3GPP TSG CN Plenary Meeting #20 **NP-030228**
4th – 6th June 2003 Hämeenlinna, FINLAND.

Source: TSG CN WG4

Title: Corrections on TEI5

Agenda item: 8.8

Document for: APPROVAL

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
29.002	635		N4-030684	Rel-5	Removal of redundant text from 29.002 Chapter 23	F	5.5.0
29.002	595	2	N4-030713	Rel-6	Removal of redundant text from 29.002 Chapter 23	A	6.1.0
29.002	580		N4-030391	Rel-5	Provision of SDL diagrams in chapter 24B	F	5.5.0
29.002	581		N4-030392	Rel-6	Provision of SDL diagrams in chapter 24B	A	6.1.0
29.002	617		N4-030513	Rel-5	Formal correction to the ASN.1 syntax of SendIdentificationRes	F	5.5.0
29.002	634		N4-030683	Rel-5	Provision of SDL diagrams and removal of redundant text in chapter 25	F	5.5.0
29.002	574	1	N4-030638	Rel-6	Provision of SDL diagrams and removal of redundant text in chapter 25	A	6.1.0
29.002	578	1	N4-030639	Rel-5	Provision of SDL diagrams and removal of redundant text in chapter 24A	F	5.5.0
29.002	579	1	N4-030640	Rel-6	Provision of SDL diagrams and removal of redundant text in chapter 24A	A	6.1.0
29.002	593	2	N4-030670	Rel-5	Provision of SDL diagrams and removal of redundant text in chapter 24	F	5.5.0
29.002	594	2	N4-030671	Rel-6	Provision of SDL diagrams and removal of redundant text in chapter 24	A	6.1.0
29.002	606	1	N4-030681	Rel-5	Provision of SDL diagrams and removal of redundant text in chapter 22	F	5.5.0
29.002	607	1	N4-030682	Rel-6	Provision of SDL diagrams and removal of redundant text in chapter 22	A	6.1.0

3GPP TSG CN WG4 Meeting #19
San Diego, CA, USA, 19th – 23rd May 2003

N4-030713
(Revision of N4-030637)

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **595** ⌘**rev** **2** ⌘ Current version: **6.1.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Removal of redundant text from 29.002 Chapter 23
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	22/05/2003
Category:	⌘	**A**
Release:	⌘	Rel-6

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	When the CR to provide SDL source files and align the text with the SDL was being reviewed in CN4, the comment was made that most of the text replicates the information in the SDL diagrams. This means unnecessary bulk in the specification, and obscures the text which is **a useful supplement to** the information in the SDL diagrams. There are several references to 23.140 as the stage 2 specification for SMS. The correct specification number is 23.040.
Summary of change:	⌘	Remove the text which replicates the information in the SDL diagrams. Correct references to 23.140 to be references to 23.040.
Consequences if not approved:	⌘	Unnecessary bulk in the specification; useful information in the text is obscured by text which replicates the information in the SDL diagrams.

Clauses affected:	⌘	2; 7.6.1.4; 7.6.3.51; 7.6.8.9; 7.6.8.16; 7.6.8.17; 17.7.6; 17.7.7; 23			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	There is no change to the SDL diagrams; they are included to make it easier to review the changes in the text. The subclauses within 23.2, 23.4 & 23.5 have been re-ordered to be more logical: the procedure in the SGSN follows immediately after the procedures in the MSC & VLR in 23.2 & 23.4, and the procedure in the SMS-GMSC now precedes the procedure in the HLR in 23.5. The text in each of the first level subclauses (23.1, 23.2, 23.3, 23.4 & 23.5) is now grouped together before the SDL diagrams. This editorial rearrangement has not been revision marked; only the changes to subclause numbers and figure numbers are marked.			

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

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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TS 21.905: "3G Vocabulary".

[2] 3GPP TS 22.001: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a Public Land Mobile Network (PLMN)".

[3] 3GPP TS 22.002: "Bearer Services Supported by a Public Land Mobile Network (PLMN)".

[4] 3GPP TS 22.003: "Circuit Teleservices Supported by a Public Land Mobile Network (PLMN)".

[5] 3GPP TS 22.004: "General on Supplementary Services".

[6] 3GPP TS 42.009: "Digital cellular telecommunications system (Phase 2+); Security aspects".

[7] 3GPP TS 22.016: "International Mobile station Equipment Identities (IMEI)".

[8] 3GPP TS 22.041: "Operator Determined Barring".

[9] 3GPP TS 22.081: "Line identification supplementary services - Stage 1".

[10] 3GPP TS 22.082: "Call Forwarding (CF) supplementary services - Stage 1".

[11] 3GPP TS 22.083: "Call Waiting (CW) and Call Hold (HOLD) Supplementary Services - Stage 1".

[12] 3GPP TS 22.084: "Multi Party (MPTY) Supplementary Services - Stage 1".

[13] 3GPP TS 22.085: "Closed User Group (CUG) supplementary services - Stage 1".

[14] 3GPP TS 22.086: "Advice of charge (AoC) Supplementary Services - Stage 1".

[15] 3GPP TS 22.088: "Call Barring (CB) supplementary services - Stage 1".

[16] 3GPP TS 22.090: "Unstructured Supplementary Service Data (USSD); - Stage 1".

[17] 3GPP TS 23.003: "Numbering, addressing and identification".

[18] Void

[19] 3GPP TS 23.007: "Restoration procedures".

[20] 3GPP TS 23.008: "Organisation of subscriber data".

[21] 3GPP TS 23.009: "Handover procedures".

[22] 3GPP TS 23.011: "Technical realization of Supplementary Services - General Aspects".

[23] 3GPP TS 23.012: "Location registration procedures".

[24] 3GPP TS 43.020: "Security related network functions".

[25] 3GPP TS 23.038: "Alphabets and language".

[25a] 3GPP TS 23.039: " Interface protocols for the connection of Short Message Service Centres (SMSCs) to Short Message Entities (SMEs)".

[26] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS) Point to Point (PP)".

<Unchanged text omitted>

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

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 with detailed reasons as follows:
  - Shape of location estimate not supported;
  - Needed LCS capability not supported in serving node;
- incompatible terminal, i.e. the requested facility is not supported by the terminal.

b) Identification or numbering problem:

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

c) Subscription problem:

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

- illegal equipment, i.e. the IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

d) Handover problem:

- no handover number available, i.e. the VLR cannot allocate a number for handover or cannot allocate the required amount of numbers for relocation;
- subsequent handover failure, i.e. handover to a third MSC failed for some reason;
- target cell outside group call area.

e) Operation and maintenance problem:

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

f) Call set-up problem:

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

g) Supplementary services problem:

- call barred;
- illegal SS operation;
- SS error status;
- SS not available;
- SS subscription violation;
- SS incompatibility;
- negative password check;
- password registration failure;
- Number of Password Attempts;
- USSD Busy;

- Unknown Alphabet;
- short term denial;
- long term denial.

For definition of these errors see 3GPP TS 24.080 [38].

h) Short message problem:

- SM delivery failure with detailed reason as follows:
  - memory capacity exceeded;
  - MS protocol error;
  - MS not equipped;
  - unknown service centre (SC);
  - SC congestion;
  - invalid SME address;
  - subscriber is not an SC subscriber;
  - and possibly detailed diagnostic information, coded as specified in 3GPP TS 23.~~1~~0040, under SMS-SUBMIT-REPORT and SMS-DELIVERY-REPORT. If the SM entity that returns the SM Delivery Failure error includes detailed diagnostic information, it shall be forwarded in the MAP_MO_FORWARD_SHORT_MESSAGE and in the MAP_MT_FORWARD_SHORT_MESSAGE response.
- message waiting list full, i.e. no further SC address can be added to the message waiting list.
- Subscriber busy for MT SMS, i.e. the mobile terminated short message transfer cannot be completed because:
  - another mobile terminated short message transfer is going on and the delivery node does not support message buffering; or
  - another mobile terminated short message transfer is going on and it is not possible to buffer the message for later delivery; or
  - the message was buffered but it is not possible to deliver the message before the expiry of the buffering time defined in 3GPP TS 23.~~1~~0040;
- Absent Subscriber SM, i.e. the mobile terminated short message transfer cannot be completed because the network cannot contact the subscriber. Diagnostic information regarding the reason for the subscriber's absence may be included with this error.

i) Location services problem:

- Unauthorised Requesting Network
- Unauthorised LCS Client with detailed reasons as follows:
  - Unauthorised Privacy Class
  - Unauthorised Call/Session Unrelated External Client
  - Unauthorised Call/Session Related External Client
- Privacy override not applicable
- Position method failure with detailed reasons as follows:
  - Congestion

- Insufficient resources
- Insufficient Measurement Data
- Inconsistent Measurement Data
- Location procedure not completed
- QoS not attainable
- Position Method Not Available in Network
- Position Method Not Available in Location Area
- Unknown or unreachable LCS Client.

j) Problem detected by an application using secure transport:

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

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

7.6.3.51 Mobile Not Reachable Reason

This parameter stores the reason for the MS being absent when an attempt to deliver a short message to an MS fails at the MSC, SGSN or both. It is defined in 3GPP TS 23.~~1~~0040.

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

7.6.8.9 Absent Subscriber Diagnostic SM

This parameter is used to indicate the reason why the subscriber is absent. For the values for this parameter see 3GPP TS 23.~~1~~0040.

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

7.6.8.16 SM-RP-MTI

This parameter represents the RP-Message Type Indicator of the Short Message. It is used to distinguish a SM sent to the mobile station in order to acknowledge an MO-SM initiated by the mobile from a normal MT-SM. This parameter is formatted according to the formatting rules of address fields as described in 3GPP TS 23.~~1~~0040.

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

7.6.8.17 SM-RP-SMEA

This parameter represents the RP-Originating SME-address of the Short Message Entity that has originated the SM. This parameter is used by the short message service relay sub-layer protocol and is formatted according to the formatting rules of address fields as described in 3GPP TS 23.~~1~~0040.

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

17.7.6 Short message data types

```
MAP-SM-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SM-DataTypes (16) version8 (8)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoutingInfoForSM-Arg,
   RoutingInfoForSM-Res,
   MO-ForwardSM-Arg,
   MO-ForwardSM-Res,
   MT-ForwardSM-Arg,
   MT-ForwardSM-Res,
   ReportSM-DeliveryStatusArg,
   ReportSM-DeliveryStatusRes,
   AlertServiceCentreArg,
   InformServiceCentreArg,
   ReadyForSM-Arg,
   ReadyForSM-Res,
   SM-DeliveryOutcome,
   AlertReason,
   Additional-Number
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   SignalInfo,
   IMSI,
   LMSI
FROM MAP-CommonDataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version8 (8)}

   AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version8 (8)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version8 (8)}
;
```

```
RoutingInfoForSM-Arg ::= SEQUENCE {
     msisdn                              [0] ISDN-AddressString,
     sm-RP-PRI                           [1] BOOLEAN,
     serviceCentreAddress                [2] AddressString,
     extensionContainer                  [6] ExtensionContainer          OPTIONAL,
     ... ,
     gprsSupportIndicator                [7]  NULL                       OPTIONAL,
     -- gprsSupportIndicator is set only if the SMS-GMSC supports
     -- receiving of two numbers from the HLR
     sm-RP-MTI                           [8] SM-RP-MTI                   OPTIONAL,
     sm-RP-SMEA                          [9] SM-RP-SMEA                  OPTIONAL }
```

```
SM-RP-MTI ::= INTEGER (0..10)
     -- 0 SMS Deliver
     -- 1 SMS Status Report
     -- other values are reserved for future use and shall be discarded if
     -- received
```

```
SM-RP-SMEA ::= OCTET STRING (SIZE (1..12))
     -- this parameter contains an address field which is encoded
     -- as defined in 3GPP TS 23.~~1~~040. An address field contains 3 elements :
     --        address-length
     --        type-of-address
     --        address-value
```

. . .
<Unchanged ASN.1 omitted>
. . .

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

17.7.7 Error data types

```
MAP-ER-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version8 (8)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoamingNotAllowedParam,
   CallBarredParam,
   CUG-RejectParam,
   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   OR-NotAllowedParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   AbsentSubscriberDiagnosticSM,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam,
   UnauthorizedRequestingNetwork-Param,
   UnauthorizedLCSClient-Param,
   PositionMethodFailure-Param,
   UnknownOrUnreachableLCSClient-Param,
   MM-EventNotSupported-Param,
   SecureTransportErrorParam,
   ATSI-NotAllowedParam,
   ATM-NotAllowedParam,
   IllegalSS-OperationParam,
   SS-NotAvailableParam,
   SS-SubscriptionViolationParam,
```

```
   InformationNotAvailableParam,
   TargetCellOutsideGCA-Param



;

IMPORTS
   SS-Status
FROM MAP-SS-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version8 (8)}

   SignalInfo,
   BasicServiceCode,
   NetworkResource
FROM MAP-CommonDataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version8 (8)}

   SecurityHeader,
   ProtectedPayload
FROM MAP-ST-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ST-DataTypes (27) version8 (8)}


   SS-Code
FROM MAP-SS-Code {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version8 (8)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version8 (8)}
;
```

```
RoamingNotAllowedParam ::= SEQUENCE {
     roamingNotAllowedCause              RoamingNotAllowedCause,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
RoamingNotAllowedCause ::= ENUMERATED {
     plmnRoamingNotAllowed  (0),
     operatorDeterminedBarring  (3)}
```

```
CallBarredParam ::= CHOICE {
     callBarringCause                    CallBarringCause,
     -- call BarringCause must not be used in version 3 and higher
     extensibleCallBarredParam           ExtensibleCallBarredParam
     -- extensibleCallBarredParam must not be used in version <3
     }
```

```
CallBarringCause ::= ENUMERATED {
     barringServiceActive  (0),
     operatorBarring  (1)}
```

```
ExtensibleCallBarredParam ::= SEQUENCE {
     callBarringCause                    CallBarringCause                OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ... ,
     unauthorisedMessageOriginator       [1] NULL                        OPTIONAL }
```

```
CUG-RejectParam ::= SEQUENCE {
     cug-RejectCause                     CUG-RejectCause                 OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
CUG-RejectCause ::= ENUMERATED {
     incomingCallsBarredWithinCUG  (0),
     subscriberNotMemberOfCUG  (1),
     requestedBasicServiceViolatesCUG-Constraints  (5),
     calledPartySS-InteractionViolation  (7)}
```

```
SS-IncompatibilityCause ::= SEQUENCE {
     ss-Code                              [1] SS-Code                          OPTIONAL,
     basicService                         BasicServiceCode                     OPTIONAL,
     ss-Status                            [4] SS-Status                        OPTIONAL,
     ...}
```

```
PW-RegistrationFailureCause ::= ENUMERATED {
     undetermined  (0),
     invalidFormat  (1),
     newPasswordsMismatch  (2)}
```

```
SM-EnumeratedDeliveryFailureCause ::= ENUMERATED {
     memoryCapacityExceeded  (0),
     equipmentProtocolError  (1),
     equipmentNotSM-Equipped  (2),
     unknownServiceCentre  (3),
     sc-Congestion  (4),
     invalidSME-Address  (5),
     subscriberNotSC-Subscriber  (6)}
```

```
SM-DeliveryFailureCause ::= SEQUENCE {
     sm-EnumeratedDeliveryFailureCause    SM-EnumeratedDeliveryFailureCause,
     diagnosticInfo                       SignalInfo                           OPTIONAL,
     extensionContainer                   ExtensionContainer                   OPTIONAL,
     ...}
```

```
AbsentSubscriberSM-Param ::= SEQUENCE {
     absentSubscriberDiagnosticSM         AbsentSubscriberDiagnosticSM      OPTIONAL,
     -- AbsentSubscriberDiagnosticSM can be either for non-GPRS
     -- or for GPRS
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...,
     additionalAbsentSubscriberDiagnosticSM    [0]  AbsentSubscriberDiagnosticSM OPTIONAL }
     -- if received, additionalAbsentSubscriberDiagnosticSM
     -- is for GPRS and absentSubscriberDiagnosticSM is
     -- for non-GPRS
```

```
AbsentSubscriberDiagnosticSM ::= INTEGER (0..255)
     -- AbsentSubscriberDiagnosticSM values are defined in ETS 300 536 (3GPP TS 23.1040)
```

. . .
<Unchanged ASN.1 omitted>
. . .

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

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~~ delivery status report 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-ordinating process is needed 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: the A_CM_SERV_REQ message is not used for SMS over GPRS. The modelling is based on the assumption that the SGSN will trigger the appropriate process, according to whether an RP_MO_DATA or an RP_SM_MEMORY_AVAILABLE is received over the LLC layer.

23.1.1 Mobile originated short message service Co-ordinator for the MSC

The process starts ~~W~~when the MSC receives an A_CM_SERV_REQ message (see 3GPP TS 24.008 [35]), with a CM service type indicating short message service, from the A-interface. ~~, it invokes the macro Process_Access_Request_MSC to request the establisment of the CM connection.~~ The process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Process_Access_Request_MSC see subclause 25.4.1.

If the macro Process_Access_Request_MSC takes the "OK" exit (which means that the MSC has sent an A_CM_SERVICE_ACCEPT to the MS)~~.~~, the MS initiates mobile originated short message transfer or sends an indication that it has memory available for more short messages. ~~The MSC creates an instance of the appropriate process as follows:~~

~~- if the MSC receives an A_RP_MO_DATA indication, it creates an instance of the process MO_SM_MSC (see subclause 23.2.1);~~

~~- if the MSC receives an A_RP_SM_MEMORY_AVAILABLE indication, it creates an instance of the process SC_Alert_MSC (see subclause 23.4.1).~~

~~After it has created the instance of the user process, the Co-ordinator relays the messages between the A-interface and the child process and between the VLR and the child process until the dialogue is terminated.~~

The SMS Co-ordinator process in the MSC is shown in figure 23.1/1.

23.1.2 Short message Gateway Co-ordinator for the HLR

The process ~~is~~ start~~s~~~~ed~~ when the HLR receives a MAP_OPEN indication using the application context shortMessageGatewayContext. ~~If the dialogue opening is successful, the Co-ordinator can receive the first service primitive from the MAP Protocol Machine. The HLR creates an instance of the appropriate process~~ The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

~~- if the HLR receives a MAP_SEND_ROUTING_INFO_FOR_SM indication, it creates an instance of the process Mobile_Terminated_SM_HLR;~~

~~- if the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it creates an instance of the process Report_SM_delivery_stat_HLR.~~

~~After it has created the instance of the user process, the Co-ordinator relays the messages between the MAP Protocol Machine and the child process until the dialogue is terminated.~~

~~The SM Gateway Co-ordinator process in the HLR is shown in figure 23.1/2.~~

If the Receive_Open_Ind macro takes the Vr exit then HLR shall perform the MAP dialogue as specified for the appropriate application context version. Depending on the subscriber data, handling at the MAP user application level may be performed as specified in subclauses 23.3.2 and 23.5.2~~1~~ of the present document:

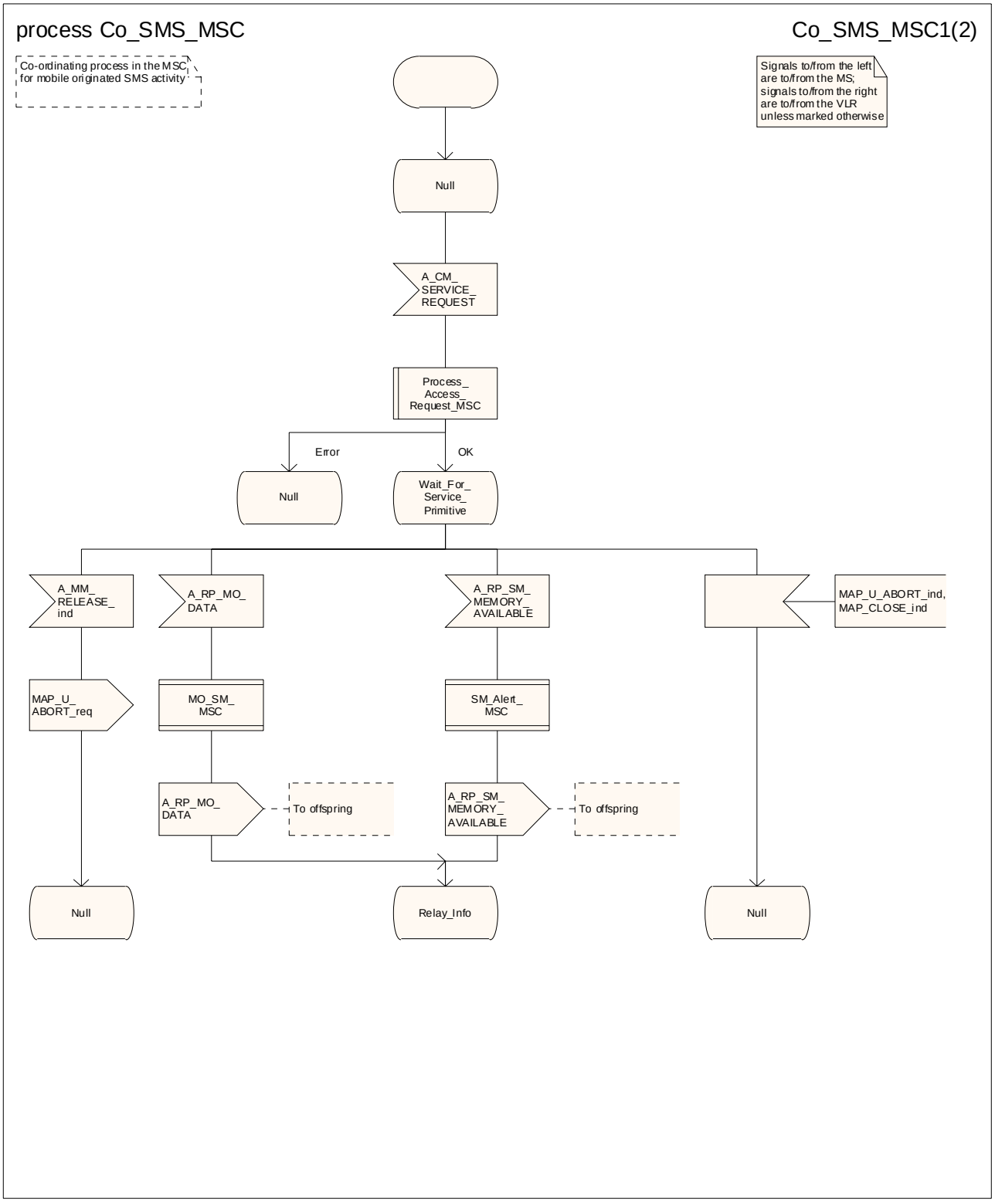


Figure 23.1/1 (sheet 1 of 2): Process Co_SMS_MSC

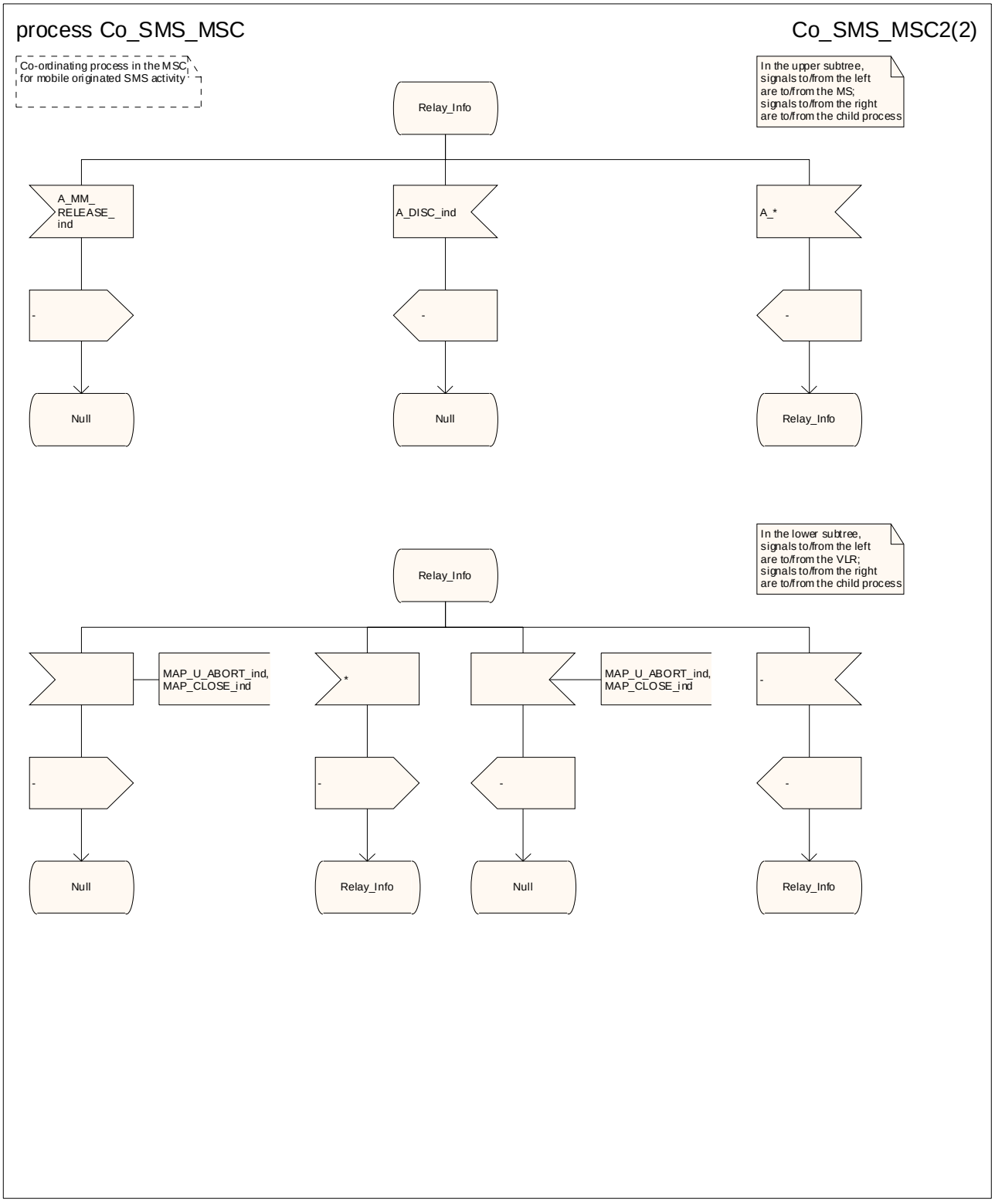


Figure 23.1/1 (sheet 2 of 2): Process Co_SMS_MSC

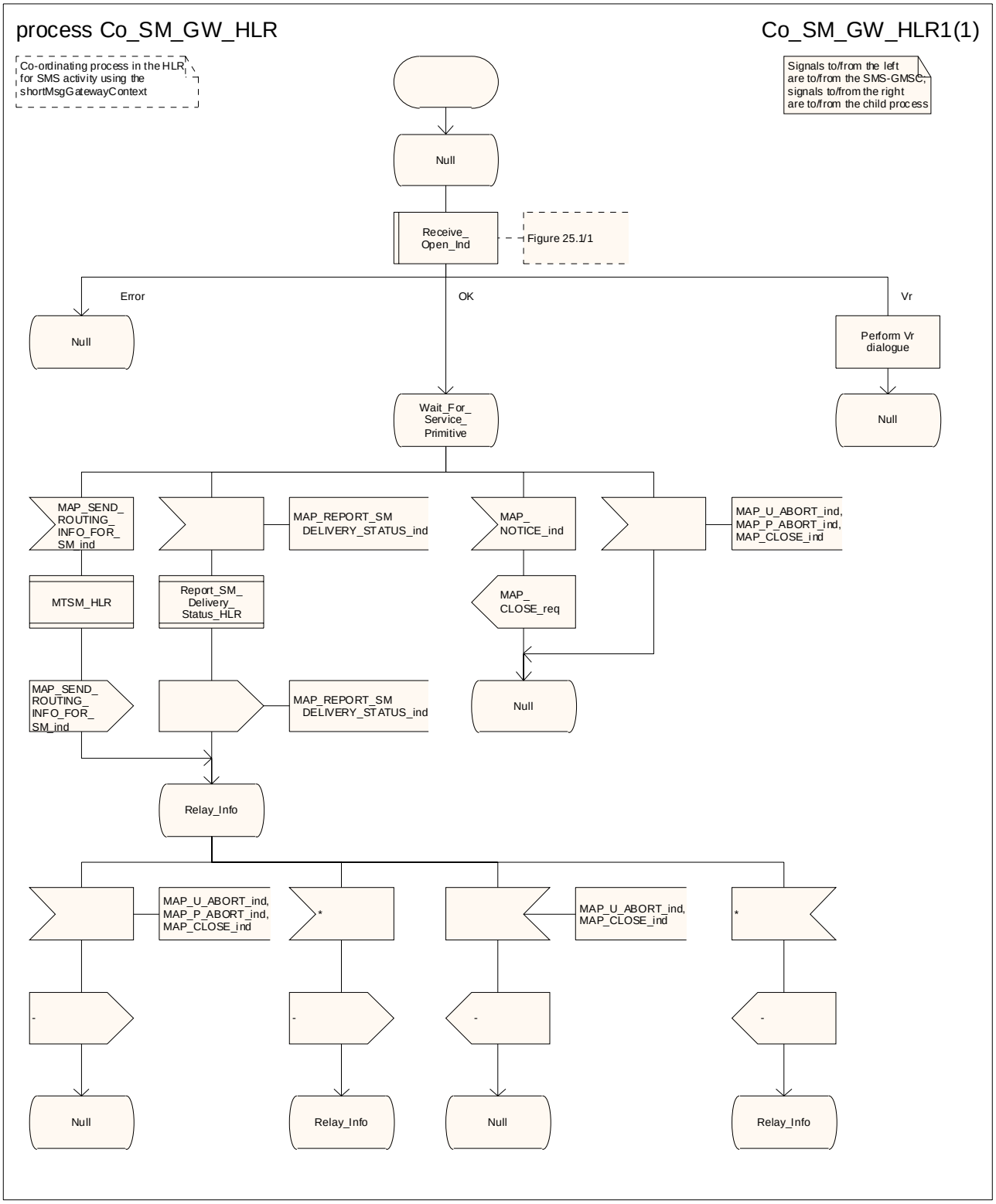
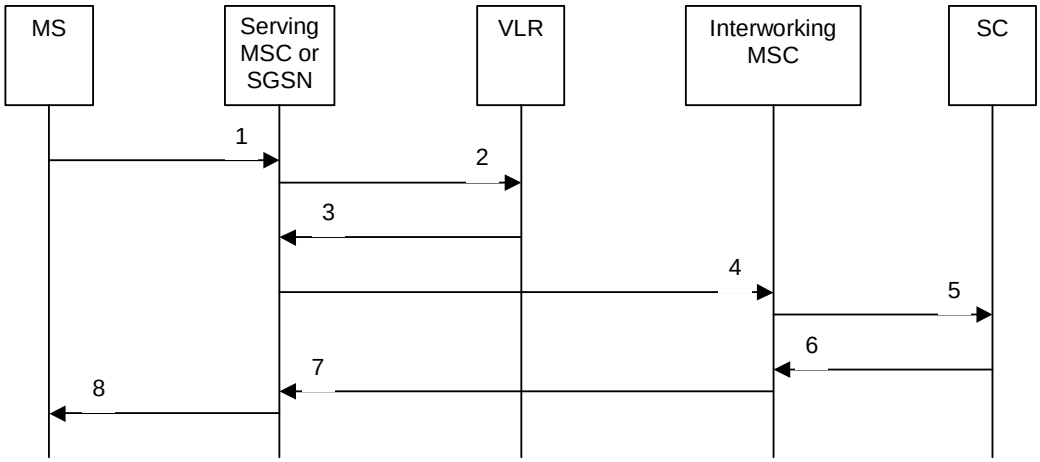


Figure 23.1/2: Process Co_SM_Gateway_HLR

23.2 The mobile originated short message transfer procedure

The mobile originated short message service procedure is used to forward a short message from a mobile subscriber to a Service Centre. The message flow for the mobile originated short message service procedure is shown in figure 23.2/1.



1) Short Message (3GPP TS 24.011 [37]).
2) MAP_SEND_INFO_FOR_MO_SMS (*).
3) MAP_SEND_INFO_FOR_MO_SMS_ACK (*).
4) MAP_MO_FORWARD_SHORT_MESSAGE.
5) Short message (3GPP TS 23.040).
6) Short message Acknowledgement (3GPP TS 23.040).
7) MAP_MO_FORWARD_SHORT_MESSAGE_ACK.
8) Short Message Acknowledgement (3GPP TS 24.011 [37]).
(*) Messages 2) and 3) are not used by the 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).

(*) These ~~messages~~ services are not used by the SGSN.

23.2.1 Procedure in the serving MSC

Any CAMEL-specific handling defined in this subclause is omitted if the MSC does not support CAMEL control of MO SMS, or if the subscriber does not have a subscription for CAMEL control of MO SMS.

The process starts when the MSC receives a short message from the MS. The process invokes macros not defined in this clause; the definition 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~~1~~.2.

Sheet 1: If the MSC is integrated with the SMS-IWMSC, it communicates directly with the Short Message Service Centre (SMSC) using one of the protocols described in 3GPP TS 23.039 [25a]; otherwise it communicates with the SMS-IWMSC using MAP.

Sheet 3: If the capacity of a message signal unit in the lower layers of the protocol is enough to carry the content of the MAP_OPEN request and the content of the MAP_MO_FORWARD_SHORT_MESSAGE request in a single TC message, the test "Message segmentation needed" takes the "No" exit; otherwise the test takes the "Yes" exit.

~~When the MSC receives the short message from the A-interface, it sends a MAP_SEND_INFO_FOR_MO_SMS request to the VLR and waits for a response. While the MSC is waiting for the response from the VLR:~~

- ~~if the VLR aborts or prematurely closes the dialogue, the MSC reports to the gsmSCF that the short message submission has failed and sends an A_RP_ERROR with error cause "Network out of order" to the MS, and the process terminates;~~
- ~~if it receives a MAP_CONTINUE_CAMEL_SMS_HANDLING indication, it checks the indication.~~
  - ~~if the indication is badly formed, the MSC sends an A_RP_ERROR with error cause "Network out of order" to the MS and aborts the dialogue with the VLR, and the process terminates;~~
  - ~~if the indication is OK, the MSC calls the procedure CAMEL_O_SMS_INIT and tests the result.~~
    - ~~if the result was "SMS_Aborted", the MSC aborts the dialogue with the VLR, and the process terminates;~~
    - ~~if the result was "Release_SMS", the MSC returns an A_RP_ERROR with an error cause as instructed by the gsmSCF to the MS and aborts the dialogue with the VLR, and the process terminates;~~
    - ~~if the result was "Redirect SMS", the MSC modifies the data for the submitted short message as instructed by the gsmSCF, sends to the VLR a MAP_SEND_INFO_FOR_MO_SMS request and waits for a response;~~
    - ~~if the result was "Continue", the MSC sends to the VLR a MAP_SEND_INFO_FOR_MO_SMS request and waits for a response. The handling for this request is shown in the procedure CAMEL_MO_SMS_VLR (see 3GPP TS 23.078 [98]).~~
- ~~if itreceives a MAP_SEND_INFO_FOR_MO_SMS confirmation from the VLR, it checks the confirmation.~~
  - ~~if the confirmation includes an error, the MSC reports to the gsmSCF that the short message submission has failed and sends an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;~~
  - ~~if the confirmation indicates a successful result, the MSC checks whether the MSC is also the SMS-IWMSC.~~
    - ~~if the MSC is separate from the SMS-IWMSC, MSC handling continues as described below under the heading "Serving MSC is separate from SMS-IWMSC".~~
    - ~~if the MSC is also the SMS-IWMSC, the MSC handling continues as described below under the heading "Serving MSC is SMS-IWMSC";~~

~~Serving MSC is separate from SMS-IWMSC~~

~~The MSC checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.~~

- ~~if the two requests can be grouped in a single TC message, the MSC requests a dialogue with the SMS-IWMSC, including the MAP_MO_FORWARD_SHORT_MESSAGE request;~~
  - ~~if the dialogue opening is successful, the MSC waits for the response from the SMS-IWMSC;~~
  - ~~if the macro Receive_Open_Cnf takes the "Error" exit, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process terminates;~~

- if the macro Receive_Open_Cnf takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol and checks the process result.

  - if the submission was successful, the MSC reports to the gsmSCF that the short message submission was successful and returns an A_RP_ACK to the MS, and the process terminates;

  - if the submission failed, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates.

- if the two requests cannot be grouped in a single TC message, the MSC requests a dialogue with the SMS-IWMSC, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;

  - if the dialogue opening is successful, the MSC sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the SMS-IWMSC, and waits for the response from the SMS-IWMSC;

  - if the macro Receive_Open_Cnf takes the "Error" exit, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process terminates;

  - if the macro Receive_Open_Cnf takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol, and checks the result.

    - if the submission was successful, the MSC reports to the gsmSCF that the short message submission was successful and returns an A_RP_ACK to the MS, and the process terminates;

    - if the submission failed, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates.

- if the MSC receives a MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the SMS-IWMSC, it checks the content of the confirmation;

  - if the confirmation indicates that the submission of the short message was successful, the MSC reports to the gsmSCF that the short message submission was successful and returns an A_RP_ACK to the MS, and the process terminates;

  - if the confirmation indicates that the submission of the short message failed, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;

- if the dialogue with the SMS-IWMSC fails, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process terminates.

Serving MSC is SMS-IWMSC

The MSC sends an SC_RP_MO_DATA request to the Short Message Service Centre (SMSC), and waits for the response.

- if the MSC receives an error response from the SMSC, it reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;

- if the SMSC aborts the dialogue, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process terminates;

- if the MSC receives a positive response from the SMSC, it reports to the gsmSCF that the short message submission was successful and returns an A_RP_ACK to the MS, and the process terminates.

The mobile originated short message service process in the MSC is shown in figure 23.2/2.

23.2.2 Procedure in the VLR

Any CAMEL-specific handling defined in this subclause is omitted if the VLR does not support CAMEL control of MO SMS.

The process ~~is triggered~~ starts when the VLR receives ~~by~~ a dialogue opening request followed by a MAP_PROCESS_ACCESS_REQUEST including a CM service type Short Message Service. The process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1;

Process_Access_Request_VLR see subclause 25.4.2.

~~If the macro Process_Access_Request_VLR takes the "OK" exit, the VLR waits for a MAP_SEND_INFO_FOR_MO_SMS indication from the MSC.~~

- ~~If the MSC aborts the dialogue, the process returns to the Null state;~~
- ~~if the indication is badly formed, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the appropriate user error;~~
- ~~if the indication is OK, the VLR checks whether the submission of the short message is allowed.~~
  - ~~if MO SMS is not provisioned, VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Teleservice not provisioned";~~
  - ~~if the submission of the short message is prevented by Operator Determined Barring of all outgoing calls, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Operator barring";~~
  - ~~if the submission of the short message is prevented by supplementary service barring of all outgoing calls, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Barring service active";~~
  - ~~the VLR calls the procedure CAMEL_MO_SMS_VLR and checks the result.~~
    - ~~if the result is "Fail", the process returns to the Null state;~~
    - ~~if the result is "Pass", the VLR continues to check the subscription information.~~
  - ~~if the submission of the short message is prevented by Operator Determined Barring (other than barring of all outgoing calls), the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Operator barring";~~
  - ~~if the submission of the short message is prevented by supplementary service barring (other than barring of all outgoing calls), the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Barring service active";~~
  - ~~if the submission of the short message is allowed, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the MSISDN of the requesting subscriber.~~

~~When the VLR has returned the MAP_SEND_INFO_FOR_MO_SMS response, the process returns to the Null state.~~

The mobile originated short message transfer process in the VLR is shown in figure 23.2/3.

23.2.34 Procedure in the SGSN

Any CAMEL-specific handling defined in this subclause is omitted if the SGSN does not support CAMEL control of MO SMS, or if the subscriber does not have a subscription for CAMEL control of MO SMS.

The process ~~is triggered~~ startsed when the SGSN receivesby a short message ~~received~~ from the MS over the Gb interface. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Sheet 2: If the capacity of a message signal unit in the lower layers of the protocol is enough to carry the content of the MAP_OPEN request and the content of the MAP_MO_FORWARD_SHORT_MESSAGE request in a single TC message, the test "Message segmentation needed" takes the "No" exit; otherwise the test takes the "Yes" exit.

~~If the MO SMS service is not provisioned, the SGSN returns a Gb_RP_ERROR with error cause "Requested facility not subscribed", and the process returns to the Null state.~~

~~If the MO SMS service is provisioned, the SGSN checks whether Operator Determined Barring or supplementary service barring of all outgoing calls is in force.~~

- ~~if Operator Determined Barring would prevent the submission of the short message, the SGSN returns a Gb_RP_ERROR with error cause "Operator determined barring" to the MS, and the process returns to the Null state;~~
- ~~if supplementary service barring would prevent the submission of the short message, the SGSN returns a Gb_RP_ERROR with error cause "Call barred" to the MS, and the process returns to the Null state;~~
- ~~if neither Operator Determined Barring nor supplementary service barring would prevent the submission of the short message, the SGSN handling continues.~~

~~The SGSN calls the procedure CAMEL_O_SMS_INIT and tests the result.~~

- ~~if the result was "SMS_Aborted", the process returns to the Null state;~~
- ~~if the result was "Release_SMS", the SGSN returns a Gb_RP_ERROR with an error cause as instructed by the gsmSCF to the MS, and the process returns to the Null state;~~
- ~~if the result was "Redirect SMS", the SGSN modifies the data for the submitted short message as instructed by the gsmSCF, and the MSC handling continues;~~
- ~~if the result was "Continue", the SGSN handling continues.~~

~~The SGSN checks whether Operator Determined Barring or supplementary service barring of outgoing calls (other than barring of all outgoing calls) would prevent the submission of the short message.~~

- ~~if Operator Determined Barring would prevent the submission of the short message, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with error cause "Operator determined barring" to the MS, and the process returns to the Null state;~~
- ~~if supplementary service barring would prevent the submission of the short message, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with error cause " Call barred " to the MS, and the process returns to the Null state;~~
- ~~if neither Operator Determined Barring nor supplementary service barring would prevent the submission of the short message, the SGSN handling continues.~~

~~The SGSN checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.~~

- ~~if the two requests can be grouped in a single TC message, the SGSN requests a dialogue with the SMS-IWMSC, including the MAP_MO_FORWARD_SHORT_MESSAGE request;~~
  - ~~if the dialogue opening is successful, the SGSN waits for the response from the SMS-IWMSC;~~

- ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with cause "Network out of order" to the MS, and the process returns to the Null state.~~

- ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and checks the result.~~

  - ~~if the submission was successful, the SGSN reports to the gsmSCF that the short message submission was successful and returns a Gb_RP_ACK to the MS, and the process returns to the Null state;~~

  - ~~if the submission failed, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with the appropriate error cause to the MS, and the process returns to the Null state.~~

~~if the two requests cannot be grouped in a single TC message, the SGSN requests a dialogue with the SMS-IWMSC, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;~~

- ~~if the dialogue opening is successful, the SGSN sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the SMS-IWMSC, and waits for the response from the SMS-IWMSC;~~

- ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with cause "Network out of order" to the MS, and the process returns to the Null state.~~

- ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and checks the result.~~

  - ~~if the submission was successful, the SGSN reports to the gsmSCF that the short message submission was successful and returns a Gb_RP_ACK to the MS, and the process returns to the Null state;~~

  - ~~if the submission failed, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with the appropriate error cause to the MS, and the process returns to the Null state.~~

~~if the SGSN receives a MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the SMS-IWMSC, it checks the content of the confirmation;~~

- ~~if the confirmation indicates that the submission of the short message was successful, the SGSN reports to the gsmSCF that the short message submission was successful and returns a Gb_RP_ACK to the MS, and the process returns to the Null state;~~

- ~~if the confirmation indicates that the submission of the short message failed, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with the appropriate error cause to the MS, and the process returns to the Null state;~~

~~if the dialogue with the SMS-IWMSC fails, the SGSN reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process returns to the Null state.~~

The mobile originated short message service process in the SGSN is shown in figure 23.2/4~~5~~.

23.2.4~~3~~ Procedure in the SMS Interworking MSC (SMS-IWMSC)

This procedure applies only when the SMS-IWMSC is not integrated with the serving MSC or SGSN.

The process ~~is triggered by~~ start~~s~~ed when the SMS-IWMSC receives a dialogue opening request with the application context shortMsgMO-RelayContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.

- ~~if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;~~

- if the macro Receive_Open_Ind takes the "Vr" exit, the SMS-IWMSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "OK" exit, the SMS-IWMSC waits for a service primitive.

  - if the dialogue with the MSC fails, the process returns to the Null state;

  - if the next primitive received is a MAP_DELIMITER indication, the SMS-IWMSC returns a MAP_DELIMITER request, and waits for a service primitive;

  - if the next primitive received is a MAP_MO_FORWARD_SHORT_MESSAGE indication, the SMS-IWMSC checks the indication.

    - if the indication is badly formed, the SMS-IWMSC returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the appropriate user error and the process returns to the Null state;

    - if the indication is OK, the SMS-IWMSC checks whether the service centre is known.

      - if the service centre is not known, the SMS-IWMSC returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the user error "SM delivery failure" with delivery failure cause "Unknown service centre" and the process returns to the Null state;

      - if the service centre is known, the SMS-IWMSC sends an SC_RP_MO_DATA request to the service centre, and waits for the response.

        - if the MAP dialogue with the serving MSC fails, the SMS-IWMSC sends an SC_ABORT request to the service centre and the process returns to the Null state;

        - if the SMS-IWMSC receives an error response from the service centre, it returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the user error "SM delivery failure" with delivery failure cause set according to the error response received from the service centre, and the process returns to the Null state;

        - if the SMS-IWMSC receives a positive acknowledgement from the service centre, it returns a MAP_MO_FORWARD_SHORT_MESSAGE response and the process returns to the Null state.

The mobile originated short message service transfer process in the SMS-IWMSC is shown in figure 23.2/54.

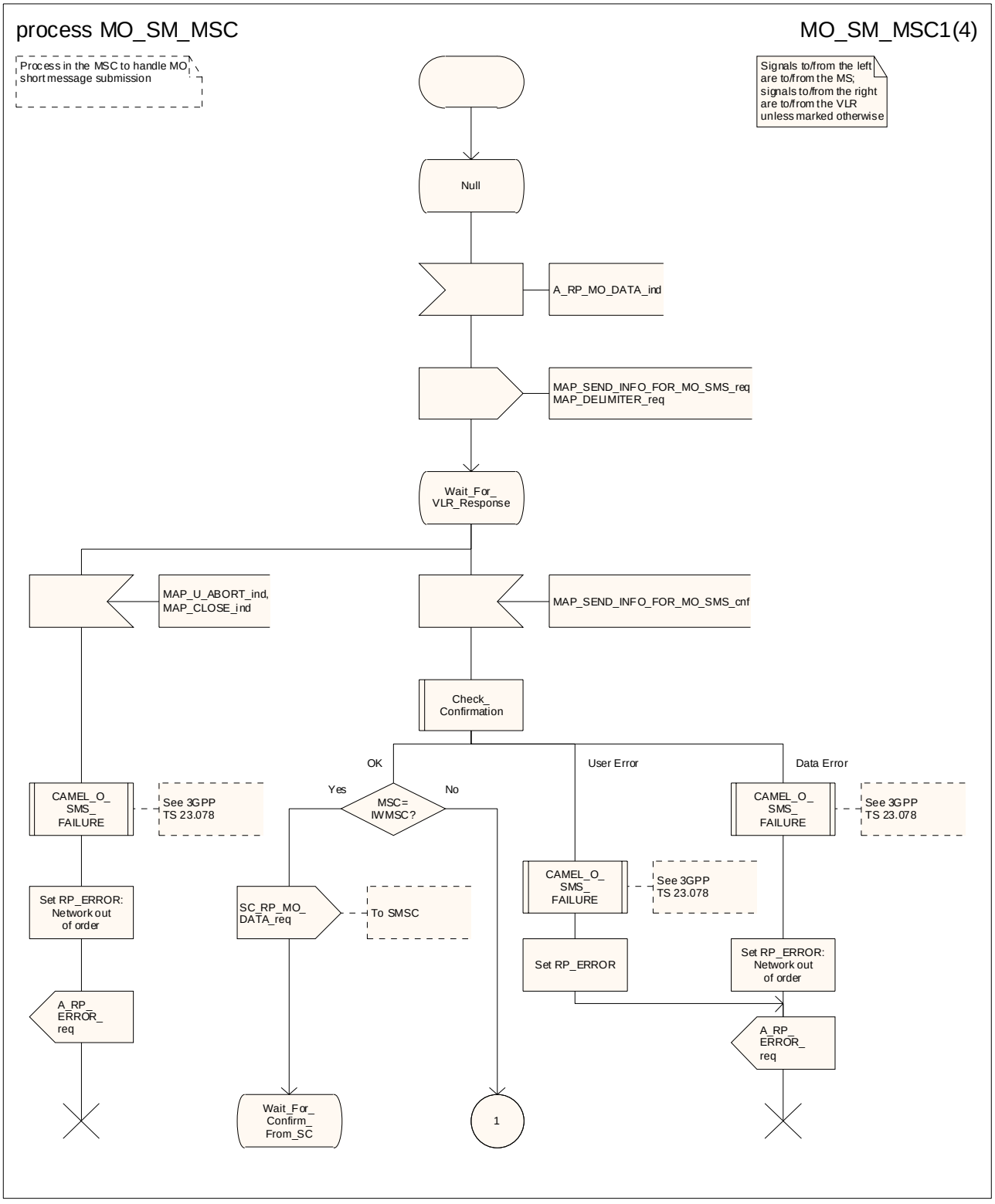


Figure 23.2/2 (sheet 1 of 4): Process MO_SM_MSC

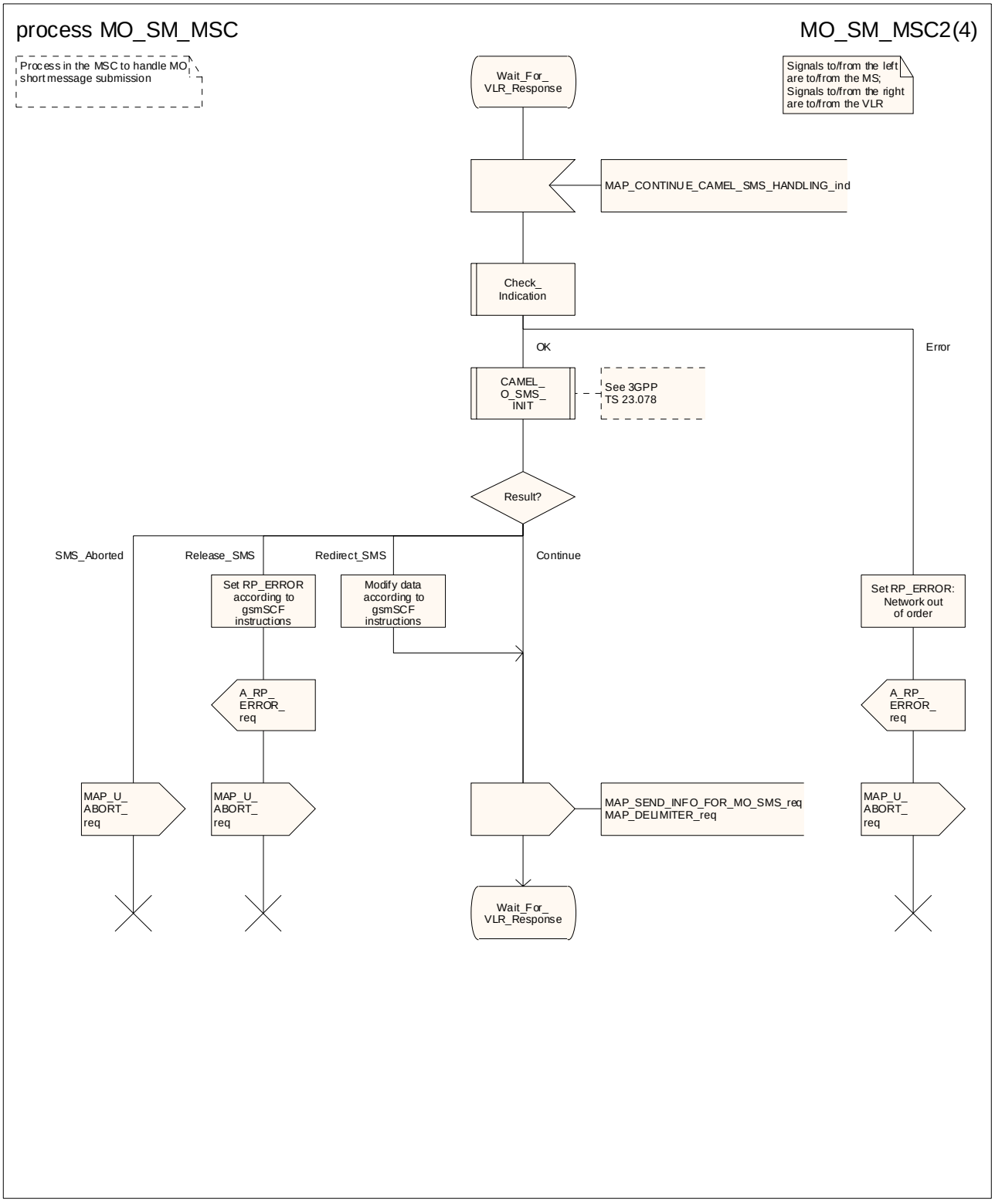


Figure 23.2/2 (sheet 2 of 4): Process MO_SM_MSC

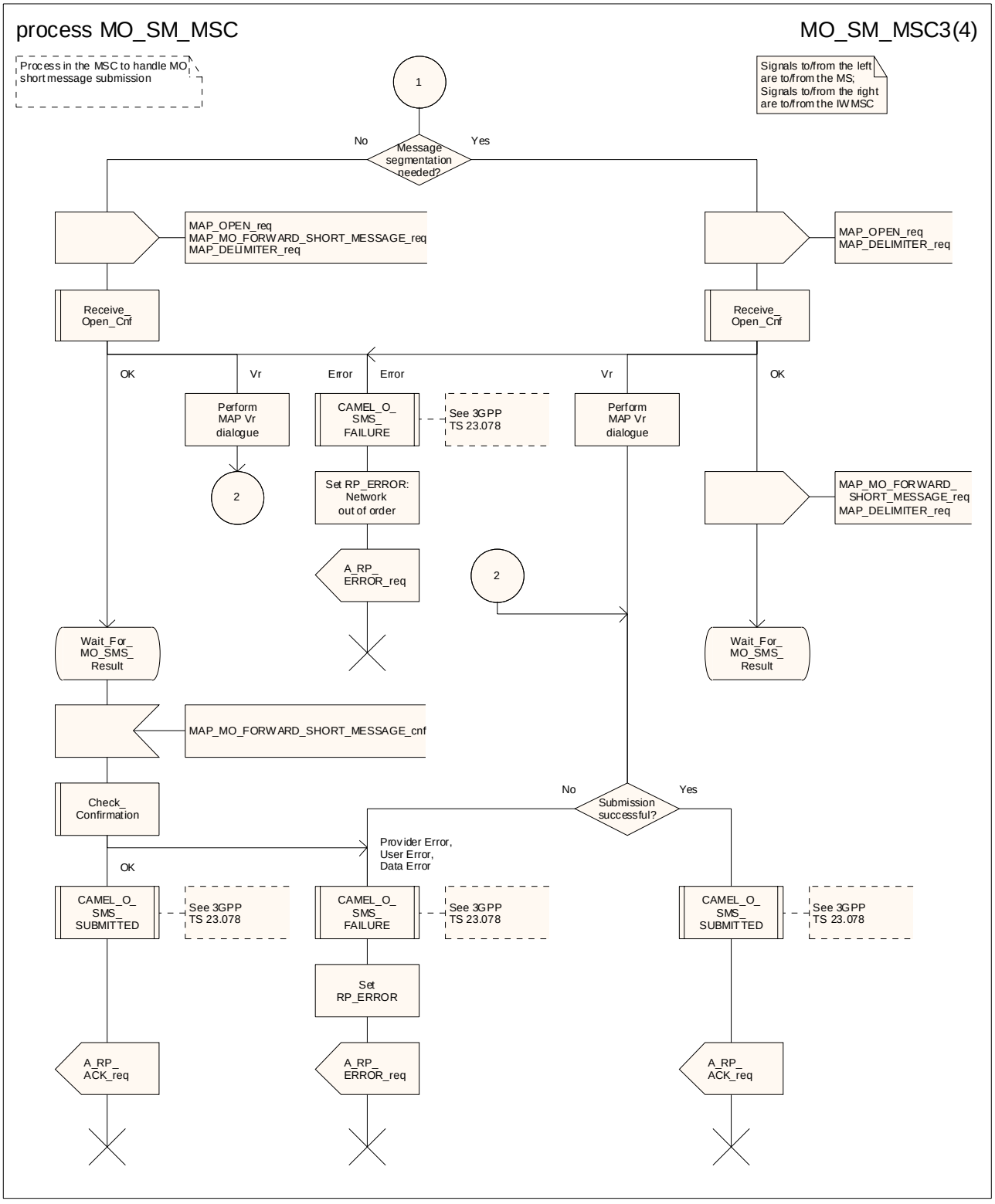


Figure 23.2/2 (sheet 3 of 4): Process MO_SM_MSC

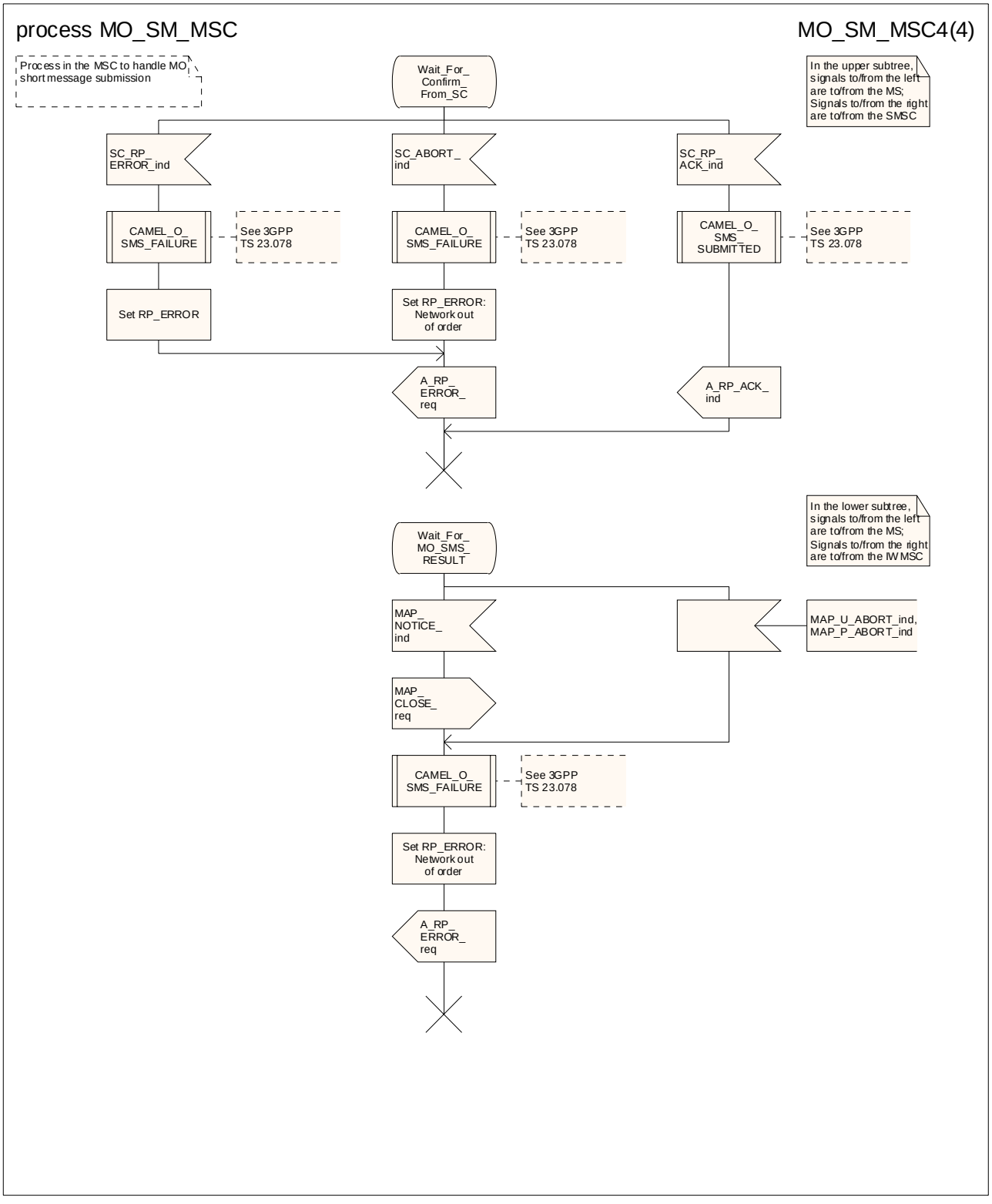


Figure 23.2/2 (sheet 4 of 4): Process MO_SM_MSC

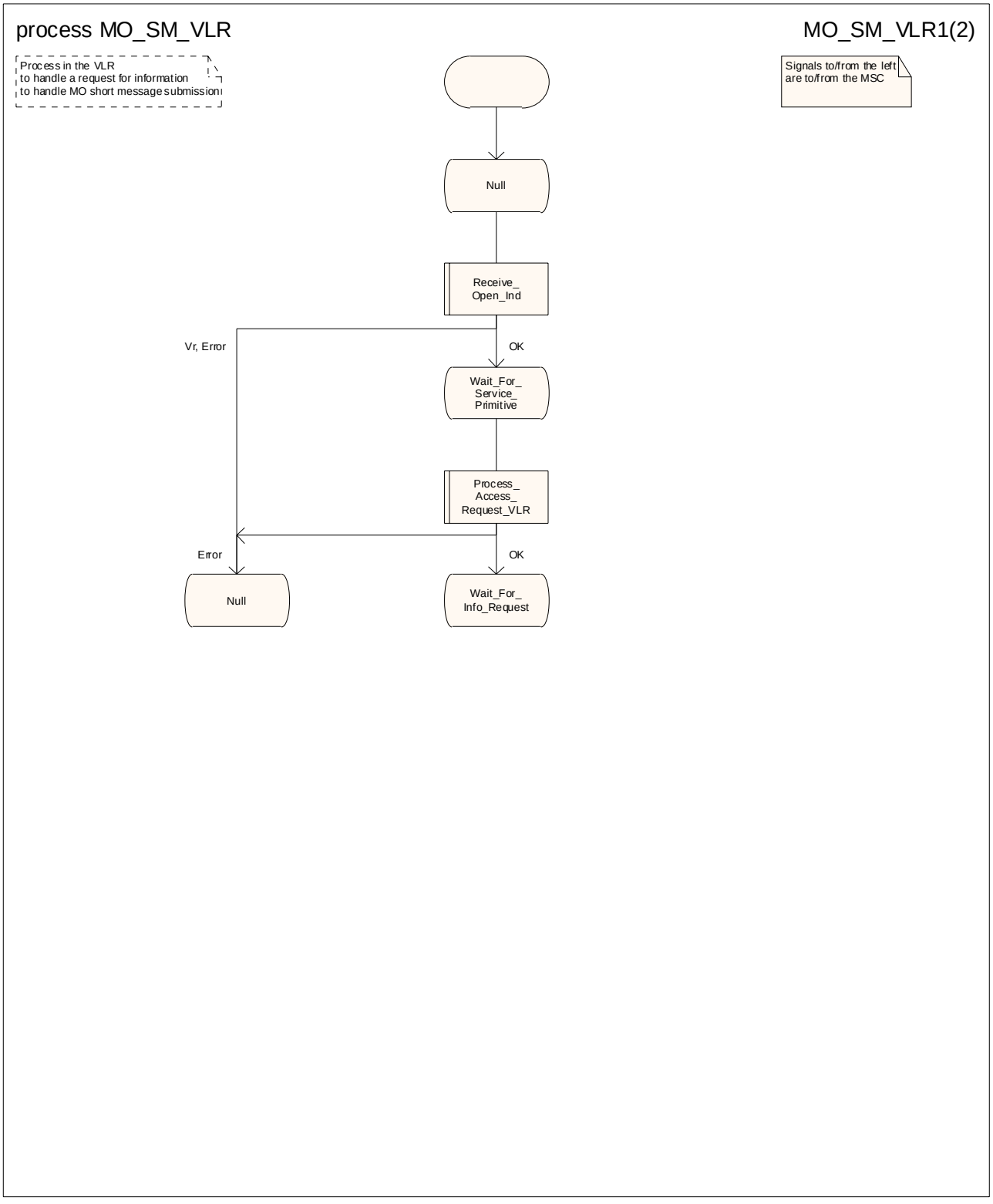


Figure 23.2/3 (sheet 1 of 2): Process MO_SM_VLR

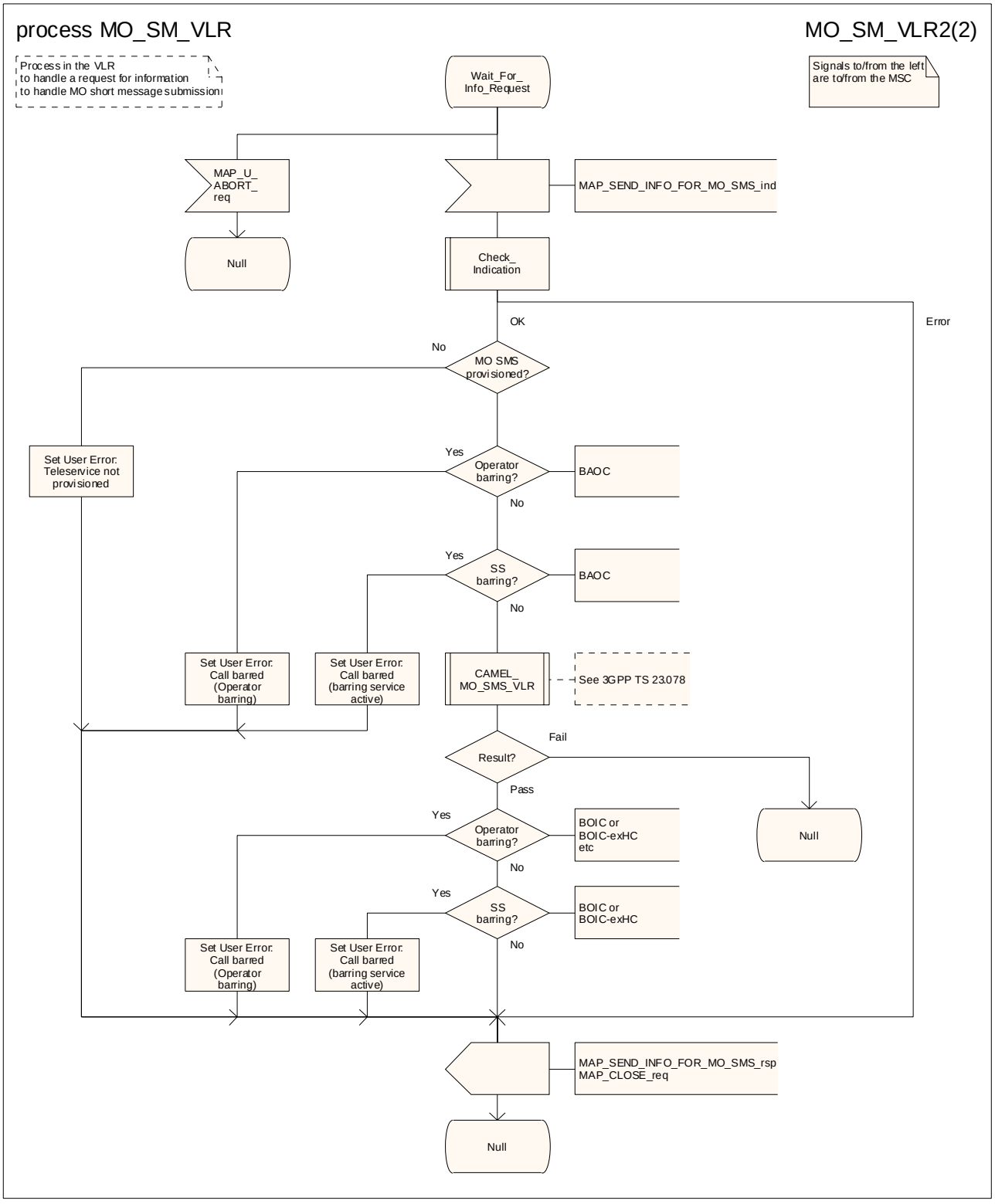


Figure 23.2/3 (sheet 2 of 2): Process MO_SM_VLR

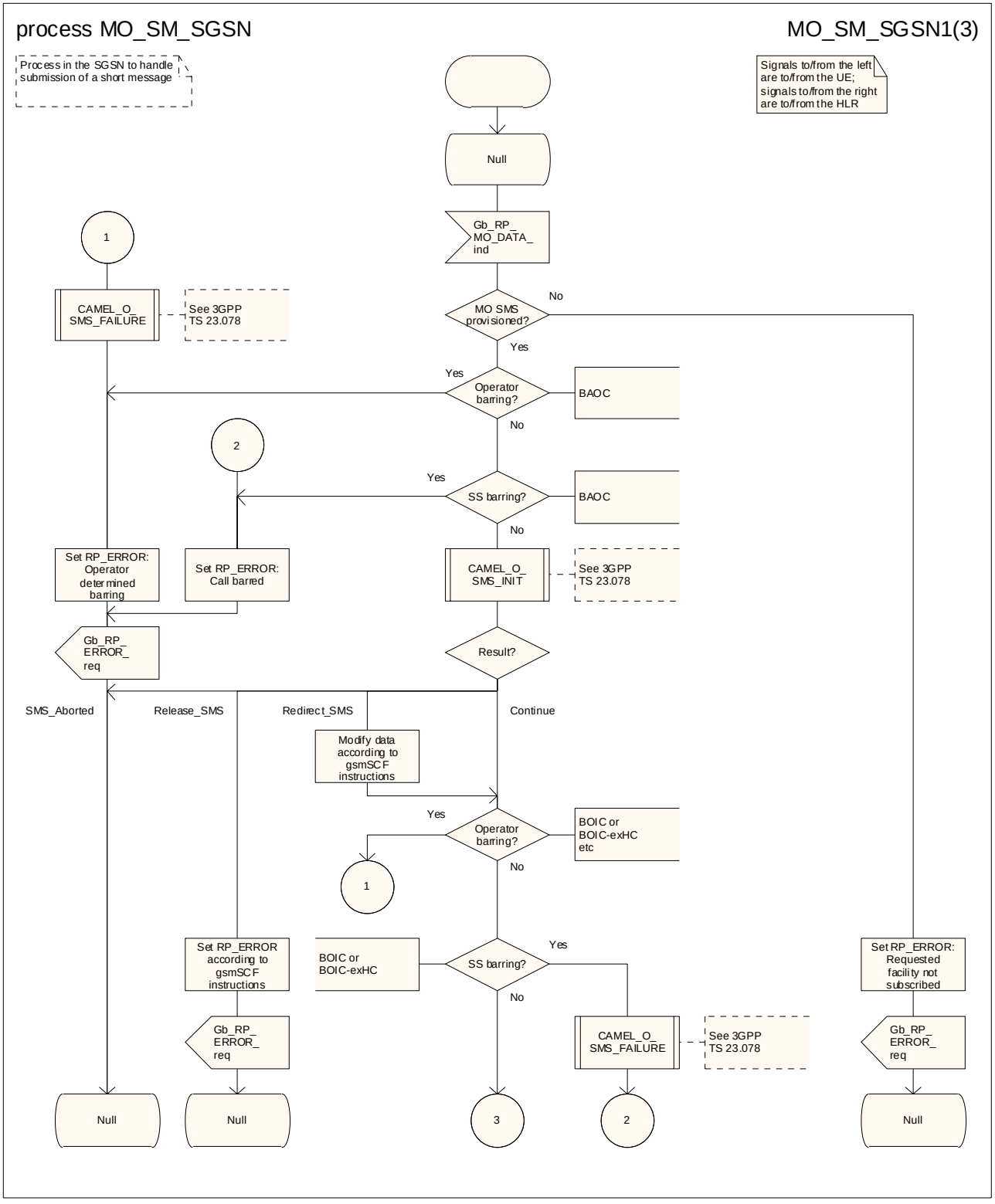


Figure 23.2/45 (sheet 1 of 3): Process MO_SM_SGSN

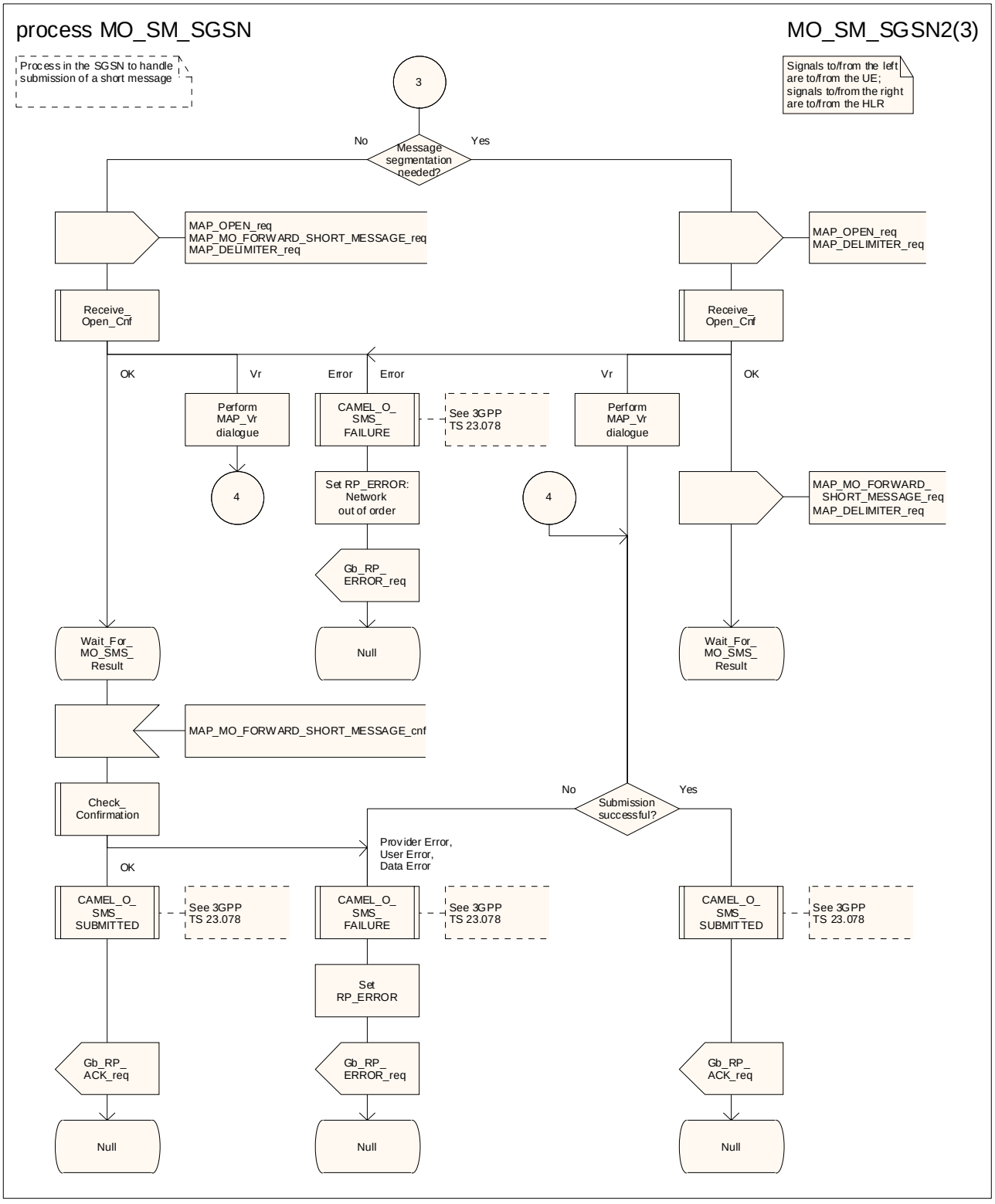


Figure 23.2/4~~5~~ (sheet 2 of 3): Process MO_SM_SGSN

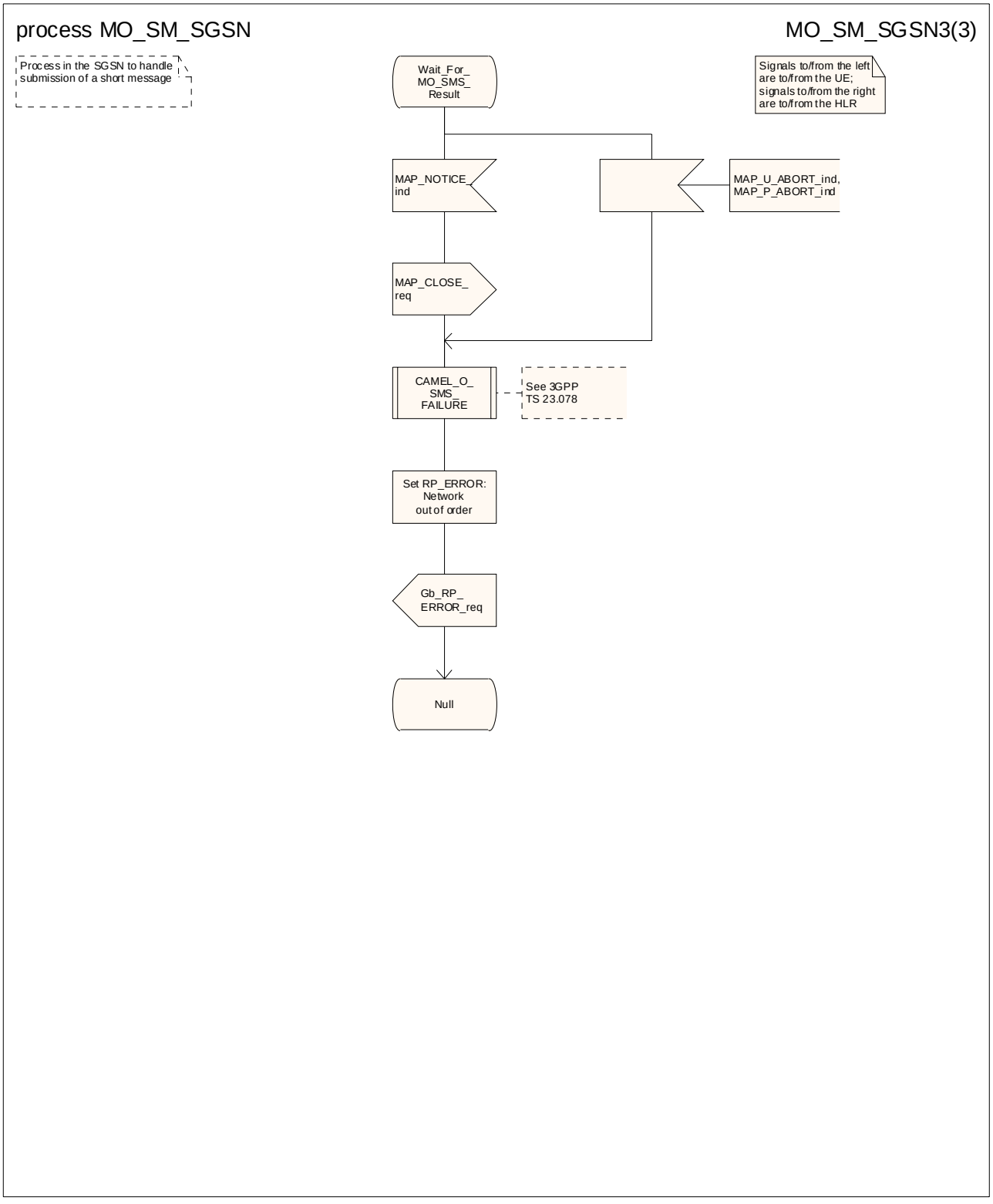


Figure 23.2/4~~5~~ (sheet 3 of 3): Process MO_SM_SGSN

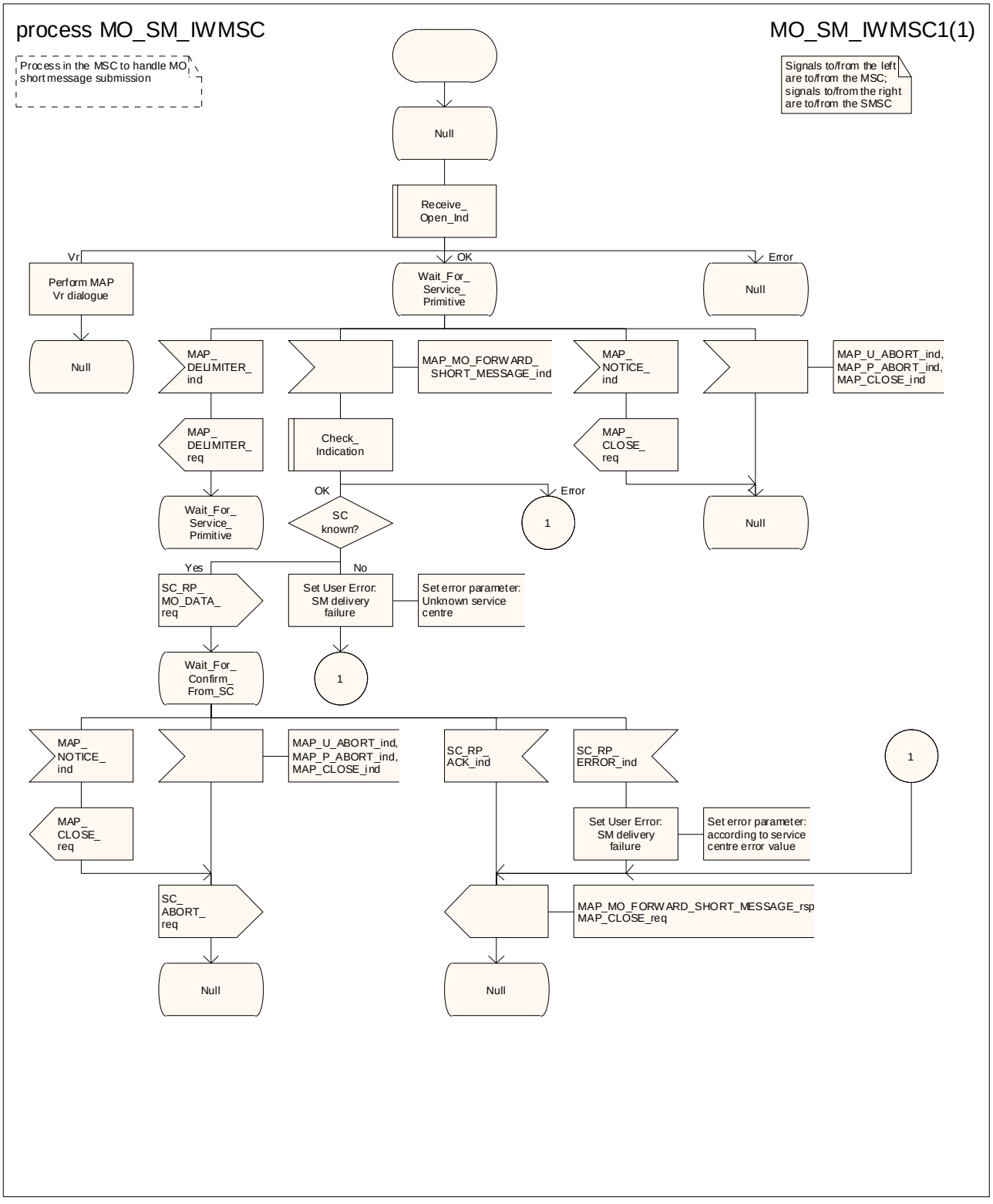


Figure 23.2/54: Process MO_SM_IWMSC

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 message flow for the mobile terminated short message procedure for a single short message transfer is shown in figure 23.3/1.

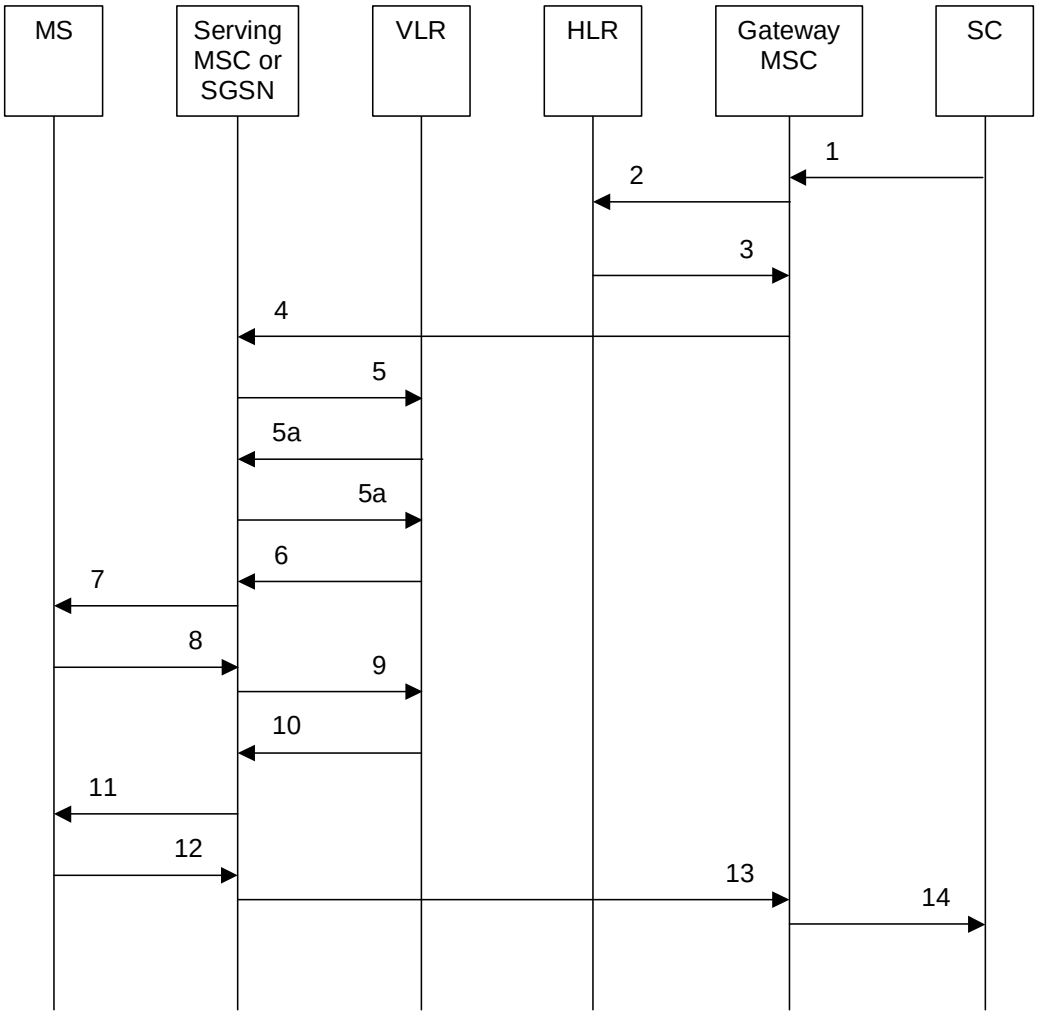


Figure 23.3/1: Mobile terminated short message service procedures

1) Short Message (3GPP TS 23.~~1~~040).
2) MAP_SEND_ROUTING_INFO_FOR_SM.
3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK.
4) MAP_MT_FORWARD_SHORT_MESSAGE.
5) MAP_SEND_INFO_FOR_MT_SMS (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (3GPP TS 24.008 [35]).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.~~1~~040).

(*) Messages 5), 5a), 5b), 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

The message flow for the mobile terminated short message procedure for multiple short message transfer is shown in figure 23.3/2.

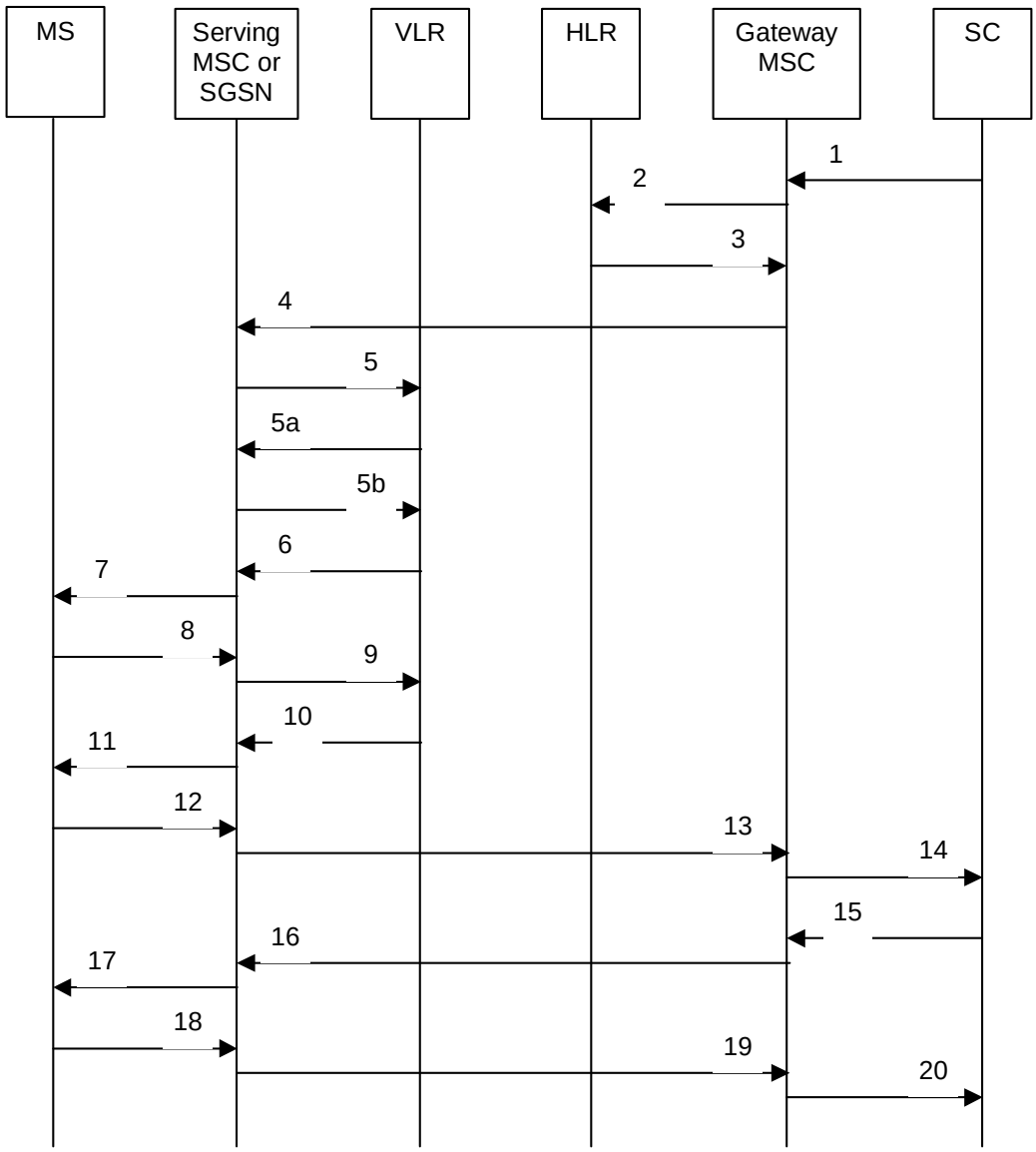


Figure 23.3/2: Mobile terminated short message procedure for multiple short message transfer

1) Short Message (3GPP TS 23.~~1~~0 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 (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (*3GPP TS 48.008 [49]*).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.~~1~~0 40).
15) Short Message (3GPP TS 23.~~1~~0 40).
16) MAP_MT_FORWARD_SHORT_MESSAGE (note 2).
17) Short Message (3GPP TS 24.011 [37]).

18) Short Message Acknowledgement (3GPP TS 24.011 [37]).
19) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
20) Short Message Acknowledgement (3GPP TS 23.~~1~~040).

(*) Messages 5), 5a), 5b) 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

NOTE 1: The “More Messages To Send” flag is TRUE.
NOTE 2: The “More Messages To Send” flag is FALSE.

In the multiple short message transfer the service MAP_MT_FORWARD_SHORT_MESSAGE can be used several times. However, the short message transfer is always acknowledged to the Service Centre before the next short message is sent.

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST	(see clause 8.3); (*)
MAP_PAGE	(see clause 8.2); (*)
MAP_SEARCH_FOR_MS	(see clause 8.2); (*)
MAP_AUTHENTICATE	(see clause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see clause 8.6); (*)
MAP_CHECK_IMEI	(see clause 8.7);
MAP_FORWARD_NEW_TMSI	(see clause 8.9); (*)
MAP_REPORT_SM_DELIVERY_STATUS	(see clause 12.3);
MAP_INFORM_SERVICE_CENTRE	(see clause 12.6);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see clause 9.1); (*)
MAP_READY_FOR_SM	(see clause 12.4).

(*) The~~o~~se ~~messages~~ services are not used by the SGSN.

23.3.1 Procedure in the SMS-GMSC

Any CAMEL-specific handling described in this subclause is omitted if the SMS-GMSC does not support CAMEL. CAMEL-specific handling is invoked only if the SMS-GMSC is integrated with the VMSC.

The ~~short message handling function of~~process ~~is~~ started when the SMS-GMSC ~~requests routing information when it~~ receives an SC_RP_MT_DATA indication from a Service Centre. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2.

Process MT_SM_GMSC sheet 1: If the MAP_SEND_ROUTING_INFO_FOR_SM confirmation included an LMSI, it may be included in the sm-RP-DA information field of the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC. In this case, the IMSI shall be included in the Destination Reference of the MAP_OPEN request. The SMS-GMSC shall not send an LMSI to an SGSN. If the SMS-GMSC does not send an LMSI to the serving node, the sm-RP-DA information field in the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC or SGSN shall contain the IMSI, and the Destination Reference in the MAP_OPEN request shall not be present. The parameter SM_RP_OA shall contain the Service Centre address.

Process MT_SM_GMSC sheet 1: The indication of which number belongs to the SGSN and which to the MSC, received from the HLR in the MAP_SEND_ROUTING_INFO_FOR_SM confirm (see subclause 23.3.2) will enable the SMS-GMSC to map the causes received from one or both serving nodes into the appropriate causes for non GPRS, GPRS or both, and send them to the SC and the HLR.

Process MT_SM_GMSC sheet 2: The SMS-GMSC maps "Unexpected data value" and "System failure" MAP errors from the serving node to a "System failure" RP_ERROR error cause. The mapping between other MAP error causes and the RP_ERROR error cause is given in 3GPP TS 23.040 [26] and 3GPP TS 24.011 [37].

Process MT_SM_GMSC sheet 2: If the SMS-GMSC receives both MSC and SGSN numbers from the HLR as routeing information, it may choose which serving node to use for the first delivery attempt.

Process MT_SM_GMSC sheet 2: If the SMS-GMSC makes two delivery attempts, it may report the result of each delivery attempt to the HLR according to the conditions described below.

Procedure MT_SM_Delivery_Attempt_GMSC sheet 1: if the macro MT_SM_Transfer_MSC takes the Error exit, the SMS-GMSC maps the MAP User Error to the corresponding SC_RP error, as defined in 3GPP TS 23.040 [26].

Procedure MT_SM_Delivery_Attempt_GMSC sheet 1, sheet 2, sheet 4, sheet 5: The SMS-GMSC invokes the macro Report_SM_Delivery_Stat_GMSC if:

- the reason received from the serving node for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause "MS memory capacity exceeded", and the SC address is not yet included in the MWD set, or
- the reason received from the serving node for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded, and the corresponding flag in the HLR (as indicated in the information received in the MAP_INFORM_ SERVICE_CENTRE) is not set, or
- the reason received from the serving node (MSC or SGSN) for failure to deliver the message is absent subscriber_SM and the absent subscriber diagnostic is different from the absent subscriber diagnostic received in the MAP_INFORM_ SERVICE_CENTRE.

Procedure MT_SM_Delivery_Attempt_GMSC sheet 1, sheet 2, sheet 4, sheet 5: If absent subscriber diagnostic information (see 3GPP TS 23.040 [26]) is included with the absent subscriber_SM error indication then the SMS-GMSC relays this information to the HLR using the MAP_REPORT_SM_DELIVERY_STATUS service.

Procedure MT_SM_Delivery_Attempt_GMSC sheet 1, sheet 4: The More Messages To Send flag is set to TRUE or FALSE according to the information received from the Service Centre.

Procedure MT_SM_Delivery_Attempt_GMSC sheet 3: If the capacity of a message signal unit in the lower layers of the protocol is enough to carry the content of the MAP_OPEN request and the content of the MAP_MT_FORWARD_SHORT_MESSAGE request in a single TC message, the test "Message segmentation needed" takes the "No" exit; otherwise the test takes the "Yes" exit.

~~The SMS-GMSC requests a MAP dialogue and sends a MAP_SEND_ROUTING_INFO_FOR_SM request, with an indication of whether the SMS-GMSC supports the delivery of short messages via an SGSN, to the HLR containing the subscriber data of the mobile subscriber.~~

- ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure" and the process returns to the Null state;~~
- ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol, and the handling continues as follows:~~
  - ~~if the HLR did not supply routeing information, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error, and the process returns to the Null state;~~

~~NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].~~

  - ~~if the HLR supplied routeing information, the handling continues as described below under the heading "Short message delivery attempts".~~
- ~~if the macro Receive_Open_Cnf takes the "OK" exit, the SMS-GMSC waits for routeing information from the HLR.~~

~~While the SMS-GMSC is waiting for routeing information from the HLR:~~

- if the service centre aborts the dialogue with the SMS-GMSC, the SMS-GMSC aborts the dialogue with the HLR and the process returns to the Null state;

- If the dialogue with the HLR fails, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure" and the process returns to the Null state;

- if the SMS-GMSC receives a MAP_SEND_ROUTING_INFO_FOR_SM confirmation, it checks the confirmation.

  - if the confirmation contained a provider error or a data error, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure", and the process returns to the Null state;

  - if the confirmation contained a user error, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error and waits for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the confirmation contained routeing information, the SMS-GMSC checks whether the routeing information included an LMSI;

    - if the routeing information included an LMSI, the SMS-GMSC sets the destination reference to the IMSI of the destination subscriber, and the destination address in the short message relay protocol to the LMSI;

    - if the routeing information did not include an LMSI, the SMS-GMSC marks the destination reference as not included, and sets the destination address in the short message relay protocol to the IMSI of the destination subscriber.

  - in both cases, the SMS-GMSC then waits for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR;

While the SMS-GMSC is waiting for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR:

- if the service centre aborts the dialogue with the SMS-GMSC, the SMS-GMSC aborts the dialogue with the HLR and the process returns to the Null state;

- if the dialogue with the HLR fails, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

- if the HLR closes the dialogue without sending a MAP_INFORM_SERVICE_CENTRE, the SMS-GMSC checks whether routeing information was received from the HLR.

  - if the HLR did not supply routeing information, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error, and the process returns to the Null state;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the HLR supplied routeing information, the handling continues as described below under the heading "Short message delivery attempts".

- if the SMS-GMSC receives a MAP_INFORM_SERVICE_CENTRE indication, it checks the indication.

  - if the indication is badly formed, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

  - if the indication is OK, the SMS-GMSC checks whether the MAP_SEND_ROUTING_INFO_FOR_SM confirmation contained an error.

    - if the MAP_SEND_ROUTING_INFO_FOR_SM confirmation contained an error, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

- if the MAP_SEND_ROUTING_INFO_FOR_SM confirmation did not contain an error, which implies that it contained routeing information, the handling continues as described below under the heading "Short message delivery attempts".

Short message delivery attempts

When the SMS-GMSC has obtained the routing information needed to forward a mobile terminated short message to the serving node (MSC or SGSN) it calls the procedure MT_SM_Delivery_Attempt_GMSC.

If the SMS-GMSC receives both MSC and SGSN numbers from the HLR as routeing information, it may choose which serving node to use for the first delivery attempt.

If the first delivery attempt succeeds, or the delivery is aborted, the process returns to the Null state. If the first delivery attempt fails and the HLR provided a second routeing address, the SMS-GMSC attempts to deliver the short message through the second choice serving node. The process then returns to the Null state.

For each delivery attempt, the SMS-GMSC checks whether the serving node for the delivery attempt is the SMS-GMSC. If the serving node for the delivery attempt is the SMS-GMSC, the handling continues as described under the heading "Serving node is SMS-GMSC"; if the serving node for the delivery attempt is not the SMS-GMSC, the handling continues as described under the heading "Serving node is separate from SMS-GMSC".

Serving node is SMS-GMSC

The SMS-GMSC invokes the macro MT_SM_Transfer_MSC. This macro is described in subclause 23.3.3 and in figure 23.3/8.

If the macro takes the Abort exit, the SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98] and the procedure returns a Fail result.

If the macro takes the Error exit, the SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98]. If required, the SMS-GMSC reports the outcome of the delivery attempt to the HLR. The SMS-GMSC sends an error report to the service centre and the procedure returns a Fail result.

NOTE: if the macro takes the Error exit, the SMS-GMSC maps the MAP User Error to the corresponding SC_RP error, as defined in 3GPP TS 23.040 [26].

If the macro takes the Release SMS exit, the SMS-GMSC sends an error report to the service centre and the procedure returns a Fail result.

If the macro takes the OK exit, the SMS-GMSC reports the successful delivery to the gsmSCF as described in 3GPP TS 23.078 [98] and checks whether the "More messages to send" indication was set in the request from the service centre.

- If the "More messages to send" indication was not set, the SMS-GMSC reports the successful delivery to the HLR, if necessary, and reports the successful delivery to the service centre. The procedure returns a Pass result.

- If the " More messages to send" indication was set, the SMS-GMSC reports the successful delivery to the service centre and waits for another message delivery request from the service centre. When the request is received, the SMS-GMSC opens a dialogue with the gsmSCF as described in 3GPP TS 23.078 [98].

  - If the gsmSCF bars the delivery of the short message (Release_SMS result) the SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

  - If the gsmSCF instructs the SMS-GMSC to continue with the delivery, the SMS-GMSC sends the message over the access interface to the destination MS and waits for a response.

    - If the delivery was successful, the SMS-GMSC reports the successful delivery to the gsmSCF as described in 3GPP TS 23.078 [98] and checks whether the "More messages to send" indication was set in the request from the service centre, as above.

    - If the delivery was unsuccessful, the SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98]. If required, the SMS-GMSC reports the outcome of the delivery attempt to the HLR. The SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

Serving node is separate from SMS-GMSC

~~The SMS-GMSC checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.~~

- ~~if the two requests can be grouped in a single TC message, the SMS-GMSC requests a dialogue with the serving node, including the MAP_MT_FORWARD_SHORT_MESSAGE request;~~
  - ~~if the dialogue opening is successful, the SMS-GMSC waits for the response from the serving node;~~
  - ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol.~~
    - ~~if delivery was successful, the procedure returns a "Pass" result;~~
    - ~~if delivery failed, the procedure returns a "Fail" result.~~
  - ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with cause "System Failure" to the SC and the procedure returns a "Fail" result.~~
- ~~if the two requests can be grouped in a single TC message, the SMS-GMSC requests a dialogue with the serving node, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;~~
  - ~~if the dialogue opening is successful, the SMS-GMSC sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the serving node, and waits for the response from the serving node;~~
  - ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol.~~
    - ~~if delivery was successful, the procedure returns a "Pass" result;~~
    - ~~if delivery failed, the procedure returns a "Fail" result.~~
  - ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with cause "System Failure" to the SC and the procedure returns a "Fail" result.~~

~~If the MAP_SEND_ROUTING_INFO_FOR_SM confirmation included an LMSI, it can be included in the sm-RP-DA information field of the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC. In this case, the IMSI shall be included in the Destination Reference of the MAP_OPEN request. The SMS-GMSC shall not send an LMSI to an SGSN. If the SMS-GMSC does not send an LMSI to the serving node, the sm-RP-DA information field in the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC or SGSN shall contain the IMSI, and the Destination Reference in the MAP_OPEN request shall not be present. The parameter SM_RP_OA shall contain the Service Centre address. The More Messages To Send flag is set to TRUE or FALSE according to the information received from the Service Centre.~~

~~When the SMS-GMSC receives the response from the serving node, it checks the content of the response.~~

~~If the response indicates successful delivery, the SMS-GMSC checks whether the "More messages to send" indication was set in the request from the service centre.~~

- ~~If the " More messages to send" indication was not set, the SMS-GMSC reports the successful delivery to the HLR, if necessary, and reports the successful delivery to the service centre. The procedure returns a Pass result.~~
- ~~If the " More messages to send" indication was set, the SMS-GMSC reports the successful delivery to the service centre and waits for another message delivery request from the service centre. When the request is received, the SMS-GMSC sends a MAP_MT_FORWARD_SHORT_MESSAGE request to the serving node and waits for a response.~~
  - ~~If the delivery was successful, the SMS-GMSC checks whether the "More messages to send" indication was set in the request from the service centre, as above.~~
  - ~~If the delivery was unsuccessful, the SMS-GMSC reports the outcome of the delivery attempt to the HLR, if required. The SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.~~

~~The SMS-GMSC invokes the procedure MAP_REPORT_SM_DELIVERY_STATUS, if:~~

- the reason received from the serving node for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded, and the SC address is not yet included in the MWD set, or

- the reason received from the serving node for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded, and the corresponding flag in the HLR (as indicated the information received in the MAP_INFORM_ SERVICE_CENTRE) is not set, or

- the reason received from the serving node (MSC or SGSN) for failure to deliver the message is absent subscriber_SM and the absent subscriber diagnostic is different from the absent subscriber diagnostic received in the MAP_INFORM_ SERVICE_CENTRE.

If absent subscriber diagnostic information (see 3GPP TS 23.040 [26]) is included with the absent subscriber_SM error indication then the SMS-GMSC relays this information to the HLR using the MAP_REPORT_SM_DELIVERY_STATUS service.

If there was an attempt to deliver the short message through both the MSC and the SGSN, and both delivery attempts failed with causes as described above, the SMS-GMSC reports to the HLR the two unsuccessful SMS delivery outcomes for GPRS and non GPRS.

If there was an attempt to deliver the short message through both the MSC and the SGSN, and the first delivery failed with causes described above but the second delivery succeeded, the SMS-GMSC reports to the HLR the unsuccessful and successful SMS delivery outcomes for GPRS and non GPRS.

The SMS-GMSC may also report successful delivery to the HLRwhen the first SMS delivery through the MSC was successful, if the MNRF or MCEF or both were set in the HLR.

The SMS-GMSC may also report successful delivery to the HLR when the first SMS delivery through the SGSN was successful, if the MNRG or MCEF or both were set in the HLR.

This procedure is described in detail in clause 23.5.

The SMS-GMSC maps "Unexpected data value" and "System failure" MAP errors from the serving node to a "System failure" error to the SC. Other MAP errors are mapped to appropriate cause values and diagnostic information from the SMS-GMSC to the SC as described in 3GPP TS 23.040 [26] and 3GPP TS 24.011 [37].

The SMS-GMSC maps the "Unidentified subscriber" MAP error to an "Absent subscriber" error with diagnostic information set to "Unidentified subscriber" to the SC as described in 3GPP TS 23.040 [26].

Note that the indication of which number belongs to the SGSN and which to the MSC, received from the HLR in the MAP_SEND_ROUTING_INFO_FOR_SM confirm (see clause 23.3.2) will enable the SMS-GMSC to map the causes received from one or both serving nodes into the appropriate causes for non GPRS, GPRS or both, and send them to the SC and the HLR.

The mobile terminated short message transfer proces~~sdure~~ in the SMS-GMSC is shown in figure 23.3/3. The procedure MT_SM_Delivery_Attempt_GMSC is shown in figure 23.3/4. The macro MT_SM_Transfer_MSC is shown in figure 23.3/7.

23.3.2 Procedure~~s~~ in the HLR

The process ~~is triggered by~~start~~ed~~ when the HLR receives a MAP_SEND_ROUTING_INFO_FOR_SM indication from the SMS-GMSC. ~~For any of the following error cases, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the appropriate user error, closes the dialogue and terminates the process:~~ The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Indication see subclause 25.2.1.

Sheet 3: If the SMS-GMSC does not support GPRS functionality, it uses the protocol defined in the Release 96 version of this specification. The parameter "msc-Number" in "RoutingInfoForSM-Res" in the Release 96 version of the protocol definition corresponds to the parameter "networkNode-Number" in "RoutingInfoForSM-Res" in the Release 97 (and later) version of the protocol definition; therefore if the HLR populates the parameter "networkNode-Number" with the SGSN number, the Release 96 SMS-GMSC will interpret the SGSN number as an MSC number. If the HLR

populates the "gprsNodeIndicator" parameter in the MAP_SEND_ROUTING_INFO_FOR_SM response, a Release 96 SMS-GMSC will silently discard the parameter.

Sheet 4: The SMS-GMSC indicates that it supports GPRS functionality if it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response.

Sheet 5: If the HLR received a LMSI from the VLR at location updating, it shall include the LMSI in the MAP_SEND_ROUTING_INFO_FOR_SM response only if the MAP_SEND_ROUTING_INFO_FOR_SM response also includes the MSC number.

- ~~if the indication is badly formed, the HLR returns the appropriate User Error;~~
- ~~if the mobile subscriber is unknown, i.e. it cannot be identified from the MSISDN given, the HLR returns the User Error "Unknown subscriber";~~
- ~~if the subscription does not include the MT SMS teleservice, the HLR returns the User Error "Teleservice not provisioned";~~
- ~~if the short message transfer would contravene the "SM filtering by the HPLMN" function criteria, the HLR returns the User Error "Call barred" with cause "Unauthorised Message Originator". The definition of the filtering function is out of the scope of UMTS specifications. Filtering may be based on the SM-RP-SMEA information element if it is received from the SMS-GMSC;~~
- ~~depending on the Network Access Mode ("Non-GPRS", "GPRS" or "Non-GPRS and GPRS"), the HLR behaves as follows:~~
  - ~~if the Network Access Mode is "Non-GPRS", i.e. the subscriber is not a GPRS subscriber, then:~~
    - ~~if the MS is not reachable in an MSC, i.e. 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, the HLR sets the MNRF and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic, i.e. "Deregistered in HLR for non GPRS", "Roaming Restricted" or "MS-Purged for non GPRS". The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";~~
    - ~~if the MSC where the subscriber is registered does not support MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;~~
    - ~~if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";~~
    - ~~if the short message transfer would contravene supplementary service barring, the HLR returns the User Error "Call barred" with cause "Barring service active";~~
    - ~~if the MNRF is set, the HLR checks whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication. If the priority information element was present, the HLR sets the "mnrf-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true". If the priority information element was not present, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for non-GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";~~
    - ~~if the MNRF is not set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".~~
  - ~~if the Network Access Mode is "GPRS", i.e. the subscriber is a GPRS subscriber, then:~~
    - ~~if the MS is not reachable in an SGSN, i.e. no MSC identity is stored for the mobile subscriber or the "SGSN Area Restricted Flag" is set or the "MS purged for GPRS" flag is set, the HLR sets the MNRG~~

flag and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the SGSN where the subscriber is registered does not support MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;

- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";

- if the short message transfer would contravene supplementary service barring, the HLR returns the User Error "Call barred" with cause "Barring service active";

- if the MNRG flag is set, the HLR checks whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication. If the priority information element was present, the HLR sets the "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. If the SMS-GMSC did not indicate in the MAP_SEND_ROUTING_INFO_FOR_SM indication that it supports GPRS functionality (i.e. it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response), the HLR maps the state of the MNRG flag into the "mnrf-Set" bit of the mw-Status parameter.

NOTE: If the SMS-GMSC does not support GPRS functionality, it uses the protocol defined in the Release 96 version of the specification. The parameter "msc-Number" in "RoutingInfoForSM-Res" in the Release 96 version of the protocol definition corresponds to the parameter "networkNode-Number" in "RoutingInfoForSM-Res" in the Release 97 (and later) version of the protocol definition; therefore if the HLR populates the parameter "networkNode-Number" with the SGSN number, the Release 96 SMS-GMSC will interpret the SGSN number as an MSC number. If the HLR populates the "gprsNodeIndicator" parameter in the MAP_SEND_ROUTING_INFO_FOR_SM response, a Release 96 SMS-GMSC will silently discard the parameter.

- The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the priority information element was not present, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the MNRG flag is not set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".

- if the Network Access Mode is "Non-GPRS and GPRS", i.e. the subscriber is a non-GPRS and GPRS subscriber, then:

  - the HLR checks whether the SMS-GMSC supports GPRS functionality, i.e. it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response;

  - if the SMS-GMSC does not support GPRS functionality then:

    - if the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

    - if the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS".

  - if the SMS-GMSC supports GPRS functionality then:

- if the MS is not reachable in an MSC (see the definition above under Network Access Mode "Non-GPRS") and not reachable in an SGSN (see the definition above under Network Access Mode "GPRS"), the HLR sets the MNRF and the MNRG flag and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the MS is not reachable in an SGSN (see the definition above under Network Access Mode "GPRS") but is reachable in an MSC, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if the MS is not reachable in an MSC (see the definition above under Network Access Mode "Non-GPRS") but is reachable in an SGSN, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS";

- if the MS is reachable in both an MSC and an SGSN, the HLR continues as described below;

- if neither the MSC nor the SGSN where the subscriber is registered supports MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;

- if only the MSC where the subscriber is registered supports MT SMS, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if only the SGSN where the subscriber is registered supports MT SMS, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS";

- if both the MSC and the SGSN where the subscriber is registered support MT SMS, the HLR checks whether the short message transfer would contravene operator determined barring or supplementary service barring.

- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";

- if the short message transfer would contravene supplementary service barring, the HLR returns the User Error "Call barred" with cause "Barring service active";

- if the short message transfer is not prevented by operator determined barring or supplementary service barring, the HLR checks the states of the MNRF and the MNRG flag, and whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication.

- if both the the MNRF and the MNRG flag are set and the priority information element was absent, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for non-GPRS or GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if one or both of the MNRF and the MNRG flag is set and the priority information element was present, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number and SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the MNRG flag is set but the the priority information element was absent, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the

MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the MNRF is set but the the priority information element was absent, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if neither the MNRF nor the MNRG flag is set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number and SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".

Addition of the Service Centre Address to the MWD list

The HLR checks whether the service centre address is included in the Message Waiting Data (MWD) list.

- if the service centre address is not in the MWD list, the HLR attempts to add the service centre address. If it was not possible to add the service centre address to the MWD list (e.g. because the MWD list was full), the HLR sets the MWD status to show that the service centre address was not included, otherwise the HLR sets the MWD status to show that the service centre address was included;

- if the service centre address is in the MWD list, the HLR sets the MWD status to show that the service centre address was included.

The HLR then checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request.

The HLR then sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

Return of Routeing Information because the SM-RP-Priority is true

The HLR checks whether the service centre address is included in the Message Waiting Data (MWD) list.

- if the service centre address is not in the MWD list, the HLR sets the MWD status to show that the service centre address was not included;

- if the service centre address is in the MWD list, the HLR sets the MWD status to show that the service centre address was included.

The HLR then checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request.

The HLR then sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

Return of Routeing Information – normal case

The HLR checks the MCEF.

- if the MCEF is set, the HLR:

  - sets the "mcef-Set" bit of the mw-Status parameter;

  - checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request;

  - sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

- if the MCEF is not set, the HLR:

- checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sends to the SMS-GMSC a MAP_INFORM_SERVICE_CENTRE request including the MSISDN-Alert parameter;

- closes the MAP dialogue and terminates the process.

Use of LMSI

If the HLR received a LMSI from the VLR at location updating, it shall include the LMSI in the MAP_SEND_ROUTING_INFO_FOR_SM response only if the MAP_SEND_ROUTING_INFO_FOR_SM response also includes the MSC number.

The mobile terminated short message transfer process in the HLR is shown in figure 23.3/5.

23.3.3 Procedure in the Serving MSC

Any CAMEL-specific handling defined in this subclause is omitted if the MSC does not support CAMEL control of MT SMS, or if the subscriber does not have a subscription for CAMEL control of MT SMS.

The process is triggered bystartsed when the MSC receives a dialogue opening request with the application context shortMsgMT-RelayContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "OK" exit, the MSC checks whether the dialogue opening request included a destination reference. If a destination reference was included, the MSC stores it and waits for a service primitive.

  - if the dialogue with the SMS-GMSC fails, the process returns to the Null state;

  - if the next primitive received is a MAP_DELIMITER indication, the MSC returns a MAP_DELIMITER request, and waits for a service primitive;

  - if the next primitive received is a MAP_MT_FORWARD_SHORT_MESSAGE indication, the MSC checks the indication.

    - if the indication is badly formed, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

    - if the indication is OK, the MSC invokes the macro MT_SM_Transfer_MSC to transfer the short message to the MS.

      - if the macro takes the "Release SMS" exit, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

      - if the macro takes the "Error" exit, the MSC reports the delivery failure to the gsmSCF (if CAMEL handling was invoked) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

      - if the macro takes the "Abort" exit, the MSC reports the delivery failure to the gsmSCF (if CAMEL handling was invoked), and the process returns to the Null state;

      - if the macro takes the "OK" exit, the MSC reports the successful delivery to the gsmSCF (if CAMEL handling was invoked) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".

- if there are no more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;

- if there are more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

- When the MSC is waiting for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC:

- if the dialogue with the SMS-GMSC fails, the MSC sends an Abort request to the MS, and the process returns to the Null state;

- if it receives a Release indication over the A-interface, the MSC aborts the dialogue with the SMS-GMSC, and the process returns to the Null state;

- if it receives a MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, it checks the indication.

- if the indication is badly formed, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

- if the indication is OK, the MSC checks whether CAMEL handling is required.

- if CAMEL handling is required, the MSC calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.

- if the result is Release_SMS, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error defined by the gsmSCF, and the process returns to the Null state;

- if the result is Continue, the MSC forwards the short message to the MS over the A interface, as described below.

- if CAMEL handling is not required, the MSC forwards the short message to the MS over the A interface, as described below;

- the MSC sends an A_RP_MT_DATA request to the MS, and waits for the response from the MS.

- When the MSC is waiting for the response from the MS for delivery of a subsequent short message:

- if the dialogue with the SMS-GMSC fails, the MSC sends an Abort request to the MS and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;

- if the MSC receives a Release indication over the A-interface, the MSC aborts the dialogue with the SMS-GMSC and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;

- if the MSC receives an error response from the MS, it maps the error to a MAP user error, reports the delivery failure to the gsmSCF (if CAMEL handling is required) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error, and the process returns to the Null state;

- if the MSC receives a positive acknowledgement from the MS, it reports the successful delivery to the gsmSCF (if CAMEL handling is required) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".

- if there are no more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;

- if there are more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the

~~dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.~~

The mobile terminated short message transfer process in the serving MSC is shown in figure 23.3/6.

The macro MT_SM_Transfer_MSC may be invoked either in a stand-alone serving MSC or in a serving MSC which is integrated with the SMS-GMSC. It is used to transfer the first MT short message of a possible sequence of messages. The macro invokes macros not defined in this clause; the definition of these macros can be found as follows:

Check_Confirmation see subclause 25.2.2.

Page_MSC see subclause 25.3.1;

Search_for_MS_MSC see subclause 25.3.2;

Process_Access_Request_MSC see subclause 25.4.1;

Trace_Subscriber_Activity_MSC see subclause 25.9.1.

~~If the MSC does not support MT-SMS, it sets the User Error to "Facility not supported" and the macro takes the "Error" exit.~~

~~If the MSC supports MT-SMS, it invokes the macro Check_Subscr_Identity_for_SMS. If the macro Check_Subscr_Identity_for_SMS takes the "Error" exit, the macro MT_SM_Transfer_MSC takes the "Error" exit.~~

~~If the macro Check_Subscr_Identity_for_SMS takes the the "OK" exit, the MSC sends a dialogue opening request, followed by a MAP_SEND_INFO_FOR_MT_SMS request, to the VLR and waits for a response.~~

~~If the dialogue opening fails, the macro takes the "Error" exit.~~

~~If the dialogue opening succeeds, the MSC sets the variable CAMEL Handling to False and waits for the response from the VLR.~~

~~When the MSC is waiting for the response from the VLR:~~

- ~~if it receives a MAP_CONTINUE_CAMEL_SMS_HANDLING indication from the VLR, it sets the variable CAMEL Handling to True, calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.~~
  - ~~if the result is Release_SMS, the MSC aborts the dialogue with the VLR, and the macro takes the "Release SMS" exit;~~
  - ~~if the result is Continue, the MSC sends a second MAP_SEND_INFO_FOR_MT_SMS request, with the "Suppress MT-SMS-CSI parameter set, to the VLR, and waits for the response from the VLR.~~
- ~~if it receives a MAP_SEND_INFO_FOR_MT_SMS confirmation, it sets the User Error parameter according to the User Error parameter received in the MAP_SEND_INFO_FOR_MT_SMS confirmation, and the macro takes the "Error" exit;~~
- ~~if it receives a MAP_PAGE indication, it invokes the Page_MSC macro described in subclause 25.3.~~
  - ~~if the Page_MSC macro takes the "Null" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;~~
  - ~~if the Page_MSC macro takes the "Error" exit, the MSC waits for a further response from the VLR;~~
  - ~~if the Page_MSC macro takes the "OK" exit, the MSC checks whether the MS supports SMS, as described below.~~
- ~~if it receives a MAP_SEARCH_FOR_MS indication, it invokes the Search_For_MS_MSC macro described in subclause 25.3.~~
  - ~~if the Search_For_MS_MSC macro takes the "Null" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;~~
  - ~~if the Search_For_MS_MSC macro takes the "Error" exit, the MSC waits for a further response from the VLR;~~

- if the Search_For_MS_MSC macro takes the "OK" exit, the MSC checks whether the MS supports SMS, as described below.

- if the MS does not support SMS, the MSC sets the User Error to "SM Delivery Failure" with delivery failure cause "Equipment not SM equipped", aborts the dialogue with the VLR and aborts the connection to the MS, and the macro takes the "Error" exit;

- if the MS supports SMS, the MSC invokes the macro Process_Access_Request_MSC described in subsclause 25.4.

  - if the Process_Access_Request_MSC macro takes the "Error" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;

  - if the Process_Access_Request_MSC macro takes the "OK" exit, the MSC waits for a further response from the VLR.

When the MSC is waiting for a further response from the VLR:

- if it receives a MAP_TRACE_SUBSCRIBER_ACTIVITY indication from the VLR, it performs tracing activity as described in subclause 25.9, and waits for a further response from the VLR;

- if it receives a MAP_SEND_INFO_FOR_MT_SMS confirmation, it checks the confirmation.

  - if the confirmation contains a User Error, the MSC sets the User Error according to the User Error received in the confirmation, and the macro takes the "Error" exit;

  - if the confirmation contains a Provider Error or a Data Error, the MSC sets the User Error to "System failure", and the macro takes the "Error" exit;

  - if the confirmation indicates success, the MSC forwards the short message to the MS, and waits for a response from the MS.

    - if the MS returns an error, the MSC sets the User Error according to the response from the MS, and the macro takes the "Error" exit;

    - if the MS returns a positive acknowledgement, the macro takes the "OK" exit.

When the MSC is waiting for a response from the VLR for the MAP_SEND_INFO_FOR_MT_SMS request, or a response from the VLR for the MAP_PROCESS_ACCESS_REQUEST request, or the response from the MS for the first short message:

- if the MSC receives a Release on the A interface, it aborts the dialogue with the VLR (if the dialogue is still open) and sets the User Error to "System failure", and the macro takes the "Error" exit;

- if the dialogue with the VLR fails, the MSC aborts the connection to the MS and sets the User Error to "System failure", and the macro takes the "Error" exit;

- if the dislogue with the SMS-GMSC fails, the the MSC aborts the dialogue with the VLR (if the dialogue is still open) and aborts the connection to the MS, and the macro takes the "Abort" exit.

The macro MT_SM_Transfer_MSC is shown in figure 23.3/7. The macro Check_Subscr_Identity_For_MT_SMS is shown in figure 23.3/8.

23.3.4 Procedures in the VLR

Any CAMEL-specific handling defined in this subclause is omitted if the VLR does not support CAMEL control of MT SMS.

The process is triggered bystarts when the VLR receives a dialogue opening request from the MSC. The process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check_Indication	see subclause 25.2.1;
Check_Confirmation	see subclause 25.2.2;

Process_Access_Request_VLR see subclause 25.4.2.

~~If the macro Receive_Open_Ind takes the "Vr" exit or the "Error" exit, the process returns to the Null state.~~

~~If the macro Receive_Open_Ind takes the "OK" exit, the VLR waits for a service primitive.~~

~~When the VLR receives a MAP_SEND_INFO_FOR_MT_SMS indication, it checks the indication.~~

- ~~if the indication is badly formed, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the appropriate User Error, and the process returns to the Null state;~~
- ~~if the indication is OK, the VLR checks the subscription information.~~

~~If the VLR has no record for the subscriber, or the subscriber record is marked as not confirmed by the HLR, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Unidentified subscriber", and the process returns to the Null state.~~

~~If the subscriber is marked as IMSI detached, or service is not allowed in the location area where the subscriber is currently registered, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Absent subscriber" with the diagnostic "IMSI detached", and the process returns to the Null state.~~

~~If the subscription checks are successful, the VLR calls the procedure CAMEL_MT_SMS_VLR, which is specified in 3GPP TS 23.078 [98], and checks the result.~~

- ~~if the result is Fail, the process returns to the Null state;~~
- ~~if the result is Pass, the VLR checks whether the location of the MS is known, and whether the location is confirmed by radio contact.~~
  - ~~if the location is known and confirmed by radio contact, the VLR sends a MAP_PAGE request to the MSC;~~
  - ~~if the location is not known, or not confirmed by radio contact, the VLR sends a MAP_SEARCH_FOR_MS request to the MSC.~~
- ~~the VLR waits for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC.~~

~~When the VLR is waiting for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC:~~

- ~~if the dialogue is aborted by the MSC, the process returns to the NULL state;~~
- ~~if it receives a MAP_PAGE confirmation, it checks the User Error received in the confirmation, as below;~~
- ~~if it receives a MAP_SEARCH_FOR_MS confirmation, it checks the confirmation.~~
  - ~~if the confirmation contained a Provider Error or a Data Error, the process returns to the Null state;~~
  - ~~if the confirmation contained a User Error, the VLR checks the User Error, as below;~~
  - ~~if the confirmation indicated a successful result, the VLR updates the LAI and sets the Confirmed by Radio Contact indicator to Confirmed, and waits for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC.~~
- ~~if it receives a MAP_PROCESS_ACCESS_REQUEST indication, it invokes the macro Process_Access_Request_VLR.~~
  - ~~if the macro takes the "Error" exit, the process returns to the Null state;~~
  - ~~if the macro takes the "OK" exit, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the MSISDN of the subscriber, and the process returns to the Null state.~~

~~If the VLR receives a MAP_PAGE confirmation or a MAP_SEARCH_FOR_MS confirmation containing a User Error, it checks the user error.~~

- ~~if the User Error is Absent Subscriber, the VLR sets the MNRF and returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Absent subscriber" with diagnostic "No response to paging", and the process returns to the Null state;~~

- for any other User Error, the VLR relays the User Error in a MAP_SEND_INFO_FOR_MT_SMS response, and the process returns to the Null state.

The mobile terminated short message transfer process in the VLR is shown in figure 23.3/9.

23.3.5 Procedure in the SGSN

Any CAMEL-specific handling defined in this subclause is omitted if the SGSN does not support CAMEL control of MT SMS, or if the subscriber does not have a subscription for CAMEL control of MT SMS.

The process is triggered bystarts when the SGSN receives a dialogue opening request with the application context shortMsgMT-RelayContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "OK" exit, the SGSN checks whether the dialogue opening request included a destination reference. If a destination reference was included, the SGSN stores it and waits for a service primitive.

  - if the dialogue with the SMS-GMSC fails, the process returns to the Null state;

  - if the next primitive received is a MAP_DELIMITER indication, the SGSN returns a MAP_DELIMITER request, and waits for a service primitive;

  - if the next primitive received is a MAP_MT_FORWARD_SHORT_MESSAGE indication, the SGSN checks the indication.

    - if the indication is badly formed, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

    - if the indication is OK, the MSC invokes the macro MT_SM_Transfer_SGSN to transfer the short message to the MS.

      - if the macro takes the "Release SMS" exit, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

      - if the macro takes the "Error" exit, the SGSN reports the delivery failure to the gsmSCF (if CAMEL handling was invoked) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

      - if the macro takes the "Abort" exit, the SGSN reports the delivery failure to the gsmSCF (if CAMEL handling was invoked), and the process returns to the Null state;

      - if the macro takes the "OK" exit, the SGSN reports the successful delivery to the gsmSCF (if CAMEL handling was invoked) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".

        - if there are no more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;

        - if there are more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

- When the SGSN is waiting for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC:
  - if the dialogue with the SMS-GMSC fails, the SGSN releases the LLC connection to the MS, and the process returns to the Null state;
  - if it receives a Release indication over the Gb-interface, the SGSN aborts the dialogue with the SMS-GMSC, and the process returns to the Null state;
  - if it receives a MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, it checks the indication.
    - if the indication is badly formed, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
    - if the indication is OK, the SGSN checks whether CAMEL handling is required.
      - if CAMEL handling is required, the SGSN calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.
        - if the result is Release_SMS, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error defined by the gsmSCF, and the process returns to the Null state;
        - if the result is Continue, the SGSN forwards the short message to the MS over the Gb interface, as described below.
      - if CAMEL handling is not required, the SGSN forwards the short message to the MS over the Gb interface, as described below;
    - the SGSN sends a Gb_RP_MT_DATA request to the MS, and waits for the response from the MS.
- When the SGSN is waiting for the response from the MS for delivery of a subsequent short message:
  - if the dialogue with the SMS-GMSC fails, the the SGSN releases the LLC connection to the MS and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the SGSN receives a Release indication over the Gb-interface, the MSC aborts the dialogue with the SMS-GMSC and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the SGSN receives an error response from the MS, it maps the error to a MAP user error, reports the delivery failure to the gsmSCF (if CAMEL handling is required) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error, and the process returns to the Null state;
  - if the SGSN receives a positive acknowledgement from the MS, it reports the successful delivery to the gsmSCF (if CAMEL handling is required) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
    - if there are no more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
    - if there are more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

The mobile terminated short message transfer process~~dure~~ in the ~~serving~~ SGSN is shown in figure 23.3/10.

The macro MT_SM_Transfer_SGSN is used to transfer the first MT short message of a possible sequence of messages. It is shown in figure 23.3/11.

~~If the SGSN does not support MT SMS, it sets the User Error to "Facility not supported" and the macro takes the "Error" exit.~~

If the SGSN supports MT SMS, it invokes the macro Check_Subscr_Identity_for_SMS.

- if the macro Check_Subscr_Identity_for_SMS takes the "Error" exit, the macro MT_SM_Transfer_SGSN takes the "Error" exit;
- if the macro Check_Subscr_Identity_for_SMS takes the "OK" exit, the SGSN checks the subscription information.
  - if the SGSN has no record for the subscriber, or the subscriber record is marked as not confirmed by the HLR, the SGSN sets the User Error to "Unidentified subscriber", and the macro takes the "Release SMS" exit;
  - if the subscriber is marked as GPRS detached, or service is not allowed in the routeing area where the subscriber is currently registered, the SGSN sets the User Error to "Absent subscriber" with the diagnostic "GPRS detached" and sets the MNRG flag, and the macro takes the "Release SMS" exit.
- if the subscription checks are successful, the SGSN calls the procedure CAMEL_MT_SMS_SGSN, which is specified in 3GPP TS 23.078 [98], and checks the result.
  - if the result is Continue, the SGSN sets the variable CAMEL Handling to False, and continues the processing for the delivery attempt;
  - if the result is CAMEL Handling, the SGSN sets the variable CAMEL Handling to True, calls the procedure CAMEL_T_SMS_INIT and checks the result.
    - if the result is Release_SMS, the SGSN sets the User Error according to the instructions from the gsmSCF, and the macro takes the "Release SMS" exit;
    - if the result is Continue, the SGSN continues the processing for the delivery attempt.
- the SGSN checks whether the location of the MS is known, and whether the location is confirmed by radio contact.
  - if the location is known and confirmed by radio contact, the SGSN calls the procedure Page_SMS_SGSN and checks the result;
  - if the location is not known, or not confirmed by radio contact, the SGSN calls the procedure Search_SMS_SGSN and checks the result.
- if the procedure Page_SMS_SGSN or the procedure Search_SMS_SGSN returns a Fail result, the SGSN checks the error cause.
  - if the error cause is Absent Subscriber, the SGSN sets the User Error to "Absent Subscriber" with the diagnostic "No response to paging" and sets the MNRG flag, and the macro takes the "Error" exit;
  - for any other error, the SGSN sets the User Error accordingly, and the macro takes the "Error" exit.
- if the procedure Page_SMS_SGSN or the procedure Search_SMS_SGSN returns a Fail result, the SGSN checks whether the MS supports SMS.
  - if the MS does not support SMS, the SGSN releases the LLC connection and sets the User Error to "SM delivery failure" with delivery failure cause "Equipment not SM equipped", and the macro takes the "Error" exit;
  - if the MS supports SMS, the SGSN forwards the short message to the MS, and waits for a response from the MS.
    - if the MS returns an error, the SGSN sets the User Error according to the response from the MS, and the macro takes the "Error" exit;
    - if the MS returns a positiva acknowledgement, the macro takes the "OK" exit;
    - if the LLC connection is released, the SGSN sets the User Error to "System failure", and the macro takes the "Error" exit;

- ~~if the dialogue with the SMS-GMSC fails, the SGSN releases the LLC connection, and the macro takes the "Abort" exit.~~

~~The macro MT_SM_Transfer_SGSN is shown in figure 23.3/11~~

The macro Check_Subscr_Identity_For_MT_SMS is shown in figure 23.3/8. The page and search procedures are shown in figures 23.3/12 and 23.3/13.

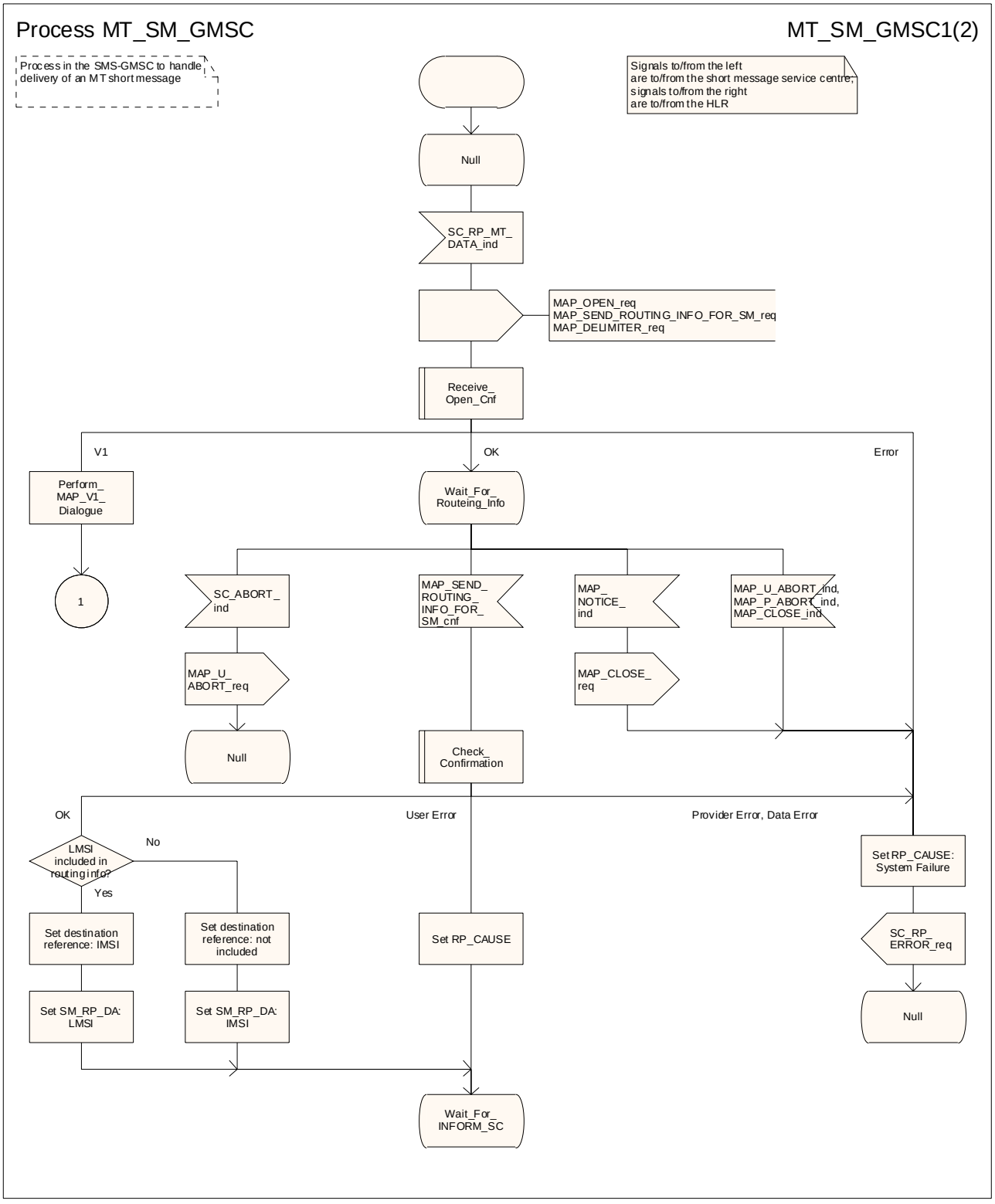


Figure 23.3/3 (sheet 1 of 2): Process MT_SM_GMSC

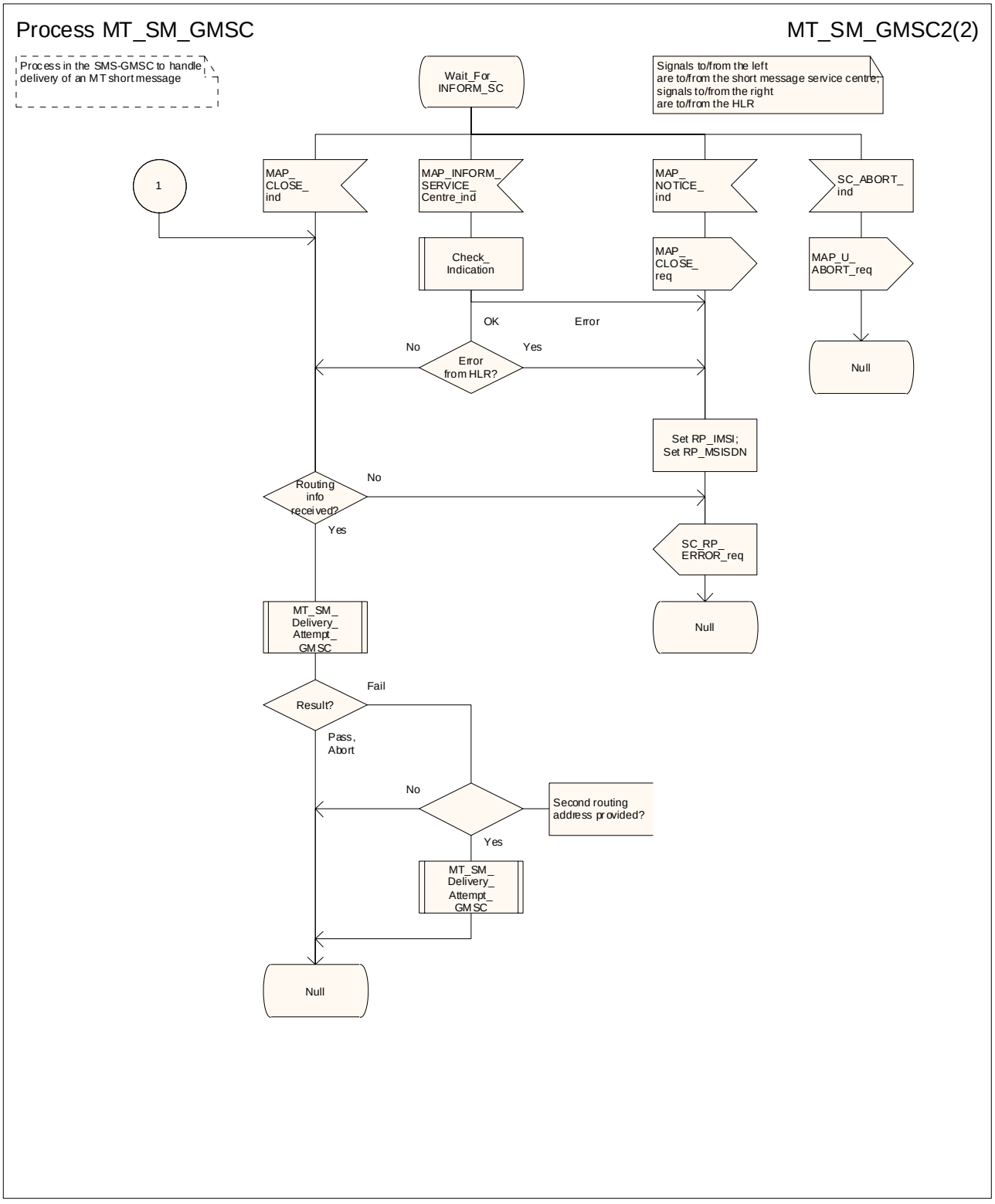


Figure 23.3/3 (sheet 2 of 2): Process MT_SM_GMSC

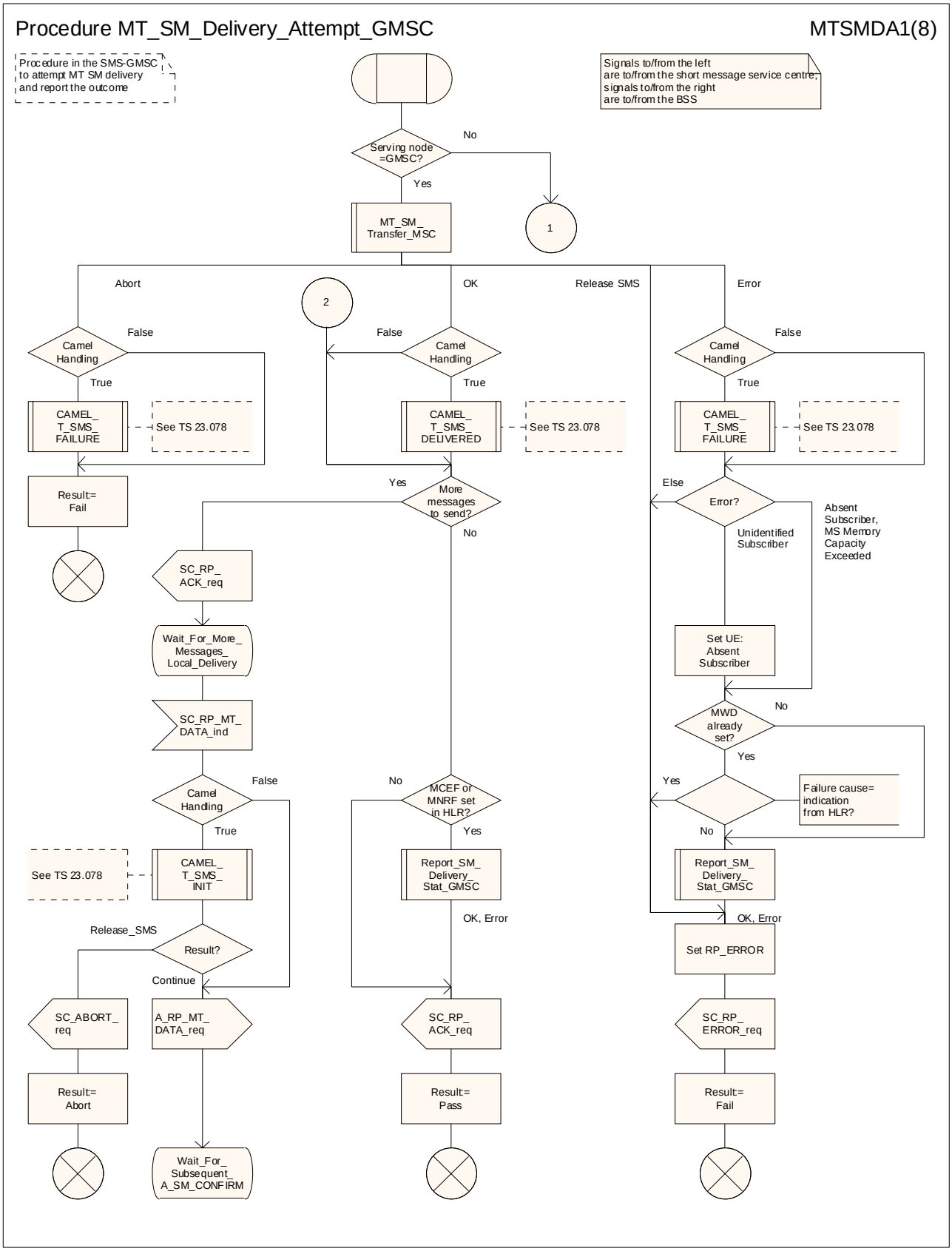


Figure 23.3/4 (sheet 1 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

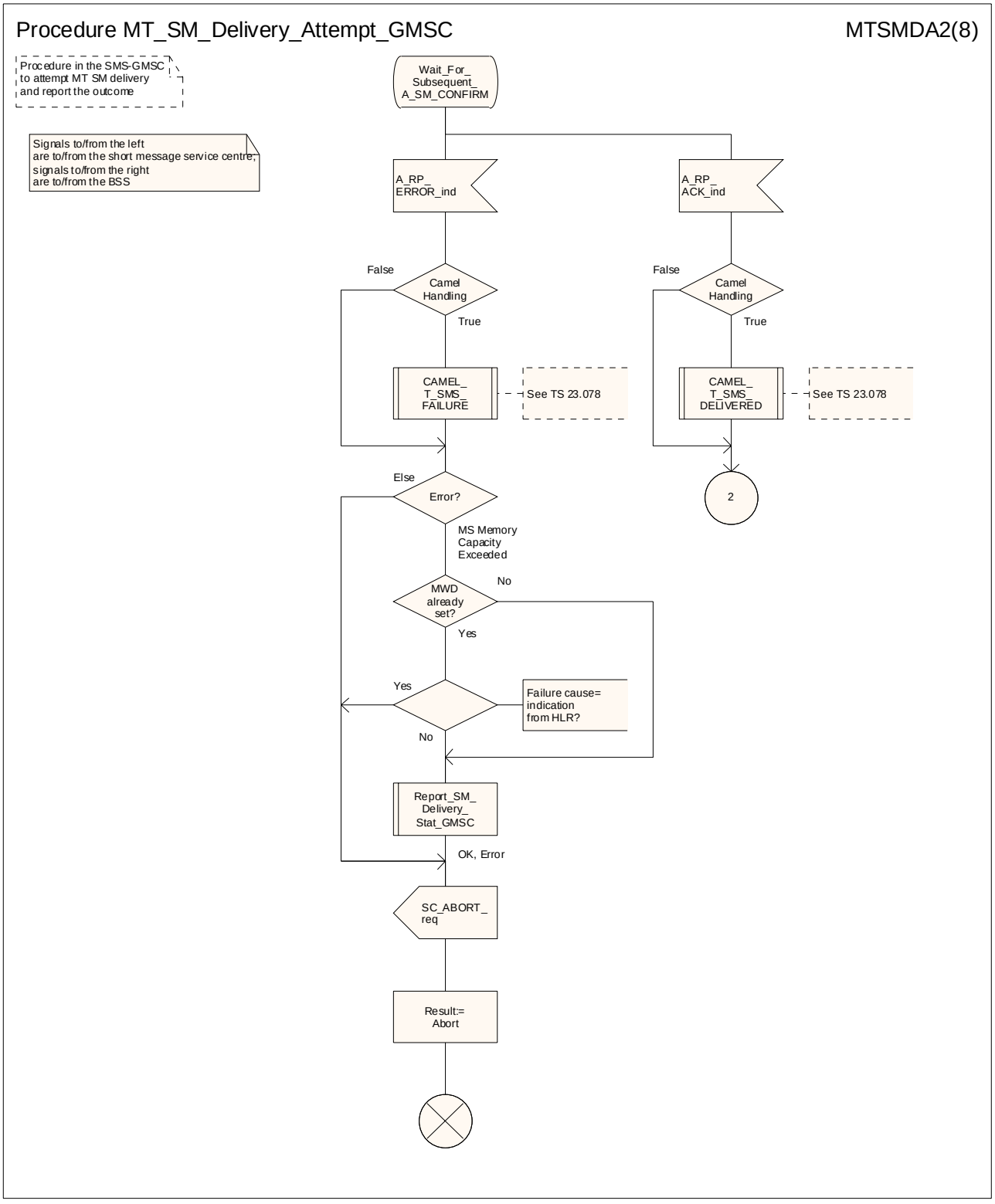


Figure 23.3/4 (sheet 2 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

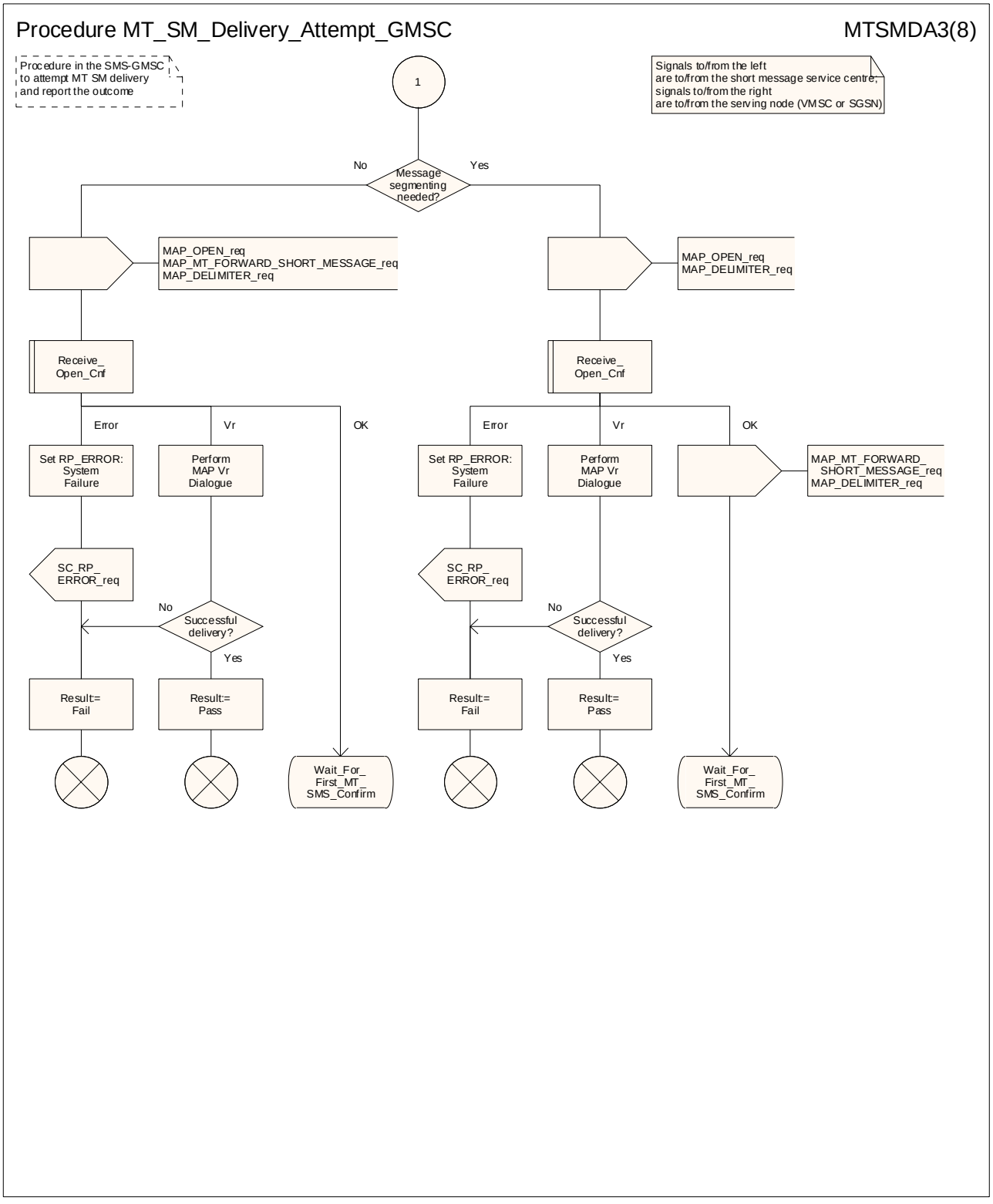


Figure 23.3/4 (sheet 3 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

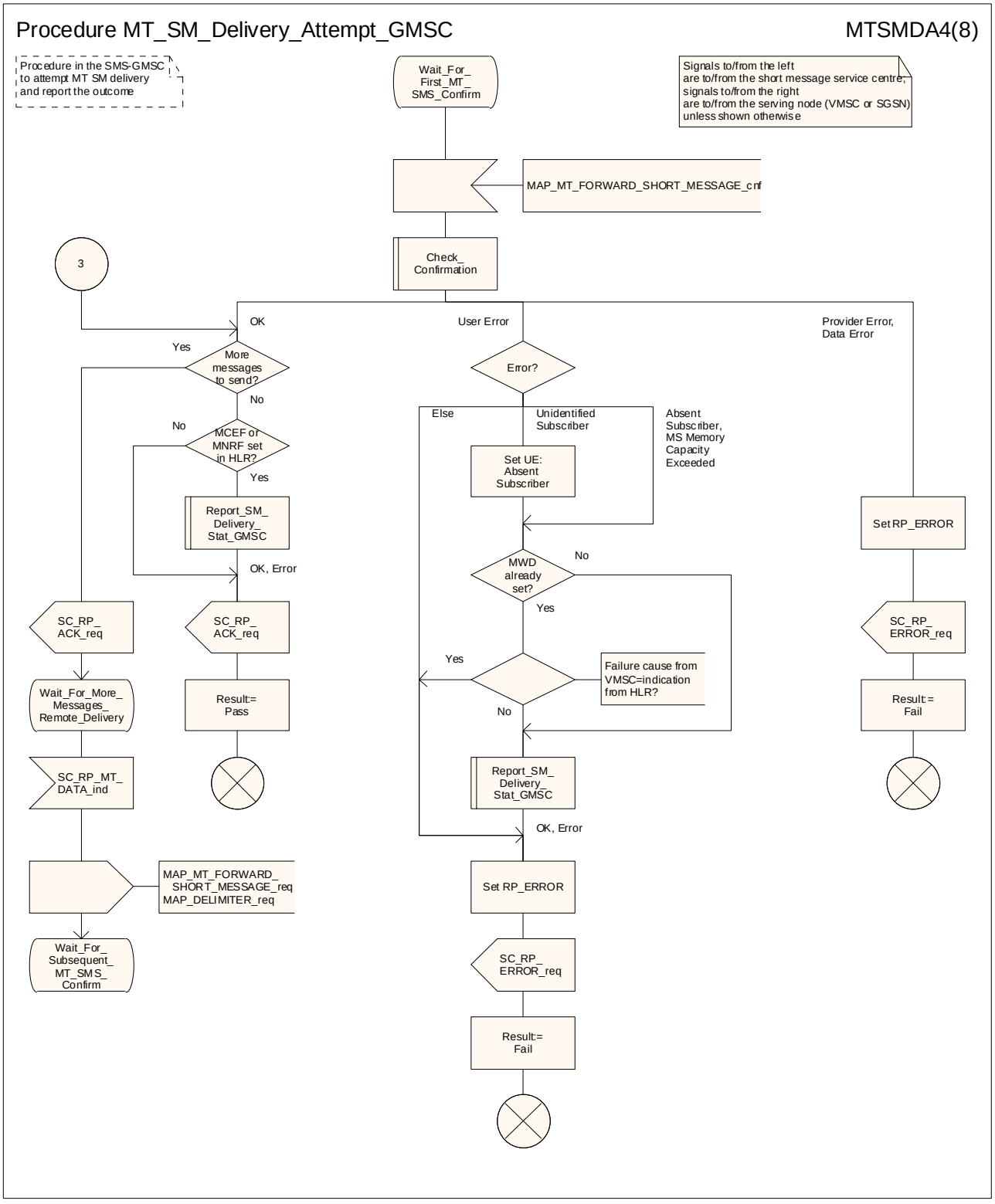


Figure 23.3/4 (sheet 4 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

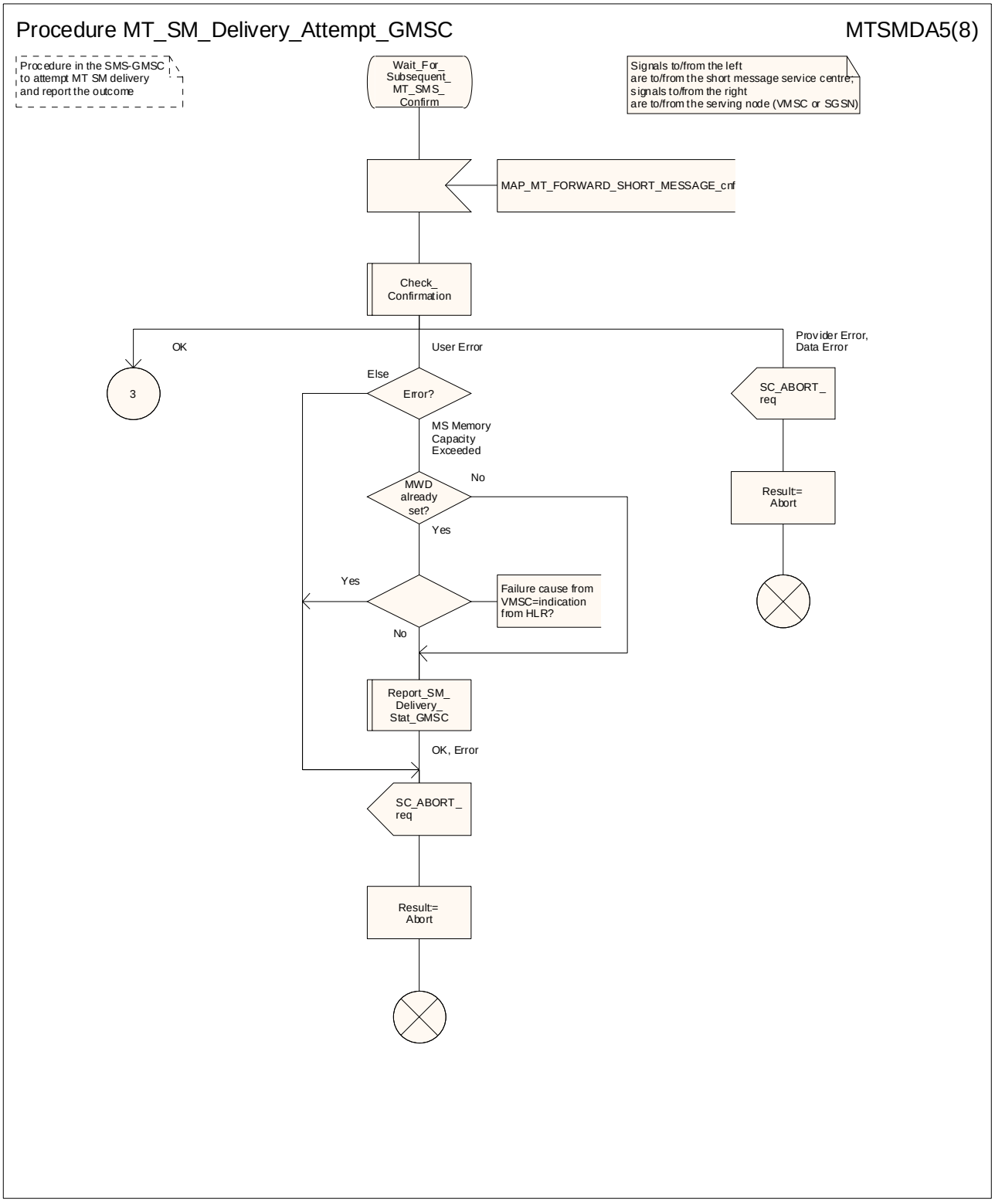


Figure 23.3/4 (sheet 5 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

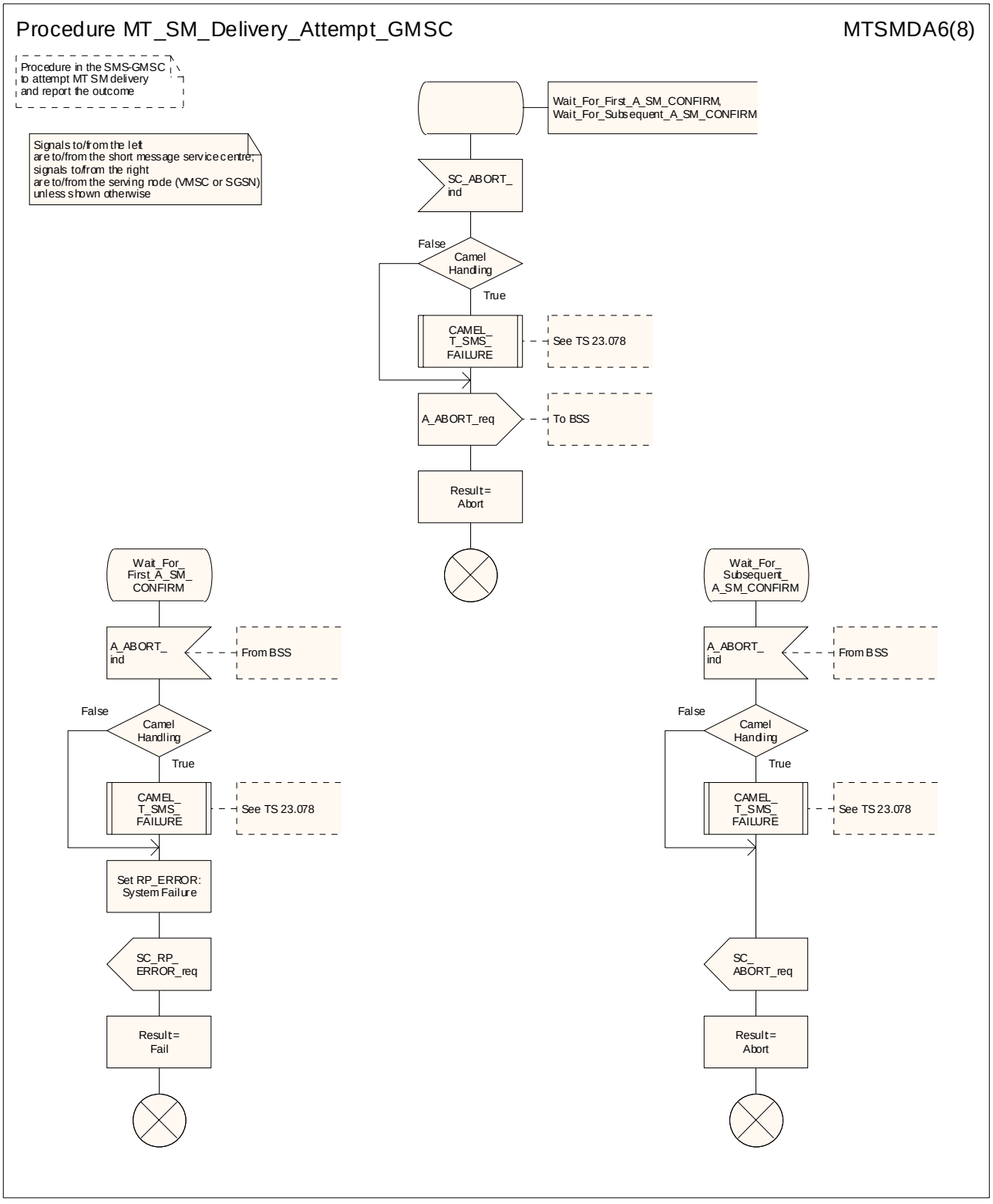


Figure 23.3/4 (sheet 6 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

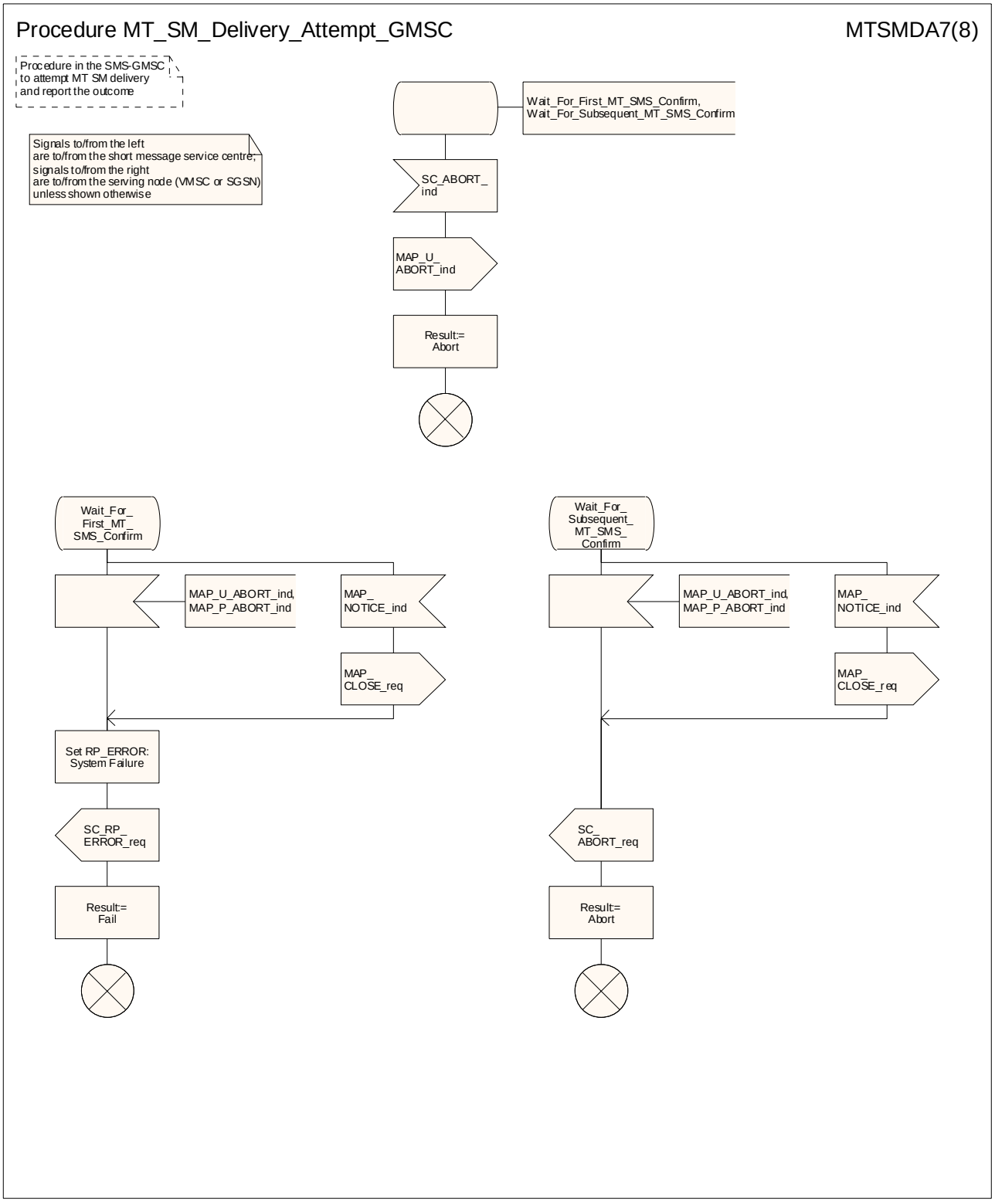


Figure 23.3/4 (sheet 7 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

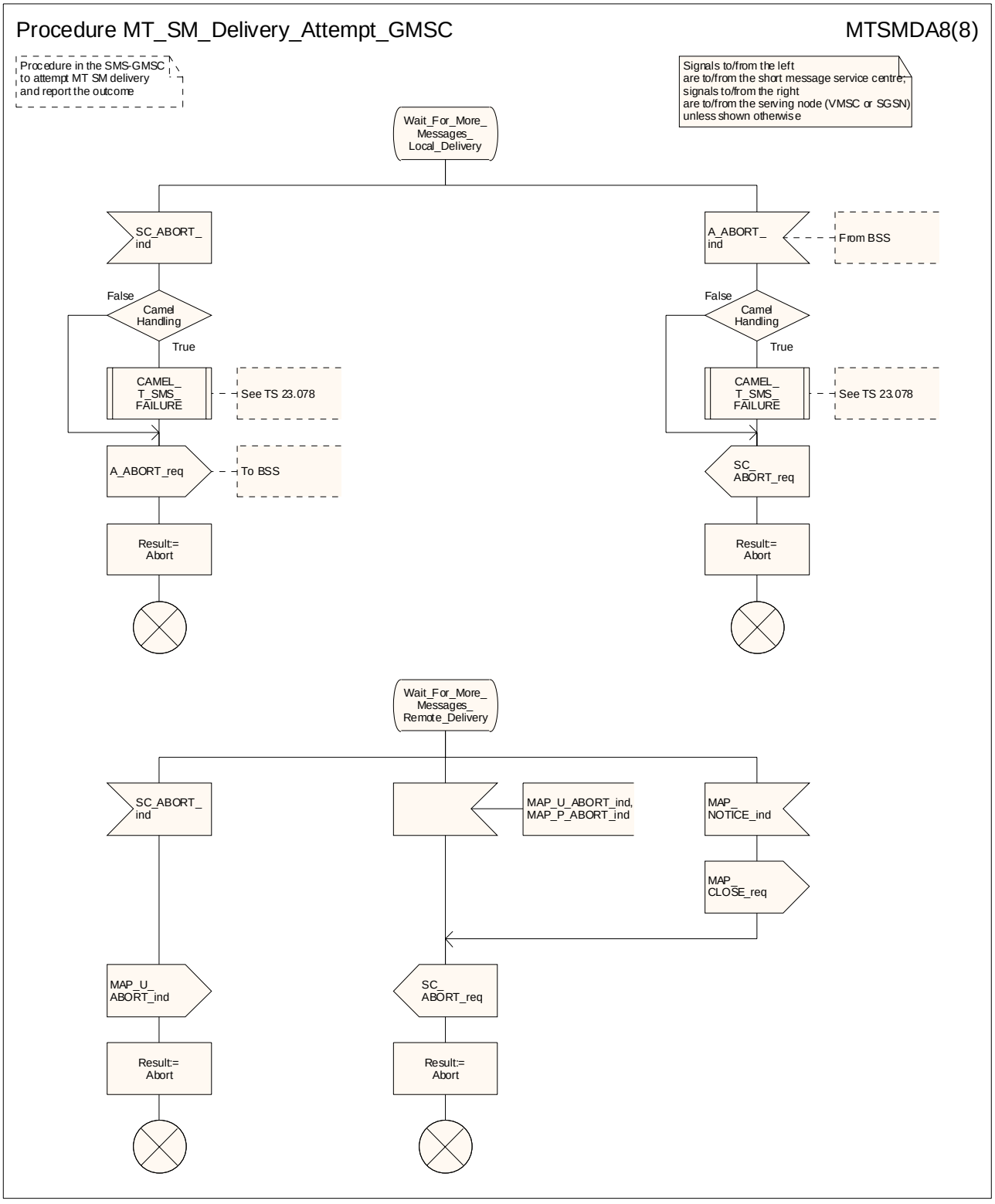


Figure 23.3/4 (sheet 8 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

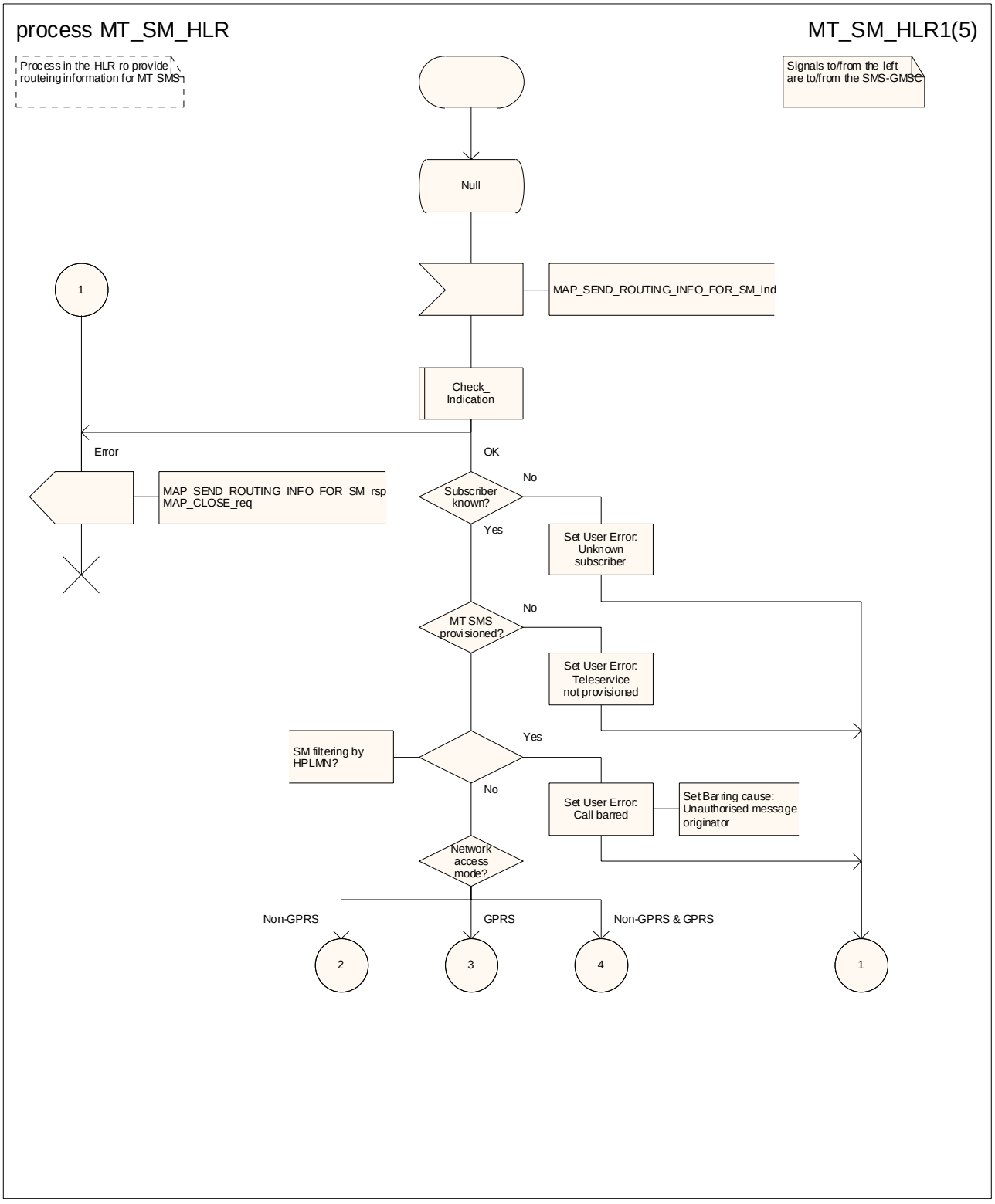


Figure 23.3/5 (sheet 1 of 5): Process MT_SM_HLR

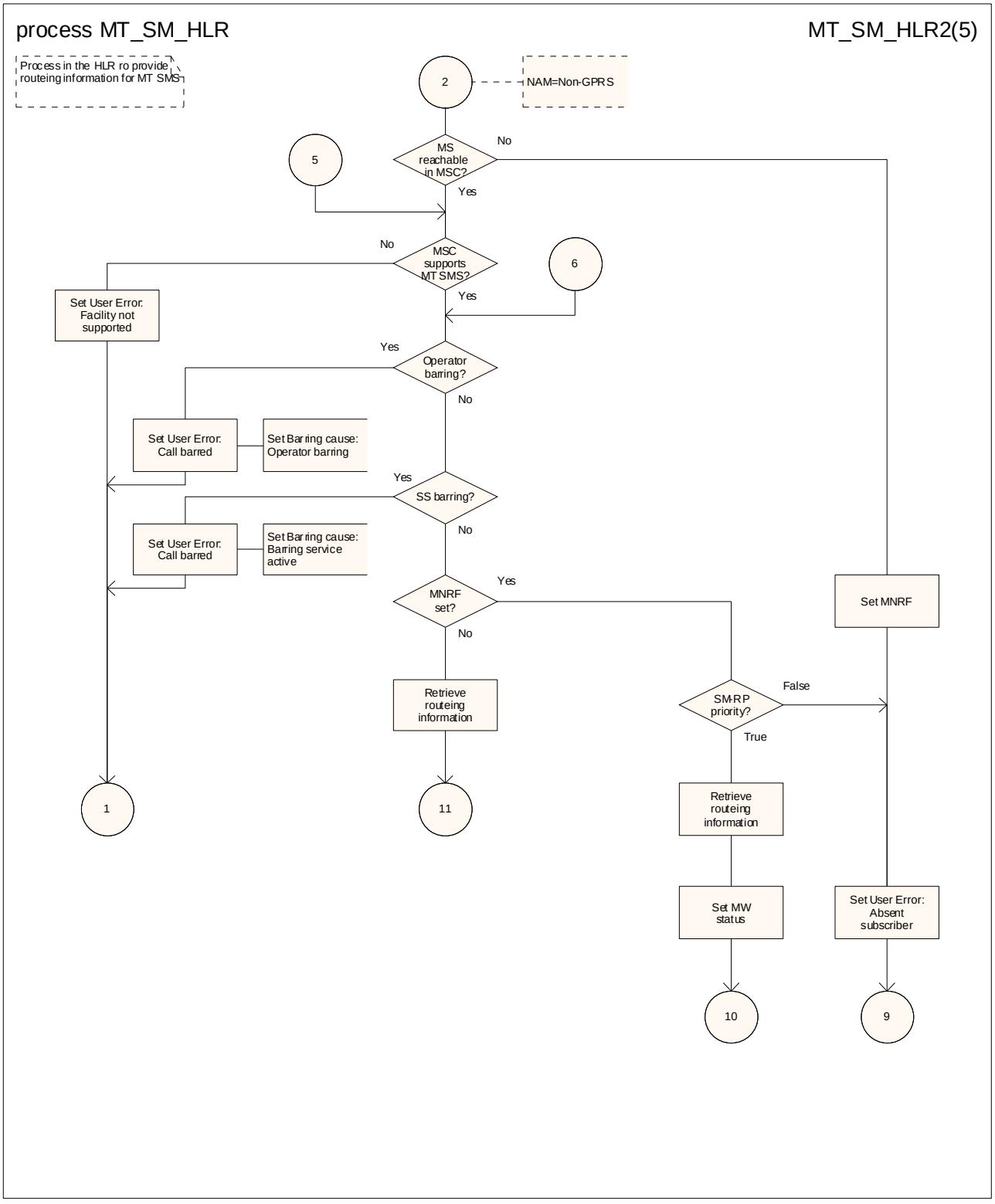


Figure 23.3/5 (sheet 2 of 5): Process MT_SM_HLR

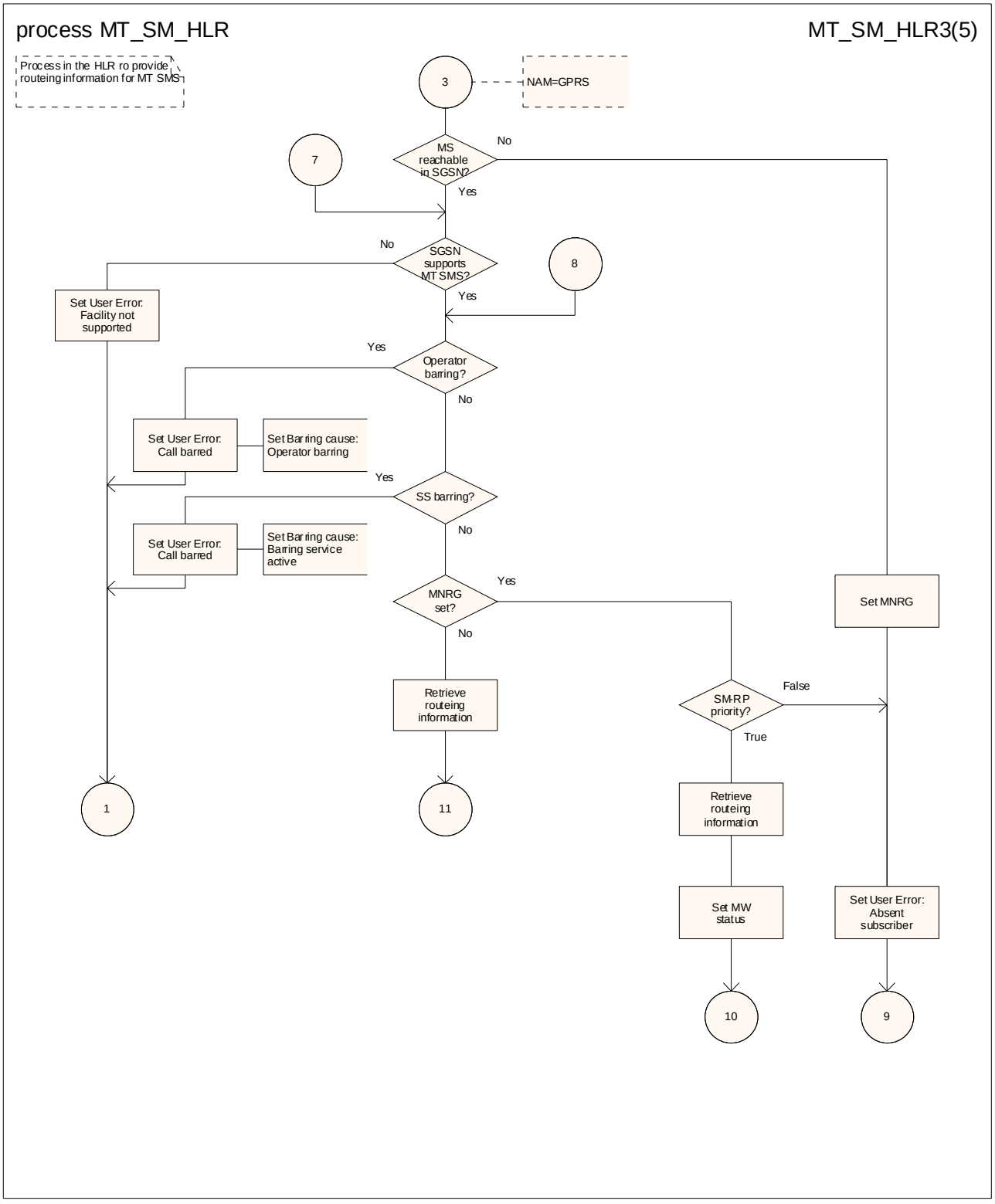


Figure 23.3/5 (sheet 3 of 5): Process MT_SM_HLR

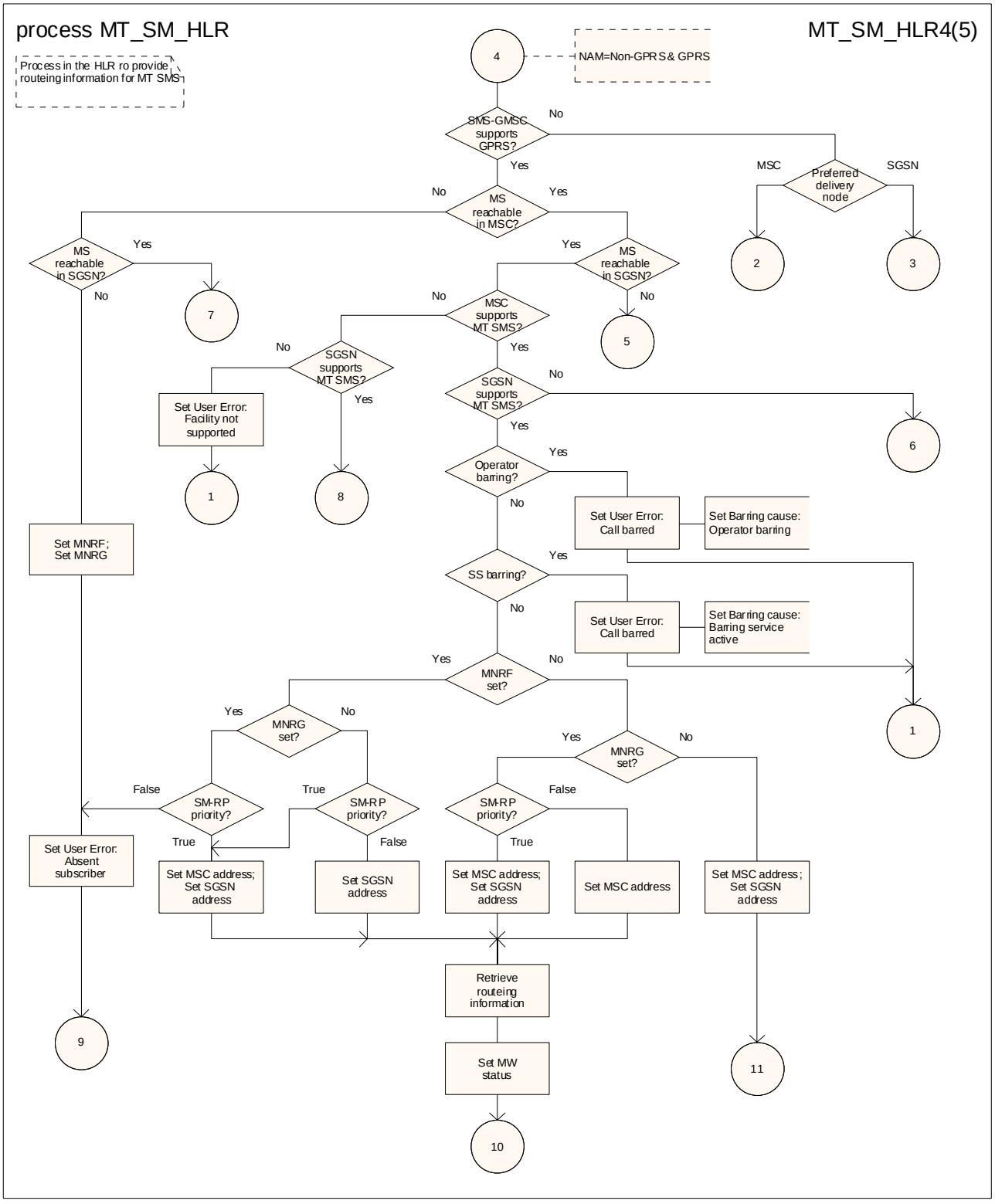


Figure 23.3/5 (sheet 4 of 5): Process MT_SM_HLR

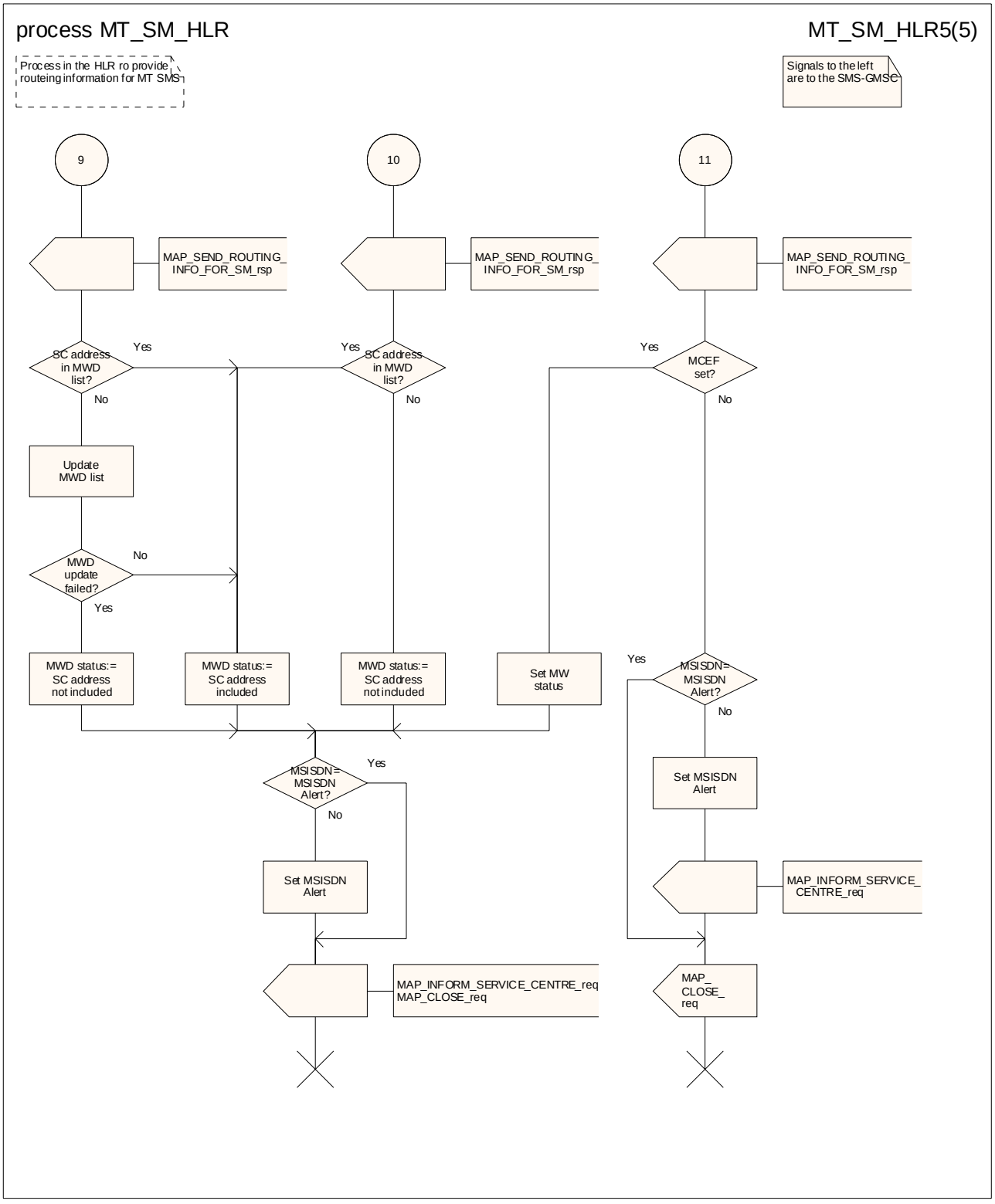


Figure 23.3/5 (sheet 5 of 5): Process MT_SM_HLR

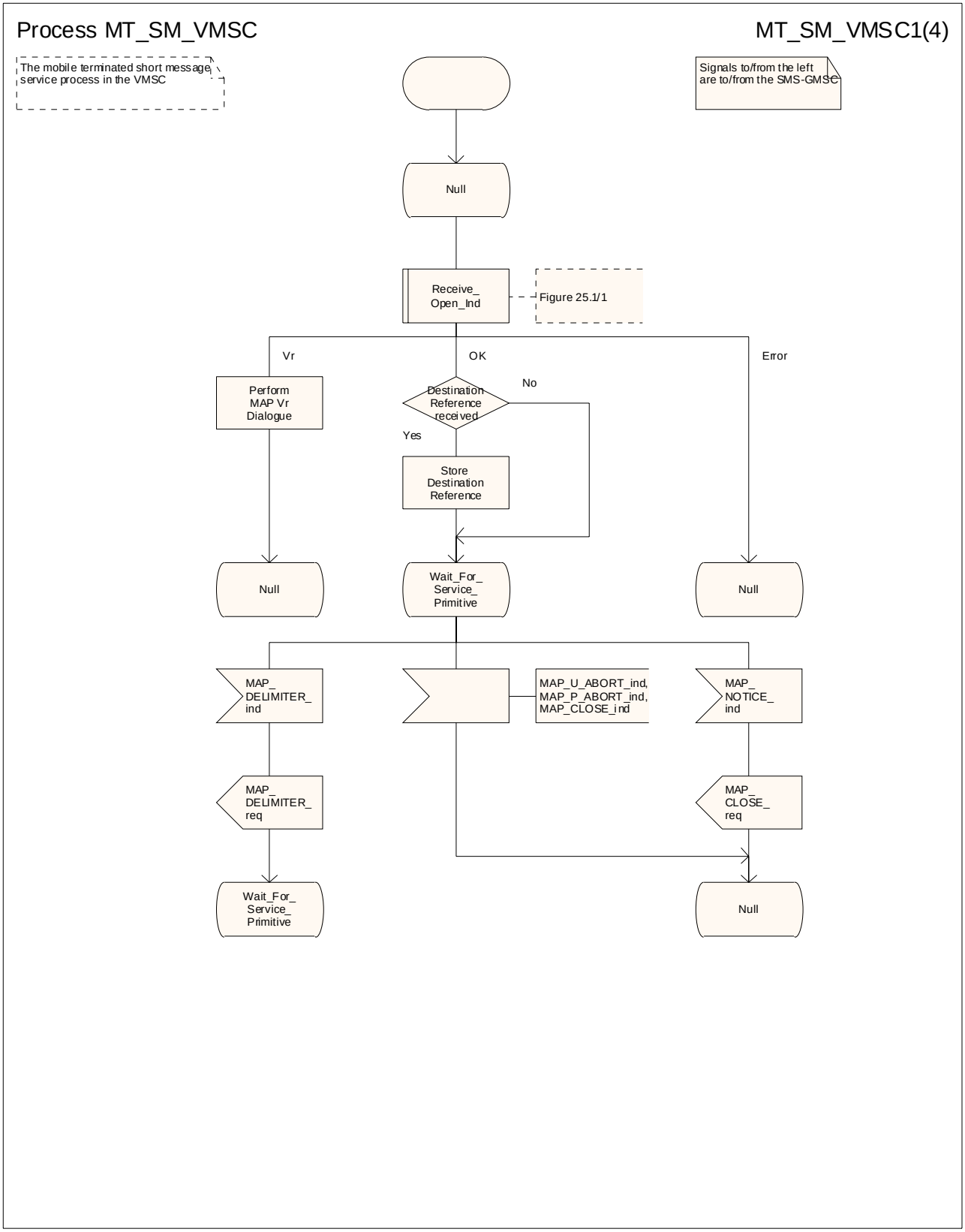


Figure 23.3/6 (sheet 1 of 4): Procedure MT_SM_VMSC

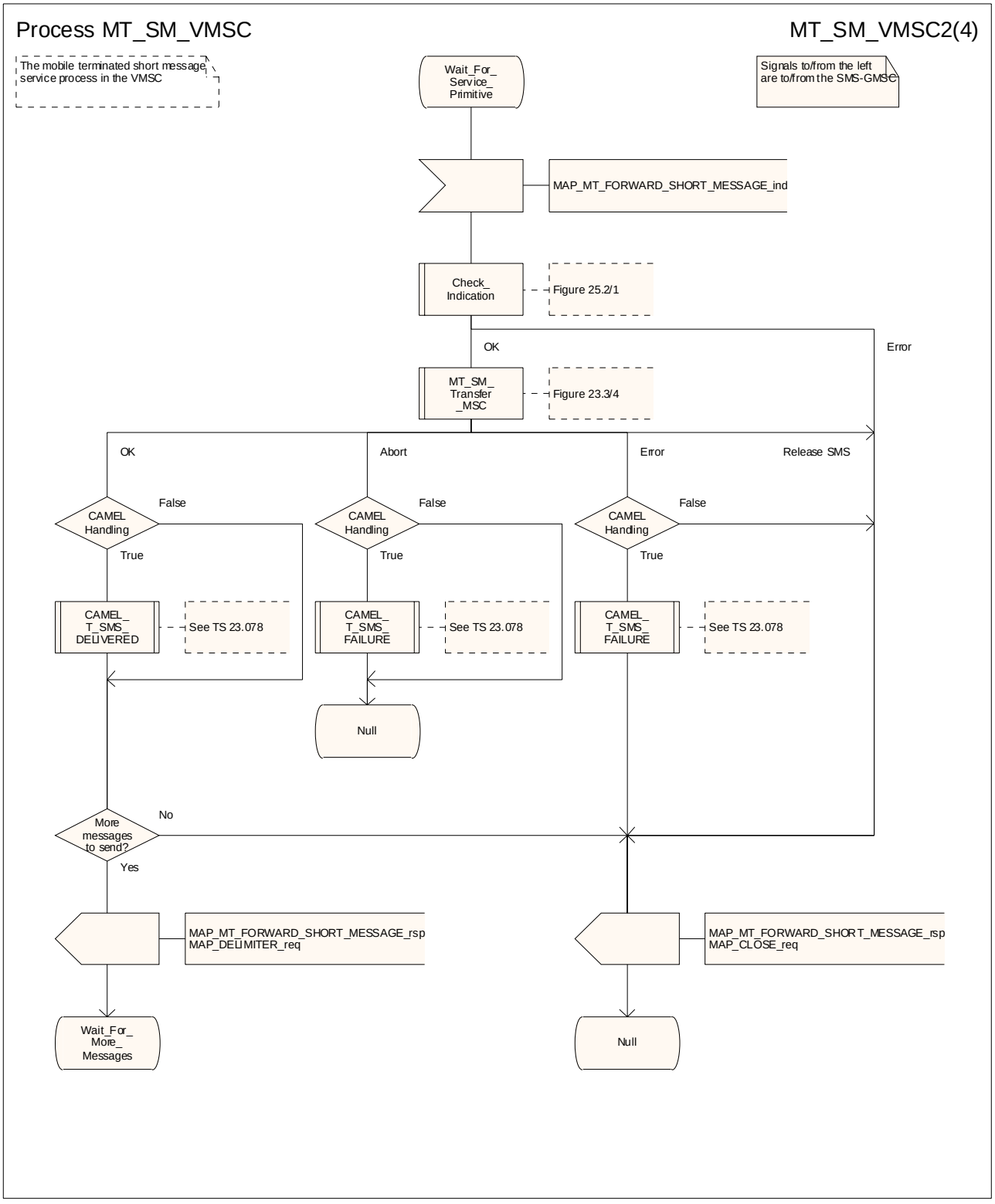


Figure 23.3/6 (sheet 2 of 4): Procedure MT_SM_VMSC

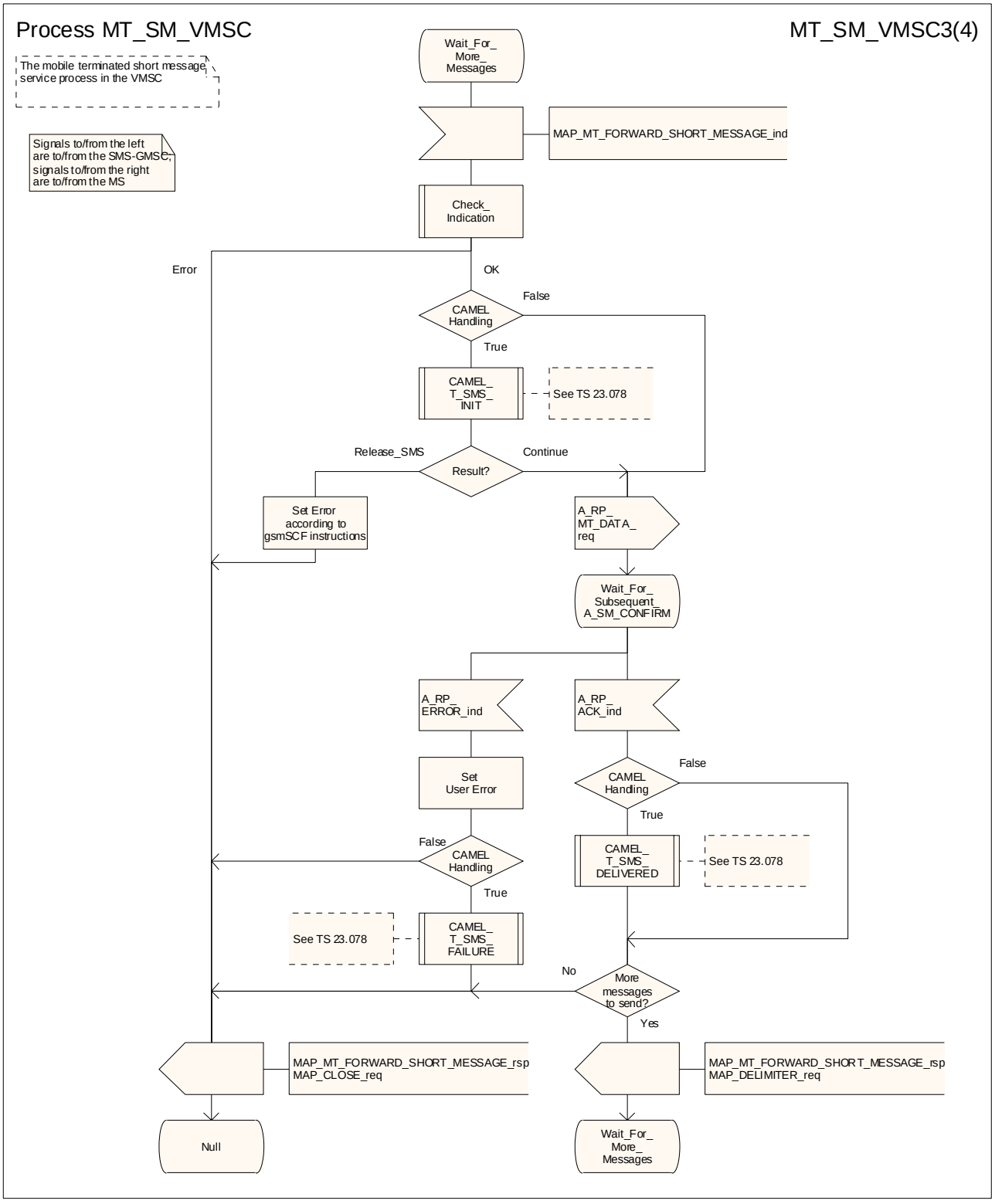


Figure 23.3/6 (sheet 3 of 4): Procedure MT_SM_VMSC

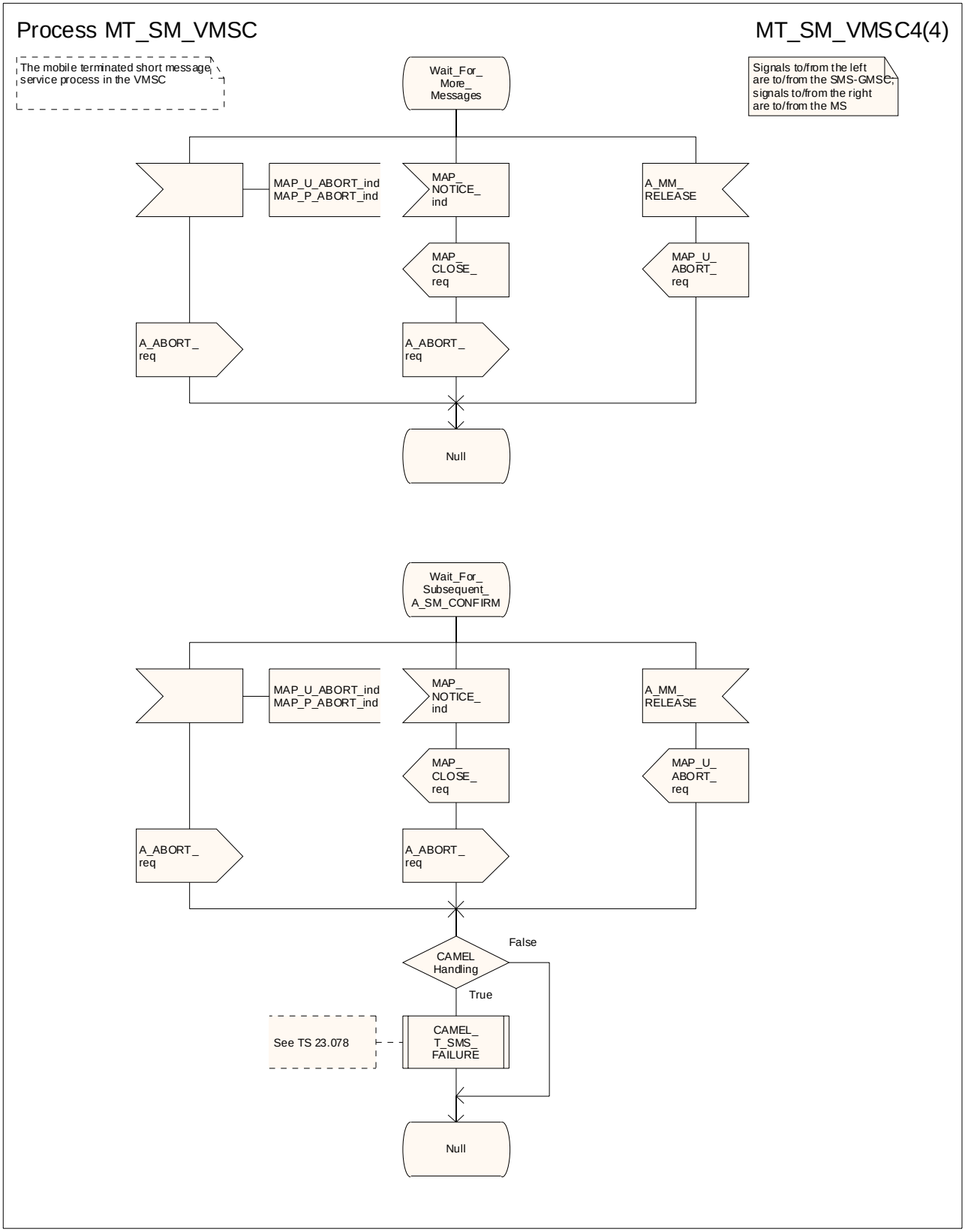


Figure 23.3/6 (sheet 4 of 4): Procedure MT_SM_VMSC

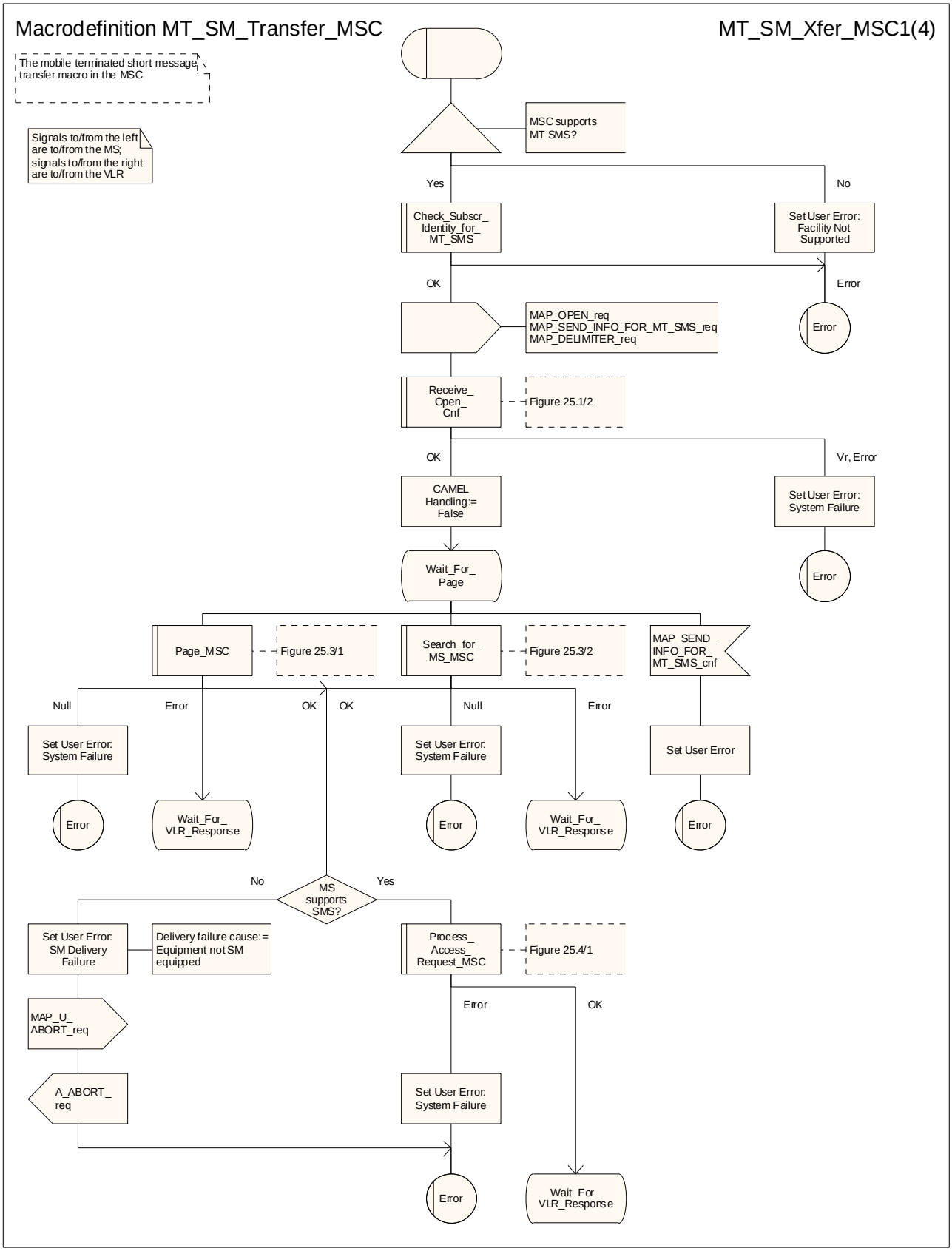


Figure 23.3/7 (sheet 1 of 4): Macro MT_SM_Transfer_MSC

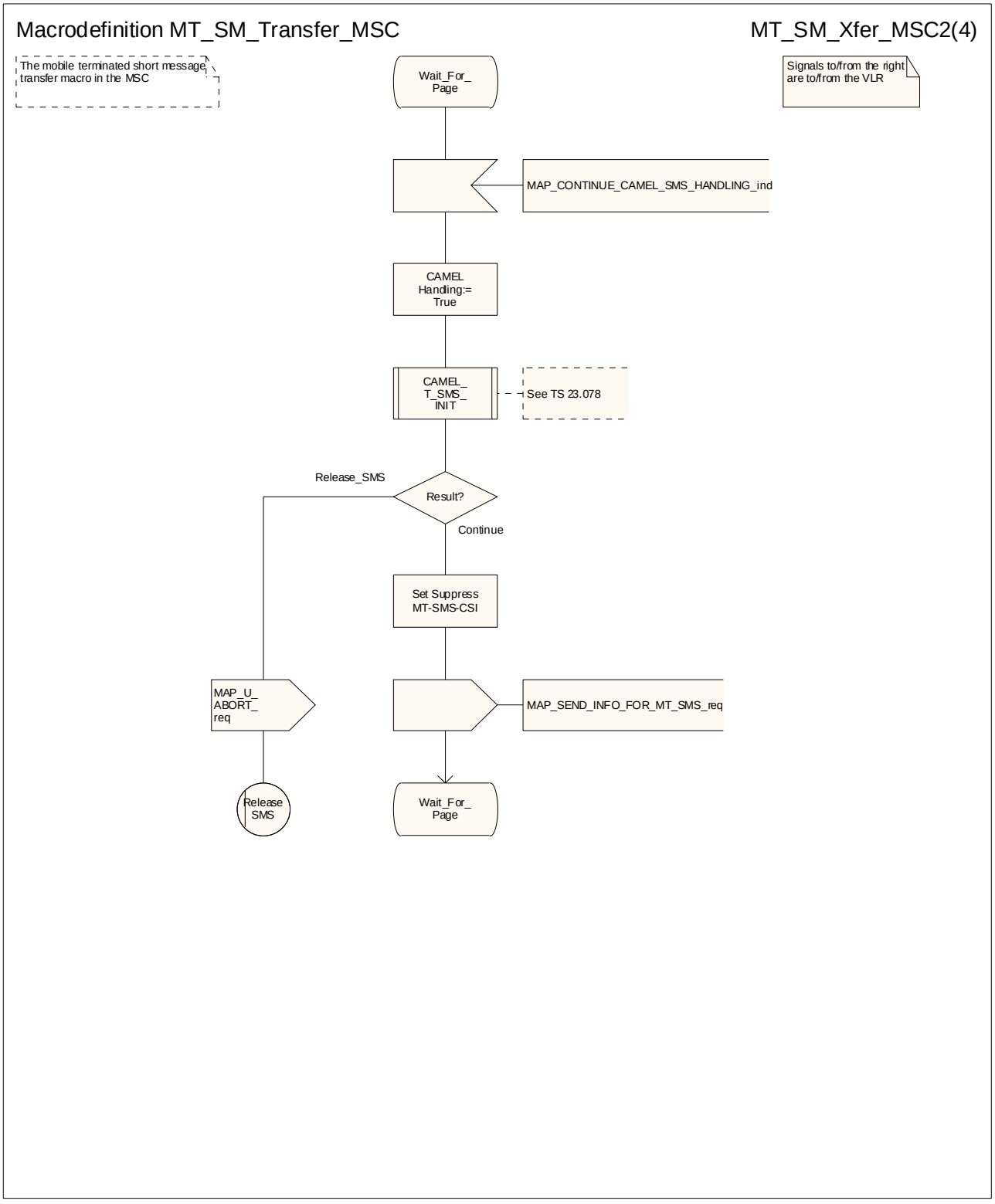


Figure 23.3/7 (sheet 2 of 4): Macro MT_SM_Transfer_MSC

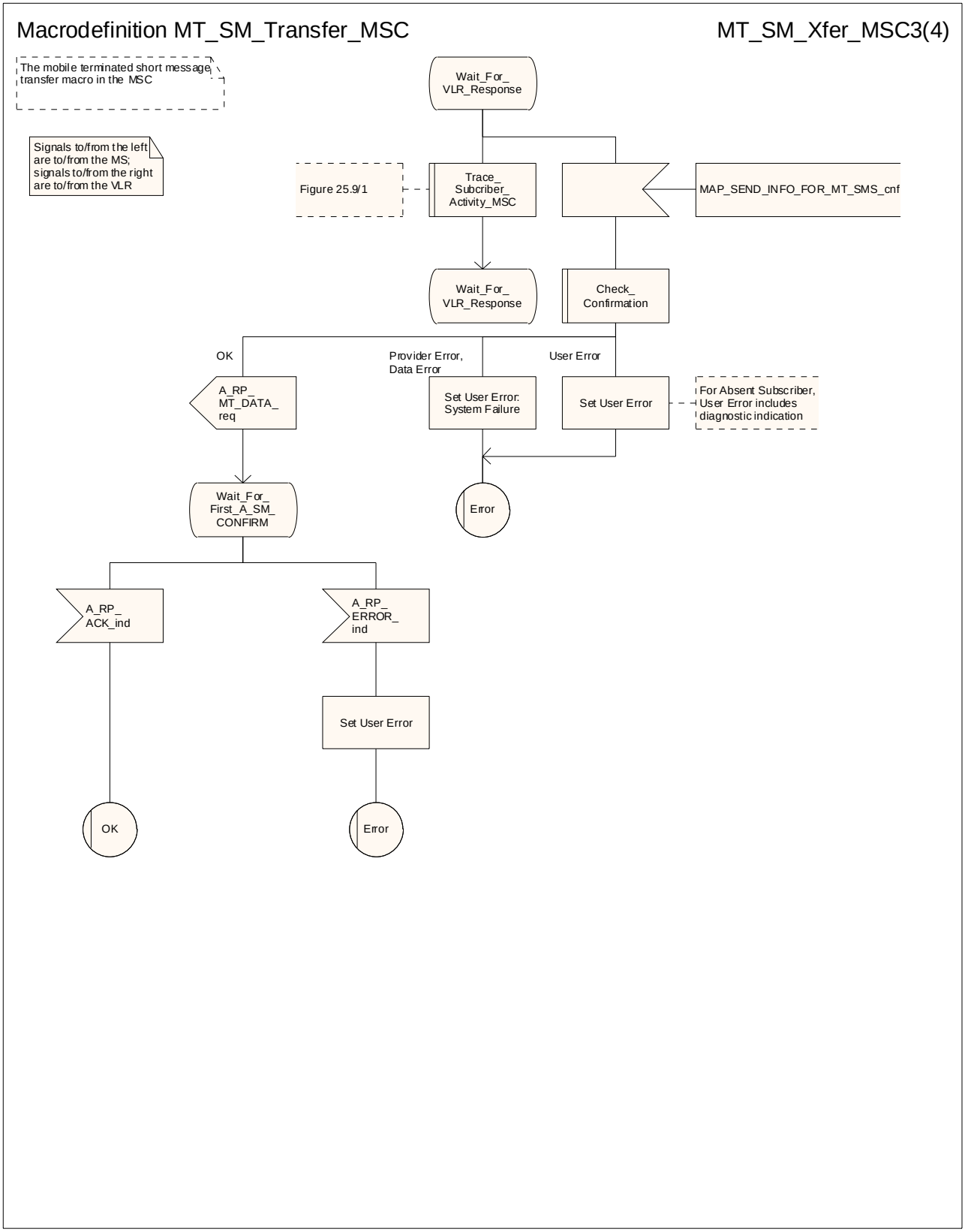


Figure 23.3/7 (sheet 3 of 4): Macro MT_SM_Transfer_MSC

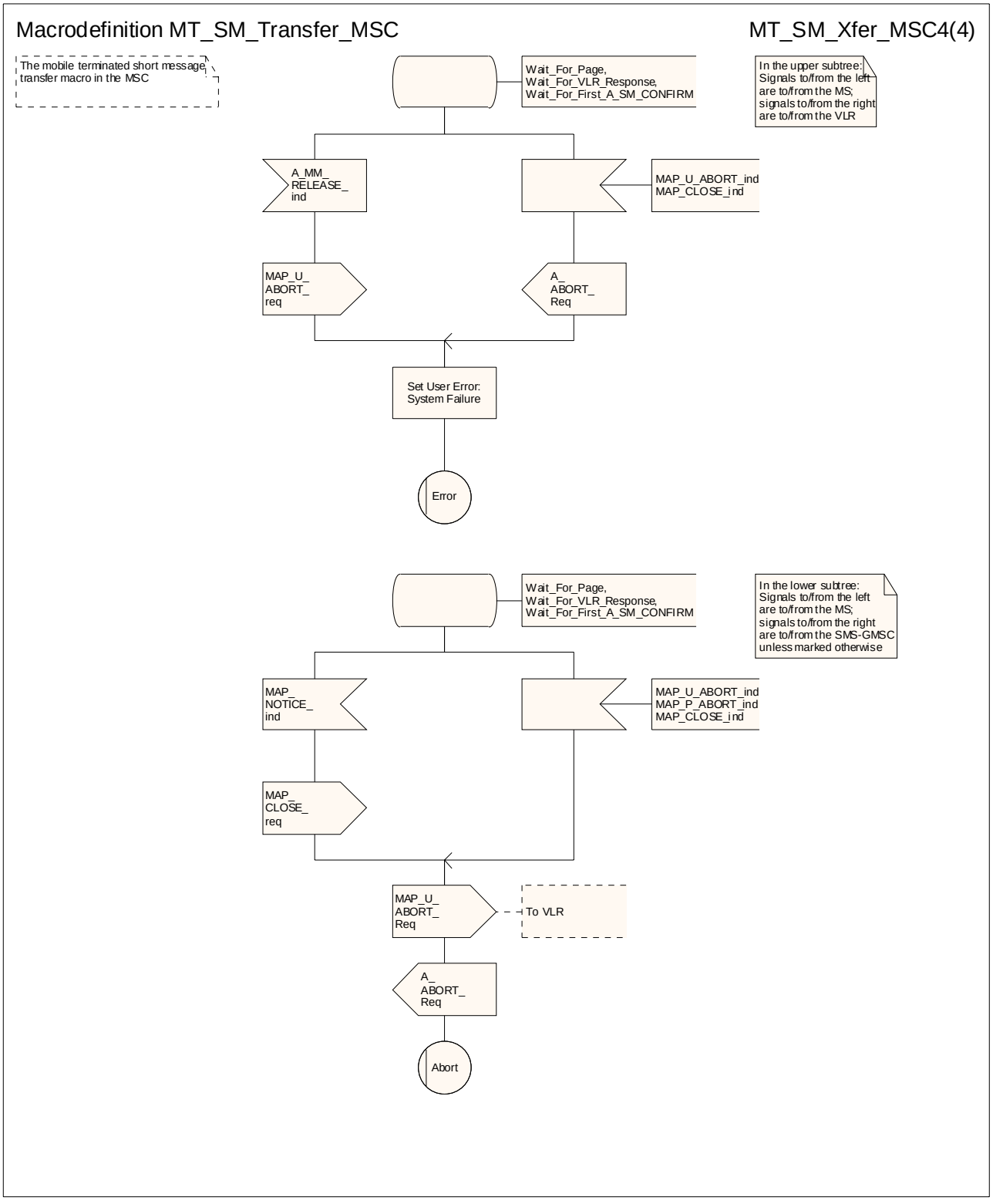


Figure 23.3/7 (sheet 4 of 4): Macro MT_SM_Transfer_MSC

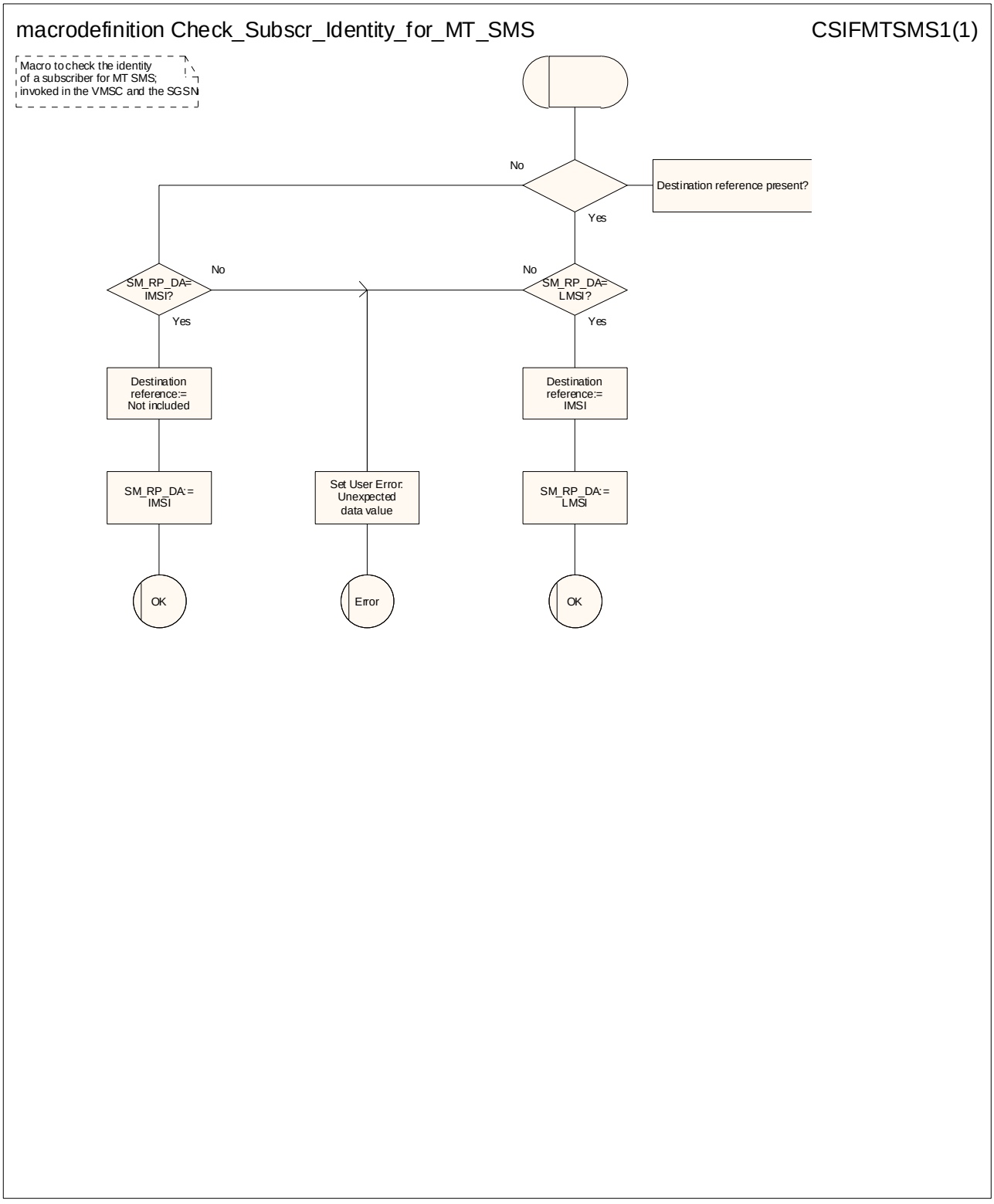


Figure 23.3/8: Macro Check_Subscr_Identity_For_MT_SMS

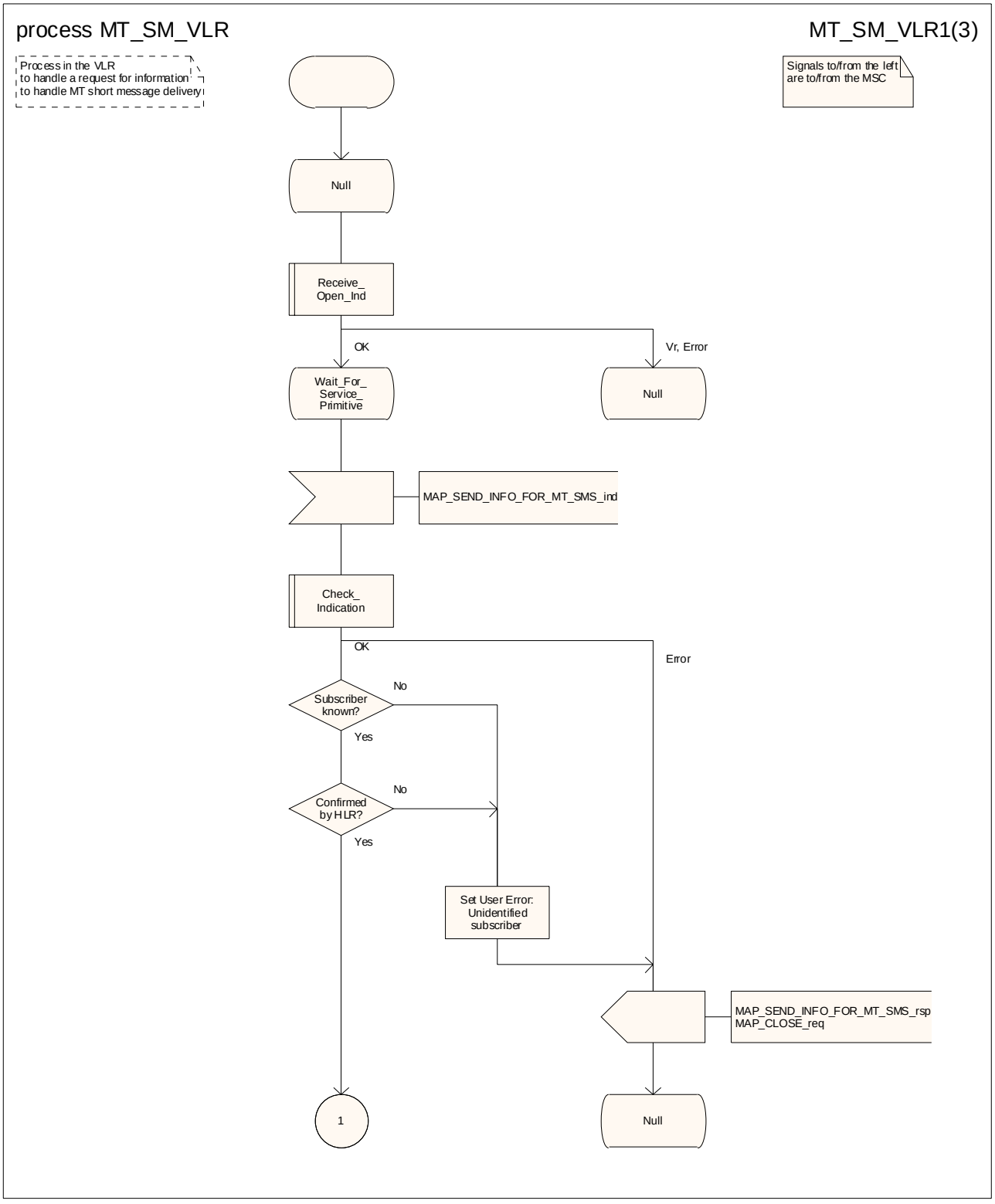


Figure 23.3/9 (sheet 1 of 3): Process MT_SM_VLR

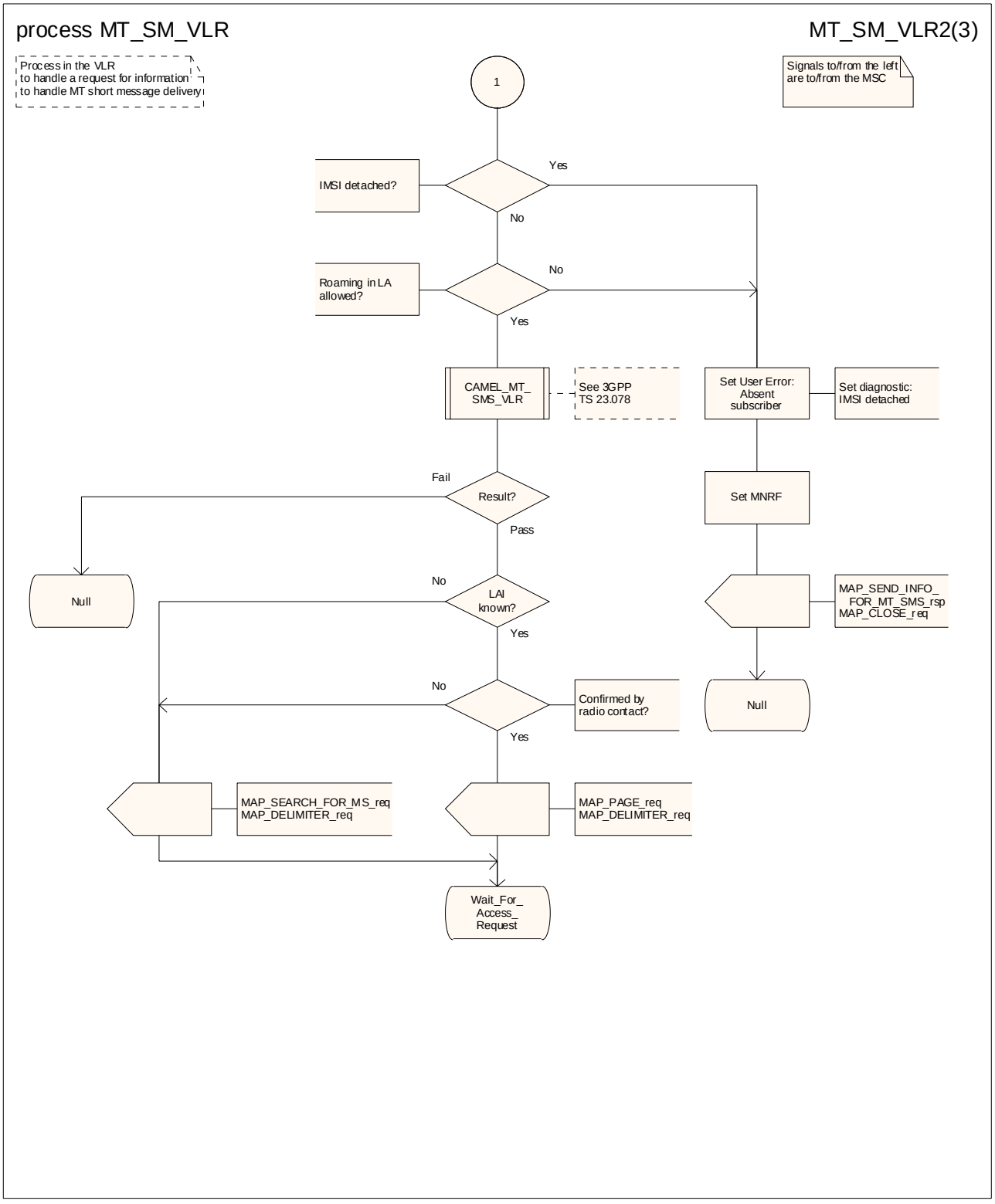


Figure 23.3/9 (sheet 2 of 3): Process MT_SM_VLR

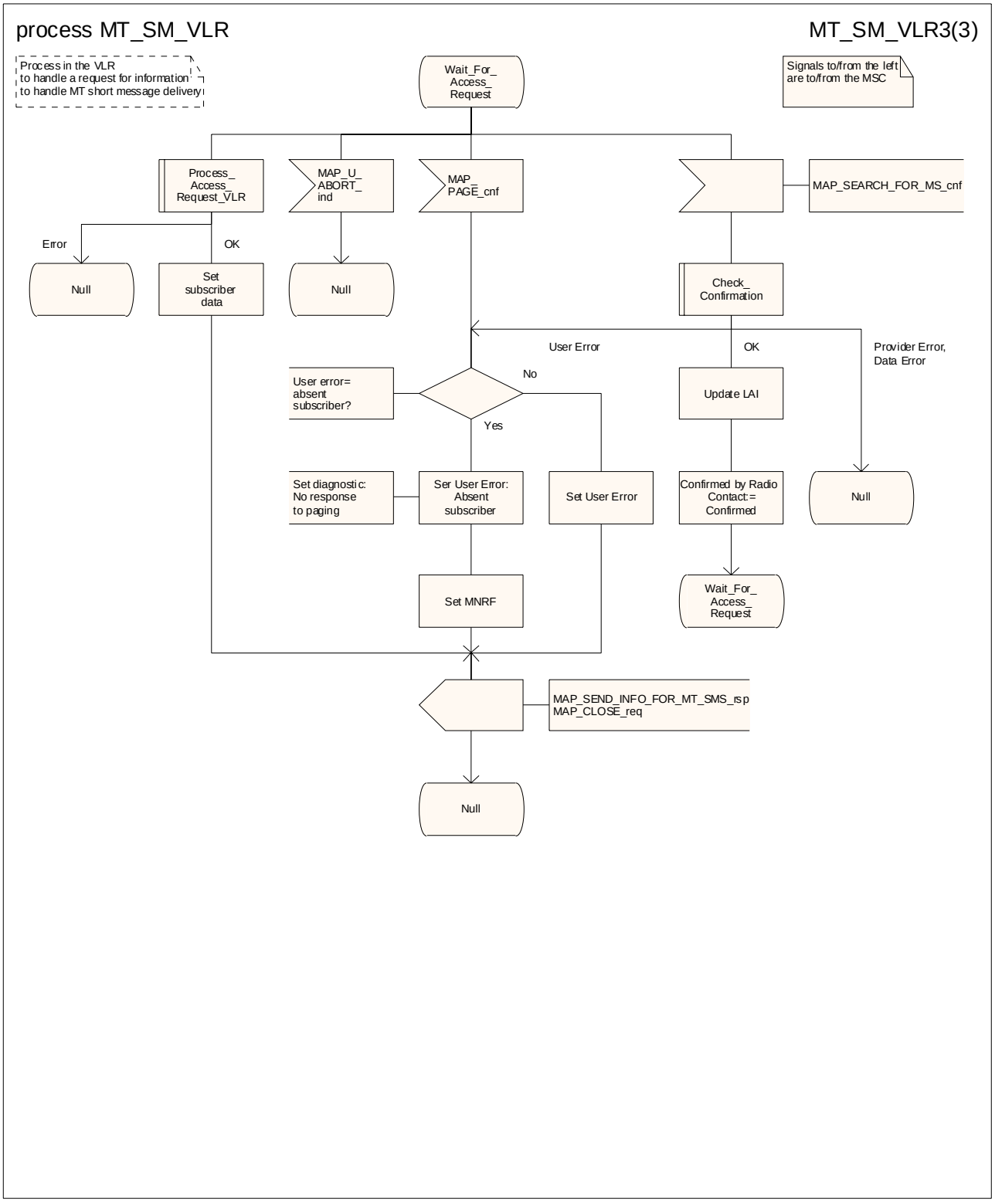


Figure 23.3/9 (sheet 3 of 3): Process MT_SM_VLR

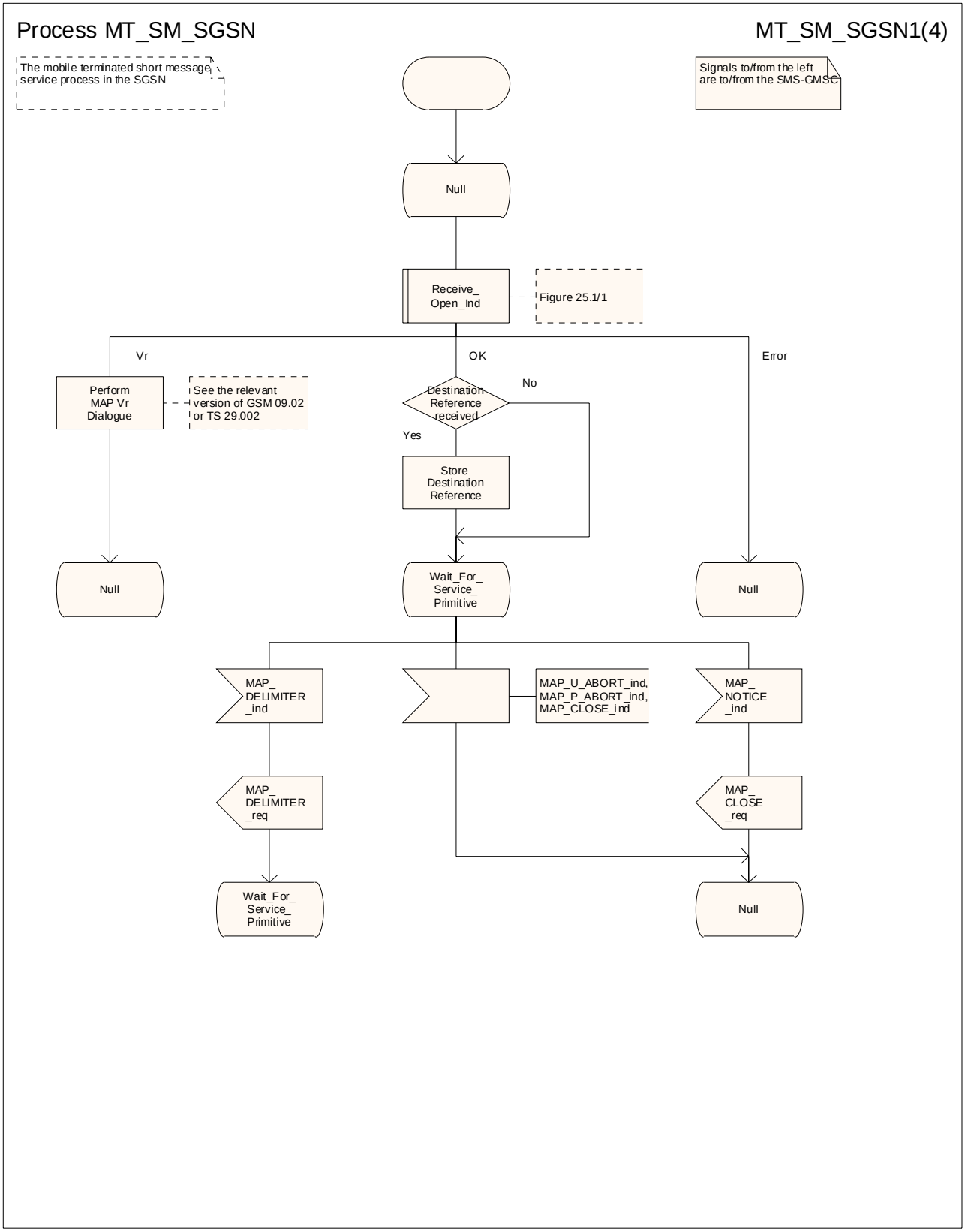


Figure 23.3/10 (sheet 1 of 4): Process MT_SM_SGSN

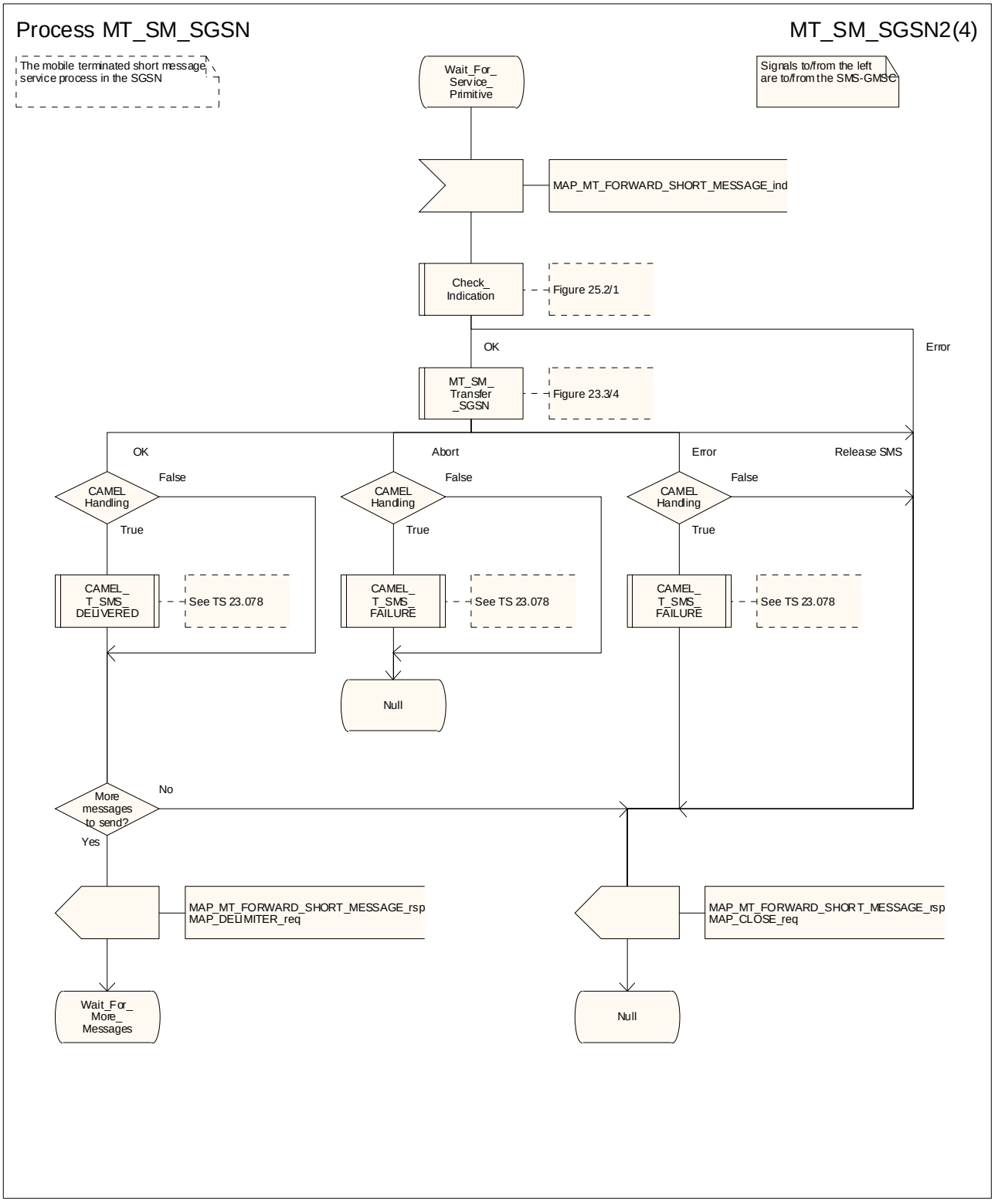


Figure 23.3/10 (sheet 2 of 4): Process MT_SM_ SGSN

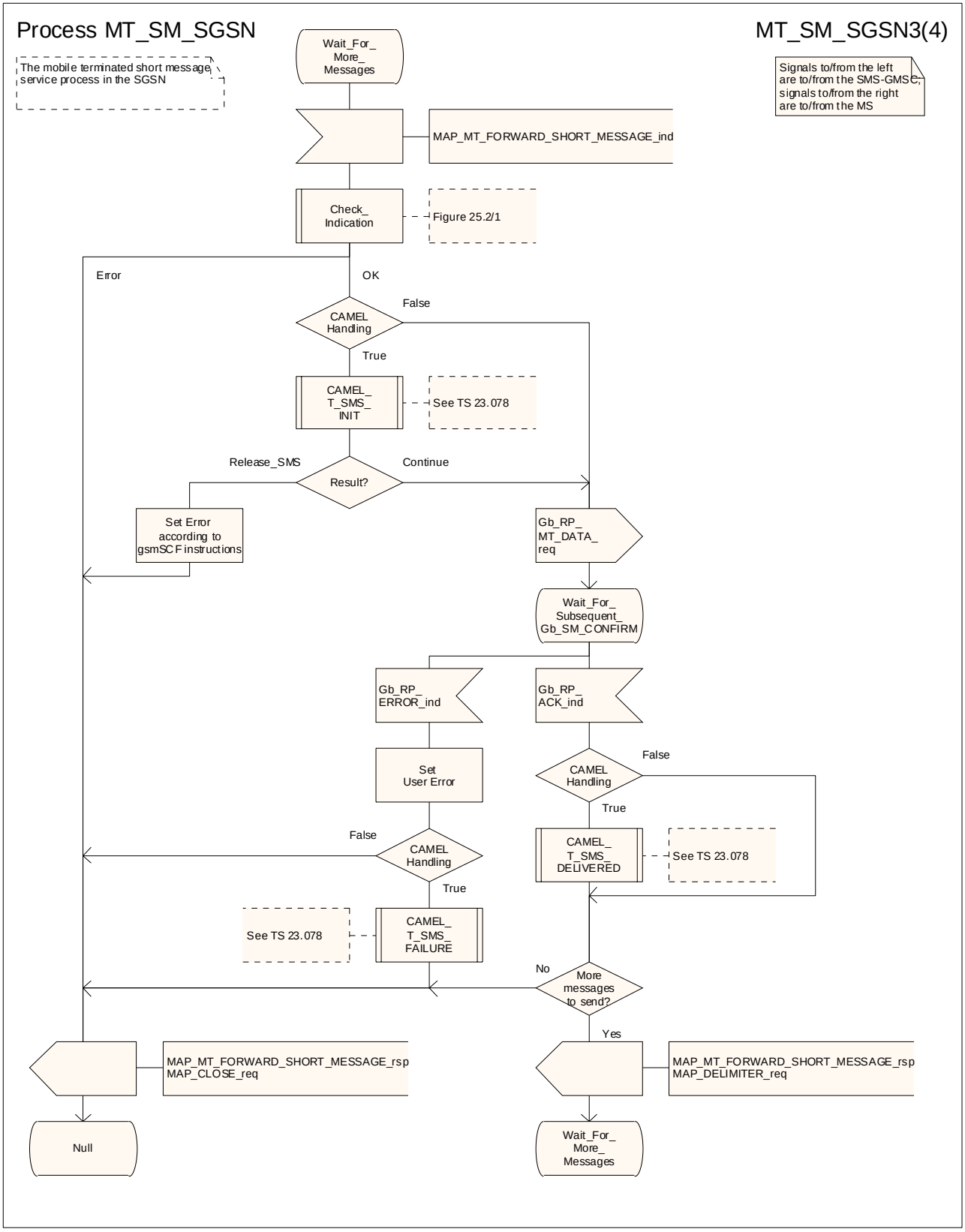


Figure 23.3/10 (sheet 3 of 4): Process MT_SM_ SGSN

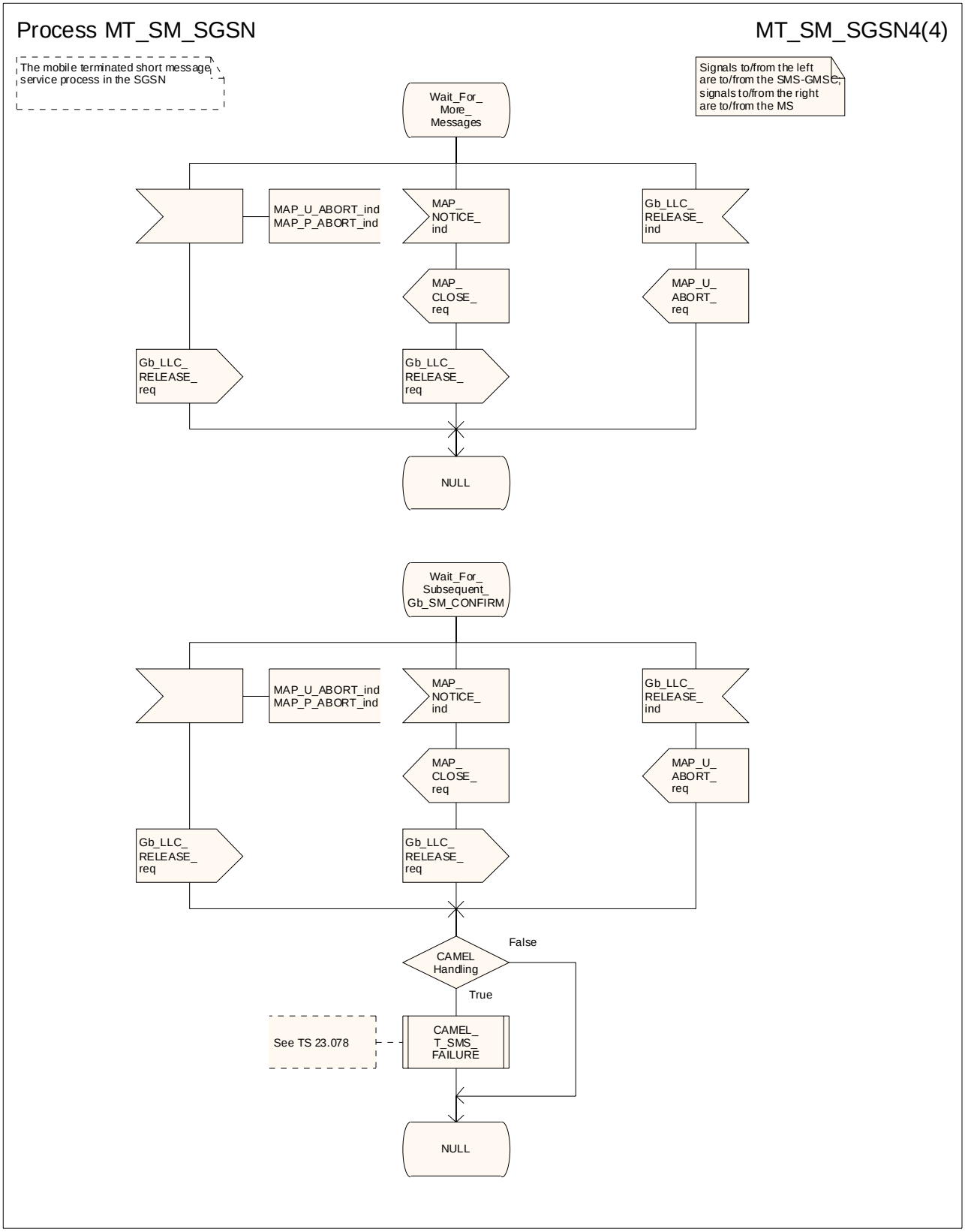


Figure 23.3/10 (sheet 4 of 4): Process MT_SM_ SGSN

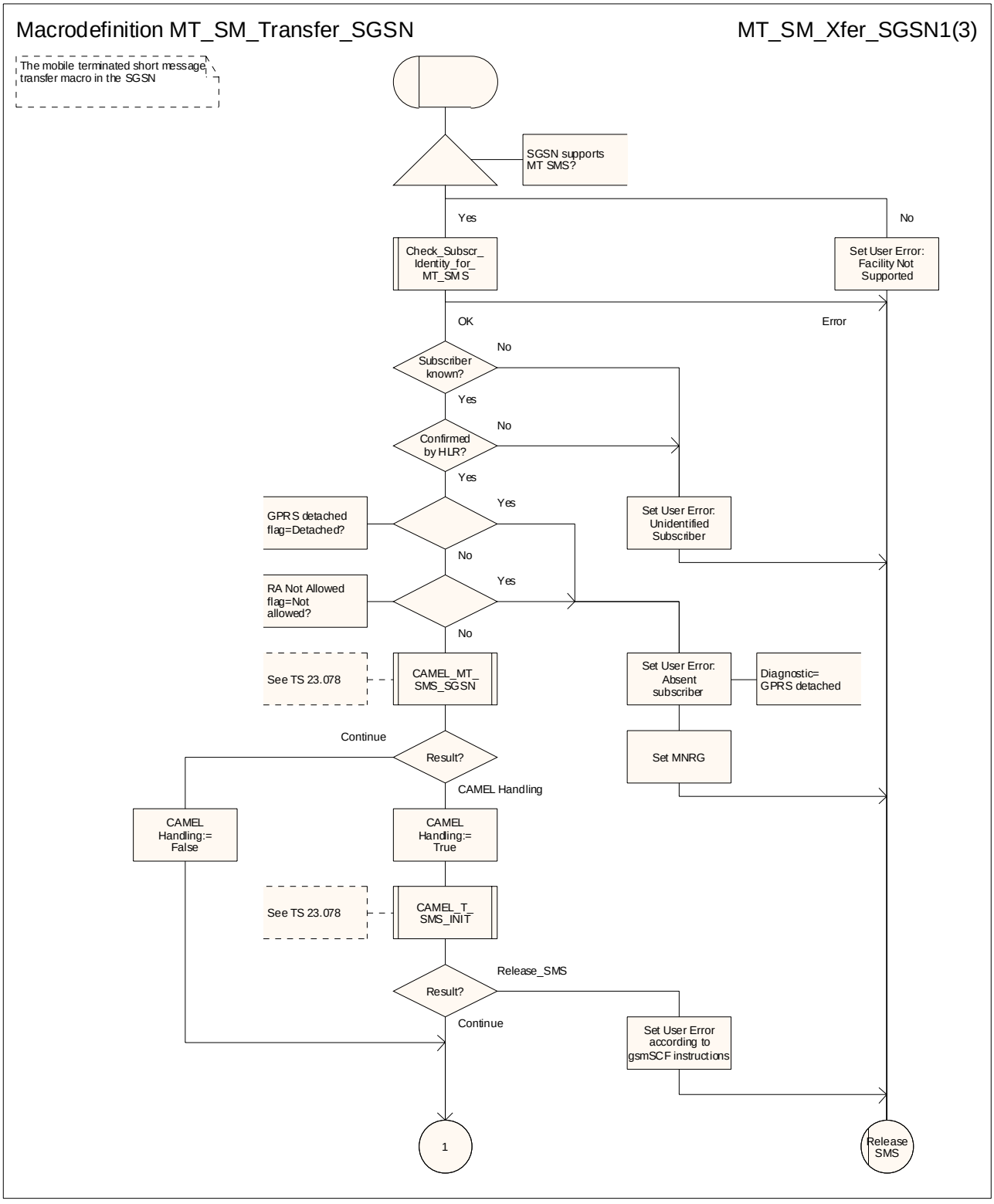


Figure 23.3/11 (sheet 1 of 3): Macro MT_SM_TRANSFER_SGSN

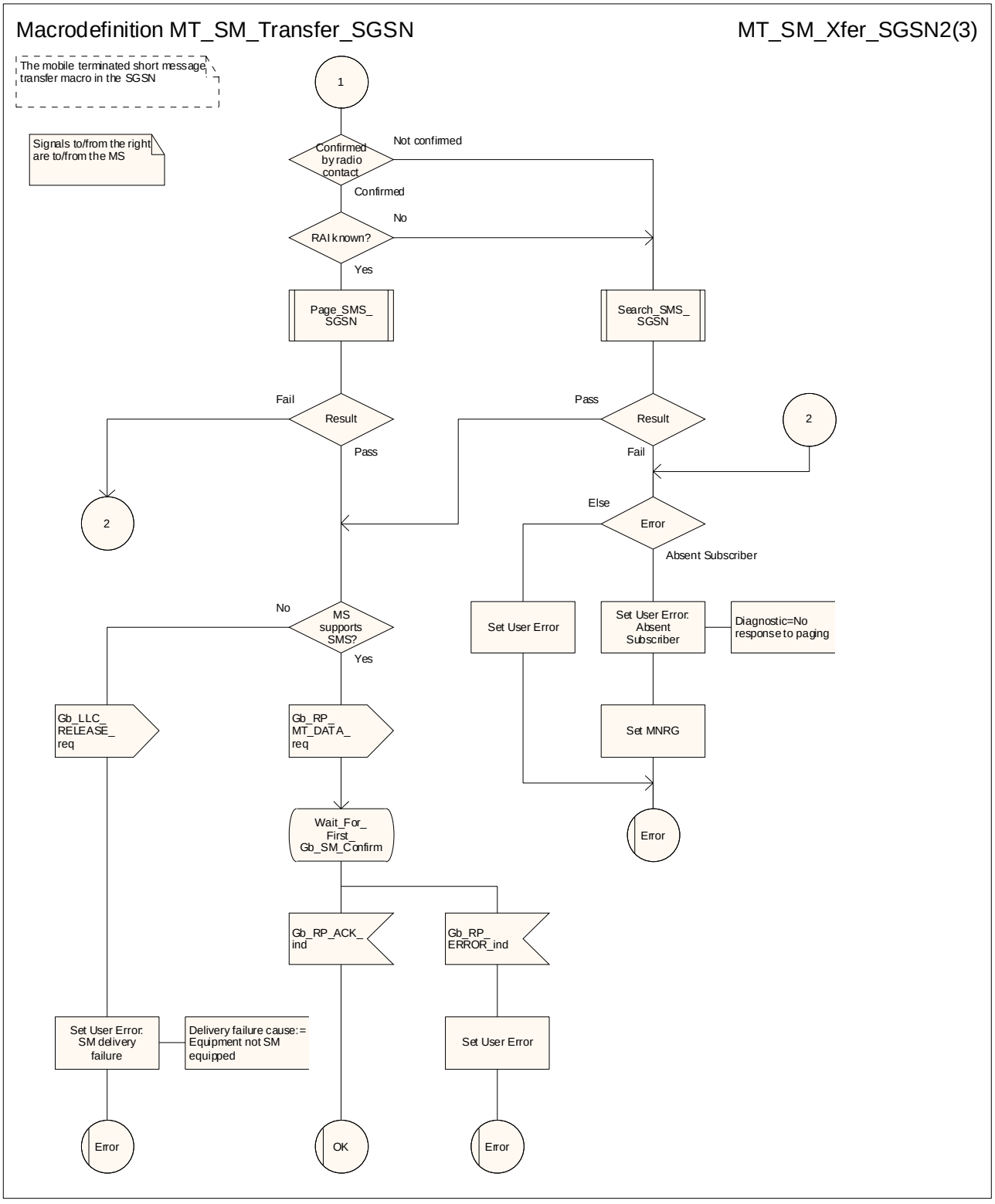


Figure 23.3/11 (sheet 2 of 3): Macro MT_SM_TRANSFER_SGSN

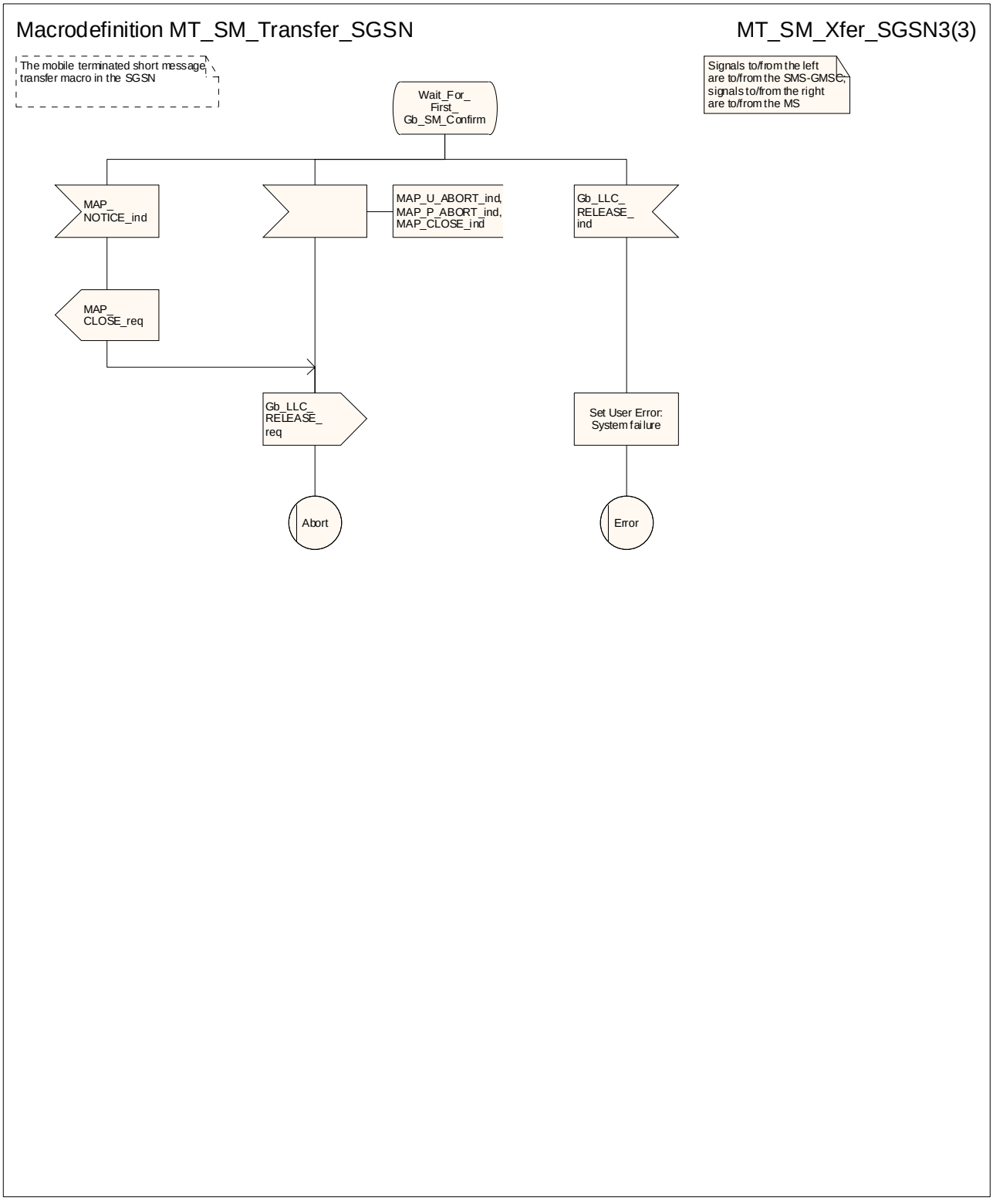


Figure 23.3/11 (sheet 3 of 3): Macro MT_SM_TRANSFER_SGSN

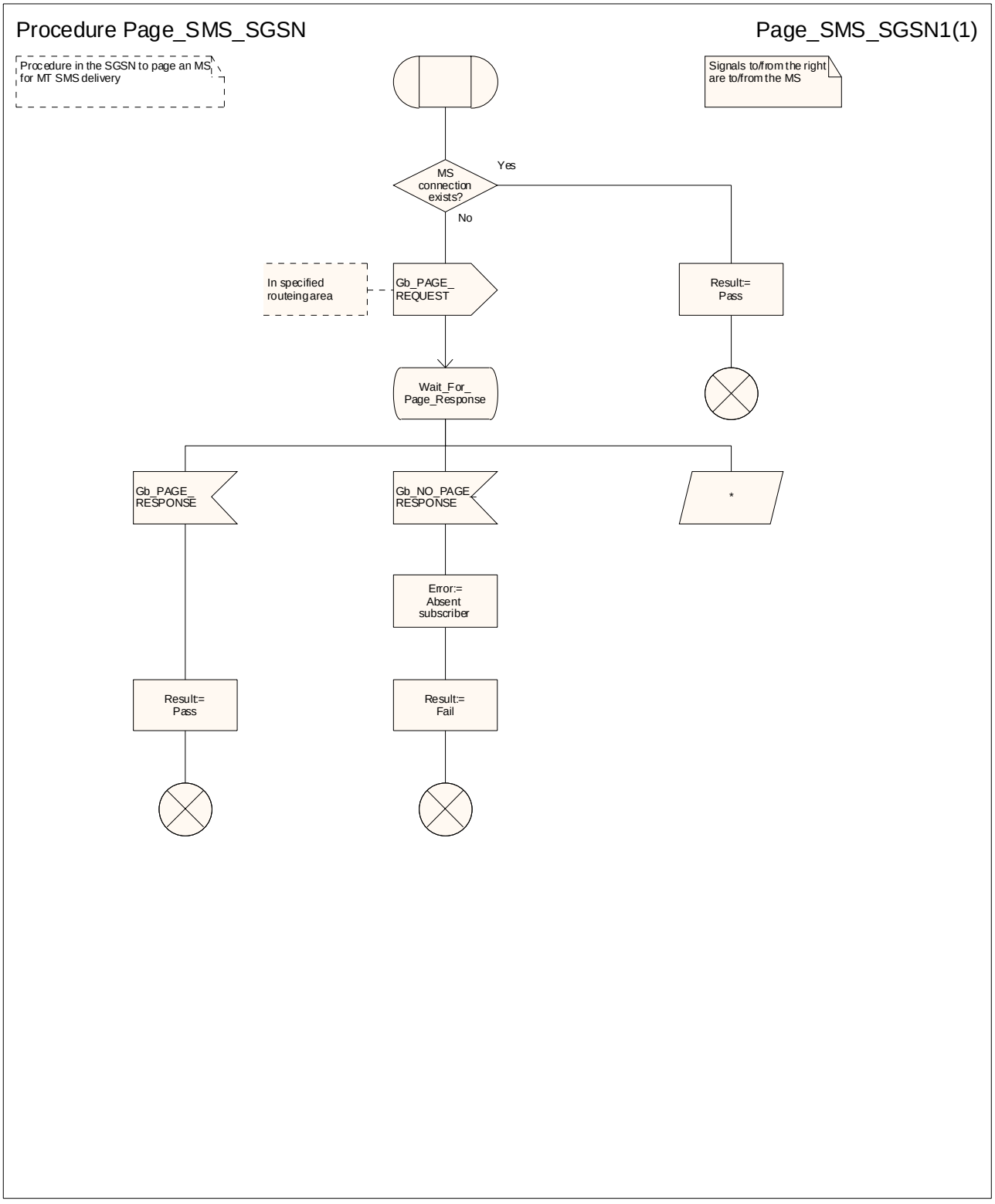


Figure 23.3/12 (sheet 1 of 1): Procedure Page_SMS_SGSN

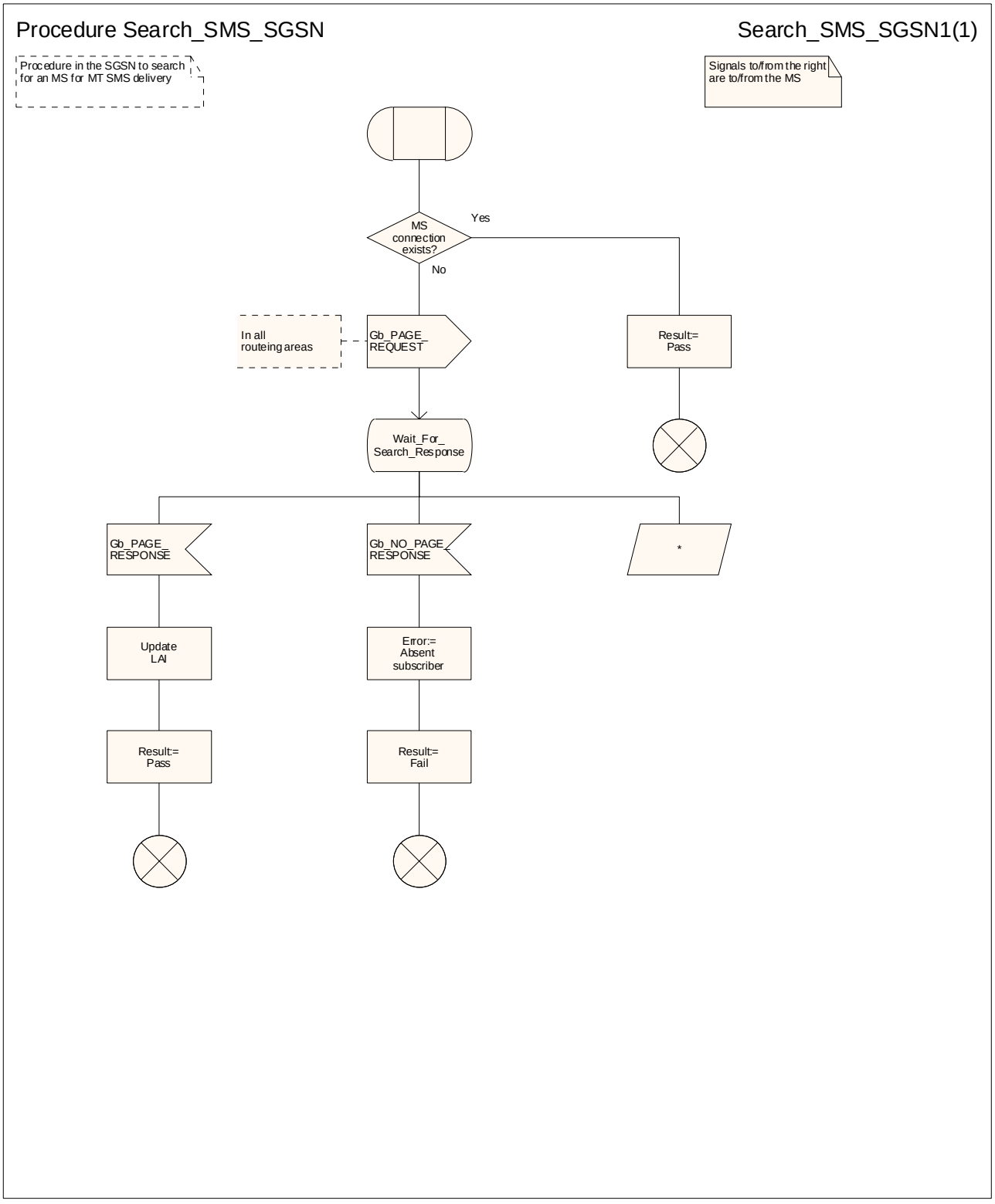
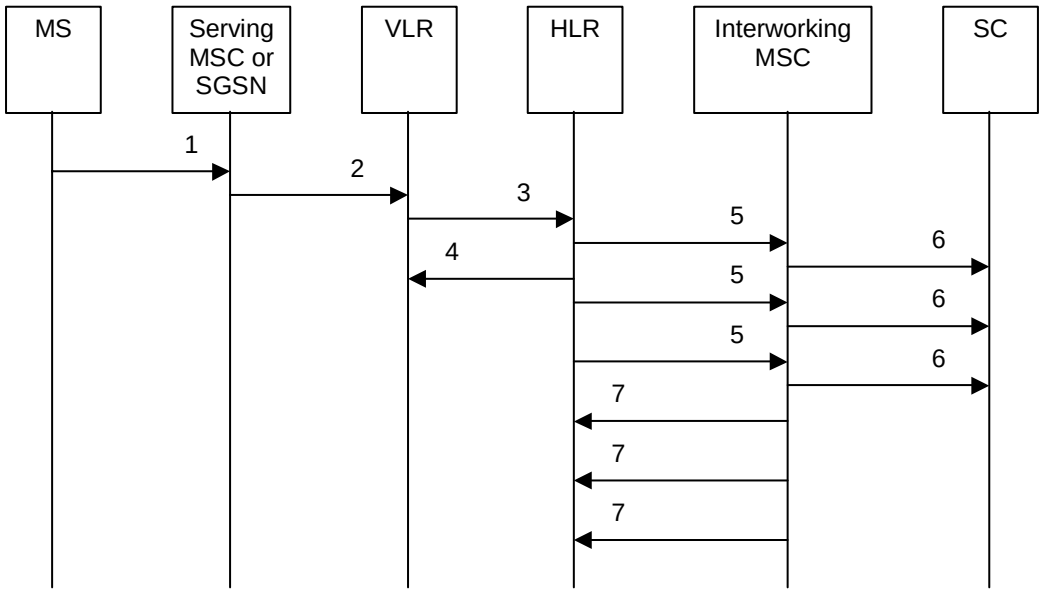


Figure 23.3/13 (sheet 1 of 1): Procedure Search_SMS_SGSN

23.4 The Short Message Alert procedure

The Short Message Alert procedure is used to alert 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 message flow for the Short Message Alert procedure for the case when the mobile subscriber was not reachable is shown in figure 23.4/1.



