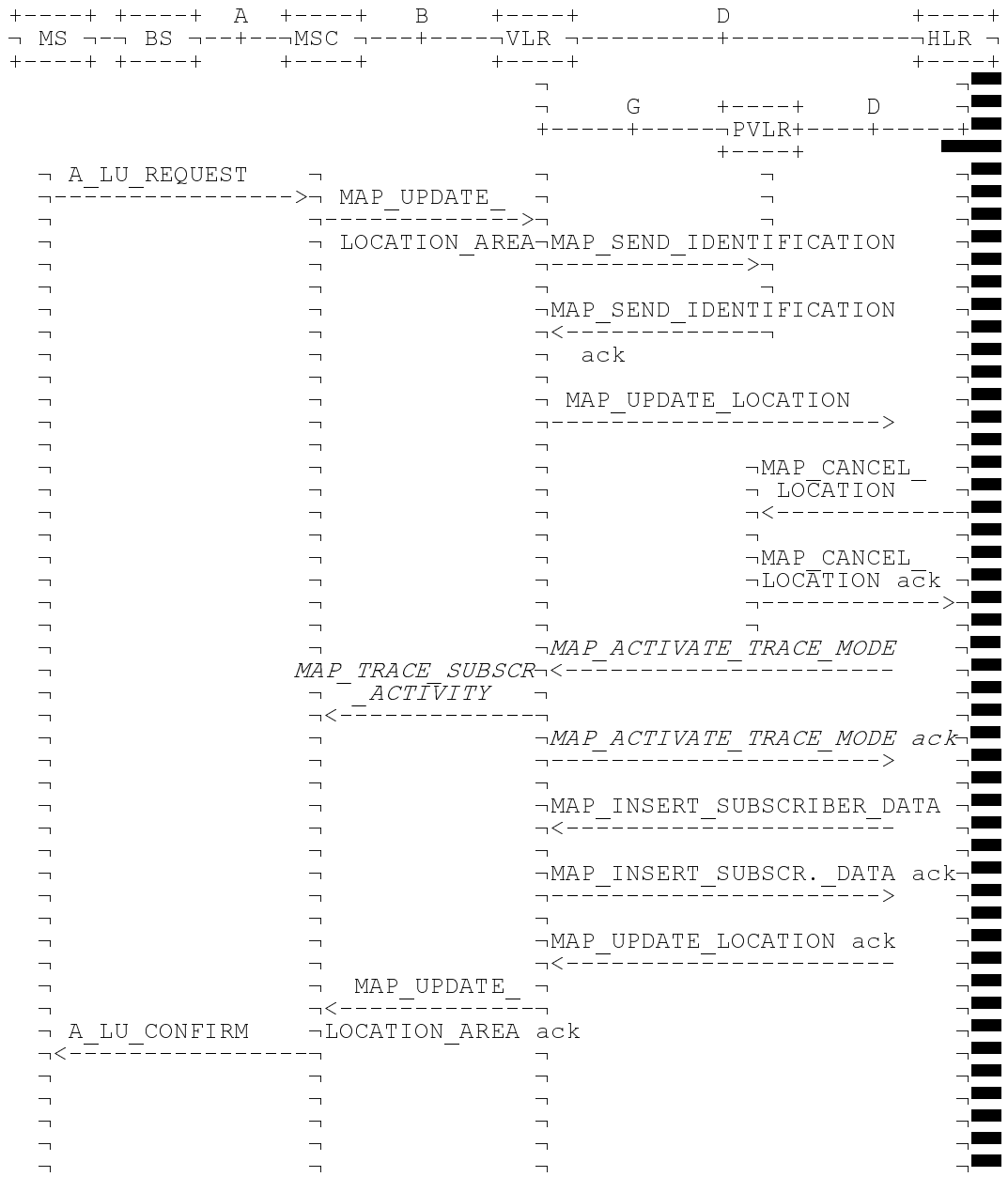
(**): not used in SGSN



NOTE 1: For details of the procedure on the radio path, see GSM 04.08. The services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

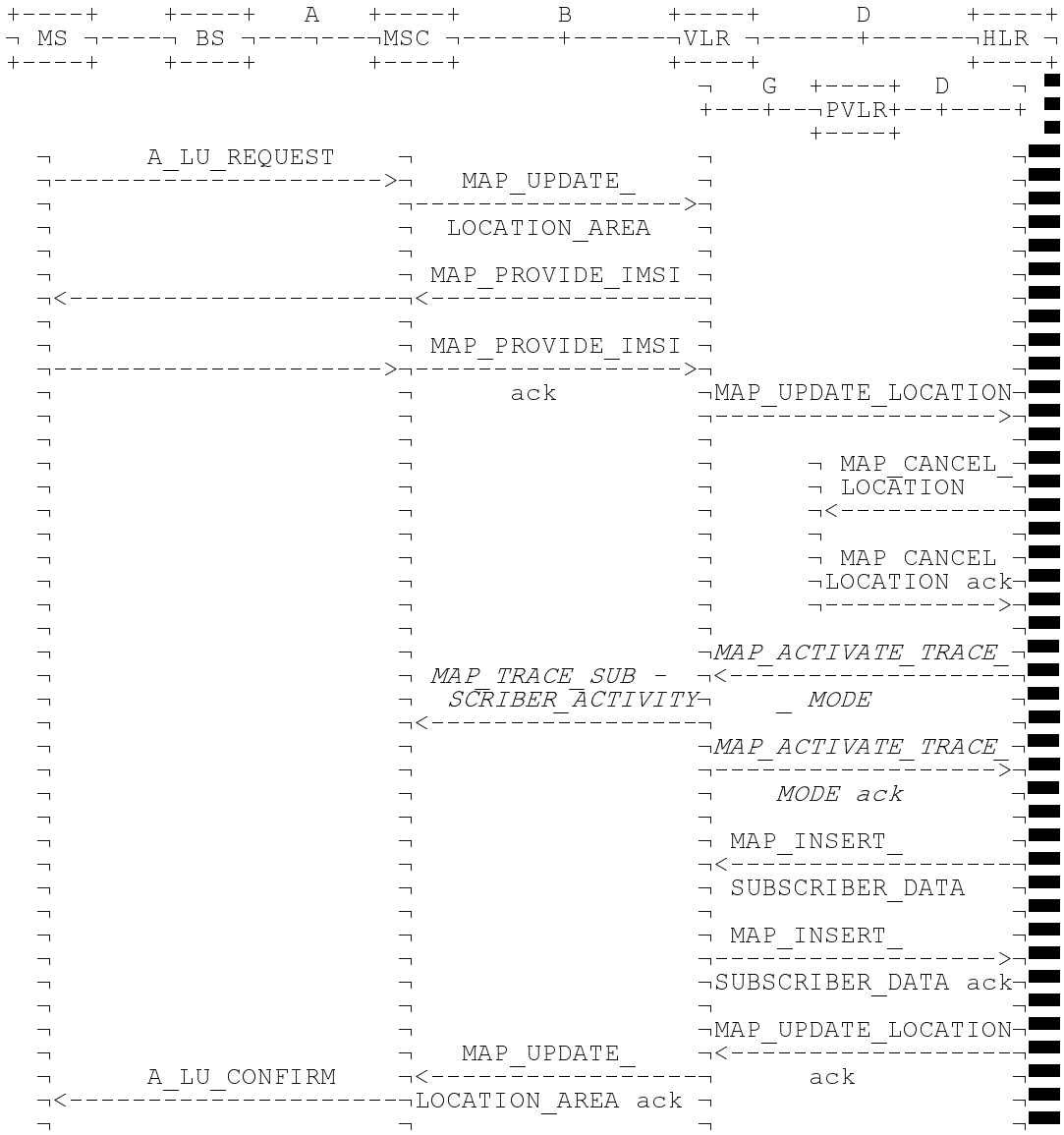
NOTE 2: Optional services are printed in *italics*.

Figure 19.1.1/1: Interface and services for location updating when roaming within an visitor location registers area (without need to update HLR)



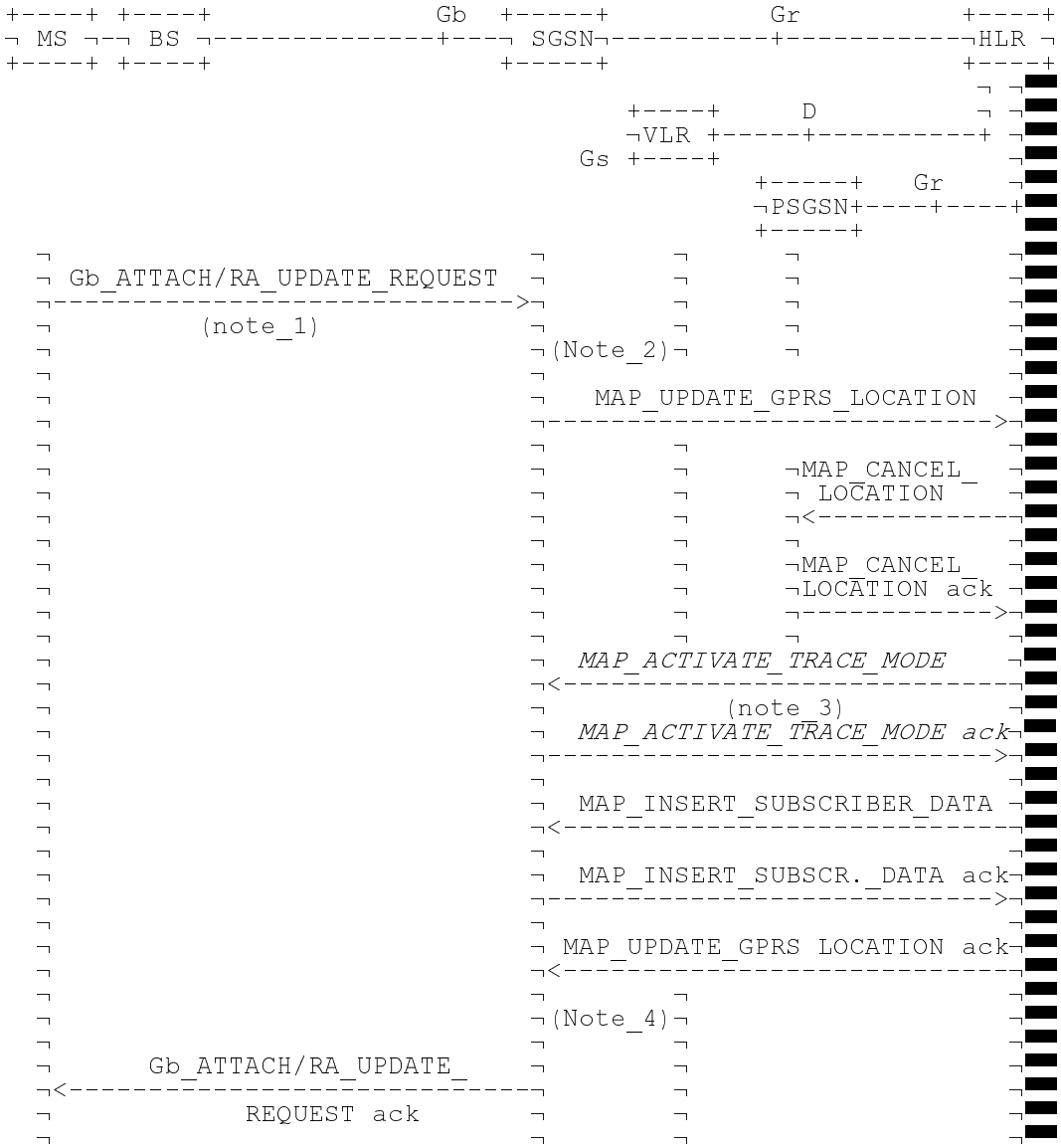
NOTE: The optional procedures in figure 19.1.1/1 apply here respectively.

Figure 19.1.1/2: Interface and services for location updating when changing the VLR area



NOTE: The optional procedures in figure 19.1.1/1 apply here respectively.

Figure 19.1.1/3: Interface and services for location updating involving both a VLR and an HLR, when IMSI can not be retrieved from the previous VLR



PSGSN = Previous SGSN

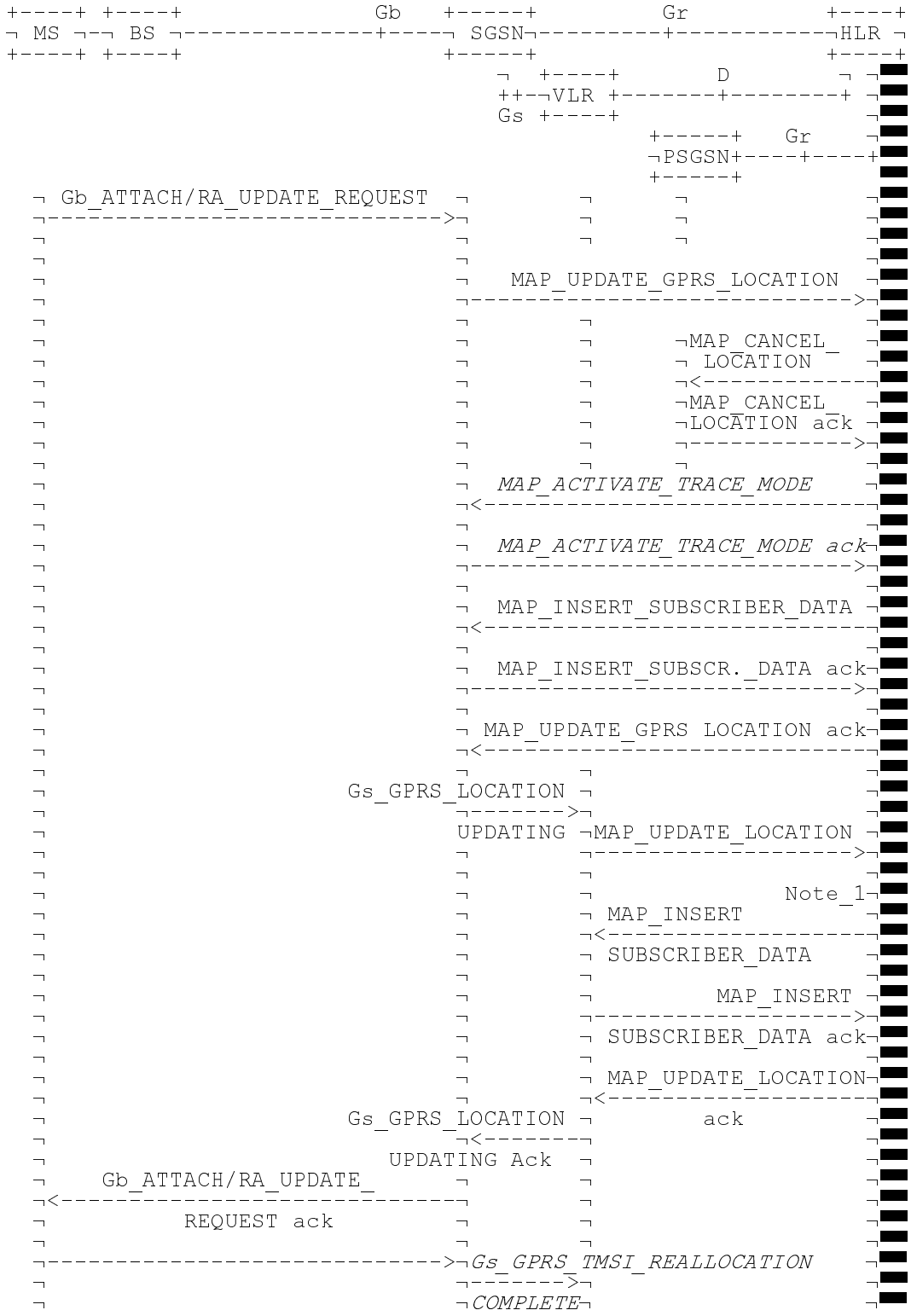
NOTE 1: For details of the procedure on the radio path, see GSM 08.18. The services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For security functions (authentication, ciphering, IMEI check) triggering refer to GSM 03.60. MAP processes invoked for those procedures are described in section 25.

NOTE 3: Optional services are printed in *italics*.

NOTE 4: Refer to GSM 03.60 for termination of the procedure and triggering of the signalling on the Gb interface.

Figure 19.1.1/14: Interface and services for GPRS location updating (Gs-interface not installed)



NOTE: The optional procedures in figure 19.1.1/14 apply here respectively. For details of the procedure on the Gs-interface, see GSM 09.18.

NOTE 1: Location Cancellation procedure toward the old VLR and optional tracing activation toward the new VLR are not represented on this figure.

Figure 19.1.1/15: Interface and services for GPRS location updating (Gs-interface installed)

19.1.1.2 Detailed procedure in the MSC

Figure 19.1.1/4 shows the MSC process for location register updating, containing macro calls for:

Receive_Open_Cnf subclause 25.1;

Authenticate_MSC subclause 25.5;

Check_IMEI_MSC subclause 25.6;

Obtain_IMSI_MSC subclause 25.8;

Trace_Subscriber_Activity_MSC subclause 25.9.

For structuring purposes, the second part of the process is placed into the macro Update Location Completion MSC, which is specific to this process (see figure 19.1.1/5).

When the MSC receives an A_LU_REQUEST (normal location updating, periodic location updating or IMSI attach) for a subscriber via the radio path, the MSC opens a dialogue to the VLR (MAP_OPEN request without any user specific parameters) and sends a MAP_UPDATE_LOCATION_AREA request, containing the parameters provided in the A_LU_REQUEST by the MS or BSS (for the parameter mapping see GSM 09.10).

If the dialogue is rejected or the VLR indicates a fallback to the version Vr procedure (see Receive_Open_Cnf macro in subclause 25.1), the MSC will send an A_LU_Rej towards the MS and terminate the procedure.

If the dialogue is accepted, the VLR will process this updating request, invoking optionally the MAP_PROVIDE_IMSI, MAP_TRACE_SUBSCRIBER_ACTIVITY, MAP_CHECK_IMEI or the MAP_AUTHENTICATE services first (see subclause 19.1.1.3 for initiation conditions, clause 25 for macros defining the handling of services in the MSC). For these macros there are two possible outcomes:

- a positive outcome, in which case the process continues waiting for the MAP_UPDATE_LOCATION_AREA confirmation; or

- an error is reported, in which case the process terminates (not applicable for Trace_Subscriber_Activity_MSC, which has only a positive outcome).

After receiving the MAP_UPDATE_LOCATION_AREA indication and handling these optional services, the VLR will decide whether a new TMSI need to be allocated to the subscriber or not.

Updating without TMSI reallocation

If the VLR does not reallocate the TMSI, the MSC will receive a MAP_UPDATE_LOCATION_AREA confirmation next (figure 19.1.1/4).

- if there are no parameters with this primitive, updating was successful and a confirmation will be sent to the MS;

- if there is an error cause contained in the received primitive, this cause will be mapped to the corresponding cause in the confirmation sent to the MS (see GSM 09.10 for the mapping of messages and causes).

Updating including TMSI reallocation

This case is covered by the macro Update Location Completion MSC given in figure 19.1.1/5. The MSC will upon receipt of a MAP_SET_CIPHERING_MODE request send a ciphering command towards BSS/MS. Thereafter, the MAP_FORWARD_NEW_TMSI indication and the MAP_UPDATE_LOCATION_AREA confirmation are received in arbitrary order, causing a confirmation on the radio path containing both new LAI and new TMSI. If the MAP_UPDATE_LOCATION_AREA confirmation contains any error, the updating request is rejected towards the MS:

- the MS will confirm receipt of the new TMSI, resulting in an empty MAP_FORWARD_NEW_TMSI response terminating the dialogue;

- if there is no confirmation received from the A-interface, the dialogue is terminated locally.

Before receiving a MAP_UPDATE_LOCATION_AREA confirmation, the MSC may receive a MAP_CHECK_IMEI indication. Handling of this indication, comprising IMEI request towards the MS and IMEI checking request towards the

EIR, is given in the macro description in subclause 25.6. The result may either be to return to the state Wait for TMSI or to return to terminate.

Forwarding the Check SS Indication

When the VLR receives a MAP_FORWARD_CHECK_SS_INDICATION_Ind during the Update LOCATION Area process, this indication is relayed to the MS (see GSM 09.11 for detailed interworking) and the MSC remains in the current state.

Abort handling

If the VLR receives a MAP_U_ABORT, a MAP_P_ABORT or a premature MAP_CLOSE indication from the VLR during the location update process, the MSC terminates the process by sending an A_LU_CONFIRM containing the error cause Updating Failure to the MS. If the MSC had already confirmed the location update towards the MS, the process terminates without notification towards the A-interface.

If the MSC receives a MAP_NOTICE indication, it issues a MAP_CLOSE and terminates the A-interface dialogue, and the process terminates.

When the procedure is terminated abnormally on the radio path, the dialogue towards the VLR is aborted with the appropriate diagnostic information, and the procedure terminates.

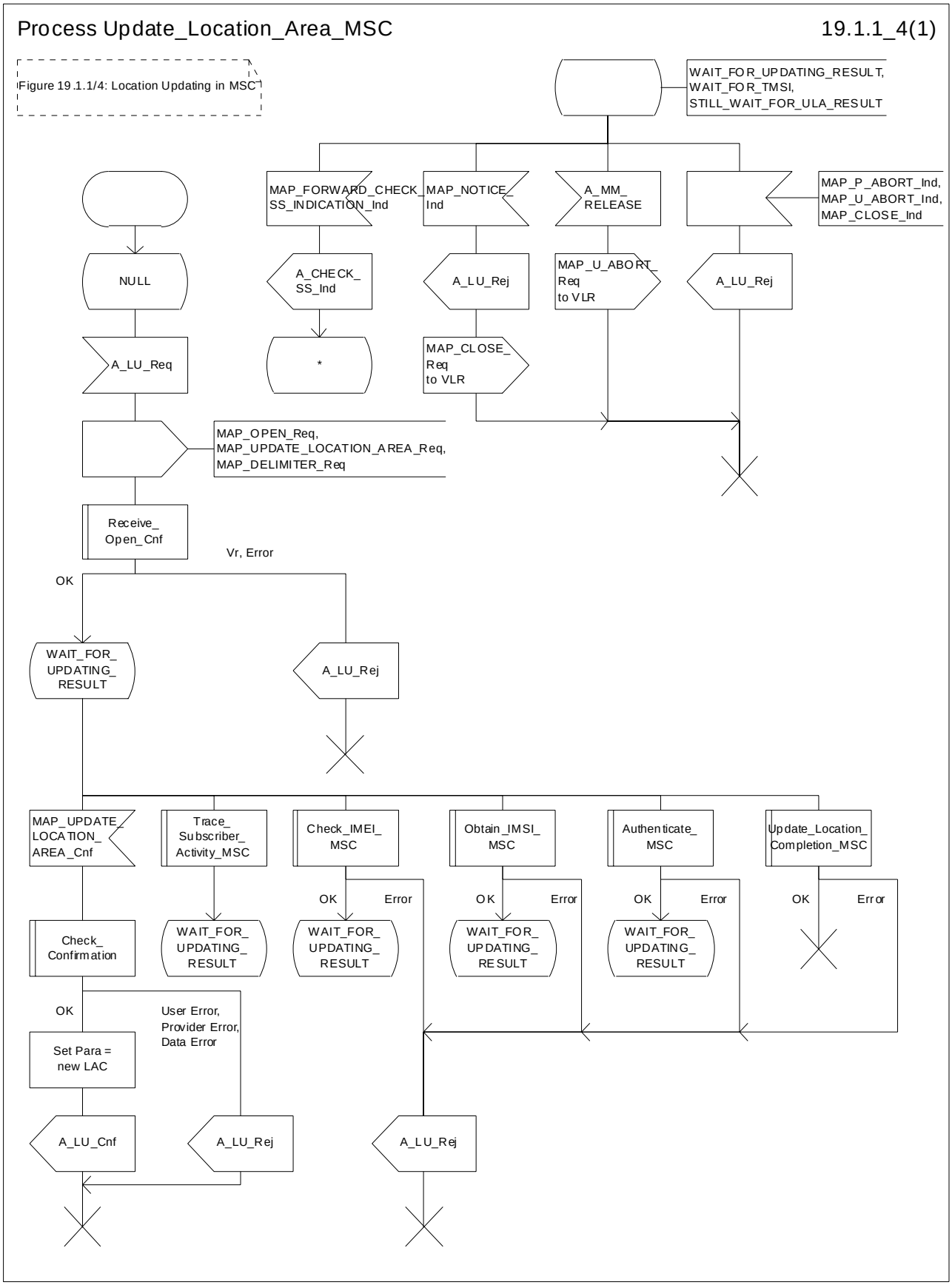


Figure 19.1.1/4: Process Update_Location_Area_MSC

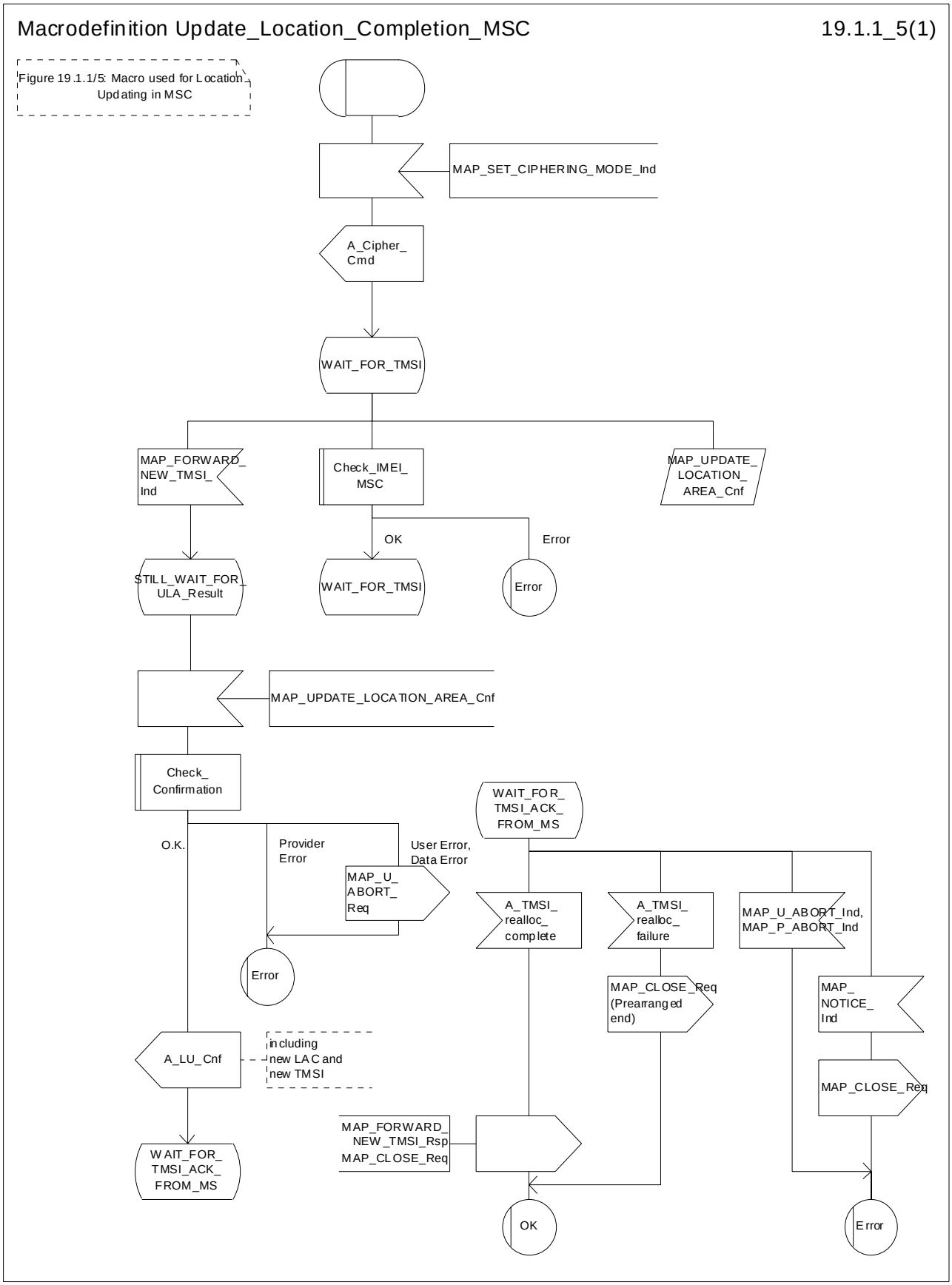


Figure 19.1.1/5: Macro Update_Location_Completion_MSC

19.1.1.3 Detailed procedure in the VLR

Figure 19.1.1/6 shows the process for location updating in the VLR. The following general macros are used:

Receive_Open_Ind	subclause 25.1;
Receive_Open_Cnf	subclause 25.1;
Authenticate_VLR	subclause 25.5;
Check_IMEI_VLR	subclause 25.6;
Insert_Subscriber_Data_VLR	subclause 25.7;
Obtain_IMSI_VLR to request the IMSI for the subscriber	subclause 25.8;
Activate_Tracing_VLR and Trace_Subscriber_Activity_VLR	subclause 25.9,
Subscriber_Present_VLR	subclause 25.10.

Additionally, the process specific macro

Location_Update_Completion_VLR, for optional initiation of Ciphering and TMSI reallocation as for acknowledgement of the MAP_UPDATE_LOCATION_AREA service, see figure 19.1.1/7,

and the optional process specific macro

VLR_Update_HLR to update the HLR and download subscriber data from there, see figure 19.1.1/8,

are invoked by this process.

Process Initiation

The location area updating process will be activated by receiving a MAP_UPDATE_LOCATION_AREA indication from the MSC. If there are parameter errors in the indication, the process is terminated with the appropriate error sent in the MAP_UPDATE_LOCATION_AREA response to the MSC. Else, The behaviour will depend on the subscriber identity received, either an IMSI or an TMSI.

Updating using IMSI

If the subscriber identity is an IMSI, the VLR checks whether the subscriber is unknown (i.e. no IMSI record). If so, the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" to initiate HLR updating later on. If the IMSI is known, the VLR checks whether the previous location area identification (LAI) provided in the primitive received from the MSC belongs to this VLR. If it does not, the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" to initiate HLR updating later on. The process may continue in both cases with the authentication check (see below).

Updating using TMSI

If the subscriber identity is a TMSI, the VLR checks whether the previous location area identification (LAI) provided in the primitive received from MSC belongs to an area of this VLR:

- if so, the TMSI will be checked. In case of location area change within a VLR, the TMSI should be known and the process may continue with the authentication check. Additionally, the indicator "Location Information Confirmed in HLR" is set to "Not confirmed" and the trace activity status is checked in case the target Location Area Id belongs to a new MSC.

- if the TMSI is not known or the subscriber data stored are incomplete, e.g. because the new LA belongs to a different VLR or due to VLR restoration, the indicator "Confirmed by VLR" is set to "Not Confirmed" to initiate HLR updating later on.

If the subscriber has not already been registered in the VLR, i.e. the previous LAI belongs to a different VLR, the indicators "Confirmed by HLR" and "Location Information Confirmed in HLR" are set to "Not Confirmed" and the VLR checks whether the identity of the Previous VLR (PVLR) is derivable from the previous LAI:

- if so, the IMSI and authentication parameters are requested from that VLR using the MAP_SEND_IDENTIFICATION service (see sheet 3 of figure 19.1.1/6), containing the subscriber's TMSI.

- if the dialogue is rejected by the PVLR, the process continues requesting the IMSI from the MS. In case the PVLR reverts to the MAP version Vr dialogue, the VLR will perform the respective procedure of version Vr, too, with outcomes as for the current MAP version dialogue. Else, the process waits the for the respective MAP_SEND_IDENTIFICATION response from the PVLR:

  - if the IMSI is received in that primitive, the process continues with the authentication check;

  - if the IMSI is not received from the previous VLR for any reason, the dialogue to the PVLR is terminated and the IMSI will be requested from the MS;

  - if a MAP_NOTICE indication is received from the PVLR, the dialogue will be terminated by sending a MAP_CLOSE indication, and the process continues requesting the IMSI from the MS;

  - if a MAP_P_ABORT or MAP_U_ABORT indication is received from the MSC while waiting for the MAP_SEND_IDENTIFICATION response, the process is terminated;

  - if a MAP_NOTICE indication is received from the MSC while waiting for the MAP_SEND_IDENTIFICATION response, the dialogue with the PVLR will be aborted by sending a MAP_U_ABORT indication (Remote Operations Failure), the dialogue with the MSC will be terminated by sending a MAP_CLOSE and the process terminates;

- if the identity of the previous VLR cannot be derived, the process continues by requesting the IMSI from the MS.

Requesting IMSI from the MS

For requesting the IMSI from the MS, the macro Obtain_IMSI_VLR described in subclause 25.8 is invoked (see figure 19.1.1/6 sheet 3). The outcome will be:

- OK, i.e. receipt of IMSI, in which case the process continues with the authentication check described below; or

- receipt of an Absent Subscriber error, indicating that the MS did not respond. In this case the System Failure error is reported in the MAP_UPDATE_LOCATION_AREA response towards the MSC and the updating process is terminated;

- aborted, i.e. the MSC dialogue has been released while waiting for the IMSI. In this case the updating process is terminated, too.

Authentication check

After a subscriber identity has been received, either in the service indication or by an explicit request procedure, the VLR checks whether authentication of this identity is required (see figure 19.1.1/6 sheet 2). If so, the authentication macro described in subclause 25.5 is invoked. The outcome of this macro can be:

- OK, i.e. the subscriber has been authenticated successfully, in which case the process is continued by setting the indicator "Confirmed by Radio Contact" to "Confirmed" and updating the location information held in the register. Thereafter,

  - if one or both of the indicators "Confirmed by HLR" and "Location Information Confirmed in HLR" is set to "Not Confirmed", HLR updating is invoked first;

  - otherwise the process continues with the Location Update Completion VLR macro described below, and the register is updated after successful completion of this macro.

- Illegal subscriber, i.e. there was a mismatch between expected and received SRES. The VLR checks whether authentication had been performed using the TMSI, in which case a new authentication attempt with IMSI may be started (VLR operator option).

  - if so, the process continues by requesting the IMSI from the MS;

  - else, the Illegal Subscriber error is reported in the MAP_UPDATE_LOCATION_AREA response.

- Unknown Subscriber, i.e. the IMSI given is unknown in the HLR. In this case, the subscriber data are deleted in the VLR and the same error is returned in the MAP_UPDATE_LOCATION_AREA response.

- Procedure error, i.e. the authentication process was unsuccessful for some other reason, e.g. because of a failure while requesting authentication information from the HLR. In this case the System Failure error is reported in the MAP_UPDATE_LOCATION_AREA response.

- Null, indicating impossible dialogue continuation (e.g. termination of the radio path), and leading to procedure termination without any further action.

Updating the HLR

If the HLR is to be updated, the VLR_Update_HLR macro described below is performed, with one of the following results (see sheet 4 of figure 19.1.1/6):

- OK, if HLR updating has been completed successfully. The response will contain the HLR number as parameter. Next, the Location_Update_Completion VLR macro is invoked (checking amongst others the roaming restrictions and regional subscription data), and upon successful outcome of this macro the register is updated and the process terminates.

- Roaming Not Allowed, qualified by PLMN Roaming Not Allowed if the location information indicates a PLMN for which the subscriber has no subscription or if the subscribers HLR cannot be reached (e.g. SS7 links to the subscribers HPLMN do not yet exist). In this case, the error Roaming Not Allowed qualified by PLMN Roaming Not Allowed is sent in the MAP_UPDATE_LOCATION_AREA response. The Subscriber Data are deleted in the VLR.

- if Roaming Not Allowed was qualified by the parameter Operator Determined Barring, the same value is sent in the MAP_UPDATE_LOCATION_AREA response to the MSC. The subscriber data are deleted in the VLR.

- Unknown Subscriber, if the subscriber is not known in the HLR. In this case, the subscriber data are deleted in the VLR, and the same error is sent in the MAP_UPDATE_LOCATION_AREA response.

- Procedure error, if there occurs some other error during HLR updating (e.g. abort of the connection to HLR):

  - if the VLR can proceed in stand alone mode (VLR operator option), the Location Update Completion VLR macro is invoked to complete the VLR updating, and the indicator "Confirmed by HLR" remains unchanged;

  - otherwise, the System Failure error is sent in the MAP_UPDATE_LOCATION_AREA response.

- Aborted, indicating that during HLR updating the MSC dialogue has been terminated. In this case, the updating process terminates without any further action.

The macro Location Update Completion VLR

This macro completes the VLR updating process. First, the VLR checks whether there is a roaming restriction for the subscriber (see figure 19.1.1/7):

- if the target LA is not allowed for the subscriber due to national roaming restrictions, the error Roaming Not Allowed with cause National Roaming Not Allowed is returned in the MAP_UPDATE_LOCATION_AREA response towards the MSC.

  The subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC. An indication that the subscriber is not allowed to roam is set in the VLR (LA Not Allowed Flag set to not allowed). As a consequence the subscriber is not reachable (checked for MTC, SMS and MT USSD) and cannot perform outgoing actions (checked in Access Management).

- if the target LA is not allowed for the subscriber because of regional subscription data (Zone Code List) or Roaming Restriction Due To Unsupported Feature stored in the VLR, the error Roaming Not Allowed with cause Location Area Not Allowed is returned towards the MSC in the MAP_UPDATE_LOCATION_AREA response.

  Also in this case the subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC. The LA Not Allowed Flag is set to not allowed in the VLR.

- if, after check of possible roaming restrictions, the subscriber is allowed to roam in the target LA, the LA Not Allowed Flag is set to allowed (if necessary), the IMSI Detached Flag is set to attached and the process SUBSCRIBER_PRESENT_VLR is started; this may inform the HLR that the subscriber is present again to retry an SMS delivery (see subclause 19.1.1.7). Thereafter, the VLR checks whether TMSI reallocation is required.

  - if so, the VLR sends a MAP_SET_CIPHERING_MODE request containing:

    - Ciphering Mode (version 1 GSM); and

    - Kc, the cipher key to be used.

- if IMEI checking is required by the operator, the VLR will invoke the CHECK_IMEI_VLR macro (see subclause 25.6) to initiate both requesting IMEI from the MS and checking of this IMEI towards the EIR. As result either the service is granted, with process continuation as given below, or the service is rejected, in which case the VLR marks the subscriber as detached and returns an Illegal Equipment error in the MAP_UPDATE_LOCATION_AREA response before the process terminates.

  - the VLR then sends a MAP_FORWARD_NEW_TMSI request containing the new TMSI, and the MAP_UPDATE_LOCATION_AREA response containing no parameters. The process will thereafter wait for the MAP_FORWARD_NEW_TMSI confirm. If this indicates a negative outcome, or if a MAP_P_ABORT or a MAP_U_ABORT primitive is received, the old TMSI is frozen. Subsequent accesses of the MS shall be accepted with both old or new TMSI.

- if TMSI reallocation is not required, the VLR invokes the CHECK_IMEI_VLR macro (see subclause 25.6) to initiate both requesting IMEI from the MS and checking of this IMEI towards the EIR, if IMEI Checking is required by the operator. As a result, either the service is granted, in which case the MAP_UPDATE_LOCATION_AREA response is sent without any parameters, or the service is rejected, in which case an Illegal Equipment error is returned in the MAP_UPDATE_LOCATION_AREA response, before the process terminates.

In all cases where the VLR sends a MAP_UPDATE_LOCATION_AREA response to the MSC, the dialogue towards the MSC is terminated by a MAP_CLOSE request with parameter Release Method indicating Normal Release.

The macro VLR Update HLR

This macro is invoked by the VLR process for location updating or by some other process handling the first subscriber access to the network after a register failure in order to perform HLR updating. If the VLR does not know the subscribers HLR (e.g. no IMSI translation exists as there are not yet any SS7 links to the subscribers HPLMN), the error Roaming Not Allowed with cause PLMN Roaming Not Allowed is returned.

If the subscribers HLR can be reached, the VLR opens a dialogue towards the HLR (see figure 19.1.1/8) by sending a MAP_OPEN request without any user specific parameters, together with a MAP_UPDATE_LOCATION request containing the parameters

- IMSI, identifying the subscriber;

- Location Info, containing the MSC number;

- VLR Number, the E.164 address of the VLR, to be used by the HLR when addressing the VLR henceforth (e.g. when requesting an MSRN);

- the LMSI as an VLR operator option; this is a subscriber identification local to the VLR, used for fast data base access.

In case the HLR rejects dialogue opening (see subclause 25.1), the VLR will terminate the procedure indicating procedure error. If the HLR indicates version Vr protocol to be used, the VLR will revert to the version Vr procedure concerning the dialogue with the HLR, with outcomes as for the current MAP version procedure.

If the HLR accepts the dialogue, the HLR will respond with:

- a MAP_INSERT_SUBSCRIBER_DATA indication, handled by the macro Insert_Subs_Data_VLR defined in subclause 25.7;

NOTE: The HLR may repeat this service several times depending on the amount of data to be transferred to the VLR and to replace subscription data in case they are not supported by the VLR.

- a MAP_ACTIVATE_TRACE_MODE indication, handled by the macro Activate_Tracing_VLR defined in subclause 25.9;

- a MAP_FORWARD_CHECK_SS_INDICATION_ind. This indication will be relayed to the MSC without any change of the current state.

- the MAP_UPDATE_LOCATION confirmation:

  - if this confirmation contains the HLR Number, this indicates that the HLR has passed all information and that updating has been successfully completed. The VLR is updated using the parameters provided in the service and needed by the VLR. If certain parameters are not needed in the VLR, e.g. because some service is not supported, the corresponding data may be discarded. The VLR sets the "Confirmed by HLR" and "Location information confirmed in HLR" indicators to "Confirmed" to indicate successful subscriber data updating;

  - if the confirmation contains an User error cause (Unknown Subscriber, Roaming Not Allowed or some other), the process calling the macro continues accordingly. In the last case, the subscriber data are marked as incomplete by setting the indicators "Confirmed by HLR" and "Location information confirmed in HLR" to "Not Confirmed". The same holds if there is a Provider error or a Data error in the confirmation;

- a MAP_P_ABORT, MAP_U_ABORT, or MAP_CLOSE indication. In these cases, the subscriber data are marked to be incomplete and the process continues as in the case of an error reported by the HLR;

- a MAP_NOTICE indication. Then, the dialogue towards the HLR is terminated, the subscriber data are marked to be incomplete and the process continues as in the case of an error reported by the HLR;

- if during HLR updating the VLR receives a MAP_P_ABORT, MAP_U_ABORT or a MAP_CLOSE indication concerning the MSC dialogue, the process is terminated by sending a MAP_U_ABORT request towards the HLR, and subscriber data are marked to be incomplete;

- if during HLR updating the VLR receives a MAP_NOTICE indication concerning the MSC dialogue, the dialogue with the MSC is terminated by sending a MAP_CLOSE, the dialogue with the HLR is terminated by sending a MAP_U_ABORT, subscriber data are marked to be incomplete and the process is terminated.

Abort Handling

If the VLR receives a MAP_NOTICE indication from the MSC while waiting for a MAP service primitive, the VLR will terminate the MSC dialogue by sending a MAP_CLOSE and any pending HLR dialogue by sending a MAP_U_ABORT (Remote Operations Failure), and the process is terminated.

Updating request via the Gs interface (optional for GPRS)

If Gs-interface is installed, the VLR may receive the Gs_GPRS_LOCATION_UPDATING_Request message from the SGSN for triggering an IMSI Attach or Location Updating procedure (see GSM 03.60 and 09.18).

Figure 19.1.1/16 shows the process for handling this Gs interface message.

The process specific macro

> « GPRS_Location_Update_Completion_VLR » for optional initiation of TMSI reallocation as for acknowledgement of the Gs_GPRS_LOCATION_UPDATING_Request message (see figure 19.1.1/17),

and the optional process specific macro

> « VLR_Update_GPRS_HLR » to update the HLR and download subscriber data from there (see figure 19.1.1/18), are invoked by this process.

On receipt of the Gs_GPRS_LOCATION_UPDATING_Request message, the VLR checks whether the subscriber is unknown (i.e. no IMSI record). If so, the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" to initiate HLR updating later on. The indicator "Confirmed by Radio Contact" is set to "Confirmed" and the location information held in the register is updated. If no VLR/SGSN association exits it is created (storage of SGSN address received) otherwise it is updated.

If the HLR is to be updated, the VLR_Update_GPRS_HLR macro described below is performed, with one of the following results (see sheet 2 of figure 19.1.1/18):

- OK, if HLR updating has been completed successfully. The response will contain the HLR number as parameter. Next, the GPRS_Location_Update_Completion VLR macro is invoked (checking amongst others the roaming restrictions and regional subscription data), and upon successful outcome of this macro the register is updated and the process terminates.

- Roaming Not Allowed, qualified by PLMN Roaming Not Allowed if the location information indicates a PLMN for which the subscriber has no subscription or if the subscribers HLR cannot be reached (e.g. SS7 links to the subscribers HPLMN do not yet exist). In this case, the appropriate error (see GSM 09.18) is sent to the SGSN in the Gs_GPRS_LOCATION_UPDATING Reject. The Subscriber Data are deleted in the VLR.

- if Roaming Not Allowed was qualified by the parameter Operator Determined Barring, the appropriate error (see GSM 09.18) is sent in the Gs_GPRS_LOCATION_UPDATING Reject to the SGSN. The subscriber data are deleted in the VLR.

- Unknown Subscriber, if the subscriber is not known in the HLR. In this case, the subscriber data are deleted in the VLR, and the appropriate error (see GSM 09.18) is sent in the Gs_GPRS_LOCATION_UPDATING Reject.

- Procedure error, if there occurs some other error during HLR updating (e.g. abort of the connection to HLR). In this case the appropriate error (see GSM 09.18) is sent in the Gs_GPRS_LOCATION_UPDATING Reject.

The macro GPRS Location Update Completion VLR

This macro completes the VLR updating process. First, the VLR checks whether there is a roaming restriction for the subscriber (see figure 19.1.1/17):

- if the target LA is not allowed for the subscriber due to national roaming restrictions, the appropriate error (see GSM 09.18) is sent in the Gs_GPRS_LOCATION_UPDATING Reject towards the SGSN.

  The subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC/VLR. An indication that the subscriber is not allowed to roam is set in the VLR (LA Not Allowed Flag set to not allowed). As a consequence the subscriber is not reachable (checked for MTC, SMS and MT USSD) and cannot perform outgoing actions (checked in Access Management).

- if the target LA is not allowed for the subscriber because of regional subscription data (Zone Code List) or Roaming Restriction Due To Unsupported Feature stored in the VLR, the appropriate error (see GSM 09.18) is returned to the SGSN in the Gs_GPRS_LOCATION_UPDATING Reject.

  Also in this case the subscriber data are not deleted from VLR, to avoid unnecessary HLR updating when roaming into other LAs of the same MSC. The LA Not Allowed Flag is set to not allowed in the VLR.

- if, after check of possible roaming restrictions, the subscriber is allowed to roam in the target LA, the LA Not Allowed Flag is set to allowed (if necessary), the IMSI Detached Flag is set to attached and the process SUBSCRIBER_PRESENT_VLR is started; this may inform the HLR that the subscriber is present again to retry an SMS delivery (see subclause 19.1.1.7). Thereafter, the VLR checks whether TMSI reallocation is required.

  - if so, the VLR sends the TMSI within the Gs_GPRS_LOCATION_UPDATING Accept message and Gs_GPRS_TMSI_REALLOCATION_Complete is expected.

- if TMSI reallocation is not required, the VLR sends the Gs_GPRS_LOCATION_UPDATING Accept message to the SGSN.

The macro VLR Update GPRS HLR

This macro is invoked by the VLR process for location updating (see GSM 03.60). If the VLR does not know the subscribers HLR (e.g. no IMSI translation exists as there are not yet any SS7 links to the subscribers HPLMN), the error Roaming Not Allowed with cause PLMN Roaming Not Allowed is returned.

If the subscribers HLR can be reached, the VLR opens a dialogue towards the HLR (see figure 19.1.1/18) by sending a MAP_OPEN request without any user specific parameters, together with a MAP_UPDATE_LOCATION request containing the parameters

- IMSI, identifying the subscriber;
- Location Info, containing the MSC number;
- VLR Number, the E.164 address of the VLR, to be used by the HLR when addressing the VLR henceforth (e.g. when requesting an MSRN);
- the LMSI as an VLR operator option; this is a subscriber identification local to the VLR, used for fast data base access.

In case the HLR rejects dialogue opening (see subclause 25.1), the VLR will terminate the procedure indicating procedure error. If the HLR indicates version Vr protocol to be used, the VLR will revert to the version Vr procedure concerning the dialogue with the HLR, with outcomes as for the current MAP version procedure.

If the HLR accepts the dialogue, the HLR will respond with:

- a MAP_INSERT_SUBSCRIBER_DATA indication, handled by the macro Insert_Subs_Data_VLR defined in subclause 25.7;

NOTE: The HLR may repeat this service several times depending on the amount of data to be transferred to the VLR and to replace subscription data in case they are not supported by the VLR.

- a MAP_ACTIVATE_TRACE_MODE indication, handled by the macro Activate_Tracing_VLR defined in subclause 25.9;
- a MAP_FORWARD_CHECK_SS_INDICATION_ind. This indication will not be relayed to the SGSN.
- the MAP_UPDATE_LOCATION confirmation:
  - if this confirmation contains the HLR Number, this indicates that the HLR has passed all information and that updating has been successfully completed. The VLR is updated using the parameters provided in the service and needed by the VLR. If certain parameters are not needed in the VLR, e.g. because some service is not supported, the corresponding data may be discarded. The VLR sets the "Confirmed by HLR" and "Location information confirmed in HLR" indicators to "Confirmed" to indicate successful subscriber data updating;
  - if the confirmation contains an User error cause (Unknown Subscriber, Roaming Not Allowed or some other), the process calling the macro continues accordingly. In the last case, the subscriber data are marked as incomplete by setting the indicators "Confirmed by HLR" and "Location information confirmed in HLR" to "Not Confirmed". The same holds if there is a Provider error or a Data error in the confirmation;
- a MAP_P_ABORT, MAP_U_ABORT, or MAP_CLOSE indication. In these cases, the subscriber data are marked to be incomplete and the process continues as in the case of an error reported by the HLR;
- a MAP_NOTICE indication. Then, the dialogue towards the HLR is terminated, the subscriber data are marked to be incomplete and the process continues as in the case of an error reported by the HLR.

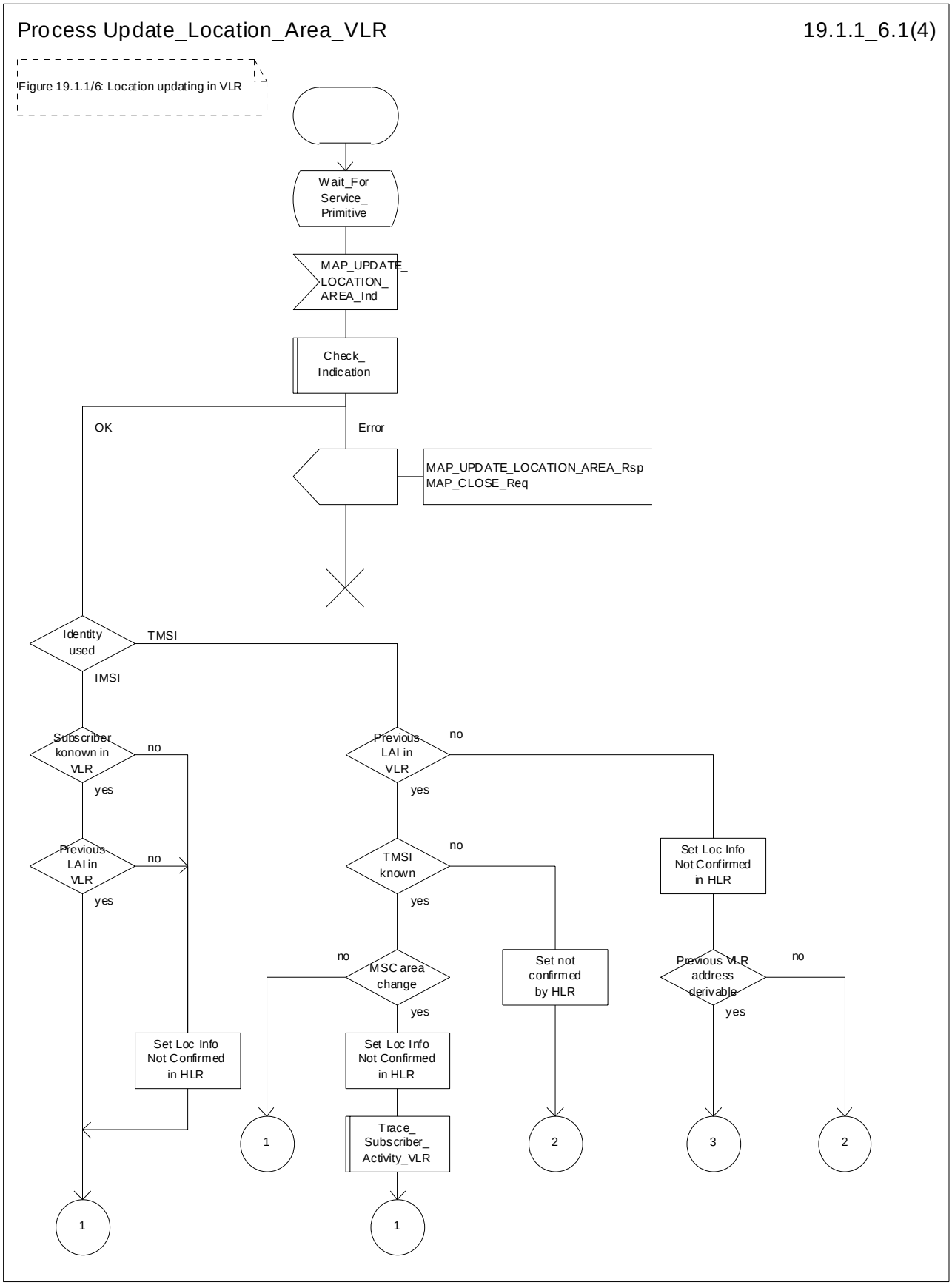


Figure 19.1.1/6 (sheet 1 of 4): Process Update_Location_Area_VLR

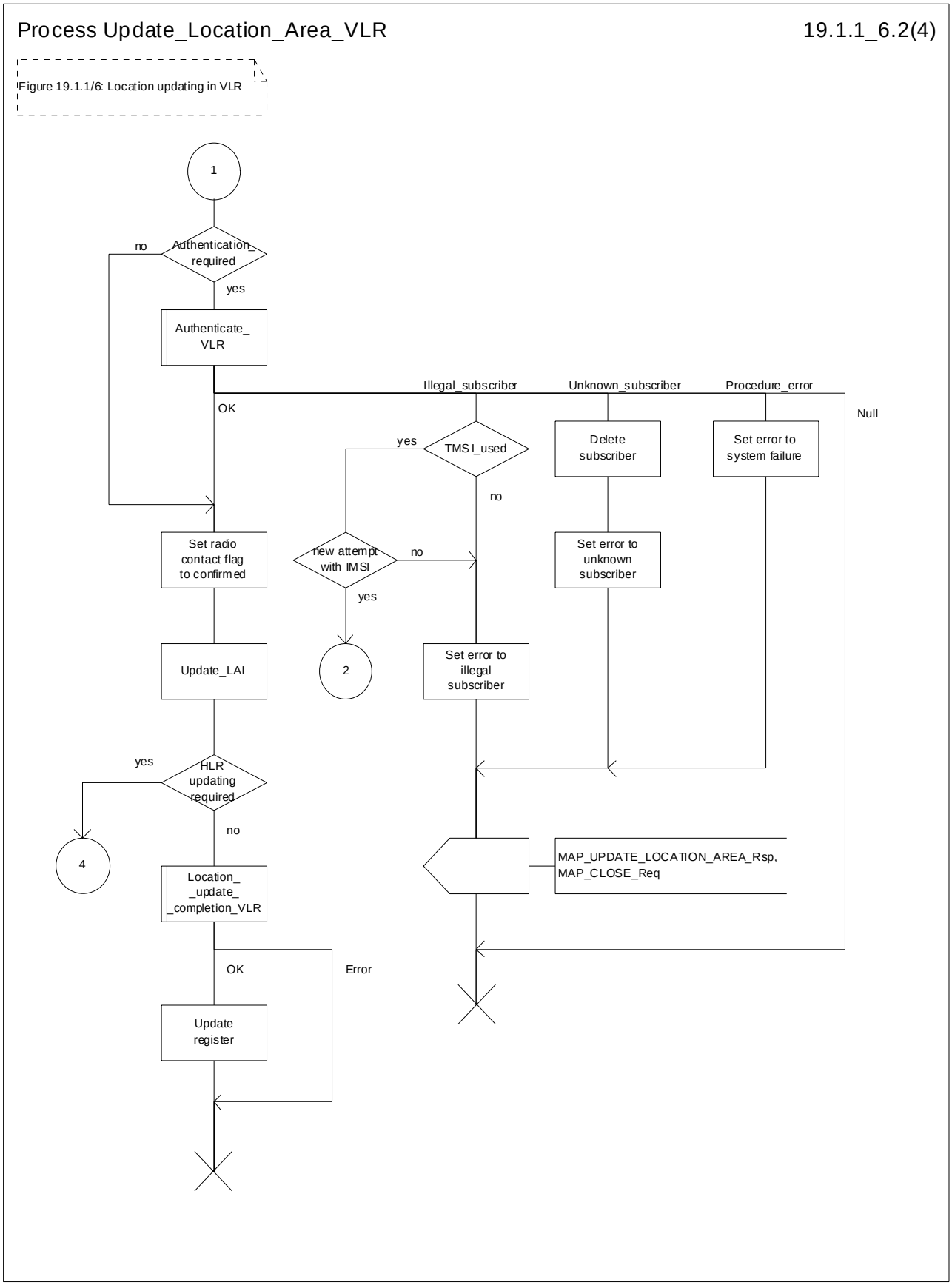


Figure 19.1.1/6 (sheet 2 of 4): Process Update_Location_Area_VLR

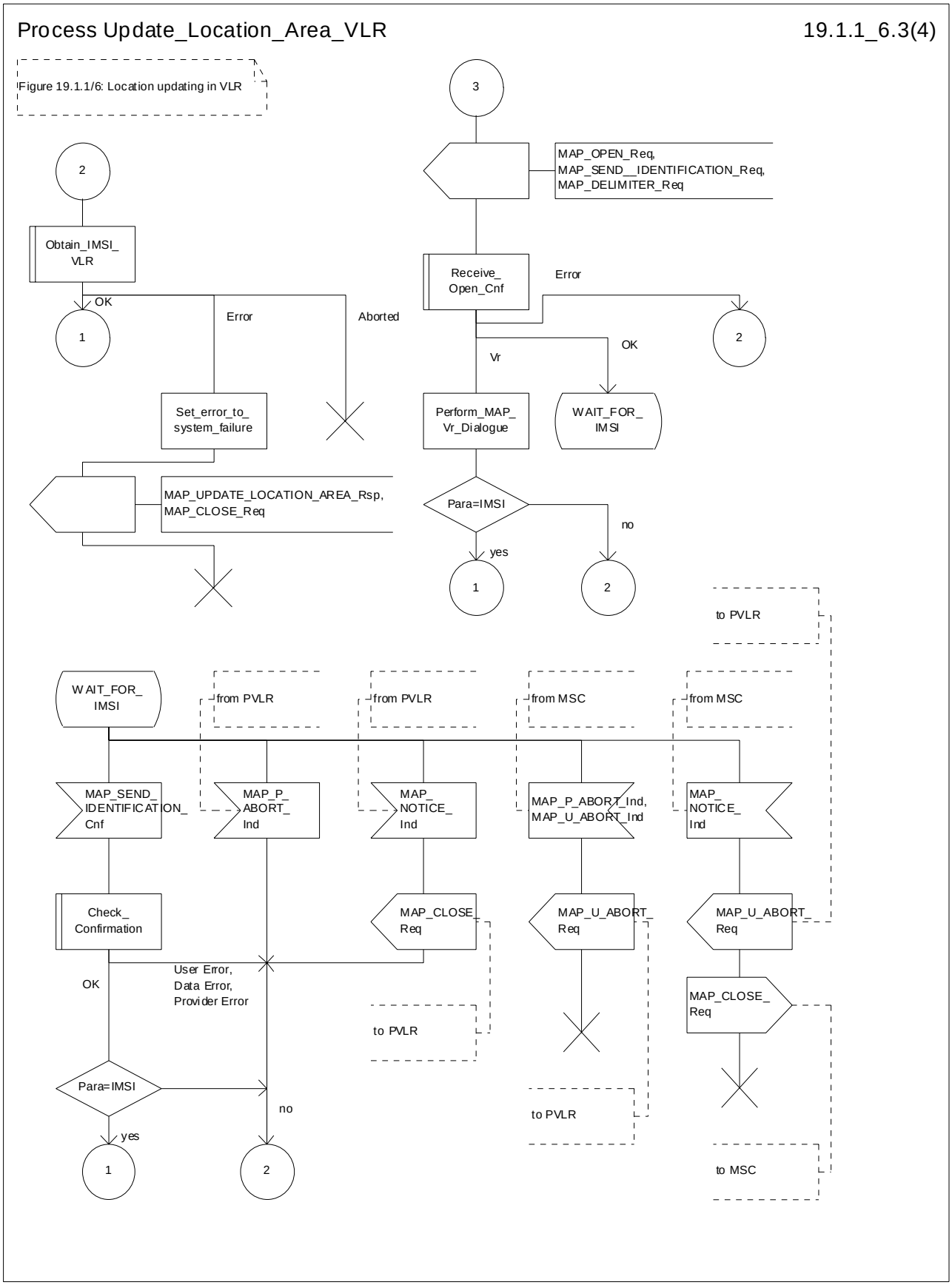


Figure 19.1.1/6 (sheet 3 of 4): Process Update_Location_Area_VLR

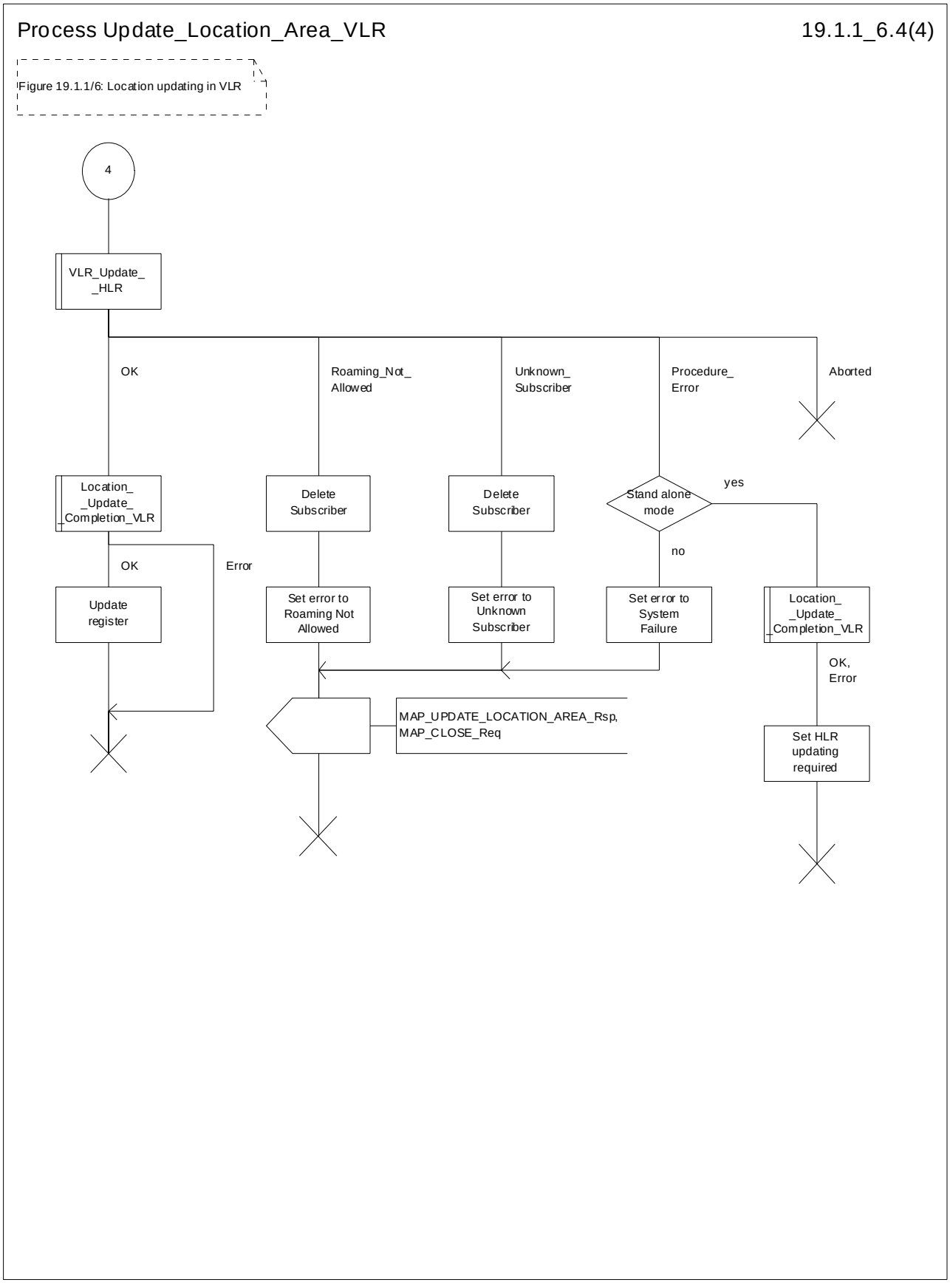


Figure 19.1.1/6 (sheet 4 of 4): Process Update_Location_Area_VLR

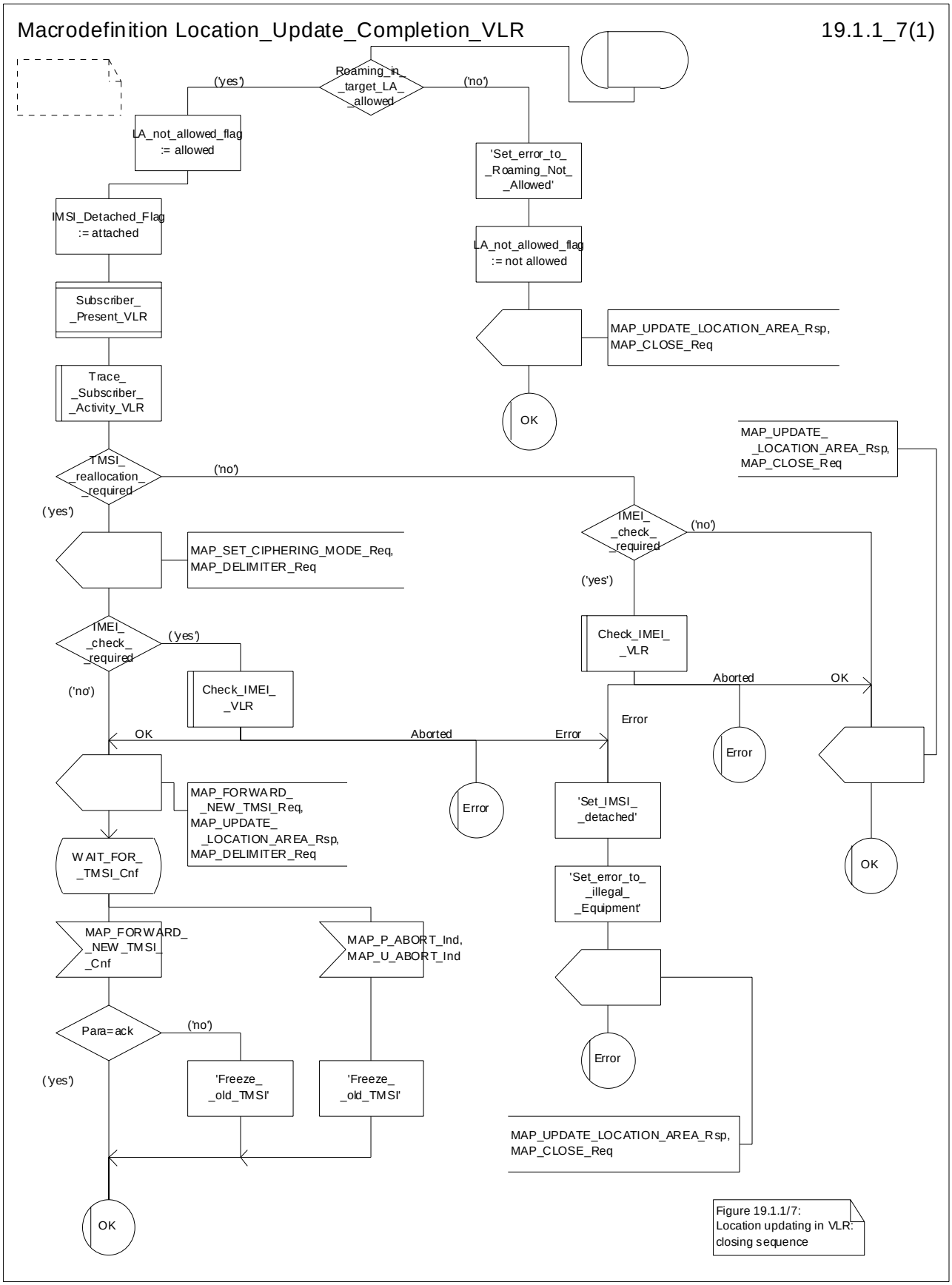


Figure 19.1.1/7: Macro Location_Update_Completion_VLR

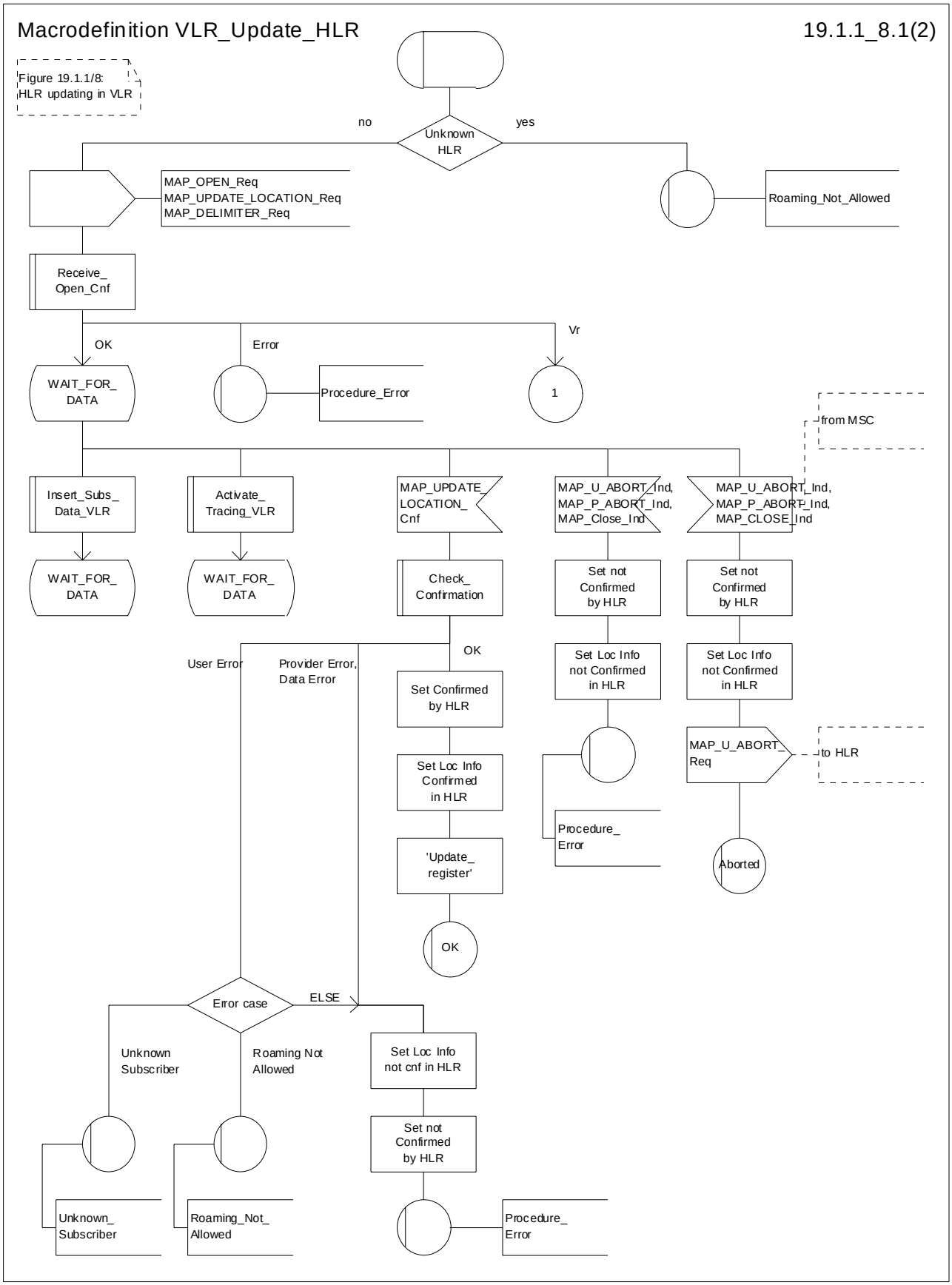


Figure 19.1.1/8 (sheet 1 of 2): Macro VLR_Update_HLR

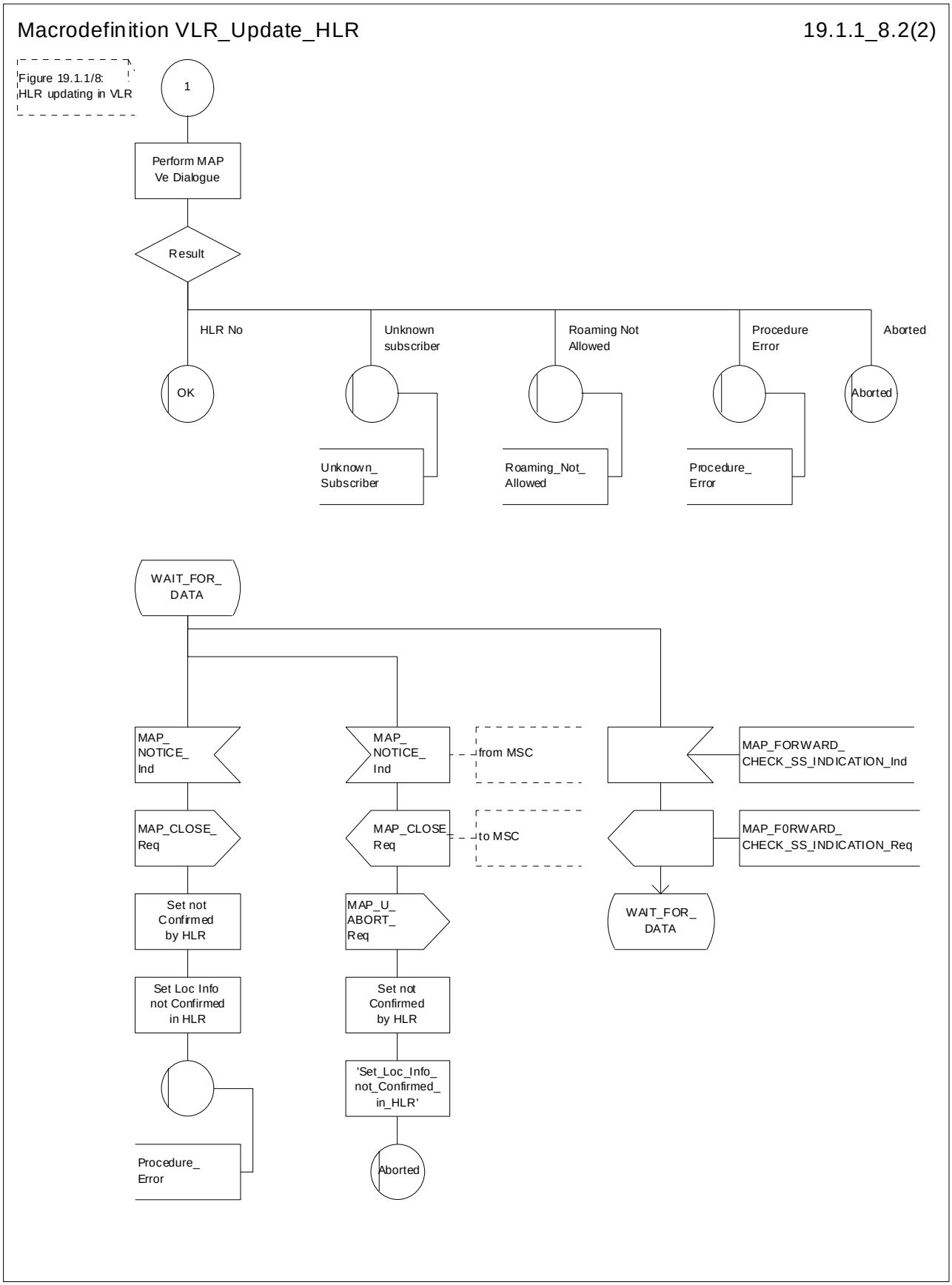


Figure 19.1.1/8 (sheet 2 of 2): Macro VLR_Update_HLR

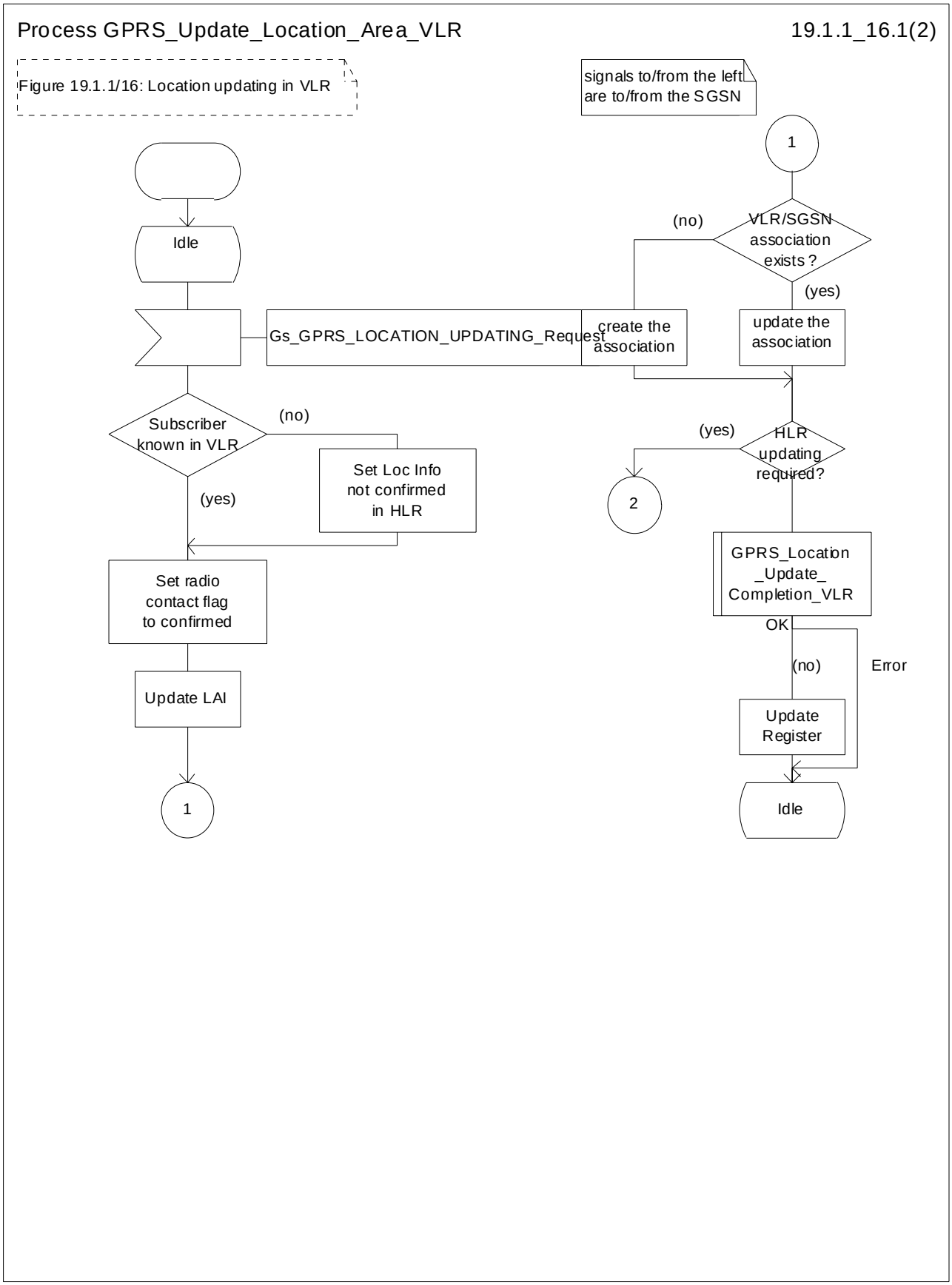


Figure 19.1.1/16 (sheet 1 of 2): Process GPRS_Update_Location_Area_VLR

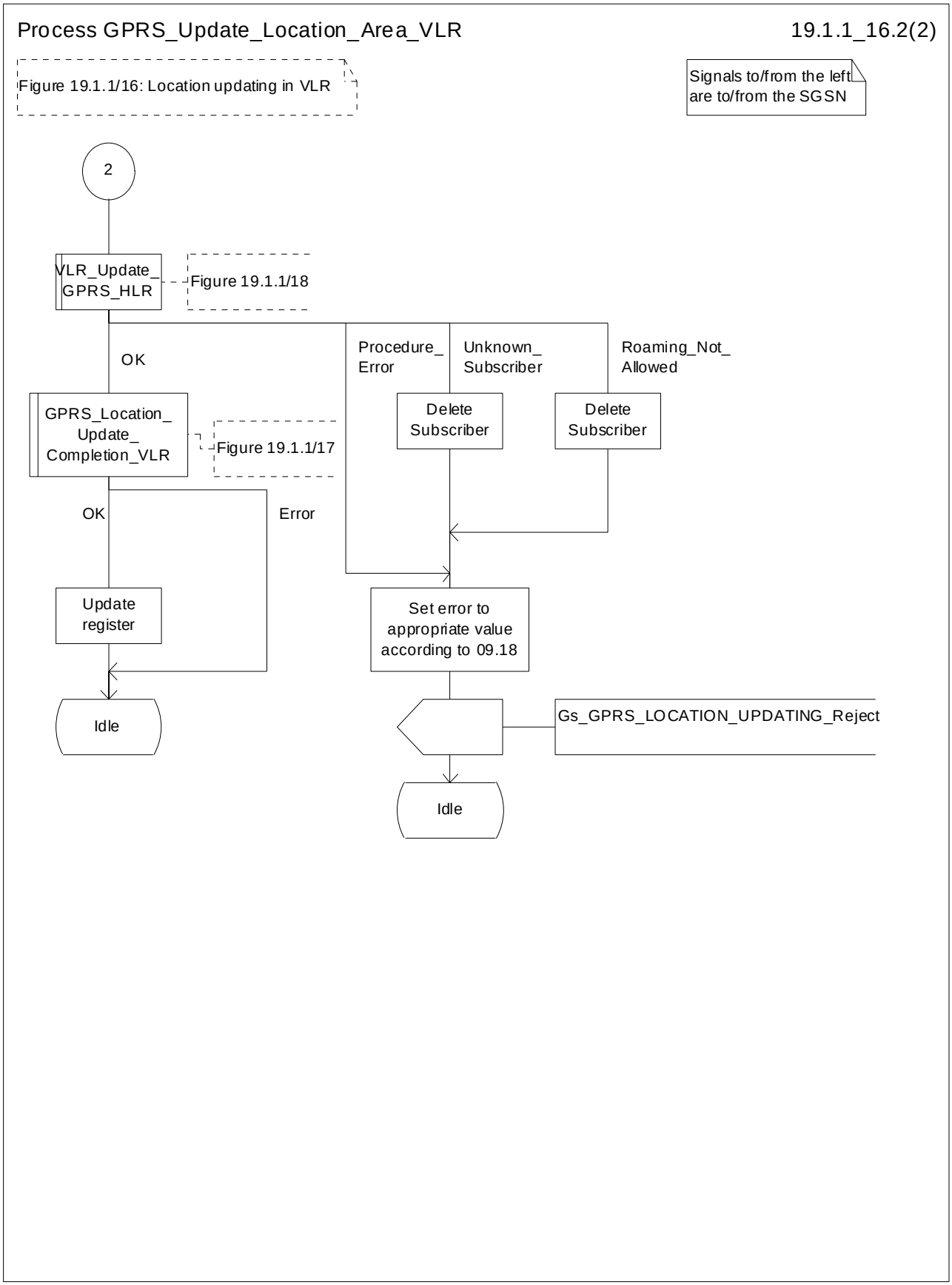


Figure 19.1.1/16 (sheet 2 of 2): Process GPRS_Update_Location_Area_VLR

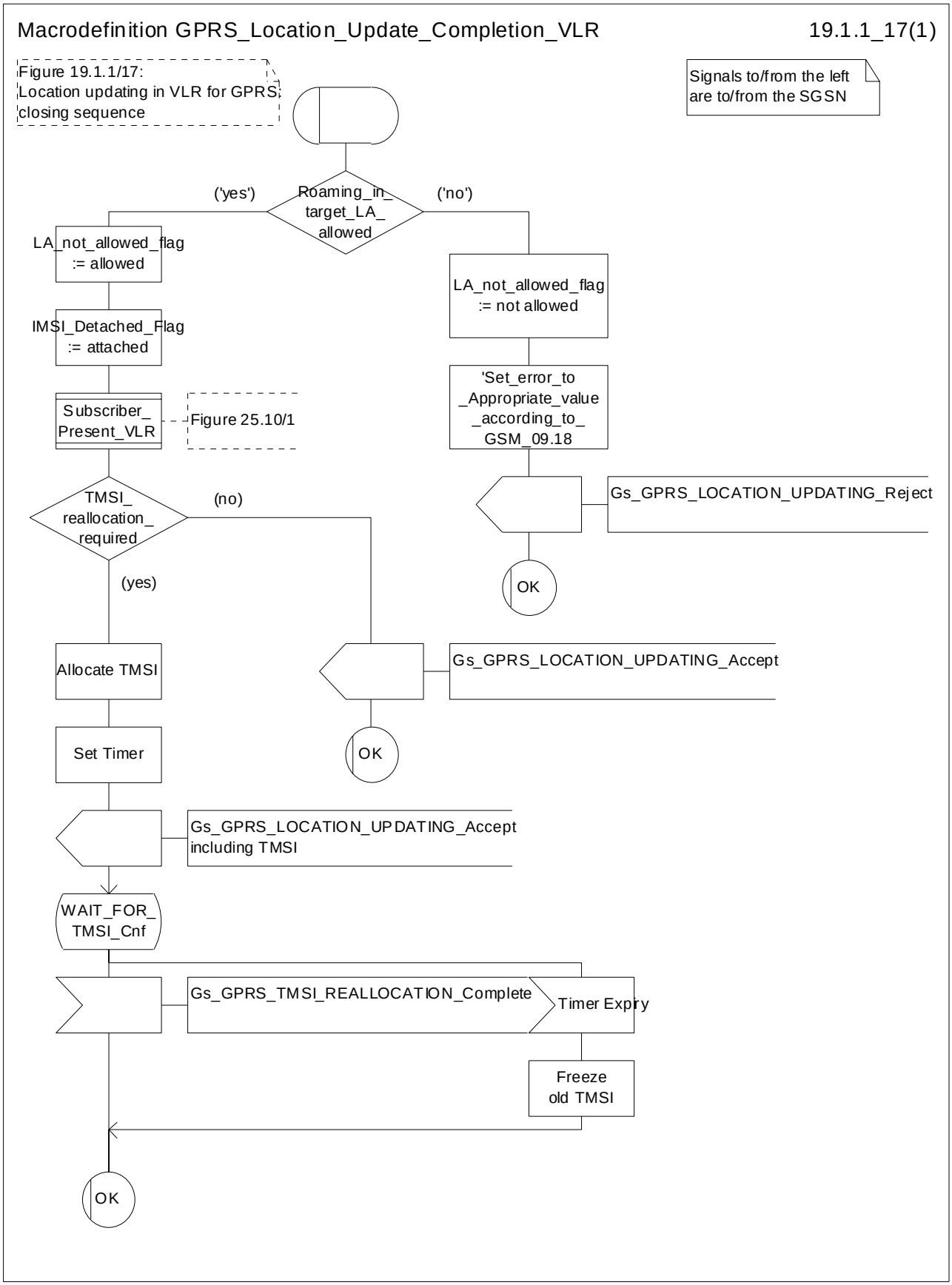


Figure 19.1.1/17: Macro GPRS_Location_Update_Completion_VLR

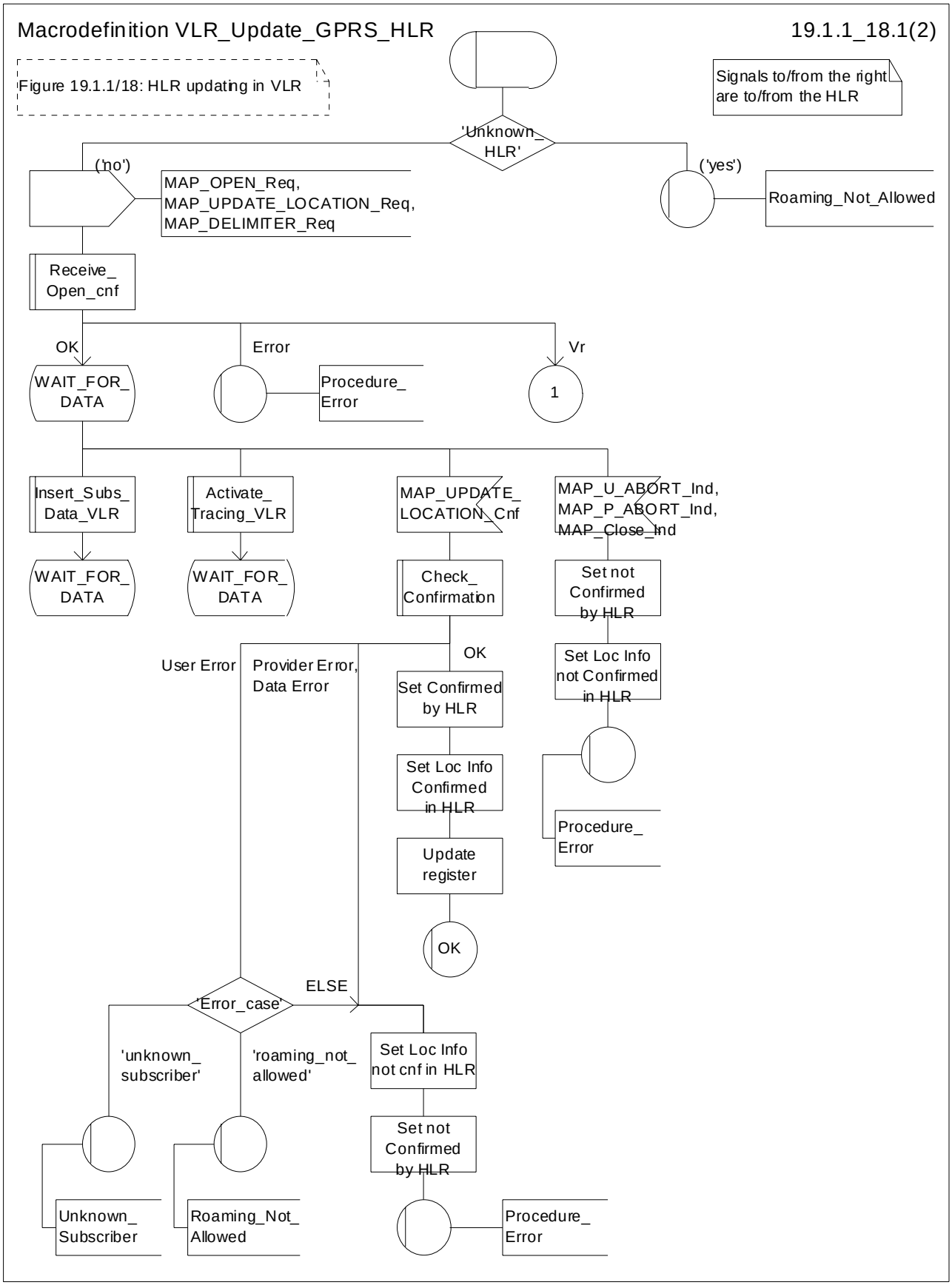


Figure 19.1.1/18 (sheet 1 of 2): Macro VLR_Update_GPRS_HLR

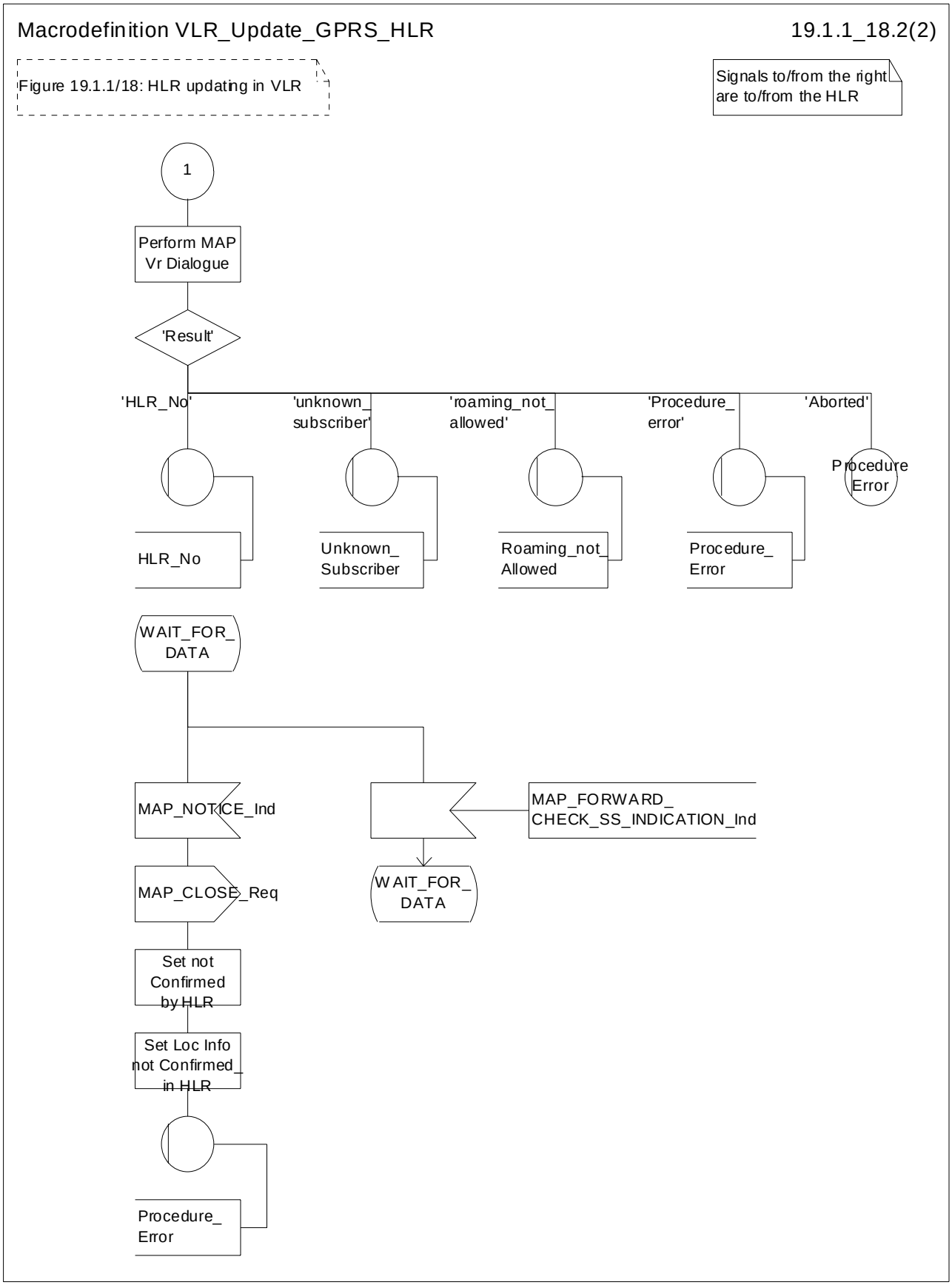


Figure 19.1.1/18 (sheet 2 of 2): Macro VLR_Update_GPRS_HLR

19.1.1.4 Detailed procedure in the HLR

When addressed by the VLR, the following macros are used by the process Update_Location_HLR:

- Receive_Open_Ind, defined in subclause 25.1;
- Check_indication, defined in subclause 25.2;
- Insert_Subs_Data_Framed_HLR, described in subclause 19.4.1;
- Control_Tracing_HLR, described in subclause 25.9;

and the processes Cancel_Location_HLR (see subclause 19.1.2) and Subscriber_Present_HLR (see subclause 19.1.1.7) are invoked.

The location updating process in the HLR is activated by receipt of a MAP_UPDATE_LOCATION indication (see figure 19.1.1/9):

- if there is a parameter problem in the indication, the error Unexpected Data Value is returned in the MAP_UPDATE_LOCATION response (see Check_indication macro defined in subclause 25.2); if the subscriber is not known in the HLR, the error Unknown Subscriber is returned in the response. In either case the process terminates;
- if Network Access Mode is set to “GPRS only” the error Unknown Subscriber is returned in the response. The process terminates;
- tracing shall be set to deactive in the VLR
- if the VLR address received in the MAP_UPDATE_LOCATION indication differs from the one actually stored against the subscriber, the Cancel_Location_HLR process is started to cancel the subscriber data in the stored VLR (see subclause 19.1.2).

The next action will be to check whether the subscriber is allowed to roam into the PLMN indicated by the VLR Number given in the MAP_UPDATE_LOCATION indication:

- if the subscriber is not allowed to roam into the PLMN, the error Roaming not Allowed with cause PLMN Roaming Not Allowed is returned in the MAP_UPDATE_LOCATION response, and the routing information stored (VLR number, MSC Number, LMSI) is deleted (deregistration);
- otherwise the HLR database will be updated with information received in the indication. The HLR sets the "MS purged for non-GPRS" flag to False and checks whether tracing is required for that subscriber. This is handled by the macro Control_Tracing_HLR described in subclause 25.9.

Thereafter, the macro Insert_Subs_Data_Framed_HLR described in subclause 19.4.1 is invoked. The outcome of this macro may be:

- aborted, in which case the process terminates;
- error, in which case the error System Failure is returned in the MAP_UPDATE_LOCATION response and the process terminates;
- OK, indicating successful outcome of downloading the subscriber data to the VLR.

The SUBSCRIBER_PRESENT_HLR process is then started to alert the Short Message Service Centre, if required (see subclause 19.1.7). Additionally, the MAP_FORWARD_CHECK_SS_INDICATION request is sent to inform the subscriber about an uncertain state of his SS-Data if this is needed due to previous HLR restoration (use of this service may be omitted as an HLR operator option).

The HLR number is then returned in the MAP_UPDATE_LOCATION response.

In all cases where the HLR sends a MAP_UPDATE_LOCATION response to the VLR, the dialogue towards the VLR is terminated by a MAP_CLOSE request with parameter Release Method indicating Normal Release.

Finally the process Update_Location_HLR sends a "Location updating complete" message to the process CCBS_Coordinator_HLR (specified in GSM 03.93 [107]) and the process terminates.

When addressed by the SGSN, the following macros are used by the process Update_GPRS_Location_HLR:

- Receive_Open_indication, defined in subclause 25.1;
- Check_indication, defined in subclause 25.2;
- Insert_Subs_Data_In_SGSN_Framed_HLR, described in subclause 19.4.x;
- Control_Tracing_HLR_with_SGSN, described in subclause 25.9;

and the processes Cancel_Location_HLR (see subclause 19.1.2) and Subscriber_Present_HLR (see subclause 19.1.1.7) are invoked.

The location updating process in the HLR is activated by receipt of a MAP_UPDATE_GPRS_LOCATION indication (see figure 19.1.1/19):

- if there is a parameter problem in the indication, the error Unexpected Data Value is returned in the MAP_UPDATE_LOCATION response (see Check_indication macro defined in subclause 25.2); if the subscriber is not known in the HLR, the error Unknown Subscriber (with diagnostic value set to “Imsi Unknown”) is returned in the response. In either case the process terminates;
- if Network Access Mode is set to “non-GPRS only” the error Unknown Subscriber (with diagnostic value set to “Gprs Subscription Unknown”) is returned in the response. The process terminates;
- tracing shall be set to deactive in the SGSN.
- if the SGSN number received in the MAP_UPDATE_GPRS_LOCATION indication differs from the one actually stored against the subscriber, the Cancel_Location_HLR process is started to cancel the subscriber data in the stored SGSN (see subclause 19.1.2).

The next action will be to check whether the subscriber is allowed to roam into the PLMN indicated by the SGSN Number given in the MAP_UPDATE_GPRS_LOCATION indication:

- if the subscriber is not allowed to roam into the PLMN, the error Roaming not Allowed with cause PLMN Roaming Not Allowed or 'Operator determined Barring', depending on the case, is returned in the MAP_UPDATE_GPRS_LOCATION response, and the routing information stored (SGSN number) is deleted (deregistration);
- otherwise the HLR database will be updated with information received in the indication. The HLR sets the "MS purged for GPRS" flag to False and checks whether tracing is required for that subscriber. This is handled by the macro Control_Tracing_HLR-with_SGSN described in subclause 25.9.

Thereafter, the macro Insert_Subs_Data_In_SGSN_Framed_HLR described in subclause 19.4.x is invoked. The outcome of this macro may be:

- aborted, in which case the process terminates;
- error, in which case the error System Failure is returned in the MAP_UPDATE_GPRS_LOCATION response and the process terminates;
- OK, indicating successful outcome of downloading the subscriber data to the SGSN.

The SUBSCRIBER_PRESENT_HLR process is then started to alert the Short Message Service Centre, if required (see subclause 19.1.7).

Finally the HLR number is returned in the MAP_UPDATE_GPRS_LOCATION response.

In all cases where the HLR sends a MAP_UPDATE_GPRS_LOCATION response to the SGSN, the dialogue towards the SGSN is terminated by a MAP_CLOSE request with parameter Release Method indicating Normal Release.

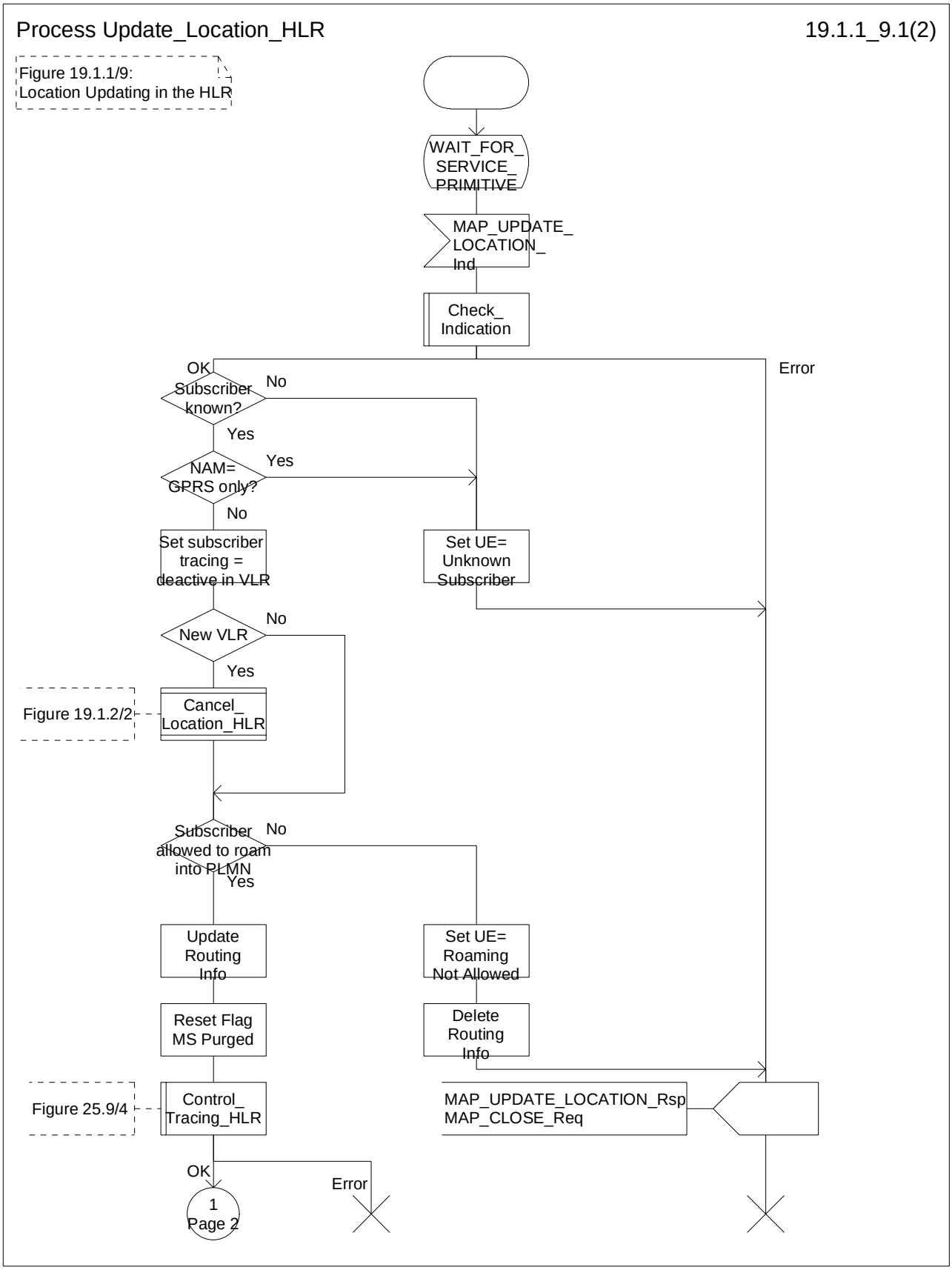


Figure 19.1.1/9 (sheet 1 of 2): Process Update_Location_HLR

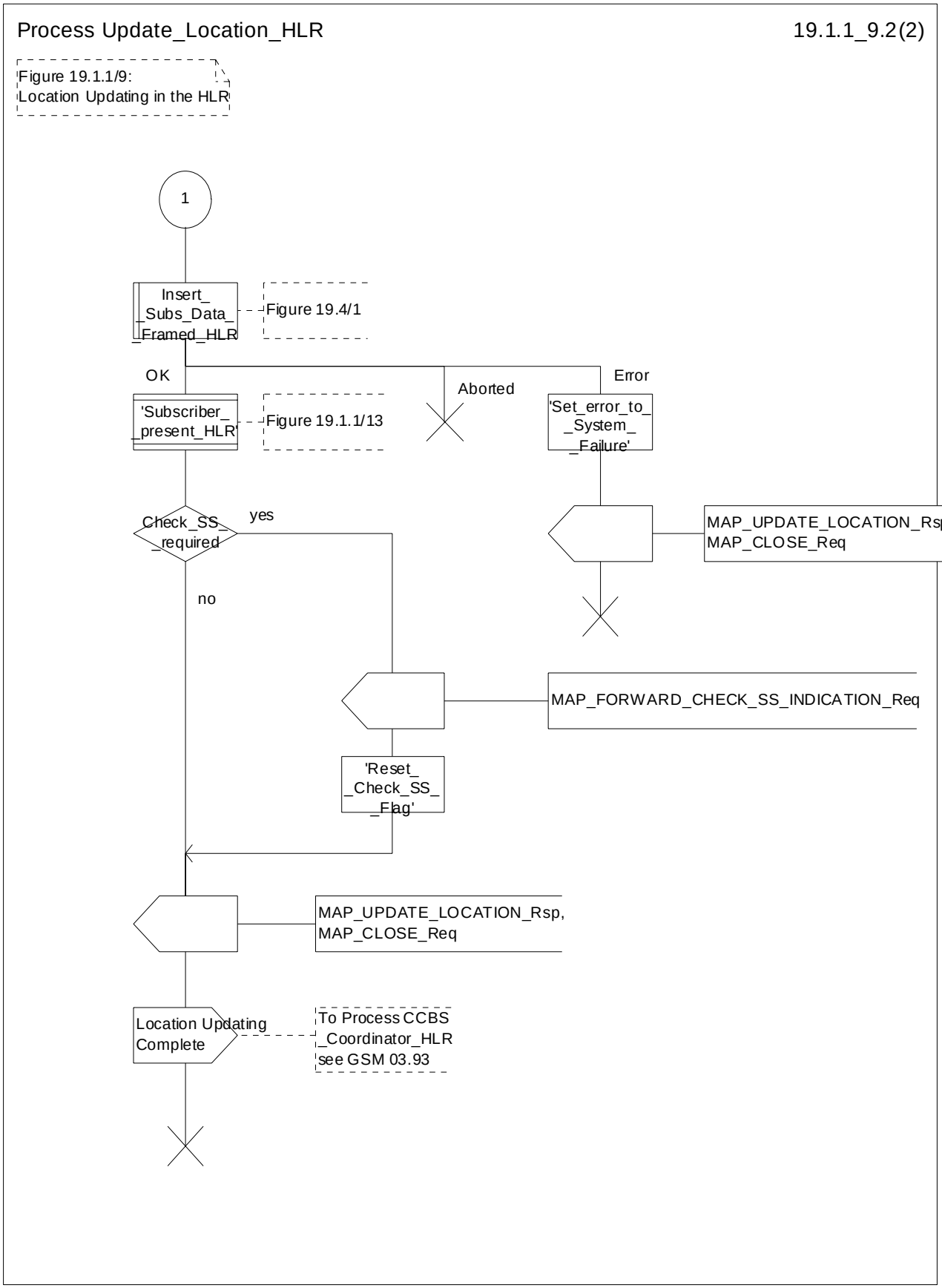


Figure 19.1.1/9 (sheet 2 of 2): Process Update_Location_HLR

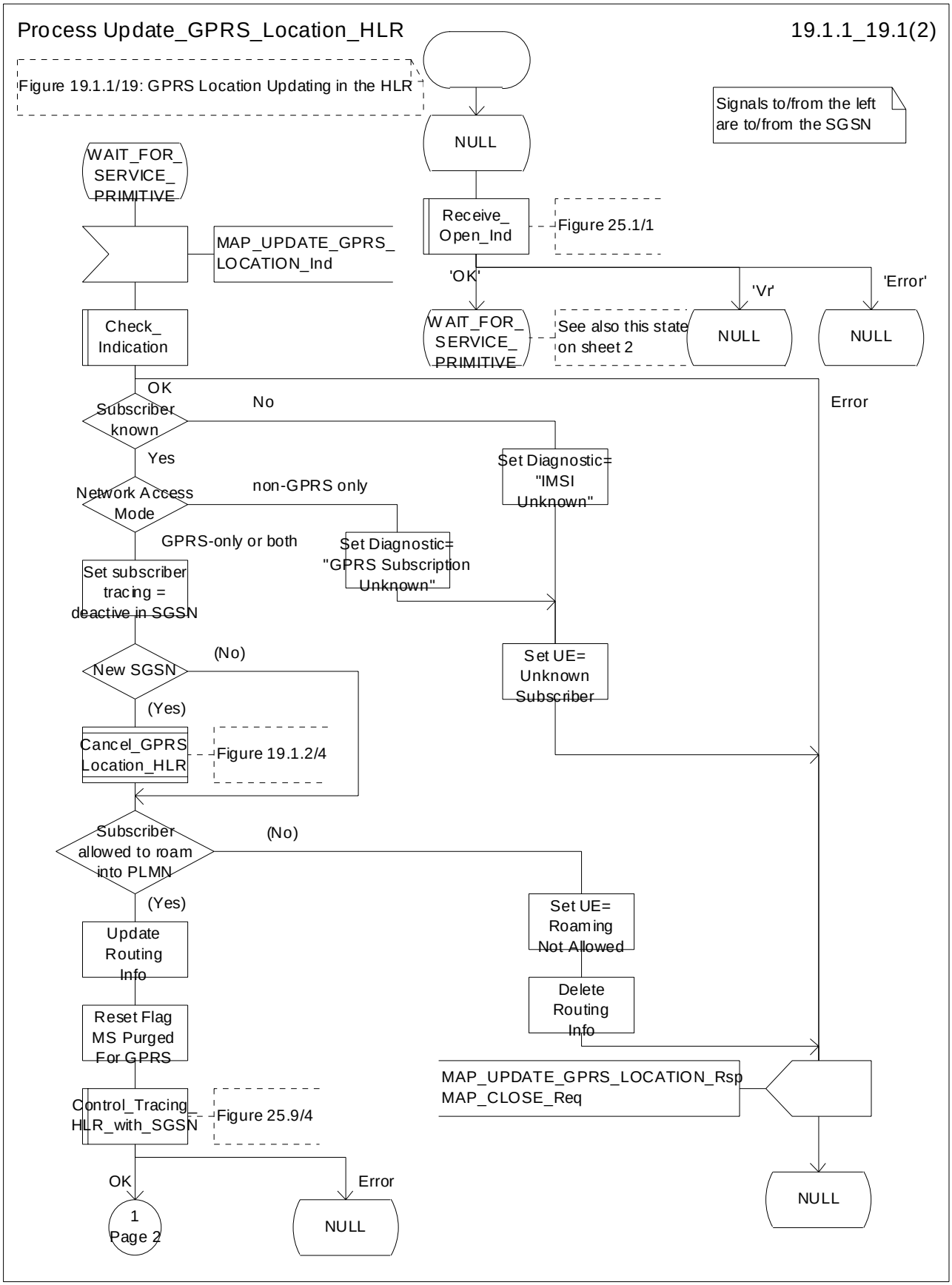


Figure 19.1.1/19 (sheet 1 of 2): Process Update_GPRS_Location_HLR

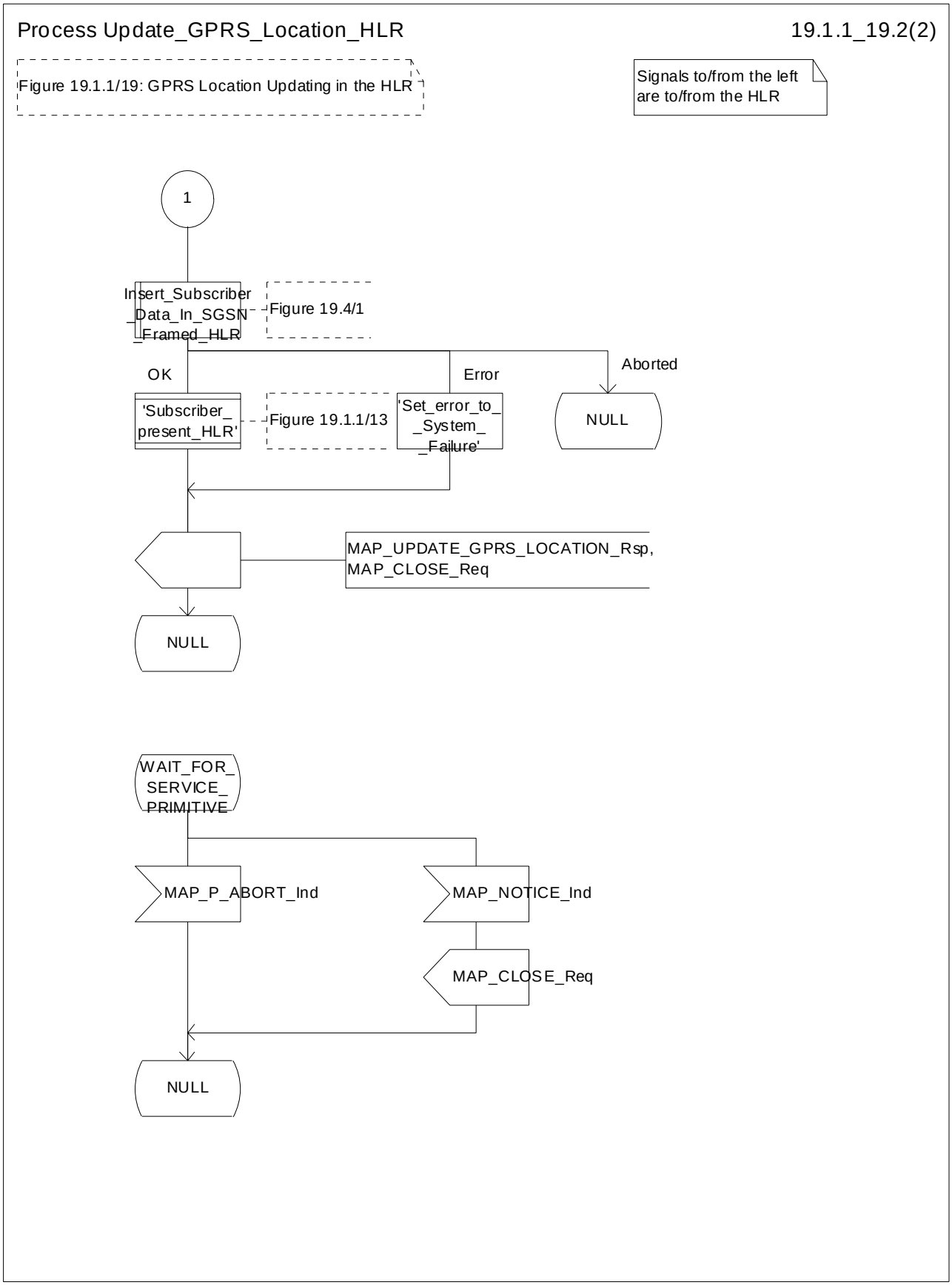
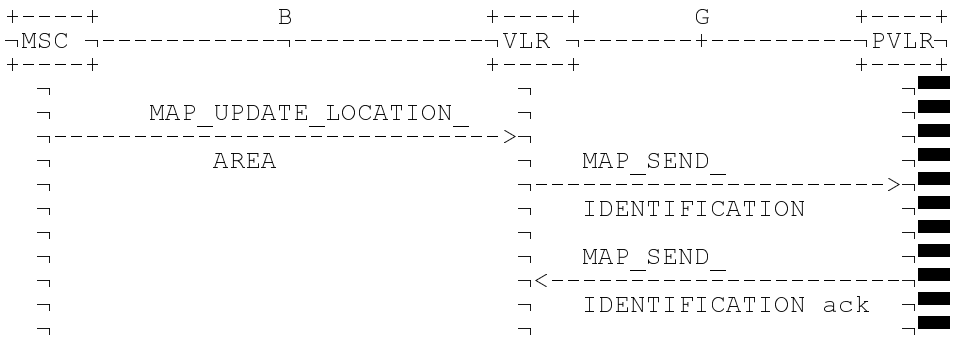


Figure 19.1.1/19 (sheet 2 of 2): Process Update_GPRS_Location_HLR

19.1.1.5 Send Identification

19.1.1.5.1 General

This service is invoked by a VLR when it receives a MAP_UPDATE_LOCATION_AREA indication containing a LAI indicating that the subscriber was registered in a different VLR (henceforth called the Previous VLR, PVLR). If the identity of the PVLR is derivable for the VLR (usually if both are within the same network), the IMSI and authentication sets are requested from the PVLR (see subclause 19.1.1.3), using the service described in subclause 8.1.4.



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

Figure 19.1.1/10: Interface and services for Send Identification

19.1.1.5.2 Detailed procedure in the VLR

The VLR procedure is part of the location area updating process described in subclause 19.1.1.3, see also figure 19.1.1/6 sheet 3.

19.1.1.5.3 Detailed procedure in the PVLR

On receipt of a dialogue request for the Send Identification procedure, (see Receive_Open_Ind macro in subclause 25.1), the PVLR will:

- terminate the procedure in case of parameter problems;
- revert to the MAP version Vr procedure in case the VLR indicated version Vr protocol; or
- continue as below, if the dialogue is accepted.

If the PVLR process receives a MAP_NOTICE indication, it terminates the dialogue by sending a MAP_CLOSE request.

If the PVLR process receives a MAP_SEND_IDENTIFICATION indication from the VLR (see figure 19.1.1/11), it checks whether the subscriber identity provided is known:

- if so, the IMSI and - if available - authentication parameters for the subscriber are returned in the MAP_SEND_IDENTIFICATION response;
- if not, the error Unidentified Subscriber is returned in the MAP_SEND_IDENTIFICATION response.

In all cases where the PVLR sends a MAP_SEND_IDENTIFICATION response to the VLR, the dialogue towards the VLR is terminated by a MAP_CLOSE request with parameter Release Method indicating Normal Release.

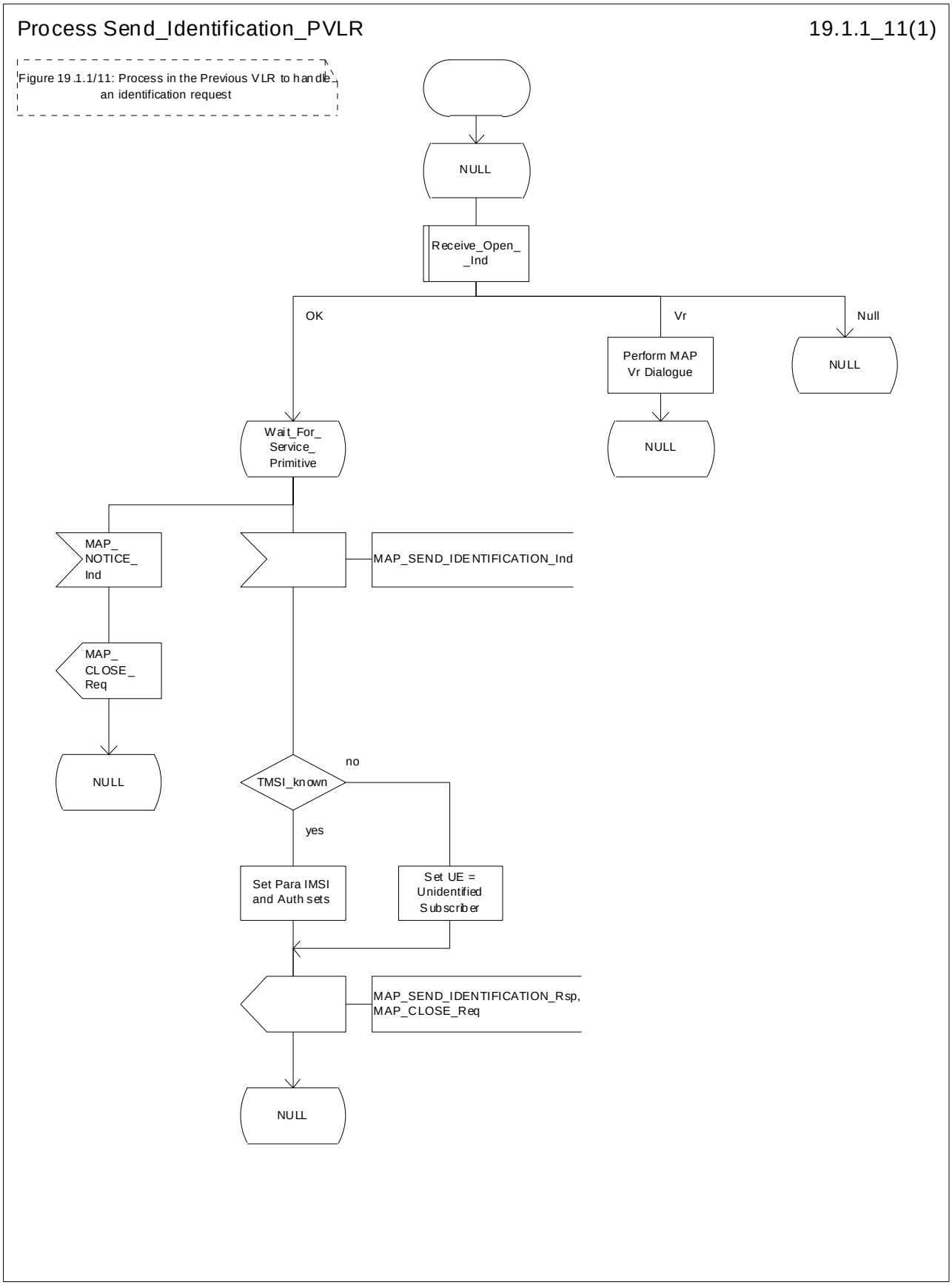


Figure 19.1.1/11: Process Send_Identification_PVLR

19.1.1.6 The Process Update Location VLR

This process is started by some other MAP user process in case the HLR need to be updated due to previous network failure. It is invoked when the subscriber accesses the network, e.g. for mobile originated call set-up, response to paging or supplementary services handling. Here, location updating consists only of invoking the macro VLR_Update_HLR described above (see subclause 19.1.1.3), which performs HLR updating and downloading of subscriber data.

If updating is successful (OK) the HLR Number is received in the MAP_UPDATE_LOCATION confirm primitive and the process terminates.

If one of the errors Roaming not Allowed or Unknown Subscriber is received instead, all subscriber data are deleted from the VLR before the process terminates.

In case some other error occurs during HLR updating, the process simply terminates. Note, in all error cases the initiating restoration flags in VLR remain false, therefore a new HLR updating attempt will be started later on.

NOTE: This process will be performed independent from the calling process, no coordination is required.

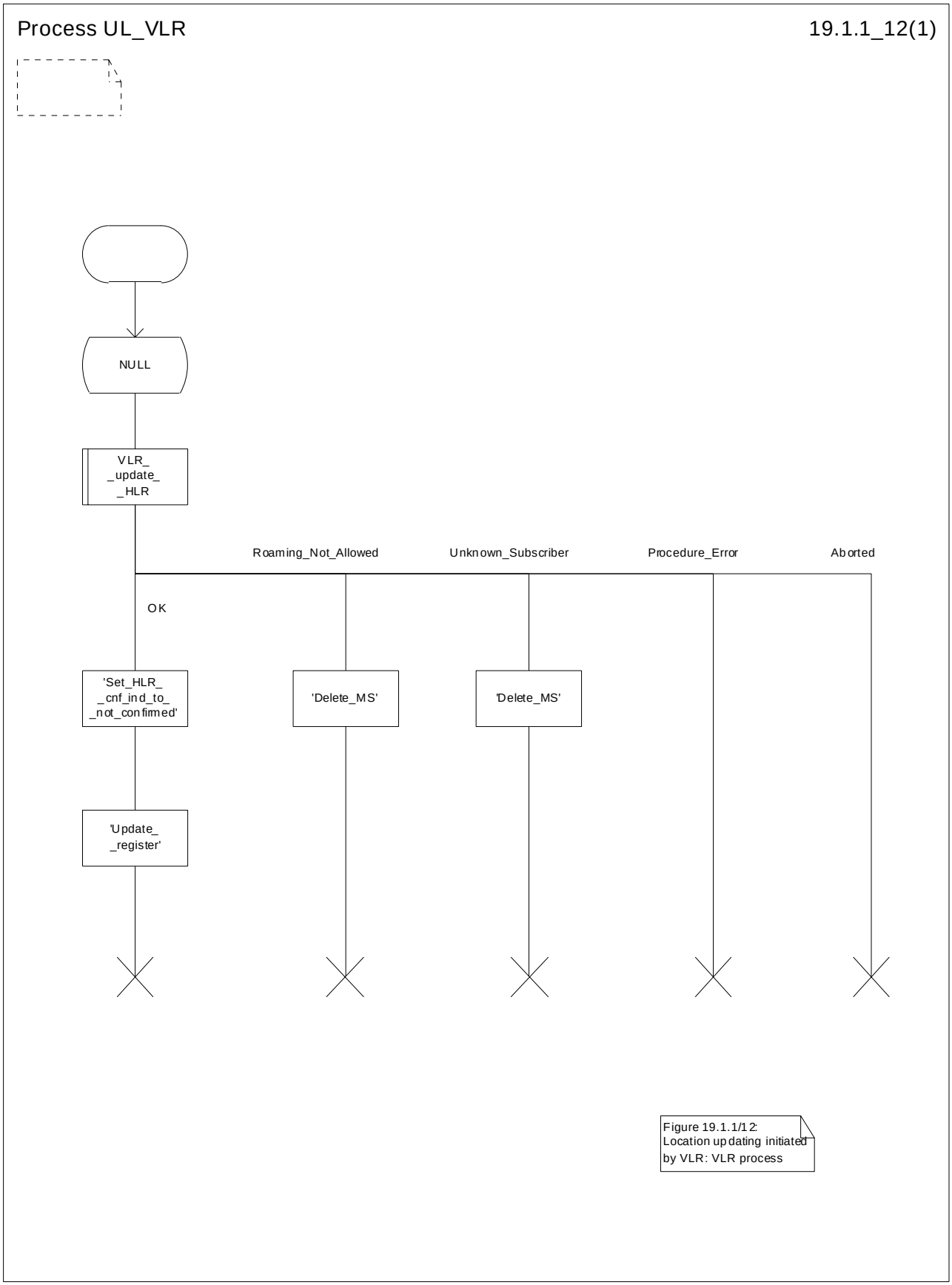


Figure 19.1.1/12: Process UL_VLR

19.1.1.7 The Process Subscriber Present HLR

The process Subscriber Present HLR is started by the location updating process in HLR to perform actions required for short message alerting. The process checks the Message Waiting Data flag, and if this is set, the macro Alert_Service_Centre_HLR defined in subclause 25.10 is invoked. This macro will alert all service centres from which there are short messages waiting for this subscriber.

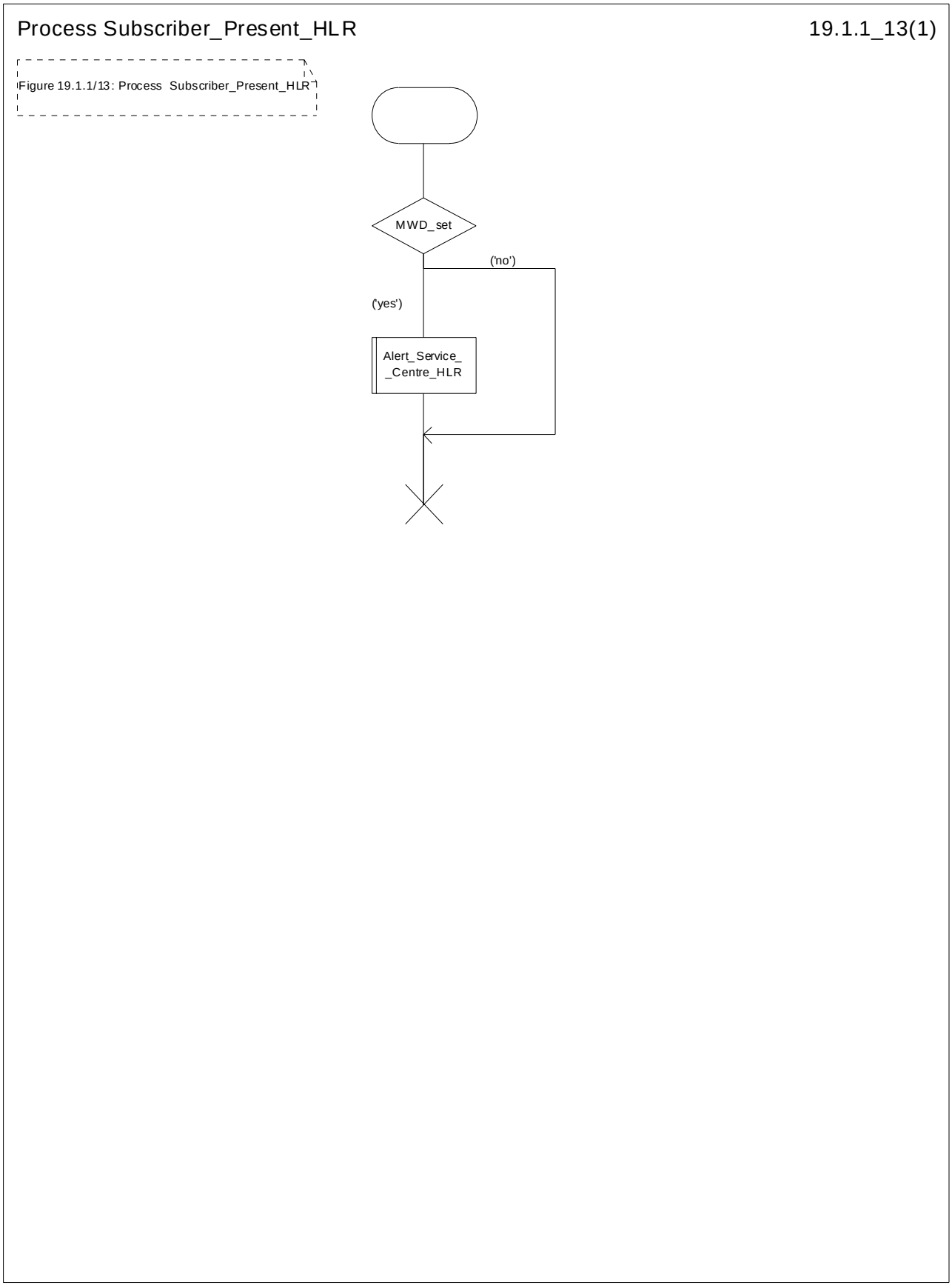


Figure 19.1.1/13: Process Subscriber_Present_HLR

19.1.1.8 Detailed procedure in the SGSN

Figure 19.1.1/20 shows the MAP process for updating of the SGSN. The following general macros are used:

Receive_Open_Cnf	subclause 25.1;
Insert_Subscriber_Data_SGSN	subclause 25.7;
Activate_Tracing_SGSN	subclause 25.9;

The location updating process

The MAP process receives an « Update HLR request » from the relevant process in the SGSN (see GSM 03.60) to perform HLR updating. If the SGSN does not know the subscribers HLR (e.g. no IMSI translation exists as there are not yet any SS7 links to the subscribers HPLMN), the « Update HLR negative response » with error Roaming Not Allowed (cause PLMN Roaming Not Allowed) is returned to the requesting process.

If the subscribers HLR can be reached, the SGSN opens a dialogue towards the HLR by sending a MAP_OPEN request without any user specific parameters, together with a MAP_UPDATE_GPRS_LOCATION request containing the parameters

- IMSI, identifying the subscriber;
- SGSN Address and SGSN number;

In case the HLR rejects dialogue opening (see subclause 25.1) or indicates version Vr protocol to be used, the SGSN will terminate the process indicating « Update HLR negative response » to the requesting process.

If the HLR accepts the dialogue, the HLR will respond with:

- a MAP_INSERT_SUBSCRIBER_DATA indication, handled by the macro Insert_Subs_Data_SGSN defined in subclause 25.7;

NOTE: The HLR may repeat this service several times depending on the amount of data to be transferred to the SGSN and to replace subscription data in case they are not supported by the SGSN.

- a MAP_ACTIVATE_TRACE_MODE indication, handled by the macro Activate_Tracing_SGSN defined in subclause 25.9;
- the MAP_UPDATE_GPRS_LOCATION confirmation:
  - if this confirmation contains the HLR Number, this indicates that the HLR has passed all information and that updating has been successfully completed. The « Update HLR response » message is returned to the requesting process for completion of the SGSN updating (see GSM 03.60).
  - if the confirmation contains an User error cause (Unknown Subscriber, Roaming Not Allowed or some other), the corresponding error is returned to the requesting process in the « Update HLR negative response ».
- a MAP_P_ABORT, MAP_U_ABORT, or MAP_CLOSE indication. In these cases, the corresponding error is returned to the requesting process in the « Update HLR negative response ».
- a MAP_NOTICE indication. Then, the dialogue towards the HLR is terminated, and the « HLR Update negative response » with the appropriate error is returned to the requesting process.

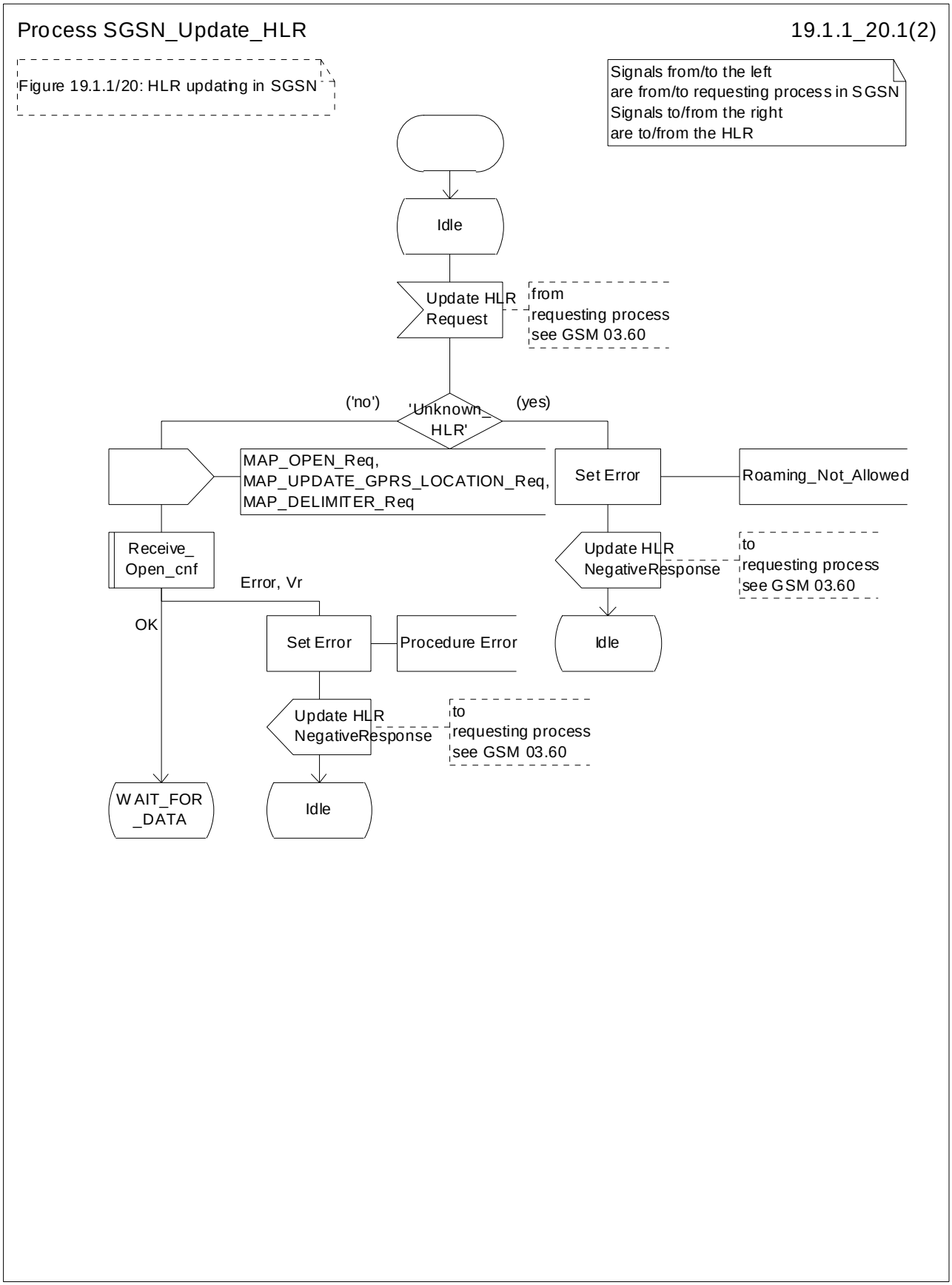


Figure 19.1.1/20 (sheet 1 of 2): Process SGSN_Update_HLR

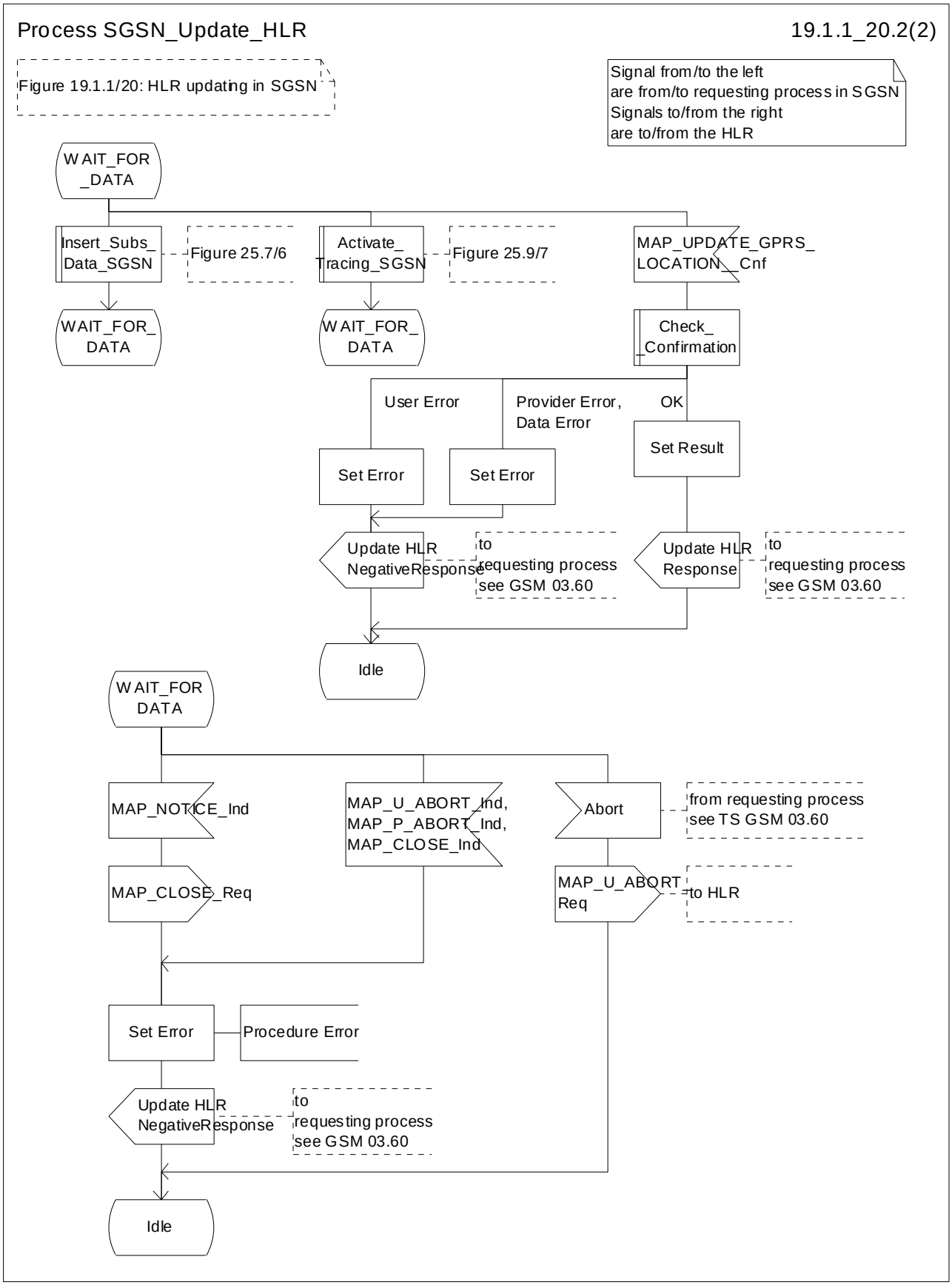


Figure 19.1.1/20 (sheet 2 of 2): Process SGSN_Update_HLR

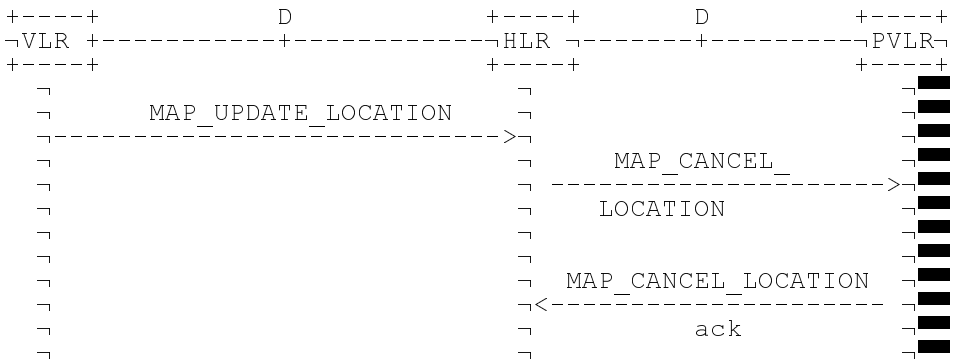
19.1.2 Location Cancellation

19.1.2.1 General

The purpose of this process is to delete a subscriber's record from a previous visitor location register after she has registered with a new visitor location register. Also this process is used to delete a subscriber's record from a old SGSN after she has registered with a SGSN. The procedure may also be used if the subscriber's record is to be deleted for other operator determined purposes, e.g. withdrawal of subscription, imposition of roaming restrictions or modifications to the subscription which result in roaming restrictions. Location cancellation can be used to enforce location updating including updating of subscriber data in the VLR or in the SGSN at the next subscriber access.

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

The service as described in subclause 8.1.3 is invoked when an HLR receives a MAP_UPDATE_LOCATION indication from a VLR other than that stored in its table for this subscriber. Also the MAP_CANCEL_LOCATION service is invoked when the HLR receives a MAP_UPDATE_GPRS_LOCATION indication from a SGSN other than stored in its table for this subscriber. Additionally the service may be invoked by operator intervention. The MAP_CANCEL_LOCATION service is in any case invoked towards the VLR or the SGSN whose identity is contained in the HLR table.



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

Figure 19.1.2/1: Interface and services for Location Cancellation

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

Figure 19.1.2/6: Interface and services for Location Cancellation in GPRS

19.1.2.2 Detailed procedure in the HLR

The location cancellation process is started by an external process as stated above. The HLR opens a dialogue with the VLR or with the SGSN whose identity is contained in the HLR table (MAP_OPEN request without any user specific parameters), sending the MAP_CANCEL_LOCATION request primitive (see figures 16.1.2/2 and 16.1.2/4), containing the parameters:

- IMSI, to identify the subscriber to be deleted from that VLR or SGSN;

-- -LMSI, which is included if available in the HLR. LMSI is not applicable between HLR and SGSN;

-- - Cancellation Type if the Cancel Location is sent to SGSN. Cancellation Type is not applicable between HLR and VLR. If the VLR receives this parameter and do not understand it this parameter shall be ignored.

The HLR then waits for the MAP_OPEN confirmation (see macro Receive_Open_Cnf, subclause 21.1), indicating either:

- reject of the dialogue (process terminates);

- reversion to version Vr when the operation is sent to SGSN (process terminates);
- reversion to version Vr when the operation is sent to VLR (process will be performed according to MAP version Vr); or
- dialogue acceptance.

When the VLR or the SGSN accepts the dialogue, it will return a MAP_CANCEL_LOCATION confirmation, containing:

- no parameter, indicating successful outcome of the procedure;
- a user error, provider error or a data error indicating unsuccessful outcome of the procedure.

In case of unsuccessful outcome or if a MAP_P_ABORT indication has been received, the HLR may repeat the MAP_CANCEL_LOCATION request later, where the number of repeat attempts and time in between are HLR operator options, depending on the error returned by the VLR or the SGSN.

19.1.2.3 Detailed procedure in the VLR

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1, with outcomes:

- reversion to version Vr procedure;
- procedure termination; or
- dialogue acceptance, with processing as below.

If the VLR process receives a MAP_NOTICE indication, it terminates the dialogue by sending a MAP_CLOSE request.

If the VLR process receives a MAP_CANCEL_LOCATION indication from the HLR (see figure 19.1.2/3), the parameters are checked first (macro Check_Indication, see subclause 25.2). In case of parameter problems the appropriate error is sent in the MAP_CANCEL_LOCATION response.

If the MAP_CANCEL_LOCATION indication contains both the IMSI and the LMSI, the VLR checks whether the stored IMSI matches the received IMSI. If it does not, the VLR attempts to process the request using the IMSI received from the HLR to define the subscriber record to be deleted.

Thereafter the VLR checks whether the subscriber identity provided is known in the VLR:

- if so, the data of the subscriber are deleted from VLR table and a MAP_CANCEL_LOCATION response is returned without any parameters;
- if not, location cancellation is regarded as being successful, too, and the MAP_CANCEL_LOCATION response is returned without any parameters.

In either case, after sending the MAP_CANCEL_LOCATION response the VLR process releases any TMSI which may be associated with the IMSI of the subscriber, terminates the dialogue (MAP_CLOSE with Release Method Normal Release) and returns to the idle state.

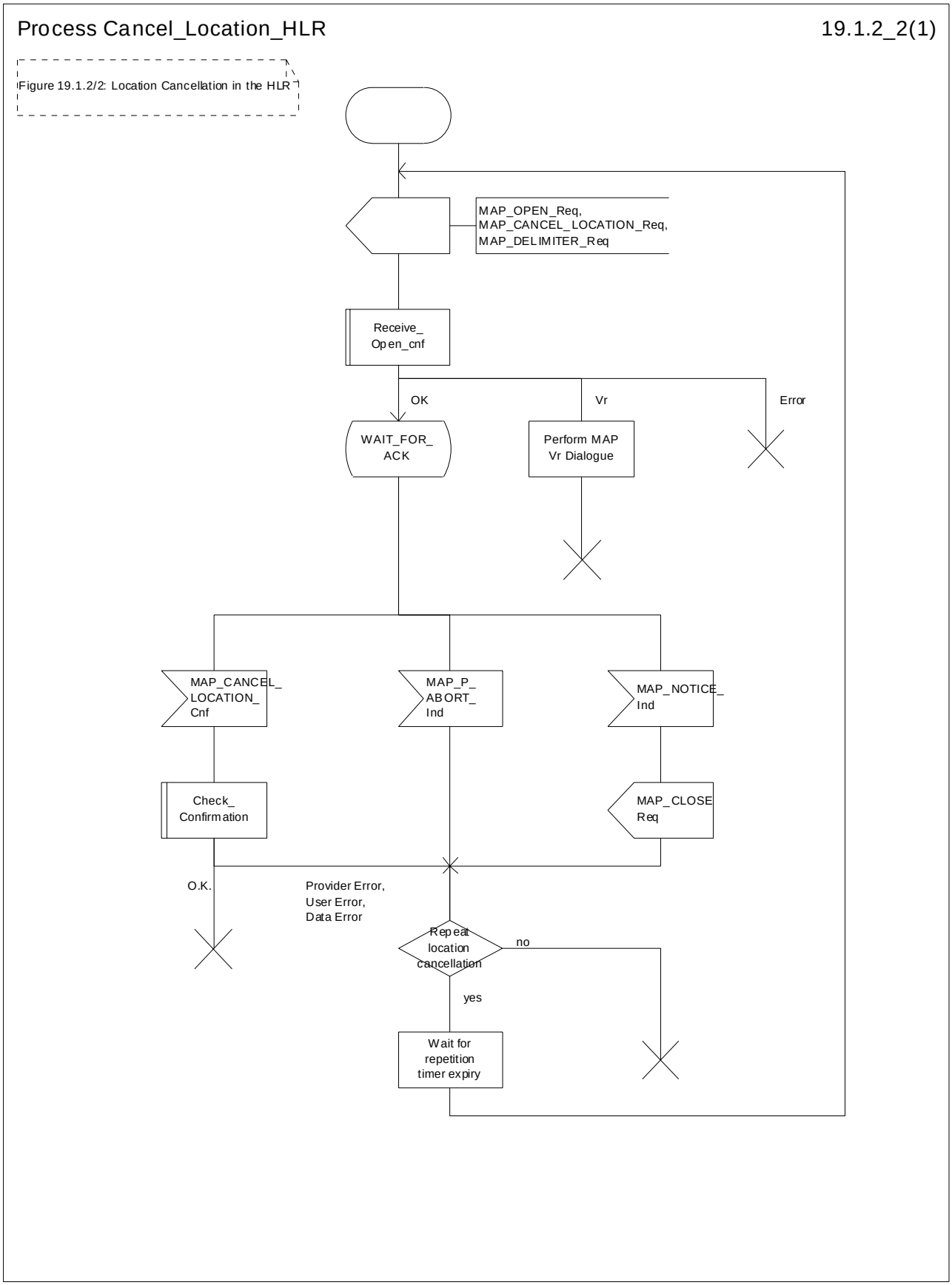


Figure 19.1.2/2: Process Cancel_Location_HLR

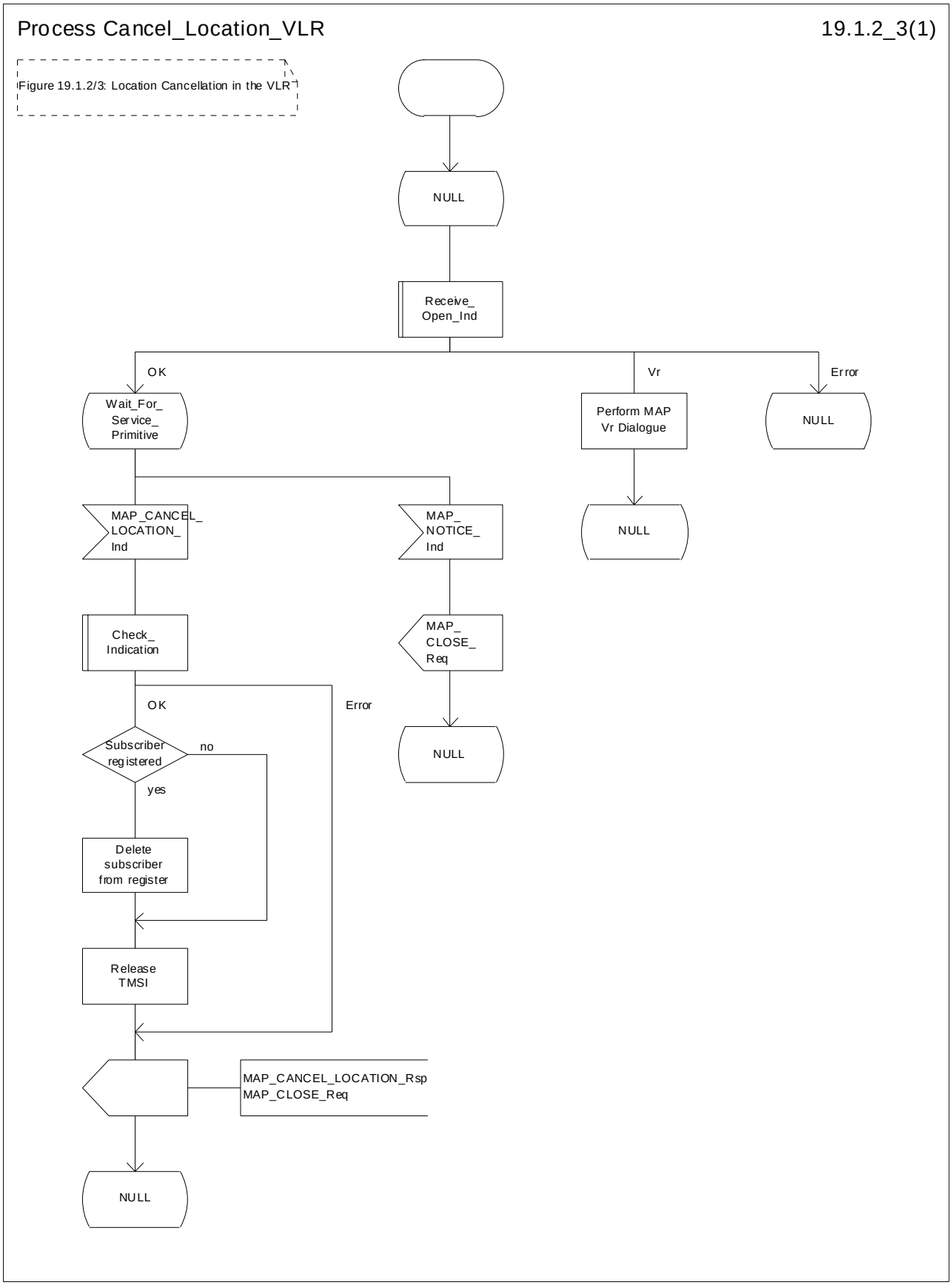


Figure 19.1.2/3: Process Cancel_Location_VLR

19.1.2.4 Detailed procedure in the SGSN

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1, with outcomes:

- procedure termination; or
- dialogue acceptance, with processing as below.

If the SGSN process receives a MAP_NOTICE indication, it terminates the dialogue by sending a MAP_CLOSE request.

If the SGSN process receives a MAP_CANCEL_LOCATION indication from the HLR (see figure 19.1.2/4), the parameters are checked first (macro Check_Indication, see subclause 25.2). In case of parameter problems the appropriate error is sent in the MAP_CANCEL_LOCATION response.

Thereafter the SGSN checks whether the subscriber identity provided is known in the SGSN:

- if so, the data of the subscriber are deleted from SGSN table and a MAP_CANCEL_LOCATION response is returned without any parameters;
- if not, location cancellation is regarded as being successful, too, and the MAP_CANCEL_LOCATION response is returned without any parameters.

In either case, after sending the MAP_CANCEL_LOCATION response the SGSN process releases any P-TMSI which may be associated with the IMSI of the subscriber, terminates the dialogue (MAP_CLOSE with Release Method Normal Release) and returns to the idle state.

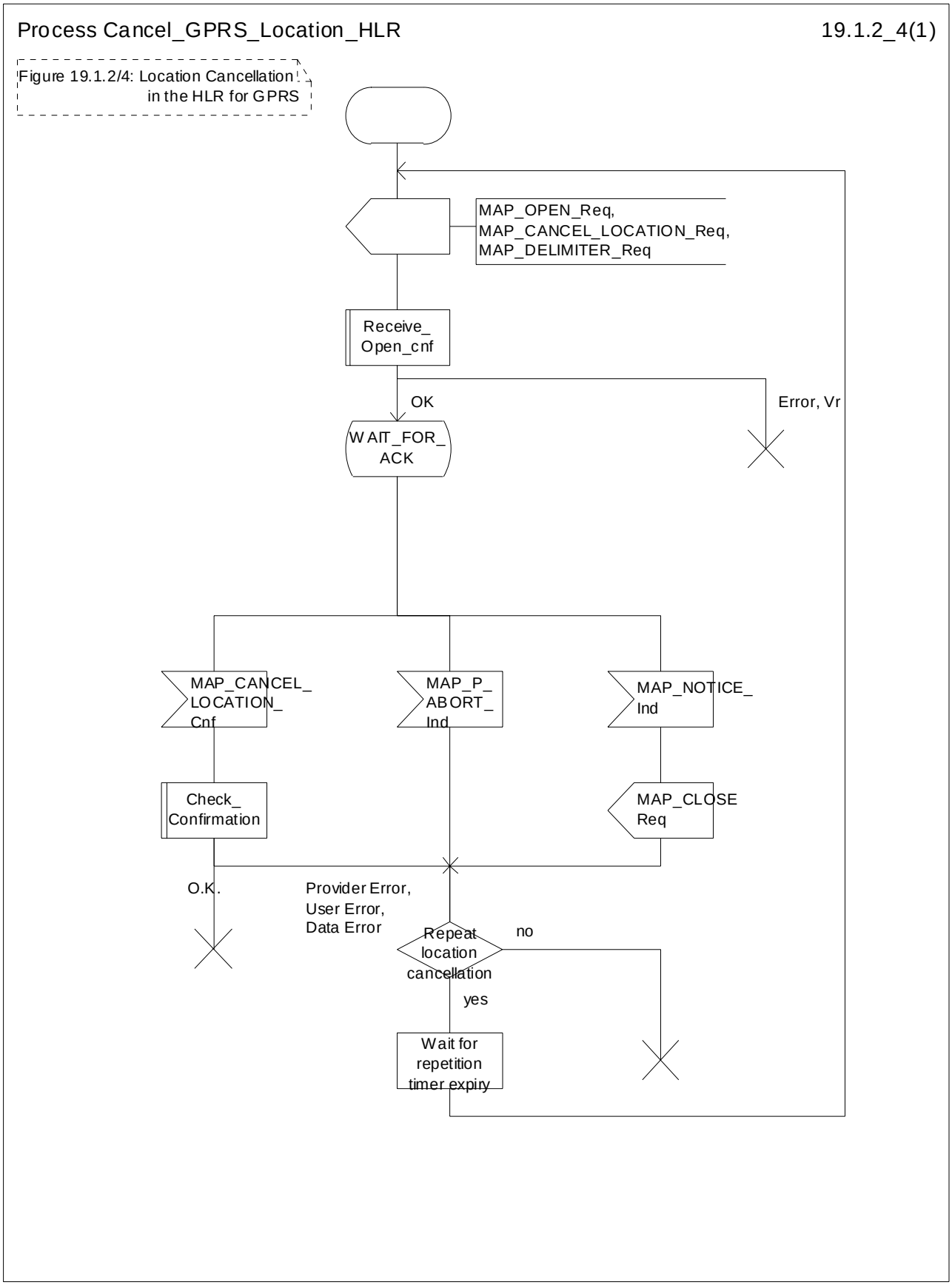


Figure 19.1.2/4: Process Cancel_GPRS_Location_HLR

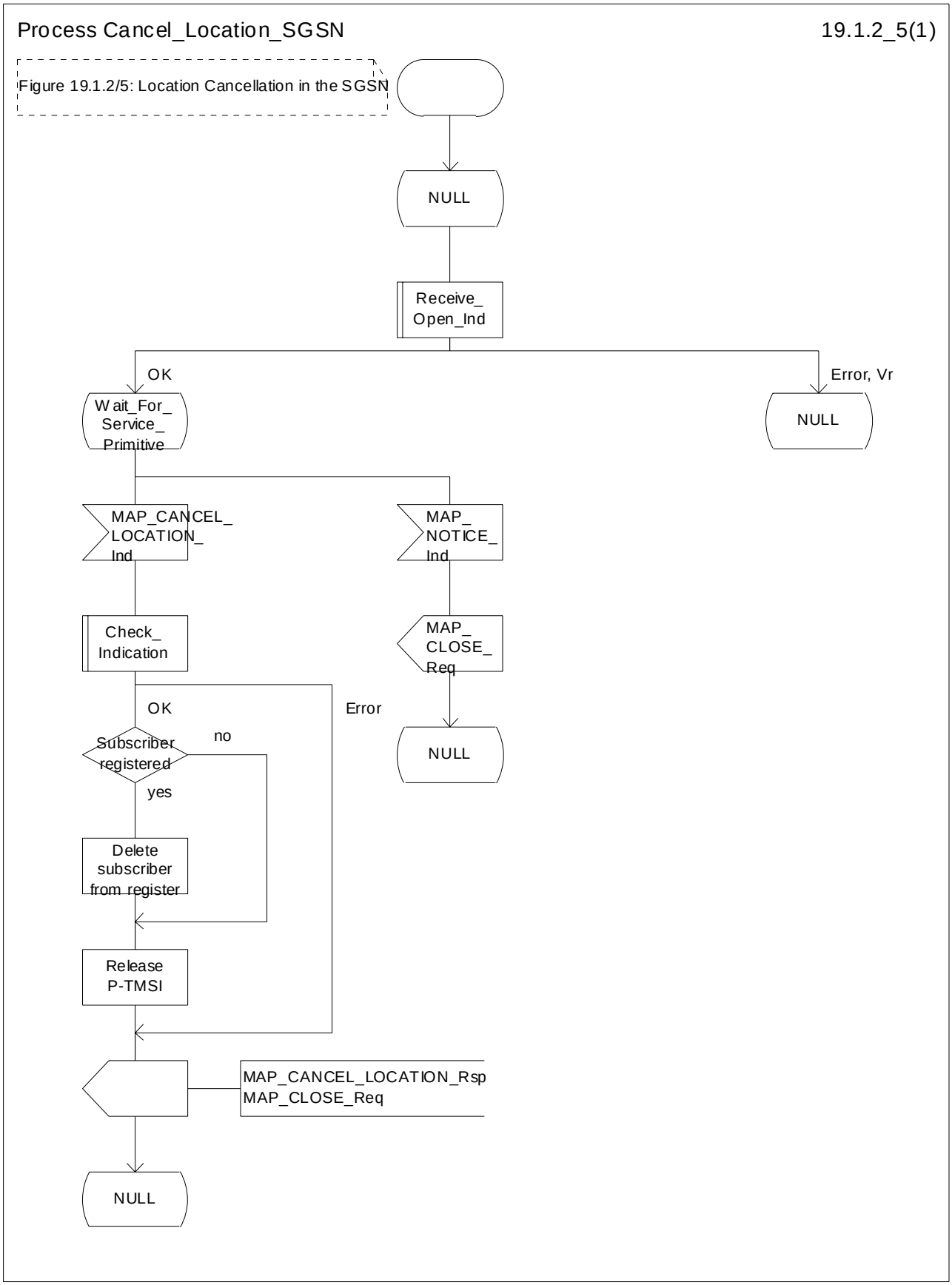


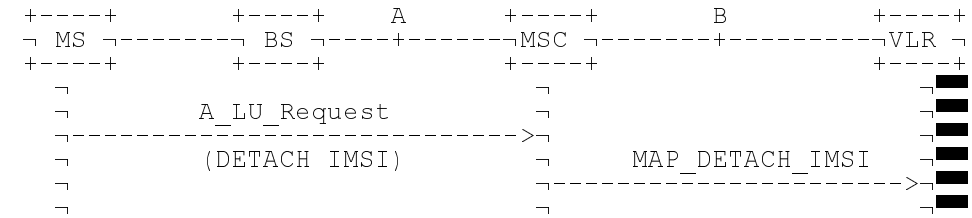
Figure 19.1.2/5: Process Cancel_Location_SGSN

19.1.3 Detach IMSI

19.1.3.1 General

On receipt of an A_LU_REQUEST (DETACH IMSI) indication from the radio interface this procedure invokes the MAP_DETACH_IMSI service described in subclause 8.1.5 in order to inform the visitor location register that a subscriber is no longer reachable (see figure 19.1.3/1), e.g. due to switched off station. This information is used by the VLR to reject mobile terminating calls or short messages without sending page messages on the radio path. The service is unconfirmed as it is likely that the MS is switched off before receiving a confirmation.

The detach IMSI feature is optional for the network operator. The MS is informed by the network whether detach IMSI is to be used or not.



NOTE: The service shown in dotted lines indicates the trigger provided by the radio interface (see GSM 09.10).

Figure 19.1.3/1: Interface and services for MAP_DETACH_IMSI

If the Gs interface is installed, the procedures to handle an IMSI Detach or a GPRS Detach request from the SGSN via the Gs interface do not require any signalling over the MAP interface. These procedures are specified in GSM 03.60 and 09.18.

19.1.3.2 Detailed procedure in the MSC

The MAP_DETACH_IMSI service is invoked by the MSC when receiving an A_LU_Request (DETACH IMSI) for a subscriber (see figure 19.1.3/2).

The MSC will open the dialogue to the VLR with a MAP_OPEN request containing no user specific parameters. The MAP_DETACH_IMSI request will contain the following parameter received from the radio side (for the mapping see GSM 09.10):

- Subscriber Id, being either a TMSI or an IMSI.

The MSC then waits for the MAP_OPEN confirmation (see macro Receive_Open_Cnf, subclause 25.1), indicating either:

- reject of dialogue (process terminates);
- reversion to version Vr(process terminates); or
- dialogue acceptance.

Thereafter, the dialogue is terminated locally by the MSC (MAP_CLOSE request with Release Method Prearranged End).

19.1.3.3 Detailed procedure in the VLR

When the VLR receives a MAP_DETACH_IMSI indication (see figure 19.1.3/3), it first checks the indication data (macro Check_Indication, see subclause 25.2). Thereafter it is checked whether the subscriber is known:

- if the subscriber is unknown the VLR ignores the indication;
- if the subscriber is known in the VLR, the IMSI detached flag is set.

The VLR process will terminate the dialogue locally (MAP_CLOSE request with Release Method Prearranged End).

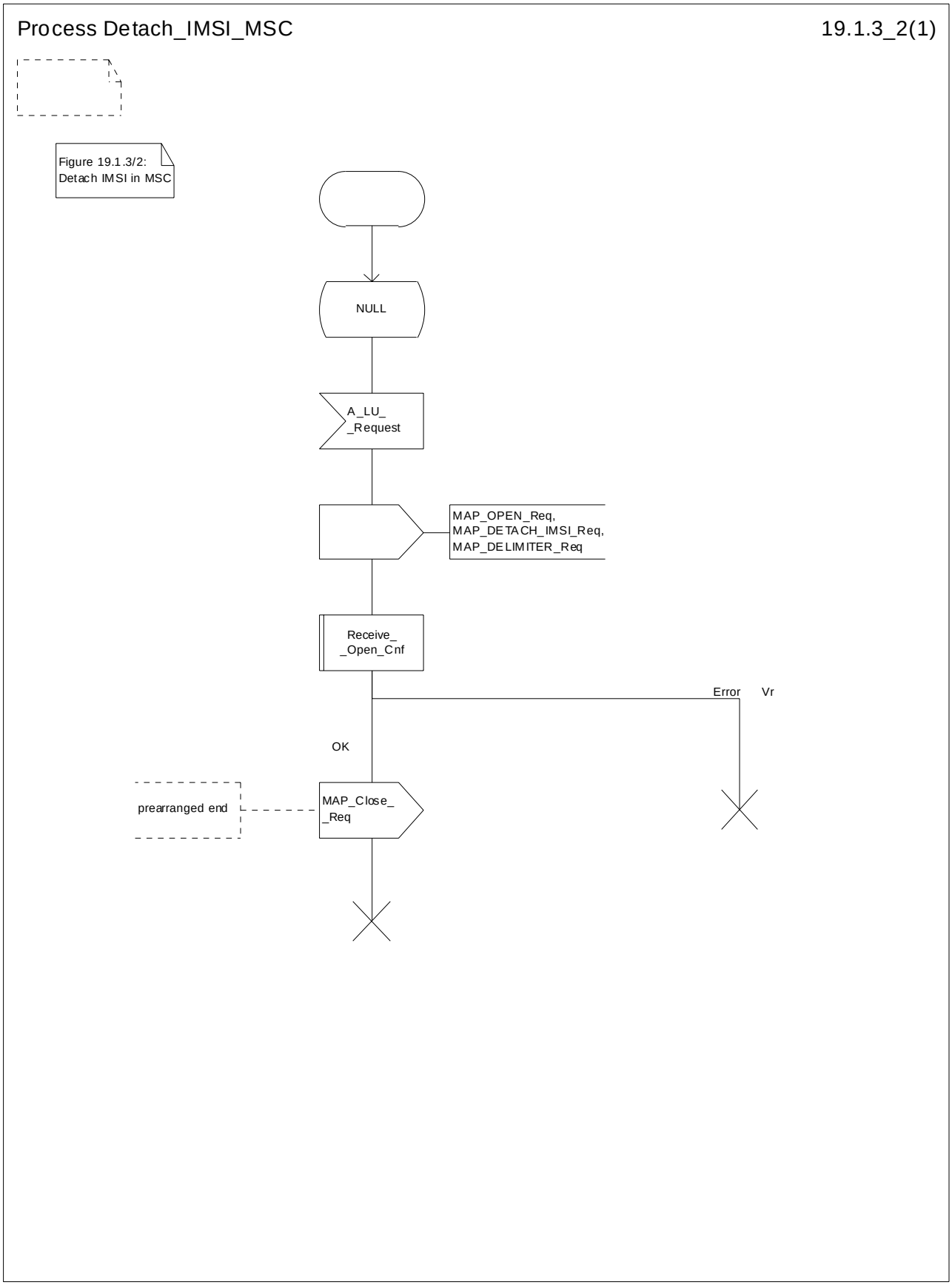


Figure 19.1.3/2: Process Detach_IMSI_MSC

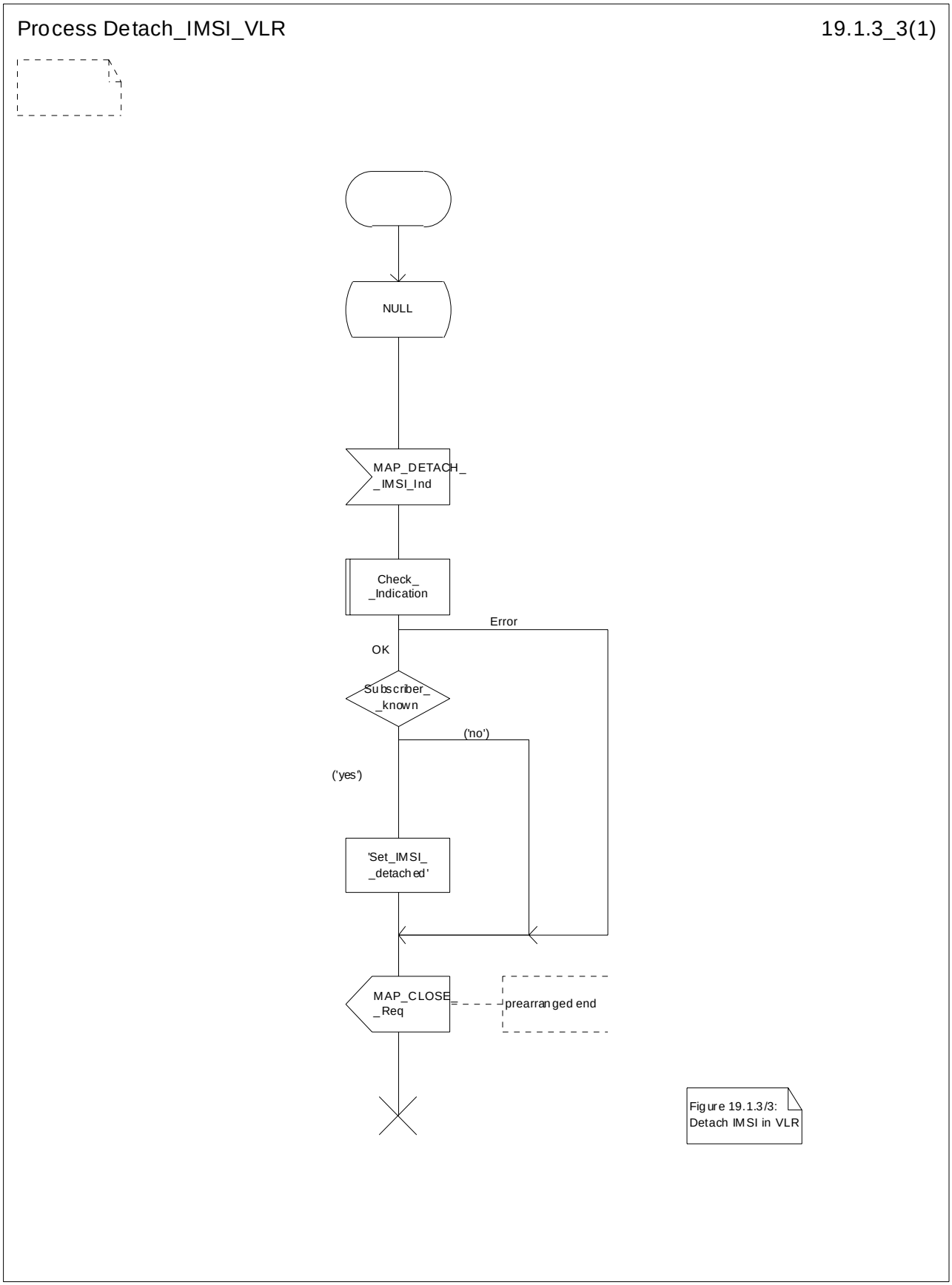


Figure 19.1.3/3: Process Detach_IMSI_VLR

19.1.4 Purge MS

19.1.4.1 General

When the VLR or the SGSN receives an indication on the O&M interface that the MS record is to be purged (either because of administrative action or because the MS has been inactive for an extended period), this procedure invokes the MAP_PURGE_MS service described in subclause 8.1.6 to request the HLR to set the "MS purged for non-GPRS" or the “MS purged for GPRS” flag for the MS so that any request for routing information for a mobile terminated call or a mobile terminated short message will be treated as if the MS is not reachable. The message flows are shown in figures 19.1.4/1and 19.1.4/5.

It is optional for the network operator to delete MS records from the VLR or from the SGSN, but if the option is used the VLR or the SGSN shall notify the HLR when a record has been deleted.

The O&M process in the VLR or in the SGSN must ensure that during the MS purging procedure any other attempt to access the MS record is blocked, to maintain consistency of data.

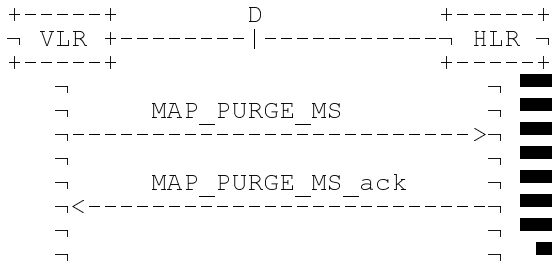


Figure 19.1.4/1: MAP-D Interface and services for MAP_PURGE_MS

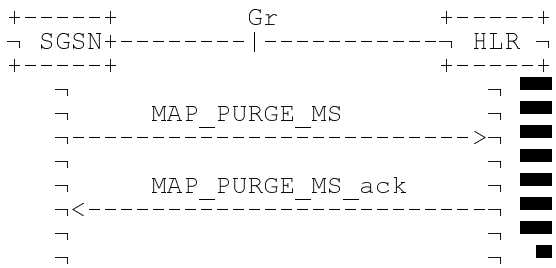


Figure 19.1.4/5: Gr Interface and services for MAP_PURGE_MS

19.1.4.2 Detailed procedure in the VLR

When the VLR receives an indication from O&M that an MS record is to be purged, it invokes the MAP_PURGE_MS service (see figure 19.1.4/2).

The VLR opens the dialogue to the HLR with a MAP_OPEN request containing no user specific parameters. The MAP_PURGE_MS request contains the IMSI of the MS which is to be purged and the VLR number.

The VLR then waits for the MAP_OPEN confirmation (see macro Receive_Open_Cnf, subclause 25.1), indicating one of:

- rejection of the dialogue (process terminates);
- reversion to version one (process terminates);
- dialogue acceptance.

If the HLR accepts the dialogue it returns a MAP_PURGE_MS confirmation, containing no parameter, indicating successful outcome of the procedure.

If a MAP_PURGE_MS confirmation containing a provider error, data error or user error, or a MAP_P_ABORT, MAP_NOTICE or premature MAP_CLOSE indication, has been received, the failure is reported to the O&M interface. Successful outcome of the procedure leads to deletion of the subscriber data and freezing of the TMSI if so requested by the HLR, and is reported to the O&M interface.

19.1.4.3 Detailed procedure in the HLR

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1. The possible outcomes are:

- termination of the procedure if the AC indicates a version 1 dialogue, as this procedure is not defined for version 1;
- termination of the procedure if there is an error;
- dialogue acceptance, in which case the procedure is as described below.

If the HLR receives a MAP_NOTICE indication, it terminates the dialogue by sending a MAP_CLOSE request.

If the HLR receives a MAP_PURGE_MS indication (see figure 19.1.4/3), it first checks the indication data (macro Check_Indication, see subclause 25.2). If there is a parameter error the HLR terminates the dialogue by sending an appropriate error in the MAP_PURGE_MS response in a MAP_CLOSE request . If there is no parameter error the HLR then checks whether the subscriber is known.

- if the subscriber is unknown, the HLR reports an error to the O&M interface, the error Unknown Subscriber is returned in the MAP_PURGE_MS response and the dialogue is terminated by sending a MAP_CLOSE request ;
- if the subscriber is known, the HLR checks whether the purging notification came from the VLR or SGSN where the MS was last registered:
    - if the received VLR number and the stored VLR number match, the HLR sets the "MS purged for non-GPRS" flag for the subscriber and sends a MAP_PURGE_MS response containing a freeze TMSI indicator to indicate successful outcome;
    - if the received VLR number and the stored VLR number do not match, the HLR sends a MAP_PURGE_MS response containing an empty result to indicate successful outcome. Since the MS is known by the HLR to be in a different VLR area, it is not appropriate to block mobile terminated calls or short messages to the MS, but the VLR which initiated the purging procedure can safely purge its record for the MS without freezing the TMSI.
    - if the received SGSN number and the stored SGSN number match, the HLR sets the "MS purged for GPRS" flag for the subscriber and sends a MAP_PURGE_MS response containing a freeze P-TMSI indicator to indicate successful outcome;
    - if the received SGSN number and the stored SGSN number do not match, the HLR sends a MAP_PURGE_MS response containing an empty result to indicate successful outcome. Since the MS is known by the HLR to be in a different SGSN area, it is not appropriate to block short messages to the MS, but the SGSN which initiated the purging procedure can safely purge its record for the MS without freezing the P-TMSI.

In either cases of successful termination the HLR terminates the dialogue by sending a MAP_CLOSE request.

19.1.4.4 Detailed procedure in the SGSN

When the SGSN receives an indication from O&M that an MS record is to be purged, it invokes the MAP_PURGE_MS service (see figure 19.1.4/4).

The SGSN opens the dialogue to the HLR with a MAP_OPEN request containing no user specific parameters. The MAP_PURGE_MS request contains the IMSI of the MS which is to be purged and the SGSN number.

The SGSN then waits for the MAP_OPEN confirmation (see macro Receive_Open_Cnf, subclause 25.1), indicating one of:

- rejection of the dialogue (process terminates);
- reversion to Vr (process terminates);
- dialogue acceptance.

If the HLR accepts the dialogue it returns a MAP_PURGE_MS confirmation, containing no parameter, indicating successful outcome of the procedure.

If a MAP_PURGE_MS confirmation containing a provider error, data error or user error, or a MAP_P_ABORT, MAP_NOTICE or premature MAP_CLOSE indication, has been received, the failure is reported to the O&M interface. Successful outcome of the procedure leads to deletion of the subscriber data and freezing of the P-TMSI if so requested by the HLR, and is reported to the O&M interface.

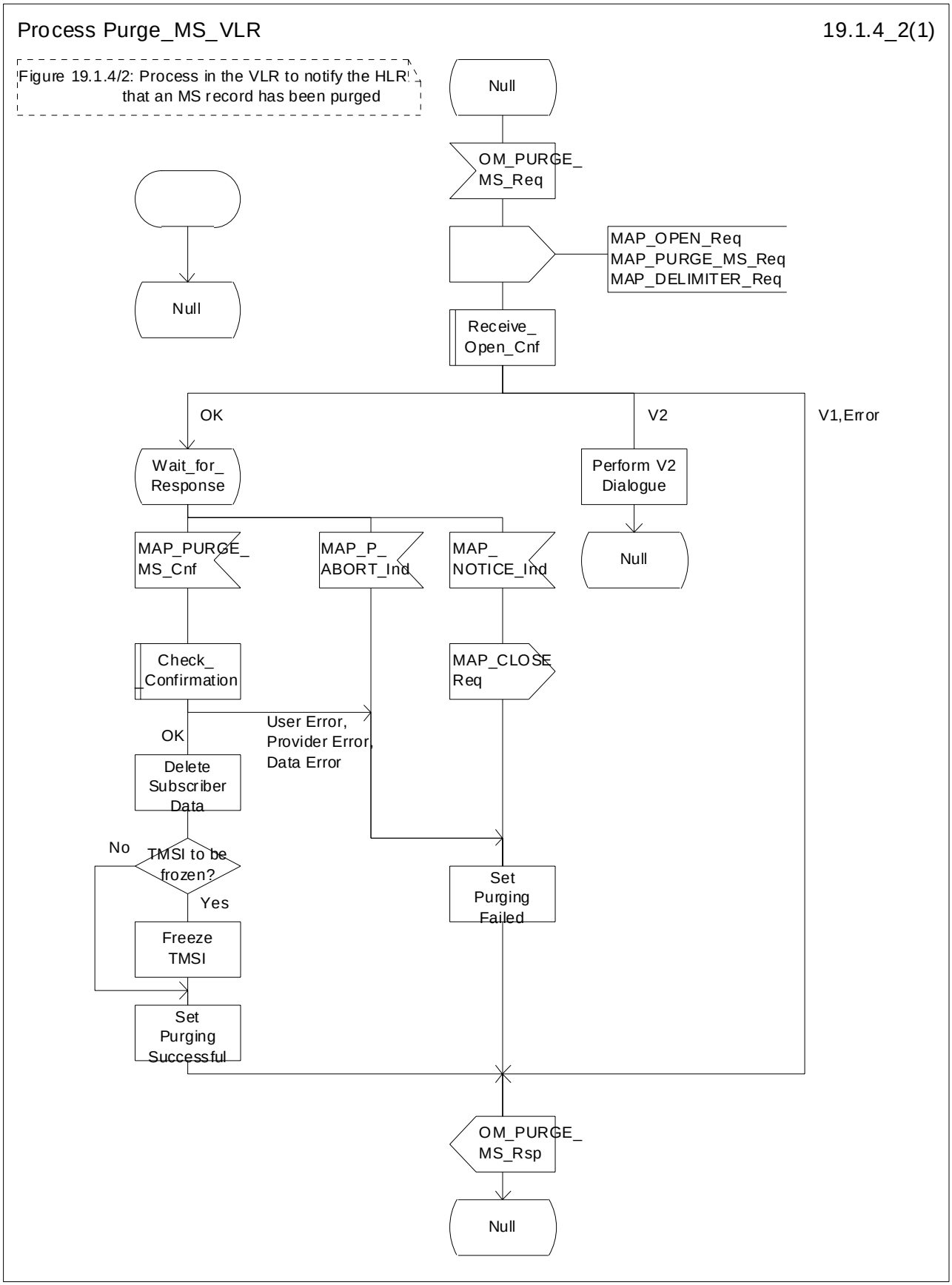


Figure 19.1.4/2: Process Purge_MS_VLR

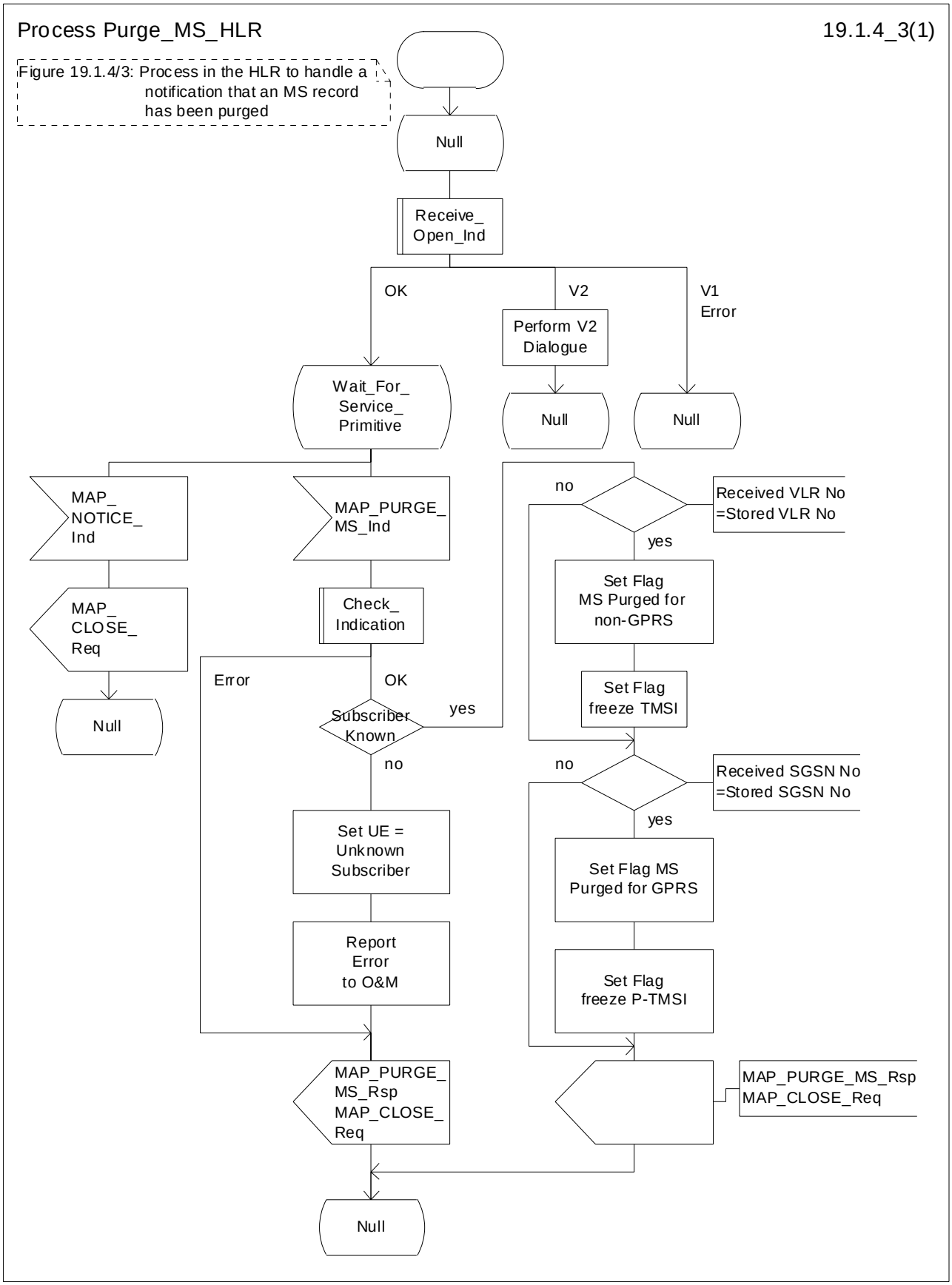


Figure 19.1.4/3: Process Purge_MS_HLR

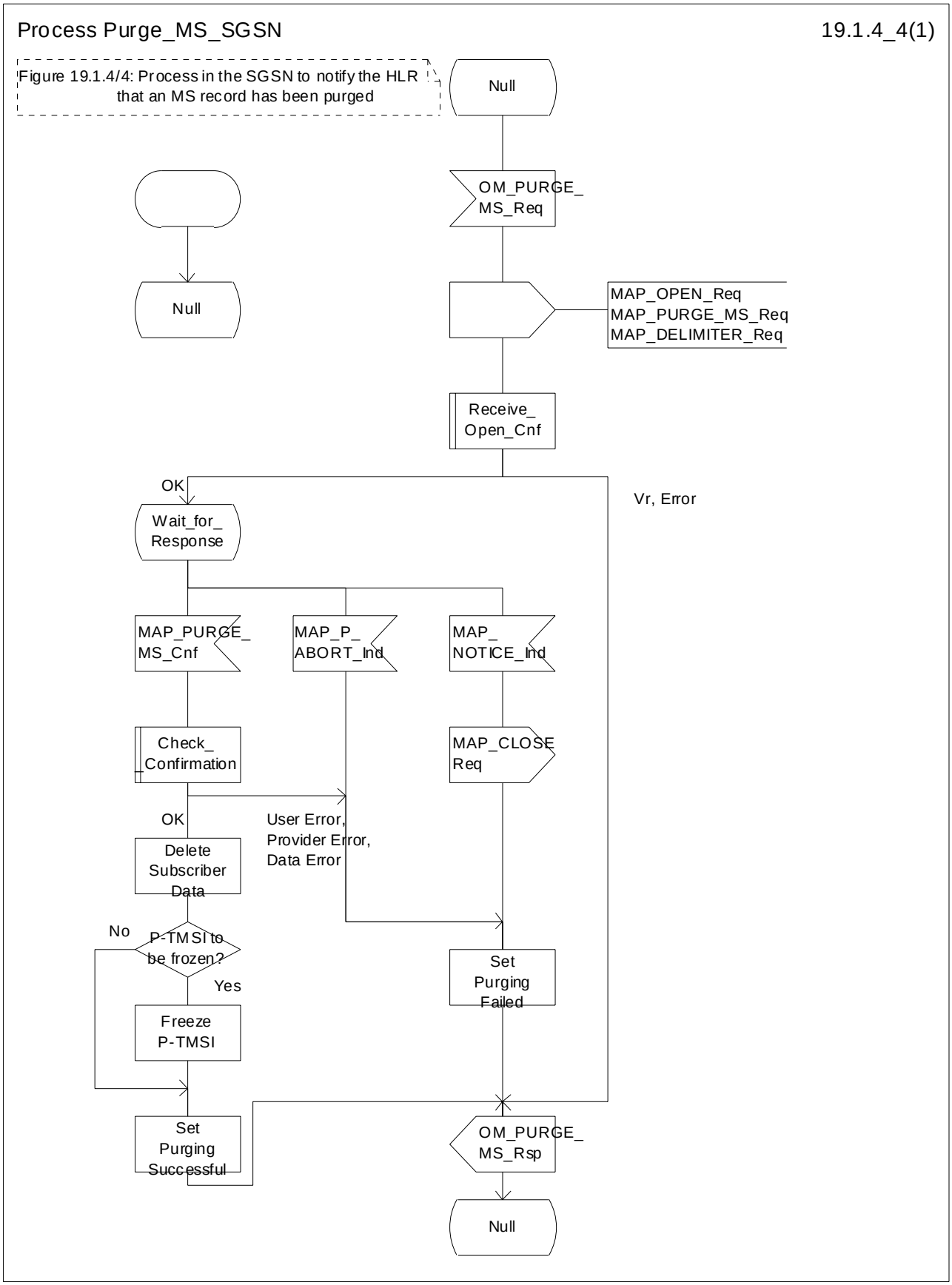


Figure 19.1.4/4: Process Purge_MS_SGSN

19.2 Handover procedure

19.2.1 General

The handover between different MSCs is called Inter-MSC handover. The interfaces involved for Inter-MSC handover are shown in figure 19.2/1. Following two Inter-MSC handover procedures apply:

1) Basic Inter-MSC handover:

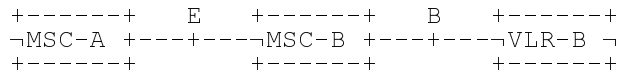
   The call is handed over from the controlling MSC, called MSC-A to another MSC, called MSC-B (figure 19.2/1a).

   Figure 19.2/2 shows a successful handover between MSC-A and MSC-B including a request for handover number allocation by MSC-B to VLR-B.

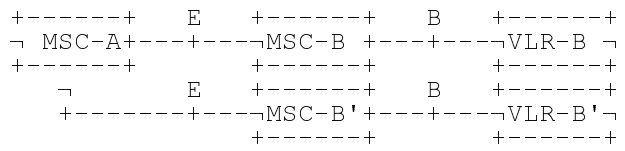
2) Subsequent Inter-MSC handover:

   After the call has been handed over from MSC-A to MSC-B, a handover to either MSC-A (figure 19.2/1a) or to a third MSC (MSC-B') (figure 19.2/1b) is necessary in order to continue the connection.

   Figure 19.2/3 shows a successful subsequent handover.



a) Basic handover procedure MSC-A to MSC-B and subsequent handover procedure MSC-B to MSC-A.



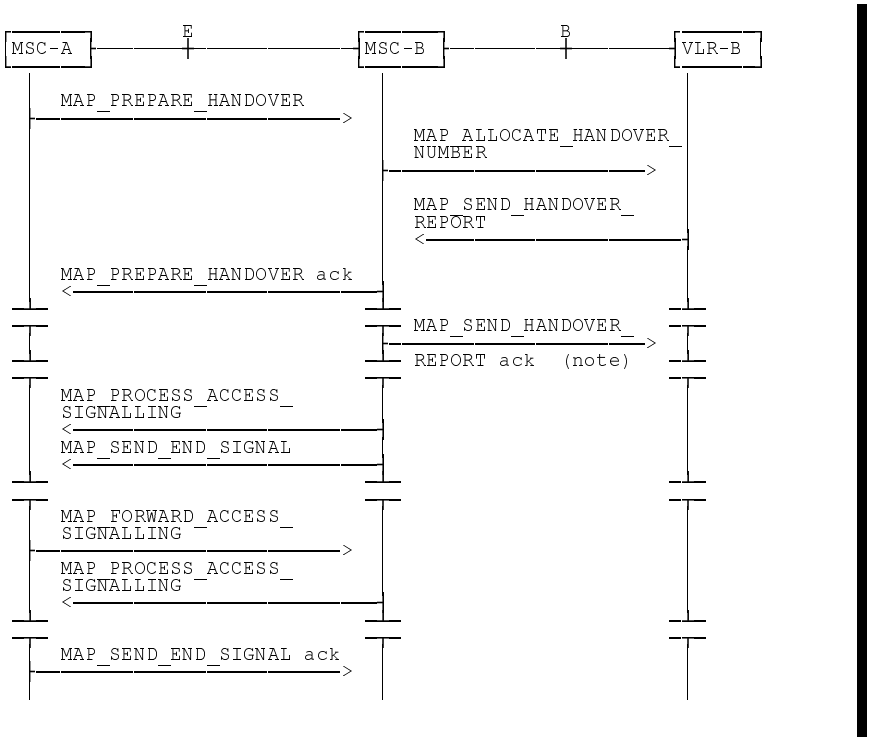
b) Subsequent handover procedure MSC-B to MSC-B'.

Figure 19.2/1: Interface structure for handover

The MAP handover procedures achieve the functionality required to set up an MSC-MSC dialogue, to optionally allocate a handover number and to transport BSSAP messages.

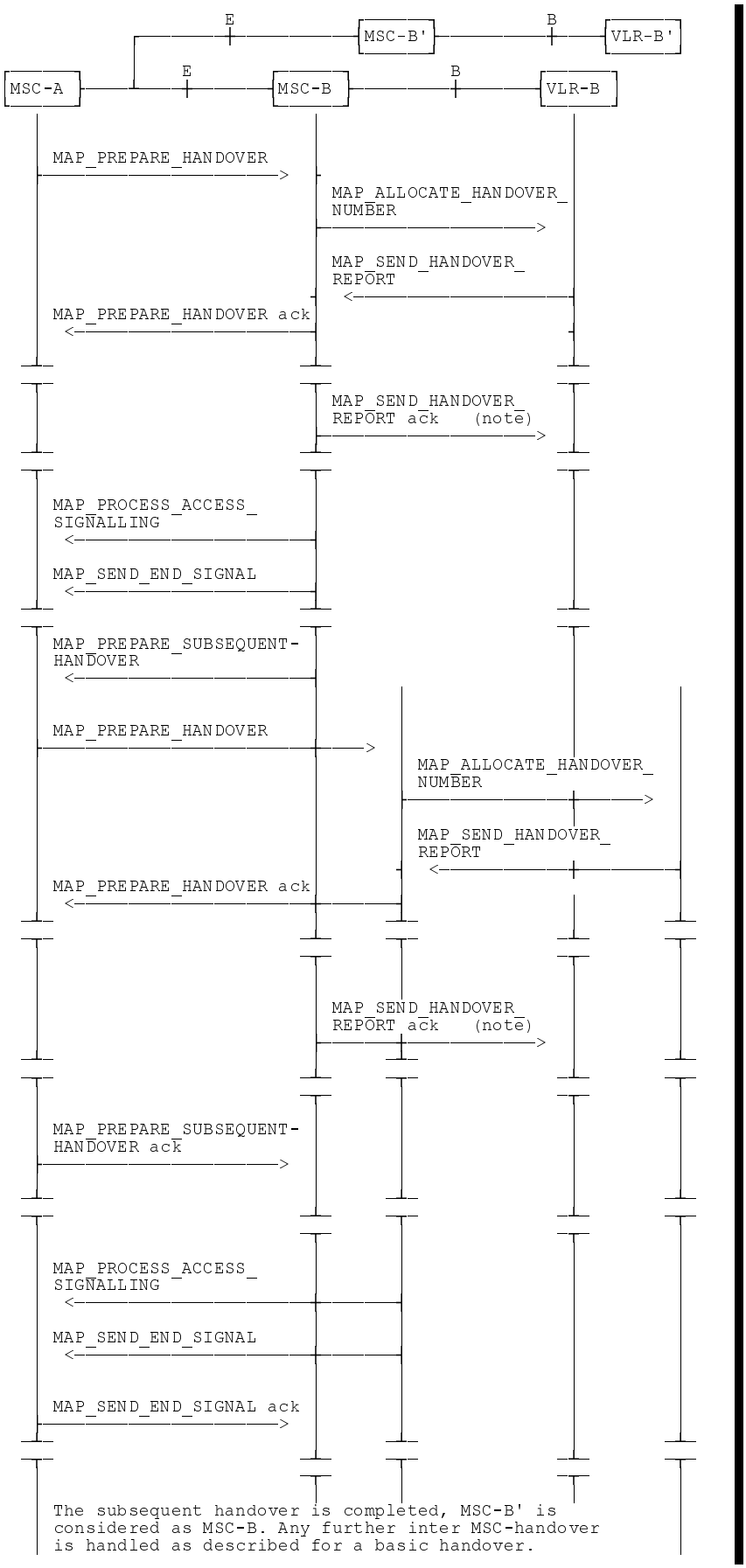
The transported BSSAP messages are controlled and handled by the Handover Control Application in the MSCs. This information will be transparent to the MAP protocol. If the MSC receives via the MAP protocol BSSAP messages, this information will be forwarded to the Handover Control Application (shown in the handover SDL diagrams with the internal HO_CA signalling, it is an internal process in the MSC) and vice versa if the Handover Control Application requires the sending of BSSAP messages via the MAP protocol.

For detailed interworking between the A-interface and MAP procedures, see GSM 03.09 and GSM 09.10.



NOTE: This can be sent at any time after the connection between MSC-A and MSC-B is established.

Figure 19.2/2: Example of a successful basic handover procedure to MSC-B



NOTE: This can be sent at any time after the connection between MSC-A and MSC-B is established

Figure 19.2/3: Example of a handover towards a third MSC

19.2.2 Handover procedure in MSC-A

This subclause describes the handover procedure in MSC-A, including the request for a basic handover to another MSC (MSC-B), subsequent handover to a third MSC (MSC-B') or back to the controlling MSC (MSC-A).

19.2.2.1 Basic handover

When MSC-A has decided that a call has to be handed over to MSC-B, the Handover Control Application in MSC-A requests the MAP application to initiate the MAP_PREPARE_HANDOVER request to MSC-B.

MSC-A opens the dialogue to MSC-B with a MAP_OPEN request containing no user specific parameters and sends a MAP_PREPARE_HANDOVER request. This request may optionally contain an indication that a handover number allocation is not required, targetCellId, for compatibility reasons, and all information required by MSC-B to allocate the necessary radio resources.

If MSC-B accepts the dialogue, it returns a MAP_PREPARE_HANDOVER confirmation containing a handover number, unless the request has included the HO-NumberNotRequired parameter, and BSSAP information which is forwarded to and handled by the Handover Control Application in MSC-A.

Optionally MSC-A can receive, after a MAP_PREPARE_HANDOVER confirmation, a MAP_PROCESS_ACCESS_SIGNALLING indication containing BSSAP information.

When the connection has been established between the MS and MSC-B, MSC-A will be informed by a MAP_SEND_END_SIGNAL indication.

When MSC-A wants to clear the connection with BSS-B, an indication from the Handover Control Application is received in the Map Application to send the MAP_SEND_END-SIGNAL response to MSC-B to close the MAP dialogue.

MSC-A may abort the handover procedure at any time (e.g. if the call is cleared).

19.2.2.2 Handling of access signalling

If required, the Handover Control Application in MSC-A requests the MAP application to invoke the MAP_FORWARD_ACCESS_SIGNALLING request containing the information to be transferred to the A-interface of MSC-B (e.g. call control information).

MAP_FORWARD_ACCESS_SIGNALLING is a non-confirmed service.

MSC-B will then forward the required information to the Handover Control Application. The MAP_FORWARD_ACCESS_SIGNALLING is composed in such a way that the information can be passed transparently to the A-interface for call control and mobility management information. Any response received in MSC-B from the A-interface that should be brought to MSC-A will require a new independent request from the Handover Control Application in MSC-B to MSC-A by invoking a MAP_PROCESS_ACCESS_SIGNALLING request.

19.2.2.3 Other procedures in stable handover situation

During a call and after handover, a number of procedures between MSC-A and BSS-B controlled by or reported to MSC-A may be initiated in both directions by invoking a MAP_FORWARD_ACCESS_SIGNALLING request and reception of a MAP_PROCESS_ACCESS_SIGNALLING indication.

19.2.2.4 Subsequent handover

When MSC-A receives a MAP_PREPARE_SUBSEQUENT_HANDOVER request, it will start the procedure of handing the call over to a third MSC (MSC-B'), or back to the controlling MSC (MSC-A). If the new handover procedure towards MSC-B' or MSC-A is successful, the handover control application in MSC-A will request the release of the dialogue towards MSC-B by sending the MAP_SEND_END_SIGNAL confirmation.

19.2.2.5 SDL Diagrams

The SDL diagrams on the following pages describe the user processes in MSC-A for the procedures described in this subclause.

The services used are defined in subclause 8.4.

NOTE: The message primitives HO_CA_MESSAGE used in the SDL-Diagrams are used to show the internal co-ordination between the MAP application and the Handover Control Application. For a detailed description of the co-ordination between the applications for the handover procedure, see GSM 03.09.

Note that in case of reception of errors from the MSCs (see the Handover error handling macro), the MAP user reports them to the Handover Control Application and does not take any action except in cases explicitly mentioned in the SDL diagrams.

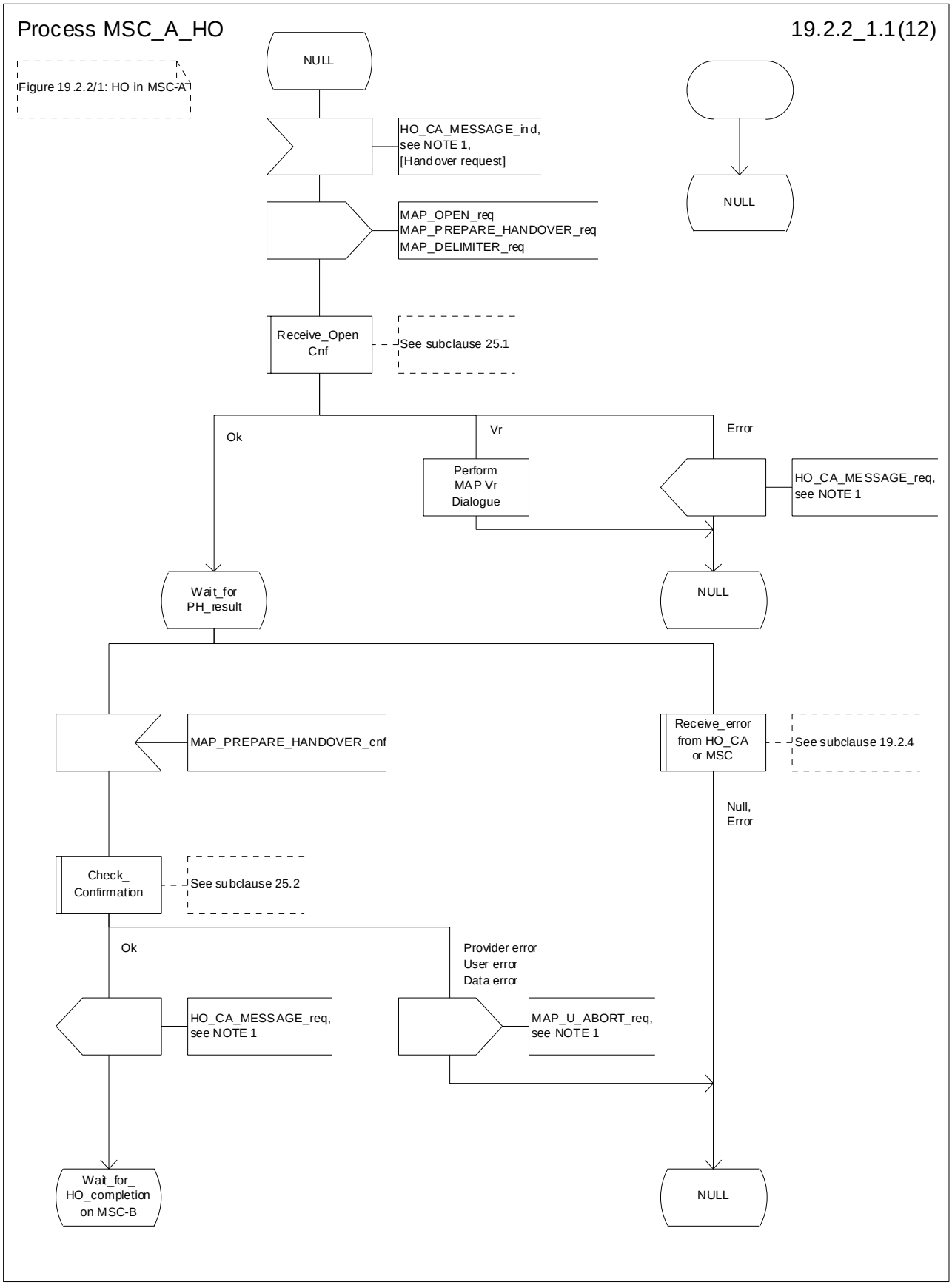


Figure 19.2.2/1 (sheet 1 of 12): Process MSC_A_HO

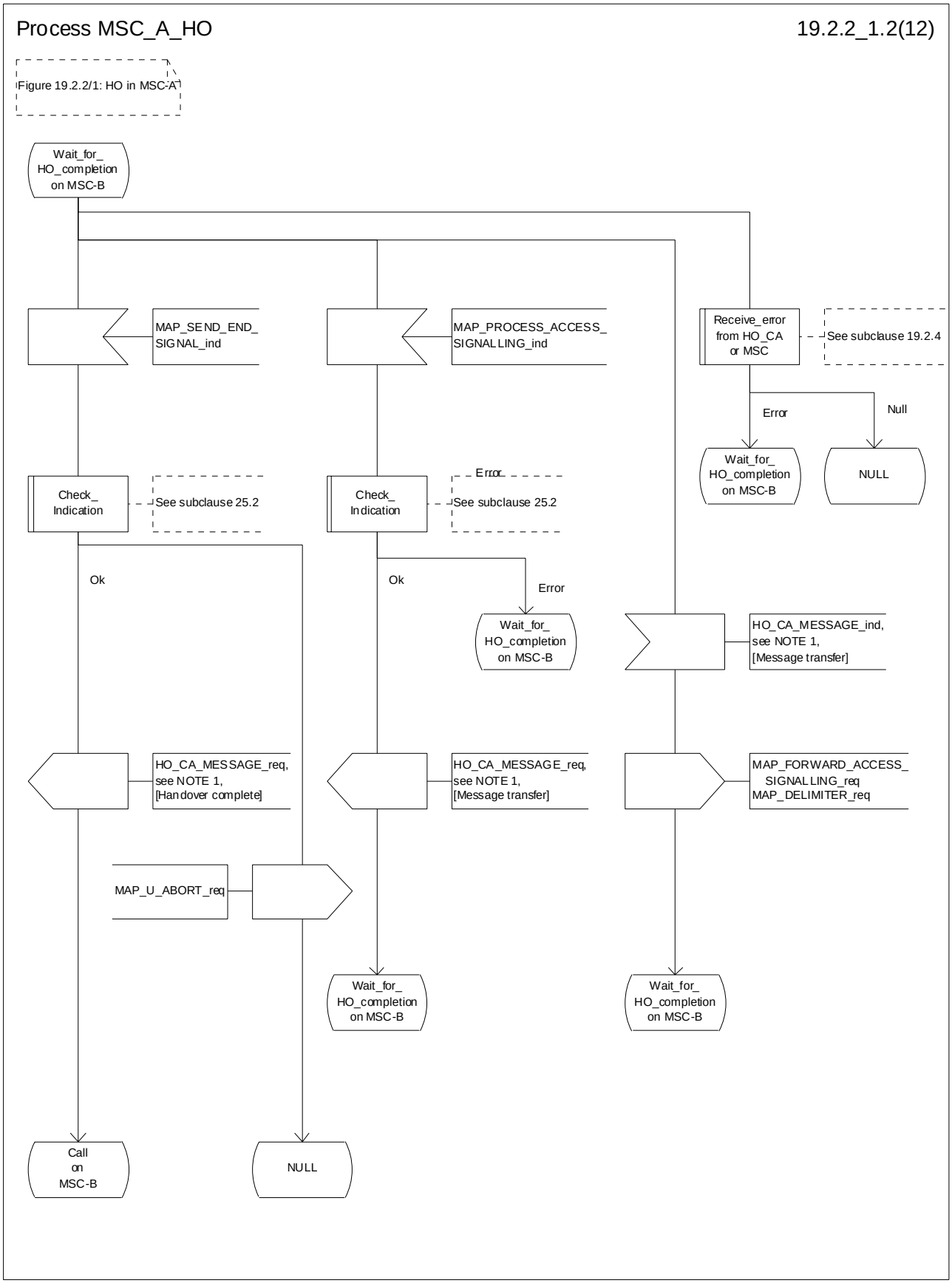


Figure 19.2.2/1 (sheet 2 of 12): Process MSC_A_HO

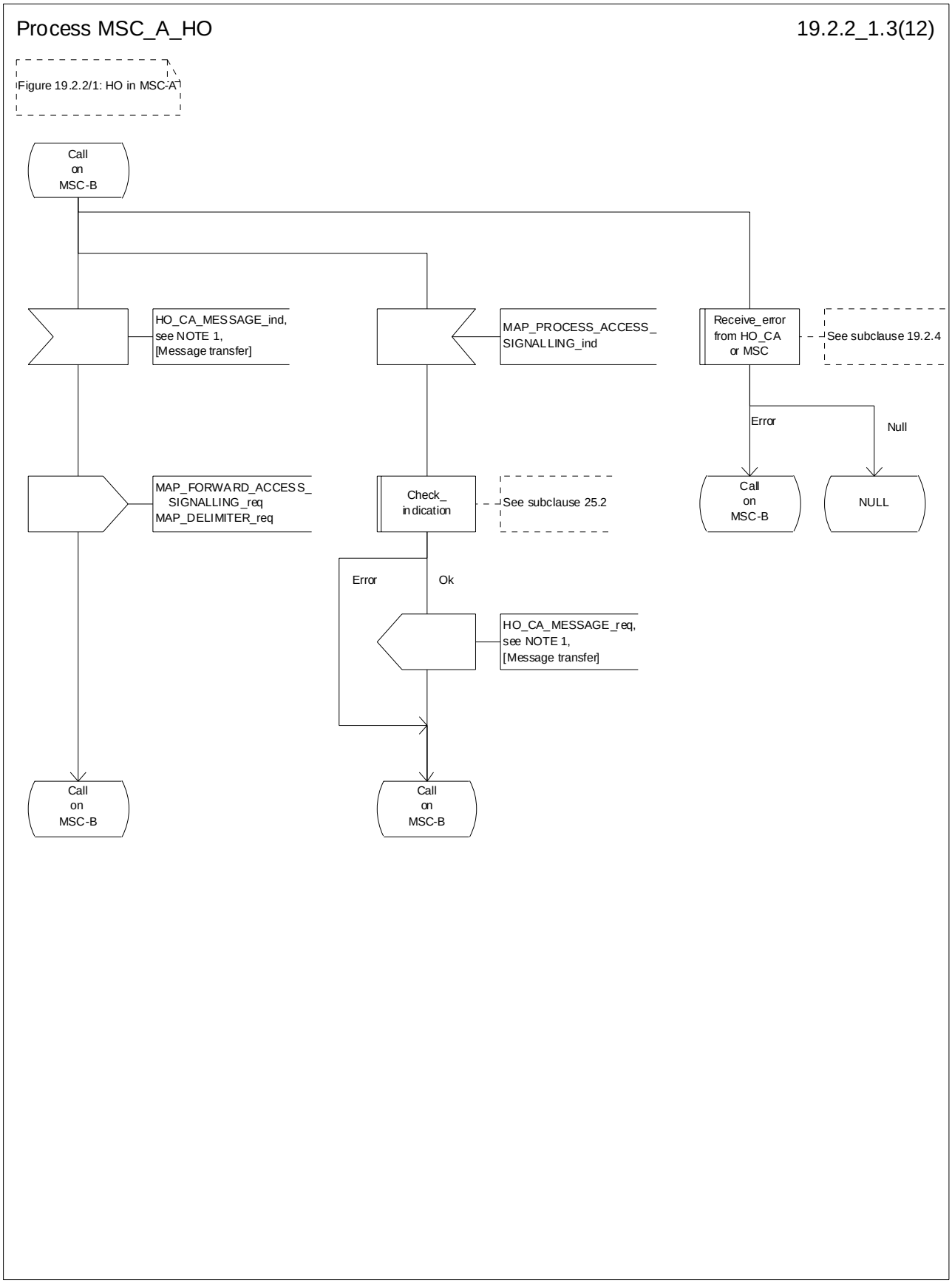


Figure 19.2.2/1 (sheet 3 of 12): Process MSC_A_HO

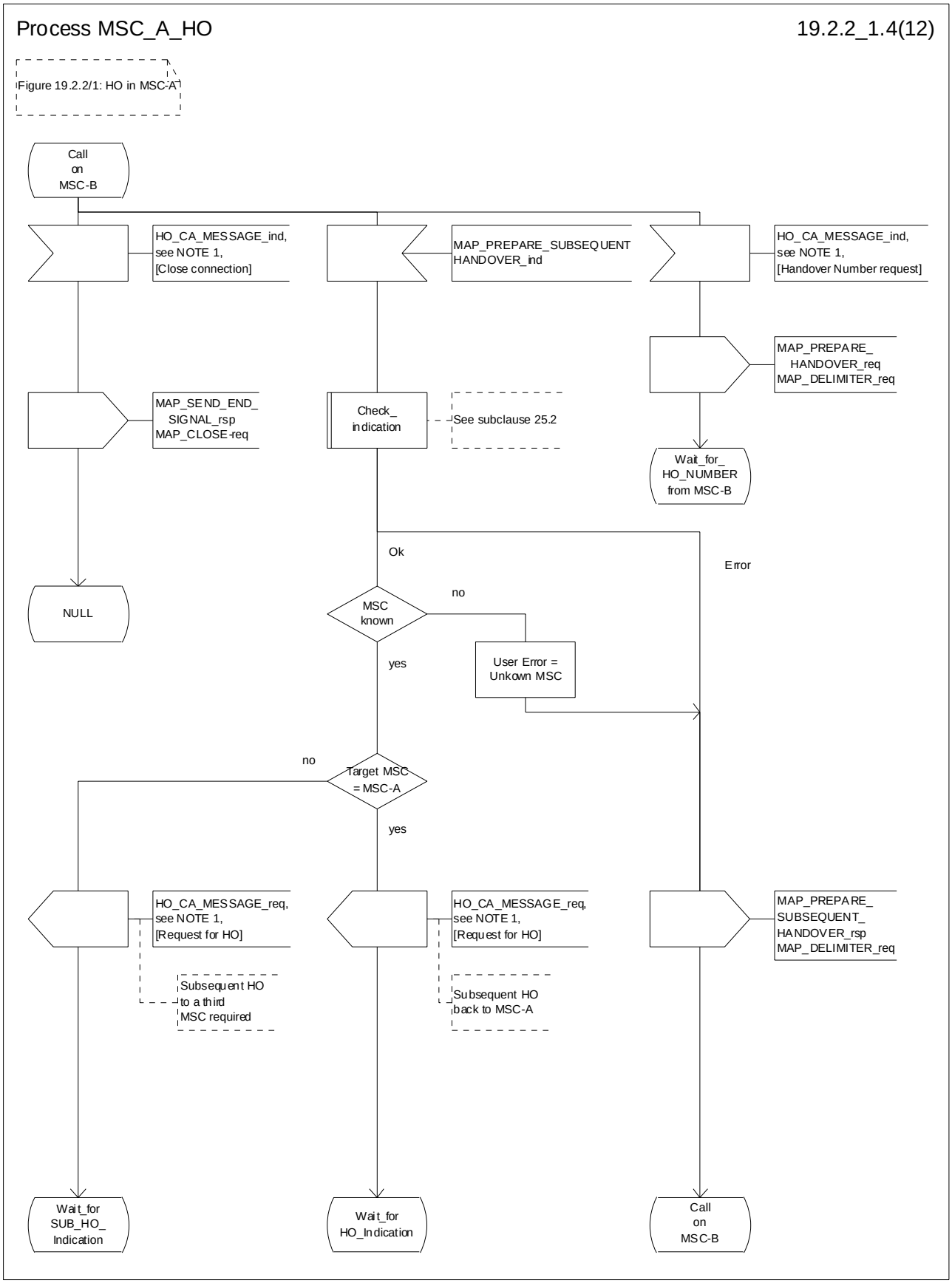


Figure 19.2.2/1 (sheet 4 of 12): Process MSC_A_HO

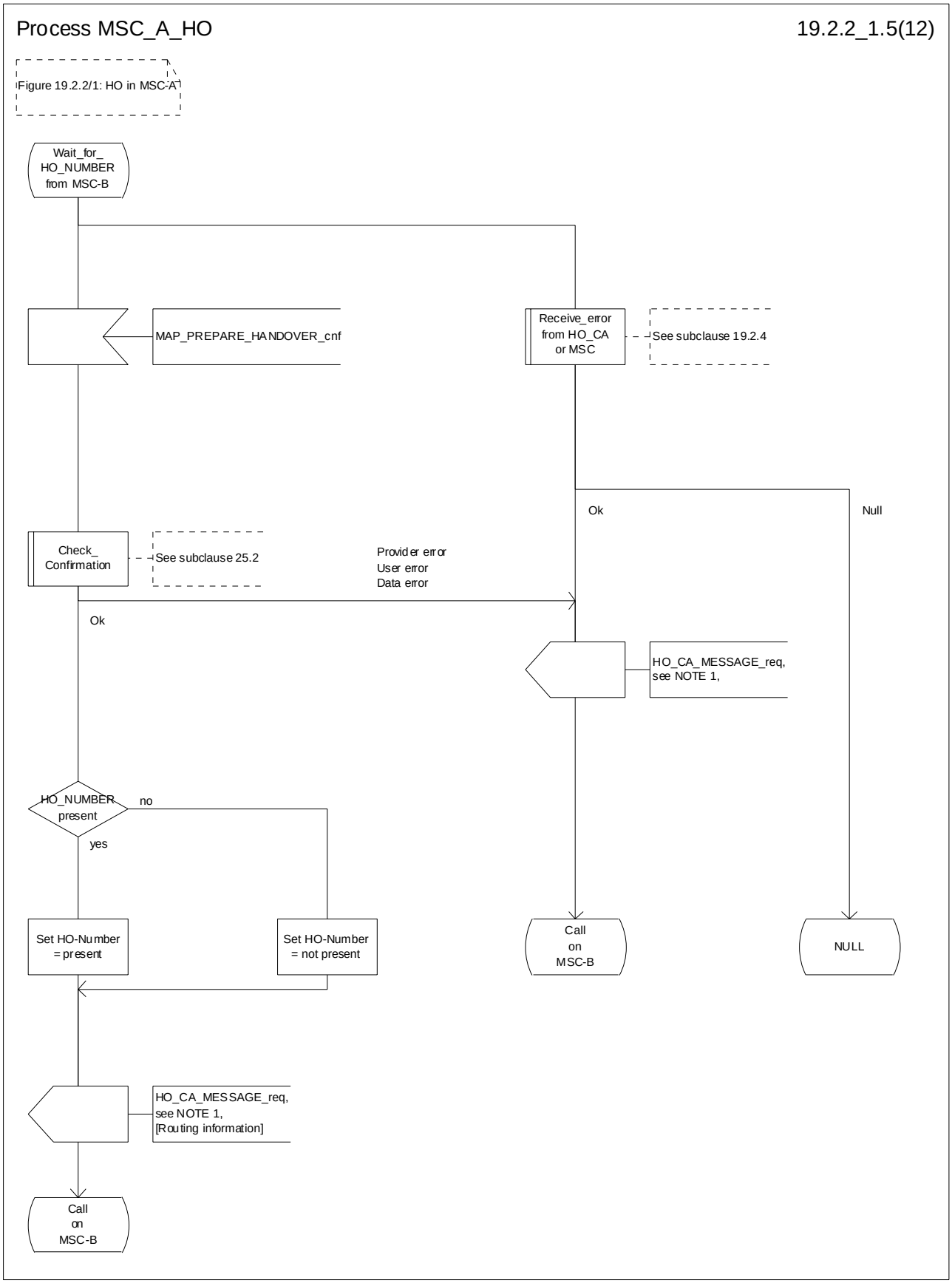


Figure 19.2.2/1 (sheet 5 of 12): Process MSC_A_HO

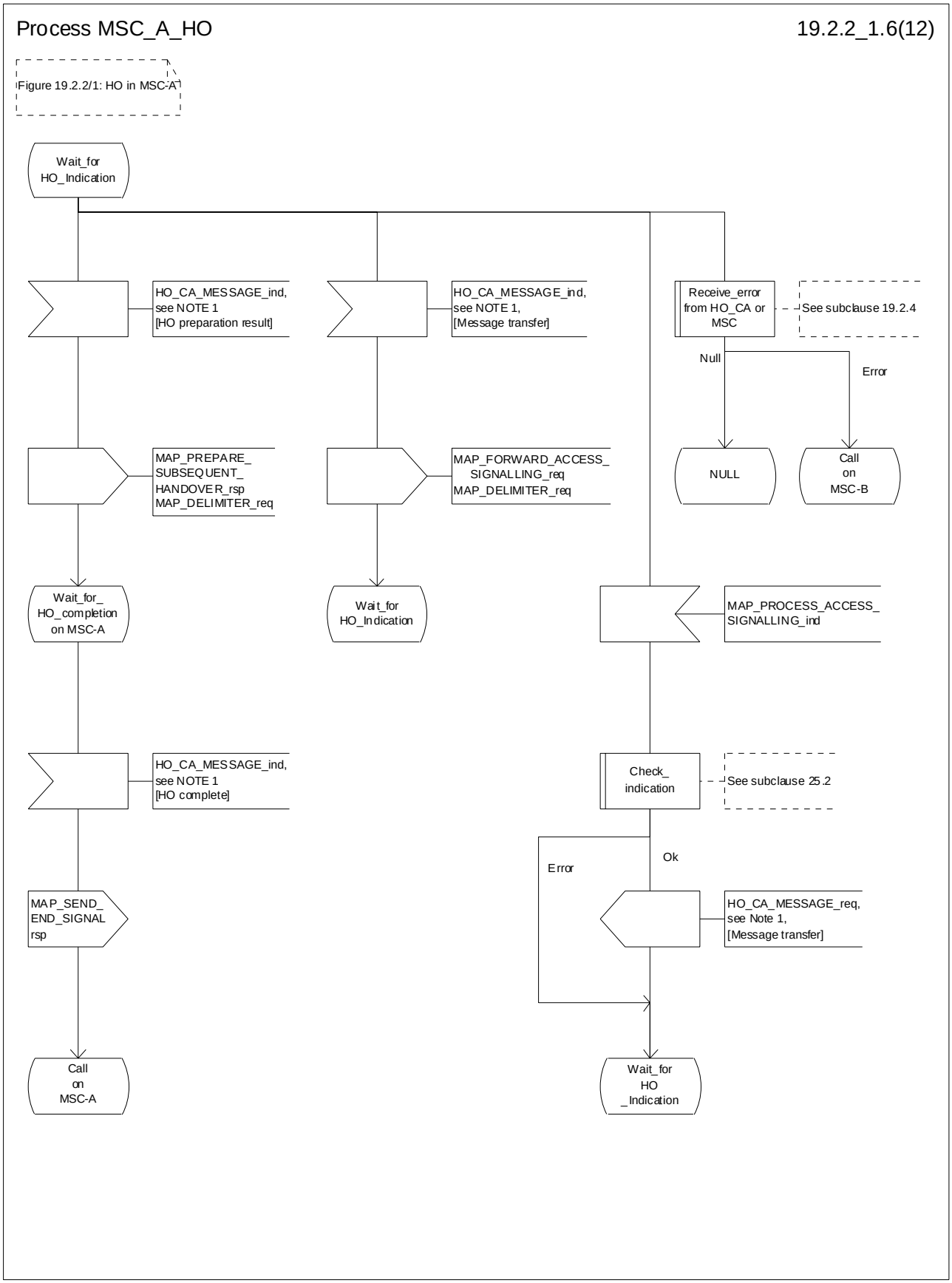


Figure 19.2.2/1 (sheet 6 of 12): Process MSC_A_HO

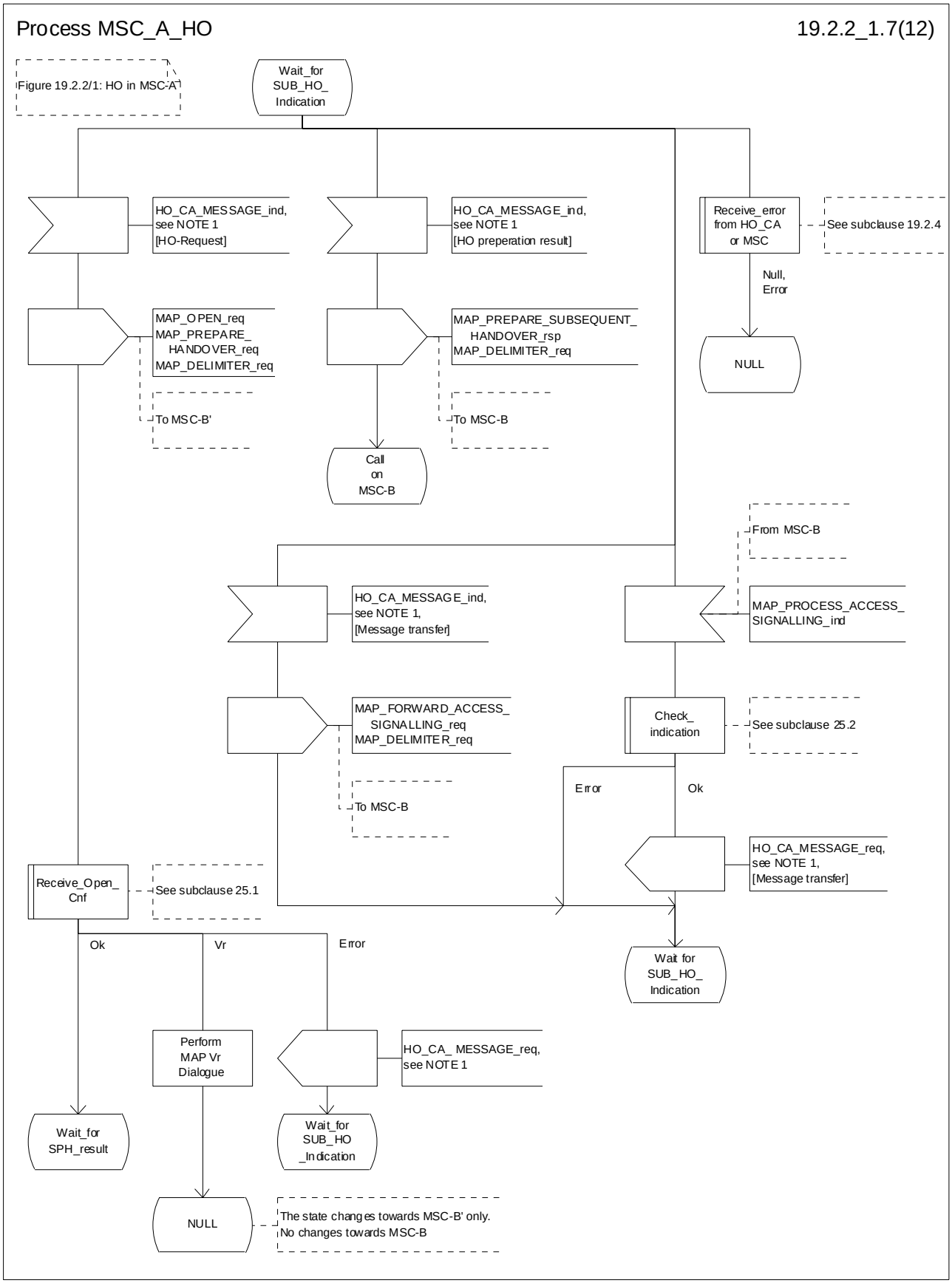


Figure 19.2.2/1 (sheet 7 of 12): Process MSC_A_HO

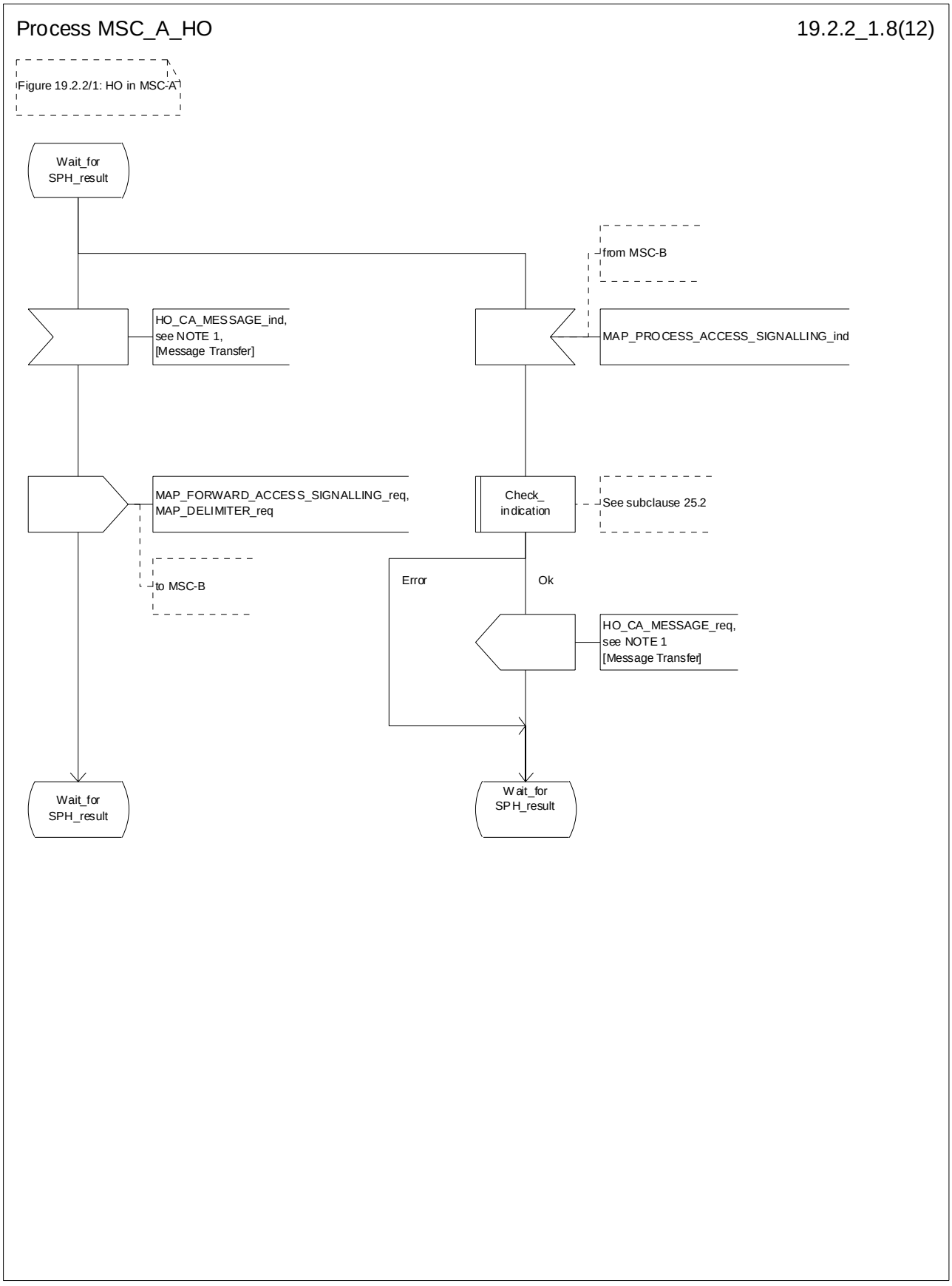


Figure 19.2.2/1 (sheet 8 of 12): Process MSC_A_HO

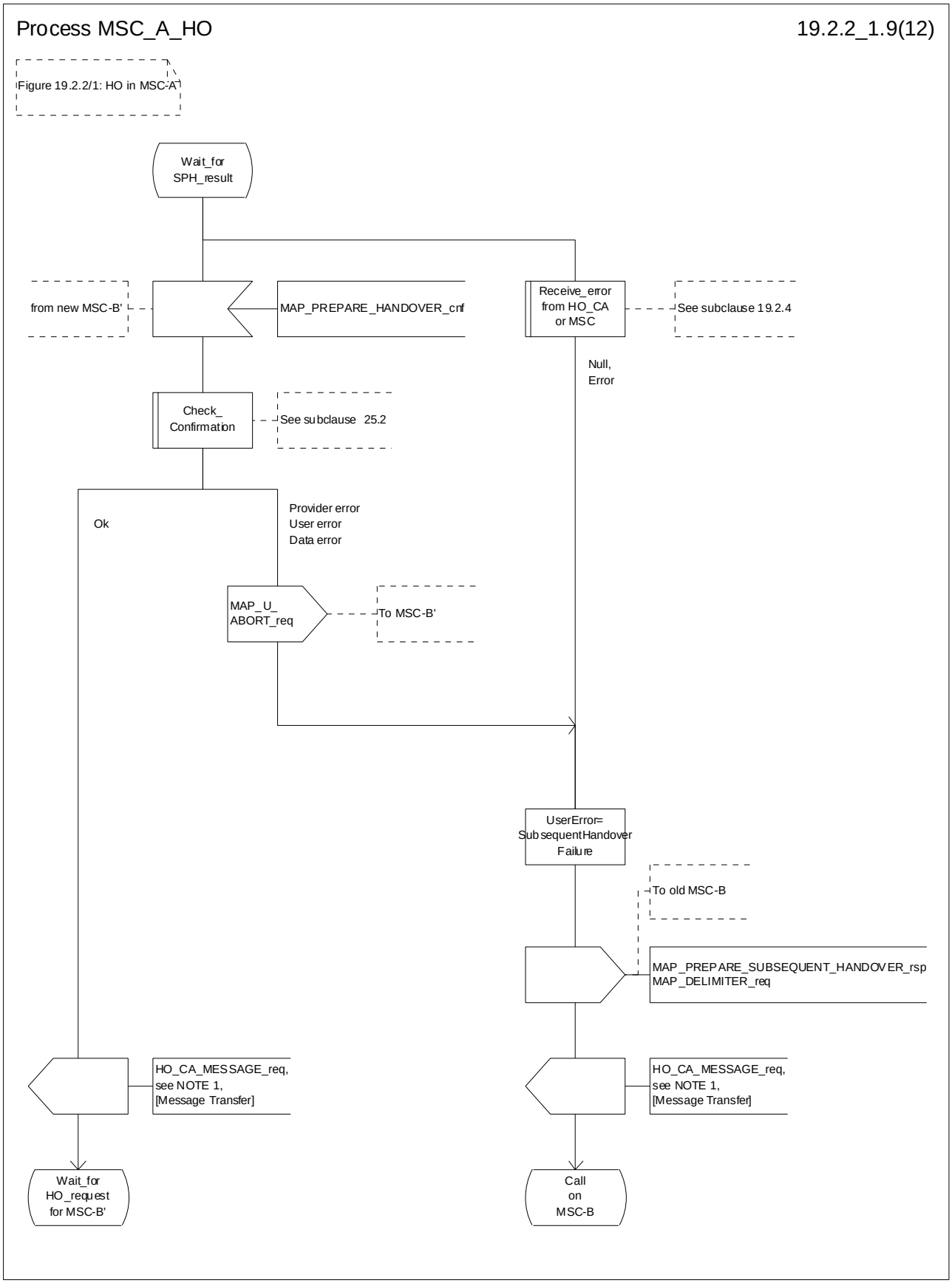


Figure 19.2.2/1 (sheet 9 of 12): Process MSC_A_HO

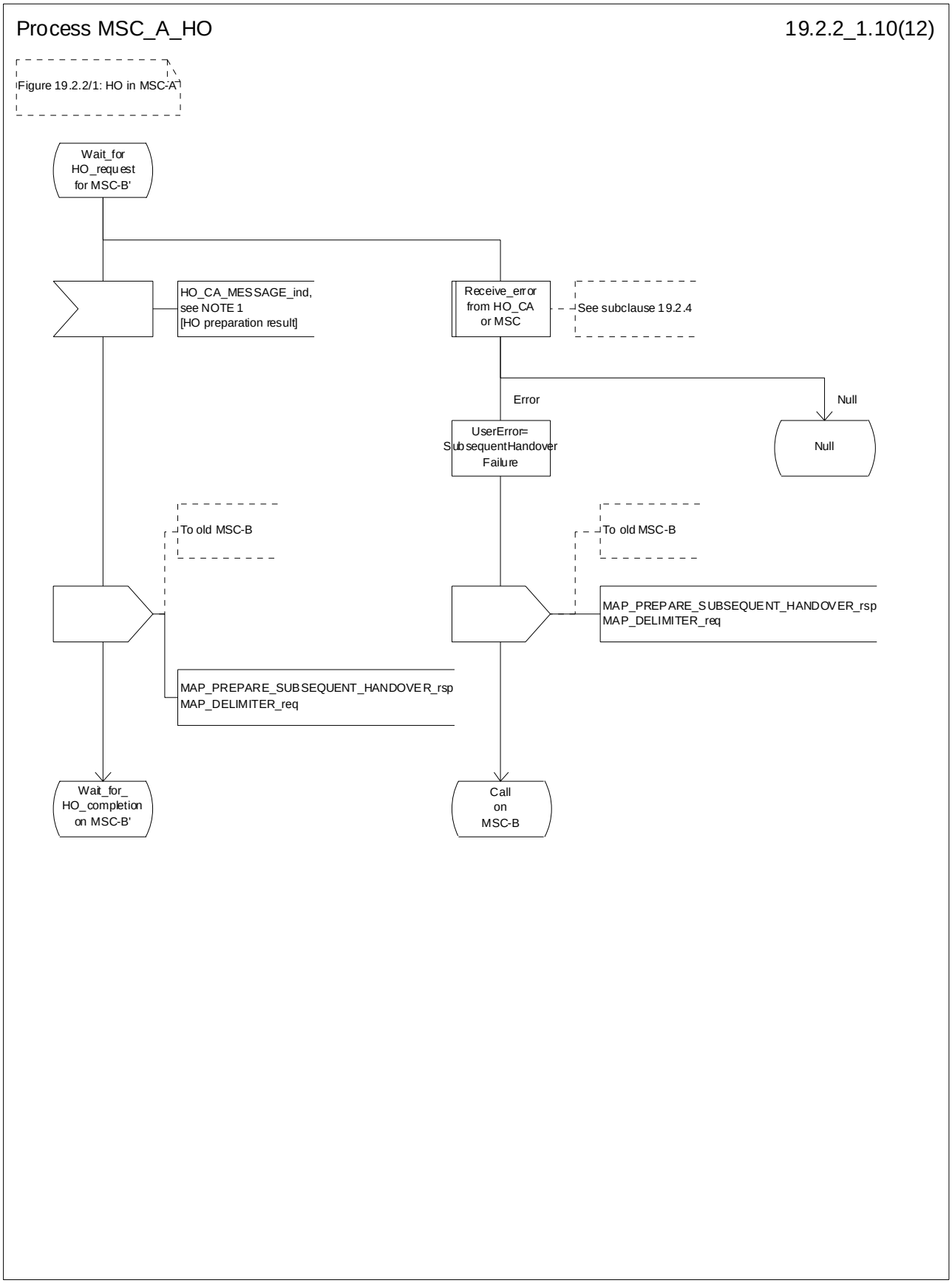


Figure 19.2.2/1 (sheet 10 of 12): Process MSC_A_HO

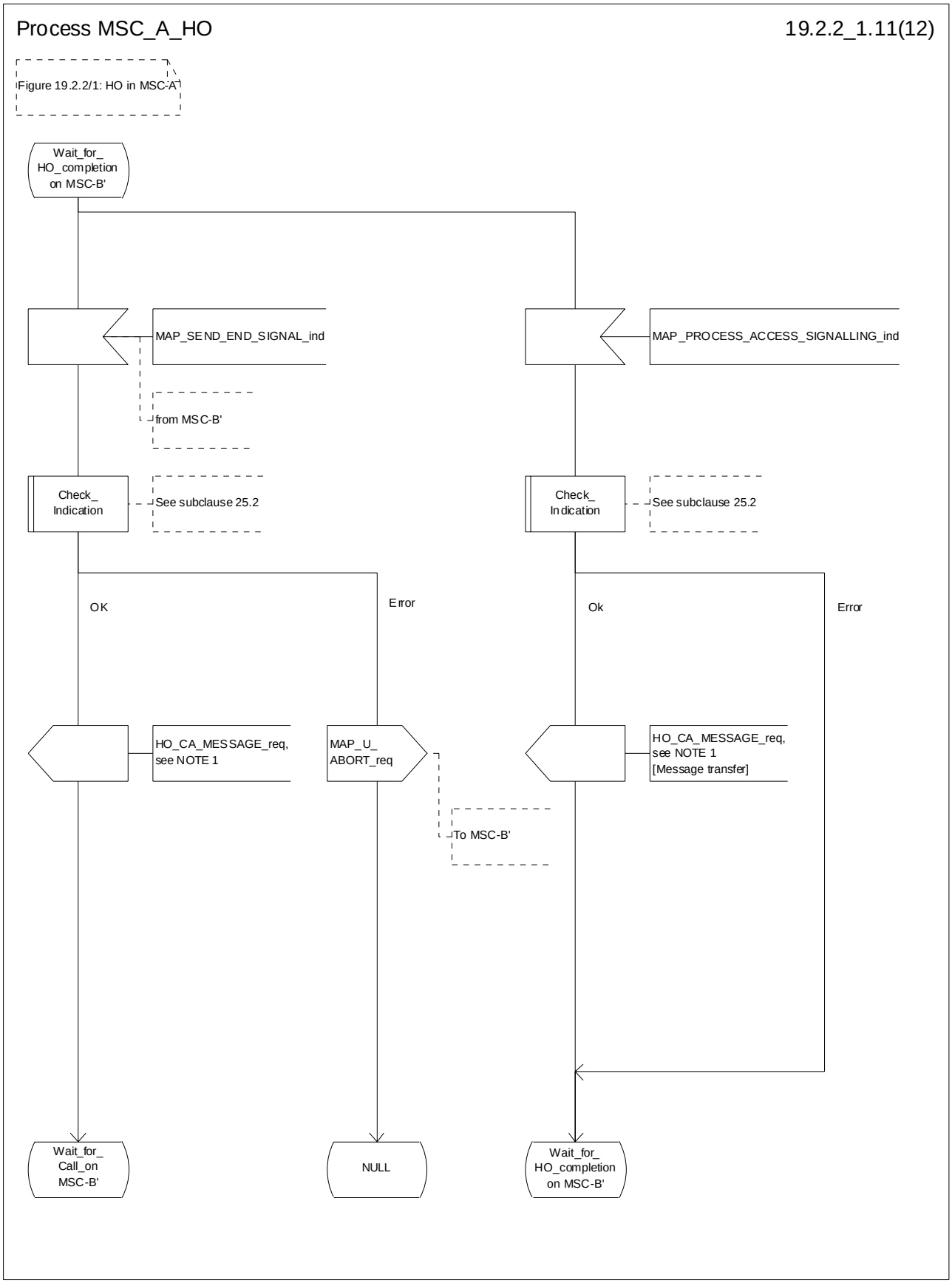


Figure 19.2.2/1 (sheet 11 of 12): Process MSC_A_HO

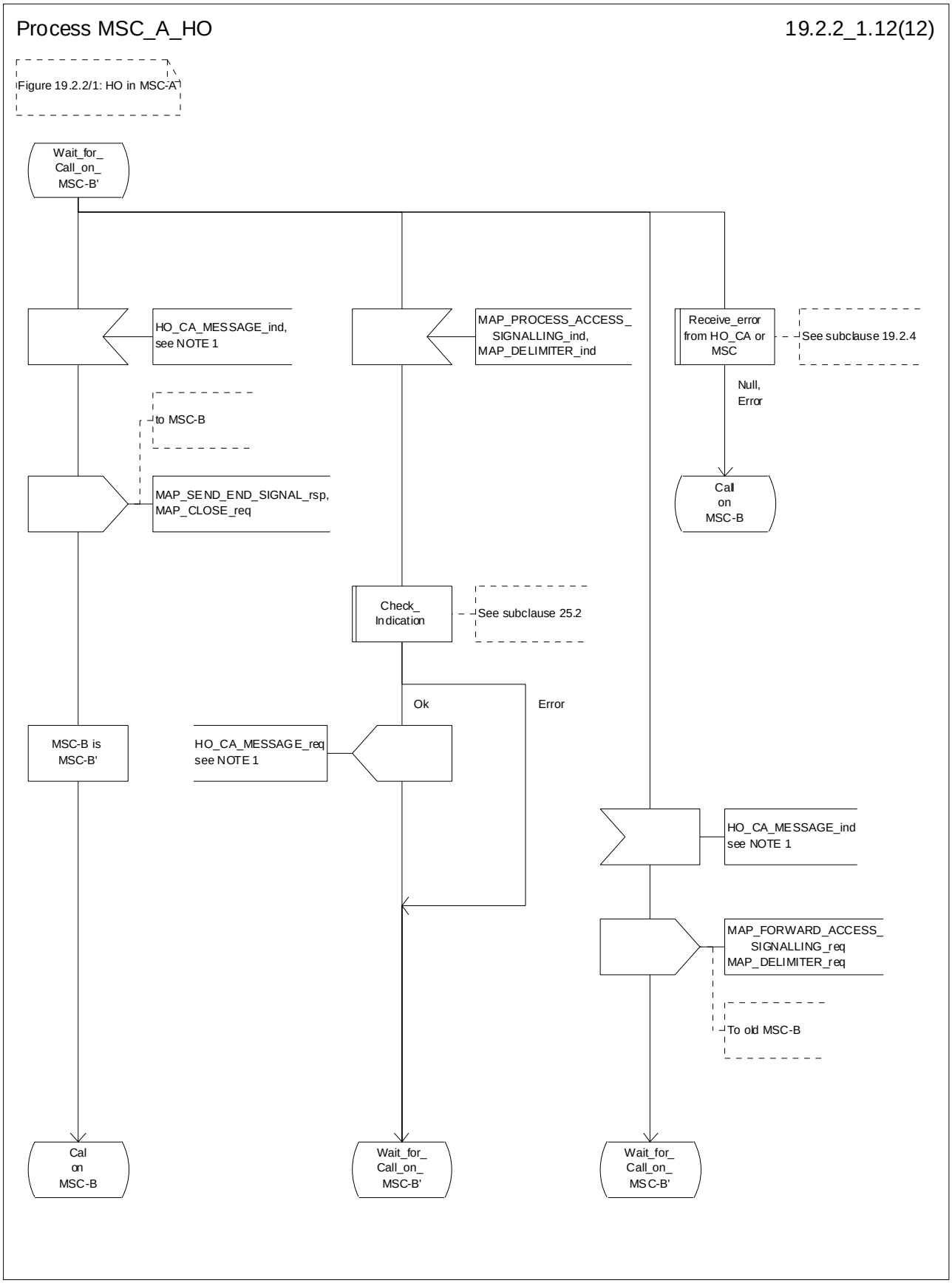


Figure 19.2.2/1 (sheet 12 of 12): Process MSC_A_HO

19.2.3 Handover procedure in MSC-B

This subclause describes the handover procedure in MSC-B, including the request for a handover from another MSC (MSC-A), subsequent handover to a third MSC (MSC-B') or back to the controlling MSC (MSC-A).