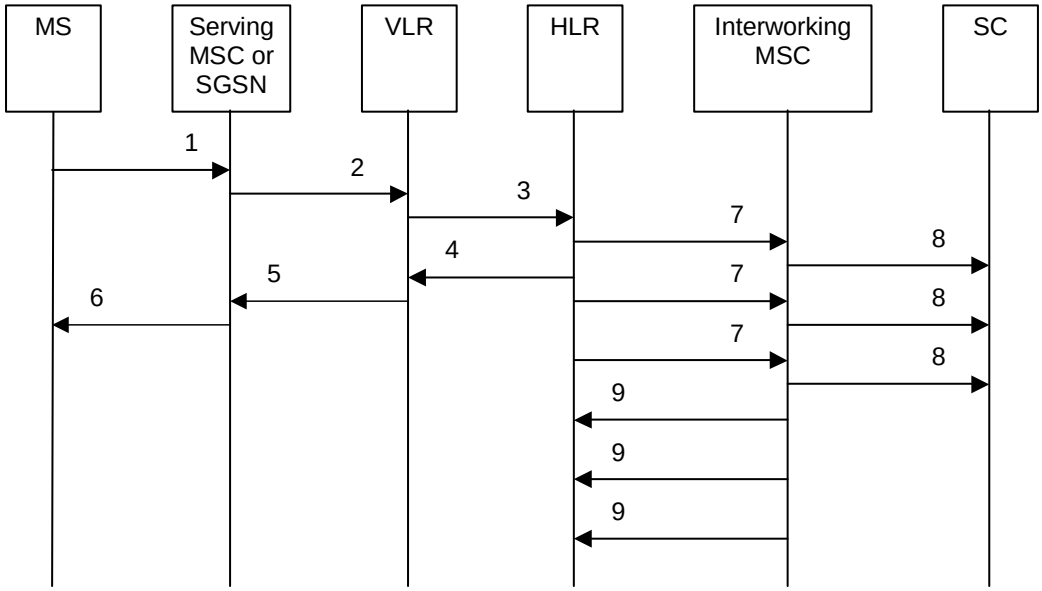
1) CM Service Request (**), Page response or Location Updating (3GPP TS 24.008 [35]).
2) MAP_PROCESS_ACCESS_REQUEST / MAP_UPDATE_LOCATION_AREA (**).
3) MAP_READY_FOR_SM (Mobile Present) / MAP_UPDATE_LOCATION / Supplementary Service Control Request (*).
4) MAP_READY_FOR_SM_ACK (*).
5) MAP_ALERT_SERVICE_CENTRE (notes 1 and 2).
6) Alert Service Centre (3GPP TS 23.~~1~~0 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.

(*) For GPRS, messages 3) and 4) are sent/received by the SGSN.
(**) The~~e~~se messages are not used by the SGSN.

Figure 23.4/1: Short message alert procedure (Mobile is present)

The message flow for the Short Message Alert procedure for the case where the MS indicates that it has memory capacity to accept one or more short messages is shown in figure 23.4/2.



1) SM memory capacity available (3GPP TS 24.011 [37]).
2) MAP_READY_FOR_SM (Memory Available) (*).
3) MAP_READY_FOR_SM (Memory Available) (**).
4) MAP_READY_FOR_SM_ACK (**).
5) MAP_READY_FOR_SM_ACK (*).
6) SM memory capacity available (Acknowledge) (3GPP TS 24.011 [37]).
7) MAP_ALERT_SERVICE_CENTRE (note).
8) Alert Service Centre (3GPP TS 23.~~1~~0 40).
9) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE: To all Service Centres in the Message Waiting List.
(*) Messages 2) and 5) are not used by the SGSN.
(**) For GPRS, messages 3) and 4) are sent/received by the SGSN.

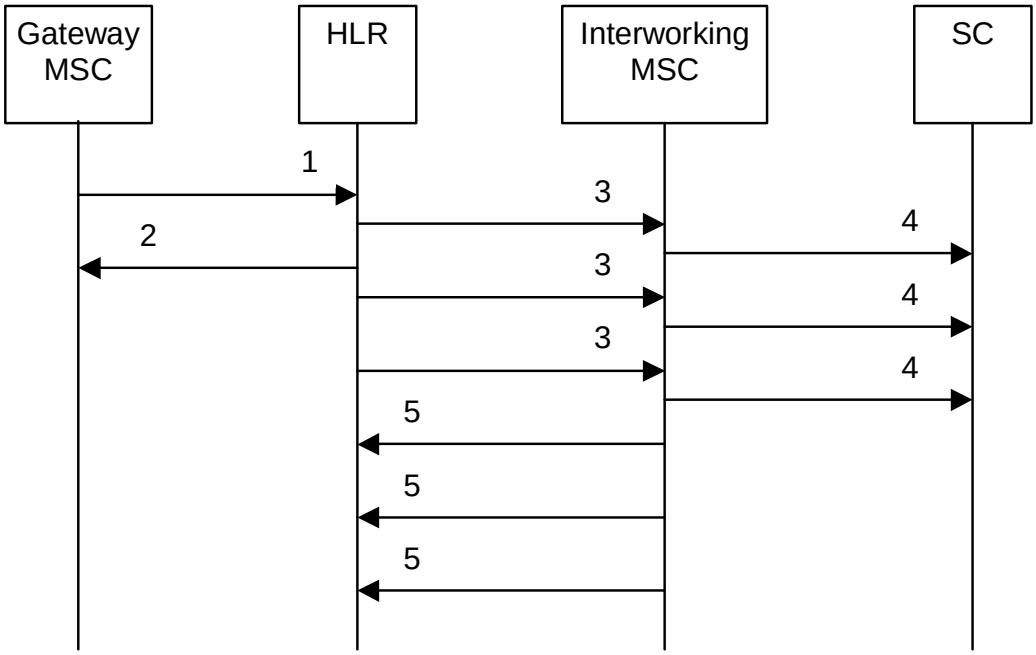
Figure 23.4/2: Short message alert procedure (MS memory capacity available)

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). (*)

(*) The~~o~~se ~~messages~~ services are not used by the SGSN.

The Short Message Alert procedure when the MS indicates successful transfer after polling is shown in figure 23.4/3.



1) MAP_REPORT_SM_DELIVERY_STATUS (Successful Transfer).
2) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
3) MAP_ALERT_SERVICE_CENTRE (note).
4) Alert Service Centre (3GPP TS 23.~~1~~040).
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 Procedure in the Serving MSC – the MS has memory available

The process starts when the MSC receives a notification from the MS that it has memory available. The process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Confirmation see subclause 25.2~~1~~.2.

~~When the MSC receives an SM memory capacity available indication, it sends to the VLR a MAP_READY_FOR_SM request indicating that the MS has memory available, and waits for a response. While the MSC is waiting for the response from the VLR:~~

- ~~if the MSC receives a Release indication from the A interface, it aborts the dialogue with the VLR, and the process terminates;~~
- ~~if the VLR aborts, or prematurely closes, the dialogue, the MSC sends an A_RP_ERROR with error cause "Network out of order" to the MS, and the process terminates;~~
- ~~if the MSC receives a MAP_READY_FOR_SM confirmation from the VLR, it checks the confirmation.~~
  - ~~if the confirmation includes an error, the MSC sends an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;~~
  - ~~if the confirmation indicates a successful outcome, the MSC sends an RP_ACK to the MS, and the process terminates.~~

The short message alert process in the MSC for the MS memory capacity available case is shown in figure 23.4/4.

23.4.2 Procedures in the VLR

23.4.2.1 The Mobile Subscriber is present

If the VLR successfully handles a MAP_PROCESS_ACCESS_REQUEST indication or a MAP_UPDATE_LOCATION_AREA indication while the MS Not Reachable Flag (MNRF) is set, the VLR sends a MAP_READY_FOR_SM request to the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for non GPRS. If authentication fails during the handling of a MAP_PROCESS_ACCESS_REQUEST indication or a MAP_UPDATE_LOCATION_AREA indication, the VLR shall not send a MAP_READY_FOR_SM request to the HLR. The process in the VLR is described in detail in subclause 25.10.1.

23.4.2.2 The MS has memory available

The process ~~is triggered by~~starts when the VLR receives a dialogue opening request followed by a MAP_PROCESS_ACCESS_REQUEST indication including a CM service type Short Message Service. The MAP process invokes macros not defined in this clause; the definition 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_Indication see subclause 25.2.1;

Check_Confirmation see subclause 25.2~~1~~.2.

~~- if the macro Process_Access_Request_VLR takes the "Error" exit, the process returns to the Null state.~~

~~- if the macro Process_Access_Request_VLR takes the "OK" exit, the VLR waits for a MAP_READY_FOR_SM indication from the MSC.~~

~~When the VLR receives a MAP_READY_FOR_SM indication from the MSC, it checks the indication.~~

~~- if the indication is badly formed, the VLR returns a MAP_READY_FOR_SM response containing the appropriate User Error;~~

~~- if the indication is OK, the VLR requests a dialogue with the HLR, including a MAP_READY_FOR_SM request with Ready for SM reason Memory available for non-GPRS, and waits for the confirmation of the dialogue.~~

~~- if the macro Receive_Open_Cnf takes the "Error" exit, the VLR returns a MAP_READY_FOR_SM response containing a User Error "System failure", and the process returns to the Null state;~~

~~- if the macro Receive_Open_Cnf takes the "V1" exit, the VLR returns a MAP_READY_FOR_SM response containing a User Error "Facility not supported", and the process returns to the Null state;~~

~~- if the macro Receive_Open_Cnf takes the "Vr" (for a version higher than 1) exit, the VLR handles the dialogue according to the specification for the earlier version of the protocol, and the process returns to the Null state;~~

~~- if the macro Receive_Open_Cnf takes the "OK" exit, the VLR waits for a response from the HLR.~~

~~When the VLR is waiting for a response from the HLR:~~

~~- if the dialogue with the HLR fails, the VLR returns a MAP_READY_FOR_SM response containing a User Error "System failure", and the process returns to the Null state;~~

~~- if it receives a MAP_READY_FOR_SM confirmation, it checks the confirmation.~~

~~- if the confirmation contains an error, the VLR returns a MAP_READY_FOR_SM response containing the appropriate User Error , and the process returns to the Null state;~~

~~- if the confirmation indicates success, the VLR returns a MAP_READY_FOR_SM response indicating success, and the process returns to the Null state.~~

The short message alert process in the VLR for the MS memory capacity available case is shown in figure 23.4/5.

23.4.35 Procedures in the SGSN

23.4.35.1 The Mobile Subscriber is present

If the SGSN successfully handles a Page response, Attach request or Routing Area Update request message (3GPP TS 24.008 [35]), while the MS Not Reachable for GPRS (MNRG) flag is set, the SGSN sends a MAP_READY_FOR_SM request to the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS. If authentication fails during the handling of a Page response, Attach request or Routing Area Update request, the SGSN shall not send a MAP_READY_FOR_SM request to the HLR

The process in the SGSN is described in detail in subclause 25.10.2/3.

23.4.35.2 The Mobile Equipment has memory available

The process is triggered bystarts when the SGSN receives an RP_SM_MEMORY_AVAILABLE indication from the MS. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.21.2.

The SGSN requests a dialogue with the HLR, including a MAP_READY_FOR_SM request with Ready for SM reason Memory available for GPRS, and waits for the confirmation of the dialogue.

- if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN returns an error response containing an RP_ERROR "Network out of order", and the process returns to the Null state;
- if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN returns an error response containing an RP_ERROR "Facility not supported", and the process returns to the Null state;
- if the macro Receive_Open_Cnf takes the "OK" exit, the VLR waits for a response from the HLR.

When the SGSN is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the SGSN returns an error response containing an RP_ERROR "Network out of order", and the process returns to the Null state;
- if it receives a Release indication from the Gb interface, it aborts the dialogue with the HLR, and the process returns to the Null state;
- if the SGSN receives a MAP_READY_FOR_SM confirmation, it checks the confirmation.
  - if the confirmation contains an error, the SGSN returns returns an error response containing the appropriate RP_ERROR, and the process returns to the Null state;
  - if the confirmation indicates success, the SGSN returns an RP_ACK, and the process returns to the Null state.

The short message alert procedure in the SGSN for the MS memory capacity available case is shown in figure 23.4/68.

23.4.43 Procedure in the HLR

The process is triggered bystarts when the HLR receives a dialogue opening request using the application context mwdMngtContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1;

Alert_Service_Centre_HLR see subclause 25.10.3.

Sheet 1: If the dialogue opening request is from an SGSN, version 2 and version 1 of the application context are not applicable.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "Vr" exit, the HLR handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

NOTE: if the dialogue opening request is from an SGSN, version 2 and version 1 of the application context are not applicable.

- if the macro Receive_Open_Ind takes the "OK" exit, the HLR waits for a service primitive.

While the HLR is waiting for the service primitive:

- if the dialogue fails, the process returns to the Null state;

- if it receives a MAP_READY_FOR_SM indication, it checks the indication.

  - if the indication is badly formed, the HLR returns a MAP_READY_FOR_SM response containing the appropriate user error, and the process returns to the Null state;

  - if the indication is OK, the HLR checks whether it supports:

    - one or both of MNRF and MNRG, and

    - MCEF and

    - MWD.

      - if the HLR does not support the message waiting features listed, it returns a MAP_READY_FOR_SM response containing the user error "Facility not supported", and the process returns to the Null state;

      - if the HLR supports the message waiting features listed, but the subscriber is not known, it returns a MAP_READY_FOR_SM response containing the user error "Unknown subscriber", and the process returns to the Null state;

      - if the subscriber is known, the HLR returns a MAP_READY_FOR_SM response indicating a successful result, and checks whether one or more of MNRF, MNRG and MCEF is set.

        - if none of MNRF, MNRG and MCEF is set, the HLR starts a race timer and waits for a possible delivery failure report. This allows for the race condition where a delivery failure report is delayed in the path through the SMS-GMSC, and is overtaken by a subsequent "ready for SM" condition reported by the serving node to the HLR;

        - if one or more of MNRF, MNRG and MCEF is set, the HLR continues by handling the alerting process as described below under the heading "Alerting the Service Centre(s)".

- if it receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it invokes the macro Report_SM_Delivery_Stat_HLR.

  - if the macro takes the "Error" exit, the HLR waits for a possible MAP_READY_FOR_SM indication;

  - if the macro takes the "OK" exit, the HLR checks whether the delivery was successful.

    - if the delivery was unsuccessful, the HLR waits for a possible MAP_READY_FOR_SM indication;

    - if the delivery was successful, the HLR stops the Race timer, and the process returns to the Null state.

When the HLR is waiting for a possible MAP_READY_FOR_SM indication or MAP_REPORT_SM_DELIVERY_STATUS indication with the race timer running:

- if the race timer expires, the process returns to the Null state;

- if the HLR receives a dialogue opening request, it invokes the macro Receive_Open_Ind.

  - if the macro takes the "Error" exit, the process returns to the Null state;

  - if the macro takes the "Vr" exit, the HLR handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "OK" exit, the HLR waits for a service primitive.

Alerting the Service Centre(s)

The HLR checks the Ready for SM reason which was received from the serving node.

- if the reason was "Memory available for GPRS", the HLR clears the MNRG flag and the MCEF and invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
- if the reason was "Subscriber present for GPRS", the HLR clears the MNRG flag and checks the MCEF.
  - if the MCEF is not set, the HLR invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
  - if the MCEF is set, the process returns to the Null state;
- if the reason was "Memory available for non-GPRS", the HLR clears the MNRF and the MCEF and invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
- if the reason was "Subscriber present for non-GPRS", the HLR clears the MNRF and checks the MCEF.
  - if the MCEF is not set, the HLR invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
  - if the MCEF is set, the process returns to the Null state.

The short message alert process in the HLR is shown in figure 23.4/76.

23.4.54 Procedures in the SMS Interworking MSC

The process is triggered bystarts when the SMS-GIWMSC receives a dialogue opening request using the application context shortMsgAlertContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the SMS-IWMSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the SMS-IWMSC waits for a service primitive.

While the SMS-IWMSC is waiting for the service primitive:

- if the dialogue fails, the process returns to the Null state;
- if it receives a MAP_ALERT_SERVICE_CENTRE indication, it checks the indication.
  - if the indication is badly formed, the SMS-IWMSC returns a MAP_ALERT_SERVICE_CENTRE response containing the appropriate user error, and the process returns to the Null state;
  - if the indication is OK, the SMS-IWMSC sends an SC_RP_ALERT_SC request to the Service Centre and returns a MAP_ALERT_SERVICE_CENTRE response indicating a successful result, and the process returns to the Null state.

The short message alert process in the SMS-IWMSC is shown in figure 23.4/87.

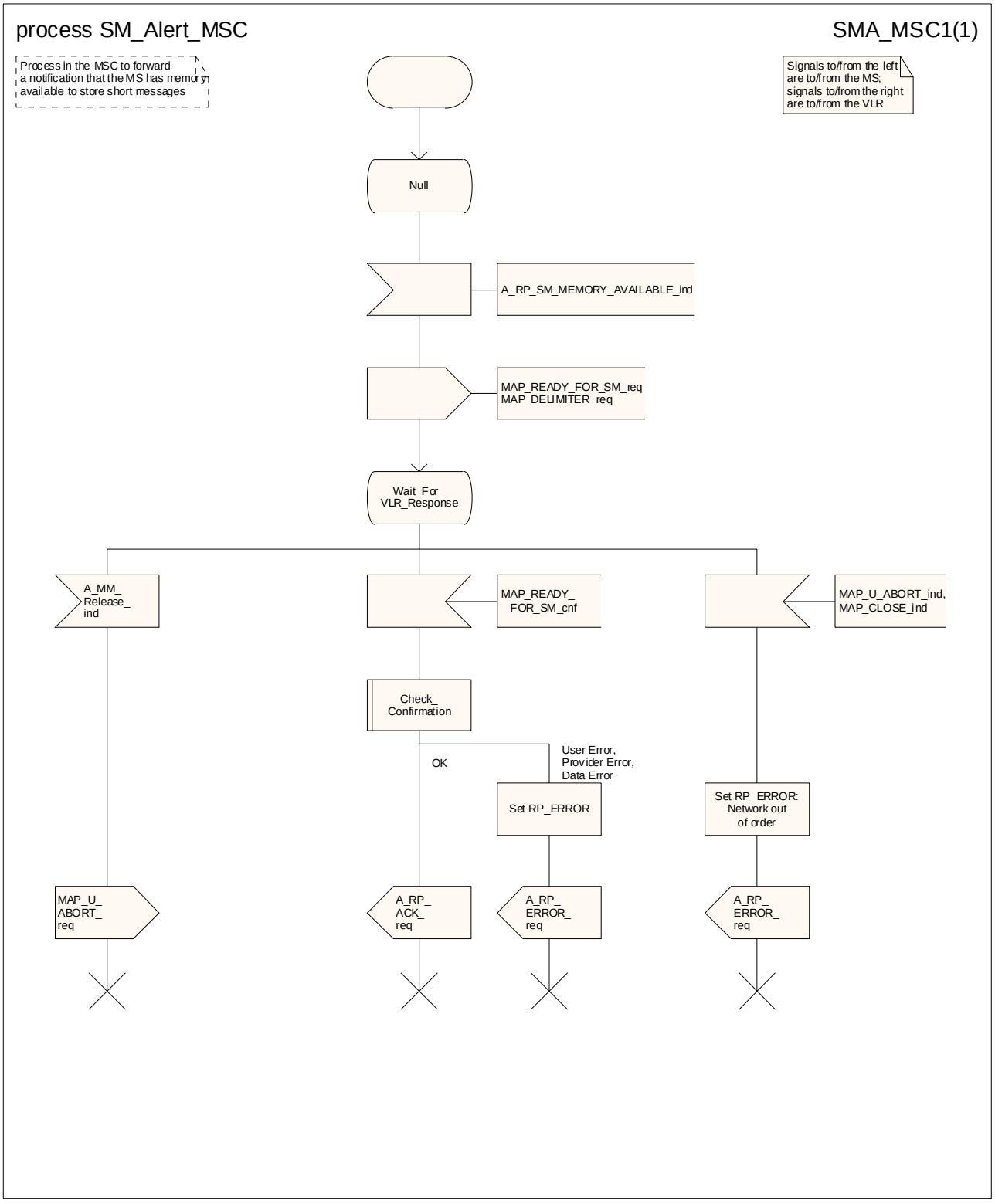


Figure 23.4/4: Procedure SM_Alert_MSC

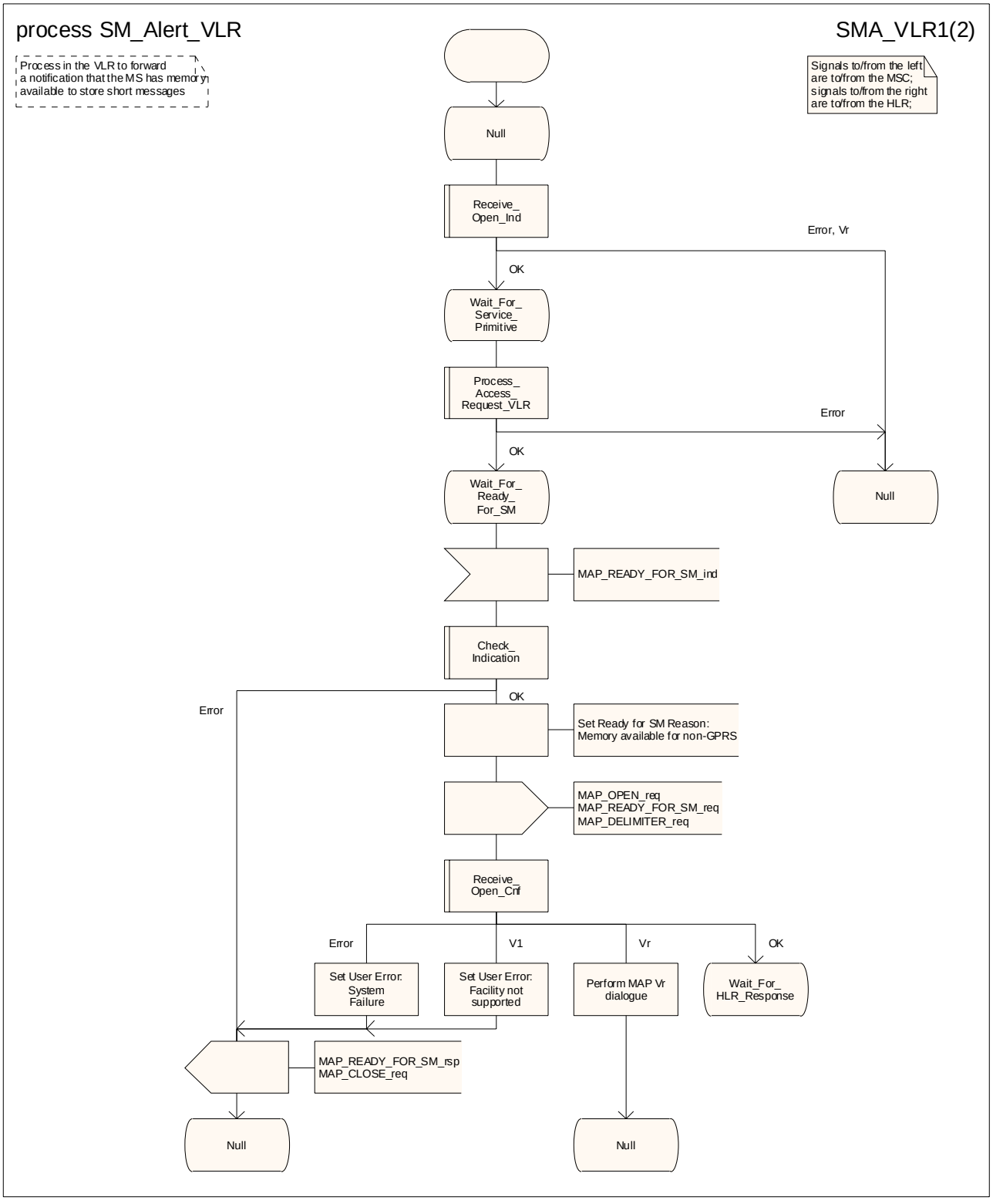


Figure 23.4/5 (sheet 1 of 2): Procedure SM_Alert_VLR

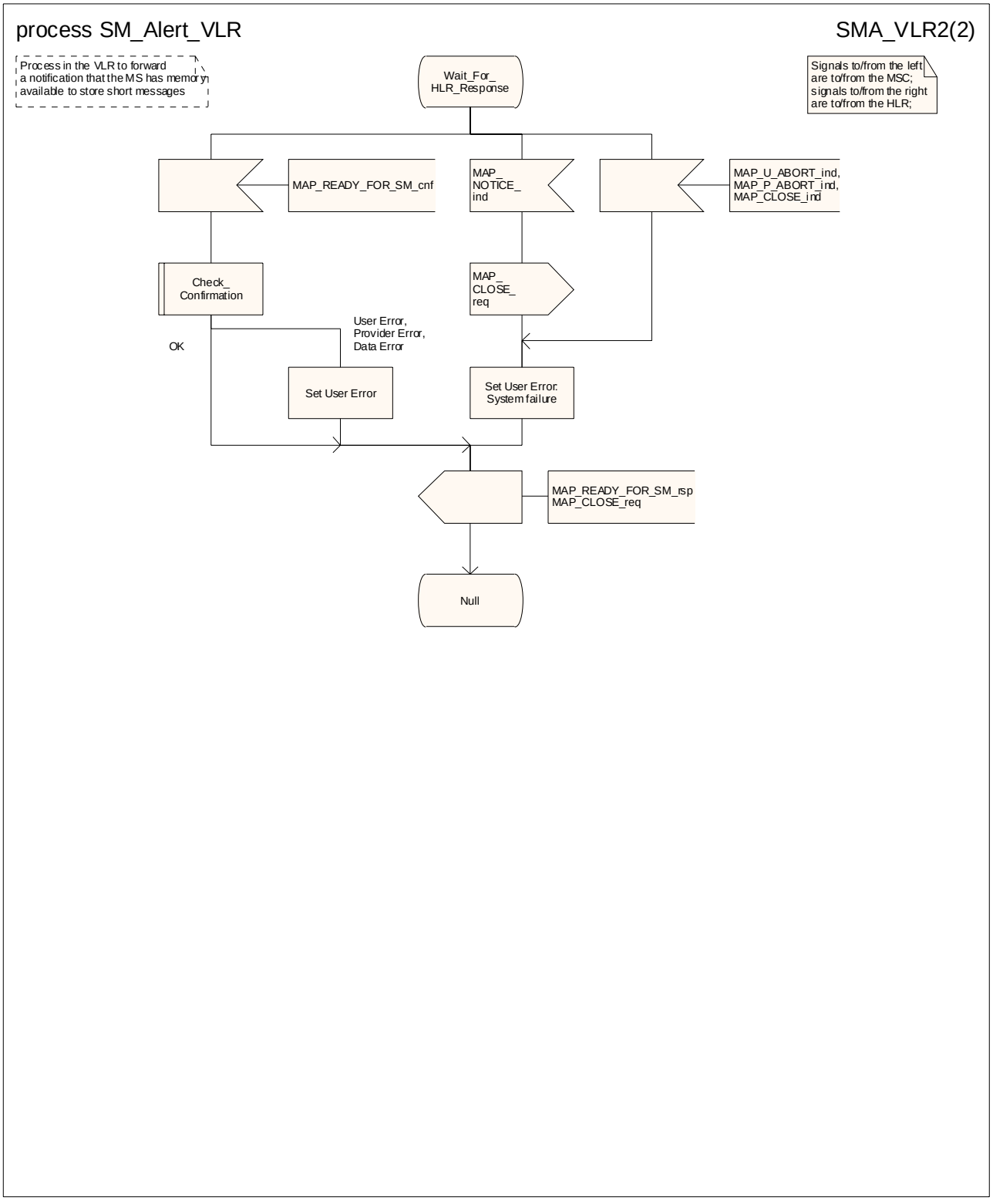


Figure 23.4/5 (sheet 2 of 2): Procedure SM_Alert_VLR

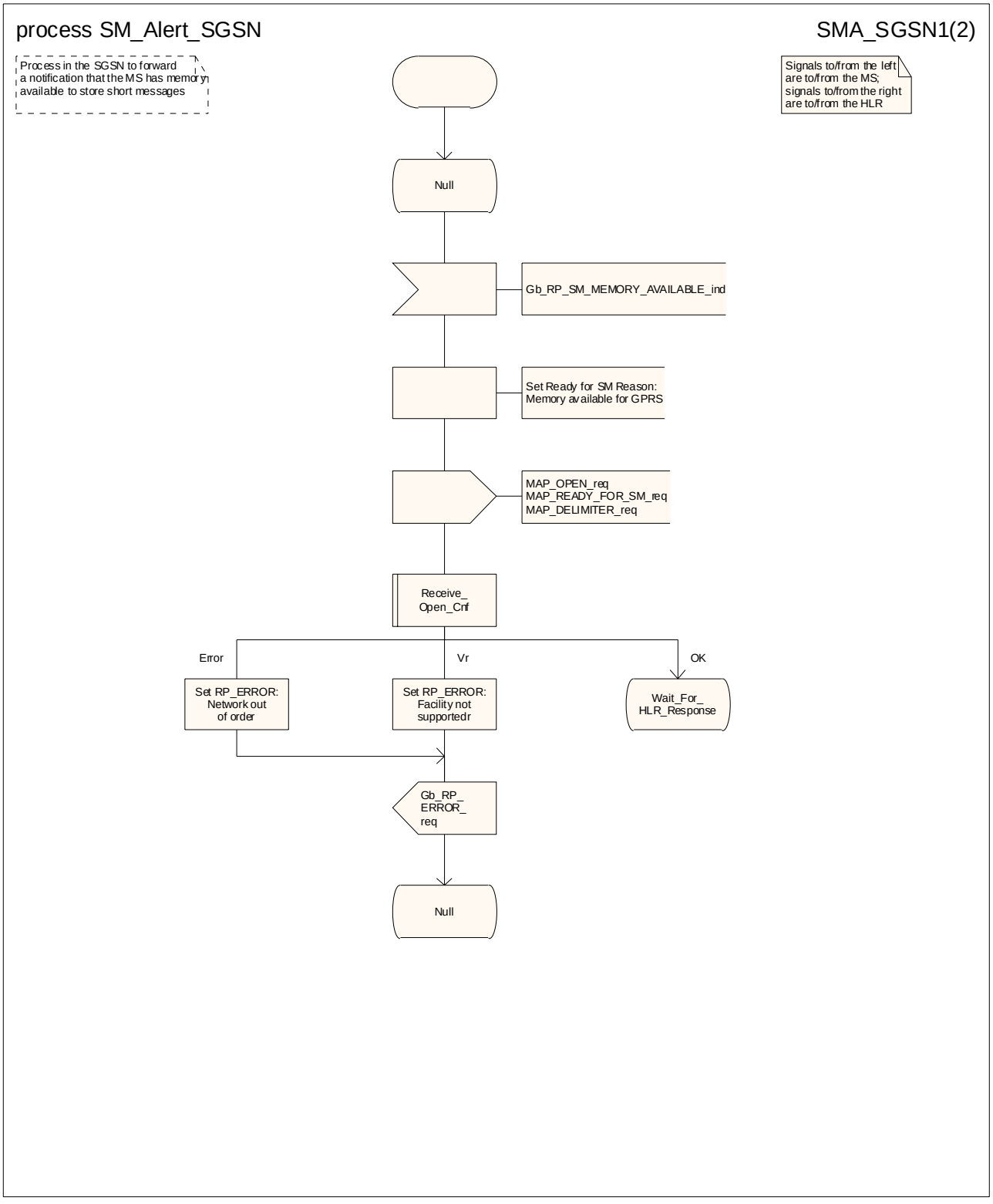


Figure 23.4/6~~8~~ (sheet 1 of 2): Process SM_Alert_SGSN

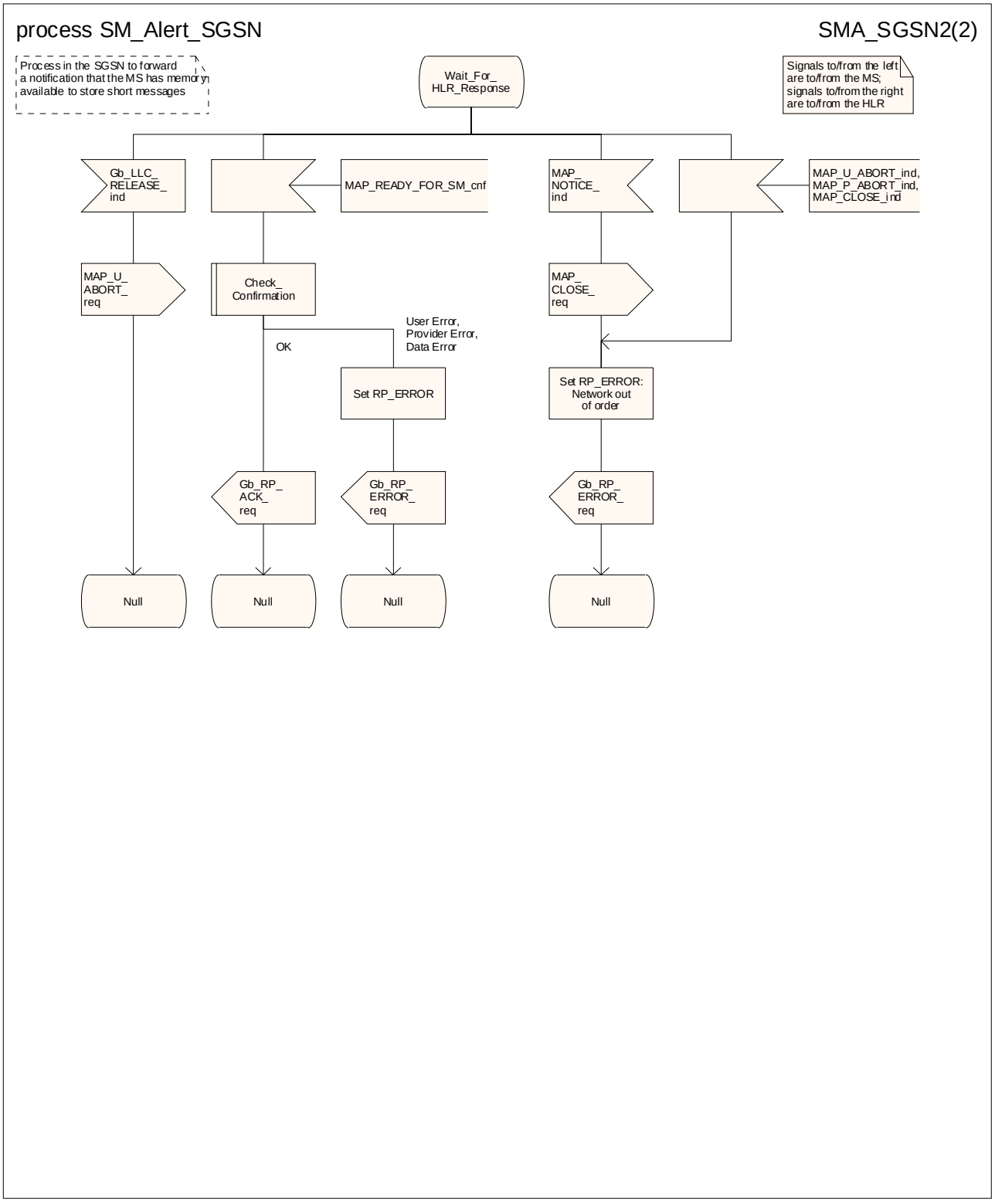


Figure 23.4/6~~8~~ (sheet 2 of 2): Process SM_Alert_SGSN

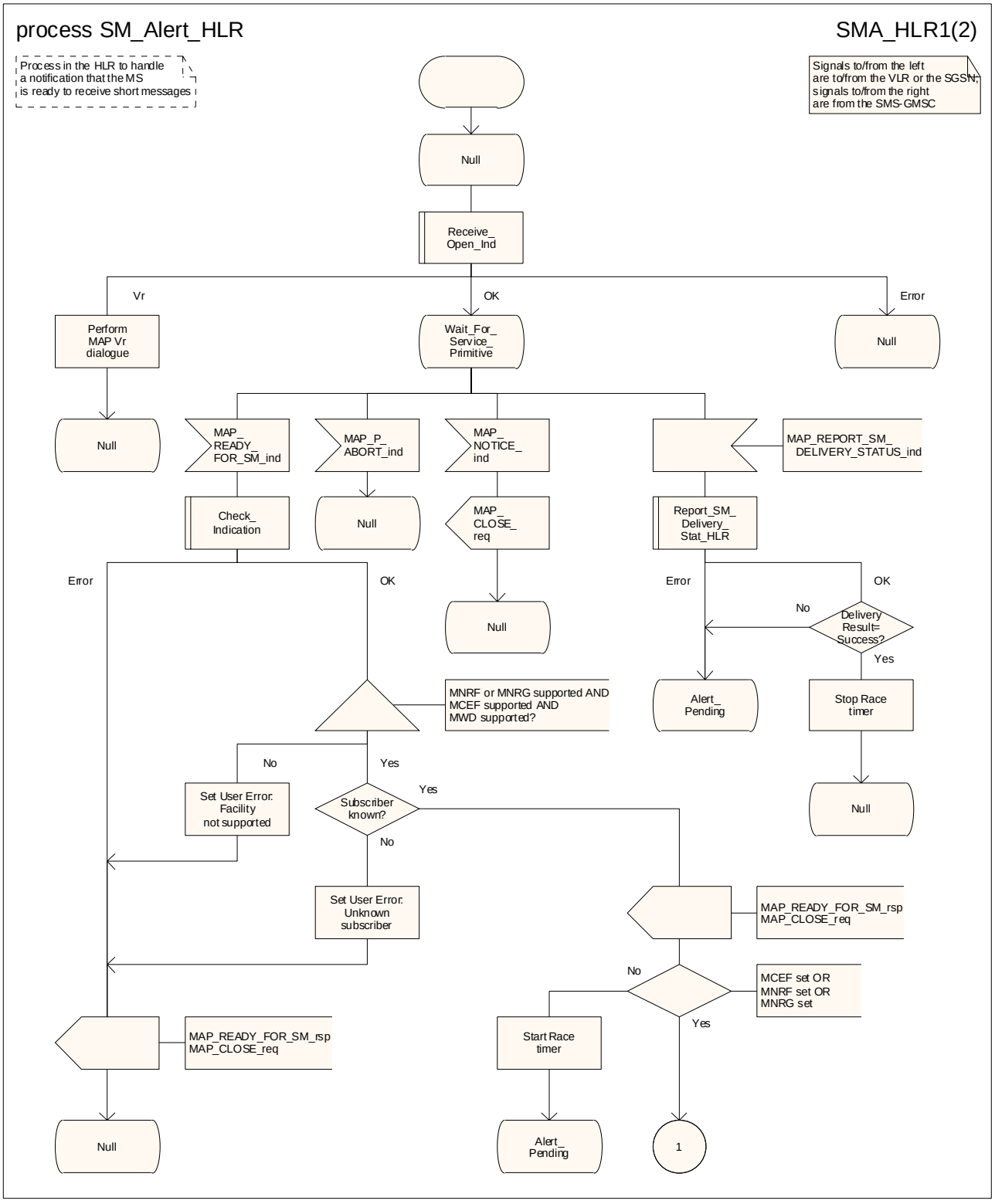


Figure 23.4/76 (sheet 1 of 2): Process SM_Alert_HLR

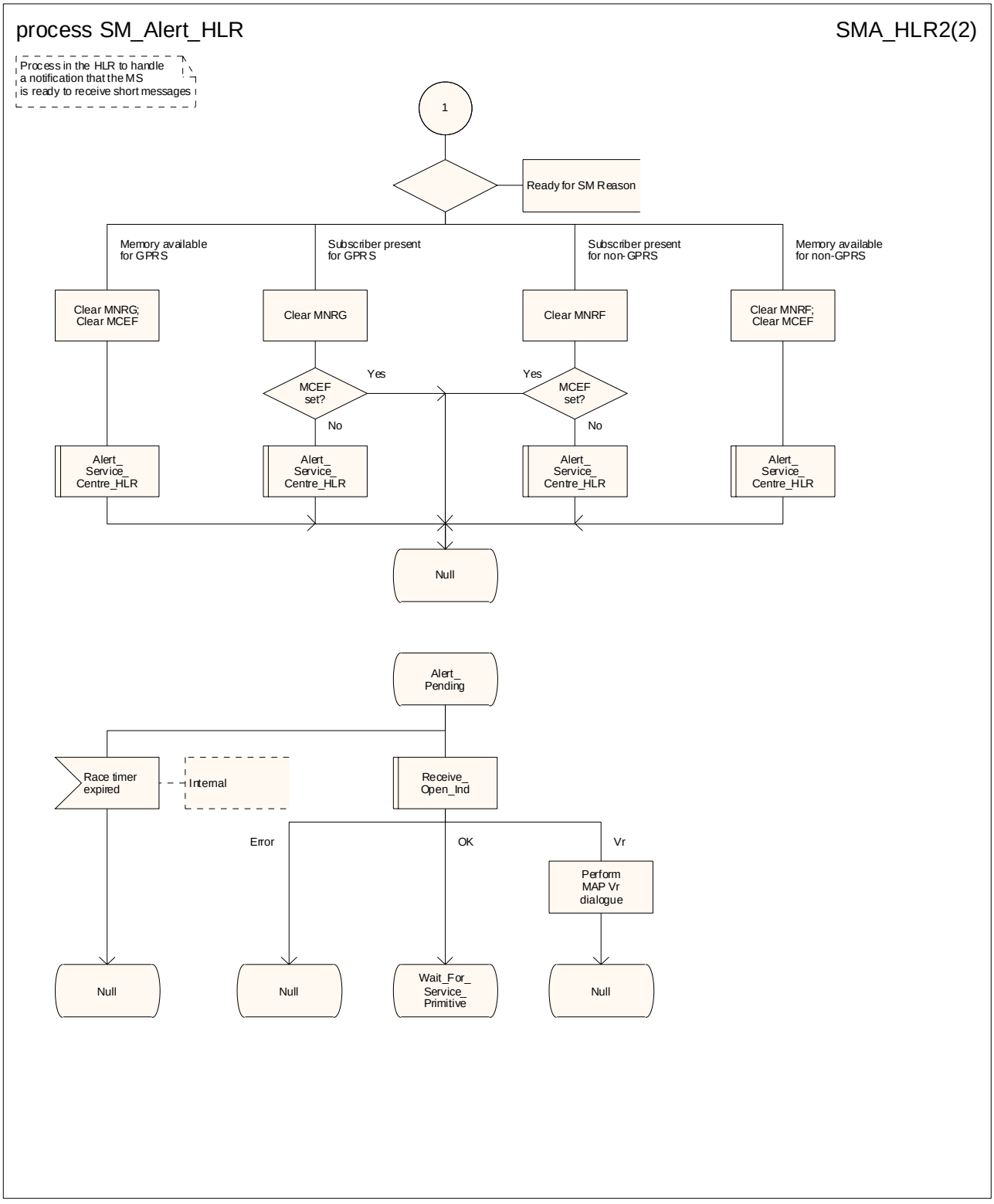


Figure 23.4/76 (sheet 2 of 2): Process SM_Alert_HLR

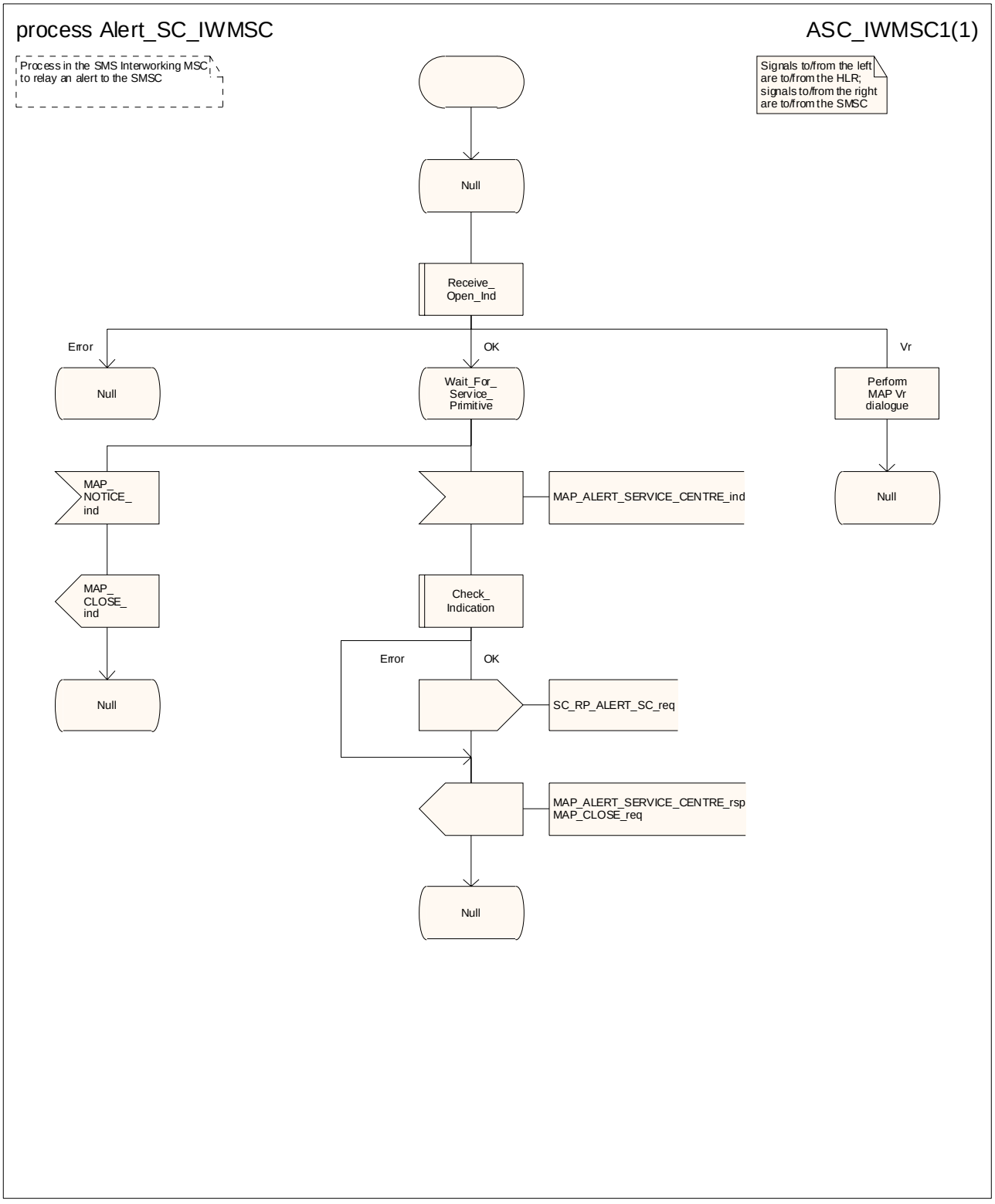


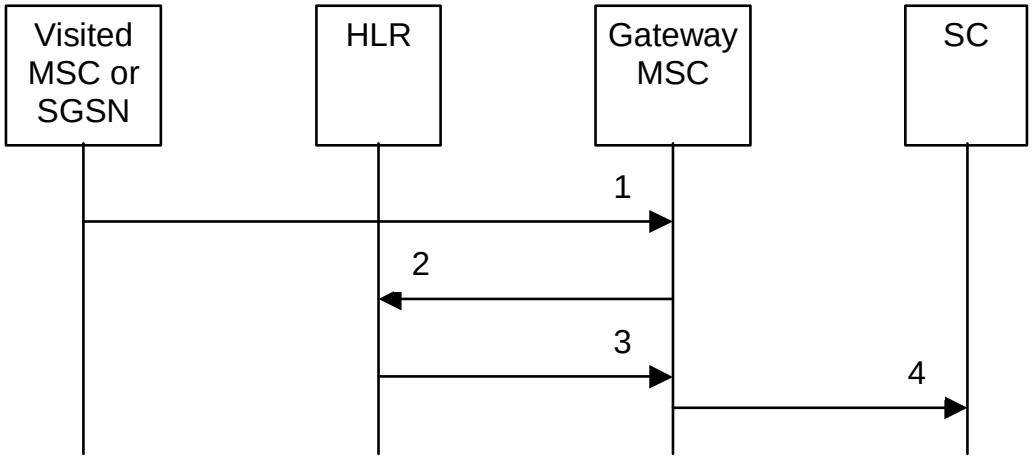
Figure 23.4/87: Process Alert_SC_IWMSC

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 after short message delivery has failed because the subscriber is absent or unidentified or the memory capacity is exceeded. The procedure sets:
  - the Memory Capacity Exceeded Flag (MCEF) in the HLR if the MS memory does not have room for more messages;
  - and/or the MS Not Reachable Flag for non-GPRS if there is no record for the subscriber in the VLR or the subscriber does not respond to paging for delivery via the MSC;
  - and/or the MS Not Reachable for GPRS (MNRG) flag if there is no record for the subscriber in the SGSN or the subscriber does not respond to paging for delivery via the SGSN.
- to report to the HLR that delivery has succeeded. The conditions for report of a successful delivery are described in subclause 23.3.1.

The message flow for the SM delivery status report procedure is shown in figure 23.5/1.



1) MAP_MT_FORWARD_SHORT_MESSAGE_ACK/_NACK (Absent subscriber_SM, unidentified subscriber or memory capacity exceeded).
2) MAP_REPORT_SM_DELIVERY_STATUS.
3) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
4) Short Message Negative Acknowledgement (3GPP TS 23.~~1~~040).

Figure 23.5/1: Short message delivery status report procedure

23.5.1~~2~~ Procedure in the SMS-GMSC

The conditions for the GMSC to invoke the short message delivery status report procedure are specified in subclause 23.3.1.

~~The SMS-GMSC requests a MAP dialogue and sends a MAP_REPORT_SM_DELIVERY_STATUS request to the HLR containing the subscriber data of the mobile subscriber.~~

- ~~if the macro Receive_Open_Cnf takes the "Error" exit, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;~~
- ~~if the macro Receive_Open_Cnf takes the "V1" exit, the SMS-GMSC checks the delivery result.~~
  - ~~if delivery was successful, or delivery failed with any reason other than "Absent subscriber", the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;~~

- if delivery failed with a reason of "Absent subscriber", the SMS-GMSC handles the dialogue according to the specification for version 1 of the protocol, and the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit;

- if the macro Receive_Open_Cnf takes the "Vr" exit (for a version greater than 1), the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol, and the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit;

- if the macro Receive_Open_Cnf takes the "OK" exit, the SMS-GMSC waits for a response from the HLR.

When the SMS-GMSC is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;

- if it receives a MAP_REPORT_SM_DELIVERY_STATUS confirmation, it checks the confirmation.

  - if the confirmation contains an error, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;

  - if the confirmation indicates a successful result, the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit.

If delivery was successful, the MAP_REPORT_SM_DELIVERY_STATUS request indicates whether delivery succeeded for GPRS or non-GPRS.

If delivery was unsuccessful because the subscriber was absent, the MAP_REPORT_SM_DELIVERY_STATUS request includes the absent subscriber diagnostic indication (if available).

If the reason for unsuccessful delivery is absent subscriber with diagnostic 'Paging failure' for GPRS or non GPRS, the MAP_REPORT_SM_DELIVERY_STATUS request includes the two SM Delivery Outcomes absent subscriber with both diagnostics 'Paging failure' for GPRS and non-GPRS..

Note that the indication of which number belongs the SGSN and which to the MSC, received from the HLR in the routing information result (see subclause 23.3.2) 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 dialogue with the Service Centre may be aborted. If so the SMS-GMSC aborts the dialogue with the HLR.

The short message delivery status report macro in the SMS-GMSC is shown in figure 23.5/2~~3~~.

23.5.2~~1~~ Procedure in the HLR

When the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it acts as described in subclause 23.6, macro Report_SM_Delivery_Stat_HLR.

The short message delivery status report process in the HLR is shown in figure 23.5/3~~2~~.

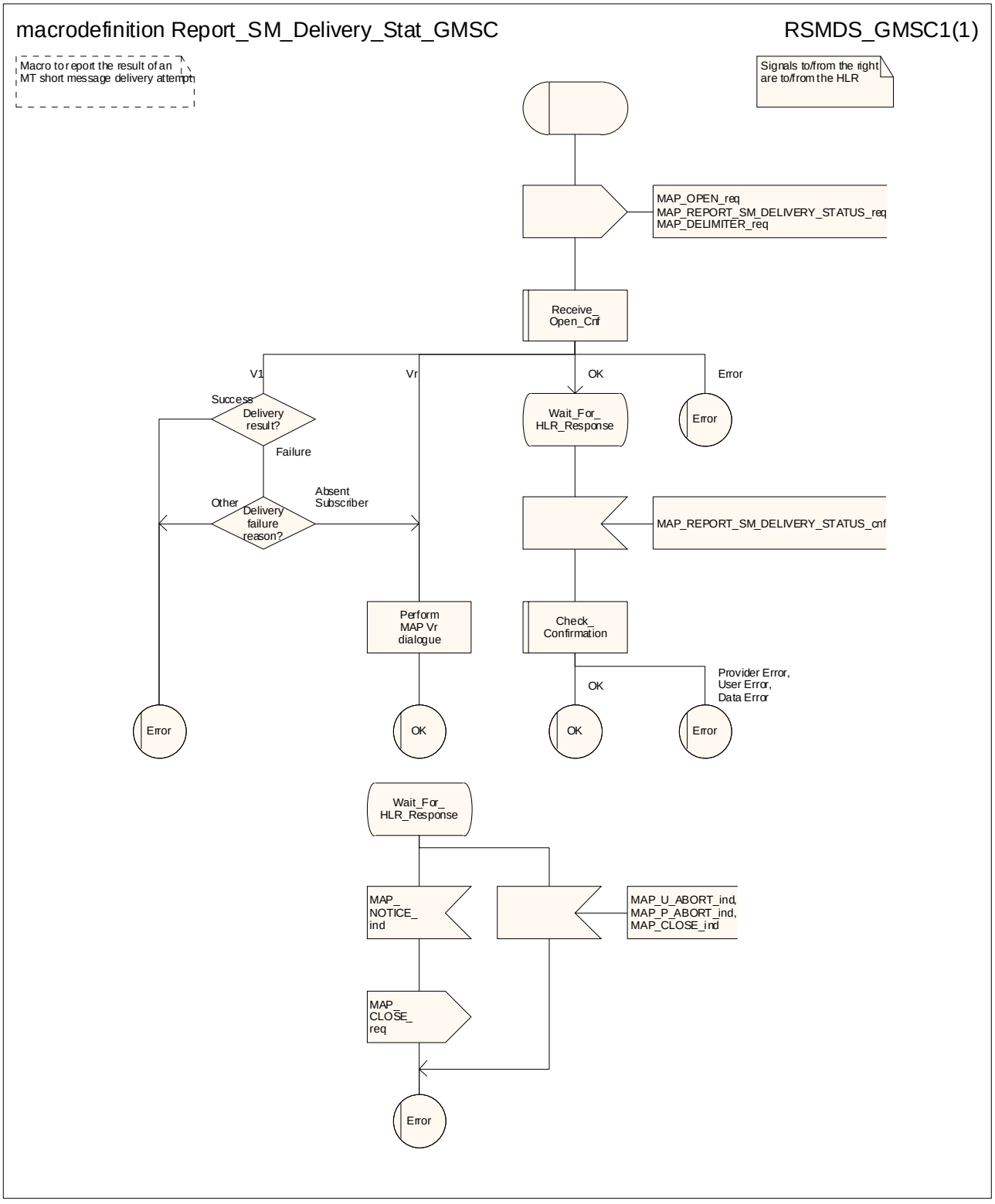


Figure 23.5/23: Macro Report_SM_Delivery_Stat_GMSC

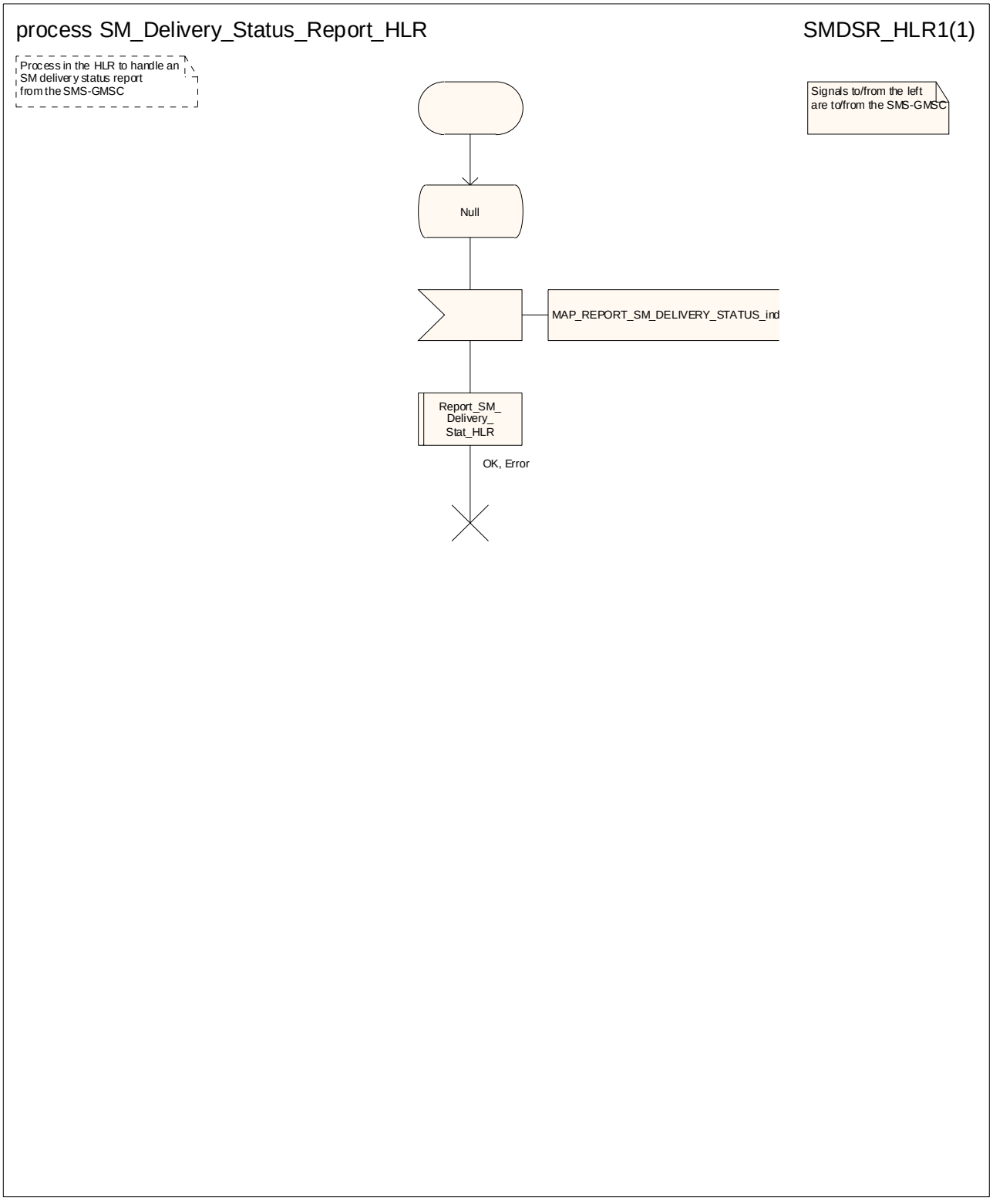


Figure 23.5/32: Process SM_Delivery_Status_Report_HLR

23.6 The macro Report_SM_Delivery_Stat_HLR

This macro is invoked when the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication from the SMS-GMSC. The macro invokes macros not defined in this clause; the definition of these macros can be found ~~HLR handles the indication~~ as follows:

Check_Indication see subclause 25.2.1;

Alert_Service_Centre_HLR see subclause 25.10.3.

Sheet 1: If the MAP_REPORT_SM_DELIVERY_STATUS indication did not include the GPRS support indicator, the HLR deduces the domain for which the delivery report applies as follows:

- if the subscriber is a GPRS-only subscriber, the report applies for GPRS;
- if the subscriber is a non-GPRS-only subscriber, the report applies for non-GPRS;
- if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the report applies for GPRS;
- if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the report applies for non-GPRS;

~~- if the indication is badly formed, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the appropriate User Error, and the macro takes the "Error" exit;~~

~~- if there is no record in the HLR for the subscriber, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the User Error "Unknown subscriber", and the macro takes the "Error" exit;~~

~~- if the MAP_REPORT_SM_DELIVERY_STATUS indication did not include the GPRS support indicator, the HLR deduces the domain for which the delivery report applies as follows:~~

~~- if the subscriber is a GPRS-only subscriber, the report applies for GPRS;~~

~~- if the subscriber is a non-GPRS-only subscriber, the report applies for non-GPRS;~~

~~- if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the report applies for GPRS;~~

~~- if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the report applies for non-GPRS;~~

~~- if the MAP_REPORT_SM_DELIVERY_STATUS indication indicated delivery failure, the HLR attempts to add the SC address to the MWD list.~~

~~- if the update of the MWD list failed, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the User Error "MWD list full", and the macro takes the "Error" exit;~~

~~- if the update of the MWD list succeeded, the HLR sets the variable Delivery Result to Failure, and continues to process the delivery failure report:~~

~~- if the MSISDN used to define the destination MS was not the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_REPORT_SM_DELIVERY_STATUS response;~~

~~- if the delivery failure cause was MS memory capacity exceeded for non-GPRS, the HLR sets the MCEF and clears the MNRF;~~

~~- if the delivery failure cause was MS memory capacity exceeded for GPRS, the HLR sets the MCEF and clears the MNRG flag;~~

~~- if the delivery failure cause was Absent Subcriber for non-GPRS, the HLR sets the MNRF;~~

~~- if the delivery failure cause was Absent Subcriber for GPRS, the HLR sets the MNRG flag;~~

- if the delivery failure cause was Absent Subcriber for non-GPRS and GPRS, the HLR sets the MNRF and the MNRG flag;
- if the delivery cause was absent subscriber and the MAP_REPORT_SM_DELIVERY_STATUS indication included a reason for absence, the HLR stores the reason for absence in the Mobile Not Reachable Reason and calls the procedure Check_Absent_Subscriber_SM_In_HLR (see 3GPP TS 23.116 [110];
- the HLR returna a MAP_REPORT_SM_DELIVERY_STATUS response indicating success, and the macro takes the "OK" exit.

- if the MAP_REPORT_SM_DELIVERY_STATUS indication indicated successful transfer,the HLR handles the indication as follows:
  - if the delivery outcome was for non-GPRS, the HLR clears the MNRF and the MCEF;
  - if the delivery outcome was for GPRS, the HLR clears the MNRG flag and the MCEF;
  - the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response indicating success;
  - the HLR invokes the macro Alert_Service_Centre_HLR to alert the service centres whose addresses are in the MWD list, as described in subclause 25.10;
  - the HLR sets the variable Delivery Result to Success, and the macro takes the "OK" exit.

The short message delivery status report macro in the HLR is shown in figure 23.6/1.

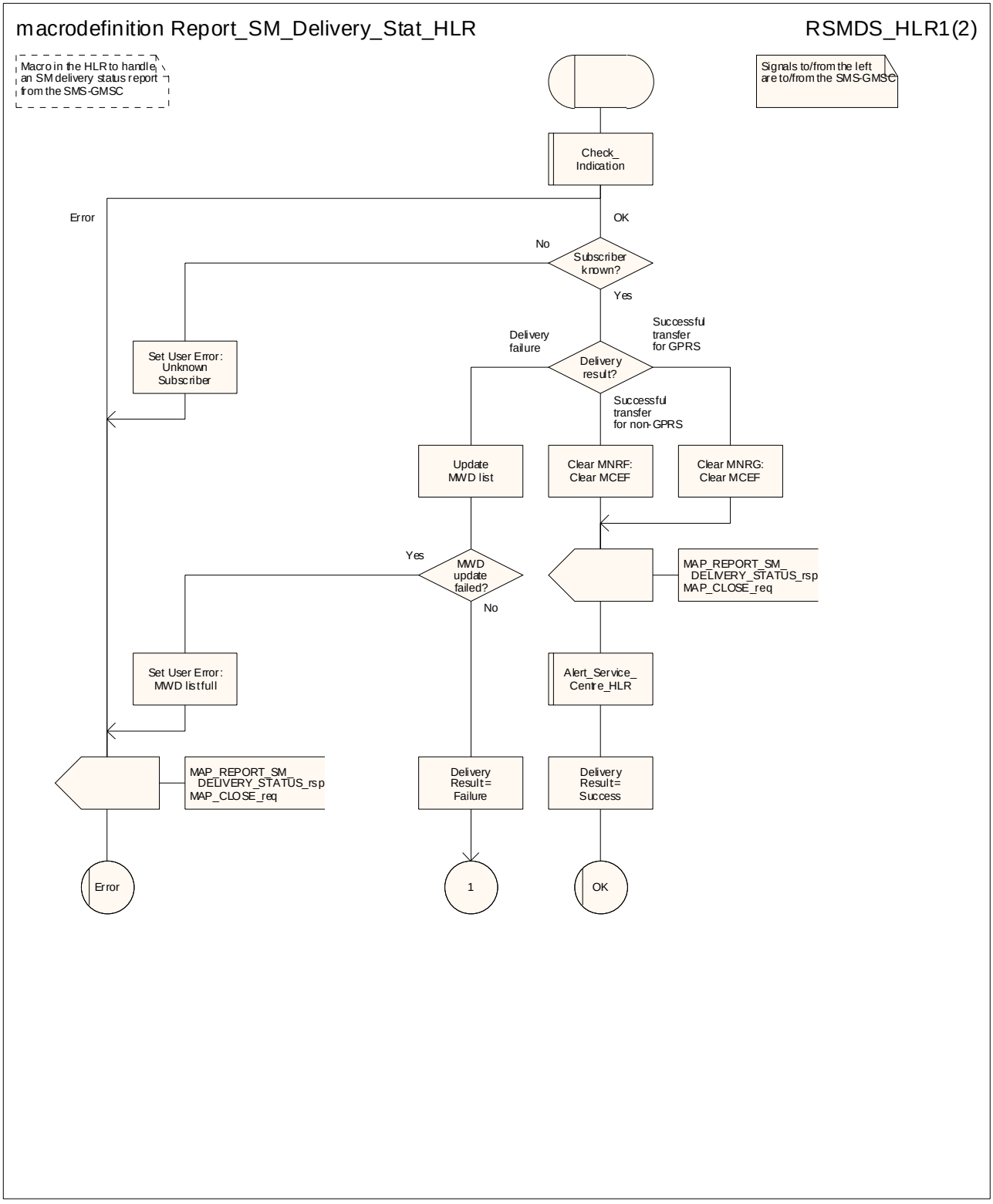


Figure 23.6/1 (sheet 1 of 2): Macro Report_SM_Delivery_Stat_HLR

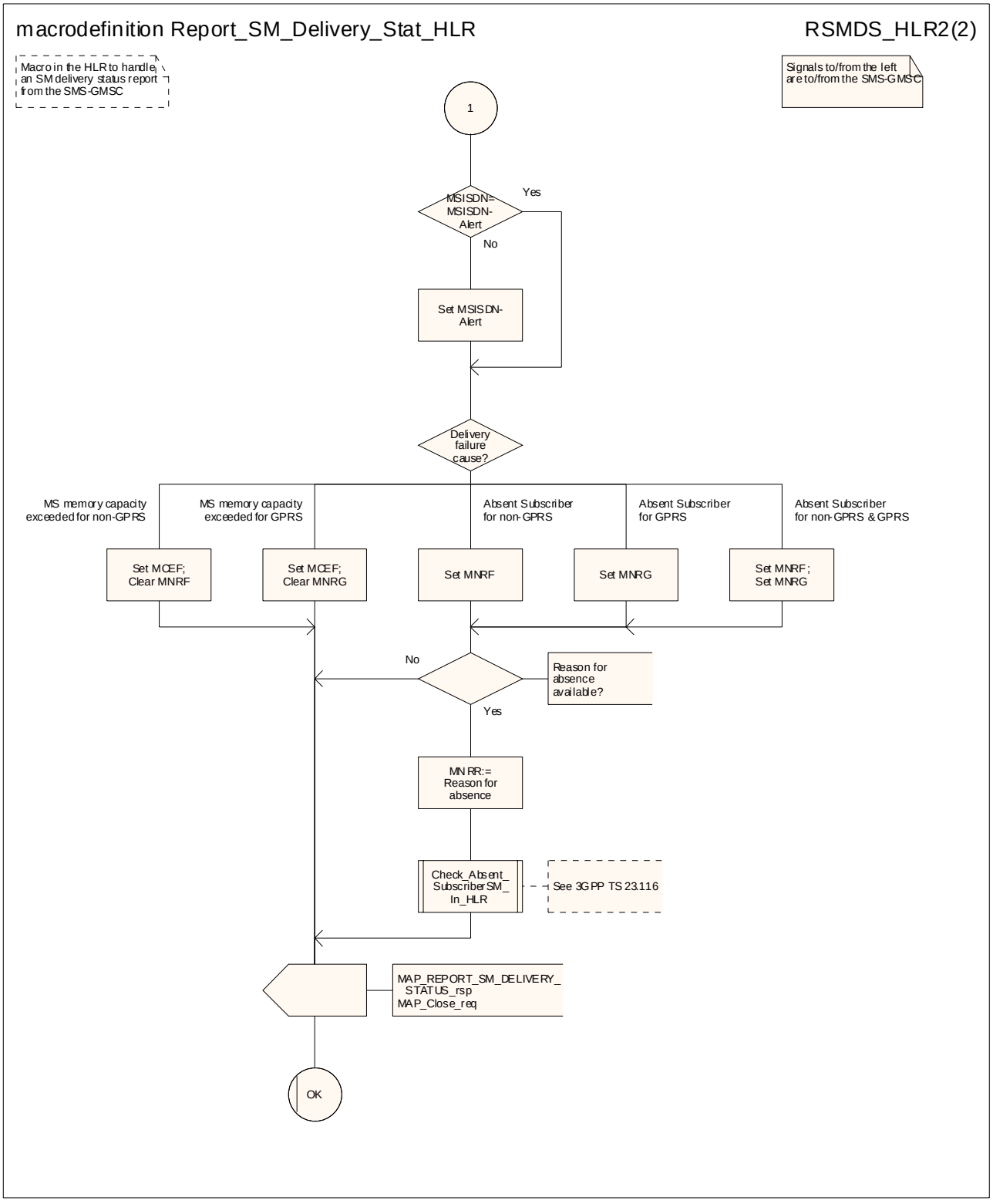


Figure 23.6/1 (sheet 2 of 2): Macro Report_SM_Delivery_Stat_HLR

***** End of document *****

3GPP TSG CN WG4 Meeting #19
San Diego, USA, 19th – 23rd May 2003

N4-030513

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **617** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Formal correction to the ASN.1 syntax of SendIdentificationRes
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	08/05/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The AuthenticationSetList is not appeared in the ASN.1 syntax of SendIdentificationRes. The compiler skipped this parameter because the AuthenticationSetList is not in the right place in the SendIdentificationRes Data Type under chapter 17.7.1
Summary of change:	⌘	SendIdentificationRes Data Type is updated in order to put the AuthenticationSetList in the right place.
Consequences if not approved:	⌘	Formal error to the ASN.1 syntax of SendIdentificationRes will remain which could lead to serious design problems.

Clauses affected:	⌘	17.7.1

		Y	N		
Other specs affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	N4-030152 corrects the same fault in Rel-6 among other.

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

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

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

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

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

*** For Information ***

Full expanded ANS.1 syntax of sendIdentification in 29.002 V5.4.0

```
sendIdentification OPERATION  ::=  {
  ARGUMENT     SEQUENCE {
    tmsi                    OCTET STRING ( SIZE( 1 .. 4 ) ),
    numberOfRequestedVectors   INTEGER ( 1 .. 5 ) OPTIONAL,
    segmentationProhibited     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     [3] IMPLICIT SEQUENCE {
    imsi                    OCTET STRING ( SIZE( 3 .. 8 ) ) OPTIONAL,
    currentSecurityContext   [2] CHOICE {
      gsm-SecurityContextData      [0] IMPLICIT SEQUENCE {
        kc         OCTET STRING ( SIZE( 8 ) ),
        cksn       OCTET STRING ( SIZE( 1 ) ),
        ... },
      umts-SecurityContextData     [1] IMPLICIT SEQUENCE {
        ck         OCTET STRING ( SIZE( 16 ) ),
        ik         OCTET STRING ( SIZE( 16 ) ),
        ksi        OCTET STRING ( SIZE( 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,
    ... }
  ERRORS     {
    dataMissing |
    unidentifiedSubscriber }
  CODE     local      : 55
  }
```

*** First Modification ***

17.7 MAP constants and data types

17.7.1 Mobile Service data types

...

```
PurgeMS-Res ::= SEQUENCE {
    freezeTMSI                      [0]  NULL                       OPTIONAL,
    freezeP-TMSI                    [1]  NULL                       OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
SendIdentificationArg ::= SEQUENCE {
    tmsi                            TMSI,
    numberOfRequestedVectors        NumberOfRequestedVectors        OPTIONAL,
    -- within a dialogue numberOfRequestedVectors shall be present in
    -- the first service request and shall not be present in subsequent service requests.
    -- If received in a subsequent service request it shall be discarded.
    segmentationProhibited          NULL                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
SendIdentificationRes ::= [3] SEQUENCE {
    imsi                            IMSI                            OPTIONAL,
    -- IMSI shall be present in the first (or only) service response of a dialogue.
    -- If multiple service requests are present in a dialogue then IMSI
    -- shall not be present in any service response other than the first one.
    authenticationSetList           AuthenticationSetList           OPTIONAL,
    currentSecurityContext          [2]CurrentSecurityContext       OPTIONAL,
    extensionContainer              [3] ExtensionContainer          OPTIONAL,
    ...}
```

****** End of the Document ******

3GPP TSG CN WG4 Meeting #19 ***N4-030683***
San Diego, CA, USA, 19th – 23rd May 2003

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **634** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Provision of SDL diagrams and removal of redundant text in chapter 25		
Source:	⌘	CN4		
Work item code:	⌘	TEI5	***Date:*** ⌘	21/05/2003
Category:	⌘	**F**	***Release:*** ⌘	Rel-5

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change: ⌘

There are no source files available for the SDL diagrams in 29.002 chapter 25. Many SDL diagrams are poorly laid out.
The service descriptions for the MAP_PAGE and MAP_PROCESS_ACCESS_REQUEST services include references to their use for circuit-switched calls. This use is redundant since the transfer of the description of the interworking between the MSC and VLR for circuit-switched calls into GSM 03.18 (now 23.018).
The Paging, Search & Process Access Request macros include redundant material, which is specific to the handling of circuit-switched calls. The definition of the paging, search and Process Access Request behaviour for circuit-switched calls in the MSC & VLR is in TS 23.018. Furthermore, these macros do not describe any MAP signalling; they deal only with access signalling and interworking between the MSC and the VLR.
Most of the text inaccurately repeats the information in the SDL diagrams; the useful additional information is buried in superfluous verbiage. The misalignment between text and SDL has led to different interpretations, and interworking problems. It was this which led to the style used in GSM 03.18/23.018, where the text is a **supplement to** the SDL. It should be noted that other chapters in 29.002 (e.g. 24B) do not have text which attempts to replicate the SDL.

Summary of change: ⌘

Redraw SDL diagrams to a consistent style. Simplify the Paging, Search & Process Access Request macros to remove the material which is specific to the handling of circuit-switched calls.

Remove from the service descriptions for MAP_PAGE and MAP_PROCESS_ACCESS_REQUEST the references to handling circuit-switched calls.

		Remove text which replicates the information in SDL diagrams. Re-order subclauses to group macros and processes for the SGSN with their counterparts for the MSC & VLR. Update subclause references elsewhere in 29.002. Align figure and subclause numbering.
Consequences if not approved:	⌘	Poor readability; unnecessary bulk in the specification; conflicting information in text and SDL diagrams.

Clauses affected:	⌘	8.2.1.1; 8.3.1.1; 19.4; 20.2.1.1; 20.2.2.1; 20.2.4.1; 21.2.5; 23.4.5.1; 25			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	The SDL changes in this CR are identical to those in CR 29.002-573 (N4-030380). Following the example approved in CR 29.002-523 & CR 29.002-524, the pretence of MAP signalling between the MSC and the VLR has been reduced by removing the handling for protocol dropback, MAP_P_ABORT and MAP_NOTICE on the B interface. References to "version of MAP" have been systematically changed to "version of the MAP specification". The one-to-one correspondence between the version of the MAP specification and the application context version ceased to exist with GSM 09.02 version 5.0.0! The handling for a repeat attempt (using the IMSI) at authenticating the mobile if the first attempt (using the TMSI) failed has been moved from the macro Process_Access_Request_VLR to the macro Authenticate_VLR. This is purely a modelling change, and does not require any change in functional behaviour. The modelling of timer handling for repeat attempts of stand-alone Insert Subscriber Data (figures 25.7/3 & 25.7/4) and Alert Service Centre (figure 25.10/3) has been formalised by showing the process entering a wait state after the timer has been started, and repeating the Insert Subscriber Data or Alert Service Centre when the timer expiry signal is received.			

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

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.

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

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~~ for mobile originated short message submission ~~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.

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

19.4 Macro Insert_Subs_Data_Framed_HLR

This macro is used by any procedure invoked in HLR which requires the transfer of subscriber data by means of the InsertSubscriberData operation (e.g. Update Location or Restore Data).

The invocation of the operation is done in a dialogue already opened by the framing procedure. Therefore the latter is the one that handles the reception of the open indication and sends the dialogue close request.

The macro calls the process "Send_Insert_Subs_Data" (see clause 25.7.7~~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_Subs~~criber~~_Data_Cnf" (see clause 25.7.5~~3~~). There the reception and handling of the service confirmations is described.

If certain services required for a subscriber are not supported by the VLR or by the SGSN (e.g. Advice of Charge Charging Level), this may result in one of the following outcomes:

- The HLR stores and sends "Roaming Restriction Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restriction Due To Unsupported Feature" is stored in the HLR, the "MSC Area Restricted Flag" shall be set to "restricted". This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR;

- The HLR stores and sends other induced subscriber data (e.g. a specific barring program) in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. This will cause rejection of mobile originated service requests, except emergency calls.

- The HLR stores and sends "Roaming Restricted in the SGSN Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restricted In SGSN Due To Unsupported Feature" is stored in the HLR, the "SGSN Area Restricted Flag" shall be set to "restricted". This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context Activation;

When the VLR receives regional subscription data (Zone Code List) it may respond with "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "MSC Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.

If the HLR neither stores "Roaming Restriction Due To Unsupported Feature" nor receives "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response, the "MSC Area Restricted Flag" in the HLR shall be set to "not restricted".

If subscriber data for CAMEL Phase 2 or 3 services are sent to a VLR which does not support CAMEL Phase 2 or 3, the service behaviour may be unpredictable or incorrect. The HLR therefore needs to ensure that at the conclusion of a location updating dialogue the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in 3GPP TS 23.078.

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2 or higher. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only after the HLR receives confirmation in the first ISD message result that CAMEL Phase 2 or higher is supported.

A Forwarded-to number non-international E.164 format shall only be sent from an HLR to a VLR if the VLR supports CAMEL Phase 2, or a subsequent phase of CAMEL.

When the SGSN receives regional subscription data (Zone Code List) it may respond with "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "SGSN Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context Activation.

If the HLR neither stores "Roaming Restricted In SGSN Due To Unsupported Feature" nor receives "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response, the "SGSN Area Restricted Flag" in the HLR shall be set to "not restricted".

The SDL diagrams are shown in figures 19.4/1 and 19.4/2.

*** Next modified section ***

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 25.9/64) 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.

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

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 25.9/4~~3~~).

The subscriber tracing activation process in the VLR is shown in figure 20.2/9.

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

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 25.9/5~~7~~).

The subscriber tracing activation process in the SGSN is shown in figure 20.2/16.

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

21.2.5 Process in the VLR to restore subscriber data

The MAP process in the HLR to restore subscriber data is shown in figure 21.2/6. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see clause 25.1.2;
Check_Confirmation	see clause 25.2.2;
Insert_Subs_Data_VLR	see clause 25.7.1;
Activate_Tracing_VLR	see clause 25.9.4~~3~~.

Successful outcome

When the MAP process receives a Restore Data request from the data restoration process in the VLR, it requests a dialogue with the HLR whose identity is contained in the Restore Data request by sending a MAP_OPEN service request, requests data restoration using a MAP_RESTORE_DATA service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

The VLR may receive a MAP_INSERT_SUBSCRIBER_DATA service indication from the HLR; this is handled by the macro Insert_Subs_Data_VLR as described in clause 25.7.1, and the MAP process waits for a further response from the HLR.

The VLR may receive a MAP_ACTIVATE_TRACE_MODE service indication from the HLR; this is handled by the macro Activate_Tracing_VLR as described in clause 25.9.4~~3~~, and the MAP process waits for a further response from the HLR.

If the MAP process receives a MAP_RESTORE_DATA service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Restore Data ack containing the information received from the HLR to the data restoration process in the VLR and returns to the idle state.

Error in MAP_RESTORE_DATA confirm

If the MAP_RESTORE_DATA service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Restore Data negative response indicating the type of error to the call handling process in the HLR, and returns to the idle state.

Earlier version MAP dialogue with the HLR

If the macro Receive_Open_Cnf takes the Vr exit, the VLR performs the earlier MAP version dialogue as specified in [51] and the process terminates.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the HLR could not be opened, the MAP process sends a negative response indicating system failure to the data restoration process in the GMSC and returns to the idle state.

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

23.4.5 Procedures in the SGSN

23.4.5.1 The Mobile Subscriber is present

If the SGSN successfully handles a Page response, Attach request or Routing Area Update request message (3GPP TS 24.008 [35]), while the MS Not Reachable for GPRS (MNRG) flag is set, the SGSN sends a MAP_READY_FOR_SM request to the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS. If authentication fails during the handling of a Page response, Attach request or Routing Area Update request, the SGSN shall not send a MAP_READY_FOR_SM request to the HLR

The process in the SGSN is described in detail in subclause 25.10.2~~/3~~.

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

25 General macro description

25.1 MAP_OPEN handling ~~open~~ macros

25.1.1 Macro Receive_Open_Ind

This macro is used by a MAP service-user procedure when a peer entity requests opening of a dialogue.

~~If the application context received in the MAP-OPEN indication primitive indicates a context name of the MAP version one context set, the macro takes the Vr exit..~~

~~If an application context different from version 1 is received, the presence of MAP_OPEN information is checked. If no MAP_OPEN information has been received, the MAP_OPEN response with:~~

- ~~Result set to Dialogue Accepted; and~~

- Application Context Name set to the received value,

is returned.

If the received version (Vr) is the one described in this version of MAP, the macro takes the OK exit, otherwise it takes the Vr exit..

If MAP_OPEN information is received, the macro "CHECK_REFERENCE" is called in order to check whether the received values for Destination Reference and Originating Reference correspond with the requirements of the received application-context-name. If the outcome of this check is an error, the MAP_OPEN responds with:

- Result set to Dialogue Refused;

- Refuse Reason set to Invalid Destination Reference or Invalid Originating Reference;

- Application Context Name set to the highest version supported,

is returned and the macro takes the error exit.

If the data values received for Destination Reference and Originating Reference are accepted for the associated application-context-name it is checked whether the Destination Reference is known if this check is required by the process that calls the macro.

If the Destination Reference (e.g. a subscribers IMSI) is unknown, the MAP_OPEN response with

- Result set to Dialogue Refused;

- Refuse Reason set to Invalid Destination Reference;

- Application Context Name set to the highest version supported,

is returned and the macro takes the error exit.

Else, if the Destination Reference is accepted or if no check is required, the MAP_OPEN response with

- Result set to Dialogue Accepted; and

- Application Context Name set to the received value,

is returned and

If the received version (Vr) is the one described in this version of MAP, the macro takes the OK exit, otherwise it takes the Vr exit.

25.1.2 Macro Receive_Open_Cnf

This macro is used by a user procedure after it has requested opening of a dialogue towards a peer entity.

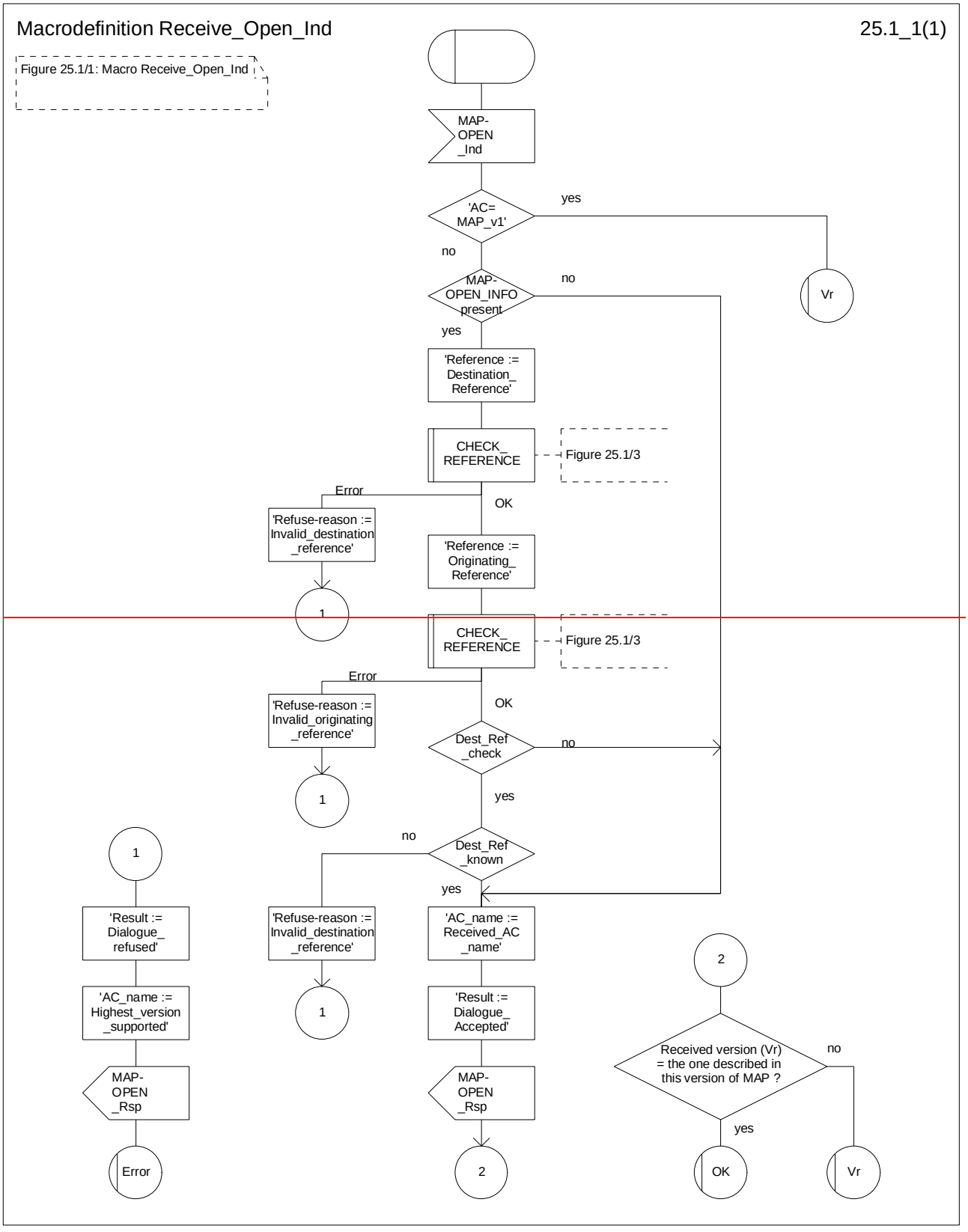
On receipt of a MAP_OPEN Confirmation with a "Result" parameter indicating "Dialogue Accepted", the macro takes the OK exit.

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.


Macrodefinition Receive_Open_Ind
25.1_1(1)
Figure 25.1/1: Macro Receive_Open_Ind
MAP-OPEN _Ind
'AC= MAP_v1'
yes
no
Vr
MAP-OPEN_INFO present
no
yes
'Reference := Destination_ Reference'
CHECK_ REFERENCE
Figure 25.1/3
Error
OK
'Refuse-reason := Invalid_destination _reference'
'Reference := Originating_ Reference'
1
CHECK_ REFERENCE
Figure 25.1/3
Error
OK
'Refuse-reason := Invalid_originating _reference'
Dest_Ref _check
no
1
yes
no
Dest_Ref _known
1
yes
'Result := Dialogue_ refused'
'Refuse-reason := Invalid_destination _reference'
'AC_name := Received_AC _name'
2
'AC_name := Highest_version _supported'
1
'Result := Dialogue_ Accepted'
Received version (Vr) = the one described in this version of MAP ?
no
MAP-OPEN _Rsp
MAP-OPEN _Rsp
yes
Error
2
OK
Vr

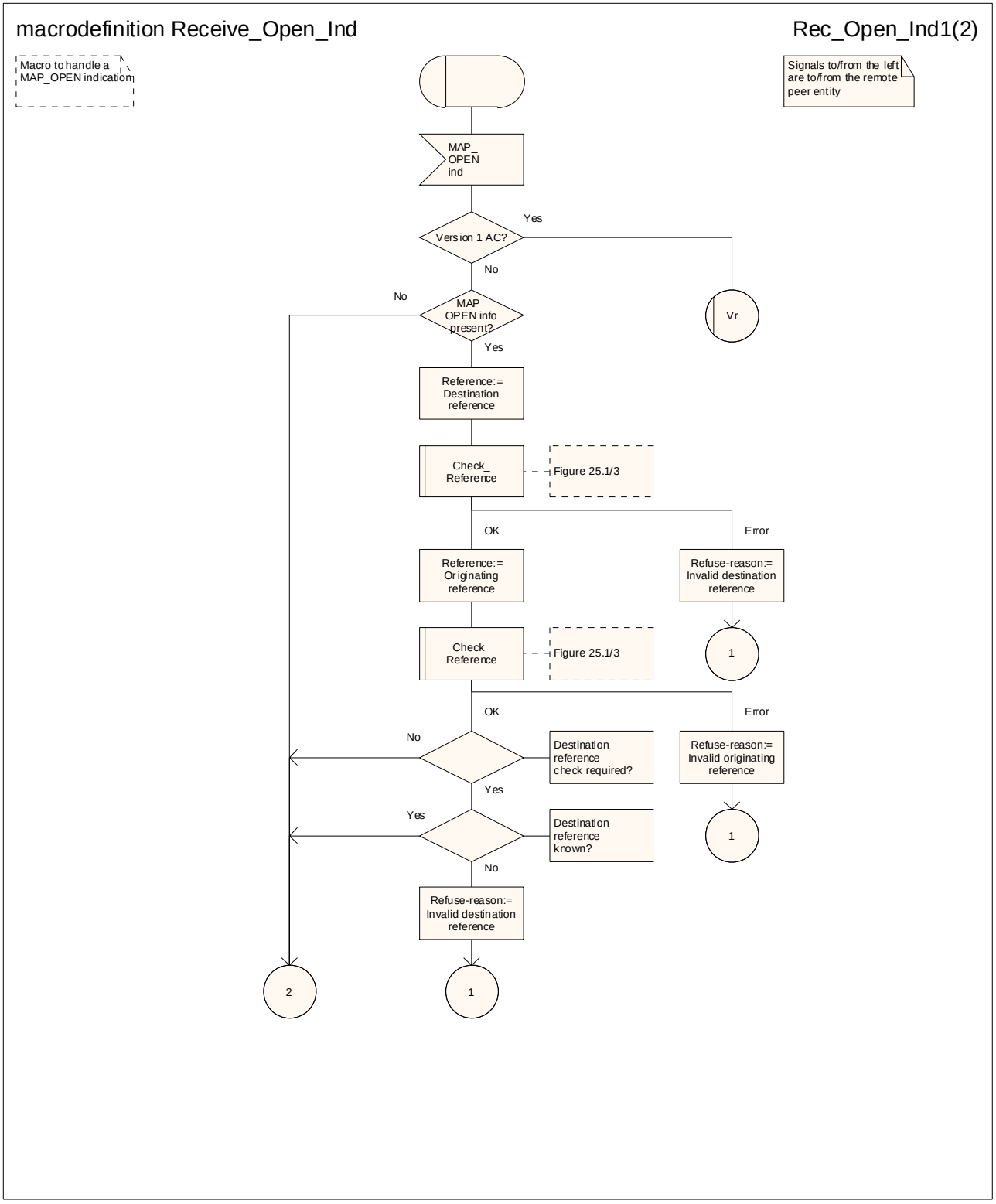


Figure 25.1/1 (sheet 1 of 2): Macro Receive_Open_Ind

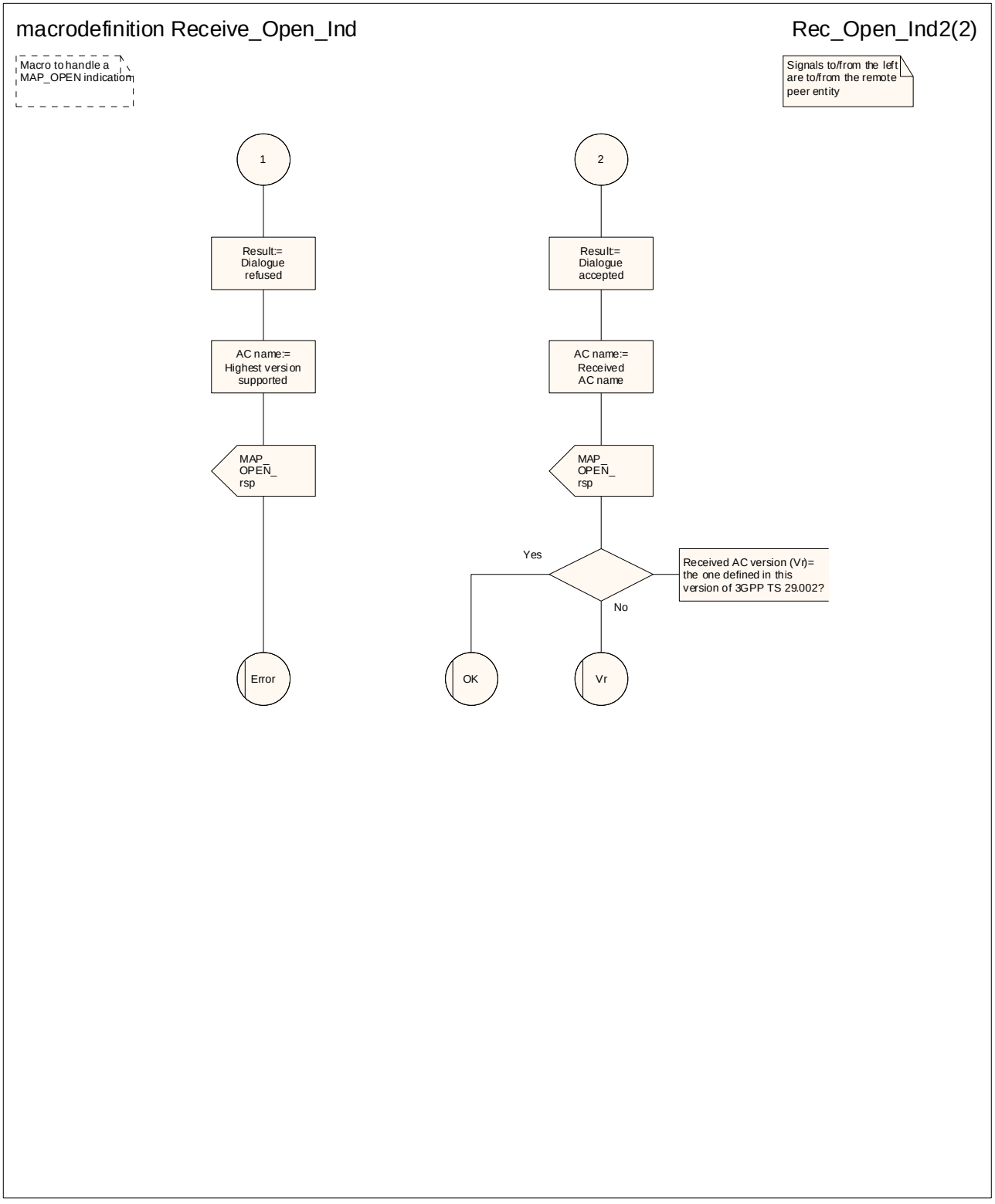
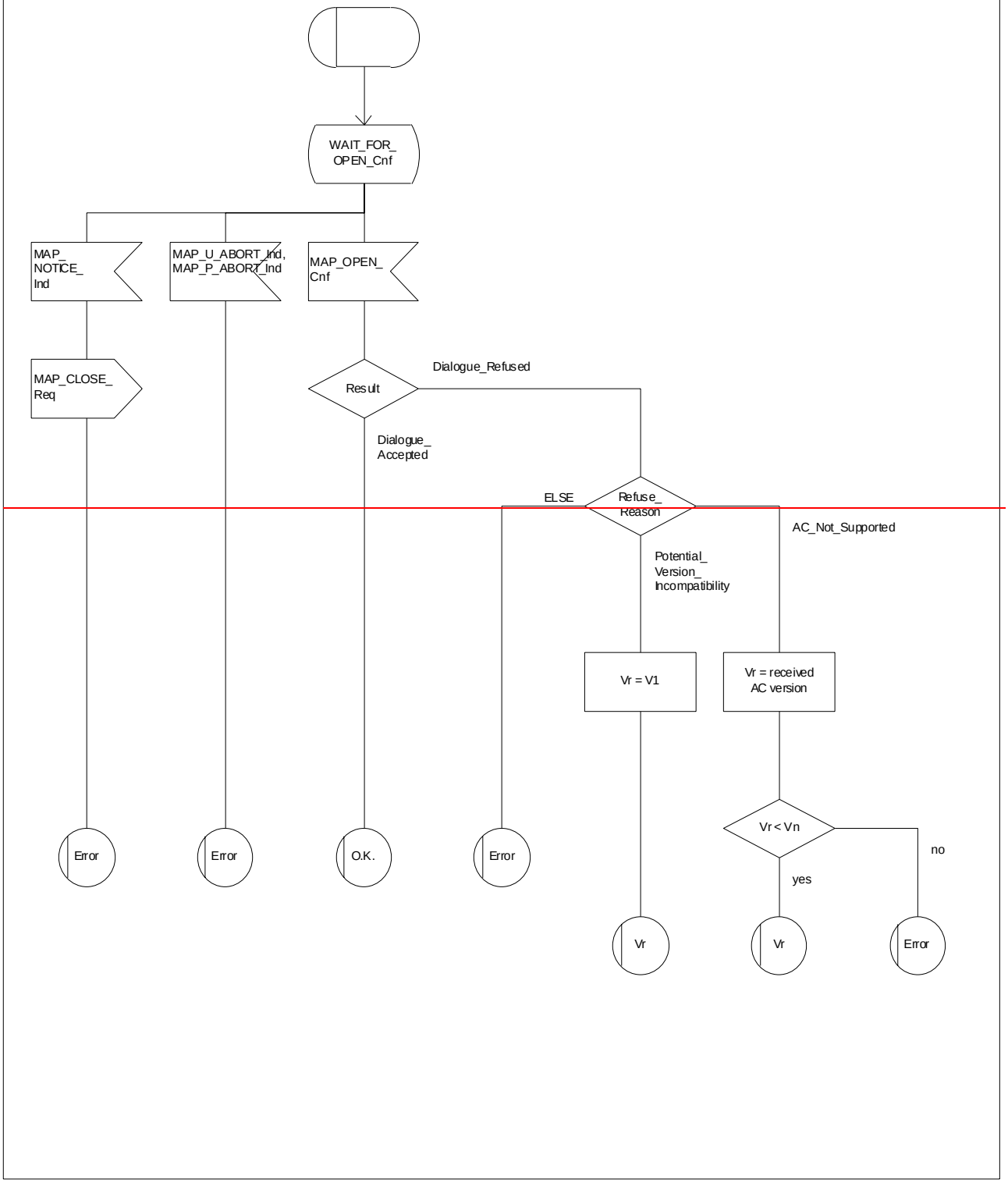


Figure 25.1/1 (sheet 2 of 2): Macro Receive_Open_Ind

Macrodefinition Receive_Open_Cnf 25.1_2(1)

Figure 25.1/2: Macro to receive a MAP_OPEN _Cnf



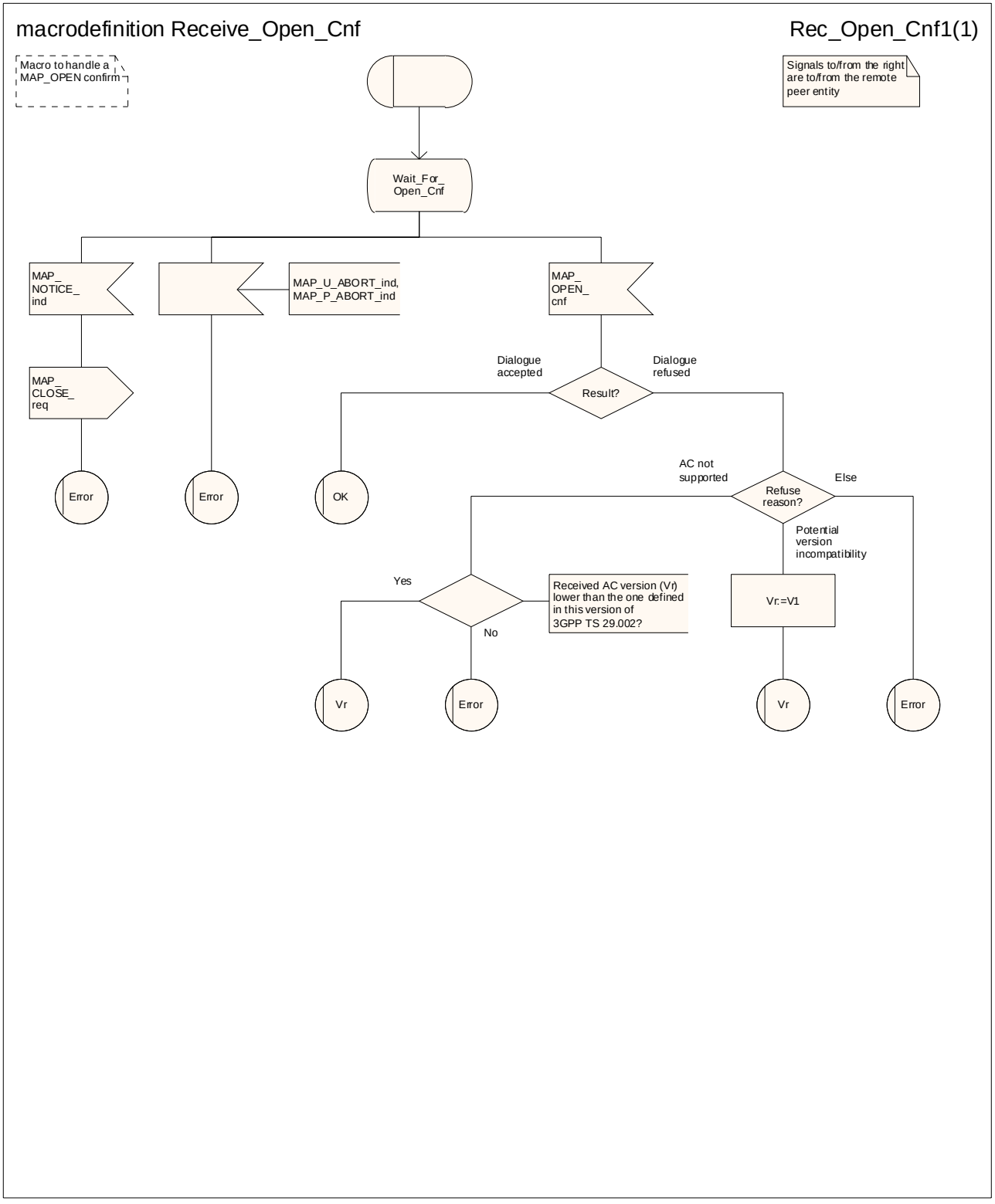
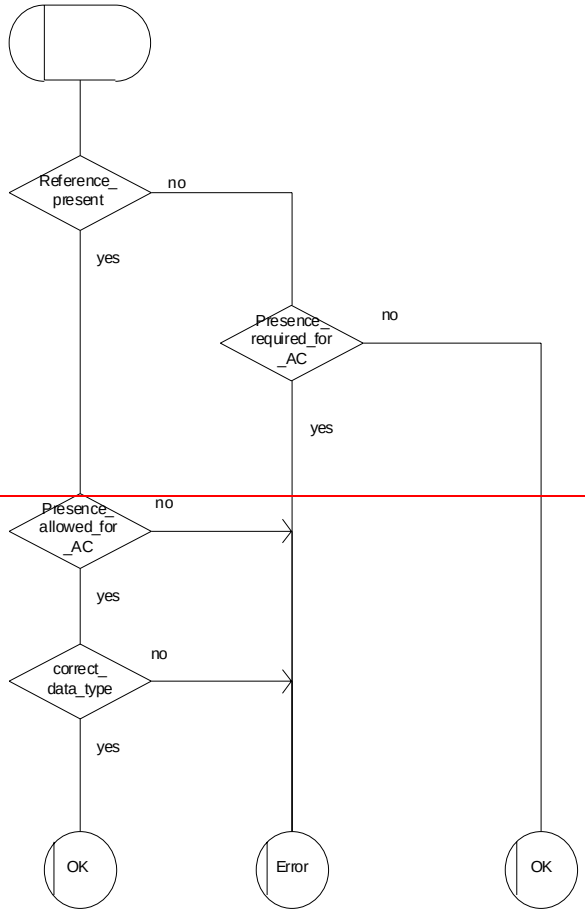


Figure 25.1/2: Macro Receive_Open_Cnf

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



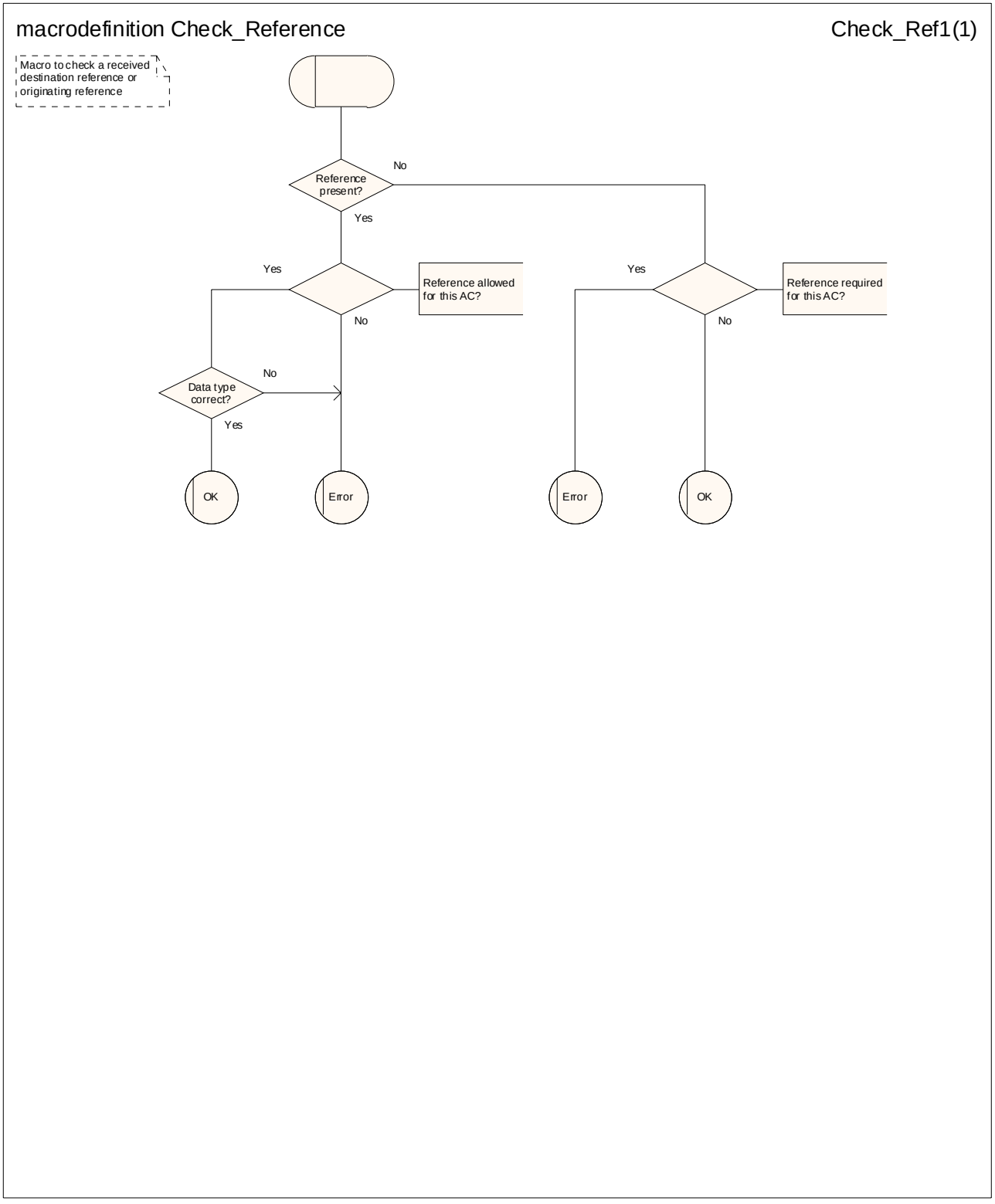


Figure 25.1/3: Macro Check~~HECK~~_Reference~~EFERENCE~~

25.2 Macros to check the content of indication and confirmation primitives

25.2.1 Macro Check_Indication

This macro checks that an indication includes all the parameters required by the application, no more and no less, and that the parameters are all within the correct range. It does not handle syntax checking; that is part of the function of the MAP protocol machine.

~~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

This macro checks whether a confirmation contains an error or a result, and if it contains a result whether the result is correctly formed.

~~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.~~

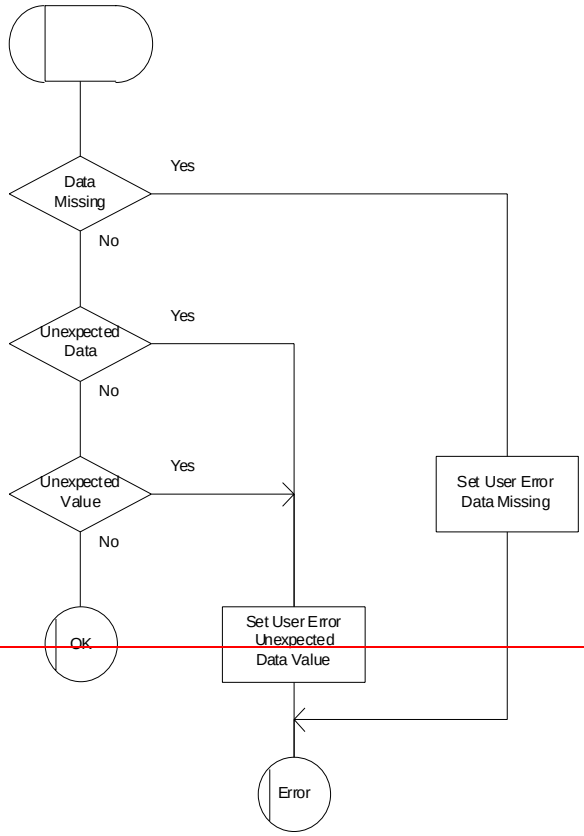
~~Otherwise, if a parameter required by the application is missing from the confirmation, or a parameter not expected by the application is present in the confirmation, or an expected parameter has a value not in the set of values permitted by the application, the macro takes the data error exit.~~

~~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



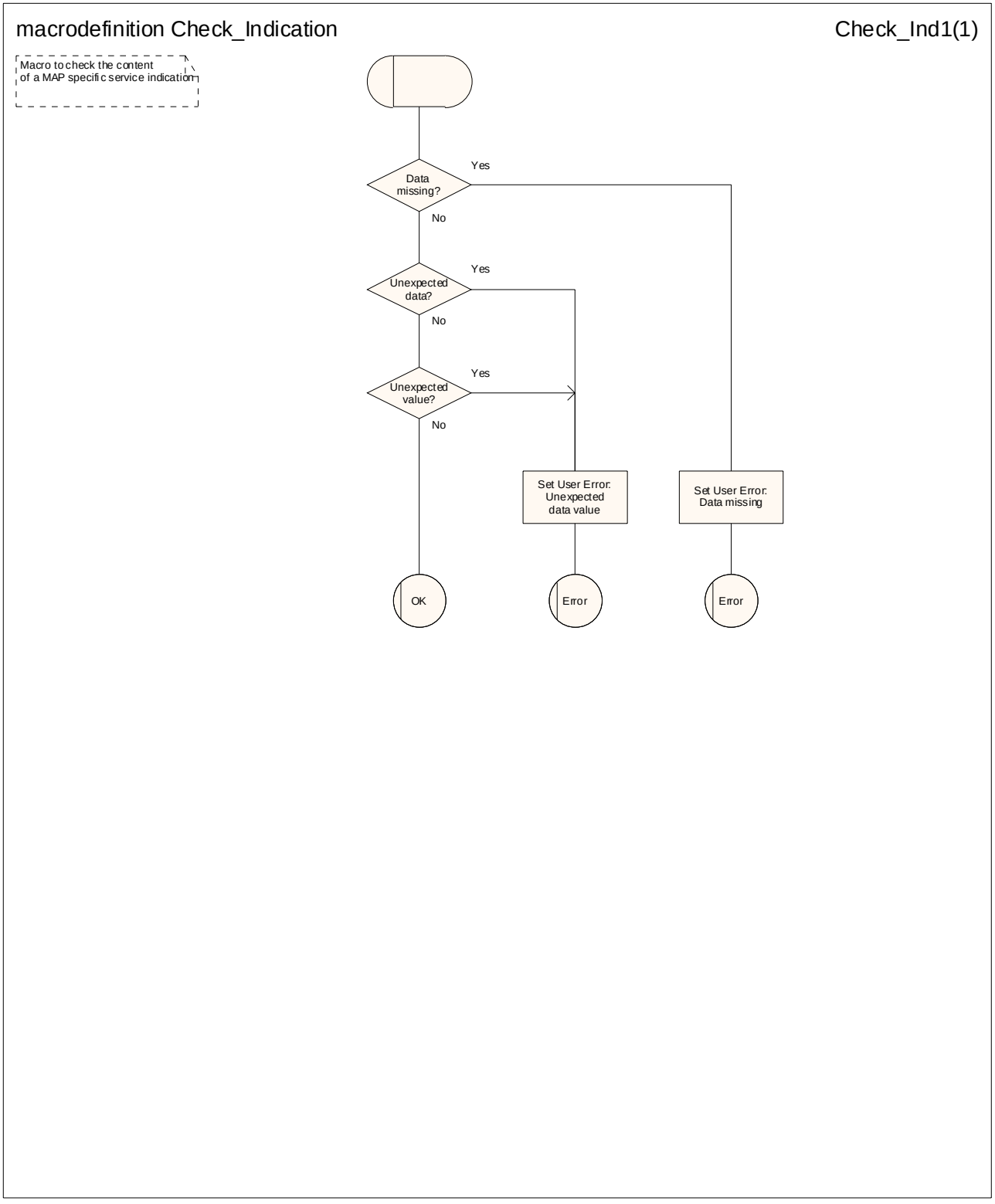
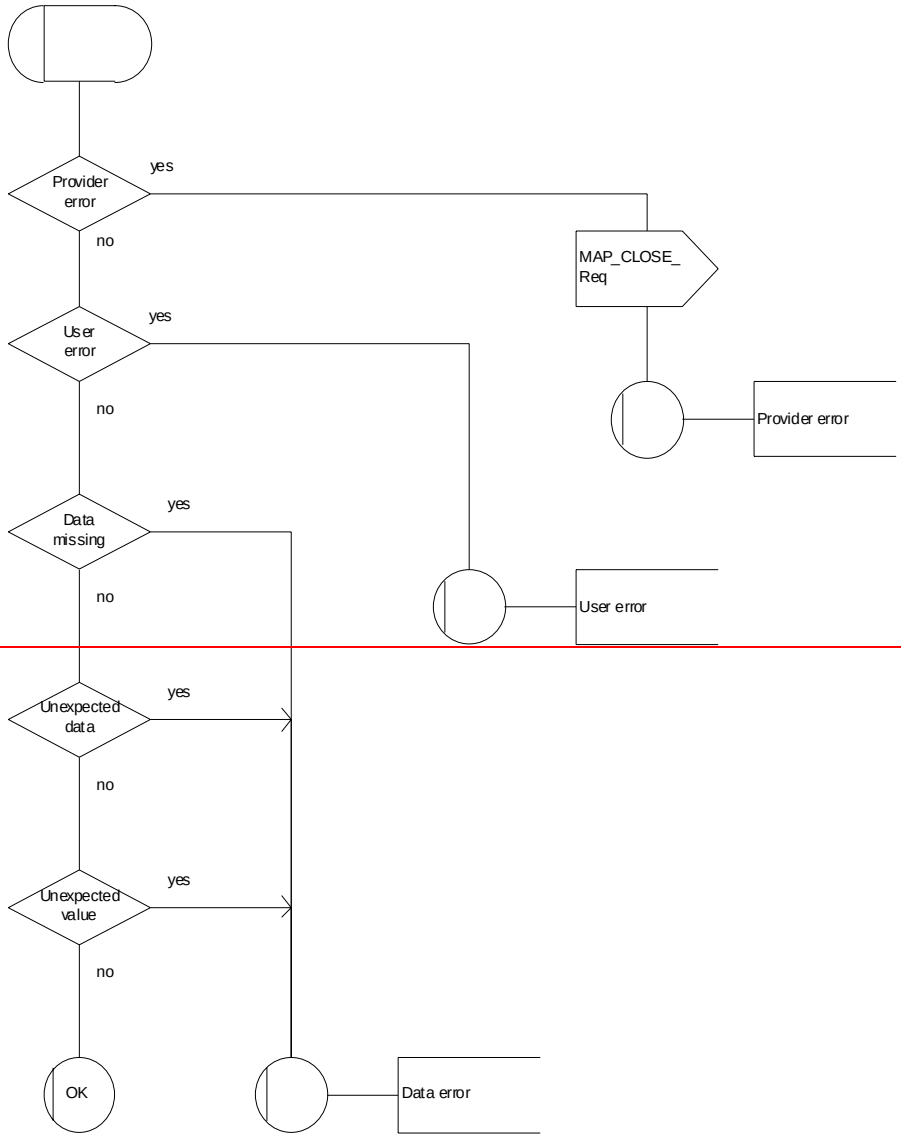


Figure 25.2/1: Macro Check_Indication

Macrodefinition Check_Confirmation 25.2_2(1)

Figure 25.2/2: Macro to check the parameters of a confirmation primitive



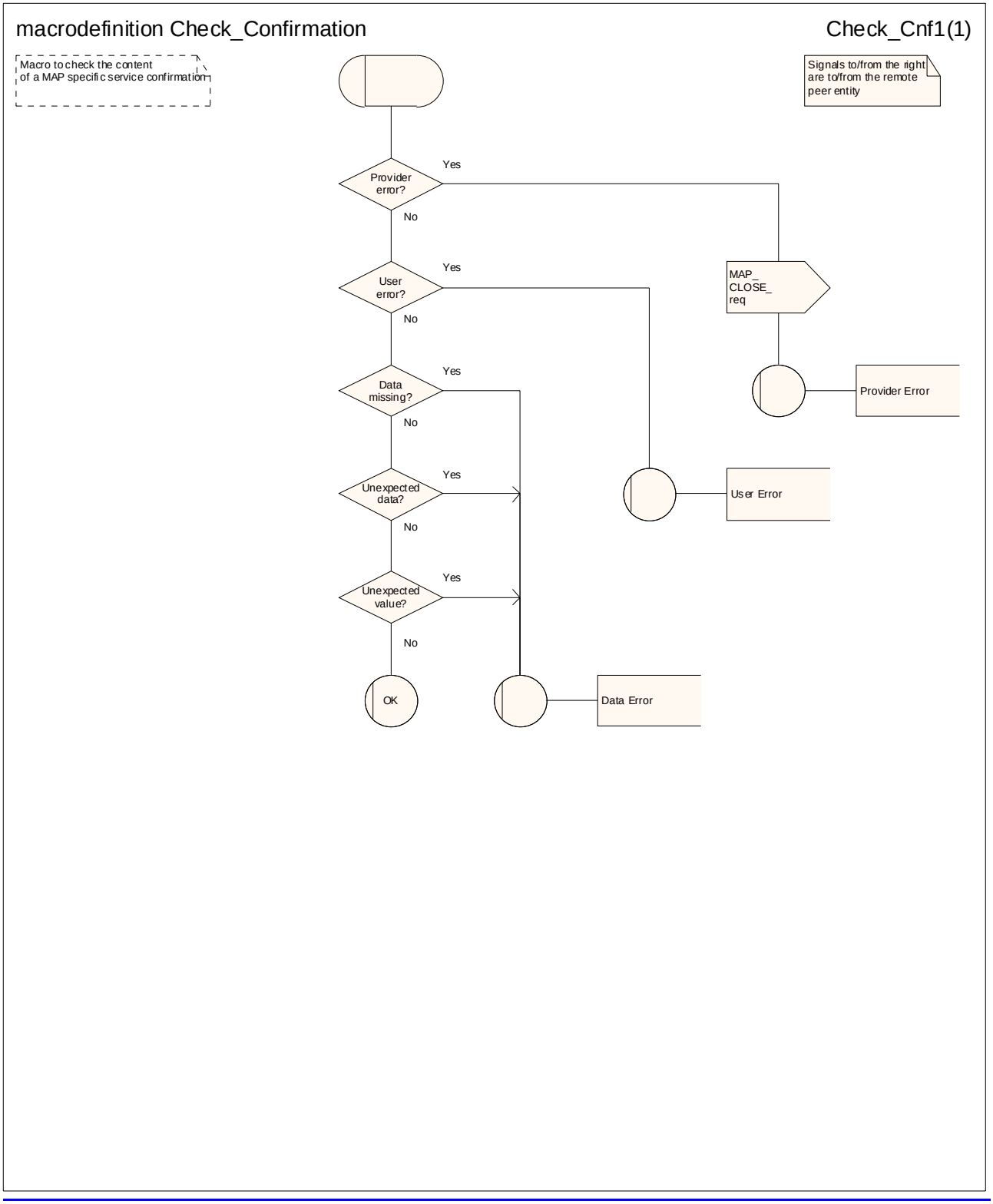


Figure 25.2/2: Macro Check_Confirmation

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.

If an MM-connection over the radio link already exists for the given IMSI, the MSC sets the access connection status according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not).

If the MSC pages the MS and the VLR provided the TMSI, the MSC uses it to identify the MS at the radio interface; otherwise the MSC uses the IMSI. The MSC also uses the IMSI to determine the page group (see 3GPP TS 24.008 [35]).

If 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. This gives priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which gives priority to the mobile terminating request.

If the paging is for MT SMS delivery and the VLR aborts the transaction before the MSC receives a response from the MS, the MSC aborts the transaction with the SMS-GMSC.

~~When the MSC receives a MAP_PAGE indication, parameter checks are performed first (macro Check_Indication, see clause 25.2). If parameter errors are detected, the MSC returns a MAP_PAGE response containing the appropriate error cause and the macro terminates with unsuccessful outcome.~~

~~Thereafter, several checks on the indication content are performed. The macro terminates by returning the MAP_PAGE response with error:~~

- ~~Unknown Location Area if the LAI is not known in the MSC;~~
- ~~System Failure if the call has been released by the calling subscriber or the SMS or SS transaction for this subscriber has been released by the originating entity in the meantime.~~

~~Next, the MSC checks if an MM-connection over the radio link already exists for the given IMSI. If so,~~

- ~~in the case of mobile terminating call set-up the MSC determines whether the busy condition can be established (see 3GPP TS 22.001 [2] for a definition of busy states). If the MSC determines that the MS is busy, it returns a MAP_PAGE response with error Busy Subscriber, qualified by either More Calls Allowed or No More Calls Allowed. The macro then terminates with unsuccessful outcome.~~
- ~~if the service requested is short message service or an unstructured SS notification or network-initiated unstructured SS request, or if the service is mobile terminating call set-up, but the existing connection is for signalling purposes only (i.e. a service different from call set-up), the access connection status is set according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not), and the macro terminates with successful outcome.~~

~~If no MM-connection for the given IMSI exists, paging is initiated at the radio interface within all cells of the location area indicated by the VLR. If the VLR provided the TMSI, the MSC uses it to identify the MS at the radio interface; otherwise the MSC uses the IMSI. The IMSI will also be used to determine the page group (see 3GPP TS 24.008 [35]). There are several possible outcomes of paging:~~

- ~~the MS responds to paging, causing the access connection status to be set accordingly (i.e. no RR-connection, in which case other values are not significant), and the macro terminates with successful outcome;~~
- ~~the MS responds with a channel request containing an establishment cause which is not "answer to paging". The MSC sends a MAP_PAGE response primitive with user error Busy Subscriber before the macro terminates with unsuccessful outcome. This will give priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which will give priority to the mobile terminating request.~~

- there is no response from the MS. The MSC sends a MAP_PAGE response primitive with user error Absent Subscriber before the macro terminates with unsuccessful outcome;

- the call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released before a response is received from the MS (indicated in the SDL by the input signal I-REL). The MAP transaction with the VLR will be released in this case by a MAP_U_ABORT request, and the unsuccessful macro termination will indicate transaction termination.

- the MAP transaction with the VLR may be released by receiving a MAP_U_ABORT or MAP_P_ABORT indication. The call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released (indicated in the SDL by the output signal I-REL), and the unsuccessful macro termination will indicate transaction termination.

25.3.2 Macro Search_For_MS_MSC

This macro (see figure 25.3/2) is called if a mobile terminating call set-up, an unstructured SS notification, a network-initiated unstructured SS request or a mobile terminating short message is to be delivered to the MS and the current location area identity of the MS is not known in VLR.

If an MM-connection over the radio link already exists for the given IMSI, the MSC returns a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS to the VLR and sets the access connection status according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not).

If the MSC pages the MS, the MSC uses the IMSI to identify the subscriber and the page group (see 3GPP TS 24.008 [35]).

If 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 with user error Busy Subscriber. This gives priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which gives priority to the mobile terminating request.

If the paging is for MT SMS delivery and the VLR aborts the transaction before the MSC receives a response from the MS, the MSC aborts the transaction with the SMS-GMSC.

When the MSC receives a MAP_SEARCH_FOR_MS Indication, parameter checks are performed first (macro Check_indication, see clause 25.2). If parameter errors are detected, the MSC returns a MAP_SEARCH_FOR_MS response containing the appropriate error cause and the macro terminates with unsuccessful outcome.

Thereafter, the MSC checks whether the call or the SMS or SS transaction still exists in the MSC. If the call or the SMS or SS transaction has been released, the MSC returns a MAP_SEARCH_FOR_MS response with error System Failure and the macro terminates with unsuccessful outcome.

Next, the MSC checks if an MM-connection over the radio link already exists for the given IMSI. If so,

- in the case of mobile terminating call set-up the MSC determines whether the busy condition can be established (see 3GPP TS 22.001 [2] for a definition of busy states). If the MSC determines that the MS is busy, it returns a MAP_SEARCH_FOR_MS response with error Busy Subscriber, qualified by either More Calls Allowed or No More Calls Allowed. The macro then terminates with unsuccessful outcome.

- if the service requested is short message service or an unstructured SS notification or network initiated unstructured SS request, or if the service is mobile terminating call set-up, but the existing connection is for signalling purposes only (i.e. a service different from call set-up), a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS is returned to the VLR. The access connection status is set according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not), and the macro terminates with successful outcome.

If no MM-connection for the given IMSI exists, paging is initiated at the radio interface within all cells of all location areas of the VLR, using the IMSI to identify the subscriber and the page group (see 3GPP TS 24.008 [35]). There are several possible outcomes of paging:

- the MS responds to paging, causing a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS to be returned to the VLR. The access connection status will be set

accordingly (i.e. no RR-connection, in which case other values are not significant), and the macro terminates with successful outcome.

- the MS responds with a channel request containing an establishment cause which is not "answer to paging". The MSC sends a MAP_SEARCH_FOR_MS response primitive with user error "Busy Subscriber" before the macro terminates with unsuccessful outcome. This will give priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which will give priority to the mobile terminating request.

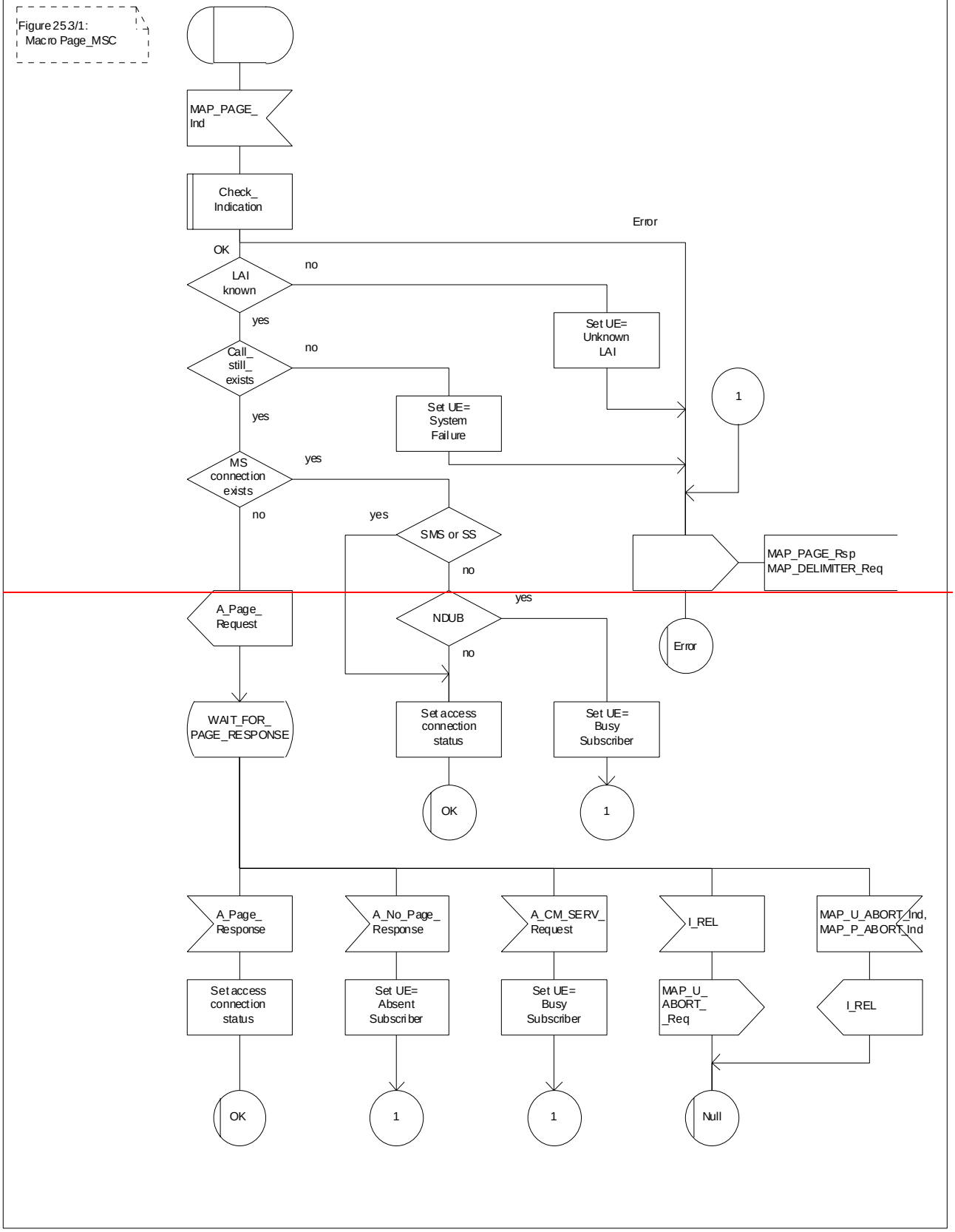
- there is no response from the MS. The MSC sends a MAP_SEARCH_FOR_MS response primitive with user error "Absent Subscriber" before the macro terminates with unsuccessful outcome.

- the call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released before a response is received from the MS (indicated in the SDL by the input signal I_REL). The MAP transaction with the VLR will be released in this case by a MAP_U_ABORT request, and the unsuccessful macro termination will indicate transaction termination.

- the MAP transaction with the VLR may be released by receiving a MAP_U_ABORT or MAP_P_ABORT indication. The call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released (indicated in the SDL by the output signal I_REL), and the unsuccessful macro termination will indicate transaction termination.

Macrodefinition Page_MSC 25.3_1(1)

Figure 25.3/1:
Macro Page_MSC



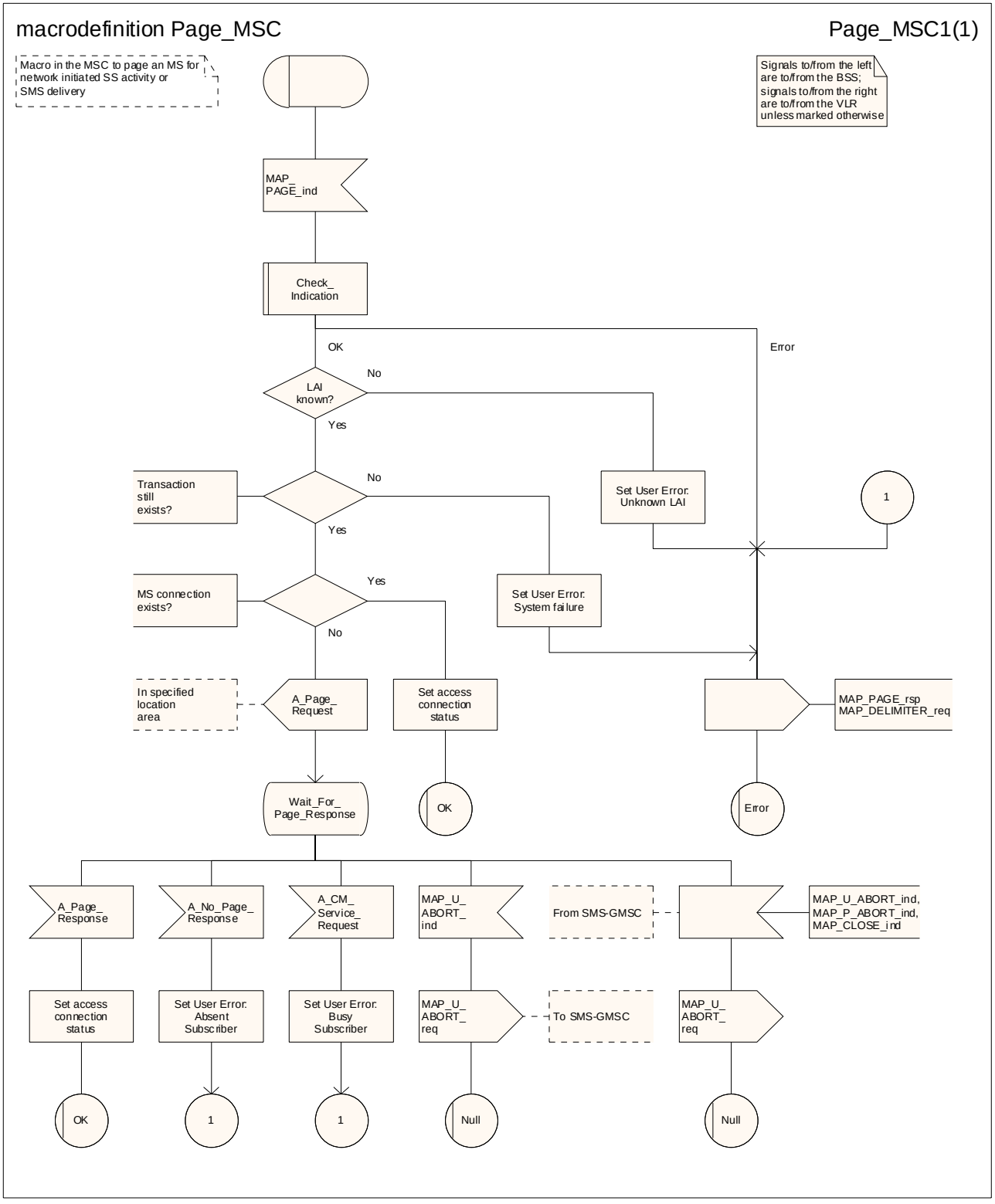
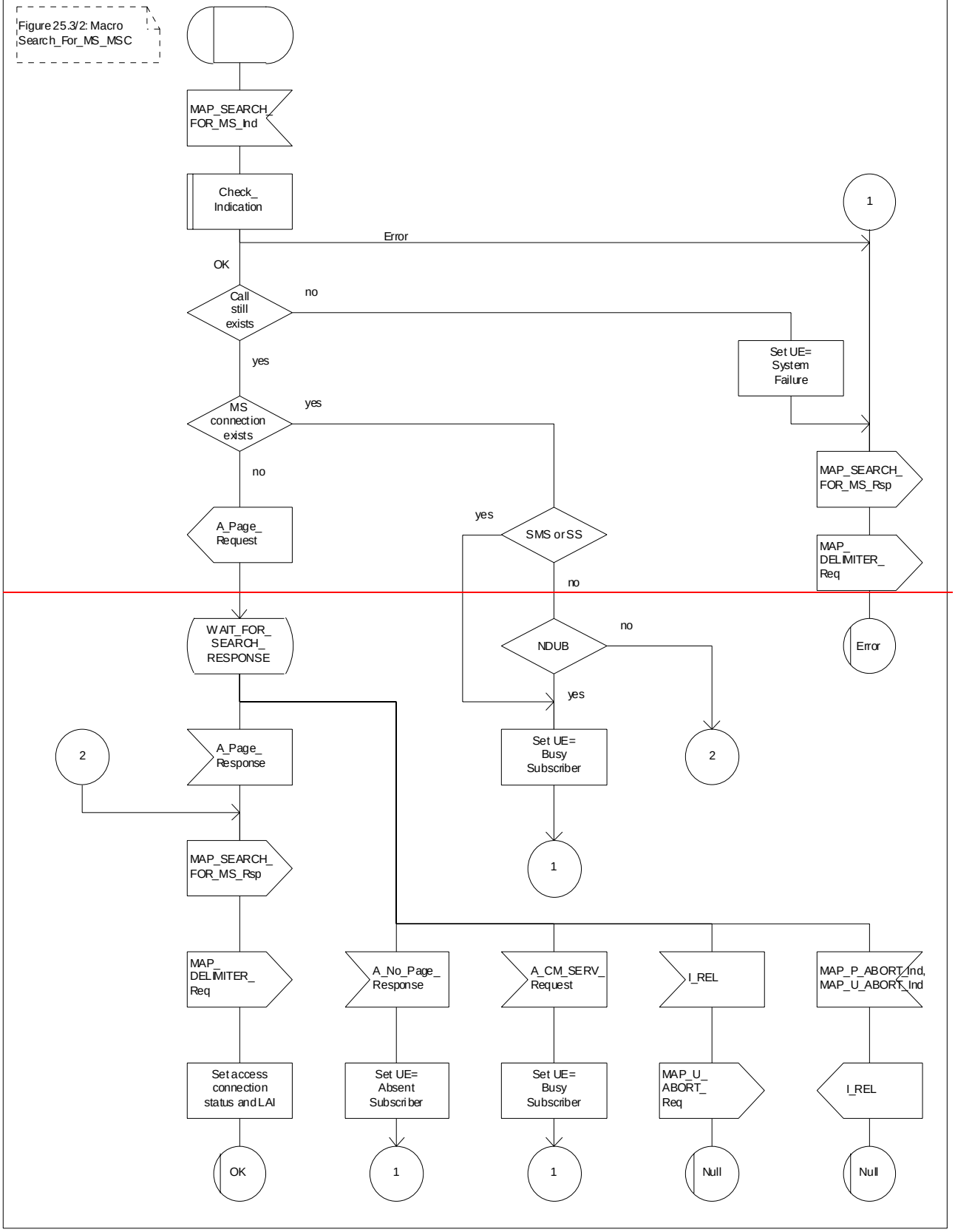


Figure 25.3/1: Macro Page_MSC

Macrodefinition Search_For_MS_MSC 25.3_2(1)

Figure 25.3/2: Macro Search_For_MS_MSC



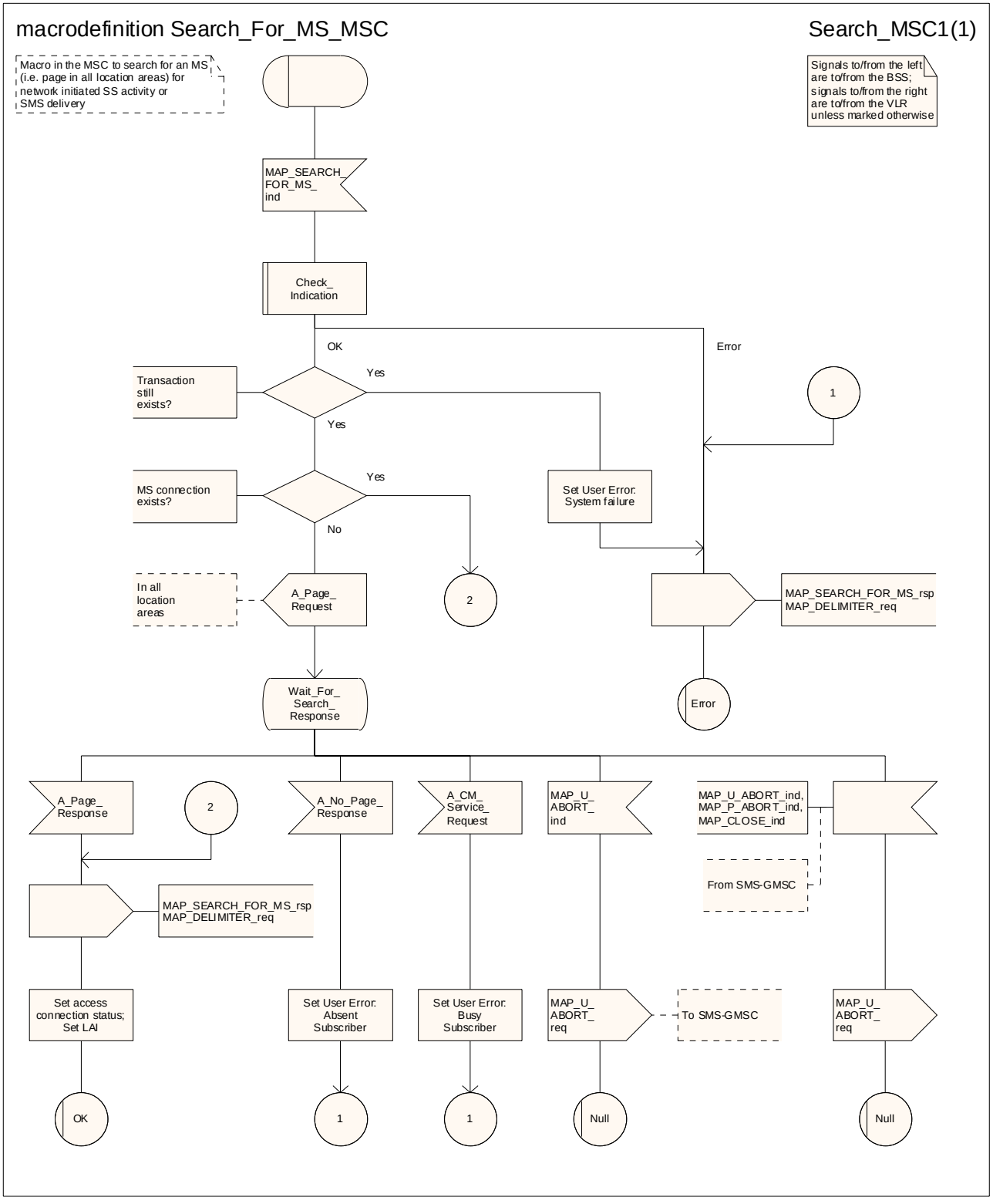


Figure 25.3/2: Macro Search_for_MS_MSC

25.4 Macros for handling an Access Request

These macros are invoked when an MS accesses the network, e.g. to ~~set up an outgoing call~~submit an MO short message or when responding to paging. The macros handle~~s~~ identification and authentication of the mobile subscriber as well as invocation of security related features (see 3GPP TS 42.009 [6]).

25.4.1 Macro Process_Access_Request_MSC

~~This macro is invoked by any procedure receiving an access request from the MS, e.g. the page response at mobile terminating call set-up or the request for outgoing call set-up.~~

~~If no dialogue with the VLR exists (e.g. within the procedure for outgoing call set-up), the MSC will open a dialogue towards the VLR by sending a MAP_OPEN request without any user specific parameters.~~

~~In any case, the parameters received from the MS are mapped to a MAP_PROCESS_ACCESS_REQUEST request primitive, containing:~~

Sheet 1: The MAP_PROCESS_ACCESS_REQUEST request includes the following parameters,

- 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.

Sheet 2, sheet 3: If the MSC receives an A_SETUP indication while it is waiting for further instructions from the VLR or for the acknowledgment of TMSI reallocation from the MS, the MSC saves the setup request for processing after control has returned from the macro Process_Access_Request_MSC to the calling process.

Sheet 3: When the MSC is waiting for a possible instruction to allocate a new TMSI, a MAP_DELIMITER indication indicates that TMSI reallocation is not required.

Sheet 3: If the MS sends a TMSI reallocation failure in response to the TMSI reallocation command, the MSC takes the OK exit; the VLR treats the lack of response as a provider error (see macro Process_Access_Request_VLR).

~~If opening of the dialogue was required, the MSC will wait for the dialogue confirmation (see macro Receive_Open_Confirmation, clause 25.1), leading either to:~~

- ~~immediate unsuccessful exit from the macro, in case no dialogue is possible;~~
- ~~reversion to MAP version one dialogue if indicated by the VLR. The macro terminates with unsuccessful outcome, as the complete dialogue will be covered by the version one procedure, so that no further action from the calling process is required;~~
- ~~continuation as given below, if the dialogue is accepted by the VLR.~~

~~The MSC waits then for the MAP_PROCESS_ACCESS_REQUEST confirmation. In between, several other indications may be received from the VLR:~~

- ~~the MSC may receive a MAP_PROVIDE_IMSI indication, handled by the macro Obtain_IMSI_MSC defined in clause 25.8. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;~~
- ~~the MSC may receive a MAP_AUTHENTICATE indication, handled by the macro Authenticate_MSC defined in clause 25.5. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;~~
- ~~the MSC may receive a MAP_TRACE_SUBSCRIBER_ACTIVITY indication, handled by the macro Trace_Subscriber_Activity_MSC defined in clause 25.9;~~

- the MSC may receive a MAP_SET_CIPHERING_MODE indication, which will be stored for initiating ciphering later on;

- the MSC may receive a MAP_CHECK_IMEI indication, handled by the macro Check_IMEI_MSC defined in clause 25.6. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;

- the MSC may receive a MAP_Obtain_IMEI indication, handled by the macro Obtain_IMEI_MSC defined in clause 25.6. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;

- the MSC may receive a MAP_U_ABORT or MAP_P_ABORT indication, or a premature MAP_CLOSE indication from the VLR. In all these cases, the macro terminates with unsuccessful outcome, after sending the appropriate reject towards the MS (see 3GPP TS 29.010 [58]);

- the MSC may receive a MAP_NOTICE indication from the VLR. In this case, the dialogue towards the VLR is terminated by a MAP_CLOSE primitive, the appropriate reject is sent towards the MS (see 3GPP TS 29.010 [58]), and the macro terminates with unsuccessful outcome;

- the MSC may receive an indication for release of the radio path, in which case the dialogue towards the VLR will be terminated by a MAP_U_ABORT primitive, containing the diagnostic information Radio Channel Release.

When the MAP_PROCESS_ACCESS_REQUEST confirmation is received, the parameters of this primitive are checked first. In case of unsuccessful outcome of the service, the MAP User Error received is mapped onto the appropriate radio interface message (see 3GPP TS 29.010 [58]), before the macro terminates with unsuccessful outcome.

In case of positive outcome of the service, ciphering is initiated on the radio path, if this had been requested by the VLR (see above). Otherwise, if the access request was not triggered by a page response from the MS, the access request is accepted explicitly by sending a CM_Service_Accept message to the MS. If the access request was triggered by a page response from the MS then no CM Service Accept message is sent.

After ciphering has been initiated, the MSC will wait for the MAP_FORWARD_NEW_TMSI indication from the VLR. While waiting, the MSC may receive:

- a MAP_U_ABORT or MAP_P_ABORT indication, or a premature MAP_CLOSE indication from the VLR. In these cases, the macro terminates with unsuccessful outcome, after sending a release request towards the MS (see 3GPP TS 29.010 [58]);

- a MAP_NOTICE indication from the VLR. In this case, the dialogue towards the VLR is terminated by a MAP_CLOSE primitive, the appropriate reject is sent towards the MS (see 3GPP TS 29.010 [58]), and the macro terminates with unsuccessful outcome;

- an indication for release of the radio path, in which case the dialogue towards the VLR will be terminated by a MAP_U_ABORT primitive, containing the diagnostic information Radio Channel Release;

- a MAP_DELIMITER request from the VLR. This will be taken as a successful outcome of the macro (i.e. the VLR did not require TMSI reallocation), and it terminates successfully;

- an A_SETUP request from the MS. This will be saved for handling by the procedure which invoked the macro Process_Access_Request_MSC after the macro has terminated.

When the MAP_FORWARD_NEW_TMSI indication is received in the MSC, the TMSI Reallocation Command is sent to the MS, and the MSC waits for an acknowledgement from the MS. In case a positive acknowledgement is received, the MSC sends an empty MAP_FORWARD_NEW_TMSI response primitive to the VLR and terminates successfully. Else, the dialogue is terminated locally (MAP_CLOSE_Req with Release method Prearranged End) without any further action.

If the MSC receives an A_SETUP request while it is waiting for the TMSI acknowledgement from the MS, the A_SETUP is saved for handling by the procedure which invoked the macro Process_Access_Request_MSC after the macro has terminated.

~~If the dialogue is aborted by the VLR while waiting for the TMSI acknowledgement from the MS, the MSC regards the access request to be failed and terminates with unsuccessful outcome, after sending a release request towards the MS (see 3GPP TS 29.010 [58]).~~

***** CR editor's note: The (much reduced!) text of the next two subclauses has been moved from its position immediately after the SDL diagram for the macro Process_Access_Request_MSC. *****

25.4.2 Macro Process_Access_Request_VLR

***** CR editor's note: The handling for a repeat attempt at authentication if an MS has identified itself with a TMSI and the authentication fails has been moved from the macro Process_Access_Request_VLR to the macro Authenticate_VLR. This is a modelling change; the functional behaviour is the same. *****

***** CR editor's note: the existing text description of the handling after successful authentication differs from the SDL description in sheet 2; the handling described in the text seems more reasonable, so the SDL has been aligned with the existing text. *****

Sheet 3: If the MSC does not send a positive response to the MAP_FORWARD_NEW_TMSI request, this is treated as a MAP_FORWARD_NEW_TMSI confirmation containing a provider error. The Macro takes the Error exit. If TMSI reallocation does not succeed, the old TMSI is frozen, to prevent it from being reallocated. In this case, both old and new TMSIs are regarded as valid.

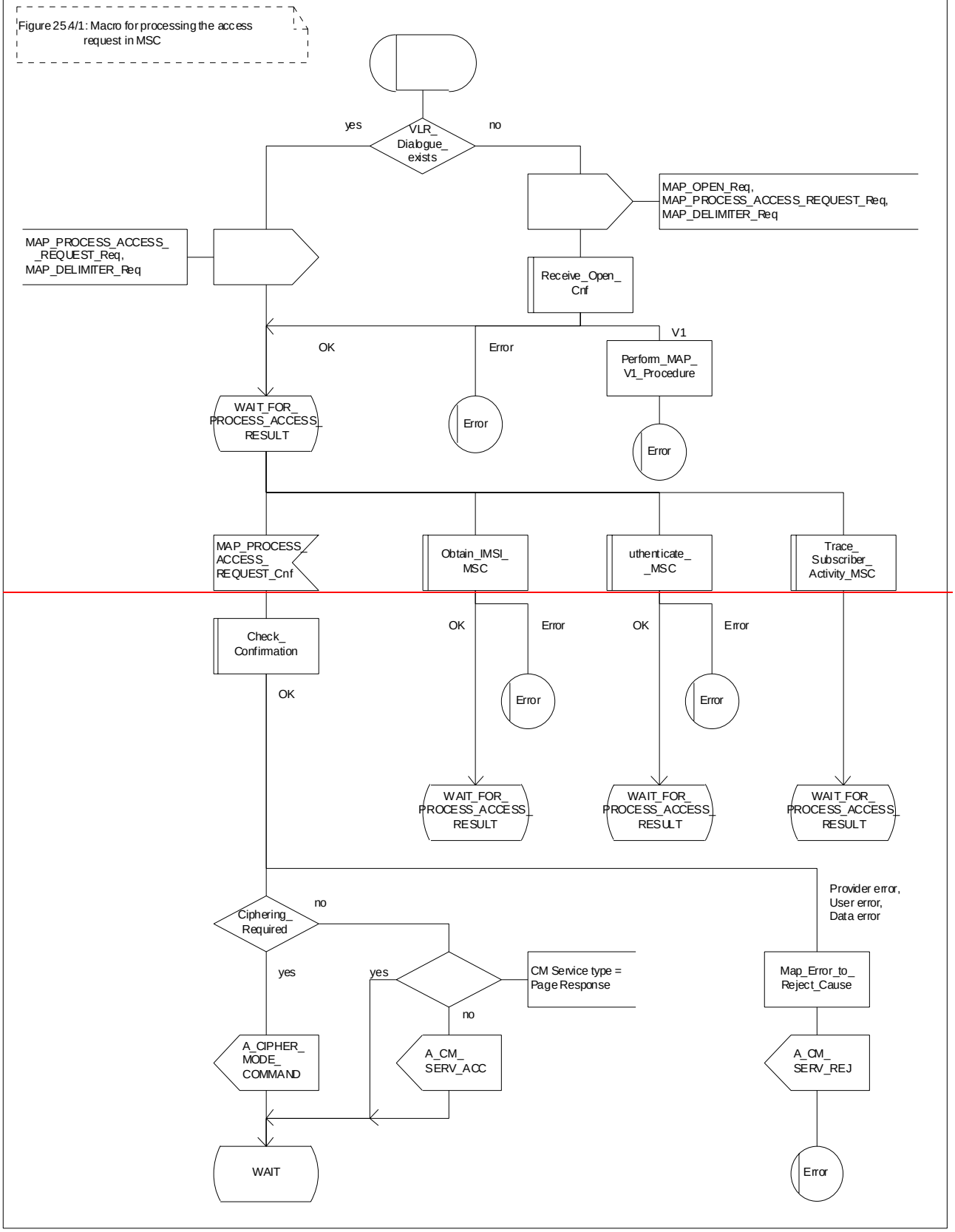
25.4.3 Macro Obtain_Identity

This macro is invoked by the macro Process_Access_Request_VLR if the subscriber's identity is not known in the VLR.

It is an operator option to allow or prevent retrieval of the IMSI without encryption.

Macrodefinition Process_Access_Request_MSC 25.4_1.1(3)

Figure 25.4/1: Macro for processing the access request in MSC



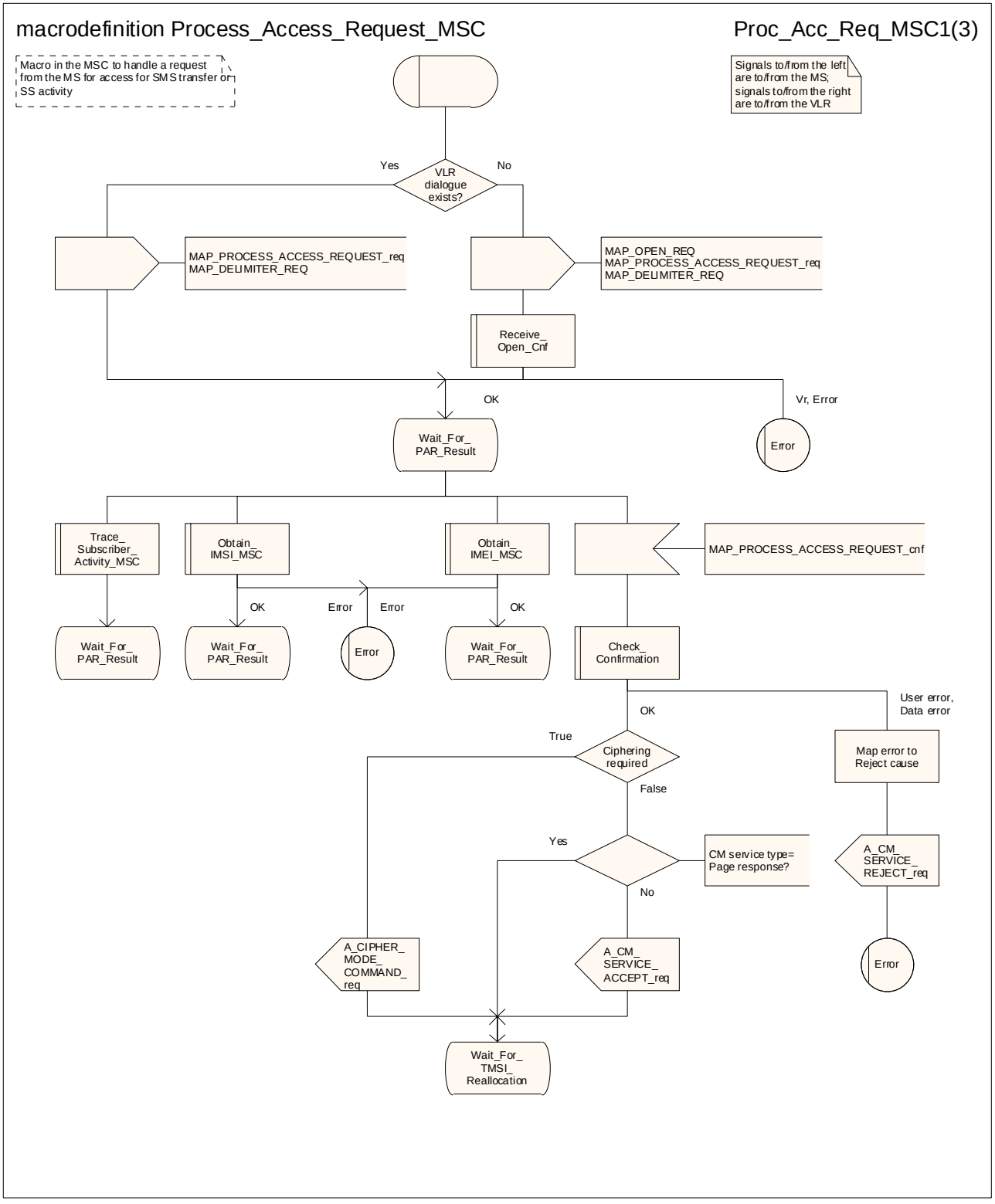
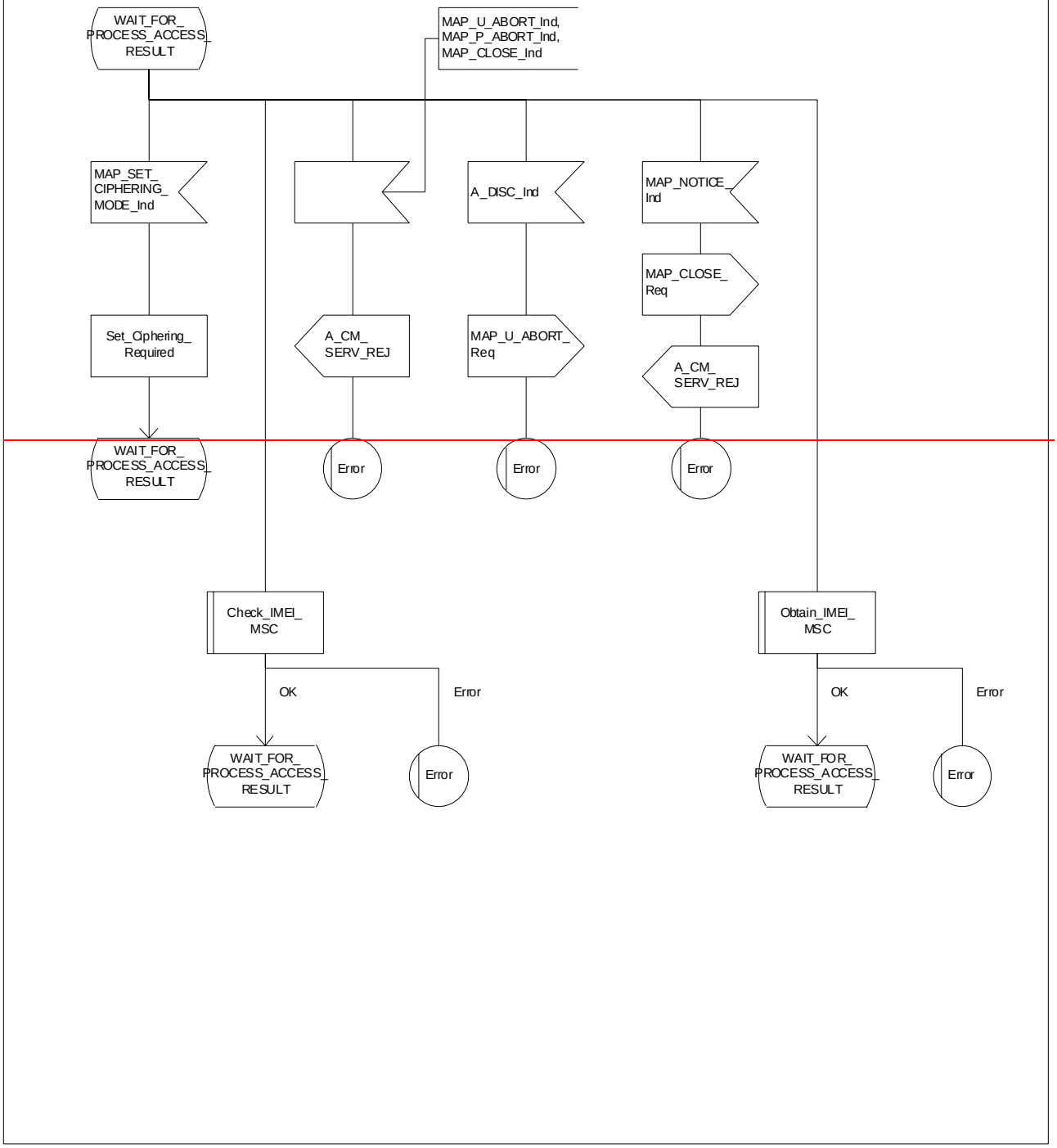


Figure 25.4/1 (sheet 1 of 3): Macro Process_Access_Request_MSC

Macrodefinition Process_Access_Request_MSC 25.4_1.2(3)

Figure 25.4/1: Macro for processing the access request in MSC



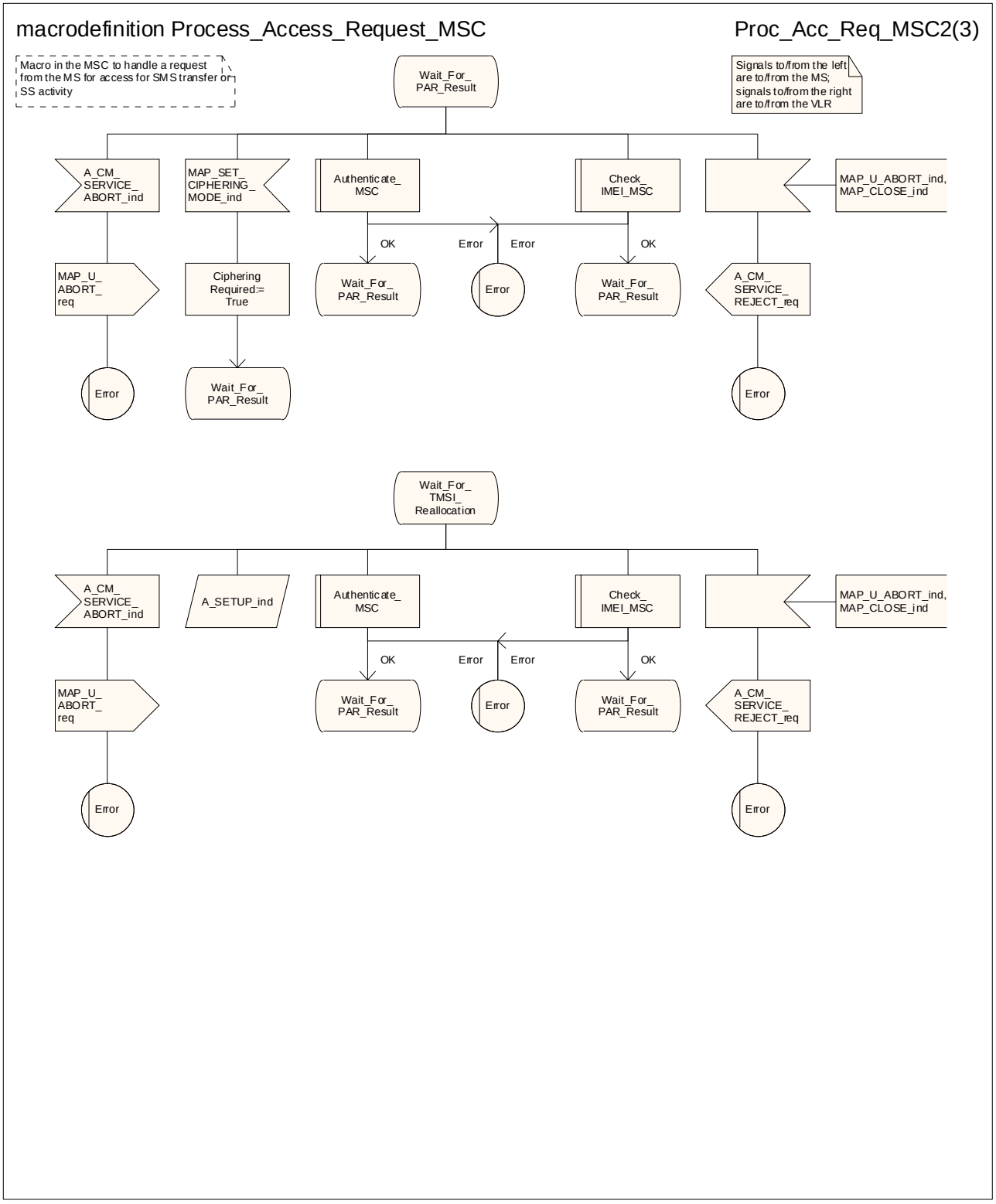
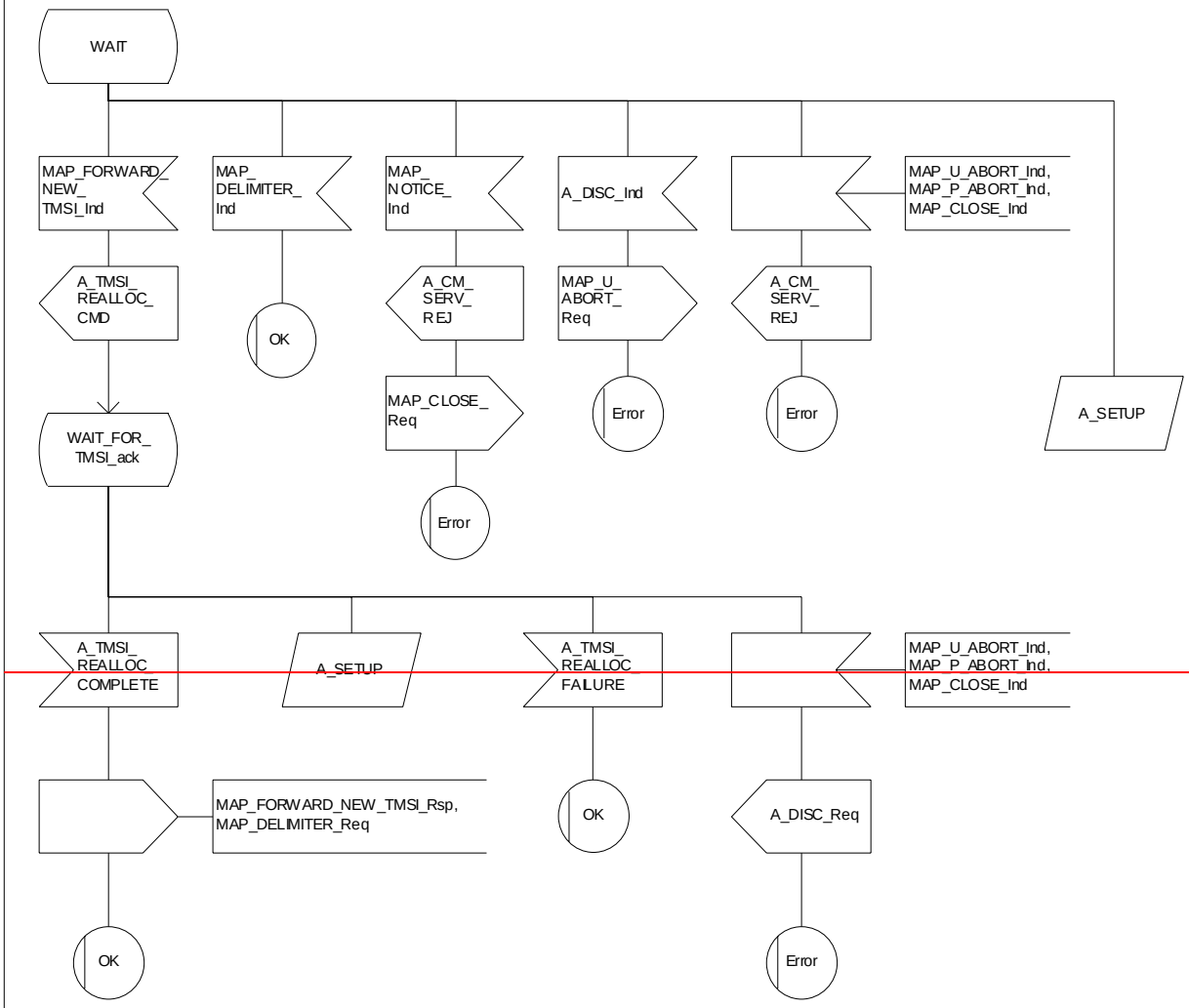


Figure 25.4/1 (sheet 2 of 3): Macro Process_Access_Request_MSC

Macrodefinition Process_Access_Request_MSC 25.4_1.3(3)

Figure 25.4/1: Macro for processing the access request in MSC



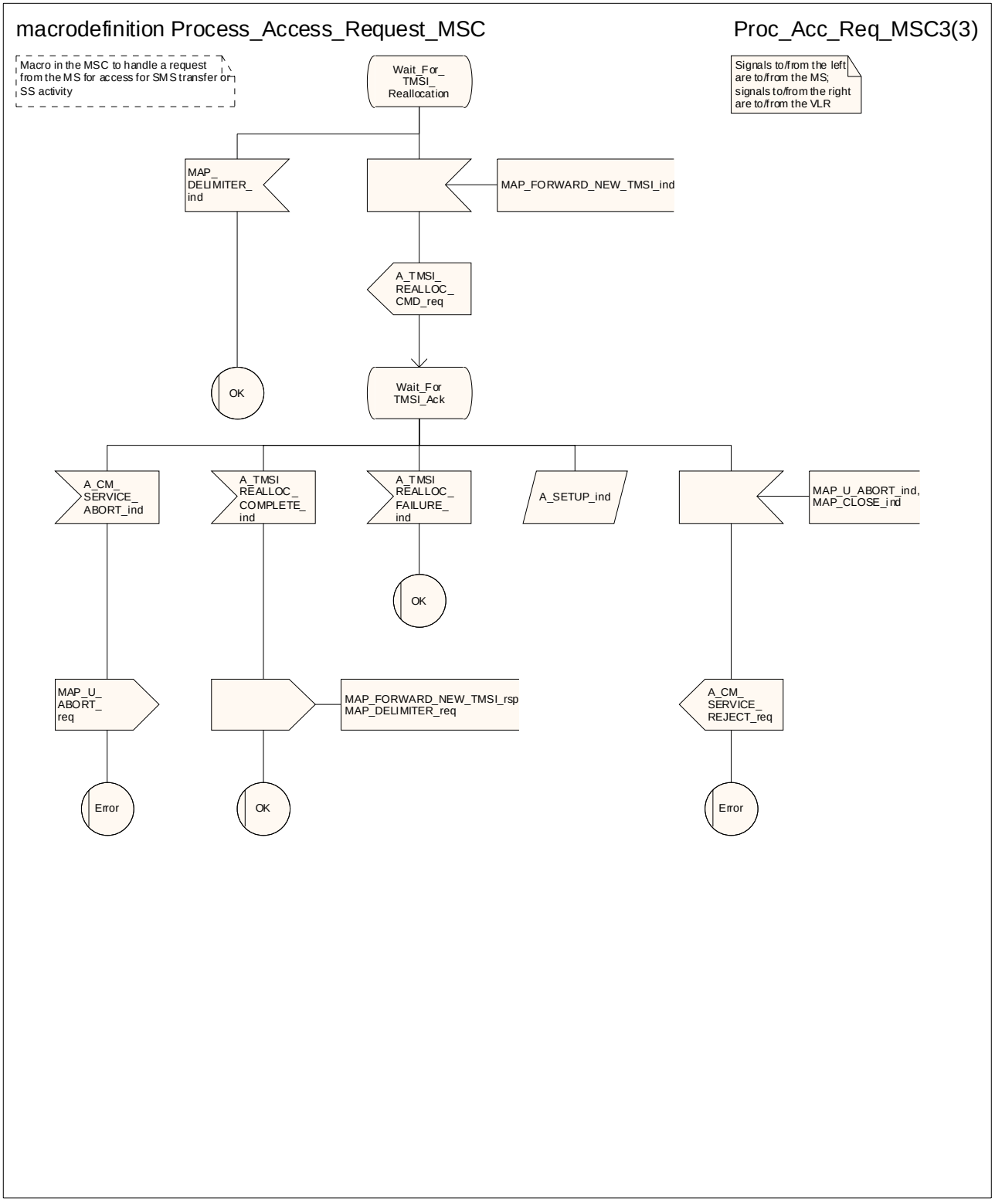


Figure 25.4/1 (sheet 3 of 3): Macro Process_Access_Request_MSC

***** CR editor's note: the (reduced!) text of the next two subclauses has been moved to follow immediately after the text of subclause 25.4.1. *****

25.4.2 Macro Process_Access_Request_VLR

When the VLR receives a MAP_PROCESS_ACCESS_REQUEST indication, the VLR will check this indication first (macro Check_Indication, see clause 25.2). In case of negative outcome, the macro will proceed with the error handling described below.

If the indication data are correct, it is checked first whether the subscriber identification (IMSI or TMSI) is known if included:

- if the identification is not known, the IMSI may be requested from the MS, described in the macro Identification_Procedure (see below) with outcome:
  - OK, if a IMSI known in the VLR has been received;
  - Error, if the VLR did not recognise the subscriber's identity. The macro will proceed with the error handling described below;
  - Aborted, if the transaction to the MSC is released. The macro will terminate immediately with unsuccessful.

In case the identity received is an IMEI, the error System Failure is set and the macro proceeds with the error handling described below.

NOTE: Emergency Call with IMEI may be accepted within the error handling phase.

For a known subscriber the authentication check is performed next (see macro Authenticate_VLR, clause 25.5), if required. If a negative result is received, the VLR proceeds on receipt of user error:

- illegal subscriber depending on the identity used for authentication;
- In case IMSI is already used or no new authentication attempt with IMSI shall not be performed (operator option), the error Illegal Subscriber is set and the macro proceeds with the error handling described below.
- If a new authentication attempt with IMSI shall be performed, the IMSI is requested from the MS (macro Obtain_IMSI_VLR, see clause 25.8):
  - the authentication will be performed again if a IMSI known in the VLR is received;
  - the error Unidentified Subscriber is set and the macro proceeds with the error handling described below, if the IMSI received is unknown in VLR;
  - if the IMSI request procedure fails for any other reason, the error System Failure is set and the macro proceeds with the error handling described below;
  - if the dialogue has been aborted during the IMSI request, the macro terminates immediately with unsuccessful outcome;
- unknown subscriber by setting the error Unidentified Subscriber and proceeding with the error handling described below.

NOTE: This can occur only in case of data inconsistency between HLR and VLR;

- procedure error by setting the error System Failure and proceeding with the error handling described below;
- null (i.e. the dialogue towards the MSC is terminated) by terminating immediately with unsuccessful outcome.

The MS access is accepted if no authentication is required or after successful authentication. Then, the indicator "Confirmed by Radio Contact" is set to "Confirmed". If the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed", HLR updating will be started as an independent process (Update_Location_VLR, see clause 19.1.1.6).

If the indicator "Confirmed by HLR" is set to "Not Confirmed", the error Unidentified Subscriber is set and the macro proceeds with the error handling described below.

If roaming is not allowed in the location area indicated in the Current Location Area Id parameter, the error Roaming Not Allowed qualified by the roaming restriction reason is set and the macro proceeds with the error handling described below.

In case roaming is allowed, the IMSI is set to attached and the process for notifying the HLR that the subscriber is present is started if required (Subscriber Present VLR, see clause 25.10).

At next, tracing is invoked if required by the operator (macro Trace_Subscriber_Activity_VLR, see clause 25.9). Thereafter,

- if ciphering is not required, IMEI checking is invoked if required by the operator (see macro Check_IMEI_VLR defined in clause 25.6).
  - The error Illegal Equipment is set in case of unsuccessful outcome of the IMEI check, the subscriber is marked as detached and the macro proceeds with the error handling described below.
  - The macro terminates immediately with unsuccessful outcome if the MSC dialogue has been released during the IMEI check.
  - Else, the macro terminates successfully by returning the MAP_PROCESS_ACCESS_REQUEST response containing the IMSI to indicate acceptance of the MS access.
- if ciphering is required, the MAP_SET_CIPHERING_MODE request containing:
  - the cipher mode indicating the cipher algorithm required; and
  - the cipher key to be used;

  is sent to the MSC.

As a further operator option, IMEI checking may be performed next.

- The error Illegal Equipment is set in case of unsuccessful outcome of the IMEI check, the subscriber is marked as detached and the macro proceeds with the error handling described below.
- The macro terminates immediately with unsuccessful outcome if the MSC dialogue has been released during the IMEI check.
- Else, the macro terminates successfully by returning the MAP_PROCESS_ACCESS_REQUEST response containing the IMSI to indicate acceptance of the MS access.

IF no TMSI reallocation is required (again an operator option), the macro terminates thereafter. Else, TMSI reallocation is performed by sending a MAP_FORWARD_NEW_TMSI request, containing the new TMSI as parameter. The old TMSI will be frozen until an acknowledgement from the MS has been received. Before the macro terminates, the VLR will wait for the MAP_FORWARD_NEW_TMSI response, containing no parameters if reallocation has been confirmed by the MS, or a Provider Error, otherwise, in which case the old TMSI is kept frozen to avoid double allocation. In this case, both the old as the new TMSI are subsequently regarded valid when used by the MS.

Error handling

In case some error is detected during handling the access request, a respective error has been set. Before returning this error cause to the MSC in a MAP_PROCESS_ACCESS_REQUEST response, it need to be checked whether this access is for emergency call set-up, as this will require extra treatment.

If the CM Service type given in the MAP_PROCESS_ACCESS_REQUEST indication is emergency call set-up, it is checked whether EC set-up in the particular error situation is permitted (operator option). If so, it is checked whether the IMEI is required, and if so the IMEI is requested from the MS (macro Obtain_IMEI_VLR, see clause 25.6).

- The macro will terminate immediately with unsuccessful outcome if the MSC transaction has been aborted during the IMEI retrieval.
- In case of an error reported back from IMEI retrieval, MAP_PROCESS_ACCESS_REQUEST response containing the error cause set previously is returned to the MSC, the dialogue is closed (MAP_CLOSE request indicating normal release) and the macro terminates with unsuccessful outcome.

When a subscriber identity required by the operator (IMSI or IMEI) is available, the user error set previously is deleted, the respective identity is returned in the MAP_PROCESS_ACCESS_REQUEST response to indicate acceptance of emergency call, and the macro terminates with successful outcome.

In all other cases, the MAP_PROCESS_ACCESS_REQUEST response containing the error cause set previously is returned to the MSC, the dialogue is closed (MAP_CLOSE request indicating normal release) and the macro terminates with unsuccessful outcome.

25.4.3 Macro Identification Procedure

This macro is invoked by the macro Process_Access_Request_VLR in case the subscribers identity is not known in the VLR.

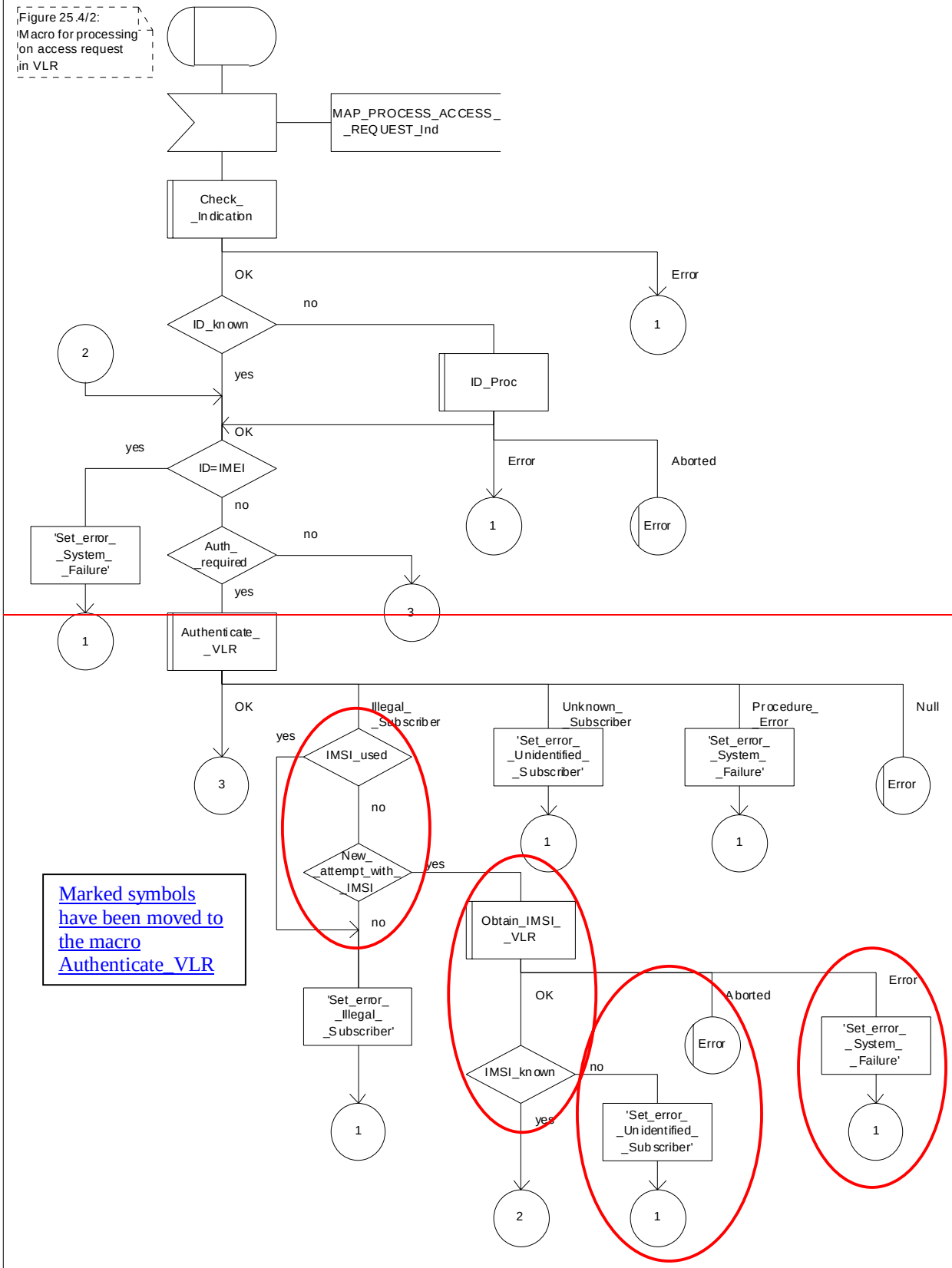
If the identity received from the MS is an IMSI, the error Unidentified Subscriber will be set and reported back to the calling macro (to be sent in the MAP_PROCESS_ACCESS_REQUEST response). The same error is used in case a TMSI was received from the MS, but the operator does not allow open identification of the MS.

If open identification of the MS is allowed, the macro Obtain_IMSI_VLR is invoked, requesting the subscribers IMSI from the MS (see clause 25.8), with outcome

- OK, in which case it is checked whether for the IMSI received there exists a subscriber record in the VLR. If so, the macro terminates successfully, else the error Unidentified Subscriber will be set and reported back to the calling macro.
- Error, in which case the error System Failure will be set and reported back to the calling macro.
- Aborted, i.e. the MSC transaction is released, in which the macro terminates accordingly.

Macrodefinition Process_Access_Request_VLR 25.4_2.1(3)

Figure 25.4/2:
Macro for processing
on access request
in VLR



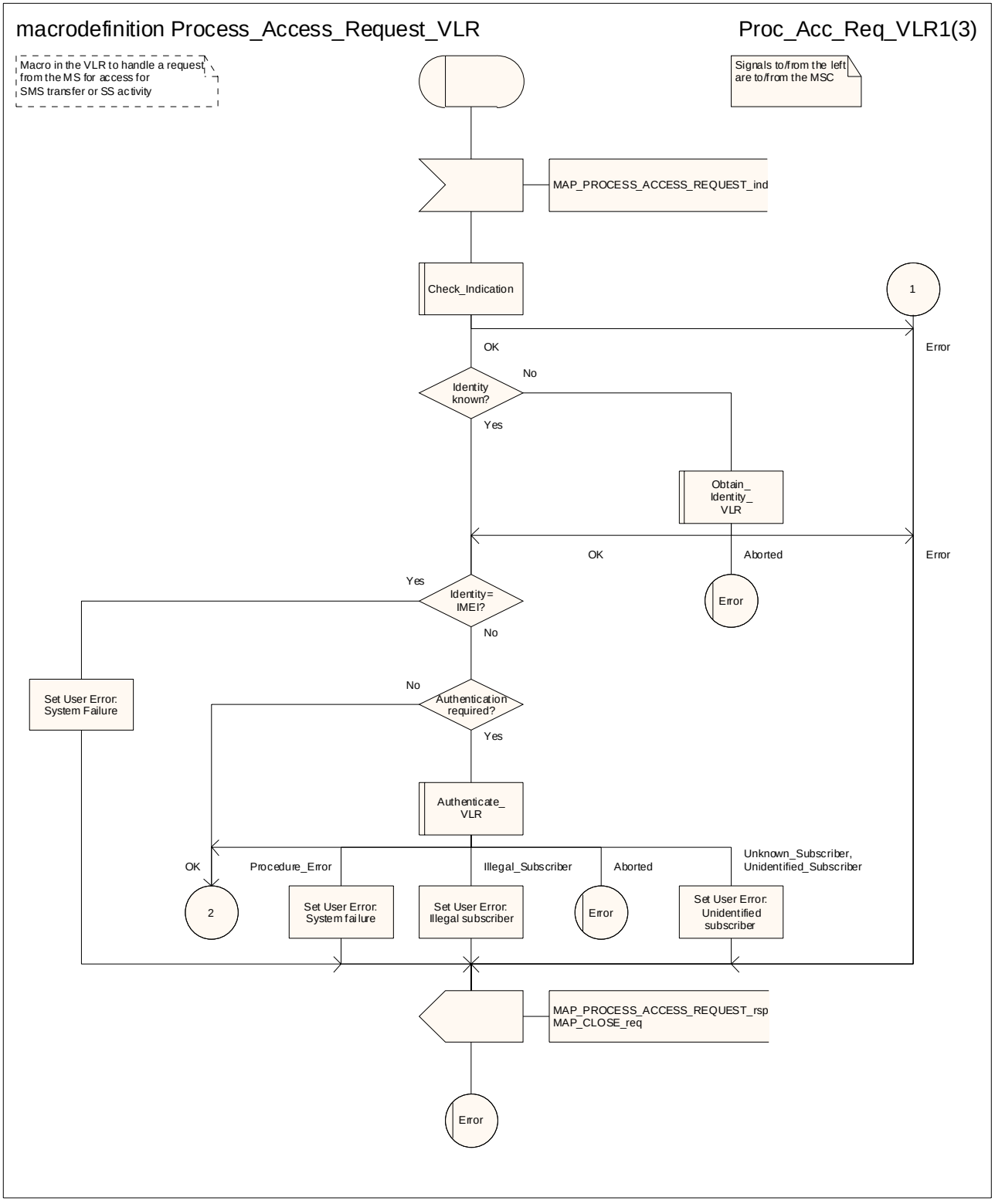
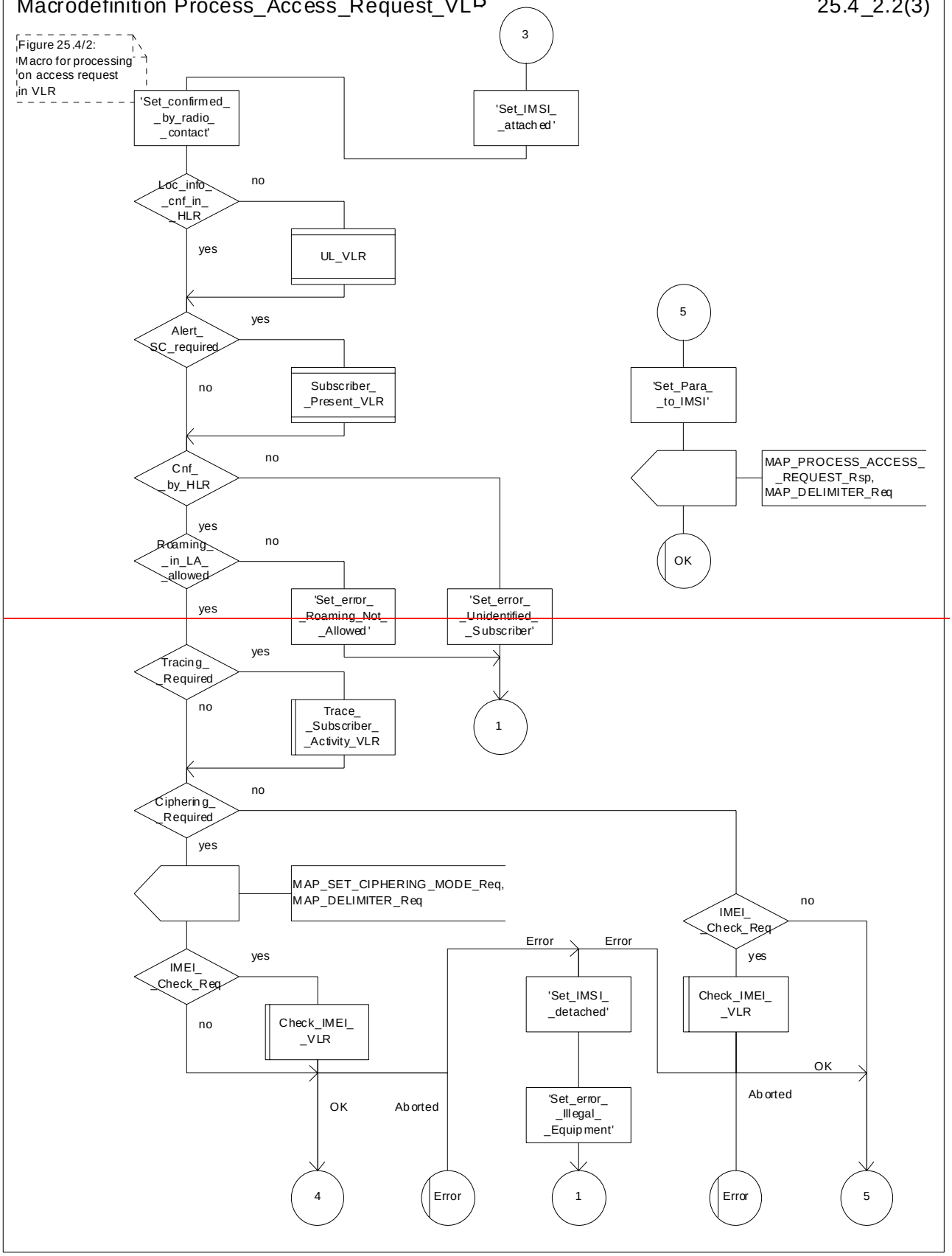


Figure 25.4/2 (sheet 1 of 3): Macro Process_Access_Request_VLR

Macrodefinition Process_Access_Request_VLR 25.4_2.2(3)

Figure 25.4/2:
Macro for processing on access request in VLR



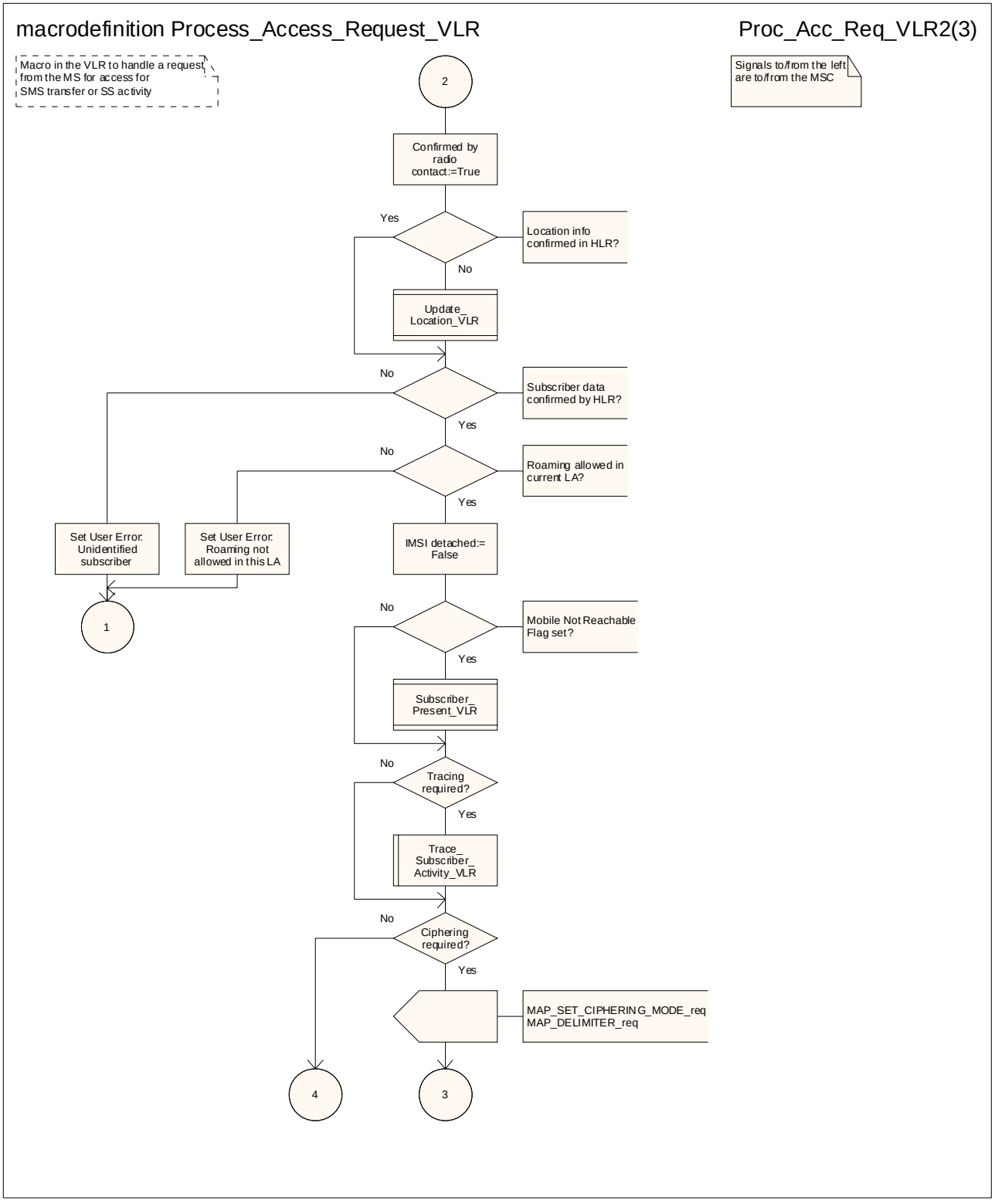
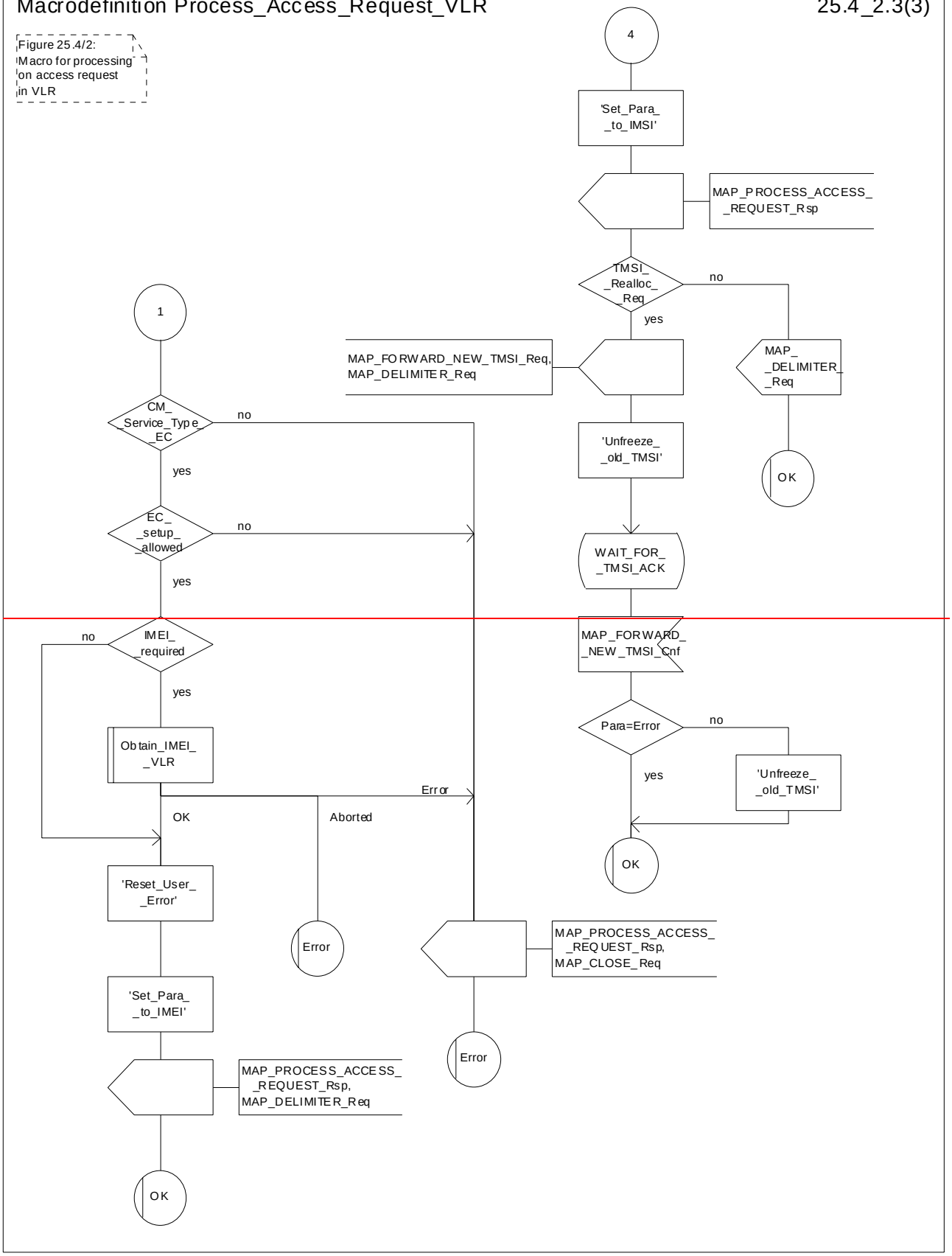


Figure 25.4/2 (sheet 2 of 3): Macro Process_Access_Request_VLR

Macrodefinition Process_Access_Request_VLR 25.4_2.3(3)

Figure 25.4/2:
Macro for processing
on access request
in VLR



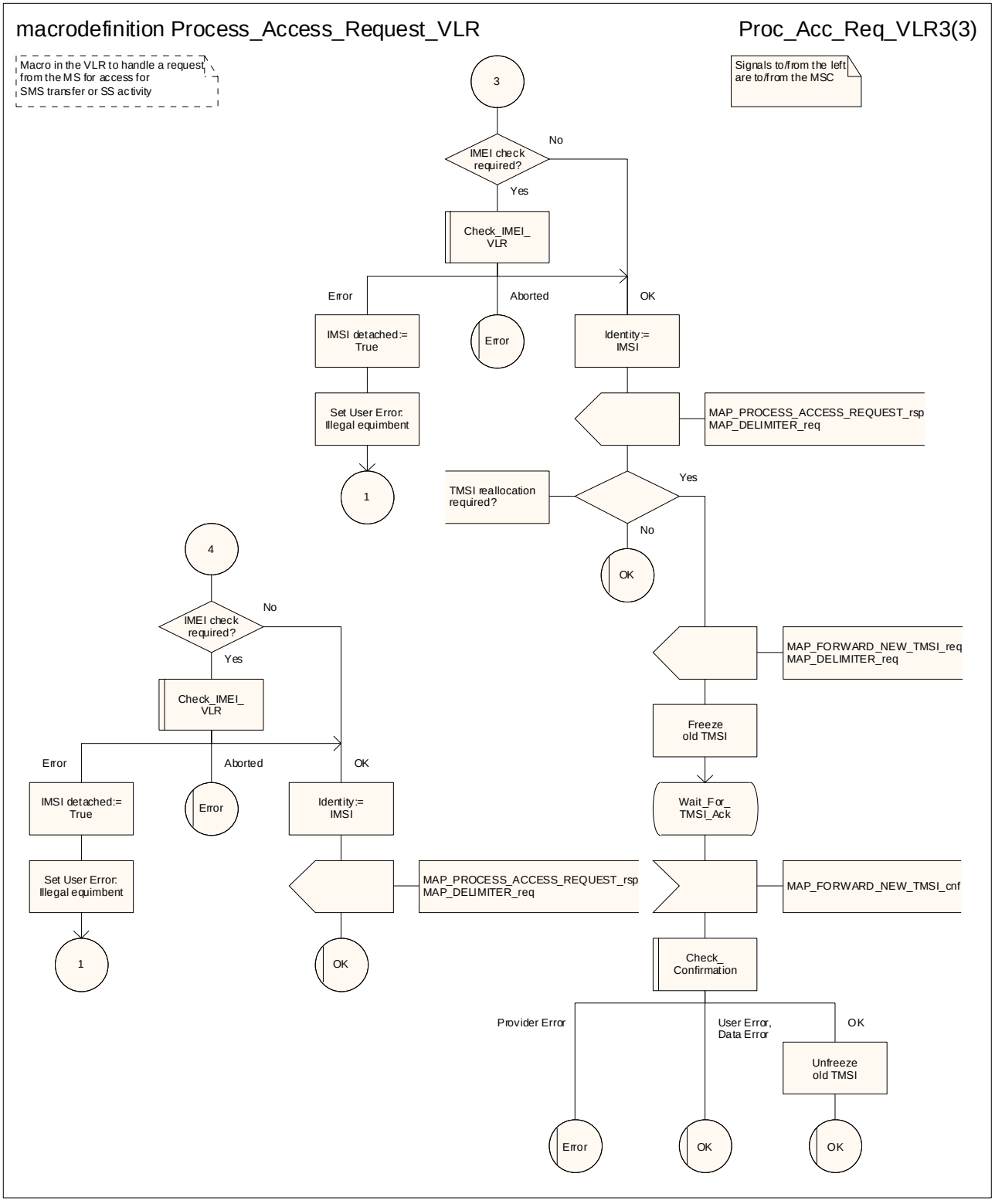
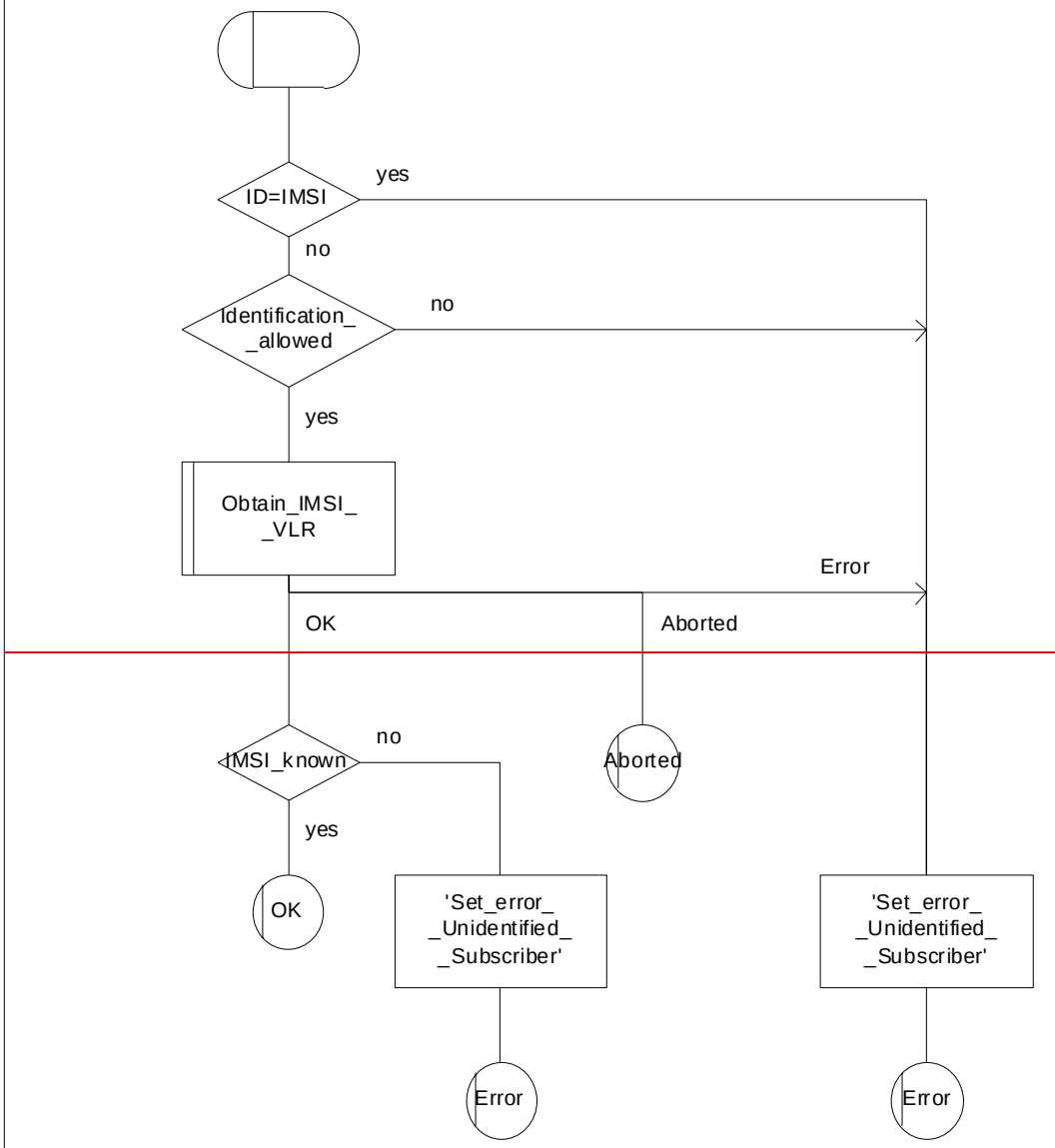


Figure 25.4/2 (sheet 3 of 3): Macro Process_Access_Request_VLR

Macrodefinition ID_Proc_VLR 25.4_3(1)

Figure 25.4/3



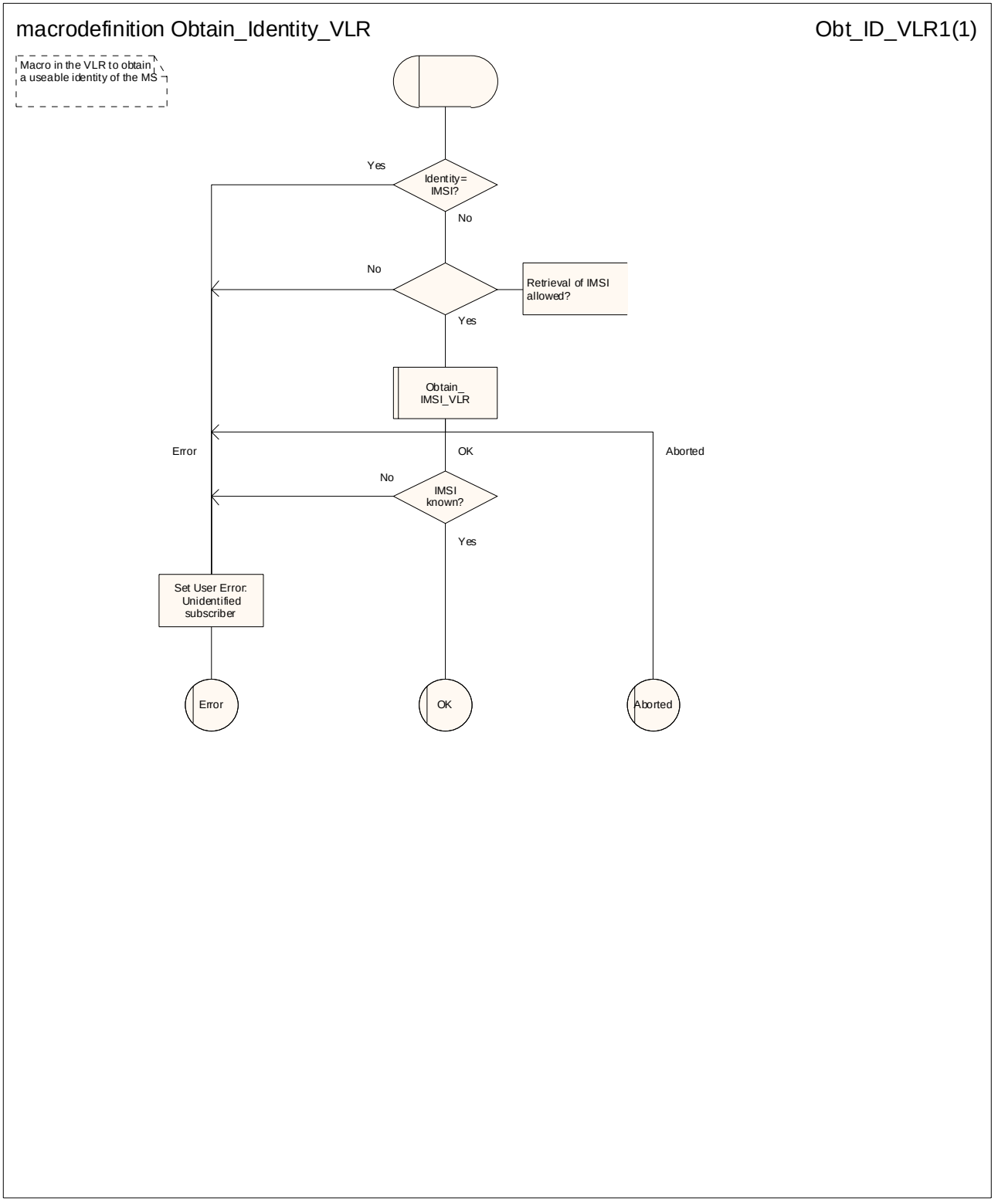


Figure 25.4/3: Macro ~~ID_Proc~~Obtain_Identity_VLR

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

***** CR editor's note: The handling for a repeat attempt at authentication if an MS has identified itself with a TMSI and the authentication fails has been moved from the macro Process_Access_Request_VLR to the macro Authenticate_VLR. This is a modelling change; the functional behaviour is the same. *****

This macro is used by the VLR to control the authentication of a subscriber. ~~The macro proceeds as follows:~~

Sheet 1: The test "Received SRES=Expected SRES" indicates:

- a comparison of the Signed RESult received from the MS with the Signed RESult received from the HLR, if GSM authentication is used (see 3GPP TS 43.020 [24]), or
- a comparison of the RESult received from the MS with the expected RESult received from the HLR, if UMTS authentication is used (see 3GPP TS 33.102).

~~- if there are not enough authentication vectors in the VLR to perform the authentication, then the macro "Obtain_Authent_Para_VLR" described below is invoked. If this macro fails, then the corresponding error (Unknown Subscriber or Procedure Error) is returned to the calling process;~~

~~- if there are enough authentication vectors in the VLR, or the Obtain_Authent_Para_VLR macro was successful, then a MAP_AUTHENTICATE request is sent to the MSC. This request contains the RAND, CKSN or KSI, and possibly AUTN parameters as indicated in the service description;~~

~~- the VLR then waits for a response from the MSC;~~

~~- if a MAP_U_ABORT, MAP_P_ABORT or MAP_CLOSE indication is received from the MSC in this wait state, the VLR checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;~~

~~- if a MAP_NOTICE indication is received from the MSC in this wait state, the VLR closes the dialogue with the MSC, then checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;~~

~~- if a MAP_AUTHENTICATE confirmation is received by the VLR, it checks whether the received Signed Result (SRES) is identical to the stored one (see 3GPP TS 43.020 [24]), or whether the received RES is identical to the stored XRES. If this is not the case, the "Illegal Subscriber" exit is used. If the SRES values or RES and XRES are identical, then the "OK" exit is used;~~

~~- before exit, the VLR may fetch a new set of triplets from the HLR. This is done by initiating a separate Obtain_Authent_Sets_VLR process described below.~~

~~The macro is described in figure 25.5/2.~~

~~25.5.3 Process Obtain_Authentication_Sets_VLR~~

~~This process is initiated by the VLR to fetch authentication vectors from a subscriber's HLR in a stand-alone, independent manner. The Obtain_Authent_Para_VLR macro described below is simply called; the process is described in figure 25.5/3.~~

25.5.34 Macro Obtain_Authent_Params_VLR

This macro is used by the VLR to request authentication vectors from the HLR. ~~The macro proceeds as follows:~~

- ~~a connection is opened, and a MAP_SEND_AUTHENTICATION_INFO request sent to the HLR;~~
- ~~if the HLR indicates that a MAP version 1 or 2 dialogue is to be used, the VLR performs the equivalent MAP version 1 or 2 dialogue, which can return a positive result containing authentication sets, an empty positive result, or an error;~~
- ~~if the dialogue opening fails, the "Procedure Error" exit is used. Otherwise, the VLR waits for the response from the HLR;~~
- ~~if a MAP_SEND_AUTHENTICATION_INFO confirmation is received from the HLR, the VLR checks the received data.~~

Sheet 1, sheet 2, sheet 3: It is an operator option whether to allow the re-use of old authentication triplets.

Sheet 2, sheet 3: Old UMTS quintuplets shall not be re-used.

Sheet 2: if the VLR requests more authentication vectors in the same dialogue, the subsequent MAP_SEND_AUTHENTIFICATION_INFO request has no parameters.

~~One of the following positive responses may be received from a MAP version 1 or MAP version 2 dialogue with the HLR:~~

- ~~Authentication triplets, in which case the outcome is successful;~~
- ~~Empty response, in which case the VLR may re-use old triplets, if allowed by the PLMN operator.~~

~~If the VLR cannot re-use old triplets (or no such triplets are available) then the "Procedure Error" exit is used.~~

~~If the outcome was successful or re-use of old parameters in the VLR is allowed, then the "OK" exit is used.~~

~~If an "Unknown Subscriber" error is returned by the MAP version 1 or 2 dialogue, then the "Unknown Subscriber" exit is used.~~

~~In a MAP version 3 dialogue a (possibly empty) set of authentication vectors may be received, transferred by means of the TC-RESULT-L service, from the HLR followed by a MAP_CLOSE_Indication or by a MAP_DELIMITER_Indication. If a MAP_DELIMITER_Indication is received, the VLR may request additional authentication vectors from the HLR by sending a new MAP_SEND_AUTHENTIFICATION_INFO_Request with no parameter part. If a MAP_CLOSE_Indication is received, and authentication vectors have been received during the dialogue, then the "OK" exit is used. If no authentication vectors have been received during the dialogue, the VLR checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.~~

~~If in a MAP version 3 dialogue an "Unknown Subscriber" error is received, then the "Unknown Subscriber" exit is used. If other errors are received, the VLR checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.~~

- ~~if a MAP-U-ABORT, MAP_P_ABORT, MAP_NOTICE or unexpected MAP_CLOSE service indication is received from the MSC, then open connections are terminated, and the macro takes the "Null" exit;~~
- ~~if a MAP-U-ABORT, MAP_P_ABORT or unexpected MAP_CLOSE service indication is received from the HLR, then the VLR checks whether old authentication parameters (GSM triplets) can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit; note that re-use of old UMTS Quintuplets is not allowed;~~
- ~~if a MAP_NOTICE service indication is received from the HLR, then the dialogue with the HLR is closed. The VLR then checks whether old authentication parameters (GSM triplets) can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit; note that re-use of old UMTS Quintuplets is not allowed.~~

~~The macro is described in figure 25.5/4.~~

25.5.4 Process Obtain_Authent_Sets_VLR

This process is initiated by the VLR to fetch authentication vectors from a subscriber's HLR independently of any other processing.

25.5.5 Process Obtain_Authent_Sets_SGSN

***** CR editor's note: this (reduced!) text has been moved from its position after the SDL diagram for the procedure Check_Available_Vectors *****

The procedure for authentication when the serving node is an SGSN is described in 3GPP TS 23.060 [104] and 3GPP TS 24.008 [35].

This process is used by the SGSN to request authentication vectors from the HLR.

Sheet 1, sheet 2: It is an operator option whether to allow the re-use of old authentication triplets.

Sheet 2: Old UMTS quintuplets shall not be re-used.

25.5.65 Process Obtain_Authent_Sets_HLR

This process is used to provide authentication vectors (triplets or quintuplets) in response to a request from a VLR or an SGSN.

~~Opening of the dialogue is described in the macro Receive_Open_Ind in clause 25.1, with outcomes:~~

- ~~reversion to version one or two procedure;~~
- ~~procedure termination; or~~
- ~~dialogue acceptance, with proceeding as below.~~

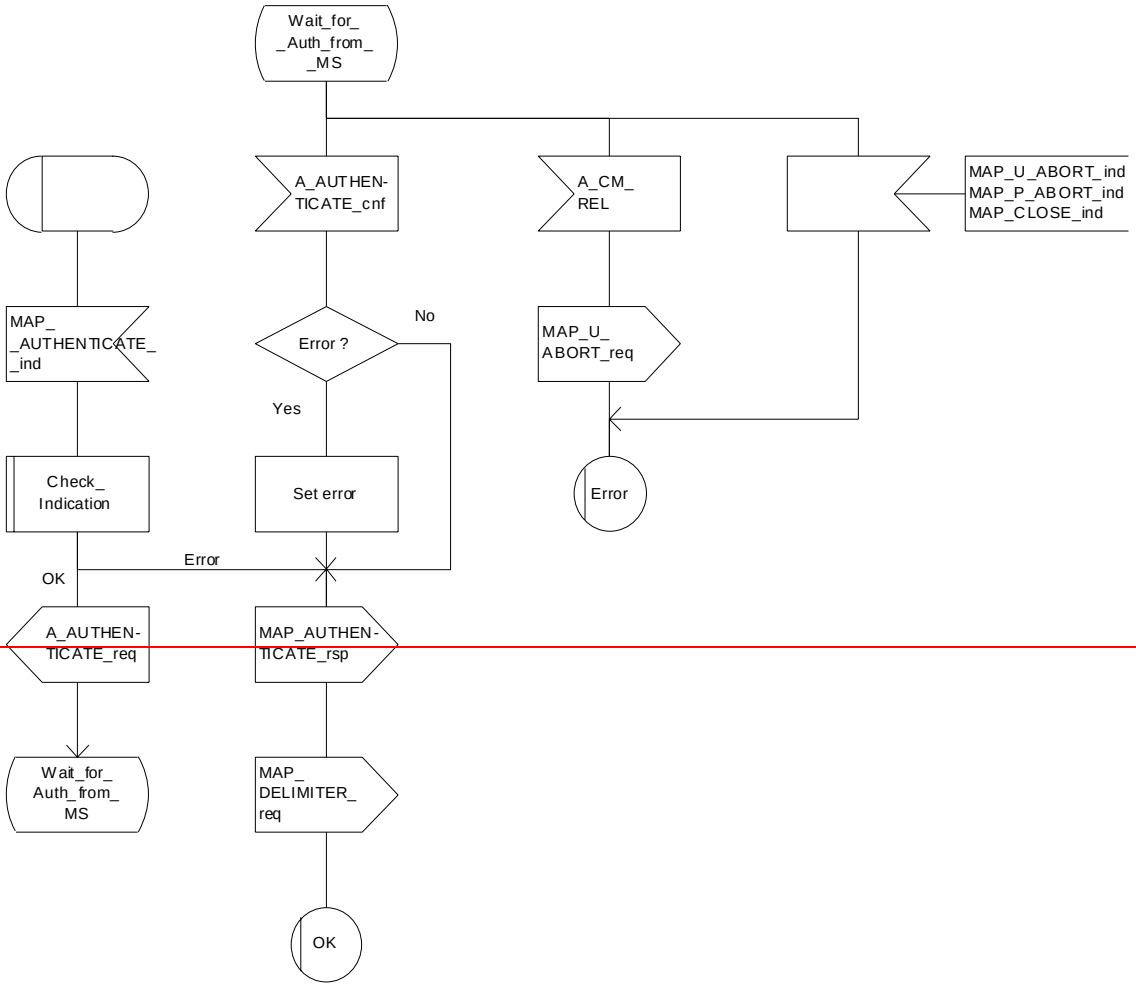
~~This process is used by the HLR to obtain authentication vectors from the AuC, upon request from the VLR or from the SGSN. The process acts as follows:~~

- ~~a MAP_SEND_AUTHENTICATION_INFO indication is received by the HLR;~~
- ~~the HLR checks the service indication for errors. If any, they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. If no errors are detected, authentication vectors are fetched from the AuC. Further details are found in 3GPP TS 43.020 [24];~~
- ~~If Network Access Mode is set to "non-GPRS only" and if the Requesting Node Type is present and indicates 'SGSN', the error Unknown Subscriber (with diagnostic value set to "Gprs Subscription Unknown") is returned in the response. The process terminates;~~
- ~~If Network Access Mode is set to "GPRS only" and if the Requesting Node Type is present and indicates 'VLR', the error Unknown Subscriber is returned in the response. The process terminates;~~
- ~~if errors are detected they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. Otherwise the authentication vectors are returned by means of the TC-RESULT-L service.~~
- ~~if segmentation of the response message is required and allowed, a MAP_SEND_AUTHENTICATION_INFO response transferred by means of the TC-RESULT-L service, containing at least one authentication vector, followed by a MAP_DELIMITER request is returned to the VLR or SGSN, the remaining authentication vectors are stored and the HLR waits for a new service indication from the VLR or SGSN.~~

~~The process is described in figure 25.5/5.~~

Macrodefinition Authenticate_MSC 25.5_1(1)

Figure 25.5/1: Authentication macro in the MSC, relaying authentication indication from the VLR to the MS, and relaying the confirmation from the MSC to the VLR



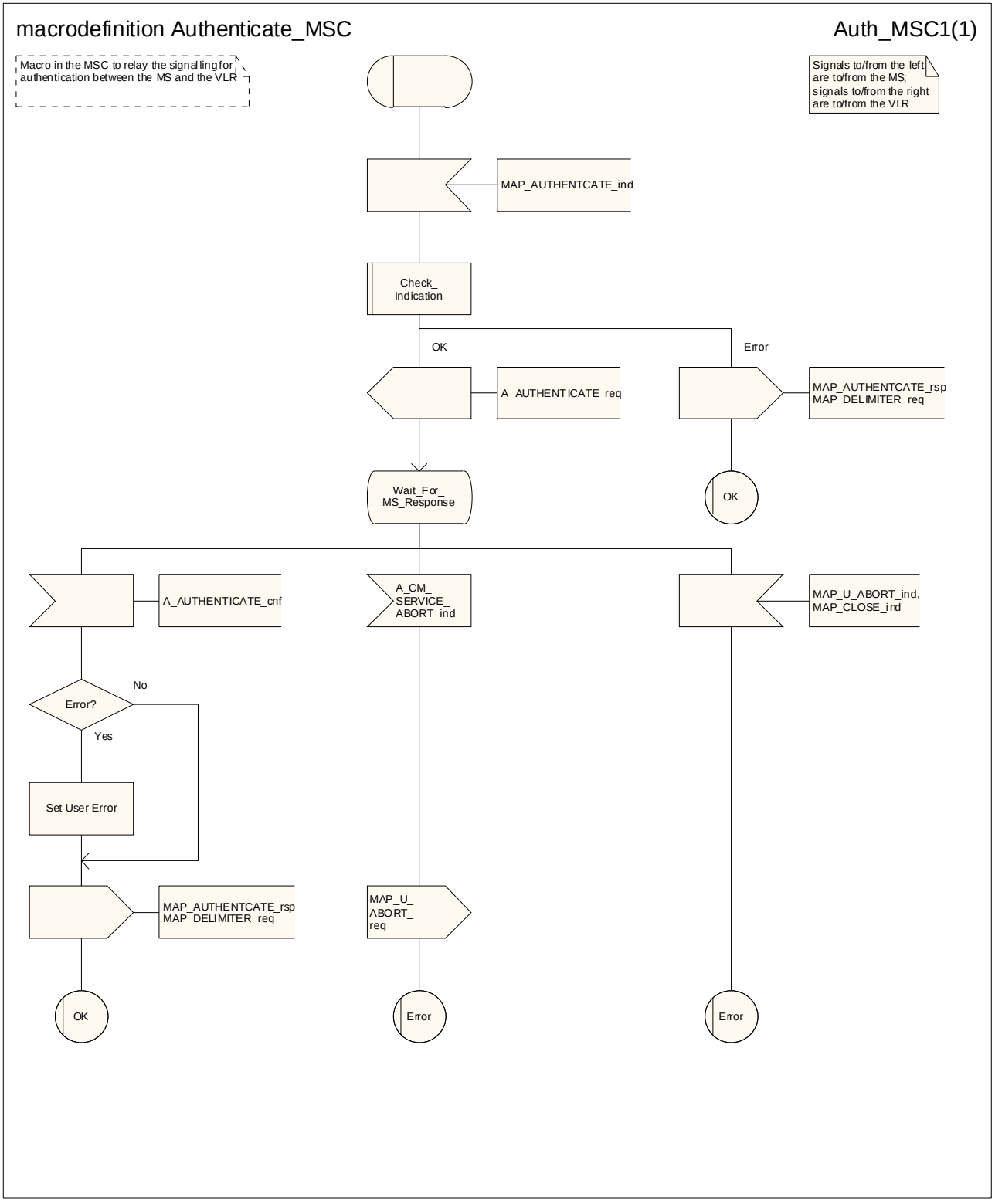
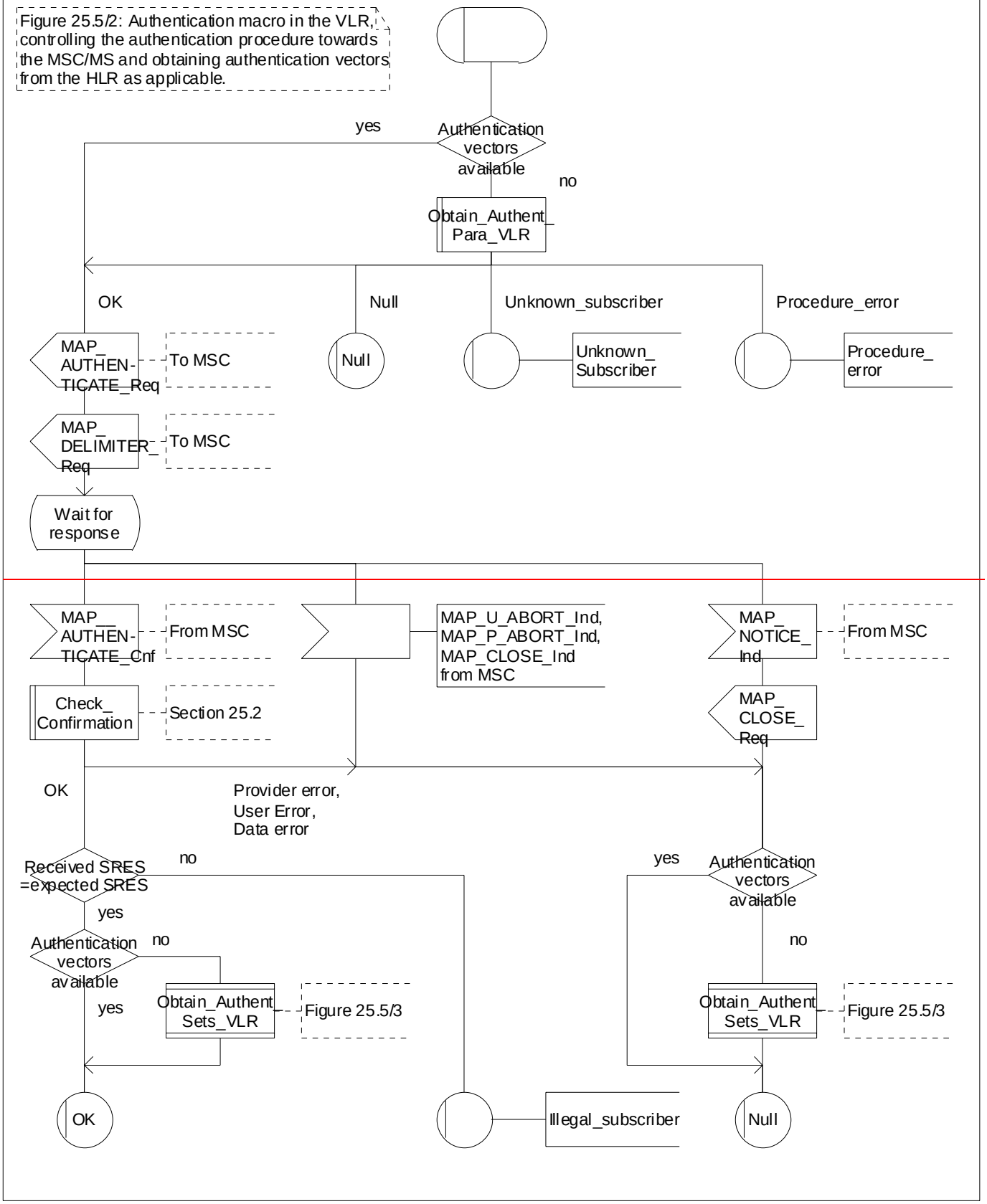


Figure 25.5/1: Macro Authenticate_MSC

Macrodefinition Authenticate_VLR 215_2(1)

Figure 25.5/2: Authentication macro in the VLR, controlling the authentication procedure towards the MSC/MS and obtaining authentication vectors from the HLR as applicable.



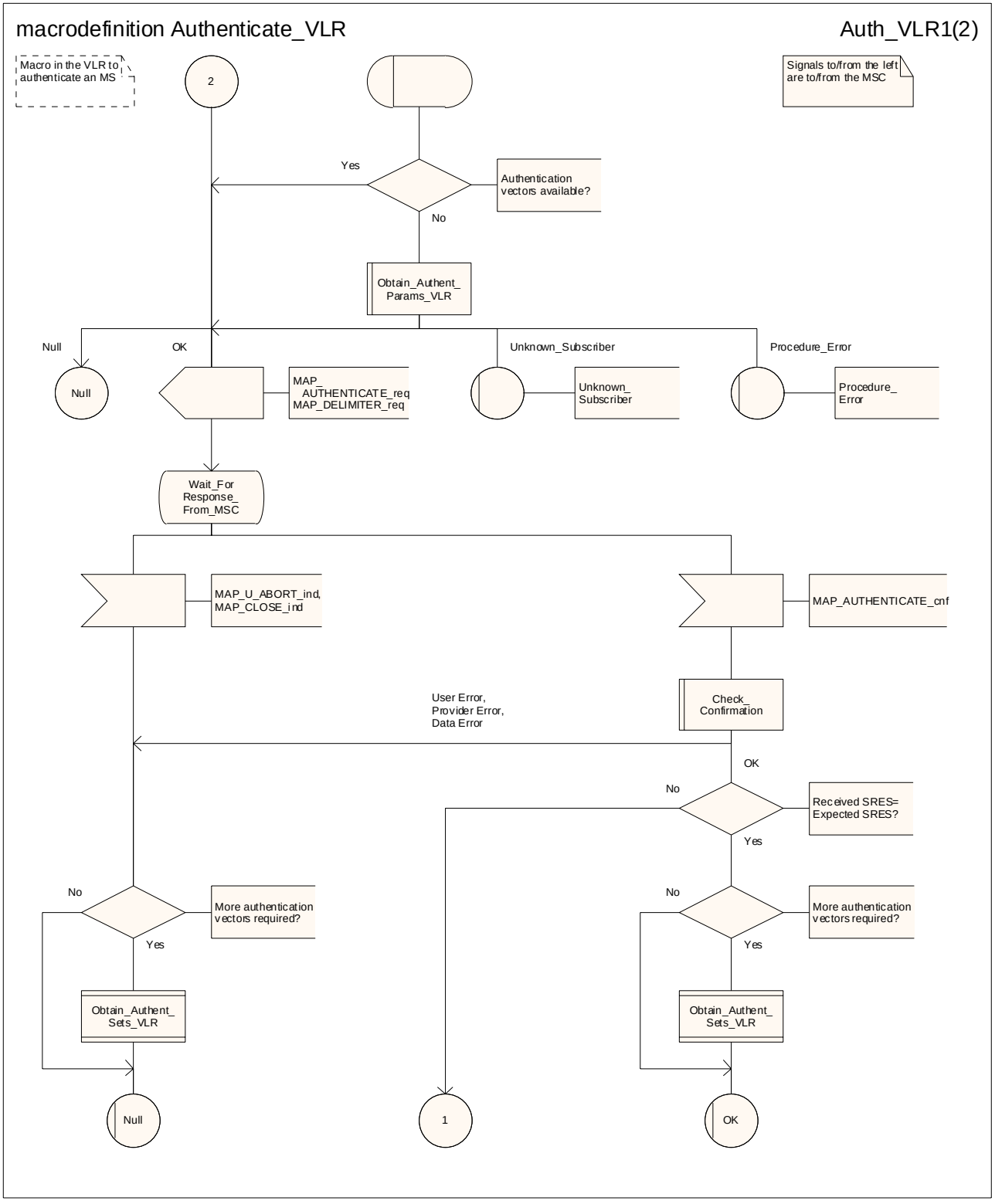


Figure 25.5/2 (sheet 1 of 2): Macro Authenticate_VLR

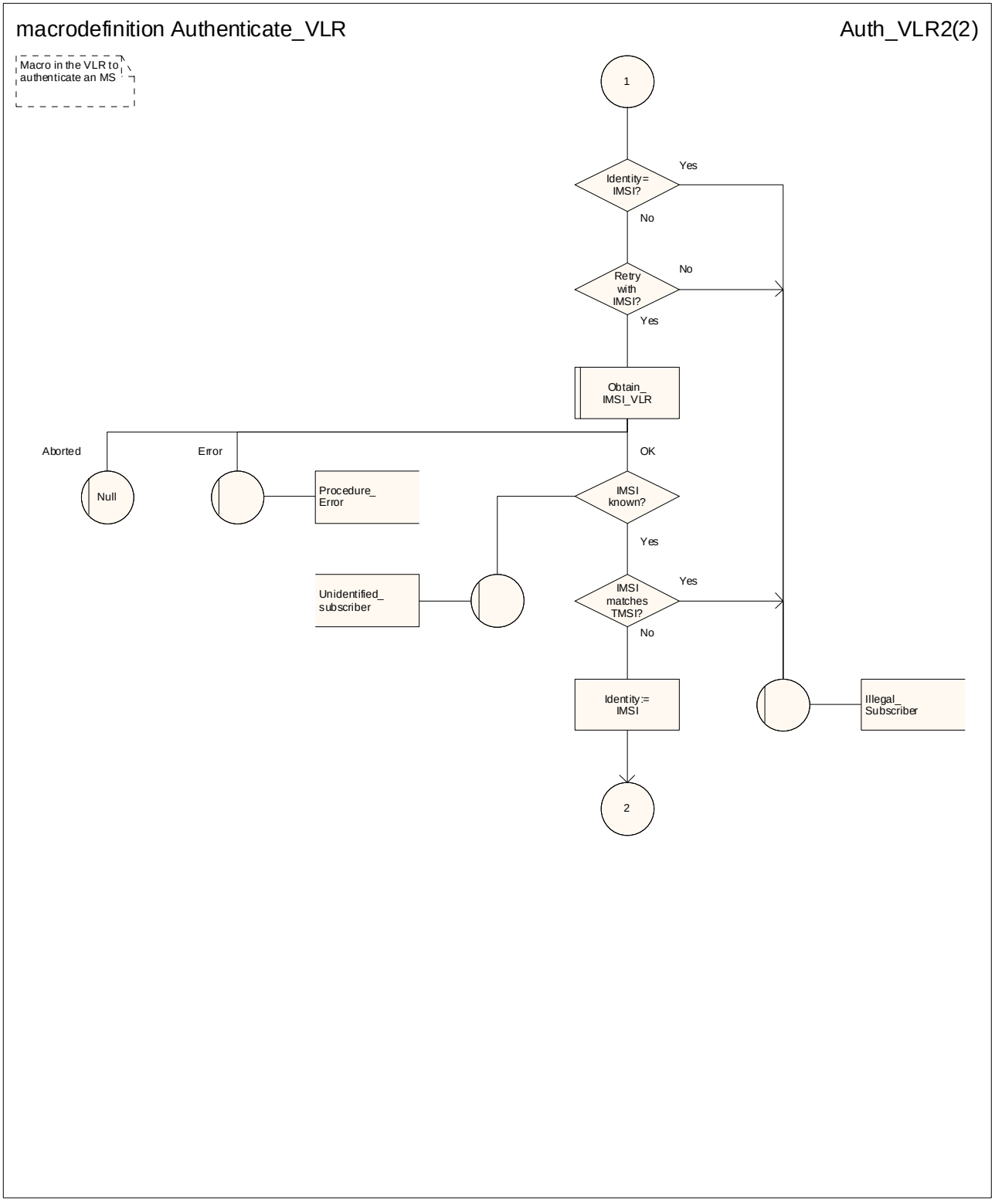
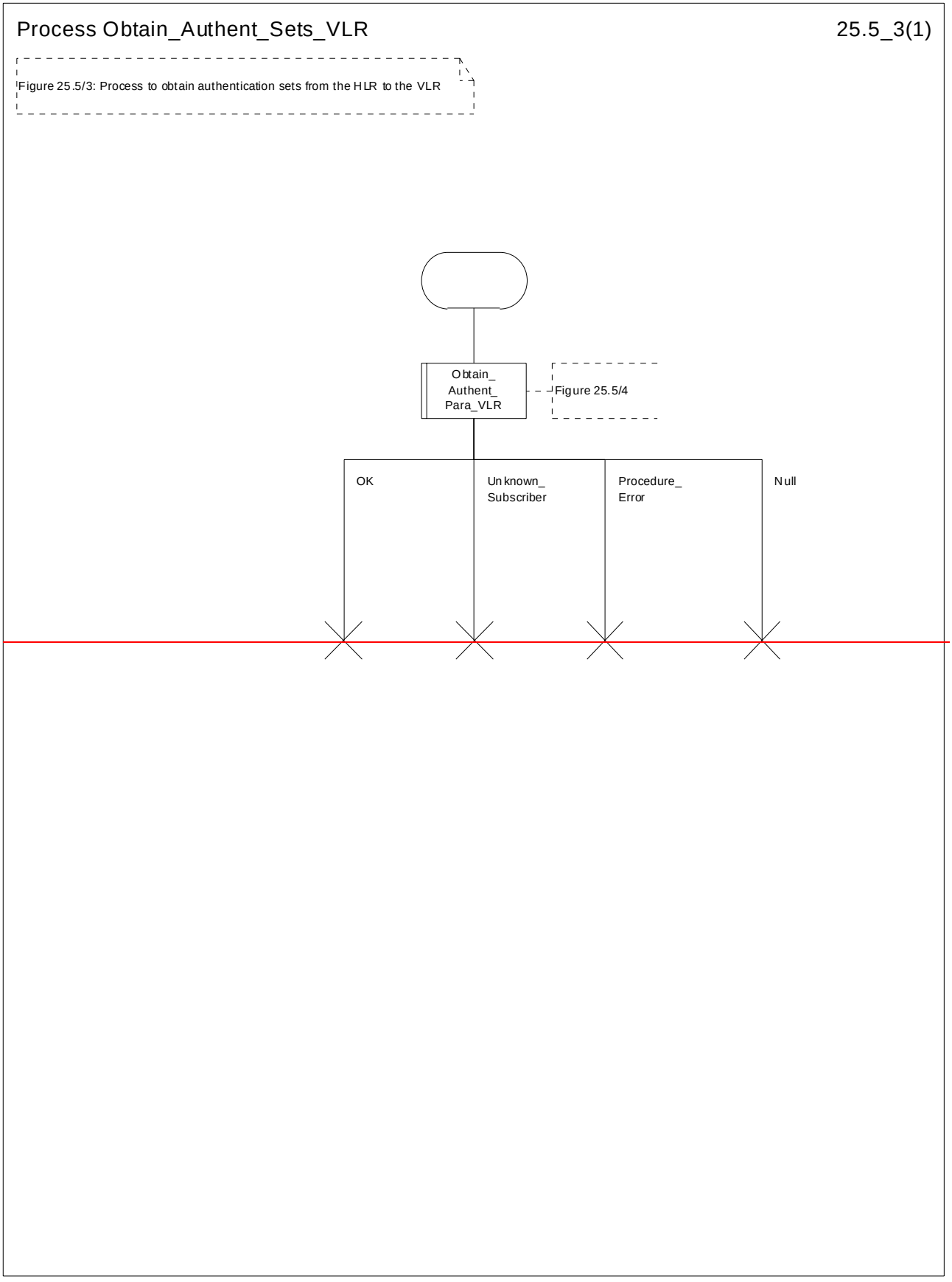


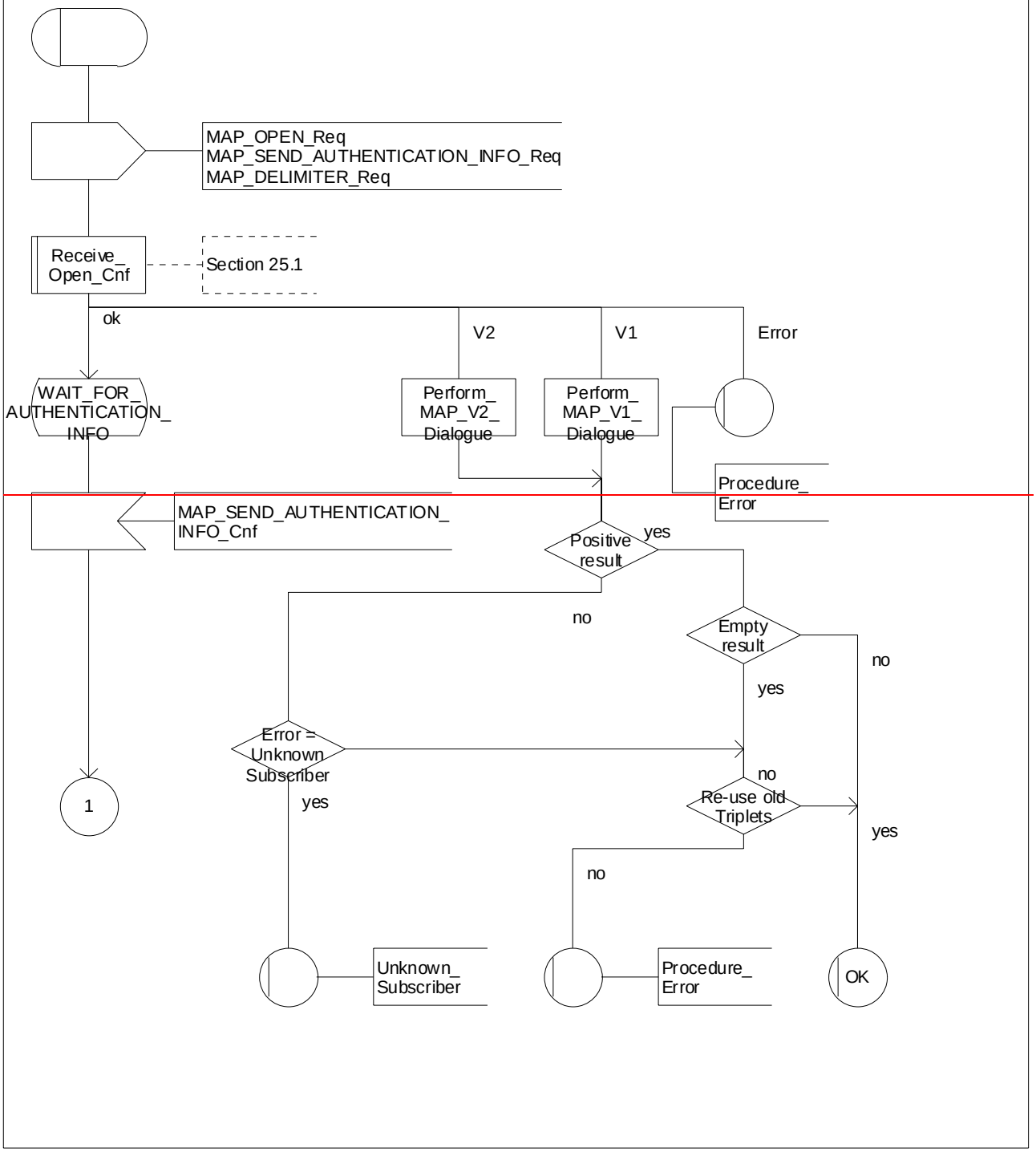
Figure 25.5/2 (sheet 2 of 2): Macro Authenticate_VLR



~~**Figure 25.5/3: Process Obtain_Authentication_Sets_VLR**~~

Macrodefinition OBTAIN_AUTHENT_PARA_VLR 1(3)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR



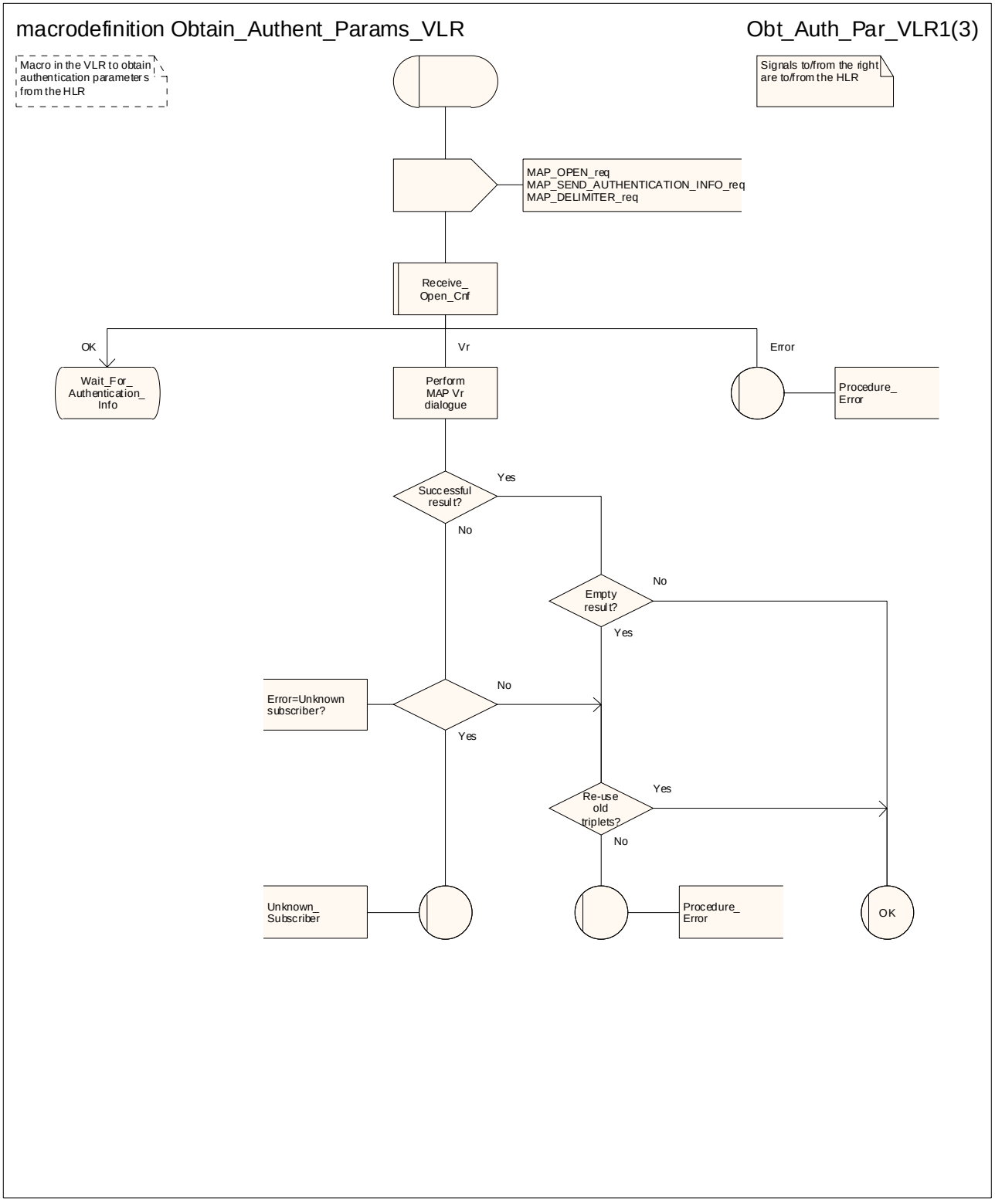
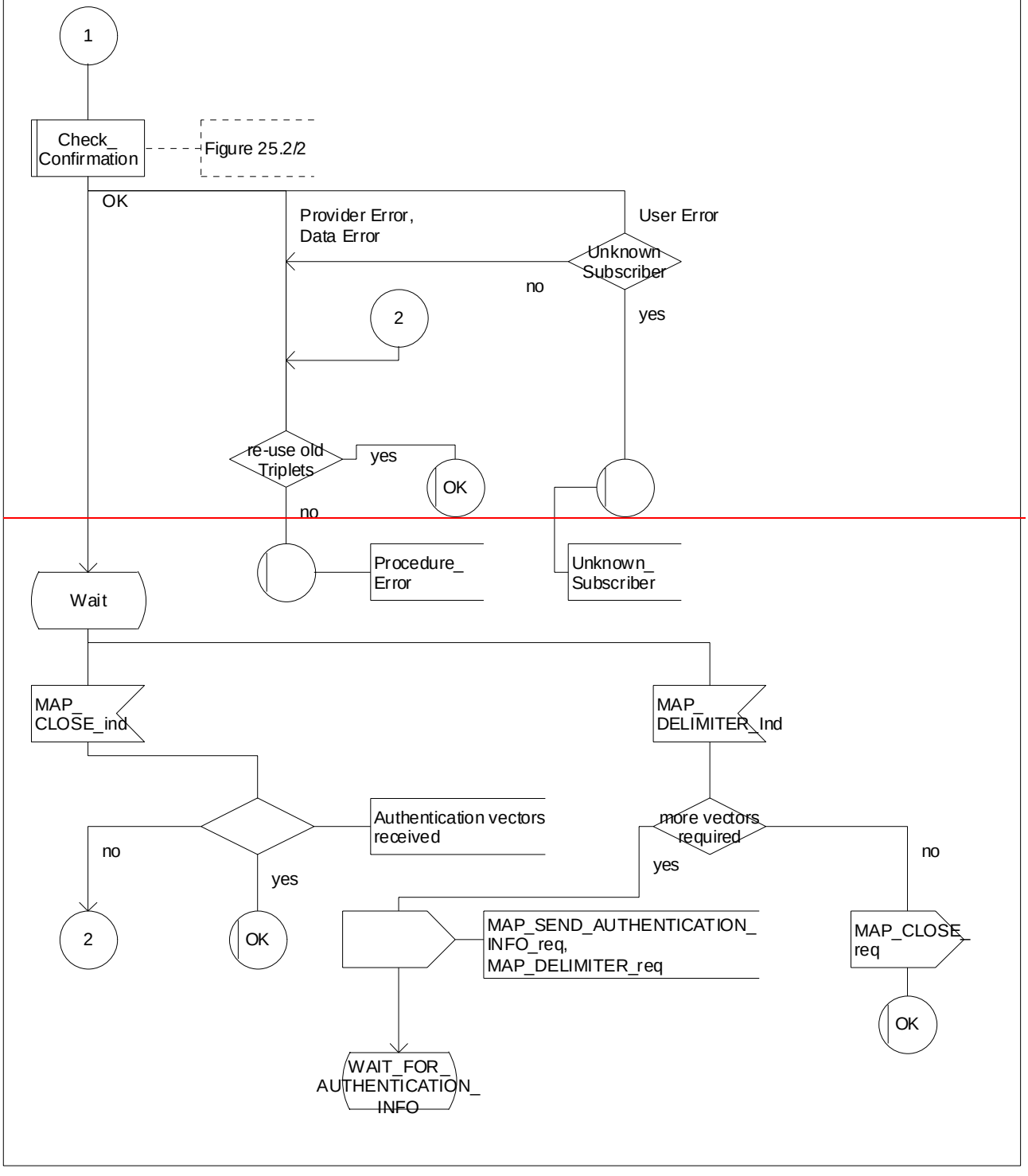


Figure 25.5/34 (sheet 1 of 3): Macro Obtain_Authent_Params_VLR

Macrodefinition OBTAIN_AUTHENT_PARA_VLR 2(3)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR



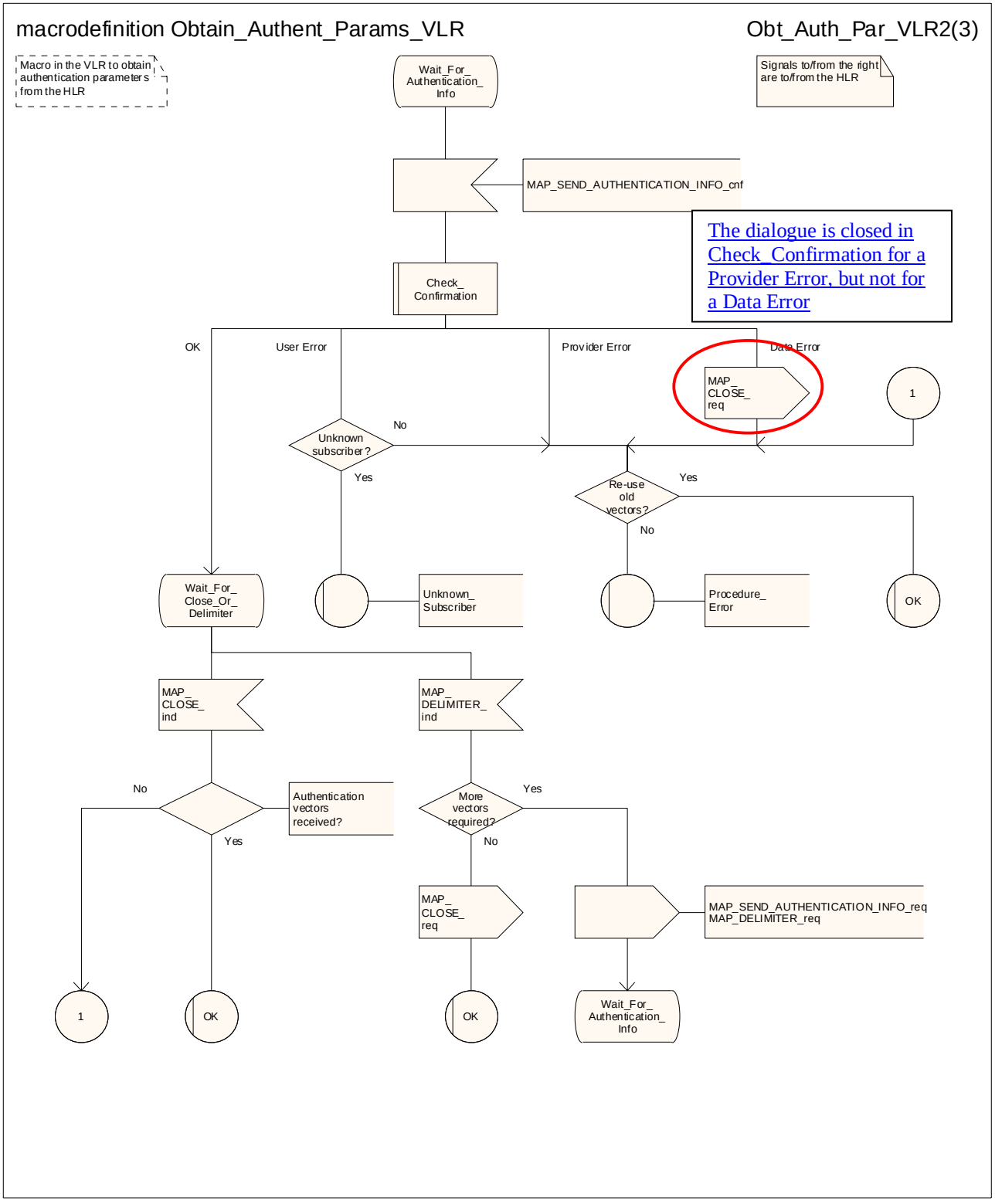
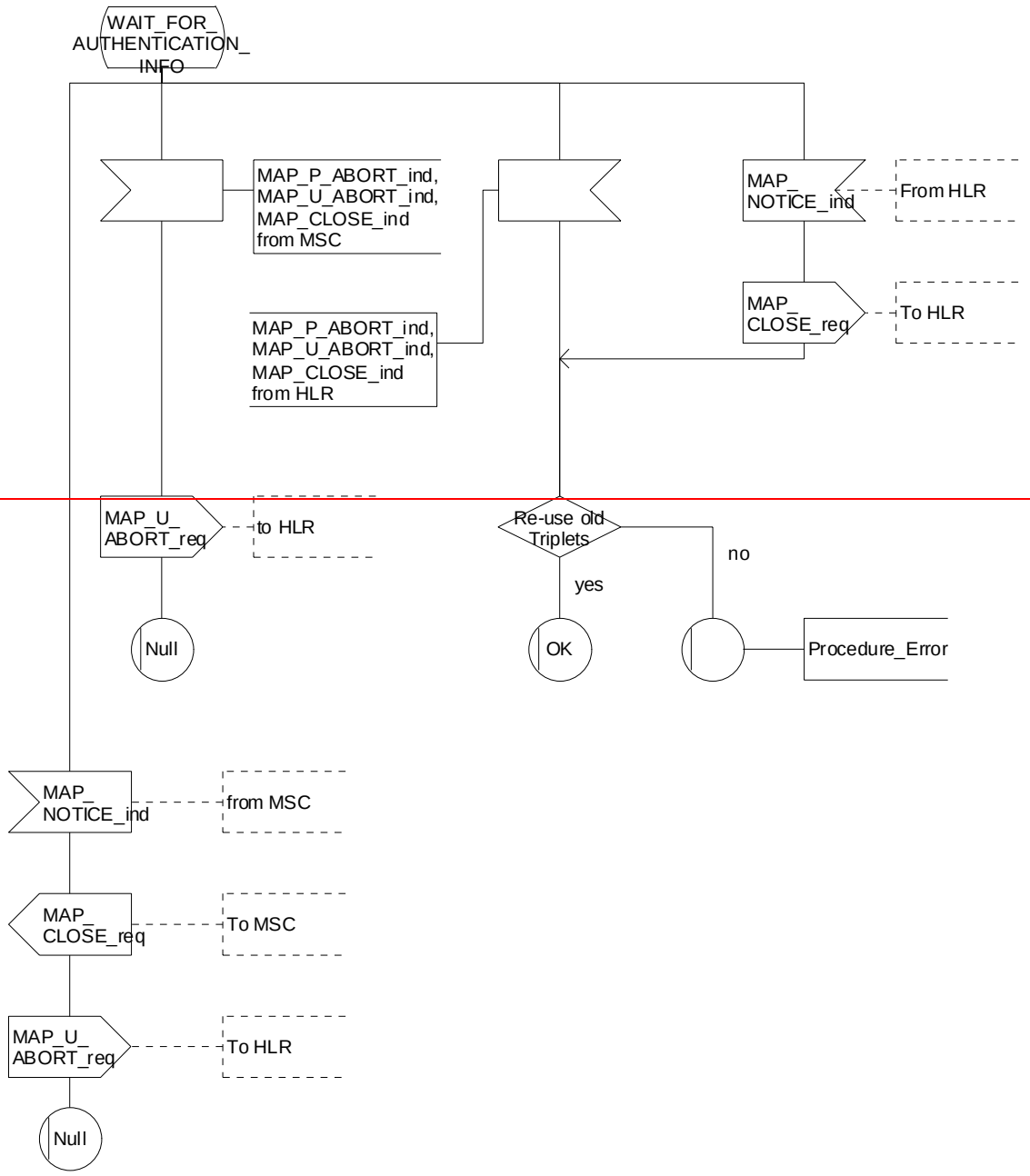


Figure 25.5/34 (sheet 2 of 3): Macro Obtain_Authent_Params_VLR

Macrodefinition OBTAIN_AUTHENT_PARA_VLR 3(3)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR



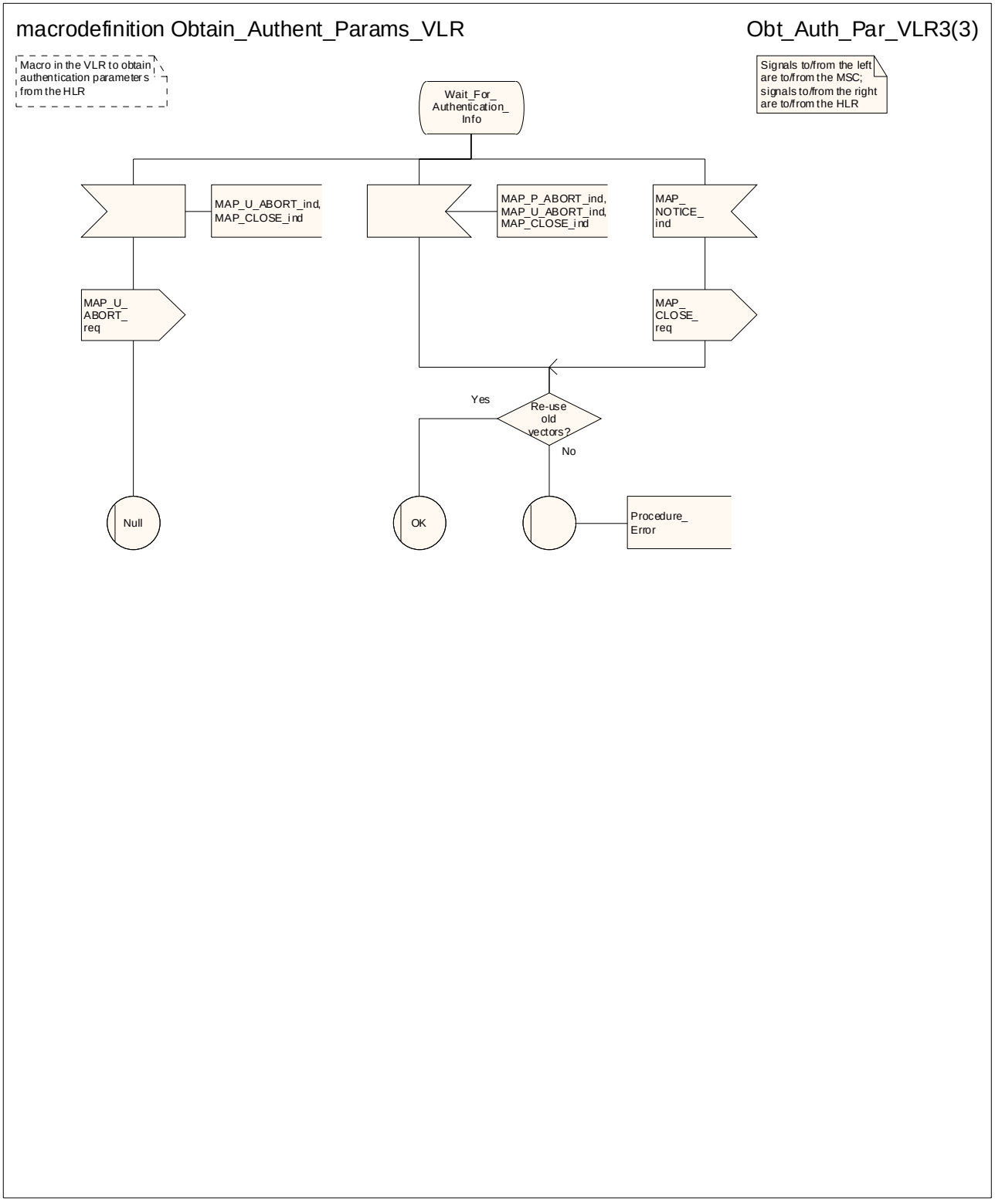


Figure 25.5/34 (sheet 3 of 3): Macro Obtain_Authent_Params_VLR

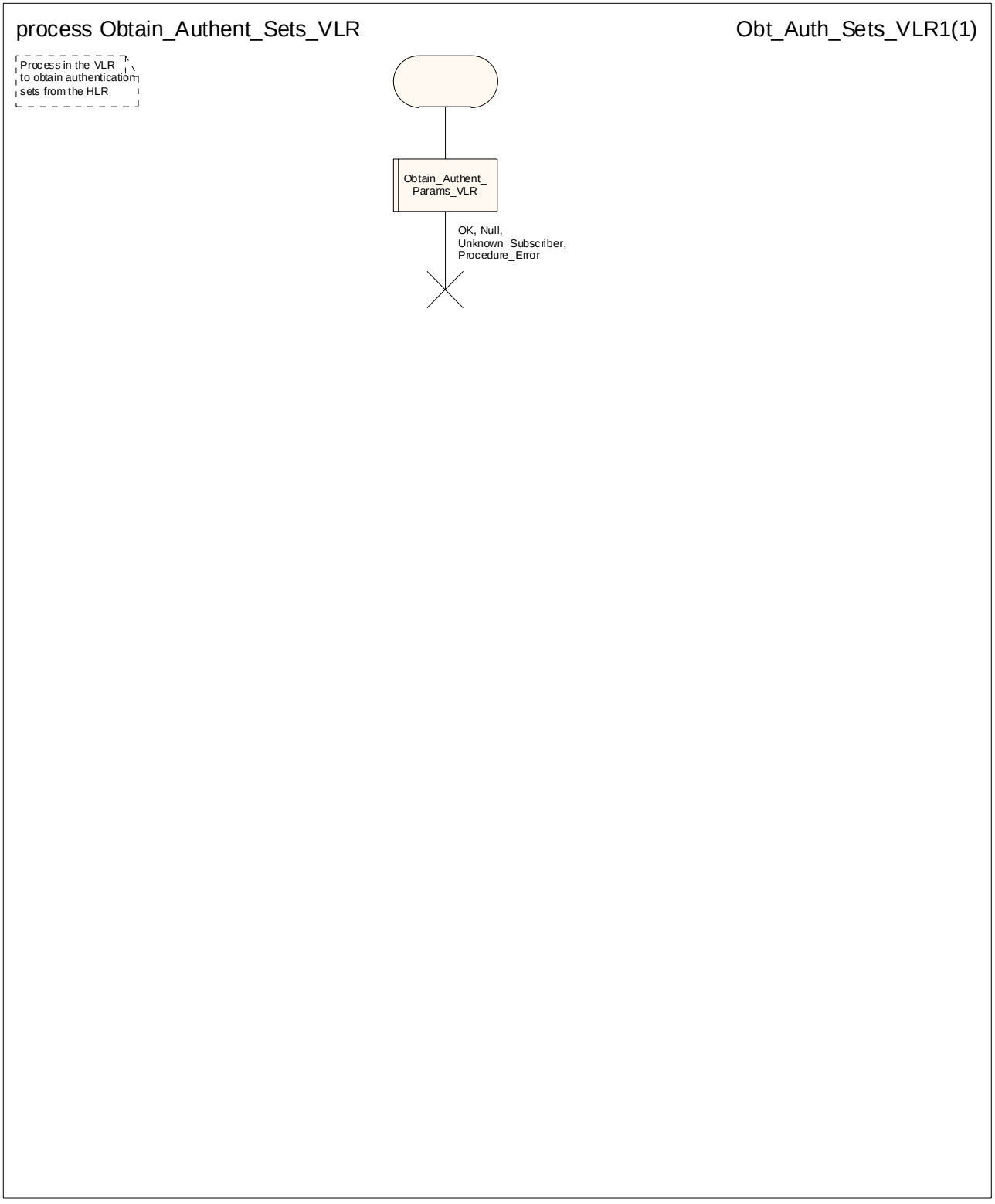


Figure 25.5/4: Process Obtain_Authent_Sets_VLR

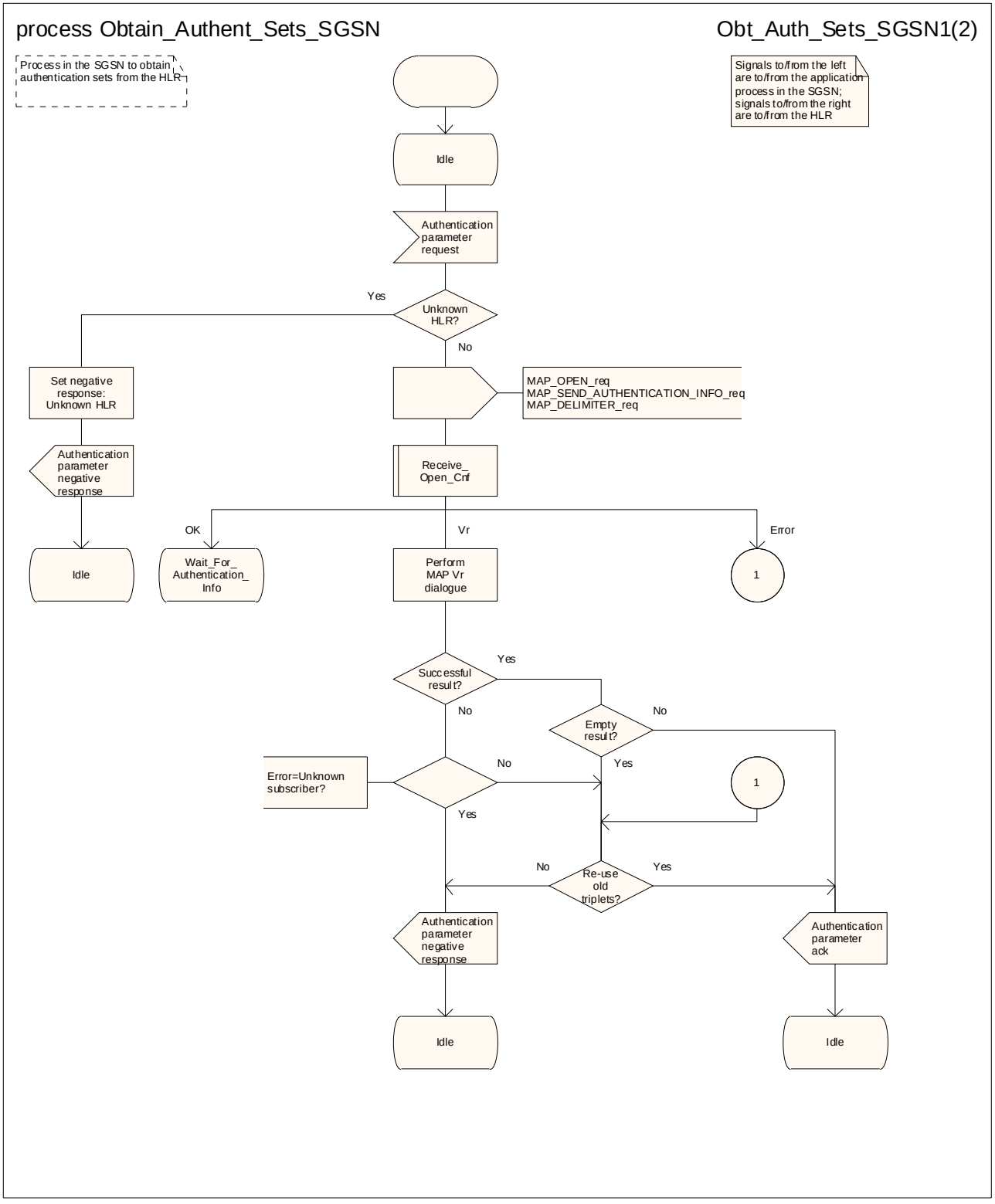


Figure 25.5/5 (sheet 1 of 2): Process Obtain_Authent_Sets_SGSN

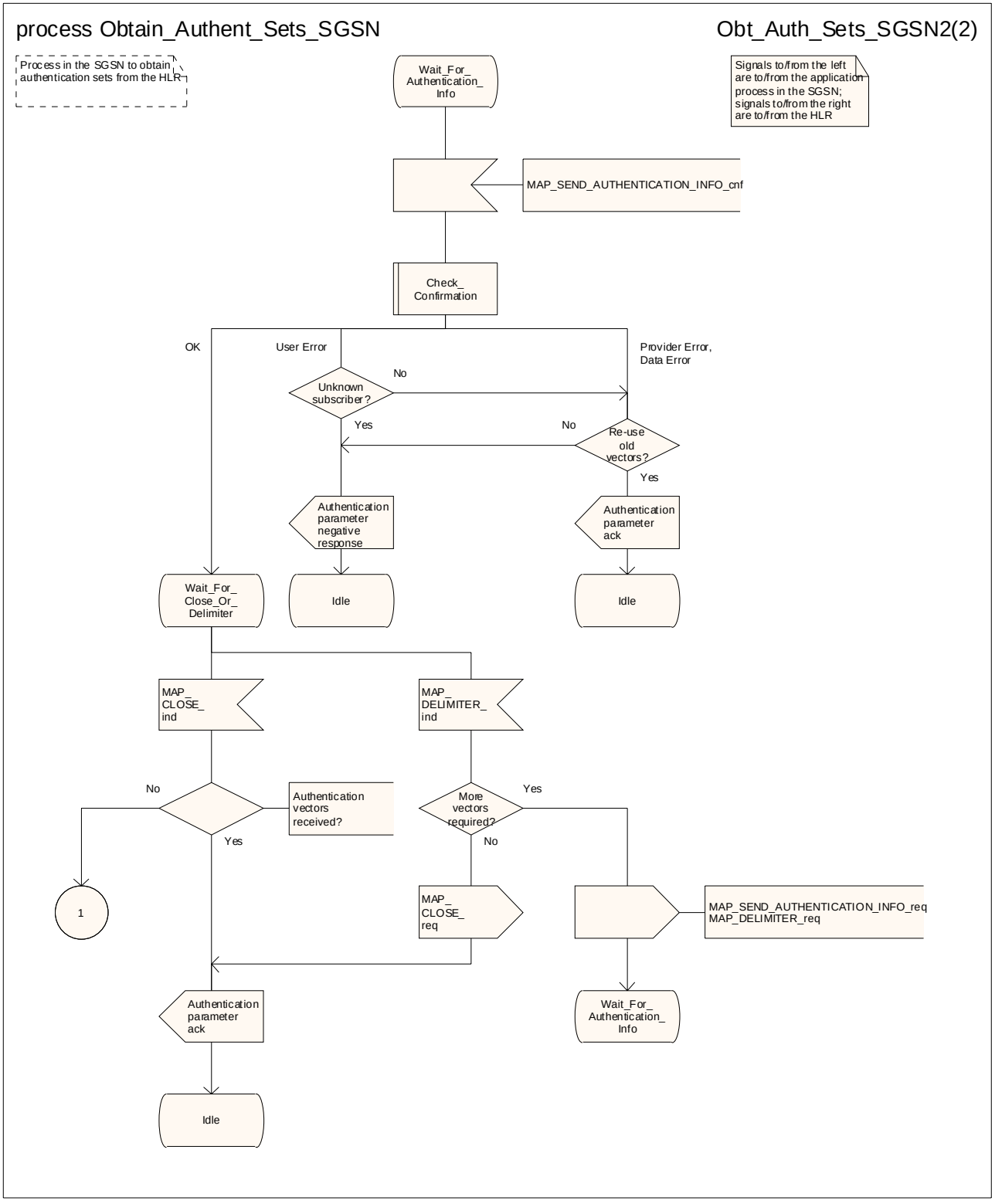
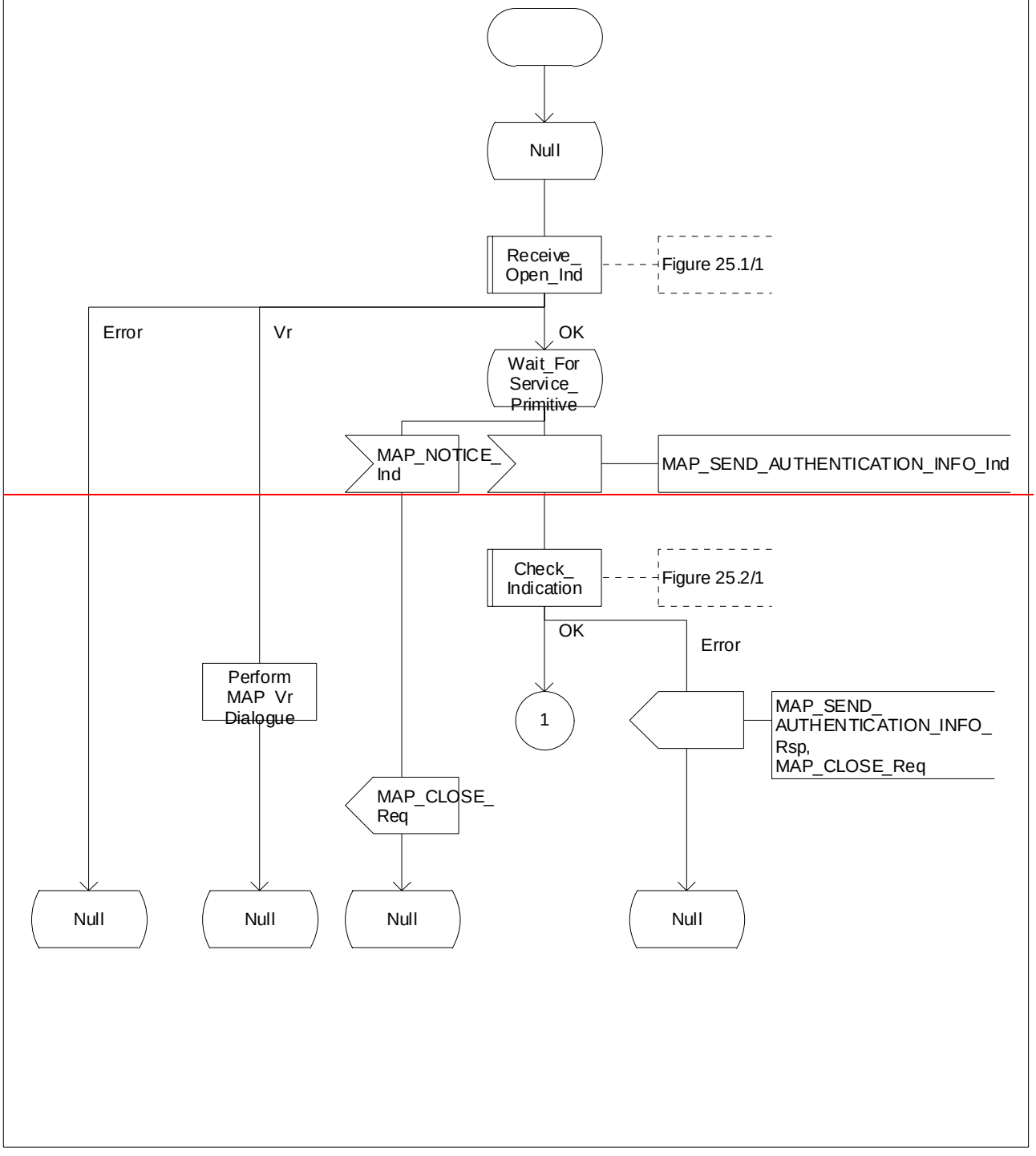


Figure 25.5/5 (sheet 2 of 2): Process Obtain_Authent_Sets_SGSN

Process Obtain_Auth_Sets_HLR 1(2)

Figure 25.5/5: Process in the HLR to obtain authentication sets from the AuC and relay them to the VLR



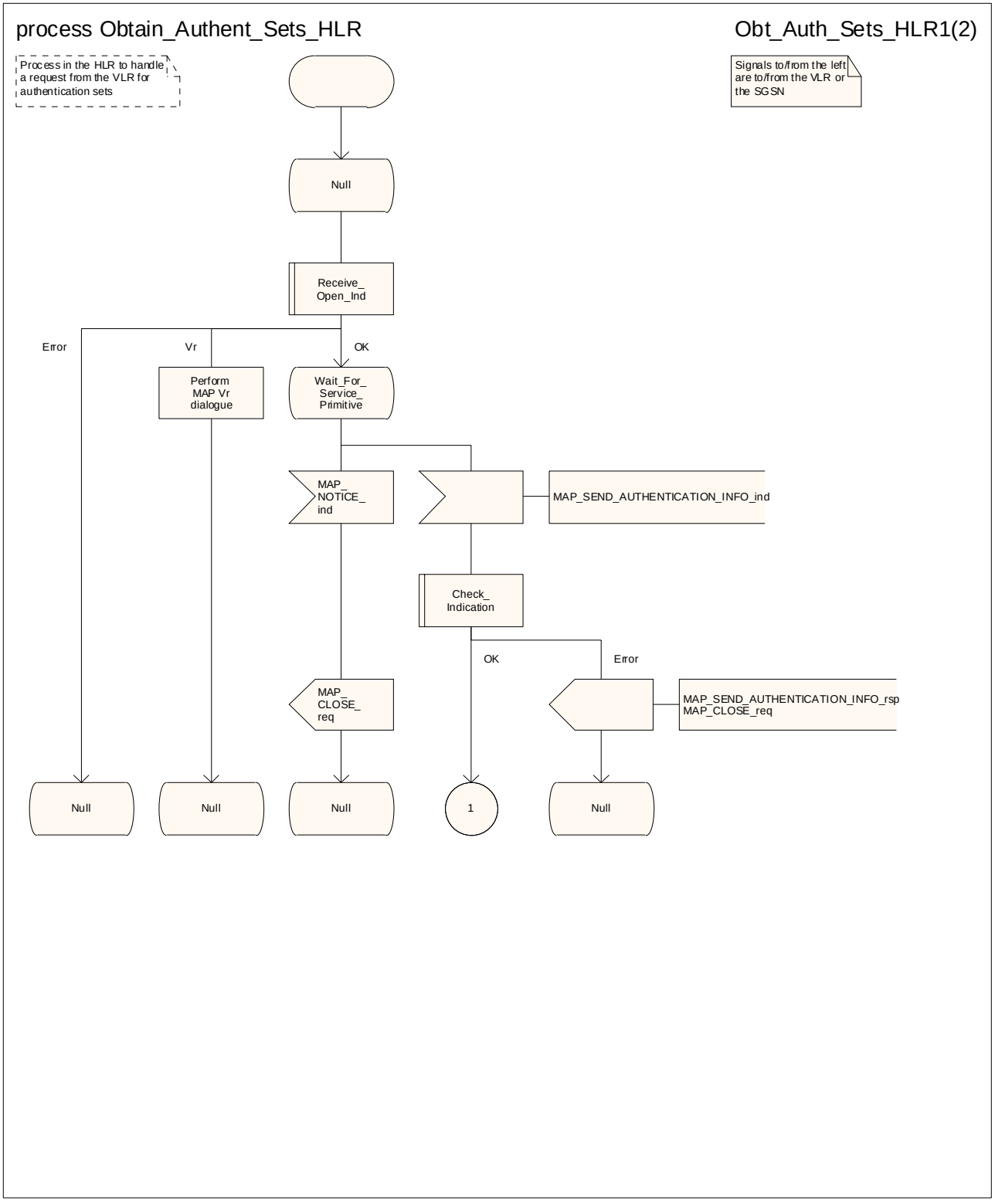
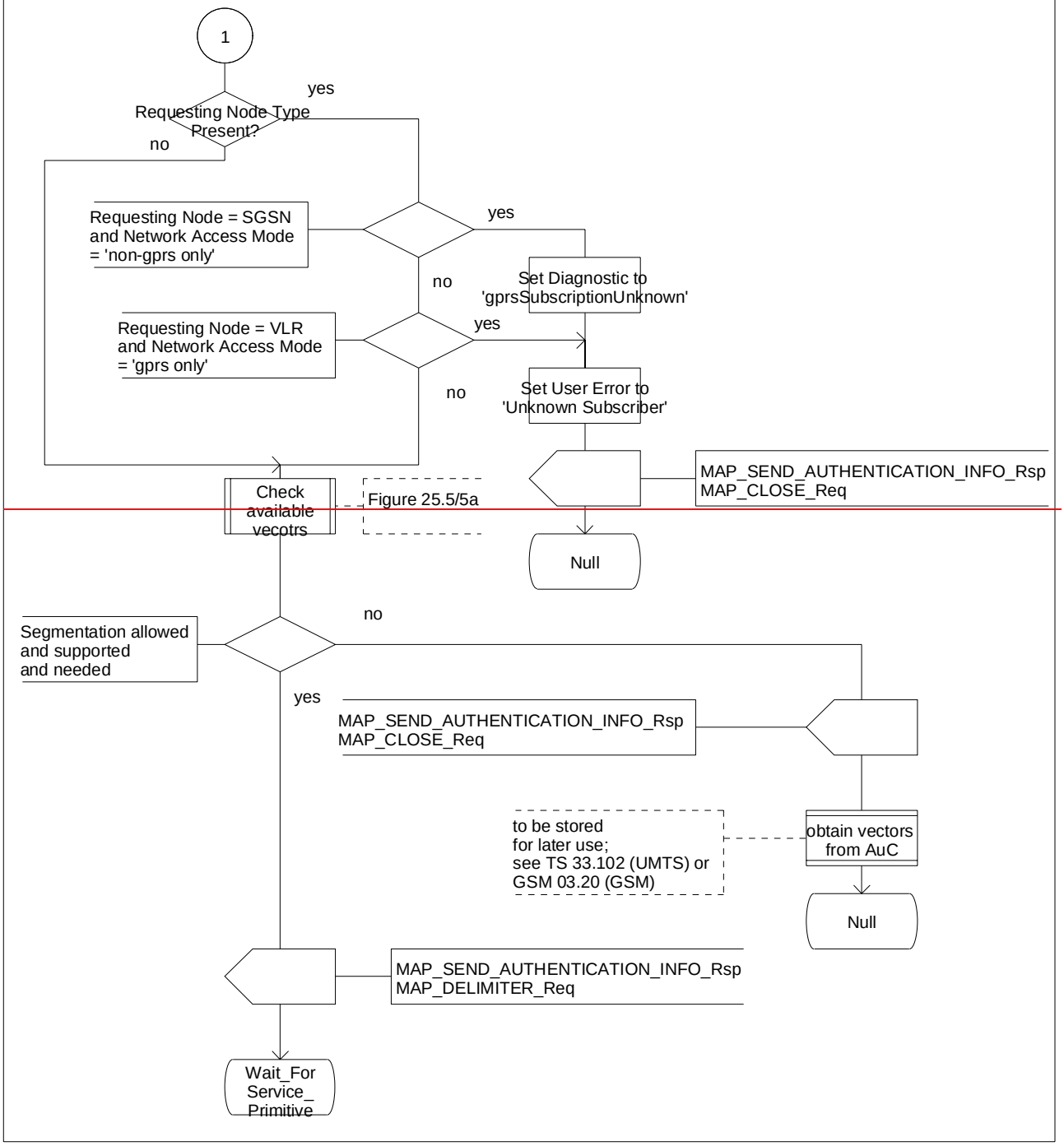


Figure 25.5/6~~5~~ (sheet 1 of 2): Process Obtain_Authent_Sets_HLR

process Obtain_Auth_Sets_HLR 2(2)

Figure 25.5/5: Process in the HLR to obtain authentication sets from the AuC and relay them to the VLR



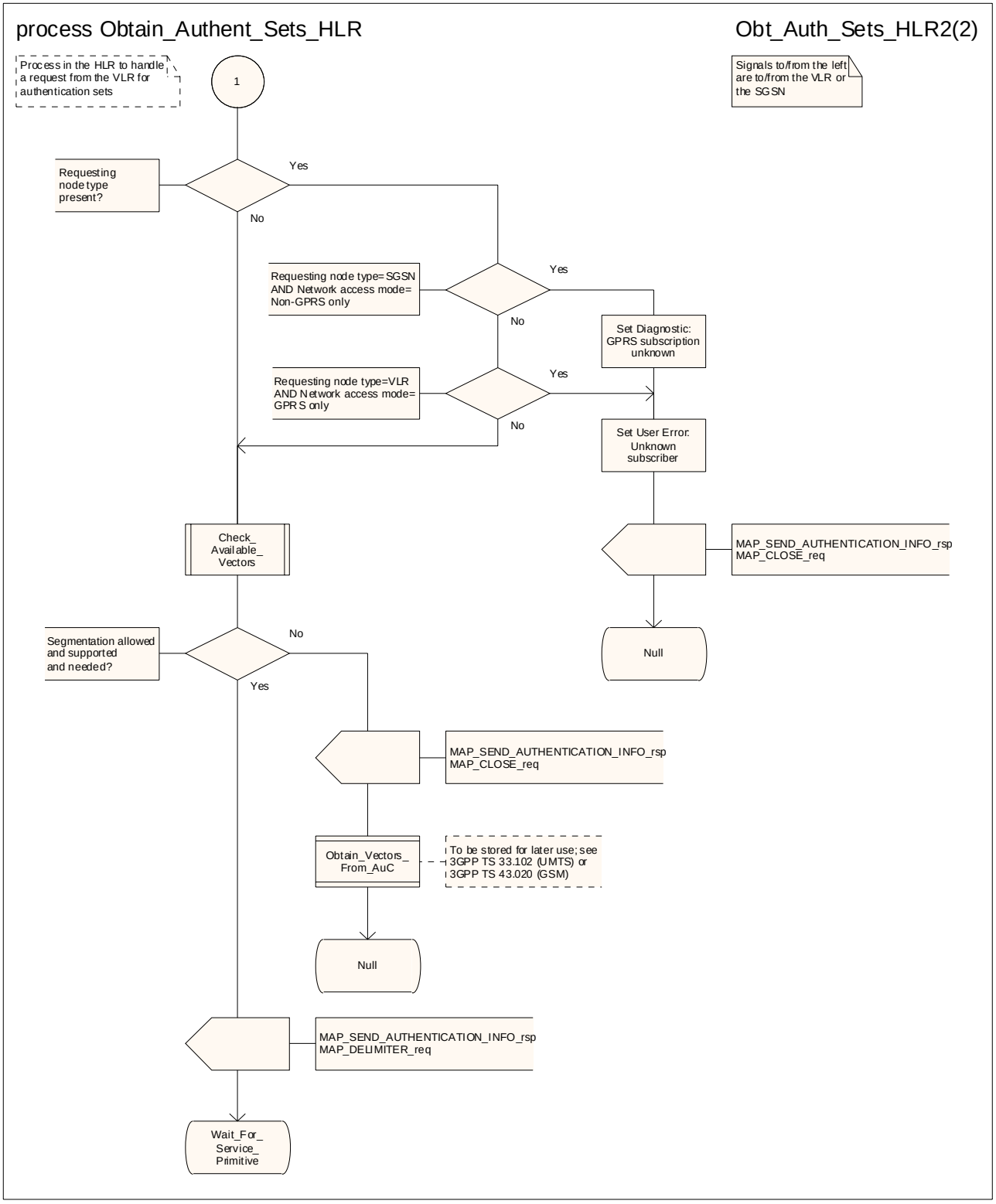
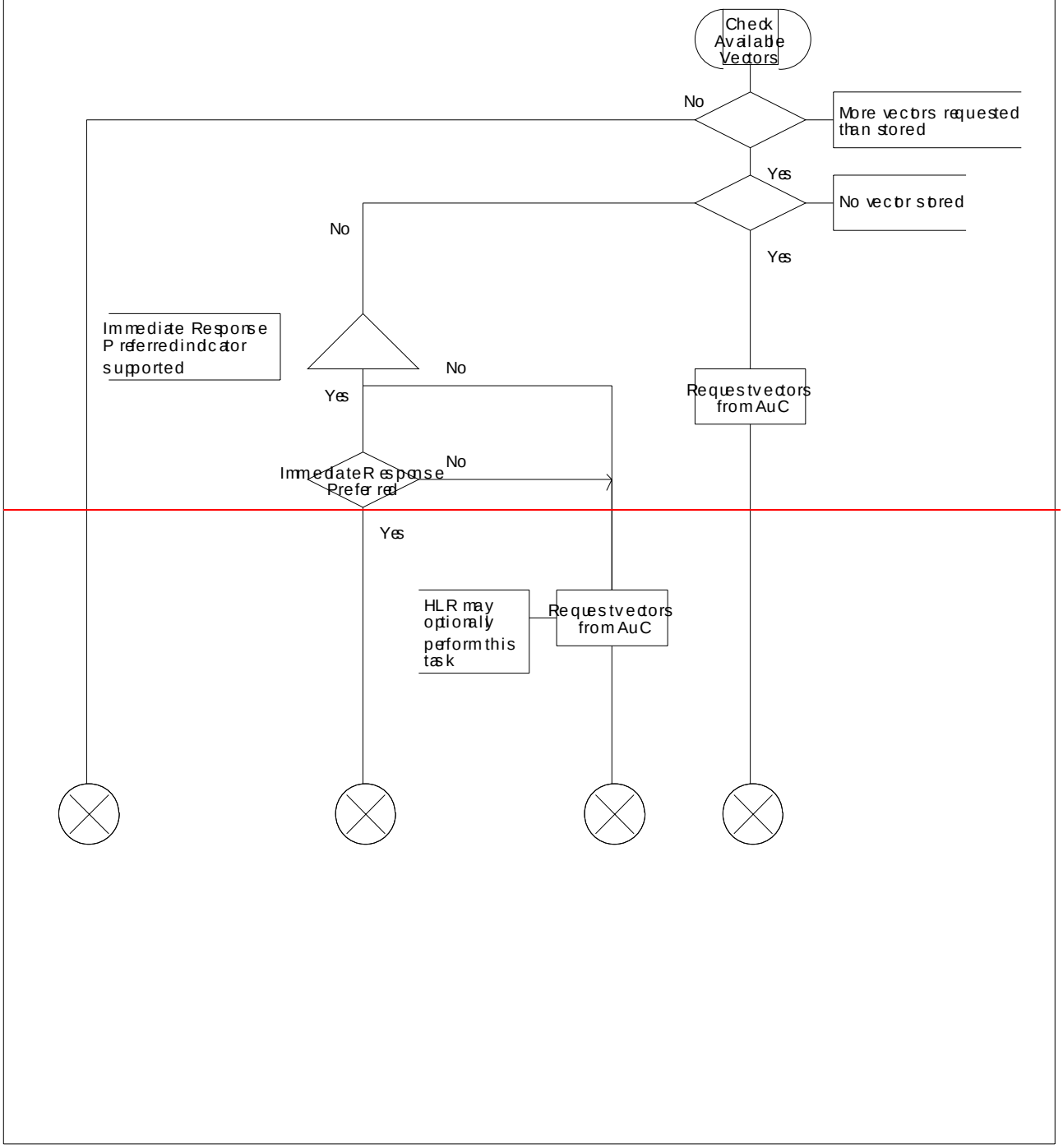


Figure 25.5/6~~5~~ (sheet 2 of 2): Process Obtain_Authent_Sets_HLR

procedure Check_Available_Vectors 1(1)

Figure 255/5a



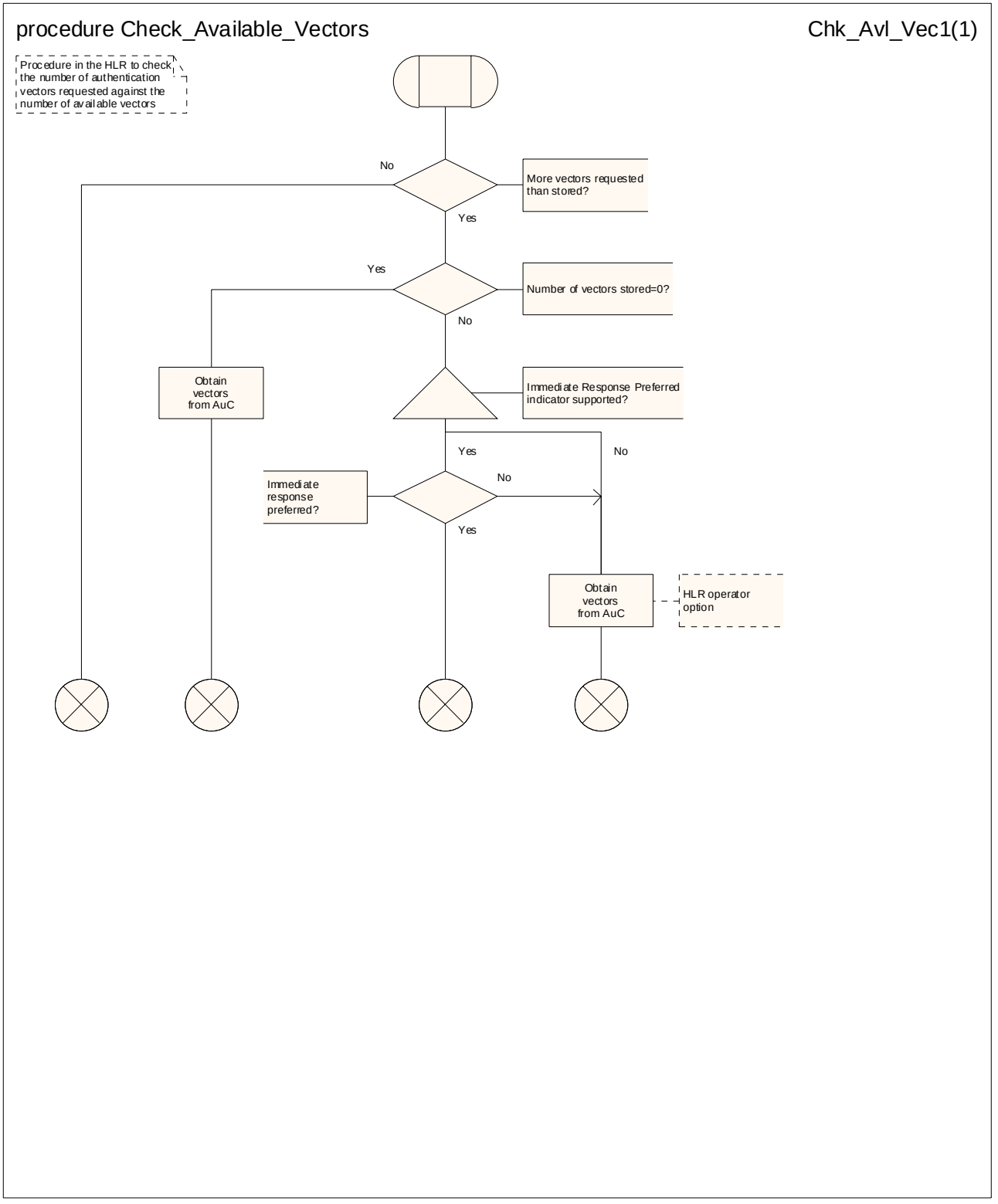


Figure 25.5/76: Procedure Check_Available_Vectors

25.5.6 Process Obtain_Authent_Para_SGSN

***** CR editor's note: this text has been moved to come immediately before the text for the process Obtain_Authent_Sets_HLR. It is now subclause 25.5.5. *****

For authentication procedure description see 3GPP TS 23.060 [104] and 3GPP TS 24.008 [35].

This Process is used by the SGSN to request authentication vectors from the HLR.

If the SGSN does not know the subscriber's HLR address (e.g. no IMSI translation exists), the Authentication Parameter negative response with error "Unknown HLR" is returned to the requesting process.

Otherwise, the Process proceeds as follows:

- a connection is opened, and a MAP_SEND_AUTHENTICATION_INFO request sent to the HLR;
- if the HLR indicates that a MAP version 1 or 2dialogue is to be used, the SGSN performs the equivalent MAP version 1 or 2dialogue. which can return a positive result containing authentication sets, an empty positive result, or an error;
- if the dialogue opening fails, the Authentication Parameters negative response with appropriate error is sent to the requesting process. Otherwise, the SGSN waits for the response from the HLR;
- if a MAP_SEND_AUTHENTICATION_INFO confirmation is received from the HLR, the SGSN checks the received data.

One of the following positive responses may be received from a MAP version 1 or MAP version 2 dialogue with the HLR:

- Authentication triplets, in which case the outcome is successful;
- Empty response, in which case the SGSN may re-use old triplets, if allowed by the PLMN operator.

If the SGSN cannot re-use old triplets (or no such triplets are available) then the Authentication Parameters negative response with appropriate error is sent to the requesting process.

If the outcome was successful or re-use of old parameters in the SGSN is allowed, then the Authentication Parameters response is sent to the requesting process

If an "Unknown Subscriber" error is included in the MAP_SEND_AUTHENTICATION_INFO confirm or is returned by the MAP version 1 dialogue, then the appropriate error is sent to the requesting process in the Authentication Parameters negative response

In a MAP version 3 dialogue a (possibly empty) set of authentication vectors may be received, transferred by means of the TC-RESULT-L service, from the HLR followed by a MAP_CLOSE_Indication or by a MAP_DELIMITER_Indication. If a MAP_DELIMITER_Indication is received, the SGSN may request additional authentication vectors from the HLR by sending a new MAP_SEND_AUTHENTIFICATION_INFO_Request. If a MAP_CLOSE_Indication is received, and authentication vectors have been received during the dialogue, then the "OK" exit is used. If no authentication vectors have been received during the dialogue, the SGSN checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

If in a MAP version 3 dialogue an "Unknown Subscriber" error is received, then the "Unknown Subscriber" exit is used. If other errors are received, the SGSN checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

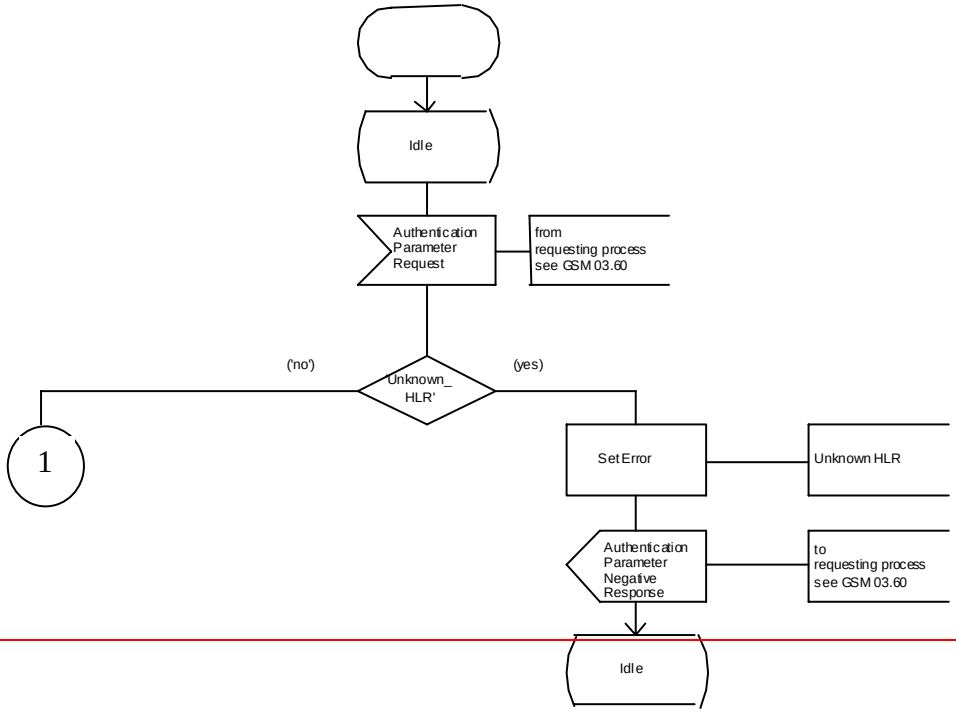
- if a MAP-U-ABORT, MAP_P_ABORT or unexpected MAP_CLOSE service indication is received from the HLR, then the SGSN checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the Authentication Parameters negative response with appropriate error is sent to the requesting process.
- if a MAP_NOTICE service indication is received from the HLR, then the dialogue with the HLR is closed. The SGSN then checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the process terminates and the Authentication Parameters negative response with appropriate error is sent to the requesting process; Otherwise the Authentication Parameters response is sent to requesting process.

~~The process is described in figure 25.5/6.~~

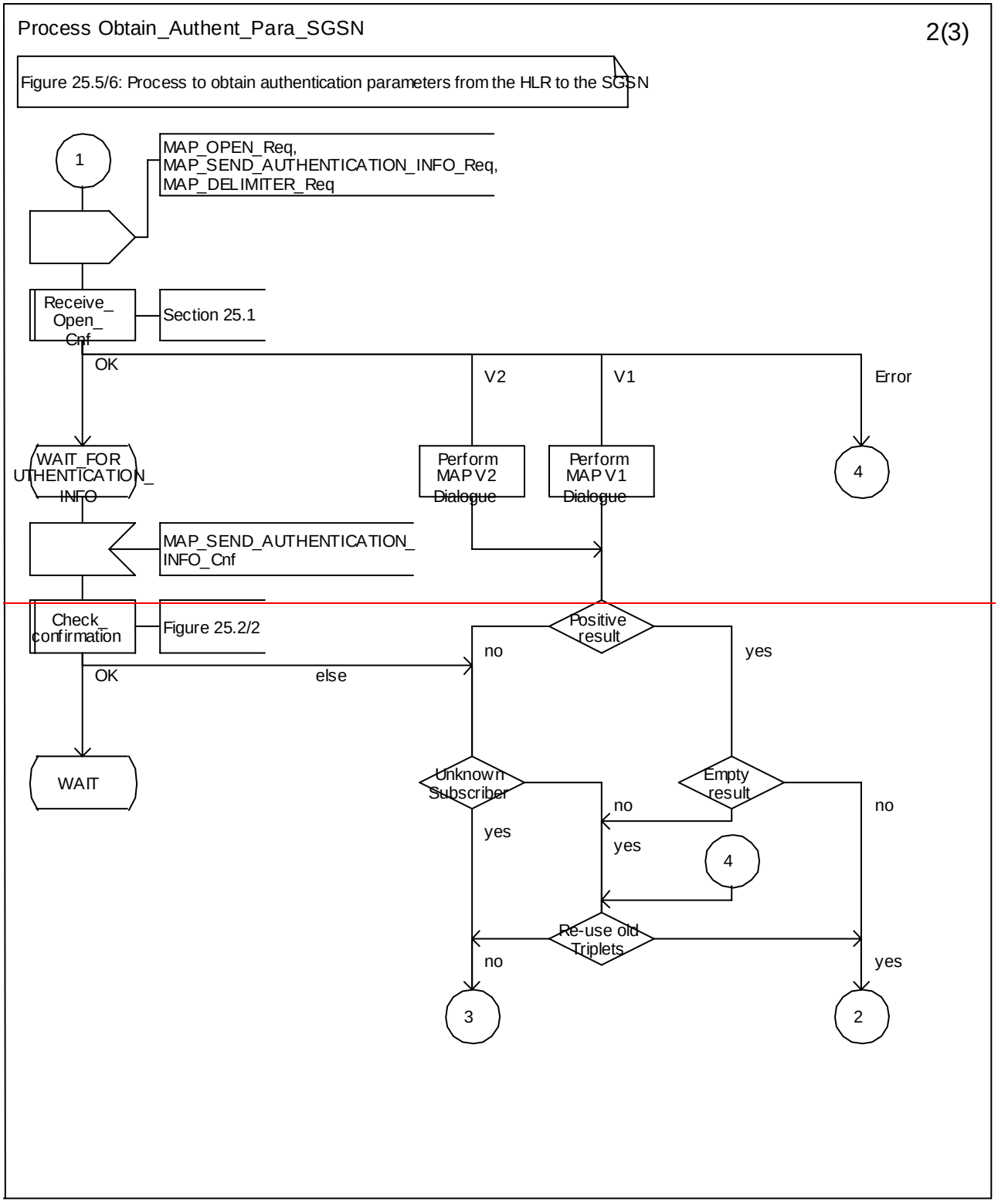
***** CR editor's note: The SDL diagram for the process Obtain_Authent_Sets_SGSN has been moved to become figure 25.5/5, immediately before the SDL diagram for the process Obtain_Authent_Sets_HLR. *****

Process Obtain_Authent_Para_SGSN 1(3)

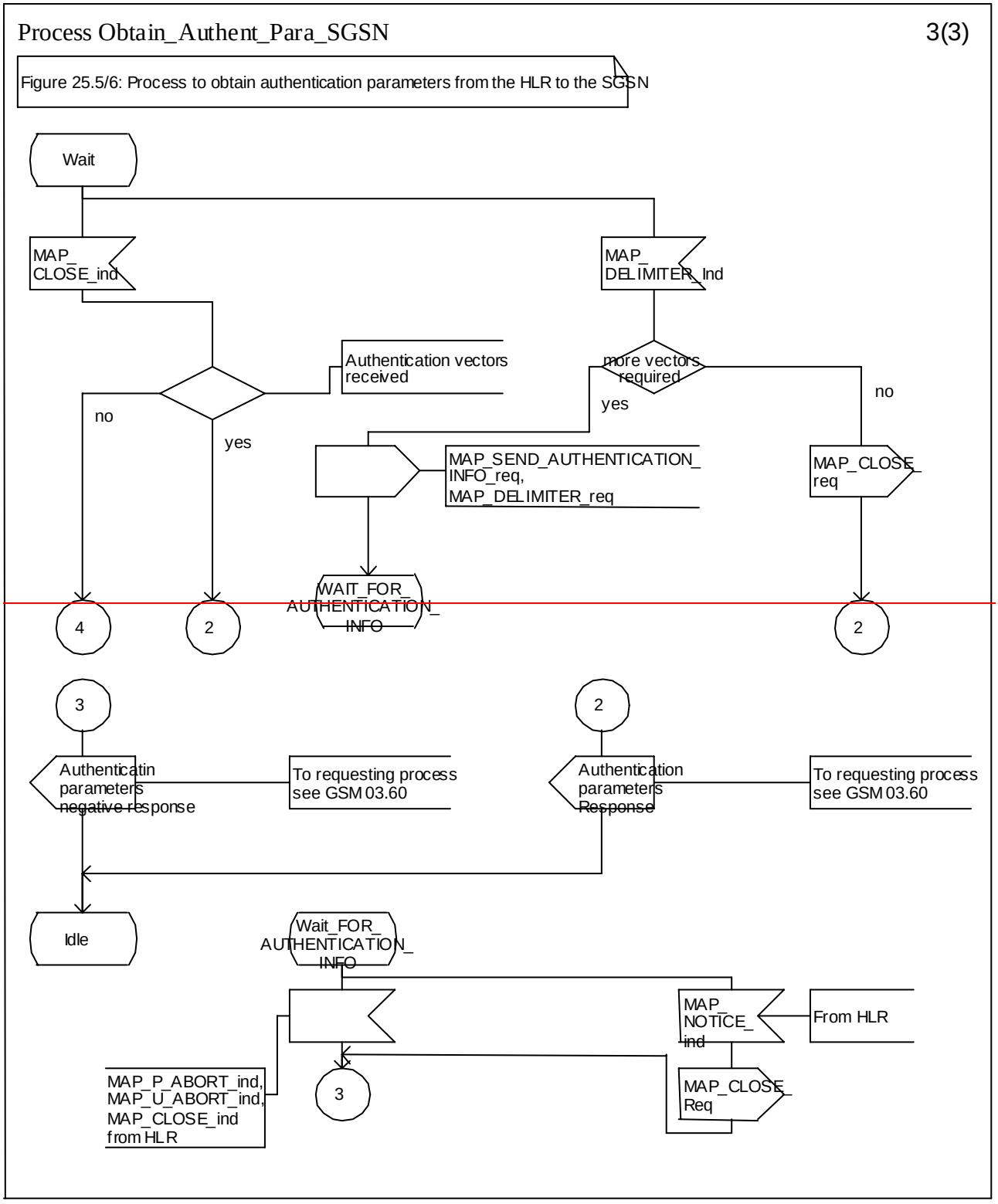
Figure 25.5/6: Process to obtain authentication parameters from the HLR to the SGSN



~~Figure 25.5/6 (sheet 1 of 3): Process Obtain_Authen_Para_SGSN~~



~~Figure 25.5/6 (sheet 2 of 3): Process Obtain_Authen_Para_SGSN~~



~~Figure 25.5/6 (sheet 3 of 3): Process Obtain_Authen_Para_SGSN~~

25.5.7 ~~Process~~ Authentication ~~–~~Failure ~~–~~Reporting

25.5.7.1 General

The Authentication Failure Report procedure is used to notify an HLR about the occurrence of an authentication failure in the SGSN or VLR.

The message flows for this procedure ~~is~~ are shown in figures 25.5/7 & 25.5/8.

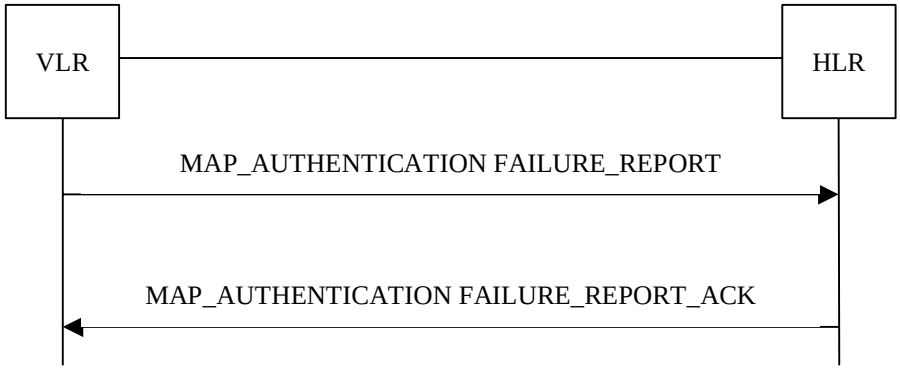


Figure 25.5/7: Message Flows ~~to~~ for Authentication Failure Report – VLR to HLR

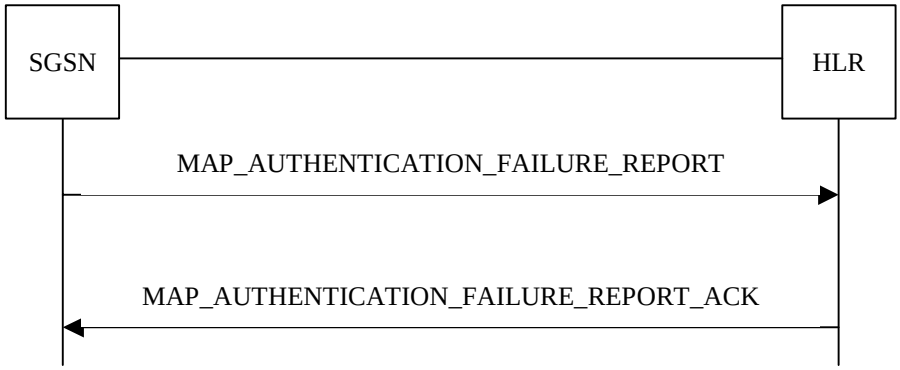
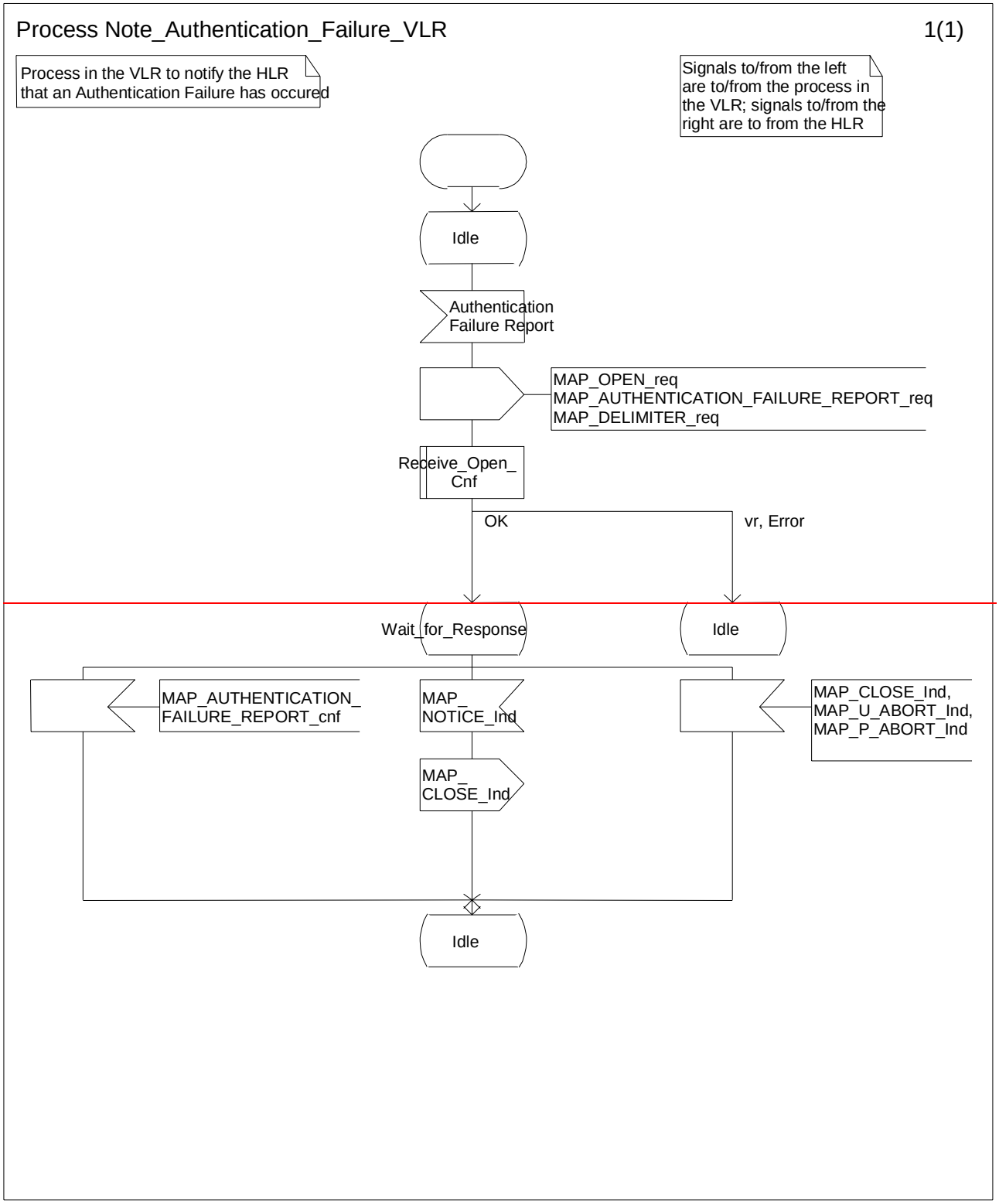


Figure 25.5~~6~~/8~~7~~: Message Flows ~~to~~ for Authentication Failure Report – SGSN to HLR

25.5.7.2 Process in the VLR



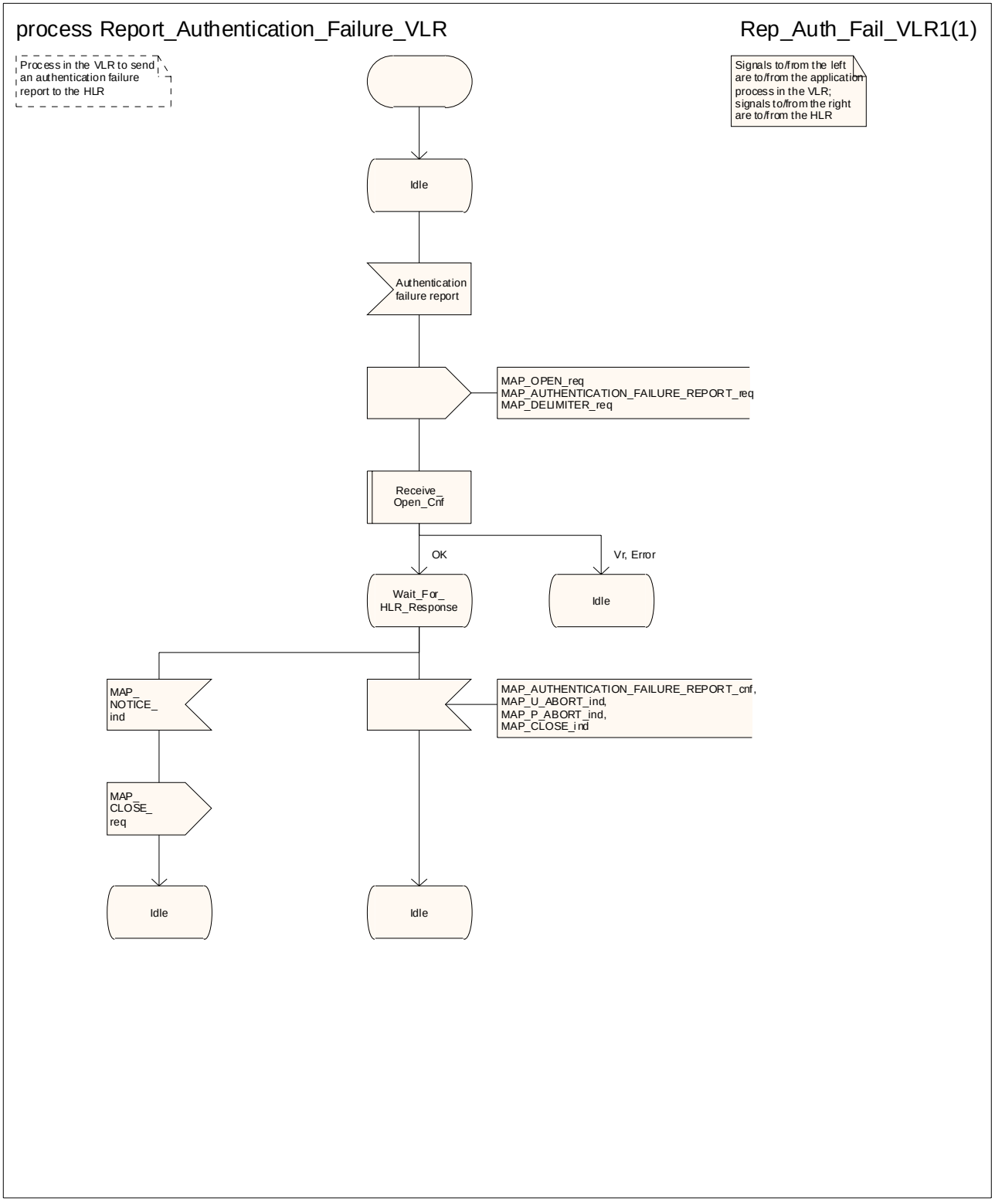
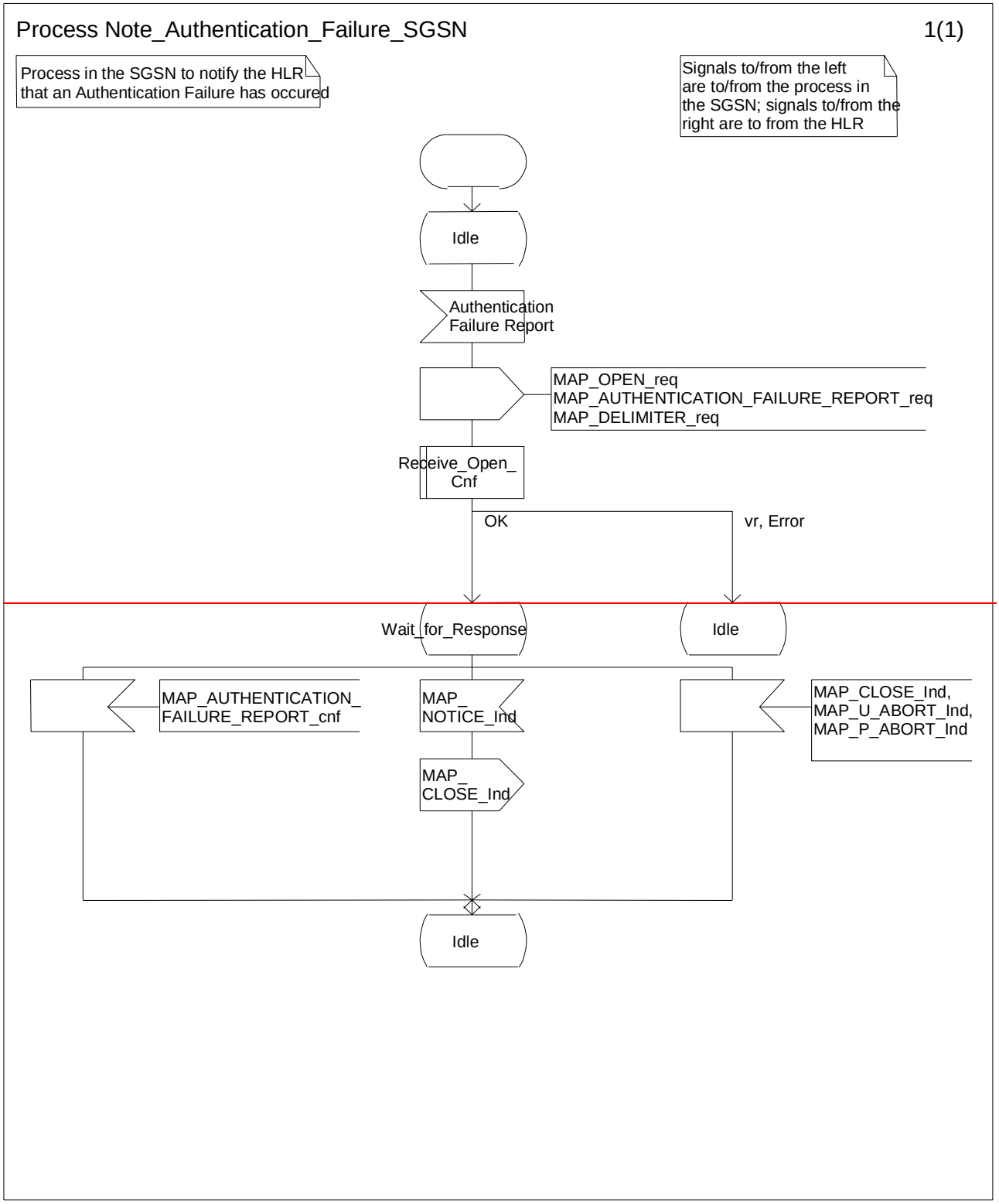


Figure 25.56/98: Process ~~Note~~Report_Authentication_Failure_VLR

25.5.7.3 Process in the SGSN



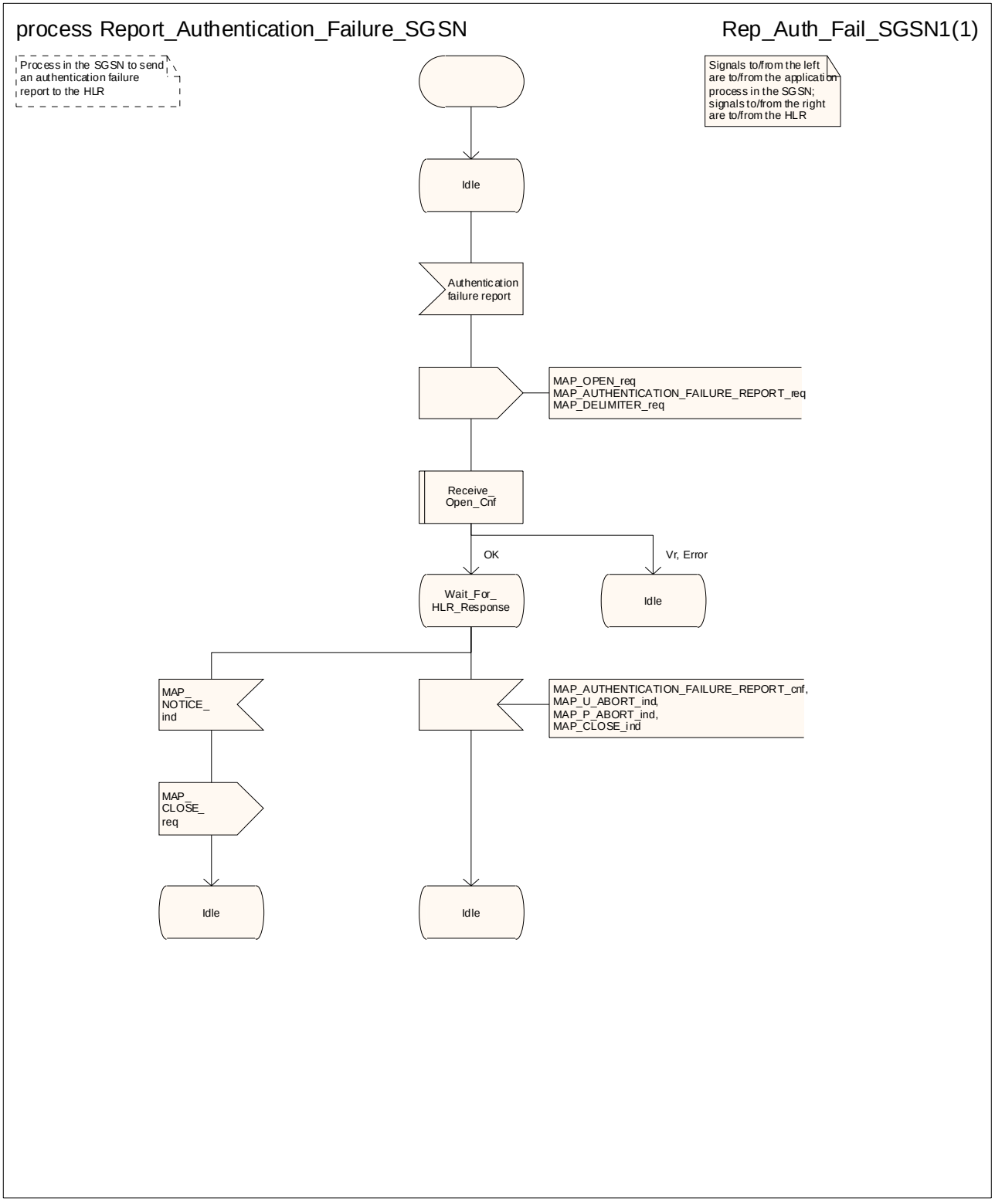
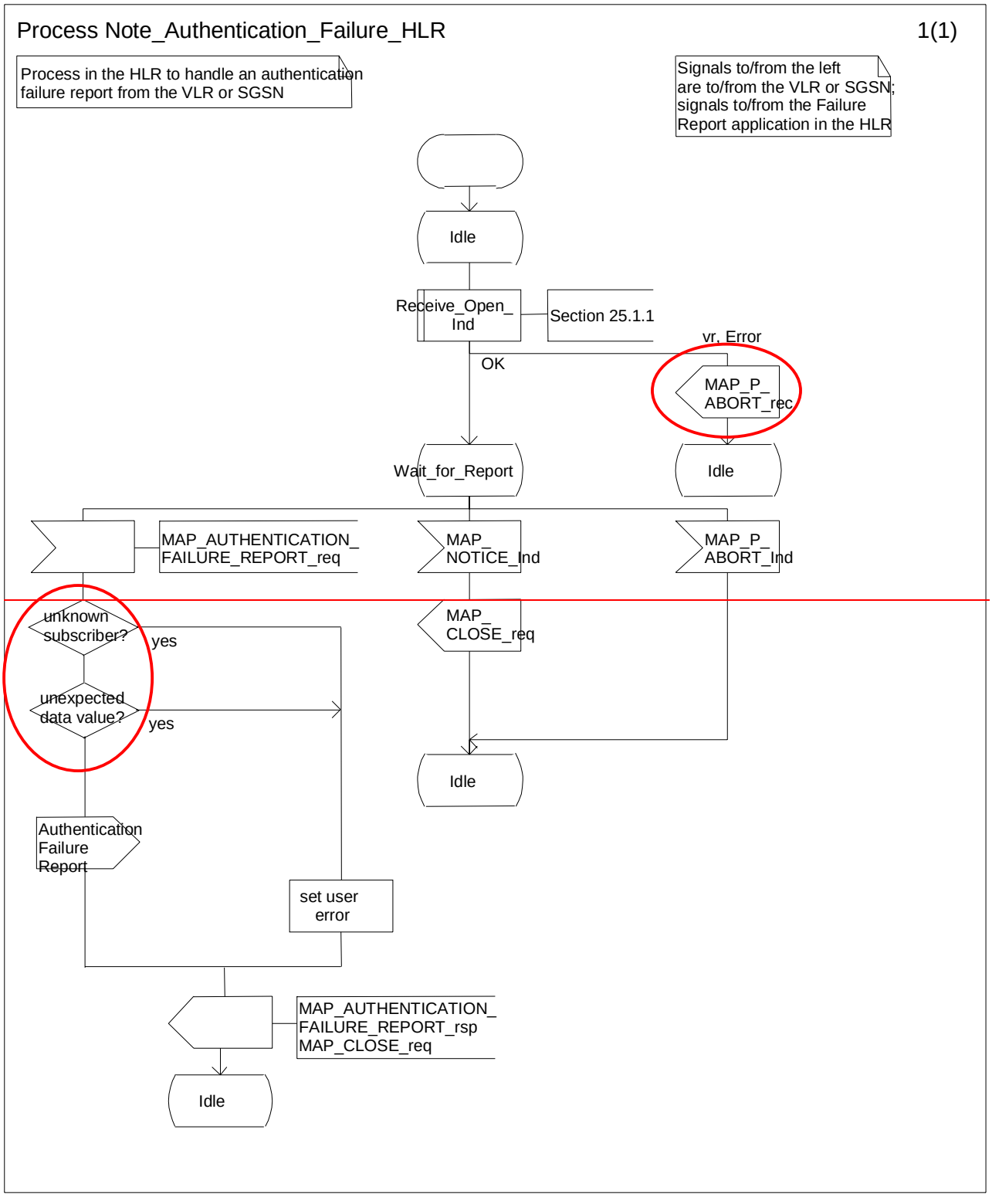


Figure 25.5~~6~~/10~~9~~: Process ~~Note~~Report_Authentication_Failure_SGSN

25.5.7.4 Process in the HLR



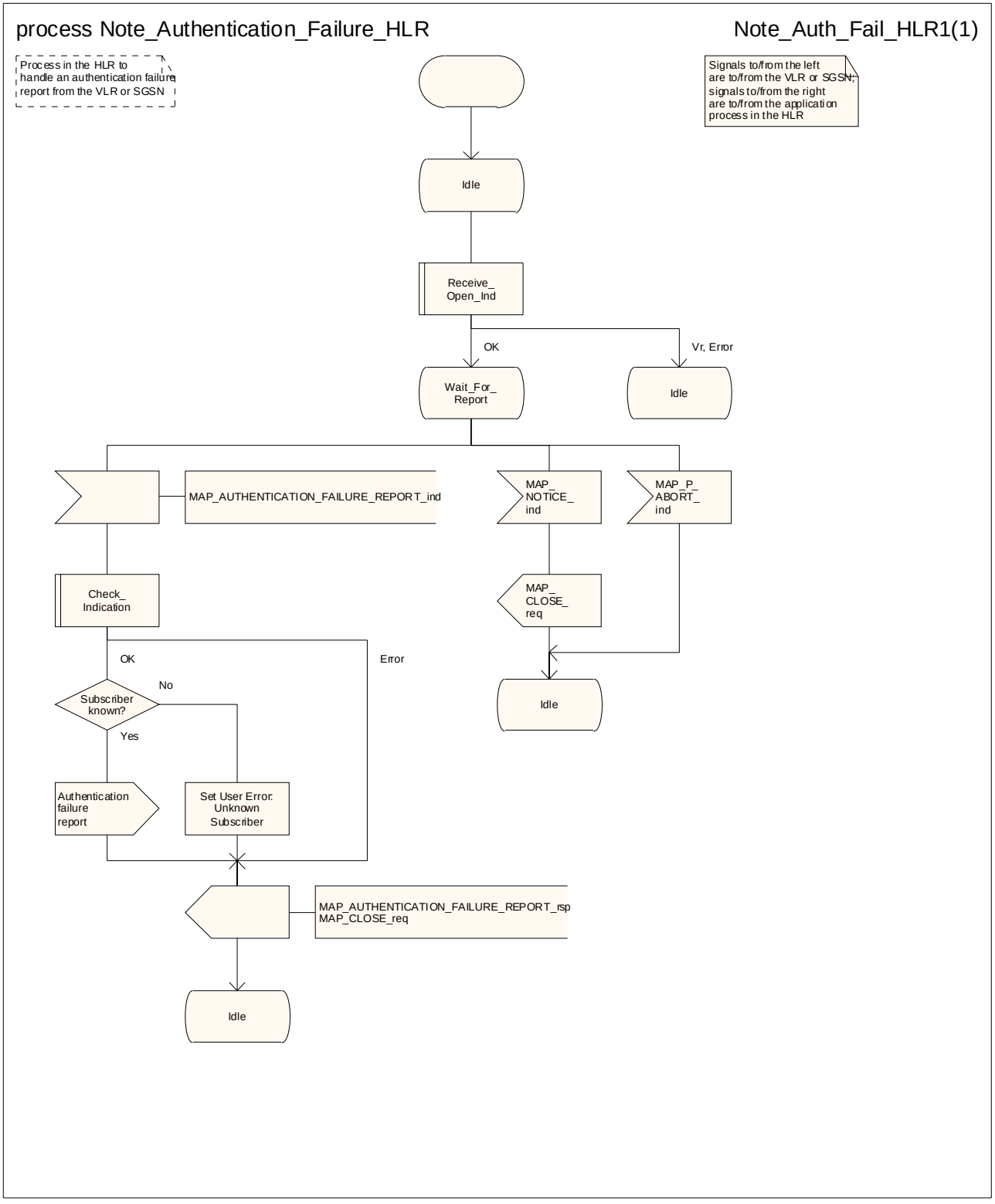


Figure 25.56/110: Process Note_Authentication_Failure_HLR

25.6 IMEI Handling Macros

The following macros are used in the ~~GSM~~ network ~~in order~~ to enable handling and checking of the mobile equipment identity.

25.6.1 Macro Check_IMEI_MSC

This macro is used by the MSC to receive a request from the VLR, relay it to the EIR, and pass the result from the EIR back to the VLR. ~~The macro proceeds as follows:~~

Sheet 1: If the dialogue with the EIR drops back to a previous protocol version and the EIR returned an error, the MSC relays the error to the VLR in the MAP_CHECK_IMEI response. If the dialogue with the EIR failed, or the EIR returned a badly formed result, the MSC sends a System Failure error to the VLR in the MAP_CHECK_IMEI response.

~~- 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.

25.6.6 Process Check_IMEI_SGSN

***** CR editor's note: this (much reduced!) text has been moved from its pposition immediately after the SDL diagram for the macro Obtain_IMEI_VLR. *****

This process is used by the SGSN to control the check of a mobile equipment's IMEI.

25.6.43 Process Check_IMEI_EIR

This process is used by the EIR to obtain the status of a piece of mobile equipment, upon request from the MSC or from the SGSN. The process acts as follows:

- a MAP_OPEN service indication is received (macro Receive_Open_Ind, clause 25.1.1). If the dialogue opening fails, the process terminates;

- otherwise, a MAP_CHECK_IMEI indication is received by the EIR, containing the IMEI to be checked;

- the EIR checks the service indication for errors. If there are any, they are reported to the MSC or to the SGSN in the MAP_CHECK_IMEI response. If no errors are detected, the EIR data base function is interrogated for the status of the given equipment. Further details are found in 3GPP TS 22.016 [7];

- the status of the equipment (white-listed, grey-listed, black-listed or unknown) is returned to the MSC or to the SGSN in the MAP_CHECK_IMEI service response;

- if a MAP_U_ABORT, MAP_P_ABORT, MAP_NOTICE or MAP_CLOSE indication is received from the MSC or from the SGSN at any time during this process, the process in the EIR terminates.

The process is described in figure 25.6/3.

25.6.54 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.

25.6.65 Macro Obtain_IMEI_VLR

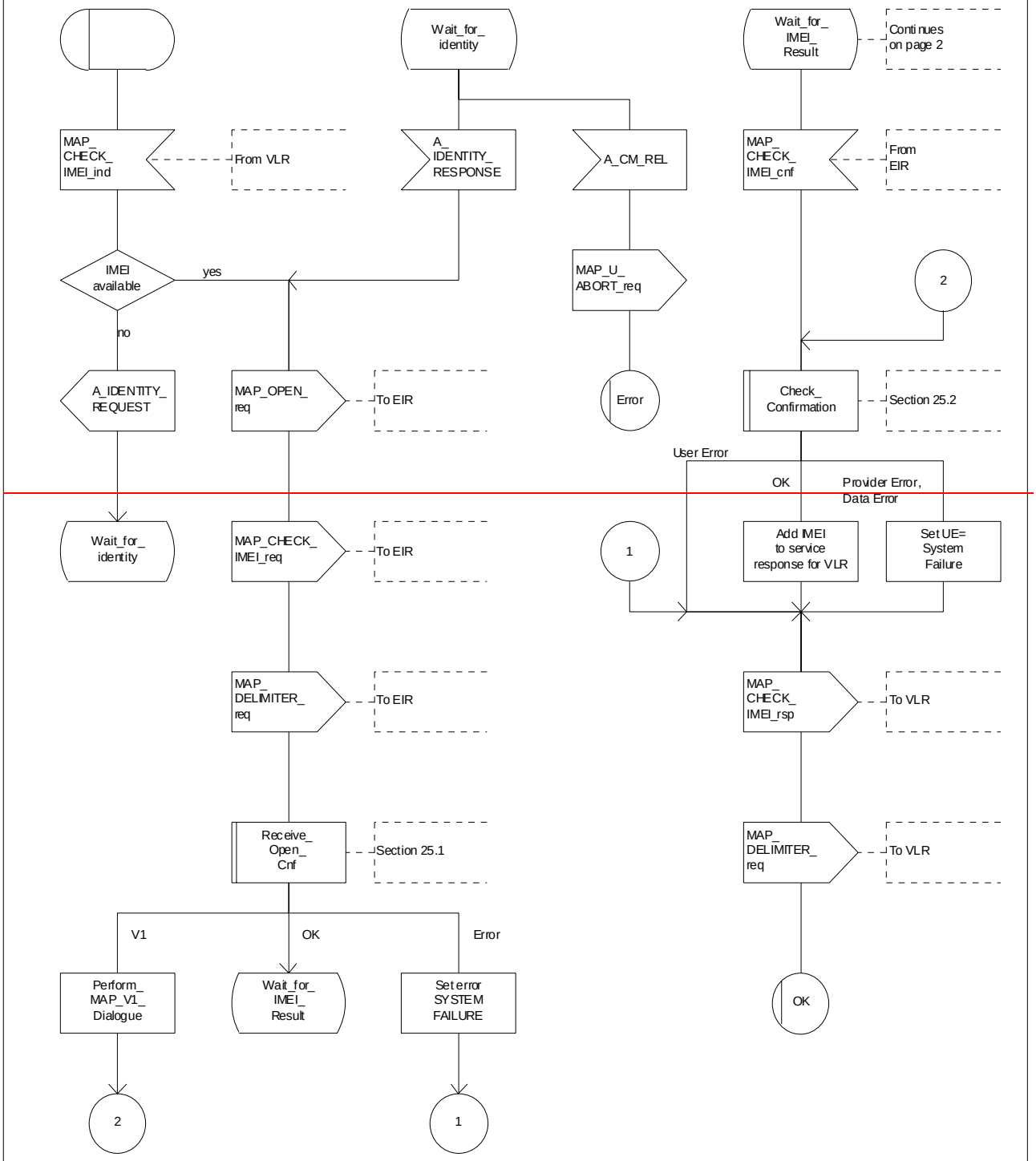
This macro is used by the VLR to obtain the IMEI from the MSC. e.g. to enable handling of emergency calls in case of authentication failure (in which case the IMEI may be used by some operators as an alternative to the IMSI). It proceeds as follows:

- 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.

Macrodefinition Check_IMEI_MSC 25.6_1.1(2)

Figure 25.6/1: Check IMEI macro in the MSC, relaying the IMEI check indication from the VLR to the MSC and relaying the confirmation from the EIR to the VLR



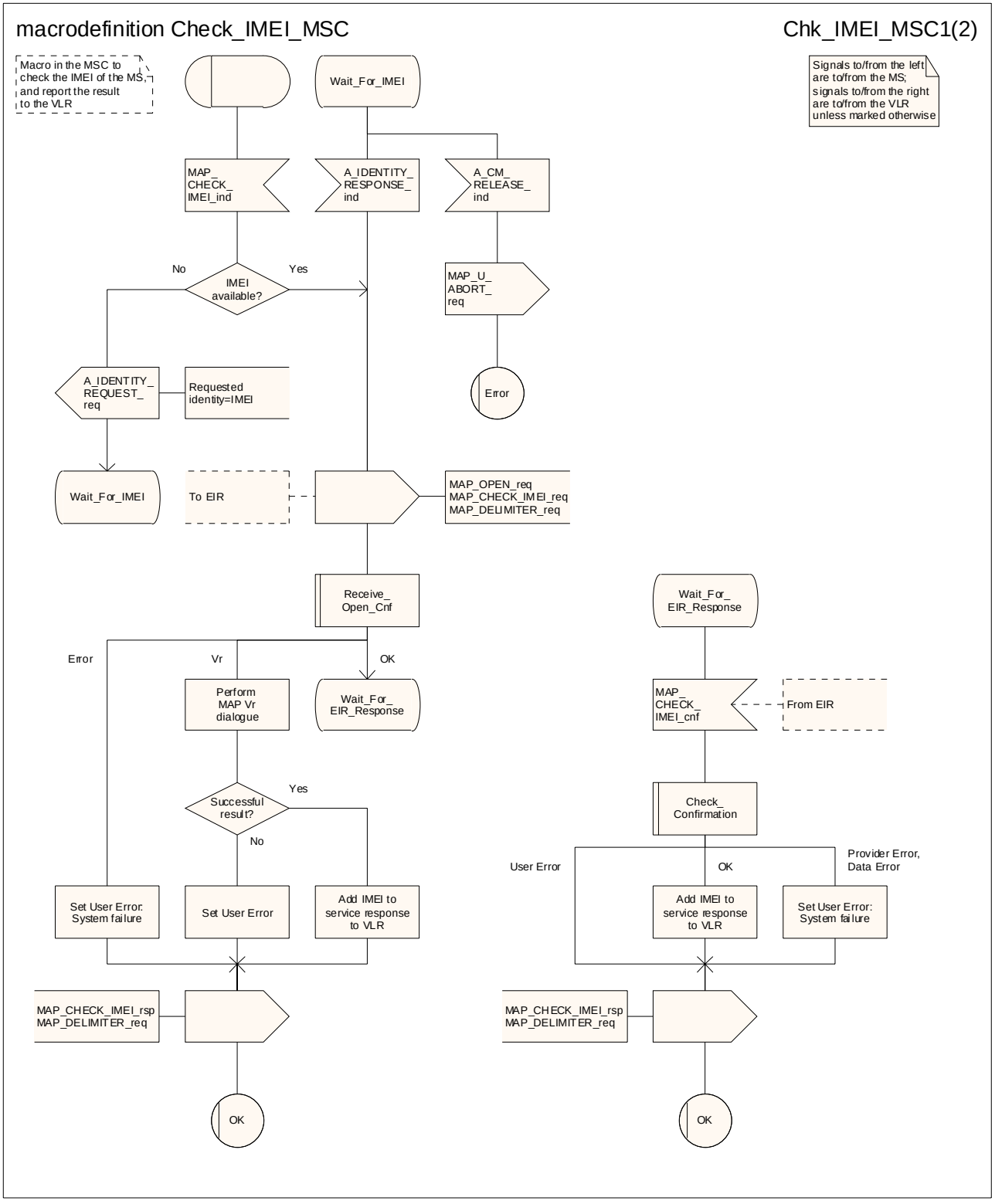
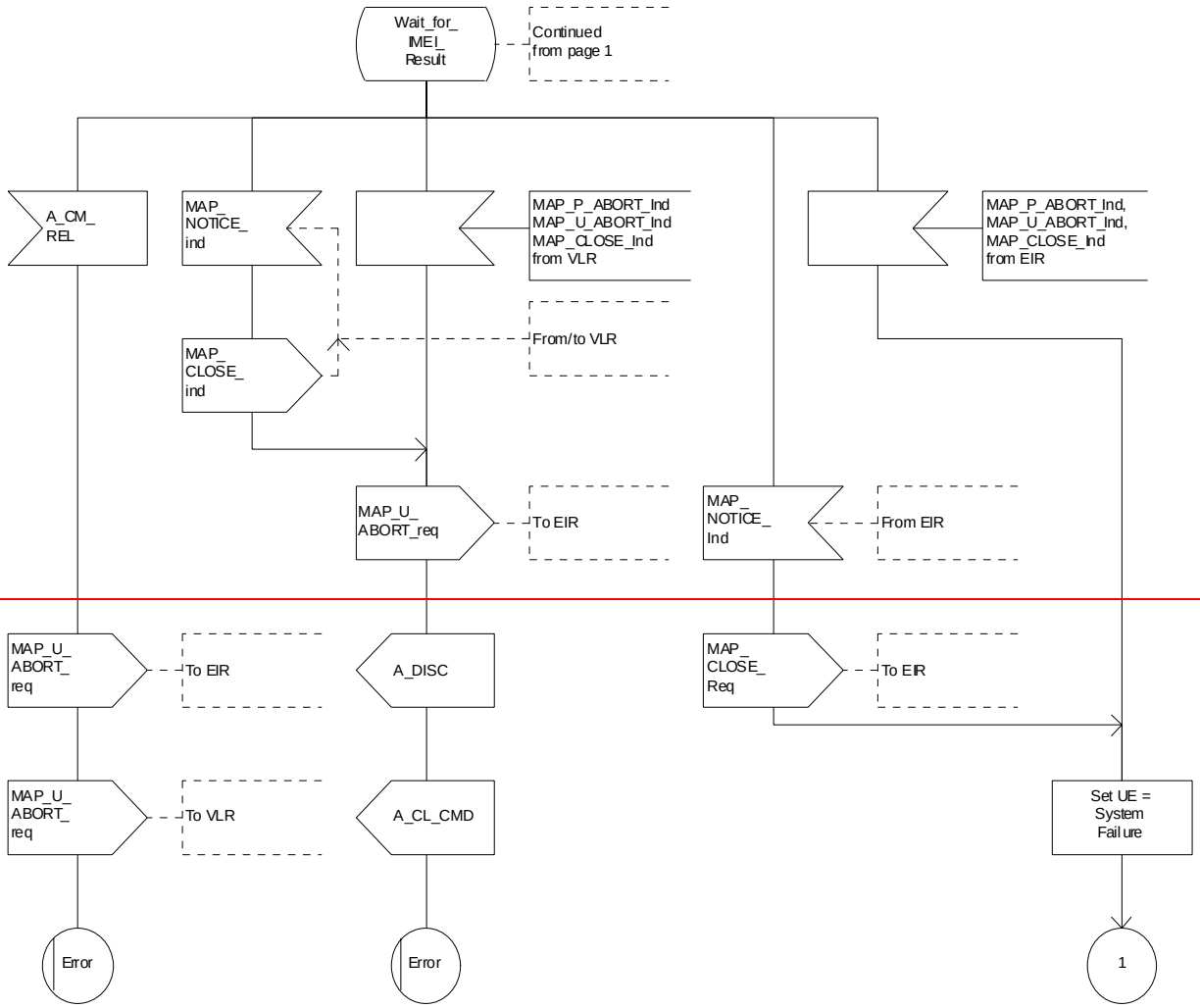


Figure 25.6/1 (sheet 1 of 2): ~~Process~~ Macro Check_IMEI_MSC

Macrodefinition Check_IMEI_MSC 25.6_1.2(2)

Figure 25.6/1: Check IMEI macro in the MSC, relaying the IMEI check indication from the VLR to the MSC and relaying the confirmation from the EIR to the VLR



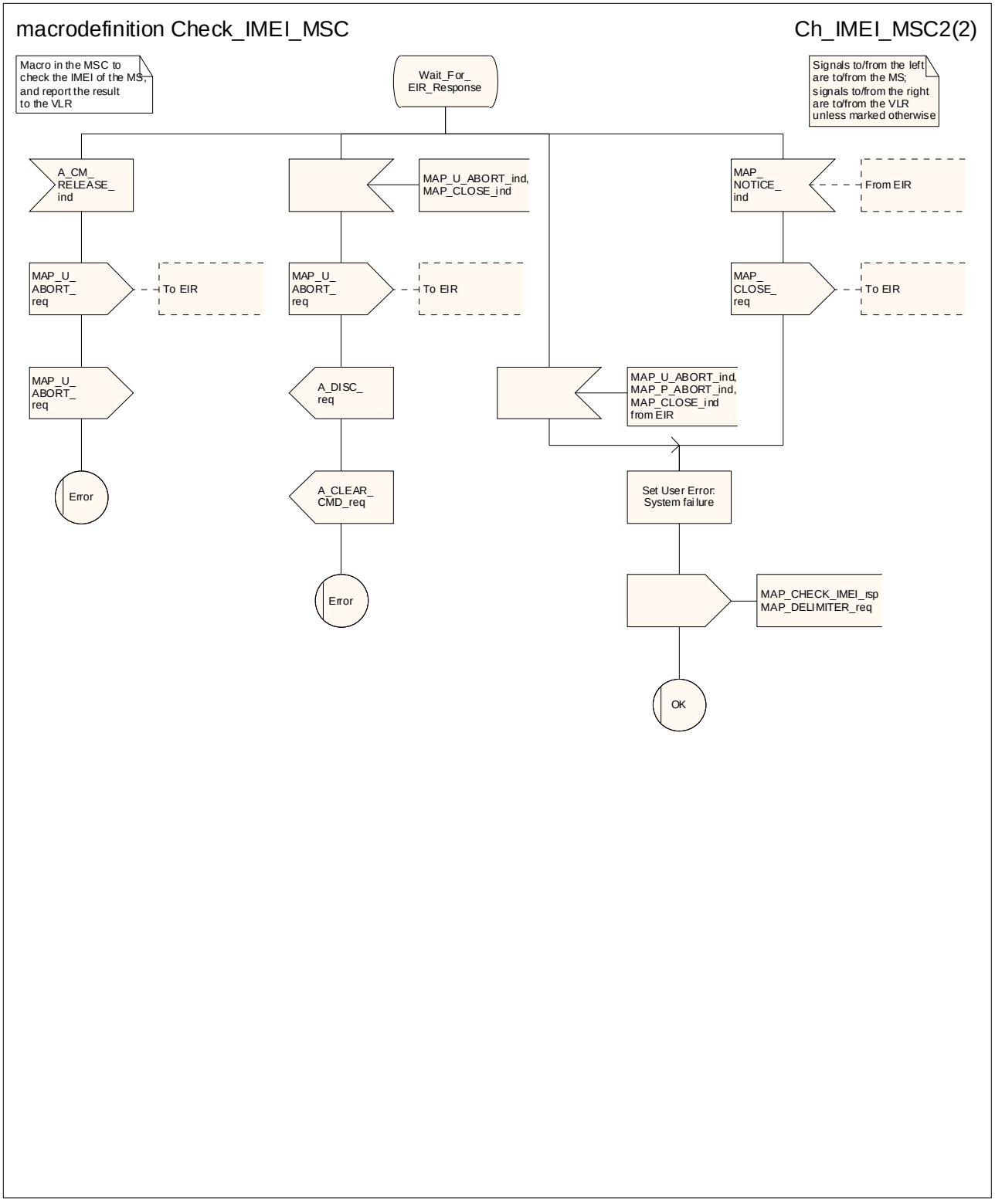
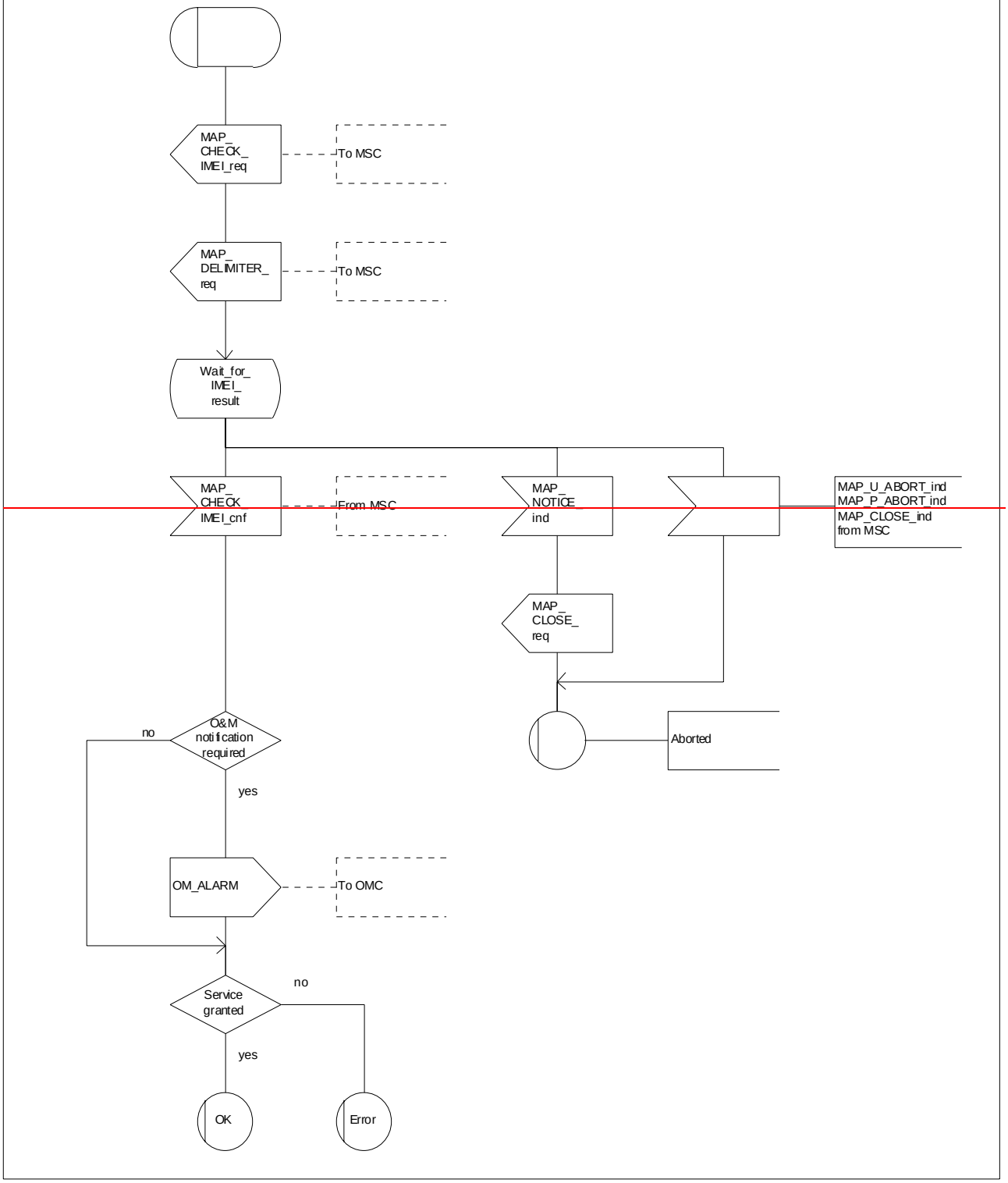


Figure 25.6/1 (sheet 2 of 2): ~~Process~~ Macro Check_IMEI_MSC

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



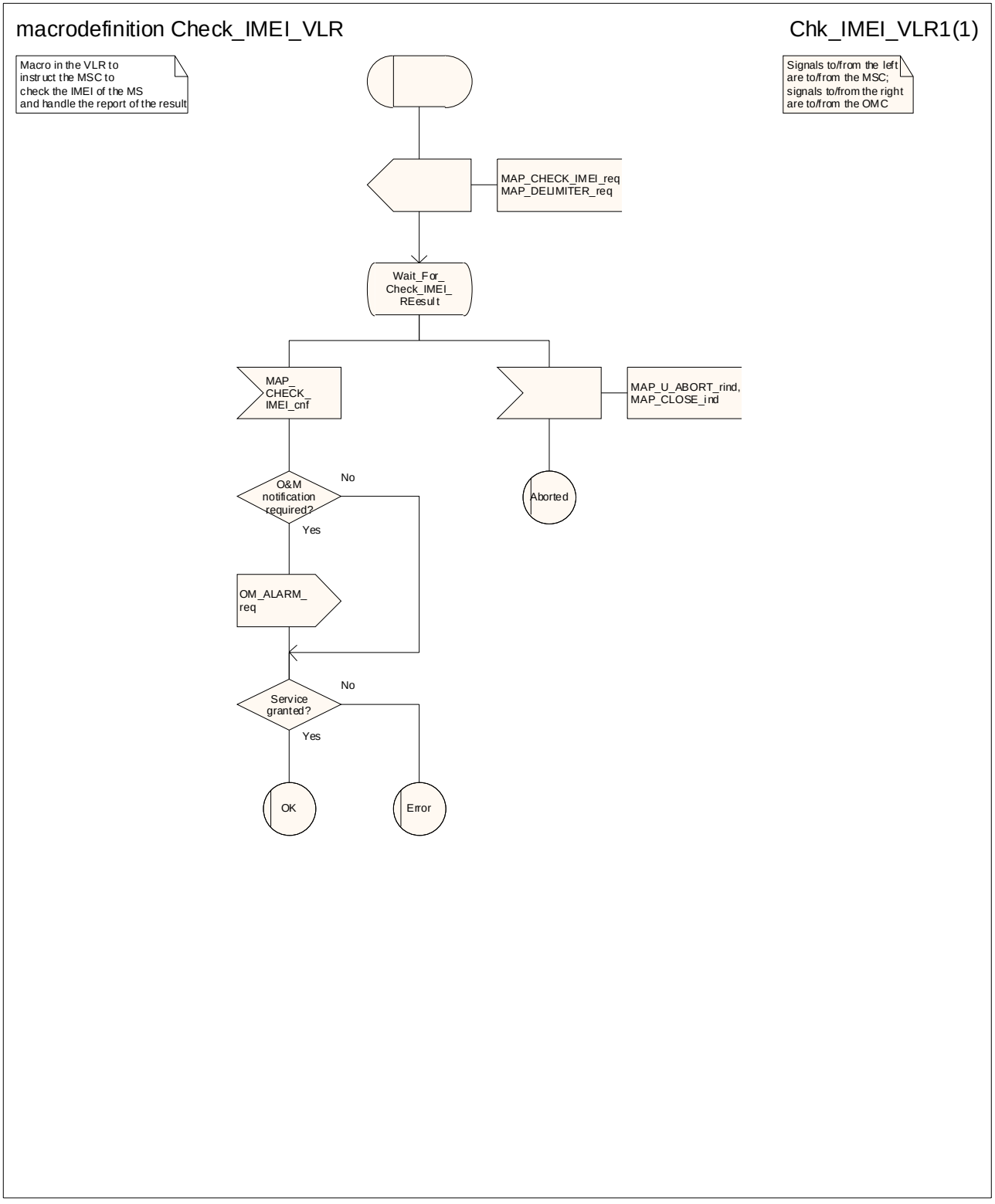


Figure 25.6/2: ~~Process~~ Macro Check_IMEI_VLR

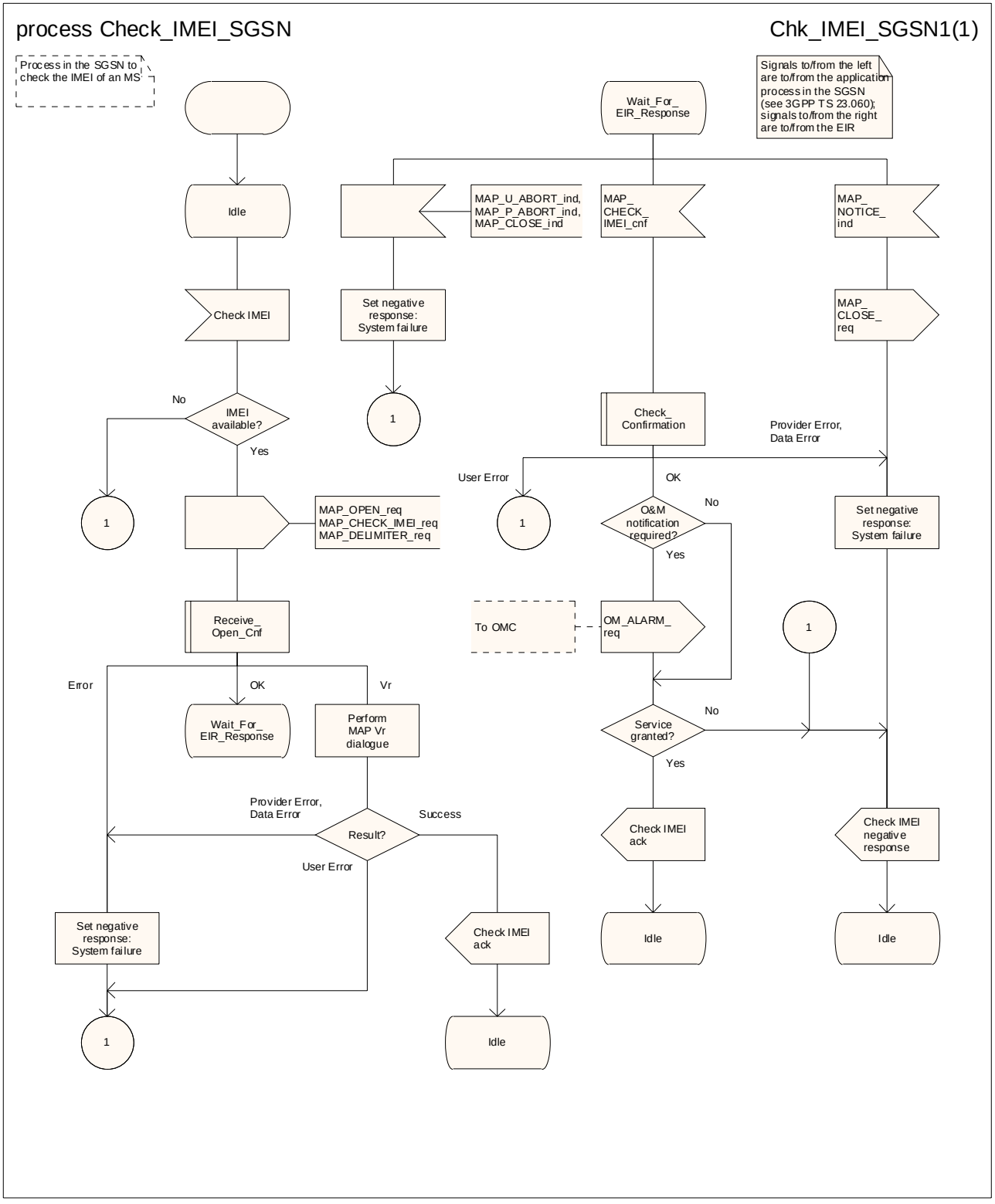
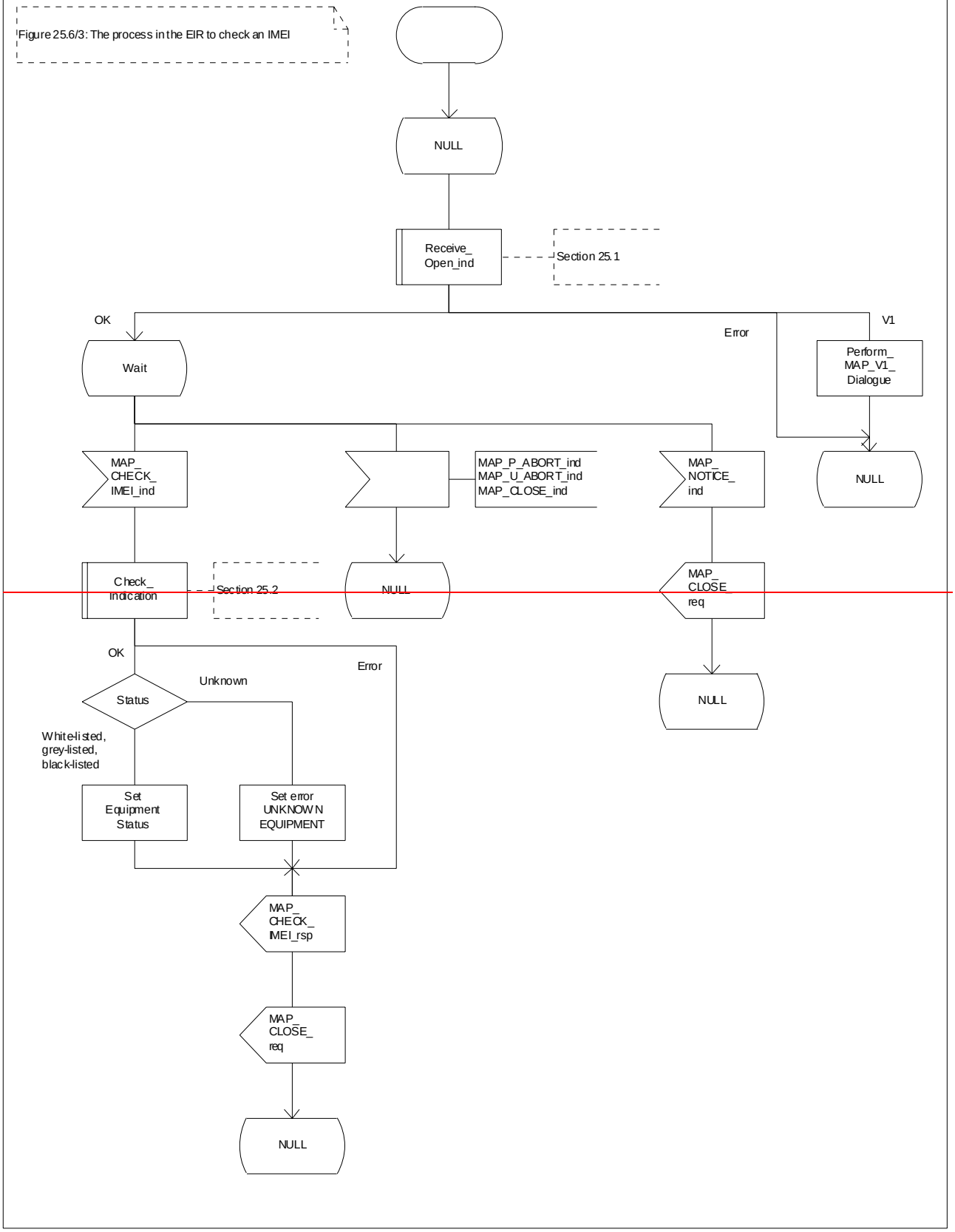


Figure 25.6/3: Process Check_IMEI_SGSN

Process Check_IMEI_EIR 25.6_3(1)

Figure 25.6/3: The process in the EIR to check an IMEI



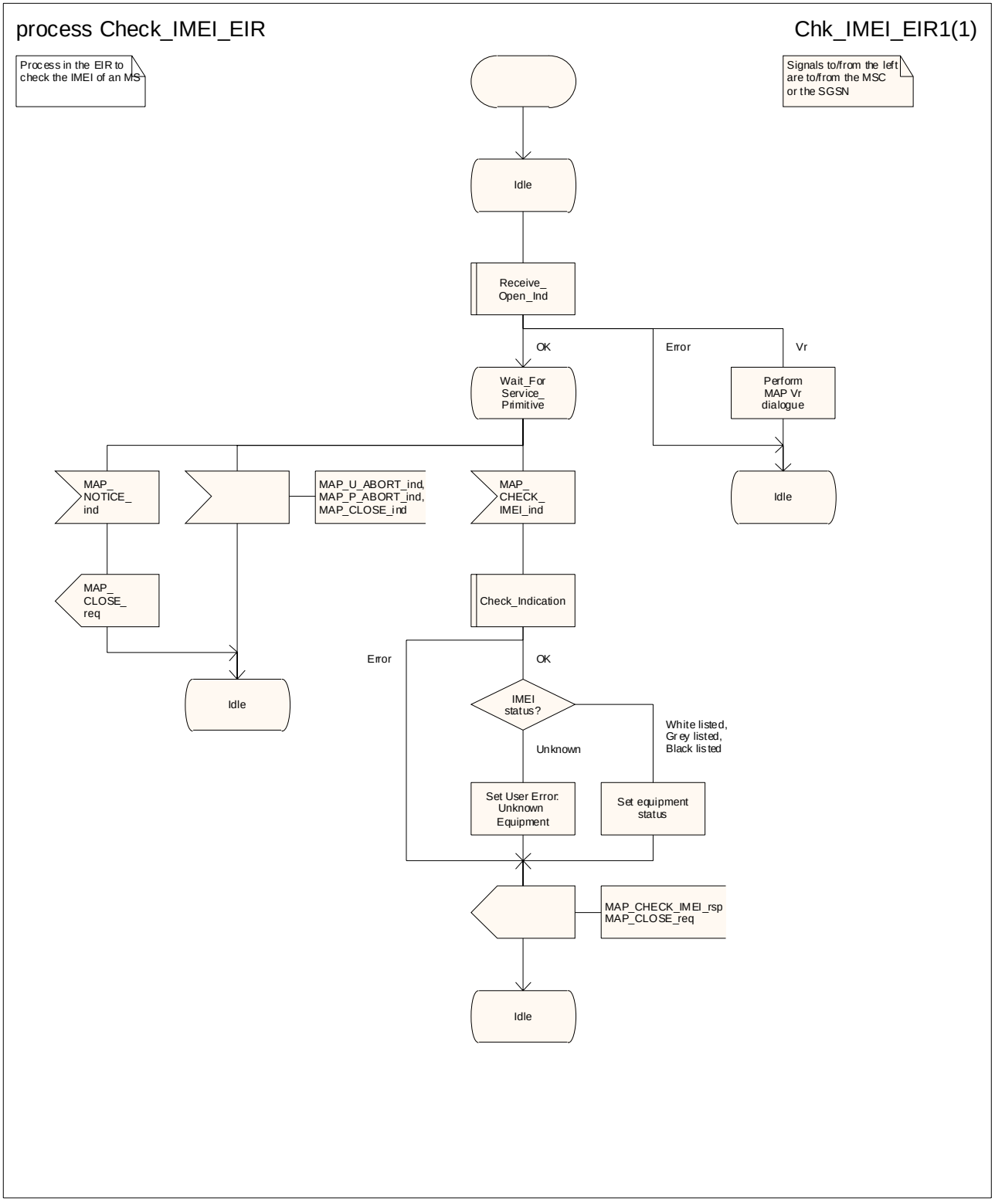
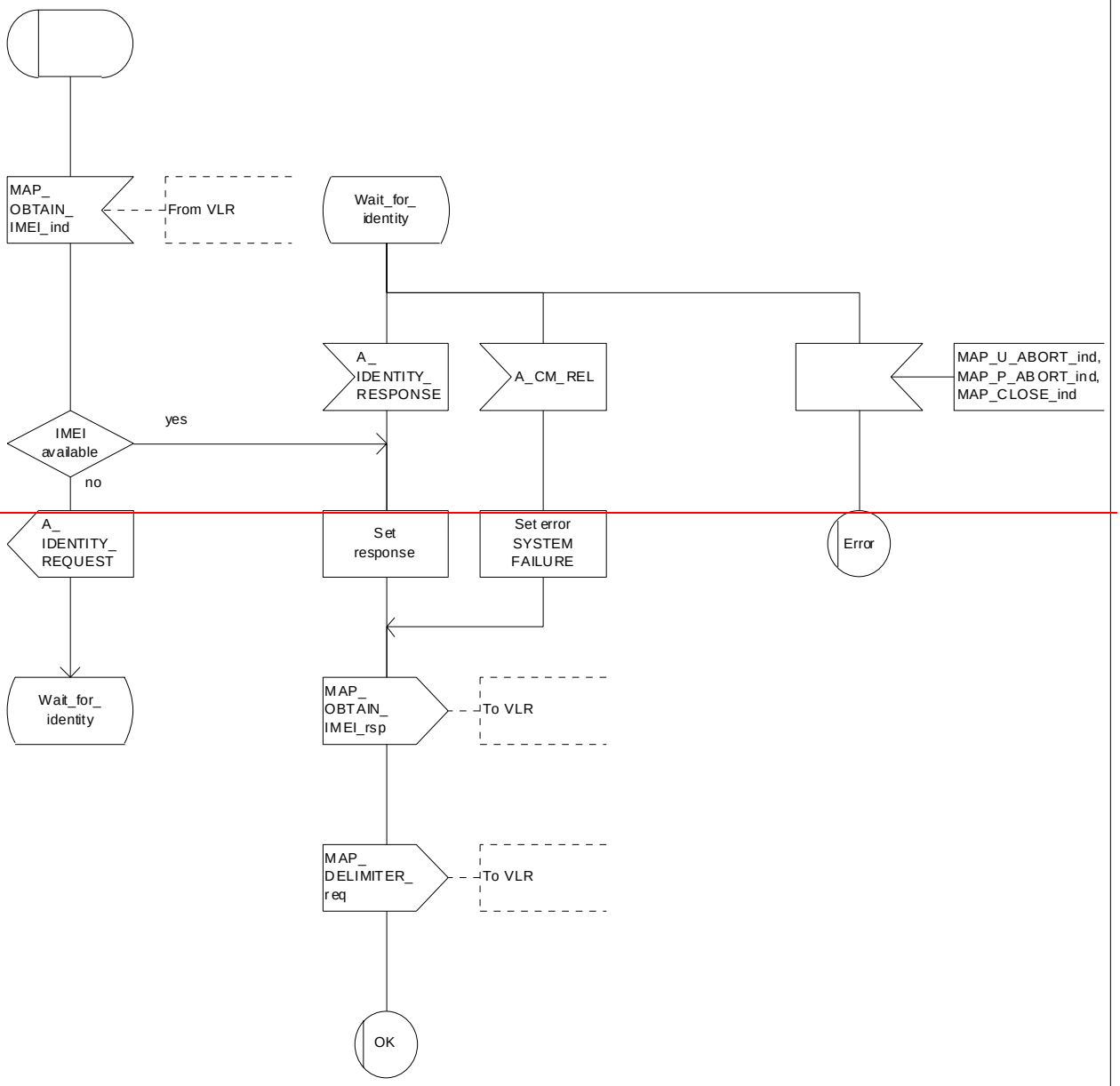


Figure 25.6/43: Process Check_IMEI_EIR

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



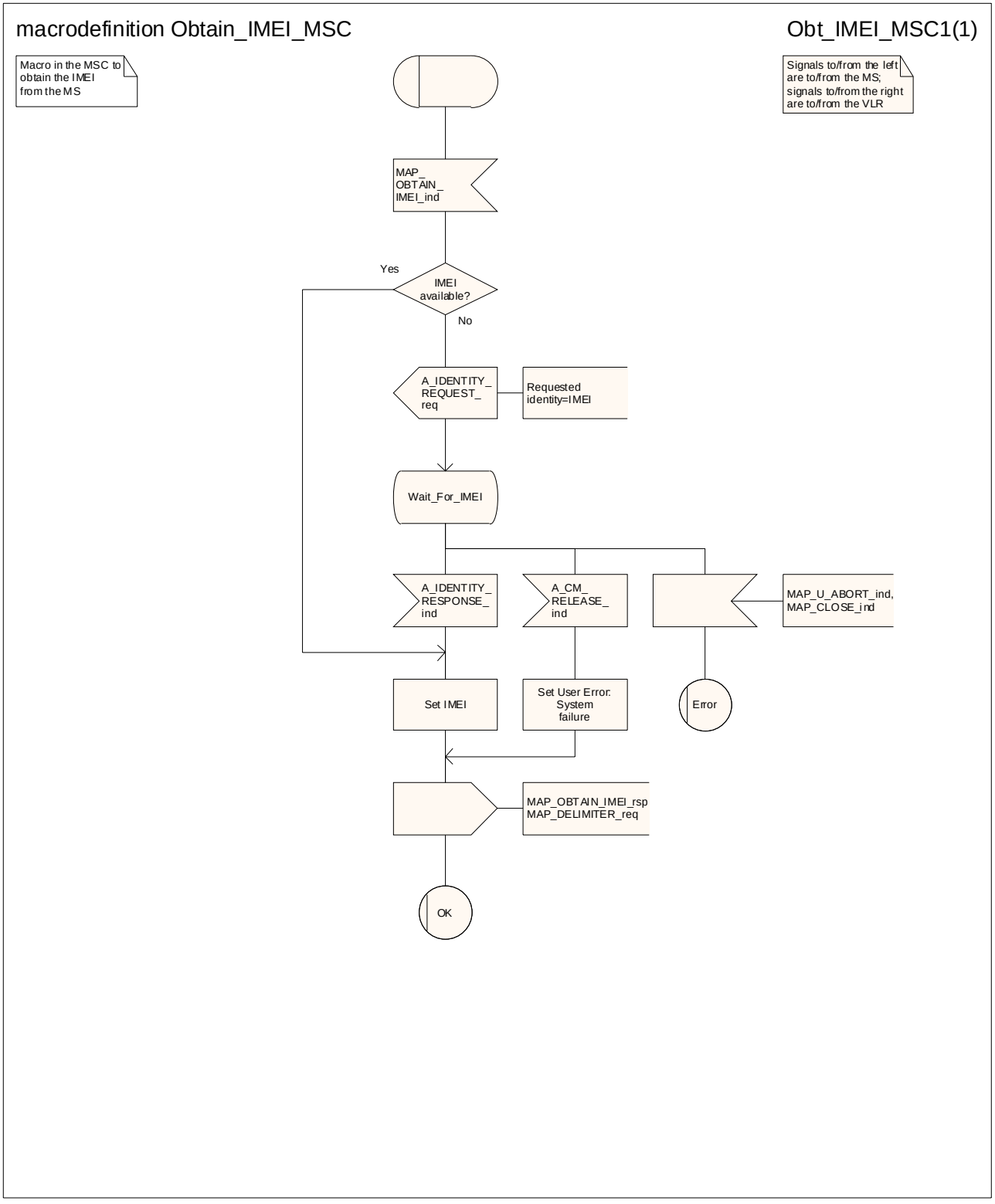
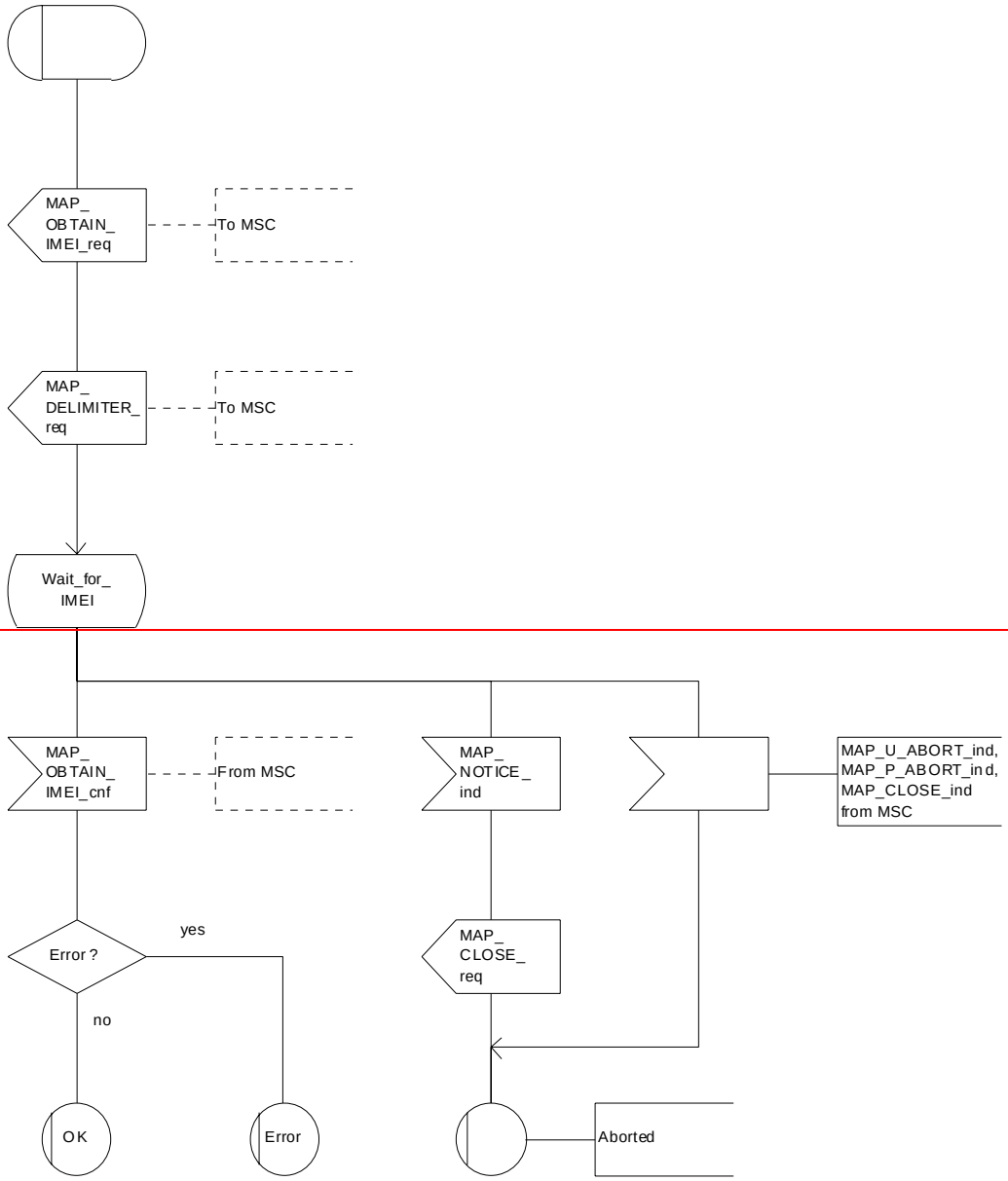


Figure 25.6/54: ~~Process~~ Macro Obtain_IMEI_MSC

Macrodefinition Obtain_IMEI_VLR 25.6_5(1)

Figure 25.6/5: Obtain IMEI macro in the VLR, controlling the request towards the MSC



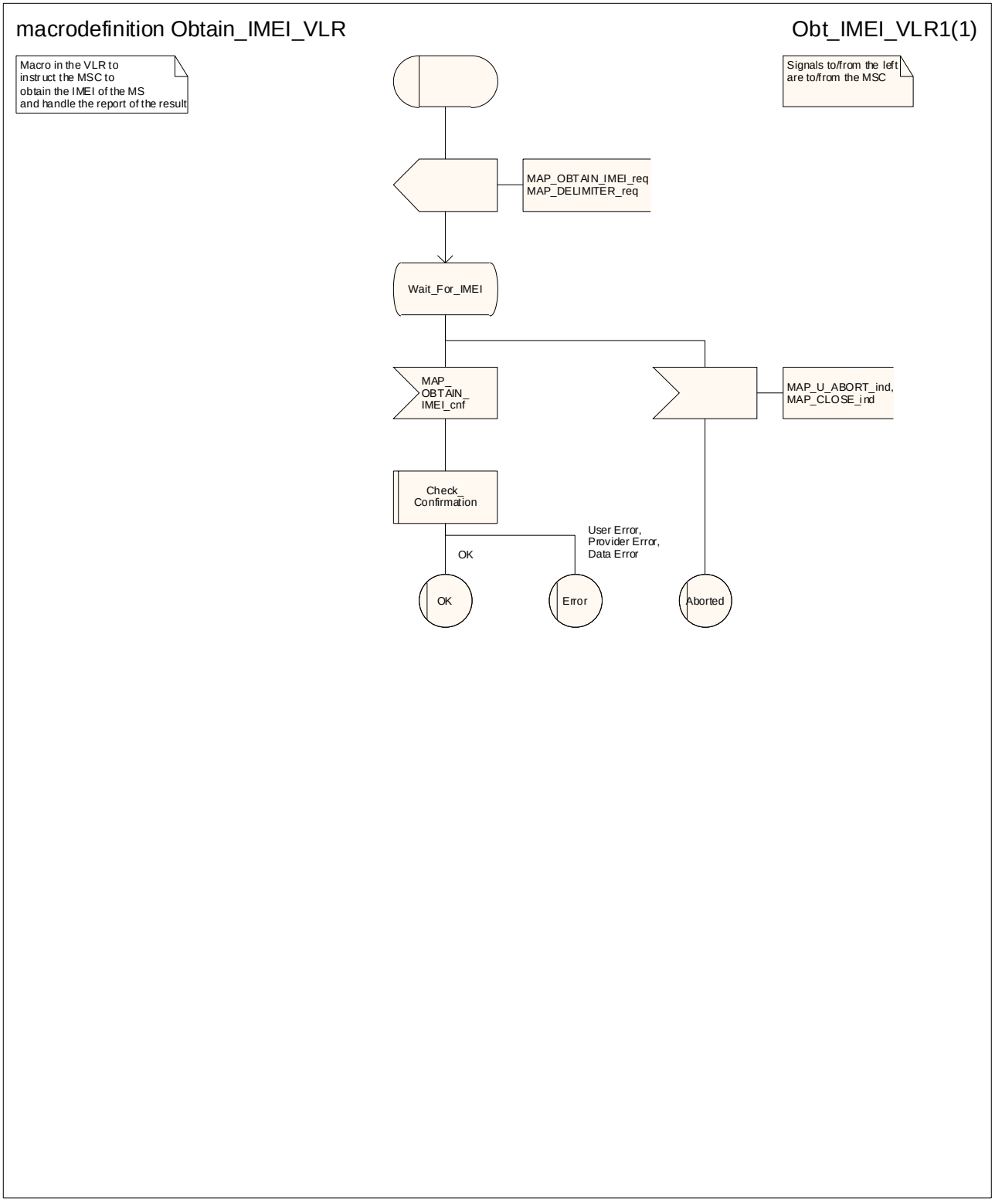


Figure 25.6/6~~5~~: ~~Process~~ Macro Obtain_IMEI_VLR

25.6.6 Process Check_IMEI_SGSN

***** CR editor's note: This text has been moved to come immediately after the text for the macro Check_IMEI_VLR. *****

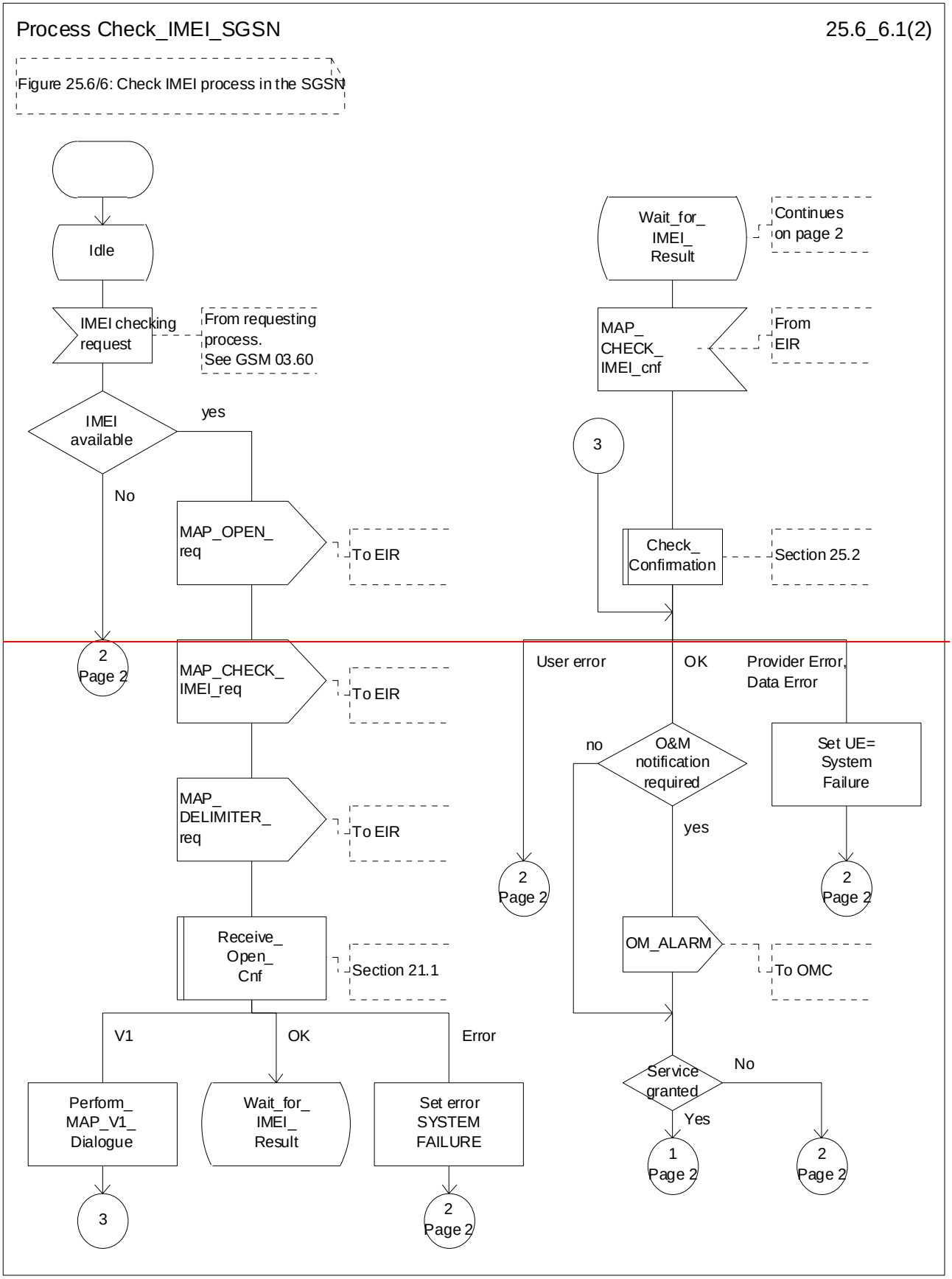
This process is used by the SGSN to control the check of a mobile equipment's IMEI. The process proceeds as follows:

- 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;

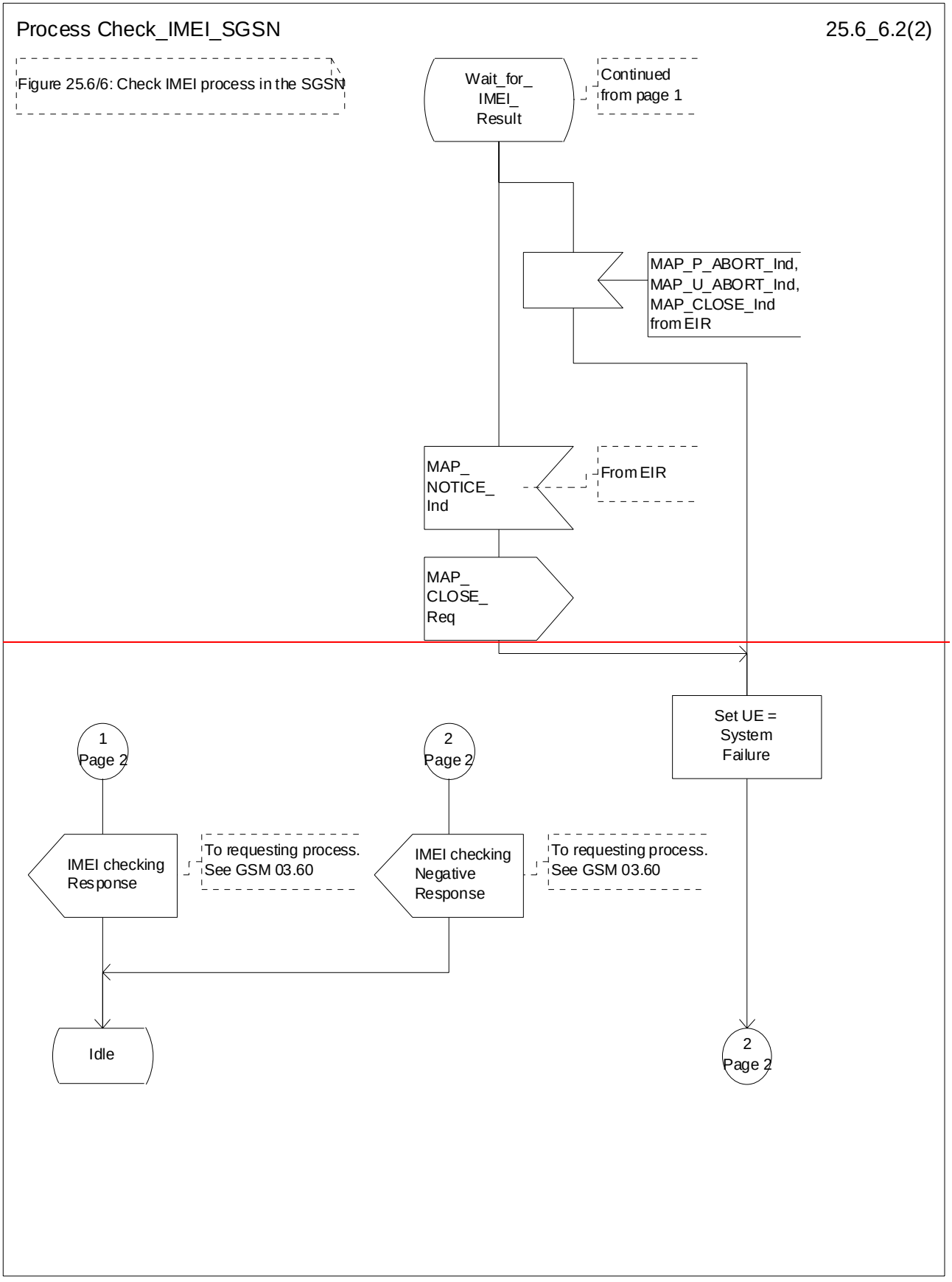
If the dialogue with the EIR drops back to version 1, the result or error returned by the EIR is checked. The use of the "Check_Confirmation" macro in the SDL diagram indicates that the checks carried out on the result returned by the EIR in a MAP v1 dialogue are functionally equivalent to those carried 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.

*****CR editor's note: The SDL diagram for the process Check_IMEI_SGSN has been moved to come immediately after the SDL diagram for the macro Check_IMEI_VLR. *****



~~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 and processes

***** CR editor's note: the (reduced!) text for each of the macros and processes in this subclause has been grouped together, with the SDL diagrams grouped together afterwards. The subclauses have also been re-ordered, to give the sequence: VLR behaviour, SGSN behaviour, HLR behaviour. *****

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 in the VLR 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.~~

25.7.2 Macro Insert_Subs_Data_SGSN

This macro is used by any procedure in the SGSN that triggers the reception of subscriber data (e.g. Update GPRS Location).

25.7.3 Process Insert_Subs_Data_Stand_Alone_HLR

This process is used by the HLR to transfer subscriber data from the HLR to the VLR in a stand alone mode, i.e. in a separate 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 the VLR.

Sheet 1: The HLR may wait for each MAP_INSERT_SUBSCRIBER_DATA request to be acknowledged before it sends the next request, or it may handle the requests and the confirmations in parallel.

Sheet 1, sheet 2: If the VLR has indicated that it does not support a service or feature (e.g. Closed User Group or Advice Of Charge Charging Level) which the HLR operator regards as essential for the subscriber, the macro Wait_for_Insert_Subs_Data_Cnf takes the Replace_Service exit; the HLR sets the Roaming Restriction Due To Unsupported Feature flag to roaming restricted and sends Roaming Restriction Due To Unsupported Feature in a subsequent MAP_INSERT_SUBSCRIBER_DATA request.

Sheet 1, sheet 2: If the HLR operator does not regard the unsupported service or feature as essential for the subscriber but the macro Wait_for_Insert_Subs_Data_Cnf takes the Replace_Service exit, the HLR sends the data for a replacement service in a subsequent MAP_INSERT_SUBSCRIBER_DATA request.

Sheet 2: It is an operator option whether to repeat the download of subscriber data if the VLR returns an error response. The number of repeat attempts and the interval between them is also an operator option, depending on the error response from the VLR.

If subscriber data for CAMEL Phase 2 or later services are sent to a VLR which does not support the appropriate phase of CAMEL, the service behaviour may be unpredictable or incorrect. The HLR should therefore ensure that at the conclusion of a stand alone Insert Subscriber data procedure the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in 3GPP TS 23.078 [98].

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2 or later. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only if the HLR previously received confirmation from the VLR at Location Update that CAMEL Phase 2 or later is supported.

25.7.4 Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

This process is used by the HLR to transfer subscriber data from the HLR to the SGSN in a stand alone mode, i.e. in a separate 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 the SGSN.

Sheet 1: The HLR may wait for each MAP_INSERT_SUBSCRIBER_DATA request to be acknowledged before it sends the next request, or it may handle the requests and the confirmations in parallel.

Sheet 1, sheet 2: If the SGSN has indicated that it does not support a service or feature which the HLR operator regards as essential for the subscriber, the macro Wait_for_Insert_GPRS_Subs_Data_Cnf takes the Replace_Service exit; the HLR sets the Roaming Restricted In SGSN Due To Unsupported Feature flag to roaming restricted and sends Roaming Restricted In SGSN Due To Unsupported Feature in a subsequent MAP_INSERT_SUBSCRIBER_DATA request.

Sheet 1, sheet 2: If the HLR operator does not regard the unsupported service or feature as essential for the subscriber but the macro Wait_for_Insert_GPRS_Subs_Data_Cnf takes the Replace_Service exit, the HLR sends the data for a replacement service in a subsequent MAP_INSERT_SUBSCRIBER_DATA request.

Sheet 2: It is an operator option whether to repeat the download of subscriber data if the SGSN returns an error response. The number of repeat attempts and the interval between them is also an operator option, depending on the error response from the SGSN.

25.7.5 Macro Wait_for_Insert_Subs_Data_Cnf

This macro is used by any process or macro that describes the handling in the HLR of the transfer of subscriber data to the VLR (e.g. Update Location or Restore Data).

25.7.6 Macro Wait_for_Insert_GPRS_Subs_Data_Cnf

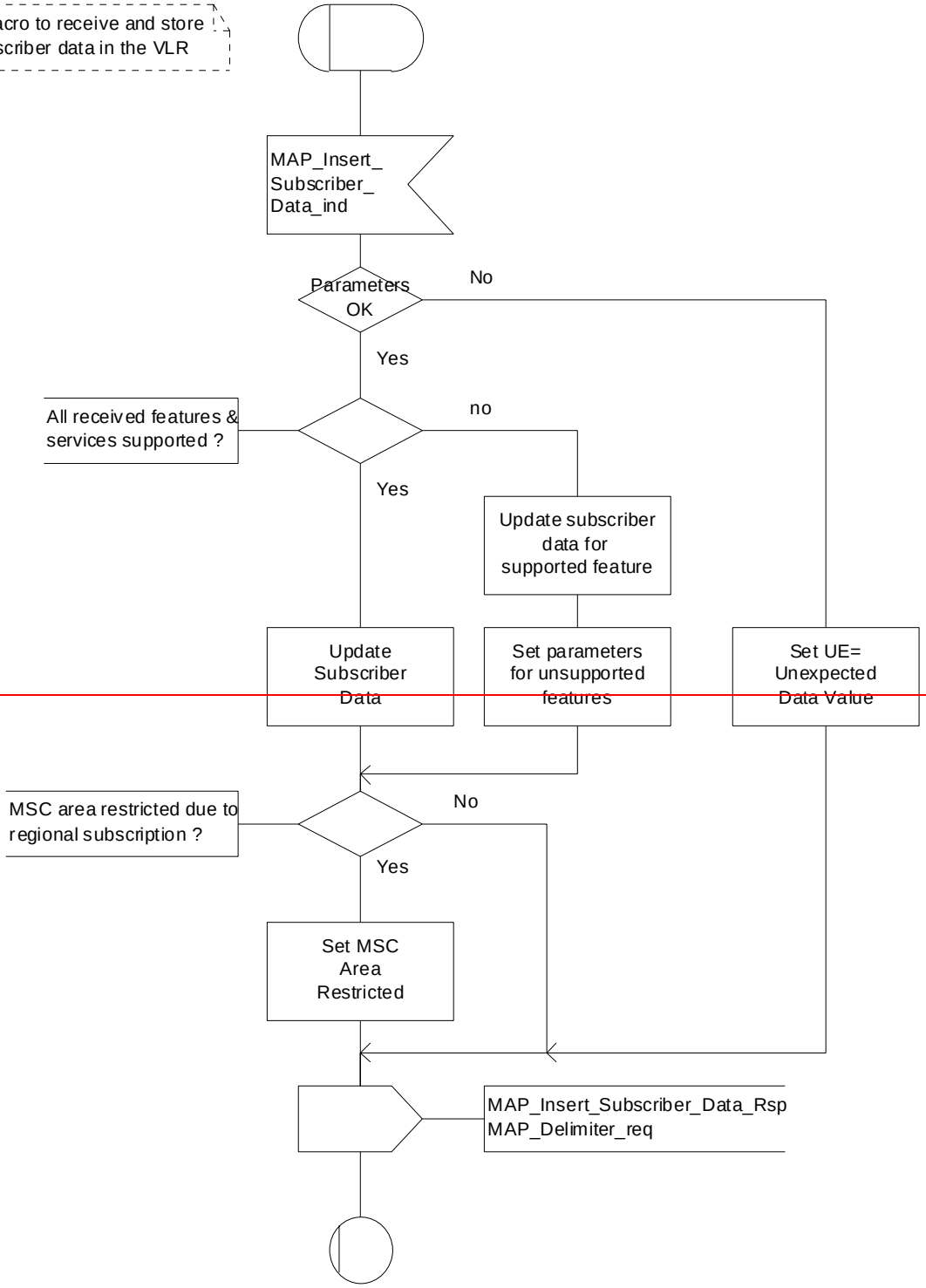
This macro is used by any process or macro that describes the handling in the HLR of the transfer of subscriber data to the SGSN (e.g. Update GPRS Location).

25.7.7 Process Send_Insert_Subs_Data

This process is used by any process or macro in the HLR where a MAP_INSERT_SUBSCRIBER_DATA request is sent to the VLR or to the SGSN.

Macrodefinition Insert_Subs_Data_VLR 25.7_1(1)

Figure 25.7/1: Macro to receive and store subscriber data in the VLR



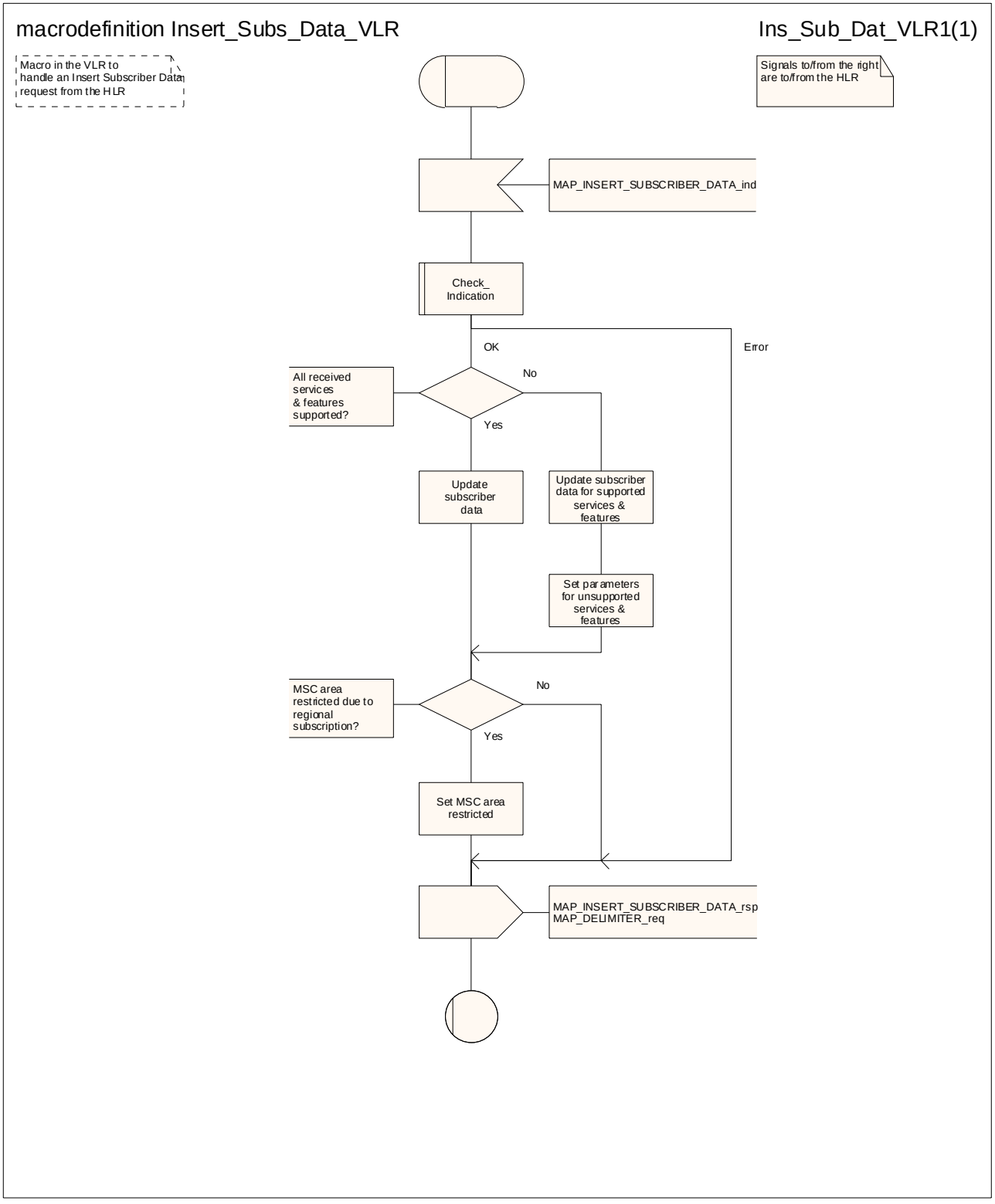


Figure 25.7/1: Macro Insert_Subs_Data_VLR

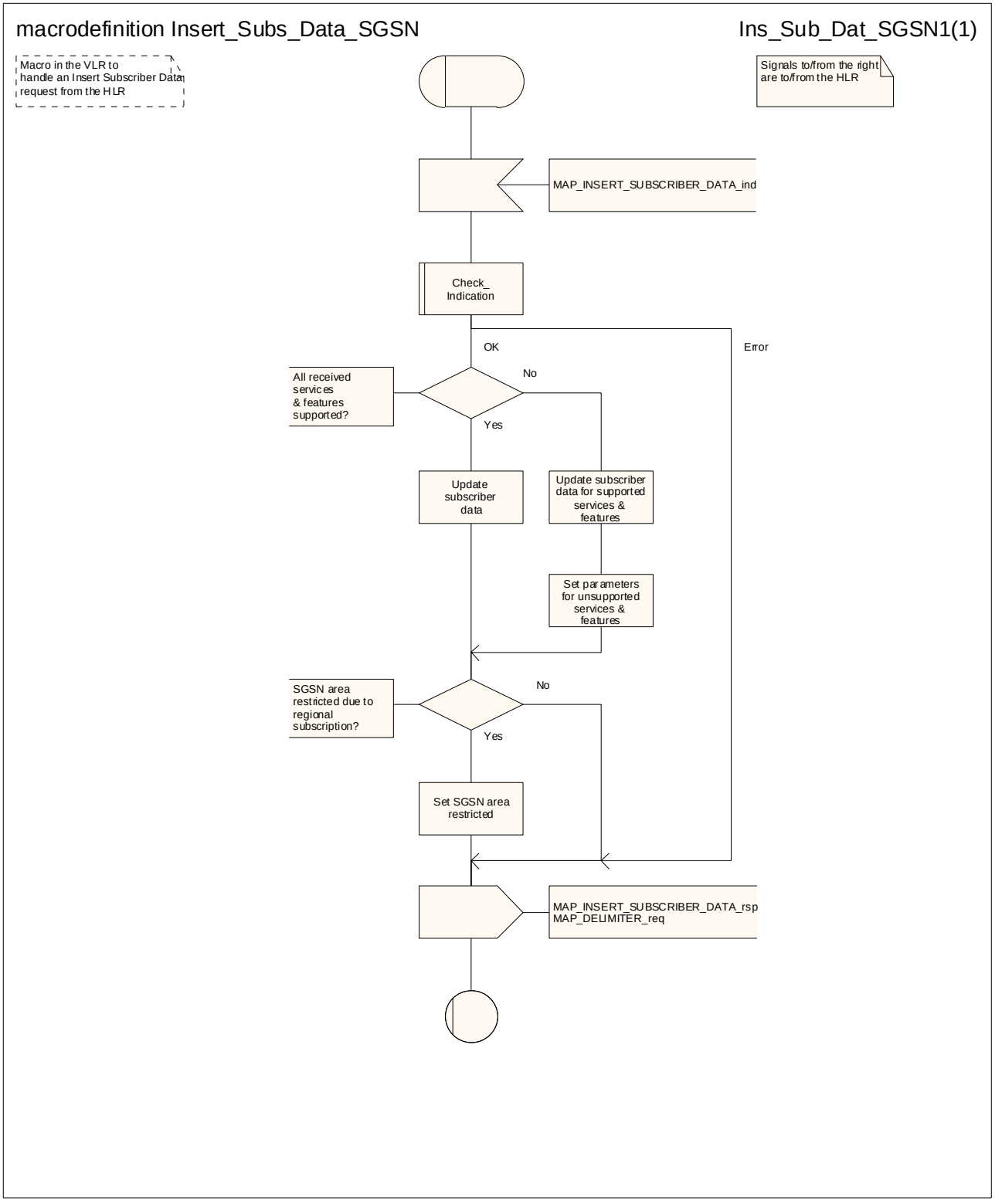


Figure 25.7/2: Macro Insert_Subs_Data_SGSN

25.7.2 Process Insert_Subs_Data_Stand_Alone_HLR

***** CR editor's note: (The reduced version of) this text is now subclauses 25.7.3 & 25.7.4; it is grouped with the text of the other subclauses of 25.7. *****

This process is used by HLR to transfer subscriber data to VLR or to SGSN in a stand alone mode, i.e. in its own dialogue. This is done whenever a change of subscriber data is performed either by the operator or by the subscriber and this change has to be reported to VLR or to SGSN.

The process, after opening the dialogue with VLR or with SGSN, sends as many requests of the InsertSubscriberData service as necessary to transfer the subscriber data. The call to the process "Send_Insert_Subs_Data" (see clause 25.7.4) is meant to describe two possible behaviours of the HLR when more than one service request has to be sent:

- either the HLR handles the requests and the confirmations in parallel; or
- the HLR sends every request after receiving the confirmation to the previous one.

The macros "Wait_for_Insert_Subs_Data_Cnf" and "Wait_for_Insert_GPRS_Subs_Data_Cnf" (see clauses 25.7.3 and 25.7.6) are also called in order to handle every single confirmation.

If the result of a primitive received from the VLR or from the SGSN is unsuccessful, the HLR may initiate re-attempts; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or by the SGSN.

If certain services required for a subscriber are not supported by the VLR or by the SGSN (e.g. Advice of Charge Charging Level), this may result in one of the following outcomes:

- the HLR stores and sends "Roaming Restriction Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restriction Due To Unsupported Feature" is stored in the HLR, the "MSC Area Restricted Flag" shall be set to "restricted". This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.
- the HLR stores and sends other induced subscriber data (e.g. a specific barring program) in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. This will cause rejection of mobile originated service requests, except emergency calls.
- the HLR stores and sends "Roaming Restricted In SGSN Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restricted In SGSN Due To Unsupported Feature" is stored in the HLR, the "SGSN Area Restricted Flag" shall be set to "restricted". This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP Context activation.

When the VLR receives regional subscription data (Zone Code List) it may respond with "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "MSC Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.

When the SGSN receives regional subscription data (Zone Code List) it may respond with "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "SGSN Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP Context activation.

If subscriber data for CAMEL Phase 2 or 3 services are sent to a VLR which does not support CAMEL Phase 2 or 3, the service behaviour may be unpredictable or incorrect. The HLR therefore needs to ensure that at the conclusion of a stand alone Insert Subscriber data procedure that the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in 3GPP TS 23.078.

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2 or 3. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only if the HLR previously received confirmation from the VLR at Location Update that CAMEL Phase 2 or 3 is supported.

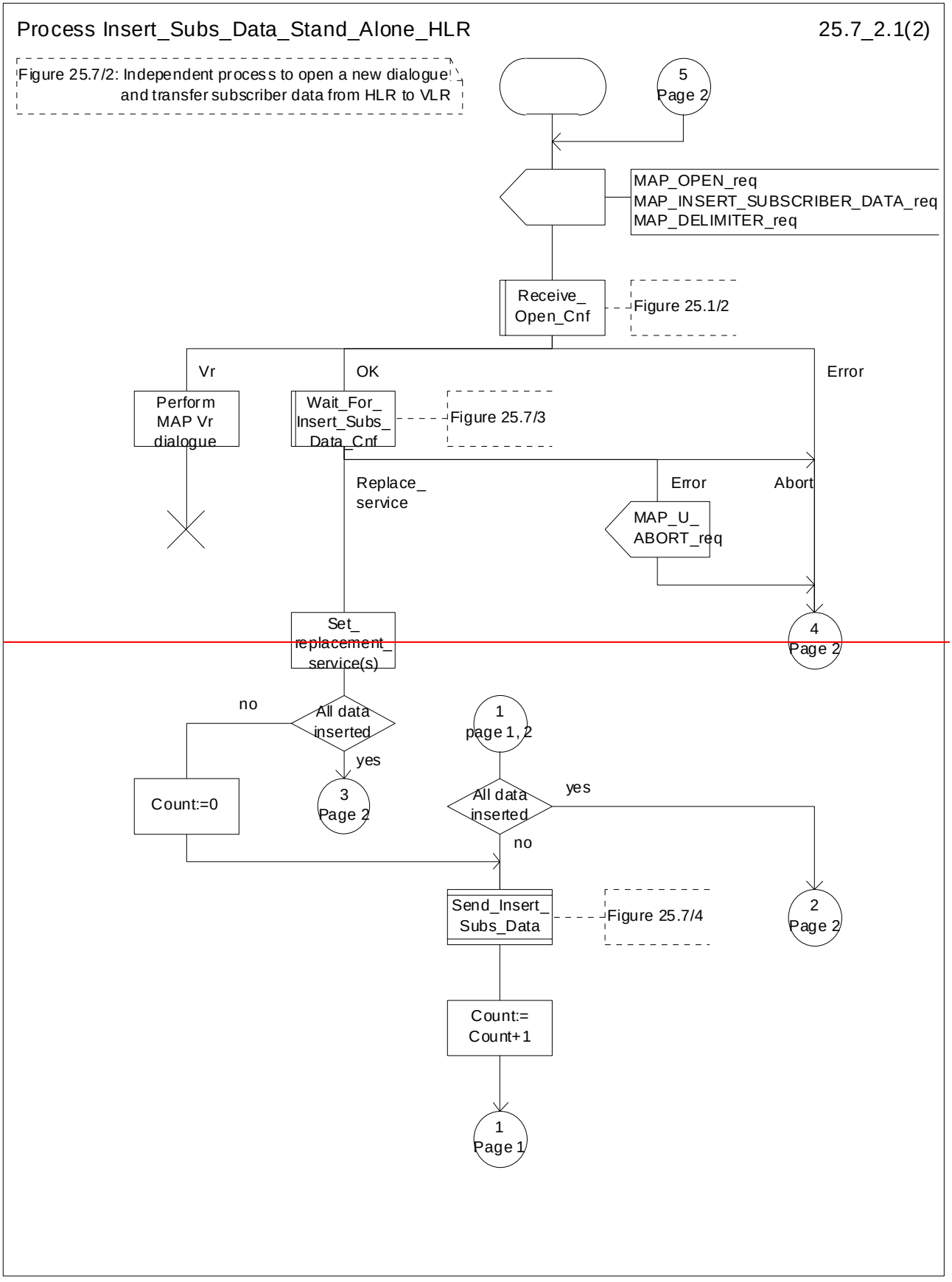
A Forwarded-to number in non-international E.164 format shall only be sent from an HLR to a VLR if the VLR supports CAMEL Phase 2, or a subsequent version of CAMEL.

~~If the HLR does not store "Roaming Restriction Due To Unsupported Feature" as a consequence of the stand alone Insert Subscriber Data procedure and the HLR does not receive "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response and "Roaming Restriction Due To Unsupported Feature" has not been stored in the HLR in the course of a previous subscriber data retrieval procedure, the "MSC Area Restricted Flag" in the HLR shall be set to "not restricted".~~

~~If the HLR does not store "Roaming Restricted In SGSN Due To Unsupported Feature" as a consequence of the stand alone Insert Subscriber Data procedure and the HLR does not receive "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response and "Roaming Restricted In SGSN Due To Unsupported Feature" has not been stored in the HLR in the course of a previous subscriber data retrieval procedure, the "SGSN Area Restricted Flag" in the HLR shall be set to "not restricted".~~

~~The SDL diagram of process between HLR and VLR is shown in figure 25.7/2;~~

~~The SDL diagram of process between HLR and SGSN is shown in figure 25.7/5.~~


Process Insert_Subs_Data_Stand_Alone_HLR
25.7_2.1(2)
Figure 25.7/2: Independent process to open a new dialogue and transfer subscriber data from HLR to VLR
5 Page 2
MAP_OPEN_req
MAP_INSERT_SUBSCRIBER_DATA_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Figure 25.1/2
Vr
OK
Error
Perform MAP Vr dialogue
Wait_For_ Insert_Subs_ Data_Cnf
Figure 25.7/3
Replace_ service
Error
Abort
MAP_U_ ABORT_req
Set_ replacement_ service(s)
4 Page 2
no
All data inserted
yes
Count:=0
3 Page 2
1 page 1, 2
All data inserted
yes
no
Send_Insert_ Subs_Data
Figure 25.7/4
2 Page 2
Count:= Count+1
1 Page 1

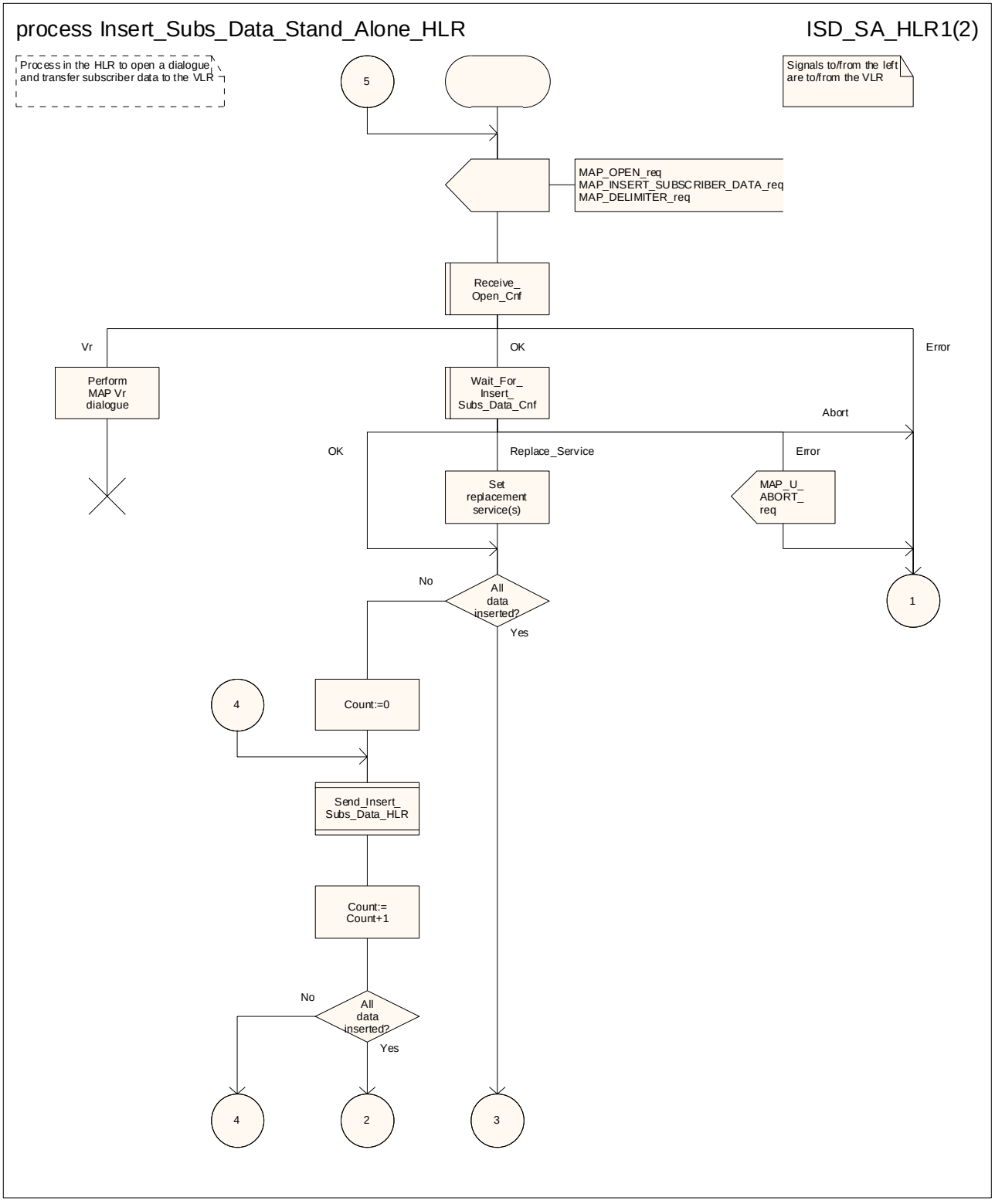
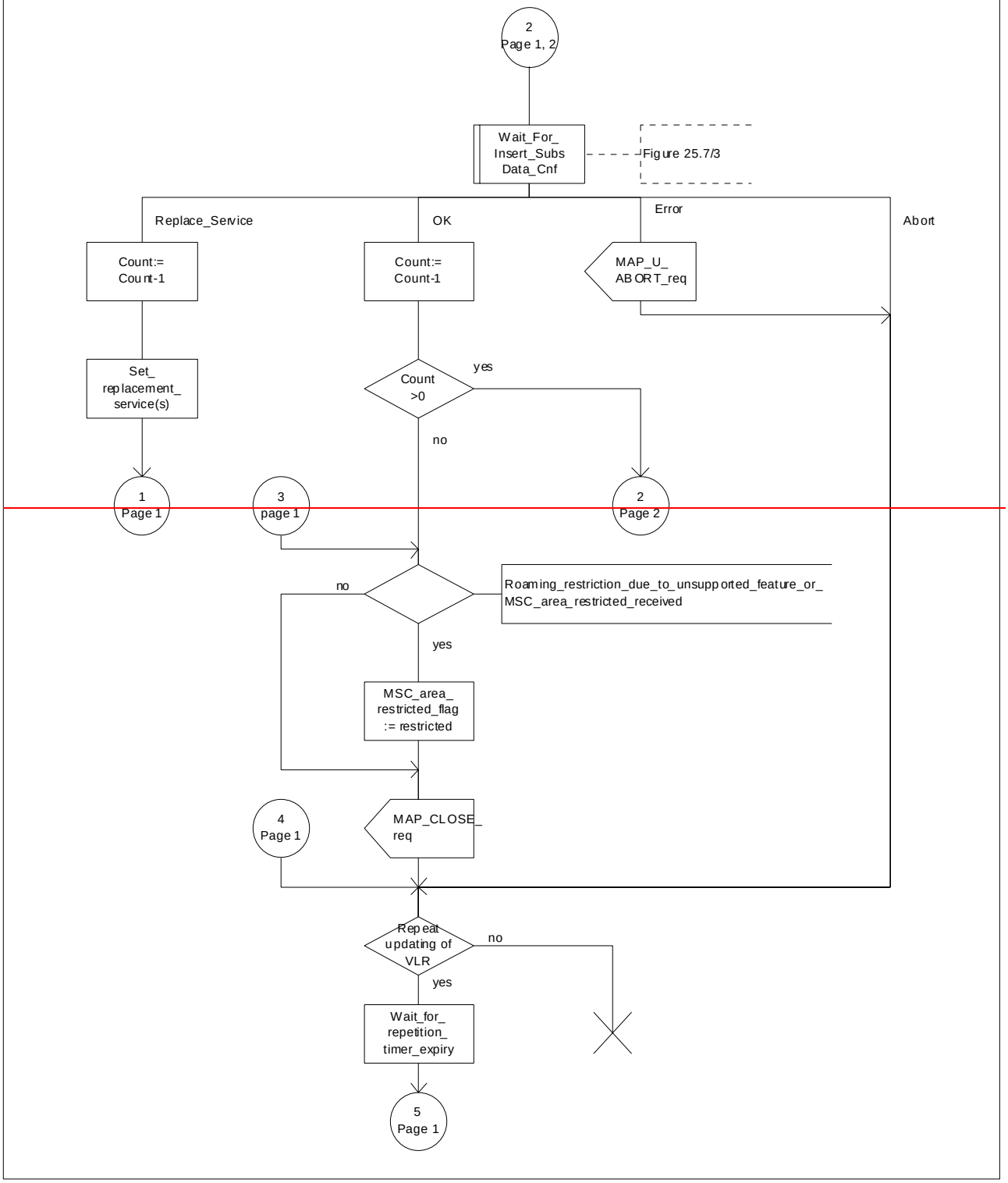


Figure 25.7/32 (sheet 1 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

Process Insert_Subs_Data_Stand_Alone_HLR 25.7_2.2(2)

Figure 25.7/2: Independent process to open a new dialogue and transfer subscriber data from HLR to VLR



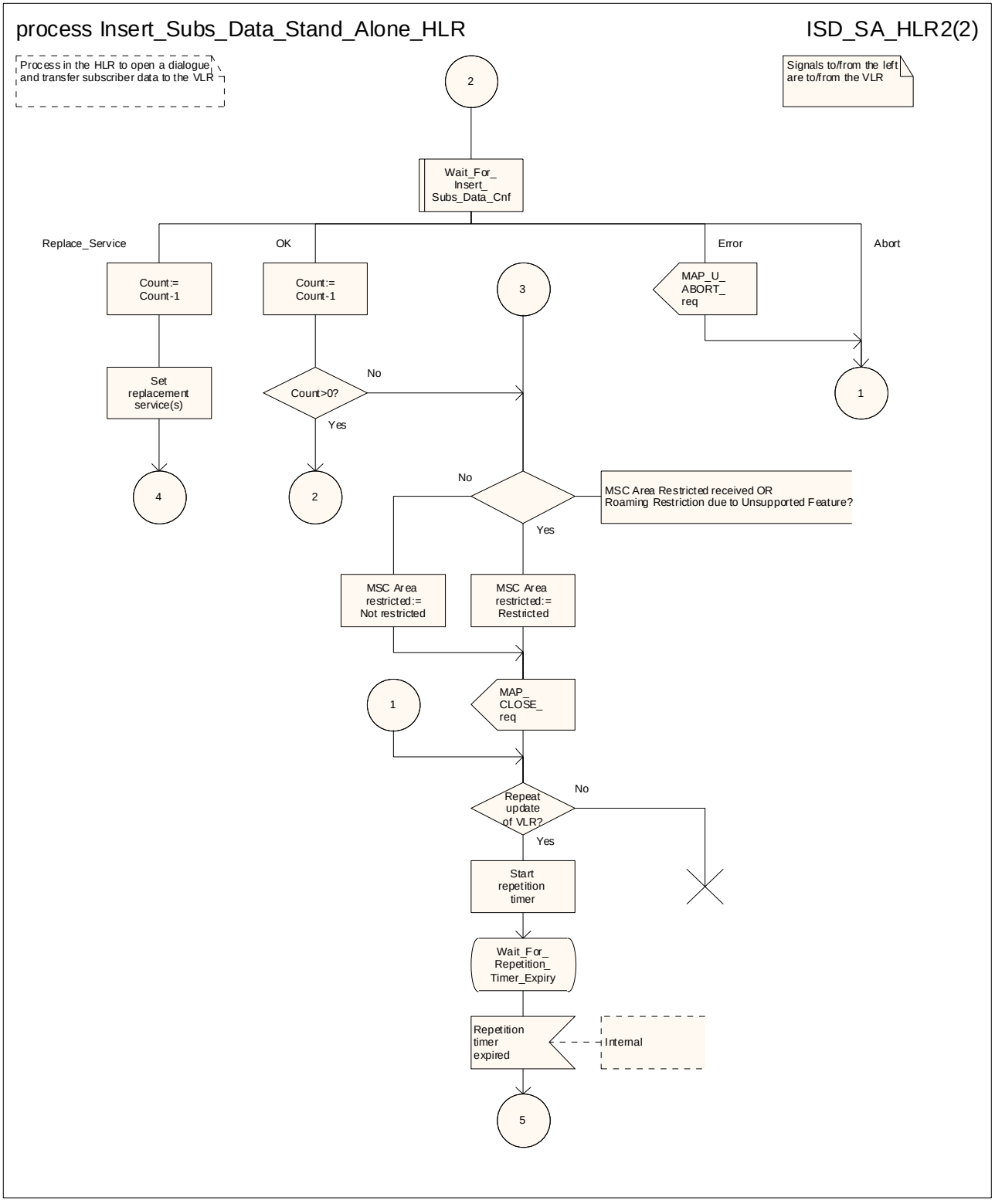
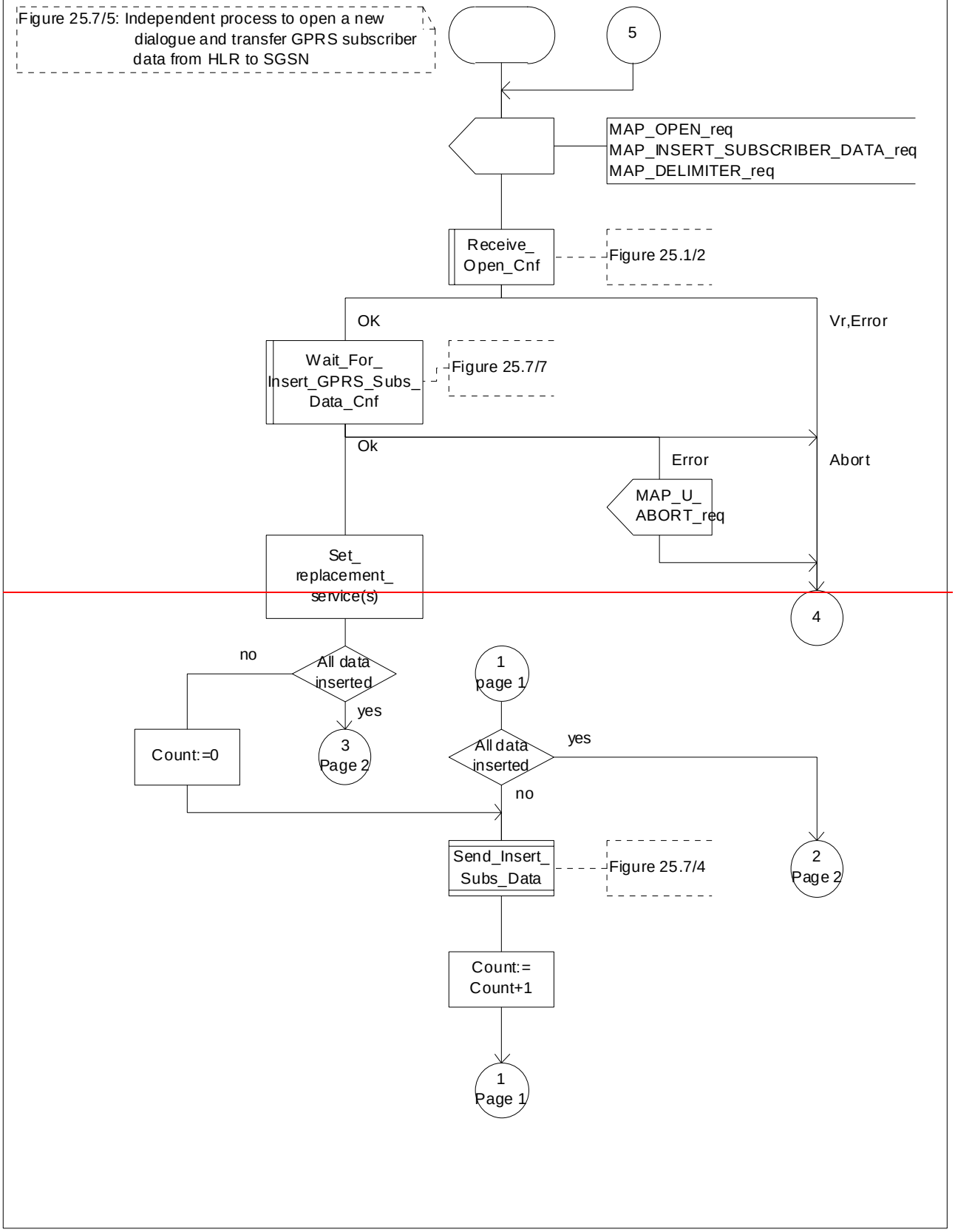


Figure 25.7/32 (sheet 2 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

Process Insert_GPRS_Subs_Data_Stand_Alone_HLR 25.7_5.1(2)

Figure 25.7/5: Independent process to open a new dialogue and transfer GPRS subscriber data from HLR to SGSN



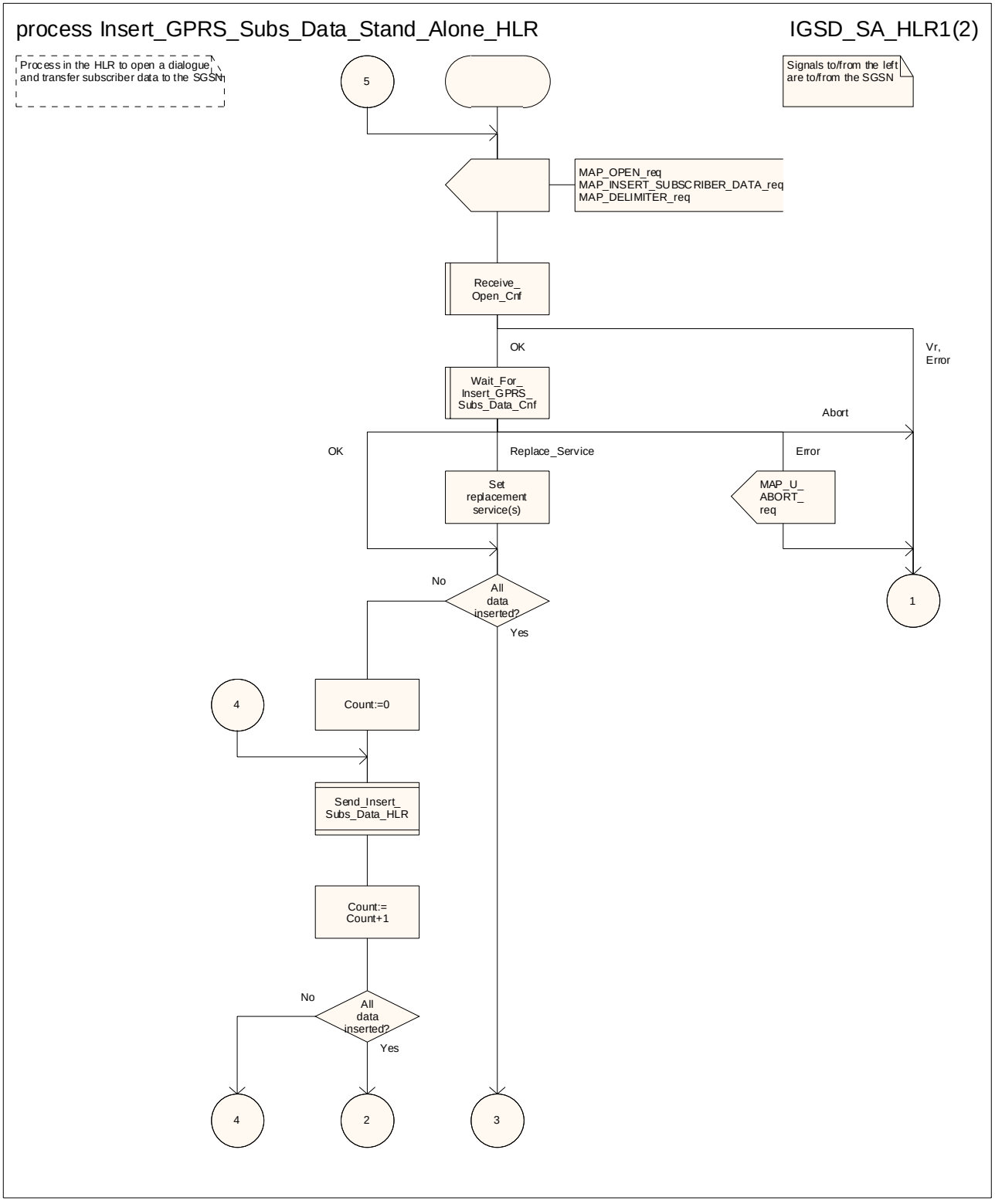
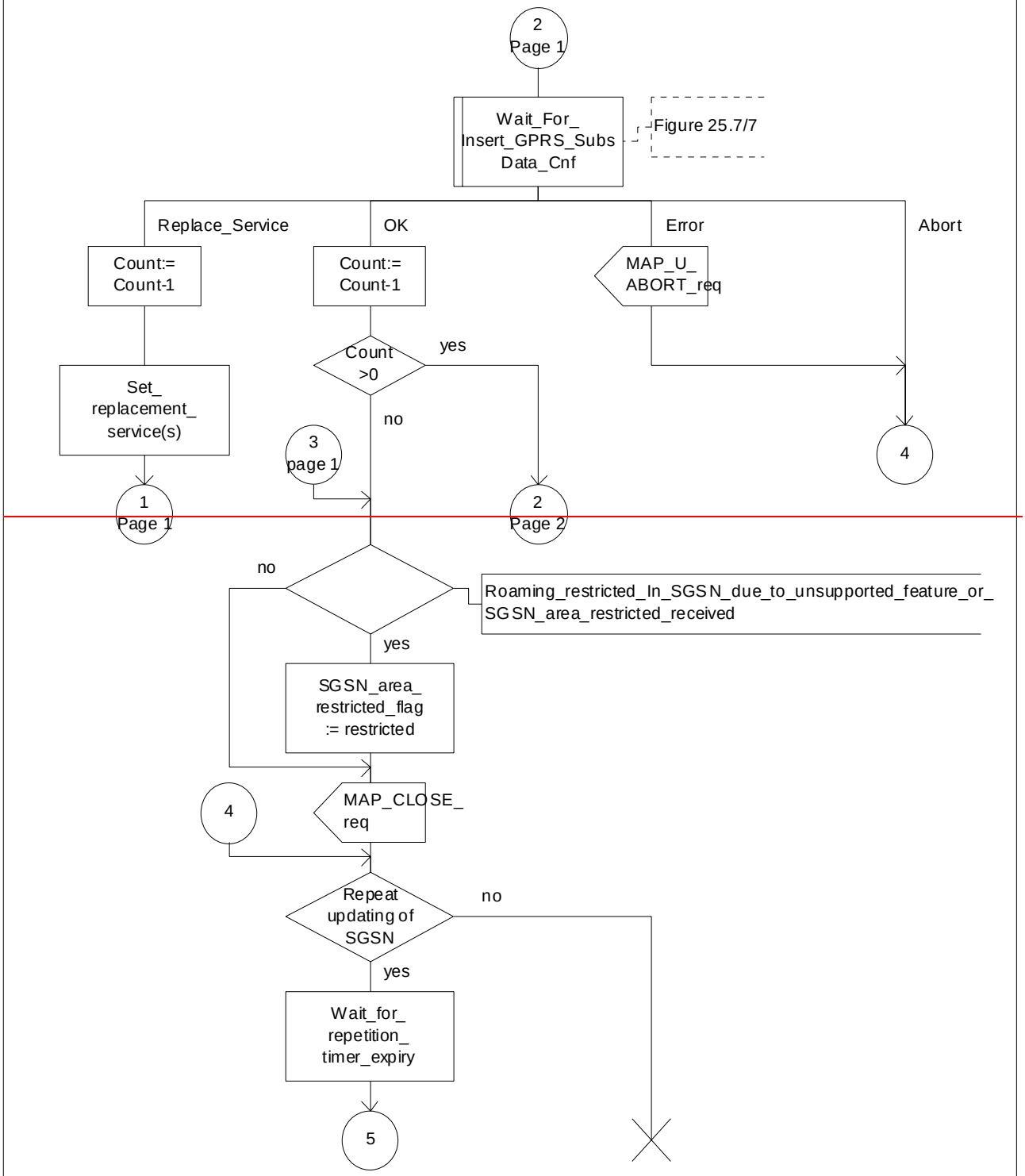
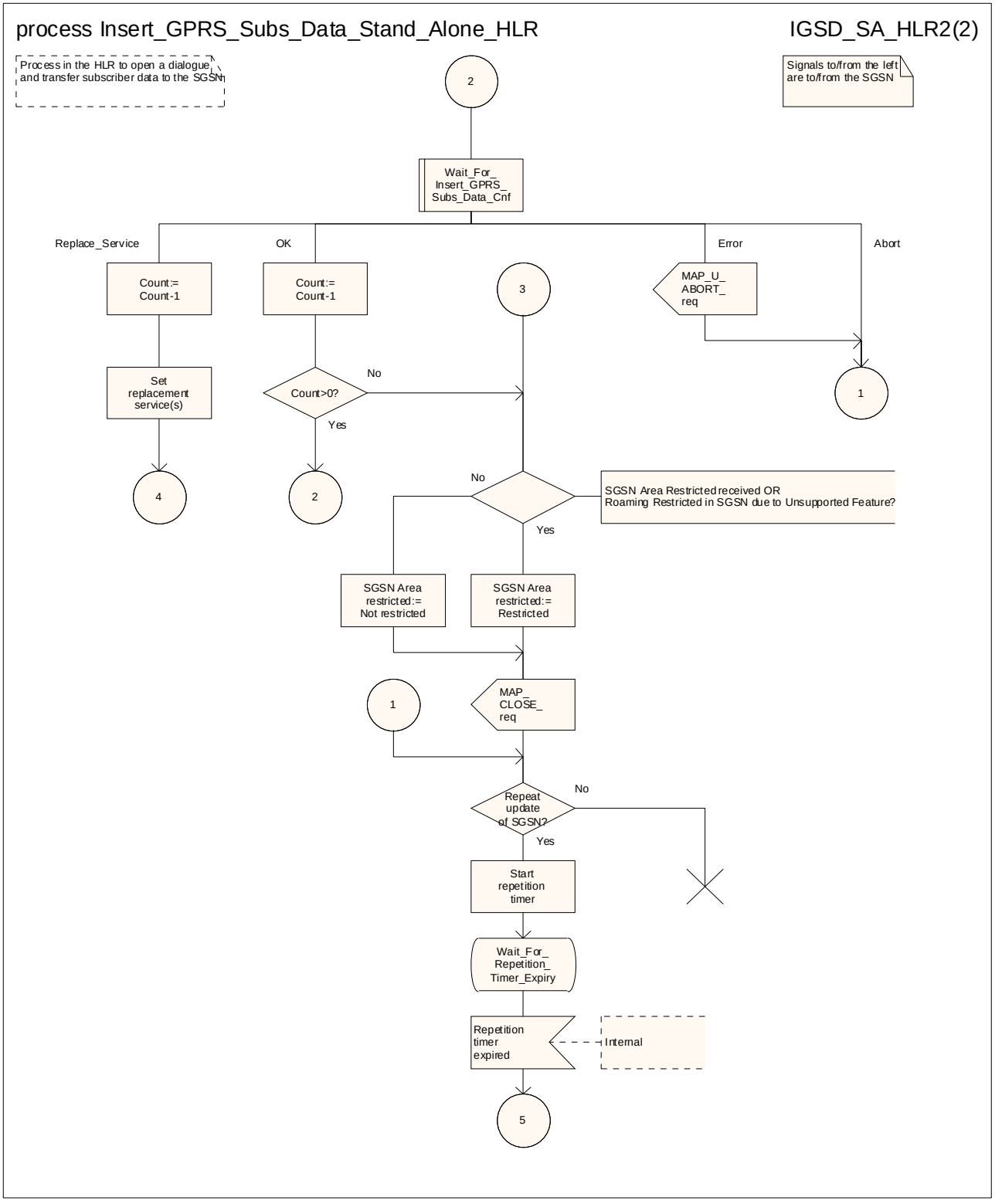


Figure 25.7/45 (sheet 1 of 2): Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

Process Insert_GPRS_Subs_Data_Stand_Alone_HLR 25.7_5.2(2)

Figure 25.7/5: Independent process to open a new dialogue and transfer GPRS subscriber data from HLR to SGSN




process Insert_GPRS_Subs_Data_Stand_Alone_HLR
IGSD_SA_HLR2(2)
Process in the HLR to open a dialogue and transfer subscriber data to the SGSN
Signals to/from the left are to/from the SGSN
2
Wait_For_ Insert_GPRS_ Subs_Data_Cnf
Replace_Service
OK
Error
Abort
Count:= Count-1
Count:= Count-1
3
MAP_U_ ABORT_ req
Set replacement service(s)
Count>0?
No
Yes
1
4
2
No
SGSN Area Restricted received OR Roaming Restricted in SGSN due to Unsupported Feature?
Yes
SGSN Area restricted:= Not restricted
SGSN Area restricted:= Restricted
1
MAP_ CLOSE_ req
Repeat update of SGSN?
No
Yes
Start repetition timer
Wait_For_ Repetition_ Timer_Expiry
Repetition timer expired
Internal
5

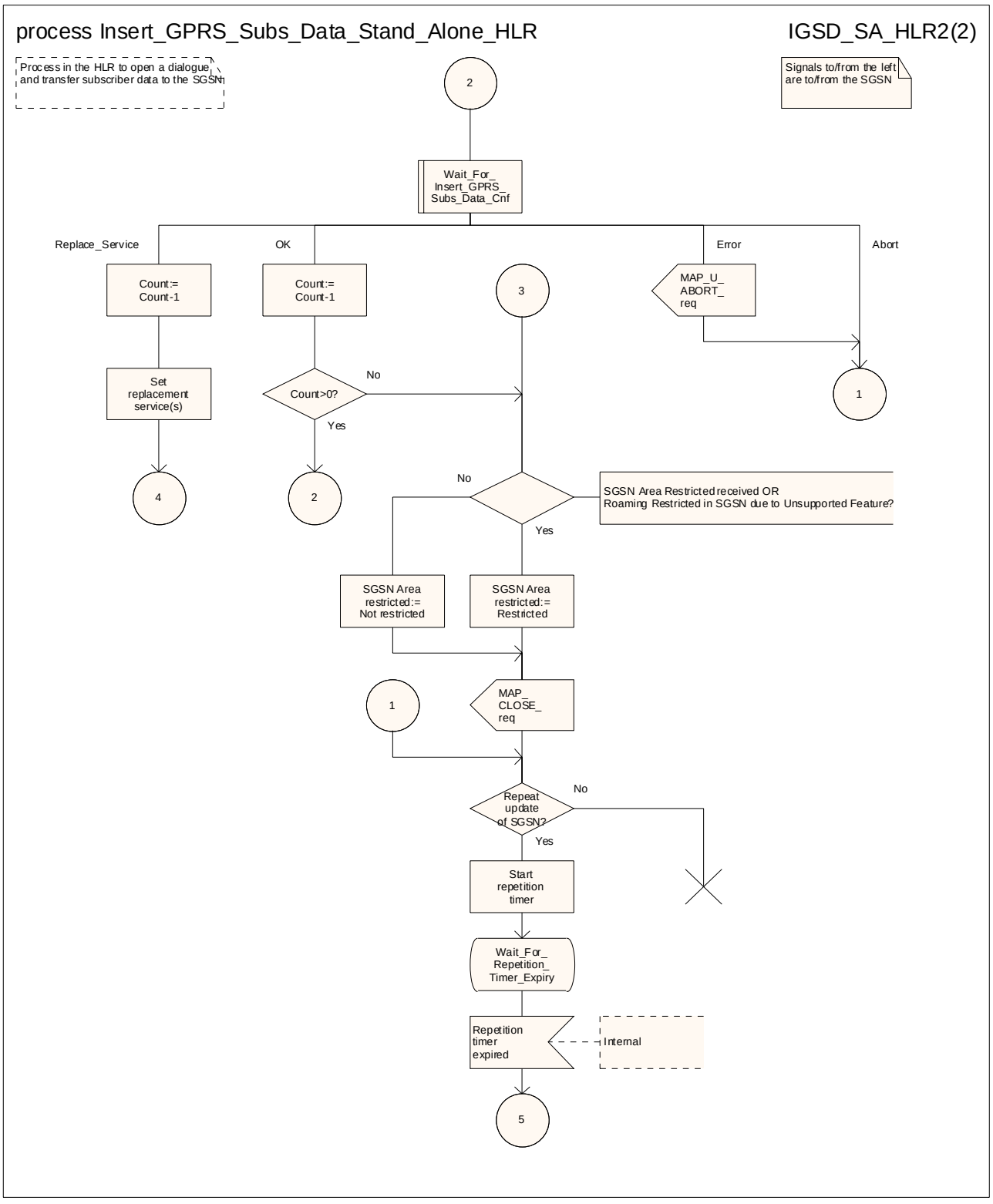


Figure 25.7/45 (sheet 2 of 2): Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

~~25.7.3 Macro Wait_for_Insert_Subs_Data_Cnf~~

***** CR editor's note: (The much reduced version of) this text is now subclause 25.7.5; it is grouped with the text of the other subclauses of 25.7. *****

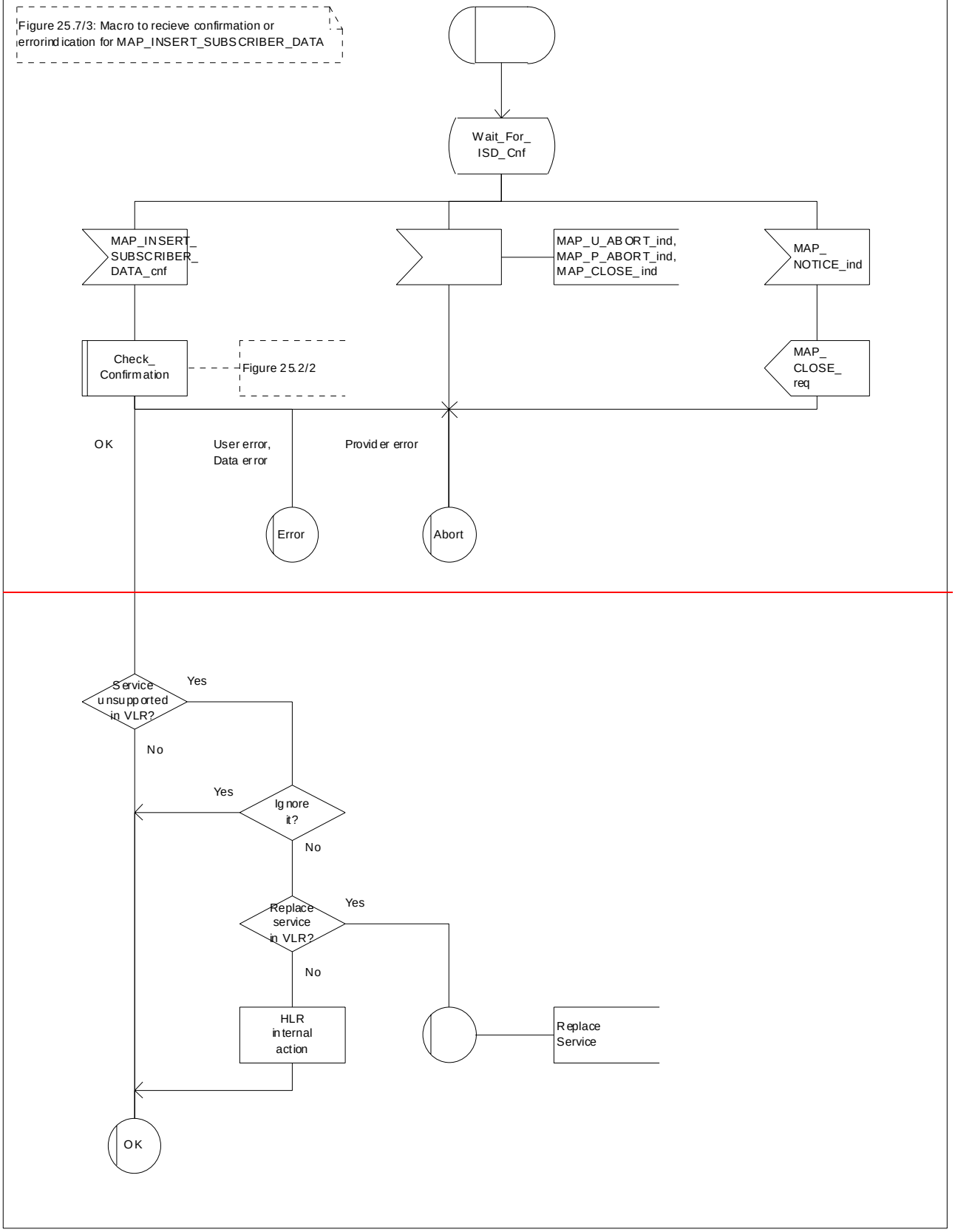
~~This macro is used by any process or macro that describes the handling of the reception of the Insert_Subscriber_Data service in HLR that is coming from VLR (e.g. Update Location or Restore Data).~~

~~If the VLR reports the non-support of some basic or supplementary service or the network feature Operator Determined Barring then three actions are possible:~~

- ~~to ignore the information received;~~
- ~~to replace the not supported service;~~
- ~~or to perform any other internal action.~~

~~The SDL diagram is shown in figure 25.7/3.~~

Macrodefinition Wait_For_Insert_Subs_Data_Cnf 25.7_3(1)



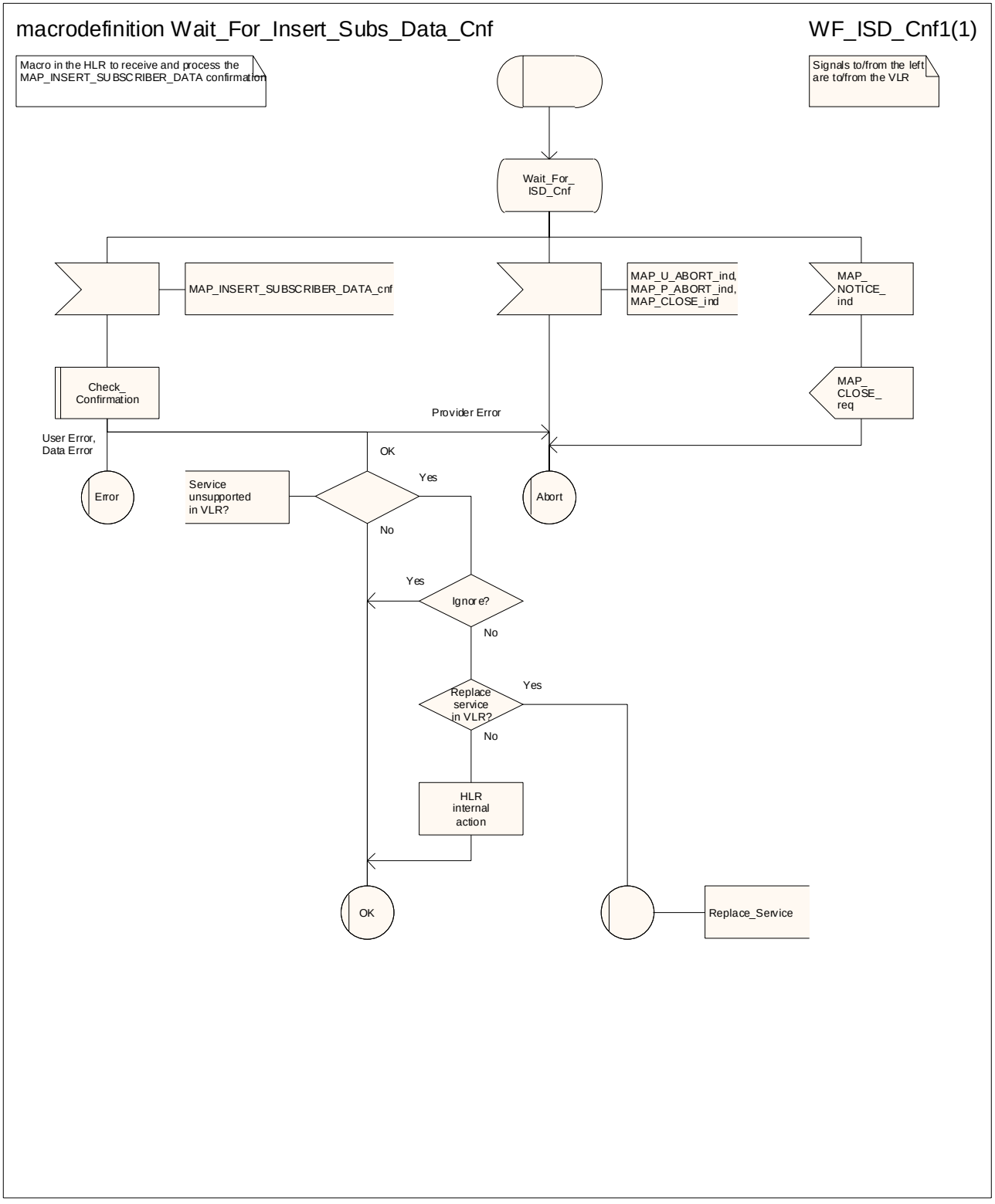


Figure 25.7/5~~3~~: Macro Wait_for_Insert_Subs_Data_Cnf

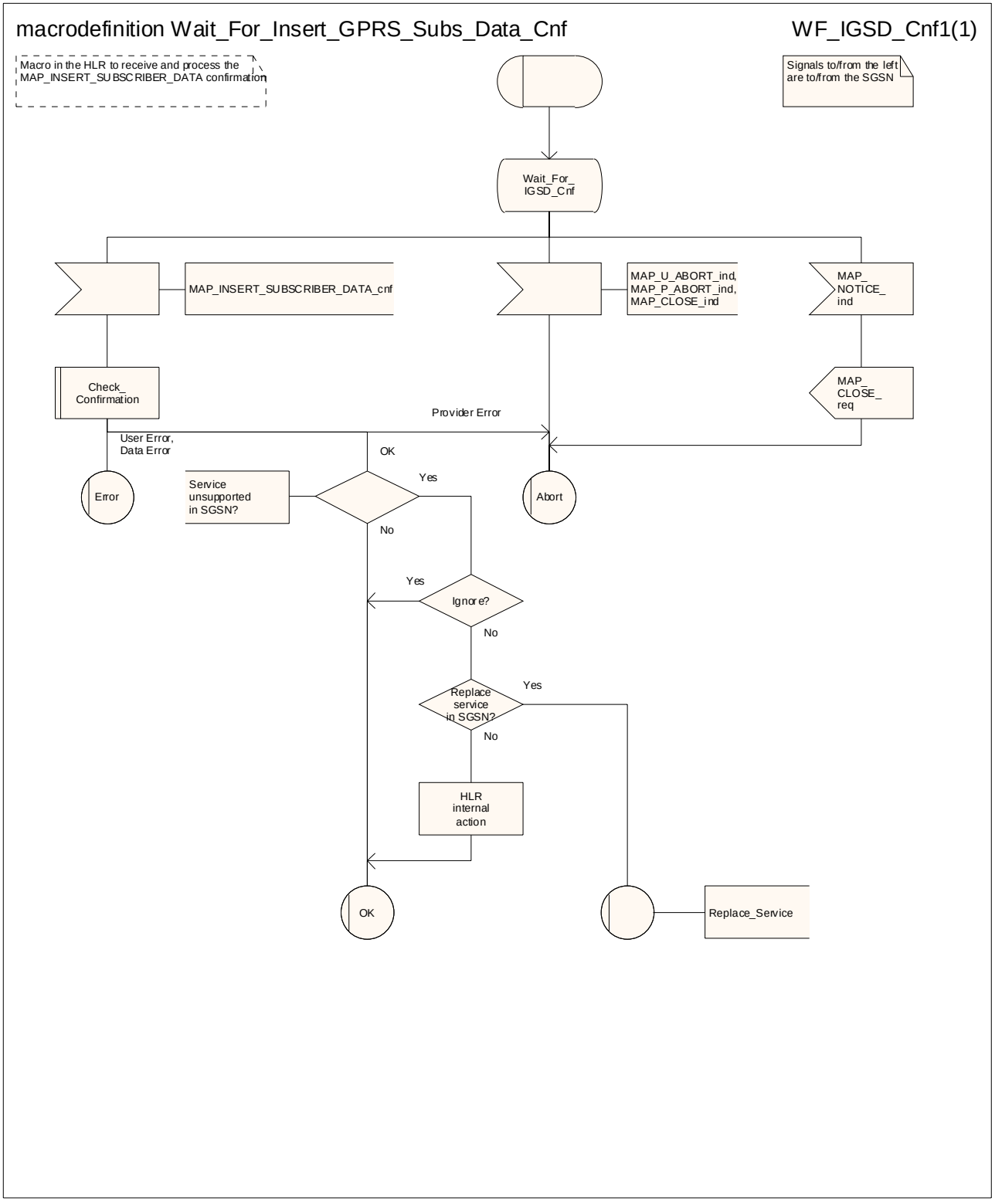


Figure 25.7/6: Macro Wait_for_Insert_GPRS_Subs_Data_Cnf

~~25.7.4 Process Send_Insert_Subs_Data~~

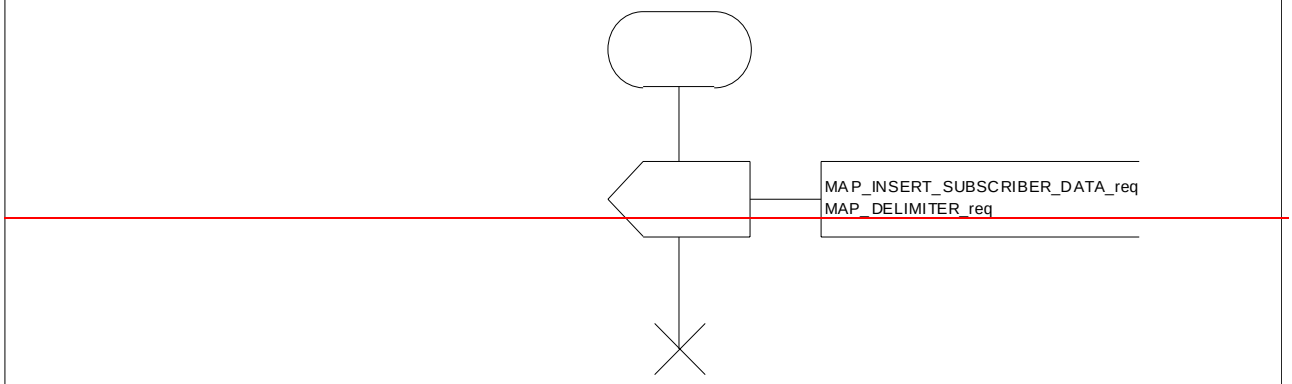
***** CR editor's note: (The much reduced version of) this text is now subclause 25.7.7; it is grouped with the text of the other subclauses of 25.7. *****

~~This process is used by any process or macro where the Insert_Subscriber_Data request is sent to VLR or to SGSN.~~

~~The SDL diagram is shown in figure 25.7/4.~~

Process Send_Insert_Subs_Data 25.7_4(1)

Figure 25.7/4: Independent process to send a component of subscriber data from HLR to VLR



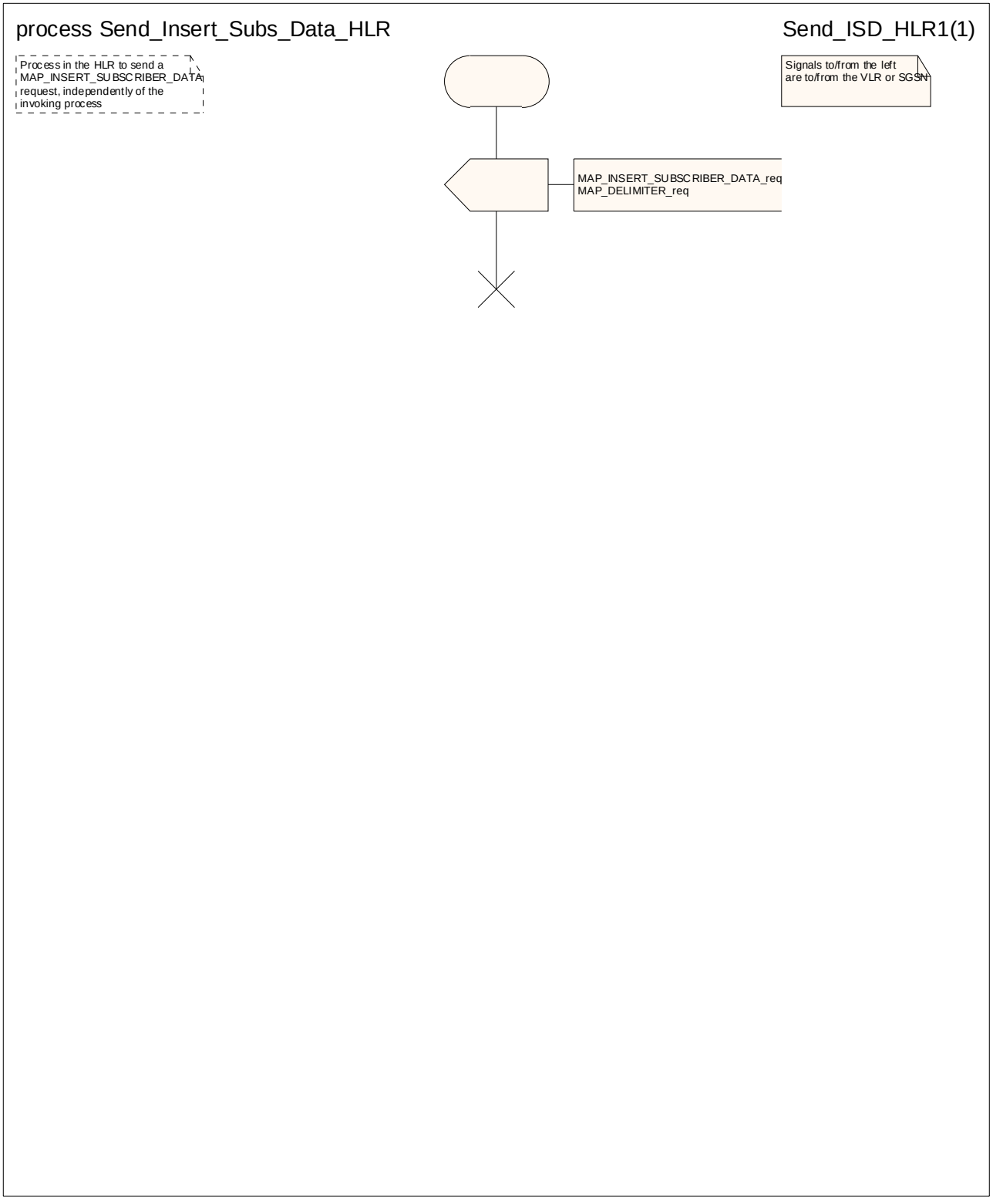


Figure 25.7/74: Process Send_Insert_Subs_Data

~~25.7.5 Macro Insert_Subs_Data_SGSN~~

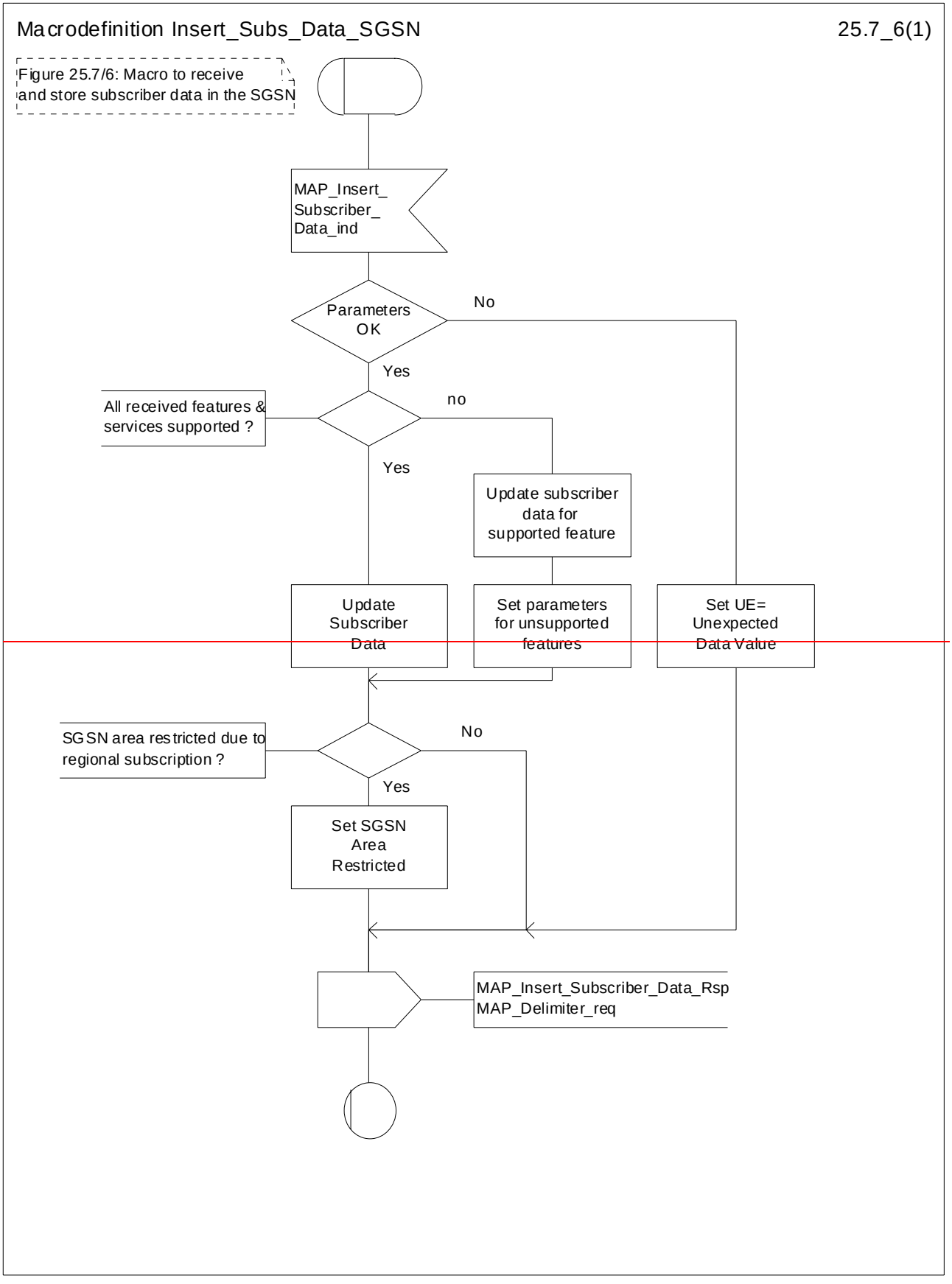
***** CR editor's note: (The much reduced version of) this text is now subclause 25.7.2; it is grouped with the text of the other subclauses of 25.7. *****

~~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~~

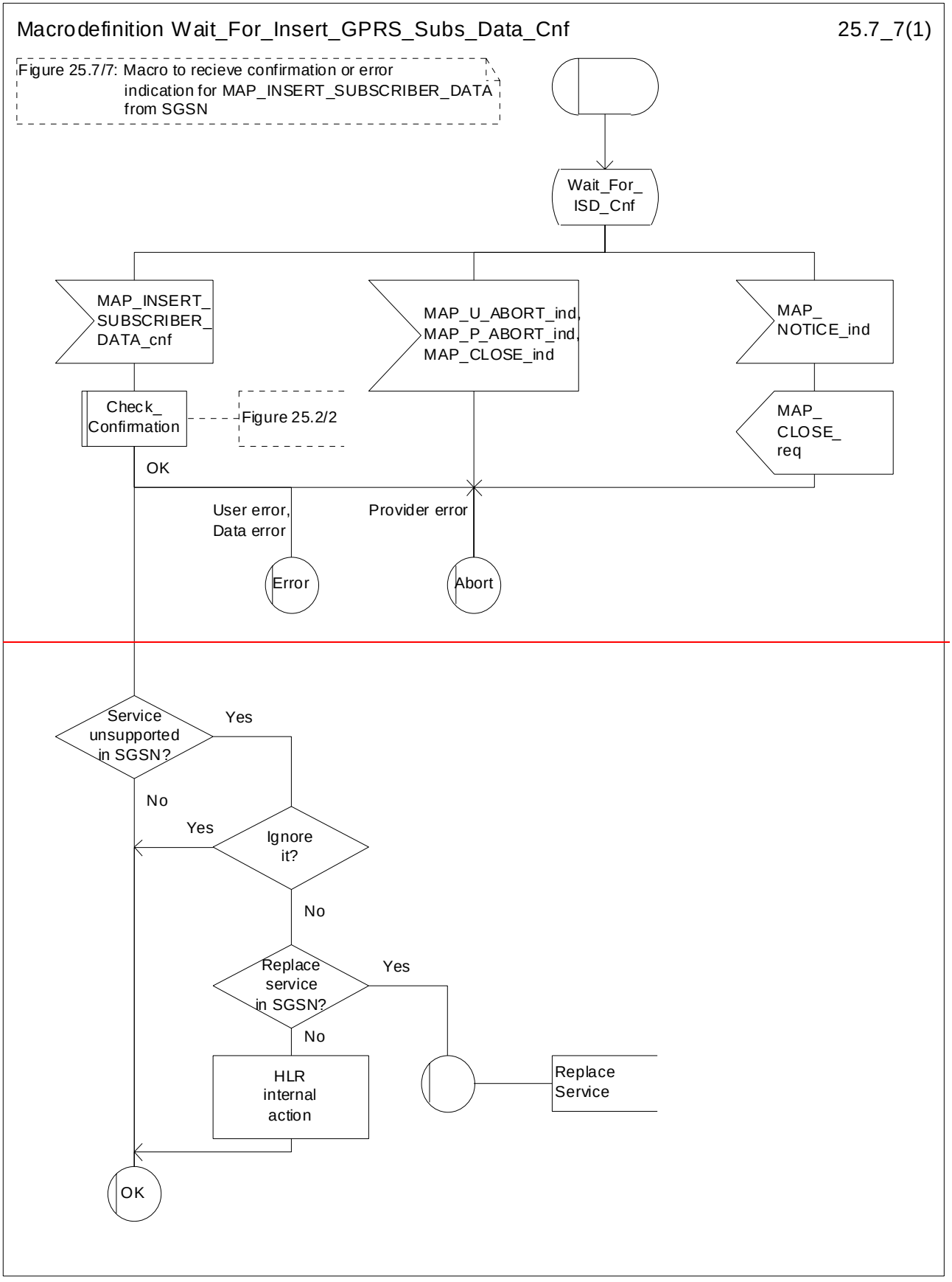
***** CR editor's note: (The much reduced version of) this text (still subclause 25.7.6) is now grouped with the text of the other subclauses of 25.7. *****

~~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).