19.2.3.1 Basic handover

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1.

When MSC-B process receives a MAP_PREPARE_HANDOVER indication from MSC-A, MSC-B requests its associated VLR to provide a handover number, unless the parameter HO-NumberNotRequired is received in the indication.

When the connection between the MS and MSC-B is established on MSC-B, the Handover Control Application will request the MAP application to indicate this event to MSC-A by invoking the MAP_SEND_END_SIGNAL request. When a call is released, MSC-A will inform MSC-B by MAP_SEND_END_SIGNAL response and the MAP dialogue between MSC-A and MSC-B is closed.

19.2.3.2 Allocation of handover number

When a handover number is required, a MAP_ALLOCATE_HANDOVER_NUMBER request will be sent to the VLR. The handover number is received in the MAP_SEND_HANDOVER_REPORT request, and will be included in the MAP_PREPARE_HANDOVER response to MSC-A.

As soon as the call from MSC-A using the handover number arrives in MSC-B, MSC-B shall release the handover number in the VLR using the MAP_SEND_HANDOVER_REPORT response.

19.2.3.3 Handling of access signalling

If required by the Handover Control Application, MSC-B invokes the MAP_PROCESS_ACCESS_SIGNALLING request containing the information received on the A-interface that should be transferred to MSC-A (e.g. call control information).

MAP_PROCESS_ACCESS_SIGNALLING is a non-confirmed service and any response from MSC-A will require a MAP_FORWARD_ACCESS_SIGNALLING request.

19.2.3.4 Other procedures in stable handover situation

During a call and after handover, a number of procedures between MSC-A and BSS-B controlled by or reported to MSC-A may be initiated by involving access signalling transfer in both directions.

19.2.3.5 Subsequent handover

The procedure is used when the Handover Control Application in MSC-B has decided that a call is to be handed over to another MSC (either back to the controlling MSC (MSC-A) or to a third MSC (MSC-B')).

After the MAP_PREPARE_SUBSEQUENT_HANDOVER response is received from MSC-A, MSC-B will await the disconnection of the call. Once the disconnect is complete, MSC-B will inform its VLR by invoking the MAP_SEND_HANDOVER_REPORT confirmation. VLR-B will then release the allocated handover number.

The subsequent handover procedure is shown in figure 19.2/3.

19.2.3.6 SDL Diagrams

The SDL diagrams on the following pages describe the user process in MSC-B for the procedures described in this subclause.

The services used are defined in subclause 8.4.

NOTE 1: The message primitives HO_CA_MESSAGE in the SDL-diagrams are used to show the internal co-ordination between the MAP application and the Handover Control Application. For a detailed description of the co-ordination between the applications for the handover procedure, see GSM 03.09.

NOTE 2: The order in the SDL diagrams to allocate first the handover number and then the radio resources is not binding.

Process MSC_B_HO 19.2.3_1.1(11)

Figure 19.2.3/1: HO in MSC-B

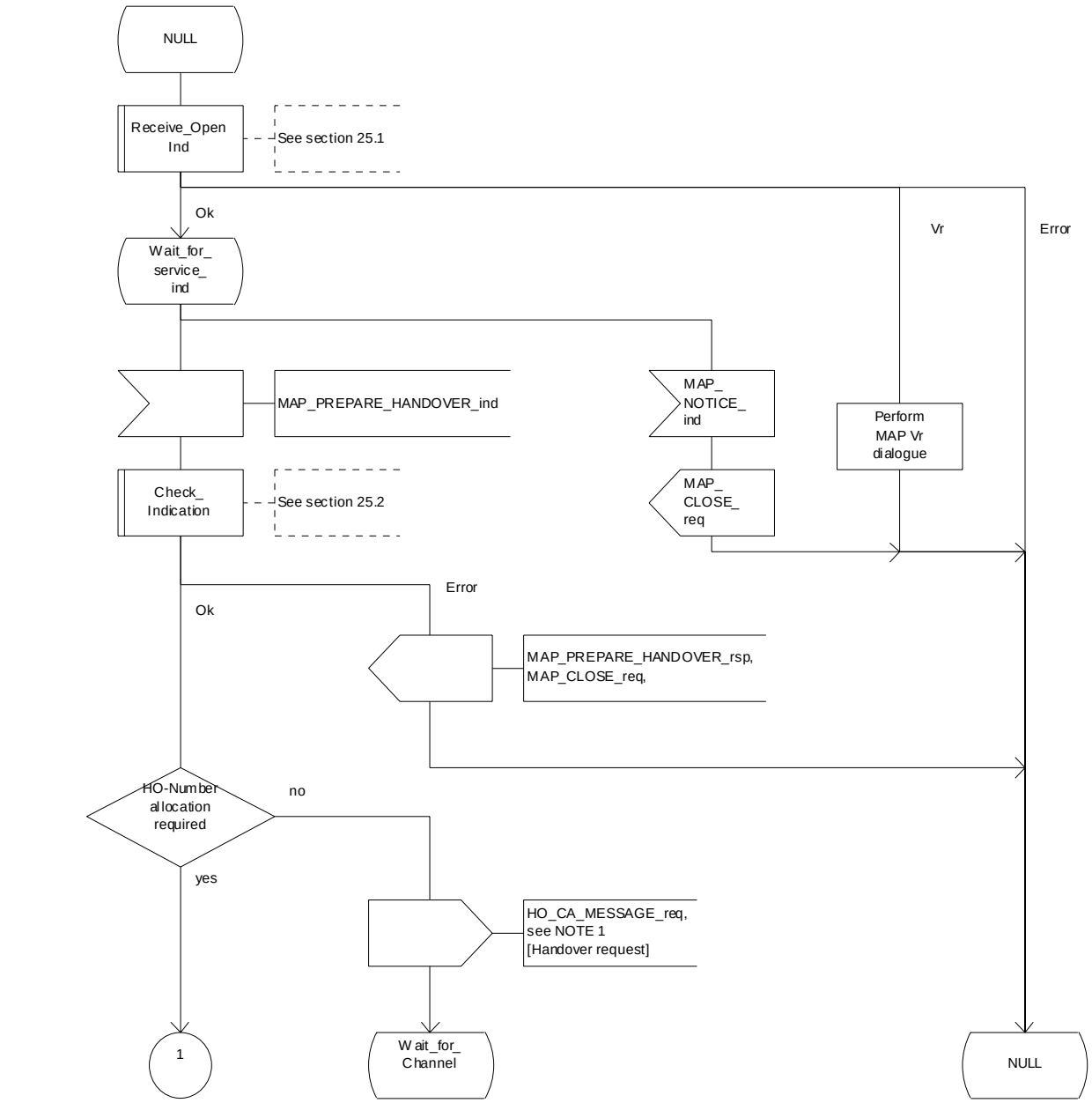


Figure 19.2.3/1 (sheet 1 of 11): Process MSC_B_HO

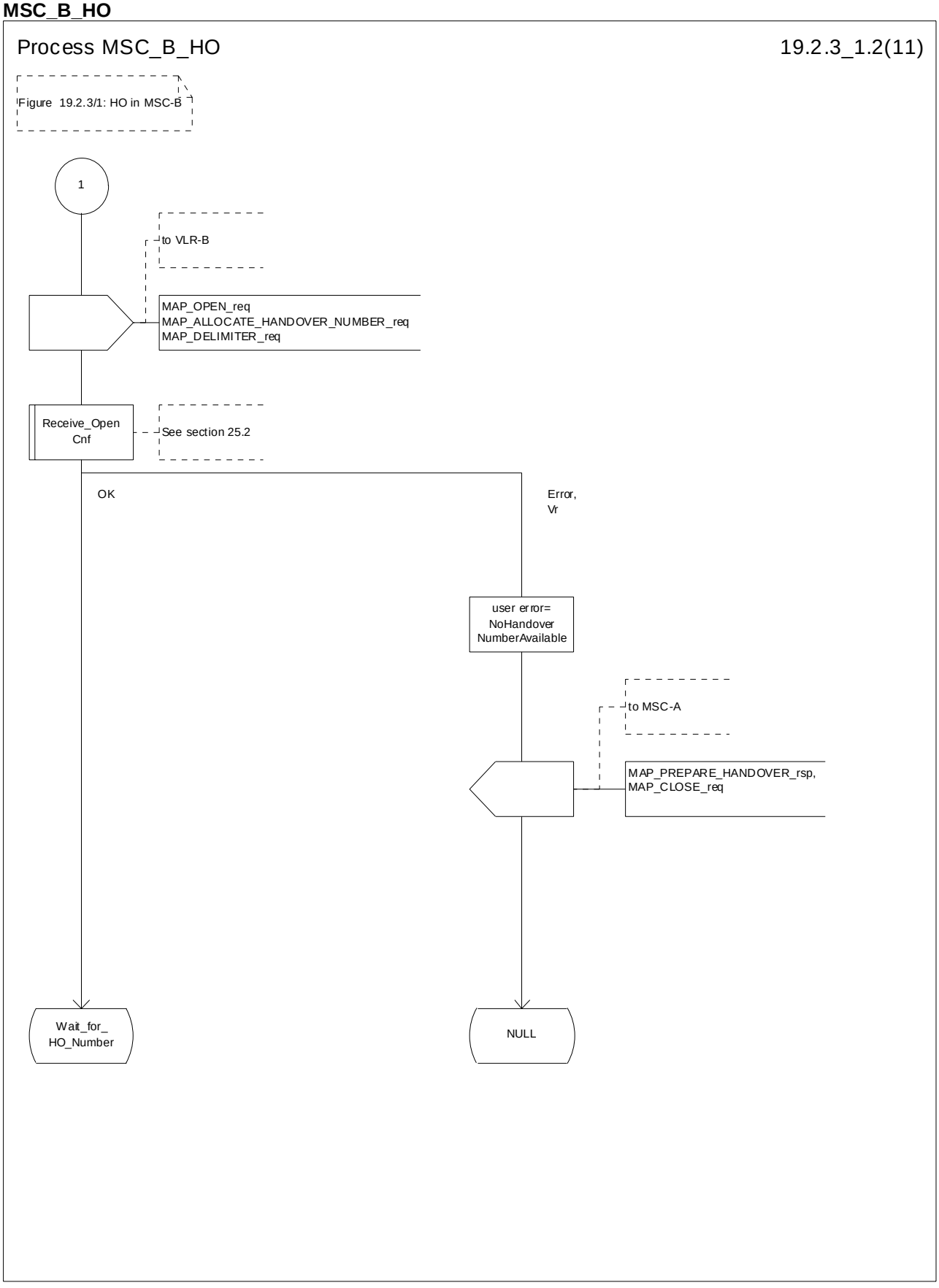


Figure 19.2.3/1 (sheet 2 of 11): Process MSC_B_HO

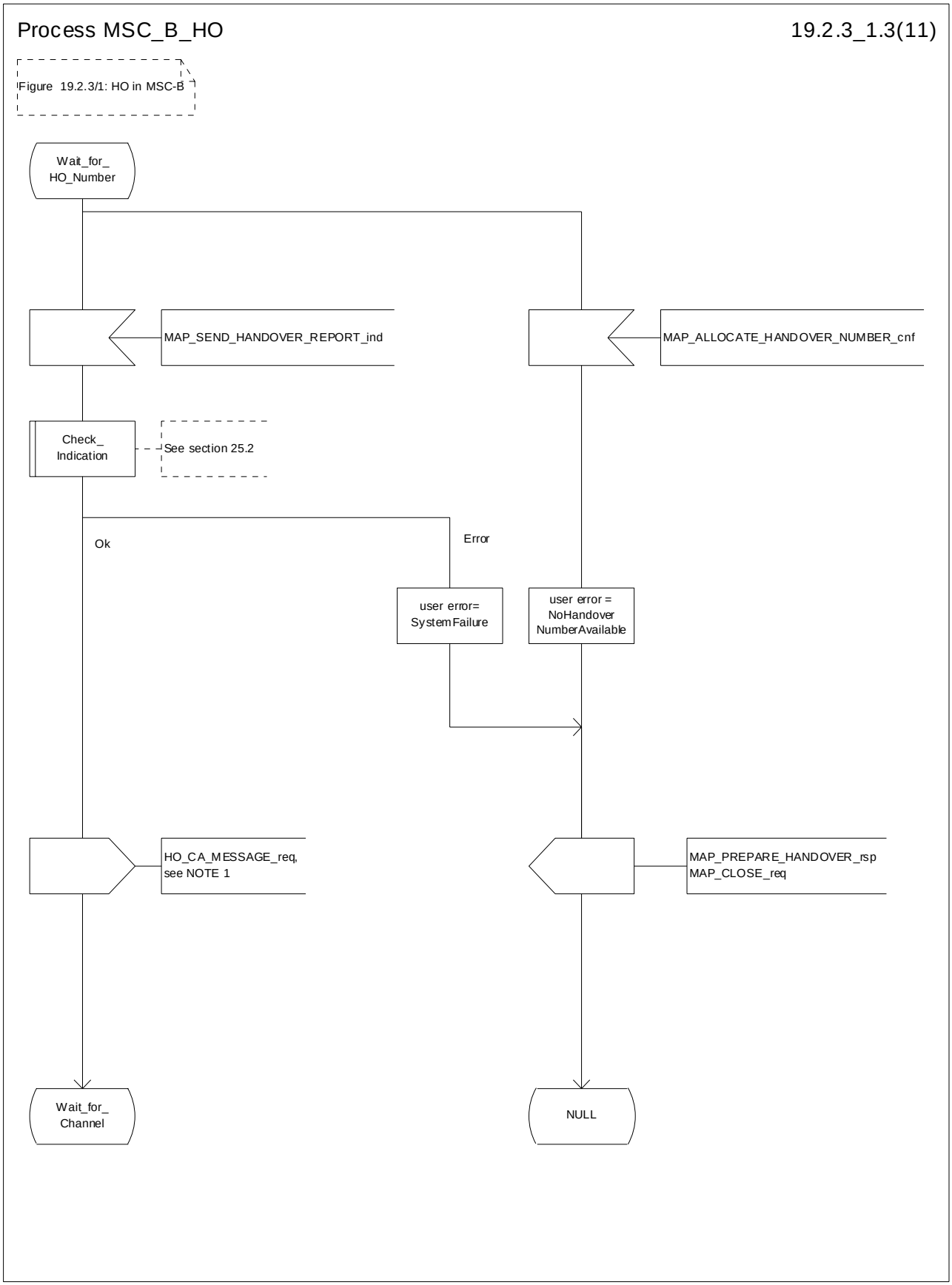


Figure 19.2.3/1 (sheet 3 of 11): Process MSC_B_HO

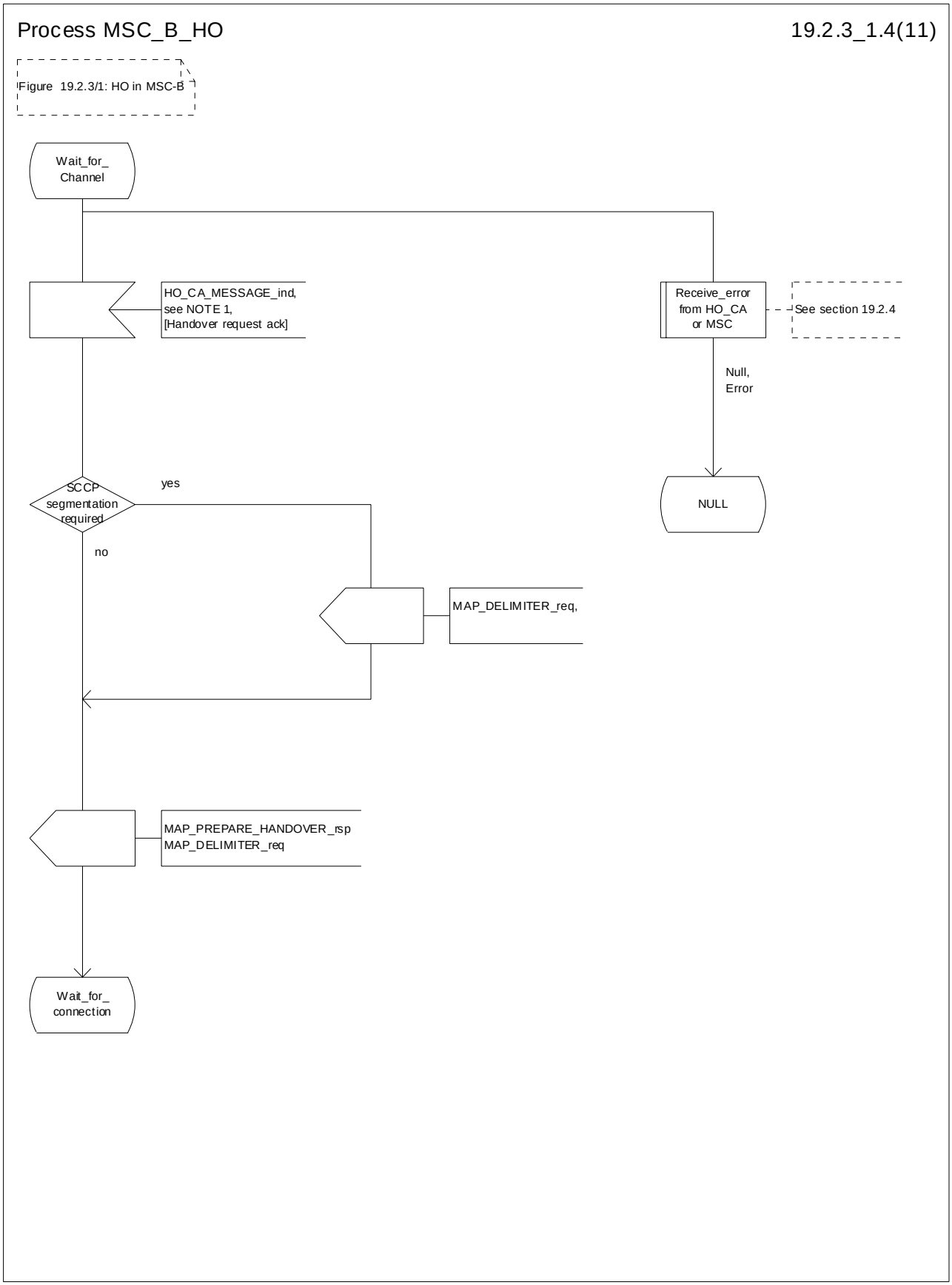


Figure 19.2.3/1 (sheet 4 of 11): Process MSC_B_HO

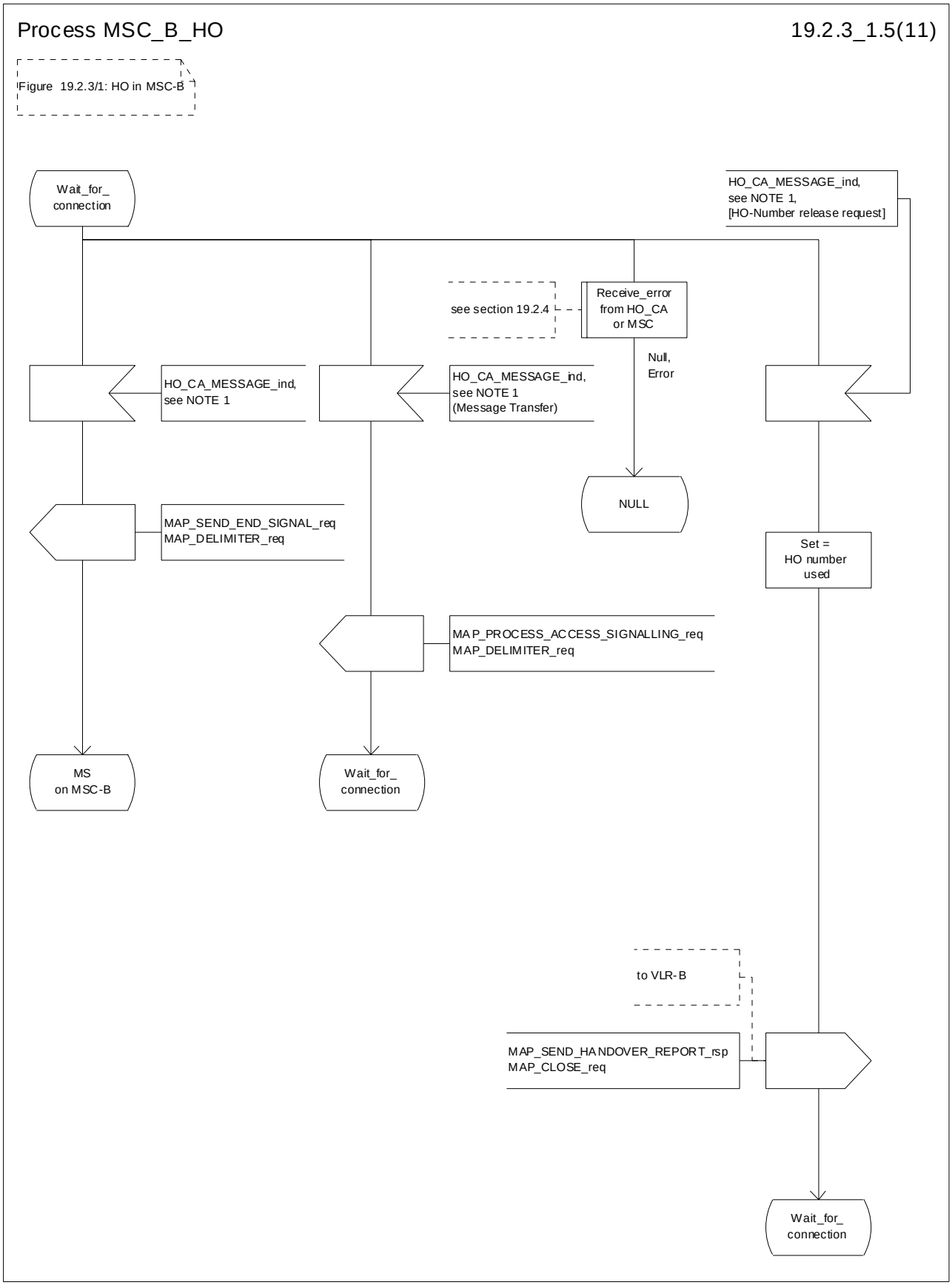


Figure 19.2.3/1 (sheet 5 of 11): Process MSC_B_HO

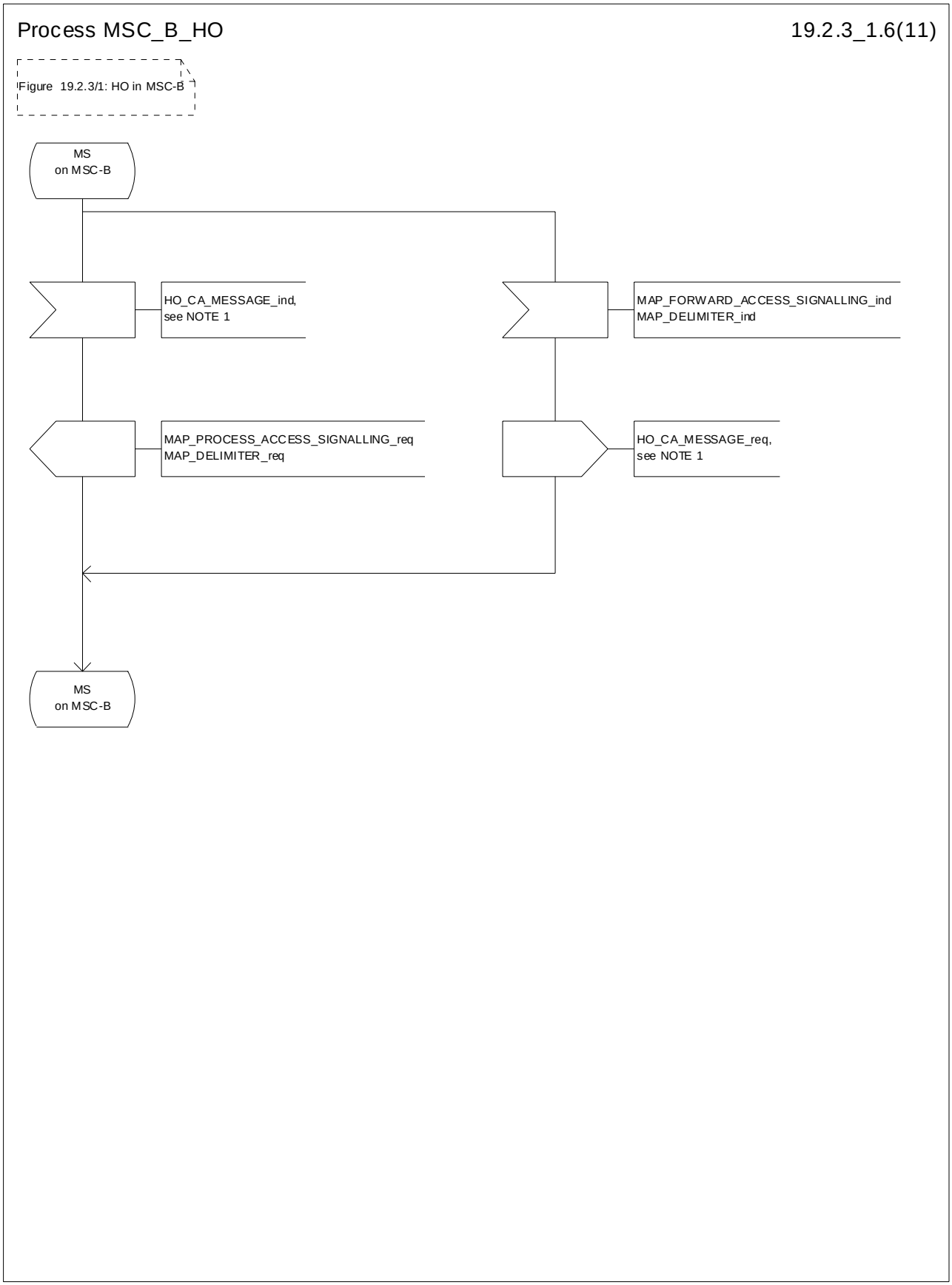


Figure 19.2.3/1 (sheet 6 of 11): Process MSC_B_HO

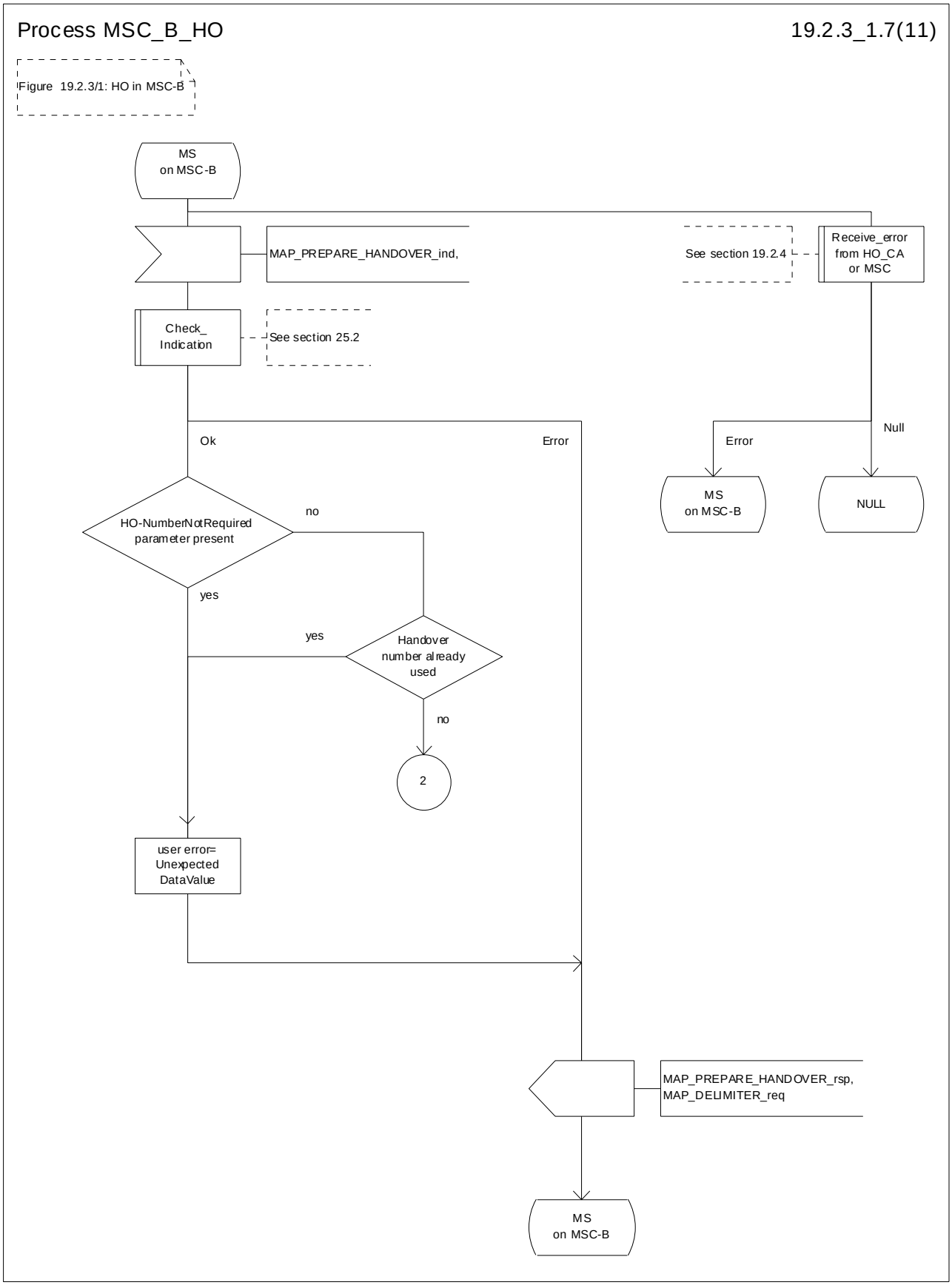


Figure 19.2.3/1 (sheet 7 of 11): Process MSC_B_HO

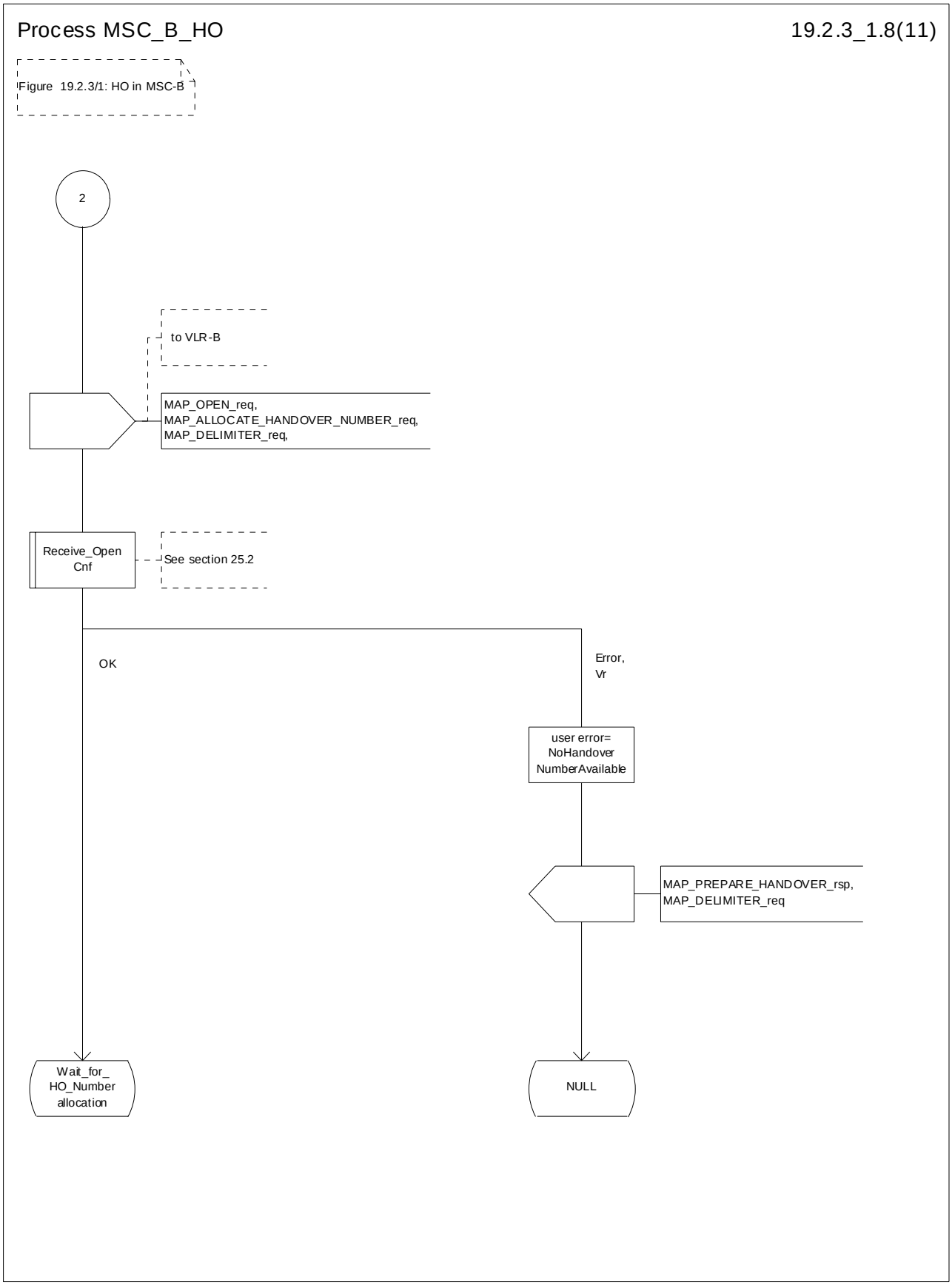


Figure 19.2.3/1 (sheet 8 of 11): Process MSC_B_HO

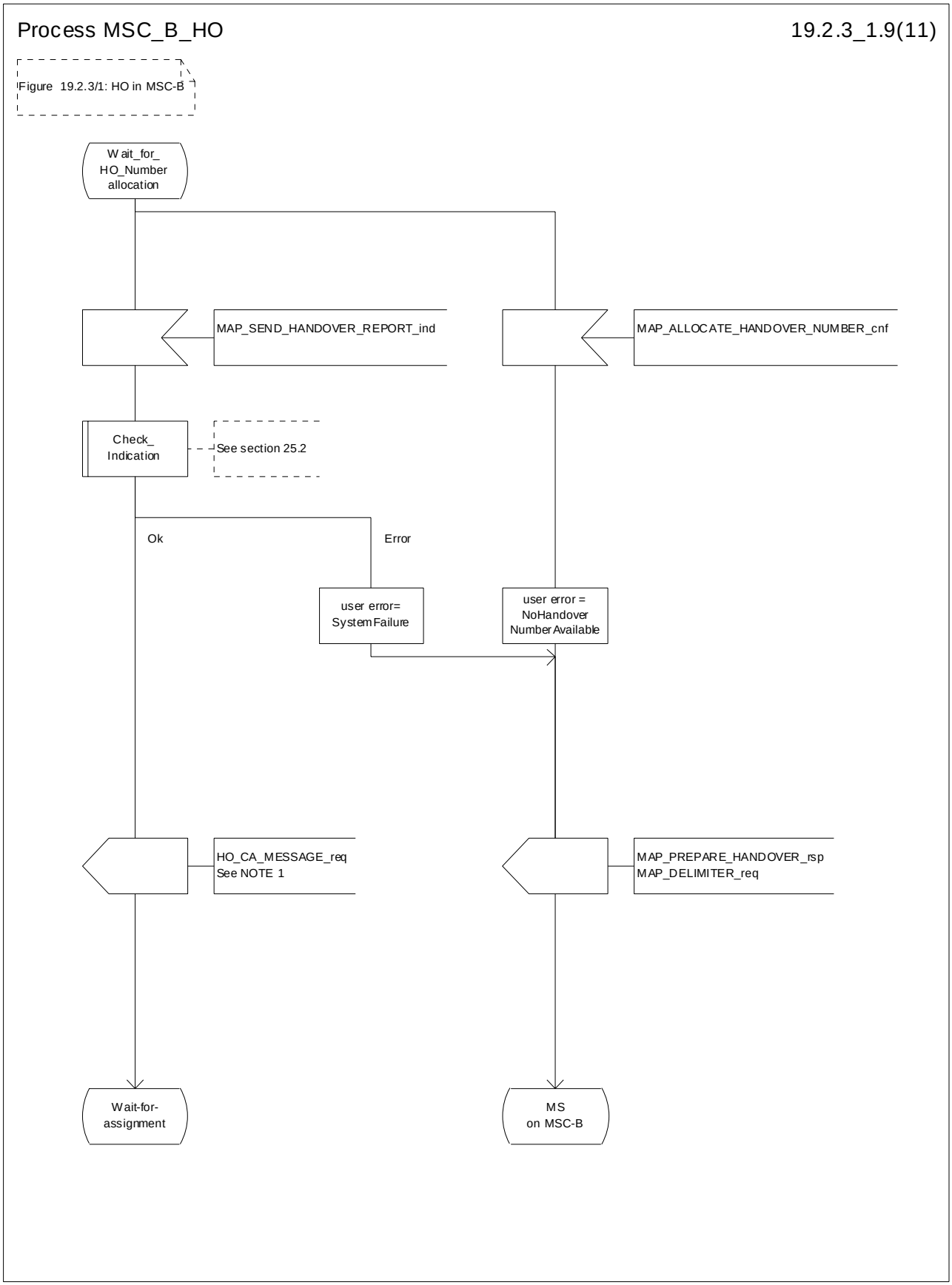


Figure 19.2.3/1 (sheet 9 of 11): Process MSC_B_HO

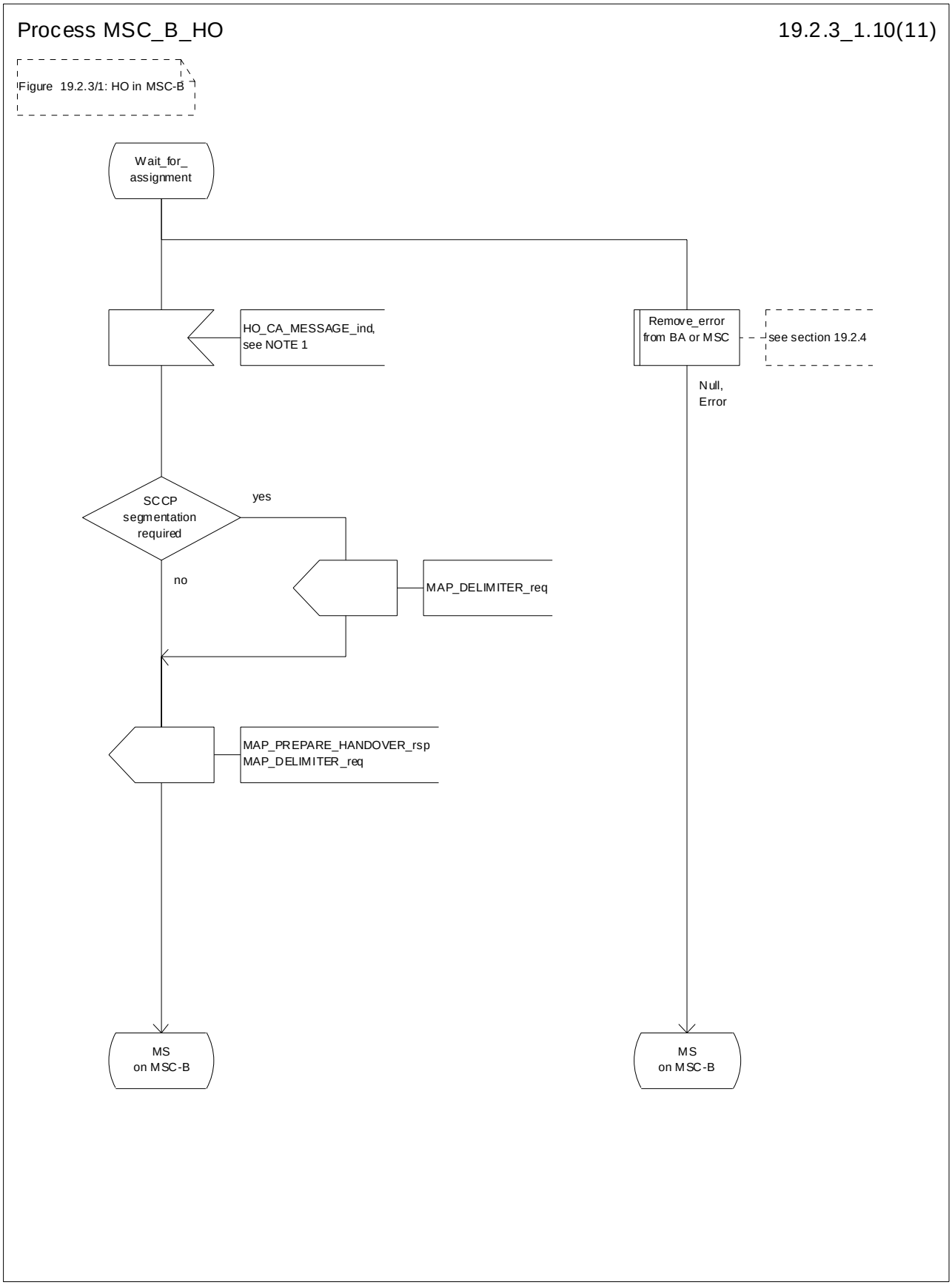


Figure 19.2.3/1 (sheet 10 of 11): Process MSC_B_HO

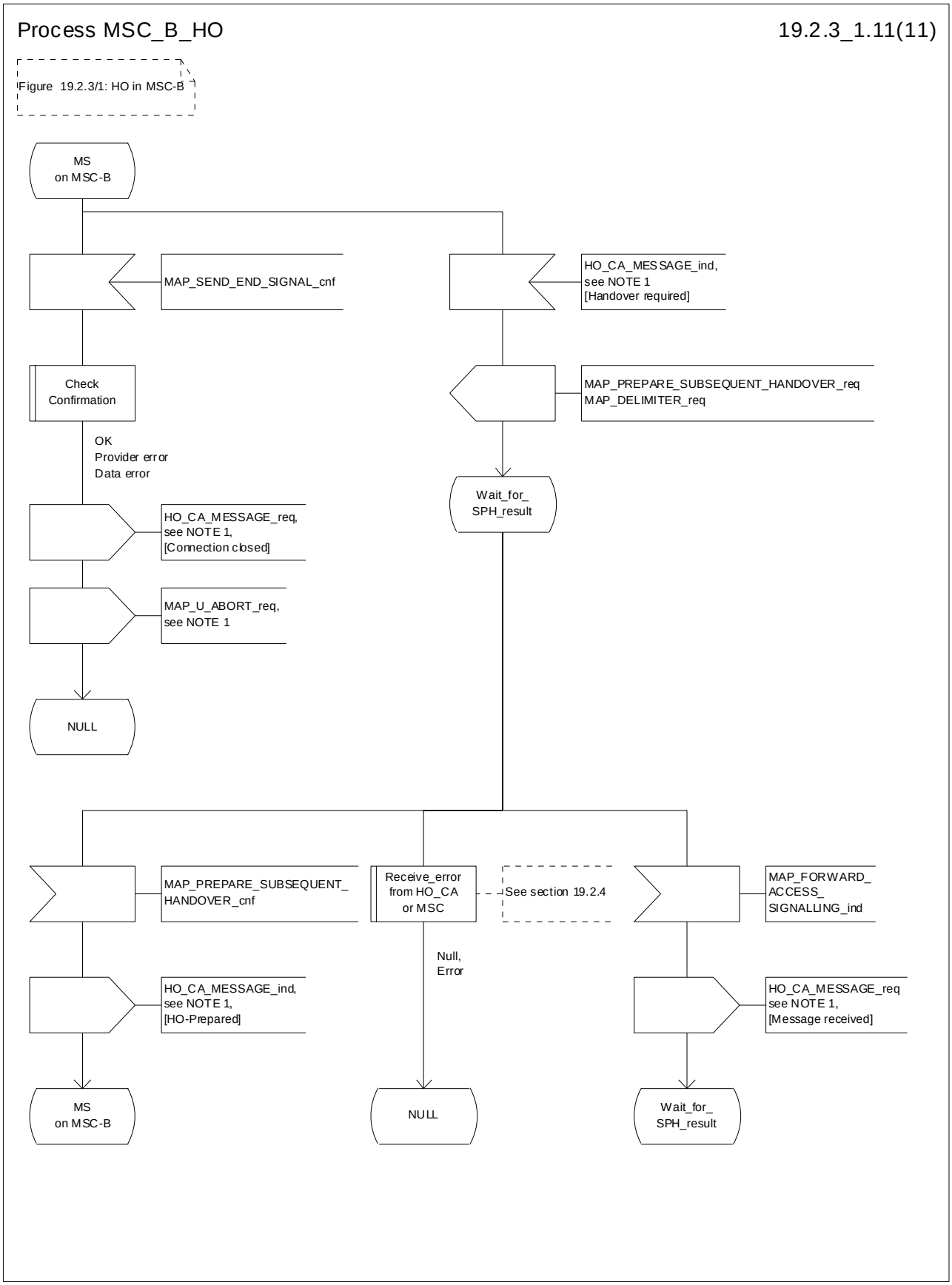


Figure 19.2.3/1 (sheet 11 of 11): Process MSC_B_HO

19.2.4 Handover error handling macro

This macro is used for the handover procedures to receive errors from the MSCs and from the Handover Control Application at any state of a handover process.

If a MAP_NOTICE indication is received, the Handover Control Application is informed and the actual situation is kept and the Handover Control Application decides how the handover process should continue. In all other cases the MSC is returned to a "NULL" state.

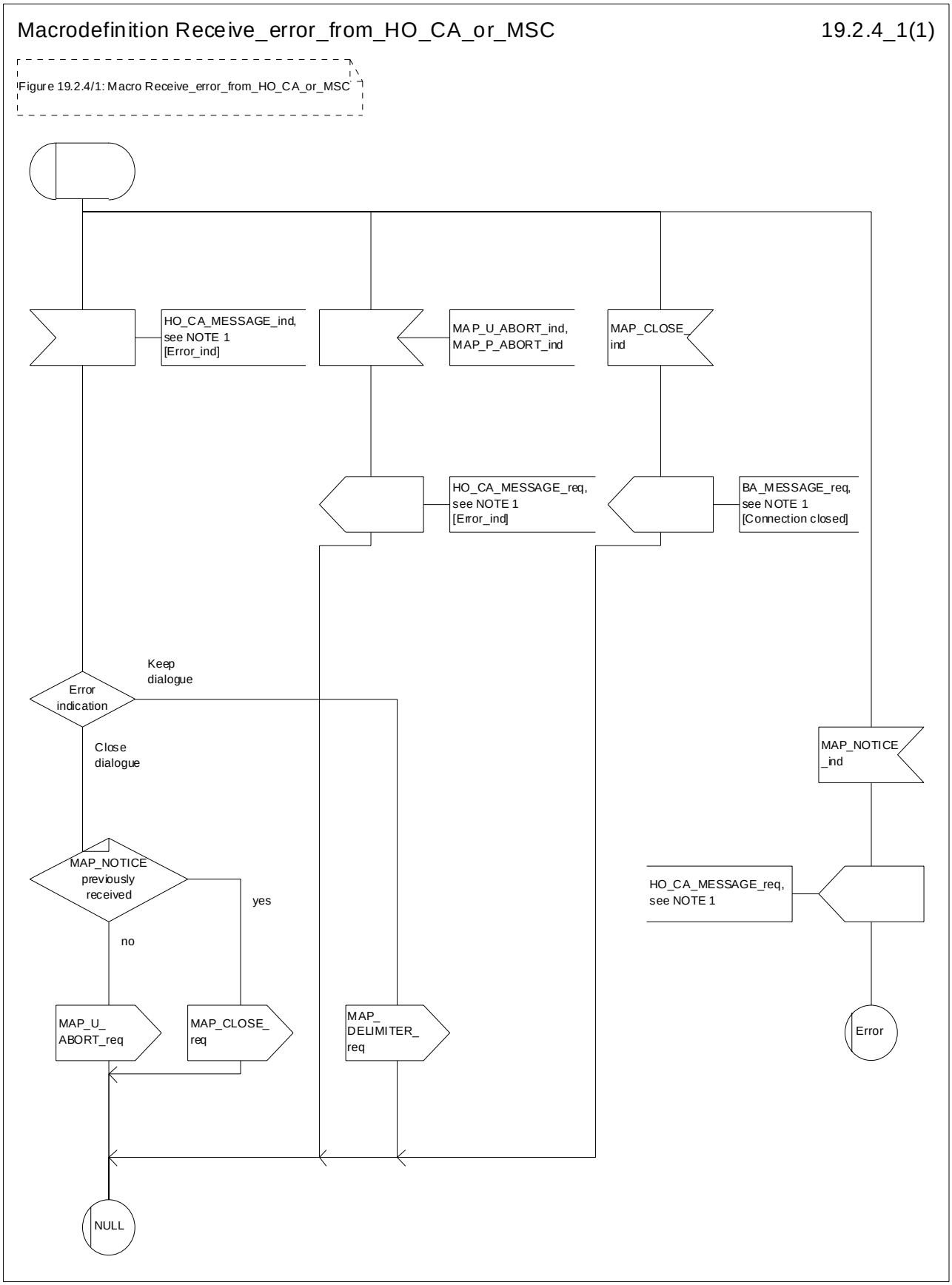


Figure 19.2.4/1: Macro Receive_error_from_HO_CA_or_MSC

19.2.5 Handover procedure in VLR

19.2.5.1 Allocation of handover number

When receiving the MAP_ALLOCATE_HANDOVER_NUMBER indication, the VLR will determine whether a handover number is available. If no handover number is available, this will be indicated by a MAP_ALLOCATE_HANDOVER_NUMBER response with the appropriate error.

The handover number allocated will otherwise be returned to MSC-B in the MAP_SEND_HANDOVER_REPORT request.

The handover number will be reserved until a MAP_SEND_HANDOVER_REPORT confirmation is received from MSC-B.

19.2.5.2 SDL Diagrams

The SDL diagrams on the following pages describe the user processes in VLR for the procedures described in this subclause.

The services used are defined in subclause 8.4.

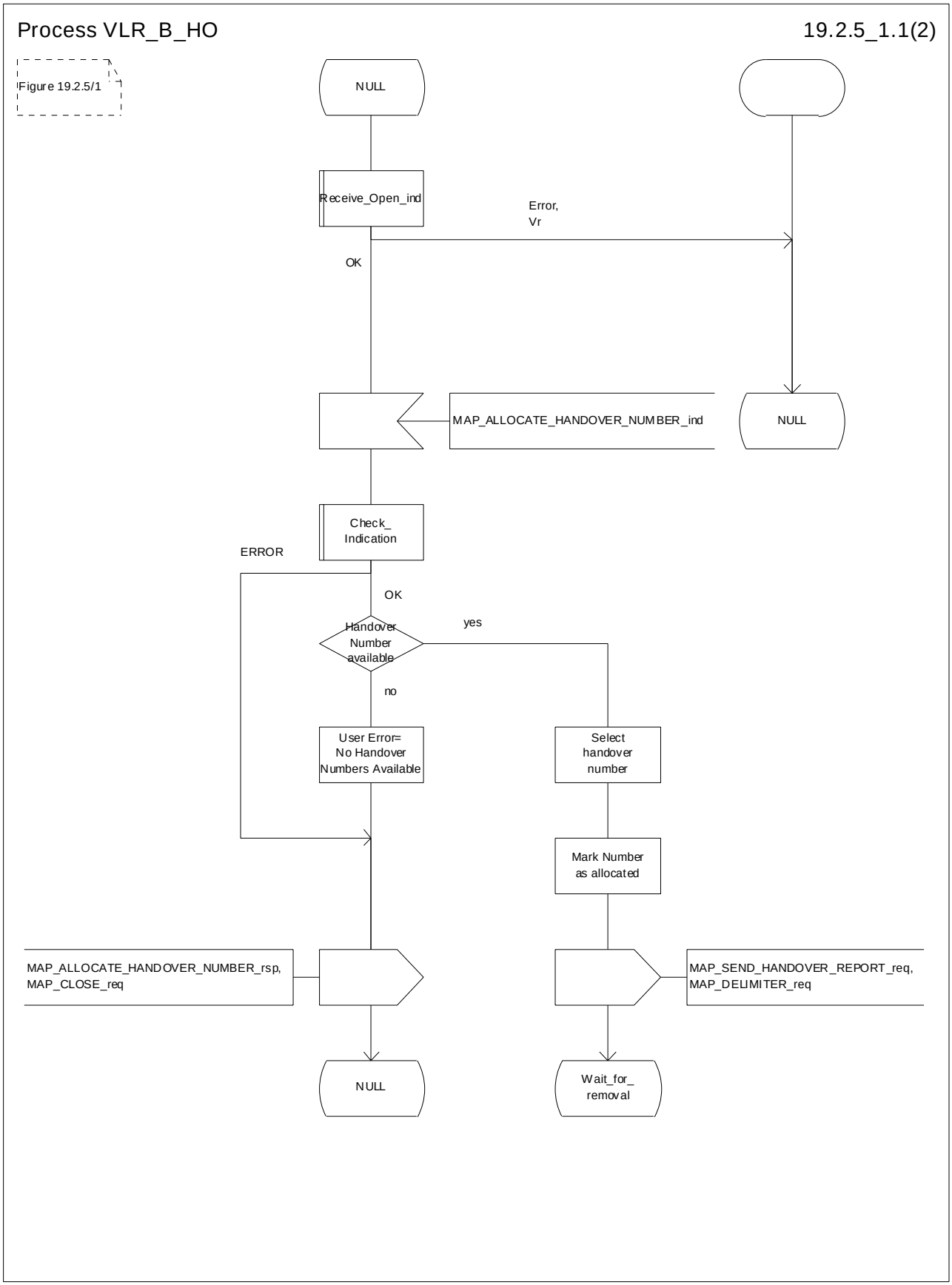


Figure 19.2.5/1 (sheet 1 of 2): Process VLR_B_HO

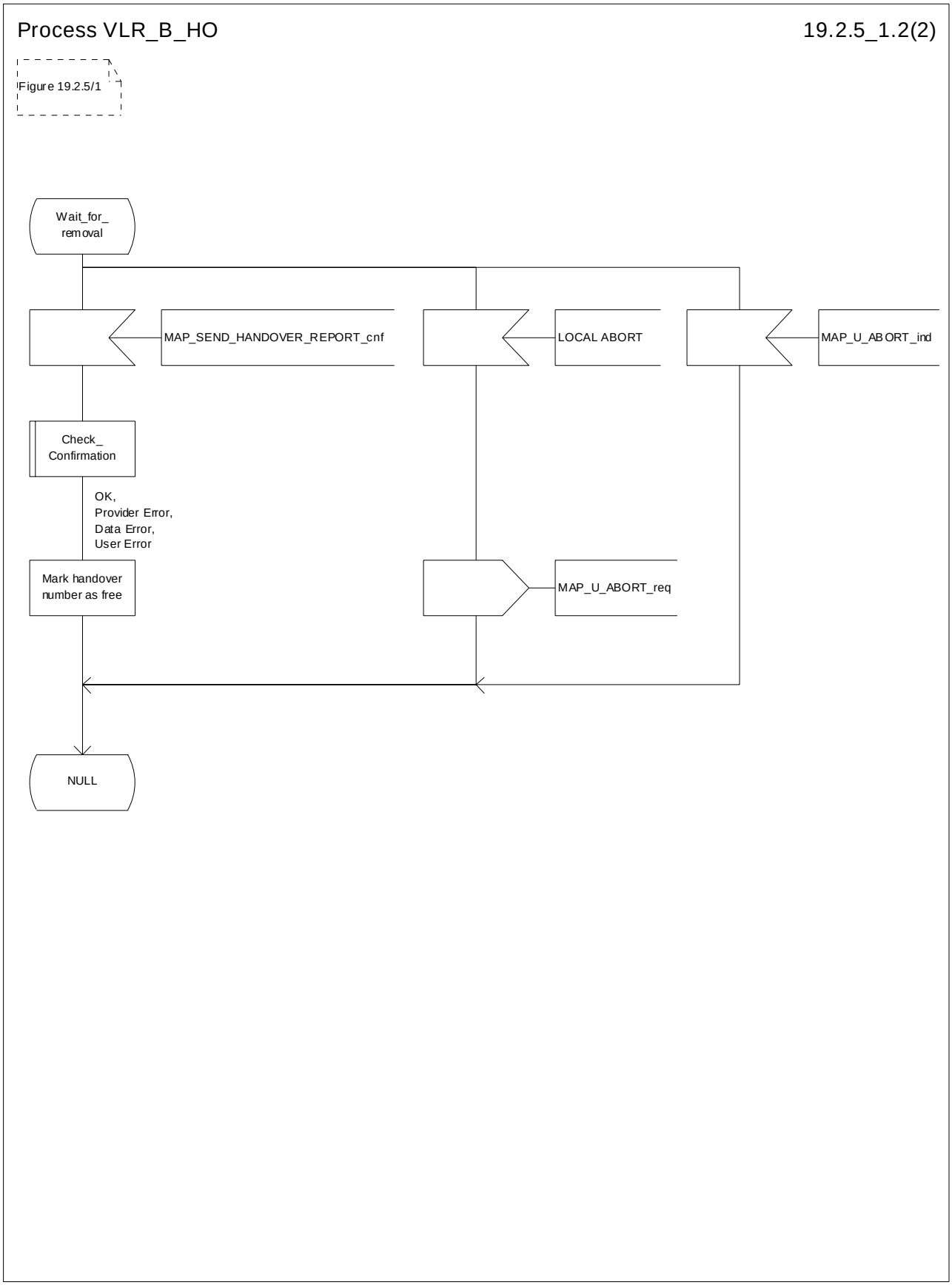


Figure 19.2.5/1 (sheet 2 of 2): Process VLR_B_HO

19.3 Fault recovery procedures

After a fault of a location register, the fault recovery procedures ensure that the subscriber data in the VLR or in the SGSN become consistent with the subscriber data that are stored in the HLR for the MS concerned and that the location information in HLR , VLR and SGSN reflect accurately the current location of the MS.

The detailed specification of fault recovery procedures of location registers is given in GSM 03.07.

19.3.1 VLR fault recovery procedures

The following processes are involved with the restoration of one IMSI record in the VLR:

- In case of a location registration request from the MS:

  Update_Location_Area_VLR subclause 19.1.1.3;

  Update_Location_HLR subclause 19.1.1.4.

- In case of a mobile terminated call:

  PRN_VLR subclause 21.2.4;

  RESTORE_DATA_VLR subclause 21.2.4;

  RESTORE_DATA_HLR subclause 19.3.3;

  ICS_VLR subclause 21.3.3.

After a restart, the VLR shall erase all IMSI records affected by the failure and shall cause all affected TMSIs and all affected LMSIs to become invalid. There will be no subscriber data or location information stored for an affected MS until after the VLR has received either a MAP_PROVIDE_ROAMING_NUMBER indication or a MAP_UPDATE_LOCATION_AREA indication for that MS. Restoration of subscriber data in the VLR is triggered individually for each IMSI record by receipt of either of these indications.

Reception of either a MAP_UPDATE_LOCATION_AREA indication or a MAP_PROVIDE_ROAMING_NUMBER indication with an IMSI that is unknown in the VLR causes creation of a skeleton IMSI record that is marked as:

- not confirmed by radio contact by the indicator "Confirmed by Radio Contact" (The function of this indicator is described in GSM 03.07), and

- not confirmed by HLR by the indicator "Confirmed by HLR" (The function of this indicator is described in GSM 03.07).

A third indicator "Location Information Confirmed in HLR" is allocated to each IMSI record in the VLR (The function of this indicator is described in GSM 03.07).

The indicator "Location Information Confirmed in HLR" shall be checked whenever authenticated radio contact with an MS has been established. The status "Not Confirmed" of this indicator shall force the VLR to invoke the MAP_UPDATE_LOCATION service but it shall never cause rejection of a mobile originated request. The status is changed from "Not Confirmed" to "Confirmed" only after successful completion of a MAP_UPDATE_LOCATION procedure for the MS concerned.

If the VLR serves only one MSC, the indicator "Location Information Confirmed in HLR" is only relevant to the HLR restoration procedure and an initial value must be assigned when an IMSI record is created in the VLR:

- if the IMSI record was created due to a roaming number request, the initial value must be set to "Confirmed";

- if reception of a MAP_UPDATE_LOCATION_AREA indication causes creation of the IMSI record, the initial value must be "Not Confirmed".

If the VLR serves more than one MSC, the indicator "Location Information Confirmed in HLR" is used in the VLR restoration procedure as well as in the HLR restoration procedure. When an IMSI record is created in the VLR, the indicator must be set to "Not Confirmed".

VLR restoration triggered by a location registration request

Upon receipt of a MAP_UPDATE_LOCATION_AREA indication, the VLR retrieves authentication data from the HLR by using the MAP_SEND_AUTHENTICATION_INFO service if authentication is required and if no authentication data are available in the VLR for the IMSI concerned (see figure 19.1.1/6).

Receipt of a MAP_UPDATE_LOCATION_AREA indication for an MS whose IMSI is unknown in the VLR or whose data stored in the VLR are marked as "Not Confirmed" by the indicator "Confirmed by HLR" and/or by the indicator "Location Information Confirmed in HLR" forces the VLR to invoke the MAP_UPDATE_LOCATION service after successful authentication, if required. The location updating procedure is performed as described in subclause 19.1.

Any other mobile originated request from an MS whose IMSI is unknown in the VLR or whose subscriber data stored in the VLR are marked as "Not Confirmed" by the indicator "Confirmed by HLR" shall be rejected with error cause "Unidentified Subscriber". This causes the MS to trigger the location registration procedure.

After successful completion of the MAP_UPDATE_LOCATION procedure, the indicators "Confirmed by HLR" and "Location Information Confirmed in HLR" are set to "Confirmed".

The indicator "Confirmed by Radio Contact" is set to "Confirmed" when the radio contact with the MS is authenticated.

VLR restoration triggered by a roaming number request

Figure 19.3/1 illustrates the signalling sequence for restoration of an IMSI record in the VLR triggered by a mobile terminating call set-up.

Upon receipt of a MAP_PROVIDE_ROAMING_NUMBER indication for an IMSI that is unknown in the VLR and for which authentication is required, the VLR retrieves authentication data from the HLR by using the MAP_SEND_AUTHENTICATION_INFO service after an MSRN has been sent to the HLR in the MAP_PROVIDE_ROAMING_NUMBER response.

Receipt of a MAP_PROVIDE_ROAMING_NUMBER indication for an MS whose IMSI is unknown in the VLR or whose data record in the VLR is marked as "Not Confirmed" by the indicator "Confirmed by HLR" forces the VLR to request subscriber data from the HLR by sending a MAP_RESTORE_DATA request which triggers one or more INSERT_SUBSCRIBER_DATA operations from the HLR. The MAP_RESTORE_DATA request may also be used to send the LMSI to the HLR.

The MAP_RESTORE_DATA process in the VLR is described in subclause 21.2.4.

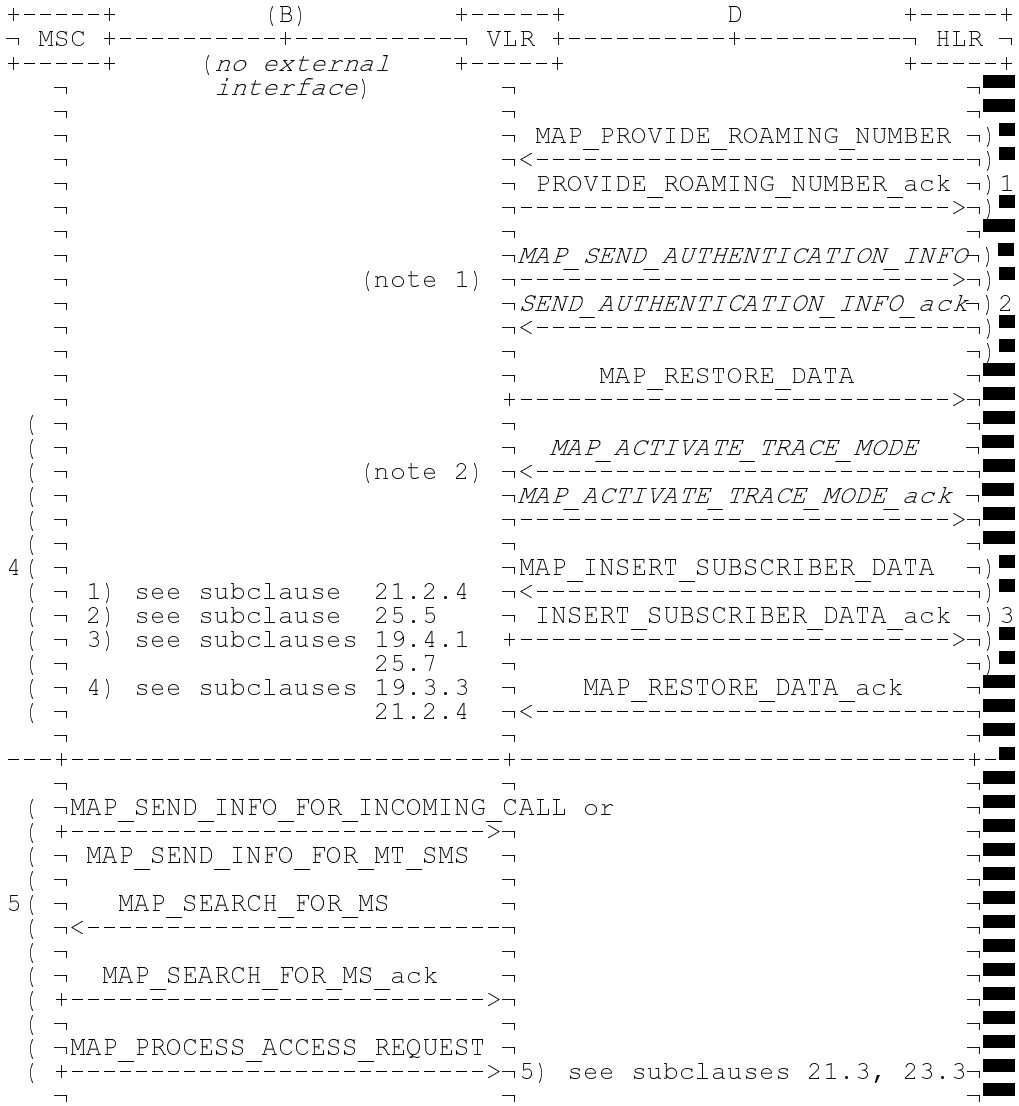
The MAP_RESTORE_DATA process in the HLR is described in subclause 19.3.3.

After successful completion of the MAP_RESTORE_DATA procedure, the indicator "Confirmed by HLR" is set to "Confirmed".

If restoration of an IMSI record was triggered by a MAP_PROVIDE_ROAMING_NUMBER indication (i.e. by a mobile terminating call), the VLR has no valid Location Area Identity information for the MS concerned before successful establishment of the first authenticated radio contact. Upon receipt of a MAP_SEND_INFO_FOR_INCOMING_CALL indication from the MSC (see 5 in figure 19.3/1) for an MS whose subscriber data are marked as "Confirmed" by the indicator "Confirmed by HLR" but not confirmed by radio contact, the VLR shall invoke a "MAP_SEARCH_FOR_MS" instead of a "MAP_PAGE".

A MAP_SEARCH_FOR_MS shall also be performed if the VLR receives a MAP_SEND_INFO_FOR_MT_SMS indication from the MSC for an MS whose IMSI record is marked as "Confirmed" by the indicator "Confirmed by HLR" but not confirmed by radio contact.

The indicator "Confirmed by Radio Contact" is set to "Confirmed" when authenticated radio contact caused by a mobile originated or a mobile terminated activity is established.



NOTE 1: If authentication required.

NOTE 2: If subscriber tracing active in HLR.

Figure 19.3/1: Procedures related to restoration of VLR in case of mobile terminated call set-up

19.3.2 HLR fault recovery procedures

The following processes are involved with the restart of the HLR:

- HLR_RESTART subclause 19.3.2;
- REC_RESET_IN_VLR subclause 19.3.2;
- REC_RESET_IN_SGSN subclause 19.3.2.

In the case of a location registration request from the MS, the following processes are involved with the HLR restoration procedure:

- Update_Location_Area_VLR subclause 19.1.1.3;
- Update_Location_HLR subclause 19.1.1.4;
- Update_GPRS_Location_HLR subclause 19.1.1.4;

- GPRS_Update_Location_Area_VLR subclause 19.1.1.3;
- SGSN_Update_HLR subclause 19.1.1.8.

In the case of a mobile originated service request, the

- Macro Process_Access_Request_VLR subclause 25.4.2; and the
- Process Update_Location_HLR subclause 19.1.1.4,

are involved with the HLR restoration procedure.

For the HLR, periodic back-up of data to non-volatile memory is mandatory.

Data that have been changed in the period of time after the last back-up storage and before the restart of the HLR cannot be recovered by reload from the non-volatile memory. Therefore, a restoration procedure is triggered individually for each IMSI record that has been affected by the HLR fault at the first authenticated radio contact that is established with the MS concerned.

The HLR restoration procedure forces updating of MSC number, VLR number, SGSN number and, if provided by the VLR, LMSI in the HLR. Consistency of subscriber data that are stored in the VLR or in the SGSN for an MS that has been affected by a HLR fault with the subscriber data stored in the HLR for this MS will be achieved.

As an implementation option, a notification can be forwarded to the MS to alert the subscriber to check the parameters for supplementary services that allow subscriber controlled input (MAP_FORWARD_CHECK_SS_INDICATION service). If the VLR receives this notification from the HLR it shall forward the notification to the MS. If the Gs-interface is present the VLR shall not forward this notification.

Figures 19.3/2 and 19.3/9 illustrates the signalling sequence for HLR restoration.

After a restart, the home location register performs the following actions for the subscriber data records that have been affected by the HLR fault (see figure 19.3/3):

- reload all data from the non-volatile back-up;
- if the MAP_FORWARD_CHECK_SS_INDICATION service is implemented, mark each subscriber record "SS Check Required" by setting the "Check SS" indicator;
- set subscriber tracing deactive in the VLR for each of its Mss;
- reset the "MS Purged" flag for each of its MSs;
- send a MAP_RESET request to the VLRs where its MSs are located (see figure 19.3/4).
- send a MAP_RESET request to the SGSNs where its MSs are located (see figure 19.3/7).

The MAP_RESET request contains the HLR number and optionally the HLR Identity List.

When receiving a MAP_RESET indication, the VLR or the SGSN will derive all involved MSs of that HLR either from the HLR Identity List (if present), or from the HLR number. The VLR or the SGSN will then mark these MSs with the indicator "Location Information Confirmed in HLR" set to "Not Confirmed" and will deactivate all subscriber tracings for these Mss (see figures 19.3/5 and 19.3/8).

The status "Not Confirmed" of the indicator "Location Information Confirmed in HLR" forces the VLR to invoke the MAP_UPDATE_LOCATION service after establishment of authenticated radio contact with the MS concerned.

Also the status "Not Confirmed" of the indicator "Location Information Confirmed in HLR" forces the SGSN to invoke the MAP_UPDATE_GPRS_LOCATION service after establishment of authenticated radio contact with the MS concerned.

The MAP_UPDATE_LOCATION procedure is performed as described in subclause 19.1.

After receipt of the MAP_UPDATE_LOCATION or the MAP_UPDATE_GPRS_LOCATION acknowledge containing the HLR number, the status of the indicator "Location Information Confirmed in HLR" is changed to "Confirmed".

If the MAP_UPDATE_LOCATION procedure is unsuccessful for any reason, the status of the indicator "Location Information Confirmed in HLR" remains unchanged except for the case that the IMSI record in the VLR is deleted because either of the errors "Unknown Subscriber" or "Roaming Not Allowed" has been received from the HLR in response to a MAP_UPDATE_LOCATION request.

If the MAP_UPDATE_GPRS_LOCATION procedure is unsuccessful for any reason, the status of the indicator "Location Information Confirmed in HLR" remains unchanged except for the case that the IMSI record in the SGSN is deleted because either of the errors "Unknown Subscriber" or "Roaming Not Allowed" has been received from the HLR in response to a MAP_UPDATE_GPRS_LOCATION request.

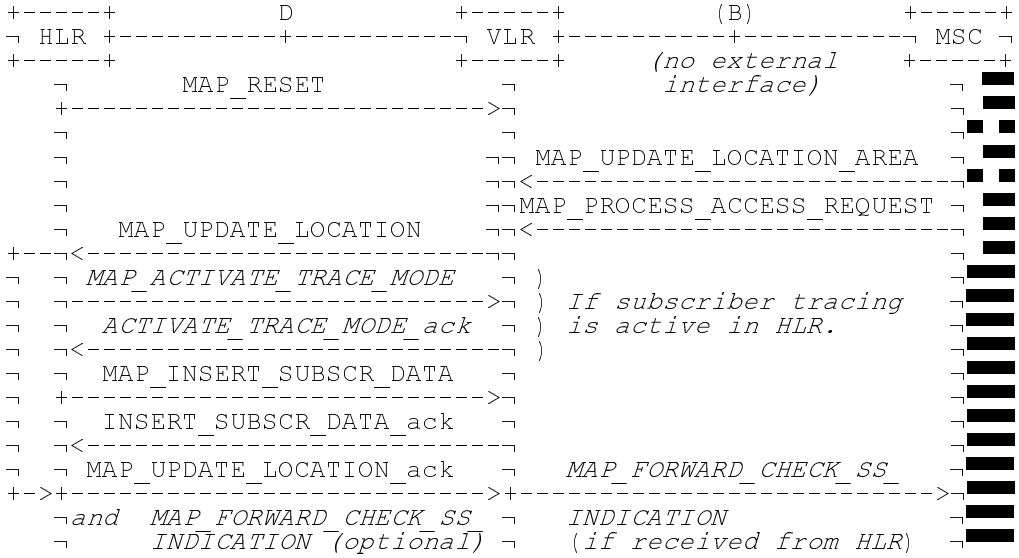


Figure 19.3/2: Procedures related to restoration of HLR

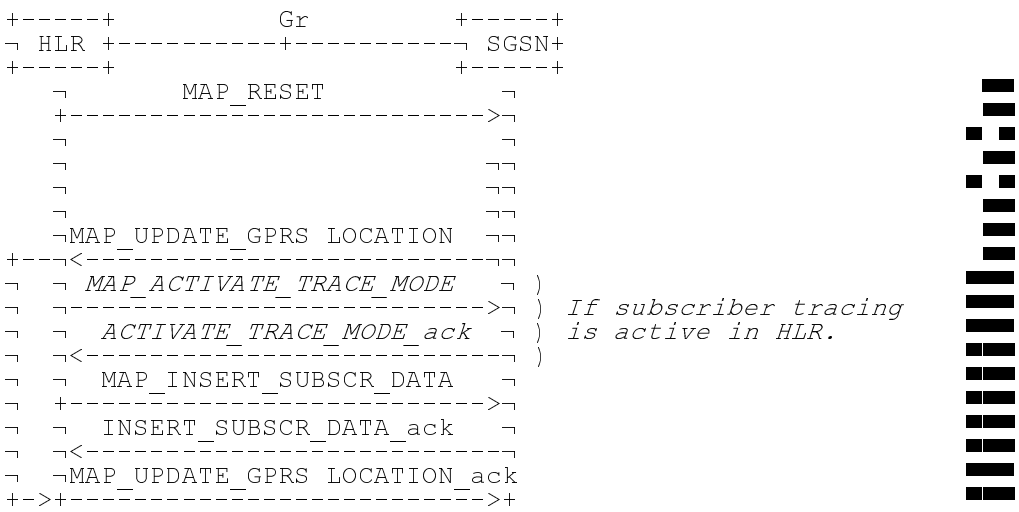


Figure 19.3/9: Procedures related to restoration of HLR for GPRS

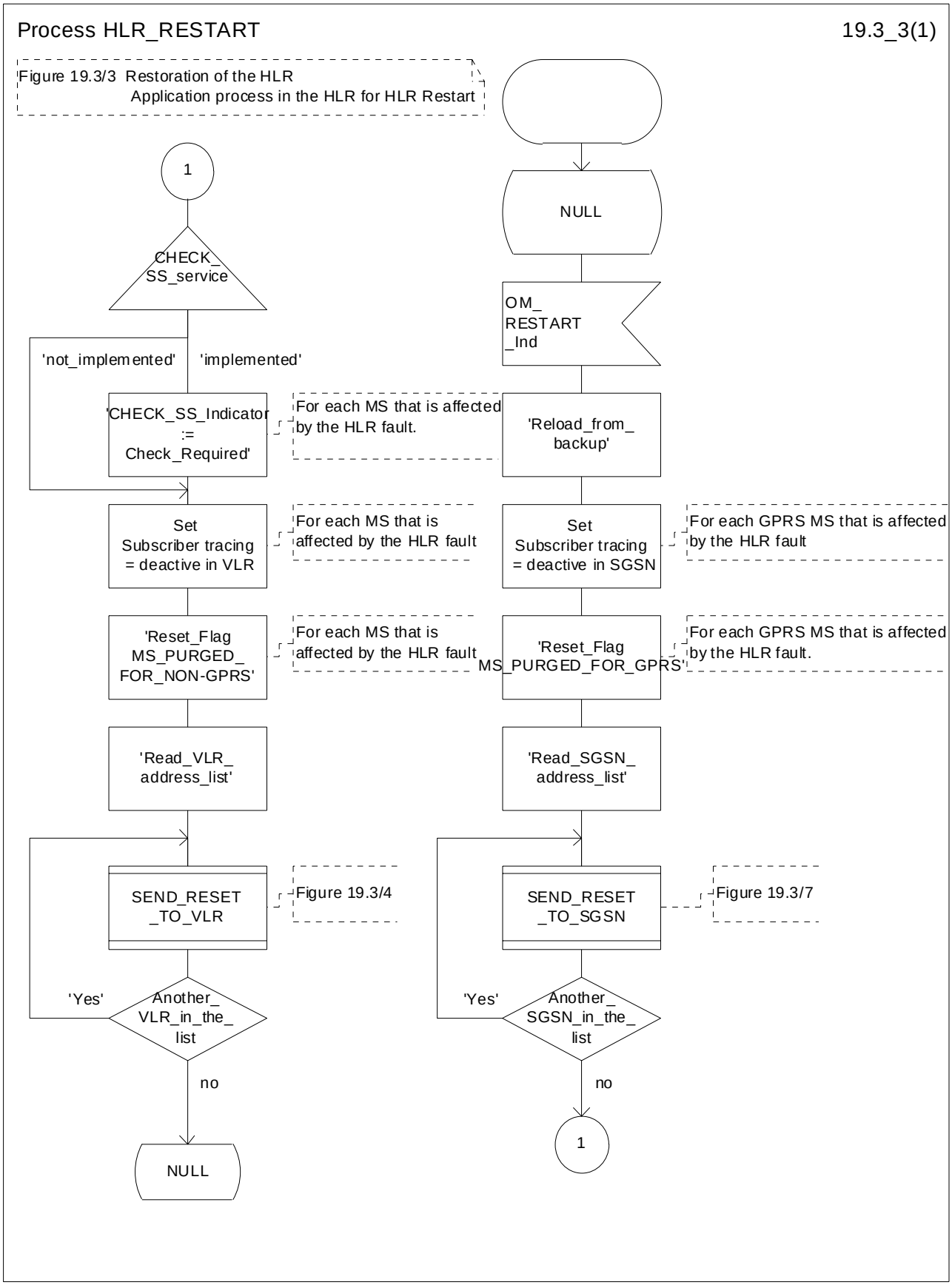


Figure 19.3/3: Process HLR_RESTART

Process SEND_RESET_TO_VLR 19.3_4(1)

Figure 19.3/4 Restoration of the HLR
Process for sending the RESET message
from HLR to VLR

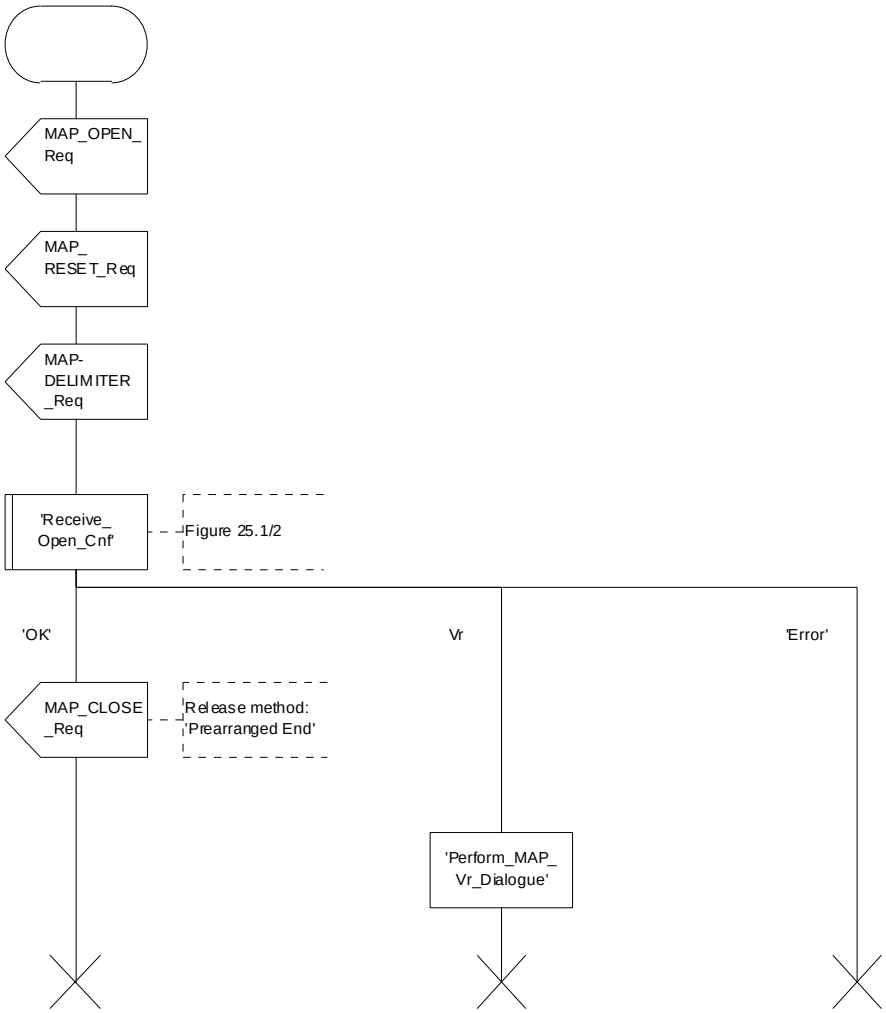


Figure 19.3/4: Process SEND_RESET_TO_VLR

Process REC_RESET_IN_VLR 19.3_5(1)

Figure 19.3/5 Restoration of the HLR - Application process in the VLR for reception of the RESET message from HLR

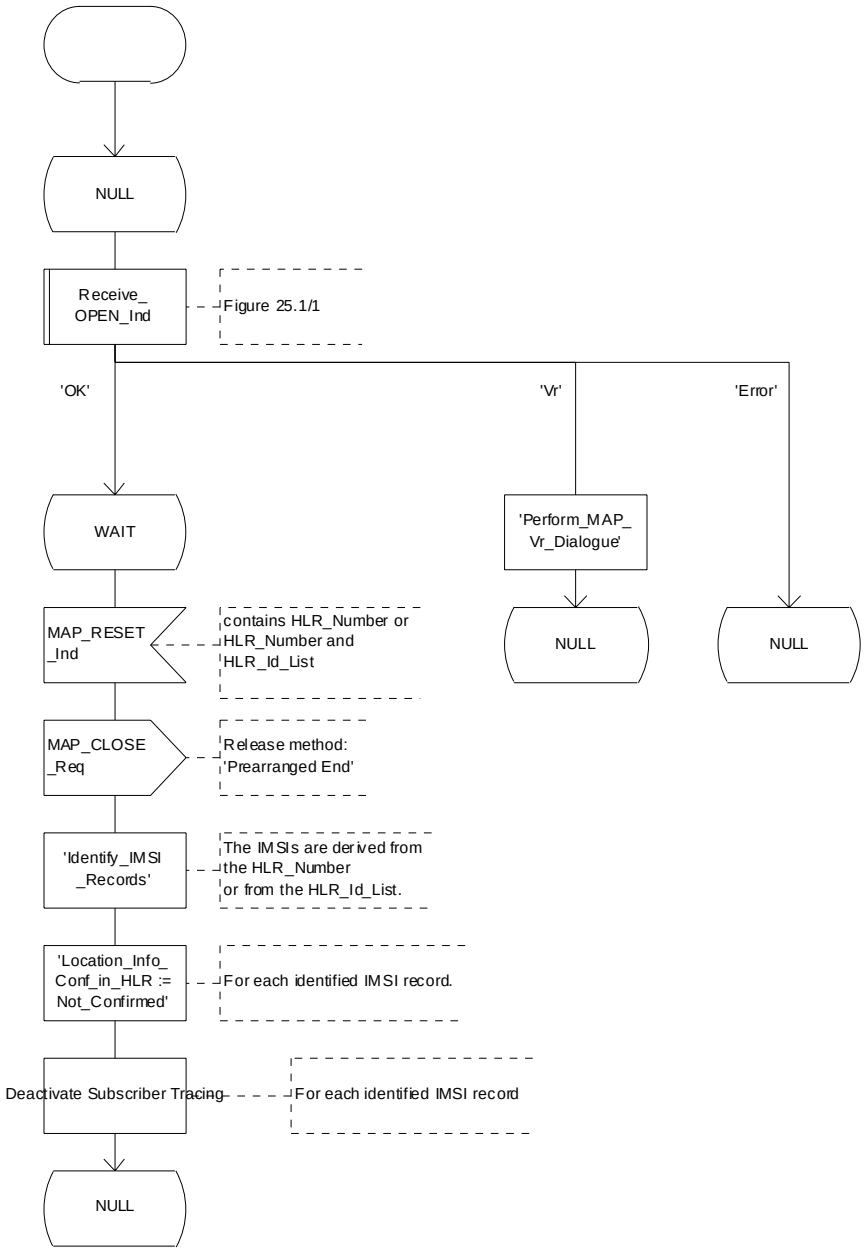


Figure 19.3/5: Process REC_RESET_IN_VLR

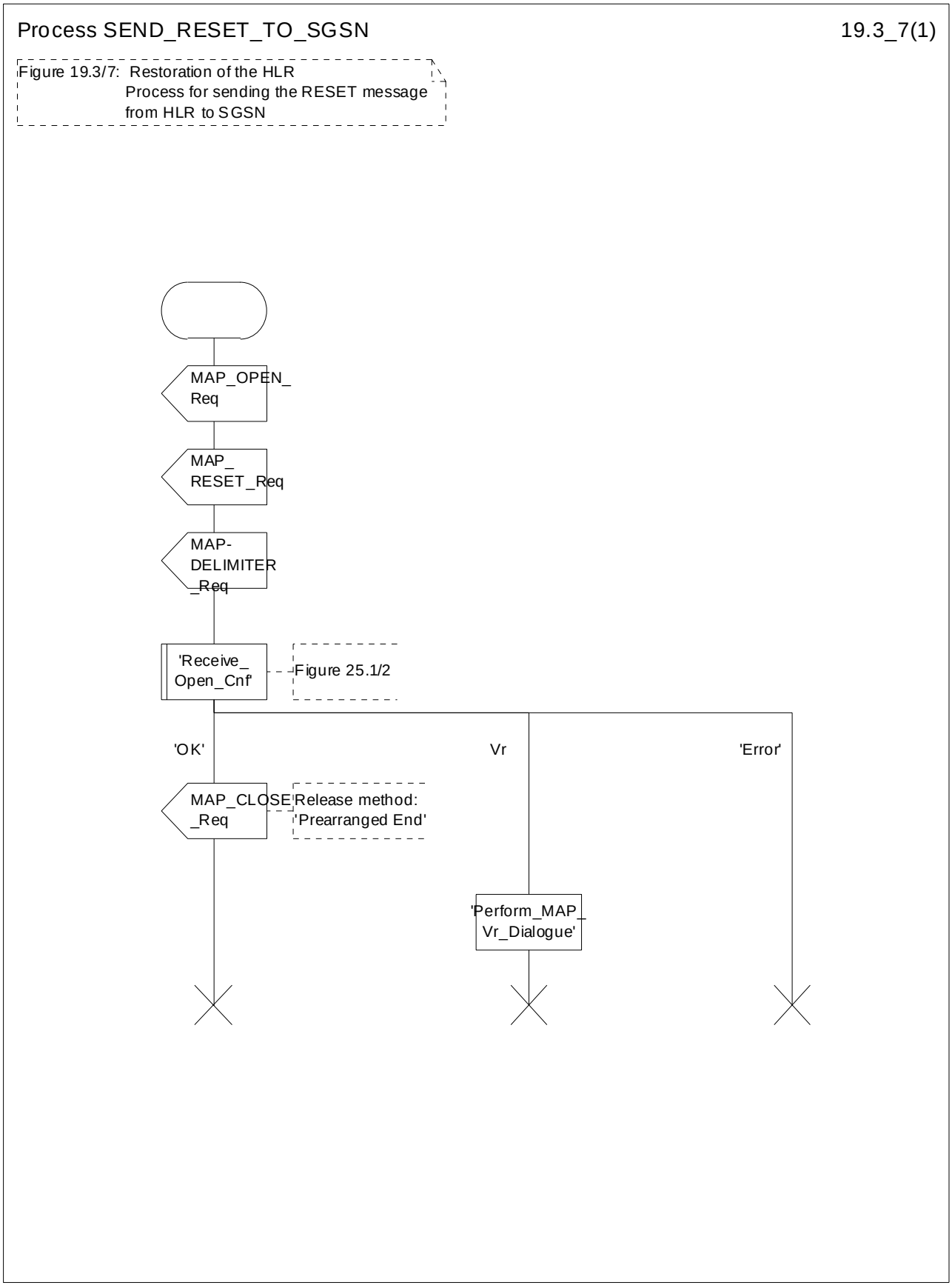


Figure 19.3/7: Process SEND_RESET_TO_SGSN

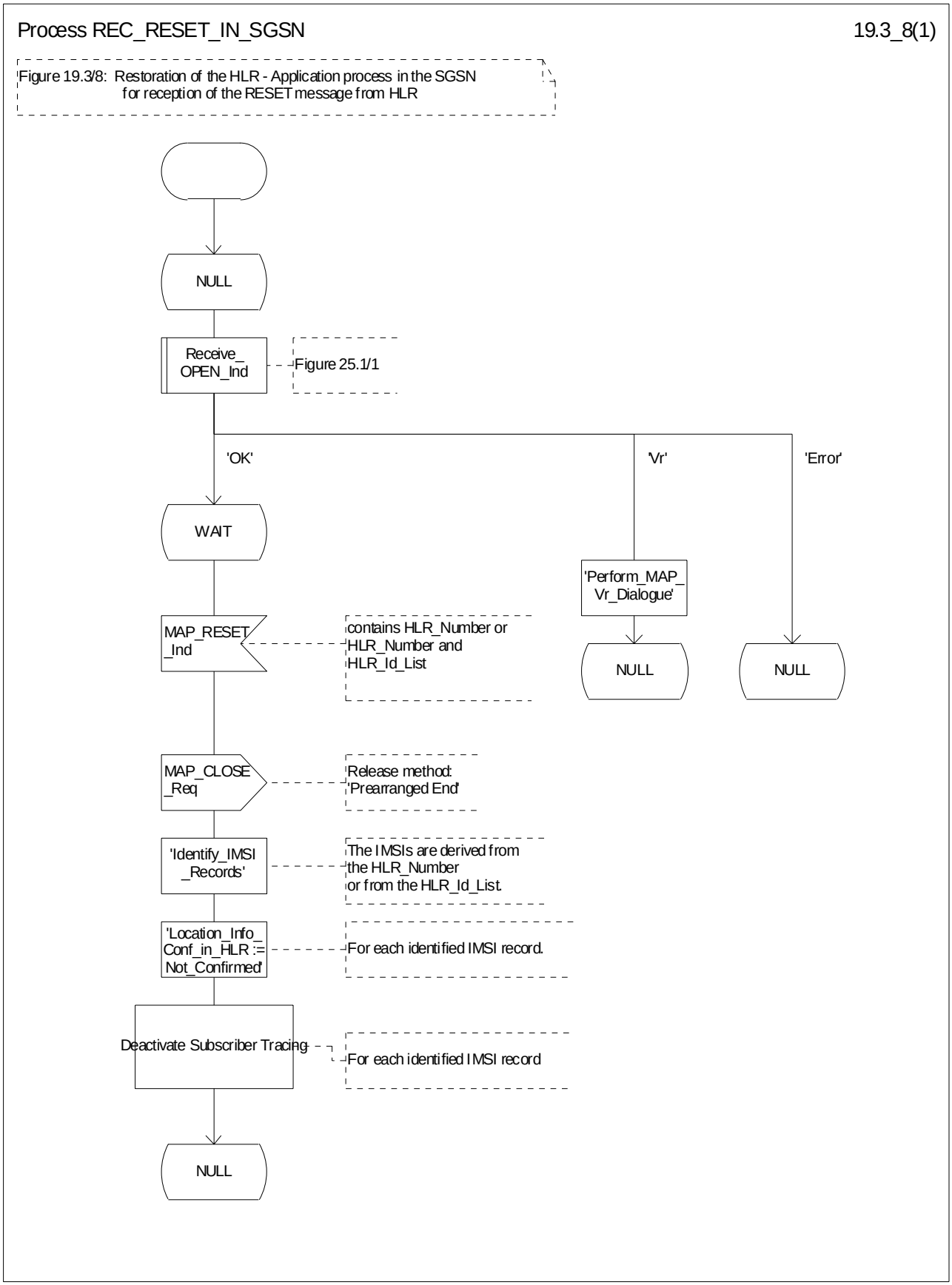


Figure 19.3/8: Process REC_RESET_IN_SGSN

19.3.3 VLR restoration: the restore data procedure in the HLR

The MAP_RESTORE_DATA procedure in the HLR (Process RESTORE_DATA_HLR) is described in this subclause; the corresponding procedure in the VLR (RESTORE_DATA_VLR) is described in subclause 21.2.4.

The process RESTORE_DATA_HLR makes use of the following macros:

- Receive_Open_Ind subclause 25.1.1;
- Check_Indication subclause 25.2.1;
- Insert_Subs_Data_Framed_HLR subclause 19.4.1.

The MAP_RESTORE_DATA service is invoked by the VLR after provision of a roaming number in response to a MAP_PROVIDE_ROAMING_NUMBER indication for an unidentified MS (i.e. IMSI unknown in VLR), or for a known MS whose IMSI record is marked as "Not Confirmed" by the indicator "Confirmed by HLR" (see 4 in figure 19.3/1). The process RESTORE_DATA_VLR is shown in figure 21.2/6.

The restore data process in the HLR is activated by receipt of a MAP_RESTORE_DATA indication from the VLR (see figure 19.3/6). If there is a parameter problem in the indication, either of the errors "Unexpected Data Value" or "Data Missing" is returned in the MAP_RESTORE_DATA response; if the subscriber is not known in the HLR, the error "Unknown Subscriber" is returned in the MAP_RESTORE_DATA response. In all of these cases the process in the HLR terminates.

If the MAP_RESTORE_DATA indication is accepted and if the LMSI is received, the HLR updates the LMSI for the IMSI received in the MAP_RESTORE_DATA indication. For this IMSI the HLR sets "subscriber-tracing-not-active-in-VLR" and checks whether tracing is required. This check is handled by the macro "Control_Tracing_HLR" that is described in subclause 25.9. Thereafter, the macro "Insert_Subs_Data_Framed_HLR" that is described in subclause 19.4.1 is invoked. The outcome of the macro Insert_Subs_Data_Framed_HLR is one of:

- abort, in which case the process terminates;
- error, in which case the HLR returns the error "System Failure" in the MAP_RESTORE_DATA response, and the process terminates;
- OK, indicating successful outcome of downloading the subscriber data to the VLR.

After successful completion of the framed MAP_INSERT_SUBSCRIBER_DATA procedure, the HLR Number and, if applicable, the "MS Not Reachable Flag" which is used for SMS, are provided in the MAP_RESTORE_DATA response.

Upon receipt of the MAP_RESTORE_DATA confirmation, the VLR behaves as described in subclause 21.2.4, figure 21.2/6.

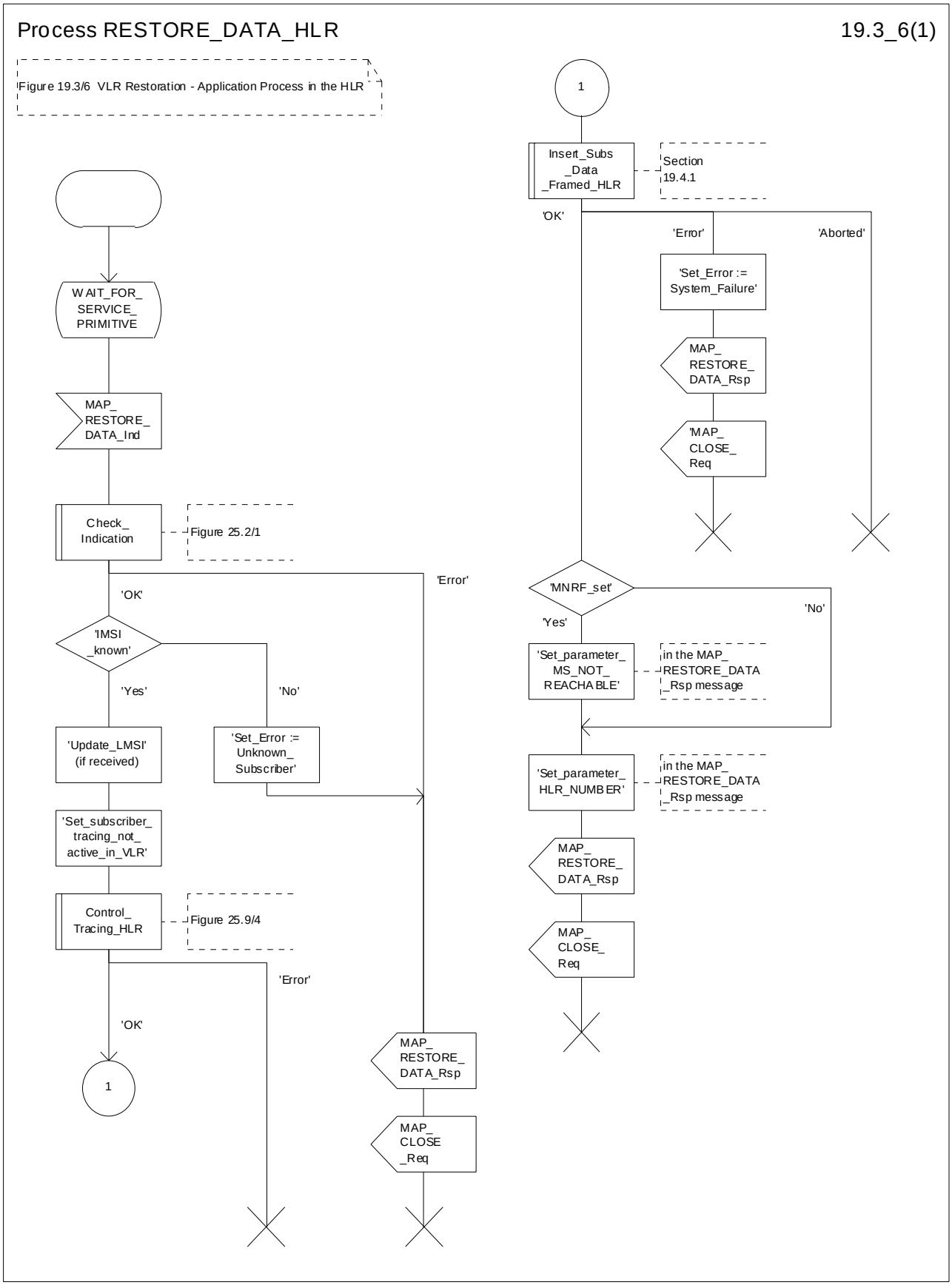


Figure 19.3/6: Process RESTORE_DATA_HLR

19.4 Macro Insert_Subs_Data_Framed_HLR

This macro is used by any procedure invoked in HLR which requires the transfer of subscriber data by means of the InsertSubscriberData operation (e.g. Update Location or Restore Data).

The invocation of the operation is done in a dialogue already opened by the framing procedure. Therefore the latter is the one that handles the reception of the open indication and sends the dialogue close request.

The macro calls the process "Send_Insert_Subs_Data" (see subclause 25.7.4) as many times as it is needed for transferring all subscriber data. This process call is meant to describe two possible behaviours of HLR to handle service requests and confirmations:

- either the HLR handles requests and confirmations in parallel; or
- the HLR sends the next request only after receiving the confirmation to the previous one.

Another call is done to the macro "Wait_for_Insert_Subscriber_Data" (see subclause 25.7.3). There the reception and handling of the service confirmations is described.

If certain services required for a subscriber are not supported by the VLR or by the SGSN (e.g. Advice of Charge Charging Level), this may result in one of the following outcomes:

- The HLR stores and sends "Roaming Restriction Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restriction Due To Unsupported Feature" is stored in the HLR, the "MSC Area Restricted Flag" shall be set to "restricted". This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR;
- The HLR stores and sends other induced subscriber data (e.g. a specific barring program) in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. This will cause rejection of mobile originated service requests, except emergency calls.
- The HLR stores and sends "Roaming Restricted in the SGSN Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restricted In SGSN Due To Unsupported Feature" is stored in the HLR, the "SGSN Area Restricted Flag" shall be set to "restricted". This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context Activation;

When the VLR receives regional subscription data (Zone Code List) it may respond with "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "MSC Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.

If the HLR neither stores "Roaming Restriction Due To Unsupported Feature" nor receives "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response, the "MSC Area Restricted Flag" in the HLR shall be set to "not restricted".

If subscriber data for CAMEL Phase 2 services are sent to a VLR which does not support CAMEL Phase 2, the service behaviour may be unpredictable or incorrect. The HLR therefore needs to ensure that at the conclusion of a location updating dialogue the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in GSM 03.78.

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only after the HLR receives confirmation in the first ISD message result that CAMEL Phase 2 is supported.

A Forwarded-to number non-international E.164 format shall only be sent from an HLR to a VLR if the VLR supports CAMEL Phase 2, or a subsequent phase of CAMEL.

When the SGSN receives regional subscription data (Zone Code List) it may respond with "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "SGSN Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context Activation.

If the HLR neither stores "Roaming Restricted In SGSN Due To Unsupported Feature" nor receives "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response, the "SGSN Area Restricted Flag" in the HLR shall be set to "not restricted".

The SDL diagrams are shown in figures 19.4/1 and 19.4/2.

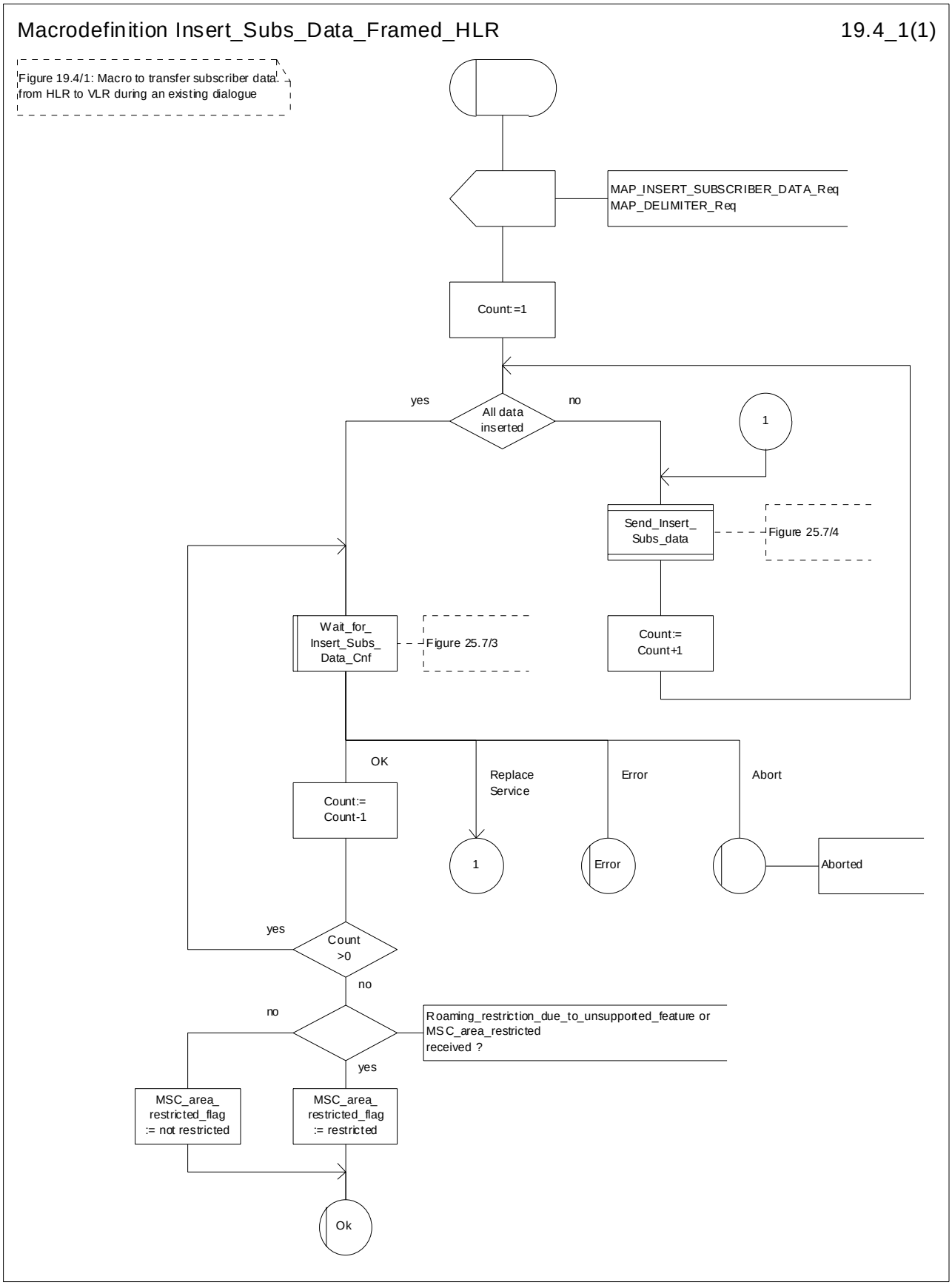


Figure 19.4/1: Macro Insert_Subs_Data_Framed_HLR

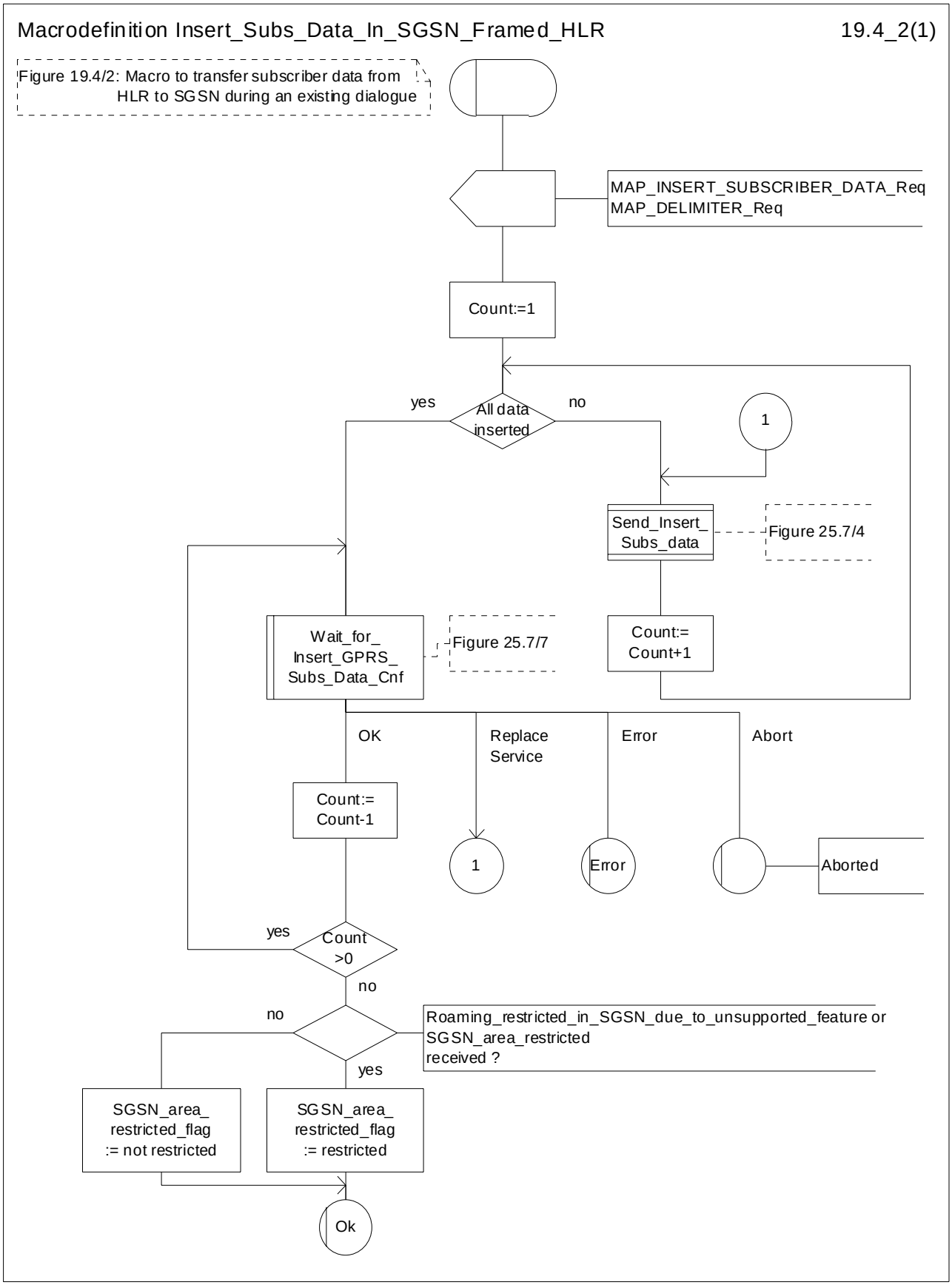


Figure 19.4/2: Macro Insert_Subs_Data_In_SGSN_Framed_HLR

20 Operation and maintenance procedures

20.1 General

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

The following procedures exist for operation and maintenance purposes:

i) Tracing procedures;

ii) Subscriber Data Management procedures;

iii) Subscriber Identity procedures.

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

- subscriberDataManagementContext;
- tracingContext.

These two application contexts need a co-ordinating process in the VLR or in the SGSN as described in the following subclauses.

20.1.1 Tracing Co-ordinator for the VLR

The MAP_OPEN indication opens the dialogue for the stand-alone tracing procedure when the application context tracingContext is received. If that service is successful, the Co-ordinator can receive the firs service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_ACTIVATE_TRACE_MODE indication is received, the process ATM_VLR_Standalone is created;
- if the MAP_DEACTIVATE_TRACE_MODE indication is received, the process DTM_VLR_Standalone is created.

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

The Tracing Co-ordinator is shown in the figure 20.1/1.

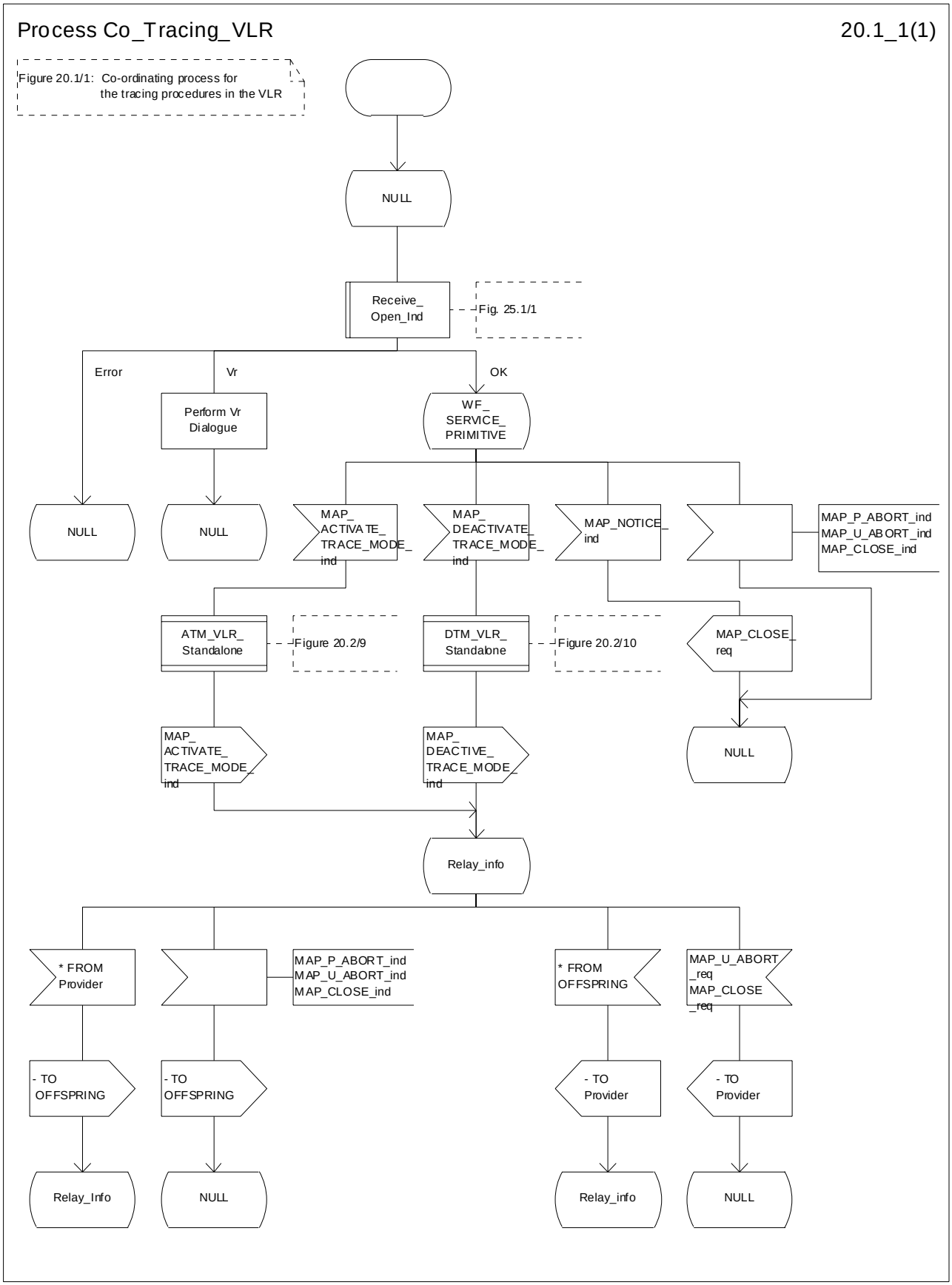


Figure 20.1/1: Process Co_Tracing_VLR

20.1.2 Subscriber Data Management Co-ordinator for the VLR

The MAP_OPEN indication opens the dialogue for the stand-alone subscriber data management procedure when the application context subscriberDataManagementContex is received. If that service is successful, the Co-ordinator can receive the firs service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_INSERT_SUBSCRIBER_DATA indication is received, the process INS_SUBS_DATA_VLR is created;

- if the MAP_DELETE_SUBSCRIBER_DATA indication is received, the process Delete_Subscriber_Data_VLR is created.

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

The Subscriber_Data_Management Co-ordinator is shown in the figure 20.1/2.

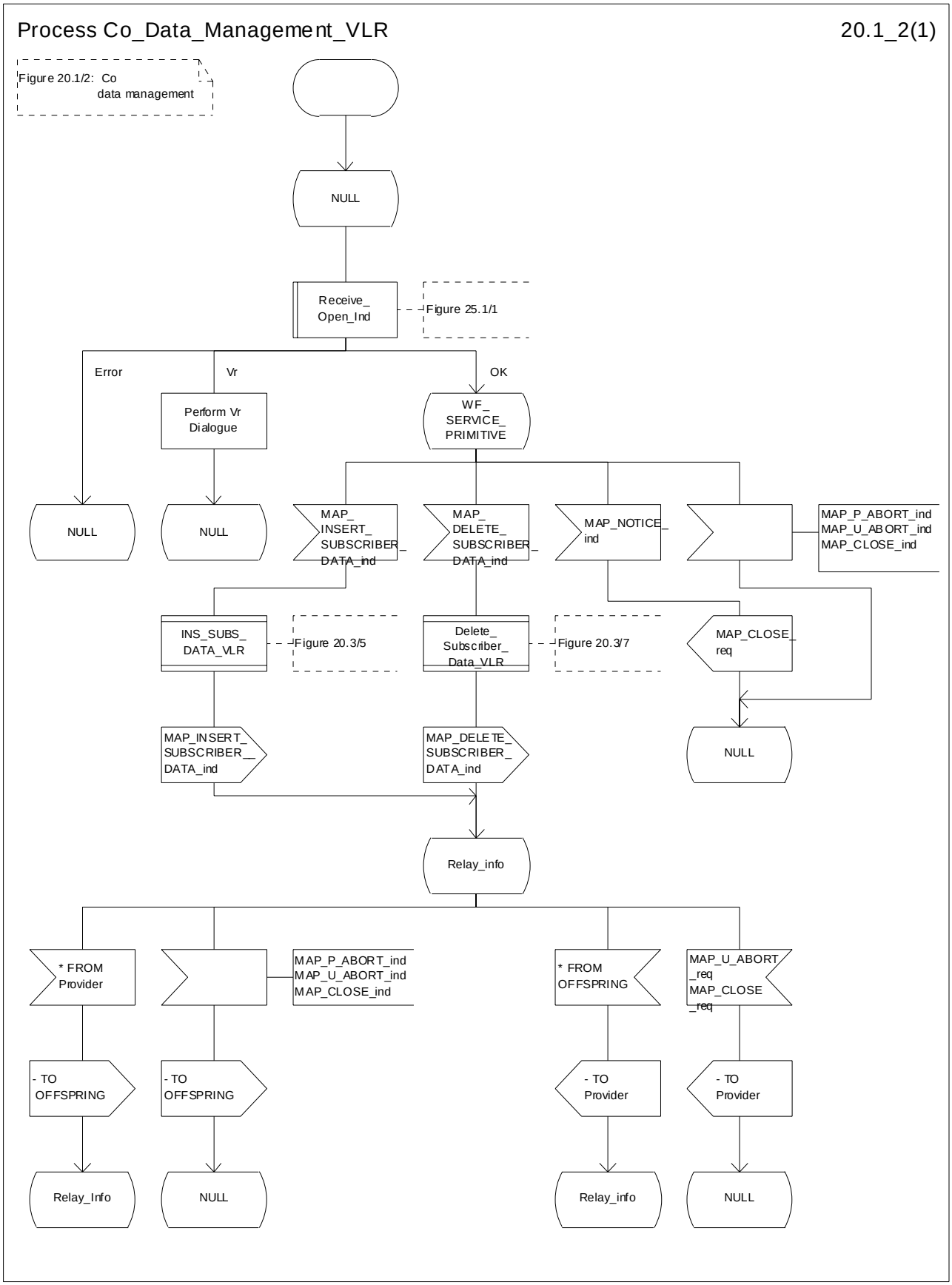


Figure 20.1/2: Process Co_Data_Management_VLR

20.1.3 Tracing Co-ordinator for the SGSN

The MAP_OPEN indication opens the dialogue for the stand-alone tracing procedure when the application context tracingContext is received. If that service is successful, the Co-ordinator can receive the firs service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_ACTIVATE_TRACE_MODE indication is received, the process ATM_SGSN_Standalone is created;
- if the MAP_DEACTIVATE_TRACE_MODE indication is received, the process DTM_SGSN_Standalone is created.

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

The Tracing Co-ordinator for the SGSN is shown in the figure 20.1/3.

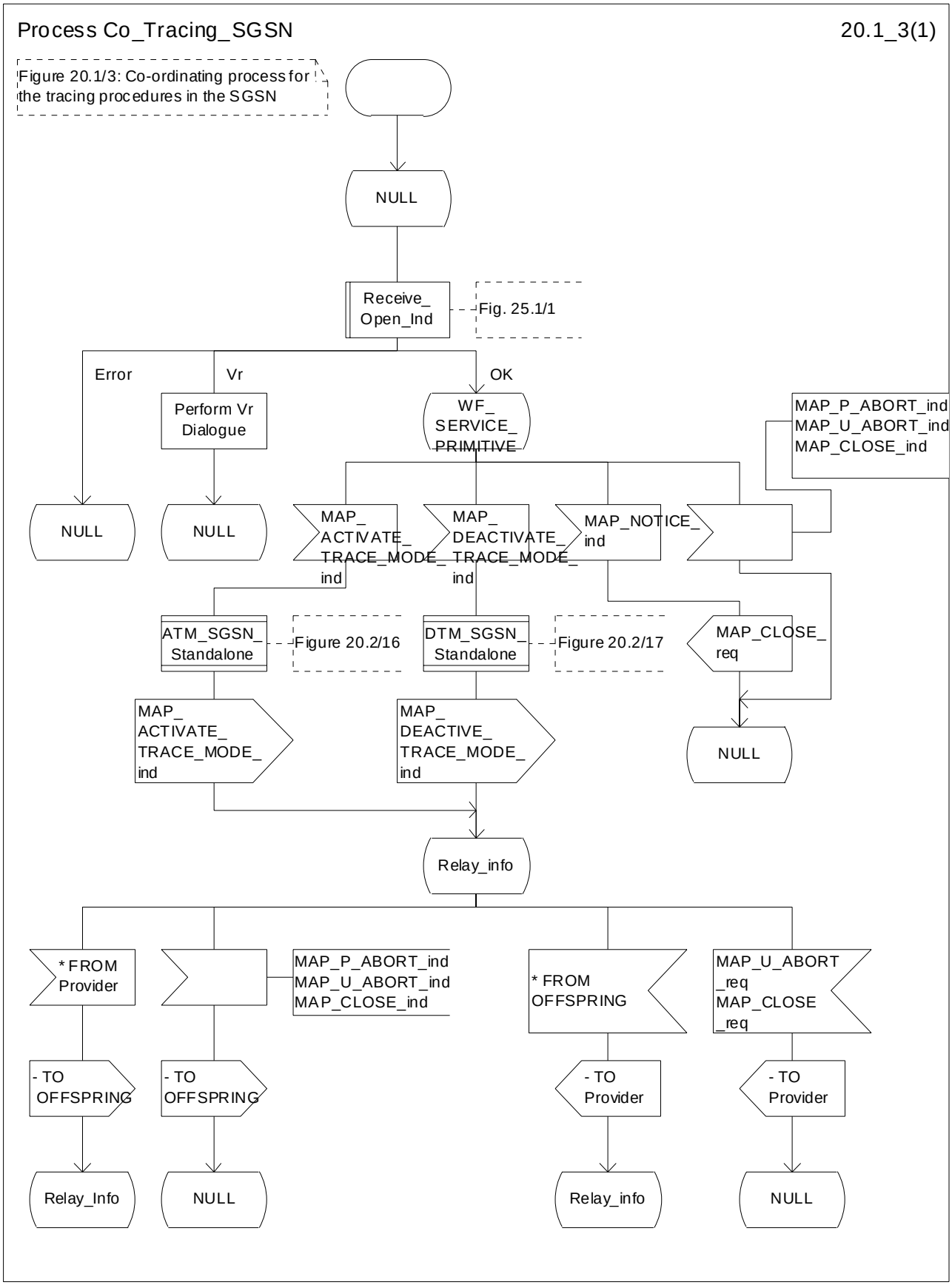


Figure 20.1/3: Process Co_Tracing_SGSN

20.1.4 Subscriber Data Management Co-ordinator for the SGSN

The MAP_OPEN indication opens the dialogue for the stand-alone subscriber data management procedure when the application context subscriberDataManagementContext is received. If that service is successful, the Co-ordinator can receive the first service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_INSERT_SUBSCRIBER_DATA indication is received, the process INS_SUBS_DATA_SGSN is created;

- if the MAP_DELETE_SUBSCRIBER_DATA indication is received, the process Delete_Subscriber_Data_SGSN is created.

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

The Subscriber_Data_Management Co-ordinator is shown in the figure 20.1/4.

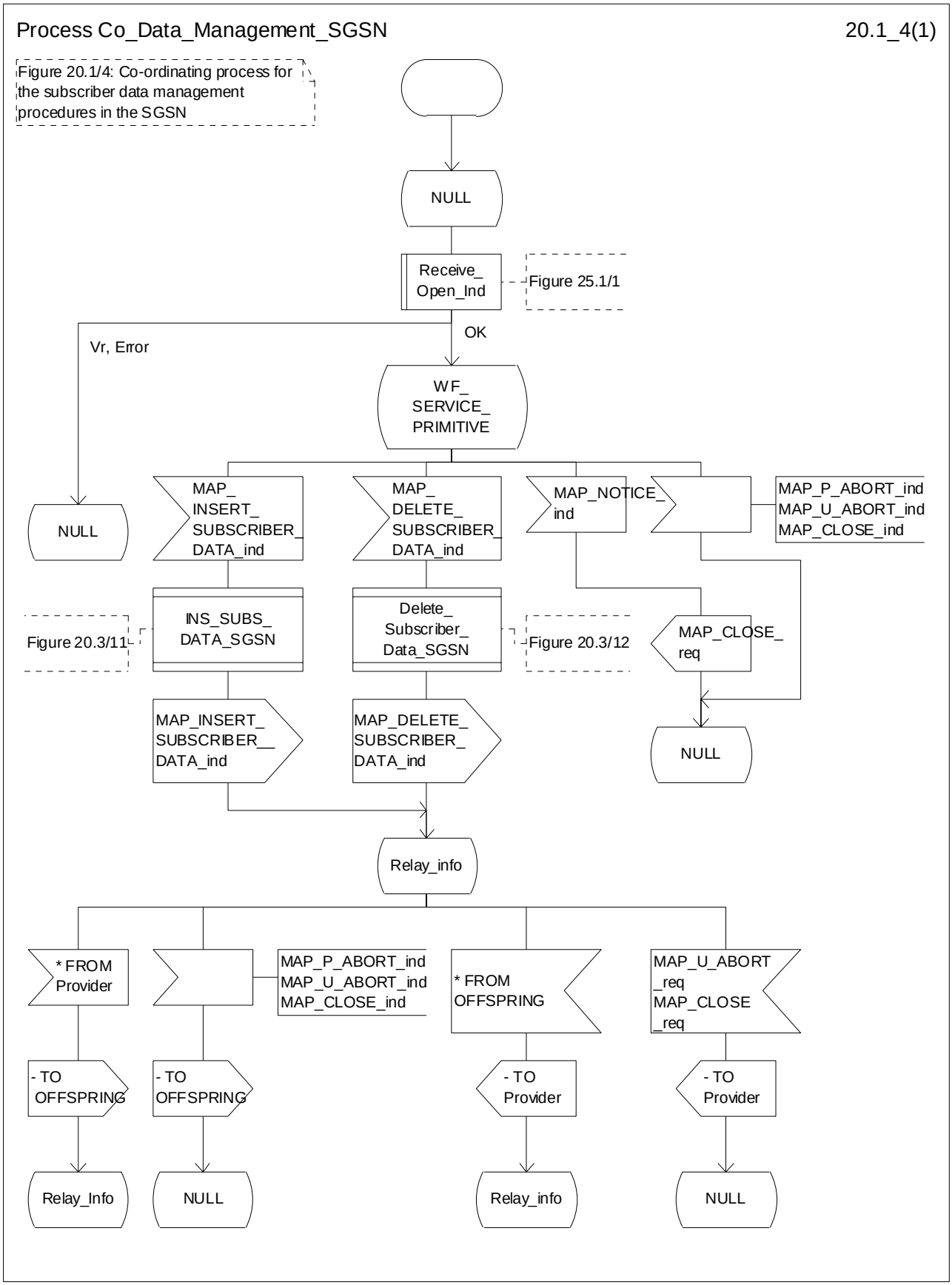


Figure 20.1/4: Process Co_Data_Management_SGSN

20.2 Tracing procedures

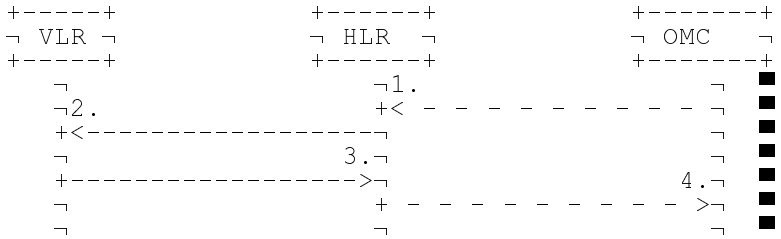
Three type of tracing procedures exist:

i) Subscriber tracing management procedures;

ii) Subscriber tracing procedures;

iii) Event tracing procedures.

The subscriber tracing management procedures are used for management of the status and the type of the tracing. The subscriber tracing activation procedure is used at location updating or data restoration when the trace mode of a subscriber is set active in the HLR or, as a stand alone procedure, when the subscriber is already registered and the trace mode becomes active in the HLR. The procedures for providing a trace request to the VLR are shown in figures 20.2/1 and 20.2/2. The procedures for providing a trace request to the SGSN are shown in figures 20.2/11 and 20.2/12.



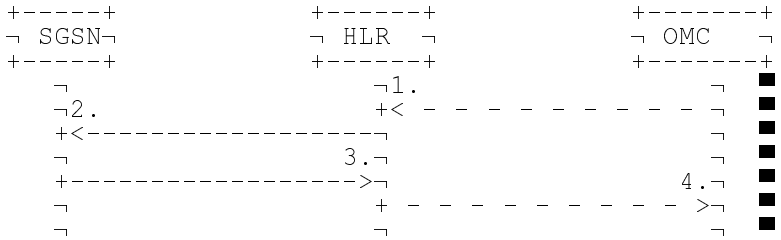
1) Subscriber Tracing Activation

2) MAP_ACTIVATE_TRACE_MODE

3) MAP_ACTIVATE_TRACE_MODE_ACK

4) Subscriber Tracing Activation Accepted

Figure 20.2/1: Stand alone subscriber tracing activation procedure



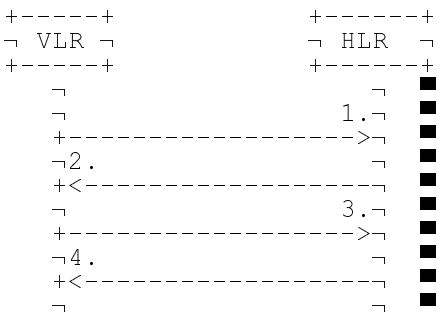
1) Subscriber Tracing Activation

2) MAP_ACTIVATE_TRACE_MODE

3) MAP_ACTIVATE_TRACE_MODE_ACK

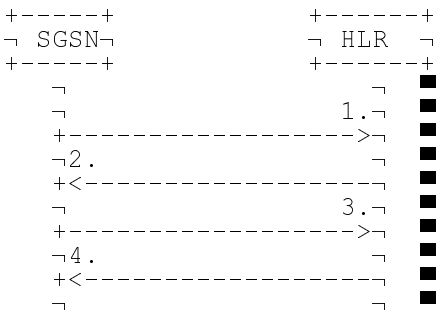
4) Subscriber Tracing Activation Accepted

Figure 20.2/11: Stand alone subscriber tracing activation procedure for GPRS



1) MAP_UPDATE_LOCATION or MAP_RESTORE_DATA
2) MAP_ACTIVATE_TRACE_MODE
3) MAP_ACTIVATE_TRACE_MODE_ACK
4) MAP_UPDATE_LOCATION_ACK or MAP_RESTORE_DATA_ACK

Figure 20.2/2: Subscriber tracing activation procedure at location updating or data restoration

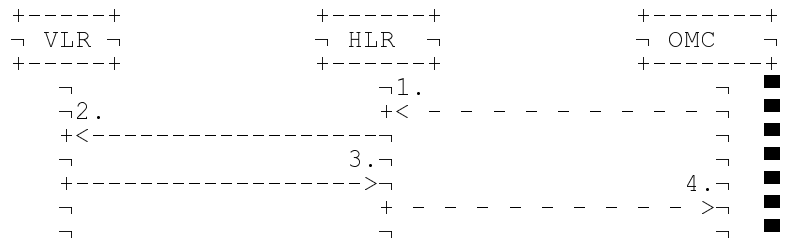


1) MAP_UPDATE_GPRS_LOCATION
2) MAP_ACTIVATE_TRACE_MODE
3) MAP_ACTIVATE_TRACE_MODE_ACK
4) MAP_UPDATE_GPRS_LOCATION_ACK

Figure 20.2/12: Subscriber tracing activation procedure at gprs location updating

The HLR sends the trace request (IMSI, trace reference, trace type and identity of the OMC) to the VLR or to the SGSN in a MAP_ACTIVATE_TRACE_MODE request. The receipt of this primitive is acknowledged. The acknowledge primitive will indicate that the trace request is accepted by the VLR or by the SGSN. If the request is not accepted, the reason will be reported to the HLR.

The subscriber tracing deactivation procedure is used when the trace request of a subscriber is to be cancelled in the VLR or in the SGSN. The procedures is shown in figures 20.2/3 and 20.2/13.



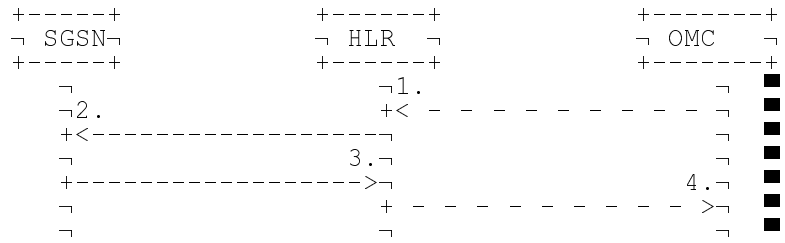
1) Subscriber Tracing Deactivation

2) MAP_DEACTIVATE_TRACE_MODE

3) MAP_DEACTIVATE_TRACE_MODE_ACK

4) Subscriber Tracing Deactivation Accepted

Figure 20.2/3: Subscriber tracing deactivation procedure



1) Subscriber Tracing Deactivation

2) MAP_DEACTIVATE_TRACE_MODE

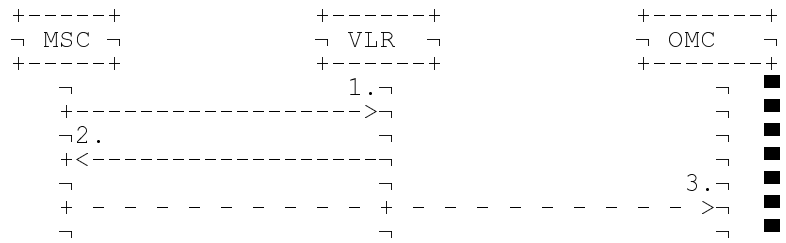
3) MAP_DEACTIVATE_TRACE_MODE_ACK

4) Subscriber Tracing Deactivation Accepted

Figure 20.2/13: Subscriber tracing deactivation procedure for GPRS

The HLR sends a MAP_DEACTIVATE_TRACE_MODE request to the VLR or to the SGSN. The VLR or the SGSN will acknowledge the deactivation. The acknowledge primitive will indicate that the trace request has been deleted by the VLR or by the SGSN. If the deactivation is not accepted, the reason will be reported to the HLR.

The subscriber tracing procedures are used when the VLR detects any subscriber related activity for which the trace mode is activated, e.g. receives the MAP_PROCESS_ACCESS_REQUEST indication. The procedure is shown in figure 20.2/4.



1) MAP_PROCESS_ACCESS_REQUEST, MAP_UPDATE_LOCATION_AREA,

2) MAP_TRACE_SUBSCRIBER_ACTIVITY

3) Subscriber tracing information

Figure 20.2/4: Subscriber tracing procedure in the servicing MSC

The VLR will generate the MAP_TRACE_SUBSCRIBER_ACTIVITY indication. The receiving MSC will send the trace record to the OMC.

[Figure numbers 20.2/5 and 20.2/6 are spare.]

20.2.1 Procedures in the HLR

20.2.1.1 Subscriber tracing activation procedure

When receiving the subscriber tracing mode activation command for a subscriber from the OMC, the HLR will activate tracing, if the subscriber is known and registered in the HLR and the subscriber is roaming in the home PLMN area. The MAP_ACTIVATE_TRACE_MODE request is sent to the VLR or to the SGSN where the subscriber is registered.

If the MAP_ACTIVATE_TRACE_MODE confirmation is received indicating an error situation, the errors are mapped to the OMC interface. The activation request may also be repeated; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or the SGSN.

If the subscriber is known in the HLR, but is deregistered or roaming outside the home PLMN area, the subscriber tracing status is activated in the HLR, but the VLR or the SGSN is not updated.

When receiving a request for location updating or data restoration while the subscriber trace mode is active, the macro Control_Tracing_HLR (see figure 25.9/4) shall be initiated by the location updating process in the HLR.

The subscriber tracing activation process in the HLR with VLR is shown in figure 20.2/7.

The subscriber tracing activation process in the HLR with SGSN is shown in figure 20.2/14.

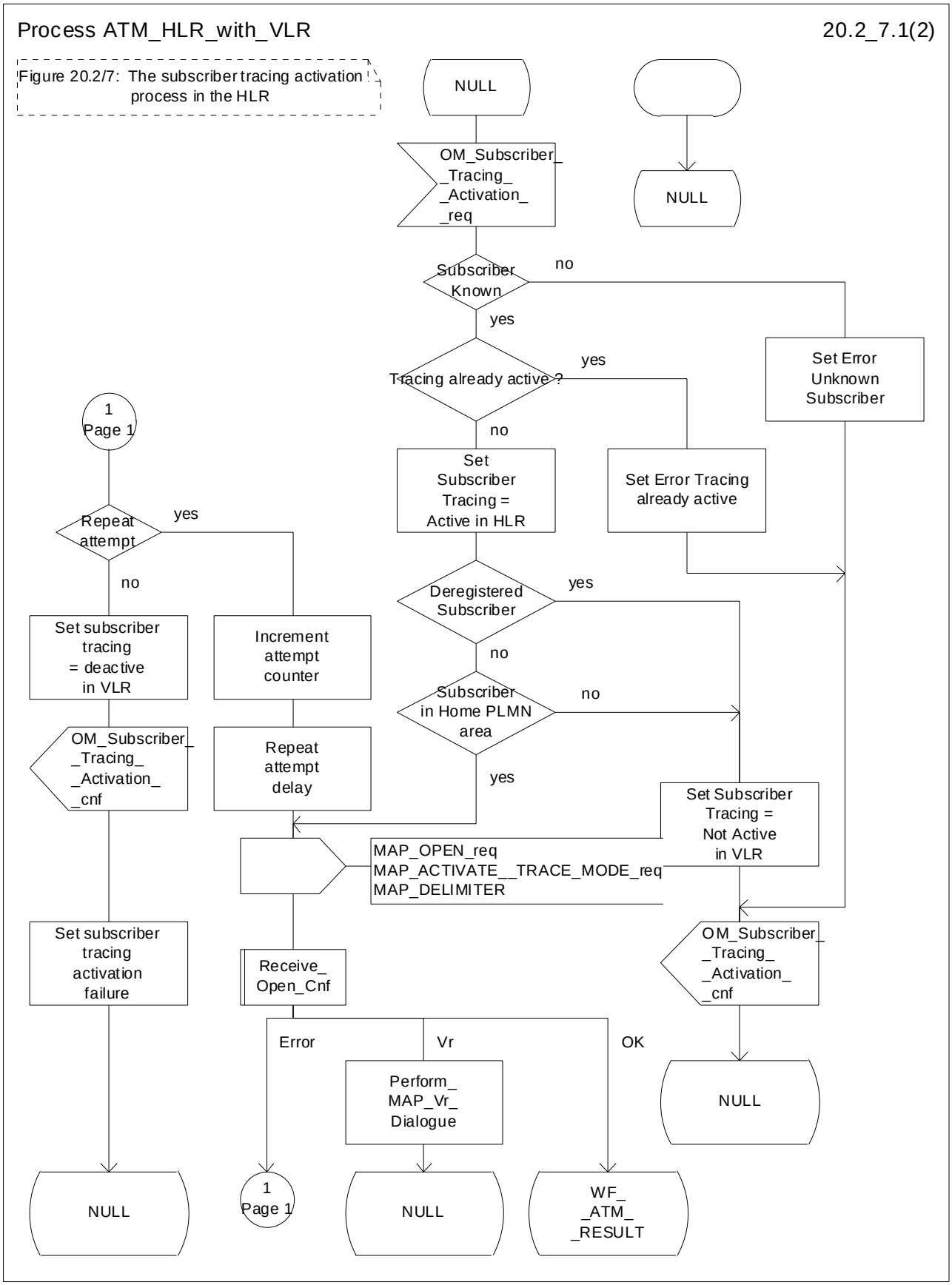


Figure 20.2/7 (sheet 1 of 2): Process ATM_HLR_with_VLR

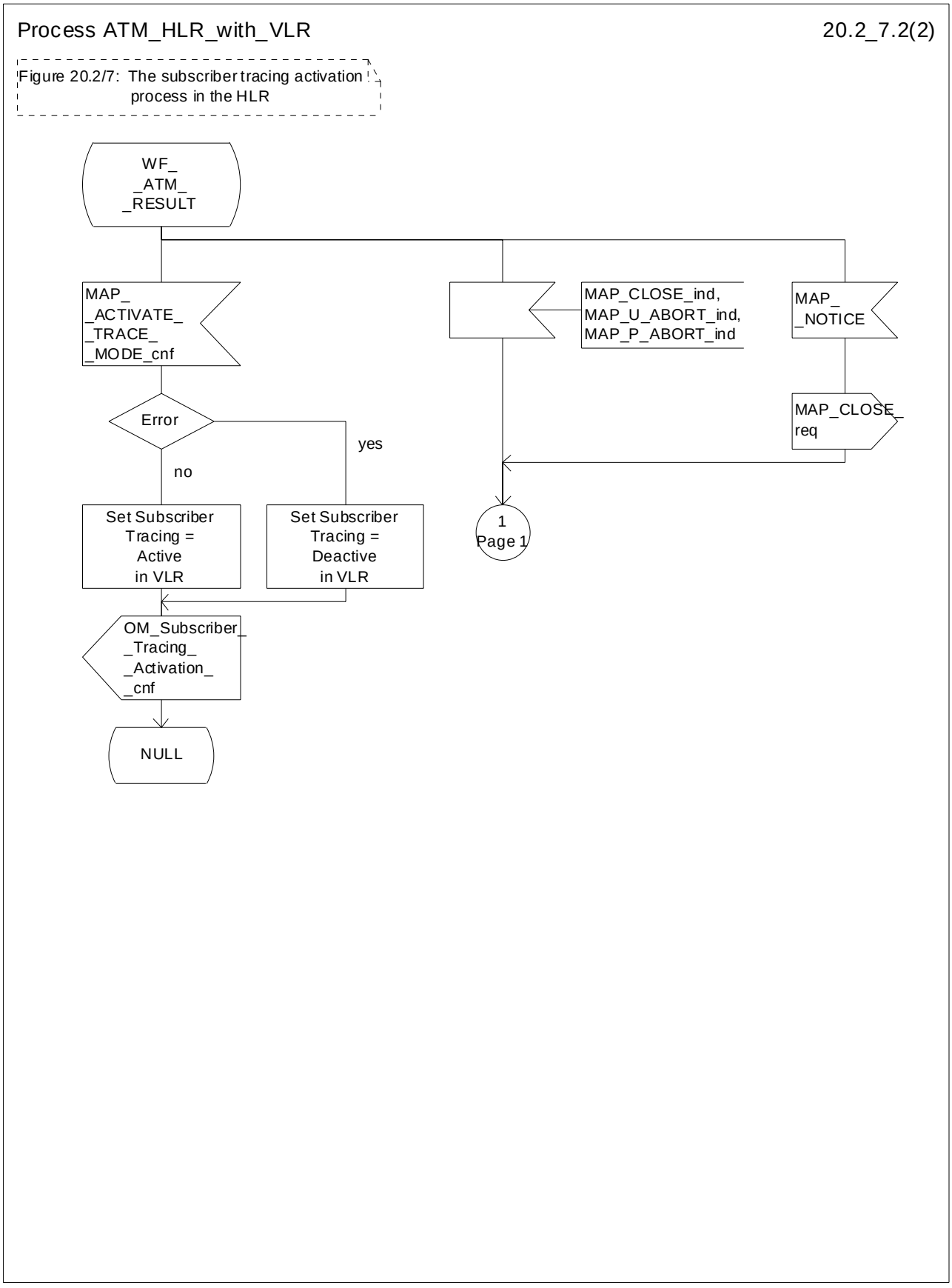


Figure 20.2/7 (sheet 2 of 2): Process ATM_HLR_with_VLR

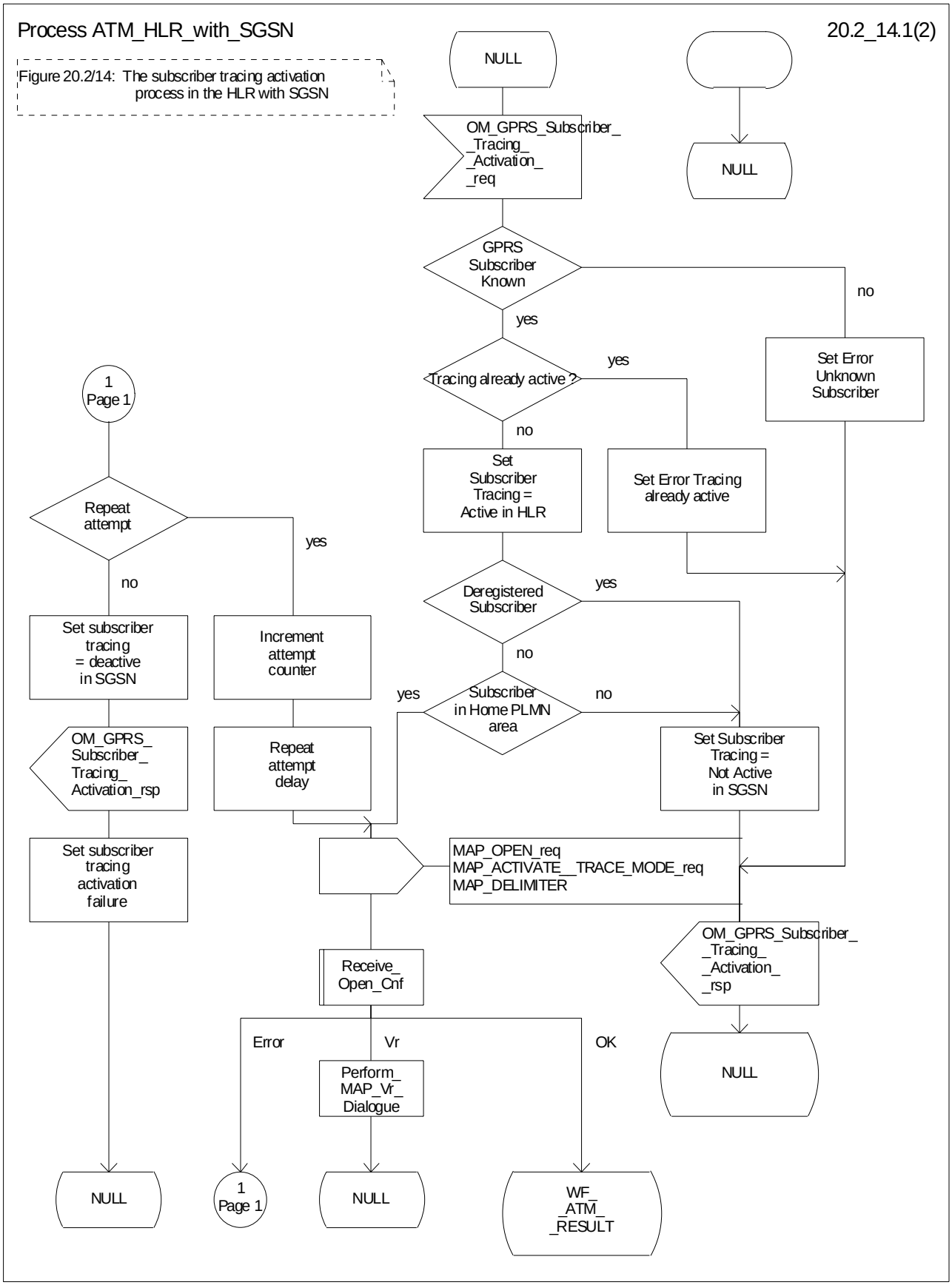


Figure 20.2/14 (sheet 1 of 2): Process ATM_HLR_with_SGSN

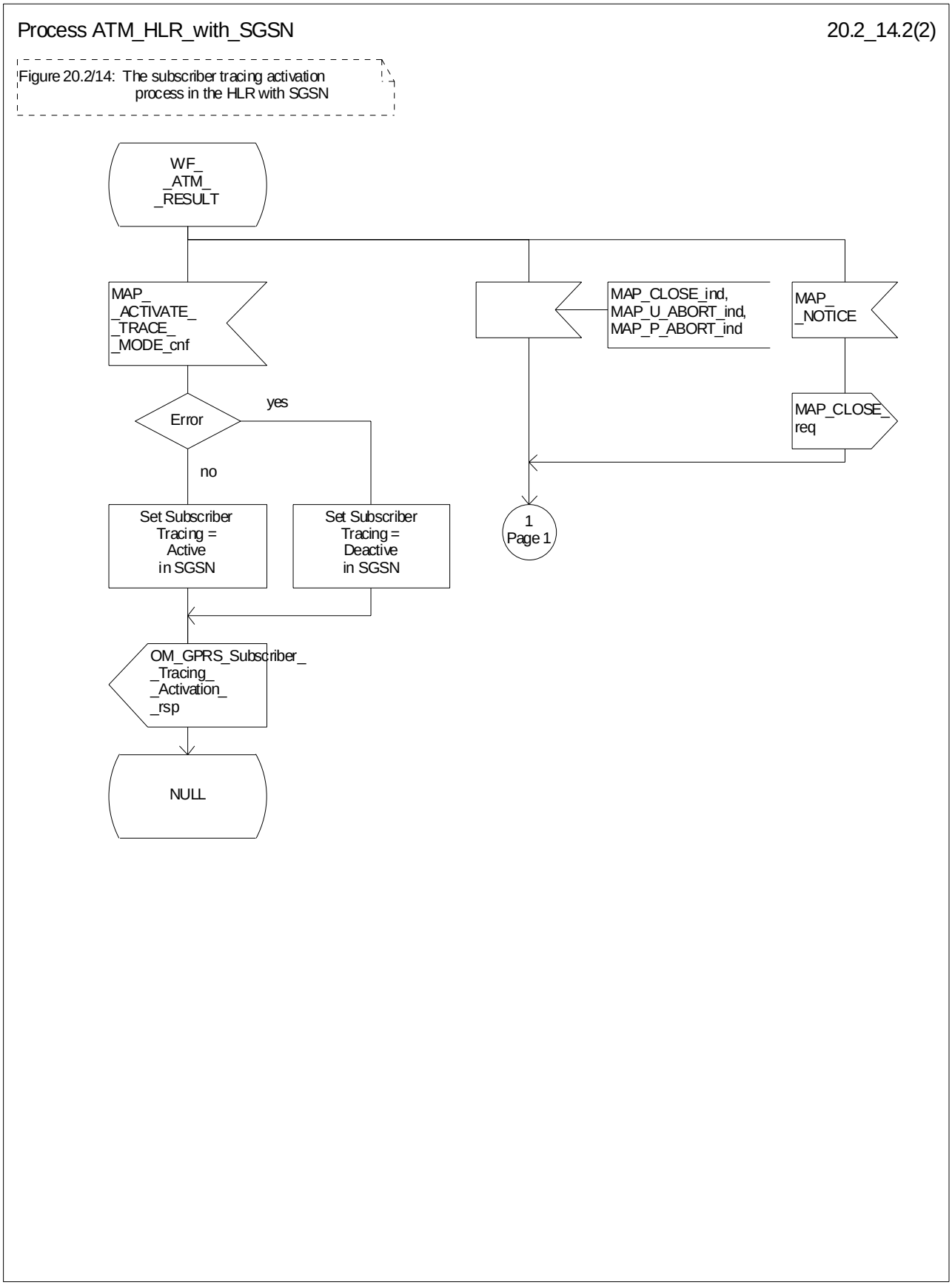


Figure 20.2/14 (sheet 2 of 2): Process ATM_HLR_with_SGSN

20.2.1.2 Subscriber tracing deactivation procedure

When receiving the subscriber trace mode deactivation command for a subscriber from the OMC, the HLR will send the MAP_DEACTIVATE_TRACE_MODE request to the VLR or to the SGSN where the subscriber is registered, if the trace mode activation has been carried out. The subscriber tracing in HLR is set to a deactive state.

If the operation is successful, the HLR will set the subscriber tracing in VLR or in SGSN to a deactive state.

If the MAP_DEACTIVATE_TRACE_MODE confirmation is received indicating an error situation, the errors are mapped to the OMC interface. The deactivation request may be also repeated; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or by the SGSN.

The subscriber tracing deactivation procedure with VLR is shown in figure 20.2/8.

The subscriber tracing deactivation procedure with SGSN is shown in figure 20.2/15.

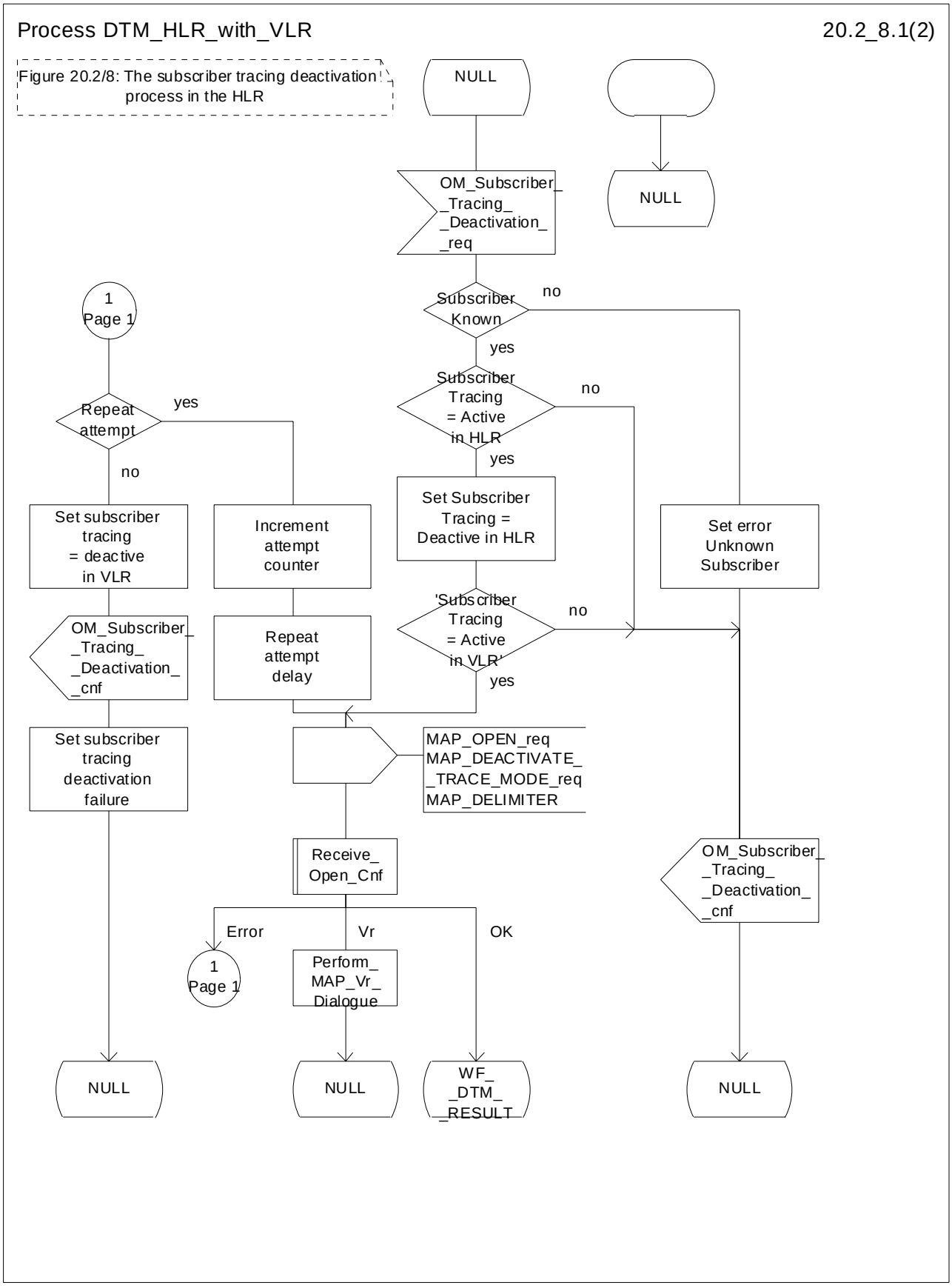


Figure 20.2/8 (sheet 1 of 2): Process DTM_HLR_with_VLR

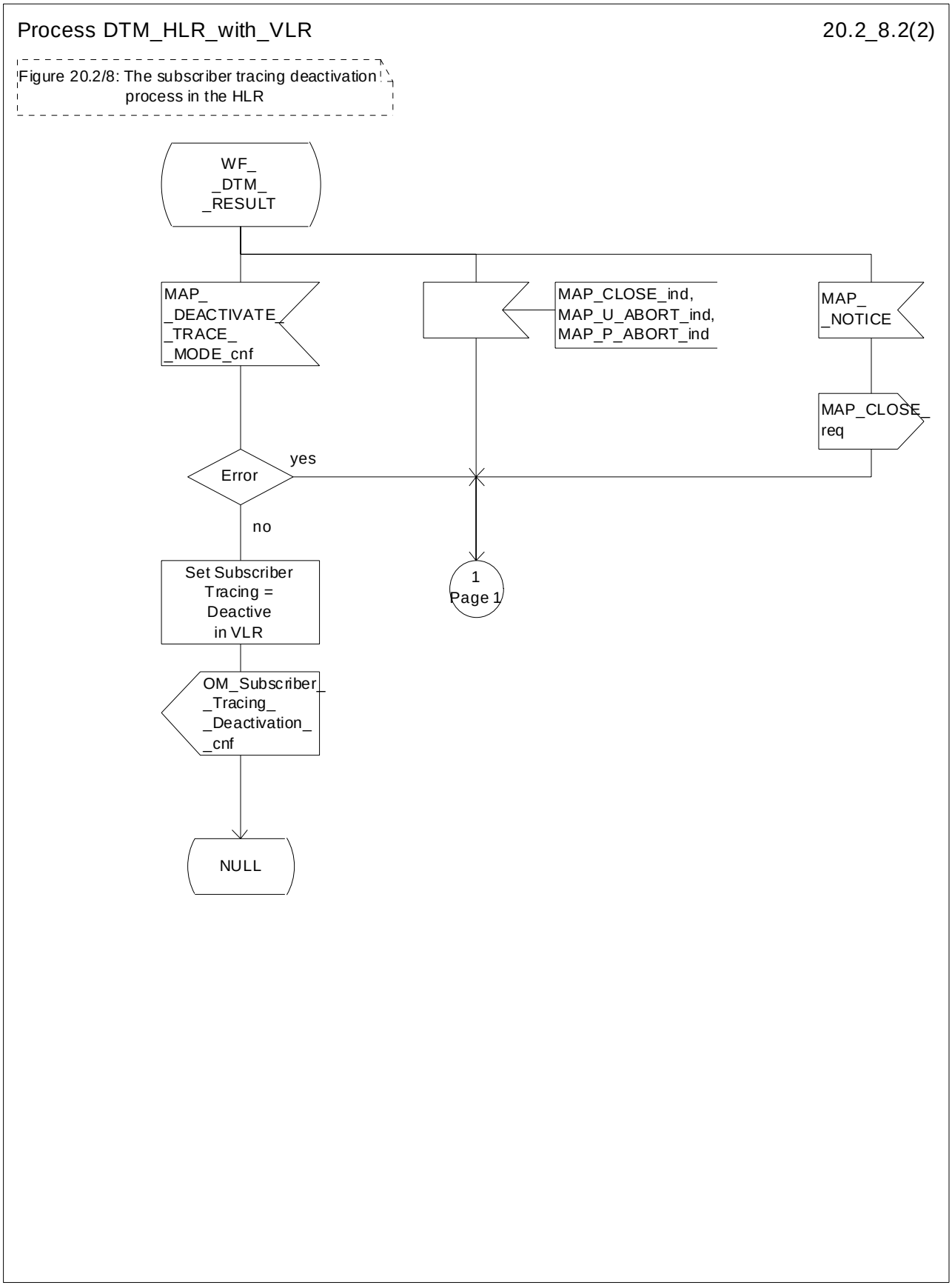


Figure 20.2/8 (sheet 2 of 2): Process DTM_HLR_with_VLR

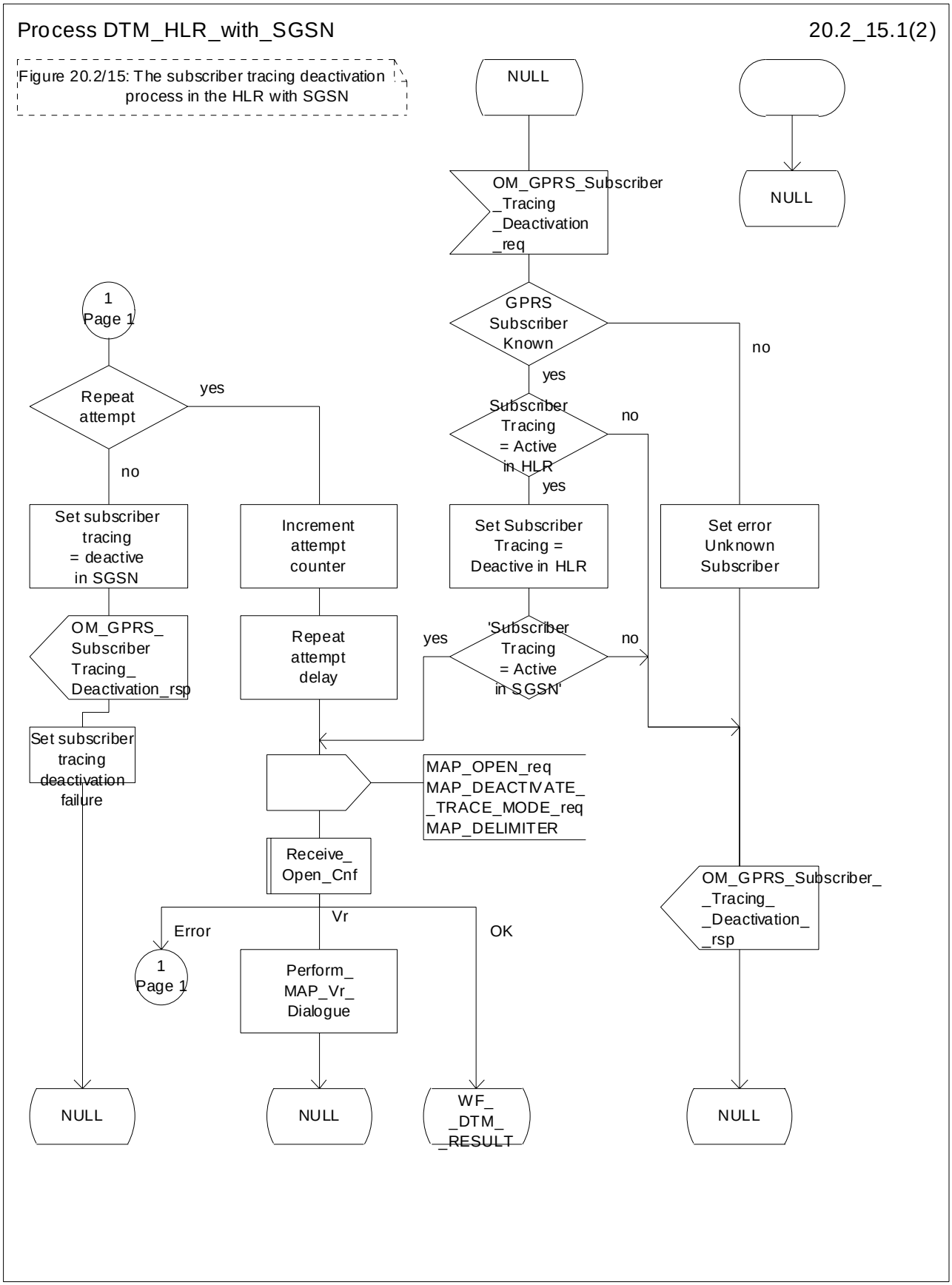


Figure 20.2/15 (sheet 1 of 2): Process DTM_HLR_with_SGSN

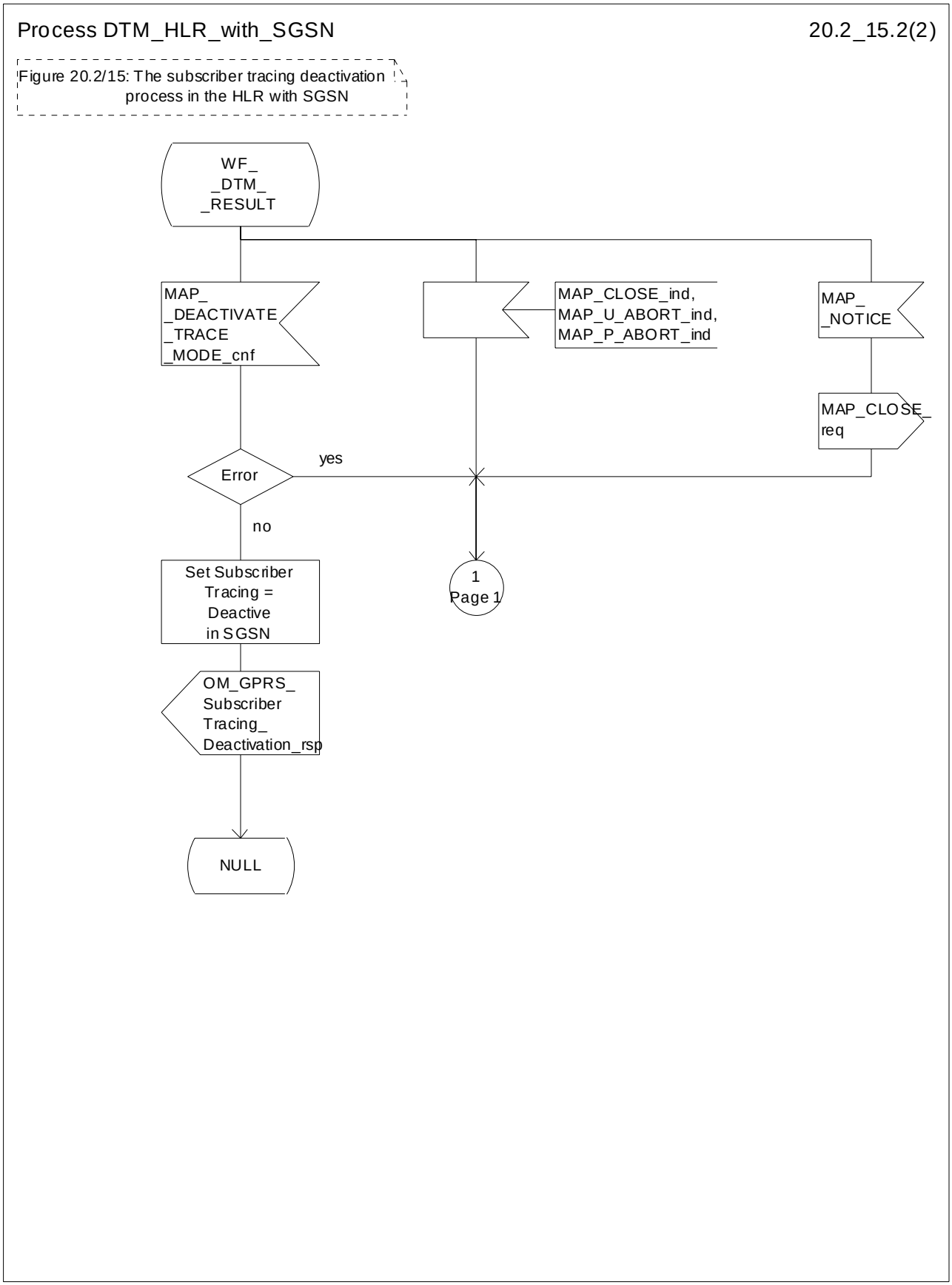


Figure 20.2/15 (sheet 2 of 2): Process DTM_HLR_with_SGSN

20.2.2 Procedures in the VLR

The VLR is involved in the following tracing procedures:

i) Subscriber tracing activation procedure;

ii) Subscriber tracing deactivation procedure;

iii) Subscriber tracing procedure.

20.2.2.1 Subscriber tracing activation procedure

When receiving a MAP_ACTIVATE_TRACE_MODE indication, the VLR will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or as a data missing error depending on the nature of the error.

If the subscriber is known, the tracing facility is supported and the tracing capacity is not exceeded, the successful report is sent in the MAP_ACTIVATE_TRACE_MODE response primitive.

The MAP_ACTIVATE_TRACE_MODE indication primitive may be received during a location updating or data restoration procedure, so the location updating or restore data process shall use the macro Activate_Tracing_VLR (see figure 25.9/3).

The subscriber tracing activation process in the VLR is shown in figure 20.2/9.

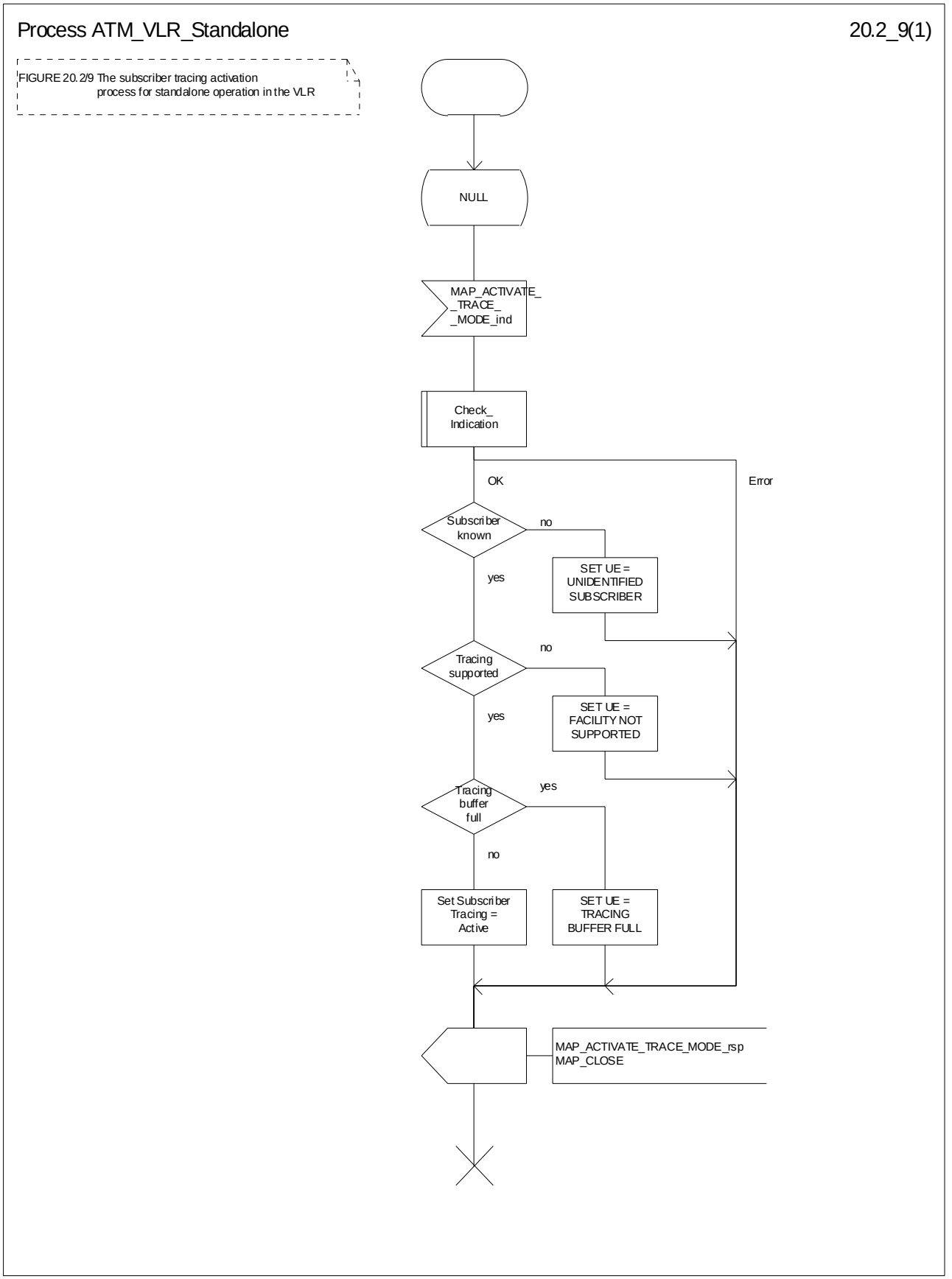


Figure 20.2/9: Process ATM_VLR_Standalone

20.2.2.2 Subscriber tracing deactivation procedure

When receiving a MAP_DEACTIVATE_TRACE_MODE indication, the VLR will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or as a data missing error depending on the nature of the error.

If the subscriber is known and the tracing facility is supported, the successful report is sent in the MAP_DEACTIVATE_TRACE_MODE response primitive.

The subscriber tracing deactivation procedure in the VLR is shown in figure 20.2/10.

Process DTM_VLR_Standalone 20.2_10(1)

Figure 20.2/10: The subscriber tracing deactivation process in the VLR

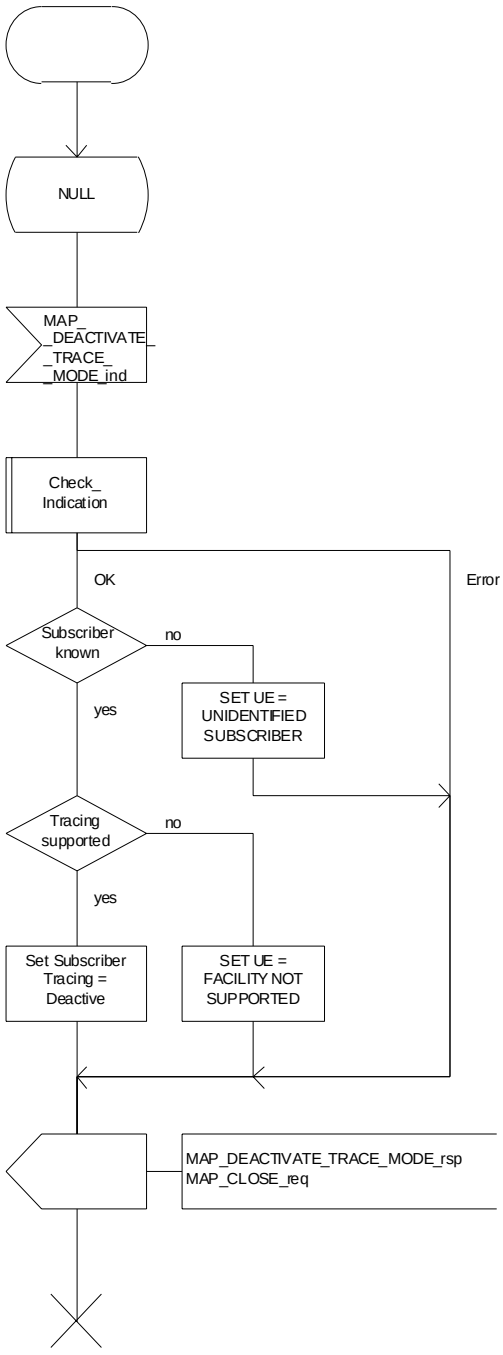


Figure 20.2/10: Process DTM_VLR_Standalone

20.2.2.3 Subscriber tracing procedure

When the VLR receives a MAP_PROCESS_ACCESS_REQUEST or MAP_UPDATE_LOCATION_AREA indication related to any subscriber activity from the MSC, the subscriber tracing procedure may be carried out. The macro Trace_Subscriber_Activity_VLR is shown in figure 25.9/2.

20.2.3 Procedures in the MSC

The MSC is involved in the following tracing procedure:

i) Subscriber tracing procedure.

20.2.3.1 Subscriber tracing procedure

When receiving the MAP_TRACE_SUBSCRIBER_ACTIVITY indication from the VLR, the MSC stores trace reference, trace type and the identity of the OMC in charge of the trace, and the MSC starts to collect the trace information. The MSC will send the trace record to the OMC.

The macro Trace_Subscriber_Activity_MSC is shown in figure 25.9/1.

20.2.4 Procedures in the SGSN

The SGSN is involved in the following tracing procedures:

i) Subscriber tracing activation procedure;

ii) Subscriber tracing deactivation procedure;

20.2.4.1 Subscriber tracing activation procedure

When receiving a MAP_ACTIVATE_TRACE_MODE indication, the SGSN will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or as a data missing error depending on the nature of the error.

If the subscriber is known, the tracing facility is supported and the tracing capacity is not exceeded, the successful report is sent in the MAP_ACTIVATE_TRACE_MODE response primitive.

The MAP_ACTIVATE_TRACE_MODE indication primitive may be received during a location updating or data restoration procedure, so the location updating or restore data process shall use the macro Activate_Tracing_SGSN (see figure 25.9/7).

The subscriber tracing activation process in the SGSN is shown in figure 20.2/16.

20.2.4.2 Subscriber tracing deactivation procedure in SGSN

When receiving a MAP_DEACTIVATE_TRACE_MODE indication, the SGSN will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or as a data missing error depending on the nature of the error.

If the subscriber is known and the tracing facility is supported, the successful report is sent in the MAP_DEACTIVATE_TRACE_MODE response primitive.

The subscriber tracing deactivation procedure in the SGSN is shown in figure 20.2/17.

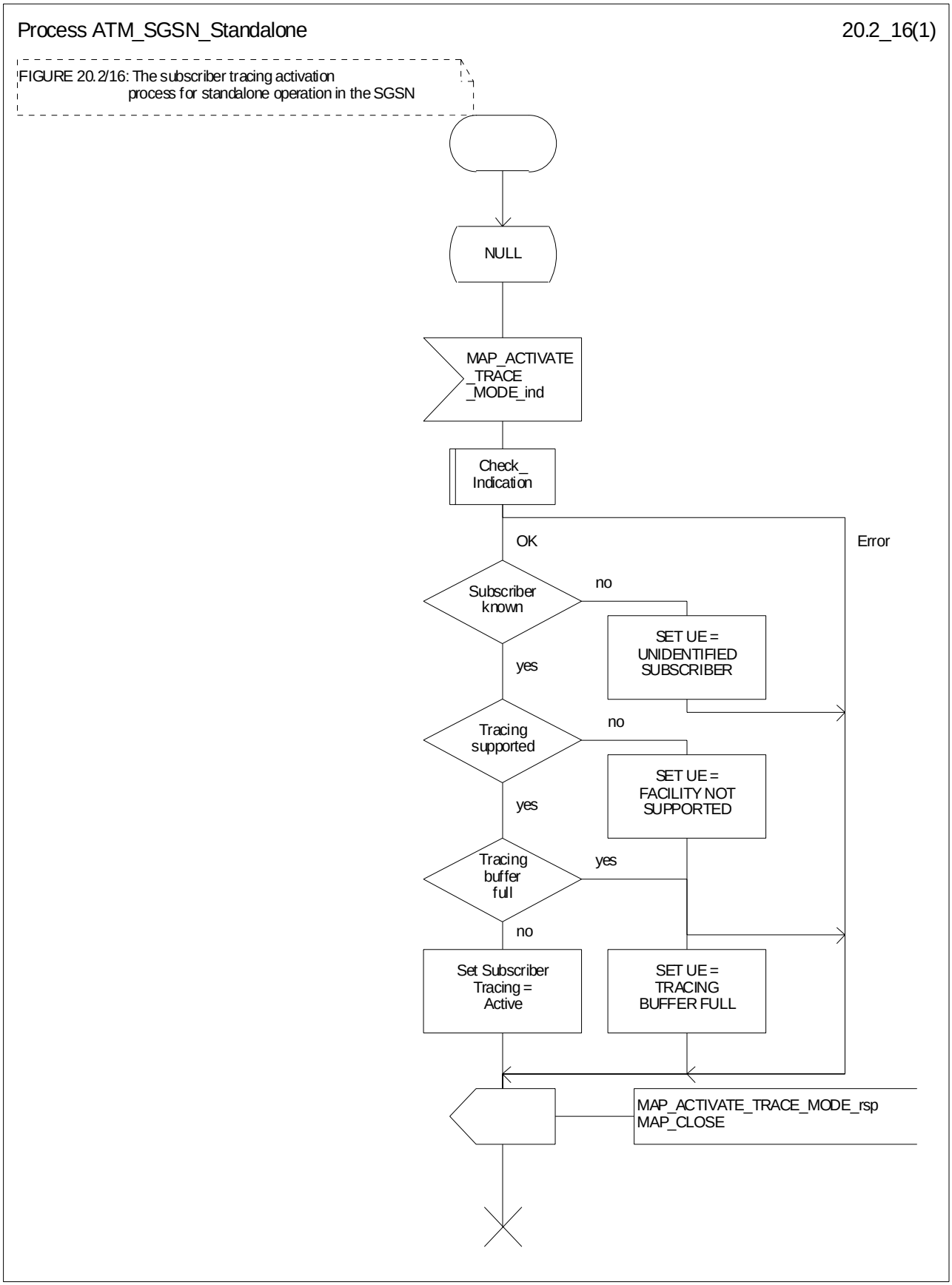


Figure 20.2/16: Process ATM_SGSN_Standalone

Process DTM_SGSN_Standalone 20.2_17(1)

Figure 20.2/17: The subscriber tracing deactivation process in the SGSN

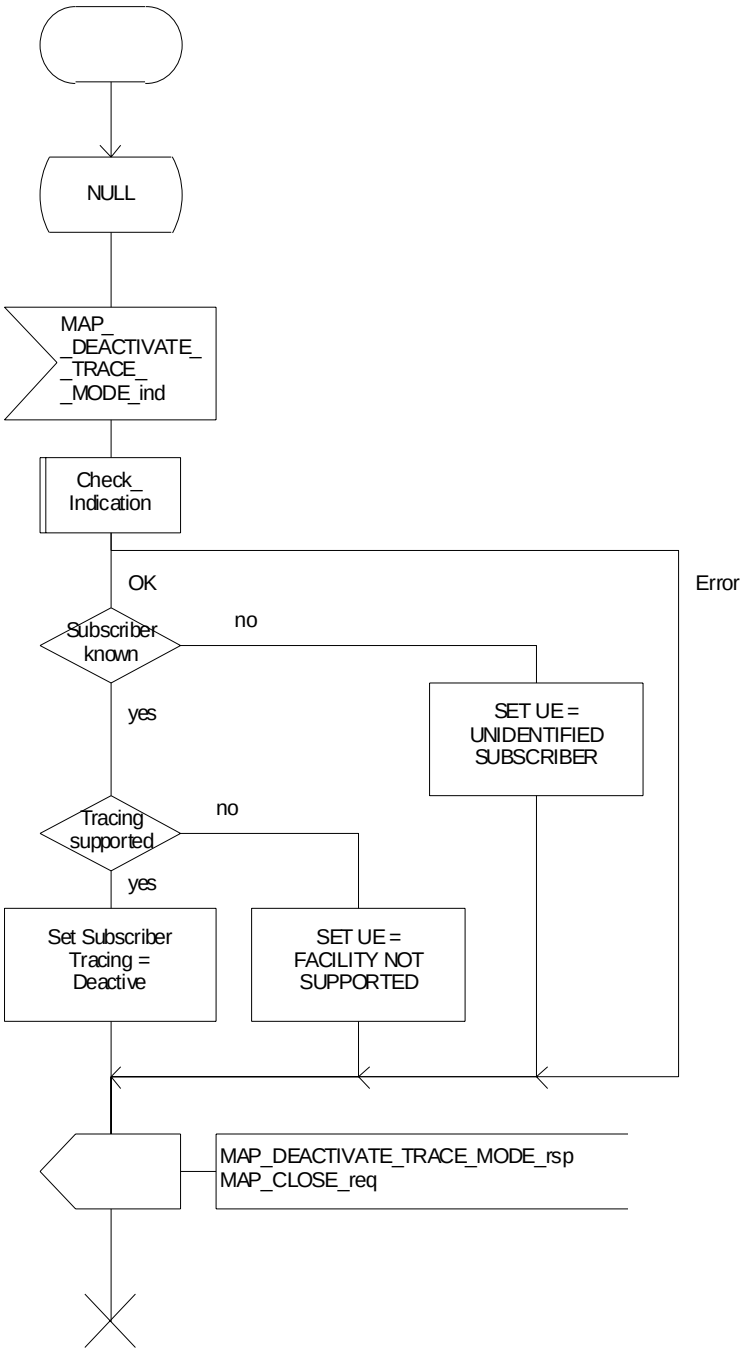


Figure 20.2/17: Process DTM_SGSN_Standalone

20.3 Subscriber data management procedures

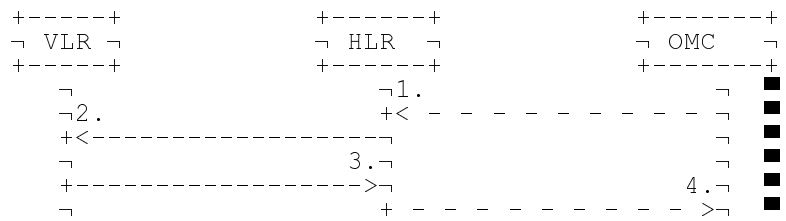
Two types of subscriber data management procedures exist in the Mobile Application Part

i) Subscriber Deletion;

ii) Subscriber Data Modification.

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

The subscriber deletion and subscriber data modification procedures are initiated by the OMC (see figures 20.3/1 , 20.3/2, 20.3/8 and 20.3/9).



1) Delete Subscriber

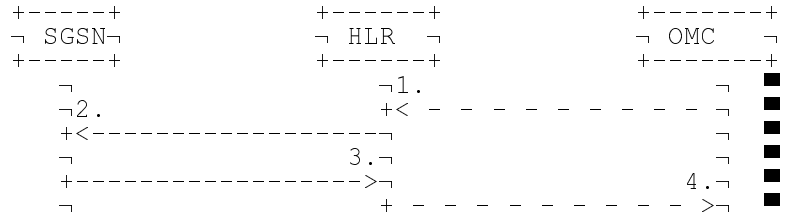
2) MAP_CANCEL_LOCATION

3) MAP_CANCEL_LOCATION_ACK

4) Subscriber Deleted

Figure 20.3/1: Subscriber deletion procedure

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



1) Delete GPRS Subscriber

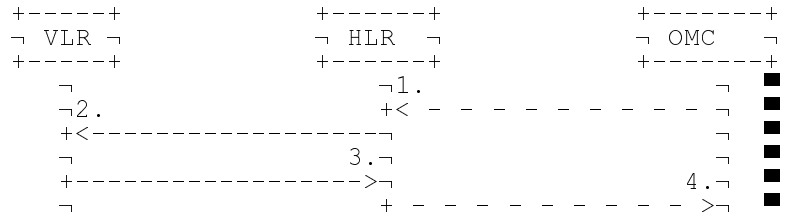
2) MAP_CANCEL_LOCATION

3) MAP_CANCEL_LOCATION_ACK

4) GPRS Subscriber Deleted

Figure 20.3/8: Subscriber deletion procedure for GPRS

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



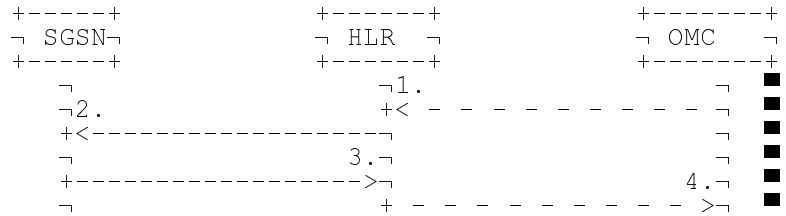
1) Modify Subscriber Data

2) MAP_CANCEL_LOCATION, MAP_INSERT_SUBSCRIBER_DATA or MAP_DELETE_SUBSCRIBER_DATA

3) MAP_CANCEL_LOCATION_ACK, MAP_INSERT_SUBSCRIBER_DATA_ACK or MAP_DELETE_SUBSCRIBER_DATA_ACK

4) Subscriber Data Modified

Figure 20.3/2: Subscriber data modification procedure



1) Modify Subscriber Data

2) MAP_CANCEL_LOCATION, MAP_INSERT_SUBSCRIBER_DATA or MAP_DELETE_SUBSCRIBER_DATA

3) MAP_CANCEL_LOCATION_ACK, MAP_INSERT_SUBSCRIBER_DATA_ACK or MAP_DELETE_SUBSCRIBER_DATA_ACK

4) Subscriber Data Modified

Figure 20.3/9: Subscriber data modification procedure for GPRS

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

20.3.1 Procedures in the HLR

20.3.1.1 Subscriber deletion procedure

When the subscriber deletion request is received from the OMC, the HLR shall delete the subscriber data from the HLR and initiate the MAP_CANCEL_LOCATION request to the VLR or to the SGSN where the subscriber is registered.

The subscriber deletion procedure in the HLR is shown in the figure 20.3/3.

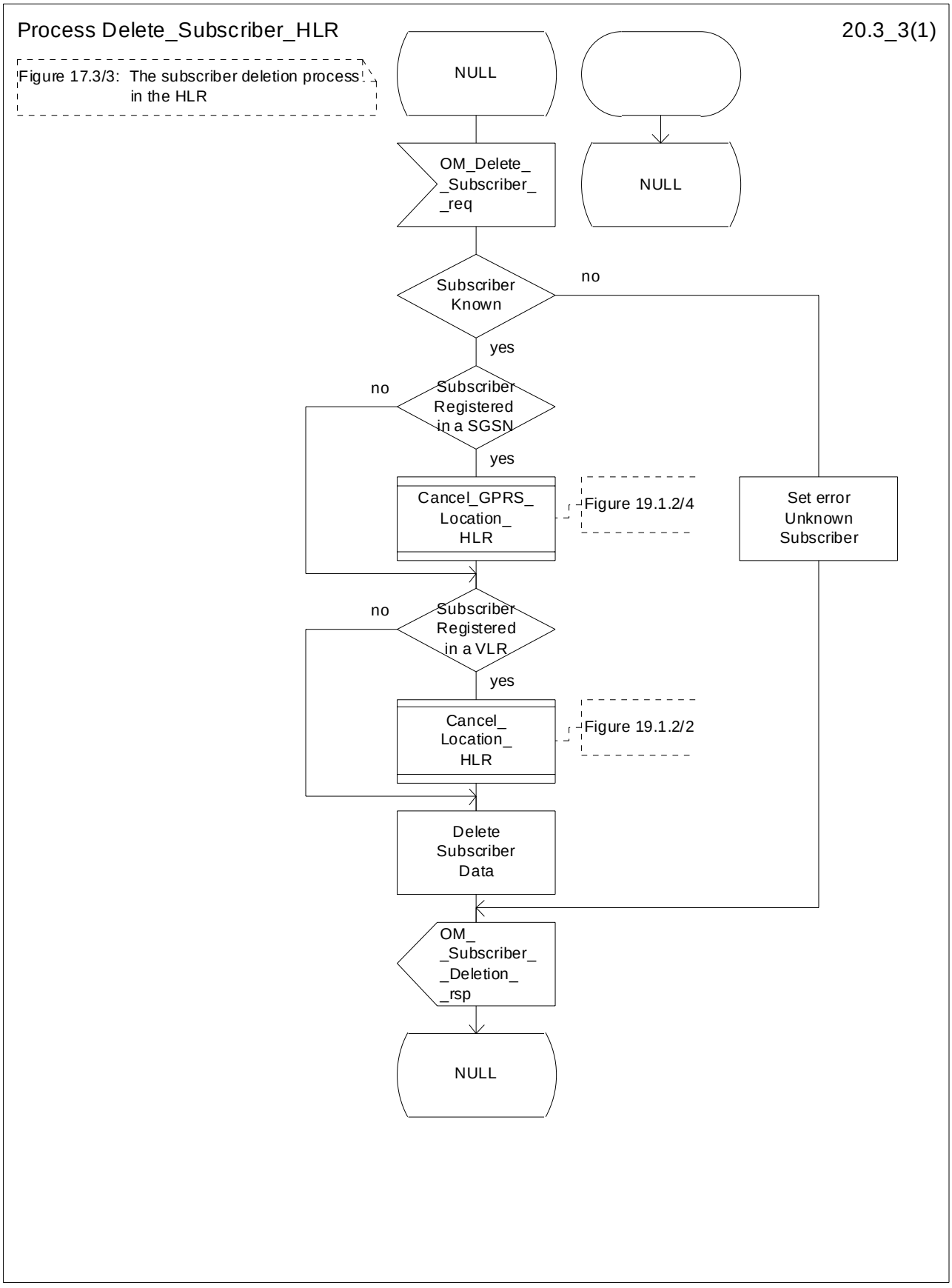


Figure 20.3/3: Process Delete_Subscriber_HLR

20.3.1.2 Subscriber data modification procedure

The OMC can modify the subscriber data in several different ways. The modifications can be categorized in following groups:

a) no effect in the VLR;

b) data shall be modified in both the HLR and the VLR;

c) withdrawal of a basic service or a supplementary service requiring change to VLR data;

d) modification affects on the roaming of the subscriber and the subscriber shall be removed from the VLR data base;

e) authentication algorithm or authentication key of the subscriber is modified;

f) no effect in the SGSN;

g) data shall be modified in both the HLR and the SGSN;

h) withdrawal of a GPRS subscription data or a basic service or both requiring change to SGSN data;

i) modification affects on the roaming of the subscriber and the subscriber shall be removed from the SGSN data base;

j) withdrawal of GPRS Subscription related to Network Access Mode;

k) withdrawal of non-GPRS Subscription related to Network Access Mode;

In case "b" and “g” the MAP_INSERT_SUBSCRIBER_DATA service is initiated in the HLR.

In case "c" and “h” the MAP_DELETE_SUBSCRIBER_DATA service is initiated in the HLR.

In cases "d", "e", “i”, “j” and “k” the MAP_CANCEL_LOCATION service is initiated in the HLR.

If the result of a primitive received from the VLR or from the SGSN is unsuccessful, the HLR may initiate re-attempts; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or by the SGSN.

The subscriber data modification procedure in the HLR is shown in the figures 20.3/4, 20.3/5 and 25.7/2.

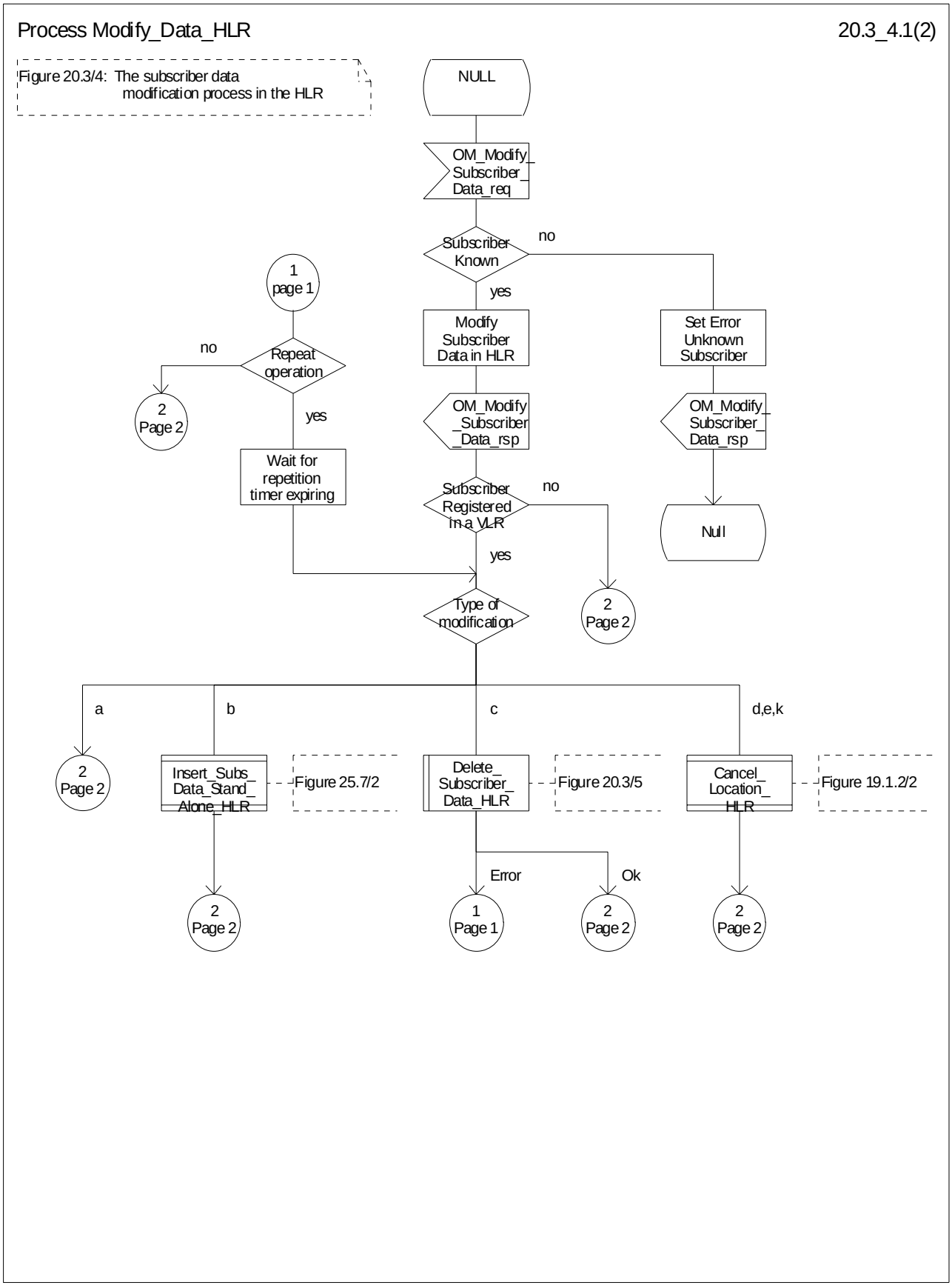


Figure 20.3/4 (sheet 1 of 2): Process Modify_Data_HLR

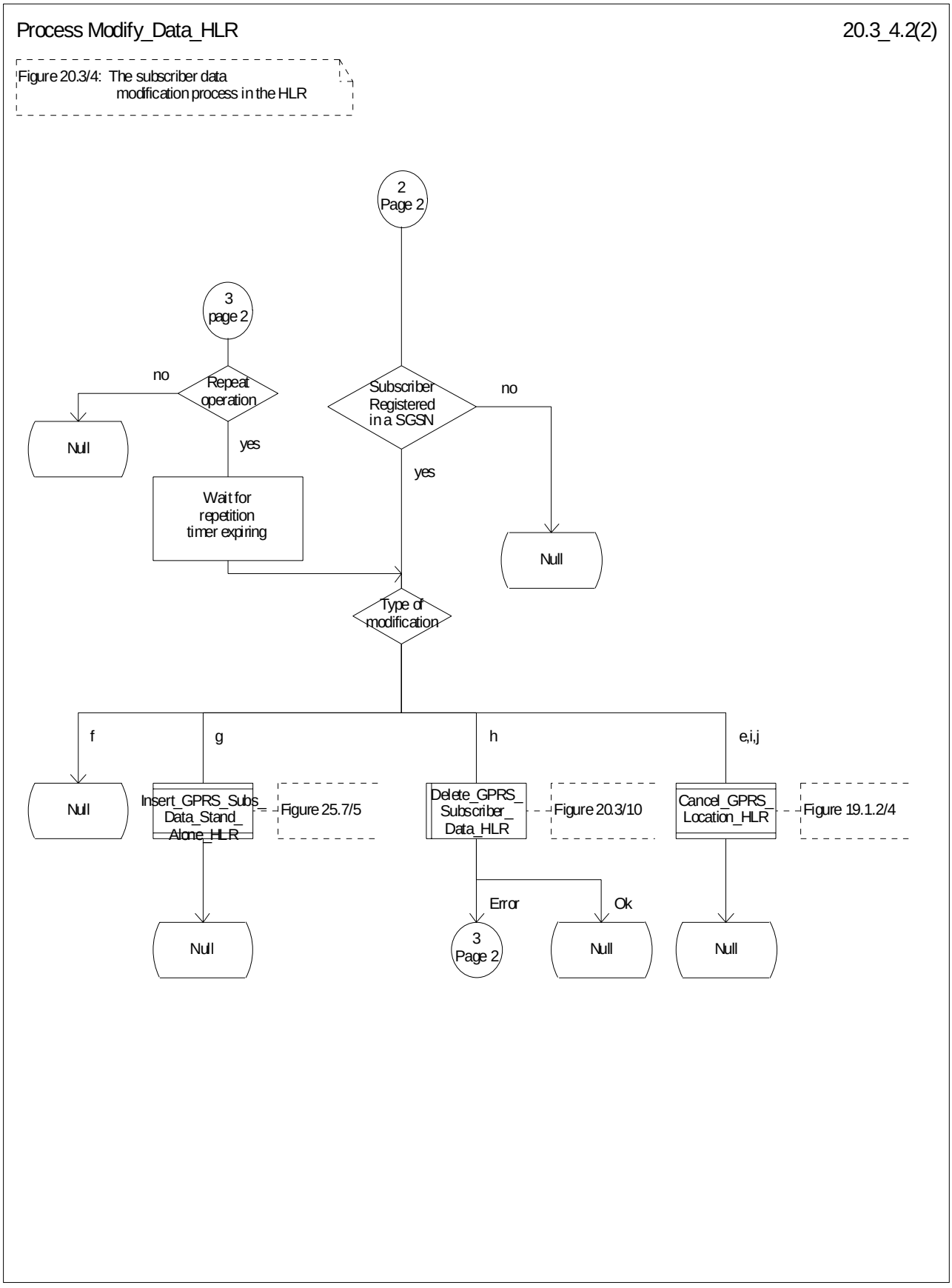


Figure 20.3/4 (sheet 2 of 2): Process Modify_Data_HLR

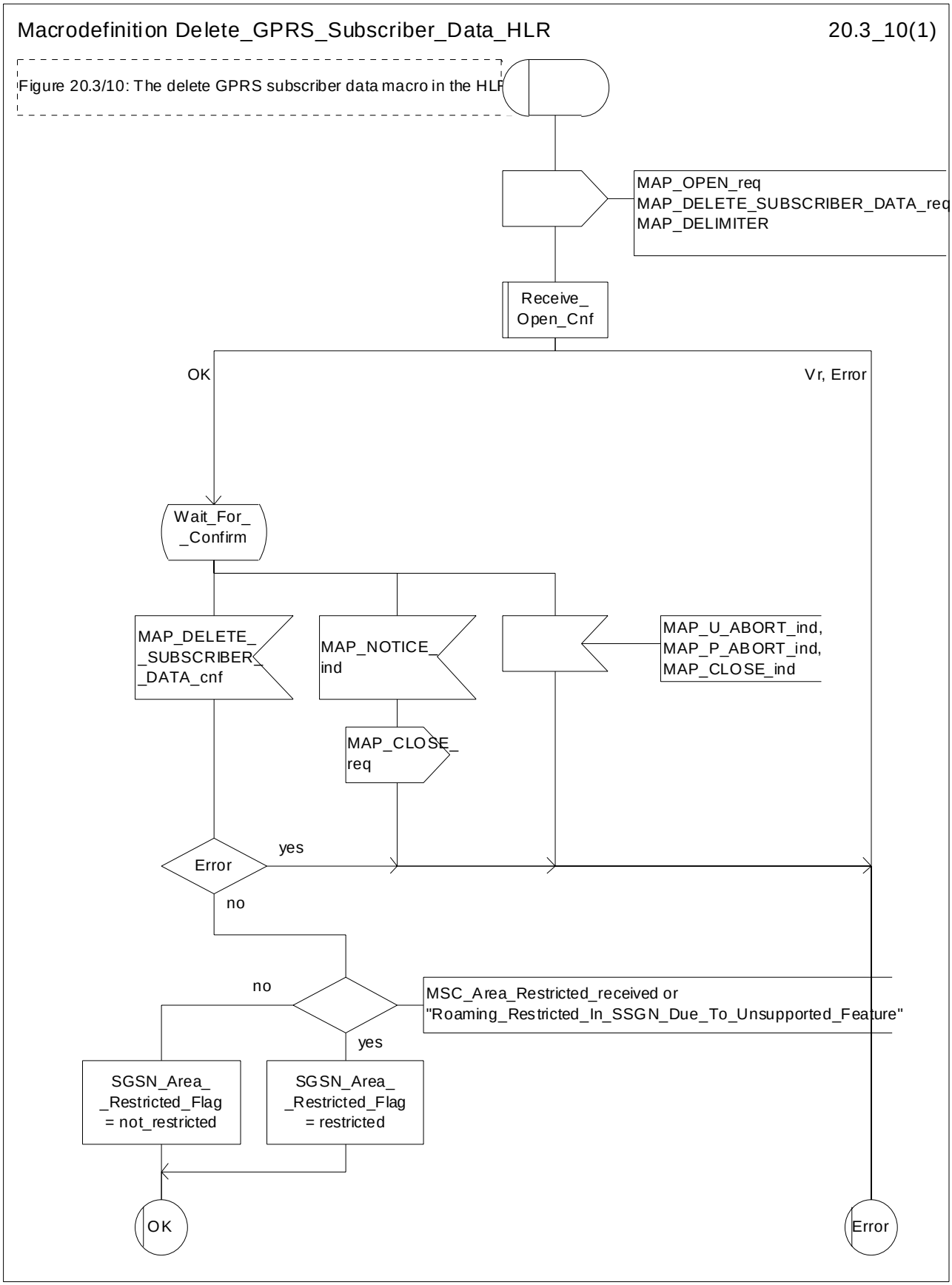


Figure 20.3/10: Macro Delete_GPRS_Subscriber_Data_HLR

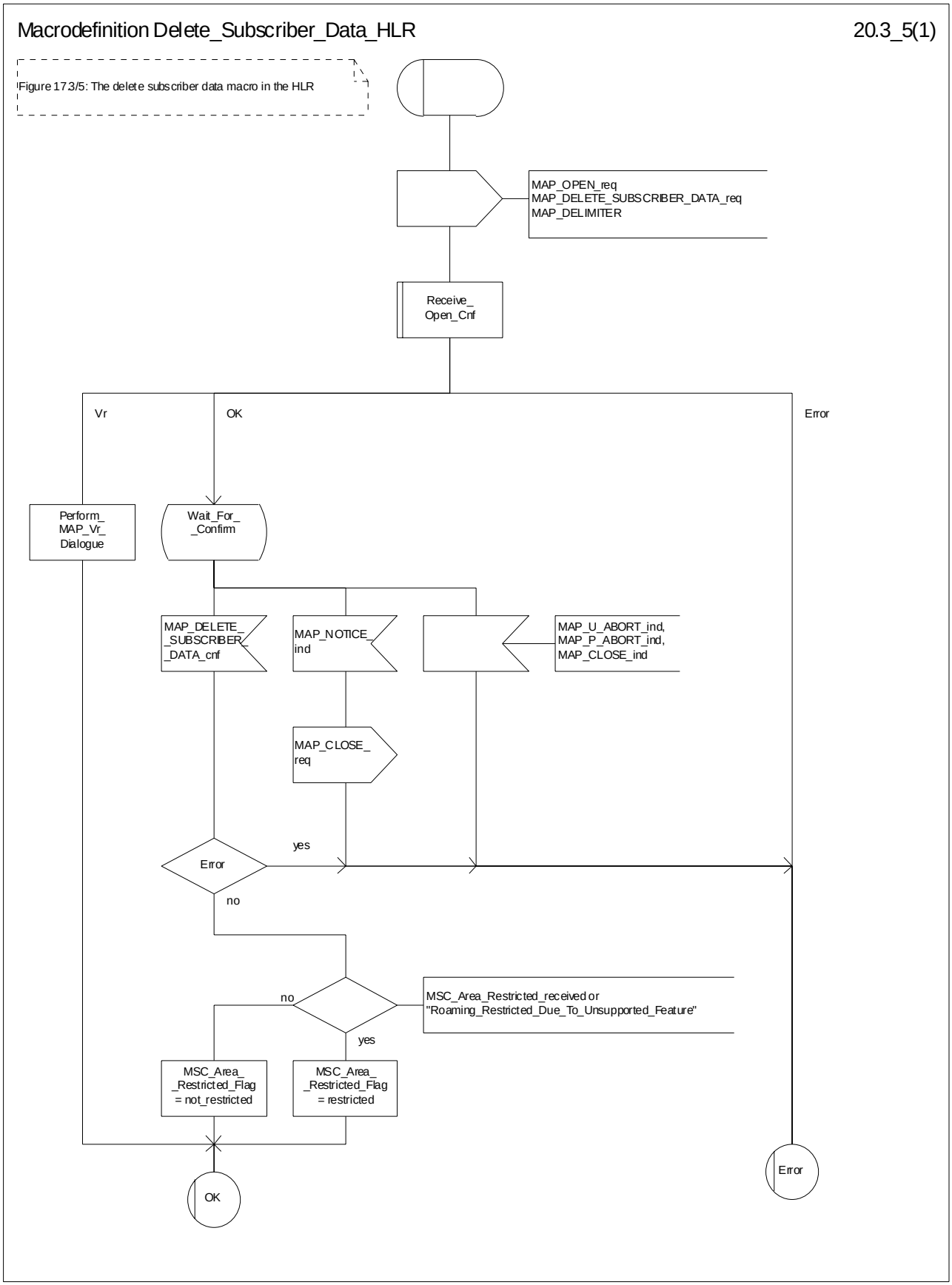


Figure 20.3/5: Macro Delete_Subscriber_Data_HLR

20.3.2 Procedures in the VLR

20.3.2.1 Subscriber deletion procedure

The subscriber deletion procedure in the VLR is described in the subclause 19.1.

20.3.2.2 Subscriber data modification procedure

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

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

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

If the entire MSC area is restricted due to regional subscription, this is reported to the HLR.

If the updating of the subscriber data is not possible, the VLR will initiate the MAP_U_ABORT request primitive. If the updating is successful, the MAP_CLOSE indication is received from the HLR.

The subscriber data modification procedure in the VLR is shown in the figures 20.3/6, 20.3/7 and 25.7/1.