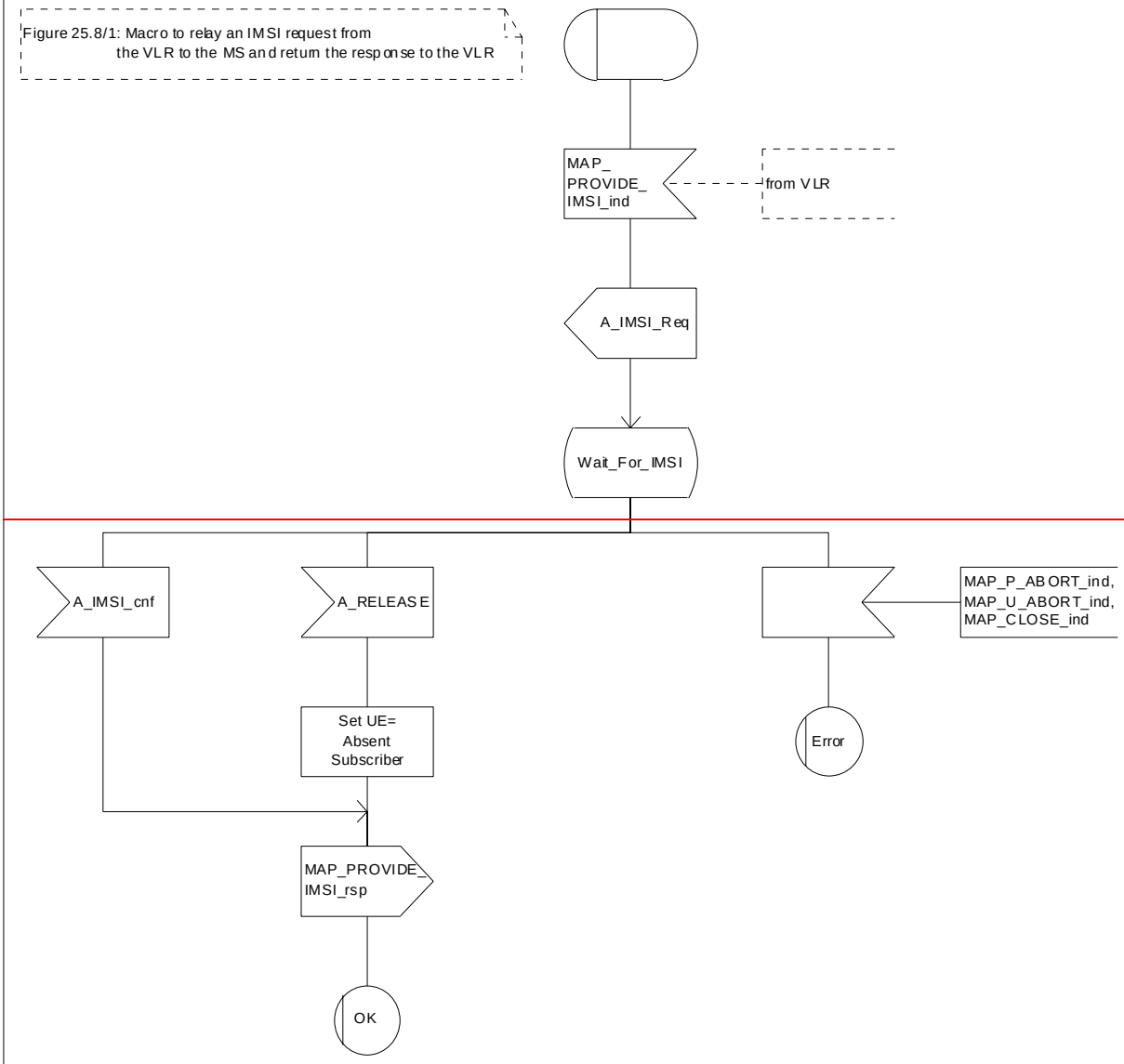
~~The SDL diagram is shown in figure 25.8/1.~~

25.8.2 Macro Obtain_IMSI_VLR

This macro describes how the VLR requests the MSC to provide the IMSI of a subscriber (e.g. at Location Updating).

Macrodefinition Obtain_IMSI_MSC 25.8_1(1)

Figure 25.8/1: Macro to relay an IMSI request from the VLR to the MS and return the response to the VLR



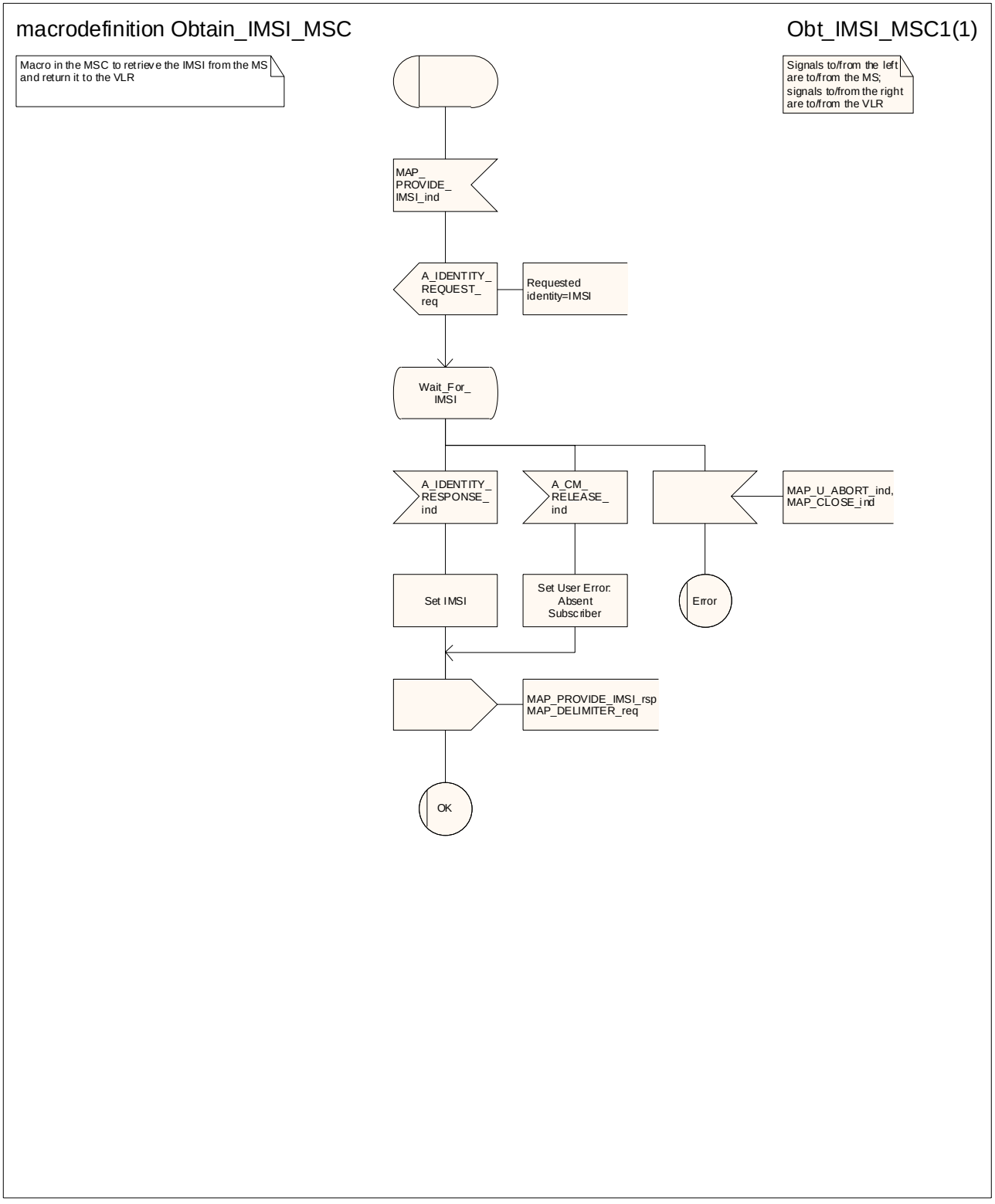


Figure 25.8/1: Macro Obtain_IMSI_MSC

~~25.8.2 Macro Obtain_IMSI_VLR~~

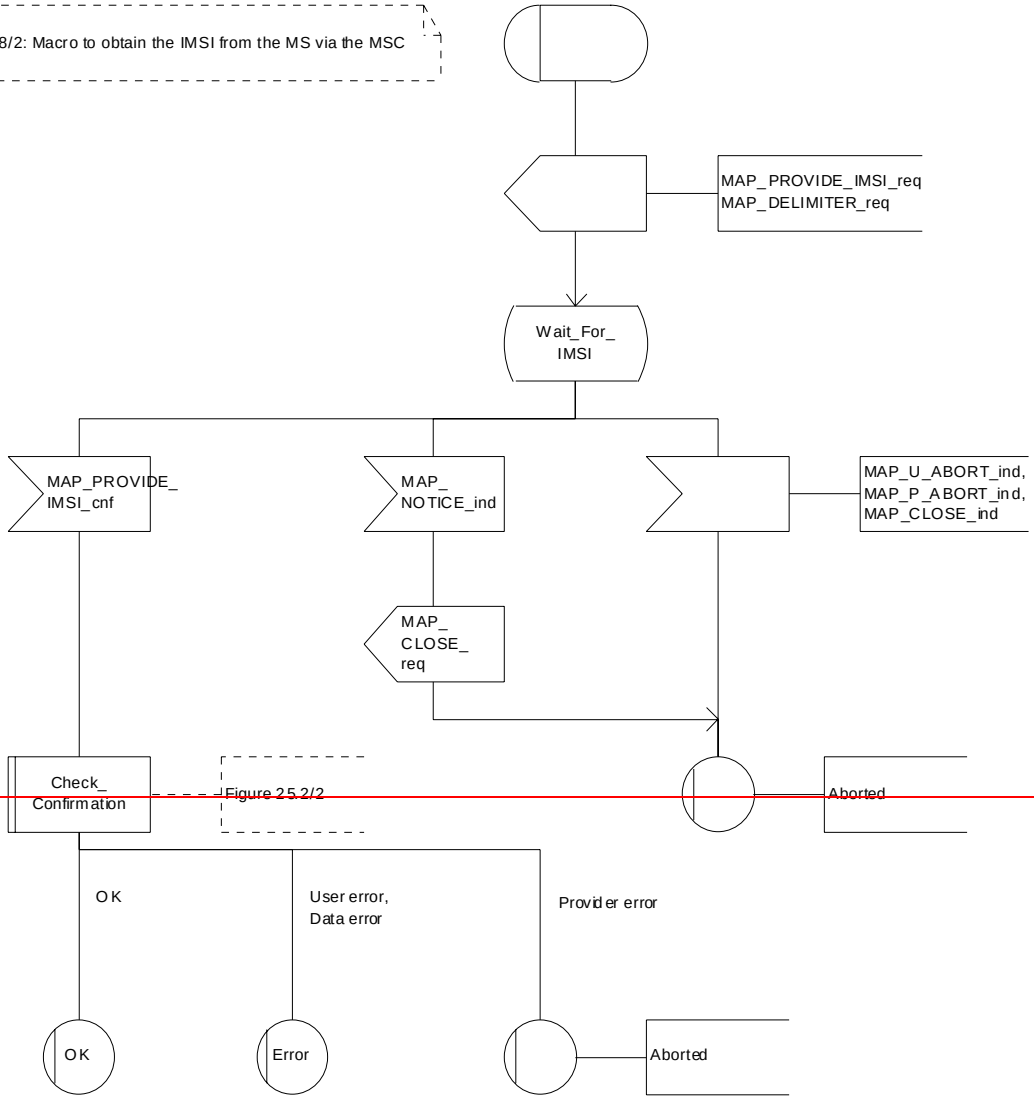
***** CR editor's note: (The reduced version of) this text now follows immediately after the text of subclause 25.8.1. *****

~~This macro describes the way VLR requests the MSC the IMSI of a subscriber (e.g. at Location Updating).~~

~~The SDL diagram is shown in figure 25.8/2.~~

Macrodefinition Obtain_IMSI_VLR 25.8_2(1)

Figure 25.8/2: Macro to obtain the IMSI from the MS via the MSC



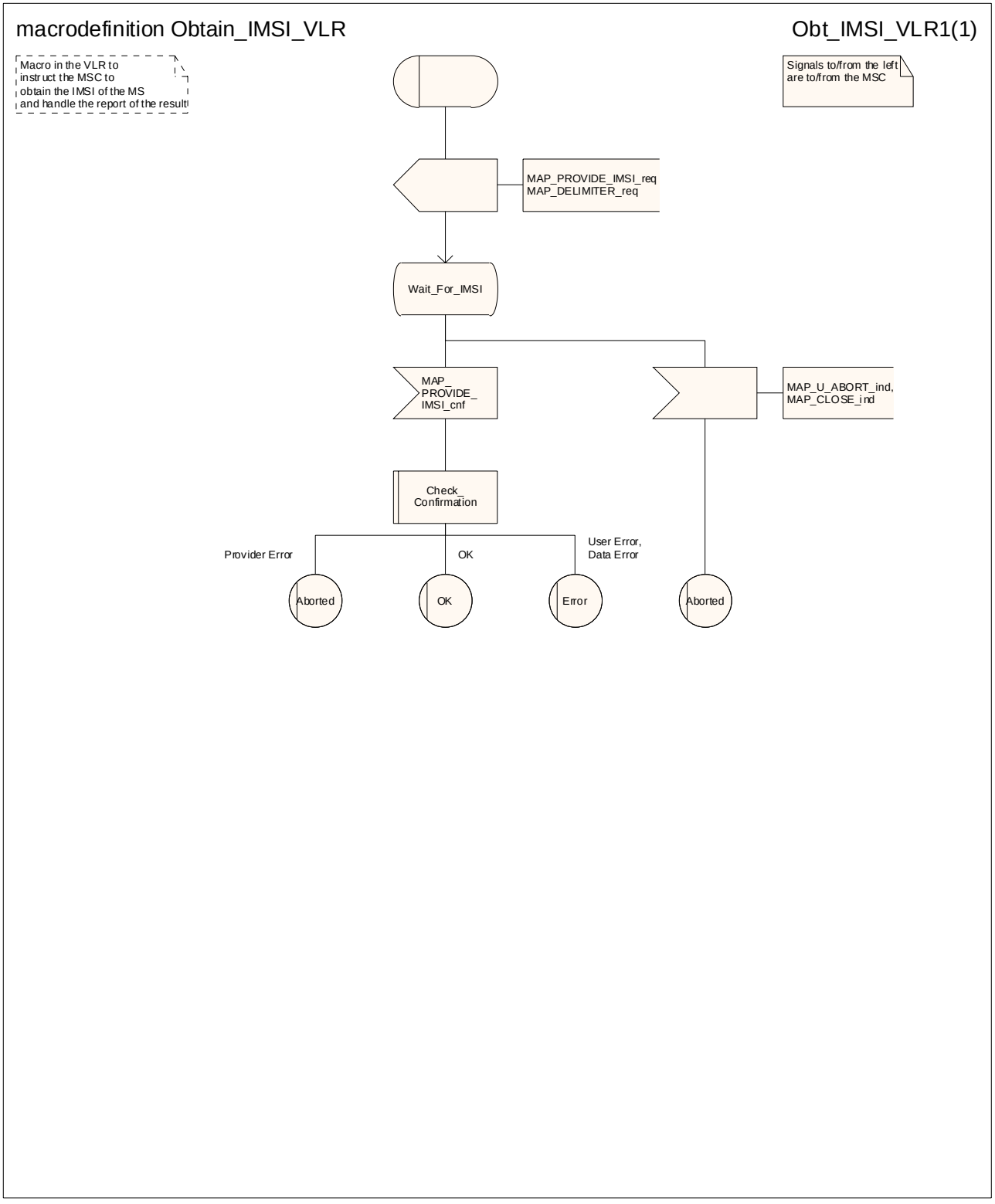


Figure 25.8/2: Macro Obtain_IMSI_VLR

25.9 Tracing macros

***** CR editor's note: the text of all the subclauses of 25.9 has been grouped together, in a more logical order. *****

25.9.1 Macro Trace_Subscriber_Activity_MSC

This macro shows the handling in the MSC for a request from the VLR to trace the activity of a subscriber.

~~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.~~

25.9.2 Macro Trace_Subscriber_Activity_VLR

This macro is called during the handling of subscriber activity in the VLR to activate tracing if necessary.

25.9.3 Macro Trace_Subscriber_Activity_SGSN

This macro is called during the handling of subscriber activity in the SGSN to activate tracing if necessary.

25.9.4 Macro Activate_Tracing_VLR

This macro shows the handling in the VLR for a request from the HLR to activate tracing for a subscriber.

25.9.6 Macro Activate_Tracing_SGSN

This macro shows the handling in the SGSN for a request from the HLR to activate tracing for a subscriber.

25.9.6 Macro Control_Tracing_HLR

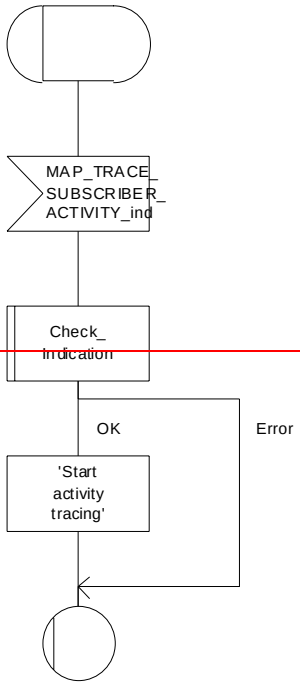
This macro shows the handling in the HLR to activate tracing in the VLR if it is required during a dialogue between the VLR and the HLR

25.9.7 Macro Control_Tracing_HLR_with_SGSN

This macro shows the handling in the HLR to activate tracing in the SGSN if it is required during a dialogue between the SGSN and the HLR

Macrodefinition Trace_Subscriber_Activity_MSC 25.9_1(1)

Figure 25.9/1: The Subscriber tracing macro in the MSC



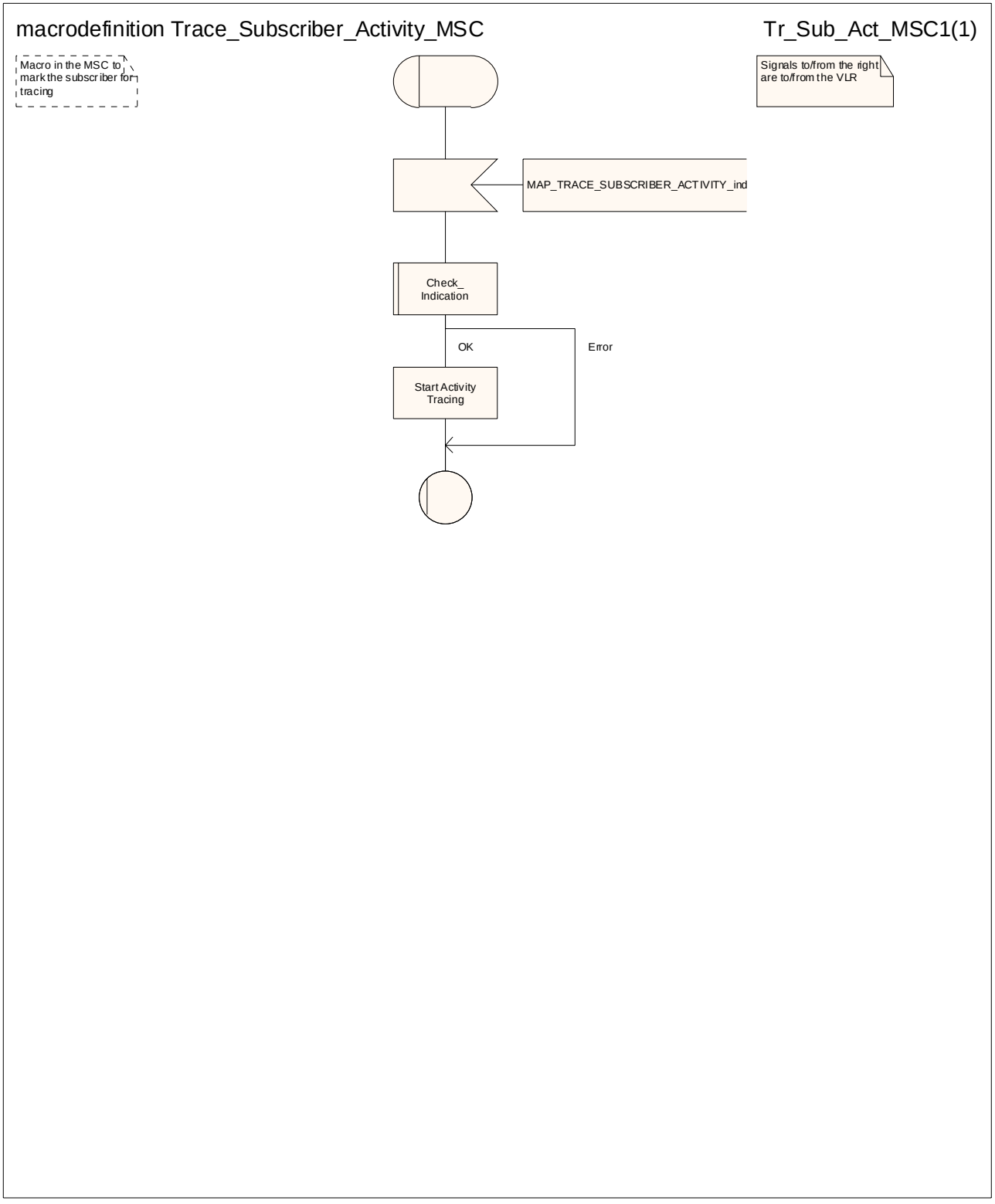


Figure 25.9/1: Macro Trace_Subscriber_Activity_MSC

~~25.9.2 Macro Trace_Subscriber_Activity_VLR~~

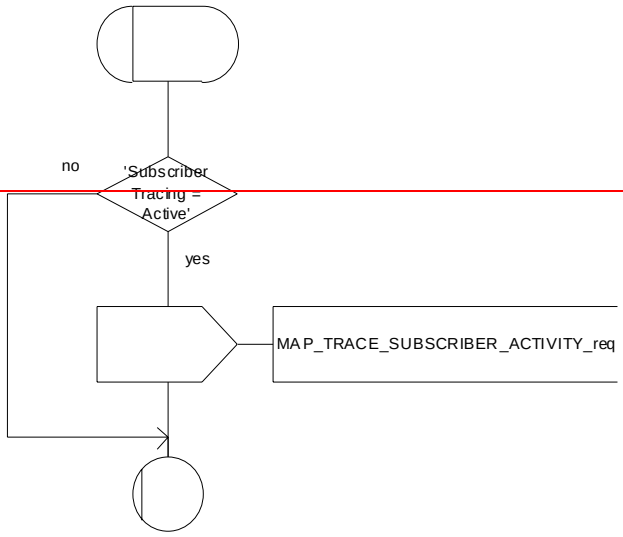
***** CR editor's note: (The reduced version of) this text has been moved to follow immediately after the text of subclause 25.9.1. *****

~~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



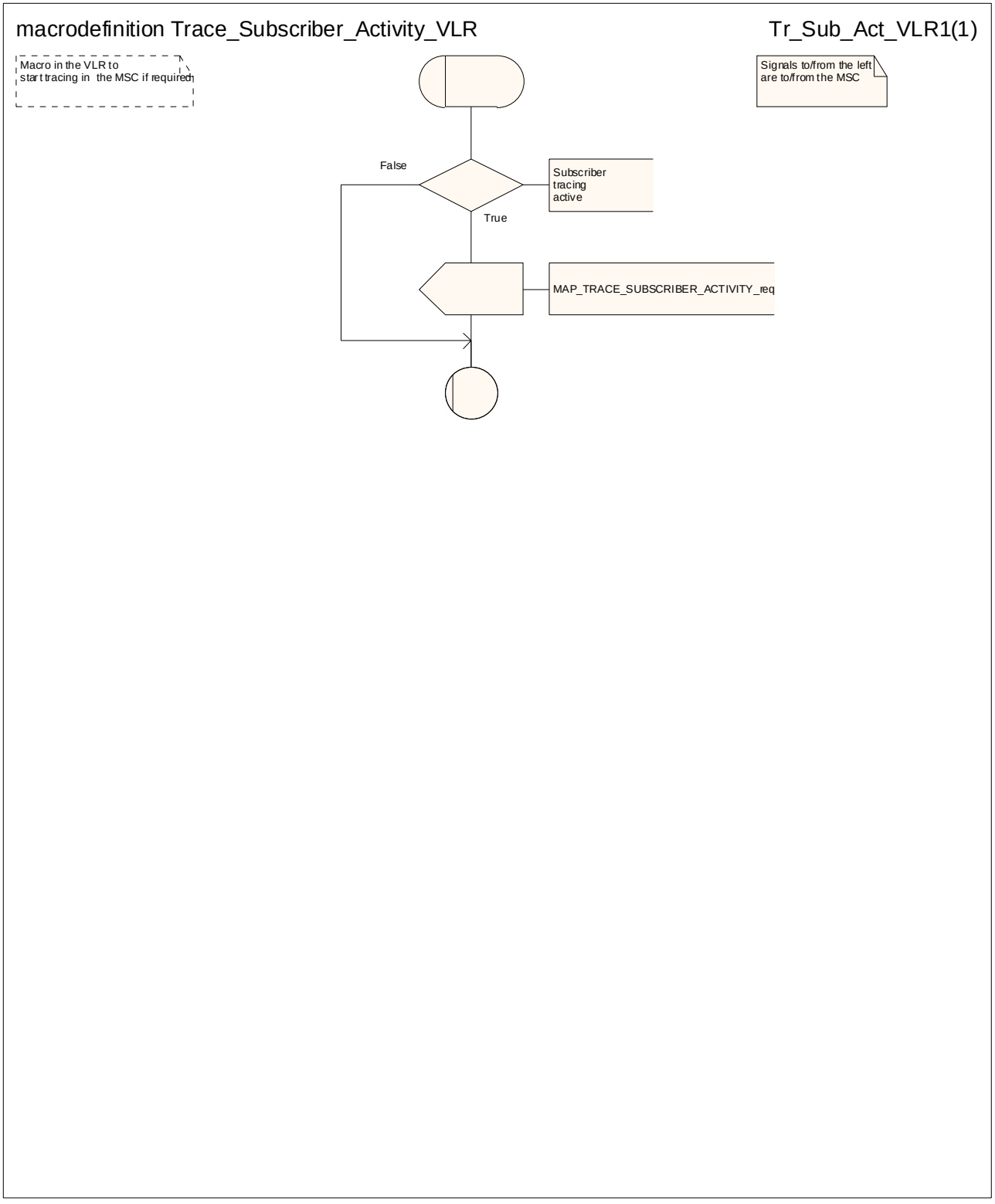


Figure 25.9/2: Macro Trace_Subscriber_Activity_VLR

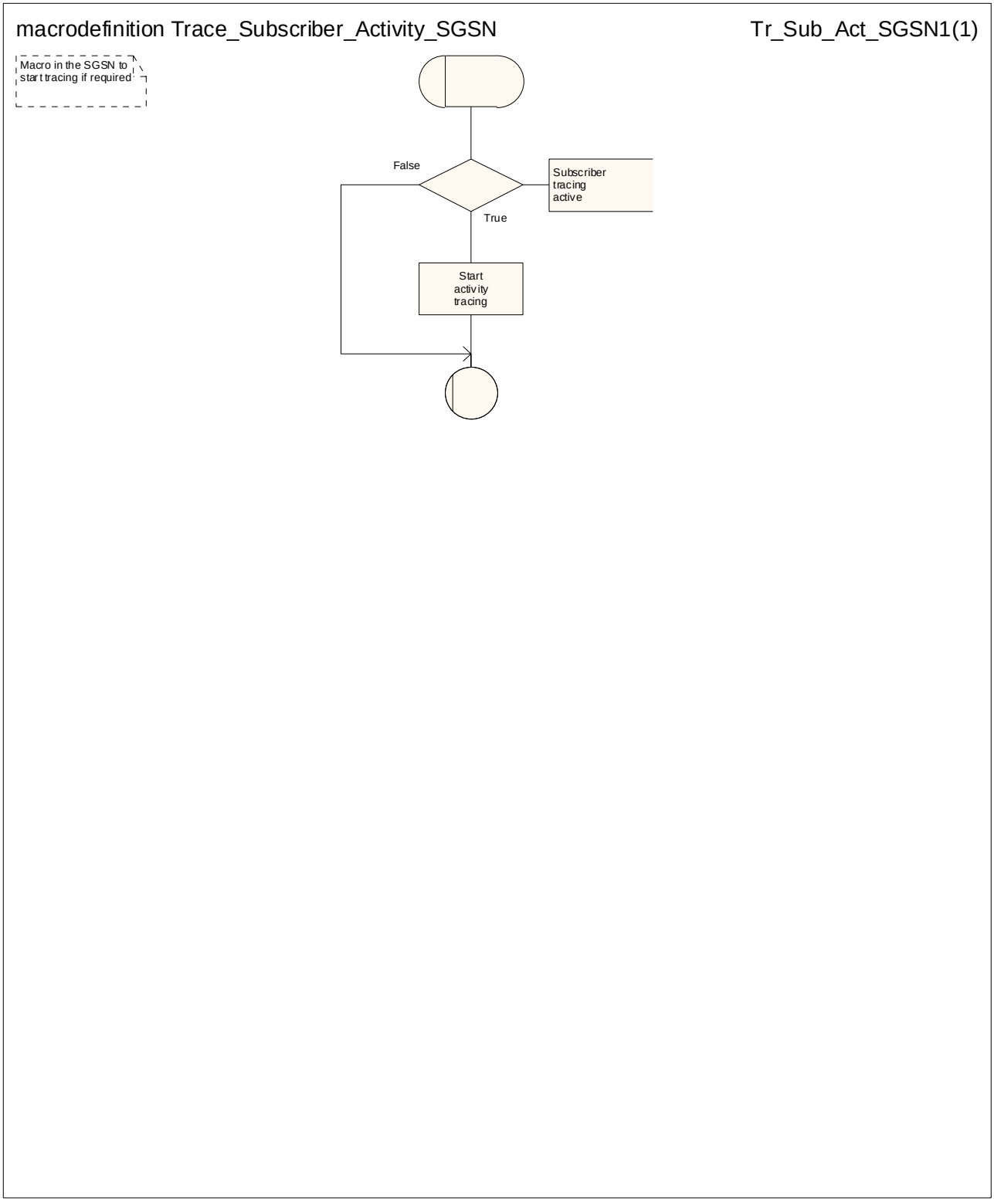


Figure 25.9/3: Macro Trace_Subscriber_Activity_SGSN

~~25.9.3 Macro Activate_Tracing_VLR~~

***** CR editor's note: the (reduced version of) this text is now subclause 25.9.4. It has been grouped with the text of the other subclauses of 25.9. *****

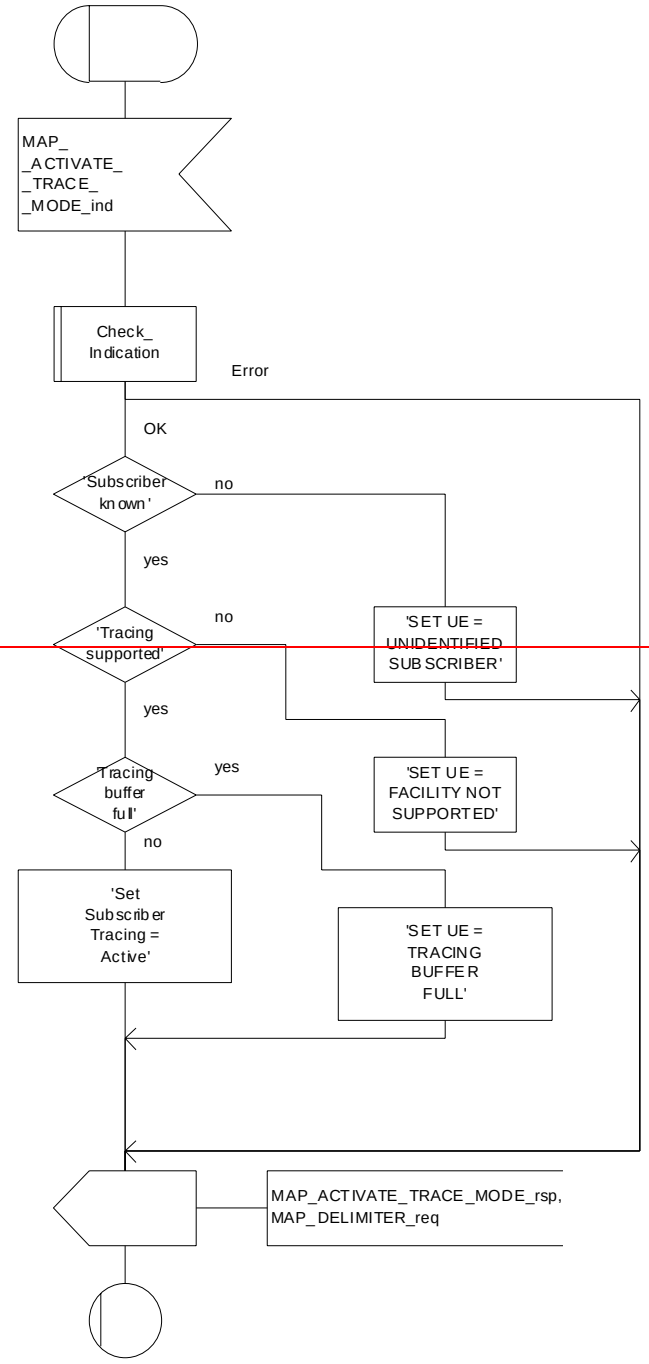
~~The Activate_Tracing_VLR macro is invoked, when the MAP_ACTIVATE_TRACE_MODE indication is received from the HLR. The primitive is processed in the VLR as follows:~~

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

The Activate_Tracing_VLR macro is described in the figure 25.9/3.

Macrodefinition Activate_Tracing_VLR 25.9_3(1)

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



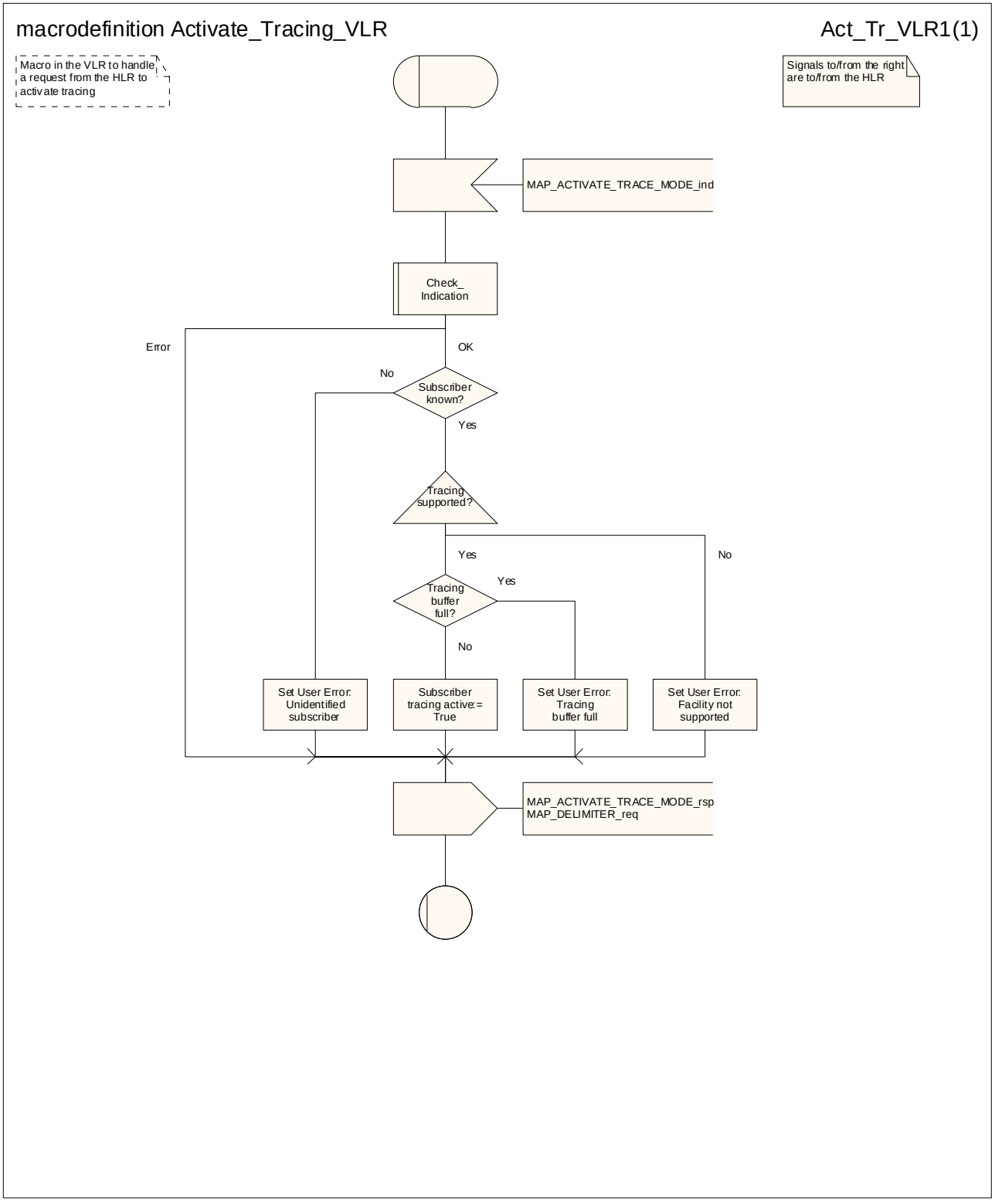


Figure 25.9/43: Macro Activate_Tracing_VLR

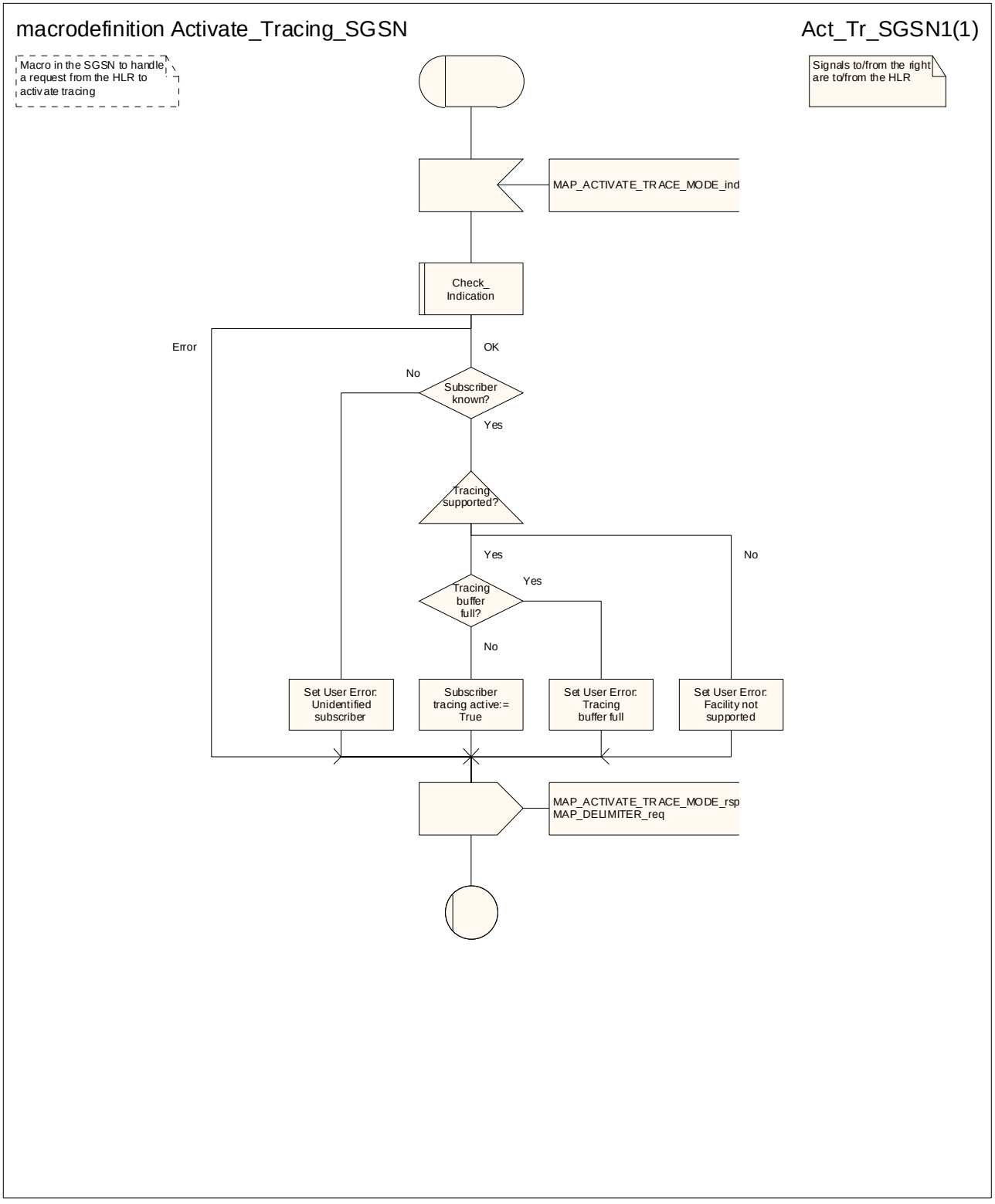


Figure 25.9/5: Macro Activate_Tracing_SGSN

~~25.9.4 Macro Control_Tracing_HLR~~

***** CR editor's note: the (reduced version of) this text is now subclauses 25.9.6 & 25.9.7. It has been grouped with the text of the other subclauses of 25.9. *****

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

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

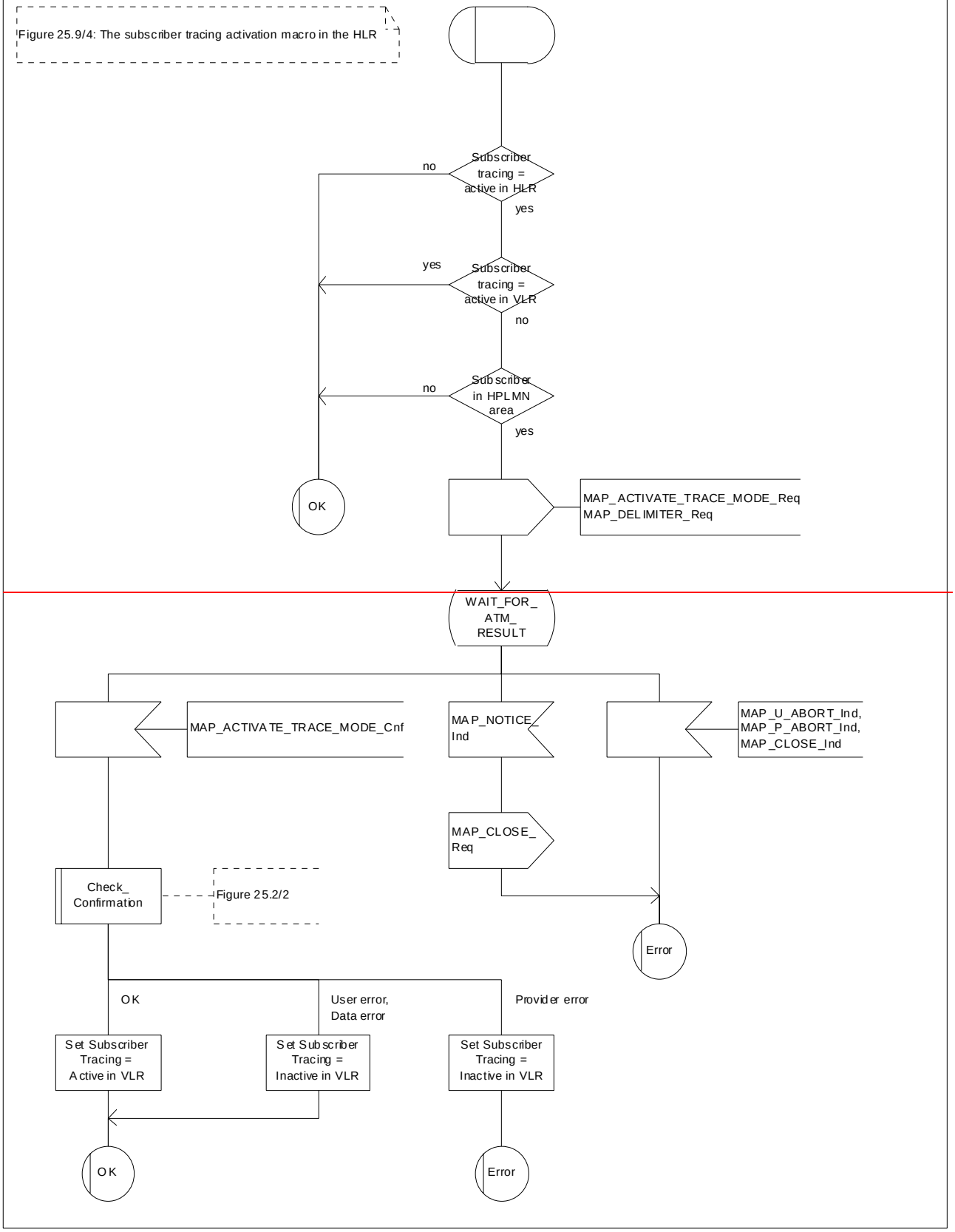
- ~~if the primitive contains a successful acknowledgement, the tracing in VLR or in the SGSN is set active;~~
- ~~if the primitive contains errors, the tracing in VLR or in SGSN is set to deactive.~~

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

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

Macrodefinition Control_Tracing_HLR 25.9_4(1)

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



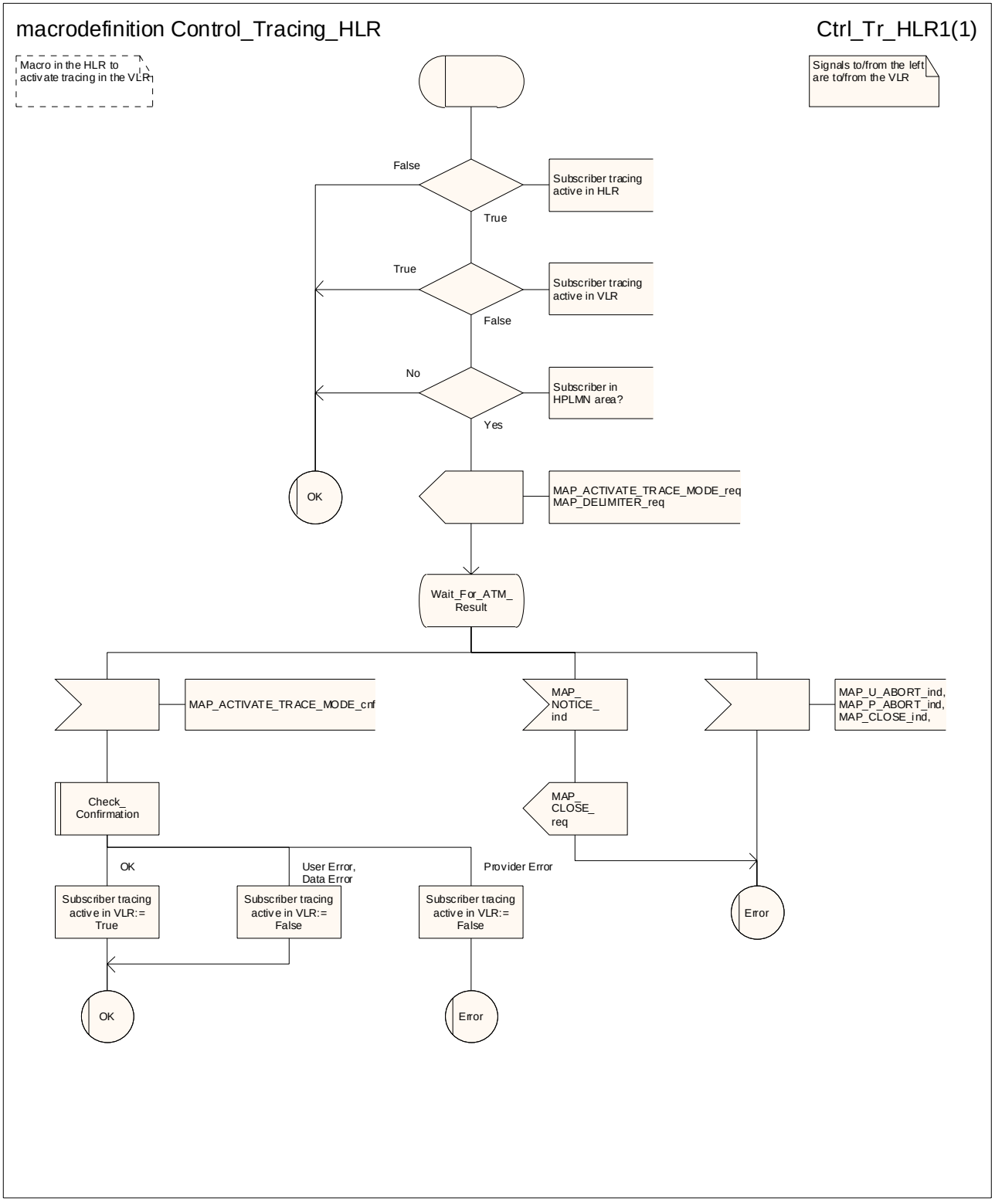
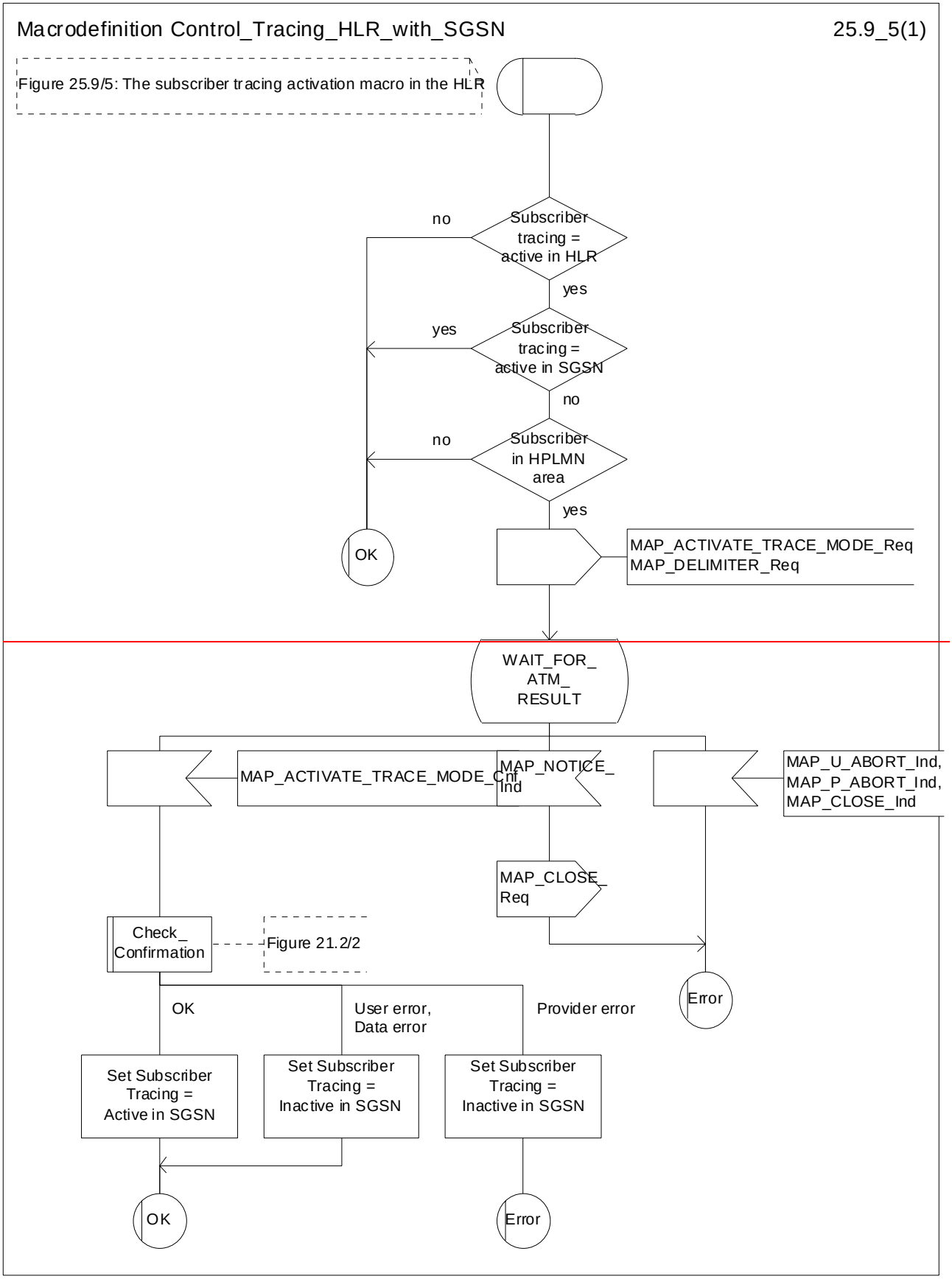


Figure 25.9/64: Macro Control_Tracing_HLR


Macrodefinition Control_Tracing_HLR_with_SGSN
25.9_5(1)
Figure 25.9/5: The subscriber tracing activation macro in the HLR
Subscriber tracing = active in HLR
no
yes
Subscriber tracing = active in SGSN
yes
no
Subscriber in HPLMN area
no
yes
OK
MAP_ACTIVATE_TRACE_MODE_Req
MAP_DELIMITER_Req
WAIT_FOR_ ATM_ RESULT
MAP_ACTIVATE_TRACE_MODE_Cnf
MAP_NOTICE_ Ind
MAP_U_ABORT_Ind,
MAP_P_ABORT_Ind,
MAP_CLOSE_Ind
MAP_CLOSE_ Req
Check_ Confirmation
Figure 21.2/2
OK
User error, Data error
Provider error
Error
Set Subscriber Tracing = Active in SGSN
Set Subscriber Tracing = Inactive in SGSN
Set Subscriber Tracing = Inactive in SGSN
OK
Error

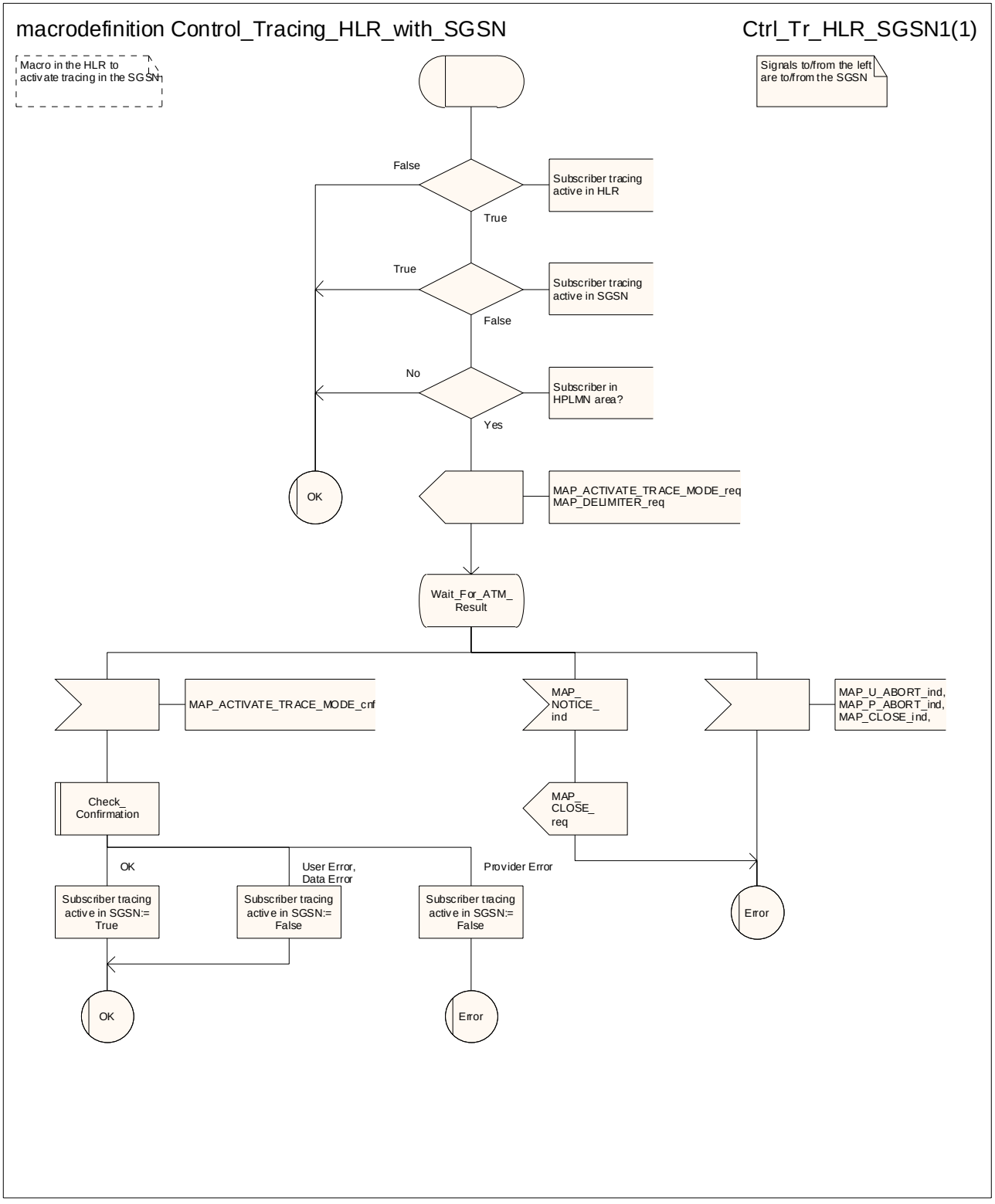


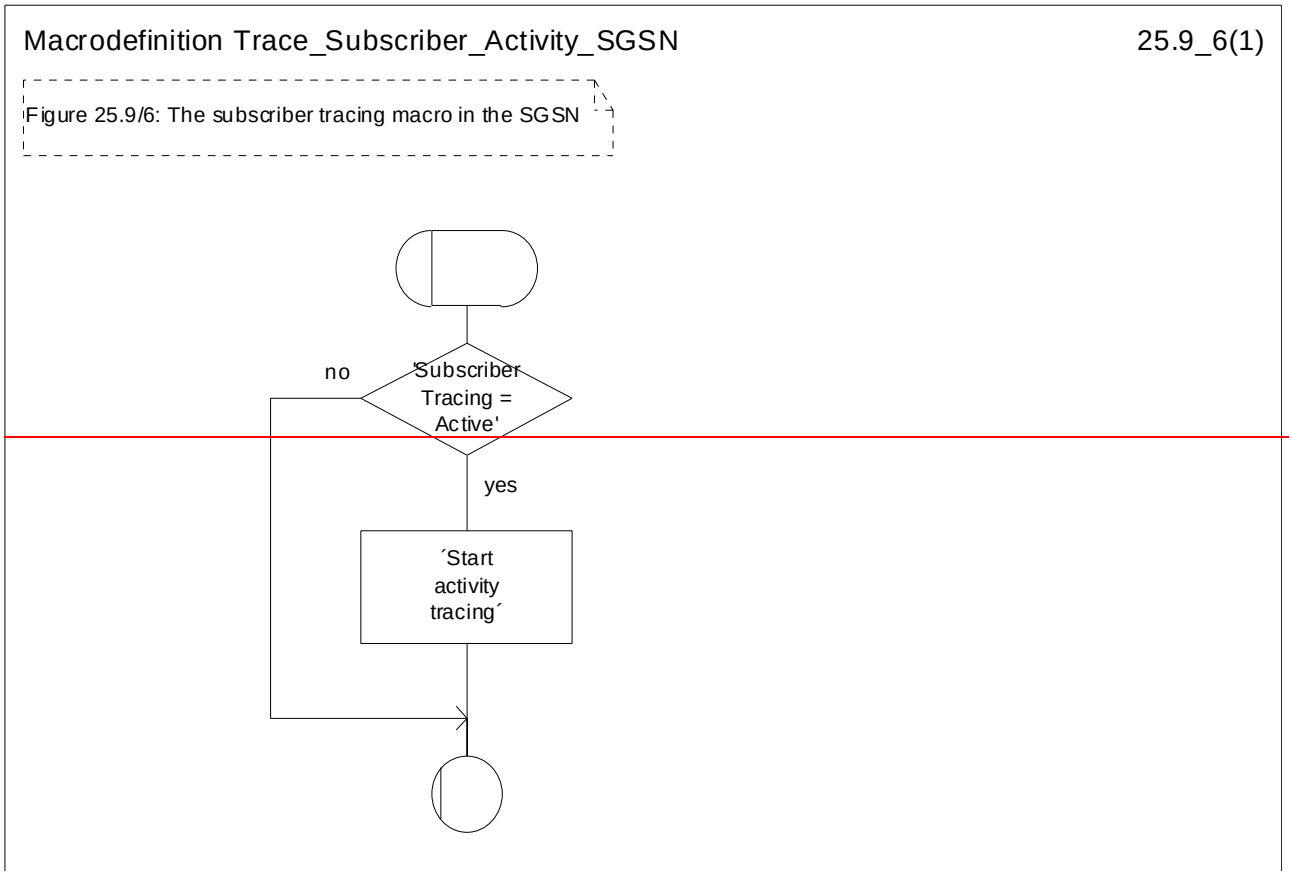
Figure 25.9/75: Macro Control_Tracing_HLR_with_SGSN

~~25.9.5 Macro Trace_Subscriber_Activity_SGSN~~

***** CR editor's note: the (reduced version of) this text is now subclause 25.9.3. It has been grouped with the text of the other subclauses of 25.9. *****

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

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



~~Figure 25.9/6: Macro Trace_Subscriber_Activity_SGSN~~

~~25.9.6 Macro Activate_Tracing_SGSN~~

***** CR editor's note: the (reduced version of) this text is now subclause 25.9.5. It has been grouped with the text of the other subclauses of 25.9. *****

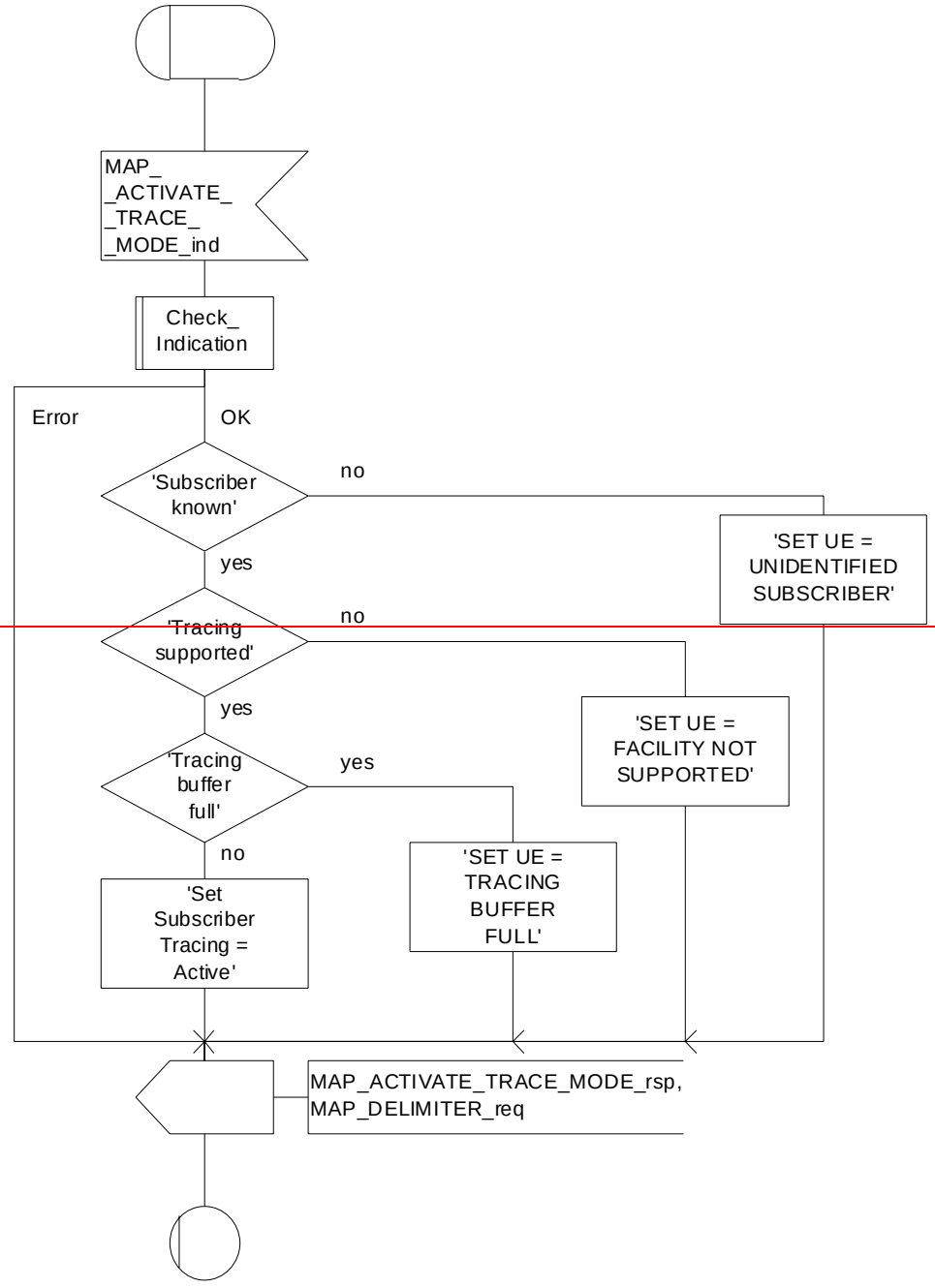
~~The Activate_Tracing_SGSN macro is invoked, when the MAP_ACTIVATE_TRACE_MODE indication is received from the HLR. The primitive is processed in the SGSN as follows:~~

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

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

Macrodefinition Activate_Tracing_SGSN 25.9_7(1)

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



~~Figure 25.9/7: Macro Activate_Tracing_SGSN~~

25.10 Short Message Alert procedures

***** CR editor's note: the text for the subclauses of 25.10 has been grouped together, in the order VLR behaviour, SGSN behaviour, HLR behaviour. *****

25.10.1 Process Subscriber_Present_VLR ~~process~~

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

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

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

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

25.10.2 Process Subscriber_Present_SGSN

The SGSN invokes the process Subscriber_Present_SGSN when it receives a Page response, a GPRS Attach request or a Routing area update request message (3GPP TS 24.008 [35]). The general description of the short message alert procedures is in clause 23.4.

25.10.3 Macro Alert_Service_Centre_HLR

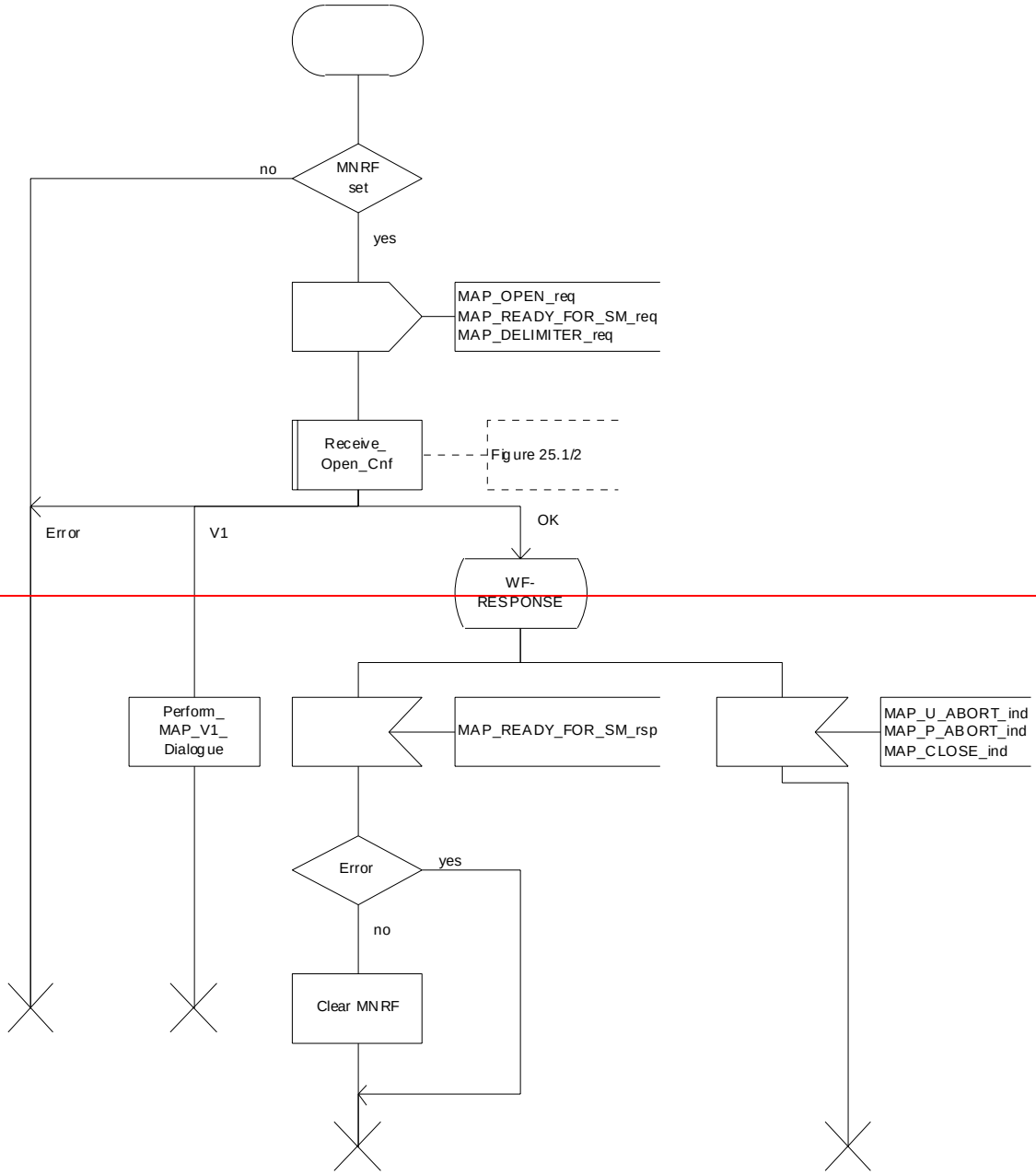
The HLR invokes the macro Alert_Service_Centre_HLR when Service Centre(s) are to be alerted.

25.10.4 Process Alert_SC_HLR

It is an operator option to resend the MAP_ALERT_SERVICE_CENTRE request to the SMS-IWMSC if the alert is unsuccessful. The number of repeat attempts and the interval between them is also an operator option. The service centre address should be purged from the MWD list if the alert is consistently unsuccessful.

Process Subscriber_Present_VLR 25.10_1(1)

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



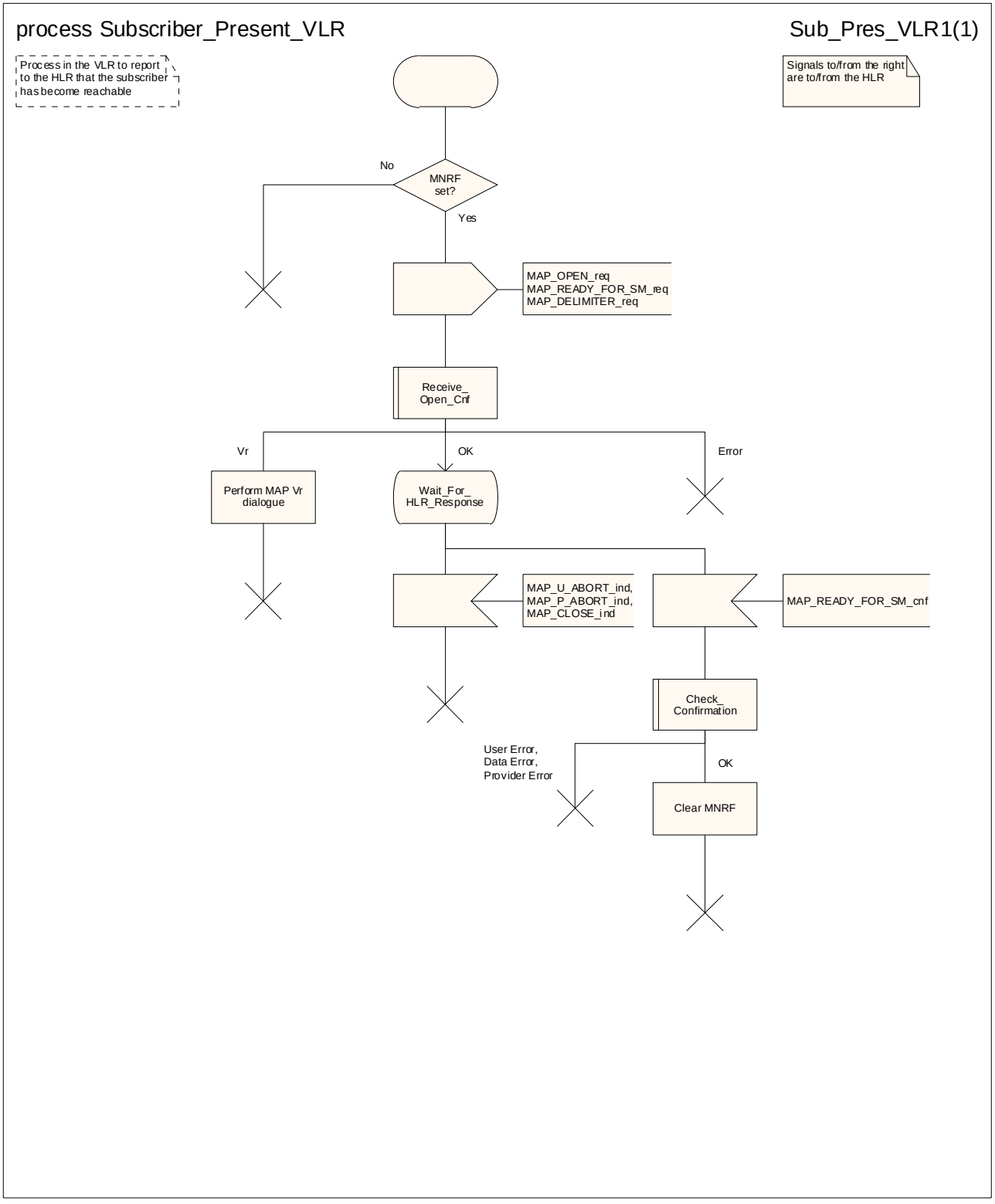


Figure 25.10/1: Process Subscriber_Present_VLR

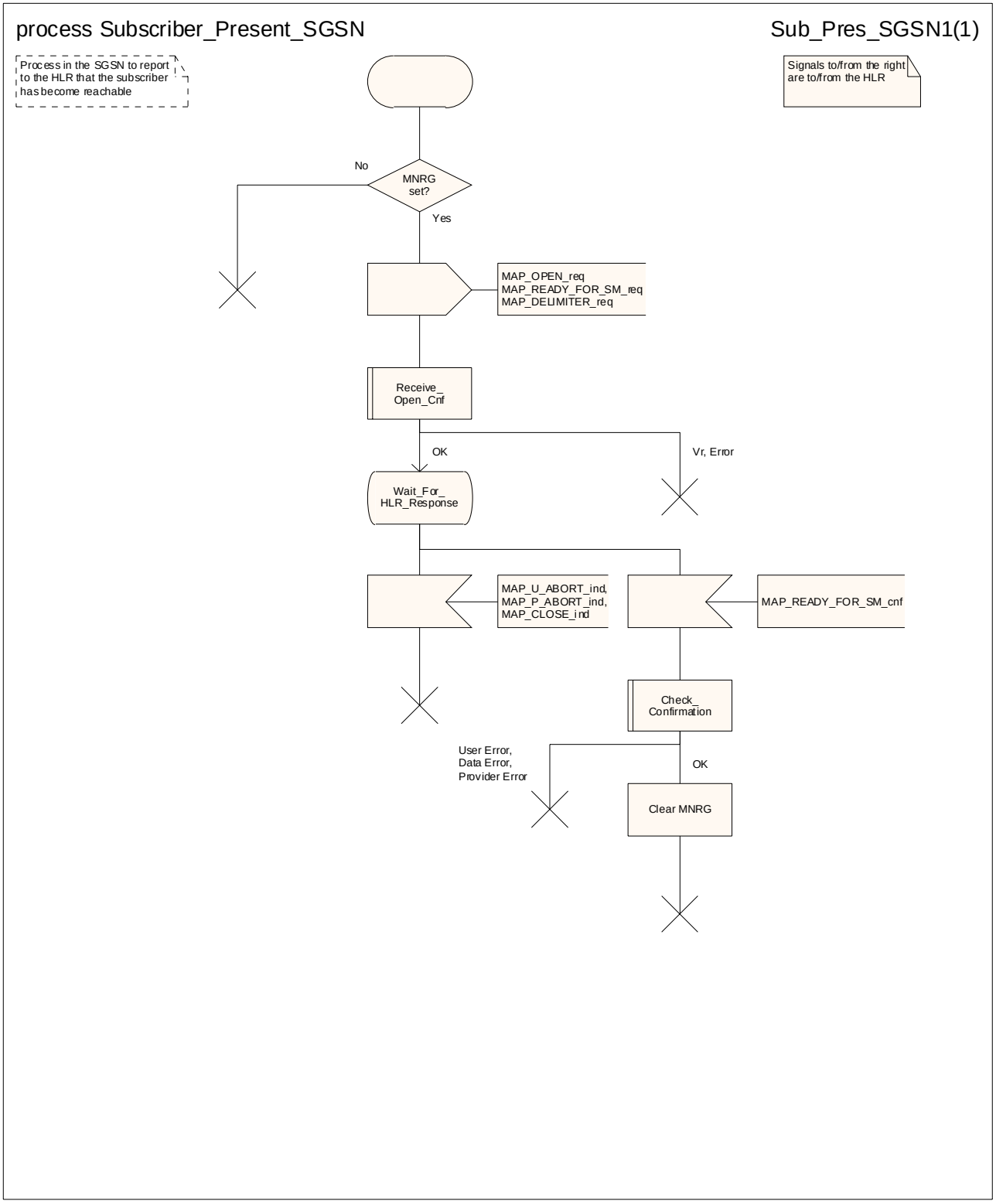


Figure 25.10/2: Process Subscriber_Present_SGSN

~~25.10.2 Macro Alert_Service_Centre_HLR~~

***** CR editor's note: (The reduced text of) this subclause is now 25.10.3 & 25.10.4. It is grouped with the text of the other subclauses of 25.10. *****

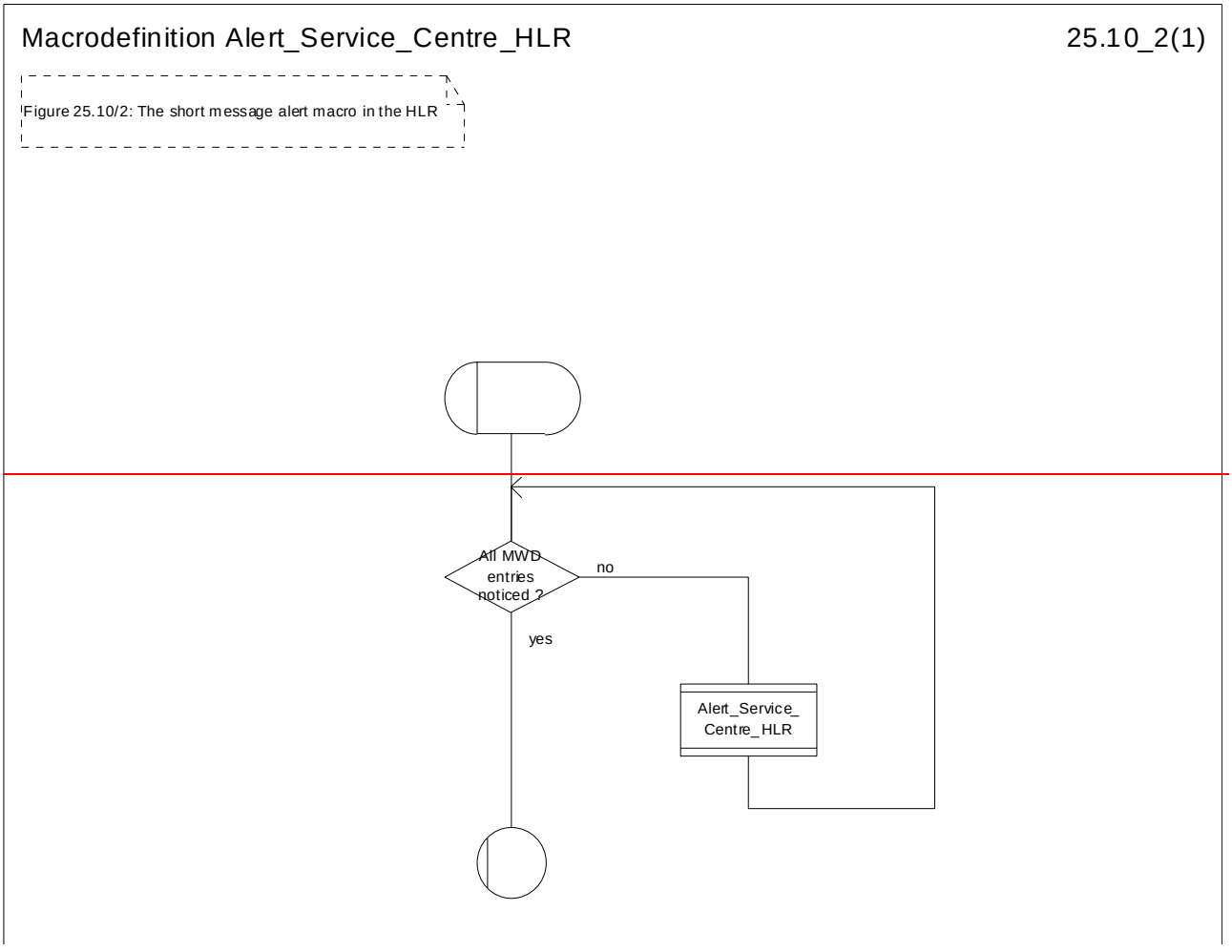
~~The Alert_Service_Centre_HLR macro is initiated when the HLR notices that the Service Centre(s) shall be alerted. The macro starts process Alert_Service_Centre_HLR for every SC address in the MWD list.~~

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

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

Macrodefinition Alert_Service_Centre_HLR 25.10_2(1)

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



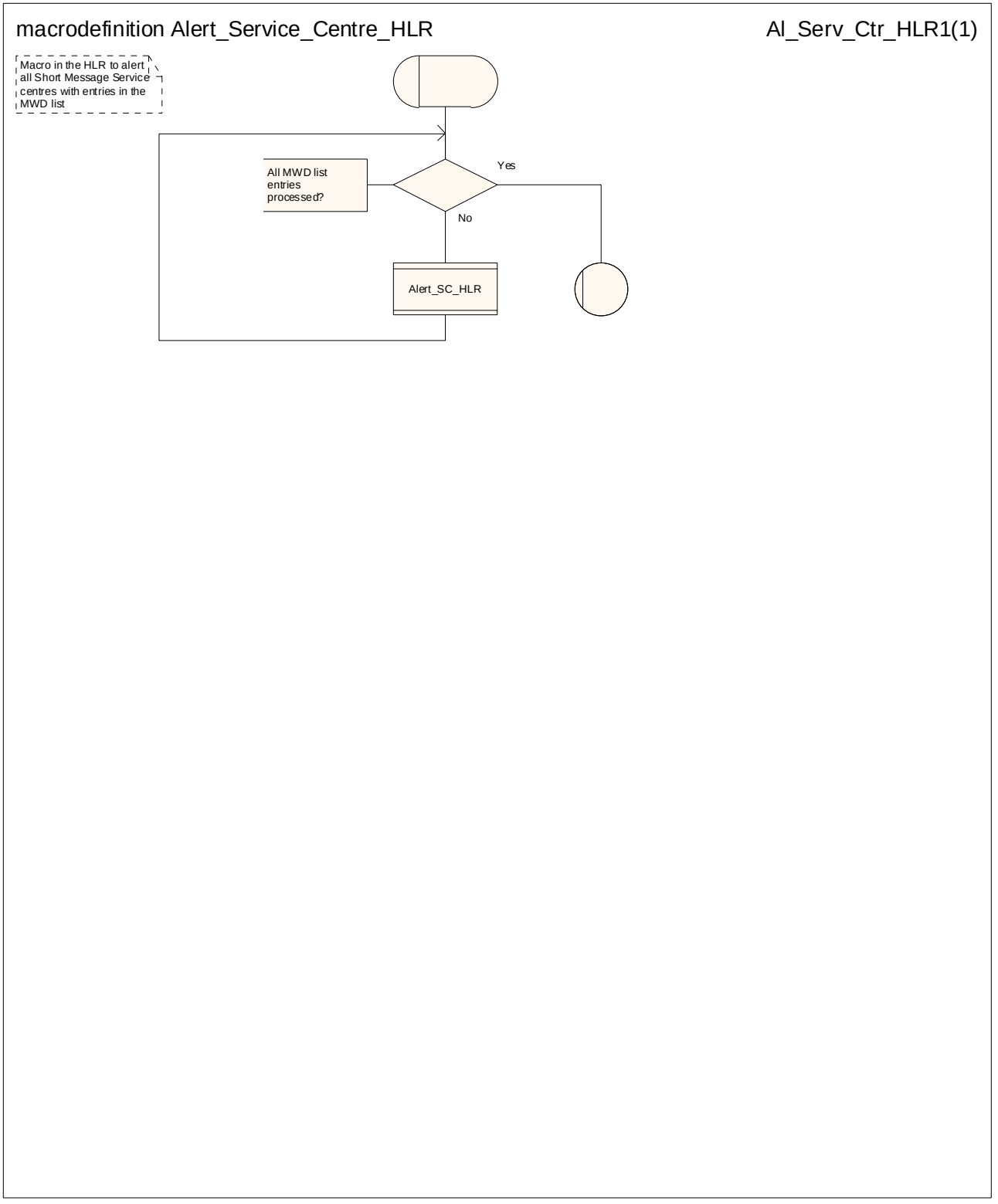
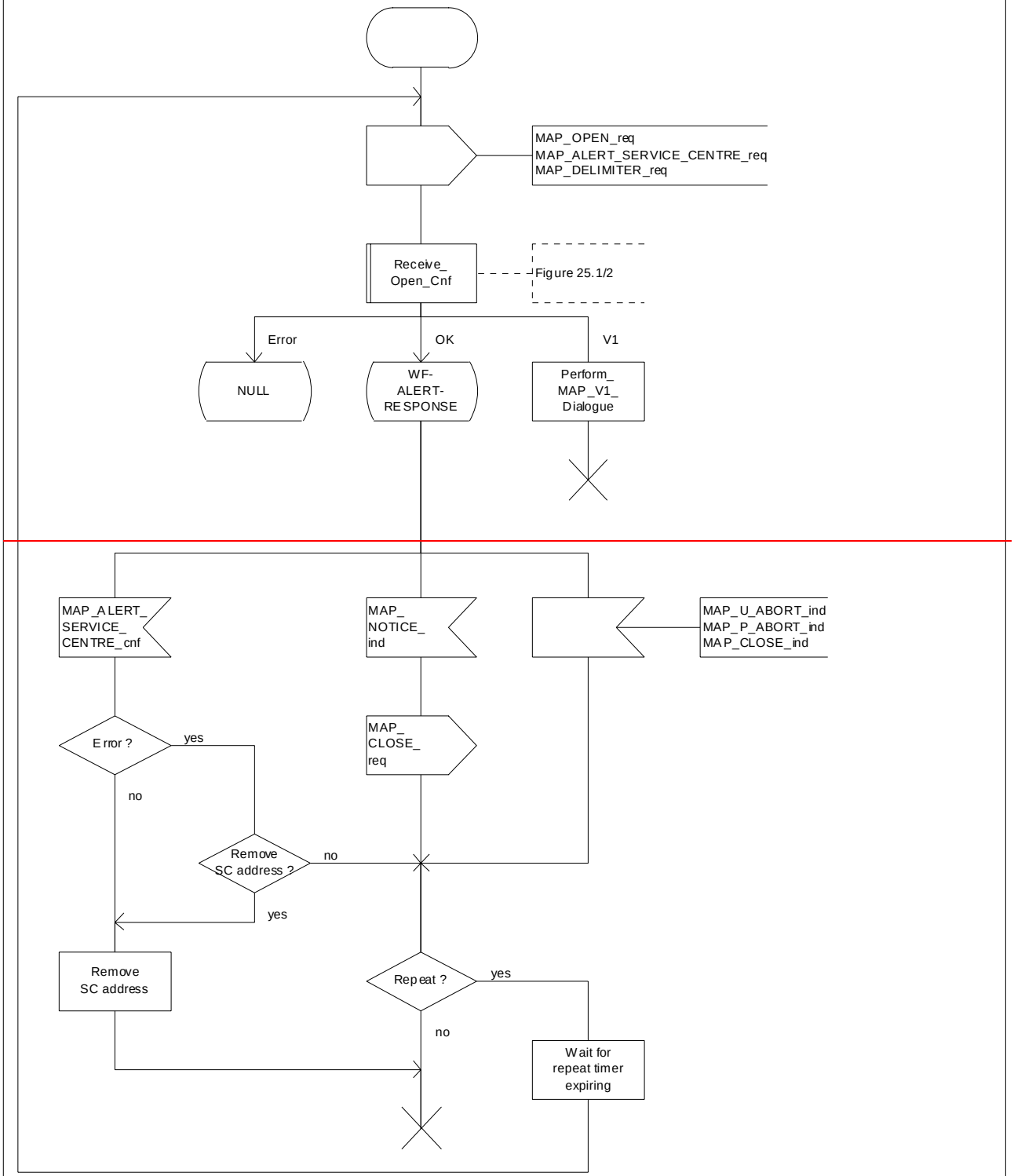


Figure 25.10/32: Macro Alert_Service_Centre_HLR

Process Alert_Service_Centre_HLR 22.10_3(1)

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



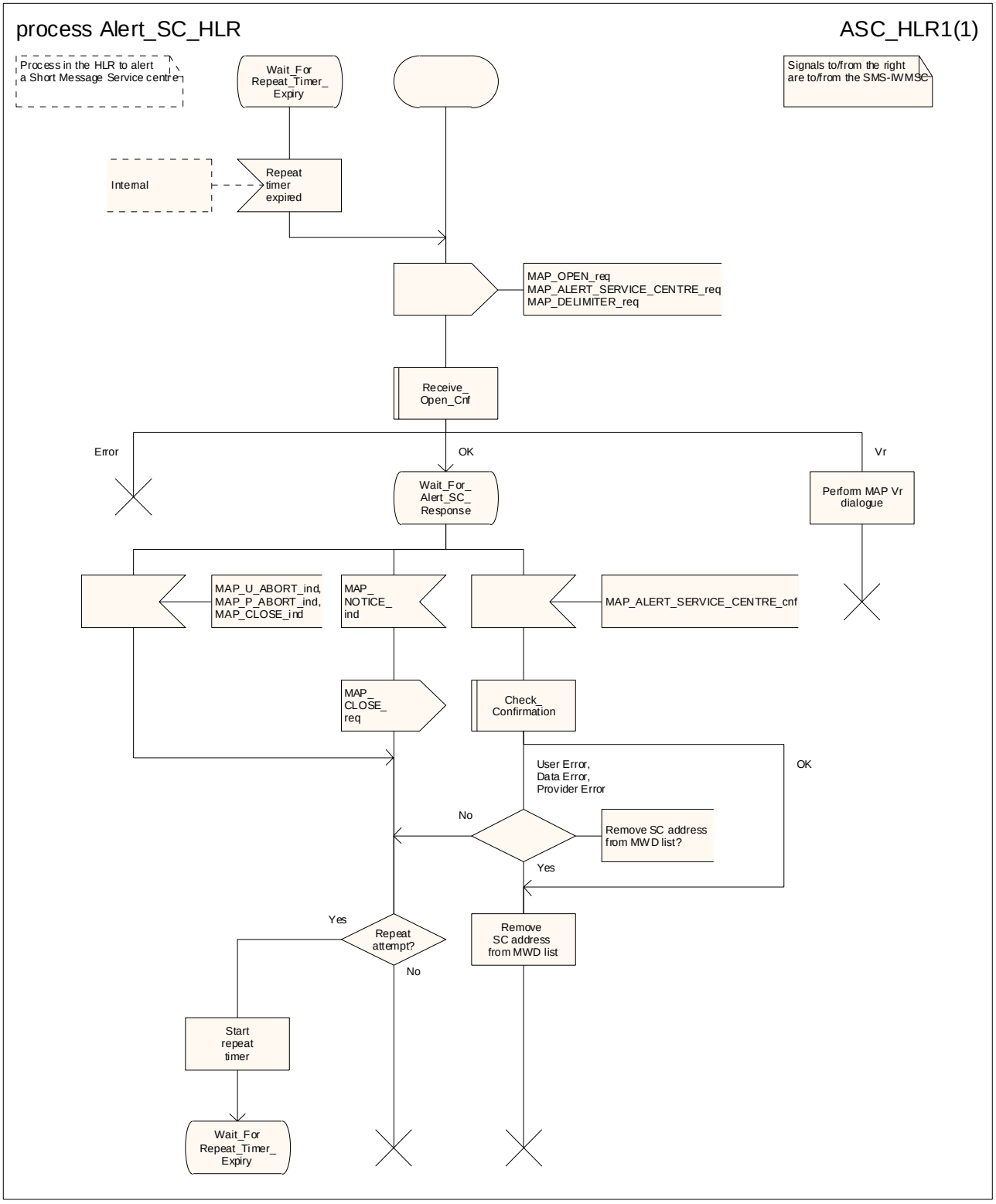


Figure 25.10/3: Process Alert_S~~ervice~~_C~~entre~~_HLR

~~25.10.3 The Mobile Subscriber is present~~

***** CR editor's note: (The reduced text of) this subclause is now 25.10.2. It is grouped with the text of the other subclauses of 25.10. *****

~~When receiving Page response, Attach request or Routing area update request messages (3GPP TS 24.008 [35]), while the MS not reachable for GPRS (MNRG) flag is set, the SGSN will send the MAP_READY_FOR_SM request towards the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS.~~

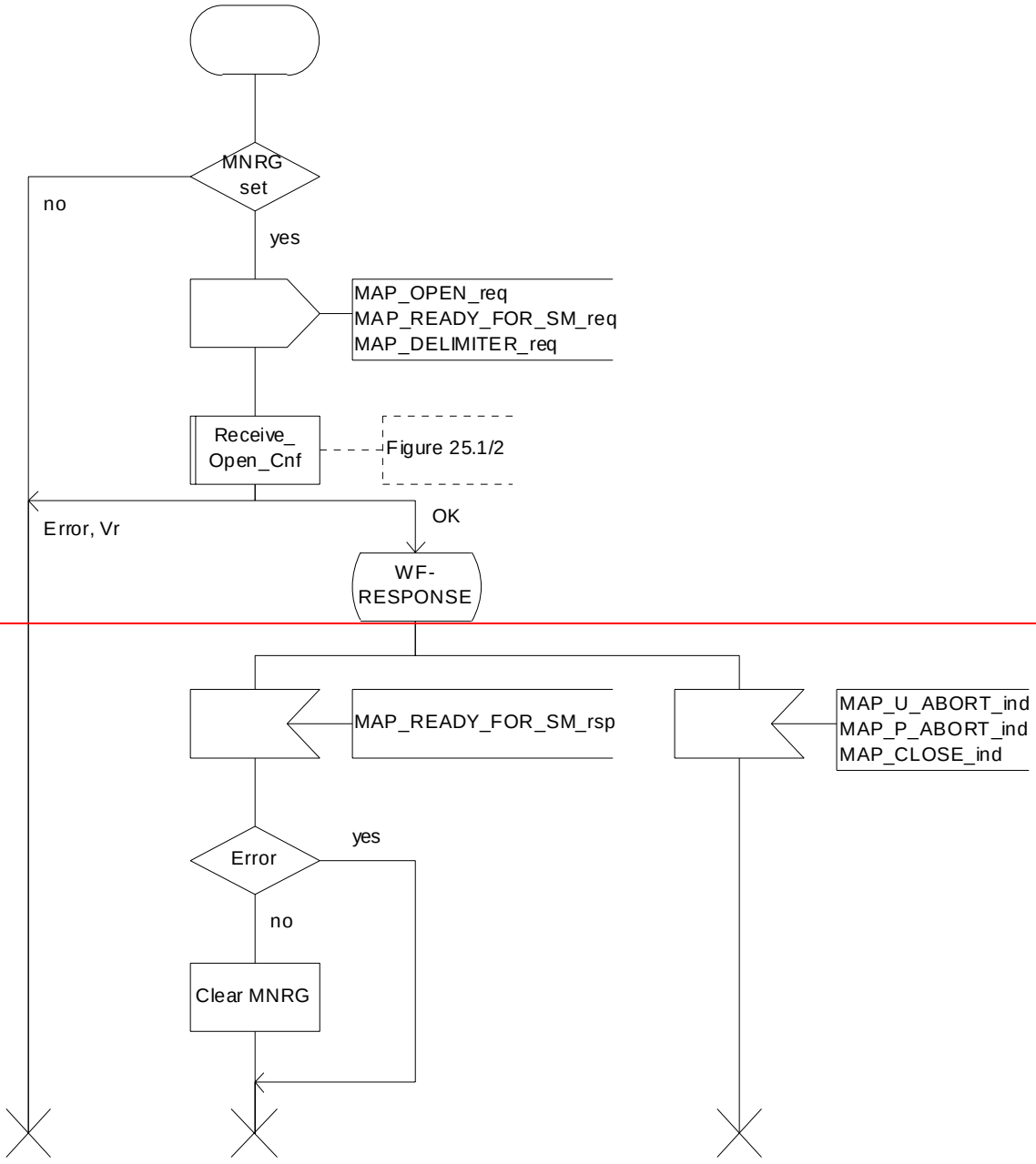
~~When receiving the answer, the SGSN will act as follows:~~

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

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

Process Subscriber_Present_SGSN 25.10_4(1)

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



~~Figure 25.10/4: Process Subscriber_Present_SGSN~~

***** End of document *****

3GPP TSG CN WG4 Meeting #19 **N4-030684**
San Diego, CA, USA, 19th – 23rd May 2003

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **635** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Removal of redundant text from 29.002 Chapter 23
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	22/05/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	When the CR to provide SDL source files and align the text with the SDL was being reviewed in CN4, the comment was made that most of the text replicates the information in the SDL diagrams. This means unnecessary bulk in the specification, and obscures the text which is **a useful supplement to** the information in the SDL diagrams. There are several references to 23.140 as the stage 2 specification for SMS. The correct specification number is 23.040.
Summary of change:	⌘	Remove the text which replicates the information in the SDL diagrams. Correct references to 23.140 to be references to 23.040.
Consequences if not approved:	⌘	Unnecessary bulk in the specification; useful information in the text is obscured by text which replicates the information in the SDL diagrams.

Clauses affected:	⌘	2; 7.6.1.4; 7.6.3.51; 7.6.8.9; 7.6.8.16; 7.6.8.17; 17.7.6; 17.7.7; 23			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	There is no change to the SDL diagrams; they are included to make it easier to review the changes in the text. The subclauses within 23.2, 23.4 & 23.5 have been re-ordered to be more logical: the procedure in the SGSN follows immediately after the procedures in the MSC & VLR in 23.2 & 23.4, and the procedure in the SMS-GMSC now precedes the procedure in the HLR in 23.5. The text in each of the first level subclauses (23.1, 23.2, 23.3, 23.4 & 23.5) is now grouped together before the SDL diagrams. This editorial rearrangement has not been revision marked; only the changes to subclause numbers and figure numbers are marked.			

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

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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TS 21.905: "3G Vocabulary".

[2] 3GPP TS 22.001: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a Public Land Mobile Network (PLMN)".

[3] 3GPP TS 22.002: "Bearer Services Supported by a Public Land Mobile Network (PLMN)".

[4] 3GPP TS 22.003: "Circuit Teleservices Supported by a Public Land Mobile Network (PLMN)".

[5] 3GPP TS 22.004: "General on Supplementary Services".

[6] 3GPP TS 42.009: "Digital cellular telecommunications system (Phase 2+); Security aspects".

[7] 3GPP TS 22.016: "International Mobile station Equipment Identities (IMEI)".

[8] 3GPP TS 22.041: "Operator Determined Barring".

[9] 3GPP TS 22.081: "Line identification supplementary services - Stage 1".

[10] 3GPP TS 22.082: "Call Forwarding (CF) supplementary services - Stage 1".

[11] 3GPP TS 22.083: "Call Waiting (CW) and Call Hold (HOLD) Supplementary Services - Stage 1".

[12] 3GPP TS 22.084: "Multi Party (MPTY) Supplementary Services - Stage 1".

[13] 3GPP TS 22.085: "Closed User Group (CUG) supplementary services - Stage 1".

[14] 3GPP TS 22.086: "Advice of charge (AoC) Supplementary Services - Stage 1".

[15] 3GPP TS 22.088: "Call Barring (CB) supplementary services - Stage 1".

[16] 3GPP TS 22.090: "Unstructured Supplementary Service Data (USSD); - Stage 1".

[17] 3GPP TS 23.003: "Numbering, addressing and identification".

[18] Void

[19] 3GPP TS 23.007: "Restoration procedures".

[20] 3GPP TS 23.008: "Organisation of subscriber data".

[21] 3GPP TS 23.009: "Handover procedures".

[22] 3GPP TS 23.011: "Technical realization of Supplementary Services - General Aspects".

[23] 3GPP TS 23.012: "Location registration procedures".

[24] 3GPP TS 43.020: "Security related network functions".

[25] 3GPP TS 23.038: "Alphabets and language".

[25a] 3GPP TS 23.039: " Interface protocols for the connection of Short Message Service Centres (SMSCs) to Short Message Entities (SMEs)".

[26] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS) Point to Point (PP)".

<Unchanged text omitted>

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

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 with detailed reasons as follows:
  - Shape of location estimate not supported;
  - Needed LCS capability not supported in serving node;
- incompatible terminal, i.e. the requested facility is not supported by the terminal.

b) Identification or numbering problem:

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

c) Subscription problem:

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

- illegal equipment, i.e. the IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

d) Handover problem:

- no handover number available, i.e. the VLR cannot allocate a number for handover or cannot allocate the required amount of numbers for relocation;
- subsequent handover failure, i.e. handover to a third MSC failed for some reason;
- target cell outside group call area.

e) Operation and maintenance problem:

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

f) Call set-up problem:

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

g) Supplementary services problem:

- call barred;
- illegal SS operation;
- SS error status;
- SS not available;
- SS subscription violation;
- SS incompatibility;
- negative password check;
- password registration failure;
- Number of Password Attempts;
- USSD Busy;

- Unknown Alphabet;
- short term denial;
- long term denial.

For definition of these errors see 3GPP TS 24.080 [38].

h) Short message problem:

- SM delivery failure with detailed reason as follows:
  - memory capacity exceeded;
  - MS protocol error;
  - MS not equipped;
  - unknown service centre (SC);
  - SC congestion;
  - invalid SME address;
  - subscriber is not an SC subscriber;
  - and possibly detailed diagnostic information, coded as specified in 3GPP TS 23.~~1~~0040, under SMS-SUBMIT-REPORT and SMS-DELIVERY-REPORT. If the SM entity that returns the SM Delivery Failure error includes detailed diagnostic information, it shall be forwarded in the MAP_MO_FORWARD_SHORT_MESSAGE and in the MAP_MT_FORWARD_SHORT_MESSAGE response.
- message waiting list full, i.e. no further SC address can be added to the message waiting list.
- Subscriber busy for MT SMS, i.e. the mobile terminated short message transfer cannot be completed because:
  - another mobile terminated short message transfer is going on and the delivery node does not support message buffering; or
  - another mobile terminated short message transfer is going on and it is not possible to buffer the message for later delivery; or
  - the message was buffered but it is not possible to deliver the message before the expiry of the buffering time defined in 3GPP TS 23.~~1~~0040;
- Absent Subscriber SM, i.e. the mobile terminated short message transfer cannot be completed because the network cannot contact the subscriber. Diagnostic information regarding the reason for the subscriber's absence may be included with this error.

i) Location services problem:

- Unauthorised Requesting Network
- Unauthorised LCS Client with detailed reasons as follows:
  - Unauthorised Privacy Class
  - Unauthorised Call/Session Unrelated External Client
  - Unauthorised Call/Session Related External Client
- Privacy override not applicable
- Position method failure with detailed reasons as follows:
  - Congestion

- Insufficient resources
- Insufficient Measurement Data
- Inconsistent Measurement Data
- Location procedure not completed
- QoS not attainable
- Position Method Not Available in Network
- Position Method Not Available in Location Area
- Unknown or unreachable LCS Client.

j) Problem detected by an application using secure transport:

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

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

7.6.3.51 Mobile Not Reachable Reason

This parameter stores the reason for the MS being absent when an attempt to deliver a short message to an MS fails at the MSC, SGSN or both. It is defined in 3GPP TS 23.~~1~~0040.

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

7.6.8.9 Absent Subscriber Diagnostic SM

This parameter is used to indicate the reason why the subscriber is absent. For the values for this parameter see 3GPP TS 23.~~1~~0040.

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

7.6.8.16 SM-RP-MTI

This parameter represents the RP-Message Type Indicator of the Short Message. It is used to distinguish a SM sent to the mobile station in order to acknowledge an MO-SM initiated by the mobile from a normal MT-SM. This parameter is formatted according to the formatting rules of address fields as described in 3GPP TS 23.~~1~~0040.

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

7.6.8.17 SM-RP-SMEA

This parameter represents the RP-Originating SME-address of the Short Message Entity that has originated the SM. This parameter is used by the short message service relay sub-layer protocol and is formatted according to the formatting rules of address fields as described in 3GPP TS 23.~~1~~0040.

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

17.7.6 Short message data types

```
MAP-SM-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SM-DataTypes (16) version8 (8)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoutingInfoForSM-Arg,
   RoutingInfoForSM-Res,
   MO-ForwardSM-Arg,
   MO-ForwardSM-Res,
   MT-ForwardSM-Arg,
   MT-ForwardSM-Res,
   ReportSM-DeliveryStatusArg,
   ReportSM-DeliveryStatusRes,
   AlertServiceCentreArg,
   InformServiceCentreArg,
   ReadyForSM-Arg,
   ReadyForSM-Res,
   SM-DeliveryOutcome,
   AlertReason,
   Additional-Number
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   SignalInfo,
   IMSI,
   LMSI
FROM MAP-CommonDataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version8 (8)}

   AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version8 (8)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version8 (8)}
;
```

```
RoutingInfoForSM-Arg ::= SEQUENCE {
     msisdn                              [0] ISDN-AddressString,
     sm-RP-PRI                           [1] BOOLEAN,
     serviceCentreAddress                [2] AddressString,
     extensionContainer                  [6] ExtensionContainer          OPTIONAL,
     ... ,
     gprsSupportIndicator                [7]  NULL                       OPTIONAL,
     -- gprsSupportIndicator is set only if the SMS-GMSC supports
     -- receiving of two numbers from the HLR
     sm-RP-MTI                           [8] SM-RP-MTI                   OPTIONAL,
     sm-RP-SMEA                          [9] SM-RP-SMEA                  OPTIONAL }
```

```
SM-RP-MTI ::= INTEGER (0..10)
     -- 0 SMS Deliver
     -- 1 SMS Status Report
     -- other values are reserved for future use and shall be discarded if
     -- received
```

```
SM-RP-SMEA ::= OCTET STRING (SIZE (1..12))
     -- this parameter contains an address field which is encoded
     -- as defined in 3GPP TS 23.~~1~~040. An address field contains 3 elements :
     --        address-length
     --        type-of-address
     --        address-value
```

. . .
<Unchanged ASN.1 omitted>
. . .

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

17.7.7 Error data types

```
MAP-ER-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version8 (8)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoamingNotAllowedParam,
   CallBarredParam,
   CUG-RejectParam,
   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   OR-NotAllowedParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   AbsentSubscriberDiagnosticSM,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam,
   UnauthorizedRequestingNetwork-Param,
   UnauthorizedLCSClient-Param,
   PositionMethodFailure-Param,
   UnknownOrUnreachableLCSClient-Param,
   MM-EventNotSupported-Param,
   SecureTransportErrorParam,
   ATSI-NotAllowedParam,
   ATM-NotAllowedParam,
   IllegalSS-OperationParam,
   SS-NotAvailableParam,
   SS-SubscriptionViolationParam,
```

```
   InformationNotAvailableParam,
   TargetCellOutsideGCA-Param



;

IMPORTS
   SS-Status
FROM MAP-SS-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version8 (8)}

   SignalInfo,
   BasicServiceCode,
   NetworkResource
FROM MAP-CommonDataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version8 (8)}

   SecurityHeader,
   ProtectedPayload
FROM MAP-ST-DataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ST-DataTypes (27) version8 (8)}


   SS-Code
FROM MAP-SS-Code {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version8 (8)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   itu-t identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version8 (8)}
;
```

```
RoamingNotAllowedParam ::= SEQUENCE {
     roamingNotAllowedCause              RoamingNotAllowedCause,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
RoamingNotAllowedCause ::= ENUMERATED {
     plmnRoamingNotAllowed  (0),
     operatorDeterminedBarring  (3)}
```

```
CallBarredParam ::= CHOICE {
     callBarringCause                    CallBarringCause,
     -- call BarringCause must not be used in version 3 and higher
     extensibleCallBarredParam           ExtensibleCallBarredParam
     -- extensibleCallBarredParam must not be used in version <3
     }
```

```
CallBarringCause ::= ENUMERATED {
     barringServiceActive  (0),
     operatorBarring  (1)}
```

```
ExtensibleCallBarredParam ::= SEQUENCE {
     callBarringCause                    CallBarringCause                OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ... ,
     unauthorisedMessageOriginator       [1] NULL                        OPTIONAL }
```

```
CUG-RejectParam ::= SEQUENCE {
     cug-RejectCause                     CUG-RejectCause                 OPTIONAL,
     extensionContainer                  ExtensionContainer              OPTIONAL,
     ...}
```

```
CUG-RejectCause ::= ENUMERATED {
     incomingCallsBarredWithinCUG  (0),
     subscriberNotMemberOfCUG  (1),
     requestedBasicServiceViolatesCUG-Constraints  (5),
     calledPartySS-InteractionViolation  (7)}
```

```
SS-IncompatibilityCause ::= SEQUENCE {
     ss-Code                              [1] SS-Code                          OPTIONAL,
     basicService                         BasicServiceCode                     OPTIONAL,
     ss-Status                            [4] SS-Status                        OPTIONAL,
     ...}
```

```
PW-RegistrationFailureCause ::= ENUMERATED {
     undetermined  (0),
     invalidFormat  (1),
     newPasswordsMismatch  (2)}
```

```
SM-EnumeratedDeliveryFailureCause ::= ENUMERATED {
     memoryCapacityExceeded  (0),
     equipmentProtocolError  (1),
     equipmentNotSM-Equipped  (2),
     unknownServiceCentre  (3),
     sc-Congestion  (4),
     invalidSME-Address  (5),
     subscriberNotSC-Subscriber  (6)}
```

```
SM-DeliveryFailureCause ::= SEQUENCE {
     sm-EnumeratedDeliveryFailureCause    SM-EnumeratedDeliveryFailureCause,
     diagnosticInfo                       SignalInfo                           OPTIONAL,
     extensionContainer                   ExtensionContainer                   OPTIONAL,
     ...}
```

```
AbsentSubscriberSM-Param ::= SEQUENCE {
     absentSubscriberDiagnosticSM         AbsentSubscriberDiagnosticSM      OPTIONAL,
     -- AbsentSubscriberDiagnosticSM can be either for non-GPRS
     -- or for GPRS
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...,
     additionalAbsentSubscriberDiagnosticSM    [0]  AbsentSubscriberDiagnosticSM OPTIONAL }
     -- if received, additionalAbsentSubscriberDiagnosticSM
     -- is for GPRS and absentSubscriberDiagnosticSM is
     -- for non-GPRS
```

```
AbsentSubscriberDiagnosticSM ::= INTEGER (0..255)
     -- AbsentSubscriberDiagnosticSM values are defined in ETS 300 536 (3GPP TS 23.1040)
```

. . .
<Unchanged ASN.1 omitted>
. . .

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

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 delivery status report ~~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-ordinating process is needed 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: the A_CM_SERV_REQ message is not used for SMS over GPRS. The modelling is based on the assumption that the SGSN will trigger the appropriate process, according to whether an RP_MO_DATA or an RP_SM_MEMORY_AVAILABLE is received over the LLC layer.

23.1.1 Mobile originated short message service Co-ordinator for the MSC

The process starts ~~W~~when the MSC receives an A_CM_SERV_REQ message (see 3GPP TS 24.008 [35]), with a CM service type indicating short message service, from the A-interface. ~~, it invokes the macro Process_Access_Request_MSC to request the establisment of the CM connection.~~ The process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Process_Access_Request_MSC see subclause 25.4.1.

If the macro Process_Access_Request_MSC takes the "OK" exit (which means that the MSC has sent an A_CM_SERVICE_ACCEPT to the MS),, the MS initiates mobile originated short message transfer or sends an indication that it has memory available for more short messages. ~~The MSC creates an instance of the appropriate process as follows:~~

~~- if the MSC receives an A_RP_MO_DATA indication, it creates an instance of the process MO_SM_MSC (see subclause 23.2.1);~~

~~- if the MSC receives an A_RP_SM_MEMORY_AVAILABLE indication, it creates an instance of the process SC_Alert_MSC (see subclause 23.4.1).~~

~~After it has created the instance of the user process, the Co-ordinator relays the messages between the A-interface and the child process and between the VLR and the child process until the dialogue is terminated.~~

The SMS Co-ordinator process in the MSC is shown in figure 23.1/1.

23.1.2 Short message Gateway Co-ordinator for the HLR

The process ~~is~~ start~~s~~~~ed~~ when the HLR receives a MAP_OPEN indication using the application context shortMessageGatewayContext. ~~If the dialogue opening is successful, the Co-ordinator can receive the first service primitive from the MAP Protocol Machine. The HLR creates an instance of the appropriate process~~ The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

~~- if the HLR receives a MAP_SEND_ROUTING_INFO_FOR_SM indication, it creates an instance of the process Mobile_Terminated_SM_HLR;~~

~~- if the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it creates an instance of the process Report_SM_delivery_stat_HLR.~~

~~After it has created the instance of the user process, the Co-ordinator relays the messages between the MAP Protocol Machine and the child process until the dialogue is terminated.~~

The SM Gateway Co-ordinator process in the HLR is shown in figure 23.1/2.

If the Receive_Open_Ind macro takes the Vr exit then HLR shall perform the MAP dialogue as specified for the appropriate application context version. Depending on the subscriber data, handling at the MAP user application level may be performed as specified in subclauses 23.3.2 and 23.5.2~~1~~ of the present document:

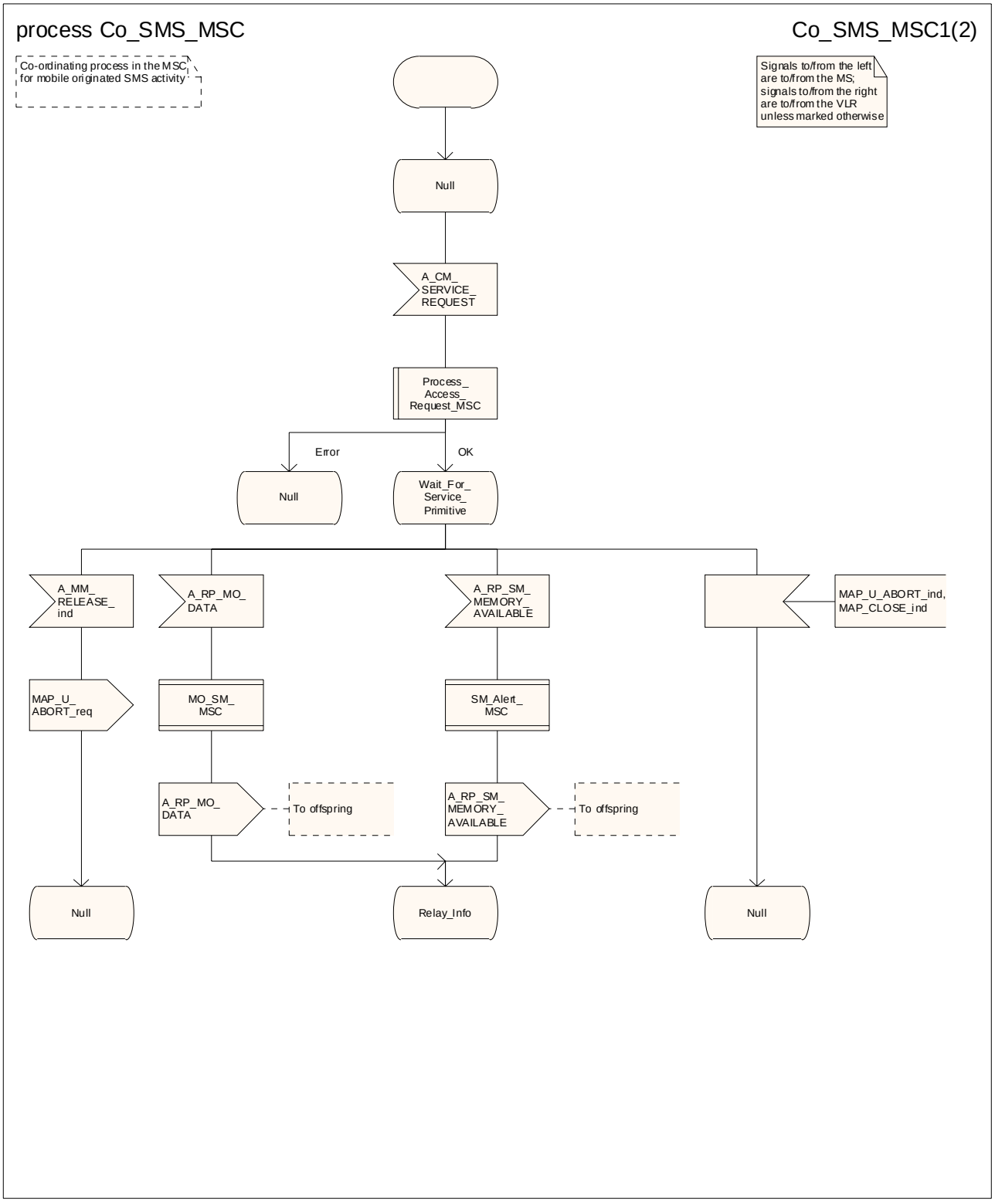


Figure 23.1/1 (sheet 1 of 2): Process Co_SMS_MSC

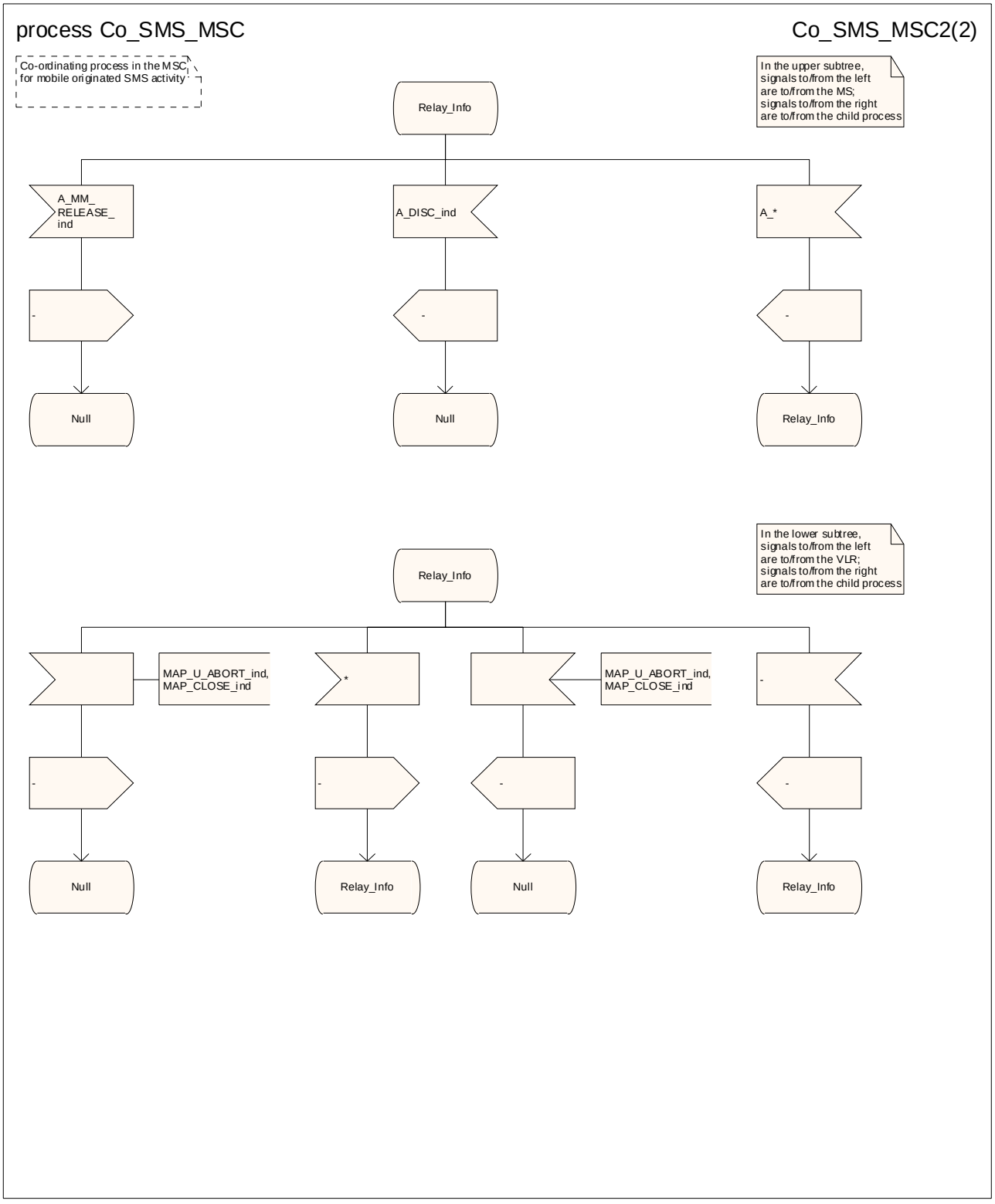


Figure 23.1/1 (sheet 2 of 2): Process Co_SMS_MSC

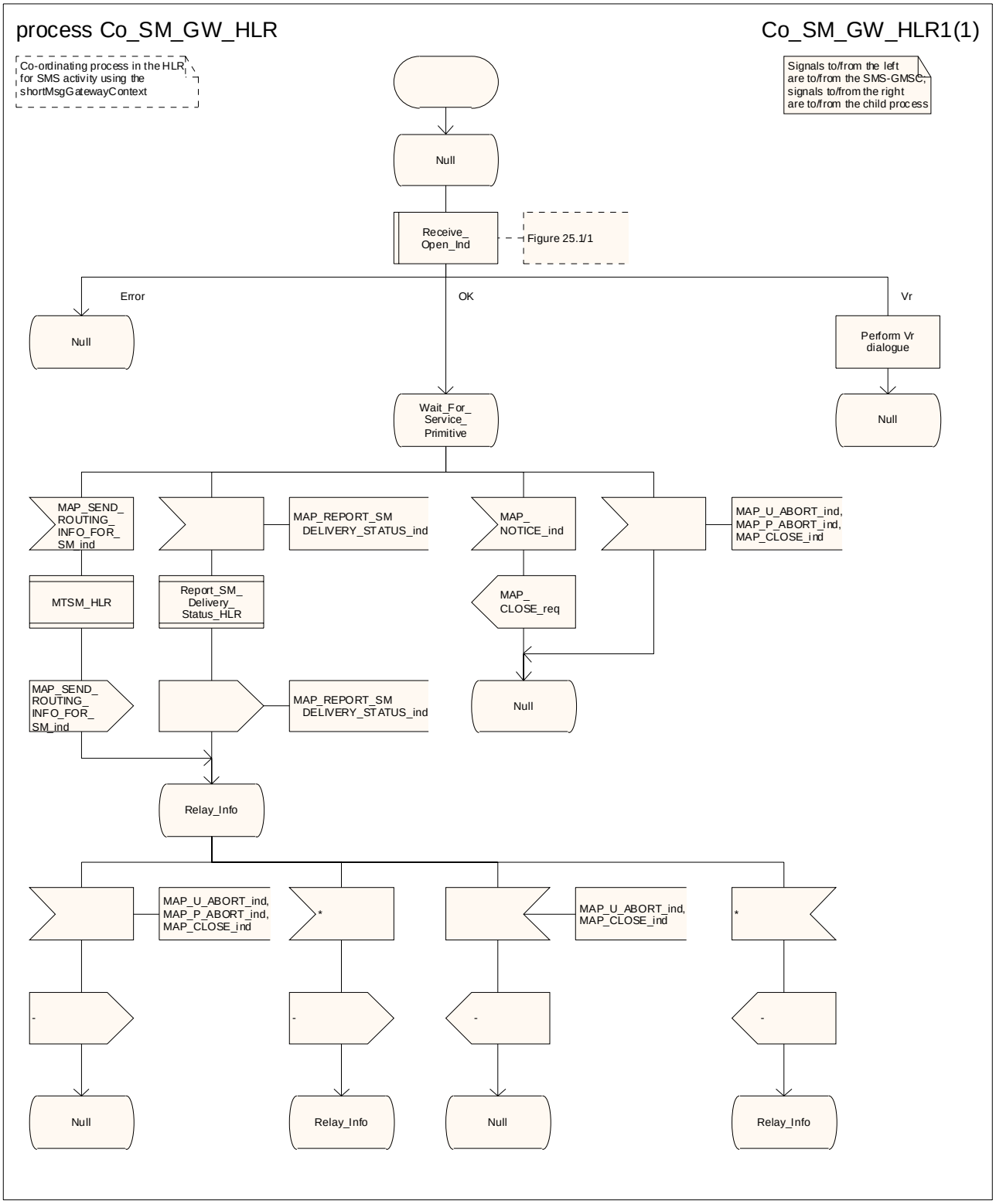
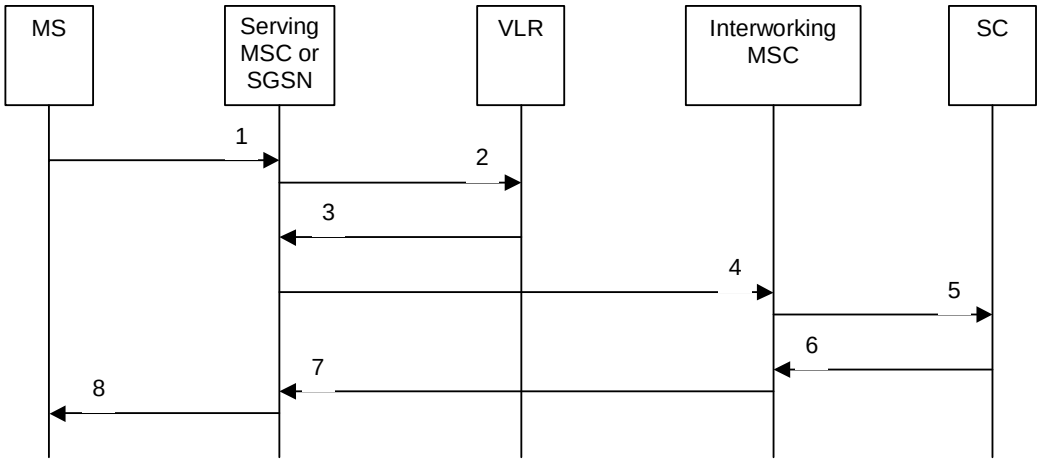


Figure 23.1/2: Process Co_SM_Gateway_HLR

23.2 The mobile originated short message transfer procedure

The mobile originated short message service procedure is used to forward a short message from a mobile subscriber to a Service Centre. The message flow for the mobile originated short message service procedure is shown in figure 23.2/1.



1) Short Message (3GPP TS 24.011 [37]).
2) MAP_SEND_INFO_FOR_MO_SMS (*).
3) MAP_SEND_INFO_FOR_MO_SMS_ACK (*).
4) MAP_MO_FORWARD_SHORT_MESSAGE.
5) Short message (3GPP TS 23.040).
6) Short message Acknowledgement (3GPP TS 23.040).
7) MAP_MO_FORWARD_SHORT_MESSAGE_ACK.
8) Short Message Acknowledgement (3GPP TS 24.011 [37]).
(*) Messages 2) and 3) are not used by the 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).

(*) These services ~~messages~~ are not used by the SGSN.

23.2.1 Procedure in the serving MSC

Any CAMEL-specific handling defined in this subclause is omitted if the MSC does not support CAMEL control of MO SMS, or if the subscriber does not have a subscription for CAMEL control of MO SMS.

The process starts when the MSC receives a short message from the MS. The process invokes macros not defined in this clause; the definition 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.

Sheet 1: If the MSC is integrated with the SMS-IWMSC, it communicates directly with the Short Message Service Centre (SMSC) using one of the protocols described in 3GPP TS 23.039 [25a]; otherwise it communicates with the SMS-IWMSC using MAP.

Sheet 3: If the capacity of a message signal unit in the lower layers of the protocol is enough to carry the content of the MAP_OPEN request and the content of the MAP_MO_FORWARD_SHORT_MESSAGE request in a single TC message, the test "Message segmentation needed" takes the "No" exit; otherwise the test takes the "Yes" exit.

~~When the MSC receives the short message from the A-interface, it sends a MAP_SEND_INFO_FOR_MO_SMS request to the VLR and waits for a response. While the MSC is waiting for the response from the VLR:~~

- ~~if the VLR aborts or prematurely closes the dialogue, the MSC reports to the gsmSCF that the short message submission has failed and sends an A_RP_ERROR with error cause "Network out of order" to the MS, and the process terminates;~~
- ~~if it receives a MAP_CONTINUE_CAMEL_SMS_HANDLING indication, it checks the indication.~~
  - ~~if the indication is badly formed, the MSC sends an A_RP_ERROR with error cause "Network out of order" to the MS and aborts the dialogue with the VLR, and the process terminates;~~
  - ~~if the indication is OK, the MSC calls the procedure CAMEL_O_SMS_INIT and tests the result.~~
    - ~~if the result was "SMS_Aborted", the MSC aborts the dialogue with the VLR, and the process terminates;~~
    - ~~if the result was "Release_SMS", the MSC returns an A_RP_ERROR with an error cause as instructed by the gsmSCF to the MS and aborts the dialogue with the VLR, and the process terminates;~~
    - ~~if the result was "Redirect SMS", the MSC modifies the data for the submitted short message as instructed by the gsmSCF, sends to the VLR a MAP_SEND_INFO_FOR_MO_SMS request and waits for a response;~~
    - ~~if the result was "Continue", the MSC sends to the VLR a MAP_SEND_INFO_FOR_MO_SMS request and waits for a response. The handling for this request is shown in the procedure CAMEL_MO_SMS_VLR (see 3GPP TS 23.078 [98]).~~
- ~~if itreceives a MAP_SEND_INFO_FOR_MO_SMS confirmation from the VLR, it checks the confirmation.~~
  - ~~if the confirmation includes an error, the MSC reports to the gsmSCF that the short message submission has failed and sends an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;~~
  - ~~if the confirmation indicates a successful result, the MSC checks whether the MSC is also the SMS-IWMSC.~~
    - ~~if the MSC is separate from the SMS-IWMSC, MSC handling continues as described below under the heading "Serving MSC is separate from SMS-IWMSC".~~
    - ~~if the MSC is also the SMS-IWMSC, the MSC handling continues as described below under the heading "Serving MSC is SMS-IWMSC";~~

~~Serving MSC is separate from SMS-IWMSC~~

~~The MSC checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.~~

- ~~if the two requests can be grouped in a single TC message, the MSC requests a dialogue with the SMS-IWMSC, including the MAP_MO_FORWARD_SHORT_MESSAGE request;~~
  - ~~if the dialogue opening is successful, the MSC waits for the response from the SMS-IWMSC;~~
  - ~~if the macro Receive_Open_Cnf takes the "Error" exit, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process terminates;~~

- if the macro Receive_Open_Cnf takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol and checks the process result.

  - if the submission was successful, the MSC reports to the gsmSCF that the short message submission was successful and returns an A_RP_ACK to the MS, and the process terminates;

  - if the submission failed, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates.

- if the two requests cannot be grouped in a single TC message, the MSC requests a dialogue with the SMS-IWMSC, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;

  - if the dialogue opening is successful, the MSC sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the SMS-IWMSC, and waits for the response from the SMS-IWMSC;

  - if the macro Receive_Open_Cnf takes the "Error" exit, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process terminates;

  - if the macro Receive_Open_Cnf takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol, and checks the result.

    - if the submission was successful, the MSC reports to the gsmSCF that the short message submission was successful and returns an A_RP_ACK to the MS, and the process terminates;

    - if the submission failed, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates.

- if the MSC receives a MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the SMS-IWMSC, it checks the content of the confirmation;

  - if the confirmation indicates that the submission of the short message was successful, the MSC reports to the gsmSCF that the short message submission was successful and returns an A_RP_ACK to the MS, and the process terminates;

  - if the confirmation indicates that the submission of the short message failed, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;

- if the dialogue with the SMS-IWMSC fails, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process terminates.

Serving MSC is SMS-IWMSC

The MSC sends an SC_RP_MO_DATA request to the Short Message Service Centre (SMSC), and waits for the response.

- if the MSC receives an error response from the SMSC, it reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;

- if the SMSC aborts the dialogue, the MSC reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process terminates;

- if the MSC receives a positive response from the SMSC, it reports to the gsmSCF that the short message submission was successful and returns an A_RP_ACK to the MS, and the process terminates.

The mobile originated short message service process in the MSC is shown in figure 23.2/2.

23.2.2 Procedure in the VLR

Any CAMEL-specific handling defined in this subclause is omitted if the VLR does not support CAMEL control of MO SMS.

The process starts when the VLR receives ~~is triggered by~~ a dialogue opening request followed by a MAP_PROCESS_ACCESS_REQUEST including a CM service type Short Message Service. The process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1;

Process_Access_Request_VLR see subclause 25.4.2.

~~If the macro Process_Access_Request_VLR takes the "OK" exit, the VLR waits for a MAP_SEND_INFO_FOR_MO_SMS indication from the MSC.~~

- ~~If the MSC aborts the dialogue, the process returns to the Null state;~~
- ~~if the indication is badly formed, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the appropriate user error;~~
- ~~if the indication is OK, the VLR checks whether the submission of the short message is allowed.~~
  - ~~if MO-SMS is not provisioned, VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Teleservice not provisioned";~~
  - ~~if the submission of the short message is prevented by Operator Determined Barring of all outgoing calls, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Operator barring";~~
  - ~~if the submission of the short message is prevented by supplementary service barring of all outgoing calls, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Barring service active";~~
  - ~~the VLR calls the procedure CAMEL_MO_SMS_VLR and checks the result.~~
    - ~~if the result is "Fail", the process returns to the Null state;~~
    - ~~if the result is "Pass", the VLR continues to check the subscription information.~~
  - ~~if the submission of the short message is prevented by Operator Determined Barring (other than barring of all outgoing calls), the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Operator barring";~~
  - ~~if the submission of the short message is prevented by supplementary service barring (other than barring of all outgoing calls), the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the user error "Call barred" with barring cause "Barring service active";~~
  - ~~if the submission of the short message is allowed, the VLR returns a MAP_SEND_INFO_FOR_MO_SMS response containing the MSISDN of the requesting subscriber.~~

~~When the VLR has returned the MAP_SEND_INFO_FOR_MO_SMS response, the process returns to the Null state.~~

The mobile originated short message transfer process in the VLR is shown in figure 23.2/3.

23.2.34 Procedure in the SGSN

Any CAMEL-specific handling defined in this subclause is omitted if the SGSN does not support CAMEL control of MO SMS, or if the subscriber does not have a subscription for CAMEL control of MO SMS.

The process starts when the SGSN receives ~~is triggered by~~ a short message received from the MS over the Gb interface. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

Sheet 2: If the capacity of a message signal unit in the lower layers of the protocol is enough to carry the content of the MAP_OPEN request and the content of the MAP_MO_FORWARD_SHORT_MESSAGE request in a single TC message, the test "Message segmentation needed" takes the "No" exit; otherwise the test takes the "Yes" exit.

~~If the MO SMS service is not provisioned, the SGSN returns a Gb_RP_ERROR with error cause "Requested facility not subscribed", and the process returns to the Null state.~~

~~If the MO SMS service is provisioned, the SGSN checks whether Operator Determined Barring of all outgoing calls is in force.~~

- ~~if Operator Determined Barring would prevent the submission of the short message, the SGSN returns a Gb_RP_ERROR with error cause "Operator determined barring" to the MS, and the process returns to the Null state;~~
- ~~if Operator Determined Barring would not prevent the submission of the short message, the SGSN handling continues.~~

~~The SGSN calls the procedure CAMEL_O_SMS_INIT and tests the result.~~

- ~~if the result was "SMS_Aborted", the process returns to the Null state;~~
- ~~if the result was "Release_SMS", the SGSN returns a Gb_RP_ERROR with an error cause as instructed by the gsmSCF to the MS, and the process returns to the Null state;~~
- ~~if the result was "Redirect SMS", the SGSN modifies the data for the submitted short message as instructed by the gsmSCF, and the MSC handling continues;~~
- ~~if the result was "Continue", the SGSN handling continues.~~

~~The SGSN checks whether Operator Determined Barring of outgoing calls (other than barring of all outgoing calls) would prevent the submission of the short message.~~

- ~~if Operator Determined Barring would prevent the submission of the short message, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with error cause "Operator determined barring" to the MS, and the process returns to the Null state;~~
- ~~if Operator Determined Barring would not prevent the submission of the short message, the SGSN handling continues.~~

~~The SGSN checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.~~

- ~~if the two requests can be grouped in a single TC message, the SGSN requests a dialogue with the SMS-IWMSC, including the MAP_MO_FORWARD_SHORT_MESSAGE request;~~
  - ~~if the dialogue opening is successful, the SGSN waits for the response from the SMS-IWMSC;~~
  - ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with cause "Network out of order" to the MS, and the process returns to the Null state.~~
  - ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and checks the result.~~

- if the submission was successful, the SGSN reports to the gsmSCF that the short message submission was successful and returns a Gb_RP_ACK to the MS, and the process returns to the Null state;

- if the submission failed, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with the appropriate error cause to the MS, and the process returns to the Null state.

- if the two requests cannot be grouped in a single TC message, the SGSN requests a dialogue with the SMS-IWMSC, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;

- if the dialogue opening is successful, the SGSN sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the SMS-IWMSC, and waits for the response from the SMS-IWMSC;

- if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with cause "Network out of order" to the MS, and the process returns to the Null state.

- if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and checks the result.

- if the submission was successful, the SGSN reports to the gsmSCF that the short message submission was successful and returns a Gb_RP_ACK to the MS, and the process returns to the Null state;

- if the submission failed, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with the appropriate error cause to the MS, and the process returns to the Null state.

- if the SGSN receives a MAP_MO_FORWARD_SHORT_MESSAGE confirmation from the SMS-IWMSC, it checks the content of the confirmation;

- if the confirmation indicates that the submission of the short message was successful, the SGSN reports to the gsmSCF that the short message submission was successful and returns a Gb_RP_ACK to the MS, and the process returns to the Null state;

- if the confirmation indicates that the submission of the short message failed, the SGSN reports to the gsmSCF that the short message submission has failed and returns a Gb_RP_ERROR with the appropriate error cause to the MS, and the process returns to the Null state;

- if the dialogue with the SMS-IWMSC fails, the SGSN reports to the gsmSCF that the short message submission has failed and returns an A_RP_ERROR with cause "Network out of order" to the MS, and the process returns to the Null state.

The mobile originated short message service process in the SGSN is shown in figure 23.2/45.

23.2.43 Procedure in the SMS Interworking MSC (SMS-IWMSC)

This procedure applies only when the SMS-IWMSC is not integrated with the serving MSC or SGSN.

The process starts when the SMS-IWMSC receives is triggered by a dialogue opening request with the application context shortMsgMO-RelayContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check_Indication	see subclause 25.2.1.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "Vr" exit, the SMS-IWMSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "OK" exit, the SMS-IWMSC waits for a service primitive.

- if the dialogue with the MSC fails, the process returns to the Null state;

- if the next primitive received is a MAP_DELIMITER indication, the SMS-IWMSC returns a MAP_DELIMITER request, and waits for a service primitive;

- if the next primitive received is a MAP_MO_FORWARD_SHORT_MESSAGE indication, the SMS-IWMSC checks the indication.

  - if the indication is badly formed, the SMS-IWMSC returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the appropriate user error and the process returns to the Null state;

  - if the indication is OK, the SMS-IWMSC checks whether the service centre is known.

    - if the service centre is not known, the SMS-IWMSC returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the user error "SM delivery failure" with delivery failure cause "Unknown service centre" and the process returns to the Null state;

    - if the service centre is known, the SMS-IWMSC sends an SC_RP_MO_DATA request to the service centre, and waits for the response.

      - if the MAP dialogue with the serving MSC fails, the SMS-IWMSC sends an SC_ABORT request to the service centre and the process returns to the Null state;

      - if the SMS-IWMSC receives an error response from the service centre, it returns a MAP_MO_FORWARD_SHORT_MESSAGE response containing the user error "SM delivery failure" with delivery failure cause set according to the error response received from the service centre, and the process returns to the Null state;

      - if the SMS-IWMSC receives a positive acknowledgement from the service centre, it returns a MAP_MO_FORWARD_SHORT_MESSAGE response and the process returns to the Null state.

The mobile originated short message service transfer process in the SMS-IWMSC is shown in figure 23.2/54.

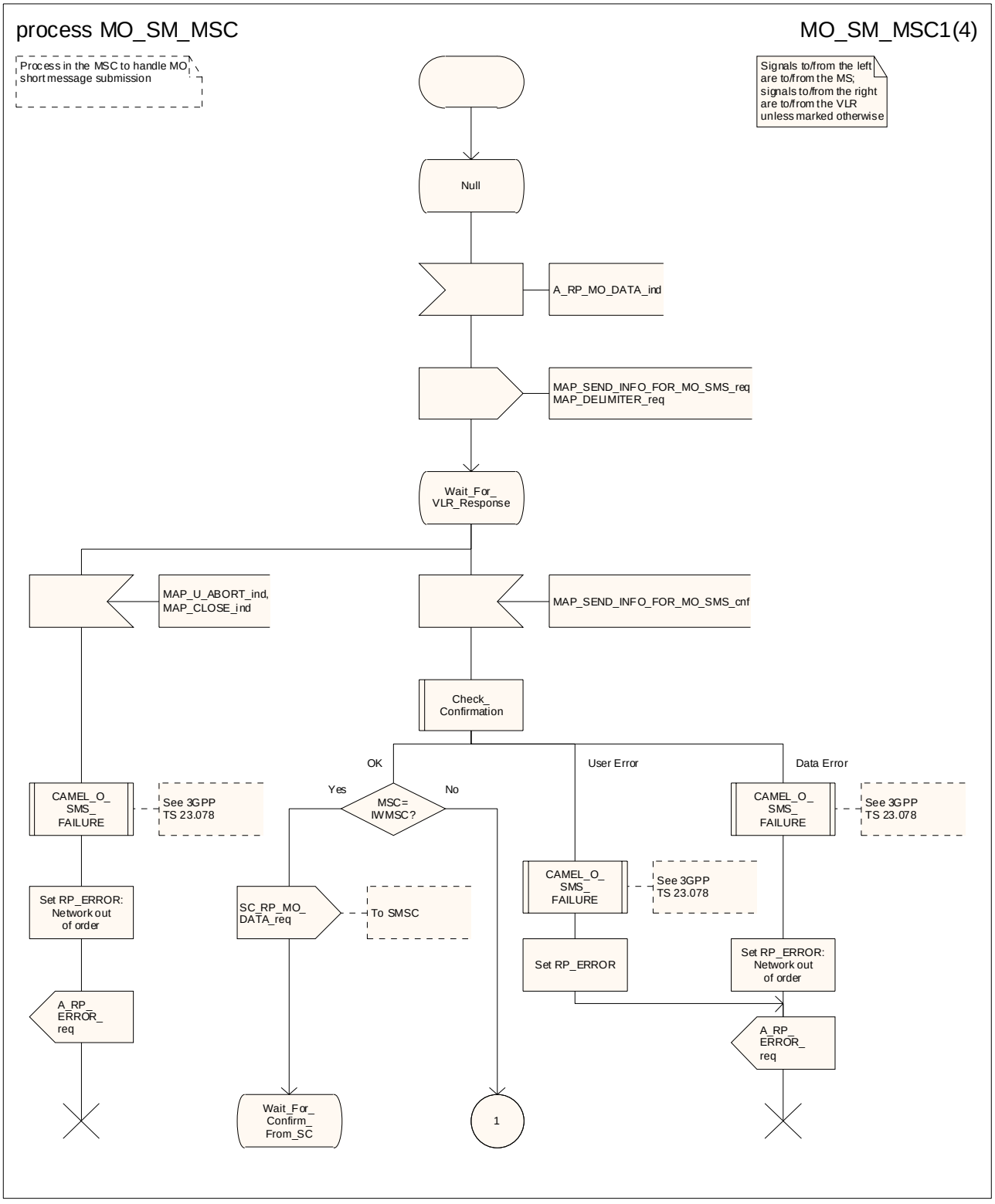


Figure 23.2/2 (sheet 1 of 4): Process MO_SM_MSC

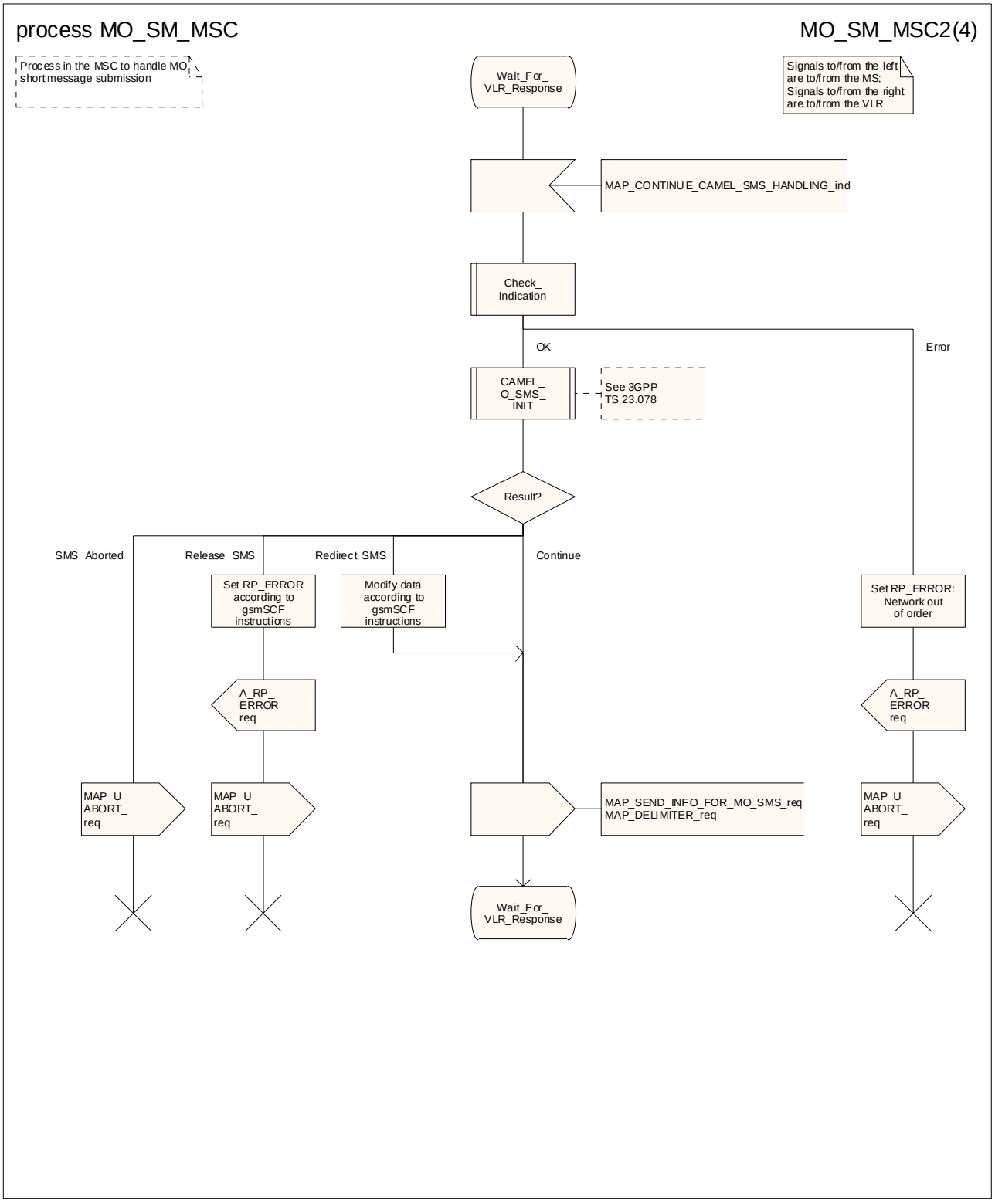


Figure 23.2/2 (sheet 2 of 4): Process MO_SM_MSC

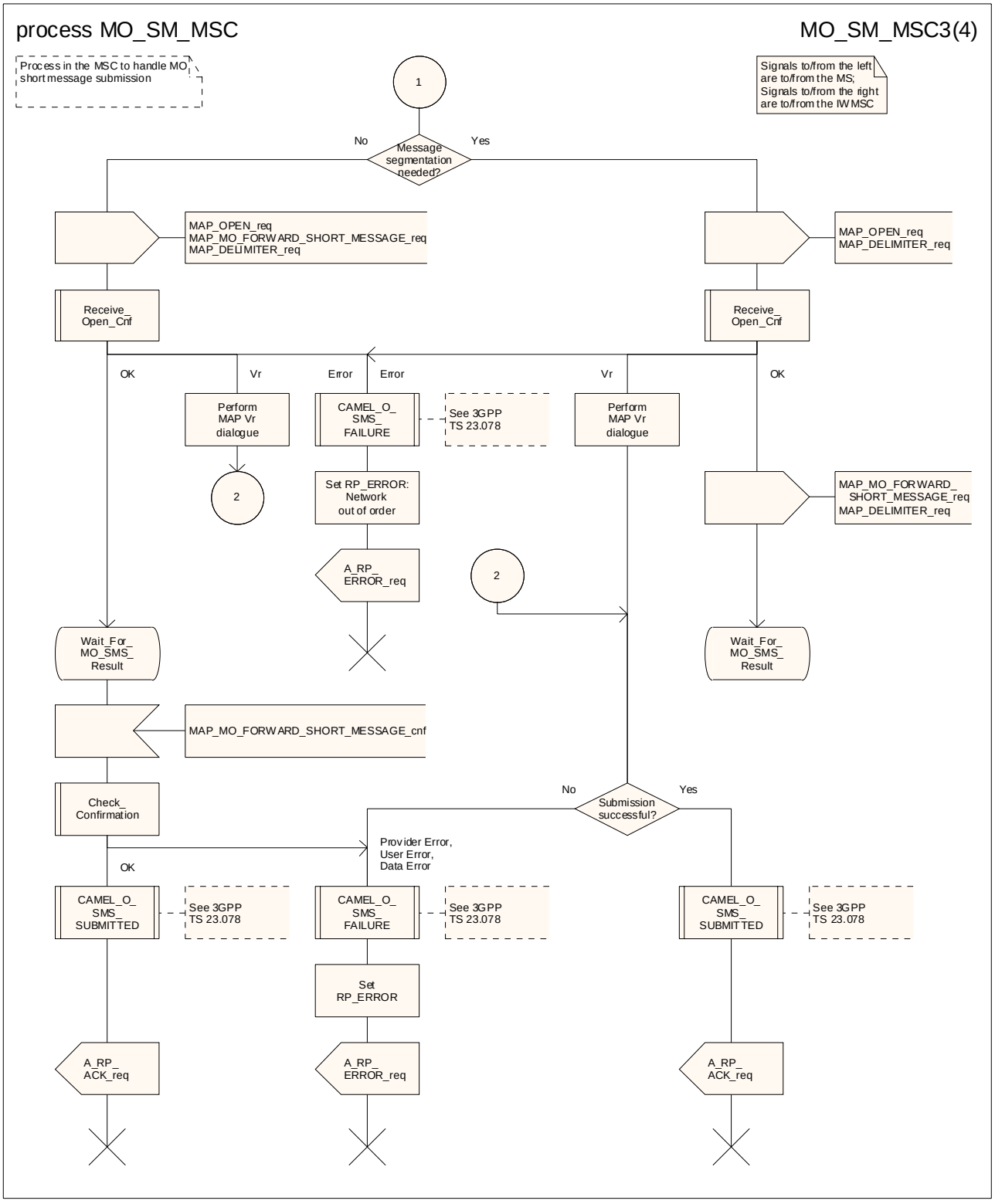


Figure 23.2/2 (sheet 3 of 4): Process MO_SM_MSC

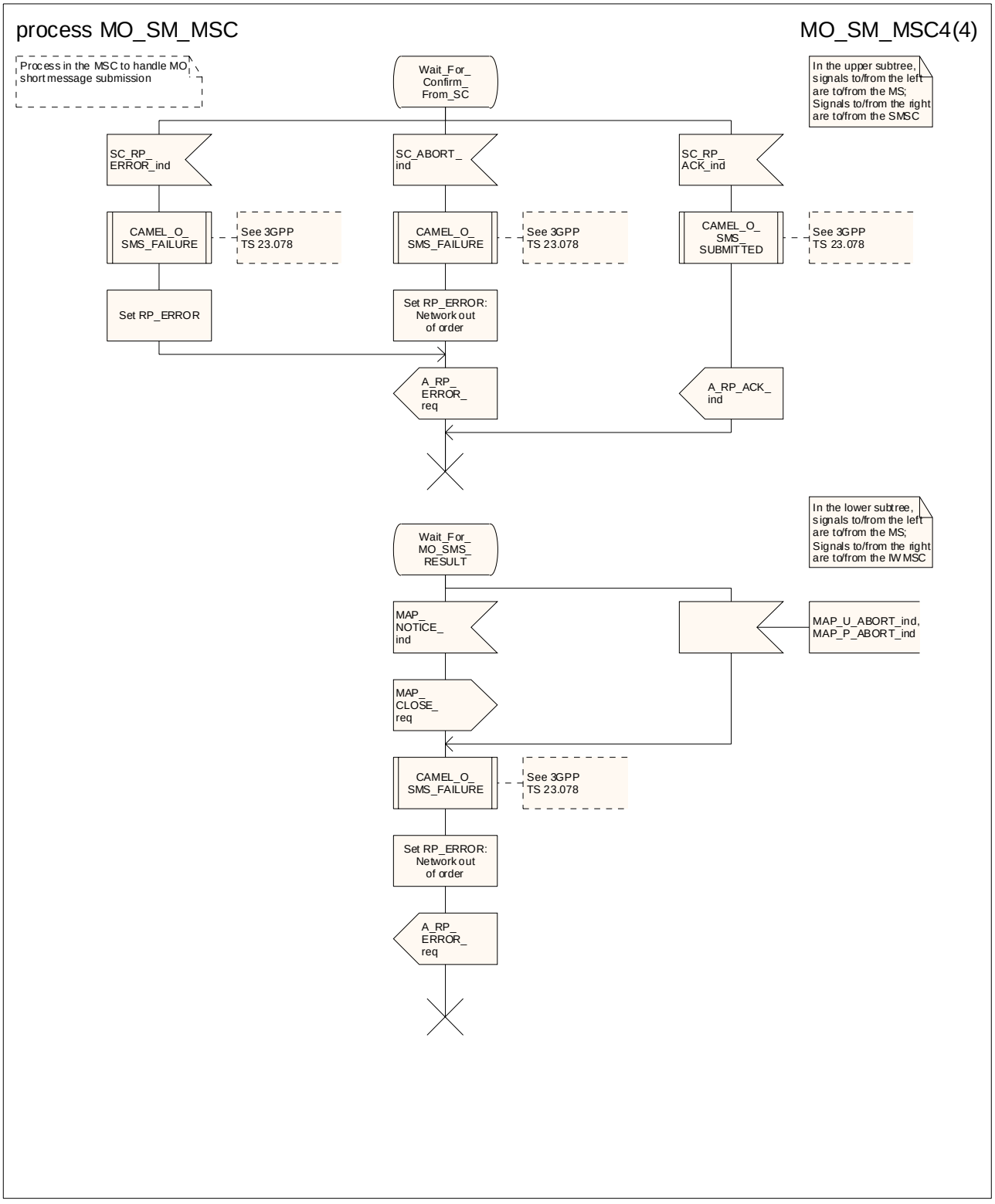


Figure 23.2/2 (sheet 4 of 4): Process MO_SM_MSC

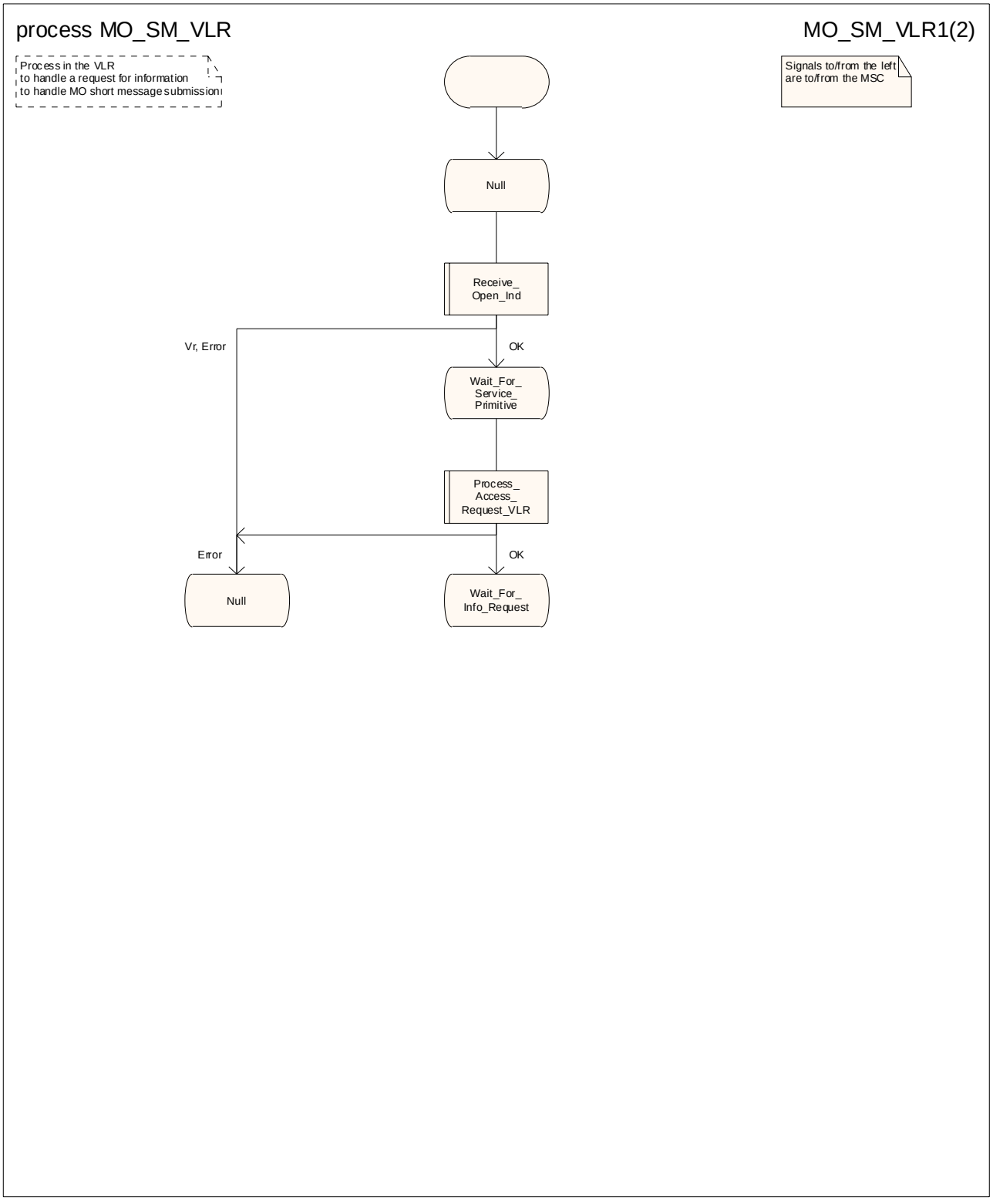


Figure 23.2/3 (sheet 1 of 2): Process MO_SM_VLR

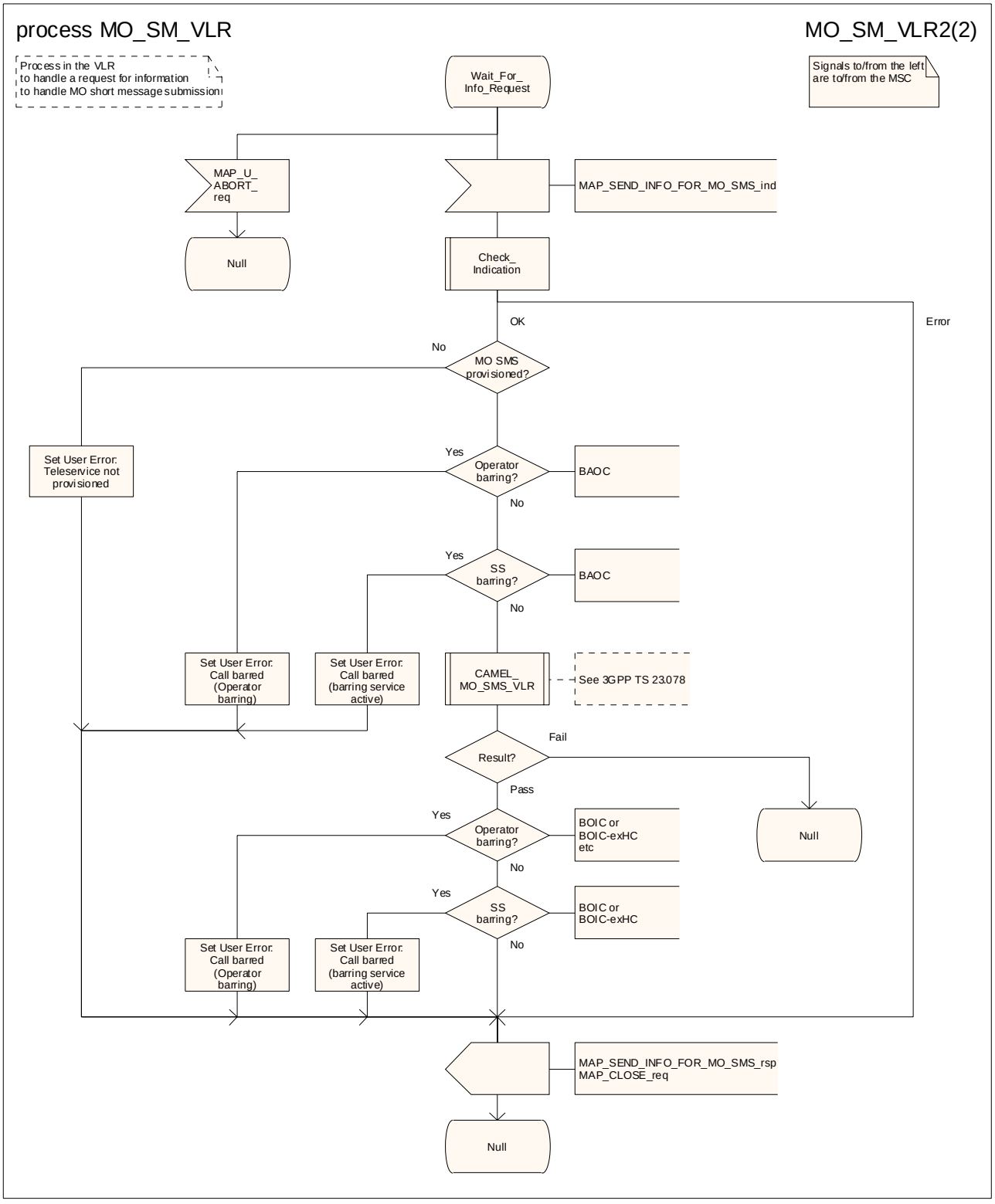


Figure 23.2/3 (sheet 2 of 2): Process MO_SM_VLR

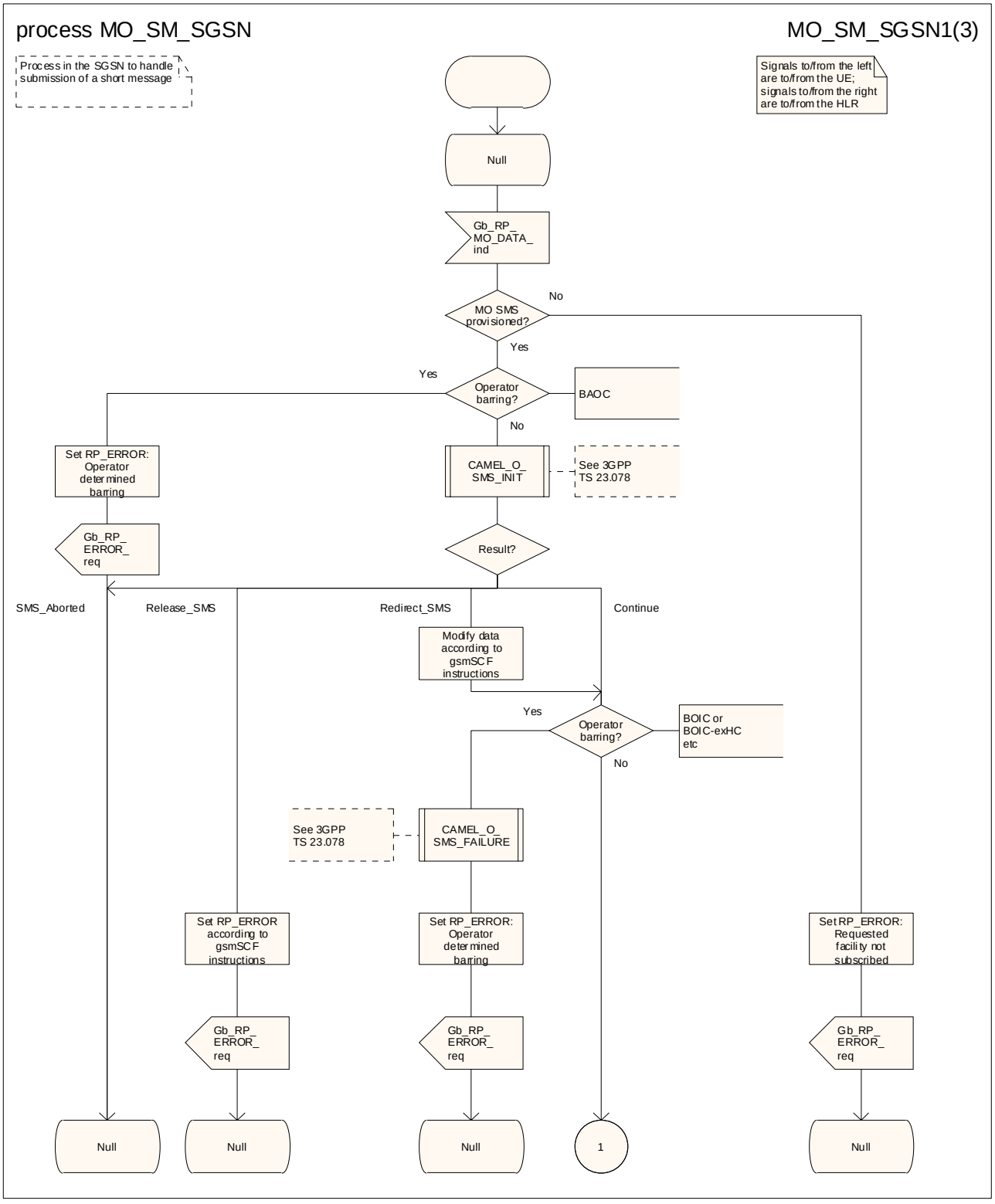


Figure 23.2/4~~5~~ (sheet 1 of 3): Process MO_SM_SGSN

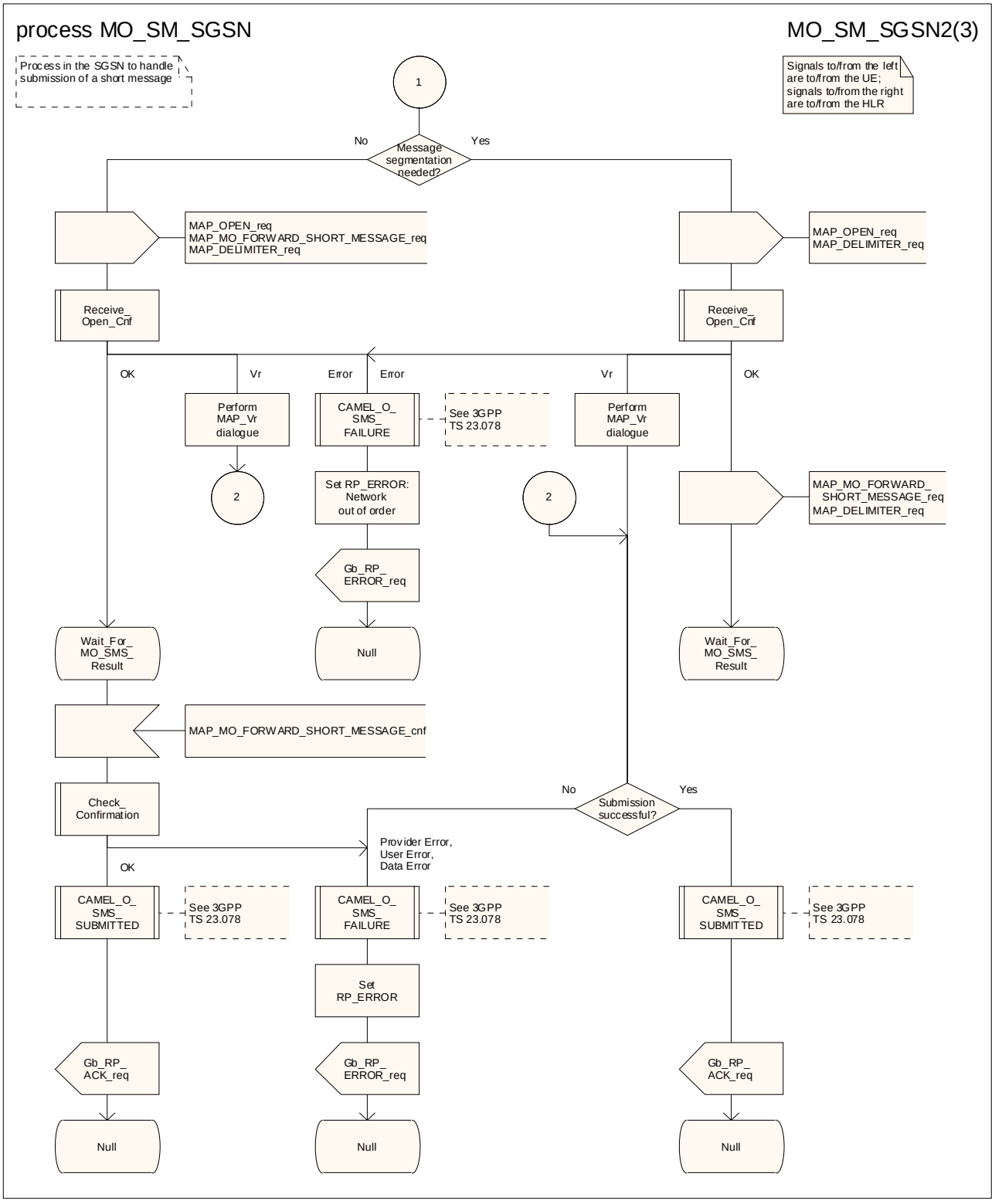


Figure 23.2/4~~5~~ (sheet 2 of 3): Process MO_SM_SGSN

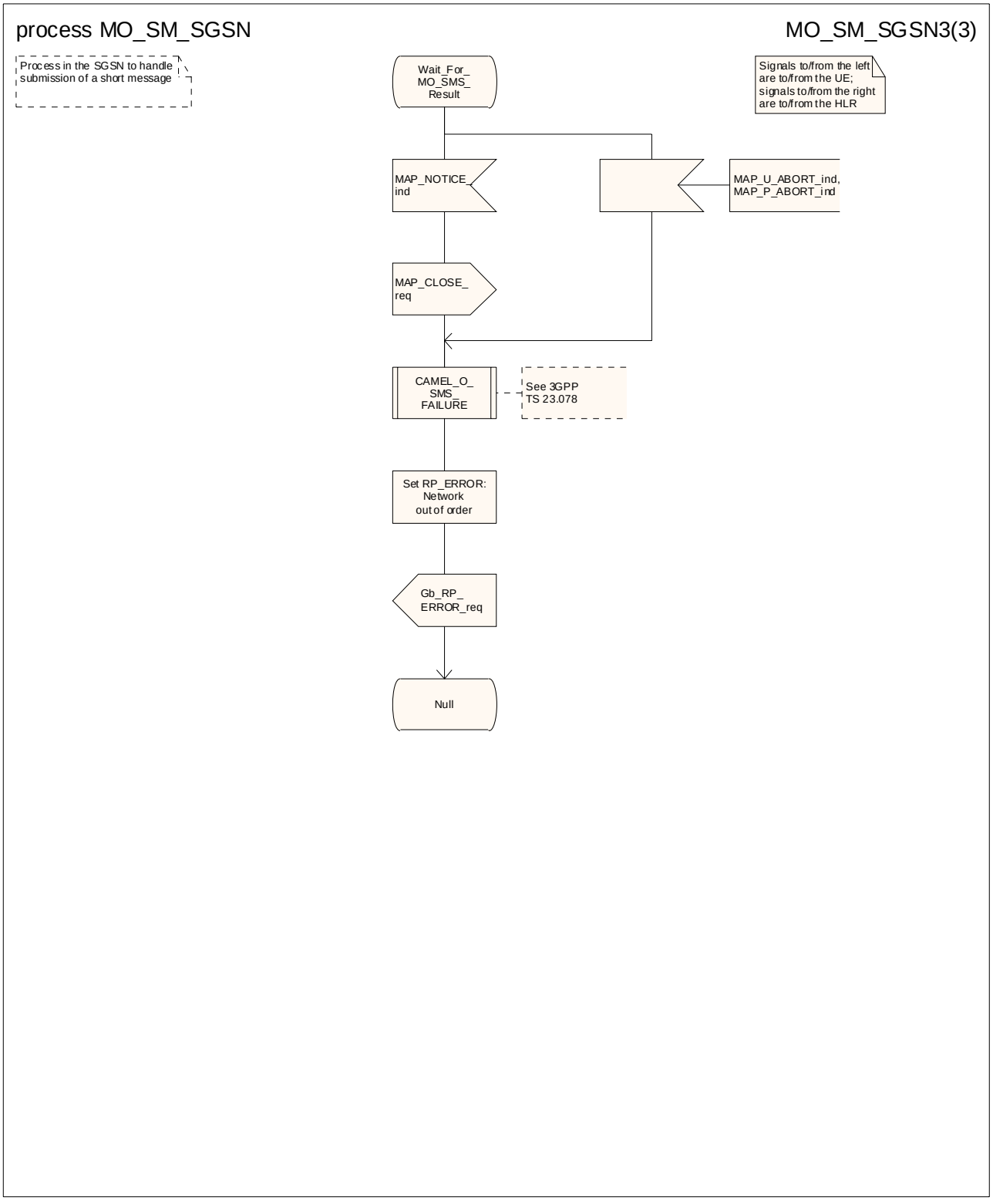


Figure 23.2/4~~5~~ (sheet 3 of 3): Process MO_SM_SGSN

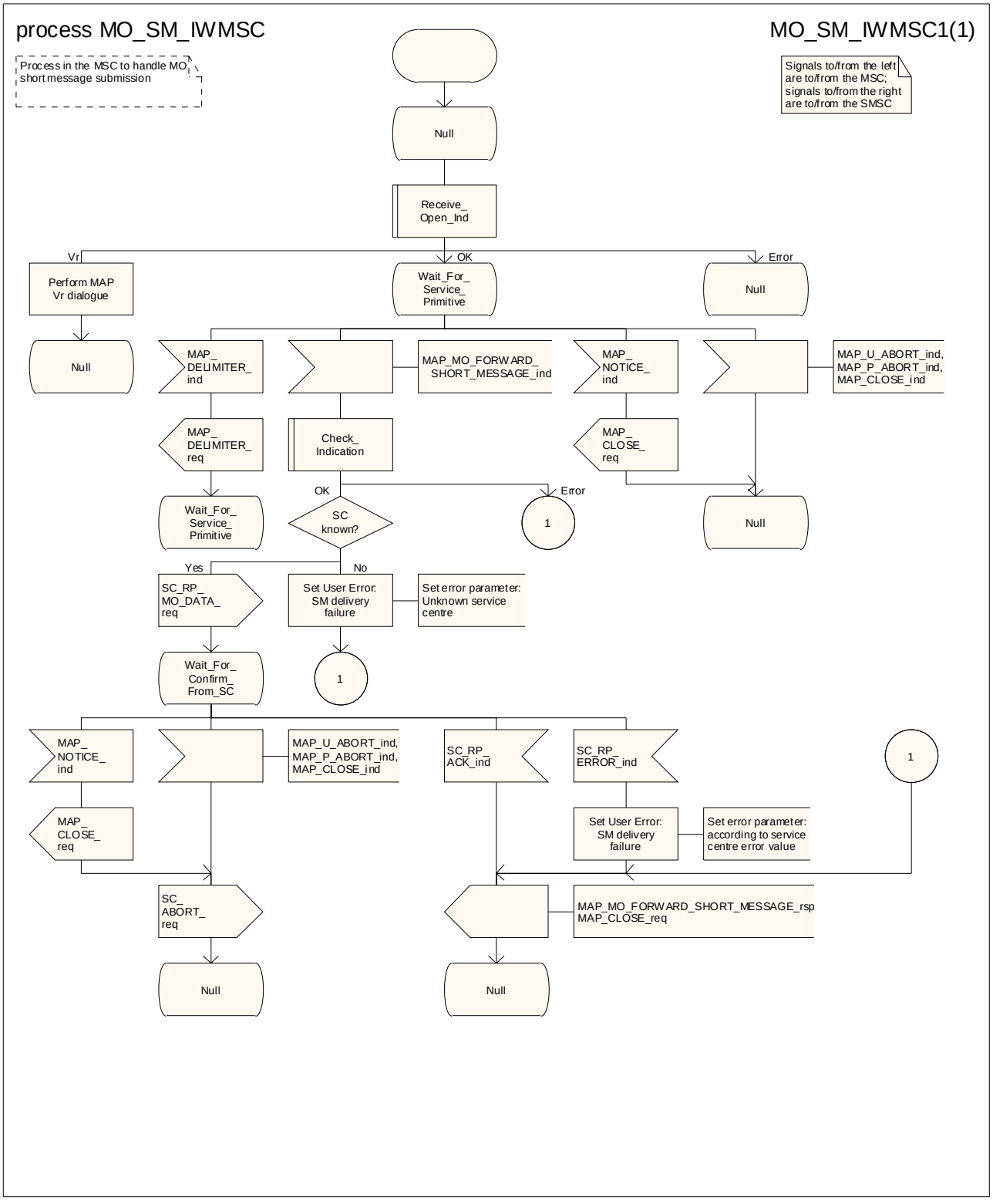


Figure 23.2/54: Process MO_SM_IWMSC

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 message flow for the mobile terminated short message procedure for a single short message transfer is shown in figure 23.3/1.

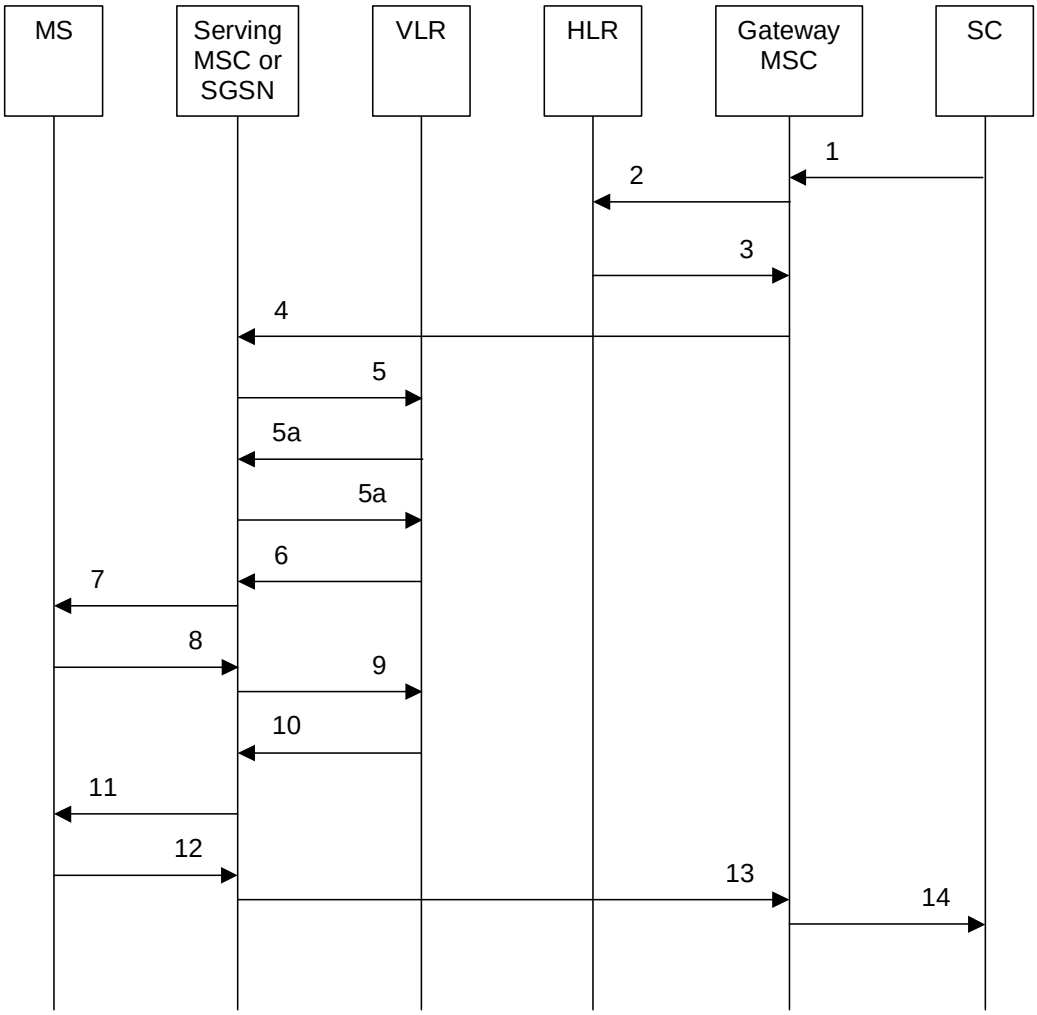


Figure 23.3/1: Mobile terminated short message service procedures

1) Short Message (3GPP TS 23.~~1~~040).
2) MAP_SEND_ROUTING_INFO_FOR_SM.
3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK.
4) MAP_MT_FORWARD_SHORT_MESSAGE.
5) MAP_SEND_INFO_FOR_MT_SMS (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (3GPP TS 24.008 [35]).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.~~1~~040).

(*) Messages 5), 5a), 5b), 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

The message flow for the mobile terminated short message procedure for multiple short message transfer is shown in figure 23.3/2.

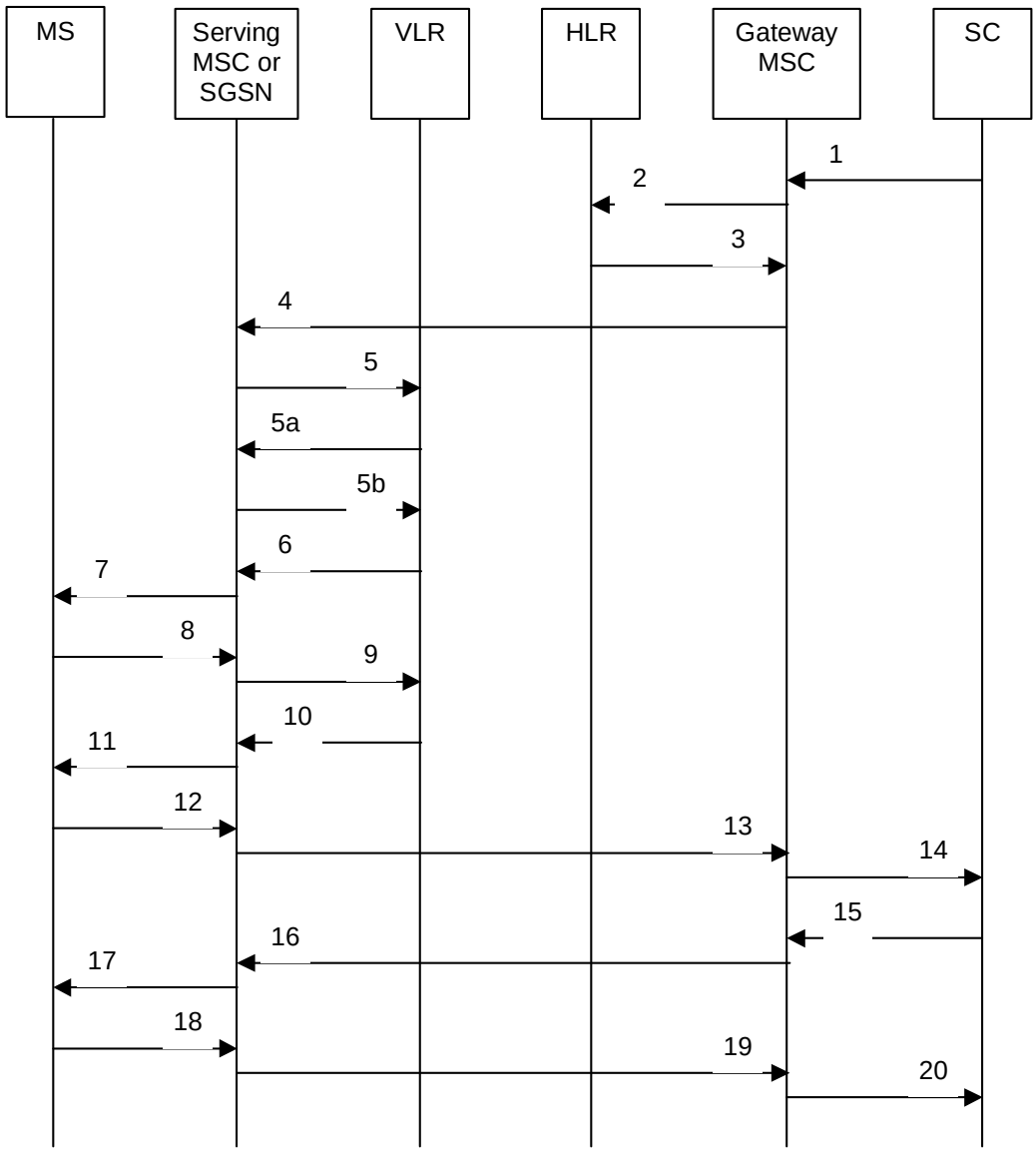


Figure 23.3/2: Mobile terminated short message procedure for multiple short message transfer

1) Short Message (3GPP TS 23.~~1~~0 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 (*).
5a) MAP_CONTINUE_CAMEL_SMS_HANDLING (*)(**)
5b) MAP_SEND_INFO_FOR_MT_SMS (*)(**)
6) MAP_PAGE/MAP_SEARCH_FOR_MOBILE_SUBSCRIBER (*).
7) Page (*3GPP TS 48.008 [49]*).
8) Page response (3GPP TS 24.008 [35]).
9) MAP_PROCESS_ACCESS_REQUEST_ACK and MAP_SEARCH_FOR_MOBILE_SUBSCRIBER_ACK (*).
10) MAP_SEND_INFO_FOR_MT_SMS_ACK (*).
11) Short Message (3GPP TS 24.011 [37]).
12) Short Message Acknowledgement (3GPP TS 24.011 [37]).
13) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
14) Short Message Acknowledgement (3GPP TS 23.~~1~~0 40).
15) Short Message (3GPP TS 23.~~1~~0 40).
16) MAP_MT_FORWARD_SHORT_MESSAGE (note 2).
17) Short Message (3GPP TS 24.011 [37]).

18) Short Message Acknowledgement (3GPP TS 24.011 [37]).
19) MAP_MT_FORWARD_SHORT_MESSAGE_ACK.
20) Short Message Acknowledgement (3GPP TS 23.~~1~~040).

(*) Messages 5), 5a), 5b) 6), 9), and 10) are not used by the SGSN.
(**) These messages are used only for a subscriber provisioned with MT-SMS-CSI in the VLR.

NOTE 1: The “More Messages To Send” flag is TRUE.
NOTE 2: The “More Messages To Send” flag is FALSE.

In the multiple short message transfer the service MAP_MT_FORWARD_SHORT_MESSAGE can be used several times. However, the short message transfer is always acknowledged to the Service Centre before the next short message is sent.

In addition the following MAP services are used:

MAP_PROCESS_ACCESS_REQUEST	(see clause 8.3); (*)
MAP_PAGE	(see clause 8.2); (*)
MAP_SEARCH_FOR_MS	(see clause 8.2); (*)
MAP_AUTHENTICATE	(see clause 8.5); (*)
MAP_SET_CIPHERING_MODE	(see clause 8.6); (*)
MAP_CHECK_IMEI	(see clause 8.7);
MAP_FORWARD_NEW_TMSI	(see clause 8.9); (*)
MAP_REPORT_SM_DELIVERY_STATUS	(see clause 12.3);
MAP_INFORM_SERVICE_CENTRE	(see clause 12.6);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see clause 9.1); (*)
MAP_READY_FOR_SM	(see clause 12.4).

(*) The~~o~~se services ~~messages~~ are not used by the SGSN.

23.3.1 Procedure in the SMS-GMSC

Any CAMEL-specific handling described in this subclause is omitted if the SMS-GMSC does not support CAMEL. CAMEL-specific handling is invoked only if the SMS-GMSC is integrated with the VMSC.

The process starts when ~~short message handling function of~~ the SMS-GMSC ~~requests routing information when it~~ receives an SC_RP_MT_DATA indication from a Service Centre. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf	see subclause 25.1.2;
Check_Confirmation	see subclause 25.2.2.

Process MT_SM_GMSC sheet 1: If the MAP_SEND_ROUTING_INFO_FOR_SM confirmation included an LMSI, it may be included in the sm-RP-DA information field of the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC. In this case, the IMSI shall be included in the Destination Reference of the MAP_OPEN request. The SMS-GMSC shall not send an LMSI to an SGSN. If the SMS-GMSC does not send an LMSI to the serving node, the sm-RP-DA information field in the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC or SGSN shall contain the IMSI, and the Destination Reference in the MAP_OPEN request shall not be present. The parameter SM_RP_OA shall contain the Service Centre address.

Process MT_SM_GMSC sheet 1: The indication of which number belongs to the SGSN and which to the MSC, received from the HLR in the MAP_SEND_ROUTING_INFO_FOR_SM confirm (see subclause 23.3.2) will enable the SMS-GMSC to map the causes received from one or both serving nodes into the appropriate causes for non GPRS, GPRS or both, and send them to the SC and the HLR.

Process MT_SM_GMSC sheet 2: The SMS-GMSC maps "Unexpected data value" and "System failure" MAP errors from the serving node to a "System failure" RP_ERROR error cause. The mapping between other MAP error causes and the RP_ERROR error cause is given in 3GPP TS 23.040 [26] and 3GPP TS 24.011 [37].

Process MT_SM_GMSC sheet 2: If the SMS-GMSC receives both MSC and SGSN numbers from the HLR as routeing information, it may choose which serving node to use for the first delivery attempt.

Process MT_SM_GMSC sheet 2: If the SMS-GMSC makes two delivery attempts, it may report the result of each delivery attempt to the HLR according to the conditions described below.

Procedure MT_SM_Delivery_Attempt_GMSC sheet 1: if the macro MT_SM_Transfer_MSC takes the Error exit, the SMS-GMSC maps the MAP User Error to the corresponding SC_RP error, as defined in 3GPP TS 23.040 [26].

Procedure MT_SM_Delivery_Attempt_GMSC sheet 1, sheet 2, sheet 4, sheet 5: The SMS-GMSC invokes the macro Report_SM_Delivery_Stat_GMSC if:

- the reason received from the serving node for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause "MS memory capacity exceeded", and the SC address is not yet included in the MWD set, or
- the reason received from the serving node for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded, and the corresponding flag in the HLR (as indicated in the information received in the MAP_INFORM_ SERVICE_CENTRE) is not set, or
- the reason received from the serving node (MSC or SGSN) for failure to deliver the message is absent subscriber_SM and the absent subscriber diagnostic is different from the absent subscriber diagnostic received in the MAP_INFORM_ SERVICE_CENTRE.

Procedure MT_SM_Delivery_Attempt_GMSC sheet 1, sheet 2, sheet 4, sheet 5: If absent subscriber diagnostic information (see 3GPP TS 23.040 [26]) is included with the absent subscriber_SM error indication then the SMS-GMSC relays this information to the HLR using the MAP_REPORT_SM_DELIVERY_STATUS service.

Procedure MT_SM_Delivery_Attempt_GMSC sheet 1, sheet 4: The More Messages To Send flag is set to TRUE or FALSE according to the information received from the Service Centre.

Procedure MT_SM_Delivery_Attempt_GMSC sheet 3: If the capacity of a message signal unit in the lower layers of the protocol is enough to carry the content of the MAP_OPEN request and the content of the MAP_MT_FORWARD_SHORT_MESSAGE request in a single TC message, the test "Message segmentation needed" takes the "No" exit; otherwise the test takes the "Yes" exit.

~~The SMS-GMSC requests a MAP dialogue and sends a MAP_SEND_ROUTING_INFO_FOR_SM request, with an indication of whether the SMS-GMSC supports the delivery of short messages via an SGSN, to the HLR containing the subscriber data of the mobile subscriber.~~

- ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure" and the process returns to the Null state;~~
- ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol, and the handling continues as follows:~~
  - ~~if the HLR did not supply routeing information, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error, and the process returns to the Null state;~~

~~NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].~~

  - ~~if the HLR supplied routeing information, the handling continues as described below under the heading "Short message delivery attempts".~~
- ~~if the macro Receive_Open_Cnf takes the "OK" exit, the SMS-GMSC waits for routeing information from the HLR.~~

~~While the SMS-GMSC is waiting for routeing information from the HLR:~~

- if the service centre aborts the dialogue with the SMS-GMSC, the SMS-GMSC aborts the dialogue with the HLR and the process returns to the Null state;

- If the dialogue with the HLR fails, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure" and the process returns to the Null state;

- if the SMS-GMSC receives a MAP_SEND_ROUTING_INFO_FOR_SM confirmation, it checks the confirmation.

  - if the confirmation contained a provider error or a data error, the SMS-GMSC returns an SC_RP_ERROR with error cause "System Failure", and the process returns to the Null state;

  - if the confirmation contained a user error, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error and waits for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the confirmation contained routeing information, the SMS-GMSC checks whether the routeing information included an LMSI;

    - if the routeing information included an LMSI, the SMS-GMSC sets the destination reference to the IMSI of the destination subscriber, and the destination address in the short message relay protocol to the LMSI;

    - if the routeing information did not include an LMSI, the SMS-GMSC marks the destination reference as not included, and sets the destination address in the short message relay protocol to the IMSI of the destination subscriber.

  - in both cases, the SMS-GMSC then waits for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR;

While the SMS-GMSC is waiting for a possible MAP_INFORM_SERVICE_CENTRE indication from the HLR:

- if the service centre aborts the dialogue with the SMS-GMSC, the SMS-GMSC aborts the dialogue with the HLR and the process returns to the Null state;

- if the dialogue with the HLR fails, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

- if the HLR closes the dialogue without sending a MAP_INFORM_SERVICE_CENTRE, the SMS-GMSC checks whether routeing information was received from the HLR.

  - if the HLR did not supply routeing information, the SMS-GMSC returns an SC_RP_ERROR with the error cause set according to the user error, and the process returns to the Null state;

NOTE: The mapping between the MAP error causes and the RP_ERROR error causes is given in 3GPP TS 23.040 [26].

  - if the HLR supplied routeing information, the handling continues as described below under the heading "Short message delivery attempts".

- if the SMS-GMSC receives a MAP_INFORM_SERVICE_CENTRE indication, it checks the indication.

  - if the indication is badly formed, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

  - if the indication is OK, the SMS-GMSC checks whether the MAP_SEND_ROUTING_INFO_FOR_SM confirmation contained an error.

    - if the MAP_SEND_ROUTING_INFO_FOR_SM confirmation contained an error, the SMS-GMSC returns an SC_RP_ERROR including the IMSI and the MSISDN of the destination subscriber, and the process returns to the Null state;

- if the MAP_SEND_ROUTING_INFO_FOR_SM confirmation did not contain an error, which implies that it contained routeing information, the handling continues as described below under the heading "Short message delivery attempts".

Short message delivery attempts

When the SMS-GMSC has obtained the routing information needed to forward a mobile terminated short message to the serving node (MSC or SGSN) it calls the procedure MT_SM_Delivery_Attempt_GMSC.

If the SMS-GMSC receives both MSC and SGSN numbers from the HLR as routeing information, it may choose which serving node to use for the first delivery attempt.

If the first delivery attempt succeeds, or the delivery is aborted, the process returns to the Null state. If the first delivery attempt fails and the HLR provided a second routeing address, the SMS-GMSC attempts to deliver the short message through the second choice serving node. The process then returns to the Null state.

For each delivery attempt, the SMS-GMSC checks whether the serving node for the delivery attempt is the SMS-GMSC. If the serving node for the delivery attempt is the SMS-GMSC, the handling continues as described under the heading "Serving node is SMS-GMSC"; if the serving node for the delivery attempt is not the SMS-GMSC, the handling continues as described under the heading "Serving node is separate from SMS-GMSC".

Serving node is SMS-GMSC

The SMS-GMSC invokes the macro MT_SM_Transfer_MSC. This macro is described in subclause 23.3.3 and in figure 23.3/8.

If the macro takes the Abort exit, the SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98] and the procedure returns a Fail result.

If the macro takes the Error exit, the SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98]. If required, the SMS-GMSC reports the outcome of the delivery attempt to the HLR. The SMS-GMSC sends an error report to the service centre and the procedure returns a Fail result.

NOTE: if the macro takes the Error exit, the SMS-GMSC maps the MAP User Error to the corresponding SC_RP error, as defined in 3GPP TS 23.040 [26].

If the macro takes the Release SMS exit, the SMS-GMSC sends an error report to the service centre and the procedure returns a Fail result.

If the macro takes the OK exit, the SMS-GMSC reports the successful delivery to the gsmSCF as described in 3GPP TS 23.078 [98] and checks whether the "More messages to send" indication was set in the request from the service centre.

- If the "More messages to send" indication was not set, the SMS-GMSC reports the successful delivery to the HLR, if necessary, and reports the successful delivery to the service centre. The procedure returns a Pass result.

- If the " More messages to send" indication was set, the SMS-GMSC reports the successful delivery to the service centre and waits for another message delivery request from the service centre. When the request is received, the SMS-GMSC opens a dialogue with the gsmSCF as described in 3GPP TS 23.078 [98].

  - If the gsmSCF bars the delivery of the short message (Release_SMS result) the SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

  - If the gsmSCF instructs the SMS-GMSC to continue with the delivery, the SMS-GMSC sends the message over the access interface to the destination MS and waits for a response.

    - If the delivery was successful, the SMS-GMSC reports the successful delivery to the gsmSCF as described in 3GPP TS 23.078 [98] and checks whether the "More messages to send" indication was set in the request from the service centre, as above.

    - If the delivery was unsuccessful, the SMS-GMSC reports the delivery failure to the gsmSCF as described in 3GPP TS 23.078 [98]. If required, the SMS-GMSC reports the outcome of the delivery attempt to the HLR. The SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.

Serving node is separate from SMS-GMSC

~~The SMS-GMSC checks whether the MAP_OPEN request and the MAP_MT_FORWARD_SHORT_MESSAGE request can be sent in a single message signal unit through the lower layers of the protocol.~~

- ~~if the two requests can be grouped in a single TC message, the SMS-GMSC requests a dialogue with the serving node, including the MAP_MT_FORWARD_SHORT_MESSAGE request;~~
  - ~~if the dialogue opening is successful, the SMS-GMSC waits for the response from the serving node;~~
  - ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol.~~
    - ~~if delivery was successful, the procedure returns a "Pass" result;~~
    - ~~if delivery failed, the procedure returns a "Fail" result.~~
  - ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with cause "System Failure" to the SC and the procedure returns a "Fail" result.~~
- ~~if the two requests can be grouped in a single TC message, the SMS-GMSC requests a dialogue with the serving node, omitting the MAP_MO_FORWARD_SHORT_MESSAGE request;~~
  - ~~if the dialogue opening is successful, the SMS-GMSC sends a MAP_MO_FORWARD_SHORT_MESSAGE request to the serving node, and waits for the response from the serving node;~~
  - ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol.~~
    - ~~if delivery was successful, the procedure returns a "Pass" result;~~
    - ~~if delivery failed, the procedure returns a "Fail" result.~~
  - ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SMS-GMSC returns an SC_RP_ERROR with cause "System Failure" to the SC and the procedure returns a "Fail" result.~~

~~If the MAP_SEND_ROUTING_INFO_FOR_SM confirmation included an LMSI, it can be included in the sm-RP-DA information field of the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC. In this case, the IMSI shall be included in the Destination Reference of the MAP_OPEN request. The SMS-GMSC shall not send an LMSI to an SGSN. If the SMS-GMSC does not send an LMSI to the serving node, the sm-RP-DA information field in the first MAP_MT_FORWARD_SHORT_MESSAGE request sent to the serving MSC or SGSN shall contain the IMSI, and the Destination Reference in the MAP_OPEN request shall not be present. The parameter SM_RP_OA shall contain the Service Centre address. The More Messages To Send flag is set to TRUE or FALSE according to the information received from the Service Centre.~~

~~When the SMS-GMSC receives the response from the serving node, it checks the content of the response.~~

~~If the response indicates successful delivery, the SMS-GMSC checks whether the "More messages to send" indication was set in the request from the service centre.~~

- ~~If the " More messages to send" indication was not set, the SMS-GMSC reports the successful delivery to the HLR, if necessary, and reports the successful delivery to the service centre. The procedure returns a Pass result.~~
- ~~If the " More messages to send" indication was set, the SMS-GMSC reports the successful delivery to the service centre and waits for another message delivery request from the service centre. When the request is received, the SMS-GMSC sends a MAP_MT_FORWARD_SHORT_MESSAGE request to the serving node and waits for a response.~~
  - ~~If the delivery was successful, the SMS-GMSC checks whether the "More messages to send" indication was set in the request from the service centre, as above.~~
  - ~~If the delivery was unsuccessful, the SMS-GMSC reports the outcome of the delivery attempt to the HLR, if required. The SMS-GMSC informs the service centre that the multiple message transfer was aborted and the procedure returns an Abort result.~~

~~The SMS-GMSC invokes the procedure MAP_REPORT_SM_DELIVERY_STATUS, if:~~

- the reason received from the serving node for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded, and the SC address is not yet included in the MWD set, or

- the reason received from the serving node for failure to deliver the message is absent subscriber_SM, unidentified subscriber or SM delivery failure with error cause MS memory capacity exceeded, and the corresponding flag in the HLR (as indicated the information received in the MAP_INFORM_ SERVICE_CENTRE) is not set, or

- the reason received from the serving node (MSC or SGSN) for failure to deliver the message is absent subscriber_SM and the absent subscriber diagnostic is different from the absent subscriber diagnostic received in the MAP_INFORM_ SERVICE_CENTRE.

If absent subscriber diagnostic information (see 3GPP TS 23.040 [26]) is included with the absent subscriber_SM error indication then the SMS-GMSC relays this information to the HLR using the MAP_REPORT_SM_DELIVERY_STATUS service.

If there was an attempt to deliver the short message through both the MSC and the SGSN, and both delivery attempts failed with causes as described above, the SMS-GMSC reports to the HLR the two unsuccessful SMS delivery outcomes for GPRS and non GPRS.

If there was an attempt to deliver the short message through both the MSC and the SGSN, and the first delivery failed with causes described above but the second delivery succeeded, the SMS-GMSC reports to the HLR the unsuccessful and successful SMS delivery outcomes for GPRS and non GPRS.

The SMS-GMSC may also report successful delivery to the HLRwhen the first SMS delivery through the MSC was successful, if the MNRF or MCEF or both were set in the HLR.

The SMS-GMSC may also report successful delivery to the HLR when the first SMS delivery through the SGSN was successful, if the MNRG or MCEF or both were set in the HLR.

This procedure is described in detail in clause 23.5.

The SMS-GMSC maps "Unexpected data value" and "System failure" MAP errors from the serving node to a "System failure" error to the SC. Other MAP errors are mapped to appropriate cause values and diagnostic information from the SMS-GMSC to the SC as described in 3GPP TS 23.040 [26] and 3GPP TS 24.011 [37].

The SMS-GMSC maps the "Unidentified subscriber" MAP error to an "Absent subscriber" error with diagnostic information set to "Unidentified subscriber" to the SC as described in 3GPP TS 23.040 [26].

Note that the indication of which number belongs to the SGSN and which to the MSC, received from the HLR in the MAP_SEND_ROUTING_INFO_FOR_SM confirm (see clause 23.3.2) will enable the SMS-GMSC to map the causes received from one or both serving nodes into the appropriate causes for non GPRS, GPRS or both, and send them to the SC and the HLR.

The mobile terminated short message transfer proces~~sdure~~ in the SMS-GMSC is shown in figure 23.3/3. The procedure MT_SM_Delivery_Attempt_GMSC is shown in figure 23.3/4. The macro MT_SM_Transfer_MSC is shown in figure 23.3/7.

23.3.2 Procedure~~s~~ in the HLR

The process starts when the HLR receives ~~is triggered by~~ a MAP_SEND_ROUTING_INFO_FOR_SM indication from the SMS-GMSC. ~~For any of the following error cases, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the appropriate user error, closes the dialogue and terminates the process:~~ The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Indication see subclause 25.2.1.

Sheet 3: If the SMS-GMSC does not support GPRS functionality, it uses the protocol defined in the Release 96 version of this specification. The parameter "msc-Number" in "RoutingInfoForSM-Res" in the Release 96 version of the protocol definition corresponds to the parameter "networkNode-Number" in "RoutingInfoForSM-Res" in the Release 97 (and later) version of the protocol definition; therefore if the HLR populates the parameter "networkNode-Number" with the SGSN number, the Release 96 SMS-GMSC will interpret the SGSN number as an MSC number. If the HLR

populates the "gprsNodeIndicator" parameter in the MAP_SEND_ROUTING_INFO_FOR_SM response, a Release 96 SMS-GMSC will silently discard the parameter.

Sheet 5: If the HLR received a LMSI from the VLR at location updating, it shall include the LMSI in the MAP_SEND_ROUTING_INFO_FOR_SM response only if the MAP_SEND_ROUTING_INFO_FOR_SM response also includes the MSC number.

- ~~if the indication is badly formed, the HLR returns the appropriate User Error;~~
- ~~if the mobile subscriber is unknown, i.e. it cannot be identified from the MSISDN given, the HLR returns the User Error "Unknown subscriber";~~
- ~~if the subscription does not include the MT SMS teleservice, the HLR returns the User Error "Teleservice not provisioned";~~
- ~~if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";~~
- ~~if the short message transfer would contravene the "SM filtering by the HPLMN" function criteria, the HLR returns the User Error "Call barred" with cause "Unauthorised Message Originator". The definition of the filtering function is out of the scope of UMTS specifications. Filtering may be based on the SM-RP-SMEA information element if it is received from the SMS-GMSC;~~
- ~~depending on the Network Access Mode ("Non-GPRS", "GPRS" or "Non-GPRS and GPRS"), the HLR behaves as follows:~~
  - ~~if the Network Access Mode is "Non-GPRS", i.e. the subscriber is not a GPRS subscriber, then:~~
    - ~~if the MS is not reachable in an MSC, i.e. 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, the HLR sets the MNRF and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic, i.e. "Deregistered in HLR for non GPRS", "Roaming Restricted" or "MS-Purged for non GPRS". The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";~~
    - ~~if the MSC where the subscriber is registered does not support MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;~~
    - ~~if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";~~
    - ~~if the short message transfer would contravene supplementary service barring, the HLR returns the User Error "Call barred" with cause "Barring service active";~~
    - ~~if the MNRF is set, the HLR checks whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication. If the priority information element was present, the HLR sets the "mnrf-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true". If the priority information element was not present, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for non-GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";~~
    - ~~if the MNRF is not set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".~~
  - ~~if the Network Access Mode is "GPRS", i.e. the subscriber is a GPRS subscriber, then:~~
    - ~~if the MS is not reachable in an SGSN, i.e. no MSC identity is stored for the mobile subscriber or the "SGSN Area Restricted Flag" is set or the "MS purged for GPRS" flag is set, the HLR sets the MNRG~~

flag and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber" with the appropriate diagnostic. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the SGSN where the subscriber is registered does not support MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;

- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";

- if the MNRG flag is set, the HLR checks whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication. If the priority information element was present, the HLR sets the "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. If the SMS-GMSC did not indicate in the MAP_SEND_ROUTING_INFO_FOR_SM indication that it supports GPRS functionality (i.e. it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response), the HLR maps the state of the MNRG flag into the "mnrf-Set" bit of the mw-Status parameter.

NOTE: If the SMS-GMSC does not support GPRS functionality, it uses the protocol defined in the Release 96 version of the specification. The parameter "msc-Number" in "RoutingInfoForSM-Res" in the Release 96 version of the protocol definition corresponds to the parameter "networkNode-Number" in "RoutingInfoForSM-Res" in the Release 97 (and later) version of the protocol definition; therefore if the HLR populates the parameter "networkNode-Number" with the SGSN number, the Release 96 SMS-GMSC will interpret the SGSN number as an MSC number. If the HLR populates the "gprsNodeIndicator" parameter in the MAP_SEND_ROUTING_INFO_FOR_SM response, a Release 96 SMS-GMSC will silently discard the parameter.

- The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the priority information element was not present, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the MNRG flag is not set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".

- if the Network Access Mode is "Non-GPRS and GPRS", i.e. the subscriber is a non-GPRS and GPRS subscriber, then:

  - the HLR checks whether the SMS-GMSC supports GPRS functionality, i.e. it can handle two routeing addresses in the MAP_SEND_ROUTING_INFO_FOR_SM response;

  - if the SMS-GMSC does not support GPRS functionality then:

    - if the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

    - if the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS".

  - if the SMS-GMSC supports GPRS functionality then:

    - if the MS is not reachable in an MSC (see the definition above under Network Access Mode "Non-GPRS") and not reachable in an SGSN (see the definition above under Network Access Mode "GPRS"), the HLR sets the MNRF and the MNRG flag and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber"

with the appropriate diagnostic. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if the MS is not reachable in an SGSN (see the definition above under Network Access Mode "GPRS") but is reachable in an MSC, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if the MS is not reachable in an MSC (see the definition above under Network Access Mode "Non-GPRS") but is reachable in an SGSN, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS";

- if the MS is reachable in both an MSC and an SGSN, the HLR continues as described below;

- if neither the MSC nor the SGSN where the subscriber is registered supports MT SMS, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Facility not supported", closes the dialogue and terminates the process;

- if only the MSC where the subscriber is registered supports MT SMS, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

- if only the SGSN where the subscriber is registered supports MT SMS, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "GPRS";

- if both the MSC and the SGSN where the subscriber is registered support MT SMS, the HLR checks whether the short message transfer would contravene operator determined barring or supplementary service barring.

- if the short message transfer would contravene operator determined barring, the HLR returns the User Error "Call barred" with cause "Operator barring";

- if the short message transfer would contravene supplementary service barring, the HLR processes the MAP_SEND_ROUTING_INFO_FOR_SM indication as described above for Network Access Mode "Non-GPRS";

NOTE: supplementary service barring is specified to apply only for SMS transfer via an MSC, not for SMS transfer via an SGSN.

- if the short message transfer is not prevented by operator determined barring or supplementary service barring, the HLR checks the states of the MNRF and the MNRG flag, and whether the SM-RP-Priority information element was present in the MAP_SEND_ROUTING_INFO_FOR_SM indication.

- if both the the MNRF and the MNRG flag are set and the priority information element was absent, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the User Error "Absent subscriber". If a reason for the subscriber's absence for non-GPRS or GPRS is stored in the mobile not reachable reason (MNRR) in the subscriber data, the HLR includes this as the diagnostic for the "Absent subscriber" error. The HLR then continues processing as described below under the heading "Addition of the Service Centre Address to the MWD list";

- if one or both of the MNRF and the MNRG flag is set and the priority information element was present, the HLR sets the "mnrf Set", "mnrg Set" and "mcef Set" bits of the mw Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number and SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the MNRG flag is set but the the priority information element was absent, the HLR sets the "mnrf-Set", "mnrg Set" and "mcef Set" bits of the mw Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if the MNRF is set but the the priority information element was absent, the HLR sets the "mnrf-Set", "mnrg-Set" and "mcef-Set" bits of the mw-Status parameter according to the state of the corresponding flags, and returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information because the SM-RP-Priority is true";

- if neither the MNRF nor the MNRG flag is set, the HLR returns a MAP_SEND_ROUTING_INFO_FOR_SM response containing the MSC number and SGSN number as routeing information. The HLR then continues processing as described below under the heading "Return of Routeing Information – normal case".

Addition of the Service Centre Address to the MWD list

The HLR checks whether the service centre address is included in the Message Waiting Data (MWD) list.

- if the service centre address is not in the MWD list, the HLR attempts to add the service centre address. If it was not possible to add the service centre address to the MWD list (e.g. because the MWD list was full), the HLR sets the MWD status to show that the service centre address was not included, otherwise the HLR sets the MWD status to show that the service centre address was included;

- if the service centre address is in the MWD list, the HLR sets the MWD status to show that the service centre address was included.

The HLR then checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request.

The HLR then sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

Return of Routeing Information because the SM-RP-Priority is true

The HLR checks whether the service centre address is included in the Message Waiting Data (MWD) list.

- if the service centre address is not in the MWD list, the HLR sets the MWD status to show that the service centre address was not included;

- if the service centre address is in the MWD list, the HLR sets the MWD status to show that the service centre address was included.

The HLR then checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request.

The HLR then sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

Return of Routeing Information – normal case

The HLR checks the MCEF.

- if the MCEF is set, the HLR:

  - sets the "mcef-Set" bit of the mw-Status parameter;

  - checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_INFORM_SERVICE_CENTRE request;

  - sends a MAP_INFORM_SERVICE_CENTRE request to the SMS-GMSC, closes the MAP dialogue and terminates the process.

- if the MCEF is not set, the HLR:

- checks whether the MSISDN used to address the destination subscriber is the same as the MSISDN-Alert. If the MSISDN used to address the destination subscriber is not the same as the MSISDN-Alert, the HLR sends to the SMS-GMSC a MAP_INFORM_SERVICE_CENTRE request including the MSISDN-Alert parameter;

- closes the MAP dialogue and terminates the process.

Use of LMSI

If the HLR received a LMSI from the VLR at location updating, it shall include the LMSI in the MAP_SEND_ROUTING_INFO_FOR_SM response only if the MAP_SEND_ROUTING_INFO_FOR_SM response also includes the MSC number.

The mobile terminated short message transfer process in the HLR is shown in figure 23.3/5.

23.3.3 Procedure in the Serving MSC

Any CAMEL-specific handling defined in this subclause is omitted if the MSC does not support CAMEL control of MT SMS, or if the subscriber does not have a subscription for CAMEL control of MT SMS.

The process starts when the MSC receives is triggered by a dialogue opening request with the application context shortMsgMT-RelayContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "Vr" exit, the MSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "OK" exit, the MSC checks whether the dialogue opening request included a destination reference. If a destination reference was included, the MSC stores it and waits for a service primitive.

  - if the dialogue with the SMS-GMSC fails, the process returns to the Null state;

  - if the next primitive received is a MAP_DELIMITER indication, the MSC returns a MAP_DELIMITER request, and waits for a service primitive;

  - if the next primitive received is a MAP_MT_FORWARD_SHORT_MESSAGE indication, the MSC checks the indication.

    - if the indication is badly formed, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

    - if the indication is OK, the MSC invokes the macro MT_SM_Transfer_MSC to transfer the short message to the MS.

      - if the macro takes the "Release SMS" exit, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

      - if the macro takes the "Error" exit, the MSC reports the delivery failure to the gsmSCF (if CAMEL handling was invoked) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

      - if the macro takes the "Abort" exit, the MSC reports the delivery failure to the gsmSCF (if CAMEL handling was invoked), and the process returns to the Null state;

      - if the macro takes the "OK" exit, the MSC reports the successful delivery to the gsmSCF (if CAMEL handling was invoked) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".

- if there are no more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;

- if there are more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

- When the MSC is waiting for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC:

- if the dialogue with the SMS-GMSC fails, the MSC sends an Abort request to the MS, and the process returns to the Null state;

- if it receives a Release indication over the A-interface, the MSC aborts the dialogue with the SMS-GMSC, and the process returns to the Null state;

- if it receives a MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, it checks the indication.

- if the indication is badly formed, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

- if the indication is OK, the MSC checks whether CAMEL handling is required.

- if CAMEL handling is required, the MSC calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.

- if the result is Release_SMS, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error defined by the gsmSCF, and the process returns to the Null state;

- if the result is Continue, the MSC forwards the short message to the MS over the A interface, as described below.

- if CAMEL handling is not required, the MSC forwards the short message to the MS over the A interface, as described below;

- the MSC sends an A_RP_MT_DATA request to the MS, and waits for the response from the MS.

- When the MSC is waiting for the response from the MS for delivery of a subsequent short message:

- if the dialogue with the SMS-GMSC fails, the MSC sends an Abort request to the MS and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;

- if the MSC receives a Release indication over the A-interface, the MSC aborts the dialogue with the SMS-GMSC and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;

- if the MSC receives an error response from the MS, it maps the error to a MAP user error, reports the delivery failure to the gsmSCF (if CAMEL handling is required) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error, and the process returns to the Null state;

- if the MSC receives a positive acknowledgement from the MS, it reports the successful delivery to the gsmSCF (if CAMEL handling is required) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".

- if there are no more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;

- if there are more messages to send, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the

~~dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.~~

The mobile terminated short message transfer process in the serving MSC is shown in figure 23.3/6.

The macro MT_SM_Transfer_MSC may be invoked either in a stand-alone serving MSC or in a serving MSC which is integrated with the SMS-GMSC. It is used to transfer the first MT short message of a possible sequence of messages. The macro invokes macros not defined in this clause; the definition of these macros can be found as follows:

Check_Confirmation see subclause 25.2.2.

Page_MSC see subclause 25.3.1;

Search_for_MS_MSC see subclause 25.3.2;

Process_Access_Request_MSC see subclause 25.4.1;

Trace_Subscriber_Activity_MSC see subclause 25.9.1.

~~If the MSC does not support MT-SMS, it sets the User Error to "Facility not supported" and the macro takes the "Error" exit.~~

~~If the MSC supports MT-SMS, it invokes the macro Check_Subscr_Identity_for_SMS. If the macro Check_Subscr_Identity_for_SMS takes the "Error" exit, the macro MT_SM_Transfer_MSC takes the "Error" exit.~~

~~If the macro Check_Subscr_Identity_for_SMS takes the the "OK" exit, the MSC sends a dialogue opening request, followed by a MAP_SEND_INFO_FOR_MT_SMS request, to the VLR and waits for a response.~~

~~If the dialogue opening fails, the macro takes the "Error" exit.~~

~~If the dialogue opening succeeds, the MSC sets the variable CAMEL Handling to False and waits for the response from the VLR.~~

~~When the MSC is waiting for the response from the VLR:~~

- ~~if it receives a MAP_CONTINUE_CAMEL_SMS_HANDLING indication from the VLR, it sets the variable CAMEL Handling to True, calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.~~
  - ~~if the result is Release_SMS, the MSC aborts the dialogue with the VLR, and the macro takes the "Release SMS" exit;~~
  - ~~if the result is Continue, the MSC sends a second MAP_SEND_INFO_FOR_MT_SMS request, with the "Suppress MT-SMS-CSI parameter set, to the VLR, and waits for the response from the VLR.~~
- ~~if it receives a MAP_SEND_INFO_FOR_MT_SMS confirmation, it sets the User Error parameter according to the User Error parameter received in the MAP_SEND_INFO_FOR_MT_SMS confirmation, and the macro takes the "Error" exit;~~
- ~~if it receives a MAP_PAGE indication, it invokes the Page_MSC macro described in subclause 25.3.~~
  - ~~if the Page_MSC macro takes the "Null" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;~~
  - ~~if the Page_MSC macro takes the "Error" exit, the MSC waits for a further response from the VLR;~~
  - ~~if the Page_MSC macro takes the "OK" exit, the MSC checks whether the MS supports SMS, as described below.~~
- ~~if it receives a MAP_SEARCH_FOR_MS indication, it invokes the Search_For_MS_MSC macro described in subclause 25.3.~~
  - ~~if the Search_For_MS_MSC macro takes the "Null" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;~~
  - ~~if the Search_For_MS_MSC macro takes the "Error" exit, the MSC waits for a further response from the VLR;~~

- ~~if the Search_For_MS_MSC macro takes the "OK" exit, the MSC checks whether the MS supports SMS, as described below.~~

- ~~if the MS does not support SMS, the MSC sets the User Error to "SM Delivery Failure" with delivery failure cause "Equipment not SM equipped", aborts the dialogue with the VLR and aborts the connection to the MS, and the macro takes the "Error" exit;~~

- ~~if the MS supports SMS, the MSC invokes the macro Process_Access_Request_MSC described in subsclause 25.4.~~

  - ~~if the Process_Access_Request_MSC macro takes the "Error" exit, the MSC sets the User Error to "System Failure", and the macro takes the "Error" exit;~~

  - ~~if the Process_Access_Request_MSC macro takes the "OK" exit, the MSC waits for a further response from the VLR.~~

~~When the MSC is waiting for a further response from the VLR:~~

- ~~if it receives a MAP_TRACE_SUBSCRIBER_ACTIVITY indication from the VLR, it performs tracing activity as described in subclause 25.9, and waits for a further response from the VLR;~~

- ~~if it receives a MAP_SEND_INFO_FOR_MT_SMS confirmation, it checks the confirmation.~~

  - ~~if the confirmation contains a User Error, the MSC sets the User Error according to the User Error received in the confirmation, and the macro takes the "Error" exit;~~

  - ~~if the confirmation contains a Provider Error or a Data Error, the MSC sets the User Error to "System failure", and the macro takes the "Error" exit;~~

  - ~~if the confirmation indicates success, the MSC forwards the short message to the MS, and waits for a response from the MS.~~

    - ~~if the MS returns an error, the MSC sets the User Error according to the response from the MS, and the macro takes the "Error" exit;~~

    - ~~if the MS returns a positive acknowledgement, the macro takes the "OK" exit.~~

~~When the MSC is waiting for a response from the VLR for the MAP_SEND_INFO_FOR_MT_SMS request, or a response from the VLR for the MAP_PROCESS_ACCESS_REQUEST request, or the response from the MS for the first short message:~~

- ~~if the MSC receives a Release on the A interface, it aborts the dialogue with the VLR (if the dialogue is still open) and sets the User Error to "System failure", and the macro takes the "Error" exit;~~

- ~~if the dialogue with the VLR fails, the MSC aborts the connection to the MS and sets the User Error to "System failure", and the macro takes the "Error" exit;~~

- ~~if the dislogue with the SMS-GMSC fails, the the MSC aborts the dialogue with the VLR (if the dialogue is still open) and aborts the connection to the MS, and the macro takes the "Abort" exit.~~

The macro MT_SM_Transfer_MSC is shown in figure 23.3/7. The macro Check_Subscr_Identity_For_MT_SMS is shown in figure 23.3/8.

23.3.4 Procedure~~s~~ in the VLR

Any CAMEL-specific handling defined in this subclause is omitted if the VLR does not support CAMEL control of MT SMS.

The process starts when the VLR receives ~~is triggered by~~ a dialogue opening request from the MSC. The process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Check_Indication	see subclause 25.2.1;
Check_Confirmation	see subclause 25.2.2;

Process_Access_Request_VLR see subclause 25.4.2.

~~If the macro Receive_Open_Ind takes the "Vr" exit or the "Error" exit, the process returns to the Null state.~~

~~If the macro Receive_Open_Ind takes the "OK" exit, the VLR waits for a service primitive.~~

~~When the VLR receives a MAP_SEND_INFO_FOR_MT_SMS indication, it checks the indication.~~

- ~~if the indication is badly formed, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the appropriate User Error, and the process returns to the Null state;~~
- ~~if the indication is OK, the VLR checks the subscription information.~~

~~If the VLR has no record for the subscriber, or the subscriber record is marked as not confirmed by the HLR, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Unidentified subscriber", and the process returns to the Null state.~~

~~If the subscriber is marked as IMSI detached, or service is not allowed in the location area where the subscriber is currently registered, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Absent subscriber" with the diagnostic "IMSI detached", and the process returns to the Null state.~~

~~If the subscription checks are successful, the VLR calls the procedure CAMEL_MT_SMS_VLR, which is specified in 3GPP TS 23.078 [98], and checks the result.~~

- ~~if the result is Fail, the process returns to the Null state;~~
- ~~if the result is Pass, the VLR checks whether the location of the MS is known, and whether the location is confirmed by radio contact.~~
  - ~~if the location is known and confirmed by radio contact, the VLR sends a MAP_PAGE request to the MSC;~~
  - ~~if the location is not known, or not confirmed by radio contact, the VLR sends a MAP_SEARCH_FOR_MS request to the MSC.~~
- ~~the VLR waits for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC.~~

~~When the VLR is waiting for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC:~~

- ~~if the dialogue is aborted by the MSC, the process returns to the NULL state;~~
- ~~if it receives a MAP_PAGE confirmation, it checks the User Error received in the confirmation, as below;~~
- ~~if it receives a MAP_SEARCH_FOR_MS confirmation, it checks the confirmation.~~
  - ~~if the confirmation contained a Provider Error or a Data Error, the process returns to the Null state;~~
  - ~~if the confirmation contained a User Error, the VLR checks the User Error, as below;~~
  - ~~if the confirmation indicated a successful result, the VLR updates the LAI and sets the Confirmed by Radio Contact indicator to Confirmed, and waits for a MAP_PROCESS_ACCESS_REQUEST indication from the MSC.~~
- ~~if it receives a MAP_PROCESS_ACCESS_REQUEST indication, it invokes the macro Process_Access_Request_VLR.~~
  - ~~if the macro takes the "Error" exit, the process returns to the Null state;~~
  - ~~if the macro takes the "OK" exit, the VLR returns a MAP_SEND_INFO_FOR_MT_SMS response containing the MSISDN of the subscriber, and the process returns to the Null state.~~

~~If the VLR receives a MAP_PAGE confirmation or a MAP_SEARCH_FOR_MS confirmation containing a User Error, it checks the user error.~~

- ~~if the User Error is Absent Subscriber, the VLR sets the MNRF and returns a MAP_SEND_INFO_FOR_MT_SMS response containing the User Error "Absent subscriber" with diagnostic "No response to paging", and the process returns to the Null state;~~

- for any other User Error, the VLR relays the User Error in a MAP_SEND_INFO_FOR_MT_SMS response, and the process returns to the Null state.

The mobile terminated short message transfer process in the VLR is shown in figure 23.3/9.

23.3.5 Procedure in the SGSN

Any CAMEL-specific handling defined in this subclause is omitted if the SGSN does not support CAMEL control of MT SMS, or if the subscriber does not have a subscription for CAMEL control of MT SMS.

The process starts when the SGSN receives is triggered by a dialogue opening request with the application context shortMsgMT-RelayContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "Vr" exit, the SGSN handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "OK" exit, the SGSN checks whether the dialogue opening request included a destination reference. If a destination reference was included, the SGSN stores it and waits for a service primitive.

  - if the dialogue with the SMS-GMSC fails, the process returns to the Null state;

  - if the next primitive received is a MAP_DELIMITER indication, the SGSN returns a MAP_DELIMITER request, and waits for a service primitive;

  - if the next primitive received is a MAP_MT_FORWARD_SHORT_MESSAGE indication, the SGSN checks the indication.

    - if the indication is badly formed, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

    - if the indication is OK, the MSC invokes the macro MT_SM_Transfer_SGSN to transfer the short message to the MS.

      - if the macro takes the "Release SMS" exit, the MSC returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

      - if the macro takes the "Error" exit, the SGSN reports the delivery failure to the gsmSCF (if CAMEL handling was invoked) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;

      - if the macro takes the "Abort" exit, the SGSN reports the delivery failure to the gsmSCF (if CAMEL handling was invoked), and the process returns to the Null state;

      - if the macro takes the "OK" exit, the SGSN reports the successful delivery to the gsmSCF (if CAMEL handling was invoked) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".

        - if there are no more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;

        - if there are more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

- When the SGSN is waiting for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC:
  - if the dialogue with the SMS-GMSC fails, the SGSN releases the LLC connection to the MS, and the process returns to the Null state;
  - if it receives a Release indication over the Gb-interface, the SGSN aborts the dialogue with the SMS-GMSC, and the process returns to the Null state;
  - if it receives a MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC, it checks the indication.
    - if the indication is badly formed, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the appropriate user error, and the process returns to the Null state;
    - if the indication is OK, the SGSN checks whether CAMEL handling is required.
      - if CAMEL handling is required, the SGSN calls the procedure CAMEL_T_SMS_INIT to determine whether the delivery should continue, and checks the result.
        - if the result is Release_SMS, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error defined by the gsmSCF, and the process returns to the Null state;
        - if the result is Continue, the SGSN forwards the short message to the MS over the Gb interface, as described below.
      - if CAMEL handling is not required, the SGSN forwards the short message to the MS over the Gb interface, as described below;
    - the SGSN sends a Gb_RP_MT_DATA request to the MS, and waits for the response from the MS.
- When the SGSN is waiting for the response from the MS for delivery of a subsequent short message:
  - if the dialogue with the SMS-GMSC fails, the the SGSN releases the LLC connection to the MS and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the SGSN receives a Release indication over the Gb-interface, the MSC aborts the dialogue with the SMS-GMSC and reports the delivery failure to the gsmSCF (if CAMEL handling is required), and the process returns to the Null state;
  - if the SGSN receives an error response from the MS, it maps the error to a MAP user error, reports the delivery failure to the gsmSCF (if CAMEL handling is required) and returns a MAP_MT_FORWARD_SHORT_MESSAGE response containing the user error, and the process returns to the Null state;
  - if the SGSN receives a positive acknowledgement from the MS, it reports the successful delivery to the gsmSCF (if CAMEL handling is required) and checks whether the MAP_MT_FORWARD_SHORT_MESSAGE indication included the parameter "More messages to send".
    - if there are no more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery and closes the dialogue with the SMS-GMSC, and the process returns to the Null state;
    - if there are more messages to send, the SGSN returns a MAP_MT_FORWARD_SHORT_MESSAGE response indicating successful delivery followed by a MAP_DELIMITER request to maintain the dialogue with the SMS-GMSC, and waits for the next MAP_MT_FORWARD_SHORT_MESSAGE indication from the SMS-GMSC.

The mobile terminated short message transfer process~~dure~~ in the ~~serving~~ SGSN is shown in figure 23.3/10.

The macro MT_SM_Transfer_SGSN is used to transfer the first MT short message of a possible sequence of messages. It is shown in figure 23.3/11.

~~If the SGSN does not support MT SMS, it sets the User Error to "Facility not supported" and the macro takes the "Error" exit.~~

If the SGSN supports MT SMS, it invokes the macro Check_Subscr_Identity_for_SMS.

- if the macro Check_Subscr_Identity_for_SMS takes the "Error" exit, the macro MT_SM_Transfer_SGSN takes the "Error" exit;
- if the macro Check_Subscr_Identity_for_SMS takes the "OK" exit, the SGSN checks the subscription information.
  - if the SGSN has no record for the subscriber, or the subscriber record is marked as not confirmed by the HLR, the SGSN sets the User Error to "Unidentified subscriber", and the macro takes the "Release SMS" exit;
  - if the subscriber is marked as GPRS detached, or service is not allowed in the routeing area where the subscriber is currently registered, the SGSN sets the User Error to "Absent subscriber" with the diagnostic "GPRS detached" and sets the MNRG flag, and the macro takes the "Release SMS" exit.
- if the subscription checks are successful, the SGSN calls the procedure CAMEL_MT_SMS_SGSN, which is specified in 3GPP TS 23.078 [98], and checks the result.
  - if the result is Continue, the SGSN sets the variable CAMEL Handling to False, and continues the processing for the delivery attempt;
  - if the result is CAMEL Handling, the SGSN sets the variable CAMEL Handling to True, calls the procedure CAMEL_T_SMS_INIT and checks the result.
    - if the result is Release_SMS, the SGSN sets the User Error according to the instructions from the gsmSCF, and the macro takes the "Release SMS" exit;
    - if the result is Continue, the SGSN continues the processing for the delivery attempt.
- the SGSN checks whether the location of the MS is known, and whether the location is confirmed by radio contact.
  - if the location is known and confirmed by radio contact, the SGSN calls the procedure Page_SMS_SGSN and checks the result;
  - if the location is not known, or not confirmed by radio contact, the SGSN calls the procedure Search_SMS_SGSN and checks the result.
- if the procedure Page_SMS_SGSN or the procedure Search_SMS_SGSN returns a Fail result, the SGSN checks the error cause.
  - if the error cause is Absent Subscriber, the SGSN sets the User Error to "Absent Subscriber" with the diagnostic "No response to paging" and sets the MNRG flag, and the macro takes the "Error" exit;
  - for any other error, the SGSN sets the User Error accordingly, and the macro takes the "Error" exit.
- if the procedure Page_SMS_SGSN or the procedure Search_SMS_SGSN returns a Fail result, the SGSN checks whether the MS supports SMS.
  - if the MS does not support SMS, the SGSN releases the LLC connection and sets the User Error to "SM delivery failure" with delivery failure cause "Equipment not SM equipped", and the macro takes the "Error" exit;
  - if the MS supports SMS, the SGSN forwards the short message to the MS, and waits for a response from the MS.
    - if the MS returns an error, the SGSN sets the User Error according to the response from the MS, and the macro takes the "Error" exit;
    - if the MS returns a positiva acknowledgement, the macro takes the "OK" exit;
    - if the LLC connection is released, the SGSN sets the User Error to "System failure", and the macro takes the "Error" exit;

- ~~if the dialogue with the SMS-GMSC fails, the SGSN releases the LLC connection, and the macro takes the "Abort" exit.~~

~~The macro MT_SM_Transfer_SGSN is shown in figure 23.3/11~~

The macro Check_Subscr_Identity_For_MT_SMS is shown in figure 23.3/8. The page and search procedures are shown in figures 23.3/12 and 23.3/13.

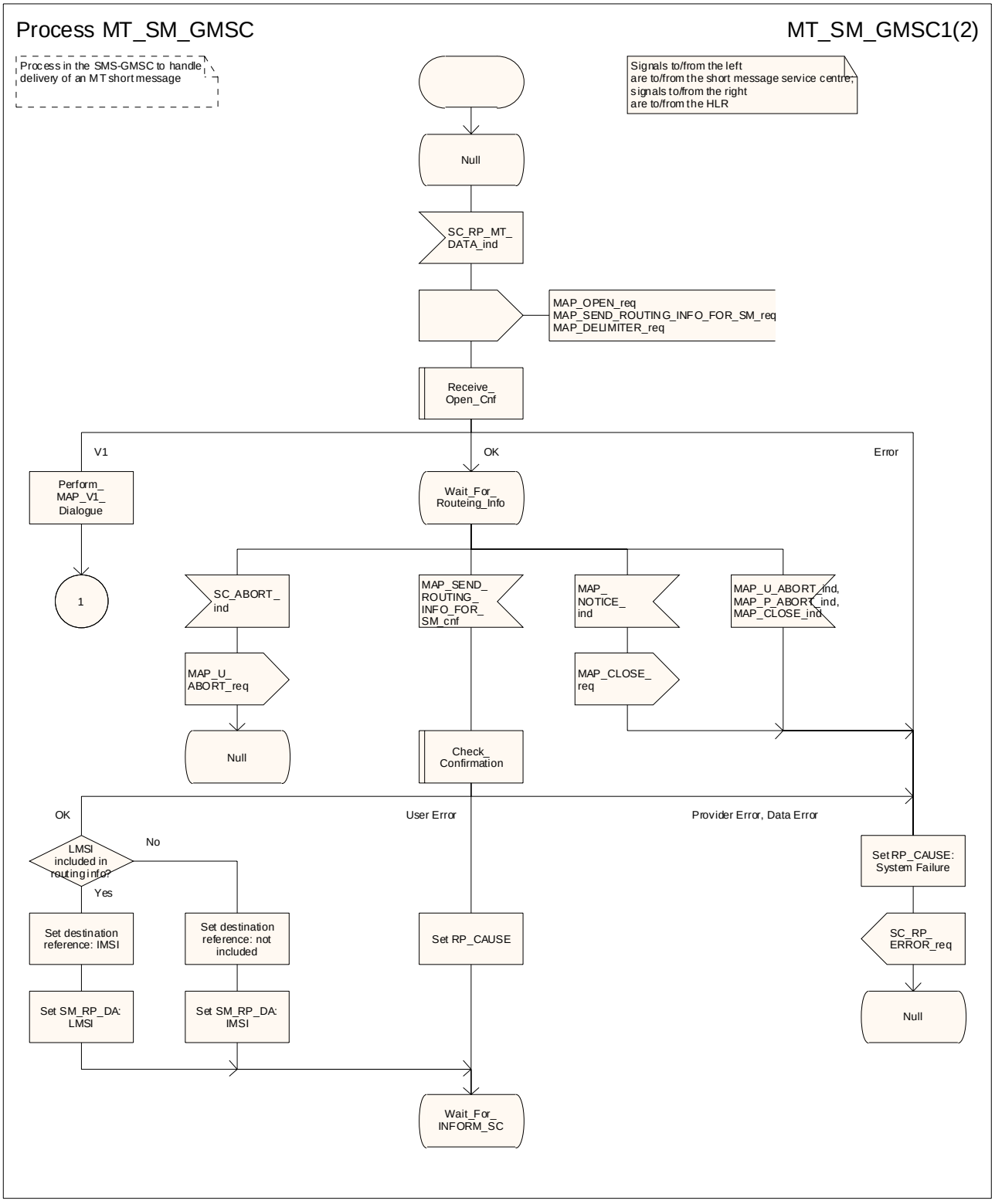


Figure 23.3/3 (sheet 1 of 2): Process MT_SM_GMSC

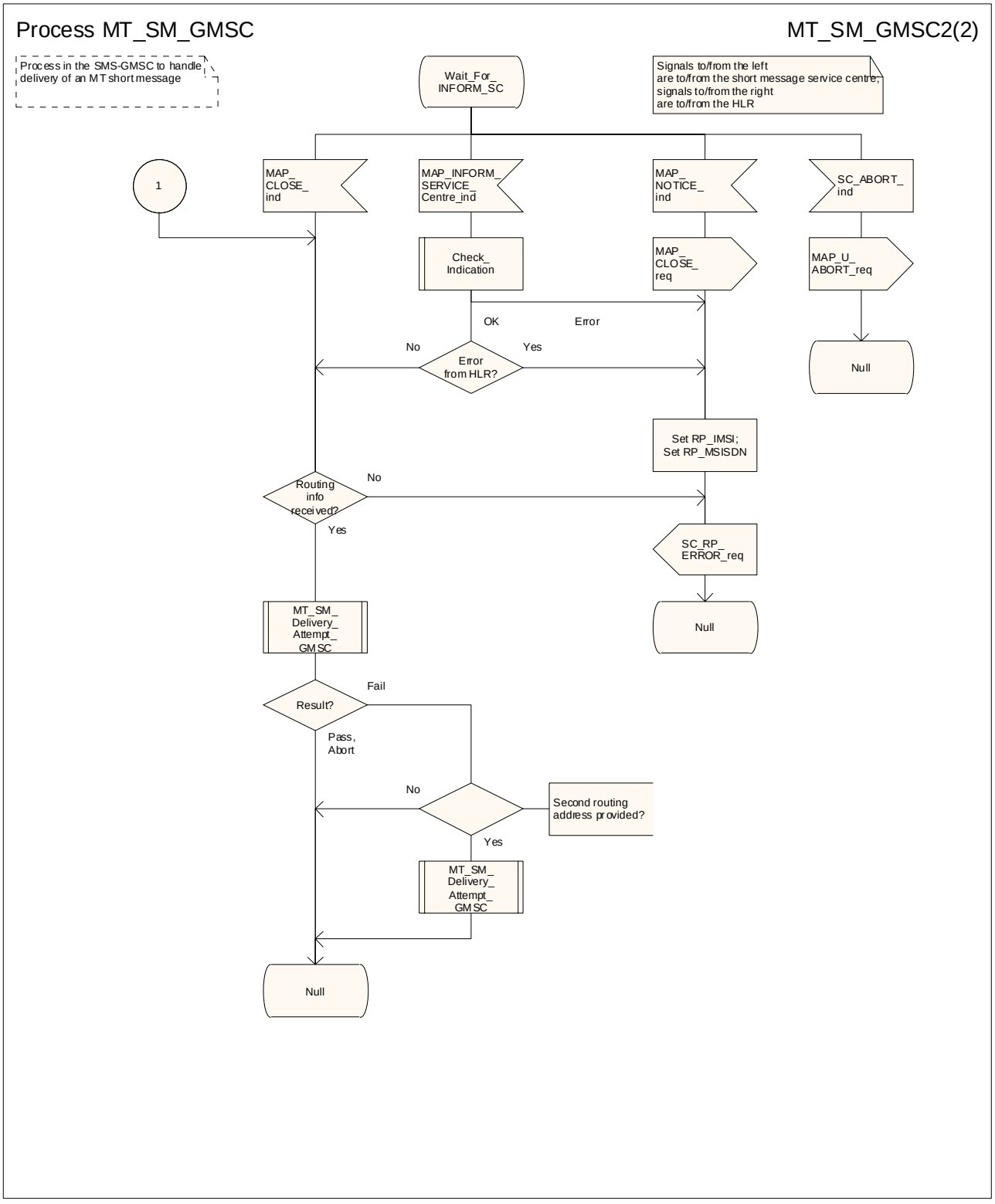


Figure 23.3/3 (sheet 2 of 2): Process MT_SM_GMSC

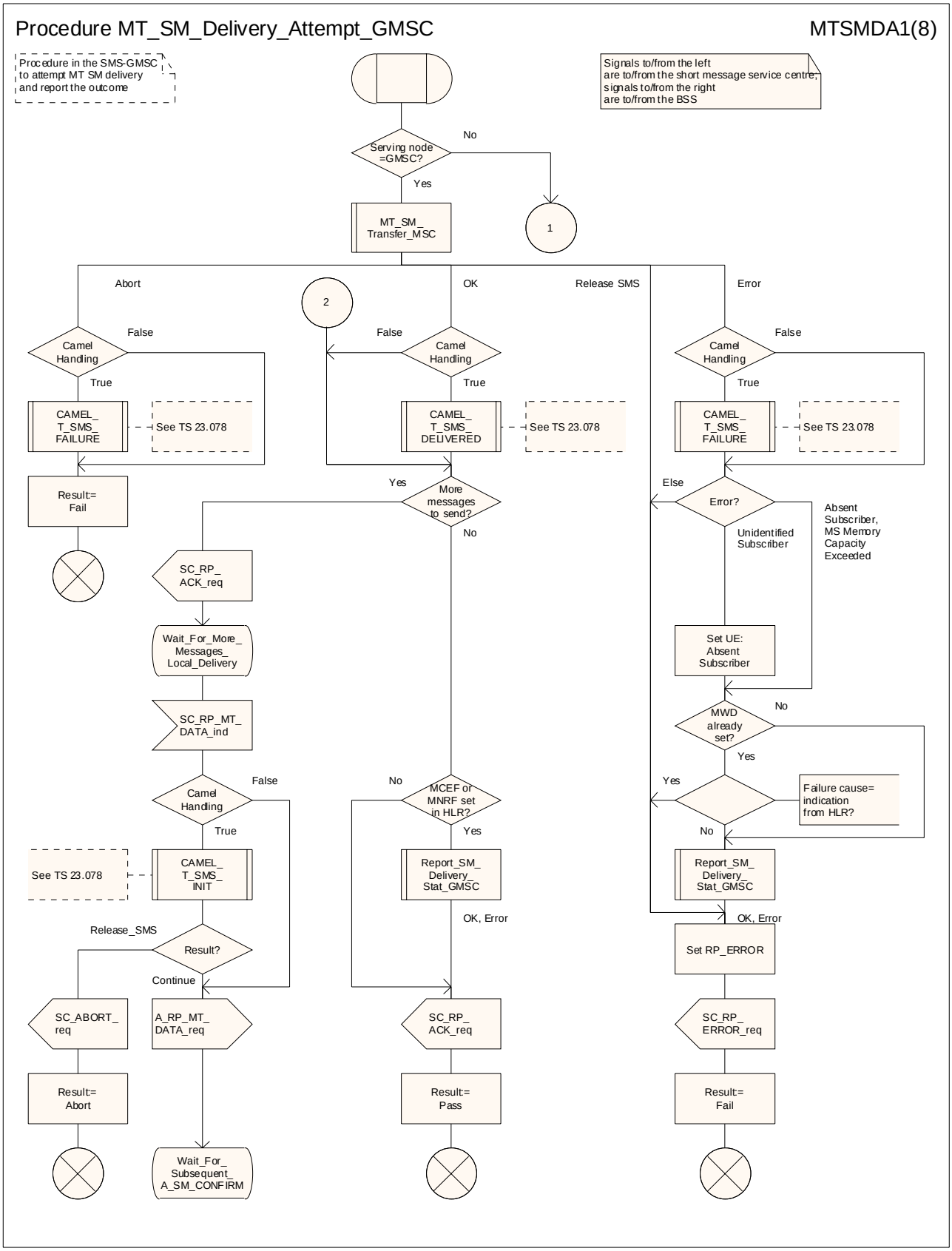


Figure 23.3/4 (sheet 1 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

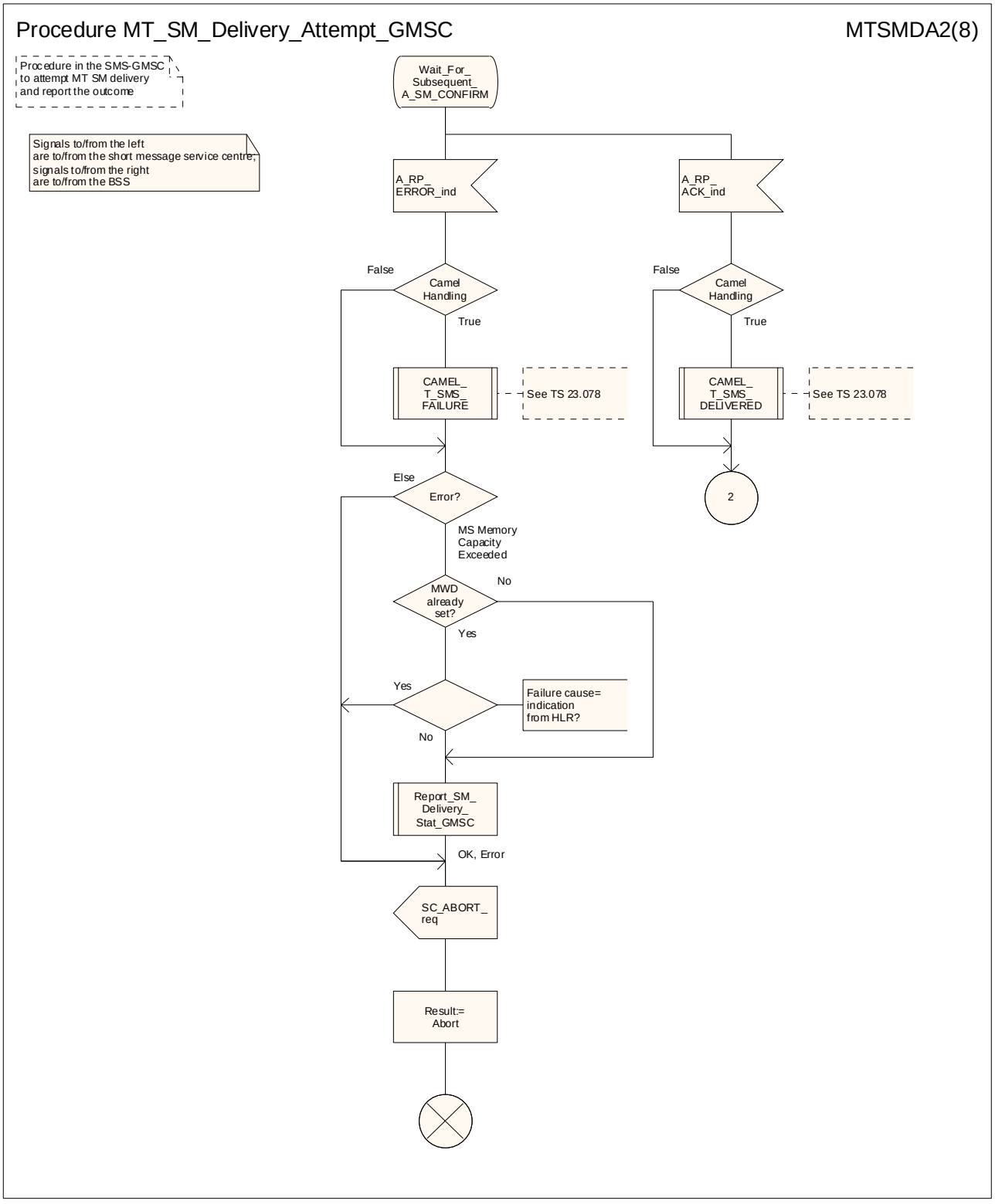


Figure 23.3/4 (sheet 2 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

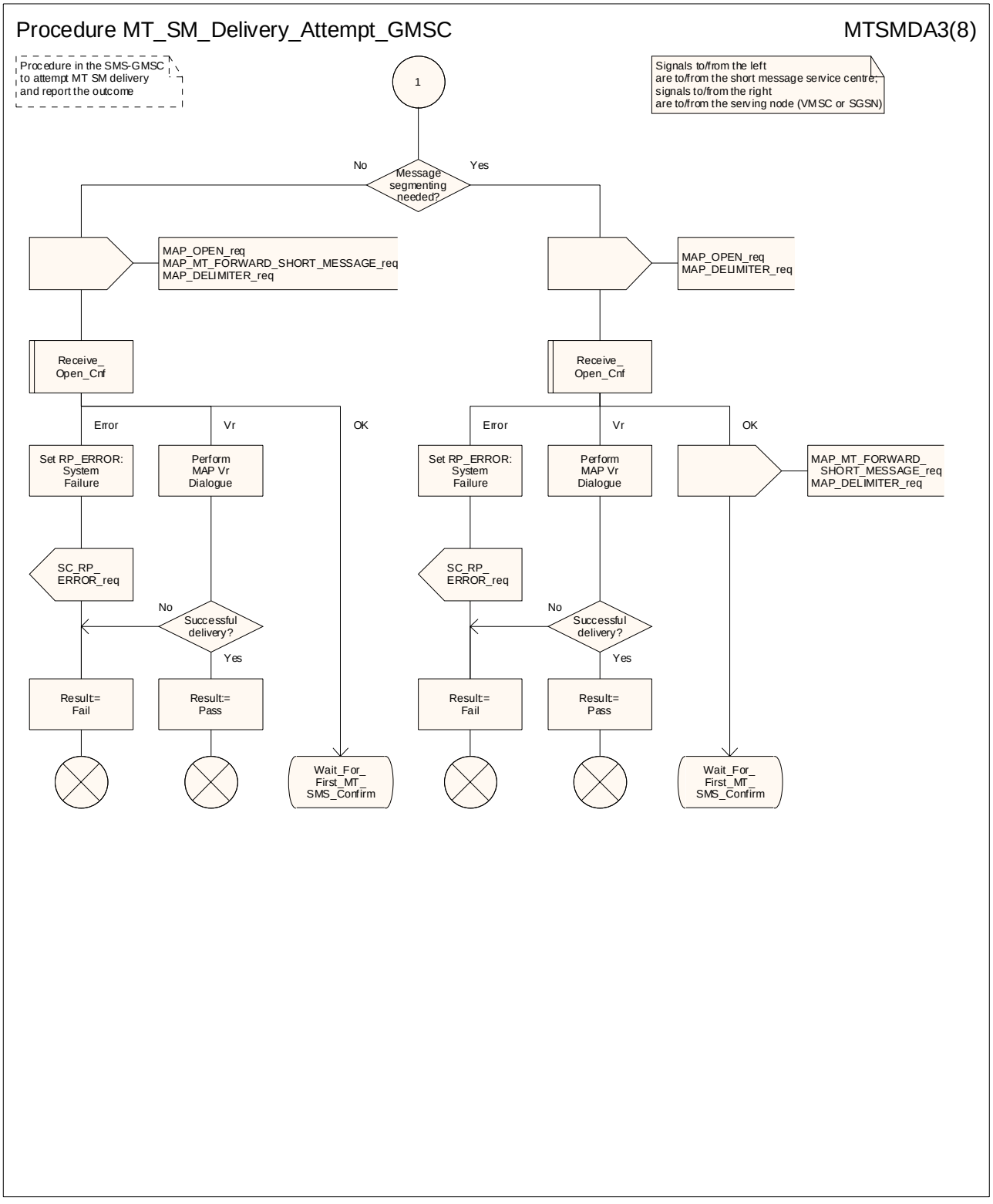


Figure 23.3/4 (sheet 3 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

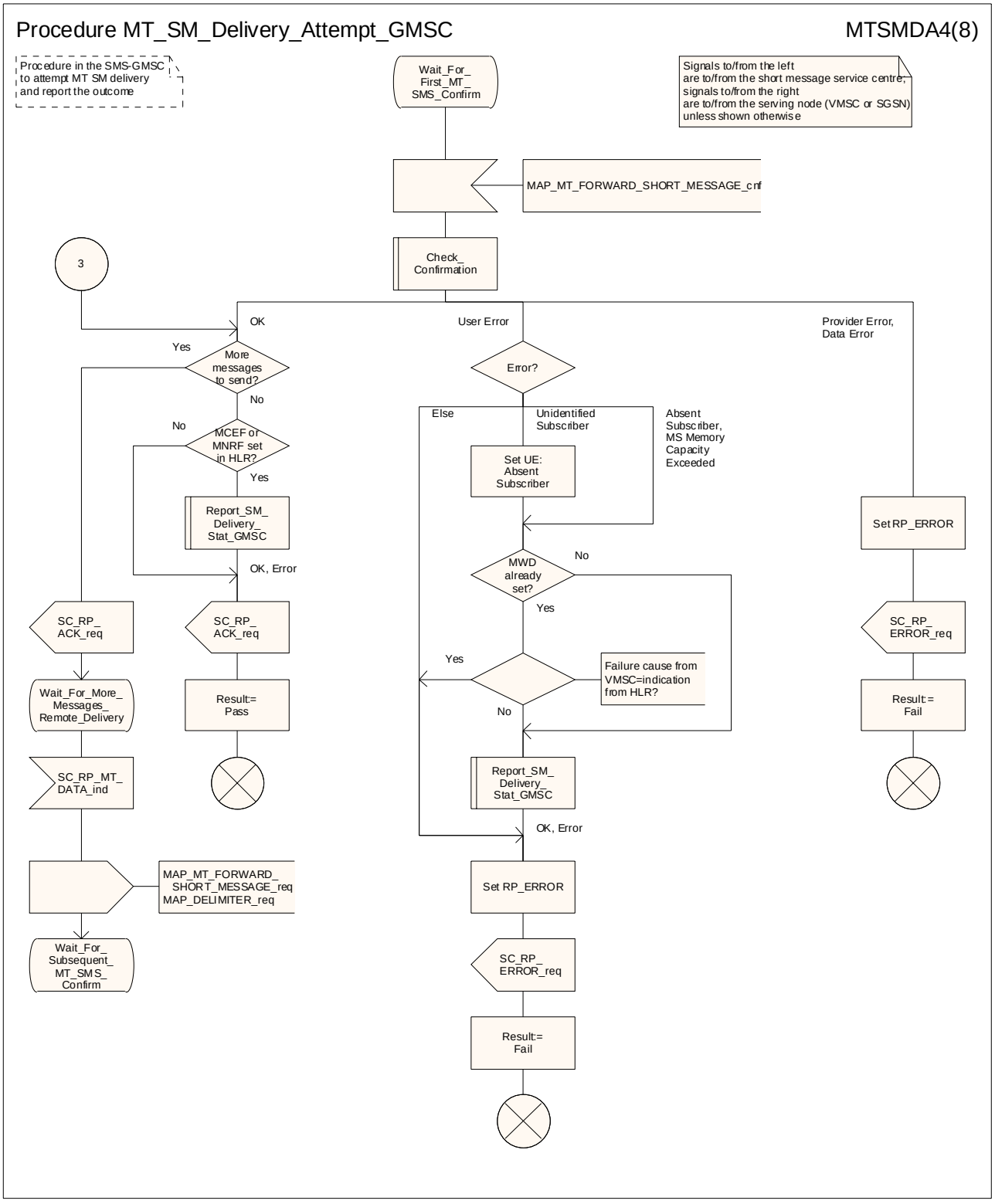


Figure 23.3/4 (sheet 4 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

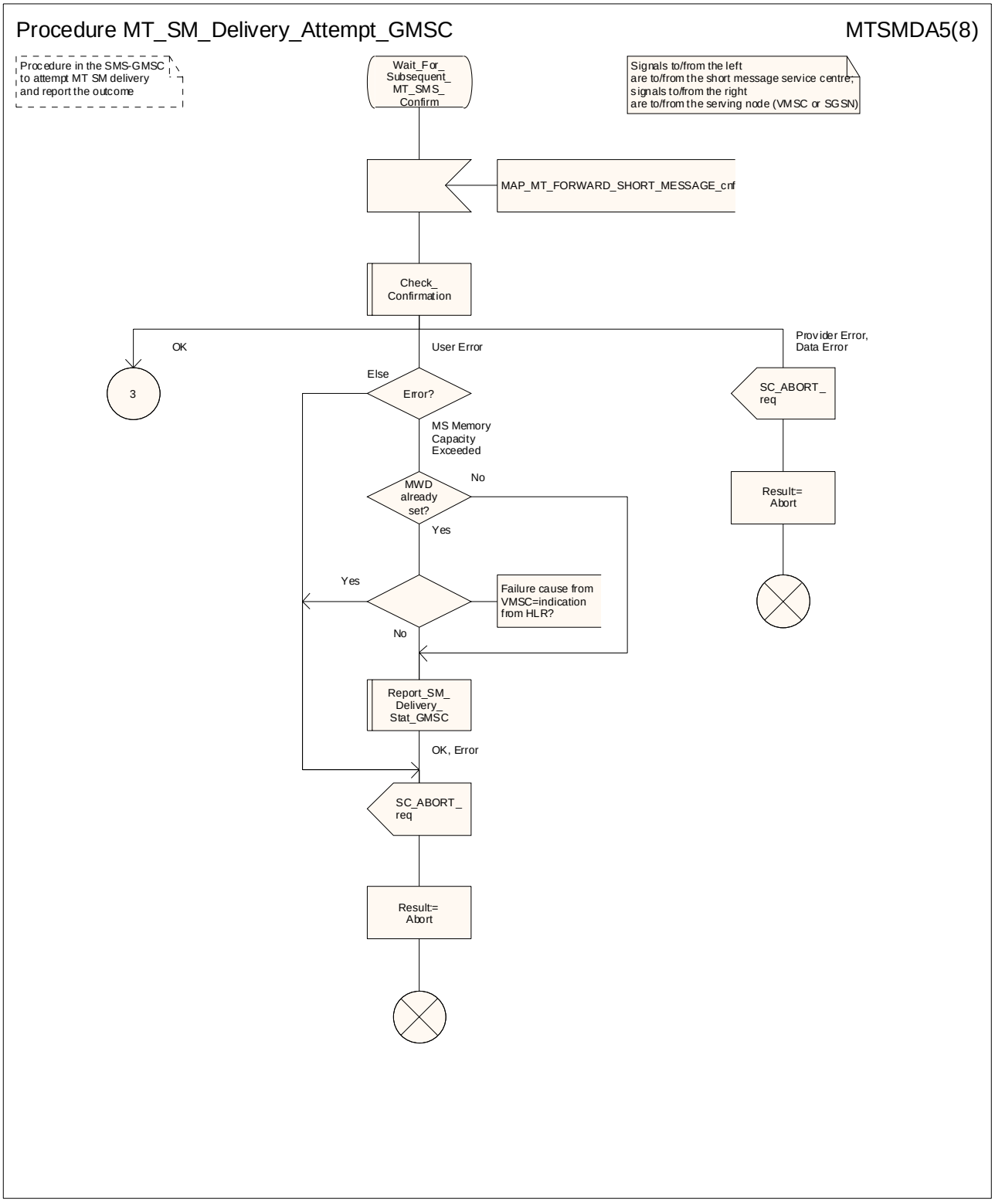


Figure 23.3/4 (sheet 5 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

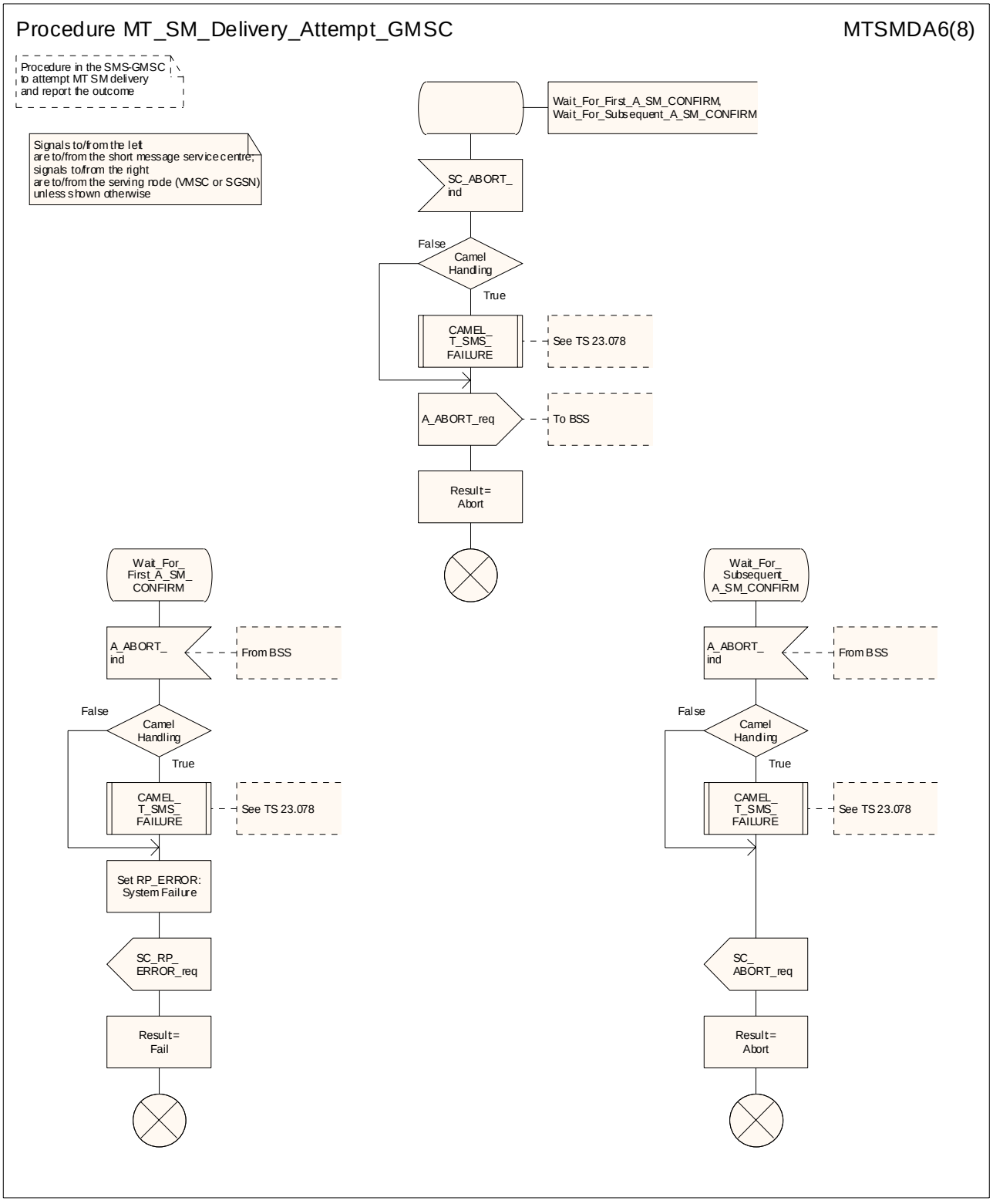


Figure 23.3/4 (sheet 6 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

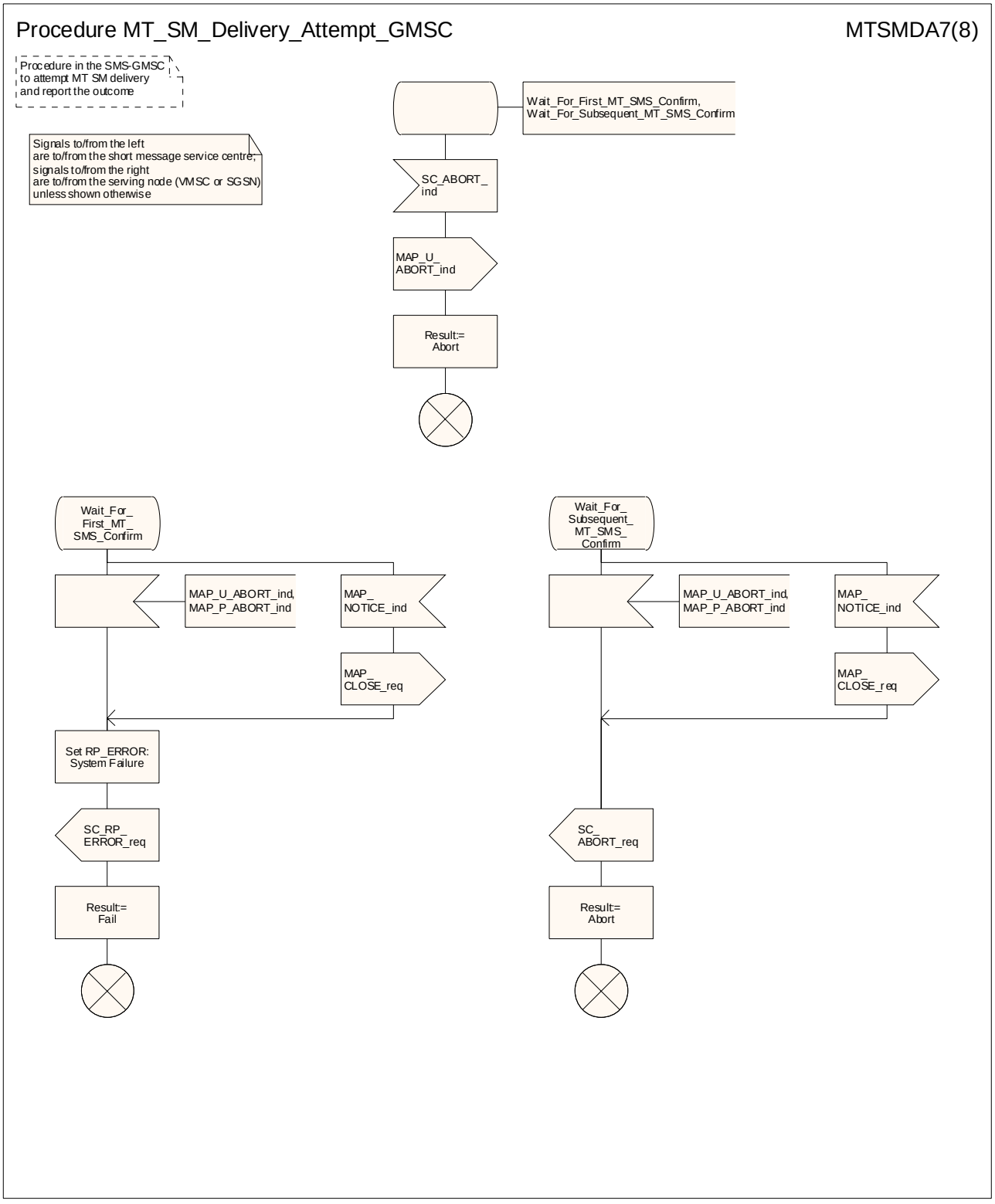


Figure 23.3/4 (sheet 7 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

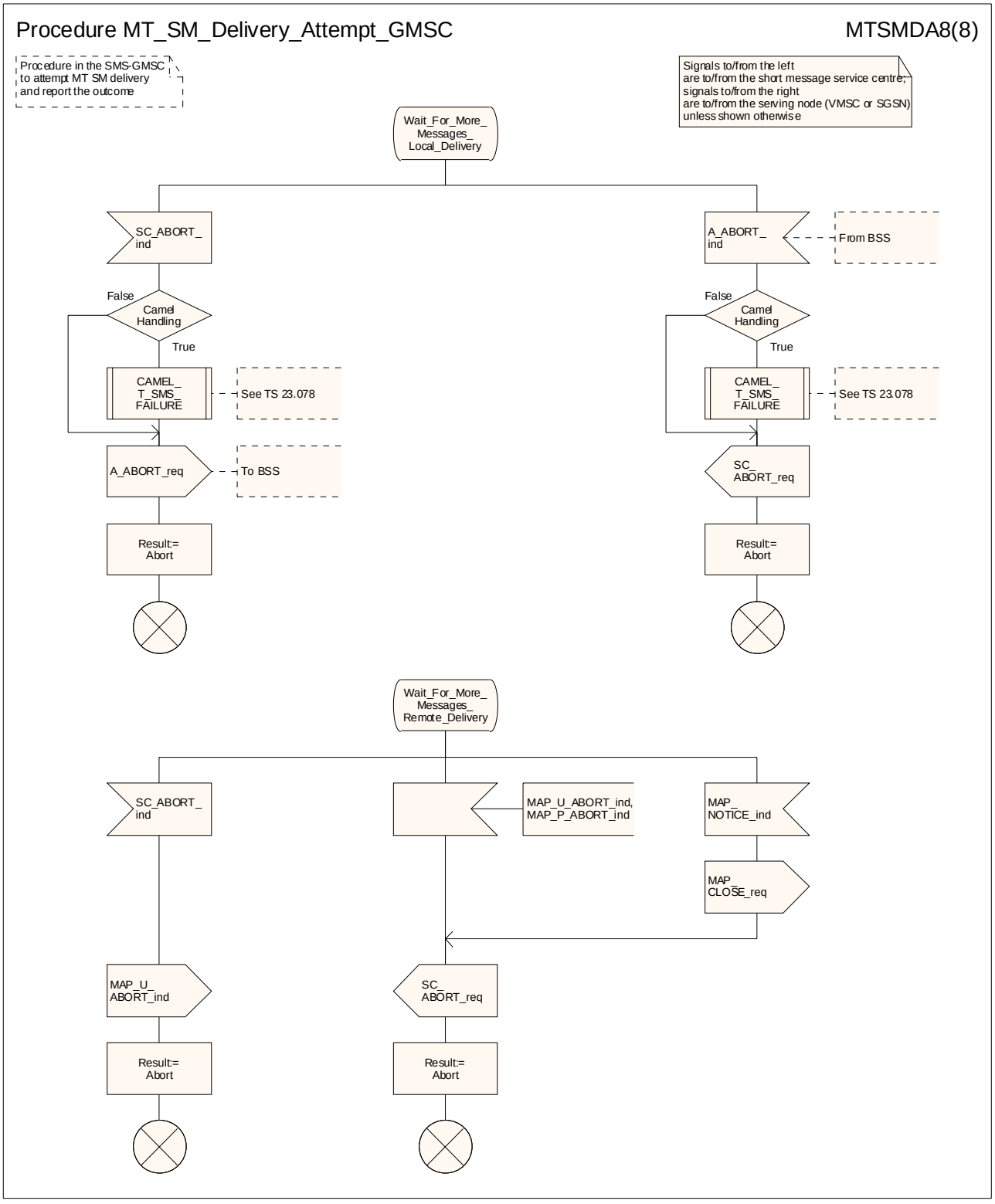


Figure 23.3/4 (sheet 8 of 8): Procedure MT_SM_Delivery_Attempt_GMSC

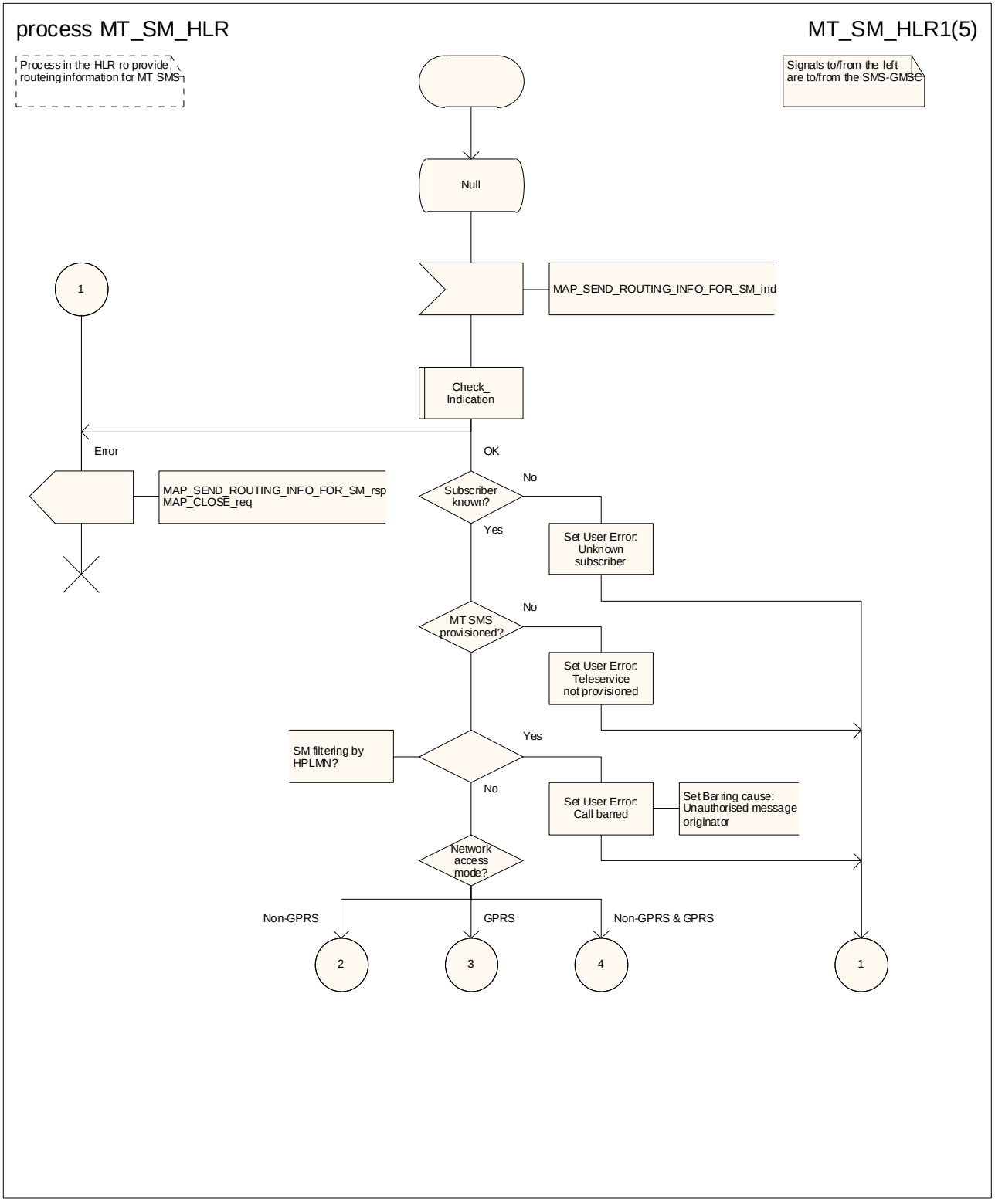


Figure 23.3/5 (sheet 1 of 5): Process MT_SM_HLR

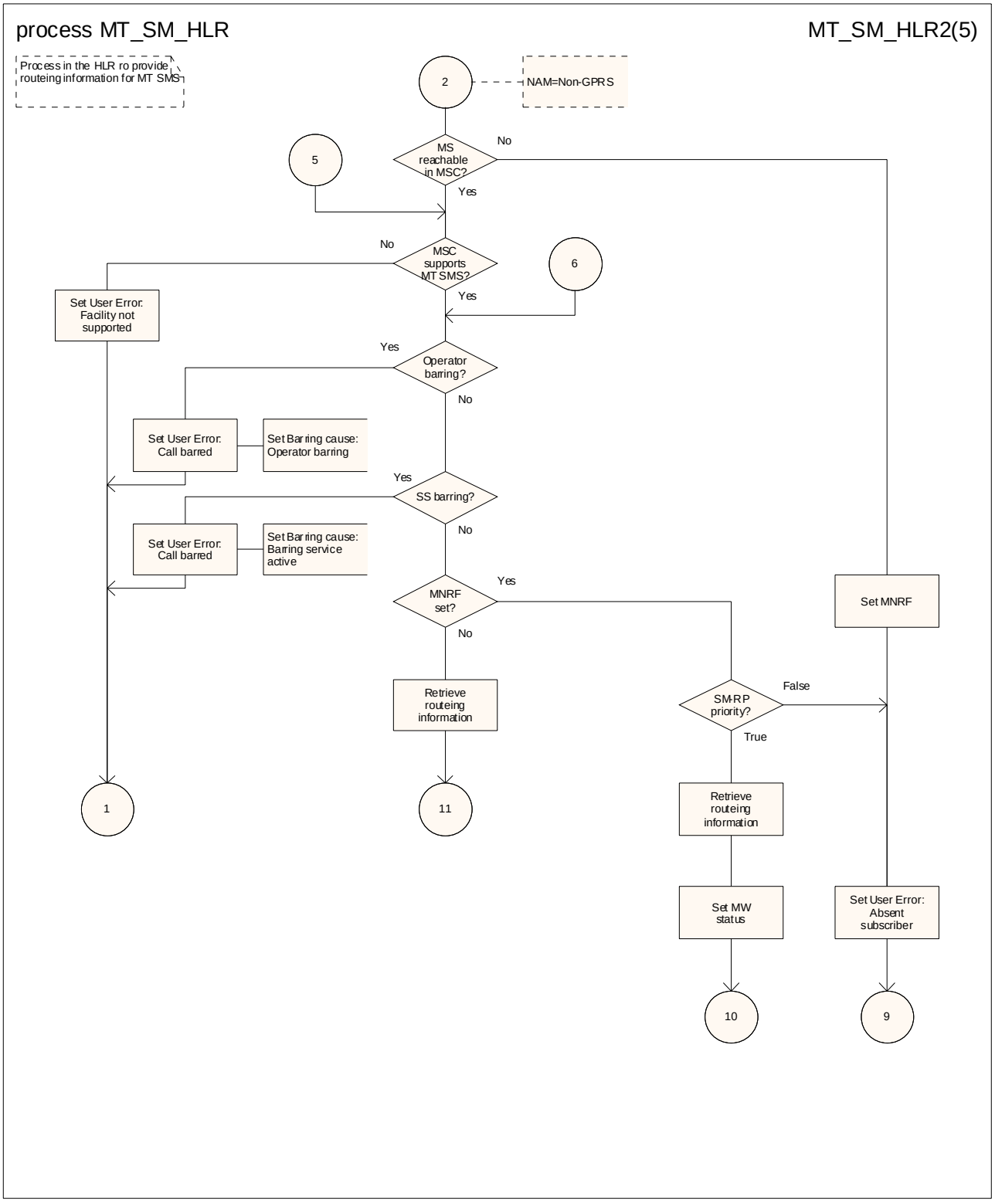


Figure 23.3/5 (sheet 2 of 5): Process MT_SM_HLR

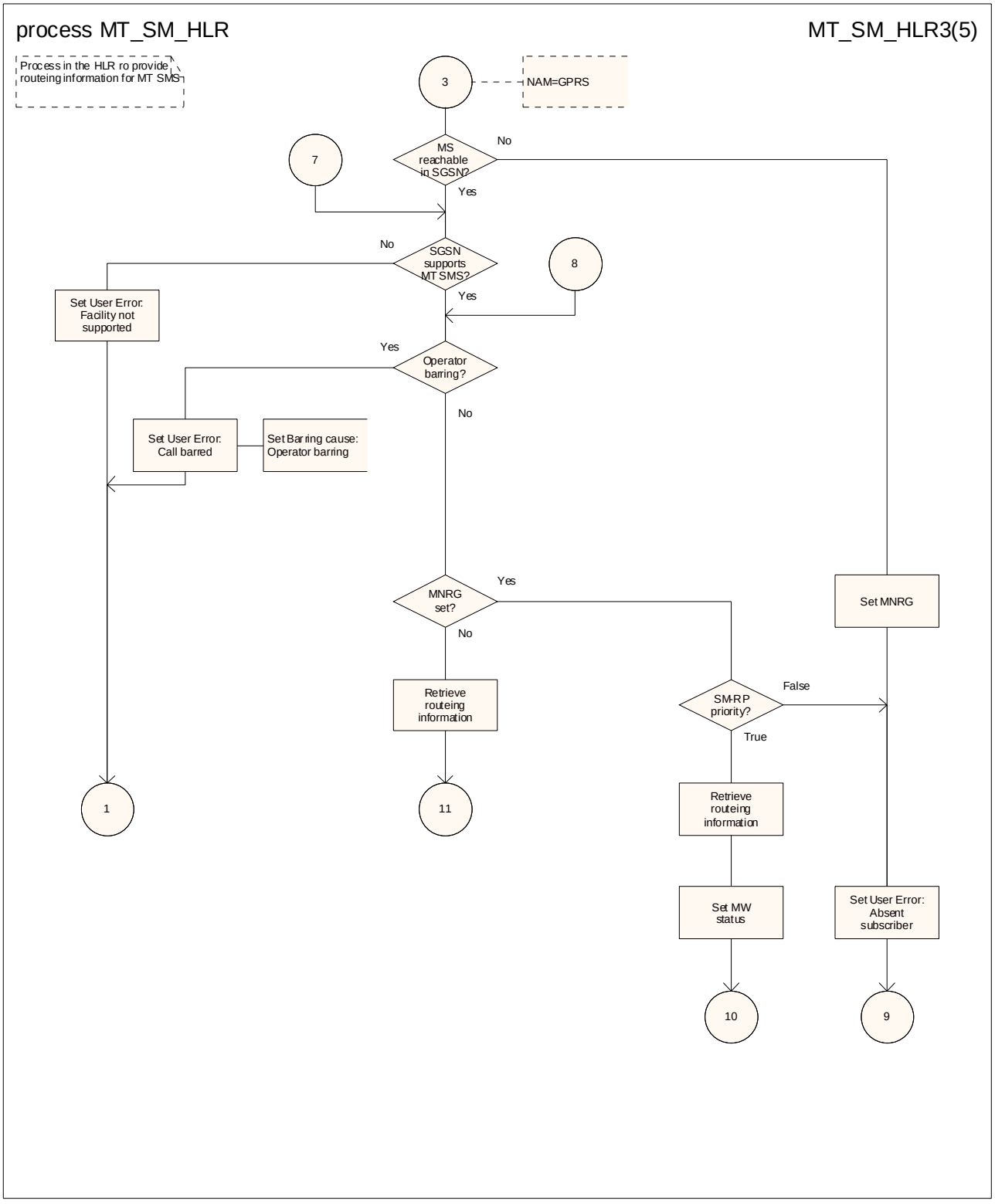


Figure 23.3/5 (sheet 3 of 5): Process MT_SM_HLR

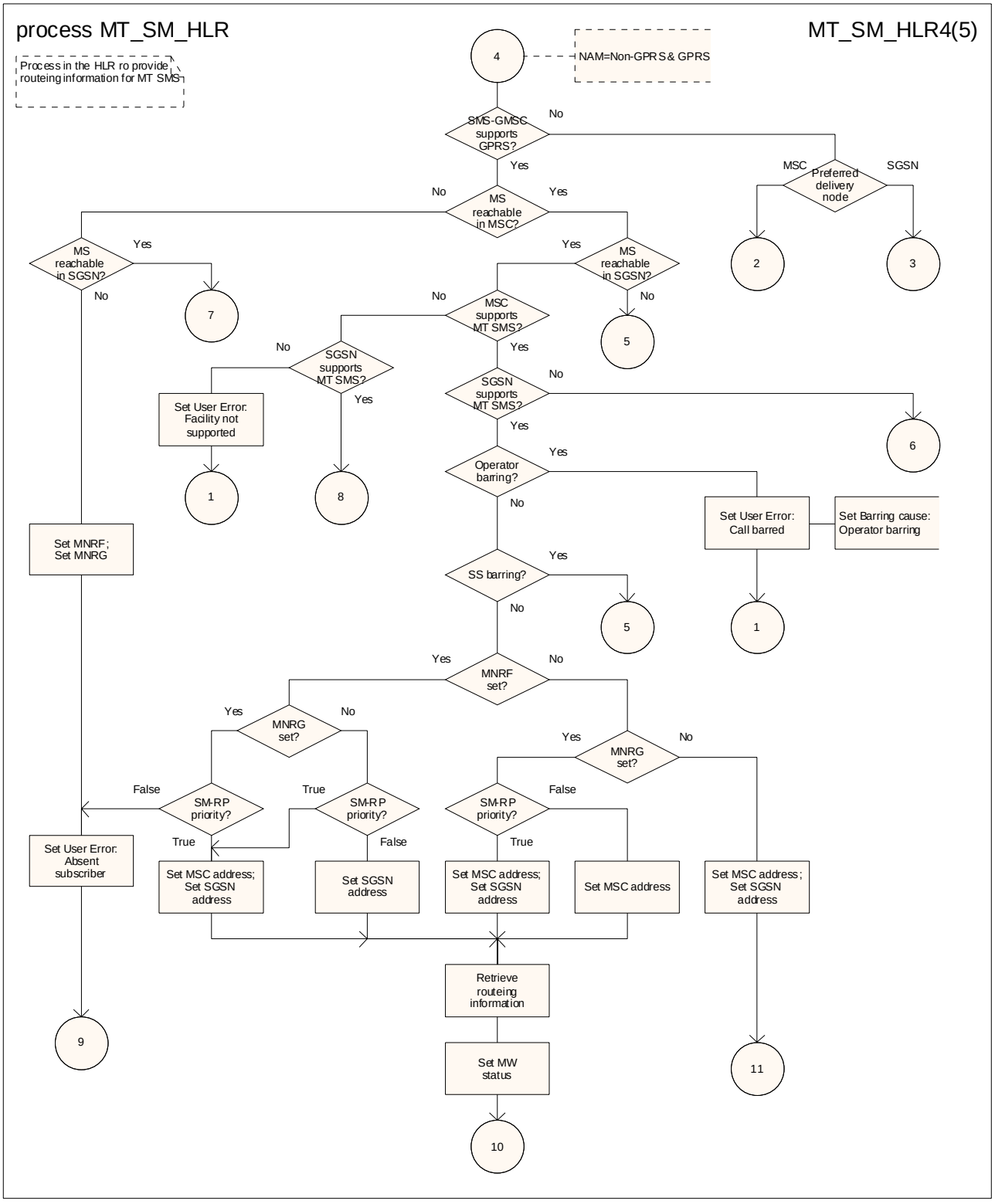


Figure 23.3/5 (sheet 4 of 5): Process MT_SM_HLR

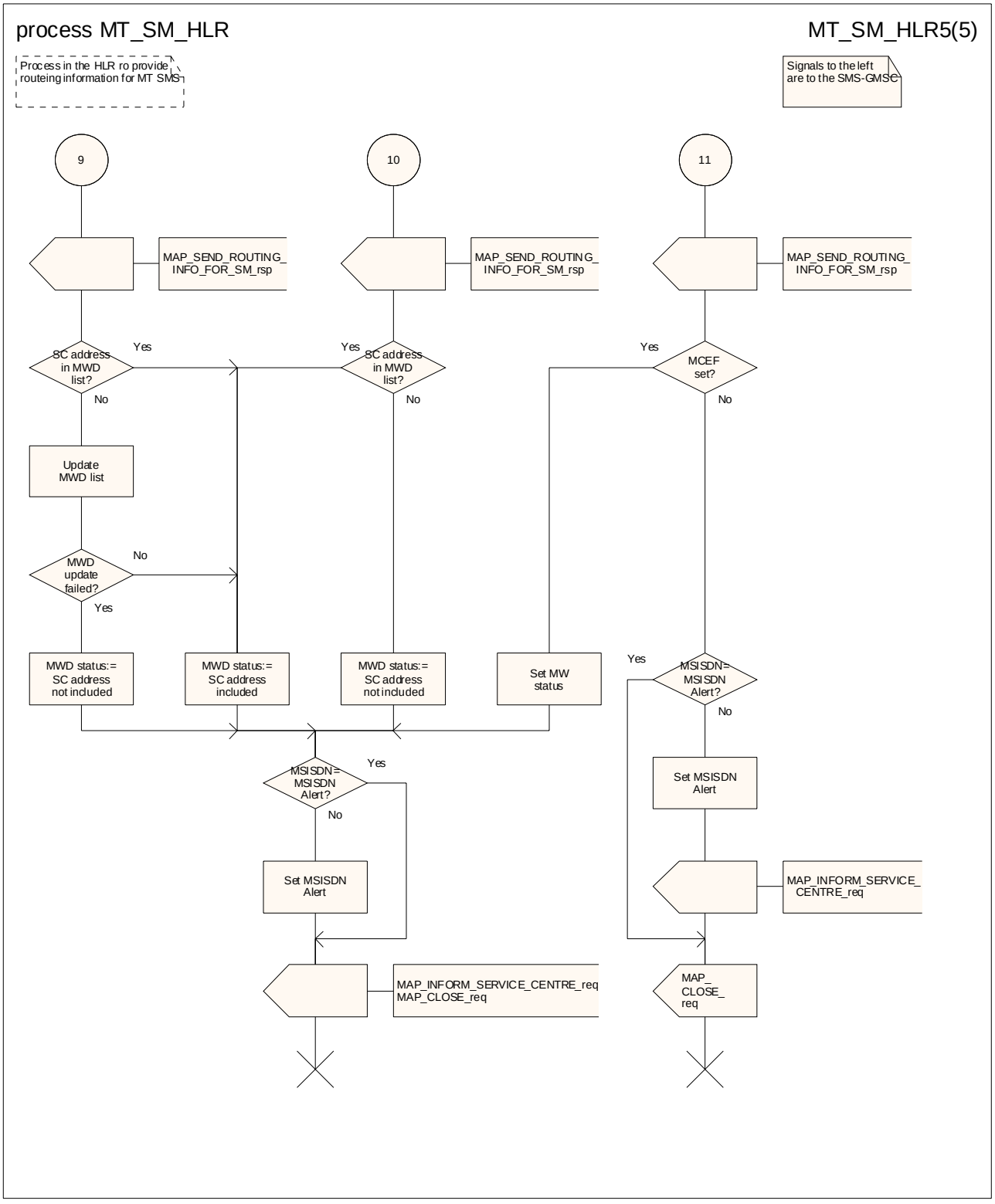


Figure 23.3/5 (sheet 5 of 5): Process MT_SM_HLR

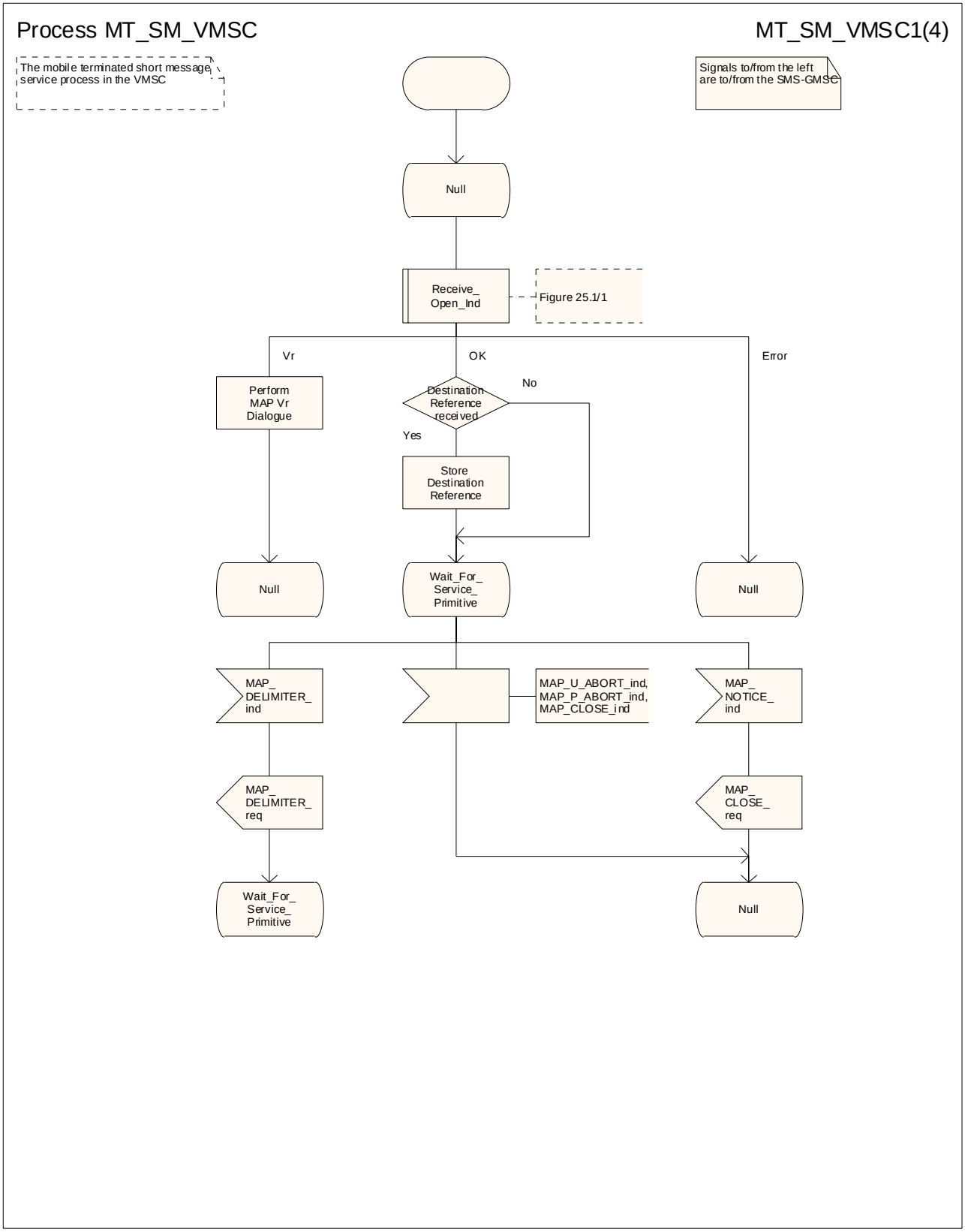


Figure 23.3/6 (sheet 1 of 4): Procedure MT_SM_VMSC

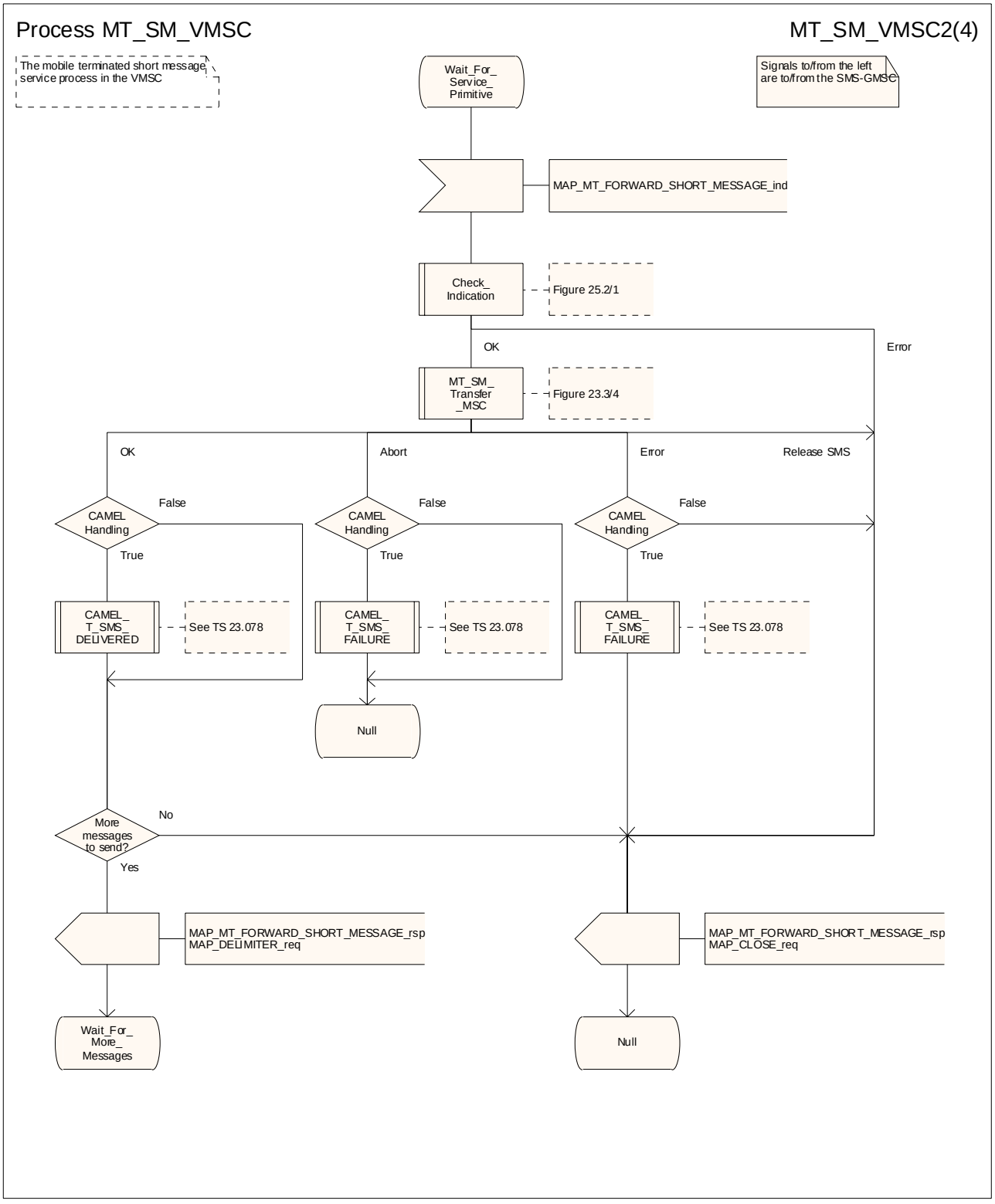


Figure 23.3/6 (sheet 2 of 4): Procedure MT_SM_VMSC

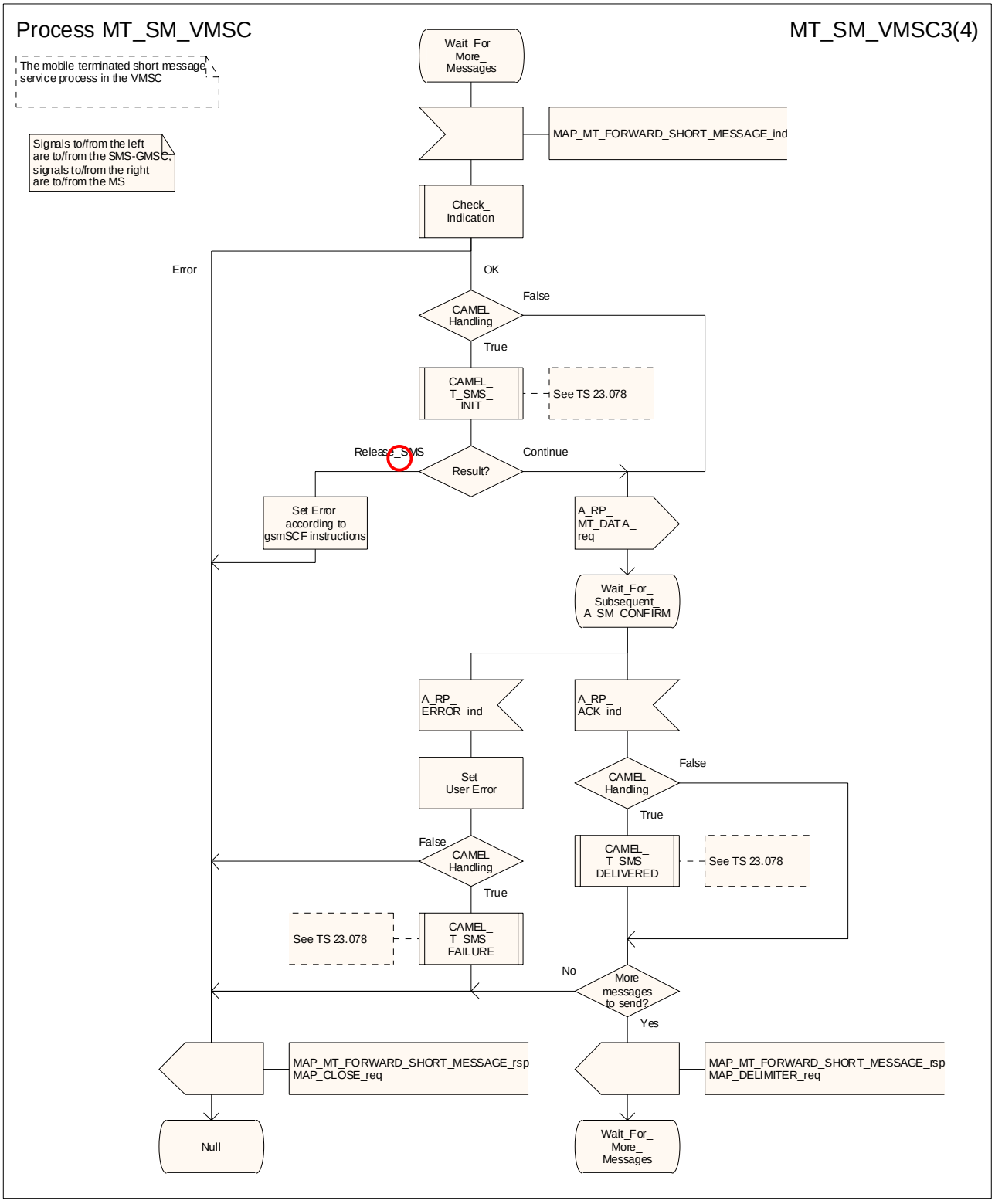


Figure 23.3/6 (sheet 3 of 4): Procedure MT_SM_VMSC

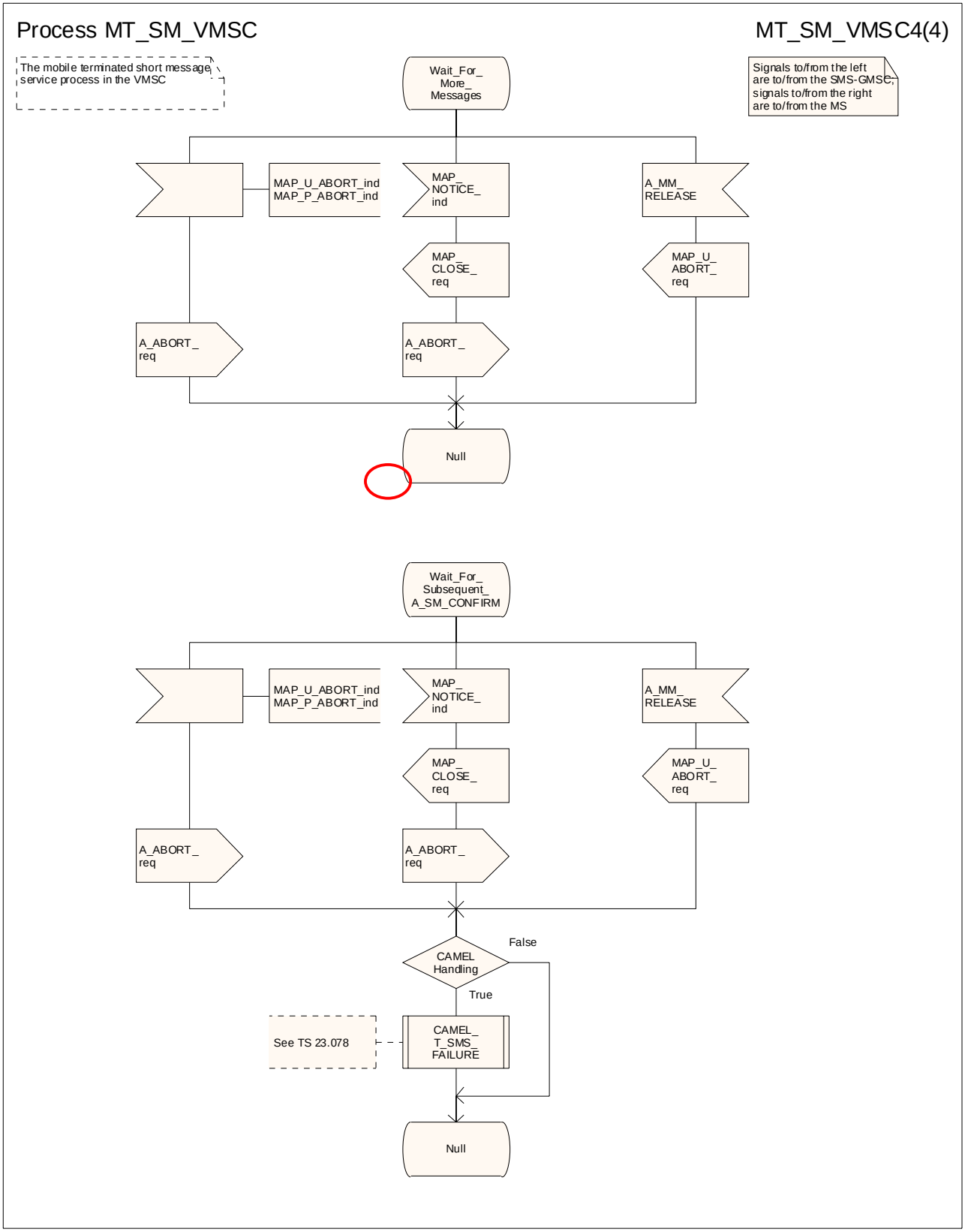


Figure 23.3/6 (sheet 4 of 4): Procedure MT_SM_VMSC

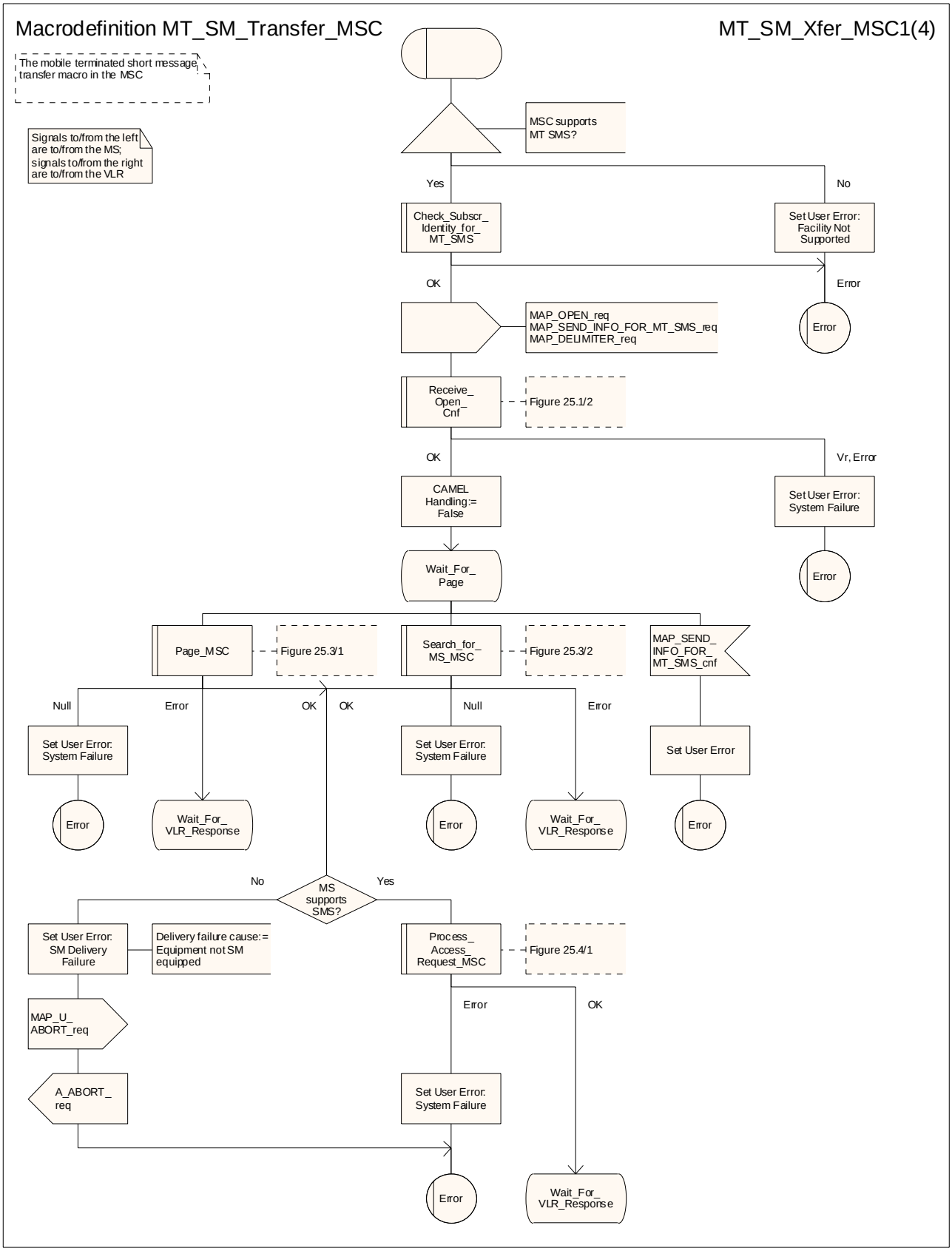


Figure 23.3/7 (sheet 1 of 4): Macro MT_SM_Transfer_MSC

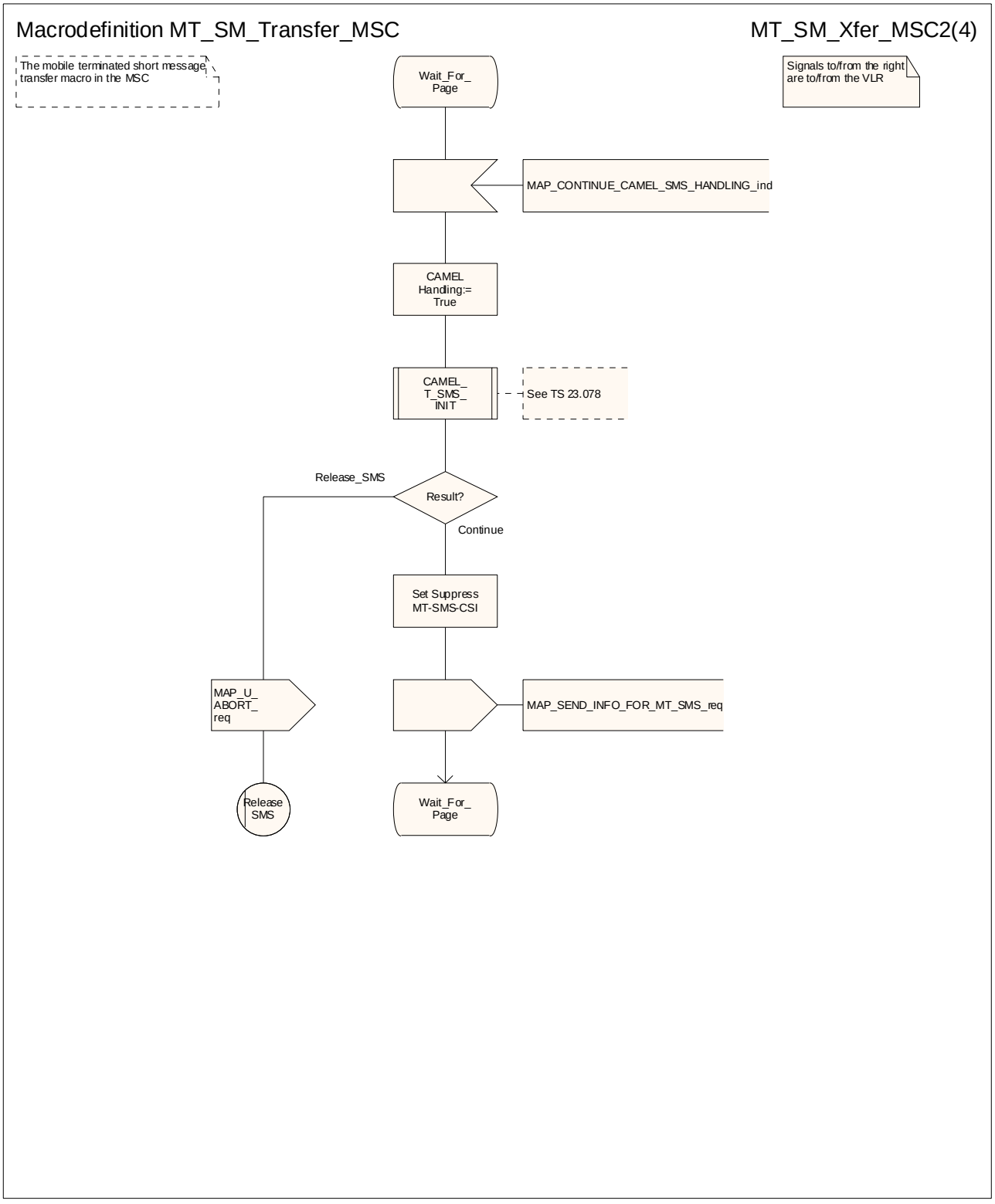


Figure 23.3/7 (sheet 2 of 4): Macro MT_SM_Transfer_MSC

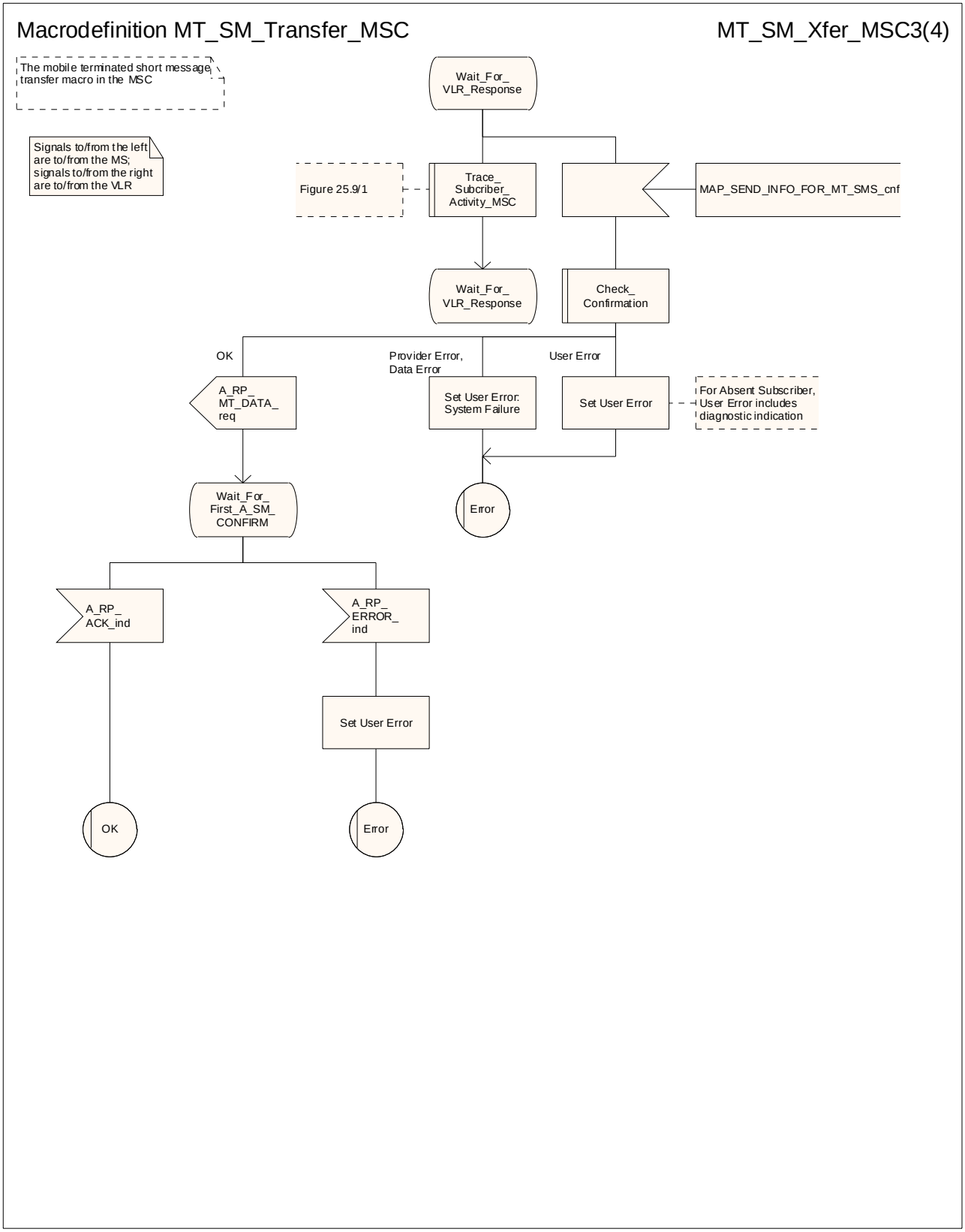


Figure 23.3/7 (sheet 3 of 4): Macro MT_SM_Transfer_MSC

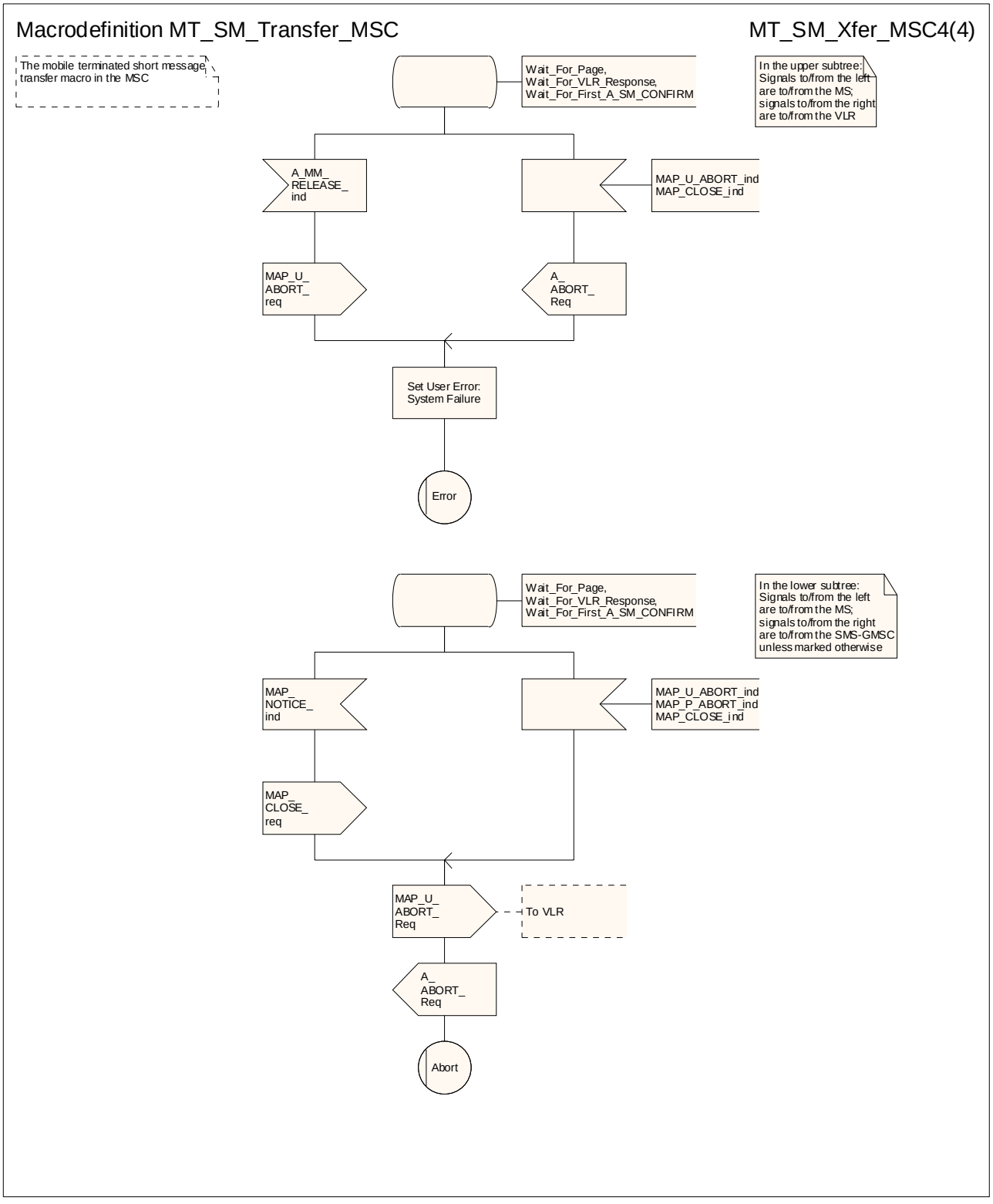


Figure 23.3/7 (sheet 4 of 4): Macro MT_SM_Transfer_MSC

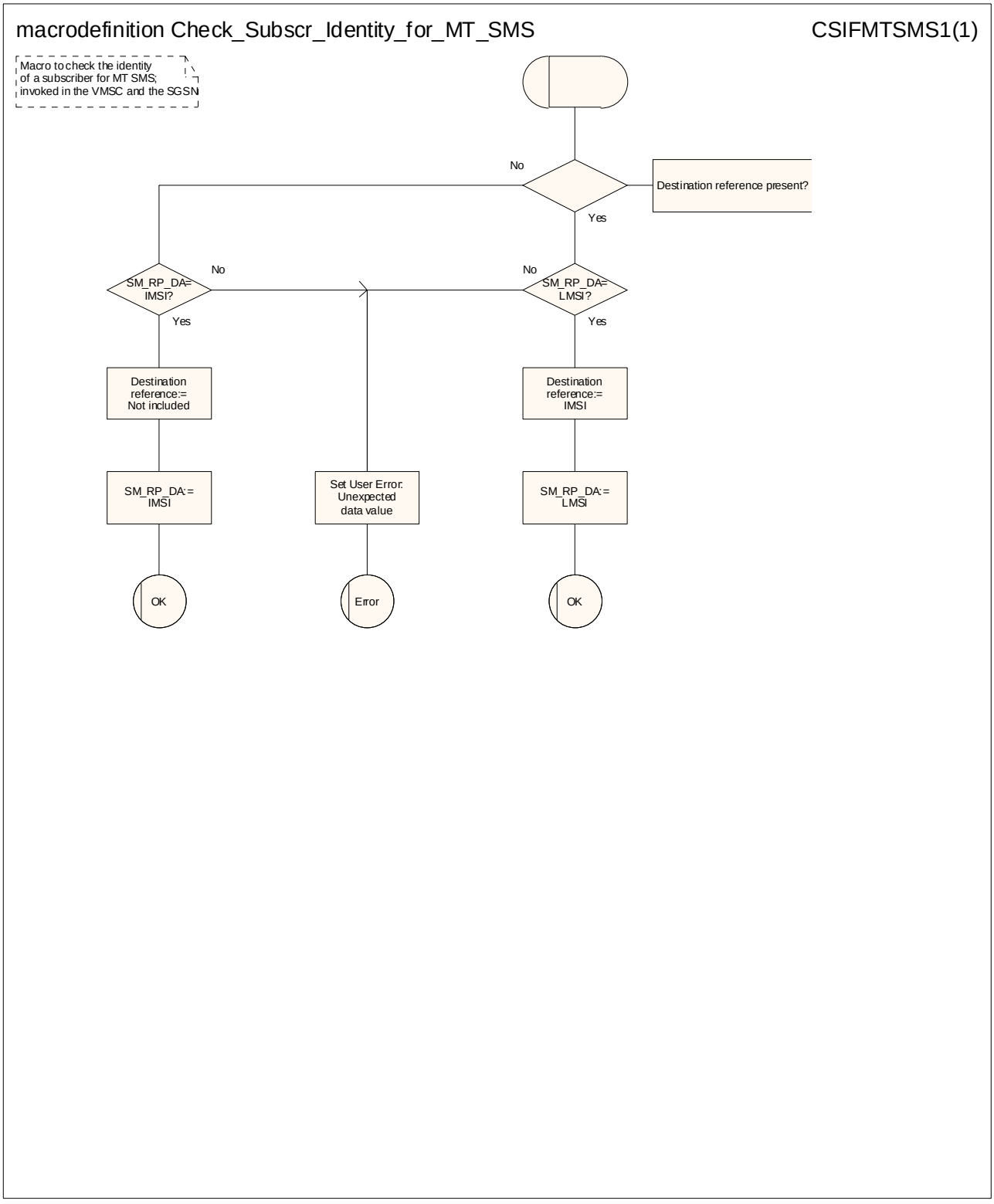


Figure 23.3/8: Macro Check_Subscr_Identity_For_MT_SMS

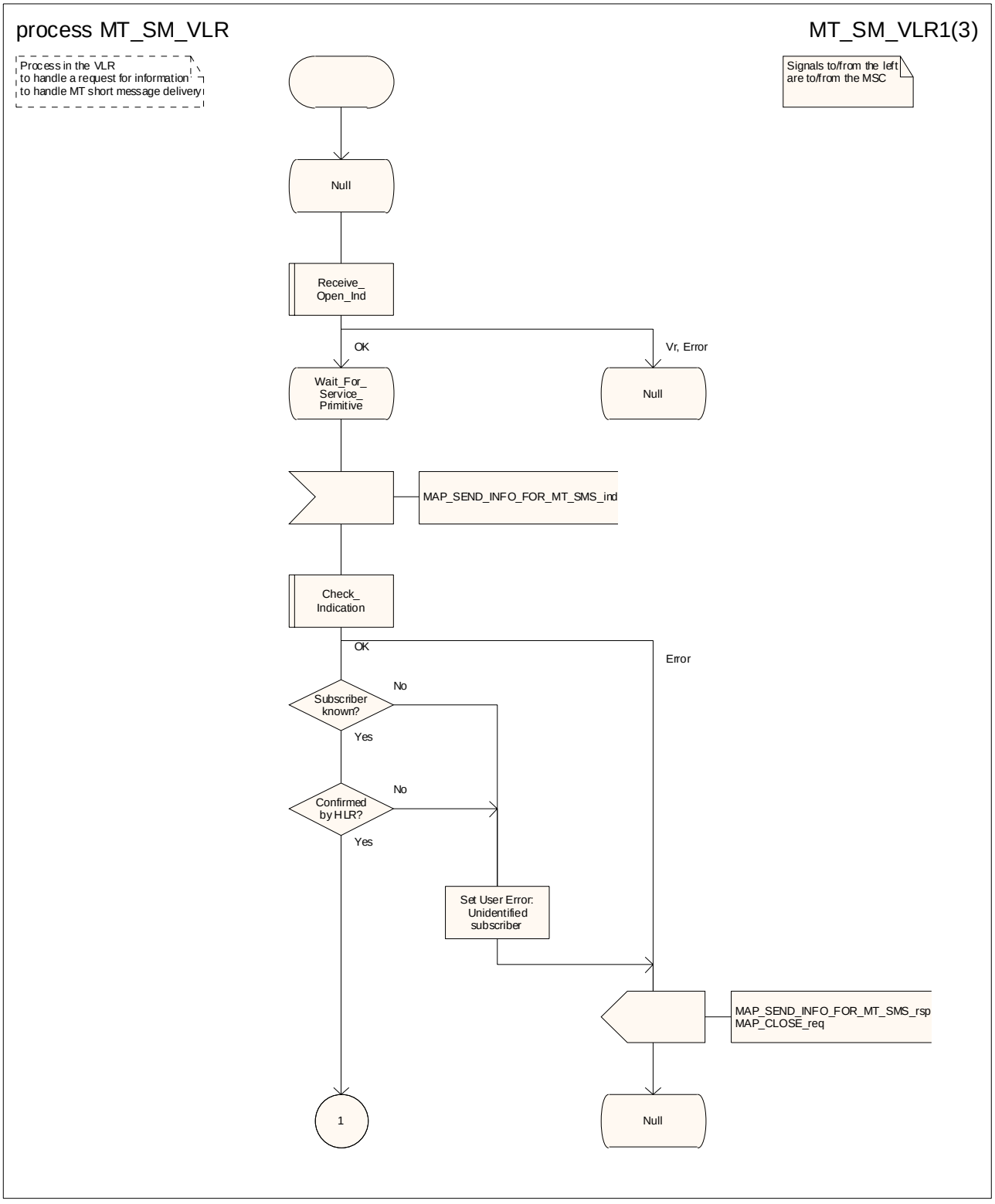


Figure 23.3/9 (sheet 1 of 3): Process MT_SM_VLR

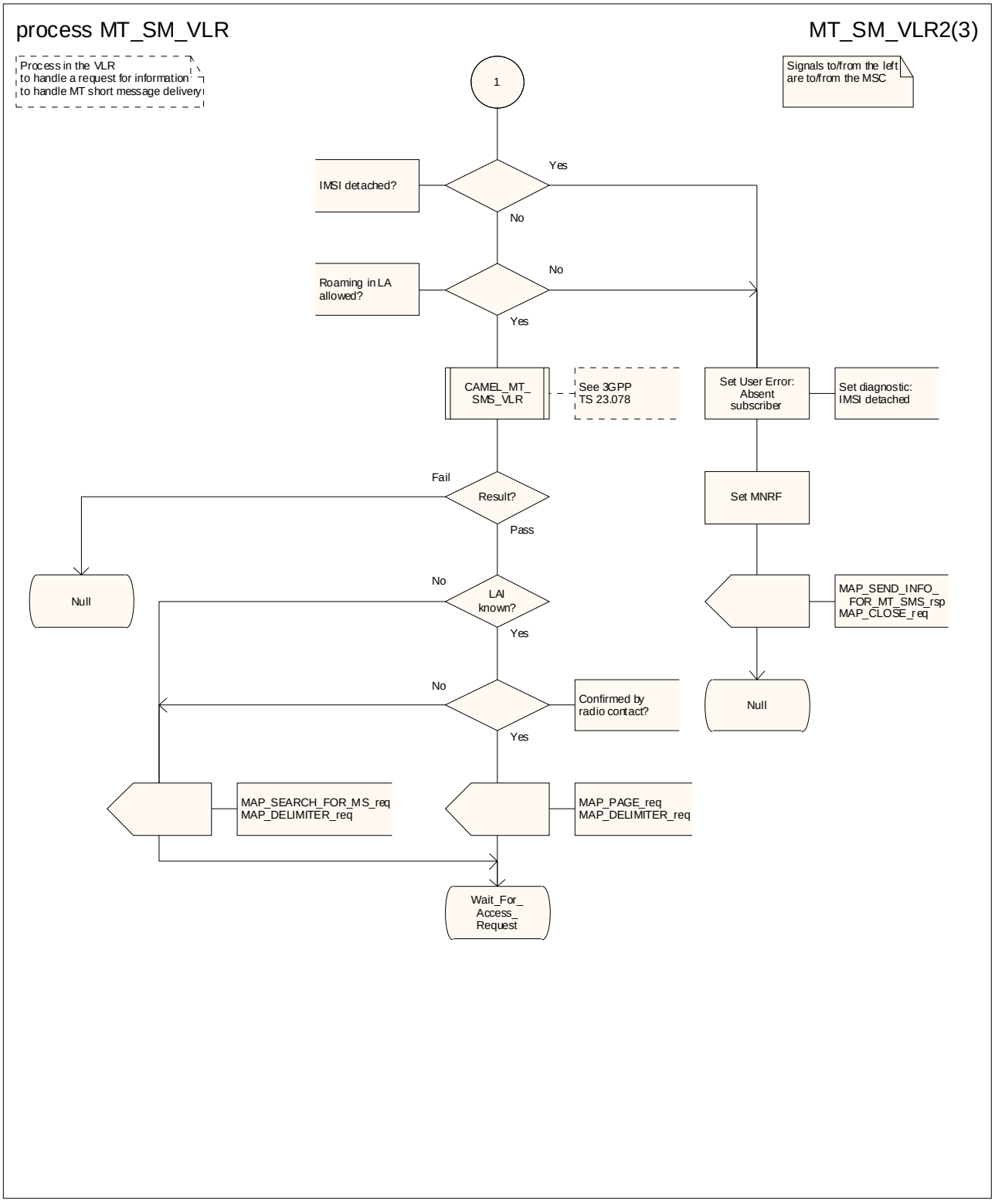


Figure 23.3/9 (sheet 2 of 3): Process MT_SM_VLR

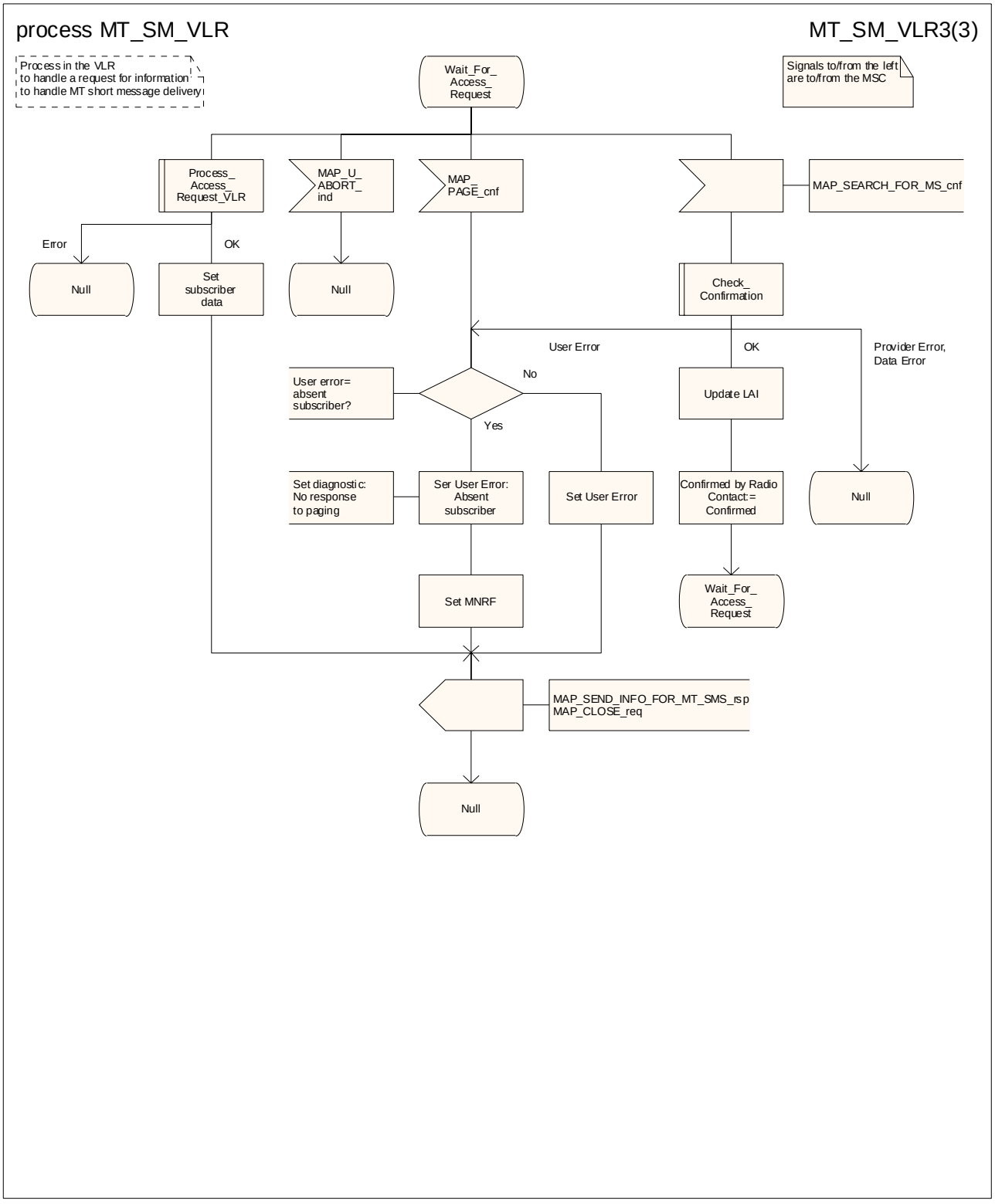


Figure 23.3/9 (sheet 3 of 3): Process MT_SM_VLR

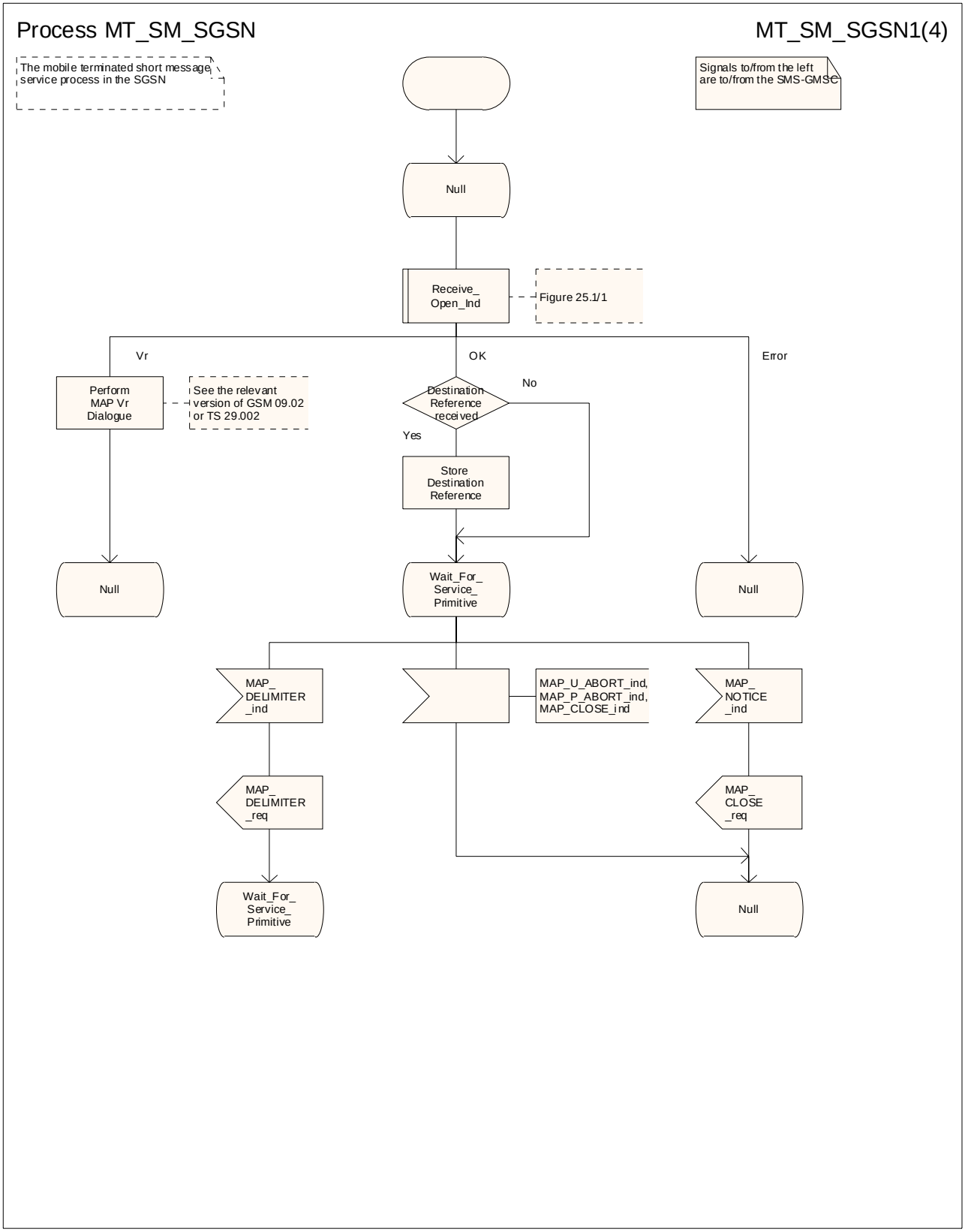


Figure 23.3/10 (sheet 1 of 4): Process MT_SM_SGSN

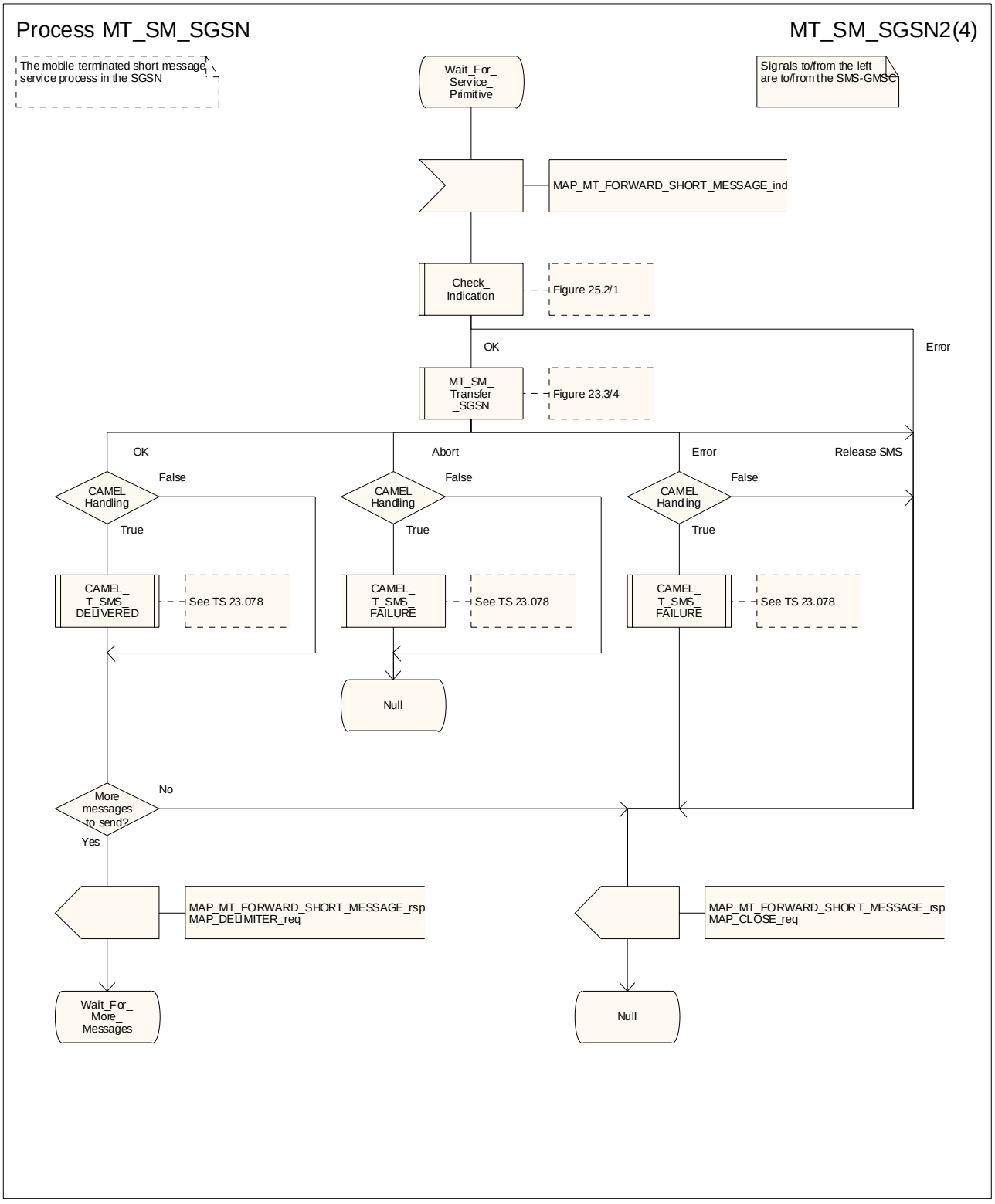


Figure 23.3/10 (sheet 2 of 4): Process MT_SM_ SGSN

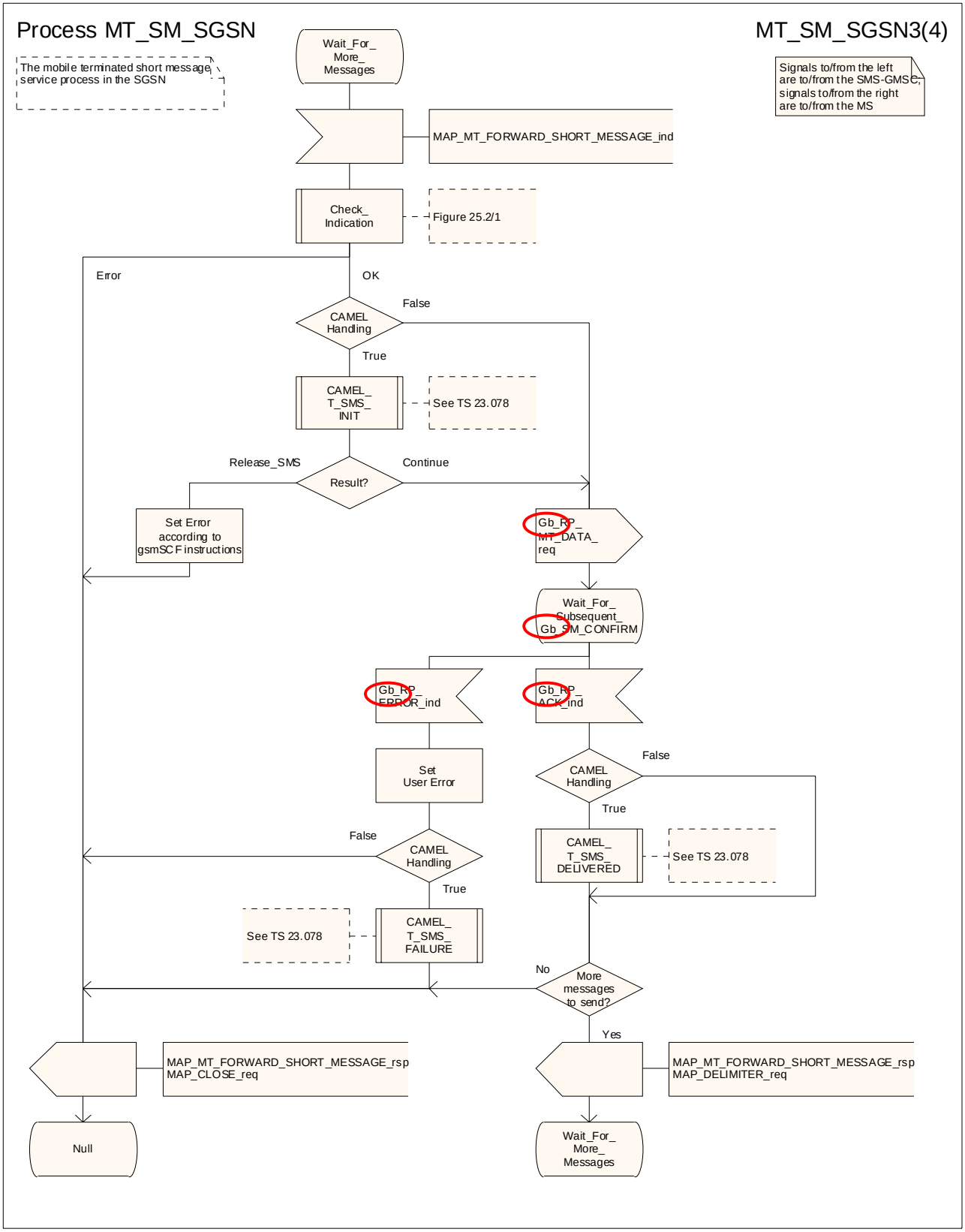


Figure 23.3/10 (sheet 3 of 4): Process MT_SM_ SGSN

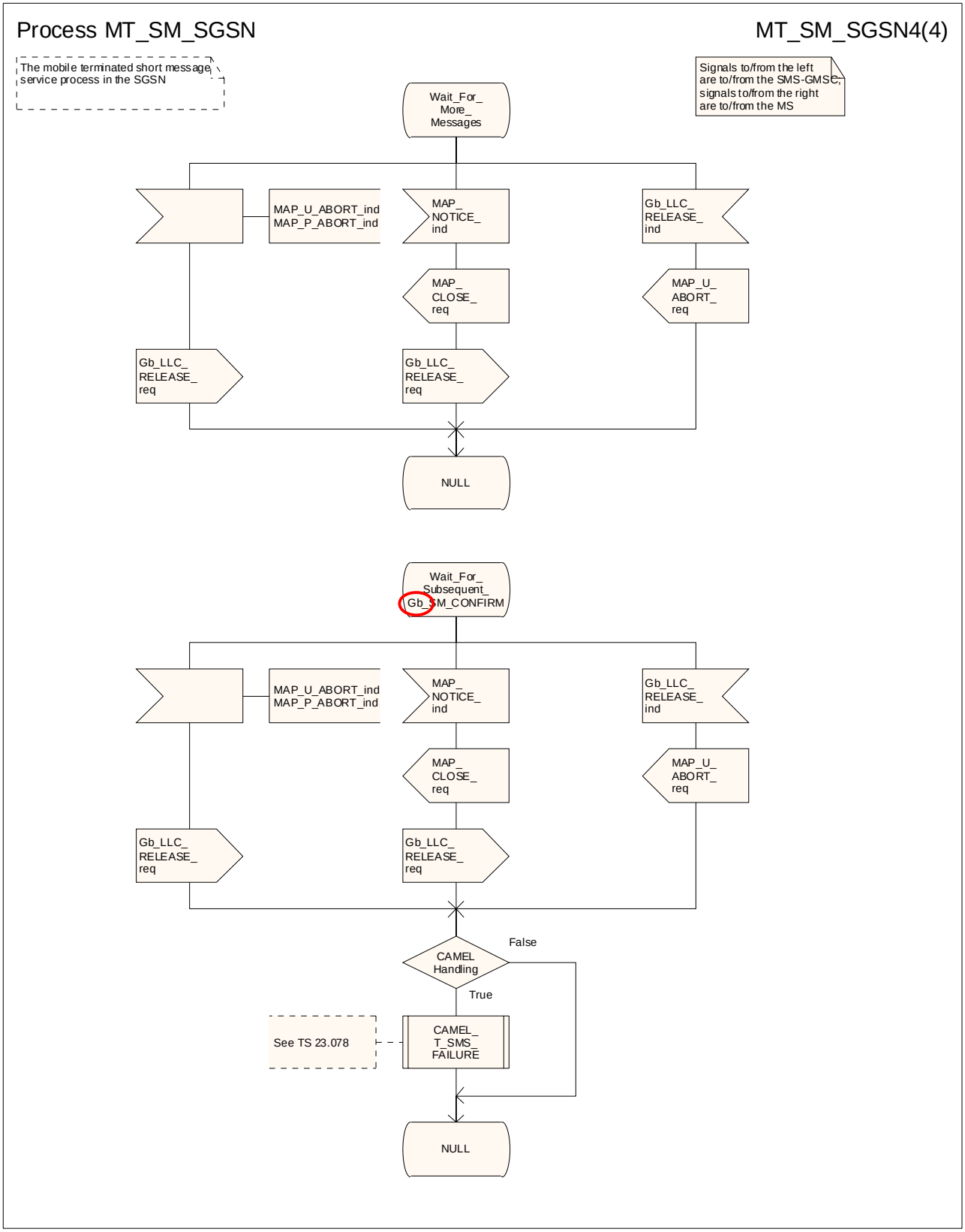


Figure 23.3/10 (sheet 4 of 4): Process MT_SM_ SGSN

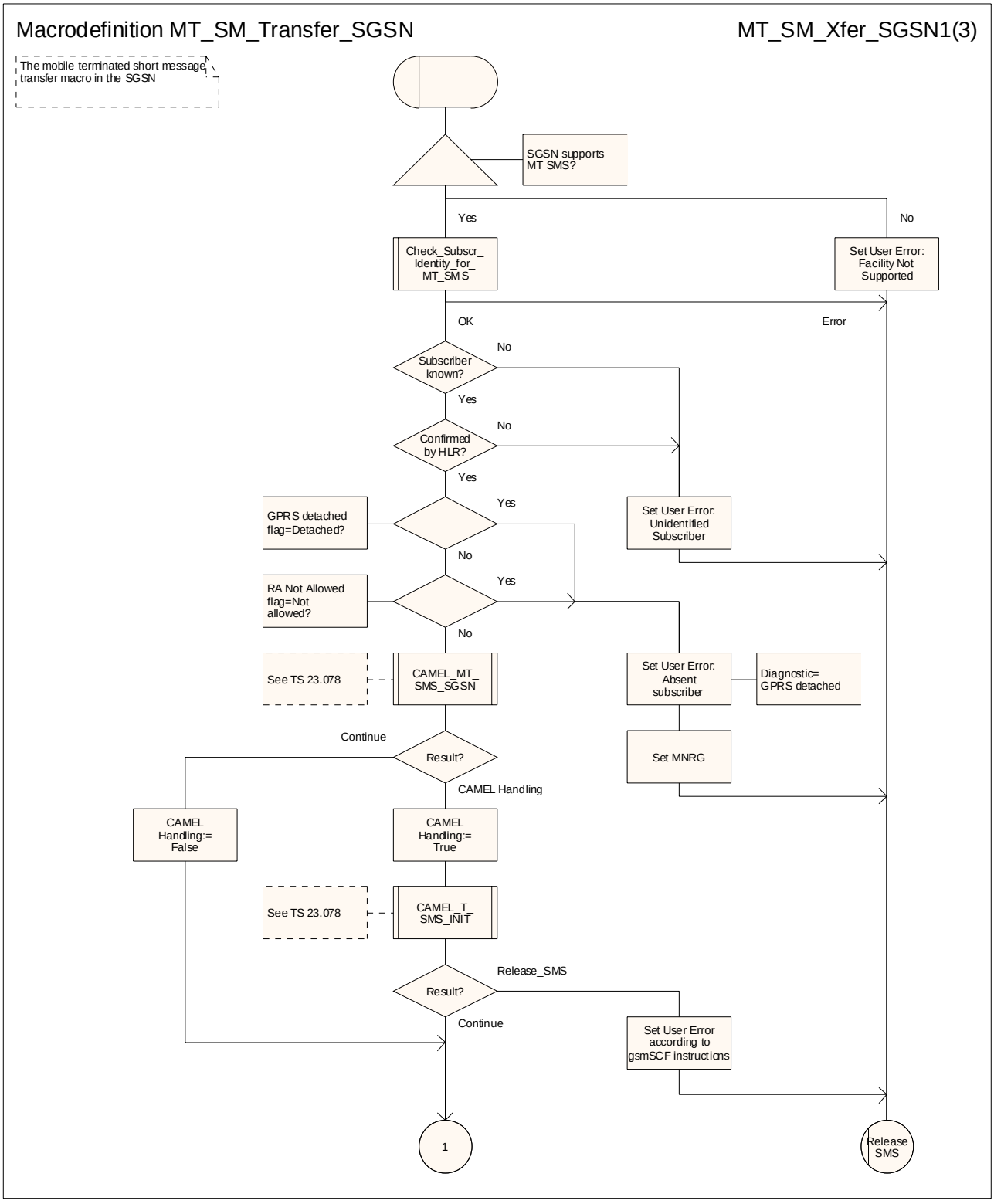


Figure 23.3/11 (sheet 1 of 3): Macro MT_SM_TRANSFER_SGSN

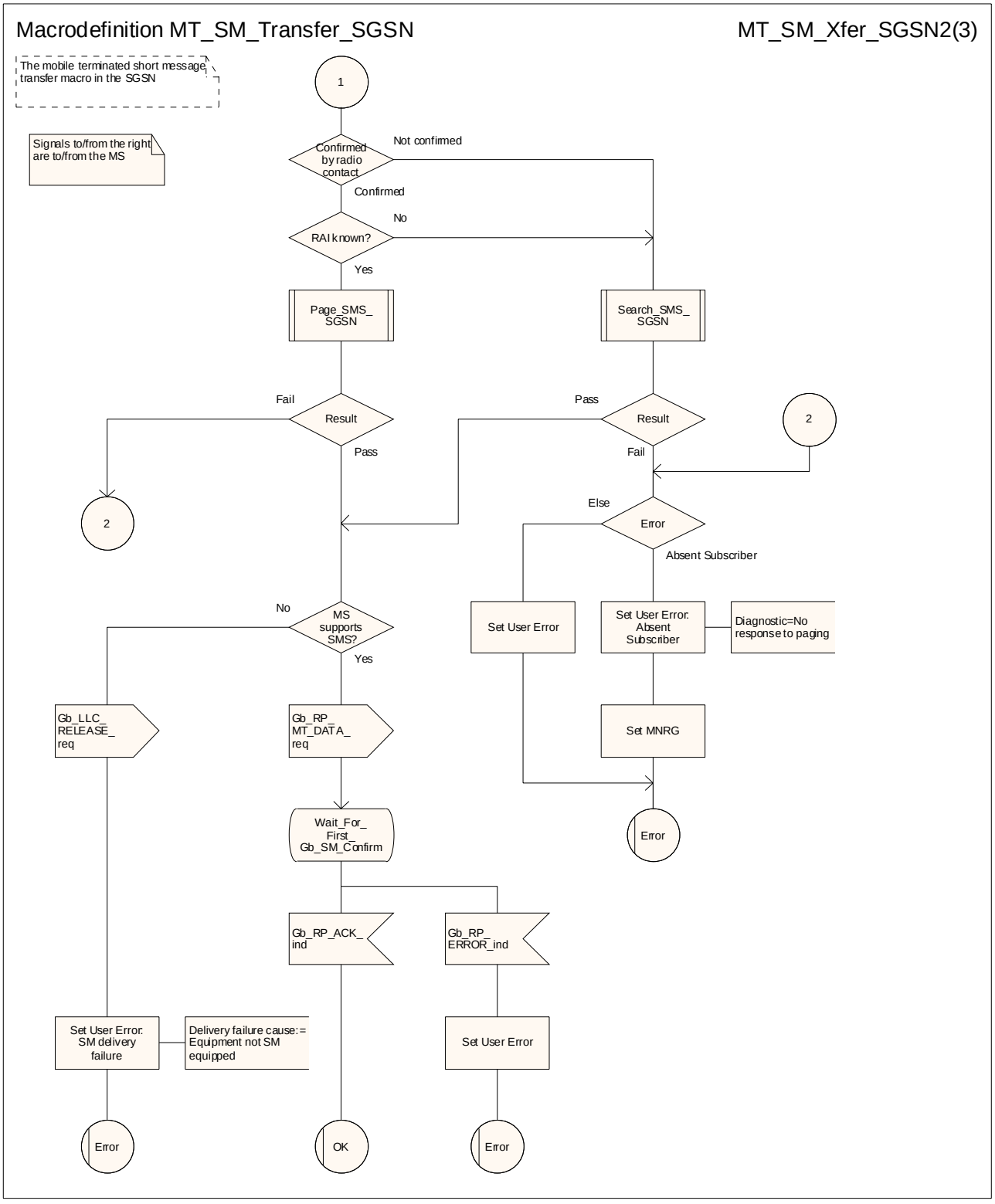


Figure 23.3/11 (sheet 2 of 3): Macro MT_SM_TRANSFER_SGSN

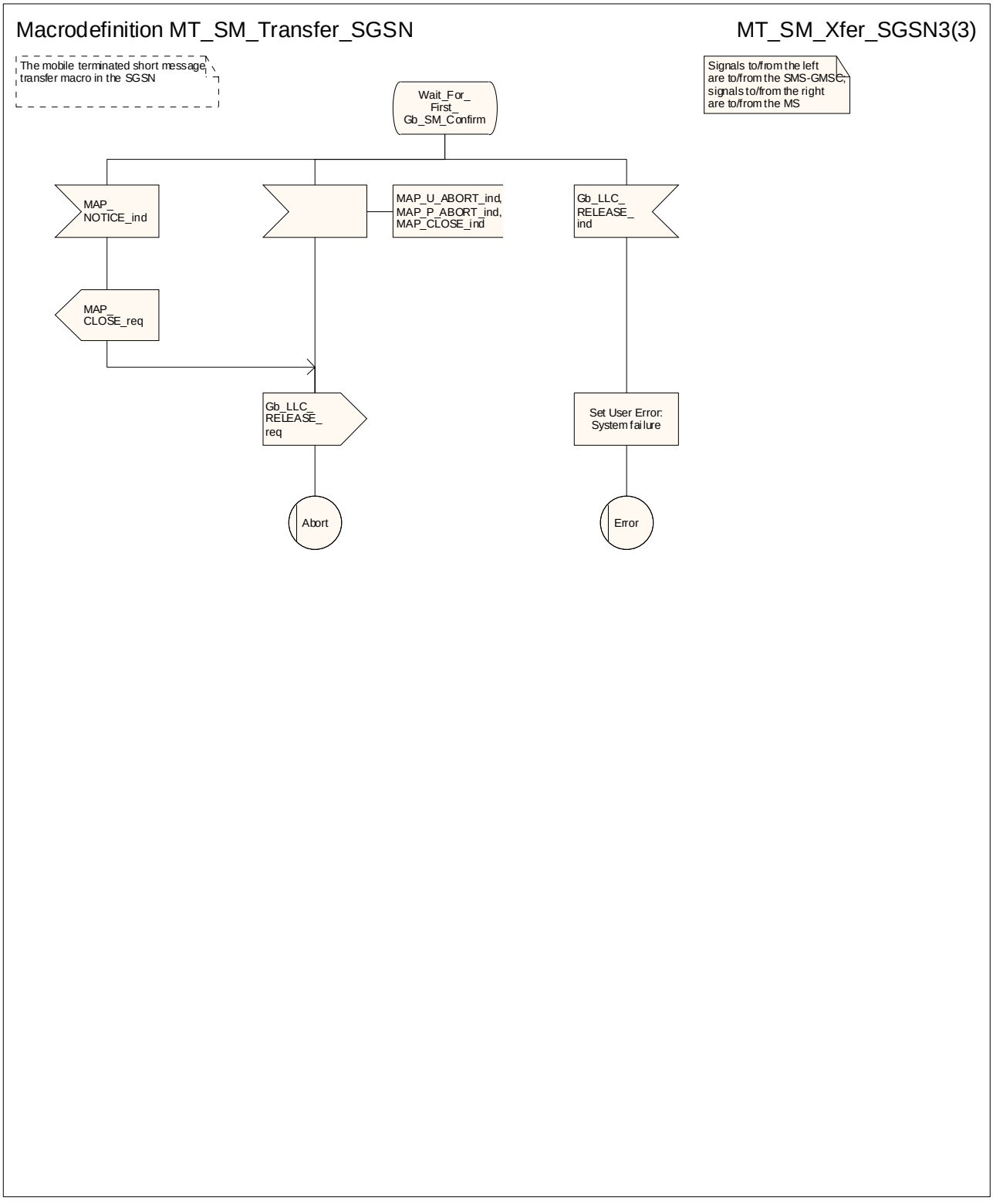


Figure 23.3/11 (sheet 3 of 3): Macro MT_SM_TRANSFER_SGSN

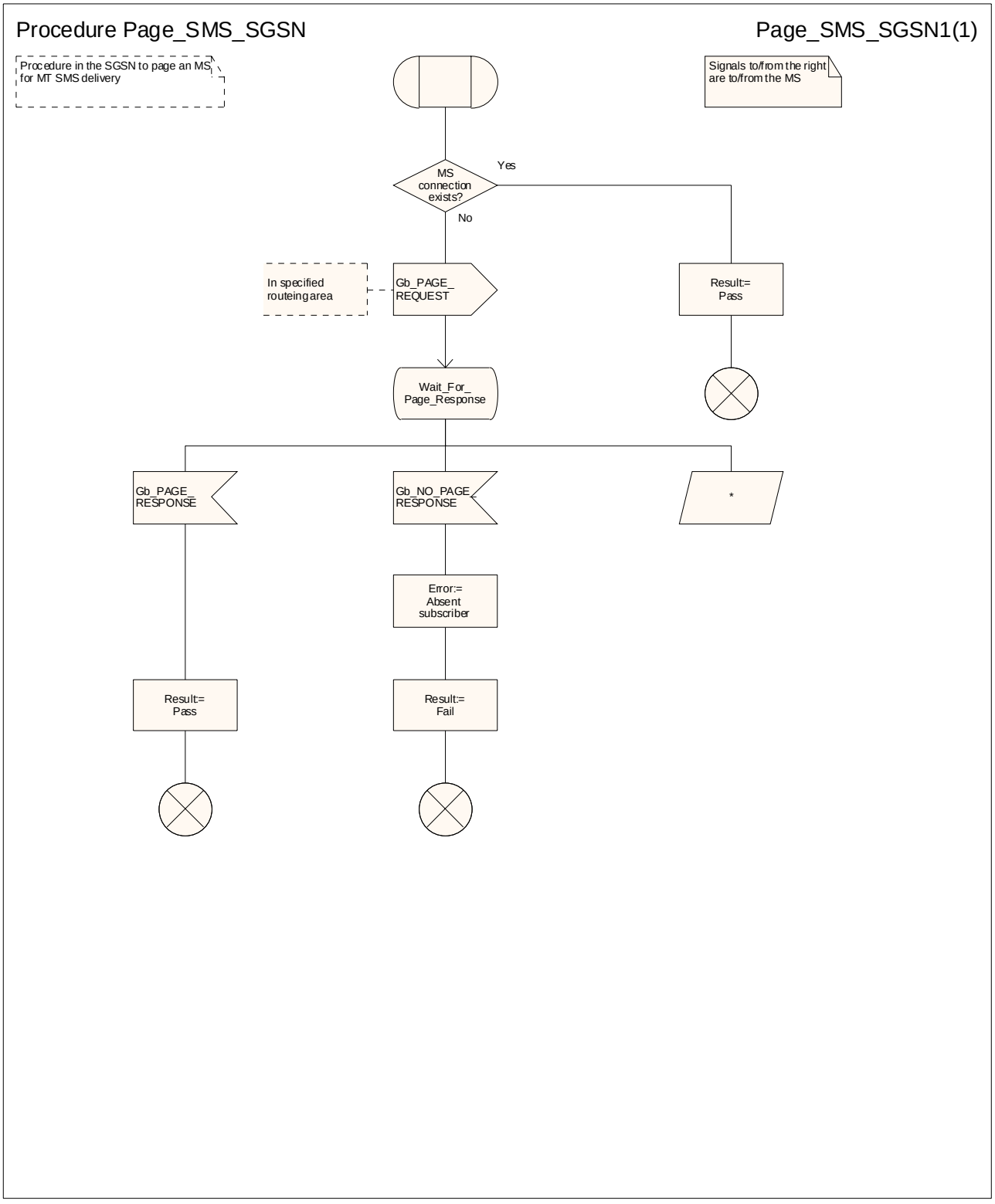


Figure 23.3/12 (sheet 1 of 1): Procedure Page_SMS_SGSN

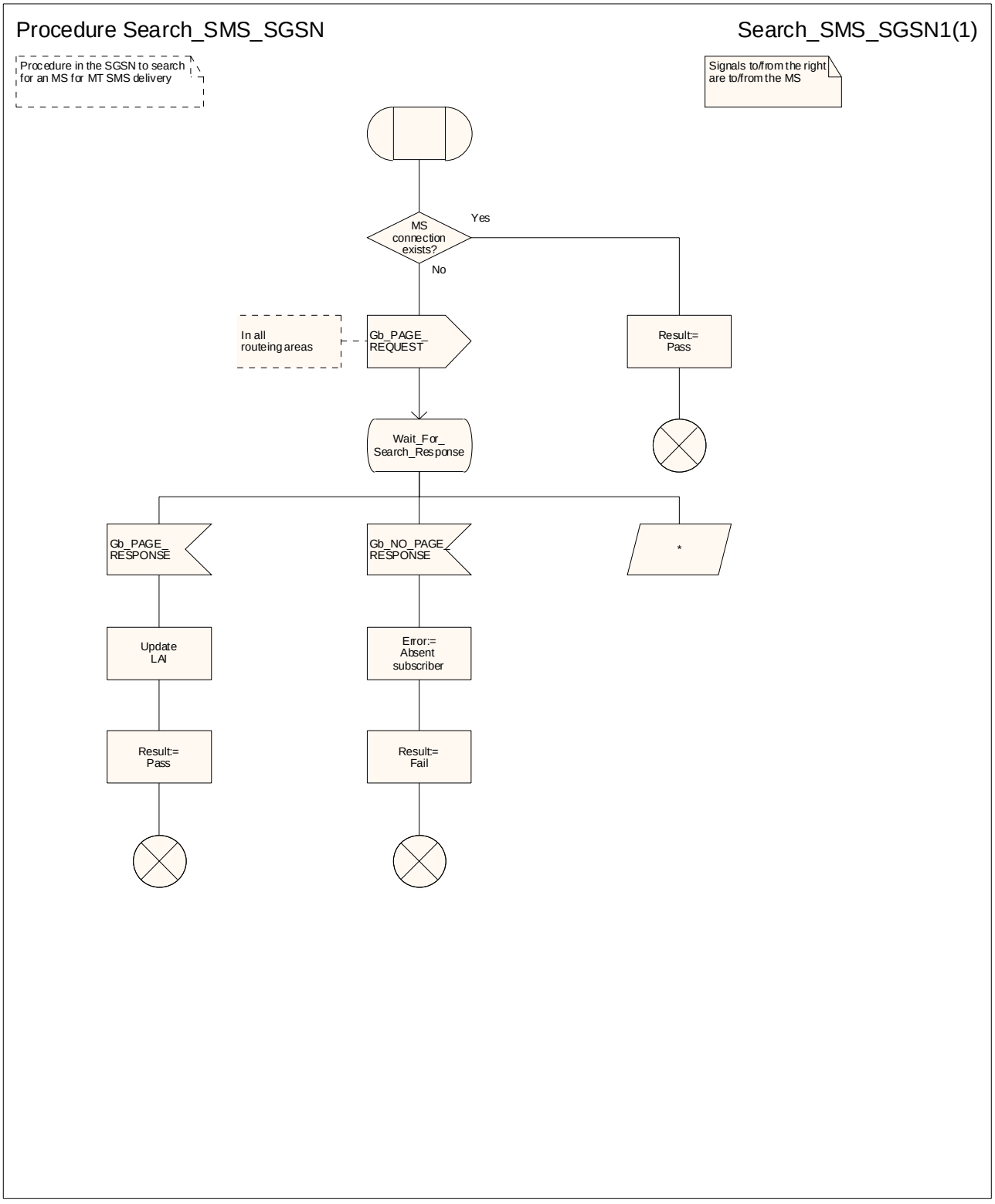
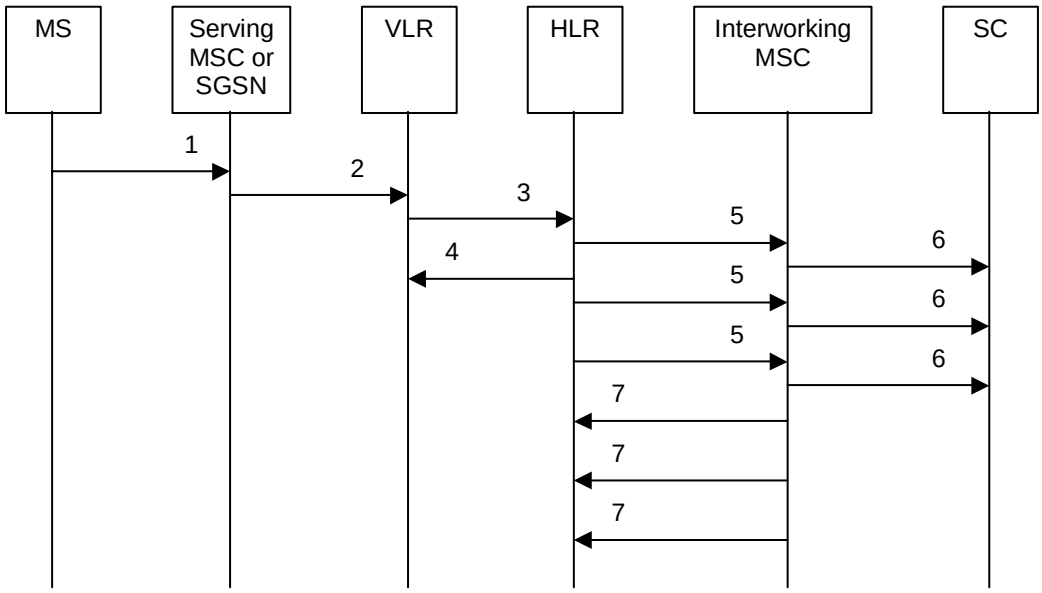


Figure 23.3/13 (sheet 1 of 1): Procedure Search_SMS_SGSN

23.4 The Short Message Alert procedure

The Short Message Alert procedure is used to alert 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 message flow for the Short Message Alert procedure for the case when the mobile subscriber was not reachable is shown in figure 23.4/1.



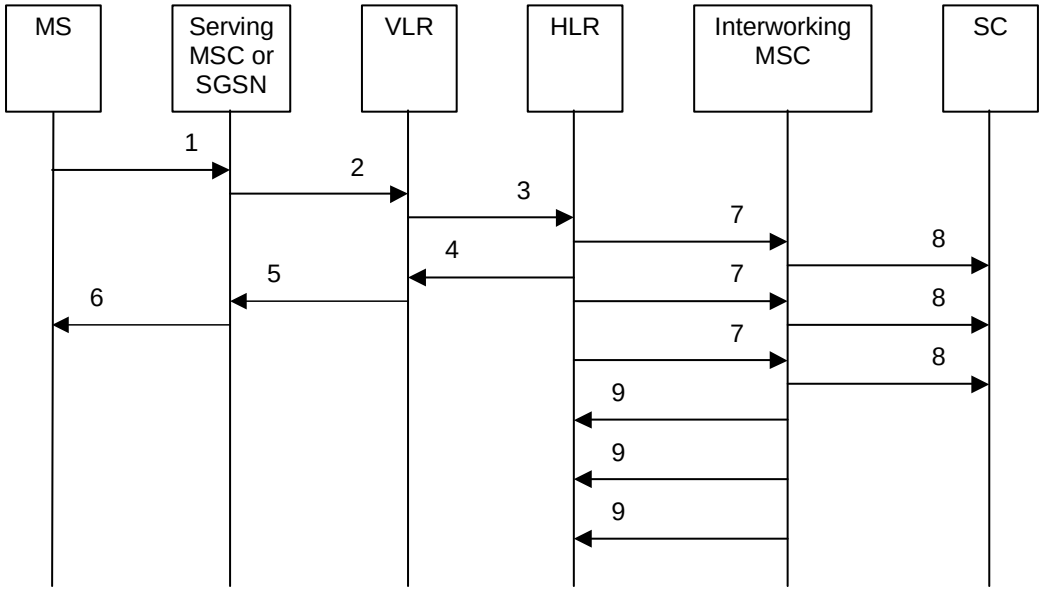
1) CM Service Request (**), Page response or Location Updating (3GPP TS 24.008 [35]).
2) MAP_PROCESS_ACCESS_REQUEST / MAP_UPDATE_LOCATION_AREA (**).
3) MAP_READY_FOR_SM (Mobile Present) / MAP_UPDATE_LOCATION / Supplementary Service Control Request (*).
4) MAP_READY_FOR_SM_ACK (*).
5) MAP_ALERT_SERVICE_CENTRE (notes 1 and 2).
6) Alert Service Centre (3GPP TS 23.~~1~~0 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.

(*) For GPRS, messages 3) and 4) are sent/received by the SGSN.
(**) The~~e~~se messages are not used by the SGSN.

Figure 23.4/1: Short message alert procedure (Mobile is present)

The message flow for the Short Message Alert procedure for the case where the MS indicates that it has memory capacity to accept one or more short messages is shown in figure 23.4/2.



1) SM memory capacity available (3GPP TS 24.011 [37]).
2) MAP_READY_FOR_SM (Memory Available) (*).
3) MAP_READY_FOR_SM (Memory Available) (**).
4) MAP_READY_FOR_SM_ACK (**).
5) MAP_READY_FOR_SM_ACK (*).
6) SM memory capacity available (Acknowledge) (3GPP TS 24.011 [37]).
7) MAP_ALERT_SERVICE_CENTRE (note).
8) Alert Service Centre (3GPP TS 23.~~1~~040).
9) MAP_ALERT_SERVICE_CENTRE_ACK.

NOTE: To all Service Centres in the Message Waiting List.
(*) Messages 2) and 5) are not used by the SGSN.
(**) For GPRS, messages 3) and 4) are sent/received by the SGSN.

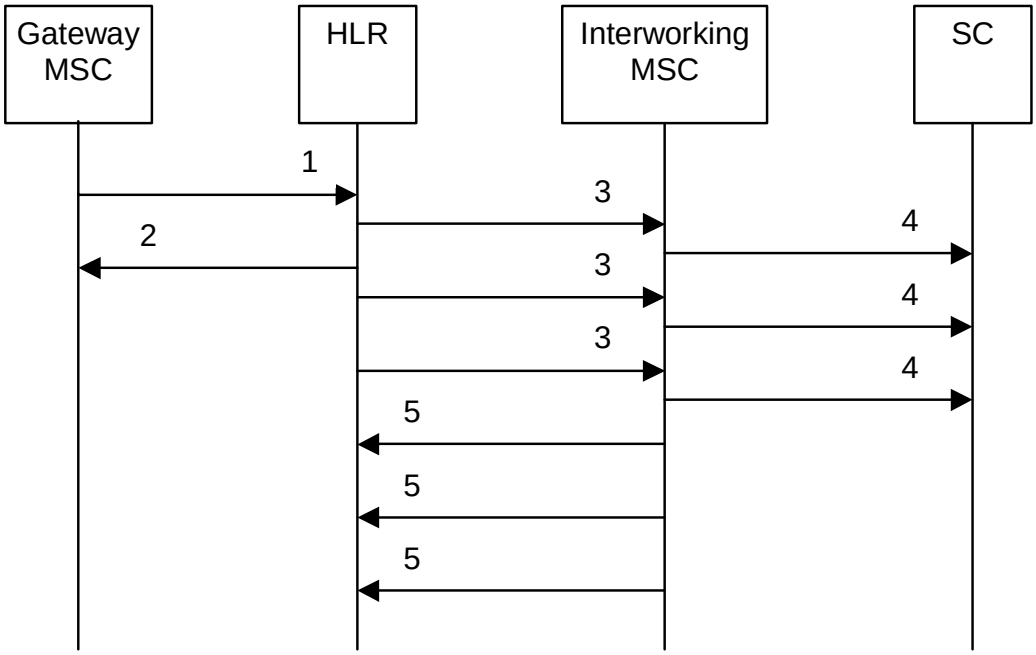
Figure 23.4/2: Short message alert procedure (MS memory capacity available)

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). (*)

(*) The~~o~~se services ~~messages~~ are not used by the SGSN.

The Short Message Alert procedure when the MS indicates successful transfer after polling is shown in figure 23.4/3.



1) MAP_REPORT_SM_DELIVERY_STATUS (Successful Transfer).
2) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
3) MAP_ALERT_SERVICE_CENTRE (note).
4) Alert Service Centre (3GPP TS 23.~~1~~040).
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 Procedure in the Serving MSC – the MS has memory available

The process starts when the MSC receives a notification from the MS that it has memory available. The process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Confirmation see subclause 25.2.2.

~~When the MSC receives an SM memory capacity available indication, it sends to the VLR a MAP_READY_FOR_SM request indicating that the MS has memory available, and waits for a response. While the MSC is waiting for the response from the VLR:~~

- ~~if the MSC receives a Release indication from the A interface, it aborts the dialogue with the VLR, and the process terminates;~~
- ~~if the VLR aborts, or prematurely closes, the dialogue, the MSC sends an A_RP_ERROR with error cause "Network out of order" to the MS, and the process terminates;~~
- ~~if the MSC receives a MAP_READY_FOR_SM confirmation from the VLR, it checks the confirmation.~~
  - ~~if the confirmation includes an error, the MSC sends an A_RP_ERROR with the appropriate error cause to the MS, and the process terminates;~~
  - ~~if the confirmation indicates a successful outcome, the MSC sends an RP_ACK to the MS, and the process terminates.~~

The short message alert process in the MSC for the MS memory capacity available case is shown in figure 23.4/4.

23.4.2 Procedures in the VLR

23.4.2.1 The Mobile Subscriber is present

If the VLR successfully handles a MAP_PROCESS_ACCESS_REQUEST indication or a MAP_UPDATE_LOCATION_AREA indication while the MS Not Reachable Flag (MNRF) is set, the VLR sends a MAP_READY_FOR_SM request to the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for non GPRS. If authentication fails during the handling of a MAP_PROCESS_ACCESS_REQUEST indication or a MAP_UPDATE_LOCATION_AREA indication, the VLR shall not send a MAP_READY_FOR_SM request to the HLR. The process in the VLR is described in detail in subclause 25.10.1.

23.4.2.2 The MS has memory available

The process starts when the VLR receives ~~is triggered by~~ a dialogue opening request followed by a MAP_PROCESS_ACCESS_REQUEST indication including a CM service type Short Message Service. The MAP process invokes macros not defined in this clause; the definition 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_Indication see subclause 25.2.1;

Check_Confirmation see subclause 25.2.2.

~~- if the macro Process_Access_Request_VLR takes the "Error" exit, the process returns to the Null state.~~

~~- if the macro Process_Access_Request_VLR takes the "OK" exit, the VLR waits for a MAP_READY_FOR_SM indication from the MSC.~~

~~When the VLR receives a MAP_READY_FOR_SM indication from the MSC, it checks the indication.~~

~~- if the indication is badly formed, the VLR returns a MAP_READY_FOR_SM response containing the appropriate User Error;~~

~~- if the indication is OK, the VLR requests a dialogue with the HLR, including a MAP_READY_FOR_SM request with Ready for SM reason Memory available for non-GPRS, and waits for the confirmation of the dialogue.~~

~~- if the macro Receive_Open_Cnf takes the "Error" exit, the VLR returns a MAP_READY_FOR_SM response containing a User Error "System failure", and the process returns to the Null state;~~

~~- if the macro Receive_Open_Cnf takes the "V1" exit, the VLR returns a MAP_READY_FOR_SM response containing a User Error "Facility not supported", and the process returns to the Null state;~~

~~- if the macro Receive_Open_Cnf takes the "Vr" (for a version higher than 1) exit, the VLR handles the dialogue according to the specification for the earlier version of the protocol, and the process returns to the Null state;~~

~~- if the macro Receive_Open_Cnf takes the "OK" exit, the VLR waits for a response from the HLR.~~

~~When the VLR is waiting for a response from the HLR:~~

~~- if the dialogue with the HLR fails, the VLR returns a MAP_READY_FOR_SM response containing a User Error "System failure", and the process returns to the Null state;~~

~~- if it receives a MAP_READY_FOR_SM confirmation, it checks the confirmation.~~

~~- if the confirmation contains an error, the VLR returns a MAP_READY_FOR_SM response containing the appropriate User Error , and the process returns to the Null state;~~

~~- if the confirmation indicates success, the VLR returns a MAP_READY_FOR_SM response indicating success, and the process returns to the Null state.~~

The short message alert process in the VLR for the MS memory capacity available case is shown in figure 23.4/5.

23.4.35 Procedures in the SGSN

23.4.35.1 The Mobile Subscriber is present

If the SGSN successfully handles a Page response, Attach request or Routing Area Update request message (3GPP TS 24.008 [35]), while the MS Not Reachable for GPRS (MNRG) flag is set, the SGSN sends a MAP_READY_FOR_SM request to the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS. If authentication fails during the handling of a Page response, Attach request or Routing Area Update request, the SGSN shall not send a MAP_READY_FOR_SM request to the HLR

The process in the SGSN is described in detail in subclause 25.10.2/3.

23.4.35.2 The Mobile Equipment has memory available

The process starts when the SGSN receives ~~is triggered by~~ an RP_SM_MEMORY_AVAILABLE indication from the MS. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

~~The SGSN requests a dialogue with the HLR, including a MAP_READY_FOR_SM request with Ready for SM reason Memory available for GPRS, and waits for the confirmation of the dialogue.~~

- ~~if the macro Receive_Open_Cnf takes the "Error" exit, the SGSN returns an error response containing an RP_ERROR "Network out of order", and the process returns to the Null state;~~
- ~~if the macro Receive_Open_Cnf takes the "Vr" exit, the SGSN returns an error response containing an RP_ERROR "Facility not supported", and the process returns to the Null state;~~
- ~~if the macro Receive_Open_Cnf takes the "OK" exit, the VLR waits for a response from the HLR.~~

~~When the SGSN is waiting for a response from the HLR:~~

- ~~if the dialogue with the HLR fails, the SGSN returns an error response containing an RP_ERROR "Network out of order", and the process returns to the Null state;~~
- ~~if it receives a Release indication from the Gb interface, it aborts the dialogue with the HLR, and the process returns to the Null state;~~
- ~~if the SGSN receives a MAP_READY_FOR_SM confirmation, it checks the confirmation.~~
  - ~~if the confirmation contains an error, the SGSN returns returns an error response containing the appropriate RP_ERROR, and the process returns to the Null state;~~
  - ~~if the confirmation indicates success, the SGSN returns an RP_ACK, and the process returns to the Null state.~~

The short message alert procedure in the SGSN for the MS memory capacity available case is shown in figure 23.4/68.

23.4.43 Procedure in the HLR

The process starts when the HLR receives ~~is triggered by~~ a dialogue opening request using the application context mwdMngtContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1;

Alert_Service_Centre_HLR see subclause 25.10.3.

Sheet 1: If the dialogue opening request is from an SGSN, version 2 and version 1 of the application context are not applicable.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "Vr" exit, the HLR handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

NOTE: if the dialogue opening request is from an SGSN, version 2 and version 1 of the application context are not applicable.

- if the macro Receive_Open_Ind takes the "OK" exit, the HLR waits for a service primitive.

While the HLR is waiting for the service primitive:

- if the dialogue fails, the process returns to the Null state;

- if it receives a MAP_READY_FOR_SM indication, it checks the indication.

  - if the indication is badly formed, the HLR returns a MAP_READY_FOR_SM response containing the appropriate user error, and the process returns to the Null state;

  - if the indication is OK, the HLR checks whether it supports:

    - one or both of MNRF and MNRG, and

    - MCEF and

    - MWD.

      - if the HLR does not support the message waiting features listed, it returns a MAP_READY_FOR_SM response containing the user error "Facility not supported", and the process returns to the Null state;

      - if the HLR supports the message waiting features listed, but the subscriber is not known, it returns a MAP_READY_FOR_SM response containing the user error "Unknown subscriber", and the process returns to the Null state;

      - if the subscriber is known, the HLR returns a MAP_READY_FOR_SM response indicating a successful result, and checks whether one or more of MNRF, MNRG and MCEF is set.

        - if none of MNRF, MNRG and MCEF is set, the HLR starts a race timer and waits for a possible delivery failure report. This allows for the race condition where a delivery failure report is delayed in the path through the SMS-GMSC, and is overtaken by a subsequent "ready for SM" condition reported by the serving node to the HLR;

        - if one or more of MNRF, MNRG and MCEF is set, the HLR continues by handling the alerting process as described below under the heading "Alerting the Service Centre(s)".

- if it receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it invokes the macro Report_SM_Delivery_Stat_HLR.

  - if the macro takes the "Error" exit, the HLR waits for a possible MAP_READY_FOR_SM indication;

  - if the macro takes the "OK" exit, the HLR checks whether the delivery was successful.

    - if the delivery was unsuccessful, the HLR waits for a possible MAP_READY_FOR_SM indication;

    - if the delivery was successful, the HLR stops the Race timer, and the process returns to the Null state.

When the HLR is waiting for a possible MAP_READY_FOR_SM indication or MAP_REPORT_SM_DELIVERY_STATUS indication with the race timer running:

- if the race timer expires, the process returns to the Null state;

- if the HLR receives a dialogue opening request, it invokes the macro Receive_Open_Ind.

  - if the macro takes the "Error" exit, the process returns to the Null state;

  - if the macro takes the "Vr" exit, the HLR handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;

- if the macro Receive_Open_Ind takes the "OK" exit, the HLR waits for a service primitive.

Alerting the Service Centre(s)

The HLR checks the Ready for SM reason which was received from the serving node.

- if the reason was "Memory available for GPRS", the HLR clears the MNRG flag and the MCEF and invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
- if the reason was "Subscriber present for GPRS", the HLR clears the MNRG flag and checks the MCEF.
  - if the MCEF is not set, the HLR invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
  - if the MCEF is set, the process returns to the Null state;
- if the reason was "Memory available for non-GPRS", the HLR clears the MNRF and the MCEF and invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
- if the reason was "Subscriber present for non-GPRS", the HLR clears the MNRF and checks the MCEF.
  - if the MCEF is not set, the HLR invokes the macro Alert_Service_Centre HLR (described in subclause 25.10), and the process returns to the Null state;
  - if the MCEF is set, the process returns to the Null state.

The short message alert process in the HLR is shown in figure 23.4/76.

23.4.54 Procedures in the SMS Interworking MSC

The process starts when the SMS-IWMSC receives is triggered by a dialogue opening request using the application context shortMsgAlertContext. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.

- if the macro Receive_Open_Ind takes the "Error" exit, the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "Vr" exit, the SMS-IWMSC handles the dialogue according to the specification for the earlier version of the protocol and the process returns to the Null state;
- if the macro Receive_Open_Ind takes the "OK" exit, the SMS-IWMSC waits for a service primitive.

While the SMS-IWMSC is waiting for the service primitive:

- if the dialogue fails, the process returns to the Null state;
- if it receives a MAP_ALERT_SERVICE_CENTRE indication, it checks the indication.
  - if the indication is badly formed, the SMS-IWMSC returns a MAP_ALERT_SERVICE_CENTRE response containing the appropriate user error, and the process returns to the Null state;
  - if the indication is OK, the SMS-IWMSC sends an SC_RP_ALERT_SC request to the Service Centre and returns a MAP_ALERT_SERVICE_CENTRE response indicating a successful result, and the process returns to the Null state.

The short message alert process in the SMS-IWMSC is shown in figure 23.4/87.

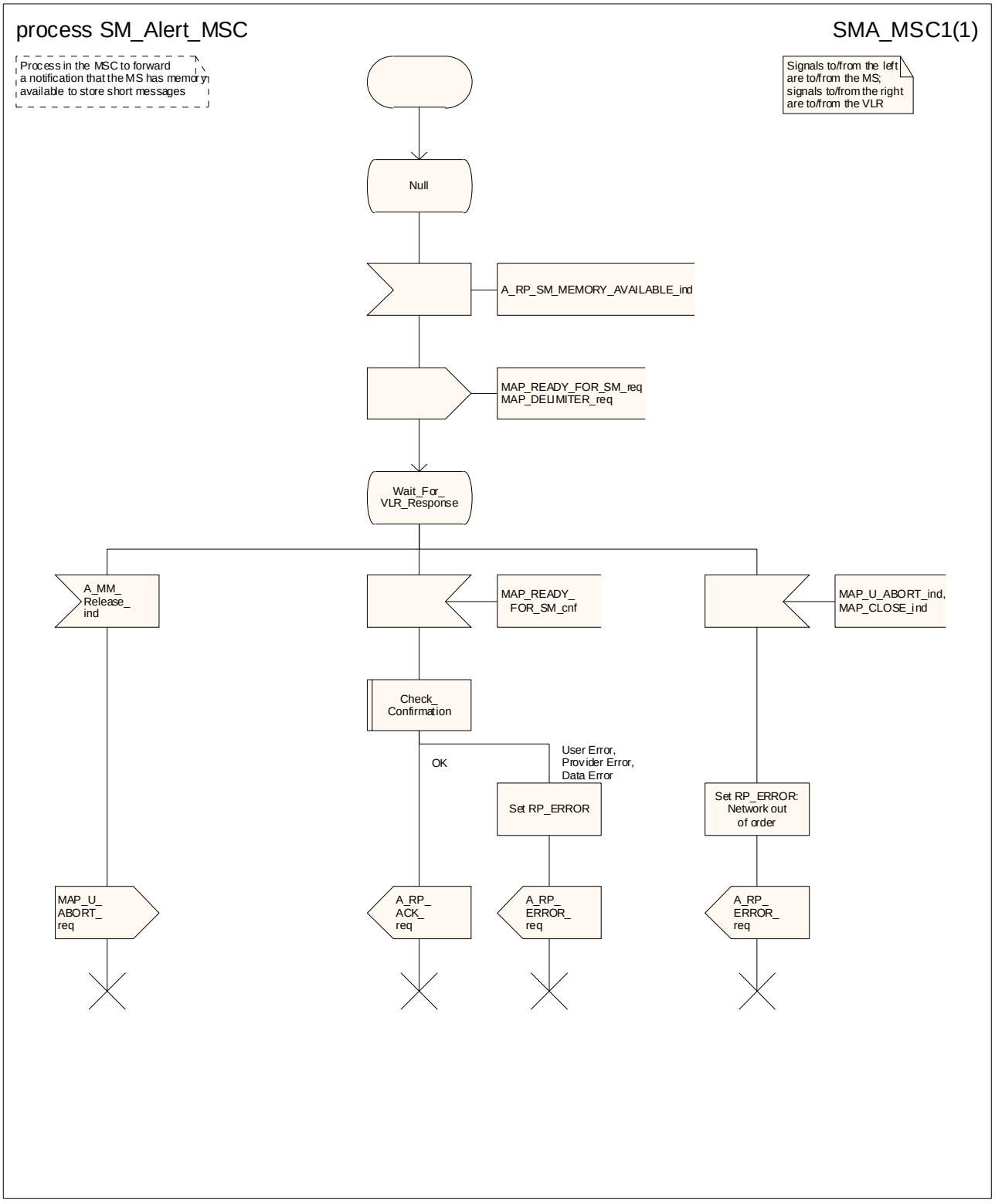


Figure 23.4/4: Procedure SM_Alert_MSC

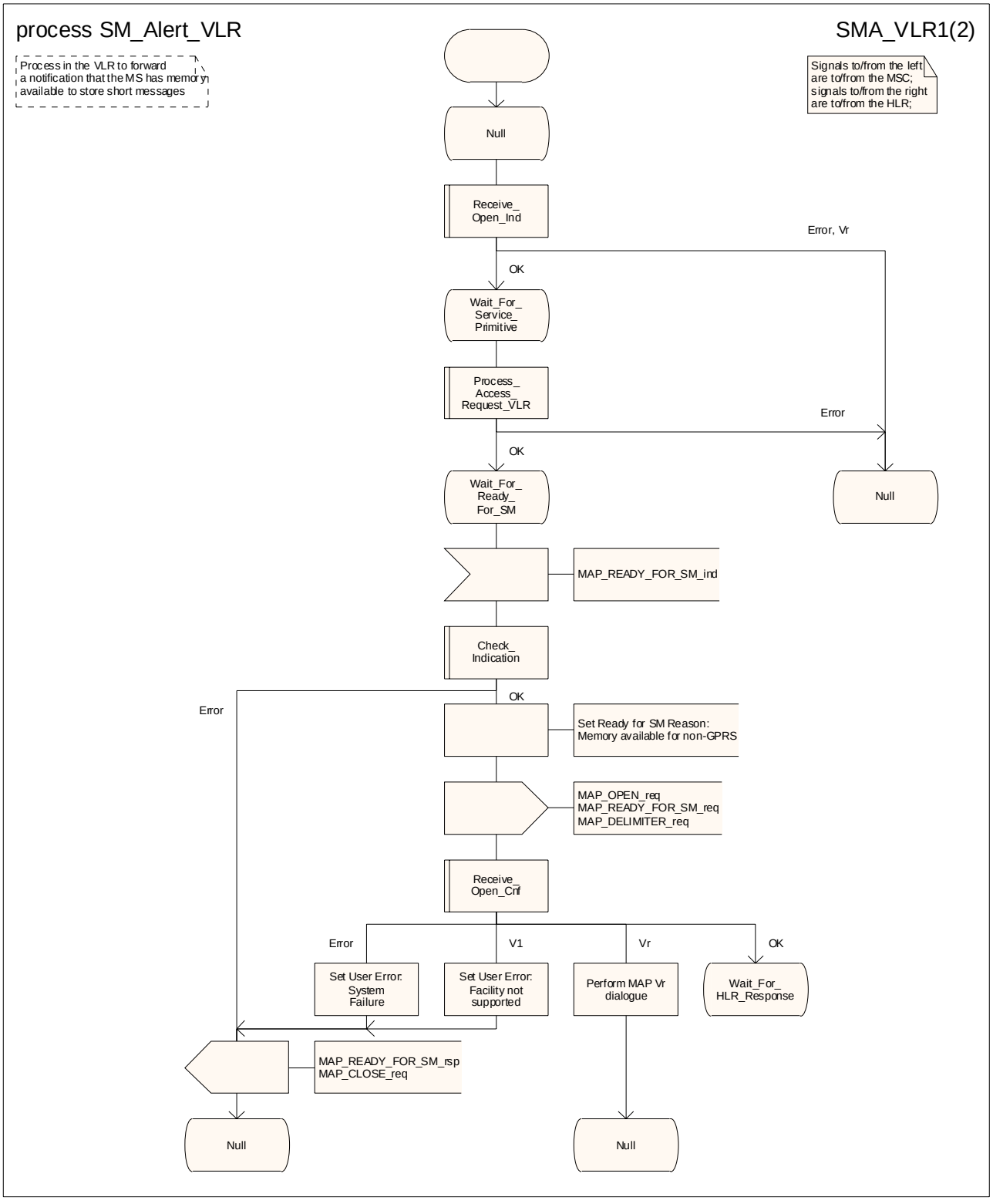


Figure 23.4/5 (sheet 1 of 2): Procedure SM_Alert_VLR

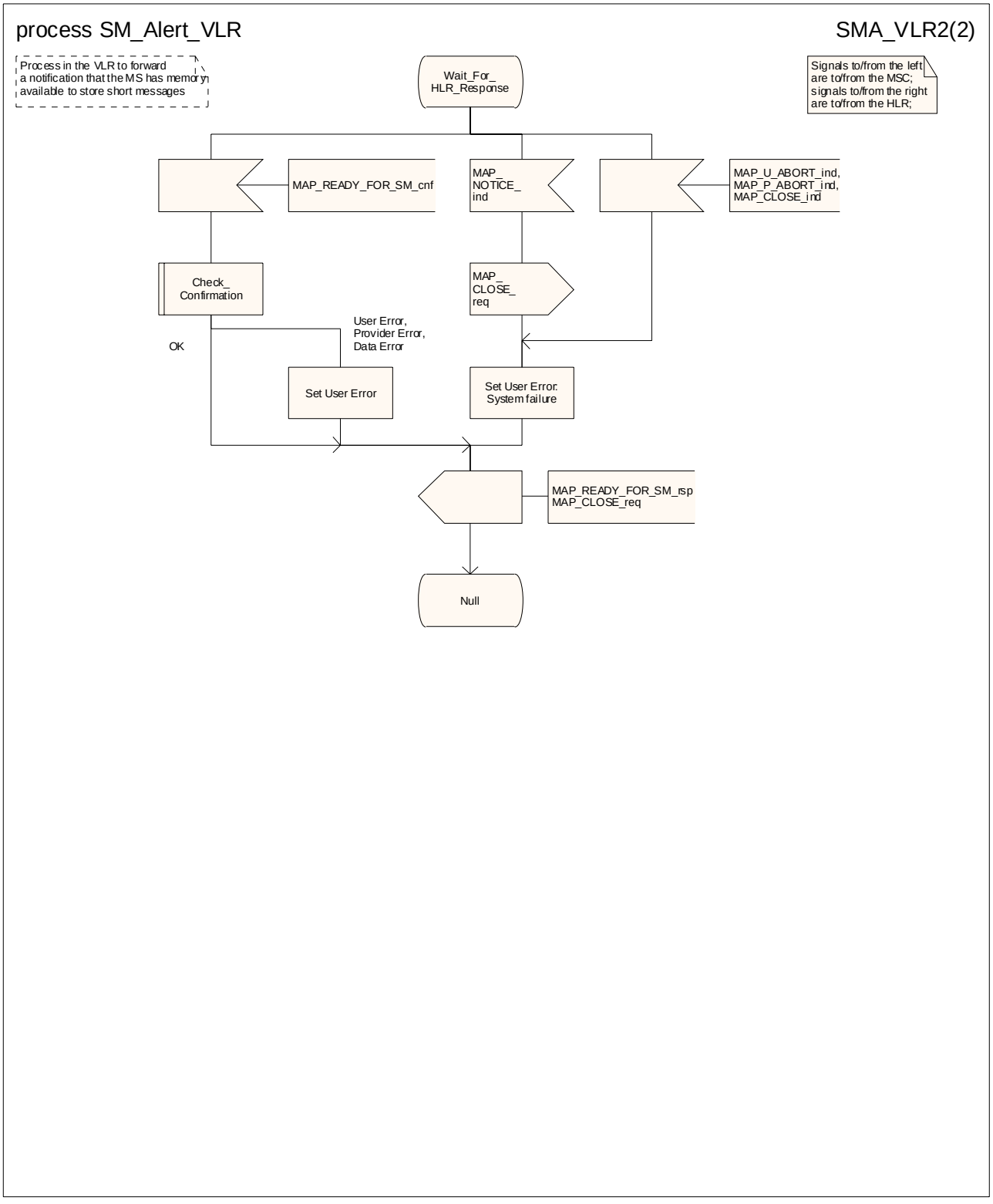


Figure 23.4/5 (sheet 2 of 2): Procedure SM_Alert_VLR

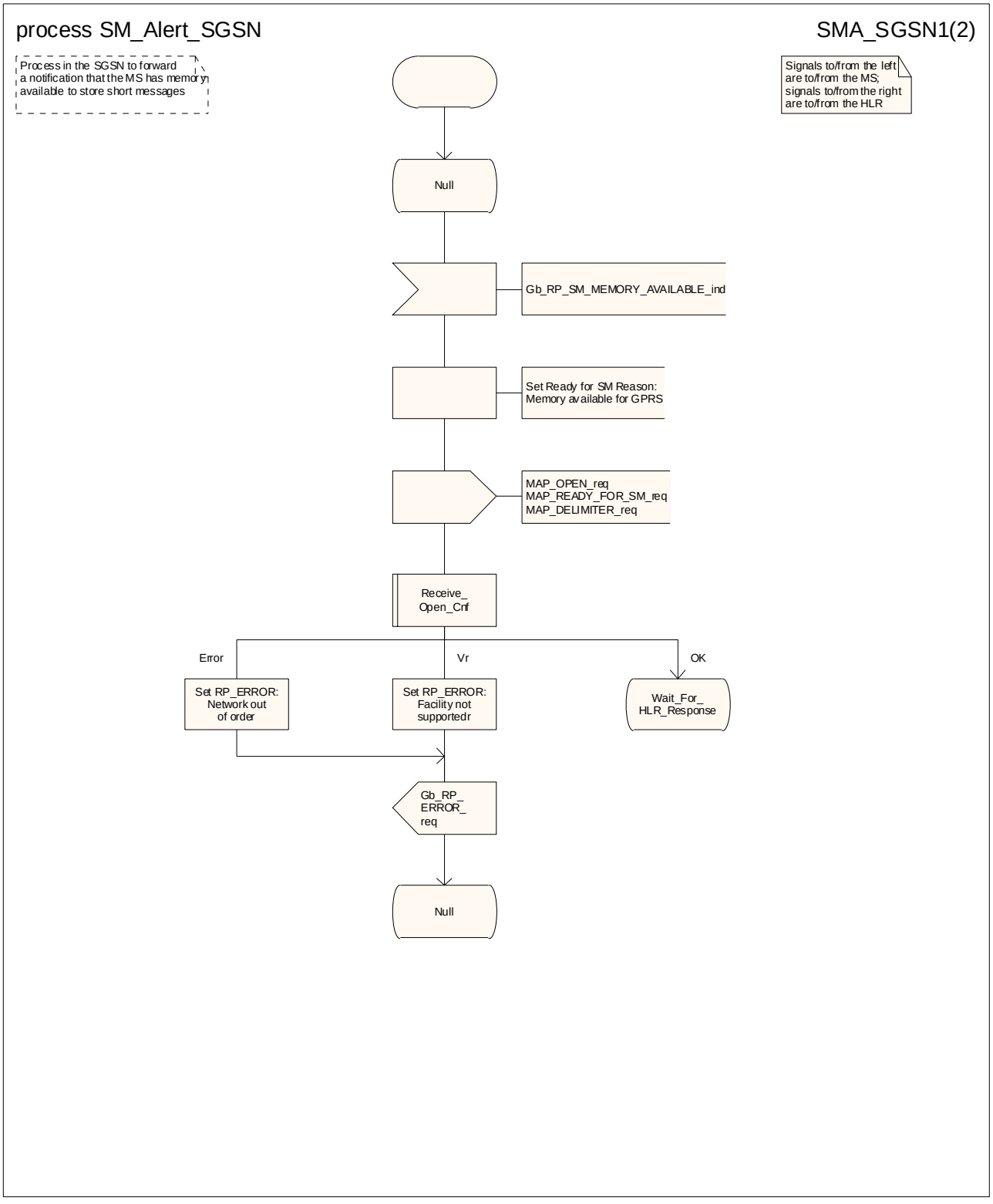


Figure 23.4/6~~8~~ (sheet 1 of 2): Process SM_Alert_SGSN

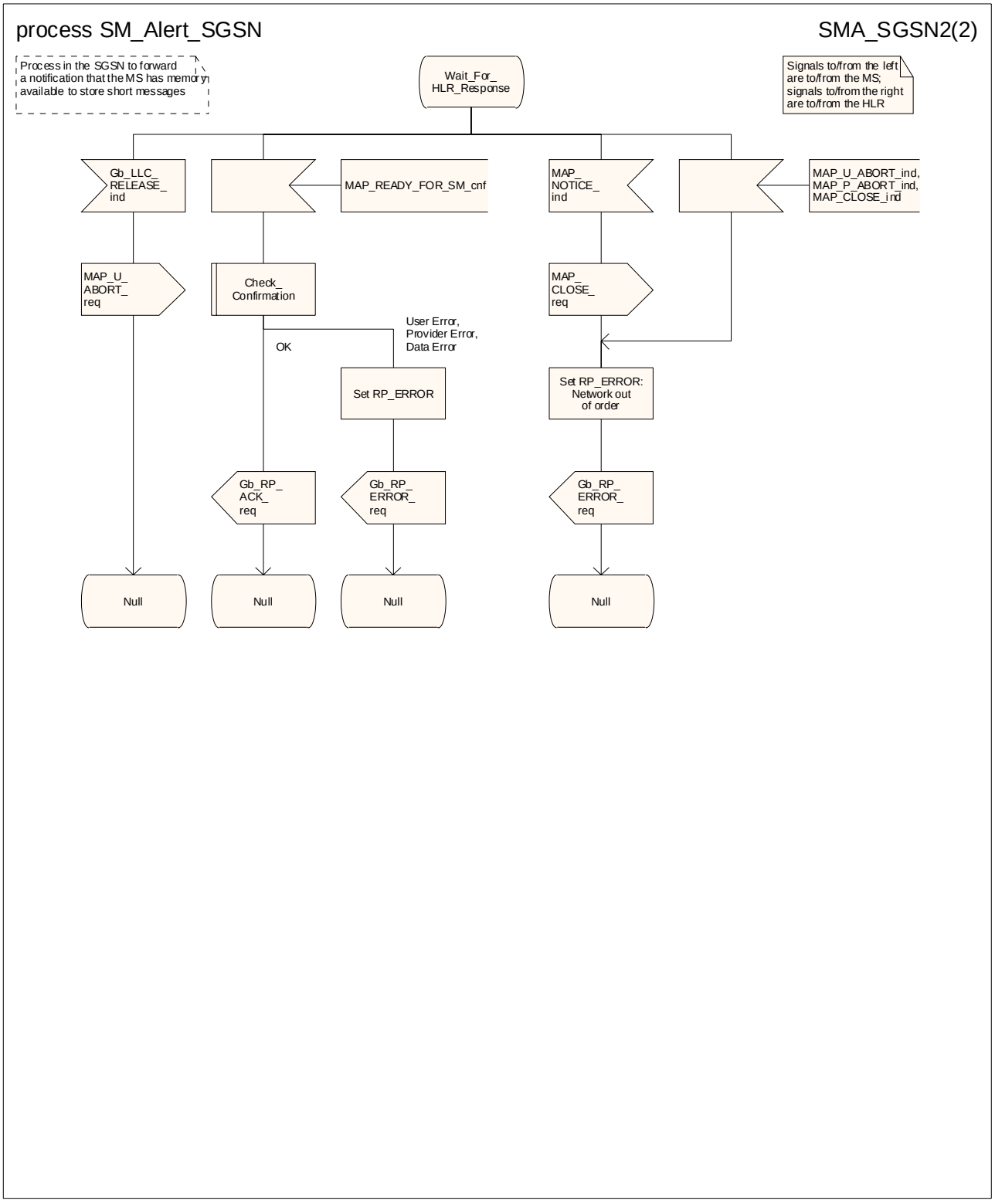


Figure 23.4/6~~8~~ (sheet 2 of 2): Process SM_Alert_SGSN

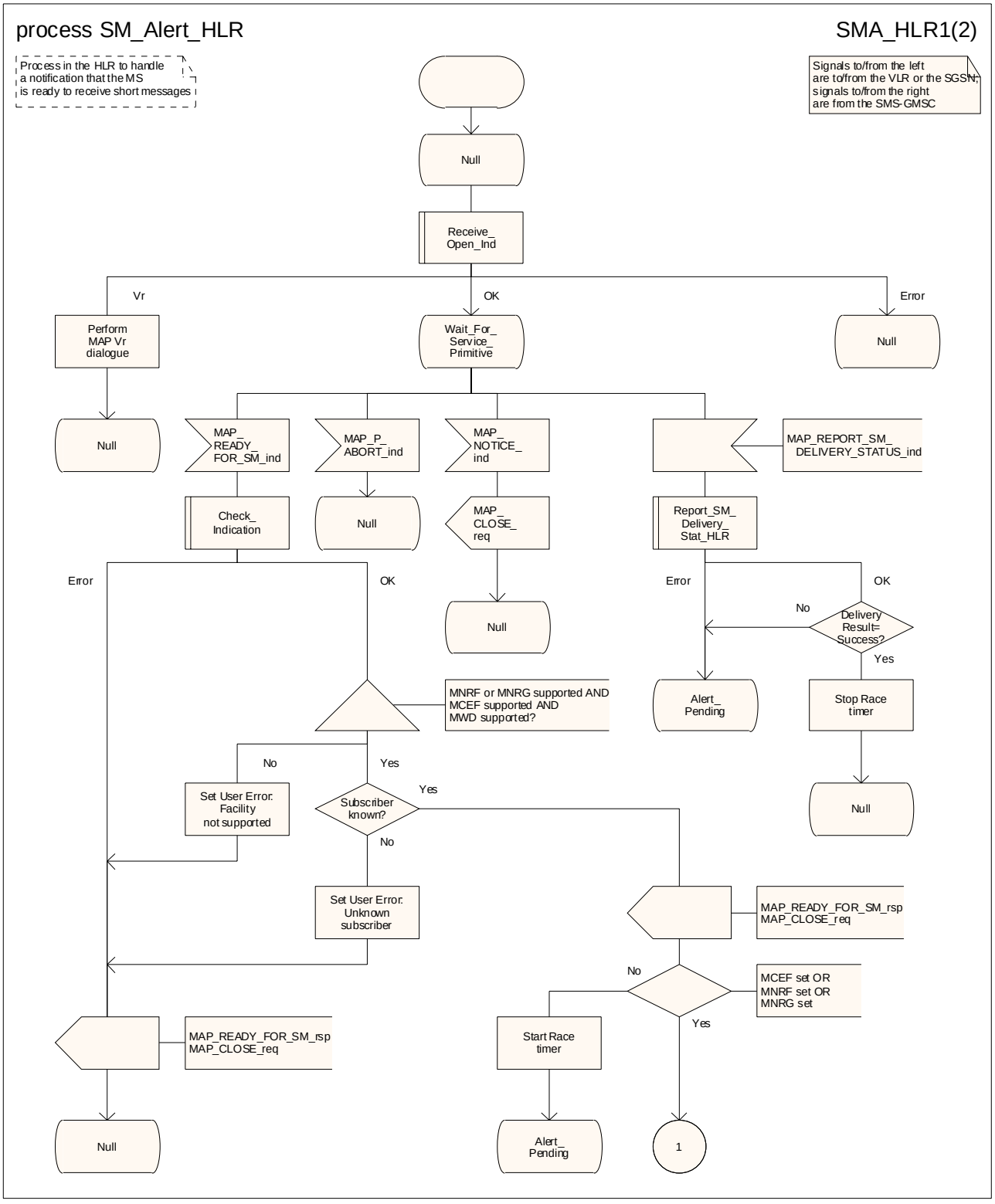


Figure 23.4/76 (sheet 1 of 2): Process SM_Alert_HLR

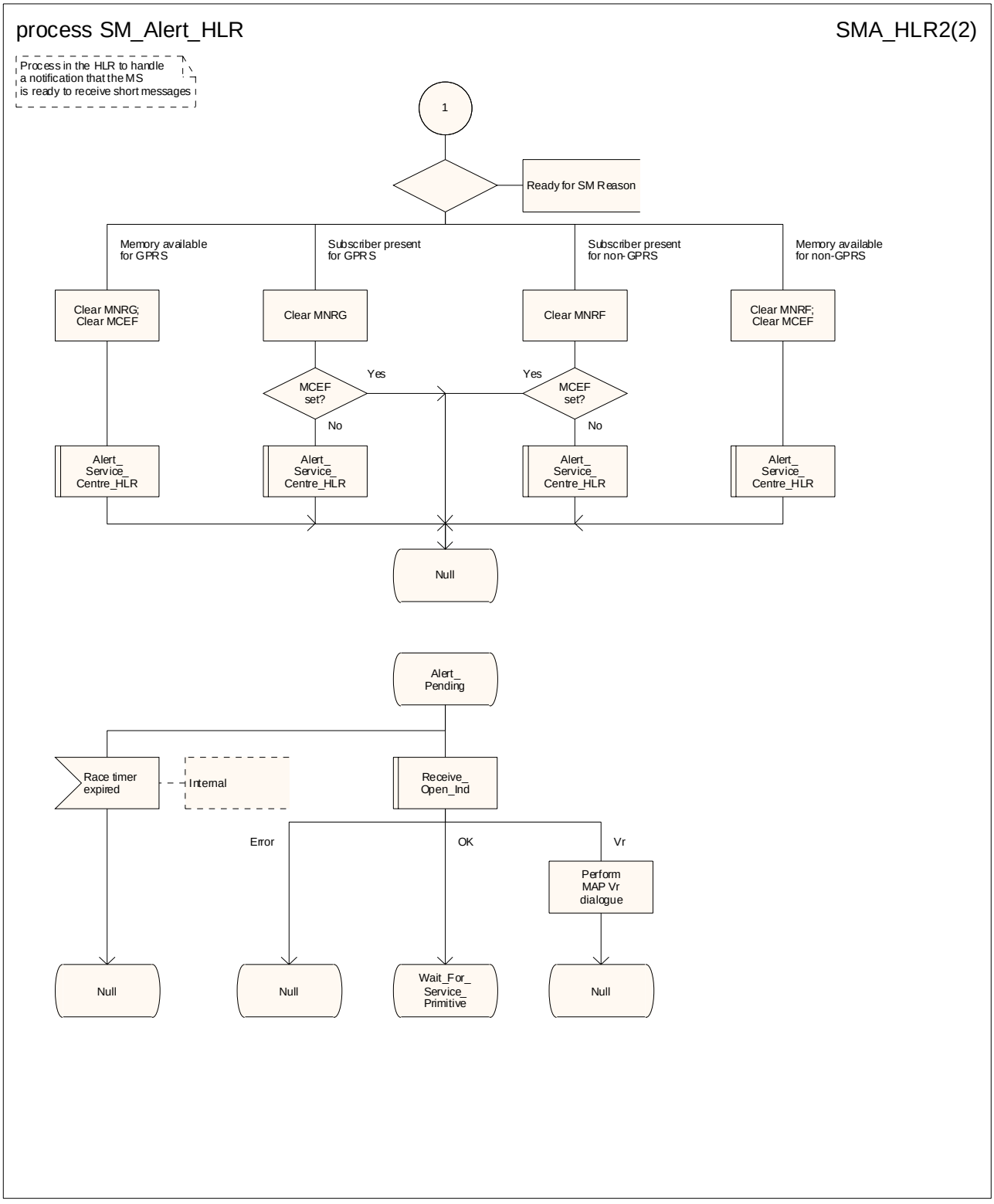


Figure 23.4/76 (sheet 2 of 2): Process SM_Alert_HLR

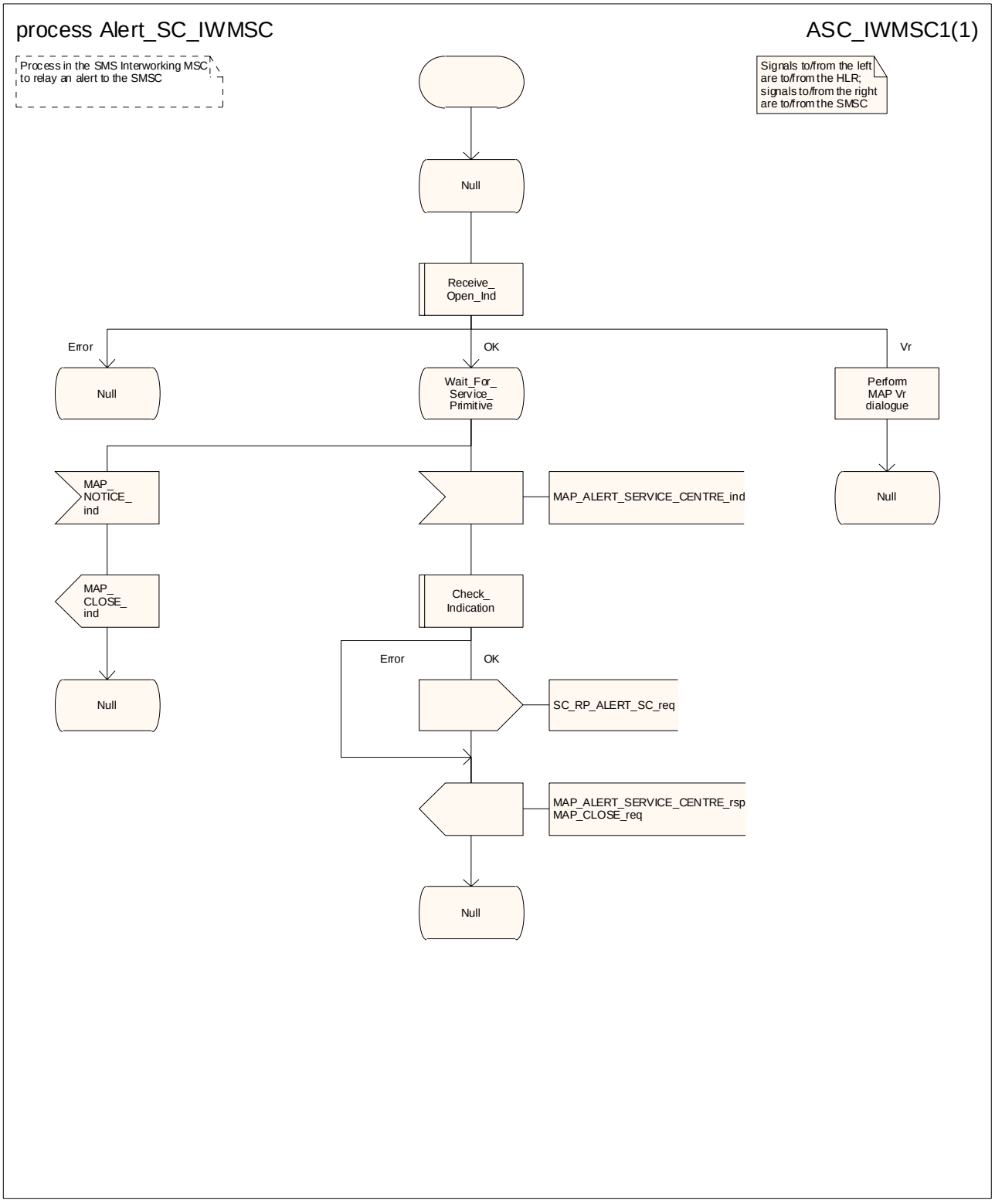


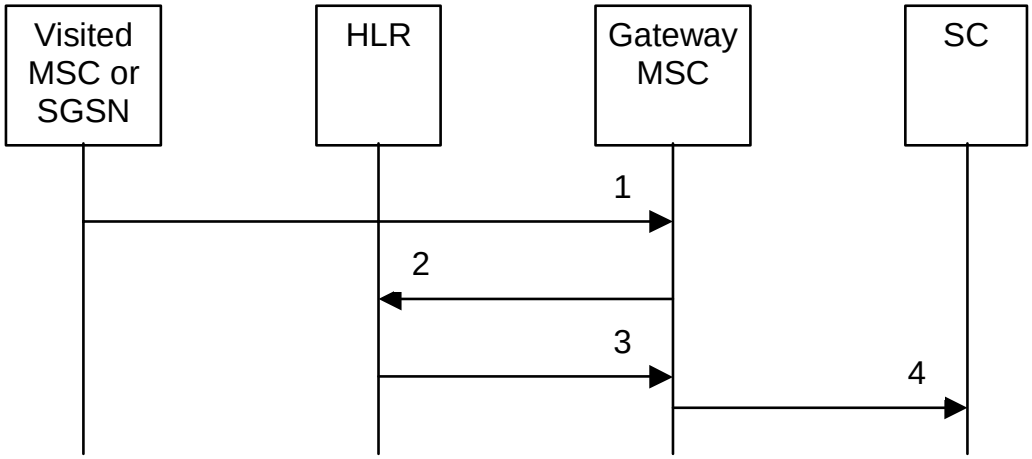
Figure 23.4/87: Process Alert_SC_IWMSC

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 after short message delivery has failed because the subscriber is absent or unidentified or the memory capacity is exceeded. The procedure sets:
  - the Memory Capacity Exceeded Flag (MCEF) in the HLR if the MS memory does not have room for more messages;
  - and/or the MS Not Reachable Flag for non-GPRS if there is no record for the subscriber in the VLR or the subscriber does not respond to paging for delivery via the MSC;
  - and/or the MS Not Reachable for GPRS (MNRG) flag if there is no record for the subscriber in the SGSN or the subscriber does not respond to paging for delivery via the SGSN.
- to report to the HLR that delivery has succeeded. The conditions for report of a successful delivery are described in subclause 23.3.1.

The message flow for the SM delivery status report procedure is shown in figure 23.5/1.



1) MAP_MT_FORWARD_SHORT_MESSAGE_ACK/_NACK (Absent subscriber_SM, unidentified subscriber or memory capacity exceeded).
2) MAP_REPORT_SM_DELIVERY_STATUS.
3) MAP_REPORT_SM_DELIVERY_STATUS_ACK.
4) Short Message Negative Acknowledgement (3GPP TS 23.~~1~~040).

Figure 23.5/1: Short message delivery status report procedure

23.5.1~~2~~ Procedure in the SMS-GMSC

The conditions for the GMSC to invoke the short message delivery status report procedure are specified in subclause 23.3.1.

~~The SMS-GMSC requests a MAP dialogue and sends a MAP_REPORT_SM_DELIVERY_STATUS request to the HLR containing the subscriber data of the mobile subscriber.~~

- ~~if the macro Receive_Open_Cnf takes the "Error" exit, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;~~
- ~~if the macro Receive_Open_Cnf takes the "V1" exit, the SMS-GMSC checks the delivery result.~~
  - ~~if delivery was successful, or delivery failed with any reason other than "Absent subscriber", the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;~~

- if delivery failed with a reason of "Absent subscriber", the SMS-GMSC handles the dialogue according to the specification for version 1 of the protocol, and the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit;

- if the macro Receive_Open_Cnf takes the "Vr" exit (for a version greater than 1), the SMS-GMSC handles the dialogue according to the specification for the earlier version of the protocol, and the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit;

- if the macro Receive_Open_Cnf takes the "OK" exit, the SMS-GMSC waits for a response from the HLR.

When the SMS-GMSC is waiting for a response from the HLR:

- if the dialogue with the HLR fails, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;

- if it receives a MAP_REPORT_SM_DELIVERY_STATUS confirmation, it checks the confirmation.

  - if the confirmation contains an error, the macro Report_SM_Delivery_Stat_GMSC takes the "Error" exit;

  - if the confirmation indicates a successful result, the macro Report_SM_Delivery_Stat_GMSC takes the "OK" exit.

If delivery was successful, the MAP_REPORT_SM_DELIVERY_STATUS request indicates whether delivery succeeded for GPRS or non-GPRS.

If delivery was unsuccessful because the subscriber was absent, the MAP_REPORT_SM_DELIVERY_STATUS request includes the absent subscriber diagnostic indication (if available).

If the reason for unsuccessful delivery is absent subscriber with diagnostic 'Paging failure' for GPRS or non GPRS, the MAP_REPORT_SM_DELIVERY_STATUS request includes the two SM Delivery Outcomes absent subscriber with both diagnostics 'Paging failure' for GPRS and non-GPRS..

Note that the indication of which number belongs the SGSN and which to the MSC, received from the HLR in the routing information result (see subclause 23.3.2) 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 dialogue with the Service Centre may be aborted. If so the SMS-GMSC aborts the dialogue with the HLR.

The short message delivery status report macro in the SMS-GMSC is shown in figure 23.5/2~~3~~.

23.5.2~~1~~ Procedure in the HLR

When the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication, it acts as described in subclause 23.6, macro Report_SM_Delivery_Stat_HLR.

The short message delivery status report process in the HLR is shown in figure 23.5/3~~2~~.

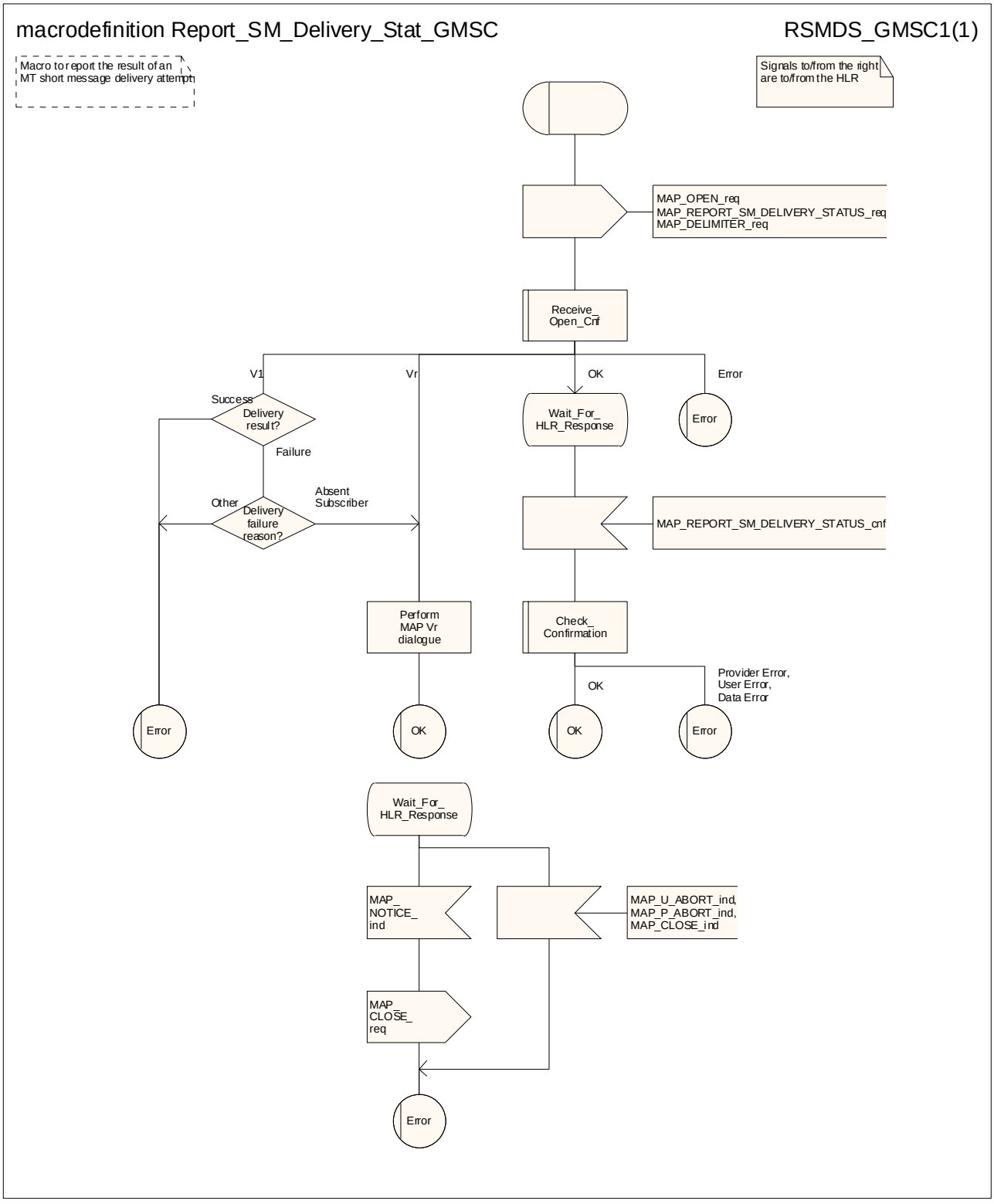


Figure 23.5/23: Macro Report_SM_Delivery_Stat_GMSC

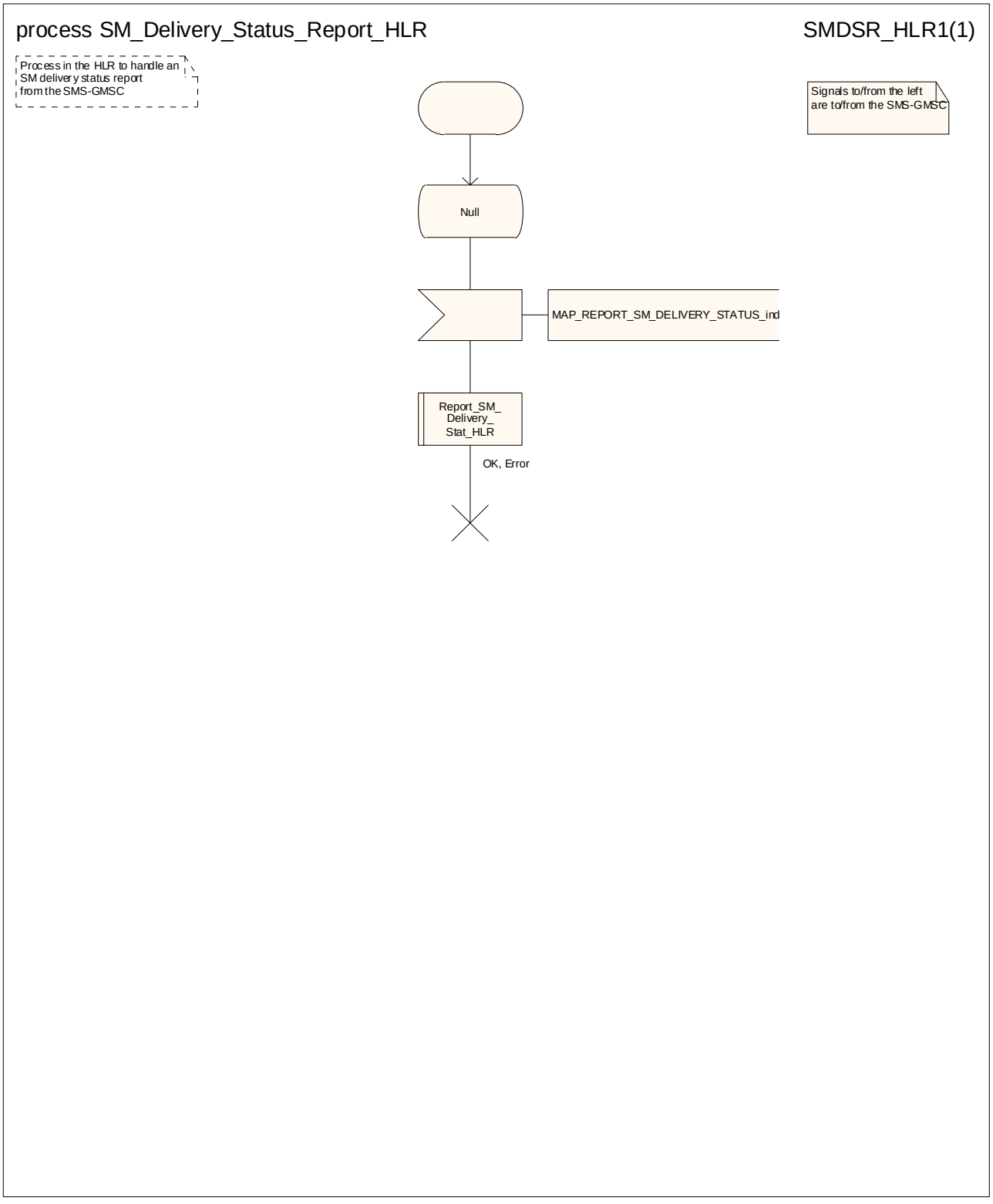


Figure 23.5/3~~2~~: Process SM_Delivery_Status_Report_HLR

23.6 The macro Report_SM_Delivery_Stat_HLR

This macro is invoked when the HLR receives a MAP_REPORT_SM_DELIVERY_STATUS indication from the SMS-GMSC. The macro invokes macros not defined in this clause; the definition of these macros can be found ~~HLR handles the indication~~ as follows:

Check_Indication see subclause 25.2.1;

Alert_Service_Centre_HLR see subclause 25.10.3.

Sheet 1: If the MAP_REPORT_SM_DELIVERY_STATUS indication did not include the GPRS support indicator, the HLR deduces the domain for which the delivery report applies as follows:

- if the subscriber is a GPRS-only subscriber, the report applies for GPRS;
- if the subscriber is a non-GPRS-only subscriber, the report applies for non-GPRS;
- if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the report applies for GPRS;
- if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the report applies for non-GPRS;

~~- if the indication is badly formed, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the appropriate User Error, and the macro takes the "Error" exit;~~

~~- if there is no record in the HLR for the subscriber, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the User Error "Unknown subscriber", and the macro takes the "Error" exit;~~

~~- if the MAP_REPORT_SM_DELIVERY_STATUS indication did not include the GPRS support indicator, the HLR deduces the domain for which the delivery report applies as follows:~~

~~- if the subscriber is a GPRS-only subscriber, the report applies for GPRS;~~

~~- if the subscriber is a non-GPRS-only subscriber, the report applies for non-GPRS;~~

~~- if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the SGSN", the report applies for GPRS;~~

~~- if the subscriber is a GPRS and non-GPRS subscriber and the subscription option for MT SMS delivery when the SMS-GMSC does not support GPRS is set to "Delivery via the MSC", the report applies for non-GPRS;~~

~~- if the MAP_REPORT_SM_DELIVERY_STATUS indication indicated delivery failure, the HLR attempts to add the SC address to the MWD list.~~

~~- if the update of the MWD list failed, the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response containing the User Error "MWD list full", and the macro takes the "Error" exit;~~

~~- if the update of the MWD list succeeded, the HLR sets the variable Delivery Result to Failure, and continues to process the delivery failure report:~~

~~- if the MSISDN used to define the destination MS was not the MSISDN-Alert, the HLR sets the MSISDN-Alert parameter in the MAP_REPORT_SM_DELIVERY_STATUS response;~~

~~- if the delivery failure cause was MS memory capacity exceeded for non-GPRS, the HLR sets the MCEF and clears the MNRF;~~

~~- if the delivery failure cause was MS memory capacity exceeded for GPRS, the HLR sets the MCEF and clears the MNRG flag;~~

~~- if the delivery failure cause was Absent Subcriber for non-GPRS, the HLR sets the MNRF;~~

~~- if the delivery failure cause was Absent Subcriber for GPRS, the HLR sets the MNRG flag;~~

- if the delivery failure cause was Absent Subcriber for non-GPRS and GPRS, the HLR sets the MNRF and the MNRG flag;
- if the delivery cause was absent subscriber and the MAP_REPORT_SM_DELIVERY_STATUS indication included a reason for absence, the HLR stores the reason for absence in the Mobile Not Reachable Reason and calls the procedure Check_Absent_Subscriber_SM_In_HLR (see 3GPP TS 23.116 [110];
- the HLR returna a MAP_REPORT_SM_DELIVERY_STATUS response indicating success, and the macro takes the "OK" exit.

- if the MAP_REPORT_SM_DELIVERY_STATUS indication indicated successful transfer,the HLR handles the indication as follows:
  - if the delivery outcome was for non-GPRS, the HLR clears the MNRF and the MCEF;
  - if the delivery outcome was for GPRS, the HLR clears the MNRG flag and the MCEF;
  - the HLR returns a MAP_REPORT_SM_DELIVERY_STATUS response indicating success;
  - the HLR invokes the macro Alert_Service_Centre_HLR to alert the service centres whose addresses are in the MWD list, as described in subclause 25.10;
  - the HLR sets the variable Delivery Result to Success, and the macro takes the "OK" exit.

The short message delivery status report macro in the HLR is shown in figure 23.6/1.

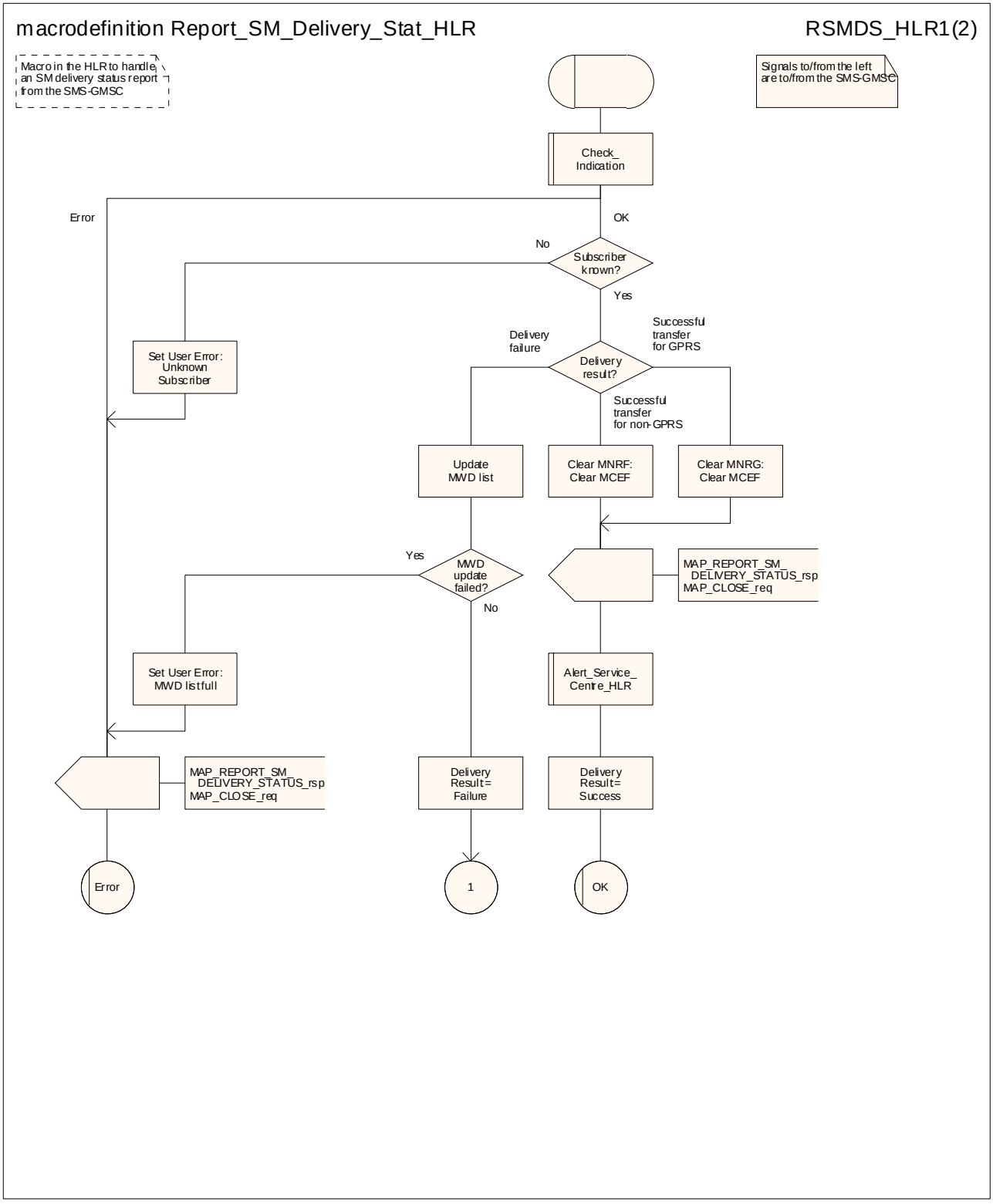


Figure 23.6/1 (sheet 1 of 2): Macro Report_SM_Delivery_Stat_HLR

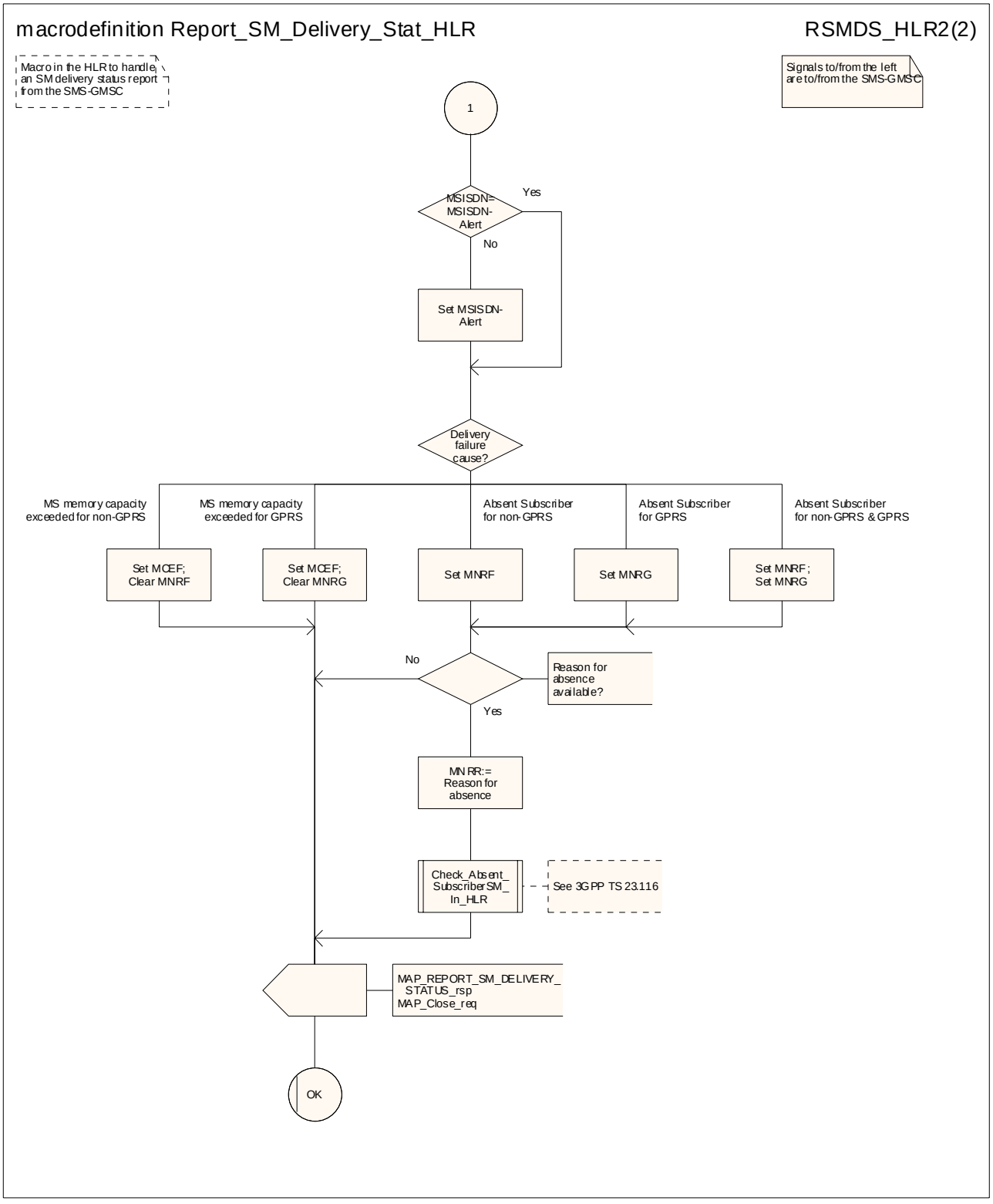


Figure 23.6/1 (sheet 2 of 2): Macro Report_SM_Delivery_Stat_HLR

***** End of document *****

3GPP TSG CN WG4 Meeting #19
San Diego, CA, USA, 19th – 23rd May 2003

N4-030391

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **580** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Provision of SDL diagrams in chapter 24B
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	15/04/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	There are no source files available for the SDL diagrams in 29.002 chapter 24B. Many SDL diagrams are poorly laid out. Message flow diagrams are drawn using linedraw characters, which do not display correctly in Word 2000. The error handling in the dialogue initiator is not properly specified (the MAP process should report a "System failure" error to the application process). The error handling in the dialogue responder is not properly specified (there is no need to send a MAP_P_ABORT if the dialogue establishment fails, because the dialogue is aborted by the MAP protocol machine).
Summary of change:	⌘	Redraw SDL diagrams to a consistent style. Redraw message flow diagrams. Add the correct error handling.
Consequences if not approved:	⌘	Impaired readability. Incorrect error handling

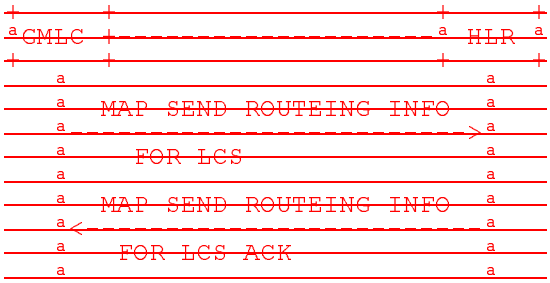
Clauses affected:	⌘	24B			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	The order of the subclauses in subclause 24B.3 has been revised so that the description of the behaviour in the dialogue initiator (MSC or SGSN) comes before the description of the behaviour in the dialogue responder (GMLC). This editorial change has not been revision marked, apart from the changes to subclause and figure numbers.			

24B Location Service process description

24B.1 Routeing information retrieval procedure for LCS

24B.1.1 General

The message flows for successful retrieval of routeing information related to location services are shown in figure 24B.1/1.



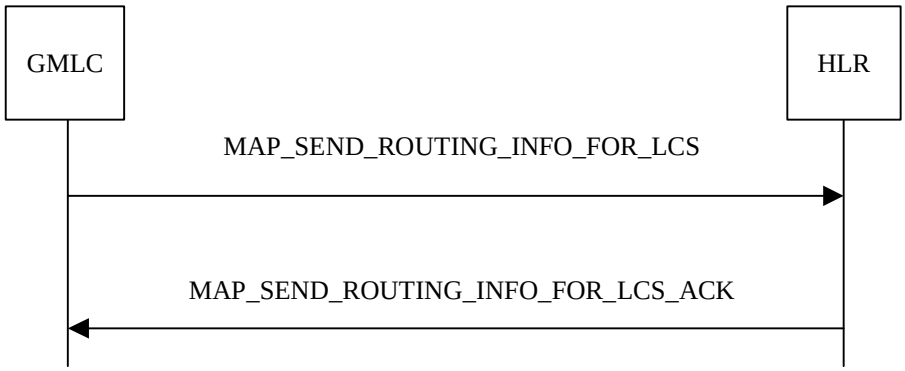


Figure 24B.1/1: Message flow for retrieval of routeing information for LCS

The following MAP services are used to retrieve routeing information:

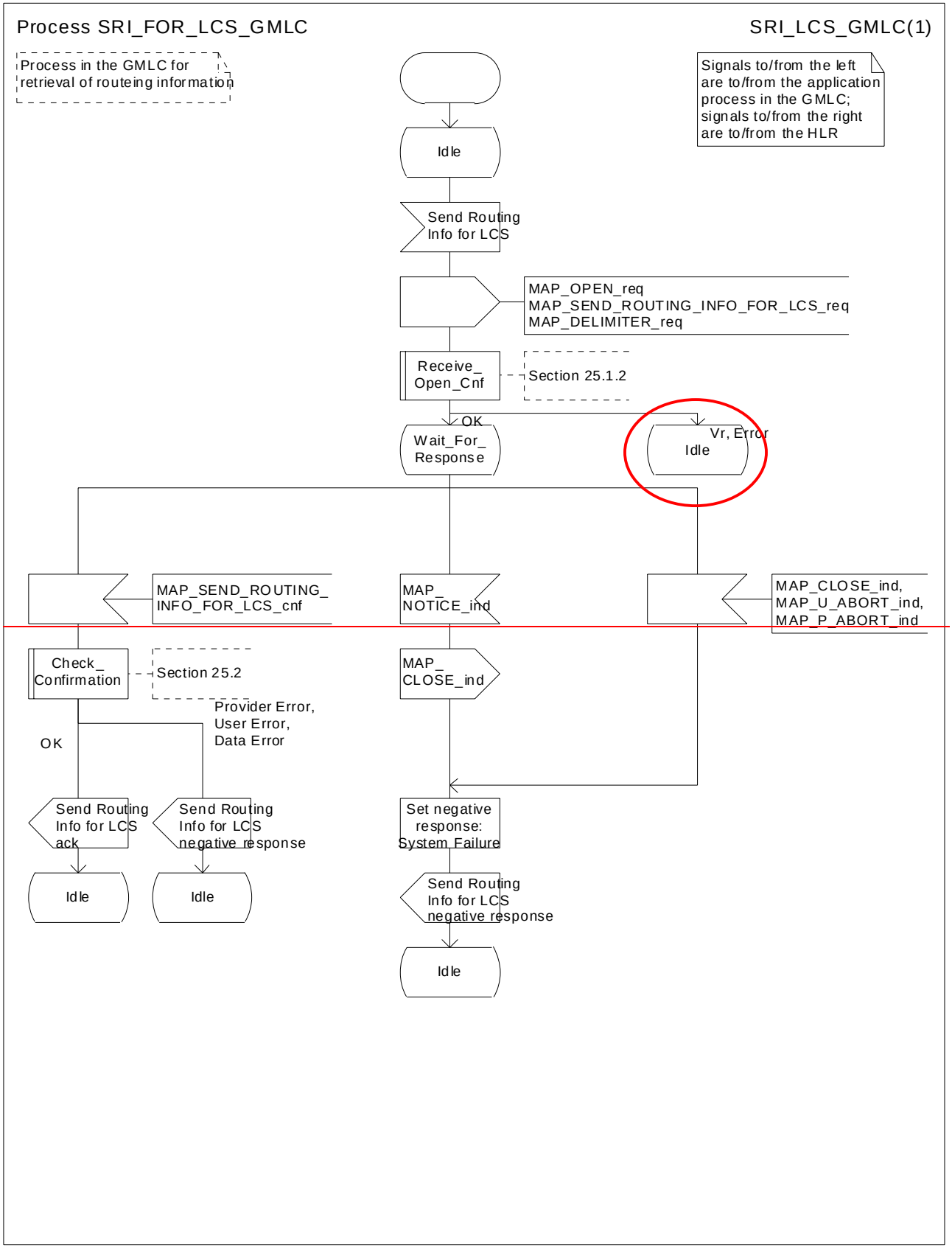
MAP_SEND_ROUTING_INFO_FOR_LCS see clause 13A.1.

24B.1.2 Process in the GMLC

The MAP process in the GMLC to request routeing information for LCS is shown in figure 24B.1/2. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.


Process SRI_FOR_LCS_GMLC
SRI_LCS_GMLC(1)
Process in the GMLC for retrieval of routeing information
Signals to/from the left are to/from the application process in the GMLC; signals to/from the right are to/from the HLR
Idle
Send Routing Info for LCS
MAP_OPEN_req
MAP_SEND_ROUTING_INFO_FOR_LCS_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Section 25.1.2
OK
Wait_For_ Response
Vr, Error
Idle
MAP_SEND_ROUTING_ INFO_FOR_LCS_cnf
MAP_ NOTICE_ind
MAP_CLOSE_ind,
MAP_U_ABORT_ind,
MAP_P_ABORT_ind
Check_ Confirmation
Section 25.2
MAP_ CLOSE_ind
Provider Error,
User Error,
Data Error
OK
Send Routing Info for LCS ack
Send Routing Info for LCS negative response
Set negative response: System Failure
Idle
Idle
Send Routing Info for LCS negative response
Idle

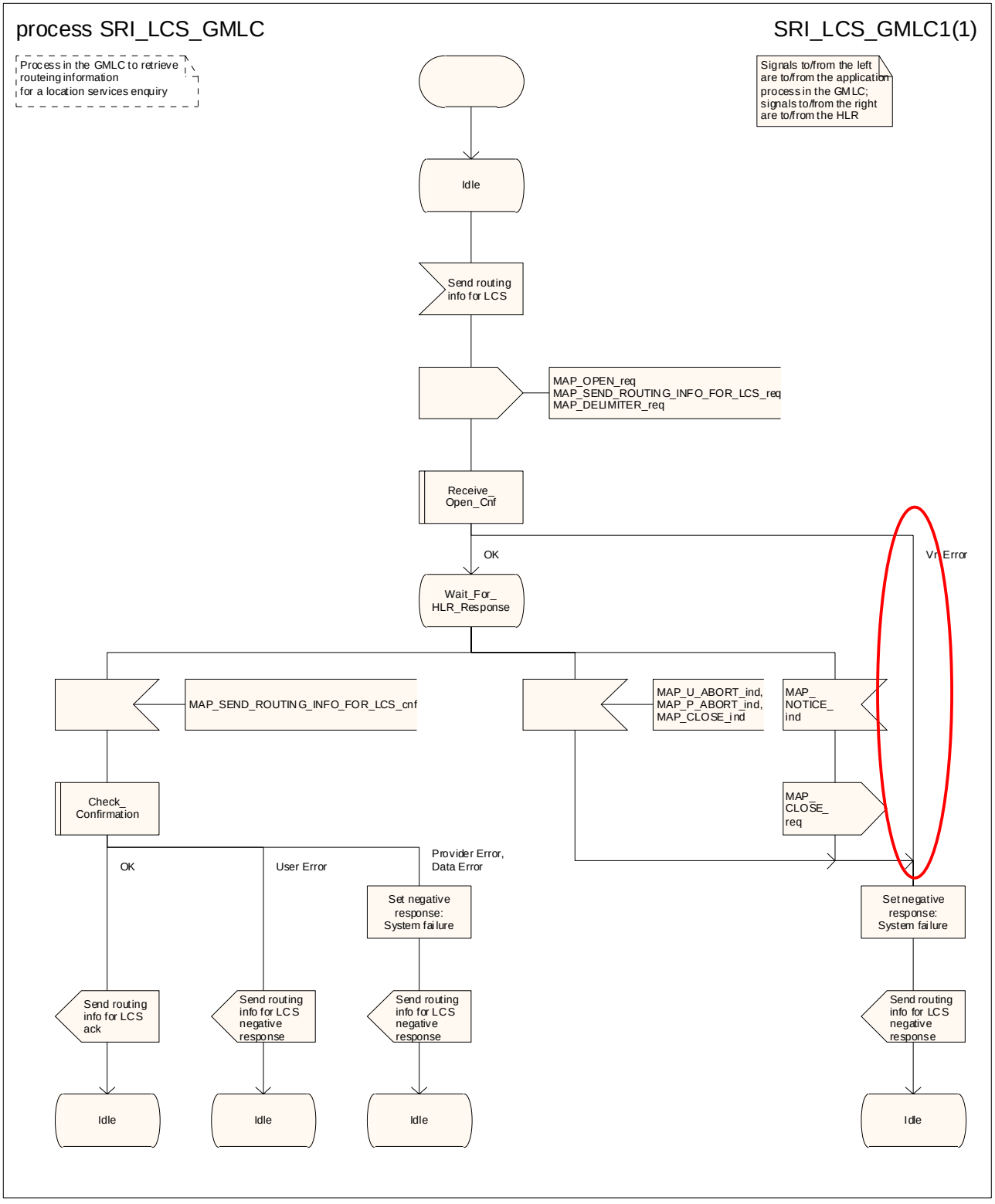


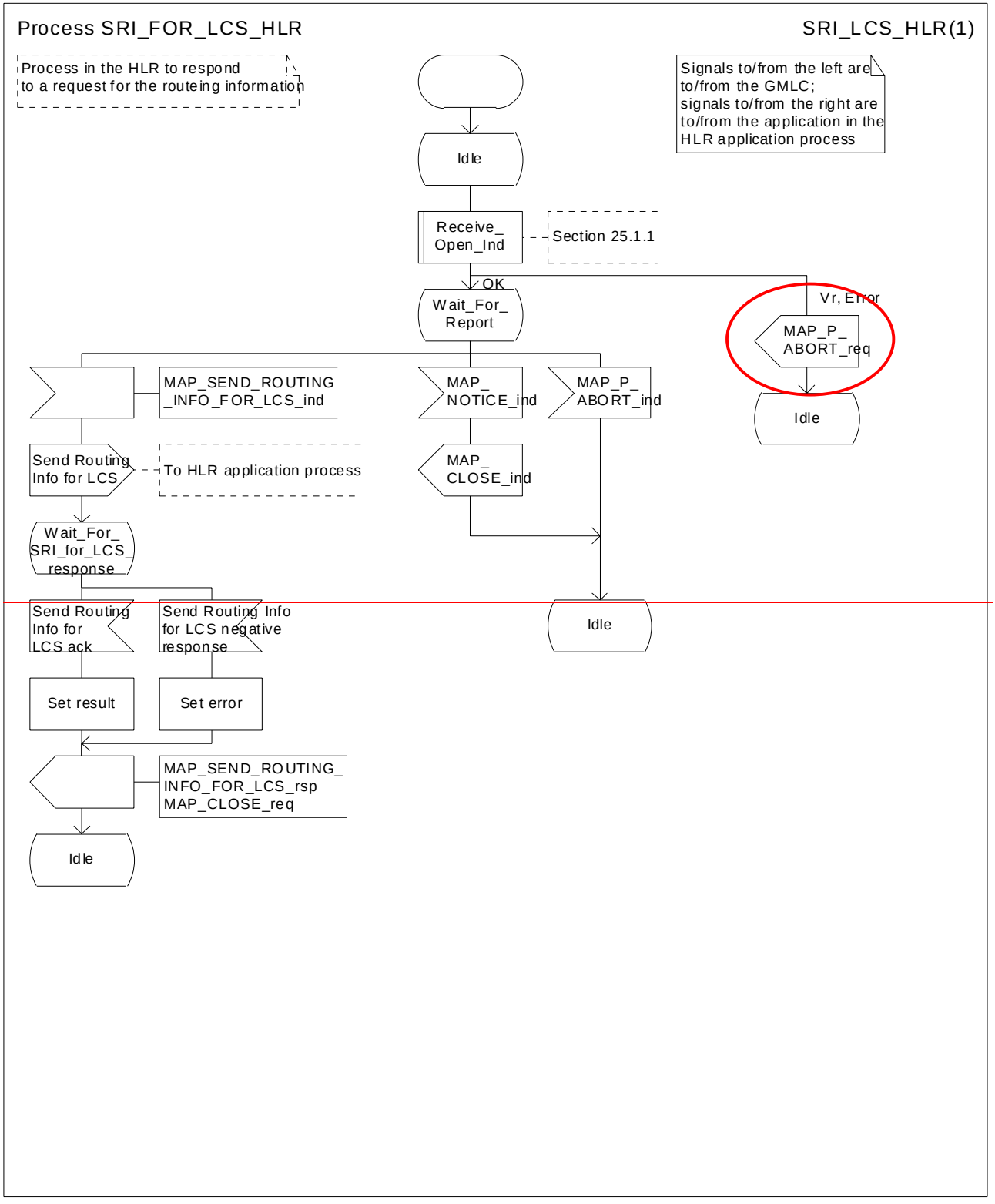
Figure 24B.1/2: Process SRI~~_FOR~~_LCS_GMLC

24B.1.3 Process in the HLR

The MAP process in the HLR to handle a request for routeing information for LCS is shown in figure 24B.1/3. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.


Process SRI_FOR_LCS_HLR
SRI_LCS_HLR(1)
Process in the HLR to respond to a request for the routeing information
Signals to/from the left are to/from the GMLC; signals to/from the right are to/from the application in the HLR application process
Idle
Receive_ Open_Ind
Section 25.1.1
OK
Vr, Error
Wait_For_ Report
MAP_P_ ABORT_req
Idle
MAP_SEND_ROUTING _INFO_FOR_LCS_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
Send Routing Info for LCS
To HLR application process
MAP_ CLOSE_ind
Wait_For_ SRI_for_LCS_ response
Send Routing Info for LCS ack
Send Routing Info for LCS negative response
Idle
Set result
Set error
MAP_SEND_ROUTING_ INFO_FOR_LCS_rsp MAP_CLOSE_req
Idle

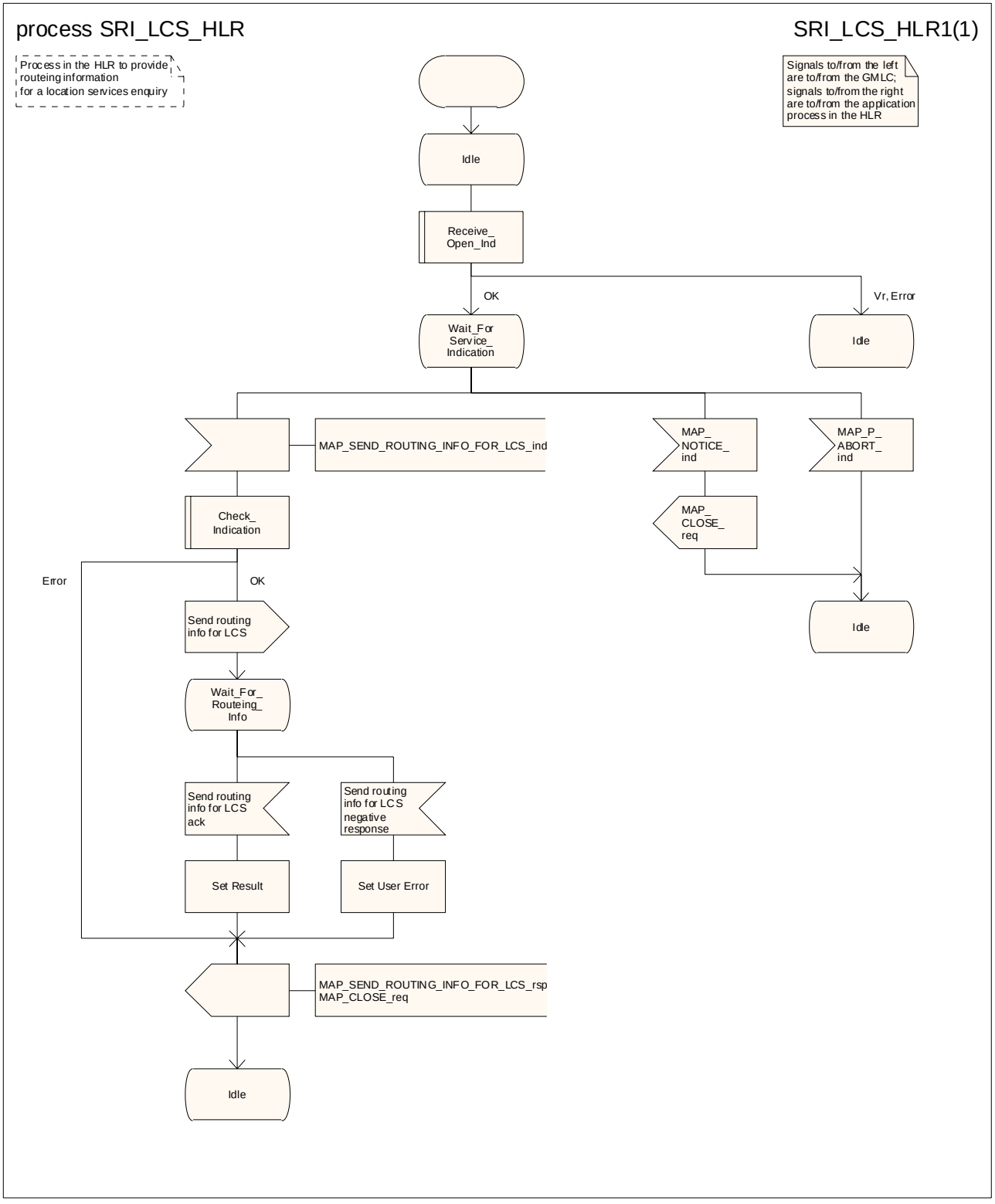


Figure 24B.1/3: Process SRI_~~FOR~~_LCS_HLR

24B.2 Provide Subscriber Location procedure

24B.2.1 General

The message flows for successful retrieval of the location information of a target MS related to location services are shown in figure 24B.1/1.

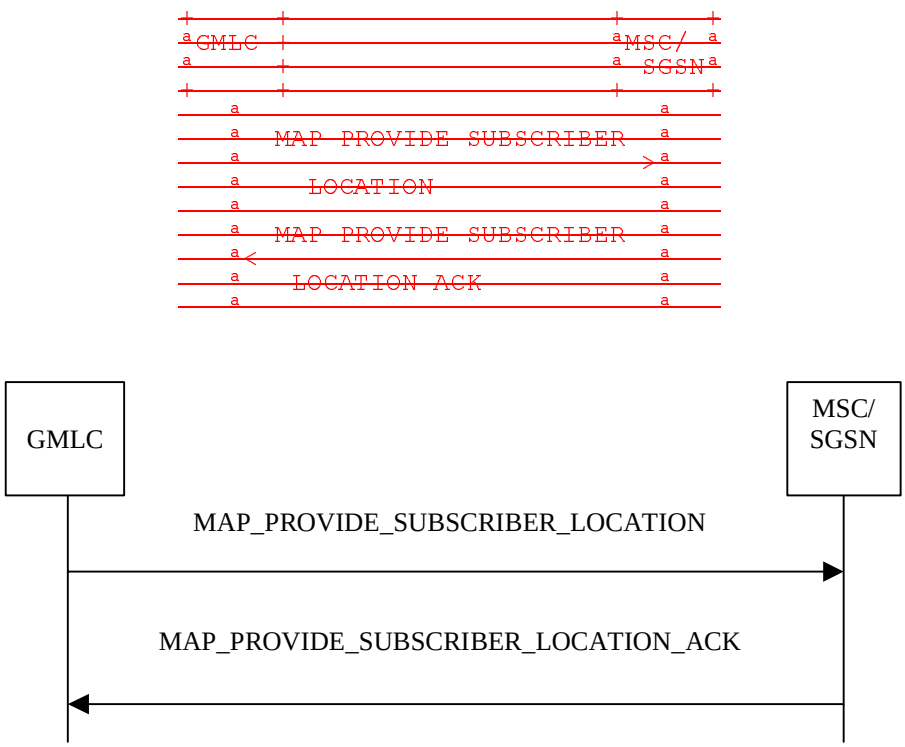


Figure 24B.2/1: Message flow for retrievalquest of the location information

The following MAP services are used to retrieve location information:

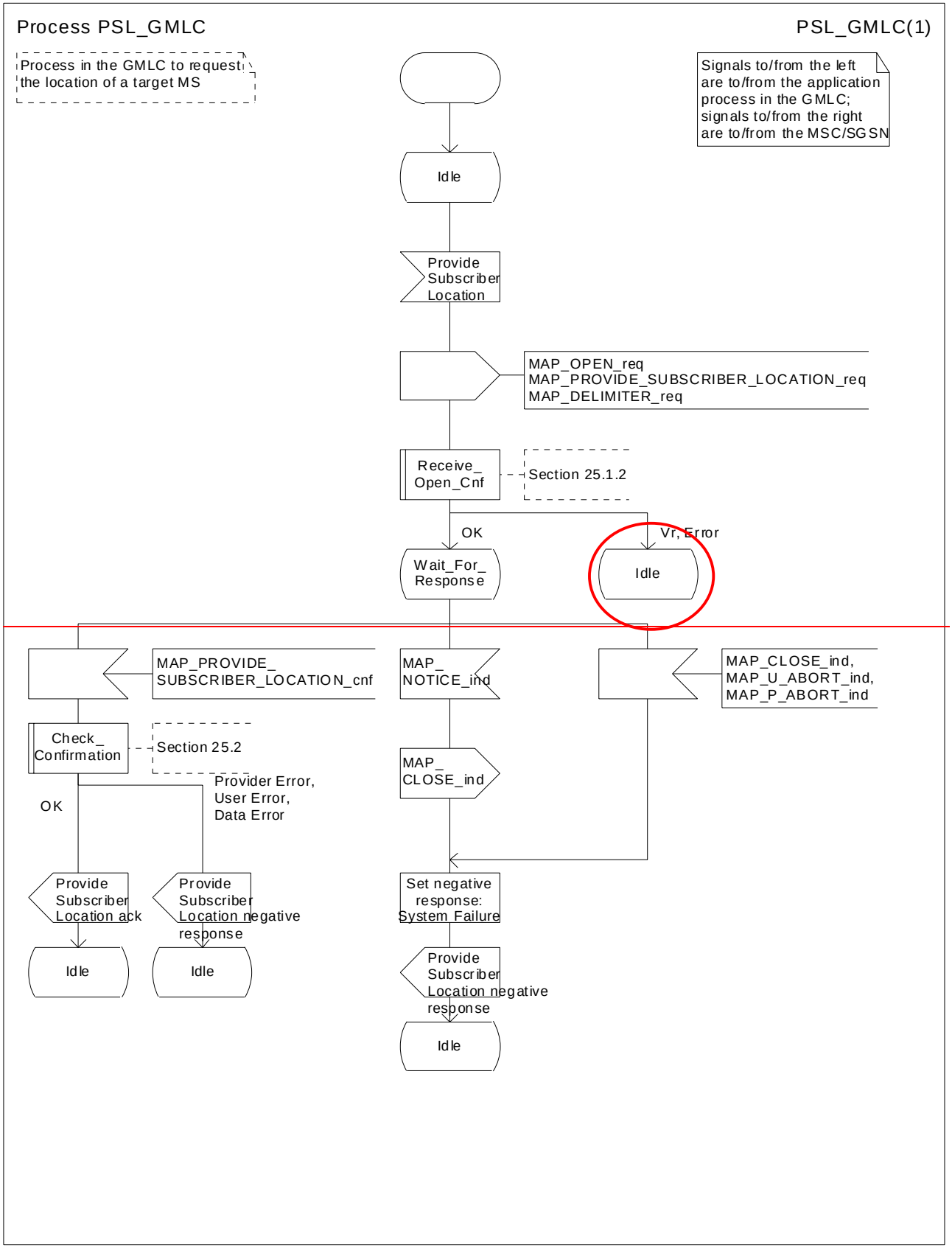
MAP_PROVIDE_SUBSCRIBER_LOCATION see clause 13A.2.

24B.2.2 Process in the GMLC

The MAP process in the GMLC to request location information from an MSC or an SGSN is shown in figure 24B.2/2.
The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.


Process PSL_GMLC
PSL_GMLC(1)
Process in the GMLC to request the location of a target MS
Signals to/from the left are to/from the application process in the GMLC; signals to/from the right are to/from the MSC/SGSN
Idle
Provide Subscriber Location
MAP_OPEN_req
MAP_PROVIDE_SUBSCRIBER_LOCATION_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Section 25.1.2
OK
Vr, Error
Wait_For_ Response
Idle
MAP_PROVIDE_ SUBSCRIBER_LOCATION_cnf
MAP_ NOTICE_ind
MAP_CLOSE_ind, MAP_U_ABORT_ind, MAP_P_ABORT_ind
Check_ Confirmation
Section 25.2
Provider Error, User Error, Data Error
OK
MAP_ CLOSE_ind
Provide Subscriber Location ack
Provide Subscriber Location negative response
Set negative response: System Failure
Idle
Idle
Provide Subscriber Location negative response
Idle

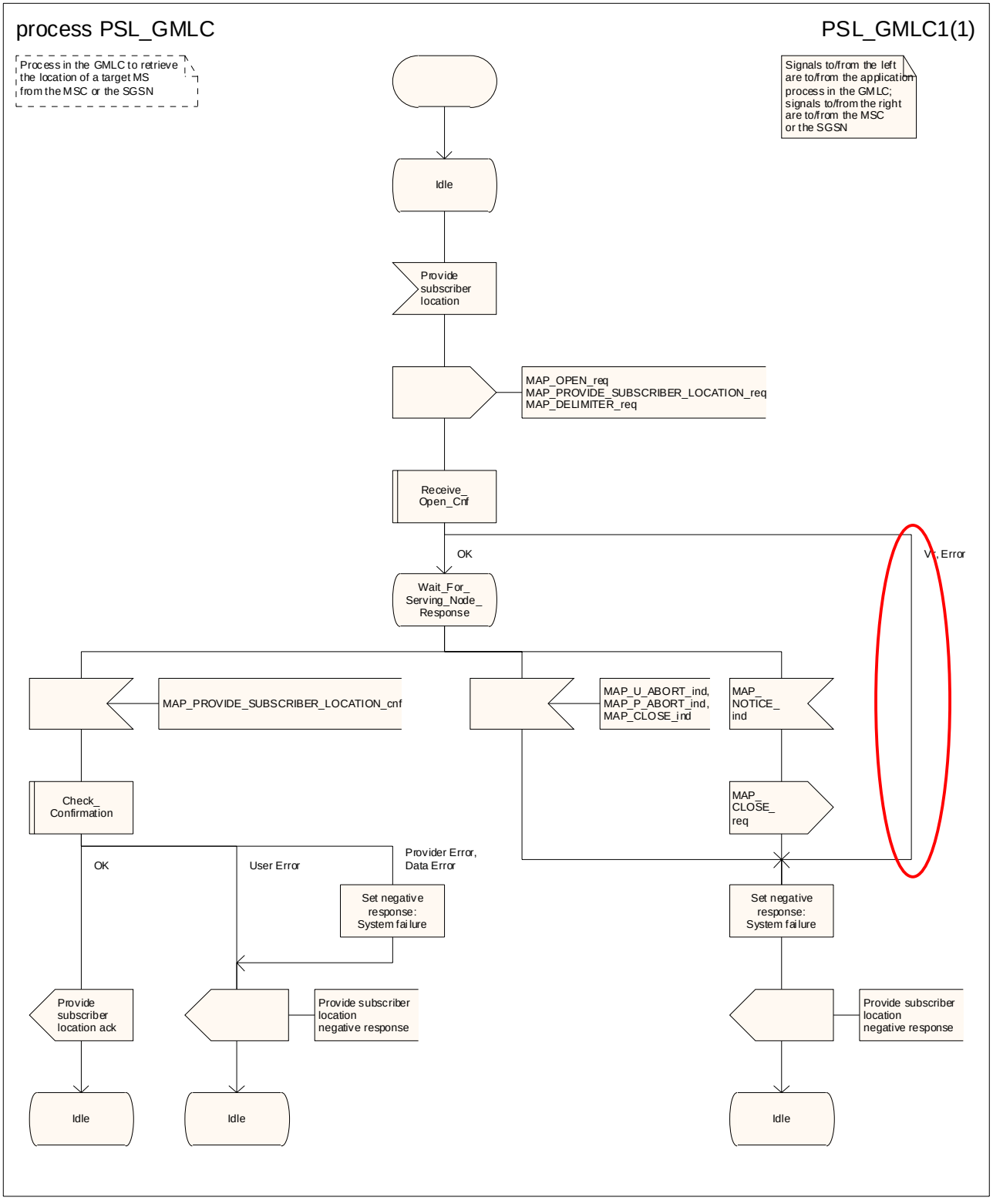


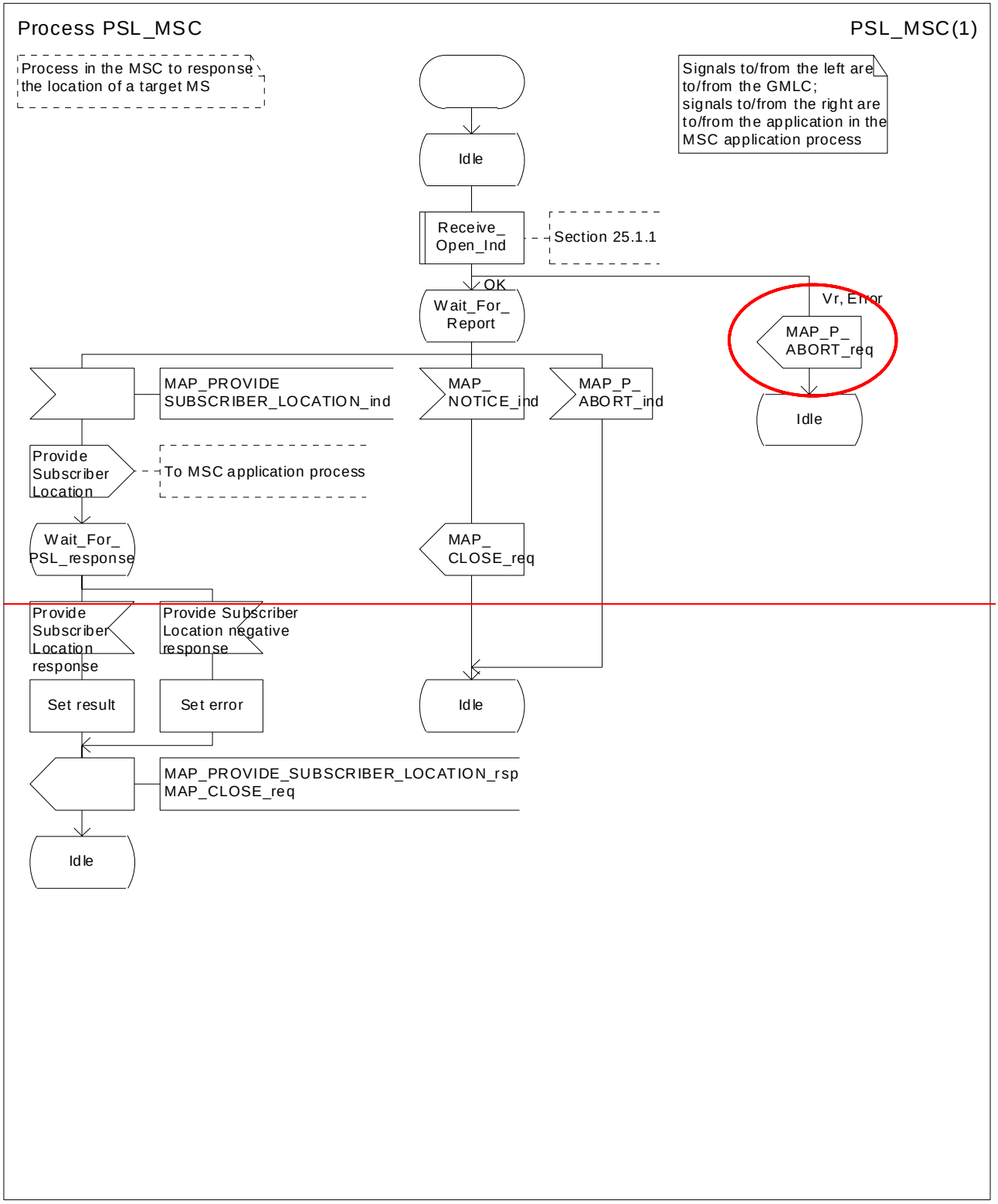
Figure 24B.2/2: Process PSL_GMLC

24B.2.3 Process in the MSC

The MAP process in the MSC to handle a request for location information from a GMLC is shown in figure 24B.2/3.
The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.