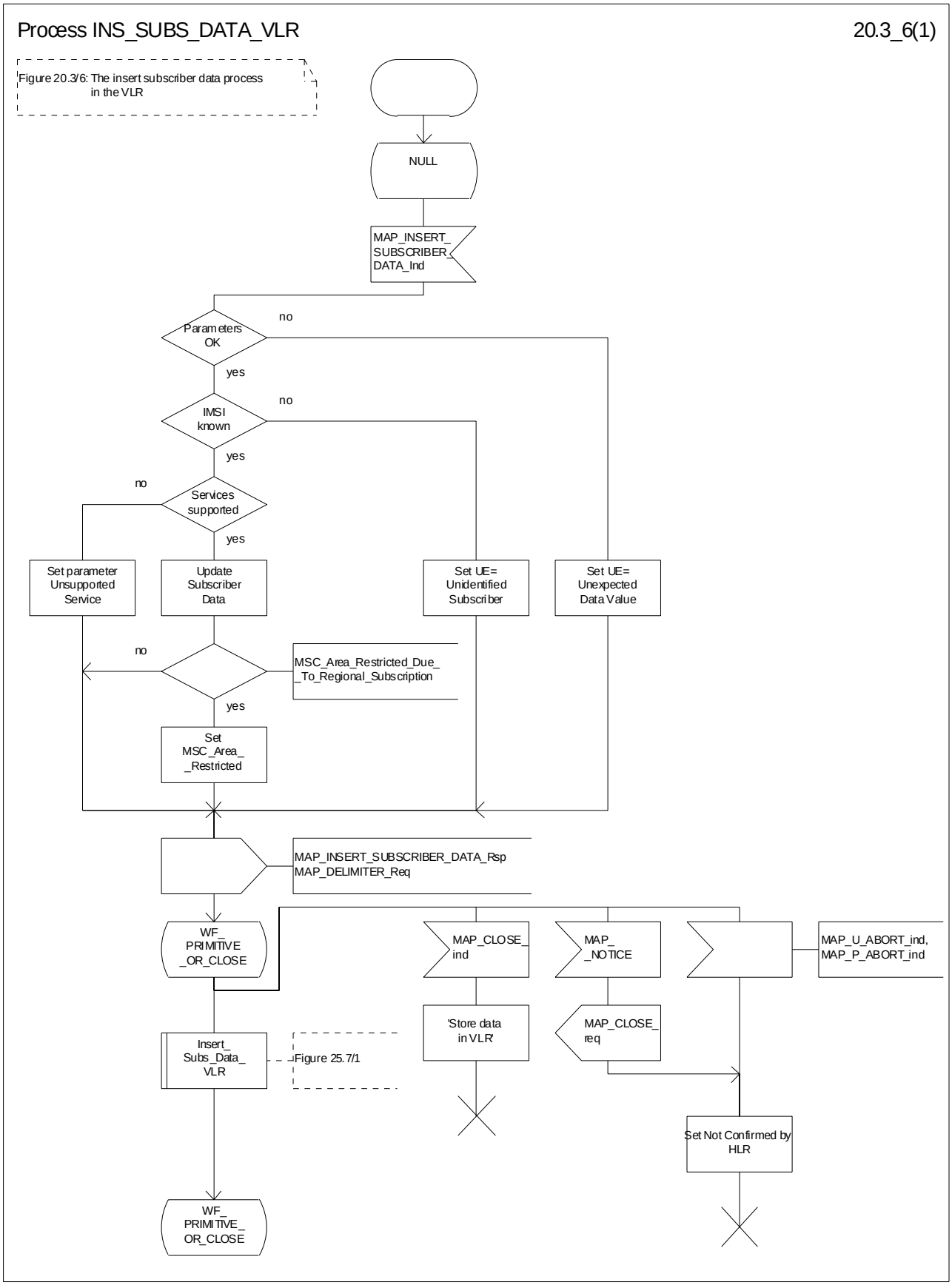


Figure 20.3/6: Process INS_SUBS_DATA_VLR

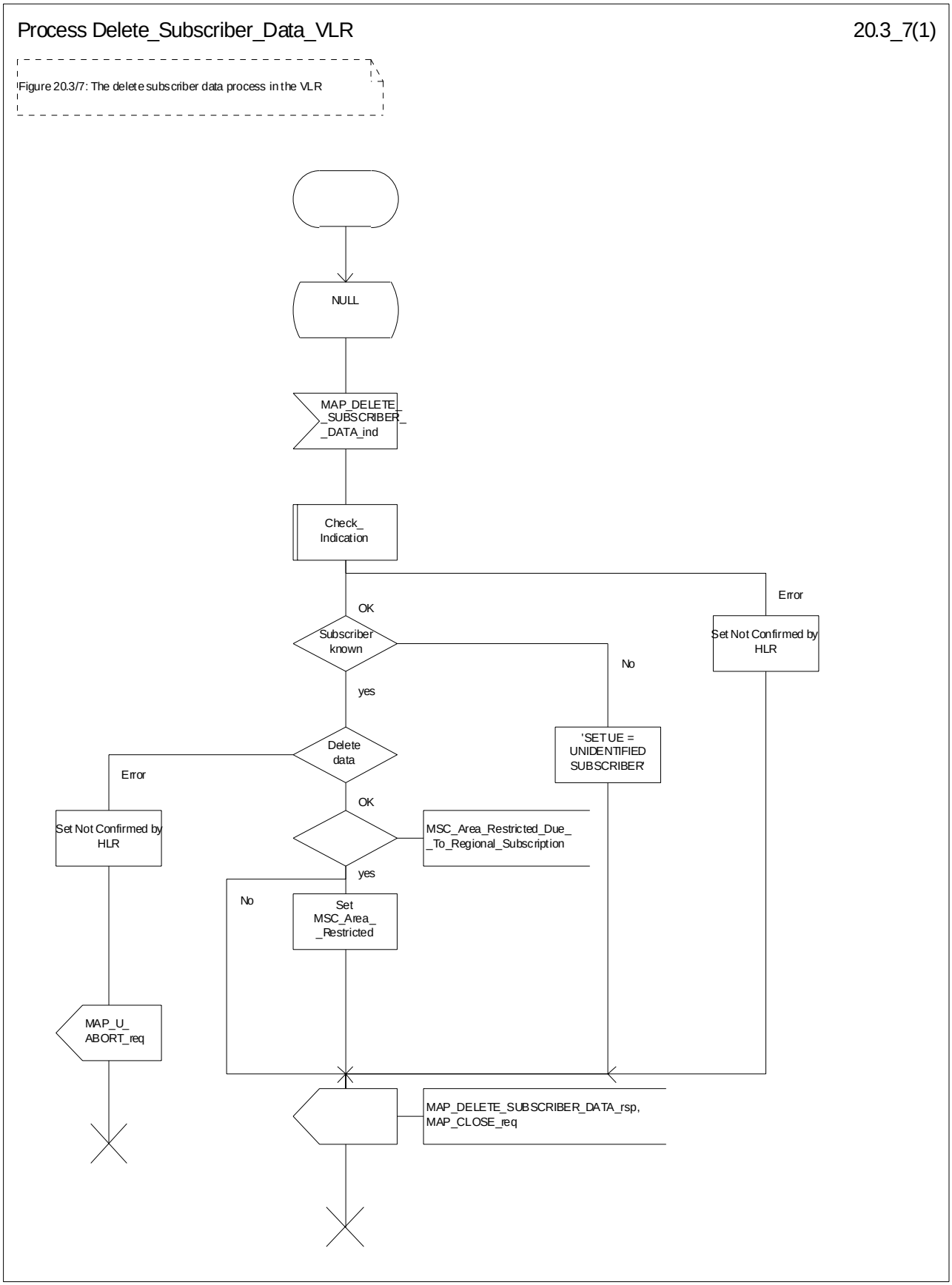


Figure 20.3/7: Process Delete_Subscriber_Data_VLR

20.3.3 Procedures in the SGSN

20.3.3.1 Subscriber deletion procedure

The subscriber deletion procedure in the SGSN is described in the subclause 19.1.

20.3.3.2 Subscriber data modification procedure

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

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

If the SGSN does not support received basic services or the network feature Operator Determined Barring, or there is a problem with Regional Subscription Data then it reports it to the HLR.

If the entire SGSN area is restricted due to regional subscription, this is reported to the HLR.

If the updating of the subscriber data is not possible, the SGSN will initiate the MAP_U_ABORT request primitive. If the updating is successful, the MAP_CLOSE indication is received from the HLR.

The subscriber data modification procedure in the SGSN is shown in the figures 20.3/11, 20.3/12 and 25.7/5.

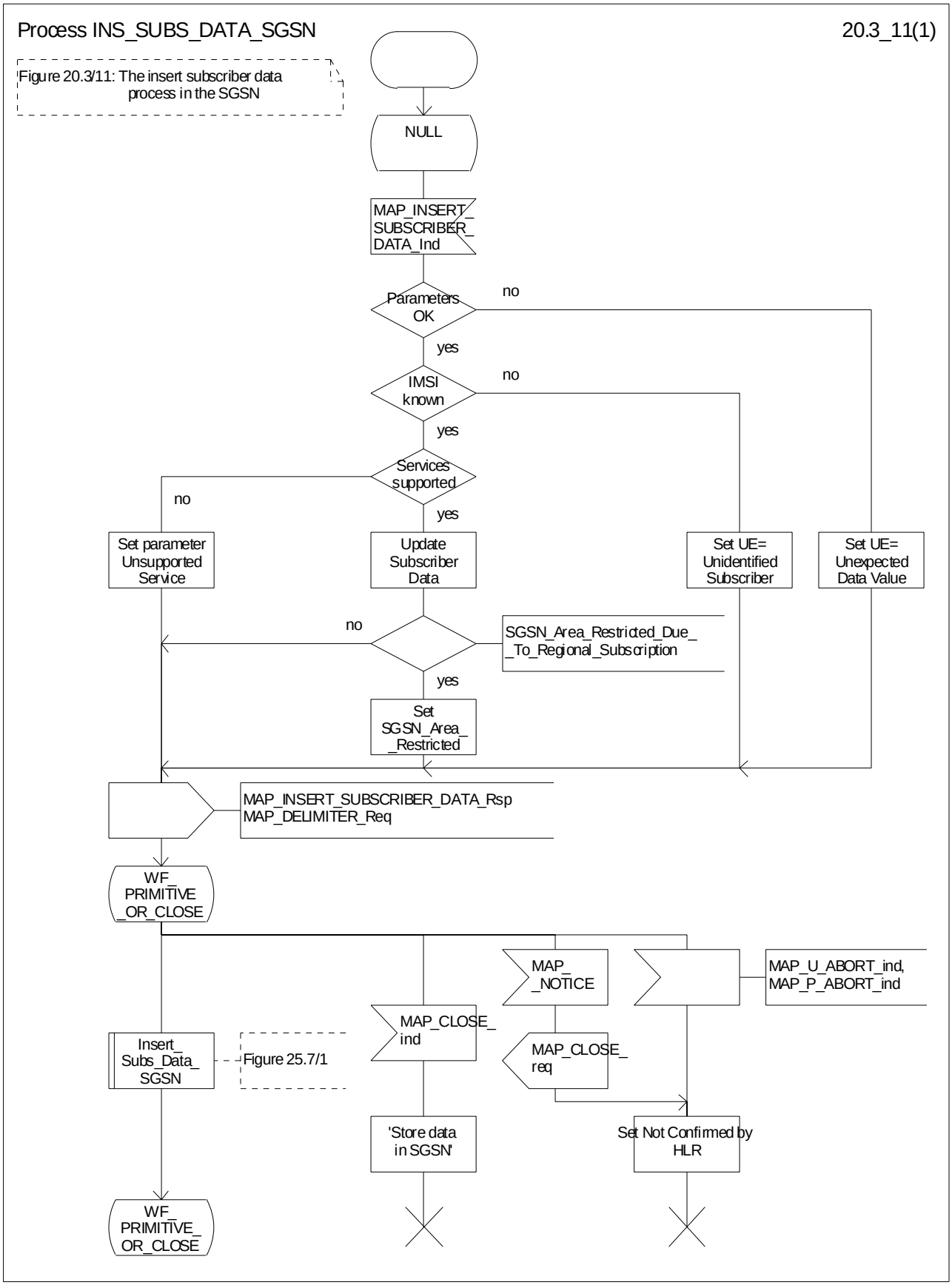


Figure 20.3/11: Process INS_SUBS_DATA_SGSN

Process Delete_Subscriber_Data_SGSN 20.3_12(1)

Figure 20.3/12: The delete subscriber data process in the SGSN

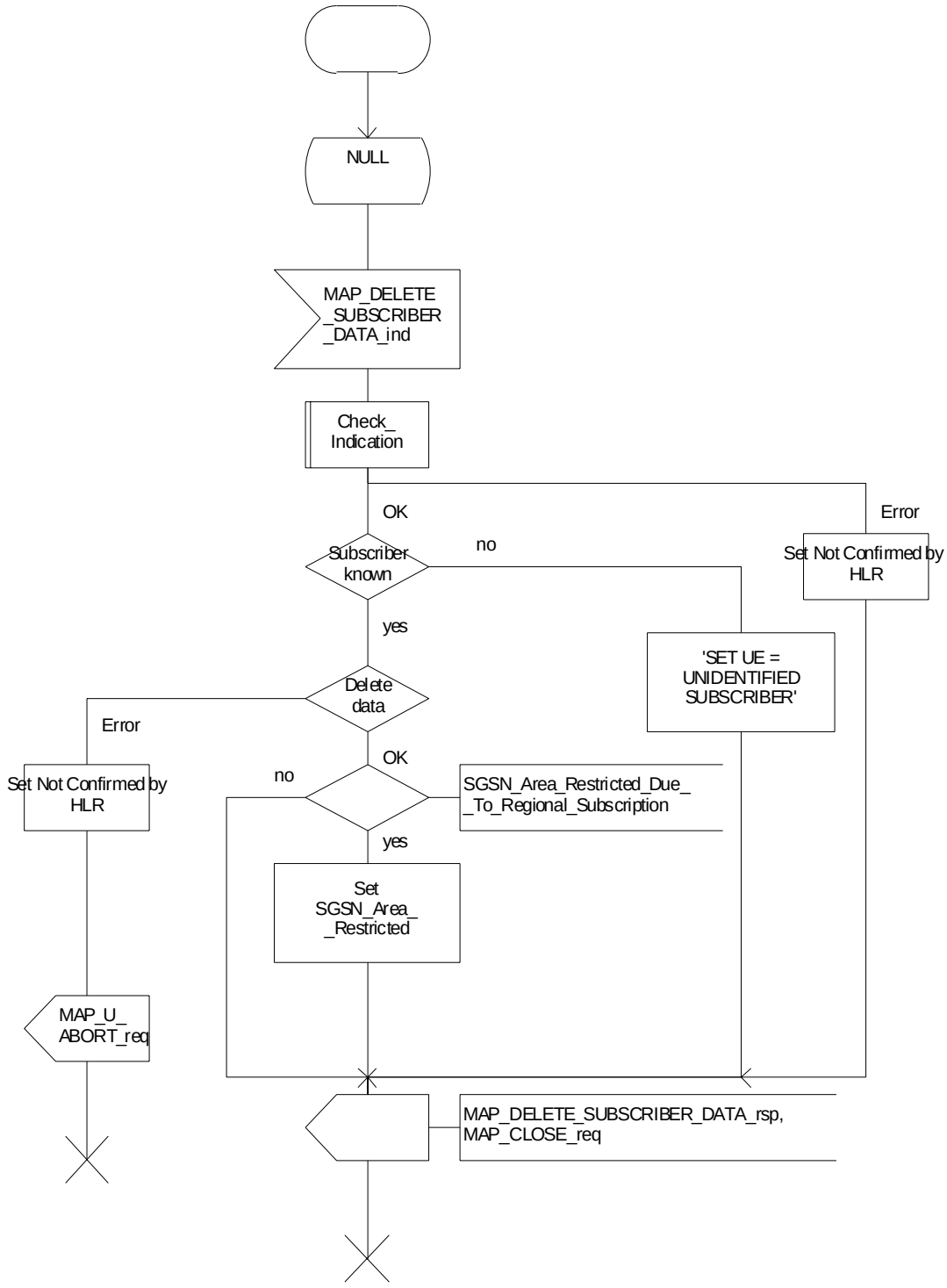
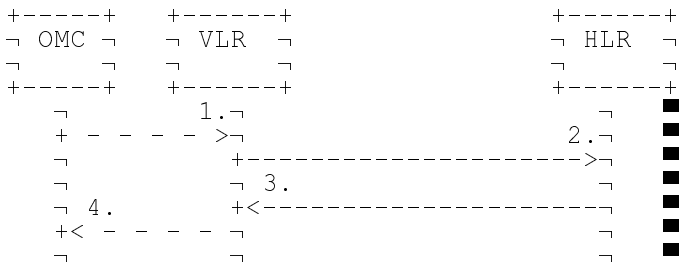


Figure 20.3/12: Process Delete_Subscriber_Data_SGSN

20.4 Subscriber Identity procedure

In the subscriber identity procedure the IMSI of the subscriber is retrieved from the HLR. The procedure is shown in figure 20.4/1.



1) Identity request

2) MAP_SEND_IMSI

3) MAP_SEND_IMSI_ACK

4) Identity confirm

Figure 20.4/1: The subscriber identity procedure

20.4.1 Subscriber identity procedure in the HLR

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1, with outcomes:

- procedure termination; or
- dialogue acceptance, with proceeding as below.

When receiving the MAP_SEND_IMSI indication, the HLR will check the parameters and data in the primitive. Data errors are reported as an unexpected data value error or a data missing error depending on the nature of the error.

If the subscriber is known in the HLR, the IMSI is fetched from the database and sent to the VLR. If the MSISDN cannot be identified, unknown subscriber indication is passed to the VLR.

The subscriber identity procedure in the HLR is shown in figure 20.4/2.

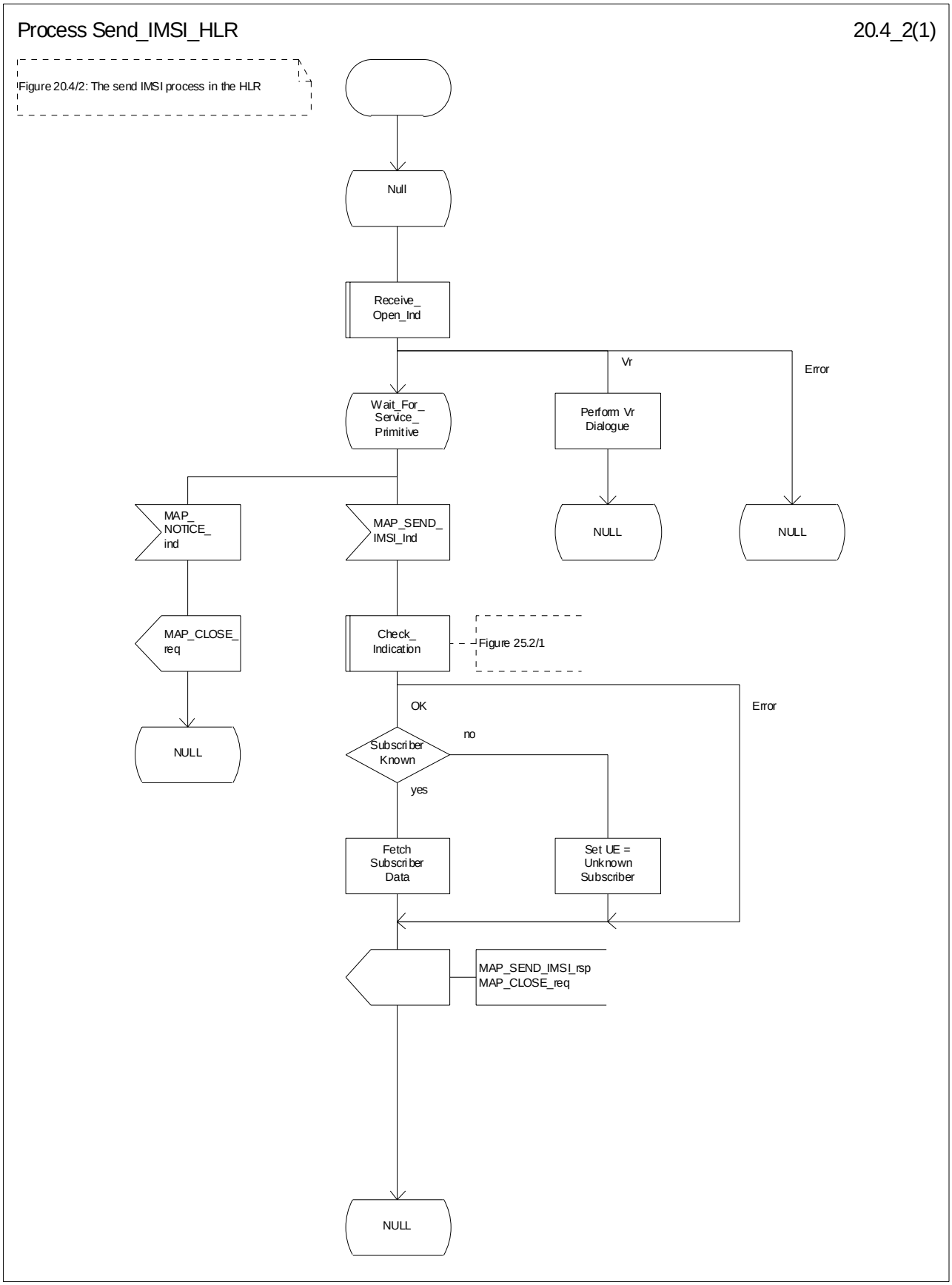


Figure 20.4/2: Process Send_IMSI_HLR

20.4.2 Subscriber identity procedure in the VLR

When the IMSI request is received from the OMC, the VLR will send the MAP_SEND_IMSI request to the HLR. The contents of the response is sent to the OMC.

The subscriber identity procedure in the VLR is shown in figure 20.4/3.

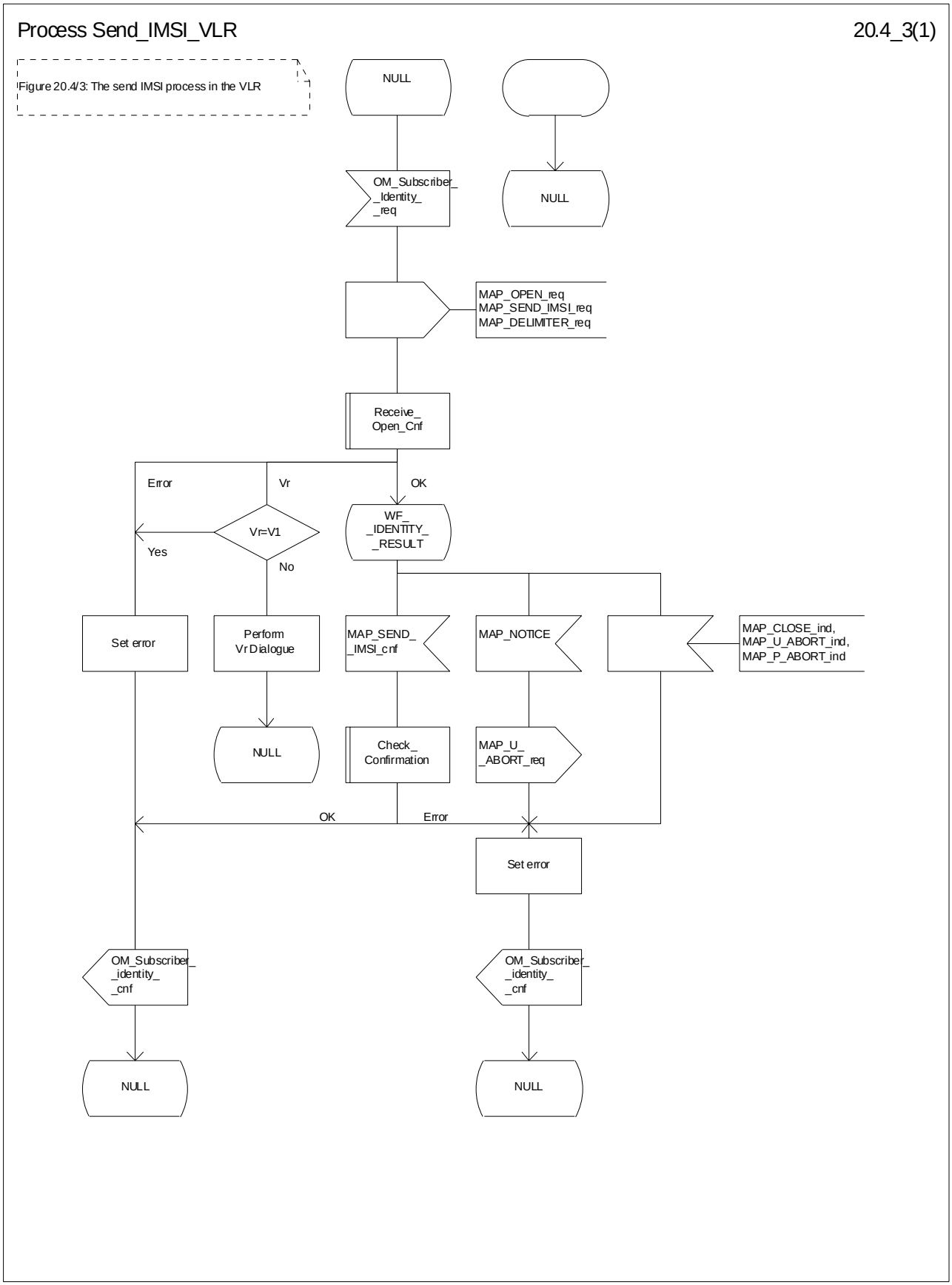


Figure 20.4/3: Process Send_IMSI_VLR

21 Call handling procedures

21.1 General

The MAP call handling procedures are used:

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

The procedures to handle a mobile originating call and a mobile terminating call after the call has arrived at the destination MSC do not require any signalling over a MAP interface. These procedures are specified in GSM 03.18 [97].

The stage 2 specification for the retrieval of routeing information to handle a mobile terminating call is in GSM 03.18 [97]; modifications to this procedure for CAMEL are specified in GSM 03.78 [98], for optimal routeing of a basic mobile-to-mobile call in GSM 03.79 [99] and for CCBS in GSM 03.93. The interworking between the MAP signalling procedures and the call handling procedures for each entity (GMSC, HLR and VLR) is shown by the transfer of signals between these procedures.

The stage 2 specification for the transfer of control of a call back to the GMSC if the call is to be forwarded is in GSM 03.79 [99]. The interworking between the MAP signalling procedures and the call handling procedures for each entity (VMSC and GMSC) is shown by the transfer of signals between these procedures.

The stage 2 specifications for inter MSC group calls / broadcast calls are in GSM 03.68 and GSM 03.69. The interworking between the MAP signalling procedures and the group call /broadcast call procedures for each entity (Anchor MSC and Relay MSC) is shown by the transfer of signals between these procedures.

The stage 2 specification for the allocation of resources in an SIWFS is in GSM 03.54. The interworking between the MAP signalling procedures and the call handling procedures for each entity (VMSC and SIWFS) is shown by the transfer of signals between these procedures.

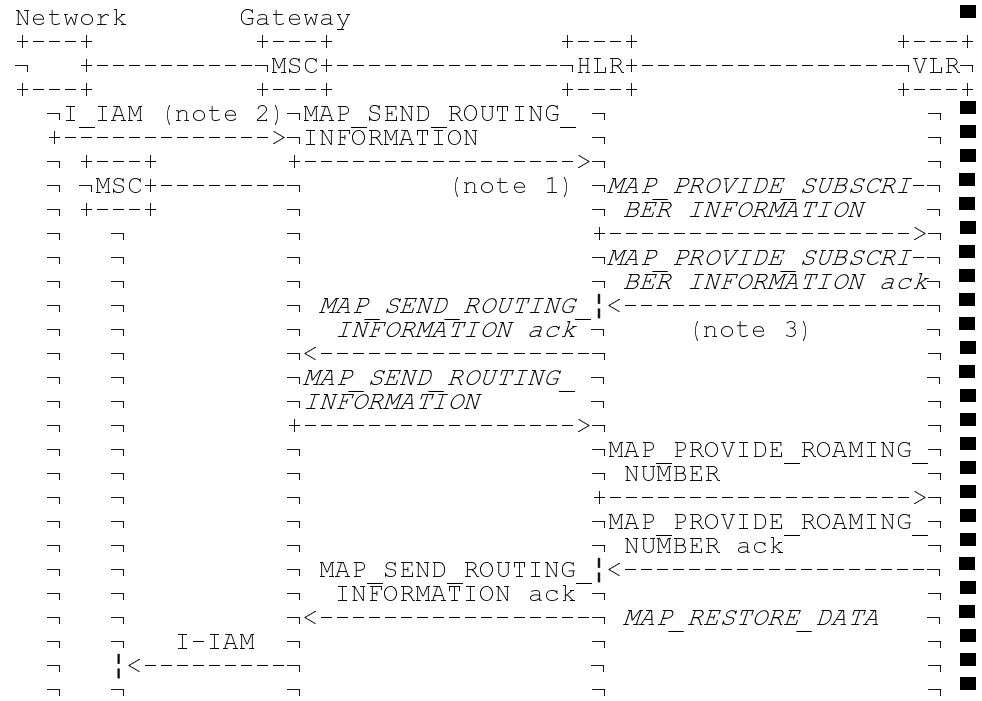
The interworking between the call handling procedures and signalling protocols other than MAP is shown in GSM 03.18,GSM 03.78 and GSM 03.79.

The stage 2 specification for the handling of reporting of MS status for call completion services and notification of remote user free for CCBS is in GSM 03.93.

21.2 Retrieval of routing information

21.2.1 General

The message flows for successful retrieval of routeing information for a mobile terminating call are shown in figure 21.2/1 (mobile terminating call which has not been optimally routed) and 21.2/2 (mobile-to-mobile call which has been optimally routed).



Notes:

xxx = Optional Procedure

NOTE 1: This service may also be used by an ISDN exchange for obtaining routing information from the HLR.

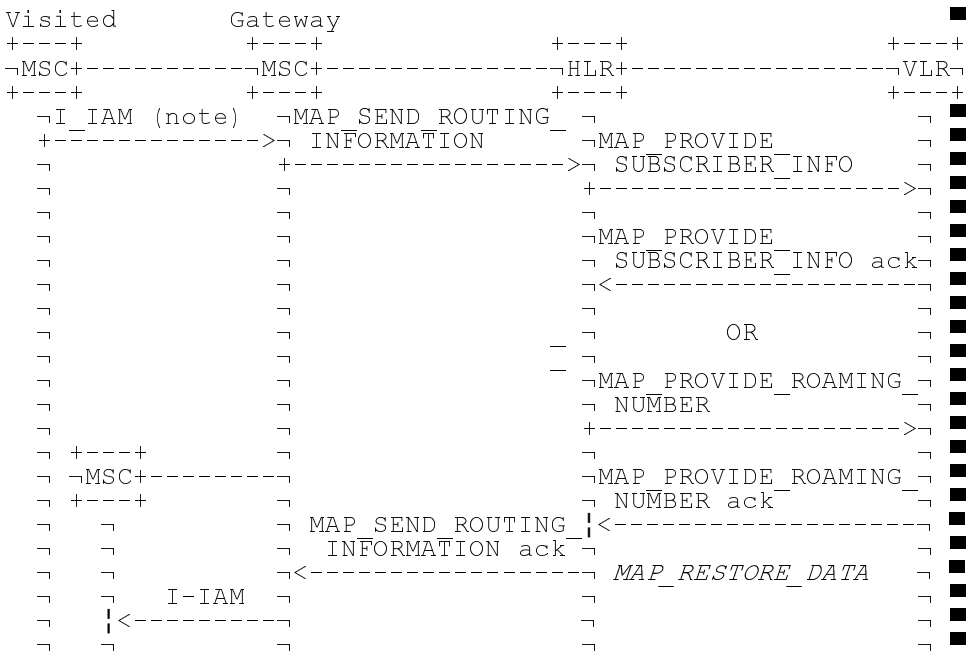
NOTE 2: TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. For further details on the TUP and ISUP procedures refer to the following ITU-T Recommendations and ETSI specification:

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

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

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

Figure 21.2/1: Message flow for retrieval of routeing information (non-optimally routed call)



Notes:

xxx = Optional Procedure

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

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

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

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

Figure 21.2/2: Message flow for retrieval of routeing information (optimally routed call)

The following MAP services are used to retrieve routing information:

MAP_SEND_ROUTING_INFORMATION	see subclause 10.1;
MAP_PROVIDE_ROAMING_NUMBER	see subclause 10.2;
MAP_PROVIDE_SUBSCRIBER_INFO	see subclause 8.11.2;
MAP_RESTORE_DATA	see subclause 8.10.3.

21.2.2 Process in the GMSC

The MAP process in the GMSC to retrieve routeing information for a mobile terminating call is shown in figure 21.2/3. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Send Routeing Info request from the call handling process in the GMSC, it requests a dialogue with the HLR whose identity is contained in the Send Routeing Info request by sending a MAP_OPEN service request, requests routeing information using a MAP_SEND_ROUTING_INFORMATION service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_SEND_ROUTING_INFORMATION service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm. If the MAP_SEND_ROUTING_INFORMATION confirm from the HLR cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Send Routeing Info ack containing the routeing information received from the HLR to the call handling process in the GMSC and returns to the idle state.

Earlier version MAP dialogue with the HLR

If the macro Receive_Open_Cnf takes the Vr exit, the MAP process checks whether this is an OR interrogation (indicated by the inclusion of the OR interrogation parameter in the MAP_SEND_ROUTING_INFORMATION service request).

If this is not an OR interrogation, the GMSC performs the earlier version MAP dialogue as specified in [51] or [96] and the process returns to the idle state.

If this is an OR interrogation, the MAP process sends a Send Routeing Info negative response indicating OR not allowed to the call handling process in the GMSC and returns to the idle state.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the HLR could not be opened, the MAP process sends an Abort to to the call handling process in the GMSC and returns to the idle state.

Error in MAP_SEND_ROUTING_INFORMATION confirm

If the MAP_SEND_ROUTING_INFORMATION service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Send Routeing Info negative response to the call handling process in the GMSC and returns to the idle state.

Call release

If the call handling process in the GMSC indicates that the call has been aborted (i.e. prematurely released by the calling subscriber), the MAP process returns to the idle state. Any response from the HLR will be discarded.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the HLR may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends a Send Routeing Info negative response to the call handling process in the GMSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a Send Routeing Info negative response indicating system failure to the call handling process in the GMSC and returns to the idle state.

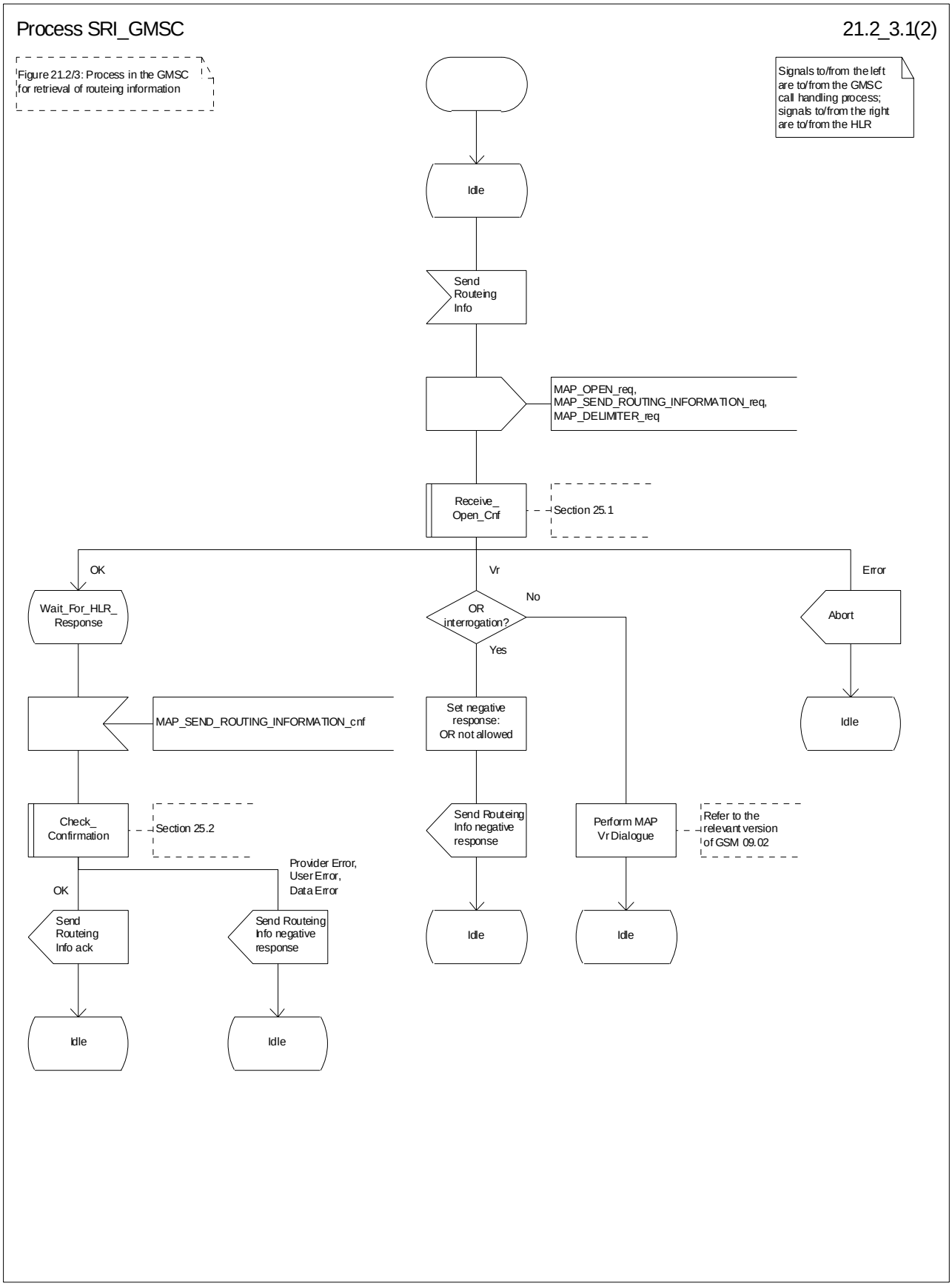


Figure 21.2/3 (sheet 1 of 2): Process SRI_GMSC

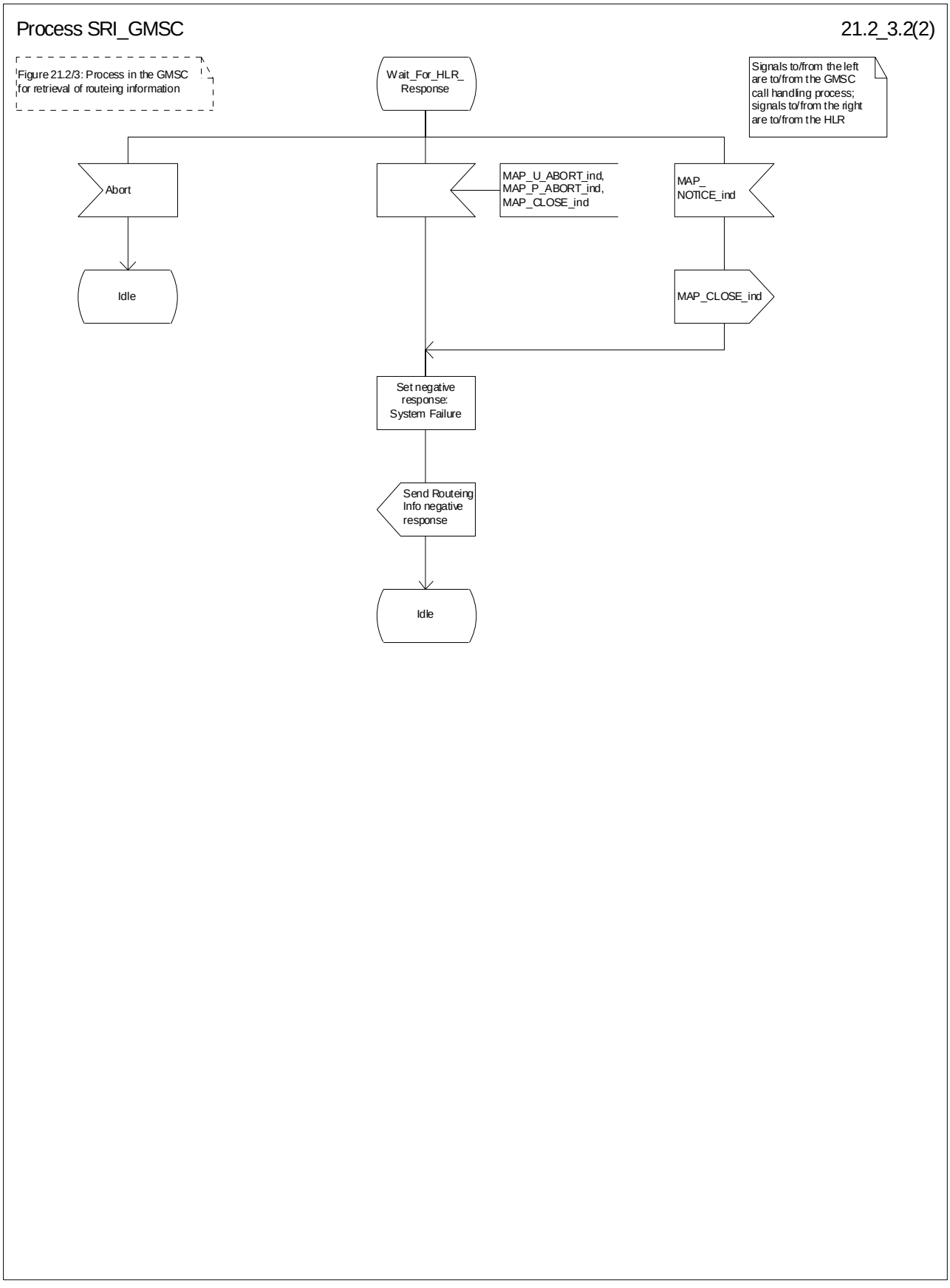


Figure 21.2/3 (sheet 2 of 2): Process SRI_GMSC

21.2.3 Procedures in the HLR

The MAP process in the HLR to retrieve routeing information for a mobile terminating call is shown in figure 21.2/4. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context locInfoRetrieval, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_SEND_ROUTING_INFORMATION service indication is received, the MAP process sends a Send Routeing Info request to the call handling process in the HLR, and waits for a response. The Send Routeing Info request contains the parameters received in the MAP_SEND_ROUTING_INFORMATION service indication.

If the call handling process in the HLR returns a Send Routeing Info ack, the MAP process constructs a MAP_SEND_ROUTING_INFORMATION service response containing the routeing information contained in the Send Routeing Info ack, constructs a MAP_CLOSE service request, sends them to the GMSC and returns to the idle state. If the MAP_SEND_ROUTING_INFORMATION response cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

If the call handling process in the HLR returns a Provide Subscriber Info request, the MAP process requests a dialogue with the VLR whose identity is contained in the Provide Subscriber Info request by sending a MAP_OPEN service request, requests the subscriber status using a MAP_PROVIDE_SUBSCRIBER_INFO service request, and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request.

If the macro takes the OK exit, the MAP process waits for the response from the VLR.

If the MAP process receives a MAP_PROVIDE_SUBSCRIBER_INFO service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Provide Subscriber Info ack containing the information received in the MAP_PROVIDE_SUBSCRIBER_INFO service confirm to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP_PROVIDE_SUBSCRIBER_INFO service confirm contains a provider error or a data error, the MAP process sends a Provide Subscriber Info negative response indicating the type of error to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

NOTE: The 'User Error' exit from the macro Check_Confirmation is shown for formal completeness; the MAP_PROVIDE_SUBSCRIBER_INFO_cnf primitive cannot contain a user error.

If the call handling process in the HLR returns a Provide Roaming Number request, the MAP process requests a dialogue with the VLR whose identity is contained in the Provide Roaming Number request by sending a MAP_OPEN service request, requests a roaming number using a MAP_PROVIDE_ROAMING_NUMBER service request, and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request.

If the macro takes the OK exit, the MAP process waits for the response from the VLR.

If the MAP process receives a MAP_PROVIDE_ROAMING_NUMBER service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Provide Roaming Number ack containing the MSRN received in the MAP_PROVIDE_ROAMING_NUMBER service confirm to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP_PROVIDE_ROAMING_NUMBER service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Provide Roaming Number negative response indicating the type of error to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response, either before or after a dialogue with the VLR to obtain a roaming number, the MAP process constructs a MAP_SEND_ROUTING_INFORMATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GMSC and returns to the idle state.

Earlier version MAP Provide Roaming Number dialogue with the VLR

If the macro Receive_Open_Cnf takes the Vr exit after the MAP process has requested opening of a Provide Roaming Number dialogue with the VLR, the MAP process checks whether this is an OR interrogation (indicated by the inclusion of the OR interrogation parameter in the MAP_PROVIDE_ROAMING_NUMBER service request).

If this is not an OR interrogation, the HLR performs the earlier version MAP dialogue as specified in [51] or [96], relays the result of the dialogue to the HLR call handling process, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If this is an OR interrogation, the MAP process sends a Provide Roaming Number negative response indicating OR not allowed to the call handling process in the HLR and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Failure of Provide Subscriber Info dialogue with the VLR

If the Receive_Open_Cnf macro takes the Vr exit or the Error exit after the MAP process has requested opening of a Provide Subscriber Info dialogue with the VLR, the MAP process sends a Provide Subscriber Info negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Failure of Provide Roaming Number dialogue with the VLR

If the Receive_Open_Cnf macro takes the Error exit after the MAP process has requested opening of a Provide Roaming Number dialogue with the VLR, the MAP process sends a Provide Roaming Number negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP process receives a MAP_U_ABORT, a MAP_P_ABORT or a premature MAP_CLOSE from the MAP provider, it sends a Provide Roaming Number negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP process receives a MAP_NOTICE from the MAP provider, it returns a MAP_CLOSE request to the MAP provider, sends a Provide Roaming Number negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Earlier version MAP dialogue with the GMSC

If the macro Receive_Open_Ind takes the Vr exit, the the HLR performs the earlier version MAP dialogue as specified in [51] or [96] and the process returns to the idle state.

Failure of dialogue opening with the GMSC

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

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

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

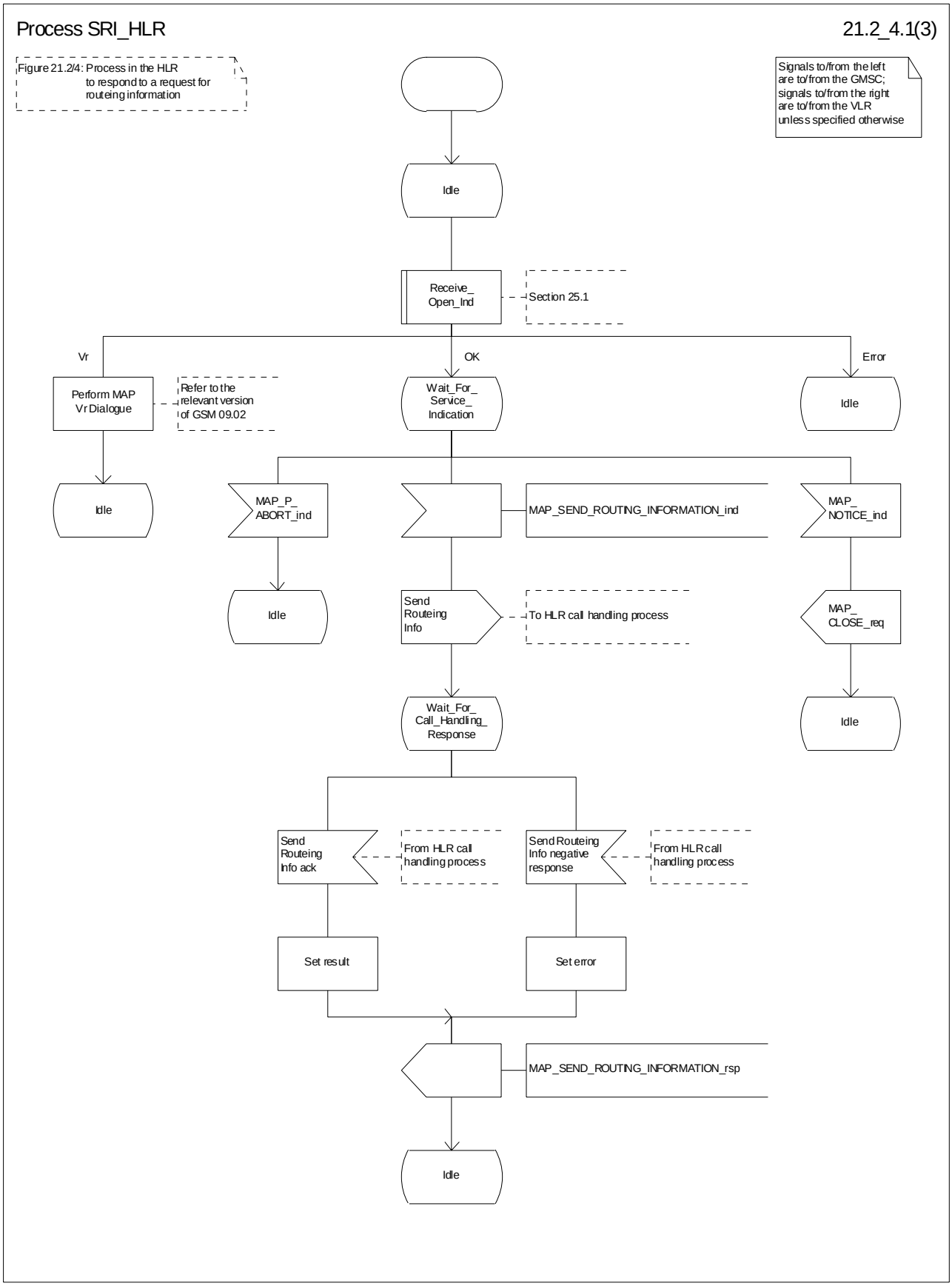


Figure 21.2/4 (sheet 1 of 3): Process SRI_HLR

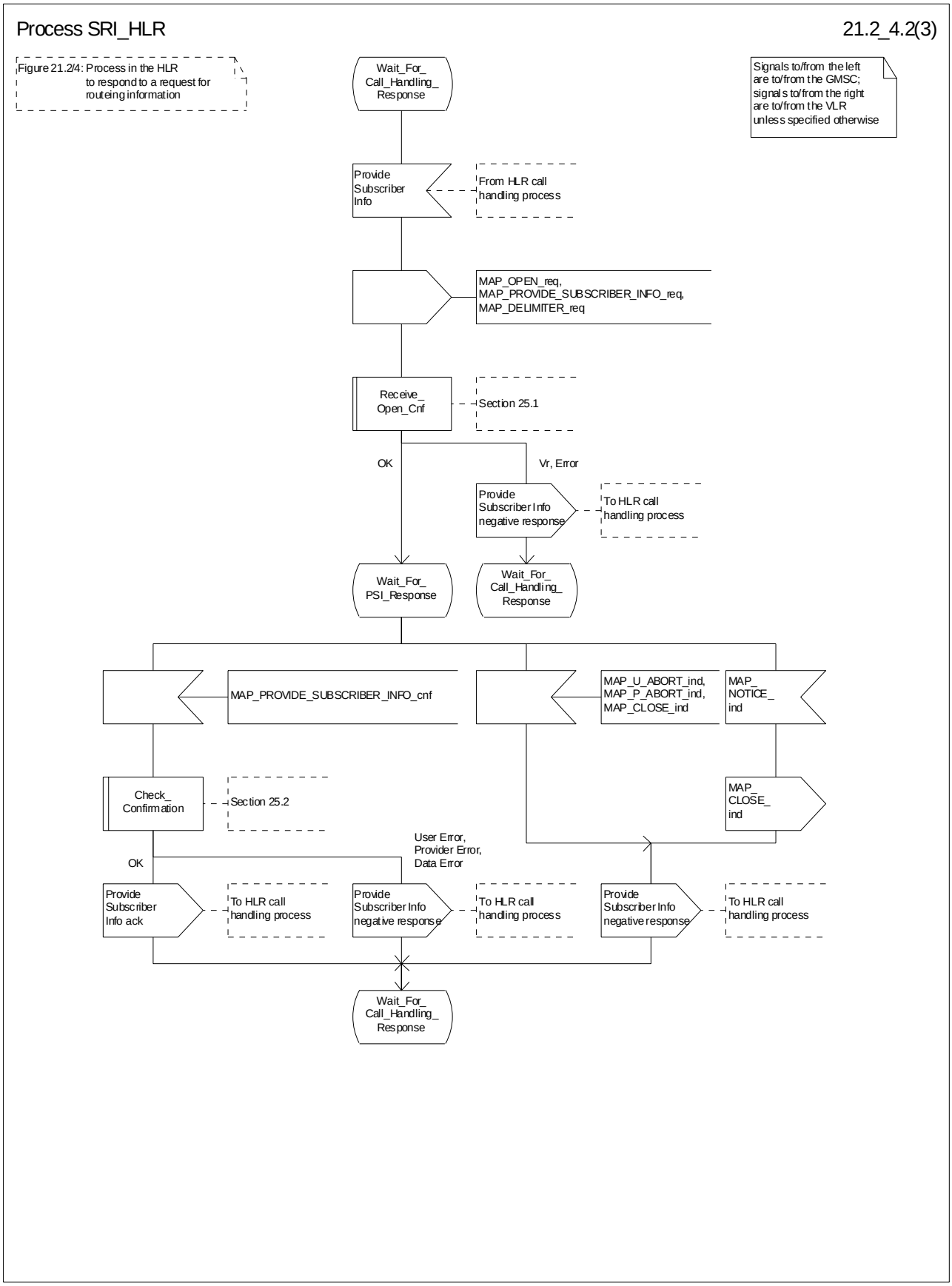


Figure 21.2/4 (sheet 2 of 3): Process SRI_HLR

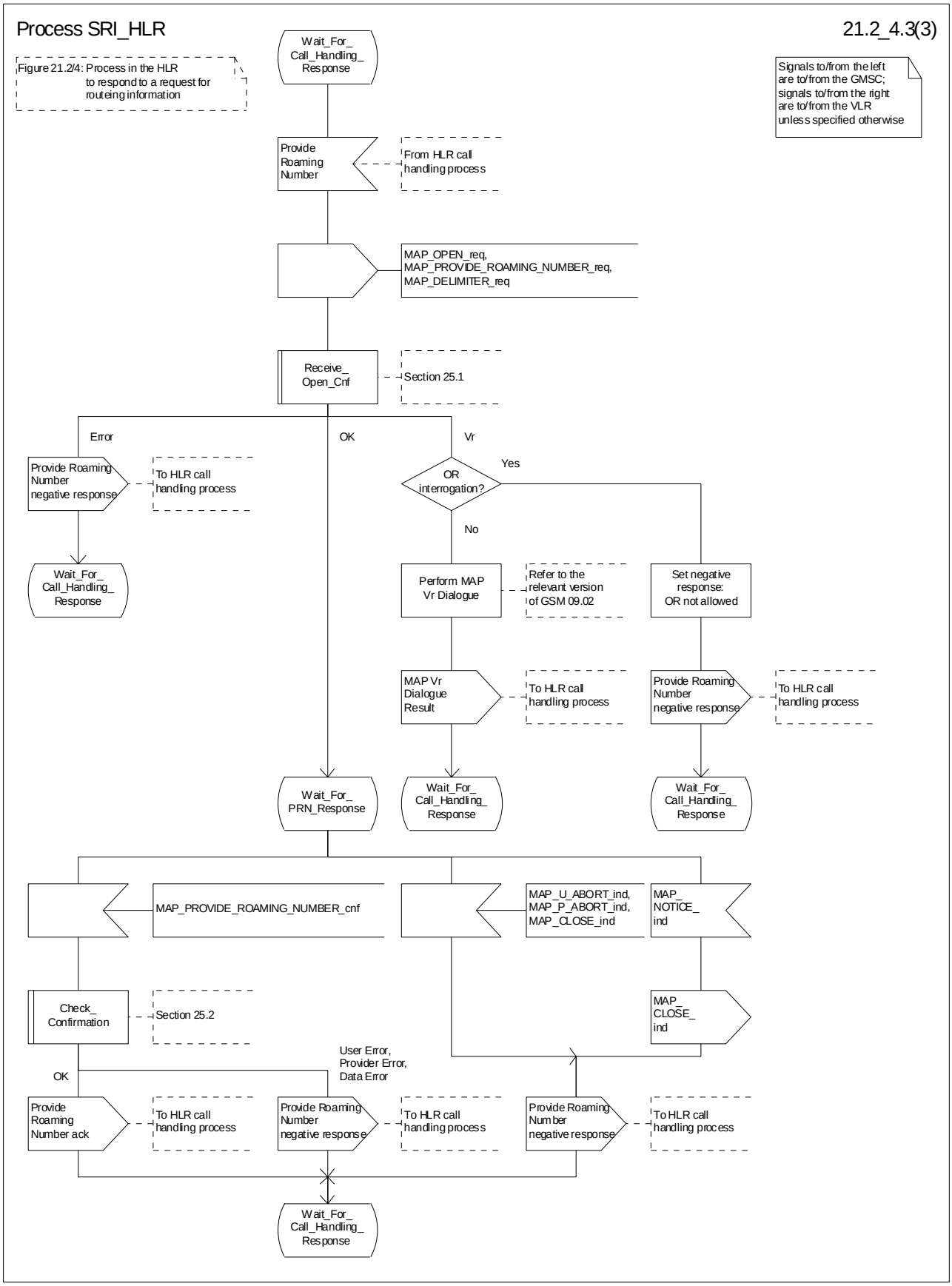


Figure 21.2/4 (sheet 3 of 3): Process SRI_HLR

21.2.4 Process in the VLR to provide a roaming number

The MAP process in the VLR to provide a roaming number for a mobile terminating call is shown in figure 21.2/5. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context roamingNbEnquiry, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_PROVIDE_ROAMING_NUMBER service indication is received, the MAP process sends a Provide Roaming Number request to the call handling process in the VLR, and waits for a response. The Provide Roaming Number request contains the parameters received in the MAP_ PROVIDE_ROAMING_NUMBER service indication.

If the call handling process in the VLR returns a Provide Roaming Number ack, the MAP process constructs a MAP_PROVIDE_ROAMING_NUMBER service response containing the roaming number contained in the Send Routeing Info ack, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Earlier version MAP dialogue with the HLR

If the macro Receive_Open_Ind takes the Vr exit, the the VLR performs the earlier version MAP dialogue as specified in [51] or [96] and the process returns to the idle state.

Failure of dialogue opening with the HLR

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

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

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

Negative response from VLR call handling process

If the call handling process in the HLR returns a negative response, the MAP process constructs a MAP_PROVIDE_ROAMING_NUMBER service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

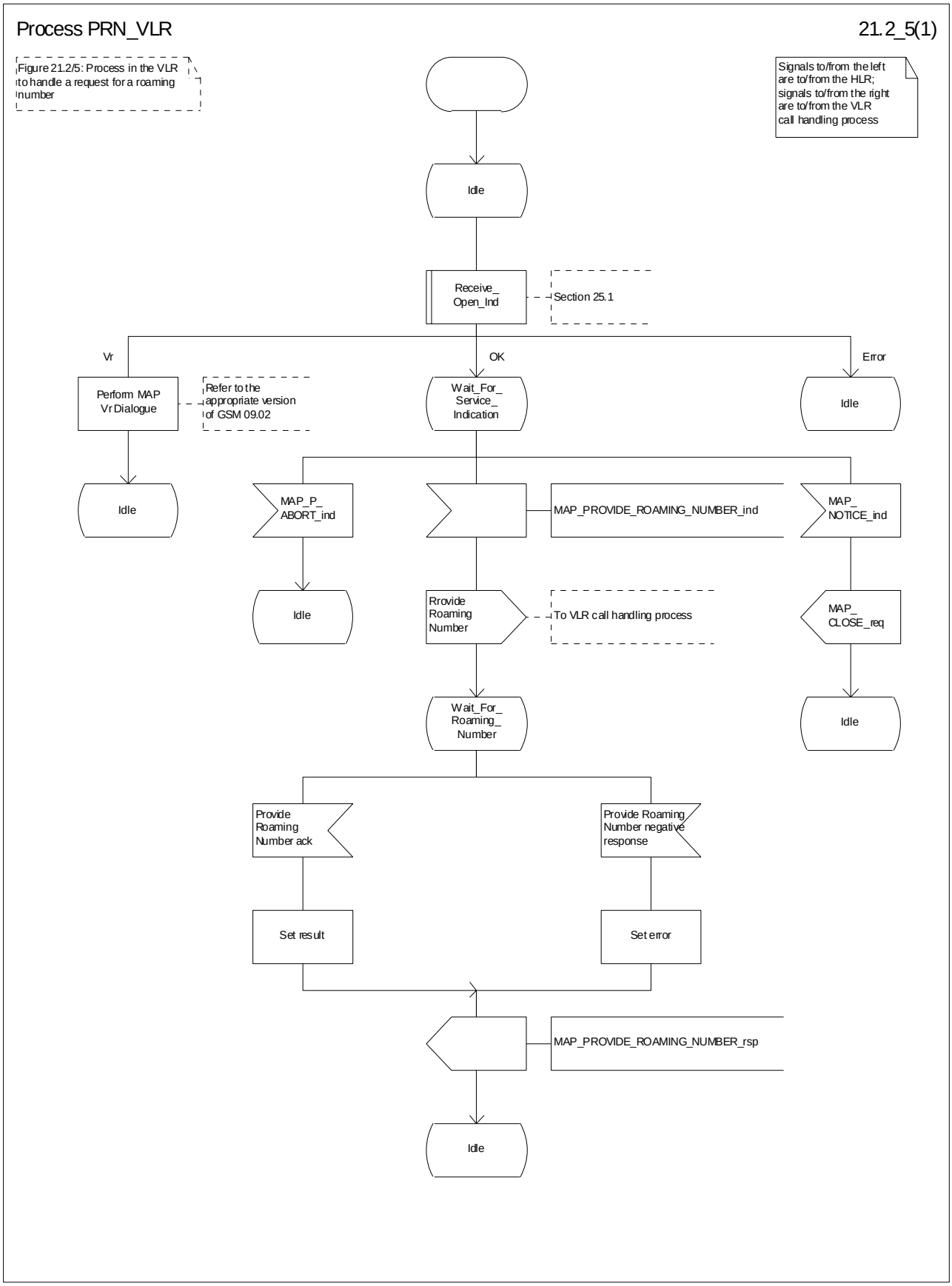


Figure 21.2/5: Process PRN_VLR

21.2.5 Process in the VLR to restore subscriber data

The MAP process in the HLR to restore subscriber data is shown in figure 21.2/6. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2;
Insert_Subs_Data_VLR	see subclause 25.7.1;
Activate_Tracing_VLR	see subclause 25.9.3.

Successful outcome

When the MAP process receives a Restore Data request from the data restoration process in the VLR, it requests a dialogue with the HLR whose identity is contained in the Restore Data request by sending a MAP_OPEN service request, requests data restoration using a MAP_RESTORE_DATA service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

The VLR may receive a MAP_INSERT_SUBSCRIBER_DATA service indication from the HLR; this is handled by the macro Insert_Subs_Data_VLR as described in subclause 25.7.1, and the MAP process waits for a further response from the HLR.

The VLR may receive a MAP_ACTIVATE_TRACE_MODE service indication from the HLR; this is handled by the macro Activate_Tracing_VLR as described in subclause 25.9.3, and the MAP process waits for a further response from the HLR.

If the MAP process receives a MAP_RESTORE_DATA service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Restore Data ack containing the information received from the HLR to the data restoration process in the VLR and returns to the idle state.

Error in MAP_RESTORE_DATA confirm

If the MAP_RESTORE_DATA service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Restore Data negative response indicating the type of error to the call handling process in the HLR, and returns to the idle state.

Ealier version MAP dialogue with the HLR

If the macro Receive_Open_Cnf takes the Vr exit, the VLR performs the earlier MAP version dialogue as specified in [51] or [96] and the process terminates.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the HLR could not be opened, the MAP process sends a negative response indicating system failure to the data restoration process in the GMSC and returns to the idle state.

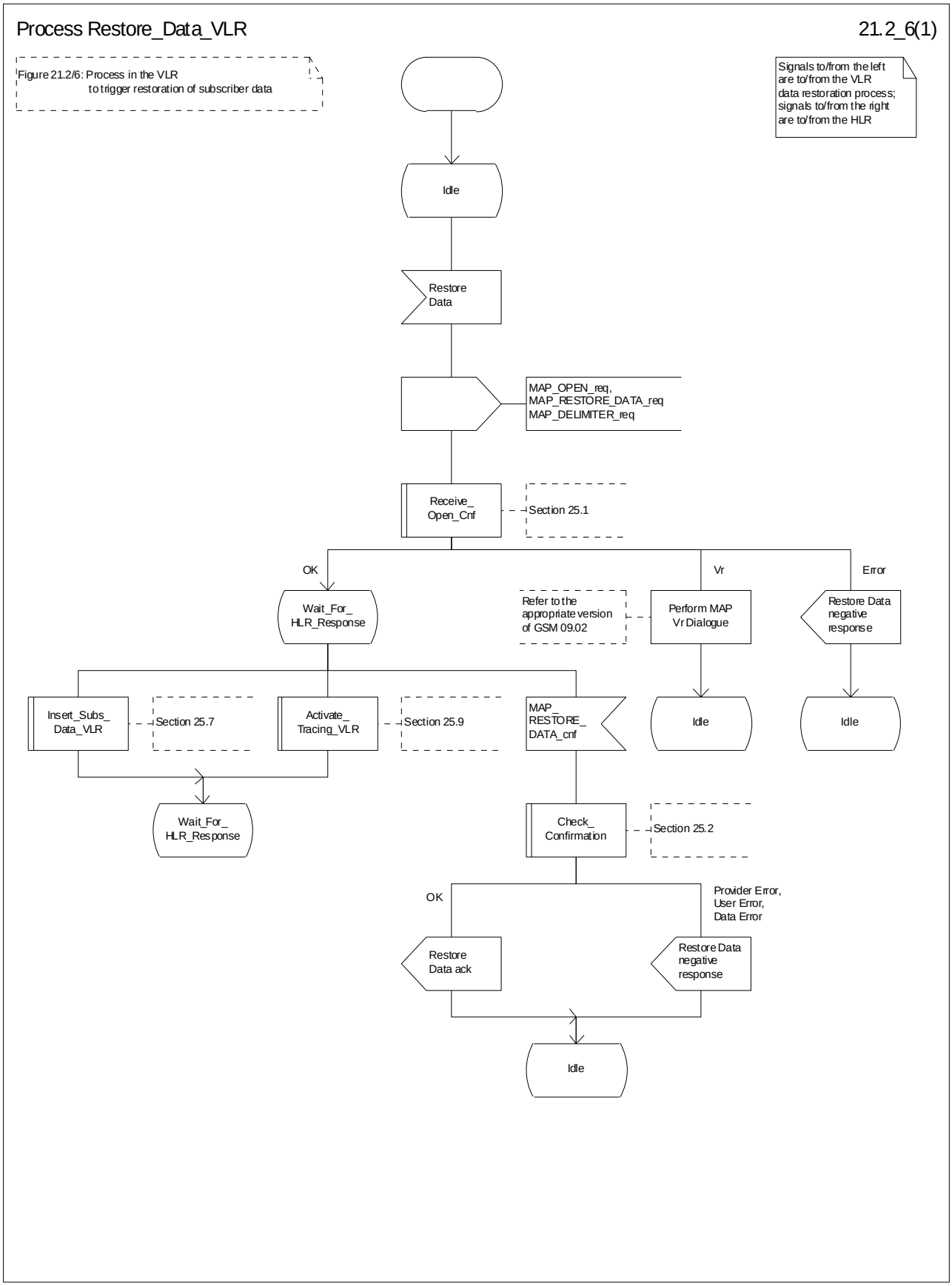


Figure 21.2/6: Process Restore_Data_VLR

21.2.6 Process in the VLR to provide subscriber information

The MAP process in the VLR to provide subscriber information for a mobile terminating call subject to CAMEL invocation is shown in figure 21.2/6. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context subscriberInfoEnquiry, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_PROVIDE_SUBSCRIBER_INFO service indication is received, the MAP process sends a Provide Subscriber Info request to the subscriber information request process in the VLR, and waits for a response. The Provide Subscriber Info request contains the parameters received in the MAP_PROVIDE_SUBSCRIBER_INFO service indication.

If the subscriber information request process in the VLR returns a Provide Subscriber Info ack, the MAP process constructs a MAP_PROVIDE_SUBSCRIBER_INFO service response containing the information contained in the Provide Subscriber Info ack, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Failure of dialogue opening with the HLR

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

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

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

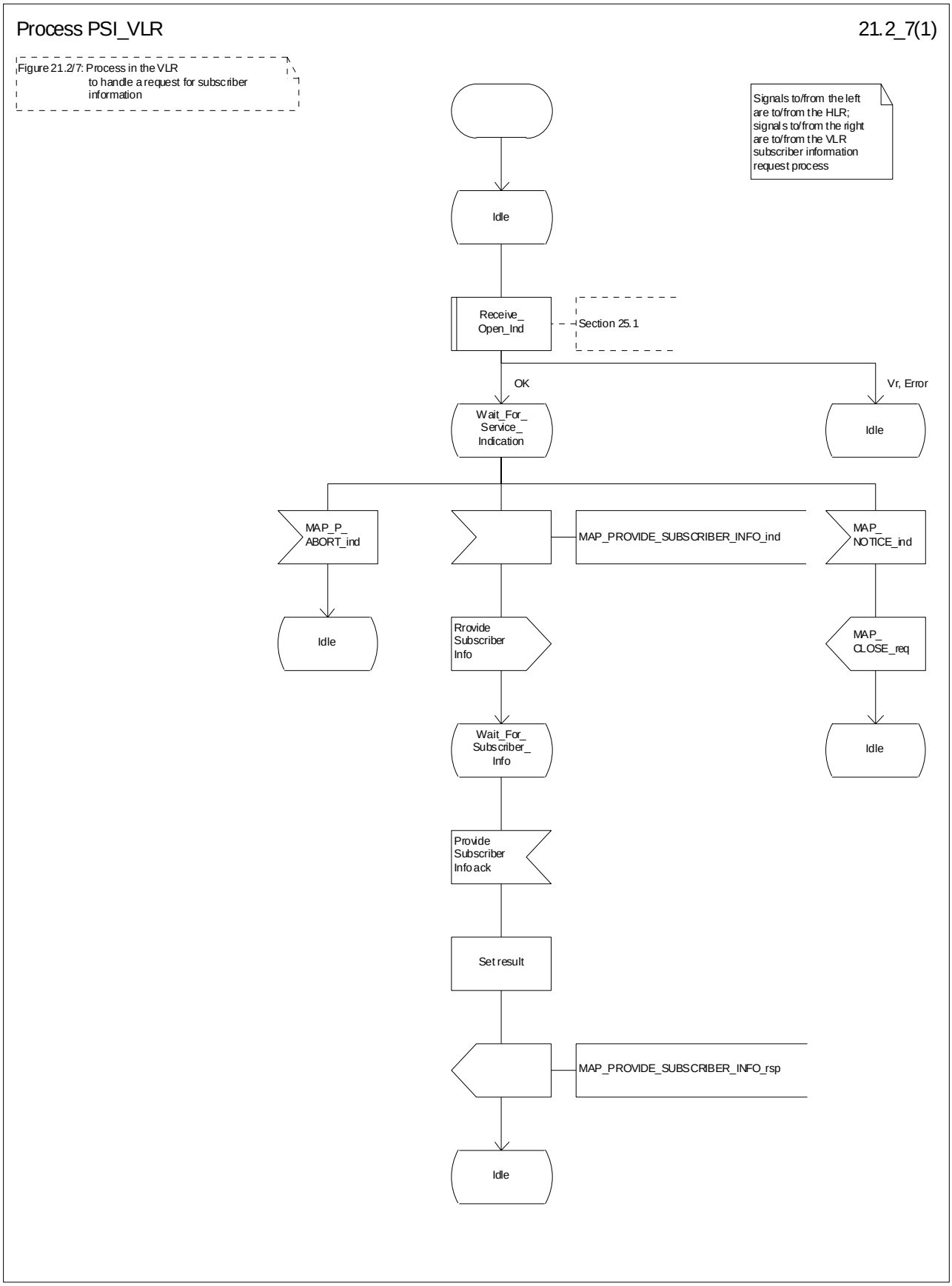


Figure 21.2/7: Process PSI_VLR

21.2.7 Process in the HLR for Any Time Interrogation

The message flows for successful retrieval of subscriber information related to an any time interrogation from the CAMEL server are shown in figure 21.2/8.

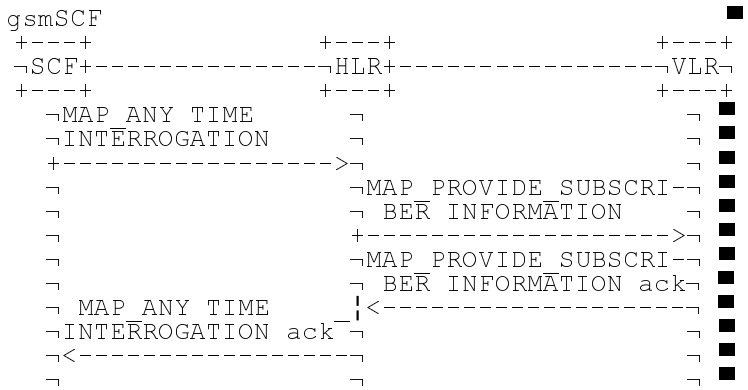


Figure 21.2/8: Message flow for any time interrogation

The following MAP services are used to retrieve routing information:

MAP_ANY_TIME_INTERROGATION see subclause 8.11.1;

MAP_PROVIDE_SUBSCRIBER_INFO see subclause 8.11.2;

21.2.7.1 Process in the gsmSCF

Out of the scope of the MAP specification.

21.2.3 Process in the HLR

The MAP process in the HLR to provide subscriber information in response to an interrogation from the CAMEL server is shown in figure 21.2/8. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context anyTimeInterrogationEnquiry, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_ANY_TIME_INTERROGATION service indication is received, the MAP process sends an Any Time Interrogation request to the call handling process in the HLR (described in GSM 03.78), and waits for a response. The Any Time Interrogation request contains the parameters received in the MAP_ ANY_TIME_INTERROGATION service indication.

If the call handling process in the HLR returns an Any Time Interrogation response, the MAP process constructs a MAP_ANY_TIME_INTERROGATION service response containing the subscriber information contained in the Any Time Interrogation response, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.

If the call handling process in the HLR returns a Provide Subscriber Info request, the MAP process requests a dialogue with the VLR whose identity is contained in the Provide Subscriber Info request by sending a MAP_OPEN service request, requests the subscriber status using a MAP_PROVIDE_SUBSCRIBER_INFO service request, and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request.

If the macro takes the OK exit, the MAP process waits for the response from the VLR.

If the MAP process receives a MAP_PROVIDE_SUBSCRIBER_INFO service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Provide Subscriber Info ack containing the information received in the MAP_PROVIDE_SUBSCRIBER_INFO service confirm to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

If the MAP_PROVIDE_SUBSCRIBER_INFO service confirm contains a provider error or a data error, the MAP process sends a Provide Subscriber Info negative response indicating the type of error to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

NOTE: The 'User Error' exit from the macro Check_Confirmation is shown for formal completeness; the MAP_PROVIDE_SUBSCRIBER_INFO_cnf primitive cannot contain a user error.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response, either before or after a dialogue with the VLR to obtain subscriber information, the MAP process constructs a MAP_ANY_TIME_INTERROGATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.

Failure of Provide Subscriber Info dialogue with the VLR

If the Receive_Open_Cnf macro takes the Vr exit or the Error exit after the MAP process has requested opening of a Provide Subscriber Info dialogue with the VLR, the MAP process sends a Provide Subscriber Info negative response indicating system failure to the call handling process in the HLR, and waits for a response. The handling of the response from the call handling process in the HLR is described above.

Failure of dialogue opening with the CAMEL server

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

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

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

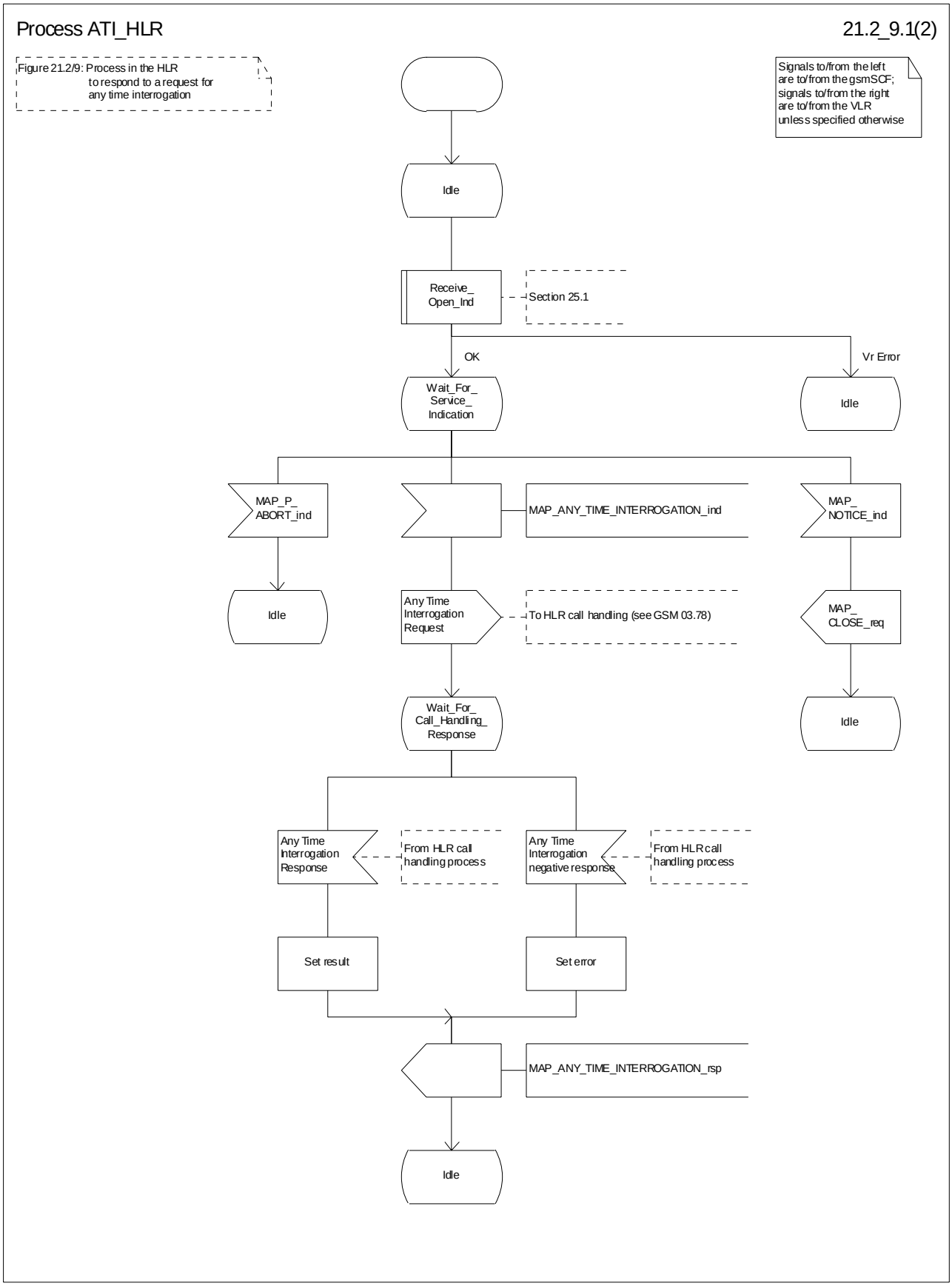


Figure 21.2/9 (sheet 1 of 2): Process ATI_HLR (New)

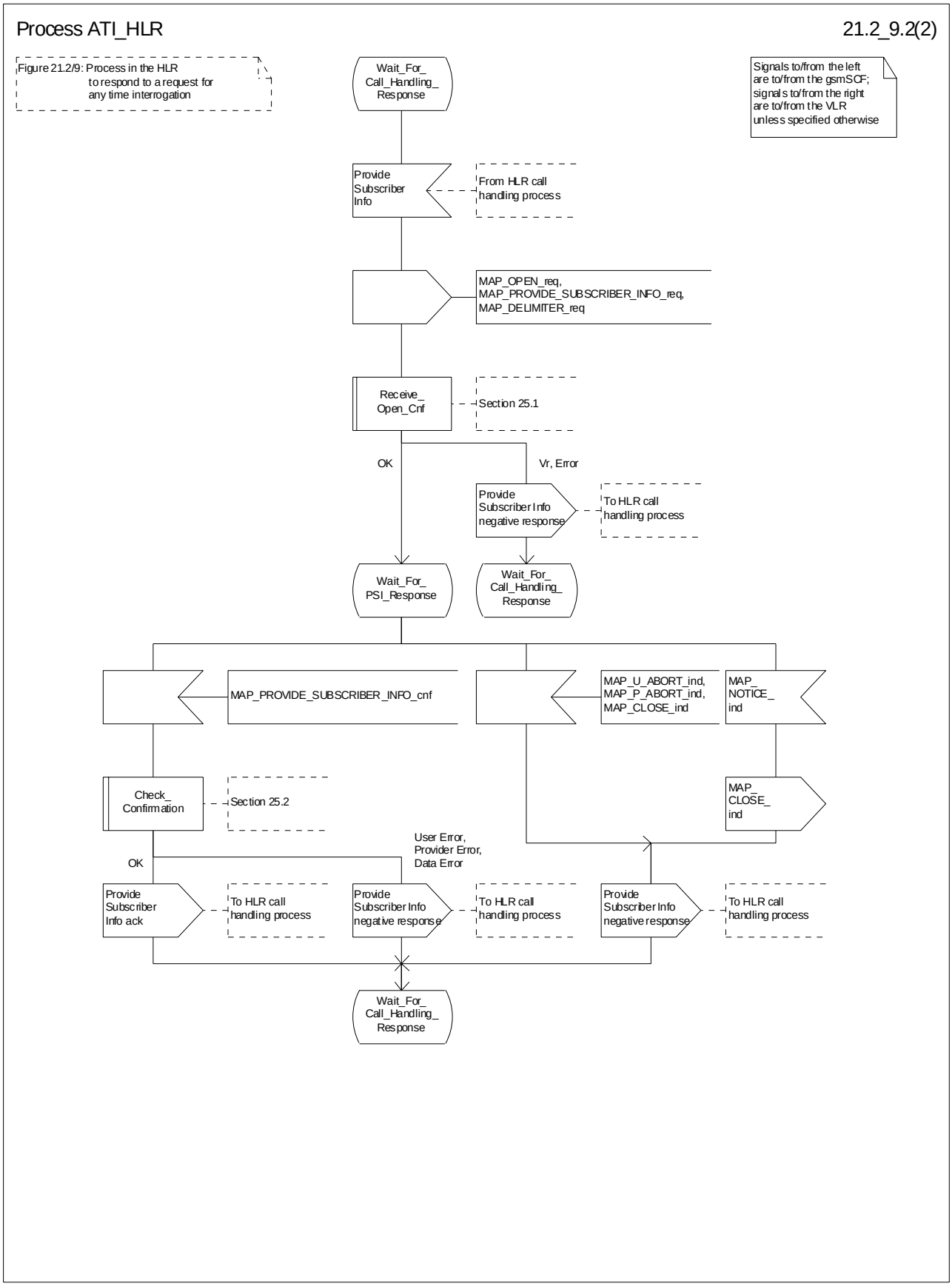
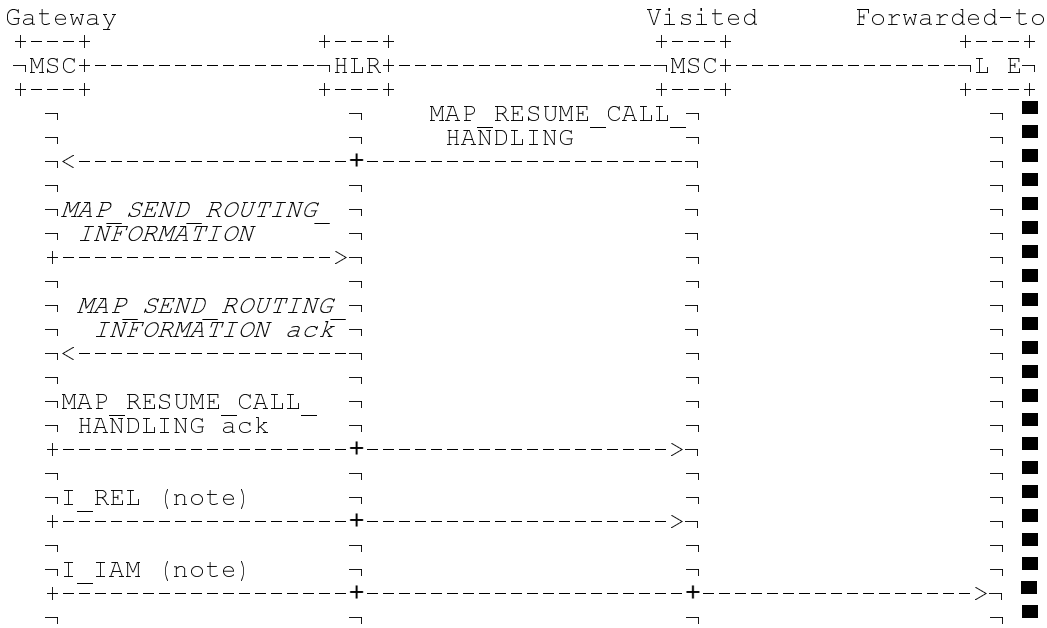


Figure 21.2/9 (sheet 2 of 2): Process ATI_HLR (New)

21.3 Transfer of call handling

21.3.1 General

The message flow for successful transfer of call handling to forward a call is shown in figure 21.3/1.



NOTES:

xxx = Optional Procedure

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

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

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

Figure 21.3/1: Message flow for transfer of call handling

If the HLR indicated in the response to the original request for routeing information that forwarding interrogation is required, the GMSC executes the Send Routeing Information procedure with the HLR to obtain forwarding information; otherwise the GMSC uses the forwarding data which were sent in the MAP_RESUME_CALL_HANDLING req/ind.

21.3.2 Process in the VMSC

The MAP process in the VMSC to retrieve routeing information for a mobile terminating call is shown in figure 21.3/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Resume Call Handling request from the call handling process in the VMSC, it requests a dialogue with the GMSC whose identity is contained in the Resume Call Handling request by sending a MAP_OPEN service request, requests routeing information using a MAP_RESUME_CALL_HANDLING service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the GMSC.

If the MAP process receives a MAP_RESUME_CALL_HANDLING service confirm from the GMSC, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Resume Call Handling ack to the call handling process in the VMSC and returns to the idle state.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the GMSC could not be opened or that the dialogue can be opened only at an earlier version, the MAP process sends an Resume Call Handling negative response indicating system failure to the call handling process in the VMSC and returns to the idle state.

Error in MAP_RESUME_CALL_HANDLING confirm

If the MAP_RESUME_CALL_HANDLING service confirm contains a user error or a provider error, the MAP process sends a Resume Call Handling negative response to the call handling process in the VMSC and returns to the idle state.

NOTE: the 'Data Error' exit from the macro Check_Confirmation is shown for formal completeness; the result is empty, so the MAP_PROVIDE_SUBSCRIBER_INFO_cnf primitive cannot contain a data error.]

Abort of GMSC dialogue

After the dialogue with the GMSC has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the GMSC may send a MAP_CLOSE indication. In either of these cases, the MAP process sends a Resume Call Handling negative response to the call handling process in the GMSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the GMSC, sends a Resume Call Handling negative response indicating system failure to the call handling process in the VMSC and returns to the idle state.

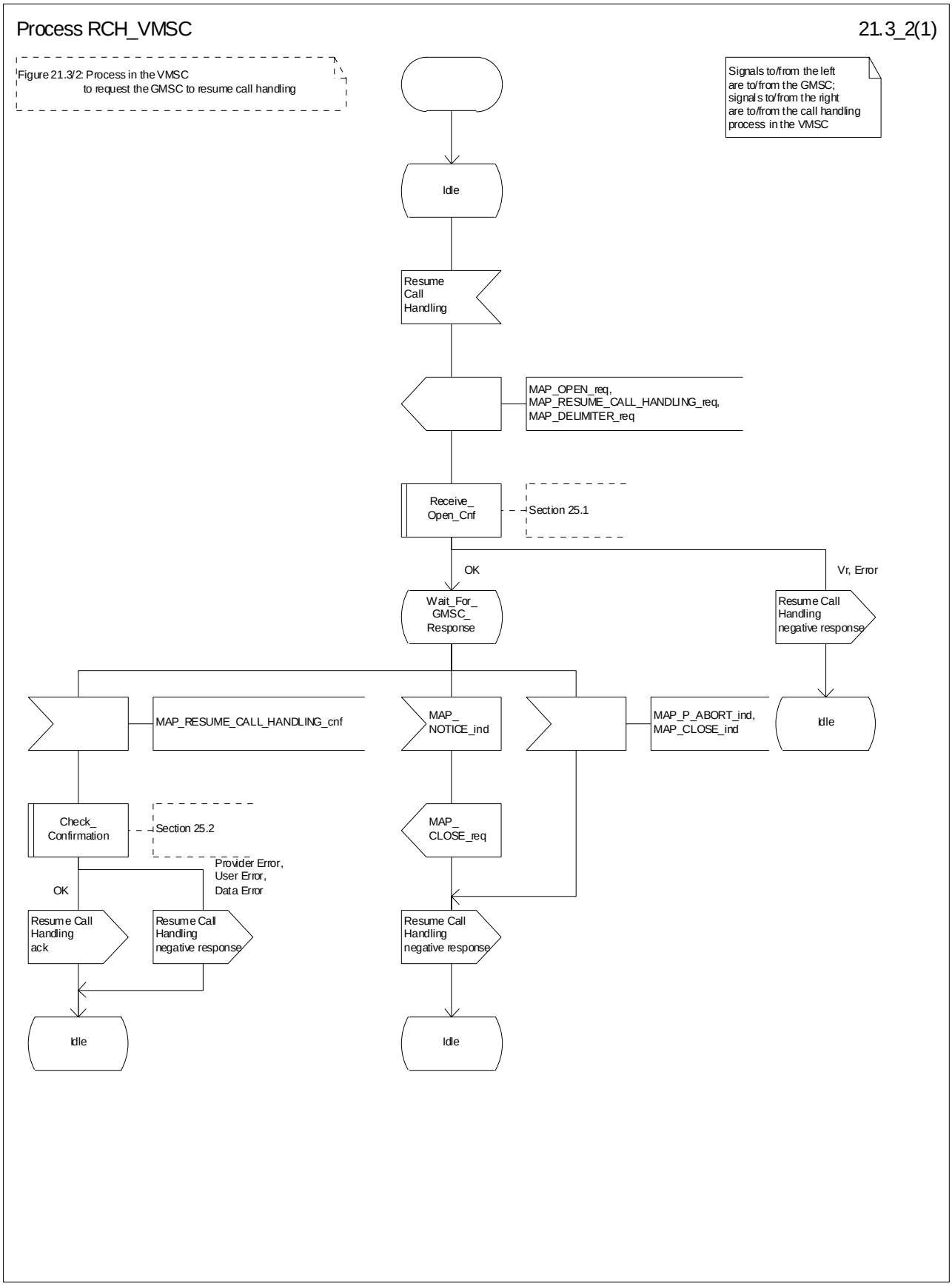


Figure 21.3/2: Process RCH_VMSC

21.3.3 Process in the GMSC

The MAP process in the GMSC to handle a request for the GMSC to resume call handling is shown in figure 21.3/3. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context callControlTransfer, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_RESUME_CALL_HANDLING service indication is received, the MAP process sends a Resume Call Handling request to the call handling process in the GMSC, and waits for a response. The Resume Call Handling request contains the parameters received in the MAP_RESUME_CALL_HANDLING service indication.

If the call handling process in the GMSC returns a Resume Call Handling ack, the MAP process constructs a MAP_RESUME_CALL_HANDLING service response, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Failure of dialogue opening with the VMSC

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

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

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

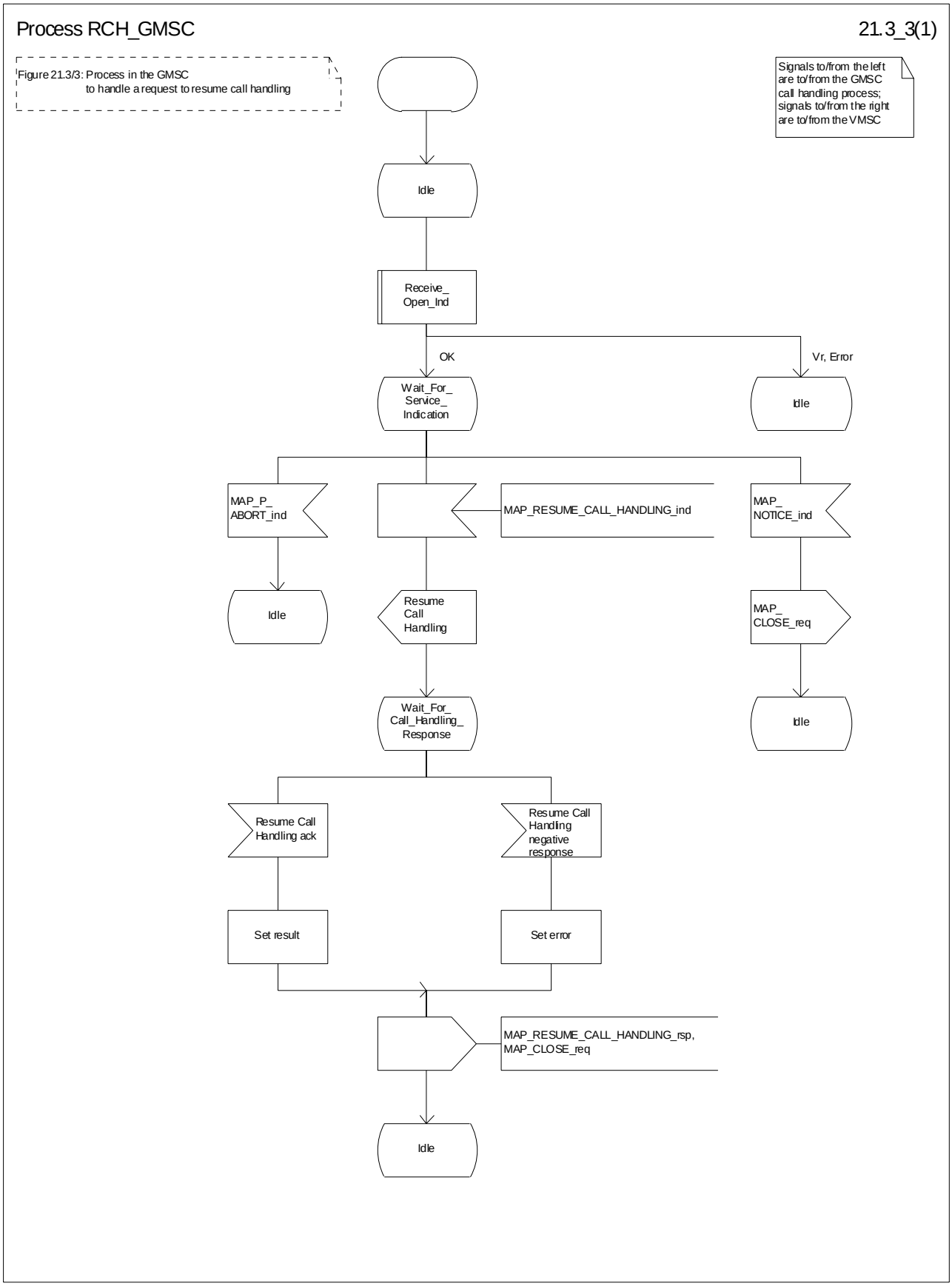
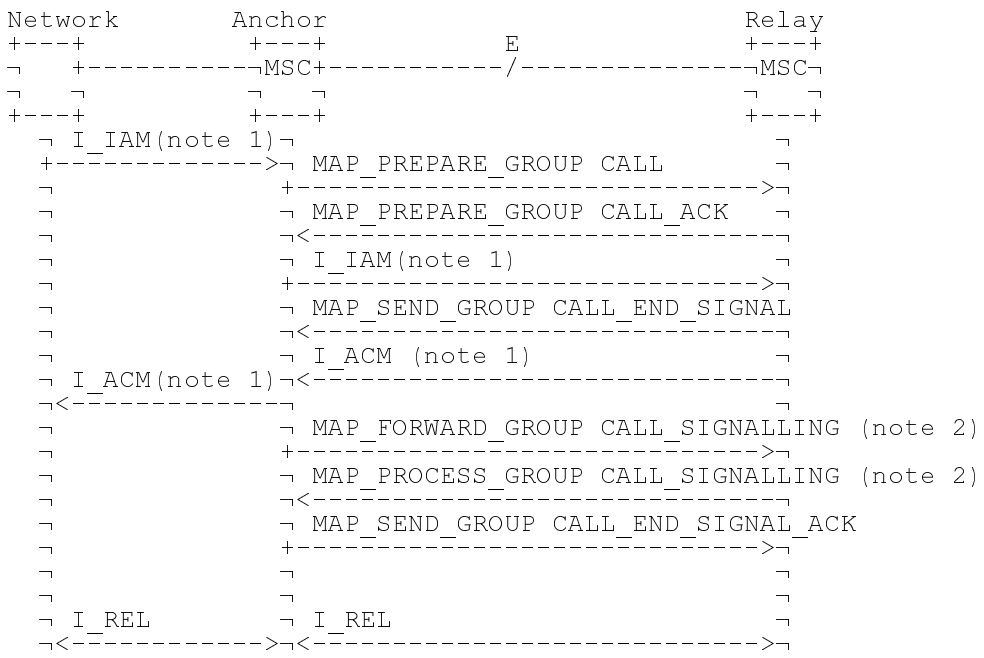


Figure 21.3/3: Process RCH_GMSC

21.4 Inter MSC Group Call Procedures

21.4.1 General

The message flows for successful inter MSC group call / broadcast call setup is shown in figure 21.4/1.



NOTE 1: TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. For further details on the TUP and ISUP procedures refer to the following ITU-T Recommendations and ETSI specification:

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

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

NOTE 2: The MAP_FORWARD_GROUP_CALL_SIGNALLING and MAP_PROCESS_GROUP_CALL_SIGNALLING services are not applicable for voice broadcast calls.

Figure 21.4/1: Message flow for inter MSC group call / broadcast call

21.4.2 Process in the Anchor MSC

The MAP process in the Anchor MSC to retrieve and transfer information from / to the Relay MSC for VBS and VGCS calls is shown in figure 21.4/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Indication see subclause 25.2.1;

Check_Confirmation see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Prepare Group Call request from the ASCI handling process in the anchor MSC, it requests a dialogue with the relay MSC whose identity is contained in the Prepare Group Call request by sending a MAP_OPEN service request, requests an Group Call number by using a MAP_PREPARE_GROUP_CALL service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the relay MSC.

If the MAP process receives a MAP_PREPARE_GROUP_CALL service confirm from the relay MSC, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Prepare Group Call ack containing the Group Call number received from the relay MSC to the ASCI handling process in the anchor MSC and waits for completion of call setup in the relay MSC.

On receipt of a MAP_SEND_GROUP_CALL_END_SIGNAL service indication from the relay MSC the MAP process invokes the macro Check_Indication to check the content of the indication.

If the macro Check_Indication takes the OK exit, the MAP process sends a Send Group Call End Signal to the ASCI handling process in the anchor MSC and waits for uplink management signals. In this state the following events are processed:

- Reception of a Send Group Call End Signal ack from the ASCI handling process in the anchor MSC;
- Reception of a Forward Group Call Signalling request from the ASCI handling process in the anchor MSC;
- Reception of a MAP_PROCESS_GROUP_CALL_SIGNALLING service indication from the relay MSC.

On reception of a Send Group Call End Signal ack from the ASCI handling process in the anchor MSC, the MAP process constructs a MAP_SEND_GROUP_CALL_END_SIGNAL service response, constructs a MAP_CLOSE service request, sends them to the relay MSC and returns to the idle state.

On reception of a Forward Group Call Signalling request from the ASCI handling process in the anchor MSC, the MAP process constructs a MAP_FORWARD_GROUP_CALL_SIGNALLING service request, sends it to the relay MSC and returns to the uplink management state.

On reception of a MAP_PROCESS_GROUP_CALL_SIGNALLING service indication from the relay MSC, the MAP process invokes the macro Check_Indication to check the content of the indication.

If the macro Check_Indication takes the OK exit, the MAP process sends a Process Group Call Signalling to the ASCI handling process in the anchor MSC and returns to the uplink management state.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the relay MSC could not be opened, the MAP process sends an Abort to the ASCI handling process and returns to the idle state.

Error in MAP_PREPARE_GROUP_CALL confirm

If the MAP_PREPARE_GROUP_CALL service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Prepare Group Call negative response to the ASCI handling process in the anchor MSC, sends a MAP_U_ABORT request to the relay MSC and returns to the idle state.

Abort of MAP dialogue

After the dialogue with the relay MSC has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the relay MSC may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends an Abort to the ASCI handling process in the anchor MSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the relay MSC, sends an Abort to the ASCI handling process in the anchor MSC and returns to the idle state.

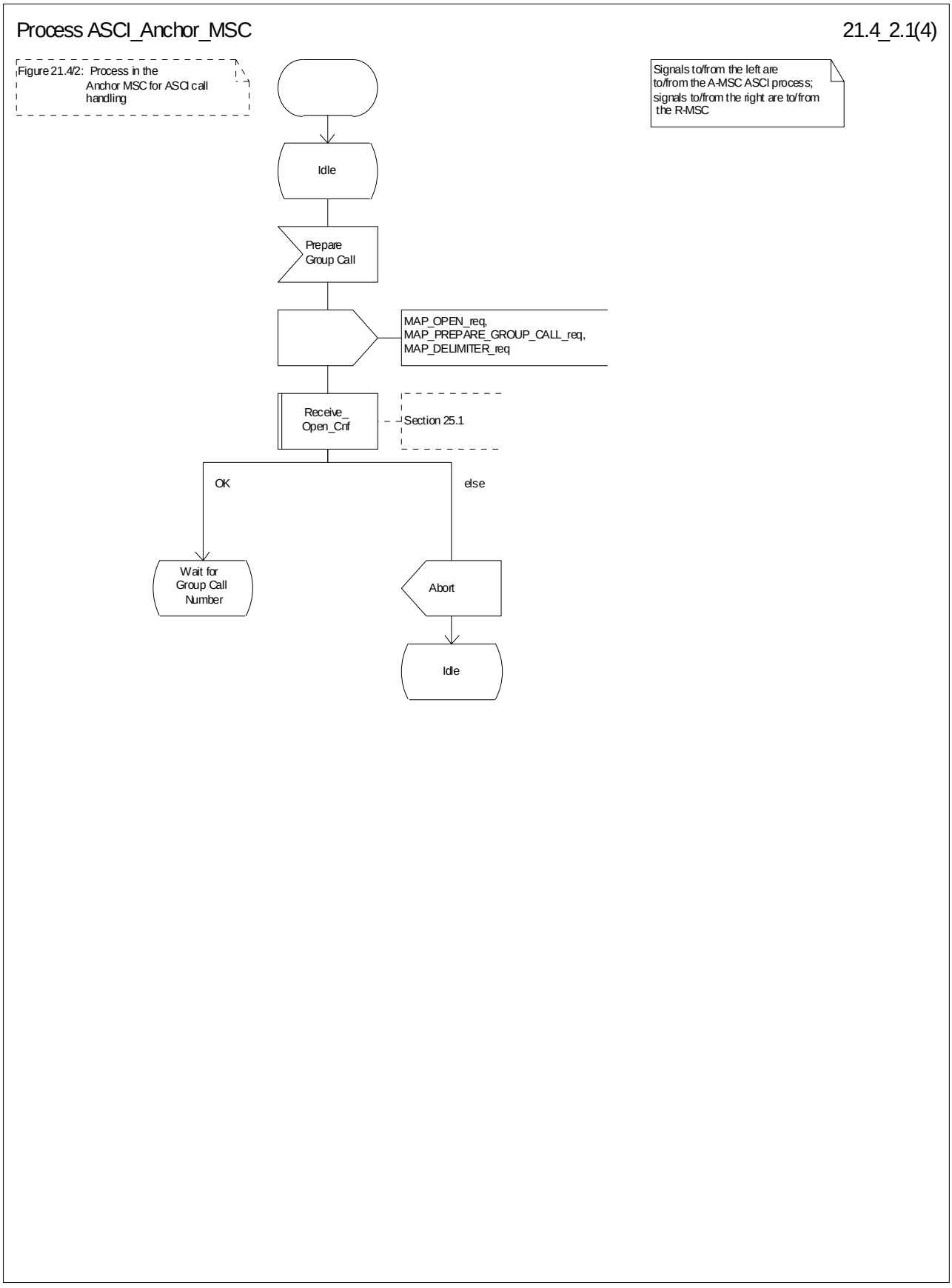


Figure 21.4/2 (sheet 1 of 4): Process ASCI_Anchor_MSC

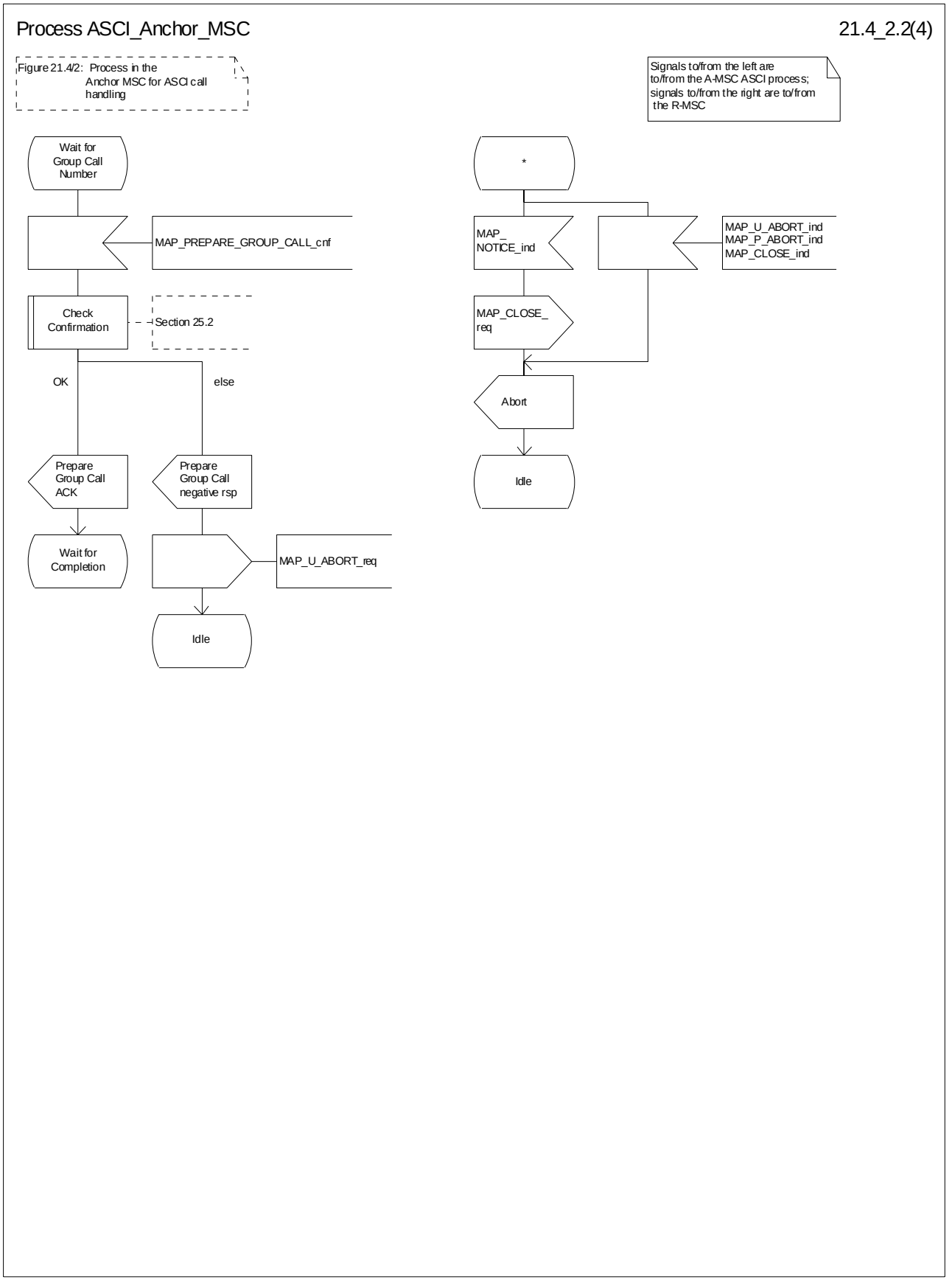


Figure 21.4/2 (sheet 2 of 4): Process ASCI_Anchor_MSC

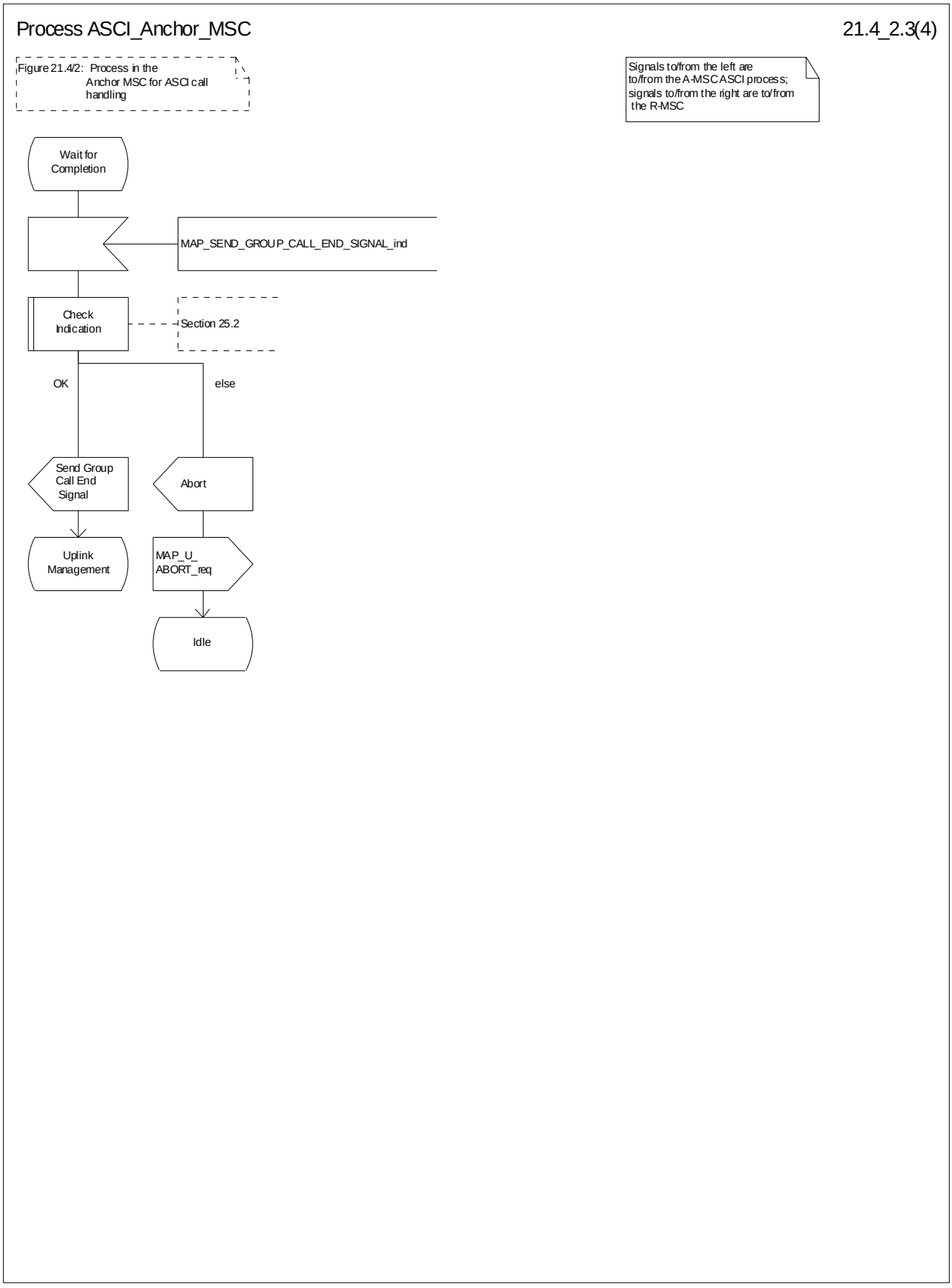


Figure 21.4/2 (sheet 3 of 4): Process ASCI_Anchor_MSC

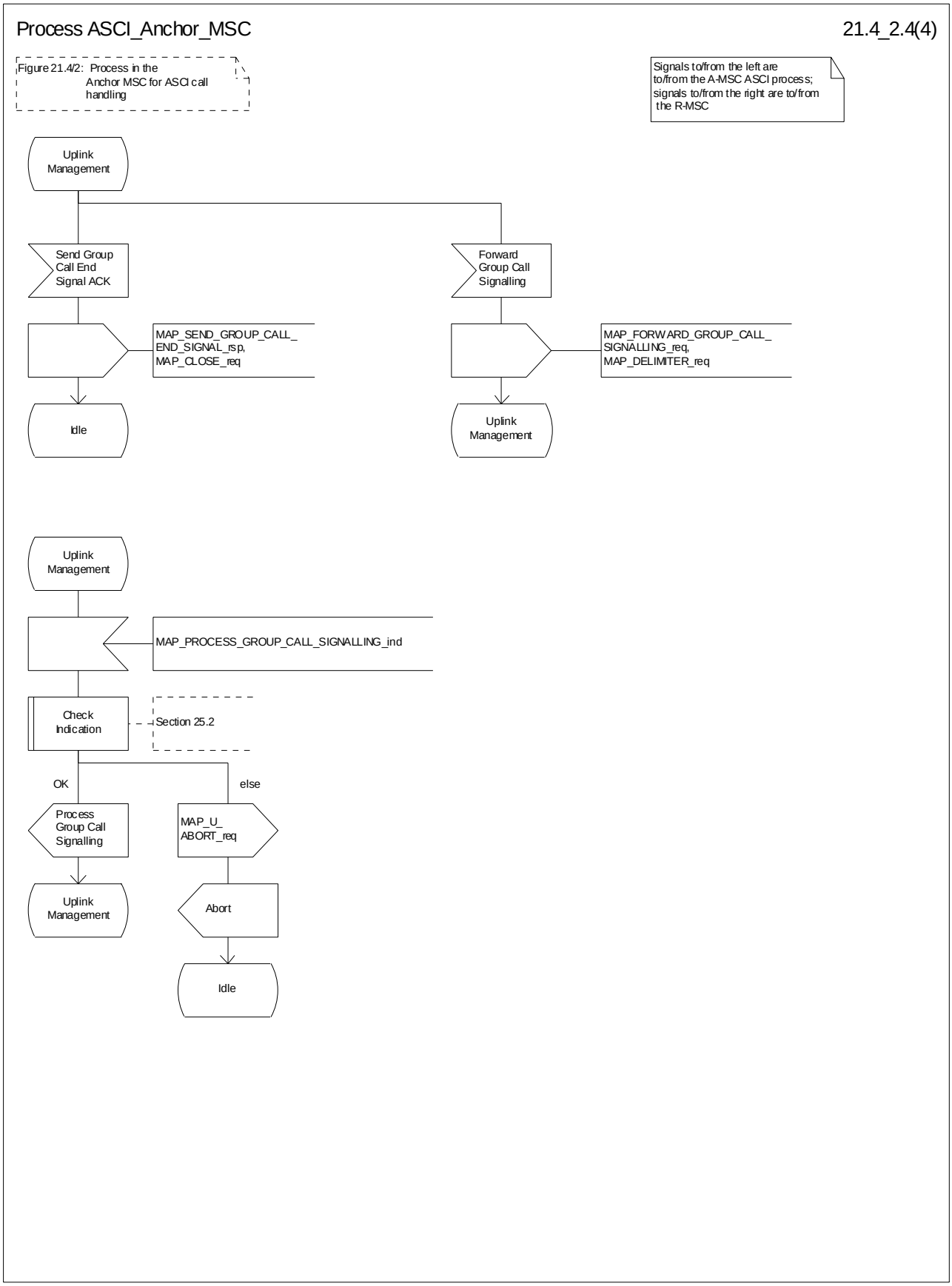


Figure 21.4/2 (sheet 4 of 4): Process ASCI_Anchor_MSC

21.4.3 Process in the Relay MSC

The MAP process in the Relay MSC to receive and transfer information from / to the Anchor MSC for VBS and VGCS calls is shown in figure 21.4/3. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.2;
Check_Indication	see subclause 25.2.1.

Successful Outcome

When the MAP process receives a MAP_OPEN indication with the application context groupCallControl, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_PREPARE_GROUP_CALL service indication is received, the MAP process invokes the macro Check_Indication.

If the macro takes the OK exit, the MAP process sends a Prepare Group Call request to the ASCI handling process in the relay MSC and waits for a response. The Prepare Group Call request contains the parameters received in the MAP_PREPARE_GROUP_CALL service indication.

If the ASCI handling process in the relay MSC returns a Prepare Group Call ack, the MAP process constructs a MAP_PREPARE_GROUP_CALL service response containing the information contained in the Prepare Group Call ack, constructs a MAP_DELIMITER service request, sends them to the anchor MSC and waits for the GROUP CALL END SIGNAL.

If the ASCI handling process in the relay MSC sends a Send Group Call End Signal request to the MAP process, the MAP process constructs a MAP_SEND_GROUP_CALL_END_SIGNAL service request containing the information contained in the SEND GROUP CALL End Signal request, constructs a MAP_DELIMITER service request, sends them to the anchor MSC and waits for uplink management signals. In this state the following events are processed:

- Reception of a MAP_SEND_GROUP_CALL_END_SIGNAL service confirmation from the anchor MSC;
- Reception of a MAP_FORWARD_GROUP_CALL_SIGNALLING service indication from the anchor MSC;
- Reception of a Process Group Call Signalling request from the ASCI handling process in the relay MSC.

On reception of a MAP_SEND_GROUP_CALL_END_SIGNAL service confirmation from the anchor MSC, the MAP process returns to the idle state.

On reception of a MAP_FORWARD_GROUP_CALL_SIGNALLING service indication from the anchor MSC, the MAP process invokes the macro Check Indication. If the macro takes the OK exit, the MAP process sends a Forward Group Call Signalling request to the ASCI handling process in the relay MSC and waits for further uplink management signals.

On reception of a Process Group Call Signalling request from the ASCI handling process in the relay MSC, the MAP process constructs a MAP_PROCESS_GROUP_CALL_SIGNALLING service request containing the information received in the Process Group Call Signalling request, constructs a MAP_DELIMITER service request, sends them to the anchor MSC and waits for further uplink management signals.

Failure of dialogue opening with the anchor MSC

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

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

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

Error in MAP_PREPARE_GROUP_CALL indication

If the macro Check Indication takes the Error exit, the MAP process sends a MAP_U_ABORT request to the anchor MSC and returns to the idle state.

Negative response received from the ASCI handling process

If the ASCI handling process in the relay MSC returns a negative response to the Prepare Group Call request, the MAP process constructs a MAP_PREPARE_GROUP_CALL service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the anchor MSC and returns to the idle state.

Error in MAP_FORWARD_GROUP CALL_SIGNALLING indication

If the macro Check Indication takes the Error exit, the MAP process sends a MAP_U_ABORT request to the anchor MSC, sends an Abort to the ASCI handling process in the relay MSC ind returns to the idle state.

Abort of MAP dialogue

After the dialogue with the anchor MSC has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the anchor MSC may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends an Abort to the ASCI handling process in the relay MSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the anchor MSC, sends an Abort to the ASCI handling process in the anchor MSC and returns to the idle state.

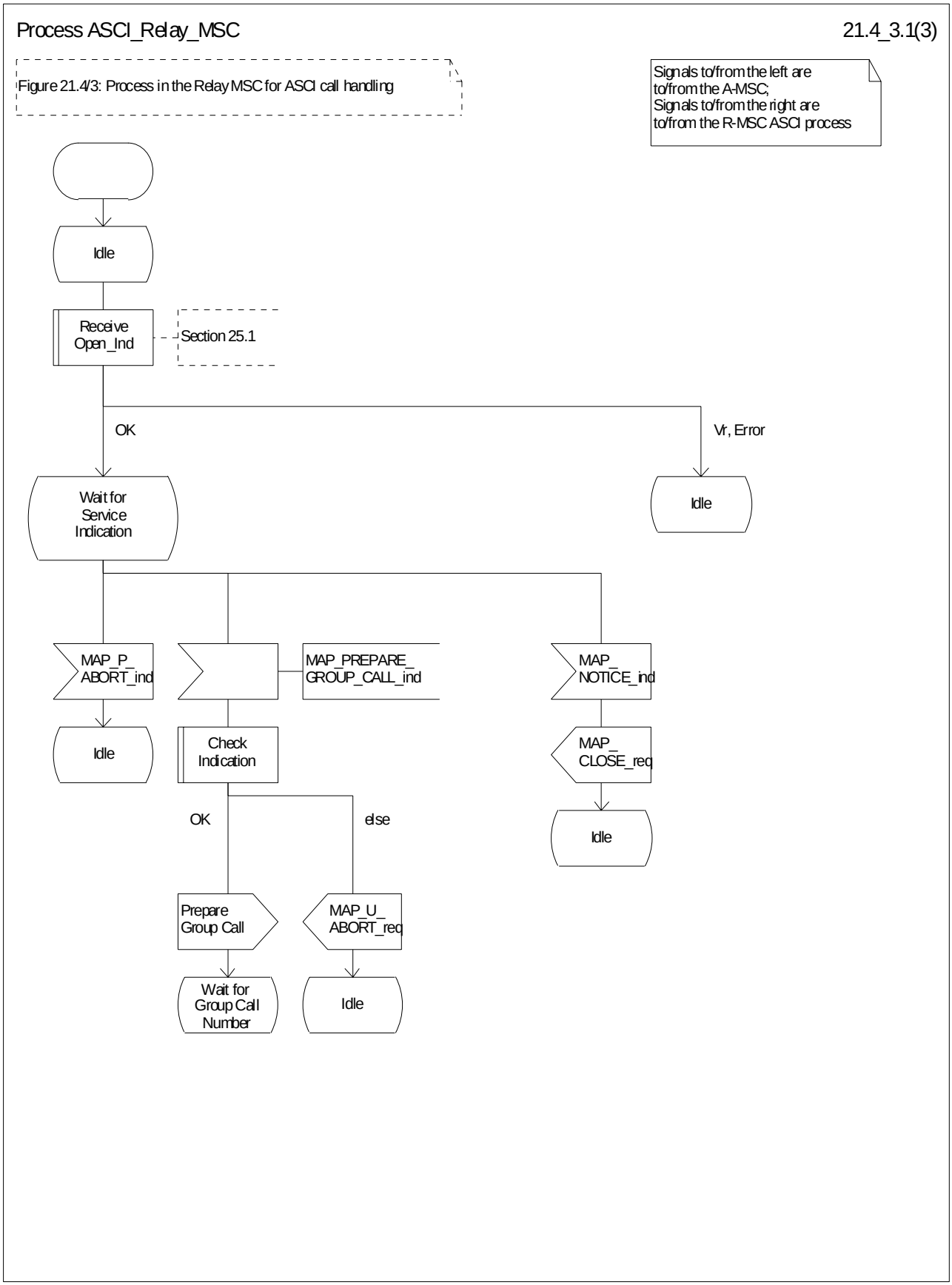


Figure 21.4/3 (sheet 1 of 3): Process ASCI_Relay_MSC

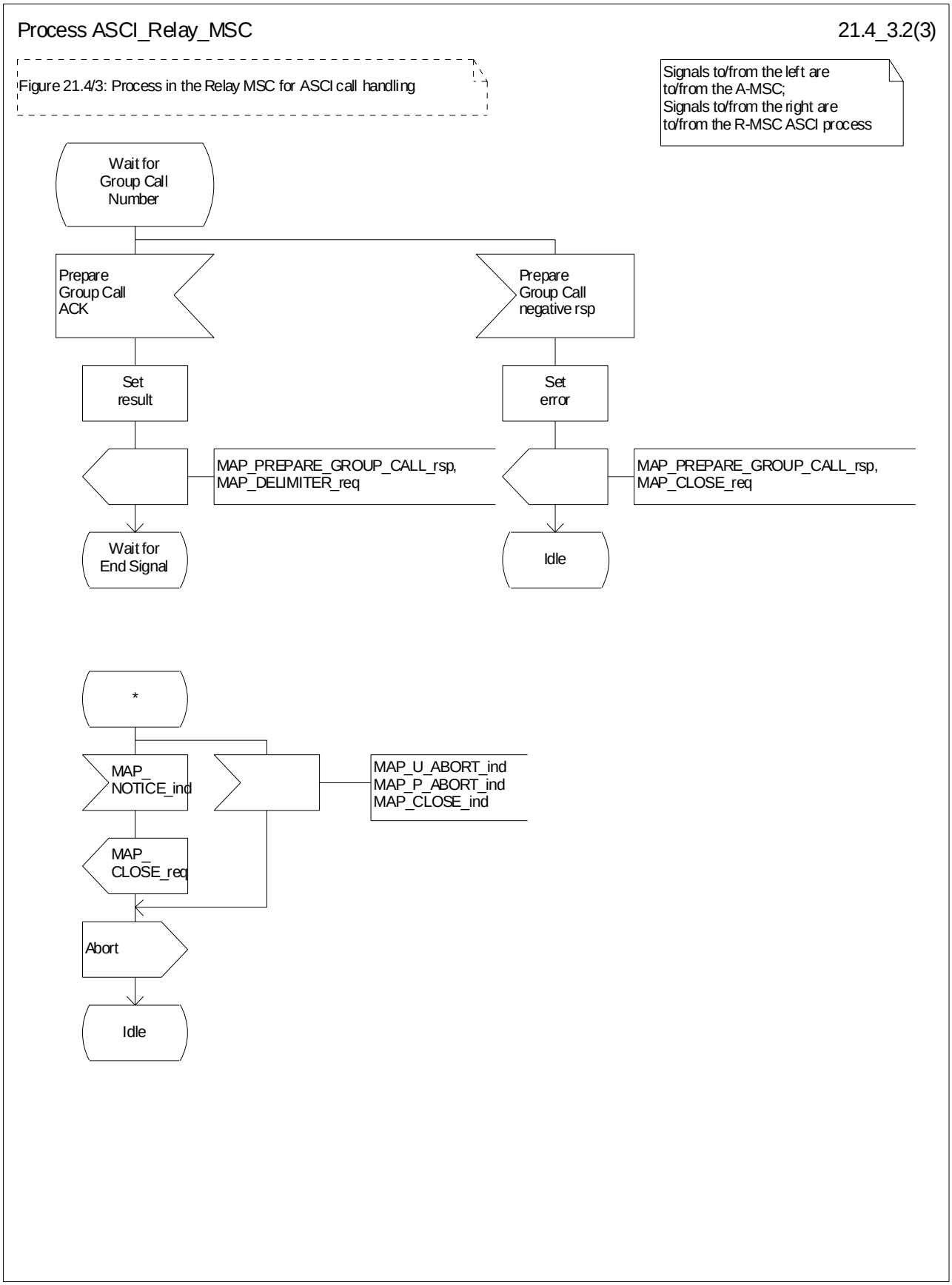


Figure 21.4/3 (sheet 2 of 3): Process ASCI_Relay_MSC

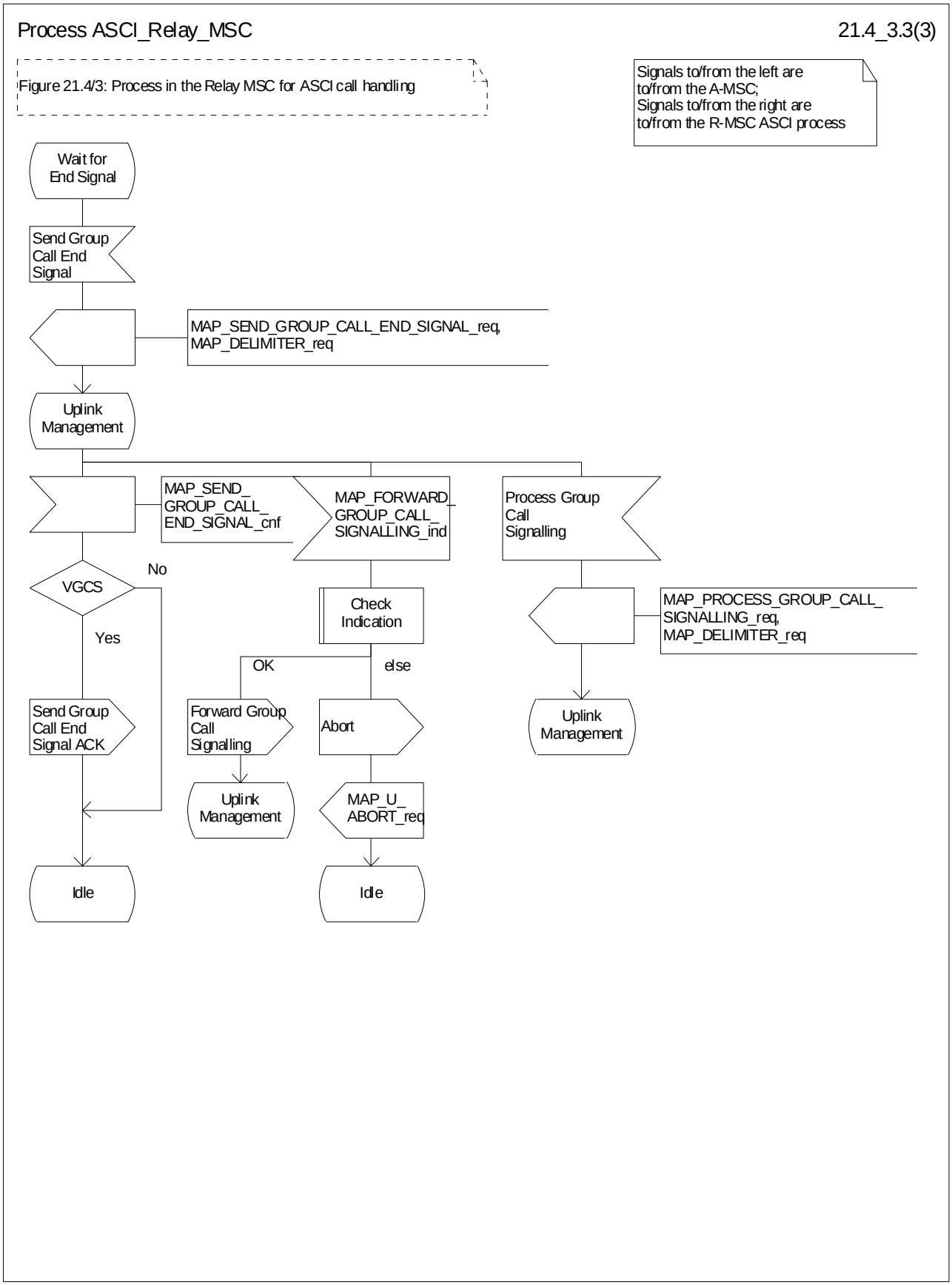
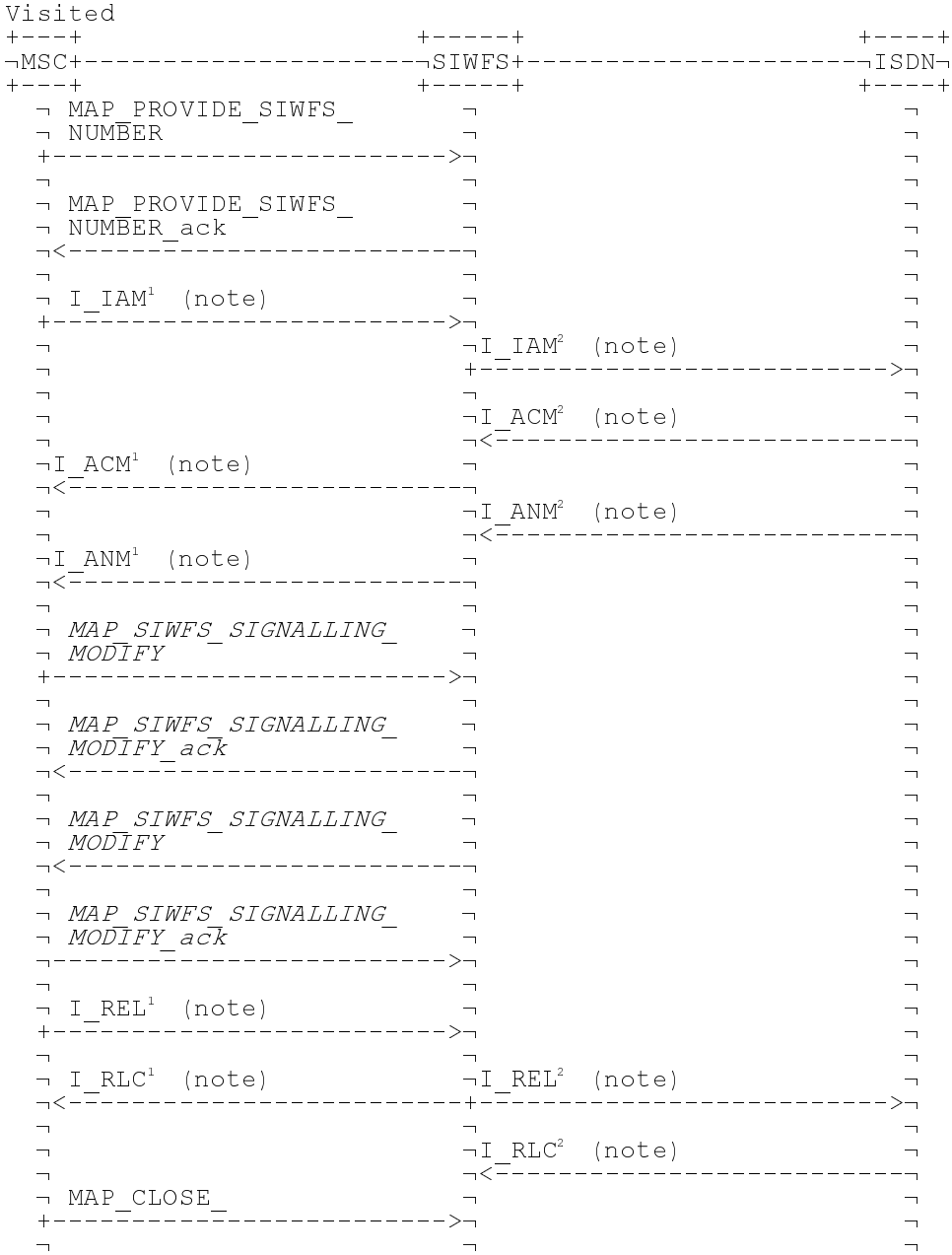


Figure 21.4/3 (sheet 3 of 3): Process ASCI_Relay_MSC

21.5 Allocation and modifications of resources in an SIWFS

21.5.1 General

The message flow for successful allocation and modification of resources in an SIWFS is shown in figure 21.5/1 (mobile originating call non-loop method), 21.5/2 (mobile originating call loop method) and 21.5/3 (mobile terminating call loop method).



Notes: *xxx = Optional Procedure*

TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. The Release message can be initiated either by the calling or called subscriber. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification:

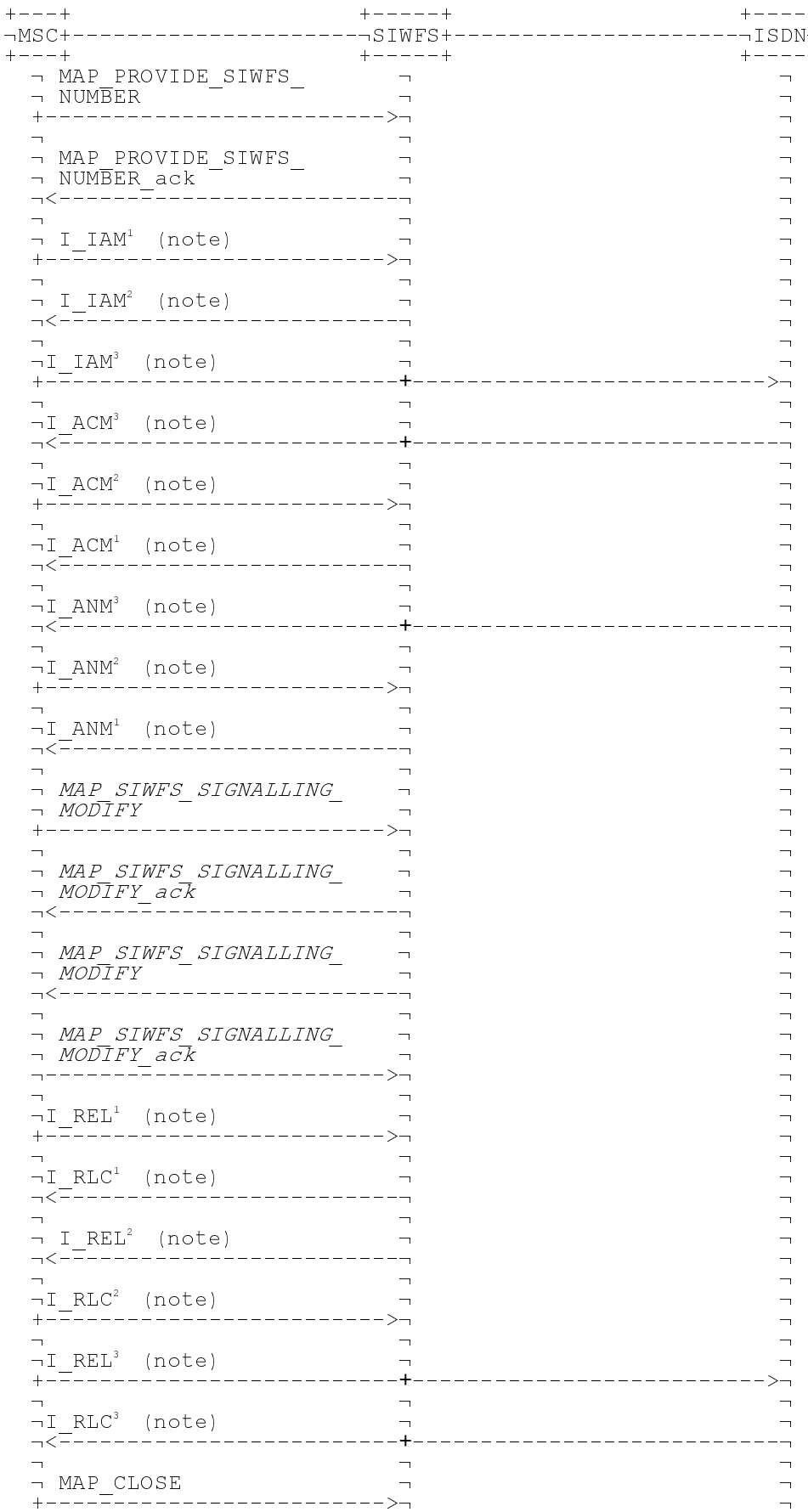
Q.721-725 - Telephone User Part (TUP);

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

The number on the ISUP messages have been added to link the messages to respective signalling sequence.

The modification of SIWF resources could be initiated any time during the call either by the VMSC or the SIWFS.

Figure 21.5/1: Message flow for mobile originating call non-loop method


Visited
MSC
SIWFS
ISDN
MAP_PROVIDE_SIWFS_NUMBER
MAP_PROVIDE_SIWFS_NUMBER_ack
I_IAM1 (note)
I_IAM2 (note)
I_IAM3 (note)
I_ACM3 (note)
I_ACM2 (note)
I_ACM1 (note)
I_ANM3 (note)
I_ANM2 (note)
I_ANM1 (note)
MAP_SIWFS_SIGNALLING_MODIFY
MAP_SIWFS_SIGNALLING_MODIFY_ack
MAP_SIWFS_SIGNALLING_MODIFY
MAP_SIWFS_SIGNALLING_MODIFY_ack
I_REL1 (note)
I_RLC1 (note)
I_REL2 (note)
I_RLC2 (note)
I_REL3 (note)
I_RLC3 (note)
MAP_CLOSE

Notes:

xxx = Optional Procedure

TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. The Release message can be initiated either by calling or called subscriber. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification:

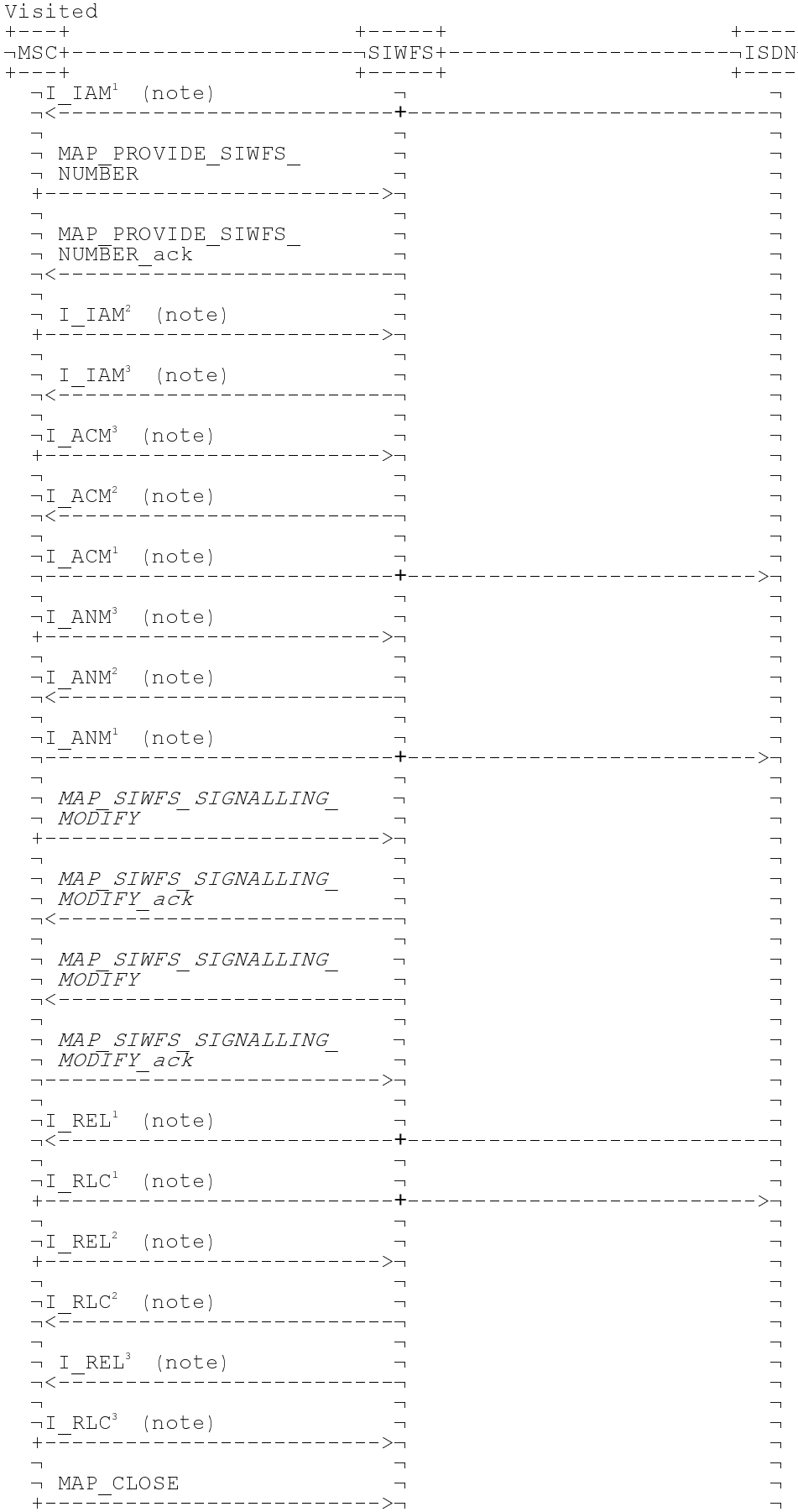
Q.721-725 - Telephone User Part (TUP);

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

The number on the ISUP messages have been added to link the messages to respective signalling sequence.

The modification of SIWF resources could be initiated any time during the call either by the VMSC or the SIWFS.

Figure 21.5/2: Message flow for mobile originating call loop method


Visited
MSC
SIWFS
ISDN
I_IAM1 (note)
MAP_PROVIDE_SIWFS_NUMBER
MAP_PROVIDE_SIWFS_NUMBER_ack
I_IAM2 (note)
I_IAM3 (note)
I_ACM3 (note)
I_ACM2 (note)
I_ACM1 (note)
I_ANM3 (note)
I_ANM2 (note)
I_ANM1 (note)
MAP_SIWFS_SIGNALLING_MODIFY
MAP_SIWFS_SIGNALLING_MODIFY_ack
MAP_SIWFS_SIGNALLING_MODIFY
MAP_SIWFS_SIGNALLING_MODIFY_ack
I_REL1 (note)
I_RLC1 (note)
I_REL2 (note)
I_RLC2 (note)
I_REL3 (note)
I_RLC3 (note)
MAP_CLOSE

Notes:

xxx = Optional Procedure

TUP or ISUP may be used in signalling between MSCs, depending on the network type between the MSCs. The Release message can be initiated either by calling or called subscriber. For further details on the TUP and ISUP procedures refer to the following CCITT Recommendations & ETSI specification:

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

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

The number on the ISUP messages have been added to link the messages to respective signalling sequence.

The modification of SIWF resources could be initiated any time during the call either by the VMSC or the SIWFS.

Figure 21.5/3: Message flow for mobile terminating call loop method

The following MAP servcies are used to allocate resources in an SIWFS:

MAP_PROVIDE_SIWFS_NUMBER see subclause 10.4.

The following MAP services are used to modify resources in an SIWFS:

MAP_SIWFS_SIGNALLING_MODIFY see subclause 10.5.

21.5.2 Process in the VMSC

The MAP process in the VMSC to allocate and modify resources in an SIWFS for a mobile call is shown in figure 21.5/4. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

21.5.2.1 Allocation of SIWFS resources

Successful Outcome

When the MAP process receives a Provide SIWFS Number request from the call handling process in the VMSC, it requests a dialogue with the SIWF whose identity is contained in the Provide SIWFS Number request by sending a MAP_OPEN service request, requests resources in the SIWFS using a MAP_PROVIDE_SIWFS_NUMBER service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the SIWFS.

If the MAP process receives a MAP_PROVIDE_SIWFS_NUMBER service confirm from the SIWFS, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Provide SIWFS Number ack containing the SIWFS Number received from the SIWFS to the call handling process in the VMSC and go to Wait_For_Modification state.

Earlier version MAP dialogue with the SIWFS

If the macro Receive_Open_Cnf takes the Vr exit, the MAP process sends an Abort to the call handling process in the VMSC and returns to the idle state.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the SIWFS could not be opened, the MAP process sends an Abort to the call handling process in the VMSC and returns to the idle state.

Error in MAP_PROVIDE_SIWFS_NUMBER confirm

If the MAP_PROVIDE_SIWFS_NUMBER service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Provide SIWFS number negative response to the call handling process in the VMSC and returns to the idle state.

Call release

If the call handling process in the VMSC indicates that the call has been aborted, the MAP process returns to the idle state. Any response from the SIWFS will be discarded.

If the call handling process in the VMSC indicates that the traffic channel has been released (i.e.call released by a user) a MAP_CLOSE_req is sent and the process is returned to the idle state.

Abort of SIWFS dialogue

During the time an answer is expected from the SIWFS, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the SIWFS may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends a Provide SIWFS number negative response to the call handling process in the VMSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the SIWFS, sends a Provide SIWFS number negative response indicating system failure to the call handling process in the VMSC and returns to the idle state.

After the dialogue with the SIWFS has been established, the MAP servcie provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the SIWFS may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the SIWFS, and returns to the idle state.

21.5.2.2 Modification of SIWFS resources initiated by the user

Successful Outcome

When the MAP process receives an SIWFS Signalling Modify request from the call handling process in the VMSC, it requests a dialogue with the SIWFS whose identity is contained in the SIWFS Signalling Modify request by sending a MAP_SIWFS_SIGNALLING_MODIFY service request and waits for a response from the SIWFS.

If the MAP process receives a MAP_SIWFS_SIGNALLING_MODIFY service confirm from the SIWFS, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends an SIWFS Signalling Modify ack containing the response received from the SIWFS to the call handling process in the VMSC and go to Wait_For_Modification state.

Error in MAP_SIWFS_SIGNALLING_MODIFY confirm

If the MAP_SIWFS_SIGNALLING_MODIFY service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends an SIWFS Signalling Modify negative response to the call handling process in the VMSC and go to Wait_For_Modification state.

Abort of SIWFS dialogue

During the time an answer is expected from the SIWFS, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the SIWFS may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends an SIWFS Signalling Modify negative response to the call handling process in the VMSC and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the SIWFS, sends an SIWFS Signalling Modify negative response indicating system failure to the call handling process in the VMSC and returns to the idle state.

21.5.2.3 Modification of SIWFS resources initiated by the SIWFS

Successful outcome

If a MAP_SIWFS_SIGNALLING_MODIFY service indication is received, the MAP process sends an SIWFS signalling modify Info request to the call handling process in the VMSC, and waits for a response. The SIWFS signalling modify request contains the parameters received in the MAP_SIWFS_SIGNALLING_MODIFY service indication.

If the call handling process in the VMSC returns an SIWFS signalling modify ack, the MAP process constructs a MAP_SIWFS_SIGNALLING_MODIFY service response contained in the Provide SIWFS Number ack, send it to the SIWFS and go to Wait_For_Modification state.

Negative response from VMSC call handling process

If the call handling process in the VMSC returns a negative response the MAP process constructs a MAP_SIWFS_SIGNALLING_MODIFY service response containing the appropriate error, send it to the SIWFS and go to Wait_For_Modification state.

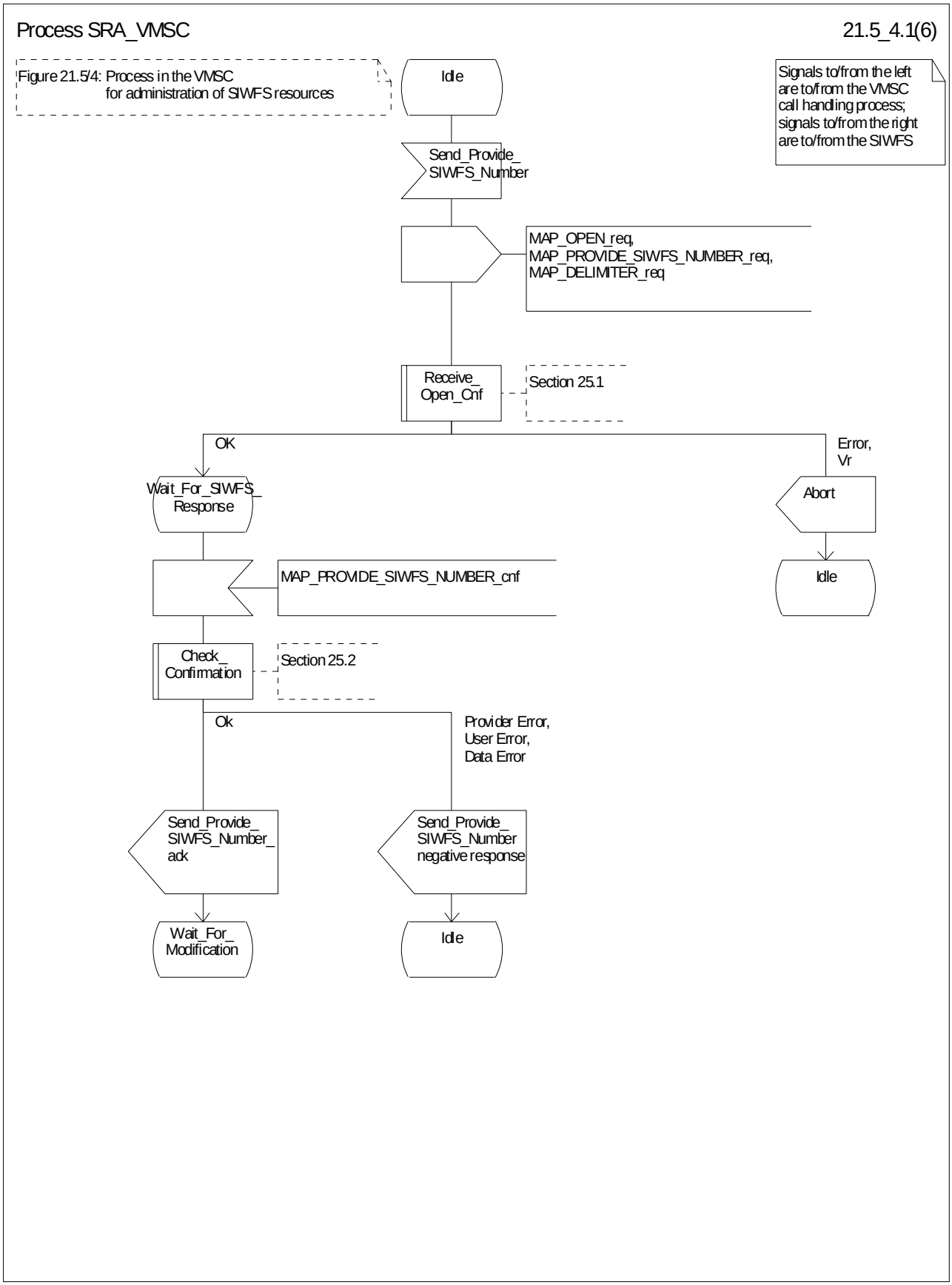


Figure 21.5/4 (sheet 1 of 6): Process SRA (SIWFS_RESOURCE_ADMINISTRATION)_VMSC

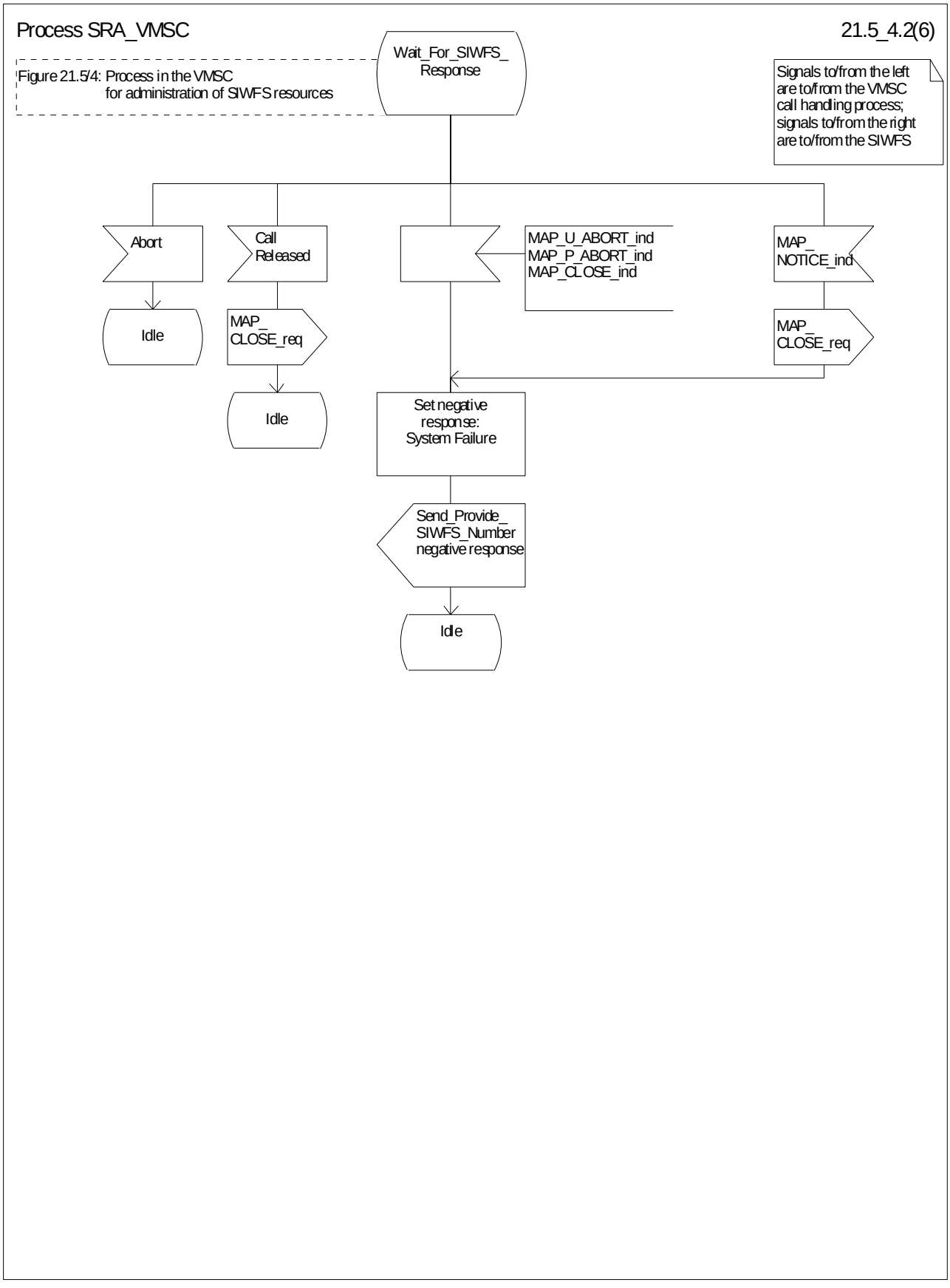


Figure 21.5/4 (sheet 2 of 6): Process SRA_VMSC

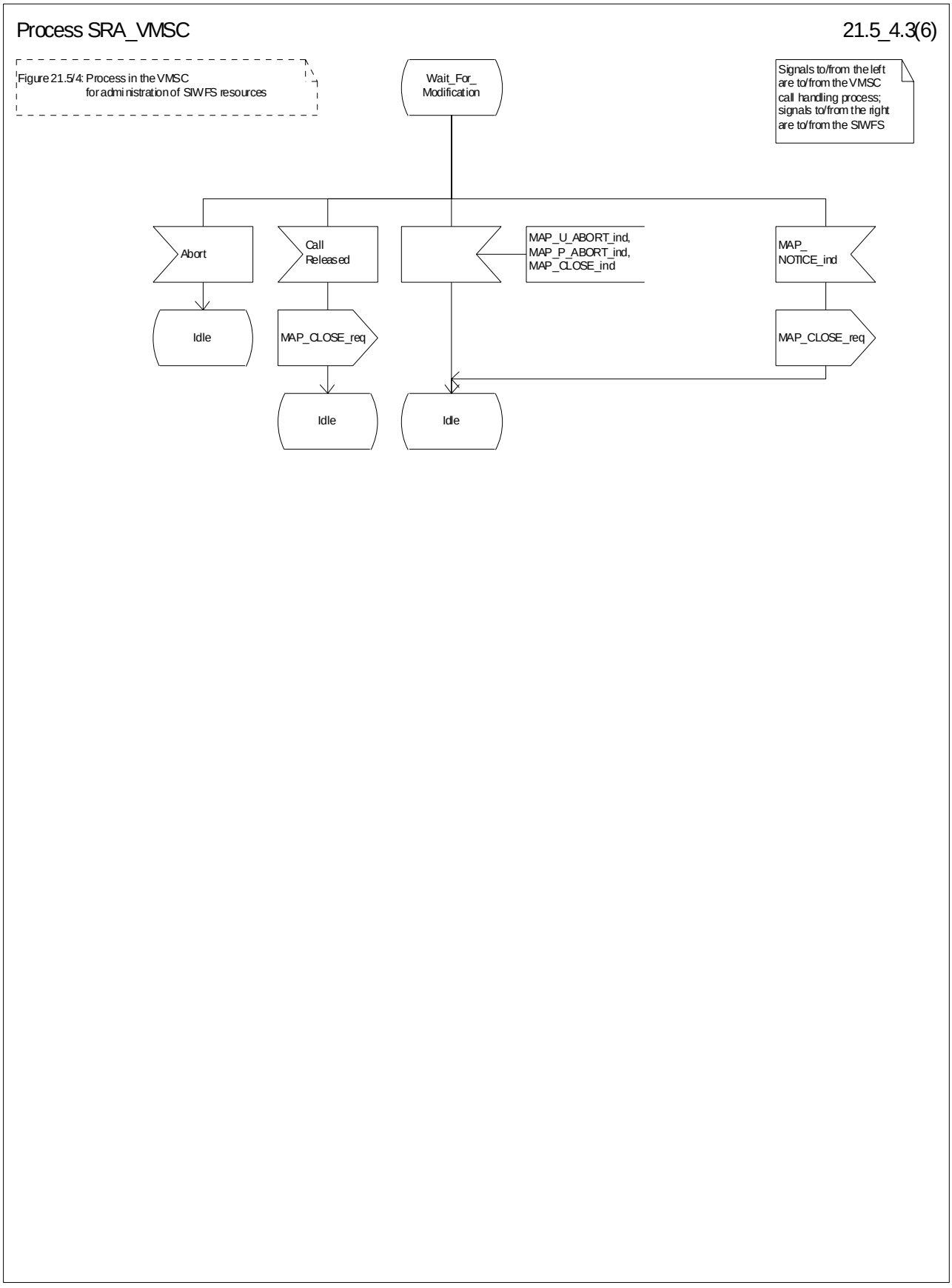


Figure 21.5/4 (sheet 3 of 6): Process SRA_VMSC

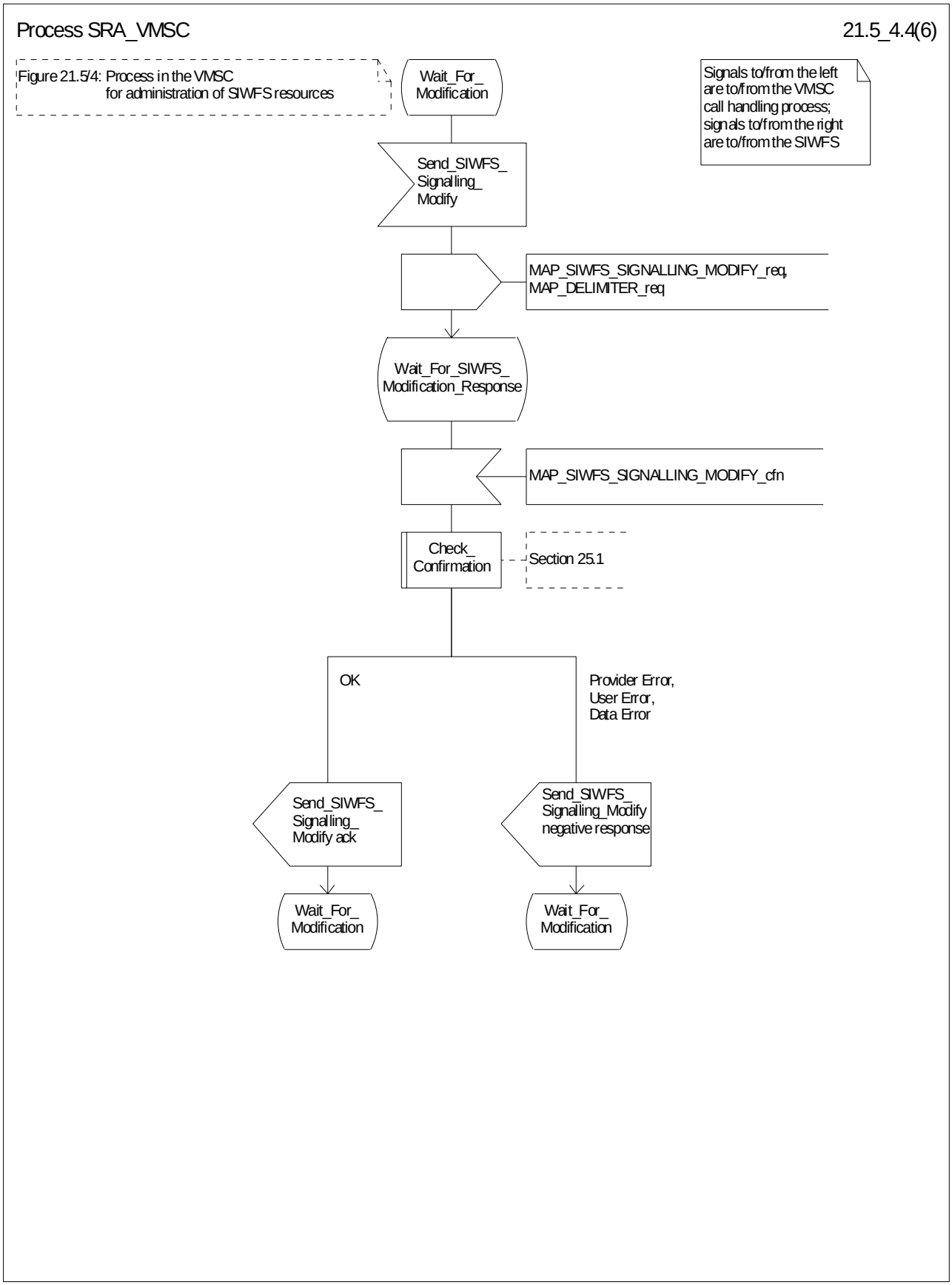


Figure 21.5/4 (sheet 4 of 6): Process SRA_VMSC

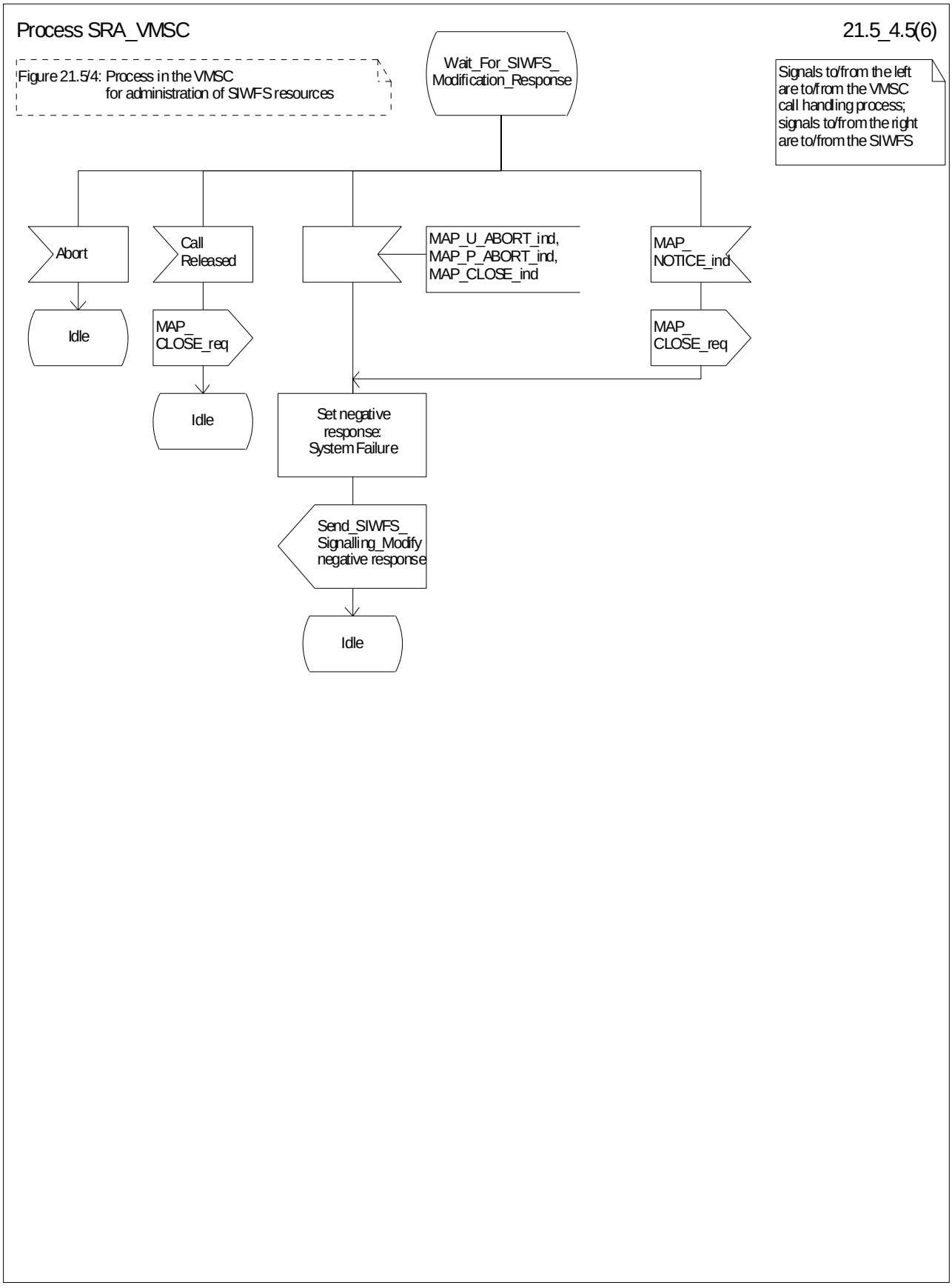


Figure 21.5/4 (sheet 5 of 6): Process SRA_VMSC

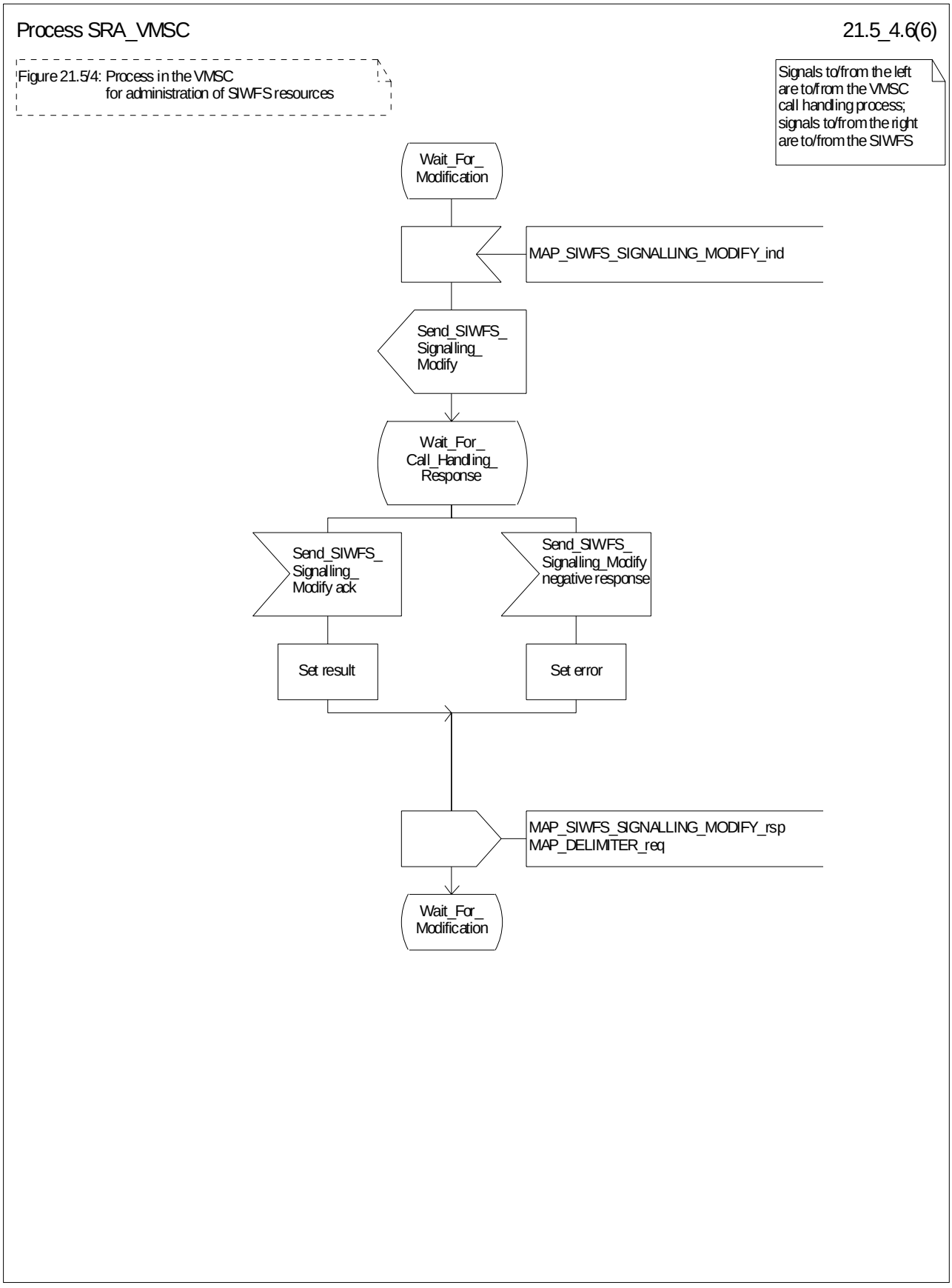


Figure 21.5/4 (sheet 6 of 6): Process SRA_VMSC

21.5.3 Process in the SIWFS

The MAP process in the SIWFS to allocate and modify SIWFS resources for a mobile call is shown in figure 21.5/5. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

Check_Confirmation see subclause 25.2.2.

21.5.3.1 Procedures for allocation of SIWFS resources

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context locInfoRetrieval, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_PROVIDE_SIWFS_NUMBER service indication is received, the MAP process sends a Provide SIWFS number Info request to the call handling process in the SIWFS, and waits for a response. The Provide SIWFS number request contains the parameters received in the MAP_PROVIDE_SIWFS_NUMBER service indication.

If the call handling process in the SIWFS returns a Provide SIWFS number ack, the MAP process constructs a MAP_PROVIDE_SIWFS_NUMBER service response containing the routing information contained in the Provide SIWFS Number ack, constructs a MAP_DELIMITER service request, sends them to the VMSC and go to Wait_For_Modification state.

Earlier version MAP dialogue with the VMSC

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

Dialogue opening failure

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

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

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

Negative response from SIWFS call handling process

If the call handling process in the SIWFS returns a negative response the MAP process constructs a MAP_PROVIDE_SIWFS_NUMBER service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the VMSC and returns to the idle state.

Call release

If the call handling process in the SIWFS indicates that the call has been aborted, the MAP process returns to the idle state. Any response from the VMSC will be discarded.

If the call handling process in the SIWFS indicates that the traffic channel has been released (i.e.call released by a user) a MAP_CLOSE_req is sent and the process is returned to the idle state.

Abort of VMSC dialogue

After the dialogoue with the VMSC has been established, the MAP servcie provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the VMSC may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VMSC, and returns to the idle state.

21.5.3.2 Process for modification of SIWFS resources initiated by the user

Successful outcome

If a MAP_SIWFS_SIGNALLING_MODIFY service indication is received, the MAP process sends an SIWFS signalling modify Info request to the call handling process in the SIWFS, and waits for a response. The SIWFS signalling modify request contains the parameters received in the MAP_SIWFS_SIGNALLING_MODIFY service indication.

If the call handling process in the SIWFS returns an SIWFS signalling modify ack, the MAP process constructs a MAP_SIWFS_SIGNALLING_MODIFY service response contained in the Provide SIWFS Number ack, send it to the VMSC and go to Wait_For_Modification state.

Negative response from SIWFS call handling process

If the call handling process in the SIWFS returns a negative response the MAP process constructs a MAP_SIWFS_SIGNALLING_MODIFY service response containing the appropriate error, send it to the VMSC and go to Wait_For_Modification state.

21.5.3.3 Process for modification of SIWFS resources initiated by the SIWFS

Successful Outcome

When the MAP process receives an SIWFS Signalling Modify request from the call handling process in the SIWF, it requests a dialogue with the VMSC whose identity is contained in the VMSC Signalling Modify request by sending a MAP_DELIMITER service request, requests resources in the VMSC using a MAP_SIWFS_SIGNALLING_MODIFY service request, the MAP process waits for a response from the VMSC.

If the MAP process receives a MAP_SIWFS_SIGNALLING_MODIFY service confirm from the VMSC, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends an SIWFS Signalling Modify ack containing the response received from the VMSC to the call handling process in the SIWF and go to Wait_For_Modification state.

Error in MAP_SIWFS_SIGNALLING_MODIFY confirm

If the MAP_SIWFS_SIGNALLING_MODIFY service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends an SIWFS Signalling Modify negative response to the call handling process in the SIWFS and go to Wait_For_Modification state.

Abort of SIWFS dialogue

During the time an answer is expected from the VMSC, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the VMSC may send a MAP_U_ABORT indication or a MAP_CLOSE indication. In any of these cases, the MAP process sends an SIWFS Signalling Modify negative response to the call handling process in the SIWFS and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VMSC, sends an SIWFS Signalling Modify negative response indicating system failure to the call handling process in the SIWFS and returns to the idle state.

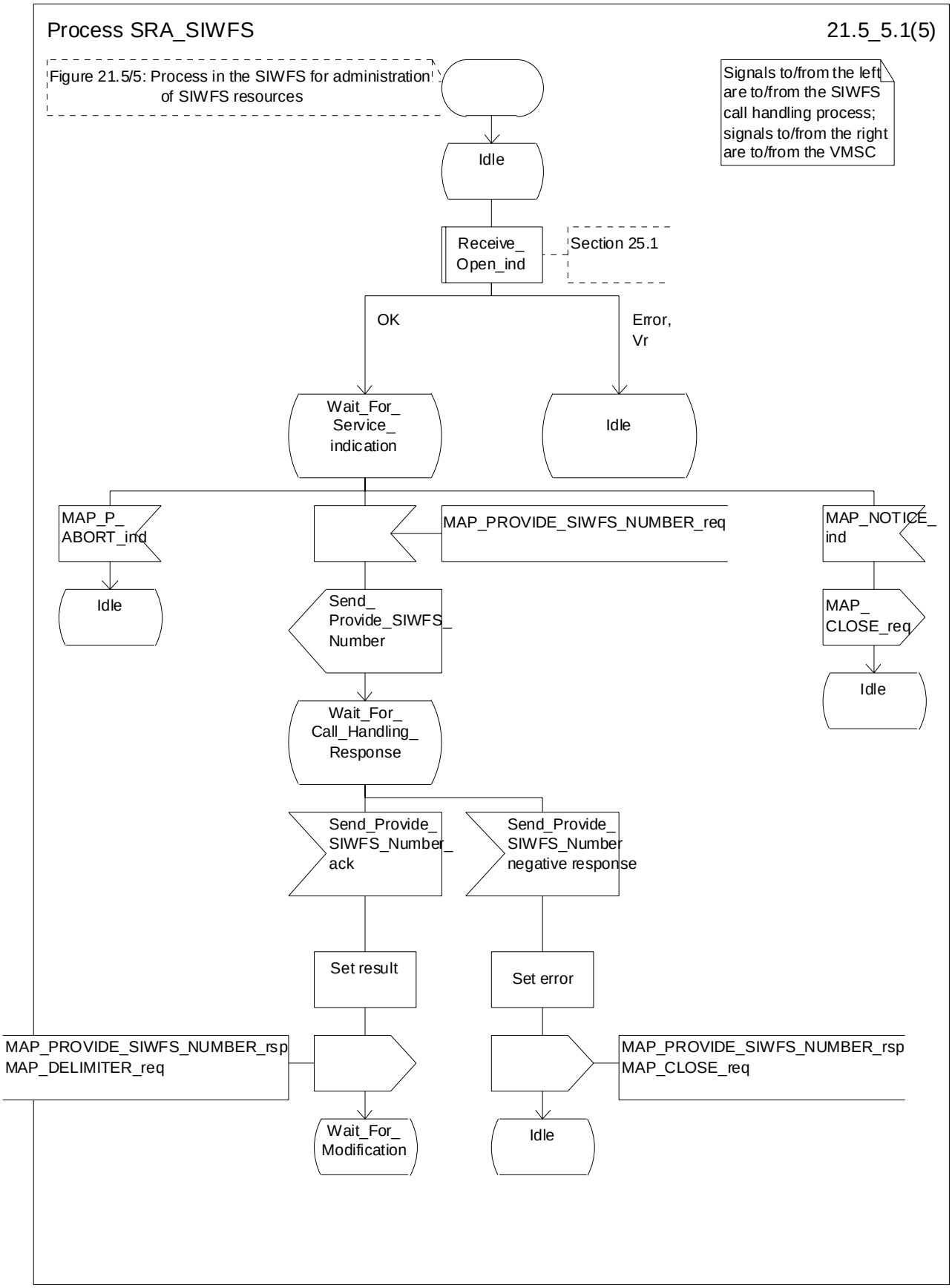


Figure 21.5/5 (sheet 1 of 5): Process SRA_SIWFS

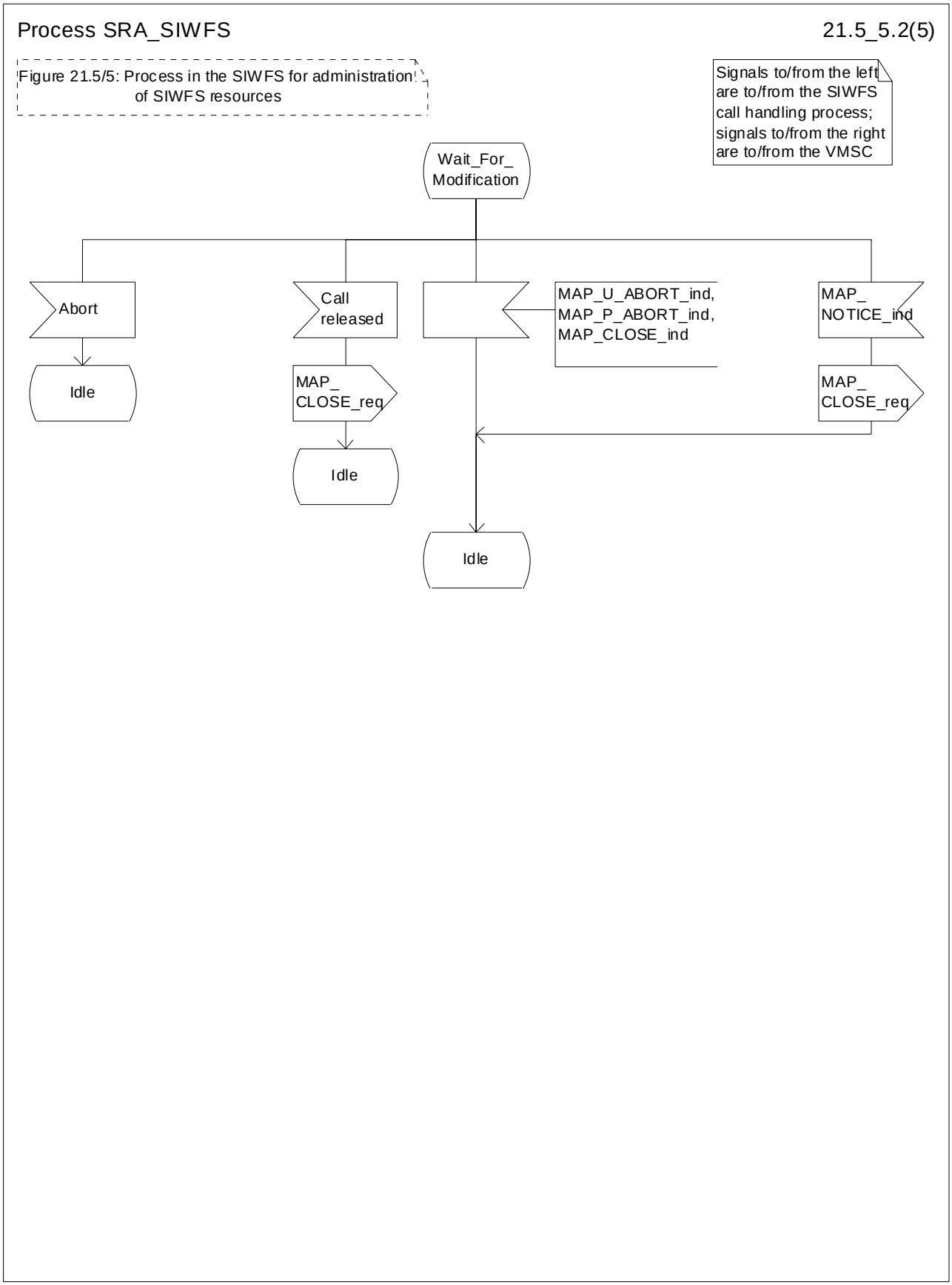


Figure 21.5/5 (sheet 2 of 5): Process SRA_SIWFS

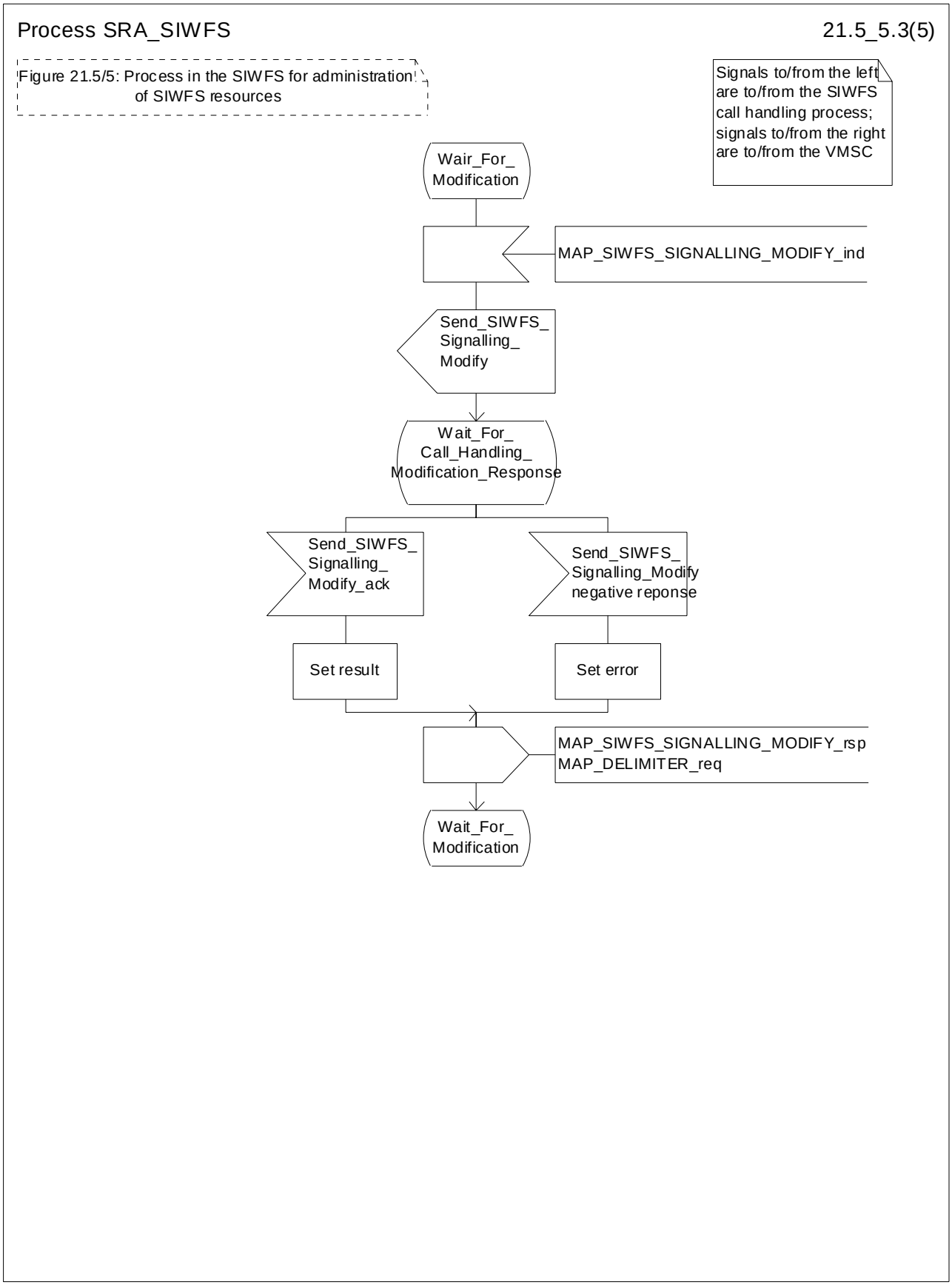


Figure 21.5/5 (sheet 3 of 5): Process SRA_SIWFS

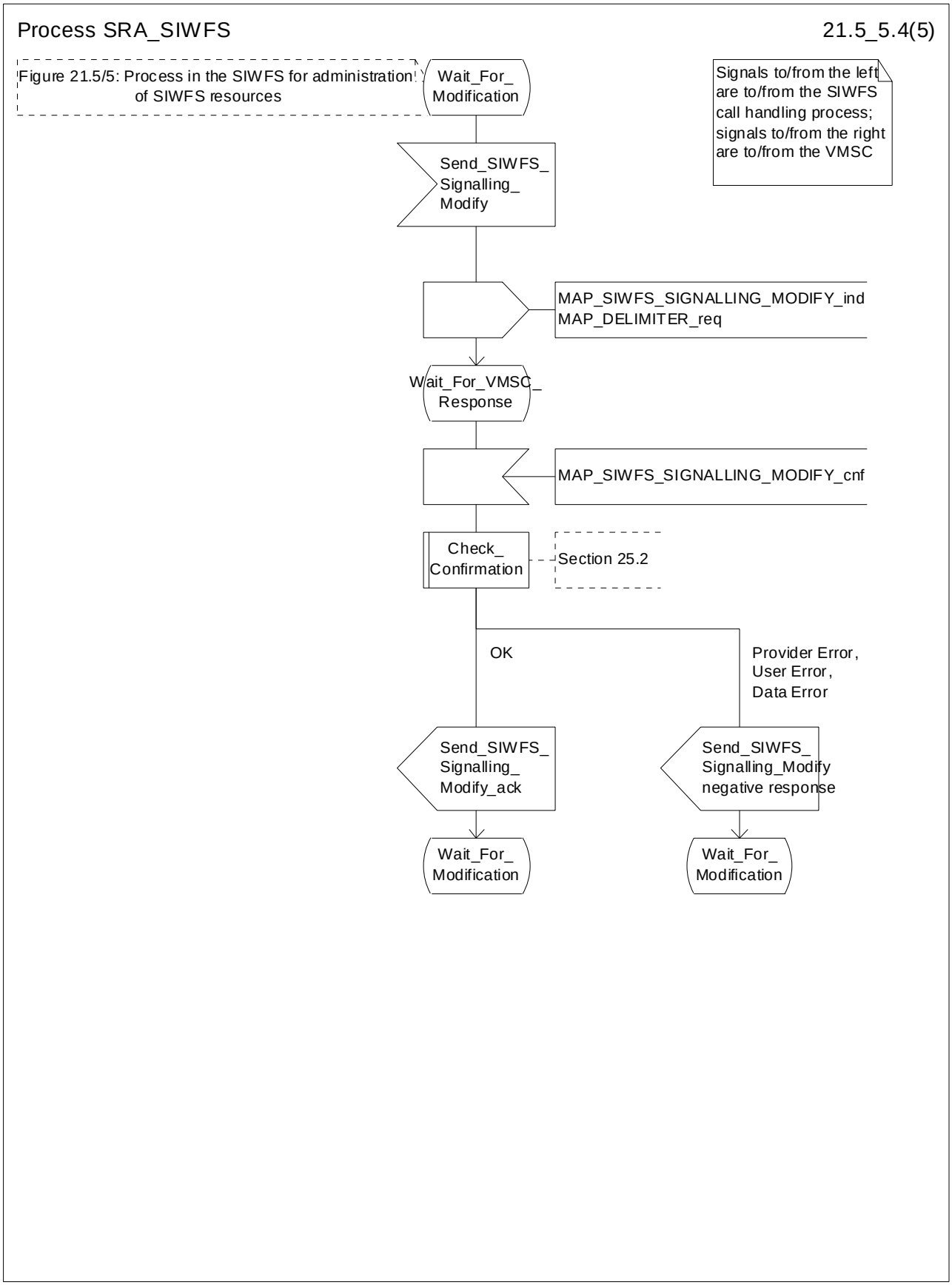


Figure 21.5/5 (sheet 4 of 5): Process SRA_SIWFS

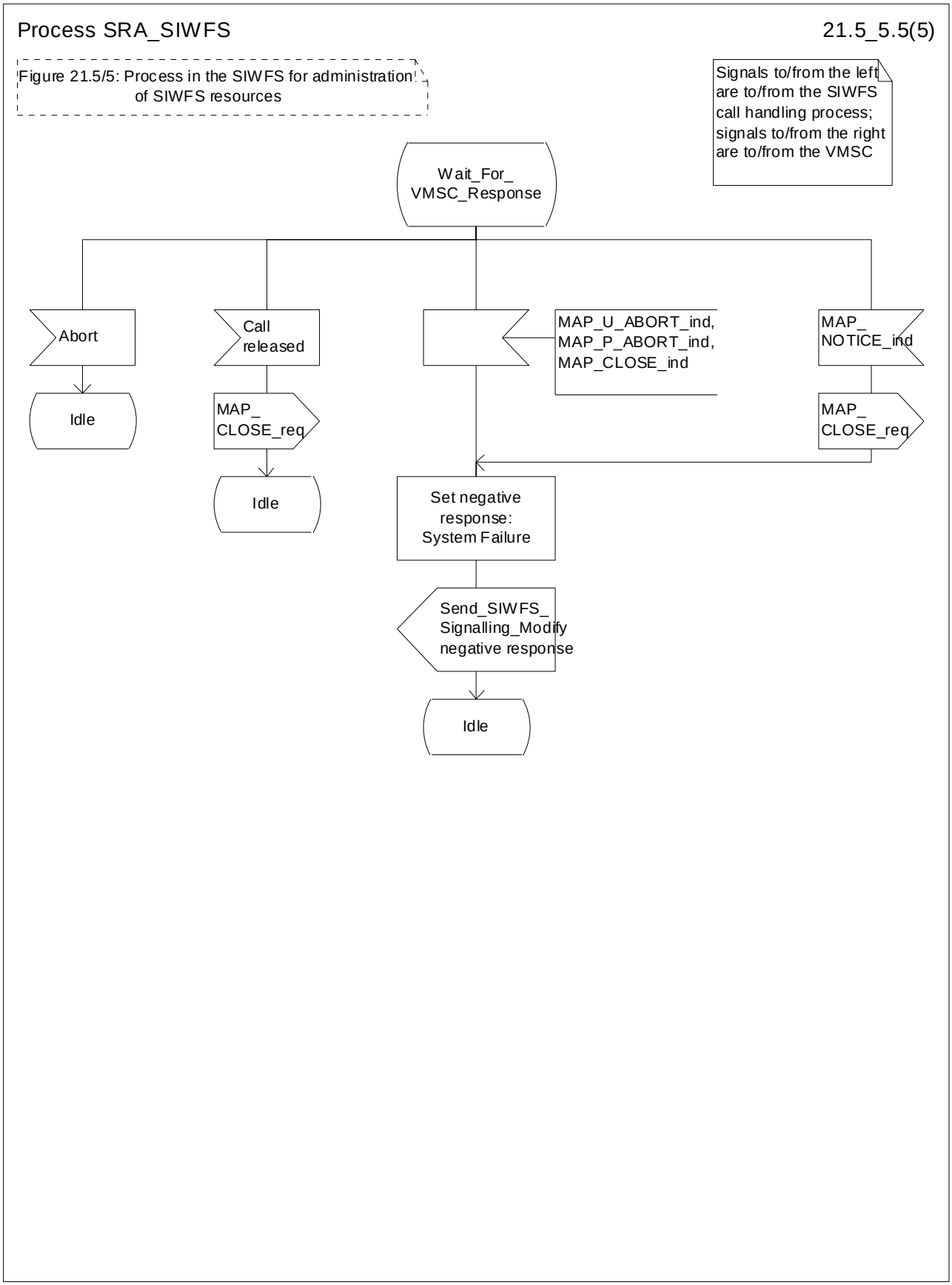


Figure 21.5/5 (sheet 5 of 5): Process SRA_SIWFS

21.6 Setting of Reporting State

21.6.1 General

The message flow for setting the reporting state in a stand-alone dialogue is shown in figure 21.6.1/1.

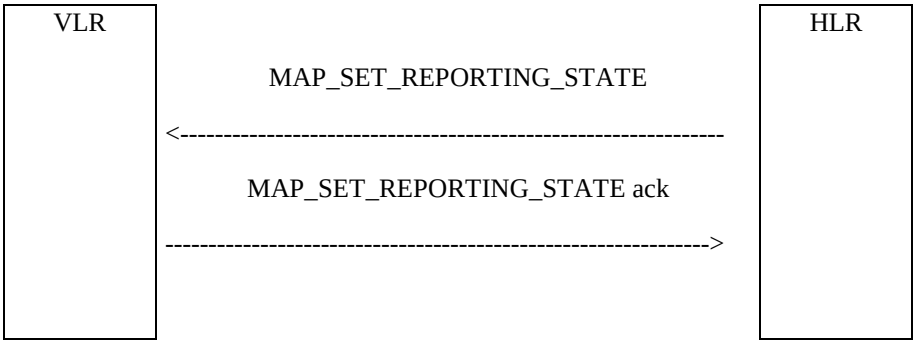


Figure 21.6/1: Message Flow for Setting the Reporting State

In Set Reporting State, the HLR can request a start or a stop of monitoring in the VLR.

21.6.2 Process in the HLR for Set Reporting State stand-alone

The MAP process in the HLR to set the reporting state in the VLR in a separate stand-alone dialogue is shown in figure 21.6/2. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Start Reporting or Stop Reporting request from the CCBS application process in the HLR, it requests a dialogue with the VLR whose identity is contained in the request by sending a MAP_OPEN service request and sending the necessary information using a MAP_SET_REPORTING_STATE service request. The HLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the VLR.

If the MAP process receives a MAP_SET_REPORTING_STATE service confirm from the VLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit and the request was for Start Reporting, the MAP process sends a positive acknowledgement containing the information received from the VLR to the CCBS application process in the HLR and returns to the idle state. In the case of Stop Reporting the CCBS application process returns to the idle state.

Failure of dialogue opening with the VLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends (in the case of Start Reporting) a negative response to the CCBS application process in the HLR and returns to the idle state.In the case of Stop Reporting the process returns to the idle state.

Error in MAP_SET_REPORTING_STATE confirm

If the MAP_SET_REPORTING_STATE service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a negative response (in the case of Start Reporting) to the CCBS application process in the HLR and returns to the idle state. In the case of Stop Reporting the CCBS application process returns to the idle state.

Abort of VLR dialogue

After the dialogue with the VLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. If the request was for the Start Reporting, the MAP process sends a Start Reporting negative response to the CCBS application process in the HLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VLR, sends a negative response (in the case of the Start Reporting) indicating system failure to the CCBS application process in the HLR and returns to the idle state. In the case of Stop Reporting the CCBS application process returns to the idle state.

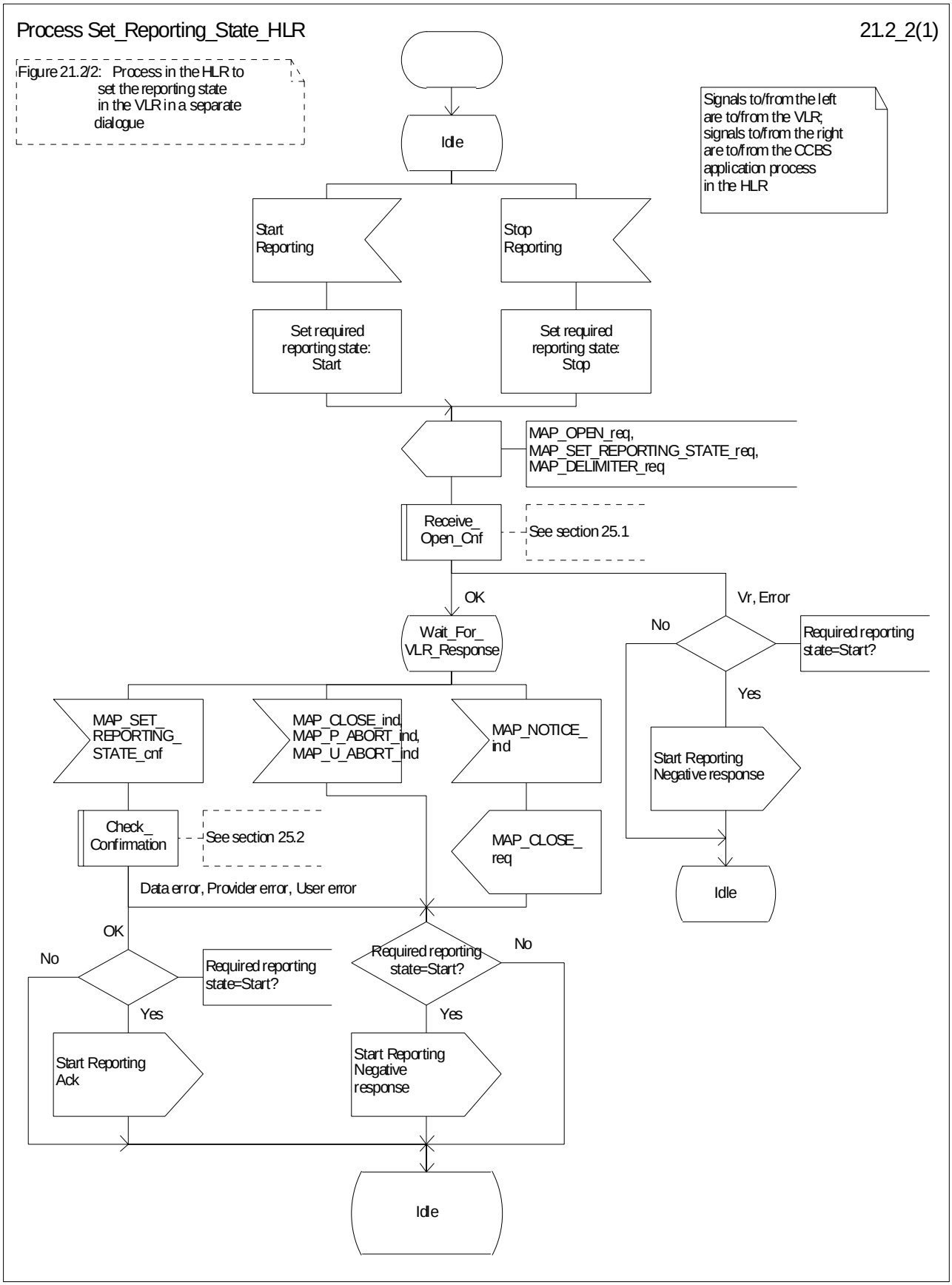


Figure 21.6/2: Process Set_Reporting_State_HLR

21.6.3 Reporting co-ordinator process in the VLR

The MAP co-ordinating process in the VLR to handle a dialogue opened with the reporting application context is shown in figure 21.6/3. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

Any reporting process in the VLR starts by the VLR receiving a MAP-OPEN service indication. If that service is successful, the VLR can handle reporting indications from the HLR. Table 21.6/1 shows the co-ordinating process' reaction on receipt of specific reporting indications from the HLR. After the relevant process is invoked, the received service indication is sent to that process.

Table 21.6/1: Relationship between received service indication and invoked process in the VLR

Service indication received	Process invoked
MAP_REMOTE_USER_FREE_ind	REMOTE_USER_FREE_VLR
MAP_SET_REPORTING_STATE_ind	SET_REPORTING_STATE_VLR

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

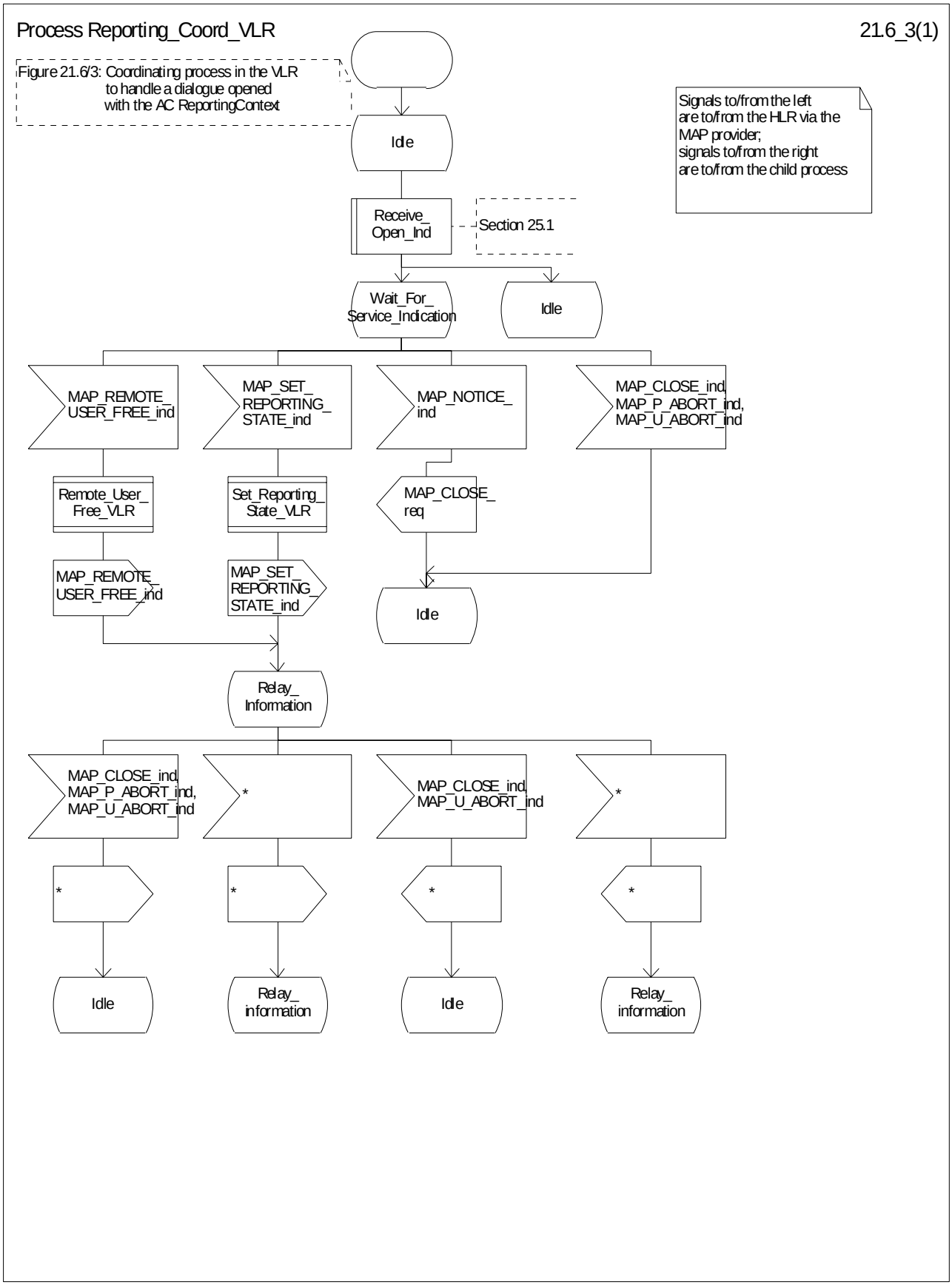


Figure 21.6/3: Process Reporting_Coord_VLR

21.6.4 Process in the VLR to set the reporting state

The MAP process in the VLR to set the reporting state is shown in figure 21.6/4.

The co-ordinator opens the process. The macro Receive_Set_Reporting_State_VLR handles the receipt of the request from the HLR, and the possible response from the CCBS application process in the VLR. When the macro exits, a MAP CLOSE is sent to the HLR and the process terminates.

The macro Set_Reporting_State_VLR is defined in figure 21.6/5.

When the VLR receives a MAP_SET_REPORTING_STATE service indication, it checks whether the required monitoring state is stopped.

If the required monitoring state is stopped, the MAP process sends a Stop Reporting message to the CCBS application in the VLR, sends a MAP_SET_REPORTING_STATE response to the HLR and exits from the macro.

If the required monitoring state is started, the MAP process sends a Start Reporting message to the CCBS application in the VLR and waits for a response.

If the CCBS application sends a Start Reporting ack, the MAP process sends a MAP_SET_REPORTING_STATE response to the HLR and exits from the macro.

If the CCBS application sends a Start Reporting negative response, the MAP process translates the negative response into a MAP user error, sends a MAP_SET_REPORTING_STATE response to the HLR and exits from the macro.

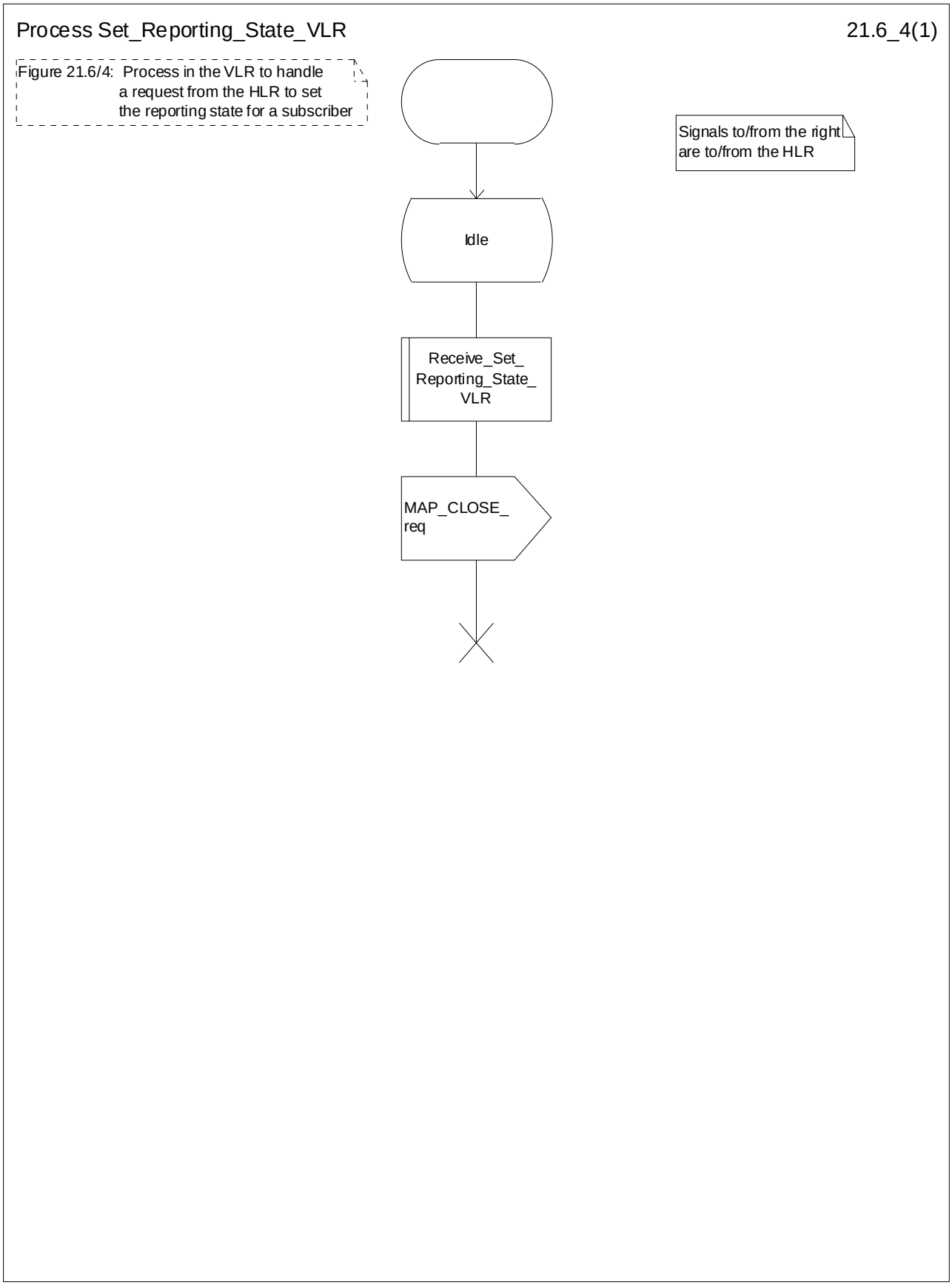


Figure 21.6/4: Process Set_Reporting_State_VLR

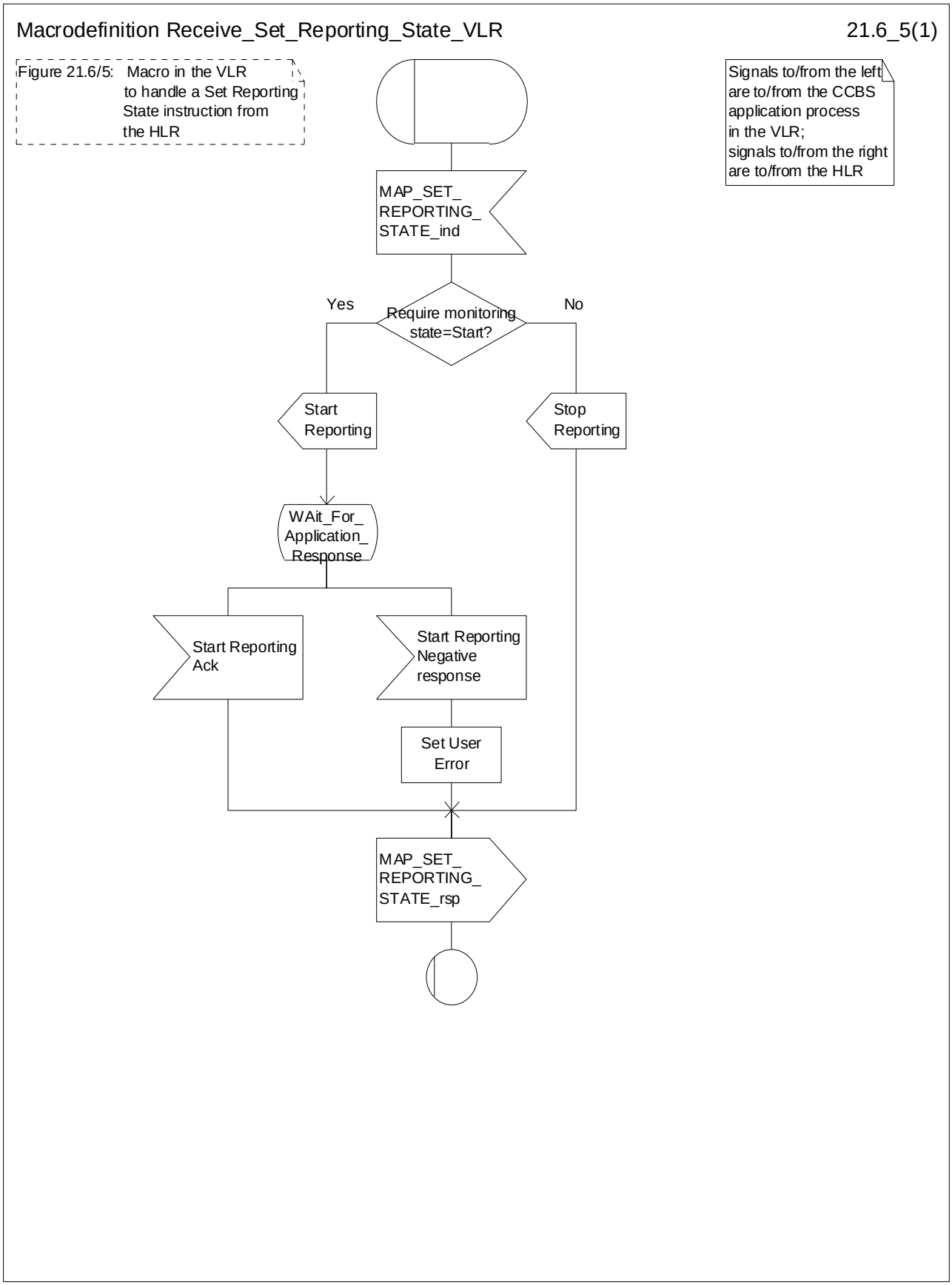


Figure 21.6/5: Macro Receive_Set_Reporting_State_VLR

21.7 Status Reporting

21.7.1 General

The message flows for reporting the status of a subscriber are shown in figures 21.7/1 and 21.7/2.

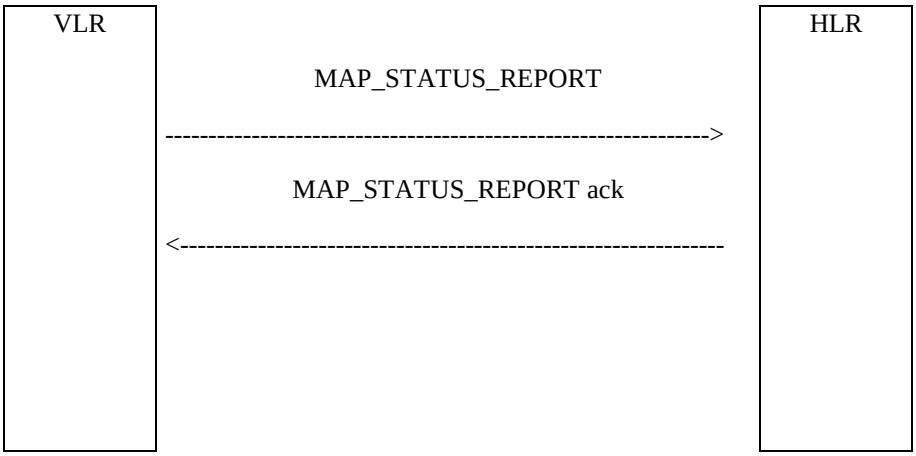


Figure 21.7/1: Status reporting, when monintoring continues in the VLR

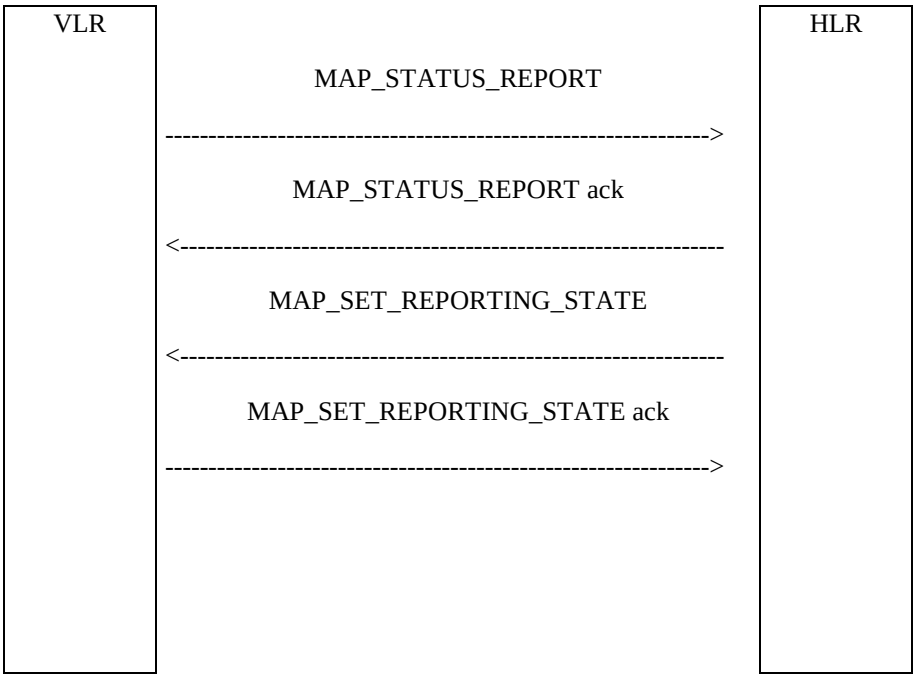


Figure 21.7/2: Status reporting, when monintoring stops

When the HLR sends a MAP_SET_REPORTING_STATE, it requests the stop of monitoring in the VLR.

21.7.2 Process in the VLR for Status Reporting

The MAP process in the VLR to send a status report to the HLR is shown in figure 21.7/3. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Successful Outcome

When the MAP process receives a Event Report or CCBS Call Report from the CCBS application process in the VLR, it requests a dialogue with the HLR whose identity is contained in the request by sending a MAP_OPEN service request, and requests status report using a MAP_STATUS_REPORT service request. The VLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_STATUS_REPORT service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends an Event Report ack or a CCBS Call Report ack containing the information received from the HLR to the CCBS application process in the VLR and waits for a possible instruction from the HLR to set the reporting state.

If the HLR requests the VLR to set a reporting state (in the macro Receive_Set_Reporting_State_VLR), the VLR closes the dialogue with the HLR by sending a MAP CLOSE to the HLR.

If the HLR requires monitoring in the VLR to continue, it closes the dialogue by sending a MAP_CLOSE, and the MAP process in the VLR sends Continue Monitoring message to the CCBS application process in the VLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a Event Report negative response or CCBS Call Report negative response to the CCBS application process in the VLR and returns to the idle state.

Error in MAP_STATUS_REPORT confirm

If the MAP_STATUS_REPORT service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends an Event Report negative response or CCBS Call Report negative response to the CCBS application process in the VLR and returns to the idle state.

Abort of HLR dialogue in State Wait_For_HLR_Response

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a Event Report or CCBS Call Report negative response to the CCBS application process in the VLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR. The VLR sends an Event Report negative response or CCBS Call Report negative response indicating system failure to the CCBS application process in the VLR and returns to the idle state.

Abort of HLR dialogue in State Wait_For_Set_Reporting

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the VLR returns to the idle state

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR and returns to the idle state.

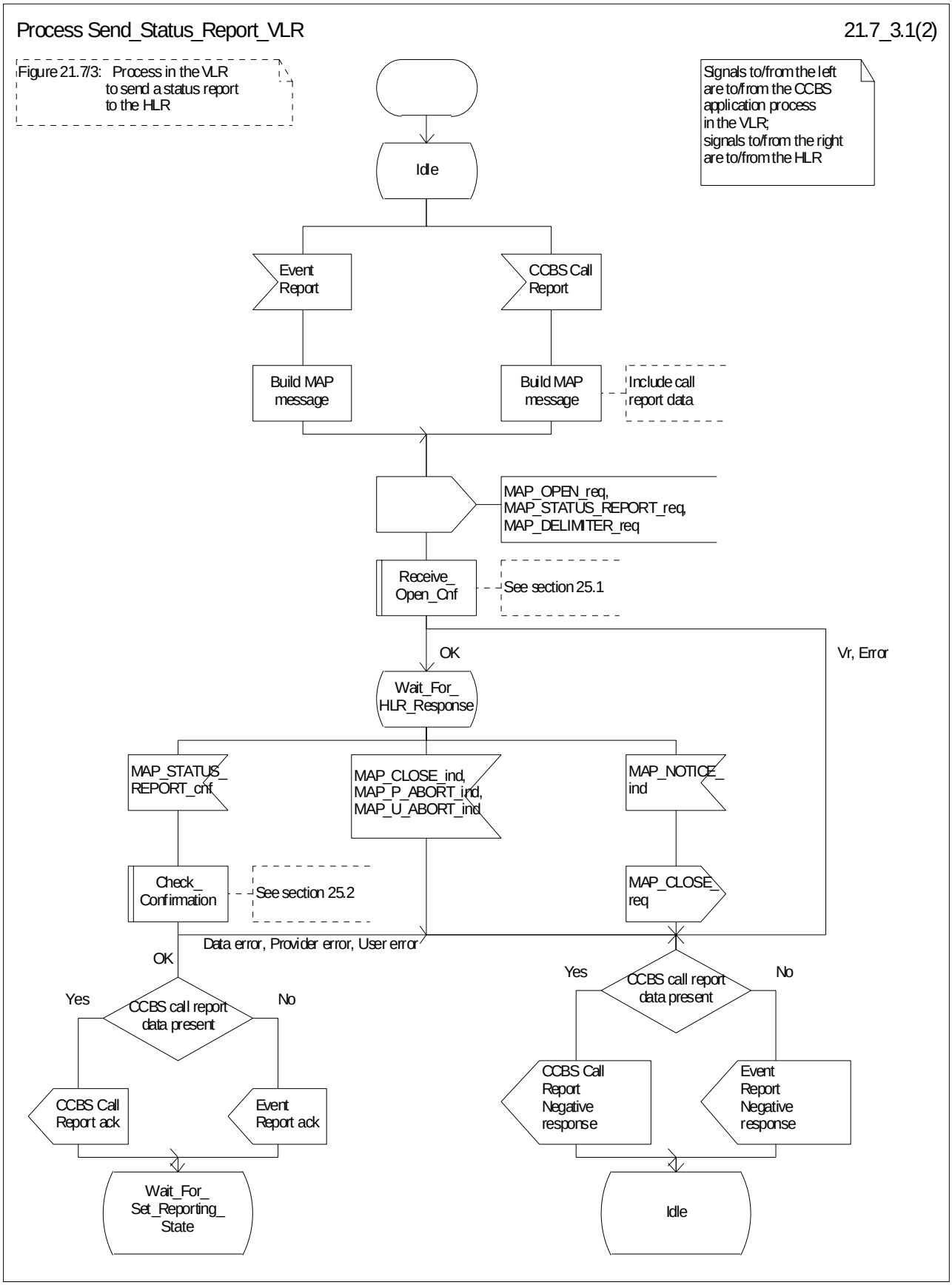


Figure 21.7/3 (sheet 1 of 2): Process Send_Status_Report_VLR

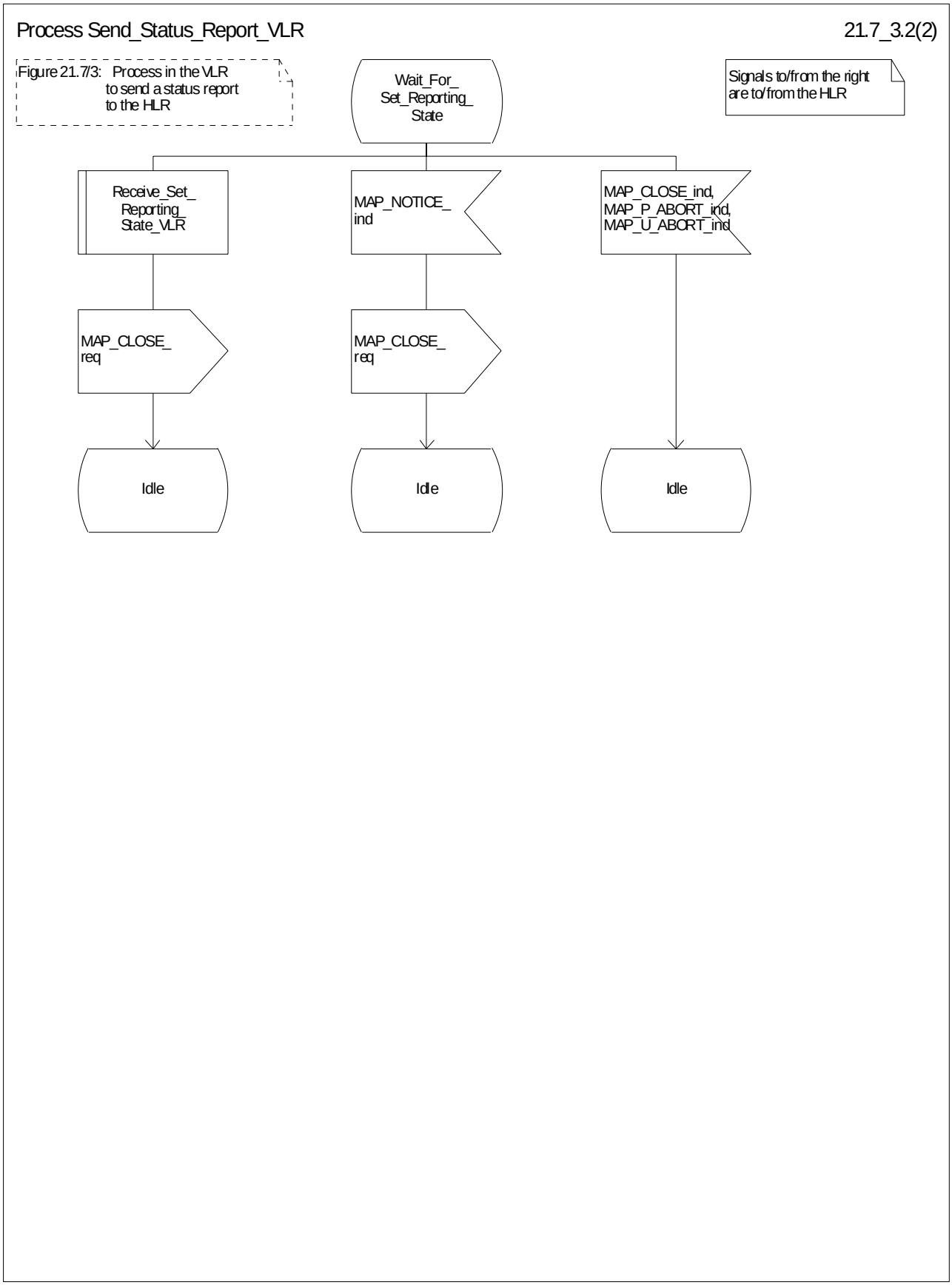


Figure 21.7/3 (sheet 2 of 2): Process Send_Status_Report_VLR

21.7.3 Process in the HLR for Status Reporting

The MAP process in the HLR to handle a status report is shown in figure 21.7/4. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Confirmation see subclause 25.2.2;

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context reporting, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

The MAP process invokes the macro Receive_Status_Report_HLR to handle a MAP_STATUS_REPORT service indication; this macro is defined in figure 21.7/5. The MAP process then waits for a response from the CCBS application in the HLR.

If the MAP process receives a Stop Reporting message from the CCBS process, it sets the required monitoring state to stop, and may send a MAP_DELIMITER service request to the VLR. The HLR then invokes the macro Set_Reporting_State_HLR. After exiting the macro, the MAP process returns to the idle state.

If the MAP process receives a Continue Reporting from the CCBS process, it sends a MAP CLOSE Request to VLR and returns to the idle state.

Failure of dialogue opening with the VLR

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

Abort of VLR dialogue in State Wait_For_Service_Indication

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication. In this case, the MAP process returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VLR and returns to the idle state.

Macro Receive_Status_Report_HLR

The macro Receive_Status_Report_HLR is shown in figure 21.7/5.

When a MAP_STATUS_REPORT service indication is received, the HLR checks whether call report data are present.

If call report data are present, the MAP process sends a CCBS Call Report message to the CCBS application process in the HLR and waits for a response; otherwise it sends an Event Report message to the CCBS application process in the HLR and waits for a response.

If the MAP process receives a CCBS Call Report ack or Event Report ack from the CCBS application process in the HLR, it sends a MAP_STATUS_REPORT service confirm to the VLR and exits from the macro.

If the MAP process receives a CCBS Call Report negative response or Event Report negative response from the CCBS application process in the HLR, it sets the User Error according to the negative response, sends a MAP_STATUS_REPORT service confirm to the VLR and exits from the macro.

Macro Set_Reporting_State_HLR

The macro Set_Reporting_State_HLR is shown in figure 21.7/6.

The MAP process in the HLR sends a MAP_SET_REPORTING_STATE service request to the VLR and waits for a response.

If the MAP process receives a MAP_SET_REPORTING_STATE service confirm from the VLR, it invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the macro Set_Reporting_State_HLR takes the OK exit.

If the macro Check_Confirmation takes the Data error, Provider error or User error exit, the macro Set_Reporting_State_HLR takes the Error exit.

While the MAP process is waiting for a response from the VLR, the MAP provider may terminate the dialogue by sending a MAP_CLOSE, MAP_P_ABORT or MAP_U_ABORT. In this case the macro takes the Aborted exit.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the VLR and the macro takes the Aborted exit.