Process PSL_MSC
PSL_MSC(1)
Process in the MSC to response the location of a target MS
Signals to/from the left are to/from the GMLC; signals to/from the right are to/from the application in the MSC application process
Idle
Receive_ Open_Ind
Section 25.1.1
OK
Wait_For_ Report
Vr, Error
MAP_P_ ABORT_req
Idle
MAP_PROVIDE SUBSCRIBER_LOCATION_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
Provide Subscriber Location
To MSC application process
Wait_For_ PSL_response
MAP_ CLOSE_req
Provide Subscriber Location response
Provide Subscriber Location negative response
Set result
Set error
Idle
MAP_PROVIDE_SUBSCRIBER_LOCATION_rsp
MAP_CLOSE_req
Idle

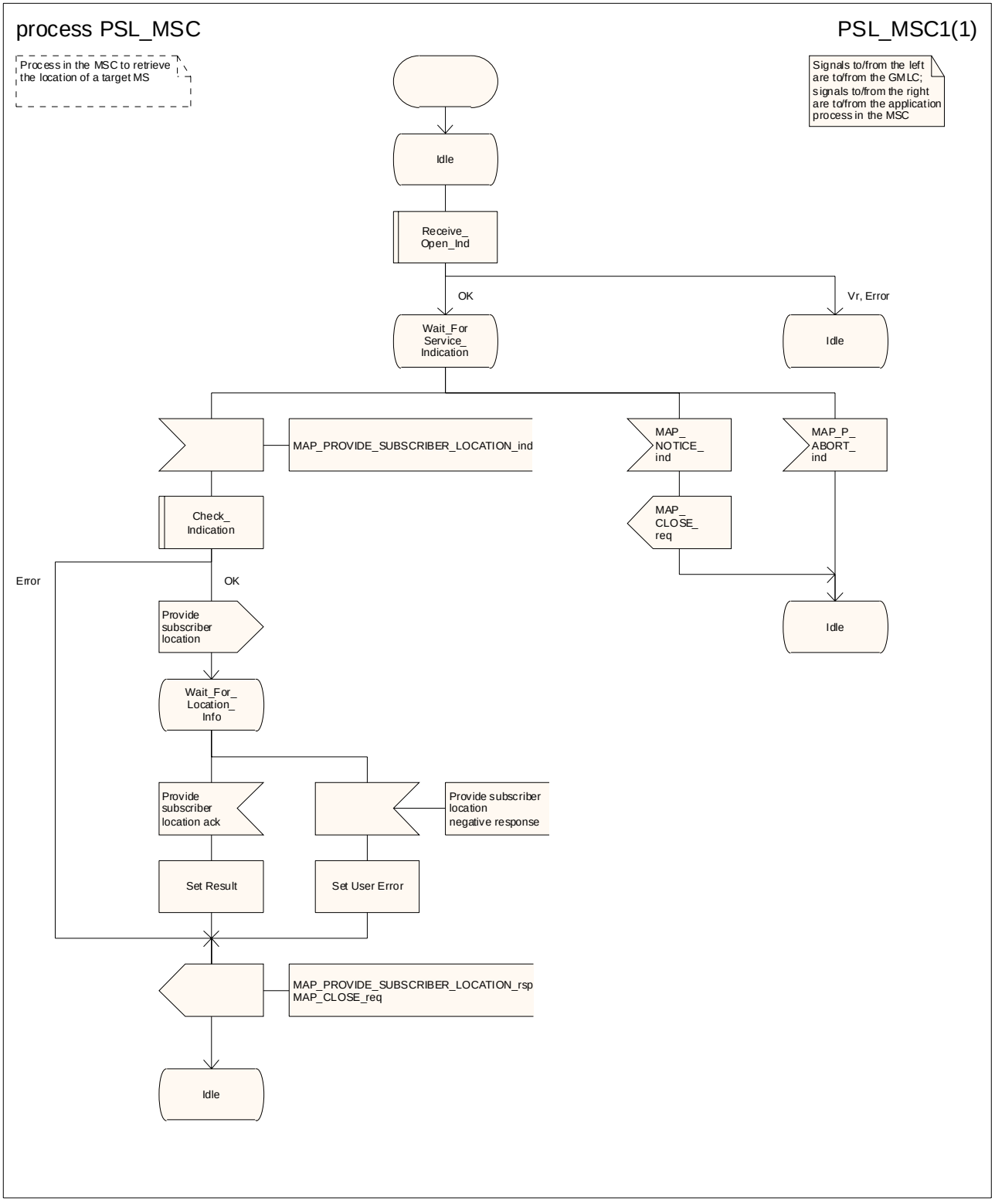


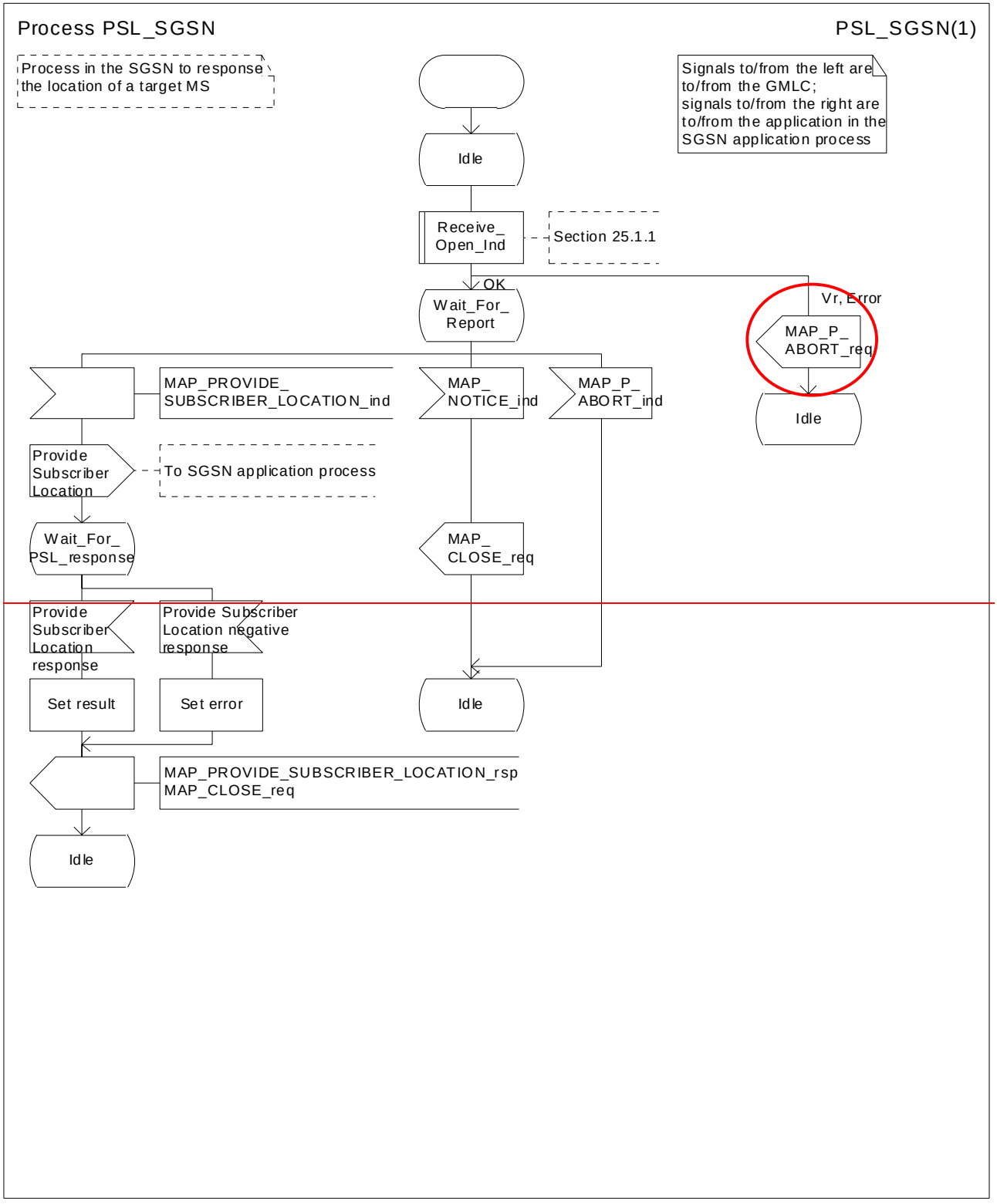
Figure 24B.2/3: Process PSL_MSC

24B.2.4 Process in the SGSN

The MAP process in the SGSN to handle a request for location information from a GMLC is shown in figure 24B.2/4.
The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.


Process PSL_SGSN
PSL_SGSN(1)
Process in the SGSN to response the location of a target MS
Signals to/from the left are to/from the GMLC; signals to/from the right are to/from the application in the SGSN application process
Idle
Receive_ Open_Ind
Section 25.1.1
OK
Wait_For_ Report
Vr, Error
MAP_P_ ABORT_req
Idle
MAP_PROVIDE_ SUBSCRIBER_LOCATION_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
Provide Subscriber Location
To SGSN application process
Wait_For_ PSL_response
MAP_ CLOSE_req
Provide Subscriber Location response
Provide Subscriber Location negative response
Set result
Set error
Idle
MAP_PROVIDE_SUBSCRIBER_LOCATION_rsp
MAP_CLOSE_req
Idle

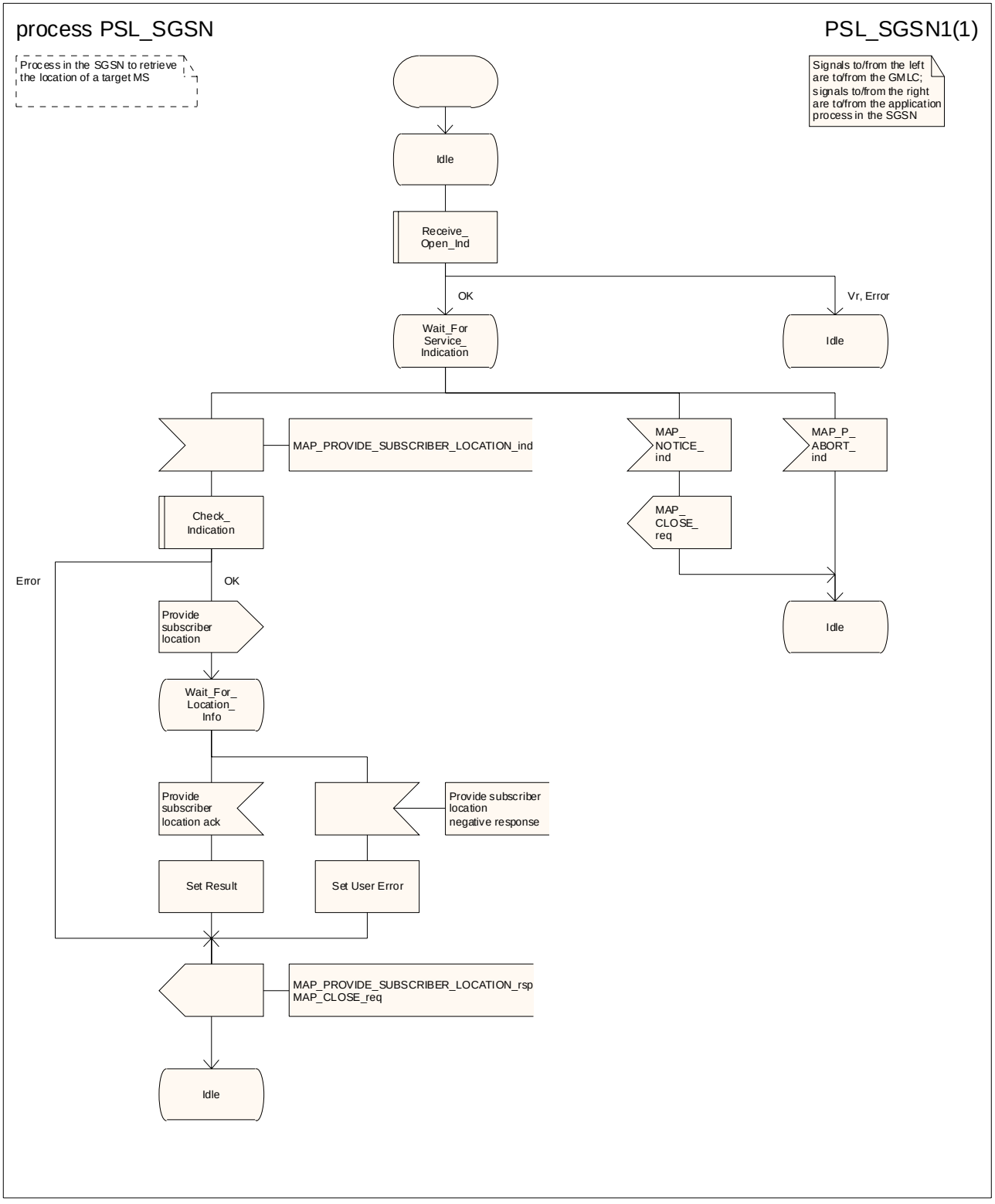


Figure 24B.2/4: Process PSL_SGSN

24B.3 Subscriber Location Report procedure

24B.3.1 General

The message flows for successful report of the location information of a target MS related to location services are shown in figure 24B.3/1.

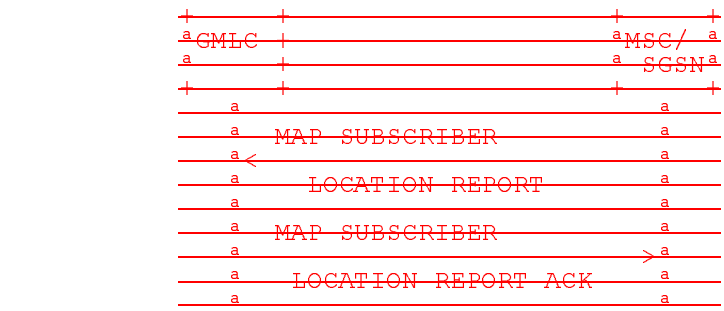


Figure 24B.3/1: Message flow for report of ~~the~~ location information

The following MAP services are used to report location information:

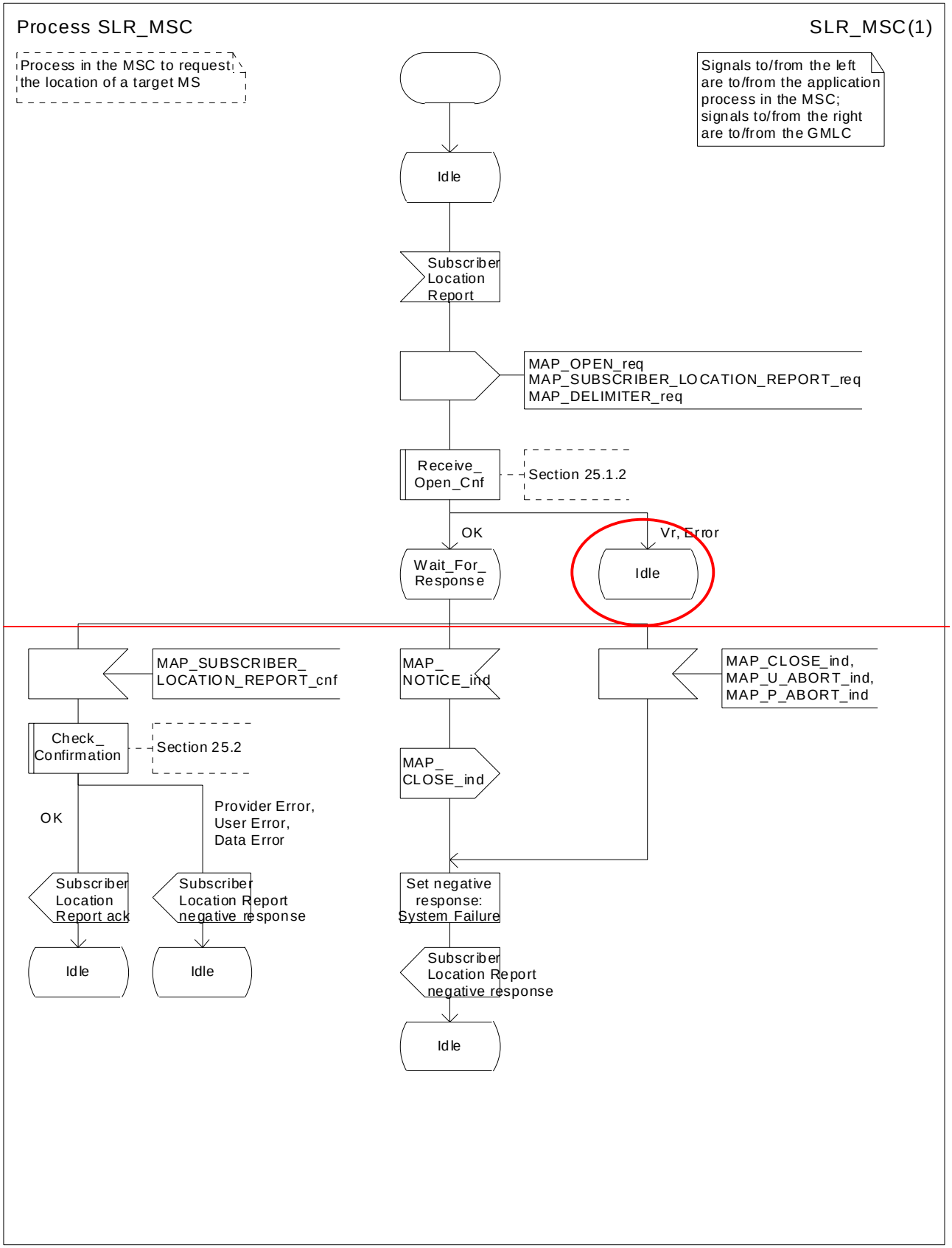
MAP_SUBSCRIBER_LOCATION_REPORT see clause 13A.3.

24B.3.2~~3~~Process in the MSC

The MAP process in the MSC to send a subscriber location report to the GMLC is shown in figure 24B.3/2. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.


Process SLR_MSC
SLR_MSC(1)
Process in the MSC to request the location of a target MS
Signals to/from the left are to/from the application process in the MSC; signals to/from the right are to/from the GMLC
Idle
Subscriber Location Report
MAP_OPEN_req
MAP_SUBSCRIBER_LOCATION_REPORT_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Section 25.1.2
OK
Vr, Error
Wait_For_ Response
Idle
MAP_SUBSCRIBER_ LOCATION_REPORT_cnf
MAP_ NOTICE_ind
MAP_CLOSE_ind, MAP_U_ABORT_ind, MAP_P_ABORT_ind
Check_ Confirmation
Section 25.2
MAP_ CLOSE_ind
OK
Provider Error, User Error, Data Error
Subscriber Location Report ack
Subscriber Location Report negative response
Set negative response: System Failure
Idle
Idle
Subscriber Location Report negative response
Idle

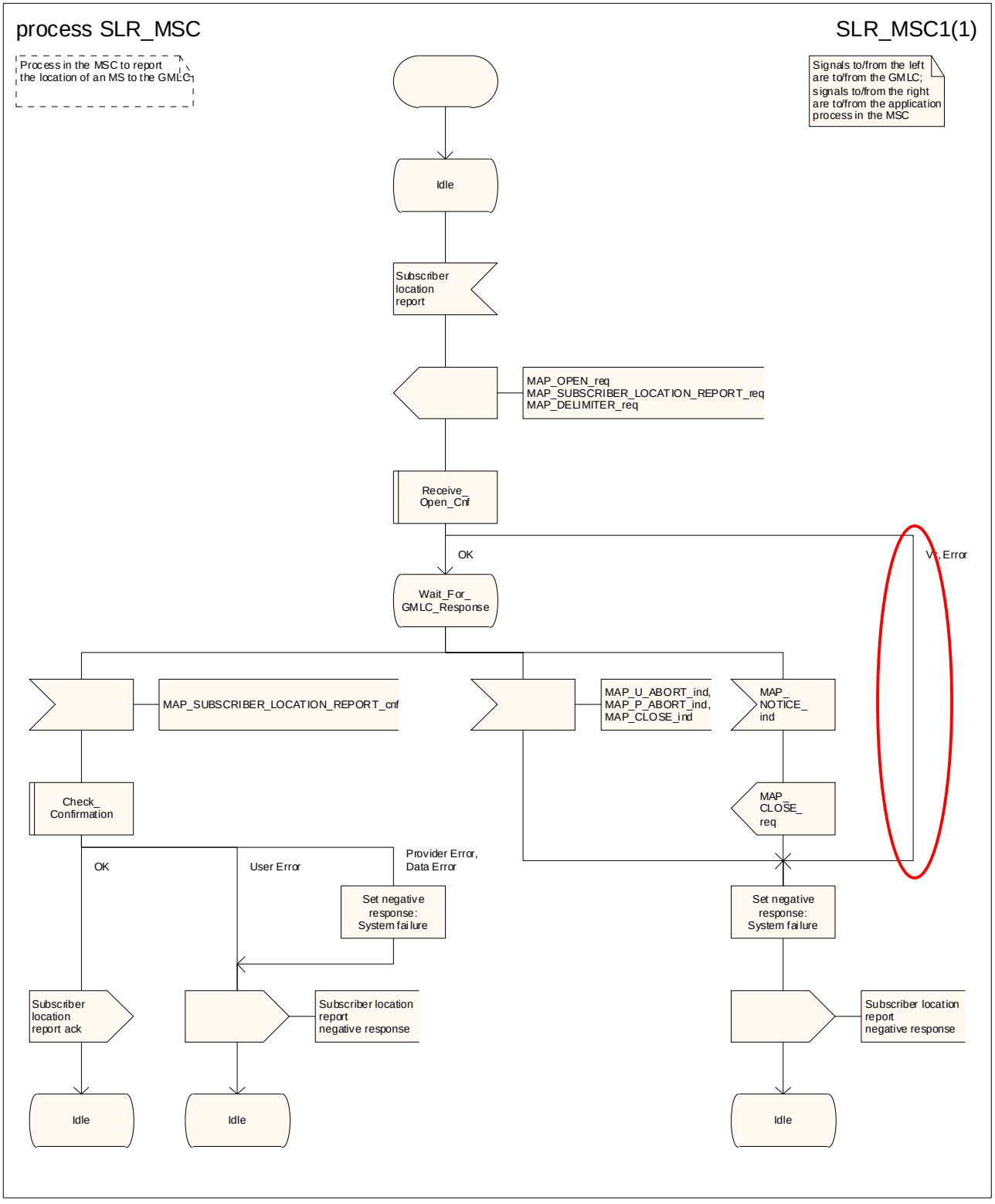


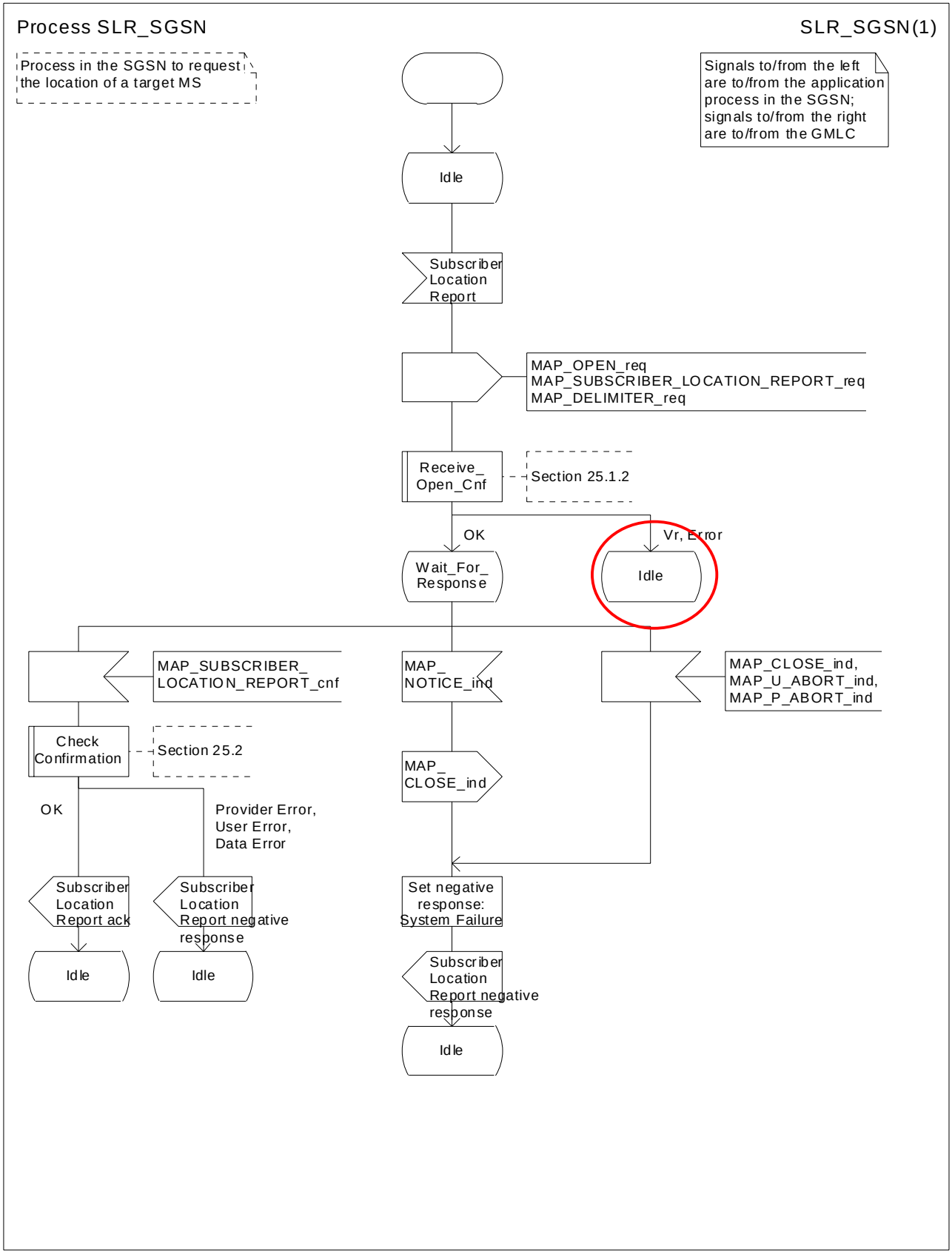
Figure 24B.3/2~~3~~ Process SLR_MSC

24B.3.34Process in the SGSN

The MAP process in the SGSN to send a subscriber location report to the GMLC is shown in figure 24B.3/3. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.


Process SLR_SGSN
SLR_SGSN(1)
Process in the SGSN to request the location of a target MS
Signals to/from the left are to/from the application process in the SGSN; signals to/from the right are to/from the GMLC
Idle
Subscriber Location Report
MAP_OPEN_req
MAP_SUBSCRIBER_LOCATION_REPORT_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Section 25.1.2
OK
Vr, Error
Wait_For_ Response
Idle
MAP_SUBSCRIBER_ LOCATION_REPORT_cnf
MAP_ NOTICE_ind
MAP_CLOSE_ind, MAP_U_ABORT_ind, MAP_P_ABORT_ind
Check Confirmation
Section 25.2
MAP_ CLOSE_ind
OK
Provider Error, User Error, Data Error
Subscriber Location Report ack
Subscriber Location Report negative response
Set negative response: System Failure
Idle
Idle
Subscriber Location Report negative response
Idle

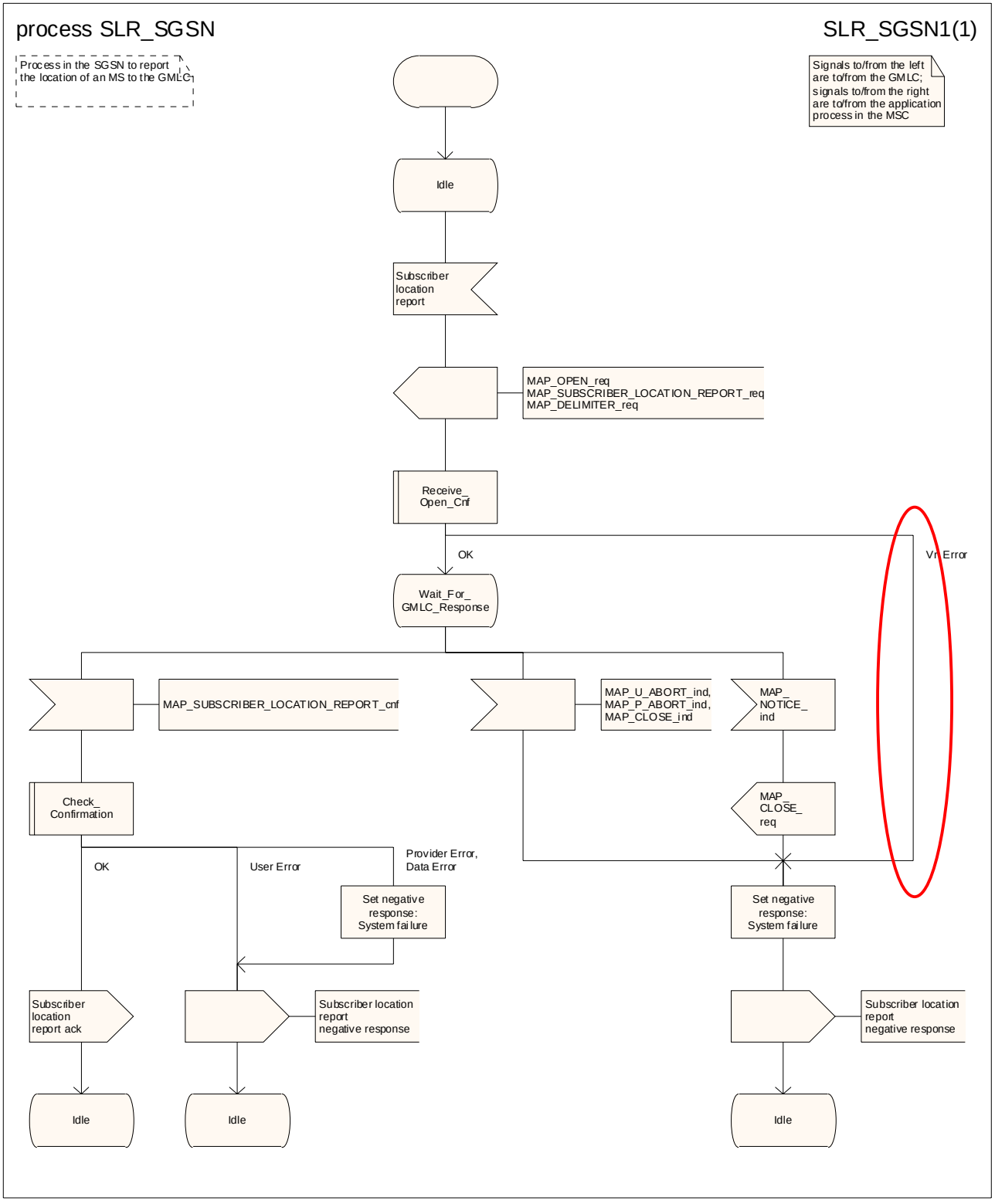


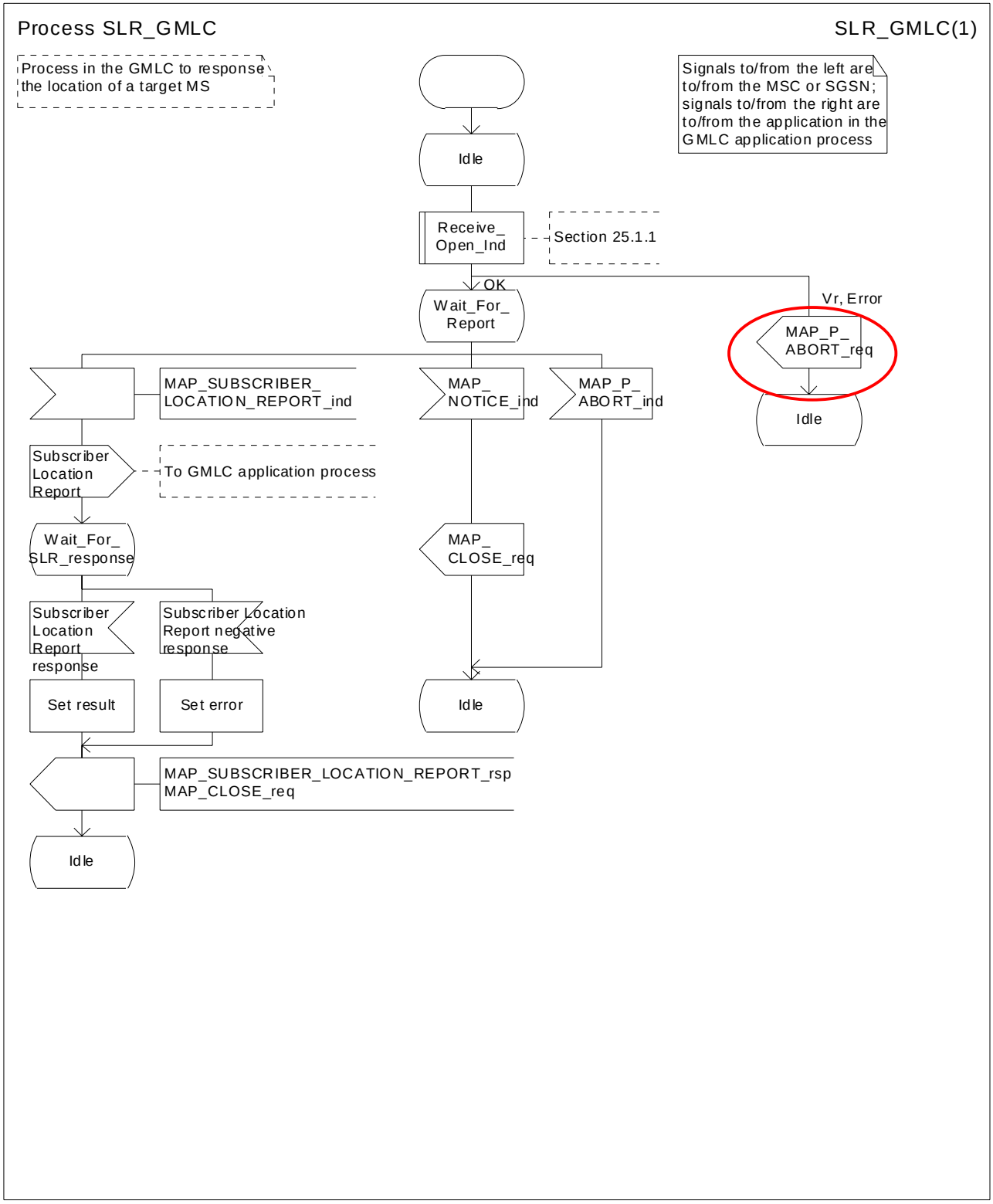
Figure 24B.3/34 Process SLR_SGSN

24B.3.42Process in the GMLC

The MAP process in the GMLC to handle a subscriber location report is shown in figure 24B.3/4. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.


Process SLR_GMLC
SLR_GMLC(1)
Process in the GMLC to response the location of a target MS
Signals to/from the left are to/from the MSC or SGSN; signals to/from the right are to/from the application in the GMLC application process
Idle
Receive_ Open_Ind
Section 25.1.1
OK
Vr, Error
Wait_For_ Report
MAP_P_ ABORT_req
Idle
MAP_SUBSCRIBER_ LOCATION_REPORT_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
Subscriber Location Report
To GMLC application process
Wait_For_ SLR_response
MAP_ CLOSE_req
Subscriber Location Report response
Subscriber Location Report negative response
Set result
Set error
Idle
MAP_SUBSCRIBER_LOCATION_REPORT_rsp
MAP_CLOSE_req
Idle

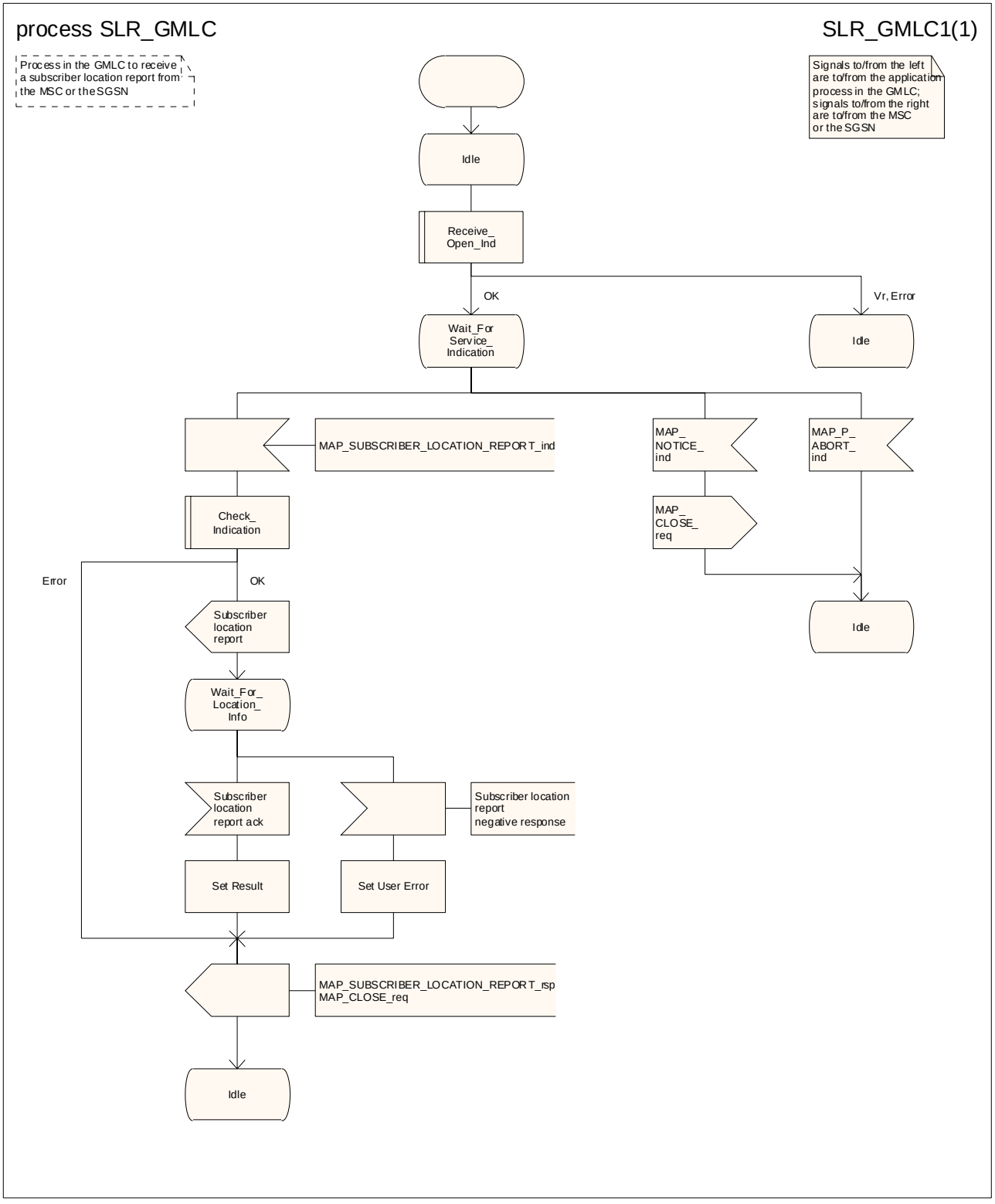


Figure 24B.3/4~~2~~ Process SLR_GMLC

3GPP TSG CN WG4 Meeting #19
San Diego, CA, USA, 19th – 23rd May 2003

N4-030392

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **581** ⌘ **rev** **-** ⌘ Current version: **6.1.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Provision of SDL diagrams in chapter 24B
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	15/04/2003
Category:	⌘	**A**
Release:	⌘	Rel-6

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	There are no source files available for the SDL diagrams in 29.002 chapter 24B. Many SDL diagrams are poorly laid out. Message flow diagrams are drawn using linedraw characters, which do not display correctly in Word 2000. The error handling in the dialogue initiator is not properly specified (the MAP process should report a "System failure" error to the application process). The error handling in the dialogue responder is not properly specified (there is no need to send a MAP_P_ABORT if the dialogue establishment fails, because the dialogue is aborted by the MAP protocol machine).
Summary of change:	⌘	Redraw SDL diagrams to a consistent style. Redraw message flow diagrams. Add the correct error handling.
Consequences if not approved:	⌘	Impaired readability. Incorrect error handling.

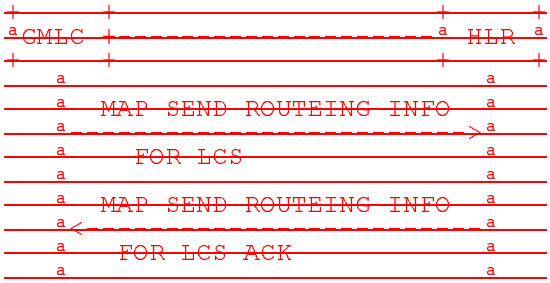
Clauses affected:	⌘	24B			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	The order of the subclauses in subclause 24B.3 has been revised so that the description of the behaviour in the dialogue initiator (MSC or SGSN) comes before the description of the behaviour in the dialogue responder (GMLC). This editorial change has not been revision marked, apart from the changes to subclause and figure numbers.			

24B Location Service process description

24B.1 Routeing information retrieval procedure for LCS

24B.1.1 General

The message flows for successful retrieval of routeing information related to location services are shown in figure 24B.1/1.



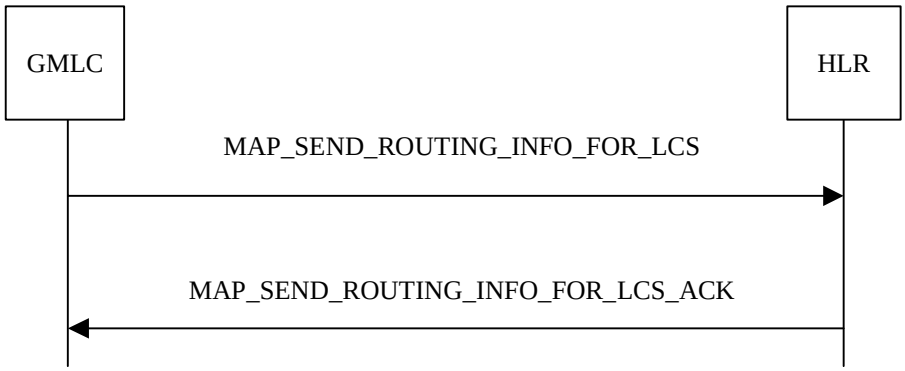


Figure 24B.1/1: Message flow for retrieval of routeing information for LCS

The following MAP services are used to retrieve routeing information:

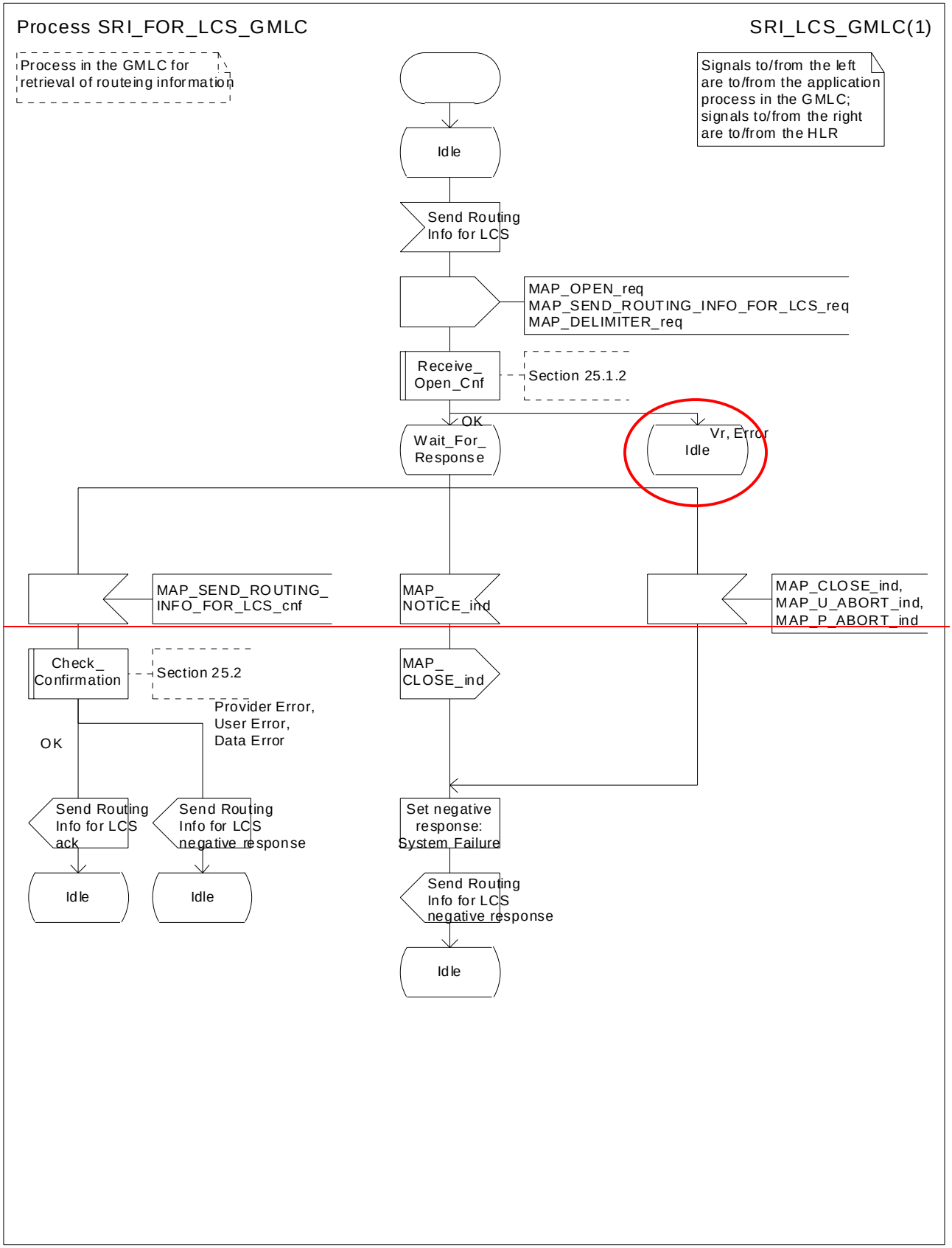
MAP_SEND_ROUTING_INFO_FOR_LCS see clause 13A.1.

24B.1.2 Process in the GMLC

The MAP process in the GMLC to request routeing information for LCS is shown in figure 24B.1/2. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.


Process SRI_FOR_LCS_GMLC
SRI_LCS_GMLC(1)
Process in the GMLC for retrieval of routeing information
Signals to/from the left are to/from the application process in the GMLC; signals to/from the right are to/from the HLR
Idle
Send Routing Info for LCS
MAP_OPEN_req
MAP_SEND_ROUTING_INFO_FOR_LCS_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Section 25.1.2
OK
Wait_For_ Response
Vr, Error
Idle
MAP_SEND_ROUTING_ INFO_FOR_LCS_cnf
MAP_ NOTICE_ind
MAP_CLOSE_ind,
MAP_U_ABORT_ind,
MAP_P_ABORT_ind
Check_ Confirmation
Section 25.2
MAP_ CLOSE_ind
Provider Error,
User Error,
Data Error
OK
Send Routing Info for LCS ack
Send Routing Info for LCS negative response
Set negative response: System Failure
Idle
Idle
Send Routing Info for LCS negative response
Idle

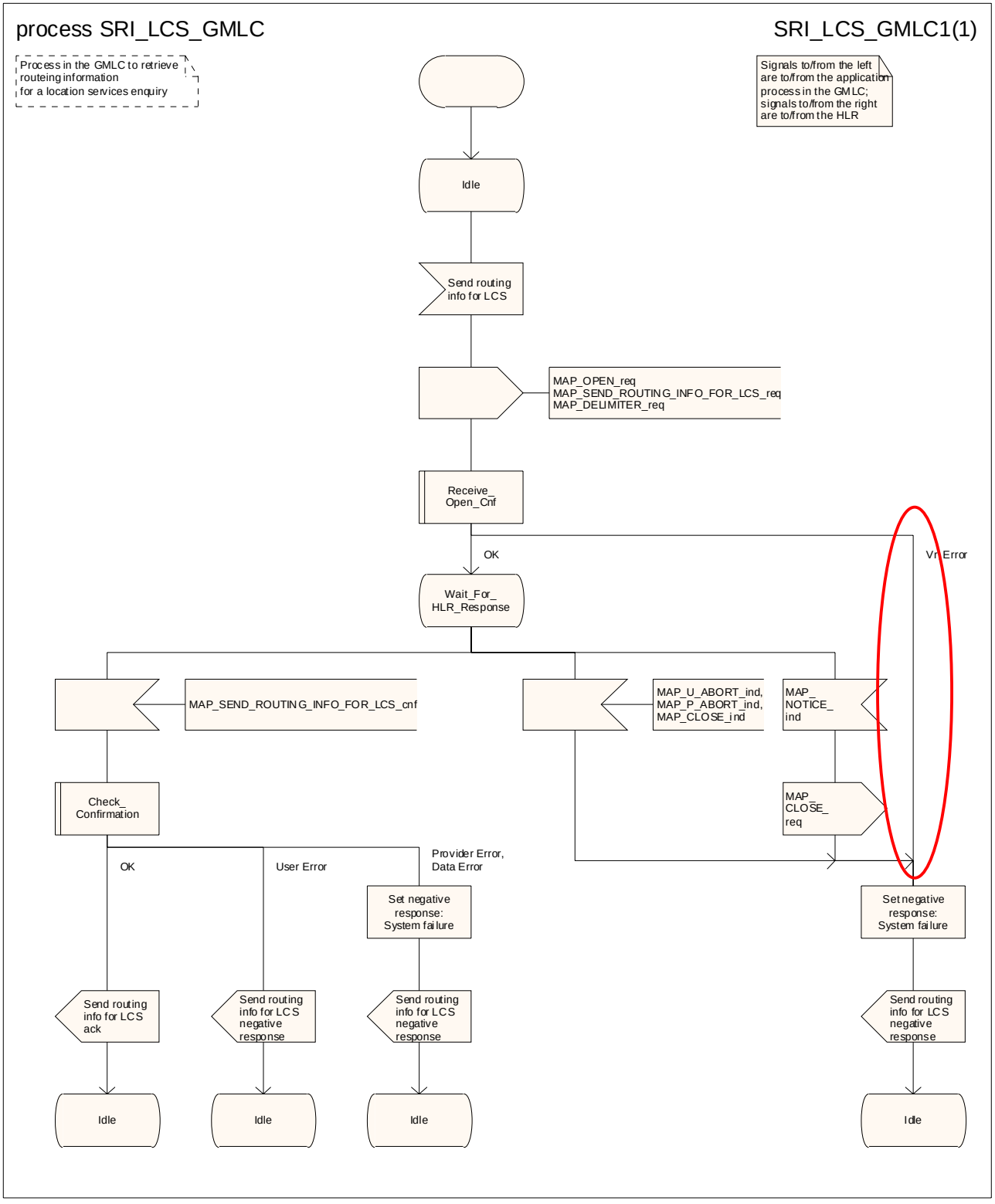


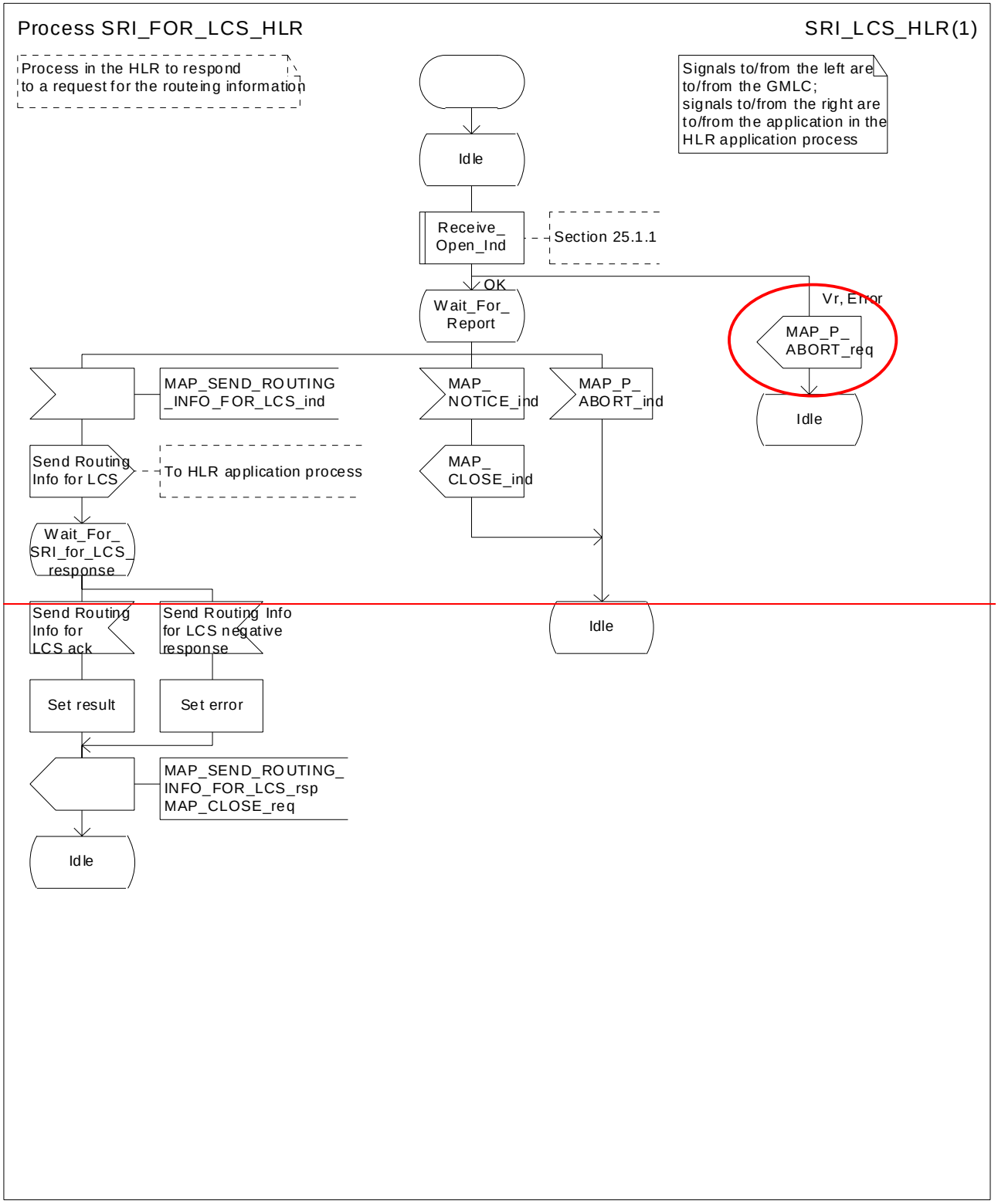
Figure 24B.1/2: Process SRI~~_FOR~~_LCS_GMLC

24B.1.3 Process in the HLR

The MAP process in the HLR to handle a request for routeing information for LCS is shown in figure 24B.1/3. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.


Process SRI_FOR_LCS_HLR
SRI_LCS_HLR(1)
Process in the HLR to respond to a request for the routeing information
Signals to/from the left are to/from the GMLC; signals to/from the right are to/from the application in the HLR application process
Idle
Receive_ Open_Ind
Section 25.1.1
OK
Wait_For_ Report
Vr, Error
MAP_P_ ABORT_req
Idle
MAP_SEND_ROUTING _INFO_FOR_LCS_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
Send Routing Info for LCS
To HLR application process
MAP_ CLOSE_ind
Wait_For_ SRI_for_LCS_ response
Send Routing Info for LCS ack
Send Routing Info for LCS negative response
Idle
Set result
Set error
MAP_SEND_ROUTING_ INFO_FOR_LCS_rsp MAP_CLOSE_req
Idle

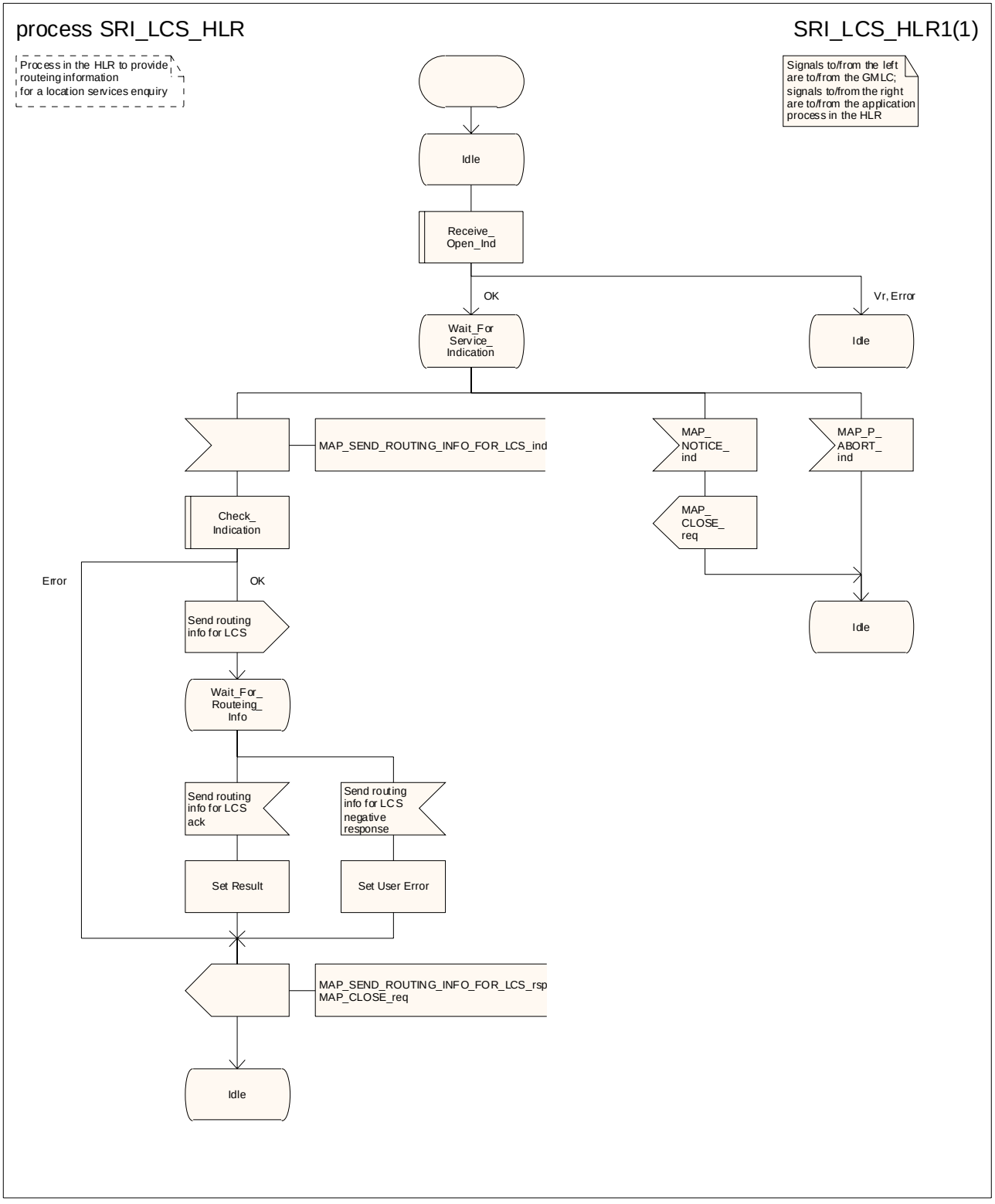


Figure 24B.1/3: Process SRI_~~FOR~~_LCS_HLR

24B.2 Provide Subscriber Location procedure

24B.2.1 General

The message flows for successful retrieval of the location information of a target MS related to location services are shown in figure 24B.1/1.

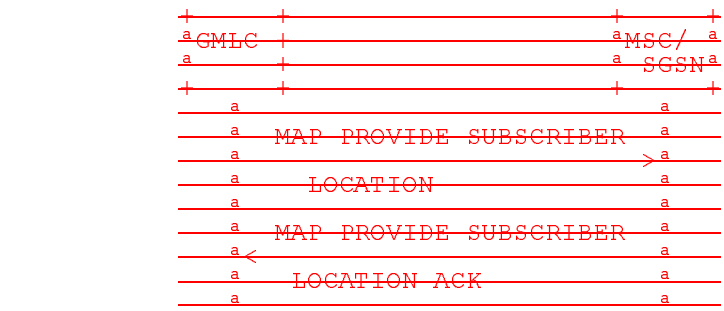


Figure 24B.2/1: Message flow for retrievalquest of the location information

The following MAP services are used to retrieve location information:

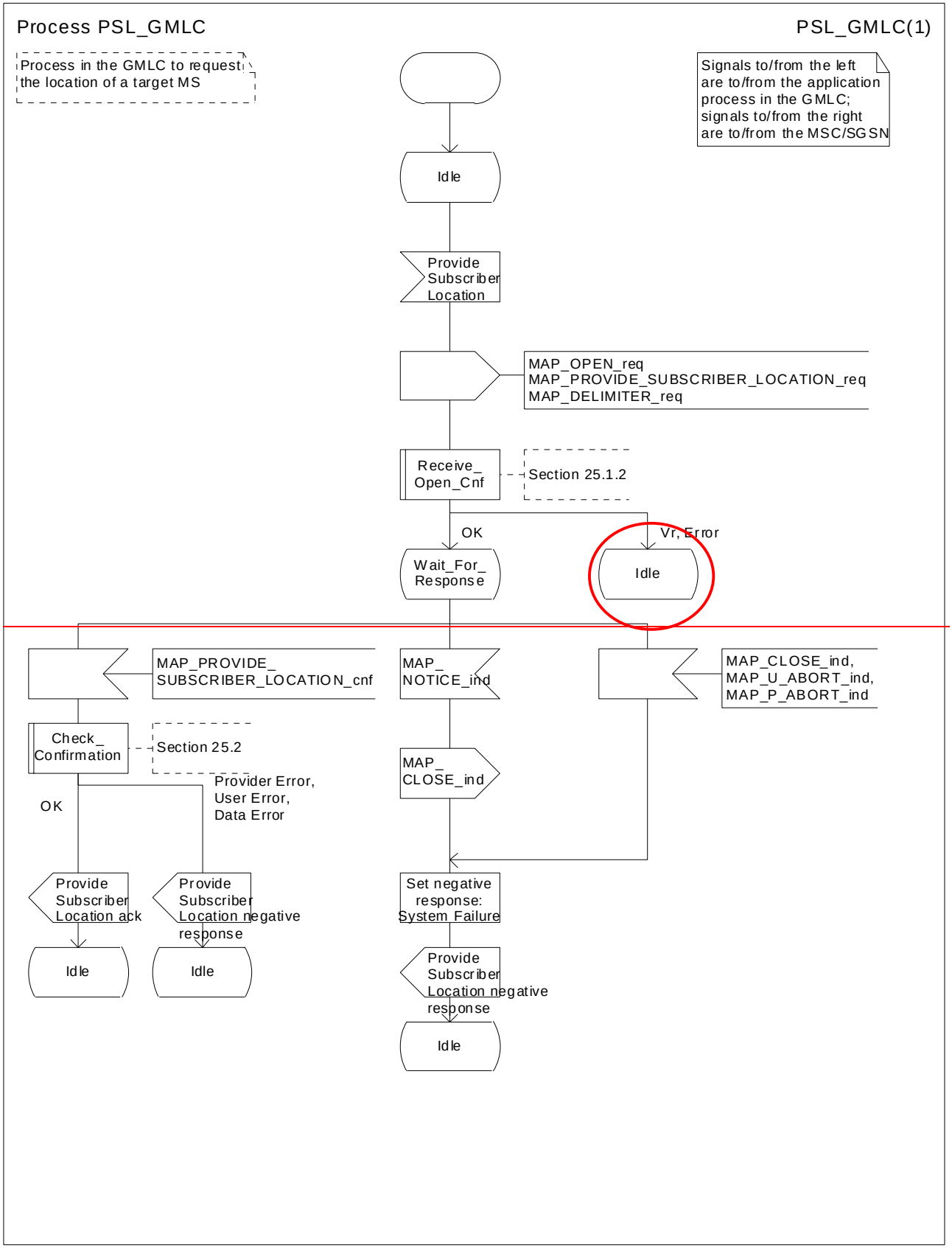
MAP_PROVIDE_SUBSCRIBER_LOCATION see clause 13A.2.

24B.2.2 Process in the GMLC

The MAP process in the GMLC to request location information from an MSC or an SGSN is shown in figure 24B.2/2.
The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.


Process PSL_GMLC
PSL_GMLC(1)
Process in the GMLC to request the location of a target MS
Signals to/from the left are to/from the application process in the GMLC; signals to/from the right are to/from the MSC/SGSN
Idle
Provide Subscriber Location
MAP_OPEN_req
MAP_PROVIDE_SUBSCRIBER_LOCATION_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Section 25.1.2
OK
Vr, Error
Wait_For_ Response
Idle
MAP_PROVIDE_ SUBSCRIBER_LOCATION_cnf
MAP_ NOTICE_ind
MAP_CLOSE_ind, MAP_U_ABORT_ind, MAP_P_ABORT_ind
Check_ Confirmation
Section 25.2
Provider Error, User Error, Data Error
OK
MAP_ CLOSE_ind
Provide Subscriber Location ack
Provide Subscriber Location negative response
Set negative response: System Failure
Idle
Idle
Provide Subscriber Location negative response
Idle

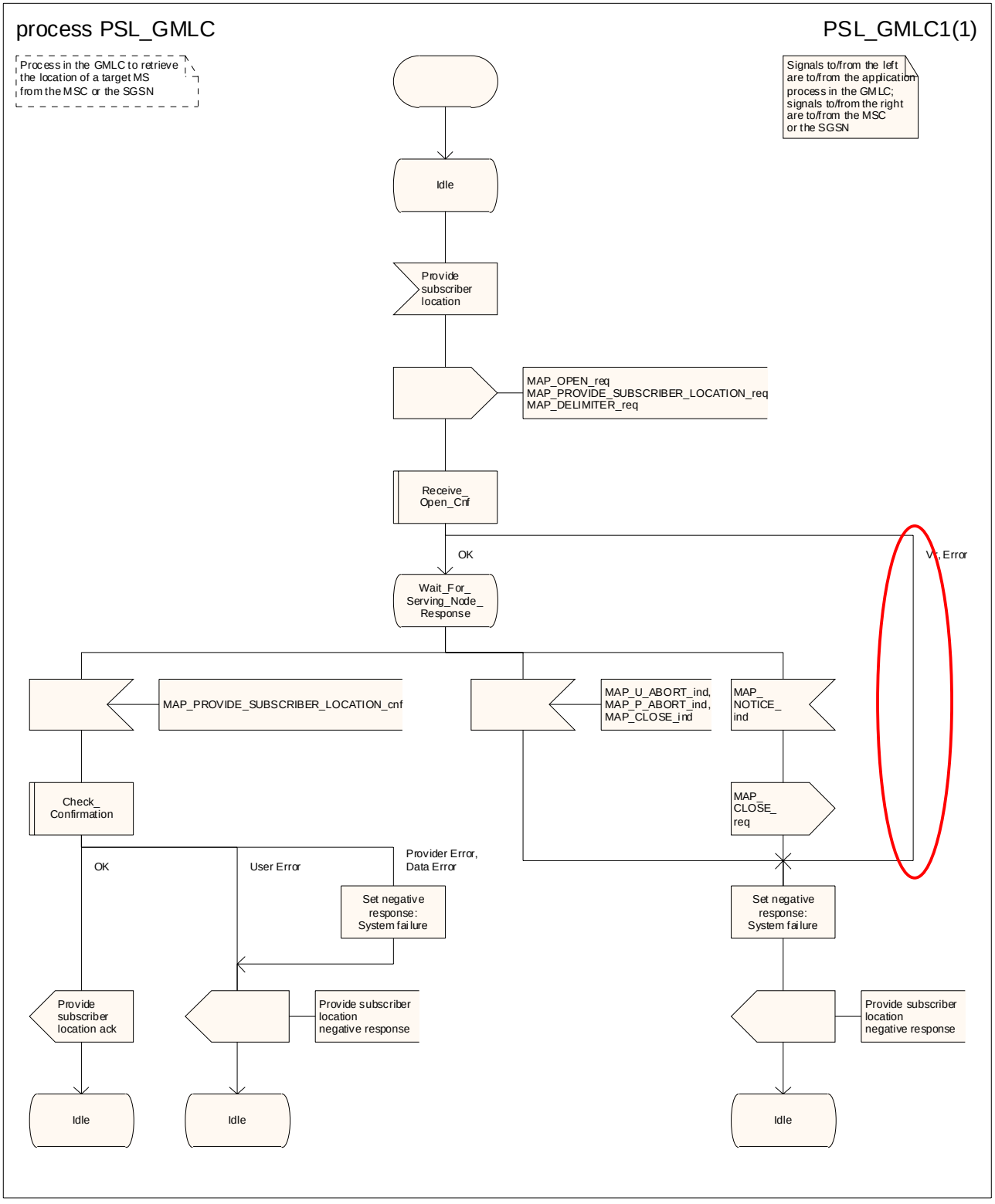


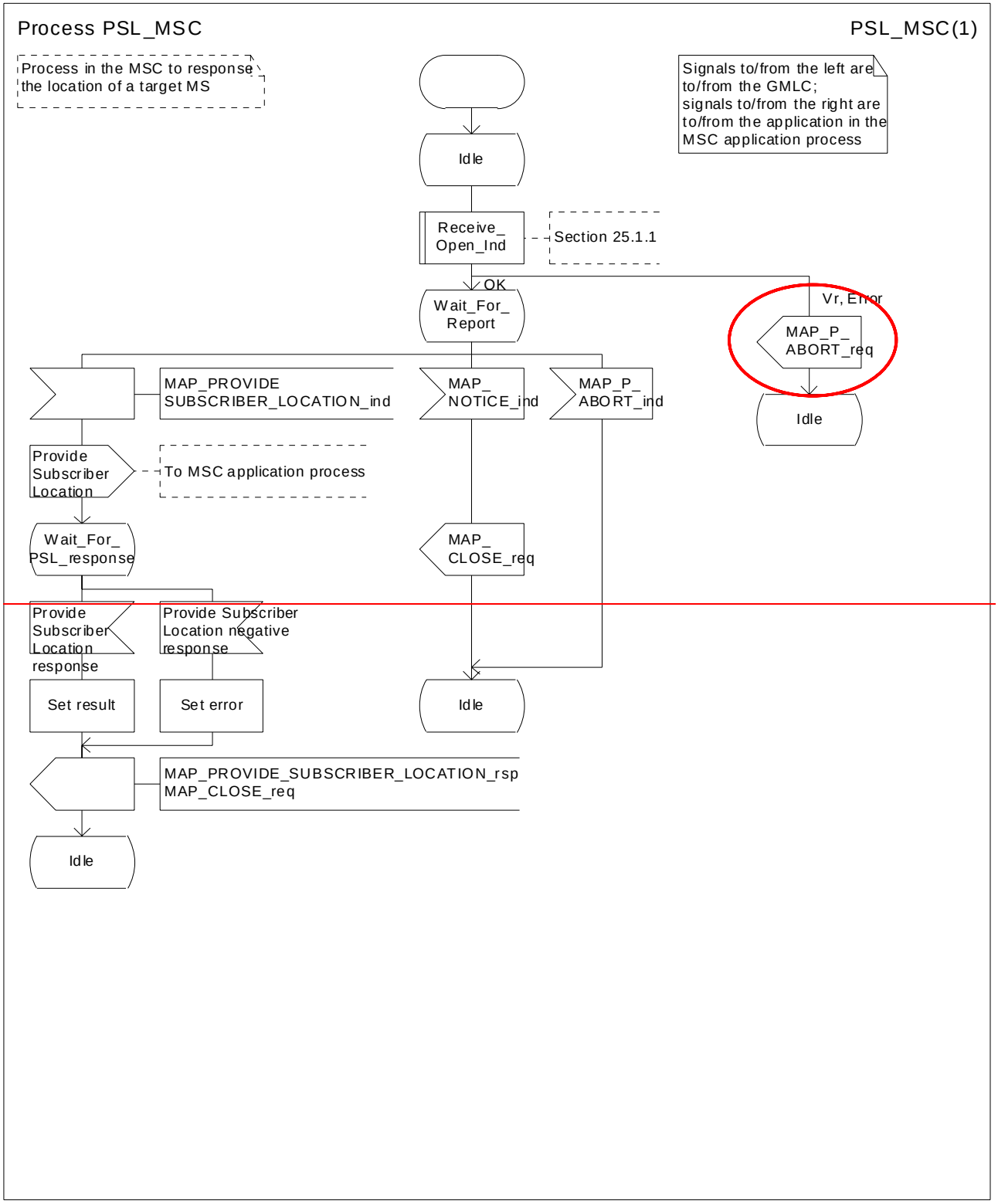
Figure 24B.2/2: Process PSL_GMLC

24B.2.3 Process in the MSC

The MAP process in the MSC to handle a request for location information from a GMLC is shown in figure 24B.2/3.
The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.


Process PSL_MSC
PSL_MSC(1)
Process in the MSC to response the location of a target MS
Signals to/from the left are to/from the GMLC; signals to/from the right are to/from the application in the MSC application process
Idle
Receive_ Open_Ind
Section 25.1.1
OK
Wait_For_ Report
Vr, Error
MAP_P_ ABORT_req
Idle
MAP_PROVIDE SUBSCRIBER_LOCATION_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
Provide Subscriber Location
To MSC application process
Wait_For_ PSL_response
MAP_ CLOSE_req
Provide Subscriber Location response
Provide Subscriber Location negative response
Set result
Set error
Idle
MAP_PROVIDE_SUBSCRIBER_LOCATION_rsp
MAP_CLOSE_req
Idle

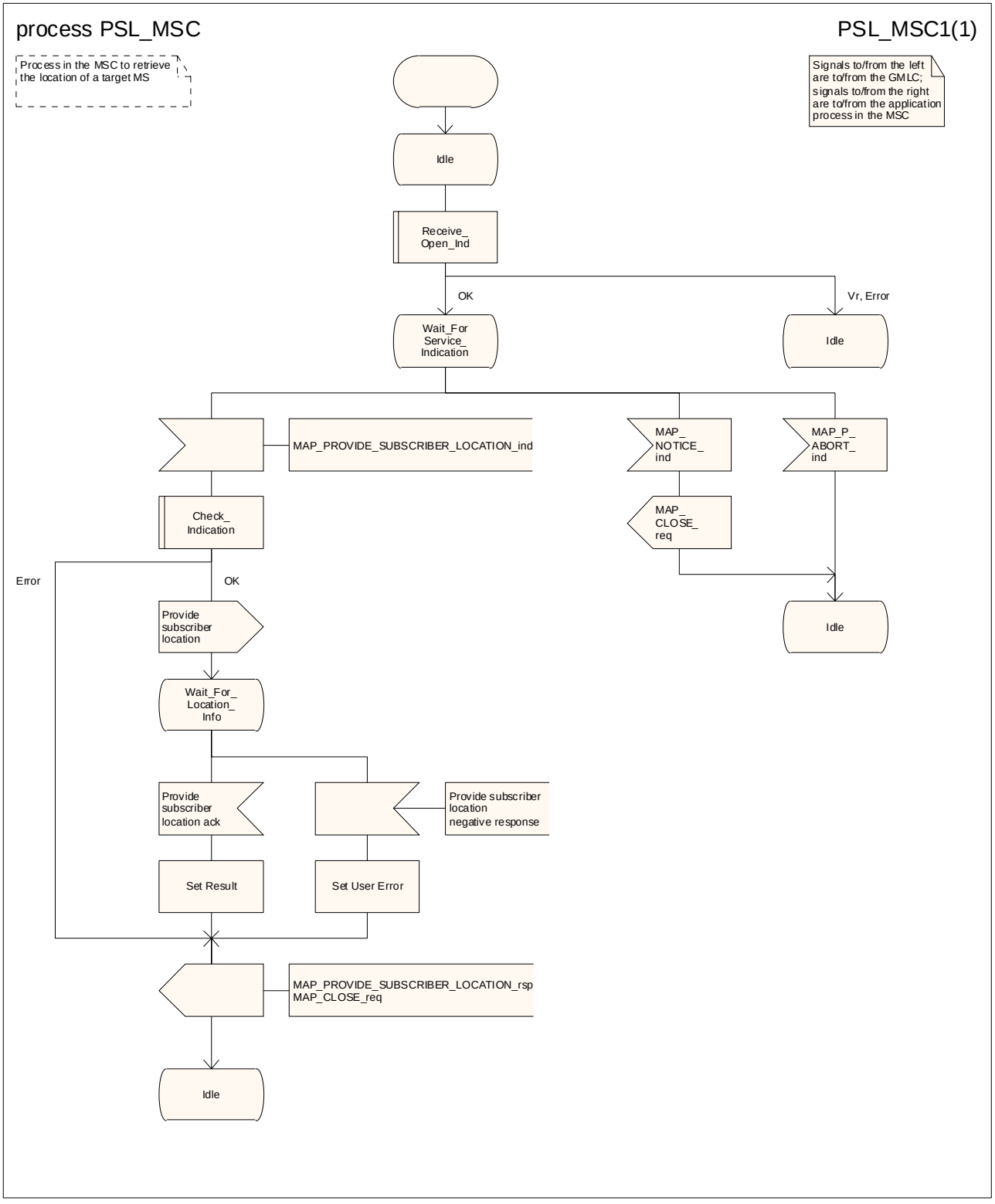


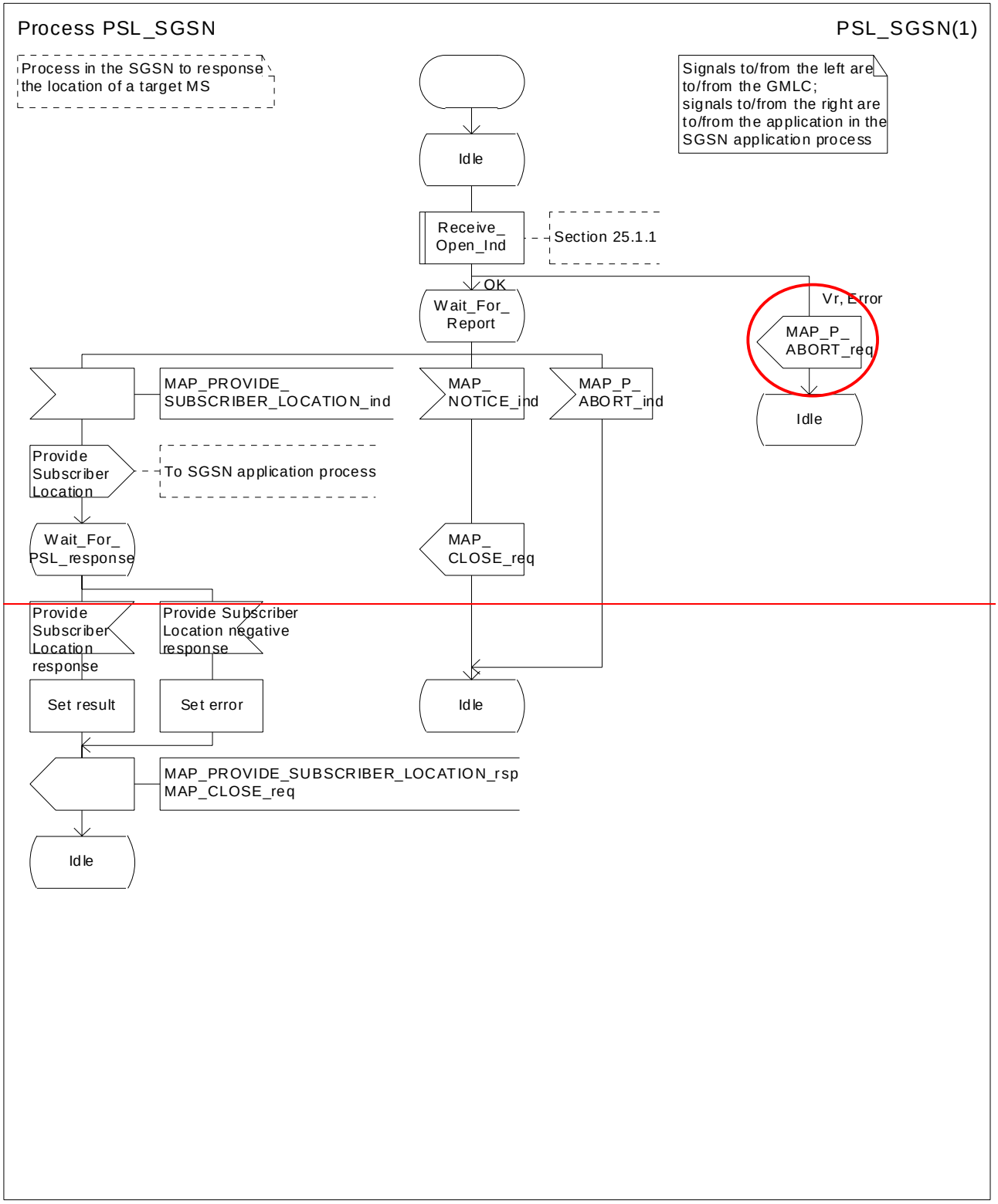
Figure 24B.2/3: Process PSL_MSC

24B.2.4 Process in the SGSN

The MAP process in the SGSN to handle a request for location information from a GMLC is shown in figure 24B.2/4.
The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.


Process PSL_SGSN
PSL_SGSN(1)
Process in the SGSN to response the location of a target MS
Signals to/from the left are to/from the GMLC; signals to/from the right are to/from the application in the SGSN application process
Idle
Receive_ Open_Ind
Section 25.1.1
OK
Wait_For_ Report
Vr, Error
MAP_P_ ABORT_req
Idle
MAP_PROVIDE_ SUBSCRIBER_LOCATION_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
Provide Subscriber Location
To SGSN application process
Wait_For_ PSL_response
MAP_ CLOSE_req
Provide Subscriber Location response
Provide Subscriber Location negative response
Set result
Set error
Idle
MAP_PROVIDE_SUBSCRIBER_LOCATION_rsp
MAP_CLOSE_req
Idle

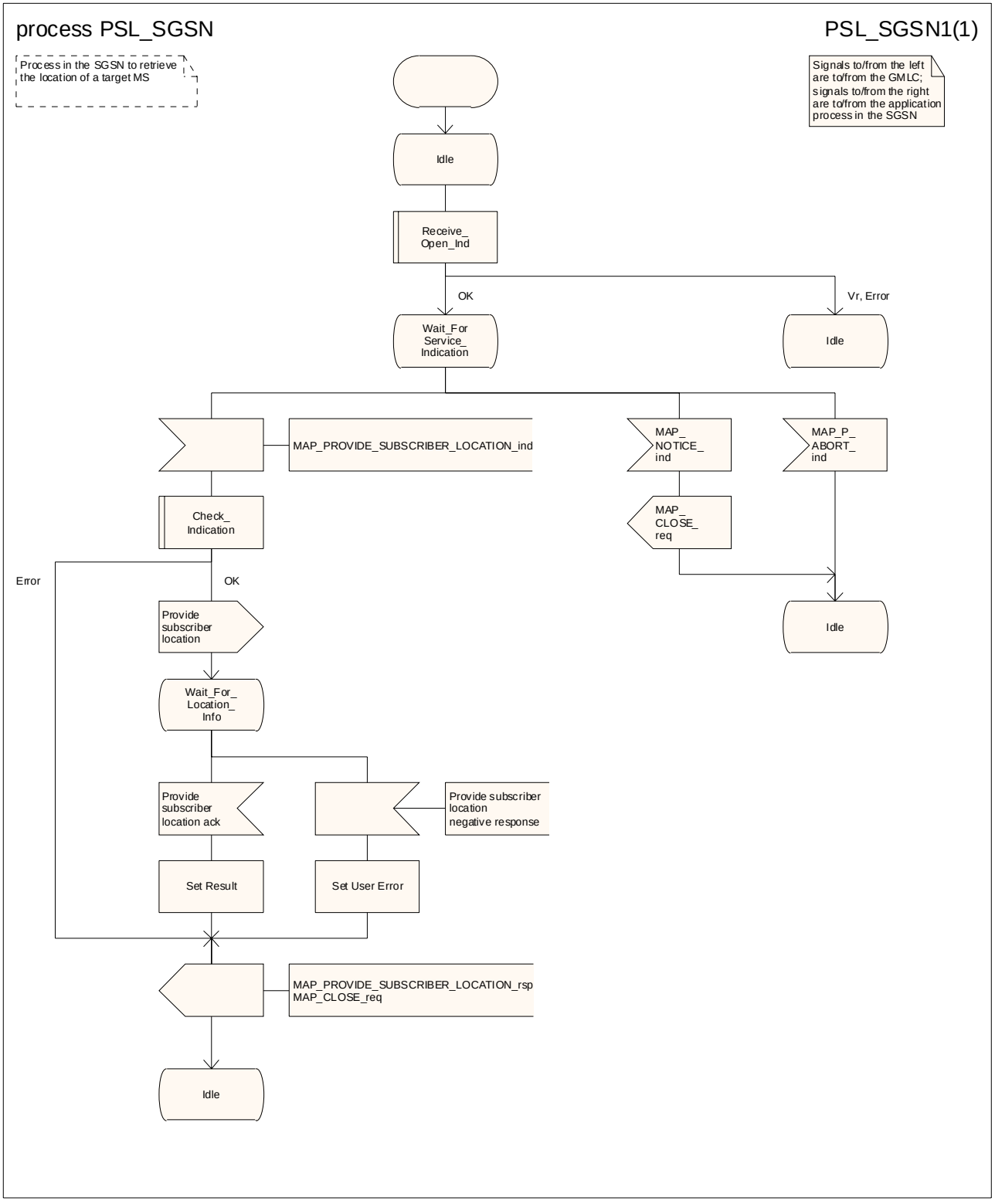


Figure 24B.2/4: Process PSL_SGSN

24B.3 Subscriber Location Report procedure

24B.3.1 General

The message flows for successful report of the location information of a target MS related to location services are shown in figure 24B.3/1.

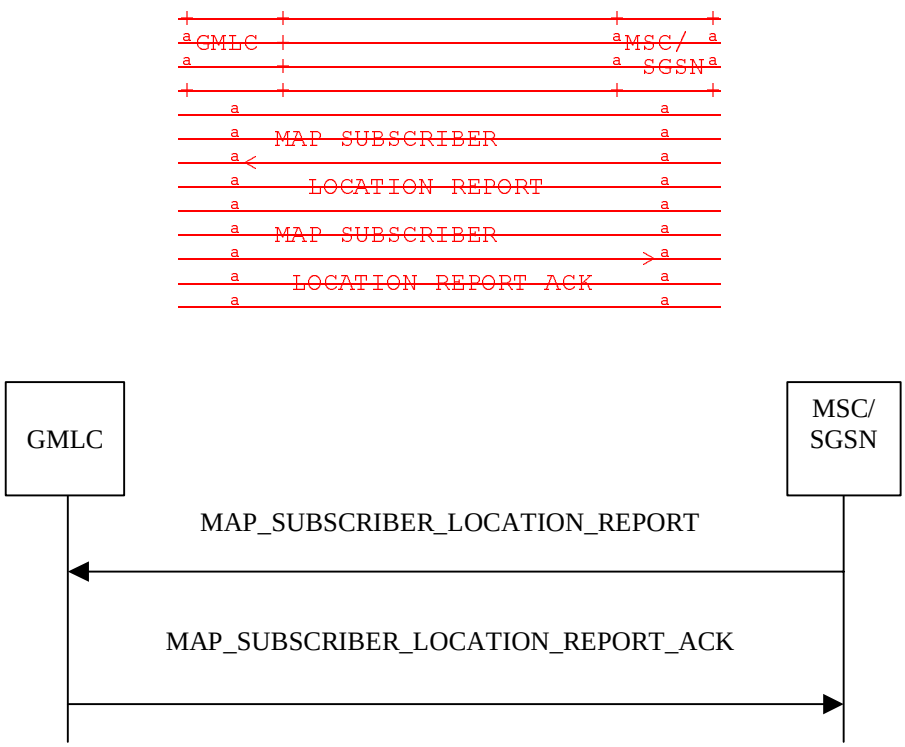


Figure 24B.3/1: Message flow for report of ~~the~~ location information

The following MAP services are used to report location information:

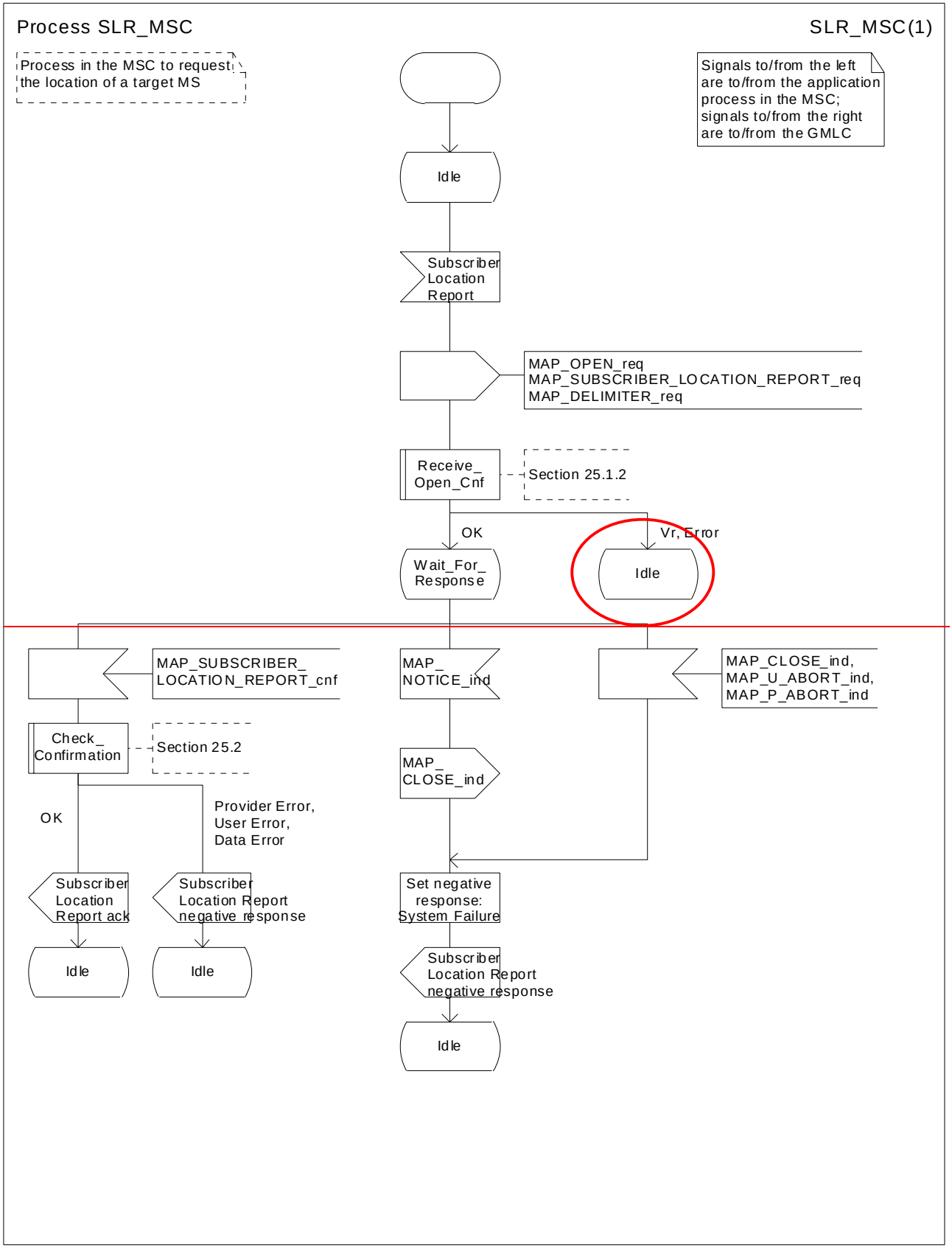
MAP_SUBSCRIBER_LOCATION_REPORT see clause 13A.3.

24B.3.23Process in the MSC

The MAP process in the MSC to send a subscriber location report to the GMLC is shown in figure 24B.3/2. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.


Process SLR_MSC
SLR_MSC(1)
Process in the MSC to request the location of a target MS
Signals to/from the left are to/from the application process in the MSC; signals to/from the right are to/from the GMLC
Idle
Subscriber Location Report
MAP_OPEN_req
MAP_SUBSCRIBER_LOCATION_REPORT_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Section 25.1.2
OK
Vr, Error
Wait_For_ Response
Idle
MAP_SUBSCRIBER_ LOCATION_REPORT_cnf
MAP_ NOTICE_ind
MAP_CLOSE_ind, MAP_U_ABORT_ind, MAP_P_ABORT_ind
Check_ Confirmation
Section 25.2
MAP_ CLOSE_ind
OK
Provider Error, User Error, Data Error
Subscriber Location Report ack
Subscriber Location Report negative response
Set negative response: System Failure
Idle
Idle
Subscriber Location Report negative response
Idle

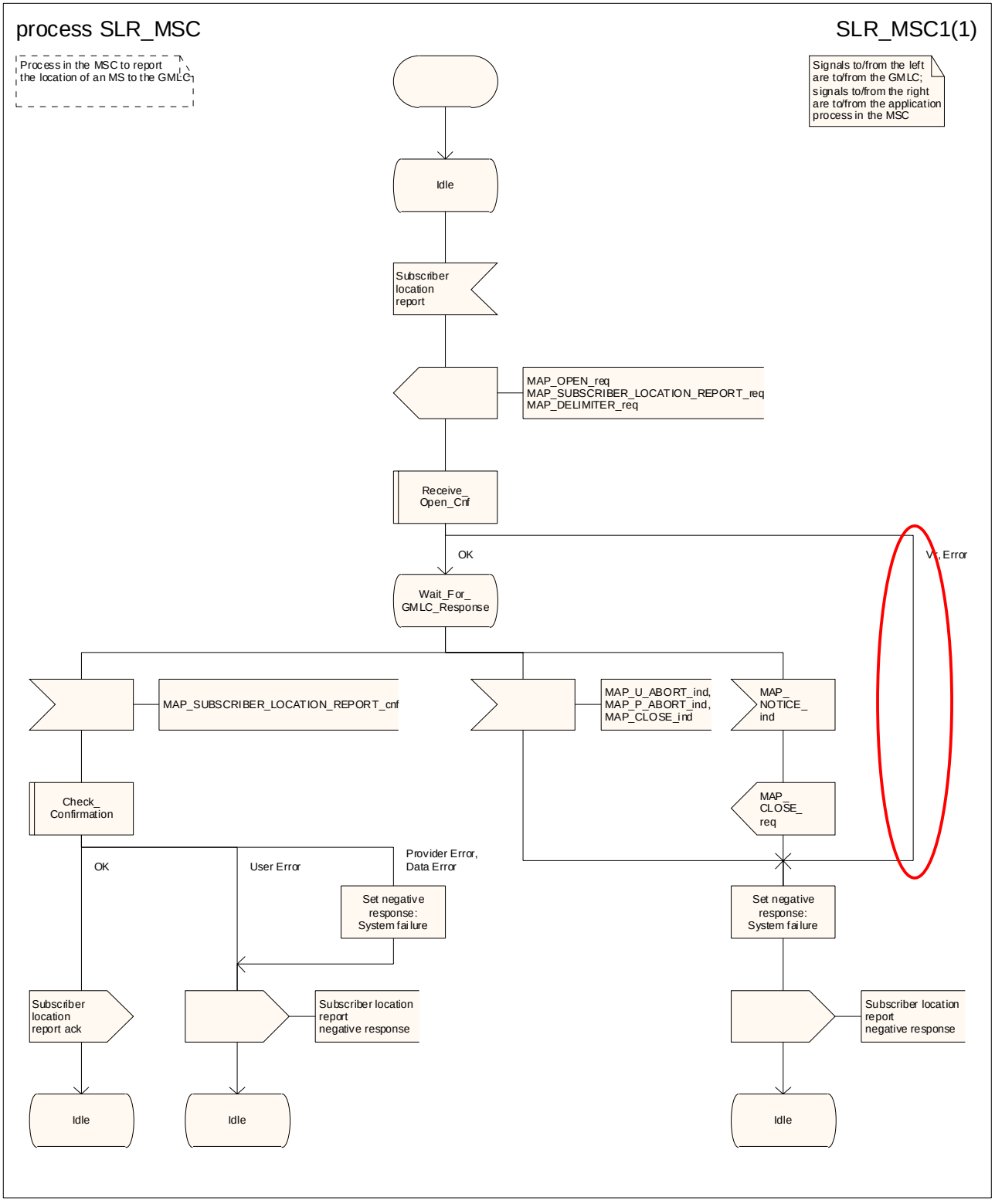


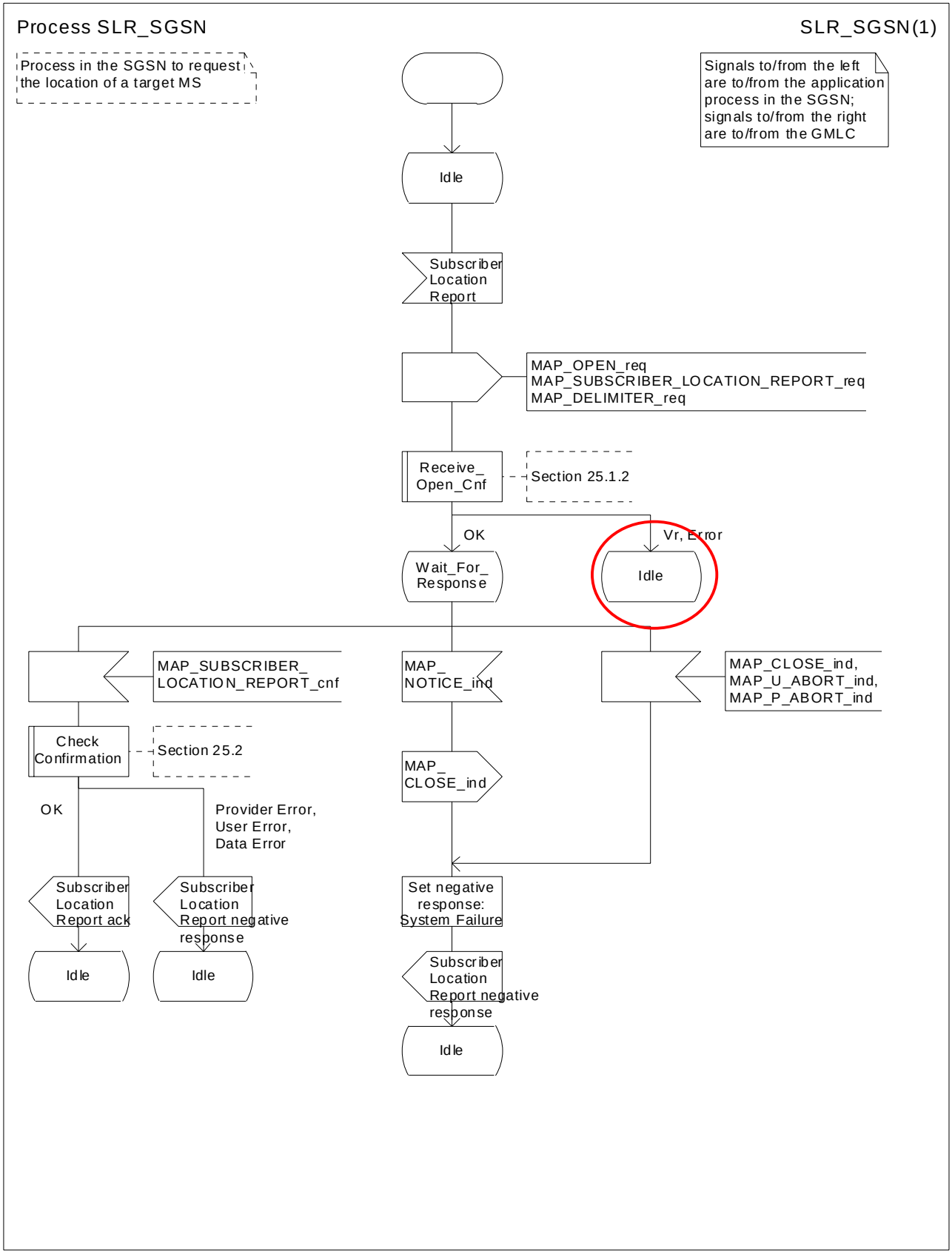
Figure 24B.3/23 Process SLR_MSC

24B.3.34Process in the SGSN

The MAP process in the SGSN to send a subscriber location report to the GMLC is shown in figure 24B.3/3. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.


Process SLR_SGSN
SLR_SGSN(1)
Process in the SGSN to request the location of a target MS
Signals to/from the left are to/from the application process in the SGSN; signals to/from the right are to/from the GMLC
Idle
Subscriber Location Report
MAP_OPEN_req
MAP_SUBSCRIBER_LOCATION_REPORT_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Section 25.1.2
OK
Vr, Error
Wait_For_ Response
Idle
MAP_SUBSCRIBER_ LOCATION_REPORT_cnf
MAP_ NOTICE_ind
MAP_CLOSE_ind, MAP_U_ABORT_ind, MAP_P_ABORT_ind
Check Confirmation
Section 25.2
MAP_ CLOSE_ind
OK
Provider Error, User Error, Data Error
Subscriber Location Report ack
Subscriber Location Report negative response
Set negative response: System Failure
Idle
Idle
Subscriber Location Report negative response
Idle

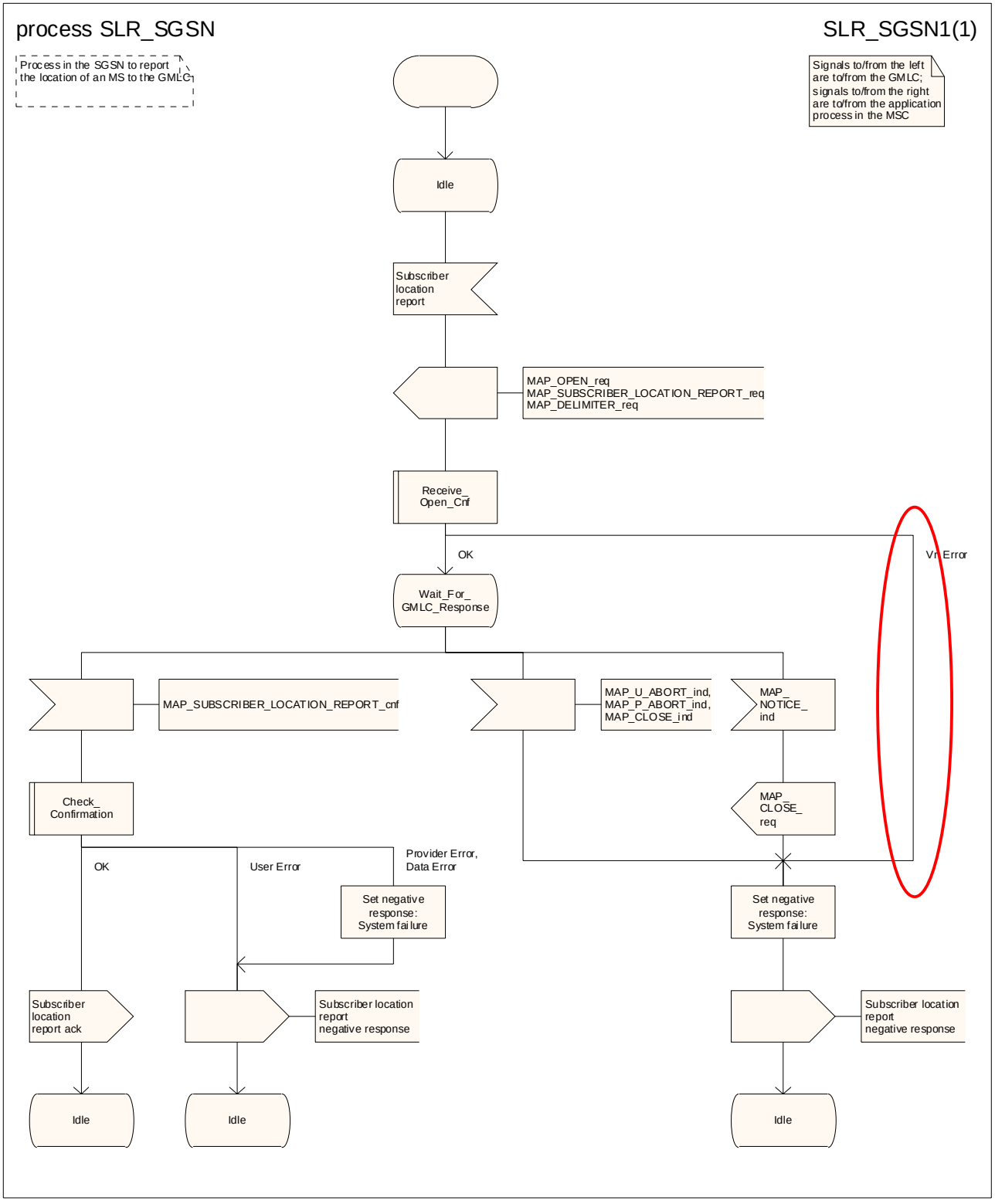


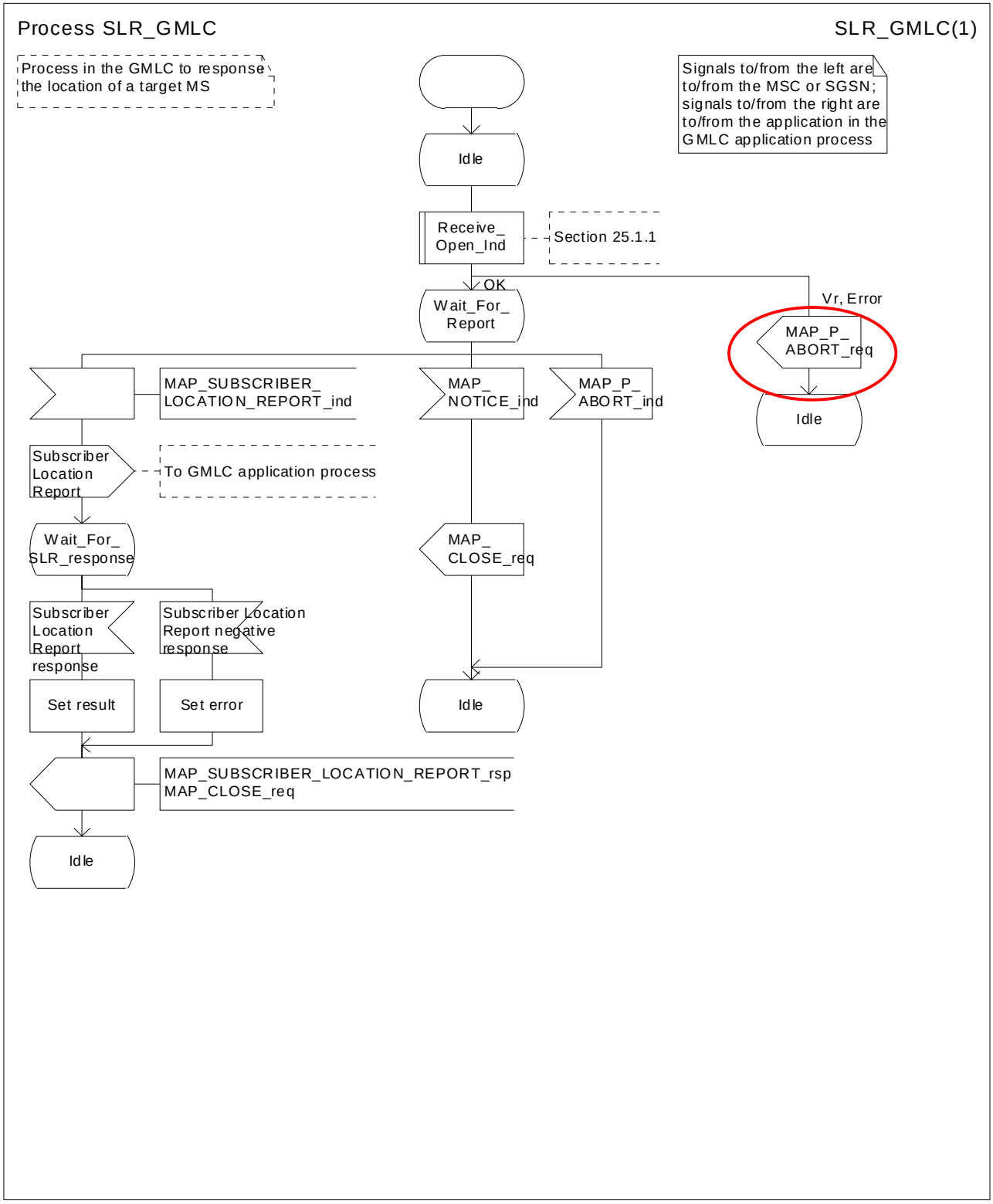
Figure 24B.3/34 Process SLR_SGSN

24B.3.42Process in the GMLC

The MAP process in the GMLC to handle a subscriber location report is shown in figure 24B.3/4. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1;

Check_Indication see subclause 25.2.1.


Process SLR_GMLC
SLR_GMLC(1)
Process in the GMLC to response the location of a target MS
Signals to/from the left are to/from the MSC or SGSN; signals to/from the right are to/from the application in the GMLC application process
Idle
Receive_ Open_Ind
Section 25.1.1
OK
Wait_For_ Report
Vr, Error
MAP_P_ ABORT_req
Idle
MAP_SUBSCRIBER_ LOCATION_REPORT_ind
MAP_ NOTICE_ind
MAP_P_ ABORT_ind
Subscriber Location Report
To GMLC application process
Wait_For_ SLR_response
MAP_ CLOSE_req
Subscriber Location Report response
Subscriber Location Report negative response
Set result
Set error
Idle
MAP_SUBSCRIBER_LOCATION_REPORT_rsp
MAP_CLOSE_req
Idle

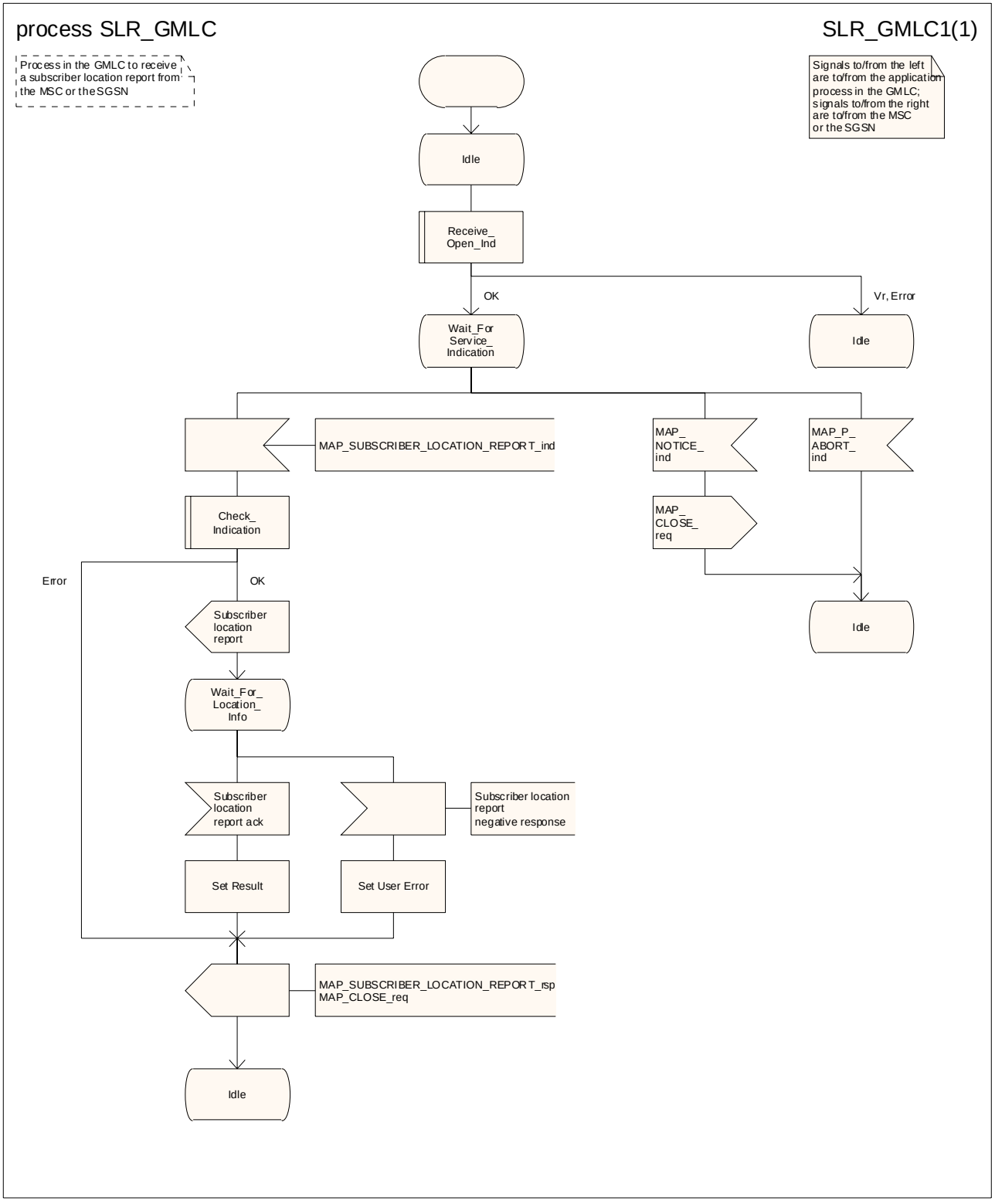


Figure 24B.3/4~~2~~ Process SLR_GMLC

3GPP TSG CN WG4 Meeting #19
San Diego, CA, USA, 19th – 23rd May 2003

N4-030638
(Revision of N4-030381)

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **574** ⌘**rev** **1** ⌘ Current version: **6.1.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Provision of SDL diagrams and removal of redundant text in chapter 25
Source:	⌘	CN4
Work item code:	⌘	TEI6
Date:	⌘	21/05/2003
Category:	⌘	**A**
Release:	⌘	Rel-6

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change: ⌘

There are no source files available for the SDL diagrams in 29.002 chapter 25. Many SDL diagrams are poorly laid out.
The service descriptions for the MAP_PAGE and MAP_PROCESS_ACCESS_REQUEST services include references to their use for circuit-switched calls. This use is redundant since the transfer of the description of the interworking between the MSC and VLR for circuit-switched calls into GSM 03.18 (now 23.018).
The Paging, Search & Process Access Request macros include redundant material, which is specific to the handling of circuit-switched calls. The definition of the paging, search and Process Access Request behaviour for circuit-switched calls in the MSC & VLR is in TS 23.018. Furthermore, these macros do not describe any MAP signalling; they deal only with access signalling and interworking between the MSC and the VLR.
Most of the text inaccurately repeats the information in the SDL diagrams; the useful additional information is buried in superfluous verbiage. The misalignment between text and SDL has led to different interpretations, and interworking problems. It was this which led to the style used in GSM 03.18/23.018, where the text is a **supplement to** the SDL. It should be noted that other chapters in 29.002 (e.g. 24B) do not have text which attempts to replicate the SDL.

Summary of change: ⌘

Redraw SDL diagrams to a consistent style. Simplify the Paging, Search & Process Access Request macros to remove the material which is specific to the handling of circuit-switched calls.

Remove from the service descriptions for MAP_PAGE and MAP_PROCESS_ACCESS_REQUEST the references to handling circuit-switched calls.

		Remove text which replicates the information in SDL diagrams. Re-order subclauses to group macros and processes for the SGSN with their counterparts for the MSC & VLR. Update subclause references elsewhere in 29.002. Align figure and subclause numbering.
Consequences if not approved:	⌘	Poor readability; unnecessary bulk in the specification; conflicting information in text and SDL diagrams.

Clauses affected:	⌘	8.2.1.1; 8.3.1.1; 19.4; 20.2.1.1; 20.2.2.1; 20.2.4.1; 21.2.5; 23.4.5.1; 25			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	The SDL changes in this CR are identical to those in CR 29.002-573 (N4-030380). Following the example approved in CR 29.002-523 & CR 29.002-524, the pretence of MAP signalling between the MSC and the VLR has been reduced by removing the handling for protocol dropback, MAP_P_ABORT and MAP_NOTICE on the B interface. References to "version of MAP" have been systematically changed to "version of the MAP specification". The one-to-one correspondence between the version of the MAP specification and the application context version ceased to exist with GSM 09.02 version 5.0.0! The handling for a repeat attempt (using the IMSI) at authenticating the mobile if the first attempt (using the TMSI) failed has been moved from the macro Process_Access_Request_VLR to the macro Authenticate_VLR. This is purely a modelling change, and does not require any change in functional behaviour. The modelling of timer handling for repeat attempts of stand-alone Insert Subscriber Data (figures 25.7/3 & 25.7/4) and Alert Service Centre (figure 25.10/3) has been formalised by showing the process entering a wait state after the timer has been started, and repeating the Insert Subscriber Data or Alert Service Centre when the timer expiry signal is received.			

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

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.

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

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~~ for mobile originated short message submission ~~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.

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

19.4 Macro Insert_Subs_Data_Framed_HLR

This macro is used by any procedure invoked in HLR which requires the transfer of subscriber data by means of the InsertSubscriberData operation (e.g. Update Location or Restore Data).

The invocation of the operation is done in a dialogue already opened by the framing procedure. Therefore the latter is the one that handles the reception of the open indication and sends the dialogue close request.

The macro calls the process "Send_Insert_Subs_Data" (see clause 25.7.7~~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_Subs~~criber~~_Data_Cnf" (see clause 25.7.5~~3~~). There the reception and handling of the service confirmations is described.

If certain services required for a subscriber are not supported by the VLR or by the SGSN (e.g. Advice of Charge Charging Level), this may result in one of the following outcomes:

- The HLR stores and sends "Roaming Restriction Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restriction Due To Unsupported Feature" is stored in the HLR, the "MSC Area Restricted Flag" shall be set to "restricted". This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR;

- The HLR stores and sends other induced subscriber data (e.g. a specific barring program) in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. This will cause rejection of mobile originated service requests, except emergency calls.

- The HLR stores and sends "Roaming Restricted in the SGSN Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restricted In SGSN Due To Unsupported Feature" is stored in the HLR, the "SGSN Area Restricted Flag" shall be set to "restricted". This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context Activation;

When the VLR receives regional subscription data (Zone Code List) it may respond with "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "MSC Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.

If the HLR neither stores "Roaming Restriction Due To Unsupported Feature" nor receives "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response, the "MSC Area Restricted Flag" in the HLR shall be set to "not restricted".

If subscriber data for CAMEL Phase 2 or 3 services are sent to a VLR which does not support CAMEL Phase 2 or 3, the service behaviour may be unpredictable or incorrect. The HLR therefore needs to ensure that at the conclusion of a location updating dialogue the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in 3GPP TS 23.078.

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2 or higher. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only after the HLR receives confirmation in the first ISD message result that CAMEL Phase 2 or higher is supported.

A Forwarded-to number non-international E.164 format shall only be sent from an HLR to a VLR if the VLR supports CAMEL Phase 2, or a subsequent phase of CAMEL.

When the SGSN receives regional subscription data (Zone Code List) it may respond with "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "SGSN Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP-Context Activation.

If the HLR neither stores "Roaming Restricted In SGSN Due To Unsupported Feature" nor receives "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response, the "SGSN Area Restricted Flag" in the HLR shall be set to "not restricted".

The SDL diagrams are shown in figures 19.4/1 and 19.4/2.

*** Next modified section ***

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 25.9/64) 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.

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

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 25.9/4~~3~~).

The subscriber tracing activation process in the VLR is shown in figure 20.2/9.

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

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 25.9/5~~7~~).

The subscriber tracing activation process in the SGSN is shown in figure 20.2/16.

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

21.2.5 Process in the VLR to restore subscriber data

The MAP process in the HLR to restore subscriber data is shown in figure 21.2/6. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf	see clause 25.1.2;
Check_Confirmation	see clause 25.2.2;
Insert_Subs_Data_VLR	see clause 25.7.1;
Activate_Tracing_VLR	see clause 25.9.4~~3~~.

Successful outcome

When the MAP process receives a Restore Data request from the data restoration process in the VLR, it requests a dialogue with the HLR whose identity is contained in the Restore Data request by sending a MAP_OPEN service request, requests data restoration using a MAP_RESTORE_DATA service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the HLR.

The VLR may receive a MAP_INSERT_SUBSCRIBER_DATA service indication from the HLR; this is handled by the macro Insert_Subs_Data_VLR as described in clause 25.7.1, and the MAP process waits for a further response from the HLR.

The VLR may receive a MAP_ACTIVATE_TRACE_MODE service indication from the HLR; this is handled by the macro Activate_Tracing_VLR as described in clause 25.9.4~~3~~, and the MAP process waits for a further response from the HLR.

If the MAP process receives a MAP_RESTORE_DATA service confirm, it invokes the macro Check_Confirmation to check the content of the confirm.

If the Check_Confirmation macro takes the OK exit, the MAP process sends a Restore Data ack containing the information received from the HLR to the data restoration process in the VLR and returns to the idle state.

Error in MAP_RESTORE_DATA confirm

If the MAP_RESTORE_DATA service confirm contains a user error or a provider error, or the macro Check_Confirmation indicates that there is a data error, the MAP process sends a Restore Data negative response indicating the type of error to the call handling process in the HLR, and returns to the idle state.

Earlier version MAP dialogue with the HLR

If the macro Receive_Open_Cnf takes the Vr exit, the VLR performs the earlier MAP version dialogue as specified in [51] and the process terminates.

Dialogue opening failure

If the macro Receive_Open_Cnf indicates that the dialogue with the HLR could not be opened, the MAP process sends a negative response indicating system failure to the data restoration process in the GMSC and returns to the idle state.

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

23.4.5 Procedures in the SGSN

23.4.5.1 The Mobile Subscriber is present

If the SGSN successfully handles a Page response, Attach request or Routing Area Update request message (3GPP TS 24.008 [35]), while the MS Not Reachable for GPRS (MNRG) flag is set, the SGSN sends a MAP_READY_FOR_SM request to the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS. If authentication fails during the handling of a Page response, Attach request or Routing Area Update request, the SGSN shall not send a MAP_READY_FOR_SM request to the HLR

The process in the SGSN is described in detail in subclause 25.10.2~~/3~~.

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

25 General macro description

25.1 MAP_OPEN handling ~~open~~ macros

25.1.1 Macro Receive_Open_Ind

This macro is used by a MAP service-user procedure when a peer entity requests opening of a dialogue.

~~If the application context received in the MAP-OPEN indication primitive indicates a context name of the MAP version one context set, the macro takes the Vr exit..~~

~~If an application context different from version 1 is received, the presence of MAP_OPEN information is checked. If no MAP_OPEN information has been received, the MAP_OPEN response with:~~

- ~~Result set to Dialogue Accepted; and~~

~~- Application Context Name set to the received value,~~

~~is returned.~~

~~If the received version (Vr) is the one described in this version of MAP, the macro takes the OK exit, otherwise it takes the Vr exit..~~

~~If MAP_OPEN information is received, the macro "CHECK_REFERENCE" is called in order to check whether the received values for Destination Reference and Originating Reference correspond with the requirements of the received application-context-name. If the outcome of this check is an error, the MAP_OPEN responds with:~~

~~- Result set to Dialogue Refused;~~

~~- Refuse Reason set to Invalid Destination Reference or Invalid Originating Reference;~~

~~- Application Context Name set to the highest version supported,~~

~~is returned and the macro takes the error exit.~~

~~If the data values received for Destination Reference and Originating Reference are accepted for the associated application-context-name it is checked whether the Destination Reference is known if this check is required by the process that calls the macro.~~

~~If the Destination Reference (e.g. a subscribers IMSI) is unknown, the MAP_OPEN response with~~

~~- Result set to Dialogue Refused;~~

~~- Refuse Reason set to Invalid Destination Reference;~~

~~- Application Context Name set to the highest version supported,~~

~~is returned and the macro takes the error exit.~~

~~Else, if the Destination Reference is accepted or if no check is required, the MAP_OPEN response with~~

~~- Result set to Dialogue Accepted; and~~

~~- Application Context Name set to the received value,~~

~~is returned and~~

~~If the received version (Vr) is the one described in this version of MAP, the macro takes the OK exit, otherwise it takes the Vr exit.~~

25.1.2 Macro Receive_Open_Cnf

This macro is used by a user procedure after it has requested opening of a dialogue towards a peer entity.

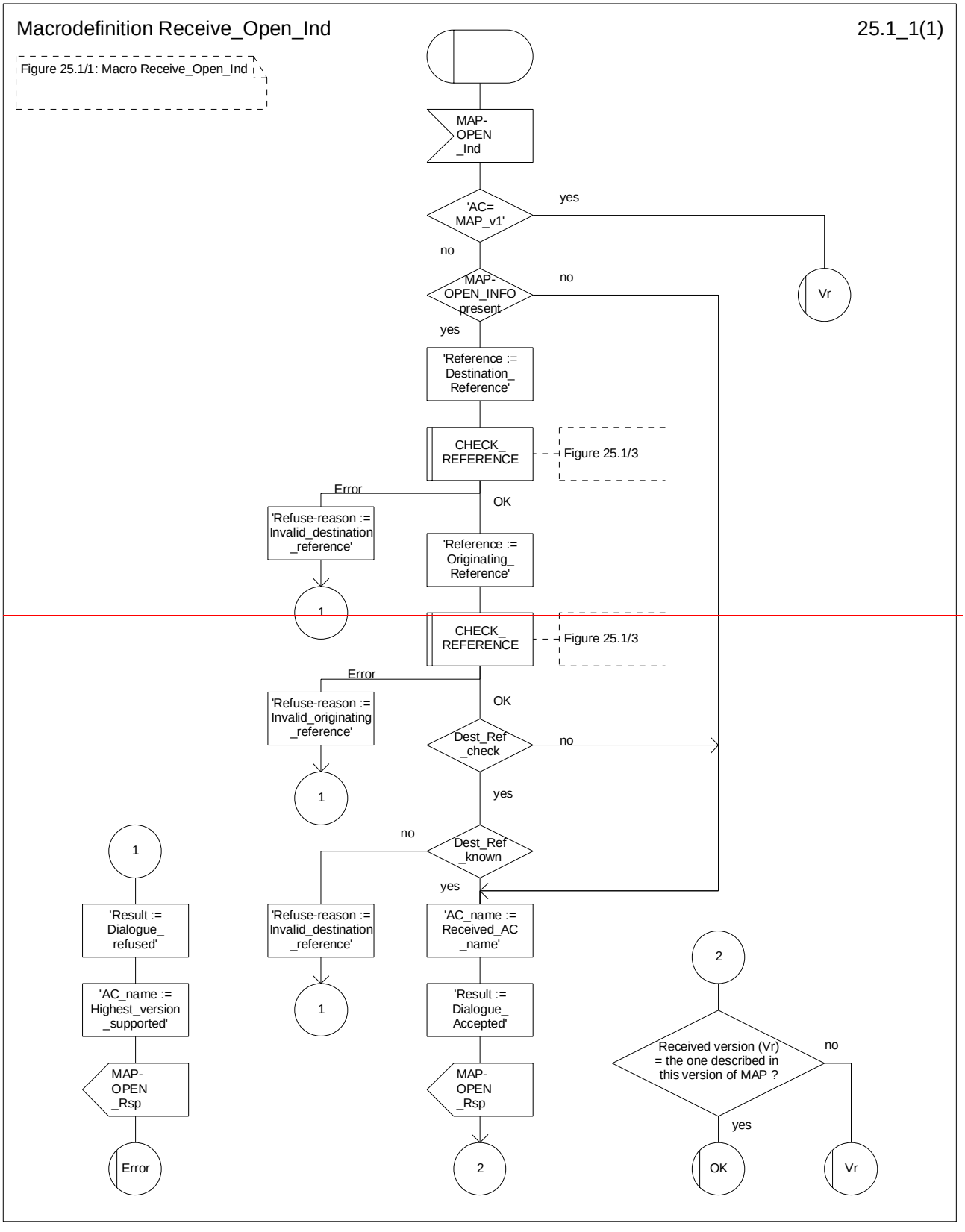
~~On receipt of a MAP_OPEN Confirmation with a "Result" parameter indicating "Dialogue Accepted", the macro takes the OK exit.~~

~~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.~~


Macrodefinition Receive_Open_Ind
25.1_1(1)
Figure 25.1/1: Macro Receive_Open_Ind
MAP-OPEN _Ind
'AC= MAP_v1'
yes
no
Vr
MAP-OPEN_INFO present
no
yes
'Reference := Destination_ Reference'
CHECK_ REFERENCE
Figure 25.1/3
Error
OK
'Refuse-reason := Invalid_destination _reference'
'Reference := Originating_ Reference'
1
CHECK_ REFERENCE
Figure 25.1/3
Error
OK
'Refuse-reason := Invalid_originating _reference'
Dest_Ref _check
no
1
yes
no
Dest_Ref _known
yes
1
'Result := Dialogue_ refused'
'Refuse-reason := Invalid_destination _reference'
'AC_name := Received_AC _name'
2
'AC_name := Highest_version _supported'
1
'Result := Dialogue_ Accepted'
Received version (Vr) = the one described in this version of MAP ?
no
MAP-OPEN _Rsp
MAP-OPEN _Rsp
yes
Error
2
OK
Vr

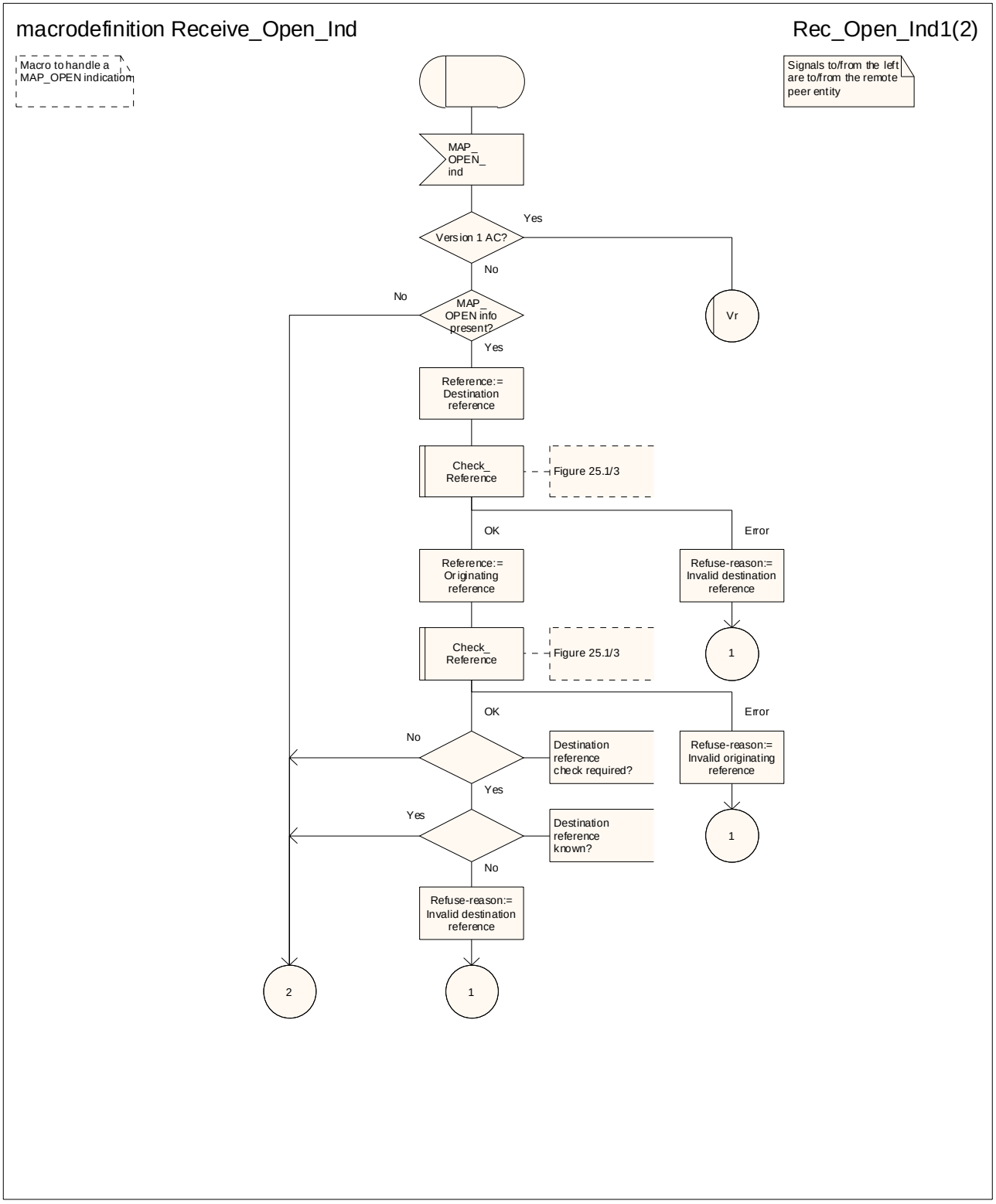


Figure 25.1/1 (sheet 1 of 2): Macro Receive_Open_Ind

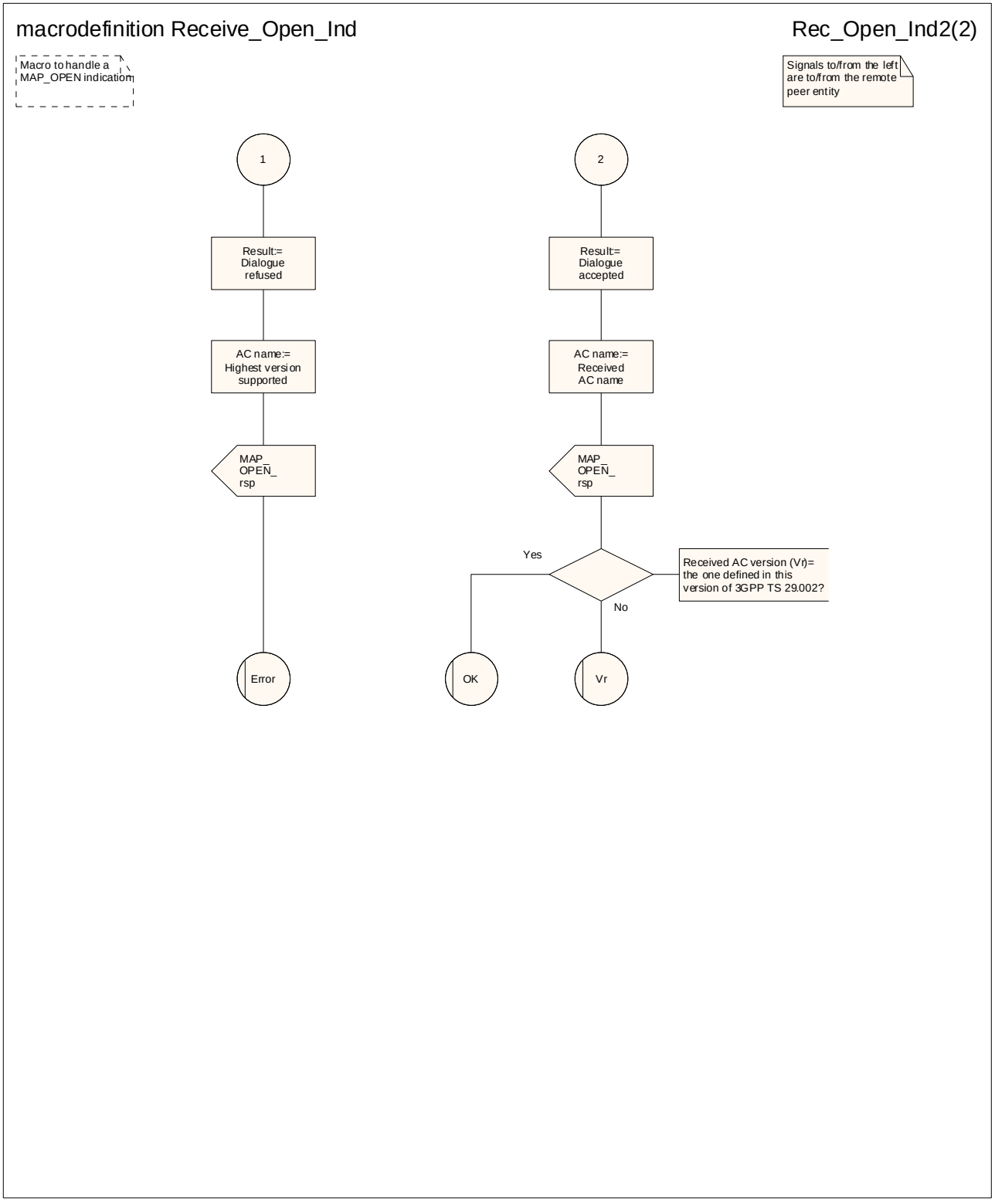
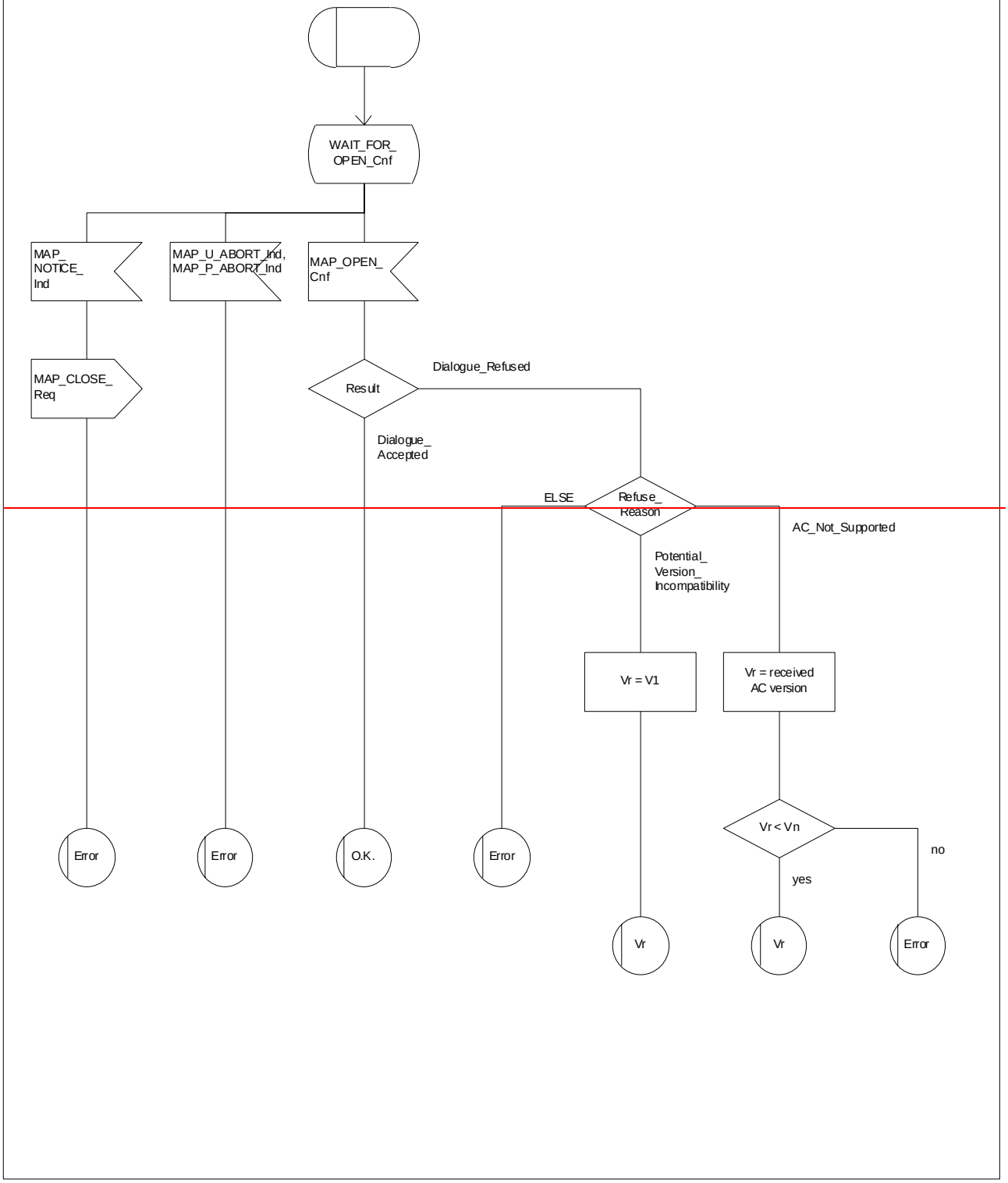


Figure 25.1/1 (sheet 2 of 2): Macro Receive_Open_Ind

Macrodefinition Receive_Open_Cnf 25.1_2(1)

Figure 25.1/2: Macro to receive a MAP_OPEN _Cnf



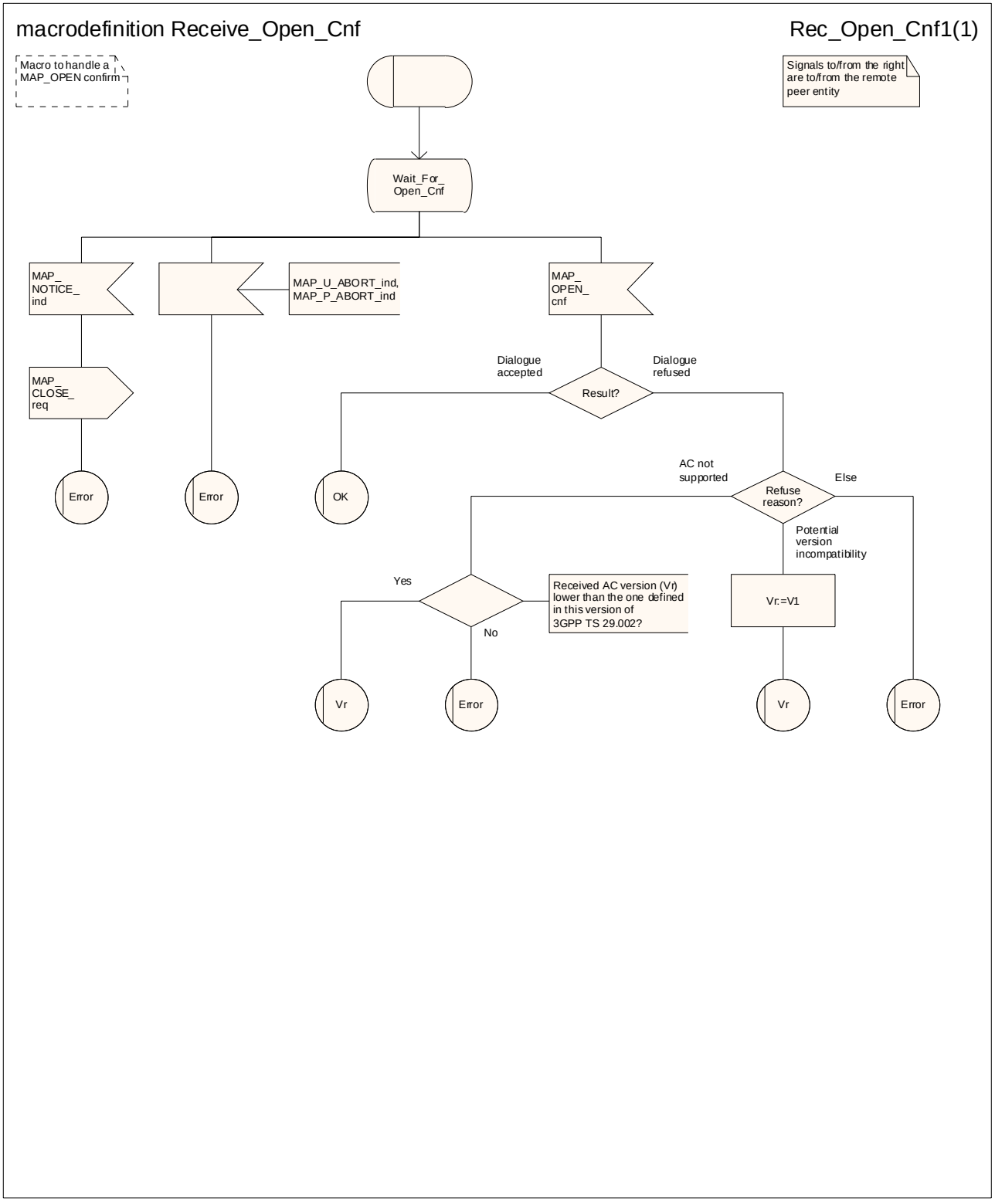
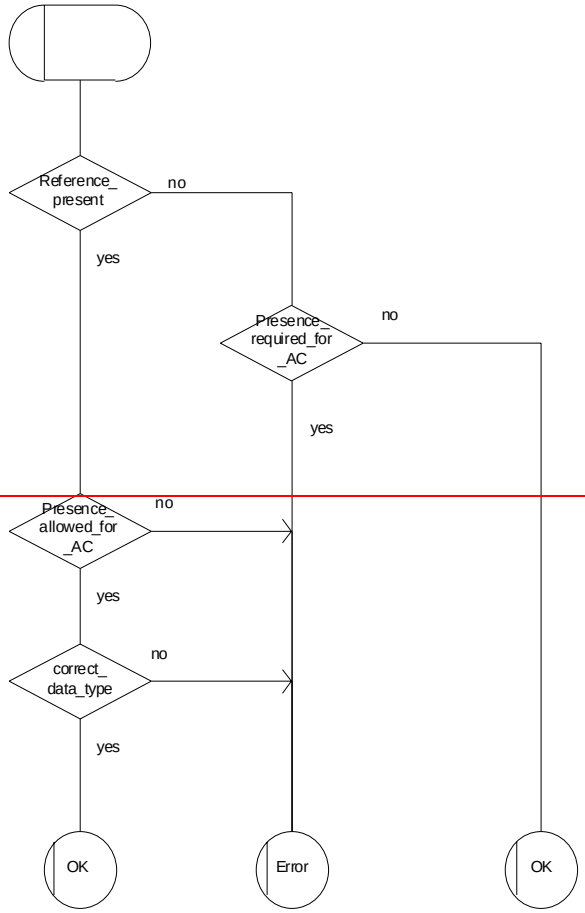


Figure 25.1/2: Macro Receive_Open_Cnf

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



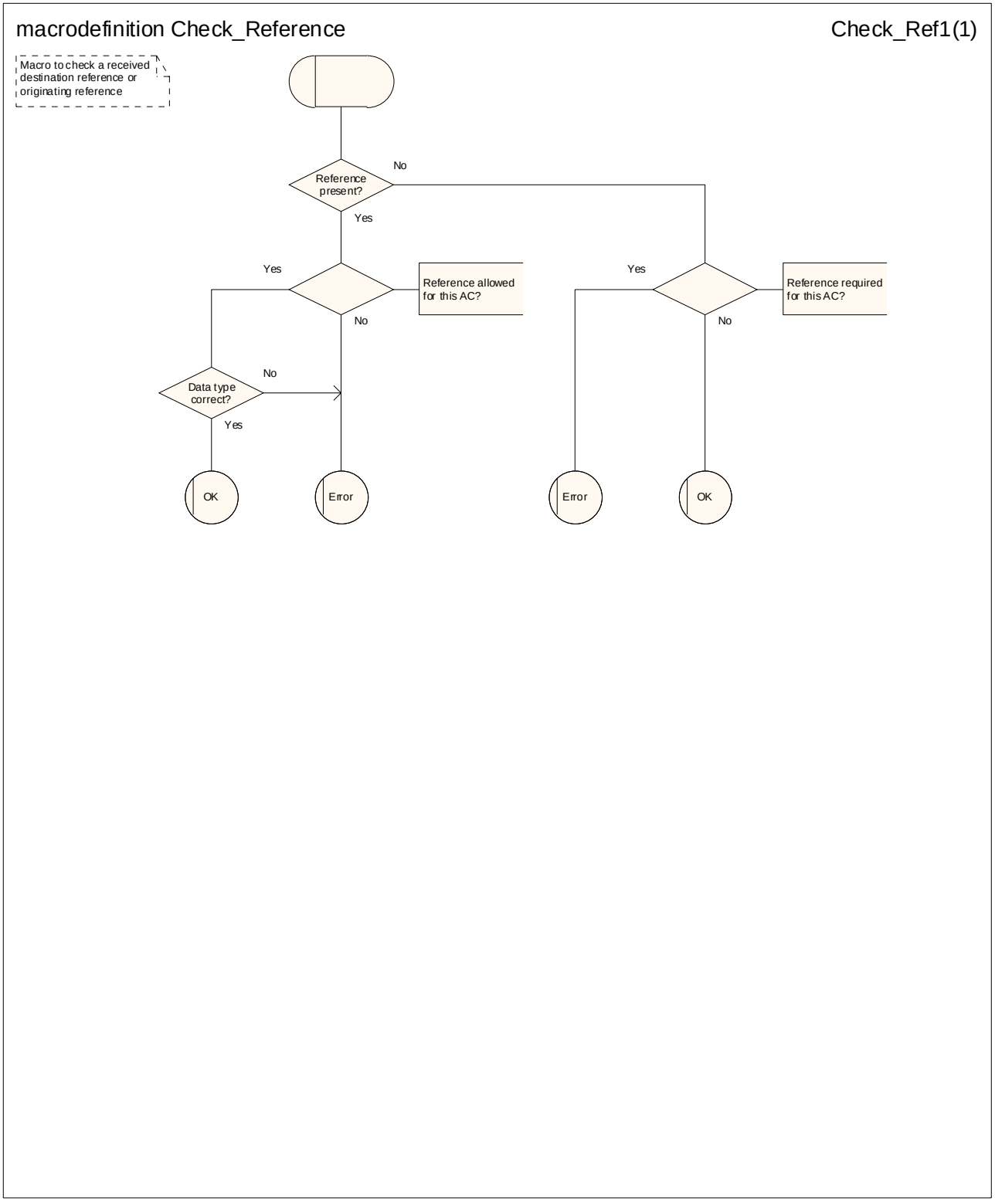


Figure 25.1/3: Macro Check~~HECK~~ Reference~~EFERENCE~~

25.2 Macros to check the content of indication and confirmation primitives

25.2.1 Macro Check_Indication

This macro checks that an indication includes all the parameters required by the application, no more and no less, and that the parameters are all within the correct range. It does not handle syntax checking; that is part of the function of the MAP protocol machine.

~~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

This macro checks whether a confirmation contains an error or a result, and if it contains a result whether the result is correctly formed.

~~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.~~

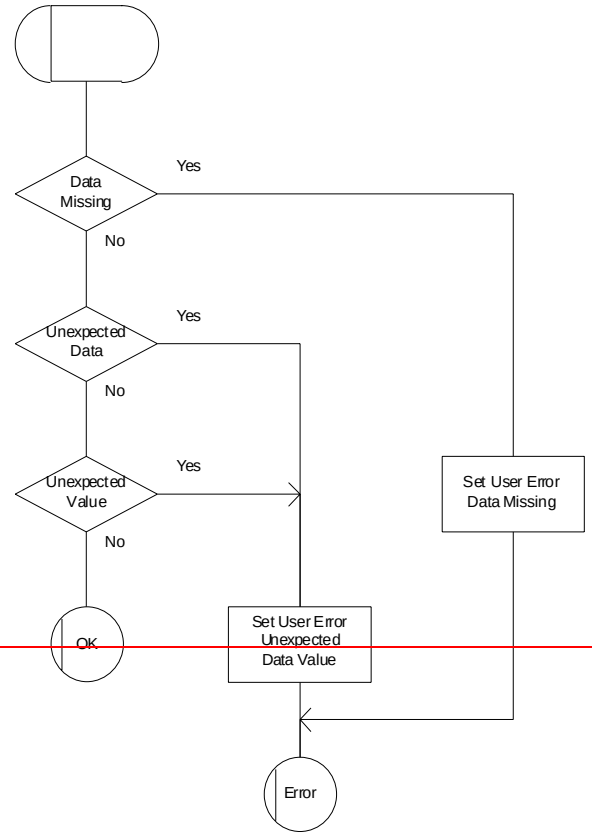
~~Otherwise, if a parameter required by the application is missing from the confirmation, or a parameter not expected by the application is present in the confirmation, or an expected parameter has a value not in the set of values permitted by the application, the macro takes the data error exit.~~

~~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



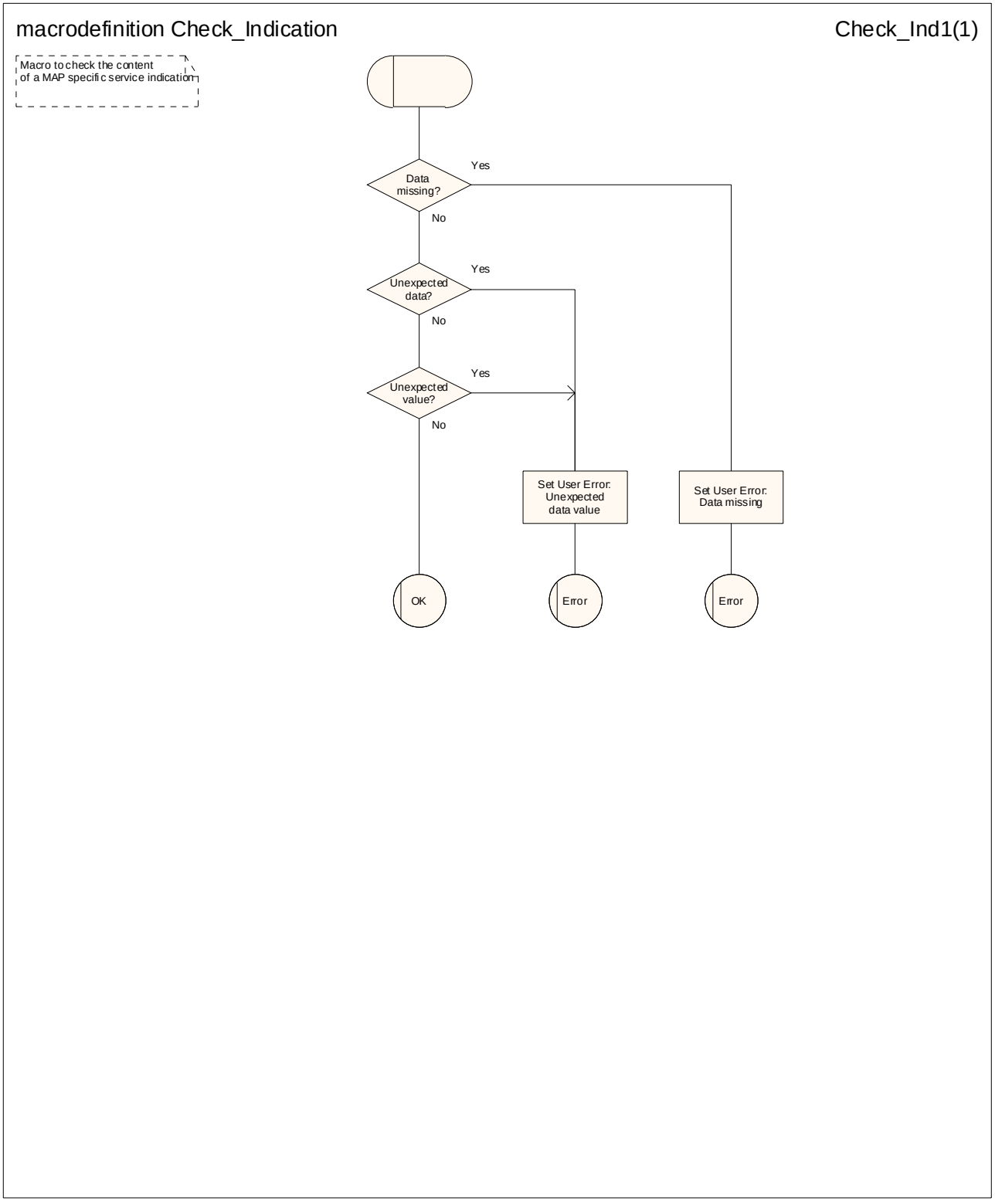
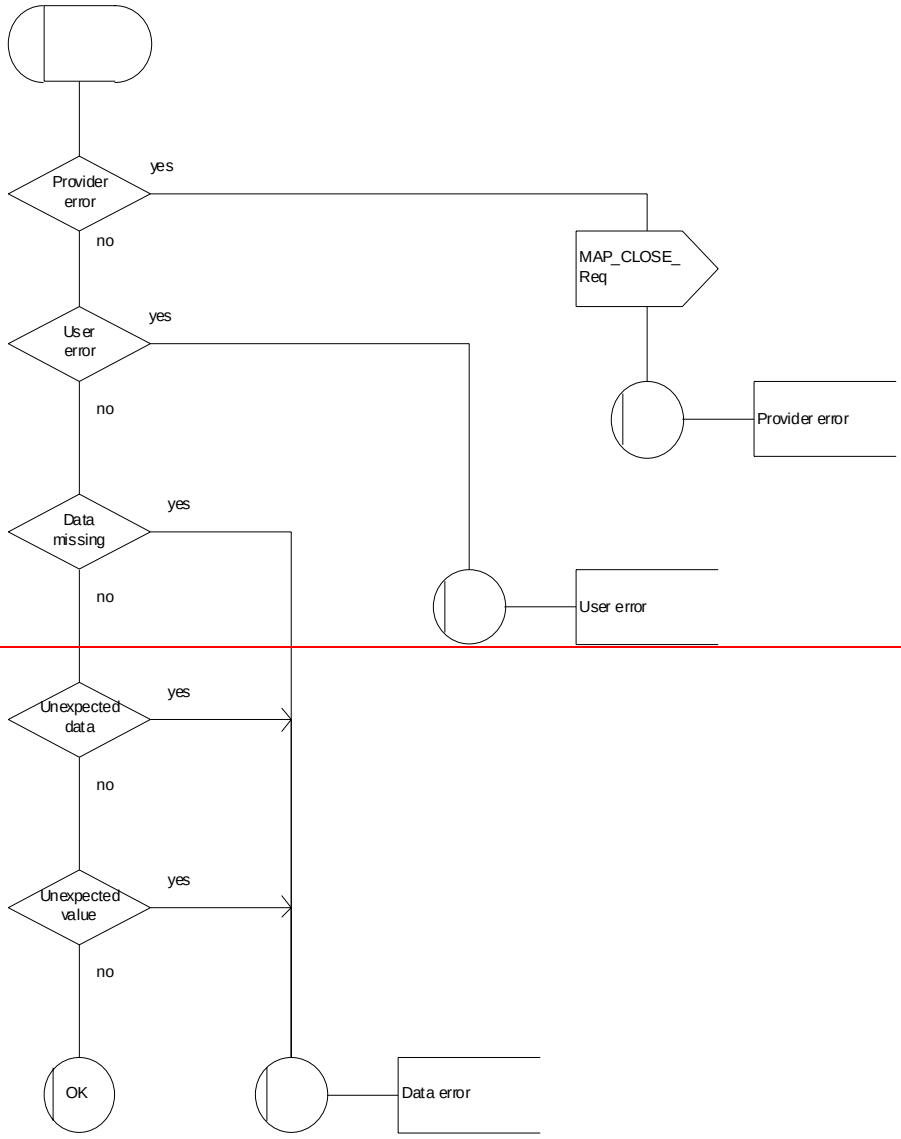


Figure 25.2/1: Macro Check_Indication

Macrodefinition Check_Confirmation 25.2_2(1)

Figure 25.2/2: Macro to check the parameters of a confirmation primitive



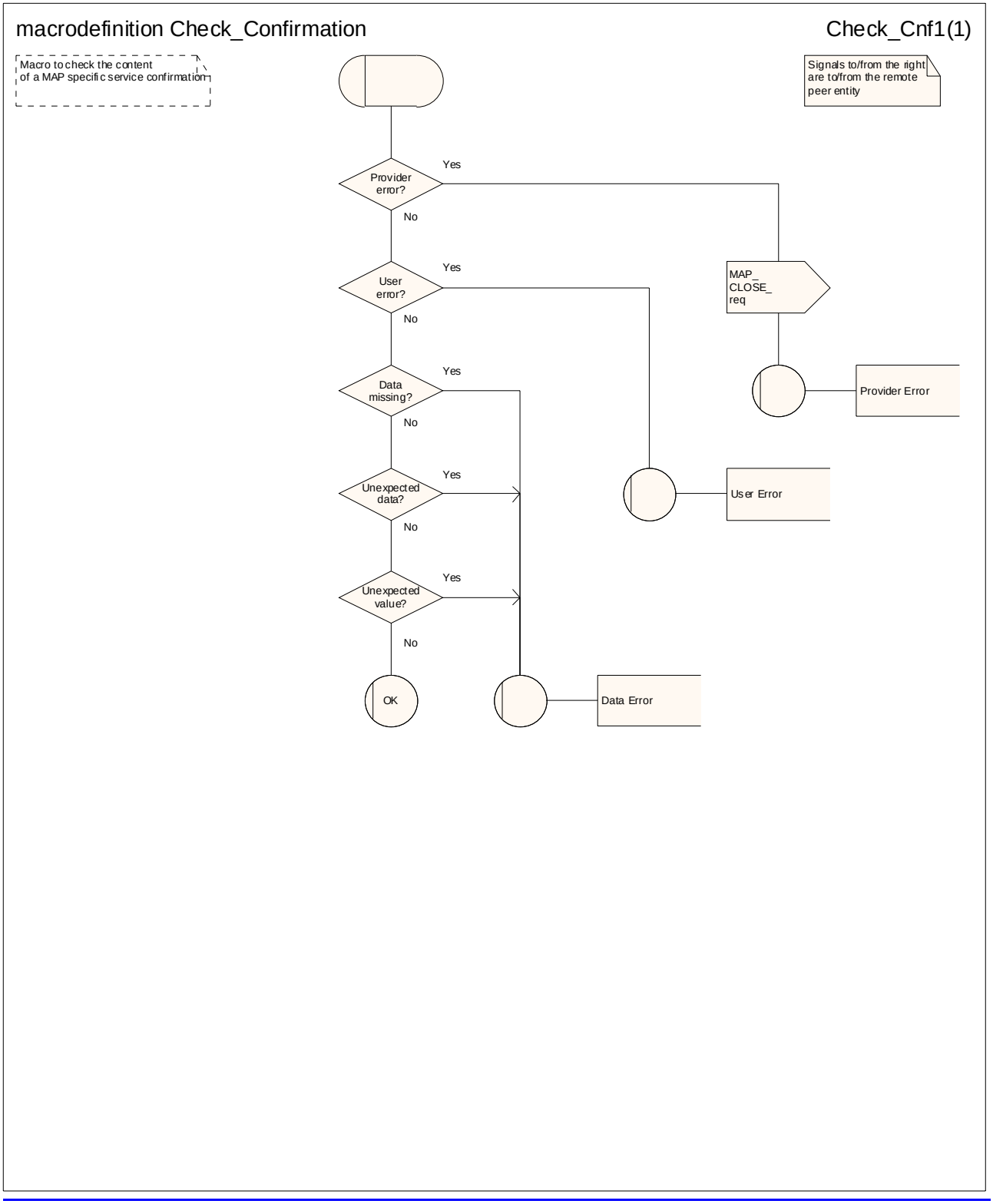


Figure 25.2/2: Macro Check_Confirmation

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.

If an MM-connection over the radio link already exists for the given IMSI, the MSC sets the access connection status according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not).

If the MSC pages the MS and the VLR provided the TMSI, the MSC uses it to identify the MS at the radio interface; otherwise the MSC uses the IMSI. The MSC also uses the IMSI to determine the page group (see 3GPP TS 24.008 [35]).

If 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. This gives priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which gives priority to the mobile terminating request.

If the paging is for MT SMS delivery and the VLR aborts the transaction before the MSC receives a response from the MS, the MSC aborts the transaction with the SMS-GMSC.

~~When the MSC receives a MAP_PAGE indication, parameter checks are performed first (macro Check_Indication, see clause 25.2). If parameter errors are detected, the MSC returns a MAP_PAGE response containing the appropriate error cause and the macro terminates with unsuccessful outcome.~~

~~Thereafter, several checks on the indication content are performed. The macro terminates by returning the MAP_PAGE response with error:~~

- ~~Unknown Location Area if the LAI is not known in the MSC;~~
- ~~System Failure if the call has been released by the calling subscriber or the SMS or SS transaction for this subscriber has been released by the originating entity in the meantime.~~

~~Next, the MSC checks if an MM-connection over the radio link already exists for the given IMSI. If so,~~

- ~~in the case of mobile terminating call set-up the MSC determines whether the busy condition can be established (see 3GPP TS 22.001 [2] for a definition of busy states). If the MSC determines that the MS is busy, it returns a MAP_PAGE response with error Busy Subscriber, qualified by either More Calls Allowed or No More Calls Allowed. The macro then terminates with unsuccessful outcome.~~
- ~~if the service requested is short message service or an unstructured SS notification or network-initiated unstructured SS request, or if the service is mobile terminating call set-up, but the existing connection is for signalling purposes only (i.e. a service different from call set-up), the access connection status is set according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not), and the macro terminates with successful outcome.~~

~~If no MM-connection for the given IMSI exists, paging is initiated at the radio interface within all cells of the location area indicated by the VLR. If the VLR provided the TMSI, the MSC uses it to identify the MS at the radio interface; otherwise the MSC uses the IMSI. The IMSI will also be used to determine the page group (see 3GPP TS 24.008 [35]). There are several possible outcomes of paging:~~

- ~~the MS responds to paging, causing the access connection status to be set accordingly (i.e. no RR-connection, in which case other values are not significant), and the macro terminates with successful outcome;~~
- ~~the MS responds with a channel request containing an establishment cause which is not "answer to paging". The MSC sends a MAP_PAGE response primitive with user error Busy Subscriber before the macro terminates with unsuccessful outcome. This will give priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which will give priority to the mobile terminating request.~~

- there is no response from the MS. The MSC sends a MAP_PAGE response primitive with user error Absent Subscriber before the macro terminates with unsuccessful outcome;

- the call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released before a response is received from the MS (indicated in the SDL by the input signal I-REL). The MAP transaction with the VLR will be released in this case by a MAP_U_ABORT request, and the unsuccessful macro termination will indicate transaction termination.

- the MAP transaction with the VLR may be released by receiving a MAP_U_ABORT or MAP_P_ABORT indication. The call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released (indicated in the SDL by the output signal I-REL), and the unsuccessful macro termination will indicate transaction termination.

25.3.2 Macro Search_For_MS_MSC

This macro (see figure 25.3/2) is called if a mobile terminating call set-up, an unstructured SS notification, a network-initiated unstructured SS request or a mobile terminating short message is to be delivered to the MS and the current location area identity of the MS is not known in VLR.

If an MM-connection over the radio link already exists for the given IMSI, the MSC returns a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS to the VLR and sets the access connection status according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not).

If the MSC pages the MS, the MSC uses the IMSI to identify the subscriber and the page group (see 3GPP TS 24.008 [35]).

If 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 with user error Busy Subscriber. This gives priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which gives priority to the mobile terminating request.

If the paging is for MT SMS delivery and the VLR aborts the transaction before the MSC receives a response from the MS, the MSC aborts the transaction with the SMS-GMSC.

When the MSC receives a MAP_SEARCH_FOR_MS Indication, parameter checks are performed first (macro Check_indication, see clause 25.2). If parameter errors are detected, the MSC returns a MAP_SEARCH_FOR_MS response containing the appropriate error cause and the macro terminates with unsuccessful outcome.

Thereafter, the MSC checks whether the call or the SMS or SS transaction still exists in the MSC. If the call or the SMS or SS transaction has been released, the MSC returns a MAP_SEARCH_FOR_MS response with error System Failure and the macro terminates with unsuccessful outcome.

Next, the MSC checks if an MM-connection over the radio link already exists for the given IMSI. If so,

- in the case of mobile terminating call set-up the MSC determines whether the busy condition can be established (see 3GPP TS 22.001 [2] for a definition of busy states). If the MSC determines that the MS is busy, it returns a MAP_SEARCH_FOR_MS response with error Busy Subscriber, qualified by either More Calls Allowed or No More Calls Allowed. The macro then terminates with unsuccessful outcome.

- if the service requested is short message service or an unstructured SS notification or network initiated unstructured SS request, or if the service is mobile terminating call set-up, but the existing connection is for signalling purposes only (i.e. a service different from call set-up), a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS is returned to the VLR. The access connection status is set according to the characteristics of the existing connection (i.e. RR-connection established, ciphering mode on/off, MM-connection existing and authenticated or not), and the macro terminates with successful outcome.

If no MM-connection for the given IMSI exists, paging is initiated at the radio interface within all cells of all location areas of the VLR, using the IMSI to identify the subscriber and the page group (see 3GPP TS 24.008 [35]). There are several possible outcomes of paging:

- the MS responds to paging, causing a MAP_SEARCH_FOR_MS response containing the IMSI and current location area identification of the called MS to be returned to the VLR. The access connection status will be set

accordingly (i.e. no RR-connection, in which case other values are not significant), and the macro terminates with successful outcome.

- the MS responds with a channel request containing an establishment cause which is not "answer to paging". The MSC sends a MAP_SEARCH_FOR_MS response primitive with user error "Busy Subscriber" before the macro terminates with unsuccessful outcome. This will give priority to the mobile originating request. Alternatively, as an implementation option, the MSC may treat this as a response to paging, which will give priority to the mobile terminating request.

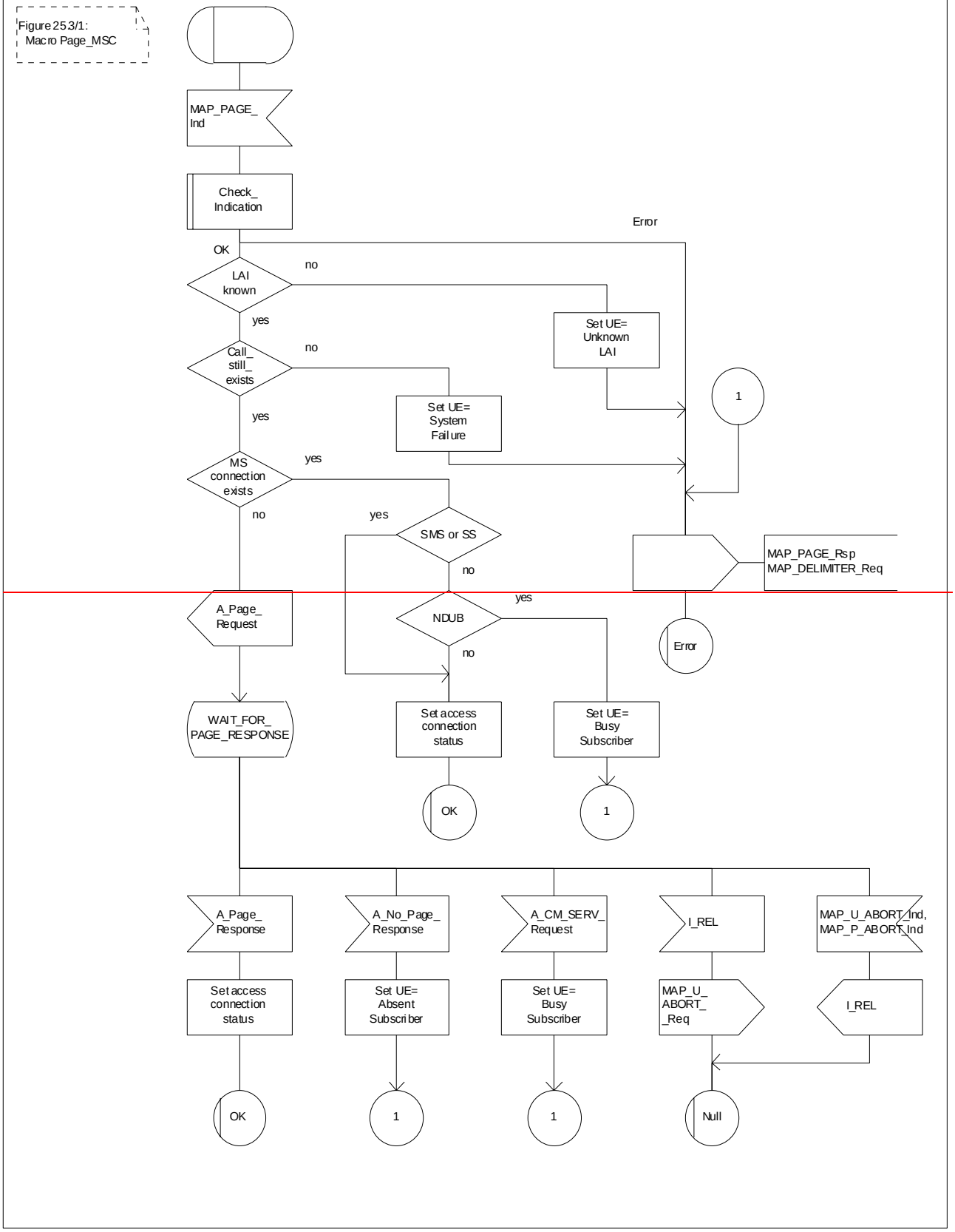
- there is no response from the MS. The MSC sends a MAP_SEARCH_FOR_MS response primitive with user error "Absent Subscriber" before the macro terminates with unsuccessful outcome.

- the call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released before a response is received from the MS (indicated in the SDL by the input signal I_REL). The MAP transaction with the VLR will be released in this case by a MAP_U_ABORT request, and the unsuccessful macro termination will indicate transaction termination.

- the MAP transaction with the VLR may be released by receiving a MAP_U_ABORT or MAP_P_ABORT indication. The call handling connection or MAP transaction on which the call, SMS or unstructured SS transaction is waiting for delivery, is released (indicated in the SDL by the output signal I_REL), and the unsuccessful macro termination will indicate transaction termination.

Macrodefinition Page_MSC 25.3_1(1)

Figure 25.3/1:
Macro Page_MSC



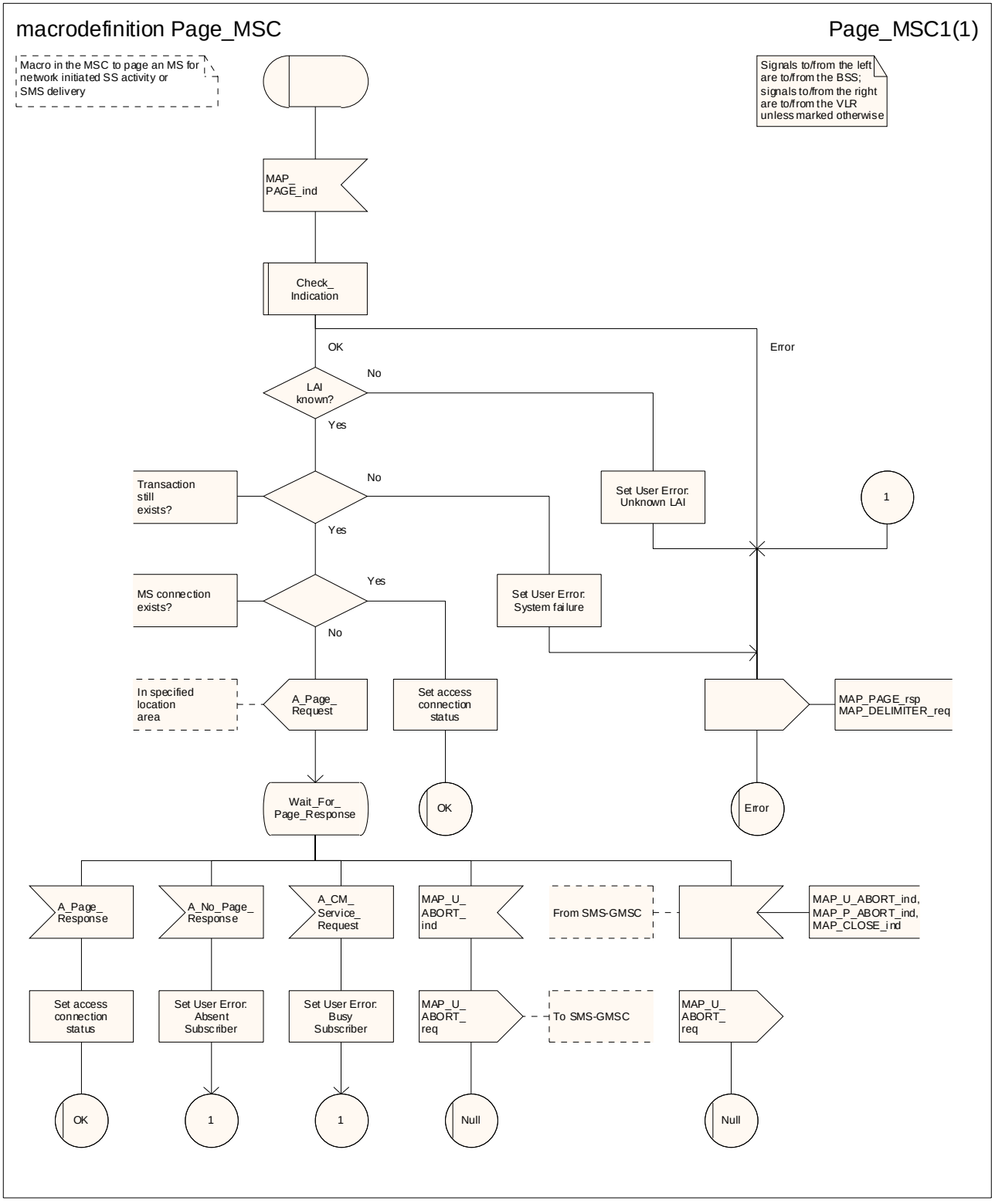
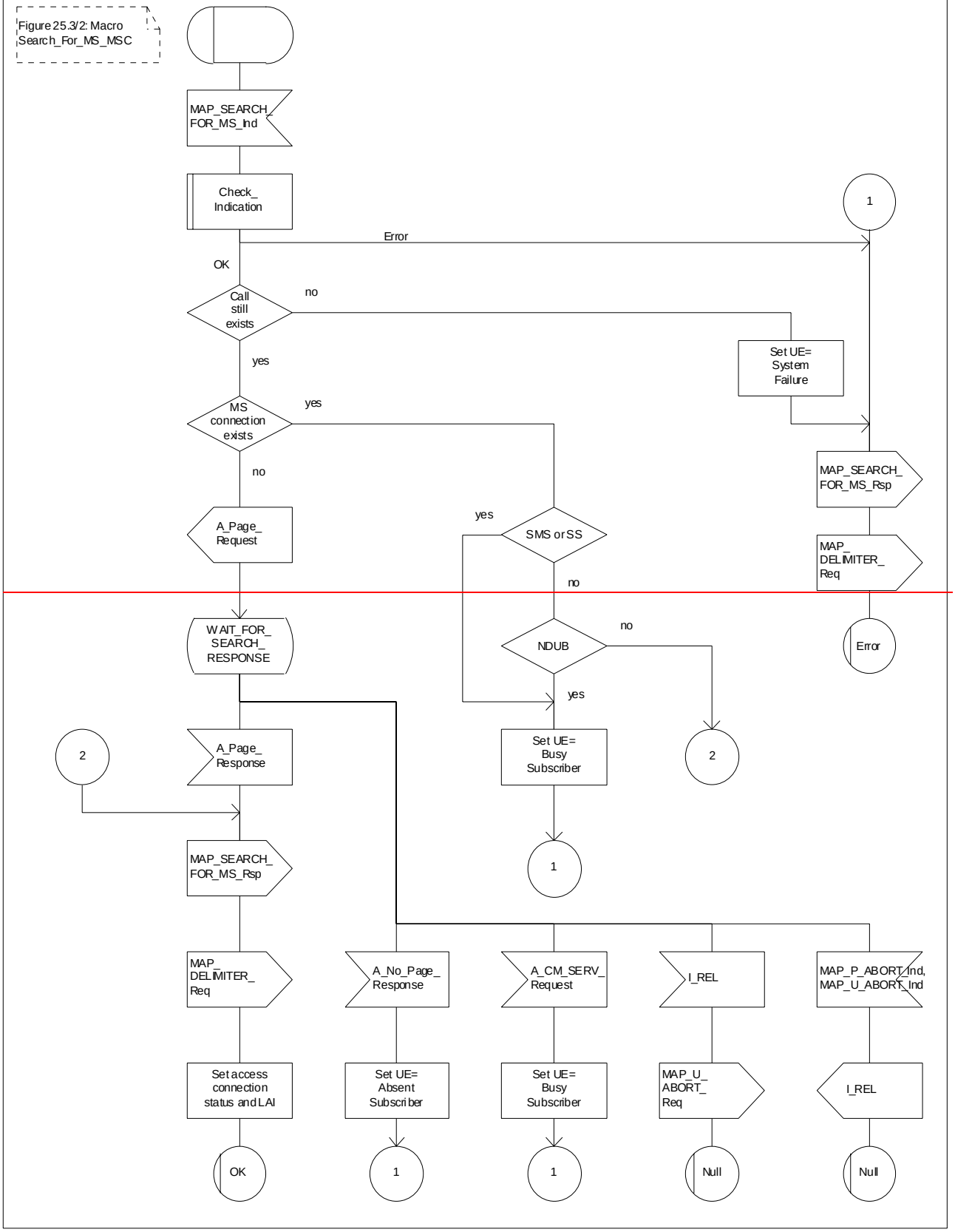


Figure 25.3/1: Macro Page_MSC

Macrodefinition Search_For_MS_MSC 25.3_2(1)

Figure 25.3/2: Macro Search_For_MS_MSC



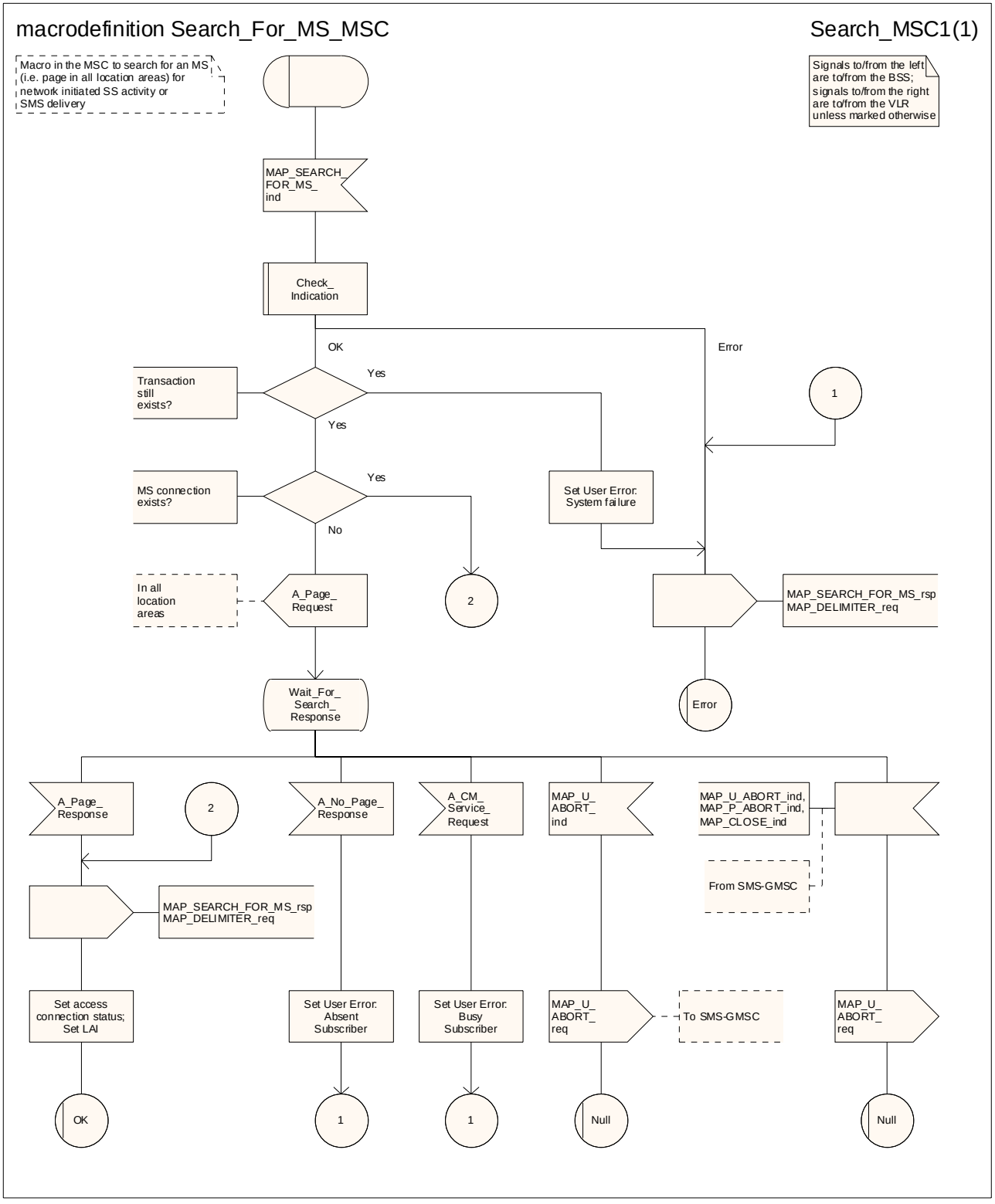


Figure 25.3/2: Macro Search_for_MS_MSC

25.4 Macros for handling an Access Request

These macros are invoked when an MS accesses the network, e.g. to ~~set up an outgoing call~~submit an MO short message or when responding to paging. The macros handle~~s~~ identification and authentication of the mobile subscriber as well as invocation of security related features (see 3GPP TS 42.009 [6]).

25.4.1 Macro Process_Access_Request_MSC

~~This macro is invoked by any procedure receiving an access request from the MS, e.g. the page response at mobile terminating call set-up or the request for outgoing call set-up.~~

~~If no dialogue with the VLR exists (e.g. within the procedure for outgoing call set-up), the MSC will open a dialogue towards the VLR by sending a MAP_OPEN request without any user specific parameters.~~

~~In any case, the parameters received from the MS are mapped to a MAP_PROCESS_ACCESS_REQUEST request primitive, containing:~~

Sheet 1: The MAP_PROCESS_ACCESS_REQUEST request includes the following parameters,

- 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.

Sheet 2, sheet 3: If the MSC receives an A_SETUP indication while it is waiting for further instructions from the VLR or for the acknowledgment of TMSI reallocation from the MS, the MSC saves the setup request for processing after control has returned from the macro Process_Access_Request_MSC to the calling process.

Sheet 3: When the MSC is waiting for a possible instruction to allocate a new TMSI, a MAP_DELIMITER indication indicates that TMSI reallocation is not required.

Sheet 3: If the MS sends a TMSI reallocation failure in response to the TMSI reallocation command, the MSC takes the OK exit; the VLR treats the lack of response as a provider error (see macro Process_Access_Request_VLR).

~~If opening of the dialogue was required, the MSC will wait for the dialogue confirmation (see macro Receive_Open_Confirmation, clause 25.1), leading either to:~~

- ~~immediate unsuccessful exit from the macro, in case no dialogue is possible;~~
- ~~reversion to MAP version one dialogue if indicated by the VLR. The macro terminates with unsuccessful outcome, as the complete dialogue will be covered by the version one procedure, so that no further action from the calling process is required;~~
- ~~continuation as given below, if the dialogue is accepted by the VLR.~~

~~The MSC waits then for the MAP_PROCESS_ACCESS_REQUEST confirmation. In between, several other indications may be received from the VLR:~~

- ~~the MSC may receive a MAP_PROVIDE_IMSI indication, handled by the macro Obtain_IMSI_MSC defined in clause 25.8. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;~~
- ~~the MSC may receive a MAP_AUTHENTICATE indication, handled by the macro Authenticate_MSC defined in clause 25.5. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;~~
- ~~the MSC may receive a MAP_TRACE_SUBSCRIBER_ACTIVITY indication, handled by the macro Trace_Subscriber_Activity_MSC defined in clause 25.9;~~

- the MSC may receive a MAP_SET_CIPHERING_MODE indication, which will be stored for initiating ciphering later on;

- the MSC may receive a MAP_CHECK_IMEI indication, handled by the macro Check_IMEI_MSC defined in clause 25.6. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;

- the MSC may receive a MAP_Obtain_IMEI indication, handled by the macro Obtain_IMEI_MSC defined in clause 25.6. In case of positive outcome, the procedure continues waiting for the MAP_PROCESS_ACCESS_REQUEST confirmation, else the macro terminates with unsuccessful outcome;

- the MSC may receive a MAP_U_ABORT or MAP_P_ABORT indication, or a premature MAP_CLOSE indication from the VLR. In all these cases, the macro terminates with unsuccessful outcome, after sending the appropriate reject towards the MS (see 3GPP TS 29.010 [58]);

- the MSC may receive a MAP_NOTICE indication from the VLR. In this case, the dialogue towards the VLR is terminated by a MAP_CLOSE primitive, the appropriate reject is sent towards the MS (see 3GPP TS 29.010 [58]), and the macro terminates with unsuccessful outcome;

- the MSC may receive an indication for release of the radio path, in which case the dialogue towards the VLR will be terminated by a MAP_U_ABORT primitive, containing the diagnostic information Radio Channel Release.

When the MAP_PROCESS_ACCESS_REQUEST confirmation is received, the parameters of this primitive are checked first. In case of unsuccessful outcome of the service, the MAP User Error received is mapped onto the appropriate radio interface message (see 3GPP TS 29.010 [58]), before the macro terminates with unsuccessful outcome.

In case of positive outcome of the service, ciphering is initiated on the radio path, if this had been requested by the VLR (see above). Otherwise, if the access request was not triggered by a page response from the MS, the access request is accepted explicitly by sending a CM_Service_Accept message to the MS. If the access request was triggered by a page response from the MS then no CM Service Accept message is sent.

After ciphering has been initiated, the MSC will wait for the MAP_FORWARD_NEW_TMSI indication from the VLR. While waiting, the MSC may receive:

- a MAP_U_ABORT or MAP_P_ABORT indication, or a premature MAP_CLOSE indication from the VLR. In these cases, the macro terminates with unsuccessful outcome, after sending a release request towards the MS (see 3GPP TS 29.010 [58]);

- a MAP_NOTICE indication from the VLR. In this case, the dialogue towards the VLR is terminated by a MAP_CLOSE primitive, the appropriate reject is sent towards the MS (see 3GPP TS 29.010 [58]), and the macro terminates with unsuccessful outcome;

- an indication for release of the radio path, in which case the dialogue towards the VLR will be terminated by a MAP_U_ABORT primitive, containing the diagnostic information Radio Channel Release;

- a MAP_DELIMITER request from the VLR. This will be taken as a successful outcome of the macro (i.e. the VLR did not require TMSI reallocation), and it terminates successfully;

- an A_SETUP request from the MS. This will be saved for handling by the procedure which invoked the macro Process_Access_Request_MSC after the macro has terminated.

When the MAP_FORWARD_NEW_TMSI indication is received in the MSC, the TMSI Reallocation Command is sent to the MS, and the MSC waits for an acknowledgement from the MS. In case a positive acknowledgement is received, the MSC sends an empty MAP_FORWARD_NEW_TMSI response primitive to the VLR and terminates successfully. Else, the dialogue is terminated locally (MAP_CLOSE_Req with Release method Prearranged End) without any further action.

If the MSC receives an A_SETUP request while it is waiting for the TMSI acknowledgement from the MS, the A_SETUP is saved for handling by the procedure which invoked the macro Process_Access_Request_MSC after the macro has terminated.

~~If the dialogue is aborted by the VLR while waiting for the TMSI acknowledgement from the MS, the MSC regards the access request to be failed and terminates with unsuccessful outcome, after sending a release request towards the MS (see 3GPP TS 29.010 [58]).~~

***** CR editor's note: The (much reduced!) text of the next two subclauses has been moved from its position immediately after the SDL diagram for the macro Process_Access_Request_MSC. *****

25.4.2 Macro Process_Access_Request_VLR

***** CR editor's note: The handling for a repeat attempt at authentication if an MS has identified itself with a TMSI and the authentication fails has been moved from the macro Process_Access_Request_VLR to the macro Authenticate_VLR. This is a modelling change; the functional behaviour is the same. *****

***** CR editor's note: the existing text description of the handling after successful authentication differs from the SDL description in sheet 2; the handling described in the text seems more reasonable, so the SDL has been aligned with the existing text. *****

Sheet 3: If the MSC does not send a positive response to the MAP_FORWARD_NEW_TMSI request, this is treated as a MAP_FORWARD_NEW_TMSI confirmation containing a provider error. The Macro takes the Error exit. If TMSI reallocation does not succeed, the old TMSI is frozen, to prevent it from being reallocated. In this case, both old and new TMSIs are regarded as valid.

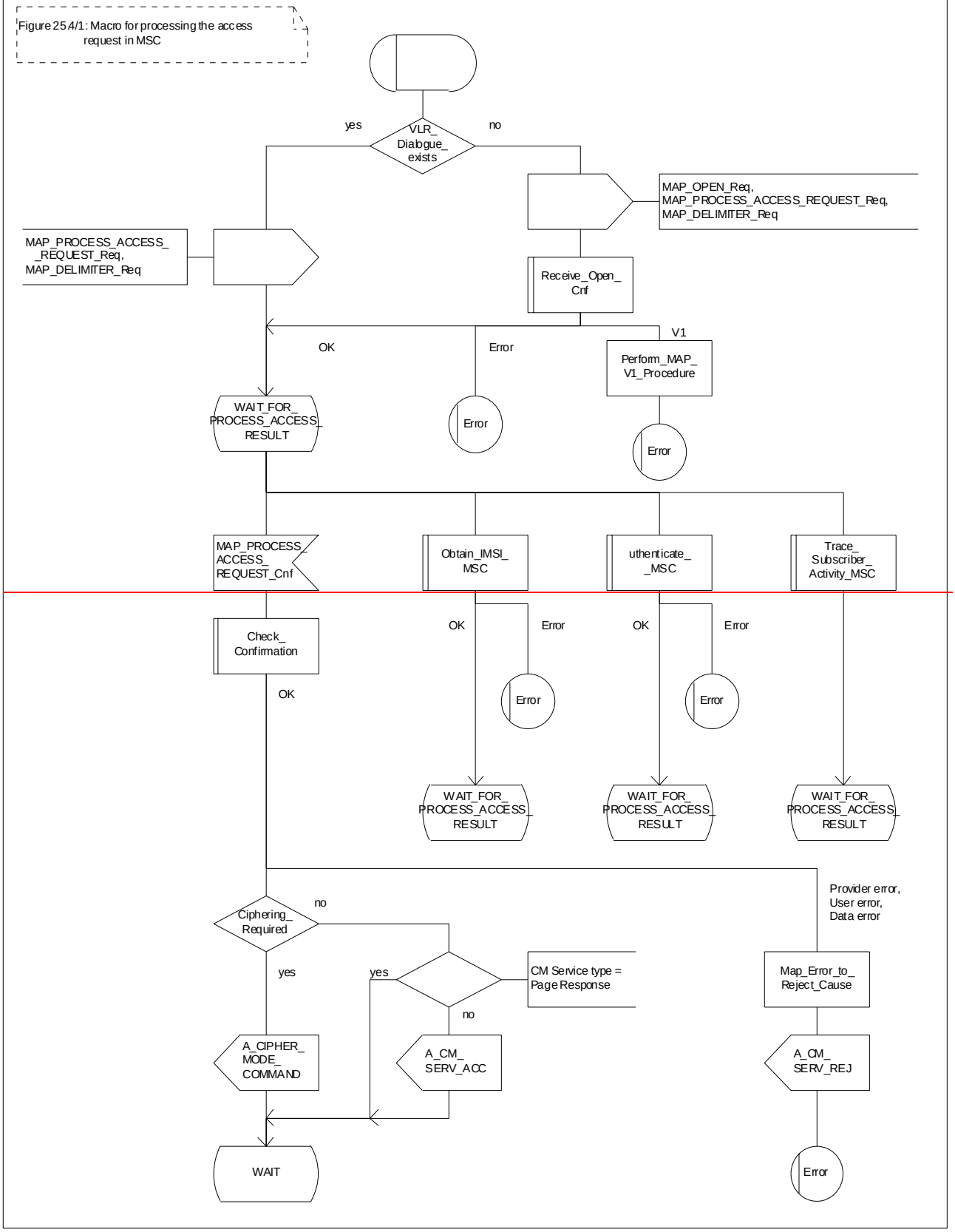
25.4.3 Macro Obtain_Identity

This macro is invoked by the macro Process_Access_Request_VLR if the subscriber's identity is not known in the VLR.

It is an operator option to allow or prevent retrieval of the IMSI without encryption.

Macrodefinition Process_Access_Request_MSC 25.4_1.1(3)

Figure 25.4/1: Macro for processing the access request in MSC



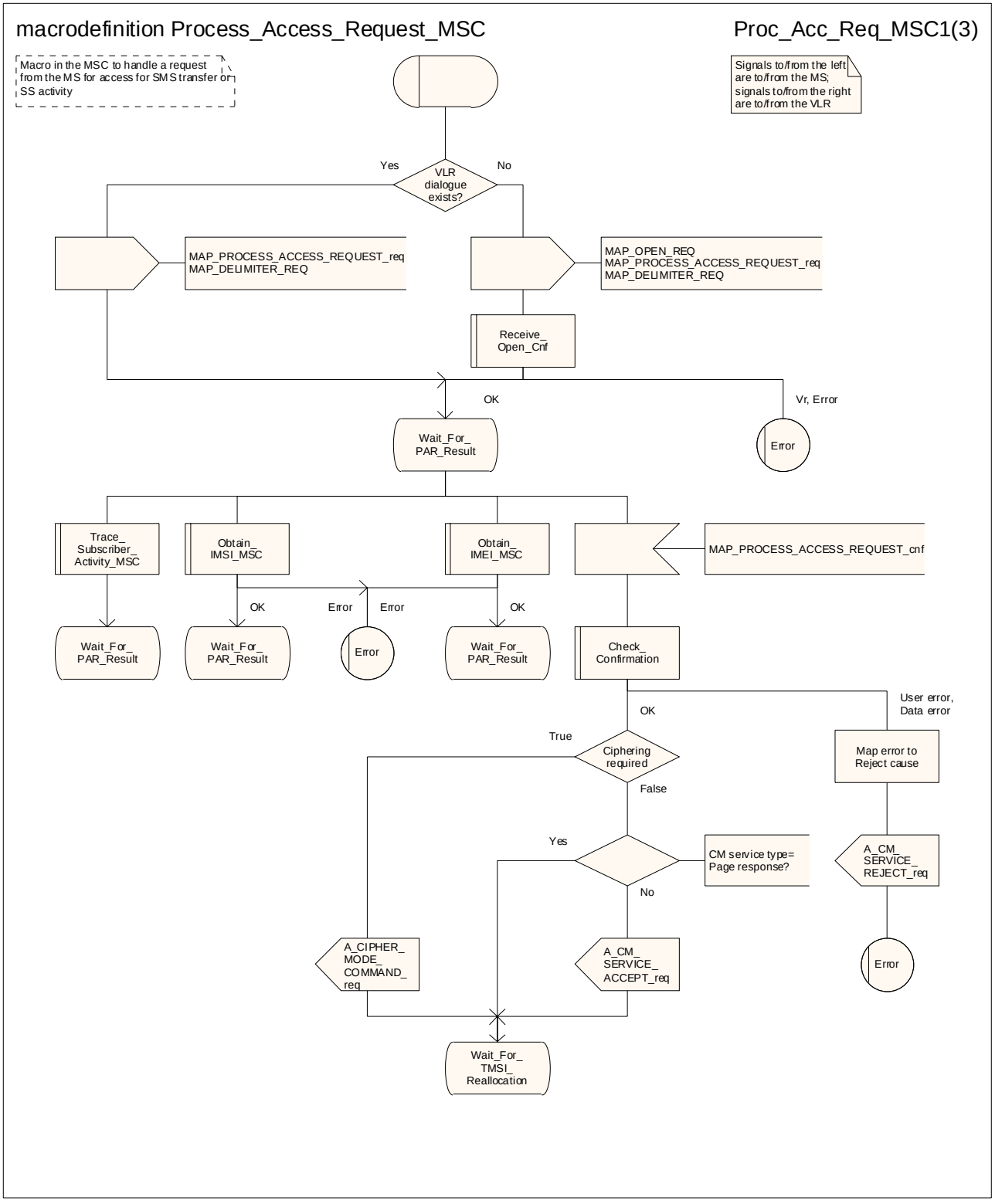
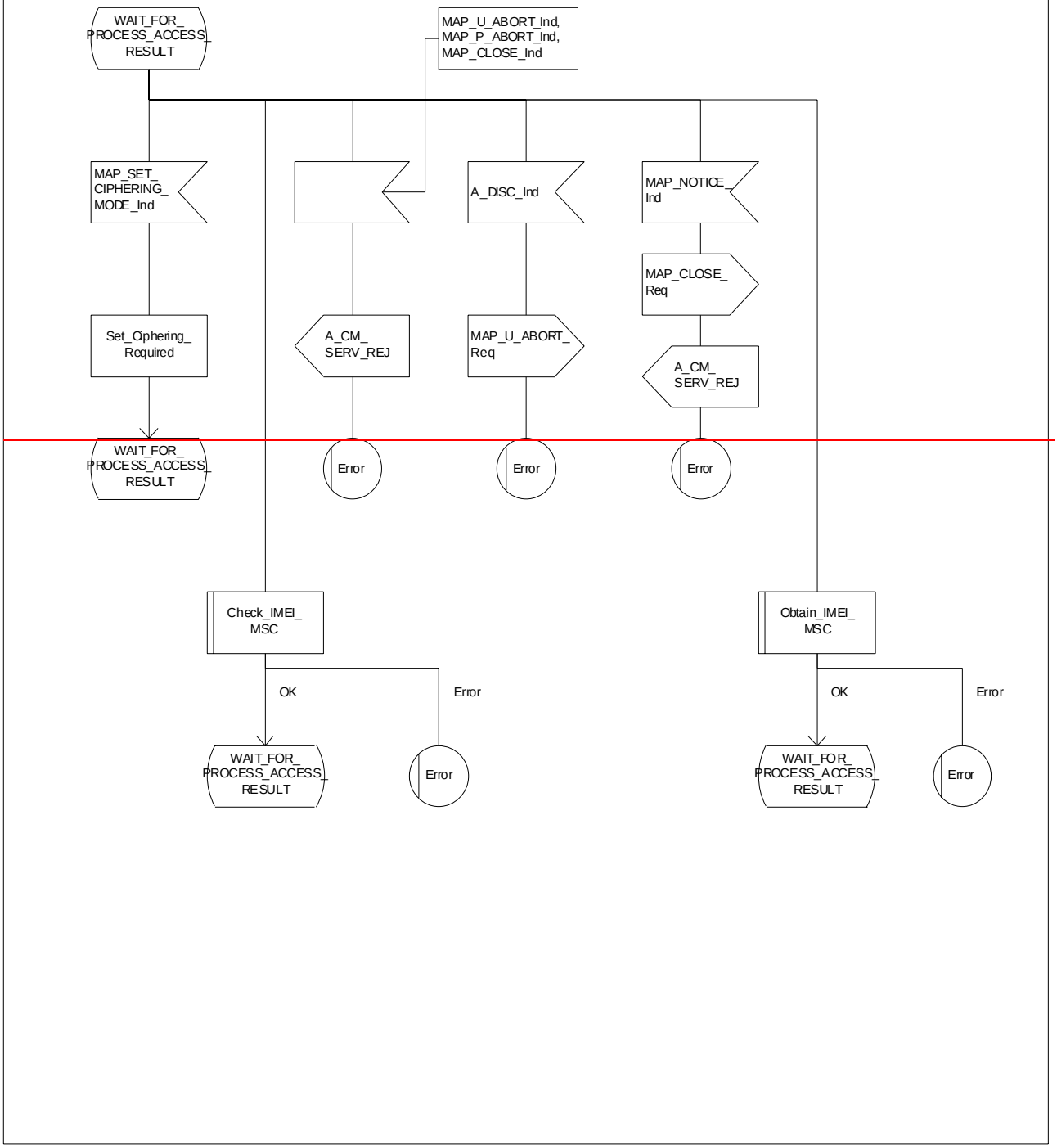


Figure 25.4/1 (sheet 1 of 3): Macro Process_Access_Request_MSC

Macrodefinition Process_Access_Request_MSC 25.4_1.2(3)

Figure 25.4/1: Macro for processing the access request in MSC



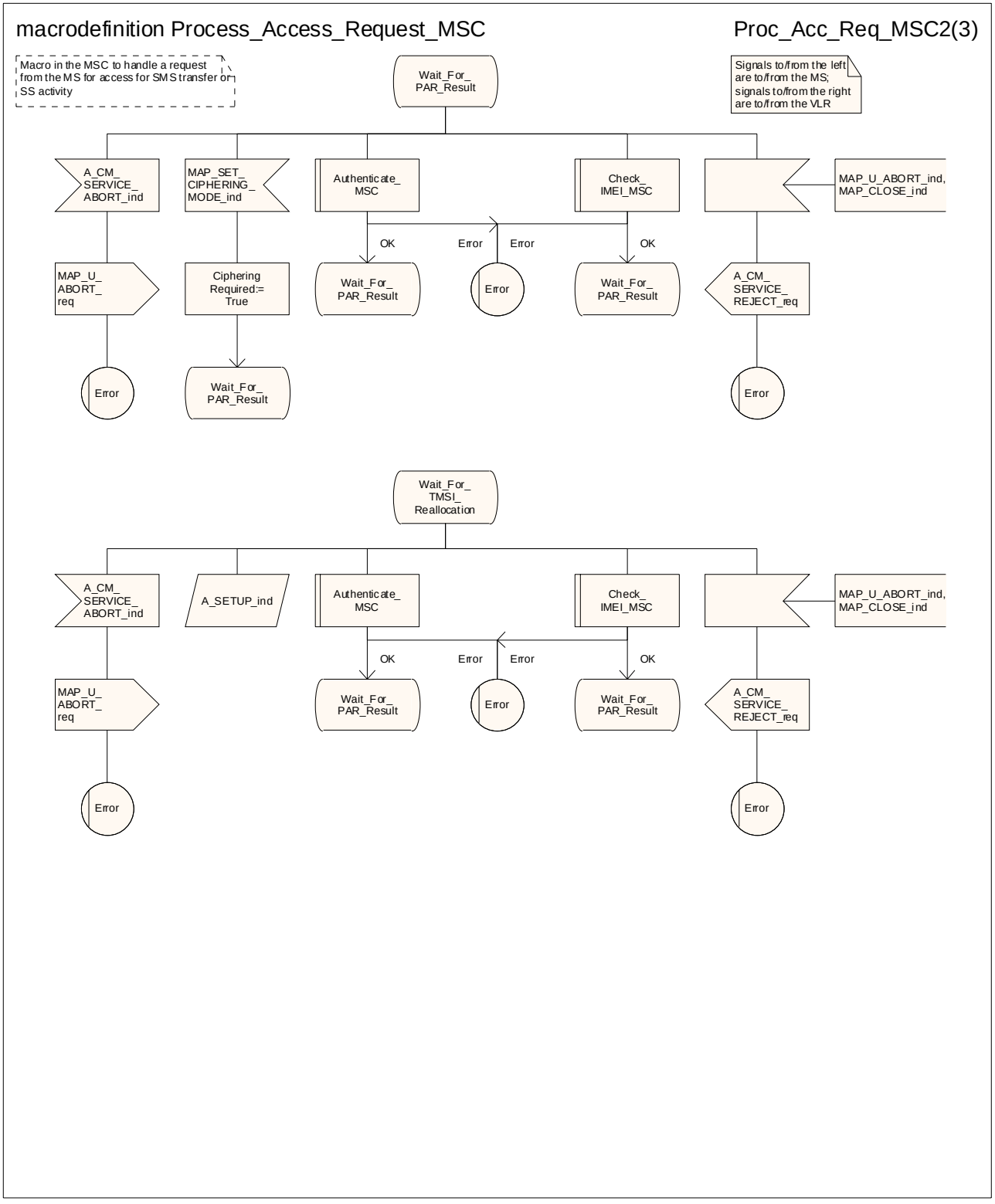
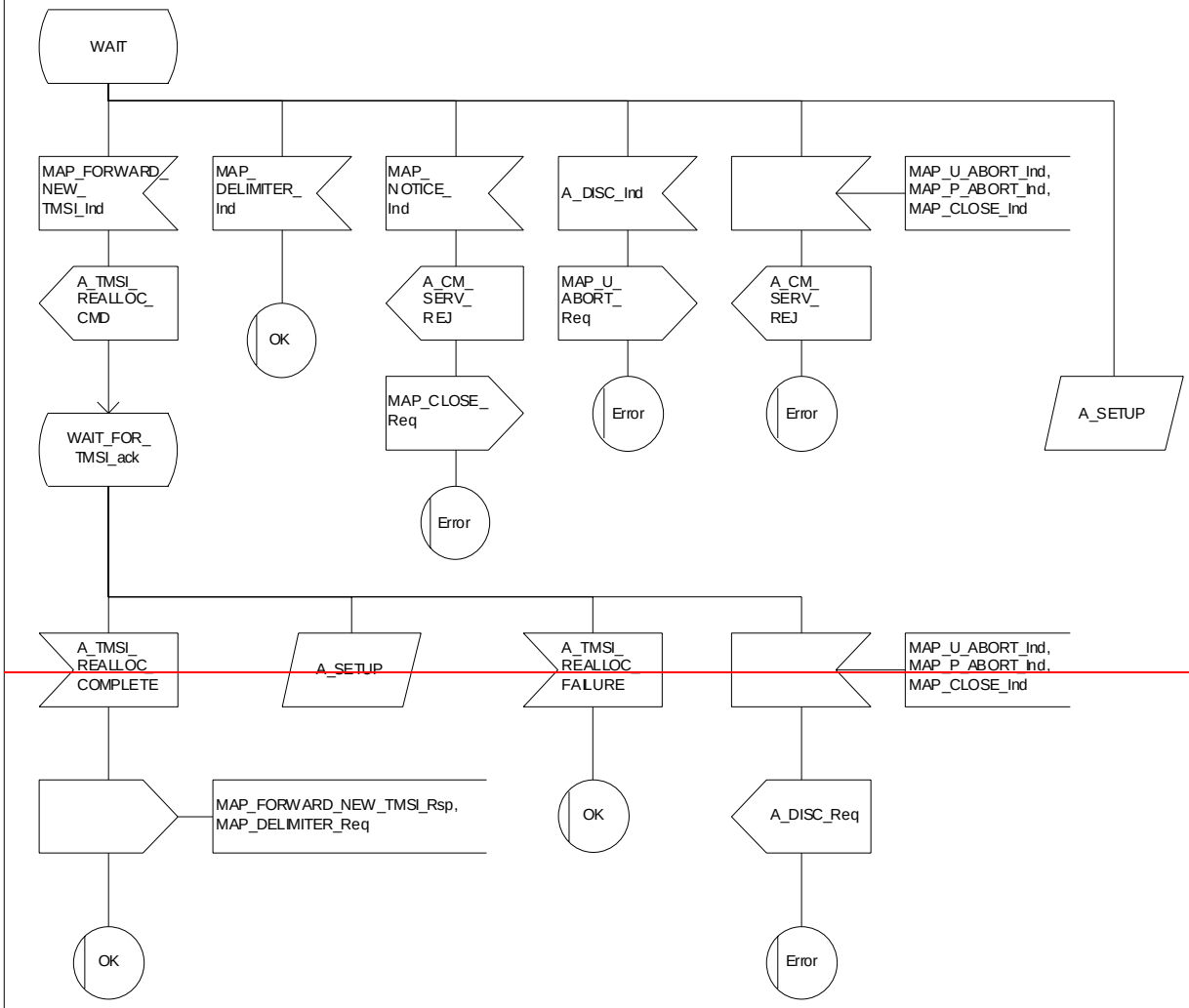


Figure 25.4/1 (sheet 2 of 3): Macro Process_Access_Request_MSC

Macrodefinition Process_Access_Request_MSC 25.4_1.3(3)

Figure 25.4/1: Macro for processing the access request in MSC



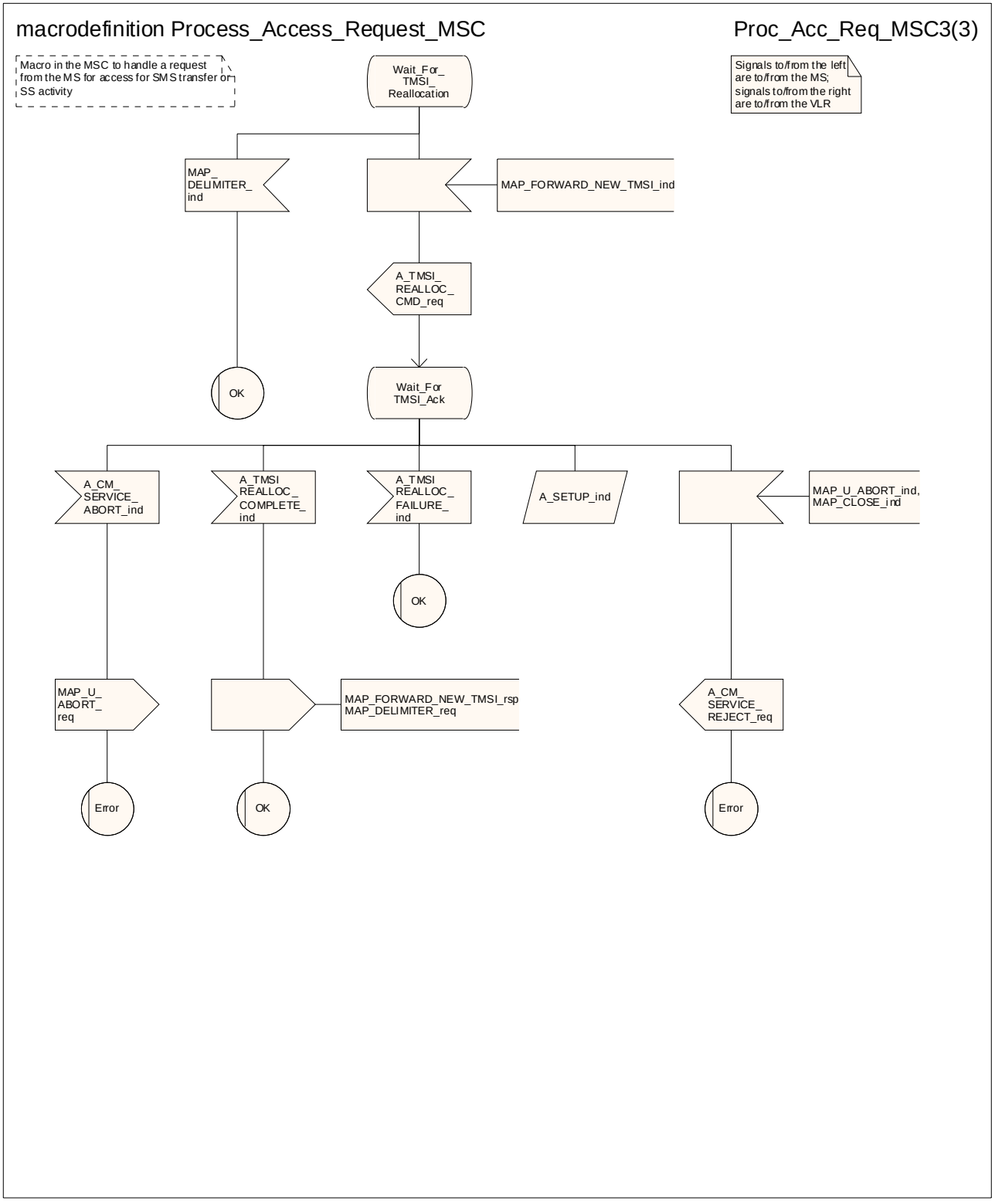


Figure 25.4/1 (sheet 3 of 3): Macro Process_Access_Request_MSC

***** CR editor's note: the (reduced!) text of the next two subclauses has been moved to follow immediately after the text of subclause 25.4.1. *****

25.4.2 Macro Process_Access_Request_VLR

When the VLR receives a MAP_PROCESS_ACCESS_REQUEST indication, the VLR will check this indication first (macro Check_Indication, see clause 25.2). In case of negative outcome, the macro will proceed with the error handling described below.

If the indication data are correct, it is checked first whether the subscriber identification (IMSI or TMSI) is known if included:

- if the identification is not known, the IMSI may be requested from the MS, described in the macro Identification_Procedure (see below) with outcome:
  - OK, if a IMSI known in the VLR has been received;
  - Error, if the VLR did not recognise the subscriber's identity. The macro will proceed with the error handling described below;
  - Aborted, if the transaction to the MSC is released. The macro will terminate immediately with unsuccessful.

In case the identity received is an IMEI, the error System Failure is set and the macro proceeds with the error handling described below.

NOTE: Emergency Call with IMEI may be accepted within the error handling phase.

For a known subscriber the authentication check is performed next (see macro Authenticate_VLR, clause 25.5), if required. If a negative result is received, the VLR proceeds on receipt of user error:

- illegal subscriber depending on the identity used for authentication;
- In case IMSI is already used or no new authentication attempt with IMSI shall not be performed (operator option), the error Illegal Subscriber is set and the macro proceeds with the error handling described below.
- If a new authentication attempt with IMSI shall be performed, the IMSI is requested from the MS (macro Obtain_IMSI_VLR, see clause 25.8):
  - the authentication will be performed again if a IMSI known in the VLR is received;
  - the error Unidentified Subscriber is set and the macro proceeds with the error handling described below, if the IMSI received is unknown in VLR;
  - if the IMSI request procedure fails for any other reason, the error System Failure is set and the macro proceeds with the error handling described below;
  - if the dialogue has been aborted during the IMSI request, the macro terminates immediately with unsuccessful outcome;
- unknown subscriber by setting the error Unidentified Subscriber and proceeding with the error handling described below.

NOTE: This can occur only in case of data inconsistency between HLR and VLR;

- procedure error by setting the error System Failure and proceeding with the error handling described below;
- null (i.e. the dialogue towards the MSC is terminated) by terminating immediately with unsuccessful outcome.

The MS access is accepted if no authentication is required or after successful authentication. Then, the indicator "Confirmed by Radio Contact" is set to "Confirmed". If the indicator "Location Information Confirmed in HLR" is set to "Not Confirmed", HLR updating will be started as an independent process (Update_Location_VLR, see clause 19.1.1.6).

If the indicator "Confirmed by HLR" is set to "Not Confirmed", the error Unidentified Subscriber is set and the macro proceeds with the error handling described below.

If roaming is not allowed in the location area indicated in the Current Location Area Id parameter, the error Roaming Not Allowed qualified by the roaming restriction reason is set and the macro proceeds with the error handling described below.

In case roaming is allowed, the IMSI is set to attached and the process for notifying the HLR that the subscriber is present is started if required (Subscriber Present VLR, see clause 25.10).

At next, tracing is invoked if required by the operator (macro Trace_Subscriber_Activity_VLR, see clause 25.9). Thereafter,

- if ciphering is not required, IMEI checking is invoked if required by the operator (see macro Check_IMEI_VLR defined in clause 25.6).
  - The error Illegal Equipment is set in case of unsuccessful outcome of the IMEI check, the subscriber is marked as detached and the macro proceeds with the error handling described below.
  - The macro terminates immediately with unsuccessful outcome if the MSC dialogue has been released during the IMEI check.
  - Else, the macro terminates successfully by returning the MAP_PROCESS_ACCESS_REQUEST response containing the IMSI to indicate acceptance of the MS access.
- if ciphering is required, the MAP_SET_CIPHERING_MODE request containing:
  - the cipher mode indicating the cipher algorithm required; and
  - the cipher key to be used;

  is sent to the MSC.

As a further operator option, IMEI checking may be performed next.

- The error Illegal Equipment is set in case of unsuccessful outcome of the IMEI check, the subscriber is marked as detached and the macro proceeds with the error handling described below.
- The macro terminates immediately with unsuccessful outcome if the MSC dialogue has been released during the IMEI check.
- Else, the macro terminates successfully by returning the MAP_PROCESS_ACCESS_REQUEST response containing the IMSI to indicate acceptance of the MS access.

IF no TMSI reallocation is required (again an operator option), the macro terminates thereafter. Else, TMSI reallocation is performed by sending a MAP_FORWARD_NEW_TMSI request, containing the new TMSI as parameter. The old TMSI will be frozen until an acknowledgement from the MS has been received. Before the macro terminates, the VLR will wait for the MAP_FORWARD_NEW_TMSI response, containing no parameters if reallocation has been confirmed by the MS, or a Provider Error, otherwise, in which case the old TMSI is kept frozen to avoid double allocation. In this case, both the old as the new TMSI are subsequently regarded valid when used by the MS.

Error handling

In case some error is detected during handling the access request, a respective error has been set. Before returning this error cause to the MSC in a MAP_PROCESS_ACCESS_REQUEST response, it need to be checked whether this access is for emergency call set-up, as this will require extra treatment.

If the CM Service type given in the MAP_PROCESS_ACCESS_REQUEST indication is emergency call set-up, it is checked whether EC set-up in the particular error situation is permitted (operator option). If so, it is checked whether the IMEI is required, and if so the IMEI is requested from the MS (macro Obtain_IMEI_VLR, see clause 25.6).

- The macro will terminate immediately with unsuccessful outcome if the MSC transaction has been aborted during the IMEI retrieval.
- In case of an error reported back from IMEI retrieval, MAP_PROCESS_ACCESS_REQUEST response containing the error cause set previously is returned to the MSC, the dialogue is closed (MAP_CLOSE request indicating normal release) and the macro terminates with unsuccessful outcome.

When a subscriber identity required by the operator (IMSI or IMEI) is available, the user error set previously is deleted, the respective identity is returned in the MAP_PROCESS_ACCESS_REQUEST response to indicate acceptance of emergency call, and the macro terminates with successful outcome.

In all other cases, the MAP_PROCESS_ACCESS_REQUEST response containing the error cause set previously is returned to the MSC, the dialogue is closed (MAP_CLOSE request indicating normal release) and the macro terminates with unsuccessful outcome.

25.4.3 Macro Identification Procedure

This macro is invoked by the macro Process_Access_Request_VLR in case the subscribers identity is not known in the VLR.

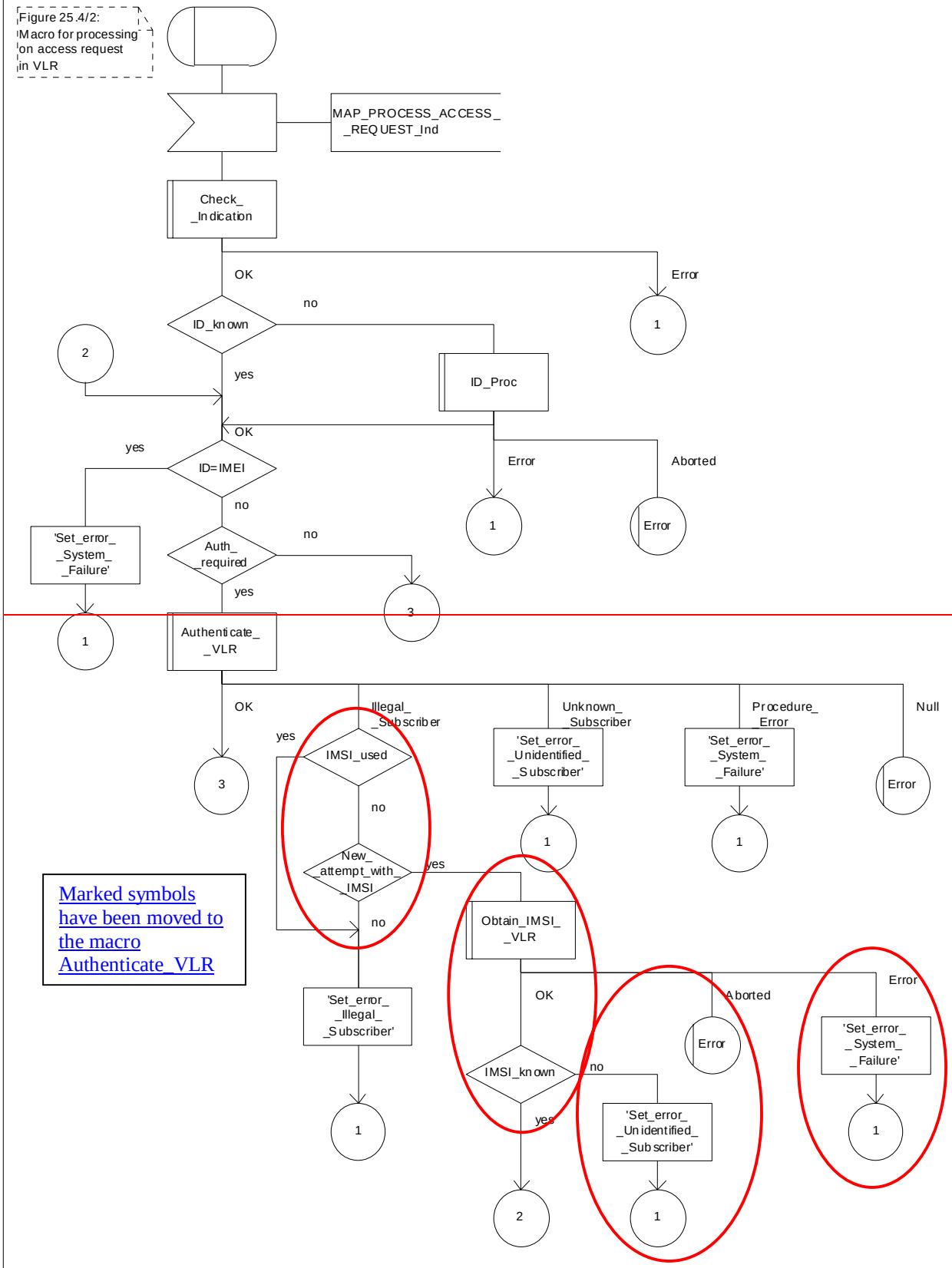
If the identity received from the MS is an IMSI, the error Unidentified Subscriber will be set and reported back to the calling macro (to be sent in the MAP_PROCESS_ACCESS_REQUEST response). The same error is used in case a TMSI was received from the MS, but the operator does not allow open identification of the MS.

If open identification of the MS is allowed, the macro Obtain_IMSI_VLR is invoked, requesting the subscribers IMSI from the MS (see clause 25.8), with outcome

- OK, in which case it is checked whether for the IMSI received there exists a subscriber record in the VLR. If so, the macro terminates successfully, else the error Unidentified Subscriber will be set and reported back to the calling macro.
- Error, in which case the error System Failure will be set and reported back to the calling macro.
- Aborted, i.e. the MSC transaction is released, in which the macro terminates accordingly.

Macrodefinition Process_Access_Request_VLR 25.4_2.1(3)

Figure 25.4/2:
Macro for processing
on access request
in VLR



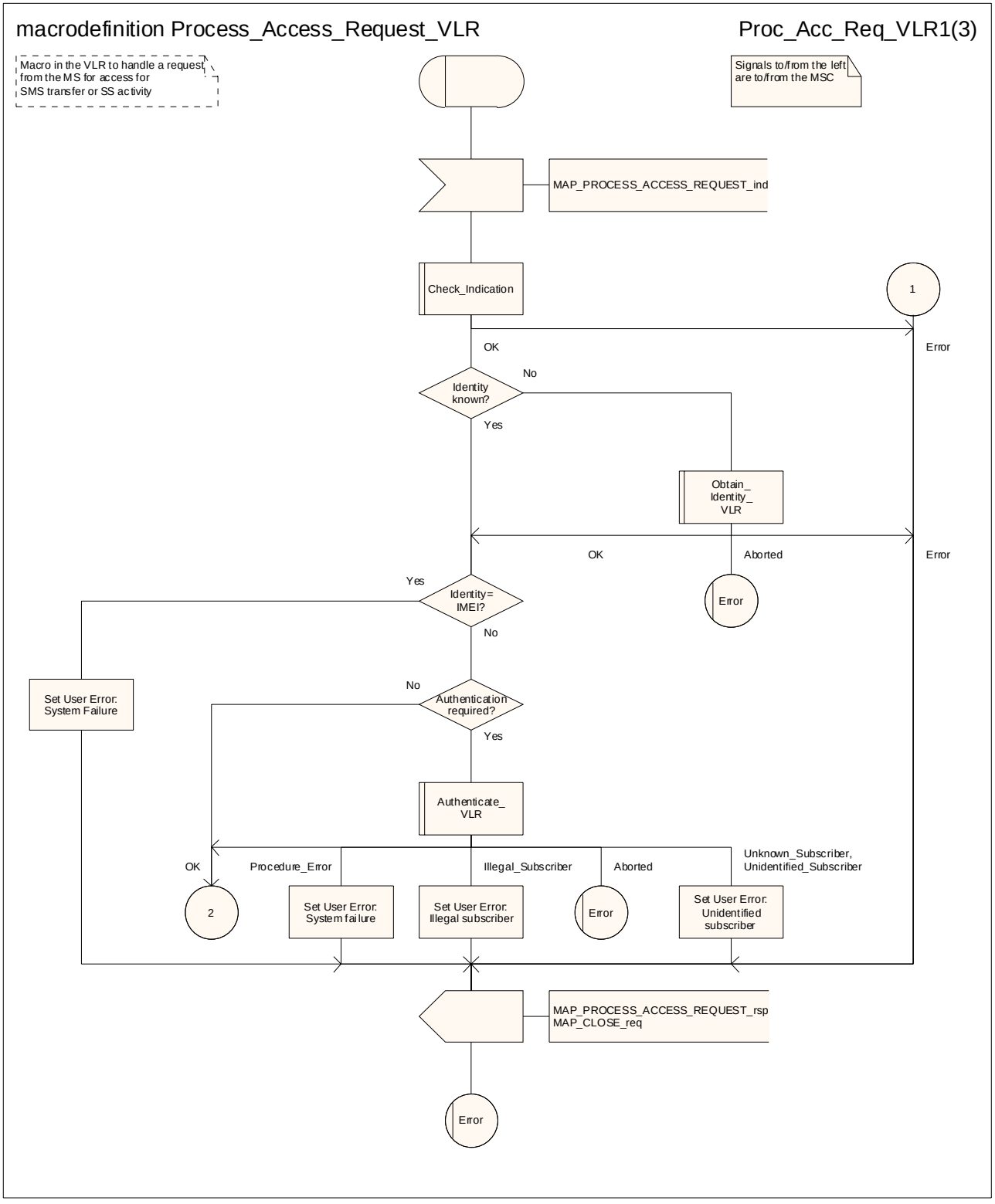
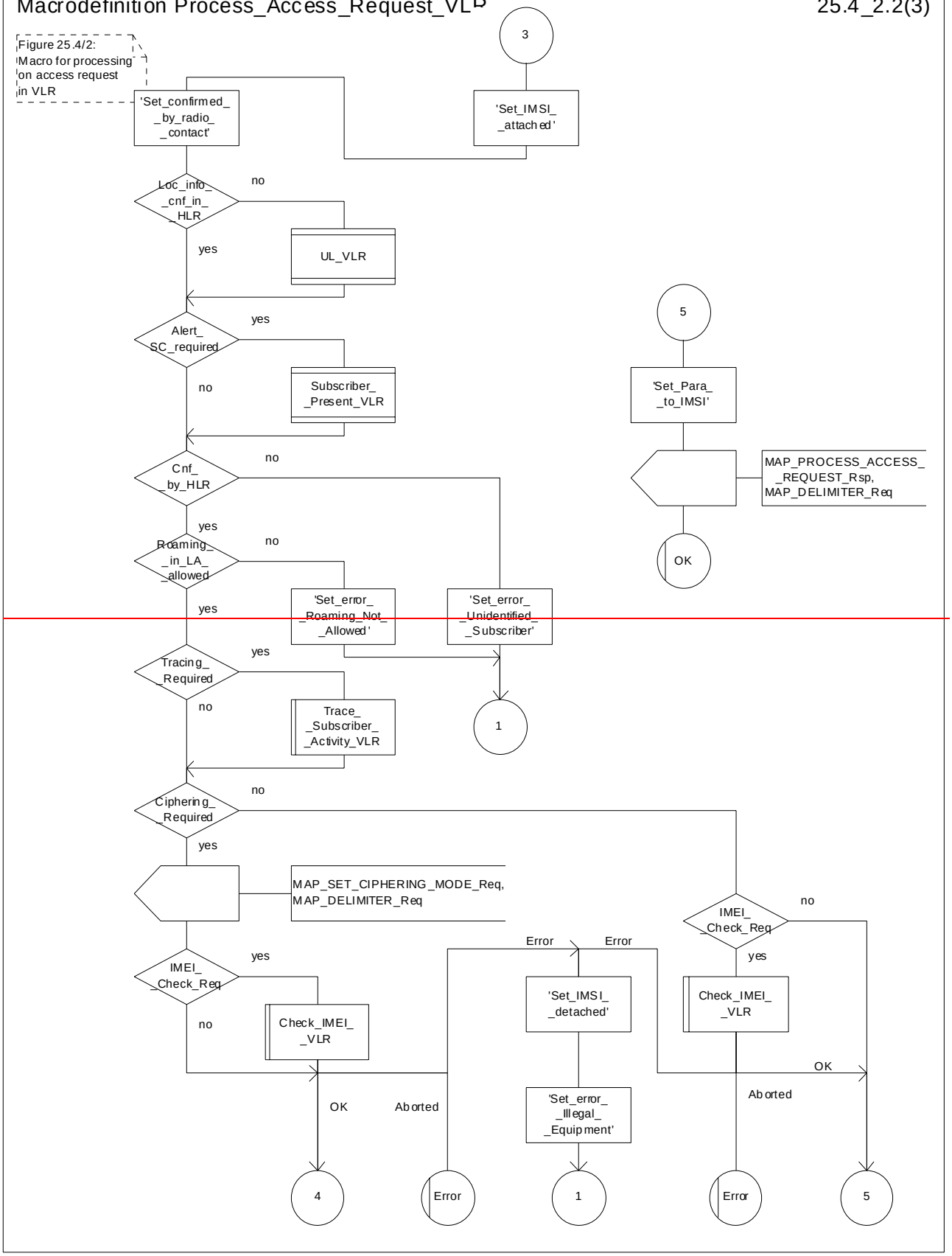


Figure 25.4/2 (sheet 1 of 3): Macro Process_Access_Request_VLR

Macrodefinition Process_Access_Request_VLR 25.4_2.2(3)

Figure 25.4/2:
Macro for processing on access request in VLR



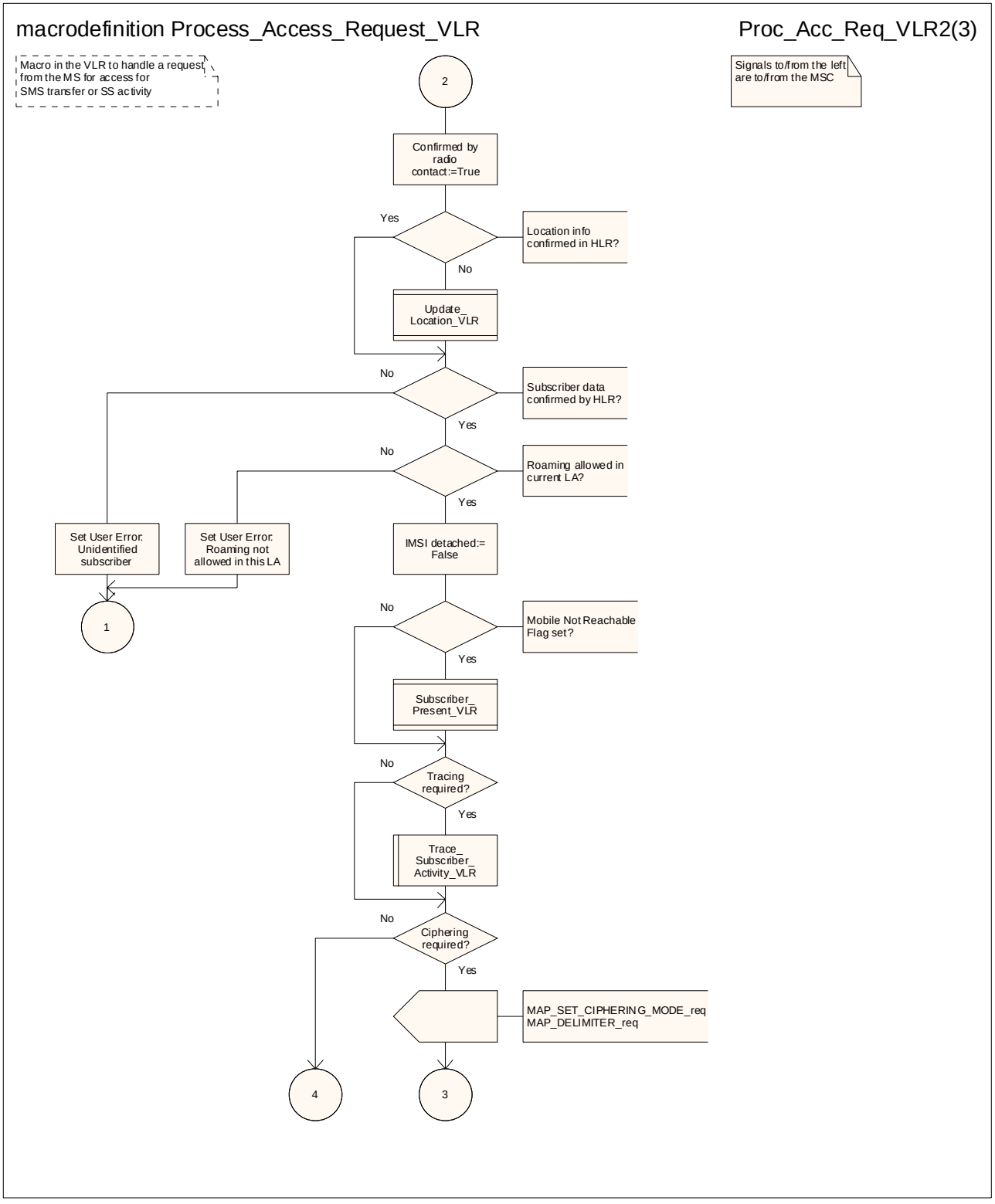
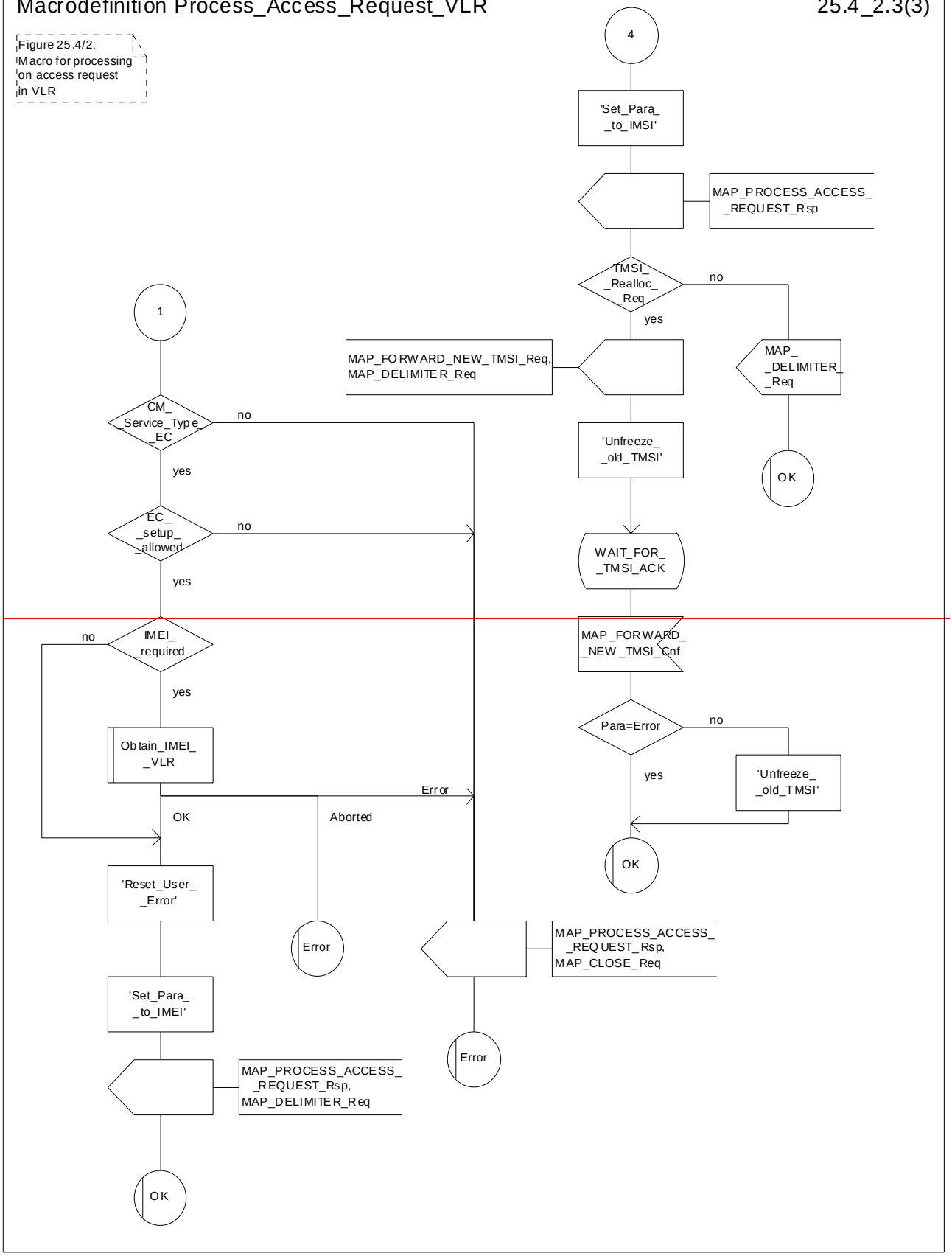


Figure 25.4/2 (sheet 2 of 3): Macro Process_Access_Request_VLR

Macrodefinition Process_Access_Request_VLR 25.4_2.3(3)

Figure 25.4/2:
Macro for processing
on access request
in VLR



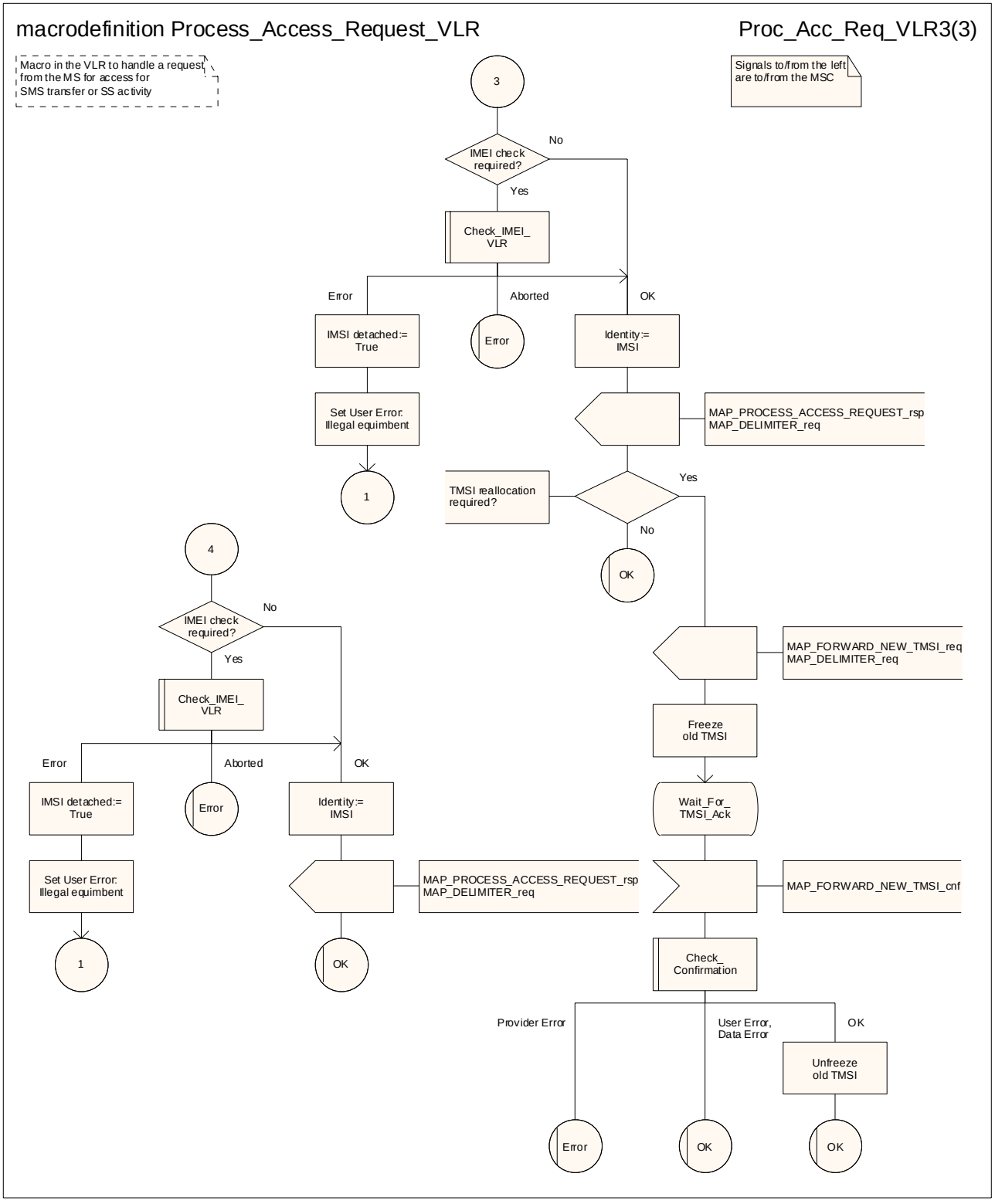
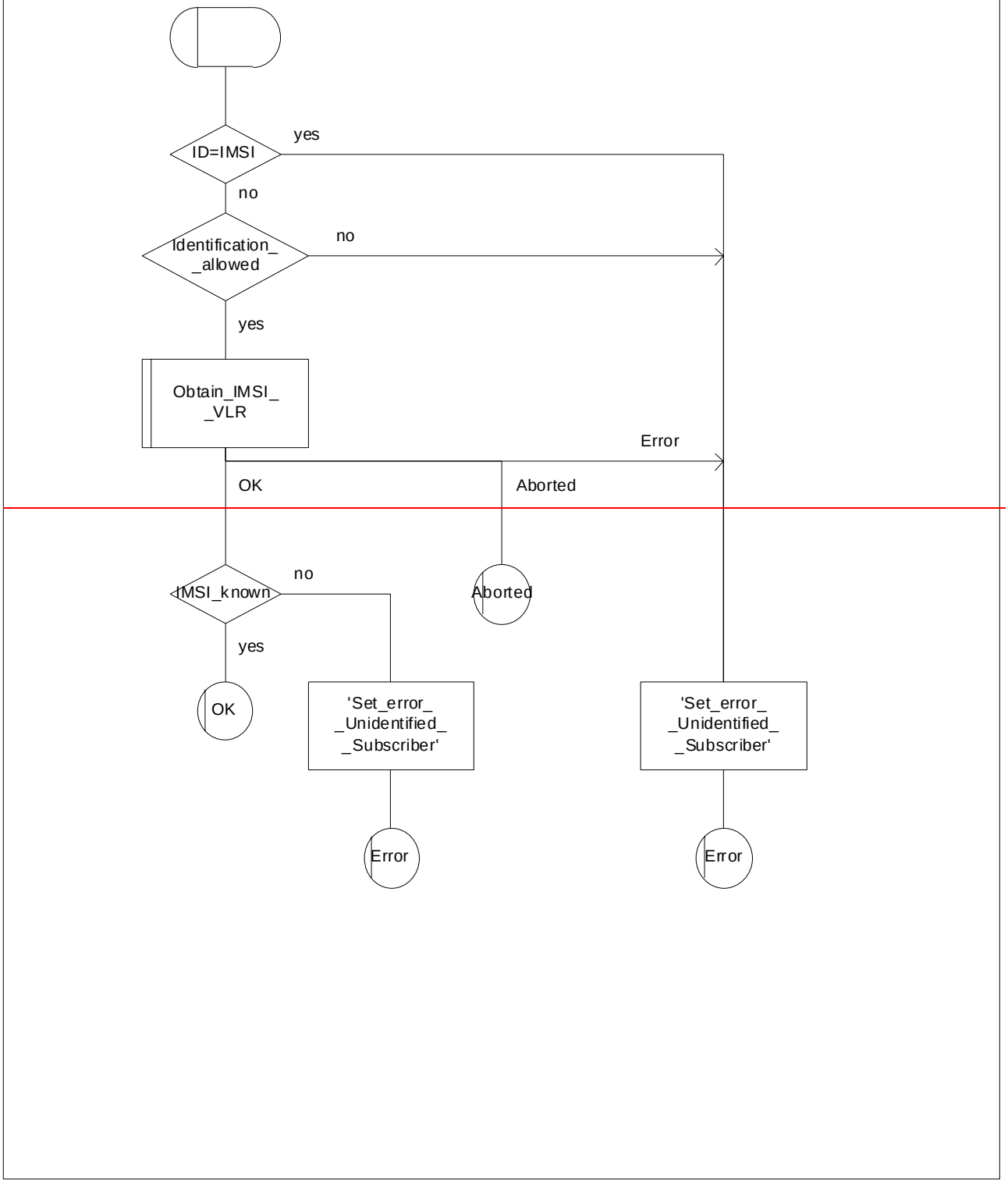


Figure 25.4/2 (sheet 3 of 3): Macro Process_Access_Request_VLR

Macrodefinition ID_Proc_VLR 25.4_3(1)

Figure 25.4/3



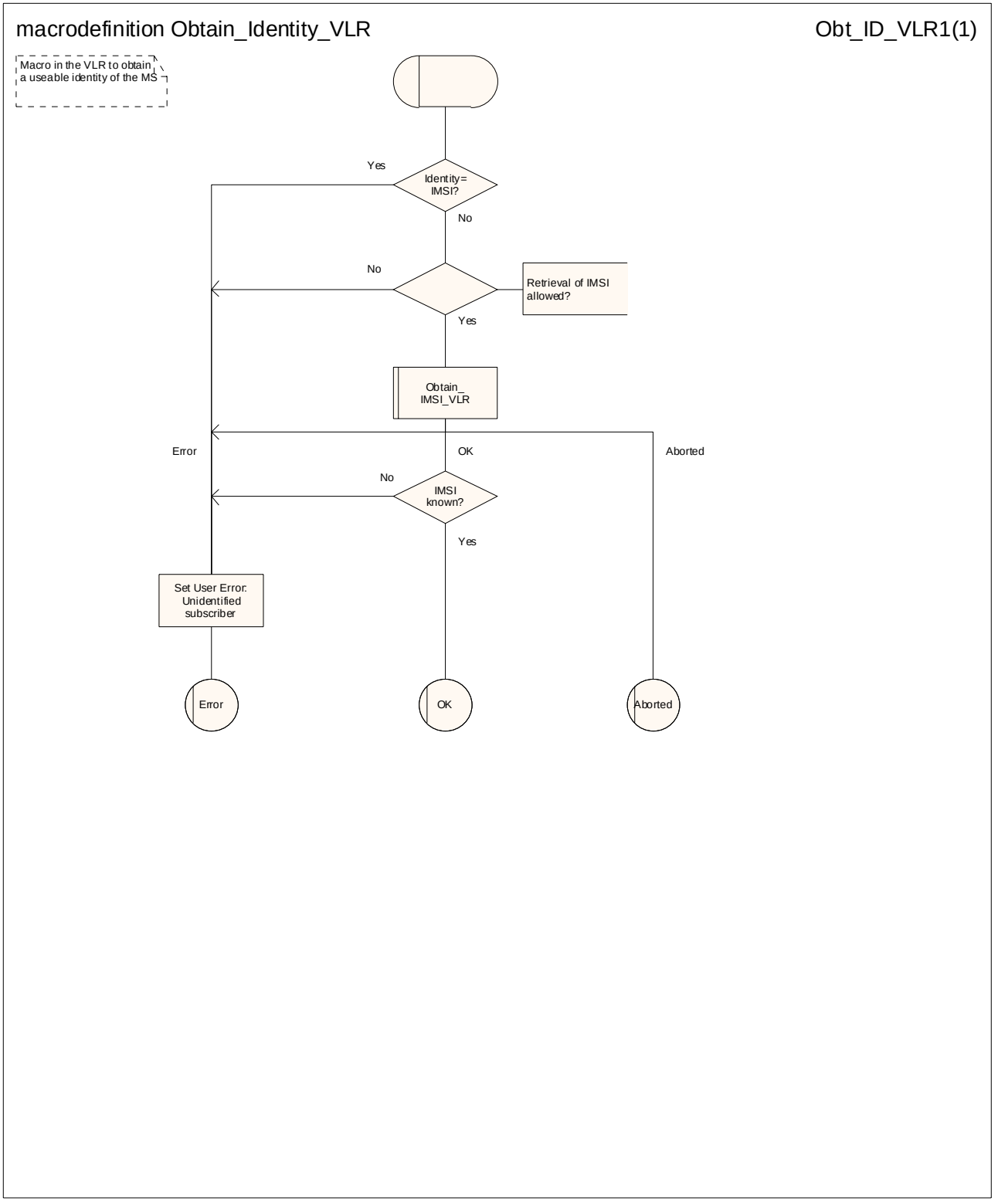


Figure 25.4/3: Macro ~~ID_Proc~~Obtain_Identity_VLR

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

***** CR editor's note: The handling for a repeat attempt at authentication if an MS has identified itself with a TMSI and the authentication fails has been moved from the macro Process_Access_Request_VLR to the macro Authenticate_VLR. This is a modelling change; the functional behaviour is the same. *****

This macro is used by the VLR to control the authentication of a subscriber. ~~The macro proceeds as follows:~~

Sheet 1: The test "Received SRES=Expected SRES" indicates:

- a comparison of the Signed RESult received from the MS with the Signed RESult received from the HLR, if GSM authentication is used (see 3GPP TS 43.020 [24]), or
- a comparison of the RESult received from the MS with the expected RESult received from the HLR, if UMTS authentication is used (see 3GPP TS 33.102).