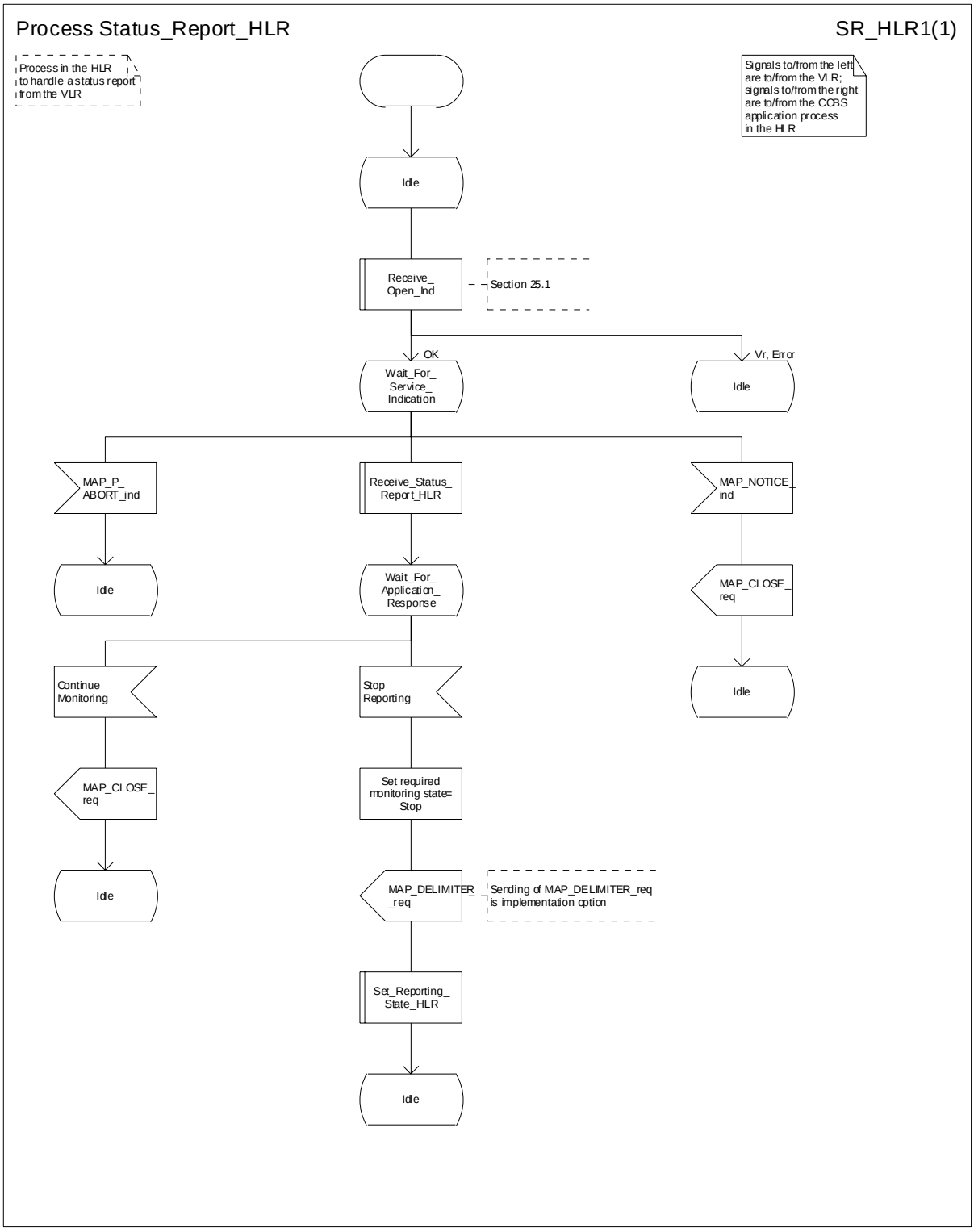


Figure 21.7/4: Process Status Report_HLR

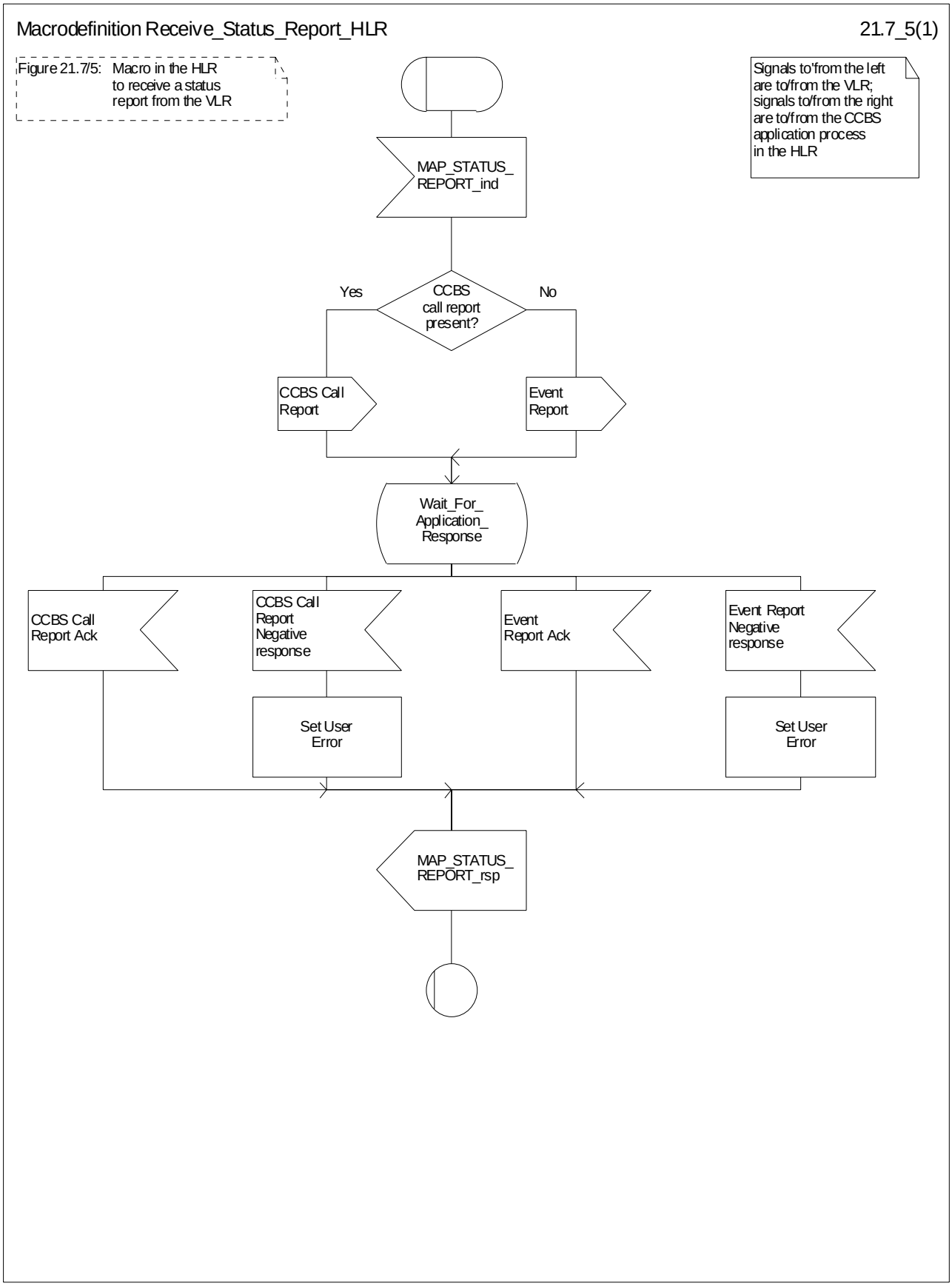


Figure 21.7/5: Macro Receive_Status_Report_HLR

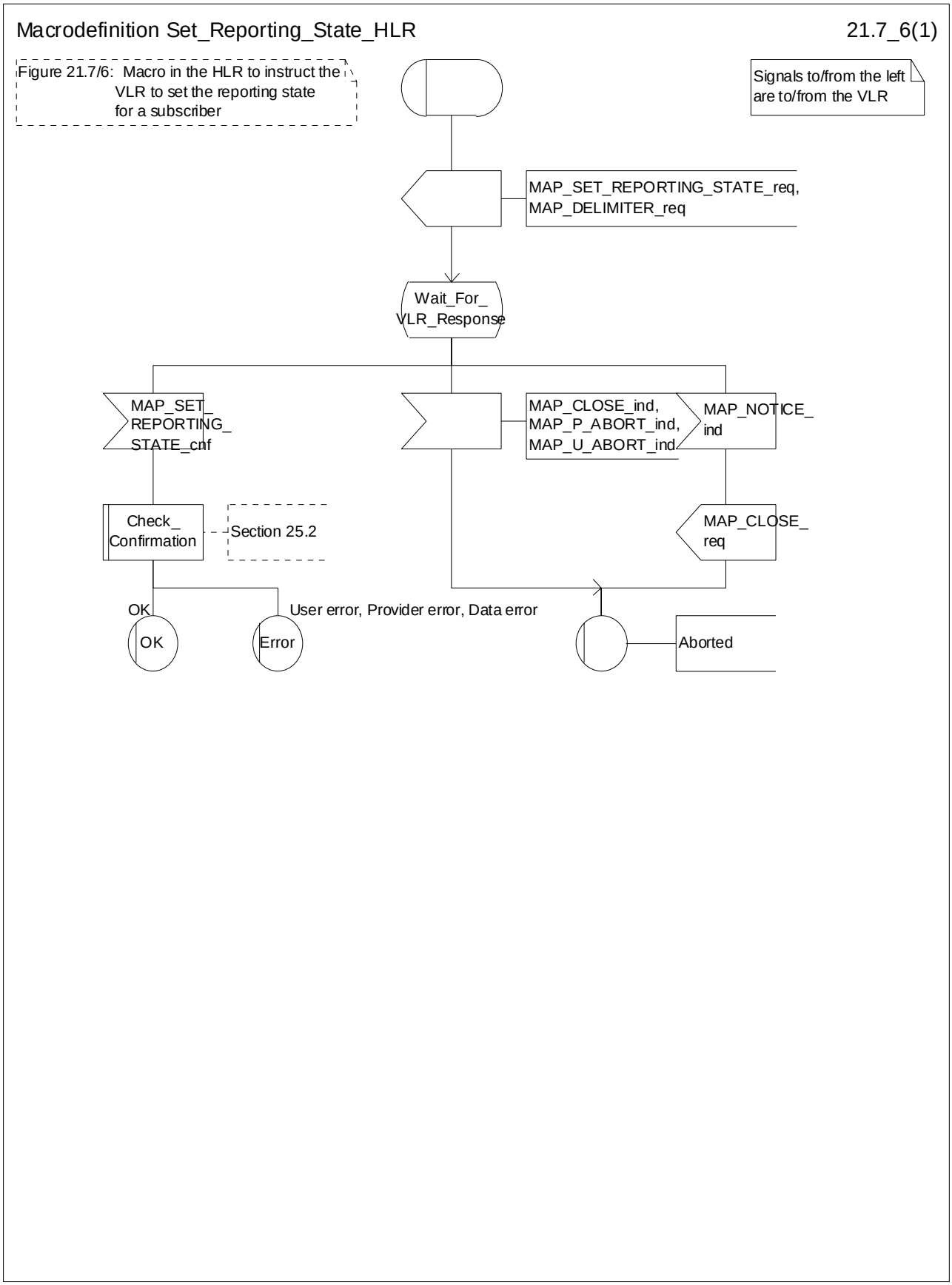


Figure 21.7/6: Macro Set_Reporting_State_HLR

21.8 Remote User Free

21.8.1 General

The message flows for handling remote user free are shown in figures 21.8/1 and 21.8/2.

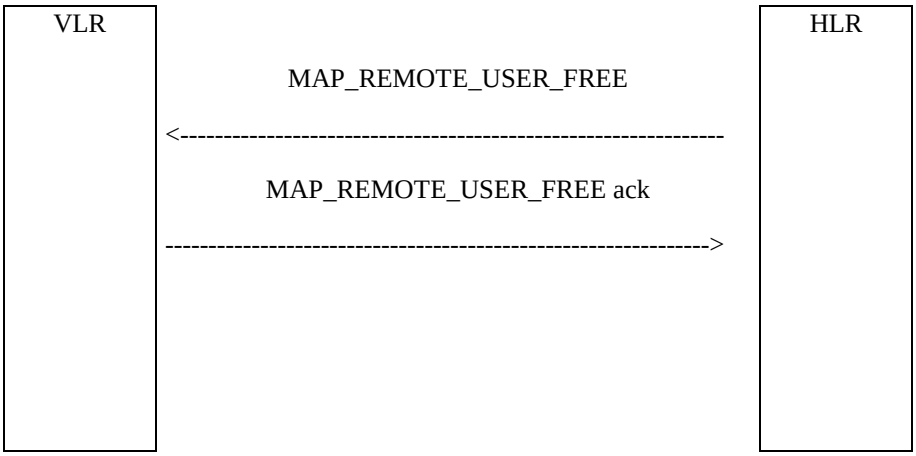


Figure 21.8/1: Remote User Free: recall not accepted

Figure 21.8/2: Remote User Free: recall accepted

21.8.2 Process in the HLR for Remote User Free

The MAP process in the HLR to handle Remote User Free is shown in figure 21.8/3. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2;

Successful Outcome

When the MAP process receives a CCBS RUF request from the CCBS application process in the HLR, it requests a dialogue with the VLR whose identity is contained in the request by sending a MAP_OPEN service request and sending the necessary information using a MAP_REMOTE_USER_FREE service request. The HLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the VLR.

If the MAP process receives a MAP_REMOTE_USER_FREE service confirm from the VLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a CCBS RUF ack containing the information received from the VLR to the CCBS application process in the HLR and waits for a MAP_STATUS_REPORT service indication from the VLR. If in this state a MAP_CLOSE service indication is received, the MAP process returns to the idle state. If in this state a MAP_STATUS_REPORT service indication is received, further processing is described by the macro Receive_Status_Report_HLR (described in subclause 21.7.3). When the macro exits, the MAP process constructs a MAP_CLOSE service request, sends it to the VLR and returns to the idle state.

Failure of dialogue opening with the VLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the CCBS application process in the HLR and returns to the idle state.

Error in MAP_REMOTE_USER_FREE confirm

If the MAP_REMOTE_USER_FREE service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a CCBS RUF negative response to the CCBS application process in the HLR and returns to the idle state.

Abort of VLR dialogue

When the MAP process is waiting for a VLR response to the MAP_REMOTE_USER_FREE, the MAP service provider may abort the dialogue by issuing a MAP_CLOSE, a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a CCBS RUF negative response to the CCBS application process in the HLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication when the MAP process is waiting for a VLR response to the MAP_REMOTE_USER_FREE, the MAP process closes the dialogue with the VLR, sends a CCBS RUF negative response indicating system failure to the CCBS application process in the HLR and returns to the idle state.

When the MAP process is waiting for a possible MAP_STATUS_REPORT from the VLR, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication when the MAP process is waiting for a possible MAP_STATUS_REPORT from the VLR, the MAP process closes the dialogue with the VLR and returns to the idle state.

If the CCBS application in the HLR decides to abort the dialogue, it sends an Abort message to the MAP process, which closes the dialogue with the VLR and returns to the idle state.

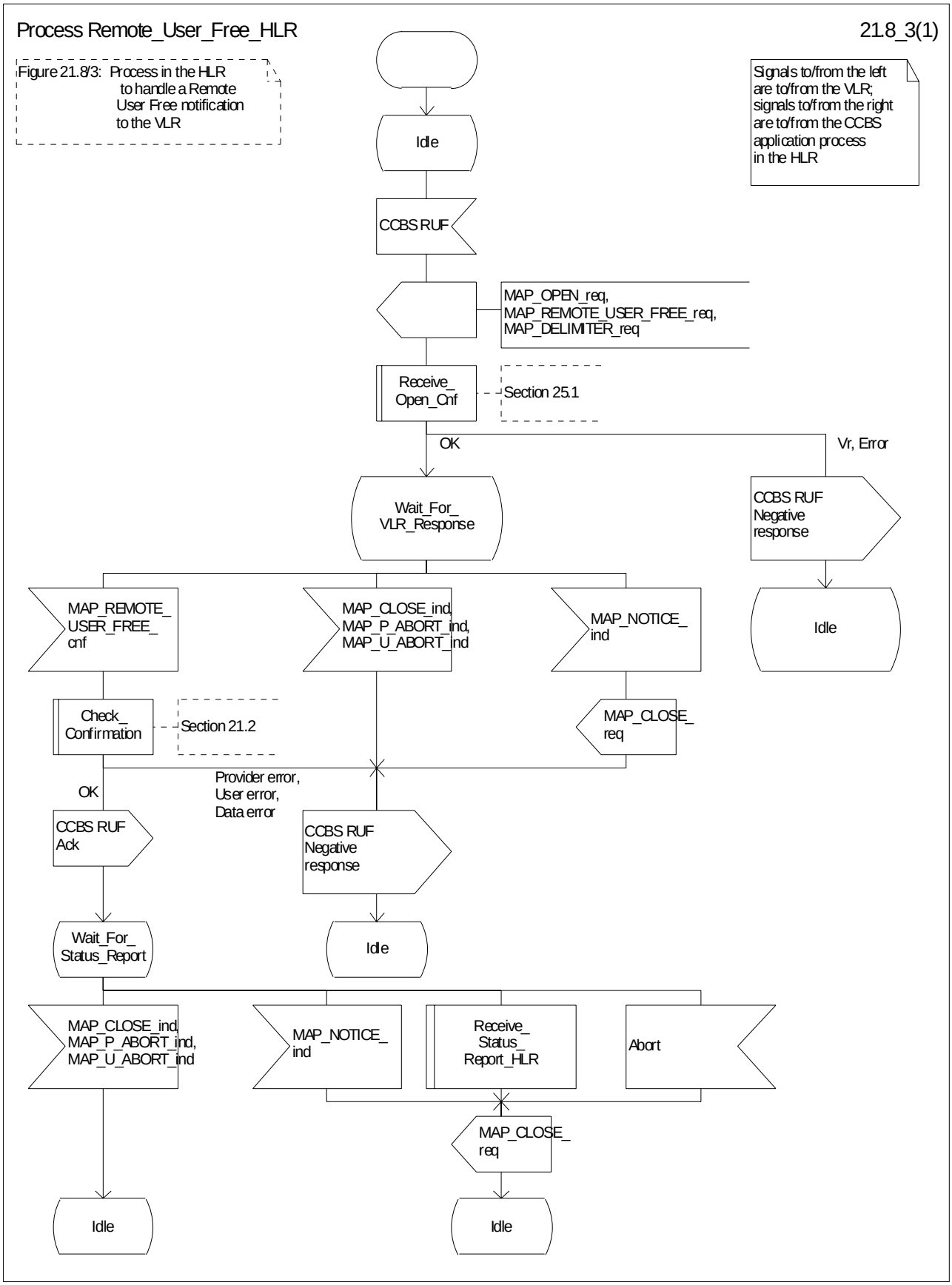


Figure 21.8/3: Process Remote_User_Free_HLR

21.8.3 Process in the VLR for Remote User Free

The MAP process in the VLR to handle Remote User Free is shown in figure 21.8/4. The MAP process invokes a macro not defined in this subclause; the definitions of this macro can be found as follows:

Check_Confirmation see subclause 25.2.2;

Successful outcome (Recall accepted)

When the MAP process receives a MAP_REMOTE_USER_FREE service indication, the VLR sends a CCBS RUF request to the CCBS application process in the VLR, and waits for a response. The request contains the parameters received in the MAP_REMOTE_USER_FREE service indication.

If the CCBS application process in the VLR returns a positive response indicating "recall accepted“, the MAP process constructs a MAP_REMOTE_USER_FREE service response and a MAP_DELIMITER service request, sends them to the VLR and waits for a CCBS Call Report message from the CCBS application process in the VLR. When the MAP process receives the CCBS Call Report from the CCBS application process in the VLR, it constructs a MAP_STATUS_REPORT service request and a MAP_DELIMITER service request, sends them to the HLR and waits for a response. If the MAP process receives a MAP_STATUS_REPORT service confirm, the VLR calls the macro Check_Confirmation. If this macro takes the OK exit, the MAP process sends a CCBS Call Report ack to the CCBS application process in the VLR and the MAP process terminates.

Successful outcome (Recall not accepted)

If the CCBS application process in the VLR returns a positive response indicating "recall not accepted“, the MAP process constructs a MAP_REMOTE_USER_FREE service response and a MAP_CLOSE service request, sends them to the HLR and terminates.

Negative response from VLR CCBS application process

If the CCBS application process in the VLR returns a negative response, the MAP process constructs a MAP_REMOTE_USER_FREE service response containing the appropriate error and a MAP_CLOSE service request, sends them to the HLR and terminates.

Failure of dialogue with the HLR

When waiting for a response or a call result from the CCBS application process in the VLR, the MAP process may receive a MAP_CLOSE service indication, a MAP_U_ABORT service indication or a MAP_P_ABORT service indication from the co-ordinating process, in which case the MAP process terminates.

When waiting for a call result from the CCBS application process in the VLR, the MAP process may receive a MAP_NOTICE indication from the co-ordinating process, in which case the MAP process constructs a MAP_CLOSE service request, sends it to the co-ordinating process and terminates.

When waiting for a response from the HLR, the MAP process may receive a MAP_CLOSE indication, a MAP_U_ABORT indication or a MAP_P_ABORT indication from the co-ordinating process, in which case the MAP process sends a CCBS Call Report negative response to the CCBS application process in the VLR and terminates.

When waiting for a response from the HLR, the MAP process may receive a MAP_NOTICE indication from the co-ordinating process, in which case the MAP process constructs a MAP_CLOSE service request, sends it to the co-ordinating process, sends a CCBS Call Report negative response to the CCBS application process in the VLR and terminates.

Error in MAP_STATUS_REPORT confirm

If the MAP_STATUS_REPORT service confirm contains a user error or a provider error, the MAP process sends a CCBS Call Report negative response to the CCBS application process in the VLR and terminates.

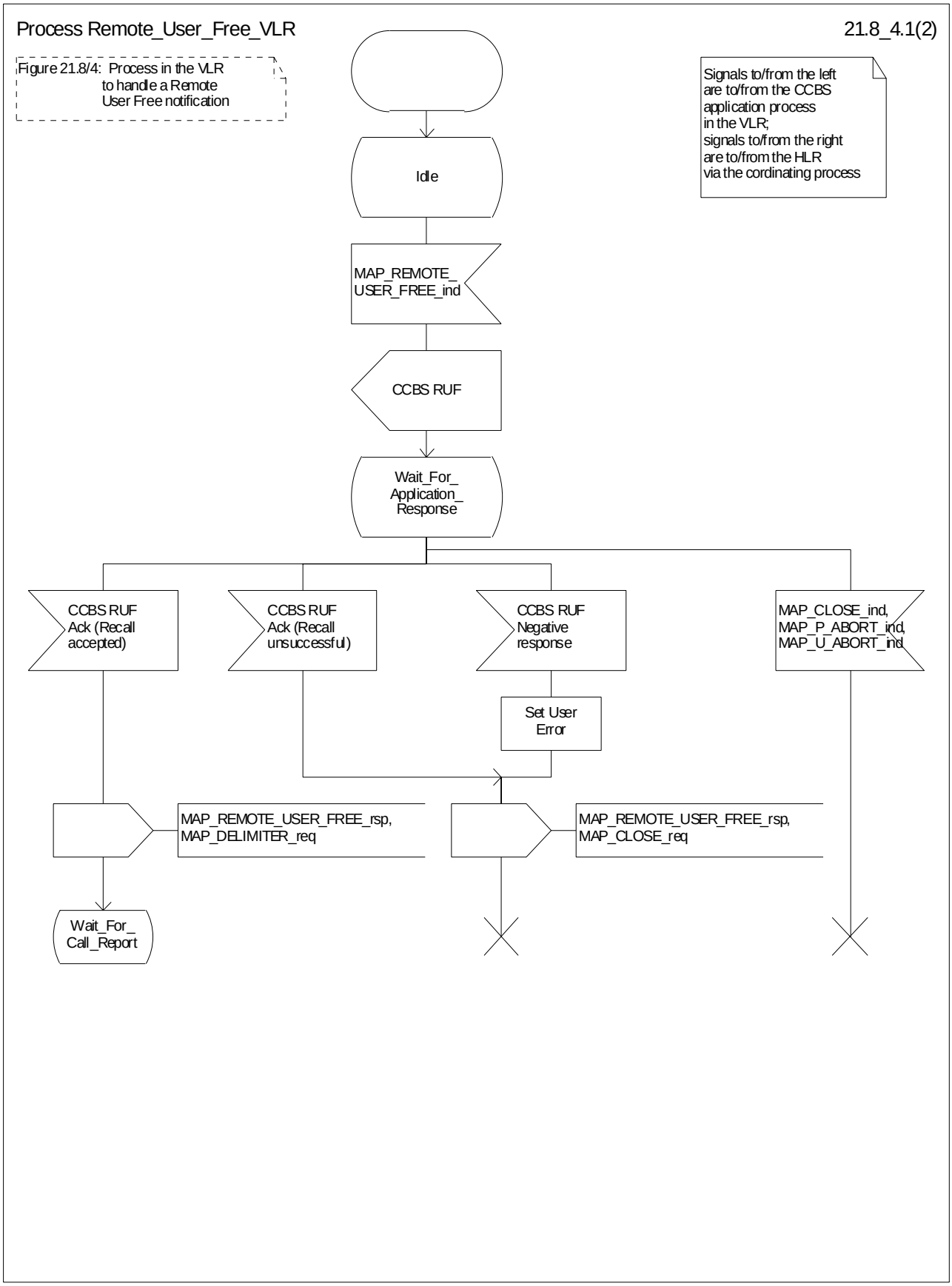


Figure 21.8/4 (sheet 1 of 2): Process Remote_User_Free_VLR

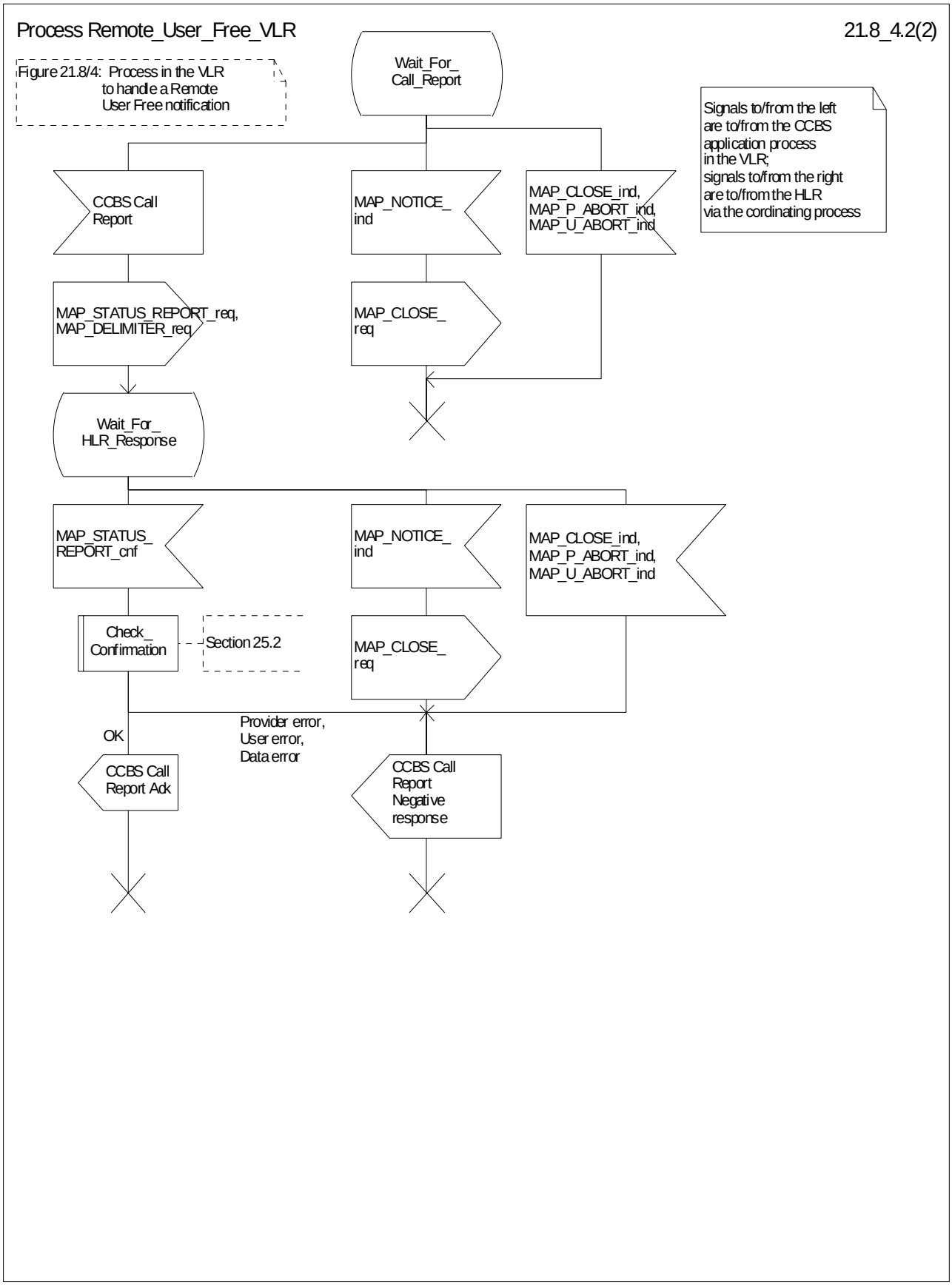


Figure 21.8/4 (sheet 2 of 2): Process Remote_User_Free_VLR

22 Supplementary services procedures

The following application contexts exist for handling of supplementary services:

- accessUnstructuredSsContext;
- accessFunctionalSsContext.

The accessUnstructuredSsContext refers to a simple MAP users, for which the corresponding MAP process can be identified by the MAP-Provider directly.

However, the accessFunctionalSsContext refers to a complex MAP-User consisting of several processes. For this user, a process co-ordinator is defined for each network entity, in order to identify the correct process to invoke. These processes open and validate the dialogue, then invoke the necessary operation-specific process. These processes are described below.

22.1 Functional supplementary service processes

22.1.1 Functional supplementary service process co-ordinator for MSC

Upon receipt of a CM-Service request with CM-service type = SS, the MSC initiates the process access request procedure towards the VLR as described in clause 25 of the present document.

Once a CM connection is established, the MSC can handle supplementary service indications from the MS. Table 22.1/1 shows the co-ordinating process' reaction on receipt of specific SS service indications on the air interface. After the relevant process is invoked, the received air interface service indication is sent to that process. The creation of service requests on the basis of air interface messages is described in GSM 09.11.

Table 22.1/1: Relationship between received service indication and invoked process in the MSC

Service indication received	Process invoked
A_REGISTER_SS_ind	REGISTER_SS_MSC
A_ERASE_SS_ind	ERASE_SS_MSC
A_ACTIVATE_SS_ind	ACTIVATE_SS_MSC
A_DEACTIVATE_SS_ind	DEACTIVATE_SS_MSC
A_INTERROGATE_SS_ind	INTERROGATE_SS_MSC
A_REGISTER_PASSWORD	REGISTER_PASSWORD_MSC

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

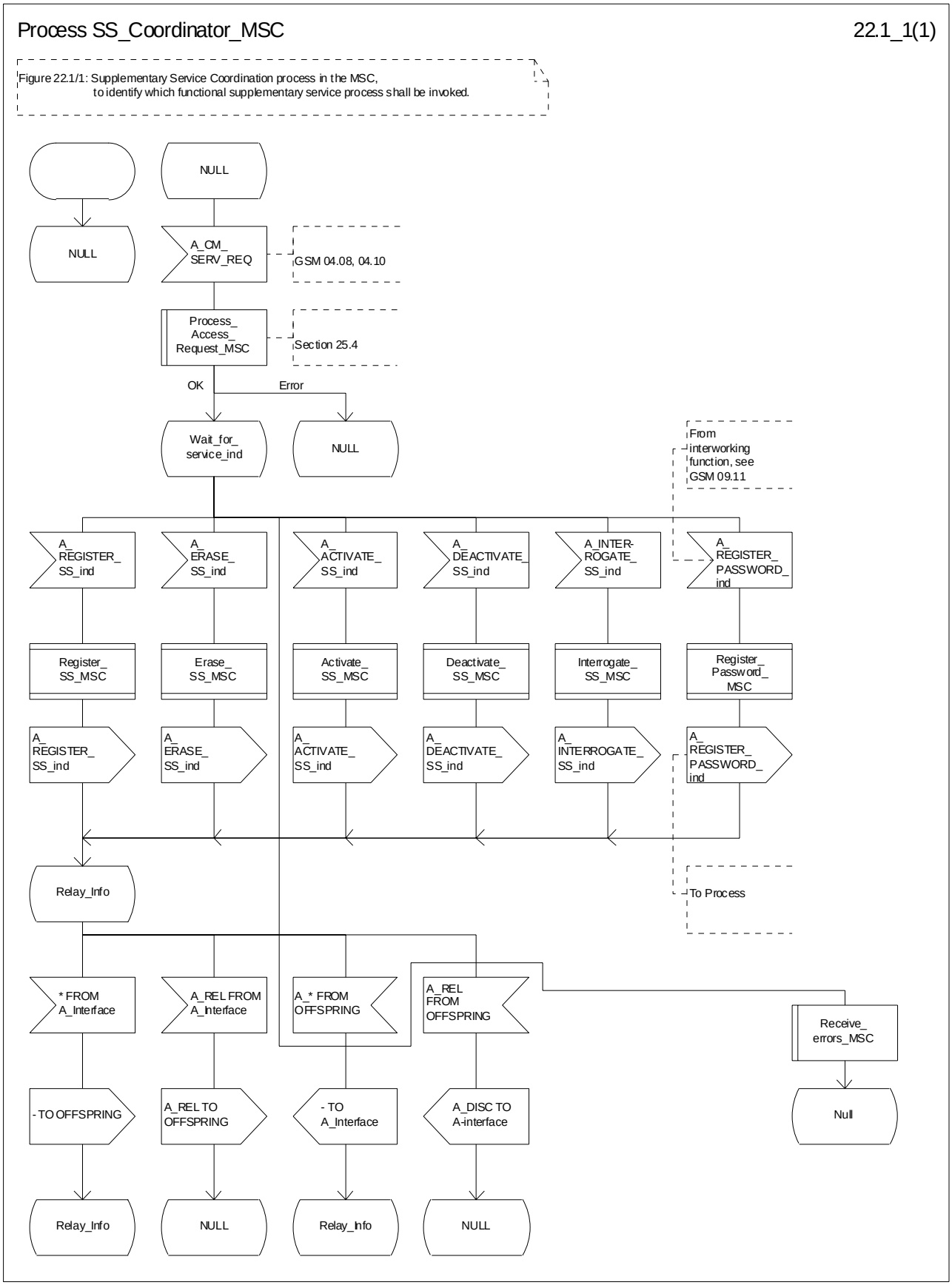


Figure 22.1/1: Process SS_Coordinator_MSC

22.1.2 Functional supplementary service process co-ordinator for VLR

Any functional SS process in the VLR starts by the VLR receiving the MAP_PROCESS_ACCESS_REQUEST indication. The VLR then acts as described in clause 25 of the present document.

If the Process Access Request was successful, the VLR can handle supplementary service indications from the MSC. Table 22.1/2 shows the co-ordinating process' reaction on receipt of specific SS service indications from the MSC. After the relevant process is invoked, the received service indication is sent to that process, and the co-ordinating process terminates.

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

Service indication received	Process invoked
MAP_REGISTER_SS_ind	REGISTER_SS_VLR
MAP_ERASE_SS_ind	ERASE_SS_VLR
MAP_ACTIVATE_SS_ind	ACTIVATE_SS_VLR
MAP_DEACTIVATE_SS_ind	DEACTIVATE_SS_VLR
MAP_INTERROGATE_SS_ind	INTERROGATE_SS_VLR
MAP_REGISTER_PASSWORD	REGISTER_PASSWORD_VLR

Figure 22.1/2 shows the co-ordinating process in the VLR.

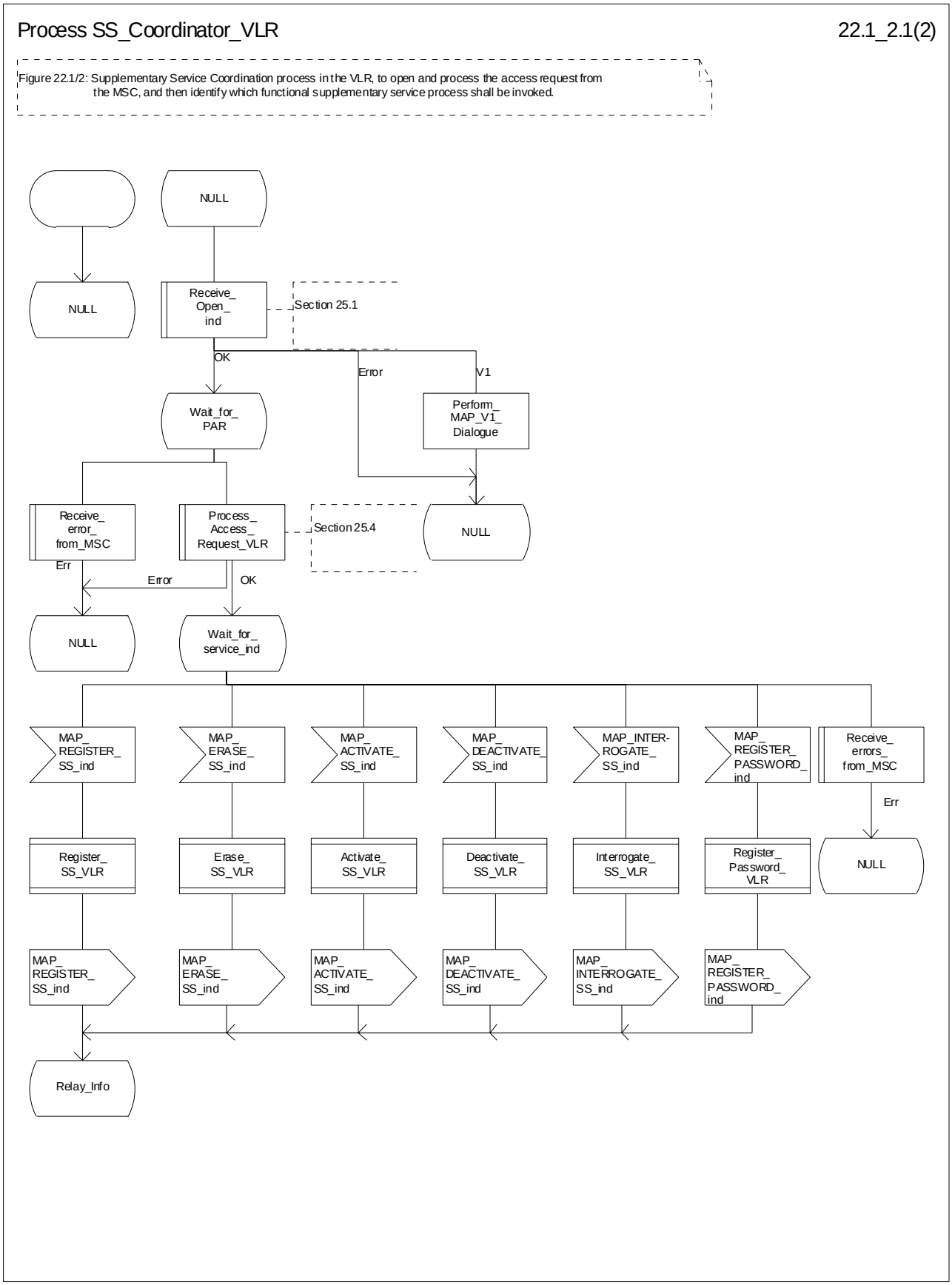


Figure 22.1/2 (sheet 1 of 2): Process SS_Coordinator_VLR

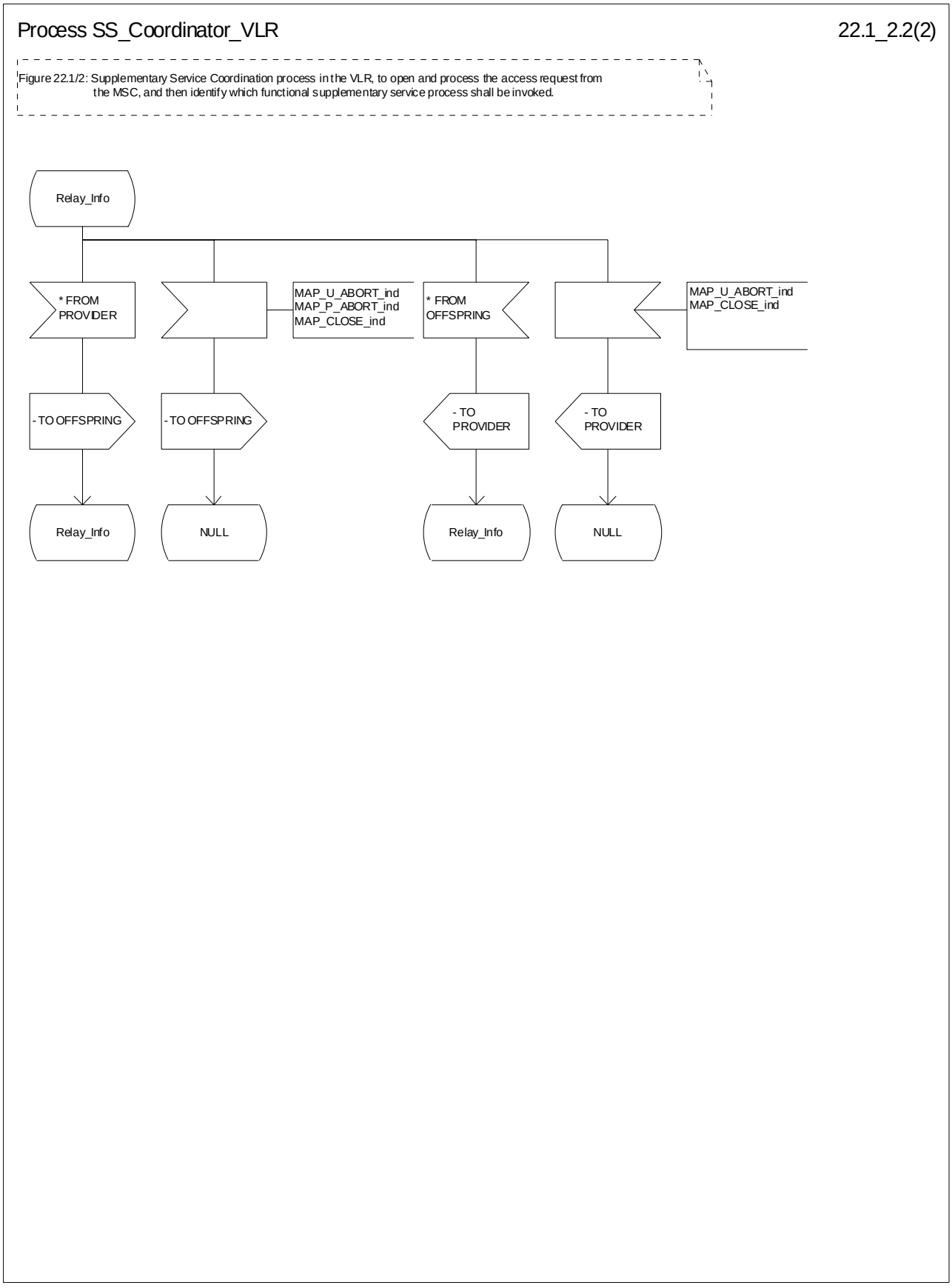


Figure 22.1/2 (sheet 2 of 2): Process SS_Coordinator_VLR

22.1.3 Functional supplementary service process co-ordinator for HLR

Any functional SS process in the HLR starts by the HLR receiving a MAP-OPEN service indication. If that service is successful, the HLR can handle supplementary service indications from the VLR. Table 22.1/3 shows the co-ordinating process' reaction on receipt of specific SS service indications from the VLR. After the relevant process is invoked, the received service indication is sent to that process, and the co-ordinating process terminates.

Table 22.1/3: Relationship between received service indication and invoked process in the HLR.

Service indication received	Process invoked
MAP_REGISTER_SS_ind	REGISTER_SS_HLR
MAP_ERASE_SS_ind	ERASE_SS_HLR
MAP_ACTIVATE_SS_ind	ACTIVATE_SS_HLR
MAP_DEACTIVATE_SS_ind	DEACTIVATE_SS_HLR
MAP_INTERROGATE_SS_ind	INTERROGATE_SS_HLR
MAP_REGISTER_PASSWORD	REGISTER_PASSWORD_HLR

Figure 22.1/3 shows the co-ordinating process in the HLR.

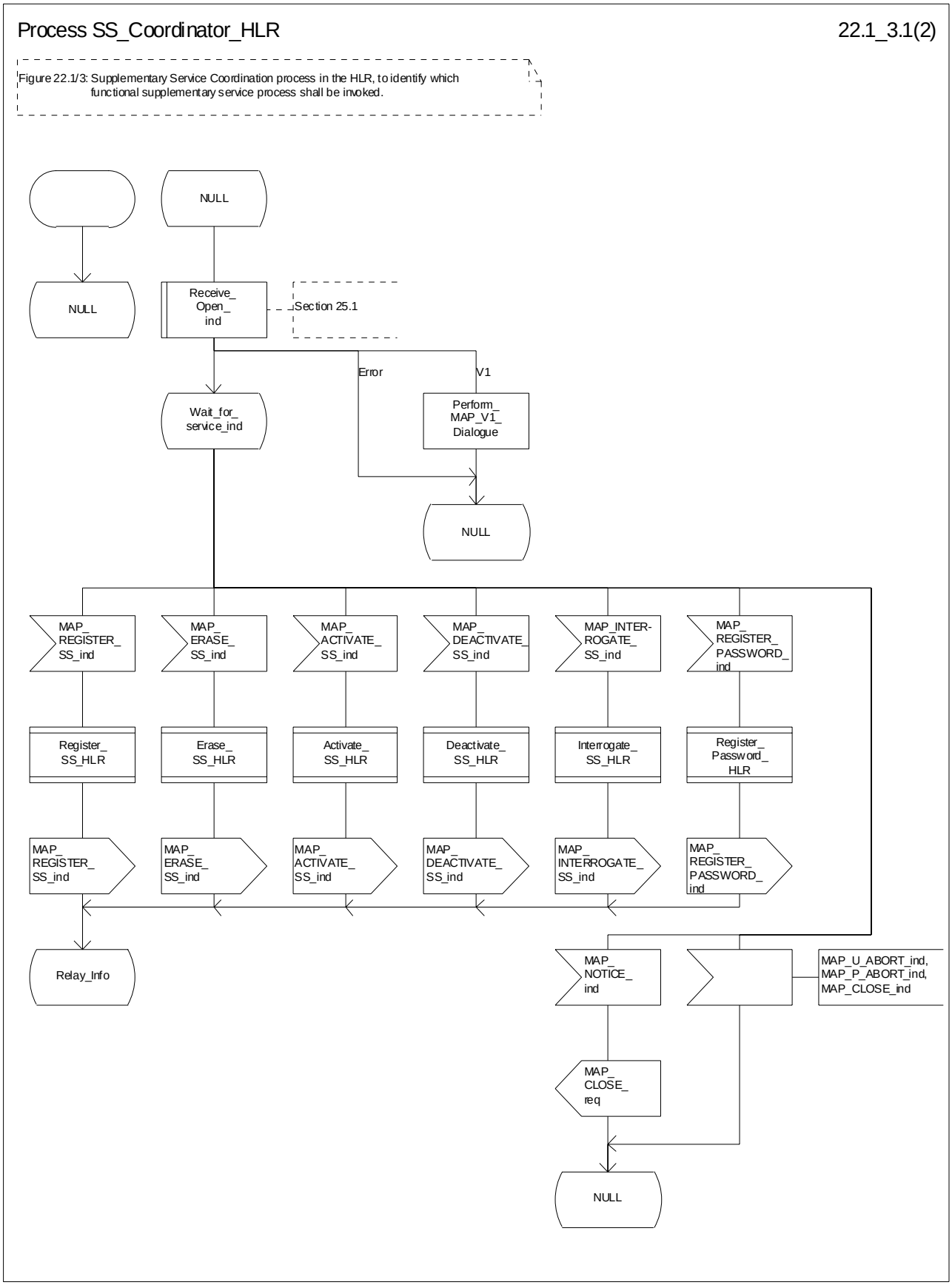


Figure 22.1/3 (sheet 1 of 2): Process SS_Coordinator_HLR

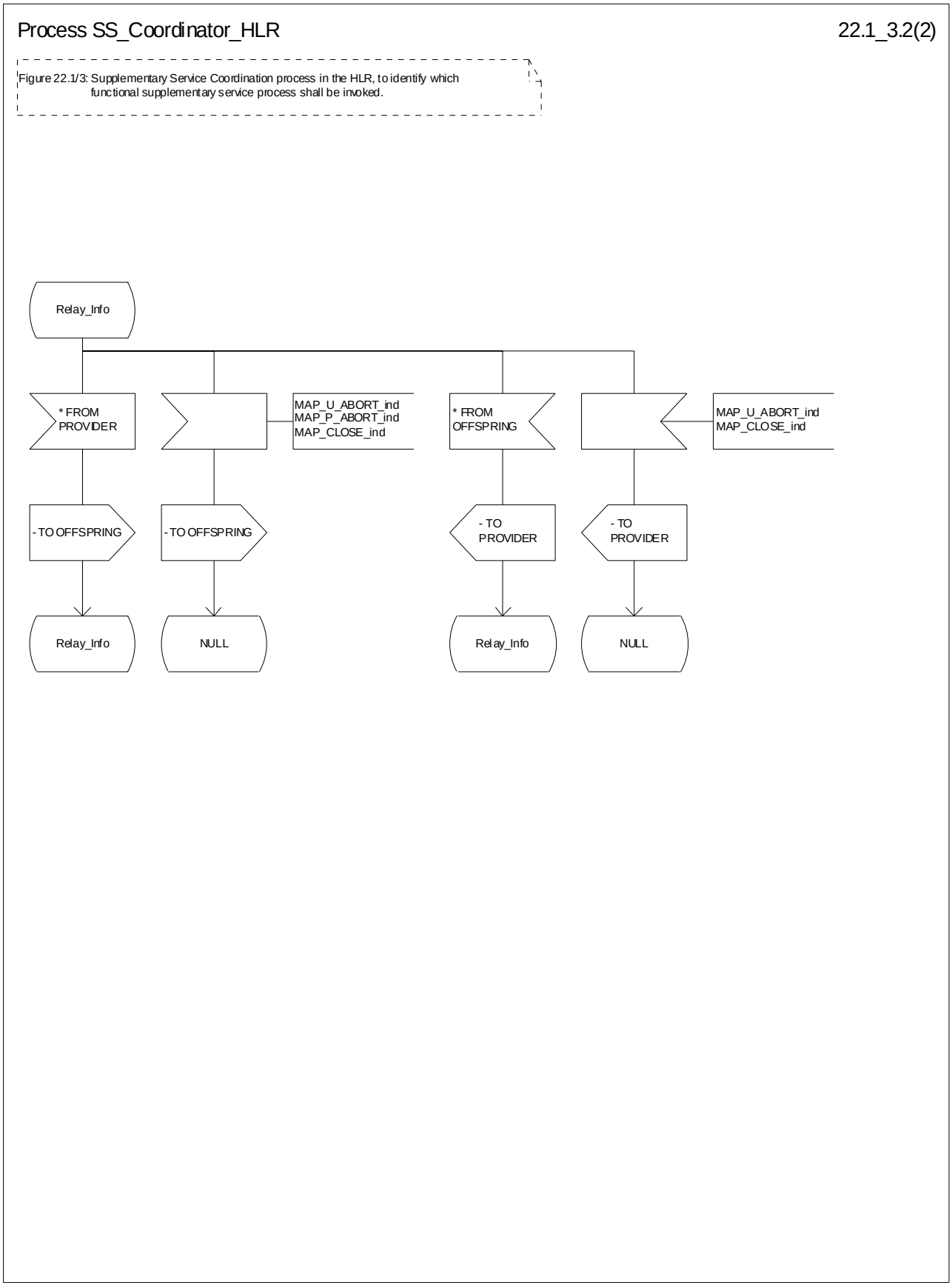


Figure 22.1/3 (sheet 2 of 2): Process SS_Coordinator_HLR

22.1.4 Call completion supplementary service process co-ordinator for HLR

The MAP co-ordinating process in the HLR to handle a dialogue opened with the callCompletion application context is shown in figure 22.1/4. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

Any call completion SS process in the HLR starts by the HLR receiving a MAP-OPEN service indication. If that service is successful, the HLR can handle call completion supplementary service indications from the VLR. Table 22.1/4 shows the co-ordinating process' reaction on receipt of specific call completion SS service indications from the VLR. After the relevant process is invoked, the received service indication is sent to that process.

Table 22.1/4: Relationship between received service indication and invoked process in the HLR.

Service indication received	Process invoked
MAP_REGISTER_CC_ENTRY_ind	REGISTER_CC_ENTRY_HLR
MAP_ERASE_CC_ENTRY_ind	ERASE_CC_ENTRY_HLR

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

The Call_Completion Co-ordinator is shown in figure 22.1/4.

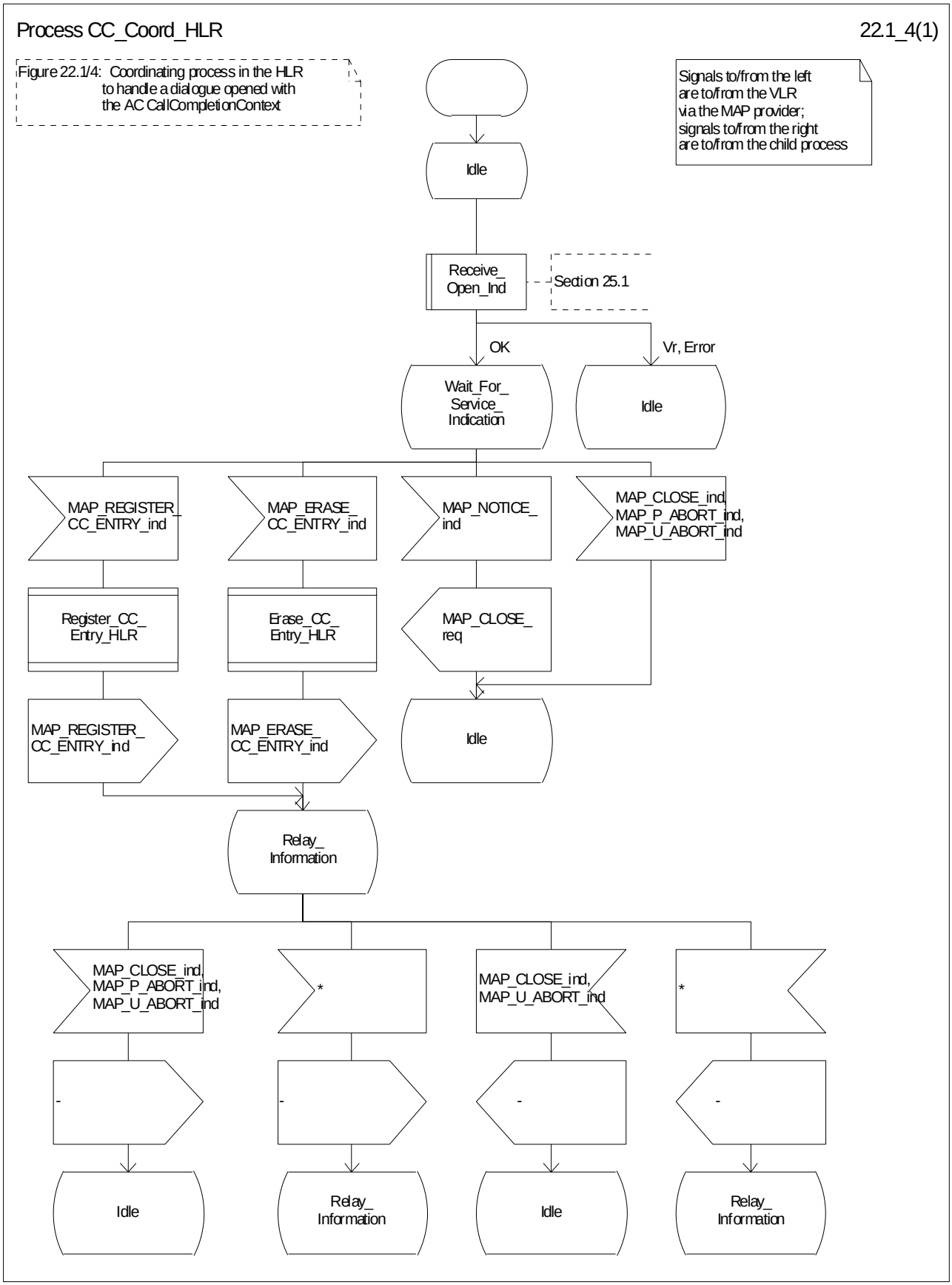


Figure 22.1/4: Process_CC_Coord_HLR

22.2 Registration procedure

22.2.1 General

The registration procedure is used to register data related to a supplementary service in the HLR. The registration procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described in the subclauses below.

The registration procedure is shown in figure 22.2.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (defined in clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (defined in clauses 9 and 25);

MAP_PROVIDE_IMSI (defined in clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (defined in clauses 8 and 25);

MAP_AUTHENTICATE (defined in clauses 8 and 25);

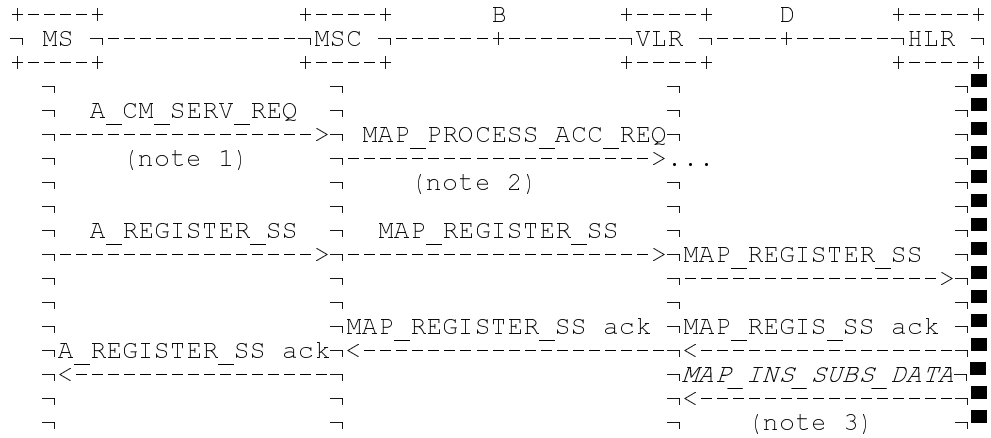
MAP_SET_CIPHERING_MODE (defined in clauses 8 and 25);

MAP_CHECK_IMEI (defined in clauses 8 and 25);

MAP_READY_FOR_SM (defined in clauses 12 and 25);

MAP_INSERT_SUBSCRIBER_DATA (defined in clauses 8 and 25);

MAP_REGISTER_SS (defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Services printed in *italics* are optional.

Figure 22.2.1/1: Interfaces and services for supplementary service registration

22.2.2 Procedures in the MSC

Supplementary service registration

The A_REGISTER_SS service indication received by the MAP user in the MSC contains the SS-Code and any parameters that are related to the supplementary service.

The MAP user transfers the received information to the VLR in the MAP_REGISTER_SS request without checking the contents of the service indication. Rules for the mapping are described in GSM 09.11.

The MSC then awaits the receipt of the MAP_REGISTER_SS confirm from the VLR. The outcome of the procedure is reported to the MS in the A_REGISTER_SS response message as described in GSM 04.8x, 04.9x and 09.11. Finally the SS-connection is released.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

Error handling

If at any time during the supplementary service part of this procedure a MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE or unexpected MAP_CLOSE indication is received from the VLR concerning the process, a CM_RELEASE_COMPLETE indication is sent to the MS (as specified in GSM 09.11). Upon receipt of a MAP_NOTICE indication from the VLR, the MSC must close the VLR dialogue by sending a MAP_CLOSE request. The process is then terminated.

If an A_CM_RELEASE indication is received from the MS, all open transactions shall be released using the MAP_U_ABORT request indicating application procedure cancellation, and the process is terminated.

The registration procedure in the MSC is shown in figure 22.2.2/1.

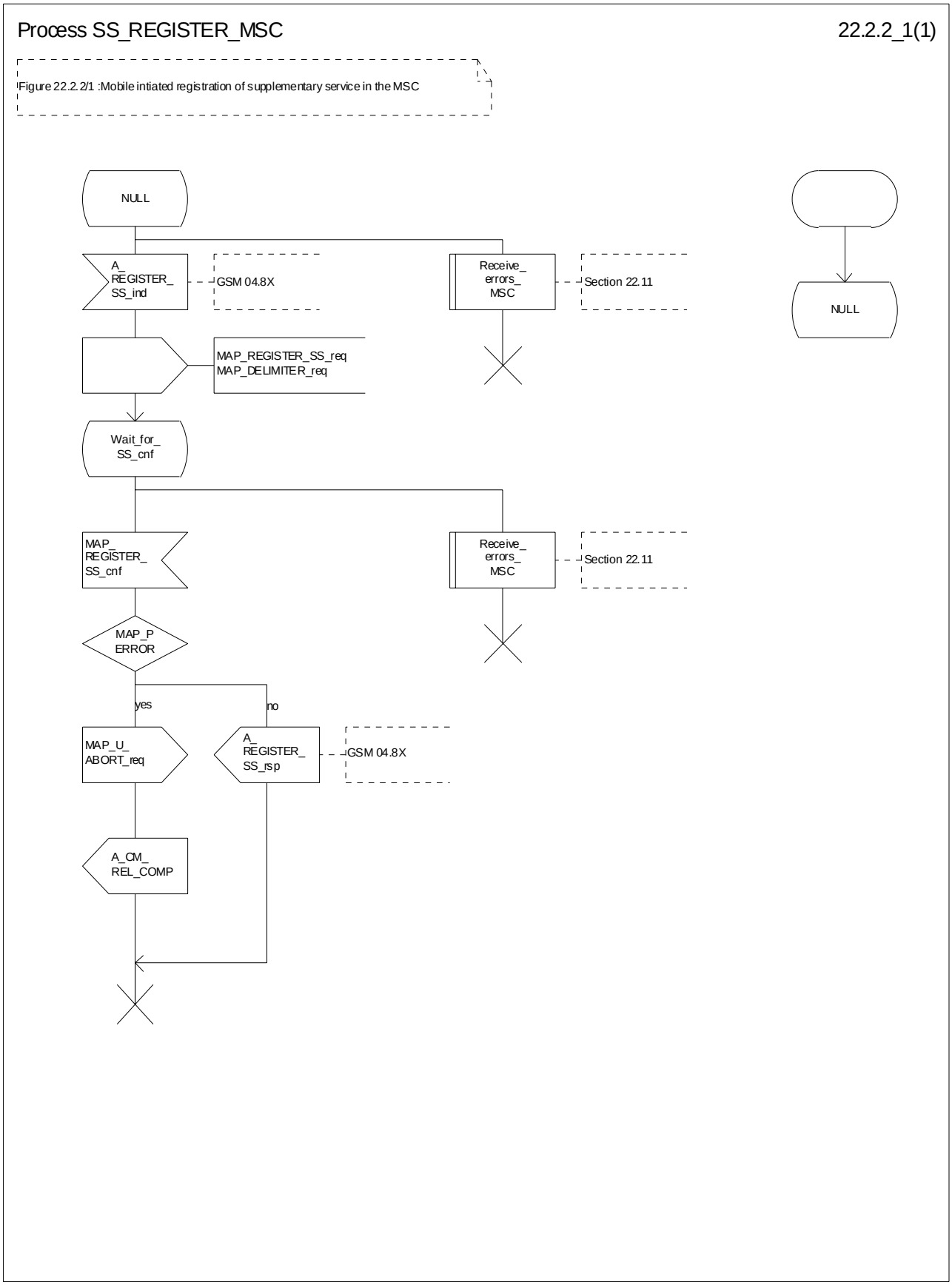


Figure 22.2.2/1: Procedure SS_Register_MSC

22.2.3 Procedures in the VLR

Supplementary service registration

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

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

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

Error handling

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

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

The registration procedure in the VLR is shown in figure 22.2.3/1.

Process SS_REGISTER_VLR 22.2.3_1.1(2)

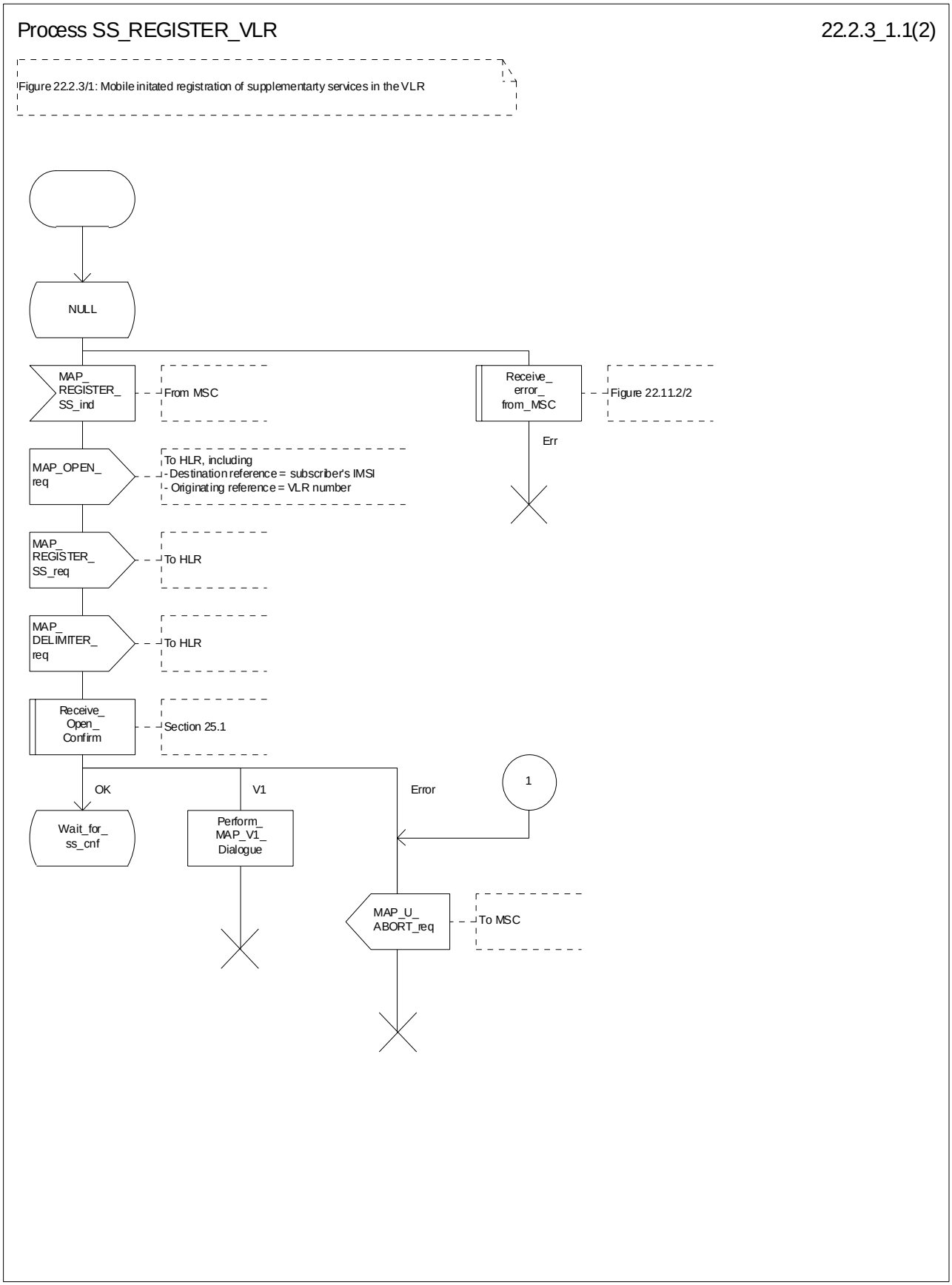


Figure 22.2.3/1 (sheet 1 of 2): Procedure SS_Register_VLR

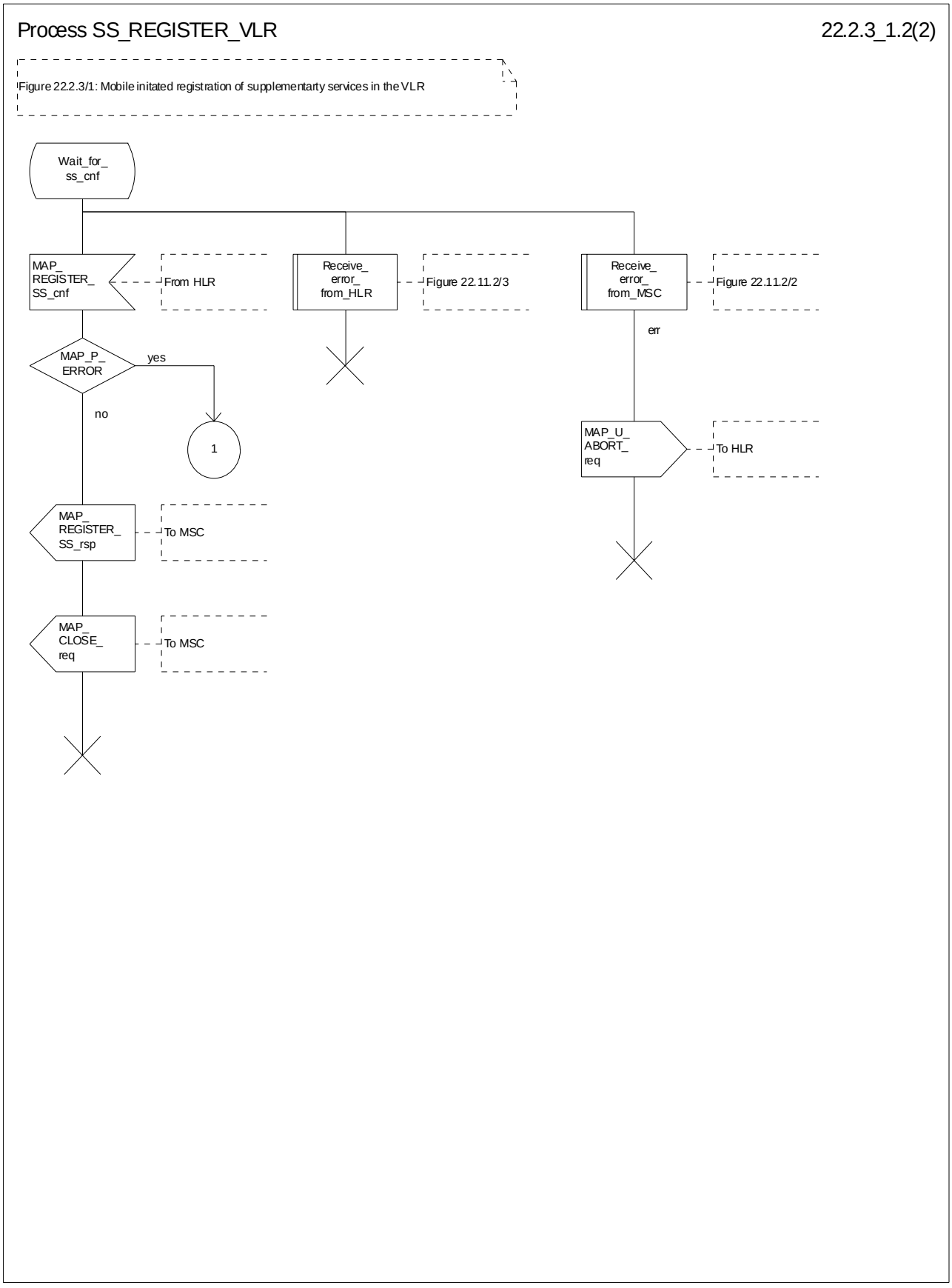


Figure 22.2.3/1 (sheet 2 of 2): Procedure SS_Register_VLR

22.2.4 Procedures in the HLR

The procedure in the HLR is initiated when it receives a MAP_REGISTER_SS indication.

The HLR acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the Call Barred error should be returned to the VLR. The parameter "operatorBarring" shall be included with the error.

The supplementary service request shall then be processed according to GSM 03.11 and the 03.8x and 03.9x-series of technical specifications. This handling may lead to either a successful result, a partially successful result, or an error being returned.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11):

- if the VLR is to be updated after the supplementary service registration, the MAP_INSERT_SUBS_DATA_HLR process shall be initiated;

- if at any time during this procedure a MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indication concerning the process is received from the VLR, the process is terminated. If a MAP_NOTICE indication is received, a MAP_CLOSE request indicating sent towards the VLR.

The registration procedure in the HLR is shown in figure 22.2.4/1.

Process SS_REGISTER_HLR 22.2.4_1.1(2)

Figure 22.2.4/1: Registration of supplementary services procedure in HLR

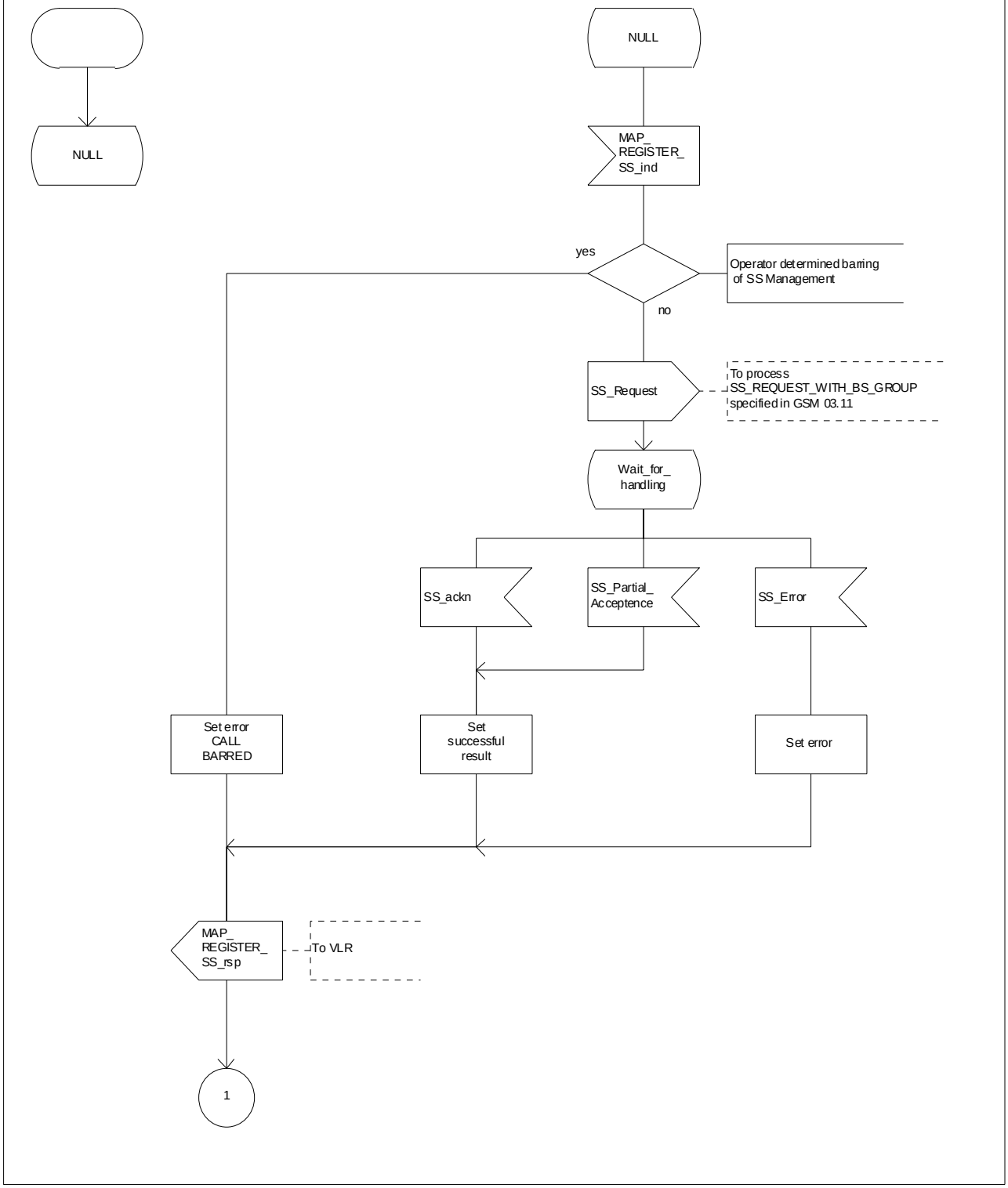


Figure 22.2.4/1 (sheet 1 of 2): Procedure SS_Register_HLR

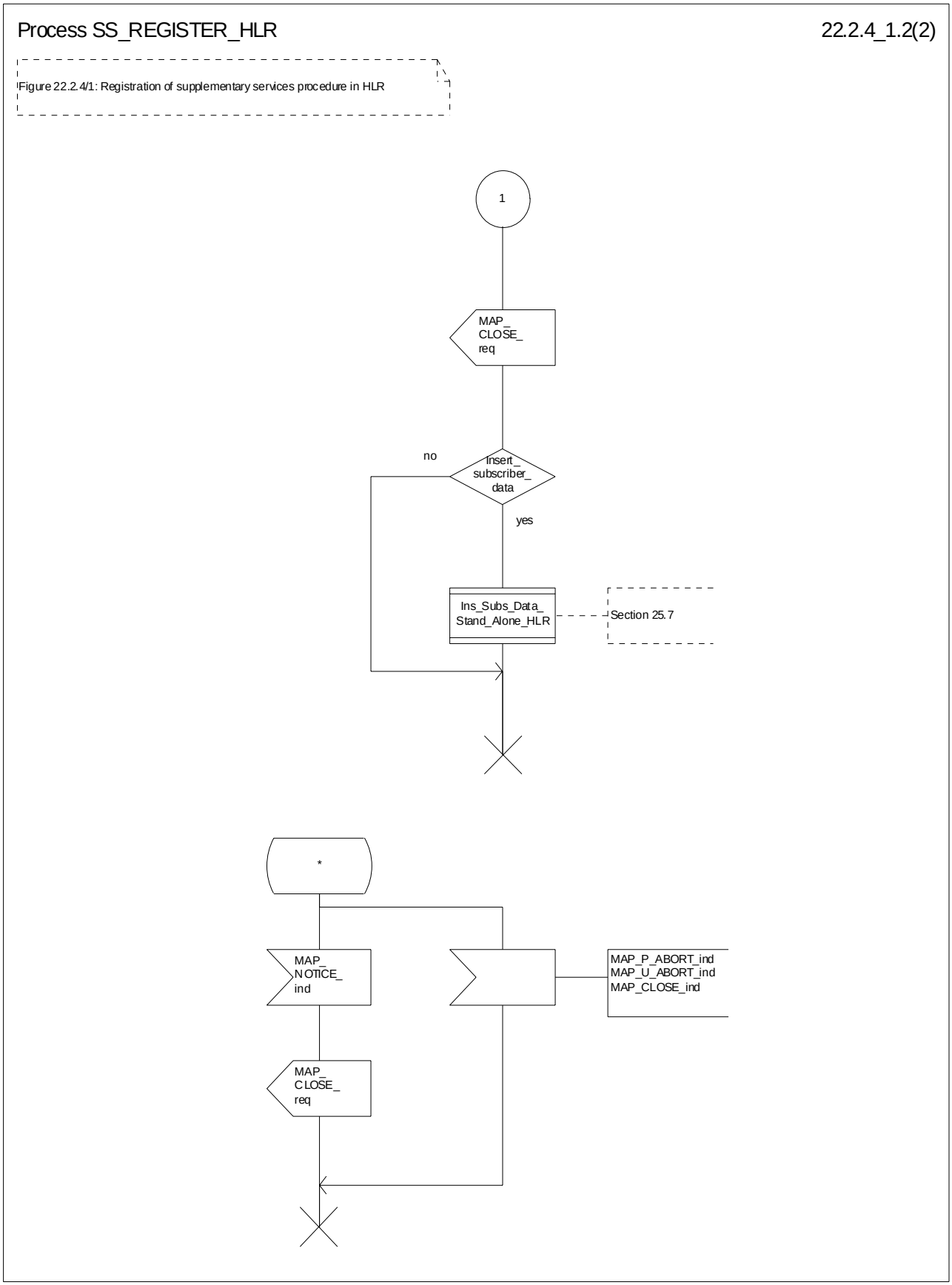


Figure 22.2.4/1 (sheet 2 of 2): Procedure SS_Register_HLR

22.3 Erasure procedure

22.3.1 General

The erasure procedure is used to erase data related to a supplementary service in the HLR. The erasure procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described in the subclauses below.

The erasure procedure is shown in figure 22.3.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (defined in subclauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (defined in clauses 9 and 25);

MAP_PROVIDE_IMSI (defined in clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (defined in clauses 8 and 25);

MAP_AUTHENTICATE (defined in clauses 8 and 25);

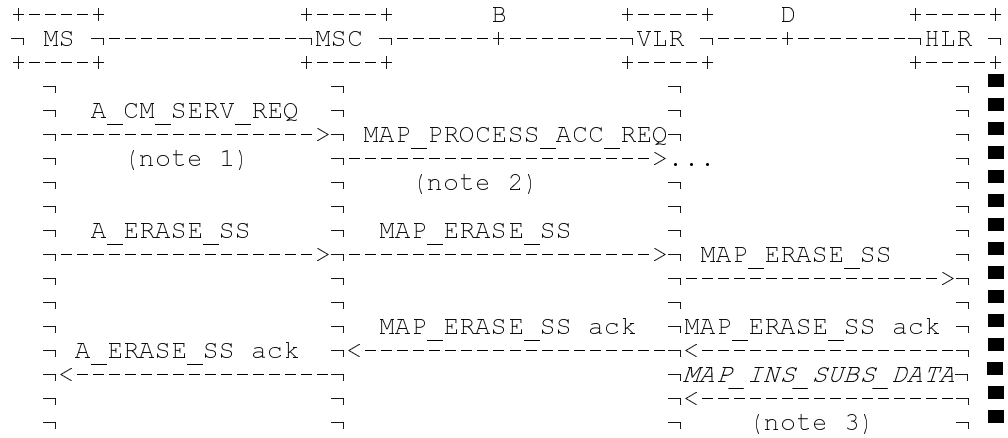
MAP_SET_CIPHERING_MODE (defined in clauses 8 and 25);

MAP_CHECK_IMEI (defined in clauses 8 and 25);

MAP_READY_FOR_SM (defined in clauses 12 and 25);

MAP_INSERT_SUBSCRIBER_DATA (defined in clauses 8 and 25);

MAP_ERASE_SS (defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Services printed in *italics* are optional.

Figure 22.3.1/1: Interfaces and services for supplementary service erasure

22.3.2 Procedures in the MSC

The MSC procedures for erasure are identical to those specified for registration in subclause 22.2.2. The text and diagrams in subclause 22.2.2 apply with all references to registration changed to erasure.

22.3.3 Procedures in the VLR

The VLR procedures for erasure are identical to those specified for registration in subclause 22.2.3. The text and diagrams in subclause 22.2.3 apply with all references to registration changed to erasure.

22.3.4 Procedures in the HLR

The HLR procedure for erasure is identical to those specified for registration in subclause 22.2.4. The text and diagrams in subclause 22.2.4 apply with all references to registration changed to erasure.

22.4 Activation procedure

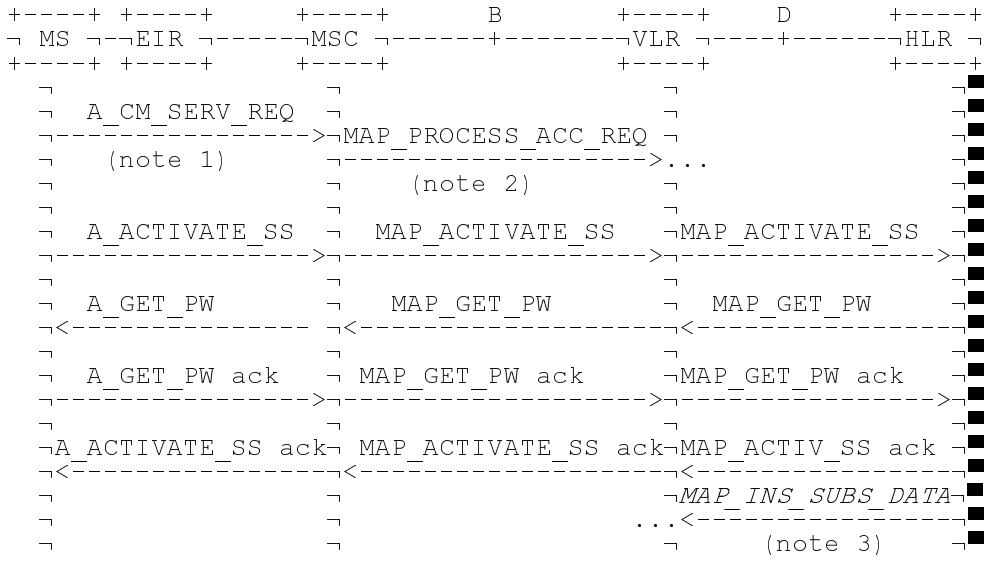
22.4.1 General

The activation procedure is used to activate a supplementary service in the HLR. The activation procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described in the subclauses below.

The activation procedure is shown in figure 22.4.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_GET_PASSWORD	(defined in clause 11);
MAP_INSERT_SUBSCRIBER_DATA	(defined in clauses 8 and 25);
MAP_ACTIVATE_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 of this document.

NOTE 3: Services printed in italics are optional.

Figure 22.4.1/1: Interfaces and services for supplementary service activation

22.4.2 Procedures in the MSC

The A_ACTIVATE_SS service indication received by the MAP user in the MSC contains the SS-Code and any parameters related to the supplementary service.

The MSC transfers the received information to the VLR in the MAP_ACTIVATE_SS request without checking the contents of the service indication. Rules for the mapping are described in GSM 09.11.

The MAP user may subsequently receive the MAP_GET_PASSWORD indication from the VLR. Upon receipt of this indication, the MSC sends the A_GET_PASSWORD message towards the MS and then awaits the response from the MS. When an A_GET_PASSWORD confirm message is received from the MS, the MSC initiates the MAP_GET_PASSWORD response towards the VLR without checking further the contents of the indication. Also see GSM 09.11.

The MSC will receive a MAP_ACTIVATE_SS confirm from the VLR. The outcome of the procedure is reported to the MS in the A_ACTIVATE_SS response message, see GSM 04.8x, 04.9x and 09.11. Finally the SS connection is released.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

The handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE or A_CM_RELEASE in this procedure is identical to the handling in the Registration procedure in the MSC, see subclause 22.2.2 of the present document.

The activation procedure in the MSC is shown in figure 22.4.2/1.

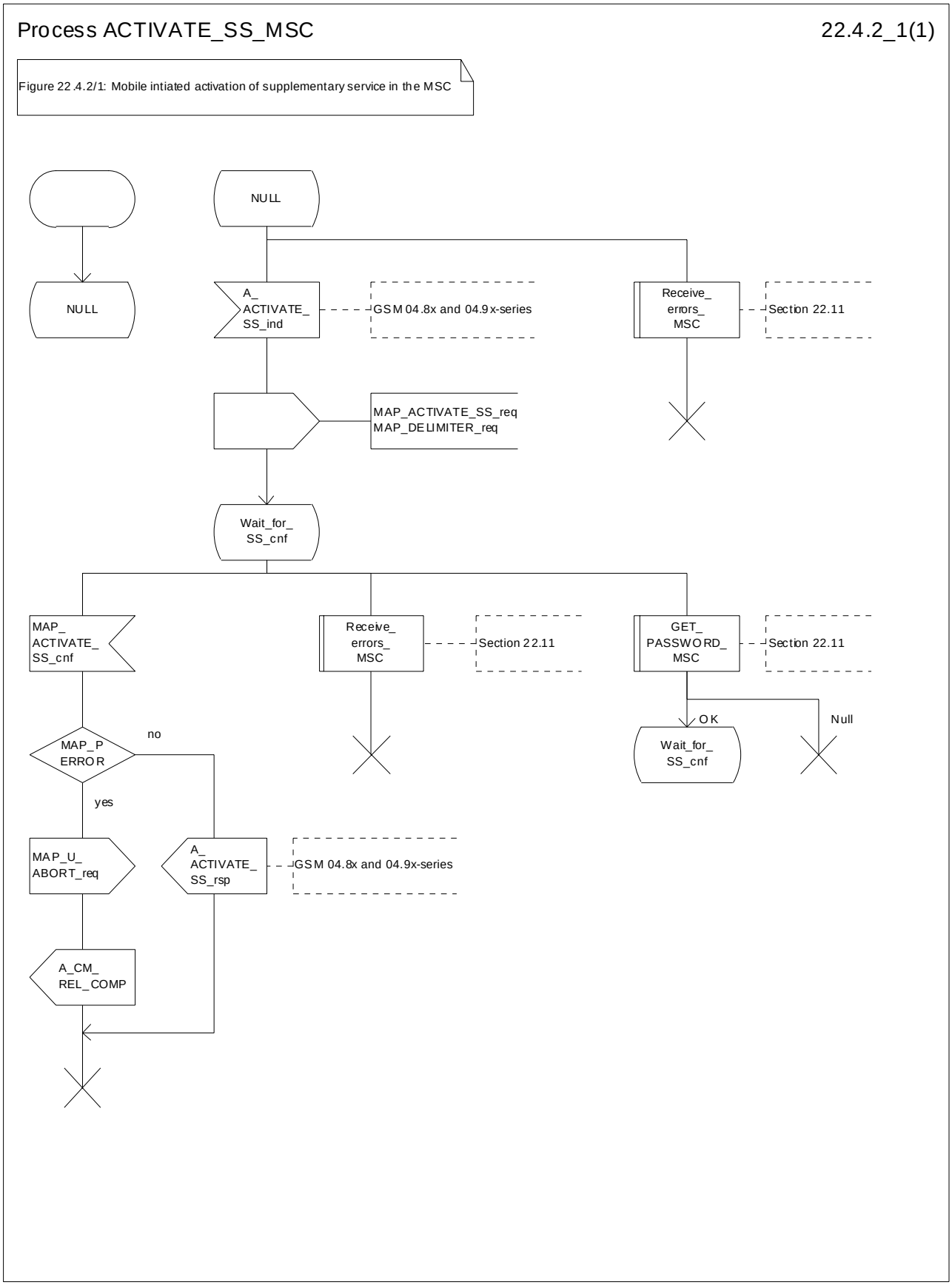


Figure 22.4.2/1: Procedure Activate_SS_MSC

22.4.3 Procedures in the VLR

Supplementary service activation

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

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

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

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

Error handling

The handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE in this procedure is identical to the handling in the Registration procedure in the VLR, see subclause 22.2.3 of the present document.

The activation procedure in the VLR is shown in figure 22.4.3/1.

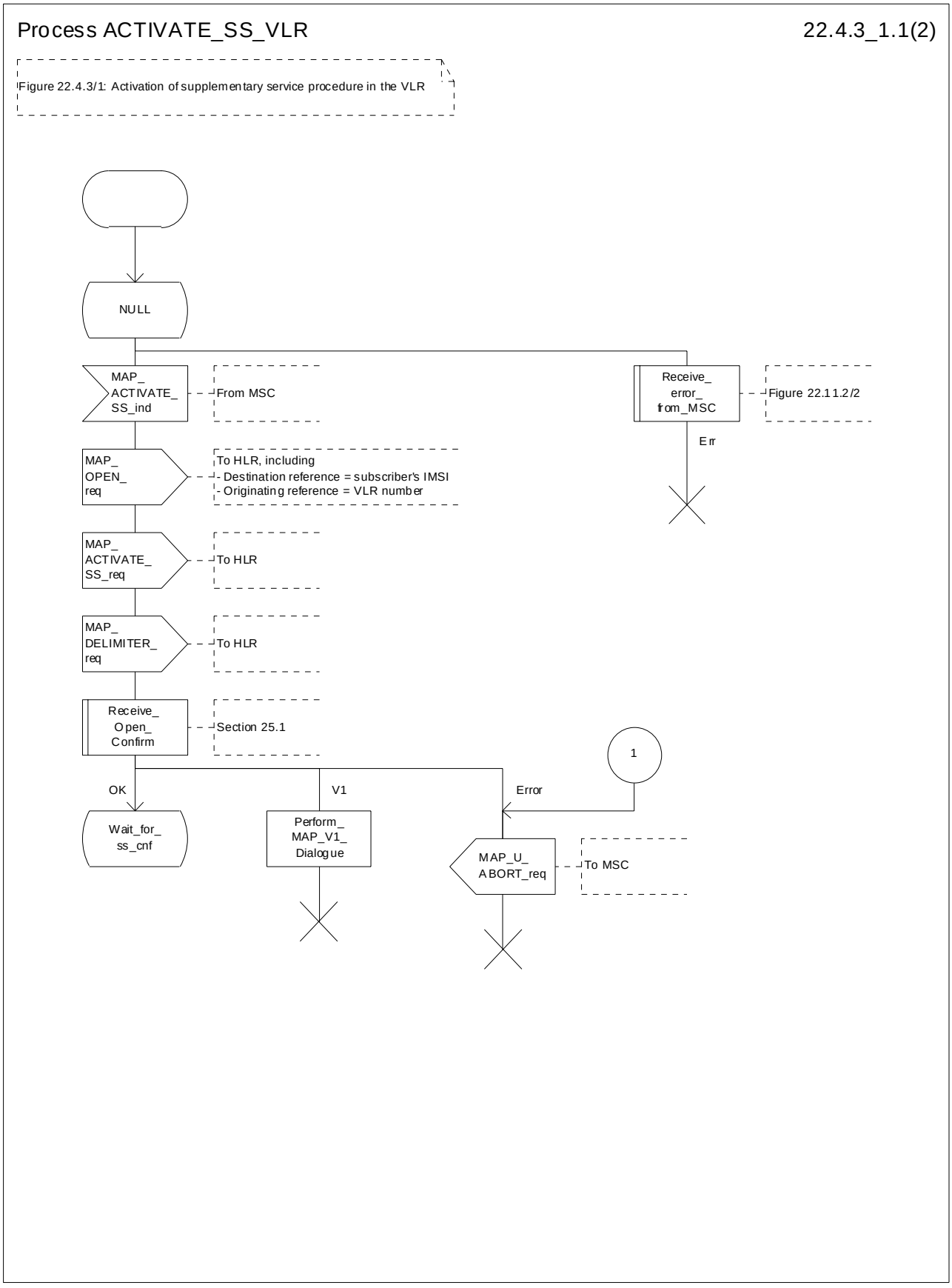


Figure 22.4.3/1 (sheet 1 of 2): Procedure Activate_SS_VLR

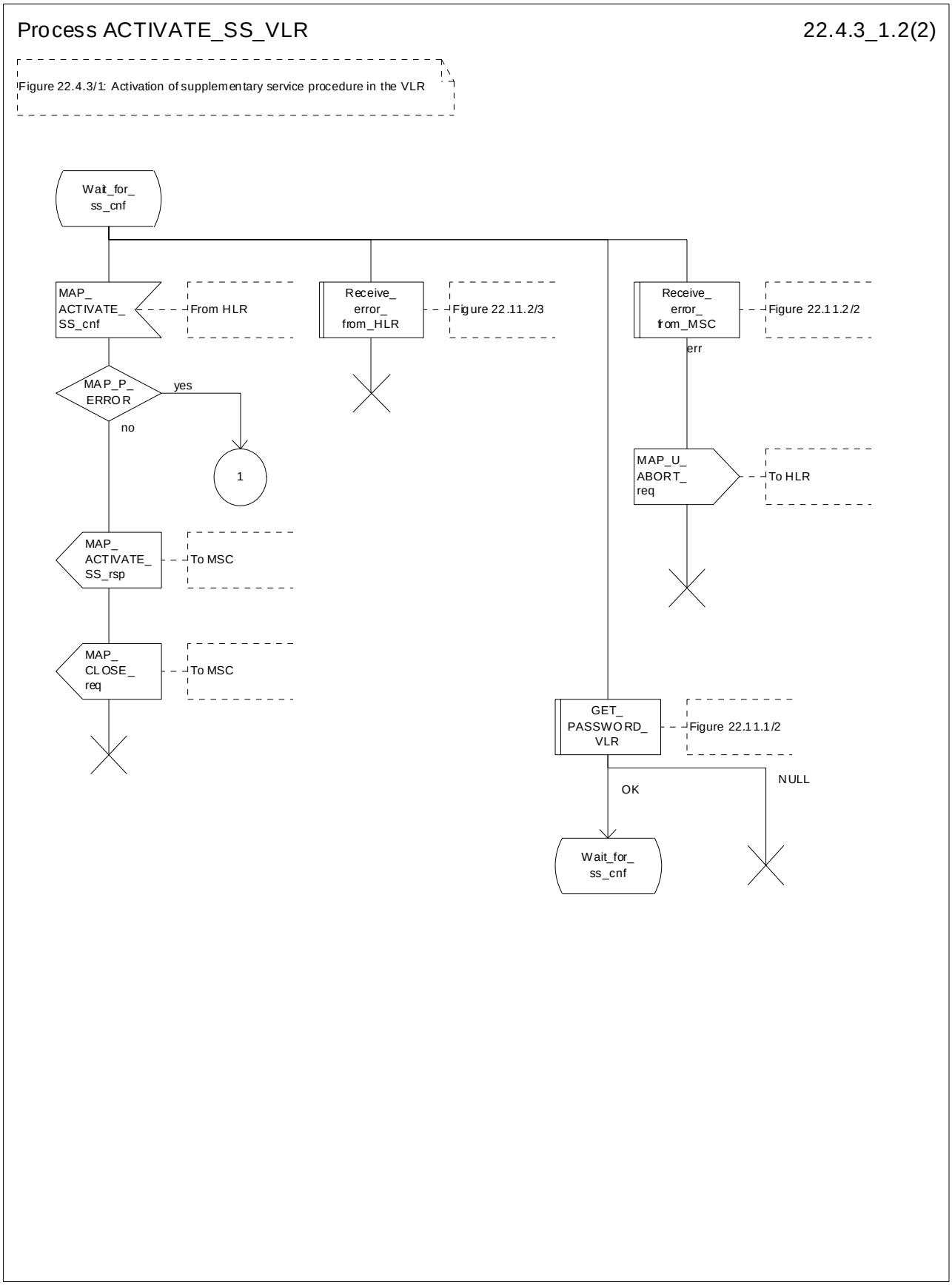


Figure 22.4.3/1 (sheet 2 of 2): Procedure SS_Activate_VLR

22.4.4 Procedures in the HLR

The procedure in the HLR is initiated when it receives a MAP_ACTIVATE_SS indication.

The HLR acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the Call Barred error should be returned to the VLR. The parameter "operatorBarring" shall be included with the error.

The supplementary service request shall then be processed according to GSM 03.11 and the 03.8x and 03.9x-series of technical specifications. This handling may lead to either a successful result, a partially successful result, or an error being returned.

During the handling of activation, the get password procedure may be initiated (as specified in GSM 03.11). This will involve the sending of a MAP_GET_PASSWORD request to the VLR.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11):

- if the VLR is to be updated after the supplementary service activation, the MAP_INSERT_SUBS_DATA_HLR process is initiated;

- handling of receipt of MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indications from the VLR is identical to their handling in the registration procedure, see subclause 22.2.4 above.

The activation procedure in the HLR is shown in figure 22.4.4/1.

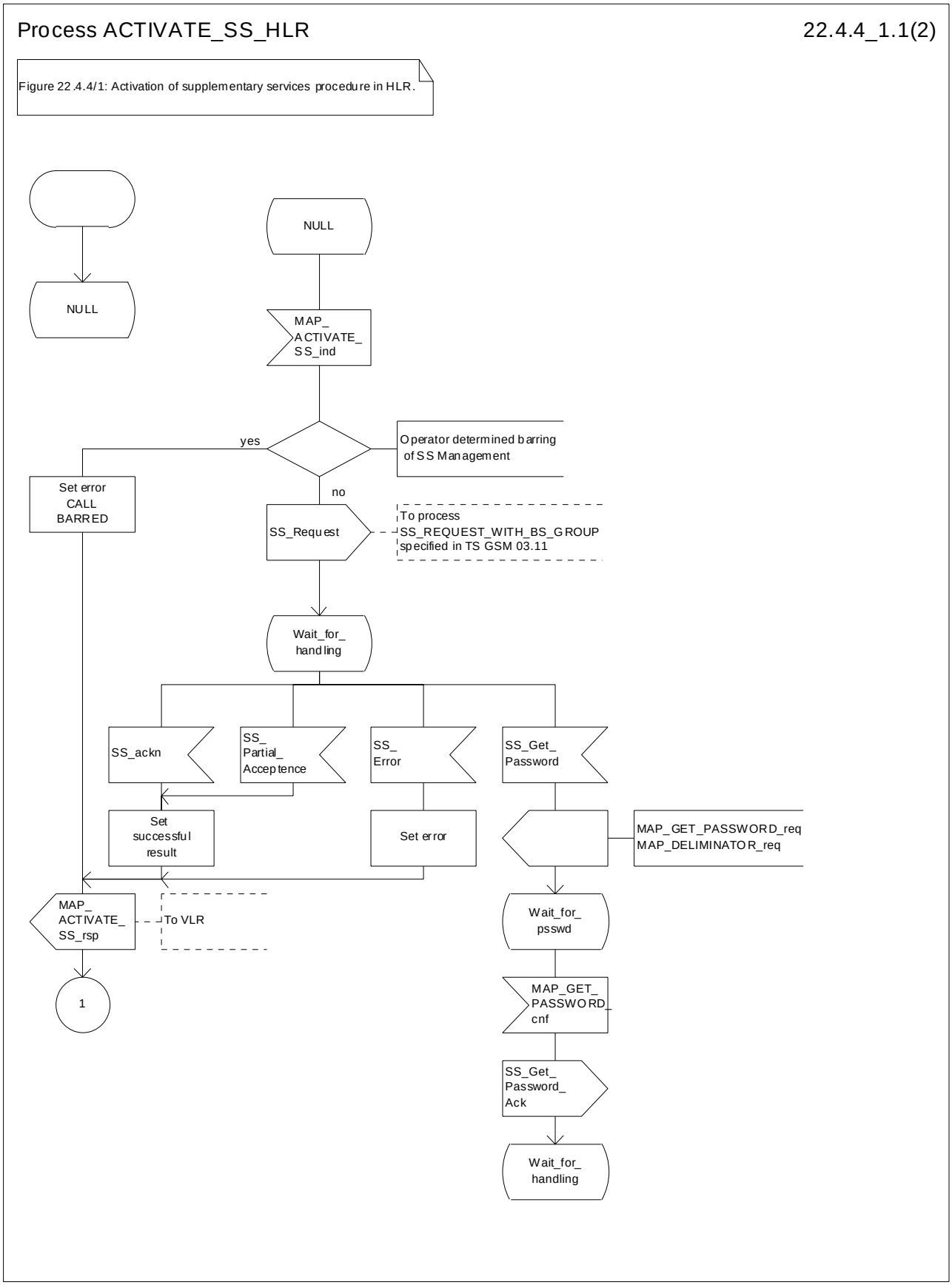


Figure 22.4.4/1 (sheet 1 of 2): Procedure Activate_SS_HLR

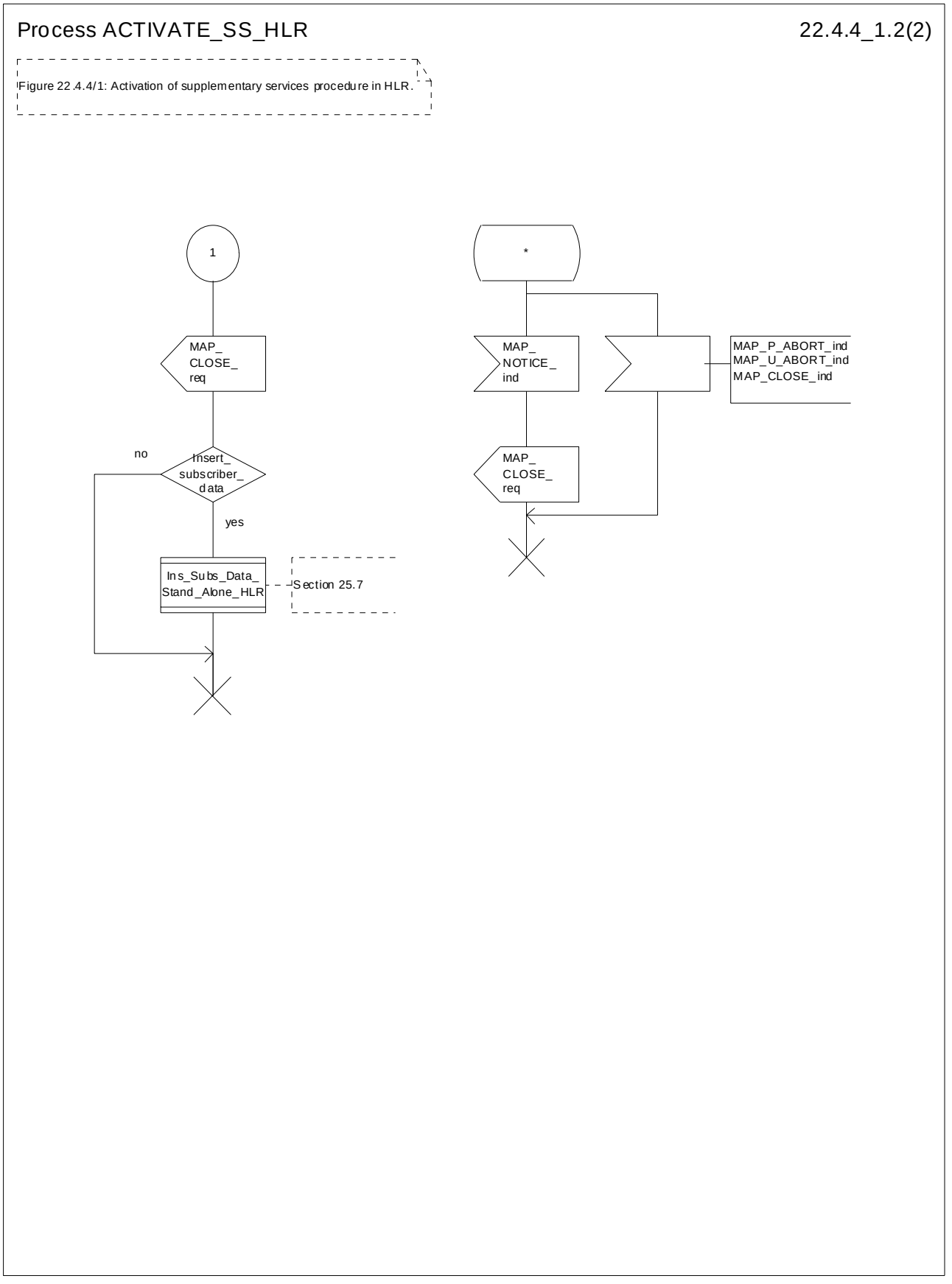


Figure 22.4.4/1 (sheet 2 of 2): Procedure Activate_SS_HLR

22.5 Deactivation procedure

22.5.1 General

The deactivation procedure is used to deactivate a supplementary service in the HLR. The deactivation procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described in the subclauses below.

The deactivation procedure is shown in figure 22.5.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (defined in clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (defined in clauses 9 and 25);

MAP_PROVIDE_IMSI (defined in clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (defined in clauses 8 and 25);

MAP_AUTHENTICATE (defined in clauses 8 and 25);

MAP_SET_CIPHERING_MODE (defined in clauses 8 and 25);

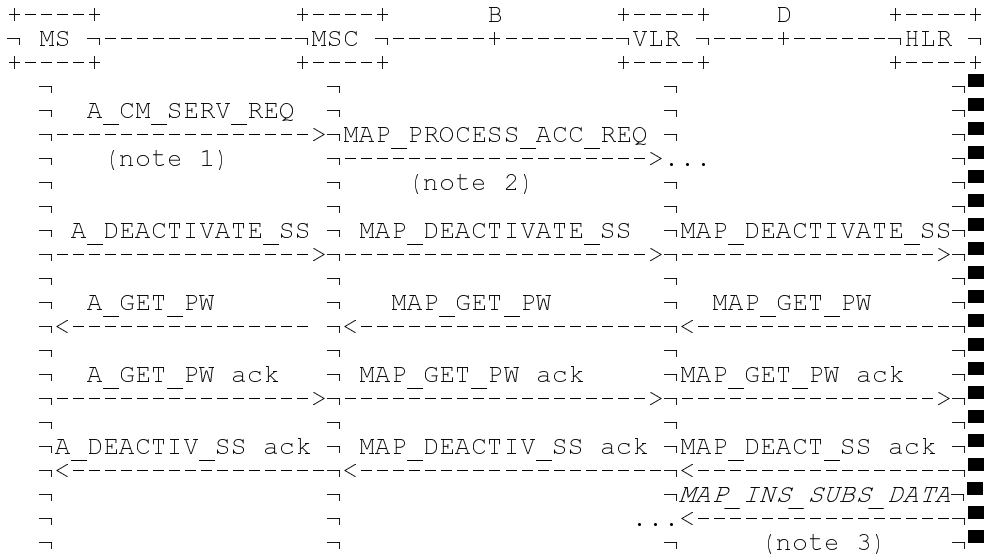
MAP_CHECK_IMEI (defined in clauses 8 and 25);

MAP_READY_FOR_SM (defined in clauses 12 and 25);

MAP_GET_PASSWORD (defined in clause 11);

MAP_INSERT_SUBSCRIBER_DATA (defined in clauses 8 and 25);

MAP_DEACTIVATE_SS (defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Services printed in *italics* are optional.

Figure 22.5.1/1: Interfaces and services for supplementary service deactivation

22.5.2 Procedures in the MSC

The MSC procedures for deactivation are identical to those specified for activation in subclause 22.4.2. The text and diagrams in subclause 22.4.2 apply with all references to activation changed to deactivation.

22.5.3 Procedures in the VLR

The VLR procedures for deactivation are identical to those specified for activation in subclause 22.4.3. The text and diagrams in subclause 22.4.3 apply with all references to activation changed to deactivation.

22.5.4 Procedures in the HLR

The HLR procedures for deactivation are identical to those specified for activation in subclause 22.4.4. The text and diagrams in subclause 22.4.4 apply with all references to activation changed to deactivation.

22.6 Interrogation procedure

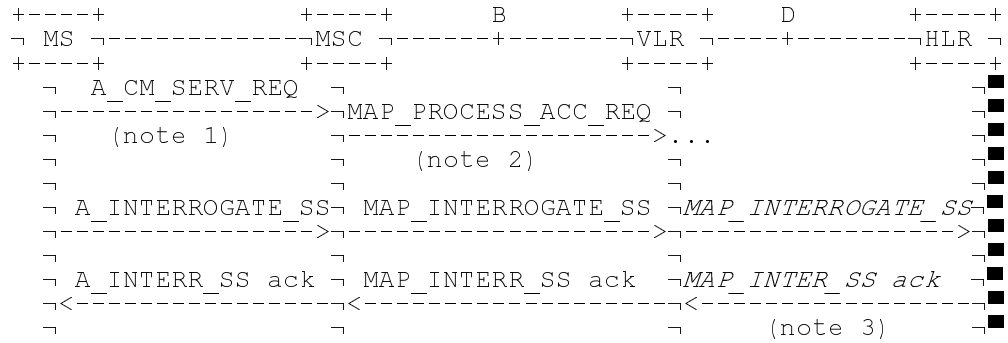
22.6.1 General

The interrogation procedure is used to retrieve information related to a supplementary service from the VLR or the HLR. It is the VLR which decides whether an interrogation request should be forwarded to the HLR or not. Some non-supplementary service related services may be invoked as a result of the procedure, as described in the subclauses below.

The interrogation procedure is shown in figure 22.6.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_INTERROGATE_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Services printed in italics are optional.

Figure 22.6.1/1: Interfaces and services for supplementary service interrogation

22.6.2 Procedures in the MSC

The MSC procedures for interrogation are identical to those specified for registration in subclause 22.2.2. The text and diagrams in subclause 22.2.2 apply with all references to registration changed to interrogation.

22.6.3 Procedures in the VLR

Supplementary service interrogation

When receiving the MAP_INTERROGATE_SS indication, the MAP user acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the error Call Barred is returned to the MSC. The parameter "operatorBarring" shall be included with the error.

The interrogation is either answered by the VLR or by the HLR, depending on the service interrogated.

a) Interrogation to be handled by the VLR

The supplementary service request shall then be processed according to GSM 03.11 and the 03.8x and 03.9x-series of technical specifications. This handling may lead to either a successful result, a partially successful result, or an error being returned.

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

b) Interrogation to be handled by HLR

If the interrogation is to be handled by the HLR, on receiving the MAP_INTERROGATE_SS indication, the MAP user in the VLR transfers the information to the HLR in the MAP_INTERROGATE_SS request without further checking the contents of the service indication.

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

For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in GSM 09.11).

Error handling

Handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE in this procedure is identical to the handling in the Registration procedure in the VLR, subclause 22.2.3. The Interrogation procedure is described in figure 22.6.3/1.

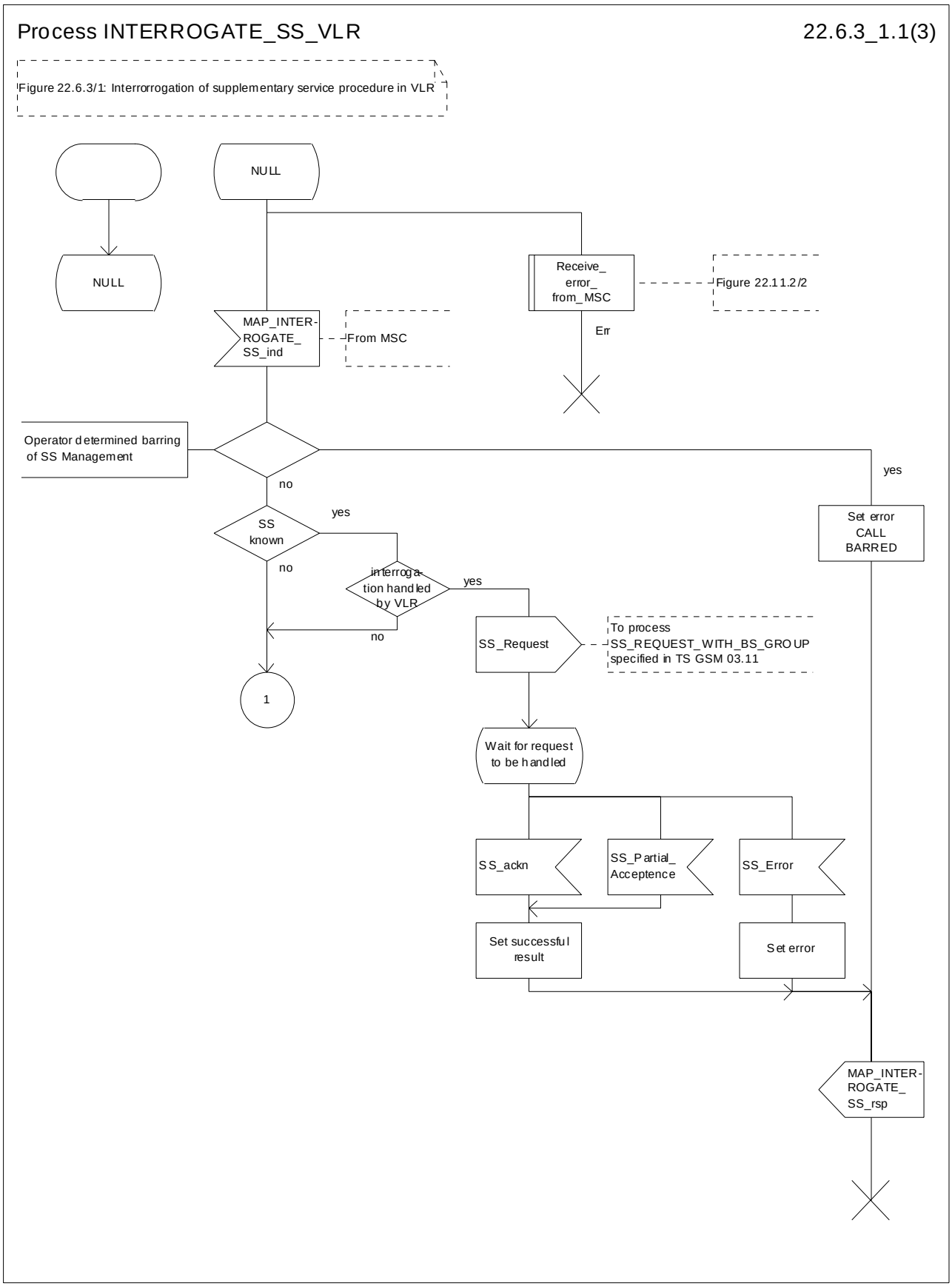


Figure 22.6.3/1 (sheet 1 of 3): Procedure Interrogate_SS_VLR

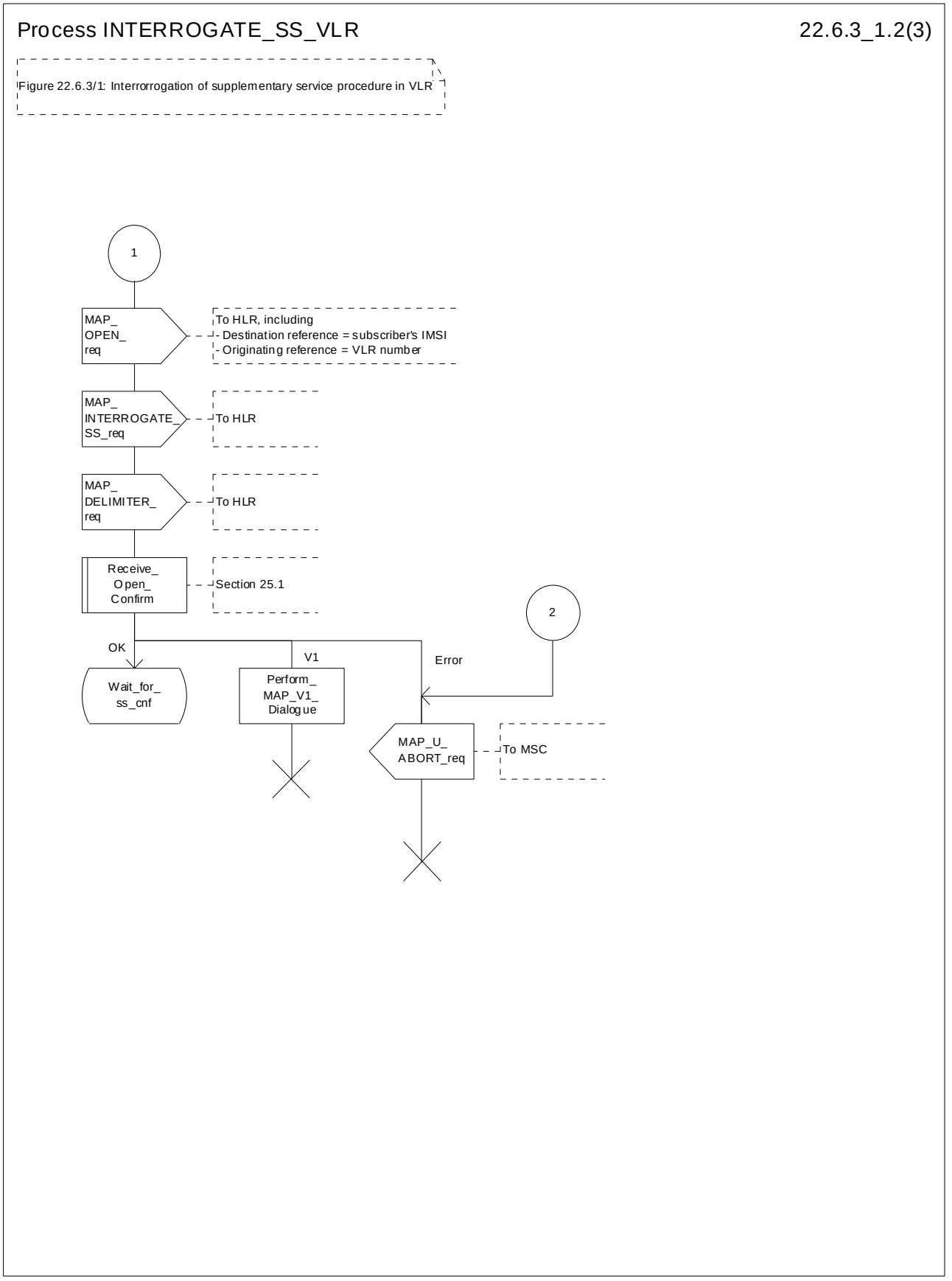


Figure 22.6.3/1 (sheet 2 of 3): Procedure Interrogate_SS_VLR

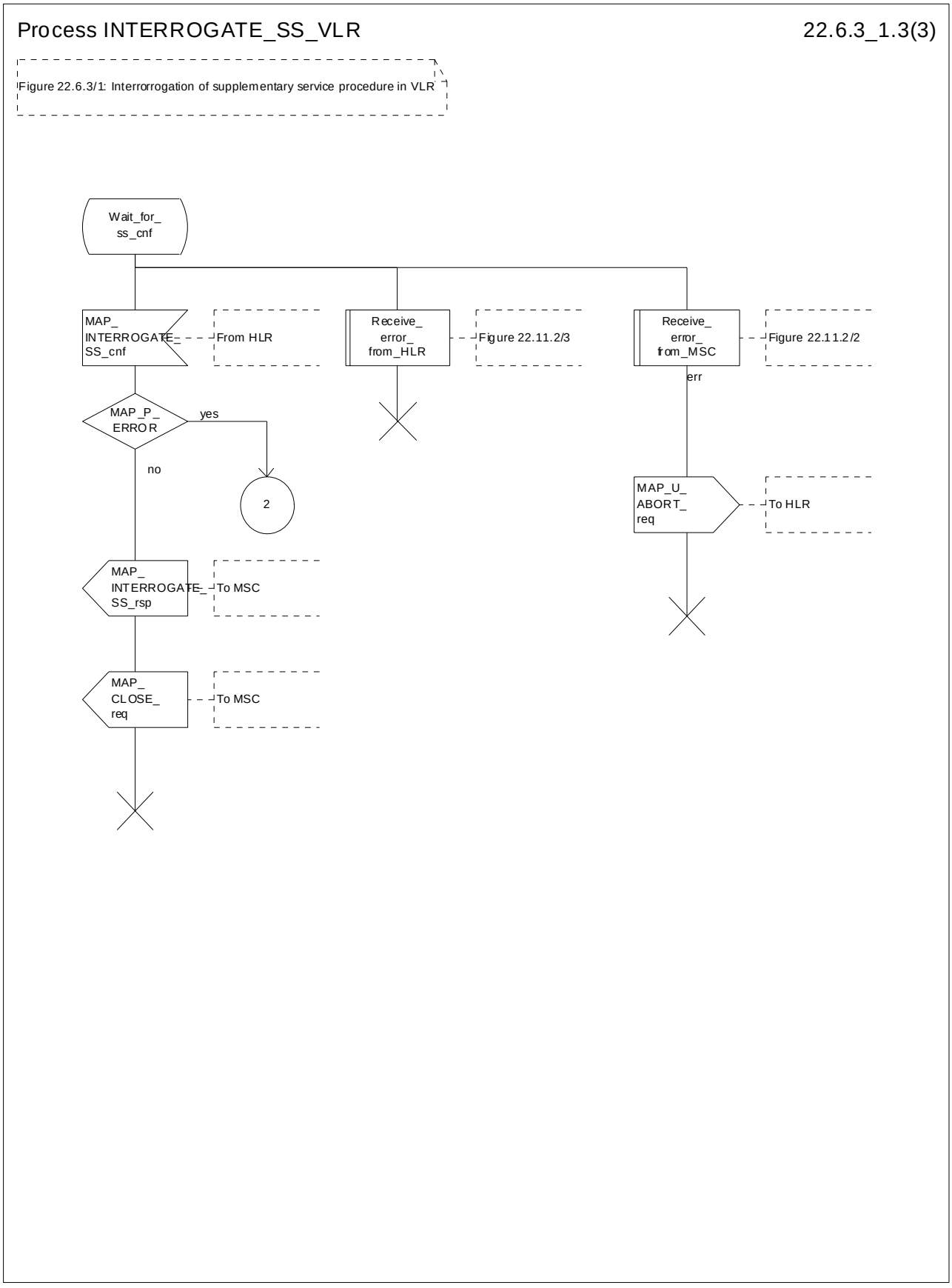


Figure 22.6.3/1 (sheet 3 of 3): Procedure Interrogate_SS_VLR

22.6.4 Procedures in the HLR

When receiving the MAP_INTERROGATE_SS indication, the MAP user acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the error Call Barred is returned to the MSC. The parameter "operatorBarring" shall be included with the error;
- if the supplementary service is not supported in HLR the error Unexpected Data Value is returned to the VLR.

The interrogation is either answered by the VLR or by the HLR, depending on the service interrogated.

a) Interrogation to be handled by the VLR

If the interrogation procedure should have been answered by the VLR, then the HLR assumes that the VLR does not support the interrogated supplementary service, and returns the SS Not Available error to the VLR.

b) Interrogation to be handled by HLR

The supplementary service request shall be processed according to GSM 03.11 and the 03.8x and 03.9x-series of technical specifications. This handling may lead to either a successful result or an error being returned.

For call independent SS operations, each message shall only contain a single component.

Error handling

Handling of MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE and unexpected MAP_CLOSE in this procedure is identical to the handling in the Registration procedure in the VLR, subclause 22.2.3. The Interrogation procedure is described in figure 22.6.4/1.

Process INTERROGATE_SS_HLR 22.6.4_1(1)

Figure 22.6.4/1: Interrogation of supplementary services procedure in HLR

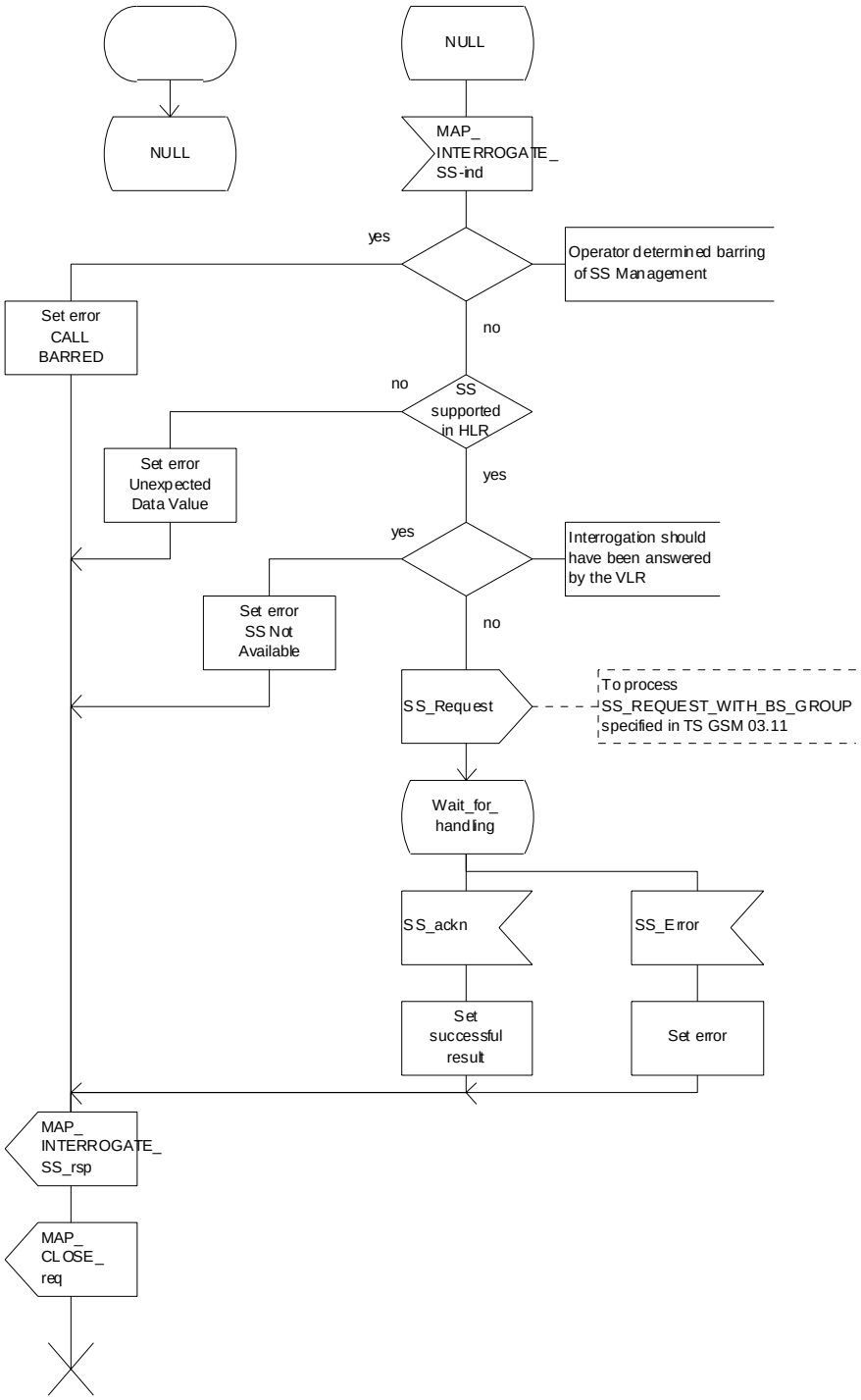


Figure 22.6.4/1: Procedure Interrogate_SS_HLR

22.7 Invocation procedure

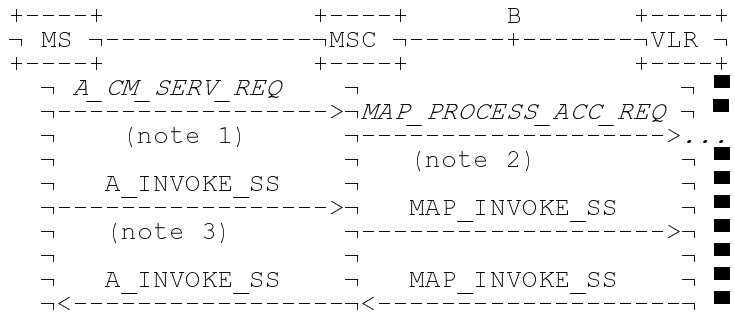
22.7.1 General

The invocation procedure is used to check subscription data in the VLR for certain supplementary services which are invoked after the call set-up phase is finished. For invocation of supplementary services which are invoked during the call set-up phase, please refer to the Call Handling procedure descriptions.

The invocation procedure is shown in figure 22.7.1/1. Note that some optional services may be invoked in connection with this procedure, as described in the subclause below.

The following services are used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_INVOKE_SS	(defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines indicate the trigger provided by the signalling on the radio path, and the signalling triggered on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: A_INVOKESS is a generic message to illustrate any supplementary service invocation request message on the air interface, e.g. BuildMPTY, see GSM 04.80.

Figure 22.7.1/1: Interfaces and services for supplementary service invocation

22.7.2 Procedures in the MSC

Process access request

Before the Call Hold or Multi-Party supplementary services can be invoked, a CC connection must be established between the MS and the MSC as described in GSM 04.08 and the Call Handling procedure descriptions within the present document.

When an A_INVOKE_SS request message arrives at the MSC during a call (as described in GSM 04.10, 04.8x and 04.9x-series of technical specifications), then if control of subscription to the invoked supplementary service is required, the MSC initiates the process access request procedure towards the VLR as described in clause 25 of the present document.

Supplementary service invocation

If the Process Access Request procedure towards the VLR is successful, the MSC shall forward a MAP_INVOKE_SS service request towards the VLR. This request shall contain the SS-Code of the supplementary service to be invoked, and possibly the Basic service code. Mapping from the A_INVOKE_SS to this service request is described in GSM 09.11.

The MSC will receive a MAP_INVOKE_SS confirm from the VLR. If the outcome of the service is successful (i.e. the service confirm is empty), the MSC will invoke the requested supplementary service as described in GSM 02.8x-series, 03.8x and 03.9x-series of technical specifications. If the outcome of the service is unsuccessful, the MSC shall send an appropriate A_INVOKE_SS response towards the MS. The structure of this message is described in GSM 09.11 and 04.8x and 04.9x-series of technical specifications.

Error handling

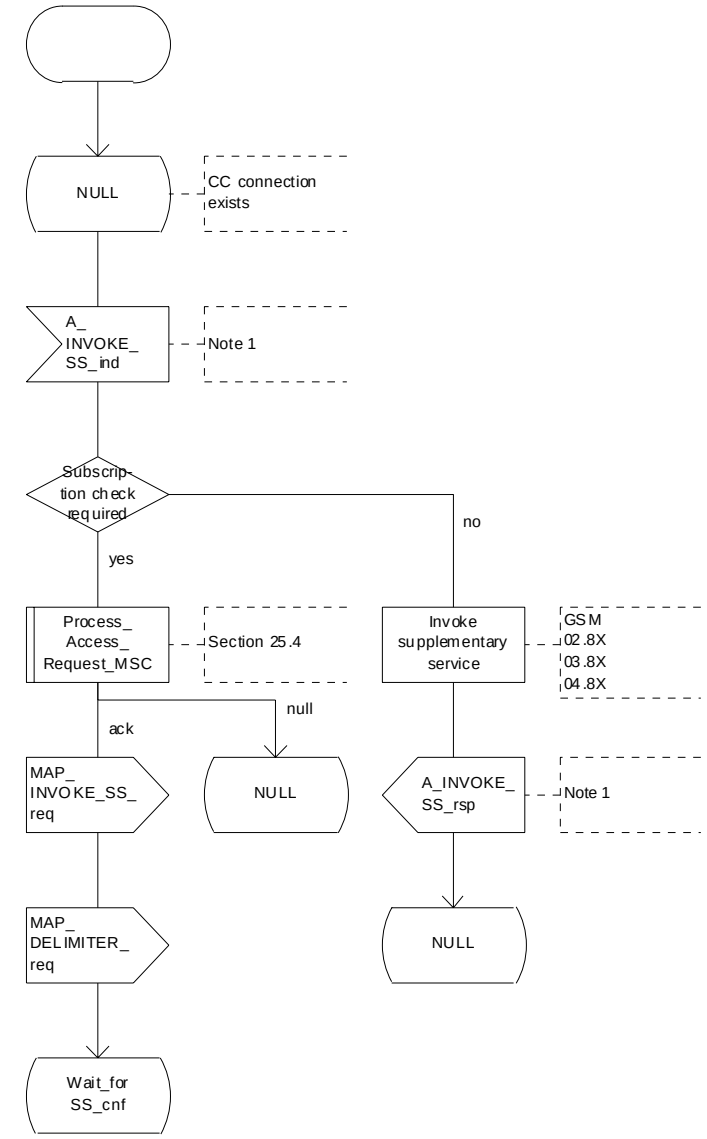
If at any time during this procedure a MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE or MAP_CLOSE indication concerning the process is received from the VLR, the process is terminated. If a MAP_NOTICE indication was received from the VLR, the VLR dialogue must also be aborted by sending a MAP_U_ABORT request indicating Procedure error towards the VLR. Possible signalling to the MS is described in GSM 04.10.

If an A_CM_RELEASE indication is received from the MS, all open transactions are released using the MAP_U_ABORT request indicating application procedure cancellation; the process terminates.

The invocation procedure in the MSC is shown in figure 22.7.2/1.

Process INVOKE_SS_MSC 22.7.2_1.1(2)

Figure 22.7.2/1: Mobile initiated invocation of supplementary service procedure in the MSC

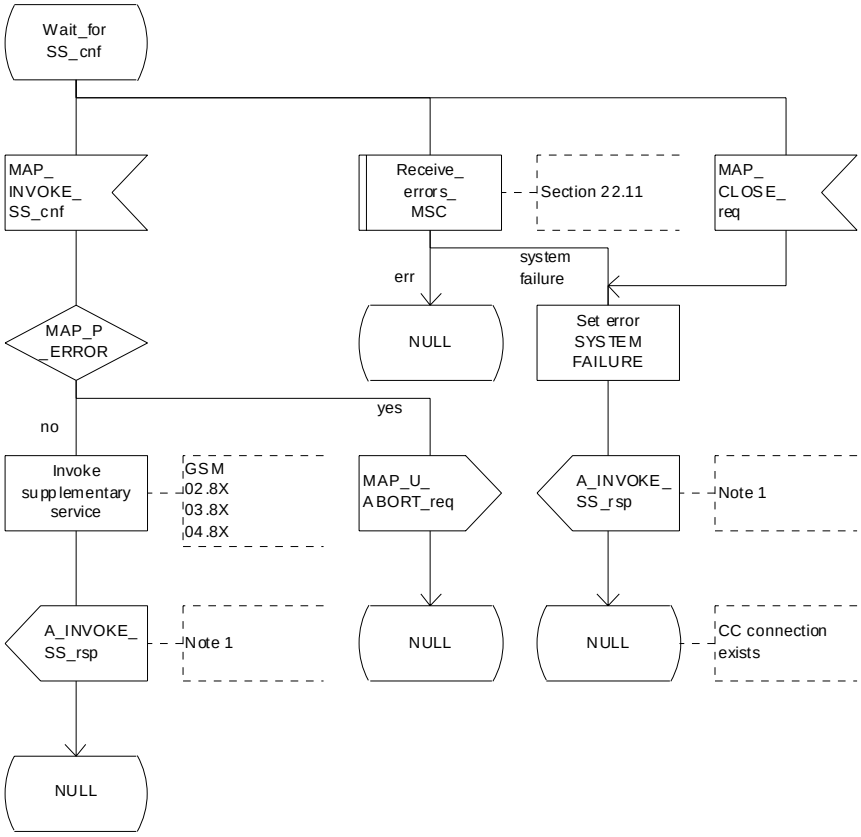


Note 1: Fictitious signal to indicate receipt/sending of SS invocation invoke component on the air interface (eg. BuildMPTY). Described in GSM 04.8X and 09.11.

Figure 22.7.2/1 (sheet 1 of 2): Procedure Invoke_SS_MSC

Process INVOKE_SS_MSC 22.7.2_1.2(2)

Figure 22.7.2/1: Mobile initiated invocation of supplementary service procedure in the MSC



Note 1: Fictitious signal to indicate receipt/ sending of SS invocation invoke component on the air interface, (eg. BuildMPTY). Described in GSM 04.8X and 09.11.

Figure 22.7.2/1 (sheet 2 of 2): Procedure Invoke_SS_MSC

22.7.3 Procedures in the VLR

Process Access Request

When receiving the MAP_PROCESS_ACCESS_REQUEST indication, the VLR acts as described in clause 25 of the present document.

Supplementary service invocation

When receiving the MAP_INVOKE_SS indication, the MAP user acts as follows:

- if the operator has barred the subscriber from access to supplementary services, the error "Call Barred" is returned to the MSC. The parameter "operatorBarring" shall be included with the error;
- if any irrelevant information elements (according to the service description) or invalid information element values are present in the service request, then the unexpected data value error is returned to the MSC in the MAP_INVOKE_SS response;
- if the VLR does not support the invoked supplementary service then the VLR shall respond with the SS Not Available error;
- if the requested supplementary service cannot be invoked by subscriber actions, then the VLR shall respond with the Illegal SS Operation error;
- if the subscriber is not provided with (i.e. subscribed to) the requested supplementary service, then the SS error status error (possibly including the SS-Status as parameter) is returned to the MSC in the MAP_INVOKE_SS response.

If all checks are passed the VLR returns an empty MAP_INVOKE_SS response to the MSC, thus indicating that the invocation request was accepted.

If at any time during this procedure a MAP_P_ABORT, MAP_U_ABORT, MAP_NOTICE or unexpected MAP_CLOSE indication concerning the process is received from the MSC, the process terminates. If a MAP_NOTICE indication was received from the MSC, that dialogue must be aborted by sending a MAP_U_ABORT request indicating Procedure error towards the MSC. The process terminates.

The invocation procedure in the VLR is shown in figure 22.7.3/1.

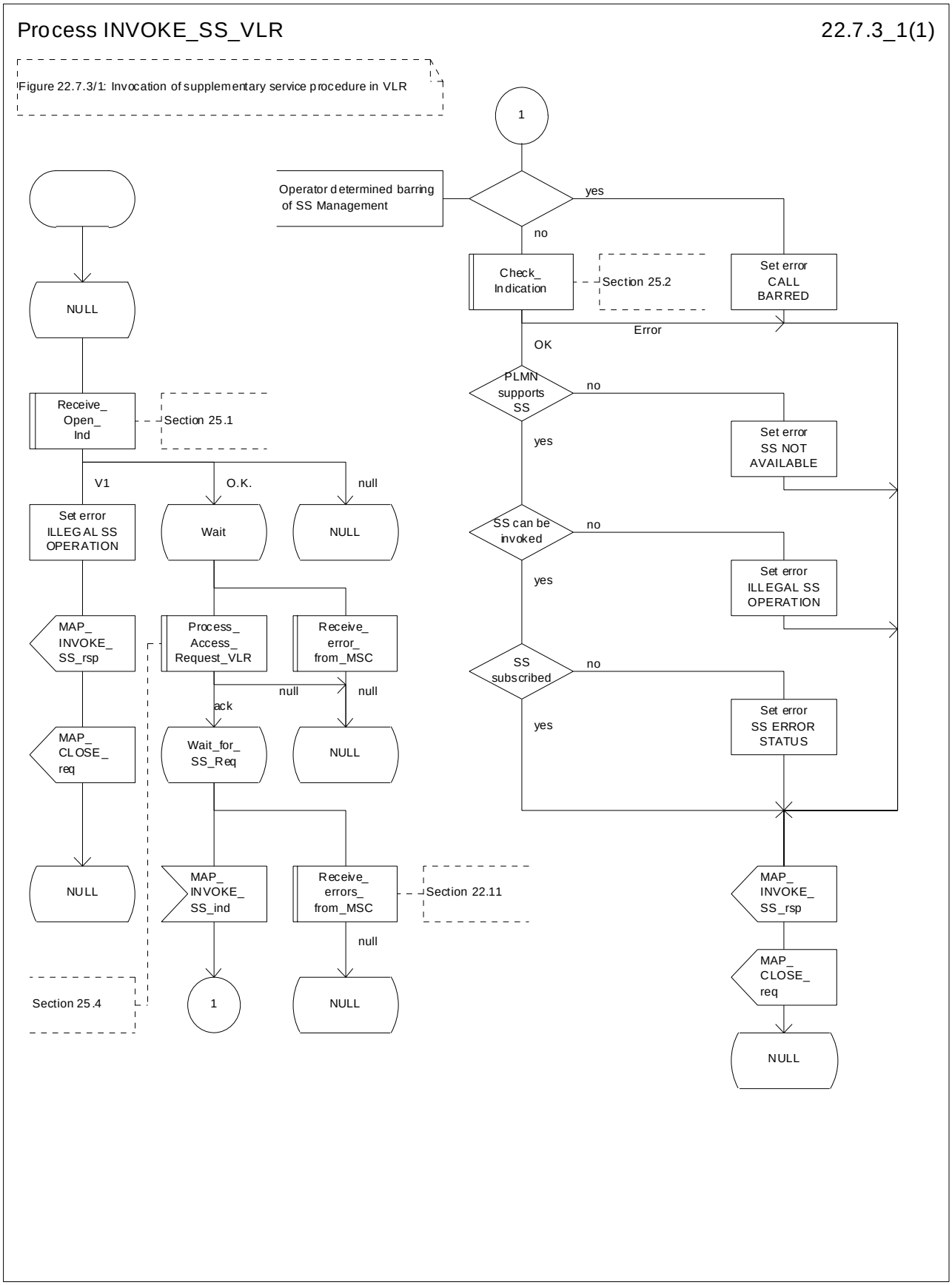


Figure 22.7.3/1: Procedure Invoke_SS_VLR

22.8 Password registration procedure

22.8.1 General

The password registration procedure is used to register a password in the HLR. The password registration procedure is a fully transparent communication between the MS and the HLR, except that some services may be invoked as a result of the procedure, as described below.

The password registration procedure is shown in figure 22.8.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (defined in clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (defined in clauses 9 and 25);

MAP_PROVIDE_IMSI (defined in clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (defined in clauses 8 and 25);

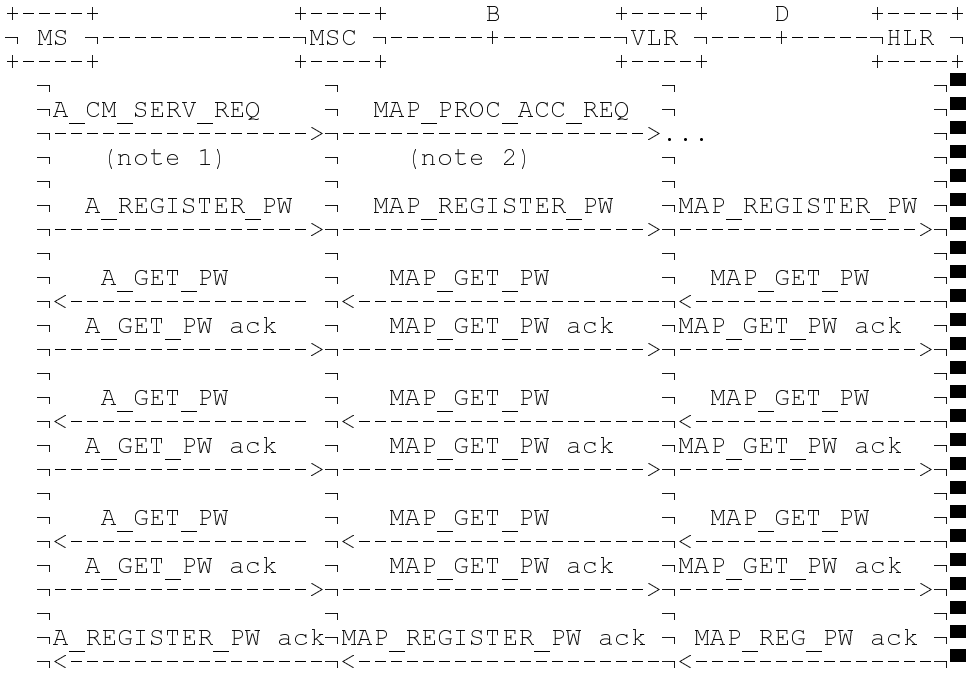
MAP_AUTHENTICATE (defined in clauses 8 and 25);

MAP_SET_CIPHERING_MODE (defined in clauses 8 and 25);

MAP_CHECK_IMEI (defined in clauses 8 and 25);

MAP_READY_FOR_SM (defined in clauses 12 and 25);

MAP_GET_PASSWORD (defined in clause 11).



NOTE 1: For details of the procedure on the radio path, see GSM 04.08, 04.10, 04.8x and 04.9x. Services shown in dotted lines are triggers/ triggered signalling on the radio path.

NOTE 2: For details on the Process Access Request procedure, please refer to clause 25 in the present document.

NOTE 3: Use of each of the three MAP_GET_PASSWORD operations is described in subclause 22.8.4.

Figure 22.8.1/1: Interfaces and services for supplementary service password registration

22.8.2 Procedures in the MSC

The password registration procedure in the MSC is identical to that for activation specified in subclause 22.4.2. All the text and diagrams in subclause 22.4.2 apply with all references to activation changed to password registration.

22.8.3 Procedures in the VLR

The password registration procedure in the VLR is identical to that for activation specified in subclause 22.4.3. All the text and diagrams in subclause 22.4.3 apply with all references to activation changed to password registration.

22.8.4 Procedures in the HLR

The procedure in the HLR is initiated when it receives a MAP_REGISTER_PASSWORD indication.

The HLR acts as follows:

- if the operator has barred the subscriber for access to supplementary services, the Call Barred error is returned to the VLR. The parameter "operatorBarring" shall be included with the error;

- if any irrelevant information elements (according to the service description) or invalid information element values are present, then the unexpected data value error is returned to the VLR in the response. This error should thus be returned if the SS-Code provided by the mobile subscriber is not allocated.

The HLR shall then process the MAP_REGISTER_PASSWORD indication as specified in GSM 03.11. During the handling of password registration, the password procedure will be initiated (as specified in GSM 03.11) This will involve the sending of MAP_GET_PASSWORD requests to the VLR.

- Handling of receipt of MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indications from the VLR is identical to their handling in the registration procedure, see subclause 22.2.4 above.

The password registration procedure in the HLR is shown in figure 22.8.4/1.

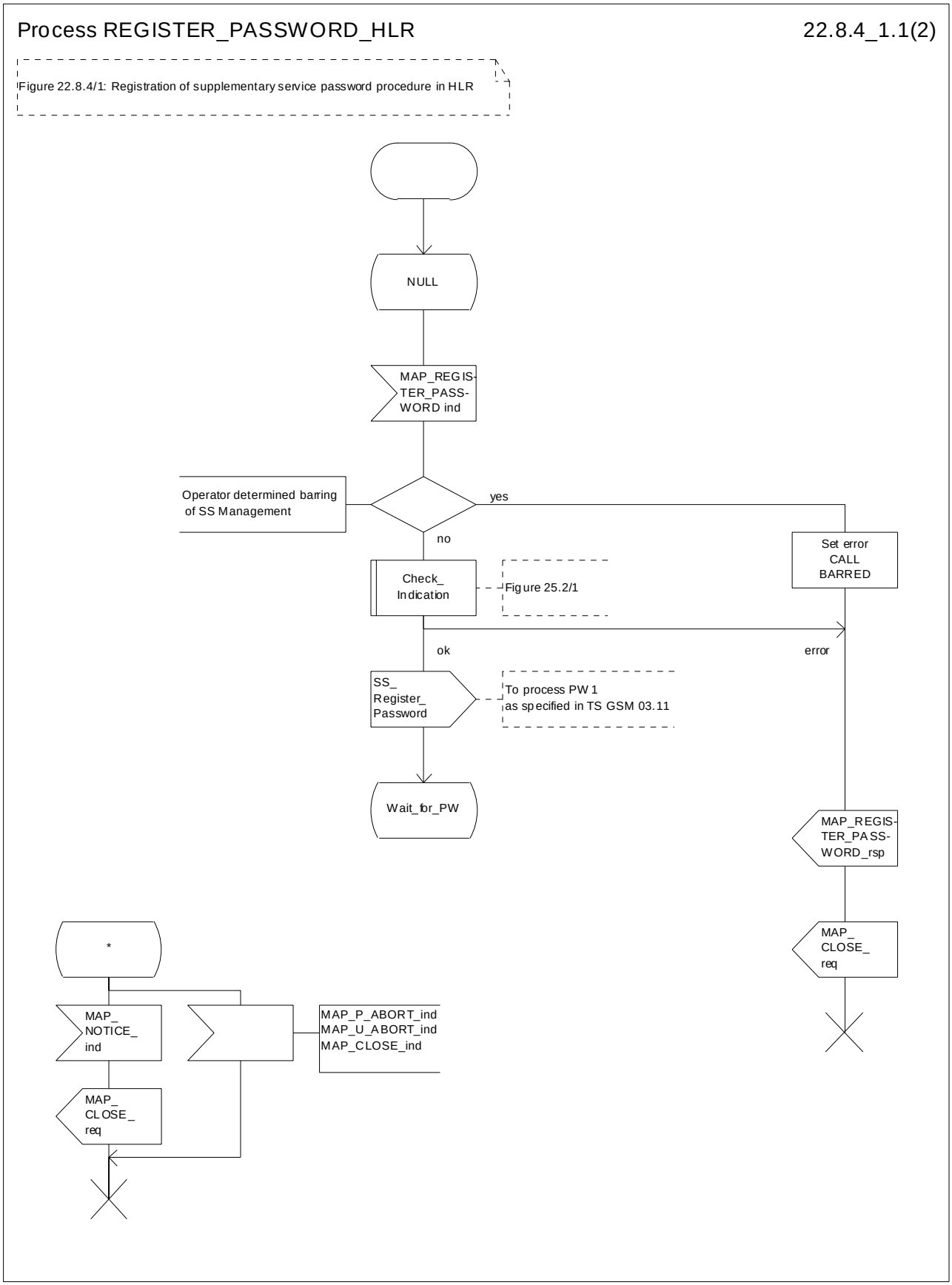


Figure 22.8.4/1 (sheet 1 of 2): Procedure Register_PW_HLR

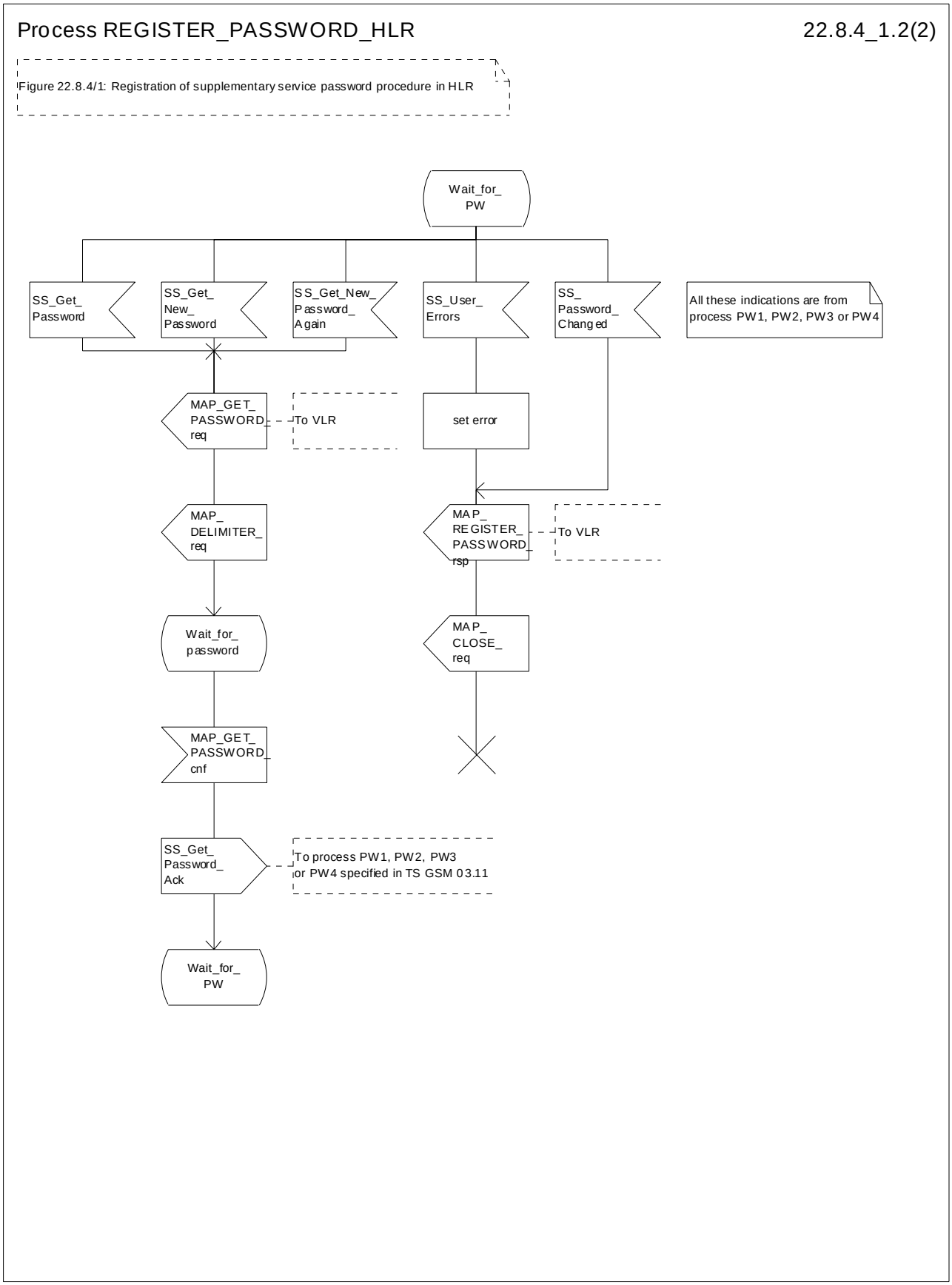


Figure 22.8.4/1 (sheet 2 of 2): Procedure Register_PW_HLR

22.9 Mobile Initiated USSD procedure

22.9.1 General

The procedure supports supplementary service signalling procedures which can allow PLMN specific services to be introduced.

The message flow for the procedure can be found in GSM 03.90.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(defined in clauses 9 and 25);
MAP_PROVIDE_IMSI	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_CHECK_IMEI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25);
MAP_UNSTRUCTURED_SS_REQUEST	(defined in clause 11);
MAP_UNSTRUCTURED_SS_NOTIFY	(defined in clause 11).

The following service is certainly used:

MAP_PROCESS_UNSTRUCTURED_SS_REQUEST	(defined in clause 11).

22.9.2 Procedures in the MSC

Before the Process Unstructured SS Request service can be invoked, a call independent CM connection must be created between the MS and the MSC.

Once a CM-connection is established, the MSC may handle the A_PROCESS_UNSTRUCTURED_SS_REQUEST from the MS. This message contains information input by the user, the message may be fed to an application contained locally in the MSC or to the VLR. The rules for determining this are specified in GSM 03.90.

1) Message Destined for VLR

If the message is destined for the VLR then the MSC shall transfer the message to the VLR using the mapping specified in detail in GSM 09.11.

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

When the MSC receives a MAP_PROCESS_UNSTRUCTURED_SS_REQUEST confirmation from the VLR then it shall pass this to the MS and initiate release of the CM connection.

2) Message Destined for Local Application

If the message is destined for the local USSD application then the MSC shall transfer the message to the application.

The MSC may subsequently receive one or more requests from the application which correspond to the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications. These shall be sent transparently to the MS. When a confirmation is received from the MS this shall be returned to the application.

When the MSC receives the result of the original operation from the application then it shall pass this to the MS and initiate release of the CM connection.

Error Handling

Both the MS and the VLR or USSD Application may initiate release of the CM-connection at any time. This is handled as shown in the diagrams.

The procedure in the MSC is shown in figure 22.9.2/1.

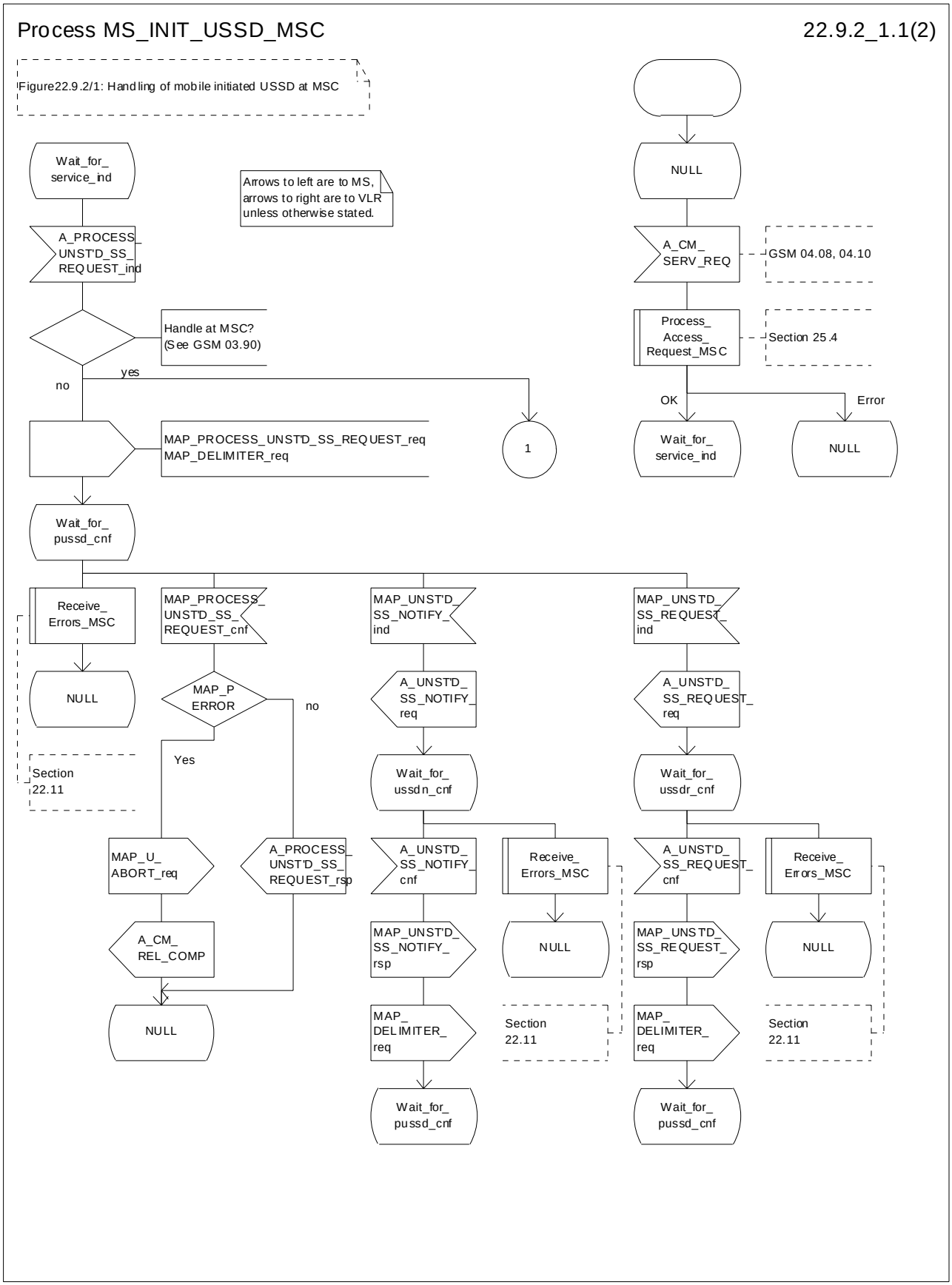


Figure 22.9.2/1 (sheet 1 of 2): Procedure MI_USSD_MSC

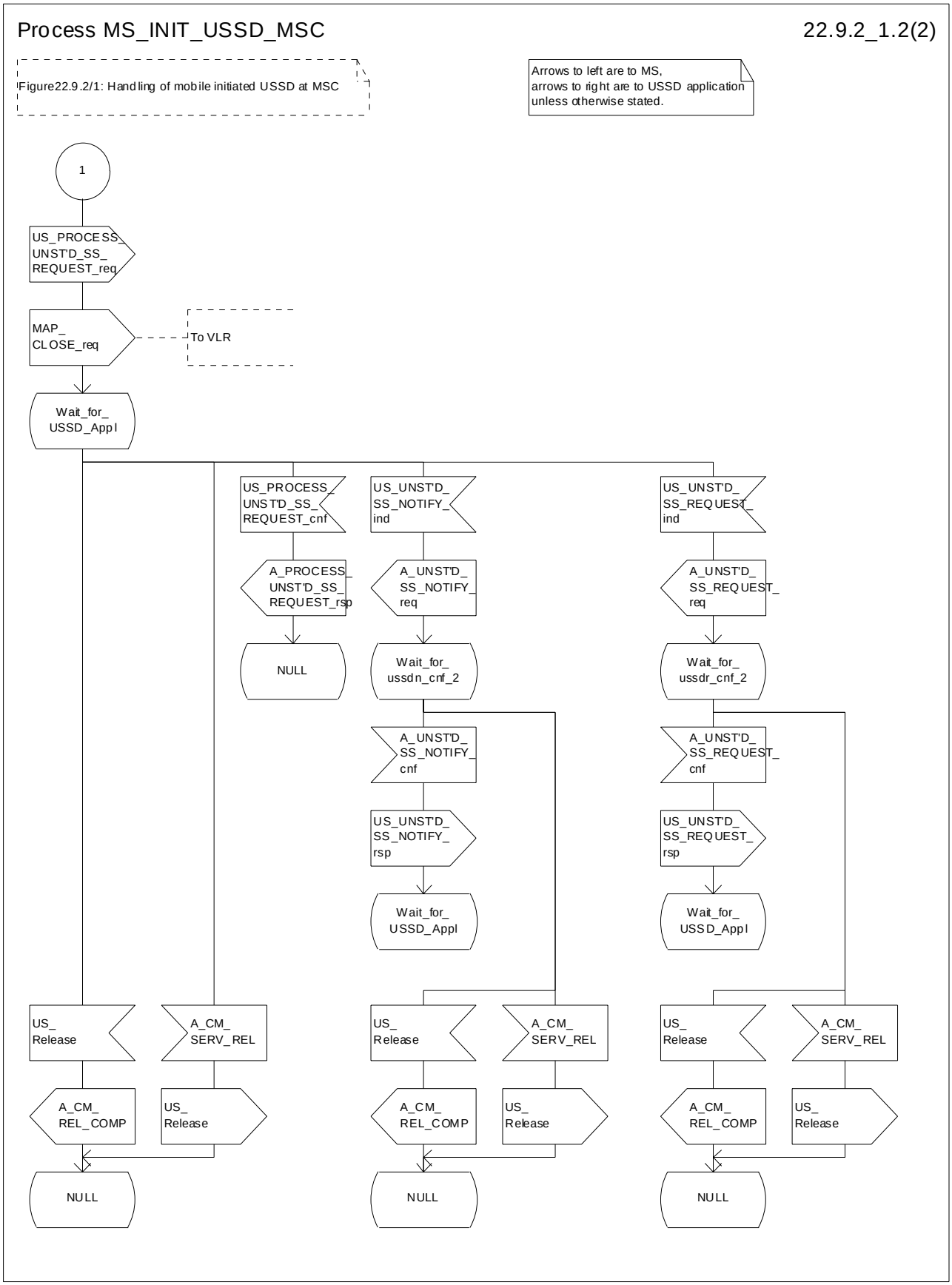


Figure 22.9.2/1 (sheet 2 of 2): Procedure MI_USSD_MSC

22.9.3 Procedures in the VLR

The initiation of the process is shown in subclause 22.1.2.

Once a MAP dialogue is established, the VLR may handle the MAP_PROCESS_UNSTRUCTURED_SS_REQUEST from the MSC. This message contains information input by the user, the message may be fed to an application contained locally in the VLR or to the HLR. The rules for determining this are specified in GSM 03.90.

Message Destined for HLR

If the message is destined for the HLR then the VLR shall transfer the message transparently to the HLR.

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

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

Message Destined for Local Application

If the message is destined for the local USSD application then the VLR shall transfer the message to the application.

The VLR may subsequently receive one or more requests from the application which correspond to the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications. These shall be sent transparently to the MSC. When a confirmation is received from the MSC this shall be returned to the application.

When the VLR receives the result of the original operation from the application then it shall pass this to the MSC and initiate release of the CM connection.

Error Handling

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

The procedure in the VLR is shown in figures 22.9.3/1 and 22.9.3/2.

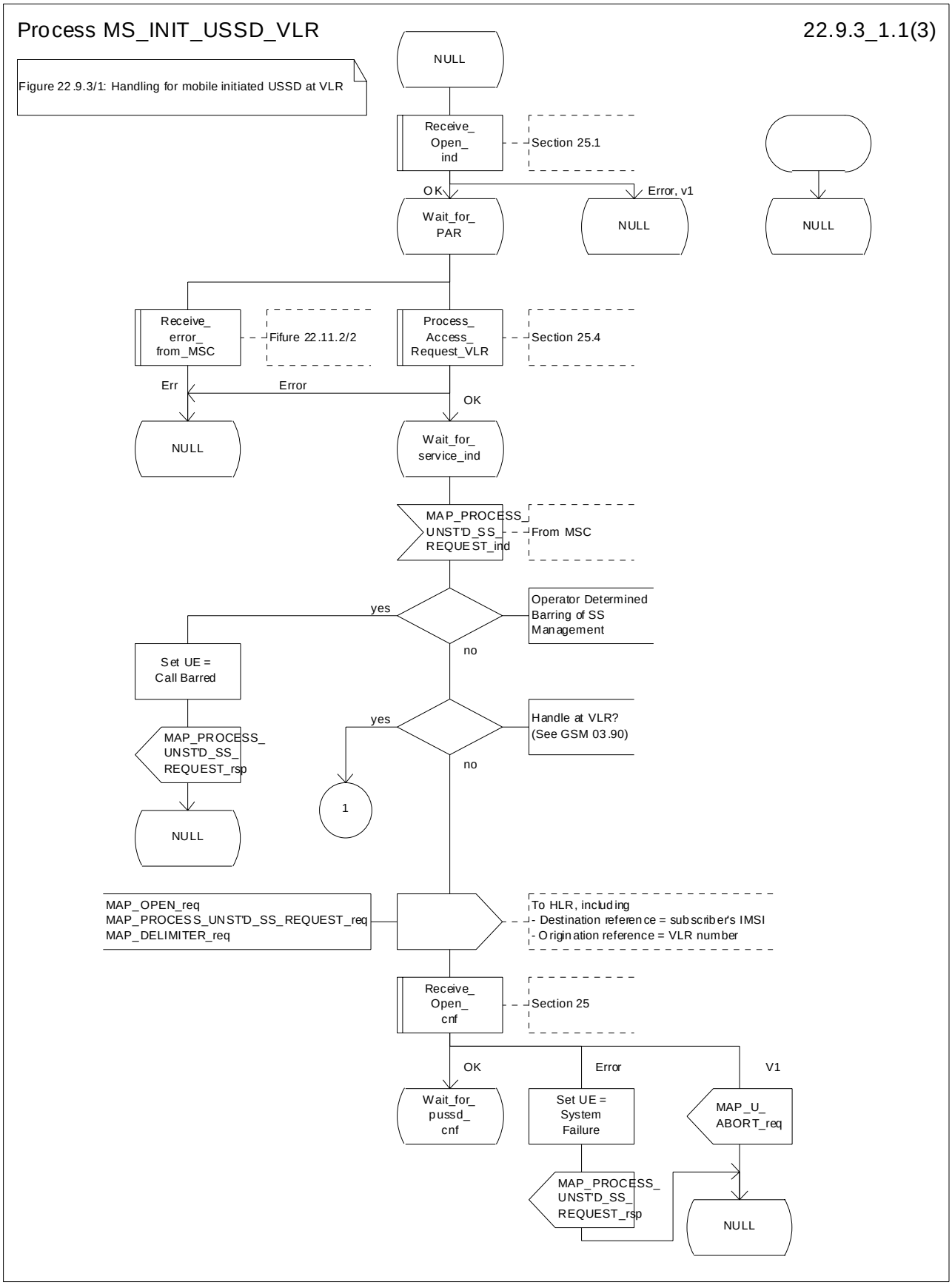


Figure 22.9.3/1 (sheet 1 of 3): Procedure MI_USSD_VLR

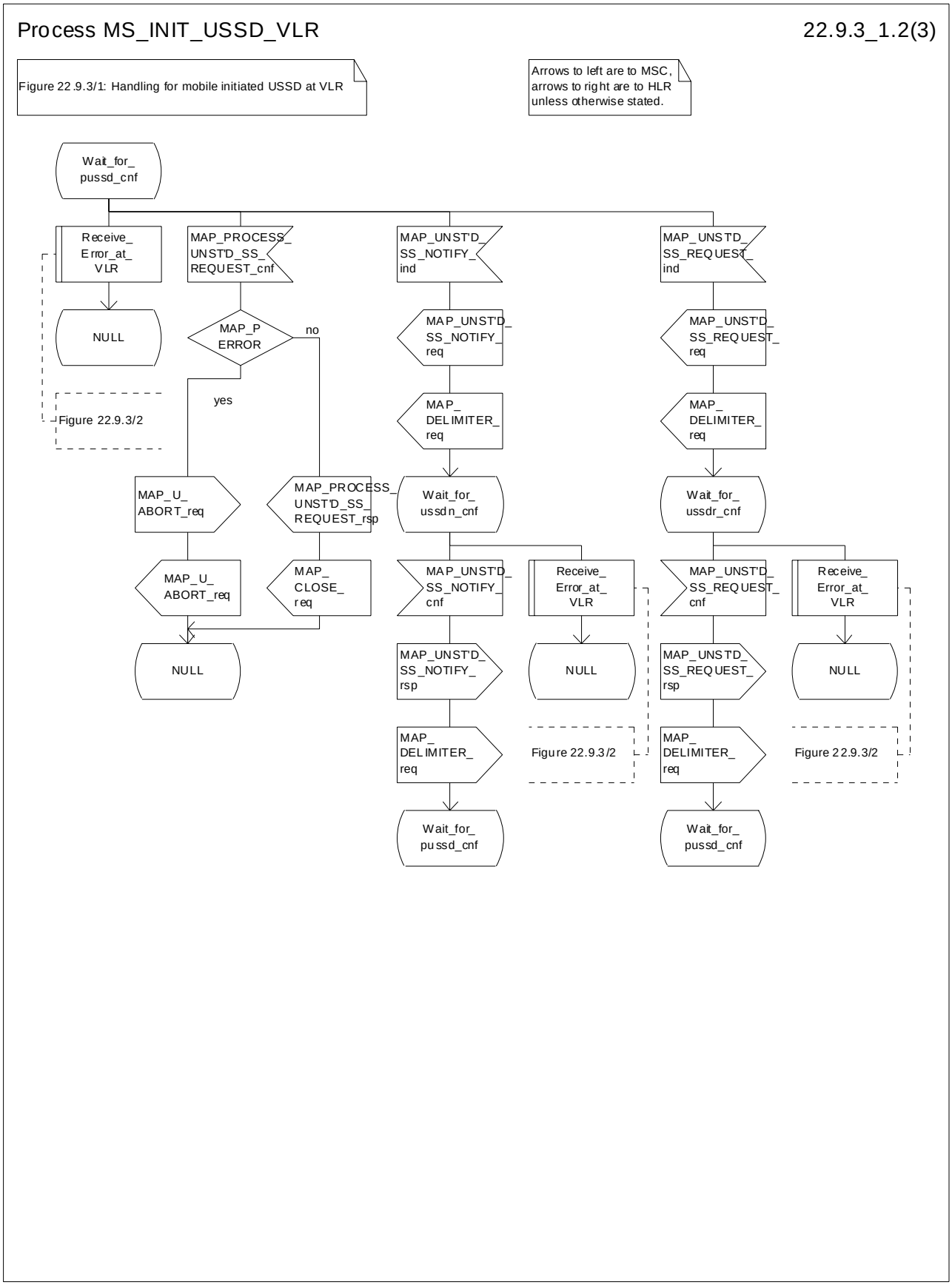


Figure 22.9.3/1 (sheet 2 of 3): Procedure MI_USSD_VLR

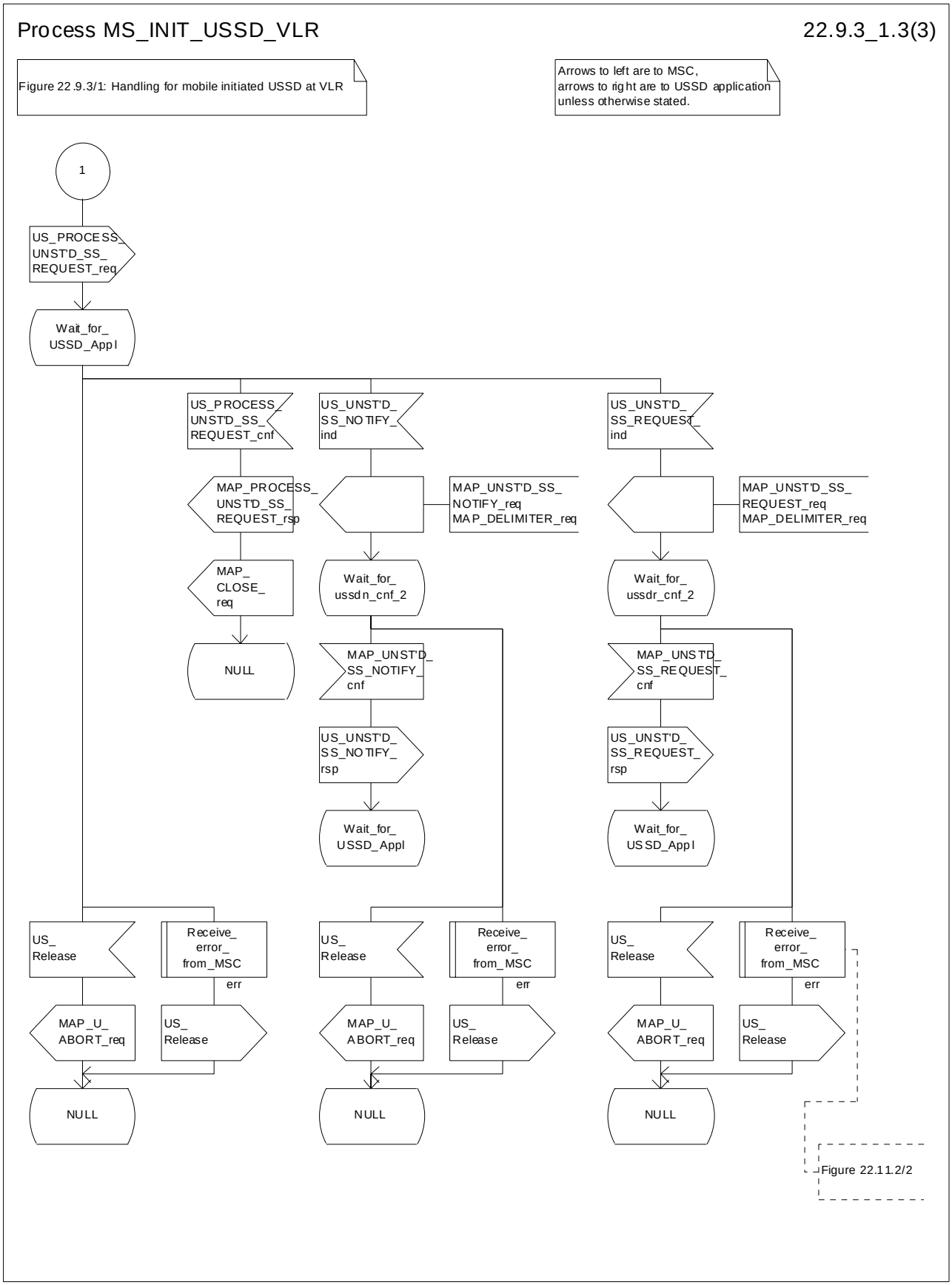


Figure 22.9.3/1 (sheet 3 of 3) : Procedure_MI_USSD_VLR

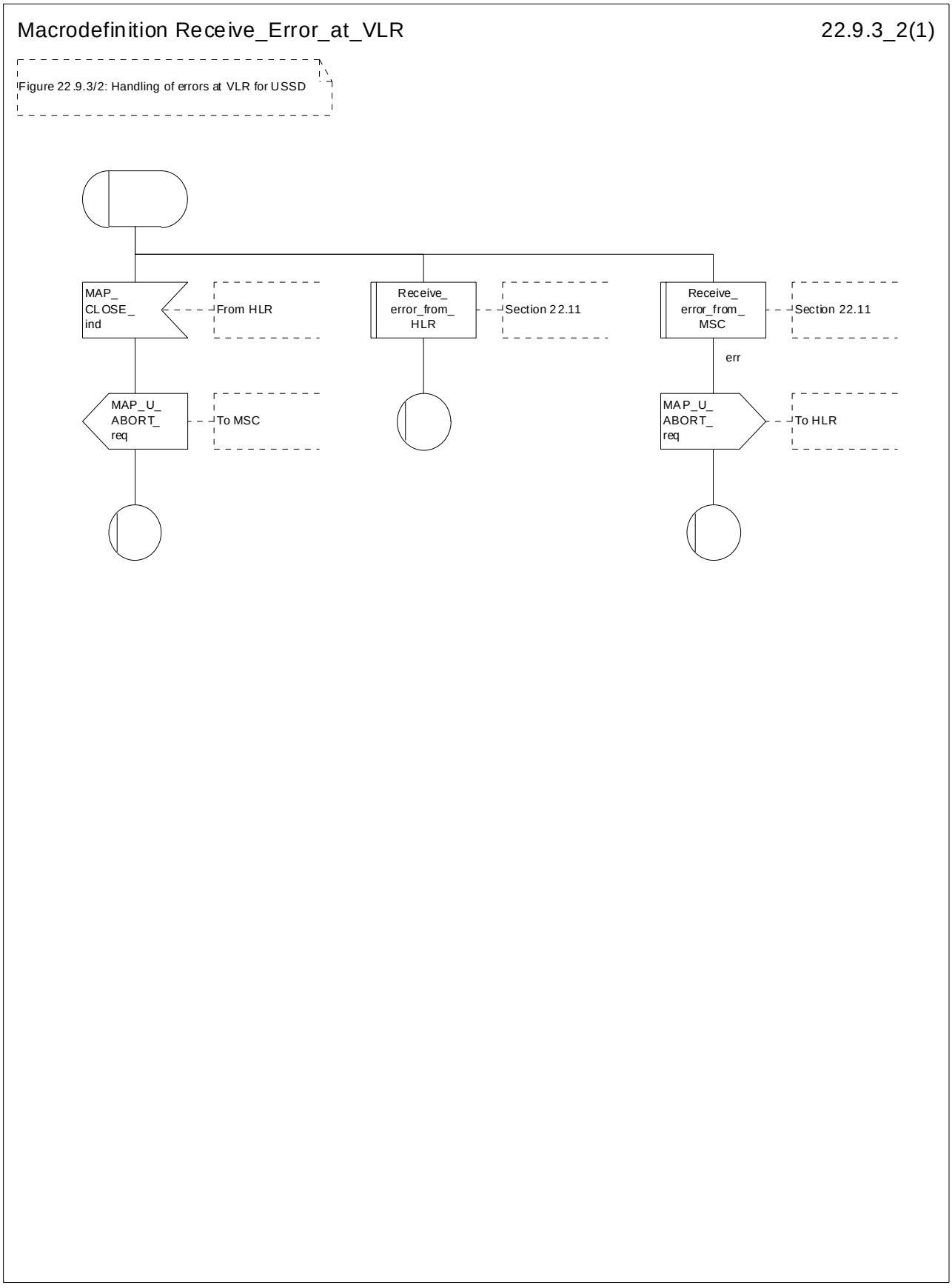


Figure 22.9.3/2: Macro Receive_Error_at_VLR

22.9.4 Procedures in the HLR

The initiation of the process is shown in subclause 22.1.3.

Once a MAP dialogue is established, the HLR may handle the MAP_PROCESS_UNSTRUCTURED_SS_REQUEST from the VLR. This message contains information input by the user. If the alphabet used for the message is understood then the message shall either be fed to an application contained locally in the HLR or to the gsmSCF. If the alphabet is not understood then the error "UnknownAlphabet" shall be returned.

Message Destined for Local Application

If the message is destined for the local USSD application then the HLR shall transfer the message to the local application.

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

When the HLR receives the result of the original operation from the application then it shall pass this to the VLR and initiate release of the CM connection.

Message Destined for gsmSCF

If the message is destined for the gsmSCF then the HLR shall transfer the message transparently to the gsmSCF.

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

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

Error Handling

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

The procedure in the HLR is shown in figure 22.9.4/1.

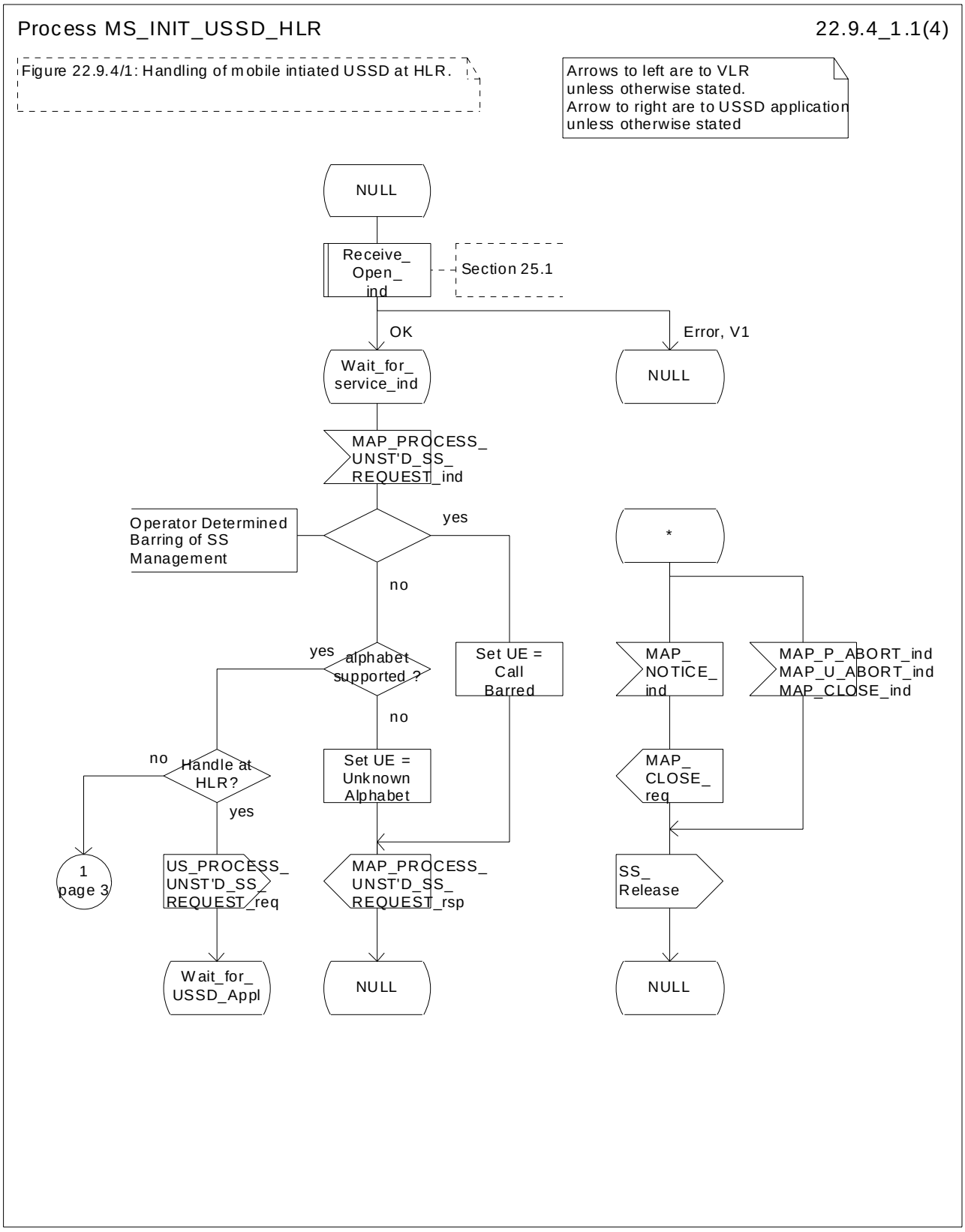


Figure 22.9.4/1 (sheet 1 of 4): Procedure MI_USSD_HLR

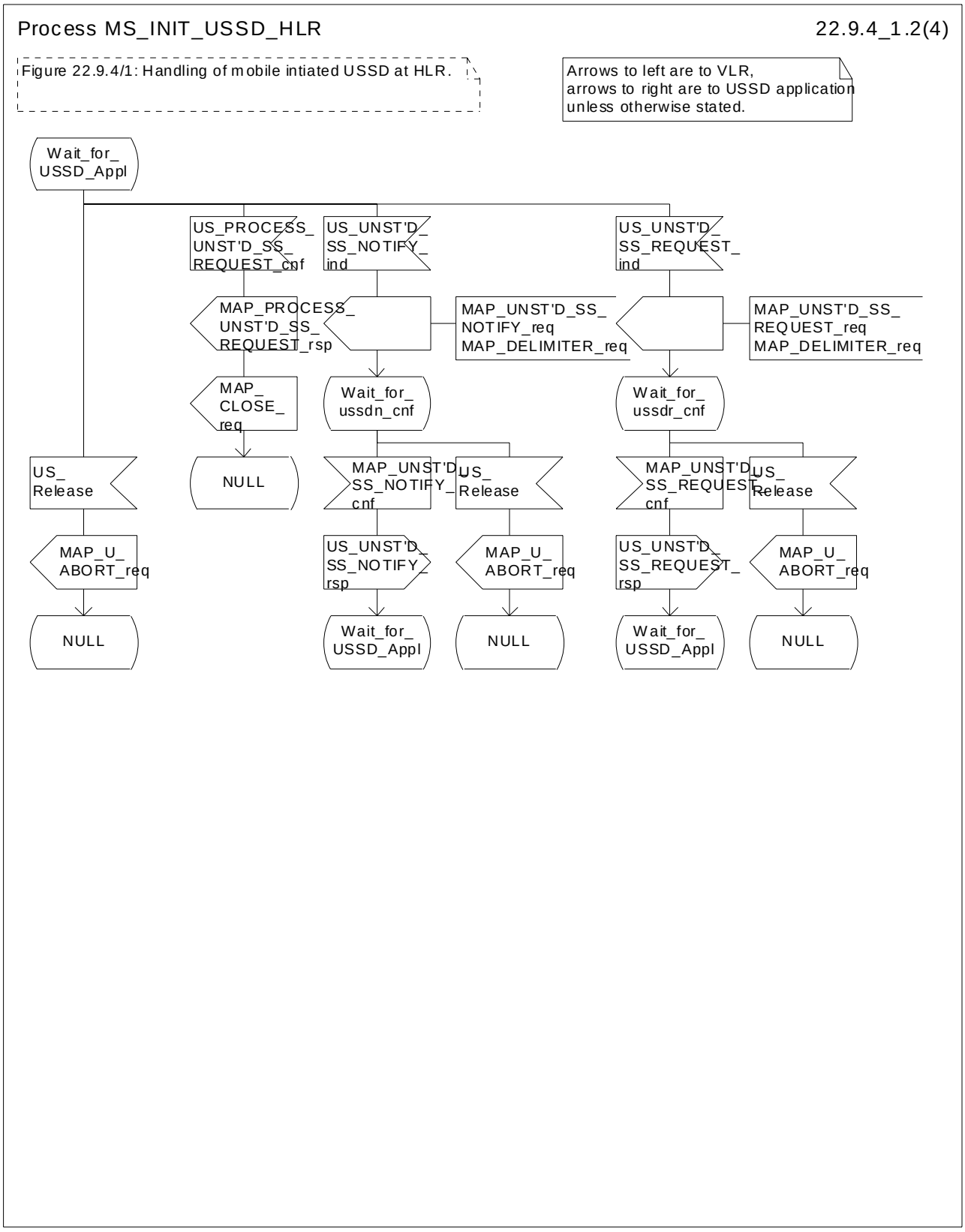


Figure 22.9.4/1 (sheet 2 of 4): Procedure MI_USSD_HLR

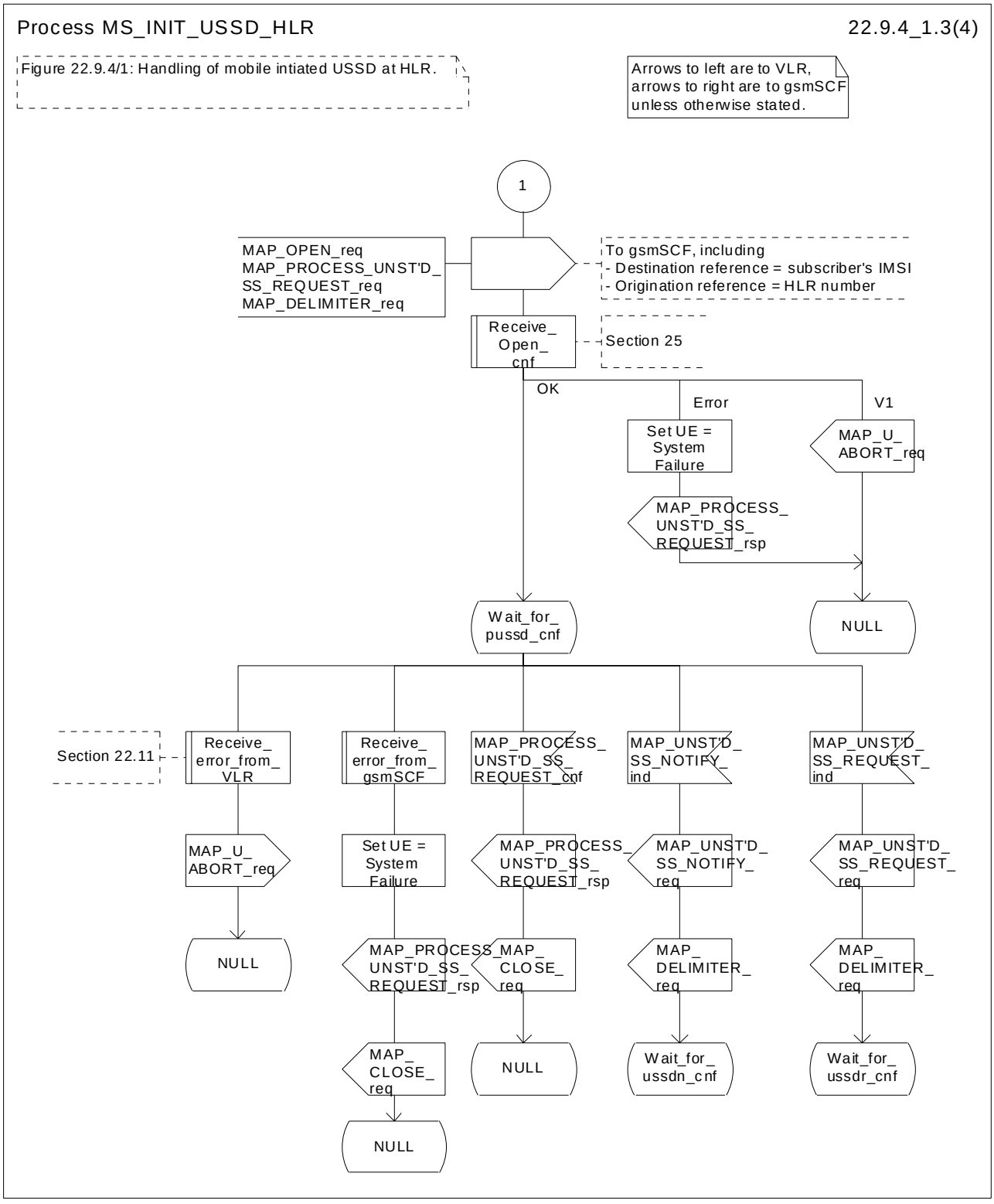


Figure 22.9.4/1 (sheet 3 of 4): Procedure MI_USSD_HLR

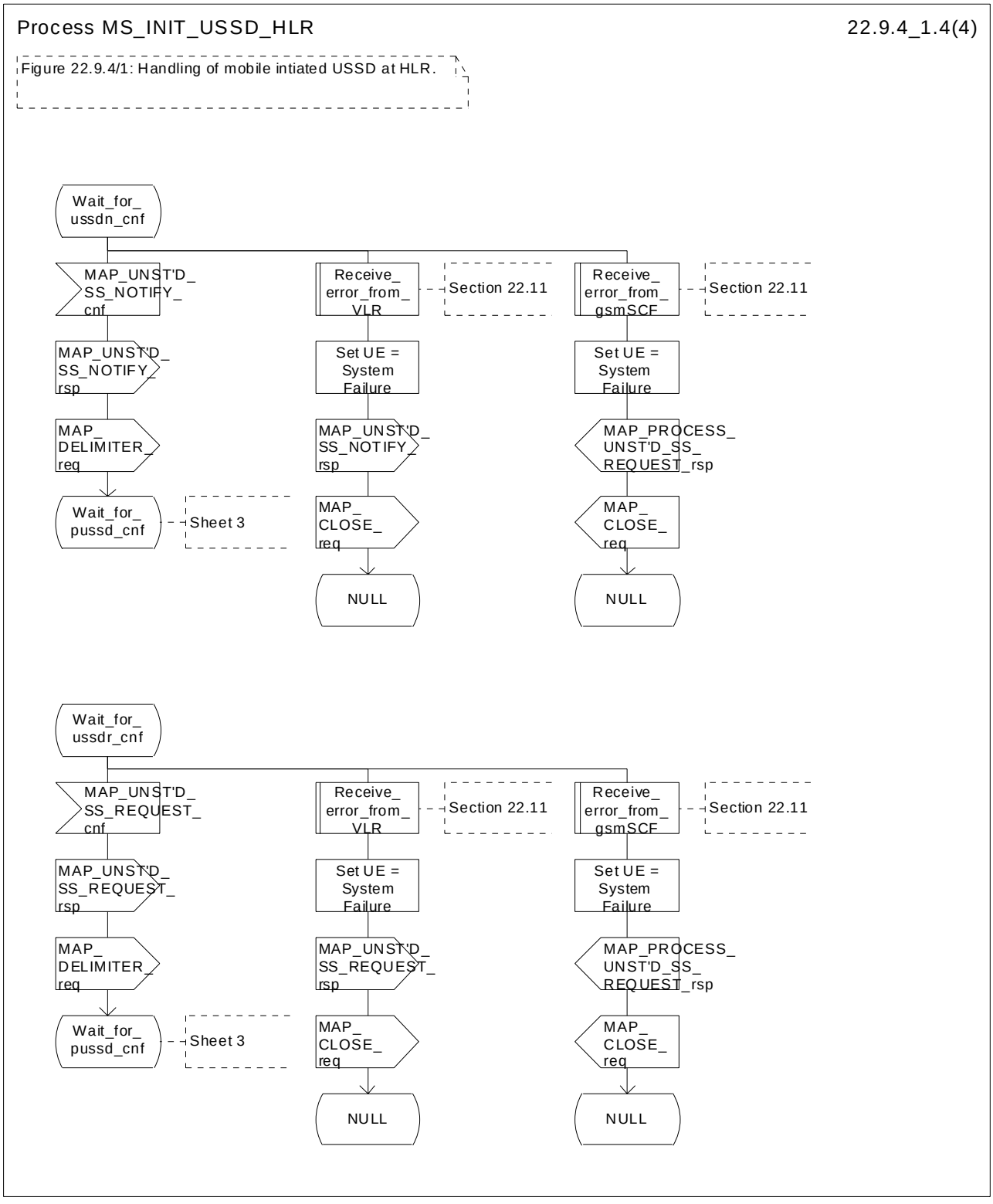


Figure 22.9.4/1 (sheet 4 of 4): Procedure MI_USSD_HLR

22.10 Network initiated USSD procedure

22.10.1 General

The procedure supports supplementary service signalling procedures which can allow PLMN specific services to be introduced.

The message flow for the procedure can be found in GSM 03.90.

The following services may be used:

MAP_PAGE	(defined in clauses 8 and 25);
MAP_SEARCH_FOR_MOBILE_SUBSCRIBER	(defined in clauses 8 and 25);
MAP_PROCESS_ACCESS_REQUEST	(defined in clauses 8 and 25);
MAP_AUTHENTICATE	(defined in clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(defined in clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(defined in clauses 8 and 25);
MAP_READY_FOR_SM	(defined in clauses 12 and 25).

At least one of the following services will certainly be used, and both may be used:

MAP_UNSTRUCTURED_SS_REQUEST	(defined in clause 11);
MAP_UNSTRUCTURED_SS_NOTIFY	(defined in clause 11).

22.10.2 Procedure in the MSC

The procedure may be invoked either by the VLR or by a USSD application local to the MSC. They may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service. If the request is initiated by a local USSD application then the MSC will open a dialogue with the HLR.

In both cases the MSC will initiate a CM connection to the MS (using the page or search macros defined in subclause 25.3). Once the connection is successfully established the message received from the VLR or USSD application will be sent to the MS using the mapping specified in GSM 09.11.

Following transfer of the message the MSC will wait for a confirmation from the MS. This will be sent to the VLR or USSD application as appropriate.

Following this, the MSC may receive further uses of the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY services, or may receive an indication to release the connection to the MS.

In the event of an error, the connection to the MS shall be released, and the MAP process with the VLR shall be aborted as shown in the diagram.

The procedure in the MSC is shown in figure 22.10.2/1.

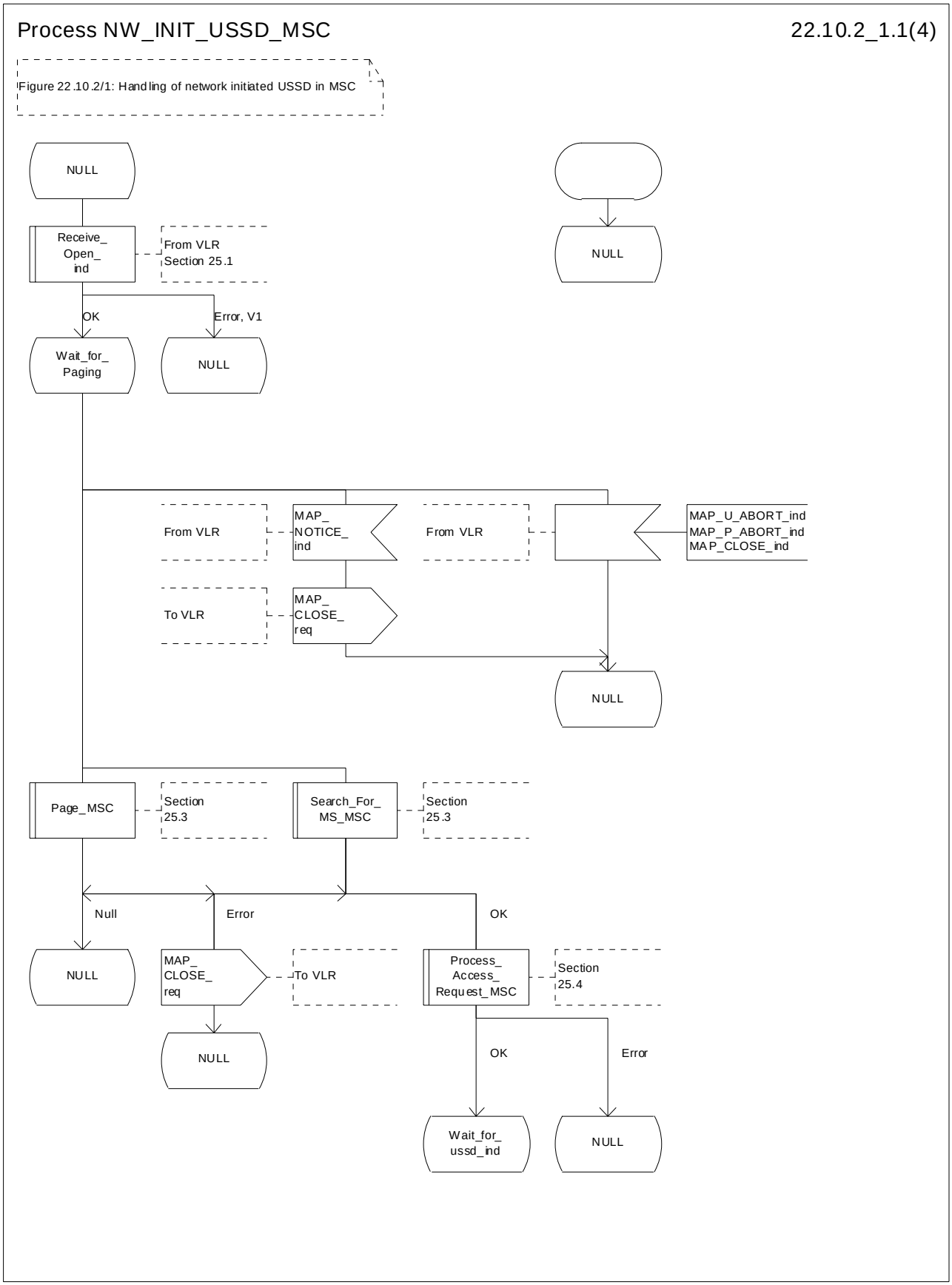


Figure 22.10.2/1 (sheet 1 of 4): Procedure NI_USSD_MSC

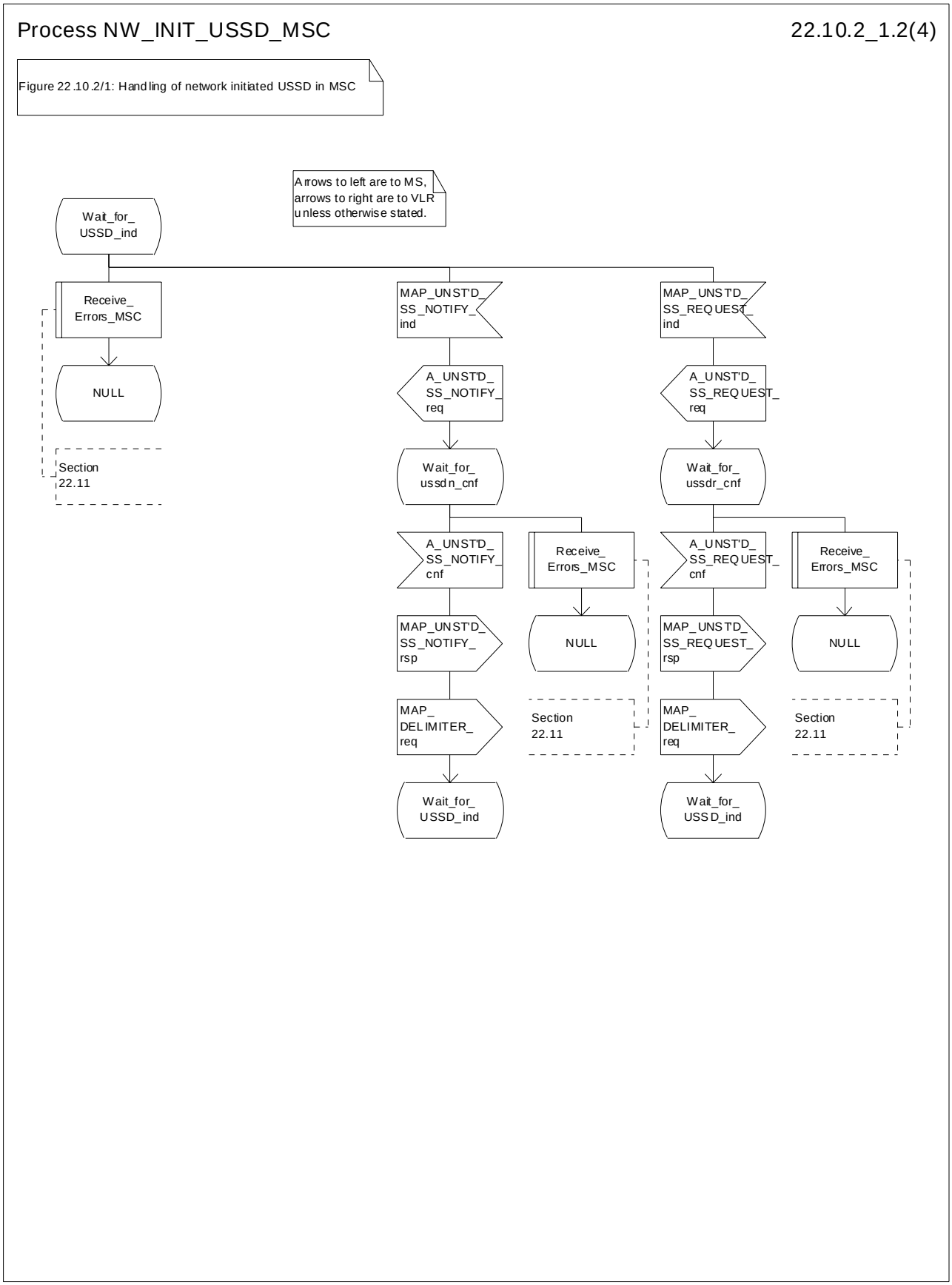


Figure 22.10.2/1 (sheet 2 of 4): Procedure NI_USSD_MSC

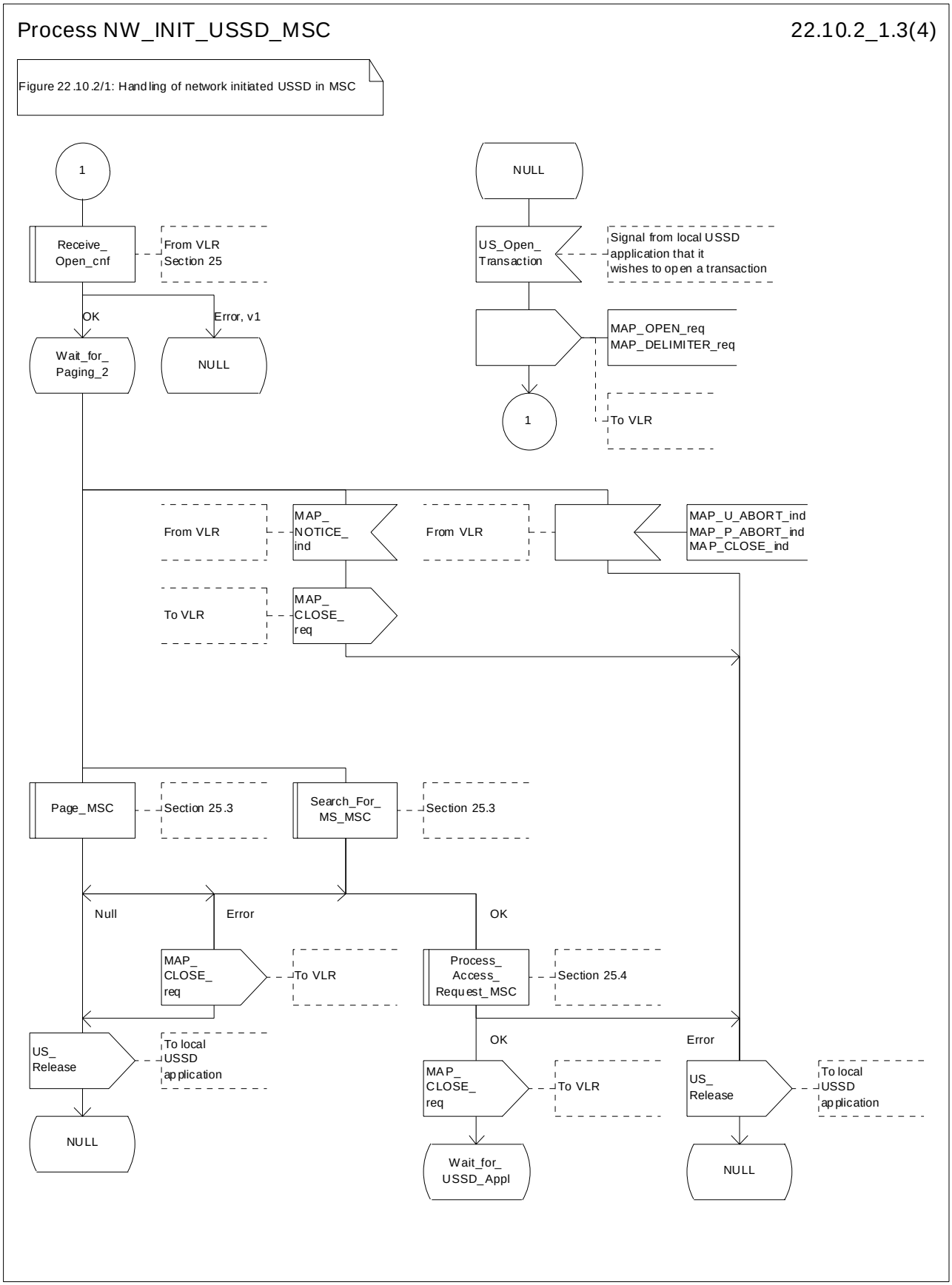


Figure 22.10.2/1 (sheet 3 of 4): Procedure NI_USSD_MSC

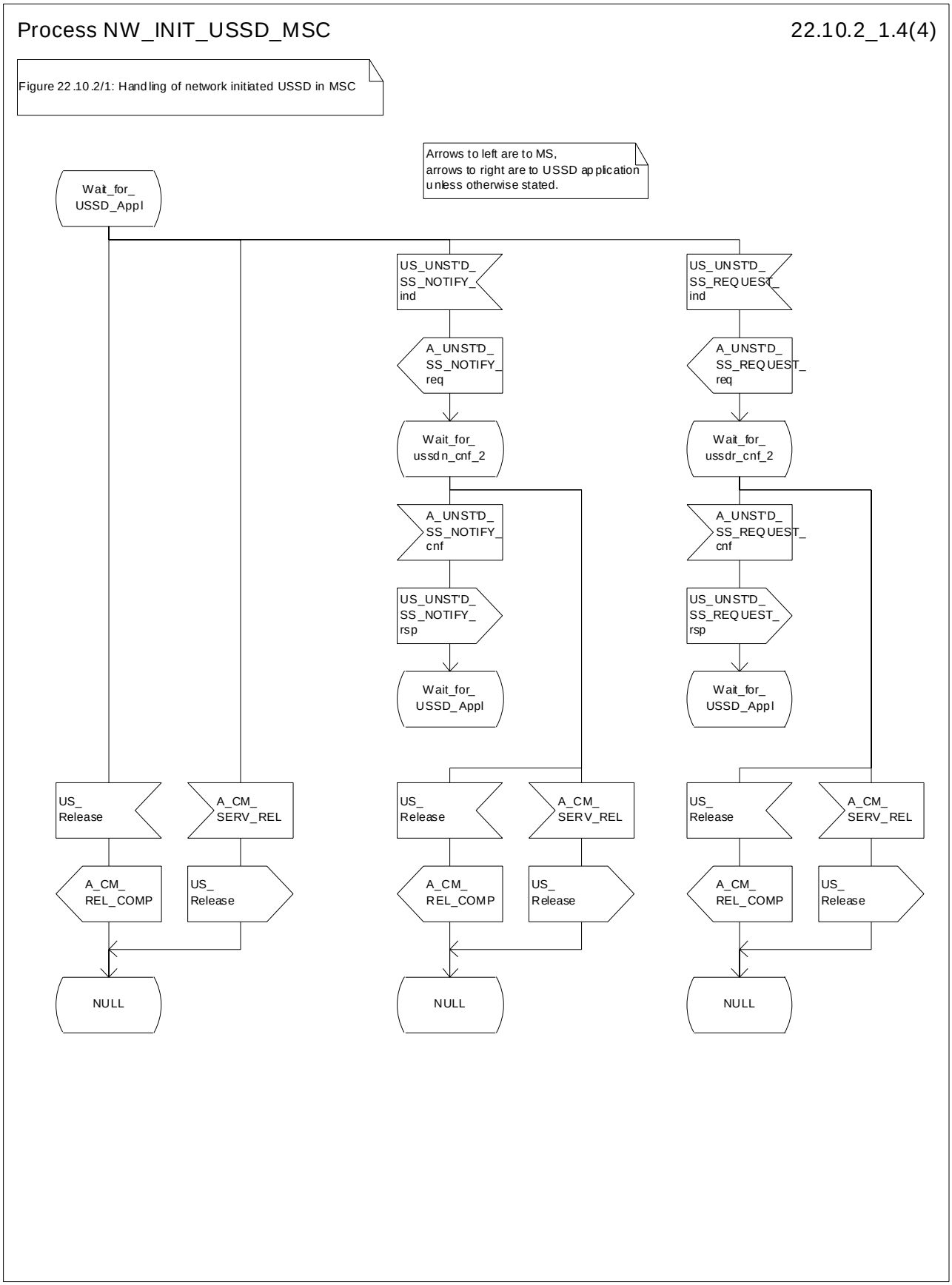


Figure 22.10.2/1 (sheet 4 of 4): Procedure NI_USSD_MSC

22.10.3 Procedure in the VLR

The procedure may be invoked either by the HLR or by a USSD application local to the VLR. They may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.

In both cases the VLR will first initiate a MAP dialogue with the MSC. When the indication for the unstructured SS request or notify is received then the macro Start_USSD_VLR will be used to page the MS and open a CM connection. Once the CM connection is successfully established the indication received from the HLR or USSD application will be sent to the MSC.

Following transfer of the message the VLR will wait for a confirmation from the MSC. This will be sent to the HLR or USSD application as appropriate.

Following this, the VLR may receive further uses of the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY services, or may receive a MAP_CLOSE_ind.

In the event of an error, the MAP process with the MSC shall be released, and if necessary the MAP process with the HLR shall be aborted as shown in the diagram.

The procedure in the VLR is shown in figure 22.10.3/1.

MSC Initiated USSD

If a USSD application in the MSC wishes to use the network initiated USSD procedure, and a connection to the MS does not exist then it shall open a dialogue to the VLR. This dialogue will automatically lead to the VLR performing page and search using the macro Start_USSD_VLR.

Macro Start_USSD_VLR

This macro is used to initiate a CM connection with the MS for transfer of network initiated unstructured SS data.

It first checks for correct data in the VLR. If a problem is found then "Err" is returned.

A page or search procedure (as appropriate) will then be used to contact the MS. Following successful page or search the macro Process_Access_Request_VLR specified in subclause 25.4 will be used to handle the CM connection establishment.

The macro is shown in figure 22.10.3/2.

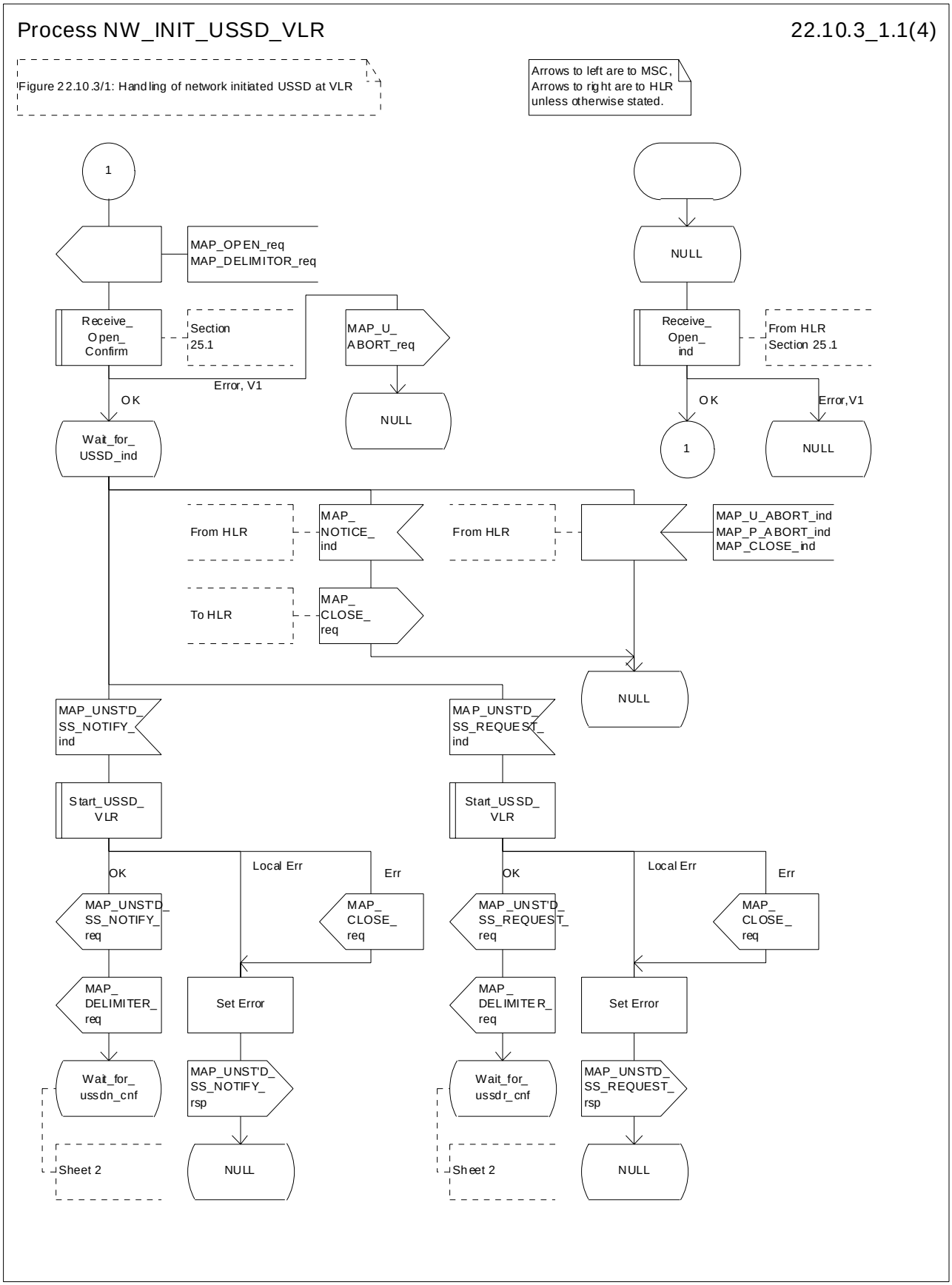


Figure 22.10.3/1 (sheet 1 of 4): Procedure NI_USSD_VLR

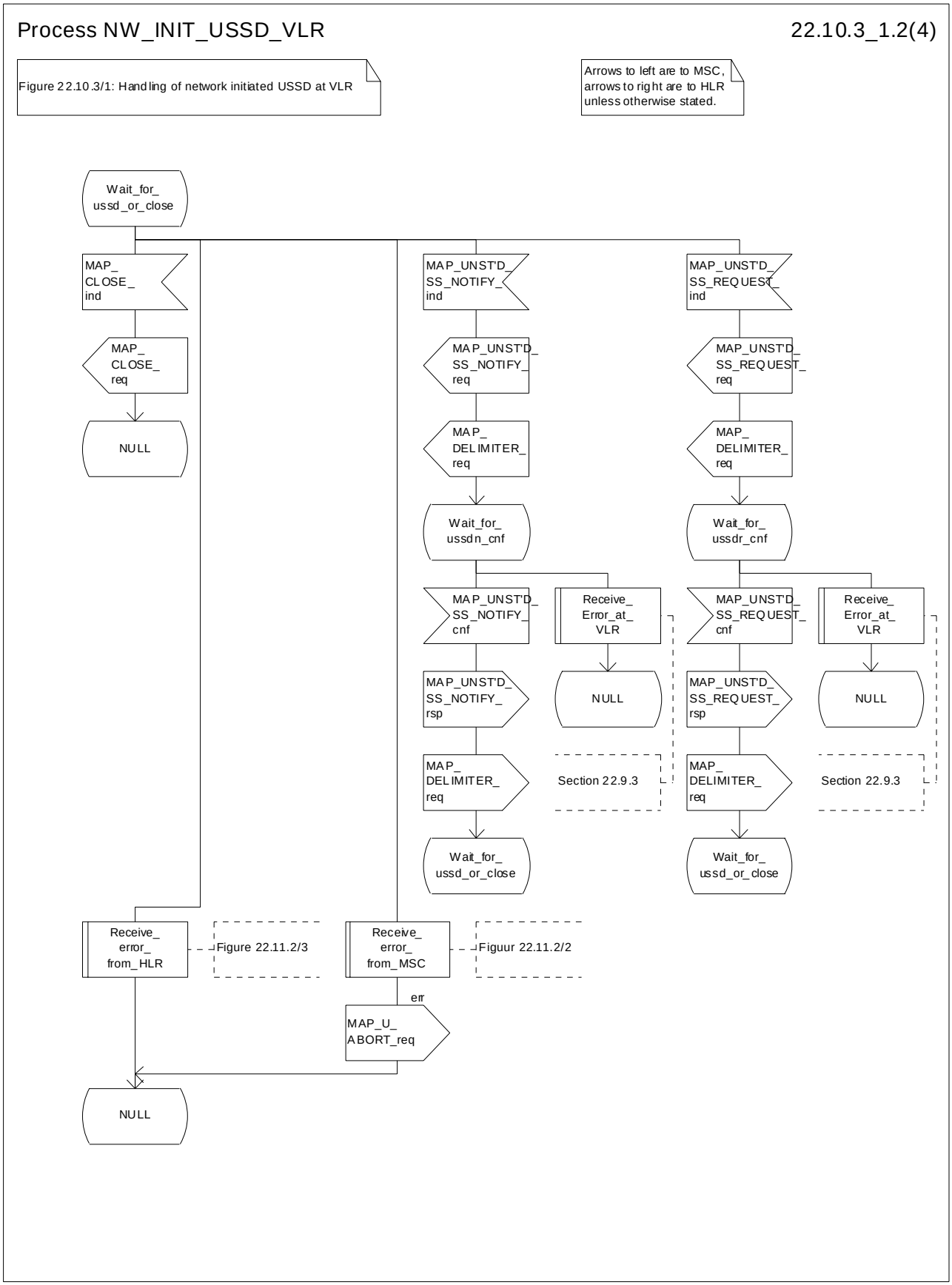


Figure 22.10.3/1 (sheet 2 of 4): Procedure NI_USSD_VLR

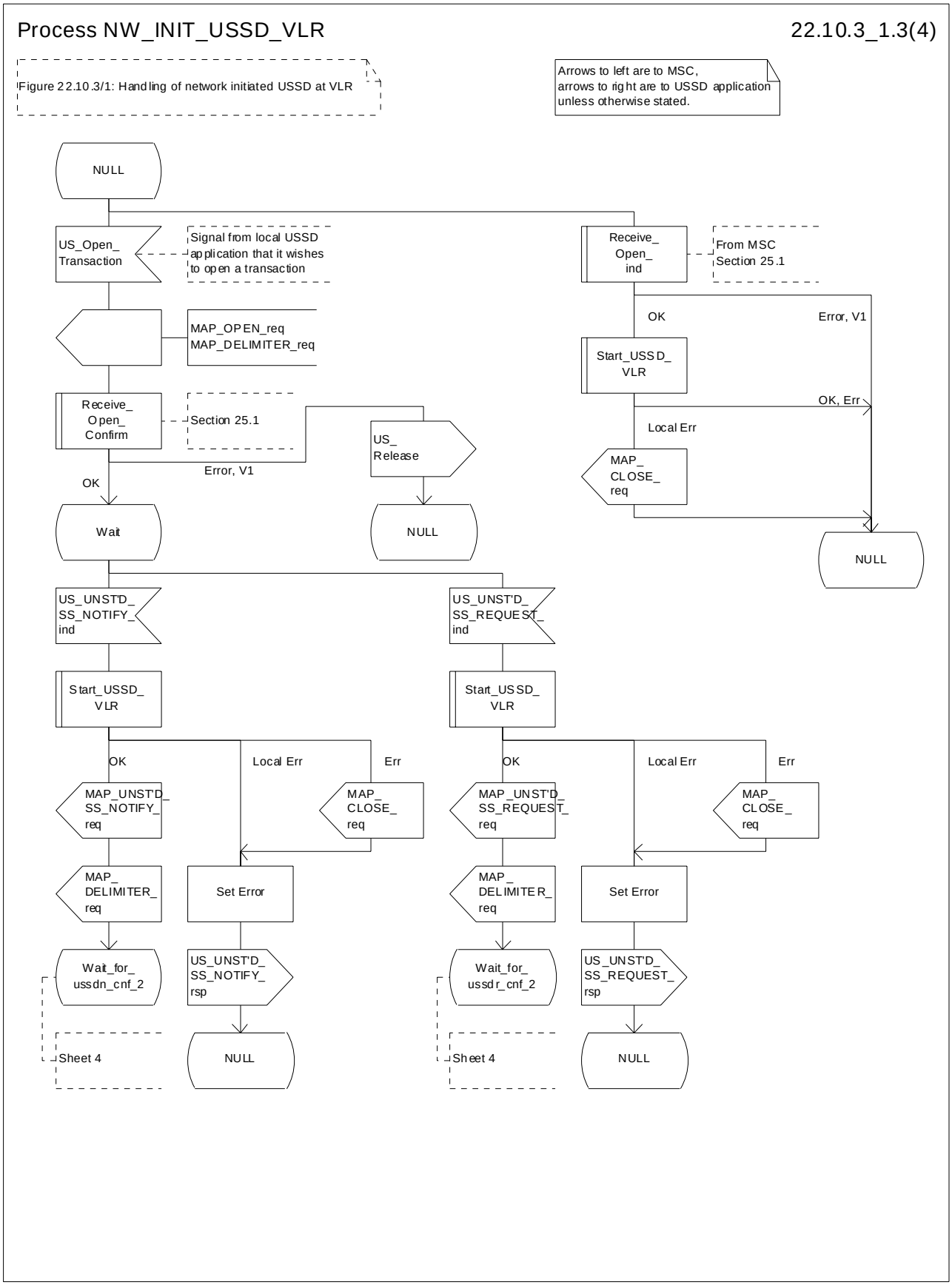


Figure 22.10.3/1 (sheet 3 of 4): Procedure NI_USSD_VLR

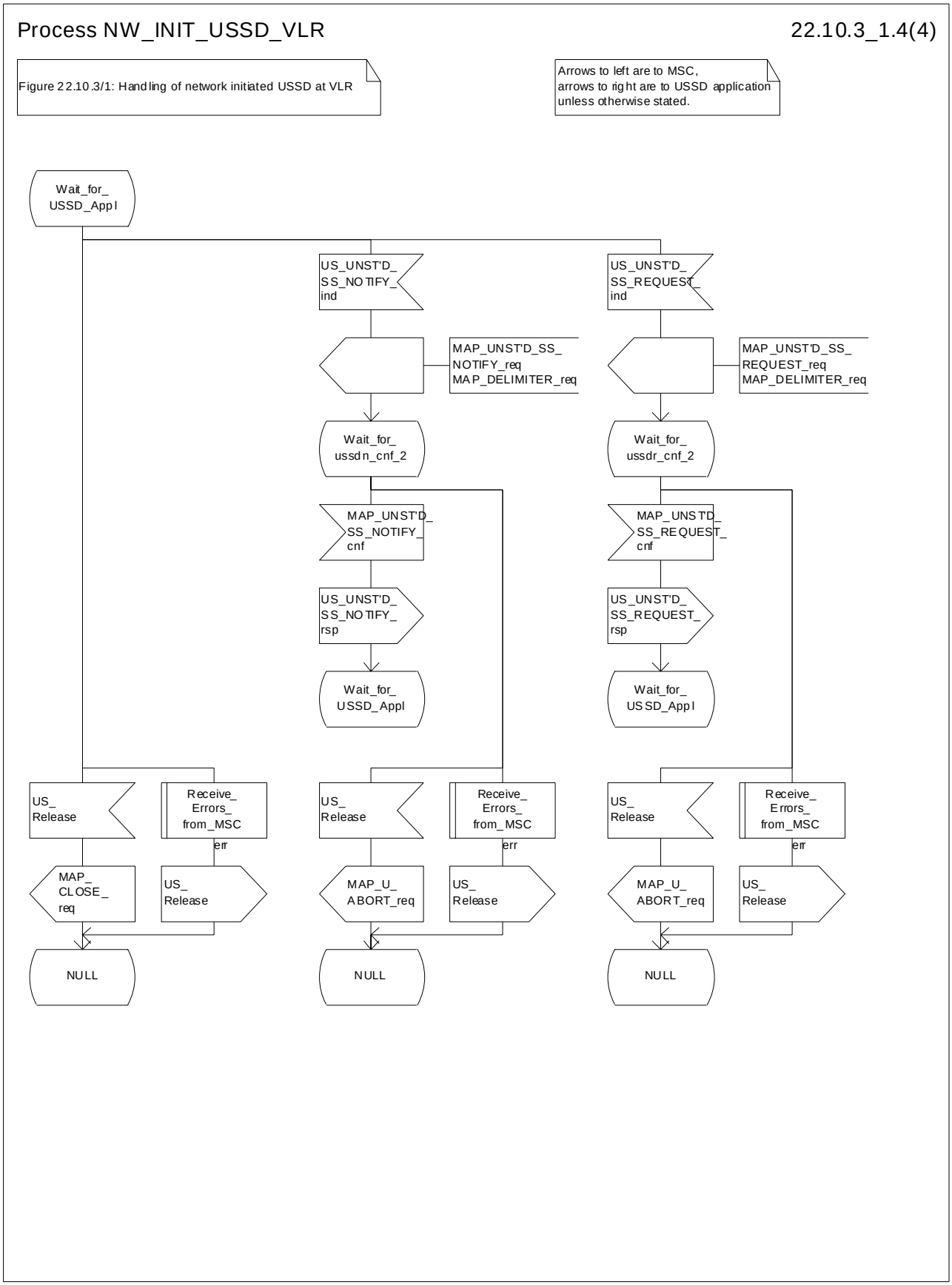


Figure 22.10.3/1 (sheet 4 of 4): Procedure NI_USSD_VLR

Macrodefinition Start_USSD_VLR 22.10.3_2.1(2)

Figure 22.10.3/2: Macro to establish a connection to the MS for a network initiated USSD operation.

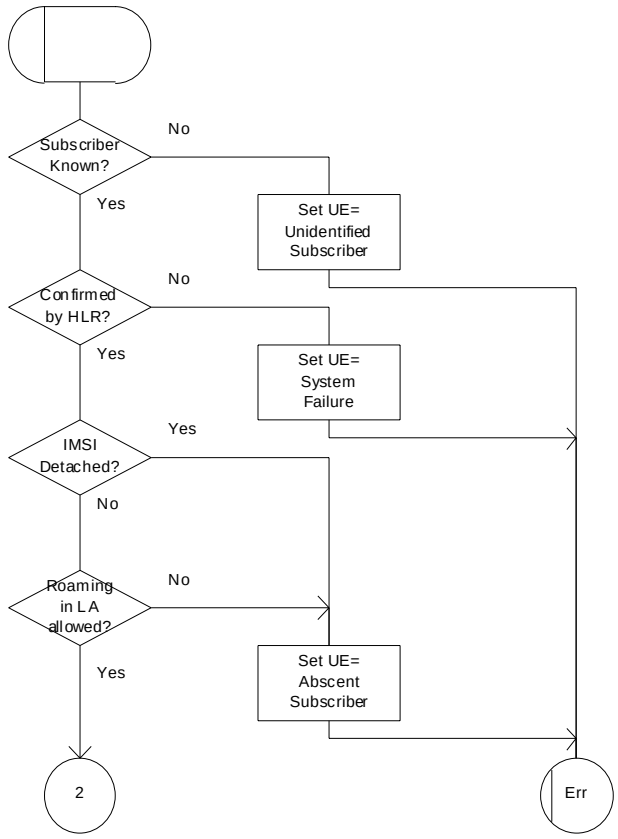


Figure 22.10.3/2 (sheet 1 of 2): Macro Start_USSD_VLR

Macrodefinition Start_USSD_VLR 22.10.3_2.2(2)

Figure 22.10.3/2: Macro to establish a connection to the MS for a network initiated USSD operation.