~~- if there are not enough authentication vectors in the VLR to perform the authentication, then the macro "Obtain_Authent_Para_VLR" described below is invoked. If this macro fails, then the corresponding error (Unknown Subscriber or Procedure Error) is returned to the calling process;~~

~~- if there are enough authentication vectors in the VLR, or the Obtain_Authent_Para_VLR macro was successful, then a MAP_AUTHENTICATE request is sent to the MSC. This request contains the RAND, CKSN or KSI, and possibly AUTN parameters as indicated in the service description;~~

~~- the VLR then waits for a response from the MSC;~~

~~- if a MAP_U_ABORT, MAP_P_ABORT or MAP_CLOSE indication is received from the MSC in this wait state, the VLR checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;~~

~~- if a MAP_NOTICE indication is received from the MSC in this wait state, the VLR closes the dialogue with the MSC, then checks whether authentication sets are available. If no sets are available the process Obtain_Authent_Sets_VLR is invoked to fetch authentication sets from the HLR. The "Null" exit is then used;~~

~~- if a MAP_AUTHENTICATE confirmation is received by the VLR, it checks whether the received Signed Result (SRES) is identical to the stored one (see 3GPP TS 43.020 [24]), or whether the received RES is identical to the stored XRES. If this is not the case, the "Illegal Subscriber" exit is used. If the SRES values or RES and XRES are identical, then the "OK" exit is used;~~

~~- before exit, the VLR may fetch a new set of triplets from the HLR. This is done by initiating a separate Obtain_Authent_Sets_VLR process described below.~~

~~The macro is described in figure 25.5/2.~~

~~25.5.3 Process Obtain_Authentication_Sets_VLR~~

~~This process is initiated by the VLR to fetch authentication vectors from a subscriber's HLR in a stand-alone, independent manner. The Obtain_Authent_Para_VLR macro described below is simply called; the process is described in figure 25.5/3.~~

25.5.34 Macro Obtain_Authent_Params_VLR

This macro is used by the VLR to request authentication vectors from the HLR. The macro proceeds as follows:

- a connection is opened, and a MAP_SEND_AUTHENTICATION_INFO request sent to the HLR;
- if the HLR indicates that a MAP version 1 or 2 dialogue is to be used, the VLR performs the equivalent MAP version 1 or 2 dialogue, which can return a positive result containing authentication sets, an empty positive result, or an error;
- if the dialogue opening fails, the "Procedure Error" exit is used. Otherwise, the VLR waits for the response from the HLR;
- if a MAP_SEND_AUTHENTICATION_INFO confirmation is received from the HLR, the VLR checks the received data.

Sheet 1, sheet 2, sheet 3: It is an operator option whether to allow the re-use of old authentication triplets.

Sheet 2, sheet 3: Old UMTS quintuplets shall not be re-used.

Sheet 2: if the VLR requests more authentication vectors in the same dialogue, the subsequent MAP_SEND_AUTHENTIFICATION_INFO request has no parameters.

One of the following positive responses may be received from a MAP version 1 or MAP version 2 dialogue with the HLR:

- Authentication triplets, in which case the outcome is successful;
- Empty response, in which case the VLR may re-use old triplets, if allowed by the PLMN operator.

If the VLR cannot re-use old triplets (or no such triplets are available) then the "Procedure Error" exit is used.

If the outcome was successful or re-use of old parameters in the VLR is allowed, then the "OK" exit is used.

If an "Unknown Subscriber" error is returned by the MAP version 1 or 2 dialogue, then the "Unknown Subscriber" exit is used.

In a MAP version 3 dialogue a (possibly empty) set of authentication vectors may be received, transferred by means of the TC-RESULT-L service, from the HLR followed by a MAP_CLOSE_Indication or by a MAP_DELIMITER_Indication. If a MAP_DELIMITER_Indication is received, the VLR may request additional authentication vectors from the HLR by sending a new MAP_SEND_AUTHENTIFICATION_INFO_Request with no parameter part. If a MAP_CLOSE_Indication is received, and authentication vectors have been received during the dialogue, then the "OK" exit is used. If no authentication vectors have been received during the dialogue, the VLR checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

If in a MAP version 3 dialogue an "Unknown Subscriber" error is received, then the "Unknown Subscriber" exit is used. If other errors are received, the VLR checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

- if a MAP_U_ABORT, MAP_P_ABORT, MAP_NOTICE or unexpected MAP_CLOSE service indication is received from the MSC, then open connections are terminated, and the macro takes the "Null" exit;
- if a MAP_U_ABORT, MAP_P_ABORT or unexpected MAP_CLOSE service indication is received from the HLR, then the VLR checks whether old authentication parameters (GSM triplets) can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit; note that re-use of old UMTS Quintuplets is not allowed;
- if a MAP_NOTICE service indication is received from the HLR, then the dialogue with the HLR is closed. The VLR then checks whether old authentication parameters (GSM triplets) can be re-used. If old parameters cannot be re-used the macro takes the "Procedure Error" exit; otherwise it takes the "OK" exit; note that re-use of old UMTS Quintuplets is not allowed.

The macro is described in figure 25.5/4.

25.5.4 Process Obtain_Authent_Sets_VLR

This process is initiated by the VLR to fetch authentication vectors from a subscriber's HLR independently of any other processing.

25.5.5 Process Obtain_Authent_Sets_SGSN

***** CR editor's note: this (reduced!) text has been moved from its position after the SDL diagram for the procedure Check_Available_Vectors *****

The procedure for authentication when the serving node is an SGSN is described in 3GPP TS 23.060 [104] and 3GPP TS 24.008 [35].

This process is used by the SGSN to request authentication vectors from the HLR.

Sheet 1, sheet 2: It is an operator option whether to allow the re-use of old authentication triplets.

Sheet 2: Old UMTS quintuplets shall not be re-used.

25.5.65 Process Obtain_Authent_Sets_HLR

This process is used to provide authentication vectors (triplets or quintuplets) in response to a request from a VLR or an SGSN.

~~Opening of the dialogue is described in the macro Receive_Open_Ind in clause 25.1, with outcomes:~~

- ~~reversion to version one or two procedure;~~
- ~~procedure termination; or~~
- ~~dialogue acceptance, with proceeding as below.~~

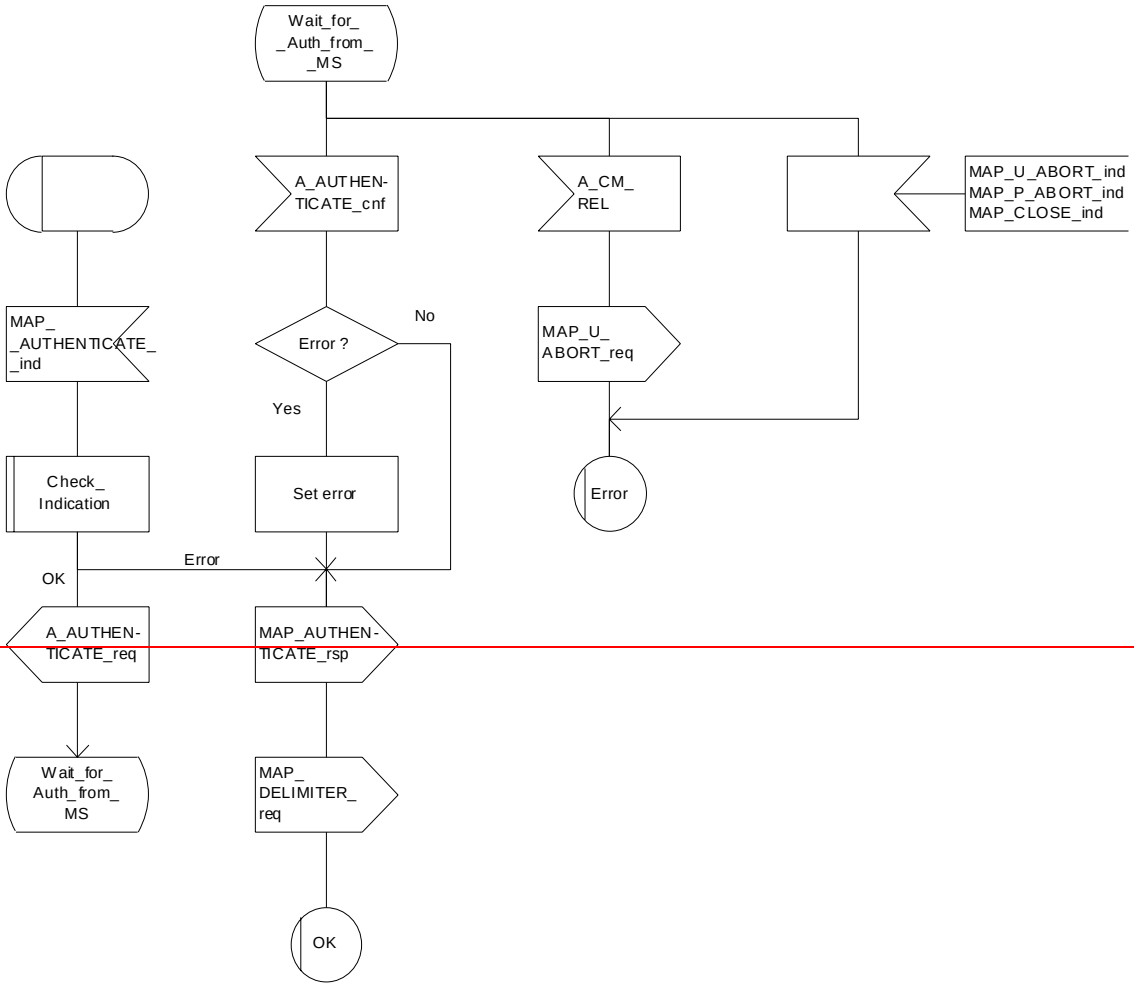
~~This process is used by the HLR to obtain authentication vectors from the AuC, upon request from the VLR or from the SGSN. The process acts as follows:~~

- ~~a MAP_SEND_AUTHENTICATION_INFO indication is received by the HLR;~~
- ~~the HLR checks the service indication for errors. If any, they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. If no errors are detected, authentication vectors are fetched from the AuC. Further details are found in 3GPP TS 43.020 [24];~~
- ~~If Network Access Mode is set to "non-GPRS only" and if the Requesting Node Type is present and indicates 'SGSN', the error Unknown Subscriber (with diagnostic value set to "Gprs Subscription Unknown") is returned in the response. The process terminates;~~
- ~~If Network Access Mode is set to "GPRS only" and if the Requesting Node Type is present and indicates 'VLR', the error Unknown Subscriber is returned in the response. The process terminates;~~
- ~~if errors are detected they are reported to the VLR or to the SGSN in the MAP_SEND_AUTHENTICATION_INFO response. Otherwise the authentication vectors are returned by means of the TC-RESULT-L service.~~
- ~~if segmentation of the response message is required and allowed, a MAP_SEND_AUTHENTICATION_INFO response transferred by means of the TC-RESULT-L service, containing at least one authentication vector, followed by a MAP_DELIMITER request is returned to the VLR or SGSN, the remaining authentication vectors are stored and the HLR waits for a new service indication from the VLR or SGSN.~~

~~The process is described in figure 25.5/5.~~

Macrodefinition Authenticate_MSC 25.5_1(1)

Figure 25.5/1: Authentication macro in the MSC, relaying authentication indication from the VLR to the MS, and relaying the confirmation from the MSC to the VLR



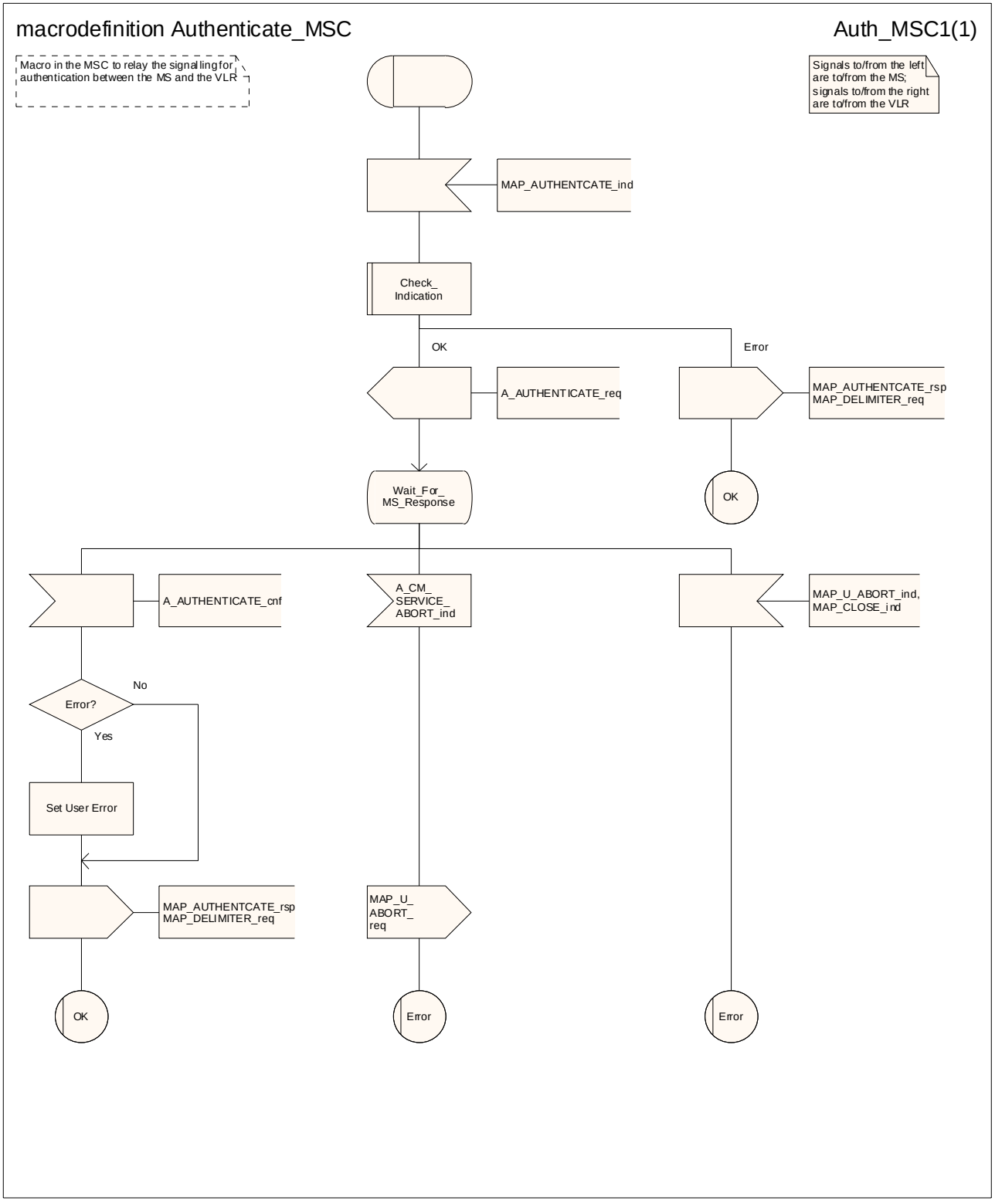
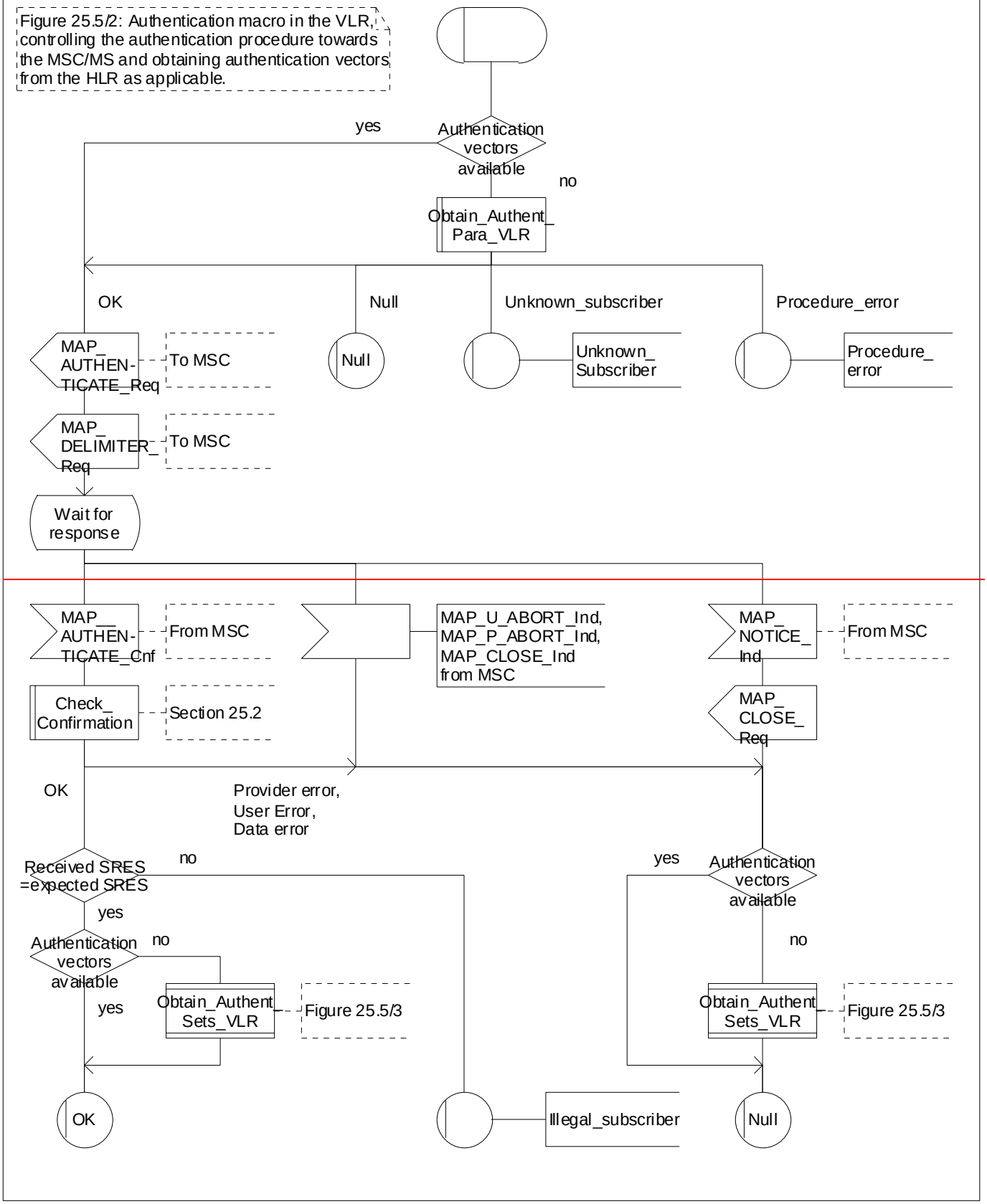


Figure 25.5/1: Macro Authenticate_MSC

Macrodefinition Authenticate_VLR 215_2(1)

Figure 25.5/2: Authentication macro in the VLR, controlling the authentication procedure towards the MSC/MS and obtaining authentication vectors from the HLR as applicable.



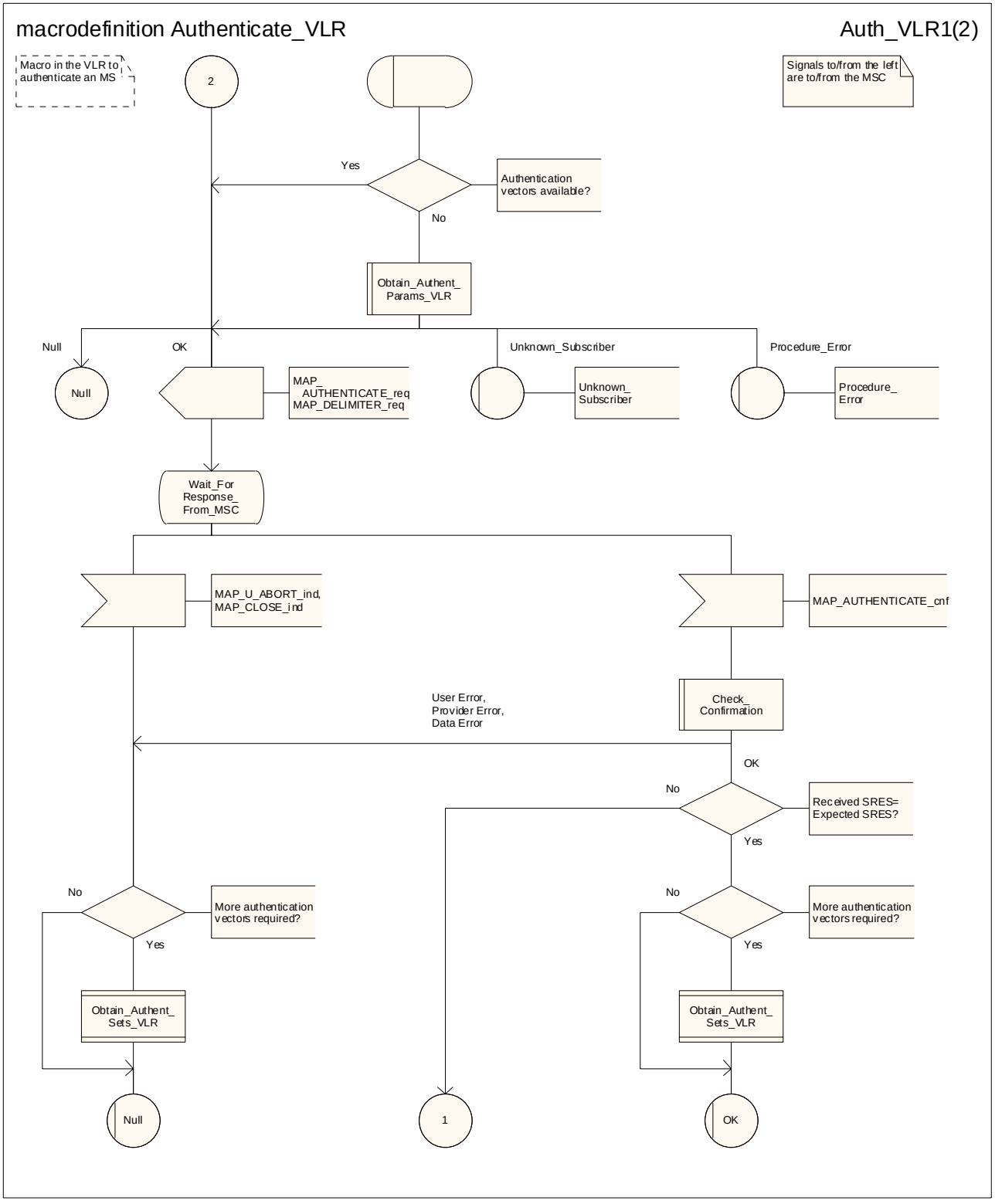


Figure 25.5/2 (sheet 1 of 2): Macro Authenticate_VLR

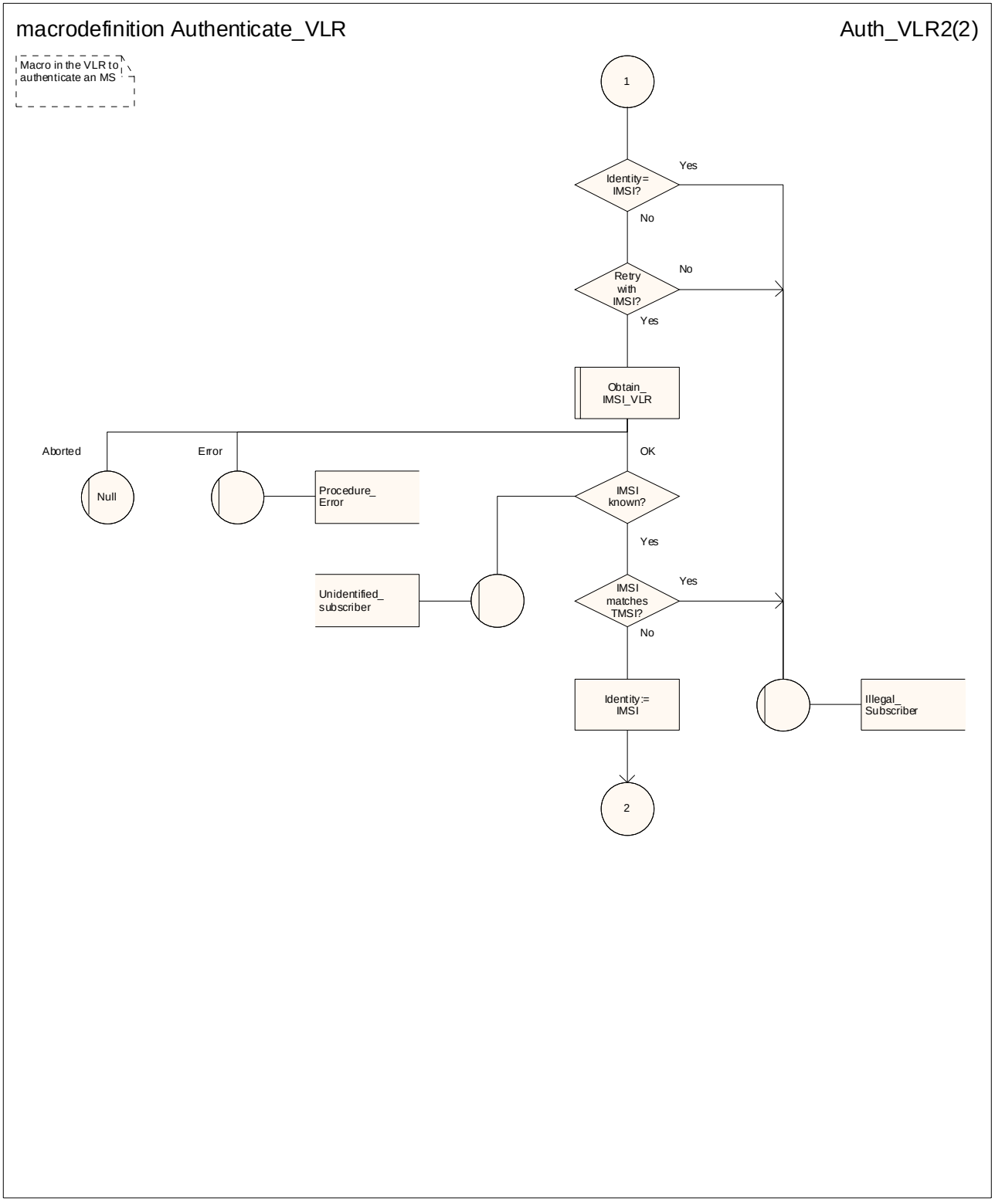
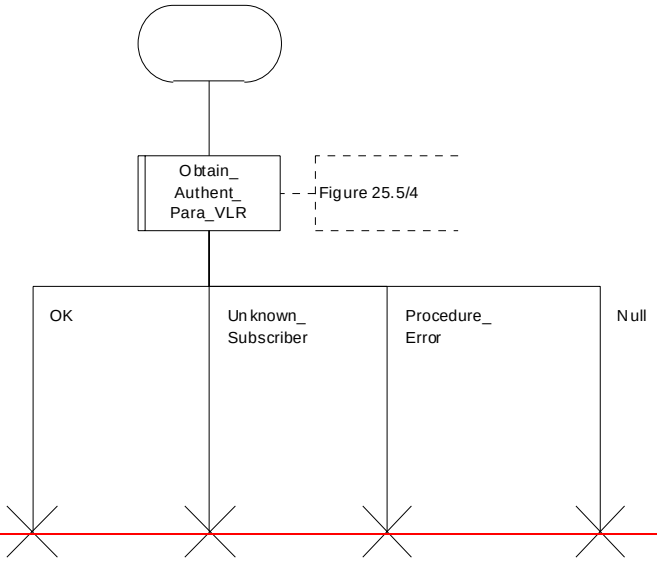


Figure 25.5/2 (sheet 2 of 2): Macro Authenticate_VLR

Process Obtain_Authent_Sets_VLR 25.5_3(1)

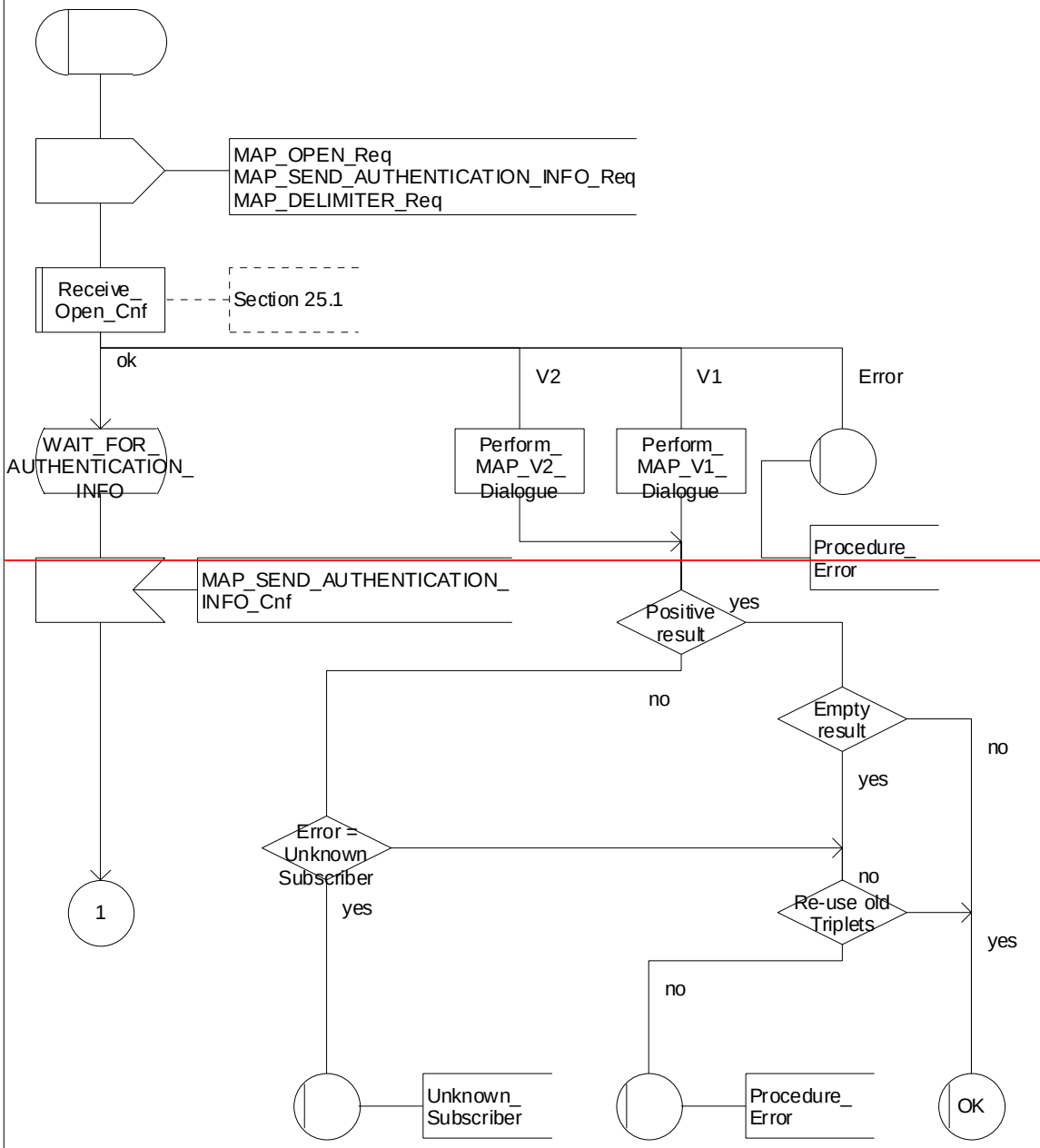
Figure 25.5/3: Process to obtain authentication sets from the HLR to the VLR



~~Figure 25.5/3: Process Obtain_Authentication_Sets_VLR~~

Macrodefinition OBTAIN_AUTHENT_PARA_VLR 1(3)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR



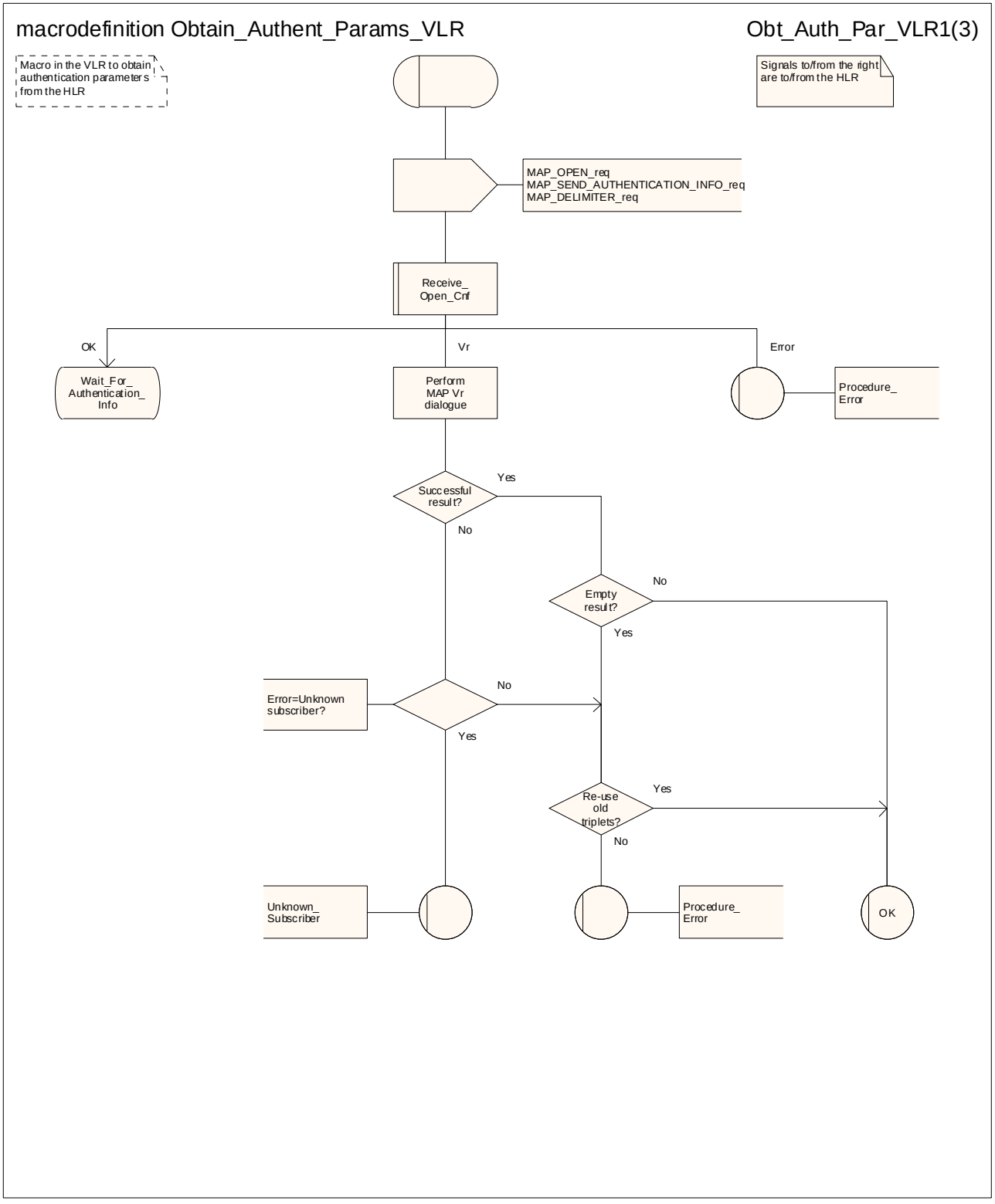
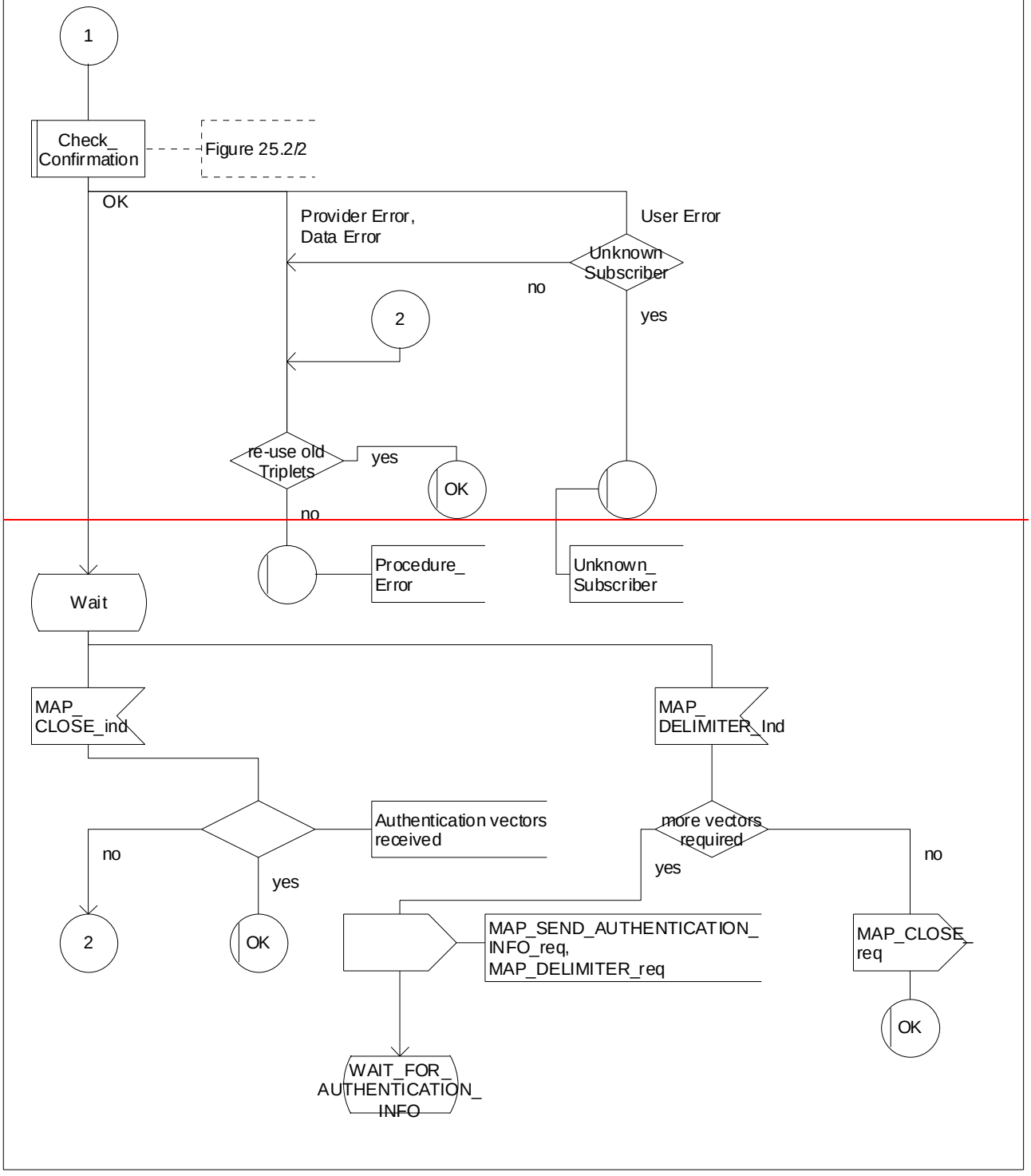


Figure 25.5/34 (sheet 1 of 3): Macro Obtain_Authent_Params_VLR

Macrodefinition OBTAIN_AUTHENT_PARA_VLR 2(3)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR



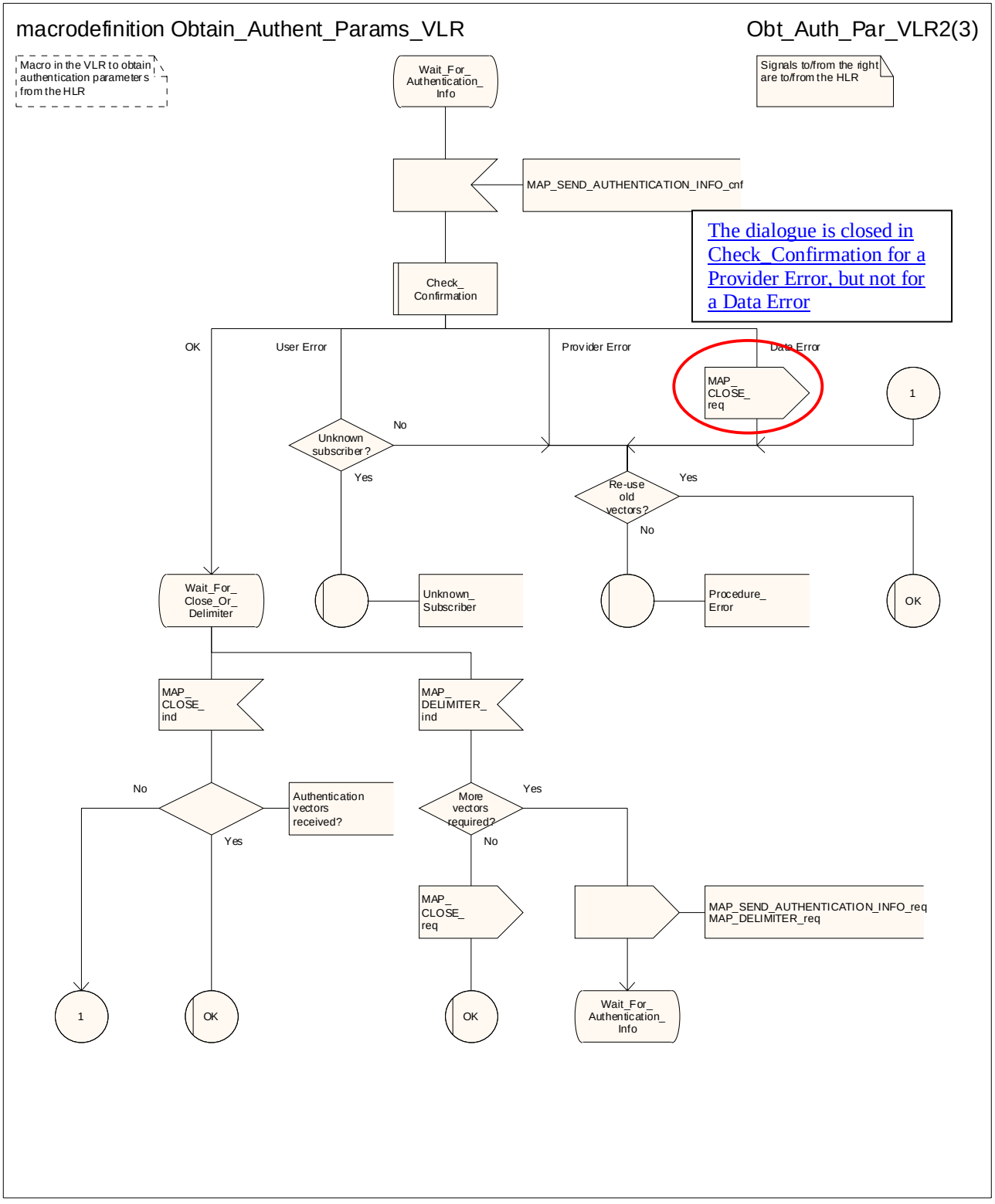
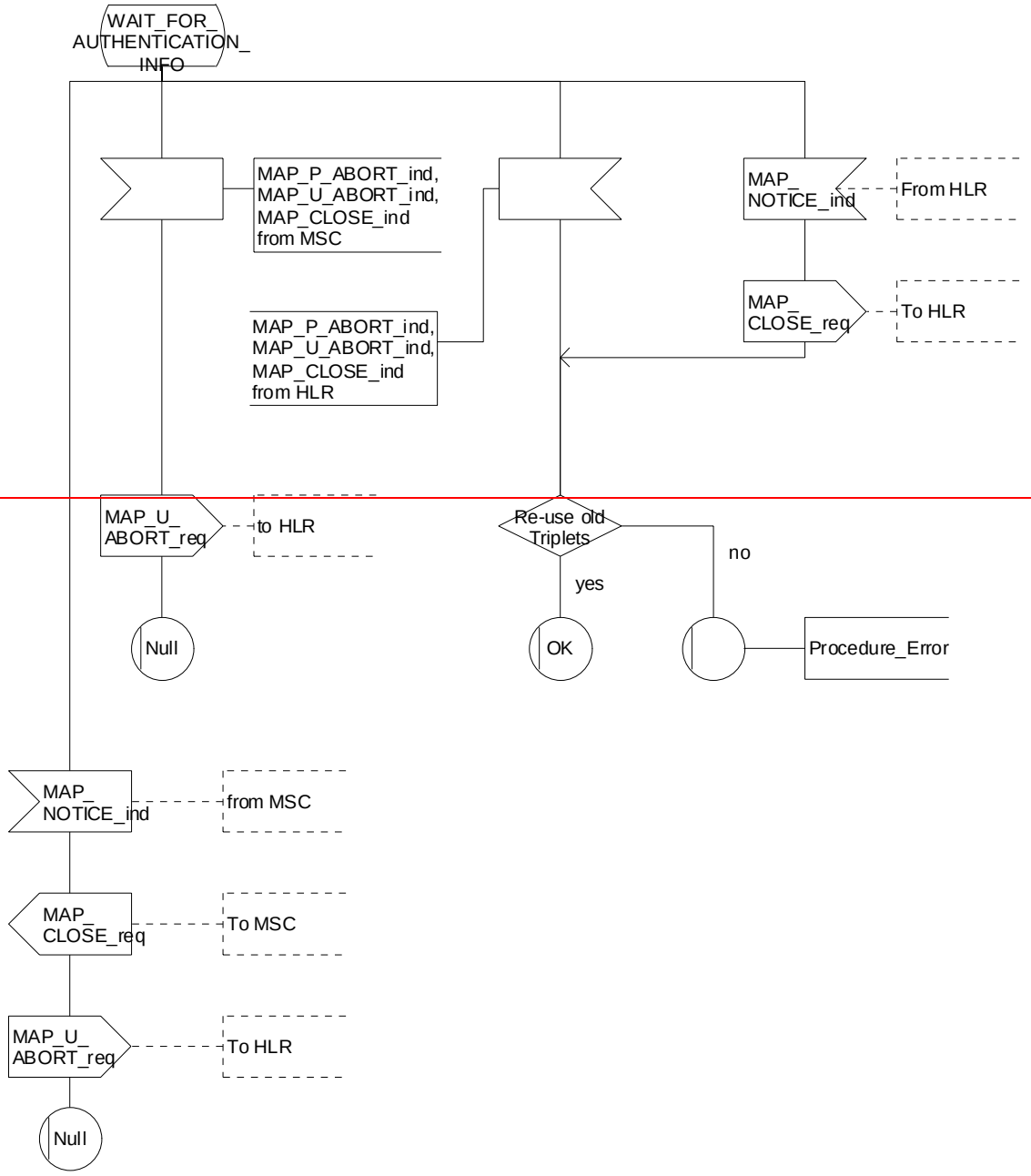


Figure 25.5/34 (sheet 2 of 3): Macro Obtain_Authent_Params_VLR

Macrodefinition OBTAIN_AUTHENT_PARA_VLR 3(3)

Figure 25.5/4: Macro to obtain authentication parameters from the HLR to the VLR



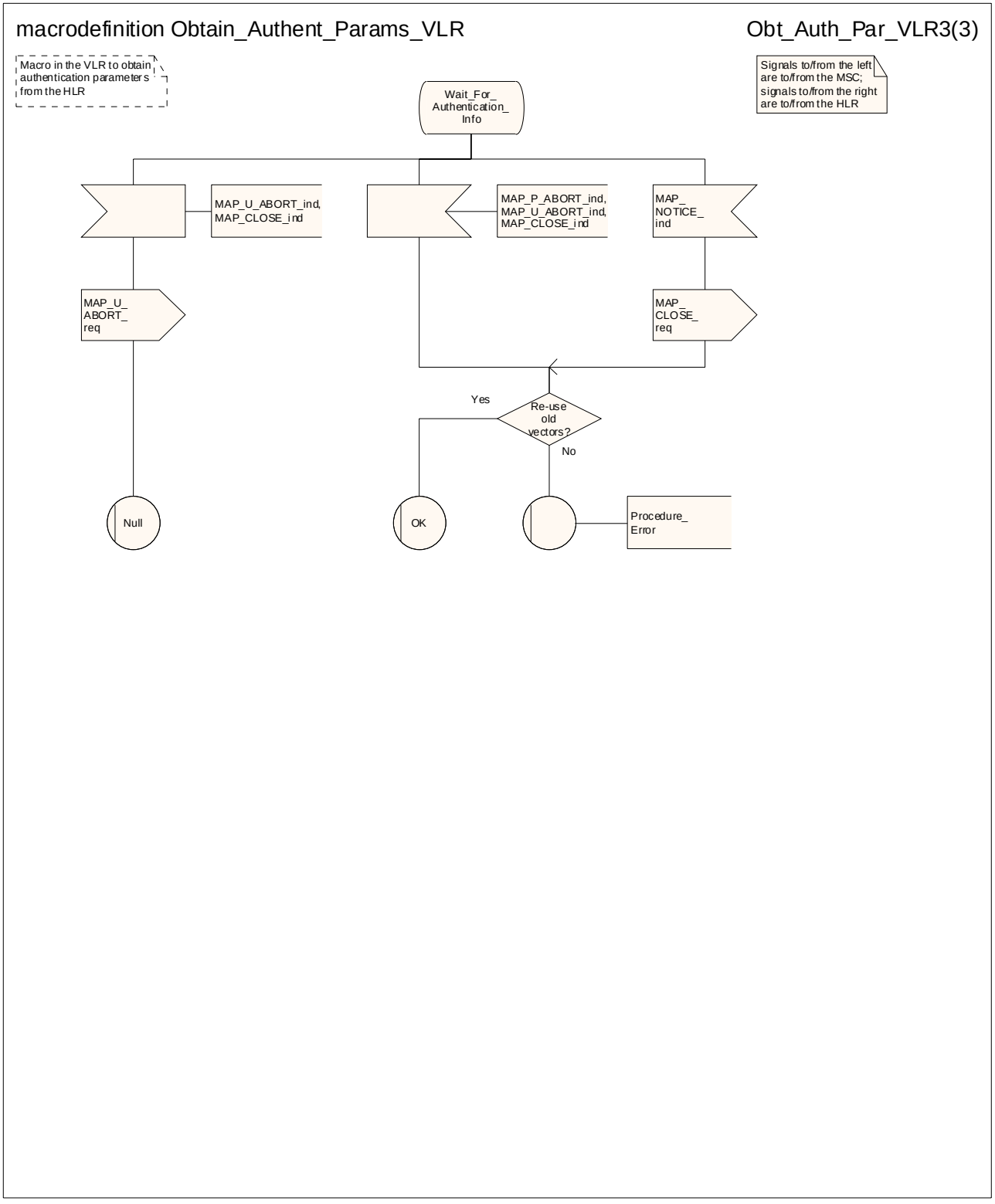


Figure 25.5/34 (sheet 3 of 3): Macro Obtain_Authent_Params_VLR

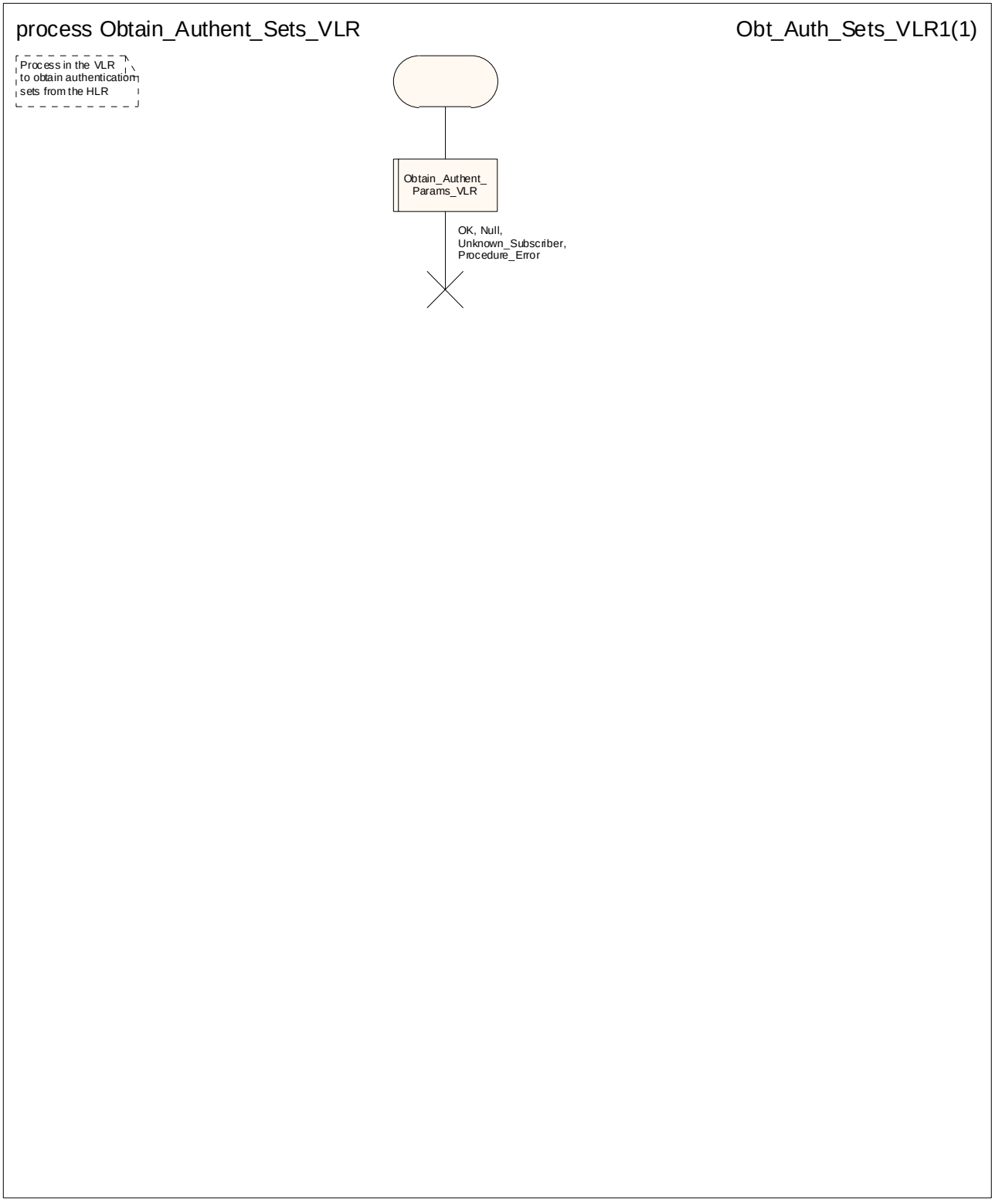


Figure 25.5/4: Process Obtain_Authent_Sets_VLR

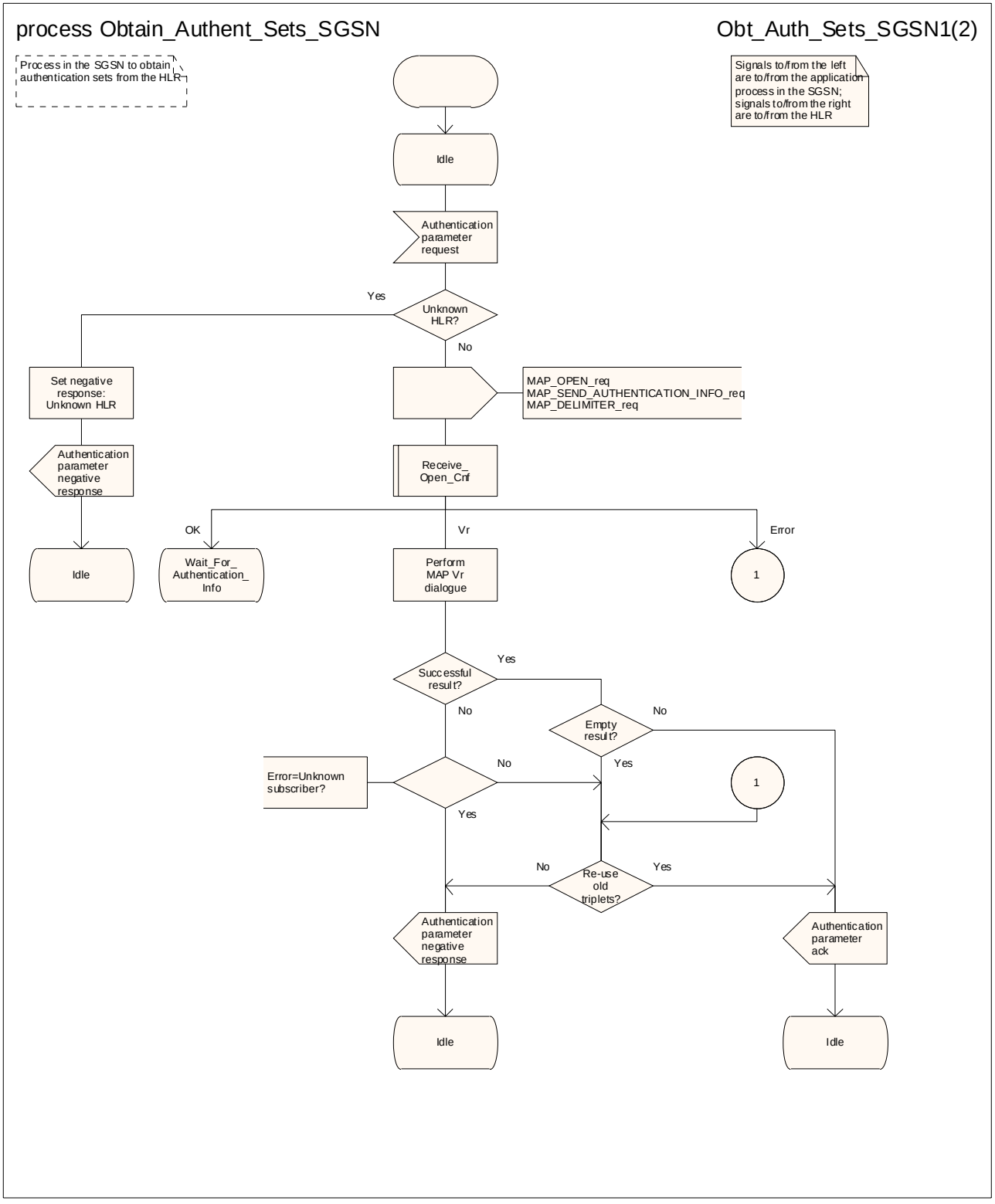


Figure 25.5/5 (sheet 1 of 2): Process Obtain_Authent_Sets_SGSN

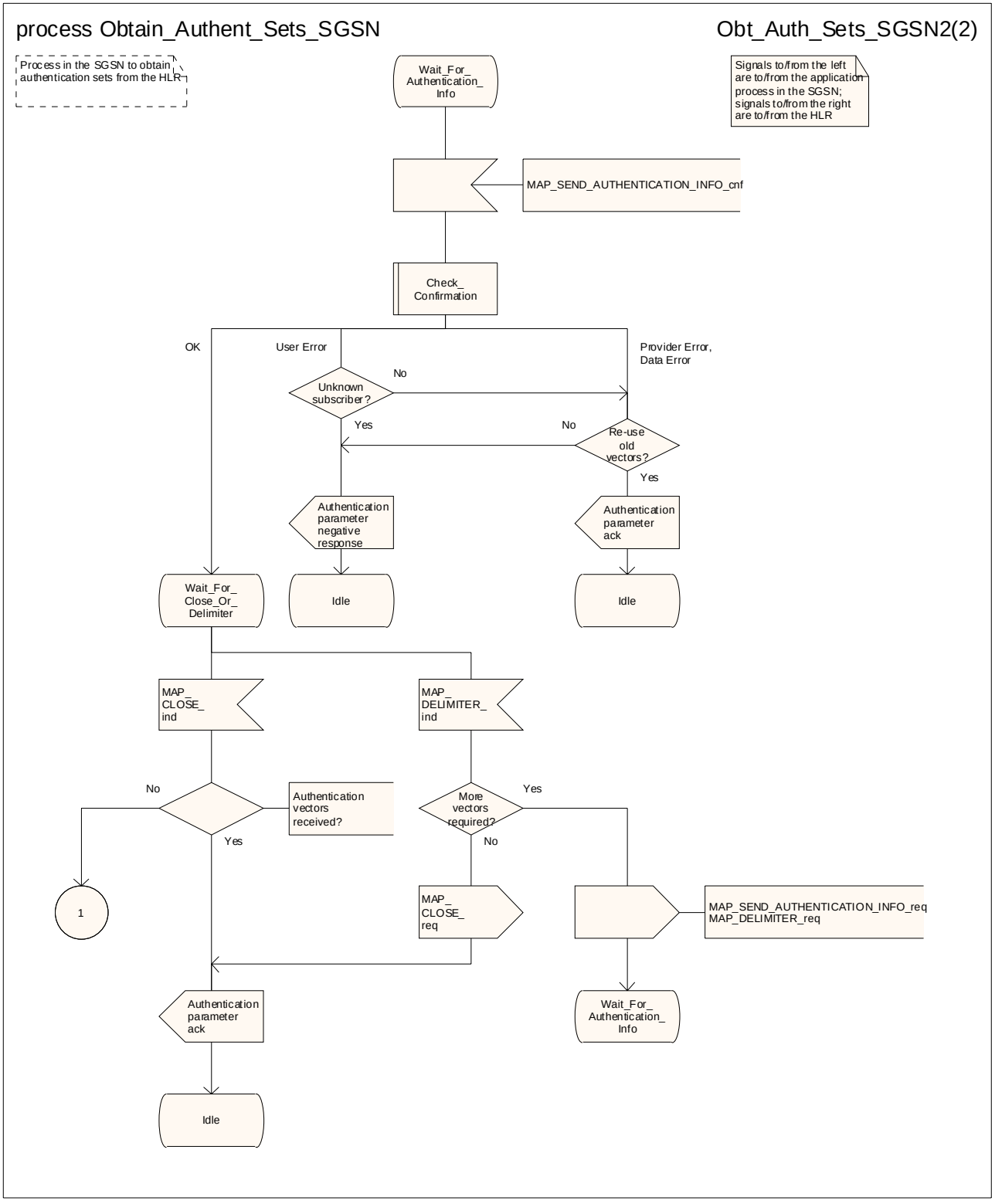
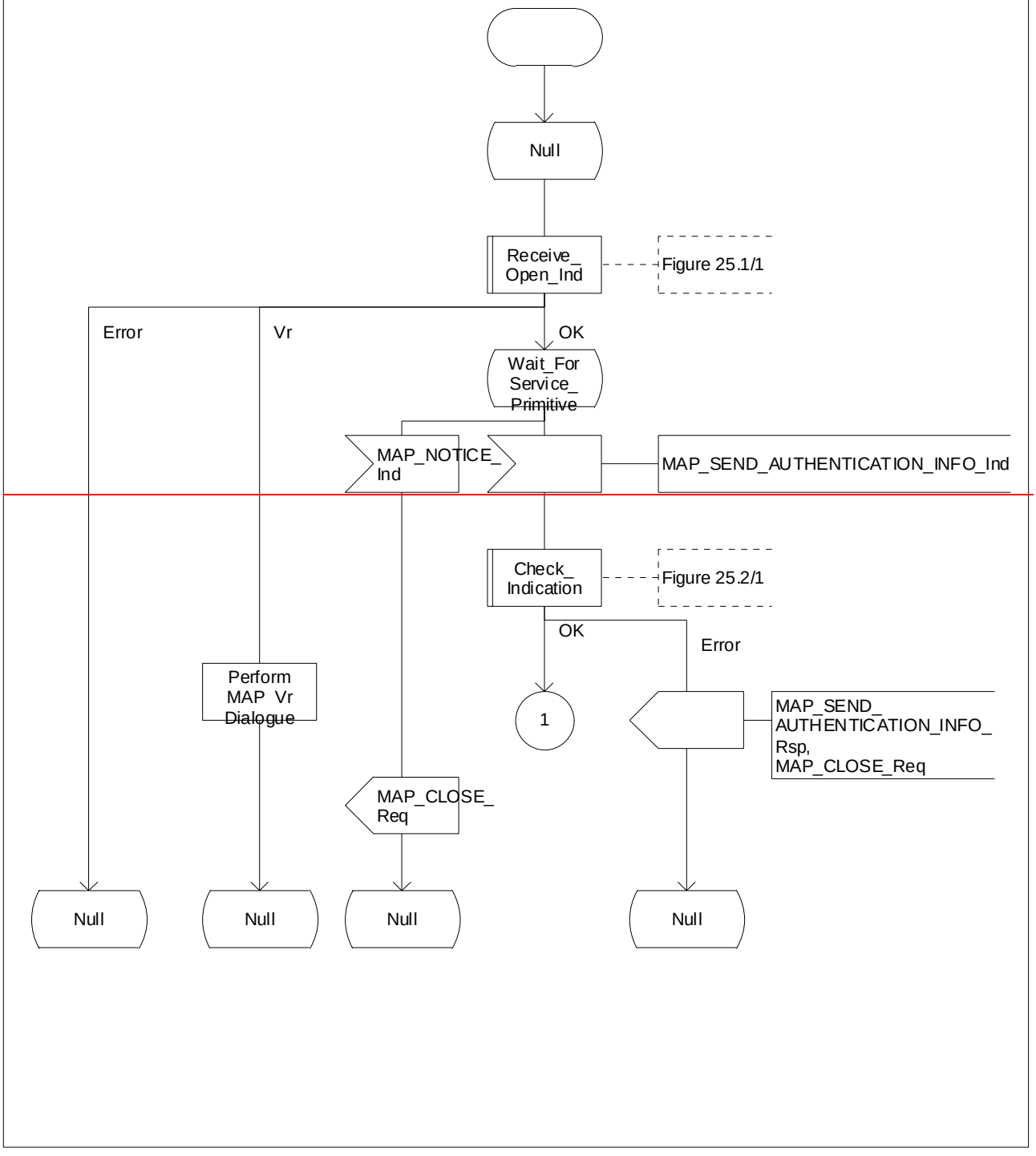


Figure 25.5/5 (sheet 2 of 2): Process Obtain_Authent_Sets_SGSN

Process Obtain_Auth_Sets_HLR 1(2)

Figure 25.5/5: Process in the HLR to obtain authentication sets from the AuC and relay them to the VLR



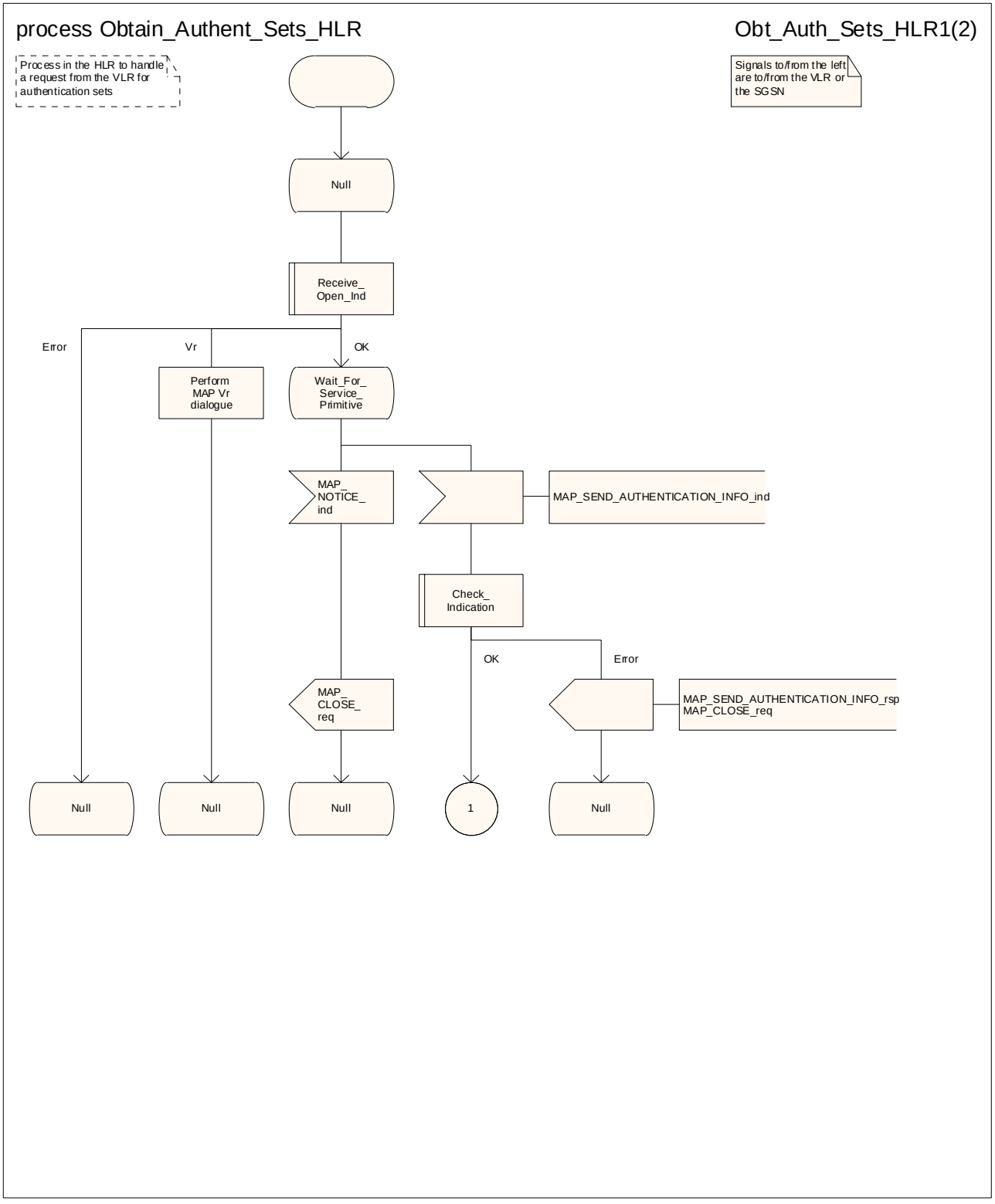
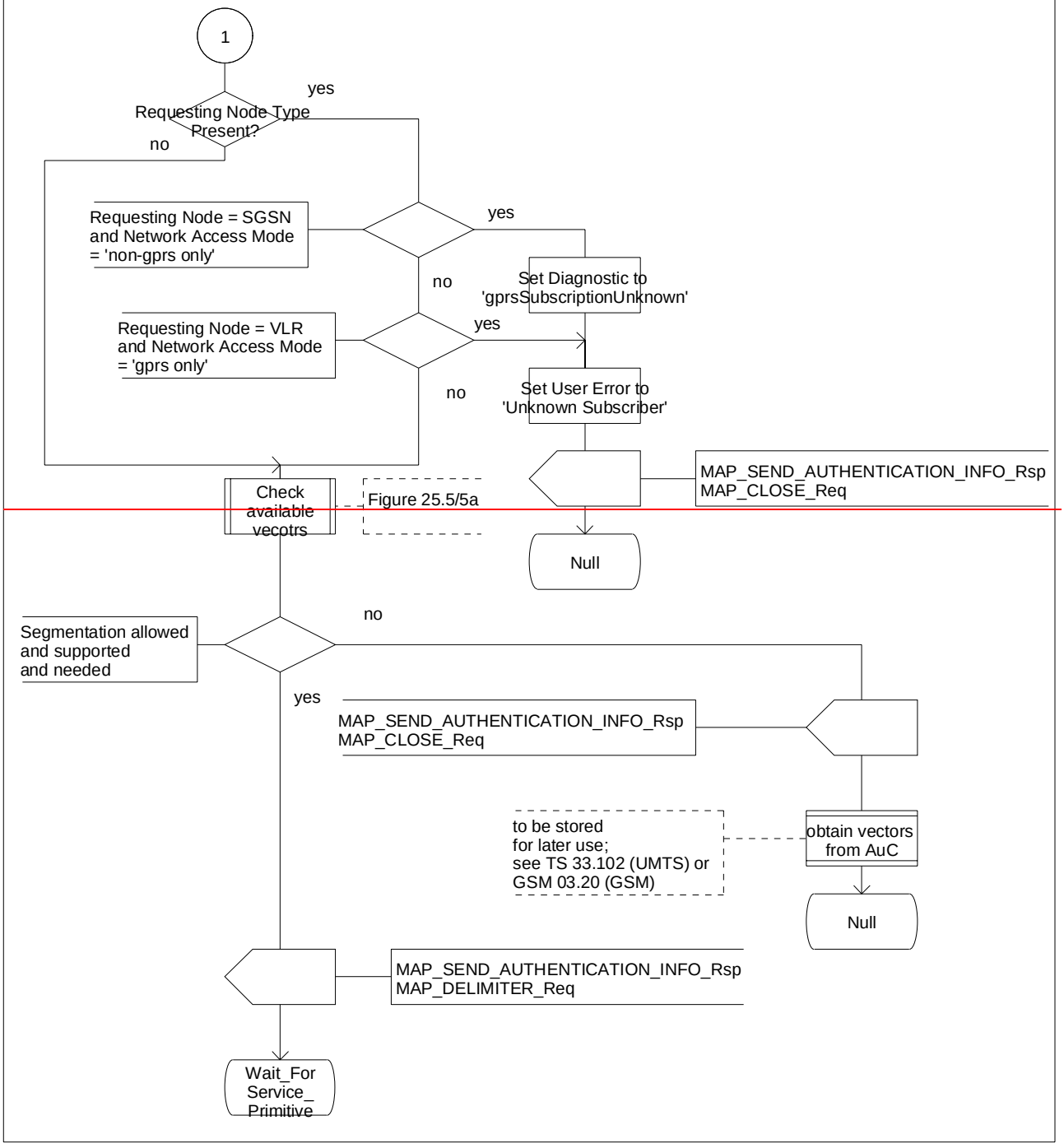


Figure 25.5/6~~5~~ (sheet 1 of 2): Process Obtain_Authent_Sets_HLR

process Obtain_Auth_Sets_HLR 2(2)

Figure 25.5/5: Process in the HLR to obtain authentication sets from the AuC and relay them to the VLR



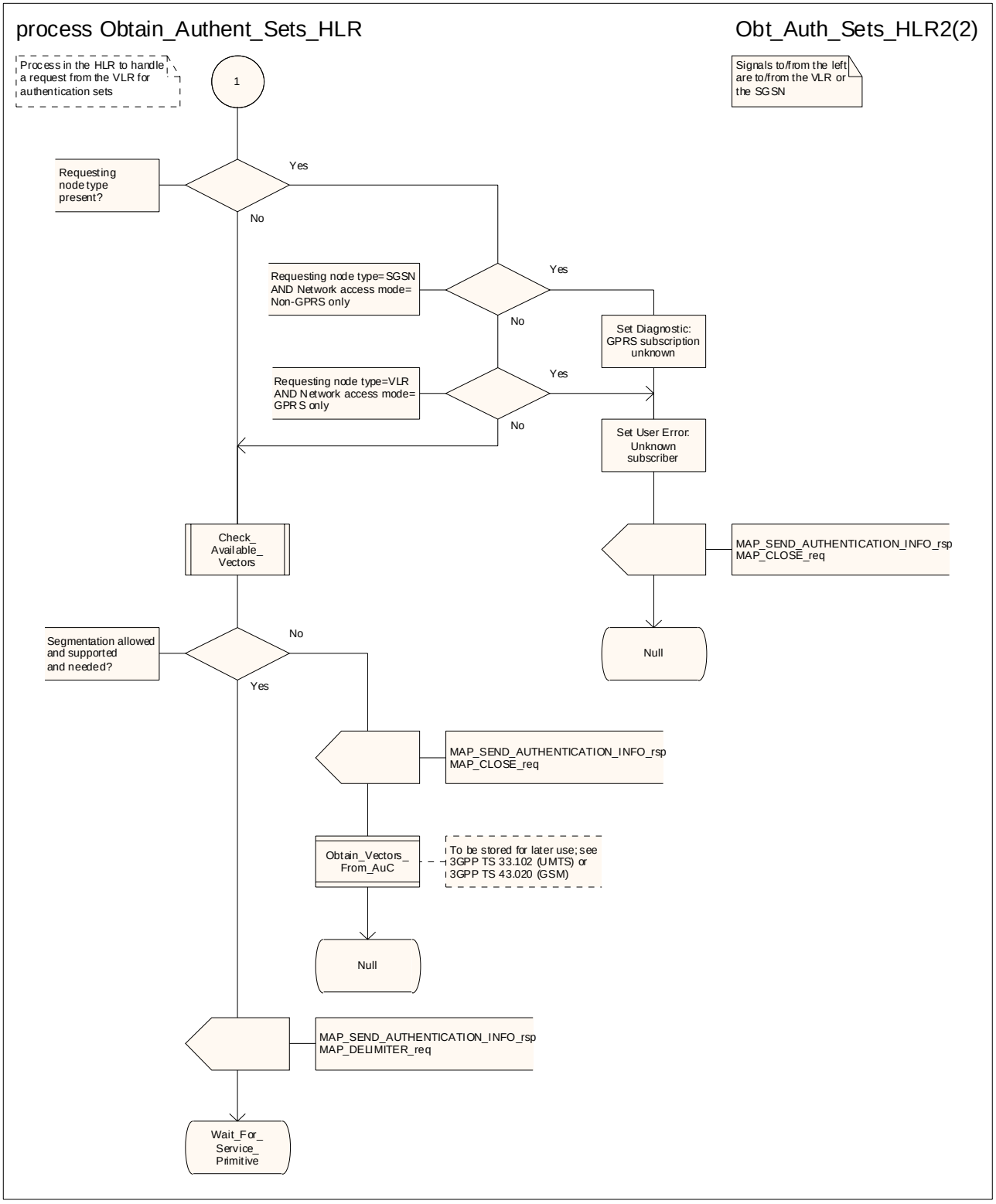
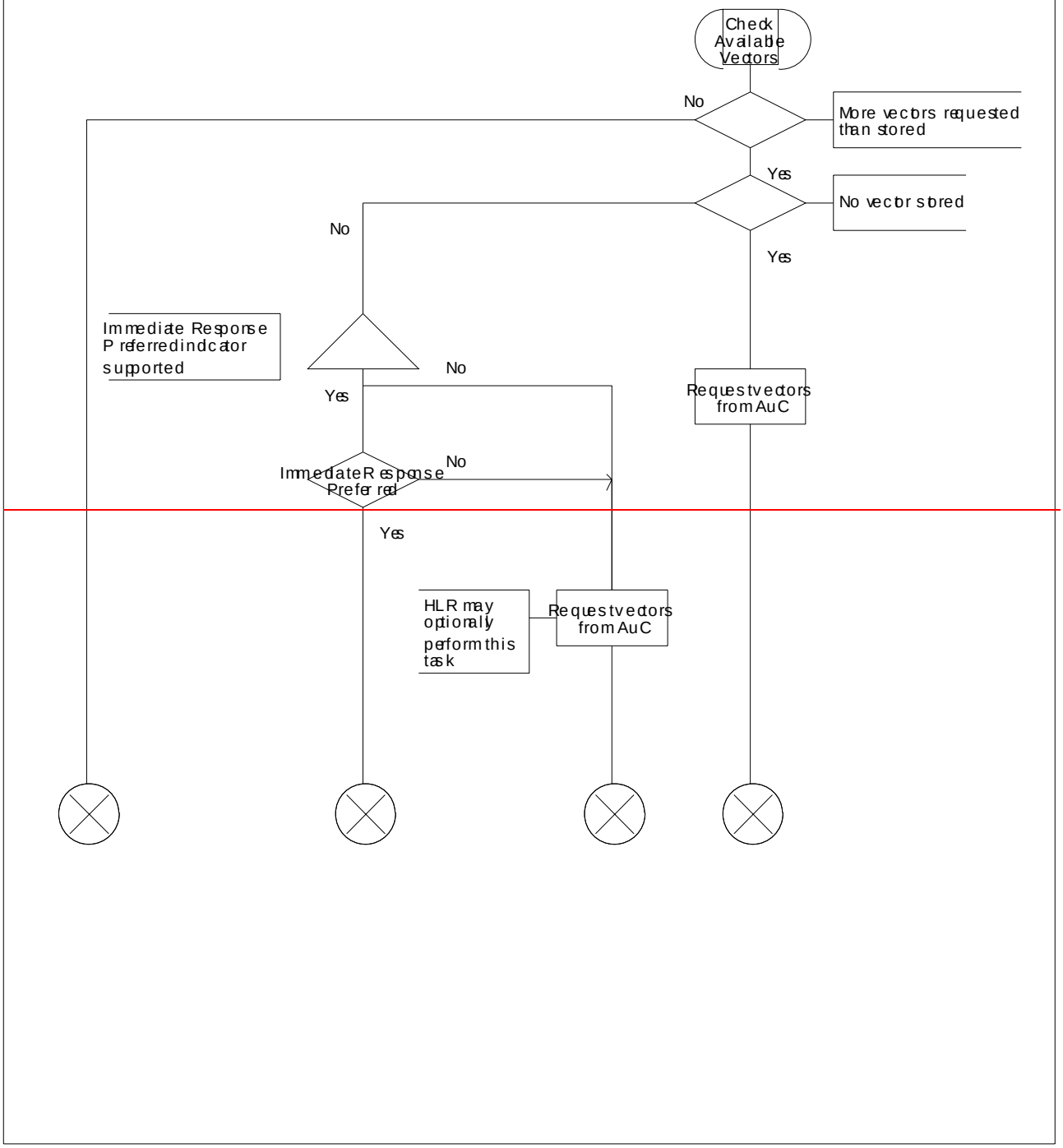


Figure 25.5/6~~5~~ (sheet 2 of 2): Process Obtain_Authent_Sets_HLR

procedure Check_Available_Vectors 1(1)

Figure 255/5a



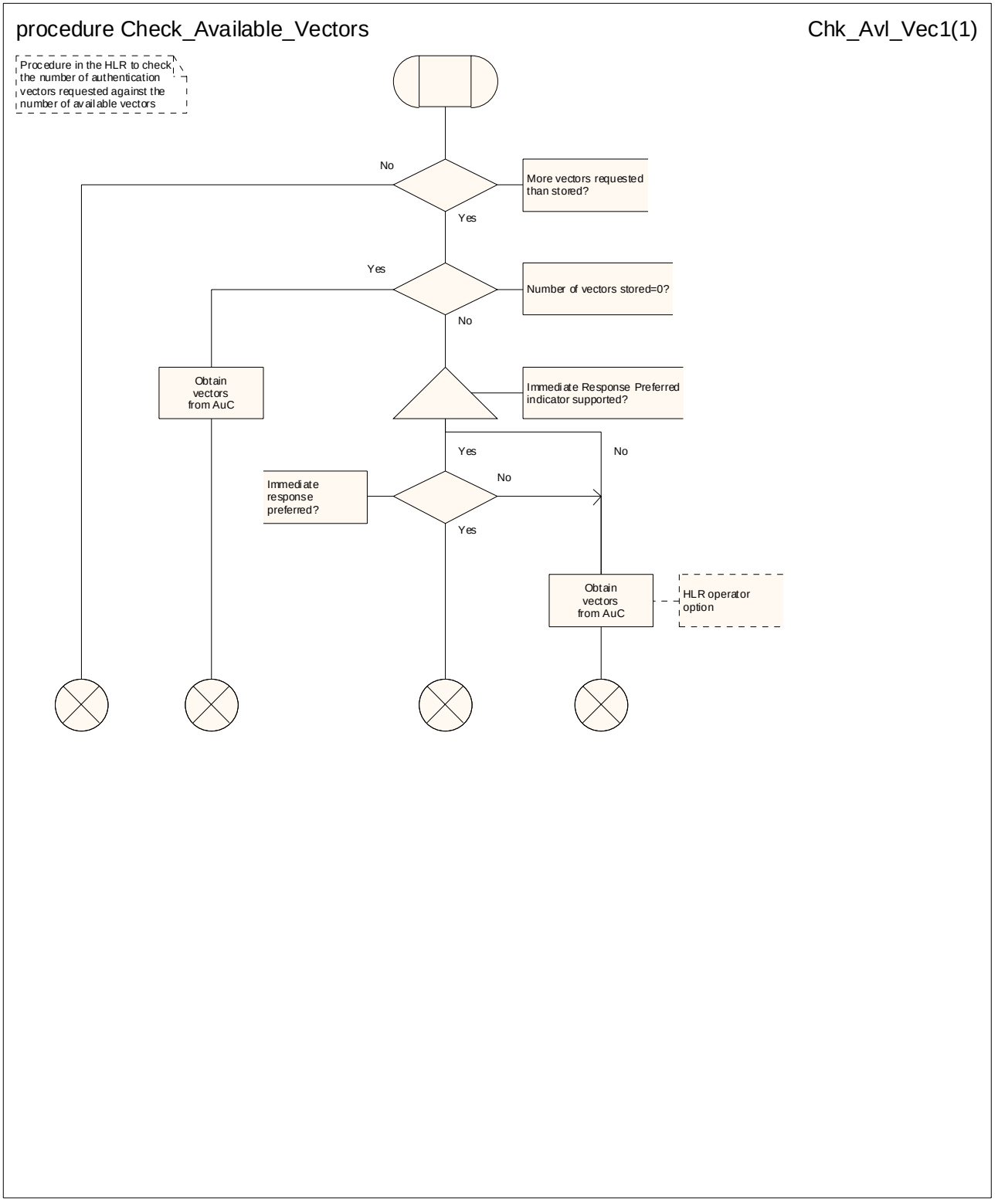


Figure 25.5/76: Procedure Check_Available_Vectors

25.5.6 Process Obtain_Authent_Para_SGSN

***** CR editor's note: this text has been moved to come immediately before the text for the process Obtain_Authent_Sets_HLR. It is now subclause 25.5.5. *****

For authentication procedure description see 3GPP TS 23.060 [104] and 3GPP TS 24.008 [35].

This Process is used by the SGSN to request authentication vectors from the HLR.

If the SGSN does not know the subscriber's HLR address (e.g. no IMSI translation exists), the Authentication Parameter negative response with error "Unknown HLR" is returned to the requesting process.

Otherwise, the Process proceeds as follows:

- a connection is opened, and a MAP_SEND_AUTHENTICATION_INFO request sent to the HLR;
- if the HLR indicates that a MAP version 1 or 2dialogue is to be used, the SGSN performs the equivalent MAP version 1 or 2dialogue. which can return a positive result containing authentication sets, an empty positive result, or an error;
- if the dialogue opening fails, the Authentication Parameters negative response with appropriate error is sent to the requesting process. Otherwise, the SGSN waits for the response from the HLR;
- if a MAP_SEND_AUTHENTICATION_INFO confirmation is received from the HLR, the SGSN checks the received data.

One of the following positive responses may be received from a MAP version 1 or MAP version 2 dialogue with the HLR:

- Authentication triplets, in which case the outcome is successful;
- Empty response, in which case the SGSN may re-use old triplets, if allowed by the PLMN operator.

If the SGSN cannot re-use old triplets (or no such triplets are available) then the Authentication Parameters negative response with appropriate error is sent to the requesting process.

If the outcome was successful or re-use of old parameters in the SGSN is allowed, then the Authentication Parameters response is sent to the requesting process

If an "Unknown Subscriber" error is included in the MAP_SEND_AUTHENTICATION_INFO confirm or is returned by the MAP version 1 dialogue, then the appropriate error is sent to the requesting process in the Authentication Parameters negative response

In a MAP version 3 dialogue a (possibly empty) set of authentication vectors may be received, transferred by means of the TC-RESULT-L service, from the HLR followed by a MAP_CLOSE_Indication or by a MAP_DELIMITER_Indication. If a MAP_DELIMITER_Indication is received, the SGSN may request additional authentication vectors from the HLR by sending a new MAP_SEND_AUTHENTIFICATION_INFO_Request. If a MAP_CLOSE_Indication is received, and authentication vectors have been received during the dialogue, then the "OK" exit is used. If no authentication vectors have been received during the dialogue, the SGSN checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

If in a MAP version 3 dialogue an "Unknown Subscriber" error is received, then the "Unknown Subscriber" exit is used. If other errors are received, the SGSN checks whether old GSM Triplets are available and can be re-used. If so, the "OK" exit is used, otherwise the "Procedure Error" exit is used. Note that re-use of old UMTS Quintuplets is not allowed.

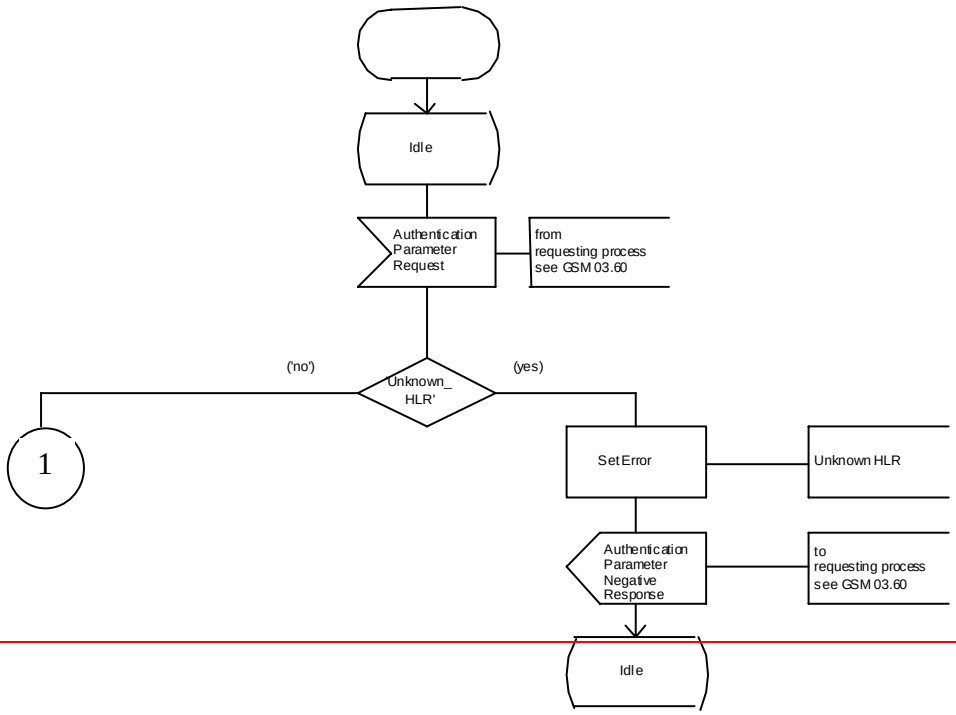
- if a MAP-U-ABORT, MAP_P_ABORT or unexpected MAP_CLOSE service indication is received from the HLR, then the SGSN checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the Authentication Parameters negative response with appropriate error is sent to the requesting process.
- if a MAP_NOTICE service indication is received from the HLR, then the dialogue with the HLR is closed. The SGSN then checks whether old authentication parameters can be re-used. If old parameters cannot be re-used the process terminates and the Authentication Parameters negative response with appropriate error is sent to the requesting process; Otherwise the Authentication Parameters response is sent to requesting process.

~~The process is described in figure 25.5/6.~~

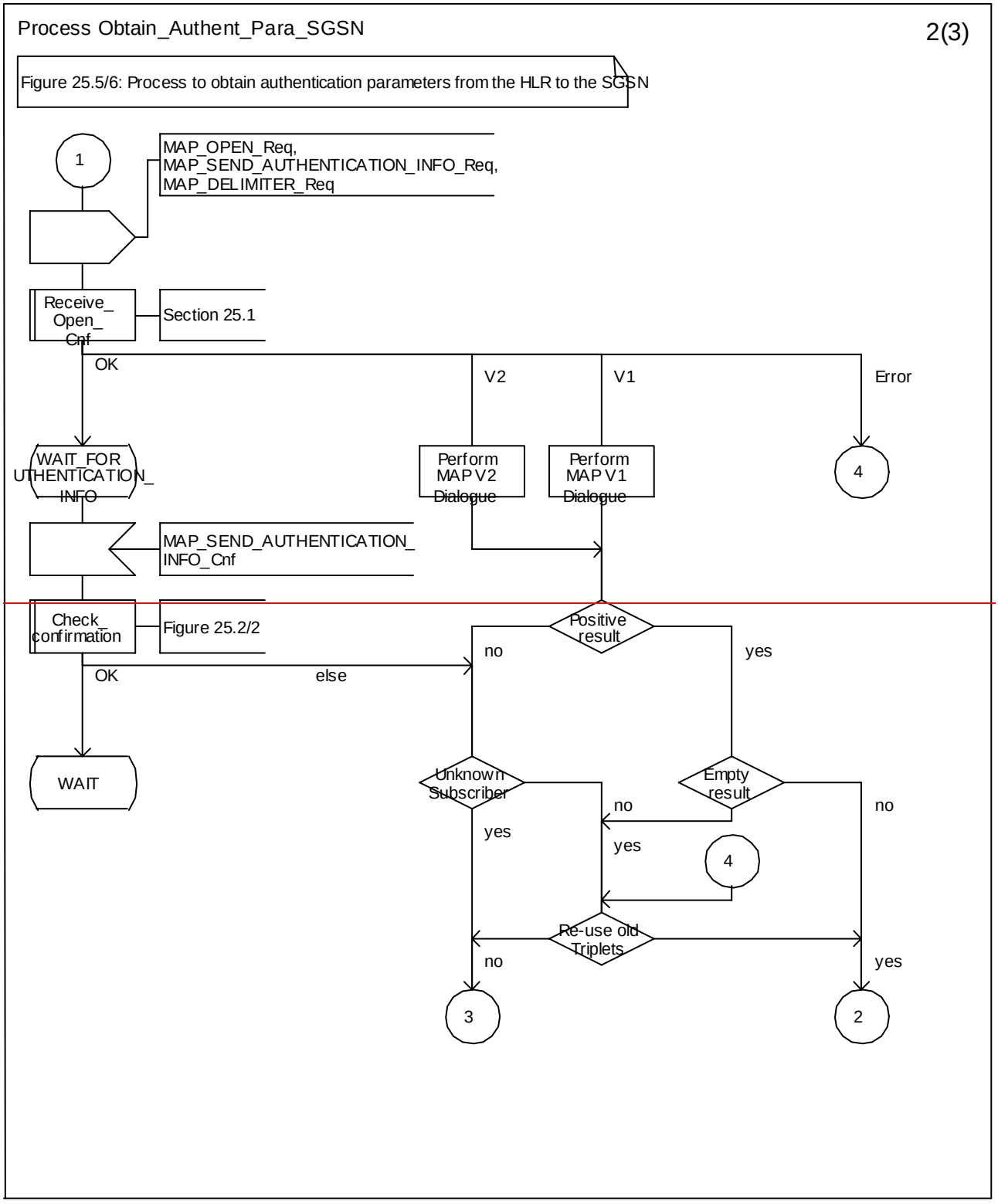
***** CR editor's note: The SDL diagram for the process Obtain_Authent_Sets_SGSN has been moved to become figure 25.5/5, immediately before the SDL diagram for the process Obtain_Authent_Sets_HLR. *****

Process Obtain_Authent_Para_SGSN 1(3)

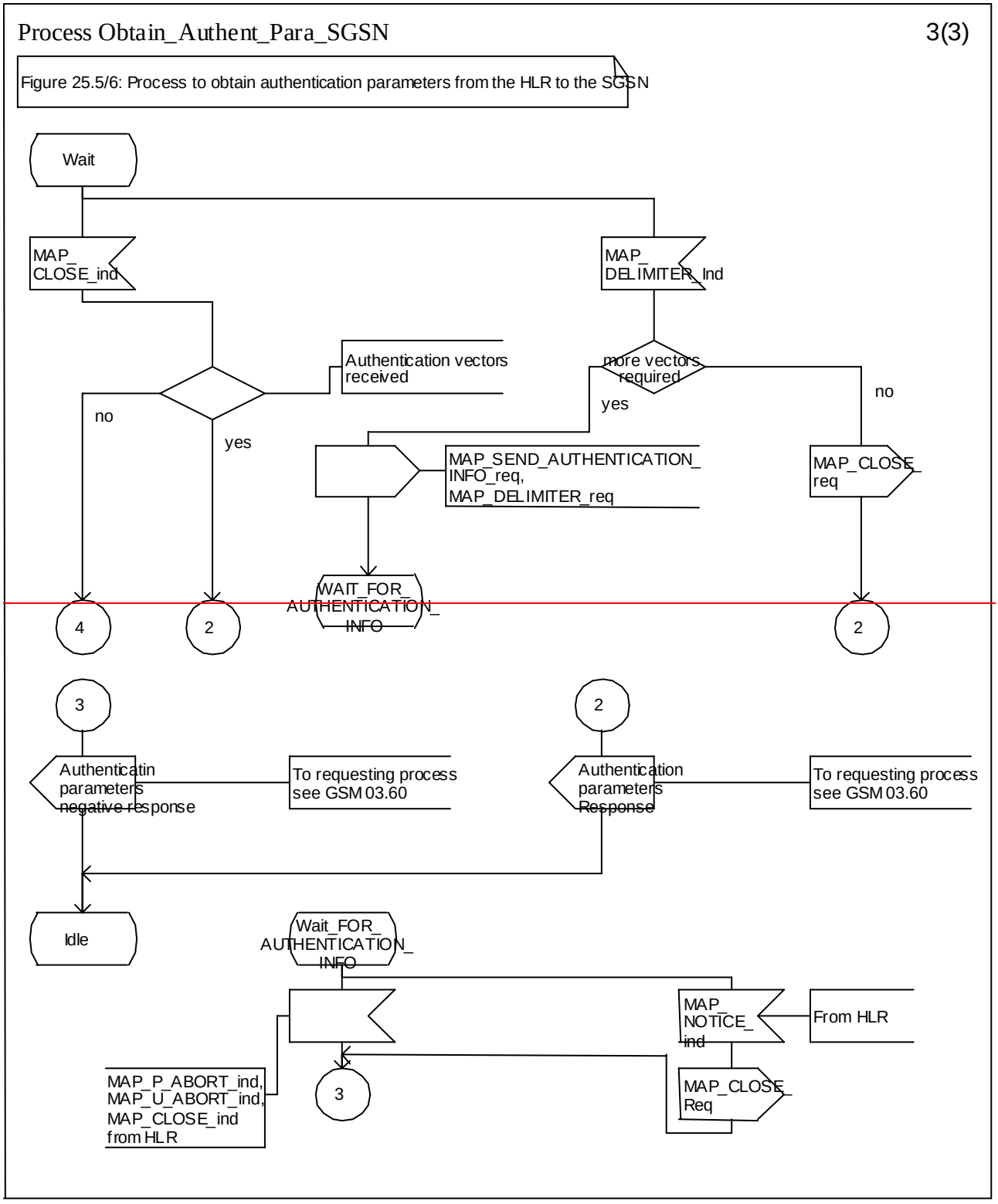
Figure 25.5/6: Process to obtain authentication parameters from the HLR to the SGSN



~~Figure 25.5/6 (sheet 1 of 3): Process Obtain_Authen_Para_SGSN~~



~~Figure 25.5/6 (sheet 2 of 3): Process Obtain_Authen_Para_SGSN~~



~~Figure 25.5/6 (sheet 3 of 3): Process Obtain_Authen_Para_SGSN~~

25.5.7 ~~Process~~ Authentication ~~–~~Failure ~~–~~Reporting

25.5.7.1 General

The Authentication Failure Report procedure is used to notify an HLR about the occurrence of an authentication failure in the SGSN or VLR.

The message flows for this procedure ~~is~~ are shown in figures 25.5/7 & 25.5/8.

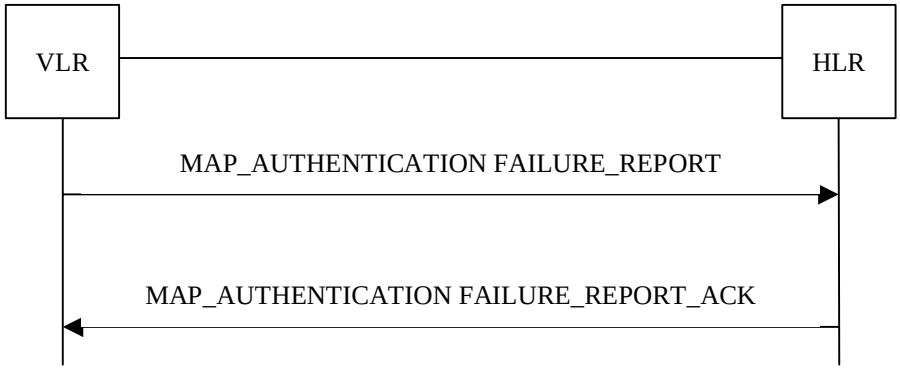


Figure 25.5/7: Message Flows ~~to~~ for Authentication Failure Report – VLR to HLR

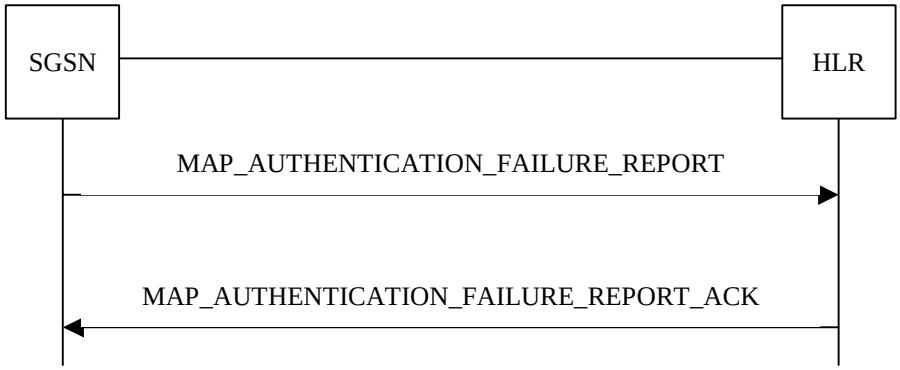
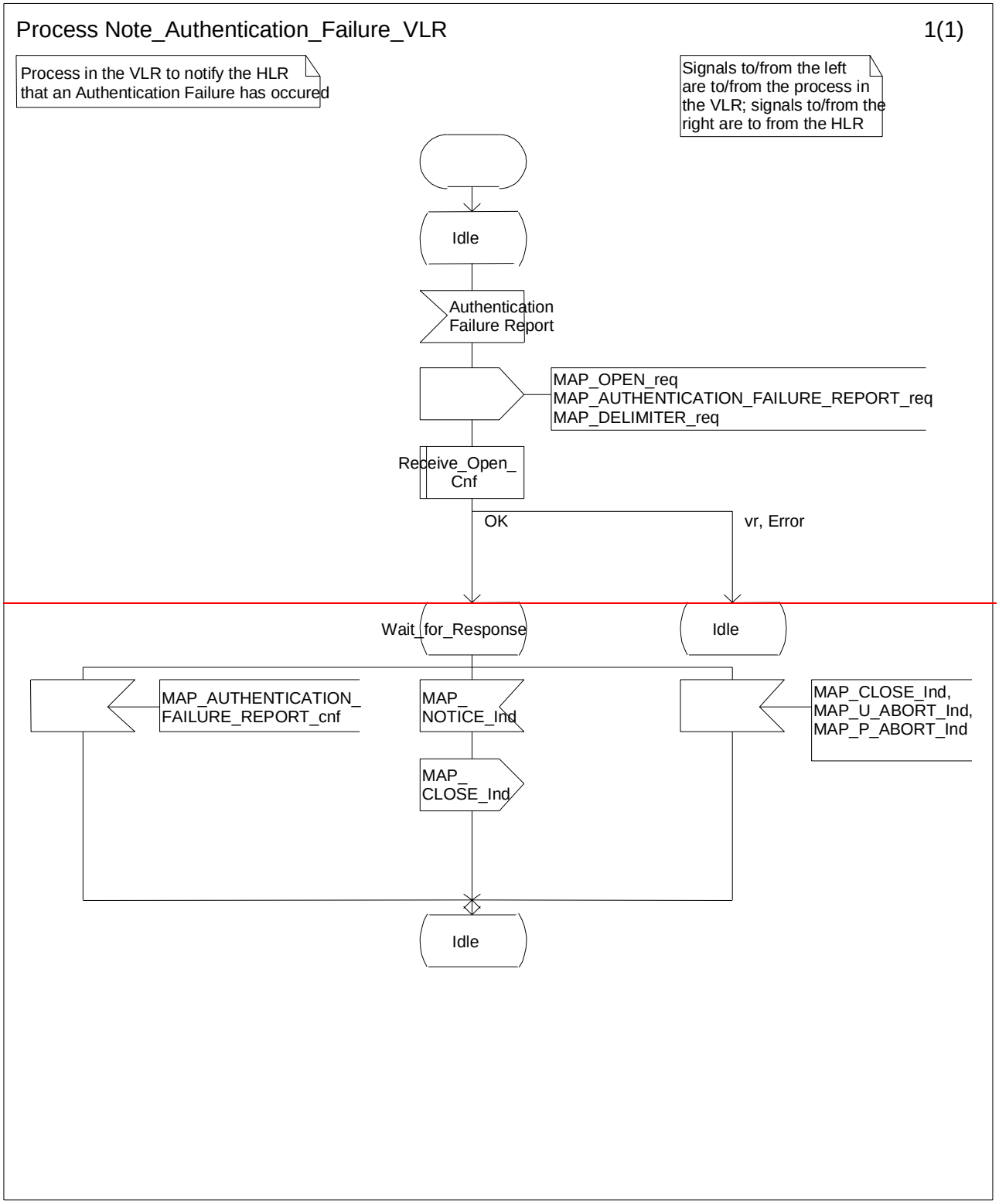


Figure 25.5~~6~~/8~~7~~: Message Flows ~~to~~ for Authentication Failure Report – SGSN to HLR

25.5.7.2 Process in the VLR



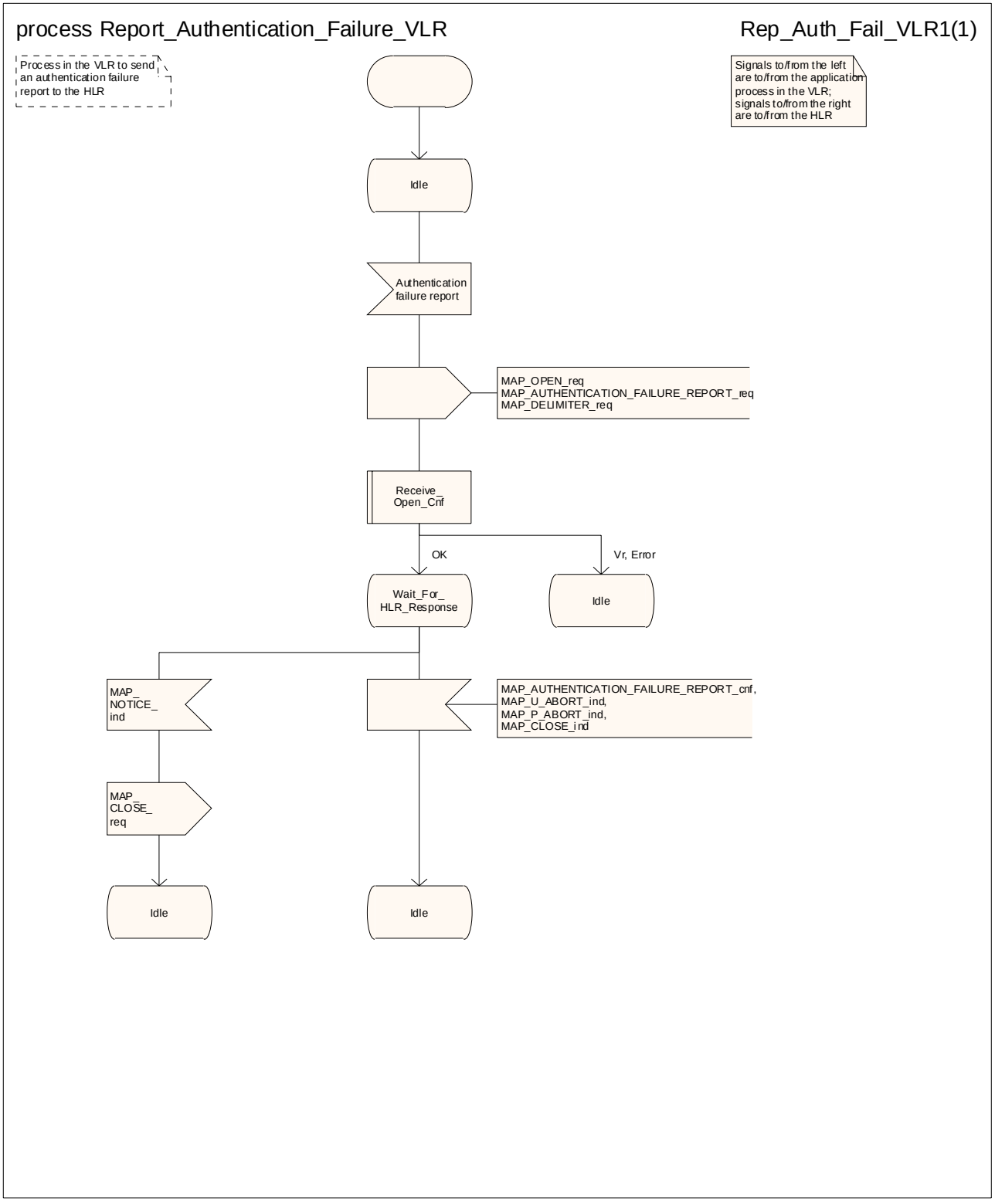
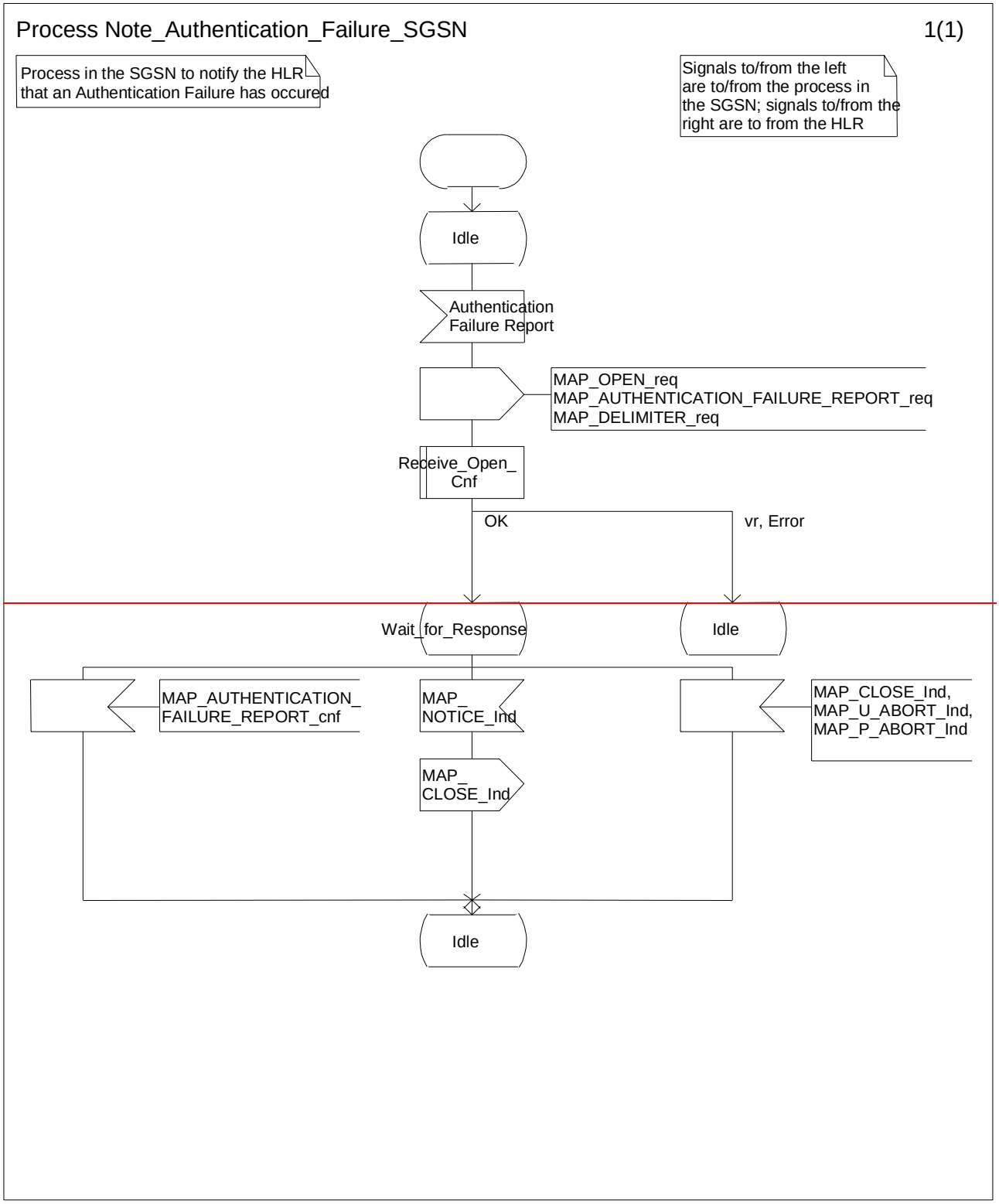


Figure 25.56/98: Process ~~Note~~Report_Authentication_Failure_VLR

25.5.7.3 Process in the SGSN



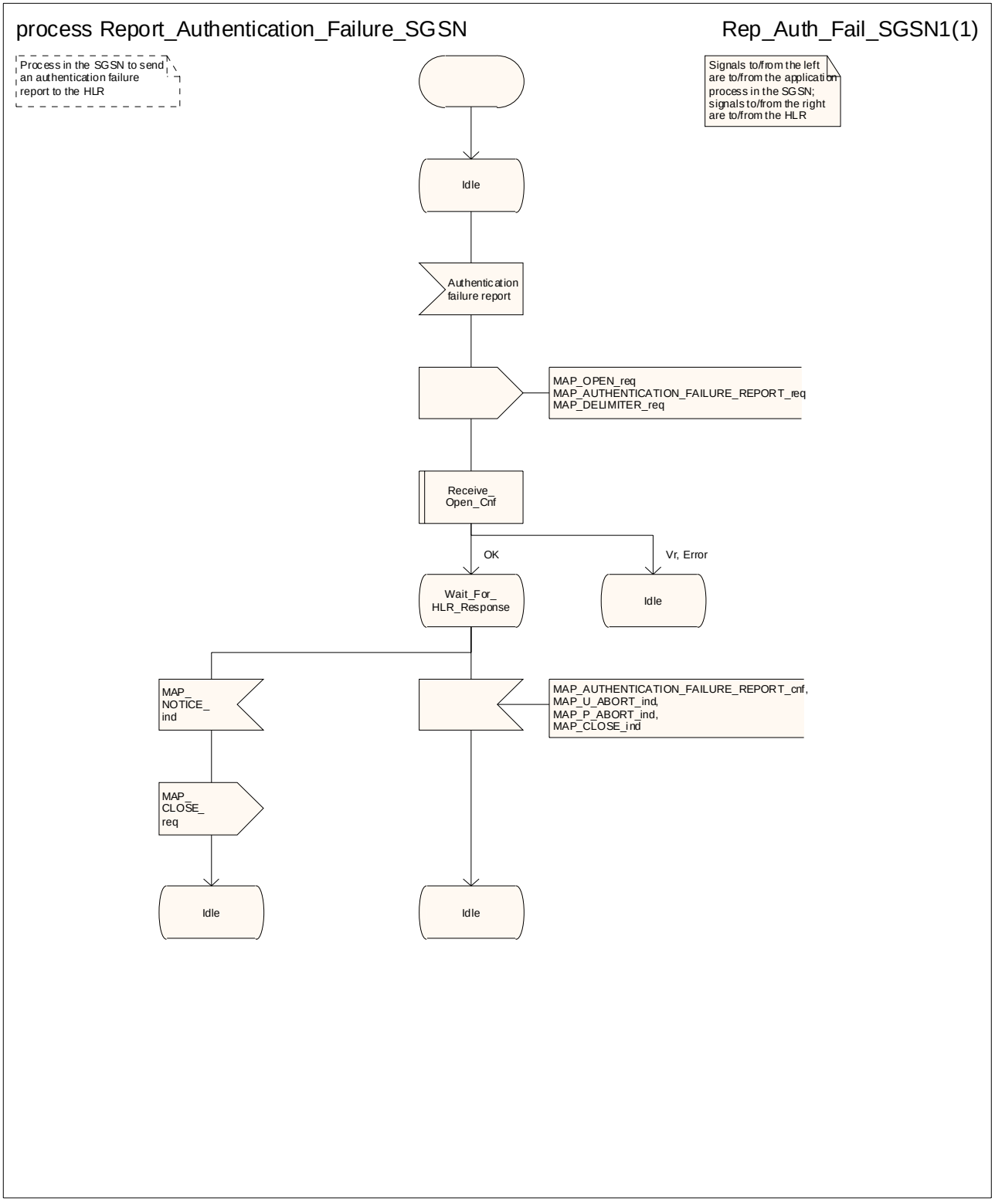
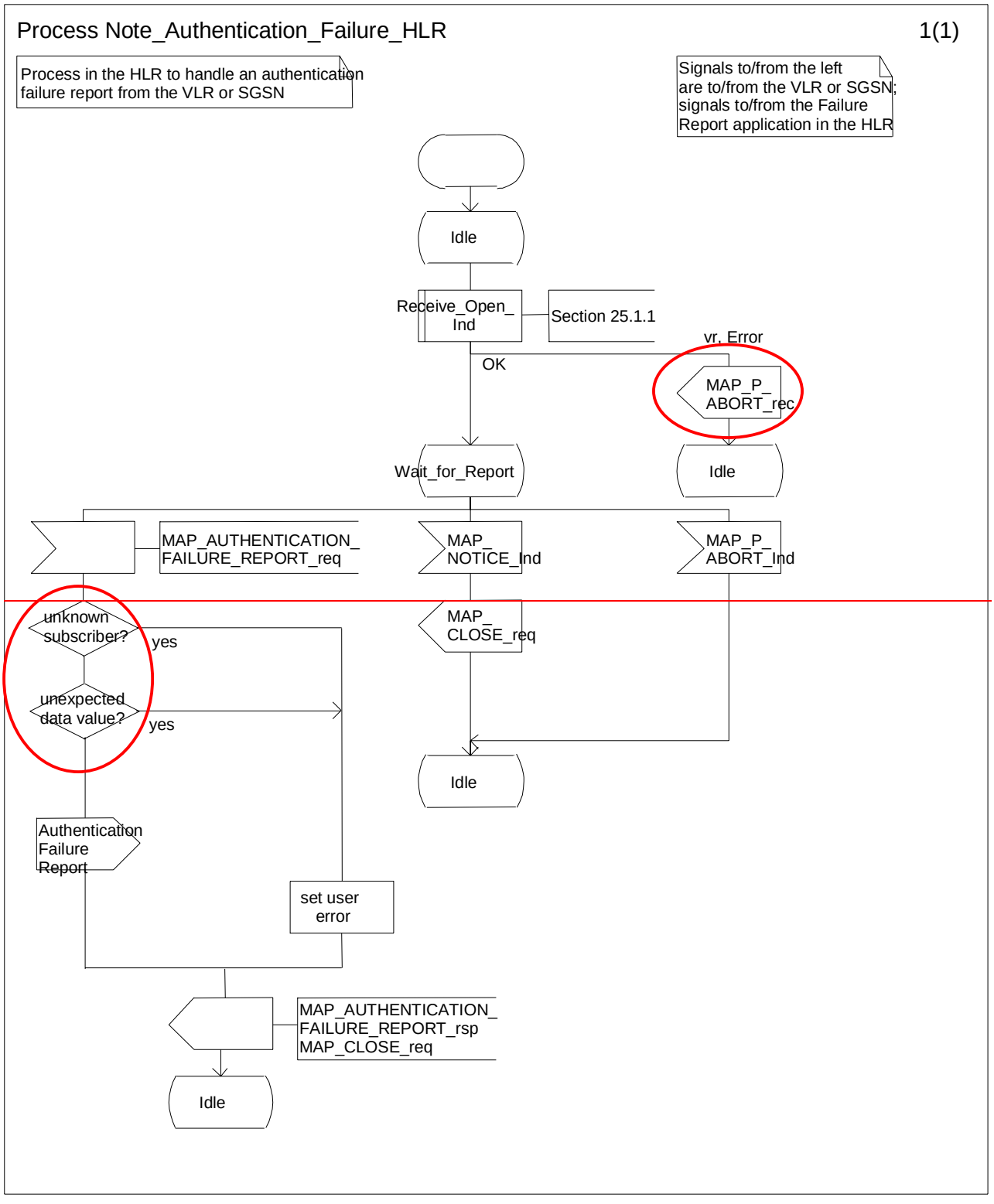


Figure 25.5~~6~~/10~~9~~: Process ~~Note~~Report_Authentication_Failure_SGSN

25.5.7.4 Process in the HLR



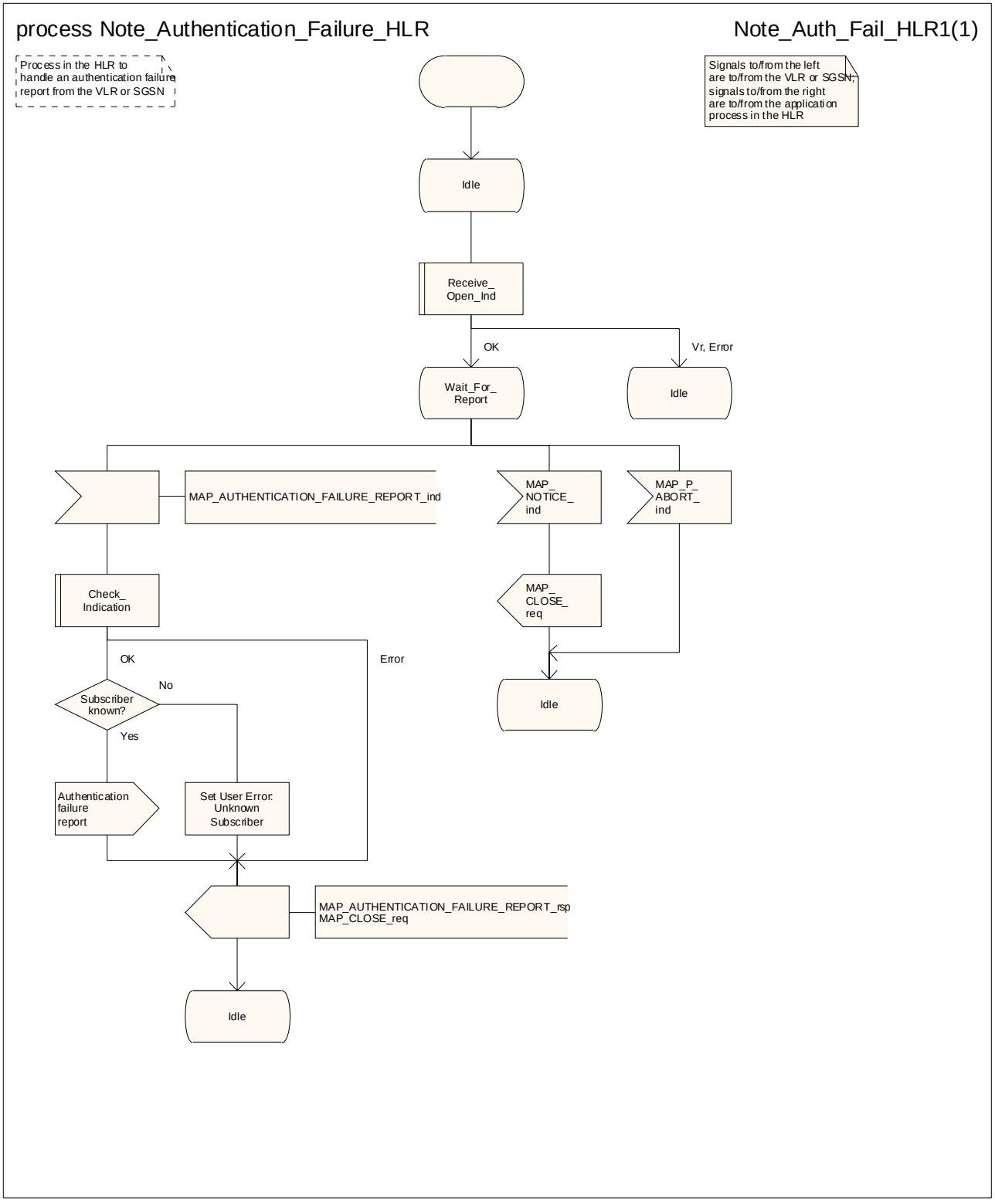


Figure 25.56/110: Process Note_Authentication_Failure_HLR

25.6 IMEI Handling Macros

The following macros are used in the ~~GSM~~ network ~~in order~~ to enable handling and checking of the mobile equipment identity.

25.6.1 Macro Check_IMEI_MSC

This macro is used by the MSC to receive a request from the VLR, relay it to the EIR, and pass the result from the EIR back to the VLR. ~~The macro proceeds as follows:~~

Sheet 1: If the dialogue with the EIR drops back to a previous protocol version and the EIR returned an error, the MSC relays the error to the VLR in the MAP_CHECK_IMEI response. If the dialogue with the EIR failed, or the EIR returned a badly formed result, the MSC sends a System Failure error to the VLR in the MAP_CHECK_IMEI response.

~~- 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.

25.6.6 Process Check_IMEI_SGSN

***** CR editor's note: this (much reduced!) text has been moved from its pposition immediately after the SDL diagram for the macro Obtain_IMEI_VLR. *****

This process is used by the SGSN to control the check of a mobile equipment's IMEI.

25.6.43 Process Check_IMEI_EIR

This process is used by the EIR to obtain the status of a piece of mobile equipment, upon request from the MSC or from the SGSN. The process acts as follows:

- a MAP_OPEN service indication is received (macro Receive_Open_Ind, clause 25.1.1). If the dialogue opening fails, the process terminates;

- otherwise, a MAP_CHECK_IMEI indication is received by the EIR, containing the IMEI to be checked;

- the EIR checks the service indication for errors. If there are any, they are reported to the MSC or to the SGSN in the MAP_CHECK_IMEI response. If no errors are detected, the EIR data base function is interrogated for the status of the given equipment. Further details are found in 3GPP TS 22.016 [7];

- the status of the equipment (white-listed, grey-listed, black-listed or unknown) is returned to the MSC or to the SGSN in the MAP_CHECK_IMEI service response;

- if a MAP_U_ABORT, MAP_P_ABORT, MAP_NOTICE or MAP_CLOSE indication is received from the MSC or from the SGSN at any time during this process, the process in the EIR terminates.

The process is described in figure 25.6/3.

25.6.54 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.

25.6.65 Macro Obtain_IMEI_VLR

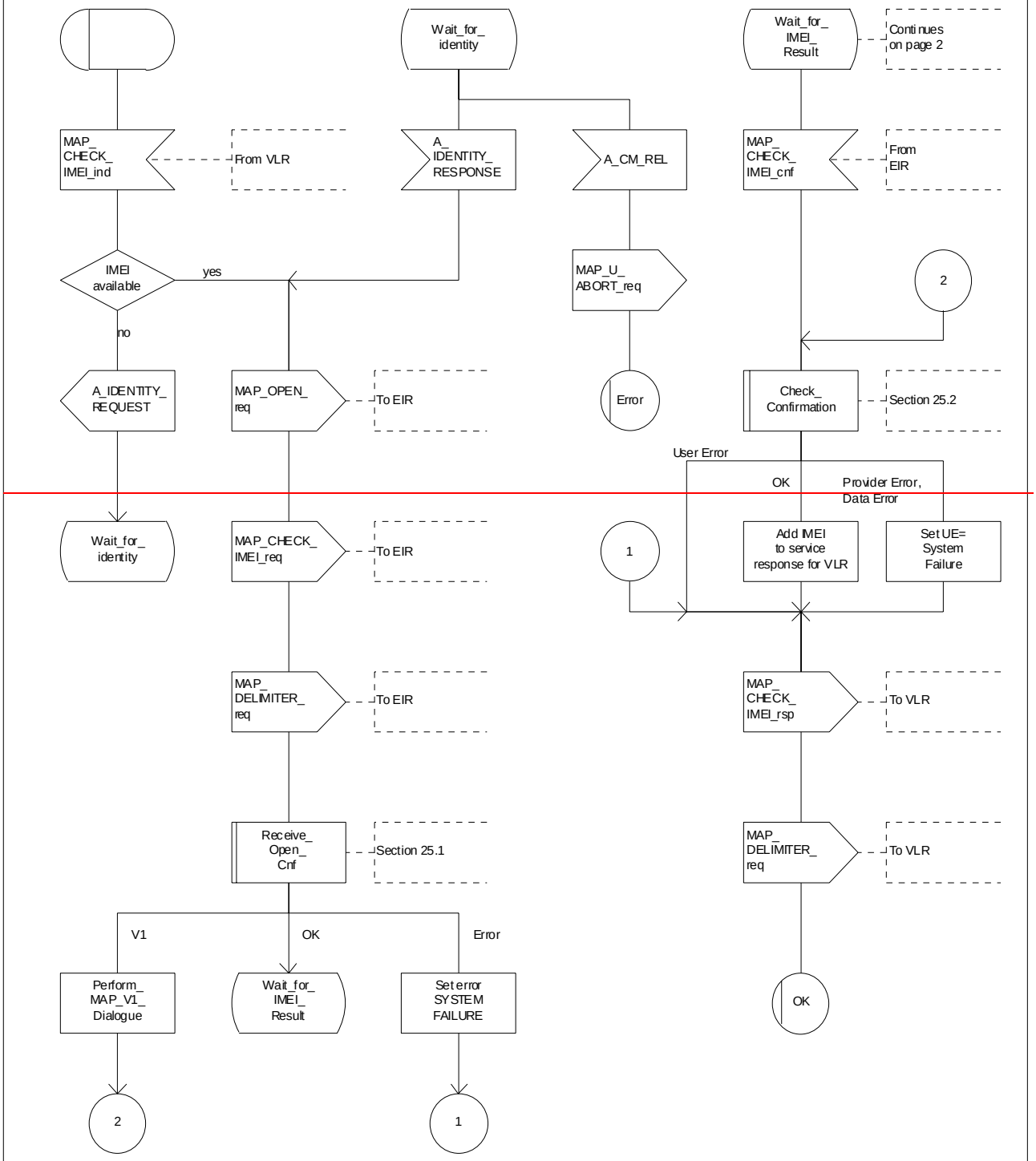
This macro is used by the VLR to obtain the IMEI from the MSC., e.g. to enable handling of emergency calls in case of authentication failure (in which case the IMEI may be used by some operators as an alternative to the IMSI). It proceeds as follows:

- 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.

Macrodefinition Check_IMEI_MSC 25.6_1.1(2)

Figure 25.6/1: Check IMEI macro in the MSC, relaying the IMEI check indication from the VLR to the MSC and relaying the confirmation from the EIR to the VLR



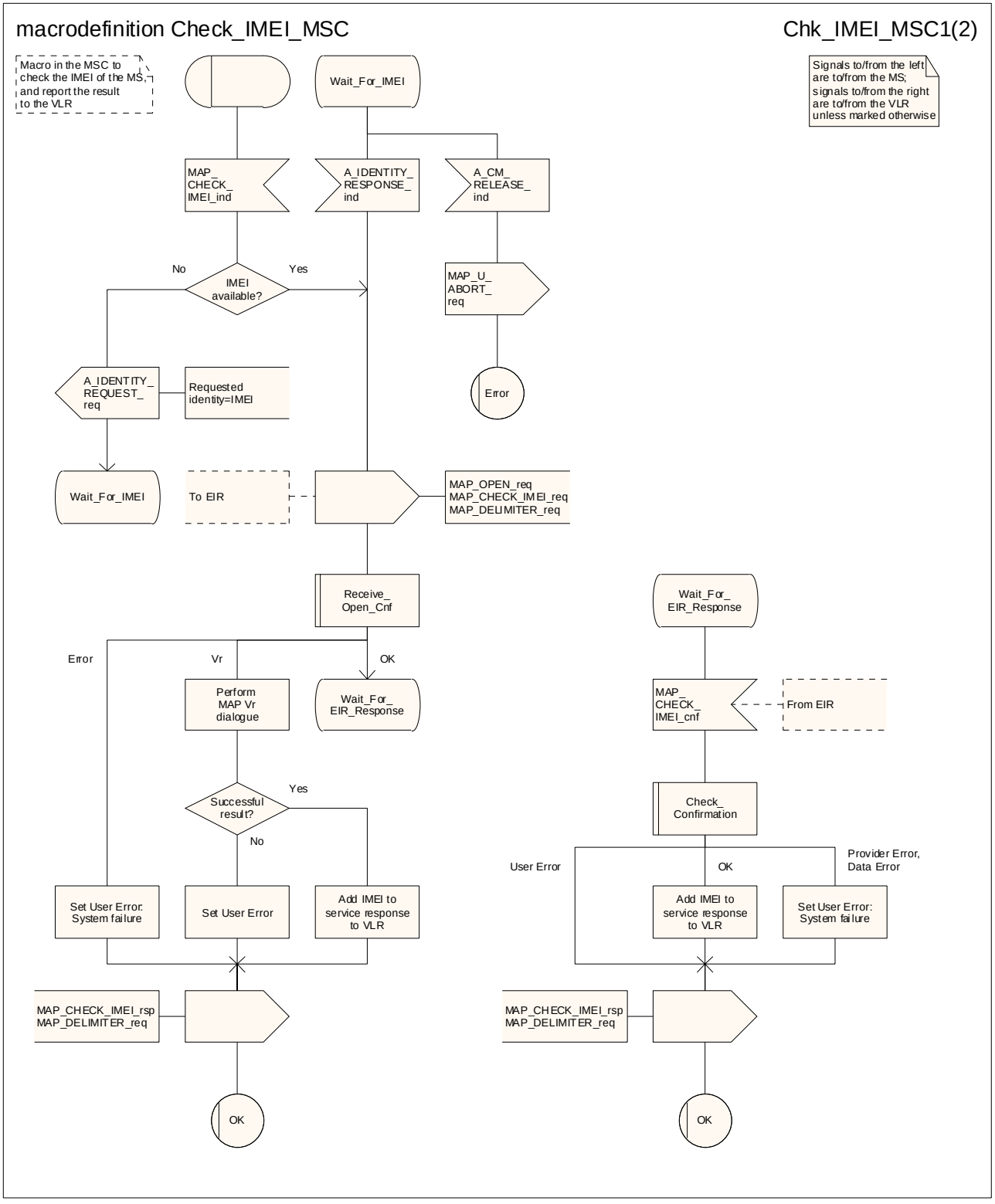
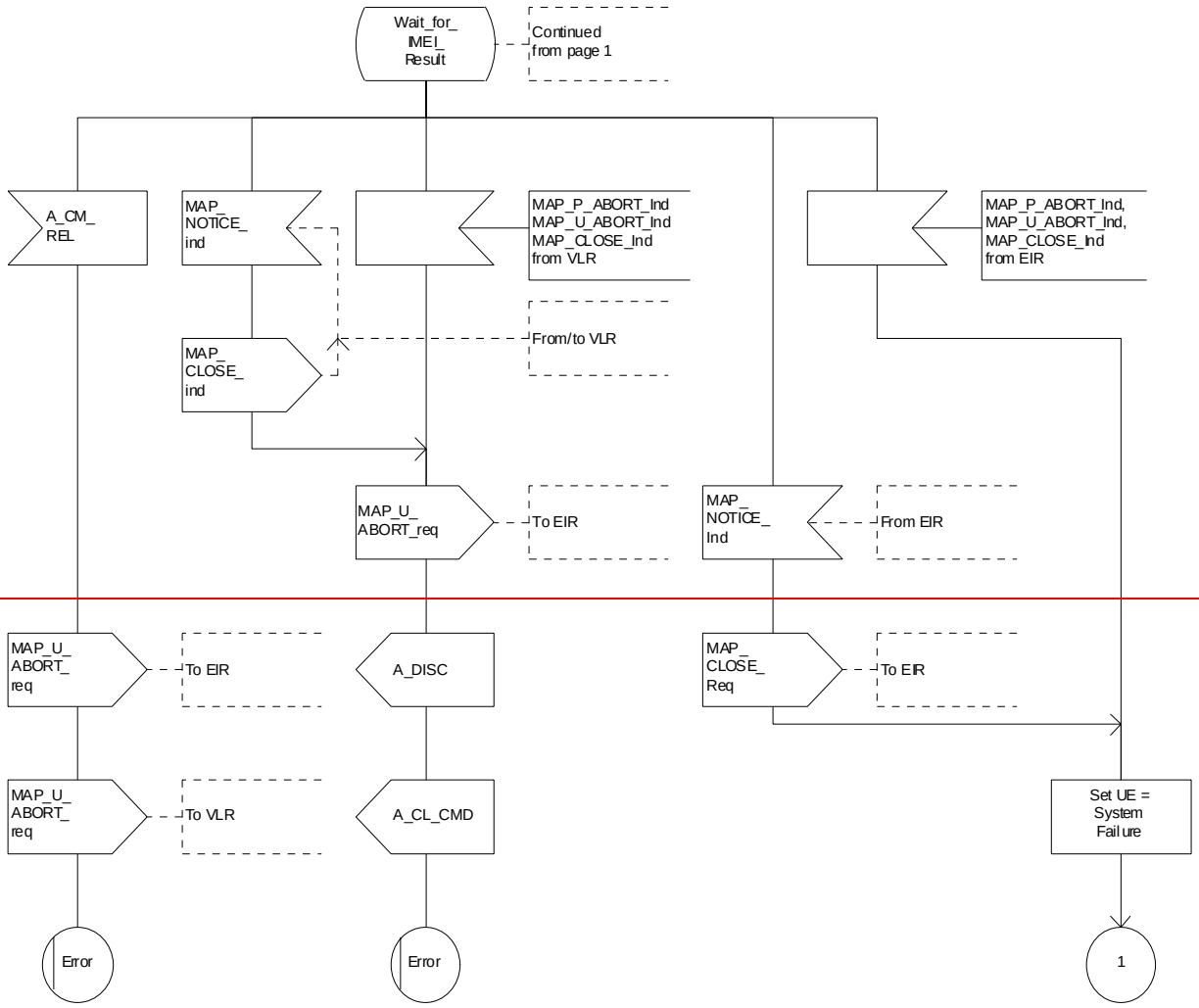


Figure 25.6/1 (sheet 1 of 2): ~~Process~~ Macro Check_IMEI_MSC

Macrodefinition Check_IMEI_MSC 25.6_1.2(2)

Figure 25.6/1: Check IMEI macro in the MSC, relaying the IMEI check indication from the VLR to the MSC and relaying the confirmation from the EIR to the VLR



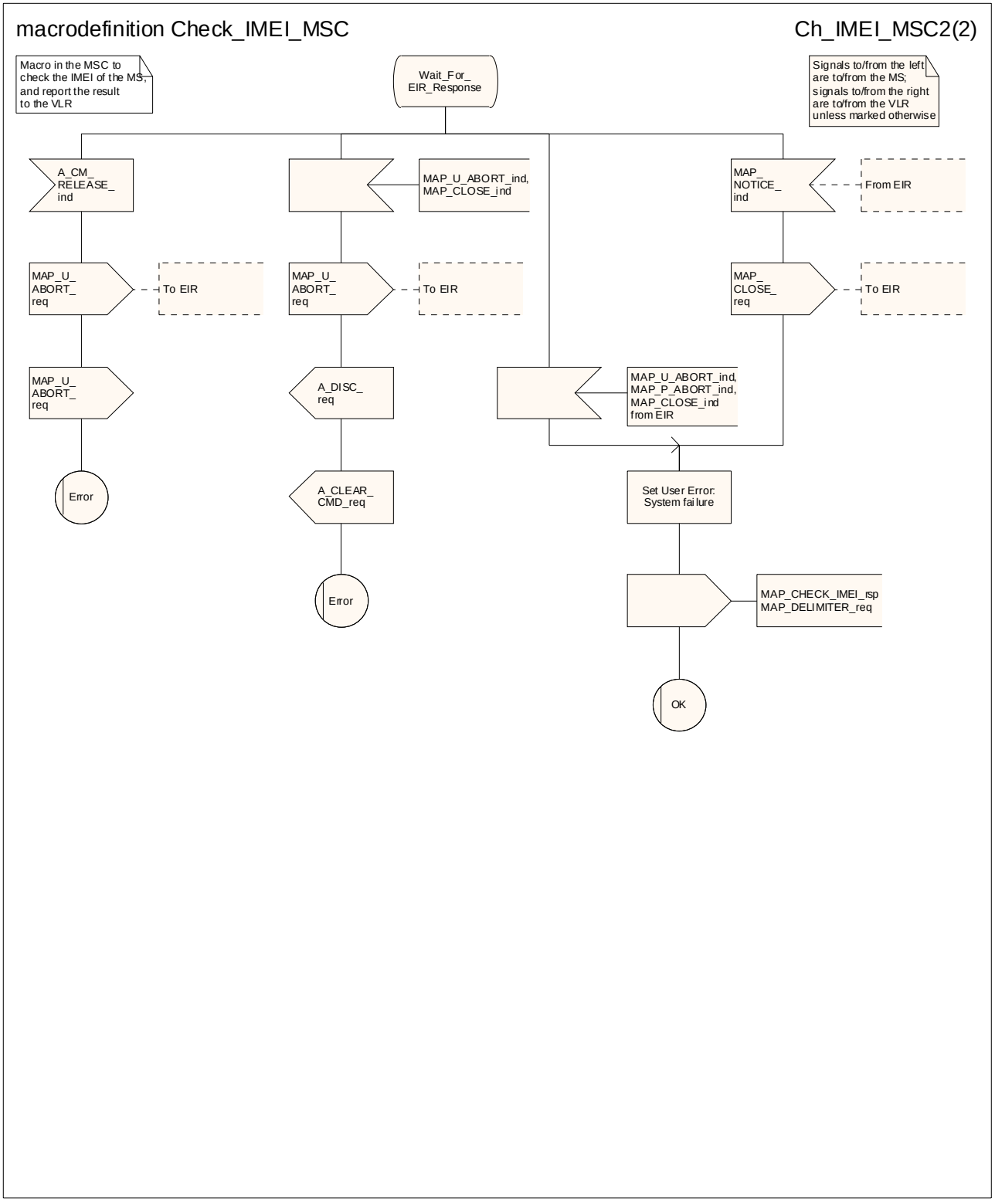
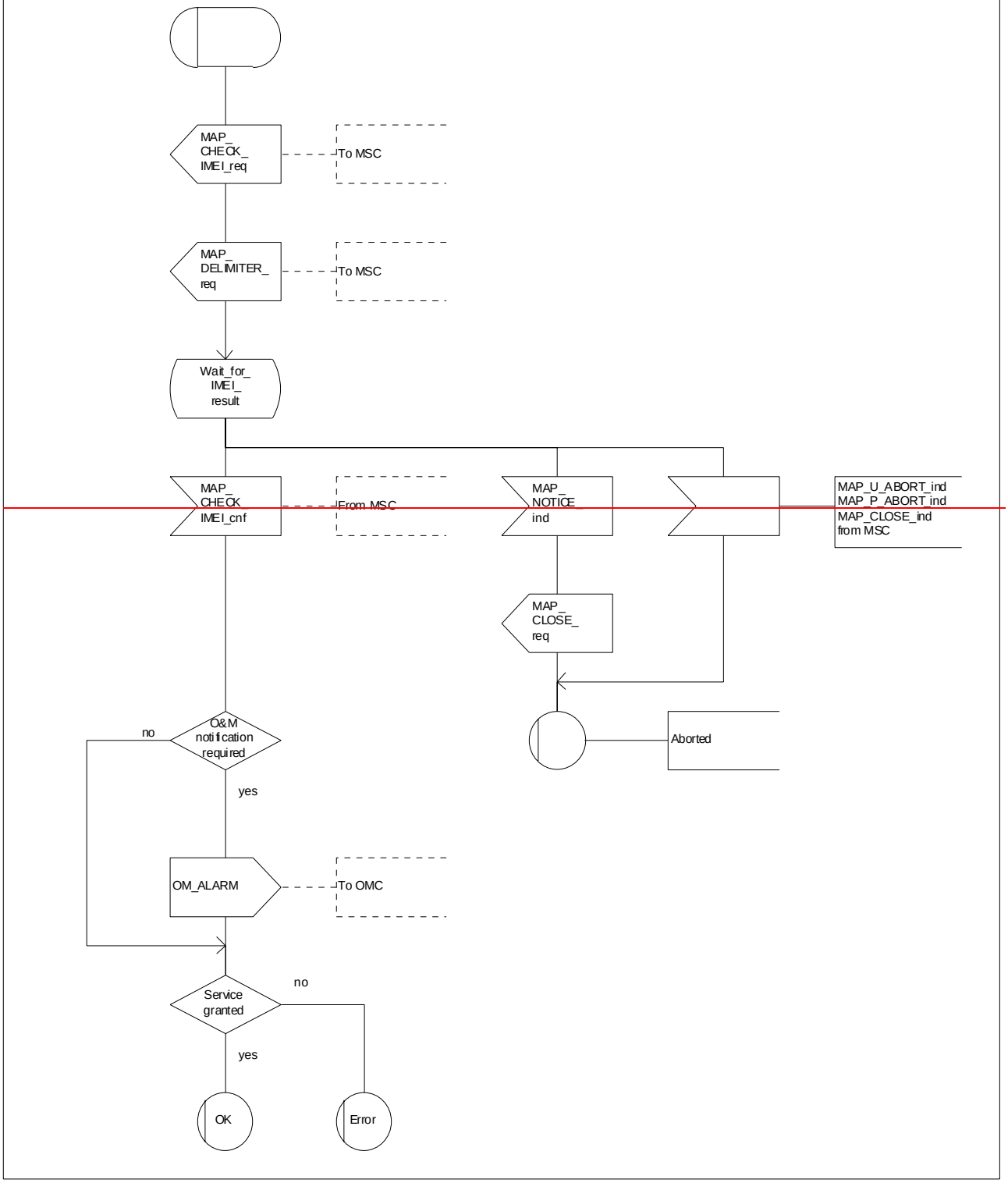


Figure 25.6/1 (sheet 2 of 2): ~~Process~~ Macro Check_IMEI_MSC

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



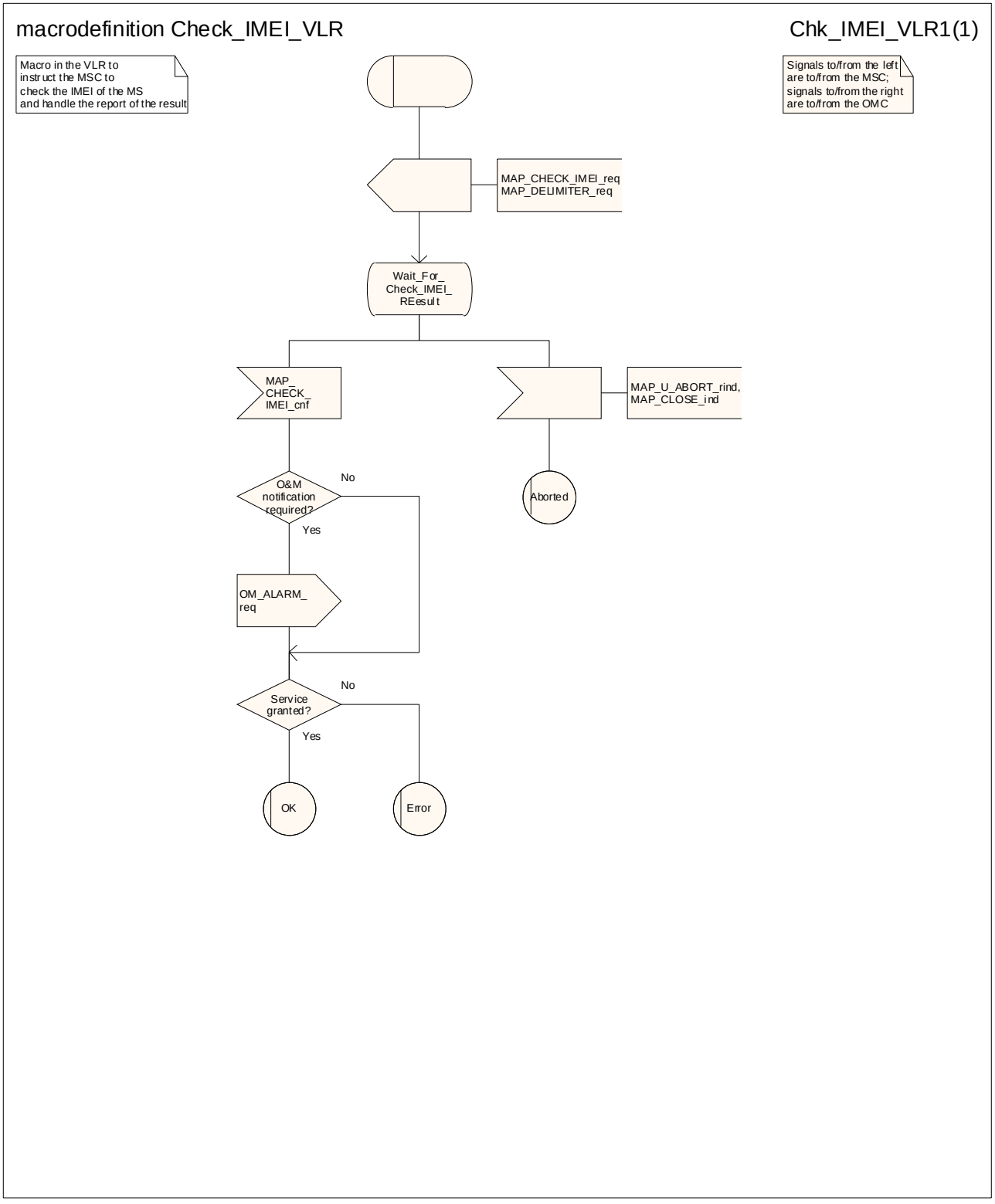


Figure 25.6/2: ~~Process~~ Macro Check_IMEI_VLR

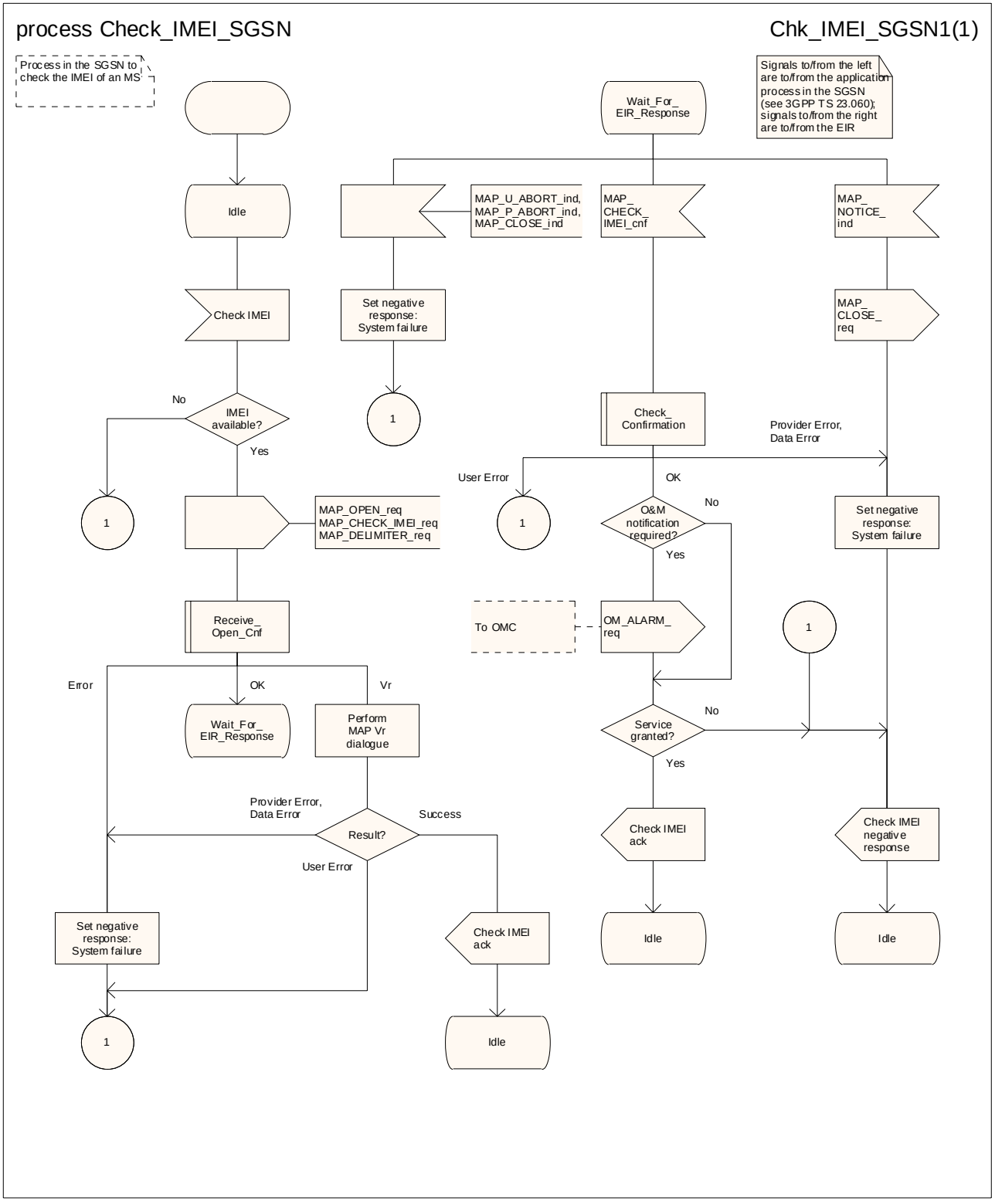
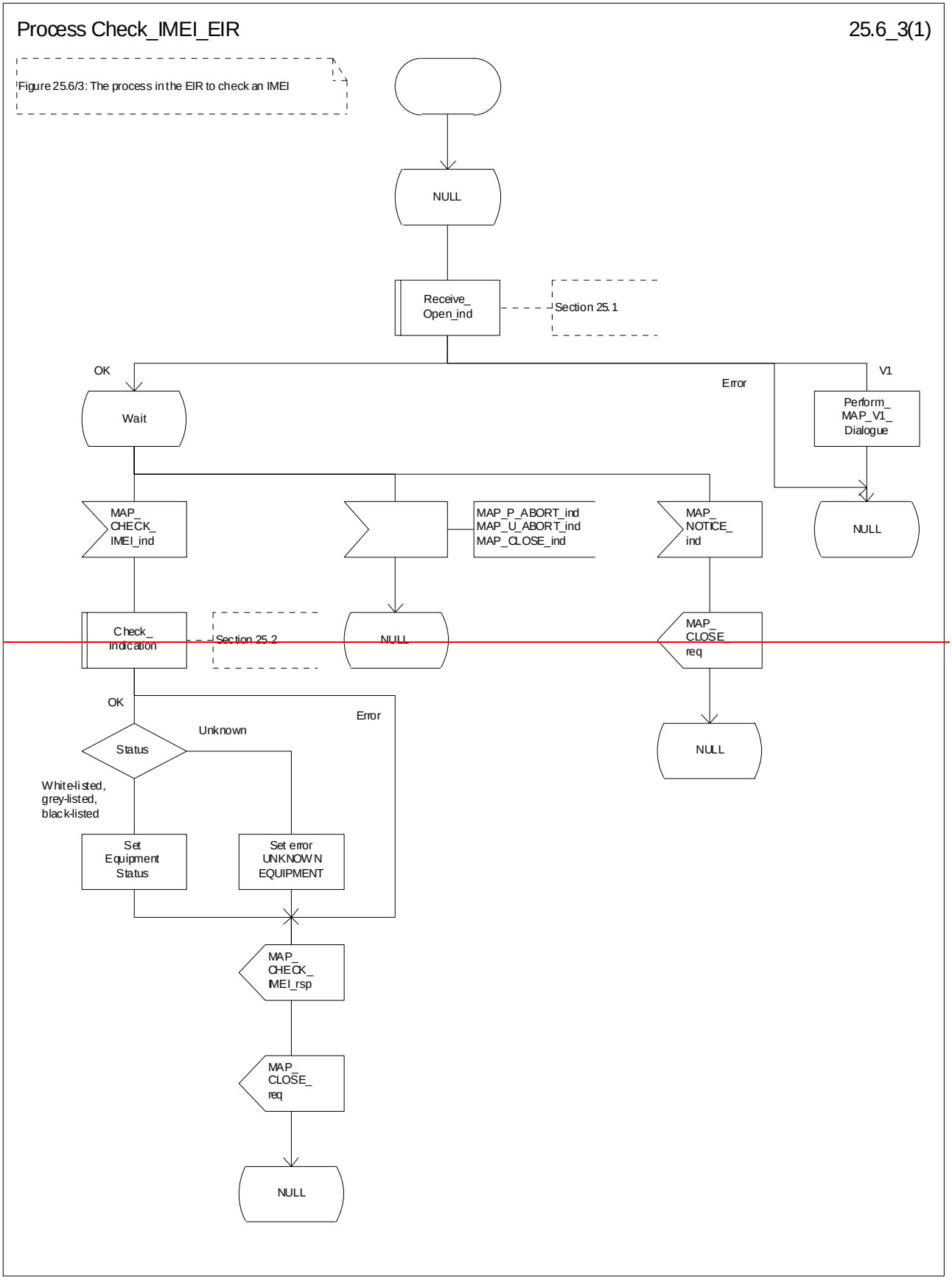


Figure 25.6/3: Process Check_IMEI_SGSN


Process Check_IMEI_EIR
25.6_3(1)
Figure 25.6/3: The process in the EIR to check an IMEI
NULL
Receive_ Open_ind
Section 25.1
OK
Error
V1
Wait
Perform_ MAP_V1_ Dialogue
MAP_ CHECK_ IMEI_ind
MAP_P_ABORT_ind
MAP_U_ABORT_ind
MAP_CLOSE_ind
MAP_ NOTICE_ ind
NULL
Check_ Indication
Section 25.2
NULL
MAP_ CLOSE_ req
OK
Error
Unknown
Status
NULL
White-listed, grey-listed, black-listed
Set Equipment Status
Set error UNKNOWN EQUIPMENT
MAP_ CHECK_ IMEI_rsp
MAP_ CLOSE_ req
NULL

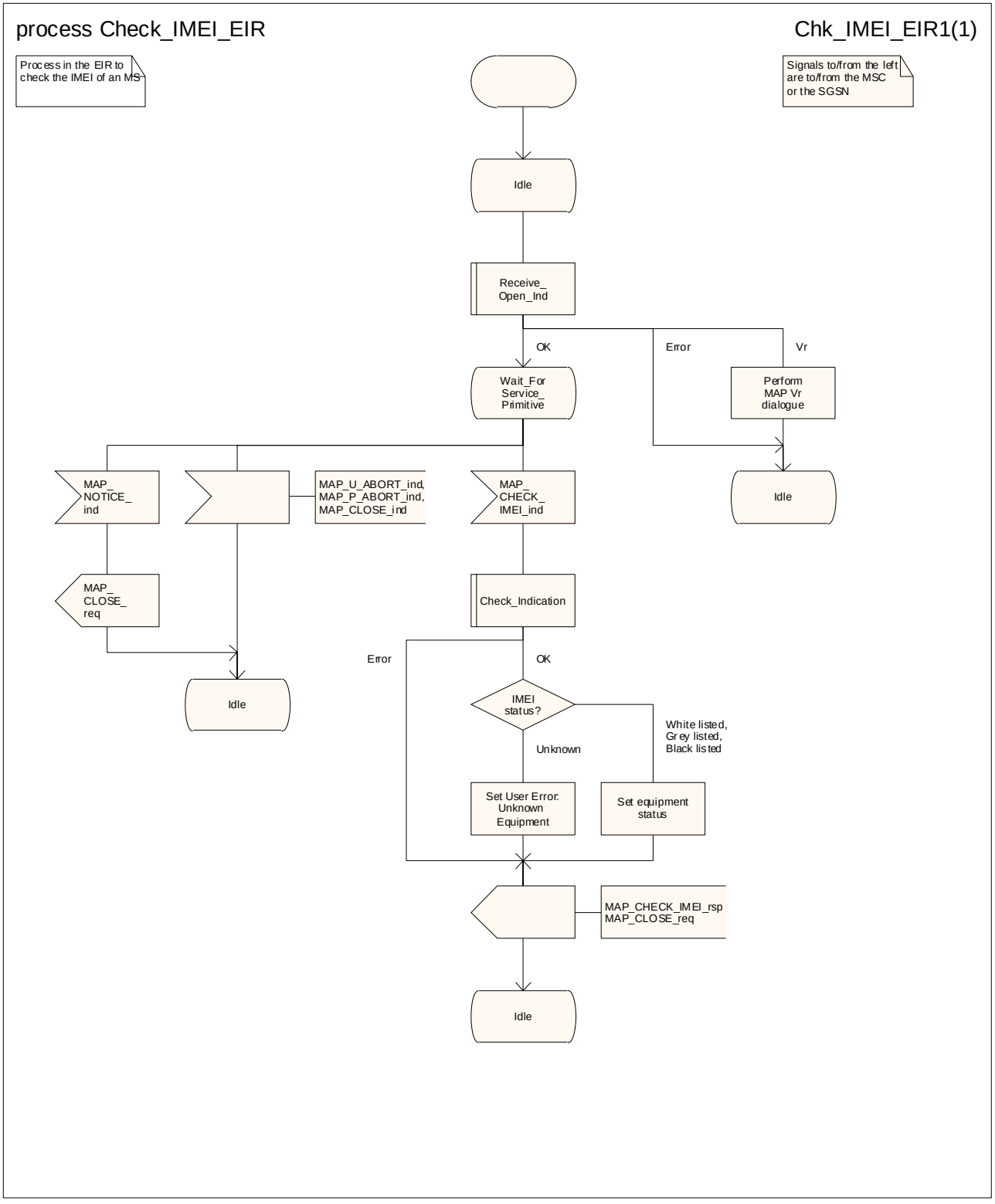
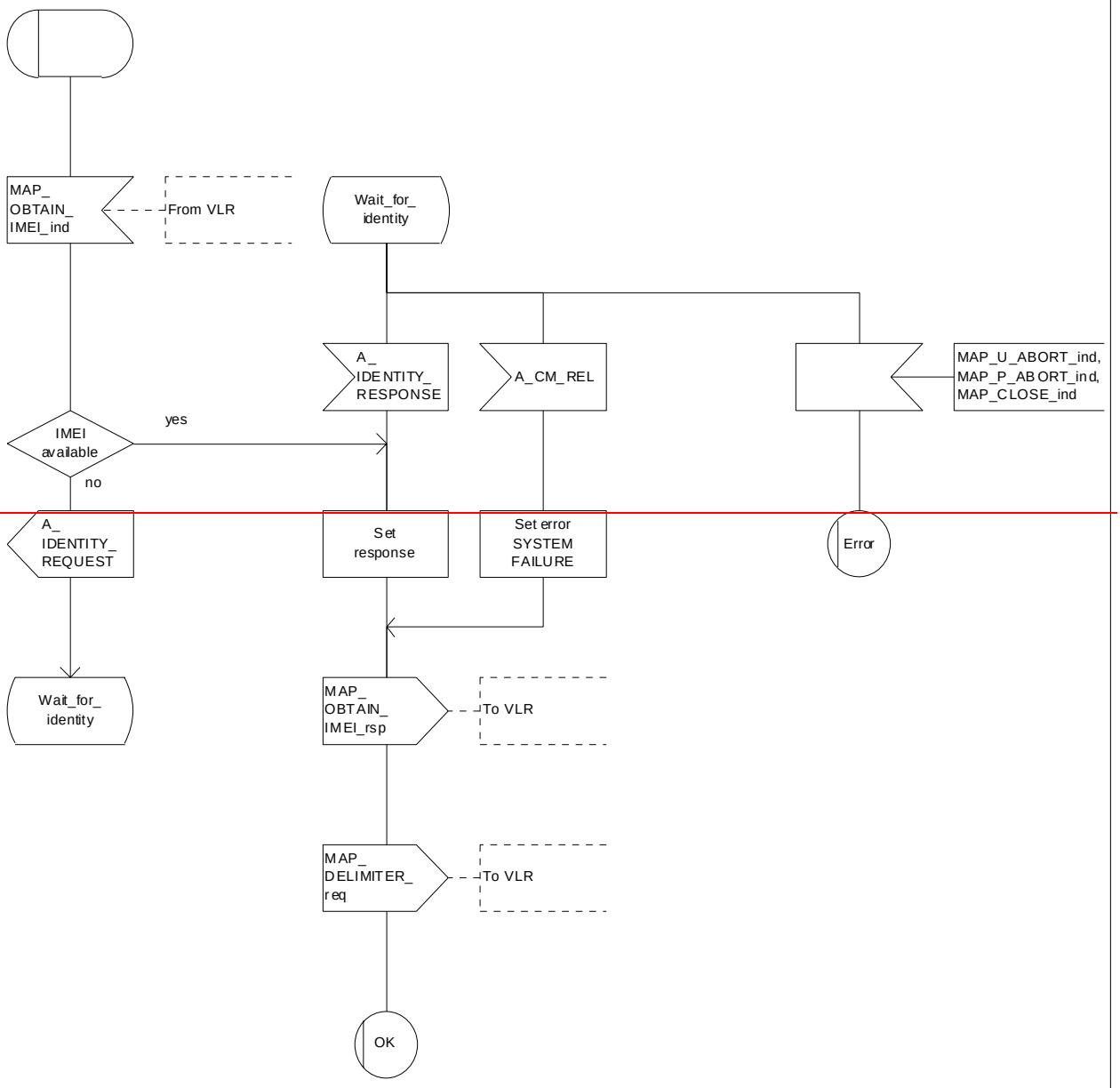


Figure 25.6/43: Process Check_IMEI_EIR

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



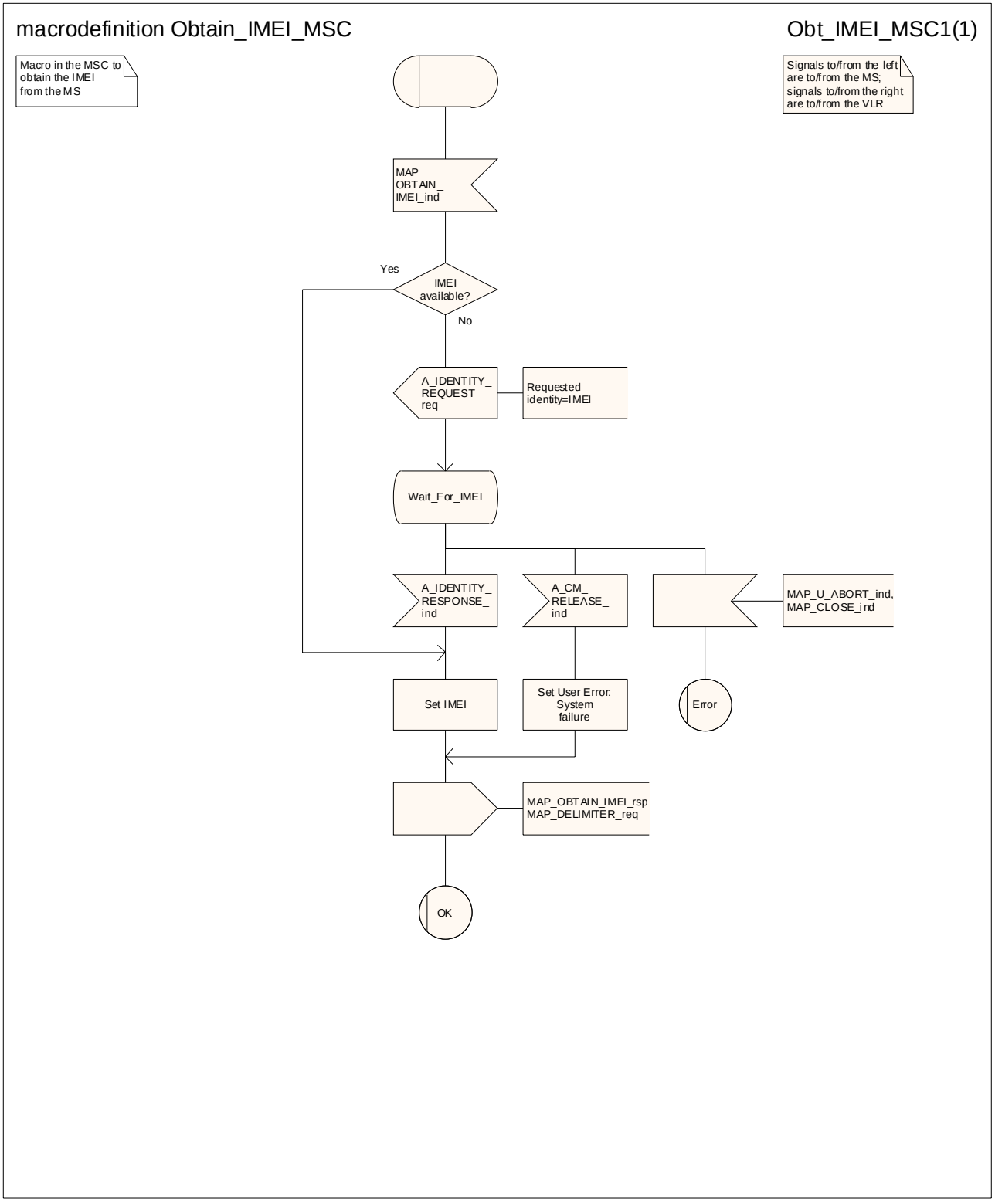
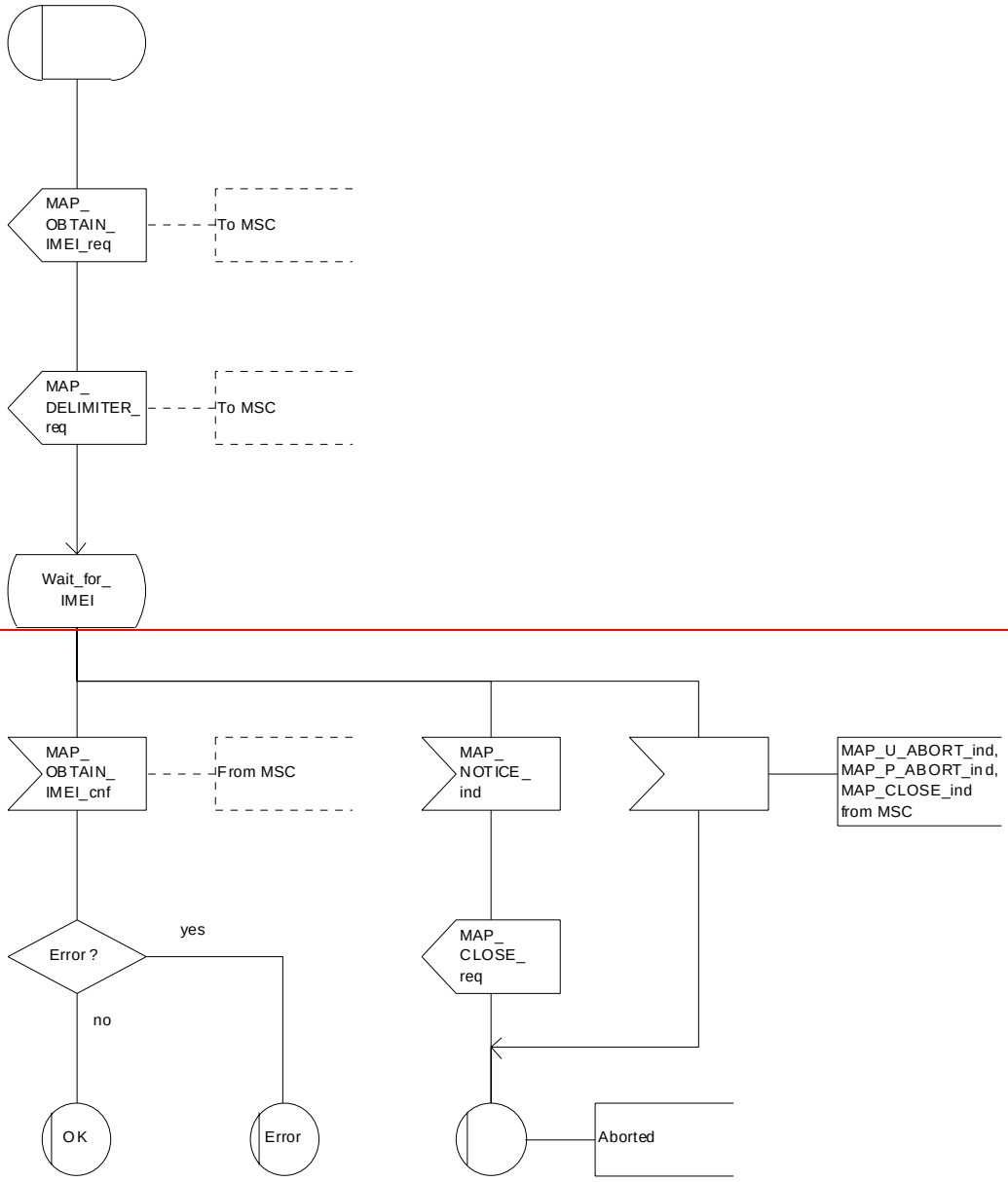


Figure 25.6/54: ~~Process~~ Macro Obtain_IMEI_MSC

Macrodefinition Obtain_IMEI_VLR 25.6_5(1)

Figure 25.6/5: Obtain IMEI macro in the VLR, controlling the request towards the MSC



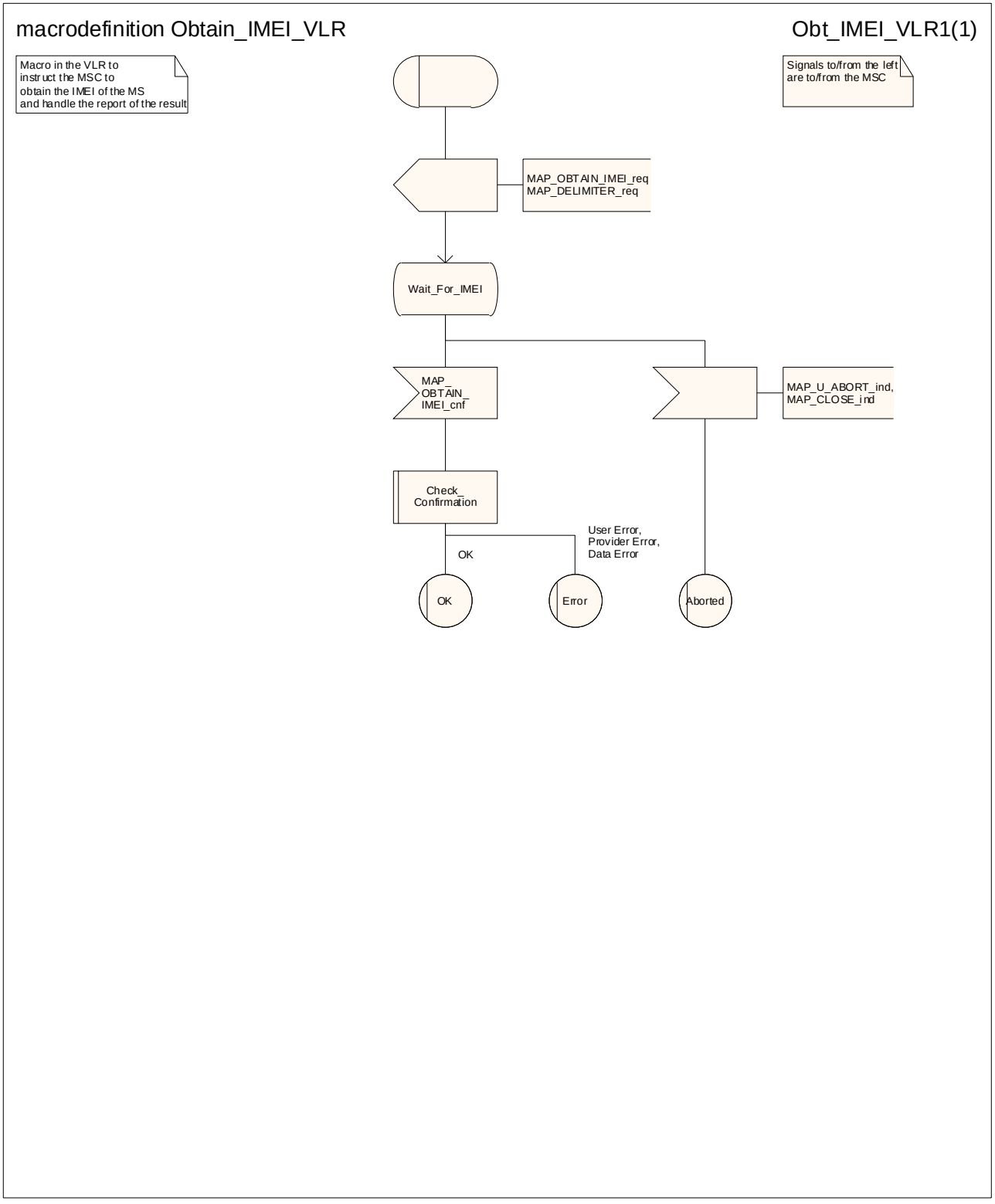


Figure 25.6/6~~5~~: ~~Process~~ Macro Obtain_IMEI_VLR

~~25.6.6 Process Check_IMEI_SGSN~~

***** CR editor's note: This text has been moved to come immediately after the text for the macro Check_IMEI_VLR. *****

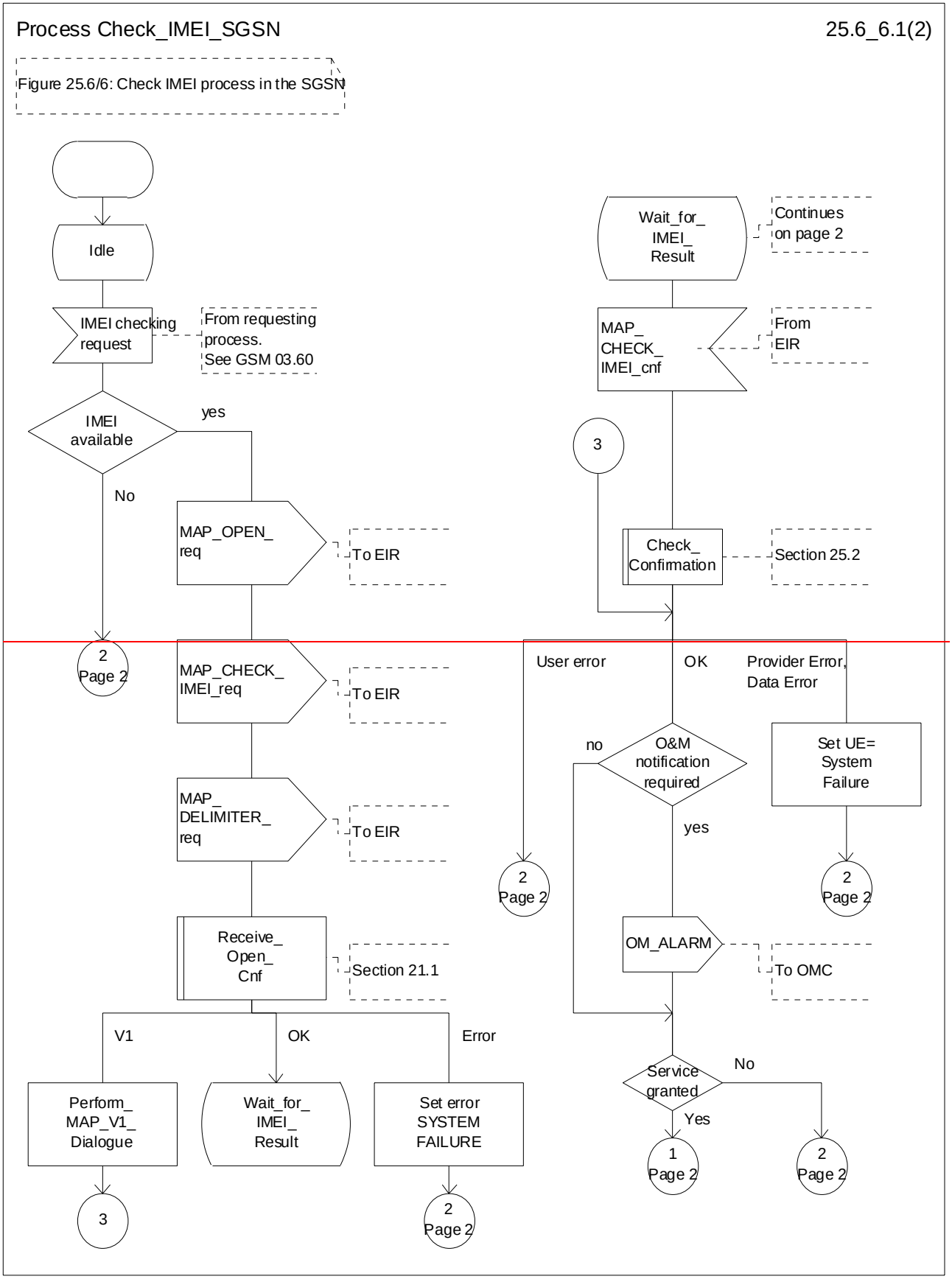
~~This process is used by the SGSN to control the check of a mobile equipment's IMEI. The process proceeds as follows:~~

- ~~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;~~

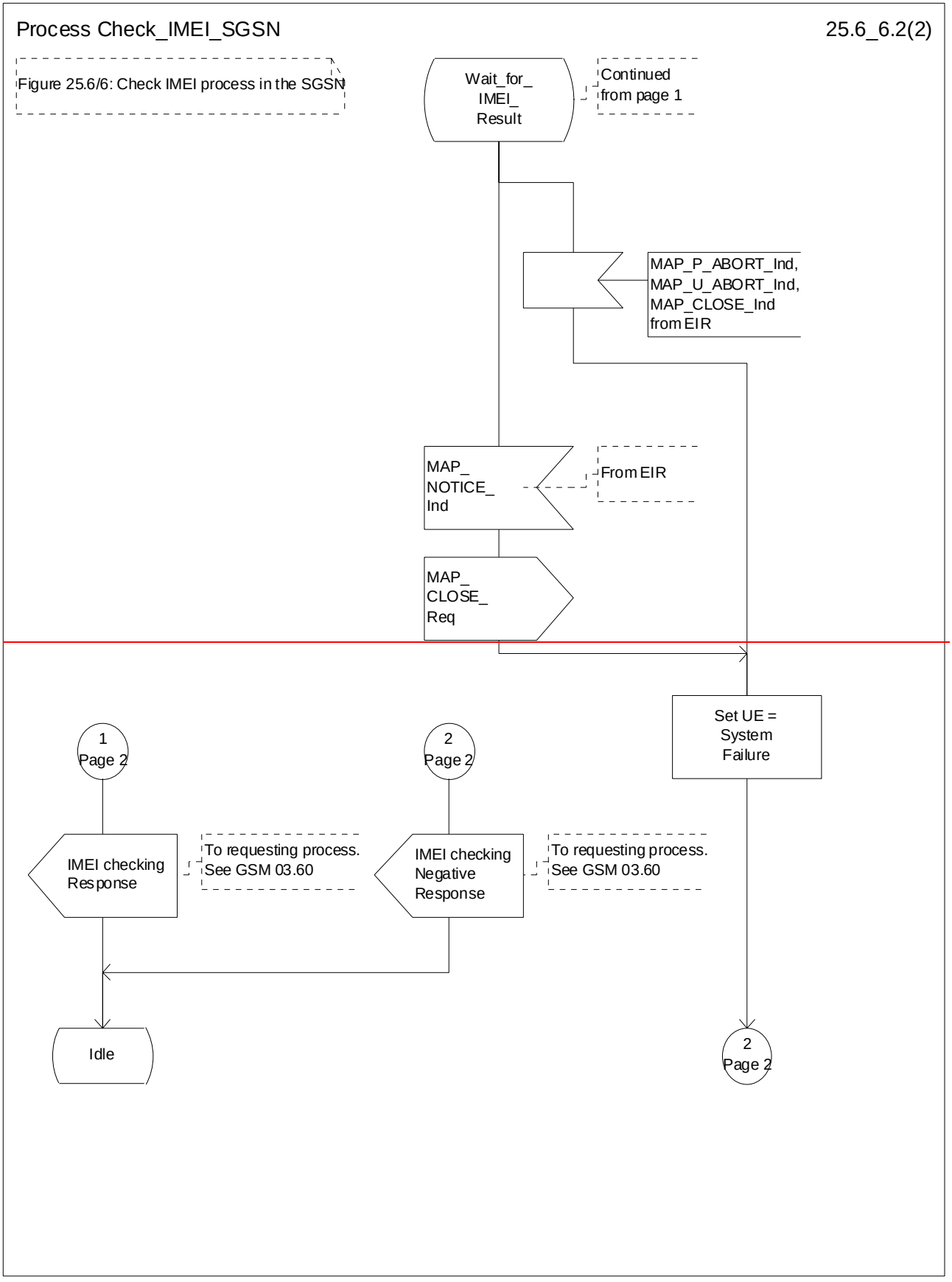
~~If the dialogue with the EIR drops back to version 1, the result or error returned by the EIR is checked. The use of the "Check_Confirmation" macro in the SDL diagram indicates that the checks carried out on the result returned by the EIR in a MAP v1 dialogue are functionally equivalent to those carried 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.~~

*****CR editor's note: The SDL diagram for the process Check_IMEI_SGSN has been moved to come immediately after the SDL diagram for the macro Check_IMEI_VLR. *****



~~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 and processes

***** CR editor's note: the (reduced!) text for each of the macros and processes in this subclause has been grouped together, with the SDL diagrams grouped together afterwards. The subclauses have also been re-ordered, to give the sequence: VLR behaviour, SGSN behaviour, HLR behaviour. *****

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 in the VLR 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.~~

25.7.2 Macro Insert_Subs_Data_SGSN

This macro is used by any procedure in the SGSN that triggers the reception of subscriber data (e.g. Update GPRS Location).

25.7.3 Process Insert_Subs_Data_Stand_Alone_HLR

This process is used by the HLR to transfer subscriber data from the HLR to the VLR in a stand alone mode, i.e. in a separate 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 the VLR.

Sheet 1: The HLR may wait for each MAP_INSERT_SUBSCRIBER_DATA request to be acknowledged before it sends the next request, or it may handle the requests and the confirmations in parallel.

Sheet 1, sheet 2: If the VLR has indicated that it does not support a service or feature (e.g. Closed User Group or Advice Of Charge Charging Level) which the HLR operator regards as essential for the subscriber, the macro Wait_for_Insert_Subs_Data_Cnf takes the Replace_Service exit; the HLR sets the Roaming Restriction Due To Unsupported Feature flag to roaming restricted and sends Roaming Restriction Due To Unsupported Feature in a subsequent MAP_INSERT_SUBSCRIBER_DATA request.

Sheet 1, sheet 2: If the HLR operator does not regard the unsupported service or feature as essential for the subscriber but the macro Wait_for_Insert_Subs_Data_Cnf takes the Replace_Service exit, the HLR sends the data for a replacement service in a subsequent MAP_INSERT_SUBSCRIBER_DATA request.

Sheet 2: It is an operator option whether to repeat the download of subscriber data if the VLR returns an error response. The number of repeat attempts and the interval between them is also an operator option, depending on the error response from the VLR.

If subscriber data for CAMEL Phase 2 or later services are sent to a VLR which does not support the appropriate phase of CAMEL, the service behaviour may be unpredictable or incorrect. The HLR should therefore ensure that at the conclusion of a stand alone Insert Subscriber data procedure the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in 3GPP TS 23.078 [98].

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2 or later. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only if the HLR previously received confirmation from the VLR at Location Update that CAMEL Phase 2 or later is supported.

25.7.4 Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

This process is used by the HLR to transfer subscriber data from the HLR to the SGSN in a stand alone mode, i.e. in a separate 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 the SGSN.

Sheet 1: The HLR may wait for each MAP_INSERT_SUBSCRIBER_DATA request to be acknowledged before it sends the next request, or it may handle the requests and the confirmations in parallel.

Sheet 1, sheet 2: If the SGSN has indicated that it does not support a service or feature which the HLR operator regards as essential for the subscriber, the macro Wait_for_Insert_GPRS_Subs_Data_Cnf takes the Replace_Service exit; the HLR sets the Roaming Restricted In SGSN Due To Unsupported Feature flag to roaming restricted and sends Roaming Restricted In SGSN Due To Unsupported Feature in a subsequent MAP_INSERT_SUBSCRIBER_DATA request.

Sheet 1, sheet 2: If the HLR operator does not regard the unsupported service or feature as essential for the subscriber but the macro Wait_for_Insert_GPRS_Subs_Data_Cnf takes the Replace_Service exit, the HLR sends the data for a replacement service in a subsequent MAP_INSERT_SUBSCRIBER_DATA request.

Sheet 2: It is an operator option whether to repeat the download of subscriber data if the SGSN returns an error response. The number of repeat attempts and the interval between them is also an operator option, depending on the error response from the SGSN.

25.7.5 Macro Wait_for_Insert_Subs_Data_Cnf

This macro is used by any process or macro that describes the handling in the HLR of the transfer of subscriber data to the VLR (e.g. Update Location or Restore Data).

25.7.6 Macro Wait_for_Insert_GPRS_Subs_Data_Cnf

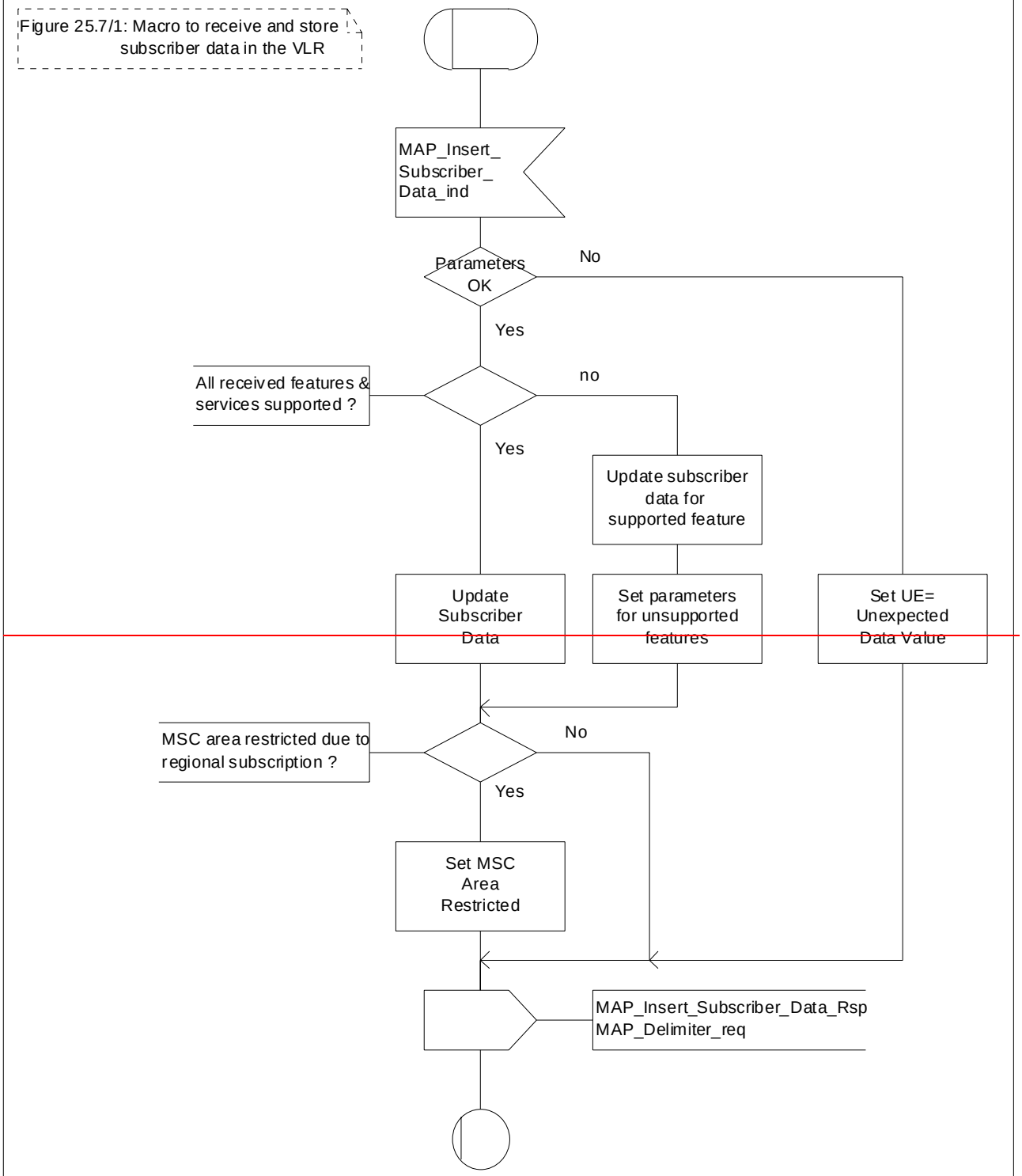
This macro is used by any process or macro that describes the handling in the HLR of the transfer of subscriber data to the SGSN (e.g. Update GPRS Location).

25.7.7 Process Send_Insert_Subs_Data

This process is used by any process or macro in the HLR where a MAP_INSERT_SUBSCRIBER_DATA request is sent to the VLR or to the SGSN.

Macrodefinition Insert_Subs_Data_VLR 25.7_1(1)

Figure 25.7/1: Macro to receive and store subscriber data in the VLR



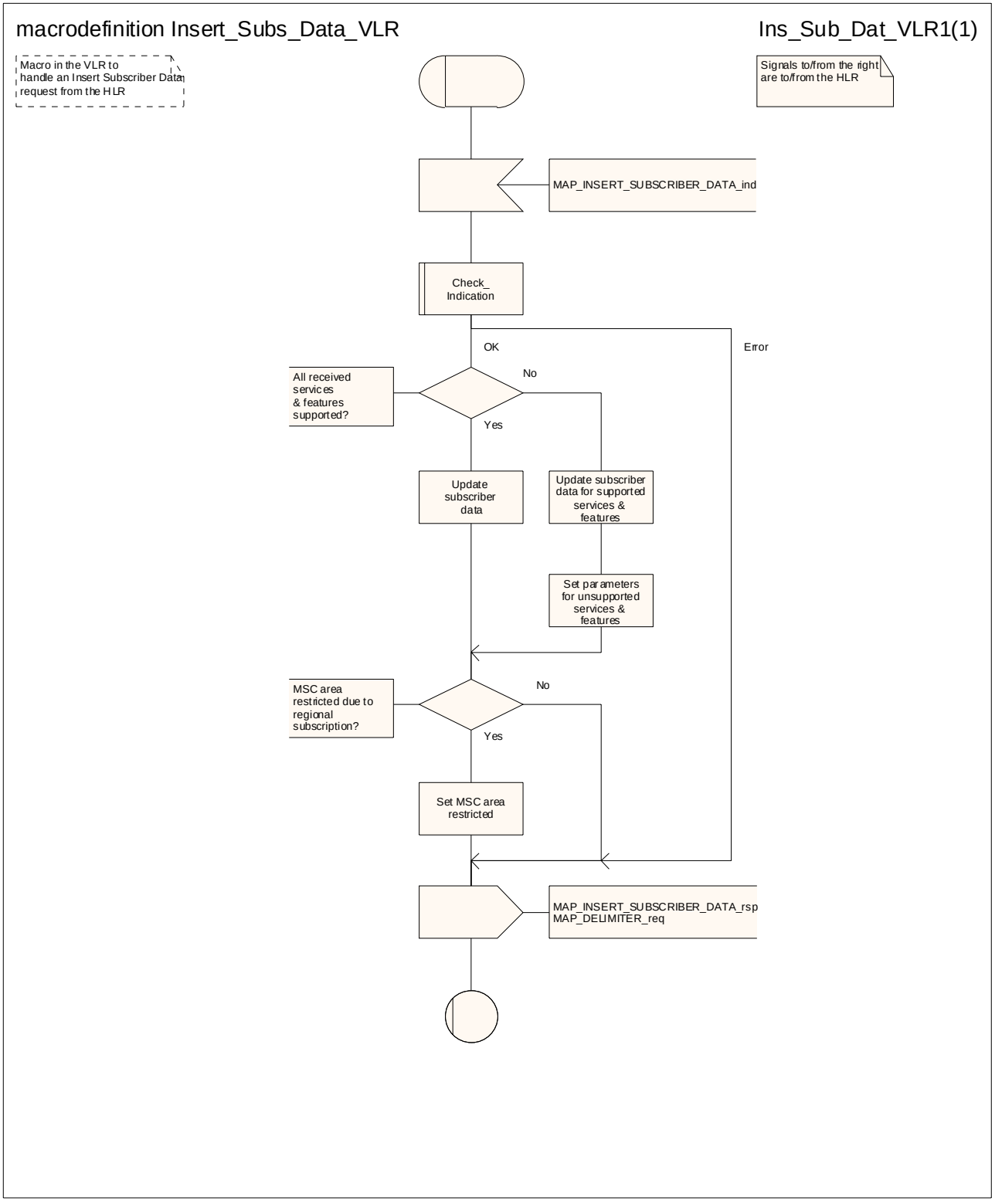


Figure 25.7/1: Macro Insert_Subs_Data_VLR

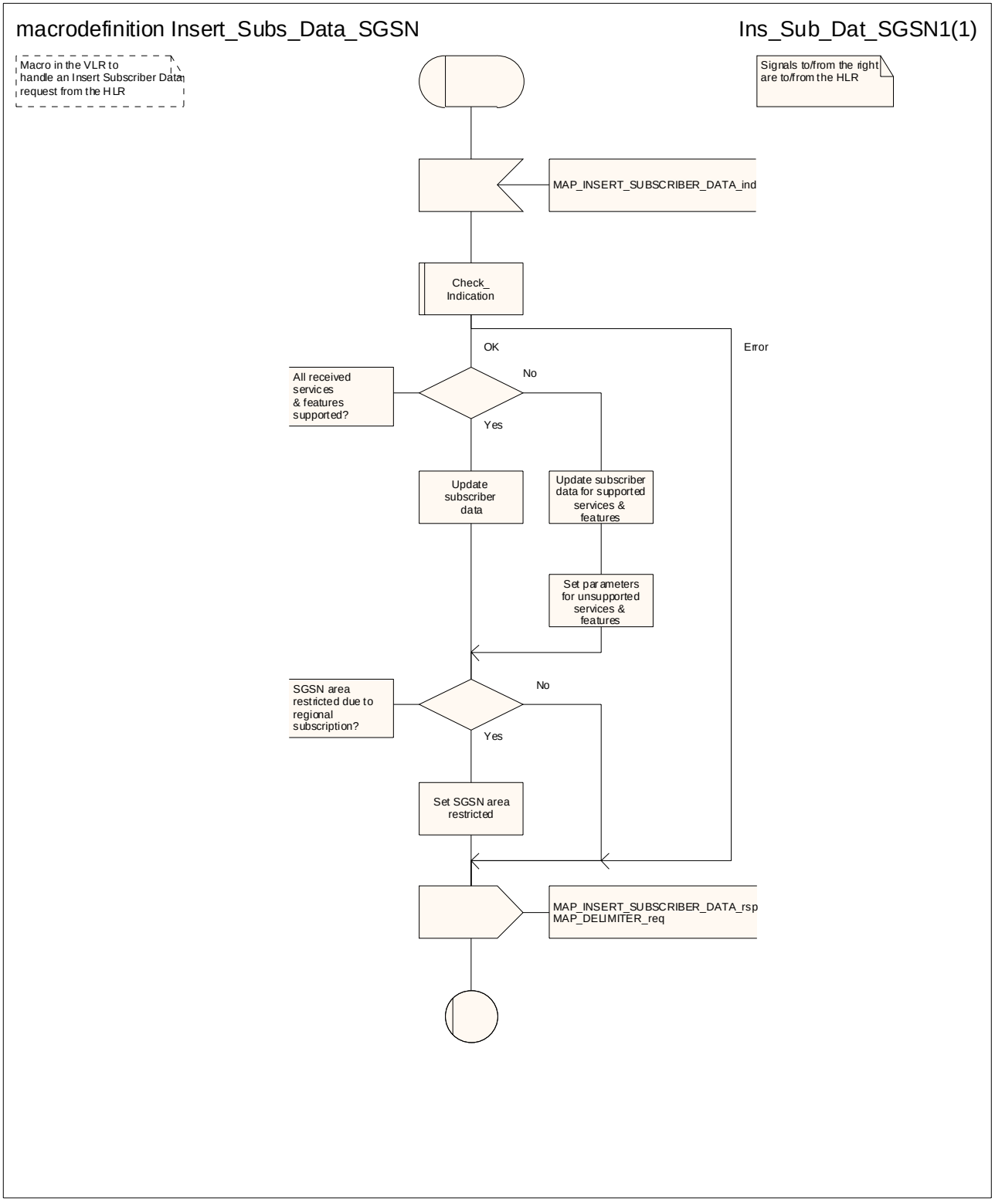


Figure 25.7/2: Macro Insert_Subs_Data_SGSN

25.7.2 Process Insert_Subs_Data_Stand_Alone_HLR

***** CR editor's note: (The reduced version of) this text is now subclauses 25.7.3 & 25.7.4; it is grouped with the text of the other subclauses of 25.7. *****

This process is used by HLR to transfer subscriber data to VLR or to SGSN in a stand alone mode, i.e. in its own dialogue. This is done whenever a change of subscriber data is performed either by the operator or by the subscriber and this change has to be reported to VLR or to SGSN.

The process, after opening the dialogue with VLR or with SGSN, sends as many requests of the InsertSubscriberData service as necessary to transfer the subscriber data. The call to the process "Send_Insert_Subs_Data" (see clause 25.7.4) is meant to describe two possible behaviours of the HLR when more than one service request has to be sent:

- either the HLR handles the requests and the confirmations in parallel; or
- the HLR sends every request after receiving the confirmation to the previous one.

The macros "Wait_for_Insert_Subs_Data_Cnf" and "Wait_for_Insert_GPRS_Subs_Data_Cnf" (see clauses 25.7.3 and 25.7.6) are also called in order to handle every single confirmation.

If the result of a primitive received from the VLR or from the SGSN is unsuccessful, the HLR may initiate re-attempts; the number of repeat attempts and the time in between are HLR operator options, depending on the error returned by the VLR or by the SGSN.

If certain services required for a subscriber are not supported by the VLR or by the SGSN (e.g. Advice of Charge Charging Level), this may result in one of the following outcomes:

- the HLR stores and sends "Roaming Restriction Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restriction Due To Unsupported Feature" is stored in the HLR, the "MSC Area Restricted Flag" shall be set to "restricted". This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.
- the HLR stores and sends other induced subscriber data (e.g. a specific barring program) in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. This will cause rejection of mobile originated service requests, except emergency calls.
- the HLR stores and sends "Roaming Restricted In SGSN Due To Unsupported Feature" in a subsequent MAP_INSERT_SUBSCRIBER_DATA service. If "Roaming Restricted In SGSN Due To Unsupported Feature" is stored in the HLR, the "SGSN Area Restricted Flag" shall be set to "restricted". This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP Context activation.

When the VLR receives regional subscription data (Zone Code List) it may respond with "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "MSC Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT calls, MT SM and MT USSD from being forwarded to the MSC/VLR.

When the SGSN receives regional subscription data (Zone Code List) it may respond with "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response. In this case the "SGSN Area Restricted Flag" shall be set to "restricted" in the HLR. This will prevent MT SM from being forwarded to the SGSN and Network Requested PDP Context activation.

If subscriber data for CAMEL Phase 2 or 3 services are sent to a VLR which does not support CAMEL Phase 2 or 3, the service behaviour may be unpredictable or incorrect. The HLR therefore needs to ensure that at the conclusion of a stand alone Insert Subscriber data procedure that the data in the VLR do not require a capability that the VLR does not have. Possible mechanisms to ensure this are described in 3GPP TS 23.078.

The HLR should send a Forwarded-to number which is not in E.164 international format to the VLR only when the HLR has ascertained that the VLR supports CAMEL Phase 2 or 3. Thus, the ISD message containing the Forwarded-to number which is not in E.164 international format shall be sent to the VLR only if the HLR previously received confirmation from the VLR at Location Update that CAMEL Phase 2 or 3 is supported.

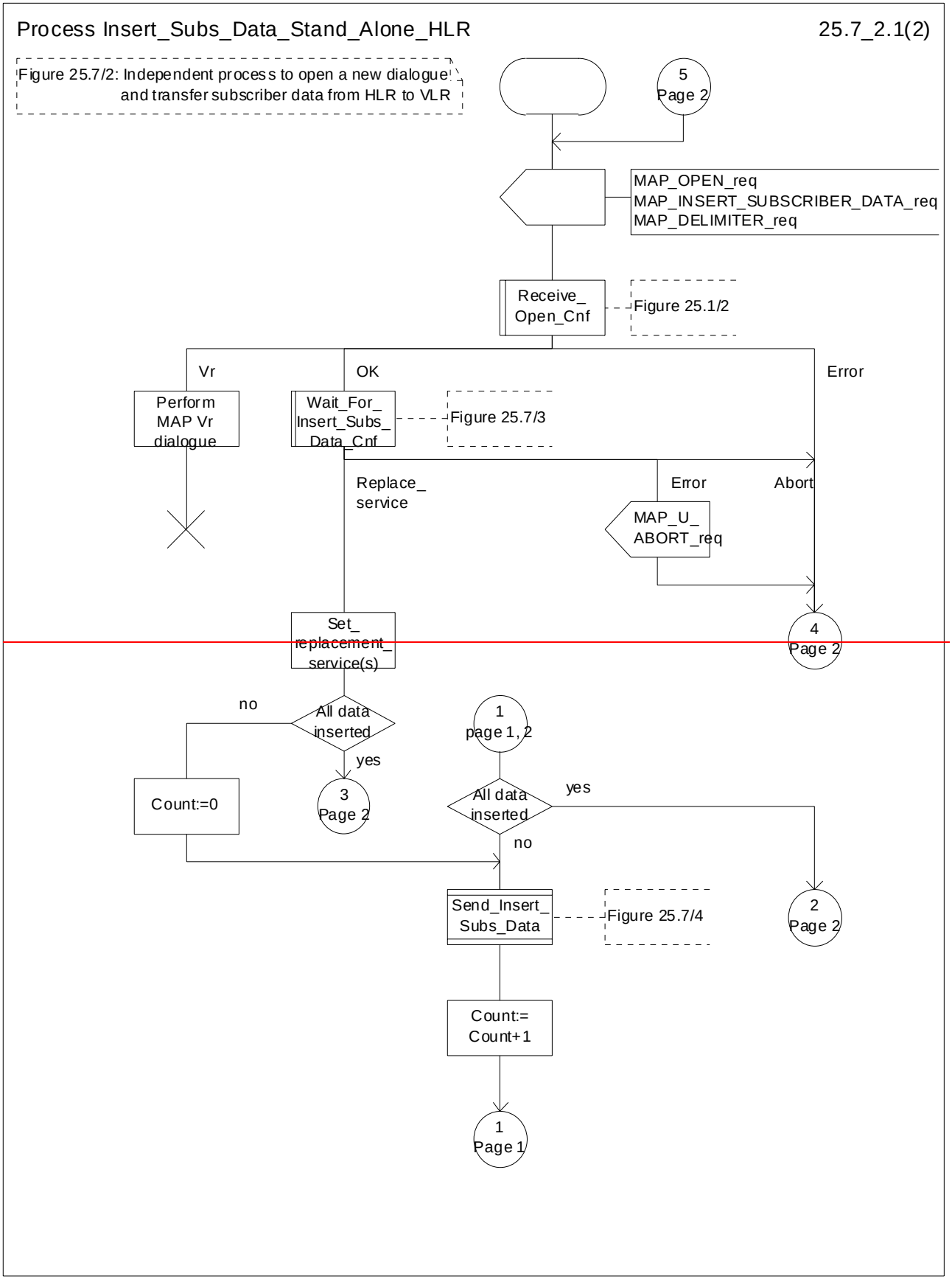
A Forwarded-to number in non-international E.164 format shall only be sent from an HLR to a VLR if the VLR supports CAMEL Phase 2, or a subsequent version of CAMEL.

~~If the HLR does not store "Roaming Restriction Due To Unsupported Feature" as a consequence of the stand alone Insert Subscriber Data procedure and the HLR does not receive "MSC Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response and "Roaming Restriction Due To Unsupported Feature" has not been stored in the HLR in the course of a previous subscriber data retrieval procedure, the "MSC Area Restricted Flag" in the HLR shall be set to "not restricted".~~

~~If the HLR does not store "Roaming Restricted In SGSN Due To Unsupported Feature" as a consequence of the stand alone Insert Subscriber Data procedure and the HLR does not receive "SGSN Area Restricted" in the MAP_INSERT_SUBSCRIBER_DATA response and "Roaming Restricted In SGSN Due To Unsupported Feature" has not been stored in the HLR in the course of a previous subscriber data retrieval procedure, the "SGSN Area Restricted Flag" in the HLR shall be set to "not restricted".~~

~~The SDL diagram of process between HLR and VLR is shown in figure 25.7/2;~~

~~The SDL diagram of process between HLR and SGSN is shown in figure 25.7/5.~~


Process Insert_Subs_Data_Stand_Alone_HLR
25.7_2.1(2)
Figure 25.7/2: Independent process to open a new dialogue and transfer subscriber data from HLR to VLR
5 Page 2
MAP_OPEN_req
MAP_INSERT_SUBSCRIBER_DATA_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Figure 25.1/2
Vr
OK
Error
Perform MAP Vr dialogue
Wait_For_ Insert_Subs_ Data_Cnf
Figure 25.7/3
Replace_ service
Error
Abort
MAP_U_ ABORT_req
4 Page 2
Set_ replacement_ service(s)
no
All data inserted
yes
Count:=0
3 Page 2
1 page 1, 2
All data inserted
yes
no
Send_Insert_ Subs_Data
Figure 25.7/4
2 Page 2
Count:= Count+1
1 Page 1

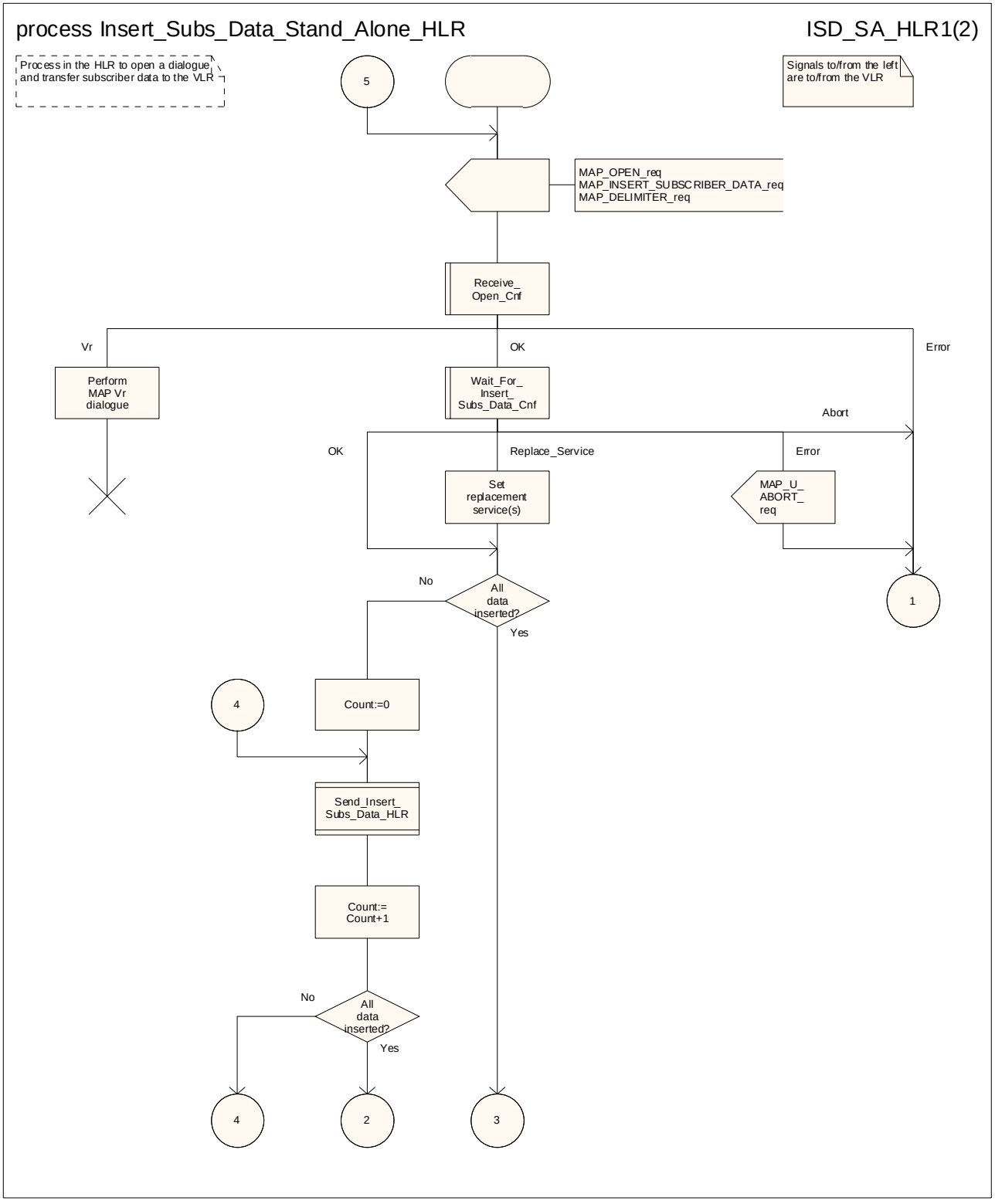
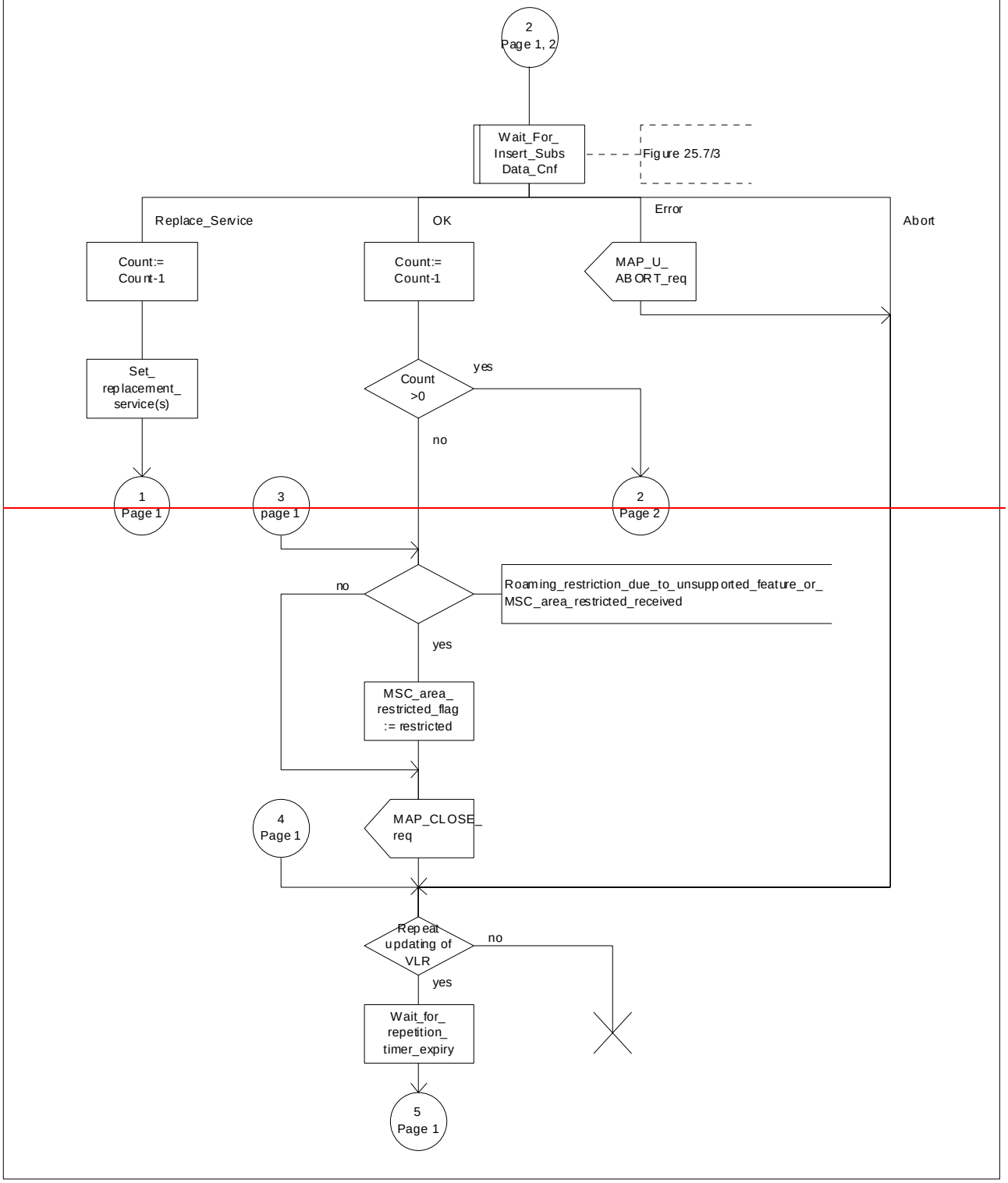


Figure 25.7/32 (sheet 1 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

Process Insert_Subs_Data_Stand_Alone_HLR 25.7_2.2(2)

Figure 25.7/2: Independent process to open a new dialogue and transfer subscriber data from HLR to VLR



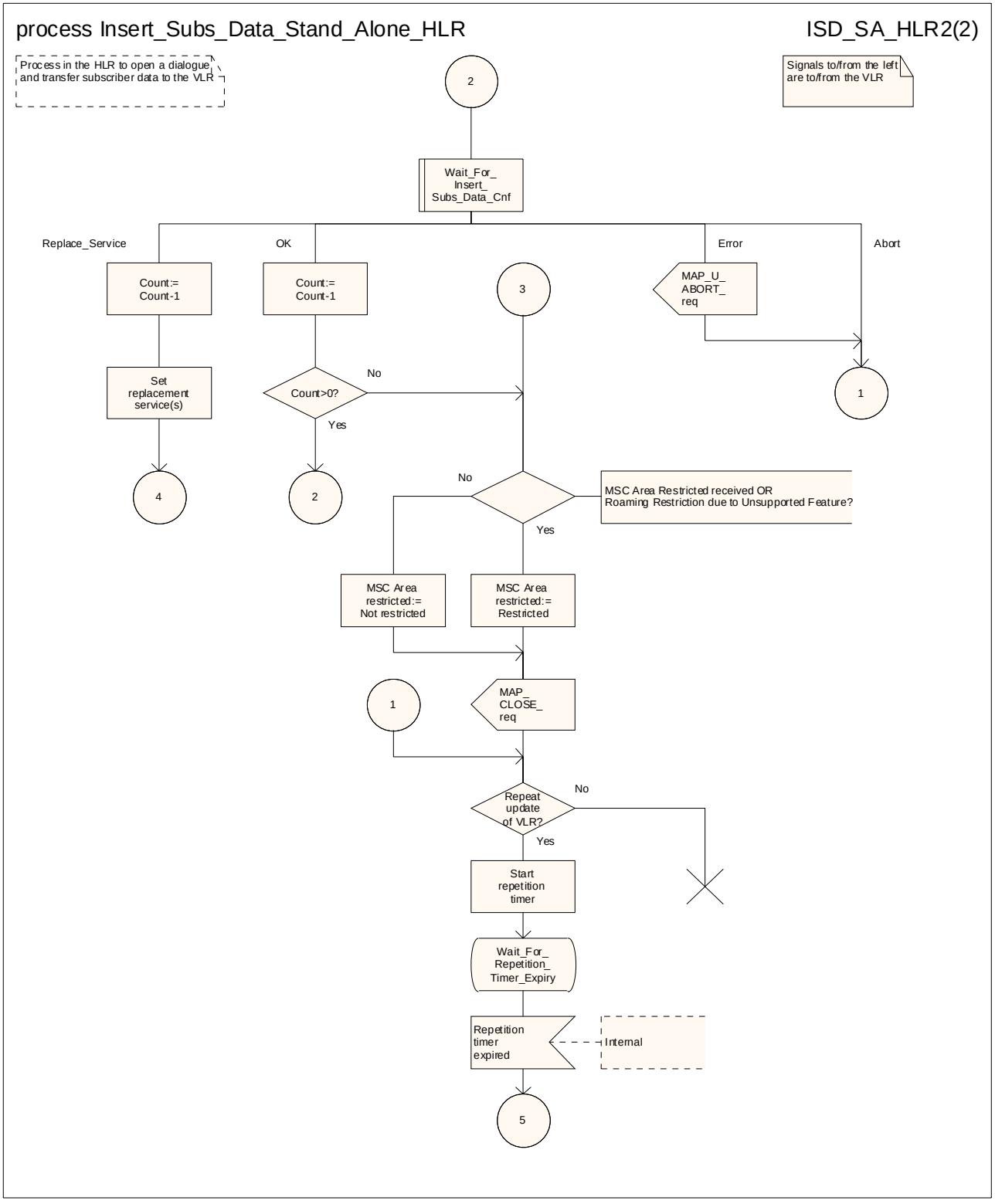
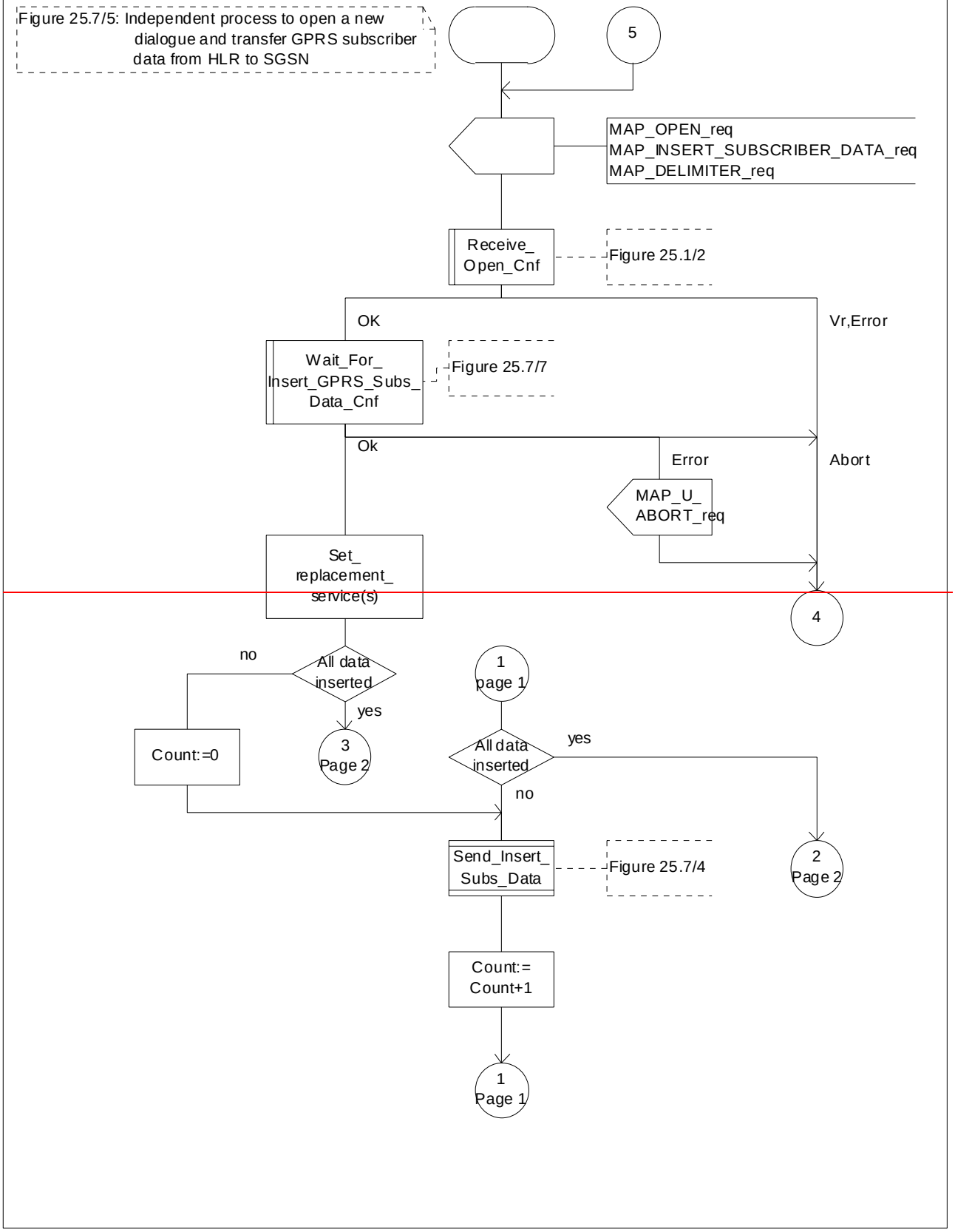


Figure 25.7/32 (sheet 2 of 2): Process Insert_Subs_Data_Stand_Alone_HLR

Process Insert_GPRS_Subs_Data_Stand_Alone_HLR 25.7_5.1(2)

Figure 25.7/5: Independent process to open a new dialogue and transfer GPRS subscriber data from HLR to SGSN



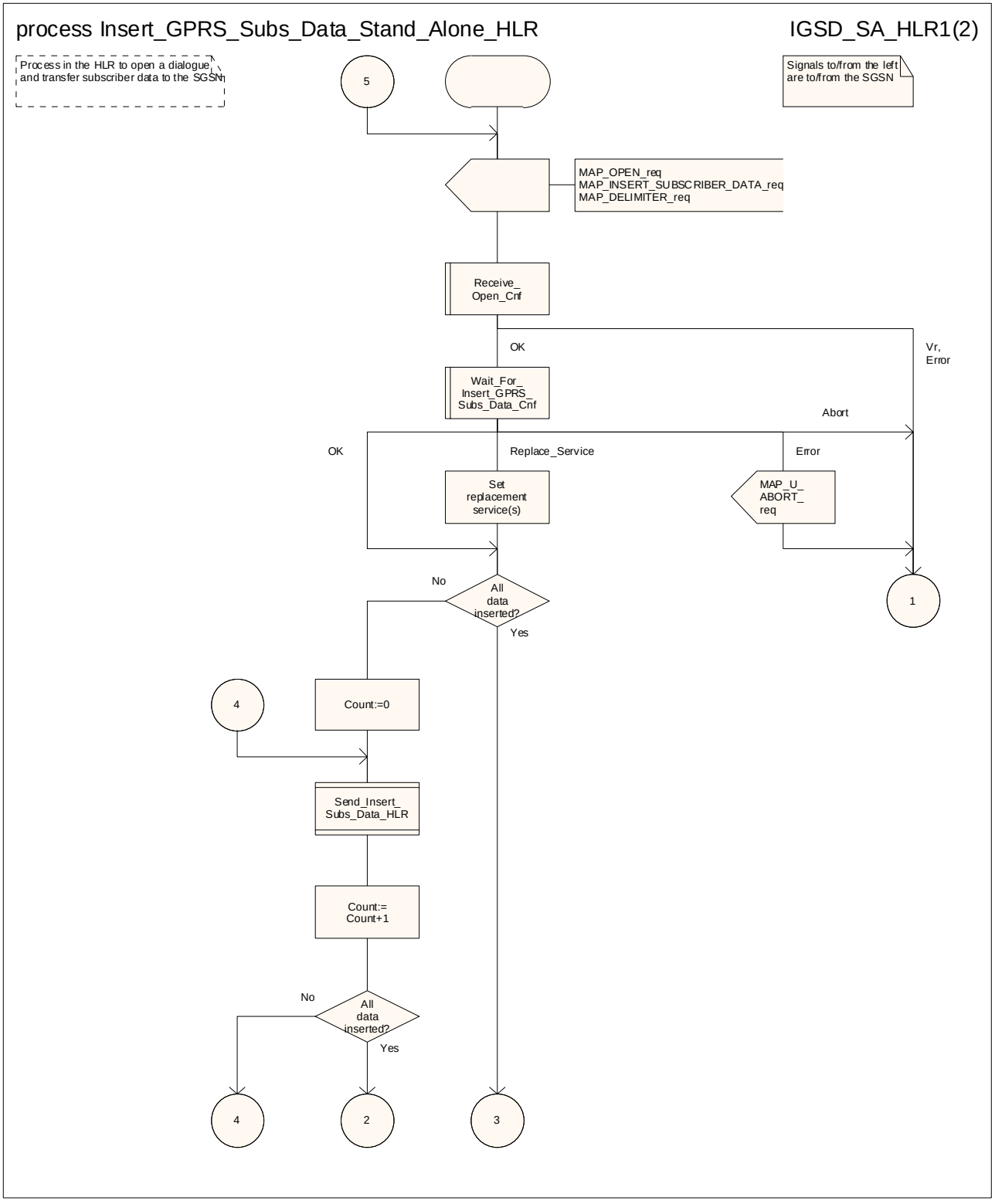
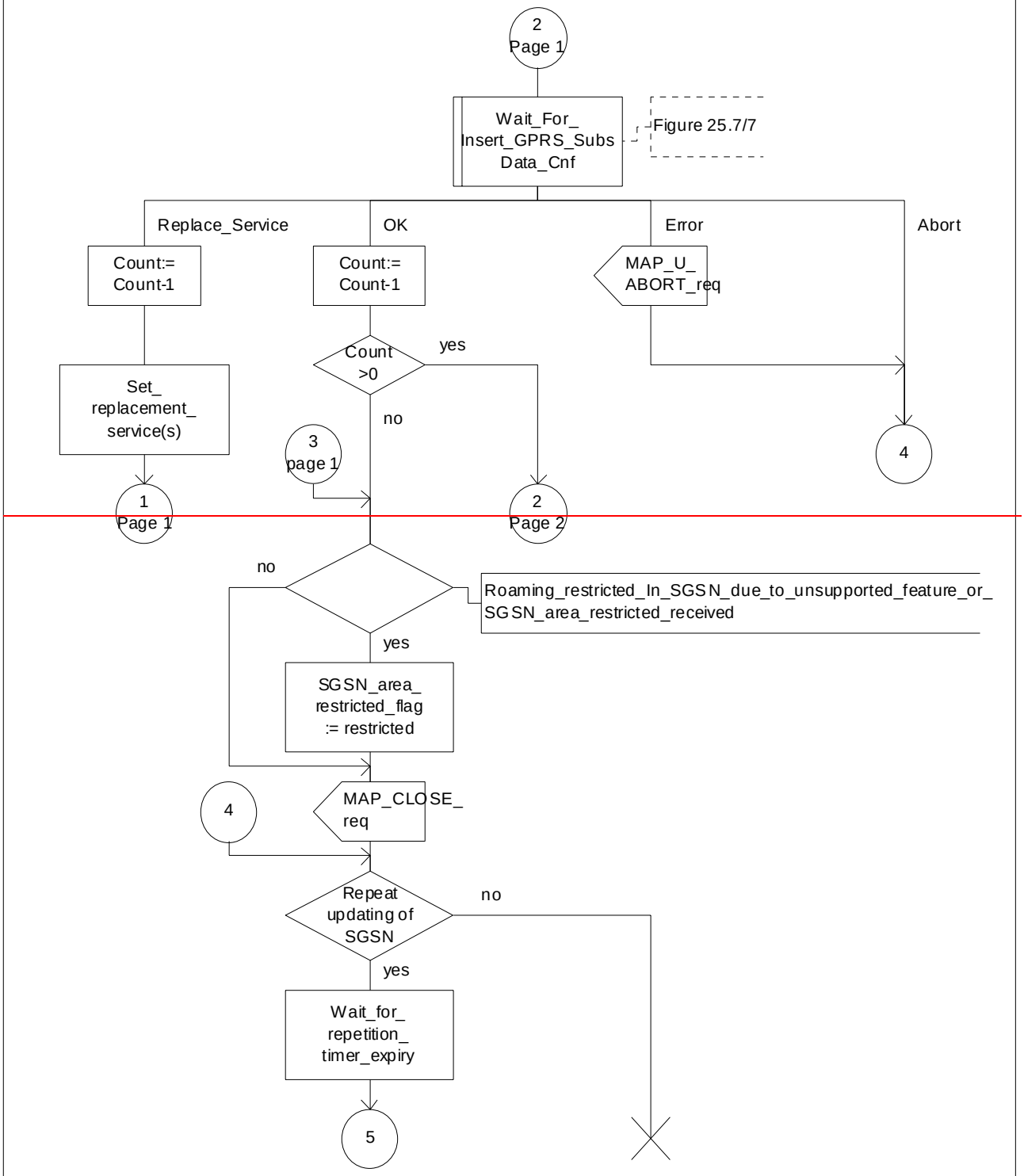
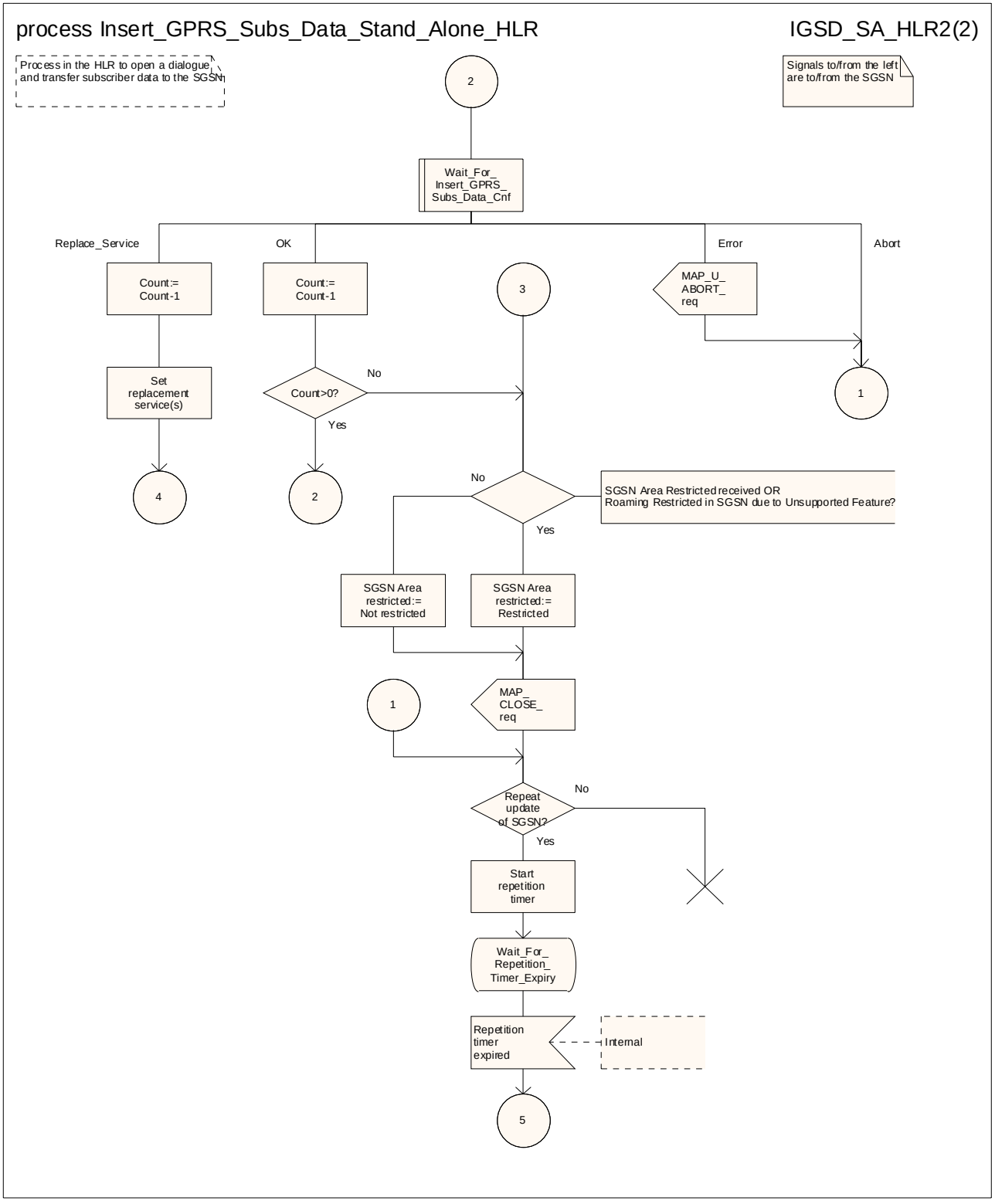


Figure 25.7/45 (sheet 1 of 2): Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

Process Insert_GPRS_Subs_Data_Stand_Alone_HLR 25.7_5.2(2)

Figure 25.7/5: Independent process to open a new dialogue and transfer GPRS subscriber data from HLR to SGSN




process Insert_GPRS_Subs_Data_Stand_Alone_HLR
IGSD_SA_HLR2(2)
Process in the HLR to open a dialogue and transfer subscriber data to the SGSN
Signals to/from the left are to/from the SGSN
2
Wait_For_ Insert_GPRS_ Subs_Data_Cnf
Replace_Service
OK
Error
Abort
Count:= Count-1
Count:= Count-1
3
MAP_U_ ABORT_ req
Set replacement service(s)
Count>0?
No
Yes
1
4
2
No
SGSN Area Restricted received OR Roaming Restricted in SGSN due to Unsupported Feature?
Yes
SGSN Area restricted:= Not restricted
SGSN Area restricted:= Restricted
1
MAP_ CLOSE_ req
Repeat update of SGSN?
No
Yes
Start repetition timer
Wait_For_ Repetition_ Timer_Expiry
Repetition timer expired
Internal
5

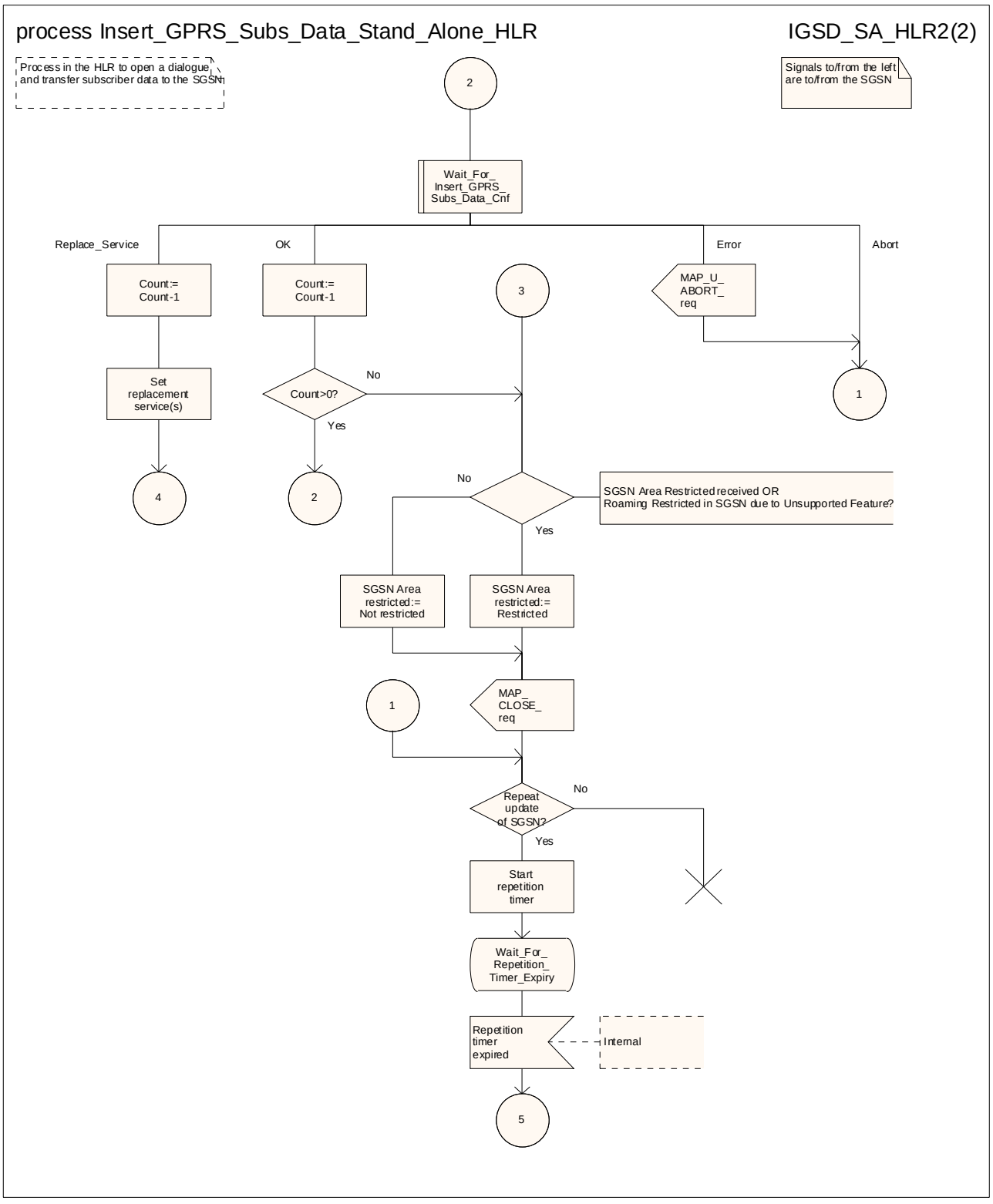


Figure 25.7/45 (sheet 2 of 2): Process Insert_GPRS_Subs_Data_Stand_Alone_HLR

~~25.7.3 Macro Wait_for_Insert_Subs_Data_Cnf~~

***** CR editor's note: (The much reduced version of) this text is now subclause 25.7.5; it is grouped with the text of the other subclauses of 25.7. *****

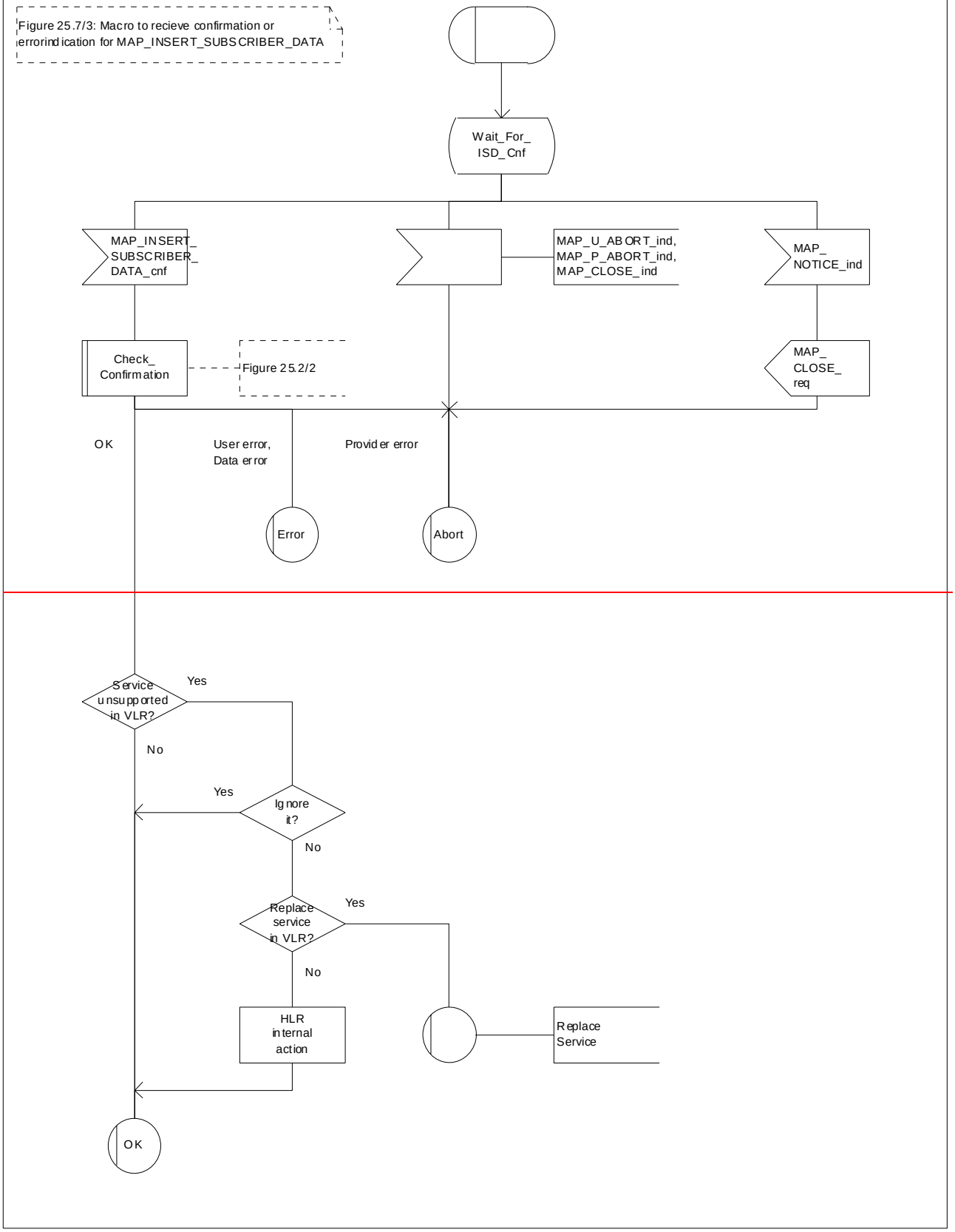
~~This macro is used by any process or macro that describes the handling of the reception of the Insert_Subscriber_Data service in HLR that is coming from VLR (e.g. Update Location or Restore Data).~~

~~If the VLR reports the non-support of some basic or supplementary service or the network feature Operator Determined Barring then three actions are possible:~~

- ~~to ignore the information received;~~
- ~~to replace the not supported service;~~
- ~~or to perform any other internal action.~~

~~The SDL diagram is shown in figure 25.7/3.~~

Macrodefinition Wait_For_Insert_Subs_Data_Cnf 25.7_3(1)



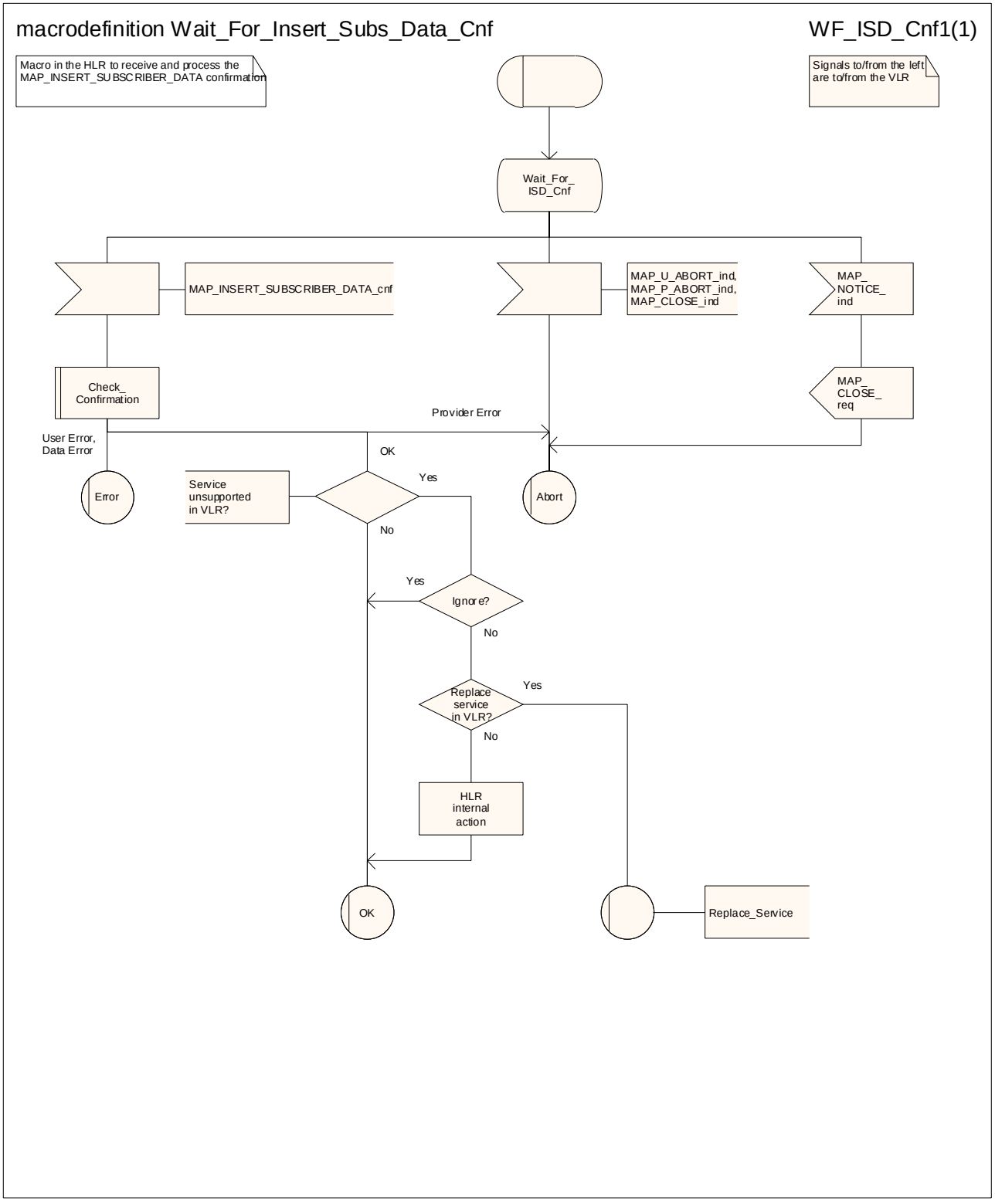


Figure 25.7/5~~3~~: Macro Wait_for_Insert_Subs_Data_Cnf

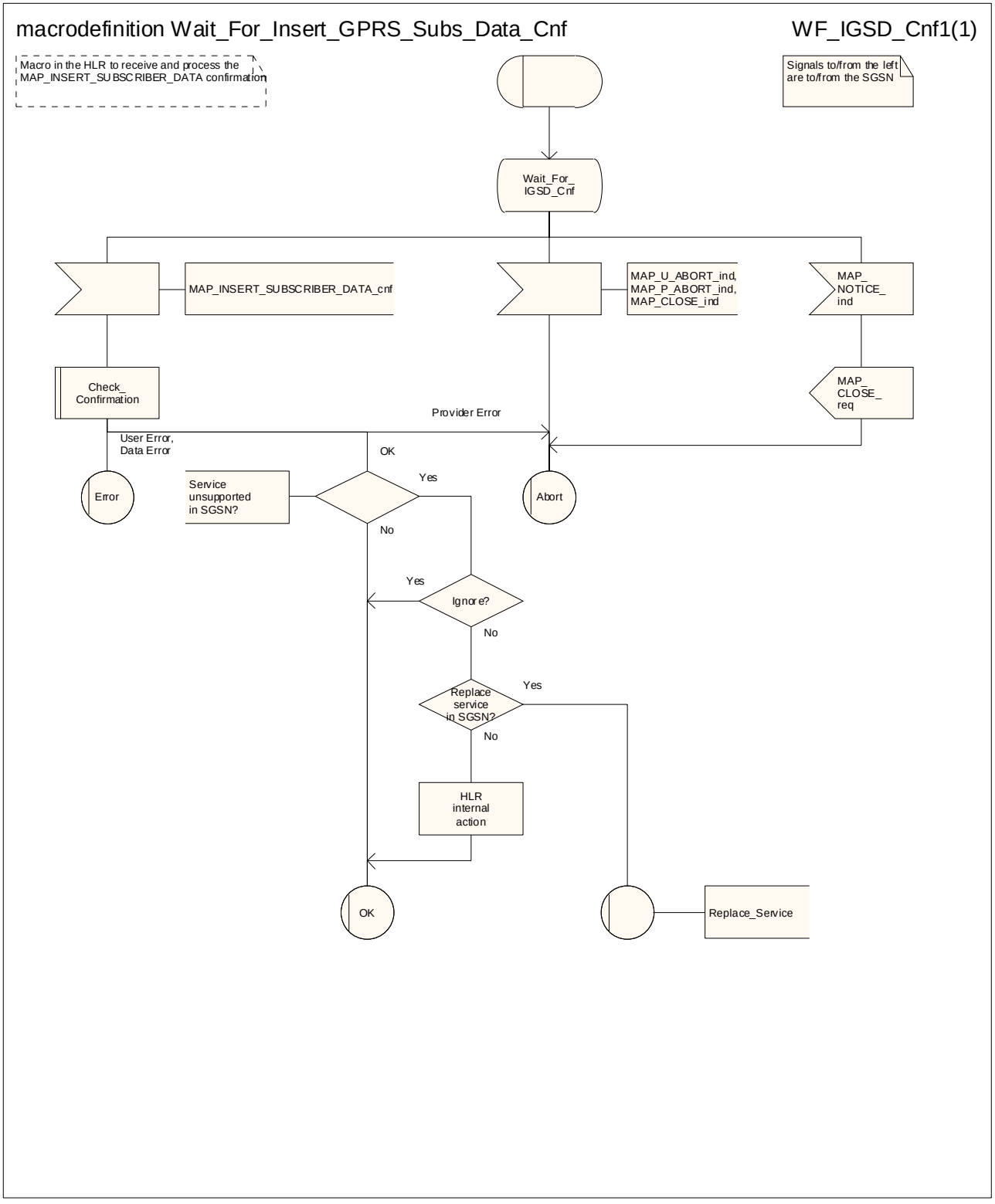


Figure 25.7/6: Macro Wait_for_Insert_GPRS_Subs_Data_Cnf

~~25.7.4 Process Send_Insert_Subs_Data~~

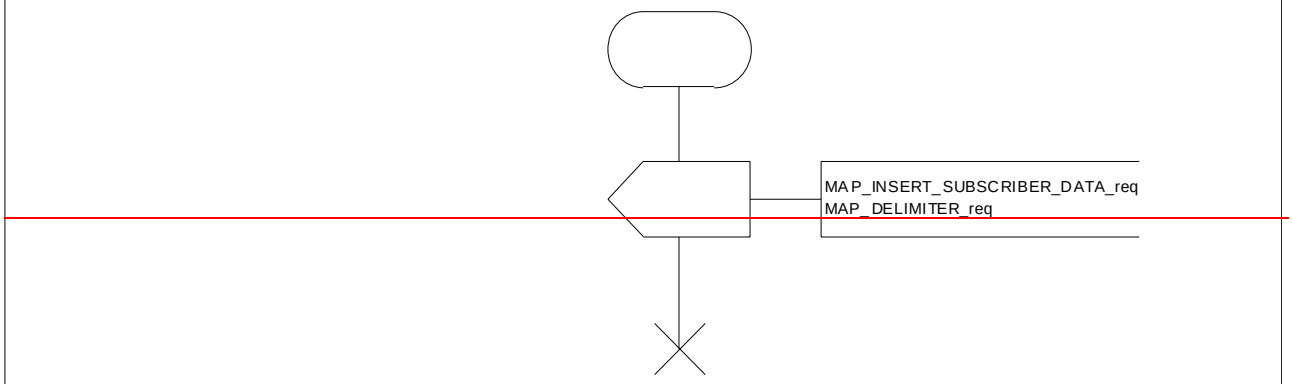
***** CR editor's note: (The much reduced version of) this text is now subclause 25.7.7; it is grouped with the text of the other subclauses of 25.7. *****

~~This process is used by any process or macro where the Insert_Subscriber_Data request is sent to VLR or to SGSN.~~

~~The SDL diagram is shown in figure 25.7/4.~~

Process Send_Insert_Subs_Data 25.7_4(1)

Figure 25.7/4: Independent process to send a component of subscriber data from HLR to VLR



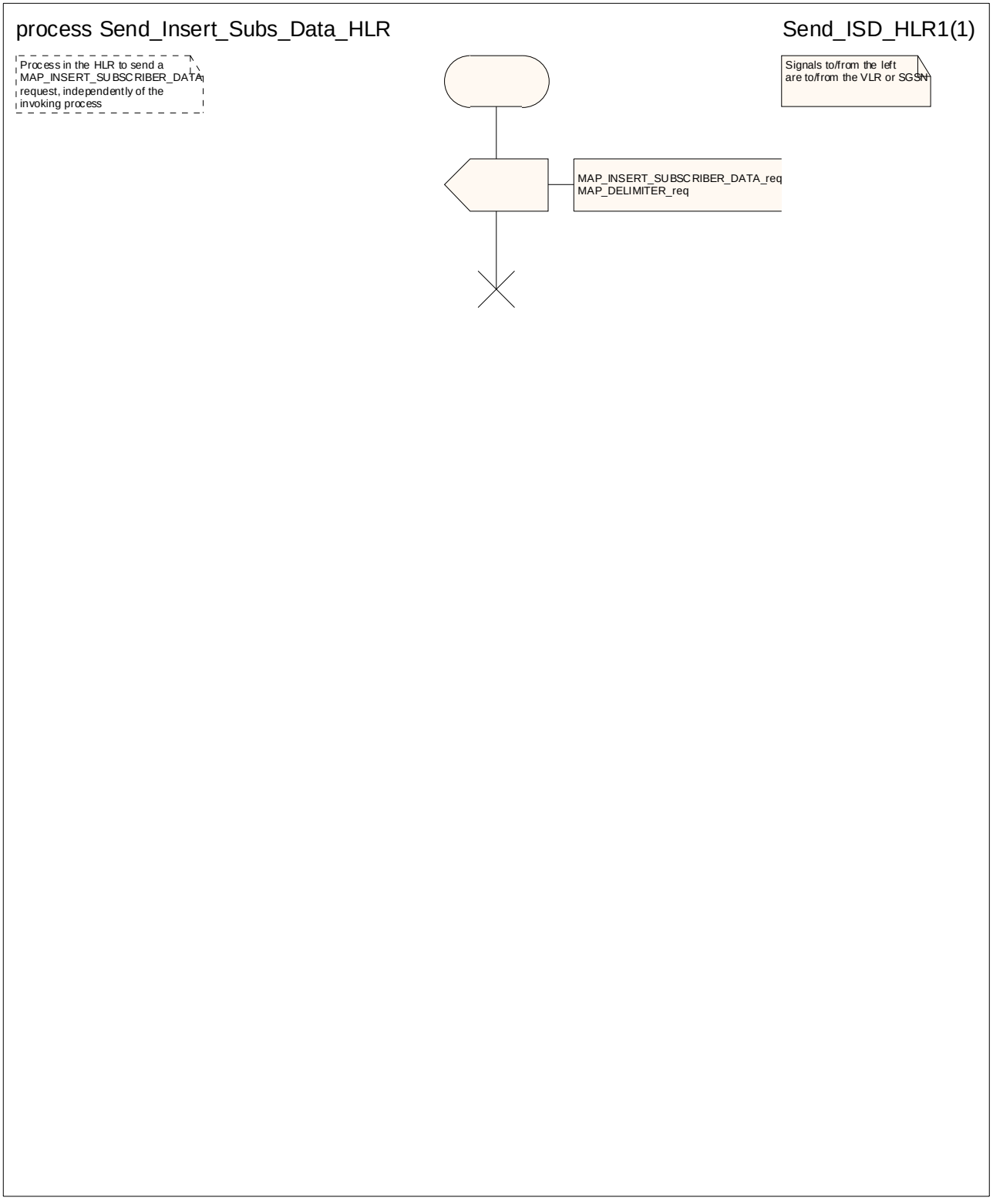


Figure 25.7/74: Process Send_Insert_Subs_Data

~~25.7.5 Macro Insert_Subs_Data_SGSN~~

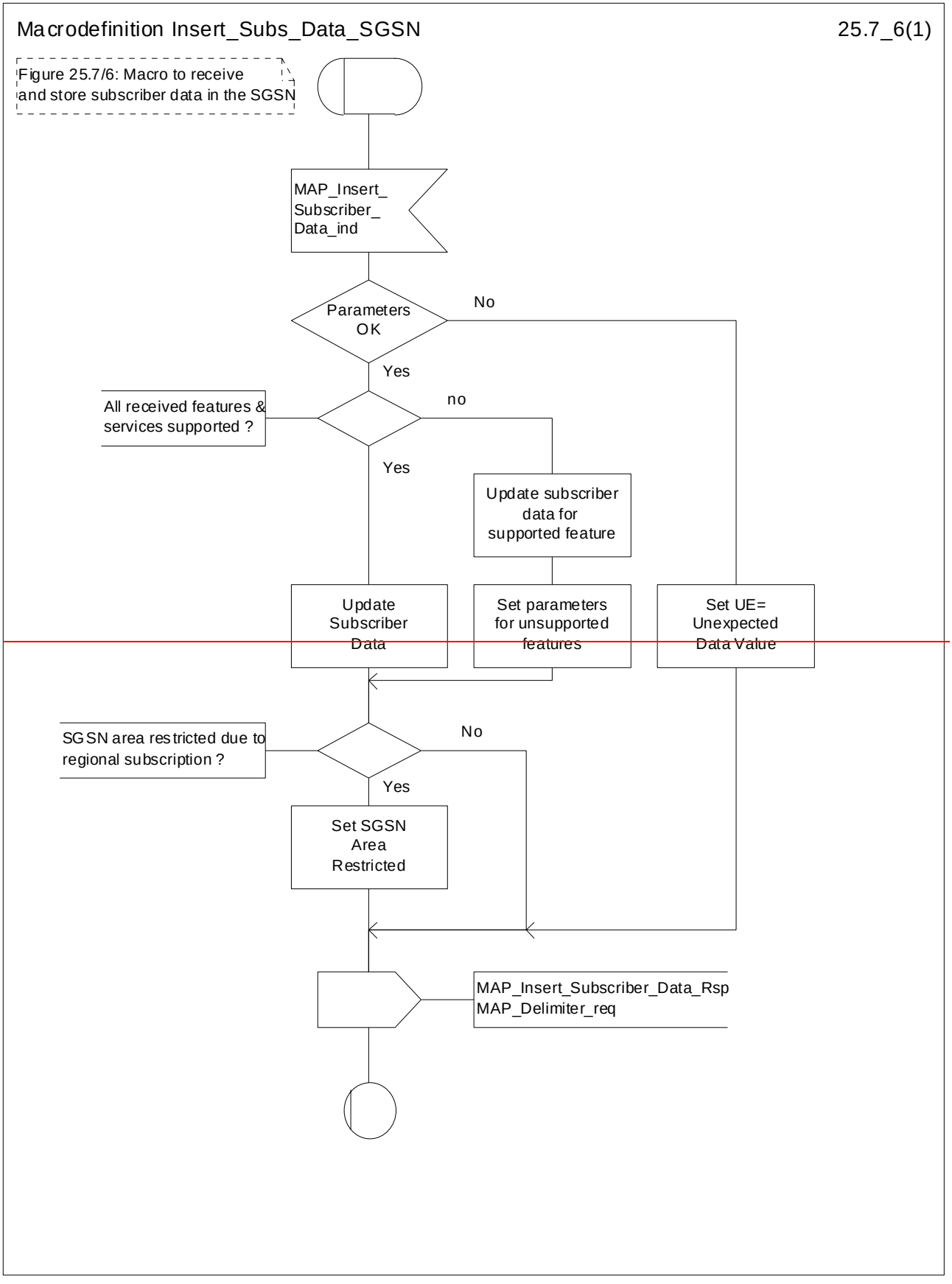
***** CR editor's note: (The much reduced version of) this text is now subclause 25.7.2; it is grouped with the text of the other subclauses of 25.7. *****

~~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~~

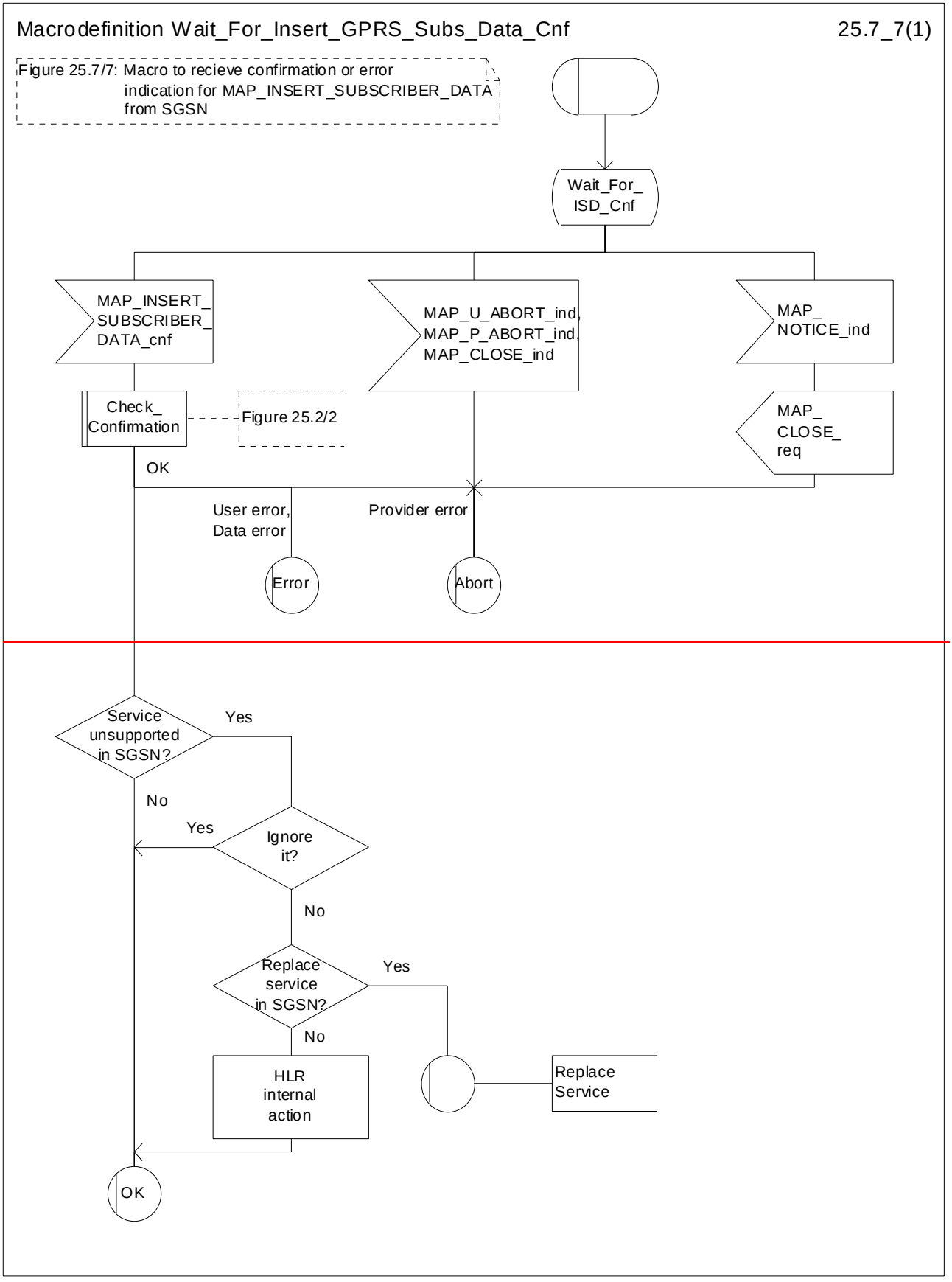
***** CR editor's note: (The much reduced version of) this text (still subclause 25.7.6) is now grouped with the text of the other subclauses of 25.7. *****

~~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).