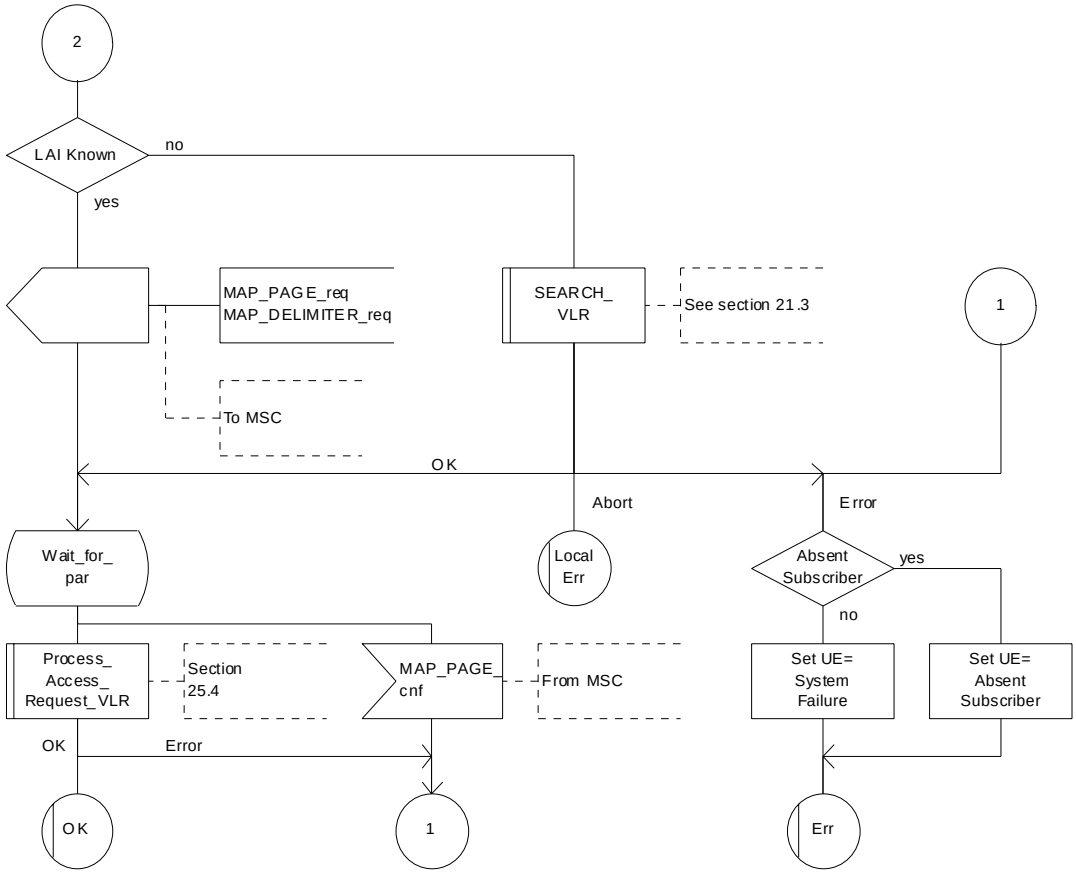


Figure 22.10.3/2 (sheet 2 of 2): Macro Start_USSD_VLR

22.10.4 Procedure in the HLR

The procedure may be invoked either by the gsmSCF or by a USSD application local to the HLR. It may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.

In both cases the HLR will first check whether the MS is reachable .

If the MS is reachable, the HLR will initiate a MAP dialogue with the VLR. Once the dialogue is successfully established the message received from the gsmSCF or USSD application will be sent to the VLR.

Following transfer of the message the HLR will wait for a confirmation from the VLR. This will be sent to the gsmSCF or USSD application as appropriate.

Following this, the HLR may receive further uses of the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY services, or may receive a MAP_CLOSE_ind.

In the event of an error, the MAP process with the VLR shall be released and if necessary the MAP process with the gsmSCF shall be aborted, as shown in the diagram.

Message Originated by gsmSCF

If the message is originated by the gsmSCF then the HLR shall transfer the message transparently to the VLR.

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

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

The procedure in the HLR is shown in figure 22.10.4/1 and 22.10.4/2.

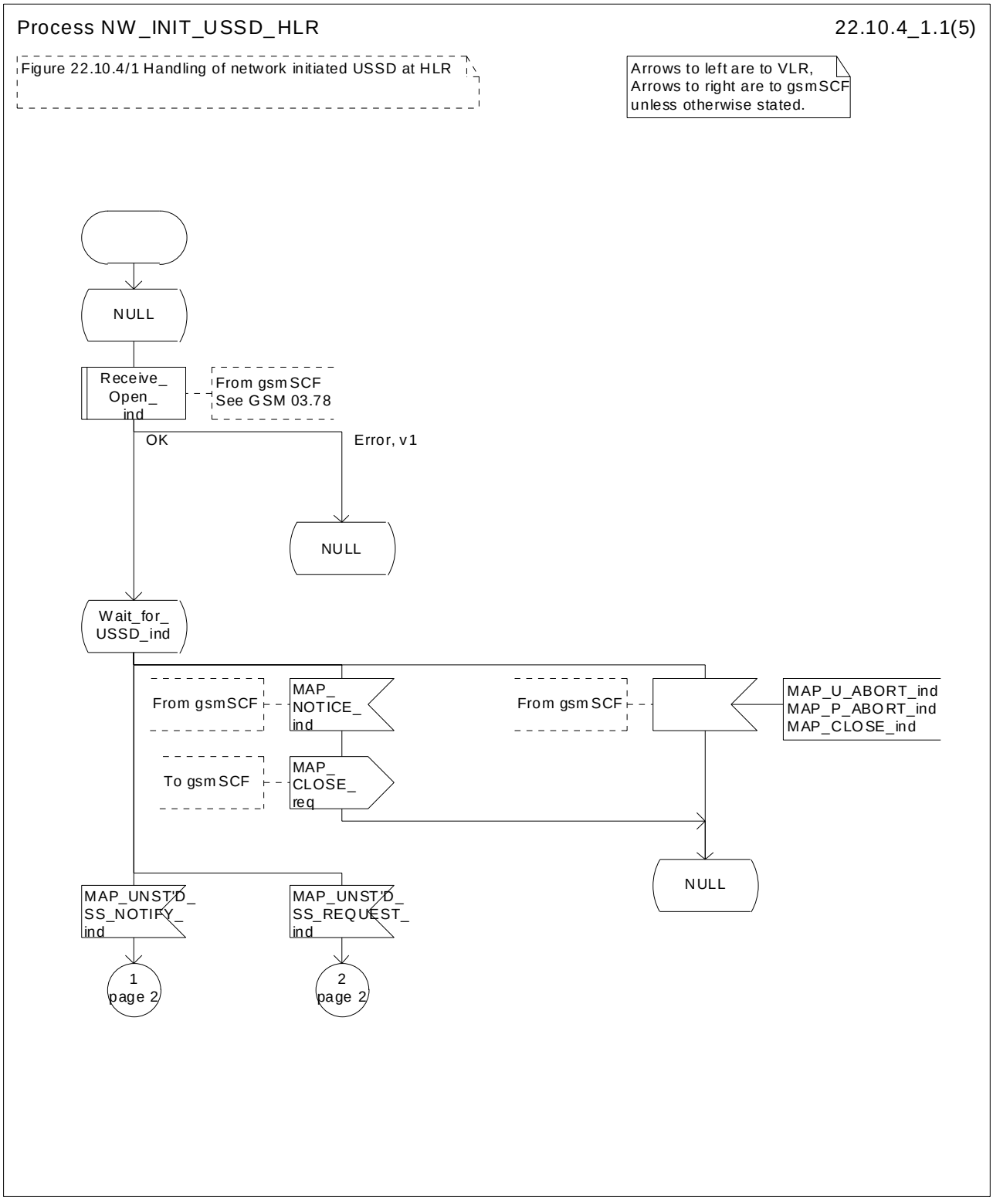


Figure 22.10.4/1 (sheet 1 of 5): Procedure NI_USSD_HLR

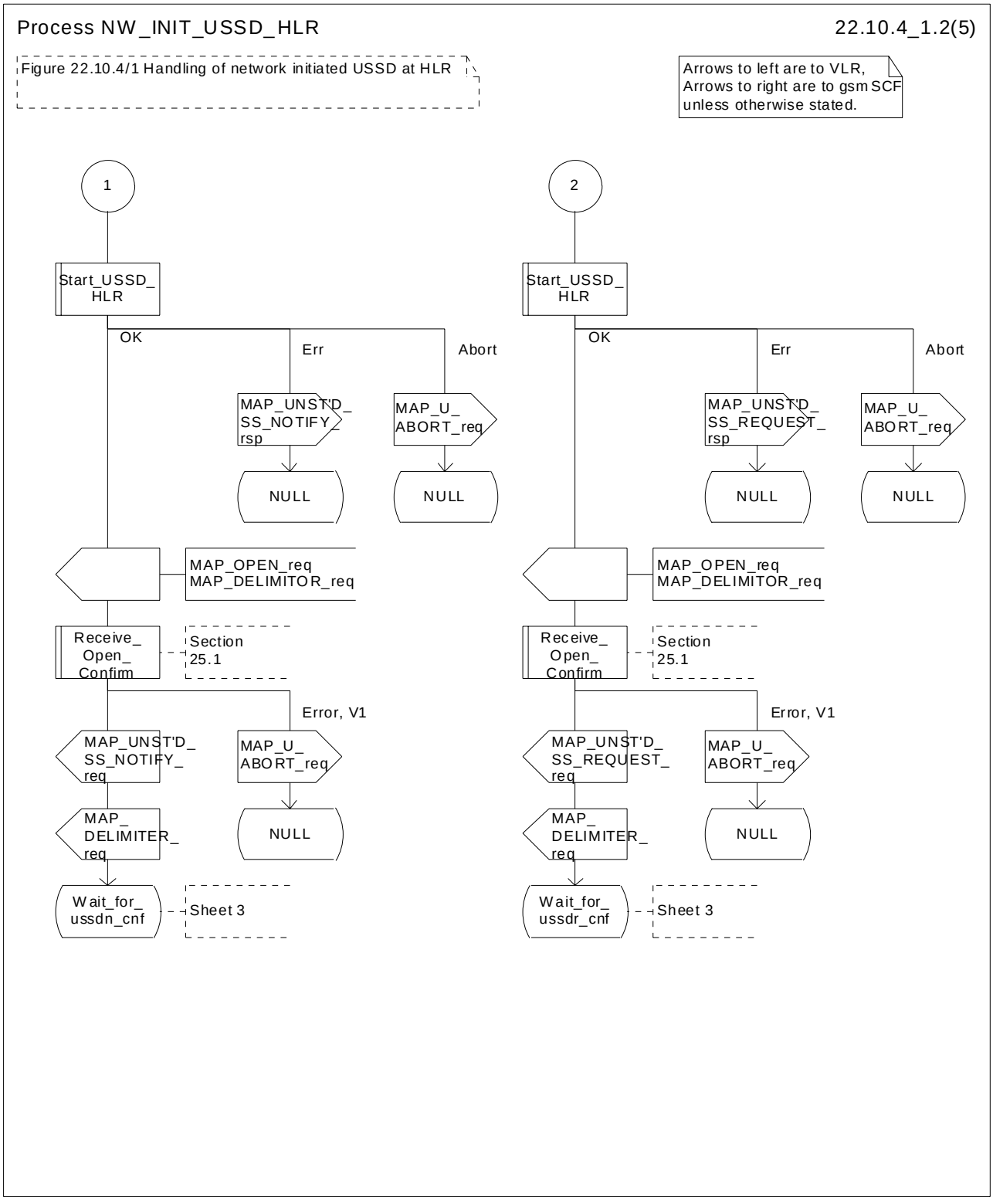


Figure 22.10.4/1 (sheet 2 of 5): Procedure NI_USSD_HLR

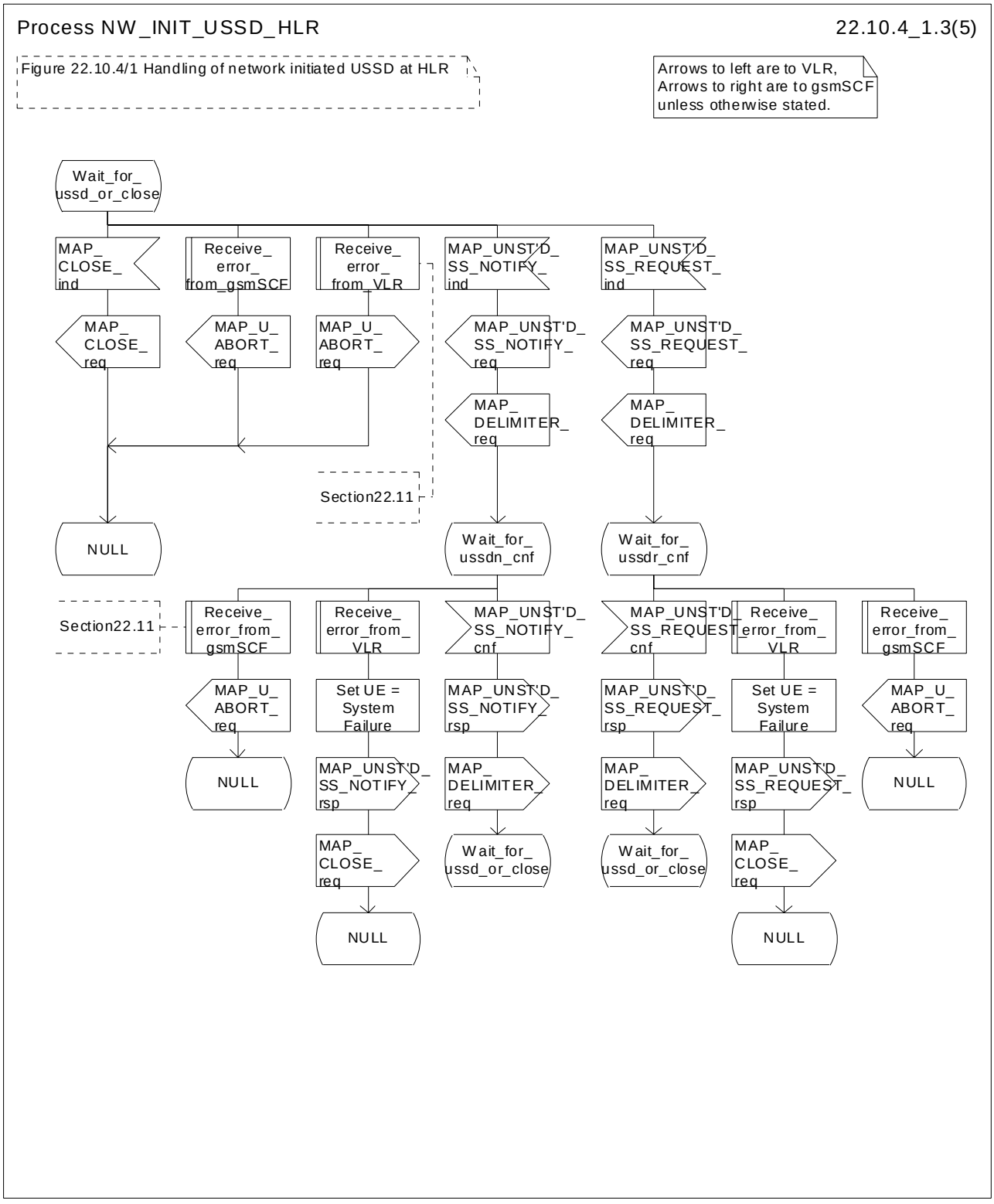


Figure 22.10.4/1 (sheet 3 of 5): Procedure NI_USSD_HLR

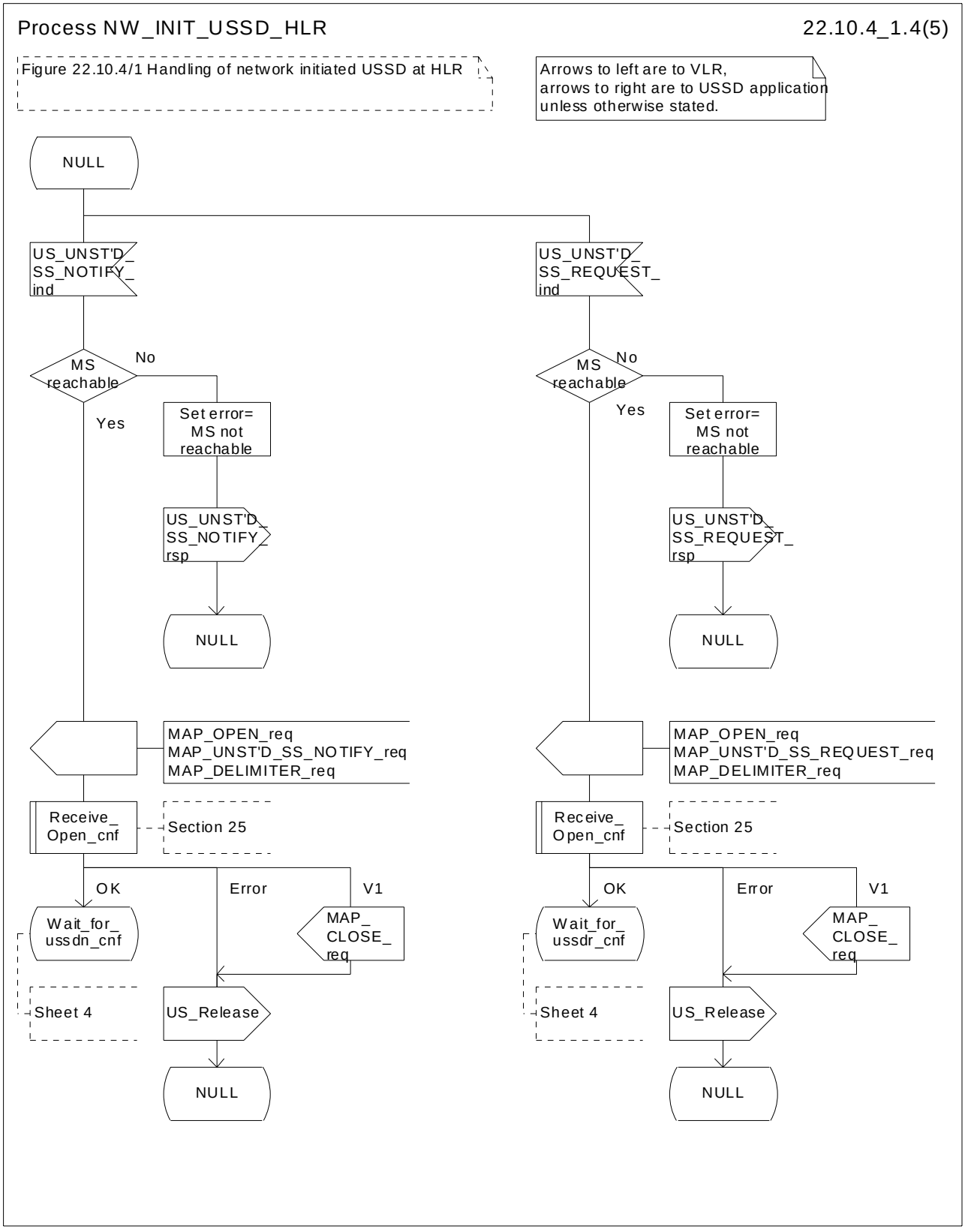


Figure 22.10.4/1 (sheet 4 of 5): Procedure NI_USSD_HLR

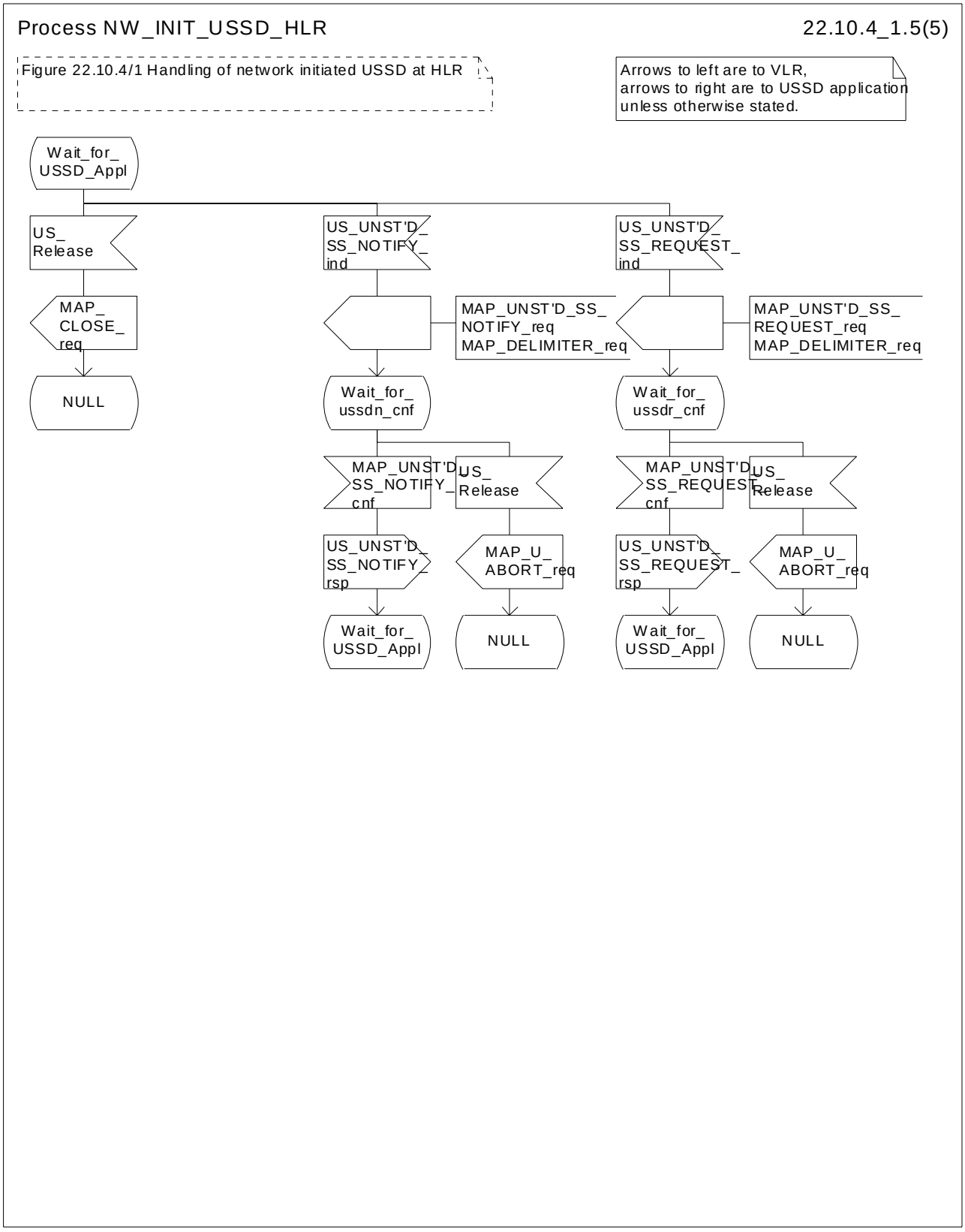


Figure 22.10.4/1 (sheet 5 of 5): Procedure NI_USSD_HLR

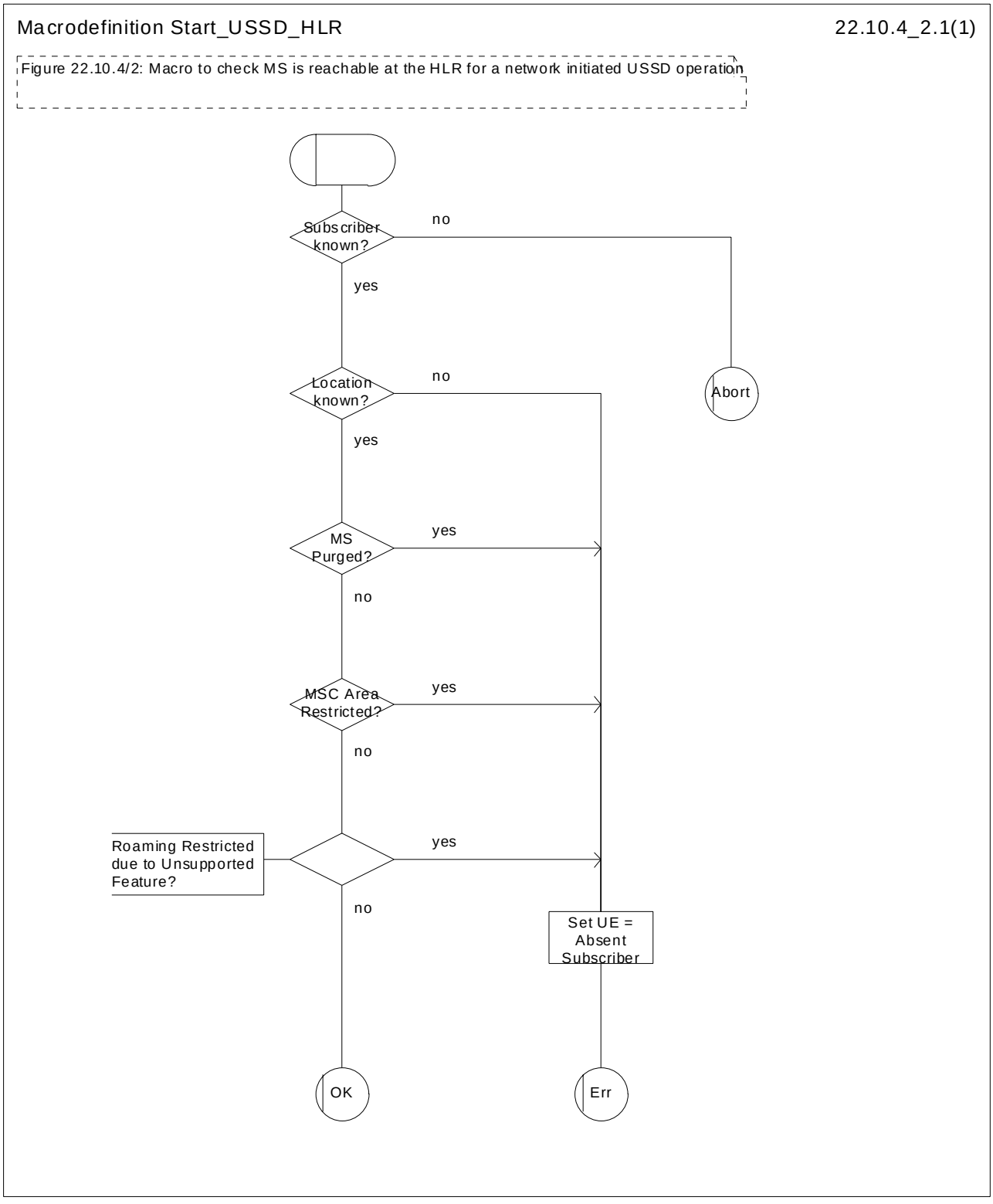


Figure 22.10.4/2: Macro Start_USSD_HLR

22.11 Common macros for clause 22

The following macros are used for the description of more than one of the supplementary service processes described in clause 22:

22.11.1 SS Password handling macros

Macro Get_Password_MSC

This macro is used by the MSC to relay a request for password from the VLR to the MS, and to relay a response from the MS back to the VLR. The macro is described in figure 22.11.1/1.

Macro Get_Password_VLR

This macro is used by the VLR to relay a request for password from the HLR to the MSC, and to relay a response from the MSC back to the HLR. The macro is described in figure 22.11.1/2.

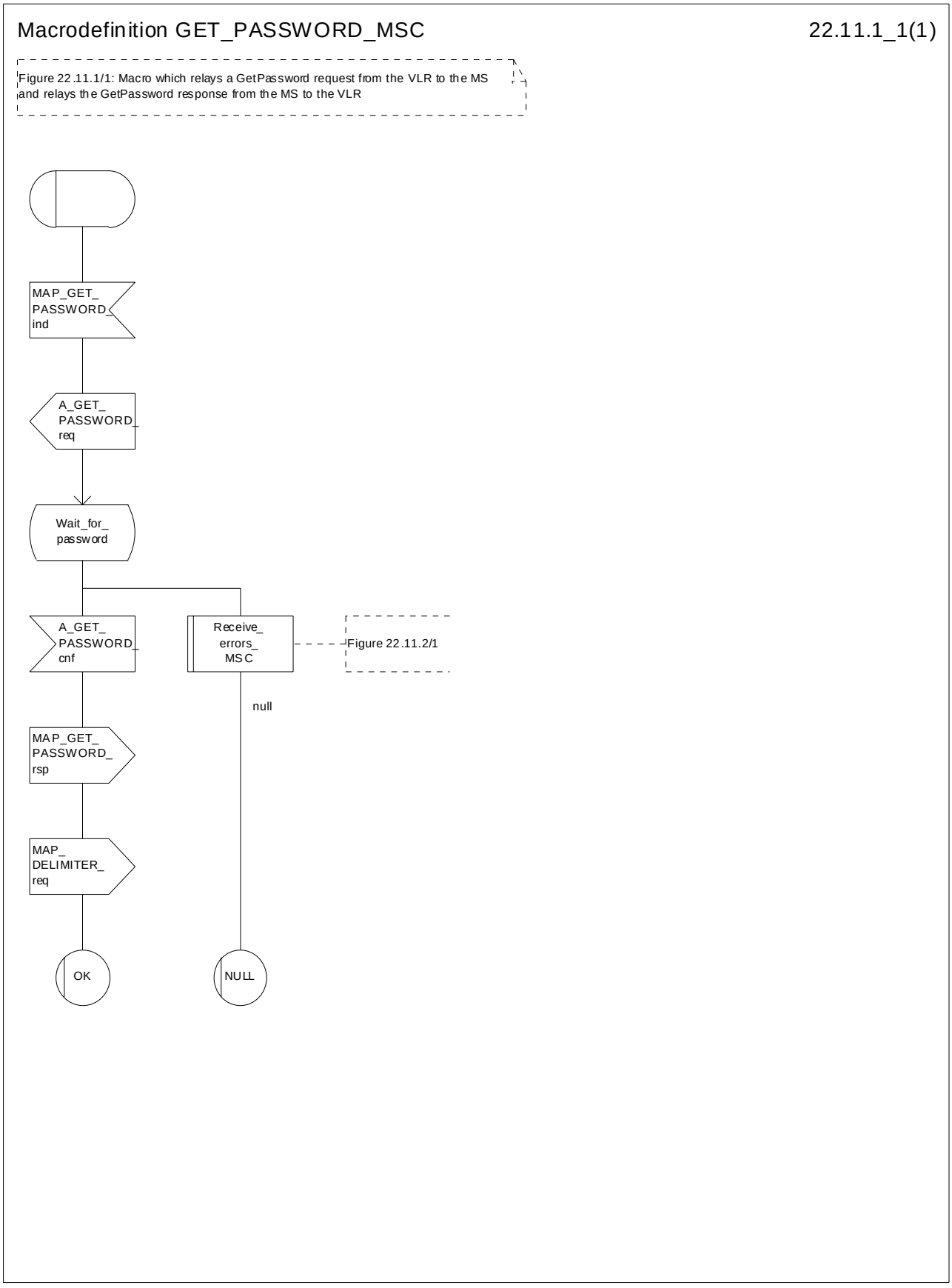


Figure 22.11.1/1: Macro Get_PW_MSC

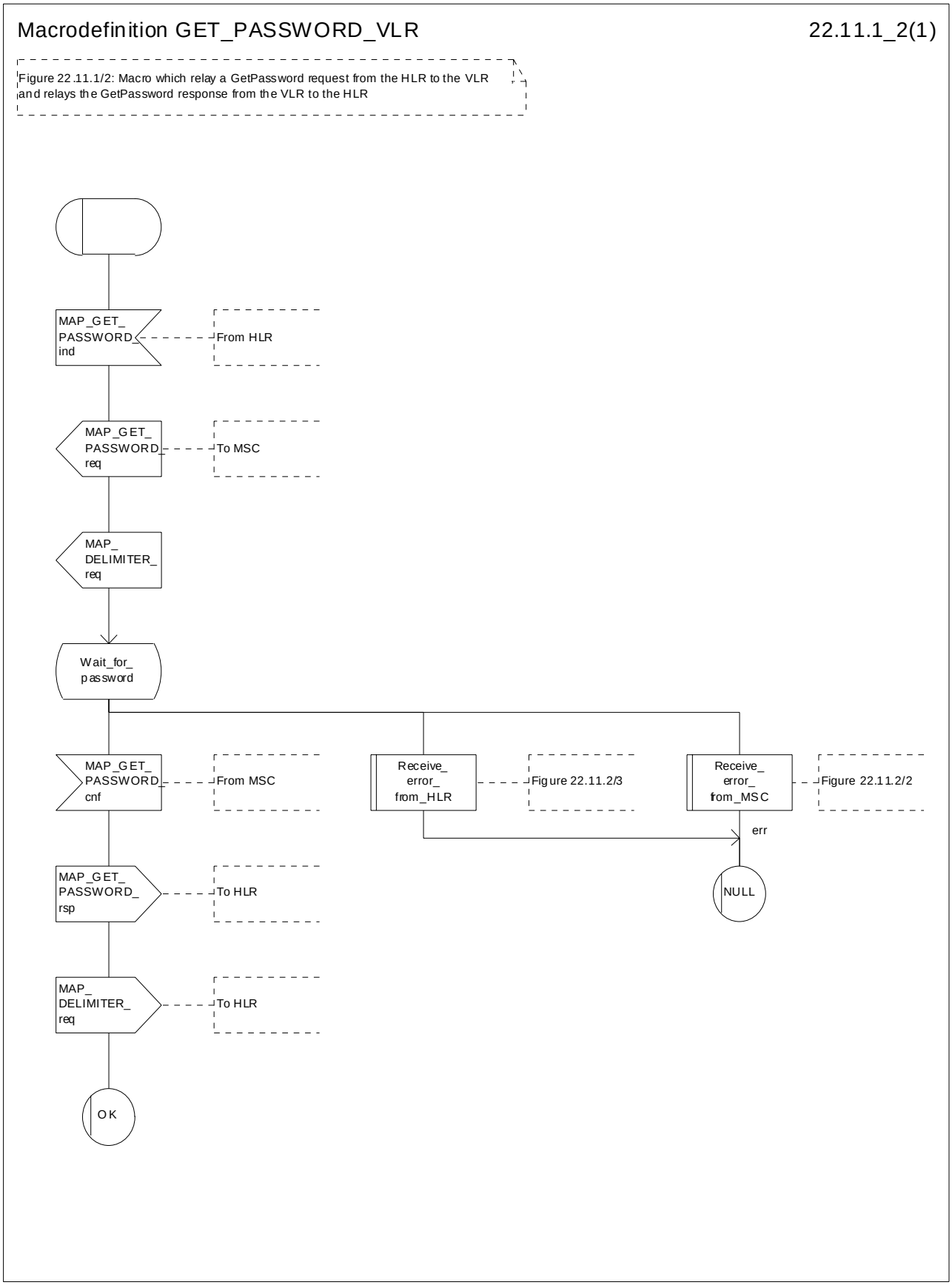


Figure 22.11.1/2: Macro Get_PW_VLR

22.11.2 SS Error handling macros

Macro Receive_errors_MSC

This macro is used by the MSC to receive signals which should lead to failure if received in any state of a supplementary service process. If the air interface connection is released by the MS, the communication towards the VLR is aborted, and the MSC should return to a stable "NULL" state. If a MAP_NOTICE indication is received from the VLR, or the VLR aborts or unexpectedly closes the connection, then the air interface connection shall be released. The macro is described in figure 22.11.2/1.

Macro Receive_error_from_MSC

This macro is used by the VLR to receive signals from the MSC which should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the MSC, that connection is closed before the only outcome of the macro, "err" is reported back to the calling process. The macro is described in figure 22.11.2/2.

Macro Receive_error_from_HLR

This macro is used by the VLR to receive signals from the HLR which should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the HLR, that connection is closed. The macro is described in figure 22.11.2/3.

Macro Receive_error_from_VLR

This macro is used by the HLR to receive signals from the VLR that should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the VLR, that connection is closed before the only outcome of the macro, "err" is reported back to the calling process. The macro is described in figure 22.11.2/4.

Macro Receive_error_from_gsmSCF

This macro is used by the HLR to receive signals from the gsmSCF that should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the gsmSCF, that connection is closed. The macro is described in figure 22.11.2/5.

Macrodefinition Receive_errors_MSC 22.11.2_1(1)

Figure 22.11.2/1: Macro which handles possible error situations while the MSC is waiting for a confirmation of a supplementary service request to the VLR

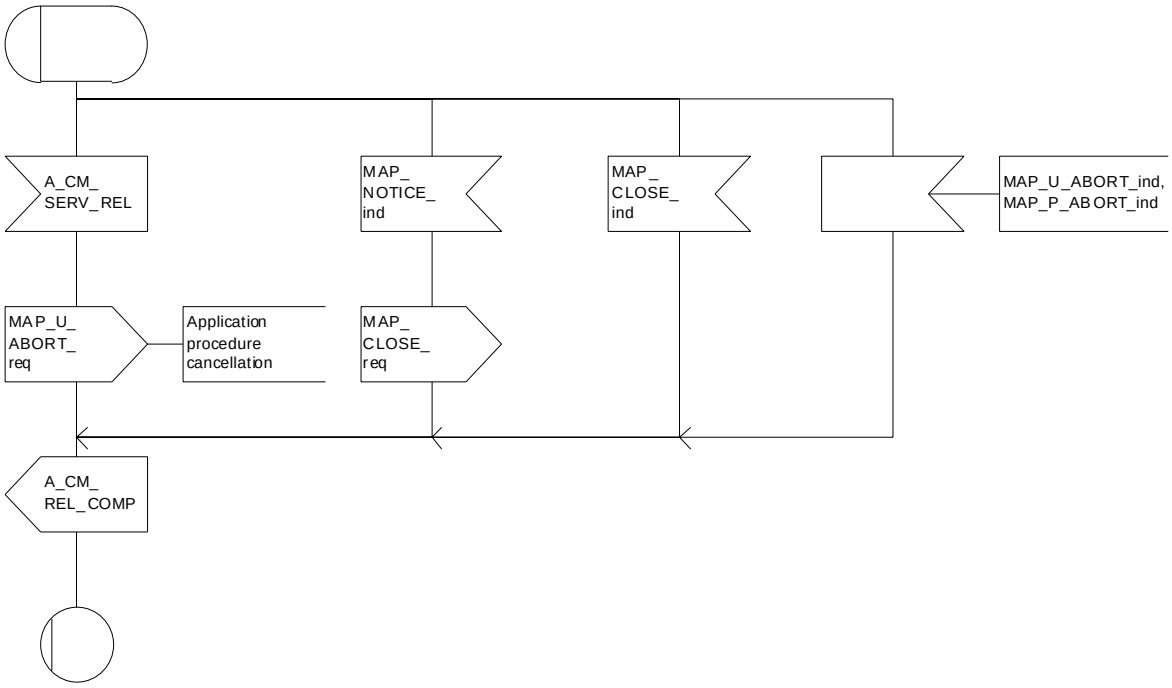


Figure 22.11.2/1: Macro Receive_Errors_MSC

Macrodefinition Receive_error_from_MSC 22.11.2_2(1)

Figure 22.11.2/2: Macro to receive errors from the MSC during supplementary services procedures in the VLR

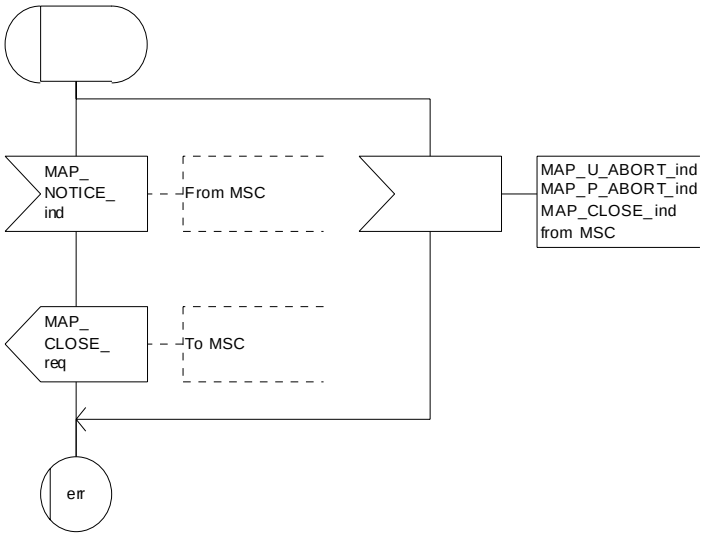


Figure 22.11.2/2: Macro Receive_Error_from_MSC

Macrodefinition Receive_error_from_HLR 22.11.2_3(1)

Figure 22.11.2/3: Macro to receive errors from the HLR while the VLR is waiting for a confirmation of a supplementary service request sent to the HLR

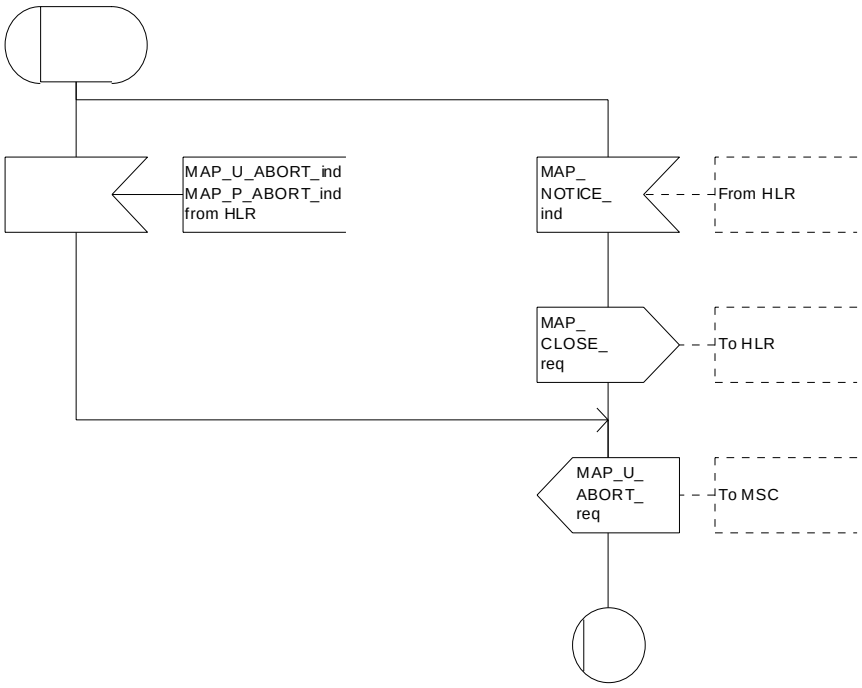


Figure 22.11.2/3: Macro Receive_Errors_HLR

Macrodefinition Receive_error_from_VLR 22.11.2_4(1)

Figure 22.11.2/4: Macro to receive errors from the VLR during supplementary services procedures in the HLR

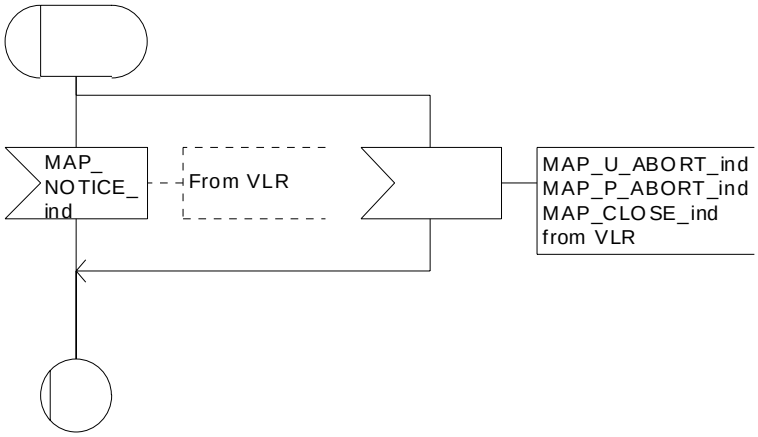


Figure 22.11.2/4: Macro Receive_error_from_VLR

Macrodefinition Receive_error_from_gsmSCF 22.11.2_5(1)

Figure 22.11.2/5: Macro to receive errors from the gsmSCF while the HLR is waiting for a confirmation of a supplementary service request sent to the gsmSCF

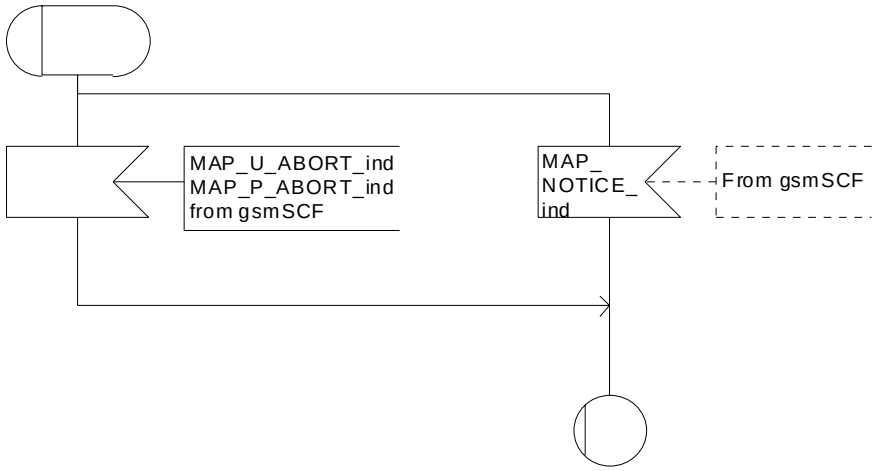


Figure 22.11.2/5: Macro Receive_error_from_gsmSCF

22.12 Supplementary Service Invocation Notification procedure

22.12.1 General

The Supplementary Service Invocation Notification procedure is used to notify a gsmSCF about the invocation of a GSM Supplementary Service.

The password registration procedure is shown in figure 22.12.1/1.

The following services may be used:

(1) MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION (MSC to gsmSCF)

(2) MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION-ACK (gsmSCF to MSC)

MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION (defined in clauses 8 and 25);

Figure 22.12.1/1: Interfaces and services for supplementary service invocation notification

22.12.2 Procedures in the MSC

The supplementary service invocation notification procedure in the MSC is triggered when the requested supplementary service is invoked at the MSC. The MSC notifies the gsmSCF of a supplementary service invocation the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION service. This is sent in a TCAP TC-BEGIN primitive. The MSC then awaits a positive or negative acknowledgement from the gsmSCF to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION. This is received in a TCAP TC-END primitive, and upon receipt the relationship between the MSC and the gsmSCF is terminated. Simmilarly, the relationship is terminated at the MSC by the sending from or receipt of a TCAP P-ABORT primitive. This is illustrated in Figure 22.12.2.

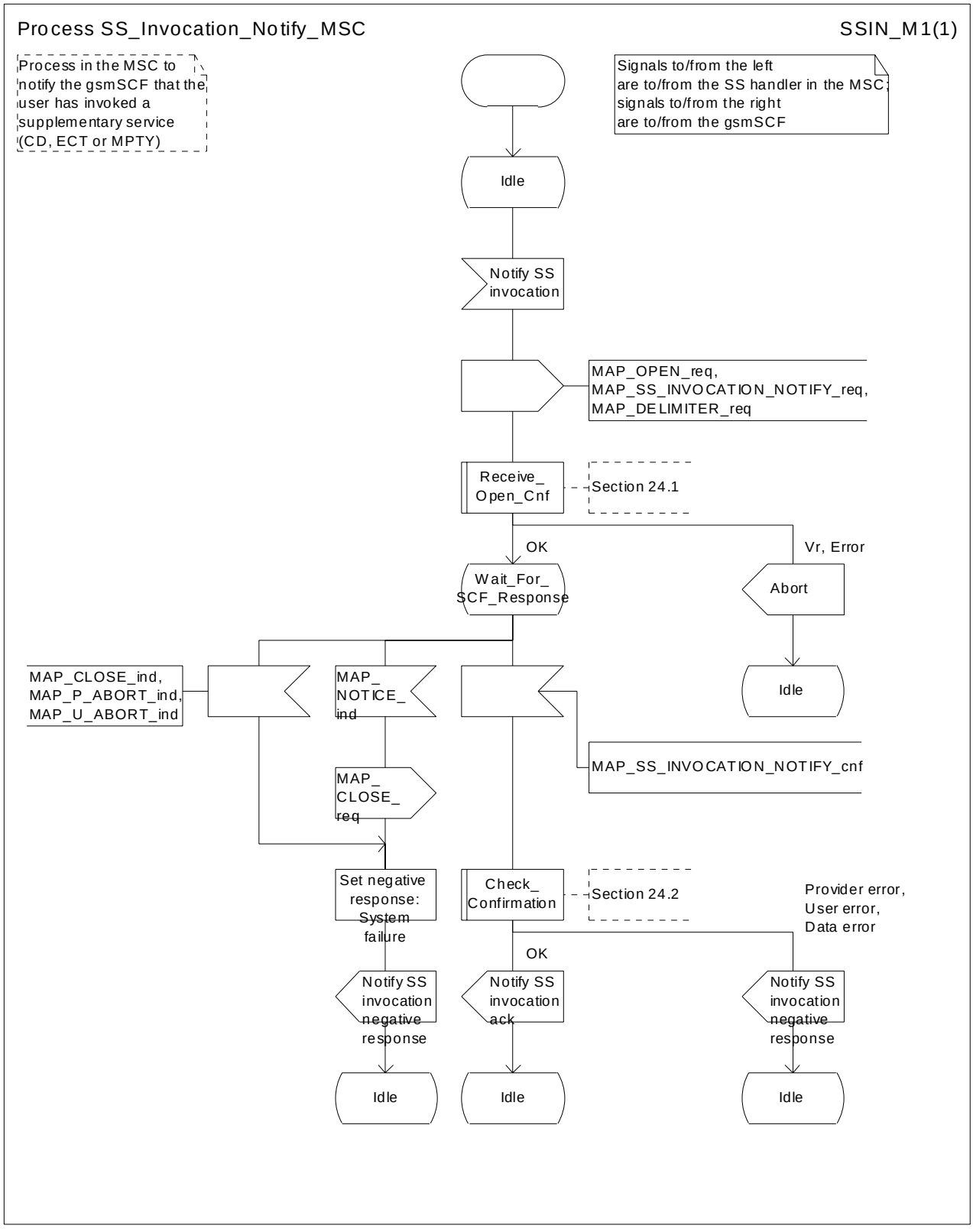


Figure 22.12.2 Process SS_Invocation_Notify_MSC (sheet 1 of 1)

22.12.3 Procedures in the gsmSCF

Upon receiving notification of the supplementary service invocation via the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION service, the gsmSCF analyses the received information. If the gsmSCF understands the information sent via the the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION service then it returns a positive acknowledgement to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION, indicating the success of the service. This is returned in a TCAP TC-END primitive, using the basic end procedure.

Otherwise, a negative acknowledgement to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION is returned. This is also returned in a TCAP TC-END primitive, again using the basic end procedure. The gsmSCF TCAP service may also choose to abort the relationship to the MSC by sending a TCAP P-ABORT primitive. It will immediately terminate processing of a MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION should a TCAP P-ABORTprimitive be received from the MSC. This is illustrated in Figure 22.12.3.

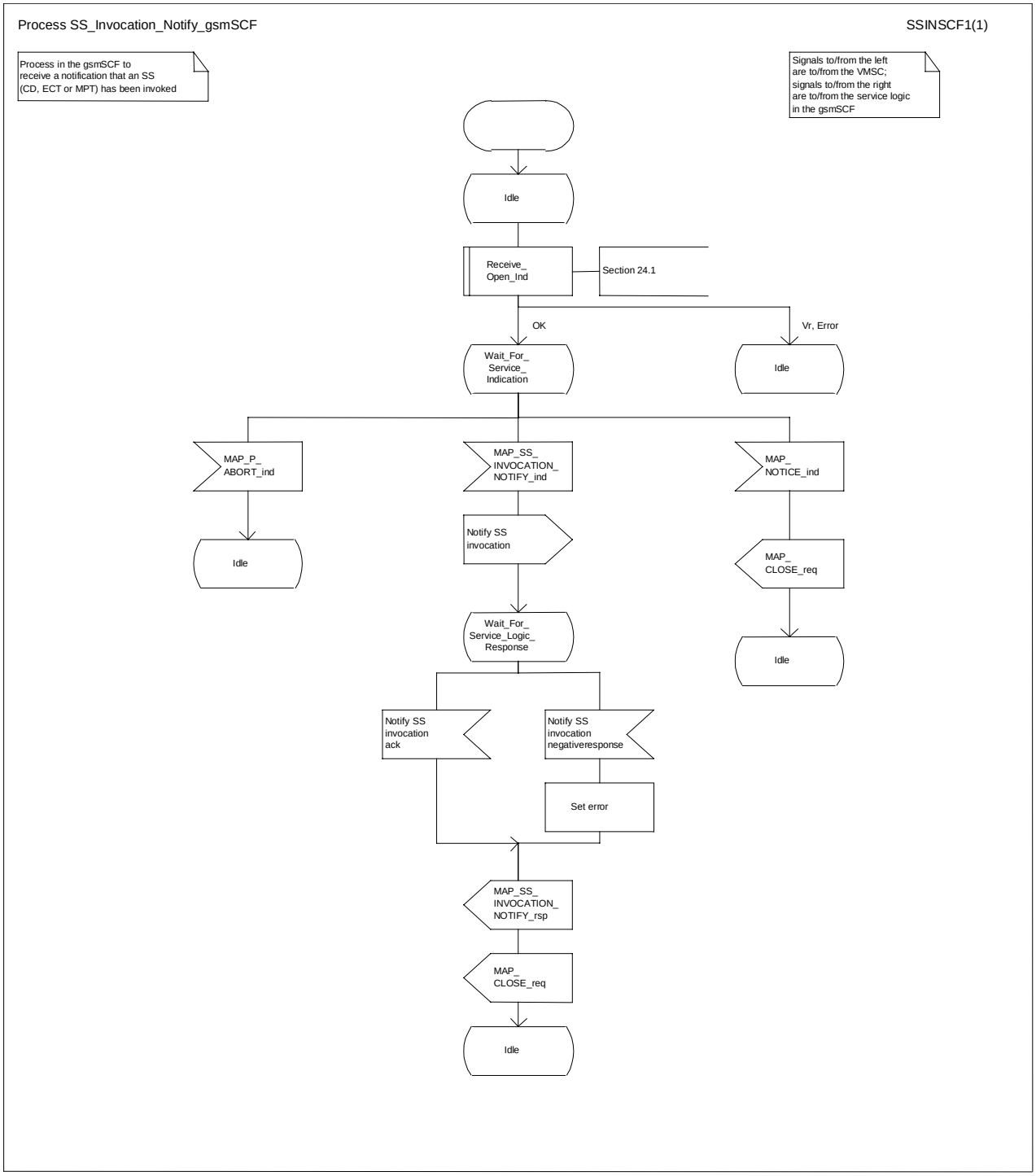


Figure 22.12.3: Process SS_Invocation_Notify_gsmSCF (sheet 1 of 1)

22.13 Activation of a CCBS request

22.13.1 General

The message flow to activate a CCBS request is shown in figure 22.13.1/1.

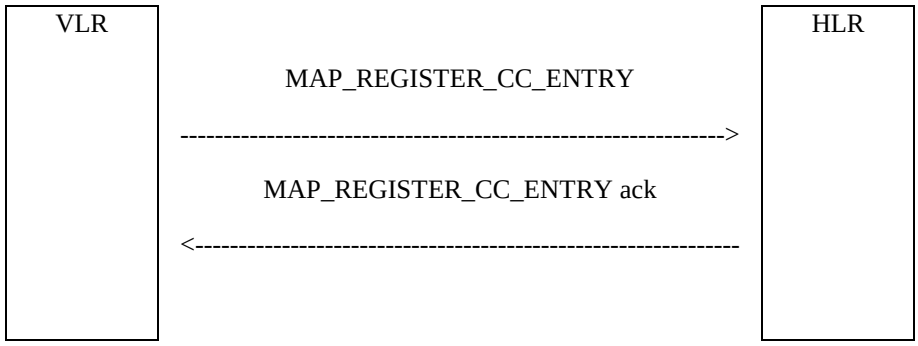


Figure 22.13.1/1: Message flow to activate a CCBS request

22.13.2 Procedure in the VLR

The MAP process in the VLR to activate a CCBS request is shown in figure 22.13.2/1. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2;

Successful Outcome

When the MAP process receives a CCBS Request message from the CCBS application process in the VLR, it requests a dialogue with the HLR whose identity is contained in the request by sending a MAP_OPEN service request and the necessary information in a MAP_REGISTER_CC_ENTRY service request. The VLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_REGISTER_CC_ENTRY service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a CCBS Request Ack message containing the information received from the HLR to the CCBS application process in the VLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a CCBS Request Negative response message to the CCBS application process in the VLR and returns to the idle state.

Error in MAP_REGISTER_CC_ENTRY confirm

If the MAP_REGISTER_CC_ENTRY service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a CCBS Request Negative response message to the CCBS application process in the VLR and returns to the idle state.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication. In this case, the MAP process sends a CCBS Request negative response to the CCBS application process in the VLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a CCBS Request negative response indicating system failure to the CCBS application process in the VLR and returns to the idle state.

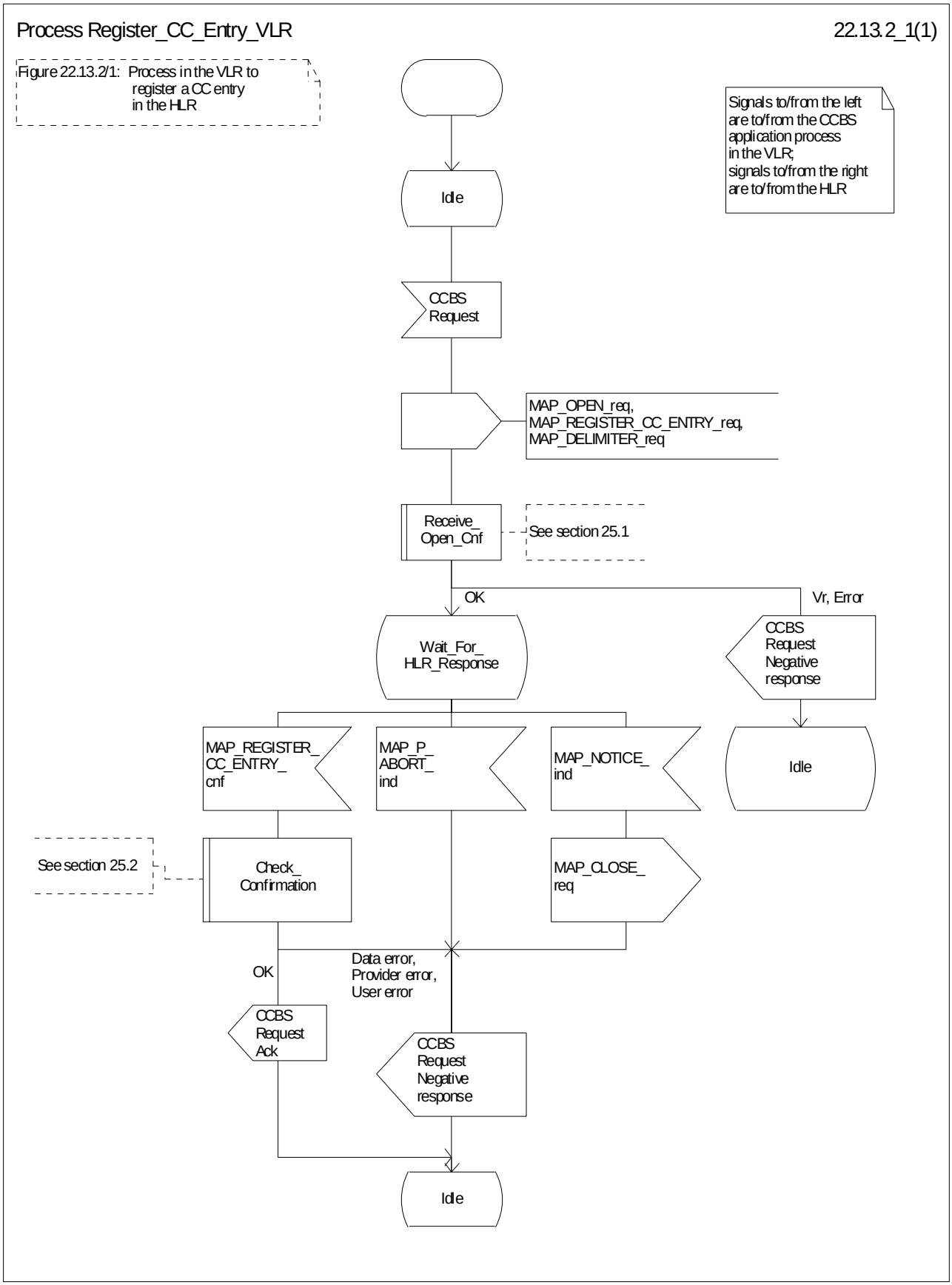


Figure 22.13.2/1: Process Register_CC_Entry_VLR

22.13.3 Procedure in the HLR

Successful outcome

When the MAP process receives a MAP_REGISTER_CC_ENTRY_indication from the co-ordinating process, it sends a CCBS Request message to the CCBS application process in the HLR, and waits for a response. The request contains the parameters received in the MAP_REGISTER_CC_ENTRY service indication.

If the CCBS application process in the HLR returns a positive response, the MAP process constructs a MAP_REGISTER_CC_ENTRY service response, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.

Negative response from HLR CCBS application process

If the CCBS application process in the HLR returns a negative response, the MAP process constructs a MAP_REGISTER_CC_ENTRY service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.

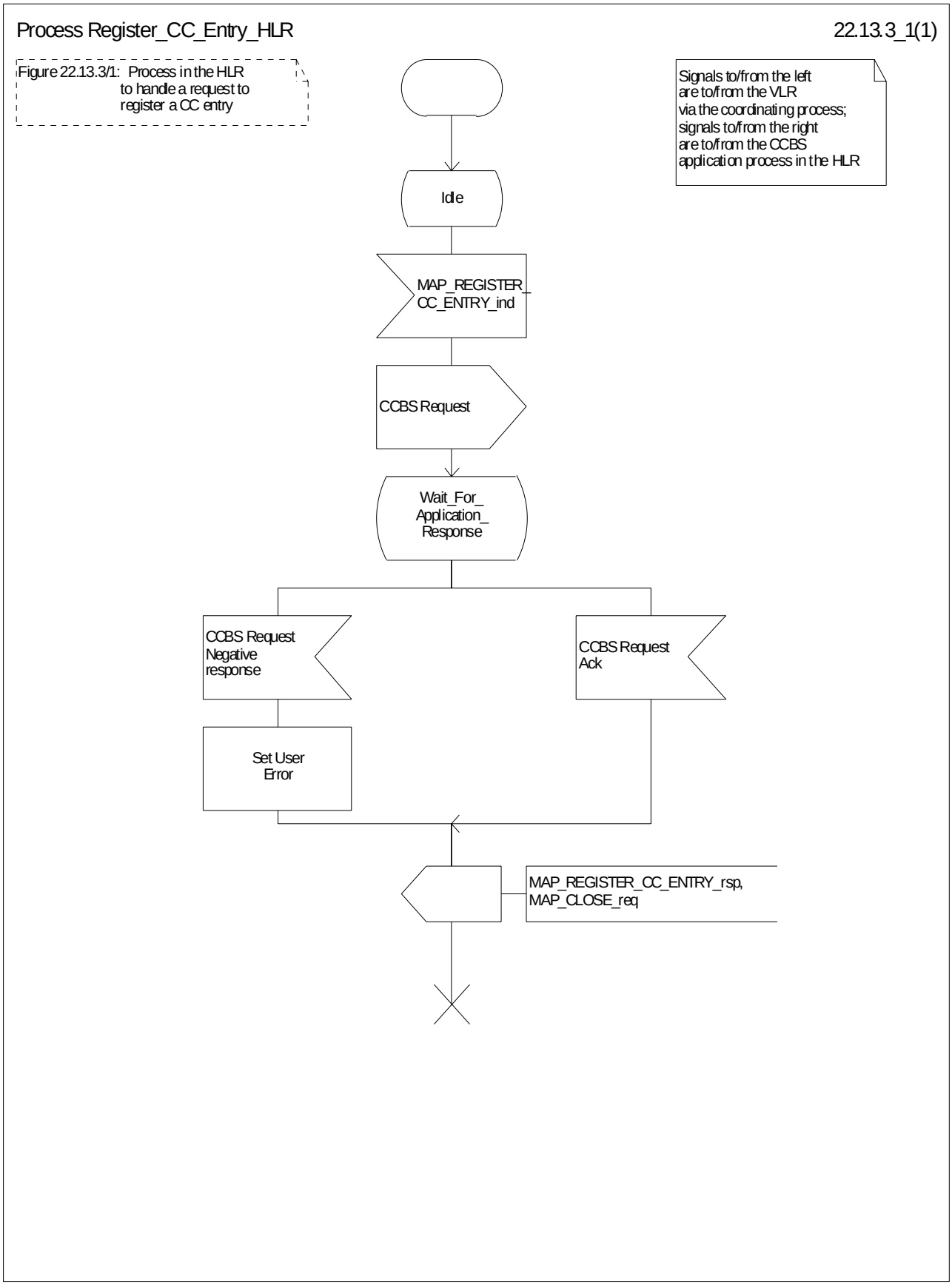


Figure 22.13.3/1: Process Register_CC_Entry_HLR

22.14 Deactivation of a CCBS request

22.14.1 General

The message flow to deactivate a CCBS request is shown in figure 22.14.1/1.

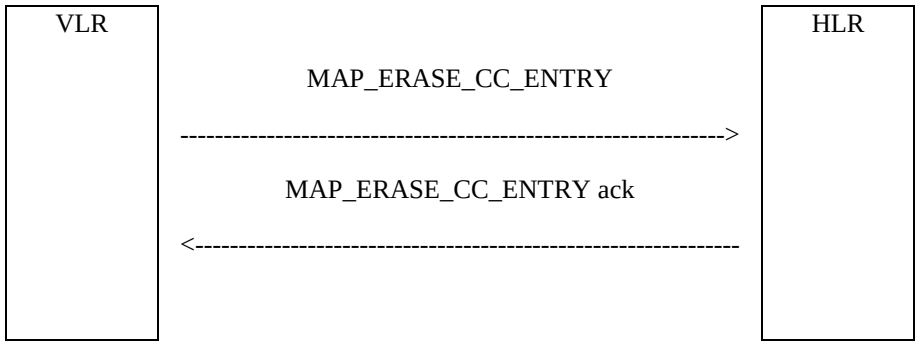


Figure 22.14.1/1: Message flow to deactivate a CCBS request

22.14.2 Procedure in the VLR

The MAP process in the VLR to deactivate a CCBS request is shown in figure 22.14.2/1. The MAP process invokes macros not defined in this subclause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2;

Successful Outcome

When the MAP process receives a Deactivate CCBS message from the CCBS application process in the VLR, it requests a dialogue with the HLR whose identity is contained in the request by sending a MAP_OPEN service request and the necessary information in a MAP_ERASE_CC_ENTRY service request. The VLR then invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_ERASE_CC_ENTRY service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Deactivate CCBS Ack message containing the information received from the HLR to the CCBS application process in the VLR and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a Deactivate CCBS Negative response message to the CCBS application process in the VLR and returns to the idle state.

Error in MAP_ERASE_CC_ENTRY confirm

If the MAP_ERASE_CC_ENTRY service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Deactivate CCBS Negative response message to the CCBS application process in the VLR and returns to the idle state.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication. In this case, the MAP process sends a Deactivate CCBS negative response to the CCBS application process in the VLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a Deactivate CCBS negative response indicating system failure to the CCBS application process in the VLR and returns to the idle state.

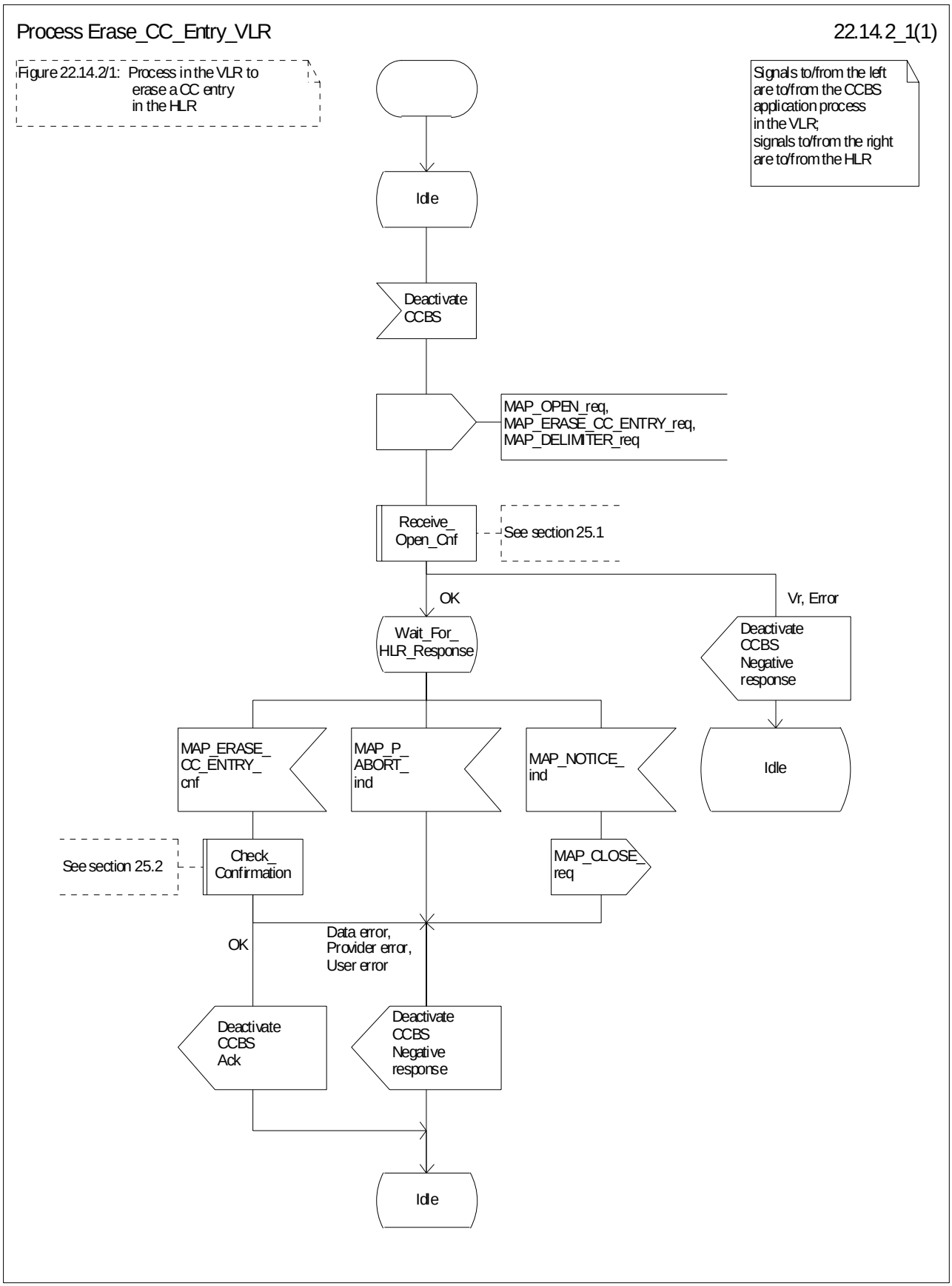


Figure 22.14.2/1: Process Erase_CC_Entry_VLR

22.14.3 Procedure in the HLR

Successful outcome

When the MAP process receives a MAP_ERASE_CC_ENTRY_indication from the co-ordinating process, it sends a Deactivate CCBS message to the CCBS application process in the HLR, and waits for a response. The message contains the parameters received in the MAP_ERASE_CC_ENTRY service indication.

If the CCBS application process in the HLR returns a positive response, the MAP process constructs a MAP_ERASE_CC_ENTRY service response, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.

Negative response from HLR CCBS application process

If the CCBS application process in the HLR returns a negative response, the MAP process constructs a MAP_ERASE_CC_ENTRY service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.

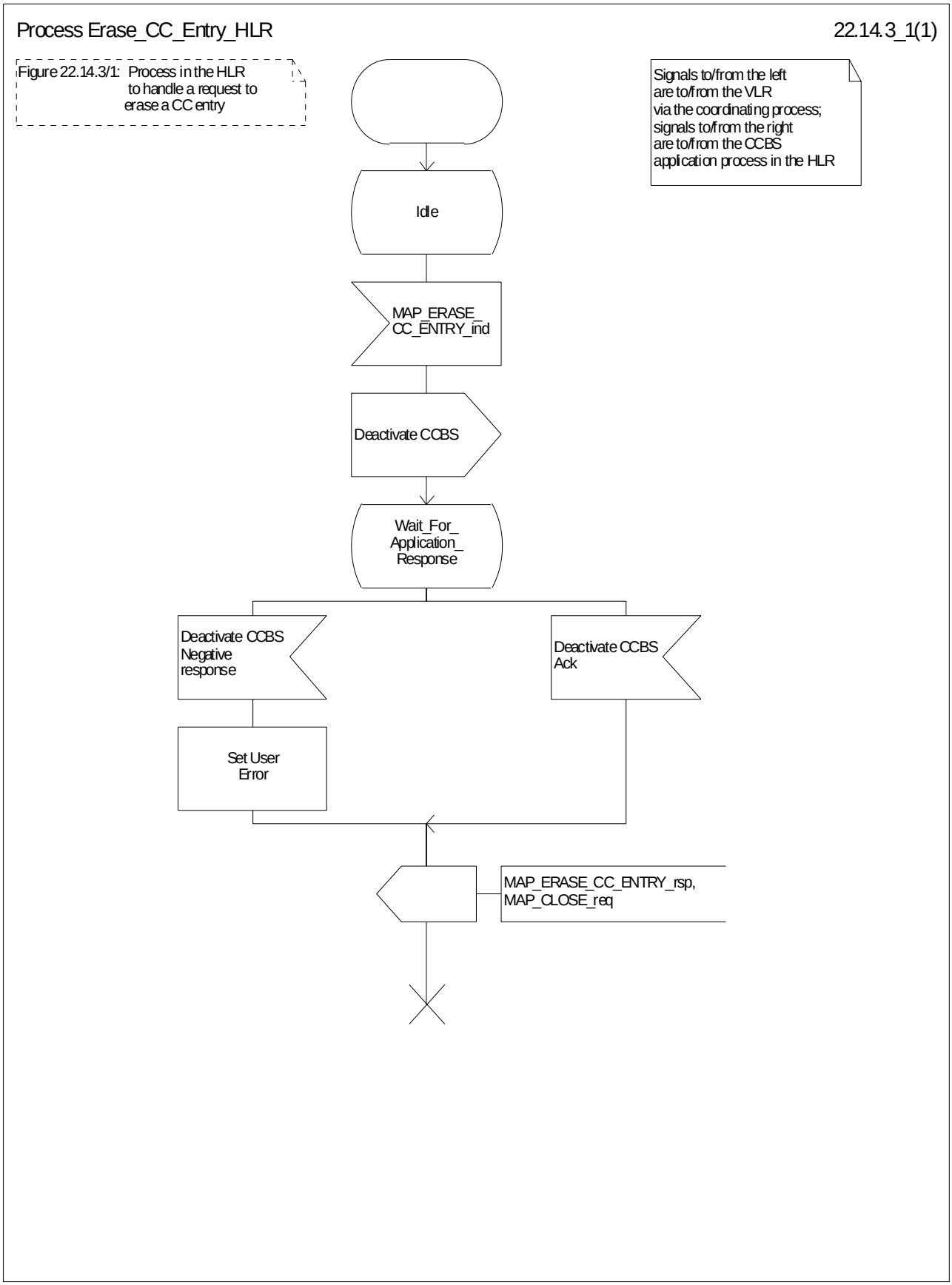


Figure 22.14.3/1: Process Erase_CC_Entry_HLR

23 Short message service procedures

23.1 General

The short message service procedures are used to control both mobile originated and mobile terminated short message transfer.

Four procedures exist for short message services:

- mobile originated short message service transfer;
- mobile terminated short message service transfer;
- short message alert procedure;
- short message waiting data set procedure.

The following application context refers to a complex MAP user consisting of several processes:

- shortMessageGatewayContext.

This application context needs a co-ordinating process in the HLR. Additionally a Co-ordinator has to be defined for the mobile originated situation in the MSC, because the A_CM_SERV_REQ message does not distinguish between mobile originated short message transfer and the short message alert procedures.

NOTE: A_CM_SERV_REQ message is not used for SMS over GPRS.

23.1.1 Mobile originated short message service Co-ordinator for the MSC

The A_CM_SERV_REQ message (GSM 04.08) is received from the A-interface containing the CM service type. This parameter indicates mobile originated short message service. The service MAP_PROCESS_ACCESS_REQUEST is started.

If the MAP_PROCESS_ACCESS_REQUEST service ends successfully, the MS initiates mobile originated short message transfer or alerting indication. Depending on the situation, the appropriate process is initiated as follows:

- if the A_RP_MO_DATA indication is received, the process MOSM_MSC is initiated (see subclause 23.2.1);
- if the A_RP_SM_MEMORY_AVAILABLE indication is received, the process SC_Alert_MSC is initiated (see subclause 23.4.1).

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

The SMS process Co-ordinator is shown in the figure 23.1/1.

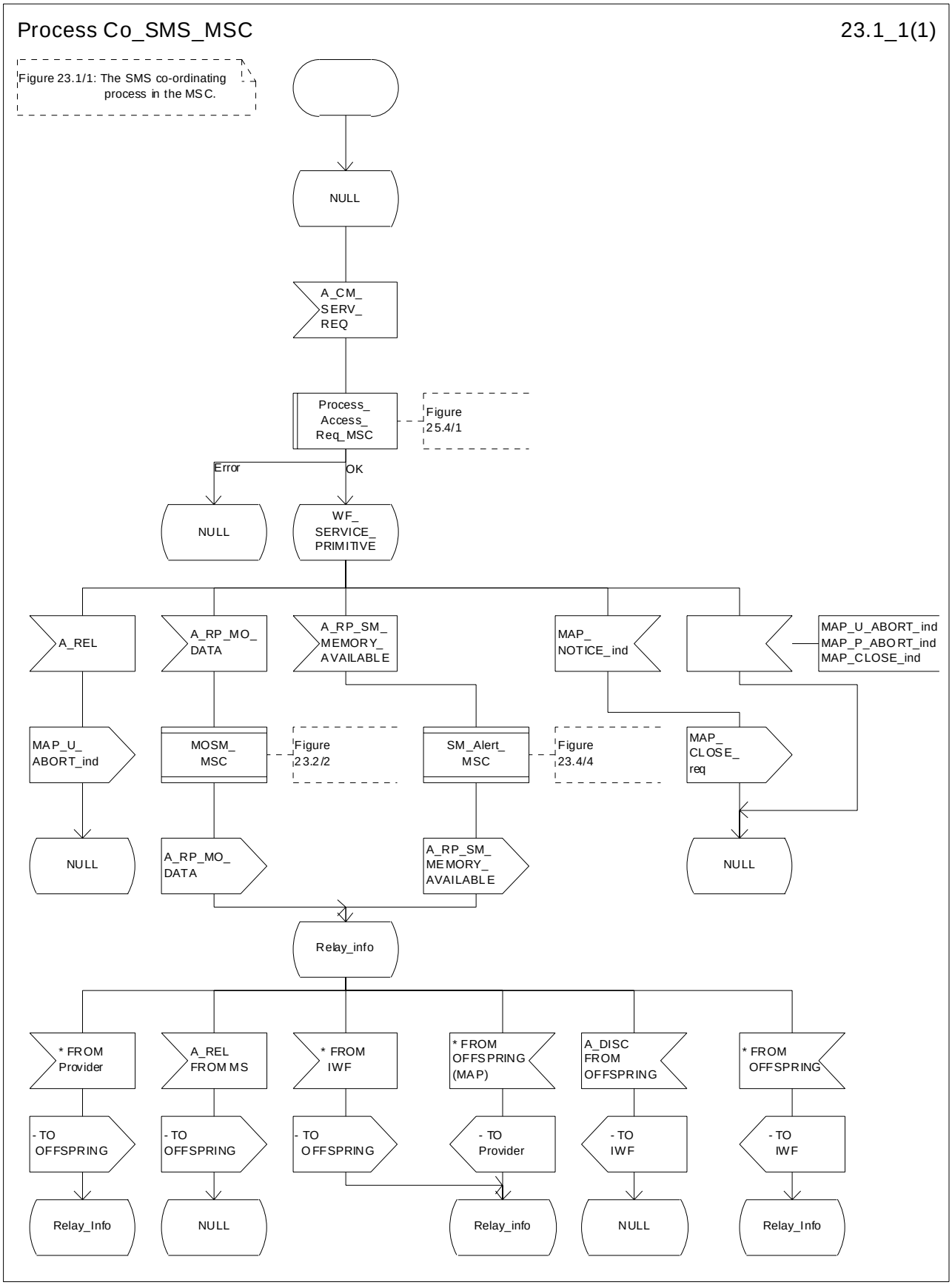


Figure 23.1/1: Process Co_SMS_MSC

23.1.2 Short message Gateway Co-ordinator for the HLR

The MAP_OPEN indication opens a dialogue for the short message procedure between the gateway MSC and the HLR when the application context shortMessageGatewayContext is received. If that service is successful, the Co-ordinator can receive the first service primitive from the MAP_PM. Depending on the received primitive, the user process is created as follows:

- if the MAP_SEND_ROUTING_INFO_FOR_SM indication is received, the process Mobile_Terminated_MS_HLR is created;

- if the MAP_REPORT_SM_DELIVERY_STATUS indication is received, the process Report_SM_delivery_stat_HLR is created.

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

The SM Gateway Co-ordinator is shown in the figure 23.1/2.

If the Receive_Open_Ind macro takes the Vr exit then HLR shall perform the MAP Vr dialogue. But based on the subscriber data, handling at the MAP user application level may be performed as described in release 97 :

- If the subscriber is not a GPRS subscriber then the behaviour of the HLR shall be the same as described in the corresponding MAP Vr release.

- If the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the MSC when GPRS is not supported in the GMSC » then the behaviour of the HLR shall be the same as described in the corresponding MAP Vr release.

- If the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only then the behaviour of the HLR shall be the same as for the case transfer over GPRS described in MAP release 97, with the following precision : because GMSC does not support MAP release 97, the previous MAP protocol release is used. When the HLR sends the MAP_SEND_ROUTING_INFO_FOR_SM_Resp, the SGSN number is mapped to the MAP parameter « MSC number ». When the HLR sends the MAP_INFORM_SERVICE_CENTRE_resp, the MNRG status shall be mapped to the MAP parameter « mnrf-set ». When the HLR receives the MAP_REPORT_SM_DELIVERY_STATUS_Ind, it shall interpret the delivery outcome as a GPRS delivery outcome.

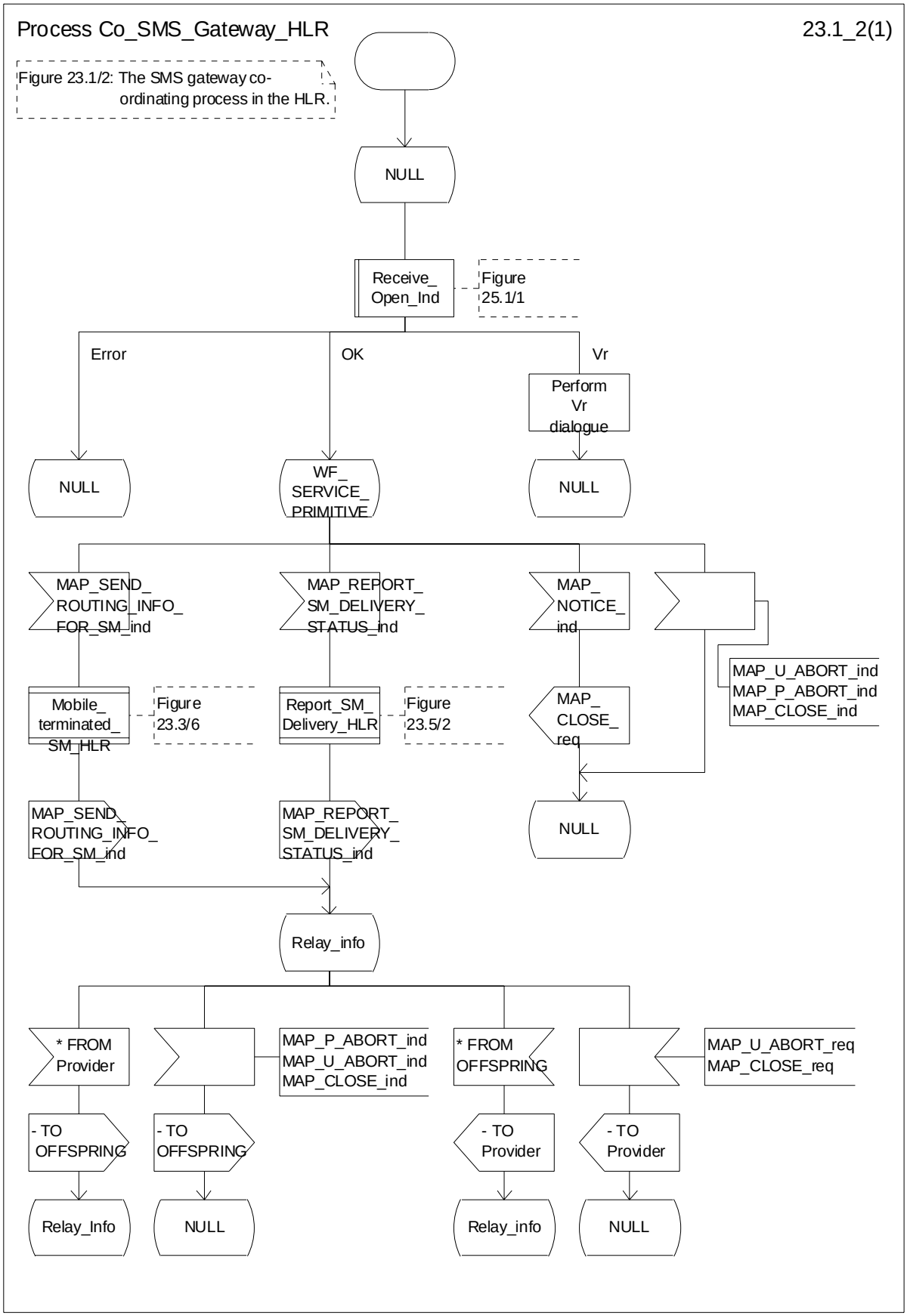


Figure 23.1/2: Process Co_SMS_Gateway_HLR

23.1.3 Mobile originated short message service Co-ordinator for the SGSN

The MS initiates mobile originated short message transfer or alerting indication. Depending on the situation, the appropriate process is initiated as follows:

- if the A_RP_MO_DATA indication is received, the process MOSM_SGSN is initiated (see subclause 23.2.4);
- if the A_RP_SM_MEMORY_AVAILABLE indication is received, the process SC_Alert_SGSN is initiated (see subclause 23.4.5).

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

The SMS process Co-ordinator is shown in the figure 23.1/3.

Process Co_SMS_SGSN 23.1_3(1)

Figure 23.1/3: The SMS co-ordinating process in the SGSN

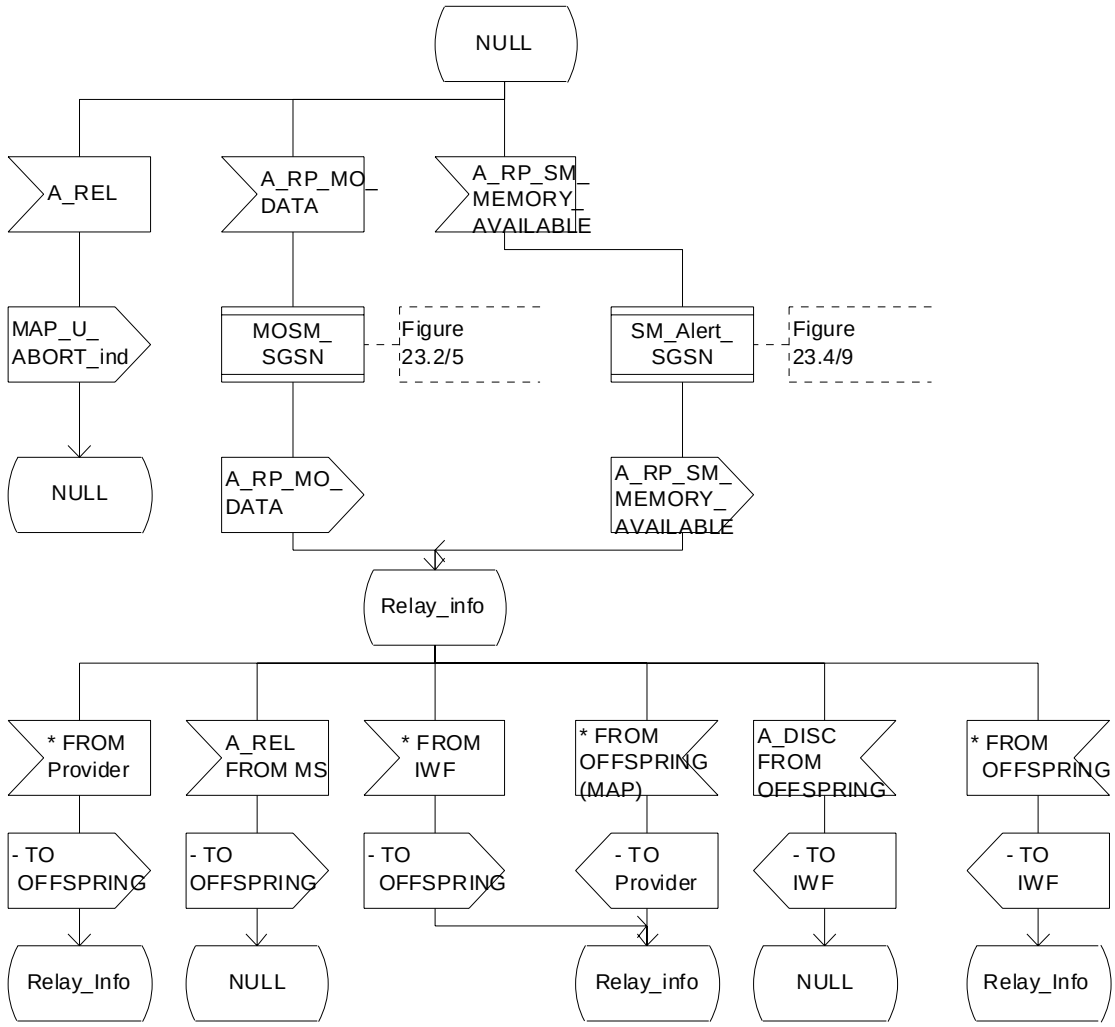
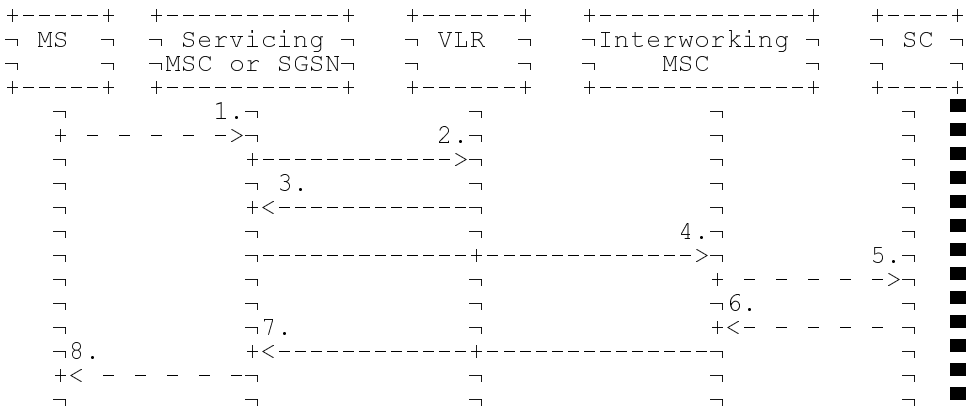


Figure 23.1/3: Process Co_SMS_SGSN

23.2 The mobile originated short message transfer procedure

The mobile originated short message service procedure is used to forward short message from a mobile subscriber to a Service Centre. The mobile originated short message service procedure is shown in figure 23.2/1.



1) Short Message (GSM 04.11)

2) MAP_SEND_INFO_FOR_MO_SMS (*)

3) MAP_SEND_INFO_FOR_MO_SMS_ACK (*)

4) MAP_MO_FORWARD_SHORT_MESSAGE

5) Short message (TS GSM 03.40)

6) Short message Acknowledgement (TS GSM 03.40)

7) MAP_MO_FORWARD_SHORT_MESSAGE_ACK

8) Short Message Acknowledgment (GSM 04.11)

(*) Messages 2) and 3) are not used by SGSN

Figure 23.2/1: Mobile originated short message transfer

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST	(see subclause 8.3); (*)
MAP_AUTHENTICATE	(see subclause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see subclause 8.6); (*)
MAP_PROVIDE_IMSI	(see subclause 8.9); (*)
MAP_CHECK_IMEI	(see subclause 8.7);
MAP_FORWARD_NEW_TMSI	(see subclause 8.9); (*)
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see subclause 9.1); (*)
MAP_READY_FOR_SM	(see subclause 12.4).

(*) Those messages are not used by SGSN.

23.2.1 Procedure in the servicing MSC

The activation of the MAP_PROCESS_ACCESS_REQUEST service is described in the subclause 25.4.1.

When receiving the short message from the A-interface, the MSC sends the MAP_SEND_INFO_FOR_MO_SMS request to the VLR. As a response the MSC will receive the MAP_SEND_INFO_FOR_MO_SMS confirmation from VLR indicating that:

- the service ends successfully. If the MSC is not itself the IWMSC, the short message transmission towards the IWMSC is initiated using the MAP_MO_FORWARD_SHORT_MESSAGE request;

- the service ends unsuccessfully. The error cause in the MAP_SEND_INFO_FOR_MO_SMS confirmation indicates the reason for the unsuccessful end. The mapping between MAP error causes and RP_ERROR causes is described in TS GSM 03.40.

If there are data errors in the MAP_SEND_INFO_FOR_MO_SMS confirmation, or there is an operation failure in MAP, the RP_ERROR cause network out of order is forwarded to the mobile station.

If the service MAP_MO_FORWARD_SHORT_MESSAGE is started, the MSC will check whether the grouping of MAP_OPEN request and MAP_MO_FORWARD_SHORT_MESSAGE request needs segmentation. If this is the case then the MAP_OPEN request primitive shall be sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MO_FORWARD_SHORT_MESSAGE request is sent. As a response to the procedure, the servicing MSC will receive the MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the IWMSC indicating that:

- the short message has been successfully delivered to the Service Centre. The acknowledgement is sent to the mobile station;

- one of several error cases has occurred. The mapping between MAP error causes and RP_ERROR causes is described in TS GSM 03.40. The appropriate indication is provided to the mobile station.

If the procedure failed, a provider error or an abort indication is received. The RP_ERROR cause network out of order is provided to the mobile station.

If the MSC itself is the interworking MSC, the short message is forwarded to the Service Centre. In that case the service MAP_MO_FORWARD_SHORT_MESSAGE is not initiated. The acknowledge message from the Service Centre is forwarded to the mobile station (TS GSM 03.40, TS GSM 04.11).

The mobile originated short message service procedure is shown in figure 23.2/2.

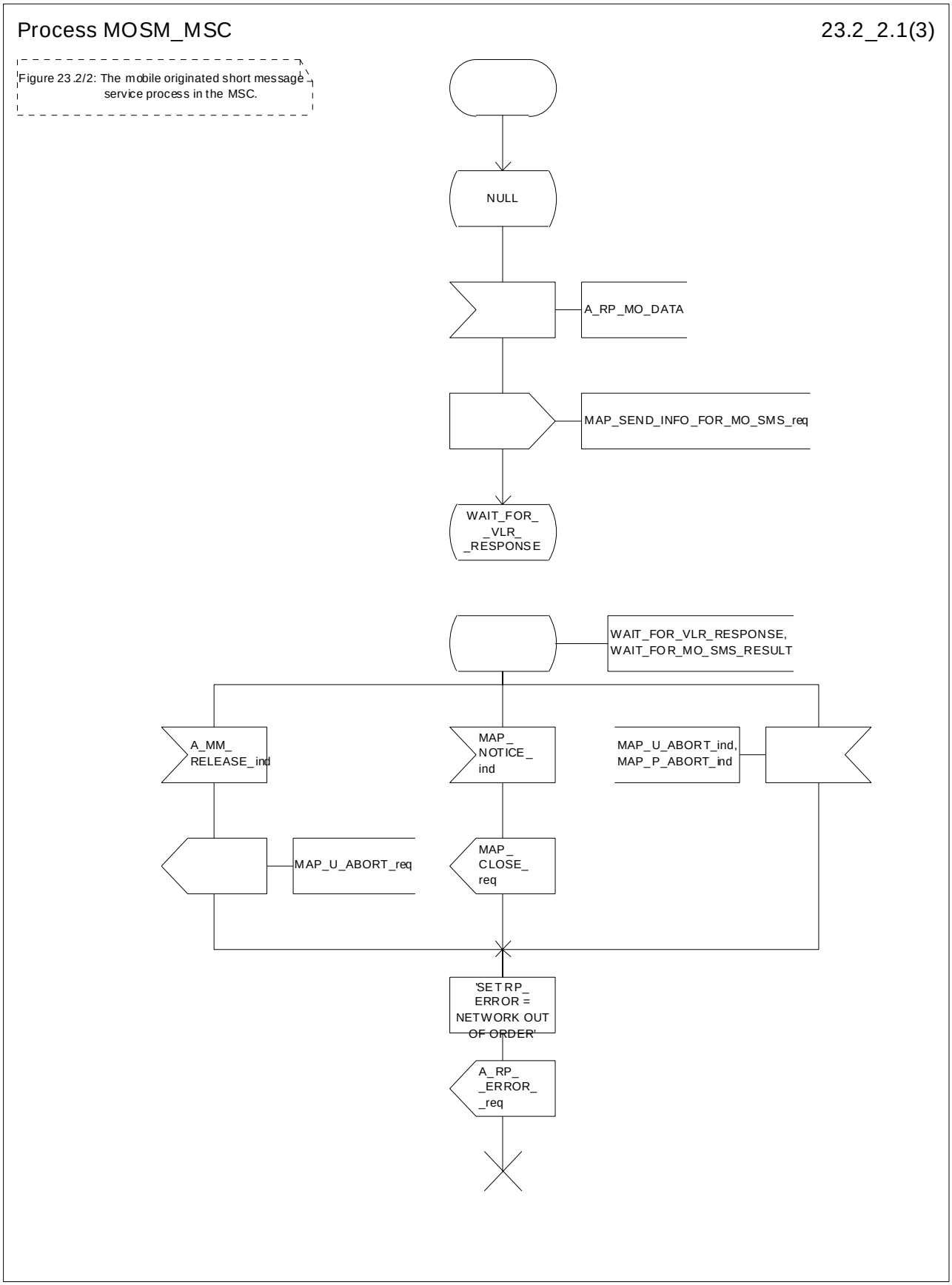


Figure 23.2/2 (sheet 1 of 3): Process MOSM_MSC

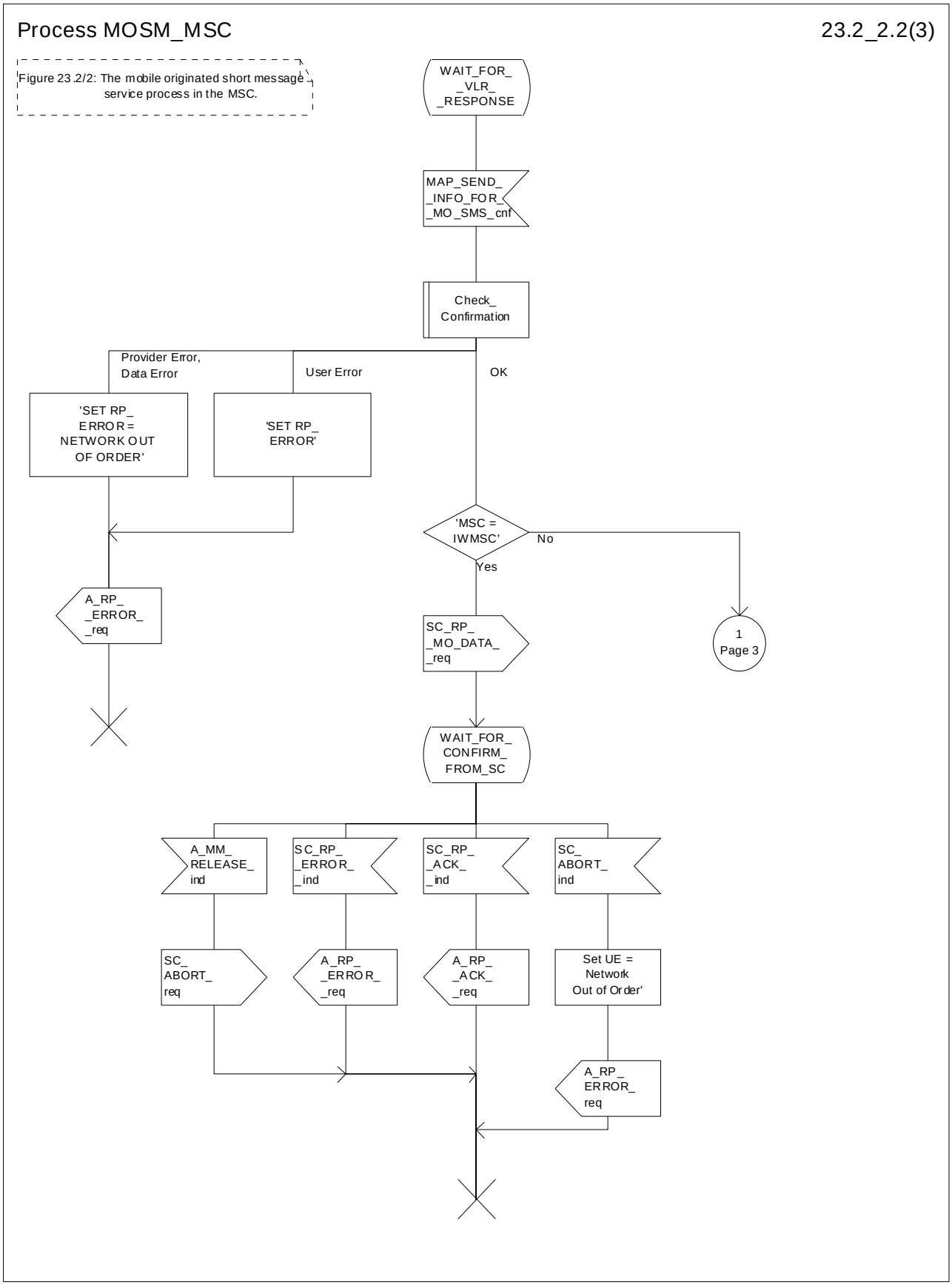


Figure 23.2/2 (sheet 2 of 3): Process MOSM_MSC

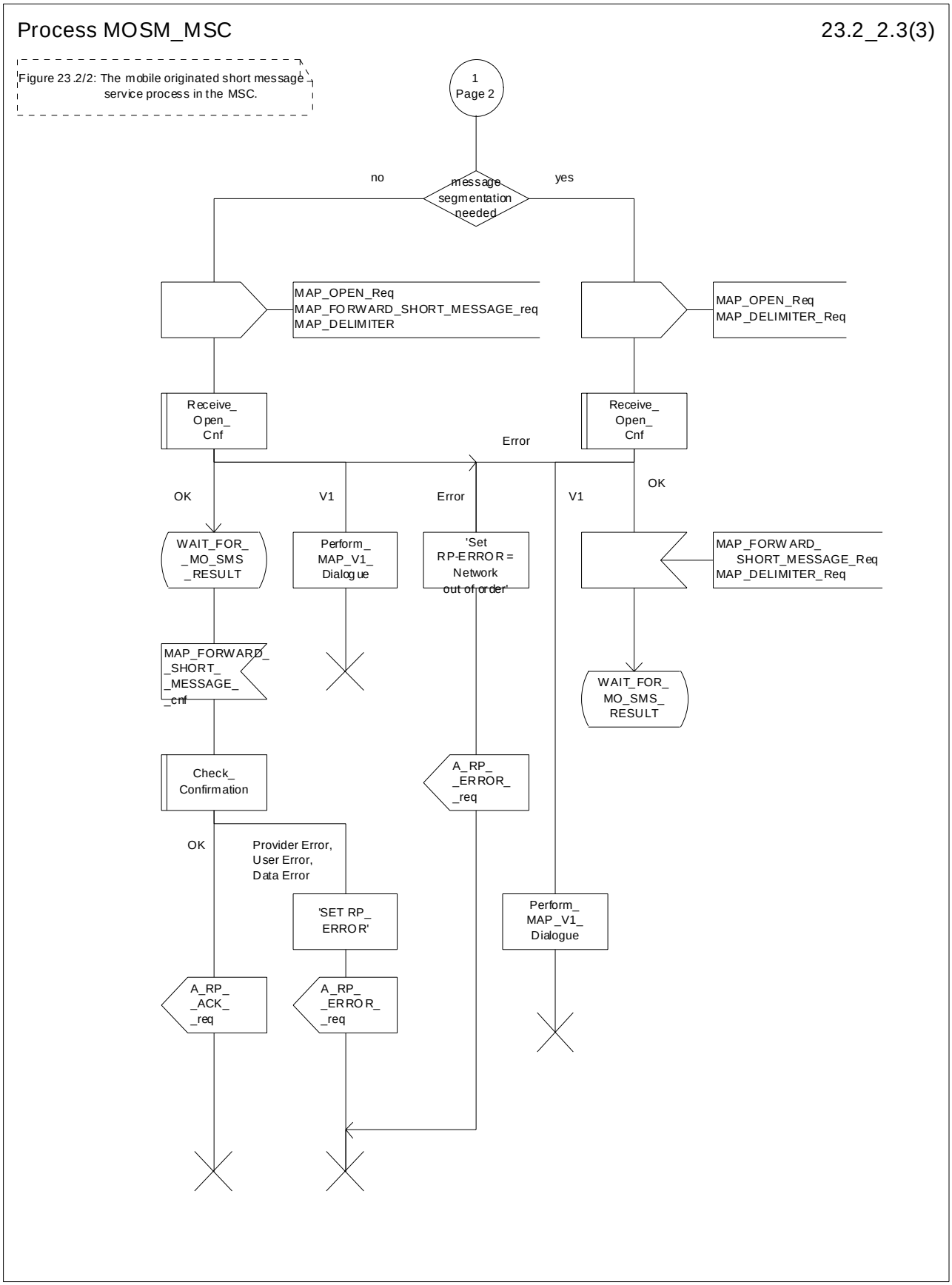


Figure 23.2/2 (sheet 3 of 3): Process MOSM_MSC

23.2.2 Procedure in the VLR

The MAP_PROCESS_ACCESS_REQUEST indication starts the MAP_PROCESS_ACCESS_REQUEST service in the VLR. The application context in the MAP_OPEN indication is mobile originated short message transfer.

If the service MAP_PROCESS_ACCESS_REQUEST is successful, the VLR waits for the next message from the MSC. When receiving the MAP_SEND_INFO_FOR_MO_SMS indication, the VLR acts as follows:

- if there is incompatibility in the subscription check, the error teleservice not provisioned is returned to the MSC;
- if the short message transfer would contravene operator determined barring, the call barred error with cause operator barring is returned;
- if the short message transfer would contravene the supplementary service call barring conditions in the VLR, the call barred error with cause barring service active is returned.

When the mobile subscriber has passed all checks, the MAP_SEND_INFO_FOR_MO_SMS response is initiated and the procedure is terminated in the VLR. The mobile originated short message transfer procedure in the VLR is shown in figure 23.2/3.

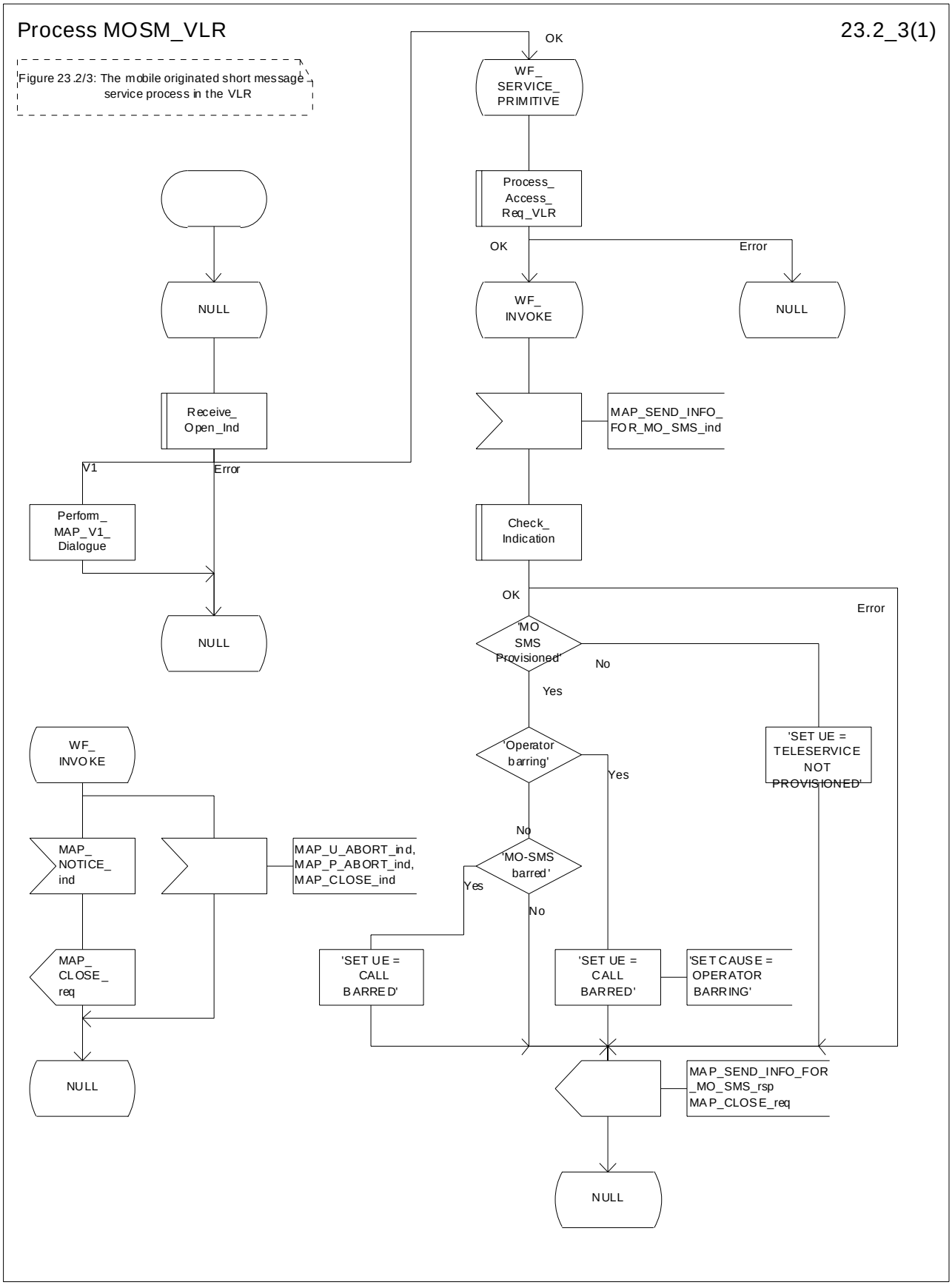


Figure 23.2/3: Process MOSM_VLR

23.2.3 Procedure in the interworking MSC

This procedure applies only when the IWMSC is not the servicing MSC or SGSN.

When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service-user in the interworking MSC issues a MAP_DELIMITER request primitive in order to trigger the local MAP service-provider to confirm the dialogue. Then a MAP_MO_FORWARD_SHORT_MESSAGE indication shall be received.

When a MAP_MO_FORWARD_SHORT_MESSAGE indication is correctly received, the Interworking MSC invokes forwarding of the short message to the Service Centre. If invalid data content is detected, an unexpected data value error or a data missing error is returned to the servicing MSC or SGSN.

The outcome of the procedure with the Service Centre is awaited before a MAP_MO_FORWARD_SHORT_MESSAGE response is given back to the servicing MSC or SGSN:

- if a short message is accepted by the Service Centre, an acknowledgement is sent back to the servicing MSC or SGSN;
- if the Service Centre is not identified, the SM Delivery Failure error is returned to the servicing MSC or SGSN;
- if the Service Centre returns an error indication, the SM Delivery Failure error is returned to the servicing MSC with the error cause and any diagnostic information received from the Service Centre;
- if the short message cannot be forwarded to the Service Centre or the procedure towards the Service Centre fails for some reason, a system failure error is sent to the servicing MSC or SGSN.

The mobile originated short message service transfer in the IWMSC is shown in figure 23.2/4.

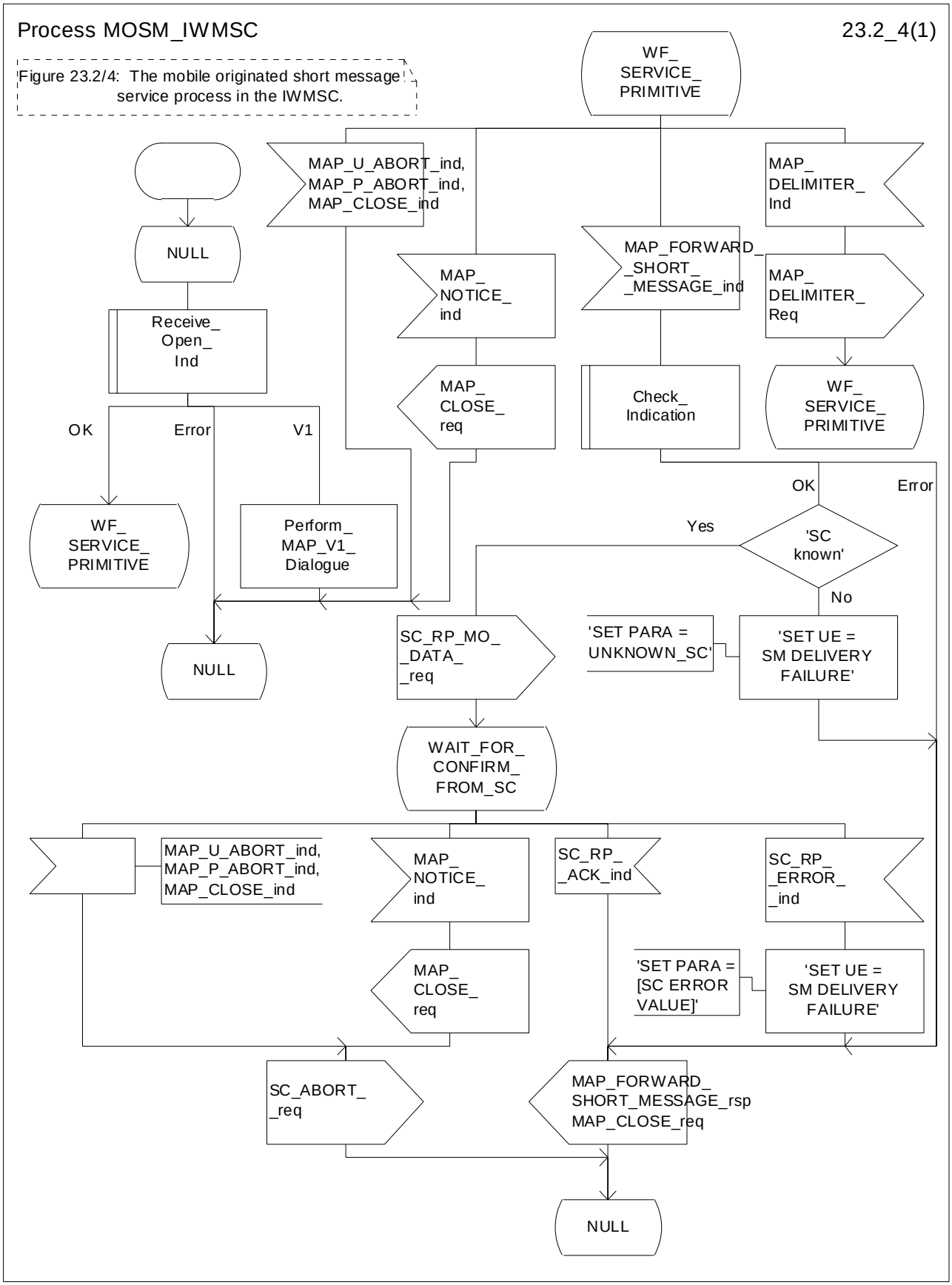


Figure 23.2/4: Process MOSM_IWMSC

23.2.4 Procedure in the servicing SGSN

When receiving the short message from the MS, the SGSN acts as follows:

- if there is incompatibility in the subscription check, the RP_ERROR cause requested facility not subscribed is provided to the mobile station;

- if the short message transfer would contravene operator determined barring, the RP_ERROR cause operator determined barring is provided to the mobile station;

NOTE: The RP_ERROR causes are described in TS GSM 04.11

- if no error is detected, the short message transmission towards the IWMSC is initiated using the MAP_MO_FORWARD_SHORT_MESSAGE request.

If the service MAP_MO_FORWARD_SHORT_MESSAGE is started, the SGSN will check whether the grouping of MAP_OPEN request and MAP_MO_FORWARD_SHORT_MESSAGE request needs segmentation.

If this is the case then the MAP_OPEN request primitive shall be sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MO_FORWARD_SHORT_MESSAGE request is sent. As a response to the procedure, the servicing SGSN will receive the MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the IWMSC indicating that:

- the short message has been successfully delivered to the Service Centre. The acknowledgement is sent to the mobile station;

- one of several error cases has occurred. The mapping between MAP error causes and RP_ERROR causes is described in TS GSM 03.40. The appropriate indication is provided to the mobile station.

If the procedure failed, a provider error or an abort indication is received. The RP_ERROR cause network out of order is provided to the mobile station.

The mobile originated short message service procedure is shown in figure 23.2/5

Process MOSM_SGSN 23.2_5.1(3)

Figure 23.2/5: The mobile originated short message service process in the SGSN.

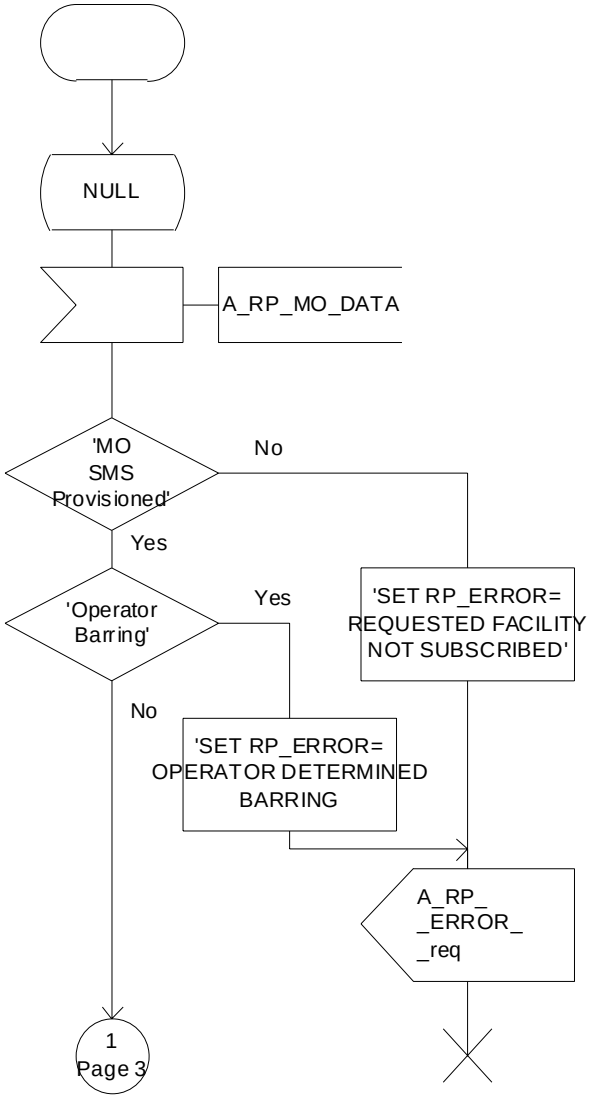


Figure 23.2/5 (sheet 1 of 3): Process MOSM_SGSN

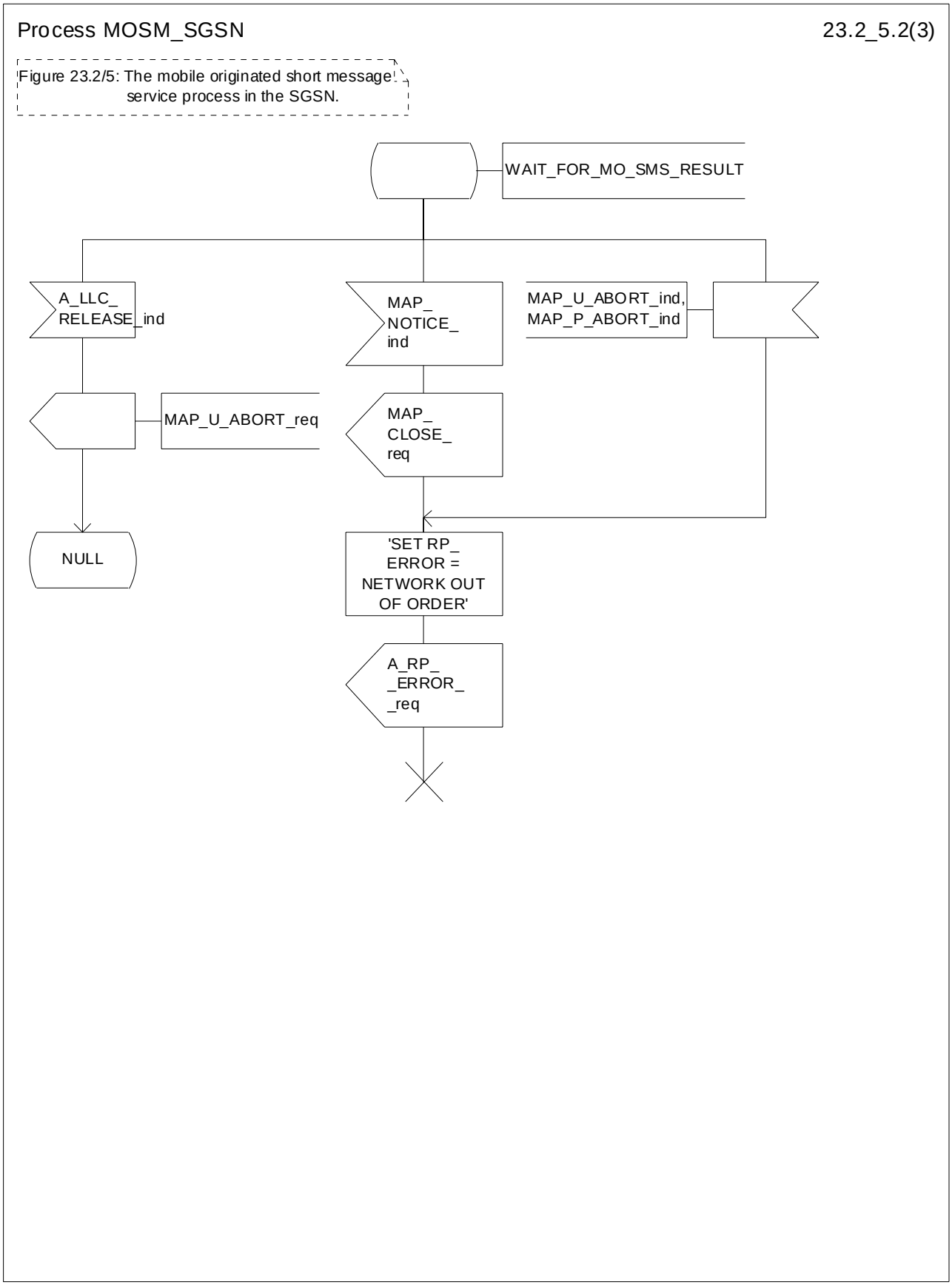


Figure 23.2/5 (sheet 2 of 3): Process MOSM_SGSN

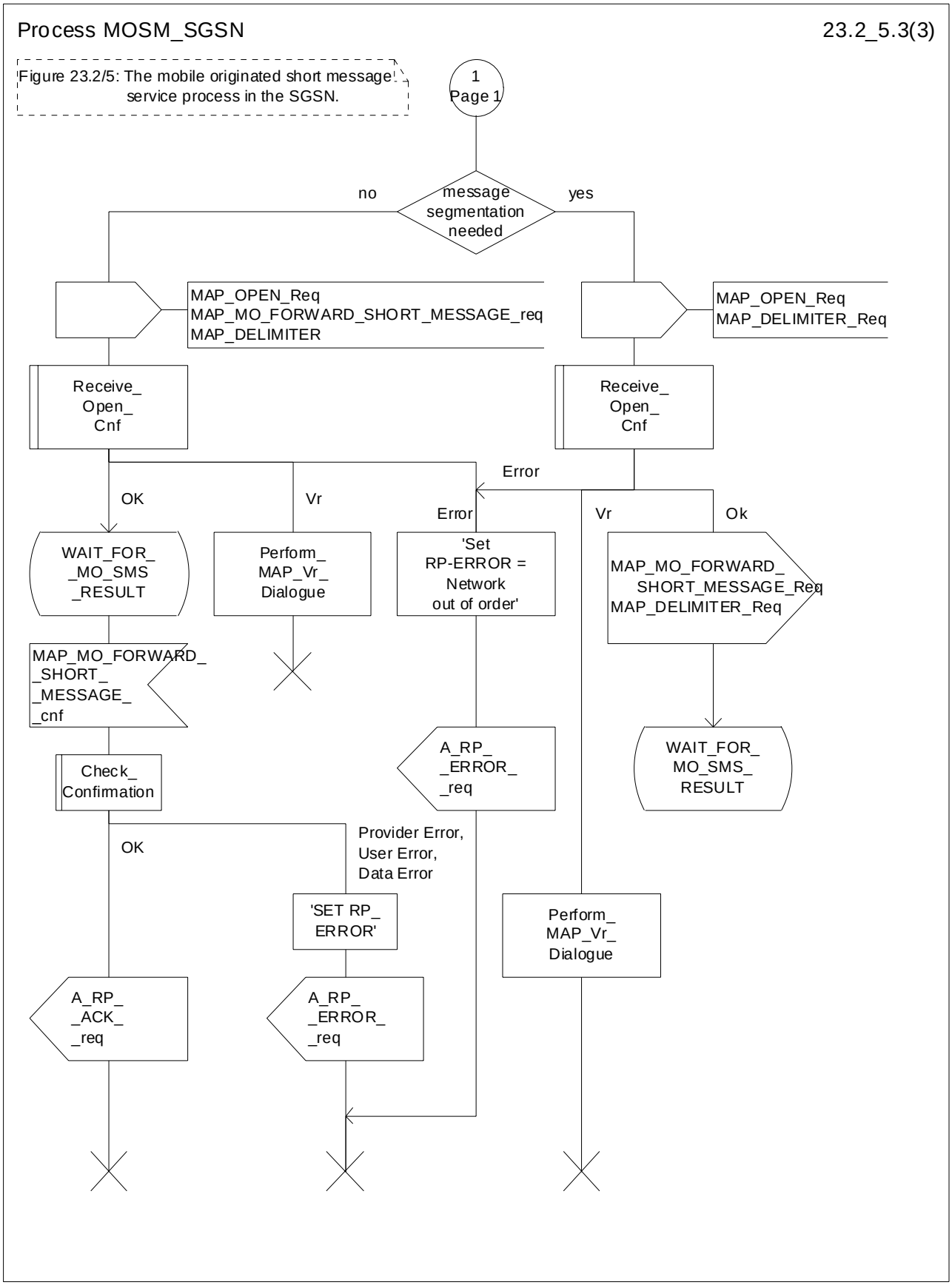
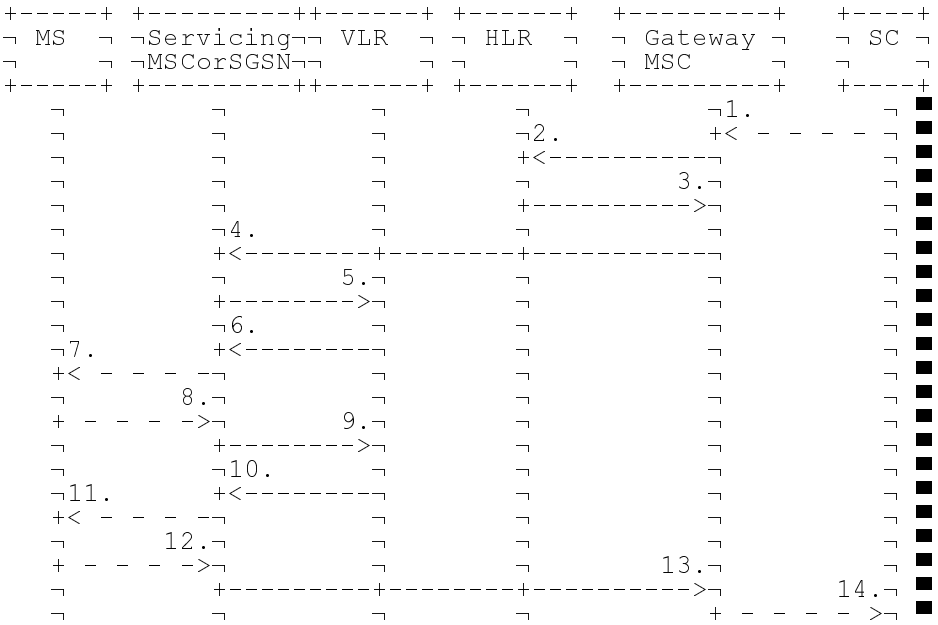


Figure 23.2/5 (sheet 3 of 3): Process MOSM_SGSN

23.3 The mobile terminated short message transfer procedure

The mobile terminated short message transfer procedure is used for forwarding a short message or several short messages from a Service Centre to a mobile subscriber. The mobile terminated short message procedure for a single short message transfer is shown in figure 23.3/1.



1) Short Message (GSM 03.40)

2) MAP_SEND_ROUTING_INFO_FOR_SM

3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK

4) MAP_MT_FORWARD_SHORT_MESSAGE

5) MAP_SEND_INFO_FOR_MT_SMS (*)

6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*)

7) Page (GSM 04.08)

8) Page response (GSM 04.08)

9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*)

10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*)

11) Short Message (GSM 04.11)

12) Short Message Acknowledgement (GSM 04.11)

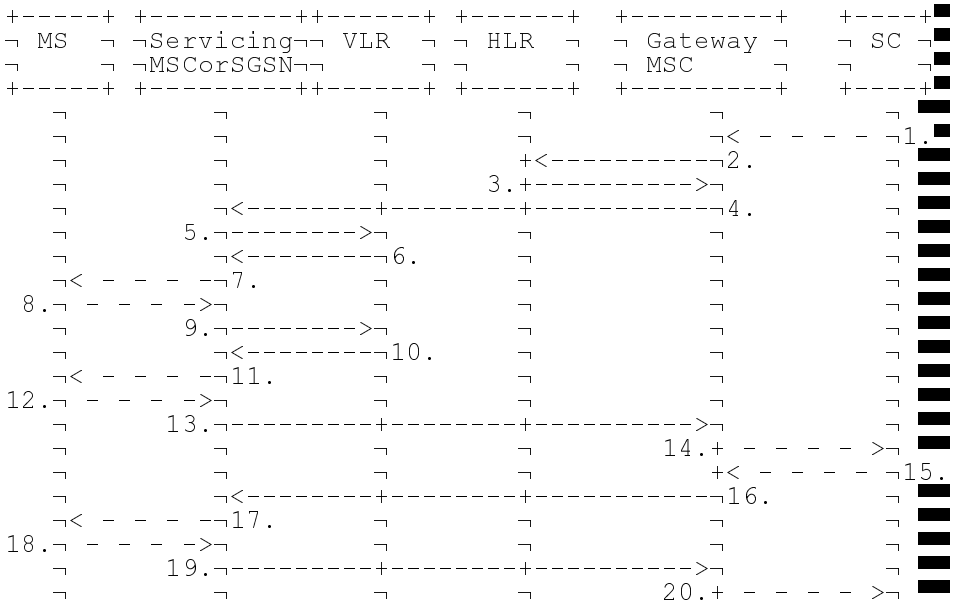
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK

14) Short Message Acknowledgment (GSM 03.40)

(*) Messages 5), 6), 9), and 10) are not used by SGSN

Figure 23.3/1: Mobile terminated short message service procedures

The mobile terminated short message procedure for multiple short message transfer is shown in figure 23.3/2.



1) Short Message (GSM 03.40)
2) MAP_SEND_ROUTING_INFO_FOR_SM
3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK
4) MAP_MT_FORWARD_SHORT_MESSAGE (note 1)
5) MAP_SEND_INFO_FOR_MT_SMS (*)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*)
7) Page (GSM 08.08)
8) Page response (GSM 04.08)
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*)
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*)
11) Short Message (GSM 04.11)
12) Short Message Acknowledgement (GSM 04.11)
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK
14) Short Message Acknowledgment (GSM 03.40)
15) Short Message (GSM 03.40)
16) MAP_MT_FORWARD_SHORT_MESSAGE (note 2)
17) Short Message (GSM 04.11)
18) Short Message Acknowledgement (GSM 04.11)
19) MAP_MT_FORWARD_SHORT_MESSAGE_ACK
20) Short Message Acknowledgement (GSM 03.40)

(*) Messages 5), 6), 9), and 10) are not used by SGSN

NOTE 1: The More Messages To Send flag is TRUE.

NOTE 2: The More Messages To Send flag is FALSE

Figure 23.3/2: Mobile terminated short message procedure for multiple short message transfer

In the multiple short message transfer the service MAP_MT_FORWARD_SHORT_MESSAGE can be used several times. However, the short message transfer is always acknowledged to the Service Centre before the next short message is sent.

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST (see subclause 8.3); (*)

MAP_PAGE (see subclause 8.2); (*)

MAP_SEARCH_FOR_MS (see subclause 8.2); (*)

MAP_AUTHENTICATE (see subclause 8.5); (*)

MAP_SET_CIPHERING_MODE (see subclause 8.6); (*)

MAP_CHECK_IMEI (see subclause 8.7);

MAP_FORWARD_NEW_TMSI (see subclause 8.9); (*)

MAP_REPORT_SM_DELIVERY_STATUS (see subclause 12.3);

MAP_INFORM_SERVICE_CENTRE see subclause 12.6);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see subclause 9.1); (*)

MAP_READY_FOR_SM (see subclause 12.4).

(*) Those messages are not used by SGSN.

23.3.1 Procedure in the Servicing MSC

When initiating the dialogue with the servicing MSC, the SMS Gateway MSC must provide the IMSI of the subscriber to whom the short message is directed.

The IMSI can be included either in the Destination Reference of the MAP_OPEN indication received from the SMS Gateway MSC or in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication.

When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service-user in the servicing MSC issues a MAP_DELIMITER request primitive in order to trigger the local MAP service-provider to confirm the dialogue.

When receiving the first MAP_MT_FORWARD_SHORT_MESSAGE indication from the gateway MSC, the servicing MSC sends the MAP_SEND_INFO_FOR_MT_SMS request primitive to the VLR, if the MAP service primitive is accepted and if short message service is supported in the servicing MSC.

The MAP_MT_FORWARD_SHORT_MESSAGE indication primitive is checked by the macro "Check_Indication". If the received MAP service primitive contains errors, the service is aborted and an unexpected data value error or data missing error is returned to the GMSC.

If the MSC does not support the short message service, the service is aborted in the servicing MSC and the error "Facility Not Supported" is returned to the GMSC.

The subscriber identity information that may be included in the MAP_OPEN indication primitive and in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS" as follows.

If a Destination Reference has been received in the MAP_OPEN indication, an LMSI must be present in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication. The LMSI shall be included in the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS request sent to the VLR; the associated MAP_OPEN request must contain a Destination Reference that carries an IMSI.

Otherwise, if the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, it is mapped into the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS request that is sent to the VLR. In this case, the IMSI is not accompanied by an LMSI and neither the MAP_OPEN indication received from the gateway MSC nor the MAP_OPEN request sent to the VLR shall include a Destination Reference.

If a Destination Reference has been received in the servicing MSC and the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication does not include an LMSI or if no Destination Reference has been received and the sm-RP-DA information field does not cover an IMSI the service is aborted in the servicing MSC and the error "Unexpected Data Value" is returned to the SMS GMSC.

The following responses to the MAP_SEND_INFO_FOR_MT_SMS request may be received from the VLR:

- unidentified subscriber or system failure error. The error code is forwarded to the GMSC;
- absent subscriber error. The absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'IMSI Detached';
- unknown subscriber error. The system failure indication is provided to the GMSC;
- data missing or unexpected data value error. The system failure indication is provided to the GMSC;
- a provider error or an abort indication. The system failure indication is provided to the GMSC;
- subscriber busy for MT SMS. The error code is forwarded to the GMSC;
- paging procedure invocation (see subclause 25.3) reporting the successful outcome of the procedure;
- search procedure invocation (see subclause 25.3) reporting the successful outcome of the procedure.

The result of the paging or the search procedure is processed as follows:

- if the procedure is completed successfully, the MSC will send the MAP_PROCESS_ACCESS_REQUEST request to the VLR (see subclause 25.4);
- if the procedure is completed successfully, but the MS has no mobile terminated short message transfer capability, the procedure is terminated and SM delivery failure indication with cause "equipment not SM equipped" is provided to the GMSC;
- if the procedure ends unsuccessfully, the termination of the procedure is awaited from the VLR. The absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'No Paging Response', but the other error causes are reported as a system failure indication.

If the short message transfer is aborted for any reason, the dialogue with the VLR is aborted. If the procedure with the VLR is aborted by the VLR or by the provider, a system failure indication is provided to the GMSC.

The unsuccessful outcome of the MAP_PROCESS_ACCESS_REQUEST service is reported by using the system failure error to the GMSC.

When the service MAP_PROCESS_ACCESS_REQUEST is carried out, the MSC will receive the MAP_SEND_INFO_FOR_MT_SMS confirmation indicating:

- the unsuccessful outcome of the procedure. The error indication received from the VLR is forwarded to the GMSC;
- the successful outcome of the procedure. The MSC initiates forwarding of the short message to the MS.

If the primitive itself is badly formatted or data is missing, the system failure error is sent to the GMSC.

If forwarding of the short message is initiated, the MSC awaits the result before one of the following responses is sent back to the GMSC:

- an acknowledge if the short message has been successfully delivered to the mobile subscriber;
- an SM delivery failure error containing a parameter indicating either of the following: there is a MS protocol error or the MS memory capacity is exceeded; detailed diagnostic information (see subclause 7.6.1.4) may also be carried;
- a system failure error if the delivery procedure is aborted.

If the More Messages To Send flag was FALSE or the service MAP_MT_FORWARD_SHORT_MESSAGE ends unsuccessfully, the transaction to the gateway MSC is terminated. Otherwise, the servicing MSC waits for the next short message from the Service Centre.

When receiving the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the gateway MSC the servicing MSC will act as follows:

- if the received primitive contains errors, the unexpected data value error or data missing error is provided to the gateway MSC;
- if the More Messages To Send flag is FALSE, the servicing MSC will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gateway MSC and the transaction is terminated.
- if the More Messages To Send flag is TRUE, the servicing MSC will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, the reason is reported to the gateway MSC and the procedure is terminated. If the procedure is successful, it is acknowledged to the gateway MSC and more short messages can be received.

The tracing procedure may be activated. It is described in detail in the clause 20.

The mobile terminated short message transfer procedure in the servicing MSC is shown in figures 23.3/3 and 23.3/4. The page and search procedures are shown in figure 25.3/1 and 25.3/2.

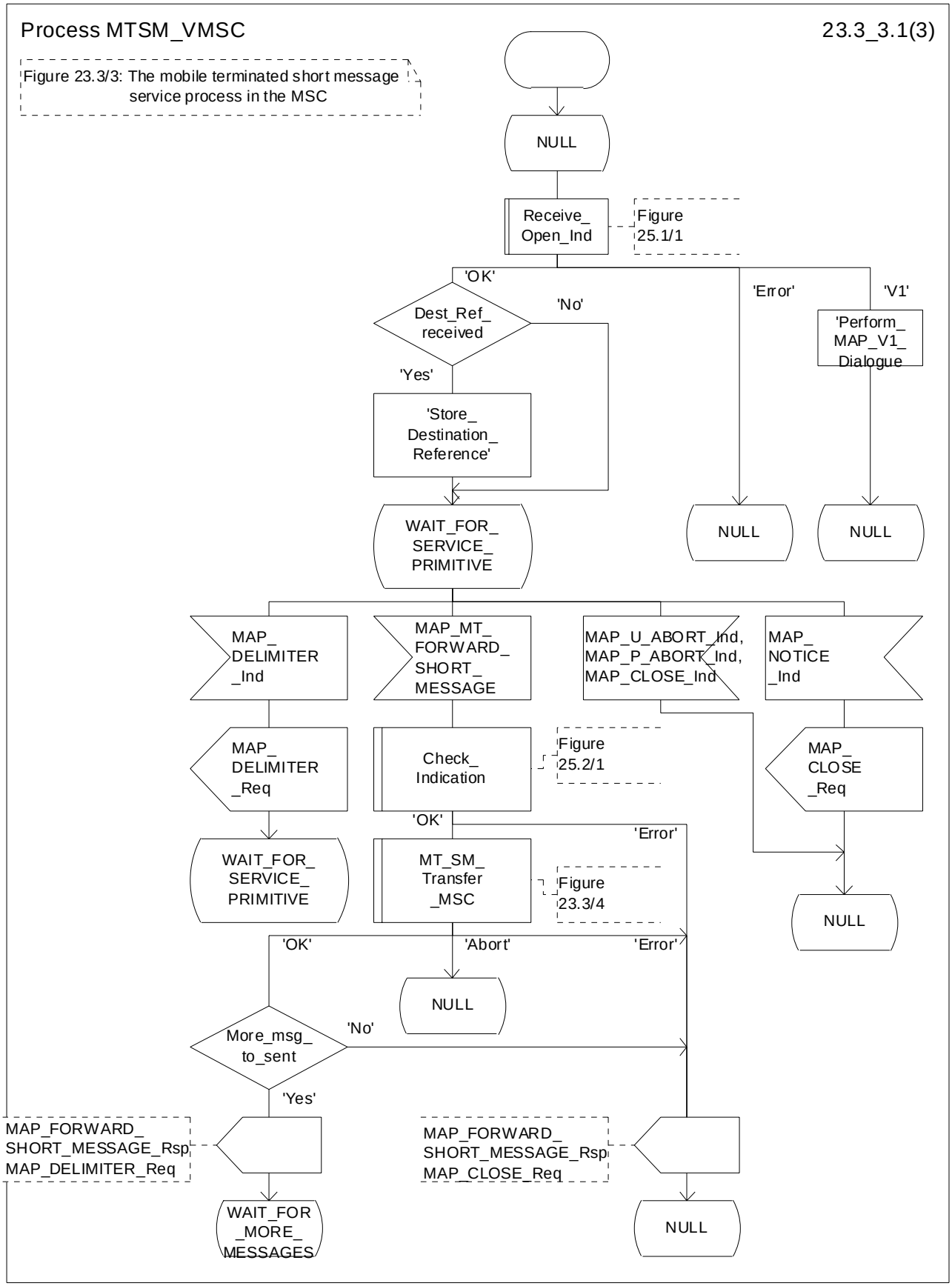


Figure 23.3/3 (sheet 1 of 3): Procedure MTSM_VMSC

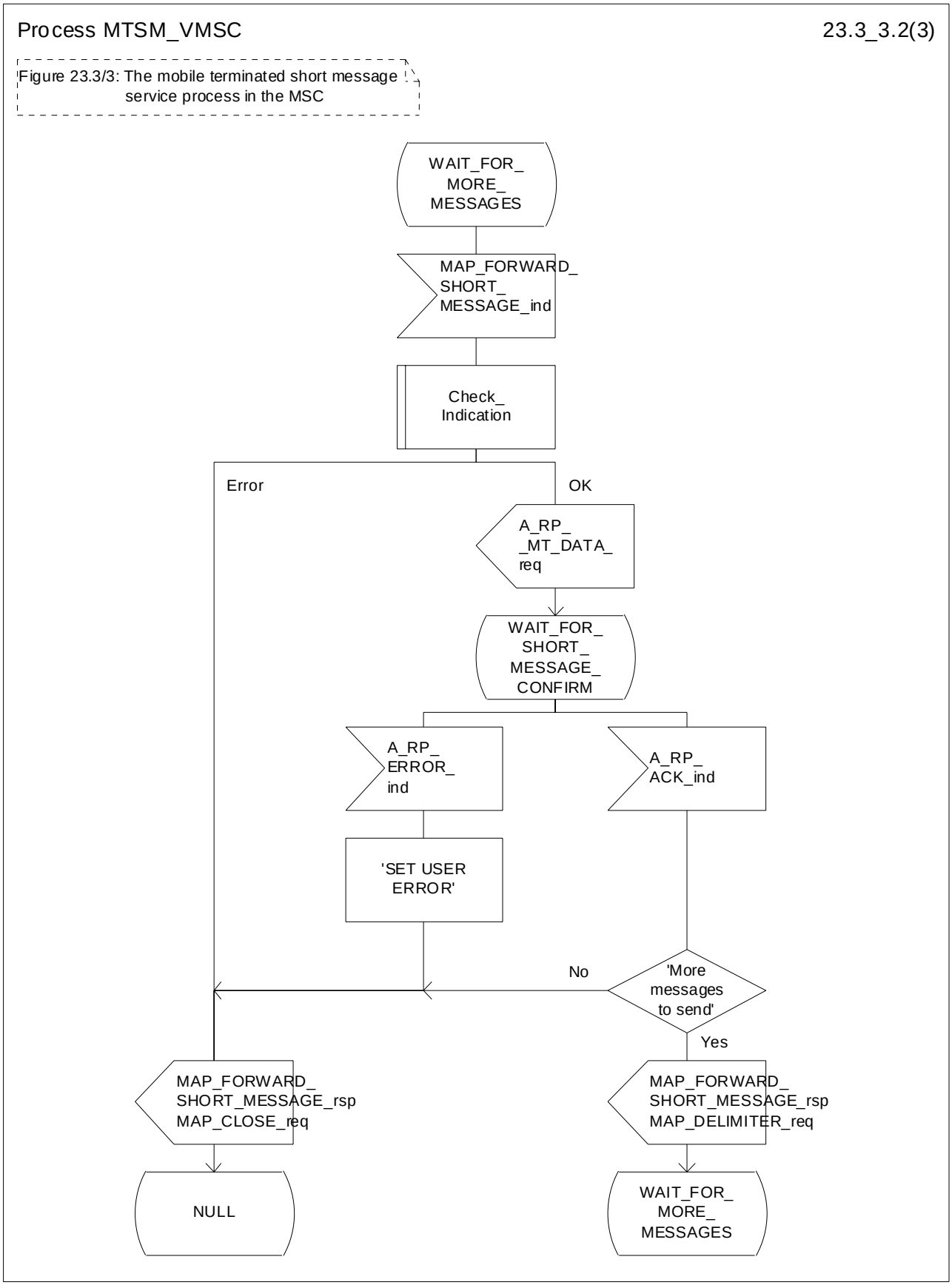


Figure 23.3/3 (sheet 2 of 3): Procedure MTSM_VMSC

Process MTSM_VMSC 23.3_3.3(3)

Figure 23.3/3: The mobile terminated short message service process in the MSC

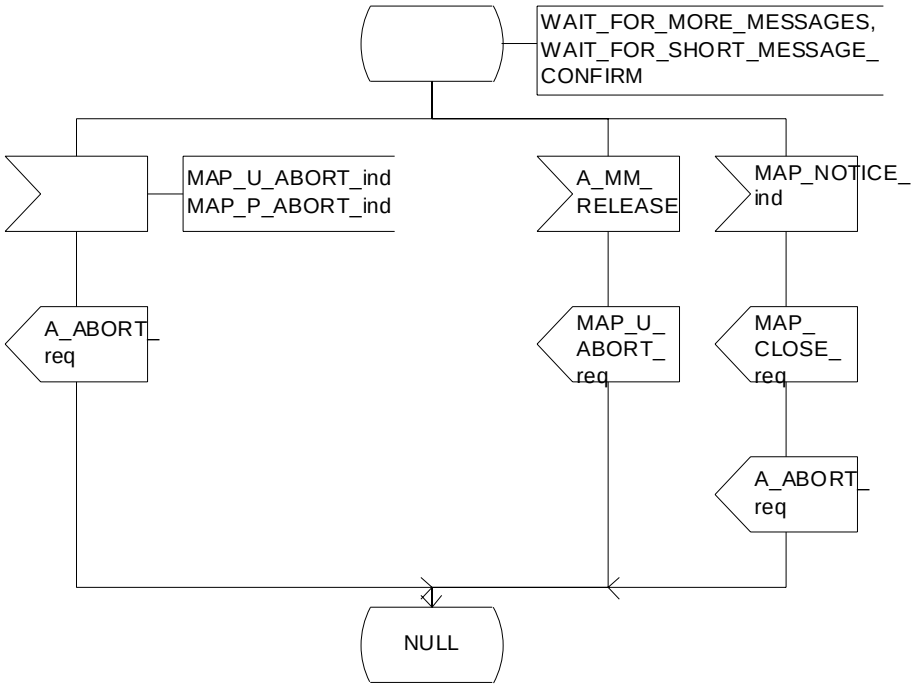


Figure 23.3/3 (sheet 3 of 3): Procedure MTSM_VMSC

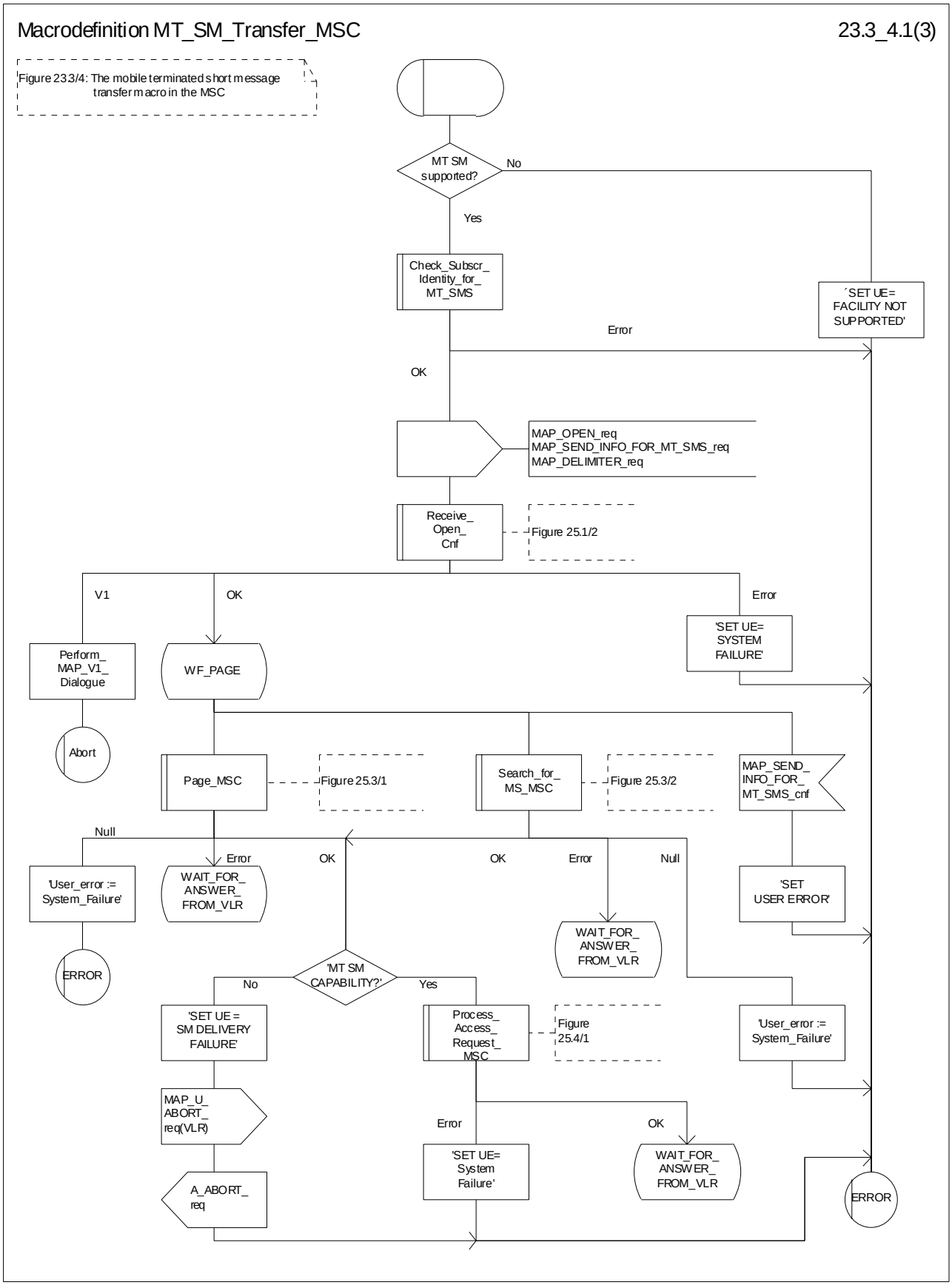


Figure 23.3/4 (sheet 1 of 3): Macro MT_SM_Transfer_MSC

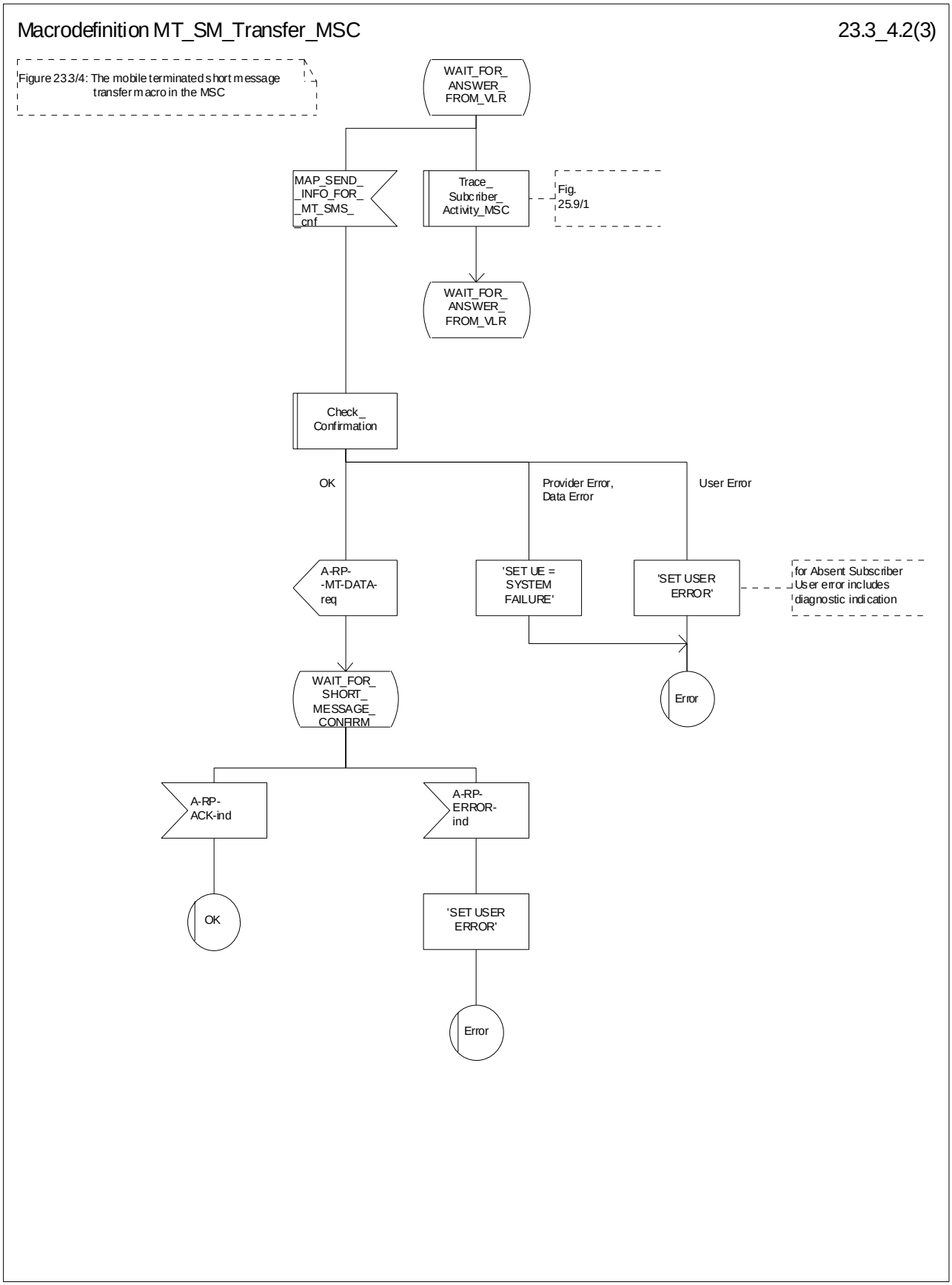


Figure 23.3/4 (sheet 2 of 3): Macro MT_SM_Transfer_MSC

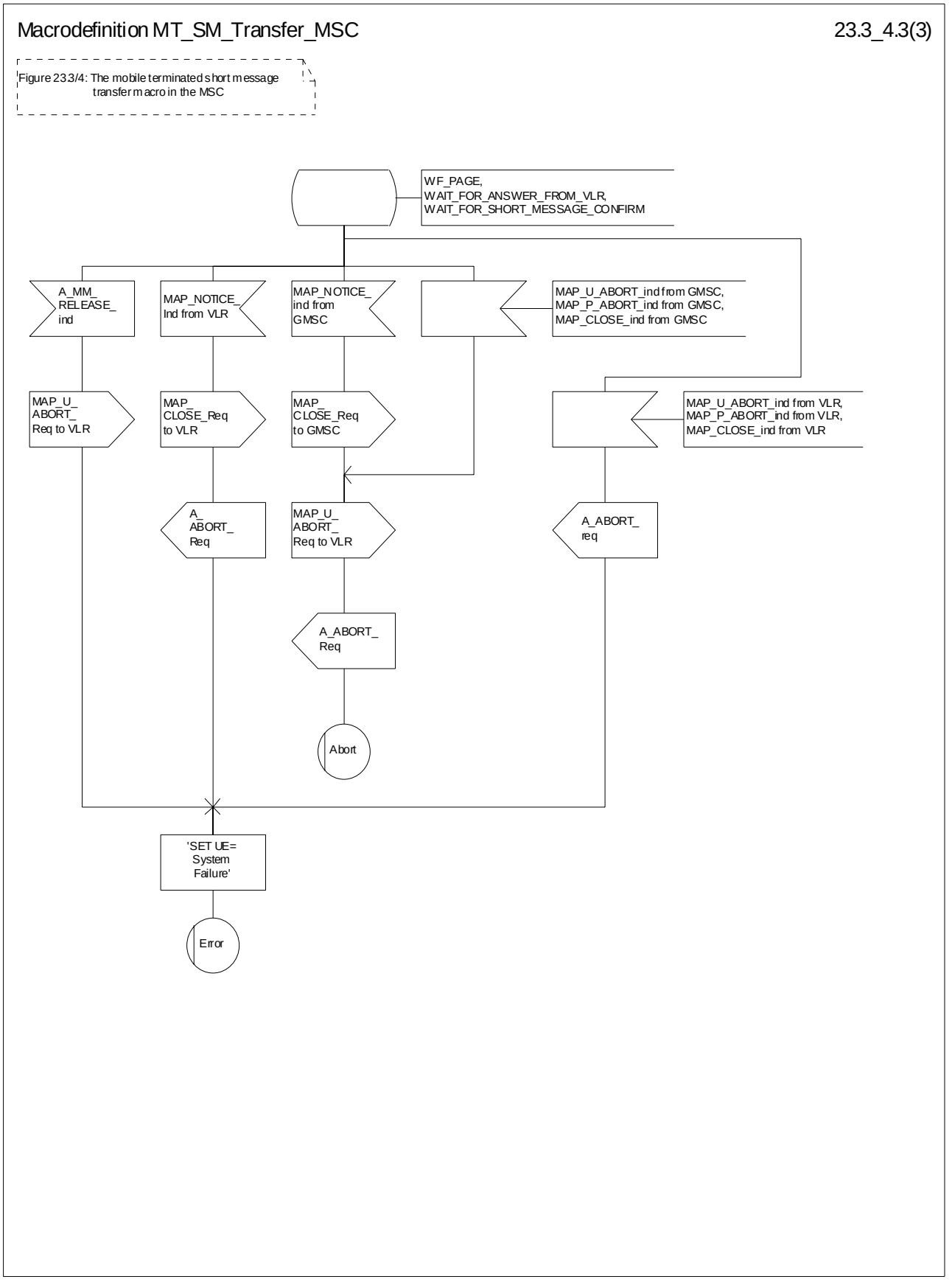


Figure 23.3/4 (sheet 3 of 3): Macro MT_SM_Transfer_MSC

23.3.2 Procedures in the VLR

When receiving the MAP_SEND_INFO_FOR_MT_SMS indication, the VLR will act as follows:

- the parameters and data in the primitive are checked by the macro "Check_Indication". A data failure is reported as an unexpected data value error or a data missing error depending on the nature of the failure;

- for mobile terminated short message the mobile subscriber is identified either by the IMSI only or by the IMSI accompanied by the LMSI. The subscriber identity information that may be included in the MAP_OPEN indication primitive and in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS". In the first case, the IMSI is included in the sm-RP-DA information field and the Destination Reference must not be present in the MAP_OPEN primitive. In the latter case the IMSI must be obtained from the Destination Reference of the MAP_OPEN indication primitive and an LMSI must be present in the sm-RP-DA information field of the MAP_SEND_INFO_FOR_MT_SMS indication. If the mobile subscriber is unknown, the unidentified subscriber error is returned;

- if the "Confirmed by HLR" indicator is set to "Not Confirmed", the unidentified subscriber error is returned;

- if the IMSI Detached Flag is set to detached or the LA Not Allowed Flag is set to not allowed in the VLR, an absent subscriber error with the diagnostic indication set to 'IMSI Detached' is returned and the MS not reachable flag (MNRF) is set;

- if the MAP_SEND_INFO_FOR_MT_SMS indication has passed all the tests, the VLR will initiate the paging procedure. If the location area identification is known and the "Confirmed by Radio Contact" indicator is set to "Confirmed", the MAP_PAGE service is used. Otherwise the MAP_SEARCH_FOR_MOBILE_SUBSCRIBER service is started.

The following responses to the paging procedure may be received from the MSC:

- the MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating a successful outcome, if the search procedure is used. After that the VLR awaits the MAP_PROCESS_ACCESS_REQUEST indication from the MSC;

- the MAP_PAGE confirmation or MAP_SEARCH_FOR_MOBILE_SUBSCRIBER confirmation indicating unsuccessful outcome. If an absent subscriber error is received, the MS not reachable flag (MNRF) is set in the VLR. The errors are forwarded to the MSC in the MAP_SEND_INFO_FOR_MT_SMS response, the absent subscriber error is forwarded with the diagnostic indication set to 'No Paging Response for non GPRS'. If the unexpected data value, or unknown location area error is received, the system failure indication is given to the MSC; if subscriber busy for MT SMS is received, this cause is given to the MSC.

- the MAP_PROCESS_ACCESS_REQUEST indication telling that the outcome of the service MAP_PAGE is successful.

If the paging procedure or process access request procedure or any other procedure invoked fails, the appropriate error is reported to the MSC.

If the process access request procedure is successful, the VLR will send the MAP_SEND_INFO_FOR_MT_SMS response to the MSC and the transaction is terminated in the VLR.

The mobile terminated short message transfer procedure in the VLR is shown in figure 23.3/5.

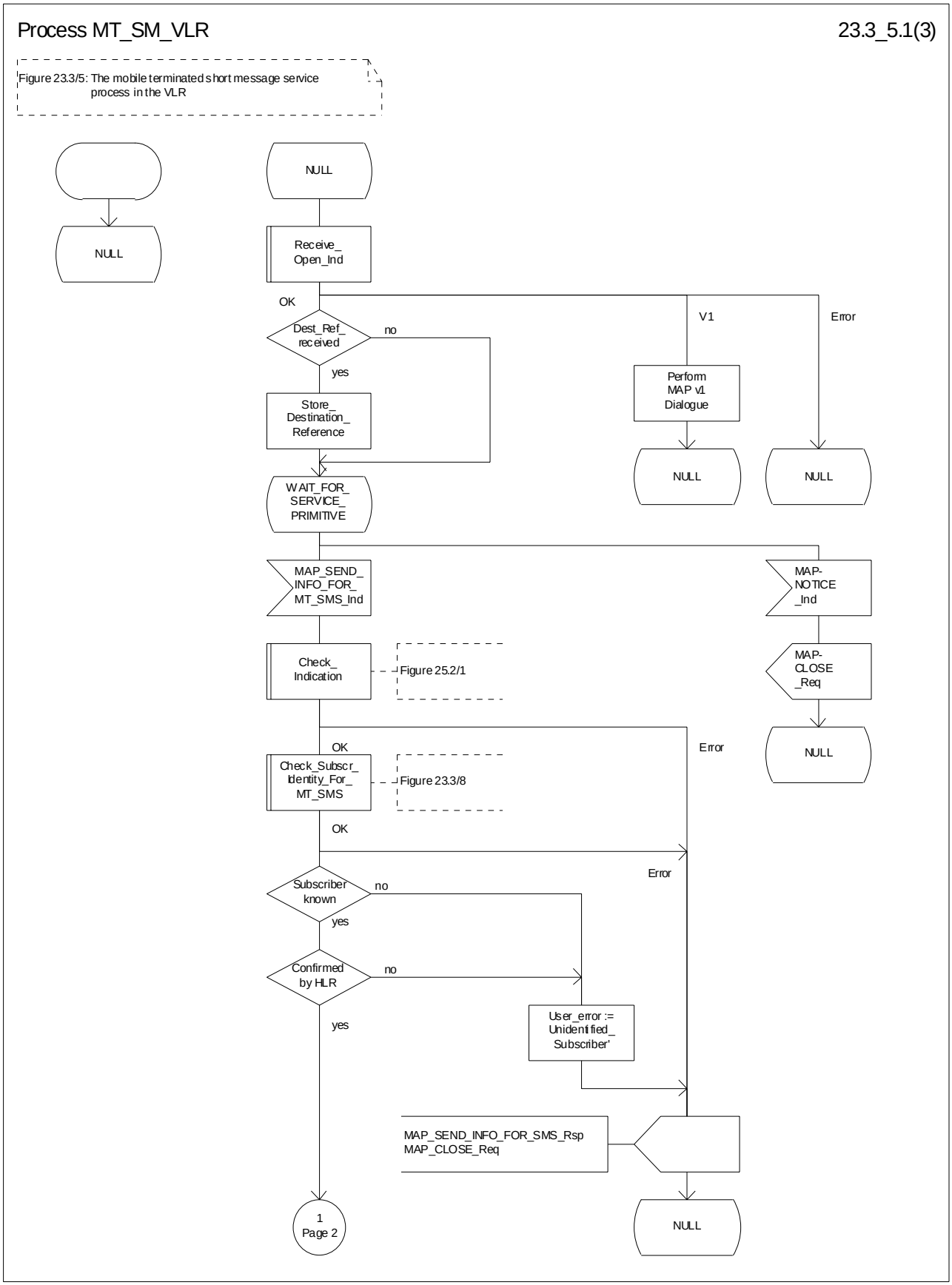


Figure 23.3/5 (sheet 1 of 3): Process MT_SM_VLR

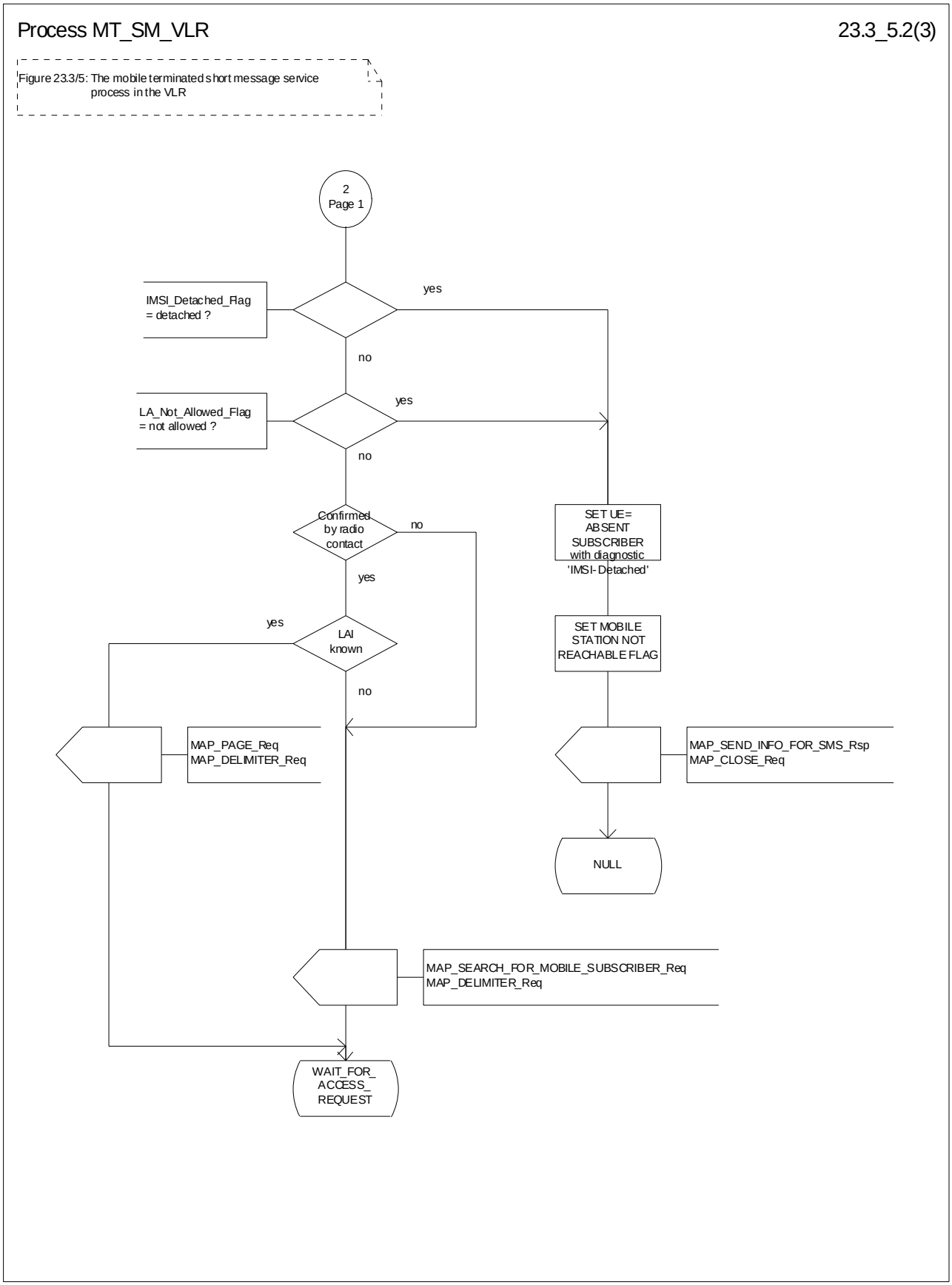


Figure 23.3/5 (sheet 2 of 3): Process MT_SM_VLR

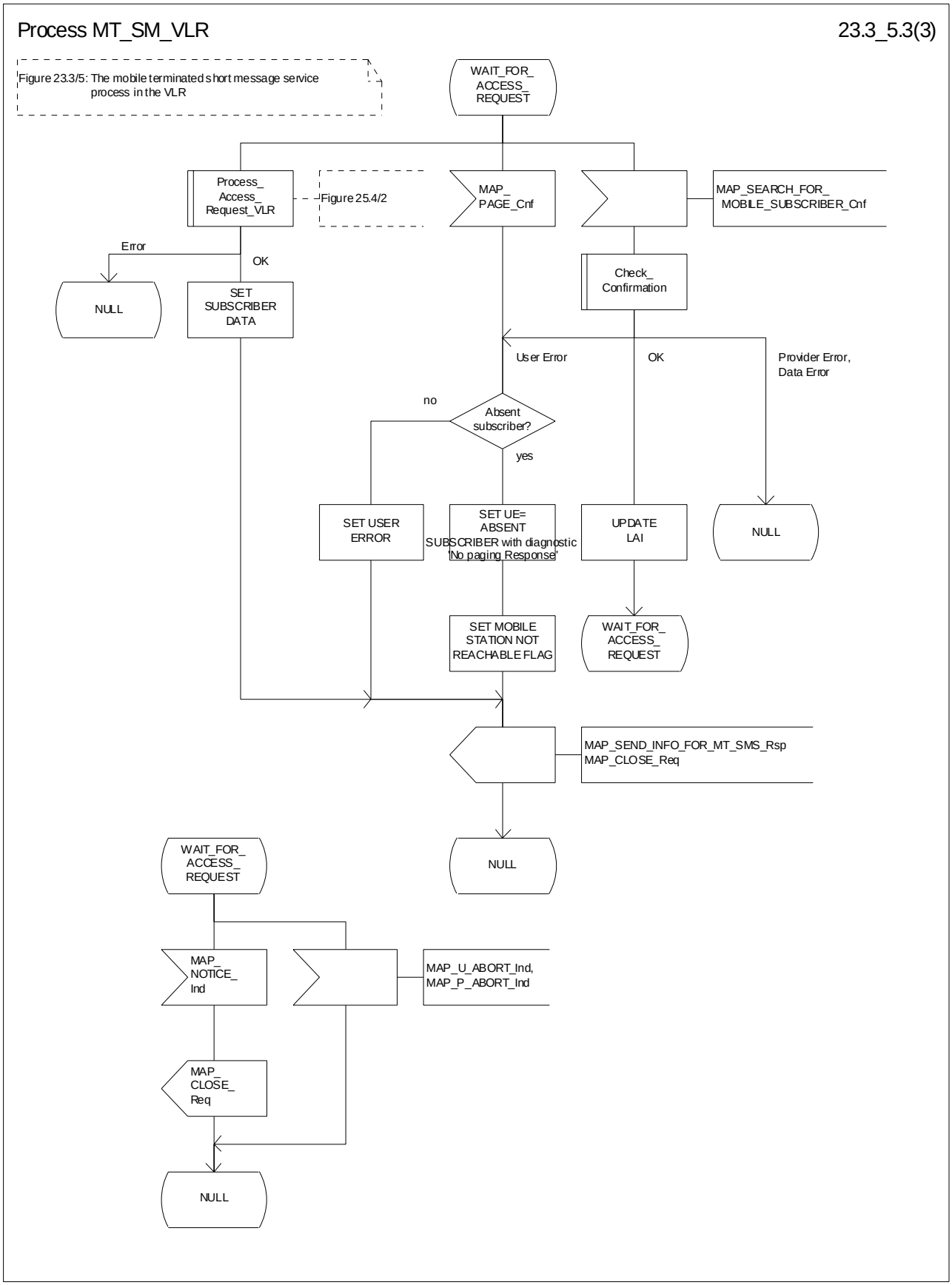


Figure 23.3/5 (sheet 3 to 3): Process MT_SM_VLR

23.3.3 Procedures in the HLR

The MAP_SEND_ROUTING_INFO_FOR_SM indication is received from the GMSC. The following error cases are reported to the GMSC in the MAP_SEND_ROUTING_INFO_FOR_SM response as an unsuccessful outcome of the procedure:

- if the necessary parameters and data are not present in the primitive or they are badly formatted, the data missing or unexpected data value error is returned;
- if the mobile subscriber is unknown, i.e. it cannot be identified from the MSISDN given, an unknown subscriber error is returned;
- if the short message transfer would contravene operator determined barring, the call barred error with cause operator barring is returned;
- if the short message transfer would contravene the « SM filtering by the HPLMN » function criteria, the call barred error with cause unauthorised Message Originator is returned (the definition of the filtering function is out of the scope of GSM specification. Filtering may be based on SM-RP-SMEA information element if received from the GMSC) ;
- if the mobile subscription identified by the given MSISDN number does not include the short message service, the teleservice not provisioned error is returned;
- if the GMSC does not support the GPRS functionality, the behaviour of the HLR depends on the following conditions:
    - If the subscriber is not a GPRS subscriber then the behaviour of the HLR shall be the same as for a subscriber only registered as non GPRS and for SMS delivery.
    - If the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the MSC when GPRS is not supported in the GMSC » then the behaviour of the HLR shall be the same as for a subscriber only registered as non GPRS and for SMS delivery.
    - If the subscriber is a GPRS subscriber and a non-GPRS subscriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscriber only then the behaviour of the HLR shall be the same as for the case transfer over GPRS described in MAP release 97, with the following precision : because GMSC does not support MAP release 97, the previous MAP protocol release is used. When the HLR sends the MAP_SEND_ROUTING_INFO_FOR_SM_Resp, the SGSN number is mapped to the MAP parameter « MSC number ». When the HLR sends the MAP_INFORM_SERVICE_CENTRE_resp, the MNRG status shall be mapped to the MAP parameter « mnrf-set ».

The HLR may send the MSC, SGSN or both numbers as routing information to SMS-GMSC based on the following:

A) The subscriber may only be registered as non GPRS and for SMS delivery:
    - if the short message transfer would contravene the supplementary service barring, the call barred error with cause barring service active is returned;
    - if the location registration of the mobile subscriber shows that the VLR in the visited PLMN does not support the MT short message service, the facility not supported error is returned;
- if no MSC identity is stored for the mobile subscriber or the "MSC Area Restricted Flag" is set or the "MS purged for non GPRS" flag is set, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flag MNRF is set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for non GPRS ', 'Roaming Restricted' or 'MS-Purged for non GPRS '.

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False) and the mobile station not reachable flag (MNRF) is set, an absent subscriber_SM error is returned. If a reason for the subscriber's absence for non GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, then this is returned with the absent subscriber_SM error. The SC-address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.

- if the priority is low (SM_RP_PRI = False), and the MNRF is clear, the routing information with MSC number is retrieved as described below;

- if the priority is high (SM_RP_PRI = True) and the MNRF is set, the HLR will send the acknowledge primitive containing the routing information with MSC number to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

B) The subscriber may only be registered as GPRS and for SMS delivery:

- if the location registration of the mobile subscriber shows that the SGSN in the visited PLMN does not support the MT short message service, the facility not supported error is returned;

- if no SGSN identity is stored for the mobile subscriber or the "SGSN Area Restricted Flag" is set or the "MS purged for GPRS" flag is set, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flag MNRG is set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for GPRS', 'Roaming Restricted' or 'MS-Purged for GPRS '.

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False) and the mobile station not reachable for GPRS (MNRG) flag is set, an absent subscriber_SM error is returned. If a reason for the subscriber's absence for GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, then this is returned with the absent subscriber_SM error. The SC-address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.

- if the priority is low (SM_RP_PRI = False), and the MNRG is clear, the routing information with SGSN number is retrieved as described below;

- if the priority is high (SM_RP_PRI = True) and the MNRG is set, the HLR will send the acknowledge primitive containing the routing information with SGSN number to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

C) The subscriber may be registered as non GPRS and GPRS and for SMS Delivery:

- if the short message transfer would contravene the supplementary service barring, the behaviour is the same as for a subcriber only registered for GPRS and SMS delivery.

- if the location registration of the mobile subscriber shows that the VLR in the visited PLMN does not support the MT short message service, the behaviour is the same as for a subcriber only registered for GPRS and SMS delivery;

- if the location registration of the mobile subscriber shows that the SGSN in the visited PLMN does not support the MT short message service, the behaviour is the same as for a subcriber only registered for non GPRS and SMS delivery;

- if no MSC and SGSN identities are stored for the mobile subscriber or the "MSC and SGSN Area Restricted Flags" are set or the "MS purged for non GPRS and GPRS" flags are set or a combination of these errors for non GPRS and GPRS are used, i.e. the MS is not reachable, the MSISDN-Alert and the SC address are included in the MWD (if possible), the flags MNRF and MNRG are set and the "Absent Subscriber_SM" error is returned with the appropriate absent subscriber diagnostic indication, i.e. 'Deregistered in HLR for non GPRS or GPRS', 'Roaming Restricted', 'MS-Purged for non GPRS or GPRS' or both.

The priority parameter (SM_RP_PRI) is processed as follows:

- if the priority is low (SM_RP_PRI = False), the MNRF and MNRG are set, an absent subscriber_SM error is returned. If reasons for the subscriber's absence for non GPRS and GPRS are stored in MNRR in the subscriber data, then this is returned with the absent subscriber_SM error. The SC-address given in the request will be included in the MWD if possible. The service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address has been included in the MWD list.

- if the priority is low (SM_RP_PRI = False), and the MNRF is clear and MNRG is set, the routing information with MSC number is retrieved as described below;

- if the priority is low (SM_RP_PRI = False), and the MNRF is set and MNRG is clear, the routing information with SGSN number is retrieved as described below

- if the priority is low (SM_RP_PRI = False), and the MNRF and MNRG are clear, the routing information with MSC and SGSN numbers is retrieved as described below;

- if the priority is high (SM_RP_PRI = True) and the MNRF, the MNRG or both are set, the HLR will send the acknowledge primitive containing the routing information with both MSC and SGSN numbers to the gateway MSC. In addition the service MAP_INFORM_SERVICE_CENTRE including the parameter MW Status is invoked to indicate whether or not the SC address is already included in the MWD list.

If the MSISDN-Alert number of the mobile subscriber stored in the MWD is not the same as that received in the MAP_SEND_ROUTING_INFO_FOR_SM indication, the HLR will include in the MAP_INFORM_SERVICE_CENTRE request to the GMSC the MSISDN-Alert number stored.

The MAP_INFORM_SERVICE_CENTRE request is sent also when the MCEF, MNRF, MNRG or both are set but the routing information is still sent to the GMSC. The status of the flags is indicated in the parameter MW Status.

The routing information is included in a MAP_SEND_ROUTING_INFO_FOR_SM response as follows:

- the IMSI will be returned to the GMSC together with the MSC, SGSN or both numbers and may be optionally accompanied by the LMSI.

- an indication specifying which number belongs the MSC and the SGSN will be returned to the GSMC.

LMSI shall not be used in case only the SGSN number is sent by HLR.

The mobile terminated short message transfer procedure in the HLR is shown in figure 23.3/6.

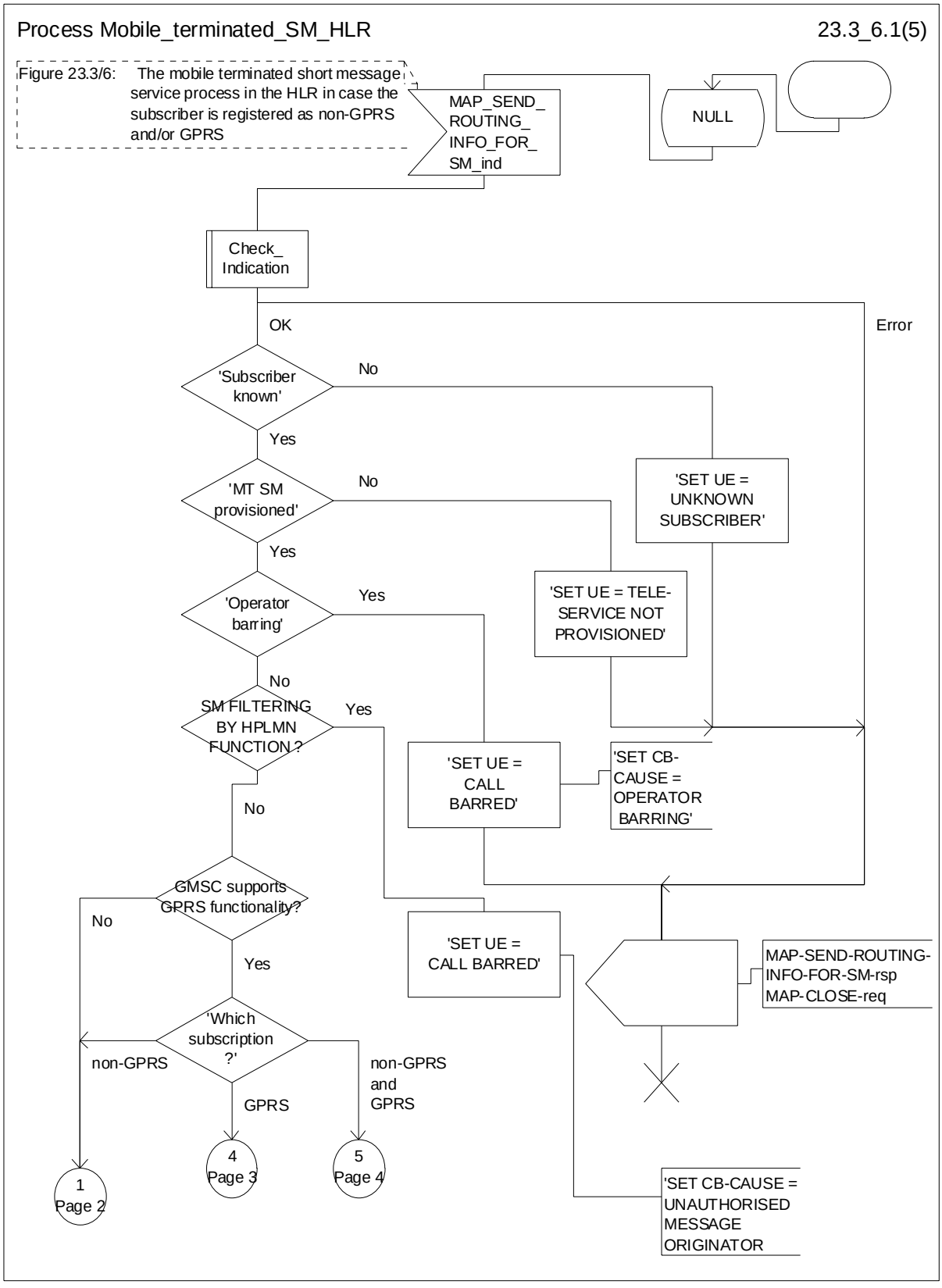


Figure 23.3/6 (sheet 1 of 5): Process Mobile_terminated_SM_HLR

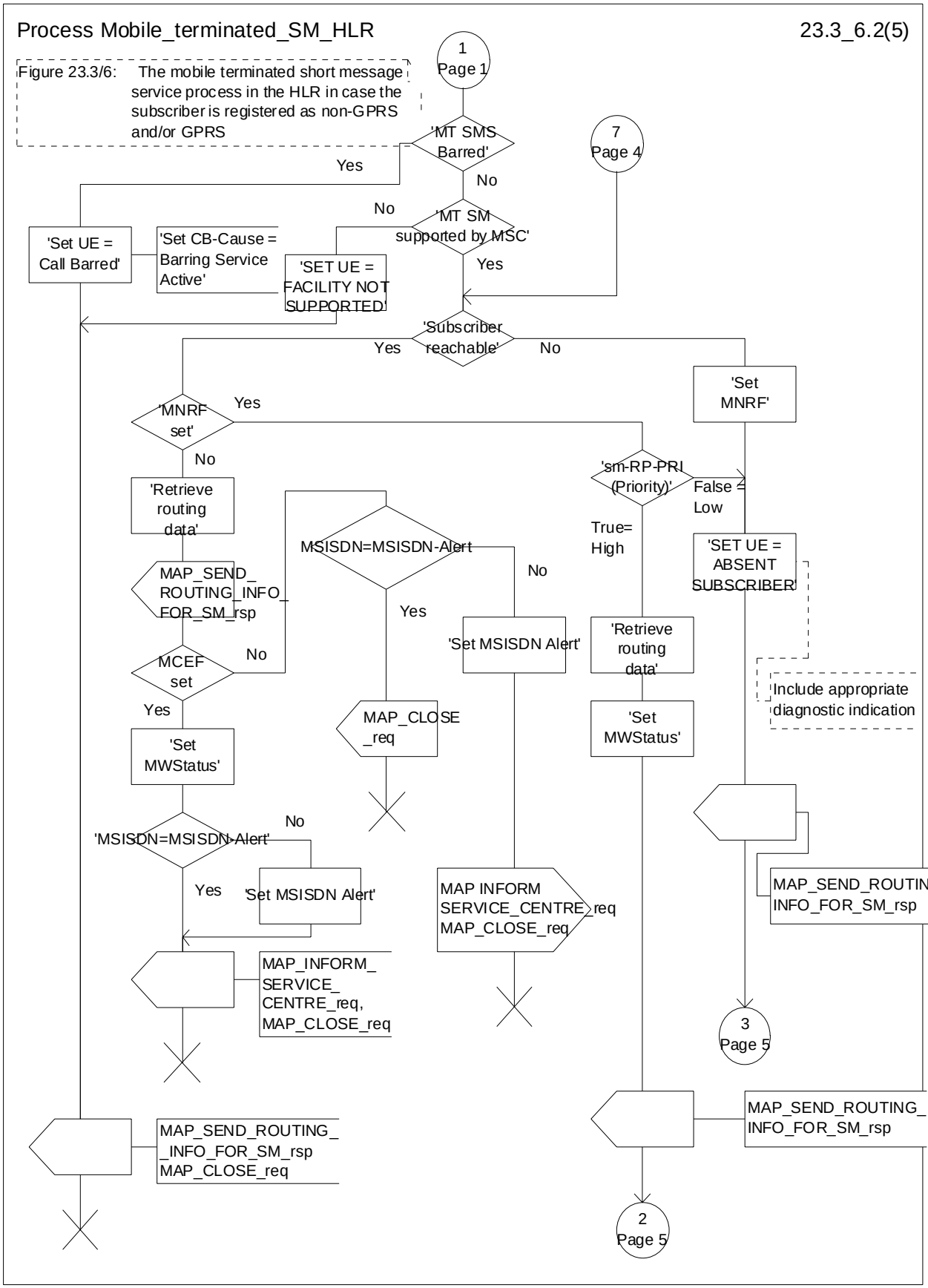


Figure 23.3/6 (sheet 2 of 5): Process Mobile_terminated_SM_HLR

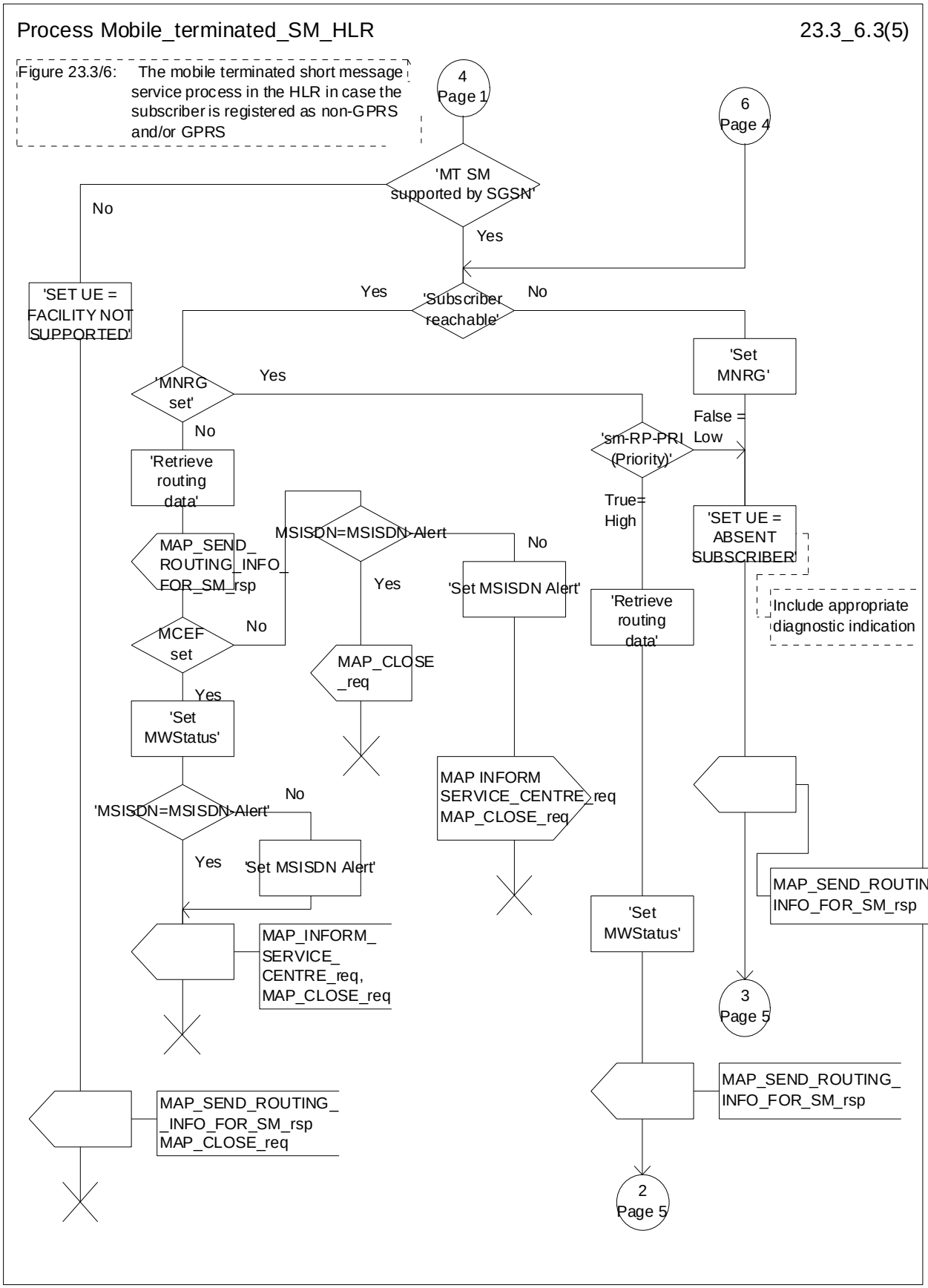


Figure 23.3/6 (sheet 3 of 5): Process Mobile_terminated_SM_HLR

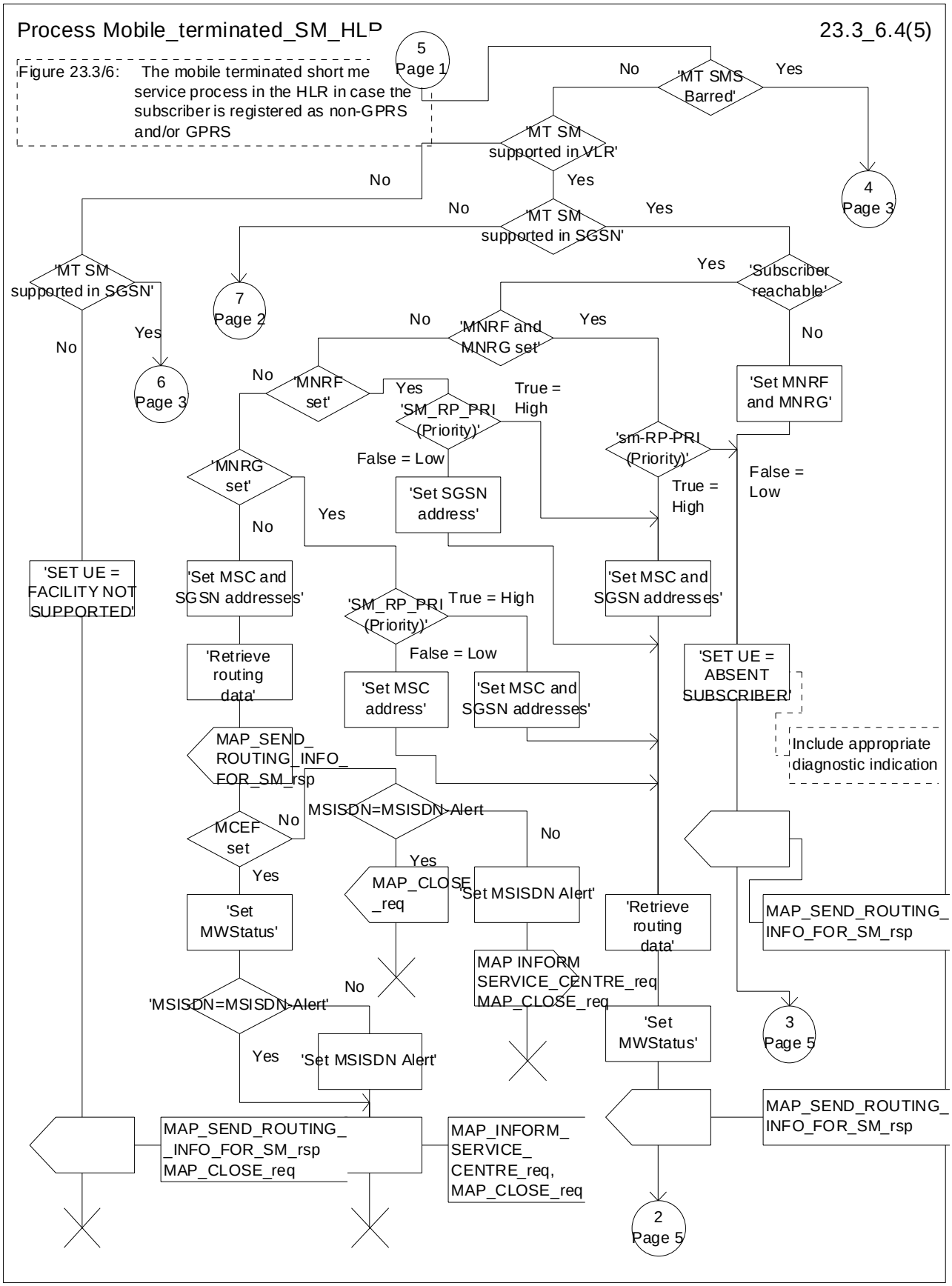


Figure 23.3/6 (sheet 4 of 5): Process Mobile_terminated_SM_HLR

Process Mobile_terminated_SM_HLR 23.3_6.5(5)

Figure 23.3/6: The mobile terminated short message service process in the HLR in case the subscriber is registered as non-GPRS and/or GPRS

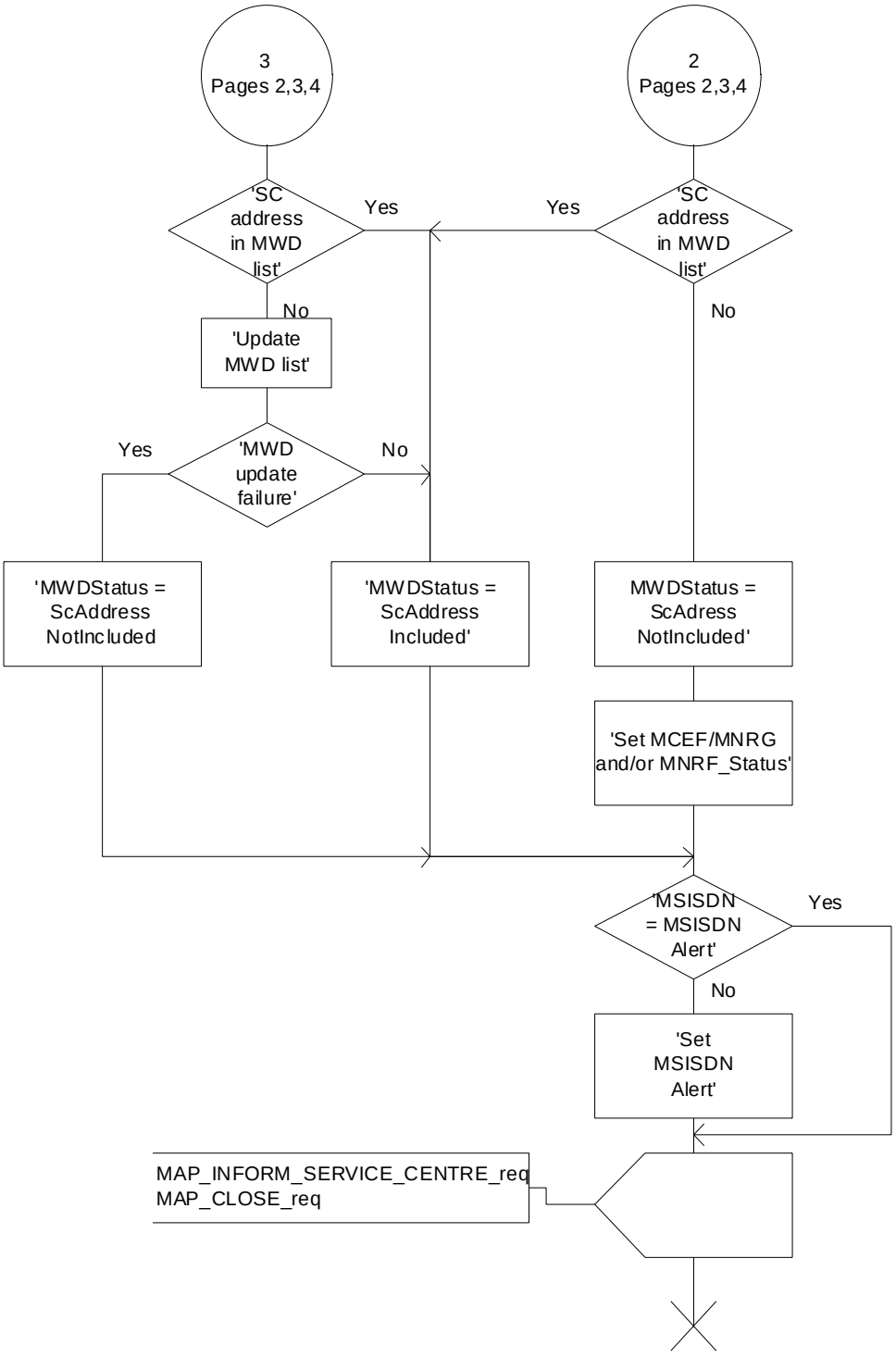


Figure 23.3/6 (sheet 5 of 5): Process Mobile_terminated_SM_HLR

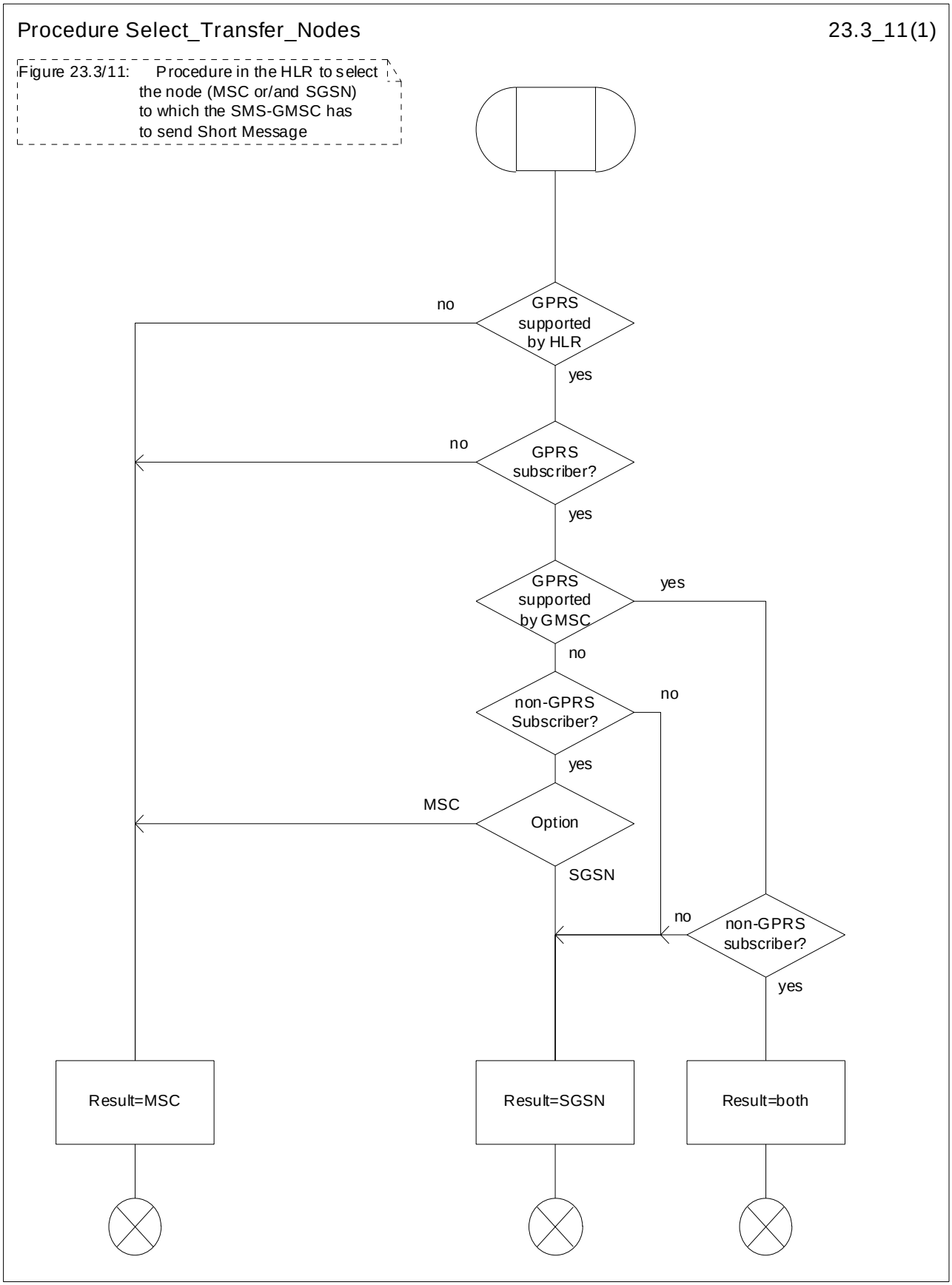


Figure 23.3/11: Procedure Select_Transfer_Nodes

23.3.4 Procedures in the gateway MSC

The short message handling function of the GMSC will request routing information when a mobile terminated short message is received from a Service Centre. The GMSC sends the MAP_SEND_ROUTING_INFO_FOR_SM request to the HLR containing the subscriber data of the mobile subscriber and the indication that the SMS-GMSC supports the GPRS functionality.

As an outcome of the procedure the MAP_SEND_ROUTING_INFO_FOR_SM confirmation is received indicating:

- an unsuccessful event indication containing an error;

  The mapping between the MAP error causes and the RP_ERROR causes is explained in TS GSM 03.40.

- a successful event indication containing following parameters:

  - an IMSI optionally accompanied by an LMSI; and

  - routing addresses (servicing MSC, SGSN or both numbers).

The LMSI shall not be used in case the short message is routed towards the SGSN.

The GMSC may also receive a MAP_INFORM_SERVICE_CENTRE indication after the MAP_SEND_ROUTING_INFO_FOR_SM confirmation. The parameter MW Status in the message indicates whether or not the Service Centre address is stored in the Message Waiting Data. It also indicates the status of the MCEF , MNRF and MNRG flags in the HLR.

If the MSISDN-Alert stored in the MWD data is not the same as the one sent to the HLR, the MSISDN-Alert is received in the MAP_INFORM_SERVICE_CENTRE indication. This MSISDN number shall be transferred in a delivery failure report to the SC.

In the abnormal end or in the provider error case the system failure error is provided to the SC.

The forward short message procedure is initiated when the GMSC has obtained the routing information needed to forward a mobile terminated short message to the servicing MSC or SGSN.

If both numbers MSC and SGSN are received from HLR as routing information, the SMS-GMSC may choose which path (SGSN or MSC) first the SMS is to be transfered.

If an LMSI has been provided in the MAP_SEND_ROUTING_INFO_FOR_SM confirmation, it can be included in the sm-RP-DA information field of the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the servicing MSC. In this case, the IMSI must be included in the Destination Reference of the MAP_OPEN request. If the LMSI is not sent by the SMS Gateway MSC, the sm-RP-DA information field in the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the servicing MSC or SGSN shall contain the IMSI and the Destination Reference in the MAP_OPEN request shall not be present. The Service Centre address is sent in the parameter SM_RP_OA. The More Messages To Send flag is set to TRUE or FALSE depending on the information received from the Service Centre.

If the GMSC is the servicing MSC then the MAP service is not initiated. The procedure in the Servicing MSC is described in subclause 23.3.1 and in the figure 23.3/4.

If the grouping of MAP_OPEN request and MAP_MT_FORWARD_SHORT_MESSAGE request together would need segmenting, these primitives must not be grouped together. The MAP_OPEN request primitive is sent first without any associated MAP service request primitive and the dialogue confirmation must be received before the MAP_MT_FORWARD_SHORT_MESSAGE request is sent.

As a response to the procedure, the GMSC will receive the MAP_MT_FORWARD_SHORT_MESSAGE confirmation indicating:

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

- unsuccessful forwarding of the short message:

  In case only one number (MSC or SGSN) was received from HLR as routing information,the mapping of the MAP error causes and the RP_ERROR causes is explained in TS GSM 03.40. The appropriate error indication is sent to the SC.

In case both numbers (MSC and SGSN) were received from HLR as routing information, the transfer of SMS is re-attempted towards the second path only when one of the following errors is received from the unsuccessful transfer over the first path:

Facility Not Supported

Unidentified Subscriber

Absent Subscriber with indication: GPRS or IMSI Detach

Unexpected Data Value

System failure

Data Missing

Subscriber Busy for MT SMS: GPRS Connection Suspended,

otherwise, the mapping of the MAP error causes and the RP_ERROR causes is performed (see TS GSM 03.40) and the appropriate error indication is sent to the SC.

If second forwarding of short message is unsuccessful, the mapping of the MAP error causes and the RP_ERROR causes is explained in TS GSM 03.40. The appropriate error indications are sent to the SC.

If second forwarding of short message is successful, the successful indication is passed to the SC.

A provider error is indicated as a system failure error to the SC.

The GMSC invokes the procedure MAP_REPORT_SM_DELIVERY_STATUS, if an absent subscriber_SM, an unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded indication is received from the servicing MSC, SGSN or both, and the corresponding flags received in the MAP_INFORM_SC are not already set or the SC address is not yet included in the MWD set.

If absent subscriber diagnostic information (see GSM 03.40) is included with the absent subscriber_SM error indication then this information is relayed to the HLR using the procedure MAP_REPORT_SM_DELIVERY_STATUS.

In case the SMS was attempted to be delivered towards the MSC and the SGSN, and both delivery failed with causes described above, the two unsuccessful SMS delivery outcomes for GPRS and non GPRS are sent to the HLR.

In case the SMS was attempted to be deliverd towards the MSC and the SGSN, and the first delivery failed with causes described above and the second delivery succeeded, the unsuccessful and successful SMS delivery outcomes for GPRS and non GPRS are sent to HLR.

The gateway MSC may also invoke the procedure when the first SMS delivery was successful towards MSC, if the MNRF, MCEF flags or both were set in the HLR.

The gateway MSC may also invoke the procedure when the fisrt SMS delivery was successful towards SGSN, if the MNRG, MCEF flags or both were set in the HLR.

This procedure is described in detail in subclause 23.5.

Unexpected data value, system failure errors are indicated as a system failure to the SC. Other errors are indicated using appropriate cause values and diagnostic information between the GMSC and the SC as described in TS GSM 03.40 and GSM 04.11.

The unidentified subscriber error is indicated to the SC as absent subscriber with diagnostic information set to 'Unidentified subscriber' as described in TS GSM 03.40.

Note that the indication, on which number belongs the SGSN and MSC, received from the HLR at routing information result (see subclause 23.3.3) will enable the GMSC to map the causes received from the SGSN, MSC or both into the appropriate causes for non GPRS, GPRS or both, and send them to the SC and HLR.

If there are more short messages to send in the Service Centre and the previous short message transfer succeeded, then the gateway MSC awaits the next short message.

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

If the gateway MSC is the servicing MSC, then the short message transfer to mobile subscriber is started as described in the subclause 23.3.1.

The mobile terminated short message transfer procedure in the gateway MSC is shown in figure 23.3/7.

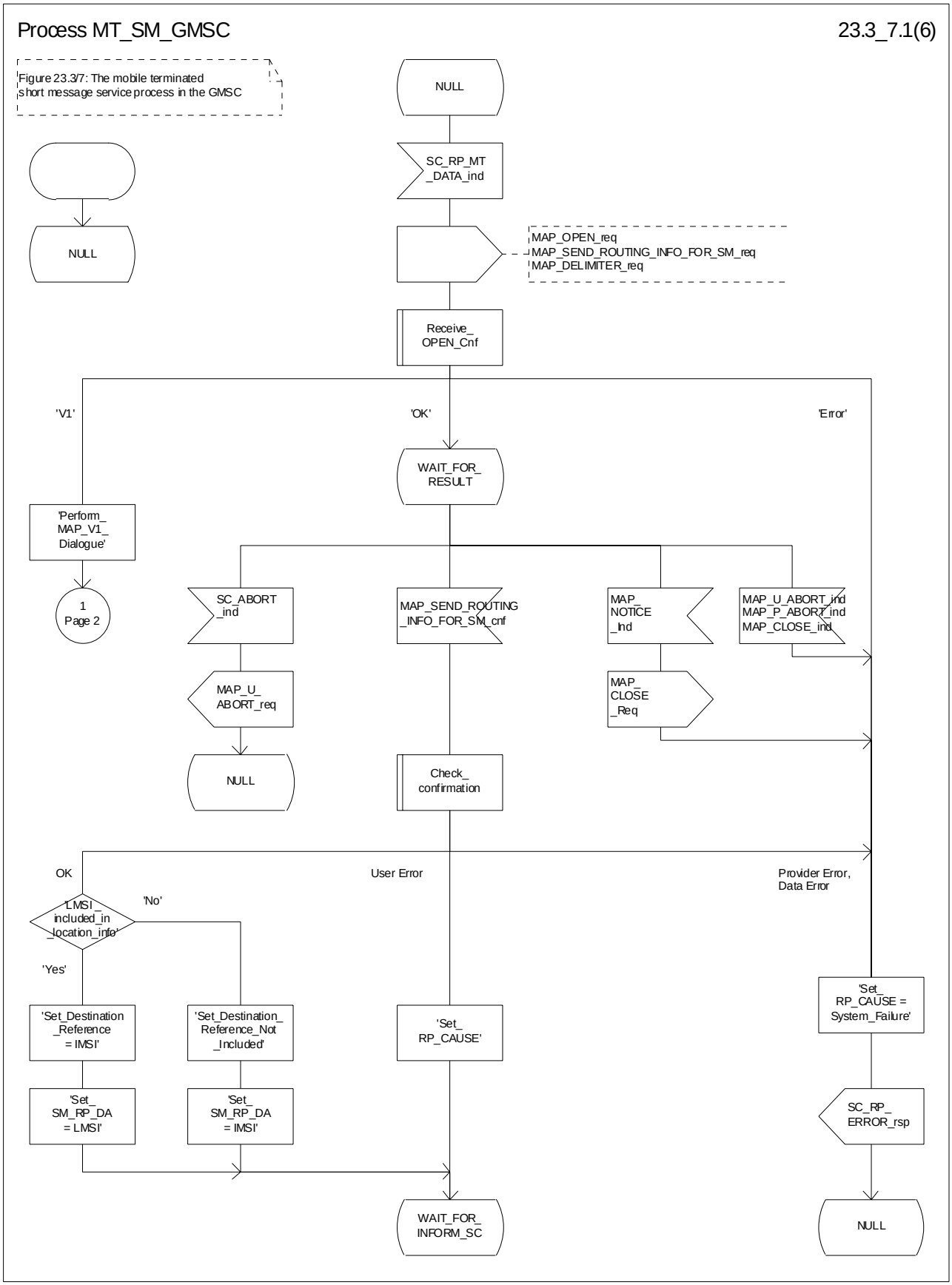


Figure 23.3/7 (sheet 1 of 6): Procedure MT_SM_GMSC

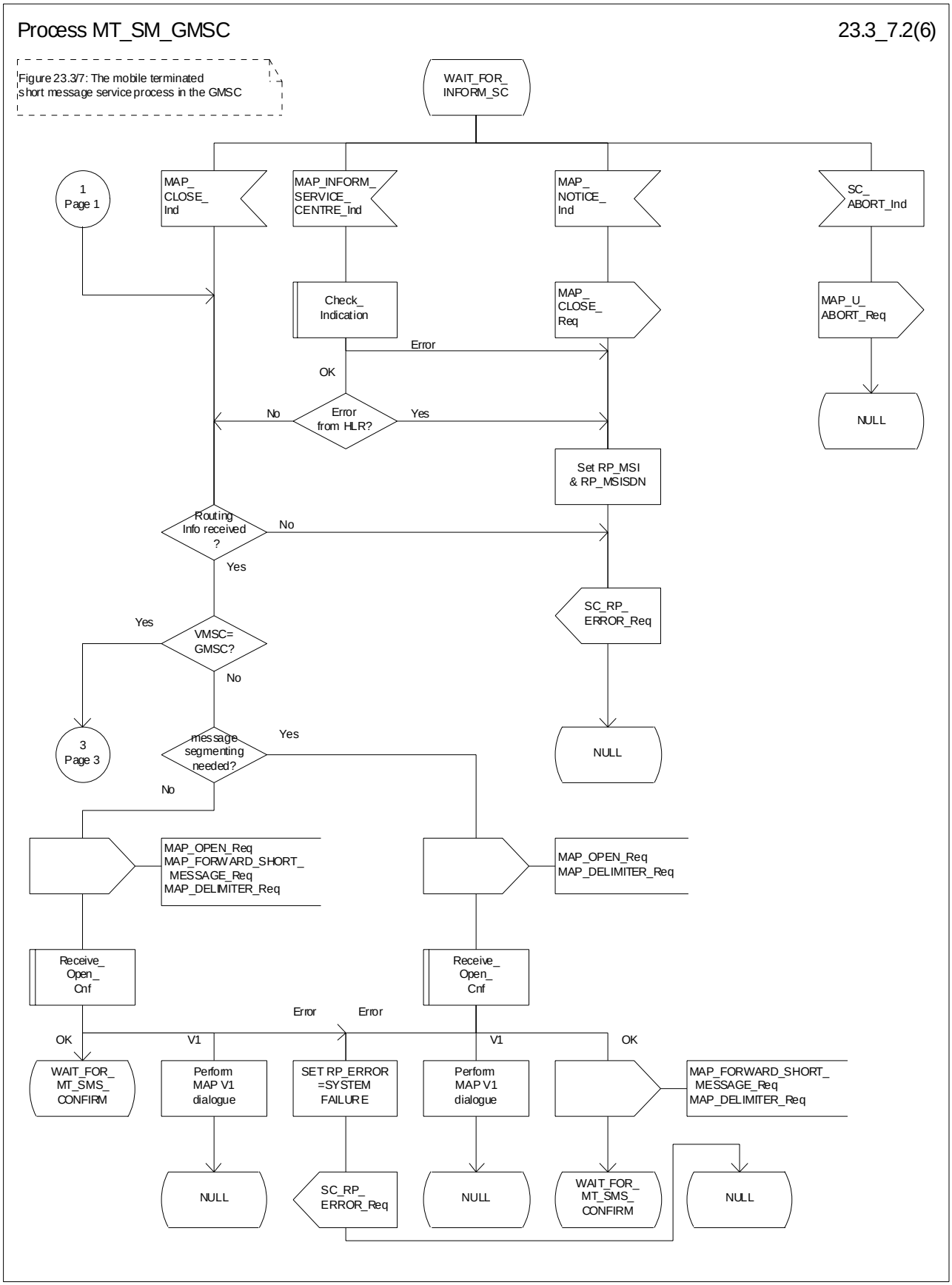


Figure 23.3/7 (sheet 2 to 6): Procedure MT_SM_GMSC

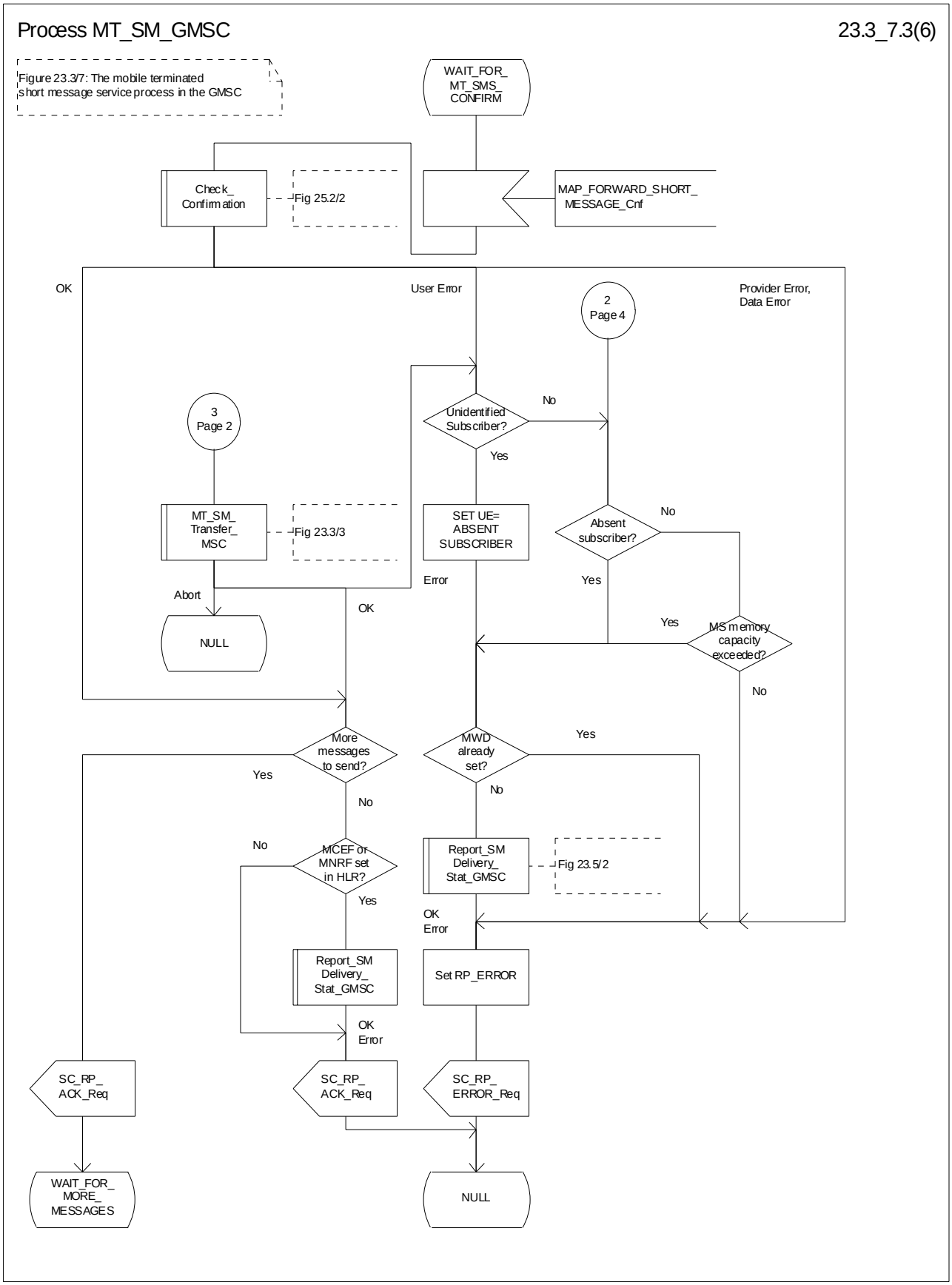


Figure 23.3/7 (sheet 3 of 6): Procedure MT_SM_GMSC

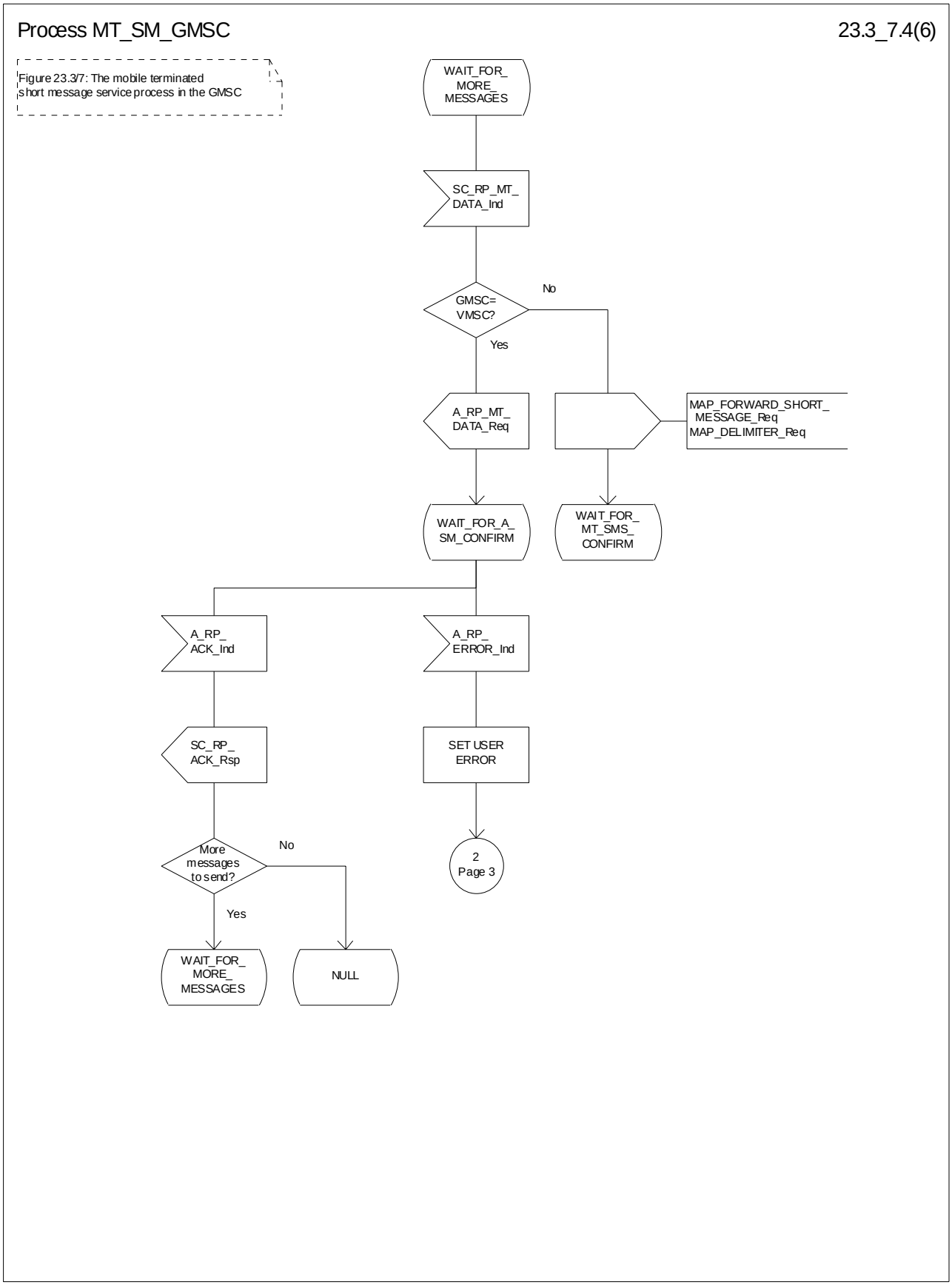


Figure 23.3/7 (sheet 4 of 6): Procedure_MT_SM_GMSC

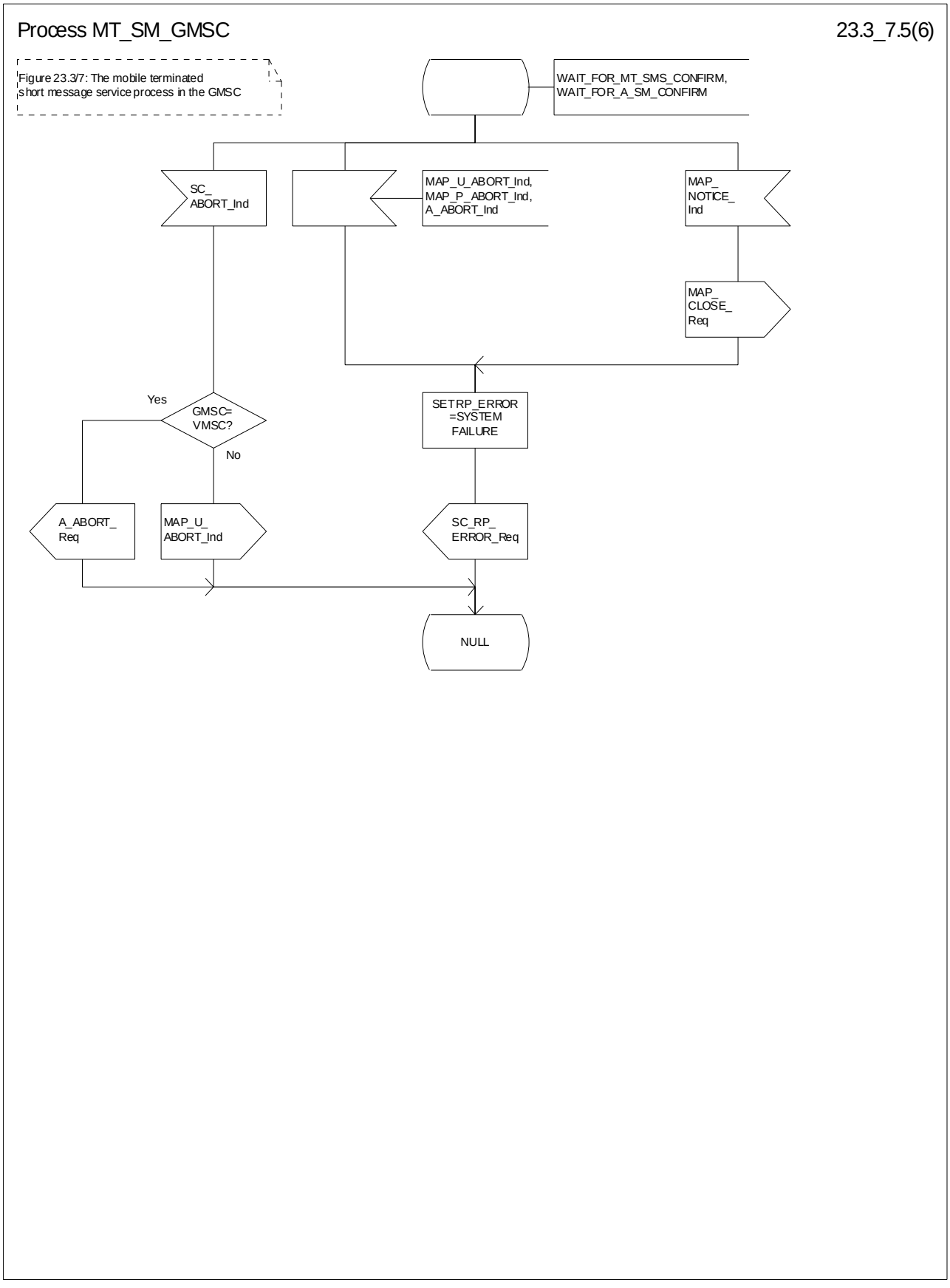


Figure 23.3/7 (sheet 5 to 6): Procedure MT_SM_GMSC

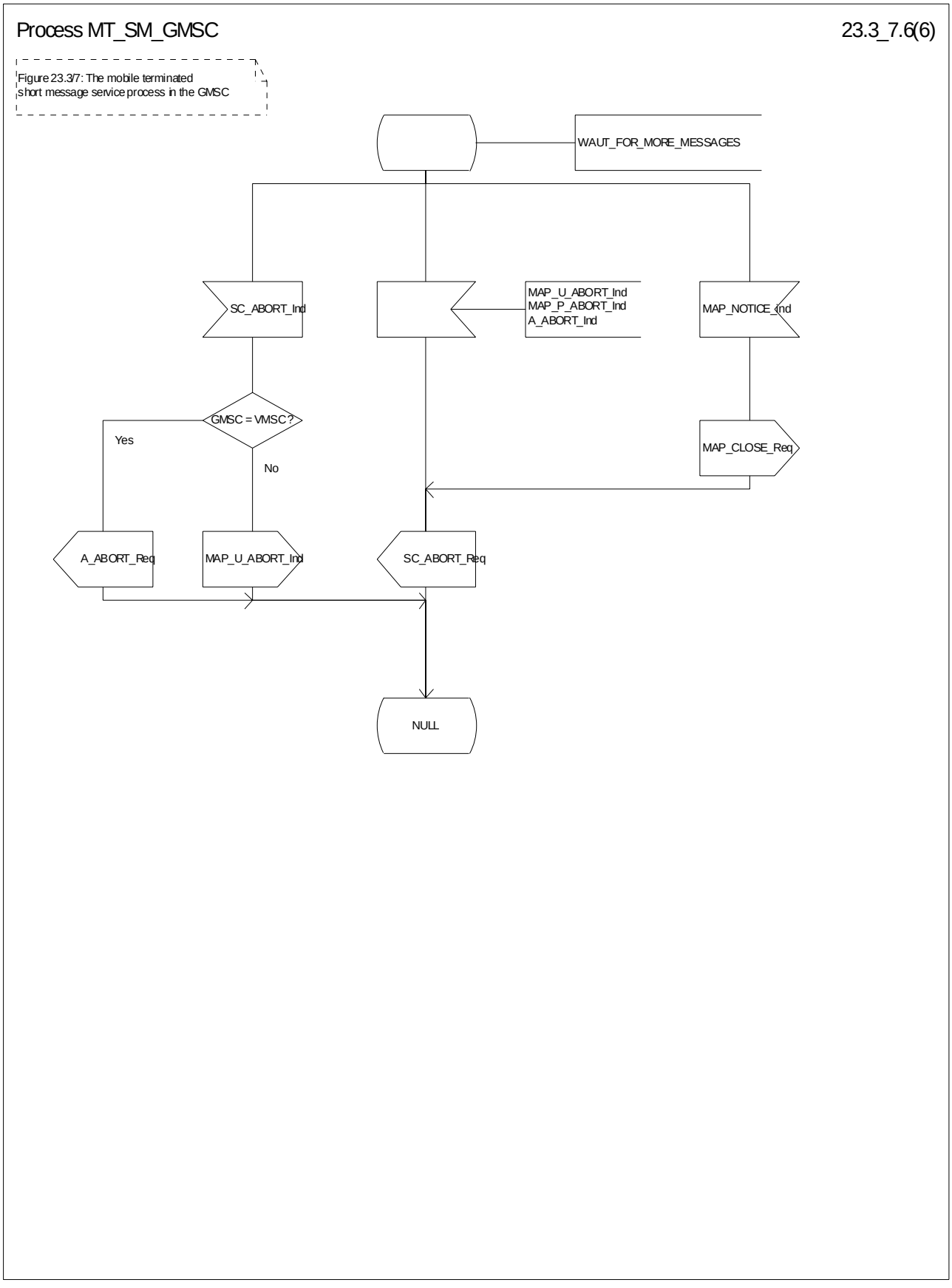


Figure 23.3/7 (sheet 6 of 6): Procedure MT_SM_GMSC

Macrodefinition Check_Subscr_Identity_For_MT_SMS 23.3_8(1)

Figure 23.3/8: Check of the subscriber identity for a mobile terminated short message in the servicing MSC and in the VLR

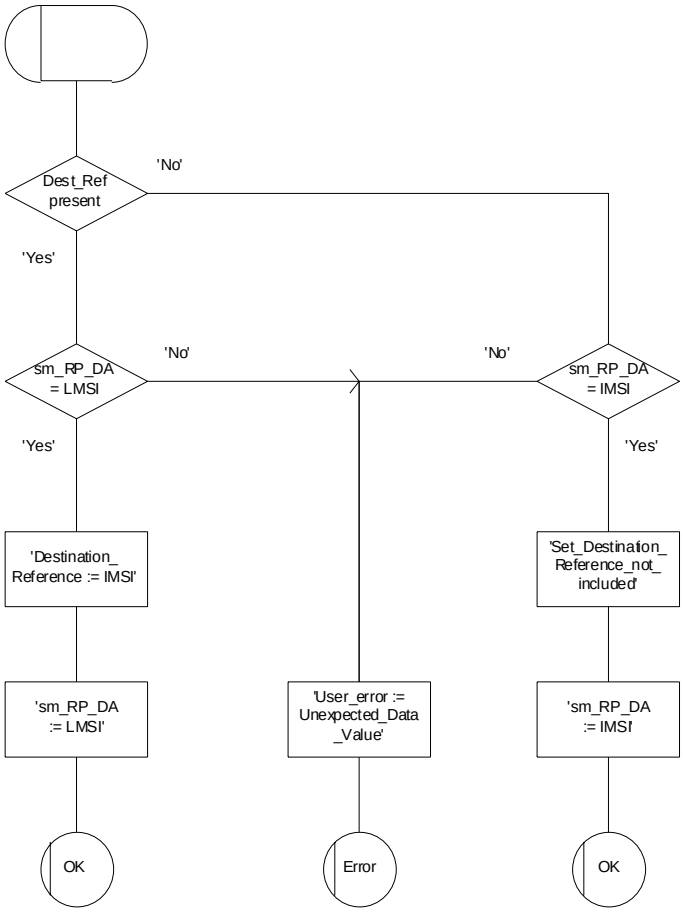


Figure 23.3/8: Macro Check_Subscr_Identity_For_MT_SMS

23.3.5 Procedure in the Servicing SGSN

When initiating the dialogue with the servicing SGSN, the SMS Gateway MSC must provide the IMSI of the subscriber to whom the short message is directed.

The IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication.

When receiving a MAP_OPEN indication primitive that is not associated with any MAP service indication primitive and if the dialogue is accepted, the MAP service-user in the servicing SGSN issues a MAP_DELIMITER request primitive in order to trigger the local MAP service-provider to confirm the dialogue.

When receiving the first MAP_MT_FORWARD_SHORT_MESSAGE indication from the gateway MSC, the servicing SGSN performs some subscriber data checks, if the MAP service primitive is accepted and if short message service is supported in the servicing SGSN.

The MAP_MT_FORWARD_SHORT_MESSAGE indication primitive is checked by the macro "Check_Indication". If the received MAP service primitive contains errors, the service is aborted and an unexpected data value error or data missing error is returned to the GMSC.

If the SGSN does not support the short message service, the service is aborted in the servicing SGSN and the error "Facility Not Supported" is returned to the GMSC.

If the connection is GPRS suspended, the SGSN sends to the GMSC an error specifying that the GPRS connection is suspended.

The subscriber identity information that are included in the MAP service indication primitive is checked by the macro "Check_Subscr_Identity_For_MT_SMS" as follows:

If the IMSI is included in the sm-RP-DA information field of the MAP_MT_FORWARD_SHORT_MESSAGE indication, the MAP_OPEN indication received from the gateway MSC shall not include a Destination Reference.

If no Destination Reference has been received and the sm-RP-DA information field does not cover an IMSI the service is aborted in the servicing SGSN and the error "Unexpected Data Value" is returned to the GMSC.

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

- if the mobile subscriber is unknown, the unidentified subscriber error is forwarded to the GMSC;
- if the “Confirmed by HLR” indicator is set to “Not Confirmed”, the unidentified subscriber error is forwarded to the GMSC.
- if the GPRS Detached Flag is set to detached or the LA Not Allowed Flag is set to not allowed in the SGSN, an absent subscriber error with the diagnostic indication set to 'GPRS Detached' is forwarded to the GMSC and the MS not reachable for GPRS (MNRG) flag is set;
- If the location area identification is known and the "Confirmed by Radio Contact" indicator is set to "Confirmed", the paging procedure is invoked (see subclause 25.3).Otherwise the search procedure is invoked (see subclause 25.3).

The result of the paging or the search procedure is processed as follows:

- if the procedure is completed successfully, the SGSN may trigger the Authentication, Ciphering and IMEI check procedures (see subclauses 25.4 and 25.5). Then, if the procedure are completed successfully, the SGSN will send the short message to the MS;

- if the procedure is completed successfully, but the MS has no mobile terminated short message transfer capability, the SM delivery failure indication with cause "equipment not SM equipped" is provided to the GMSC;

- if the procedure is ended unsuccessfully because of subscriber already busy for SMS, another paging, emergency call, location updating, inter SGSN routing area update or a call set-up, the subscriber busy for MT SMS is provided to the GMSC.

- if the procedure is ended unsuccessfully, the absent subscriber_SM error is forwarded to the GMSC with the absent subscriber diagnostic indication set to 'No Paging Response for GPRS', but if the location area is unknown, the system failure indication is provided to the GMSC.

If forwarding of the short message is initiated, the SGSN awaits the result before one of the following responses is sent back to the GMSC:

- an acknowledge if the short message has been successfully delivered to the mobile subscriber;

- an SM delivery failure error containing a parameter indicating either of the following: there is a MS protocol error or the MS memory capacity is exceeded; detailed diagnostic information (see subclause 7.6.1.4) may also be carried;

- a system failure error if the delivery procedure is aborted.

If the More Messages To Send flag was FALSE or the service MAP_MT_FORWARD_SHORT_MESSAGE ends unsuccessfully, the transaction to the gateway MSC is terminated. Otherwise, the servicing SGSN waits for the next short message from the Service Centre.

When receiving the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the gateway MSC the servicing MSC will act as follows:

- if the received primitive contains errors, the unexpected data value error or data missing error is provided to the gateway MSC;

- if the More Messages To Send flag is FALSE, the servicing SGSN will start the short message transfer procedure to the mobile subscriber. The successful or unsuccessful outcome of this procedure is reported to the gateway MSC and the transaction is terminated.

- if the More Messages To Send flag is TRUE, the servicing SGSN will start the short message transfer to the mobile subscriber. If the outcome of this procedure is unsuccessful, the reason is reported to the gateway MSC and the procedure is terminated. If the procedure is successful, it is acknowledged to the gateway MSC and more short messages can be received.

The mobile terminated short message transfer procedure in the servicing SGSN is shown in figures 23.3/9 and 23.3/10. The page and search procedures are shown in figure 25.3/1 and 25.3/2.

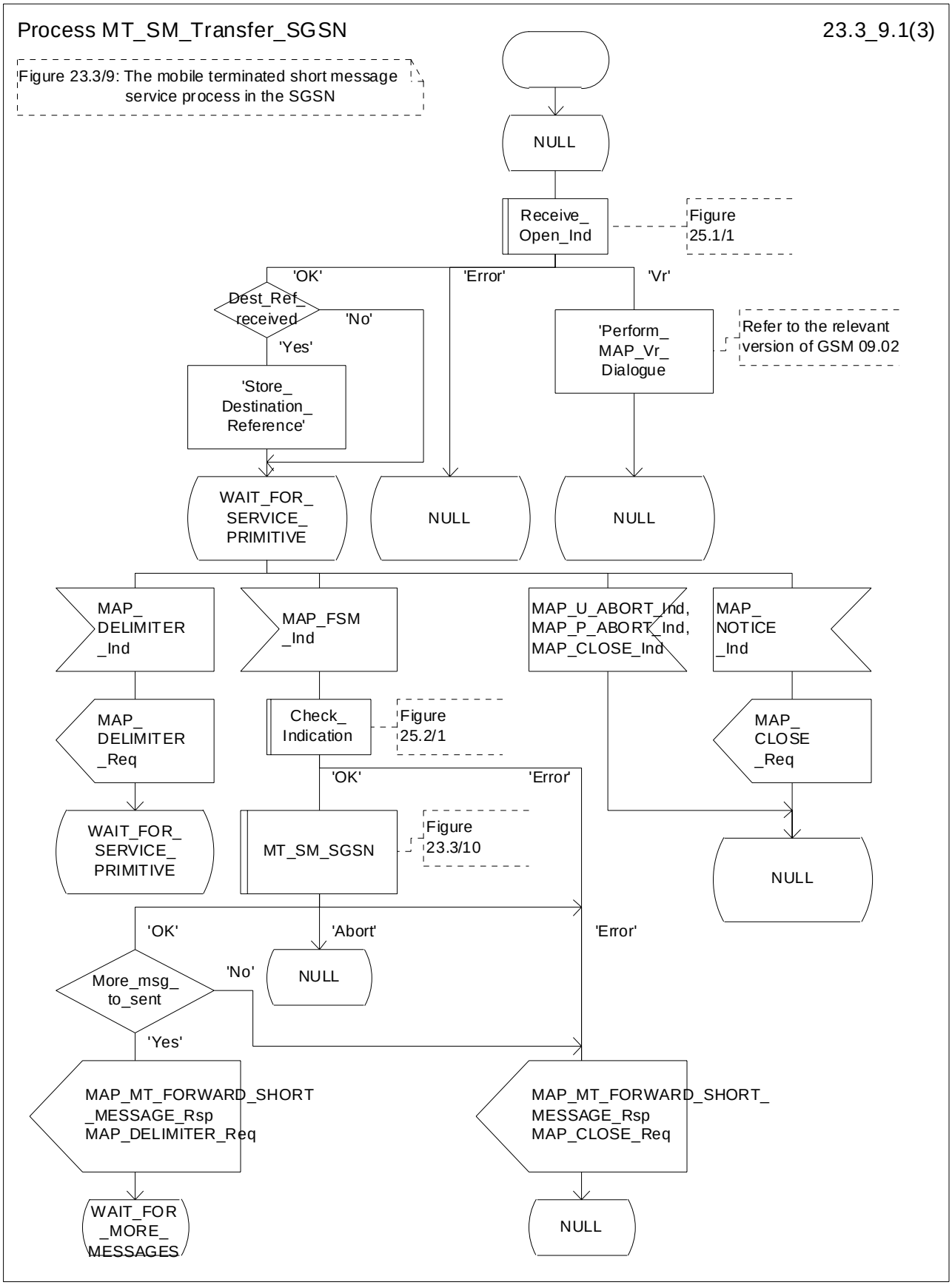


Figure 23.3/9 (sheet 1 of 3): Procedure MT_SM_Transfer_SGSN

Process MT_SM_Transfer_SGSN 23.3_9.2(3)

Figure 23.3/9: The mobile terminated short message service process in the SGSN

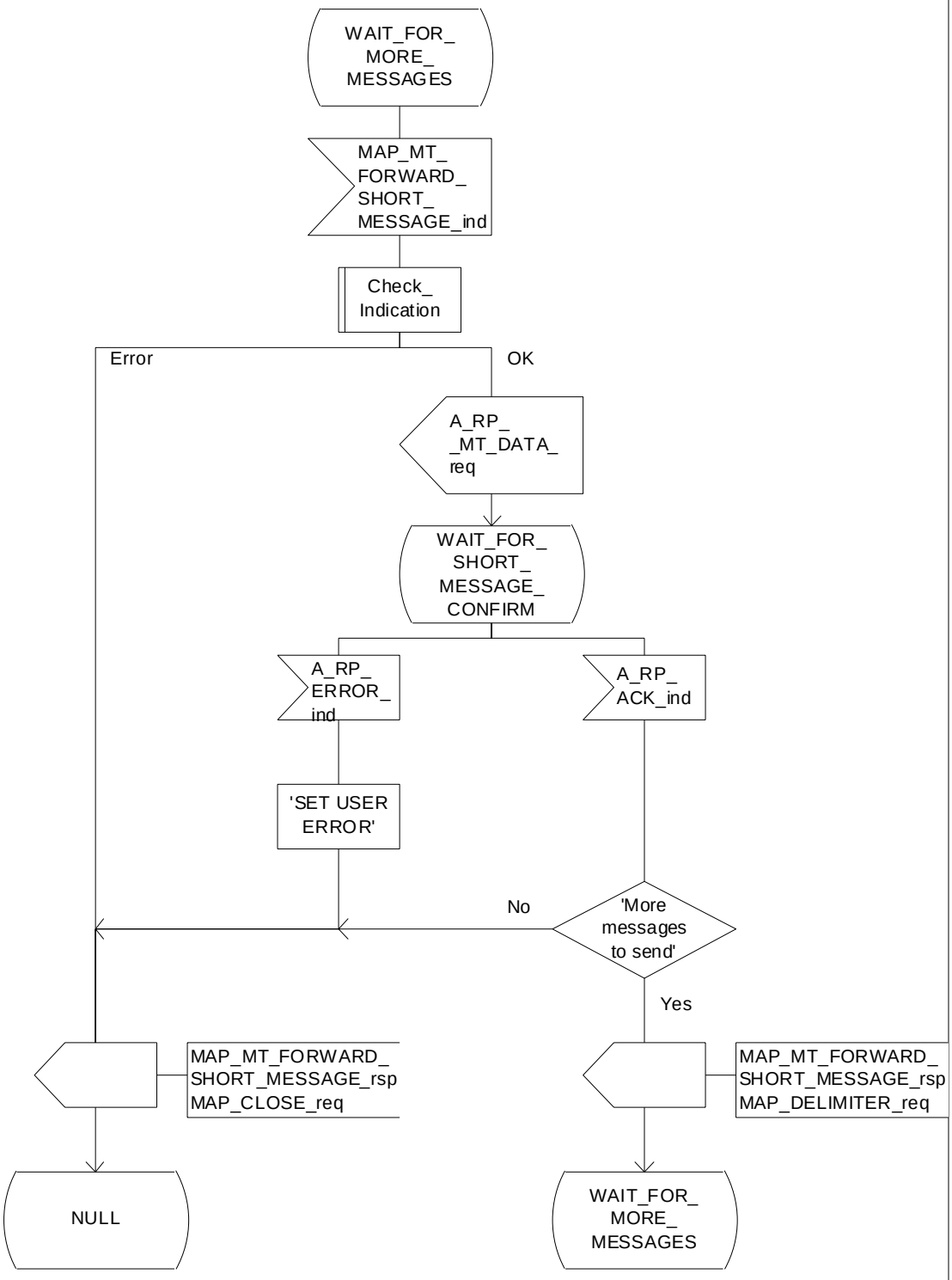


Figure 23.3/9 (sheet 2 of 3): Procedure MT_SM_Transfer_SGSN

Process MT_SM_Transfer_SGSN 23.3_9.3(3)

Figure 23.3/9: The mobile terminated short message service process in the SGSN

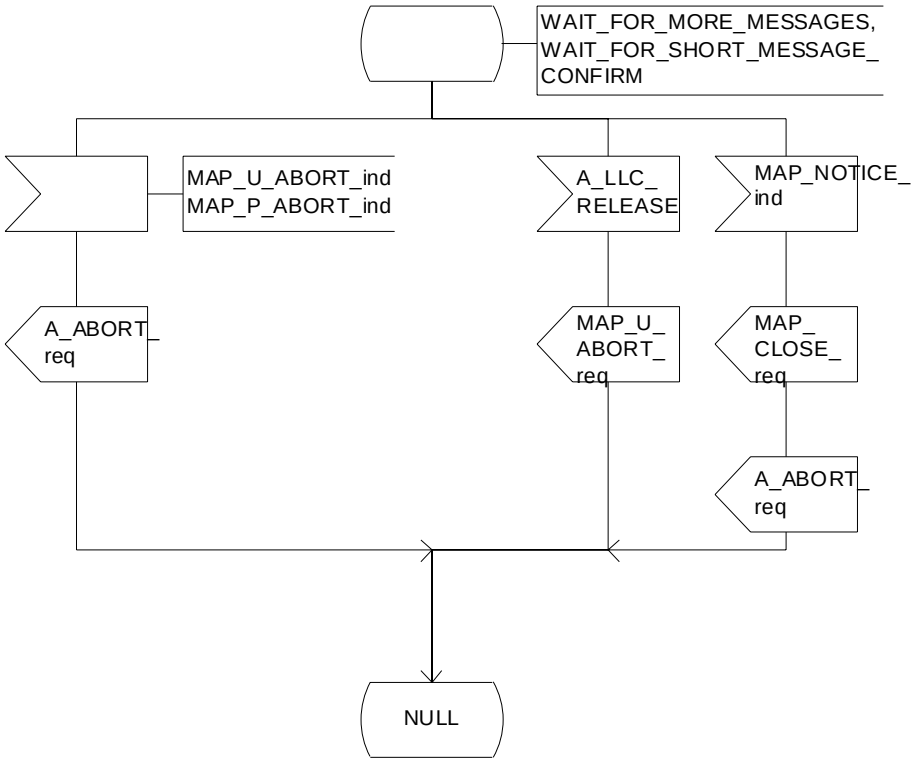


Figure 23.3/9 (sheet 3 of 3): Procedure MT_SM_Transfer_SGSN

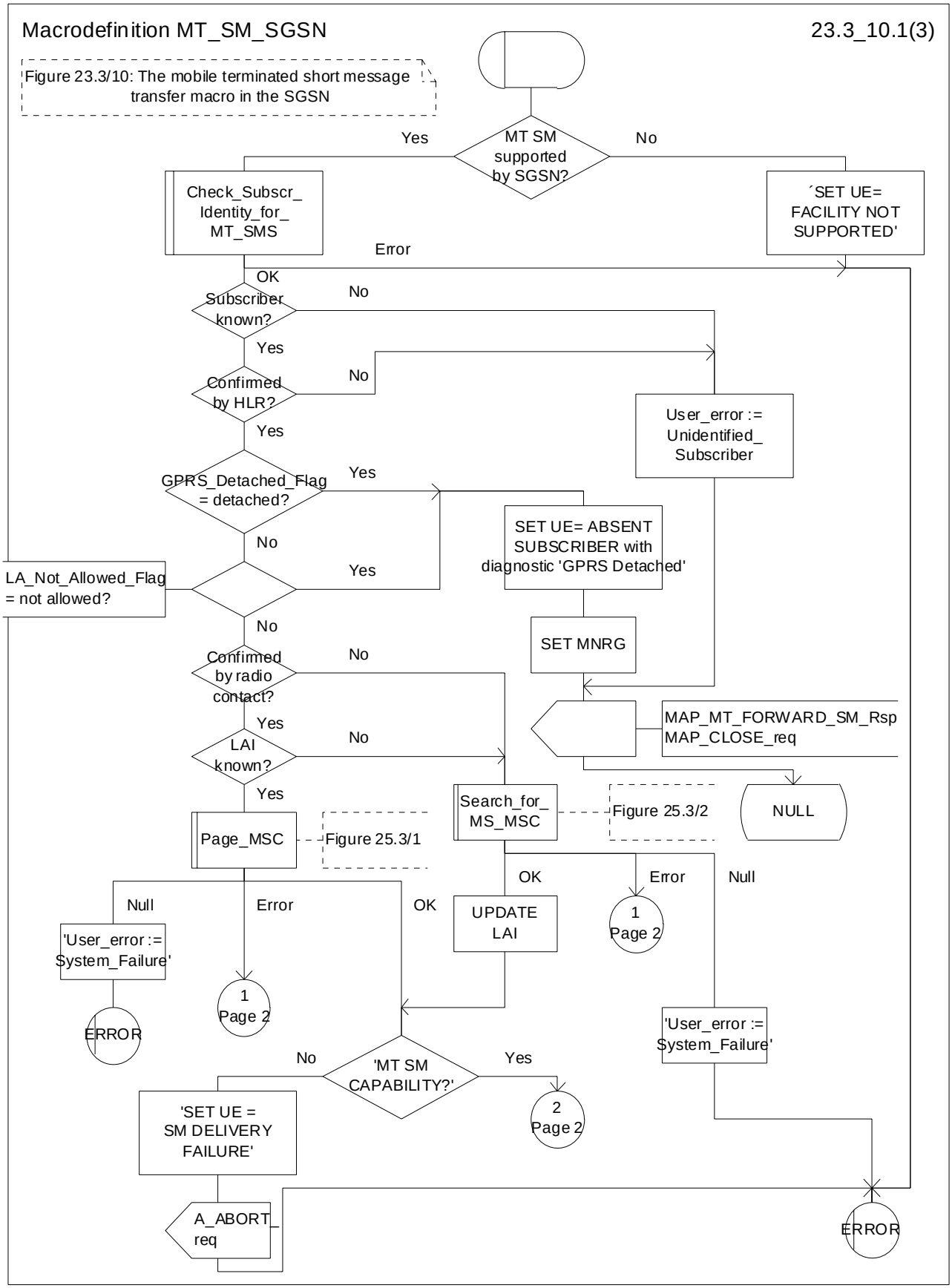


Figure 23.3/10 (sheet 1 of 3): Macro MT_SM_SGSN

Macrodefinition MT_SM_SGSN 23.3_10.2(3)

Figure 23.3/10: The mobile terminated short message transfer macro in the SGSN

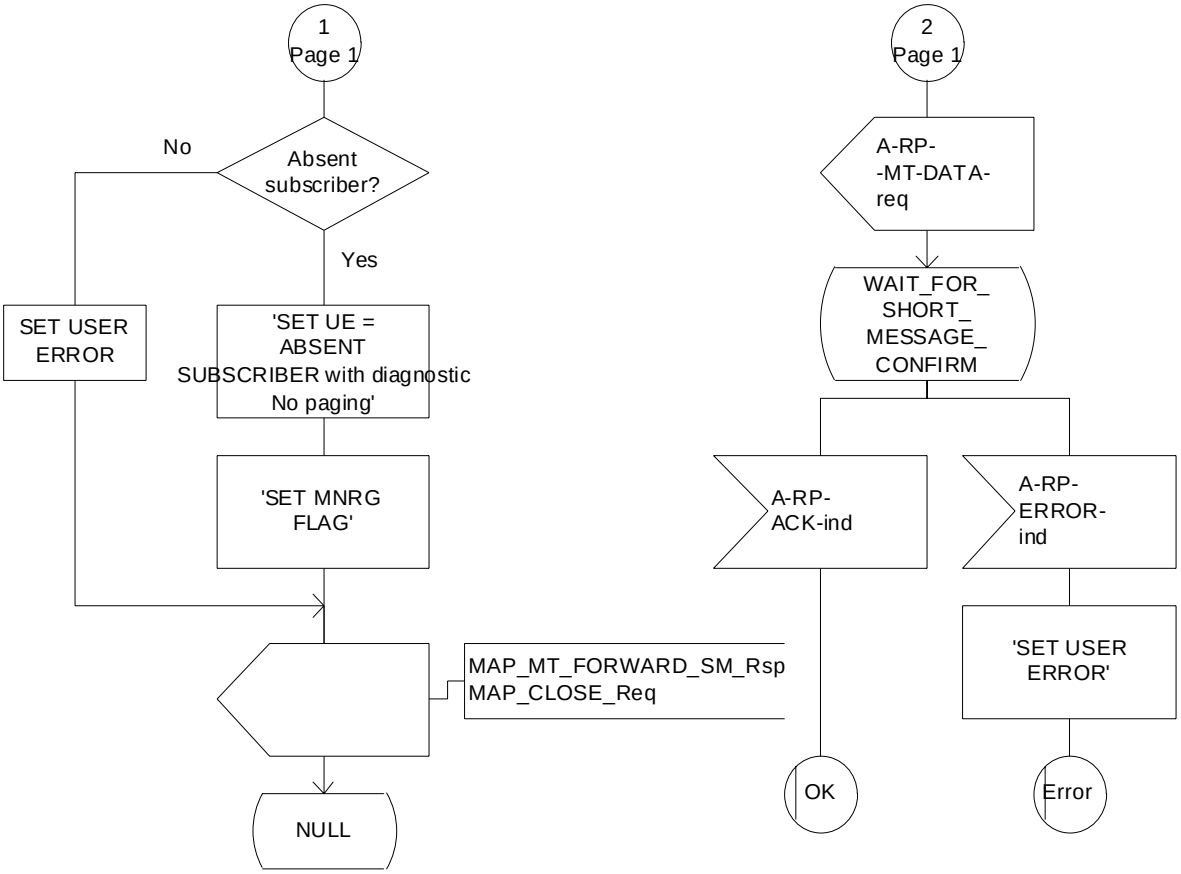


Figure 23.3/10 (sheet 2 of 3): Macro MT_SM_SGSN

Macrodefinition MT_SM_SGSN 23.3_10.3(3)

Figure 23.3/10: The mobile terminated short message transfer macro in the SGSN

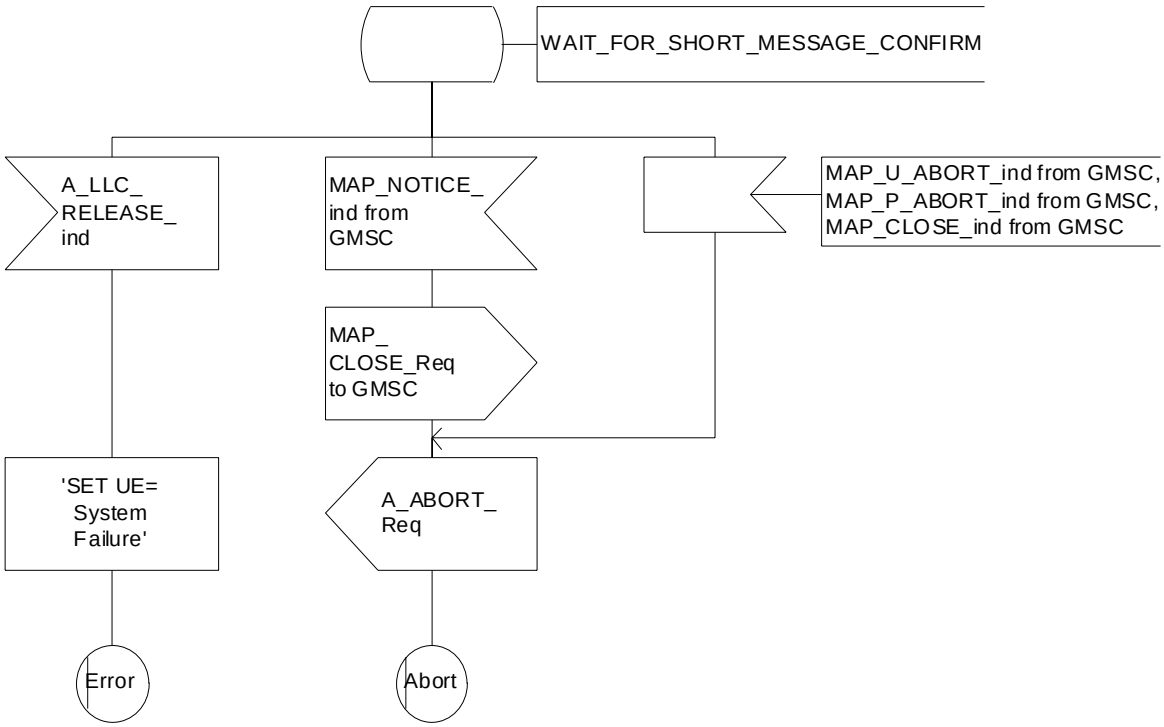
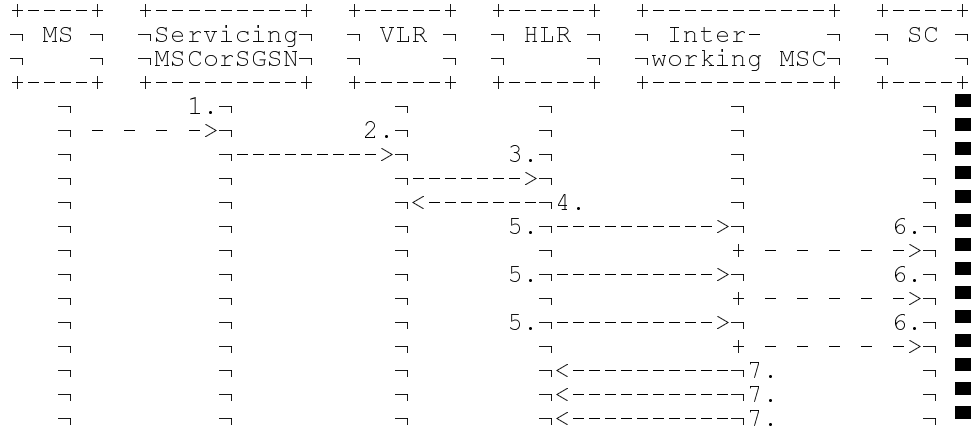


Figure 23.3/10 (sheet 3 of 3): Macro MT_SM_SGSN

23.4 The Short Message Alert procedure

The Short Message Alert procedure is used for alerting the Service Centre when the mobile subscriber is active after a short message transfer has failed because the mobile subscriber is not reachable or when the MS has indicated that it has memory capacity to accept a short message.

The Short Message Alert procedure for the case when the mobile subscriber was not reachable is shown in figure 23.4/1.



1) CM Service Request (**), Page response or Location Updating (GSM 04.08)

2) MAP_PROCESS_ACCESS_REQUEST / MAP_UPDATE_LOCATION_AREA (**),

3) MAP_READY_FOR_SM (Mobile Present) / MAP_UPDATE_LOCATION / Supplementary Service Control Request (*)

4) MAP_READY_FOR_SM_ACK (*)

5) MAP_ALERT_SERVICE_CENTRE (notes 1 and 2)

6) Alert Service Centre (GSM 03.40)

7) MAP_ALERT_SERVICE_CENTRE_ACK

NOTE 1: To all Service Centres in the Message Waiting List.

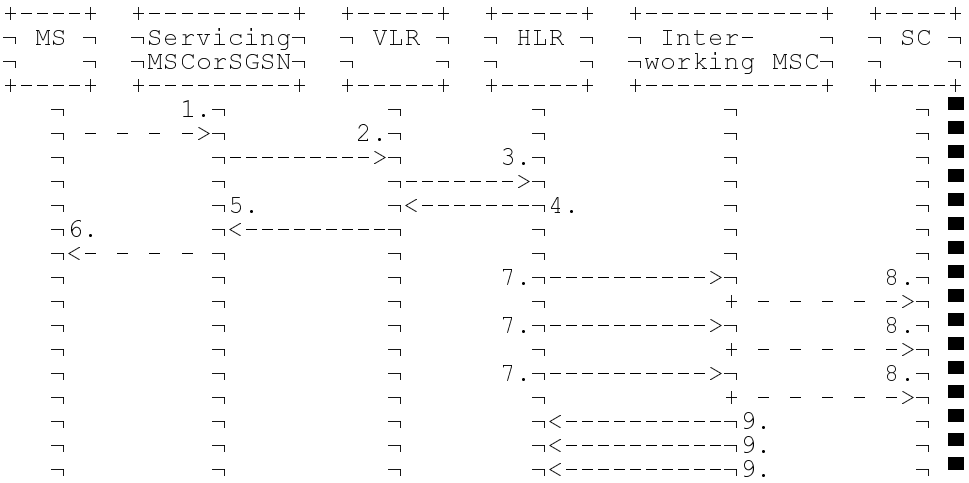
NOTE 2: The HLR initiates the MAP_ALERT_SERVICE_CENTRE service only if the MS Memory Capacity Exceeded flag is clear.

(*) In case of GPRS, messages 3) and 4) are sent/received by SGSN

(**) Those messages are not used by SGSN

Figure 23.4/1: Short message alert procedure (Mobile is present)

The Short Message Alert procedure for the case where the MS indicates that it has memory capacity to accept one or more short messages is shown in figure 23.4/2.



1) SM memory capacity available (GSM 04.11)

2) MAP_READY_FOR_SM (Memory Available) (*)

3) MAP_READY_FOR_SM (Memory Available) (**)

4) MAP_READY_FOR_SM_ACK (**)

5) MAP_READY_FOR_SM_ACK (*)

6) SM memory capacity available (Acknowledge) (GSM 04.11)

7) MAP_ALERT_SERVICE_CENTRE (note 1)

8) Alert Service Centre (GSM 03.40)

9) MAP_ALERT_SERVICE_CENTRE_ACK

NOTE 1: To all Service Centres in the Message Waiting List.

(*) Message 2) and 5) are not used by SGSN

(**) In the case of GPRS messages 3) and 4) are sent/received by SGSN

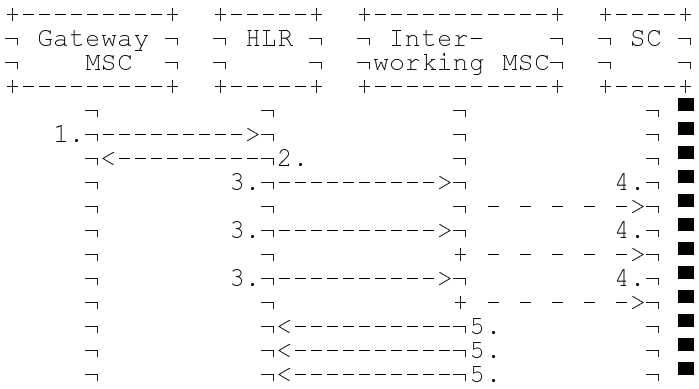
Figure 23.4/2: Short message alert procedure (MS memory capacity available)

In addition the following MAP services are used in the MS memory available case:

MAP_PROCESS_ACCESS_REQUEST	(see subclause 8.3); (*)
MAP_AUTHENTICATE	(see subclause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see subclause 8.6); (*)
MAP_PROVIDE_IMSI	(see subclause 8.9); (*)
MAP_CHECK_IMEI	(see subclause 8.7);
MAP_FORWARD_NEW_TMSI	(see subclause 8.9); (*)
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see subclause 9.1). (*)

(*) Those messages are not used by SGSN.

The Short Message Alert procedure when the MS indicates successful transfer after polling is shown in figure 23.4/3.



1) MAP_REPORT_SM_DELIVERY_STATUS (Successful Transfer)

2) MAP_REPORT_SM_DELIVERY_STATUS_ACK

3) MAP_ALERT_SERVICE_CENTRE (note)

4) Alert Service Centre (GSM 03.40)

5) MAP_ALERT_SERVICE_CENTRE_ACK

NOTE: To all Service Centres in the Message Waiting List.

Figure 23.4/3: Short message alert procedure (Successful transfer after polling)

23.4.1 Procedures in the Servicing MSC

The activation of the MAP_PROCESS_ACCESS_REQUEST service is described in the subclause 23.6.2.

After receiving the SM memory capacity available indication, the servicing MSC sends the MAP_READY_FOR_SM request to the VLR indicating memory available. The outcome of that procedure is one of the following:

- successful acknowledgment. The MSC sends the corresponding message to the MS;
- negative acknowledgment, where the error causes are treated as follows:
  - unexpected data value, data missing and system failure errors are reported as network out of order error to the MS;
  - facility not supported is reported as requested facility not implemented error to the MS;
- procedure failure, which is reported as network out of order error to the MS if a connection to the MS still exists.

The short message alert procedure in the MSC for the MS memory capacity available case is shown in figure 23.4/4.

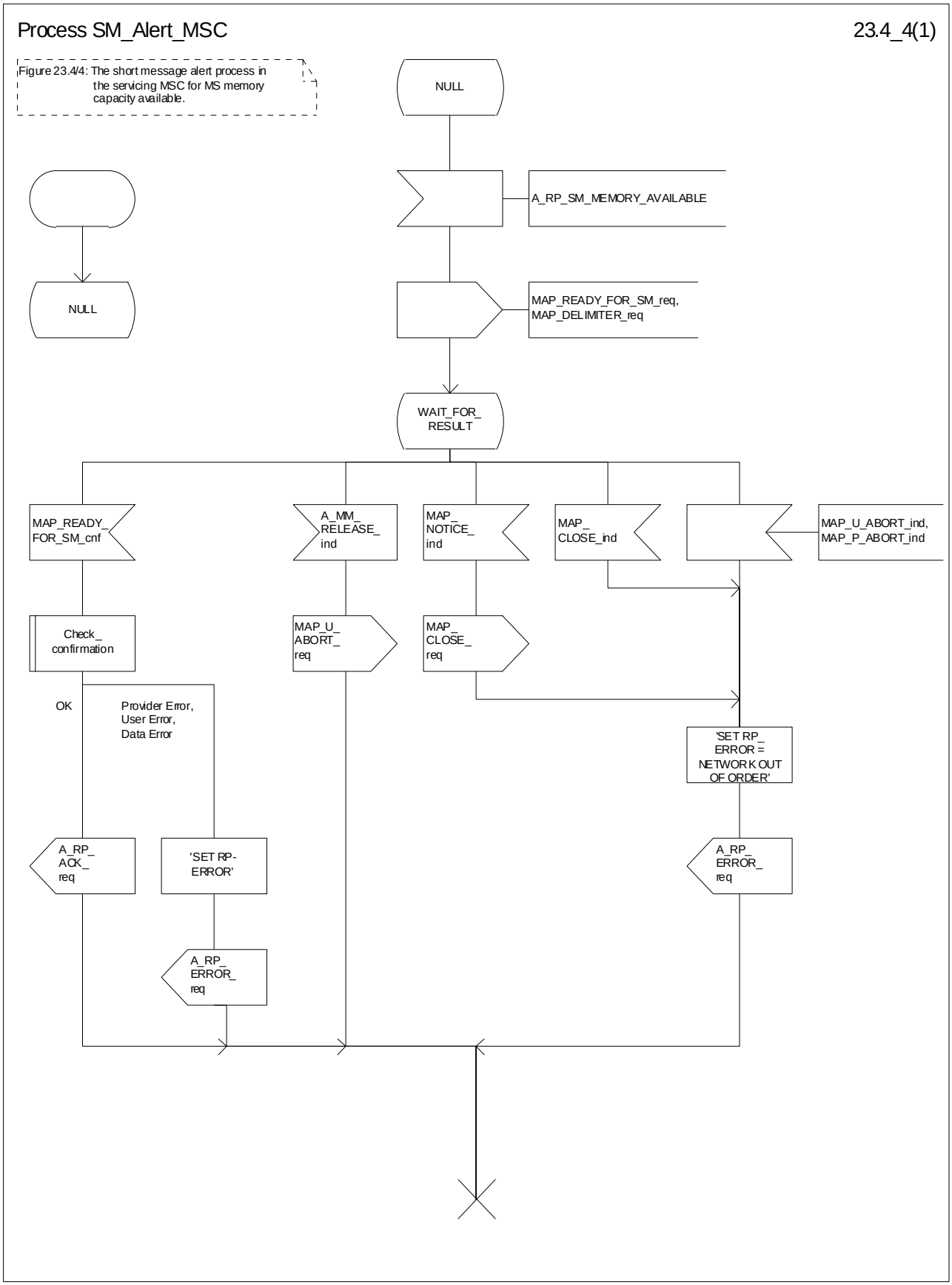


Figure 23.4/4: Procedure SM_Alert_MSC

23.4.2 Procedures in the VLR

23.4.2.1 The Mobile Subscriber is present

When receiving the MAP_PROCESS_ACCESS_REQUEST indication, MAP_UPDATE_LOCATION_AREA indication while the MS not reachable flag (MNRF) is set, the VLR will send the MAP_READY_FOR_SM request towards the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for non GPRS. If the authentication procedure is initiated and it fails, the VLR will not initiate the service. The process in VLR is described in detail in the subclause 25.10.

23.4.2.2 The Mobile Equipment has memory available

The MAP_PROCESS_ACCESS_REQUEST indication starts the MAP_PROCESS_ACCESS_REQUEST service in the VLR. The application context in the MAP_OPEN indication refers to the short message alerting procedure.

If the service MAP_PROCESS_ACCESS_REQUEST is successful, the VLR waits for the next message from the MSC. When receiving the MAP_READY_FOR_SM indication from the MSC, the VLR will check the contents. Data errors are reported to the MSC as an unexpected data value or data missing error, depending on the error. If the primitive passes the data check, the VLR forwards it to the HLR and awaits an acknowledgment.

When receiving the MAP_READY_FOR_SM confirmation from the HLR and the Alert Reason is MS memory available, the VLR will act as follows:

- the MAP_READY_FOR_SM response is sent to the MSC as follows:
  - an acknowledge in the positive case;
  - system failure error, if unexpected data value, data missing, or unknown subscriber errors are received, otherwise the error cause received from the HLR;
  - a facility not supported error, if the HLR supports MAP Vr only;
  - procedure failure is reported as a system failure error.

The short message alert procedure in the VLR is shown in figures 23.4/5.

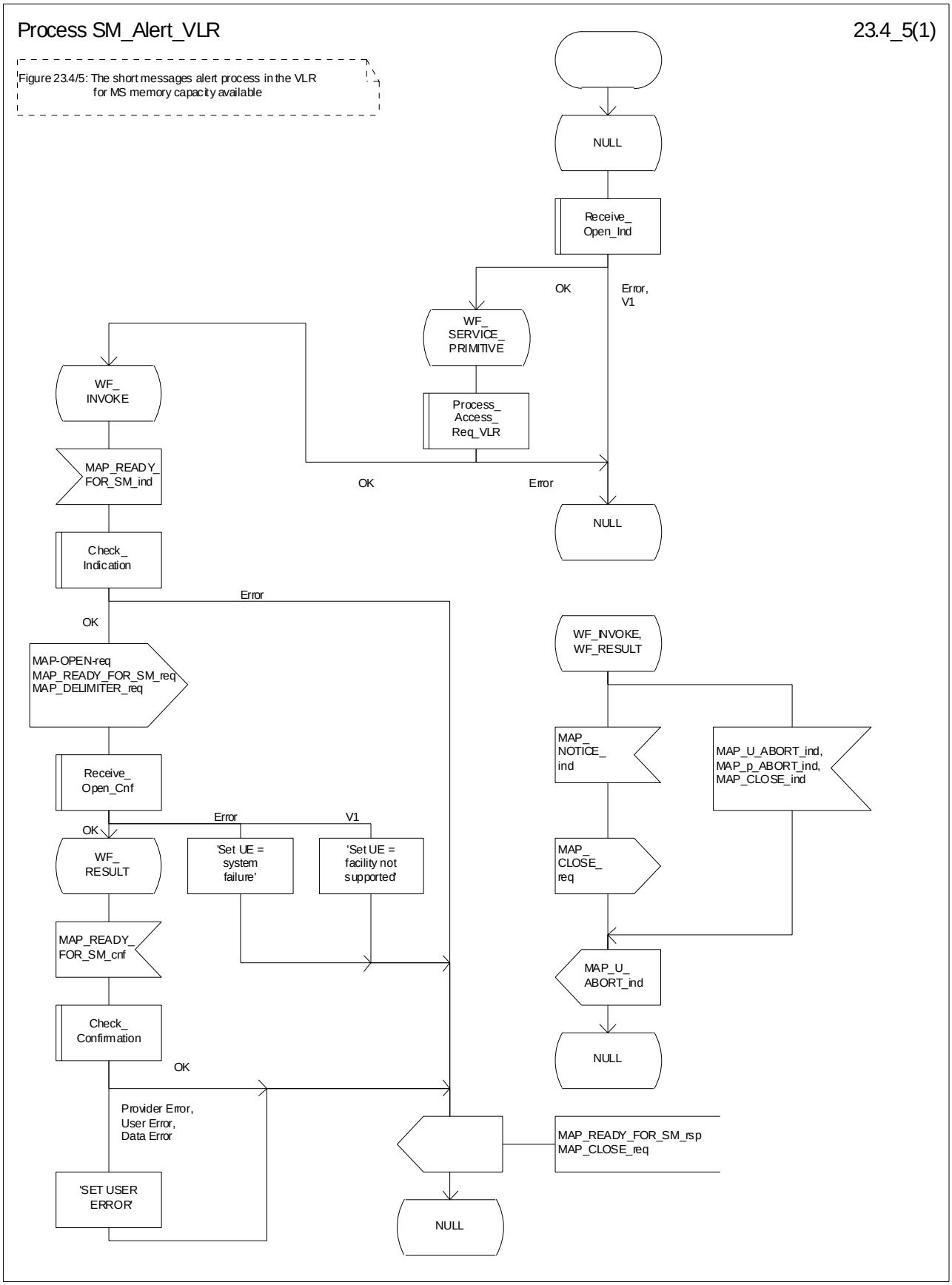


Figure 23.4/5: Procedure SM_Alert_VLR

23.4.3 Procedures in the HLR

When receiving the MAP_READY_FOR_SM indication, the HLR will check the contents. Data errors are reported to the VLR as an unexpected data value or a data missing error depending on the error. If the HLR does not support the MNRF or MNRG, MCEF, and MWD a facility not supported error is reported to the VLR or SGSN. If the IMSI is unknown an unknown subscriber error is reported to the VLR or SGSN. Otherwise an acknowledgement is returned to the VLR or SGSN.

If neither the MS not reachable flag (MNRF) or the MS not reachable for GPRS (MNRG) flag, nor the memory capacity exceeded flag (MCEF) are set, and MAP_READY_FOR_SM is received from the VLR or SGSN, the HLR sets a timer and waits for it to expire. This ensures that in the race situation the MAP_REPORT_SM_DELIVERY_STATUS service (as described in the subclause 23.6) for the same subscriber can be carried out when delayed in the GMSC.

If the Alert Reason indicates the mobile present for non GPRS situation, or when the update location procedure has been successfully completed or Supplementary Service Control request is received, the MS not reachable flag (MNRF) is cleared and the service centre alert procedure is initiated. If the memory capacity exceeded flag is set, the MS not reachable flag is cleared and stored reason for absence for non GPRS are cleared but the alert procedure is not started.

If the Alert Reason indicates the mobile present for GPRS situation, or when the Update GPRSlocation procedure has been successfully completed, the MS not reachable for GPRS (MNRG) flag is cleared and the service centre alert procedure is initiated. If the memory capacity exceeded flag is set, the MS detach for GPRS flag is cleared and stored reason for absence for GPRS are cleared but the alert procedure is not started.

If the Alert Reason indicates the memory available for non GPRS situation, the HLR initiates the alert procedure. The MS not reachable and memory capacity available flags are cleared.

If the Alert Reason indicates the memory available for GPRS situation, the HLR initiates the alert procedure. The MS detach for GPRS and memory capacity available flags are cleared.

If the MAP_REPORT_SM_DELIVERY_STATUS indication is received and it indicates the successful transfer of the mobile terminated short message for non GPRS, the HLR initiates the alert procedure described in the subclause 25.10 and clears MCEF and MNRF flags and stored reason for absence for non GPRS are cleared.

If the MAP_REPORT_SM_DELIVERY_STATUS indication is received and it indicates the successful transfer of the mobile terminated short message for GPRS, the HLR initiates the alert procedure described in the subclause 25.10 and clears MCEF and MNRG flags and stored reason for absence for GPRS are cleared.

The short message alert procedure in the HLR is shown in figures 23.4/6 and 25.10/2.

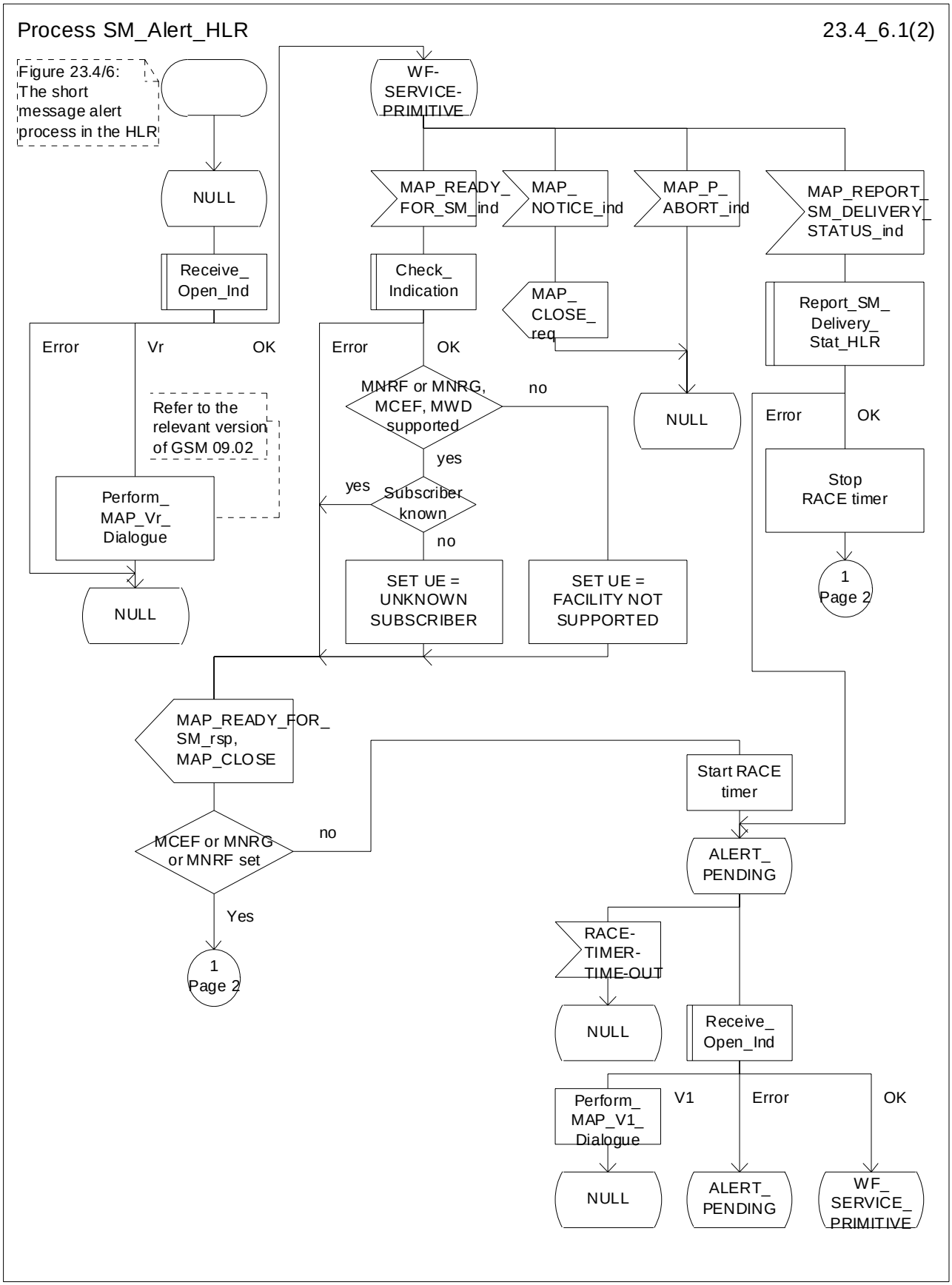


Figure 23.4/6 (sheet 1 of 2): Process SM_Alert_HLR

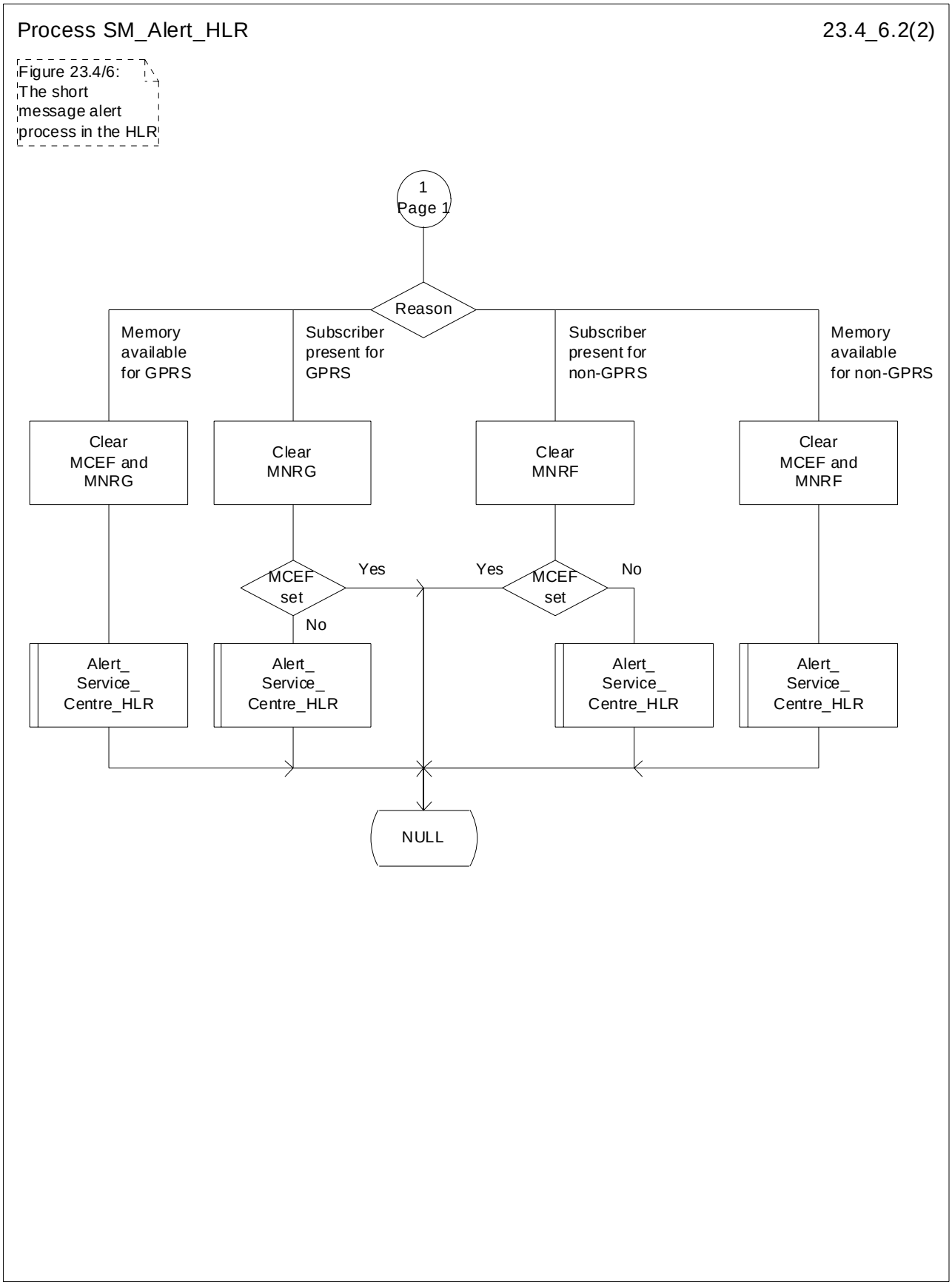


Figure 23.4/6 (sheet 2 of 2): Process SM_Alert_HLR

23.4.4 Procedures in the Interworking MSC

When a MAP_ALERT_SERVICE_CENTRE indication is correctly received by the IWMSC, the IWMSC will forward the alerting to the given Service Centre if possible.

Data errors are reported to the HLR as an unexpected data value or a data missing error depending on the error.

The short message alert procedure is shown in figure 23.4/7.

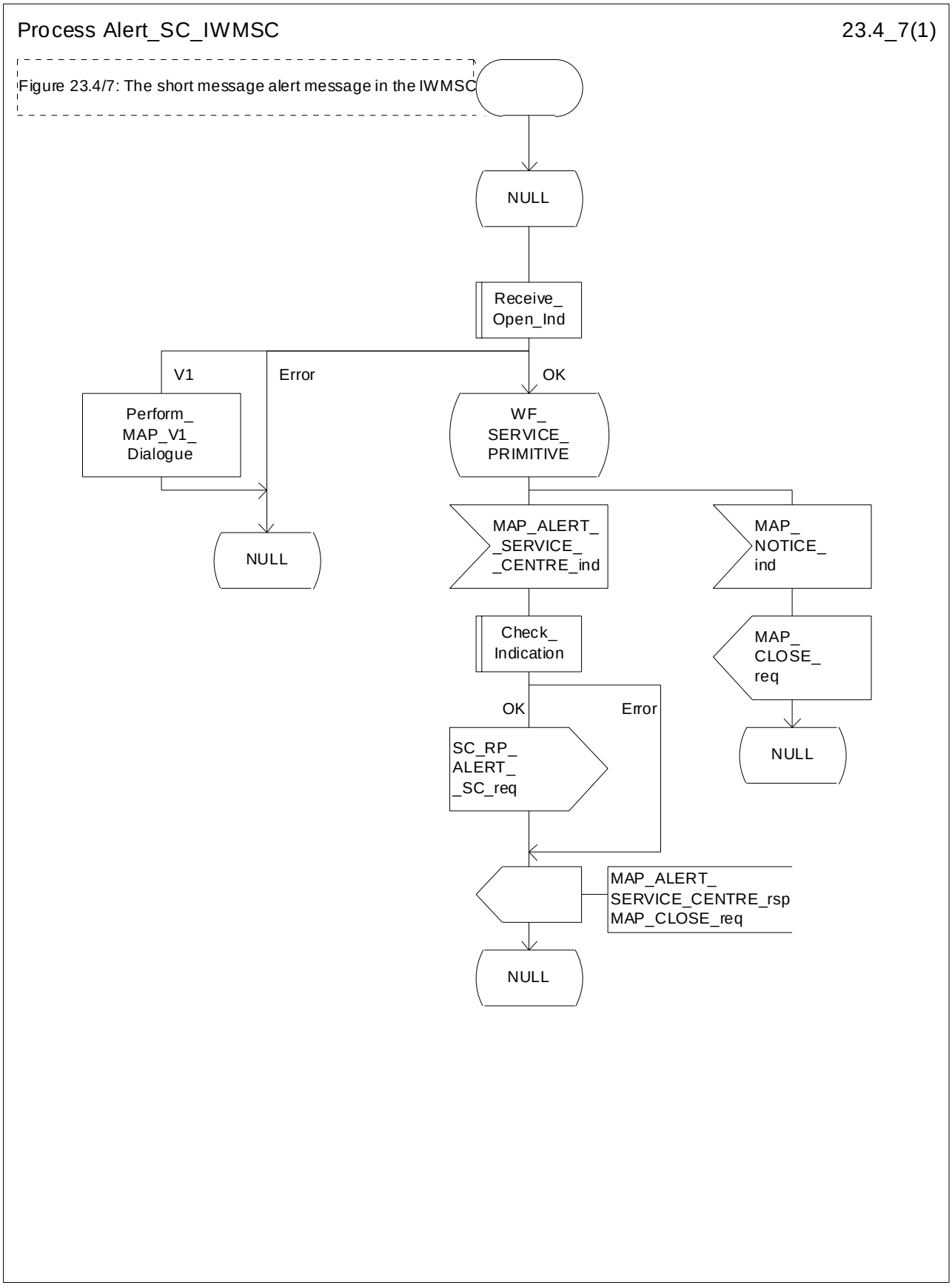


Figure 23.4/7: Process Alert_SC_IWMSC

23.4.5 Procedures in the Servicing SGSN

23.4.5.1 The Mobile Subscriber is present

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

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

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

The process in SGSN is described in detail in the subclause 25.10/3.

23.4.5.2 The Mobile Equipment has memory available

After receiving the SM memory capacity available indication, the servicing SGSN sends the MAP_READY_FOR_SM request to the HLR indicating memory available for GPRS. The outcome of that procedure is one of the following:

- successful acknowledgment. The SGSN sends the corresponding message to the MS;
- negative acknowledgment, where the error causes are treated as follows:
  - unexpected data value, data missing and system failure errors are reported as network out of order error to the MS;
  - facility not supported is reported as requested facility not implemented error to the MS;
- procedure failure, which is reported as network out of order error to the MS if a connection to the MS still exists.

The short message alert procedure in the SGSN for the MS memory capacity available case is shown in figure 23.4/8.

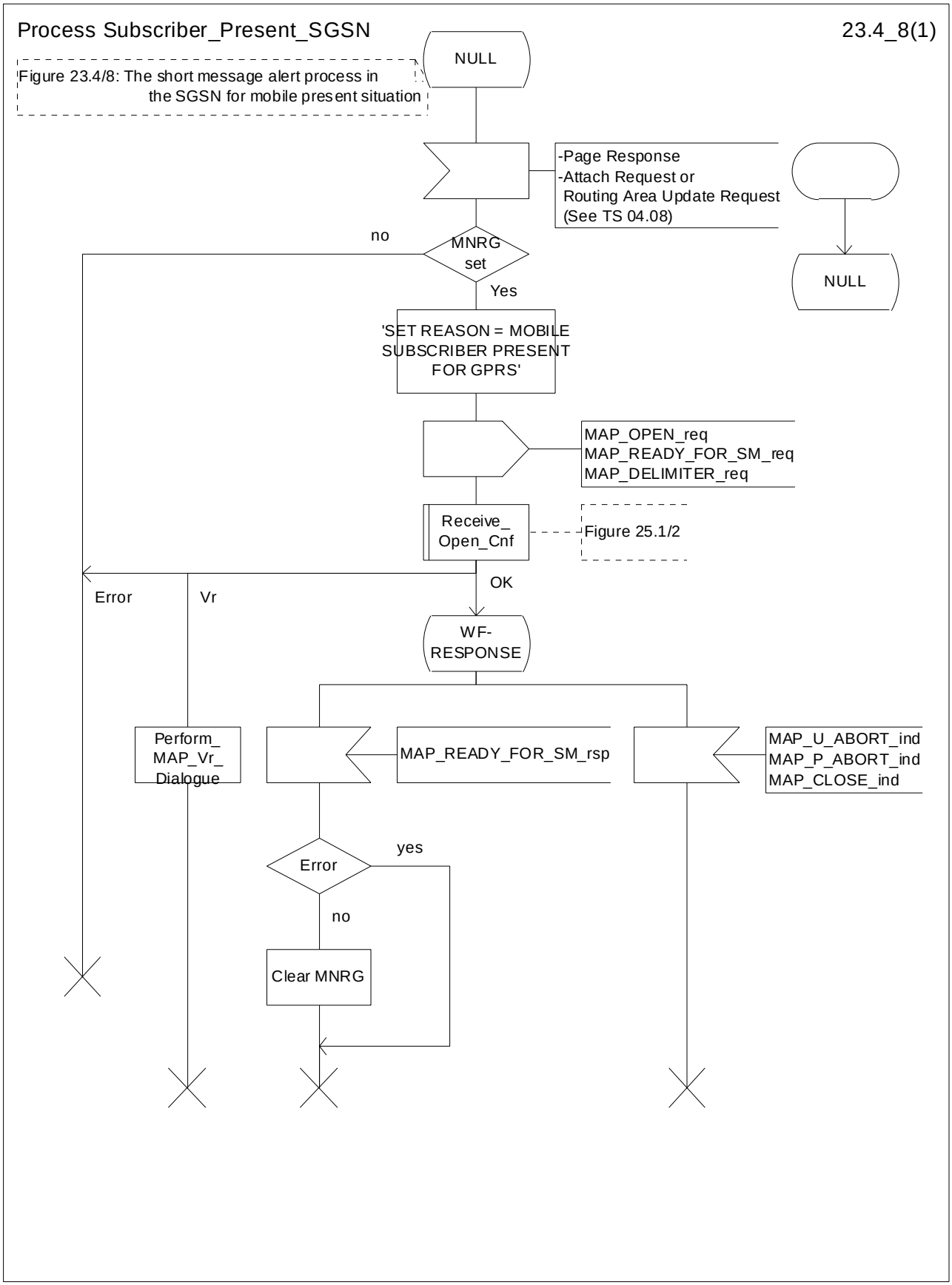


Figure 23.4/8: Process Subscriber_Present_SGSN

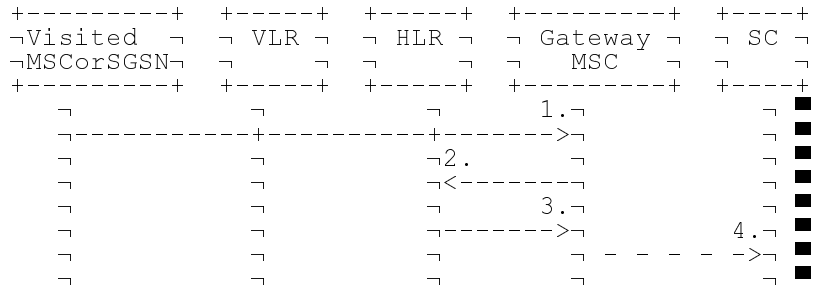
23.5 The SM delivery status report procedure

The SM delivery status report procedure is used to set the Service Centre address into the message waiting list in the HLR because the subscriber is absent or unidentified or the memory capacity is exceeded. The procedure sets

- the memory capacity exceeded flag in the HLR if the MS memory does not have room for more messages
- and/or the MS not reachable flag for non GPRS in the case of unidentified or absent subscriber
- and/or the MS not reachable for GPRS flag in the case of unidentified or absent susbscriber for GPRS

Additionally the procedure is used to report the HLR about the successful transfer for GPRS or non GPRS after the Service Centre has polled the subscriber. This procedure is described also in the subclause 23.4.

The SM delivery status report procedure is shown in figure 23.5/1.



1) MAP_MT_FORWARD_SHORT_MESSAGE_ACK/_NACK (Absent subscriber_SM, unidentified subscriber or memory capacity exceeded)
2) MAP_REPORT_SM_DELIVERY_STATUS
3) MAP_REPORT_SM_DELIVERY_STATUS_ACK
4) Short Message Negative Acknowledgement (GSM 03.40)

Figure 23.5/1: Short message delivery status report procedure

23.5.1 Procedures in the HLR

When the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it acts as described in the subclause 23.6, macro Report_SM_Delivery_Stat_HLR.

The short message delivery status report process in the HLR is shown in figure 23.5/2.

Process SM_Delivery_Status_Report_HLR 23.5_2(1)

Figure 23.5/2: The report SM delivery process in the HLR

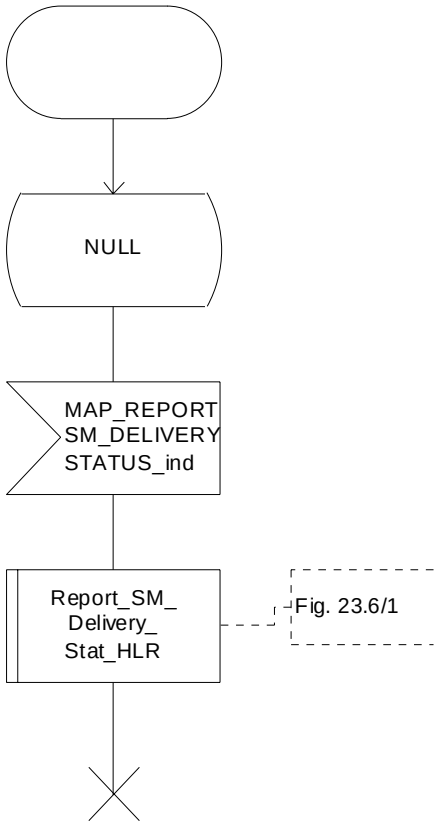


Figure 23.5/2: Process SM_Delivery_Status_Report_HLR

23.5.2 Procedures in the gateway MSC

The GMSC invokes the short message delivery status report procedure if an absent subscriber_SM indication, unidentified subscriber indication, SM delivery failure error indicating MS memory capacity exceeded or both are received from the servicing MSC, SGSN or both during a mobile terminated short message transfer, and the HLR has not indicated that the SC address is included in the MWD. The unidentified subscriber indication is however processed as the absent subscriber_SM indication

In case of successful SMS delivery on the second path, the successful SMS Delivery outcome is sent in combination with the unsuccessful SMS Delivery outcome to the HLR.

The service is invoked also when the HLR has indicated that either of the flags MCEF, MNRF or both are set and the first SM delivery was successful from the servicing MSC or, in case of subsequent SM, the last SM delivery was successful from the servicing MSC.

The service is invoked also when the HLR has indicated that either of the flags MCEF, MNRF or both are set and the SM delivery was successful from the servicing SGSN or, in case of subsequent SM, the last SM delivery was successful from the servicing SGSN.

The reason for unsuccessful, successful for GPRS, non GPRS or both deliveries of the short message are included in the SM Delivery Outcome in the MAP_REPORT_SM_DELIVERY_STATUS request. In the case of an unsuccessful delivery due to the subscriber being absent the absent subscriber diagnostic indication (if available) is also included in the MAP_REPORT_SM_DELIVERY_STATUS request.

If the reason for unsuccessful delivery is absent subscriber with diagnostic ´Paging failure´ for GPRS or non GPRS, the two SM Delivery Outcomes absent subscriber with both diagnostics ´Paging failure´ for GPRS and non GPRS is included in the MAP_REPORT_SM_DELIVERY_STATUS request.

The GMSC sends the MAP_REPORT_SM_DELIVERY_STATUS request to the HLR. As a response the GMSC will receive the MAP_REPORT_SM_DELIVERY_STATUS confirmation reporting:

- successful outcome of the procedure. The acknowledge primitive may contain the MSISDN-Alert number which is stored in the MWD List in the HLR;
- unsuccessful outcome of the procedure. The system failure indication is forwarded to the SC. In that case, if the SM Delivery Outcome was successful SMS delivery for GPRS or non GPRS (combined or not with another unsuccessful reason), a successful report is forwarded to the SC.

A provider error is indicated as a system failure to the SC.

Note that the indication, on which number belongs the SGSN and MSC, received from the HLR at routing information result (see subclause 23.3.3) will enable the GMSC to map the causes received from the SGSN, MSC or both into the appropriate causes for GPRS, non GPRS or both, and send them to the SC and HLR.

The procedure towards the Service Centre may also be aborted. If so the operation towards the HLR is also aborted.

The short message delivery status report procedure in the GMSC is shown in figure 23.5/3.

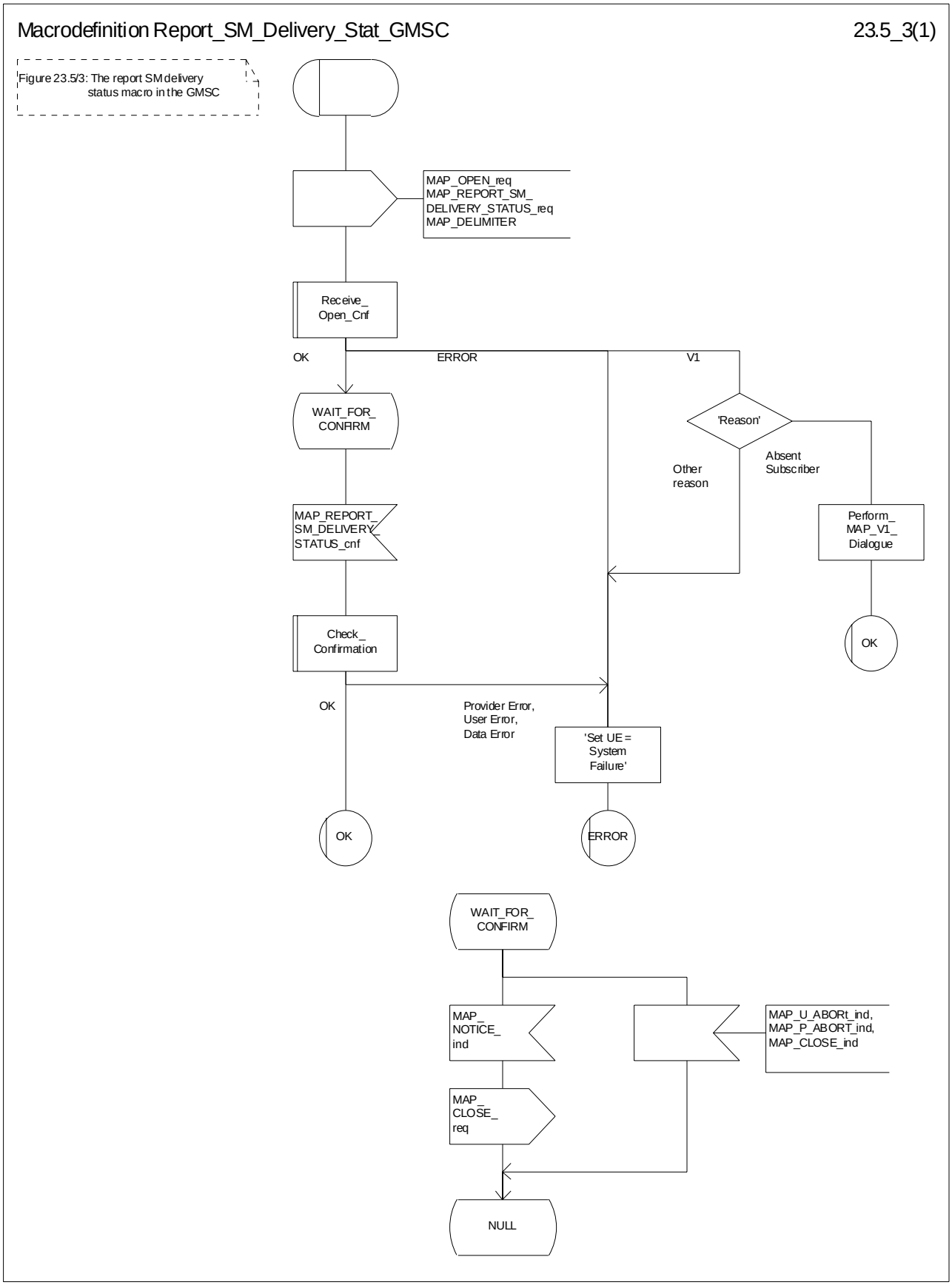


Figure 23.5/3: Macro Report_SM_Delivery_Stat_GMSC

23.6 Common procedures for the short message clause

23.6.1 The macro Report_SM_Delivery_Stat_HLR

This macro is used when the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication from the GMSC. The HLR responses to the indication as follows:

- if the flag « GPRS Support Indicator » is absent then if the subscriber is a GPRS subscriber and a non-GPRS susbcsriber with the option « transfer of SM via the SGSN when GPRS is not supported in the GMSC » or if the subscriber is a GPRS subscsriber only, the HLR shall interpret the delivery outcome as a GPRS delivery outcome.

- if invalid data content is detected, an unexpected data value error or a data missing error is returned to the GMSC;

- if the MSISDN number provided is not recognized by the HLR, an unknown subscriber error is returned to the GMSC;

- if the MAP_REPORT_SM_DELIVERY_STATUS indication reports a successful SM delivery, the Service Centres in the Message Waiting list are alerted as described in the subclause 25.10;

- if the SM Delivery Outcome reports unsuccessful delivery and the inclusion of the SC address in the MWD is not possible, a message waiting list full error is returned to the GMSC;

- if the SM Delivery Outcome reports unsuccessful delivery and the message waiting list is not full, the given Service Centre address is inserted and an acknowledgement is sent to the GMSC. If the MSISDN-Alert stored in the subscriber data is not the same as that received in the MAP_REPORT_SM_DELIVERY_STATUS indication, the MSISDN-Alert is sent in a response primitive to the GMSC;

  The SC address is only stored in the MWD if the unsuccessful SM Delivery Outcome is not received in combination with another successful SM Delivery Outcome

- if the SM Delivery Outcome is MS memory capacity exceeded for non GPRS, the HLR sets the memory capacity exceeded flag in the subscriber data and resets the MNRF;

- if the SM Delivery Outcome is MS memory capacity exceeded for GPRS the HLR sets the memory capacity exceeded flag in the subscriber data and resets the MNRG;

- if the SM Delivery Outcome is absent subscriber for non GPRS, the HLR sets the mobile station not reachable flag in the subscriber data. If a reason for absence is provided by the GMSC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.

- if the SM Delivery Outcome is absent subscriber for GPRS, the HLR sets the mobile station not reachable for GPRS flag in the subscriber data. If a reason for absence is provided by the GMSC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.

  Note that a combination of all the SM Delivery Outcome specified above may be provided to the HLR from the SMS-GMSC.

The short message delivery status report macro in the HLR is shown in figure 23.6/1.

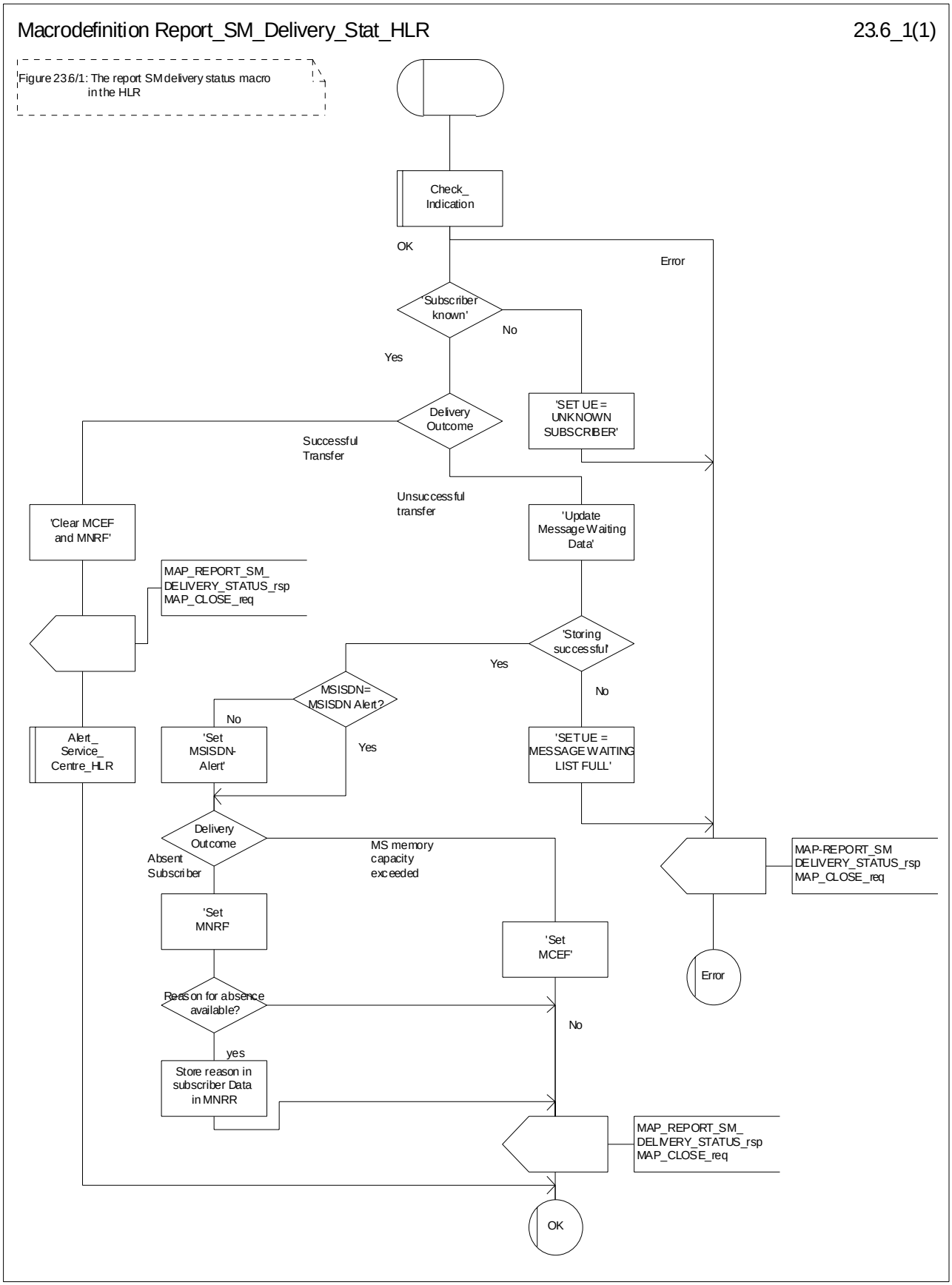


Figure 23.6/1: Macro Report_SM_Delivery_Stat_HLR

24 GPRS process description

24.1 General

The MAP GPRS procedures are used for the Network Requested PDP-Context Activation procedures.

The stage 2 specification for General Packet Radio Service (GPRS) is in GSM 03.60 [100].

24.1.1 Process in the HLR for Send Routing Information for GPRS

The MAP process in the HLR to provide routing information for a network-requested PDP context activation is shown in figure 24.1/1. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check_Indication	see subclause 25.2.1.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context gprsLocationInfoRetrieval, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

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

If the GPRS application process in the HLR returns a positive response containing the routing information, the MAP process constructs a MAP_SEND_ROUTING_INFO_FOR_GPRS service response containing the routing info, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Negative response from HLR GPRS application process

If the GPRS application process in the HLR returns a negative response, the MAP process constructs a MAP_SEND_ROUTING_INFO_FOR_GPRS service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Failure of dialogue opening with the GGSN

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

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

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

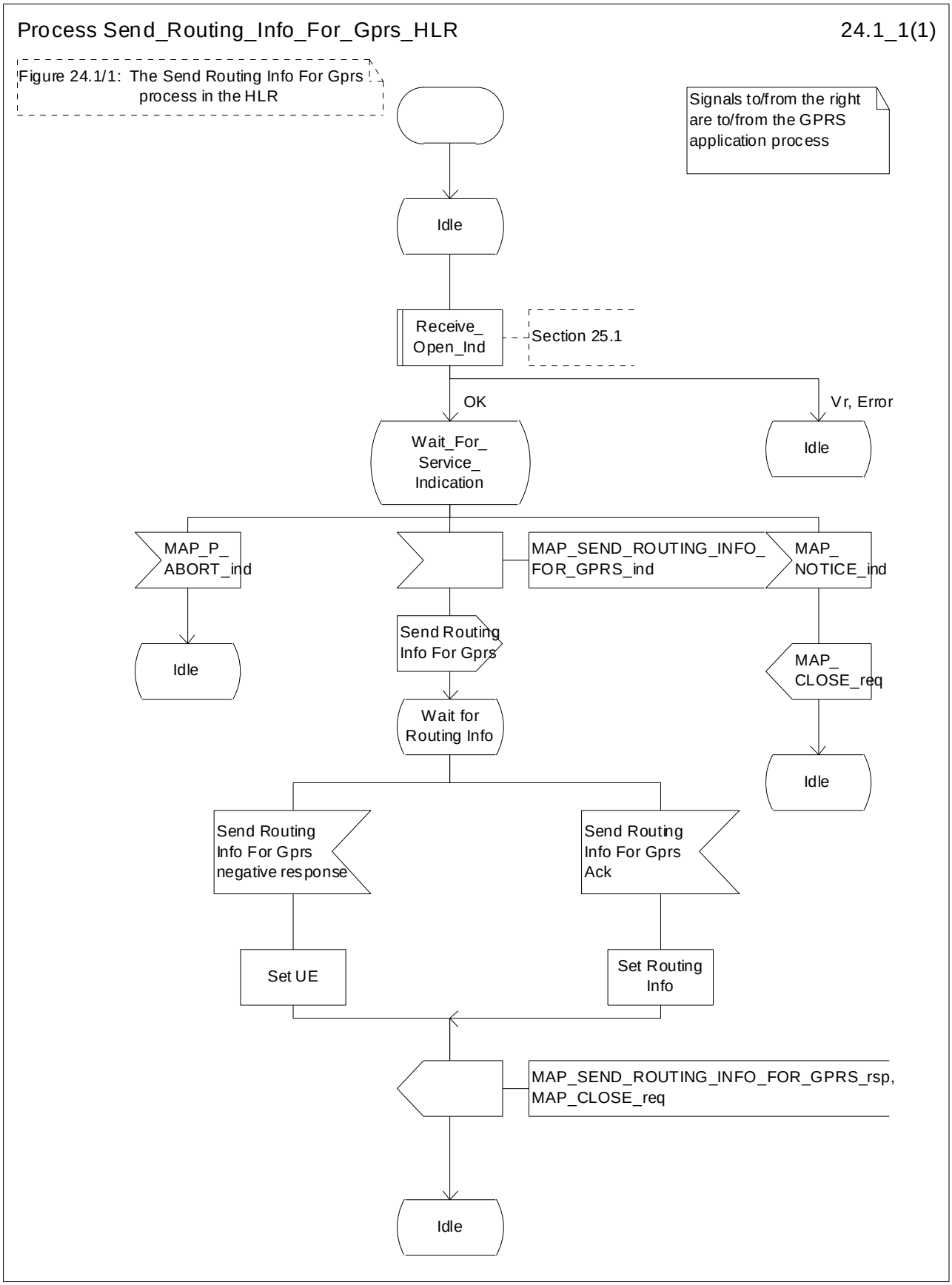

Process Send_Routing_Info_For_Gprs_HLR
24.1_1(1)
Figure 24.1/1: The Send Routing Info For Gprs process in the HLR
Signals to/from the right are to/from the GPRS application process
Idle
Receive_ Open_Ind
Section 25.1
OK
Vr, Error
Wait_For_ Service_ Indication
Idle
MAP_P_ ABORT_ind
MAP_SEND_ROUTING_INFO_ FOR_GPRS_ind
MAP_ NOTICE_ind
Idle
Send Routing Info For Gprs
MAP_ CLOSE_req
Wait for Routing Info
Idle
Send Routing Info For Gprs negative response
Send Routing Info For Gprs Ack
Set UE
Set Routing Info
MAP_SEND_ROUTING_INFO_FOR_GPRS_rsp, MAP_CLOSE_req
Idle

Figure 24.1/0

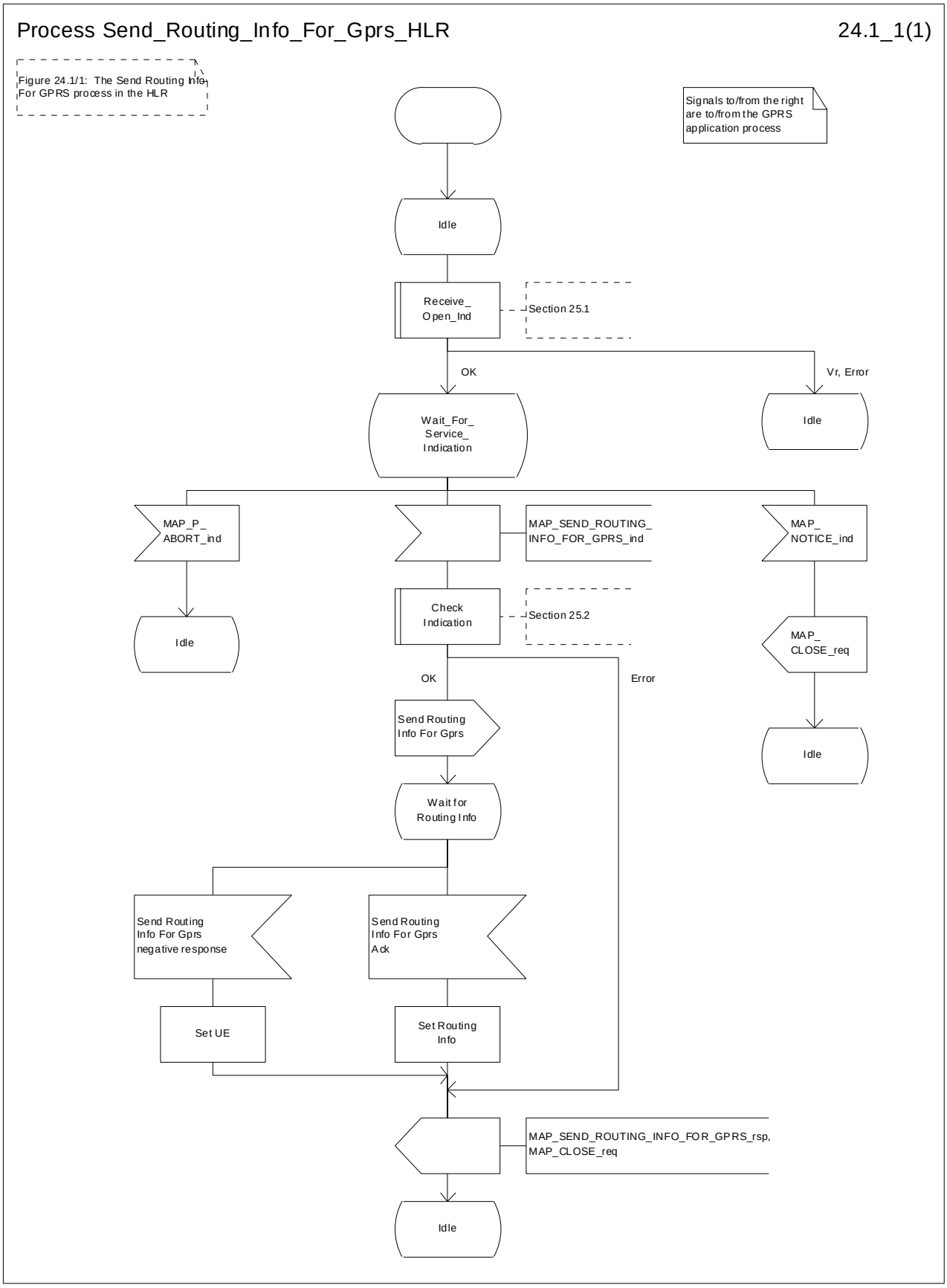


Figure 24.1/1: Process Send Routing Info For Gprs_HLR

24.1.2 Process in the GGSN for Send Routing Information for GPRS

Successful Outcome

When the MAP process receives a Send Routing Info For Gprs request from the GPRS application process in the GGSN, it requests a dialogue with the HLR whose identity is contained in the Send Routing Info For Gprs request by sending a MAP_OPEN service request, requests routeing information using a MAP_SEND_ROUTING_INFO_FOR_GPRS service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_SEND_ROUTING_INFO_FOR_GPRS service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Send Routing Info For Gprs ack containing the routing information received from the HLR to the GPRS application process in the GGSN and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the GPRS application process in the GGSN and returns to the idle state.

Error in MAP_SEND_ROUTING_INFO_FOR_GPRS confirm

If the MAP_SEND_ROUTING_INFO_FOR_GPRS service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Send Routing Info For Gprs negative response to the GPRS application process in the GGSN and returns to the idle state.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a Send Routing Info For Gprs negative response to the GPRS application process in the GGSN and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a Send Routing Info For Gprs negative response indicating system failure to the GPRS application process in the GGSN and returns to the idle state.

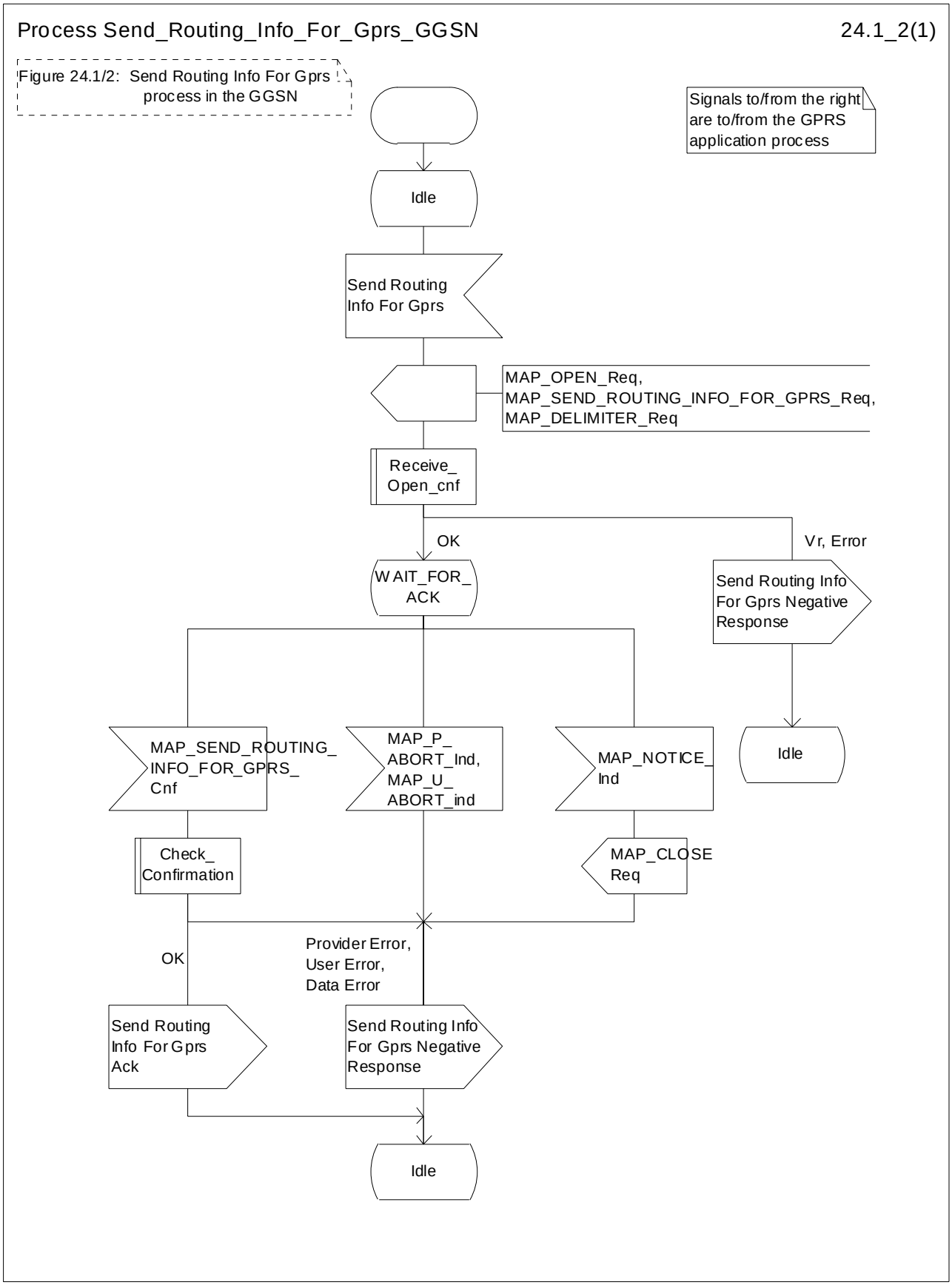


Figure 24.1/2: Process Send_Routing_Info_For_Gprs_GGSN

24.2.1 Process in the HLR for Failure Report

The MAP process in the HLR to set the MNRG (Mobile station Not Reachable for GPRS) flag for the subcriber is shown in figure 24.2/1. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check Indication	see subclause 25.2.1.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context failureReport, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

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

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

Negative response from HLR GPRS application process

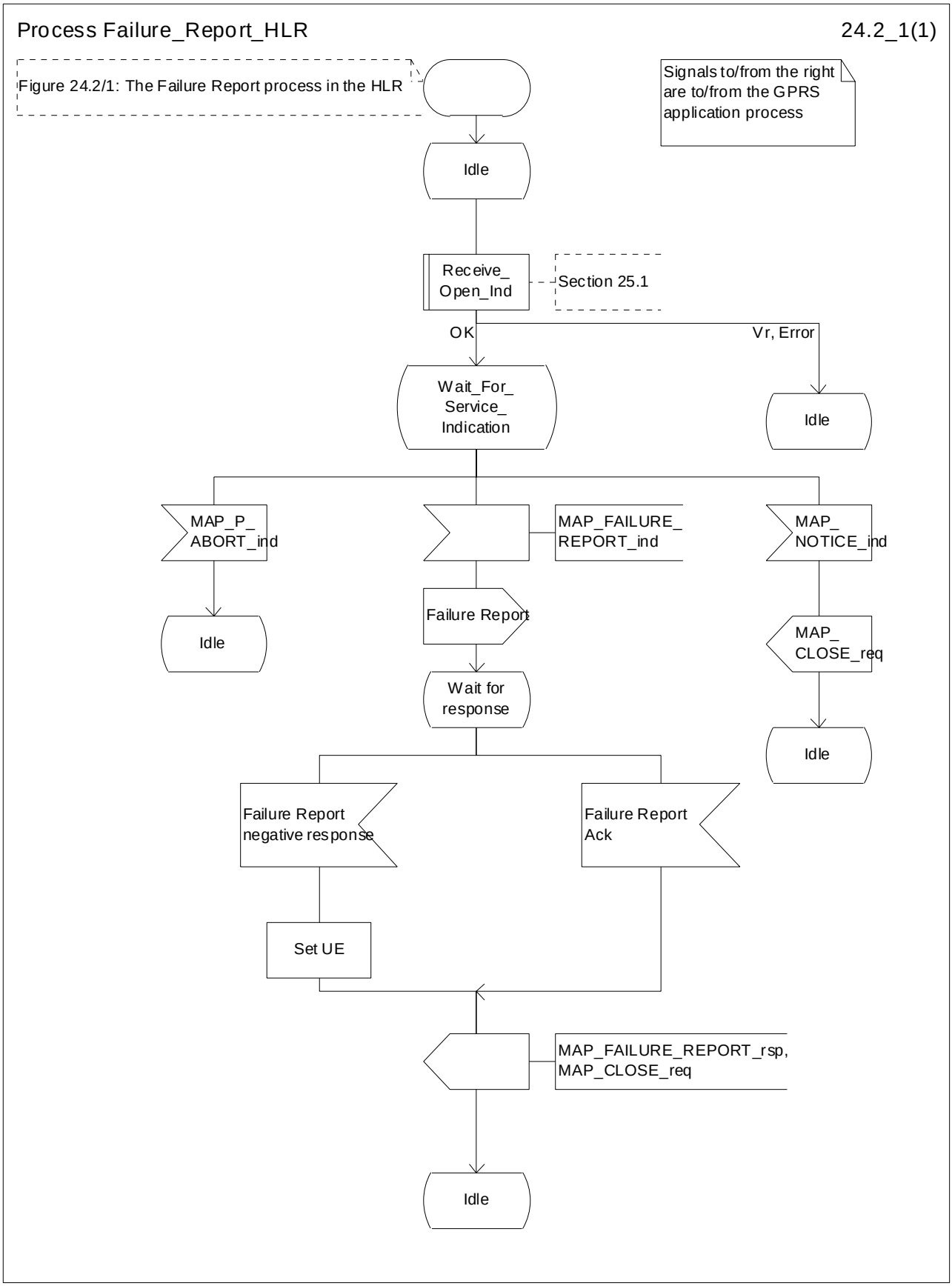
If the GPRS application process in the HLR returns a negative response, the MAP process constructs a MAP_FAILURE_REPORT service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Failure of dialogue opening with the GGSN

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

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

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


Process Failure_Report_HLR
24.2_1(1)
Figure 24.2/1: The Failure Report process in the HLR
Signals to/from the right are to/from the GPRS application process
Idle
Receive_ Open_Ind
Section 25.1
OK
Vr, Error
Wait_For_ Service_ Indication
Idle
MAP_P_ ABORT_ind
MAP_FAILURE_ REPORT_ind
MAP_ NOTICE_ind
Idle
Failure Report
MAP_ CLOSE_req
Wait for response
Idle
Failure Report negative response
Failure Report Ack
Set UE
MAP_FAILURE_REPORT_rsp, MAP_CLOSE_req
Idle

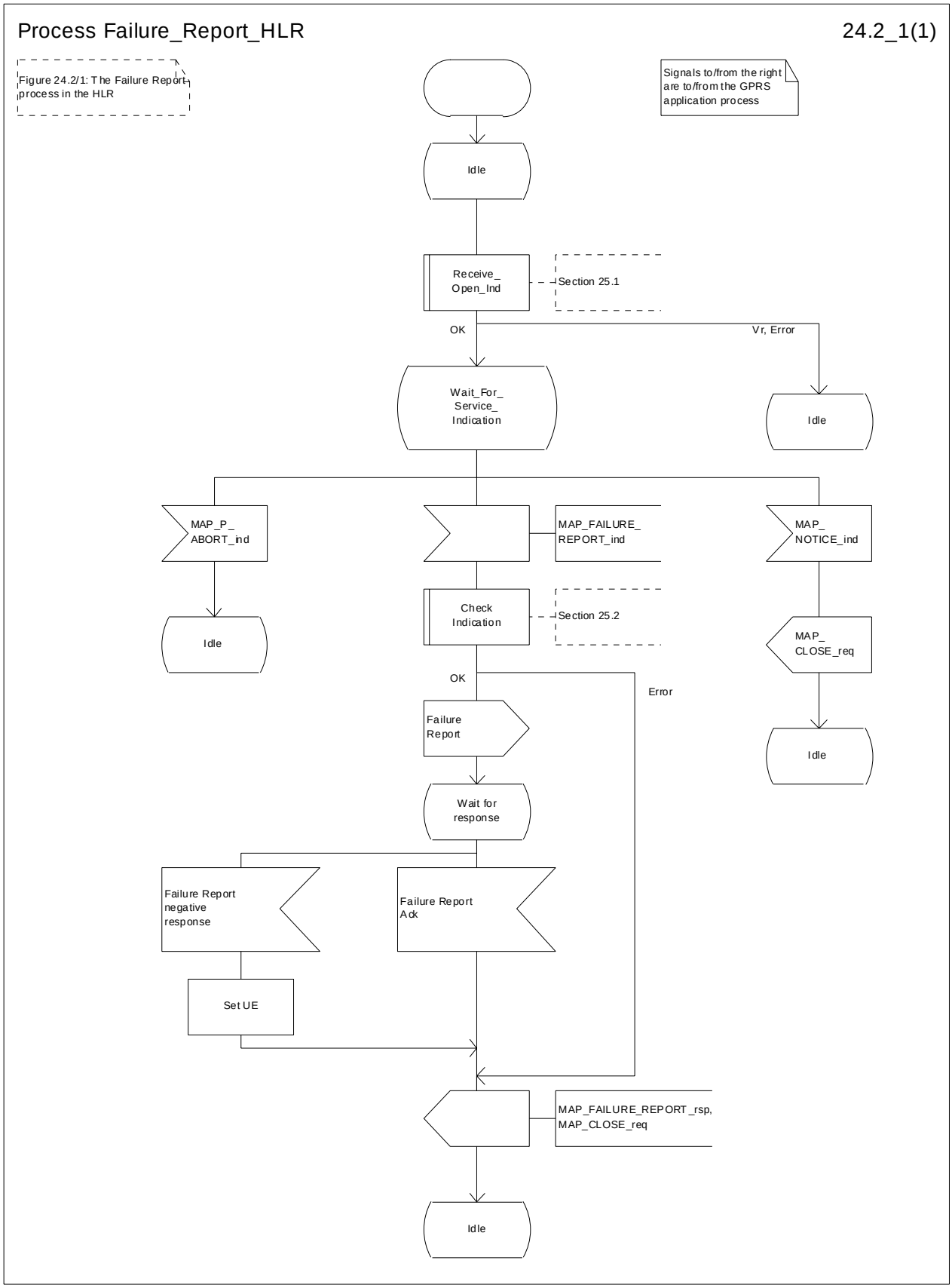


Figure 24.2/1: Process Failure_Report_HLR

24.2.2 Process in the GGSN for Failure Report

Successful Outcome

When the MAP process receives a Failure Report request from the GPRS application process in the GGSN, it requests a dialogue with the HLR whose identity is contained in the Failure Report request by sending a MAP_OPEN service request, sending failure information using a MAP_FAILURE_REPORT service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

If the MAP process receives a MAP_FAILURE_REPORT service confirm from the HLR, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Failure Report ack containing the information received from the HLR to the GPRS application process in the GGSN and returns to the idle state.

Failure of dialogue opening with the HLR

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the GPRS application process in the GGSN and returns to the idle state.

Error in MAP_FAILURE_REPORT confirm

If the MAP_FAILURE_REPORT service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Failure Report negative response to the GPRS application process in the GGSN and returns to the idle state.

Abort of HLR dialogue

After the dialogue with the HLR has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a Failure Report negative response to the GPRS application process in the GGSN and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the HLR, sends a Failure Report negative response indicating system failure to the GPRS application process in the GGSN and returns to the idle state.

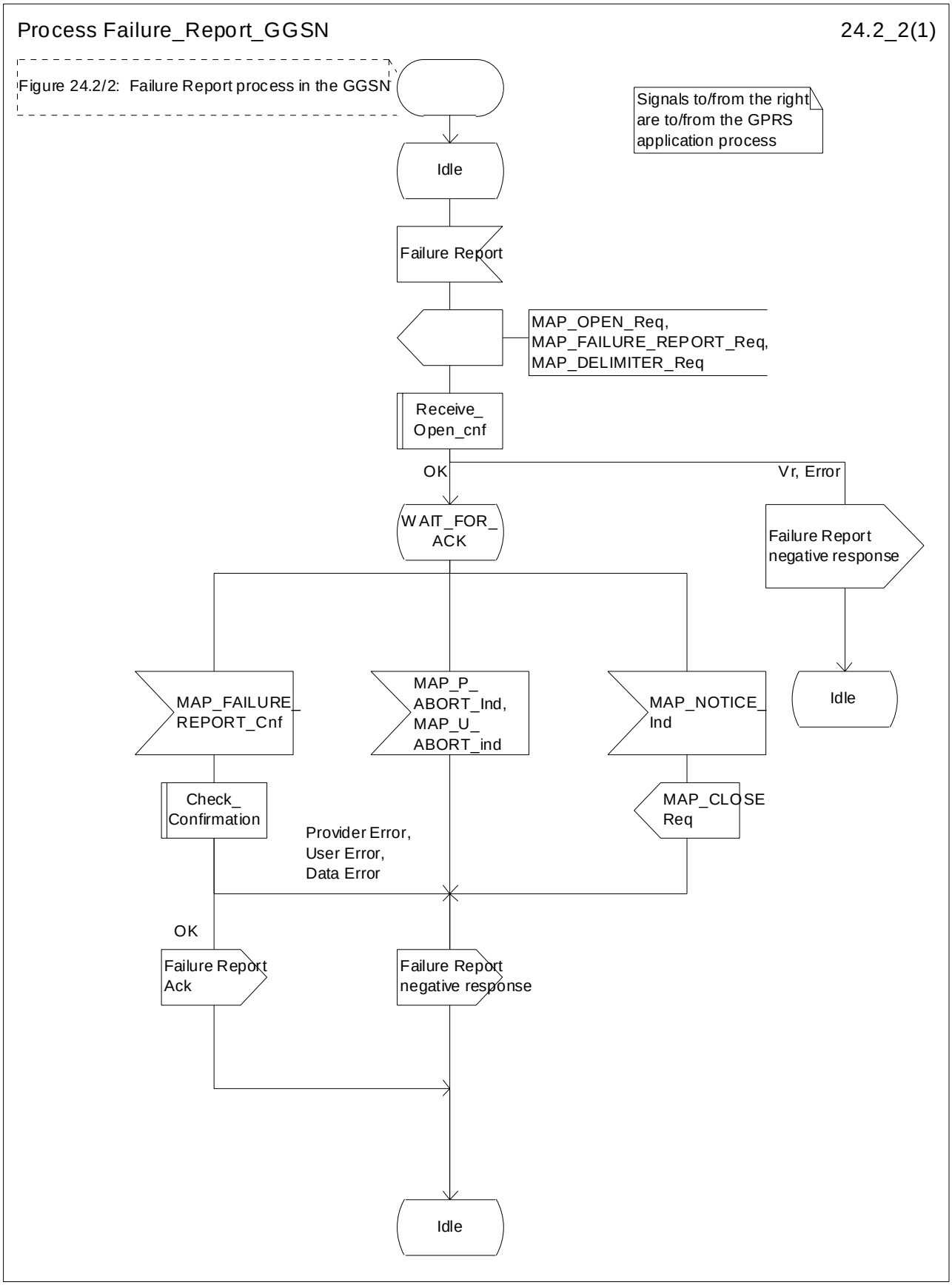


Figure 24.2/2: Process Failure_Report_GGSN

24.3.1 Process in the GGSN for Note Ms Present For Gprs

The MAP process in the GGSN to inform that the subscriber is present for GPRS again is shown in figure 24.3/1. The MAP process invokes a macro not defined in this subclause; the definition of this macro can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check_Indication	see subclause 25.2.1.

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context gprsNotify, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_NOTE_MS_PRESENT_FOR_GPRS service indication is received, the GGSN sends a Note Ms Present For Gprs request to the GPRS application process in the GGSN, and wait for a response. The Note Ms Present For Gprs request contains the parameter received in the MAP_NOTE_MS_PRESENT_FOR_GPRS service indication.

If the GPRS application process in the GGSN returns a positive response, the MAP process constructs a MAP_NOTE_MS_PRESENT_FOR_GPRS service response, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Negative response from GGSN GPRS application process

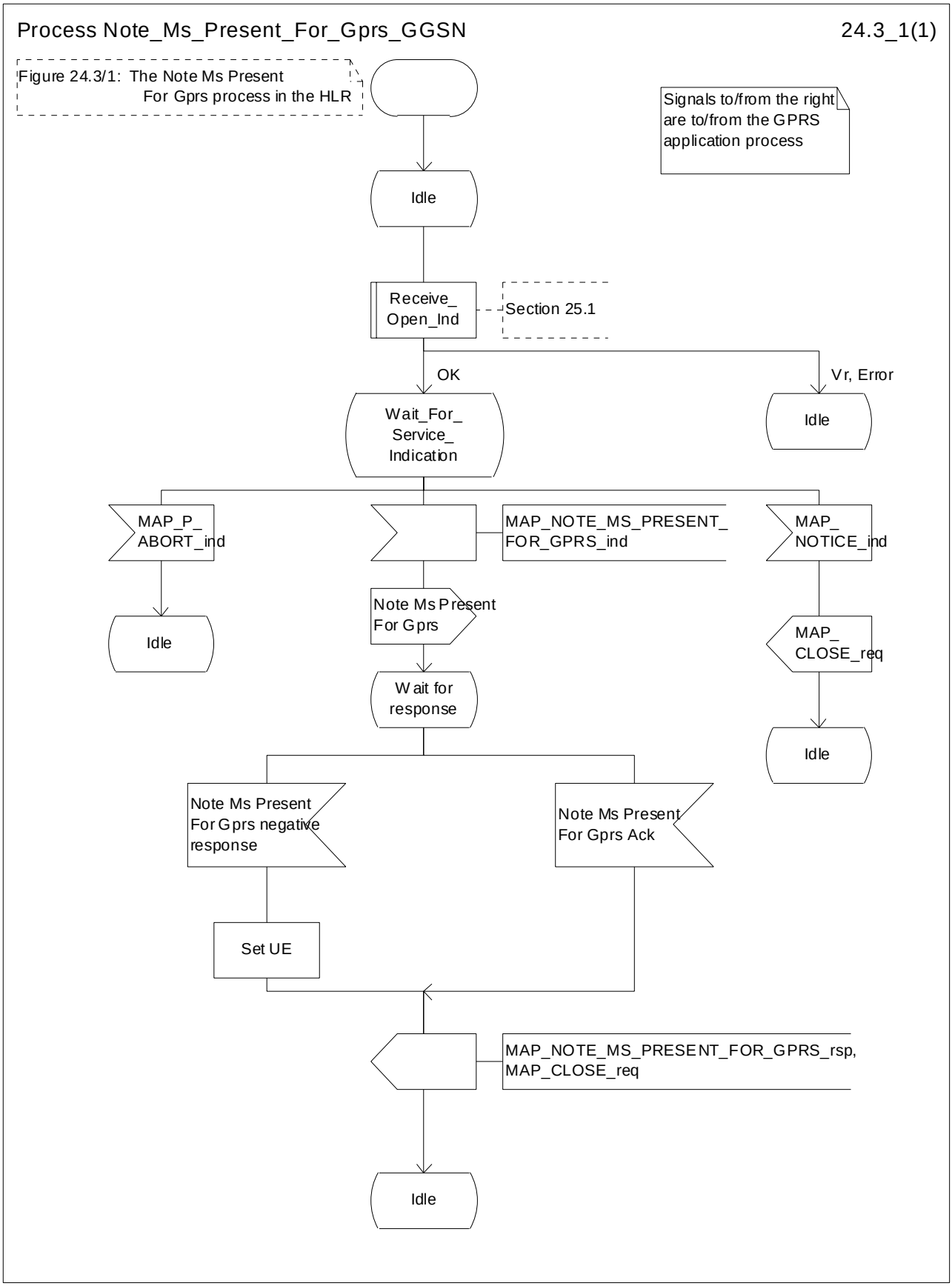
If the GPRS application process in the GGSN returns a negative response, the MAP process constructs a MAP_NOTE_MS_PRESENT_FOR_GPRS service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Failure of dialogue opening with the HLR

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

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

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


Process Note_Ms_Present_For_Gprs_GGSN
24.3_1(1)
Figure 24.3/1: The Note Ms Present For Gprs process in the HLR
Signals to/from the right are to/from the GPRS application process
Idle
Receive_ Open_Ind
Section 25.1
OK
Vr, Error
Wait_For_ Service_ Indication
Idle
MAP_P_ ABORT_ind
MAP_NOTE_MS_PRESENT_ FOR_GPRS_ind
MAP_ NOTICE_ind
Idle
Note Ms Present For Gprs
MAP_ CLOSE_req
Wait for response
Idle
Note Ms Present For Gprs negative response
Note Ms Present For Gprs Ack
Set UE
MAP_NOTE_MS_PRESENT_FOR_GPRS_rsp, MAP_CLOSE_req
Idle

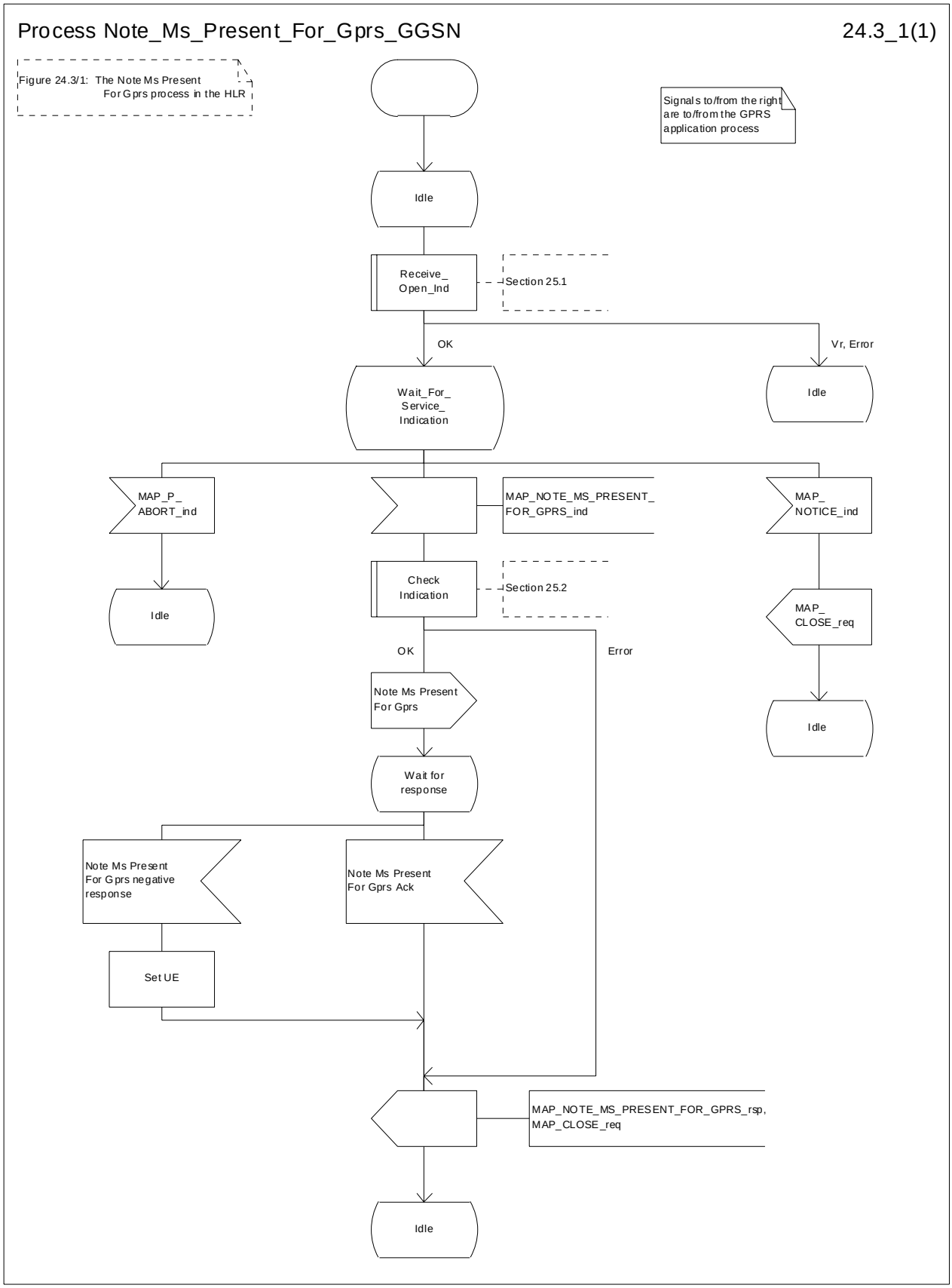


Figure 24.3/1: Process Note_Ms_Present_For_Gprs_GGSN

24.3.2 Process in the HLR for Note Ms Present For Gprs

Successful Outcome

When the MAP process receives a Note Ms Present For Gprs request from the GPRS application process in the HLR, it requests a dialogue with the GGSN whose identity is contained in the Note Ms Present For Gprs request by sending a MAP_OPEN service request, sending necessary information using a MAP_NOTE_MS_PRESENT_FOR_GPRS service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the GGSN.

If the MAP process receives a MAP_NOTE_MS_PRESENT_FOR_GPRS service confirm from the GGSN, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.

If the macro Check_Confirmation takes the OK exit, the MAP process sends a Note Ms Present For Gprs ack containing the information received from the GGSN to the GPRS application process in the HLR and returns to the idle state.

Failure of dialogue opening with the GGSN

If the macro Receive_Open_Cnf takes the Vr exit or the Error exit, the MAP process sends a negative response to the GPRS application process in the HLR and returns to the idle state.

Error in MAP_NOTE_MS_PRESENT_FOR_GPRS confirm

If the MAP_NOTE_MS_PRESENT_FOR_GPRS service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Note Ms Present For Gprs negative response to the GPRS application process in the HLR and returns to the idle state.

Abort of GGSN dialogue

After the dialogue with the GGSN has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT or a MAP_U_ABORT indication. In this case, the MAP process sends a Note Ms Present For Gprs negative response to the GPRS application process in the HLR and returns to the idle state.

If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the GGSN, sends a Failure Report negative response indicating system failure to the GPRS application process in the HLR and returns to the idle state.

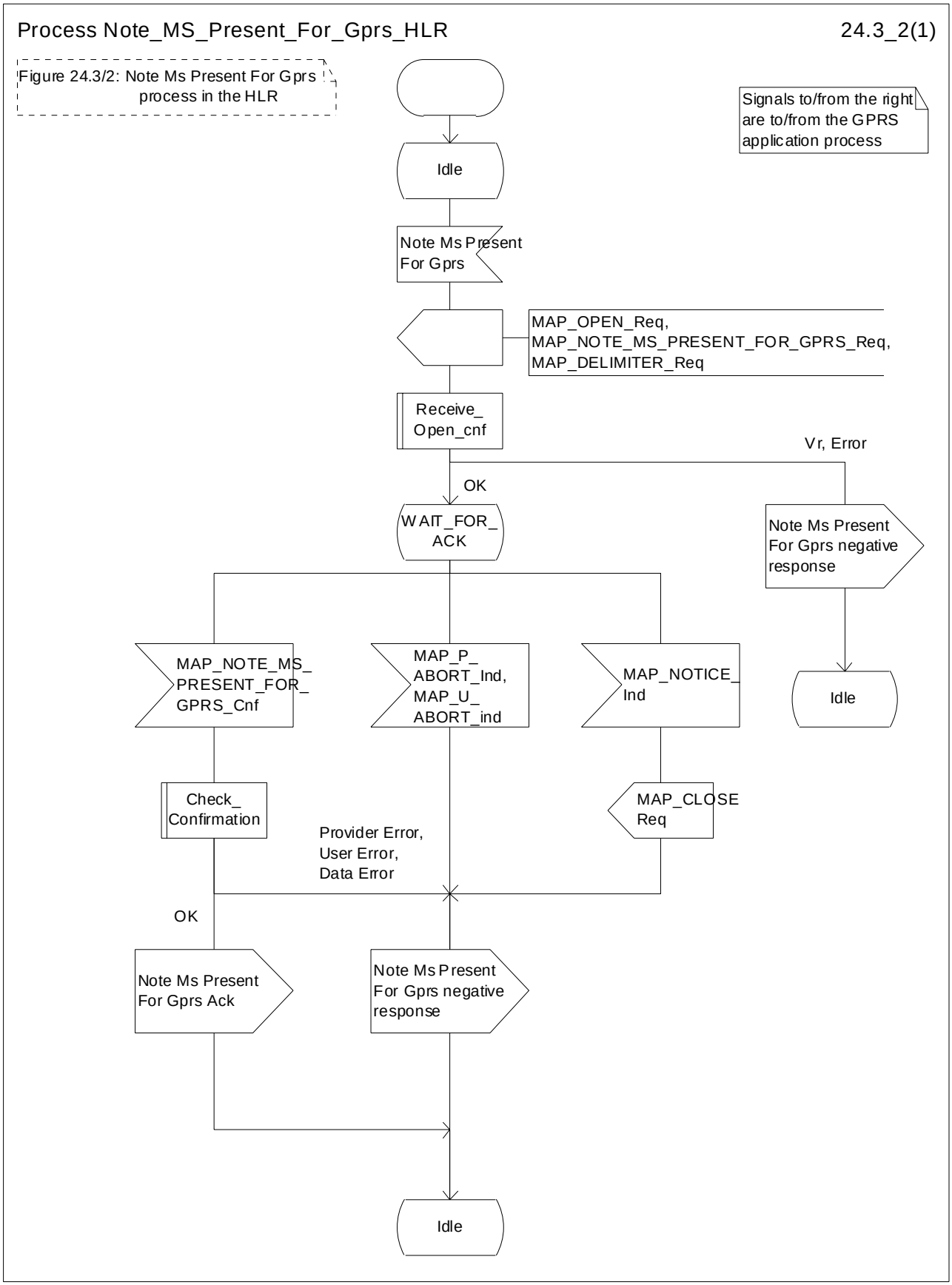


Figure 24.3/2: Process Note_Ms_Present_For_Gprs_HLR

25 General macro description

25.1 MAP open macros

25.1.1 Macro Receive_Open_Ind

This macro is used by a MAP service-user procedure when a peer entity requests opening of a dialogue.

If the application context received in the MAP-OPEN indication primitive indicates a context name of the MAP version one context set, the macro takes the Vr exit..

If an application-context different from version 1 is received, the presence of MAP_OPEN information is checked. If no MAP_OPEN information has been received, the MAP_OPEN response with:

- Result set to Dialogue Accepted; and
- Application Context Name set to the received value,

is returned

If the received version (Vr) is the one described in this version of MAP, the macro takes the OK exit, otherwise it takes the Vr exit..

If MAP_OPEN information is received, the macro "CHECK_REFERENCE" is called in order to check whether the received values for Destination Reference and Originating Reference correspond with the requirements of the received application-context-name. The outcome of this check is an error, the MAP_OPEN response with:

- Result set to Dialogue Refused;
- Refuse Reason set to Invalid Destination Reference or Invalid Originating Reference;
- Application Context Name set to the highest version supported,

is returned and the macro takes the error exit.

If the data values received for Destination Reference and Originating Reference are accepted for the associated application-context-name it is checked whether the Destination Reference is known if this check is required by the process that calls the macro.

If the Destination Reference (e.g. a subscribers IMSI) is unknown, the MAP_OPEN response with

- Result set to Dialogue Refused;
- Refuse Reason set to Invalid Destination Reference;
- Application Context Name set to the highest version supported,

is returned and the macro takes the error exit.

Else, if the Destination Reference is accepted or if no check is required, the MAP_OPEN response with

- Result set to Dialogue Accepted; and
- Application Context Name set to the received value,

is returned and

If the received version (Vr) is the one described in this version of MAP, the macro takes the OK exit, otherwise it takes the Vr exit.

25.1.2 Macro Receive_Open_Cnf

This macro is used by a user procedure after it requested opening of a dialogue towards a peer entity.

On receipt of a MAP_OPEN Confirmation with a "Result" parameter indicating "Dialogue Accepted", the macro takes the OK exit.

If the "Result" parameter indicates "Dialogue Refused", the "Refuse-reason" parameter is examined. If the "Refuse-reason" parameter indicates "Potential Version Incompatibility", the macro terminates in a way that causes restart of the dialogue by using the version 1 protocol.

If the "Refuse-reason" parameter indicates "Application Context Not Supported" and if the received Application Context Name indicates "Version Vr" (Vr < Vn), the macro terminates in a way that causes restart of the dialogue by using the version Vr protocol. Otherwise, the macro takes the Error exit.

If the "Refuse-reason" parameter indicates neither "Potential Version Incompatibility" nor "Application Context Not Supported", the macro takes the Error exit.

If a MAP_U_ABORT, a MAP_P_ABORT or a MAP_NOTICE Indication is received, the macro takes the Error exit.

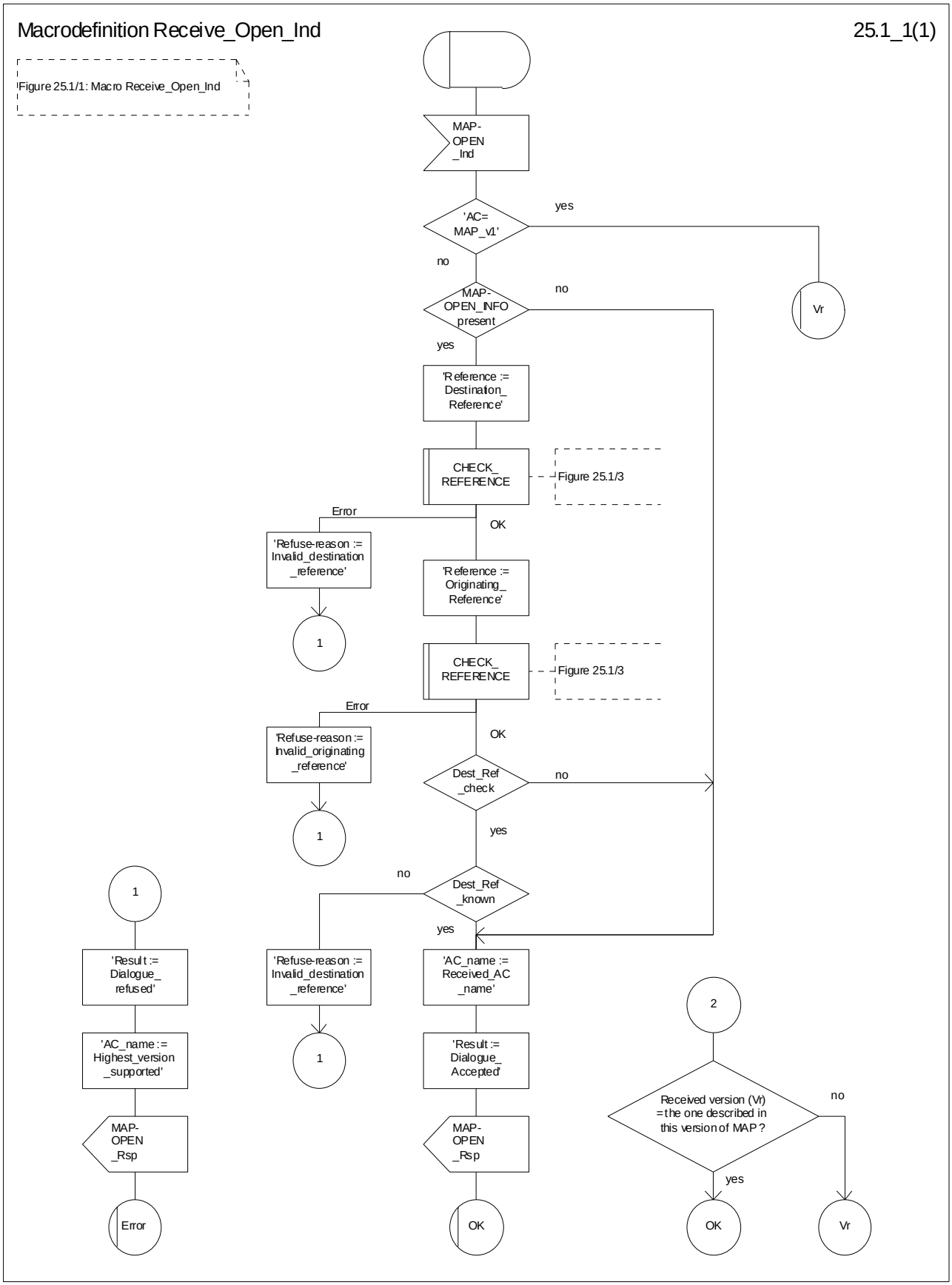


Figure 25.1/1: Macro Receive_Open_Ind

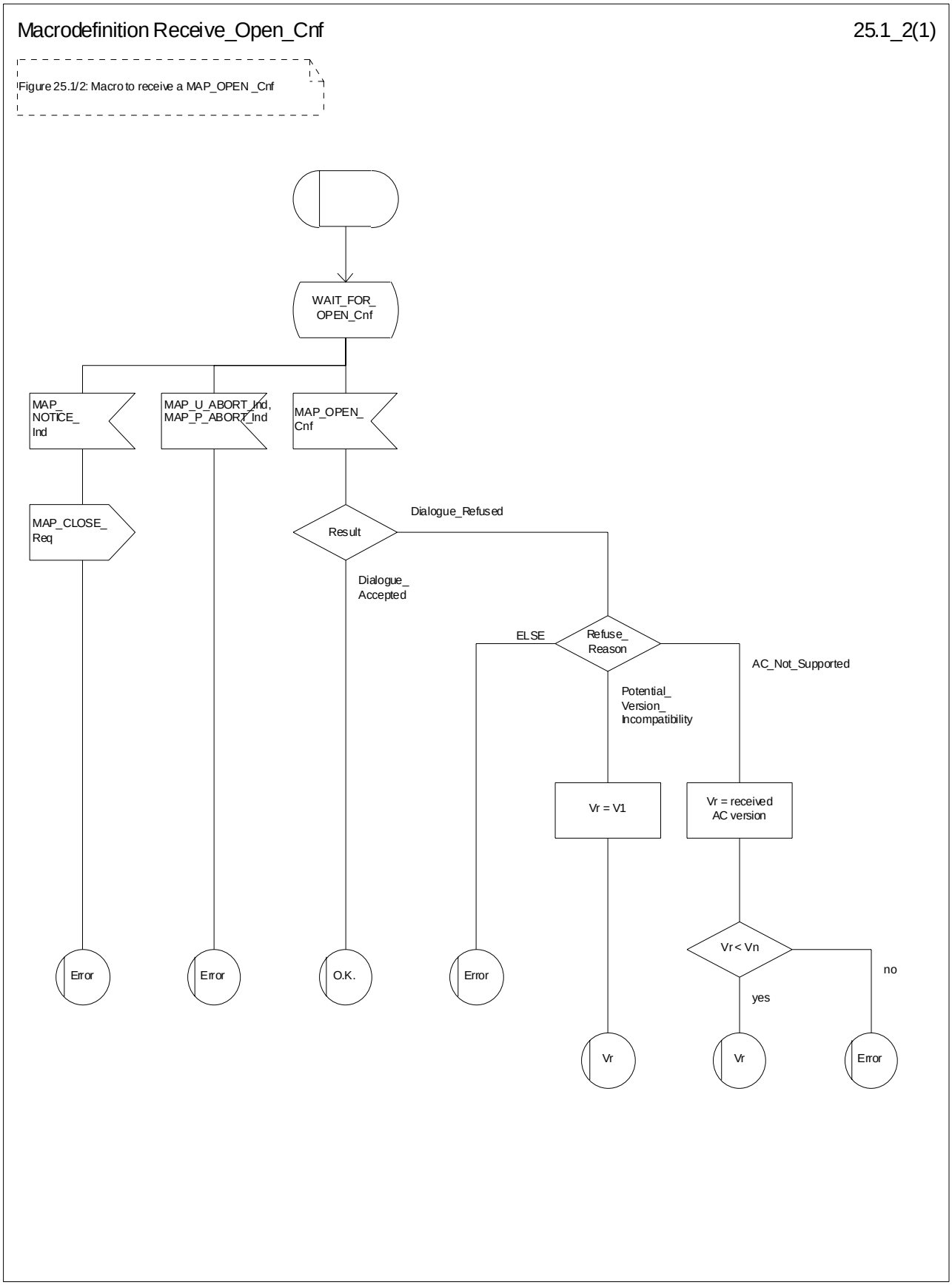


Figure 25.1/2: Macro Receive_Open_Cnf

Macrodefinition CHECK_REFERENCE 25.1_3(1)

Figure 25.1/3: Check of Destination Reference and Originating Reference received in a MAP-OPEN indication primitive

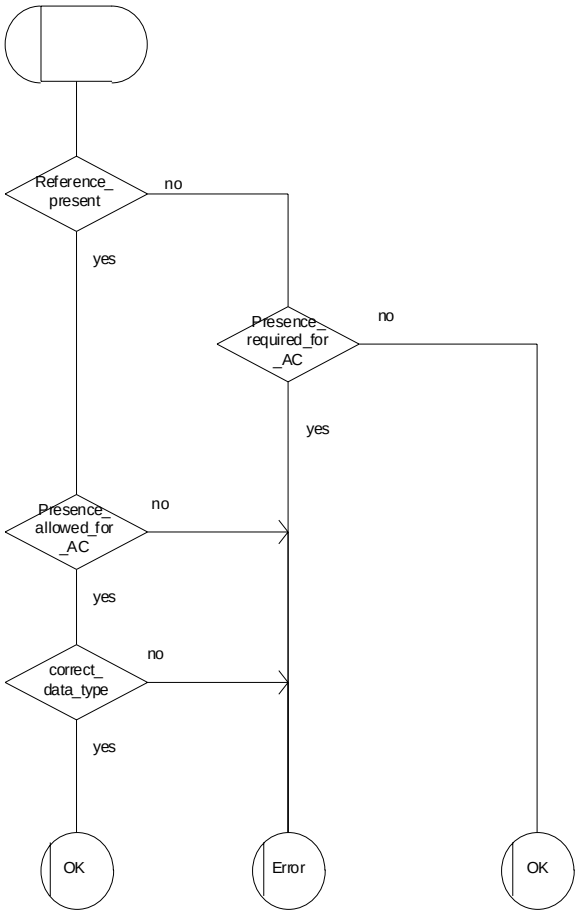


Figure 25.1/3: Macro CHECK_REFERENCE

25.2 Macros to check the content of indication and confirmation primitives

25.2.1 Macro Check_Indication

If a parameter required by the application is missing from the indication, the macro takes the error exit, with a user error of "Data Missing".

If a parameter not expected by the application is present in the indication, or an expected parameter has a value not in the set of values permitted by the application, the macro takes the error exit, with a user error of "Unexpected Data Value".

Otherwise the macro takes the "OK" exit.

The macro is shown in figure 25.2/1.

25.2.2 Macro Check_Confirmation

If the confirmation contains a provider error the macro issues a MAP CLOSE request and takes the provider error exit.

Otherwise, if the confirmation contains a user error the macro takes the user error exit.

Otherwise, if a parameter required by the application is missing from the confirmation, or a parameter not expected by the application is present in the confirmation, or an expected parameter has a value not in the set of values permitted by the application, the macro takes the data error exit.

Otherwise the macro takes the "OK" exit.

The macro is shown in figure 25.2/2.

Macrodefinition Check_Indication 25.2_1(1)

Figure 25.2/1: Macro to check the parameters of an indication primitive

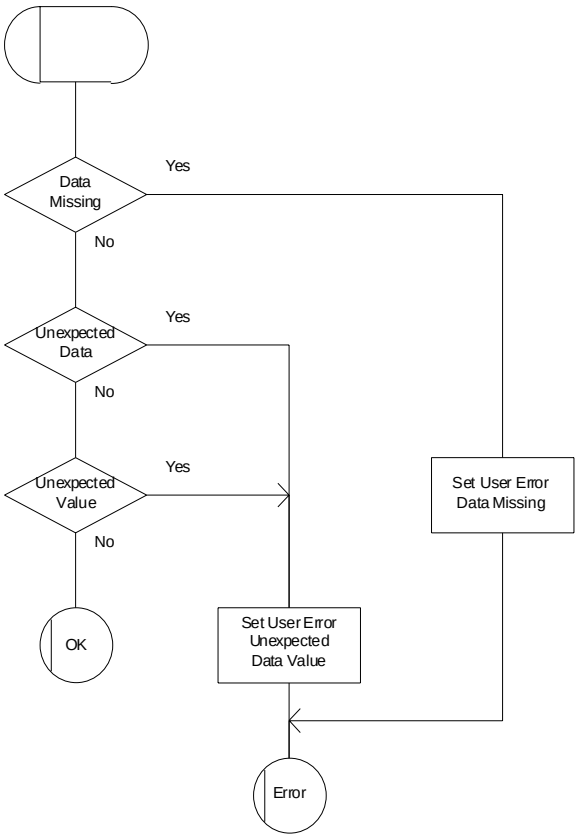


Figure 25.2/1: Macro Check_Indication

Macrodefinition Check_Confirmation 25.2_2(1)

Figure 25.2/2: Macro to check the parameters of a confirmation primitive

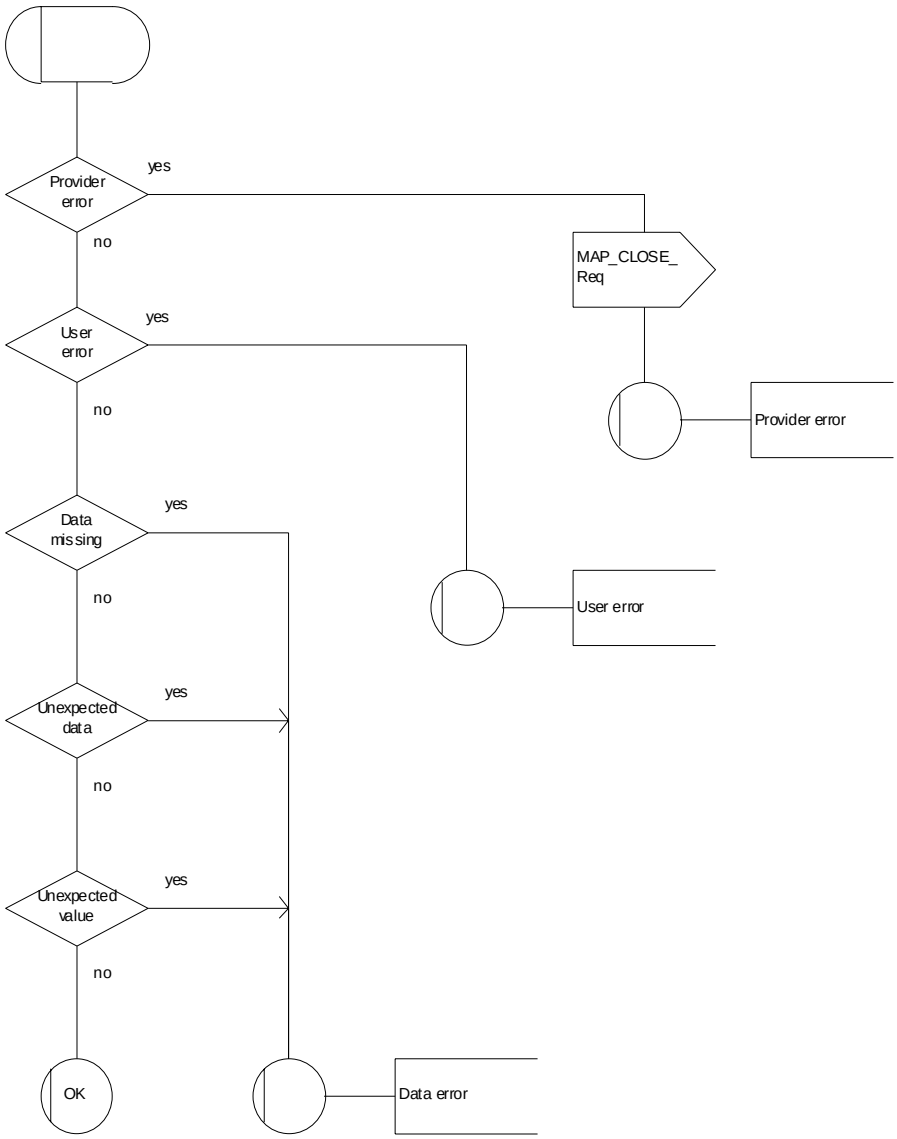


Figure 25.2/2: Macro Check_Confirmation

25.3 The page and search macros

25.3.1 Macro PAGE_MSC

This macro (see figure 25.3/1) is called if a mobile terminating call set-up, an unstructured SS notification, a network-initiated unstructured SS request or a mobile terminating short message is to be delivered to the MS and the current location area identity of the MS is known in the VLR.

When the MSC receives a MAP_PAGE indication, parameter checks are performed first (macro Check_Indication, see subclause 25.2). If parameter errors are detected, the MSC returns a MAP_PAGE response containing the appropriate error cause and the macro terminates with unsuccessful outcome.

Thereafter, several checks on the indication content are performed. The macro terminates by returning the MAP_PAGE response with error:

Unknown Location Area if the LAI is not known in the MSC;

System Failure if the call has been released by the calling subscriber or the SMS or SS transaction for this subscriber has been released by the originating entity in the meantime.

Next, the MSC checks if an MM-connection over the radio link already exists for the given IMSI. If so,

- in the case of mobile terminating call set-up the MSC determines whether the busy condition can be established (see GSM 02.01 for a definition of busy states). If the MSC determines that the MS is busy, it returns a MAP_PAGE response with error Busy Subscriber, qualified by either More Calls Allowed or No More Calls Allowed. The macro then terminates with unsuccessful outcome.

- if the service requested is short message service or an unstructured SS notification or network-initiated unstructured SS request, or if the service is mobile terminating call set-up, but the existing connection is for signalling purposes only (i.e. a service different from call set-up), the access connection status is set according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not), and the macro terminates with successful outcome.

If no MM-connection for the given IMSI exists, paging is initiated at the radio interface within all cells of the location area indicated by the VLR. If the VLR provided the TMSI, the MSC uses it to identify the MS at the radio interface; otherwise the MSC uses the IMSI. The IMSI will also be used to determine the page group (see GSM 04.08). There are several possible outcomes of paging:

- the MS responds to paging, causing the access connection status to be set accordingly (i.e. no RR-connection, in which case other values are not significant), and the macro terminates with successful outcome;

- the MS responds with a channel request containing an establishment cause which is not "answer to paging". The MSC sends a MAP_PAGE response primitive with user error Busy Subscriber before the macro terminates with unsuccessful outcome. This will give priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which will give priority to the mobile terminating request.

- there is no response from the MS. The MSC sends a MAP_PAGE response primitive with user error Absent Subscriber before the macro terminates with unsuccessful outcome;

- the call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released before a response is received from the MS (indicated in the SDL by the input signal I-REL). The MAP transaction with the VLR will be released in this case by a MAP_U_ABORT request, and the unsuccessful macro termination will indicate transaction termination.

- the MAP transaction with the VLR may be released by receiving a MAP_U_ABORT or MAP_P_ABORT indication. The call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released (indicated in the SDL by the output signal I-REL), and the unsuccessful macro termination will indicate transaction termination.

25.3.2 Macro Search_For_MS_MSC

This macro (see figure 25.3/2) is called if a mobile terminating call set-up, an unstructured SS notification, a network-initiated unstructured SS request or a mobile terminating short message is to be delivered to the MS and the current location area identity of the MS is not known in VLR.

When the MSC receives a MAP_SEARCH_FOR_MS Indication, parameter checks are performed first (macro Check_indication, see subclause 25.2). If parameter errors are detected, the MSC returns a MAP_SEARCH_FOR_MS response containing the appropriate error cause and the macro terminates with unsuccessful outcome.

Thereafter, the MSC checks whether the call or the SMS or SS transaction still exists in the MSC. If the call or the SMS or SS transaction has been released, the MSC returns a MAP_SEARCH_FOR_MS response with error System Failure and the macro terminates with unsuccessful outcome.

Next, the MSC checks if an MM-connection over the radio link already exists for the given IMSI. If so,

- in the case of mobile terminating call set-up the MSC determines whether the busy condition can be established (see GSM 02.01 for a definition of busy states). If the MSC determines that the MS is busy, it returns a MAP_SEARCH_FOR_MS response with error Busy Subscriber, qualified by either More Calls Allowed or No More Calls Allowed. The macro then terminates with unsuccessful outcome.

- if the service requested is short message service or an unstructured SS notification or network-initiated unstructured SS request, or if the service is mobile terminating call set-up, but the existing connection is for signalling purposes only (i.e. a service different from call set-up), a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS is returned to the VLR. The access connection status is set according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not), and the macro terminates with successful outcome.

If no MM-connection for the given IMSI exists, paging is initiated at the radio interface within all cells of all location areas of the VLR, using the IMSI to identify the subscriber and the page group (see GSM 04.08). There are several possible outcomes of paging:

- the MS responds to paging, causing a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS to be returned to the VLR. The access connection status will be set accordingly (i.e. no RR-connection, in which case other values are not significant), and the macro terminates with successful outcome.

- the MS responds with a channel request containing an establishment cause which is not "answer to paging". The MSC sends a MAP_SEARCH_FOR_MS response primitive with user error "Busy Subscriber" before the macro terminates with unsuccessful outcome. This will give priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which will give priority to the mobile terminating request.

- there is no response from the MS. The MSC sends a MAP_SEARCH_FOR_MS response primitive with user error "Absent Subscriber" before the macro terminates with unsuccessful outcome.

- the call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released before a response is received from the MS (indicated in the SDL by the input signal I-REL). The MAP transaction with the VLR will be released in this case by a MAP_U_ABORT request, and the unsuccessful macro termination will indicate transaction termination.

- the MAP transaction with the VLR may be released by receiving a MAP_U_ABORT or MAP_P_ABORT indication. The call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released (indicated in the SDL by the output signal I-REL), and the unsuccessful macro termination will indicate transaction termination.

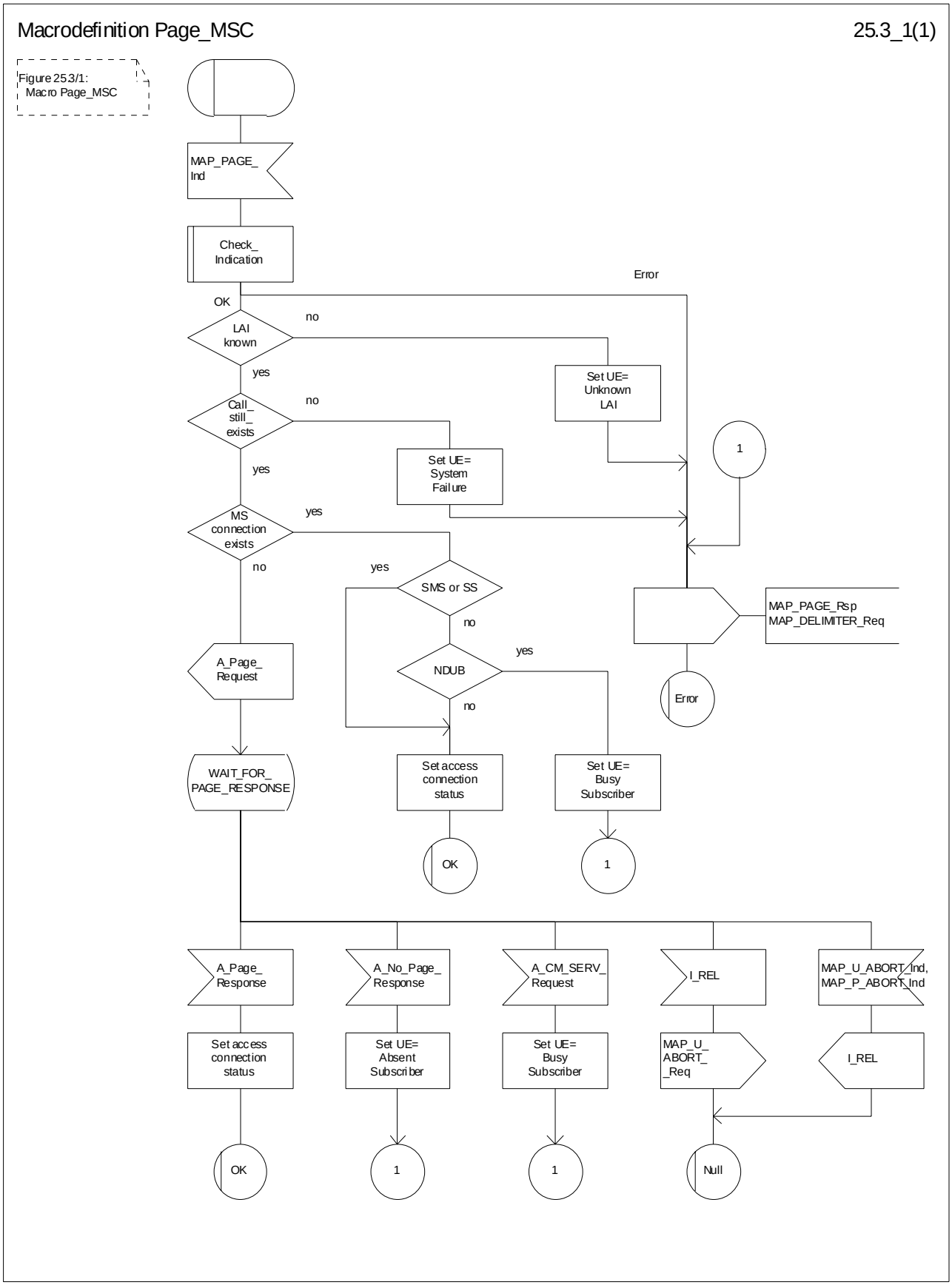


Figure 25.3/1: Macro Page_MSC

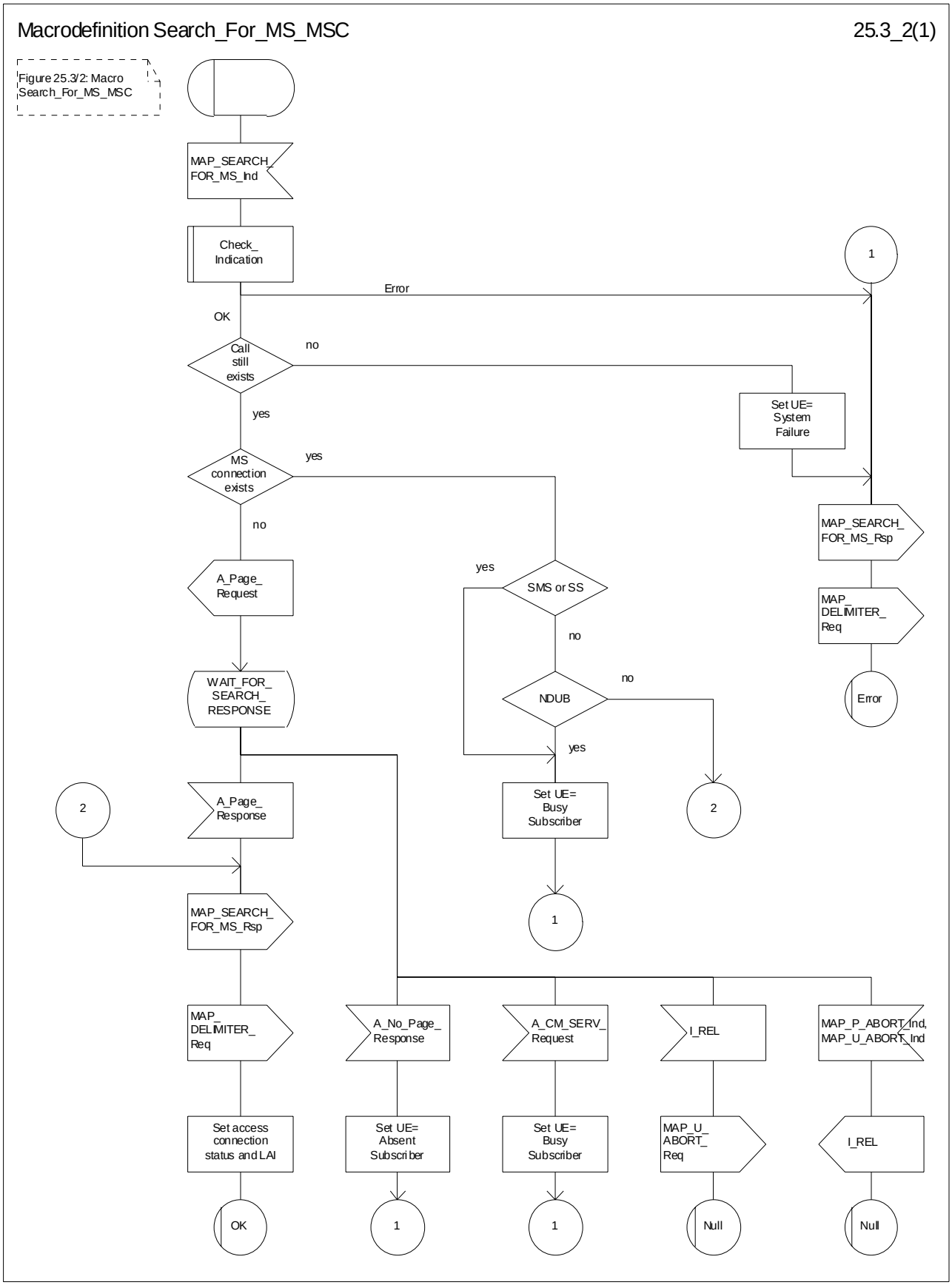


Figure 25.3/2: Macro Search_for_MS_MSC

25.4 Macros for handling an Access Request

These macros are invoked when a MS accesses the network, e.g. to set up an outgoing call or when responding to paging. The macro handles identification and authentication of the mobile subscriber as well as invocation of security related features (see GSM 02.09).

25.4.1 Macro Process_Access_Request_MSC

This macro is invoked by any procedure receiving an access request from the MS, e.g. the page response at mobile terminating call set-up or the request for outgoing call set-up.

If no dialogue with the VLR exists (e.g. within the procedure for outgoing call set-up), the MSC will open a dialogue towards the VLR by sending a MAP_OPEN request without any user specific parameters.

In any case, the parameters received from the MS are mapped to a MAP_PROCESS_ACCESS_REQUEST request primitive, containing:

- the received subscriber identification (IMSI, TMSI) or - in case of emergency call set-up - an IMEI;
- the CM service type, indicating the type of request;
- the status of the access connection, i.e. whether a connection to this MS already exists and if so, whether it is already authenticated and ciphered;
- the current location area id of the MS; and
- the CKSN received from the MS.

If opening of the dialogue was required, the MSC will wait for the dialogue confirmation (see macro Receive_Open_Confirmation, subclause 25.1), leading either to:

- immediate unsuccessful exit from the macro, in case no dialogue is possible;
- reversion to MAP version one dialogue if indicated by the VLR. The macro terminates with unsuccessful outcome, as the complete dialogue will be covered by the version one procedure, so that no further action from the calling process is required;
- continuation as given below, if the dialogue is accepted by the VLR.

The MSC waits then for the MAP_PROCESS_ACCESS_REQUEST confirmation. In between, several other indications may be received from the VLR:

- the MSC may receive a MAP_PROVIDE_IMSI indication, handled by the macro Obtain_IMSI_MSC defined in subclause 25.8. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;
- the MSC may receive a MAP_AUTHENTICATE indication, handled by the macro Authenticate_MSC defined in subclause 25.5. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;
- the MSC may receive a MAP_TRACE_SUBSCRIBER_ACTIVITY indication, handled by the macro Trace_Subscriber_Activity_MSC defined in subclause 25.9;
- the MSC may receive a MAP_SET_CIPHERING_MODE indication, which will be stored for initiating ciphering later on;
- the MSC may receive a MAP_CHECK_IMEI indication, handled by the macro Check_IMEI_MSC defined in subclause 25.6. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;
- the MSC may receive a MAP_Obtain_IMEI indication, handled by the macro Obtain_IMEI_MSC defined in subclause 25.6. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;

- the MSC may receive a MAP_U_ABORT or MAP_P_ABORT indication, or a premature MAP_CLOSE indication from the VLR. In all these cases, the macro terminates with unsuccessful outcome, after sending the appropriate reject towards the MS (see GSM 09.10);

- the MSC may receive a MAP_NOTICE indication from the VLR. In this case, the dialogue towards the VLR is terminated by a MAP_CLOSE primitive, the appropriate reject is sent towards the MS (see GSM 09.10), and the macro terminates with unsuccessful outcome;

- the MSC may receive an indication for release of the radio path, in which case the dialogue towards the VLR will be terminated by a MAP_U_ABORT primitive, containing the diagnostic information Radio Channel Release.

When the MAP_PROCESS_ACCESS_REQUEST confirmation is received, the parameters of this primitive are checked first. In case of unsuccessful outcome of the service, the MAP User Error received is mapped onto the appropriate radio interface message (see GSM 09.10), before the macro terminates with unsuccessful outcome.

In case of positive outcome of the service, ciphering is initiated on the radio path, if this had been requested by the VLR (see above). Otherwise, if the access request was not triggered by a page response from the MS, the access request is accepted explicitly by sending a CM_Service_Accept message to the MS. If the access request was triggered by a page response from the MS then no CM Service Accept message is sent.

After ciphering has been initiated, the MSC will wait for the MAP_FORWARD_NEW_TMSI indication from the VLR. While waiting, the MSC may receive:

- a MAP_U_ABORT or MAP_P_ABORT indication, or a premature MAP_CLOSE indication from the VLR. In these cases, the macro terminates with unsuccessful outcome, after sending a release request towards the MS (see GSM 09.10);

- a MAP_NOTICE indication from the VLR. In this case, the dialogue towards the VLR is terminated by a MAP_CLOSE primitive, the appropriate reject is sent towards the MS (see GSM 09.10), and the macro terminates with unsuccessful outcome;

- an indication for release of the radio path, in which case the dialogue towards the VLR will be terminated by a MAP_U_ABORT primitive, containing the diagnostic information Radio Channel Release;

- a MAP_DELIMITER request from the VLR. This will be taken as a successful outcome of the macro (i.e. the VLR did not require TMSI reallocation), and it terminates successfully;

- an A_SETUP request from the MS. This will be saved for handling by the procedure which invoked the macro Process_Access_Request_MSC after the macro has terminated.

When the MAP_FORWARD_NEW_TMSI indication is received in the MSC, the TMSI Reallocation Command is sent to the MS, and the MSC waits for an acknowledgement from the MS. In case a positive acknowledgement is received, the MSC sends an empty MAP_FORWARD_NEW_TMSI response primitive to the VLR and terminates successfully. Else, the dialogue is terminated locally (MAP_CLOSE_Req with Release method Prearranged End) without any further action.

If the MSC receives an A_SETUP request while it is waiting for the TMSI acknowledgement from the MS, the A_SETUP is saved for handling by the procedure which invoked the macro Process_Access_Request_MSC after the macro has terminated.

If the dialogue is aborted by the VLR while waiting for the TMSI acknowledgement from the MS, the MSC regards the access request to be failed and terminates with unsuccessful outcome, after sending a release request towards the MS (see GSM 09.10).

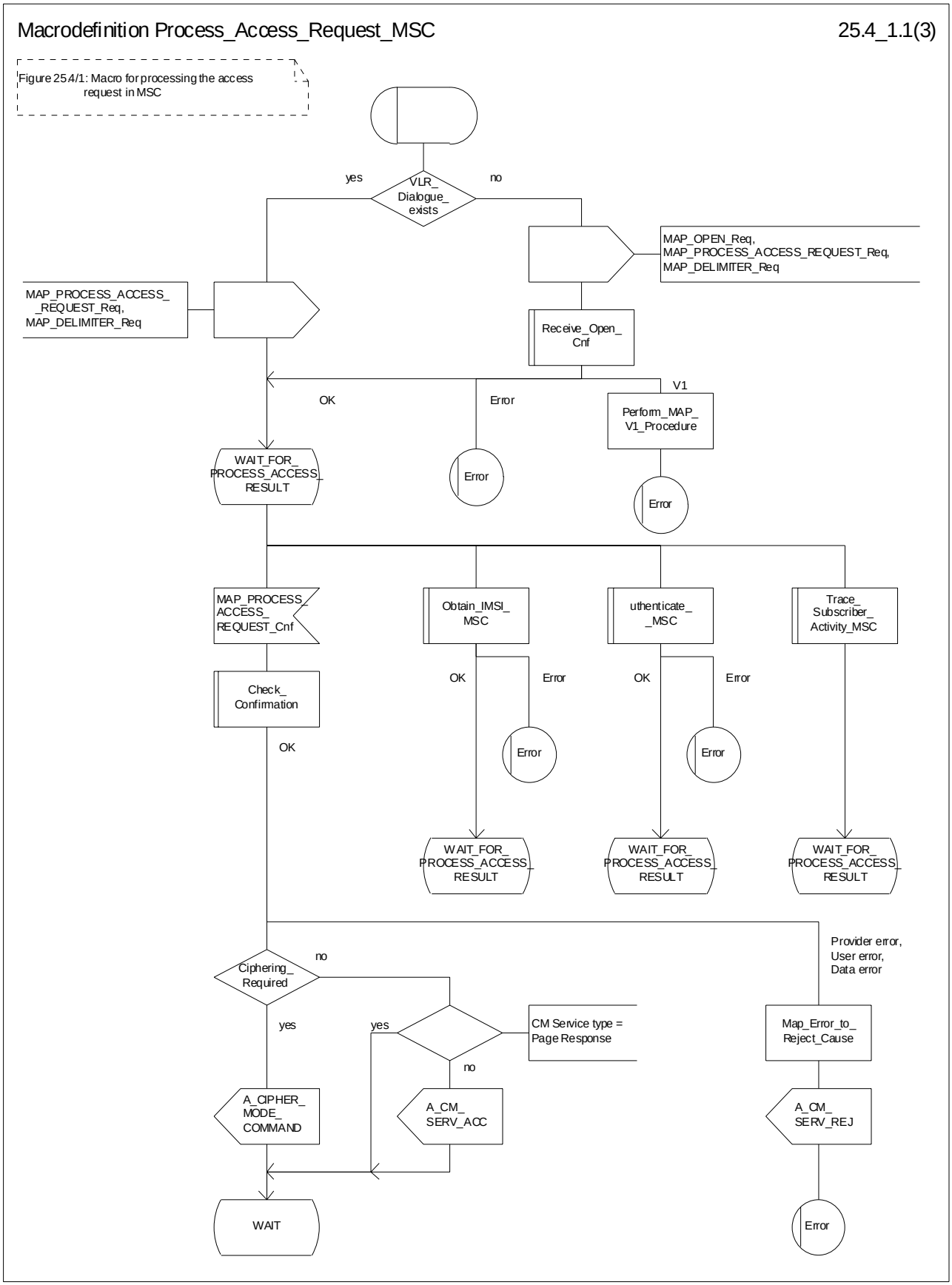


Figure 25.4/1 (sheet 1 of 3): Macro Process_Access_Request_MSC

Macrodefinition Process_Access_Request_MSC 25.4_1.2(3)

Figure 25.4/1: Macro for processing the access request in MSC

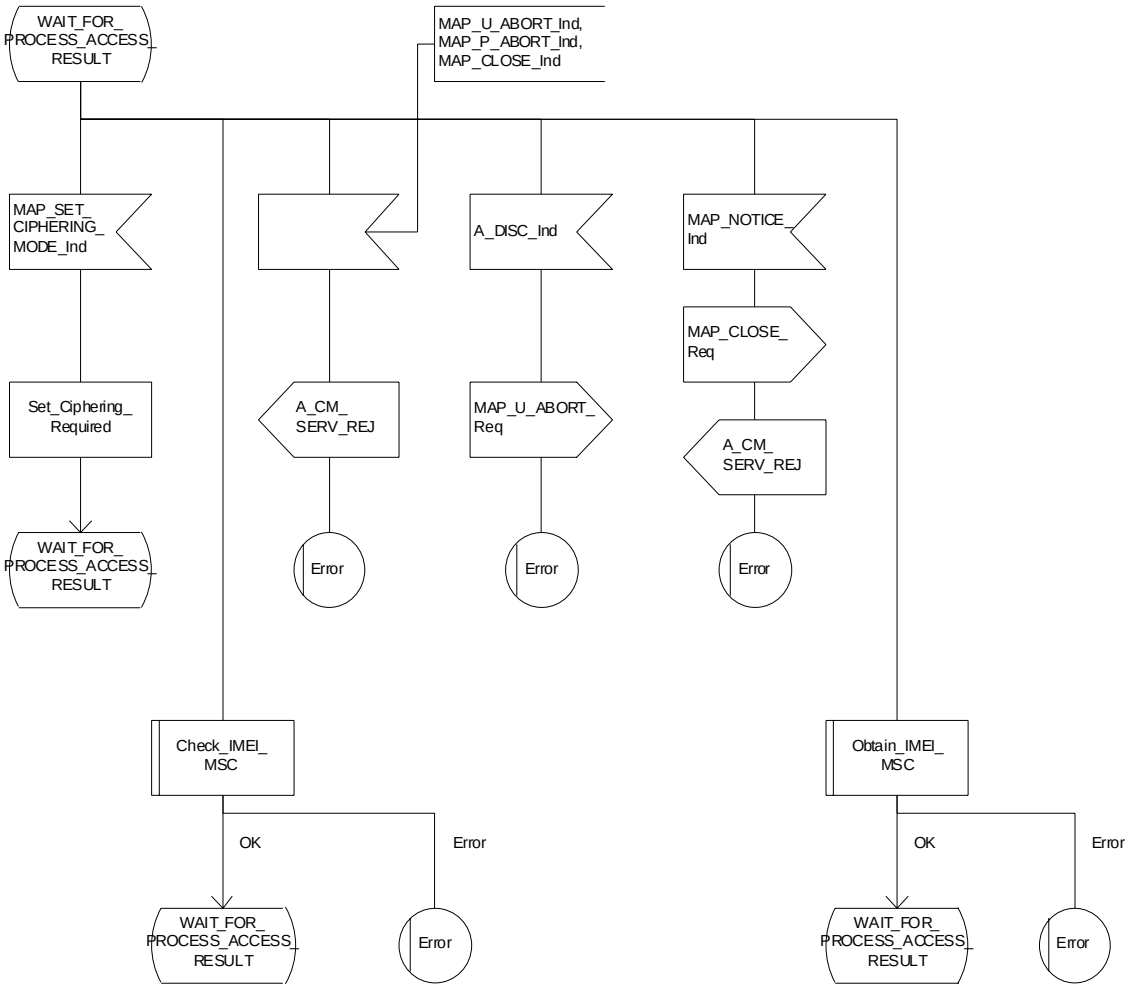


Figure 25.4/1 (sheet 2 of 3): Macro Process_Access_Request_MSC

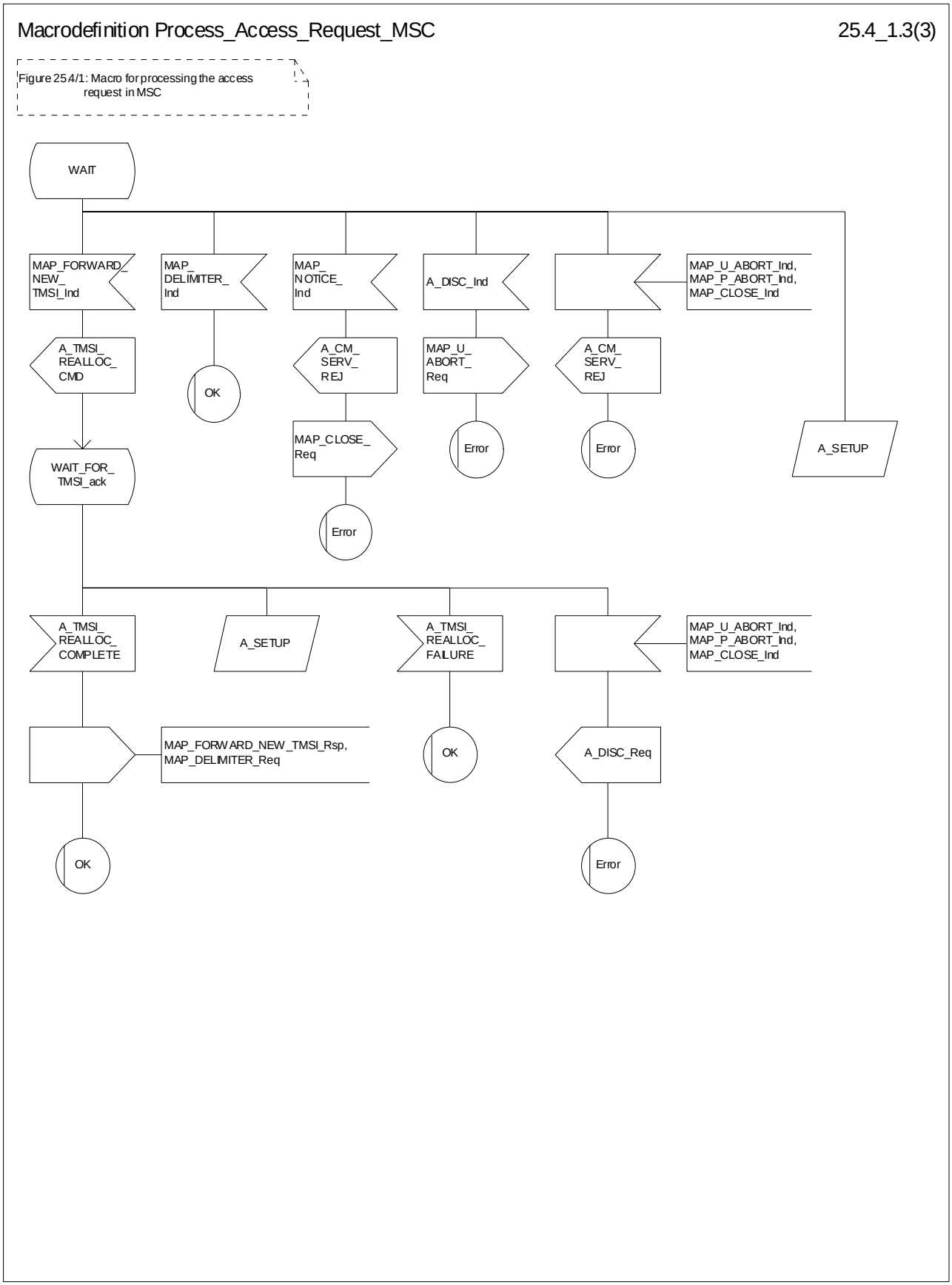


Figure 25.4/1 (sheet 3 of 3): Macro Process_Access_Request_MSC

25.4.2 Macro Process_Access_Request_VLR

When the VLR receives a MAP_PROCESS_ACCESS_REQUEST indication, the VLR will check this indication first (macro Check_Indication, see subclause 25.2). In case of negative outcome, the macro will proceed with the error handling described below.

If the indication data are correct, it is checked first whether the subscriber identification (IMSI or TMSI) is known if included:

- if the identification is not known, the IMSI may be requested from the MS, described in the macro Identification_Procedure (see below) with outcome:
  - OK, if a IMSI known in the VLR has been received;
  - Error, if the VLR did not recognize the subscriber's identity. The macro will proceed with the error handling described below;
  - Aborted, if the transaction to the MSC is released. The macro will terminate immediately with unsuccessful.

In case the identity received is an IMEI, the error System Failure is set and the macro proceeds with the error handling described below.

NOTE: Emergency Call with IMEI may be accepted within the error handling phase.

For a known subscriber the authentication check is performed next (see macro Authenticate_VLR, subclause 25.5), if required. If a negative result is received, the VLR proceeds on receipt of user error:

- illegal subscriber depending on the identity used for authentication;

  In case IMSI is already used or no new authentication attempt with IMSI shall not be performed (operator option), the error Illegal Subscriber is set and the macro proceeds with the error handling described below.

  If a new authentication attempt with IMSI shall be performed, the IMSI is requested from the MS (macro Obtain_IMSI_VLR, see subclause 25.8):
  - the authentication will be performed again if a IMSI known in the VLR is received;
  - the error Unidentified Subscriber is set and the macro proceeds with the error handling described below, if the IMSI received is unknown in VLR;
  - if the IMSI request procedure fails for any other reason, the error System Failure is set and the macro proceeds with the error handling described below;
  - if the dialogue has been aborted during the IMSI request, the macro terminates immediately with unsuccessful outcome;
- unknown subscriber by setting the error Unidentified Subscriber and proceeding with the error handling described below.

NOTE: This can occur only in case of data inconsistency between HLR and VLR;

- procedure error by setting the error System Failure and proceeding with the error handling described below;
- null (i.e. the dialogue towards the MSC is terminated) by terminating immediately with unsuccessful outcome.

The MS access is accepted if no authentication is required or after successful authentication. Then, the indicator "Confirmed by Radio Contact" is set to "Confirmed". If the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed", HLR updating will be started as an independent process (Update_Location_VLR, see subclause 19.1.1.6).

If the indicator "Confirmed by HLR" is set to "Not Confirmed", the error Unidentified Subscriber is set and the macro proceeds with the error handling described below.

If roaming is not allowed in the location area indicated in the Current Location Area Id parameter, the error Roaming Not Allowed qualified by the roaming restriction reason is set and the macro proceeds with the error handling described below.

In case roaming is allowed, the IMSI is set to attached and the process for notifying the HLR that the subscriber is present is started if required (Subscriber Present VLR, see subclause 25.10).

At next, tracing is invoked if required by the operator (macro Trace_Subscriber_Activity_VLR, see subclause 25.9). Thereafter,

if ciphering is not required, IMEI checking is invoked if required by the operator (see macro Check_IMEI_VLR defined in subclause 25.6).

The error Illegal Equipment is set in case of unsuccessful outcome of the IMEI check, the subscriber is marked as detached and the macro proceeds with the error handling described below.

The macro terminates immediately with unsuccessful outcome if the MSC dialogue has been released during the IMEI check.

Else, the macro terminates successfully by returning the MAP_PROCESS_ACCESS_REQUEST response containing the IMSI to indicate acceptance of the MS access.

if ciphering is required, the MAP_SET_CIPHERING_MODE request containing:

- the cipher mode indicating the cipher algorithm required; and
- the cipher key to be used;

is sent to the MSC.

As a further operator option, IMEI checking may be performed next.

The error Illegal Equipment is set in case of unsuccessful outcome of the IMEI check, the subscriber is marked as detached and the macro proceeds with the error handling described below.

The macro terminates immediately with unsuccessful outcome if the MSC dialogue has been released during the IMEI check.

Else, the macro terminates successfully by returning the MAP_PROCESS_ACCESS_REQUEST response containing the IMSI to indicate acceptance of the MS access.

IF no TMSI reallocation is required (again an operator option), the macro terminates thereafter. Else, TMSI reallocation is performed by sending a MAP_FORWARD_NEW_TMSI request, containing the new TMSI as parameter. The old TMSI will be frozen until an acknowledgement from the MS has been received. Before the macro terminates, the VLR will wait for the MAP_FORWARD_NEW_TMSI response, containing no parameters if reallocation has been confirmed by the MS, or a Provider Error, otherwise, in which case the old TMSI is kept frozen to avoid double allocation. In this case, both the old as the new TMSI are subsequently regarded valid when used by the MS.

Error handling

In case some error is detected during handling the access request, a respective error has been set. Before returning this error cause to the MSC in a MAP_PROCESS_ACCESS_REQUEST response, it need to be checked whether this access is for emergency call set-up, as this will require extra treatment.

If the CM Service type given in the MAP_PROCESS_ACCESS_REQUEST indication is emergency call set-up, it is checked whether EC set-up in the particular error situation is permitted (operator option). If so, it is checked whether the IMEI is required, and if so the IMEI is requested from the MS (macro Obtain_IMEI_VLR, see subclause 25.6).

The macro will terminate immediately with unsuccessful outcome if the MSC transaction has been aborted during the IMEI retrieval.

In case of an error reported back from IMEI retrieval, MAP_PROCESS_ACCESS_REQUEST response containing the error cause set previously is returned to the MSC, the dialogue is closed (MAP_CLOSE request indicating normal release) and the macro terminates with unsuccessful outcome.

When a subscriber identity required by the operator (IMSI or IMEI) is available, the user error set previously is deleted, the respective identity is returned in the MAP_PROCESS_ACCESS_REQUEST response to indicate acceptance of emergency call, and the macro terminates with successful outcome.

In all other cases, the MAP_PROCESS_ACCESS_REQUEST response containing the error cause set previously is returned to the MSC, the dialogue is closed (MAP_CLOSE request indicating normal release) and the macro terminates with unsuccessful outcome.

25.4.3 Macro Identification Procedure

This macro is invoked by the macro Process_Access_Request_VLR in case the subscribers identity is not known in the VLR.

If the identity received from the MS is an IMSI, the error Unidentified Subscriber will be set and reported back to the calling macro (to be sent in the MAP_PROCESS_ACCESS_REQUEST response). The same error is used in case a TMSI was received from the MS, but the operator does not allow open identification of the MS.

If open identification of the MS is allowed, the macro Obtain_IMSI_VLR is invoked, requesting the subscribers IMSI from the MS (see subclause 25.8), with outcome

OK, in which case it is checked whether for the IMSI received there exists a subscriber record in the VLR. If so, the macro terminates successfully, else the error Unidentified Subscriber will be set and reported back to the calling macro.

Error, in which case the error System Failure will be set and reported back to the calling macro.

Aborted, i.e. the MSC transaction is released, in which the macro terminates accordingly.

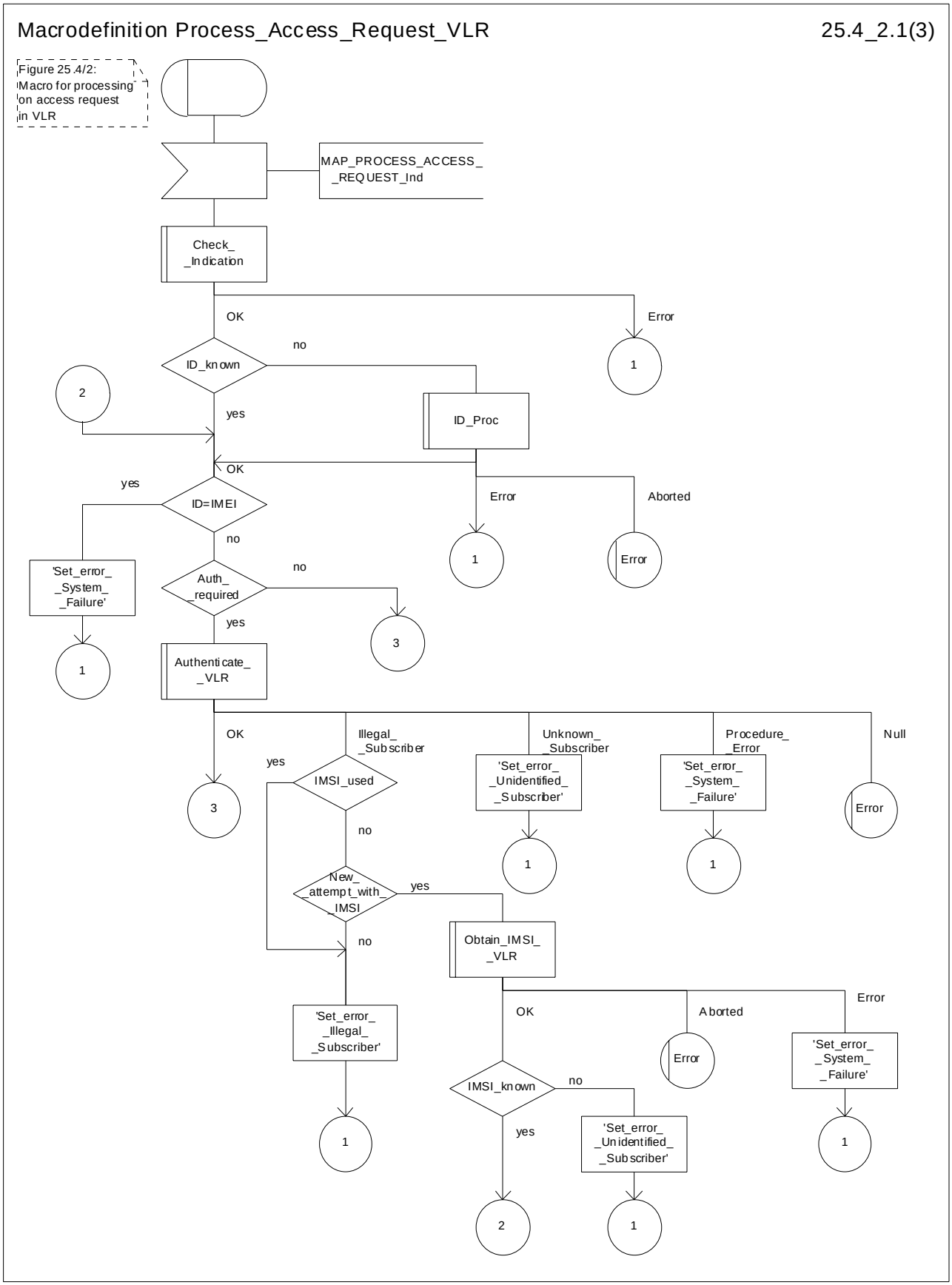


Figure 25.4/2 (sheet 1 of 3): Macro Process_Access_Request_VLR

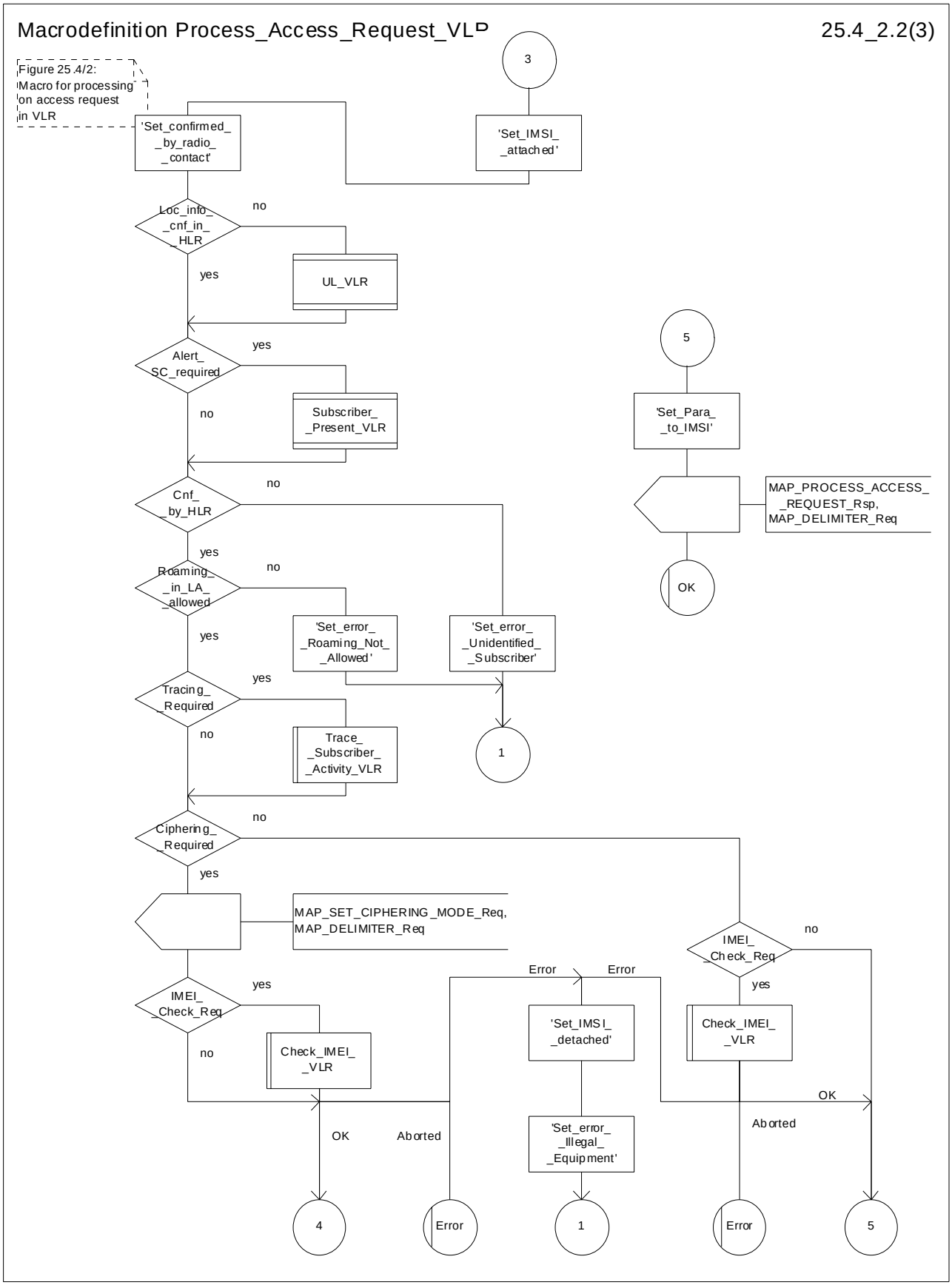


Figure 25.4/2 (sheet 2 of 3): Macro Process_Access_Request_VLR

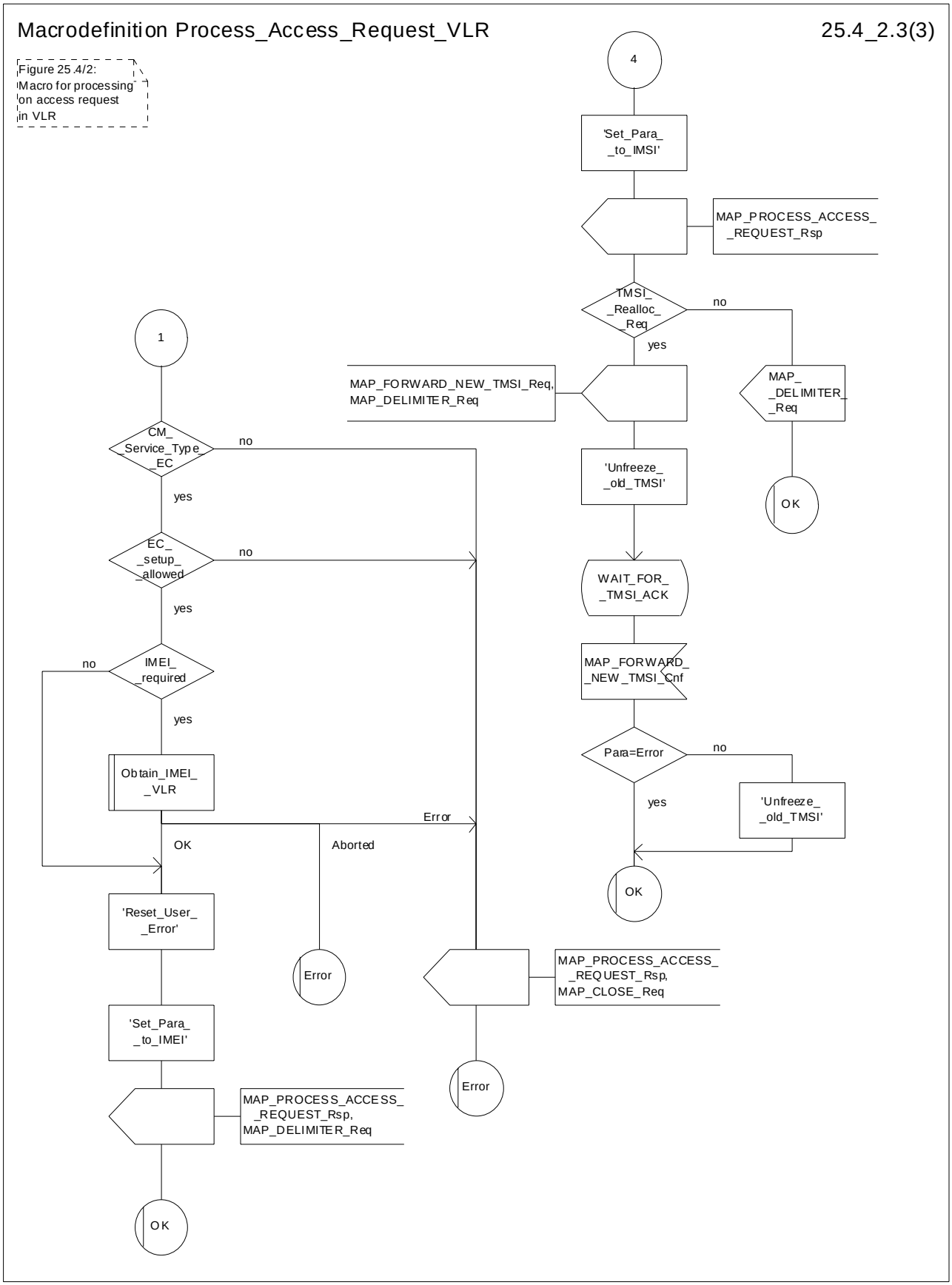


Figure 25.4/2 (sheet 3 of 3): Macro Process_Access_Request_VLR

Macrodefinition ID_Proc_VLR 25.4_3(1)

Figure 25.4/3

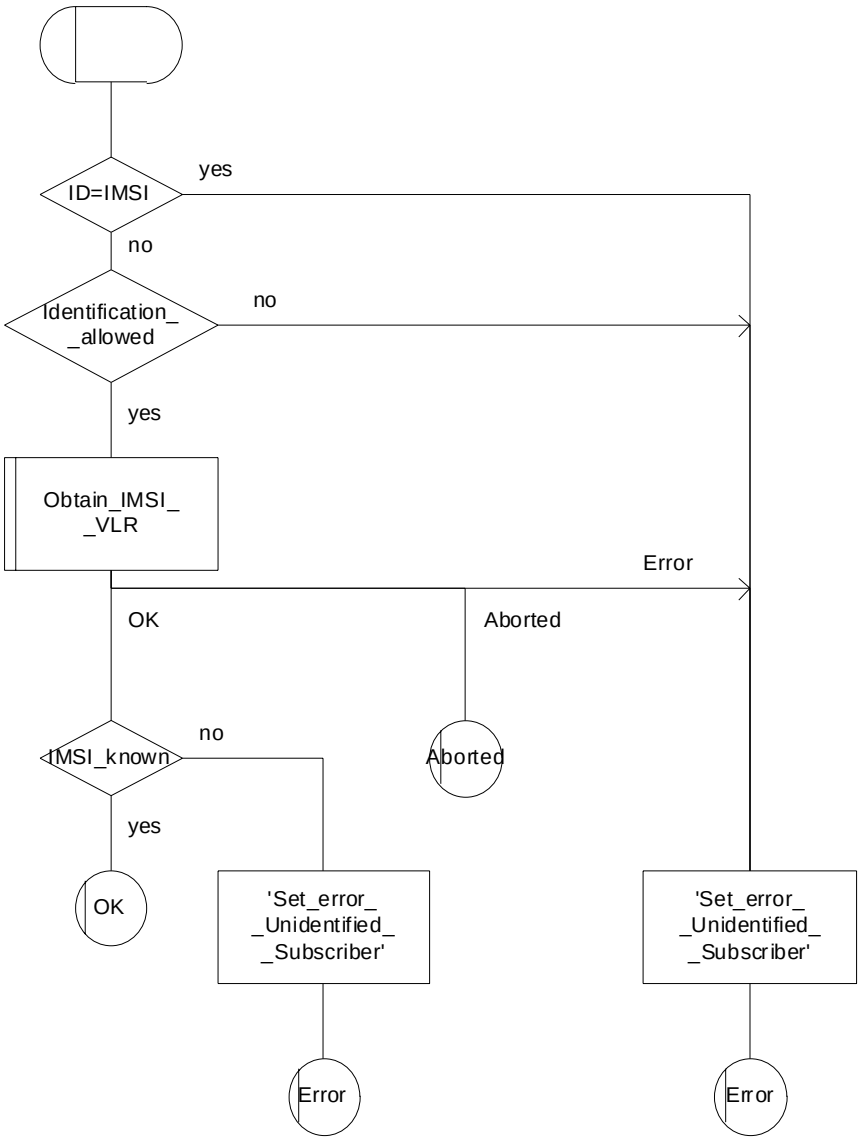


Figure 25.4/3: Macro ID_Proc_VLR

25.5 Authentication macros and processes

The following macros are used in the GSM network in order to enable authentication of a mobile subscriber.

25.5.1 Macro Authenticate_MSC

This macro is used by the MSC to relay a request for authentication transparently from the VLR to the MS, wait for a response from the MS and to relay the response from the MS back to the VLR. If, while the MSC is waiting for the authentication response, the air interface connection is released or a MAP_U_ABORT, MAP_P_ABORT or MAP_CLOSE indication is received from the VLR, then necessary connections are released and the "Error" exit is used. The macro is described in figure 25.5/1.

25.5.2 Macro Authenticate_VLR

This macro is used by the VLR to control the authentication of a subscriber. The macro proceeds as follows:

- if there are not enough authentication triplets in the VLR to perform the authentication, then the macro "Obtain_Authent_Para_VLR" described below is invoked. If this macro fails, then the corresponding error (Unknown Subscriber or Procedure Error) is returned to the calling process;

- if there are enough authentication triplets in the VLR, or the Obtain_Authent_Para_VLR macro was successful, then a MAP_AUTHENTICATE request is sent to the MSC. This request contains the RAND and CKSN parameters as indicated in the service description;

- the VLR then waits for a response from the MSC;

- if a MAP_U_ABORT, MAP_P_ABORT or MAP_CLOSE indication is received from the MSC in this wait state, the VLR checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;

- if a MAP_NOTICE indication is received from the MSC in this wait state, the VLR closes the dialogue with the MSC, then checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;

- if a MAP_AUTHENTICATE confirmation is received by the VLR, it checks whether the received Signed Result (SRES) is identical to the stored one (see GSM 03.20). If this is not the case, the "Illegal Subscriber" exit is used. If the SRES values are identical, then the "OK" exit is used;

- before exit, the VLR may fetch a new set of triplets from the HLR. This is done by initiating a separate Obtain_Authent_Sets_VLR process described below.

The macro is described in figure 25.5/2.

25.5.3 Process Obtain_Authentication_Sets_VLR

This process is initiated by the VLR to fetch triplets from a subscriber's HLR in a stand-alone, independent manner. The Obtain_Authent_Para_VLR macro described below is simply called; the process is described in figure 25.5/3.

25.5.4 Macro Obtain_Authent_Para_VLR

This macro is used by the VLR to request authentication triplets from the HLR. The macro proceeds as follows:

- a connection is opened, and a MAP_SEND_AUTHENTICATION_INFO request sent to the HLR;
- if the HLR indicates that a MAP version 1 dialogue is to be used, the VLR performs the equivalent MAP version 1 dialogue. which can return a positive result containing authentication sets, an empty positive result, or an error;
- if the dialogue opening fails, the "Procedure Error" exit is used. Otherwise, the VLR waits for the response from the HLR;
- if a MAP_SEND_AUTHENTICATION_INFO confirmation is received from the HLR, the VLR checks the received data.

One of the following positive responses may be received from a MAP version 1 or MAP version 2 dialogue with the HLR:

- Authentication triplets, in which case the outcome is successful;
- Empty response, in which case the VLR may re-use old triplets, if allowed by the PLMN operator.

If the VLR cannot re-use old triplets (or no such triplets are available) then the "Procedure Error" exit is used.

If the outcome was successful or re-use of old parameters in the VLR is allowed, then the "OK" exit is used.

If an "Unknown Subscriber" error is included in the MAP_SEND_AUTHENTICATION_INFO confirm or is returned by the MAP version 1 dialogue, then the "Unknown Subscriber" exit is used.

- if a MAP-U-ABORT, MAP_P_ABORT, MAP_NOTICE or unexpected MAP_CLOSE service indication is received from the MSC, then open connections are terminated, and the macro takes the "Null" exit;
- if a MAP-U-ABORT, MAP_P_ABORT or unexpected MAP_CLOSE service indication is received from the HLR, then the VLR checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit;
- if a MAP_NOTICE service indication is received from the HLR, then the dialogue with the HLR is closed. The VLR then checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit.

The macro is described in figure 25.5/4.

25.5.5 Process Obtain_Auth_Sets_HLR

Opening of the dialogue is described in the macro Receive_Open_Ind in subclause 25.1, with outcomes:

- reversion to version one procedure;
- procedure termination; or
- dialogue acceptance, with proceeding as below.

This process is used by the HLR to obtain authentication triplets from the AuC, upon request from the VLR or from the SGSN. The process acts as follows:

- a MAP_SEND_AUTHENTICATION_INFO indication is received by the HLR;
- the HLR checks the service indication for errors. If any, they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. If no errors are detected, authentication triplets are fetched from the AuC. Further details are found in GSM 03.20;
- if errors are detected they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. Otherwise the authentication triplets are returned.

The process is described in figure 25.5/5.

Macrodefinition Authenticate_MSC 25.5_1(1)

Figure 25.5/1: Authentication macro in the MSC, relaying authentication indication from the VLR to the MS, and relaying the confirmation from the MSC to the VLR

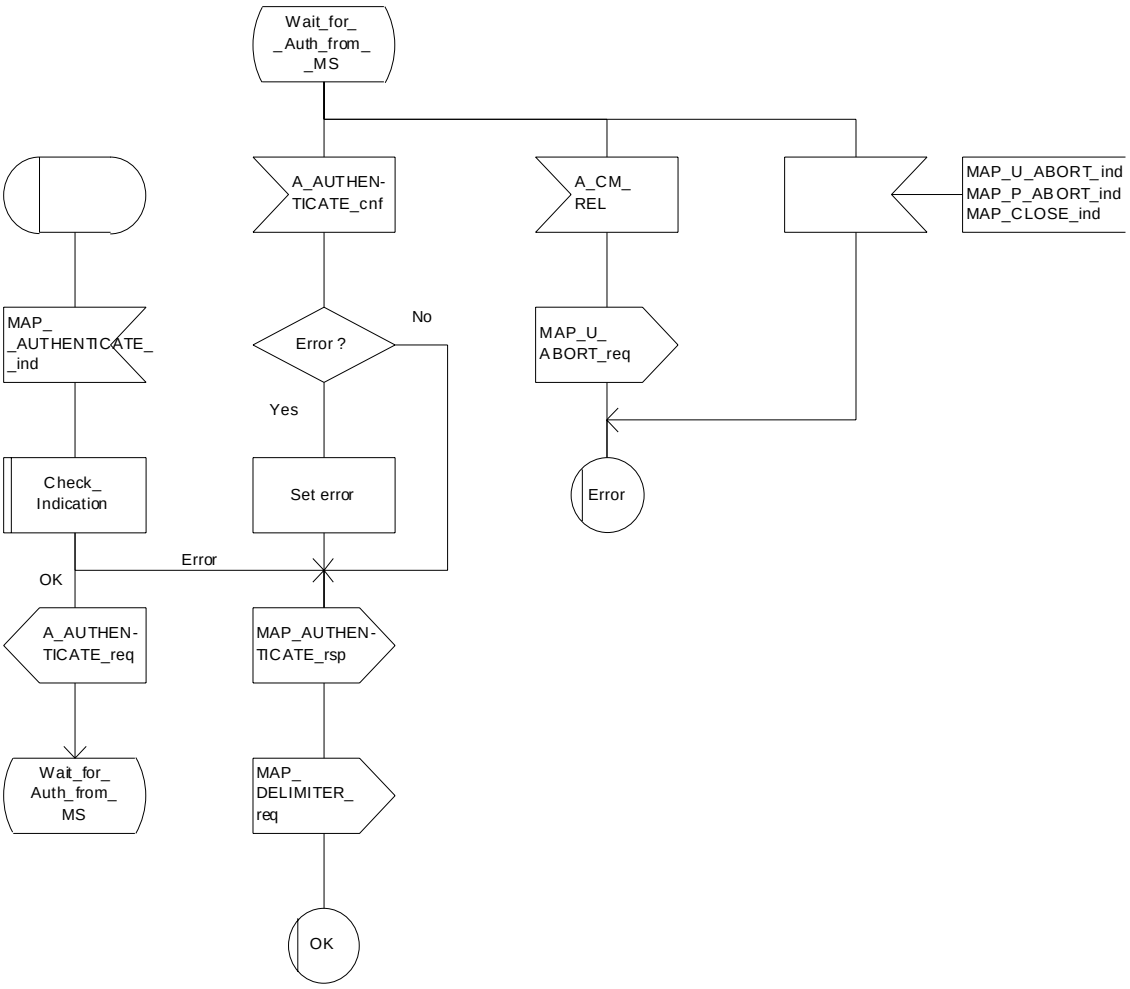


Figure 25.5/1: Macro Authenticate_MSC

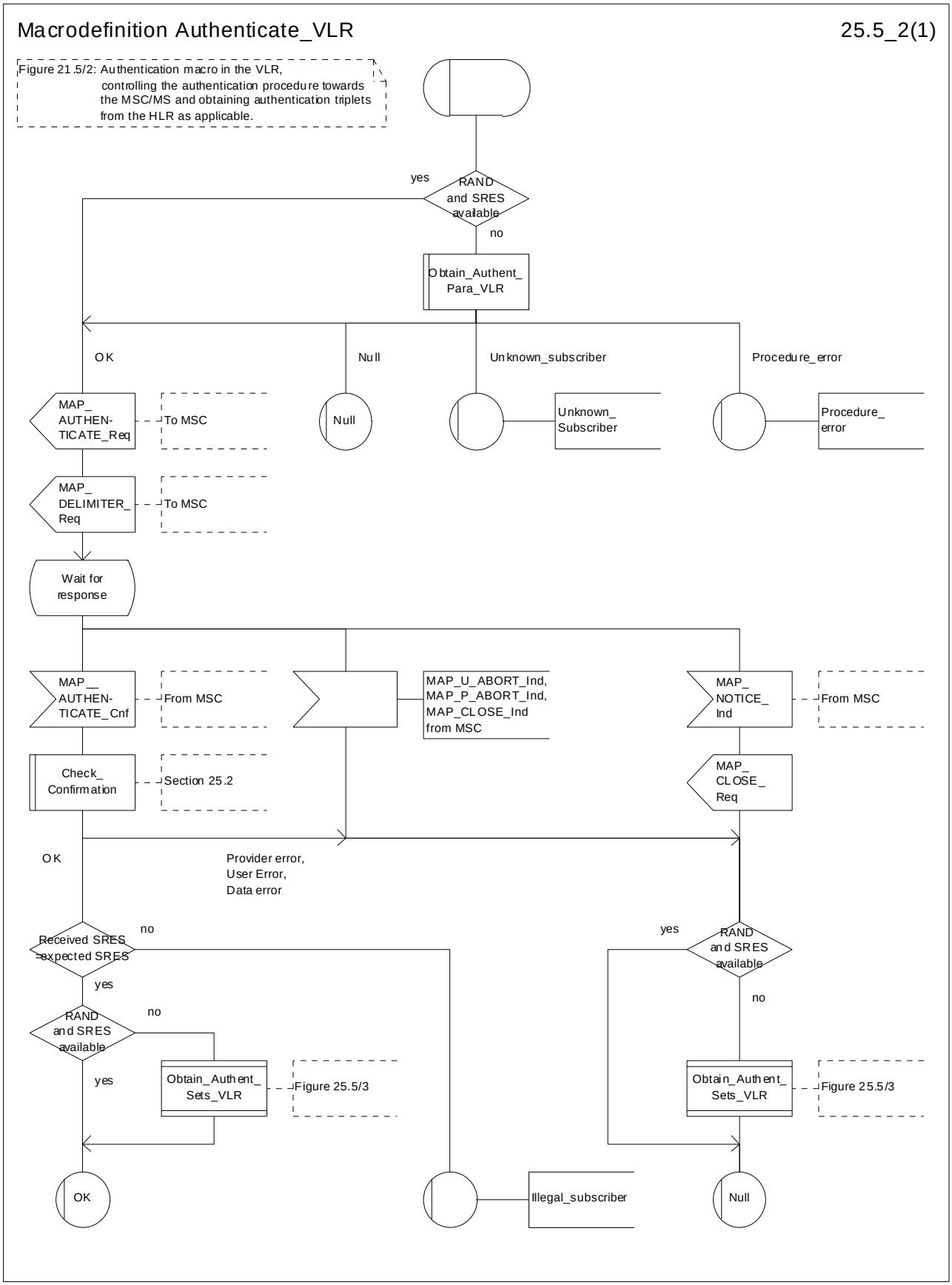


Figure 25.5/2: Macro Authenticate_VLR

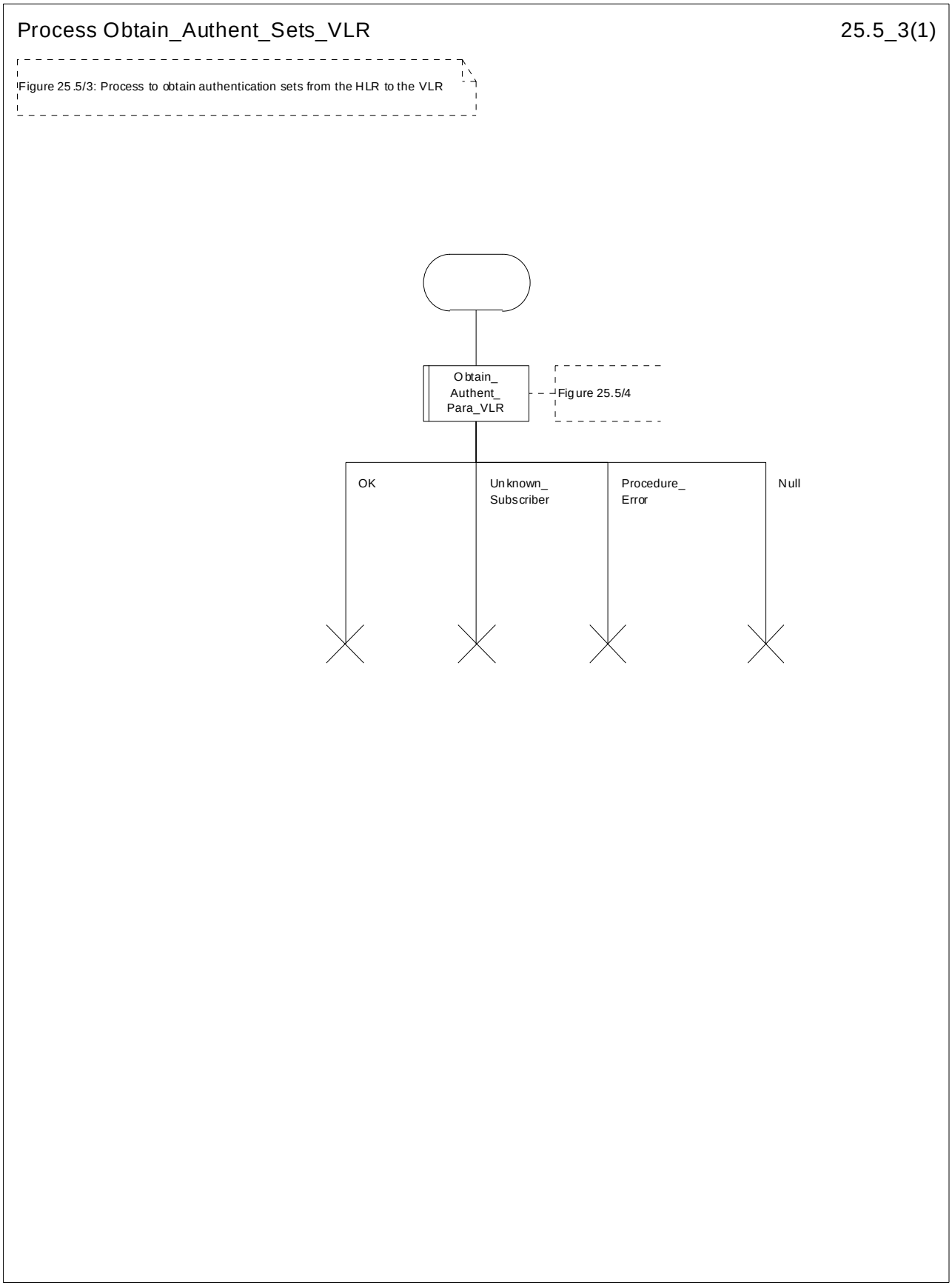


Figure 25.5/3: Process Obtain_Authentication_Sets_VLR

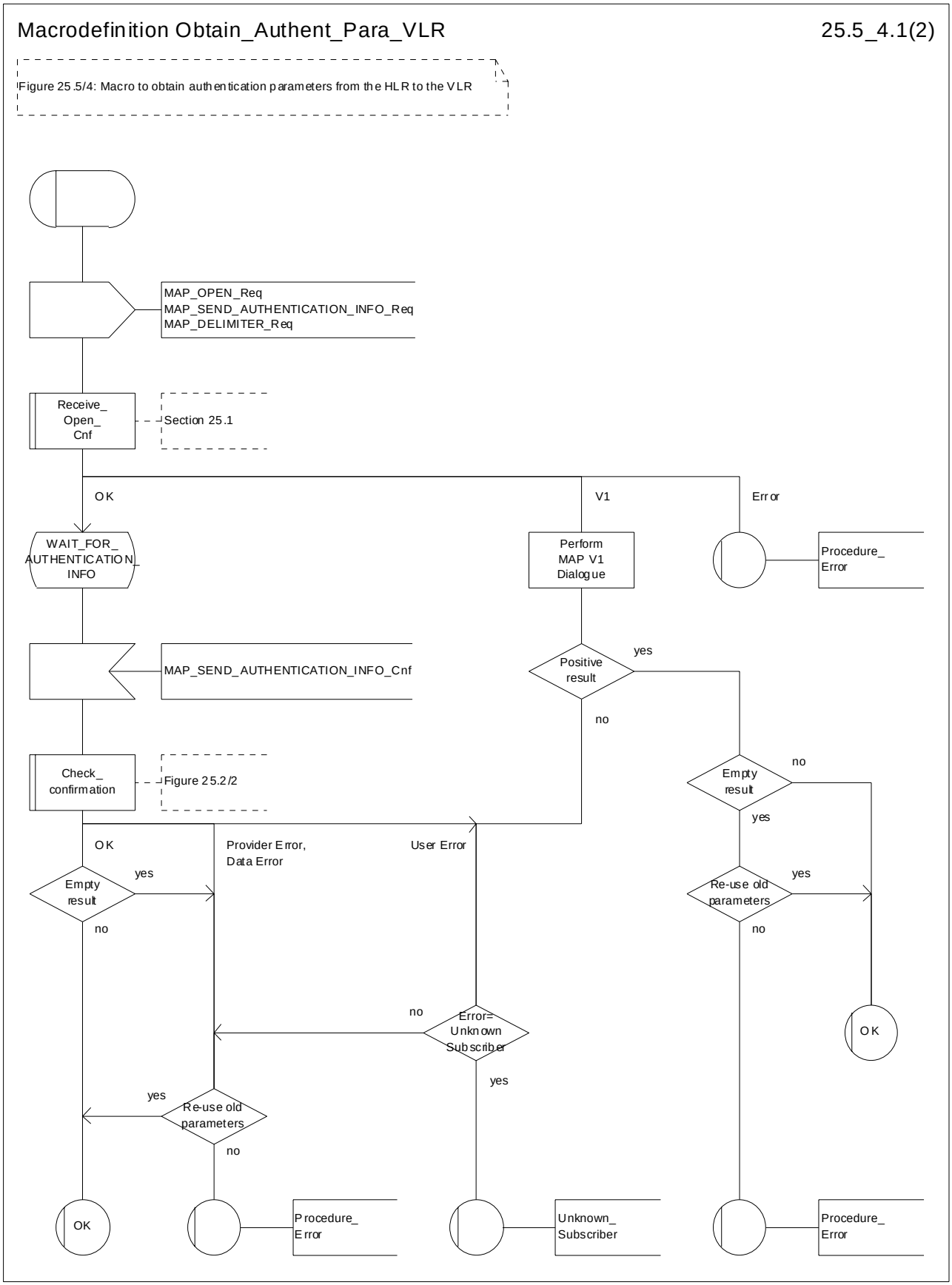


Figure 25.5/4 (sheet 1 of 2): Macro Obtain_Authent_Para_VLR

Macrodefinition Obtain_Authent_Para_VLR 25.5_4.2(2)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR

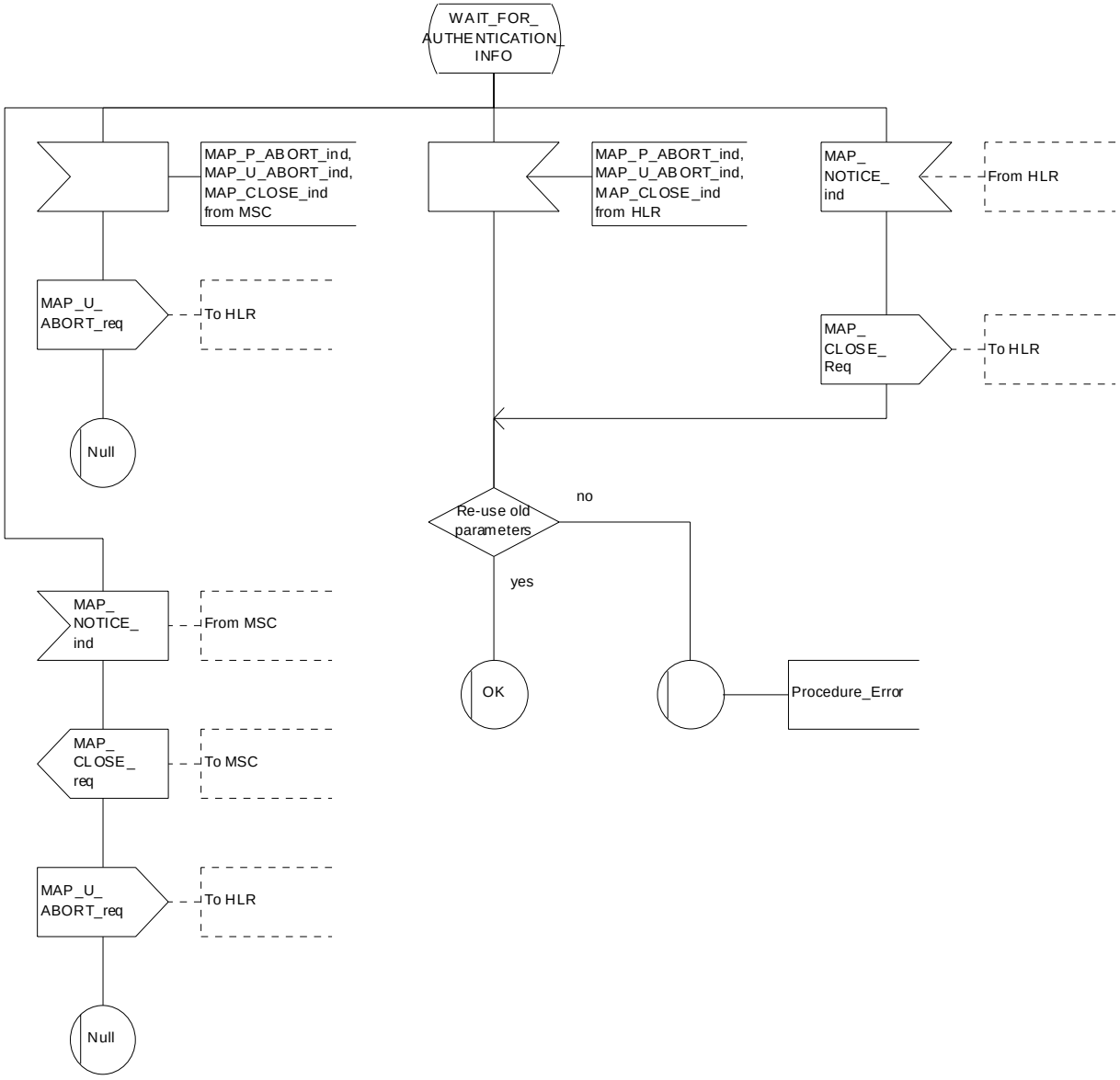


Figure 25.5/4 (sheet 2 of 2): Macro Obtain_Authent_Para_VLR

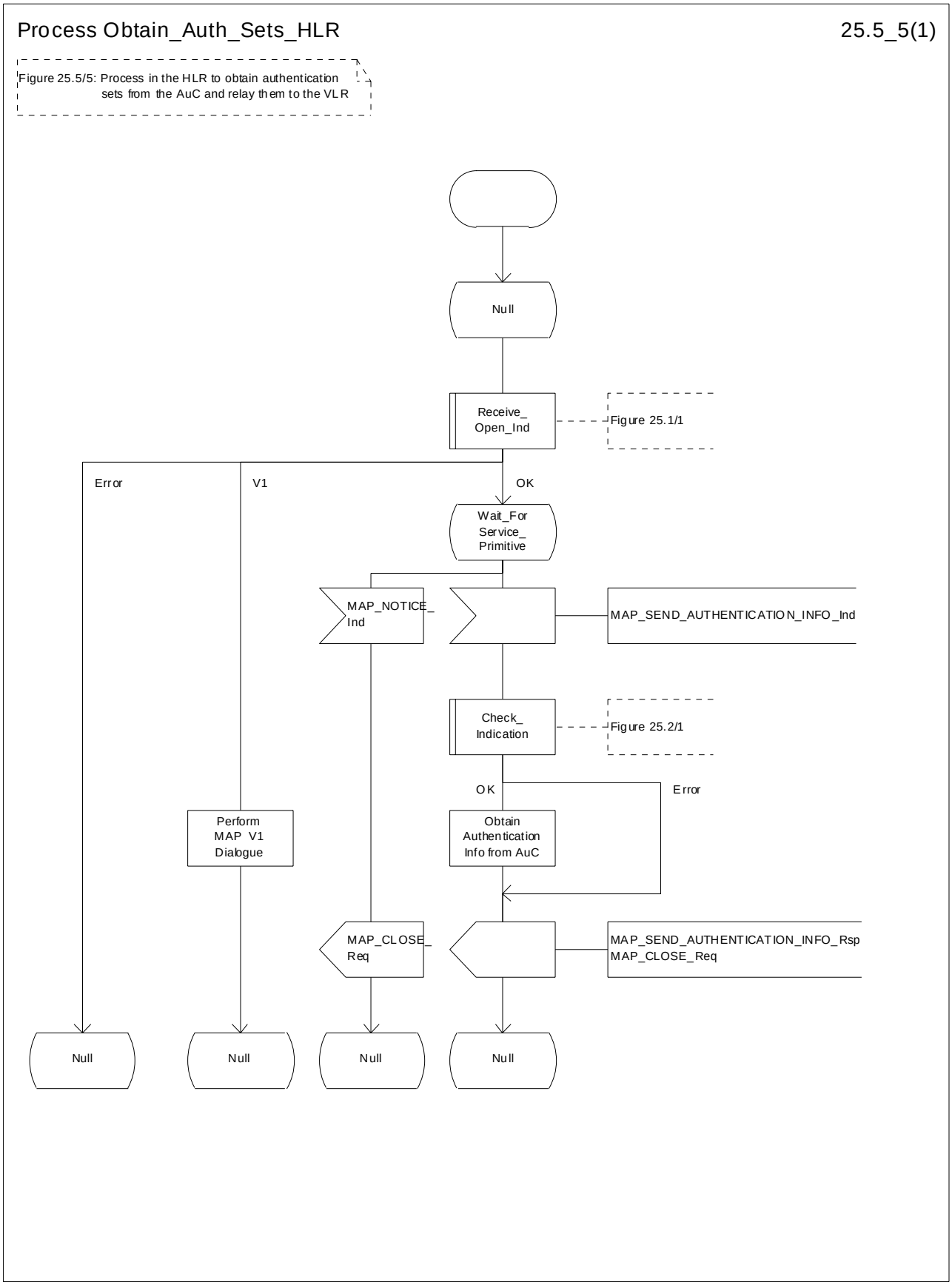


Figure 25.5/5: Process Obtain_Auth_Sets_HLR

25.5.6 Process Obtain_Authent_Para_SGSN

For authentication procedure description see GSM 03.60 and GSM 04.08.

This Process is used by the SGSN to request authentication triplets from the HLR. The Process proceeds as follows:

- a connection is opened, and a MAP_SEND_AUTHENTICATION_INFO request sent to the HLR;
- if the HLR indicates that a MAP version 1 dialogue is to be used, the SGSN performs the equivalent MAP version 1 dialogue. which can return a positive result containing authentication sets, an empty positive result, or an error;
- if the dialogue opening fails, the Authentication Parameters negative response with appropriate error is sent to the requesting process. Otherwise, the SGSN waits for the response from the HLR;
- if a MAP_SEND_AUTHENTICATION_INFO confirmation is received from the HLR, the SGSN checks the received data.

One of the following positive responses may be received from a MAP version 1 or MAP version 2 dialogue with the HLR:

- Authentication triplets, in which case the outcome is successful;
- Empty response, in which case the SGSN may re-use old triplets, if allowed by the PLMN operator.

If the SGSN cannot re-use old triplets (or no such triplets are available) then the the Authentication Parameters negative response with appropriate error is sent to the requesting process.

If the outcome was successful or re-use of old parameters in the SGSN is allowed, then the Authentication Parameters response is sent to the requesting process

If an "Unknown Subscriber" error is included in the MAP_SEND_AUTHENTICATION_INFO confirm or is returned by the MAP version 1 dialogue, then the appropriate error is sent to the requesting process in the Authentication Parameters negative response

- if a MAP-U-ABORT, MAP_P_ABORT or unexpected MAP_CLOSE service indication is received from the HLR, then the SGSN checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the Authentication Parameters negative response with appropriate error is sent to the requesting process.
- if a MAP_NOTICE service indication is received from the HLR, then the dialogue with the HLR is closed. The SGSN then checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the process terminates and the Authentication Parameters negative response with appropriate error is sent to the requesting process; Otherwise the Authentication Parameters response is sent to requesting process.

The process is described in figure 25.5/6.

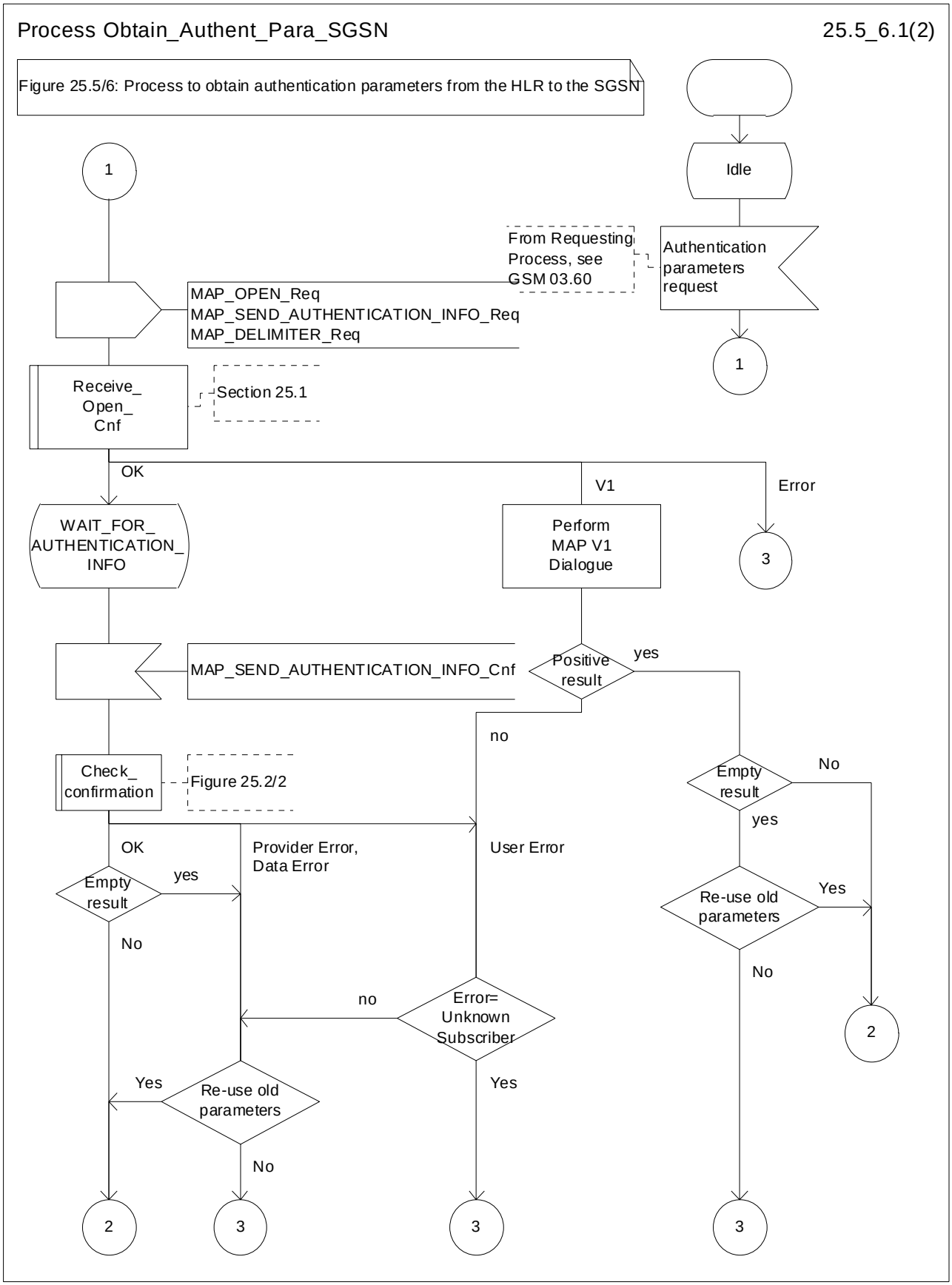


Figure 25.5/6 (sheet 1 of 2): Macro Obtain_Authen_Para_SGSN

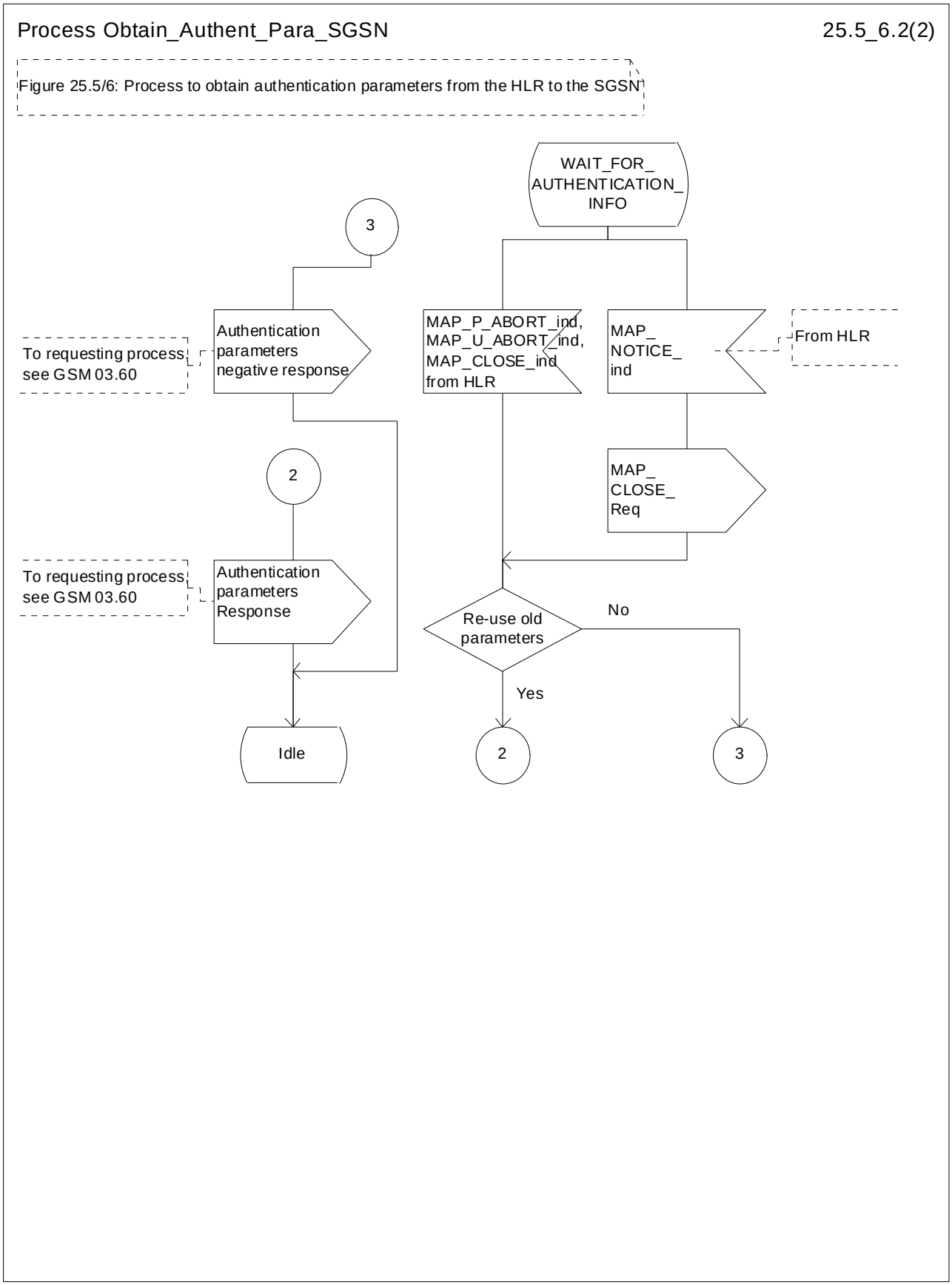


Figure 25.5/6 (sheet 2 of 2): Macro Obtain_Authen_Para_SGSN

25.6 IMEI Handling Macros

The following macros are used in the GSM network in order to enable handling and checking of the mobile equipment identity.

25.6.1 Macro Check_IMEI_MSC

This macro is used by the MSC to receive a request from the VLR, relay it to the EIR, and pass the result from the EIR back to the VLR. The macro proceeds as follows:

- a MAP_CHECK_IMEI service indication containing only the Invoke Id is received from the VLR;
- if the IMEI is not available in the MSC, it is requested from the MS using the IDENTITY REQUEST message;
- if the MS releases the radio resources, a MAP_U_ABORT request indicating "Application procedure Cancellation" is sent to the VLR, and the "Error" exit of the macro is used;
- when the IMEI is known, a connection is set up towards the EIR, and a MAP_CHECK_IMEI service request is sent including the IMEI;
- if the opening of the dialogue fails, a System Failure is reported to the VLR. Otherwise, the MSC waits for a response from the EIR;
- when the MAP_CHECK_IMEI service confirm is received, it is checked for errors. Any errors discovered in the MSC lead to the System Failure error to be reported to the VLR in the MAP_CHECK_IMEI response. Any errors reported from the EIR are sent directly to the VLR in the MAP_CHECK_IMEI service response. If no errors are detected by or reported to the MSC, the IMEI is added to the MAP_CHECK_IMEI service response returned to the VLR. The "OK" exit is used in all cases;
- if a MAP_P_ABORT, MAP_U_ABORT, MAP_CLOSE or MAP_NOTICE service indication is received from the EIR, the MSC closes the transaction with the EIR (if necessary), reports a System Failure error back to the VLR in the MAP_CHECK_IMEI response, and uses the macro's "OK" exit;
- if a MAP_P_ABORT, MAP_U_ABORT, MAP_CLOSE or MAP_NOTICE indication is received from the VLR, the MSC closes the transaction with the VLR (if necessary) and aborts the connections towards the EIR and the MS; the macro takes the "Error" exit.

If the dialogue with the EIR drops back to version 1, the result or error returned by the EIR is checked. The use of the "Check_Confirmation" macro in the SDL diagram indicates that the checks carried out on the result returned by the EIR in a MAP v1 dialogue are functionally equivalent to those carried out on the parameters of the MAP_CHECK_IMEI confirm received from the EIR in a MAP v2 dialogue.

The macro is described in figure 25.6/1.

25.6.2 Macro Check_IMEI_VLR

This macro is used by the VLR to control the check of a mobile equipment's IMEI. The macro proceeds as follows:

- a MAP_CHECK_IMEI service request is sent to the MSC, including only the Invoke Id;
- the VLR then waits for the response from the MSC;

- if a MAP_CHECK_IMEI service confirm including either:

  - the IMEI and the Equipment Status; or

  - an error;

  is received, the VLR checks whether the response requires that an alarm be generated on the Operation and Maintenance interface. The criteria for such alarms are PLMN operator dependent;

- the VLR then checks whether the response from the MSC means that service is granted to the MS. The criteria for granting service depending on the equipment status or errors received in the MAP_CHECK_IMEI service response are also PLMN operator dependent;

- if a MAP_P_ABORT, MAP_U_ABORT, MAP_CLOSE or MAP_NOTICE indication is received from the MSC, then the MSC connection is closed (if necessary) and the macro takes the "Aborted" exit.

The macro is described in figure 25.6/2.

25.6.3 Process Check_IMEI_EIR

This process is used by the EIR to obtain the status of a piece of mobile equipment, upon request from the MSC or from the SGSN. The process acts as follows:

- a MAP_OPEN service indication is received (macro Receive_Open_Ind, subclause 25.1.1). If the dialogue opening fails, the process terminates;

- otherwise, a MAP_CHECK_IMEI indication is received by the EIR, containing the IMEI to be checked;

- the EIR checks the service indication for errors. If there are any, they are reported to the MSC or to the SGSN in the MAP-CHECK_IMEI response. If no errors are detected, the EIR data base function is interrogated for the status of the given equipment. Further details are found in GSM 02.16;

- the status of the equipment (white-listed, grey-listed, black-listed or unknown) is returned to the MSC or to the SGSN in the MAP_CHECK_IMEI service response;

- if a MAP_U_ABORT, MAP_P_ABORT, MAP_NOTICE or MAP_CLOSE indication is received from the MSC or from the SGSN at any time during this process, the process in the EIR terminates.

The process is described in figure 25.6/3.

25.6.4 Macro Obtain_IMEI_MSC

This macro is used by the MSC to respond to a request from the VLR to provide the IMEI. The macro proceeds as follows:

- a MAP_OBTAIN_IMEI service indication containing only the Invoke Id is received from the VLR;

- if the IMEI is not available in the MSC, it is requested from the MS using the IDENTITY REQUEST message;

- when the IMEI is known, it is returned to the VLR in the MAP_OBTAIN_IMEI service response. The macro terminates at the "OK" exit;

- if the IMEI cannot be obtained by the MSC, the System Failure error is reported back to the VLR in the MAP_OBTAIN_IMEI service response. The macro terminates at the "OK" exit;

- if a MAP_P_ABORT, MAP_U_ABORT or MAP_CLOSE indication is received from the VLR, the macro terminates at the "Error" exit.

The macro is described in figure 25.6/4.

25.6.5 Macro Obtain_IMEI_VLR

This macro is used by the VLR to obtain the IMEI from the MSC, e.g. to enable handling of emergency calls in case of authentication failure (in which case the IMEI may be used by some operators as an alternative to the IMSI). It proceeds as follows:

- the MAP_OBTAIN_IMEI service request is sent to the MSC, including only the Invoke Id;
- the VLR then waits for the response from the MSC;
- if the IMEI is received in the MAP_OBTAIN_IMEI service response, the macro terminates at the "OK" exit;
- if the System Failure error is reported in the MAP_OBTAIN_IMEI service response, the "Error" exit is used;
- if the MSC terminates the dialogue using a MAP_P_ABORT, MAP_U_ABORT, MAP_CLOSE or MAP_NOTICE service indication, the necessary connections are released, and the "Aborted" exit is used for termination of the macro.

The macro is shown in figure 25.6/5.

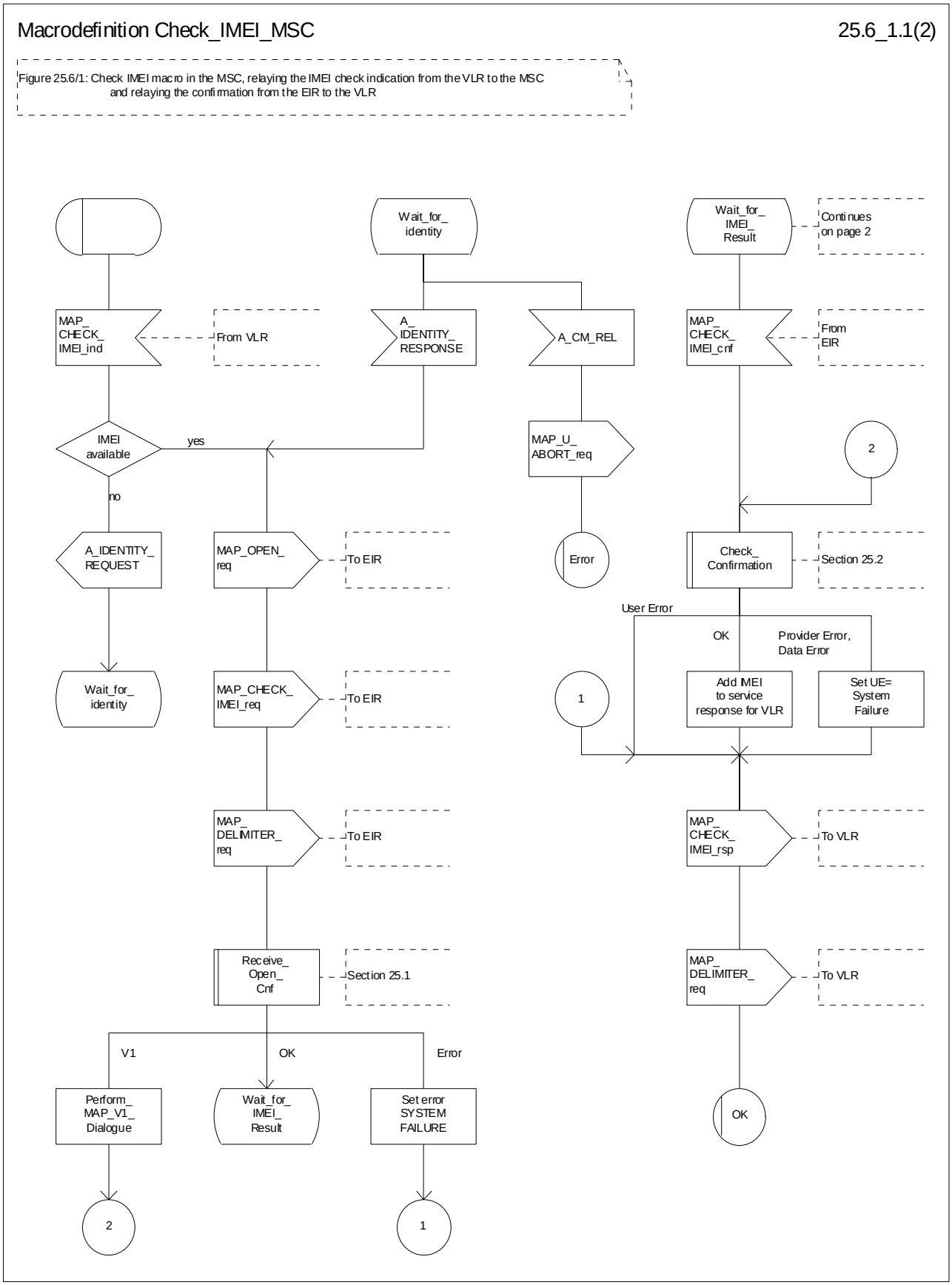


Figure 25.6/1 (sheet 1 of 2): Macro Check_IMEI_MSC

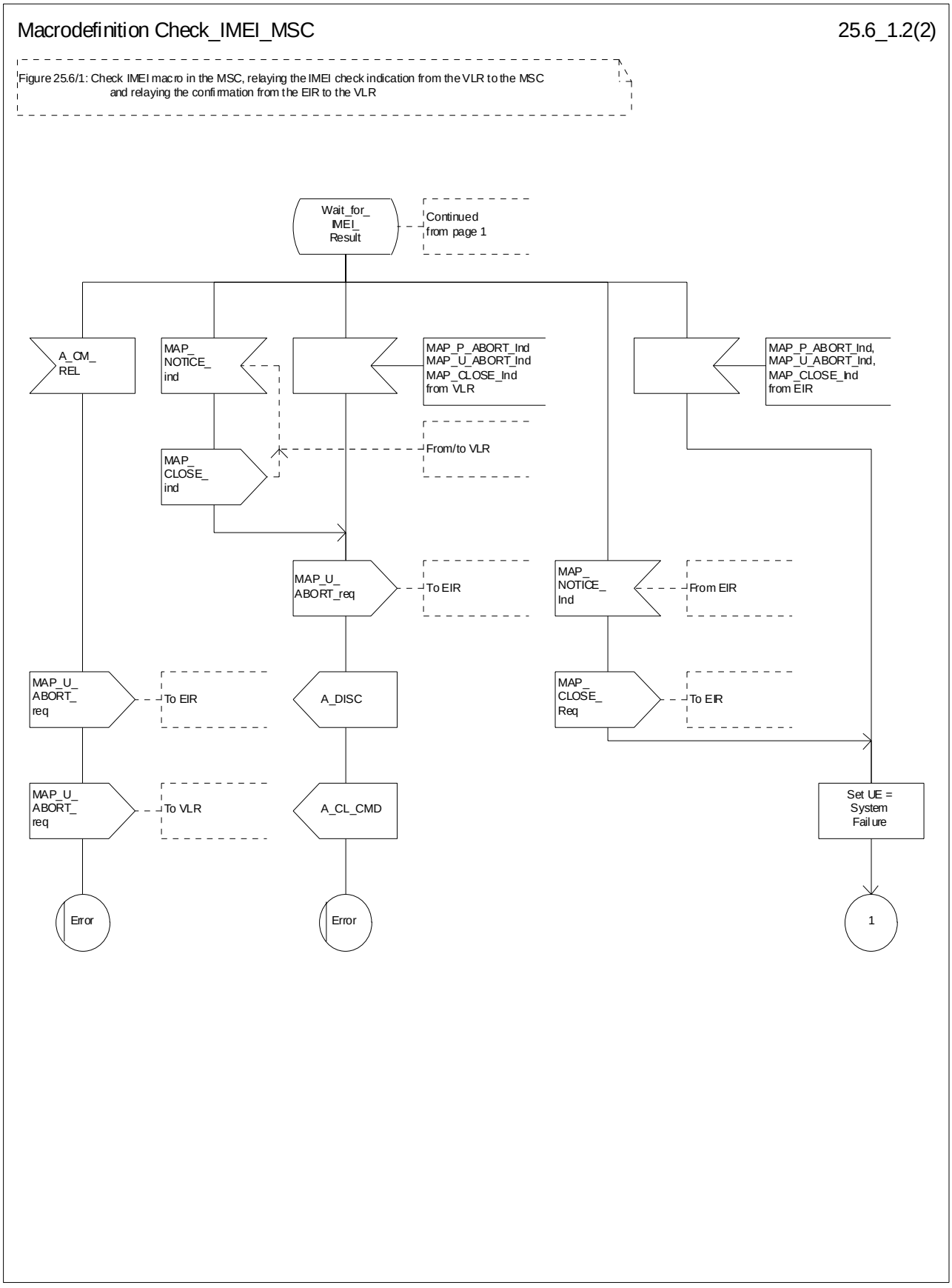


Figure 25.6/1 (sheet 2 of 2): Macro Check_IMEI_MSC

Macrodefinition Check_IMEI_VLR 25.6_2(1)

Figure 25.6/2: Check IMEI macro in the VLR, containing the request towards the MSC/EIR

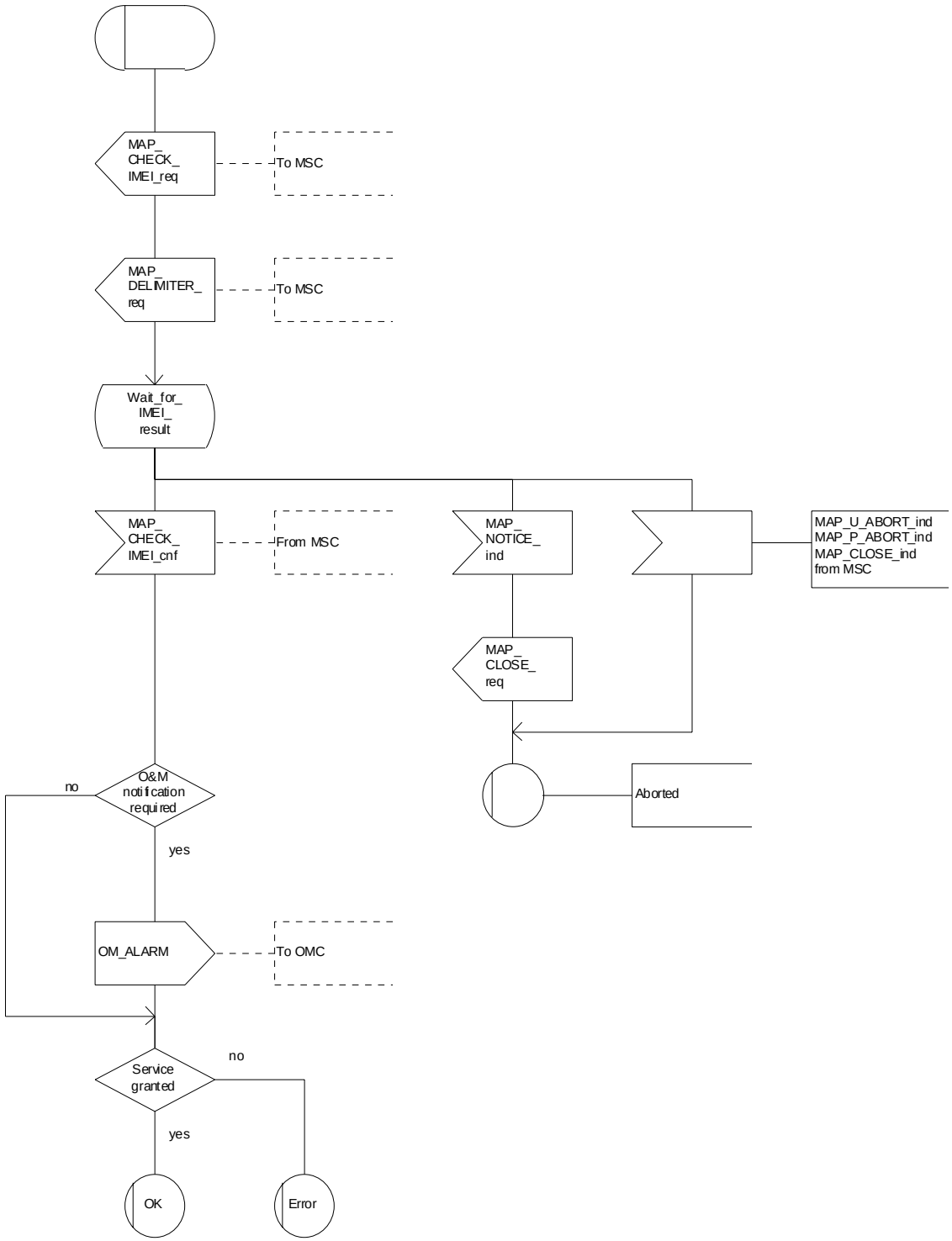


Figure 25.6/2: Macro Check_IMEI_VLR

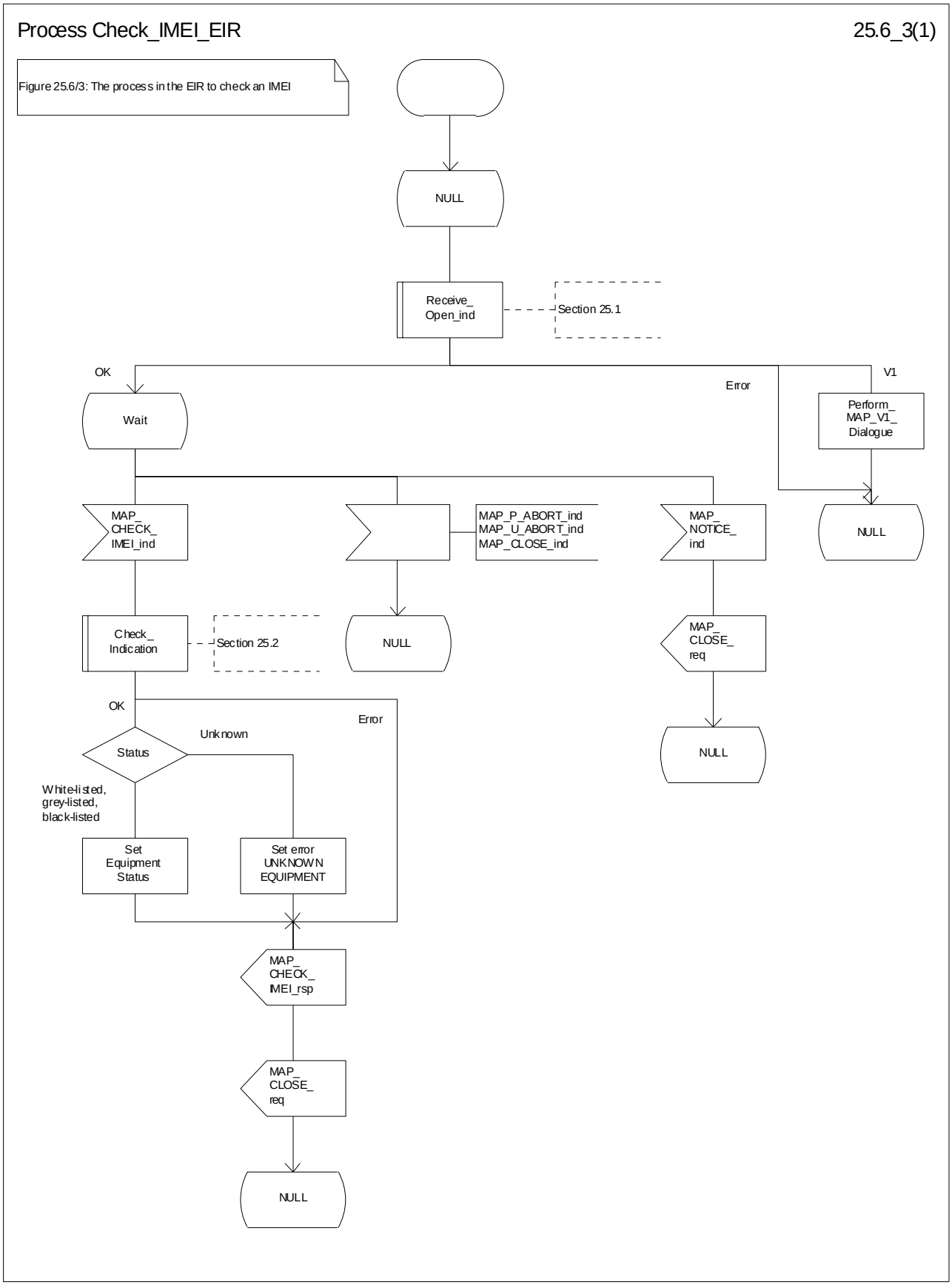


Figure 25.6/3: Process Check_IMEI_EIR

Macrodefinition Obtain_IMEI_MSC 25.6_4(1)

Figure 25.6/4: Obtain IMEI macro in the MSC, receiving the Obtain_IMEI indication from the VLR to the MSC and returning the confirmation to the VLR

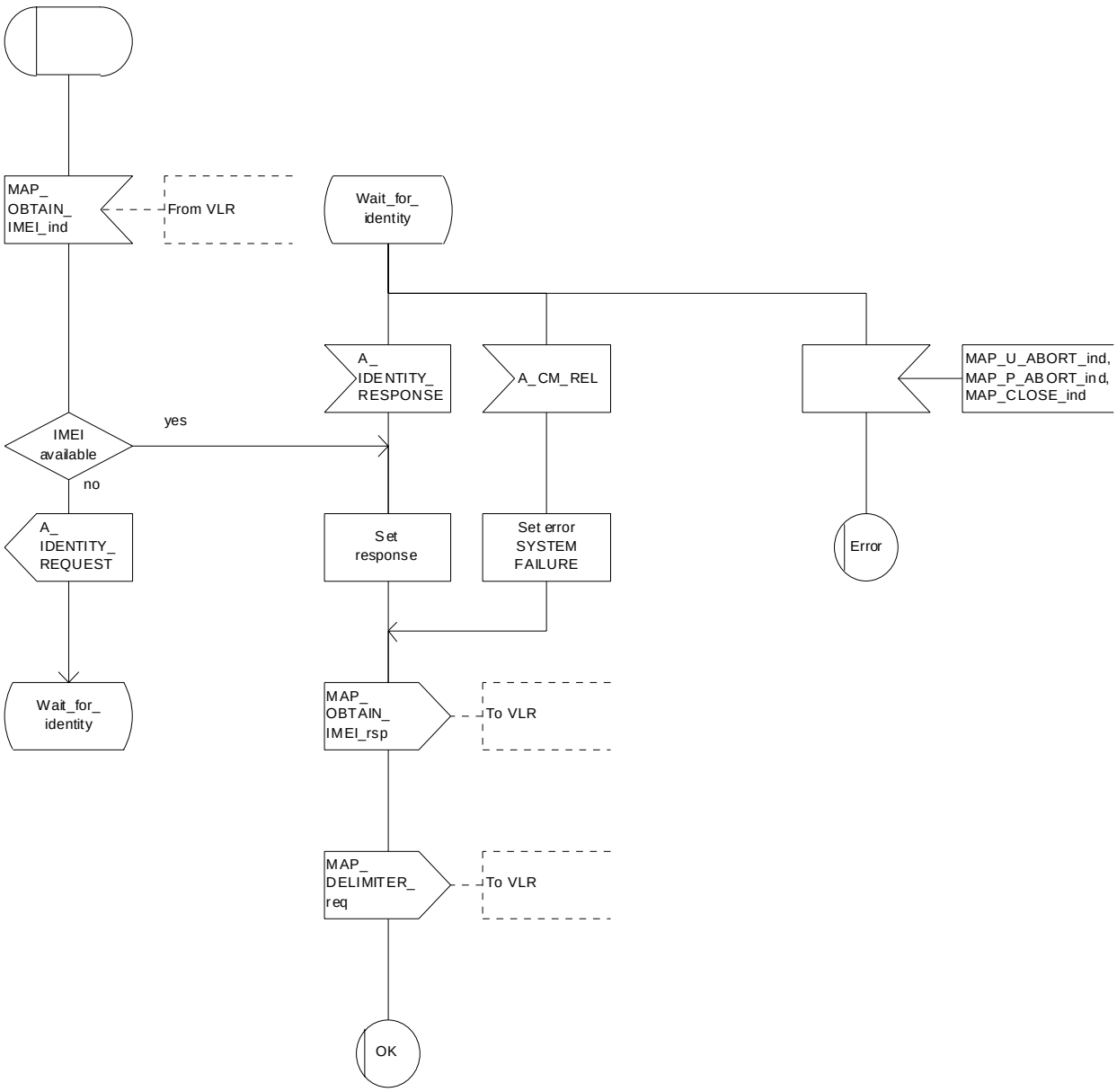


Figure 25.6/4: Macro Obtain_IMEI_MSC

Macrodefinition Obtain_IMEI_VLR 25.6_5(1)

Figure 25.6/5: Obtain IMEI macro in the VLR, controlling the request towards the MSC

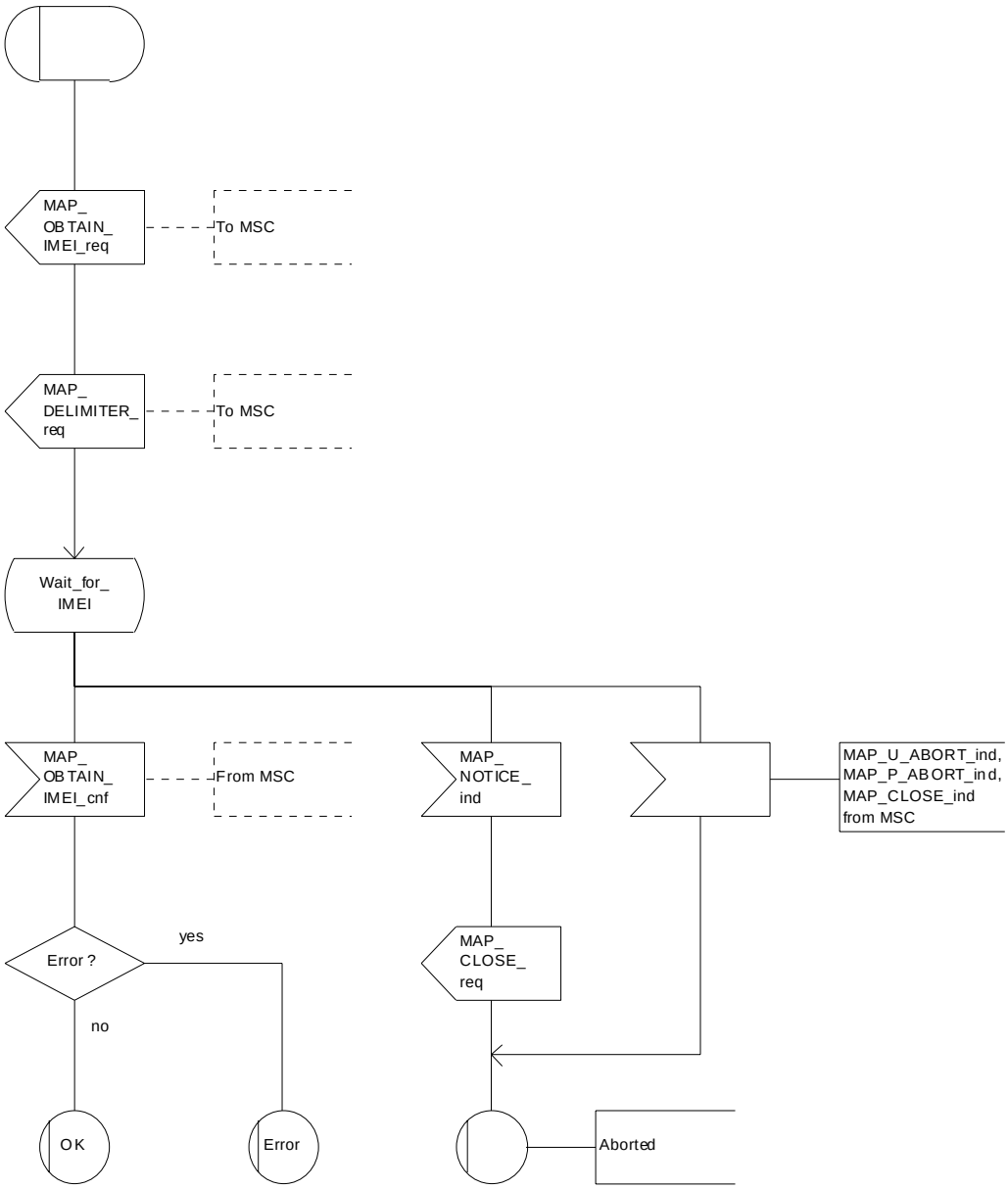


Figure 25.6/5: Macro Obtain_IMEI_VLR

25.6.6 Process Check_IMEI_SGSN

This process is used by the SGSN to control the check of a mobile equipment's IMEI. The process proceeds as follows:

- if the MS does not complete successfully the procedure, the "Error" exit of the macro is used;
- when the IMEI is known, a connection is set up towards the EIR, and a MAP_CHECK_IMEI service request is sent including the IMEI;
- if the opening of the dialogue fails, a System Failure is set. Otherwise, the SGSN waits for a response from the EIR;
- if a MAP_CHECK_IMEI service confirm including either:
  - the IMEI and the Equipment Status; or
  - an error;

  is received, the SGSN checks whether the response requires that an alarm be generated on the Operation and Maintenance interface. The criteria for such alarms are PLMN operator dependent;
- the SGSN then checks whether the response from the EIR means that service is granted to the MS. The criteria for granting service depending on the equipment status or errors received in the MAP_CHECK_IMEI service response are also PLMN operator dependent;

If the dialogue with the EIR drops back to version 1, the result or error returned by the EIR is checked. The use of the "Check_Confirmation" macro in the SDL diagram indicates that the checks carried out on the result returned by the EIR in a MAP v1 dialogue are functionally equivalent to those carried out on the parameters of the MAP_CHECK_IMEI confirm received from the EIR in a MAP v2 dialogue.

The process is described in figure 25.6/6.

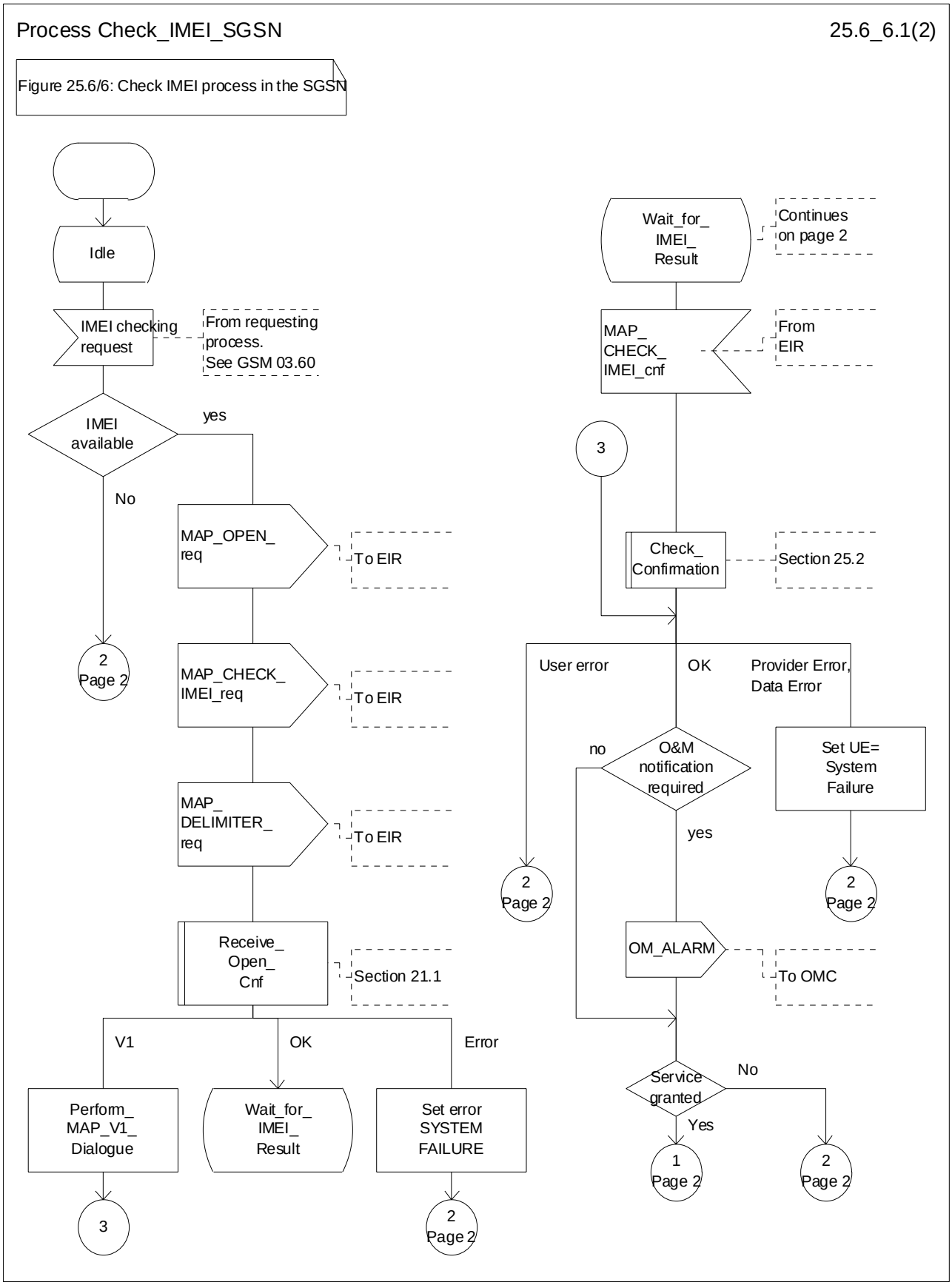


Figure 25.6/6 (sheet 1 of 2): Process Check_IMEI_SGSN

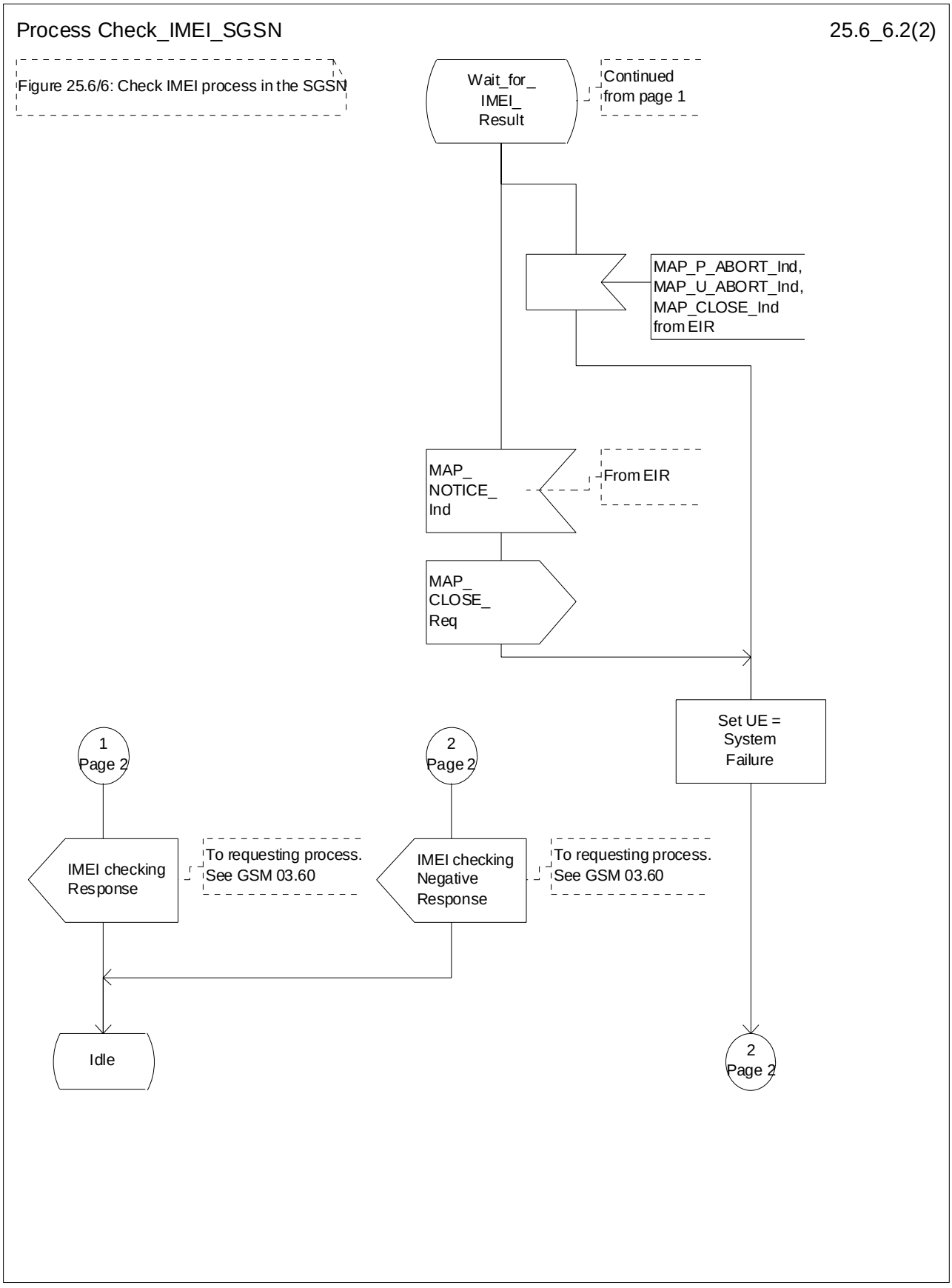


Figure 25.6/6 (sheet 2 of 2): Process Check_IMEI_SGSN

25.7 Insert Subscriber Data Macros

25.7.1 Macro Insert_Subs_Data_VLR

This macro describes the reception of the InsertSubscriberData service indication. This macro is used by any procedure that triggers the reception of subscriber data (e.g. Update Location or Restore Data).

If the VLR does not support any basic or supplementary service or the network feature Operator Determined Barring, or there is a problem with Regional Subscription Data then it reports it to the HLR.

If the entire MSC area is restricted due to regional subscription this is reported to the HLR.

The SDL diagram is shown in figure 25.7/1.

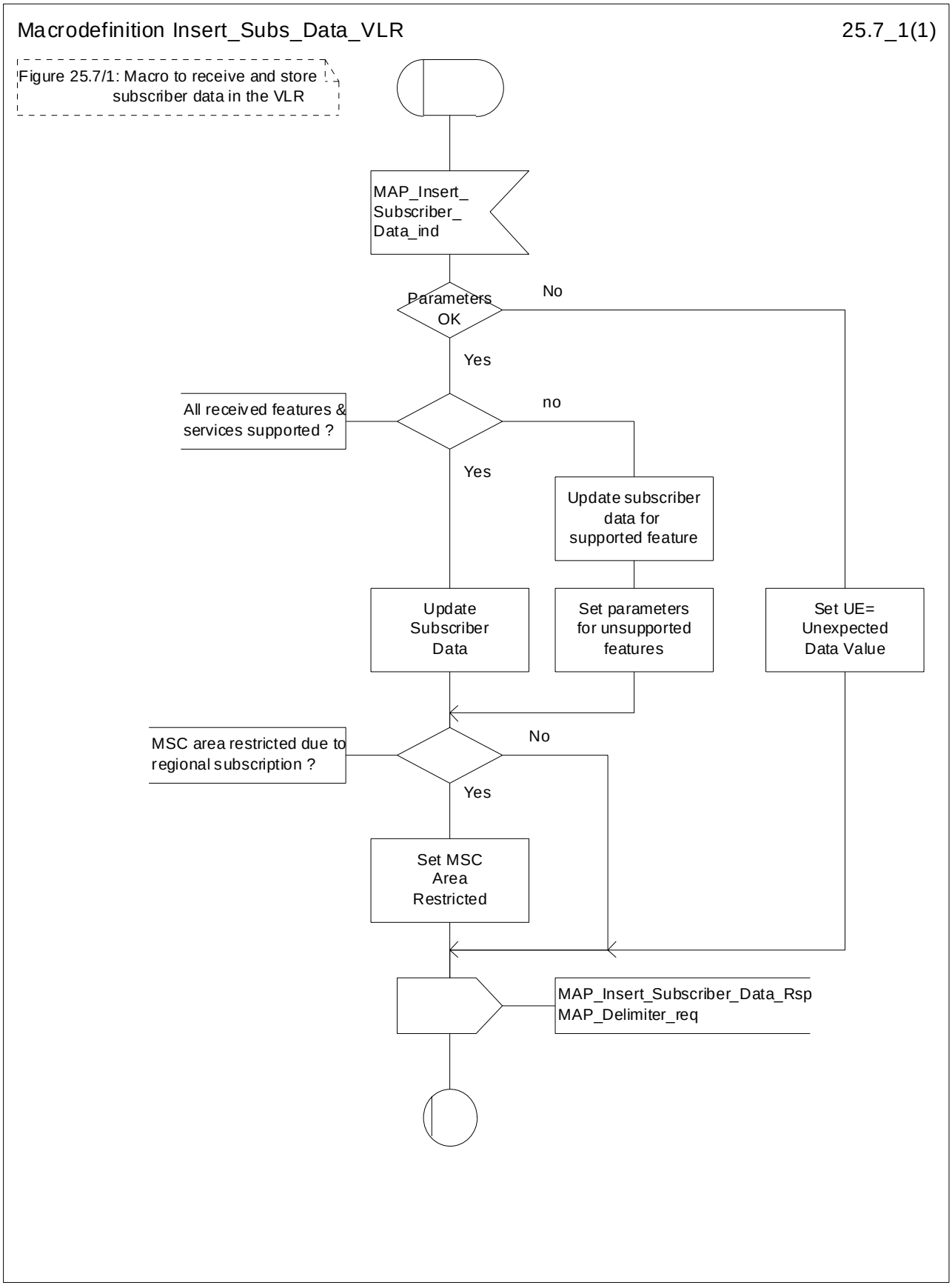


Figure 25.7/1: Macro Insert_Subs_Data_VLR

25.7.2 Process Insert_Subs_Data_Stand_Alone_HLR

This process is used by HLR to transfer subscriber data to VLR or to SGSN in a stand alone mode, i.e. in its own dialogue. this is done whenever a change of subscriber data is performed either by the operator or by the subscriber and this change has to be reported to VLR or to SGSN.

The process, after opening the dialogue with VLR or with SGSN, sends as many requests of the InsertSubscriberData service as necessary to transfer the subscriber data. The call to the process "Send_Insert_Subs_Data" (see subclause 25.7.4) is meant to describe two possible behaviours of the HLR when more than one service request has to be sent:

- either the HLR handles the requests and the confirmations in parallel; or
- the HLR sends every request after receiving the confirmation to the previous one.

The macros "Wait_for_Insert_Subs_Data_Cnf" and “Wait_for_Insert_GPRS_Subs_Data_Cnf” (see subclauses 25.7.3 and 25.7.6) are also called in order to handle every single confirmation.

If the result of a primitive received from the VLR or from the SGSN is unsuccessful, the HLR may initiate re-attempts; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or by the SGSN.

If certain services required for a subscriber are not supported by the VLR or by the SGSN (e.g. Advice of Charge Charging Level), this may result in one of the following outcomes:

- the HLR stores and sends "Roaming Restriction Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restriction Due To Unsupported Feature" is stored in the HLR, the "MSC Area Restricted Flag" shall be set to "restricted". This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.
- the HLR stores and sends other induced subscriber data (e.g. a specific barring program) in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. This will cause rejection of mobile originated service requests, except emergency calls.
- the HLR stores and sends "Roaming Restricted In SGSN Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restricted In SGSN Due To Unsupported Feature" is stored in the HLR, the "SGSN Area Restricted Flag" shall be set to "restricted". This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context activation.

When the VLR receives regional subscription data (Zone Code List) it may respond with "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "MSC Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.

When the SGSN receives regional subscription data (Zone Code List) it may respond with "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "SGSN Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context activation.

If subscriber data for CAMEL Phase 2 services are sent to a VLR which does not support CAMEL Phase 2, the service behaviour may be unpredictable or incorrect. The HLR therefore needs to ensure that at the conclusion of a stand alone Insert Subscriber data procedure that the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in GSM 03.78.

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only if the HLR previously received confirmation from the VLR at Location Update that CAMEL Phase 2 is supported.

A Forwarded-to number in non-international E.164 format shall only be sent from an HLR to a VLR if the VLR supports CAMEL Phase 2, or a subsequent version of CAMEL.

If the HLR does not store "Roaming Restriction Due To Unsupported Feature" as a consequence of the stand alone Insert Subscriber Data procedure and the HLR does not receive "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response and "Roaming Restriction Due To Unsupported Feature" has not been stored in the HLR in the course of a previous subscriber data retrieval procedure, the "MSC Area Restricted Flag" in the HLR shall be set to "not restricted".

If the HLR does not store "Roaming Restricted In SGSN Due To Unsupported Feature" as a consequence of the stand alone Insert Subscriber Data procedure and the HLR does not receive "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response and "Roaming Restricted In SGSN Due To Unsupported Feature" has not been stored in the HLR in the course of a previous subscriber data retrieval procedure, the "SGSN Area Restricted Flag" in the HLR shall be set to "not restricted".

The SDL diagram of process between HLR and VLR is shown in figure 25.7/2;

The SDL diagram of process between HLR and SGSN is shown in figure 25.7/5.

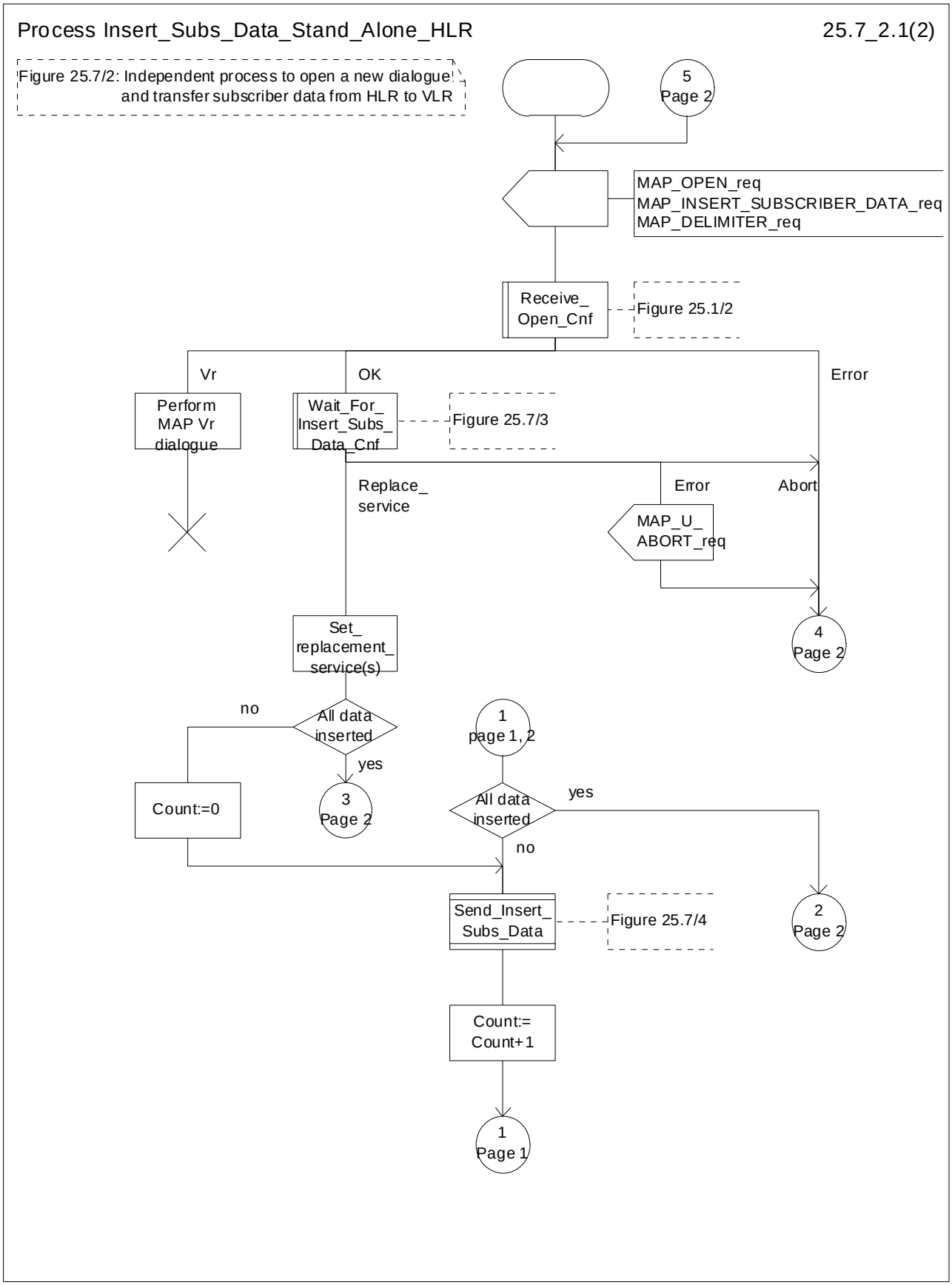


Figure 25.7/2 (sheet 1 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

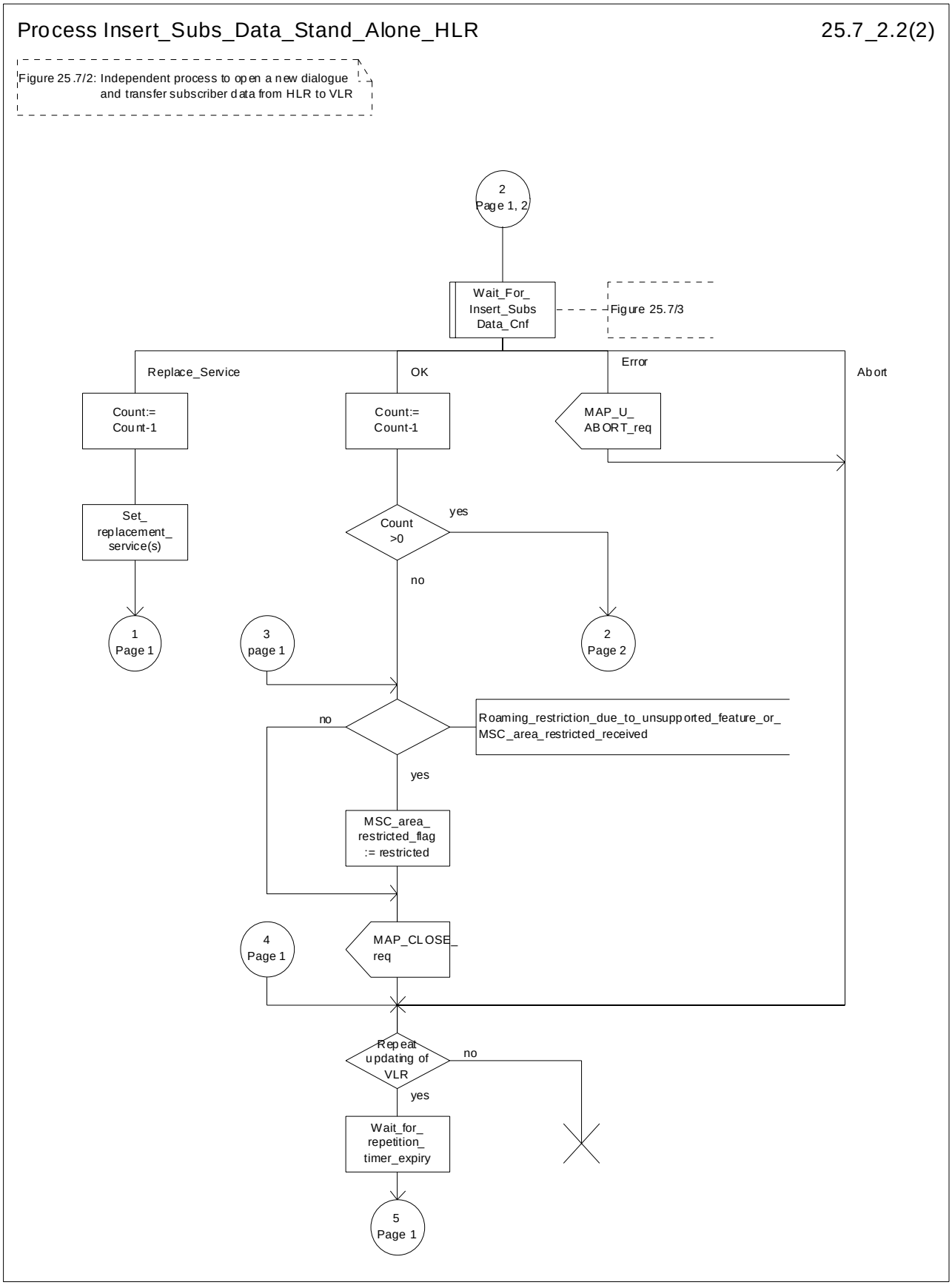


Figure 25.7/2 (sheet 2 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

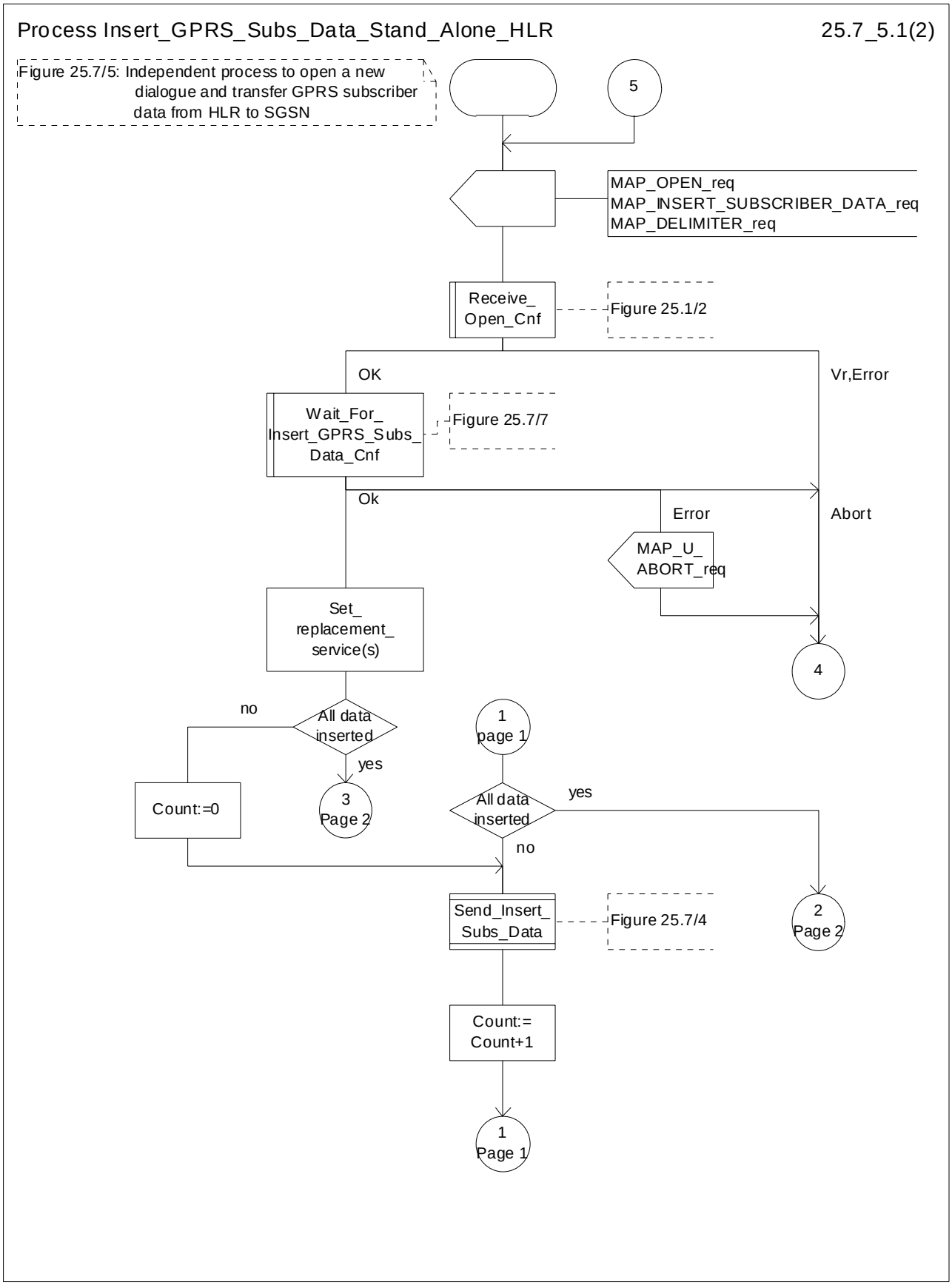


Figure 25.7/5 (sheet 1 of 2): Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

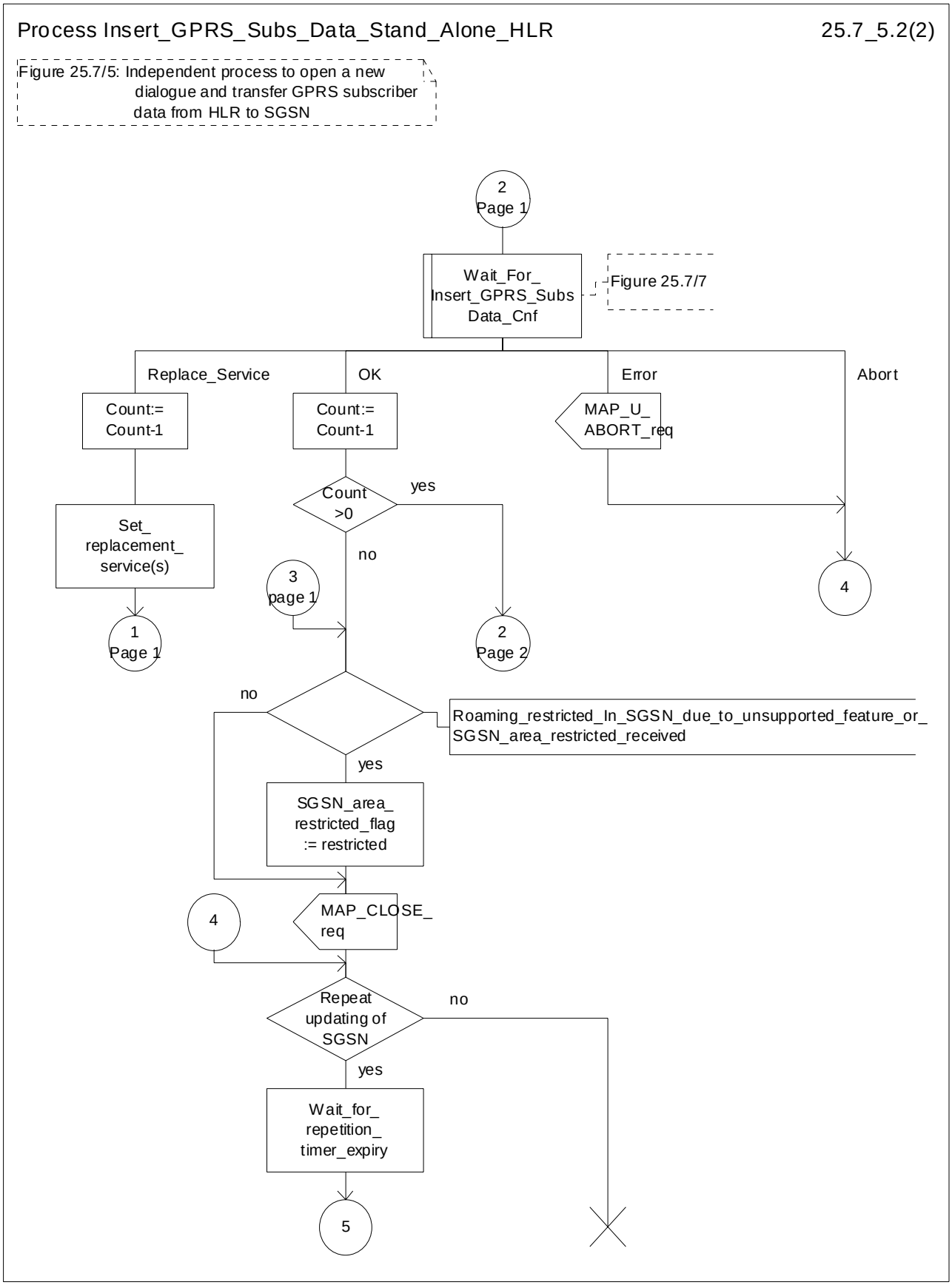


Figure 25.7/5 (sheet 2 of 2): Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

25.7.3 Macro Wait_for_Insert_Subs_Data_Cnf

This macro is used by any process or macro that describes the handling of the reception of the Insert_Subscriber_Data service in HLR that is coming from VLR (e.g. Update Location or Restore Data).

If the VLR reports the non-support of some basic or supplementary service or the network feature Operator Determined Barring then three actions are possible:

- to ignore the information received;
- to replace the not supported service;
- or to perform any other internal action.

The SDL diagram is shown in figure 25.7/3.

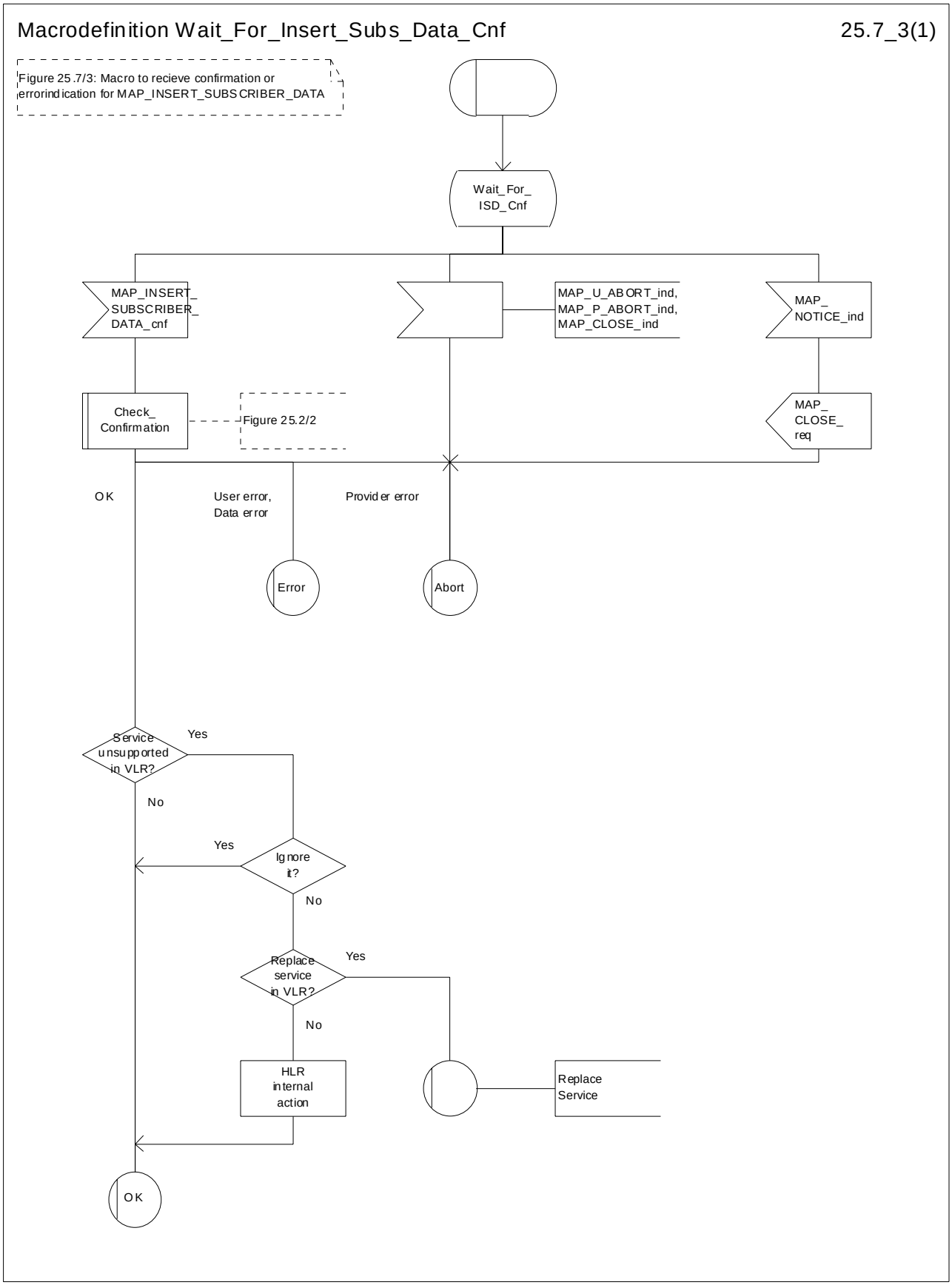


Figure 25.7/3: Macro Wait_for_Insert_Subs_Data_Cnf

25.7.4 Process Send_Insert_Subs_Data

This process is used by any process or macro where the Insert_Subscriber_Data request is sent to VLR or to SGSN.

The SDL diagram is shown in figure 25.7/4.

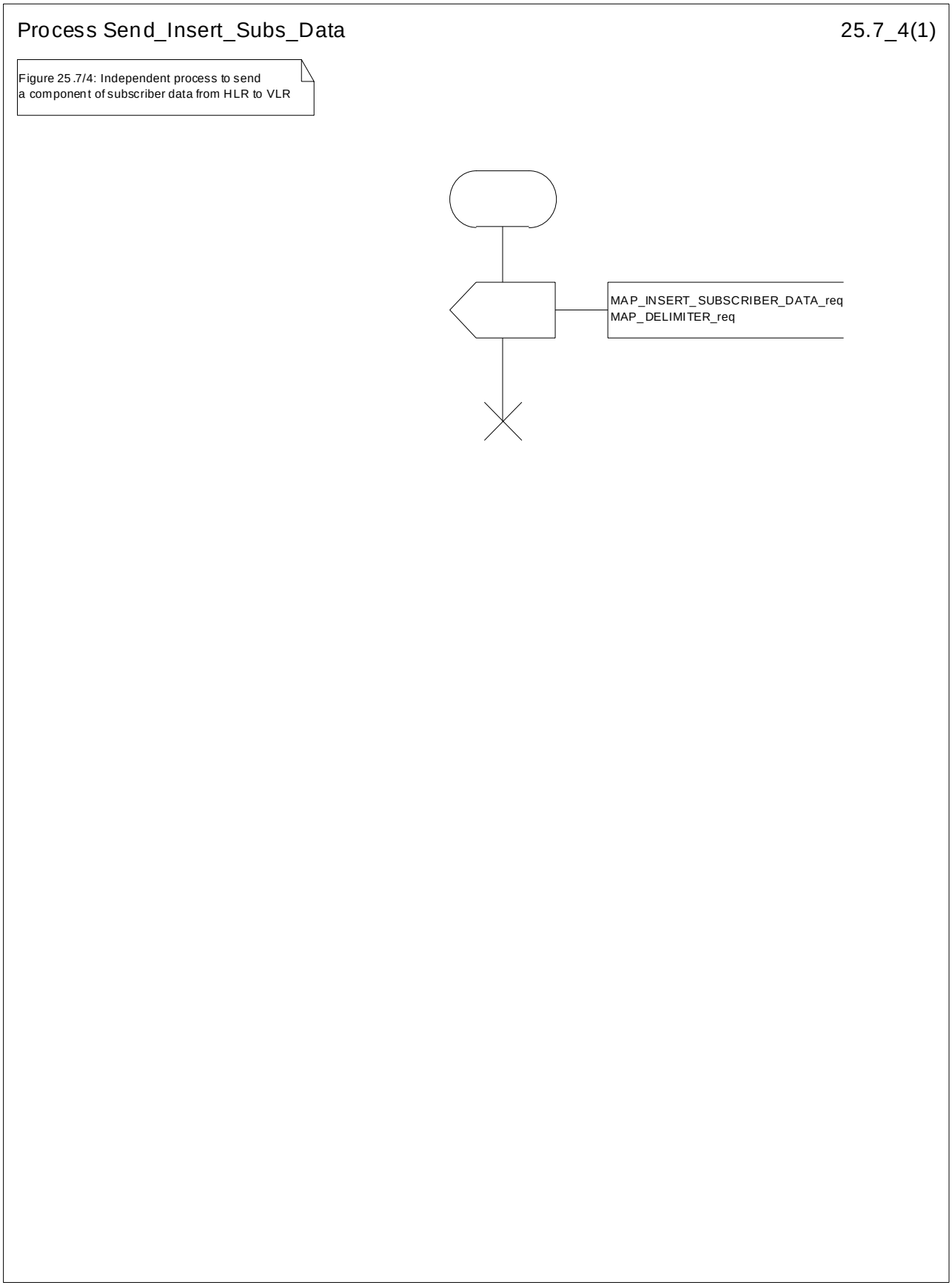


Figure 25.7/4: Process Send_Insert_Subs_Data

25.7.5 Macro Insert_Subs_Data_SGSN

This macro describes the reception of the InsertSubscriberData service indication. This macro is used by any procedure that triggers the reception of subscriber data (e.g. Update GPRS Location).

If the SGSN does not support any basic or the network feature Operator Determined Barring, or there is a problem with Regional Subscription Data then it reports it to the HLR.

If the entire SGSN area is restricted due to regional subscription this is reported to the HLR.

The SDL diagram is shown in figure 25.7/6.

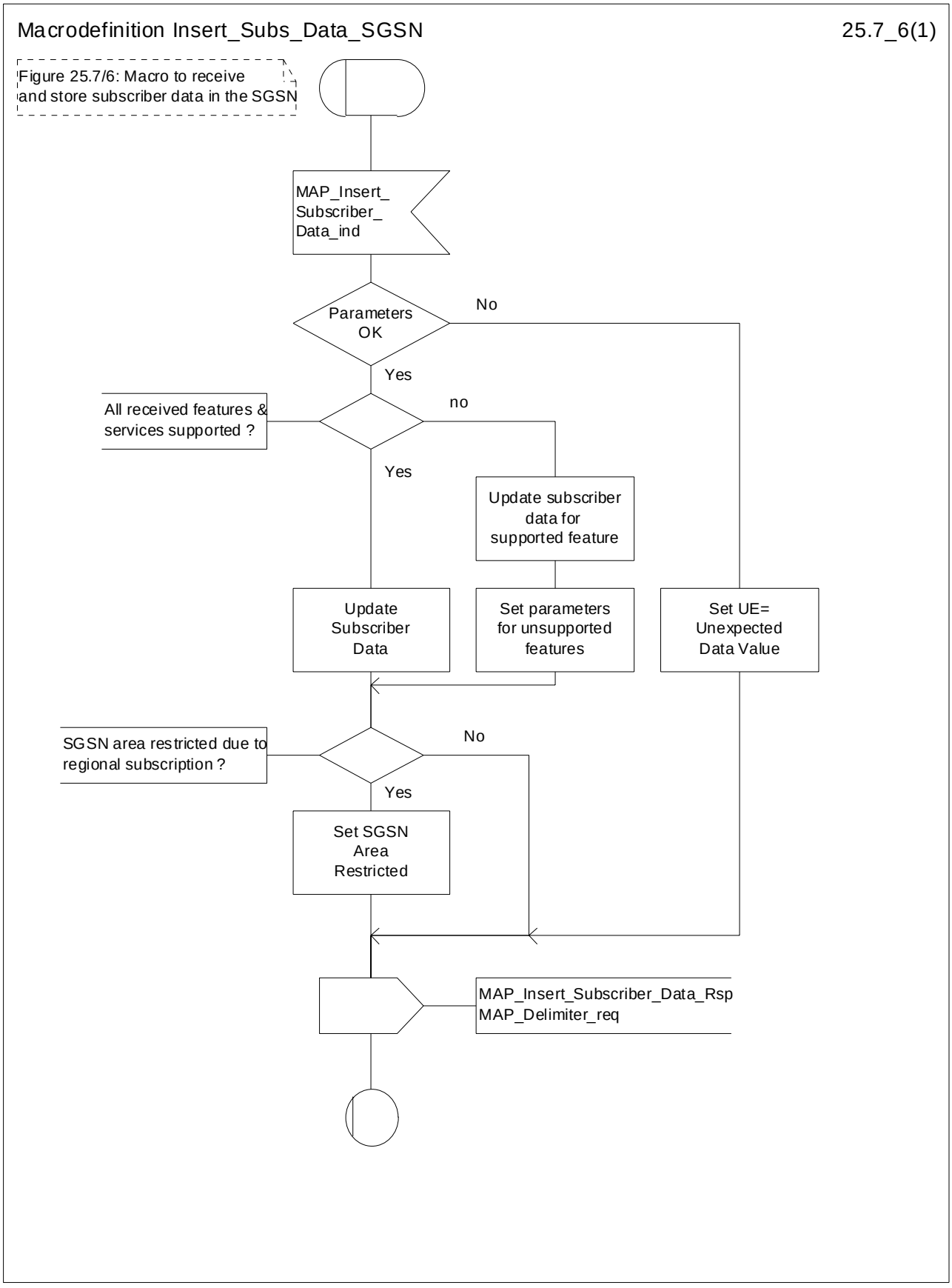


Figure 25.7/6: Macro Insert_Subs_Data_SGSN

25.7.6 Macro Wait_for_Insert_GPRS_Subs_Data_Cnf

This macro is used by any process or macro that describes the handling of the reception of the Insert_Subscriber_Data service in HLR that is coming from SGSN (e.g. Update GPRS Location).

If the SGSN reports the non-support of some basic or the network feature Operator Determined Barring then three actions are possible:

- to ignore the information received;
- to replace the not supported service;
- or to perform any other internal action.

The SDL diagram is shown in figure 25.7/7.

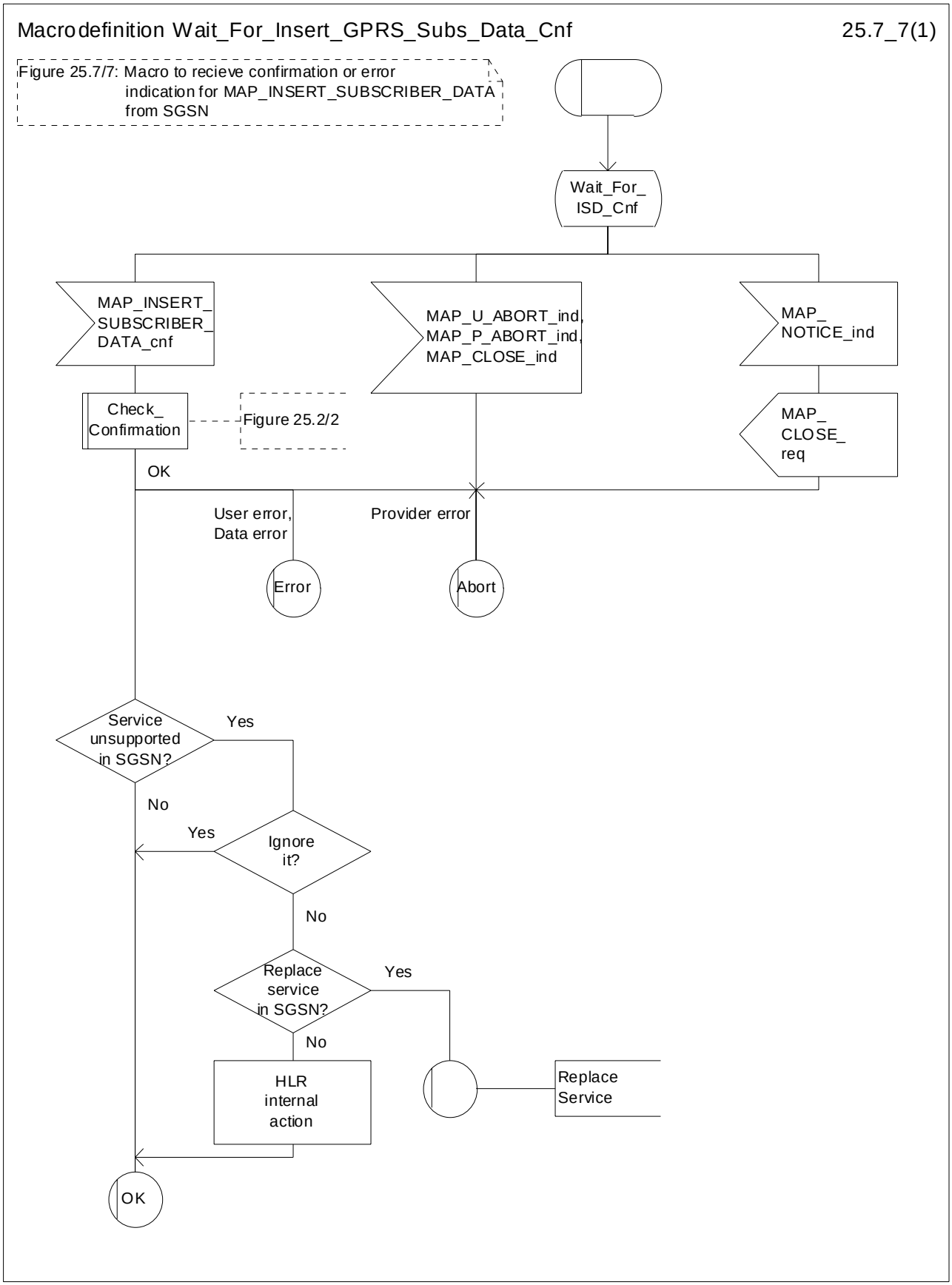


Figure 25.7/7: Macro Wait_for_Insert_GPRS_Subs_Data_Cnf

25.8 Request IMSI Macros

25.8.1 Macro Obtain_IMSI_MSC

This macro describes the handling of the request received from the VLR to provide the IMSI of a subscriber (e.g. at Location Updating).

The SDL diagram is shown in figure 25.8/1.

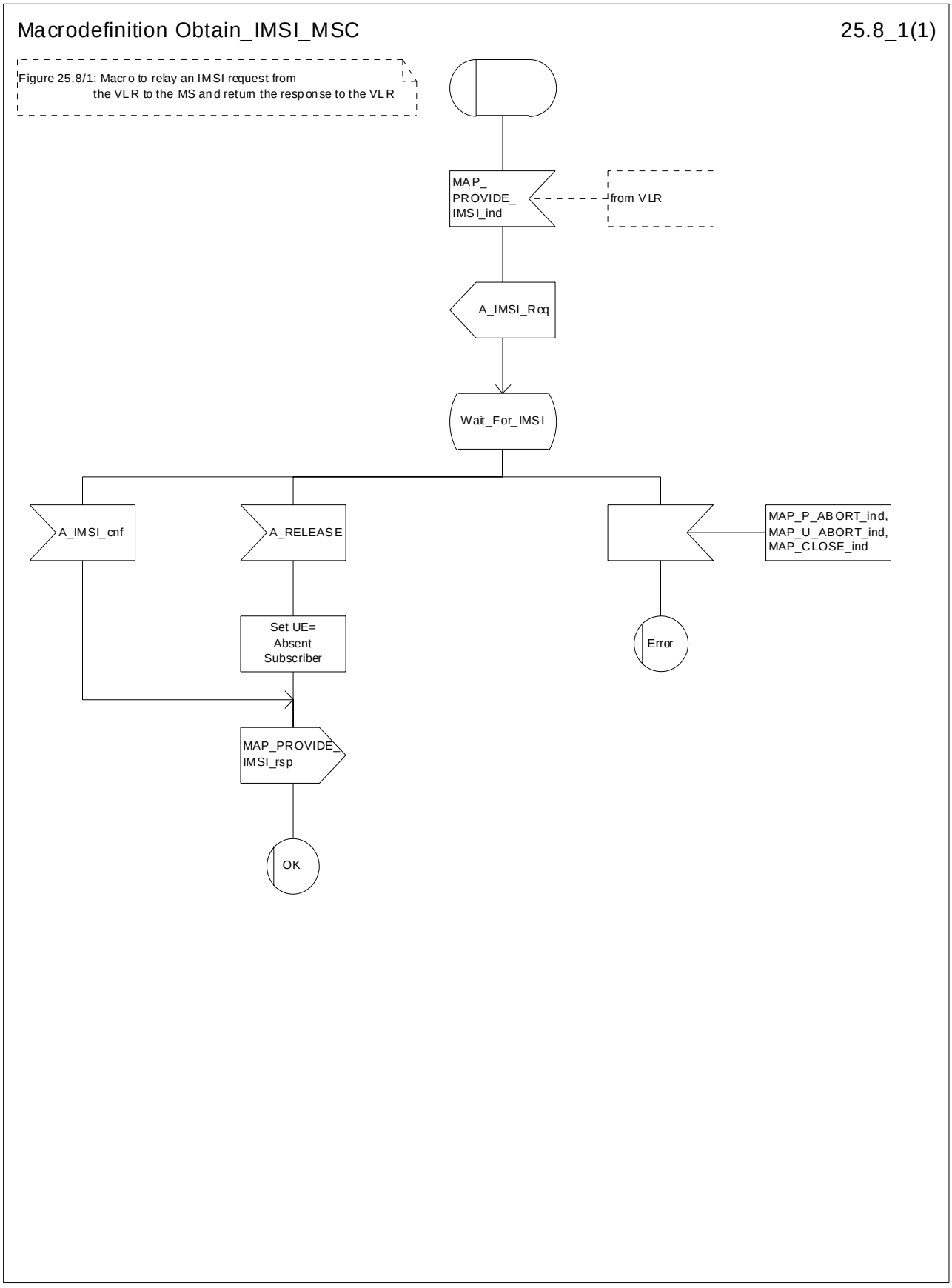


Figure 25.8/1: Macro Obtain_IMSI_MSC

25.8.2 Macro Obtain_IMSI_VLR

This macro describes the way VLR requests the MSC the IMSI of a subscriber (e.g. at Location Updating).

The SDL diagram is shown in figure 25.8/2.

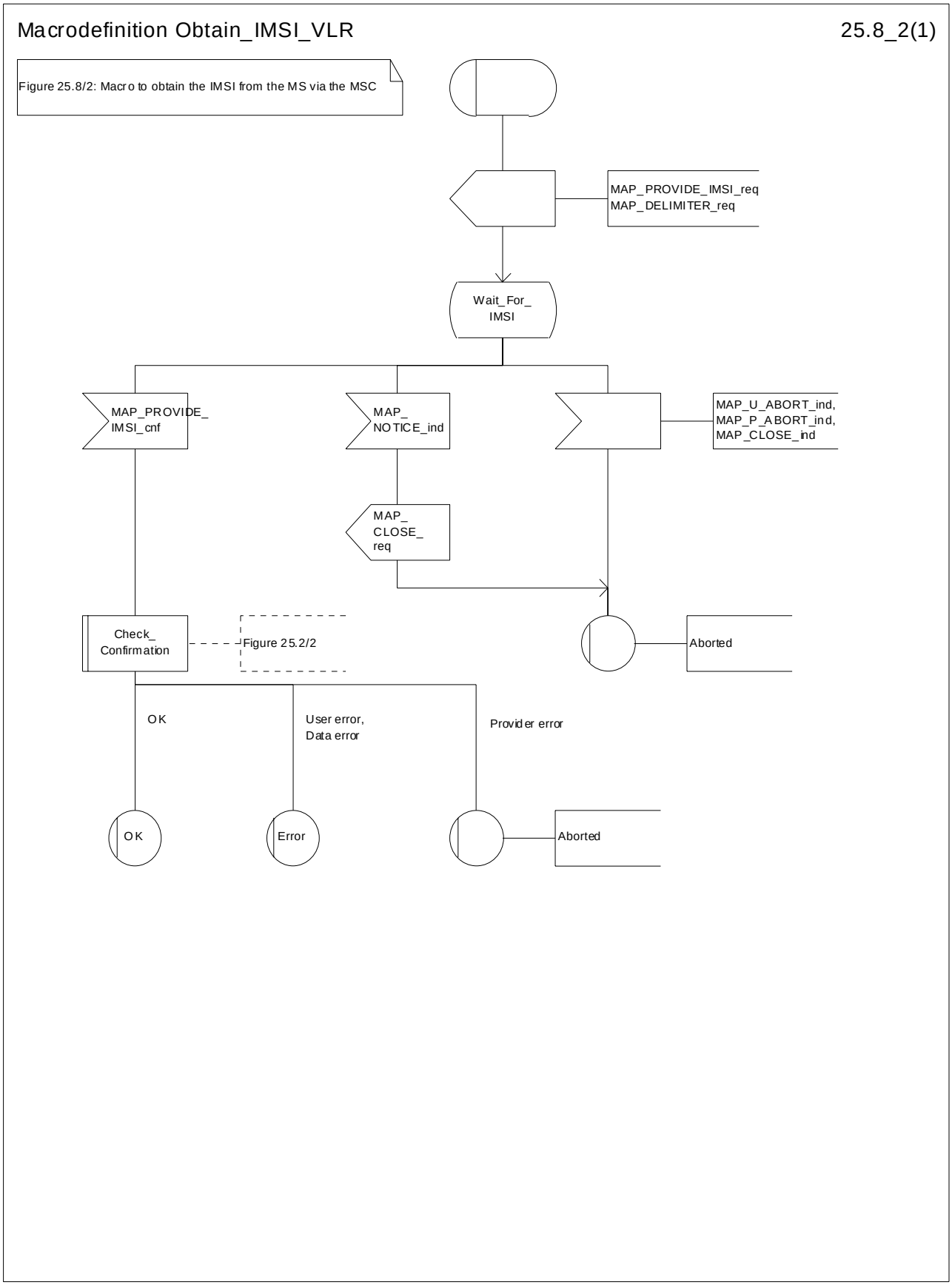


Figure 25.8/2: Macro Obtain_IMSI_VLR

25.9 Tracing macros

25.9.1 Macro Trace_Subscriber_Activity_MSC

The Trace_Subscriber_Activity_MSC is invoked in the MSC, when the MSC receives the MAP_TRACE_SUBSCRIBER_ACTIVITY indication from the VLR. The data of the primitive is checked and the tracing in the MSC is started if the content includes no errors. No response is returned to the VLR.

The Trace_Subscriber_Activity_MSC macro is described in the figure 25.9/1.

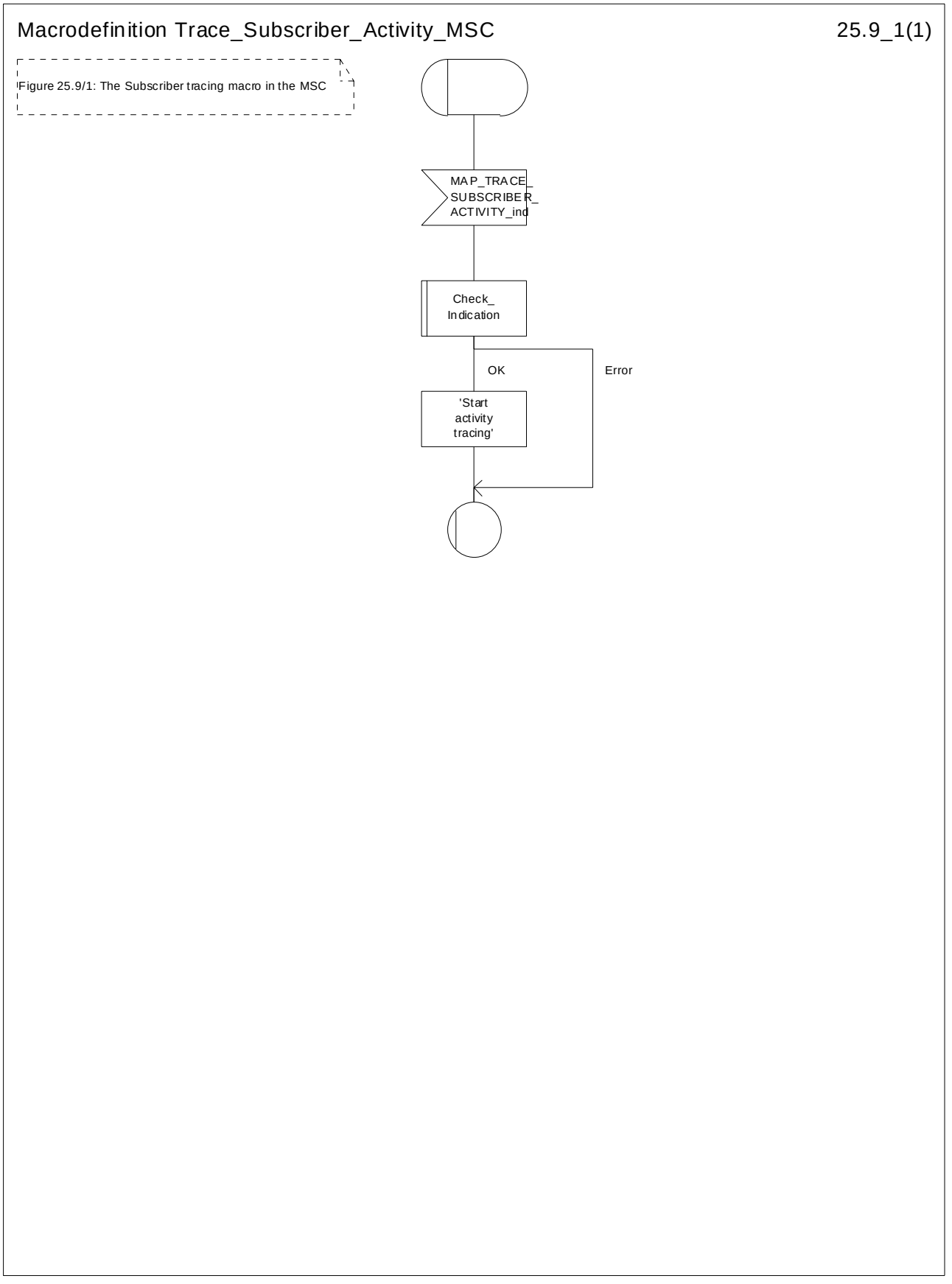


Figure 25.9/1: Macro Trace_Subscriber_Activity_MSC

25.9.2 Macro Trace_Subscriber_Activity_VLR

The macro Trace_Subscriber_Activity_VLR is invoked, if the subscriber activity is detected by the VLR and the tracing is active. The VLR sends MAP_TRACE_SUBSCRIBER_ACTIVITY request to the MSC. No answer is awaited from the MSC.

The Trace_Subscriber_Activity_VLR macro is shown in the figure 25.9/2.

Macrodefinition Trace_Subscriber_Activity_VLR 25.9_2(1)

Figure 25.9/2: The subscriber tracing macro in the VLR

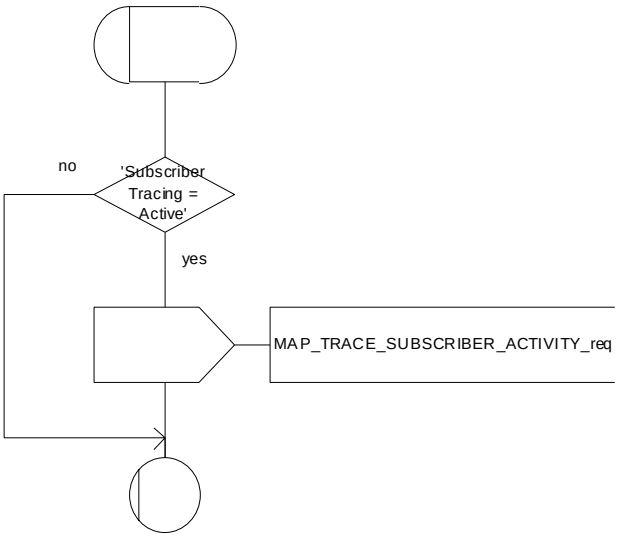


Figure 25.9/2: Macro Trace_Subscriber_Activity_VLR

25.9.3 Macro Activate_Tracing_VLR

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

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

The Activate_Tracing_VLR macro is described in the figure 25.9/3.

Macrodefinition Activate_Tracing_VLR 25.9_3(1)

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

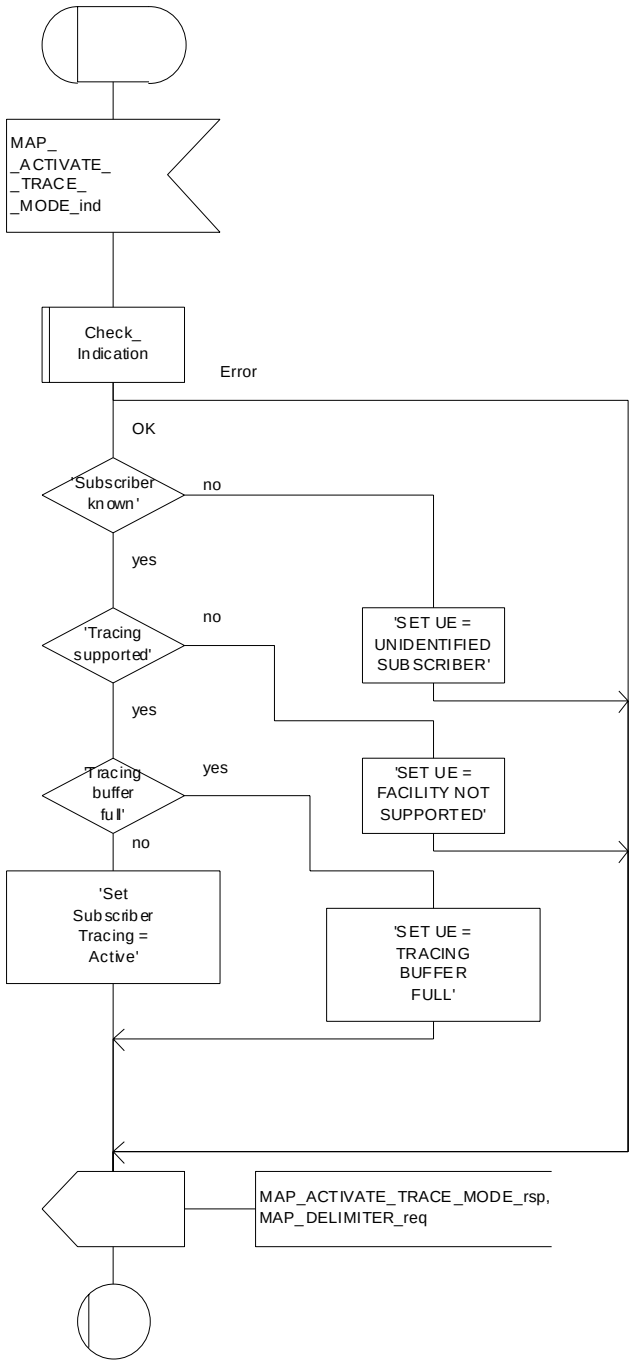


Figure 25.9/3: Macro Activate_Tracing_VLR

25.9.4 Macro Control_Tracing_HLR

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

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

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

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

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

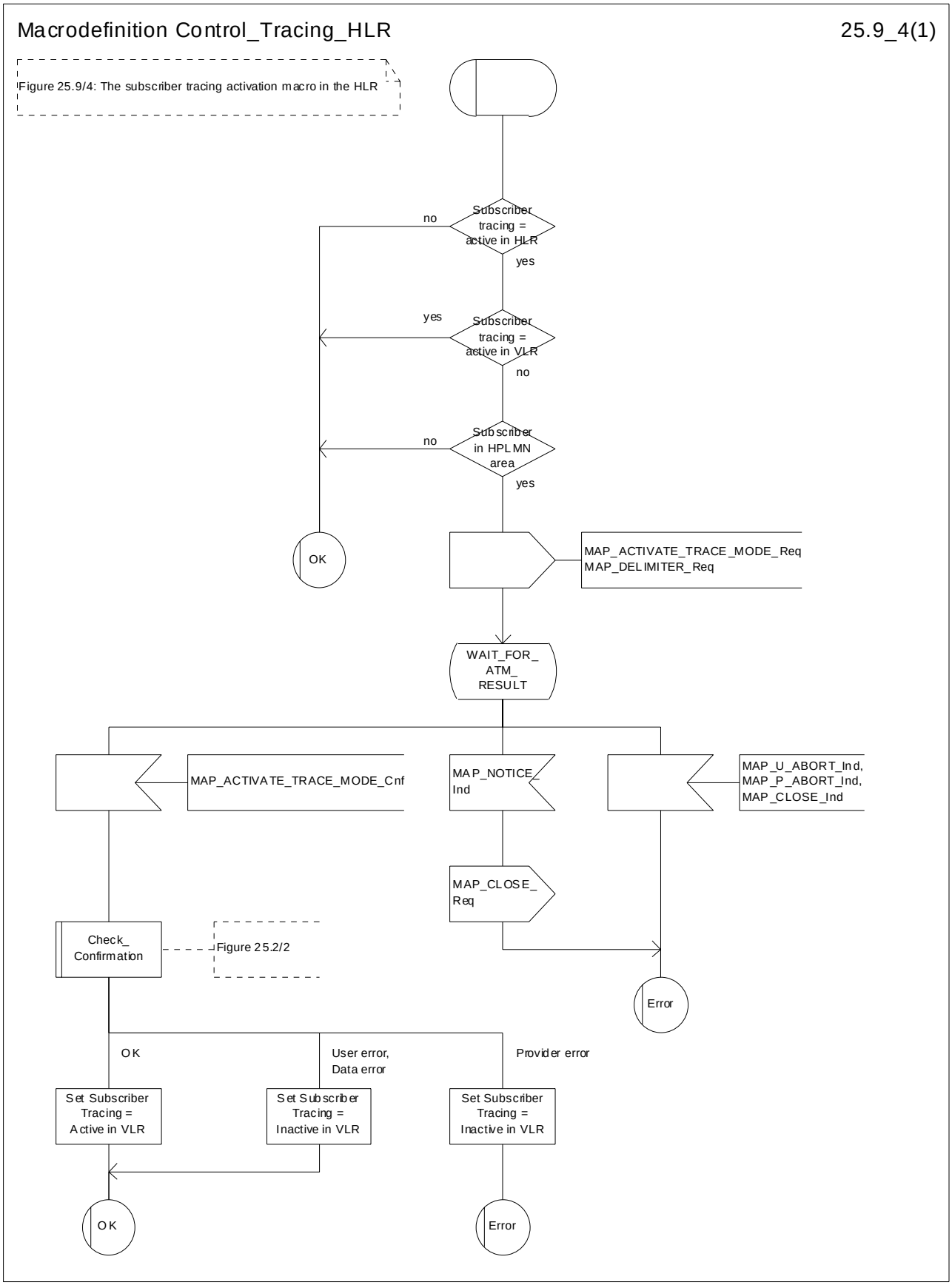


Figure 25.9/4: Macro Control_Tracing_HLR

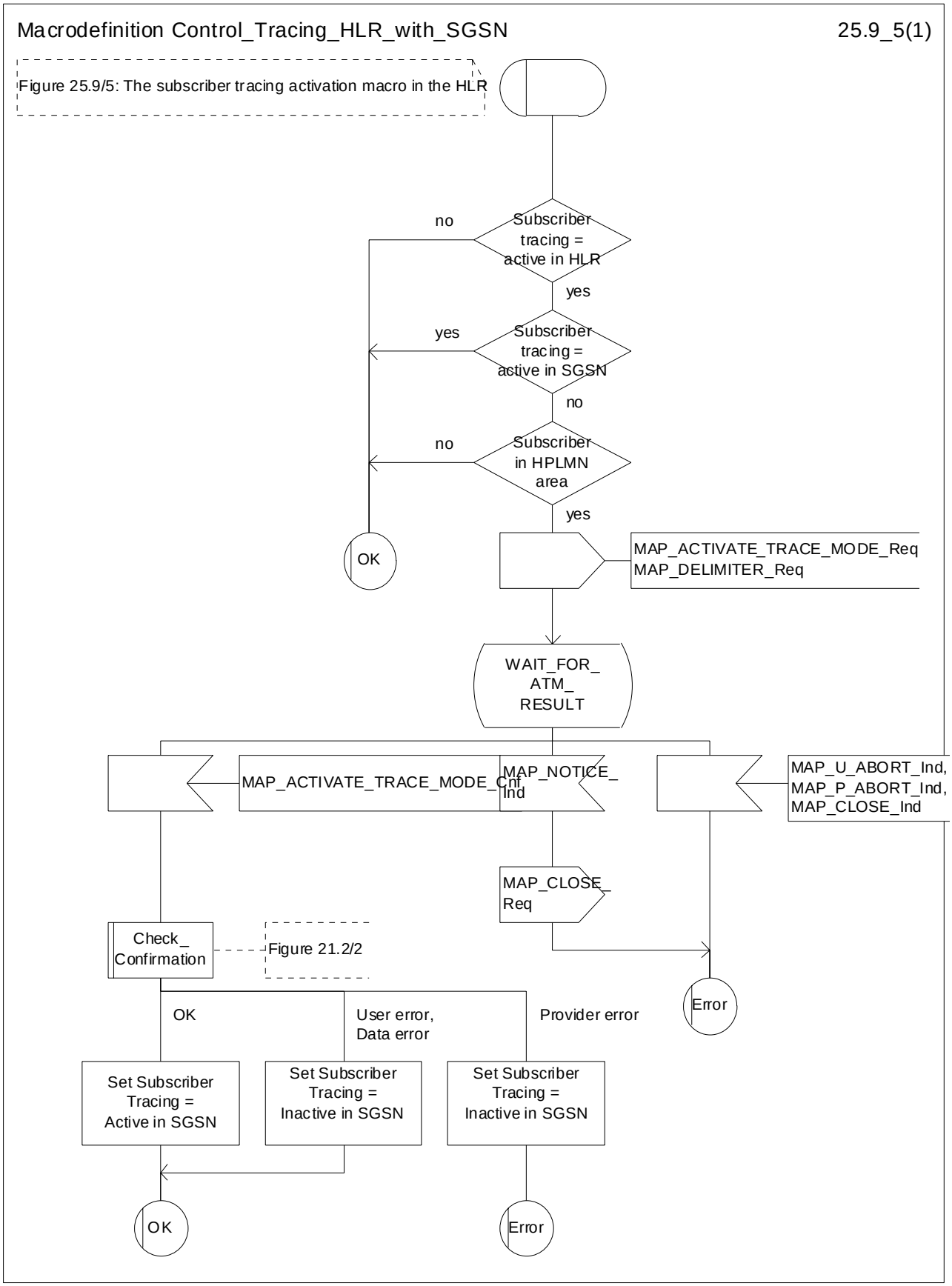


Figure 25.9/5: Macro Control_Tracing_HLR_with_SGSN

25.9.5 Macro Trace_Subscriber_Activity_SGSN

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

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

Macrodefinition Trace_Subscriber_Activity_SGSN 25.9_6(1)

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

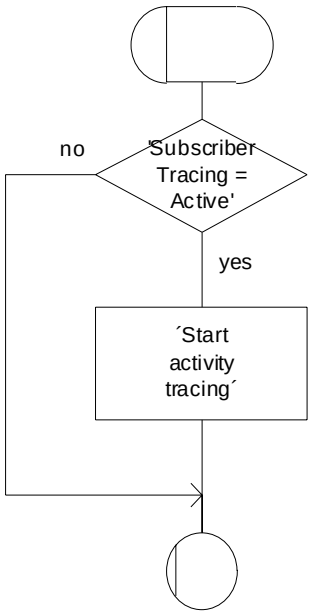


Figure 25.9/6: Macro Trace_Subscriber_Activity_SGSN

25.9.6 Macro Activate_Tracing_SGSN

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

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

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

Macrodefinition Activate_Tracing_SGSN 25.9_7(1)

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

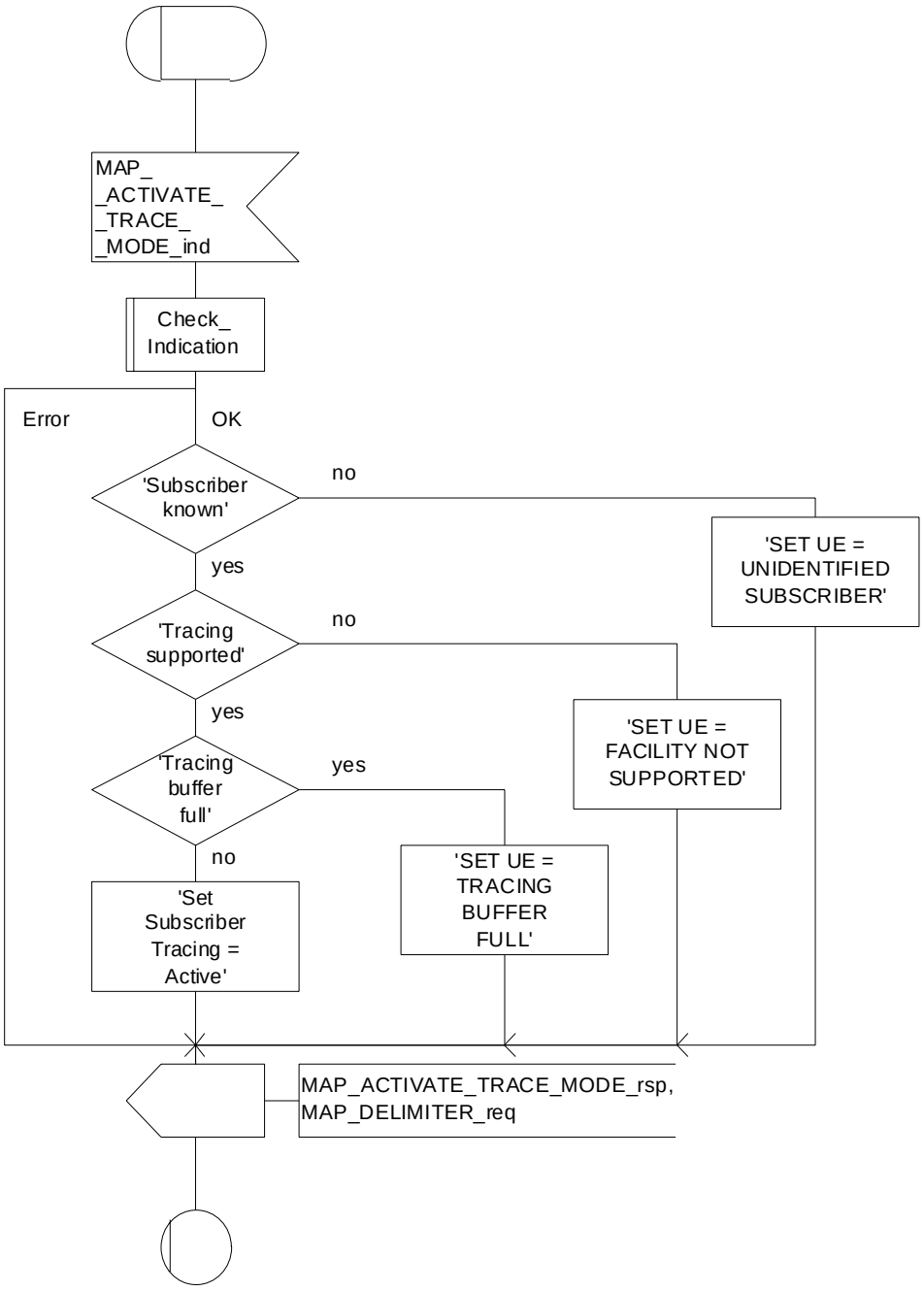


Figure 25.9/7: Macro Activate_Tracing_SGSN

25.10 Short Message Alert procedures

25.10.1 Subscriber_Present_VLR process

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

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

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

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

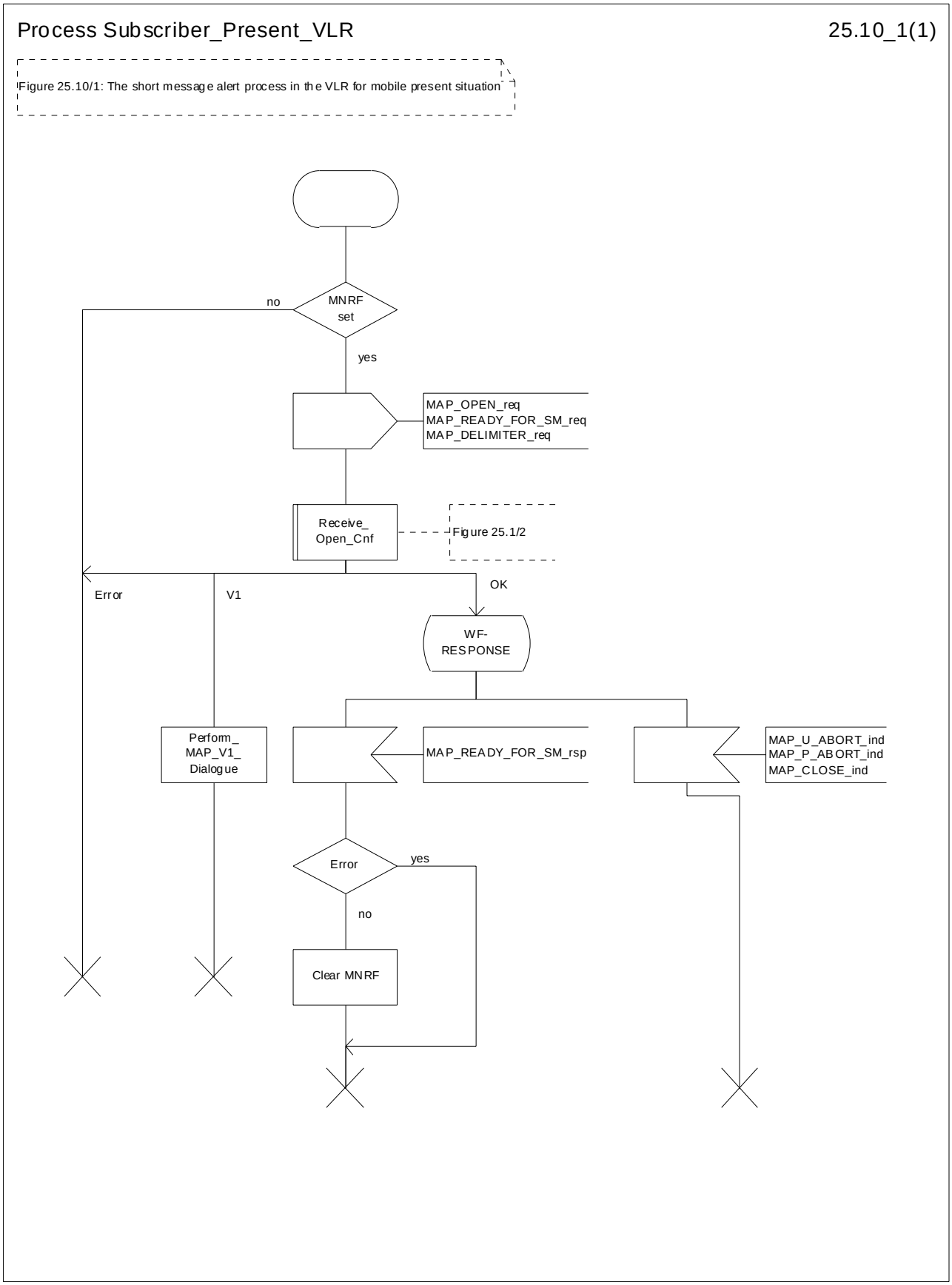


Figure 25.10/1: Process Subscriber_Present_VLR

25.10.2 Macro Alert_Service_Centre_HLR

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

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

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

Macrodefinition Alert_Service_Centre_HLR 25.10_2(1)

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

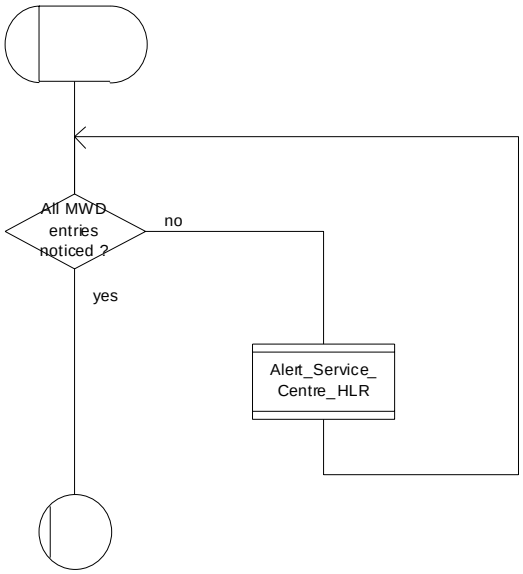


Figure 25.10/2: Macro Alert_Service_Centre_HLR

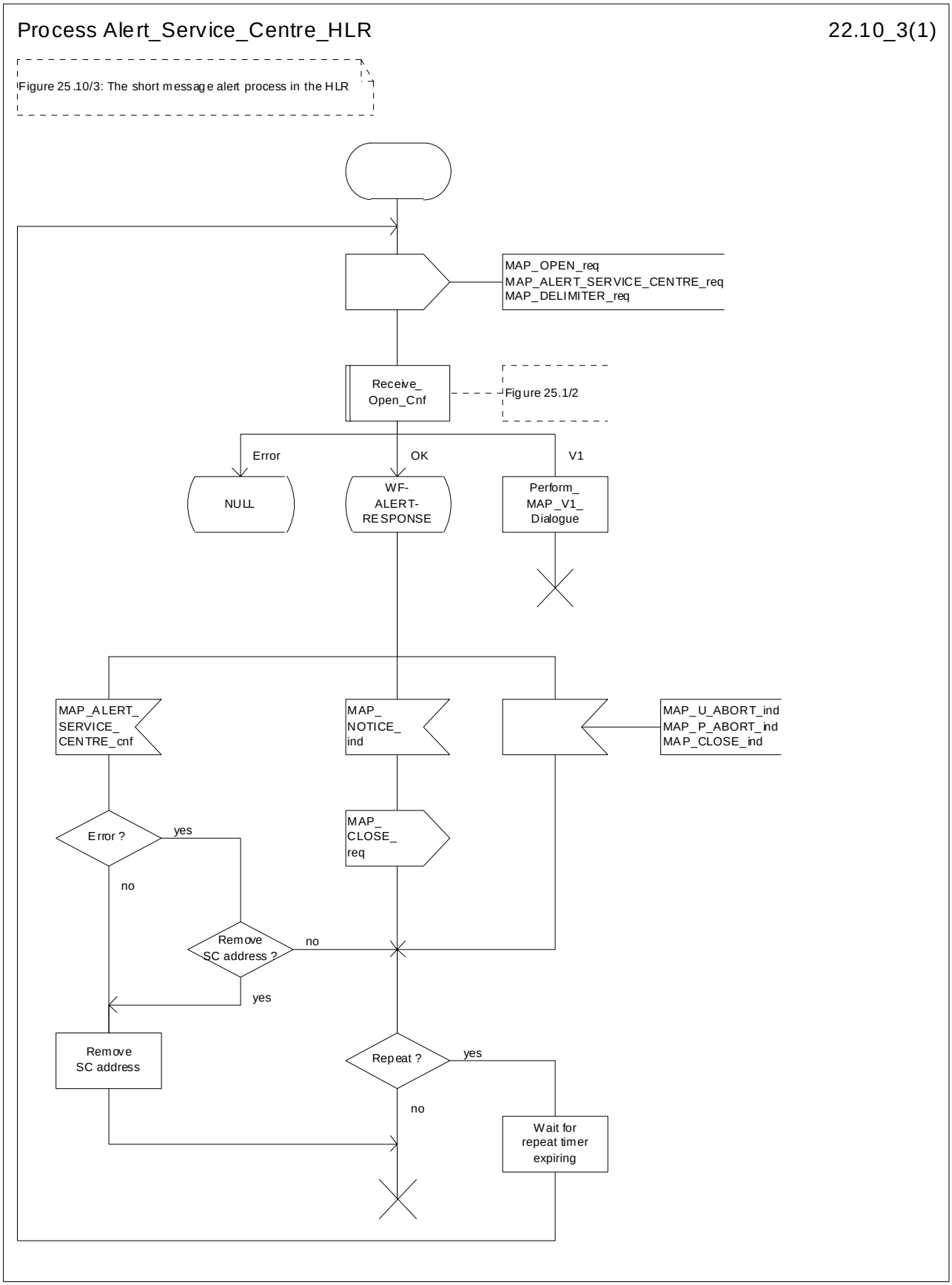


Figure 25.10/3: Process Alert_Service_Centre_HLR

25.10.3 The Mobile Subscriber is present

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

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

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

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

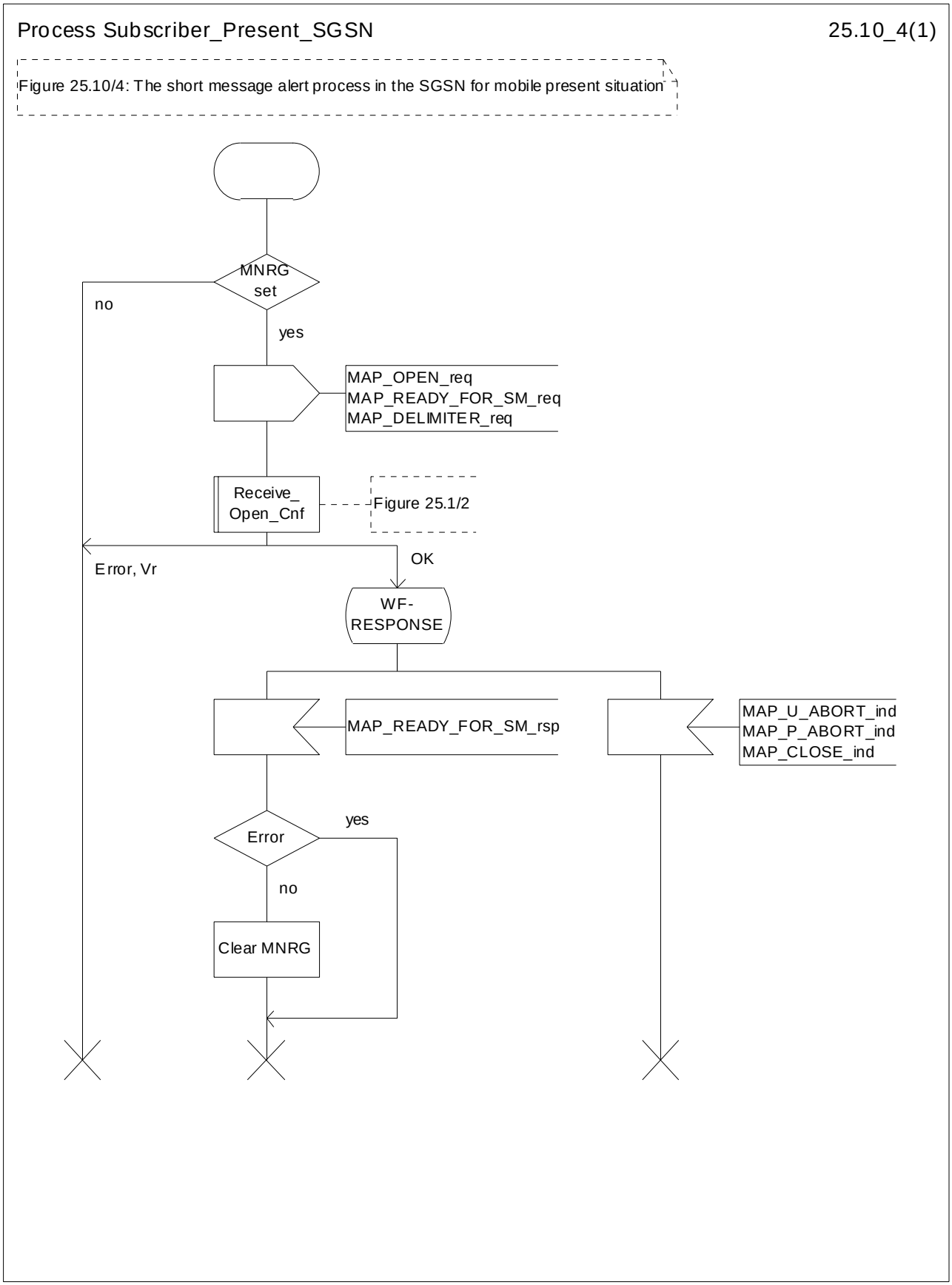


Figure 25.10/4: Process Subscriber_Present_SGSN

Annex A (informative): Cross-reference for abstract syntaxes of MAP

Annex A is not part of the standard, it is included for information purposes only.

For every ASN.1 item such as identifier, type-reference or value-reference the cross-reference allows to locate all occurrences by means of module-name and line numbers. For that purpose line numbers are printed at the left margin in front of each ASN.1 source line starting with 1 for every module.

The items are sorted alphabetically in the cross-reference in a case-insensitive manner. Occurrences of an item are its definition and all its usages such as in exports, imports or within a type or value assignment.

For every item additional information is provided such as kind of item (identifier, value reference, type reference), and tag, associated type and value if applicable.

The cross-reference for a root module includes all modules referred to directly or indirectly via imports. The cross-references for the root modules MAP-Protocol/TCAPMessages and MAP-DialoguePDU are included.

```
TAG   R4.21    Cross Reference Listing for MAP-Protocol            99-12-21  12:08:21  PAGE   1


       &extensionId.........................identifier of Fieldspec
          DEFINED in MAP-ExtensionDataTypes :     24
             USED in MAP-ExtensionDataTypes :     41

       &ExtensionType.......................identifier of Fieldspec
          DEFINED in MAP-ExtensionDataTypes :     23
             USED in MAP-ExtensionDataTypes :     43

       abort................................identifier of [APPLICATION 7] IMPLICIT Abort
          DEFINED in TCAPMessages           :     56

       Abort................................type reference SEQUENCE
          DEFINED in TCAPMessages           :     74
             USED in TCAPMessages           :     56

       absentSubscriber.....................value reference AbsentSubscriber, CHOICE VALUE
          DEFINED in MAP-Protocol           :    325

       AbsentSubscriber.....................type reference ERROR
          DEFINED in MAP-Errors             :    244
             USED in MAP-Protocol           :    120   325
             USED in MAP-MobileServiceOpera :     80   328
             USED in MAP-CallHandlingOperat :     38    89   107   178
             USED in MAP-SupplementaryServi :     50   197   211
             USED in MAP-ShortMessageServic :     36
             USED in MAP-Errors             :     47

       absentSubscriber.....................identifier of Named Number, 1
          DEFINED in MAP-SM-DataTypes       :    164

       absentSubscriberDiagnosticSM.........identifier of [0] AbsentSubscriberDiagnosticSM
          DEFINED in MAP-SM-DataTypes       :    146

       absentSubscriberDiagnosticSM.........identifier of AbsentSubscriberDiagnosticSM
          DEFINED in MAP-ER-DataTypes       :    141

       AbsentSubscriberDiagnosticSM.........type reference INTEGER
          DEFINED in MAP-ER-DataTypes       :    151
             USED in MAP-MS-DataTypes       :    143   797
             USED in MAP-SM-DataTypes       :     40   146   158
             USED in MAP-ER-DataTypes       :     43   141   146

       absentSubscriberParam................identifier of AbsentSubscriberParam
          DEFINED in MAP-Errors             :    246

       AbsentSubscriberParam................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    227
             USED in MAP-Errors             :    109   246
             USED in MAP-ER-DataTypes       :     34

       absentSubscriberReason...............identifier of [0] AbsentSubscriberReason
          DEFINED in MAP-ER-DataTypes       :    230
```

```
AbsentSubscriberReason.................type reference ENUMERATED
   DEFINED in MAP-ER-DataTypes       :    232
      USED in MAP-ER-DataTypes       :    230

absentsubscriberSM.....................value reference AbsentSubscriberSM, CHOICE VALUE
   DEFINED in MAP-Protocol           :    365

AbsentSubscriberSM.....................type reference ERROR
   DEFINED in MAP-Errors             :    351
      USED in MAP-Protocol           :    141   365
      USED in MAP-ShortMessageServic :     41    80   110
      USED in MAP-Errors             :     74

absentSubscriberSM-Param...............identifier of AbsentSubscriberSM-Param
   DEFINED in MAP-Errors             :    353

AbsentSubscriberSM-Param...............type reference SEQUENCE
   DEFINED in MAP-ER-DataTypes       :    140
      USED in MAP-Errors             :    119   353
      USED in MAP-ER-DataTypes       :     42

accepted...............................identifier of Named Number, 0
   DEFINED in MAP-CH-DataTypes       :    379

activateSS.............................value reference ActivateSS, CHOICE VALUE
   DEFINED in MAP-Protocol           :    218
```

```
       TAG   R4.21    Cross Reference Listing for MAP-Protocol            99-12-21  12:08:21  PAGE
2

       ActivateSS.............................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    121
             USED in MAP-Protocol           :     64   218
             USED in MAP-SupplementaryServi :     15

       activateTraceMode......................value reference ActivateTraceMode, CHOICE VALUE
          DEFINED in MAP-Protocol           :    197

       ActivateTraceMode......................type reference OPERATION
          DEFINED in MAP-OperationAndMainte :     50
             USED in MAP-Protocol           :     41   197
             USED in MAP-OperationAndMainte :     13

       activateTraceModeArg...................identifier of ActivateTraceModeArg
          DEFINED in MAP-OperationAndMainte :     52

       ActivateTraceModeArg...................type reference SEQUENCE
          DEFINED in MAP-OM-DataTypes       :     36
             USED in MAP-OperationAndMainte :     34    52
             USED in MAP-OM-DataTypes       :     14

       activateTraceModeRes...................identifier of ActivateTraceModeRes
          DEFINED in MAP-OperationAndMainte :     54

       ActivateTraceModeRes...................type reference SEQUENCE
          DEFINED in MAP-OM-DataTypes       :     50
             USED in MAP-OperationAndMainte :     35    54
             USED in MAP-OM-DataTypes       :     15

       additionalAbsentSubscriberDiagnosticSM..identifier of [5] AbsentSubscriberDiagnosticSM
          DEFINED in MAP-SM-DataTypes       :    158

       additionalAbsentSubscriberDiagnosticSM..identifier of [0] AbsentSubscriberDiagnosticSM
          DEFINED in MAP-ER-DataTypes       :    146

       additionalSM-DeliveryOutcome...........identifier of [4] SM-DeliveryOutcome
          DEFINED in MAP-SM-DataTypes       :    156

       additional-Number......................identifier of [6] Additional-Number
          DEFINED in MAP-SM-DataTypes       :     93

       Additional-Number......................type reference CHOICE
          DEFINED in MAP-SM-DataTypes       :     97
             USED in MAP-SM-DataTypes       :     93

       AddressString..........................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :     79
             USED in MAP-CommonDataTypes    :     16   123
             USED in MAP-OM-DataTypes       :     21    40
             USED in MAP-SS-DataTypes       :     44    72   273
             USED in MAP-SM-DataTypes       :     31    55   134   139   144   175

       ageOfLocationInformation...............identifier of AgeOfLocationInformation
          DEFINED in MAP-MS-DataTypes       :    902

       AgeOfLocationInformation...............type reference INTEGER
          DEFINED in MAP-MS-DataTypes       :    910
             USED in MAP-MS-DataTypes       :    902

       alertingCategory-1.....................value reference AlertingPattern, '00000100'B
          DEFINED in MAP-CommonDataTypes    :    213

       alertingCategory-2.....................value reference AlertingPattern, '00000101'B
          DEFINED in MAP-CommonDataTypes    :    214

       alertingCategory-3.....................value reference AlertingPattern, '00000110'B
          DEFINED in MAP-CommonDataTypes    :    215

       alertingCategory-4.....................value reference AlertingPattern, '00000111'B
          DEFINED in MAP-CommonDataTypes    :    216

       alertingCategory-5.....................value reference AlertingPattern, '00001000'B
          DEFINED in MAP-CommonDataTypes    :    217

       alertingLevel-0........................value reference AlertingPattern, '00000000'B
          DEFINED in MAP-CommonDataTypes    :    207

       alertingLevel-1........................value reference AlertingPattern, '00000001'B
          DEFINED in MAP-CommonDataTypes    :    208
```

```
alertingLevel-2.......................value reference AlertingPattern, '00000010'B
   DEFINED in MAP-CommonDataTypes    :    209
```

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       AlertingPattern.....................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :    194
             USED in MAP-CommonDataTypes    :     23   207   208   209   213   214   215   216   217
             USED in MAP-CH-DataTypes       :     63   102   180   369
             USED in MAP-SS-DataTypes       :     49   211

       alertingPattern.....................identifier of [14] AlertingPattern
          DEFINED in MAP-CH-DataTypes       :    102

       alertingPattern.....................identifier of [12] AlertingPattern
          DEFINED in MAP-CH-DataTypes       :    180

       alertingPattern.....................identifier of [5] AlertingPattern
          DEFINED in MAP-CH-DataTypes       :    369

       alertingPattern.....................identifier of AlertingPattern
          DEFINED in MAP-SS-DataTypes       :    211

       alertReason.........................identifier of AlertReason
          DEFINED in MAP-SM-DataTypes       :    194

       AlertReason.........................type reference ENUMERATED
          DEFINED in MAP-SM-DataTypes       :    206
             USED in MAP-SM-DataTypes       :     27   194

       alertReasonIndicator................identifier of NULL
          DEFINED in MAP-SM-DataTypes       :    195

       alertServiceCentre..................value reference AlertServiceCentre, CHOICE VALUE
          DEFINED in MAP-Protocol           :    238

       AlertServiceCentre..................type reference OPERATION
          DEFINED in MAP-ShortMessageServic :    124
             USED in MAP-Protocol           :     84   238
             USED in MAP-ShortMessageServic :     17

       alertServiceCentreArg...............identifier of AlertServiceCentreArg
          DEFINED in MAP-ShortMessageServic :    126

       AlertServiceCentreArg...............type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    173
             USED in MAP-ShortMessageServic :     54   126
             USED in MAP-SM-DataTypes       :     22

       allAdditionalInfoTransferSS.........value reference SS-Code, '10000000'B
          DEFINED in MAP-SS-Code            :    105

       allAlternateSpeech-DataCDA..........value reference BearerServiceCode, '00110000'B
          DEFINED in MAP-BS-Code            :     82

       allAlternateSpeech-DataCDS..........value reference BearerServiceCode, '00111000'B
          DEFINED in MAP-BS-Code            :     84

       allAsynchronousServices.............value reference BearerServiceCode, '01100000'B
          DEFINED in MAP-BS-Code            :     95

       allBarringSS........................value reference SS-Code, '10010000'B
          DEFINED in MAP-SS-Code            :    112

       allBearerServices...................value reference BearerServiceCode, '00000000'B
          DEFINED in MAP-BS-Code            :     49

       allCallCompletionSS.................value reference SS-Code, '01000000'B
          DEFINED in MAP-SS-Code            :     72

       allCallOfferingSS...................value reference SS-Code, '00110000'B
          DEFINED in MAP-SS-Code            :     63

       allCallPrioritySS...................value reference SS-Code, '10100000'B
          DEFINED in MAP-SS-Code            :    148

       allChargingSS.......................value reference SS-Code, '01110000'B
          DEFINED in MAP-SS-Code            :     97

       allCommunityOfInterest-SS...........value reference SS-Code, '01100000'B
          DEFINED in MAP-SS-Code            :     91

       allCondForwardingSS.................value reference SS-Code, '00101000'B
          DEFINED in MAP-SS-Code            :     52
```

```
allDataCDA-Services.....................value reference BearerServiceCode, '00010000'B
```

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          DEFINED in MAP-BS-Code            :     51

       allDataCDS-Services.....................value reference BearerServiceCode, '00011000'B
          DEFINED in MAP-BS-Code            :     60

       allDataCircuitAsynchronous..............value reference BearerServiceCode, '01010000'B
          DEFINED in MAP-BS-Code            :     92

       allDataCircuitSynchronous...............value reference BearerServiceCode, '01011000'B
          DEFINED in MAP-BS-Code            :     98

       allDataPDS-Services.....................value reference BearerServiceCode, '00101000'B
          DEFINED in MAP-BS-Code            :     76

       allDataTeleservices.....................value reference TeleserviceCode, '01110000'B
          DEFINED in MAP-TS-Code            :     55

       allECT-Barred...........................identifier of Named Number, 9
          DEFINED in MAP-MS-DataTypes       :    411

       allFacsimileTransmissionServices........value reference TeleserviceCode, '01100000'B
          DEFINED in MAP-TS-Code            :     48

       allForwardingSS.........................value reference SS-Code, '00100000'B
          DEFINED in MAP-SS-Code            :     48

       allGPRSData.............................identifier of NULL
          DEFINED in MAP-MS-DataTypes       :    637

       allLineIdentificationSS.................value reference SS-Code, '00010000'B
          DEFINED in MAP-SS-Code            :     25

       allMultiPartySS.........................value reference SS-Code, '01010000'B
          DEFINED in MAP-SS-Code            :     85

       allNameIdentificationSS.................value reference SS-Code, '00011000'B
          DEFINED in MAP-SS-Code            :     40

       allOG-CallsBarred.......................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    402

       allPadAccessCA-Services.................value reference BearerServiceCode, '00100000'B
          DEFINED in MAP-BS-Code            :     67

       allPLMN-specificBS......................value reference BearerServiceCode, '11010000'B
          DEFINED in MAP-BS-Code            :    110

       allPLMN-specificSS......................value reference SS-Code, '11110000'B
          DEFINED in MAP-SS-Code            :    131

       allPLMN-specificTS......................value reference TeleserviceCode, '11010000'B
          DEFINED in MAP-TS-Code            :     72

       allShortMessageServices.................value reference TeleserviceCode, '00100000'B
          DEFINED in MAP-TS-Code            :     44

       allSpeechFollowedByDataCDA..............value reference BearerServiceCode, '01000000'B
          DEFINED in MAP-BS-Code            :     86

       allSpeechFollowedByDataCDS..............value reference BearerServiceCode, '01001000'B
          DEFINED in MAP-BS-Code            :     88

       allSpeechTransmissionServices...........value reference TeleserviceCode, '00010000'B
          DEFINED in MAP-TS-Code            :     40

       allSS...................................value reference SS-Code, '00000000'B
          DEFINED in MAP-SS-Code            :     21

       allSynchronousServices..................value reference BearerServiceCode, '01101000'B
          DEFINED in MAP-BS-Code            :    101

       allTeleservices.........................value reference TeleserviceCode, '00000000'B
          DEFINED in MAP-TS-Code            :     38

       allTeleservices-ExeptSMS................value reference TeleserviceCode, '10000000'B
          DEFINED in MAP-TS-Code            :     58

       allVoiceGroupCallServices...............value reference TeleserviceCode, '10010000'B
          DEFINED in MAP-TS-Code            :     67
```

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anyTimeInterrogation...................value reference AnyTimeInterrogation, CHOICE VALUE
   DEFINED in MAP-Protocol          :    247
```

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       AnyTimeInterrogation...................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    202
             USED in MAP-Protocol           :     30   247
             USED in MAP-MobileServiceOpera :     27

       anyTimeInterrogationArg................identifier of AnyTimeInterrogationArg
          DEFINED in MAP-MobileServiceOpera :    204

       AnyTimeInterrogationArg................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    946
             USED in MAP-MobileServiceOpera :    110   204
             USED in MAP-MS-DataTypes       :     78

       anyTimeInterrogationRes................identifier of AnyTimeInterrogationRes
          DEFINED in MAP-MobileServiceOpera :    206

       AnyTimeInterrogationRes................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    953
             USED in MAP-MobileServiceOpera :    111   206
             USED in MAP-MS-DataTypes       :     79

       aocc...................................value reference SS-Code, '01110010'B
          DEFINED in MAP-SS-Code            :    102

       aoci...................................value reference SS-Code, '01110001'B
          DEFINED in MAP-SS-Code            :    100

       apn....................................identifier of [20] APN
          DEFINED in MAP-MS-DataTypes       :    325

       APN....................................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    340
             USED in MAP-MS-DataTypes       :    325

       asciCallReference......................identifier of ASCI-CallReference
          DEFINED in MAP-GR-DataTypes       :     51

       ASCI-CallReference.....................type reference TBCD-STRING
          DEFINED in MAP-CommonDataTypes    :    227
             USED in MAP-CommonDataTypes    :     35
             USED in MAP-GR-DataTypes       :     26    51

       assumedIdle............................identifier of [0] NULL
          DEFINED in MAP-MS-DataTypes       :    933

       ati-NotAllowed.........................value reference ATI-NotAllowed, CHOICE VALUE
          DEFINED in MAP-Protocol           :    336

       ATI-NotAllowed.........................type reference ERROR
          DEFINED in MAP-Errors             :    288
             USED in MAP-Protocol           :    127   336
             USED in MAP-MobileServiceOpera :     77   209
             USED in MAP-Errors             :     54

       ati-NotAllowedParam....................identifier of ATI-NotAllowedParam
          DEFINED in MAP-Errors             :    290

       ATI-NotAllowedParam....................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    258
             USED in MAP-Errors             :    116   290
             USED in MAP-ER-DataTypes       :     39

       AuthenticationSet......................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    226
             USED in MAP-MS-DataTypes       :    224

       authenticationSetList..................identifier of AuthenticationSetList
          DEFINED in MAP-MS-DataTypes       :    220

       AuthenticationSetList..................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    223
             USED in MAP-MS-DataTypes       :    220   278

       automaticFacsimileGroup3...............value reference TeleserviceCode, '01100010'B
          DEFINED in MAP-TS-Code            :     50

       a-side.................................identifier of Named Number, 0
          DEFINED in MAP-CH-DataTypes       :    342
```

```
badlyFormattedTransactionPortion........identifier of Named Number, 2
   DEFINED in TCAPMessages           :    105
```

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       badlyStructuredComponent..............identifier of Named Number, 2
          DEFINED in TCAPMessages           :    181

       baic..................................value reference SS-Code, '10011010'B
          DEFINED in MAP-SS-Code            :    125

       baoc..................................value reference SS-Code, '10010010'B
          DEFINED in MAP-SS-Code            :    116

       barringOfIncomingCalls................value reference SS-Code, '10011001'B
          DEFINED in MAP-SS-Code            :    123

       barringOfOutgoingCalls................value reference SS-Code, '10010001'B
          DEFINED in MAP-SS-Code            :    114

       barringServiceActive..................identifier of Named Number, 0
          DEFINED in MAP-ER-DataTypes       :     93

       basicCall.............................identifier of Named Number, 0
          DEFINED in MAP-CH-DataTypes       :    109

       basicService..........................identifier of Ext-BasicServiceCode
          DEFINED in MAP-MS-DataTypes       :    449

       basicService..........................identifier of Ext-BasicServiceCode
          DEFINED in MAP-MS-DataTypes       :    526

       basicService..........................identifier of Ext-BasicServiceCode
          DEFINED in MAP-MS-DataTypes       :    569

       basicService..........................identifier of [5] Ext-BasicServiceCode
          DEFINED in MAP-CH-DataTypes       :    137

       basicService..........................identifier of BasicServiceCode
          DEFINED in MAP-SS-DataTypes       :     71

       basicService..........................identifier of BasicServiceCode
          DEFINED in MAP-SS-DataTypes       :     95

       basicService..........................identifier of BasicServiceCode
          DEFINED in MAP-SS-DataTypes       :    148

       basicService..........................identifier of BasicServiceCode
          DEFINED in MAP-SS-DataTypes       :    176

       basicService..........................identifier of BasicServiceCode
          DEFINED in MAP-ER-DataTypes       :    115

       BasicServiceCode......................type reference CHOICE
          DEFINED in MAP-CommonDataTypes    :    312
             USED in MAP-CommonDataTypes    :     41
             USED in MAP-SS-DataTypes       :     48    71    95   148   176   196   251
             USED in MAP-ER-DataTypes       :     59   115

       basicServiceCriteria..................identifier of [1] BasicServiceCriteria
          DEFINED in MAP-MS-DataTypes       :    727

       BasicServiceCriteria..................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    747
             USED in MAP-MS-DataTypes       :     57   727
             USED in MAP-CH-DataTypes       :     42

       basicServiceGroup.....................identifier of [9] Ext-BasicServiceCode
          DEFINED in MAP-CH-DataTypes       :     96

       basicServiceGroup.....................identifier of [1] Ext-BasicServiceCode
          DEFINED in MAP-CH-DataTypes       :    191

       basicServiceGroup.....................identifier of [3] BasicServiceCode
          DEFINED in MAP-SS-DataTypes       :    196

       basicServiceGroupList.................identifier of Ext-BasicServiceGroupList
          DEFINED in MAP-MS-DataTypes       :    544

       basicServiceGroupList.................identifier of Ext-BasicServiceGroupList
          DEFINED in MAP-MS-DataTypes       :    591

       basicServiceGroupList.................identifier of BasicServiceGroupList
          DEFINED in MAP-SS-DataTypes       :    156
```

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basicServiceGroupList..................identifier of [2] BasicServiceGroupList
```

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          DEFINED in MAP-SS-DataTypes       :    203

       BasicServiceGroupList..................type reference SEQUENCE OF
          DEFINED in MAP-SS-DataTypes       :    250
             USED in MAP-SS-DataTypes       :    156   203

       basicServiceList.......................identifier of [1] BasicServiceList
          DEFINED in MAP-MS-DataTypes       :    622

       BasicServiceList.......................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    643
             USED in MAP-MS-DataTypes       :    622

       bearerService..........................identifier of [2] BearerServiceCode
          DEFINED in MAP-CommonDataTypes    :    313

       BearerServiceCode......................type reference OCTET STRING
          DEFINED in MAP-BS-Code            :     11
             USED in MAP-CommonDataTypes    :     54   313
             USED in MAP-BS-Code            :     49    51    52    53    54    55    56    57    58
                                                  60    61    62    63    64    65    67    68    69
                                                  70    71    72    73    74    76    77    78    79
                                                  80    82    84    86    88    92    95    98   101
                                                 110   111   112   113   114   115   116   117   118
                                                 119   120   121   122   123   124   125

       bearerServiceList......................identifier of [4] BearerServiceList
          DEFINED in MAP-MS-DataTypes       :    363

       BearerServiceList......................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    385
             USED in MAP-MS-DataTypes       :    363   605

       bearerServiceList......................identifier of [2] BearerServiceList
          DEFINED in MAP-MS-DataTypes       :    605

       bearerServiceNotProvisioned...........value reference BearerServiceNotProvisioned, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    303

       BearerServiceNotProvisioned............type reference ERROR
          DEFINED in MAP-Errors             :    209
             USED in MAP-Protocol           :    113   303
             USED in MAP-CallHandlingOperat :     35    87
             USED in MAP-SupplementaryServi :     37    97   114   131   151   169
             USED in MAP-Errors             :     32

       bearerServNotProvParam.................identifier of BearerServNotProvParam
          DEFINED in MAP-Errors             :    211

       BearerServNotProvParam.................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    211
             USED in MAP-Errors             :    104   211
             USED in MAP-ER-DataTypes       :     30

       begin..................................identifier of [APPLICATION 2] IMPLICIT Begin
          DEFINED in TCAPMessages           :     53

       Begin..................................type reference SEQUENCE
          DEFINED in TCAPMessages           :     61
             USED in TCAPMessages           :     53

       bicRoam................................value reference SS-Code, '10011011'B
          DEFINED in MAP-SS-Code            :    127

       blackListed............................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    285

       boic...................................value reference SS-Code, '10010011'B
          DEFINED in MAP-SS-Code            :    118

       boicExHC...............................value reference SS-Code, '10010100'B
          DEFINED in MAP-SS-Code            :    120

       bothMSCAndSGSN.........................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    307

       broadcastInitEntitlement...............identifier of NULL
          DEFINED in MAP-MS-DataTypes       :    867
```

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bss-APDU.............................identifier of ExternalSignalInfo
   DEFINED in MAP-MobileServiceOpera :    229
```

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       bss-APDU..............................identifier of ExternalSignalInfo
          DEFINED in MAP-MobileServiceOpera :    234

       bss-APDU..............................identifier of ExternalSignalInfo
          DEFINED in MAP-MobileServiceOpera :    238

       bss-APDU..............................identifier of ExternalSignalInfo
          DEFINED in MAP-MobileServiceOpera :    244

       bss-APDU..............................identifier of ExternalSignalInfo
          DEFINED in MAP-MS-DataTypes       :    260

       bss-APDU..............................identifier of ExternalSignalInfo
          DEFINED in MAP-MS-DataTypes       :    265

       bss-APDU..............................identifier of ExternalSignalInfo
          DEFINED in MAP-MS-DataTypes       :    271

       busy..................................identifier of Named Number, 1
          DEFINED in MAP-CH-DataTypes       :    118

       busy..................................identifier of Named Number, 2
          DEFINED in MAP-CH-DataTypes       :    352

       busySubscriber........................value reference BusySubscriber, CHOICE VALUE
          DEFINED in MAP-Protocol           :    326

       BusySubscriber........................type reference ERROR
          DEFINED in MAP-Errors             :    251
             USED in MAP-Protocol           :    121   326
             USED in MAP-CallHandlingOperat :     39    90   180
             USED in MAP-Errors             :     45

       busySubscriberParam...................identifier of BusySubscriberParam
          DEFINED in MAP-Errors             :    253

       BusySubscriberParam...................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    240
             USED in MAP-Errors             :    110   253
             USED in MAP-ER-DataTypes       :     35

       b-side................................identifier of Named Number, 1
          DEFINED in MAP-CH-DataTypes       :    343

       b-subscriberNumber....................identifier of [1] ISDN-AddressString
          DEFINED in MAP-SS-DataTypes       :    194

       b-subscriberSubaddress................identifier of [2] ISDN-SubaddressString
          DEFINED in MAP-SS-DataTypes       :    195

       b-Subscriber-Address..................identifier of [3] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    262

       callBarred............................value reference CallBarred, CHOICE VALUE
          DEFINED in MAP-Protocol           :    328

       CallBarred............................type reference ERROR
          DEFINED in MAP-Errors             :    261
             USED in MAP-Protocol           :    123   328
             USED in MAP-CallHandlingOperat :     41    92
             USED in MAP-SupplementaryServi :     39    99   116   133   153   171   185   226   260
                                                 277
             USED in MAP-ShortMessageServic :     37    79
             USED in MAP-Errors             :     48

       callBarredParam.......................identifier of CallBarredParam
          DEFINED in MAP-Errors             :    263

       CallBarredParam.......................type reference CHOICE
          DEFINED in MAP-ER-DataTypes       :     85
             USED in MAP-Errors             :    112   263
             USED in MAP-ER-DataTypes       :     15

       callBarringCause......................identifier of CallBarringCause
          DEFINED in MAP-ER-DataTypes       :     86

       CallBarringCause......................type reference ENUMERATED
          DEFINED in MAP-ER-DataTypes       :     92
             USED in MAP-ER-DataTypes       :     86    97
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```
callBarringCause.....................identifier of CallBarringCause
   DEFINED in MAP-ER-DataTypes       :     97
```

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       CallBarringFeature.....................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    147
             USED in MAP-SS-DataTypes       :    145

       callBarringFeatureList.................identifier of Ext-CallBarFeatureList
          DEFINED in MAP-MS-DataTypes       :    518

       callBarringFeatureList.................identifier of CallBarringFeatureList
          DEFINED in MAP-SS-DataTypes       :    141

       CallBarringFeatureList.................type reference SEQUENCE OF
          DEFINED in MAP-SS-DataTypes       :    144
             USED in MAP-SS-DataTypes       :    141

       callBarringInfo........................identifier of [1] Ext-CallBarInfo
          DEFINED in MAP-MS-DataTypes       :    433

       callBarringInfo........................identifier of [1] CallBarringInfo
          DEFINED in MAP-SS-DataTypes       :     82

       CallBarringInfo........................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    139
             USED in MAP-SS-DataTypes       :     82

       CallDirection..........................type reference OCTET STRING
          DEFINED in MAP-CH-DataTypes       :    269
             USED in MAP-CH-DataTypes       :    261

       calledPartySS-InteractionViolation......identifier of Named Number, 7
          DEFINED in MAP-ER-DataTypes       :    111

       callInfo...............................identifier of [1] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    365

       callInfo...............................identifier of [3] ExternalSignalInfo
          DEFINED in MAP-SS-DataTypes       :    286

       callOutcome............................identifier of [1] CallOutcome
          DEFINED in MAP-CH-DataTypes       :    337

       CallOutcome............................type reference ENUMERATED
          DEFINED in MAP-CH-DataTypes       :    349
             USED in MAP-CH-DataTypes       :    337

       callReferenceNumber....................identifier of [7] CallReferenceNumber
          DEFINED in MAP-CH-DataTypes       :     94

       CallReferenceNumber....................type reference OCTET STRING
          DEFINED in MAP-CH-DataTypes       :    114
             USED in MAP-CH-DataTypes       :     22    94   176   190

       callReferenceNumber....................identifier of [9] CallReferenceNumber
          DEFINED in MAP-CH-DataTypes       :    176

       callReferenceNumber....................identifier of [0] CallReferenceNumber
          DEFINED in MAP-CH-DataTypes       :    190

       callReportdata.........................identifier of [2] CallReportData
          DEFINED in MAP-CH-DataTypes       :    326

       CallReportData.........................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    335
             USED in MAP-CH-DataTypes       :    326

       callTypeCriteria.......................identifier of [2] CallTypeCriteria
          DEFINED in MAP-MS-DataTypes       :    728

       CallTypeCriteria.......................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    758
             USED in MAP-MS-DataTypes       :    728

       call-Direction.........................identifier of [2] CallDirection
          DEFINED in MAP-CH-DataTypes       :    261

       camelBusy..............................identifier of [1] NULL
          DEFINED in MAP-MS-DataTypes       :    934

       camelCapabilityHandling................identifier of [0] CamelCapabilityHandling
          DEFINED in MAP-MS-DataTypes       :    687
```

```
CamelCapabilityHandling.................type reference INTEGER
```

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          DEFINED in MAP-MS-DataTypes       :    775
             USED in MAP-MS-DataTypes       :     56   687
             USED in MAP-CH-DataTypes       :     41   232

       camelCapabilityHandling.................identifier of [0] CamelCapabilityHandling
          DEFINED in MAP-CH-DataTypes       :    232

       camelInfo...............................identifier of [11] CamelInfo
          DEFINED in MAP-CH-DataTypes       :     98

       CamelInfo...............................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    204
             USED in MAP-CH-DataTypes       :     98

       camelRoutingInfo........................identifier of [8] CamelRoutingInfo
          DEFINED in MAP-CH-DataTypes       :    212

       CamelRoutingInfo........................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    214
             USED in MAP-CH-DataTypes       :    212

       camelSubscriptionInfoWithdraw...........identifier of [9] NULL
          DEFINED in MAP-MS-DataTypes       :    630

       camel-invoked...........................identifier of Named Number, 1
          DEFINED in MAP-SS-DataTypes       :    292

       cancellationType........................identifier of CancellationType
          DEFINED in MAP-MS-DataTypes       :    178

       CancellationType........................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    187
             USED in MAP-MS-DataTypes       :    178

       cancelLocation..........................value reference CancelLocation, CHOICE VALUE
          DEFINED in MAP-Protocol           :    156

       CancelLocation..........................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    146
             USED in MAP-Protocol           :     13   156
             USED in MAP-MobileServiceOpera :     16

       cancelLocationArg.......................identifier of CancelLocationArg
          DEFINED in MAP-MobileServiceOpera :    148

       CancelLocationArg.......................type reference  [3] SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    176
             USED in MAP-MobileServiceOpera :     88   148
             USED in MAP-MS-DataTypes       :     18

       cancelLocationRes.......................identifier of CancelLocationRes
          DEFINED in MAP-MobileServiceOpera :    150

       CancelLocationRes.......................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    194
             USED in MAP-MobileServiceOpera :     89   150
             USED in MAP-MS-DataTypes       :     19

       category................................identifier of [2] Category
          DEFINED in MAP-MS-DataTypes       :    361

       Category................................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    378
             USED in MAP-MS-DataTypes       :    361

       ccbsIdle................................identifier of Named Number, 1
          DEFINED in MAP-CH-DataTypes       :    315

       ccbsNotIdle.............................identifier of Named Number, 0
          DEFINED in MAP-CH-DataTypes       :    314

       ccbsNotReachable........................identifier of Named Number, 2
          DEFINED in MAP-CH-DataTypes       :    316

       ccbs-A..................................value reference SS-Code, '01000011'B
          DEFINED in MAP-SS-Code            :     79

       ccbs-B..................................value reference SS-Code, '01000100'B
          DEFINED in MAP-SS-Code            :     81
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ccbs-Busy.............................identifier of [1] NULL
   DEFINED in MAP-ER-DataTypes       :    244
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       ccbs-Call..............................identifier of [15] NULL
          DEFINED in MAP-CH-DataTypes       :    103

       ccbs-Call..............................identifier of [13] NULL
          DEFINED in MAP-CH-DataTypes       :    181

       ccbs-Data..............................identifier of [1] CCBS-Data
          DEFINED in MAP-SS-DataTypes       :    279

       CCBS-Data..............................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    282
             USED in MAP-SS-DataTypes       :    279

       ccbs-Feature...........................identifier of [2] CCBS-Feature
          DEFINED in MAP-CH-DataTypes       :    366

       CCBS-Feature...........................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    192
             USED in MAP-CH-DataTypes       :     52   366
             USED in MAP-SS-DataTypes       :     34   188   283   297

       ccbs-Feature...........................identifier of [0] CCBS-Feature
          DEFINED in MAP-SS-DataTypes       :    283

       ccbs-Feature...........................identifier of [0] CCBS-Feature
          DEFINED in MAP-SS-DataTypes       :    297

       ccbs-FeatureList.......................identifier of [2] CCBS-FeatureList
          DEFINED in MAP-SS-DataTypes       :    185

       CCBS-FeatureList.......................type reference SEQUENCE OF
          DEFINED in MAP-SS-DataTypes       :    187
             USED in MAP-SS-DataTypes       :    185

       ccbs-Index.............................identifier of [0] CCBS-Index
          DEFINED in MAP-SS-DataTypes       :    193

       CCBS-Index.............................type reference INTEGER
          DEFINED in MAP-SS-DataTypes       :    199
             USED in MAP-SS-DataTypes       :    193   302

       ccbs-Index.............................identifier of [1] CCBS-Index
          DEFINED in MAP-SS-DataTypes       :    302

       ccbs-Indicators........................identifier of [11] CCBS-Indicators
          DEFINED in MAP-CH-DataTypes       :    144

       CCBS-Indicators........................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    147
             USED in MAP-CH-DataTypes       :    144

       ccbs-Monitoring........................identifier of [2] ReportingState
          DEFINED in MAP-CH-DataTypes       :    296

       ccbs-Possible..........................identifier of [0] NULL
          DEFINED in MAP-CH-DataTypes       :    148

       ccbs-Possible..........................identifier of [8] NULL
          DEFINED in MAP-CH-DataTypes       :    198

       ccbs-Possible..........................identifier of [0] NULL
          DEFINED in MAP-ER-DataTypes       :    243

       ccbs-SubscriberStatus..................identifier of [0] CCBS-SubscriberStatus
          DEFINED in MAP-CH-DataTypes       :    309

       CCBS-SubscriberStatus..................type reference ENUMERATED
          DEFINED in MAP-CH-DataTypes       :    313
             USED in MAP-CH-DataTypes       :    309   331

       ccbs-SubscriberStatus..................identifier of [0] CCBS-SubscriberStatus
          DEFINED in MAP-CH-DataTypes       :    331

       cd.....................................value reference SS-Code, '00100100'B
          DEFINED in MAP-SS-Code            :     60

       cellIdFixedLength......................identifier of [0] CellIdFixedLength
          DEFINED in MAP-CommonDataTypes    :    289
```

```
CellIdFixedLength.....................type reference OCTET STRING
   DEFINED in MAP-CommonDataTypes    :    292
```

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             USED in MAP-CommonDataTypes    :    289

       cellIdOrLAI............................identifier of [3] CellIdOrLAI
          DEFINED in MAP-MS-DataTypes       :    906

       CellIdOrLAI............................type reference CHOICE
          DEFINED in MAP-CommonDataTypes    :    288
             USED in MAP-MS-DataTypes       :    128   906
             USED in MAP-CommonDataTypes    :     38

       cfb....................................value reference SS-Code, '00101001'B
          DEFINED in MAP-SS-Code            :     54

       cfnrc..................................value reference SS-Code, '00101011'B
          DEFINED in MAP-SS-Code            :     58

       cfnry..................................value reference SS-Code, '00101010'B
          DEFINED in MAP-SS-Code            :     56

       cfu....................................value reference SS-Code, '00100001'B
          DEFINED in MAP-SS-Code            :     50

       channelType............................identifier of [0] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    283

       chargeableECT-Barred...................identifier of Named Number, 10
          DEFINED in MAP-MS-DataTypes       :    412

       checkIMEI..............................value reference CheckIMEI, CHOICE VALUE
          DEFINED in MAP-Protocol           :    178

       CheckIMEI..............................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    267
             USED in MAP-Protocol           :     23   178
             USED in MAP-MobileServiceOpera :     40

       chosenChannel..........................identifier of [4] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    263

       chosenChannel..........................identifier of [1] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    284

       chosenChannel..........................identifier of [0] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    289

       cipheringAlgorithm.....................identifier of CipheringAlgorithm
          DEFINED in MAP-GR-DataTypes       :     53

       CipheringAlgorithm.....................type reference OCTET STRING
          DEFINED in MAP-GR-DataTypes       :     99
             USED in MAP-GR-DataTypes       :     53

       clip...................................value reference SS-Code, '00010001'B
          DEFINED in MAP-SS-Code            :     28

       clir...................................value reference SS-Code, '00010010'B
          DEFINED in MAP-SS-Code            :     30

       cliRestrictionOption...................identifier of [2] CliRestrictionOption
          DEFINED in MAP-SS-DataTypes       :    162

       CliRestrictionOption...................type reference ENUMERATED
          DEFINED in MAP-SS-DataTypes       :    165
             USED in MAP-SS-DataTypes       :     27   162   181

       cliRestrictionOption...................identifier of CliRestrictionOption
          DEFINED in MAP-SS-DataTypes       :    181

       clir-invoked...........................identifier of Named Number, 0
          DEFINED in MAP-SS-DataTypes       :    291

       cnap...................................value reference SS-Code, '00011001'B
          DEFINED in MAP-SS-Code            :     42

       codec-Info.............................identifier of CODEC-Info
          DEFINED in MAP-GR-DataTypes       :     52

       CODEC-Info.............................type reference OCTET STRING
          DEFINED in MAP-GR-DataTypes       :     94
             USED in MAP-GR-DataTypes       :     52
```

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collectedInfo.........................identifier of Named Number, 2
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          DEFINED in MAP-MS-DataTypes       :    711

       colp.................................value reference SS-Code, '00010011'B
          DEFINED in MAP-SS-Code            :     32

       colr.................................value reference SS-Code, '00010100'B
          DEFINED in MAP-SS-Code            :     34

       completeDataListIncluded.............identifier of NULL
          DEFINED in MAP-MS-DataTypes       :    332

       Component............................type reference CHOICE
          DEFINED in TCAPMessages           :    124
             USED in TCAPMessages           :     47   115

       ComponentPortion.....................type reference  [APPLICATION 12] IMPLICIT SEQUENCE OF
          DEFINED in TCAPMessages           :    115
             USED in TCAPMessages           :     59    63    67    72

       components...........................identifier of ComponentPortion
          DEFINED in TCAPMessages           :     59

       components...........................identifier of ComponentPortion
          DEFINED in TCAPMessages           :     63

       components...........................identifier of ComponentPortion
          DEFINED in TCAPMessages           :     67

       components...........................identifier of ComponentPortion
          DEFINED in TCAPMessages           :     72

       ContextId............................type reference INTEGER
          DEFINED in MAP-MS-DataTypes       :    329
             USED in MAP-MS-DataTypes       :    320   641

       contextIdList........................identifier of ContextIdList
          DEFINED in MAP-MS-DataTypes       :    638

       ContextIdList........................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    640
             USED in MAP-MS-DataTypes       :    638

       Continue.............................type reference SEQUENCE
          DEFINED in TCAPMessages           :     69
             USED in TCAPMessages           :     55

       continueCall.........................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    768

       continue-ME..........................identifier of [APPLICATION 5] IMPLICIT Continue
          DEFINED in TCAPMessages           :     55

       controllingMSC.......................identifier of Named Number, 4
          DEFINED in MAP-CommonDataTypes    :    269

       cug..................................value reference SS-Code, '01100001'B
          DEFINED in MAP-SS-Code            :     94

       cugIC-CallBarred.....................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    555

       cugOG-CallBarred.....................identifier of Named Number, 2
          DEFINED in MAP-MS-DataTypes       :    556

       cugSubscriptionFlag..................identifier of [6] NULL
          DEFINED in MAP-CH-DataTypes       :    134

       CUG-CheckInfo........................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :     78
             USED in MAP-CH-DataTypes       :     88   133   194

       cug-CheckInfo........................identifier of [1] CUG-CheckInfo
          DEFINED in MAP-CH-DataTypes       :     88

       cug-CheckInfo........................identifier of [3] CUG-CheckInfo
          DEFINED in MAP-CH-DataTypes       :    133

       cug-CheckInfo........................identifier of [4] CUG-CheckInfo
          DEFINED in MAP-CH-DataTypes       :    194
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CUG-Feature.............................type reference SEQUENCE
   DEFINED in MAP-MS-DataTypes       :    568
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      USED in MAP-MS-DataTypes       :    561

cug-FeatureList.....................identifier of CUG-FeatureList
   DEFINED in MAP-MS-DataTypes       :    533

CUG-FeatureList.....................type reference SEQUENCE OF
   DEFINED in MAP-MS-DataTypes       :    560
      USED in MAP-MS-DataTypes       :    533

cug-Index...........................identifier of CUG-Index
   DEFINED in MAP-MS-DataTypes       :    541

CUG-Index...........................type reference INTEGER
   DEFINED in MAP-MS-DataTypes       :    548
      USED in MAP-MS-DataTypes       :     60   541   570

cug-Info............................identifier of [2] CUG-Info
   DEFINED in MAP-MS-DataTypes       :    434

CUG-Info............................type reference SEQUENCE
   DEFINED in MAP-MS-DataTypes       :    531
      USED in MAP-MS-DataTypes       :    434

cug-Interlock.......................identifier of CUG-Interlock
   DEFINED in MAP-MS-DataTypes       :    542

CUG-Interlock.......................type reference OCTET STRING
   DEFINED in MAP-MS-DataTypes       :    551
      USED in MAP-MS-DataTypes       :     61   542
      USED in MAP-CH-DataTypes       :     43    79

cug-Interlock.......................identifier of CUG-Interlock
   DEFINED in MAP-CH-DataTypes       :     79

cug-OutgoingAccess..................identifier of NULL
   DEFINED in MAP-CH-DataTypes       :     80

cug-Reject..........................value reference CUG-Reject, CHOICE VALUE
   DEFINED in MAP-Protocol           :    332

CUG-Reject..........................type reference ERROR
   DEFINED in MAP-Errors             :    276
      USED in MAP-Protocol           :    126   332
      USED in MAP-CallHandlingOperat :     44    93
      USED in MAP-Errors             :     51

cug-RejectCause.....................identifier of CUG-RejectCause
   DEFINED in MAP-ER-DataTypes       :    103

CUG-RejectCause.....................type reference ENUMERATED
   DEFINED in MAP-ER-DataTypes       :    107
      USED in MAP-ER-DataTypes       :    103

cug-RejectParam.....................identifier of CUG-RejectParam
   DEFINED in MAP-Errors             :    278

CUG-RejectParam.....................type reference SEQUENCE
   DEFINED in MAP-ER-DataTypes       :    102
      USED in MAP-Errors             :    115   278
      USED in MAP-ER-DataTypes       :     16

CUG-Subscription....................type reference SEQUENCE
   DEFINED in MAP-MS-DataTypes       :    540
      USED in MAP-MS-DataTypes       :    538

cug-SubscriptionList................identifier of CUG-SubscriptionList
   DEFINED in MAP-MS-DataTypes       :    532

CUG-SubscriptionList................type reference SEQUENCE OF
   DEFINED in MAP-MS-DataTypes       :    537
      USED in MAP-MS-DataTypes       :    532

currentPassword.....................identifier of Password
   DEFINED in MAP-SupplementaryServi :    238

cw..................................value reference SS-Code, '01000001'B
   DEFINED in MAP-SS-Code            :     75

dataCDA-1200bps.....................value reference BearerServiceCode, '00010010'B
   DEFINED in MAP-BS-Code            :     53
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dataCDA-1200-75bps.....................value reference BearerServiceCode, '00010011'B
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          DEFINED in MAP-BS-Code            :     54

       dataCDA-2400bps.......................value reference BearerServiceCode, '00010100'B
          DEFINED in MAP-BS-Code            :     55

       dataCDA-300bps........................value reference BearerServiceCode, '00010001'B
          DEFINED in MAP-BS-Code            :     52

       dataCDA-4800bps.......................value reference BearerServiceCode, '00010101'B
          DEFINED in MAP-BS-Code            :     56

       dataCDA-9600bps.......................value reference BearerServiceCode, '00010110'B
          DEFINED in MAP-BS-Code            :     57

       dataCDS-1200bps.......................value reference BearerServiceCode, '00011010'B
          DEFINED in MAP-BS-Code            :     61

       dataCDS-2400bps.......................value reference BearerServiceCode, '00011100'B
          DEFINED in MAP-BS-Code            :     62

       dataCDS-4800bps.......................value reference BearerServiceCode, '00011101'B
          DEFINED in MAP-BS-Code            :     63

       dataCDS-9600bps.......................value reference BearerServiceCode, '00011110'B
          DEFINED in MAP-BS-Code            :     64

       dataMissing...........................value reference DataMissing, CHOICE VALUE
          DEFINED in MAP-Protocol           :    282

       DataMissing...........................type reference ERROR
          DEFINED in MAP-Errors             :    139
             USED in MAP-Protocol           :    102   282
             USED in MAP-MobileServiceOpera :     70   141   153   163   173   197   210   223   247
                                            :    261   274   286   297   316   330   344   358
             USED in MAP-OperationAndMainte :     24    58    72    83
             USED in MAP-CallHandlingOperat :     29    81   103   127   139   153   167   176
             USED in MAP-SupplementaryServi :     34    95   112   129   149   167   182   195   209
                                            :    224   247   258   275
             USED in MAP-ShortMessageServic :     28    74   102   119   130   144
             USED in MAP-Errors             :     15

       dataMissingParam......................identifier of DataMissingParam
          DEFINED in MAP-Errors             :    141

       DataMissingParam......................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    166
             USED in MAP-Errors             :     95   141
             USED in MAP-ER-DataTypes       :     21

       dataPDS-2400bps.......................value reference BearerServiceCode, '00101100'B
          DEFINED in MAP-BS-Code            :     77

       dataPDS-4800bps.......................value reference BearerServiceCode, '00101101'B
          DEFINED in MAP-BS-Code            :     78

       dataPDS-9600bps.......................value reference BearerServiceCode, '00101110'B
          DEFINED in MAP-BS-Code            :     79

       deactivateSS..........................value reference DeactivateSS, CHOICE VALUE
          DEFINED in MAP-Protocol           :    219

       DeactivateSS..........................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    141
             USED in MAP-Protocol           :     65   219
             USED in MAP-SupplementaryServi :     16

       deactivateTraceMode...................value reference DeactivateTraceMode, CHOICE VALUE
          DEFINED in MAP-Protocol           :    198

       DeactivateTraceMode...................type reference OPERATION
          DEFINED in MAP-OperationAndMainte :     64
             USED in MAP-Protocol           :     42   198
             USED in MAP-OperationAndMainte :     14

       deactivateTraceModeArg................identifier of DeactivateTraceModeArg
          DEFINED in MAP-OperationAndMainte :     66

       DeactivateTraceModeArg................type reference SEQUENCE
          DEFINED in MAP-OM-DataTypes       :     54
             USED in MAP-OperationAndMainte :     36    66
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            USED in MAP-OM-DataTypes       :     16
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       deactivateTraceModeRes.................identifier of DeactivateTraceModeRes
          DEFINED in MAP-OperationAndMainte :     68

       DeactivateTraceModeRes.................type reference SEQUENCE
          DEFINED in MAP-OM-DataTypes       :     60
             USED in MAP-OperationAndMainte :     37    68
             USED in MAP-OM-DataTypes       :     17

       defaultCallHandling....................identifier of [1] DefaultCallHandling
          DEFINED in MAP-MS-DataTypes       :    703

       DefaultCallHandling....................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    767
             USED in MAP-MS-DataTypes       :     55   703
             USED in MAP-CH-DataTypes       :     39   246

       defaultCallHandling....................identifier of [1] DefaultCallHandling
          DEFINED in MAP-CH-DataTypes       :    246

       defaultPriority........................identifier of EMLPP-Priority
          DEFINED in MAP-CommonDataTypes    :    322

       defaultPriority........................identifier of [7] EMLPP-Priority
          DEFINED in MAP-SS-DataTypes       :     76

       defaultPriority........................identifier of EMLPP-Priority
          DEFINED in MAP-SS-DataTypes       :    158

       defaultPriority........................identifier of [1] EMLPP-Priority
          DEFINED in MAP-SS-DataTypes       :    184

       deleteSubscriberData...................value reference DeleteSubscriberData, CHOICE VALUE
          DEFINED in MAP-Protocol           :    184

       DeleteSubscriberData...................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    290
             USED in MAP-Protocol           :     25   184
             USED in MAP-MobileServiceOpera :     44

       deleteSubscriberDataArg................identifier of DeleteSubscriberDataArg
          DEFINED in MAP-MobileServiceOpera :    292

       DeleteSubscriberDataArg................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    620
             USED in MAP-MobileServiceOpera :    103   292
             USED in MAP-MS-DataTypes       :     44

       deleteSubscriberDataRes................identifier of DeleteSubscriberDataRes
          DEFINED in MAP-MobileServiceOpera :    294

       DeleteSubscriberDataRes................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    648
             USED in MAP-MobileServiceOpera :    104   294
             USED in MAP-MS-DataTypes       :     45

       deliveryOutcomeIndicator...............identifier of [3] NULL
          DEFINED in MAP-SM-DataTypes       :    153

       derivable..............................identifier of InvokeIdType
          DEFINED in TCAPMessages           :    167

       destinationNumberCriteria..............identifier of [0] DestinationNumberCriteria
          DEFINED in MAP-MS-DataTypes       :    726

       DestinationNumberCriteria..............type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    731
             USED in MAP-MS-DataTypes       :    726

       destinationNumberLengthList............identifier of [2] DestinationNumberLengthList
          DEFINED in MAP-MS-DataTypes       :    734

       DestinationNumberLengthList............type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    744
             USED in MAP-MS-DataTypes       :    734

       destinationNumberList..................identifier of [1] DestinationNumberList
          DEFINED in MAP-MS-DataTypes       :    733

       DestinationNumberList..................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    739
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            USED in MAP-MS-DataTypes       :    733
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       DestTransactionID.....................type reference  [APPLICATION 9] IMPLICIT
TransactionID
          DEFINED in TCAPMessages           :     98
             USED in TCAPMessages           :     65    70    74

       diagnosticInfo.......................identifier of SignalInfo
          DEFINED in MAP-ER-DataTypes       :    136

       dialoguePortion......................identifier of DialoguePortion
          DEFINED in TCAPMessages           :     58

       dialoguePortion......................identifier of DialoguePortion
          DEFINED in TCAPMessages           :     62

       dialoguePortion......................identifier of DialoguePortion
          DEFINED in TCAPMessages           :     66

       dialoguePortion......................identifier of DialoguePortion
          DEFINED in TCAPMessages           :     71

       dialoguePortion......................identifier of DialoguePortion
          DEFINED in TCAPMessages           :     77

       DialoguePortion......................type reference  [APPLICATION 11] EXTERNAL
          DEFINED in TCAPMessages           :     82
             USED in TCAPMessages           :     58    62    66    71    77

       doublyChargeableECT-Barred.............identifier of Named Number, 13
          DEFINED in MAP-MS-DataTypes       :    415

       dtid.................................identifier of DestTransactionID
          DEFINED in TCAPMessages           :     65

       dtid.................................identifier of DestTransactionID
          DEFINED in TCAPMessages           :     70

       dtid.................................identifier of DestTransactionID
          DEFINED in TCAPMessages           :     74

       duplicateInvokeID....................identifier of Named Number, 0
          DEFINED in TCAPMessages           :    183

       ect..................................value reference SS-Code, '00110001'B
          DEFINED in MAP-SS-Code            :     66

       eir..................................identifier of Named Number, 6
          DEFINED in MAP-CommonDataTypes    :    271

       emergencyCalls.......................value reference TeleserviceCode, '00010010'B
          DEFINED in MAP-TS-Code            :     42

       emlpp................................value reference SS-Code, '10100001'B
          DEFINED in MAP-SS-Code            :    151

       emlpp-Info...........................identifier of [4] EMLPP-Info
          DEFINED in MAP-MS-DataTypes       :    436

       EMLPP-Info...........................type reference SEQUENCE
          DEFINED in MAP-CommonDataTypes    :    320
             USED in MAP-MS-DataTypes       :    131   436
             USED in MAP-CommonDataTypes    :     43

       EMLPP-Priority.......................type reference INTEGER
          DEFINED in MAP-CommonDataTypes    :    326
             USED in MAP-CommonDataTypes    :     44   321   322   332   333   334   335   336   337
                                                338
             USED in MAP-SS-DataTypes       :     50    76   158   183   184
             USED in MAP-GR-DataTypes       :     25    56

       enabling.............................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    764

       End..................................type reference SEQUENCE
          DEFINED in TCAPMessages           :     65
             USED in TCAPMessages           :     54

       end-ME...............................identifier of [APPLICATION 4] IMPLICIT End
          DEFINED in TCAPMessages           :     54

       enterNewPW...........................identifier of Named Number, 1
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          DEFINED in MAP-SS-DataTypes       :    236

       enterNewPW-Again.....................identifier of Named Number, 2
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          DEFINED in MAP-SS-DataTypes       :    237

       enterPW.............................identifier of Named Number, 0
          DEFINED in MAP-SS-DataTypes       :    235

       equipmentNotSM-Equipped.............identifier of Named Number, 2
          DEFINED in MAP-ER-DataTypes       :    128

       equipmentProtocolError..............identifier of Named Number, 1
          DEFINED in MAP-ER-DataTypes       :    127

       equipmentStatus.....................identifier of EquipmentStatus
          DEFINED in MAP-MobileServiceOpera :    271

       EquipmentStatus.....................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    283
             USED in MAP-MobileServiceOpera :    100   271
             USED in MAP-MS-DataTypes       :     38

       eraseCC-Entry.......................value reference EraseCC-Entry, CHOICE VALUE
          DEFINED in MAP-Protocol           :    228

       EraseCC-Entry.......................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    268
             USED in MAP-Protocol           :     74   228
             USED in MAP-SupplementaryServi :     25

       eraseCC-EntryArg....................identifier of EraseCC-EntryArg
          DEFINED in MAP-SupplementaryServi :    270

       EraseCC-EntryArg....................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    300
             USED in MAP-SupplementaryServi :     72   270
             USED in MAP-SS-DataTypes       :     37

       eraseCC-EntryRes....................identifier of EraseCC-EntryRes
          DEFINED in MAP-SupplementaryServi :    272

       EraseCC-EntryRes....................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    305
             USED in MAP-SupplementaryServi :     73   272
             USED in MAP-SS-DataTypes       :     38

       eraseSS.............................value reference EraseSS, CHOICE VALUE
          DEFINED in MAP-Protocol           :    217

       EraseSS.............................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    104
             USED in MAP-Protocol           :     63   217
             USED in MAP-SupplementaryServi :     14

       errorCode...........................identifier of ERROR
          DEFINED in TCAPMessages           :    158
             USED in TCAPMessages           :    159

       ets-300102-1........................identifier of Named Number, 4
          DEFINED in MAP-CommonDataTypes    :    192

       eventReportData.....................identifier of [1] EventReportData
          DEFINED in MAP-CH-DataTypes       :    325

       EventReportData.....................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    330
             USED in MAP-CH-DataTypes       :    325

       extendedRoutingInfo.................identifier of ExtendedRoutingInfo
          DEFINED in MAP-CH-DataTypes       :    132

       ExtendedRoutingInfo.................type reference CHOICE
          DEFINED in MAP-CH-DataTypes       :    210
             USED in MAP-CH-DataTypes       :    132

       extensibleCallBarredParam...........identifier of ExtensibleCallBarredParam
          DEFINED in MAP-ER-DataTypes       :     88

       ExtensibleCallBarredParam...........type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :     96
             USED in MAP-ER-DataTypes       :     88

       extensibleSystemFailureParam........identifier of ExtensibleSystemFailureParam
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          DEFINED in MAP-ER-DataTypes       :    157
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       ExtensibleSystemFailureParam............type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    161
             USED in MAP-ER-DataTypes       :    157

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    160

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    166

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    173

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    179

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    195

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    202

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    208

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    244

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    252

       extensionContainer......................identifier of [14] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    294

       extensionContainer......................identifier of [21] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    326

       extensionContainer......................identifier of [2] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    337

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    398

       extensionContainer......................identifier of [0] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    442

       extensionContainer......................identifier of [9] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    458

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    519

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    528

       extensionContainer......................identifier of [0] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    534

       extensionContainer......................identifier of [0] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    545

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    572

       extensionContainer......................identifier of [5] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    592

       extensionContainer......................identifier of [7] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    611

       extensionContainer......................identifier of [6] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    631

       extensionContainer......................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    651

       extensionContainer......................identifier of [1] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    656

       extensionContainer......................identifier of ExtensionContainer
```

```
          DEFINED in MAP-MS-DataTypes       :    664
```

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       extensionContainer.....................identifier of [0] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    670

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    685

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    704

       extensionContainer.....................identifier of [3] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    791

       extensionContainer.....................identifier of [3] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    798

       extensionContainer.....................identifier of [3] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    807

       extensionContainer.....................identifier of [1] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    811

       extensionContainer.....................identifier of [3] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    820

       extensionContainer.....................identifier of [0] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    824

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    838

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    845

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    862

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    868

       extensionContainer.....................identifier of [3] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    881

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    886

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    892

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    898

       extensionContainer.....................identifier of [4] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    907

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    950

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-MS-DataTypes       :    955

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-CommonDataTypes    :    173

       extensionContainer.....................identifier of [1] ExtensionContainer
          DEFINED in MAP-CommonDataTypes    :    276

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-CommonDataTypes    :    323

       extensionContainer.....................identifier of [4] ExtensionContainer
          DEFINED in MAP-OM-DataTypes       :     41

       extensionContainer.....................identifier of [0] ExtensionContainer
          DEFINED in MAP-OM-DataTypes       :     51

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-OM-DataTypes       :     57

       extensionContainer.....................identifier of [0] ExtensionContainer
          DEFINED in MAP-OM-DataTypes       :     61
```

```
extensionContainer.....................identifier of ExtensionContainer
```

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          DEFINED in MAP-CH-DataTypes       :     81

       extensionContainer.....................identifier of [13] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    100

       extensionContainer.....................identifier of [0] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    140

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    150

       extensionContainer.....................identifier of [7] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    164

       extensionContainer.....................identifier of [11] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    178

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    186

       extensionContainer.....................identifier of [7] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    196

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    201

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    207

       extensionContainer.....................identifier of [1] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    217

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    223

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    230

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    247

       extensionContainer.....................identifier of [7] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    266

       extensionContainer.....................identifier of [1] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    279

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    285

       extensionContainer.....................identifier of [1] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    290

       extensionContainer.....................identifier of [3] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    297

       extensionContainer.....................identifier of [1] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    310

       extensionContainer.....................identifier of [3] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    327

       extensionContainer.....................identifier of [1] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    332

       extensionContainer.....................identifier of [2] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    338

       extensionContainer.....................identifier of [0] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    360

       extensionContainer.....................identifier of [6] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    370

       extensionContainer.....................identifier of [1] ExtensionContainer
          DEFINED in MAP-CH-DataTypes       :    375

       extensionContainer.....................identifier of [4] ExtensionContainer
          DEFINED in MAP-SS-DataTypes       :    264
```

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extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SS-DataTypes       :    268
```

```
extensionContainer.....................identifier of [6] ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :     56

extensionContainer.....................identifier of [4] ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :     82

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :     88

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    110

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    115

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    123

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    128

extensionContainer.....................identifier of [1] ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    148

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    169

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    181

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    198

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-SM-DataTypes       :    202

extensionContainer.....................identifier of [4] ExtensionContainer
   DEFINED in MAP-GR-DataTypes       :     58

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-GR-DataTypes       :     63

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-GR-DataTypes       :     68

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-GR-DataTypes       :     72

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-GR-DataTypes       :     82

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-GR-DataTypes       :     89

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-ER-DataTypes       :     78

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-ER-DataTypes       :     98

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-ER-DataTypes       :    104

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-ER-DataTypes       :    137

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-ER-DataTypes       :    144

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-ER-DataTypes       :    163

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-ER-DataTypes       :    167

extensionContainer.....................identifier of ExtensionContainer
   DEFINED in MAP-ER-DataTypes       :    171

extensionContainer.....................identifier of ExtensionContainer
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          DEFINED in MAP-ER-DataTypes       :    175
```

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       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    179

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    183

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    196

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    200

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    204

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    208

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    212

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    216

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    220

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    224

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    228

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    241

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    247

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    251

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    255

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    259

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    263

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    270

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    274

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    278

       extensionContainer.....................identifier of ExtensionContainer
          DEFINED in MAP-ER-DataTypes       :    282

       ExtensionContainer.....................type reference SEQUENCE
          DEFINED in MAP-ExtensionDataTypes :     32
             USED in MAP-MS-DataTypes       :    138   160   166   173   179   195   202   208   244
                                                 252   294   326   337   398   442   458   519   528
                                                 534   545   572   592   611   631   651   656   664
                                                 670   685   704   791   798   807   811   820   824
                                                 838   845   862   868   881   886   892   898   907
                                                 950   955
             USED in MAP-CommonDataTypes    :     60   173   276   323
             USED in MAP-OM-DataTypes       :     27    41    51    57    61
             USED in MAP-CH-DataTypes       :     71    81   100   140   150   164   178   186   196
                                                 201   207   217   223   230   247   266   279   285
                                                 290   297   310   327   332   338   360   370   375
             USED in MAP-SS-DataTypes       :     57   264   268
             USED in MAP-SM-DataTypes       :     45    56    82    88   110   115   123   128   148
                                                 169   181   198   202
             USED in MAP-GR-DataTypes       :     42    58    63    68    72    82    89
```

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USED in MAP-ER-DataTypes       :     70    78    98   104   137   144   163   167   171
                                    175   179   183   196   200   204   208   212   216
```

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                                            220   224   228   241   247   251   255   259   263
                                            270   274   278   282
            USED in MAP-ExtensionDataTypes :     16

       ExtensionSet.............information object set reference MAP-EXTENSION, Information Object
Set
          DEFINED in MAP-ExtensionDataTypes :     48
             USED in MAP-ExtensionDataTypes :     42    44

       ExternalSignalInfo.....................type reference SEQUENCE
          DEFINED in MAP-CommonDataTypes    :    168
             USED in MAP-MobileServiceOpera :    123   229   234   238   244
             USED in MAP-MS-DataTypes       :    123   260   265   271
             USED in MAP-CommonDataTypes    :     20
             USED in MAP-CH-DataTypes       :     59    97   172   173   259   260   263   264   265
                                            283   284   289   365
             USED in MAP-SS-DataTypes       :     51   286   287

       extId..................................identifier of InformationObjectClassFieldType
          DEFINED in MAP-ExtensionDataTypes :     41

       extType................................identifier of InformationObjectClassFieldType
          DEFINED in MAP-ExtensionDataTypes :     43

       Ext-BasicServiceCode...................type reference CHOICE
          DEFINED in MAP-CommonDataTypes    :    316
             USED in MAP-MS-DataTypes       :    129   449   526   564   569   644   748
             USED in MAP-CommonDataTypes    :     42
             USED in MAP-CH-DataTypes       :     62    96   137   191

       Ext-BasicServiceGroupList..............type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    563
             USED in MAP-MS-DataTypes       :    544   591

       ext-BearerService......................identifier of [2] Ext-BearerServiceCode
          DEFINED in MAP-CommonDataTypes    :    317

       Ext-BearerServiceCode..................type reference OCTET STRING
          DEFINED in MAP-BS-Code            :     25
             USED in MAP-MS-DataTypes       :    109   386
             USED in MAP-CommonDataTypes    :     55   317

       Ext-CallBarFeatureList.................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    522
             USED in MAP-MS-DataTypes       :    518

       Ext-CallBarInfo........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    516
             USED in MAP-MS-DataTypes       :    433

       Ext-CallBarringFeature.................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    525
             USED in MAP-MS-DataTypes       :    523

       Ext-ForwFeature........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    448
             USED in MAP-MS-DataTypes       :    446

       Ext-ForwFeatureList....................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    445
             USED in MAP-MS-DataTypes       :    441

       Ext-ForwInfo...........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    439
             USED in MAP-MS-DataTypes       :    432

       Ext-ForwOptions........................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    482
             USED in MAP-MS-DataTypes       :    456

       Ext-NoRepCondTime......................type reference INTEGER
          DEFINED in MAP-MS-DataTypes       :    509
             USED in MAP-MS-DataTypes       :    457

       Ext-SS-Data............................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    587
             USED in MAP-MS-DataTypes       :    435

       Ext-SS-Info............................type reference CHOICE
          DEFINED in MAP-MS-DataTypes       :    431
```

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            USED in MAP-MS-DataTypes       :    429

       Ext-SS-InfoList.....................type reference SEQUENCE OF
```

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          DEFINED in MAP-MS-DataTypes       :    428
             USED in MAP-MS-DataTypes       :    369

       Ext-SS-Status.........................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    461
             USED in MAP-MS-DataTypes       :    450   527   589

       ext-Teleservice.......................identifier of [3] Ext-TeleserviceCode
          DEFINED in MAP-CommonDataTypes    :    318

       Ext-TeleserviceCode...................type reference OCTET STRING
          DEFINED in MAP-TS-Code            :     20
             USED in MAP-MS-DataTypes       :    114   391
             USED in MAP-CommonDataTypes    :     49   318
             USED in MAP-GR-DataTypes       :     31    50

       facilityNotSupParam...................identifier of FacilityNotSupParam
          DEFINED in MAP-Errors             :    153

       FacilityNotSupParam...................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    174
             USED in MAP-Errors             :     97   153
             USED in MAP-ER-DataTypes       :     23

       facilityNotSupported..................value reference FacilityNotSupported, CHOICE VALUE
          DEFINED in MAP-Protocol           :    284

       FacilityNotSupported..................type reference ERROR
          DEFINED in MAP-Errors             :    151
             USED in MAP-Protocol           :    104   284
             USED in MAP-OperationAndMainte :     26    60    74
             USED in MAP-CallHandlingOperat :     31    83   105   155
             USED in MAP-SupplementaryServi :     55   266
             USED in MAP-ShortMessageServic :     30    76    91   104   146
             USED in MAP-Errors             :     17

       facsimileGroup3AndAlterSpeech.........value reference TeleserviceCode, '01100001'B
          DEFINED in MAP-TS-Code            :     49

       facsimileGroup4.......................value reference TeleserviceCode, '01100011'B
          DEFINED in MAP-TS-Code            :     51

       failure...............................identifier of Named Number, 1
          DEFINED in MAP-CH-DataTypes       :    351

       failureReport.........................value reference FailureReport, CHOICE VALUE
          DEFINED in MAP-Protocol           :    272

       FailureReport.........................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    336
             USED in MAP-Protocol           :     32   272
             USED in MAP-MobileServiceOpera :     55

       failureReportArg......................identifier of FailureReportArg
          DEFINED in MAP-MobileServiceOpera :    338

       FailureReportArg......................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    803
             USED in MAP-MobileServiceOpera :    114   338
             USED in MAP-MS-DataTypes       :     86

       failureReportRes......................identifier of FailureReportRes
          DEFINED in MAP-MobileServiceOpera :    340

       FailureReportRes......................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    810
             USED in MAP-MobileServiceOpera :    115   340
             USED in MAP-MS-DataTypes       :     87

       forwardAccessSignalling...............value reference ForwardAccessSignalling, CHOICE VALUE
          DEFINED in MAP-Protocol           :    166

       ForwardAccessSignalling...............type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    236
             USED in MAP-Protocol           :     20   166
             USED in MAP-MobileServiceOpera :     33

       forwardCheckSS-Indication.............value reference ForwardCheckSS-Indication, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    190
```

```
ForwardCheckSS-Indication..............type reference OPERATION
   DEFINED in MAP-MobileServiceOpera :    307
```

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             USED in MAP-Protocol          :     27   190
             USED in MAP-MobileServiceOpera :     48

       forwarded..............................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    759

       forwardedToNumber......................identifier of [5] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    451

       forwardedToNumber......................identifier of [5] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    158

       forwardedToNumber......................identifier of [4] AddressString
          DEFINED in MAP-SS-DataTypes       :     72

       forwardedToNumber......................identifier of [5] ISDN-AddressString
          DEFINED in MAP-SS-DataTypes       :     97

       forwardedToSubaddress..................identifier of [8] ISDN-SubaddressString
          DEFINED in MAP-MS-DataTypes       :    455

       forwardedToSubaddress..................identifier of [4] ISDN-SubaddressString
          DEFINED in MAP-CH-DataTypes       :    162

       forwardedToSubaddress..................identifier of [6] ISDN-SubaddressString
          DEFINED in MAP-SS-DataTypes       :     73

       forwardedToSubaddress..................identifier of [8] ISDN-SubaddressString
          DEFINED in MAP-SS-DataTypes       :     98

       forwardGroupCallSignalling.............value reference ForwardGroupCallSignalling, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    259

       ForwardGroupCallSignalling.............type reference OPERATION
          DEFINED in MAP-Group-Call-Operati :     67
             USED in MAP-Protocol           :     94   259
             USED in MAP-Group-Call-Operati :     15

       forwardGroupCallSignallingArg..........identifier of ForwardGroupCallSignallingArg
          DEFINED in MAP-Group-Call-Operati :     69

       ForwardGroupCallSignallingArg..........type reference SEQUENCE
          DEFINED in MAP-GR-DataTypes       :     75
             USED in MAP-Group-Call-Operati :     35    69
             USED in MAP-GR-DataTypes       :     18

       forwarding.............................identifier of Named Number, 1
          DEFINED in MAP-CH-DataTypes       :    110

       forwardingData.........................identifier of ForwardingData
          DEFINED in MAP-CH-DataTypes       :    155

       ForwardingData.........................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    157
             USED in MAP-CH-DataTypes       :    155   192   215

       forwardingData.........................identifier of [2] ForwardingData
          DEFINED in MAP-CH-DataTypes       :    192

       forwardingData.........................identifier of ForwardingData
          DEFINED in MAP-CH-DataTypes       :    215

       forwardingFailed.......................value reference ForwardingFailed, CHOICE VALUE
          DEFINED in MAP-Protocol           :    329

       ForwardingFailed.......................type reference ERROR
          DEFINED in MAP-Errors             :    271
             USED in MAP-Protocol           :    125   329
             USED in MAP-CallHandlingOperat :     43   116
             USED in MAP-Errors             :     50

       forwardingFailedParam..................identifier of ForwardingFailedParam
          DEFINED in MAP-Errors             :    273

       ForwardingFailedParam..................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    254
             USED in MAP-Errors             :    114   273
             USED in MAP-ER-DataTypes       :     38
```

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ForwardingFeature.....................type reference SEQUENCE
   DEFINED in MAP-SS-DataTypes       :     94
      USED in MAP-SS-DataTypes       :     92
```

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       forwardingFeatureList..................identifier of Ext-ForwFeatureList
          DEFINED in MAP-MS-DataTypes       :    441

       forwardingFeatureList..................identifier of ForwardingFeatureList
          DEFINED in MAP-SS-DataTypes       :     87

       ForwardingFeatureList..................type reference SEQUENCE OF
          DEFINED in MAP-SS-DataTypes       :     90
             USED in MAP-SS-DataTypes       :     87   204

       forwardingFeatureList..................identifier of [3] ForwardingFeatureList
          DEFINED in MAP-SS-DataTypes       :    204

       forwardingInfo.........................identifier of [0] Ext-ForwInfo
          DEFINED in MAP-MS-DataTypes       :    432

       forwardingInfo.........................identifier of [0] ForwardingInfo
          DEFINED in MAP-SS-DataTypes       :     81

       ForwardingInfo.........................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :     85
             USED in MAP-SS-DataTypes       :     81

       forwardingInterrogationRequired.........identifier of [4] NULL
          DEFINED in MAP-CH-DataTypes       :    138

       forwardingOptions......................identifier of [6] Ext-ForwOptions
          DEFINED in MAP-MS-DataTypes       :    456

       forwardingOptions......................identifier of [6] ForwardingOptions
          DEFINED in MAP-CH-DataTypes       :    163

       forwardingOptions......................identifier of [6] ForwardingOptions
          DEFINED in MAP-SS-DataTypes       :     99

       ForwardingOptions......................type reference OCTET STRING
          DEFINED in MAP-SS-DataTypes       :    118
             USED in MAP-CH-DataTypes       :     50   163
             USED in MAP-SS-DataTypes       :     29    99

       forwardingReason.......................identifier of [8] ForwardingReason
          DEFINED in MAP-CH-DataTypes       :     95

       ForwardingReason.......................type reference ENUMERATED
          DEFINED in MAP-CH-DataTypes       :    116
             USED in MAP-CH-DataTypes       :     95

       forwardingViolation....................value reference ForwardingViolation, CHOICE VALUE
          DEFINED in MAP-Protocol           :    331

       ForwardingViolation....................type reference ERROR
          DEFINED in MAP-Errors             :    266
             USED in MAP-Protocol           :    124   331
             USED in MAP-CallHandlingOperat :     42    94
             USED in MAP-Errors             :     49

       forwardingViolationParam...............identifier of ForwardingViolationParam
          DEFINED in MAP-Errors             :    268

       ForwardingViolationParam...............type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    250
             USED in MAP-Errors             :    113   268
             USED in MAP-ER-DataTypes       :     37

       freezeP-TMSI...........................identifier of [1] NULL
          DEFINED in MAP-MS-DataTypes       :    207

       freezeTMSI.............................identifier of [0] NULL
          DEFINED in MAP-MS-DataTypes       :    206

       generalProblem.........................identifier of [0] IMPLICIT GeneralProblem
          DEFINED in TCAPMessages           :    170

       GeneralProblem.........................type reference INTEGER
          DEFINED in TCAPMessages           :    179
             USED in TCAPMessages           :    170

       general-dataCDA........................value reference BearerServiceCode, '00010111'B
          DEFINED in MAP-BS-Code            :     58
```

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general-dataCDS.....................value reference BearerServiceCode, '00011111'B
```

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          DEFINED in MAP-BS-Code            :     65

       general-dataPDS.......................value reference BearerServiceCode, '00101111'B
          DEFINED in MAP-BS-Code            :     80

       general-padAccessCA...................value reference BearerServiceCode, '00100111'B
          DEFINED in MAP-BS-Code            :     74

       GenericServiceInfo....................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    179
             USED in MAP-SS-DataTypes       :    205

       genericServiceInfo....................identifier of [4] GenericServiceInfo
          DEFINED in MAP-SS-DataTypes       :    205

       geographicalInformation...............identifier of [0] GeographicalInformation
          DEFINED in MAP-MS-DataTypes       :    903

       GeographicalInformation...............type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    919
             USED in MAP-MS-DataTypes       :    903

       getPassword...........................value reference GetPassword, CHOICE VALUE
          DEFINED in MAP-Protocol           :    226

       GetPassword...........................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    234
             USED in MAP-Protocol           :     71   226
             USED in MAP-SupplementaryServi :     22   232

       ggsn-Address..........................identifier of [1] GSN-Address
          DEFINED in MAP-MS-DataTypes       :    789

       ggsn-Address..........................identifier of [1] GSN-Address
          DEFINED in MAP-MS-DataTypes       :    796

       ggsn-Address..........................identifier of [2] GSN-Address
          DEFINED in MAP-MS-DataTypes       :    806

       ggsn-Address..........................identifier of [0] GSN-Address
          DEFINED in MAP-MS-DataTypes       :    811

       ggsn-Address..........................identifier of [2] GSN-Address
          DEFINED in MAP-MS-DataTypes       :    819

       ggsn-Number...........................identifier of [2] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    790

       ggsn-Number...........................identifier of [1] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    805

       GlobalCellId..........................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :    255
             USED in MAP-MS-DataTypes       :    127   258   269
             USED in MAP-CommonDataTypes    :     32

       gmscCamelSubscriptionInfo.............identifier of [0] GmscCamelSubscriptionInfo
          DEFINED in MAP-CH-DataTypes       :    216

       GmscCamelSubscriptionInfo.............type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    220
             USED in MAP-CH-DataTypes       :    216

       gmsc-Address..........................identifier of [6] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :     93

       gmsc-Address..........................identifier of [8] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    175

       gprsConnectionSuspended...............identifier of NULL
          DEFINED in MAP-ER-DataTypes       :    265

       GPRSDataList..........................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    314
             USED in MAP-MS-DataTypes       :    336

       gprsDataList..........................identifier of [1] GPRSDataList
          DEFINED in MAP-MS-DataTypes       :    336

       gprsNodeIndicator.....................identifier of [5] NULL
```

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          DEFINED in MAP-SM-DataTypes       :     90
```

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       gprsSubscriptionData...................identifier of [16] GPRSSubscriptionData
          DEFINED in MAP-MS-DataTypes       :    298

       GPRSSubscriptionData...................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    331
             USED in MAP-MS-DataTypes       :    298

       gprsSubscriptionDataWithdraw...........identifier of [10] GPRSSubscriptionDataWithdraw
          DEFINED in MAP-MS-DataTypes       :    633

       GPRSSubscriptionDataWithdraw...........type reference CHOICE
          DEFINED in MAP-MS-DataTypes       :    636
             USED in MAP-MS-DataTypes       :    633

       gprsSubscriptionUnknown................identifier of Named Number, 1
          DEFINED in MAP-ER-DataTypes       :    189

       gprsSupportIndicator...................identifier of [7] NULL
          DEFINED in MAP-SM-DataTypes       :     58

       gprsSupportIndicator...................identifier of [2] NULL
          DEFINED in MAP-SM-DataTypes       :    150

       greyListed.............................identifier of Named Number, 2
          DEFINED in MAP-MS-DataTypes       :    286

       groupCallNumber........................identifier of ISDN-AddressString
          DEFINED in MAP-GR-DataTypes       :     62

       groupId................................identifier of GroupId
          DEFINED in MAP-MS-DataTypes       :    861

       groupid................................identifier of GroupId
          DEFINED in MAP-MS-DataTypes       :    866

       GroupId................................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    871
             USED in MAP-MS-DataTypes       :    861   866

       groupKey...............................identifier of [1] Kc
          DEFINED in MAP-GR-DataTypes       :     55

       groupKeyNumber.........................identifier of [0] GroupKeyNumber
          DEFINED in MAP-GR-DataTypes       :     54

       GroupKeyNumber.........................type reference INTEGER
          DEFINED in MAP-GR-DataTypes       :     92
             USED in MAP-GR-DataTypes       :     54

       gsmSCF-Address.........................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    669

       gsmSCF-Address.........................identifier of [0] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    702

       gsmSCF-Address.........................identifier of [3] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    949

       gsmSCF-Address.........................identifier of [0] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    245

       gsm-0408...............................identifier of Named Number, 1
          DEFINED in MAP-CommonDataTypes    :    188

       gsm-0806...............................identifier of Named Number, 2
          DEFINED in MAP-CommonDataTypes    :    189

       gsm-BearerCapability...................identifier of [5] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    172

       gsm-BearerCapability...................identifier of [0] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    259

       gsm-BSSMAP.............................identifier of Named Number, 3
          DEFINED in MAP-CommonDataTypes    :    190

       GSN-Address............................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    247
             USED in MAP-MS-DataTypes       :    243   789   795   796   806   811   818   819
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guidanceInfo.........................identifier of GuidanceInfo
   DEFINED in MAP-SupplementaryServi :    236
```

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       GuidanceInfo.........................type reference ENUMERATED
          DEFINED in MAP-SS-DataTypes       :    234
             USED in MAP-SupplementaryServi :     67   236
             USED in MAP-SS-DataTypes       :     23

       handoverNumber.......................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    264

       highLayerCompatibility..............identifier of [6] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    265

       hlr..................................identifier of Named Number, 1
          DEFINED in MAP-CommonDataTypes    :    266

       HLR-Id...............................type reference IMSI
          DEFINED in MAP-CommonDataTypes    :    244
             USED in MAP-CommonDataTypes    :    249

       hlr-List.............................identifier of HLR-List
          DEFINED in MAP-MS-DataTypes       :    832

       HLR-List.............................type reference SEQUENCE OF
          DEFINED in MAP-CommonDataTypes    :    248
             USED in MAP-MS-DataTypes       :    125   832
             USED in MAP-CommonDataTypes    :     30

       hlr-Number...........................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    171

       hlr-Number...........................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    251

       hlr-Number...........................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    831

       hlr-Number...........................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    843

       hold.................................value reference SS-Code, '01000010'B
          DEFINED in MAP-SS-Code            :     77

       ho-NumberNotRequired.................identifier of NULL
          DEFINED in MAP-MS-DataTypes       :    259

       identity.............................identifier of Identity
          DEFINED in MAP-MS-DataTypes       :    177

       Identity.............................type reference CHOICE
          DEFINED in MAP-MS-DataTypes       :    182
             USED in MAP-MS-DataTypes       :    177

       illegalEquipment.....................value reference IllegalEquipment, CHOICE VALUE
          DEFINED in MAP-Protocol           :    302

       IllegalEquipment.....................type reference ERROR
          DEFINED in MAP-Errors             :    203
             USED in MAP-Protocol           :    112   302
             USED in MAP-SupplementaryServi :     52   199   213
             USED in MAP-ShortMessageServic :     34   107
             USED in MAP-Errors             :     31

       illegalEquipmentParam................identifier of IllegalEquipmentParam
          DEFINED in MAP-Errors             :    205

       IllegalEquipmentParam................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    207
             USED in MAP-Errors             :    103   205
             USED in MAP-ER-DataTypes       :     29

       illegalSS-Operation..................value reference IllegalSS-Operation, CHOICE VALUE
          DEFINED in MAP-Protocol           :    345

       IllegalSS-Operation..................type reference ERROR
          DEFINED in MAP-Errors             :    296
             USED in MAP-Protocol           :    128   345
             USED in MAP-SupplementaryServi :     40   100   117   134   154   172   261   278
             USED in MAP-Errors             :     57

       illegalSubscriber....................value reference IllegalSubscriber, CHOICE VALUE
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          DEFINED in MAP-Protocol          :    301
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       IllegalSubscriber.....................type reference ERROR
          DEFINED in MAP-Errors             :    197
             USED in MAP-Protocol           :    111   301
             USED in MAP-SupplementaryServi :     51   198   212
             USED in MAP-ShortMessageServic :     33   106
             USED in MAP-Errors             :     30

       illegalSubscriberParam.................identifier of IllegalSubscriberParam
          DEFINED in MAP-Errors             :    199

       IllegalSubscriberParam.................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    203
             USED in MAP-Errors             :    102   199
             USED in MAP-ER-DataTypes       :     28

       imei...................................identifier of IMEI
          DEFINED in MAP-MobileServiceOpera :    269

       IMEI...................................type reference TBCD-STRING
          DEFINED in MAP-CommonDataTypes    :    237
             USED in MAP-MobileServiceOpera :    125   269
             USED in MAP-CommonDataTypes    :     29

       imsi...................................identifier of IMSI
          DEFINED in MAP-OperationAndMainte :     81

       imsi...................................identifier of IMSI
          DEFINED in MAP-MS-DataTypes       :    155

       imsi...................................identifier of IMSI
          DEFINED in MAP-MS-DataTypes       :    183

       imsi...................................identifier of IMSI
          DEFINED in MAP-MS-DataTypes       :    199

       imsi...................................identifier of IMSI
          DEFINED in MAP-MS-DataTypes       :    213

       imsi...................................identifier of IMSI
          DEFINED in MAP-MS-DataTypes       :    219

       imsi...................................identifier of IMSI
          DEFINED in MAP-MS-DataTypes       :    241

       imsi...................................identifier of [0] IMSI
          DEFINED in MAP-MS-DataTypes       :    292

       imsi...................................identifier of [0] IMSI
          DEFINED in MAP-MS-DataTypes       :    621

       imsi...................................identifier of [0] IMSI
          DEFINED in MAP-MS-DataTypes       :    788

       imsi...................................identifier of [0] IMSI
          DEFINED in MAP-MS-DataTypes       :    804

       imsi...................................identifier of [0] IMSI
          DEFINED in MAP-MS-DataTypes       :    817

       imsi...................................identifier of IMSI
          DEFINED in MAP-MS-DataTypes       :    836

       imsi...................................identifier of [0] IMSI
          DEFINED in MAP-MS-DataTypes       :    878

       imsi...................................identifier of [0] IMSI
          DEFINED in MAP-MS-DataTypes       :    959

       IMSI...................................type reference TBCD-STRING
          DEFINED in MAP-CommonDataTypes    :    224
             USED in MAP-OperationAndMainte :     43    81
             USED in MAP-MS-DataTypes       :    124   155   183   199   213   219   241   276   292
                                               621   788   804   817   836   878   959
             USED in MAP-CommonDataTypes    :     26   234   244
             USED in MAP-OM-DataTypes       :     22    37    55
             USED in MAP-CH-DataTypes       :     60   128   168   193   294   324   364
             USED in MAP-SS-DataTypes       :     47   256
             USED in MAP-SM-DataTypes       :     34    80   132   193
             USED in MAP-GR-DataTypes       :     24    67    76
```

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imsi.................................identifier of [0] IMSI
   DEFINED in MAP-CommonDataTypes    :    234
```

```
imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-OM-DataTypes       :     37

imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-OM-DataTypes       :     55

imsi.....................................identifier of [9] IMSI
   DEFINED in MAP-CH-DataTypes       :    128

imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-CH-DataTypes       :    168

imsi.....................................identifier of [3] IMSI
   DEFINED in MAP-CH-DataTypes       :    193

imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-CH-DataTypes       :    294

imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-CH-DataTypes       :    324

imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-CH-DataTypes       :    364

imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-SS-DataTypes       :    256

imsi.....................................identifier of IMSI
   DEFINED in MAP-SM-DataTypes       :     80

imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-SM-DataTypes       :    132

imsi.....................................identifier of [0] IMSI
   DEFINED in MAP-SM-DataTypes       :    193

imsi.....................................identifier of IMSI
   DEFINED in MAP-GR-DataTypes       :     67

imsi.....................................identifier of IMSI
   DEFINED in MAP-GR-DataTypes       :     76

imsiDetach...............................identifier of Named Number, 0
   DEFINED in MAP-ER-DataTypes       :    233

imsiDetached.............................identifier of Named Number, 1
   DEFINED in MAP-MS-DataTypes       :    940

imsiUnknown..............................identifier of Named Number, 0
   DEFINED in MAP-ER-DataTypes       :    188

imsi-WithLMSI............................identifier of IMSI-WithLMSI
   DEFINED in MAP-MS-DataTypes       :    184

IMSI-WithLMSI............................type reference SEQUENCE
   DEFINED in MAP-MS-DataTypes       :    212
      USED in MAP-MS-DataTypes       :    184

incomingCallsBarredWithinCUG.............identifier of Named Number, 0
   DEFINED in MAP-ER-DataTypes       :    108

incompatibleTerminal.....................value reference IncompatibleTerminal, CHOICE VALUE
   DEFINED in MAP-Protocol           :    285

IncompatibleTerminal.....................type reference ERROR
   DEFINED in MAP-Errors             :    157
      USED in MAP-Protocol           :    146   285
      USED in MAP-CallHandlingOperat :     46   177
      USED in MAP-Errors             :     18

incompatibleTerminalParam................identifier of IncompatibleTerminalParam
   DEFINED in MAP-Errors             :    159

IncompatibleTerminalParam................type reference SEQUENCE
   DEFINED in MAP-ER-DataTypes       :    281
      USED in MAP-Errors             :    122   159
      USED in MAP-ER-DataTypes       :     46

incorrectTransactionPortion..............identifier of Named Number, 3
```

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          DEFINED in TCAPMessages          :    106
```

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       informServiceCentre.....................value reference InformServiceCentre, CHOICE VALUE
          DEFINED in MAP-Protocol           :    237

       InformServiceCentre.....................type reference OPERATION
          DEFINED in MAP-ShortMessageServic :    133
             USED in MAP-Protocol           :     85   237
             USED in MAP-ShortMessageServic :     18

       informServiceCentreArg..................identifier of InformServiceCentreArg
          DEFINED in MAP-ShortMessageServic :    135

       InformServiceCentreArg..................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    178
             USED in MAP-ShortMessageServic :     55   135
             USED in MAP-SM-DataTypes       :     23

       inhibiting..............................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    763

       initiatingRelease.......................identifier of Named Number, 4
          DEFINED in TCAPMessages           :    187

       insertSubscriberData....................value reference InsertSubscriberData, CHOICE VALUE
          DEFINED in MAP-Protocol           :    183

       InsertSubscriberData....................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    279
             USED in MAP-Protocol           :     24   183
             USED in MAP-MobileServiceOpera :     43

       insertSubscriberDataArg.................identifier of InsertSubscriberDataArg
          DEFINED in MAP-MobileServiceOpera :    281

       InsertSubscriberDataArg.................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    291
             USED in MAP-MobileServiceOpera :    101   281
             USED in MAP-MS-DataTypes       :     42

       insertSubscriberDataRes.................identifier of InsertSubscriberDataRes
          DEFINED in MAP-MobileServiceOpera :    283

       InsertSubscriberDataRes.................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    603
             USED in MAP-MobileServiceOpera :    102   283
             USED in MAP-MS-DataTypes       :     43

       interCUG-Restrictions...................identifier of InterCUG-Restrictions
          DEFINED in MAP-MS-DataTypes       :    571

       InterCUG-Restrictions...................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    575
             USED in MAP-MS-DataTypes       :     62   571

       internationalECT-Barred.................identifier of Named Number, 11
          DEFINED in MAP-MS-DataTypes       :    413

       internationalOGCallsBarred..............identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    403

       internationalOGCallsNotToHPLMN-CountryBaidentifier of Named Number, 2
          DEFINED in MAP-MS-DataTypes       :    404

       interrogateSS...........................value reference InterrogateSS, CHOICE VALUE
          DEFINED in MAP-Protocol           :    220

       InterrogateSS...........................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    160
             USED in MAP-Protocol           :     66   220
             USED in MAP-SupplementaryServi :     17

       interrogateSS-Res.......................identifier of InterrogateSS-Res
          DEFINED in MAP-SupplementaryServi :    164

       InterrogateSS-Res.......................type reference CHOICE
          DEFINED in MAP-SS-DataTypes       :    201
             USED in MAP-SupplementaryServi :     63   164
             USED in MAP-SS-DataTypes       :     19

       interrogationType.......................identifier of [3] InterrogationType
          DEFINED in MAP-CH-DataTypes       :     90
```

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InterrogationType.....................type reference ENUMERATED
```

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          DEFINED in MAP-CH-DataTypes       :    108
             USED in MAP-CH-DataTypes       :     90

       interzonalECT-Barred...................identifier of Named Number, 12
          DEFINED in MAP-MS-DataTypes       :    414

       interzonalOGCallsAndInternationalOGCallsidentifier of Named Number, 8
          DEFINED in MAP-MS-DataTypes       :    407

       interzonalOGCallsBarred................identifier of Named Number, 6
          DEFINED in MAP-MS-DataTypes       :    405

       interzonalOGCallsNotToHPLMN-CountryBarreidentifier of Named Number, 7
          DEFINED in MAP-MS-DataTypes       :    406

       intraCUG-Options.......................identifier of IntraCUG-Options
          DEFINED in MAP-MS-DataTypes       :    543

       IntraCUG-Options.......................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    553
             USED in MAP-MS-DataTypes       :     63   543

       invalidFormat..........................identifier of Named Number, 1
          DEFINED in MAP-ER-DataTypes       :    121

       invalidSME-Address.....................identifier of Named Number, 5
          DEFINED in MAP-ER-DataTypes       :    131

       invoke.................................identifier of [1] IMPLICIT Invoke
          DEFINED in TCAPMessages           :    125

       Invoke.................................type reference SEQUENCE
          DEFINED in TCAPMessages           :    133
             USED in TCAPMessages           :    125

       invokeID...............................identifier of InvokeIdType
          DEFINED in TCAPMessages           :    134

       invokeID...............................identifier of InvokeIdType
          DEFINED in TCAPMessages           :    145

       invokeID...............................identifier of InvokeIdType
          DEFINED in TCAPMessages           :    157

       invokeID...............................identifier of CHOICE
          DEFINED in TCAPMessages           :    166

       InvokeIdType...........................type reference INTEGER
          DEFINED in TCAPMessages           :    175
             USED in TCAPMessages           :     47   134   135   145   157   167

       invokeProblem..........................identifier of [1] IMPLICIT InvokeProblem
          DEFINED in TCAPMessages           :    171

       InvokeProblem..........................type reference INTEGER
          DEFINED in TCAPMessages           :    183
             USED in TCAPMessages           :    171

       ISDN-AddressString.....................type reference AddressString
          DEFINED in MAP-CommonDataTypes    :    122
             USED in MAP-OperationAndMainte :     42    79
             USED in MAP-MS-DataTypes       :    120   157   158   171   200   201   242   251   264
                                                 270   360   451   669   702   740   790   805   831
                                                 843   904   949   960
             USED in MAP-CommonDataTypes    :     17
             USED in MAP-CH-DataTypes       :     57    87    93   139   154   158   169   170   175
                                                 185   245   262   278   367
             USED in MAP-SS-DataTypes       :     45    97   194   212   257   284
             USED in MAP-SM-DataTypes       :     32    53    86    98    99   138   143   168   174
                                                 179
             USED in MAP-GR-DataTypes       :     23    62

       isdn-BearerCapability..................identifier of [1] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    260

       ISDN-SubaddressString..................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :    128
             USED in MAP-MS-DataTypes       :    122   455
             USED in MAP-CommonDataTypes    :     19
             USED in MAP-CH-DataTypes       :     58   162
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        USED in MAP-SS-DataTypes        :     46    73    98   195
```

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       kc.....................................identifier of Kc
          DEFINED in MAP-MS-DataTypes       :    229

       Kc.....................................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    236
             USED in MAP-MS-DataTypes       :     39   229
             USED in MAP-GR-DataTypes       :     36    55

       keepCCBS-CallIndicator.................identifier of [1] NULL
          DEFINED in MAP-CH-DataTypes       :    149

       laiFixedLength.........................identifier of [1] LAIFixedLength
          DEFINED in MAP-CommonDataTypes    :    290

       LAIFixedLength.........................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :    301
             USED in MAP-CommonDataTypes    :    290

       linkedID...............................identifier of [0] IMPLICIT InvokeIdType
          DEFINED in TCAPMessages           :    135

       linkedResponseUnexpected...............identifier of Named Number, 6
          DEFINED in TCAPMessages           :    189

       lmsi...................................identifier of [10] LMSI
          DEFINED in MAP-MS-DataTypes       :    159

       lmsi...................................identifier of LMSI
          DEFINED in MAP-MS-DataTypes       :    214

       lmsi...................................identifier of LMSI
          DEFINED in MAP-MS-DataTypes       :    837

       lmsi...................................identifier of [1] LMSI
          DEFINED in MAP-MS-DataTypes       :    879

       LMSI...................................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :    253
             USED in MAP-MS-DataTypes       :    126   159   214   837   879
             USED in MAP-CommonDataTypes    :     31
             USED in MAP-CH-DataTypes       :     61   171   295
             USED in MAP-SM-DataTypes       :     35    87   133

       lmsi...................................identifier of [4] LMSI
          DEFINED in MAP-CH-DataTypes       :    171

       lmsi...................................identifier of [1] LMSI
          DEFINED in MAP-CH-DataTypes       :    295

       lmsi...................................identifier of LMSI
          DEFINED in MAP-SM-DataTypes       :     87

       lmsi...................................identifier of [1] LMSI
          DEFINED in MAP-SM-DataTypes       :    133

       locationInformation....................identifier of [0] LocationInformation
          DEFINED in MAP-MS-DataTypes       :    890

       locationInformation....................identifier of [0] NULL
          DEFINED in MAP-MS-DataTypes       :    896

       LocationInformation....................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    901
             USED in MAP-MS-DataTypes       :     74   890

       locationInfoWithLMSI...................identifier of [0] LocationInfoWithLMSI
          DEFINED in MAP-SM-DataTypes       :     81

       LocationInfoWithLMSI...................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :     85
             USED in MAP-SM-DataTypes       :     81

       locationNumber.........................identifier of [2] LocationNumber
          DEFINED in MAP-MS-DataTypes       :    905

       LocationNumber.........................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    929
             USED in MAP-MS-DataTypes       :    905

       longTermDenial.........................value reference LongTermDenial, CHOICE VALUE
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          DEFINED in MAP-Protocol          :    357
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       LongTermDenial.......................type reference ERROR
          DEFINED in MAP-Errors            :    329
             USED in MAP-Protocol          :    145   357
             USED in MAP-SupplementaryServi :     54   265
             USED in MAP-Errors            :     68

       longTermDenialParam..................identifier of LongTermDenialParam
          DEFINED in MAP-Errors            :    331

       LongTermDenialParam..................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes      :    288
             USED in MAP-Errors            :    124   331
             USED in MAP-ER-DataTypes      :     48

       lowerLayerCompatibility..............identifier of [5] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes      :    264

       mah..................................value reference SS-Code, '00110010'B
          DEFINED in MAP-SS-Code           :     68

       MAP-BS-Code..........................module reference
          DEFINED in MAP-BS-Code           :      1
             USED in MAP-MS-DataTypes      :    110
             USED in MAP-CommonDataTypes   :     56

       MAP-CallHandlingOperations...........module reference
          DEFINED in MAP-CallHandlingOperat :      1
             USED in MAP-Protocol          :     57

       MAP-CH-DataTypes.....................module reference
          DEFINED in MAP-CH-DataTypes      :      1
             USED in MAP-CallHandlingOperat :     68

       MAP-CommonDataTypes..................module reference
          DEFINED in MAP-CommonDataTypes   :      1
             USED in MAP-MobileServiceOpera :    126
             USED in MAP-OperationAndMainte :     44
             USED in MAP-MS-DataTypes      :    134
             USED in MAP-OM-DataTypes      :     23
             USED in MAP-CH-DataTypes      :     67
             USED in MAP-SS-DataTypes      :     53
             USED in MAP-SM-DataTypes      :     36
             USED in MAP-GR-DataTypes      :     27
             USED in MAP-ER-DataTypes      :     61

       MAP-Errors...........................module reference
          DEFINED in MAP-Errors            :      1
             USED in MAP-Protocol          :    147
             USED in MAP-MobileServiceOpera :     82
             USED in MAP-OperationAndMainte :     30
             USED in MAP-CallHandlingOperat :     49
             USED in MAP-SupplementaryServi :     56
             USED in MAP-ShortMessageServic :     42
             USED in MAP-Group-Call-Operati :     27

       MAP-ER-DataTypes.....................module reference
          DEFINED in MAP-ER-DataTypes      :      1
             USED in MAP-Errors            :    126
             USED in MAP-MS-DataTypes      :    144
             USED in MAP-SM-DataTypes      :     41

       MAP-EXTENSION........................information object class reference CLASS
          DEFINED in MAP-ExtensionDataTypes :     22
             USED in MAP-ExtensionDataTypes :     41    43    48

       MAP-ExtensionDataTypes...............module reference
          DEFINED in MAP-ExtensionDataTypes :      1
             USED in MAP-MS-DataTypes      :    139
             USED in MAP-CommonDataTypes   :     61
             USED in MAP-OM-DataTypes      :     28
             USED in MAP-CH-DataTypes      :     72
             USED in MAP-SS-DataTypes      :     58
             USED in MAP-SM-DataTypes      :     46
             USED in MAP-GR-DataTypes      :     43
             USED in MAP-ER-DataTypes      :     71

       MAP-Group-Call-Operations............module reference
          DEFINED in MAP-Group-Call-Operati :      1
             USED in MAP-Protocol          :     96
```

```
MAP-GR-DataTypes.....................module reference
   DEFINED in MAP-GR-DataTypes       :      1
```

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             USED in MAP-Group-Call-Operati :     37

       MAP-MobileServiceOperations.............module reference
          DEFINED in MAP-MobileServiceOpera :      1
             USED in MAP-Protocol           :     36

       MAP-MS-DataTypes........................module reference
          DEFINED in MAP-MS-DataTypes       :      1
             USED in MAP-MobileServiceOpera :    119
             USED in MAP-CH-DataTypes       :     46
             USED in MAP-GR-DataTypes       :     37

       MAP-OM-DataTypes........................module reference
          DEFINED in MAP-OM-DataTypes       :      1
             USED in MAP-OperationAndMainte :     38

       MAP-OperationAndMaintenanceOperations...module reference
          DEFINED in MAP-OperationAndMainte :      1
             USED in MAP-Protocol           :     44

       MAP-Protocol............................module reference
          DEFINED in MAP-Protocol           :      1

       MAP-ShortMessageServiceOperations.......module reference
          DEFINED in MAP-ShortMessageServic :      1
             USED in MAP-Protocol           :     87

       MAP-SM-DataTypes........................module reference
          DEFINED in MAP-SM-DataTypes       :      1
             USED in MAP-ShortMessageServic :     58

       MAP-SS-Code.............................module reference
          DEFINED in MAP-SS-Code            :      1
             USED in MAP-SupplementaryServi :     79
             USED in MAP-MS-DataTypes       :    105
             USED in MAP-SS-DataTypes       :     63
             USED in MAP-ER-DataTypes       :     66

       MAP-SS-DataTypes........................module reference
          DEFINED in MAP-SS-DataTypes       :      1
             USED in MAP-SupplementaryServi :     74
             USED in MAP-Errors             :     87
             USED in MAP-MS-DataTypes       :    100
             USED in MAP-CH-DataTypes       :     53
             USED in MAP-ER-DataTypes       :     54

       MAP-SupplementaryServiceOperations......module reference
          DEFINED in MAP-SupplementaryServi :      1
             USED in MAP-Protocol           :     75

       MAP-TS-Code.............................module reference
          DEFINED in MAP-TS-Code            :      1
             USED in MAP-MS-DataTypes       :    115
             USED in MAP-CommonDataTypes    :     50
             USED in MAP-GR-DataTypes       :     32

       matchType...............................identifier of [0] MatchType
          DEFINED in MAP-MS-DataTypes       :    732

       MatchType...............................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    762
             USED in MAP-MS-DataTypes       :    732

       maxAddressLength........................value reference INTEGER, 20
          DEFINED in MAP-CommonDataTypes    :    120
             USED in MAP-CommonDataTypes    :     79

       maxEventSpecification...................value reference INTEGER, 2
          DEFINED in MAP-SS-DataTypes       :    275
             USED in MAP-SS-DataTypes       :    272

       maximumentitledPriority.................identifier of EMLPP-Priority
          DEFINED in MAP-CommonDataTypes    :    321

       maximumEntitledPriority.................identifier of [0] EMLPP-Priority
          DEFINED in MAP-SS-DataTypes       :    183

       maxISDN-AddressLength...................value reference INTEGER, 9
          DEFINED in MAP-CommonDataTypes    :    126
             USED in MAP-MS-DataTypes       :    121
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            USED in MAP-CommonDataTypes    :     18   123
```

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       maxISDN-SubaddressLength.............value reference INTEGER, 21
          DEFINED in MAP-CommonDataTypes    :    166
             USED in MAP-CommonDataTypes    :    129

       maxNumOfBasicServiceGroups.............value reference INTEGER, 13
          DEFINED in MAP-SS-DataTypes       :    253
             USED in MAP-SS-DataTypes       :     91   144   250

       maxNumOfBasicServices..................value reference INTEGER, 70
          DEFINED in MAP-MS-DataTypes       :    646
             USED in MAP-MS-DataTypes       :    643

       maxNumOfBearerServices.................value reference INTEGER, 50
          DEFINED in MAP-MS-DataTypes       :    388
             USED in MAP-MS-DataTypes       :    385

       maxNumOfCamelBasicServiceCriteria.......value reference INTEGER, 5
          DEFINED in MAP-MS-DataTypes       :    756
             USED in MAP-MS-DataTypes       :    747

       maxNumOfCamelDestinationNumberLengths...value reference INTEGER, 3
          DEFINED in MAP-MS-DataTypes       :    754
             USED in MAP-MS-DataTypes       :    744

       maxNumOfCamelDestinationNumbers.........value reference INTEGER, 10
          DEFINED in MAP-MS-DataTypes       :    752
             USED in MAP-MS-DataTypes       :    739

       maxNumOfCamelSSEvents..................value reference INTEGER, 10
          DEFINED in MAP-MS-DataTypes       :    681
             USED in MAP-MS-DataTypes       :    674

       maxNumOfCamelTDPData...................value reference INTEGER, 10
          DEFINED in MAP-MS-DataTypes       :    697
             USED in MAP-MS-DataTypes       :     59   690   721
             USED in MAP-CH-DataTypes       :     36   235

       maxNumOfCCBS-Requests..................value reference INTEGER, 5
          DEFINED in MAP-SS-DataTypes       :    190
             USED in MAP-SS-DataTypes       :    187   199

       maxNumOfCUG............................value reference INTEGER, 10
          DEFINED in MAP-MS-DataTypes       :    558
             USED in MAP-MS-DataTypes       :    537

       maxNumOfExt-BasicServiceGroups.........value reference INTEGER, 32
          DEFINED in MAP-MS-DataTypes       :    566
             USED in MAP-MS-DataTypes       :    445   522   560   563

       maxNumOfHLR-Id.........................value reference INTEGER, 50
          DEFINED in MAP-CommonDataTypes    :    251
             USED in MAP-CommonDataTypes    :    248

       maxNumOfISDN-AddressDigits.............value reference INTEGER, 15
          DEFINED in MAP-MS-DataTypes       :    750
             USED in MAP-MS-DataTypes       :    745

       maxNumOfPDP-Contexts...................value reference INTEGER, 50
          DEFINED in MAP-MS-DataTypes       :    317
             USED in MAP-MS-DataTypes       :    314   329   640

       maxNumOfPrivateExtensions..............value reference INTEGER, 10
          DEFINED in MAP-ExtensionDataTypes :     46
             USED in MAP-ExtensionDataTypes :     37

       maxNumOfSS.............................value reference INTEGER, 30
          DEFINED in MAP-SS-DataTypes       :    245
             USED in MAP-MS-DataTypes       :     97   428
             USED in MAP-SS-DataTypes       :     30   242   247

       maxNumOfTeleservices...................value reference INTEGER, 20
          DEFINED in MAP-MS-DataTypes       :    393
             USED in MAP-MS-DataTypes       :    390

       maxNumOfVBSGroupIds....................value reference INTEGER, 50
          DEFINED in MAP-MS-DataTypes       :    856
             USED in MAP-MS-DataTypes       :    850

       maxNumOfVGCSGroupIds...................value reference INTEGER, 50
          DEFINED in MAP-MS-DataTypes       :    858
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            USED in MAP-MS-DataTypes       :    853
```

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       maxNumOfZoneCodes.....................value reference INTEGER, 10
          DEFINED in MAP-MS-DataTypes       :    601
             USED in MAP-MS-DataTypes       :     50   595

       maxSignalInfoLength...................value reference INTEGER, 200
          DEFINED in MAP-CommonDataTypes    :    179
             USED in MAP-CommonDataTypes    :     22   177

       maxUSSD-StringLength..................value reference INTEGER, 160
          DEFINED in MAP-SS-DataTypes       :    228
             USED in MAP-SS-DataTypes       :    224

       mcef-Set..............................identifier of Named Number, 2
          DEFINED in MAP-SM-DataTypes       :    187

       mci...................................value reference SS-Code, '00010101'B
          DEFINED in MAP-SS-Code            :     36

       memoryAvailable.......................identifier of Named Number, 1
          DEFINED in MAP-SM-DataTypes       :    208

       memoryCapacityExceeded................identifier of Named Number, 0
          DEFINED in MAP-SM-DataTypes       :    163

       memoryCapacityExceeded................identifier of Named Number, 0
          DEFINED in MAP-ER-DataTypes       :    126

       MessageType...........................type reference CHOICE
          DEFINED in TCAPMessages           :     51
             USED in TCAPMessages           :     47

       messageWaitingListFull................value reference MessageWaitingListFull, CHOICE VALUE
          DEFINED in MAP-Protocol           :    364

       MessageWaitingListFull................type reference ERROR
          DEFINED in MAP-Errors             :    346
             USED in MAP-Protocol           :    140   364
             USED in MAP-ShortMessageServic :     40   122
             USED in MAP-Errors             :     73

       messageWaitListFullParam..............identifier of MessageWaitListFullParam
          DEFINED in MAP-Errors             :    348

       MessageWaitListFullParam..............type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    269
             USED in MAP-Errors             :    118   348
             USED in MAP-ER-DataTypes       :     41

       mistypedComponent.....................identifier of Named Number, 1
          DEFINED in TCAPMessages           :    180

       mistypedParameter.....................identifier of Named Number, 2
          DEFINED in TCAPMessages           :    185

       mistypedParameter.....................identifier of Named Number, 2
          DEFINED in TCAPMessages           :    194

       mistypedParameter.....................identifier of Named Number, 4
          DEFINED in TCAPMessages           :    200

       mnrf-Set..............................identifier of Named Number, 1
          DEFINED in MAP-SM-DataTypes       :    186

       mnrg-Set..............................identifier of Named Number, 3
          DEFINED in MAP-SM-DataTypes       :    188

       mobileNotReachableReason..............identifier of [2] AbsentSubscriberDiagnosticSM
          DEFINED in MAP-MS-DataTypes       :    797

       monitoringMode........................identifier of [0] MonitoringMode
          DEFINED in MAP-CH-DataTypes       :    336

       MonitoringMode........................type reference ENUMERATED
          DEFINED in MAP-CH-DataTypes       :    341
             USED in MAP-CH-DataTypes       :    336

       moreMessagesToSend....................identifier of NULL
          DEFINED in MAP-SM-DataTypes       :    122

       mo-forwardSM..........................value reference MO-ForwardSM, CHOICE VALUE
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          DEFINED in MAP-Protocol          :    234
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       MO-ForwardSM.........................type reference OPERATION
          DEFINED in MAP-ShortMessageServic :     82
             USED in MAP-Protocol           :     81   234
             USED in MAP-ShortMessageServic :     14

       mo-forwardSM-Arg.....................identifier of MO-ForwardSM-Arg
          DEFINED in MAP-ShortMessageServic :     84

       MO-ForwardSM-Arg.....................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    106
             USED in MAP-ShortMessageServic :     48    84
             USED in MAP-SM-DataTypes       :     16

       mo-forwardSM-Res.....................identifier of MO-ForwardSM-Res
          DEFINED in MAP-ShortMessageServic :     86

       MO-ForwardSM-Res.....................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    113
             USED in MAP-ShortMessageServic :     49    86
             USED in MAP-SM-DataTypes       :     17

       msc-Number...........................identifier of [1] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    157

       msc-Number...........................identifier of [1] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    169

       msc-Number...........................identifier of [0] ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :     98

       msisdn...............................identifier of ISDN-AddressString
          DEFINED in MAP-OperationAndMainte :     79

       msisdn...............................identifier of [1] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    360

       msisdn...............................identifier of [1] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    960

       msisdn...............................identifier of [0] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :     87

       msisdn...............................identifier of [2] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    170

       msisdn...............................identifier of [0] ISDN-AddressString
          DEFINED in MAP-SS-DataTypes       :    212

       msisdn...............................identifier of [1] ISDN-AddressString
          DEFINED in MAP-SS-DataTypes       :    257

       msisdn...............................identifier of [0] ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :     53

       msisdn...............................identifier of [2] ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :    138

       msisdn...............................identifier of ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :    143

       msisdn...............................identifier of ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :    174

       msNotReachable.......................identifier of NULL
          DEFINED in MAP-MS-DataTypes       :    844

       msPurged.............................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    939

       ms-Present...........................identifier of Named Number, 0
          DEFINED in MAP-SM-DataTypes       :    207

       mt-forwardSM.........................value reference MT-ForwardSM, CHOICE VALUE
          DEFINED in MAP-Protocol           :    235

       MT-ForwardSM.........................type reference OPERATION
          DEFINED in MAP-ShortMessageServic :     94
             USED in MAP-Protocol           :     82   235
             USED in MAP-ShortMessageServic :     15
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mt-forwardSM-Arg.....................identifier of MT-ForwardSM-Arg
   DEFINED in MAP-ShortMessageServic :     96
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       MT-ForwardSM-Arg.....................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    118
             USED in MAP-ShortMessageServic :     50    96
             USED in MAP-SM-DataTypes       :     18

       mt-forwardSM-Res.....................identifier of MT-ForwardSM-Res
          DEFINED in MAP-ShortMessageServic :     98

       MT-ForwardSM-Res.....................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    126
             USED in MAP-ShortMessageServic :     51    98
             USED in MAP-SM-DataTypes       :     19

       multipleECT-Barred...................identifier of Named Number, 14
          DEFINED in MAP-MS-DataTypes       :    416

       multiPTY.............................value reference SS-Code, '01010001'B
          DEFINED in MAP-SS-Code            :     88

       mw-Status............................identifier of MW-Status
          DEFINED in MAP-SM-DataTypes       :    180

       MW-Status............................type reference BIT STRING
          DEFINED in MAP-SM-DataTypes       :    184
             USED in MAP-SM-DataTypes       :    180

       NAEA-CIC.............................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :    279
             USED in MAP-CommonDataTypes    :    275

       naea-PreferredCI.....................identifier of [15] NAEA-PreferredCI
          DEFINED in MAP-MS-DataTypes       :    296

       NAEA-PreferredCI.....................type reference SEQUENCE
          DEFINED in MAP-CommonDataTypes    :    274
             USED in MAP-MS-DataTypes       :    130   296
             USED in MAP-CommonDataTypes    :     34
             USED in MAP-CH-DataTypes       :     64   142

       naea-PreferredCI.....................identifier of [10] NAEA-PreferredCI
          DEFINED in MAP-CH-DataTypes       :    142

       naea-PreferredCIC....................identifier of [0] NAEA-CIC
          DEFINED in MAP-CommonDataTypes    :    275

       negativePW-Check.....................value reference NegativePW-Check, CHOICE VALUE
          DEFINED in MAP-Protocol           :    353

       NegativePW-Check.....................type reference ERROR
          DEFINED in MAP-Errors             :    320
             USED in MAP-Protocol           :    136   353
             USED in MAP-SupplementaryServi :     46   138   157   229
             USED in MAP-Errors             :     65

       netDetNotReachable...................identifier of NotReachableReason
          DEFINED in MAP-MS-DataTypes       :    935

       networkAccessMode....................identifier of [24] NetworkAccessMode
          DEFINED in MAP-MS-DataTypes       :    301

       NetworkAccessMode....................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    306
             USED in MAP-MS-DataTypes       :    301

       networkNode-AreaRestricted...........identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    615

       networkNode-Number...................identifier of [1] ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :     86

       NetworkResource......................type reference ENUMERATED
          DEFINED in MAP-CommonDataTypes    :    264
             USED in MAP-CommonDataTypes    :     33
             USED in MAP-ER-DataTypes       :     60   155   162

       networkResource......................identifier of NetworkResource
          DEFINED in MAP-ER-DataTypes       :    155

       networkResource......................identifier of NetworkResource
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          DEFINED in MAP-ER-DataTypes       :    162
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       networkSignalInfo.....................identifier of [10] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :     97

       networkSignalInfo.....................identifier of [6] ExternalSignalInfo
          DEFINED in MAP-CH-DataTypes       :    173

       networkSignalInfo.....................identifier of [4] ExternalSignalInfo
          DEFINED in MAP-SS-DataTypes       :    287

       newPassword...........................identifier of Password
          DEFINED in MAP-SupplementaryServi :    221

       newPasswordsMismatch..................identifier of Named Number, 2
          DEFINED in MAP-ER-DataTypes       :    122

       noCUG-Restrictions....................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    554

       noGroupCallNbParam....................identifier of NoGroupCallNbParam
          DEFINED in MAP-Errors             :    360

       NoGroupCallNbParam....................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    277
             USED in MAP-Errors             :    121   360
             USED in MAP-ER-DataTypes       :     45

       noGroupCallNumberAvailable.............value reference NoGroupCallNumberAvailable, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    340

       NoGroupCallNumberAvailable.............type reference ERROR
          DEFINED in MAP-Errors             :    358
             USED in MAP-Protocol           :    143   340
             USED in MAP-Group-Call-Operati :     26    53
             USED in MAP-Errors             :     77

       noHandoverNumberAvailable..............value reference NoHandoverNumberAvailable, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    311

       NoHandoverNumberAvailable..............type reference ERROR
          DEFINED in MAP-Errors             :    224
             USED in MAP-Protocol           :    115   311
             USED in MAP-MobileServiceOpera :     78   225
             USED in MAP-Errors             :     36

       noPageResponse........................identifier of Named Number, 2
          DEFINED in MAP-ER-DataTypes       :    235

       noReply...............................identifier of Named Number, 2
          DEFINED in MAP-CH-DataTypes       :    119

       noReplyConditionTime..................identifier of [7] Ext-NoRepCondTime
          DEFINED in MAP-MS-DataTypes       :    457

       noReplyConditionTime..................identifier of [5] NoReplyConditionTime
          DEFINED in MAP-SS-DataTypes       :     74

       NoReplyConditionTime..................type reference INTEGER
          DEFINED in MAP-SS-DataTypes       :     78
             USED in MAP-SS-DataTypes       :     28    74   100

       noReplyConditionTime..................identifier of [7] NoReplyConditionTime
          DEFINED in MAP-SS-DataTypes       :    100

       noResponseFromBusyMS..................identifier of Named Number, 3
          DEFINED in MAP-CH-DataTypes       :    382

       noResponseFromFreeMS..................identifier of Named Number, 2
          DEFINED in MAP-CH-DataTypes       :    381

       noRoamingNbParam......................identifier of NoRoamingNbParam
          DEFINED in MAP-Errors             :    241

       NoRoamingNbParam......................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    223
             USED in MAP-Errors             :    107   241
             USED in MAP-ER-DataTypes       :     33
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       noRoamingNumberAvailable.............value reference NoRoamingNumberAvailable, CHOICE
VALUE
          DEFINED in MAP-Protocol          :    324

       NoRoamingNumberAvailable.............type reference ERROR
          DEFINED in MAP-Errors            :    239
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             USED in MAP-Protocol           :    119   324
             USED in MAP-CallHandlingOperat :     37   108
             USED in MAP-Errors             :     44

       noSM-RP-DA.............................identifier of [5] NULL
          DEFINED in MAP-SM-DataTypes       :    135

       noSM-RP-OA.............................identifier of [5] NULL
          DEFINED in MAP-SM-DataTypes       :    140

       noSubscriberReply......................value reference NoSubscriberReply, CHOICE VALUE
          DEFINED in MAP-Protocol           :    327

       NoSubscriberReply......................type reference ERROR
          DEFINED in MAP-Errors             :    256
             USED in MAP-Protocol           :    122   327
             USED in MAP-CallHandlingOperat :     40    91
             USED in MAP-Errors             :     46

       noSubscriberReplyParam.................identifier of NoSubscriberReplyParam
          DEFINED in MAP-Errors             :    258

       NoSubscriberReplyParam.................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    246
             USED in MAP-Errors             :    111   258
             USED in MAP-ER-DataTypes       :     36

       noteMsPresentForGprs...................value reference NoteMsPresentForGprs, CHOICE VALUE
          DEFINED in MAP-Protocol           :    276

       NoteMsPresentForGprs...................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    350
             USED in MAP-Protocol           :     33   276
             USED in MAP-MobileServiceOpera :     58

       noteMsPresentForGprsArg................identifier of NoteMsPresentForGprsArg
          DEFINED in MAP-MobileServiceOpera :    352

       NoteMsPresentForGprsArg................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    816
             USED in MAP-MobileServiceOpera :    116   352
             USED in MAP-MS-DataTypes       :     90

       noteMsPresentForGprsRes................identifier of NoteMsPresentForGprsRes
          DEFINED in MAP-MobileServiceOpera :    354

       NoteMsPresentForGprsRes................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    823
             USED in MAP-MobileServiceOpera :    117   354
             USED in MAP-MS-DataTypes       :     91

       notForwarded...........................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    760

       notProvidedFromVLR.....................identifier of [2] NULL
          DEFINED in MAP-MS-DataTypes       :    936

       notReachable...........................identifier of Named Number, 0
          DEFINED in MAP-CH-DataTypes       :    117

       NotReachableReason.....................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    938
             USED in MAP-MS-DataTypes       :    935

       notRegistered..........................identifier of Named Number, 3
          DEFINED in MAP-MS-DataTypes       :    942

       not-derivable..........................identifier of NULL
          DEFINED in TCAPMessages           :    168

       numberChanged..........................value reference NumberChanged, CHOICE VALUE
          DEFINED in MAP-Protocol           :    292

       NumberChanged..........................type reference ERROR
          DEFINED in MAP-Errors             :    175
             USED in MAP-Protocol           :    106   292
             USED in MAP-CallHandlingOperat :     34    86
             USED in MAP-Errors             :     23

       numberChangedParam.....................identifier of NumberChangedParam
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          DEFINED in MAP-Errors            :    177
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       NumberChangedParam.....................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    195
             USED in MAP-Errors             :     99   177
             USED in MAP-ER-DataTypes       :     26

       NumberOfForwarding.....................type reference INTEGER
          DEFINED in MAP-CH-DataTypes       :     84
             USED in MAP-CH-DataTypes       :     20    89

       numberOfForwarding.....................identifier of [2] NumberOfForwarding
          DEFINED in MAP-CH-DataTypes       :     89

       numberOfPW-AttemptsViolation.........value reference NumberOfPW-AttemptsViolation, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    354

       NumberOfPW-AttemptsViolation............type reference ERROR
          DEFINED in MAP-Errors             :    322
             USED in MAP-Protocol           :    137   354
             USED in MAP-SupplementaryServi :     47   139   158   230
             USED in MAP-Errors             :     66

       odb-Data...............................identifier of [8] ODB-Data
          DEFINED in MAP-MS-DataTypes       :    370

       ODB-Data...............................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    395
             USED in MAP-MS-DataTypes       :     47   370

       odb-GeneralData........................identifier of ODB-GeneralData
          DEFINED in MAP-MS-DataTypes       :    396

       ODB-GeneralData........................type reference BIT STRING
          DEFINED in MAP-MS-DataTypes       :    401
             USED in MAP-MS-DataTypes       :    396   607

       odb-GeneralData........................identifier of [4] ODB-GeneralData
          DEFINED in MAP-MS-DataTypes       :    607

       odb-HPLMN-Data.........................identifier of ODB-HPLMN-Data
          DEFINED in MAP-MS-DataTypes       :    397

       ODB-HPLMN-Data.........................type reference BIT STRING
          DEFINED in MAP-MS-DataTypes       :    420
             USED in MAP-MS-DataTypes       :    397

       omc-Id.................................identifier of [3] AddressString
          DEFINED in MAP-OM-DataTypes       :     40

       onlyMSC................................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    308

       onlySGSN...............................identifier of Named Number, 2
          DEFINED in MAP-MS-DataTypes       :    309

       operationCode..........................identifier of OPERATION
          DEFINED in TCAPMessages           :    136
             USED in TCAPMessages           :    137

       operationCode..........................identifier of OPERATION
          DEFINED in TCAPMessages           :    147
             USED in TCAPMessages           :    148

       operatorBarring........................identifier of Named Number, 1
          DEFINED in MAP-ER-DataTypes       :     94

       operatorDeterminedBarring..............identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    383

       operatorDeterminedBarring..............identifier of Named Number, 3
          DEFINED in MAP-ER-DataTypes       :     83

       OrigTransactionID......................type reference  [APPLICATION 8] IMPLICIT
TransactionID
          DEFINED in TCAPMessages           :     97
             USED in TCAPMessages           :     61    69

       or-Capability..........................identifier of [5] OR-Phase
          DEFINED in MAP-CH-DataTypes       :     92
```

```
or-Interrogation.....................identifier of [4] NULL
   DEFINED in MAP-CH-DataTypes       :     91

or-Interrogation.....................identifier of [10] NULL
```

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          DEFINED in MAP-CH-DataTypes       :    177

       or-NotAllowed.........................value reference OR-NotAllowed, CHOICE VALUE
          DEFINED in MAP-Protocol           :    330

       OR-NotAllowed.........................type reference ERROR
          DEFINED in MAP-Errors             :    281
             USED in MAP-Protocol           :    118   330
             USED in MAP-CallHandlingOperat :     32    84   106   117
             USED in MAP-Errors             :     43

       or-NotAllowedParam.....................identifier of OR-NotAllowedParam
          DEFINED in MAP-Errors             :    283

       OR-NotAllowedParam.....................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    178
             USED in MAP-Errors             :    108   283
             USED in MAP-ER-DataTypes       :     24

       OR-Phase...............................type reference INTEGER
          DEFINED in MAP-CH-DataTypes       :    112
             USED in MAP-CH-DataTypes       :     92

       otid...................................identifier of OrigTransactionID
          DEFINED in TCAPMessages           :     61

       otid...................................identifier of OrigTransactionID
          DEFINED in TCAPMessages           :     69

       overrideCategory.......................identifier of [1] OverrideCategory
          DEFINED in MAP-SS-DataTypes       :    163

       OverrideCategory.......................type reference ENUMERATED
          DEFINED in MAP-SS-DataTypes       :    170
             USED in MAP-SS-DataTypes       :     26   163

       overrideDisabled.......................identifier of Named Number, 1
          DEFINED in MAP-SS-DataTypes       :    172

       overrideEnabled........................identifier of Named Number, 0
          DEFINED in MAP-SS-DataTypes       :    171

       O-BcsmCamelTDPCriteriaList.............type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    721
             USED in MAP-MS-DataTypes       :     52   659
             USED in MAP-CH-DataTypes       :     45   225

       O-BcsmCamelTDPData.....................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    699
             USED in MAP-MS-DataTypes       :    691

       o-BcsmCamelTDPDataList.................identifier of O-BcsmCamelTDPDataList
          DEFINED in MAP-MS-DataTypes       :    684

       O-BcsmCamelTDPDataList.................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    690
             USED in MAP-MS-DataTypes       :    684

       O-BcsmCamelTDP-Criteria................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    724
             USED in MAP-MS-DataTypes       :    722

       o-BcsmCamelTDP-CriteriaList............identifier of [4] O-BcsmCamelTDPCriteriaList
          DEFINED in MAP-MS-DataTypes       :    659

       o-BcsmCamelTDP-CriteriaList............identifier of [3] O-BcsmCamelTDPCriteriaList
          DEFINED in MAP-CH-DataTypes       :    225

       o-BcsmTriggerDetectionPoint............identifier of O-BcsmTriggerDetectionPoint
          DEFINED in MAP-MS-DataTypes       :    700

       O-BcsmTriggerDetectionPoint............type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    710
             USED in MAP-MS-DataTypes       :    700   725

       o-BcsmTriggerDetectionPoint............identifier of O-BcsmTriggerDetectionPoint
          DEFINED in MAP-MS-DataTypes       :    725

       o-CSI..................................identifier of [0] O-CSI
          DEFINED in MAP-MS-DataTypes       :    655
```

```
O-CSI.................................type reference SEQUENCE
```

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          DEFINED in MAP-MS-DataTypes       :    683
             USED in MAP-MS-DataTypes       :     51   655
             USED in MAP-CH-DataTypes       :     44   195   222

       o-CSI.................................identifier of [5] O-CSI
          DEFINED in MAP-CH-DataTypes       :    195

       o-CSI.................................identifier of [1] O-CSI
          DEFINED in MAP-CH-DataTypes       :    222

       padAccessCA-1200bps.....................value reference BearerServiceCode, '00100010'B
          DEFINED in MAP-BS-Code            :     69

       padAccessCA-1200-75bps..................value reference BearerServiceCode, '00100011'B
          DEFINED in MAP-BS-Code            :     70

       padAccessCA-2400bps.....................value reference BearerServiceCode, '00100100'B
          DEFINED in MAP-BS-Code            :     71

       padAccessCA-300bps......................value reference BearerServiceCode, '00100001'B
          DEFINED in MAP-BS-Code            :     68

       padAccessCA-4800bps.....................value reference BearerServiceCode, '00100101'B
          DEFINED in MAP-BS-Code            :     72

       padAccessCA-9600bps.....................value reference BearerServiceCode, '00100110'B
          DEFINED in MAP-BS-Code            :     73

       parameter...............................identifier of ANY DEFINED BY operationCode
          DEFINED in TCAPMessages           :    137

       parameter...............................identifier of ANY DEFINED BY operationCode
          DEFINED in TCAPMessages           :    148

       parameter...............................identifier of ANY DEFINED BY errorCode
          DEFINED in TCAPMessages           :    159

       Password................................type reference NumericString
          DEFINED in MAP-SS-DataTypes       :    230
             USED in MAP-SupplementaryServi :     66   221   238
             USED in MAP-SS-DataTypes       :     22

       pcs-Extensions..........................identifier of [1] PCS-Extensions
          DEFINED in MAP-ExtensionDataTypes :     34

       PCS-Extensions..........................type reference SEQUENCE
          DEFINED in MAP-ExtensionDataTypes :     56
             USED in MAP-ExtensionDataTypes :     34

       pdp-Address.............................identifier of [17] PDP-Address
          DEFINED in MAP-MS-DataTypes       :    322

       PDP-Address.............................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    347
             USED in MAP-MS-DataTypes       :    322

       PDP-Context.............................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    319
             USED in MAP-MS-DataTypes       :    315

       pdp-ContextId...........................identifier of ContextId
          DEFINED in MAP-MS-DataTypes       :    320

       pdp-Type................................identifier of [16] PDP-Type
          DEFINED in MAP-MS-DataTypes       :    321

       PDP-Type................................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    344
             USED in MAP-MS-DataTypes       :    321

       permanent...............................identifier of Named Number, 0
          DEFINED in MAP-SS-DataTypes       :    166

       phase1..................................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    781

       phase2..................................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    782

       plmn....................................identifier of Named Number, 0
```

```
          DEFINED in MAP-CommonDataTypes    :    265
```

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       plmnRoamingNotAllowed..................identifier of Named Number, 0
          DEFINED in MAP-ER-DataTypes       :     82

       plmn-SpecificBarringType1..............identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    421

       plmn-SpecificBarringType2..............identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    422

       plmn-SpecificBarringType3..............identifier of Named Number, 2
          DEFINED in MAP-MS-DataTypes       :    423

       plmn-SpecificBarringType4..............identifier of Named Number, 3
          DEFINED in MAP-MS-DataTypes       :    424

       plmn-specificBS-1......................value reference BearerServiceCode, '11010001'B
          DEFINED in MAP-BS-Code            :    111

       plmn-specificBS-2......................value reference BearerServiceCode, '11010010'B
          DEFINED in MAP-BS-Code            :    112

       plmn-specificBS-3......................value reference BearerServiceCode, '11010011'B
          DEFINED in MAP-BS-Code            :    113

       plmn-specificBS-4......................value reference BearerServiceCode, '11010100'B
          DEFINED in MAP-BS-Code            :    114

       plmn-specificBS-5......................value reference BearerServiceCode, '11010101'B
          DEFINED in MAP-BS-Code            :    115

       plmn-specificBS-6......................value reference BearerServiceCode, '11010110'B
          DEFINED in MAP-BS-Code            :    116

       plmn-specificBS-7......................value reference BearerServiceCode, '11010111'B
          DEFINED in MAP-BS-Code            :    117

       plmn-specificBS-8......................value reference BearerServiceCode, '11011000'B
          DEFINED in MAP-BS-Code            :    118

       plmn-specificBS-9......................value reference BearerServiceCode, '11011001'B
          DEFINED in MAP-BS-Code            :    119

       plmn-specificBS-A......................value reference BearerServiceCode, '11011010'B
          DEFINED in MAP-BS-Code            :    120

       plmn-specificBS-B......................value reference BearerServiceCode, '11011011'B
          DEFINED in MAP-BS-Code            :    121

       plmn-specificBS-C......................value reference BearerServiceCode, '11011100'B
          DEFINED in MAP-BS-Code            :    122

       plmn-specificBS-D......................value reference BearerServiceCode, '11011101'B
          DEFINED in MAP-BS-Code            :    123

       plmn-specificBS-E......................value reference BearerServiceCode, '11011110'B
          DEFINED in MAP-BS-Code            :    124

       plmn-specificBS-F......................value reference BearerServiceCode, '11011111'B
          DEFINED in MAP-BS-Code            :    125

       plmn-specificSS-1......................value reference SS-Code, '11110001'B
          DEFINED in MAP-SS-Code            :    132

       plmn-specificSS-2......................value reference SS-Code, '11110010'B
          DEFINED in MAP-SS-Code            :    133

       plmn-specificSS-3......................value reference SS-Code, '11110011'B
          DEFINED in MAP-SS-Code            :    134

       plmn-specificSS-4......................value reference SS-Code, '11110100'B
          DEFINED in MAP-SS-Code            :    135

       plmn-specificSS-5......................value reference SS-Code, '11110101'B
          DEFINED in MAP-SS-Code            :    136

       plmn-specificSS-6......................value reference SS-Code, '11110110'B
          DEFINED in MAP-SS-Code            :    137

       plmn-specificSS-7......................value reference SS-Code, '11110111'B
          DEFINED in MAP-SS-Code            :    138
```

```
plmn-specificSS-8.....................value reference SS-Code, '11111000'B
```

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          DEFINED in MAP-SS-Code            :    139

       plmn-specificSS-9.....................value reference SS-Code, '11111001'B
          DEFINED in MAP-SS-Code            :    140

       plmn-specificSS-A.....................value reference SS-Code, '11111010'B
          DEFINED in MAP-SS-Code            :    141

       plmn-specificSS-B.....................value reference SS-Code, '11111011'B
          DEFINED in MAP-SS-Code            :    142

       plmn-specificSS-C.....................value reference SS-Code, '11111100'B
          DEFINED in MAP-SS-Code            :    143

       plmn-specificSS-D.....................value reference SS-Code, '11111101'B
          DEFINED in MAP-SS-Code            :    144

       plmn-specificSS-E.....................value reference SS-Code, '11111110'B
          DEFINED in MAP-SS-Code            :    145

       plmn-specificSS-F.....................value reference SS-Code, '11111111'B
          DEFINED in MAP-SS-Code            :    146

       plmn-specificTS-1.....................value reference TeleserviceCode, '11010001'B
          DEFINED in MAP-TS-Code            :     73

       plmn-specificTS-2.....................value reference TeleserviceCode, '11010010'B
          DEFINED in MAP-TS-Code            :     74

       plmn-specificTS-3.....................value reference TeleserviceCode, '11010011'B
          DEFINED in MAP-TS-Code            :     75

       plmn-specificTS-4.....................value reference TeleserviceCode, '11010100'B
          DEFINED in MAP-TS-Code            :     76

       plmn-specificTS-5.....................value reference TeleserviceCode, '11010101'B
          DEFINED in MAP-TS-Code            :     77

       plmn-specificTS-6.....................value reference TeleserviceCode, '11010110'B
          DEFINED in MAP-TS-Code            :     78

       plmn-specificTS-7.....................value reference TeleserviceCode, '11010111'B
          DEFINED in MAP-TS-Code            :     79

       plmn-specificTS-8.....................value reference TeleserviceCode, '11011000'B
          DEFINED in MAP-TS-Code            :     80

       plmn-specificTS-9.....................value reference TeleserviceCode, '11011001'B
          DEFINED in MAP-TS-Code            :     81

       plmn-specificTS-A.....................value reference TeleserviceCode, '11011010'B
          DEFINED in MAP-TS-Code            :     82

       plmn-specificTS-B.....................value reference TeleserviceCode, '11011011'B
          DEFINED in MAP-TS-Code            :     83

       plmn-specificTS-C.....................value reference TeleserviceCode, '11011100'B
          DEFINED in MAP-TS-Code            :     84

       plmn-specificTS-D.....................value reference TeleserviceCode, '11011101'B
          DEFINED in MAP-TS-Code            :     85

       plmn-specificTS-E.....................value reference TeleserviceCode, '11011110'B
          DEFINED in MAP-TS-Code            :     86

       plmn-specificTS-F.....................value reference TeleserviceCode, '11011111'B
          DEFINED in MAP-TS-Code            :     87

       preferentialCUG-Indicator..............identifier of CUG-Index
          DEFINED in MAP-MS-DataTypes       :    570

       premiumRateEntertainementOGCallsBarred..identifier of Named Number, 4
          DEFINED in MAP-MS-DataTypes       :    409

       premiumRateInformationOGCallsBarred.....identifier of Named Number, 3
          DEFINED in MAP-MS-DataTypes       :    408

       prepareGroupCall......................value reference PrepareGroupCall, CHOICE VALUE
          DEFINED in MAP-Protocol           :    256
```

```
PrepareGroupCall.....................type reference OPERATION
   DEFINED in MAP-Group-Call-Operati :     46
```

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             USED in MAP-Protocol          :     92   256
             USED in MAP-Group-Call-Operati :     13

       prepareGroupCallArg.....................identifier of PrepareGroupCallArg
          DEFINED in MAP-Group-Call-Operati :     48

       PrepareGroupCallArg.....................type reference SEQUENCE
          DEFINED in MAP-GR-DataTypes       :     49
             USED in MAP-Group-Call-Operati :     31    48
             USED in MAP-GR-DataTypes       :     14

       prepareGroupCallRes.....................identifier of PrepareGroupCallRes
          DEFINED in MAP-Group-Call-Operati :     50

       PrepareGroupCallRes.....................type reference SEQUENCE
          DEFINED in MAP-GR-DataTypes       :     61
             USED in MAP-Group-Call-Operati :     32    50
             USED in MAP-GR-DataTypes       :     15

       prepareHandover.........................value reference PrepareHandover, CHOICE VALUE
          DEFINED in MAP-Protocol           :    163

       PrepareHandover.........................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    216
             USED in MAP-Protocol           :     17   163
             USED in MAP-MobileServiceOpera :     30

       prepareHO-Arg...........................identifier of PrepareHO-Arg
          DEFINED in MAP-MobileServiceOpera :    218

       PrepareHO-Arg...........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    257
             USED in MAP-MobileServiceOpera :     95   218
             USED in MAP-MS-DataTypes       :     29

       prepareHO-Res...........................identifier of PrepareHO-Res
          DEFINED in MAP-MobileServiceOpera :    220

       PrepareHO-Res...........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    263
             USED in MAP-MobileServiceOpera :     96   220
             USED in MAP-MS-DataTypes       :     30

       prepareSubsequentHandover...............value reference PrepareSubsequentHandover, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    167

       PrepareSubsequentHandover...............type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    240
             USED in MAP-Protocol           :     21   167
             USED in MAP-MobileServiceOpera :     34

       prepareSubsequentHO-Arg.................identifier of PrepareSubsequentHO-Arg
          DEFINED in MAP-MobileServiceOpera :    242

       PrepareSubsequentHO-Arg.................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    268
             USED in MAP-MobileServiceOpera :     97   242
             USED in MAP-MS-DataTypes       :     31

       priority................................identifier of [2] EMLPP-Priority
          DEFINED in MAP-GR-DataTypes       :     56

       priorityLevel0..........................value reference EMLPP-Priority, 0
          DEFINED in MAP-CommonDataTypes    :    334

       priorityLevel1..........................value reference EMLPP-Priority, 1
          DEFINED in MAP-CommonDataTypes    :    335

       priorityLevel2..........................value reference EMLPP-Priority, 2
          DEFINED in MAP-CommonDataTypes    :    336

       priorityLevel3..........................value reference EMLPP-Priority, 3
          DEFINED in MAP-CommonDataTypes    :    337

       priorityLevel4..........................value reference EMLPP-Priority, 4
          DEFINED in MAP-CommonDataTypes    :    338

       priorityLevelA..........................value reference EMLPP-Priority, 6
          DEFINED in MAP-CommonDataTypes    :    332
```

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priorityLevelB.......................value reference EMLPP-Priority, 5
   DEFINED in MAP-CommonDataTypes    :    333
```

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       PrivateExtension.....................type reference SEQUENCE
          DEFINED in MAP-ExtensionDataTypes :     40
             USED in MAP-ExtensionDataTypes :     15    38

       privateExtensionList.................identifier of [0] PrivateExtensionList
          DEFINED in MAP-ExtensionDataTypes :     33

       PrivateExtensionList.................type reference SEQUENCE OF
          DEFINED in MAP-ExtensionDataTypes :     37
             USED in MAP-ExtensionDataTypes :     33

       problem..............................identifier of CHOICE
          DEFINED in TCAPMessages           :    169

       processAccessSignalling..............value reference ProcessAccessSignalling, CHOICE VALUE
          DEFINED in MAP-Protocol           :    165

       ProcessAccessSignalling..............type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    232
             USED in MAP-Protocol           :     19   165
             USED in MAP-MobileServiceOpera :     32

       processGroupCallSignalling.............value reference ProcessGroupCallSignalling, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    258

       ProcessGroupCallSignalling.............type reference OPERATION
          DEFINED in MAP-Group-Call-Operati :     63
             USED in MAP-Protocol           :     93   258
             USED in MAP-Group-Call-Operati :     16

       processGroupCallSignallingArg..........identifier of ProcessGroupCallSignallingArg
          DEFINED in MAP-Group-Call-Operati :     65

       ProcessGroupCallSignallingArg..........type reference SEQUENCE
          DEFINED in MAP-GR-DataTypes       :     85
             USED in MAP-Group-Call-Operati :     36    65
             USED in MAP-GR-DataTypes       :     19

       processUnstructuredSS-Request.......value reference ProcessUnstructuredSS-Request, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    221

       ProcessUnstructuredSS-Request..........type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    175
             USED in MAP-Protocol           :     67   221
             USED in MAP-SupplementaryServi :     18

       protocolId...........................identifier of ProtocolId
          DEFINED in MAP-CommonDataTypes    :    169

       ProtocolId...........................type reference ENUMERATED
          DEFINED in MAP-CommonDataTypes    :    187
             USED in MAP-CommonDataTypes    :    169

       provideRoamingNumber.................value reference ProvideRoamingNumber, CHOICE VALUE
          DEFINED in MAP-Protocol           :    205

       ProvideRoamingNumber.................type reference OPERATION
          DEFINED in MAP-CallHandlingOperat :     96
             USED in MAP-Protocol           :     50   205
             USED in MAP-CallHandlingOperat :     14

       provideRoamingNumberArg..............identifier of ProvideRoamingNumberArg
          DEFINED in MAP-CallHandlingOperat :     98

       ProvideRoamingNumberArg..............type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    167
             USED in MAP-CallHandlingOperat :     54    98
             USED in MAP-CH-DataTypes       :     16

       provideRoamingNumberRes..............identifier of ProvideRoamingNumberRes
          DEFINED in MAP-CallHandlingOperat :    100

       ProvideRoamingNumberRes..............type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    184
             USED in MAP-CallHandlingOperat :     55   100
             USED in MAP-CH-DataTypes       :     17
```

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provideSIWFSNumber.....................value reference ProvideSIWFSNumber, CHOICE VALUE
   DEFINED in MAP-Protocol           :    207

ProvideSIWFSNumber.....................type reference OPERATION
```

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          DEFINED in MAP-CallHandlingOperat :    120
             USED in MAP-Protocol           :     52   207
             USED in MAP-CallHandlingOperat :     16

       provideSIWFSNumberArg...................identifier of ProvideSIWFSNumberArg
          DEFINED in MAP-CallHandlingOperat :    122

       ProvideSIWFSNumberArg..................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    258
             USED in MAP-CallHandlingOperat :     58   122
             USED in MAP-CH-DataTypes       :     23

       provideSIWFSNumberRes...................identifier of ProvideSIWFSNumberRes
          DEFINED in MAP-CallHandlingOperat :    124

       ProvideSIWFSNumberRes..................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    277
             USED in MAP-CallHandlingOperat :     59   124
             USED in MAP-CH-DataTypes       :     24

       provideSubscriberInfo..................value reference ProvideSubscriberInfo, CHOICE VALUE
          DEFINED in MAP-Protocol           :    243

       ProvideSubscriberInfo..................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    191
             USED in MAP-Protocol           :     29   243
             USED in MAP-MobileServiceOpera :     24

       provideSubscriberInfoArg................identifier of ProvideSubscriberInfoArg
          DEFINED in MAP-MobileServiceOpera :    193

       ProvideSubscriberInfoArg................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    877
             USED in MAP-MobileServiceOpera :    108   193
             USED in MAP-MS-DataTypes       :     71

       provideSubscriberInfoRes................identifier of ProvideSubscriberInfoRes
          DEFINED in MAP-MobileServiceOpera :    195

       ProvideSubscriberInfoRes................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    884
             USED in MAP-MobileServiceOpera :    109   195
             USED in MAP-MS-DataTypes       :     72

       provisionedSS...........................identifier of [7] Ext-SS-InfoList
          DEFINED in MAP-MS-DataTypes       :    369

       purgeMS.................................value reference PurgeMS, CHOICE VALUE
          DEFINED in MAP-Protocol           :    157

       PurgeMS.................................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    156
             USED in MAP-Protocol           :     14   157
             USED in MAP-MobileServiceOpera :     17

       purgeMS-Arg.............................identifier of PurgeMS-Arg
          DEFINED in MAP-MobileServiceOpera :    158

       PurgeMS-Arg.............................type reference  [3] SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    198
             USED in MAP-MobileServiceOpera :     90   158
             USED in MAP-MS-DataTypes       :     20

       purgeMS-Res.............................identifier of PurgeMS-Res
          DEFINED in MAP-MobileServiceOpera :    160

       PurgeMS-Res.............................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    205
             USED in MAP-MobileServiceOpera :     91   160
             USED in MAP-MS-DataTypes       :     21

       pvlr....................................identifier of Named Number, 3
          DEFINED in MAP-CommonDataTypes    :    268

       pw-RegistrationFailure..................value reference PW-RegistrationFailure, CHOICE VALUE
          DEFINED in MAP-Protocol           :    352

       PW-RegistrationFailure..................type reference ERROR
          DEFINED in MAP-Errors             :    316
             USED in MAP-Protocol           :    135   352
```

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USED in MAP-SupplementaryServi :     45   228
USED in MAP-Errors             :     64
```

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       pw-RegistrationFailureCause.............identifier of PW-RegistrationFailureCause
          DEFINED in MAP-Errors             :    318

       PW-RegistrationFailureCause.............type reference ENUMERATED
          DEFINED in MAP-ER-DataTypes       :    119
             USED in MAP-Errors             :     92   318
             USED in MAP-ER-DataTypes       :     18

       p-abortCause............................identifier of P-AbortCause
          DEFINED in TCAPMessages           :     76

       P-AbortCause............................type reference  [APPLICATION 10] IMPLICIT INTEGER
          DEFINED in TCAPMessages           :    102
             USED in TCAPMessages           :     76

       qos-Subscribed..........................identifier of [18] QoS-Subscribed
          DEFINED in MAP-MS-DataTypes       :    323

       QoS-Subscribed..........................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    355
             USED in MAP-MS-DataTypes       :    323

       rand....................................identifier of RAND
          DEFINED in MAP-MS-DataTypes       :    227

       RAND....................................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    232
             USED in MAP-MS-DataTypes       :    227

       readyForSM..............................value reference ReadyForSM, CHOICE VALUE
          DEFINED in MAP-Protocol           :    239

       ReadyForSM..............................type reference OPERATION
          DEFINED in MAP-ShortMessageServic :    137
             USED in MAP-Protocol           :     86   239
             USED in MAP-ShortMessageServic :     19

       readyForSM-Arg..........................identifier of ReadyForSM-Arg
          DEFINED in MAP-ShortMessageServic :    139

       ReadyForSM-Arg..........................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    192
             USED in MAP-ShortMessageServic :     56   139
             USED in MAP-SM-DataTypes       :     24

       readyForSM-Res..........................identifier of ReadyForSM-Res
          DEFINED in MAP-ShortMessageServic :    141

       ReadyForSM-Res..........................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    201
             USED in MAP-ShortMessageServic :     57   141
             USED in MAP-SM-DataTypes       :     25

       reason..................................identifier of CHOICE
          DEFINED in TCAPMessages           :     75

       regionalSubscNotSupported...............identifier of Named Number, 3
          DEFINED in MAP-MS-DataTypes       :    618

       regionalSubscriptionData................identifier of [10] ZoneCodeList
          DEFINED in MAP-MS-DataTypes       :    372

       regionalSubscriptionIdentifier..........identifier of [5] ZoneCode
          DEFINED in MAP-MS-DataTypes       :    627

       regionalSubscriptionResponse............identifier of [5] RegionalSubscriptionResponse
          DEFINED in MAP-MS-DataTypes       :    608

       RegionalSubscriptionResponse............type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    614
             USED in MAP-MS-DataTypes       :    609   650

       regionalSubscriptionResponse............identifier of [0] RegionalSubscriptionResponse
          DEFINED in MAP-MS-DataTypes       :    649

       registerCC-Entry........................value reference RegisterCC-Entry, CHOICE VALUE
          DEFINED in MAP-Protocol           :    227

       RegisterCC-Entry........................type reference OPERATION
```

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DEFINED in MAP-SupplementaryServi :    251
   USED in MAP-Protocol           :     73   227
```

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             USED in MAP-SupplementaryServi :     24

       registerCC-EntryArg.....................identifier of RegisterCC-EntryArg
          DEFINED in MAP-SupplementaryServi :    253

       RegisterCC-EntryArg.....................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    277
             USED in MAP-SupplementaryServi :     70   253
             USED in MAP-SS-DataTypes       :     35

       registerCC-EntryRes.....................identifier of RegisterCC-EntryRes
          DEFINED in MAP-SupplementaryServi :    255

       RegisterCC-EntryRes.....................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    296
             USED in MAP-SupplementaryServi :     71   255
             USED in MAP-SS-DataTypes       :     36

       registerPassword........................value reference RegisterPassword, CHOICE VALUE
          DEFINED in MAP-Protocol           :    225

       RegisterPassword........................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    217
             USED in MAP-Protocol           :     70   225
             USED in MAP-SupplementaryServi :     21

       registerSS..............................value reference RegisterSS, CHOICE VALUE
          DEFINED in MAP-Protocol           :    216

       RegisterSS..............................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :     87
             USED in MAP-Protocol           :     62   216
             USED in MAP-SupplementaryServi :     13

       registerSS-Arg..........................identifier of RegisterSS-Arg
          DEFINED in MAP-SupplementaryServi :     89

       RegisterSS-Arg..........................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :     69
             USED in MAP-SupplementaryServi :     60    89
             USED in MAP-SS-DataTypes       :     14

       reject..................................identifier of [4] IMPLICIT Reject
          DEFINED in TCAPMessages           :    128

       Reject..................................type reference SEQUENCE
          DEFINED in TCAPMessages           :    165
             USED in TCAPMessages           :    128

       rejected................................identifier of Named Number, 1
          DEFINED in MAP-CH-DataTypes       :    380

       releaseCall.............................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    769

       releaseGroupCall........................identifier of [2] NULL
          DEFINED in MAP-GR-DataTypes       :     88

       remoteUserFree..........................value reference RemoteUserFree, CHOICE VALUE
          DEFINED in MAP-Protocol           :    211

       RemoteUserFree..........................type reference OPERATION
          DEFINED in MAP-CallHandlingOperat :    169
             USED in MAP-Protocol           :     56   211
             USED in MAP-CallHandlingOperat :     20

       remoteUserFreeArg.......................identifier of RemoteUserFreeArg
          DEFINED in MAP-CallHandlingOperat :    171

       RemoteUserFreeArg.......................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    363
             USED in MAP-CallHandlingOperat :     66   171
             USED in MAP-CH-DataTypes       :     31

       remoteUserFreeRes.......................identifier of RemoteUserFreeRes
          DEFINED in MAP-CallHandlingOperat :    173

       RemoteUserFreeRes.......................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    373
             USED in MAP-CallHandlingOperat :     67   173
```

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            USED in MAP-CH-DataTypes        :      32
```

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       replaceB-Number.......................identifier of [4] NULL
          DEFINED in MAP-CH-DataTypes       :    368

       ReportingState........................type reference ENUMERATED
          DEFINED in MAP-CH-DataTypes       :    300
             USED in MAP-CH-DataTypes       :    296

       reportSM-DeliveryStatus...............value reference ReportSM-DeliveryStatus, CHOICE VALUE
          DEFINED in MAP-Protocol           :    236

       ReportSM-DeliveryStatus...............type reference OPERATION
          DEFINED in MAP-ShortMessageServic :    112
             USED in MAP-Protocol           :     83   236
             USED in MAP-ShortMessageServic :     16

       reportSM-DeliveryStatusArg............identifier of ReportSM-DeliveryStatusArg
          DEFINED in MAP-ShortMessageServic :    114

       ReportSM-DeliveryStatusArg............type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    142
             USED in MAP-ShortMessageServic :     52   114
             USED in MAP-SM-DataTypes       :     20

       reportSM-DeliveryStatusRes............identifier of ReportSM-DeliveryStatusRes
          DEFINED in MAP-ShortMessageServic :    116

       ReportSM-DeliveryStatusRes............type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :    167
             USED in MAP-ShortMessageServic :     53   116
             USED in MAP-SM-DataTypes       :     21

       requestedBasicServiceViolatesCUG-Constraidentifier of Named Number, 5
          DEFINED in MAP-ER-DataTypes       :    110

       requestedInfo.........................identifier of [2] RequestedInfo
          DEFINED in MAP-MS-DataTypes       :    880

       RequestedInfo.........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    895
             USED in MAP-MS-DataTypes       :    880   948

       requestedInfo.........................identifier of [1] RequestedInfo
          DEFINED in MAP-MS-DataTypes       :    948

       reset.................................value reference Reset, CHOICE VALUE
          DEFINED in MAP-Protocol           :    189

       Reset.................................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    303
             USED in MAP-Protocol           :     26   189
             USED in MAP-MobileServiceOpera :     47

       resetArg..............................identifier of ResetArg
          DEFINED in MAP-MobileServiceOpera :    305

       ResetArg..............................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    830
             USED in MAP-MobileServiceOpera :    105   305
             USED in MAP-MS-DataTypes       :     66

       resourceLimitation....................value reference ResourceLimitation, CHOICE VALUE
          DEFINED in MAP-Protocol           :    286

       ResourceLimitation....................type reference ERROR
          DEFINED in MAP-Errors             :    162
             USED in MAP-Protocol           :    142   286
             USED in MAP-CallHandlingOperat :     45   126   138   154
             USED in MAP-Errors             :     19

       resourceLimitation....................identifier of Named Number, 4
          DEFINED in TCAPMessages           :    107

       resourceLimitation....................identifier of Named Number, 3
          DEFINED in TCAPMessages           :    186

       resourceLimitationParam...............identifier of ResourceLimitationParam
          DEFINED in MAP-Errors             :    164

       ResourceLimitationParam...............type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    273
```

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USED in MAP-Errors            :    120   164
USED in MAP-ER-DataTypes      :     44
```

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       restoreData............................value reference RestoreData, CHOICE VALUE
          DEFINED in MAP-Protocol           :    192

       RestoreData............................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    309
             USED in MAP-Protocol           :     28   192
             USED in MAP-MobileServiceOpera :     49

       restoreDataArg.........................identifier of RestoreDataArg
          DEFINED in MAP-MobileServiceOpera :    311

       RestoreDataArg.........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    835
             USED in MAP-MobileServiceOpera :    106   311
             USED in MAP-MS-DataTypes       :     67

       restoreDataRes.........................identifier of RestoreDataRes
          DEFINED in MAP-MobileServiceOpera :    313

       RestoreDataRes.........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    842
             USED in MAP-MobileServiceOpera :    107   313
             USED in MAP-MS-DataTypes       :     68

       restrictedArea.........................identifier of Named Number, 2
          DEFINED in MAP-MS-DataTypes       :    941

       restrictedArea.........................identifier of Named Number, 1
          DEFINED in MAP-ER-DataTypes       :    234

       result-RR..............................identifier of SEQUENCE
          DEFINED in TCAPMessages           :    146

       resumeCallHandling.....................value reference ResumeCallHandling, CHOICE VALUE
          DEFINED in MAP-Protocol           :    206

       ResumeCallHandling.....................type reference OPERATION
          DEFINED in MAP-CallHandlingOperat :    110
             USED in MAP-Protocol           :     51   206
             USED in MAP-CallHandlingOperat :     15

       resumeCallHandlingArg..................identifier of ResumeCallHandlingArg
          DEFINED in MAP-CallHandlingOperat :    112

       ResumeCallHandlingArg..................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    189
             USED in MAP-CallHandlingOperat :     56   112
             USED in MAP-CH-DataTypes       :     18

       resumeCallHandlingRes..................identifier of ResumeCallHandlingRes
          DEFINED in MAP-CallHandlingOperat :    114

       ResumeCallHandlingRes..................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    200
             USED in MAP-CallHandlingOperat :     57   114
             USED in MAP-CH-DataTypes       :     19

       returnError............................identifier of [3] IMPLICIT ReturnError
          DEFINED in TCAPMessages           :    127

       ReturnError............................type reference SEQUENCE
          DEFINED in TCAPMessages           :    156
             USED in TCAPMessages           :    127

       returnErrorProblem.....................identifier of [3] IMPLICIT ReturnErrorProblem
          DEFINED in TCAPMessages           :    173

       ReturnErrorProblem.....................type reference INTEGER
          DEFINED in TCAPMessages           :    196
             USED in TCAPMessages           :    173

       returnErrorUnexpected..................identifier of Named Number, 1
          DEFINED in TCAPMessages           :    197

       ReturnResult...........................type reference SEQUENCE
          DEFINED in TCAPMessages           :    144
             USED in TCAPMessages           :    126   129

       returnResultLast.......................identifier of [2] IMPLICIT ReturnResult
```

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          DEFINED in TCAPMessages          :    126
```

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       returnResultNotLast.....................identifier of [7] IMPLICIT ReturnResult
          DEFINED in TCAPMessages           :    129

       returnResultProblem.....................identifier of [2] IMPLICIT ReturnResultProblem
          DEFINED in TCAPMessages           :    172

       ReturnResultProblem.....................type reference INTEGER
          DEFINED in TCAPMessages           :    192
             USED in TCAPMessages           :    172

       returnResultUnexpected..................identifier of Named Number, 1
          DEFINED in TCAPMessages           :    193

       roamingNotAllowed.......................value reference RoamingNotAllowed, CHOICE VALUE
          DEFINED in MAP-Protocol           :    300

       RoamingNotAllowed.......................type reference ERROR
          DEFINED in MAP-Errors             :    193
             USED in MAP-Protocol           :    110   300
             USED in MAP-MobileServiceOpera :     76   144   187
             USED in MAP-Errors             :     29

       roamingNotAllowedCause..................identifier of RoamingNotAllowedCause
          DEFINED in MAP-ER-DataTypes       :     77

       RoamingNotAllowedCause..................type reference ENUMERATED
          DEFINED in MAP-ER-DataTypes       :     81
             USED in MAP-ER-DataTypes       :     77

       roamingNotAllowedParam..................identifier of RoamingNotAllowedParam
          DEFINED in MAP-Errors             :    195

       RoamingNotAllowedParam..................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :     76
             USED in MAP-Errors             :    101   195
             USED in MAP-ER-DataTypes       :     14

       roamingNumber...........................identifier of ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    154

       roamingNumber...........................identifier of ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    185

       roamingRestrictedInSgsnDueToUnsupportedFidentifier of [23] NULL
          DEFINED in MAP-MS-DataTypes       :    299

       roamingRestrictedInSgsnDueToUnsuppportedidentifier of [11] NULL
          DEFINED in MAP-MS-DataTypes       :    634

       roamingRestrictionDueToUnsupportedFeaturidentifier of [9] NULL
          DEFINED in MAP-MS-DataTypes       :    371

       roamingRestrictionDueToUnsupportedFeaturidentifier of [4] NULL
          DEFINED in MAP-MS-DataTypes       :    626

       RoutingInfo.............................type reference CHOICE
          DEFINED in MAP-CH-DataTypes       :    153
             USED in MAP-CH-DataTypes       :    211

       routingInfo.............................identifier of RoutingInfo
          DEFINED in MAP-CH-DataTypes       :    211

       routingInfoForSM-Arg....................identifier of RoutingInfoForSM-Arg
          DEFINED in MAP-ShortMessageServic :     69

       RoutingInfoForSM-Arg....................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :     52
             USED in MAP-ShortMessageServic :     46    69
             USED in MAP-SM-DataTypes       :     14

       routingInfoForSM-Res....................identifier of RoutingInfoForSM-Res
          DEFINED in MAP-ShortMessageServic :     71

       RoutingInfoForSM-Res....................type reference SEQUENCE
          DEFINED in MAP-SM-DataTypes       :     79
             USED in MAP-ShortMessageServic :     47    71
             USED in MAP-SM-DataTypes       :     15

       rss.....................................identifier of Named Number, 7
          DEFINED in MAP-CommonDataTypes    :    272
```

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ruf-Outcome.............................identifier of [0] RUF-Outcome
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          DEFINED in MAP-CH-DataTypes       :    374

       RUF-Outcome............................type reference ENUMERATED
          DEFINED in MAP-CH-DataTypes       :    378
             USED in MAP-CH-DataTypes       :    374

       sc-AddressNotIncluded..................identifier of Named Number, 0
          DEFINED in MAP-SM-DataTypes       :    185

       sc-Congestion..........................identifier of Named Number, 4
          DEFINED in MAP-ER-DataTypes       :    130

       sendAuthenticationInfo.................value reference SendAuthenticationInfo, CHOICE VALUE
          DEFINED in MAP-Protocol           :    173

       SendAuthenticationInfo.................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    253
             USED in MAP-Protocol           :     22   173
             USED in MAP-MobileServiceOpera :     37

       sendAuthenticationInfoArg..............identifier of SendAuthenticationInfoArg
          DEFINED in MAP-MobileServiceOpera :    255

       SendAuthenticationInfoArg..............type reference IMSI
          DEFINED in MAP-MS-DataTypes       :    276
             USED in MAP-MobileServiceOpera :     98   255
             USED in MAP-MS-DataTypes       :     34

       sendAuthenticationInfoRes..............identifier of SendAuthenticationInfoRes
          DEFINED in MAP-MobileServiceOpera :    257

       SendAuthenticationInfoRes..............type reference AuthenticationSetList
          DEFINED in MAP-MS-DataTypes       :    278
             USED in MAP-MobileServiceOpera :     99   257
             USED in MAP-MS-DataTypes       :     35

       sendEndSignal..........................value reference SendEndSignal, CHOICE VALUE
          DEFINED in MAP-Protocol           :    164

       SendEndSignal..........................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    227
             USED in MAP-Protocol           :     18   164
             USED in MAP-MobileServiceOpera :     31

       sendGroupCallEndSignal.................value reference SendGroupCallEndSignal, CHOICE VALUE
          DEFINED in MAP-Protocol           :    257

       SendGroupCallEndSignal.................type reference OPERATION
          DEFINED in MAP-Group-Call-Operati :     56
             USED in MAP-Protocol           :     95   257
             USED in MAP-Group-Call-Operati :     14

       sendGroupCallEndSignalArg..............identifier of SendGroupCallEndSignalArg
          DEFINED in MAP-Group-Call-Operati :     58

       SendGroupCallEndSignalArg..............type reference SEQUENCE
          DEFINED in MAP-GR-DataTypes       :     66
             USED in MAP-Group-Call-Operati :     33    58
             USED in MAP-GR-DataTypes       :     16

       sendGroupCallEndSignalRes..............identifier of SendGroupCallEndSignalRes
          DEFINED in MAP-Group-Call-Operati :     60

       SendGroupCallEndSignalRes..............type reference SEQUENCE
          DEFINED in MAP-GR-DataTypes       :     71
             USED in MAP-Group-Call-Operati :     34    60
             USED in MAP-GR-DataTypes       :     17

       sendIdentification.....................value reference SendIdentification, CHOICE VALUE
          DEFINED in MAP-Protocol           :    158

       SendIdentification.....................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    167
             USED in MAP-Protocol           :     15   158
             USED in MAP-MobileServiceOpera :     18

       sendIdentificationRes..................identifier of SendIdentificationRes
          DEFINED in MAP-MobileServiceOpera :    171

       SendIdentificationRes..................type reference SEQUENCE
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          DEFINED in MAP-MS-DataTypes       :    218
             USED in MAP-MobileServiceOpera :     92   171
```

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             USED in MAP-MS-DataTypes       :     22

       sendIMSI..............................value reference SendIMSI, CHOICE VALUE
          DEFINED in MAP-Protocol           :    199

       SendIMSI..............................type reference OPERATION
          DEFINED in MAP-OperationAndMainte :     77
             USED in MAP-Protocol           :     43   199
             USED in MAP-OperationAndMainte :     15

       sendRoutingInfo.......................value reference SendRoutingInfo, CHOICE VALUE
          DEFINED in MAP-Protocol           :    204

       SendRoutingInfo.......................type reference OPERATION
          DEFINED in MAP-CallHandlingOperat :     74
             USED in MAP-Protocol           :     49   204
             USED in MAP-CallHandlingOperat :     13

       sendRoutingInfoArg....................identifier of SendRoutingInfoArg
          DEFINED in MAP-CallHandlingOperat :     76

       SendRoutingInfoArg....................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :     86
             USED in MAP-CallHandlingOperat :     52    76
             USED in MAP-CH-DataTypes       :     14

       sendRoutingInfoForGprs................value reference SendRoutingInfoForGprs, CHOICE VALUE
          DEFINED in MAP-Protocol           :    268

       SendRoutingInfoForGprs................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    322
             USED in MAP-Protocol           :     31   268
             USED in MAP-MobileServiceOpera :     52

       sendRoutingInfoForGprsArg.............identifier of SendRoutingInfoForGprsArg
          DEFINED in MAP-MobileServiceOpera :    324

       SendRoutingInfoForGprsArg.............type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    787
             USED in MAP-MobileServiceOpera :    112   324
             USED in MAP-MS-DataTypes       :     82

       sendRoutingInfoForGprsRes.............identifier of SendRoutingInfoForGprsRes
          DEFINED in MAP-MobileServiceOpera :    326

       SendRoutingInfoForGprsRes.............type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    794
             USED in MAP-MobileServiceOpera :    113   326
             USED in MAP-MS-DataTypes       :     83

       sendRoutingInfoForSM..................value reference SendRoutingInfoForSM, CHOICE VALUE
          DEFINED in MAP-Protocol           :    233

       SendRoutingInfoForSM..................type reference OPERATION
          DEFINED in MAP-ShortMessageServic :     67
             USED in MAP-Protocol           :     80   233
             USED in MAP-ShortMessageServic :     13

       sendRoutingInfoRes....................identifier of SendRoutingInfoRes
          DEFINED in MAP-CallHandlingOperat :     78

       SendRoutingInfoRes....................type reference  [3] SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    127
             USED in MAP-CallHandlingOperat :     53    78
             USED in MAP-CH-DataTypes       :     15

       serviceCentreAddress..................identifier of [2] AddressString
          DEFINED in MAP-SM-DataTypes       :     55

       serviceCentreAddress..................identifier of AddressString
          DEFINED in MAP-SM-DataTypes       :    144

       serviceCentreAddress..................identifier of AddressString
          DEFINED in MAP-SM-DataTypes       :    175

       serviceCentreAddressDA................identifier of [4] AddressString
          DEFINED in MAP-SM-DataTypes       :    134

       serviceCentreAddressOA................identifier of [4] AddressString
          DEFINED in MAP-SM-DataTypes       :    139
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serviceGranted.....................identifier of Named Number, 0
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          DEFINED in MAP-MS-DataTypes       :    382

       serviceIndicator.....................identifier of [2] ServiceIndicator
          DEFINED in MAP-SS-DataTypes       :    285

       ServiceIndicator.....................type reference BIT STRING
          DEFINED in MAP-SS-DataTypes       :    290
             USED in MAP-SS-DataTypes       :    285

       serviceKey...........................identifier of ServiceKey
          DEFINED in MAP-MS-DataTypes       :    701

       ServiceKey...........................type reference INTEGER
          DEFINED in MAP-MS-DataTypes       :    708
             USED in MAP-MS-DataTypes       :     54   701
             USED in MAP-CH-DataTypes       :     38   244

       serviceKey...........................identifier of ServiceKey
          DEFINED in MAP-CH-DataTypes       :    244

       setReportingState....................value reference SetReportingState, CHOICE VALUE
          DEFINED in MAP-Protocol           :    209

       SetReportingState....................type reference OPERATION
          DEFINED in MAP-CallHandlingOperat :    143
             USED in MAP-Protocol           :     54   209
             USED in MAP-CallHandlingOperat :     18

       setReportingStateArg.................identifier of SetReportingStateArg
          DEFINED in MAP-CallHandlingOperat :    145

       SetReportingStateArg.................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    293
             USED in MAP-CallHandlingOperat :     62   145
             USED in MAP-CH-DataTypes       :     27

       setReportingStateRes.................identifier of SetReportingStateRes
          DEFINED in MAP-CallHandlingOperat :    147

       SetReportingStateRes.................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    308
             USED in MAP-CallHandlingOperat :     63   147
             USED in MAP-CH-DataTypes       :     28

       sgsn-Address.........................identifier of GSN-Address
          DEFINED in MAP-MS-DataTypes       :    243

       sgsn-Address.........................identifier of [0] GSN-Address
          DEFINED in MAP-MS-DataTypes       :    795

       sgsn-Address.........................identifier of [1] GSN-Address
          DEFINED in MAP-MS-DataTypes       :    818

       sgsn-Number..........................identifier of [1] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    201

       sgsn-Number..........................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    242

       sgsn-Number..........................identifier of [1] ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :     99

       shortMessageMO-PP....................value reference TeleserviceCode, '00100010'B
          DEFINED in MAP-TS-Code            :     46

       shortMessageMT-PP....................value reference TeleserviceCode, '00100001'B
          DEFINED in MAP-TS-Code            :     45

       shortTermDenial......................value reference ShortTermDenial, CHOICE VALUE
          DEFINED in MAP-Protocol           :    356

       ShortTermDenial......................type reference ERROR
          DEFINED in MAP-Errors             :    324
             USED in MAP-Protocol           :    144   356
             USED in MAP-SupplementaryServi :     53   264
             USED in MAP-Errors             :     67

       shortTermDenialParam.................identifier of ShortTermDenialParam
          DEFINED in MAP-Errors             :    326
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ShortTermDenialParam...................type reference SEQUENCE
   DEFINED in MAP-ER-DataTypes       :    285
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             USED in MAP-Errors             :    123   326
             USED in MAP-ER-DataTypes       :     47

       signalInfo.............................identifier of SignalInfo
          DEFINED in MAP-CommonDataTypes    :    170

       SignalInfo.............................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :    177
             USED in MAP-CommonDataTypes    :     21   170
             USED in MAP-SM-DataTypes       :     33   109   114   121   127
             USED in MAP-ER-DataTypes       :     58   136

       sIWFSNumber............................identifier of [0] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    278

       sIWFSSignallingModify..................value reference SIWFSSignallingModify, CHOICE VALUE
          DEFINED in MAP-Protocol           :    208

       SIWFSSignallingModify..................type reference OPERATION
          DEFINED in MAP-CallHandlingOperat :    131
             USED in MAP-Protocol           :     53   208
             USED in MAP-CallHandlingOperat :     17

       sIWFSSignallingModifyArg...............identifier of SIWFSSignallingModifyArg
          DEFINED in MAP-CallHandlingOperat :    133

       SIWFSSignallingModifyArg...............type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    282
             USED in MAP-CallHandlingOperat :     60   133
             USED in MAP-CH-DataTypes       :     25

       sIWFSSignallingModifyRes...............identifier of SIWFSSignallingModifyRes
          DEFINED in MAP-CallHandlingOperat :    135

       SIWFSSignallingModifyRes...............type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    288
             USED in MAP-CallHandlingOperat :     61   135
             USED in MAP-CH-DataTypes       :     26

       sm-DeliveryFailure.....................value reference SM-DeliveryFailure, CHOICE VALUE
          DEFINED in MAP-Protocol           :    363

       SM-DeliveryFailure.....................type reference ERROR
          DEFINED in MAP-Errors             :    342
             USED in MAP-Protocol           :    139   363
             USED in MAP-ShortMessageServic :     39    92   109
             USED in MAP-Errors             :     72

       sm-DeliveryFailureCause................identifier of SM-DeliveryFailureCause
          DEFINED in MAP-Errors             :    344

       SM-DeliveryFailureCause................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    134
             USED in MAP-Errors             :     93   344
             USED in MAP-ER-DataTypes       :     19

       sm-DeliveryOutcome.....................identifier of SM-DeliveryOutcome
          DEFINED in MAP-SM-DataTypes       :    145

       SM-DeliveryOutcome.....................type reference ENUMERATED
          DEFINED in MAP-SM-DataTypes       :    162
             USED in MAP-SM-DataTypes       :     26   145   156

       SM-EnumeratedDeliveryFailureCause.......type reference ENUMERATED
          DEFINED in MAP-ER-DataTypes       :    125
             USED in MAP-ER-DataTypes       :    135

       sm-EnumeratedDeliveryFailureCause.......identifier of SM-EnumeratedDeliveryFailureCause
          DEFINED in MAP-ER-DataTypes       :    135

       sm-RP-DA...............................identifier of SM-RP-DA
          DEFINED in MAP-SM-DataTypes       :    107

       sm-RP-DA...............................identifier of SM-RP-DA
          DEFINED in MAP-SM-DataTypes       :    119

       SM-RP-DA...............................type reference CHOICE
          DEFINED in MAP-SM-DataTypes       :    131
             USED in MAP-SM-DataTypes       :    107   119
```

```
sm-RP-MTI.............................identifier of [8] SM-RP-MTI
   DEFINED in MAP-SM-DataTypes       :     61
```

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       SM-RP-MTI..............................type reference INTEGER
          DEFINED in MAP-SM-DataTypes       :     64
             USED in MAP-SM-DataTypes       :     61

       sm-RP-OA...............................identifier of SM-RP-OA
          DEFINED in MAP-SM-DataTypes       :    108

       sm-RP-OA...............................identifier of SM-RP-OA
          DEFINED in MAP-SM-DataTypes       :    120

       SM-RP-OA...............................type reference CHOICE
          DEFINED in MAP-SM-DataTypes       :    137
             USED in MAP-SM-DataTypes       :    108   120

       sm-RP-PRI..............................identifier of [1] BOOLEAN
          DEFINED in MAP-SM-DataTypes       :     54

       sm-RP-SMEA.............................identifier of [9] SM-RP-SMEA
          DEFINED in MAP-SM-DataTypes       :     62

       SM-RP-SMEA.............................type reference OCTET STRING
          DEFINED in MAP-SM-DataTypes       :     71
             USED in MAP-SM-DataTypes       :     62

       sm-RP-UI...............................identifier of SignalInfo
          DEFINED in MAP-SM-DataTypes       :    109

       sm-RP-UI...............................identifier of SignalInfo
          DEFINED in MAP-SM-DataTypes       :    114

       sm-RP-UI...............................identifier of SignalInfo
          DEFINED in MAP-SM-DataTypes       :    121

       sm-RP-UI...............................identifier of SignalInfo
          DEFINED in MAP-SM-DataTypes       :    127

       sres...................................identifier of SRES
          DEFINED in MAP-MS-DataTypes       :    228

       SRES...................................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    234
             USED in MAP-MS-DataTypes       :    228

       ss-AccessBarred........................identifier of Named Number, 5
          DEFINED in MAP-MS-DataTypes       :    410

       ss-CamelData...........................identifier of SS-CamelData
          DEFINED in MAP-MS-DataTypes       :    663

       SS-CamelData...........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    667
             USED in MAP-MS-DataTypes       :    663

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-SupplementaryServi :    219

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-MS-DataTypes       :    440

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-MS-DataTypes       :    517

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-MS-DataTypes       :    588

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-SS-DataTypes       :     70

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-SS-DataTypes       :     86

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-SS-DataTypes       :    140

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-SS-DataTypes       :    153

       ss-Code................................identifier of SS-Code
          DEFINED in MAP-SS-DataTypes       :    175
```

```
ss-Code.............................identifier of [0] SS-Code
```

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          DEFINED in MAP-SS-DataTypes       :    278

       ss-Code.............................identifier of [0] SS-Code
          DEFINED in MAP-SS-DataTypes       :    301

       ss-Code.............................identifier of [0] SS-Code
          DEFINED in MAP-SS-DataTypes       :    306

       SS-Code.............................type reference OCTET STRING
          DEFINED in MAP-SS-Code            :     11
             USED in MAP-SupplementaryServi :     78   219
             USED in MAP-MS-DataTypes       :    104   440   517   588   674
             USED in MAP-SS-DataTypes       :     62    70    86   140   153   175   243   258   278
                                                 301   306
             USED in MAP-SS-Code            :     21    25    28    30    32    34    36    40    42
                                                  48    50    52    54    56    58    60    63    66
                                                  68    72    75    77    79    81    85    88    91
                                                  94    97   100   102   105   108   112   114   116
                                                 118   120   123   125   127   131   132   133   134
                                                 135   136   137   138   139   140   141   142   143
                                                 144   145   146   148   151
             USED in MAP-ER-DataTypes       :     65   114

       ss-Code.............................identifier of [1] SS-Code
          DEFINED in MAP-ER-DataTypes       :    114

       ss-CSI..............................identifier of [2] SS-CSI
          DEFINED in MAP-MS-DataTypes       :    658

       SS-CSI..............................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    662
             USED in MAP-MS-DataTypes       :     53   658

       ss-Data.............................identifier of [3] Ext-SS-Data
          DEFINED in MAP-MS-DataTypes       :    435

       ss-Data.............................identifier of [3] SS-Data
          DEFINED in MAP-SS-DataTypes       :     83

       SS-Data.............................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    152
             USED in MAP-SS-DataTypes       :     31    83

       ss-ErrorStatus......................value reference SS-ErrorStatus, CHOICE VALUE
          DEFINED in MAP-Protocol           :    346

       SS-ErrorStatus......................type reference ERROR
          DEFINED in MAP-Errors             :    298
             USED in MAP-Protocol           :    129   346
             USED in MAP-SupplementaryServi :     41   101   118   135   155   262   279
             USED in MAP-Errors             :     58

       ss-Event............................identifier of [2] SS-Code
          DEFINED in MAP-SS-DataTypes       :    258

       ss-EventList........................identifier of SS-EventList
          DEFINED in MAP-MS-DataTypes       :    668

       SS-EventList........................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    674
             USED in MAP-MS-DataTypes       :    668

       ss-EventSpecification...............identifier of [3] SS-EventSpecification
          DEFINED in MAP-SS-DataTypes       :    263

       SS-EventSpecification...............type reference SEQUENCE OF
          DEFINED in MAP-SS-DataTypes       :    272
             USED in MAP-SS-DataTypes       :    263

       ss-ForBS............................identifier of SS-ForBS-Code
          DEFINED in MAP-SupplementaryServi :    106

       ss-ForBS............................identifier of SS-ForBS-Code
          DEFINED in MAP-SupplementaryServi :    123

       ss-ForBS............................identifier of SS-ForBS-Code
          DEFINED in MAP-SupplementaryServi :    143

       ss-ForBS............................identifier of SS-ForBS-Code
          DEFINED in MAP-SupplementaryServi :    162
```

```
SS-ForBS-Code.........................type reference SEQUENCE
```

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          DEFINED in MAP-SS-DataTypes       :    174
             USED in MAP-SupplementaryServi :     62   106   123   143   162
             USED in MAP-SS-DataTypes       :     18

       ss-Incompatibility.....................value reference SS-Incompatibility, CHOICE VALUE
          DEFINED in MAP-Protocol           :    349

       SS-Incompatibility.....................type reference ERROR
          DEFINED in MAP-Errors             :    307
             USED in MAP-Protocol           :    132   349
             USED in MAP-SupplementaryServi :     44   102   137   263
             USED in MAP-Errors             :     61

       ss-IncompatibilityCause................identifier of SS-IncompatibilityCause
          DEFINED in MAP-Errors             :    309

       SS-IncompatibilityCause................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    113
             USED in MAP-Errors             :     91   309
             USED in MAP-ER-DataTypes       :     17

       ss-Info................................identifier of SS-Info
          DEFINED in MAP-SupplementaryServi :     91

       ss-Info................................identifier of SS-Info
          DEFINED in MAP-SupplementaryServi :    108

       ss-Info................................identifier of SS-Info
          DEFINED in MAP-SupplementaryServi :    125

       ss-Info................................identifier of SS-Info
          DEFINED in MAP-SupplementaryServi :    145

       SS-Info................................type reference CHOICE
          DEFINED in MAP-SS-DataTypes       :     80
             USED in MAP-SupplementaryServi :     61    91   108   125   145
             USED in MAP-SS-DataTypes       :     15   248

       SS-InfoList............................type reference SEQUENCE OF
          DEFINED in MAP-SS-DataTypes       :    247
             USED in MAP-SS-DataTypes       :     25

       ss-InvocationNotification..............value reference SS-InvocationNotification, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    251

       SS-InvocationNotification..............type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    240
             USED in MAP-Protocol           :     72   251
             USED in MAP-SupplementaryServi :     23

       ss-InvocationNotificationArg...........identifier of SS-InvocationNotificationArg
          DEFINED in MAP-SupplementaryServi :    242

       SS-InvocationNotificationArg...........type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    255
             USED in MAP-SupplementaryServi :     68   242
             USED in MAP-SS-DataTypes       :     32

       ss-InvocationNotificationRes...........identifier of SS-InvocationNotificationRes
          DEFINED in MAP-SupplementaryServi :    244

       SS-InvocationNotificationRes...........type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    267
             USED in MAP-SupplementaryServi :     69   244
             USED in MAP-SS-DataTypes       :     33

       ss-List................................identifier of [3] SS-List
          DEFINED in MAP-MS-DataTypes       :    606

       ss-List................................identifier of [2] SS-List
          DEFINED in MAP-MS-DataTypes       :    625

       ss-List................................identifier of [1] SS-List
          DEFINED in MAP-CH-DataTypes       :    136

       SS-List................................type reference SEQUENCE OF
          DEFINED in MAP-SS-DataTypes       :    242
             USED in MAP-MS-DataTypes       :     99   606   625
             USED in MAP-CH-DataTypes       :     51   136
```

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            USED in MAP-SS-DataTypes       :     24

       ss-NotAvailable.....................value reference SS-NotAvailable, CHOICE VALUE
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          DEFINED in MAP-Protocol           :    347

       SS-NotAvailable.....................type reference ERROR
          DEFINED in MAP-Errors             :    303
             USED in MAP-Protocol           :    130   347
             USED in MAP-SupplementaryServi :     42   173
             USED in MAP-Errors             :     59

       ss-Status...........................identifier of SS-Status
          DEFINED in MAP-Errors             :    300

       ss-Status...........................identifier of [4] Ext-SS-Status
          DEFINED in MAP-MS-DataTypes       :    450

       ss-Status...........................identifier of [4] Ext-SS-Status
          DEFINED in MAP-MS-DataTypes       :    527

       ss-Status...........................identifier of [4] Ext-SS-Status
          DEFINED in MAP-MS-DataTypes       :    589

       ss-Status...........................identifier of [4] SS-Status
          DEFINED in MAP-SS-DataTypes       :     96

       SS-Status...........................type reference OCTET STRING
          DEFINED in MAP-SS-DataTypes       :    103
             USED in MAP-Errors             :     86   300
             USED in MAP-SS-DataTypes       :     16    96   149   154   180   202   307
             USED in MAP-ER-DataTypes       :     53   116

       ss-Status...........................identifier of [4] SS-Status
          DEFINED in MAP-SS-DataTypes       :    149

       ss-Status...........................identifier of [4] SS-Status
          DEFINED in MAP-SS-DataTypes       :    154

       ss-Status...........................identifier of SS-Status
          DEFINED in MAP-SS-DataTypes       :    180

       ss-Status...........................identifier of [0] SS-Status
          DEFINED in MAP-SS-DataTypes       :    202

       ss-Status...........................identifier of [1] SS-Status
          DEFINED in MAP-SS-DataTypes       :    307

       ss-Status...........................identifier of [4] SS-Status
          DEFINED in MAP-ER-DataTypes       :    116

       ss-SubscriptionOption...............identifier of SS-SubscriptionOption
          DEFINED in MAP-MS-DataTypes       :    590

       ss-SubscriptionOption...............identifier of SS-SubscriptionOption
          DEFINED in MAP-SS-DataTypes       :    155

       SS-SubscriptionOption...............type reference CHOICE
          DEFINED in MAP-SS-DataTypes       :    161
             USED in MAP-MS-DataTypes       :     98   590
             USED in MAP-SS-DataTypes       :     17   155

       ss-SubscriptionViolation............value reference SS-SubscriptionViolation, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    348

       SS-SubscriptionViolation............type reference ERROR
          DEFINED in MAP-Errors             :    305
             USED in MAP-Protocol           :    131   348
             USED in MAP-SupplementaryServi :     43   136   156   227
             USED in MAP-Errors             :     60

       startMonitoring.....................identifier of Named Number, 1
          DEFINED in MAP-CH-DataTypes       :    302

       statusReport........................value reference StatusReport, CHOICE VALUE
          DEFINED in MAP-Protocol           :    210

       StatusReport........................type reference OPERATION
          DEFINED in MAP-CallHandlingOperat :    157
             USED in MAP-Protocol           :     55   210
             USED in MAP-CallHandlingOperat :     19

       statusReportArg.....................identifier of StatusReportArg
```

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   DEFINED in MAP-CallHandlingOperat :    159

StatusReportArg.....................type reference SEQUENCE
```

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          DEFINED in MAP-CH-DataTypes       :    323
             USED in MAP-CallHandlingOperat :     64   159
             USED in MAP-CH-DataTypes       :     29

       statusReportRes.......................identifier of StatusReportRes
          DEFINED in MAP-CallHandlingOperat :    161

       StatusReportRes.......................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    359
             USED in MAP-CallHandlingOperat :     65   161
             USED in MAP-CH-DataTypes       :     30

       stopMonitoring........................identifier of Named Number, 0
          DEFINED in MAP-CH-DataTypes       :    301

       storedMSISDN..........................identifier of ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :    168

       storedMSISDN..........................identifier of ISDN-AddressString
          DEFINED in MAP-SM-DataTypes       :    179

       subBusyForMT-SMS-Param................identifier of SubBusyForMT-SMS-Param
          DEFINED in MAP-Errors             :    339

       SubBusyForMT-SMS-Param................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    262
             USED in MAP-Errors             :    117   339
             USED in MAP-ER-DataTypes       :     40

       subscriberBusyForMT-SMS...............value reference SubscriberBusyForMT-SMS, CHOICE VALUE
          DEFINED in MAP-Protocol           :    362

       SubscriberBusyForMT-SMS...............type reference ERROR
          DEFINED in MAP-Errors             :    337
             USED in MAP-Protocol           :    138   362
             USED in MAP-ShortMessageServic :     38   108
             USED in MAP-Errors             :     71

       SubscriberData........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    359
             USED in MAP-MS-DataTypes       :     46   293

       SubscriberId..........................type reference CHOICE
          DEFINED in MAP-CommonDataTypes    :    233
             USED in MAP-CommonDataTypes    :     28

       subscriberIdentity....................identifier of [0] SubscriberIdentity
          DEFINED in MAP-MS-DataTypes       :    947

       SubscriberIdentity....................type reference CHOICE
          DEFINED in MAP-MS-DataTypes       :    958
             USED in MAP-MS-DataTypes       :    947

       subscriberInfo........................identifier of SubscriberInfo
          DEFINED in MAP-MS-DataTypes       :    885

       SubscriberInfo........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    889
             USED in MAP-MS-DataTypes       :     73   885   954
             USED in MAP-CH-DataTypes       :     37   135

       subscriberInfo........................identifier of SubscriberInfo
          DEFINED in MAP-MS-DataTypes       :    954

       subscriberInfo........................identifier of [7] SubscriberInfo
          DEFINED in MAP-CH-DataTypes       :    135

       subscriberNotMemberOfCUG..............identifier of Named Number, 1
          DEFINED in MAP-ER-DataTypes       :    109

       subscriberNotSC-Subscriber............identifier of Named Number, 6
          DEFINED in MAP-ER-DataTypes       :    132

       subscriberState.......................identifier of [1] SubscriberState
          DEFINED in MAP-MS-DataTypes       :    891

       subscriberState.......................identifier of [1] NULL
          DEFINED in MAP-MS-DataTypes       :    897

       SubscriberState.......................type reference CHOICE
```

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          DEFINED in MAP-MS-DataTypes       :    932
             USED in MAP-MS-DataTypes       :     75   891
```

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       subscriberStatus.....................identifier of [3] SubscriberStatus
          DEFINED in MAP-MS-DataTypes       :    362

       SubscriberStatus.....................type reference ENUMERATED
          DEFINED in MAP-MS-DataTypes       :    381
             USED in MAP-MS-DataTypes       :     48   362

       subscriptionWithdraw.................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    189

       subsequentHandoverFailure............value reference SubsequentHandoverFailure, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    313

       SubsequentHandoverFailure............type reference ERROR
          DEFINED in MAP-Errors             :    226
             USED in MAP-Protocol           :    116   313
             USED in MAP-MobileServiceOpera :     79   249
             USED in MAP-Errors             :     37

       success..............................identifier of Named Number, 0
          DEFINED in MAP-CH-DataTypes       :    350

       successfulTransfer...................identifier of Named Number, 2
          DEFINED in MAP-SM-DataTypes       :    165

       supportedCamelPhases.................identifier of [0] SupportedCamelPhases
          DEFINED in MAP-MS-DataTypes       :    165

       supportedCamelPhases.................identifier of [6] SupportedCamelPhases
          DEFINED in MAP-MS-DataTypes       :    610

       SupportedCamelPhases.................type reference BIT STRING
          DEFINED in MAP-MS-DataTypes       :    780
             USED in MAP-MS-DataTypes       :     58   165   610
             USED in MAP-CH-DataTypes       :     40   182   205

       supportedCamelPhases.................identifier of SupportedCamelPhases
          DEFINED in MAP-CH-DataTypes       :    205

       supportedCamelPhasesInGMSC...........identifier of [15] SupportedCamelPhases
          DEFINED in MAP-CH-DataTypes       :    182

       supportedCCBS-Phase..................identifier of [16] SupportedCCBS-Phase
          DEFINED in MAP-CH-DataTypes       :    104

       SupportedCCBS-Phase..................type reference INTEGER
          DEFINED in MAP-CH-DataTypes       :    121
             USED in MAP-CH-DataTypes       :    104

       suppressionOfAnnouncement............identifier of [12] SuppressionOfAnnouncement
          DEFINED in MAP-CH-DataTypes       :     99

       SuppressionOfAnnouncement............type reference NULL
          DEFINED in MAP-CH-DataTypes       :    106
             USED in MAP-CH-DataTypes       :     21    99   174

       suppressionOfAnnouncement............identifier of [7] SuppressionOfAnnouncement
          DEFINED in MAP-CH-DataTypes       :    174

       suppress-T-CSI.......................identifier of NULL
          DEFINED in MAP-CH-DataTypes       :    206

       systemFailure........................value reference SystemFailure, CHOICE VALUE
          DEFINED in MAP-Protocol           :    281

       SystemFailure........................type reference ERROR
          DEFINED in MAP-Errors             :    134
             USED in MAP-Protocol           :    101   281
             USED in MAP-MobileServiceOpera :     69   140   184   208   222   260   273   315   329
                                                 343   357
             USED in MAP-OperationAndMainte :     23    57    71
             USED in MAP-CallHandlingOperat :     28    80   102   129   141   150   165   179
             USED in MAP-SupplementaryServi :     33    94   111   128   148   166   181   194   208
                                                 223   257   274
             USED in MAP-ShortMessageServic :     27    73    89   101   129
             USED in MAP-Group-Call-Operati :     24    52
             USED in MAP-Errors             :     14
```

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systemFailureParam.....................identifier of SystemFailureParam
   DEFINED in MAP-Errors              :    136
```

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       SystemFailureParam.....................type reference CHOICE
          DEFINED in MAP-ER-DataTypes       :    154
             USED in MAP-Errors             :     94   136
             USED in MAP-ER-DataTypes       :     20

       targetCellId...........................identifier of GlobalCellId
          DEFINED in MAP-MS-DataTypes       :    258

       targetCellId...........................identifier of GlobalCellId
          DEFINED in MAP-MS-DataTypes       :    269

       targetMSC-Number.......................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    270

       TBCD-STRING............................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :     69
             USED in MAP-CommonDataTypes    :    224   227   237

       TCAPMessages...........................module reference
          DEFINED in TCAPMessages           :      1
             USED in MAP-MobileServiceOpera :     66
             USED in MAP-OperationAndMainte :     20
             USED in MAP-CallHandlingOperat :     25
             USED in MAP-SupplementaryServi :     30
             USED in MAP-ShortMessageServic :     24
             USED in MAP-Group-Call-Operati :     21
             USED in MAP-Errors             :     83

       telephony..............................value reference TeleserviceCode, '00010001'B
          DEFINED in MAP-TS-Code            :     41

       teleservice............................identifier of [3] TeleserviceCode
          DEFINED in MAP-CommonDataTypes    :    314

       teleservice............................identifier of Ext-TeleserviceCode
          DEFINED in MAP-GR-DataTypes       :     50

       TeleserviceCode........................type reference OCTET STRING
          DEFINED in MAP-TS-Code            :     11
             USED in MAP-CommonDataTypes    :     48   314
             USED in MAP-TS-Code            :     38    40    41    42    44    45    46    48    49
                                                  50    51    55    58    67    69    70    72    73
                                                  74    75    76    77    78    79    80    81    82
                                                  83    84    85    86    87

       teleserviceList........................identifier of [6] TeleserviceList
          DEFINED in MAP-MS-DataTypes       :    366

       TeleserviceList........................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    390
             USED in MAP-MS-DataTypes       :    366   604

       teleserviceList........................identifier of [1] TeleserviceList
          DEFINED in MAP-MS-DataTypes       :    604

       teleserviceNotProvisioned..............value reference TeleserviceNotProvisioned, CHOICE
VALUE
          DEFINED in MAP-Protocol           :    305

       TeleserviceNotProvisioned..............type reference ERROR
          DEFINED in MAP-Errors             :    215
             USED in MAP-Protocol           :    114   305
             USED in MAP-CallHandlingOperat :     36    88
             USED in MAP-SupplementaryServi :     38    98   115   132   152   170
             USED in MAP-ShortMessageServic :     35    78
             USED in MAP-Errors             :     33

       teleservNotProvParam...................identifier of TeleservNotProvParam
          DEFINED in MAP-Errors             :    217

       TeleservNotProvParam...................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    215
             USED in MAP-Errors             :    105   217
             USED in MAP-ER-DataTypes       :     31

       temporaryDefaultAllowed................identifier of Named Number, 2
          DEFINED in MAP-SS-DataTypes       :    168

       temporaryDefaultRestricted.............identifier of Named Number, 1
          DEFINED in MAP-SS-DataTypes       :    167
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termAttemptAuthorized..................identifier of Named Number, 12
   DEFINED in MAP-CH-DataTypes       :    251
```

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       tmsi.................................identifier of TMSI
          DEFINED in MAP-MobileServiceOpera :    169

       TMSI.................................type reference OCTET STRING
          DEFINED in MAP-CommonDataTypes    :    231
             USED in MAP-MobileServiceOpera :    124   169
             USED in MAP-CommonDataTypes    :     27   235

       tmsi.................................identifier of [1] TMSI
          DEFINED in MAP-CommonDataTypes    :    235

       tooManyZoneCodes.....................identifier of Named Number, 1
          DEFINED in MAP-MS-DataTypes       :    616

       traceReference.......................identifier of [1] TraceReference
          DEFINED in MAP-OM-DataTypes       :     38

       TraceReference.......................type reference OCTET STRING
          DEFINED in MAP-OM-DataTypes       :     44
             USED in MAP-OM-DataTypes       :     38    56

       traceReference.......................identifier of [1] TraceReference
          DEFINED in MAP-OM-DataTypes       :     56

       traceType............................identifier of [2] TraceType
          DEFINED in MAP-OM-DataTypes       :     39

       TraceType............................type reference INTEGER
          DEFINED in MAP-OM-DataTypes       :     46
             USED in MAP-OM-DataTypes       :     39

       tracingBufferFull....................value reference TracingBufferFull, CHOICE VALUE
          DEFINED in MAP-Protocol           :    319

       TracingBufferFull....................type reference ERROR
          DEFINED in MAP-Errors             :    231
             USED in MAP-Protocol           :    117   319
             USED in MAP-OperationAndMainte :     29    62
             USED in MAP-Errors             :     40

       tracingBufferFullParam...............identifier of TracingBufferFullParam
          DEFINED in MAP-Errors             :    233

       TracingBufferFullParam...............type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    219
             USED in MAP-Errors             :    106   233
             USED in MAP-ER-DataTypes       :     32

       TransactionID........................type reference OCTET STRING
          DEFINED in TCAPMessages           :    100
             USED in TCAPMessages           :     47    97    98

       translatedB-Number...................identifier of [3] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    367

       translatedB-Number...................identifier of [1] ISDN-AddressString
          DEFINED in MAP-SS-DataTypes       :    284

       T-BcsmCamelTDPData...................type reference SEQUENCE
          DEFINED in MAP-CH-DataTypes       :    242
             USED in MAP-CH-DataTypes       :    236

       t-BcsmCamelTDPDataList...............identifier of T-BcsmCamelTDPDataList
          DEFINED in MAP-CH-DataTypes       :    229

       T-BcsmCamelTDPDataList...............type reference SEQUENCE OF
          DEFINED in MAP-CH-DataTypes       :    235
             USED in MAP-CH-DataTypes       :    229

       t-BcsmTriggerDetectionPoint..........identifier of T-BcsmTriggerDetectionPoint
          DEFINED in MAP-CH-DataTypes       :    243

       T-BcsmTriggerDetectionPoint..........type reference ENUMERATED
          DEFINED in MAP-CH-DataTypes       :    250
             USED in MAP-CH-DataTypes       :    243

       t-CSI................................identifier of [0] T-CSI
          DEFINED in MAP-CH-DataTypes       :    221
```

```
T-CSI.................................type reference SEQUENCE
   DEFINED in MAP-CH-DataTypes       :    228
```

```
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             USED in MAP-CH-DataTypes       :    221

       udubFromBusyMS.........................identifier of Named Number, 5
          DEFINED in MAP-CH-DataTypes       :    384

       udubFromFreeMS.........................identifier of Named Number, 4
          DEFINED in MAP-CH-DataTypes       :    383

       unauthorisedMessageOriginator..........identifier of [1] NULL
          DEFINED in MAP-ER-DataTypes       :    100

       undetermined...........................identifier of Named Number, 0
          DEFINED in MAP-ER-DataTypes       :    120

       unexpectedDataParam....................identifier of UnexpectedDataParam
          DEFINED in MAP-Errors             :    147

       UnexpectedDataParam....................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    170
             USED in MAP-Errors             :     96   147
             USED in MAP-ER-DataTypes       :     22

       unexpectedDataValue....................value reference UnexpectedDataValue, CHOICE VALUE
          DEFINED in MAP-Protocol           :    283

       UnexpectedDataValue....................type reference ERROR
          DEFINED in MAP-Errors             :    145
             USED in MAP-Protocol           :    103   283
             USED in MAP-MobileServiceOpera :     71   142   154   164   185   198   211   224   246
                                            :    262   287   298   317   331   345   359
             USED in MAP-OperationAndMainte :     25    59    73    84
             USED in MAP-CallHandlingOperat :     30    82   104   118   128   140   152   166   175
             USED in MAP-SupplementaryServi :     35    96   113   130   150   168   183   196   210
                                            :    225   248   259   276
             USED in MAP-ShortMessageServic :     29    75    90   103   120   131   145
             USED in MAP-Group-Call-Operati :     25    54
             USED in MAP-Errors             :     16

       unexpectedError........................identifier of Named Number, 3
          DEFINED in TCAPMessages           :    199

       unexpectedLinkedOperation..............identifier of Named Number, 7
          DEFINED in TCAPMessages           :    190

       unidentifiedSubParam...................identifier of UnidentifiedSubParam
          DEFINED in MAP-Errors             :    184

       UnidentifiedSubParam...................type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes       :    199
             USED in MAP-Errors             :    100   184
             USED in MAP-ER-DataTypes       :     27

       unidentifiedSubscriber.................value reference UnidentifiedSubscriber, CHOICE VALUE
          DEFINED in MAP-Protocol           :    294

       UnidentifiedSubscriber.................type reference ERROR
          DEFINED in MAP-Errors             :    182
             USED in MAP-Protocol           :    108   294
             USED in MAP-MobileServiceOpera :     74   174   288   299
             USED in MAP-OperationAndMainte :     28    61    75
             USED in MAP-CallHandlingOperat :     47   151
             USED in MAP-ShortMessageServic :     32   105
             USED in MAP-Errors             :     25

       unidirectional.........................identifier of [APPLICATION 1] IMPLICIT Unidirectional
          DEFINED in TCAPMessages           :     52

       Unidirectional.........................type reference SEQUENCE
          DEFINED in TCAPMessages           :     58
             USED in TCAPMessages           :     52

       unknownAlphabet........................value reference UnknownAlphabet, CHOICE VALUE
          DEFINED in MAP-Protocol           :    350

       UnknownAlphabet........................type reference ERROR
          DEFINED in MAP-Errors             :    312
             USED in MAP-Protocol           :    133   350
             USED in MAP-SupplementaryServi :     48   184   200   214
             USED in MAP-Errors             :     62
```

```
unknownEquipment.....................value reference UnknownEquipment, CHOICE VALUE
   DEFINED in MAP-Protocol          :    295
```

```
       TAG   R4.21    Cross Reference Listing for MAP-Protocol            99-12-21  12:08:21  PAGE
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       UnknownEquipment.....................type reference ERROR
          DEFINED in MAP-Errors            :    188
             USED in MAP-Protocol          :    109   295
             USED in MAP-MobileServiceOpera :     75   275
             USED in MAP-Errors            :     26

       unknownMSC...........................value reference UnknownMSC, CHOICE VALUE
          DEFINED in MAP-Protocol          :    293

       UnknownMSC...........................type reference ERROR
          DEFINED in MAP-Errors            :    180
             USED in MAP-Protocol          :    107   293
             USED in MAP-MobileServiceOpera :     73   248
             USED in MAP-Errors            :     24

       unknownServiceCentre.................identifier of Named Number, 3
          DEFINED in MAP-ER-DataTypes      :    129

       unknownSubscriber....................value reference UnknownSubscriber, CHOICE VALUE
          DEFINED in MAP-Protocol          :    291

       UnknownSubscriber....................type reference ERROR
          DEFINED in MAP-Errors            :    169
             USED in MAP-Protocol          :    105   291
             USED in MAP-MobileServiceOpera :     72   143   165   186   212   263   318   332   346
                                           360
             USED in MAP-OperationAndMainte :     27    85
             USED in MAP-CallHandlingOperat :     33    85   164
             USED in MAP-SupplementaryServi :     36   249
             USED in MAP-ShortMessageServic :     31    77   121   147
             USED in MAP-Errors            :     22

       unknownSubscriberDiagnostic..........identifier of UnknownSubscriberDiagnostic
          DEFINED in MAP-ER-DataTypes      :    185

       UnknownSubscriberDiagnostic..........type reference ENUMERATED
          DEFINED in MAP-ER-DataTypes      :    187
             USED in MAP-ER-DataTypes      :    185

       unknownSubscriberParam...............identifier of UnknownSubscriberParam
          DEFINED in MAP-Errors            :    171

       UnknownSubscriberParam...............type reference SEQUENCE
          DEFINED in MAP-ER-DataTypes      :    182
             USED in MAP-Errors            :     98   171
             USED in MAP-ER-DataTypes      :     25

       unrecognizedComponent................identifier of Named Number, 0
          DEFINED in TCAPMessages          :    179

       unrecognizedError....................identifier of Named Number, 2
          DEFINED in TCAPMessages          :    198

       unrecognizedInvokeID.................identifier of Named Number, 0
          DEFINED in TCAPMessages          :    192

       unrecognizedInvokeID.................identifier of Named Number, 0
          DEFINED in TCAPMessages          :    196

       unrecognizedLinkedID.................identifier of Named Number, 5
          DEFINED in TCAPMessages          :    188

       unrecognizedMessageType..............identifier of Named Number, 0
          DEFINED in TCAPMessages          :    103

       unrecognizedOperation................identifier of Named Number, 1
          DEFINED in TCAPMessages          :    184

       unrecognizedTransactionID............identifier of Named Number, 1
          DEFINED in TCAPMessages          :    104

       unstructuredSS-Notify................value reference UnstructuredSS-Notify, CHOICE VALUE
          DEFINED in MAP-Protocol          :    224

       UnstructuredSS-Notify................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    203
             USED in MAP-Protocol          :     69   224
             USED in MAP-SupplementaryServi :     20
```

```
      unstructuredSS-Request.................value reference UnstructuredSS-Request, CHOICE VALUE
         DEFINED in MAP-Protocol          :    223
```

```
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       UnstructuredSS-Request.................type reference OPERATION
          DEFINED in MAP-SupplementaryServi :    187
             USED in MAP-Protocol           :     68   223
             USED in MAP-SupplementaryServi :     19

       updateGprsLocation.....................value reference UpdateGprsLocation, CHOICE VALUE
          DEFINED in MAP-Protocol           :    264

       UpdateGprsLocation.....................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    178
             USED in MAP-Protocol           :     16   264
             USED in MAP-MobileServiceOpera :     21

       updateGprsLocationArg..................identifier of UpdateGprsLocationArg
          DEFINED in MAP-MobileServiceOpera :    180

       UpdateGprsLocationArg..................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    240
             USED in MAP-MobileServiceOpera :     93   180
             USED in MAP-MS-DataTypes       :     23

       updateGprsLocationRes..................identifier of UpdateGprsLocationRes
          DEFINED in MAP-MobileServiceOpera :    182

       UpdateGprsLocationRes..................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    250
             USED in MAP-MobileServiceOpera :     94   182
             USED in MAP-MS-DataTypes       :     24

       updateLocation.........................value reference UpdateLocation, CHOICE VALUE
          DEFINED in MAP-Protocol           :    155

       UpdateLocation.........................type reference OPERATION
          DEFINED in MAP-MobileServiceOpera :    134
             USED in MAP-Protocol           :     12   155
             USED in MAP-MobileServiceOpera :     15

       updateLocationArg......................identifier of UpdateLocationArg
          DEFINED in MAP-MobileServiceOpera :    136

       UpdateLocationArg......................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    154
             USED in MAP-MobileServiceOpera :     86   136
             USED in MAP-MS-DataTypes       :     16

       updateLocationRes......................identifier of UpdateLocationRes
          DEFINED in MAP-MobileServiceOpera :    138

       UpdateLocationRes......................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    170
             USED in MAP-MobileServiceOpera :     87   138
             USED in MAP-MS-DataTypes       :     17

       updateProcedure........................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    188

       uplinkFree.............................identifier of [3] NULL
          DEFINED in MAP-GR-DataTypes       :     57

       uplinkRejectCommand....................identifier of [2] NULL
          DEFINED in MAP-GR-DataTypes       :     79

       uplinkReleaseCommand...................identifier of [4] NULL
          DEFINED in MAP-GR-DataTypes       :     81

       uplinkReleaseIndication................identifier of [1] NULL
          DEFINED in MAP-GR-DataTypes       :     78

       uplinkReleaseIndication................identifier of [1] NULL
          DEFINED in MAP-GR-DataTypes       :     87

       uplinkRequest..........................identifier of [0] NULL
          DEFINED in MAP-GR-DataTypes       :     86

       uplinkRequestAck.......................identifier of [0] NULL
          DEFINED in MAP-GR-DataTypes       :     77

       uplinkSeizedCommand....................identifier of [3] NULL
          DEFINED in MAP-GR-DataTypes       :     80
```

```
ussd-Arg.............................identifier of USSD-Arg
```

```
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          DEFINED in MAP-SupplementaryServi :    177

       ussd-Arg..............................identifier of USSD-Arg
          DEFINED in MAP-SupplementaryServi :    189

       ussd-Arg..............................identifier of USSD-Arg
          DEFINED in MAP-SupplementaryServi :    205

       USSD-Arg..............................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    207
             USED in MAP-SupplementaryServi :     64   177   189   205
             USED in MAP-SS-DataTypes       :     20

       ussd-Busy.............................value reference USSD-Busy, CHOICE VALUE
          DEFINED in MAP-Protocol           :    351

       USSD-Busy.............................type reference ERROR
          DEFINED in MAP-Errors             :    314
             USED in MAP-Protocol           :    134   351
             USED in MAP-SupplementaryServi :     49   201   215
             USED in MAP-Errors             :     63

       ussd-DataCodingScheme..................identifier of USSD-DataCodingScheme
          DEFINED in MAP-SS-DataTypes       :    208

       ussd-DataCodingScheme..................identifier of USSD-DataCodingScheme
          DEFINED in MAP-SS-DataTypes       :    215

       USSD-DataCodingScheme..................type reference OCTET STRING
          DEFINED in MAP-SS-DataTypes       :    219
             USED in MAP-SS-DataTypes       :     39   208   215

       ussd-Res..............................identifier of USSD-Res
          DEFINED in MAP-SupplementaryServi :    179

       ussd-Res..............................identifier of USSD-Res
          DEFINED in MAP-SupplementaryServi :    191

       USSD-Res..............................type reference SEQUENCE
          DEFINED in MAP-SS-DataTypes       :    214
             USED in MAP-SupplementaryServi :     65   179   191
             USED in MAP-SS-DataTypes       :     21

       ussd-String...........................identifier of USSD-String
          DEFINED in MAP-SS-DataTypes       :    209

       ussd-String...........................identifier of USSD-String
          DEFINED in MAP-SS-DataTypes       :    216

       USSD-String...........................type reference OCTET STRING
          DEFINED in MAP-SS-DataTypes       :    224
             USED in MAP-SS-DataTypes       :     40   209   216

       uus...................................value reference SS-Code, '10000001'B
          DEFINED in MAP-SS-Code            :    108

       VBSDataList...........................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    850
             USED in MAP-MS-DataTypes       :    373

       vbsGroupIndication....................identifier of [7] NULL
          DEFINED in MAP-MS-DataTypes       :    628

       vbsSubscriptionData...................identifier of [11] VBSDataList
          DEFINED in MAP-MS-DataTypes       :    373

       VGCSDataList..........................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    853
             USED in MAP-MS-DataTypes       :    374

       vgcsGroupIndication...................identifier of [8] NULL
          DEFINED in MAP-MS-DataTypes       :    629

       vgcsSubscriptionData..................identifier of [12] VGCSDataList
          DEFINED in MAP-MS-DataTypes       :    374

       vlr...................................identifier of Named Number, 2
          DEFINED in MAP-CommonDataTypes    :    267

       vlrCamelSubscriptionInfo..............identifier of [13] VlrCamelSubscriptionInfo
```

```
          DEFINED in MAP-MS-DataTypes       :    375
```

```
       TAG   R4.21    Cross Reference Listing for MAP-Protocol            99-12-21  12:08:21  PAGE
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       VlrCamelSubscriptionInfo..............type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    654
             USED in MAP-MS-DataTypes       :    375

       vlr-Capability........................identifier of [6] VLR-Capability
          DEFINED in MAP-MS-DataTypes       :    162

       VLR-Capability........................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    164
             USED in MAP-MS-DataTypes       :    162   840

       vlr-Capability........................identifier of [6] VLR-Capability
          DEFINED in MAP-MS-DataTypes       :    840

       vlr-Number............................identifier of ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    158

       vlr-Number............................identifier of [0] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    200

       vlr-number............................identifier of [1] ISDN-AddressString
          DEFINED in MAP-MS-DataTypes       :    904

       vmsc..................................identifier of Named Number, 5
          DEFINED in MAP-CommonDataTypes    :    270

       vmsc-Address..........................identifier of [2] ISDN-AddressString
          DEFINED in MAP-CH-DataTypes       :    139

       voiceBroadcastCall....................value reference TeleserviceCode, '10010010'B
          DEFINED in MAP-TS-Code            :     70

       VoiceBroadcastData....................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    865
             USED in MAP-MS-DataTypes       :    851

       voiceGroupCall........................value reference TeleserviceCode, '10010001'B
          DEFINED in MAP-TS-Code            :     69

       VoiceGroupCallData....................type reference SEQUENCE
          DEFINED in MAP-MS-DataTypes       :    860
             USED in MAP-MS-DataTypes       :    854

       vplmnAddressAllowed...................identifier of [19] NULL
          DEFINED in MAP-MS-DataTypes       :    324

       whiteListed...........................identifier of Named Number, 0
          DEFINED in MAP-MS-DataTypes       :    284

       ZoneCode..............................type reference OCTET STRING
          DEFINED in MAP-MS-DataTypes       :    598
             USED in MAP-MS-DataTypes       :    596   627

       ZoneCodeList..........................type reference SEQUENCE OF
          DEFINED in MAP-MS-DataTypes       :    595
             USED in MAP-MS-DataTypes       :     49   372

       zoneCodesConflict.....................identifier of Named Number, 2
          DEFINED in MAP-MS-DataTypes       :    617
```

Annex B (informative): Fully expanded ASN.1 sources for abstract syntaxes of MAP

Annex B is not part of the standard, it is included for information purposes only.

For every (Value)Assignment in the root ASN.1 module all the used defined types and defined values, which are defined within the ASN.1 module or imported from ASN.1 modules, are replaced by the constructs this type or value is composed of.

The fully expanded ASN.1 root module is itself a correct and equivalent representation of the MAP-Protocol.

It allows to see at all the parameters, including all nested ones for a specific operationcode or errorcode at once.

Note that for those operations which use a result without parameters the keyword RESULT is not shown. Empty results are only defined in the ASN.1 description in clause 17.

B.1 Fully Expanded ASN.1 Source of MAP-Protocol/TCAPMessages

```
--          Expanded ASN1 Module 'MAP-Protocol'
--SIEMENS ASN.1 Compiler       R4.21  (42-00-04)
--             Date: 99-12-21 Time: 12:08:21

MAP-Protocol{ 0 identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
map-Protocol (4) version4 (4) }

DEFINITIONS

::=

BEGIN

updateLocation OPERATION
   ARGUMENT
      updateLocationArg SEQUENCE {
         imsi                 OCTET STRING ( SIZE (3..8 ) ),
         msc-Number           [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         vlr-Number           OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         lmsi                 [10] IMPLICIT OCTET STRING ( SIZE (4 ) ) OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         vlr-Capability       [6] IMPLICIT SEQUENCE {
            supportedCamelPhases   [0] IMPLICIT BIT STRING {
               phase1  (0 ),
               phase2  (1 )} ( SIZE (1..16 ) ) OPTIONAL,
            extensionContainer     SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL}
   RESULT
```

```
      updateLocationRes SEQUENCE {
         hlr-Number           OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1,
      -- roamingNotAllowed -- localValue : 8}
 ::= localValue : 2

cancelLocation OPERATION
   ARGUMENT
      cancelLocationArg [3] IMPLICIT SEQUENCE {
         identity             CHOICE {
            imsi              OCTET STRING ( SIZE (3..8 ) ),
            imsi-WithLMSI     SEQUENCE {
               imsi       OCTET STRING ( SIZE (3..8 ) ),
               lmsi       OCTET STRING ( SIZE (4 ) ),
               ... }},
         cancellationType     ENUMERATED {
            updateProcedure         (0 ),
            subscriptionWithdraw    (1 ),
            ... } OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      cancelLocationRes SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36}
 ::= localValue : 3

purgeMS    OPERATION
   ARGUMENT
      purgeMS-Arg [3] IMPLICIT SEQUENCE {
         imsi                 OCTET STRING ( SIZE (3..8 ) ),
         vlr-Number           [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ) OPTIONAL,
         sgsn-Number          [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ) OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
```

```
                    ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      purgeMS-Res SEQUENCE {
         freezeTMSI           [0] IMPLICIT NULL OPTIONAL,
         freezeP-TMSI         [1] IMPLICIT NULL OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 67

sendIdentification OPERATION
   ARGUMENT
      tmsi       OCTET STRING ( SIZE (1..4 ) )
   RESULT
      sendIdentificationRes SEQUENCE {
         imsi                   OCTET STRING ( SIZE (3..8 ) ),
         authenticationSetList   SEQUENCE  ( SIZE (1..5 ) ) OF
            SEQUENCE {
               rand       OCTET STRING ( SIZE (16 ) ),
               sres       OCTET STRING ( SIZE (4 ) ),
               kc         OCTET STRING ( SIZE (8 ) ),
               ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unidentifiedSubscriber -- localValue : 5}
 ::= localValue : 55

prepareHandover OPERATION
   ARGUMENT
      prepareHO-Arg SEQUENCE {
         targetCellId           OCTET STRING ( SIZE (5..7 ) ) OPTIONAL,
         ho-NumberNotRequired   NULL OPTIONAL,
         bss-APDU               SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      prepareHO-Res SEQUENCE {
         handoverNumber   OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ) OPTIONAL,
         bss-APDU         SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
```

```
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... }
      ERRORS {
         -- systemFailure -- localValue : 34,
         -- dataMissing -- localValue : 35,
         -- unexpectedDataValue -- localValue : 36,
         -- noHandoverNumberAvailable -- localValue : 25}
   ::= localValue : 68

sendEndSignal OPERATION
      ARGUMENT
         bss-APDU   SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... }
   ::= localValue : 29

processAccessSignalling OPERATION
      ARGUMENT
         bss-APDU   SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... }
   ::= localValue : 33

forwardAccessSignalling OPERATION
      ARGUMENT
         bss-APDU   SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
```

```
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 34

prepareSubsequentHandover OPERATION
   ARGUMENT
      prepareSubsequentHO-Arg SEQUENCE {
         targetCellId       OCTET STRING ( SIZE (5..7 ) ),
         targetMSC-Number   OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         bss-APDU           SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
         ... }
   RESULT
      bss-APDU   SEQUENCE {
         protocolId           ENUMERATED {
            gsm-0408        (1 ),
            gsm-0806        (2 ),
            gsm-BSSMAP      (3 ),
            ets-300102-1    (4 )},
         signalInfo           OCTET STRING ( SIZE (1..200 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- unexpectedDataValue -- localValue : 36,
      -- dataMissing -- localValue : 35,
      -- unknownMSC -- localValue : 3,
      -- subsequentHandoverFailure -- localValue : 26}
 ::= localValue : 69

sendAuthenticationInfo OPERATION
   ARGUMENT
      sendAuthenticationInfoArg OCTET STRING ( SIZE (3..8 ) )
   RESULT
      sendAuthenticationInfoRes SEQUENCE  ( SIZE (1..5 ) ) OF
         SEQUENCE {
            rand       OCTET STRING ( SIZE (16 ) ),
            sres       OCTET STRING ( SIZE (4 ) ),
            kc         OCTET STRING ( SIZE (8 ) ),
            ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 56

checkIMEI  OPERATION
   ARGUMENT
      imei       OCTET STRING ( SIZE (8 ) )
```

```
   RESULT
      equipmentStatus ENUMERATED {
         whiteListed    (0 ),
         blackListed    (1 ),
         greyListed     (2 )}
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unknownEquipment -- localValue : 7}
 ::= localValue : 43

insertSubscriberData OPERATION
   ARGUMENT
      insertSubscriberDataArg SEQUENCE {
         imsi                                          [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) )
OPTIONAL,
         msisdn                                    [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) (
SIZE (1..9 ) ) OPTIONAL,
         category                                  [2] IMPLICIT OCTET STRING ( SIZE (1 ) )
OPTIONAL,
         subscriberStatus                          [3] IMPLICIT ENUMERATED {
            serviceGranted              (0 ),
            operatorDeterminedBarring   (1 )} OPTIONAL,
         bearerServiceList                         [4] IMPLICIT SEQUENCE  ( SIZE (1..50 ) ) OF
            OCTET STRING ( SIZE (1..5 ) ) OPTIONAL,
         teleserviceList                           [6] IMPLICIT SEQUENCE  ( SIZE (1..20 ) ) OF
            OCTET STRING ( SIZE (1..5 ) ) OPTIONAL,
         provisionedSS                             [7] IMPLICIT SEQUENCE  ( SIZE (1..30 ) ) OF
            CHOICE {
               forwardingInfo      [0] IMPLICIT SEQUENCE {
                  ss-Code                 OCTET STRING ( SIZE (1 ) ),
                  forwardingFeatureList   SEQUENCE  ( SIZE (1..32 ) ) OF
                     SEQUENCE {
                        basicService            CHOICE {
                           ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
                           ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )}
OPTIONAL,
                        ss-Status               [4] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
                        forwardedToNumber       [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE
(1..9 ) ) OPTIONAL,
                        forwardedToSubaddress   [8] IMPLICIT OCTET STRING ( SIZE (1..21 ) )
OPTIONAL,
                        forwardingOptions       [6] IMPLICIT OCTET STRING ( SIZE (1..5 ) ) OPTIONAL,
                        noReplyConditionTime    [7] IMPLICIT INTEGER ( 1..100 ) OPTIONAL,
                        extensionContainer      [9] IMPLICIT SEQUENCE {
                           privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                              SEQUENCE {
                                 extId      MAP-EXTENSION .&extensionId  ( {
                                    ,
                                    ...} ) ,
                                 extType    MAP-EXTENSION .&ExtensionType  ( {
                                    ,
                                    ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                           pcs-Extensions         [1] IMPLICIT SEQUENCE {
                              ... } OPTIONAL,
                           ... } OPTIONAL,
                        ... },
                  extensionContainer      [0] IMPLICIT SEQUENCE {
                     privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                        SEQUENCE {
                           extId      MAP-EXTENSION .&extensionId  ( {
                              ,
                              ...} ) ,
                           extType    MAP-EXTENSION .&ExtensionType  ( {
                              ,
                              ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                     pcs-Extensions         [1] IMPLICIT SEQUENCE {
                        ... } OPTIONAL,
                     ... } OPTIONAL,
                  ... },
               callBarringInfo     [1] IMPLICIT SEQUENCE {
                  ss-Code                 OCTET STRING ( SIZE (1 ) ),
                  callBarringFeatureList   SEQUENCE  ( SIZE (1..32 ) ) OF
                     SEQUENCE {
                        basicService         CHOICE {
                           ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
                           ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )}
OPTIONAL,
                        ss-Status            [4] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
                        extensionContainer   SEQUENCE {
                           privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                              SEQUENCE {
                                 extId      MAP-EXTENSION .&extensionId  ( {
```

```
                              ,
                              ...} ) ,
                           extType    MAP-EXTENSION .&ExtensionType  ( {
                              ,
                              ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                        pcs-Extensions         [1] IMPLICIT SEQUENCE {
                           ... } OPTIONAL,
                        ... } OPTIONAL,
                     ... },
                  extensionContainer       SEQUENCE {
                     privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                        SEQUENCE {
                           extId      MAP-EXTENSION .&extensionId  ( {
                              ,
                              ...} ) ,
                           extType    MAP-EXTENSION .&ExtensionType  ( {
                              ,
                              ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                     pcs-Extensions         [1] IMPLICIT SEQUENCE {
                        ... } OPTIONAL,
                     ... } OPTIONAL,
                  ... },
               cug-Info            [2] IMPLICIT SEQUENCE {
                  cug-SubscriptionList   SEQUENCE  ( SIZE (0..10 ) ) OF
                     SEQUENCE {
                        cug-Index               INTEGER ( 0..32767 ),
                        cug-Interlock           OCTET STRING ( SIZE (4 ) ),
                        intraCUG-Options        ENUMERATED {
                           noCUG-Restrictions    (0 ),
                           cugIC-CallBarred      (1 ),
                           cugOG-CallBarred      (2 )},
                        basicServiceGroupList   SEQUENCE  ( SIZE (1..32 ) ) OF
                           CHOICE {
                              ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
                              ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )}
OPTIONAL,
                        extensionContainer      [0] IMPLICIT SEQUENCE {
                           privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                              SEQUENCE {
                                 extId      MAP-EXTENSION .&extensionId  ( {
                                    ,
                                    ...} ) ,
                                 extType    MAP-EXTENSION .&ExtensionType  ( {
                                    ,
                                    ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                           pcs-Extensions         [1] IMPLICIT SEQUENCE {
                              ... } OPTIONAL,
                           ... } OPTIONAL,
                        ... },
                     cug-FeatureList        SEQUENCE  ( SIZE (1..32 ) ) OF
                        SEQUENCE {
                           basicService               CHOICE {
                           ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
                           ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )}
OPTIONAL,
                        preferentialCUG-Indicator   INTEGER ( 0..32767 ) OPTIONAL,
                        interCUG-Restrictions       OCTET STRING ( SIZE (1 ) ),
                        extensionContainer          SEQUENCE {
                           privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                              SEQUENCE {
                                 extId      MAP-EXTENSION .&extensionId  ( {
                                    ,
                                    ...} ) ,
                                 extType    MAP-EXTENSION .&ExtensionType  ( {
                                    ,
                                    ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                           pcs-Extensions         [1] IMPLICIT SEQUENCE {
                              ... } OPTIONAL,
                           ... } OPTIONAL,
                        ... } OPTIONAL,
                     extensionContainer     [0] IMPLICIT SEQUENCE {
                        privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                           SEQUENCE {
                              extId      MAP-EXTENSION .&extensionId  ( {
                                 ,
                                 ...} ) ,
                              extType    MAP-EXTENSION .&ExtensionType  ( {
                                 ,
                                 ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                        pcs-Extensions         [1] IMPLICIT SEQUENCE {
                           ... } OPTIONAL,
                        ... } OPTIONAL,
                     ... },
```

```
      ss-Data            [3] IMPLICIT SEQUENCE {
         ss-Code                 OCTET STRING ( SIZE (1 ) ),
         ss-Status               [4] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
         ss-SubscriptionOption   CHOICE {
            cliRestrictionOption     [2] IMPLICIT ENUMERATED {
               permanent                    (0 ),
               temporaryDefaultRestricted   (1 ),
               temporaryDefaultAllowed      (2 )},
            overrideCategory         [1] IMPLICIT ENUMERATED {
               overrideEnabled    (0 ),
               overrideDisabled   (1 )}} OPTIONAL,
         basicServiceGroupList   SEQUENCE  ( SIZE (1..32 ) ) OF
            CHOICE {
               ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
               ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )} OPTIONAL,
         extensionContainer      [5] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... },
      emlpp-Info          [4] IMPLICIT SEQUENCE {
         maximumentitledPriority   INTEGER ( 0..15 ),
         defaultPriority           INTEGER ( 0..15 ),
         extensionContainer        SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }} OPTIONAL,
   odb-Data                                  [8] IMPLICIT SEQUENCE {
      odb-GeneralData      BIT STRING {
         allOG-CallsBarred  (0 ),
         internationalOGCallsBarred  (1 ),
         internationalOGCallsNotToHPLMN-CountryBarred  (2 ),
         interzonalOGCallsBarred  (6 ),
         interzonalOGCallsNotToHPLMN-CountryBarred  (7 ),
         interzonalOGCallsAndInternationalOGCallsNotToHPLMN-CountryBarre  (8 ),
         premiumRateInformationOGCallsBarred  (3 ),
         premiumRateEntertainementOGCallsBarred  (4 ),
         ss-AccessBarred  (5 ),
         allECT-Barred  (9 ),
         chargeableECT-Barred  (10 ),
         internationalECT-Barred  (11 ),
         interzonalECT-Barred  (12 ),
         doublyChargeableECT-Barred  (13 ),
         multipleECT-Barred  (14 )} ( SIZE (15..32 ) ),
      odb-HPLMN-Data       BIT STRING {
         plmn-SpecificBarringType1  (0 ),
         plmn-SpecificBarringType2  (1 ),
         plmn-SpecificBarringType3  (2 ),
         plmn-SpecificBarringType4  (3 )} ( SIZE (4..32 ) ) OPTIONAL,
      extensionContainer   SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL,
      ... } OPTIONAL,
   roamingRestrictionDueToUnsupportedFeature   [9] IMPLICIT NULL OPTIONAL,
   regionalSubscriptionData                    [10] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
      OCTET STRING ( SIZE (2 ) ) OPTIONAL,
   vbsSubscriptionData                         [11] IMPLICIT SEQUENCE  ( SIZE (1..50 ) ) OF
```

```
            SEQUENCE {
               groupid                    OCTET STRING ( SIZE (3 ) ),
               broadcastInitEntitlement   NULL OPTIONAL,
               extensionContainer         SEQUENCE {
                  privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                     SEQUENCE {
                        extId      MAP-EXTENSION .&extensionId  ( {
                           ,
                           ...} ) ,
                        extType    MAP-EXTENSION .&ExtensionType  ( {
                           ,
                           ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... } OPTIONAL,
         vgcsSubscriptionData                        [12] IMPLICIT SEQUENCE  ( SIZE (1..50 ) ) OF
            SEQUENCE {
               groupId              OCTET STRING ( SIZE (3 ) ),
               extensionContainer   SEQUENCE {
                  privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                     SEQUENCE {
                        extId      MAP-EXTENSION .&extensionId  ( {
                           ,
                           ...} ) ,
                        extType    MAP-EXTENSION .&ExtensionType  ( {
                           ,
                           ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... } OPTIONAL,
         vlrCamelSubscriptionInfo                    [13] IMPLICIT SEQUENCE {
            o-CSI                        [0] IMPLICIT SEQUENCE {
               o-BcsmCamelTDPDataList    SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     o-BcsmTriggerDetectionPoint   ENUMERATED {
                        collectedInfo    (2 ),
                        ... },
                     serviceKey                    INTEGER ( 0..2147483647 ),
                     gsmSCF-Address                [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) (
SIZE (1..9 ) ),
                     defaultCallHandling           [1] IMPLICIT ENUMERATED {
                        continueCall    (0 ),
                        releaseCall     (1 ),
                        ... },
                     extensionContainer            [2] IMPLICIT SEQUENCE {
                        privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                           SEQUENCE {
                              extId      MAP-EXTENSION .&extensionId  ( {
                                 ,
                                 ...} ) ,
                              extType    MAP-EXTENSION .&ExtensionType  ( {
                                 ,
                                 ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                        pcs-Extensions         [1] IMPLICIT SEQUENCE {
                           ... } OPTIONAL,
                        ... } OPTIONAL,
                     ... },
               extensionContainer         SEQUENCE {
                  privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                     SEQUENCE {
                        extId      MAP-EXTENSION .&extensionId  ( {
                           ,
                           ...} ) ,
                        extType    MAP-EXTENSION .&ExtensionType  ( {
                           ,
                           ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... ,
               camelCapabilityHandling   [0] IMPLICIT INTEGER ( 1..16 ) OPTIONAL} OPTIONAL,
            extensionContainer            [1] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
```

```
            ... } OPTIONAL,
         ... } OPTIONAL,
      ... ,
      ss-CSI                        [2] IMPLICIT SEQUENCE {
         ss-CamelData          SEQUENCE {
            ss-EventList          SEQUENCE  ( SIZE (1..10 ) ) OF
               OCTET STRING ( SIZE (1 ) ),
            gsmSCF-Address        OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
            extensionContainer   [0] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... } OPTIONAL,
      o-BcsmCamelTDP-CriteriaList   [4] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
         SEQUENCE {
            o-BcsmTriggerDetectionPoint   ENUMERATED {
               collectedInfo    (2 ),
               ... },
            destinationNumberCriteria     [0] IMPLICIT SEQUENCE {
               matchType                     [0] IMPLICIT ENUMERATED {
                  inhibiting    (0 ),
                  enabling      (1 )},
               destinationNumberList         [1] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ) OPTIONAL,
               destinationNumberLengthList   [2] IMPLICIT SEQUENCE  ( SIZE (1..3 ) ) OF
                  INTEGER ( 1..15 ) OPTIONAL,
               ... } OPTIONAL,
            basicServiceCriteria          [1] IMPLICIT SEQUENCE  ( SIZE (1..5 ) ) OF
               CHOICE {
                  ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
                  ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )} OPTIONAL,
            callTypeCriteria              [2] IMPLICIT ENUMERATED {
               forwarded       (0 ),
               notForwarded    (1 )} OPTIONAL,
            ... } OPTIONAL} OPTIONAL,
   extensionContainer                              [14] IMPLICIT SEQUENCE {
      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
         SEQUENCE {
            extId      MAP-EXTENSION .&extensionId  ( {
               ,
               ...} ) ,
            extType    MAP-EXTENSION .&ExtensionType  ( {
               ,
               ...} { @extId   }  )  OPTIONAL} OPTIONAL,
      pcs-Extensions         [1] IMPLICIT SEQUENCE {
         ... } OPTIONAL,
      ... } OPTIONAL,
   ... ,
   naea-PreferredCI                                [15] IMPLICIT SEQUENCE {
      naea-PreferredCIC    [0] IMPLICIT OCTET STRING ( SIZE (3 ) ),
      extensionContainer   [1] IMPLICIT SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL,
```

```
      ... } OPTIONAL,
   gprsSubscriptionData                              [16] IMPLICIT SEQUENCE {
      completeDataListIncluded   NULL OPTIONAL,
      gprsDataList               [1] IMPLICIT SEQUENCE  ( SIZE (1..50 ) ) OF
         SEQUENCE {
            pdp-ContextId         INTEGER ( 1..50 ),
            pdp-Type              [16] IMPLICIT OCTET STRING ( SIZE (2 ) ),
            pdp-Address           [17] IMPLICIT OCTET STRING ( SIZE (1..16 ) ) OPTIONAL,
            qos-Subscribed        [18] IMPLICIT OCTET STRING ( SIZE (3 ) ),
            vplmnAddressAllowed   [19] IMPLICIT NULL OPTIONAL,
            apn                   [20] IMPLICIT OCTET STRING ( SIZE (2..63 ) ),
            extensionContainer    [21] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
      extensionContainer         [2] IMPLICIT SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL,
      ... } OPTIONAL,
   roamingRestrictedInSgsnDueToUnsupportedFeature   [23] IMPLICIT NULL OPTIONAL,
   networkAccessMode                                [24] IMPLICIT ENUMERATED {
      bothMSCAndSGSN    (0 ),
      onlyMSC           (1 ),
      onlySGSN          (2 ),
      ... } OPTIONAL}
RESULT
   insertSubscriberDataRes SEQUENCE {
      teleserviceList               [1] IMPLICIT SEQUENCE  ( SIZE (1..20 ) ) OF
         OCTET STRING ( SIZE (1..5 ) ) OPTIONAL,
      bearerServiceList             [2] IMPLICIT SEQUENCE  ( SIZE (1..50 ) ) OF
         OCTET STRING ( SIZE (1..5 ) ) OPTIONAL,
      ss-List                       [3] IMPLICIT SEQUENCE  ( SIZE (1..30 ) ) OF
         OCTET STRING ( SIZE (1 ) ) OPTIONAL,
      odb-GeneralData               [4] IMPLICIT BIT STRING {
         allOG-CallsBarred  (0 ),
         internationalOGCallsBarred  (1 ),
         internationalOGCallsNotToHPLMN-CountryBarred  (2 ),
         interzonalOGCallsBarred  (6 ),
         interzonalOGCallsNotToHPLMN-CountryBarred  (7 ),
         interzonalOGCallsAndInternationalOGCallsNotToHPLMN-CountryBarre  (8 ),
         premiumRateInformationOGCallsBarred  (3 ),
         premiumRateEntertainementOGCallsBarred  (4 ),
         ss-AccessBarred  (5 ),
         allECT-Barred  (9 ),
         chargeableECT-Barred  (10 ),
         internationalECT-Barred  (11 ),
         interzonalECT-Barred  (12 ),
         doublyChargeableECT-Barred  (13 ),
         multipleECT-Barred  (14 )} ( SIZE (15..32 ) ) OPTIONAL,
      regionalSubscriptionResponse   [5] IMPLICIT ENUMERATED {
         networkNode-AreaRestricted    (0 ),
         tooManyZoneCodes              (1 ),
         zoneCodesConflict             (2 ),
         regionalSubscNotSupported     (3 )} OPTIONAL,
      supportedCamelPhases          [6] IMPLICIT BIT STRING {
         phase1  (0 ),
         phase2  (1 )} ( SIZE (1..16 ) ) OPTIONAL,
      extensionContainer            [7] IMPLICIT SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
```

```
                    ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unidentifiedSubscriber -- localValue : 5}
 ::= localValue : 7

deleteSubscriberData OPERATION
   ARGUMENT
      deleteSubscriberDataArg SEQUENCE {
         imsi                                          [0] IMPLICIT OCTET STRING ( SIZE (3..8 )
),
         basicServiceList                              [1] IMPLICIT SEQUENCE  ( SIZE (1..70 ) )
OF
            CHOICE {
               ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
               ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )} OPTIONAL,
         ss-List                                       [2] IMPLICIT SEQUENCE  ( SIZE (1..30 ) )
OF
            OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         roamingRestrictionDueToUnsupportedFeature     [4] IMPLICIT NULL OPTIONAL,
         regionalSubscriptionIdentifier                [5] IMPLICIT OCTET STRING ( SIZE (2 ) )
OPTIONAL,
         vbsGroupIndication                            [7] IMPLICIT NULL OPTIONAL,
         vgcsGroupIndication                           [8] IMPLICIT NULL OPTIONAL,
         camelSubscriptionInfoWithdraw                 [9] IMPLICIT NULL OPTIONAL,
         extensionContainer                            [6] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         gprsSubscriptionDataWithdraw                  [10] CHOICE {
            allGPRSData       NULL,
            contextIdList     SEQUENCE  ( SIZE (1..50 ) ) OF
               INTEGER ( 1..50 )} OPTIONAL,
         roamingRestrictedInSgsnDueToUnsuppportedFeature   [11] IMPLICIT NULL OPTIONAL}
   RESULT
      deleteSubscriberDataRes SEQUENCE {
         regionalSubscriptionResponse   [0] IMPLICIT ENUMERATED {
            networkNode-AreaRestricted    (0 ),
            tooManyZoneCodes              (1 ),
            zoneCodesConflict             (2 ),
            regionalSubscNotSupported     (3 )} OPTIONAL,
         extensionContainer             SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unidentifiedSubscriber -- localValue : 5}
 ::= localValue : 8

reset      OPERATION
   ARGUMENT
      resetArg   SEQUENCE {
         hlr-Number   OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         hlr-List     SEQUENCE  ( SIZE (1..50 ) ) OF
            OCTET STRING ( SIZE (3..8 ) ) OPTIONAL,
         ... }
 ::= localValue : 37
```

```
forwardCheckSS-Indication OPERATION
 ::= localValue : 38

restoreData OPERATION
   ARGUMENT
      restoreDataArg SEQUENCE {
         imsi                 OCTET STRING ( SIZE (3..8 ) ),
         lmsi                 OCTET STRING ( SIZE (4 ) ) OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         vlr-Capability       [6] IMPLICIT SEQUENCE {
            supportedCamelPhases   [0] IMPLICIT BIT STRING {
               phase1  (0 ),
               phase2  (1 )} ( SIZE (1..16 ) ) OPTIONAL,
            extensionContainer     SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL}
   RESULT
      restoreDataRes SEQUENCE {
         hlr-Number           OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         msNotReachable       NULL OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 57

activateTraceMode OPERATION
   ARGUMENT
      activateTraceModeArg SEQUENCE {
         imsi                 [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ) OPTIONAL,
         traceReference       [1] IMPLICIT OCTET STRING ( SIZE (1..2 ) ),
         traceType            [2] IMPLICIT INTEGER ( 0..255 ),
         omc-Id               [3] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) OPTIONAL,
         extensionContainer   [4] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
```

```
      activateTraceModeRes SEQUENCE {
         extensionContainer   [0] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- facilityNotSupported -- localValue : 21,
      -- unidentifiedSubscriber -- localValue : 5,
      -- tracingBufferFull -- localValue : 40}
 ::= localValue : 50

deactivateTraceMode OPERATION
   ARGUMENT
      deactivateTraceModeArg SEQUENCE {
         imsi                [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ) OPTIONAL,
         traceReference      [1] IMPLICIT OCTET STRING ( SIZE (1..2 ) ),
         extensionContainer   [2] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      deactivateTraceModeRes SEQUENCE {
         extensionContainer   [0] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- facilityNotSupported -- localValue : 21,
      -- unidentifiedSubscriber -- localValue : 5}
 ::= localValue : 51

sendIMSI   OPERATION
   ARGUMENT
      msisdn     OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
   RESULT
      imsi       OCTET STRING ( SIZE (3..8 ) )
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 58

sendRoutingInfo OPERATION
   ARGUMENT
      sendRoutingInfoArg SEQUENCE {
         msisdn                     [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         cug-CheckInfo              [1] IMPLICIT SEQUENCE {
            cug-Interlock        OCTET STRING ( SIZE (4 ) ),
            cug-OutgoingAccess   NULL OPTIONAL,
            extensionContainer   SEQUENCE {
```

```
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... } OPTIONAL,
      numberOfForwarding          [2] IMPLICIT INTEGER ( 1..5 ) OPTIONAL,
      interrogationType           [3] IMPLICIT ENUMERATED {
         basicCall     (0 ),
         forwarding    (1 )},
      or-Interrogation            [4] IMPLICIT NULL OPTIONAL,
      or-Capability               [5] IMPLICIT INTEGER ( 1..127 ) OPTIONAL,
      gmsc-Address                [6] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
      callReferenceNumber         [7] IMPLICIT OCTET STRING ( SIZE (1..8 ) ) OPTIONAL,
      forwardingReason            [8] IMPLICIT ENUMERATED {
         notReachable    (0 ),
         busy            (1 ),
         noReply         (2 )} OPTIONAL,
      basicServiceGroup              [9] CHOICE {
         ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
         ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )} OPTIONAL,
      networkSignalInfo              [10] IMPLICIT SEQUENCE {
         protocolId           ENUMERATED {
            gsm-0408        (1 ),
            gsm-0806        (2 ),
            gsm-BSSMAP      (3 ),
            ets-300102-1    (4 )},
         signalInfo            OCTET STRING ( SIZE (1..200 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... } OPTIONAL,
      camelInfo                   [11] IMPLICIT SEQUENCE {
         supportedCamelPhases   BIT STRING {
            phase1  (0 ),
            phase2  (1 )} ( SIZE (1..16 ) ),
         suppress-T-CSI         NULL OPTIONAL,
         extensionContainer     SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... } OPTIONAL,
      suppressionOfAnnouncement   [12] IMPLICIT NULL OPTIONAL,
      extensionContainer          [13] IMPLICIT SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL,
      ... ,
      alertingPattern             [14] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
      ccbs-Call                   [15] IMPLICIT NULL OPTIONAL,
      supportedCCBS-Phase         [16] IMPLICIT INTEGER ( 1..127 ) OPTIONAL}
RESULT
```

```
      sendRoutingInfoRes [3] IMPLICIT SEQUENCE {
         imsi                              [9] IMPLICIT OCTET STRING ( SIZE (3..8 ) ) OPTIONAL,
         extendedRoutingInfo               CHOICE {
            routingInfo          CHOICE {
               roamingNumber      OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
               forwardingData     SEQUENCE {
                  forwardedToNumber       [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
                  forwardedToSubaddress   [4] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
                  forwardingOptions       [6] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  extensionContainer      [7] IMPLICIT SEQUENCE {
                     privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                        SEQUENCE {
                           extId      MAP-EXTENSION .&extensionId  ( {
                              ,
                              ...} ) ,
                           extType    MAP-EXTENSION .&ExtensionType  ( {
                              ,
                              ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                     pcs-Extensions         [1] IMPLICIT SEQUENCE {
                        ... } OPTIONAL,
                     ... } OPTIONAL,
                  ... }},
            camelRoutingInfo     [8] IMPLICIT SEQUENCE {
               forwardingData              SEQUENCE {
                  forwardedToNumber       [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
                  forwardedToSubaddress   [4] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
                  forwardingOptions       [6] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  extensionContainer      [7] IMPLICIT SEQUENCE {
                     privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                        SEQUENCE {
                           extId      MAP-EXTENSION .&extensionId  ( {
                              ,
                              ...} ) ,
                           extType    MAP-EXTENSION .&ExtensionType  ( {
                              ,
                              ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                     pcs-Extensions         [1] IMPLICIT SEQUENCE {
                        ... } OPTIONAL,
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               gmscCamelSubscriptionInfo   [0] IMPLICIT SEQUENCE {
                  t-CSI                        [0] IMPLICIT SEQUENCE {
                     t-BcsmCamelTDPDataList    SEQUENCE  ( SIZE (1..10 ) ) OF
                        SEQUENCE {
                           t-BcsmTriggerDetectionPoint   ENUMERATED {
                              termAttemptAuthorized    (12 ),
                              ... },
                           serviceKey                    INTEGER ( 0..2147483647 ),
                           gsmSCF-Address                [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) )
( SIZE (1..9 ) ),
                           defaultCallHandling           [1] IMPLICIT ENUMERATED {
                              continueCall    (0 ),
                              releaseCall     (1 ),
                              ... },
                           extensionContainer            [2] IMPLICIT SEQUENCE {
                              privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                                 SEQUENCE {
                                    extId      MAP-EXTENSION .&extensionId  ( {
                                       ,
                                       ...} ) ,
                                    extType    MAP-EXTENSION .&ExtensionType  ( {
                                       ,
                                       ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                              pcs-Extensions         [1] IMPLICIT SEQUENCE {
                                 ... } OPTIONAL,
                              ... } OPTIONAL,
                           ... },
                     extensionContainer        SEQUENCE {
                        privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                           SEQUENCE {
                              extId      MAP-EXTENSION .&extensionId  ( {
                                 ,
                                 ...} ) ,
                              extType    MAP-EXTENSION .&ExtensionType  ( {
                                 ,
                                 ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                        pcs-Extensions         [1] IMPLICIT SEQUENCE {
                           ... } OPTIONAL,
                        ... } OPTIONAL,
                     ... ,
                     camelCapabilityHandling   [0] IMPLICIT INTEGER ( 1..16 ) OPTIONAL} OPTIONAL,
```

```
                o-CSI                          [1] IMPLICIT SEQUENCE {
                   o-BcsmCamelTDPDataList    SEQUENCE  ( SIZE (1..10 ) ) OF
                      SEQUENCE {
                         o-BcsmTriggerDetectionPoint   ENUMERATED {
                            collectedInfo    (2 ),
                            ... },
                         serviceKey                    INTEGER ( 0..2147483647 ),
                         gsmSCF-Address                [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) )
( SIZE (1..9 ) ),
                         defaultCallHandling           [1] IMPLICIT ENUMERATED {
                            continueCall    (0 ),
                            releaseCall     (1 ),
                            ... },
                         extensionContainer            [2] IMPLICIT SEQUENCE {
                            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                               SEQUENCE {
                                  extId      MAP-EXTENSION .&extensionId  ( {
                                     ,
                                     ...} ) ,
                                  extType    MAP-EXTENSION .&ExtensionType  ( {
                                     ,
                                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                            pcs-Extensions         [1] IMPLICIT SEQUENCE {
                               ... } OPTIONAL,
                            ... } OPTIONAL,
                         ... },
                      extensionContainer        SEQUENCE {
                         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                            SEQUENCE {
                               extId      MAP-EXTENSION .&extensionId  ( {
                                  ,
                                  ...} ) ,
                               extType    MAP-EXTENSION .&ExtensionType  ( {
                                  ,
                                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                         pcs-Extensions         [1] IMPLICIT SEQUENCE {
                            ... } OPTIONAL,
                         ... } OPTIONAL,
                      ... ,
                      camelCapabilityHandling   [0] IMPLICIT INTEGER ( 1..16 ) OPTIONAL} OPTIONAL,
                   extensionContainer            [2] IMPLICIT SEQUENCE {
                      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                         SEQUENCE {
                            extId      MAP-EXTENSION .&extensionId  ( {
                               ,
                               ...} ) ,
                            extType    MAP-EXTENSION .&ExtensionType  ( {
                               ,
                               ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                      pcs-Extensions         [1] IMPLICIT SEQUENCE {
                         ... } OPTIONAL,
                      ... } OPTIONAL,
                   ... ,
                   o-BcsmCamelTDP-CriteriaList   [3] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                      SEQUENCE {
                         o-BcsmTriggerDetectionPoint   ENUMERATED {
                            collectedInfo    (2 ),
                            ... },
                         destinationNumberCriteria     [0] IMPLICIT SEQUENCE {
                            matchType                     [0] IMPLICIT ENUMERATED {
                               inhibiting    (0 ),
                               enabling      (1 )},
                            destinationNumberList         [1] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                               OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ) OPTIONAL,
                            destinationNumberLengthList   [2] IMPLICIT SEQUENCE  ( SIZE (1..3 ) ) OF
                               INTEGER ( 1..15 ) OPTIONAL,
                            ... } OPTIONAL,
                         basicServiceCriteria          [1] IMPLICIT SEQUENCE  ( SIZE (1..5 ) ) OF
                            CHOICE {
                               ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
                               ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )}
OPTIONAL,
                         callTypeCriteria              [2] IMPLICIT ENUMERATED {
                            forwarded       (0 ),
                            notForwarded    (1 )} OPTIONAL,
                         ... } OPTIONAL},
                   extensionContainer          [1] IMPLICIT SEQUENCE {
                      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                         SEQUENCE {
                            extId      MAP-EXTENSION .&extensionId  ( {
                               ,
                               ...} ) ,
                            extType    MAP-EXTENSION .&ExtensionType  ( {
```

```
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... }} OPTIONAL,
         cug-CheckInfo                     [3] IMPLICIT SEQUENCE {
            cug-Interlock        OCTET STRING ( SIZE (4 ) ),
            cug-OutgoingAccess   NULL OPTIONAL,
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
         cugSubscriptionFlag               [6] IMPLICIT NULL OPTIONAL,
         subscriberInfo                    [7] IMPLICIT SEQUENCE {
            locationInformation   [0] IMPLICIT SEQUENCE {
               ageOfLocationInformation   INTEGER ( 0..32767 ) OPTIONAL,
               geographicalInformation    [0] IMPLICIT OCTET STRING ( SIZE (8 ) ) OPTIONAL,
               vlr-number                 [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
               locationNumber             [2] IMPLICIT OCTET STRING ( SIZE (2..10 ) ) OPTIONAL,
               cellIdOrLAI                [3] CHOICE {
                  cellIdFixedLength     [0] IMPLICIT OCTET STRING ( SIZE (7 ) ),
                  laiFixedLength        [1] IMPLICIT OCTET STRING ( SIZE (5 ) )} OPTIONAL,
               extensionContainer         [4] IMPLICIT SEQUENCE {
                  privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                     SEQUENCE {
                        extId      MAP-EXTENSION .&extensionId  ( {
                           ,
                           ...} ) ,
                        extType    MAP-EXTENSION .&ExtensionType  ( {
                           ,
                           ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... } OPTIONAL,
            subscriberState       [1] CHOICE {
               assumedIdle            [0] IMPLICIT NULL,
               camelBusy              [1] IMPLICIT NULL,
               netDetNotReachable     ENUMERATED {
                  msPurged          (0 ),
                  imsiDetached      (1 ),
                  restrictedArea    (2 ),
                  notRegistered     (3 )},
               notProvidedFromVLR     [2] IMPLICIT NULL} OPTIONAL,
            extensionContainer    [2] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
         ss-List                           [1] IMPLICIT SEQUENCE  ( SIZE (1..30 ) ) OF
            OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         basicService                      [5] CHOICE {
            ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
            ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )} OPTIONAL,
         forwardingInterrogationRequired   [4] IMPLICIT NULL OPTIONAL,
         vmsc-Address                      [2] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9
) ) OPTIONAL,
         extensionContainer                [0] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
```

```
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         naea-PreferredCI                  [10] IMPLICIT SEQUENCE {
            naea-PreferredCIC    [0] IMPLICIT OCTET STRING ( SIZE (3 ) ),
            extensionContainer   [1] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
         ccbs-Indicators                   [11] IMPLICIT SEQUENCE {
            ccbs-Possible            [0] IMPLICIT NULL OPTIONAL,
            keepCCBS-CallIndicator   [1] IMPLICIT NULL OPTIONAL,
            extensionContainer       [2] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL}
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- facilityNotSupported -- localValue : 21,
      -- or-NotAllowed -- localValue : 48,
      -- unknownSubscriber -- localValue : 1,
      -- numberChanged -- localValue : 44,
      -- bearerServiceNotProvisioned -- localValue : 10,
      -- teleserviceNotProvisioned -- localValue : 11,
      -- absentSubscriber -- localValue : 27,
      -- busySubscriber -- localValue : 45,
      -- noSubscriberReply -- localValue : 46,
      -- callBarred -- localValue : 13,
      -- cug-Reject -- localValue : 15,
      -- forwardingViolation -- localValue : 14}
 ::= localValue : 22

provideRoamingNumber OPERATION
   ARGUMENT
      provideRoamingNumberArg SEQUENCE {
         imsi                          [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         msc-Number                    [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         msisdn                        [2] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL,
         lmsi                          [4] IMPLICIT OCTET STRING ( SIZE (4 ) ) OPTIONAL,
         gsm-BearerCapability          [5] IMPLICIT SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo             OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
```

```
         networkSignalInfo            [6] IMPLICIT SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo             OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
         suppressionOfAnnouncement    [7] IMPLICIT NULL OPTIONAL,
         gmsc-Address                 [8] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL,
         callReferenceNumber          [9] IMPLICIT OCTET STRING ( SIZE (1..8 ) ) OPTIONAL,
         or-Interrogation             [10] IMPLICIT NULL OPTIONAL,
         extensionContainer           [11] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         alertingPattern              [12] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         ccbs-Call                    [13] IMPLICIT NULL OPTIONAL,
         supportedCamelPhasesInGMSC   [15] IMPLICIT BIT STRING {
            phase1  (0 ),
            phase2  (1 )} ( SIZE (1..16 ) ) OPTIONAL}
   RESULT
      provideRoamingNumberRes SEQUENCE {
         roamingNumber        OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- facilityNotSupported -- localValue : 21,
      -- or-NotAllowed -- localValue : 48,
      -- absentSubscriber -- localValue : 27,
      -- noRoamingNumberAvailable -- localValue : 39}
 ::= localValue : 4

resumeCallHandling OPERATION
   ARGUMENT
      resumeCallHandlingArg SEQUENCE {
         callReferenceNumber   [0] IMPLICIT OCTET STRING ( SIZE (1..8 ) ),
         basicServiceGroup     [1] CHOICE {
            ext-BearerService     [2] IMPLICIT OCTET STRING ( SIZE (1..5 ) ),
            ext-Teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1..5 ) )},
         forwardingData        [2] IMPLICIT SEQUENCE {
            forwardedToNumber       [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL,
            forwardedToSubaddress   [4] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
            forwardingOptions       [6] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            extensionContainer      [7] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
```

```
                SEQUENCE {
                   extId      MAP-EXTENSION .&extensionId  ( {
                      ,
                      ...} ) ,
                   extType    MAP-EXTENSION .&ExtensionType  ( {
                      ,
                      ...} { @extId   }  )  OPTIONAL} OPTIONAL,
             pcs-Extensions         [1] IMPLICIT SEQUENCE {
                ... } OPTIONAL,
             ... } OPTIONAL,
          ... },
       imsi                [3] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
       cug-CheckInfo       [4] IMPLICIT SEQUENCE {
          cug-Interlock       OCTET STRING ( SIZE (4 ) ),
          cug-OutgoingAccess  NULL OPTIONAL,
          extensionContainer  SEQUENCE {
             privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                SEQUENCE {
                   extId      MAP-EXTENSION .&extensionId  ( {
                      ,
                      ...} ) ,
                   extType    MAP-EXTENSION .&ExtensionType  ( {
                      ,
                      ...} { @extId   }  )  OPTIONAL} OPTIONAL,
             pcs-Extensions         [1] IMPLICIT SEQUENCE {
                ... } OPTIONAL,
             ... } OPTIONAL,
          ... } OPTIONAL,
       o-CSI               [5] IMPLICIT SEQUENCE {
          o-BcsmCamelTDPDataList    SEQUENCE  ( SIZE (1..10 ) ) OF
             SEQUENCE {
                o-BcsmTriggerDetectionPoint   ENUMERATED {
                   collectedInfo    (2 ),
                   ... },
                serviceKey                    INTEGER ( 0..2147483647 ),
                gsmSCF-Address                [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE
(1..9 ) ),
                defaultCallHandling           [1] IMPLICIT ENUMERATED {
                   continueCall    (0 ),
                   releaseCall     (1 ),
                   ... },
                extensionContainer            [2] IMPLICIT SEQUENCE {
                   privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                      SEQUENCE {
                         extId      MAP-EXTENSION .&extensionId  ( {
                            ,
                            ...} ) ,
                         extType    MAP-EXTENSION .&ExtensionType  ( {
                            ,
                            ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                   pcs-Extensions         [1] IMPLICIT SEQUENCE {
                      ... } OPTIONAL,
                   ... } OPTIONAL,
                ... },
             extensionContainer        SEQUENCE {
                privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                   SEQUENCE {
                      extId      MAP-EXTENSION .&extensionId  ( {
                         ,
                         ...} ) ,
                      extType    MAP-EXTENSION .&ExtensionType  ( {
                         ,
                         ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                pcs-Extensions         [1] IMPLICIT SEQUENCE {
                   ... } OPTIONAL,
                ... } OPTIONAL,
             ... ,
             camelCapabilityHandling   [0] IMPLICIT INTEGER ( 1..16 ) OPTIONAL} OPTIONAL,
       extensionContainer    [7] IMPLICIT SEQUENCE {
          privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
             SEQUENCE {
                extId      MAP-EXTENSION .&extensionId  ( {
                   ,
                   ...} ) ,
                extType    MAP-EXTENSION .&ExtensionType  ( {
                   ,
                   ...} { @extId   }  )  OPTIONAL} OPTIONAL,
          pcs-Extensions         [1] IMPLICIT SEQUENCE {
             ... } OPTIONAL,
          ... } OPTIONAL,
       ... ,
       ccbs-Possible         [8] IMPLICIT NULL OPTIONAL}
   RESULT
```

```
      resumeCallHandlingRes SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- forwardingFailed -- localValue : 47,
      -- or-NotAllowed -- localValue : 48,
      -- unexpectedDataValue -- localValue : 36}
 ::= localValue : 6

provideSIWFSNumber OPERATION
   ARGUMENT
      provideSIWFSNumberArg SEQUENCE {
         gsm-BearerCapability      [0] IMPLICIT SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
         isdn-BearerCapability     [1] IMPLICIT SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
         call-Direction            [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
         b-Subscriber-Address      [3] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         chosenChannel             [4] IMPLICIT SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
```

```
               ... } OPTIONAL,
            ... },
         lowerLayerCompatibility   [5] IMPLICIT SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
         highLayerCompatibility    [6] IMPLICIT SEQUENCE {
            protocolId           ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo           OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
         extensionContainer        [7] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      provideSIWFSNumberRes SEQUENCE {
         sIWFSNumber          [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         extensionContainer   [1] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- resourceLimitation -- localValue : 51,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- systemFailure -- localValue : 34}
 ::= localValue : 31

sIWFSSignallingModify OPERATION
   ARGUMENT
      sIWFSSignallingModifyArg SEQUENCE {
         channelType          [0] IMPLICIT SEQUENCE {
            protocolId           ENUMERATED {
```

```
            gsm-0408        (1 ),
            gsm-0806        (2 ),
            gsm-BSSMAP      (3 ),
            ets-300102-1    (4 )},
         signalInfo           OCTET STRING ( SIZE (1..200 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... } OPTIONAL,
      chosenChannel        [1] IMPLICIT SEQUENCE {
         protocolId           ENUMERATED {
            gsm-0408        (1 ),
            gsm-0806        (2 ),
            gsm-BSSMAP      (3 ),
            ets-300102-1    (4 )},
         signalInfo           OCTET STRING ( SIZE (1..200 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... } OPTIONAL,
      extensionContainer   [2] IMPLICIT SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL,
      ... }
RESULT
   sIWFSSignallingModifyRes SEQUENCE {
      chosenChannel        [0] IMPLICIT SEQUENCE {
         protocolId           ENUMERATED {
            gsm-0408        (1 ),
            gsm-0806        (2 ),
            gsm-BSSMAP      (3 ),
            ets-300102-1    (4 )},
         signalInfo           OCTET STRING ( SIZE (1..200 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... } OPTIONAL,
      extensionContainer   [1] IMPLICIT SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
```

```
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- resourceLimitation -- localValue : 51,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- systemFailure -- localValue : 34}
 ::= localValue : 32

setReportingState OPERATION
   ARGUMENT
      setReportingStateArg SEQUENCE {
         imsi                [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ) OPTIONAL,
         lmsi                [1] IMPLICIT OCTET STRING ( SIZE (4 ) ) OPTIONAL,
         ccbs-Monitoring     [2] IMPLICIT ENUMERATED {
            stopMonitoring    (0 ),
            startMonitoring   (1 ),
            ... } OPTIONAL,
         extensionContainer   [3] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      setReportingStateRes SEQUENCE {
         ccbs-SubscriberStatus   [0] IMPLICIT ENUMERATED {
            ccbsNotIdle         (0 ),
            ccbsIdle            (1 ),
            ccbsNotReachable    (2 ),
            ... } OPTIONAL,
         extensionContainer      [1] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- unidentifiedSubscriber -- localValue : 5,
      -- unexpectedDataValue -- localValue : 36,
      -- dataMissing -- localValue : 35,
      -- resourceLimitation -- localValue : 51,
      -- facilityNotSupported -- localValue : 21}
 ::= localValue : 73

statusReport OPERATION
   ARGUMENT
      statusReportArg SEQUENCE {
         imsi                [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         eventReportData     [1] IMPLICIT SEQUENCE {
            ccbs-SubscriberStatus   [0] IMPLICIT ENUMERATED {
               ccbsNotIdle         (0 ),
               ccbsIdle            (1 ),
               ccbsNotReachable    (2 ),
               ... } OPTIONAL,
            extensionContainer      [1] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
```

```
            ... } OPTIONAL,
         callReportdata       [2] IMPLICIT SEQUENCE {
            monitoringMode       [0] IMPLICIT ENUMERATED {
               a-side      (0 ),
               b-side      (1 ),
               ... } OPTIONAL,
            callOutcome          [1] IMPLICIT ENUMERATED {
               success     (0 ),
               failure     (1 ),
               busy        (2 ),
               ... } OPTIONAL,
            extensionContainer   [2] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... } OPTIONAL,
         extensionContainer   [3] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      statusReportRes SEQUENCE {
         extensionContainer   [0] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- unknownSubscriber -- localValue : 1,
      -- systemFailure -- localValue : 34,
      -- unexpectedDataValue -- localValue : 36,
      -- dataMissing -- localValue : 35}
 ::= localValue : 74

remoteUserFree OPERATION
   ARGUMENT
      remoteUserFreeArg SEQUENCE {
         imsi                 [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         callInfo             [1] IMPLICIT SEQUENCE {
            protocolId             ENUMERATED {
               gsm-0408        (1 ),
               gsm-0806        (2 ),
               gsm-BSSMAP      (3 ),
               ets-300102-1    (4 )},
            signalInfo             OCTET STRING ( SIZE (1..200 ) ),
            extensionContainer     SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
```

```
         ccbs-Feature         [2] IMPLICIT SEQUENCE {
            ccbs-Index              [0] IMPLICIT INTEGER ( 1..5 ) OPTIONAL,
            b-subscriberNumber      [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL,
            b-subscriberSubaddress  [2] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
            basicServiceGroup       [3] CHOICE {
               bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
               teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
            ... },
         translatedB-Number   [3] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         replaceB-Number      [4] IMPLICIT NULL OPTIONAL,
         alertingPattern      [5] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         extensionContainer   [6] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      remoteUserFreeRes SEQUENCE {
         ruf-Outcome          [0] IMPLICIT ENUMERATED {
            accepted               (0 ),
            rejected               (1 ),
            noResponseFromFreeMS   (2 ),
            noResponseFromBusyMS   (3 ),
            udubFromFreeMS         (4 ),
            udubFromBusyMS         (5 ),
            ... },
         extensionContainer   [1] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- unexpectedDataValue -- localValue : 36,
      -- dataMissing -- localValue : 35,
      -- incompatibleTerminal -- localValue : 28,
      -- absentSubscriber -- localValue : 27,
      -- systemFailure -- localValue : 34,
      -- busySubscriber -- localValue : 45}
 ::= localValue : 75

registerSS OPERATION
   ARGUMENT
      registerSS-Arg SEQUENCE {
         ss-Code                OCTET STRING ( SIZE (1 ) ),
         basicService           CHOICE {
            bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
            teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
         forwardedToNumber       [4] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) OPTIONAL,
         forwardedToSubaddress   [6] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
         noReplyConditionTime    [5] IMPLICIT INTEGER ( 5..30 ) OPTIONAL,
         ... ,
         defaultPriority         [7] IMPLICIT INTEGER ( 0..15 ) OPTIONAL}
   RESULT
      ss-Info    CHOICE {
         forwardingInfo      [0] IMPLICIT SEQUENCE {
            ss-Code                OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            forwardingFeatureList   SEQUENCE  ( SIZE (1..13 ) ) OF
               SEQUENCE {
                  basicService           CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ss-Status              [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  forwardedToNumber      [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
                  forwardedToSubaddress   [8] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
                  forwardingOptions      [6] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
```

```
                noReplyConditionTime    [7] IMPLICIT INTEGER ( 5..30 ) OPTIONAL,
                ... },
            ... },
         callBarringInfo     [1] IMPLICIT SEQUENCE {
            ss-Code                  OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            callBarringFeatureList   SEQUENCE  ( SIZE (1..13 ) ) OF
               SEQUENCE {
                  basicService   CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ss-Status      [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  ... },
            ... },
         ss-Data             [3] IMPLICIT SEQUENCE {
            ss-Code                OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            ss-Status              [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            ss-SubscriptionOption   CHOICE {
               cliRestrictionOption     [2] IMPLICIT ENUMERATED {
                  permanent                    (0 ),
                  temporaryDefaultRestricted   (1 ),
                  temporaryDefaultAllowed      (2 )},
               overrideCategory         [1] IMPLICIT ENUMERATED {
                  overrideEnabled     (0 ),
                  overrideDisabled    (1 )}} OPTIONAL,
            basicServiceGroupList   SEQUENCE  ( SIZE (1..13 ) ) OF
               CHOICE {
                  bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                  teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
            ... ,
            defaultPriority         INTEGER ( 0..15 ) OPTIONAL}}
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- bearerServiceNotProvisioned -- localValue : 10,
      -- teleserviceNotProvisioned -- localValue : 11,
      -- callBarred -- localValue : 13,
      -- illegalSS-Operation -- localValue : 16,
      -- ss-ErrorStatus -- localValue : 17,
      -- ss-Incompatibility -- localValue : 20}
 ::= localValue : 10

eraseSS    OPERATION
   ARGUMENT
      ss-ForBS   SEQUENCE {
         ss-Code        OCTET STRING ( SIZE (1 ) ),
         basicService   CHOICE {
            bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
            teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
         ... }
   RESULT
      ss-Info    CHOICE {
         forwardingInfo      [0] IMPLICIT SEQUENCE {
            ss-Code                OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            forwardingFeatureList   SEQUENCE  ( SIZE (1..13 ) ) OF
               SEQUENCE {
                  basicService           CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ss-Status              [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  forwardedToNumber      [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
                  forwardedToSubaddress   [8] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
                  forwardingOptions       [6] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  noReplyConditionTime    [7] IMPLICIT INTEGER ( 5..30 ) OPTIONAL,
                  ... },
            ... },
         callBarringInfo     [1] IMPLICIT SEQUENCE {
            ss-Code                  OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            callBarringFeatureList   SEQUENCE  ( SIZE (1..13 ) ) OF
               SEQUENCE {
                  basicService   CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ss-Status      [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  ... },
            ... },
         ss-Data             [3] IMPLICIT SEQUENCE {
            ss-Code                OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            ss-Status              [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            ss-SubscriptionOption   CHOICE {
               cliRestrictionOption     [2] IMPLICIT ENUMERATED {
                  permanent                    (0 ),
```

```
                  temporaryDefaultRestricted    (1 ),
                  temporaryDefaultAllowed       (2 )},
               overrideCategory         [1] IMPLICIT ENUMERATED {
                  overrideEnabled     (0 ),
                  overrideDisabled    (1 )}} OPTIONAL,
            basicServiceGroupList   SEQUENCE  ( SIZE (1..13 ) ) OF
               CHOICE {
                  bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                  teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
            ... ,
            defaultPriority         INTEGER ( 0..15 ) OPTIONAL}}
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- bearerServiceNotProvisioned -- localValue : 10,
      -- teleserviceNotProvisioned -- localValue : 11,
      -- callBarred -- localValue : 13,
      -- illegalSS-Operation -- localValue : 16,
      -- ss-ErrorStatus -- localValue : 17}
 ::= localValue : 11

activateSS OPERATION
   ARGUMENT
      ss-ForBS   SEQUENCE {
         ss-Code        OCTET STRING ( SIZE (1 ) ),
         basicService   CHOICE {
            bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
            teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
         ... }
   RESULT
      ss-Info    CHOICE {
         forwardingInfo      [0] IMPLICIT SEQUENCE {
            ss-Code                OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            forwardingFeatureList   SEQUENCE  ( SIZE (1..13 ) ) OF
               SEQUENCE {
                  basicService           CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ss-Status              [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  forwardedToNumber      [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
                  forwardedToSubaddress   [8] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
                  forwardingOptions       [6] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  noReplyConditionTime    [7] IMPLICIT INTEGER ( 5..30 ) OPTIONAL,
                  ... },
            ... },
         callBarringInfo     [1] IMPLICIT SEQUENCE {
            ss-Code                 OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            callBarringFeatureList   SEQUENCE  ( SIZE (1..13 ) ) OF
               SEQUENCE {
                  basicService   CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ss-Status      [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  ... },
            ... },
         ss-Data             [3] IMPLICIT SEQUENCE {
            ss-Code                OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            ss-Status              [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            ss-SubscriptionOption   CHOICE {
               cliRestrictionOption     [2] IMPLICIT ENUMERATED {
                  permanent                   (0 ),
                  temporaryDefaultRestricted    (1 ),
                  temporaryDefaultAllowed       (2 )},
               overrideCategory         [1] IMPLICIT ENUMERATED {
                  overrideEnabled     (0 ),
                  overrideDisabled    (1 )}} OPTIONAL,
            basicServiceGroupList   SEQUENCE  ( SIZE (1..13 ) ) OF
               CHOICE {
                  bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                  teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
            ... ,
            defaultPriority         INTEGER ( 0..15 ) OPTIONAL}}
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- bearerServiceNotProvisioned -- localValue : 10,
      -- teleserviceNotProvisioned -- localValue : 11,
      -- callBarred -- localValue : 13,
      -- illegalSS-Operation -- localValue : 16,
      -- ss-ErrorStatus -- localValue : 17,
```

```
      -- ss-SubscriptionViolation -- localValue : 19,
      -- ss-Incompatibility -- localValue : 20,
      -- negativePW-Check -- localValue : 38,
      -- numberOfPW-AttemptsViolation -- localValue : 43}
 ::= localValue : 12

deactivateSS OPERATION
   ARGUMENT
      ss-ForBS   SEQUENCE {
         ss-Code        OCTET STRING ( SIZE (1 ) ),
         basicService   CHOICE {
            bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
            teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
         ... }
   RESULT
      ss-Info    CHOICE {
         forwardingInfo      [0] IMPLICIT SEQUENCE {
            ss-Code                OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            forwardingFeatureList   SEQUENCE  ( SIZE (1..13 ) ) OF
               SEQUENCE {
                  basicService           CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ss-Status              [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  forwardedToNumber      [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
                  forwardedToSubaddress   [8] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
                  forwardingOptions       [6] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  noReplyConditionTime    [7] IMPLICIT INTEGER ( 5..30 ) OPTIONAL,
                  ... },
            ... },
         callBarringInfo     [1] IMPLICIT SEQUENCE {
            ss-Code                 OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            callBarringFeatureList   SEQUENCE  ( SIZE (1..13 ) ) OF
               SEQUENCE {
                  basicService   CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ss-Status      [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
                  ... },
            ... },
         ss-Data             [3] IMPLICIT SEQUENCE {
            ss-Code                OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            ss-Status              [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
            ss-SubscriptionOption   CHOICE {
               cliRestrictionOption     [2] IMPLICIT ENUMERATED {
                  permanent                    (0 ),
                  temporaryDefaultRestricted    (1 ),
                  temporaryDefaultAllowed       (2 )},
               overrideCategory         [1] IMPLICIT ENUMERATED {
                  overrideEnabled     (0 ),
                  overrideDisabled    (1 )}} OPTIONAL,
            basicServiceGroupList   SEQUENCE  ( SIZE (1..13 ) ) OF
               CHOICE {
                  bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                  teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
            ... ,
            defaultPriority         INTEGER ( 0..15 ) OPTIONAL}}
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- bearerServiceNotProvisioned -- localValue : 10,
      -- teleserviceNotProvisioned -- localValue : 11,
      -- callBarred -- localValue : 13,
      -- illegalSS-Operation -- localValue : 16,
      -- ss-ErrorStatus -- localValue : 17,
      -- ss-SubscriptionViolation -- localValue : 19,
      -- negativePW-Check -- localValue : 38,
      -- numberOfPW-AttemptsViolation -- localValue : 43}
 ::= localValue : 13

interrogateSS OPERATION
   ARGUMENT
      ss-ForBS   SEQUENCE {
         ss-Code        OCTET STRING ( SIZE (1 ) ),
         basicService   CHOICE {
            bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
            teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
         ... }
   RESULT
      interrogateSS-Res CHOICE {
         ss-Status                [0] IMPLICIT OCTET STRING ( SIZE (1 ) ),
```

```
         basicServiceGroupList     [2] IMPLICIT SEQUENCE  ( SIZE (1..13 ) ) OF
            CHOICE {
               bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
               teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )},
         forwardingFeatureList     [3] IMPLICIT SEQUENCE  ( SIZE (1..13 ) ) OF
            SEQUENCE {
               basicService            CHOICE {
                  bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                  teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
               ss-Status                [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
               forwardedToNumber        [5] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL,
               forwardedToSubaddress    [8] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
               forwardingOptions        [6] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
               noReplyConditionTime     [7] IMPLICIT INTEGER ( 5..30 ) OPTIONAL,
               ... },
         genericServiceInfo        [4] IMPLICIT SEQUENCE {
            ss-Status                OCTET STRING ( SIZE (1 ) ),
            cliRestrictionOption     ENUMERATED {
               permanent                    (0 ),
               temporaryDefaultRestricted   (1 ),
               temporaryDefaultAllowed      (2 )} OPTIONAL,
            ... ,
            maximumEntitledPriority   [0] IMPLICIT INTEGER ( 0..15 ) OPTIONAL,
            defaultPriority           [1] IMPLICIT INTEGER ( 0..15 ) OPTIONAL,
            ccbs-FeatureList          [2] IMPLICIT SEQUENCE  ( SIZE (1..5 ) ) OF
               SEQUENCE {
                  ccbs-Index               [0] IMPLICIT INTEGER ( 1..5 ) OPTIONAL,
                  b-subscriberNumber       [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9
) ) OPTIONAL,
                  b-subscriberSubaddress   [2] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
                  basicServiceGroup        [3] CHOICE {
                     bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                     teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
                  ... } OPTIONAL}}
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- bearerServiceNotProvisioned -- localValue : 10,
      -- teleserviceNotProvisioned -- localValue : 11,
      -- callBarred -- localValue : 13,
      -- illegalSS-Operation -- localValue : 16,
      -- ss-NotAvailable -- localValue : 18}
 ::= localValue : 14

processUnstructuredSS-Request OPERATION
   ARGUMENT
      ussd-Arg   SEQUENCE {
         ussd-DataCodingScheme   OCTET STRING ( SIZE (1 ) ),
         ussd-String             OCTET STRING ( SIZE (1..160 ) ),
         ... ,
         alertingPattern         OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         msisdn                  [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL}
   RESULT
      ussd-Res   SEQUENCE {
         ussd-DataCodingScheme   OCTET STRING ( SIZE (1 ) ),
         ussd-String             OCTET STRING ( SIZE (1..160 ) ),
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownAlphabet -- localValue : 71,
      -- callBarred -- localValue : 13}
 ::= localValue : 59

unstructuredSS-Request OPERATION
   ARGUMENT
      ussd-Arg   SEQUENCE {
         ussd-DataCodingScheme   OCTET STRING ( SIZE (1 ) ),
         ussd-String             OCTET STRING ( SIZE (1..160 ) ),
         ... ,
         alertingPattern         OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         msisdn                  [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL}
   RESULT
      ussd-Res   SEQUENCE {
         ussd-DataCodingScheme   OCTET STRING ( SIZE (1 ) ),
         ussd-String             OCTET STRING ( SIZE (1..160 ) ),
         ... }
   ERRORS {
```

```
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- absentSubscriber -- localValue : 27,
      -- illegalSubscriber -- localValue : 9,
      -- illegalEquipment -- localValue : 12,
      -- unknownAlphabet -- localValue : 71,
      -- ussd-Busy -- localValue : 72}
 ::= localValue : 60

unstructuredSS-Notify OPERATION
   ARGUMENT
      ussd-Arg   SEQUENCE {
         ussd-DataCodingScheme   OCTET STRING ( SIZE (1 ) ),
         ussd-String             OCTET STRING ( SIZE (1..160 ) ),
         ... ,
         alertingPattern         OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         msisdn                  [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL}
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- absentSubscriber -- localValue : 27,
      -- illegalSubscriber -- localValue : 9,
      -- illegalEquipment -- localValue : 12,
      -- unknownAlphabet -- localValue : 71,
      -- ussd-Busy -- localValue : 72}
 ::= localValue : 61

registerPassword OPERATION
   ARGUMENT
      ss-Code    OCTET STRING ( SIZE (1 ) )
   RESULT
      newPassword NumericString ( FROM ("0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9" )|SIZE (4 ) )
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- callBarred -- localValue : 13,
      -- ss-SubscriptionViolation -- localValue : 19,
      -- pw-RegistrationFailure -- localValue : 37,
      -- negativePW-Check -- localValue : 38,
      -- numberOfPW-AttemptsViolation -- localValue : 43}
   LINKED {
      -- getPassword -- localValue : 18}
 ::= localValue : 17

getPassword OPERATION
   ARGUMENT
      guidanceInfo ENUMERATED {
         enterPW             (0 ),
         enterNewPW          (1 ),
         enterNewPW-Again    (2 )}
   RESULT
      currentPassword NumericString ( FROM ("0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9" )|SIZE (4 ) )
 ::= localValue : 18

registerCC-Entry OPERATION
   ARGUMENT
      registerCC-EntryArg SEQUENCE {
         ss-Code     [0] IMPLICIT OCTET STRING ( SIZE (1 ) ),
         ccbs-Data   [1] IMPLICIT SEQUENCE {
            ccbs-Feature         [0] IMPLICIT SEQUENCE {
               ccbs-Index              [0] IMPLICIT INTEGER ( 1..5 ) OPTIONAL,
               b-subscriberNumber      [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL,
               b-subscriberSubaddress  [2] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
               basicServiceGroup       [3] CHOICE {
                  bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
                  teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
               ... },
            translatedB-Number   [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
            serviceIndicator     [2] IMPLICIT BIT STRING {
               clir-invoked  (0 ),
               camel-invoked  (1 )} ( SIZE (2..32 ) ) OPTIONAL,
            callInfo             [3] IMPLICIT SEQUENCE {
               protocolId           ENUMERATED {
                  gsm-0408        (1 ),
                  gsm-0806        (2 ),
                  gsm-BSSMAP      (3 ),
                  ets-300102-1    (4 )},
               signalInfo             OCTET STRING ( SIZE (1..200 ) ),
```

```
               extensionContainer   SEQUENCE {
                  privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                     SEQUENCE {
                        extId      MAP-EXTENSION .&extensionId  ( {
                           ,
                           ...} ) ,
                        extType    MAP-EXTENSION .&ExtensionType  ( {
                           ,
                           ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... },
            networkSignalInfo    [4] IMPLICIT SEQUENCE {
               protocolId           ENUMERATED {
                  gsm-0408        (1 ),
                  gsm-0806        (2 ),
                  gsm-BSSMAP      (3 ),
                  ets-300102-1    (4 )},
               signalInfo           OCTET STRING ( SIZE (1..200 ) ),
               extensionContainer   SEQUENCE {
                  privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                     SEQUENCE {
                        extId      MAP-EXTENSION .&extensionId  ( {
                           ,
                           ...} ) ,
                        extType    MAP-EXTENSION .&ExtensionType  ( {
                           ,
                           ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... },
            ... } OPTIONAL,
         ... }
   RESULT
      registerCC-EntryRes SEQUENCE {
         ccbs-Feature   [0] IMPLICIT SEQUENCE {
            ccbs-Index              [0] IMPLICIT INTEGER ( 1..5 ) OPTIONAL,
            b-subscriberNumber      [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )
OPTIONAL,
            b-subscriberSubaddress   [2] IMPLICIT OCTET STRING ( SIZE (1..21 ) ) OPTIONAL,
            basicServiceGroup        [3] CHOICE {
               bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
               teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- callBarred -- localValue : 13,
      -- illegalSS-Operation -- localValue : 16,
      -- ss-ErrorStatus -- localValue : 17,
      -- ss-Incompatibility -- localValue : 20,
      -- shortTermDenial -- localValue : 29,
      -- longTermDenial -- localValue : 30,
      -- facilityNotSupported -- localValue : 21}
 ::= localValue : 76

eraseCC-Entry OPERATION
   ARGUMENT
      eraseCC-EntryArg SEQUENCE {
         ss-Code      [0] IMPLICIT OCTET STRING ( SIZE (1 ) ),
         ccbs-Index   [1] IMPLICIT INTEGER ( 1..5 ) OPTIONAL,
         ... }
   RESULT
      eraseCC-EntryRes SEQUENCE {
         ss-Code     [0] IMPLICIT OCTET STRING ( SIZE (1 ) ),
         ss-Status   [1] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- callBarred -- localValue : 13,
      -- illegalSS-Operation -- localValue : 16,
      -- ss-ErrorStatus -- localValue : 17}
 ::= localValue : 77

sendRoutingInfoForSM OPERATION
   ARGUMENT
      routingInfoForSM-Arg SEQUENCE {
```

```
         msisdn                [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         sm-RP-PRI             [1] IMPLICIT BOOLEAN,
         serviceCentreAddress  [2] IMPLICIT OCTET STRING ( SIZE (1..20 ) ),
         extensionContainer    [6] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         gprsSupportIndicator  [7] IMPLICIT NULL OPTIONAL,
         sm-RP-MTI             [8] IMPLICIT INTEGER ( 0..10 ) OPTIONAL,
         sm-RP-SMEA            [9] IMPLICIT OCTET STRING ( SIZE (1..12 ) ) OPTIONAL}
   RESULT
      routingInfoForSM-Res SEQUENCE {
         imsi                  OCTET STRING ( SIZE (3..8 ) ),
         locationInfoWithLMSI  [0] IMPLICIT SEQUENCE {
            networkNode-Number   [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
            lmsi                  OCTET STRING ( SIZE (4 ) ) OPTIONAL,
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... ,
            gprsNodeIndicator    [5] IMPLICIT NULL OPTIONAL,
            additional-Number    [6] CHOICE {
               msc-Number      [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
               sgsn-Number     [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )}
OPTIONAL},
         extensionContainer    [4] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- facilityNotSupported -- localValue : 21,
      -- unknownSubscriber -- localValue : 1,
      -- teleserviceNotProvisioned -- localValue : 11,
      -- callBarred -- localValue : 13,
      -- absentsubscriberSM -- localValue : 6}
 ::= localValue : 45

mo-forwardSM OPERATION
   ARGUMENT
      mo-forwardSM-Arg SEQUENCE {
         sm-RP-DA              CHOICE {
            imsi                       [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
            lmsi                       [1] IMPLICIT OCTET STRING ( SIZE (4 ) ),
            serviceCentreAddressDA     [4] IMPLICIT OCTET STRING ( SIZE (1..20 ) ),
            noSM-RP-DA                 [5] IMPLICIT NULL},
         sm-RP-OA              CHOICE {
            msisdn                     [2] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
            serviceCentreAddressOA     [4] IMPLICIT OCTET STRING ( SIZE (1..20 ) ),
            noSM-RP-OA                 [5] IMPLICIT NULL},
         sm-RP-UI              OCTET STRING ( SIZE (1..200 ) ),
         extensionContainer    SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
```

```
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... }
   RESULT
      mo-forwardSM-Res SEQUENCE {
         sm-RP-UI             OCTET STRING ( SIZE (1..200 ) ) OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- unexpectedDataValue -- localValue : 36,
      -- facilityNotSupported -- localValue : 21,
      -- sm-DeliveryFailure -- localValue : 32}
 ::= localValue : 46

mt-forwardSM OPERATION
   ARGUMENT
      mt-forwardSM-Arg SEQUENCE {
         sm-RP-DA             CHOICE {
            imsi                      [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
            lmsi                      [1] IMPLICIT OCTET STRING ( SIZE (4 ) ),
            serviceCentreAddressDA    [4] IMPLICIT OCTET STRING ( SIZE (1..20 ) ),
            noSM-RP-DA                [5] IMPLICIT NULL},
         sm-RP-OA             CHOICE {
            msisdn                    [2] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
            serviceCentreAddressOA    [4] IMPLICIT OCTET STRING ( SIZE (1..20 ) ),
            noSM-RP-OA                [5] IMPLICIT NULL},
         sm-RP-UI             OCTET STRING ( SIZE (1..200 ) ),
         moreMessagesToSend   NULL OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      mt-forwardSM-Res SEQUENCE {
         sm-RP-UI             OCTET STRING ( SIZE (1..200 ) ) OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- facilityNotSupported -- localValue : 21,
      -- unidentifiedSubscriber -- localValue : 5,
      -- illegalSubscriber -- localValue : 9,
```

```
      -- illegalEquipment -- localValue : 12,
      -- subscriberBusyForMT-SMS -- localValue : 31,
      -- sm-DeliveryFailure -- localValue : 32,
      -- absentsubscriberSM -- localValue : 6}
 ::= localValue : 44

reportSM-DeliveryStatus OPERATION
   ARGUMENT
      reportSM-DeliveryStatusArg SEQUENCE {
         msisdn                              OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         serviceCentreAddress                OCTET STRING ( SIZE (1..20 ) ),
         sm-DeliveryOutcome                  ENUMERATED {
            memoryCapacityExceeded    (0 ),
            absentSubscriber          (1 ),
            successfulTransfer        (2 )},
         absentSubscriberDiagnosticSM             [0] IMPLICIT INTEGER ( 0..255 ) OPTIONAL,
         extensionContainer                       [1] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         gprsSupportIndicator                     [2] IMPLICIT NULL OPTIONAL,
         deliveryOutcomeIndicator                 [3] IMPLICIT NULL OPTIONAL,
         additionalSM-DeliveryOutcome             [4] IMPLICIT ENUMERATED {
            memoryCapacityExceeded    (0 ),
            absentSubscriber          (1 ),
            successfulTransfer        (2 )} OPTIONAL,
         additionalAbsentSubscriberDiagnosticSM   [5] IMPLICIT INTEGER ( 0..255 ) OPTIONAL}
   RESULT
      reportSM-DeliveryStatusRes SEQUENCE {
         storedMSISDN         OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ) OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1,
      -- messageWaitingListFull -- localValue : 33}
 ::= localValue : 47

informServiceCentre OPERATION
   ARGUMENT
      informServiceCentreArg SEQUENCE {
         storedMSISDN         OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ) OPTIONAL,
         mw-Status            BIT STRING {
            sc-AddressNotIncluded  (0 ),
            mnrf-Set  (1 ),
            mcef-Set  (2 ),
            mnrg-Set  (3 )} ( SIZE (6..16 ) ) OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 63
```

```
alertServiceCentre OPERATION
   ARGUMENT
      alertServiceCentreArg SEQUENCE {
         msisdn                OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         serviceCentreAddress   OCTET STRING ( SIZE (1..20 ) ),
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36}
 ::= localValue : 64

readyForSM OPERATION
   ARGUMENT
      readyForSM-Arg SEQUENCE {
         imsi                  [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         alertReason           ENUMERATED {
            ms-Present         (0 ),
            memoryAvailable    (1 )},
         alertReasonIndicator   NULL OPTIONAL,
         extensionContainer     SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      readyForSM-Res SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- facilityNotSupported -- localValue : 21,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 66

provideSubscriberInfo OPERATION
   ARGUMENT
      provideSubscriberInfoArg SEQUENCE {
         imsi                [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         lmsi                [1] IMPLICIT OCTET STRING ( SIZE (4 ) ) OPTIONAL,
         requestedInfo       [2] IMPLICIT SEQUENCE {
            locationInformation   [0] IMPLICIT NULL OPTIONAL,
            subscriberState       [1] IMPLICIT NULL OPTIONAL,
            extensionContainer    [2] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
         extensionContainer   [3] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
```

```
                    ,
                    ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      provideSubscriberInfoRes SEQUENCE {
         subscriberInfo       SEQUENCE {
            locationInformation   [0] IMPLICIT SEQUENCE {
               ageOfLocationInformation   INTEGER ( 0..32767 ) OPTIONAL,
               geographicalInformation    [0] IMPLICIT OCTET STRING ( SIZE (8 ) ) OPTIONAL,
               vlr-number                 [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
               locationNumber             [2] IMPLICIT OCTET STRING ( SIZE (2..10 ) ) OPTIONAL,
               cellIdOrLAI                [3] CHOICE {
                  cellIdFixedLength     [0] IMPLICIT OCTET STRING ( SIZE (7 ) ),
                  laiFixedLength        [1] IMPLICIT OCTET STRING ( SIZE (5 ) )} OPTIONAL,
               extensionContainer         [4] IMPLICIT SEQUENCE {
                  privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                     SEQUENCE {
                        extId      MAP-EXTENSION .&extensionId  ( {
                           ,
                           ...} ) ,
                        extType    MAP-EXTENSION .&ExtensionType  ( {
                           ,
                           ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... } OPTIONAL,
            subscriberState       [1] CHOICE {
               assumedIdle            [0] IMPLICIT NULL,
               camelBusy              [1] IMPLICIT NULL,
               netDetNotReachable     ENUMERATED {
                  msPurged          (0 ),
                  imsiDetached      (1 ),
                  restrictedArea    (2 ),
                  notRegistered     (3 )},
               notProvidedFromVLR     [2] IMPLICIT NULL} OPTIONAL,
            extensionContainer    [2] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36}
 ::= localValue : 70

anyTimeInterrogation OPERATION
   ARGUMENT
      anyTimeInterrogationArg SEQUENCE {
         subscriberIdentity   [0] CHOICE {
            imsi         [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
            msisdn       [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) )},
         requestedInfo        [1] IMPLICIT SEQUENCE {
            locationInformation   [0] IMPLICIT NULL OPTIONAL,
            subscriberState       [1] IMPLICIT NULL OPTIONAL,
            extensionContainer    [2] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
```

```
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
         gsmSCF-Address       [3] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         extensionContainer   [2] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... }
   RESULT
      anyTimeInterrogationRes SEQUENCE {
         subscriberInfo       SEQUENCE {
            locationInformation   [0] IMPLICIT SEQUENCE {
               ageOfLocationInformation   INTEGER ( 0..32767 ) OPTIONAL,
               geographicalInformation    [0] IMPLICIT OCTET STRING ( SIZE (8 ) ) OPTIONAL,
               vlr-number                 [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 )
) OPTIONAL,
               locationNumber             [2] IMPLICIT OCTET STRING ( SIZE (2..10 ) ) OPTIONAL,
               cellIdOrLAI                [3] CHOICE {
                  cellIdFixedLength     [0] IMPLICIT OCTET STRING ( SIZE (7 ) ),
                  laiFixedLength        [1] IMPLICIT OCTET STRING ( SIZE (5 ) )} OPTIONAL,
               extensionContainer          [4] IMPLICIT SEQUENCE {
                  privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                     SEQUENCE {
                        extId      MAP-EXTENSION .&extensionId  ( {
                           ,
                           ...} ) ,
                        extType    MAP-EXTENSION .&ExtensionType  ( {
                           ,
                           ...} { @extId   }  )  OPTIONAL} OPTIONAL,
                  pcs-Extensions         [1] IMPLICIT SEQUENCE {
                     ... } OPTIONAL,
                  ... } OPTIONAL,
               ... } OPTIONAL,
            subscriberState       [1] CHOICE {
               assumedIdle            [0] IMPLICIT NULL,
               camelBusy              [1] IMPLICIT NULL,
               netDetNotReachable     ENUMERATED {
                  msPurged          (0 ),
                  imsiDetached      (1 ),
                  restrictedArea    (2 ),
                  notRegistered     (3 )},
               notProvidedFromVLR     [2] IMPLICIT NULL} OPTIONAL,
            extensionContainer    [2] IMPLICIT SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... },
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
```

```
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- ati-NotAllowed -- localValue : 49,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 71

ss-InvocationNotification OPERATION
   ARGUMENT
      ss-InvocationNotificationArg SEQUENCE {
         imsi                   [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         msisdn                 [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         ss-Event               [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
         ss-EventSpecification  [3] IMPLICIT SEQUENCE  ( SIZE (1..2 ) ) OF
            OCTET STRING ( SIZE (1..20 ) ) OPTIONAL,
         extensionContainer     [4] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      ss-InvocationNotificationRes SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 72

prepareGroupCall OPERATION
   ARGUMENT
      prepareGroupCallArg SEQUENCE {
         teleservice          OCTET STRING ( SIZE (1..5 ) ),
         asciCallReference    OCTET STRING ( SIZE (1..8 ) ),
         codec-Info           OCTET STRING ( SIZE (5..10 ) ),
         cipheringAlgorithm   OCTET STRING ( SIZE (1 ) ),
         groupKeyNumber       [0] IMPLICIT INTEGER ( 0..15 ) OPTIONAL,
         groupKey             [1] IMPLICIT OCTET STRING ( SIZE (8 ) ) OPTIONAL,
         priority             [2] IMPLICIT INTEGER ( 0..15 ) OPTIONAL,
         uplinkFree           [3] IMPLICIT NULL OPTIONAL,
         extensionContainer   [4] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      prepareGroupCallRes SEQUENCE {
         groupCallNumber      OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
```

```
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL,
      ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- noGroupCallNumberAvailable -- localValue : 50,
      -- unexpectedDataValue -- localValue : 36}
 ::= localValue : 39

sendGroupCallEndSignal OPERATION
   ARGUMENT
      sendGroupCallEndSignalArg SEQUENCE {
         imsi                 OCTET STRING ( SIZE (3..8 ) ) OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      sendGroupCallEndSignalRes SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 40

processGroupCallSignalling OPERATION
   ARGUMENT
      processGroupCallSignallingArg SEQUENCE {
         uplinkRequest             [0] IMPLICIT NULL OPTIONAL,
         uplinkReleaseIndication   [1] IMPLICIT NULL OPTIONAL,
         releaseGroupCall          [2] IMPLICIT NULL OPTIONAL,
         extensionContainer        SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 41

forwardGroupCallSignalling OPERATION
   ARGUMENT
      forwardGroupCallSignallingArg SEQUENCE {
         imsi                     OCTET STRING ( SIZE (3..8 ) ) OPTIONAL,
         uplinkRequestAck         [0] IMPLICIT NULL OPTIONAL,
         uplinkReleaseIndication  [1] IMPLICIT NULL OPTIONAL,
         uplinkRejectCommand      [2] IMPLICIT NULL OPTIONAL,
         uplinkSeizedCommand      [3] IMPLICIT NULL OPTIONAL,
         uplinkReleaseCommand     [4] IMPLICIT NULL OPTIONAL,
         extensionContainer       SEQUENCE {
            privateExtensionList  [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
```

```
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 42

updateGprsLocation OPERATION
   ARGUMENT
      updateGprsLocationArg SEQUENCE {
         imsi                 OCTET STRING ( SIZE (3..8 ) ),
         sgsn-Number          OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         sgsn-Address         OCTET STRING ( SIZE (5..17 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      updateGprsLocationRes SEQUENCE {
         hlr-Number           OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1,
      -- roamingNotAllowed -- localValue : 8}
 ::= localValue : 23

sendRoutingInfoForGprs OPERATION
   ARGUMENT
      sendRoutingInfoForGprsArg SEQUENCE {
         imsi                 [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         ggsn-Address         [1] IMPLICIT OCTET STRING ( SIZE (5..17 ) ) OPTIONAL,
         ggsn-Number          [2] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         extensionContainer   [3] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      sendRoutingInfoForGprsRes SEQUENCE {
         sgsn-Address              [0] IMPLICIT OCTET STRING ( SIZE (5..17 ) ),
         ggsn-Address              [1] IMPLICIT OCTET STRING ( SIZE (5..17 ) ) OPTIONAL,
         mobileNotReachableReason  [2] IMPLICIT INTEGER ( 0..255 ) OPTIONAL,
         extensionContainer        [3] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
```

```
                    ,
                    ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- absentSubscriber -- localValue : 27,
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 24

failureReport OPERATION
   ARGUMENT
      failureReportArg SEQUENCE {
         imsi                [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         ggsn-Number         [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) ( SIZE (1..9 ) ),
         ggsn-Address        [2] IMPLICIT OCTET STRING ( SIZE (5..17 ) ) OPTIONAL,
         extensionContainer   [3] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      failureReportRes SEQUENCE {
         ggsn-Address        [0] IMPLICIT OCTET STRING ( SIZE (5..17 ) ) OPTIONAL,
         extensionContainer   [1] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 25

noteMsPresentForGprs OPERATION
   ARGUMENT
      noteMsPresentForGprsArg SEQUENCE {
         imsi                [0] IMPLICIT OCTET STRING ( SIZE (3..8 ) ),
         sgsn-Address        [1] IMPLICIT OCTET STRING ( SIZE (5..17 ) ),
         ggsn-Address        [2] IMPLICIT OCTET STRING ( SIZE (5..17 ) ) OPTIONAL,
         extensionContainer   [3] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   RESULT
      noteMsPresentForGprsRes SEQUENCE {
         extensionContainer   [0] IMPLICIT SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
```

```
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
   ERRORS {
      -- systemFailure -- localValue : 34,
      -- dataMissing -- localValue : 35,
      -- unexpectedDataValue -- localValue : 36,
      -- unknownSubscriber -- localValue : 1}
 ::= localValue : 26

systemFailure ERROR
   PARAMETER
      systemFailureParam CHOICE {
         networkResource                  ENUMERATED {
            plmn              (0 ),
            hlr               (1 ),
            vlr               (2 ),
            pvlr              (3 ),
            controllingMSC    (4 ),
            vmsc              (5 ),
            eir               (6 ),
            rss               (7 )},
         extensibleSystemFailureParam     SEQUENCE {
            networkResource      ENUMERATED {
               plmn              (0 ),
               hlr               (1 ),
               vlr               (2 ),
               pvlr              (3 ),
               controllingMSC    (4 ),
               vmsc              (5 ),
               eir               (6 ),
               rss               (7 )} OPTIONAL,
            extensionContainer   SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... }}
 ::= localValue : 34

dataMissing ERROR
   PARAMETER
      dataMissingParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 35

unexpectedDataValue ERROR
   PARAMETER
      unexpectedDataParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
```

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            ... } OPTIONAL,
         ... }
 ::= localValue : 36

facilityNotSupported ERROR
   PARAMETER
      facilityNotSupParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 21

incompatibleTerminal ERROR
   PARAMETER
      incompatibleTerminalParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 28

resourceLimitation ERROR
   PARAMETER
      resourceLimitationParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 51

unknownSubscriber ERROR
   PARAMETER
      unknownSubscriberParam SEQUENCE {
         extensionContainer            SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         unknownSubscriberDiagnostic   ENUMERATED {
            imsiUnknown              (0 ),
            gprsSubscriptionUnknown  (1 ),
            ... } OPTIONAL}
 ::= localValue : 1

numberChanged ERROR
   PARAMETER
      numberChangedParam SEQUENCE {
```

```
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 44

unknownMSC ERROR
 ::= localValue : 3

unidentifiedSubscriber ERROR
   PARAMETER
      unidentifiedSubParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 5

unknownEquipment ERROR
 ::= localValue : 7

roamingNotAllowed ERROR
   PARAMETER
      roamingNotAllowedParam SEQUENCE {
         roamingNotAllowedCause   ENUMERATED {
            plmnRoamingNotAllowed        (0 ),
            operatorDeterminedBarring    (3 )},
         extensionContainer       SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 8

illegalSubscriber ERROR
   PARAMETER
      illegalSubscriberParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 9

illegalEquipment ERROR
   PARAMETER
      illegalEquipmentParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
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               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 12

bearerServiceNotProvisioned ERROR
   PARAMETER
      bearerServNotProvParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 10

teleserviceNotProvisioned ERROR
   PARAMETER
      teleservNotProvParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 11

noHandoverNumberAvailable ERROR
 ::= localValue : 25

subsequentHandoverFailure ERROR
 ::= localValue : 26

tracingBufferFull ERROR
   PARAMETER
      tracingBufferFullParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 40

noRoamingNumberAvailable ERROR
   PARAMETER
      noRoamingNbParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
```

```
                    ,
                    ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 39

absentSubscriber ERROR
   PARAMETER
      absentSubscriberParam SEQUENCE {
         extensionContainer       SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         absentSubscriberReason   [0] IMPLICIT ENUMERATED {
            imsiDetach        (0 ),
            restrictedArea    (1 ),
            noPageResponse    (2 ),
            ... } OPTIONAL}
 ::= localValue : 27

busySubscriber ERROR
   PARAMETER
      busySubscriberParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         ccbs-Possible        [0] IMPLICIT NULL OPTIONAL,
         ccbs-Busy            [1] IMPLICIT NULL OPTIONAL}
 ::= localValue : 45

noSubscriberReply ERROR
   PARAMETER
      noSubscriberReplyParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 46

callBarred ERROR
   PARAMETER
      callBarredParam CHOICE {
         callBarringCause             ENUMERATED {
            barringServiceActive    (0 ),
            operatorBarring         (1 )},
         extensibleCallBarredParam    SEQUENCE {
            callBarringCause              ENUMERATED {
               barringServiceActive    (0 ),
               operatorBarring         (1 )} OPTIONAL,
            extensionContainer            SEQUENCE {
               privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
                  SEQUENCE {
                     extId      MAP-EXTENSION .&extensionId  ( {
```

```
                        ,
                        ...} ) ,
                     extType    MAP-EXTENSION .&ExtensionType  ( {
                        ,
                        ...} { @extId   }  )  OPTIONAL} OPTIONAL,
               pcs-Extensions         [1] IMPLICIT SEQUENCE {
                  ... } OPTIONAL,
               ... } OPTIONAL,
            ... ,
            unauthorisedMessageOriginator   [1] IMPLICIT NULL OPTIONAL}}
 ::= localValue : 13

forwardingFailed ERROR
   PARAMETER
      forwardingFailedParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 47

or-NotAllowed ERROR
   PARAMETER
      or-NotAllowedParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 48

forwardingViolation ERROR
   PARAMETER
      forwardingViolationParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 14

cug-Reject ERROR
   PARAMETER
      cug-RejectParam SEQUENCE {
         cug-RejectCause      ENUMERATED {
            incomingCallsBarredWithinCUG                  (0 ),
            subscriberNotMemberOfCUG                      (1 ),
            requestedBasicServiceViolatesCUG-Constraints  (5 ),
            calledPartySS-InteractionViolation            (7 )} OPTIONAL,
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
```

```
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 15

ati-NotAllowed ERROR
   PARAMETER
      ati-NotAllowedParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 49

noGroupCallNumberAvailable ERROR
   PARAMETER
      noGroupCallNbParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 50

illegalSS-Operation ERROR
 ::= localValue : 16

ss-ErrorStatus ERROR
   PARAMETER
      ss-Status  OCTET STRING ( SIZE (1 ) )
 ::= localValue : 17

ss-NotAvailable ERROR
 ::= localValue : 18

ss-SubscriptionViolation ERROR
 ::= localValue : 19

ss-Incompatibility ERROR
   PARAMETER
      ss-IncompatibilityCause SEQUENCE {
         ss-Code        [1] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         basicService   CHOICE {
            bearerService     [2] IMPLICIT OCTET STRING ( SIZE (1 ) ),
            teleservice       [3] IMPLICIT OCTET STRING ( SIZE (1 ) )} OPTIONAL,
         ss-Status      [4] IMPLICIT OCTET STRING ( SIZE (1 ) ) OPTIONAL,
         ... }
 ::= localValue : 20

unknownAlphabet ERROR
 ::= localValue : 71

ussd-Busy  ERROR
 ::= localValue : 72

pw-RegistrationFailure ERROR
   PARAMETER
      pw-RegistrationFailureCause ENUMERATED {
         undetermined            (0 ),
         invalidFormat           (1 ),
         newPasswordsMismatch    (2 )}
 ::= localValue : 37

negativePW-Check ERROR
 ::= localValue : 38
```

```
numberOfPW-AttemptsViolation ERROR
 ::= localValue : 43

shortTermDenial ERROR
   PARAMETER
      shortTermDenialParam SEQUENCE {
         ... }
 ::= localValue : 29

longTermDenial ERROR
   PARAMETER
      longTermDenialParam SEQUENCE {
         ... }
 ::= localValue : 30

subscriberBusyForMT-SMS ERROR
   PARAMETER
      subBusyForMT-SMS-Param SEQUENCE {
         extensionContainer        SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         gprsConnectionSuspended   NULL OPTIONAL}
 ::= localValue : 31

sm-DeliveryFailure ERROR
   PARAMETER
      sm-DeliveryFailureCause SEQUENCE {
         sm-EnumeratedDeliveryFailureCause   ENUMERATED {
            memoryCapacityExceeded        (0 ),
            equipmentProtocolError        (1 ),
            equipmentNotSM-Equipped       (2 ),
            unknownServiceCentre          (3 ),
            sc-Congestion                 (4 ),
            invalidSME-Address            (5 ),
            subscriberNotSC-Subscriber    (6 )},
         diagnosticInfo                      OCTET STRING ( SIZE (1..200 ) ) OPTIONAL,
         extensionContainer                  SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 32

messageWaitingListFull ERROR
   PARAMETER
      messageWaitListFullParam SEQUENCE {
         extensionContainer   SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... }
 ::= localValue : 33

absentsubscriberSM ERROR
   PARAMETER
      absentSubscriberSM-Param SEQUENCE {
```

```
         absentSubscriberDiagnosticSM             INTEGER ( 0..255 ) OPTIONAL,
         extensionContainer                       SEQUENCE {
            privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
               SEQUENCE {
                  extId      MAP-EXTENSION .&extensionId  ( {
                     ,
                     ...} ) ,
                  extType    MAP-EXTENSION .&ExtensionType  ( {
                     ,
                     ...} { @extId   }  )  OPTIONAL} OPTIONAL,
            pcs-Extensions         [1] IMPLICIT SEQUENCE {
               ... } OPTIONAL,
            ... } OPTIONAL,
         ... ,
         additionalAbsentSubscriberDiagnosticSM   [0] IMPLICIT INTEGER ( 0..255 ) OPTIONAL}
 ::= localValue : 6

END
```

B.2 Fully Expanded ASN.1 Source of MAP-DialogueInformation

```
--    Expanded ASN1 Module 'MAP-DialogueInformation'
--SIEMENS ASN.1 Compiler       R4.21  (42-00-04)
--             Date: 99-12-21 Time: 12:08:21

MAP-DialogueInformation{ 0 identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1)
modules (3) map-DialogueInformation (3) version4 (4) }

DEFINITIONS

::=

BEGIN

EXPORTS
   map-DialogueAS,
   MAP-DialoguePDU;


map-DialogueAS OBJECT IDENTIFIER ::= { ccitt (0) identified-organization (4) etsi (0) mobileDomain
(0) gsm-Network (1) 1 map-DialoguePDU (1) version1 (1) }

MAP-DialoguePDU ::= CHOICE {
   map-open              [0] IMPLICIT SEQUENCE {
      destinationReference   [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) OPTIONAL,
      originationReference   [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) OPTIONAL,
      ... ,
      extensionContainer     SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL},
   map-accept            [1] IMPLICIT SEQUENCE {
      ... ,
      extensionContainer   SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL},
   map-close             [2] IMPLICIT SEQUENCE {
      ... ,
      extensionContainer   SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
```

```
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL},
   map-refuse            [3] IMPLICIT SEQUENCE {
      reason               ENUMERATED {
         noReasonGiven                (0 ),
         invalidDestinationReference  (1 ),
         invalidOriginatingReference  (2 )},
      ... ,
      extensionContainer   SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL},
   map-userAbort         [4] IMPLICIT SEQUENCE {
      map-UserAbortChoice   CHOICE {
         userSpecificReason                [0] IMPLICIT NULL,
         userResourceLimitation            [1] IMPLICIT NULL,
         resourceUnavailable               [2] IMPLICIT ENUMERATED {
            shortTermResourceLimitation    (0 ),
            longTermResourceLimitation     (1 )},
         applicationProcedureCancellation     [3] IMPLICIT ENUMERATED {
            handoverCancellation          (0 ),
            radioChannelRelease           (1 ),
            networkPathRelease            (2 ),
            callRelease                   (3 ),
            associatedProcedureFailure    (4 ),
            tandemDialogueRelease         (5 ),
            remoteOperationsFailure       (6 )}},
      ... ,
      extensionContainer    SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL},
   map-providerAbort     [5] IMPLICIT SEQUENCE {
      map-ProviderAbortReason   ENUMERATED {
         abnormalDialogue    (0 ),
         invalidPDU          (1 )},
      ... ,
      extensionContainer        SEQUENCE {
         privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
            SEQUENCE {
               extId      MAP-EXTENSION .&extensionId  ( {
                  ,
                  ...} ) ,
               extType    MAP-EXTENSION .&ExtensionType  ( {
                  ,
                  ...} { @extId   }  )  OPTIONAL} OPTIONAL,
         pcs-Extensions         [1] IMPLICIT SEQUENCE {
            ... } OPTIONAL,
         ... } OPTIONAL}}

MAP-OpenInfo ::= SEQUENCE {
   destinationReference   [0] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) OPTIONAL,
   originationReference   [1] IMPLICIT OCTET STRING ( SIZE (1..20 ) ) OPTIONAL,
   ... ,
   extensionContainer     SEQUENCE {
      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
         SEQUENCE {
            extId      MAP-EXTENSION .&extensionId  ( {
               ,
```

```
               ...} ) ,
            extType    MAP-EXTENSION .&ExtensionType  ( {
               ,
               ...} { @extId   }  )  OPTIONAL} OPTIONAL,
      pcs-Extensions         [1] IMPLICIT SEQUENCE {
         ... } OPTIONAL,
      ... } OPTIONAL}

MAP-AcceptInfo ::= SEQUENCE {
   ... ,
   extensionContainer   SEQUENCE {
      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
         SEQUENCE {
            extId      MAP-EXTENSION .&extensionId  ( {
               ,
               ...} ) ,
            extType    MAP-EXTENSION .&ExtensionType  ( {
               ,
               ...} { @extId   }  )  OPTIONAL} OPTIONAL,
      pcs-Extensions         [1] IMPLICIT SEQUENCE {
         ... } OPTIONAL,
      ... } OPTIONAL}

MAP-CloseInfo ::= SEQUENCE {
   ... ,
   extensionContainer   SEQUENCE {
      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
         SEQUENCE {
            extId      MAP-EXTENSION .&extensionId  ( {
               ,
               ...} ) ,
            extType    MAP-EXTENSION .&ExtensionType  ( {
               ,
               ...} { @extId   }  )  OPTIONAL} OPTIONAL,
      pcs-Extensions         [1] IMPLICIT SEQUENCE {
         ... } OPTIONAL,
      ... } OPTIONAL}

MAP-RefuseInfo ::= SEQUENCE {
   reason               ENUMERATED {
      noReasonGiven                 (0 ),
      invalidDestinationReference   (1 ),
      invalidOriginatingReference   (2 )},
   ... ,
   extensionContainer   SEQUENCE {
      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
         SEQUENCE {
            extId      MAP-EXTENSION .&extensionId  ( {
               ,
               ...} ) ,
            extType    MAP-EXTENSION .&ExtensionType  ( {
               ,
               ...} { @extId   }  )  OPTIONAL} OPTIONAL,
      pcs-Extensions         [1] IMPLICIT SEQUENCE {
         ... } OPTIONAL,
      ... } OPTIONAL}

Reason     ::= ENUMERATED {
   noReasonGiven                 (0 ),
   invalidDestinationReference   (1 ),
   invalidOriginatingReference   (2 )}

MAP-UserAbortInfo ::= SEQUENCE {
   map-UserAbortChoice   CHOICE {
      userSpecificReason                  [0] IMPLICIT NULL,
      userResourceLimitation              [1] IMPLICIT NULL,
      resourceUnavailable                 [2] IMPLICIT ENUMERATED {
         shortTermResourceLimitation    (0 ),
         longTermResourceLimitation     (1 )},
      applicationProcedureCancellation    [3] IMPLICIT ENUMERATED {
         handoverCancellation          (0 ),
         radioChannelRelease           (1 ),
         networkPathRelease            (2 ),
         callRelease                   (3 ),
         associatedProcedureFailure    (4 ),
         tandemDialogueRelease         (5 ),
         remoteOperationsFailure       (6 )}},
   ... ,
   extensionContainer    SEQUENCE {
      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
         SEQUENCE {
            extId      MAP-EXTENSION .&extensionId  ( {
               ,
```

```
               ...} ) ,
            extType    MAP-EXTENSION .&ExtensionType  ( {
               ,
               ...} { @extId   }  )  OPTIONAL} OPTIONAL,
      pcs-Extensions         [1] IMPLICIT SEQUENCE {
         ... } OPTIONAL,
      ... } OPTIONAL}

MAP-UserAbortChoice ::= CHOICE {
   userSpecificReason                  [0] IMPLICIT NULL,
   userResourceLimitation              [1] IMPLICIT NULL,
   resourceUnavailable                 [2] IMPLICIT ENUMERATED {
      shortTermResourceLimitation    (0 ),
      longTermResourceLimitation     (1 )},
   applicationProcedureCancellation    [3] IMPLICIT ENUMERATED {
      handoverCancellation          (0 ),
      radioChannelRelease           (1 ),
      networkPathRelease            (2 ),
      callRelease                   (3 ),
      associatedProcedureFailure    (4 ),
      tandemDialogueRelease         (5 ),
      remoteOperationsFailure       (6 )}}

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

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

MAP-ProviderAbortInfo ::= SEQUENCE {
   map-ProviderAbortReason   ENUMERATED {
      abnormalDialogue    (0 ),
      invalidPDU          (1 )},
   ... ,
   extensionContainer        SEQUENCE {
      privateExtensionList   [0] IMPLICIT SEQUENCE  ( SIZE (1..10 ) ) OF
         SEQUENCE {
            extId      MAP-EXTENSION .&extensionId  ( {
               ,
               ...} ) ,
            extType    MAP-EXTENSION .&ExtensionType  ( {
               ,
               ...} { @extId   }  )  OPTIONAL} OPTIONAL,
      pcs-Extensions         [1] IMPLICIT SEQUENCE {
         ... } OPTIONAL,
      ... } OPTIONAL}

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

END
```

Annex C (informative): Formal protocol incompatibilities between versions 1 & 2 of MAP

C.1 Introduction

Annex C is not normative; it presents for information those parts of the MAP version 2 protocol which are not backward compatible with (i.e. a true superset of) the MAP version 1 protocol. For each incompatibility there is a commentary on the impact on the interworking of MAP version 1 and MAP version 2 entities.

SMG have decided that the MAP specification should include the operations and procedures used on the B interface (MSC/VLR) only for modelling purposes; the B interface cannot be implemented as an open interface. Hence any incompatibilities which affect operations used only on the B interface have no impact on the interworking of MAP version 1 and MAP version 2 entities.

C.2 Deletion of operations and errors

This subclause lists the operations and errors which have been completely removed from the MAP protocol.

C.2.1 Deletion of operation DeregisterMobileSubscriber

Although it is defined in the protocol in the MAP version 1 specification, this operation is not used (see subclause 1.2 of the latest phase 1 version of GSM 09.02).

C.2.2 Deletion of operation RegisterChargingInfo

There is no known implementation of MAP version 1 which supports this operation. The deletion has been approved by SMG.

C.2.3 Deletion of operation ForwardSS-Notification

There is no known implementation of MAP version 1 which supports this operation. The deletion has been approved by SMG.

C.2.4 Deletion of operations used only on the B-interface

The following operations (listed in alphabetical order) are not defined in the MAP version 2 protocol, because they are used only on the B-interface:

AllocateHandoverNumber; AttachIMSI; Authenticate; CompleteCall; DetachIMSI; ForwardNewTMSI; InvokeSS; Page; ProcessAccessRequest; ProvideIMSI; SearchForMobileSubscriber; SendHandoverReport; SendInfoForIncomingCall; SendInfoForOutgoingCall; SetCipheringMode; UpdateLocationArea.

C.2.5 Deletion of error InsufficientBearerCapabilities

This error is defined in the MAP version 1 protocol, but it is not specified for use with any operation.

C.3 Deletion of errors for operations

This subclause lists the cases where an error which is specified for use with an operation in the MAP version 1 specification is not specified for use with the same operation in the MAP version 2 specification.

C.3.1 Error NegativePW-Check for operation RegisterSS

Password checking is not used for the supplementary services to which registration applies.

C.3.2 Error NegativePW-Check for operation EraseSS

Password checking is not used for the supplementary services to which erasure applies.

C.3.3 Error NegativePW-Check for operation InterrogateSS

Password checking is not used for the interrogation of supplementary services.

C.3.4 Error CUG-Reject for operation SendRoutingInfoForSM

Closed User Group does not apply to the short message service.

C.4 Changes to definitions of data types

This subclause lists in alphabetical order those data types whose definitions have been directly or indirectly changed. For constructed data types, only the components which have been changed are mentioned. The commentary on the end effect of each change is given in subclauses C.6 (parameters of operations), C.7 (results of operations) or C.8 (errors of operations).

C.4.1 CUG-Feature

The type CUG-Feature was a sequence of four components; these have been deleted and replaced by three new components. It is used for the components of the type CUG-FeatureList.

C.4.2 CUG-FeatureList

The type CUG-FeatureList is a sequence of components of type CUG-Feature. It is used for a component of the type CUG-Info.

C.4.3 CUG-Info

The type CUG-Info is a sequence. One component of the sequence has been replaced by a component of a new type; the other component was a choice between a cug-Feature and a cug-FeatureList, and is now an optional cug-FeatureList. The type CUG-Info is used for a component of the type SS-Info.

C.4.4 CUG-RejectCause

The range of permitted values of the enumerated type CUG-RejectCause has been extended. The type is used for the parameter of the error CUG-Reject.

C.4.5 IMSI

The lower limit of the length of an IMSI has been increased from 2 octets to 3 octets. It is not possible to code a minimum length IMSI (MCC+MNC+MSIN) in 2 octets, so the theoretical lower limit of 2 octets should never be used by a MAP version 1 entity to send an IMSI; if it is, a MAP version 2 entity will treat it as a protocol error. Since this change has no practical impact it is not discussed further.

C.4.6 ISDN-AddressString

The upper limit of the length of an ISDN-AddressString has been reduced from 10 octets to 9 octets. The maximum length of an E.164 number is 15 digits; this can be encoded as a TBCD-string in 8 octets, plus a further octet to hold the type of number and number plan indicator. The cases where the ISDN-AddressString type was used in MAP version 1 to carry anything other than an E.164 number are described in subclause C.6; the other cases are not discussed further.

C.4.7 Password

In MAP version 1 the type Password was a choice between a printable string of length 4 to 8 octets or a numeric string of length 4 octets. It is now a numeric string of length 4 octets. The type Password is used for the result of the operation GetPassword.

C.4.8 RequestParameter

The enumerated type RequestParameter is no longer allowed to take the value requestCUG-Info. It is used as a component of the type RequestParameterList.

C.4.9 RequestParameterList

The type RequestParameterList is a sequence of components of type RequestParameter. The parameter of the operation SendParameters is a sequence of which one component is of type RequestParameterList.

C.4.10 SentParameter

The type SentParameter is a choice of which one component is of type SubscriberData. It is used as a component of the type SentParameterList.

C.4.11 SentParameterList

The type SentParameterList is a sequence whose components are of type SentParameter. The maximum number of components in the sequence has been reduced from 10 to 6.

The type SentParameterList is used for the result of the operation SendParameters.

C.4.12 SS-Data

The type SS-Data is a sequence of which one component is of type SS-SubscriptionOption. It is used for a component of the type SS-Info.

C.4.13 SS-Info

The type SS-Info is a choice of which one component is of type CUG-Info and another component is of type SS-Data. It is used for the result of the operations RegisterSS, EraseSS, ActivateSS and DeactivateSS, and for components of the type SS-InfoList.

C.4.14 SS-InfoList

The type SS-InfoList is a sequence of components of type SS-Info. It is used for a component of the type SubscriberData.

C.4.15 SS-SubscriptionOption

The type SS-SubscriptionOption was a choice from five components: perCallBasis (used for the CLIR supplementary service); notificationToHeldRetrievedParty (used for the Call Transfer supplementary service); userToUserServiceIndicator (used for the User to User Signalling supplementary service); maximumConfereesNumber (used for the Conference Calling supplementary service); and huntGroupAccessSelectionOrder (used for the Mobile Access Hunting supplementary service. It has been replaced by a choice from two components: cliRestrictionOption (used for the CLIR supplementary service); and overrideCategory (used for the CLIP and COLP supplementary services).

The Call Transfer, User to User Signalling, Conference Calling and Mobile Access Hunting supplementary services are not specified for GSM Phase 1 or GSM Phase 2, so data for these services should not be transferred in a dialogue involving a MAP version 1 entity. These cases will therefore not be discussed further.

The type SS-SubscriptionOption is used for a component of SS-Data and for the parameter of the error SS-SubscriptionViolation.

C.4.16 SubscriberData

The type SubscriberData is a sequence of which one component is of type SS-InfoList. Components of SubscriberData are used as a component of the parameter of the operation InsertSubscriberData; the type is also used for a component of the type SentParameter.

C.5 Changes to parameters of errors

This subclause lists in alphabetical order the errors whose parameters have changed.

C.5.1 CUG-Reject

The error CUG-Reject has an optional parameter of type CUG-RejectCause. The error CUG-Reject is used for the operation SendRoutingInfo.

C.5.2 SS-SubscriptionViolation

The error SS-SubscriptionViolation has an optional parameter of type SS-SubscriptionOption. The error SS-SubscriptionViolation is used for the operations ActivateSS, DeactivateSS, EraseSS and RegisterSS.

C.6 Changes to parameters of operations

This subclause lists in alphabetical order the operations whose parameters have changed, and gives a commentary on the effect of the changes on each operation.

C.6.1 InsertSubscriberData

The parameter of the operation InsertSubscriberData is a sequence of which one component is a sequence of components of SubscriberData. The components of SubscriberData which are affected by the changes listed in subclause C.4 are cug-Info and ss-SubscriptionOption.

The CUG supplementary service is not supported by MAP version 1; CUG-Info should therefore not be used as a component of SubscriberData in a dialogue involving a MAP version 1 entity.

The replacement of the perCallBasis (type BOOLEAN) subscription option by the cliRestrictionOption (type ENUMERATED) for the CLIR supplementary service means that full support for the CLIR supplementary service is not possible if either entity involved can support only MAP version 1.

C.6.2 RegisterSS

The forwardedToNumber component of the parameter of the operation RegisterSS had a maximum length of 10 octets in MAP version 1, as it was of the type ISDN-AddressString. In MAP version 2 the maximum length is 20 octets, as the type is AddressString. The maximum length (9 octets) of the ISDN-AddressString type in MAP version 2 may not be adequate to hold the forwardedToNumber, which is not necessarily an E.164 number; the user may enter the number using the digits for international access rather than the "+" key.

C.6.3 SendParameters

The operation SendParameters uses as its parameter a sequence of which one component is of type RequestParameter. The value requestCUG-Info can no longer be used for this component. The SendParameters operation is used only when interworking with a MAP version 1 entity, and MAP version 1 does not support the GSM Phase 2 CUG supplementary service, so the SendParameters operation should in any case not be used to request CUG information.

C.6.4 SendRoutingInfoForSM

The cug-Interlock component of the parameter of the operation SendRoutingInfoForSM has been deleted. Closed User Group does not apply to the short message service.

C.7 Changes to results of operations

This subclause lists in alphabetical order the operations whose results have changed, and gives a commentary on the effect of the changes on each operation.

C.7.1 ActivateSS

The result of the operation ActivateSS is of type SS-Info. Two data types used for components of SS-Info have suffered incompatible changes: CUG-Info and SS-SubscriptionOption.

The ActivateSS operation does not apply to the CUG supplementary service, so the cug-Info component of SS-Info should never be present in the result of the operation ActivateSS.

The ActivateSS operation does not apply to the CLIP, CLIR or COLP supplementary services, for which the type SS-SubscriptionOption is used, so the ss-SubscriptionOption component of SS-Info should never be present in the result of the operation ActivateSS.

C.7.2 DeactivateSS

The result of the operation DeactivateSS is of type SS-Info. Two data types used for components of SS-Info have suffered incompatible changes: CUG-Info and SS-SubscriptionOption.

The DeactivateSS operation does not apply to the CUG supplementary service, so the cug-Info component of SS-Info should never be present in the result of the operation DeactivateSS.

The DeactivateSS operation does not apply to the CLIP, CLIR or COLP supplementary services, for which the type SS-SubscriptionOption is used, so the ss-SubscriptionOption component of SS-Info should never be present in the result of the operation DeactivateSS.

C.7.3 EraseSS

The result of the operation EraseSS is of type SS-Info. Two data types used for components of SS-Info have suffered incompatible changes: CUG-Info and SS-SubscriptionOption.

The EraseSS operation does not apply to the CUG supplementary service, so the cug-Info component of SS-Info should never be present in the result of the operation EraseSS.

The EraseSS operation does not apply to the CLIP, CLIR or COLP supplementary services, for which the type SS-SubscriptionOption is used, so the ss-SubscriptionOption component of SS-Info should never be present in the result of the operation EraseSS.

C.7.4 GetPassword

The result of the operation GetPassword is of type Password. In MAP version 1 this was a choice between a printable string of length 4 to 8 octets or a numeric string of length 4 octets. It is now a numeric string of length 4 octets. The printable string option was never used in MAP version 1, as indicated by a comment in the ASN.1 in the latest phase 1 version of GSM 09.02.

C.7.5 InterrogateSS

The result of the InterrogateSS operation is a CHOICE; one of the components of the CHOICE is a list of basic services to which the supplementary service applies, which is used for the Call Barring supplementary service. In MAP version 1 this list can in principle have up to 70 members, the number of individual basic services. However Call Barring can apply to only 13 basic service groups. In MAP version 2 the length of the list of basic service codes which can be returned in the result of the InterrogateSS operation is reduced to 13 to reflect this.

C.7.6 RegisterSS

The result of the operation RegisterSS is of type SS-Info. Two data types used for components of SS-Info have suffered incompatible changes: CUG-Info and SS-SubscriptionOption.

The RegisterSS operation does not apply to the CUG supplementary service, so the cug-Info component of SS-Info should never be present in the result of the operation RegisterSS.

The RegisterSS operation does not apply to the CLIP, CLIR or COLP supplementary services, for which the type SS-SubscriptionOption is used, so the ss-SubscriptionOption component of SS-Info should never be present in the result of the operation RegisterSS.

C.7.7 SendParameters

The result of the operation SendParameters is of type SentParameterList, which is a sequence of components of type SentParameter. The maximum number of components in the sequence has been reduced from 10 to 6. MAP version 1 could in principle send 10 sets of CUG-Information, but the supplementary service Closed User Group is not defined for GSM Phase 1, and the MAP version 1 signalling protocol will not support Closed User Group as defined for GSM Phase 2, so a MAP version 1 entity should never request parameters for CUG. The maximum number of sent parameters therefore consists of an IMSI and 5 AuthenticationSets - a total of 6.

The type SentParameter is a choice of which one component is of type SubscriberData. The components of SubscriberData which are affected by the changes listed in subclause C.4 are CUG-Info and ss-SubscriptionOption.

The CUG supplementary service is not supported by MAP version 1; CUG-Info should therefore not be used as a component of SubscriberData in a dialogue involving a MAP version 1 entity.

The replacement of the perCallBasis (type BOOLEAN) subscription option by the cliRestrictionOption (type ENUMERATED) for the CLIR supplementary service means that full support for the CLIR supplementary service is not possible if either entity involved can support only MAP version 1.

C.7.8 SendRoutingInfoForSM

The result of the operation SendRoutingInfoForSM is a sequence of which one component was a choice between location information (optionally with an associated LMSI) and forwarding data; the choice of forwarding data has been removed. Call Forwarding does not apply to the short message service.

C.8 Changes to errors of operations

This subclause lists in alphabetical order the operations whose errors have changed, and gives a commentary on the effect of the changes on each operation.

C.8.1 ActivateSS

The definition of the type SS-SubscriptionOption used for the optional parameter of the error SS-SubscriptionViolation has been changed. However the only use defined for the error SS-SubscriptionViolation is when the user attempts to activate or deactivate a Call Barring supplementary service and the subscription option "Control by Service Provider" has been taken. The MAP version 1 protocol does not define this subscription option, so there is no case when the error SS-SubscriptionViolation will be used with the optional parameter.

C.8.2 DeactivateSS

The definition of the type SS-SubscriptionOption used for the optional parameter of the error SS-SubscriptionViolation has been changed. However the only use defined for the error SS-SubscriptionViolation is when the user attempts to activate or deactivate a Call Barring supplementary service and the subscription option "Control by Service Provider" has been taken. The MAP version 1 protocol does not define this subscription option, so there is no case when the error SS-SubscriptionViolation will be used with the optional parameter.

C.8.3 EraseSS

The definition of the type SS-SubscriptionOption used for the optional parameter of the error SS-SubscriptionViolation has been changed. However the only use defined for the error SS-SubscriptionViolation is when the user attempts to activate or deactivate a Call Barring supplementary service and the subscription option "Control by Service Provider" has been taken, so there is no case when the error SS-SubscriptionViolation will be used for the operation EraseSS.

C.8.4 RegisterSS

The definition of the type SS-SubscriptionOption used for the optional parameter of the error SS-SubscriptionViolation has been changed. However the only use defined for the error SS-SubscriptionViolation is when the user attempts to activate or deactivate a Call Barring supplementary service and the subscription option "Control by Service Provider" has been taken, so there is no case when the error SS-SubscriptionViolation will be used for the operation RegisterSS.

C.8.5 SendRoutingInfo

The definition of the type (CUG-RejectCause) used for the optional parameter of the error CUG-Reject has been changed. However the supplementary service Closed User Group is not defined for GSM Phase 1, and the MAP version 1 signalling protocol will not support Closed User Group as defined for GSM Phase 2, so the error CUG-Reject should not be used in a dialogue involving a MAP version 1 entity.

Annex D (informative): Clause mapping table

D.1 Mapping of Clause numbers

The clause numbers have been modified according to table D.1.

Table D.1: Clause mapping from Version 5.9.0 to Version 6.0.0

Old Clause No (V5.9.0)	New Clause No (V6.0.0)		Old Clause No (V5.9.0)	New Clause No (V6.0.0)
1.1	2		17.*	20.*
1.2	3		18.*	21.*
2.*	4.*		19.*	22.*
3.*	5.*		19.0.*	22.1.*
4.*	6.*		19.1.*	22.2.*
5.*	7.*		19.2.*	22.3.*
6.*	8.*		19.3.*	22.4.*
7.*	9.*		19.4.*	22.5.*
8.*	10.*		19.5.*	22.6.*
9.*	11.*		19.6.*	22.7.*
10.*	12.*		19.7.*	22.8.*
new11.*	13.*		19.8.*	22.9.*
old11.*	14.*		19.9.*	22.10.*
12.*	15.*		19.10.*	22.11.*
13.*	16.*		19.11.*	22.12.*
14.*	17.*		20.*	23.*
15.*	18.*		new22.*	24.*
16.*	19.*		old21.*	25.*

Annex E (informative): Change History

SMG#	TDoc	SPEC	VERS	CR	REV	PHASE	CAT	SUBJECT	NEW_VERS	WORKITEM
s22	372/97	09.02	5.9.0	A087		R97	B	Allocation of an SS-code for the Calling Name Presentation SS. {based on 5.5.0}	6.0.0d1.0	CNAP R97
s23	97-689	09.02	5.9.0	A095	1	R97	B	Support of NAEA {based on 5.6.0}	6.0.0d1.0	NAEA
s24	97-971	09.02	5.9.0	A084	3	R97	B	Network's indication of alerting {based on 5.7.0}	6.0.0d1.0	NIAlerting in MS
s24	97-989	09.02	5.9.0	A094	2	R97	B	Modifications due to ASCI phase 2 {based on 5.7.0}	6.0.0d1.0	ASCI R97
s24	97-912	09.02	5.9.0	A103	6	R97	B	Introduction of SIWFS {based on 5.7.0}	6.0.0d1.0	SIWF
s25	98-0093	09.02	5.9.0	A105	9	R97	B	MAP changes for GPRS	6.0.0	GPRS
s25	98-0152	09.02	5.9.0	A109		R97	B	SMS Screening	6.0.0	SMS Enh.: Filtering
s25	98-0083	09.02	5.9.0	A111	4	R97	B	CAMEL phase 2	6.0.0	CAMEL R97
s25	98-0088	09.02	5.9.0	A114		R97	B	Introduction of description of VBS/VGSC Relay MSC in ASCI R97	6.0.0	ASCI R97
s25	98-0085	09.02	5.9.0	A115	1	R97	C	Introduction of Alerting categories	6.0.0	CAMEL R97, NetworkIA
s26	98-0413	09.02	6.0.0	A104	1	R97	F	SMS interworking with GPRS	6.1.0	
s26	98-0413	09.02	6.0.0	A123	2	R97	C	Subscription withdrawn from SGSN	6.1.0	
s26	98-0413	09.02	6.0.0	A124		R97	F	SMS interworking with GPRS	6.1.0	
s26	98-0413	09.02	6.0.0	A124	2	R97	C	Modification of Insert Subscriber Data and Delete Subscriber Data Procedures for GPRS	6.1.0	
s26	98-0413	09.02	6.0.0	A130	1	R97	C	Network access mode in the Insert-Subscriber-data to SGSN and VLR	6.1.0	
s26	98-0408	09.02	6.0.0	A120		R97	C	Modification of CUG-Info	6.1.0	
s26	98-0411	09.02	6.0.0	A113	2	R97	C	Support of CAMEL Phase 2	6.1.0	
s26	98-0407	09.02	6.0.0	A127	2	R97	A	Queuing of short messages at the VMSC and SGSN	6.1.0	
s26	98-0355	09.02	6.0.0	A097	8	R97	B	MAP impacts for CCBS	6.1.0	
s27		09.02	6.1.1	A136		R97	F	Correction to the Status Reporting procedure	6.2.0	
s27		09.02	6.1.1	A138		R97	F	Extending the applicability of GMSC Address in ProvideRoamingNumber	6.2.0	
s27		09.02	6.1.1	A140		R97	F	Minor corrections to SMS over GPRS	6.2.0	
s27		09.02	6.1.1	A129	1	R97	A	E.214 addressing of the HLR	6.2.0	
s27		09.02	6.1.1	A132	1	R97	F	09.02 Corrections	6.2.0	

SMG#	TDoc	SPEC	VERS	CR	REV	PHASE	CAT	SUBJECT	NEW_VERS	WORKITEM
s27		09.02	6.1.1	A133	1	R97	F	Clarification on applicability of application contexts	6.2.0	
s27		09.02	6.1.1	A139	2	R97	D	Clarification of GSM 09.02 when the SMS over GPRS functionality is not supported by SMS-GMSC.	6.2.0	
s27		09.02	6.1.1	A147	1	R97	F	Correction to the Status Reporting process in the VLR	6.2.0	
s27		09.02	6.1.1	A149		R97	F	Clarification of limit on length of O-CSI in MAP_RESUME_CALL-HANDLING	6.2.0	
s27		09.02	6.1.1	A152	1	R97	C	Support of CAMEL Phase 2	6.2.0	
s27		09.02	6.1.1	A151		R97	F	Removal of CCBS-feature from SS-Data	6.2.0	
s27		09.02	6.1.1	A158	1	R97	F	Restricting the use of extension containers in RegisterCCEntry and Erase CCEntry user errors	6.2.0	
s27		09.02	6.1.1	A153	1	R97	F	Correction in overload control tables for GPRS operations applicability	6.2.0	
s27		09.02	6.1.1	A154		R97	F	Usage of ShortMsgRelayPackage-v2 in GPRS	6.2.0	
s27		09.02	6.1.1	A150	1	R97	F	ASN.1 corrections	6.2.0	
s28		09.02	6.2.0	A159		R97	F	ASN.1 corrections	6.3.0	
s28		09.02	6.2.0	A161	1	R97	C	Clarification on the use of SCCP addresses in response	6.3.0	
s28		09.02	6.2.0	A162		R97	C	Removal of unused ST parameters	6.3.0	
s28		09.02	6.2.0	A164	1	R97	A	Use of SCCP Class 1	6.3.0	
s28		09.02	6.2.0	A167	1	R97	A	Corrections and updating of the 09.02	6.3.0	
s28		09.02	6.2.0	A170		R97	A	Optionality of sm-RP-UI in MO-ForwardSM-Res	6.3.0	
s28		09.02	6.2.0	A171	2	R97	F	Inclusion of “Check Indication” macro in GPRS SDLs	6.3.0	
s28		09.02	6.2.0	A172		R97	D	Editorial corrections of the GPRS enhancement of MAP	6.3.0	
s28		09.02	6.2.0	A173	1	R97	F	Alignment of the Failure Report-Arg message with GS	6.3.0	
s28		09.02	6.2.0	A174		R97	F	Correction on ODB applicability for GPRS ph 1	6.3.0	
s28		09.02	6.2.0	A179	1	R97	F	Alignment of the GSN-Address GSM 09.02 ASN.1 def	6.3.0	
s28		09.02	6.2.0	A180		R97	F	Applicability of SS Binding package	6.3.0	
s28		09.02	6.2.0	A181		R97	F	Definition of DestinationNumberLength	6.3.0	
s28		09.02	6.2.0	A185		R97	F	Clarification for MNRR	6.3.0	

SMG#	TDoc	SPEC	VERS	CR	REV	PHASE	CAT	SUBJECT	NEW_VERS	WORKITEM
s28		09.02	6.2.0	A188	1	R97	F	Correction of ASN.1 definition of PDP address	6.3.0	
s28		09.02	6.2.0	A192		R97	A	Re-use of security related information	6.3.0	
s28		09.02	6.2.0	A195		R97	F	ASN.1 coding for Access Point name	6.3.0	
s28		09.02	6.2.0	A159	2	R97	B	Introduction of 3-digit MNCs	6.3.0	
s29	N2-99643	09.02	6.3.0	A235	1	R97	F	Modification of the O-CSI ASN.1 structur	6.4.0	CAMEL phase 2
s29	N2-99667	09.02	6.3.0	A233		R97	F	Correction of mapping from MAP service to TC service	6.4.0	TEI
s29	N2-99560	09.02	6.3.0	A230		R97	F	Correction to the Purge MS "Detailed procedure in the HLR"	6.4.0	GPRS
s29	N2-99583	09.02	6.3.0	A229		R97	F	Removal of 3-digit MNCs	6.4.0	TEI
s29	N2b99518	09.02	6.3.0	A221		R97	A	VBS data	6.4.0	TEI
s29	N2-99270	09.02	6.3.0	A213	1	R97	C	Introduction of MSISDN in USSD operation	6.4.0	CAMEL phase 2
s29	N2-99179	09.02	6.3.0	A207		R97	D	Clarification in ASN.1 encoding of O-CSI and T-CSI	6.4.0	CAMEL phase 2
s29	N2-99 169	09.02	6.3.0	A206		R97	D	Use of E interface	6.4.0	ASCI phase 2
s29	N2-99168	09.02	6.3.0	A205		R97	F	Alignment with GSM 04.80	6.4.0	TEI
s29	N2-99249	09.02	6.3.0	A203	1	R97	F	Adding of MAP_DELIMITER_req to the Status Report operation	6.4.0	CCBS
CN#5	N2-99727	09.02	6.4.0	A239		R97	F	Corrections related to GGSN-HLR Interface	6.5.0	GPRS phase 1
CN#5	N2-99757	09.02	6.4.0	A241		R97	F	Clarification on VLR CAMEL Subscription Info	6.5.0	CAMEL phase 2
CN#5	N2-99914	09.02	6.4.0	A243	1	R97	D	Clarification on DestinationNumberCriteria	6.5.0	CAMEL Phase 2
CN#5	N2-99763	09.02	6.4.0	A247		R97	F	Removal of TDP-Criteria from RCH	6.5.0	CAMEL phase 2
CN#05	N2-99827	09.02	6.4.0	A250	1	R97	F	Update Location handling for GPRS-only subscription	6.5.0	GPRS Phase 1
CN#5	N2-99828	09.02	6.4.0	A251	1	R97	F	Correction of OP & AC definitions for NoteMS-PresentForGPRS	6.5.0	GPRS phase 1
CN#5	N2-99960	09.02	6.4.0	A260	1	R97	F	GMSC-CAMEL phase 2 support IE in PRN	6.5.0	CAMEL Phase 2
CN#5	N2-99A17	09.02	6.4.0	A262		R97	F	Alignment of 09.02 with 02.67	6.5.0	eMLPP

SMG#	TDoc	SPEC	VERS	CR	REV	PHASE	CAT	SUBJECT	NEW_VERS	WORKITEM
CN#5	N2-99C25	09.02	6.4.0	A267		R97	A	Clarification on 'Supported CAMEL Phases' in ISD ack	6.5.0	CAMEL Phase 2
CN#5	N2-99D02	09.02	6.4.0	A269	1	R97	F	Addition of exception handling to the CancellationType	6.5.0	GPRS
CN#6	N2-99G48	09.02	6.5.0	A278		R97	F	Addition of GGSN number for the SRIforGPRS	6.6.0	GPRS
CN#6	N2-99G82	09.02	6.5.0	A236	1	R97	F	Correction of the USSD procedure in the HLR	6.6.0	USSD
CN#6	N2-99K08	09.02	6.5.0	A276	1	R97	F	Use of SSN for GPRS	6.6.0	GPRS

Note: CR 09.02 A109r3 was not completely implemented in v6.0.0 and v6.1.1 so is introduced in v6.2.0. SDL changes to figure 23.3/6 (sheet 1of 5) "Process Mobile_terminated_SM_HLR".

History

Document history		
V6.1.1	August 1998	Publication
V6.2.0	November 1998	Publication
V6.4.0	August 1999	Publication
V6.6.0	February 2000	Publication