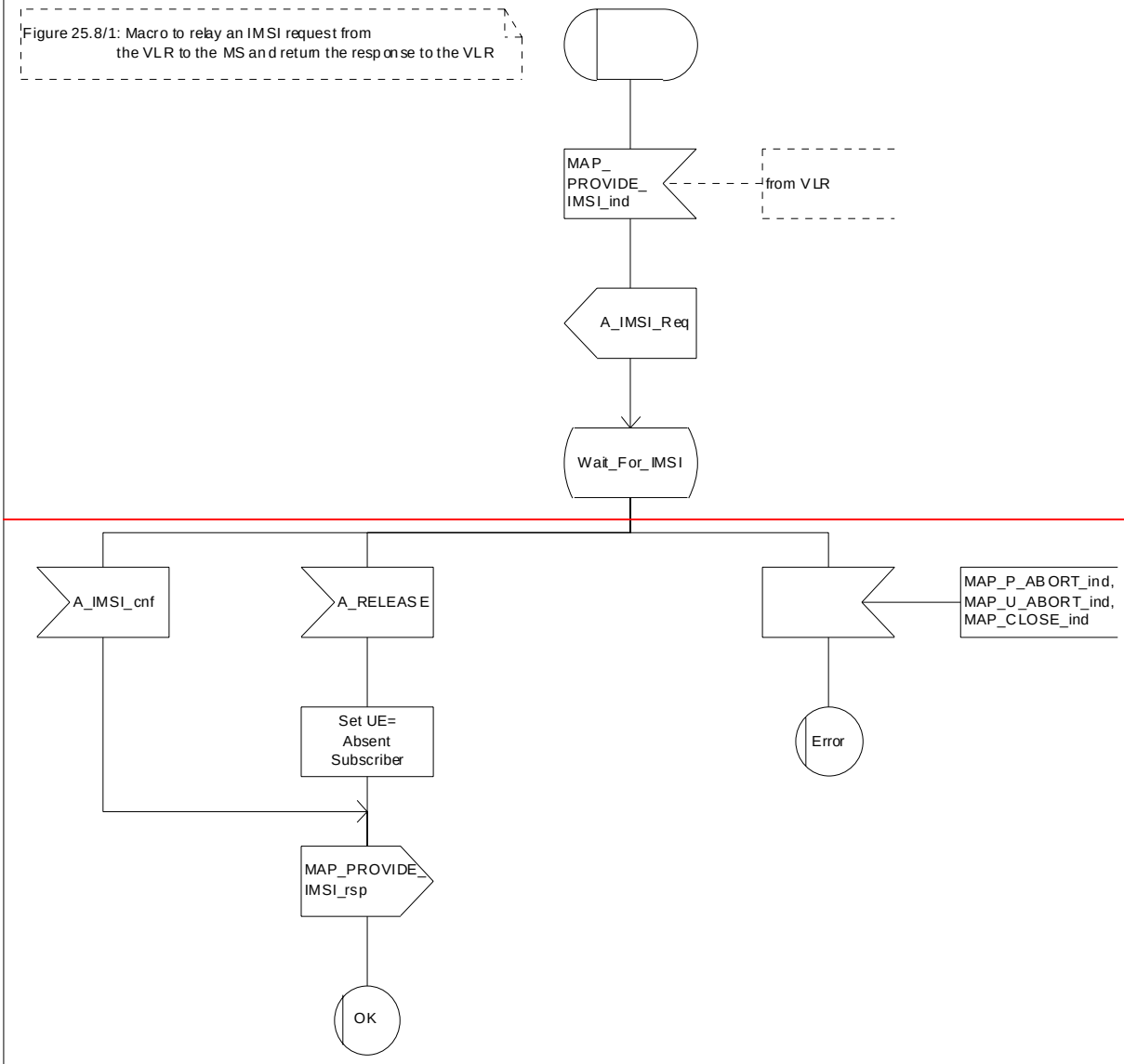
~~The SDL diagram is shown in figure 25.8/1.~~

25.8.2 Macro Obtain_IMSI_VLR

This macro describes how the VLR requests the MSC to provide the IMSI of a subscriber (e.g. at Location Updating).

Macrodefinition Obtain_IMSI_MSC 25.8_1(1)

Figure 25.8/1: Macro to relay an IMSI request from the VLR to the MS and return the response to the VLR



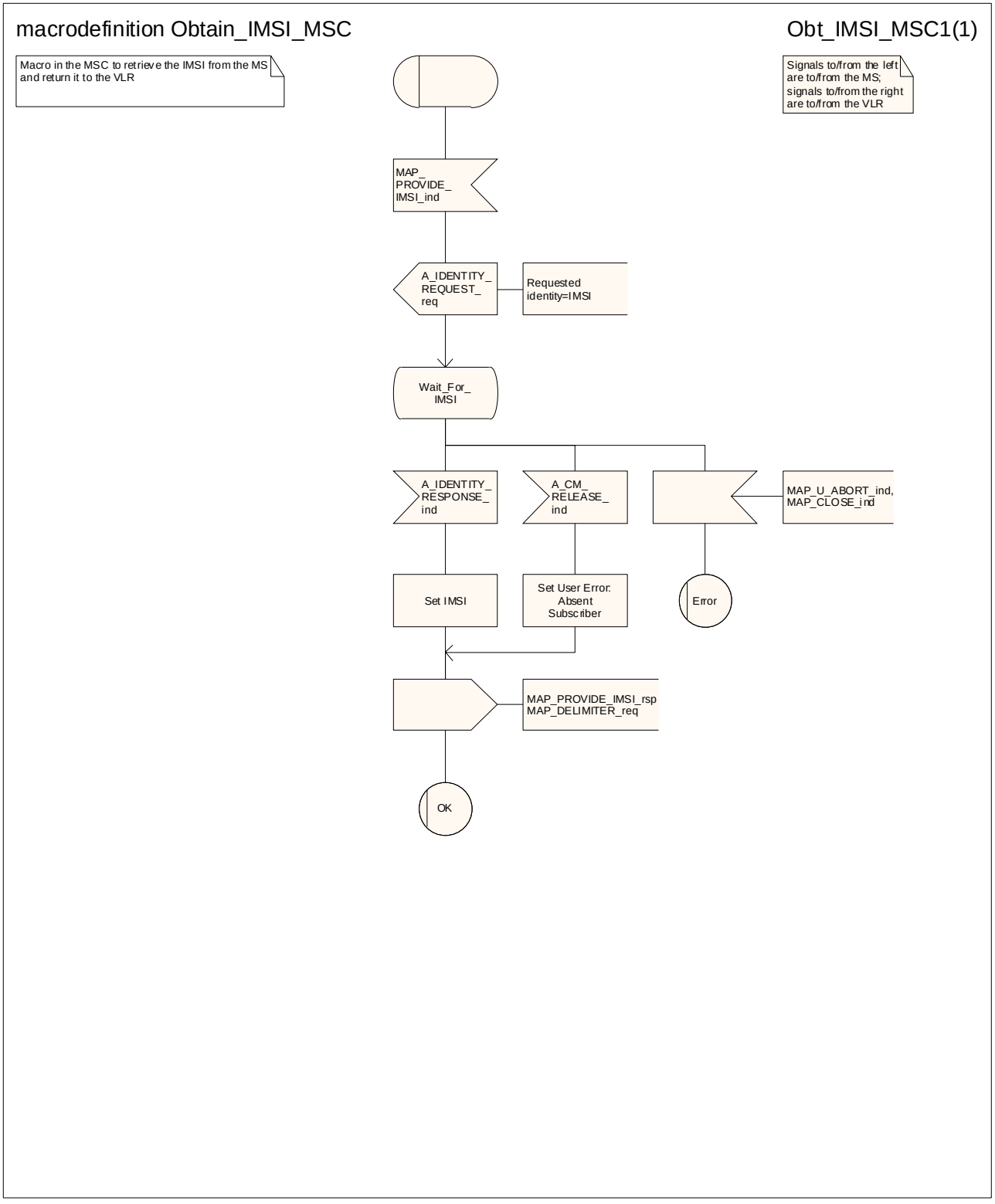


Figure 25.8/1: Macro Obtain_IMSI_MSC

~~25.8.2 Macro Obtain_IMSI_VLR~~

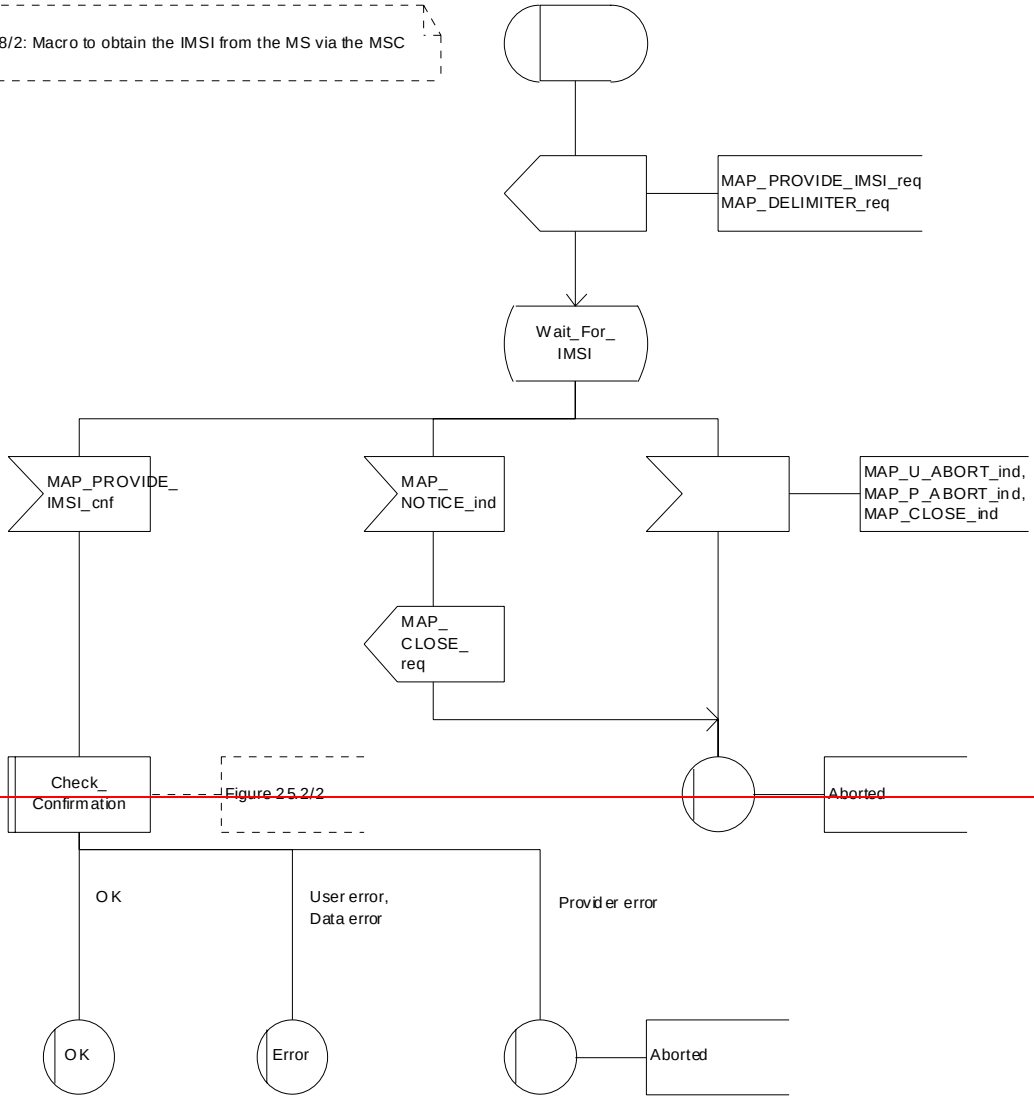
***** CR editor's note: (The reduced version of) this text now follows immediately after the text of subclause 25.8.1. *****

~~This macro describes the way VLR requests the MSC the IMSI of a subscriber (e.g. at Location Updating).~~

~~The SDL diagram is shown in figure 25.8/2.~~

Macrodefinition Obtain_IMSI_VLR 25.8_2(1)

Figure 25.8/2: Macro to obtain the IMSI from the MS via the MSC



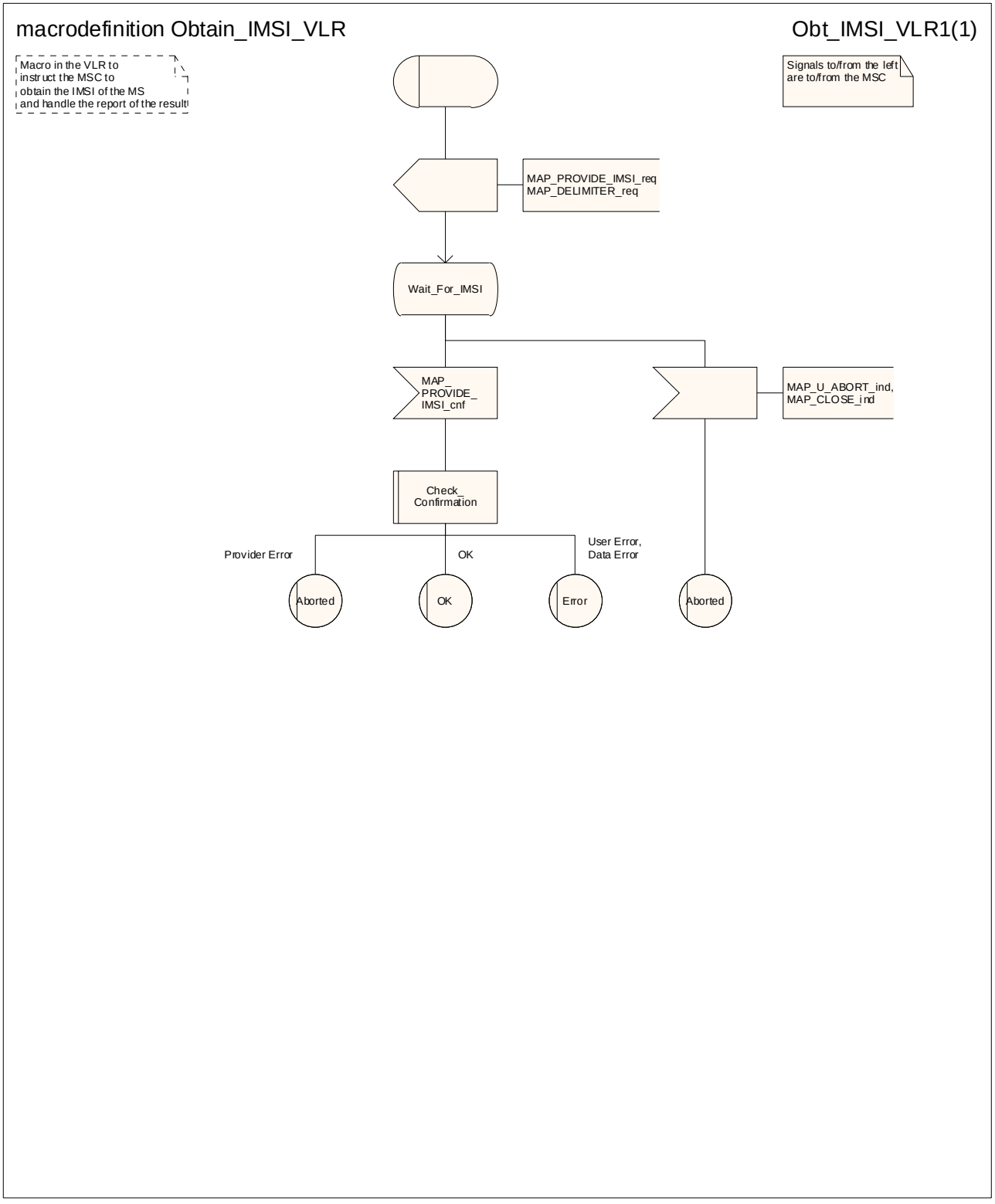


Figure 25.8/2: Macro Obtain_IMSI_VLR

25.9 Tracing macros

***** CR editor's note: the text of all the subclauses of 25.9 has been grouped together, in a more logical order. *****

25.9.1 Macro Trace_Subscriber_Activity_MSC

This macro shows the handling in the MSC for a request from the VLR to trace the activity of a subscriber.

~~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.~~

25.9.2 Macro Trace_Subscriber_Activity_VLR

This macro is called during the handling of subscriber activity in the VLR to activate tracing if necessary.

25.9.3 Macro Trace_Subscriber_Activity_SGSN

This macro is called during the handling of subscriber activity in the SGSN to activate tracing if necessary.

25.9.4 Macro Activate_Tracing_VLR

This macro shows the handling in the VLR for a request from the HLR to activate tracing for a subscriber.

25.9.6 Macro Activate_Tracing_SGSN

This macro shows the handling in the SGSN for a request from the HLR to activate tracing for a subscriber.

25.9.6 Macro Control_Tracing_HLR

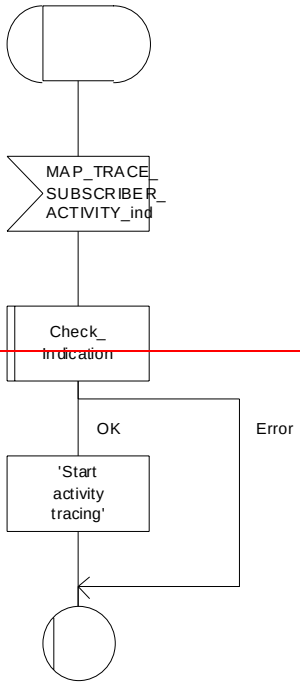
This macro shows the handling in the HLR to activate tracing in the VLR if it is required during a dialogue between the VLR and the HLR

25.9.7 Macro Control_Tracing_HLR_with_SGSN

This macro shows the handling in the HLR to activate tracing in the SGSN if it is required during a dialogue between the SGSN and the HLR

Macrodefinition Trace_Subscriber_Activity_MSC 25.9_1(1)

Figure 25.9/1: The Subscriber tracing macro in the MSC



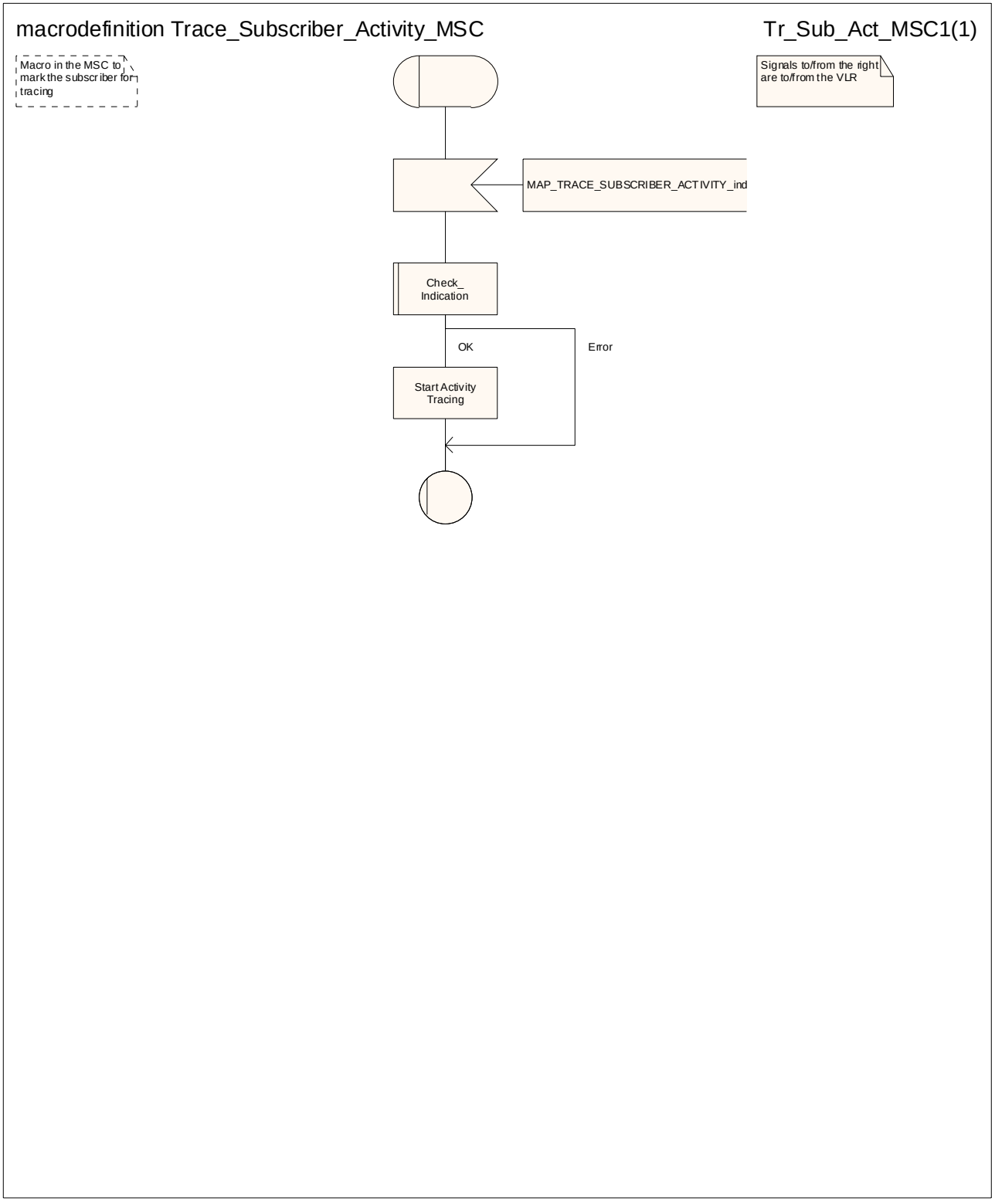


Figure 25.9/1: Macro Trace_Subscriber_Activity_MSC

~~25.9.2 Macro Trace_Subscriber_Activity_VLR~~

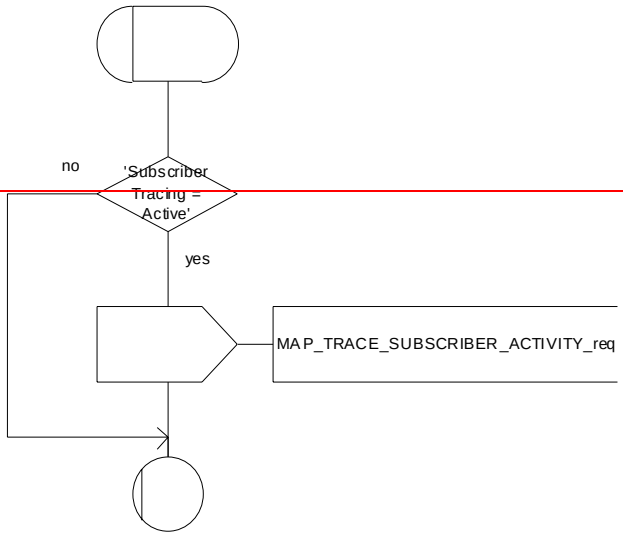
***** CR editor's note: (The reduced version of) this text has been moved to follow immediately after the text of subclause 25.9.1. *****

~~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



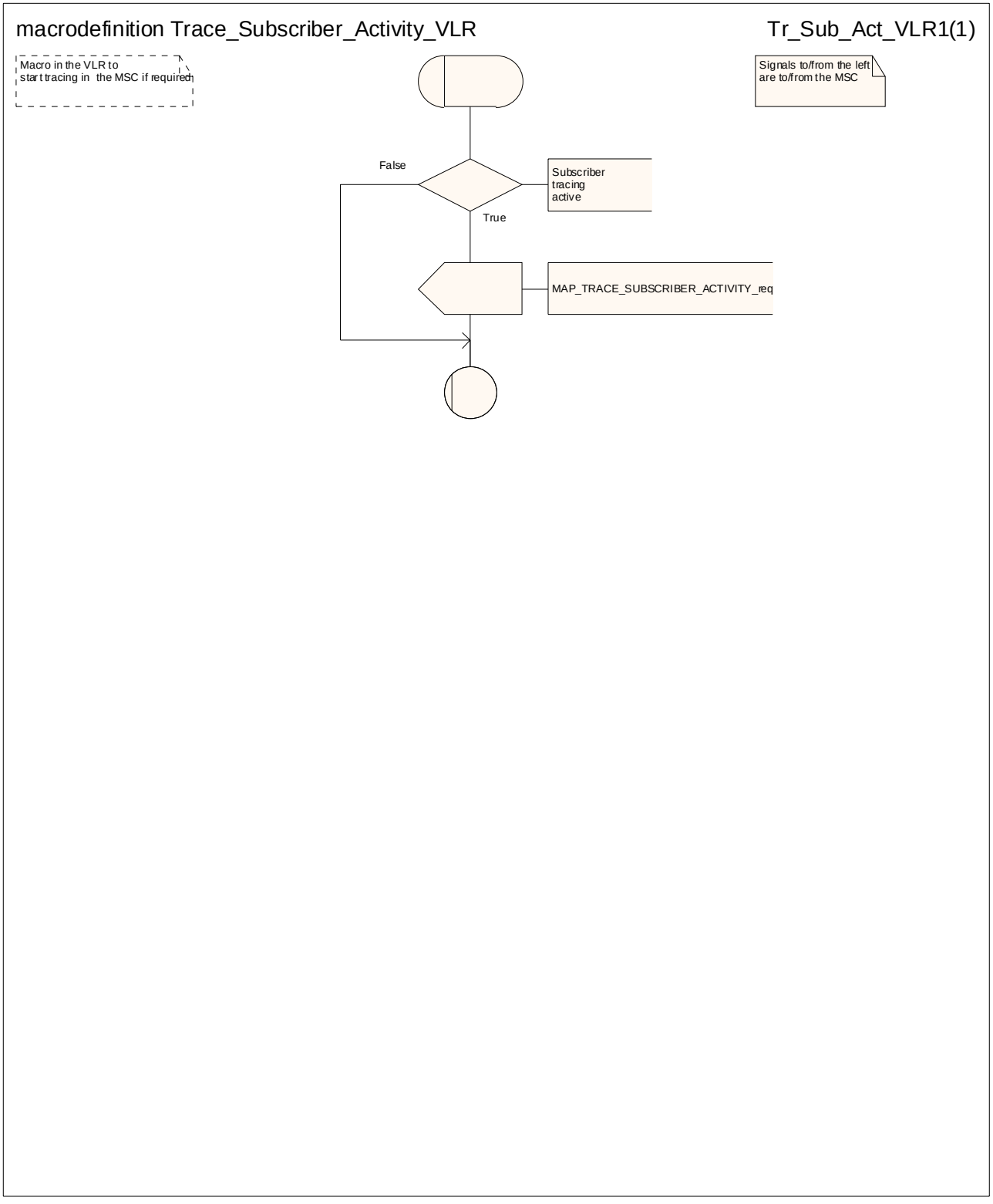


Figure 25.9/2: Macro Trace_Subscriber_Activity_VLR

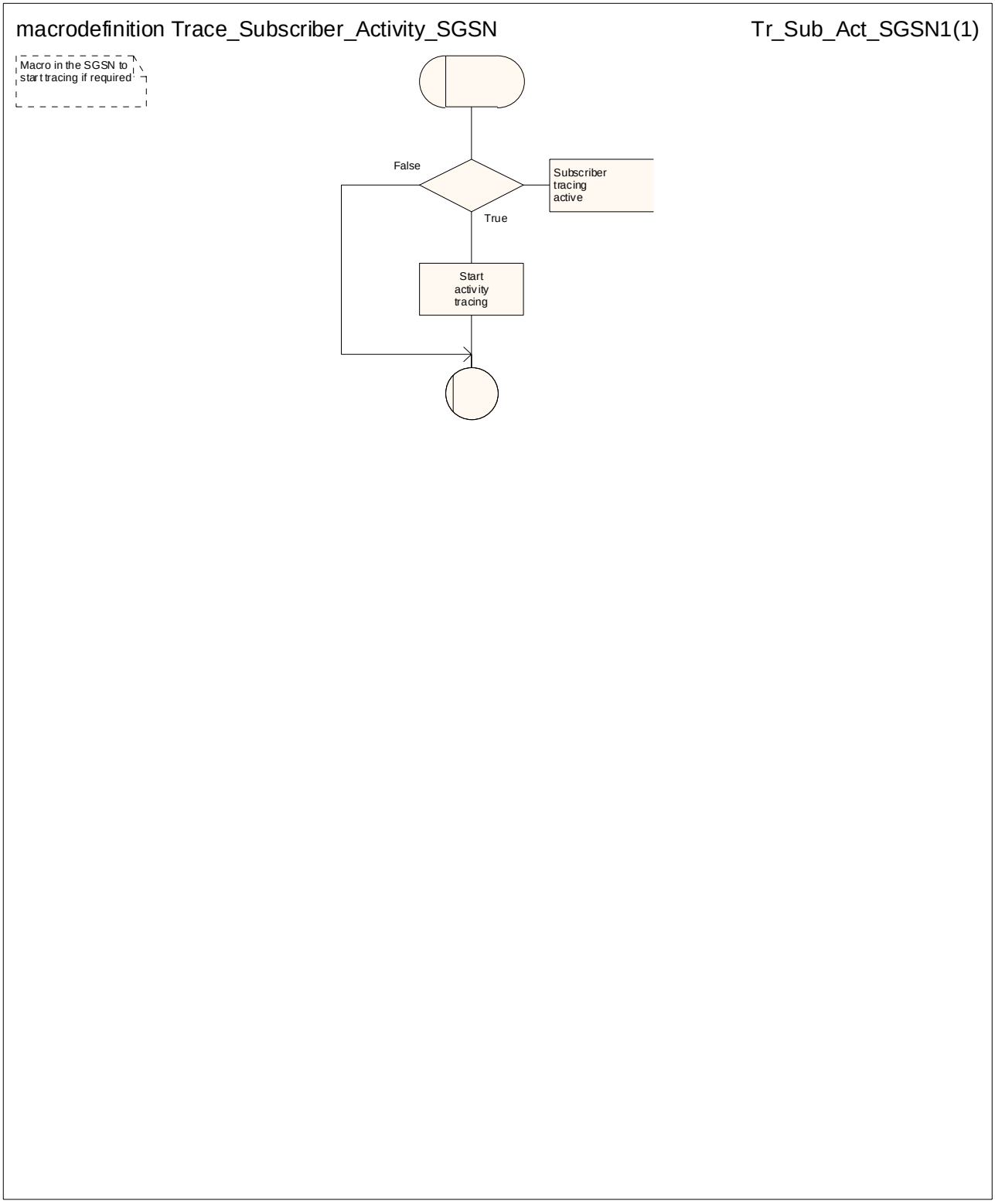


Figure 25.9/3: Macro Trace_Subscriber_Activity_SGSN

~~25.9.3 Macro Activate_Tracing_VLR~~

***** CR editor's note: the (reduced version of) this text is now subclause 25.9.4. It has been grouped with the text of the other subclauses of 25.9. *****

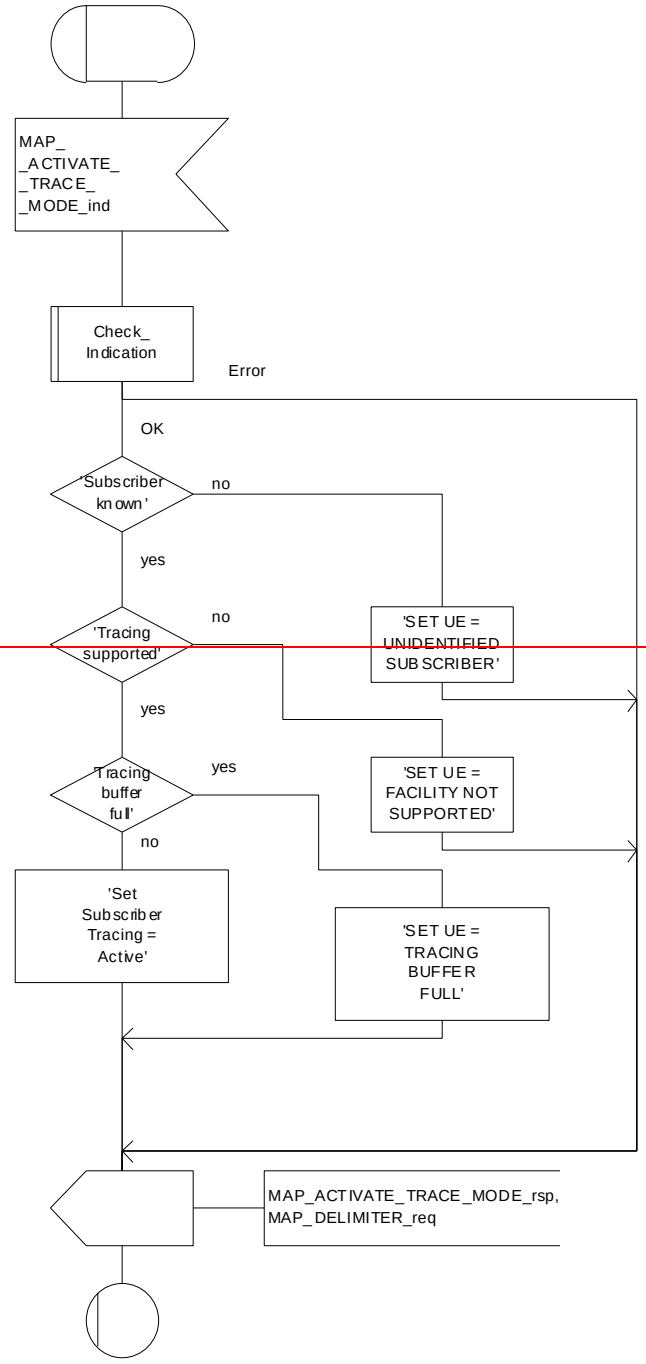
~~The Activate_Tracing_VLR macro is invoked, when the MAP_ACTIVATE_TRACE_MODE indication is received from the HLR. The primitive is processed in the VLR as follows:~~

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

The Activate_Tracing_VLR macro is described in the figure 25.9/3.

Macrodefinition Activate_Tracing_VLR 25.9_3(1)

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



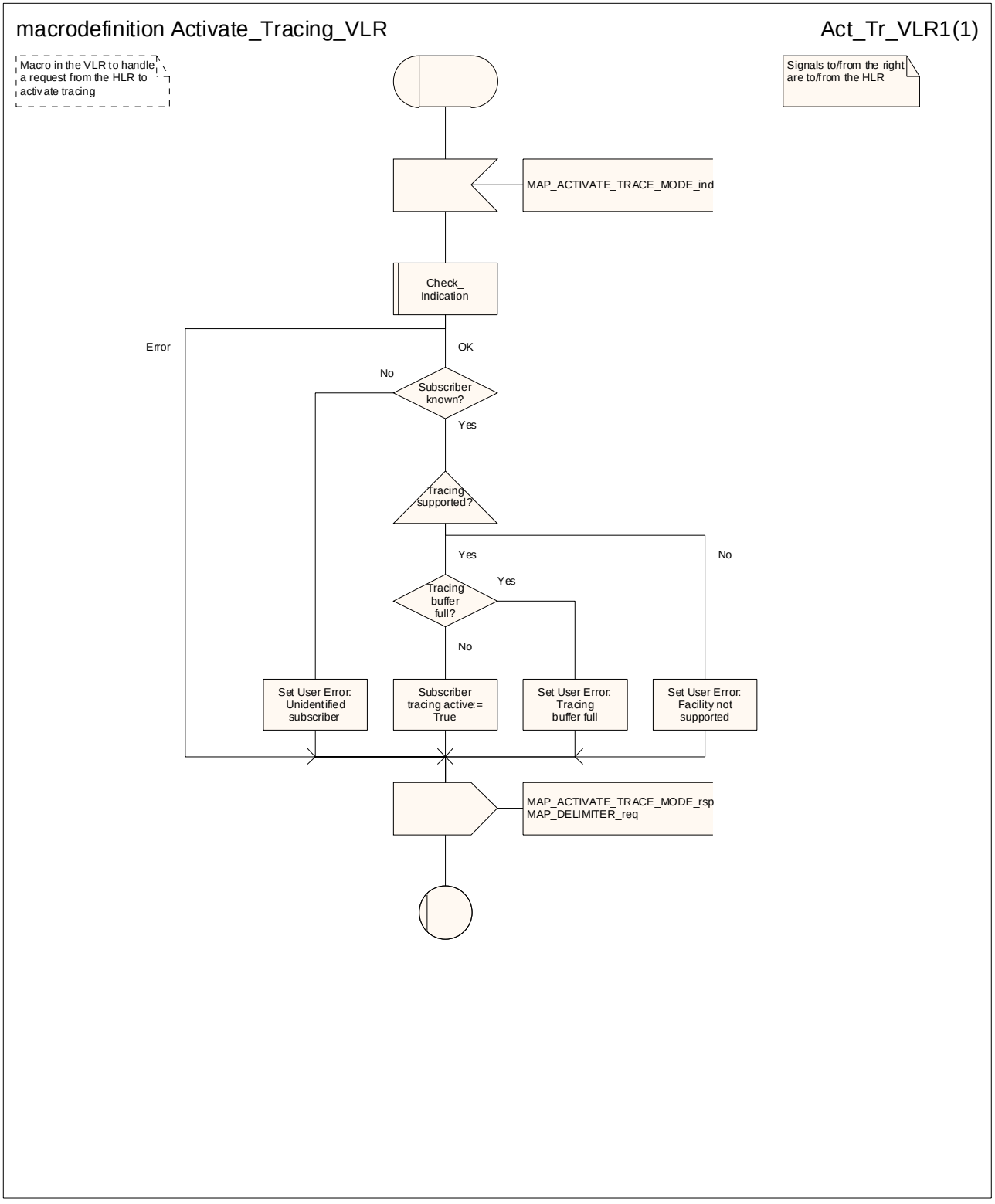


Figure 25.9/43: Macro Activate_Tracing_VLR

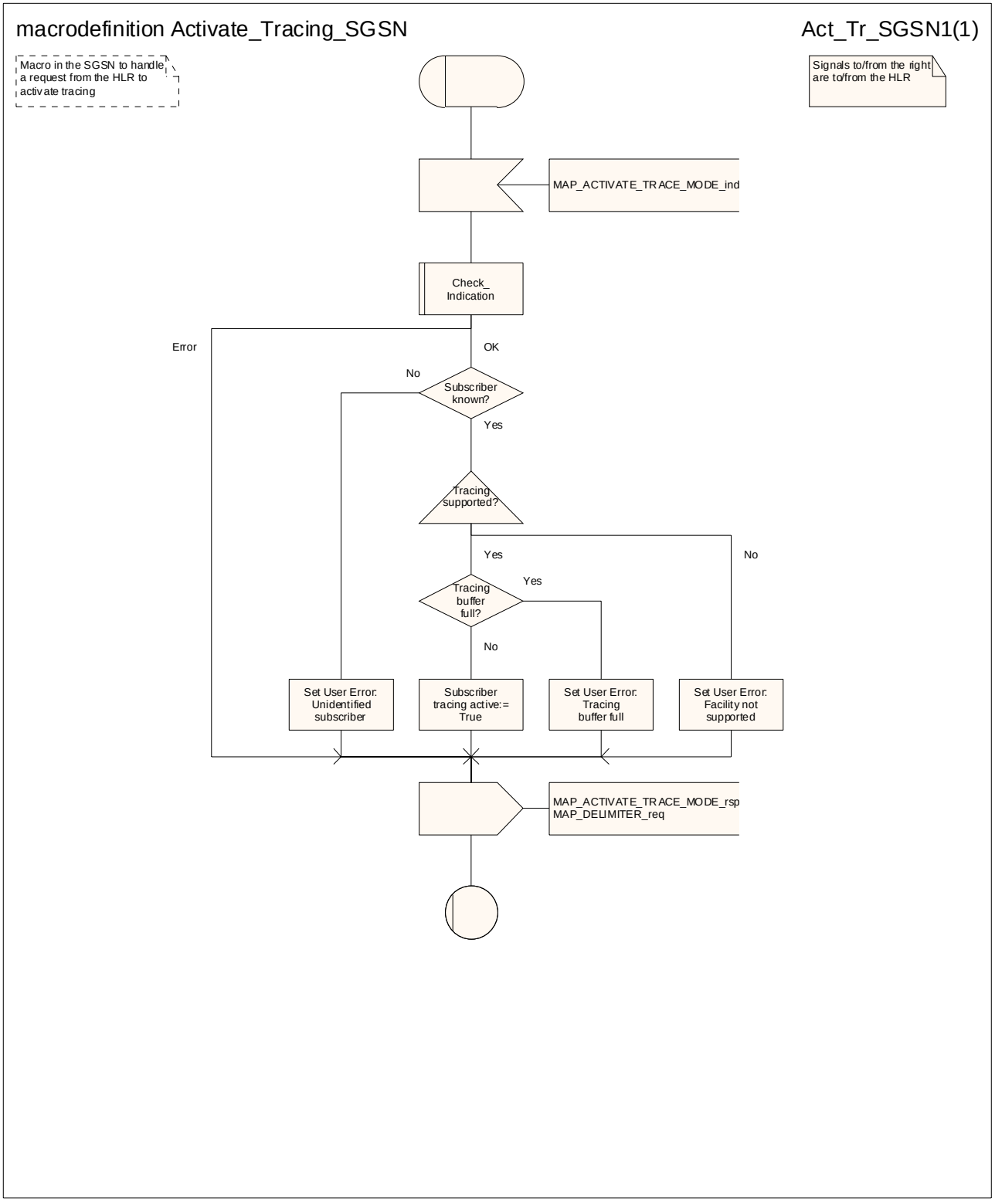


Figure 25.9/5: Macro Activate_Tracing_SGSN

~~25.9.4 Macro Control_Tracing_HLR~~

***** CR editor's note: the (reduced version of) this text is now subclauses 25.9.6 & 25.9.7. It has been grouped with the text of the other subclauses of 25.9. *****

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

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

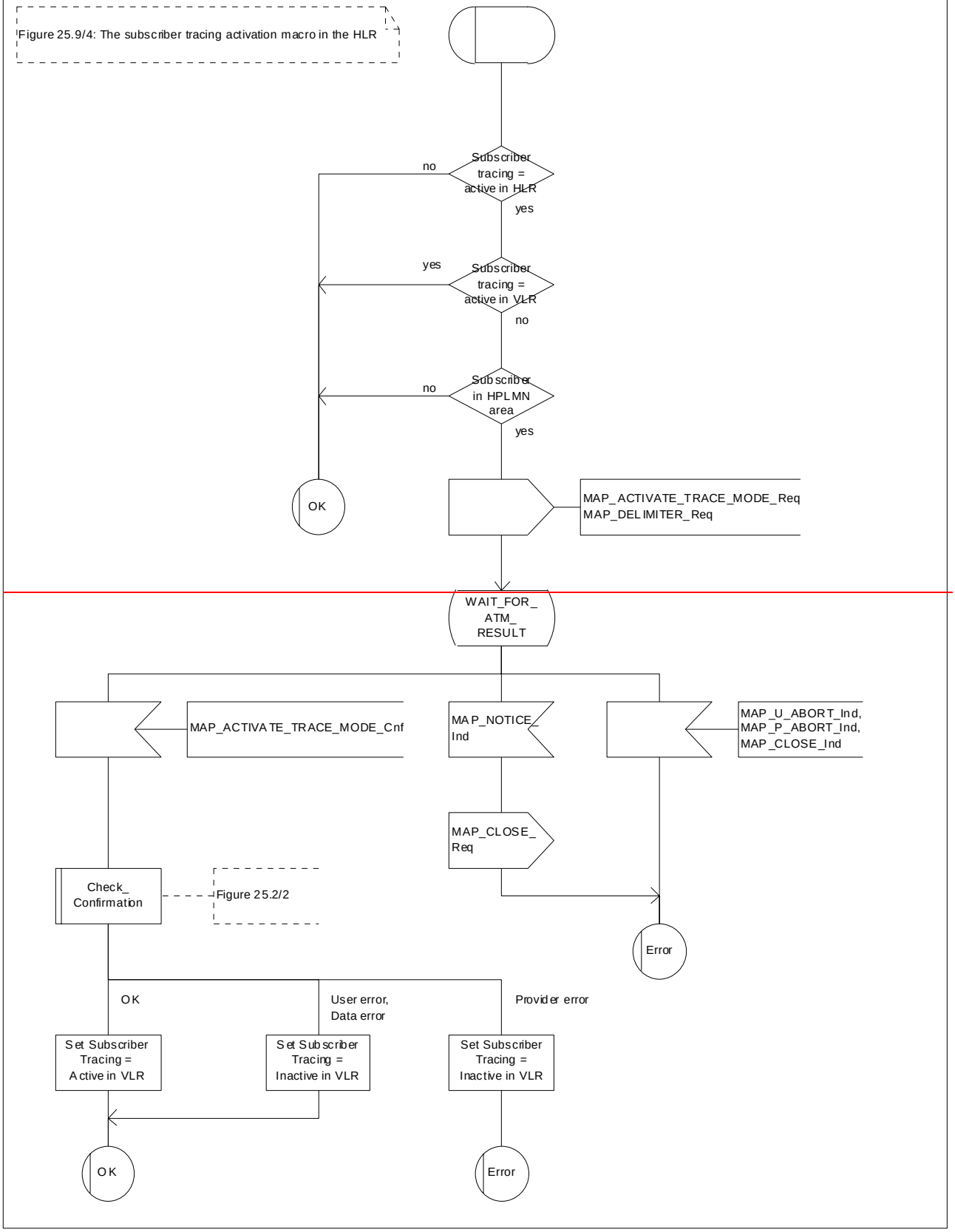
- ~~if the primitive contains a successful acknowledgement, the tracing in VLR or in the SGSN is set active;~~
- ~~if the primitive contains errors, the tracing in VLR or in SGSN is set to deactive.~~

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

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

Macrodefinition Control_Tracing_HLR 25.9_4(1)

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



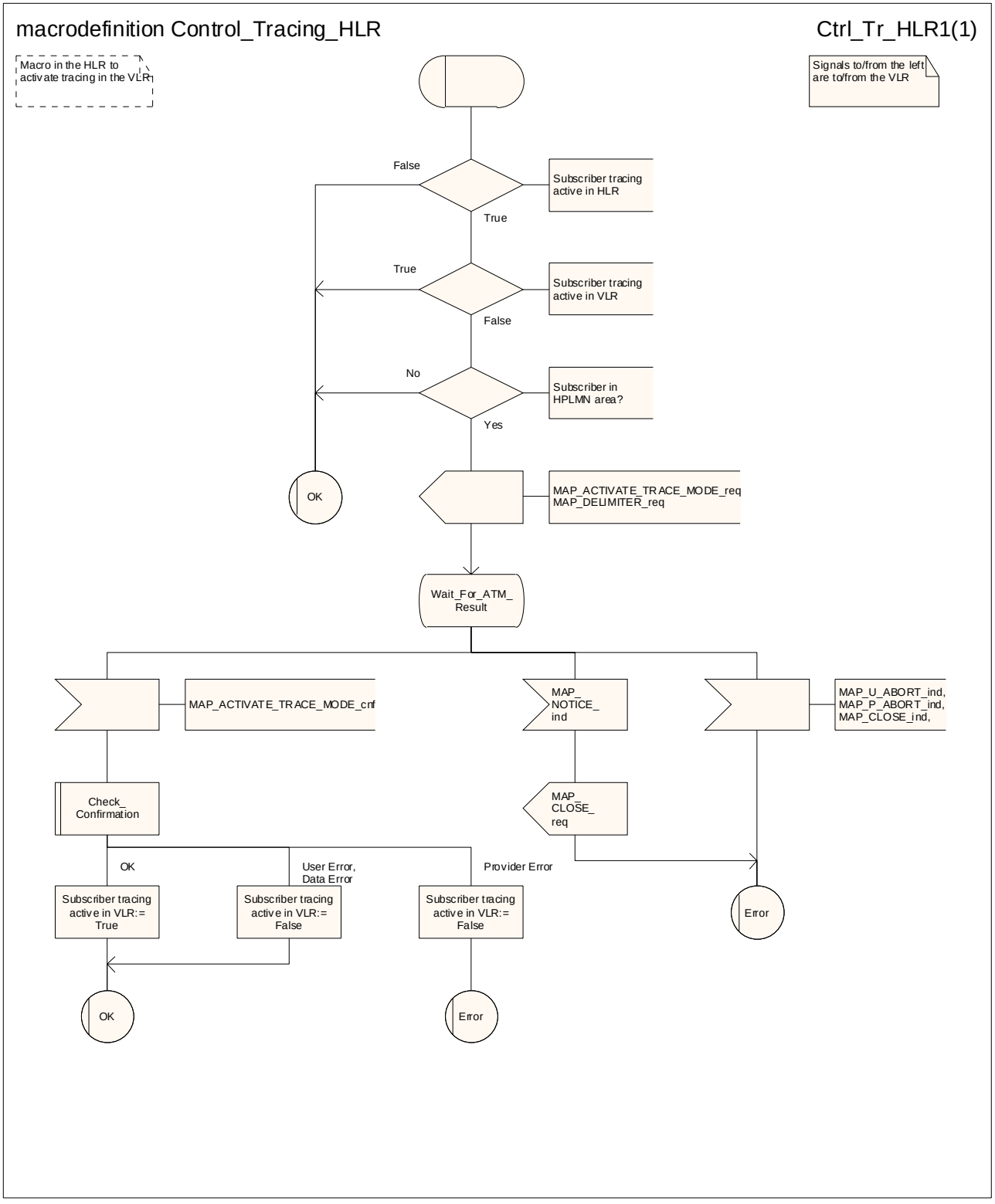
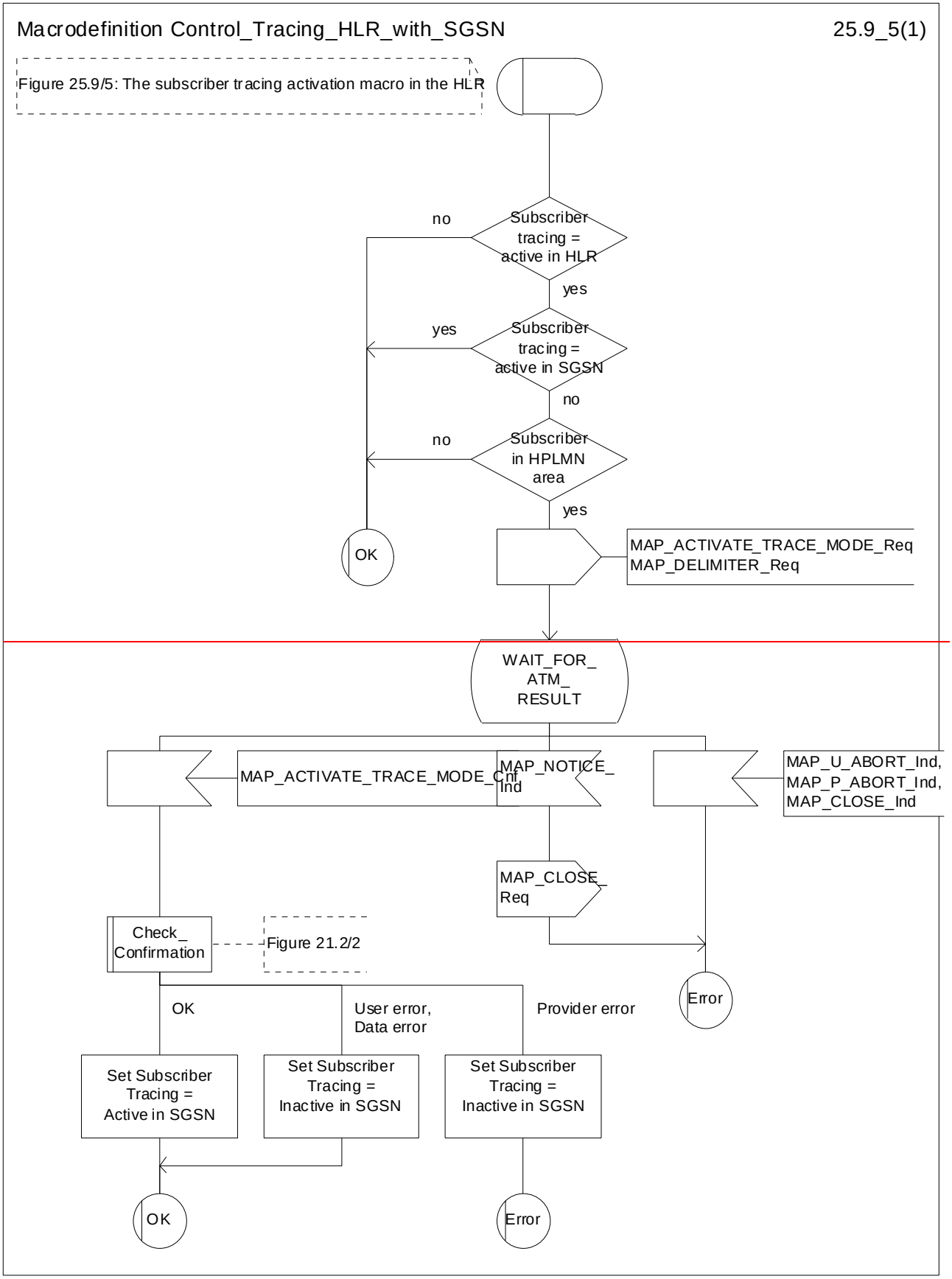


Figure 25.9/64: Macro Control_Tracing_HLR


Macrodefinition Control_Tracing_HLR_with_SGSN
25.9_5(1)
Figure 25.9/5: The subscriber tracing activation macro in the HLR
Subscriber tracing = active in HLR
no
yes
Subscriber tracing = active in SGSN
yes
no
Subscriber in HPLMN area
no
yes
OK
MAP_ACTIVATE_TRACE_MODE_Req
MAP_DELIMITER_Req
WAIT_FOR_ ATM_ RESULT
MAP_ACTIVATE_TRACE_MODE_Cnf
MAP_NOTICE_ Ind
MAP_U_ABORT_Ind,
MAP_P_ABORT_Ind,
MAP_CLOSE_Ind
MAP_CLOSE_ Req
Check_ Confirmation
Figure 21.2/2
Error
OK
User error, Data error
Provider error
Set Subscriber Tracing = Active in SGSN
Set Subscriber Tracing = Inactive in SGSN
Set Subscriber Tracing = Inactive in SGSN
OK
Error

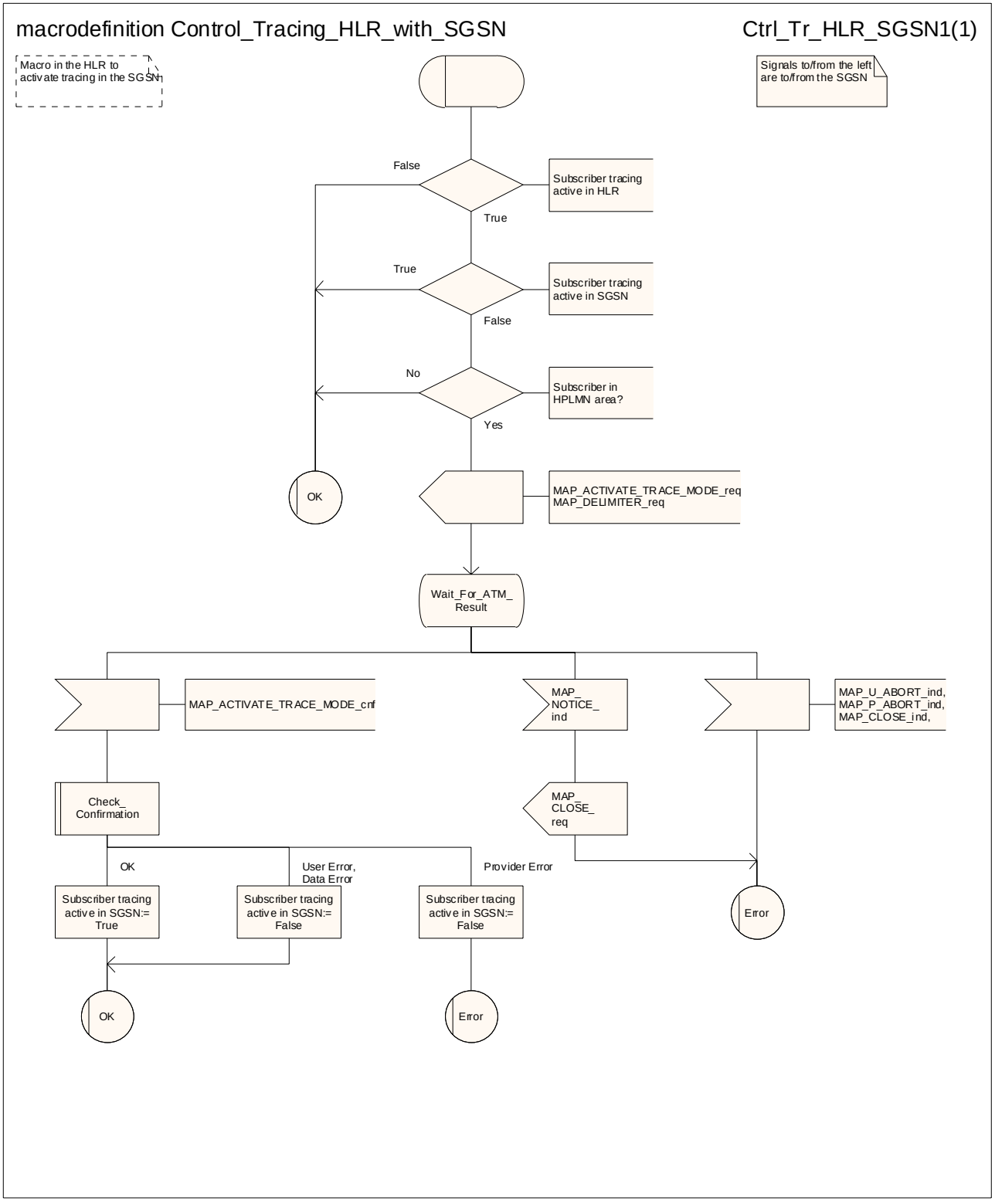


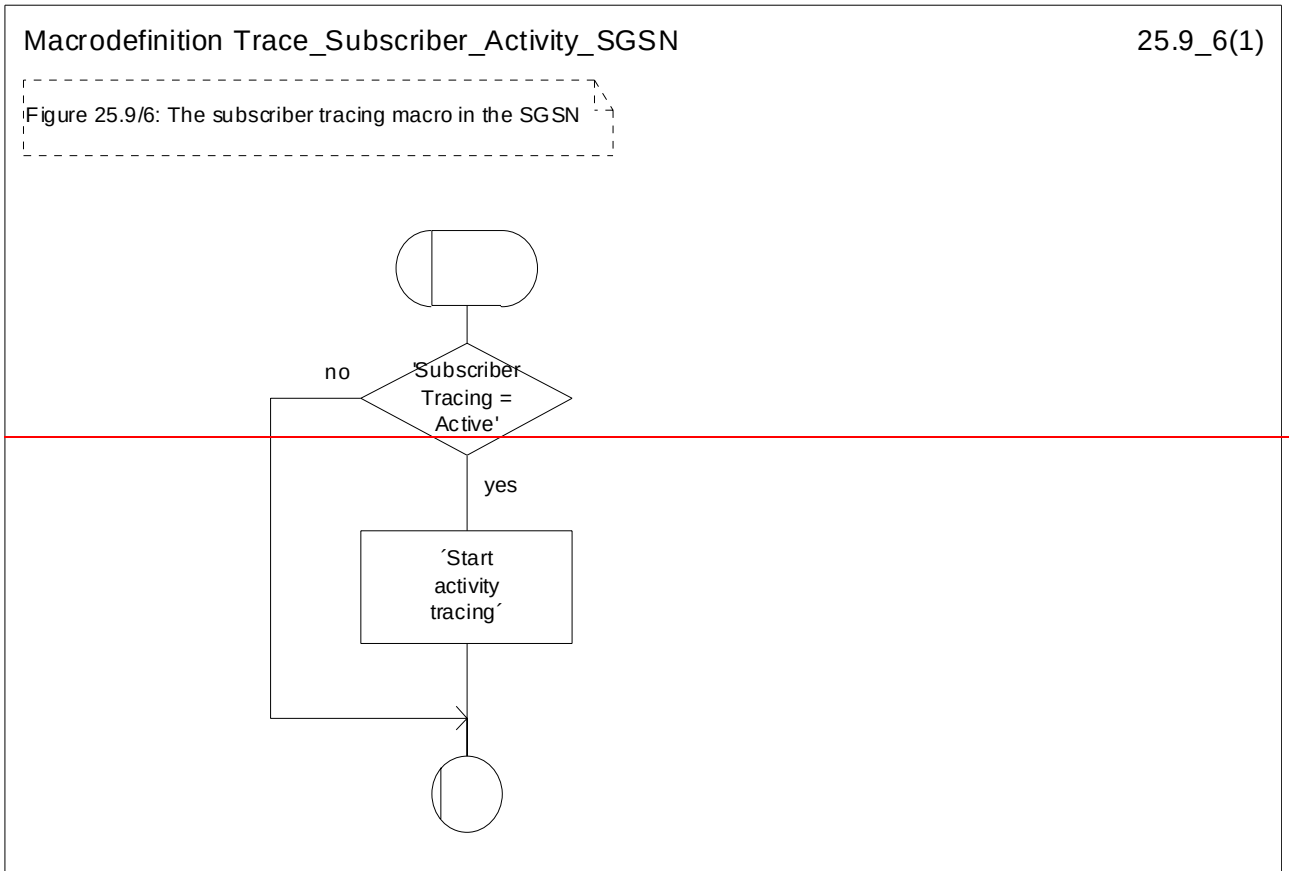
Figure 25.9/75: Macro Control_Tracing_HLR_with_SGSN

~~25.9.5 Macro Trace_Subscriber_Activity_SGSN~~

***** CR editor's note: the (reduced version of) this text is now subclause 25.9.3. It has been grouped with the text of the other subclauses of 25.9. *****

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

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



~~Figure 25.9/6: Macro Trace_Subscriber_Activity_SGSN~~

~~25.9.6 Macro Activate_Tracing_SGSN~~

***** CR editor's note: the (reduced version of) this text is now subclause 25.9.5. It has been grouped with the text of the other subclauses of 25.9. *****

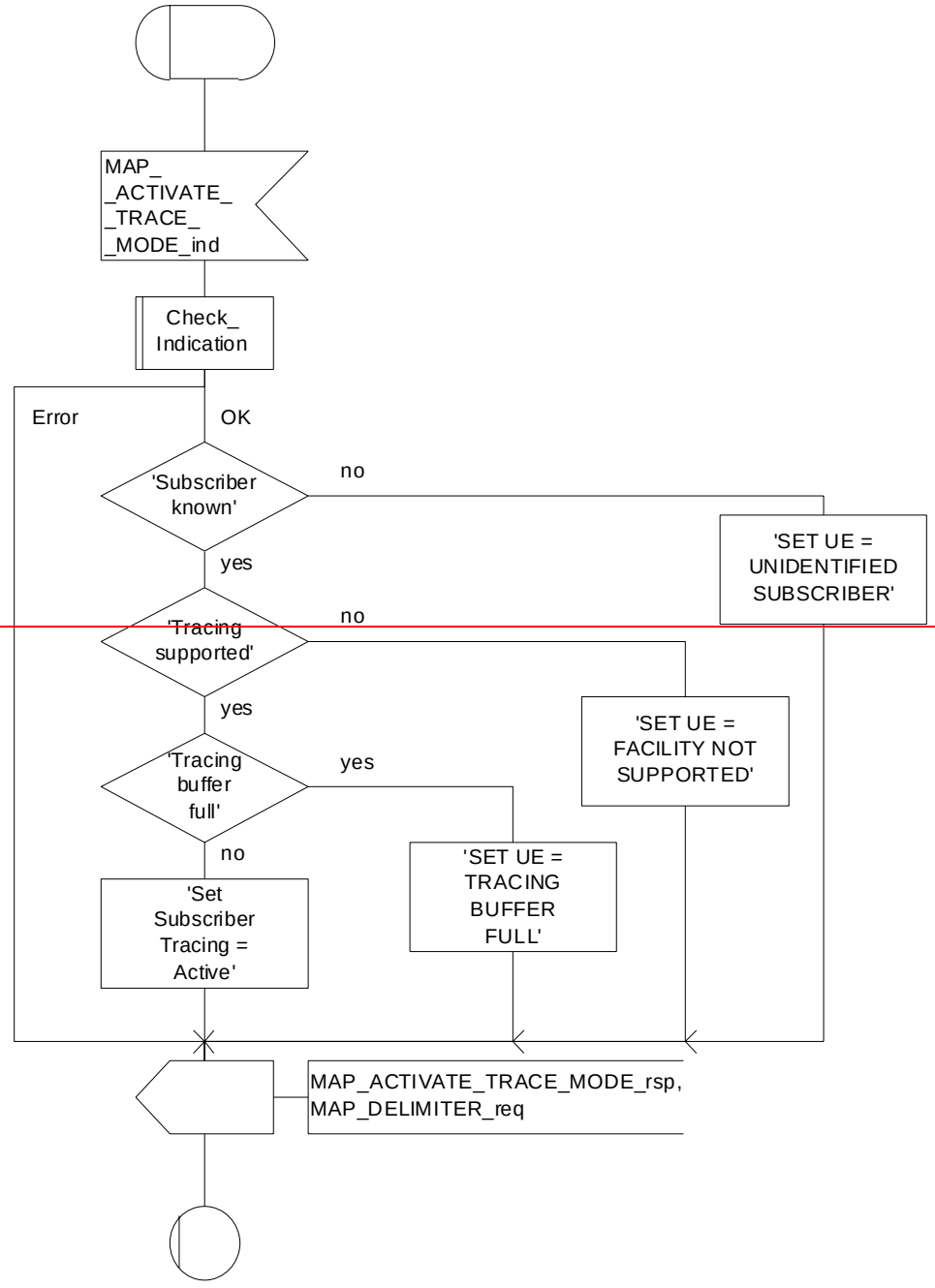
~~The Activate_Tracing_SGSN macro is invoked, when the MAP_ACTIVATE_TRACE_MODE indication is received from the HLR. The primitive is processed in the SGSN as follows:~~

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

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

Macrodefinition Activate_Tracing_SGSN 25.9_7(1)

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



~~Figure 25.9/7: Macro Activate_Tracing_SGSN~~

25.10 Short Message Alert procedures

***** CR editor's note: the text for the subclauses of 25.10 has been grouped together, in the order VLR behaviour, SGSN behaviour, HLR behaviour. *****

25.10.1 Process Subscriber_Present_VLR ~~process~~

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

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

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

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

25.10.2 Process Subscriber_Present_SGSN

The SGSN invokes the process Subscriber_Present_SGSN when it receives a Page response, a GPRS Attach request or a Routing area update request message (3GPP TS 24.008 [35]). The general description of the short message alert procedures is in clause 23.4.

25.10.3 Macro Alert_Service_Centre_HLR

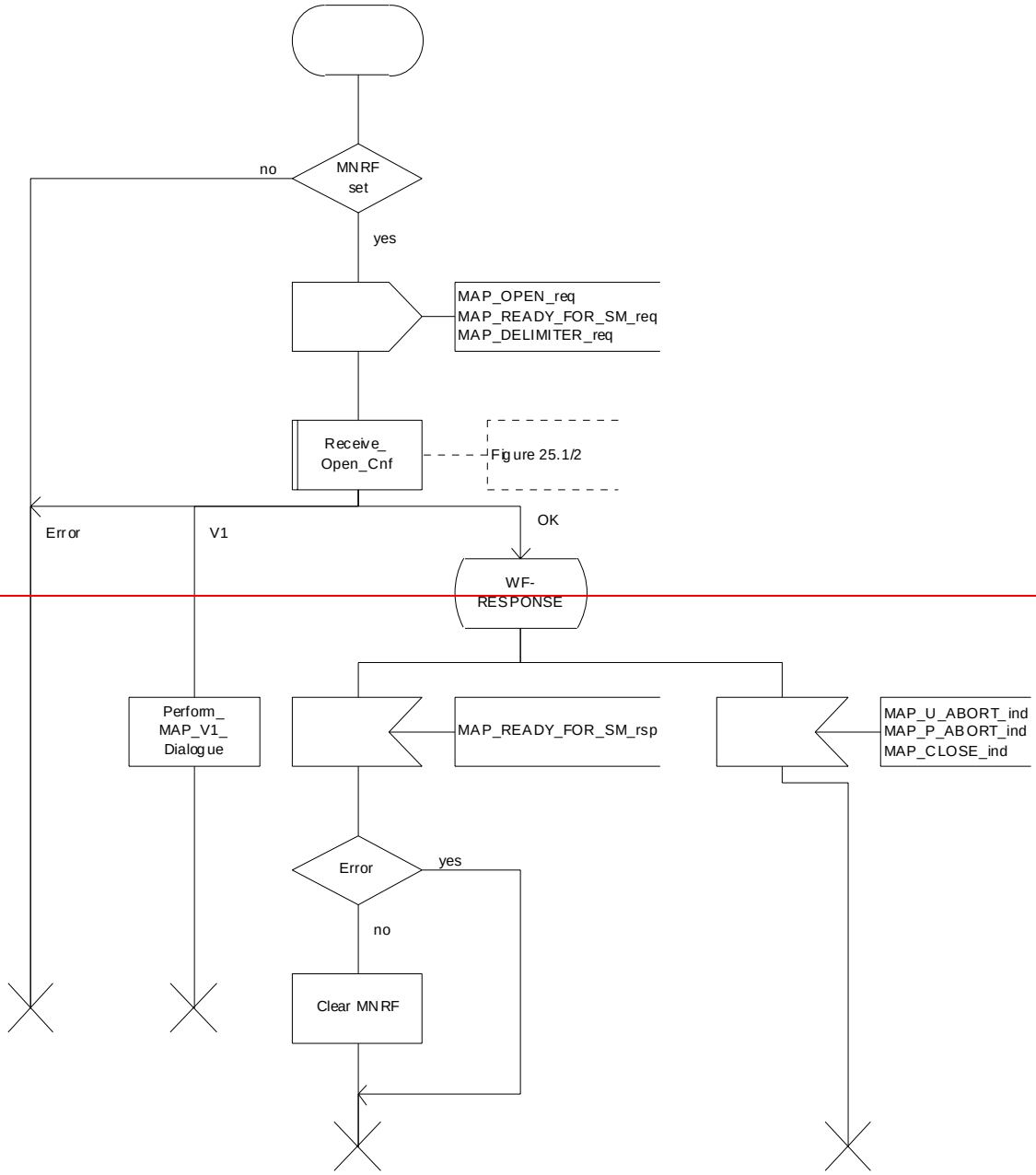
The HLR invokes the macro Alert_Service_Centre_HLR when Service Centre(s) are to be alerted.

25.10.4 Process Alert_SC_HLR

It is an operator option to resend the MAP_ALERT_SERVICE_CENTRE request to the SMS-IWMSC if the alert is unsuccessful. The number of repeat attempts and the interval between them is also an operator option. The service centre address should be purged from the MWD list if the alert is consistently unsuccessful.

Process Subscriber_Present_VLR 25.10_1(1)

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



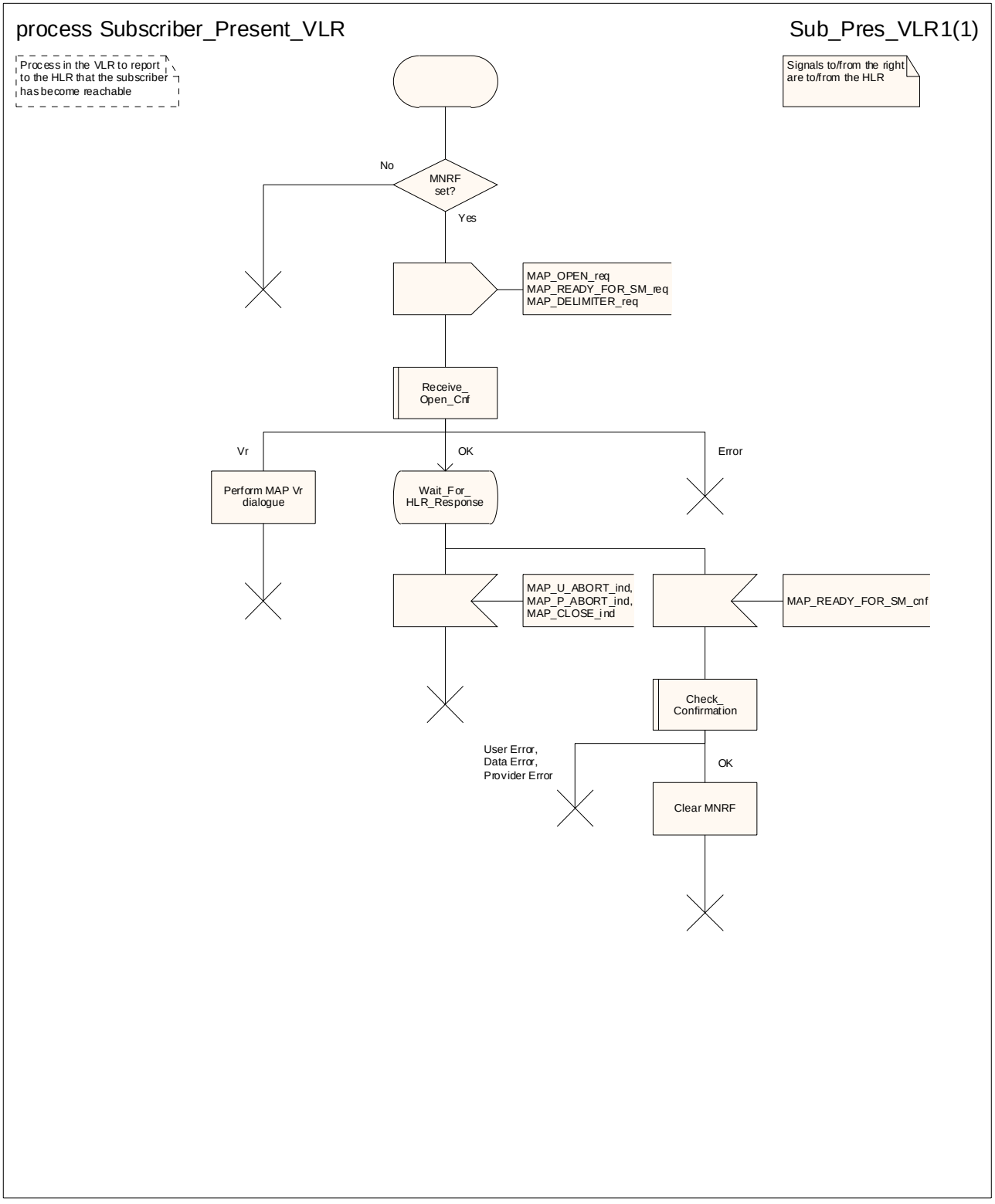


Figure 25.10/1: Process Subscriber_Present_VLR

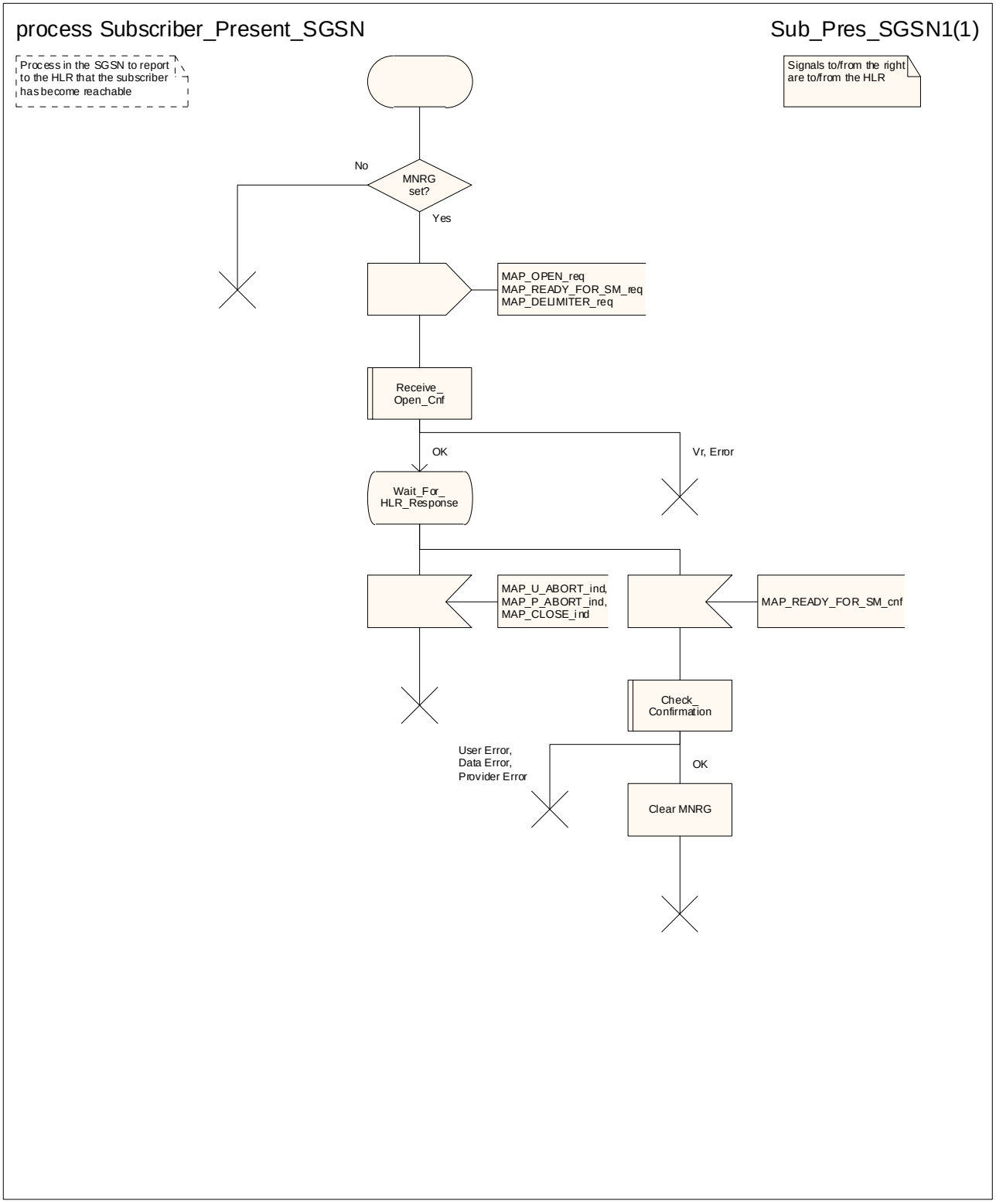


Figure 25.10/2: Process Subscriber_Present_SGSN

~~25.10.2 Macro Alert_Service_Centre_HLR~~

***** CR editor's note: (The reduced text of) this subclause is now 25.10.3 & 25.10.4. It is grouped with the text of the other subclauses of 25.10. *****

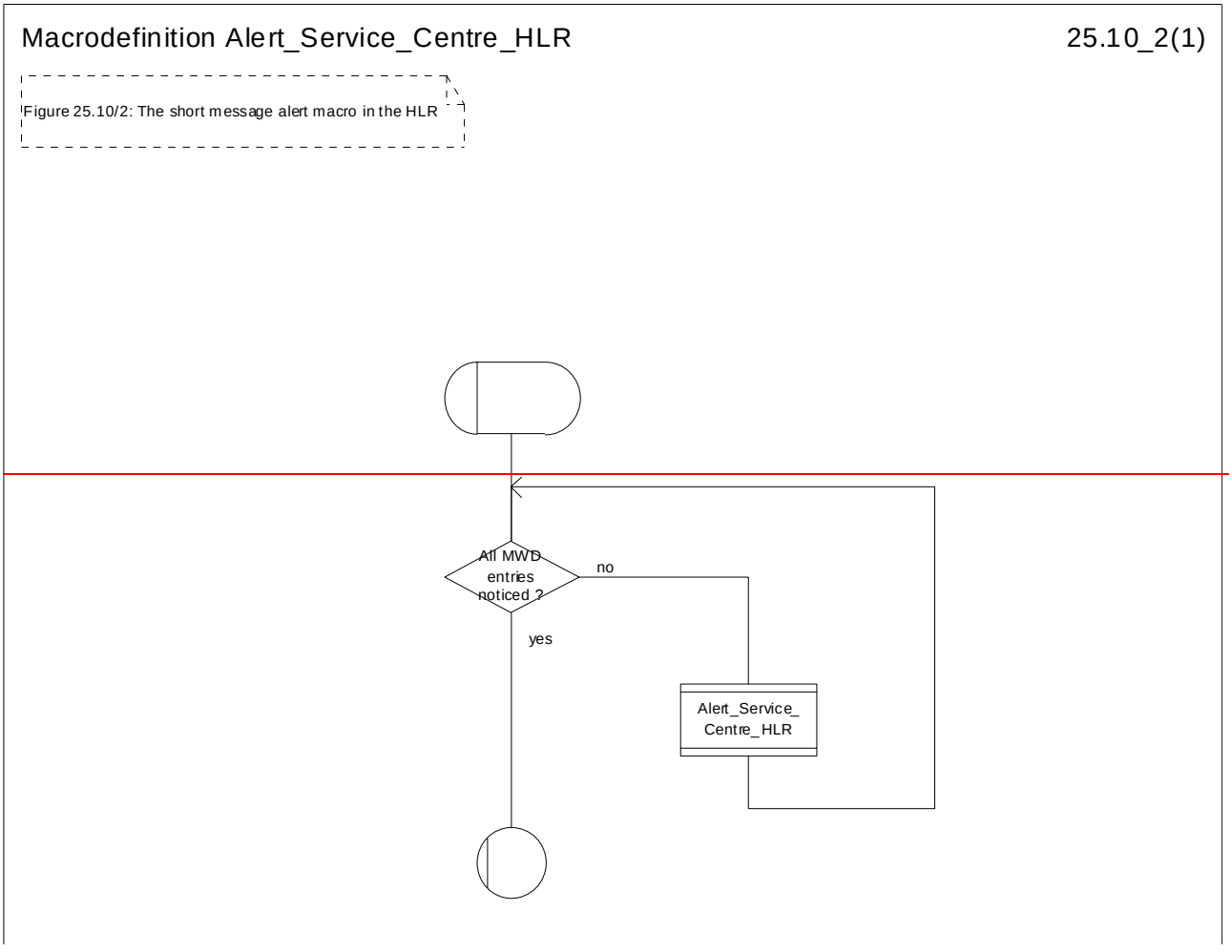
~~The Alert_Service_Centre_HLR macro is initiated when the HLR notices that the Service Centre(s) shall be alerted. The macro starts process Alert_Service_Centre_HLR for every SC address in the MWD list.~~

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

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

Macrodefinition Alert_Service_Centre_HLR 25.10_2(1)

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



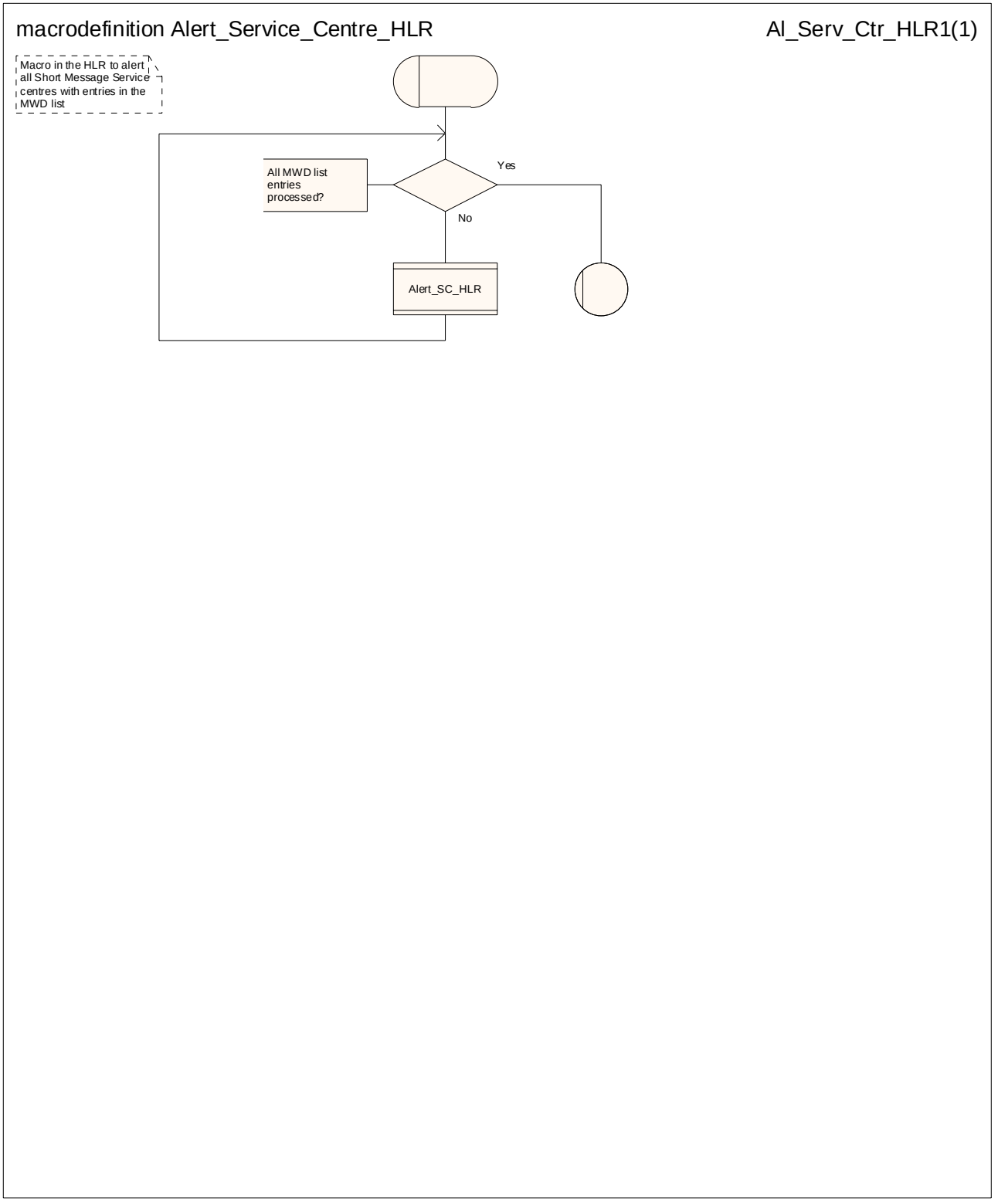
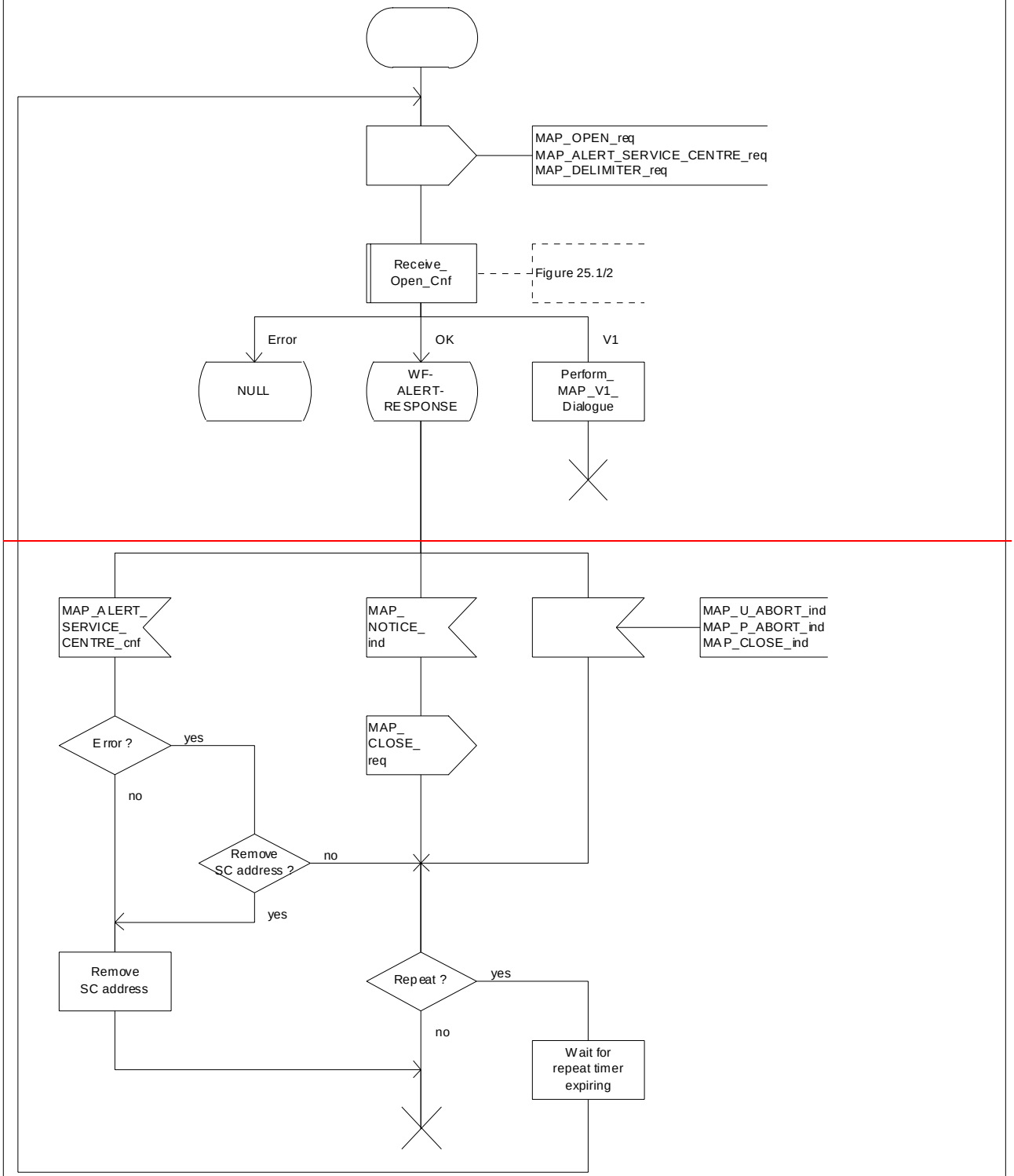


Figure 25.10/32: Macro Alert_Service_Centre_HLR

Process Alert_Service_Centre_HLR 22.10_3(1)

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



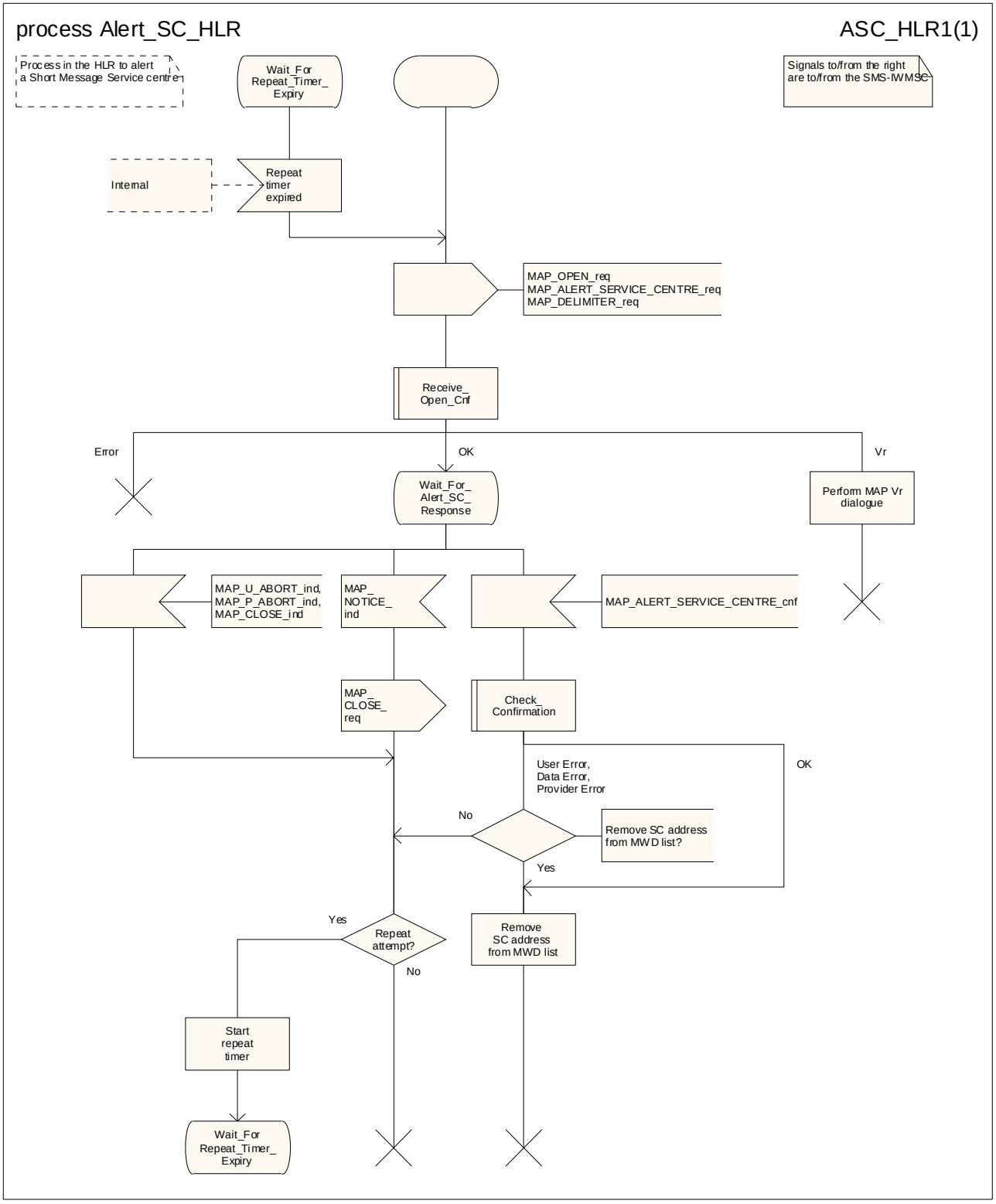


Figure 25.10/3: Process Alert_S~~ervice~~_C~~entre~~_HLR

~~25.10.3 The Mobile Subscriber is present~~

***** CR editor's note: (The reduced text of) this subclause is now 25.10.2. It is grouped with the text of the other subclauses of 25.10. *****

~~When receiving Page response, Attach request or Routing area update request messages (3GPP TS 24.008 [35]), while the MS not reachable for GPRS (MNRG) flag is set, the SGSN will send the MAP_READY_FOR_SM request towards the HLR. The Alert Reason is set to indicate that the mobile subscriber is present for GPRS.~~

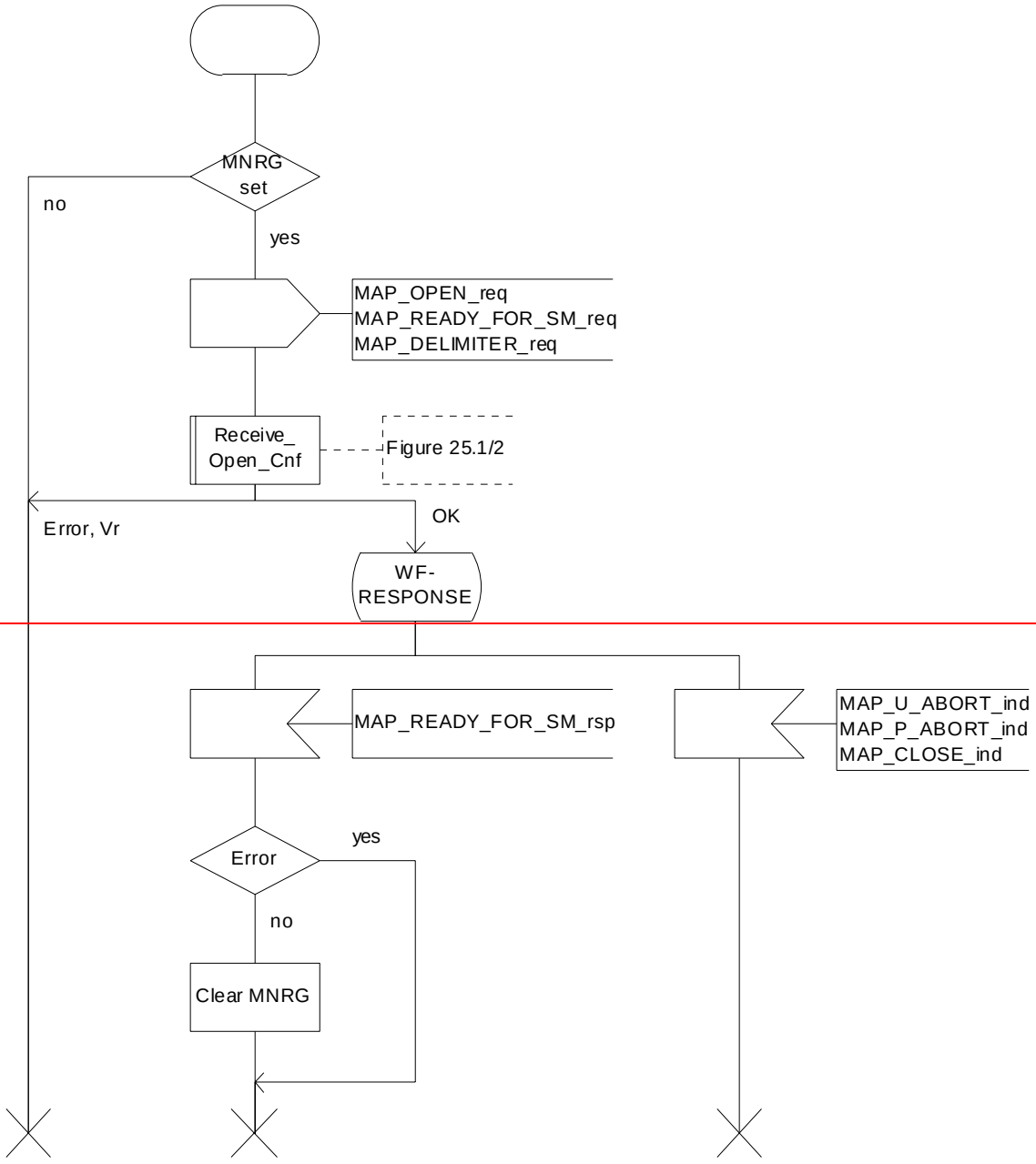
~~When receiving the answer, the SGSN will act as follows:~~

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

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

Process Subscriber_Present_SGSN 25.10_4(1)

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



~~Figure 25.10/4: Process Subscriber_Present_SGSN~~

***** End of document *****

3GPP TSG CN WG4 Meeting #19
San Diego, CA, USA, 19th – 23rd May 2003

N4-030639
(Revision of N4-030389)

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **578** ⌘**rev** **1** ⌘ Current version: **5.4.0** ⌘

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

Proposed change affects: UICC apps⌘ [ ] ME [ ] Radio Access Network [ ] Core Network [X]

Title:	⌘	Provision of SDL diagrams and removal of redundant text in chapter 24A
Source:	⌘	CN4
Work item code:	⌘	TEI5
Date:	⌘	21/05/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	There are no source files available for the SDL diagrams in 29.002 chapter 24A. Many SDL diagrams are poorly laid out. Some message flow diagrams are drawn using linedraw characters, which do not display correctly in Word 2000. The text incorrectly states that the procedures in the gsmSCF for Any Time Subscription Interrogation and Any Time Modification are "Out of the scope of the MAP specification". This is true for the application procedures in the gsmSCF, but not for the protocol handling procedures. The handling in the HLR for a dialogue opening request using the application context anyTimeInfoHandlingContext requires a co-ordinating process in the HLR to handle the dialogue opening and to create an instance of the appropriate process (ATSI_HLR or ATM_HLR). Most of the text replicates (inaccurately!) the material in the SDL diagrams.
Summary of change:	⌘	Redraw SDL diagrams to a consistent style. Redraw message flow diagrams. Provide SDL diagrams for the protocol handling in the gsmSCF for Any Time Subscription Interrogation and Any Time Modification. Remove text which duplicates SDL diagrams.
Consequences if not approved:	⌘	Impaired readability; modelling errors; unecessary bulk in the specification; useful information in the text is buried in redundant information.

Clauses affected:	⌘	24A			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

24A CSE control of subscriber data

24A.1 General

The following application context refers to a complex MAP user consisting of several processes:

- anyTimeInfoHandlingContext

This application context needs a co-ordinating process in the HLR.

The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 25.1.1;

The Any Time Info Handling Co-ordinator process in the HLR is shown in figure 24A.1/1.

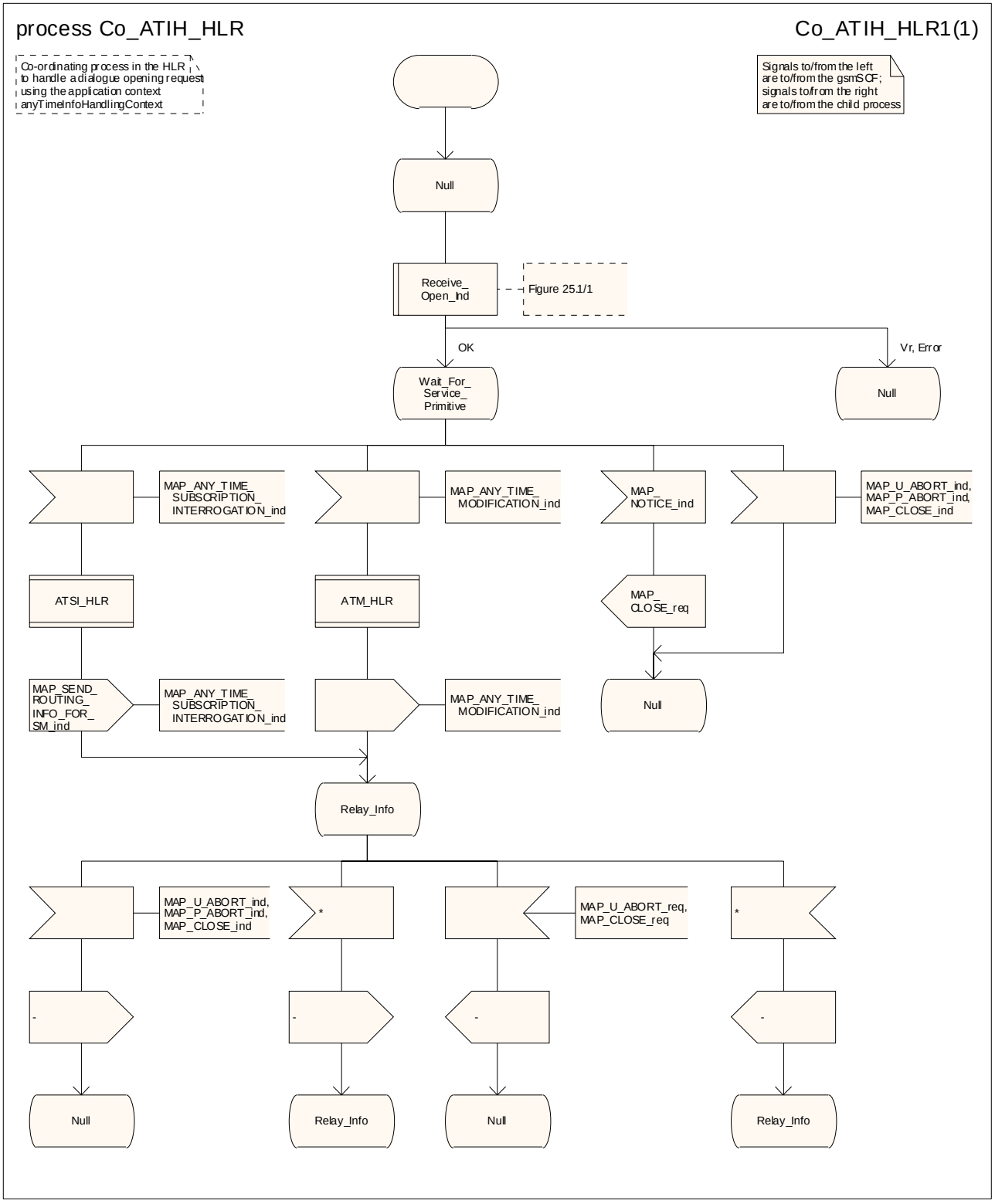


Figure 24A.1/1: Process Co_ATIH_HLR

24A.~~1~~2 Any Time Subscription Interrogation procedure

24A.~~1~~2.1 General

The message flow~~s~~ for successful retrieval of subscription information related to an any time subscription interrogation from the CAMEL server ~~are~~ is shown in figure 24A.1/1.~~-~~ In an IP Multimedia Core Network, an IM-SSF can take on the role of a gsmSCF for this procedure (see 3GPP TS 23.278).

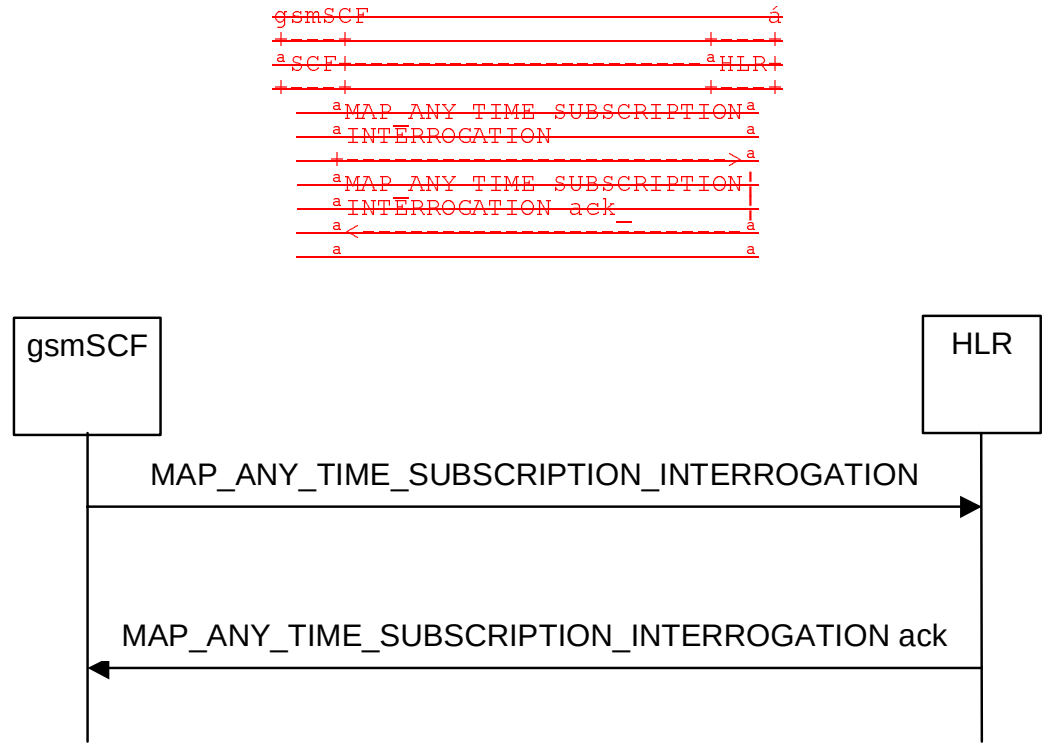


Figure 24A.2~~1~~/1: Message flow for any time subscription interrogation

The following MAP service is ~~are~~ used to retrieve the requested information:

MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION see clause 8.11.3~~x~~.

24A.~~1~~2.2 Process in the gsmSCF

The MAP process in the gsmSCF to obtain subscription information in response to a request from the application process in the gsmSCF is shown in figure 24A.2/2. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 25.2.2

~~Out of the scope of the MAP specification.~~

24A.~~1~~2.3 Process in the HLR

The MAP process in the HLR to provide subscription information in response to an interrogation from the CAMEL server is shown in figure 24A.1/2. The MAP process invokes a macro~~s~~ not defined in this clause; the definition~~s~~ of thi~~es~~e macro~~s~~ can be found as follows:

~~Receive_Open_Ind see clause 25.1.1;~~

Check Indication see clause 25.2.2

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context anyTimeInformationHandlng, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service indication is received, the MAP process sends an Any Time Subscription Interrogation request to the call handling process in the HLR (described in 3GPP TS 23.078 and 3GPP TS 23.278), and waits for a response. The Any Time Subscription Interrogation request contains the parameters received in the MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service indication.

If the call handling process in the HLR returns an Any Time Subscription Interrogation response, the MAP process constructs a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service response containing the subscription information contained in the Any Time Subscription Interrogation response, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state. If the MAP_ANY_TIME_ SUBSCRIPTION_INTERROGATION service response cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response to obtain subscription information, the MAP process constructs a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.

Failure of dialogue opening with the CAMEL server

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

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

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

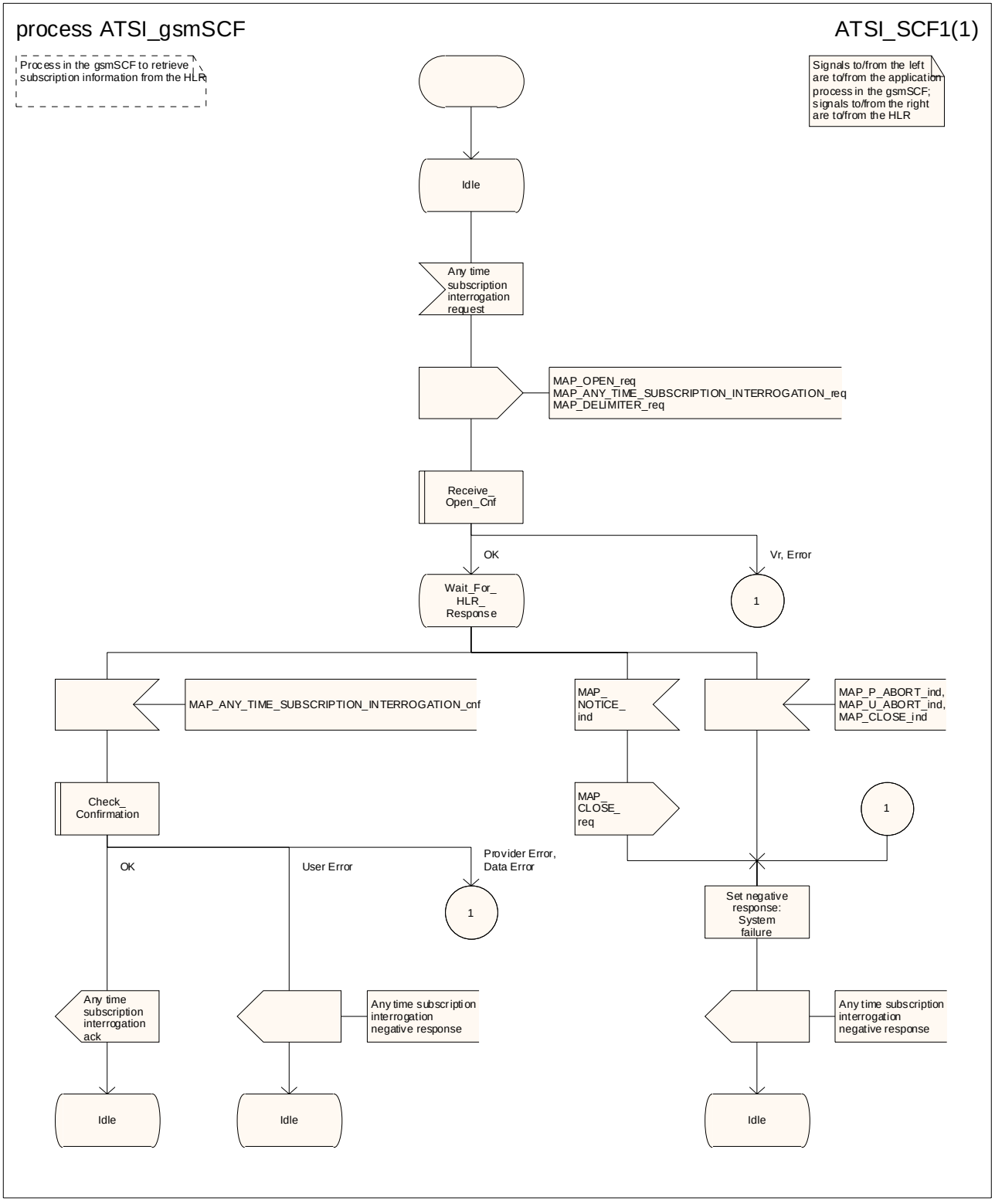
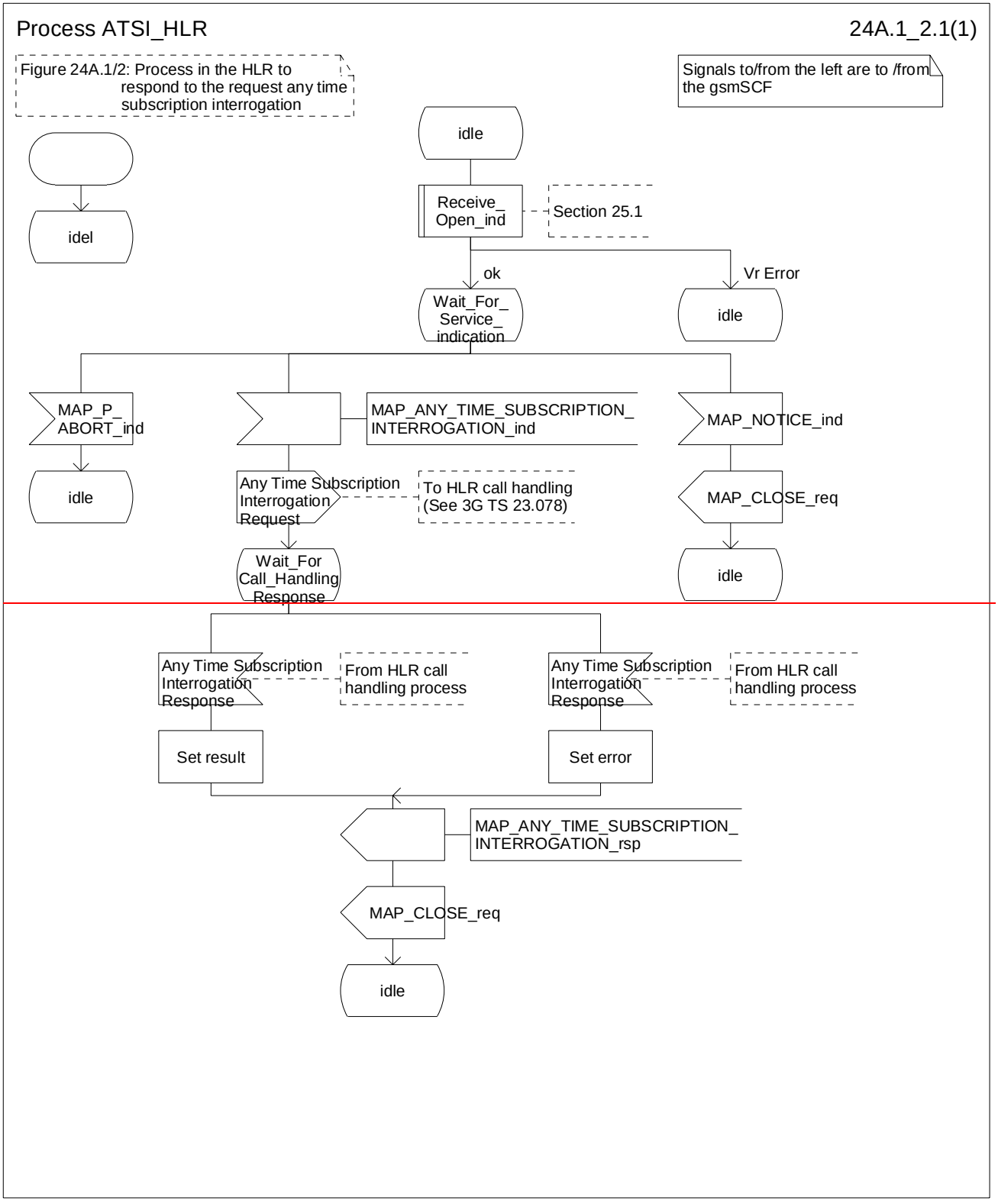


Figure 24A.2/2: Process ATSI_gsmSCF


Process ATSI_HLR
24A.1_2.1(1)
Figure 24A.1/2: Process in the HLR to respond to the request any time subscription interrogation
Signals to/from the left are to /from the gsmSCF
idle
idel
Receive_ Open_ind
Section 25.1
ok
Vr Error
Wait_For_ Service_ indication
idle
MAP_P_ ABORT_ind
MAP_ANY_TIME_SUBSCRIPTION_ INTERROGATION_ind
MAP_NOTICE_ind
idle
Any Time Subscription Interrogation Request
To HLR call handling (See 3G TS 23.078)
MAP_CLOSE_req
Wait_For Call_Handling Response
idle
Any Time Subscription Interrogation Response
From HLR call handling process
Any Time Subscription Interrogation Response
From HLR call handling process
Set result
Set error
MAP_ANY_TIME_SUBSCRIPTION_ INTERROGATION_rsp
MAP_CLOSE_req
idle

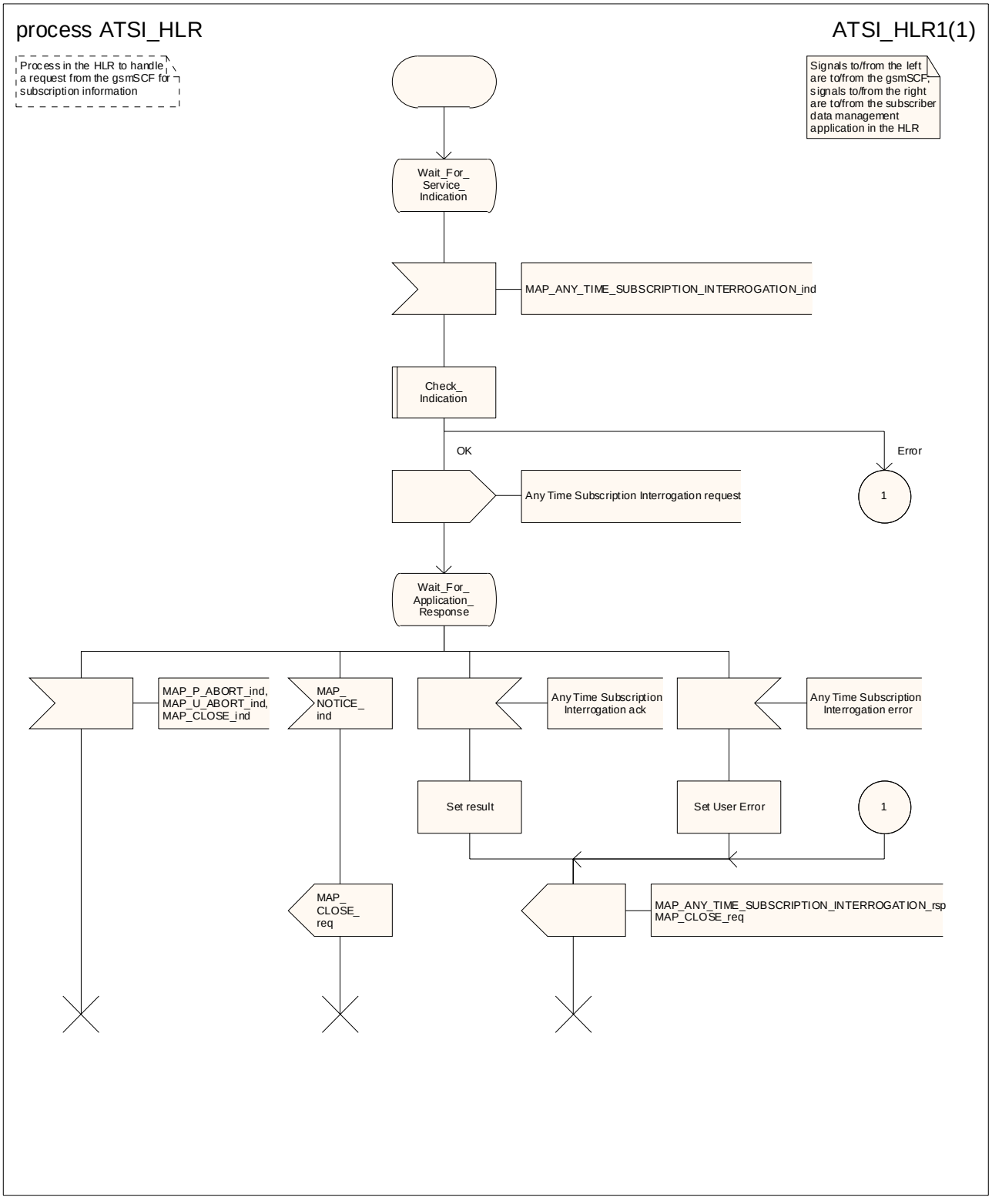


Figure 24A.21/32: Process ATSI_HLR

24A.~~2~~3 Any Time Modification procedure

24A.~~2~~3.1 General

The message flow~~s~~ for successful modification of subscription~~ber~~ information related to an any time modification request from the CAMEL server ~~are~~ is shown in figure 24A.2/1

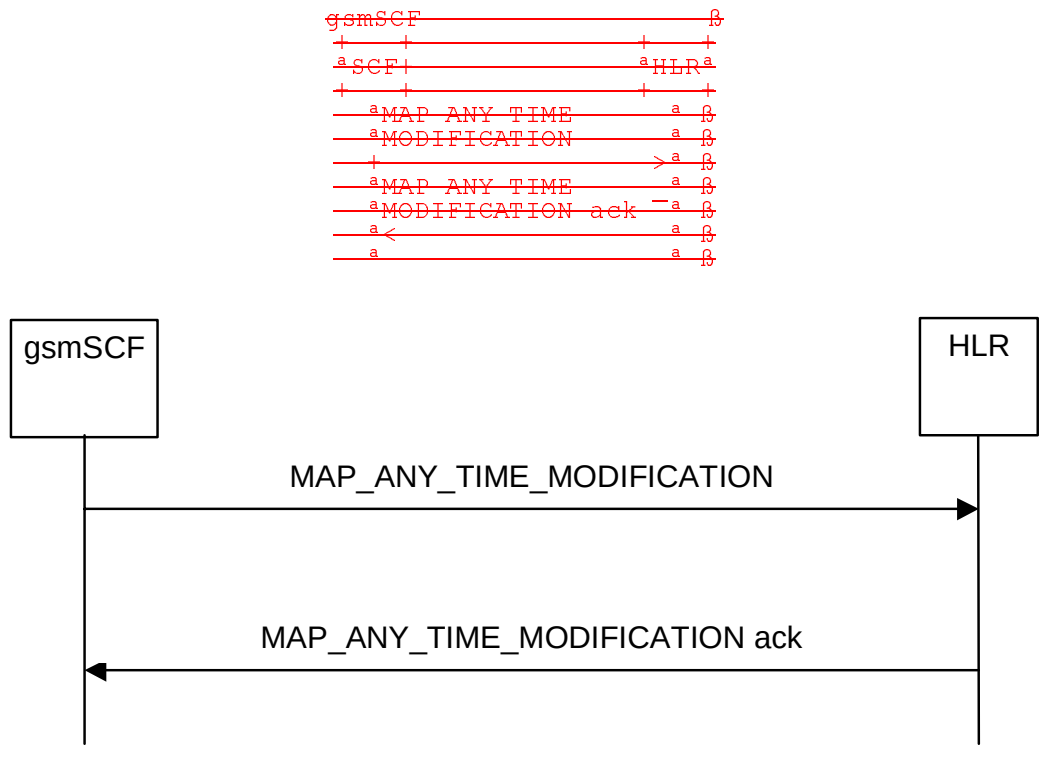


Figure 24A.3~~2~~/1: Message flow for any time modification

The following MAP service is ~~are~~ used to modify subscription information:

MAP_ANY_TIME_MODIFICATIONsee clause 8.11.4~~x~~.

24A.~~2~~3.2 Process in the gsmSCF

The MAP process in the gsmSCF to modify subscription information in response to a request from the application process in the gsmSCF is shown in figure 24A.3/2. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 25.2.2

~~Out of the scope of the MAP specification.~~

24A.~~2~~3.3 Process in the HLR

The MAP process in the HLR to modify subscriber information in response to a modification request from the CAMEL server is shown in figure 24A.~~2~~3/3~~2~~. The MAP process invokes a macro and a process not defined in this clause; the definitions of these ~~macros~~ can be found as follows:

~~Receive_Open_Ind see clause 25.1.1;~~

Check_Indication see clause 25.2.2;

Insert_Subs_Data_Stand_Alone_HLR see clause 25.7.3~~2;~~

Successful outcome

~~When the MAP process receives a MAP_OPEN indication with the application context anyTimeInfromationHandling, it checks it by invoking the macro Receive_Open_Ind.~~

~~If the macro takes the OK exit, the MAP process waits for a service indication.~~

~~If a MAP_ANY_TIME_MODIFICATION service indication is received, the MAP process sends an Any Time modification request to the call handling process in the HLR (described in 3GPP TS 23.078 and 3GPP TS 23.278), and waits for a response. The Any Time modification request contains the parameters received in the MAP_ ANY_TIME_ MODIFICATION service indication.~~

~~If the call handling process in the HLR returns an Any Time modification response, the MAP process constructs a MAP_ANY_TIME_ MODIFICATION service response containing the modified subscription information contained in the Any Time modification response, constructs a MAP_CLOSE service request, sends them to the CAMEL server.~~ If the MAP_ANY_TIME_MODIFICATION service response cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

If~~F~~ the serving node (VLR~~/~~ or SGSN) is to be updated after the modification, the ~~MAP_INSERT_SUBS_DATA_HLR~~ MAP process creates an instance of the appropriate process (Insert_Subs_Data_Stand_Alone_HLR for VLR update, Insert_GPRS_Subs_Data_Stand_Alone_HLR for SGSN update)~~shall be initiated and then returns to the idle state~~.

~~**Negative response from HLR call handling process**~~

~~If the call handling process in the HLR returns a negative response to modify subscription information, the MAP process constructs a MAP_ANY_TIME_ MODIFICATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.~~

~~**Failure of dialogue opening with the CAMEL server**~~

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

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

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

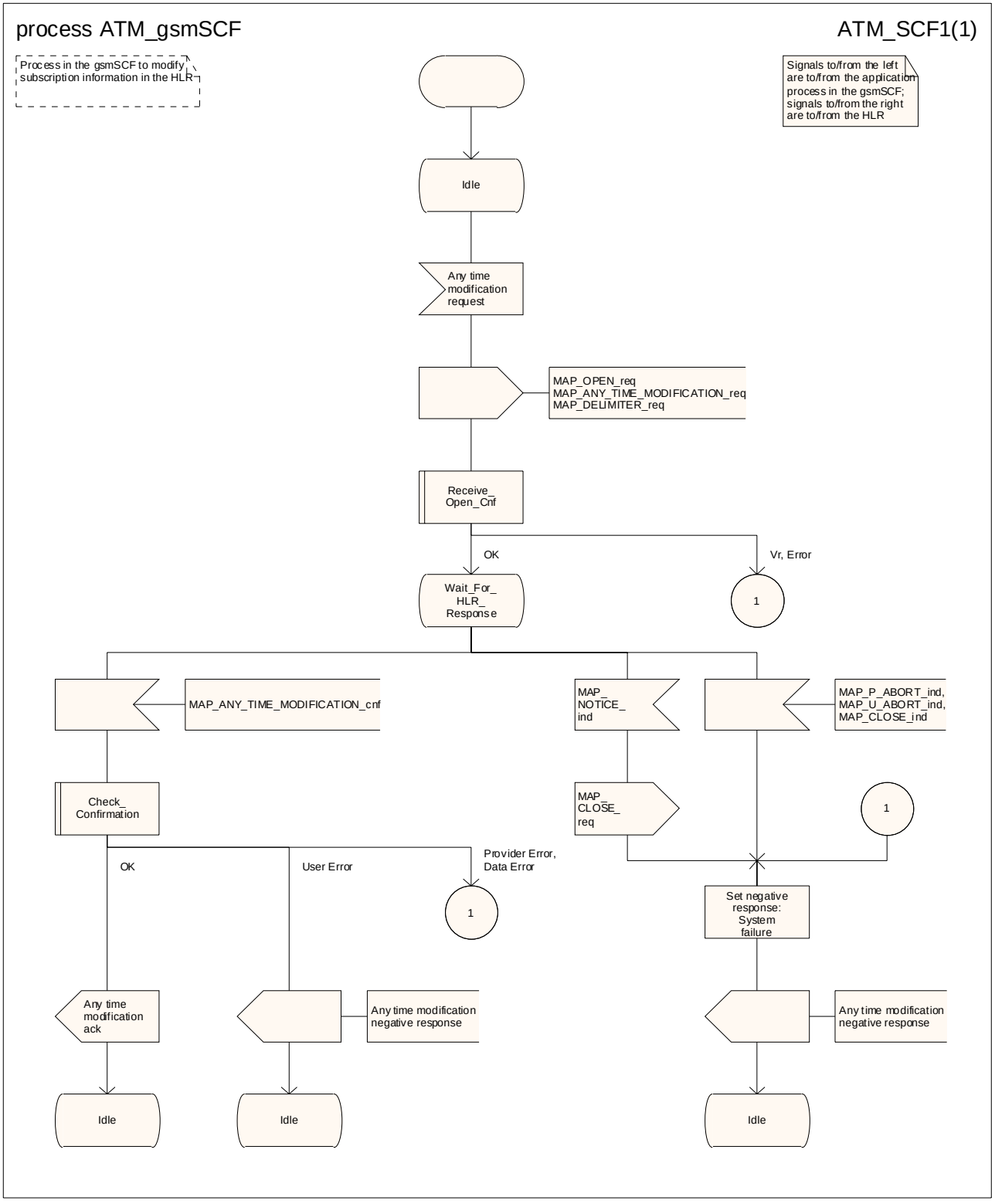
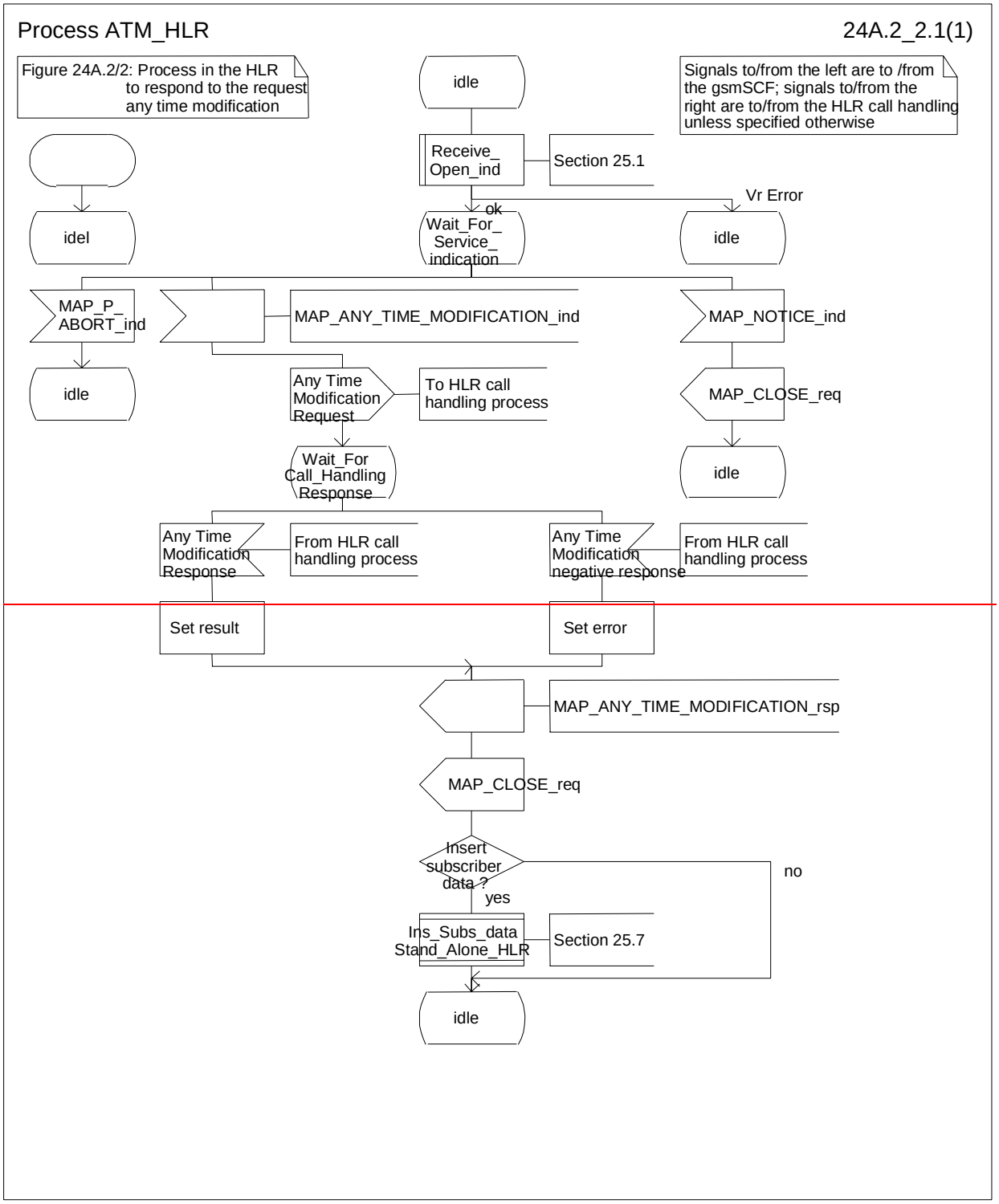


Figure 24A.3/2: Process ATM_gsmSCF


Process ATM_HLR
24A.2_2.1(1)
Figure 24A.2/2: Process in the HLR to respond to the request any time modification
idle
Signals to/from the left are to /from the gsmSCF; signals to/from the right are to/from the HLR call handling unless specified otherwise
Receive_ Open_ind
Section 25.1
Vr Error
ok
idel
Wait_For_ Service_ indication
idle
MAP_P_ ABORT_ind
MAP_ANY_TIME_MODIFICATION_ind
MAP_NOTICE_ind
idle
Any Time Modification Request
To HLR call handling process
MAP_CLOSE_req
Wait_For Call_Handling Response
idle
Any Time Modification Response
From HLR call handling process
Any Time Modification negative response
From HLR call handling process
Set result
Set error
MAP_ANY_TIME_MODIFICATION_rsp
MAP_CLOSE_req
Insert subscriber data ?
no
yes
Ins_Subs_data Stand_Alone_HLR
Section 25.7
idle

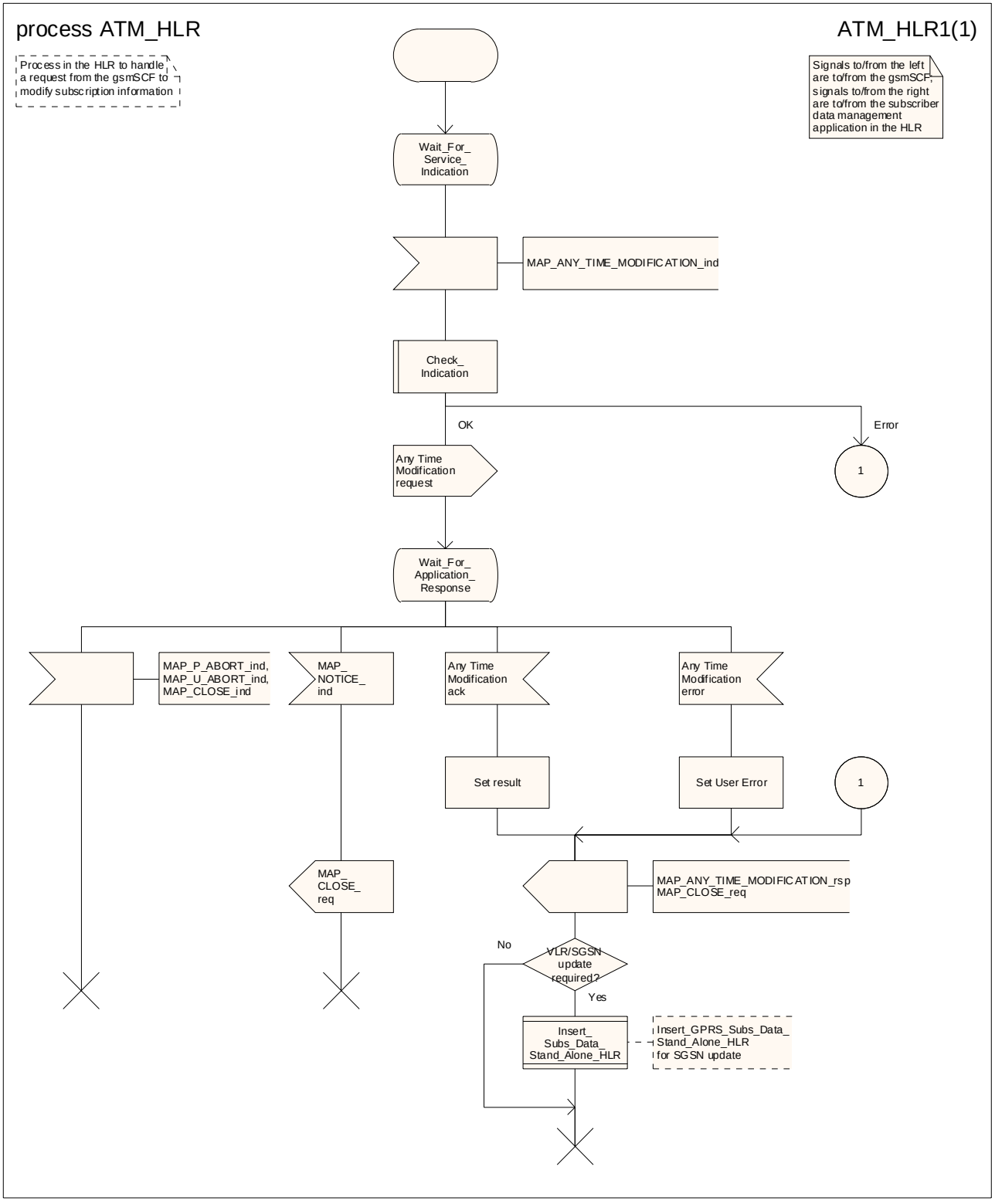


Figure 24A.32/32: Process ATM_HLR

24A.~~3~~4 Subscriber Data Modification Notification procedure

24A.~~3~~4.1 General

The Subscriber Data Modification Notification procedure is used to notify a gsmSCF about the modification of subscriber data. In an IP Multimedia Core Network, an IM-SSF can take on the role of a gsmSCF for this procedure.

The stage 2 specification for Subscriber Data Modification Notification is in 3GPP TS 23.078 and 3GPP TS 23.278. The interworking between the MAP signalling procedures and the Subscriber Data Modification Notification procedures for each entity (HLR, gsmSCF) is shown by the transfer of signals between these process~~dur~~es.

~~The following services are used:~~

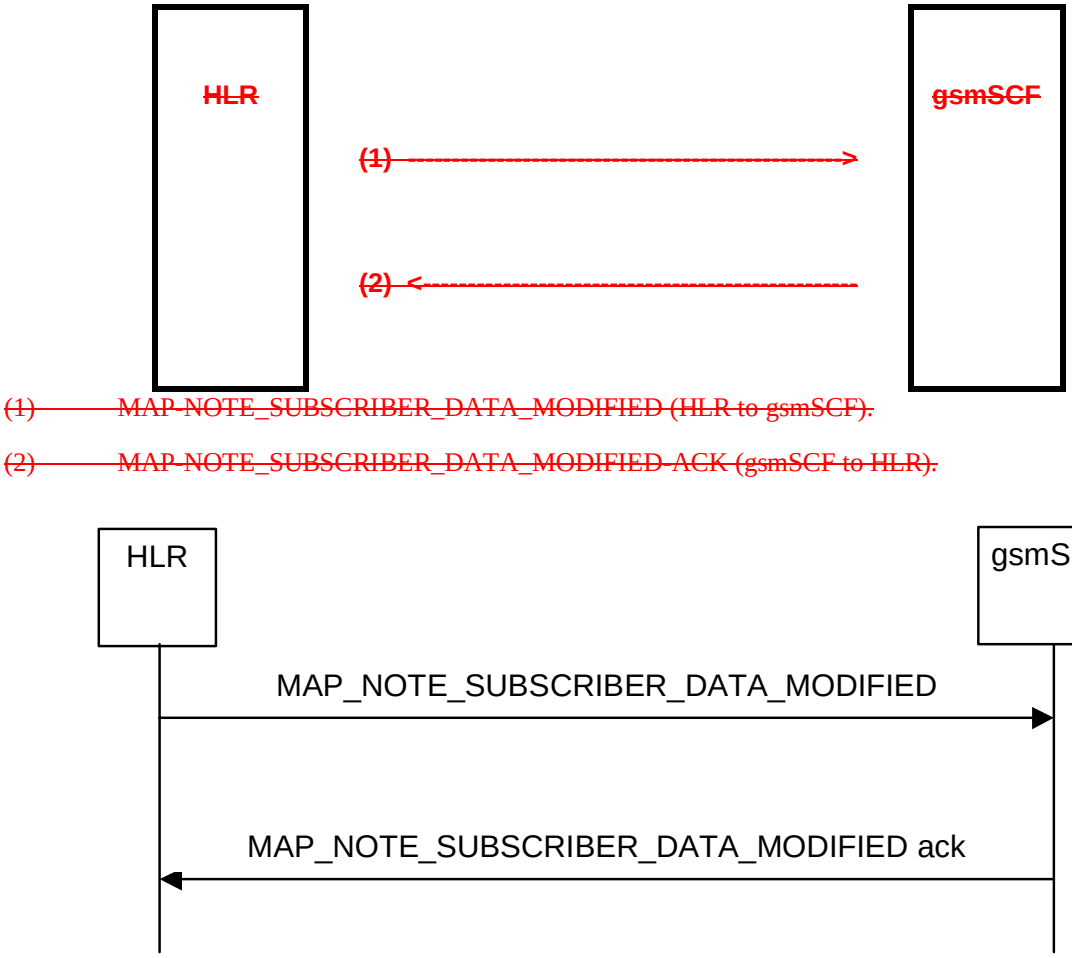


Figure 24A.~~4~~3/1: Message flow ~~Interfaces and services~~ for subscriber data modification notification

The following MAP service is used to send the notification to the gsmSCF:

MAP_NOTE_SUBSCRIBER_DATA_MODIFIED see clause 8.11.5.

~~24A.3.2 Processes in the MAP Entities~~

~~The text in this clause is a supplement to the definition in the SDL diagrams; it does not duplicate the information in the SDL diagrams.~~

***** CR editor's note: This applies to the whole chapter, not just to this subclause *****

24A.~~3~~4.2~~.1~~ Process in the HLR

The MAP process in the HLR to send modified data to the gsmSCF is shown in figure 24A.4~~3~~/2. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 25.2.2.

If the required information cannot be carried in a single MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request, the HLR segments the information into two or more requests. The "All Information Sent" parameter is omitted from each request except the last.

Sheet 2: If the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request contained the "All Information Sent" parameter, the test "All information sent" takes the "Yes" exit.

~~**Successful Outcome**~~

~~When the MAP process receives a Notify Subscriber Data Change request from the process in the HLR, it requests a dialogue with the gsmSCF whose identity is contained in the Note Subscriber Data Modified request by sending a MAP_OPEN service request, notifies modified subscriber data to the gsmSCF using a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the gsmSCF.~~

~~If the HLR notices after receiving a Notify Subscriber Data Change request that the segmentation is needed the HLR does not set the "All Information Sent" indicator. Otherwise the indicator is set and the process returns to the Wait for SCF response state.~~

~~If the MAP process receives a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service confirm from the gsmSCF, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.~~

~~If the macro Check_Confirmation takes the OK exit, the MAP process checks if the "All Information Sent" indicator is set. If it is set the MAP process sends a Notify Subscriber Data Modified ack to the process in the HLR and returns to the idle state. If the "All Information Sent" indicator is not set the MAP process checks if the further segmentation is needed. If segmentation is needed the HLR does not set the indicator and sends MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request to the gsmSCF. Otherwise the indicator is set and the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request is sent to the gsmSCF.~~

~~**Dialogue opening failure**~~

~~If the macro Receive_Open_Cnf indicates that the dialogue with the gsmSCF could not be opened or that the dialogue can be opened only at an earlier version, the MAP process sends a Notify Subscriber Data Modified negative response indicating system failure to the process in the HLR and returns to the idle state.~~

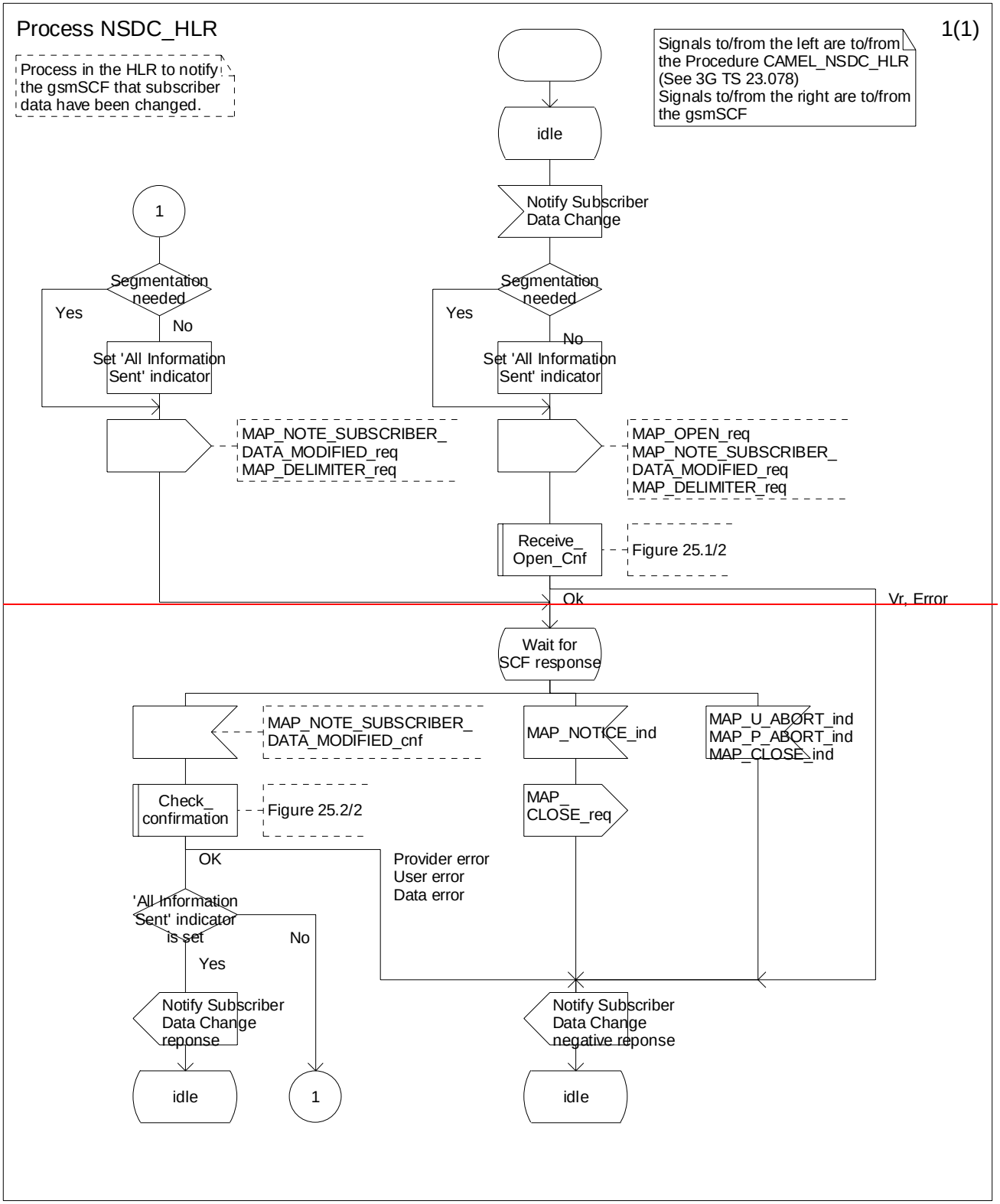
~~**Error in MAP_NOTE_SUBSCRIBER_DATA_MODIFIED confirm**~~

~~If the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service confirm contains a user error or a provider error, the MAP process sends a Notify Subscriber Data Change negative response to the process in the HLR and returns to the idle state.~~

~~**Abort of gsmSCF dialogue**~~

~~After the dialogue with the gsmSCF has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the gsmSCF may send a MAP_CLOSE indication. In either of these cases, the MAP process sends a Notify Subscriber Data Change negative response to the process in the HLR and returns to the idle state.~~

~~If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the gsmSCF, sends a Notify Subscriber Data Change negative response indicating system failure to the process in the HLR and returns to the idle state.~~



~~Figure 24A.3/2 Process Subscriber_Data_Modification_Notification_HLR (sheet 1 of 1)~~

24A.~~3~~4.3~~2.2~~ Process in the gsmSCF

The MAP process in the gsmSCF to handle a notification to the gsmSCF of change of subscriber data ~~resume~~ is shown in figure 24A.4~~3~~/3. The MAP process invokes ~~a~~ macros not defined in this clause; the definitions of th~~i~~ese macros can be found as follows:

Receive_Open_Ind see clause 25.1.1;

Check_Indication see clause 25.2.1

If the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication contained the "All Information Sent" parameter, the test "All information sent" takes the "Yes" exit.

If the test "All information sent" takes the "No" exit, the MAP process stores the data received in the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication. If the test "All information sent" takes the "Yes" exit, the MAP process assembles the data received in all the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indications received in the dialogue and sends the assembled data to the application process in the gsmSCF.

~~**Successful outcome**~~

~~When the MAP process receives a MAP_OPEN indication with the application context noteSubscriberDataModified, it checks it by invoking the macro Receive_Open_Ind.~~

~~If the macro takes the OK exit, the MAP process waits for a service indication.~~

~~If a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication is received, the MAP process checks if the "All Information Sent" indicator is set and if so it sends a Subscriber Data Changed request including all the stored data to the process in the gsmSCF, and waits for a response. The Subscriber Data Changed request contains the parameters received in the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication. If the "All Information Sent" indicator is not set, the received data is stored and the MAP process constructs an empty MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service response, sends it to the HLR and returns to the Wait for response state.~~

~~If the process in the gsmSCF returns a negative response, the MAP process constructs a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service response, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.~~

~~**Failure of dialogue opening with the HLR**~~

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

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

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

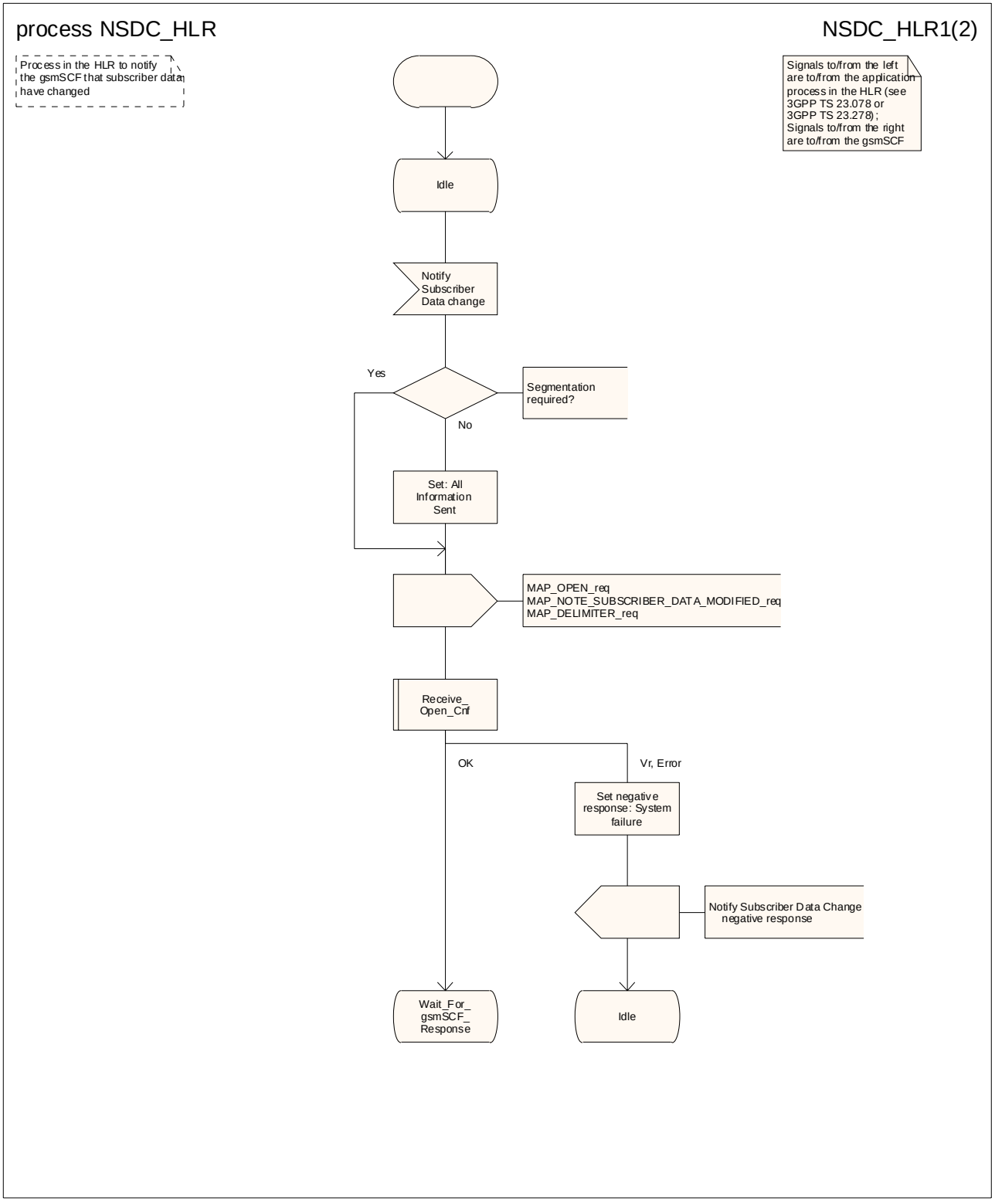


Figure 24A.4/2 (sheet 1 of 2): Process NS_DC_HLR

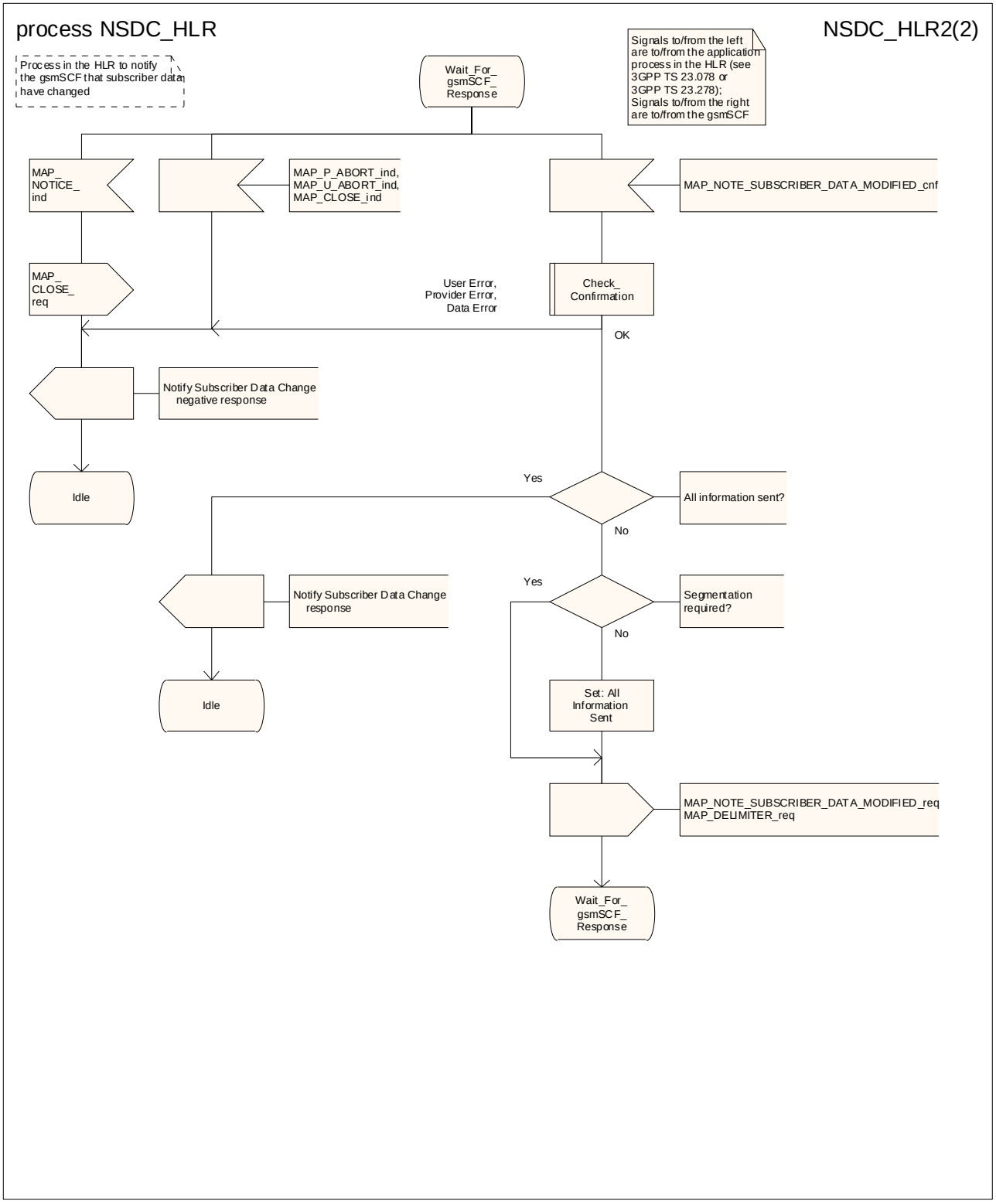
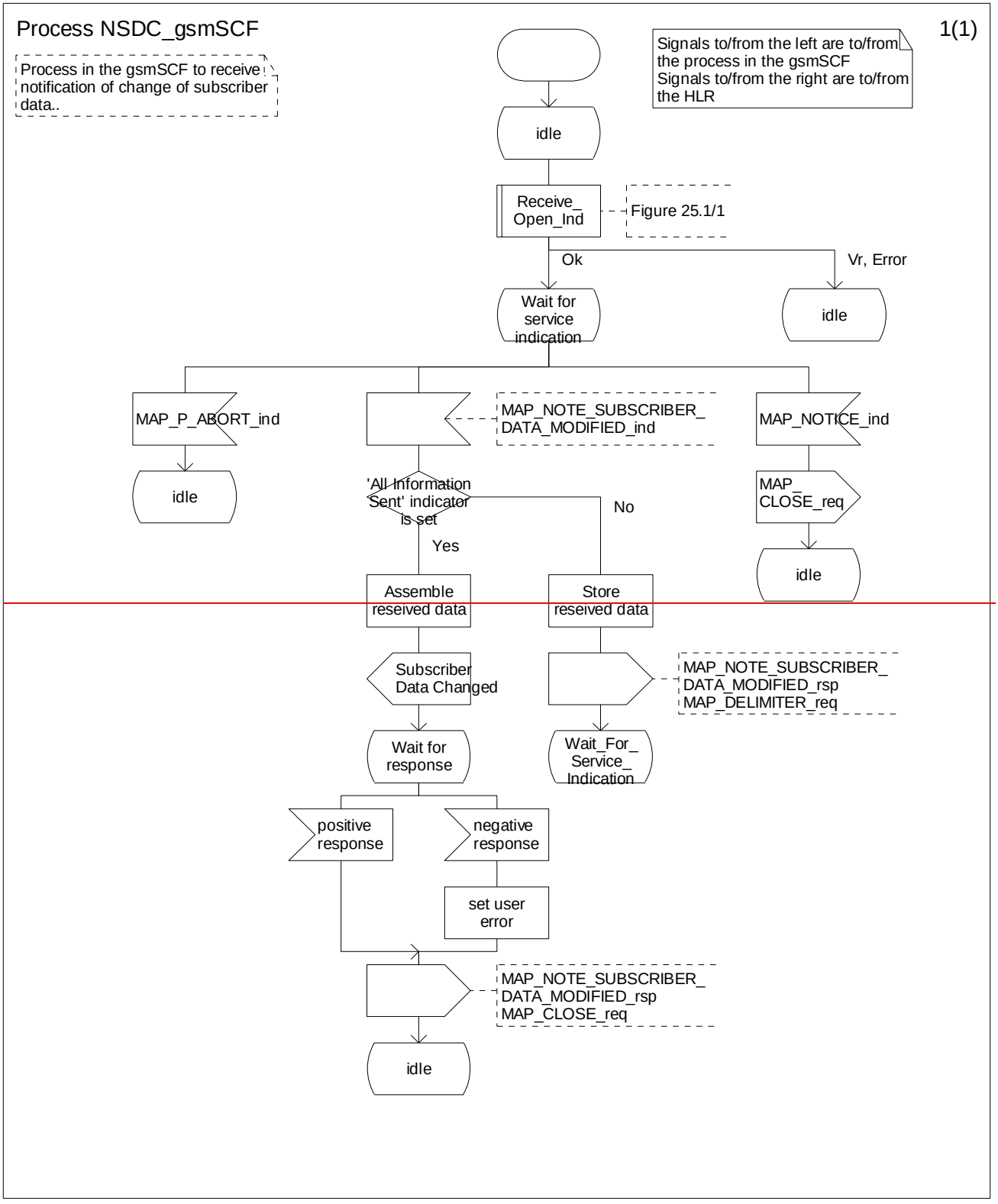


Figure 24A.4/2 (sheet 2 of 2): Process NSDC_HLR


Process NSDC_gsmSCF
1(1)
Process in the gsmSCF to receive notification of change of subscriber data..
Signals to/from the left are to/from the process in the gsmSCF
Signals to/from the right are to/from the HLR
idle
Receive_ Open_Ind
Figure 25.1/1
Ok
Vr, Error
Wait for service indication
idle
MAP_P_ABORT_ind
MAP_NOTE_SUBSCRIBER_ DATA_MODIFIED_ind
MAP_NOTICE_ind
idle
'All Information Sent' indicator is set
No
Yes
MAP_ CLOSE_req
idle
Assemble reseived data
Store reseived data
Subscriber Data Changed
MAP_NOTE_SUBSCRIBER_ DATA_MODIFIED_rsp MAP_DELIMITER_req
Wait for response
Wait_For_ Service_ Indication
positive response
negative response
set user error
MAP_NOTE_SUBSCRIBER_ DATA_MODIFIED_rsp MAP_CLOSE_req
idle

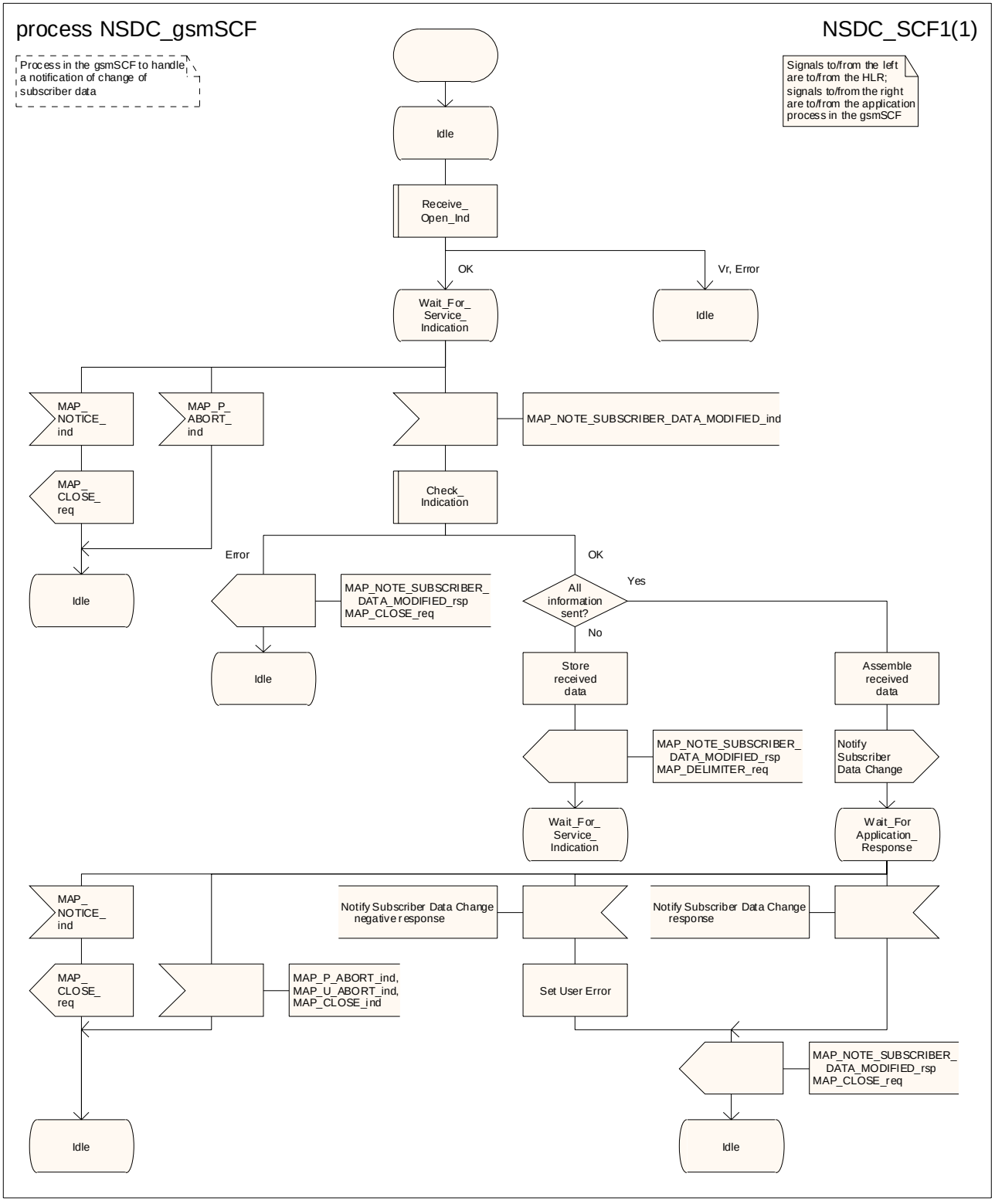


Figure 24A.~~43~~/3: Process ~~Subscriber_Data_Modification_Notification~~NSDC_gsmSCF ~~(sheet 1 of 1)~~

3GPP TSG CN WG4 Meeting #19 ***N4-030640***
San Diego, CA, USA, 19th – 23rd May 2003

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **579** ⌘**rev** **1** ⌘ Current version: **6.1.0** ⌘

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

Proposed change affects: UICC apps⌘ [ ] ME [ ] Radio Access Network [ ] Core Network [X]

Title:	⌘	Provision of SDL diagrams and removal of redundant text in chapter 24A
Source:	⌘	Vodafone
Work item code:	⌘	TEI5
Date:	⌘	10/04/2003
Category:	⌘	**A**
Release:	⌘	Rel-6

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	There are no source files available for the SDL diagrams in 29.002 chapter 24A. Many SDL diagrams are poorly laid out. Some message flow diagrams are drawn using linedraw characters, which do not display correctly in Word 2000. The text incorrectly states that the procedures in the gsmSCF for Any Time Subscription Interrogation and Any Time Modification are "Out of the scope of the MAP specification". This is true for the application procedures in the gsmSCF, but not for the protocol handling procedures. The handling in the HLR for a dialogue opening request using the application context anyTimeInfoHandlingContext requires a co-ordinating process in the HLR to handle the dialogue opening and to create an instance of the appropriate process (ATSI_HLR or ATM_HLR). Most of the text replicates (inaccurately!) the material in the SDL diagrams.
Summary of change:	⌘	Redraw SDL diagrams to a consistent style. Redraw message flow diagrams. Provide SDL diagrams for the protocol handling in the gsmSCF for Any Time Subscription Interrogation and Any Time Modification. Remove text which duplicates SDL diagrams.
Consequences if not approved:	⌘	Impaired readability; modelling errors; unecessary bulk in the specification; useful information in the text is buried in redundant information.

Clauses affected:	⌘	24A			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

24A CSE control of subscriber data

24A.1 General

The following application context refers to a complex MAP user consisting of several processes:

- anyTimeInfoHandlingContext

This application context needs a co-ordinating process in the HLR.

The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see clause 25.1.1;

The Any Time Info Handling Co-ordinator process in the HLR is shown in figure 24A.1/1.

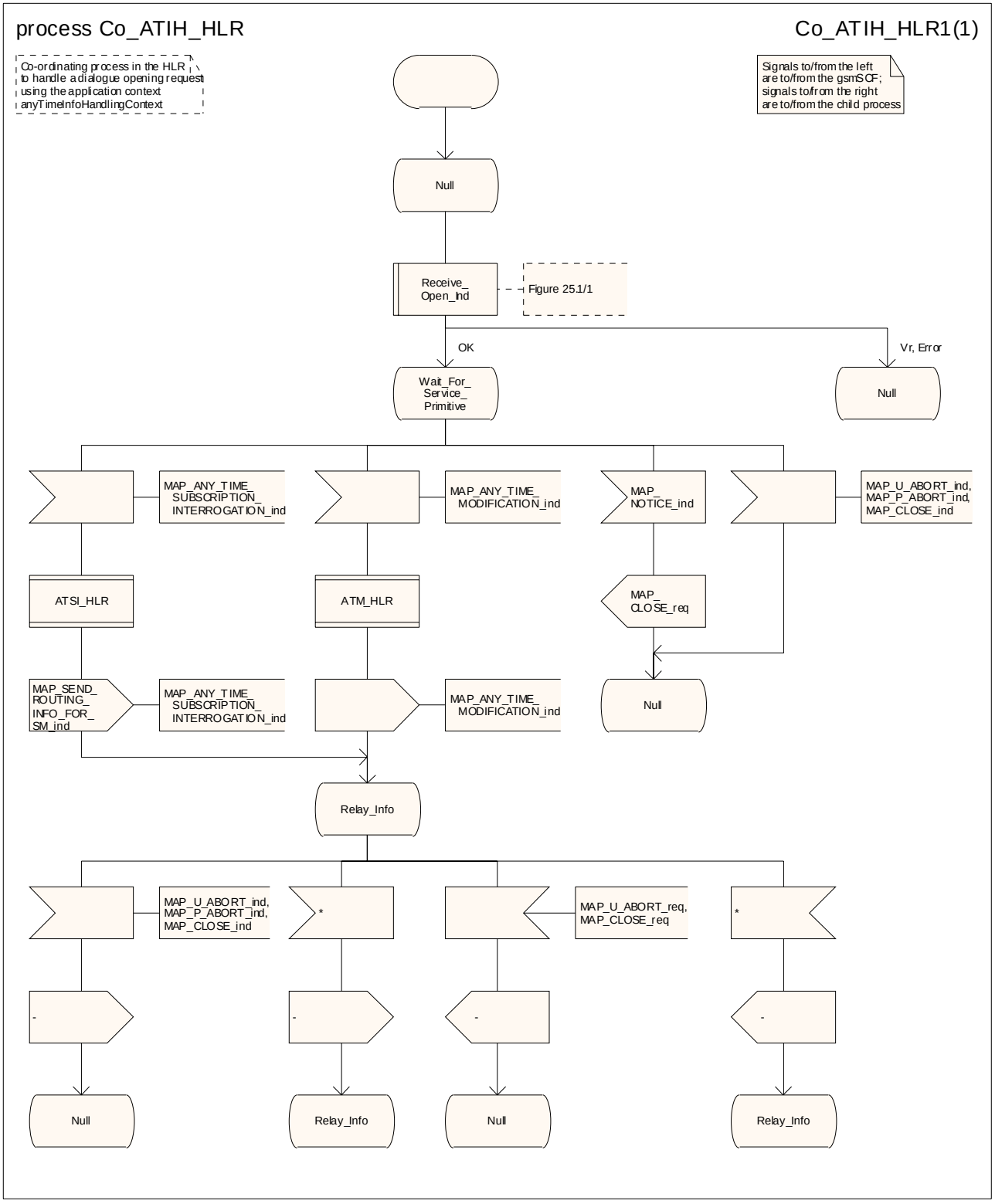


Figure 24A.1/1: Process Co_ATIH_HLR

24A.~~1~~2 Any Time Subscription Interrogation procedure

24A.~~1~~2.1 General

The message flow~~s~~ for successful retrieval of subscription information related to an any time subscription interrogation from the CAMEL server ~~are~~ is shown in figure 24A.1/1.~~-~~ In an IP Multimedia Core Network, an IM-SSF can take on the role of a gsmSCF for this procedure (see 3GPP TS 23.278).

~~gsmSCF á~~
~~+----+ +----+~~
~~a SCF+----------HLR+~~
~~+----+ +----+~~
~~a MAP_ANY_TIME_SUBSCRIPTION a~~
~~a INTERROGATION a~~
~~+----------> a~~
~~a MAP_ANY_TIME_SUBSCRIPTION |~~
~~a INTERROGATION ack |~~
~~a <----------a~~
~~a a~~

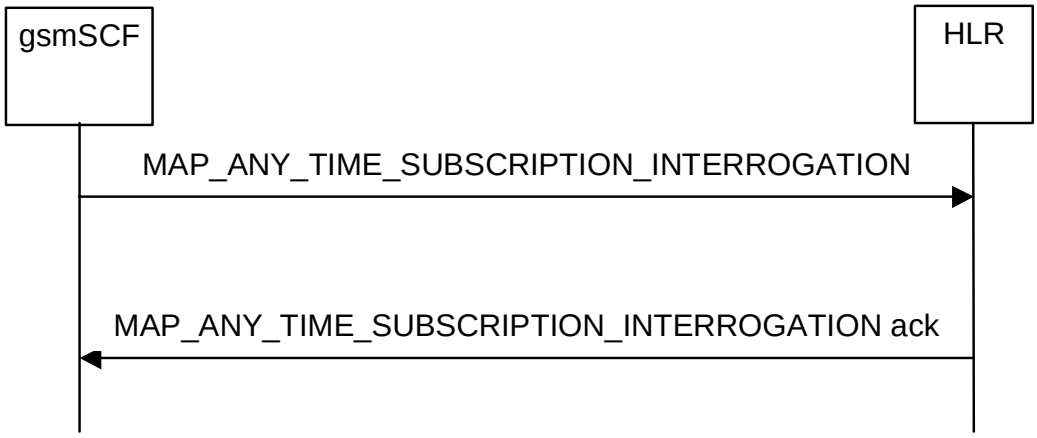


Figure 24A.2~~1~~/1: Message flow for any time subscription interrogation

The following MAP service is ~~are~~ used to retrieve the requested information:

MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION see clause 8.11.3~~x~~.

24A.~~1~~2.2 Process in the gsmSCF

The MAP process in the gsmSCF to obtain subscription information in response to a request from the application process in the gsmSCF is shown in figure 24A.2/2. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 25.2.2

~~Out of the scope of the MAP specification.~~

24A.~~1~~2.3 Process in the HLR

The MAP process in the HLR to provide subscription information in response to an interrogation from the CAMEL server is shown in figure 24A.1/2. The MAP process invokes a macro~~s~~ not defined in this clause; the definition~~s~~ of thi~~es~~e macro~~s~~ can be found as follows:

~~Receive_Open_Ind see clause 25.1.1;~~

Check Indication see clause 25.2.2

Successful outcome

When the MAP process receives a MAP_OPEN indication with the application context anyTimeInformationHandlng, it checks it by invoking the macro Receive_Open_Ind.

If the macro takes the OK exit, the MAP process waits for a service indication.

If a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service indication is received, the MAP process sends an Any Time Subscription Interrogation request to the call handling process in the HLR (described in 3GPP TS 23.078 and 3GPP TS 23.278), and waits for a response. The Any Time Subscription Interrogation request contains the parameters received in the MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service indication.

If the call handling process in the HLR returns an Any Time Subscription Interrogation response, the MAP process constructs a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service response containing the subscription information contained in the Any Time Subscription Interrogation response, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state. If the MAP_ANY_TIME_ SUBSCRIPTION_INTERROGATION service response cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

Negative response from HLR call handling process

If the call handling process in the HLR returns a negative response to obtain subscription information, the MAP process constructs a MAP_ANY_TIME_SUBSCRIPTION_INTERROGATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.

Failure of dialogue opening with the CAMEL server

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

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

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

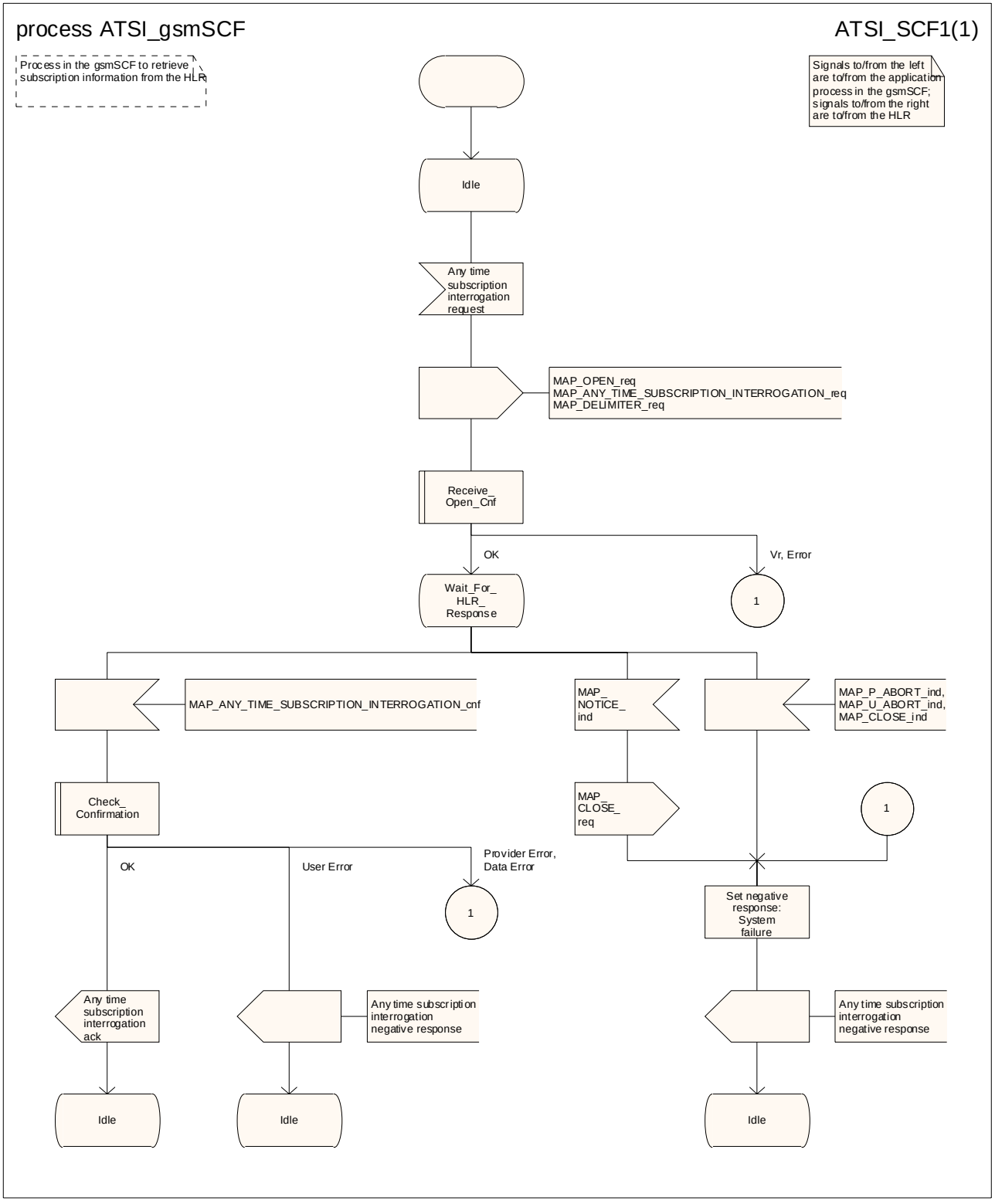
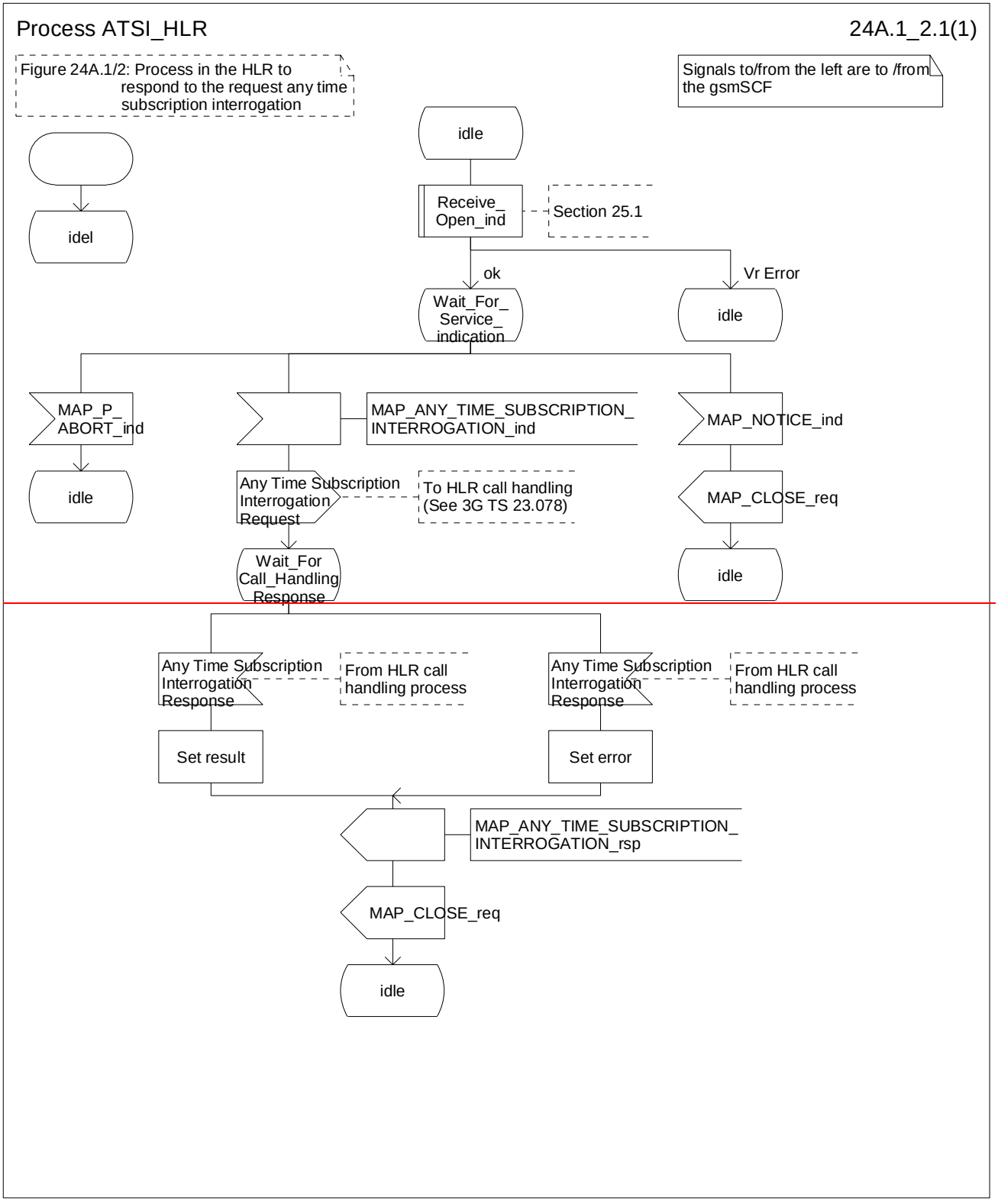


Figure 24A.2/2: Process ATSI_gsmSCF


Process ATSI_HLR
24A.1_2.1(1)
Figure 24A.1/2: Process in the HLR to respond to the request any time subscription interrogation
Signals to/from the left are to /from the gsmSCF
idle
idel
Receive_ Open_ind
Section 25.1
ok
Vr Error
Wait_For_ Service_ indication
idle
MAP_P_ ABORT_ind
MAP_ANY_TIME_SUBSCRIPTION_ INTERROGATION_ind
MAP_NOTICE_ind
idle
Any Time Subscription Interrogation Request
To HLR call handling (See 3G TS 23.078)
MAP_CLOSE_req
Wait_For Call_Handling Response
idle
Any Time Subscription Interrogation Response
From HLR call handling process
Any Time Subscription Interrogation Response
From HLR call handling process
Set result
Set error
MAP_ANY_TIME_SUBSCRIPTION_ INTERROGATION_rsp
MAP_CLOSE_req
idle

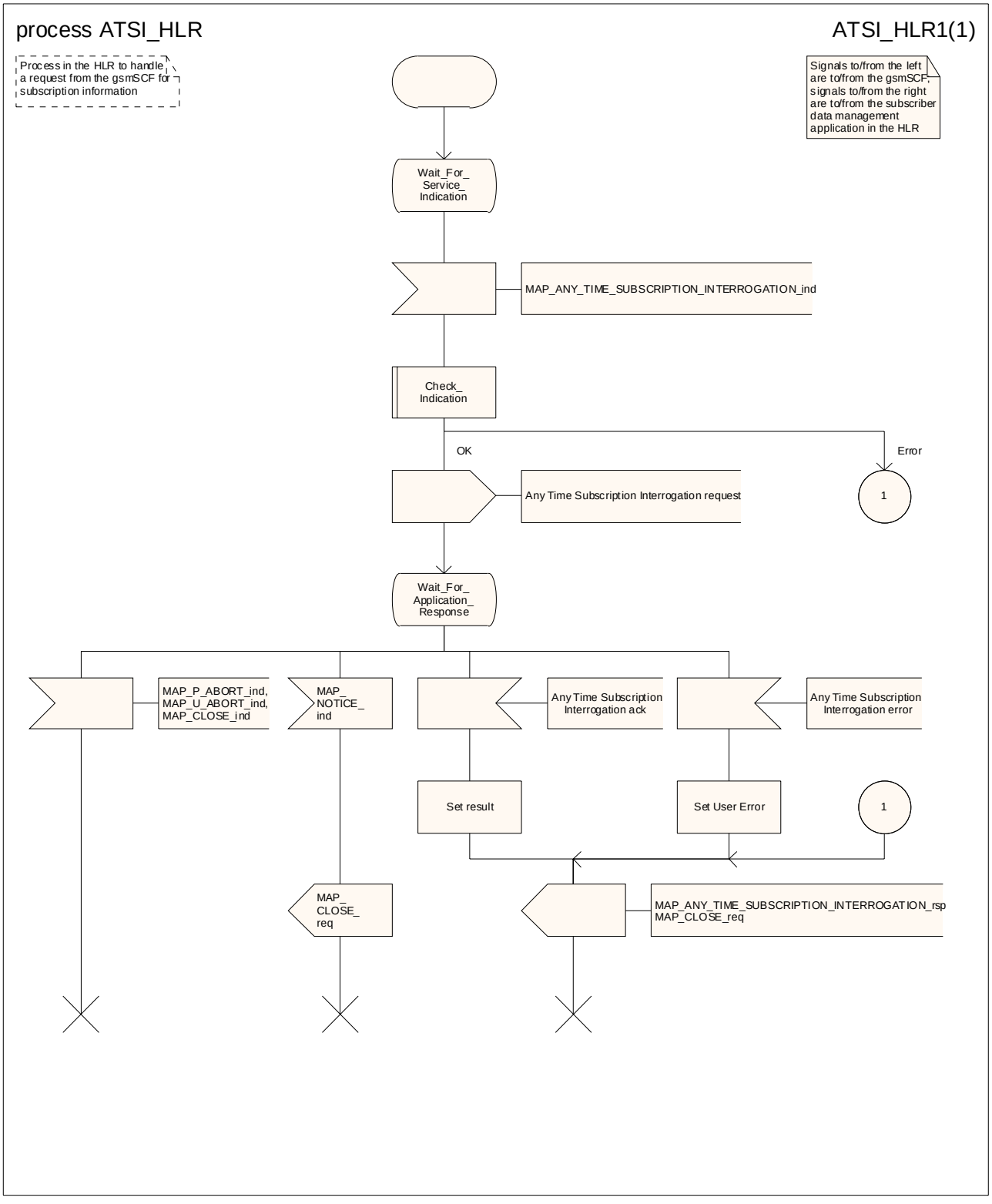


Figure 24A.2~~1~~/3~~2~~: Process ATSI_HLR

24A.~~2~~3 Any Time Modification procedure

24A.~~2~~3.1 General

The message flow~~s~~ for successful modification of subscription~~ber~~ information related to an any time modification request from the CAMEL server ~~are~~ is shown in figure 24A.2/1

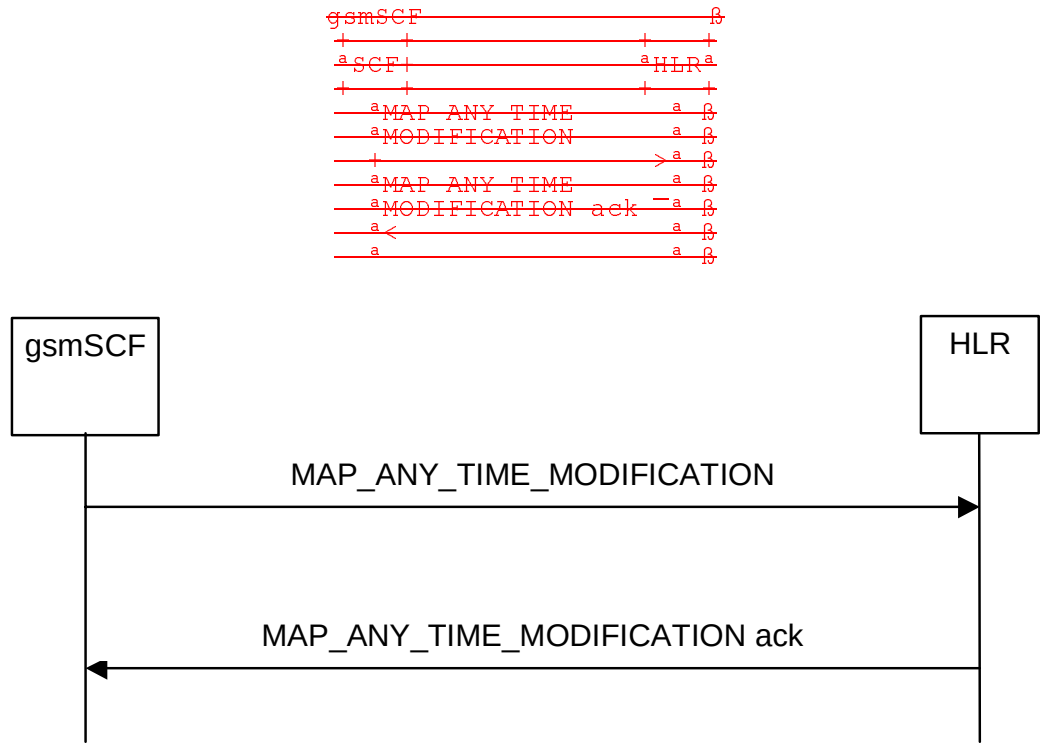


Figure 24A.3~~2~~/1: Message flow for any time modification

The following MAP service is ~~are~~ used to modify subscription information:

MAP_ANY_TIME_MODIFICATIONsee clause 8.11.4~~x~~.

24A.~~2~~3.2 Process in the gsmSCF

The MAP process in the gsmSCF to modify subscription information in response to a request from the application process in the gsmSCF is shown in figure 24A.3/2. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 25.2.2

~~Out of the scope of the MAP specification.~~

24A.~~2~~3.3 Process in the HLR

The MAP process in the HLR to modify subscriber information in response to a modification request from the CAMEL server is shown in figure 24A.~~2~~3/3~~2~~. The MAP process invokes a macro and a process not defined in this clause; the definitions of these ~~macros~~ can be found as follows:

~~Receive_Open_Ind see clause 25.1.1;~~

Check_Indication see clause 25.2.2;

Insert_Subs_Data_Stand_Alone_HLR see clause 25.7.3~~2;~~

Successful outcome

~~When the MAP process receives a MAP_OPEN indication with the application context anyTimeInfromationHandling, it checks it by invoking the macro Receive_Open_Ind.~~

~~If the macro takes the OK exit, the MAP process waits for a service indication.~~

~~If a MAP_ANY_TIME_MODIFICATION service indication is received, the MAP process sends an Any Time modification request to the call handling process in the HLR (described in 3GPP TS 23.078 and 3GPP TS 23.278), and waits for a response. The Any Time modification request contains the parameters received in the MAP_ ANY_TIME_ MODIFICATION service indication.~~

~~If the call handling process in the HLR returns an Any Time modification response, the MAP process constructs a MAP_ANY_TIME_ MODIFICATION service response containing the modified subscription information contained in the Any Time modification response, constructs a MAP_CLOSE service request, sends them to the CAMEL server.~~ If the MAP_ANY_TIME_MODIFICATION service response cannot be carried in a single TC-Result component, it is carried in one or more TC-Result-NL components (each sent in a TC-CONTINUE), followed by a TC-Result-L component in a TC-END message.

If~~F~~ the serving node (VLR~~/~~ or SGSN) is to be updated after the modification, the ~~MAP_INSERT_SUBS_DATA_HLR~~ MAP process creates an instance of the appropriate process (Insert_Subs_Data_Stand_Alone_HLR for VLR update, Insert_GPRS_Subs_Data_Stand_Alone_HLR for SGSN update)~~shall be initiated and then returns to the idle state~~.

~~**Negative response from HLR call handling process**~~

~~If the call handling process in the HLR returns a negative response to modify subscription information, the MAP process constructs a MAP_ANY_TIME_ MODIFICATION service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the CAMEL server and returns to the idle state.~~

~~**Failure of dialogue opening with the CAMEL server**~~

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

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

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

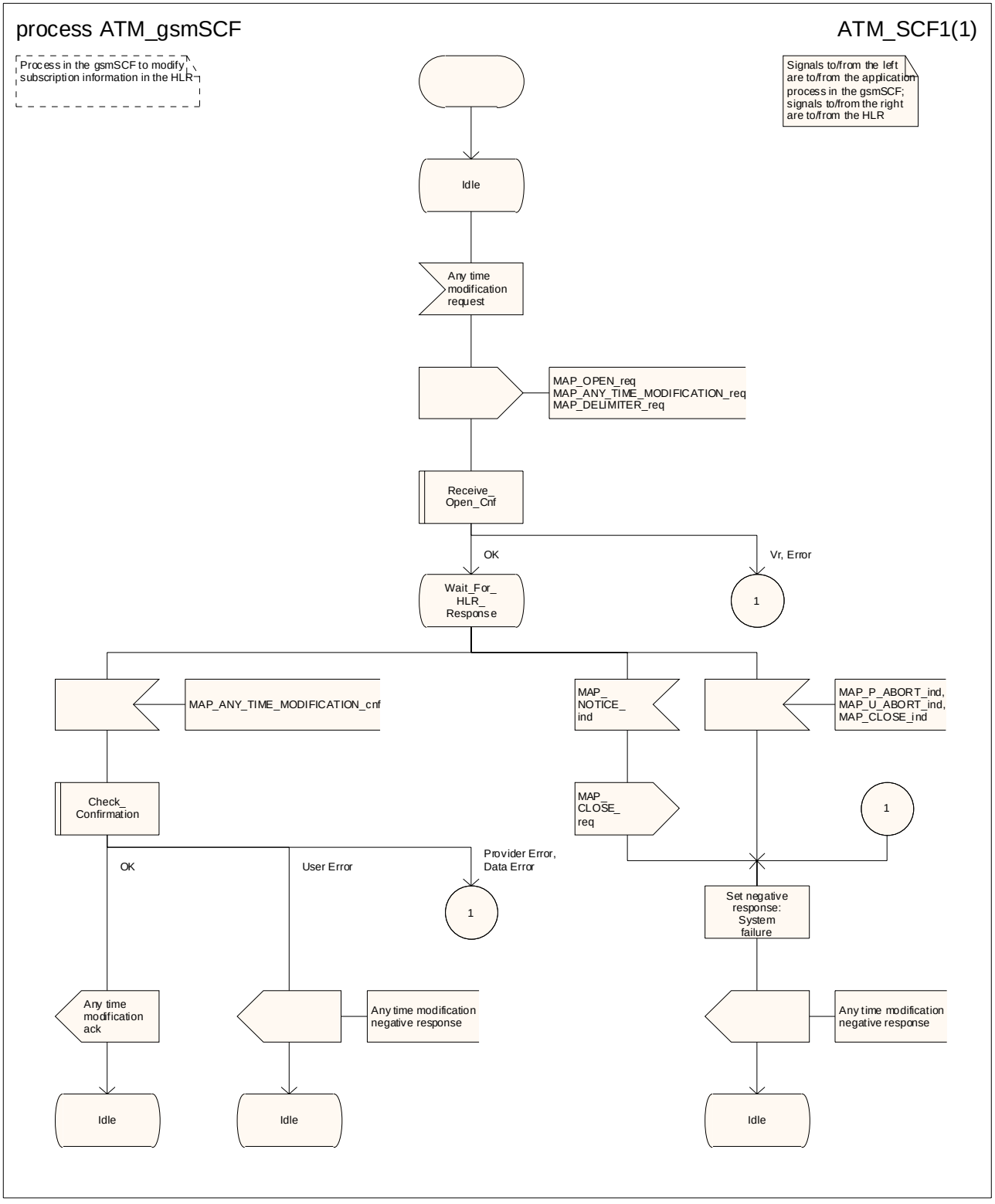
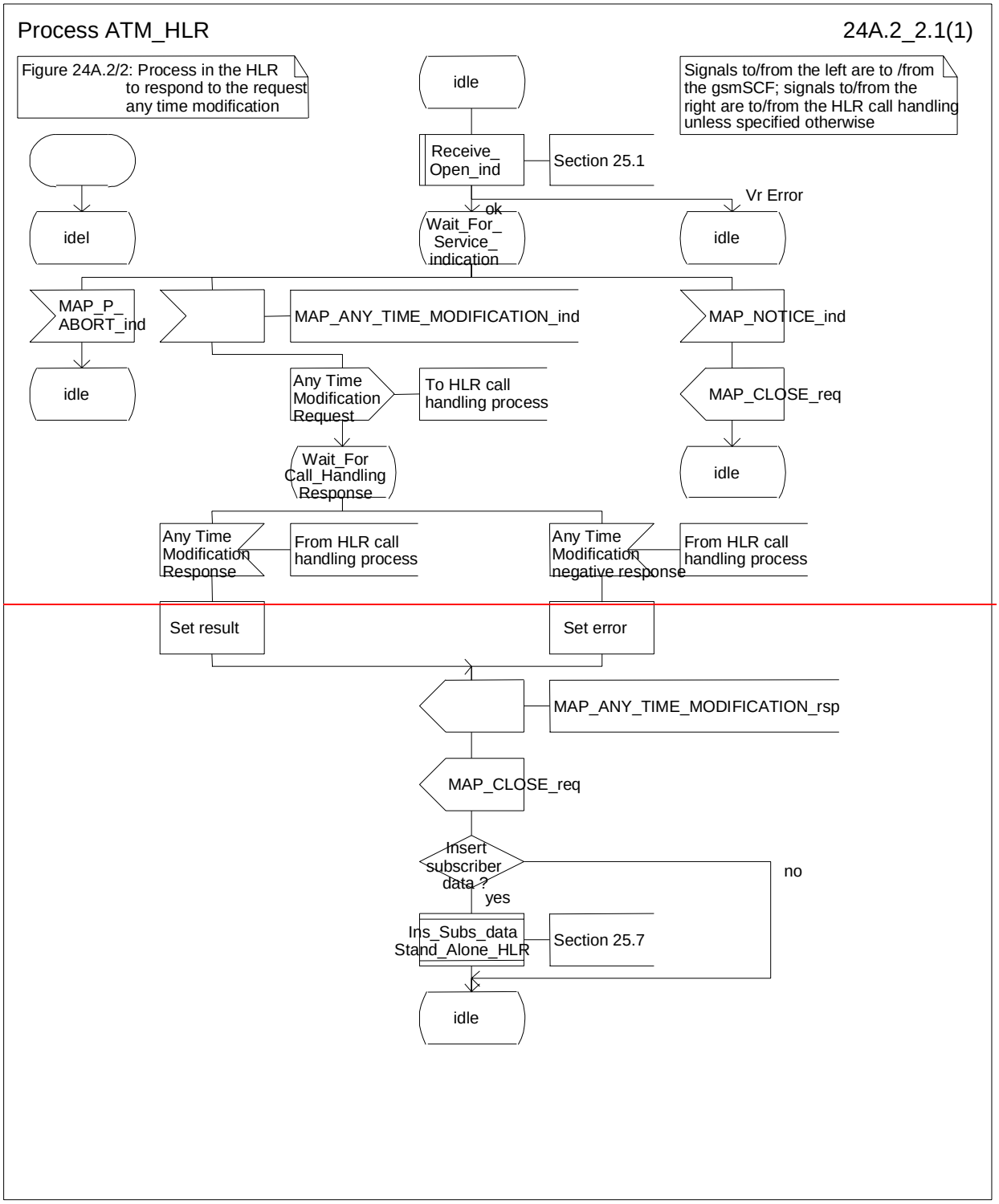


Figure 24A.3/2: Process ATM_gsmSCF


Process ATM_HLR
24A.2_2.1(1)
Figure 24A.2/2: Process in the HLR to respond to the request any time modification
idle
Signals to/from the left are to /from the gsmSCF; signals to/from the right are to/from the HLR call handling unless specified otherwise
Receive_ Open_ind
Section 25.1
Vr Error
ok
idel
Wait_For_ Service_ indication
idle
MAP_P_ ABORT_ind
MAP_ANY_TIME_MODIFICATION_ind
MAP_NOTICE_ind
idle
Any Time Modification Request
To HLR call handling process
MAP_CLOSE_req
Wait_For Call_Handling Response
idle
Any Time Modification Response
From HLR call handling process
Any Time Modification negative response
From HLR call handling process
Set result
Set error
MAP_ANY_TIME_MODIFICATION_rsp
MAP_CLOSE_req
Insert subscriber data ?
no
yes
Ins_Subs_data Stand_Alone_HLR
Section 25.7
idle

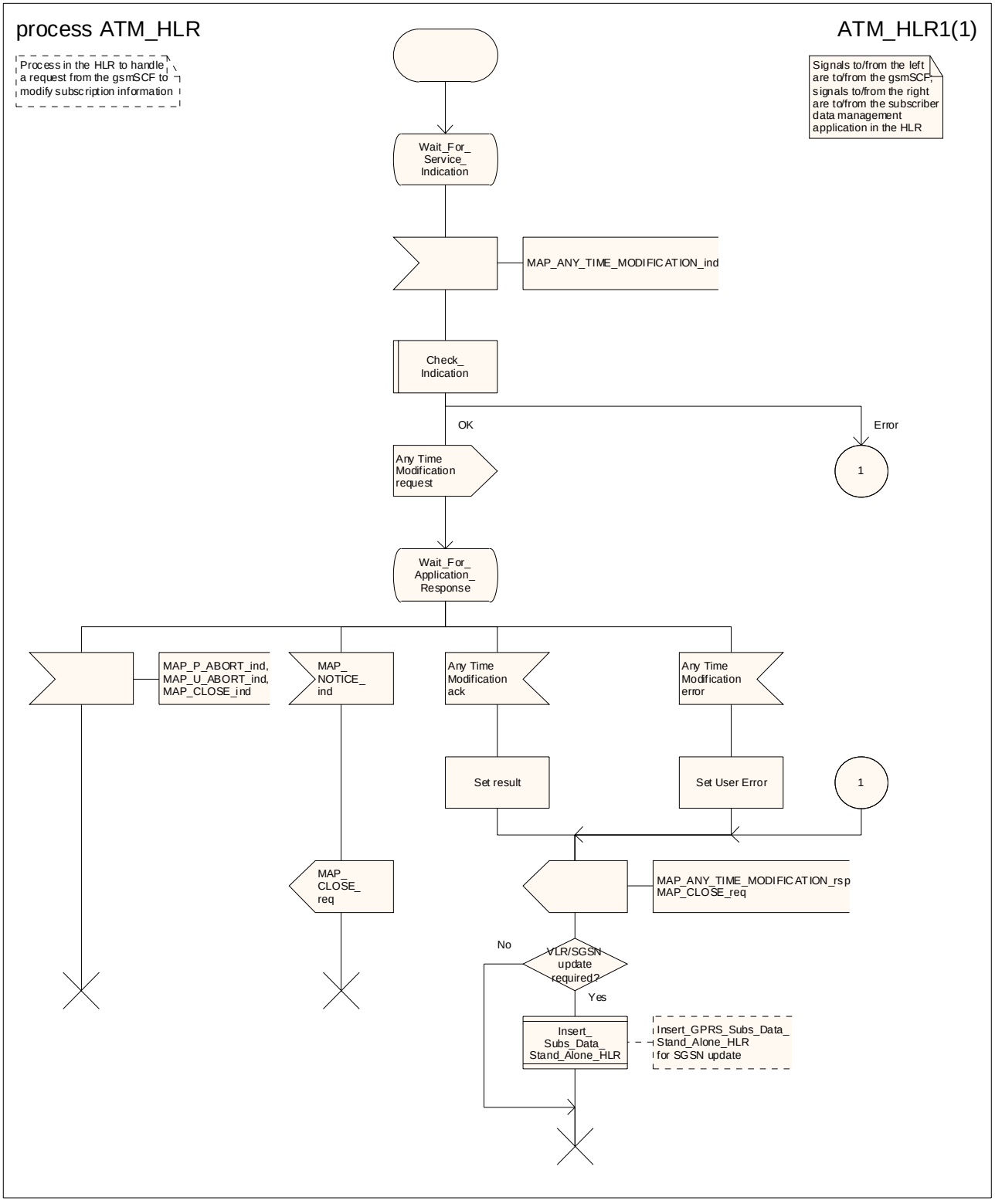


Figure 24A.32/32: Process ATM_HLR

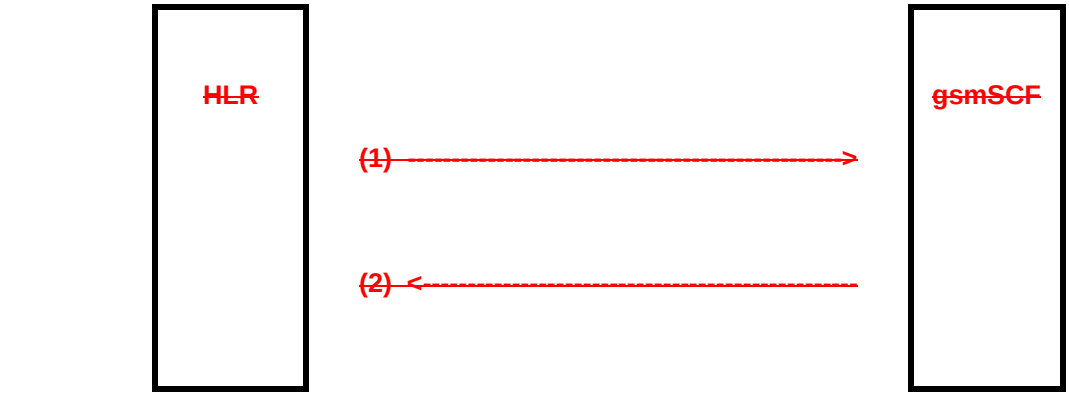
24A.~~3~~4 Subscriber Data Modification Notification procedure

24A.~~3~~4.1 General

The Subscriber Data Modification Notification procedure is used to notify a gsmSCF about the modification of subscriber data. In an IP Multimedia Core Network, an IM-SSF can take on the role of a gsmSCF for this procedure.

The stage 2 specification for Subscriber Data Modification Notification is in 3GPP TS 23.078 and 3GPP TS 23.278. The interworking between the MAP signalling procedures and the Subscriber Data Modification Notification procedures for each entity (HLR, gsmSCF) is shown by the transfer of signals between these process~~dur~~es.

~~The following services are used:~~



~~(1) MAP-NOTE_SUBSCRIBER_DATA_MODIFIED (HLR to gsmSCF).~~

~~(2) MAP-NOTE_SUBSCRIBER_DATA_MODIFIED-ACK (gsmSCF to HLR).~~

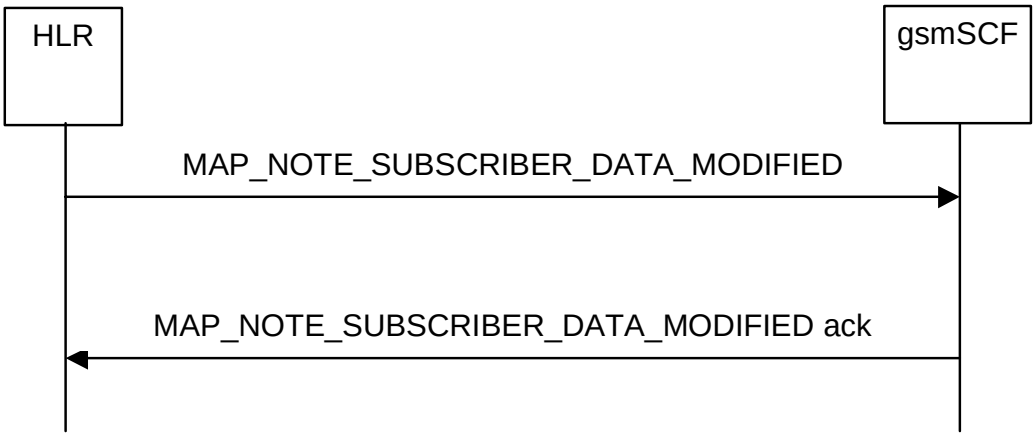


Figure 24A.~~4~~3/1: Message flow ~~Interfaces and services~~ for subscriber data modification notification

The following MAP service is used to send the notification to the gsmSCF:

MAP_NOTE_SUBSCRIBER_DATA_MODIFIED see clause 8.11.5.

~~24A.3.2 Processes in the MAP Entities~~

~~The text in this clause is a supplement to the definition in the SDL diagrams; it does not duplicate the information in the SDL diagrams.~~

***** CR editor's note: This applies to the whole chapter, not just to this subclause *****

24A.~~3~~4.2~~.1~~ Process in the HLR

The MAP process in the HLR to send modified data to the gsmSCF is shown in figure 24A.4~~3~~/2. The MAP process invokes macros not defined in this clause; the definitions of these macros can be found as follows:

Receive_Open_Cnf see clause 25.1.2;

Check_Confirmation see clause 25.2.2.

If the required information cannot be carried in a single MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request, the HLR segments the information into two or more requests. The "All Information Sent" parameter is omitted from each request except the last.

Sheet 2: If the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request contained the "All Information Sent" parameter, the test "All information sent" takes the "Yes" exit.

~~**Successful Outcome**~~

~~When the MAP process receives a Notify Subscriber Data Change request from the process in the HLR, it requests a dialogue with the gsmSCF whose identity is contained in the Note Subscriber Data Modified request by sending a MAP_OPEN service request, notifies modified subscriber data to the gsmSCF using a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request and invokes the macro Receive_Open_Cnf to wait for the response to the dialogue opening request. If the dialogue opening is successful, the MAP process waits for a response from the gsmSCF.~~

~~If the HLR notices after receiving a Notify Subscriber Data Change request that the segmentation is needed the HLR does not set the "All Information Sent" indicator. Otherwise the indicator is set and the process returns to the Wait for SCF response state.~~

~~If the MAP process receives a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service confirm from the gsmSCF, the MAP process invokes the macro Check_Confirmation to check the content of the confirm.~~

~~If the macro Check_Confirmation takes the OK exit, the MAP process checks if the "All Information Sent" indicator is set. If it is set the MAP process sends a Notify Subscriber Data Modified ack to the process in the HLR and returns to the idle state. If the "All Information Sent" indicator is not set the MAP process checks if the further segmentation is needed. If segmentation is needed the HLR does not set the indicator and sends MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request to the gsmSCF. Otherwise the indicator is set and the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service request is sent to the gsmSCF.~~

~~**Dialogue opening failure**~~

~~If the macro Receive_Open_Cnf indicates that the dialogue with the gsmSCF could not be opened or that the dialogue can be opened only at an earlier version, the MAP process sends a Notify Subscriber Data Modified negative response indicating system failure to the process in the HLR and returns to the idle state.~~

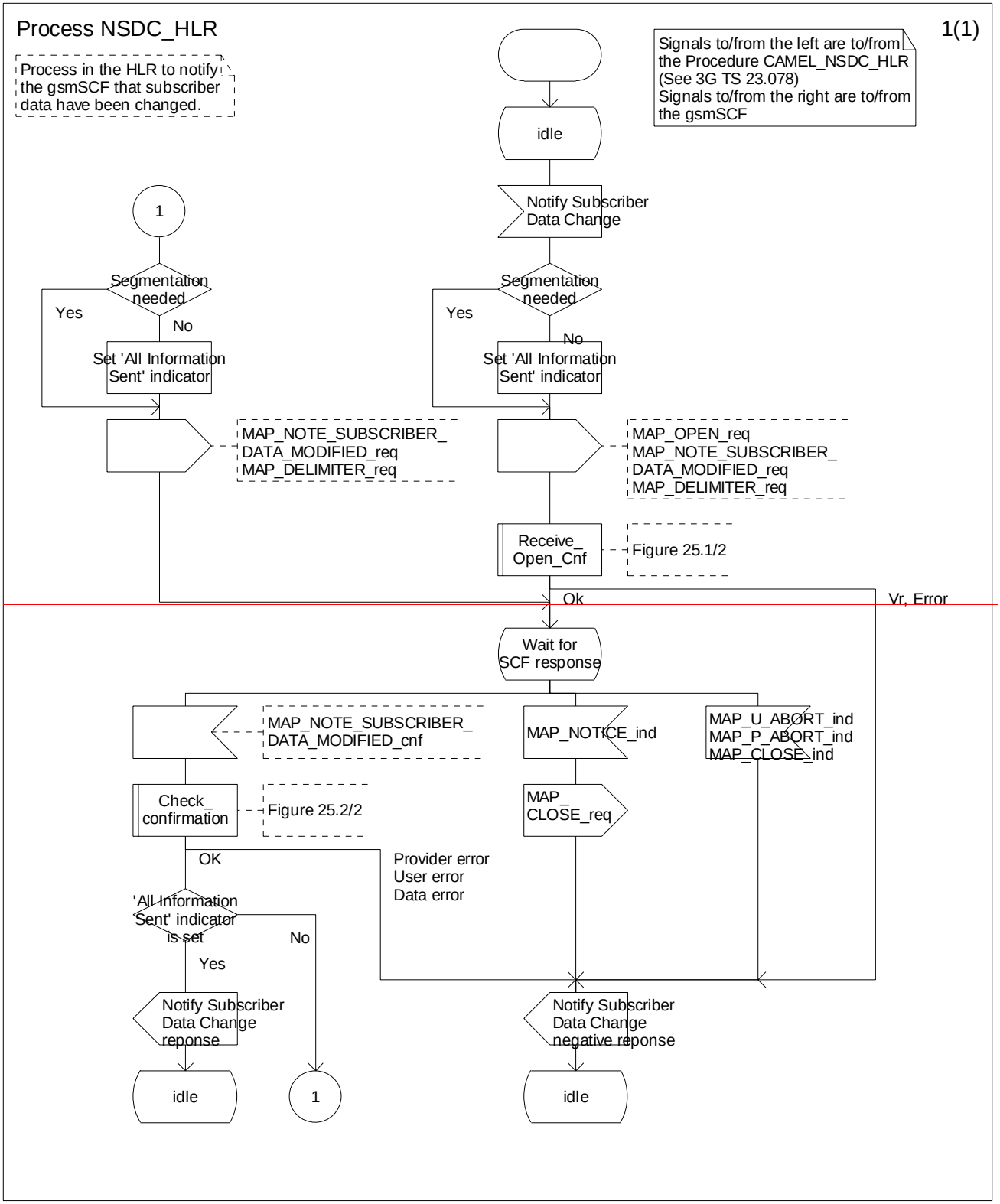
~~**Error in MAP_NOTE_SUBSCRIBER_DATA_MODIFIED confirm**~~

~~If the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service confirm contains a user error or a provider error, the MAP process sends a Notify Subscriber Data Change negative response to the process in the HLR and returns to the idle state.~~

~~**Abort of gsmSCF dialogue**~~

~~After the dialogue with the gsmSCF has been established, the MAP service provider may abort the dialogue by issuing a MAP_P_ABORT indication, or the gsmSCF may send a MAP_CLOSE indication. In either of these cases, the MAP process sends a Notify Subscriber Data Change negative response to the process in the HLR and returns to the idle state.~~

~~If the MAP provider indicates a protocol problem by sending a MAP_NOTICE indication, the MAP process closes the dialogue with the gsmSCF, sends a Notify Subscriber Data Change negative response indicating system failure to the process in the HLR and returns to the idle state.~~



~~Figure 24A.3/2 Process Subscriber_Data_Modification_Notification_HLR (sheet 1 of 1)~~

24A.~~3~~4.3~~2.2~~ Process in the gsmSCF

The MAP process in the gsmSCF to handle a notification to the gsmSCF of change of subscriber data ~~resume~~ is shown in figure 24A.4~~3~~/3. The MAP process invokes ~~a~~ macros not defined in this clause; the definitions of th~~i~~ese macros can be found as follows:

Receive_Open_Ind see clause 25.1.1;

Check_Indication see clause 25.2.1

If the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication contained the "All Information Sent" parameter, the test "All information sent" takes the "Yes" exit.

If the test "All information sent" takes the "No" exit, the MAP process stores the data received in the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication. If the test "All information sent" takes the "Yes" exit, the MAP process assembles the data received in all the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indications received in the dialogue and sends the assembled data to the application process in the gsmSCF.

~~**Successful outcome**~~

~~When the MAP process receives a MAP_OPEN indication with the application context noteSubscriberDataModified, it checks it by invoking the macro Receive_Open_Ind.~~

~~If the macro takes the OK exit, the MAP process waits for a service indication.~~

~~If a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication is received, the MAP process checks if the "All Information Sent" indicator is set and if so it sends a Subscriber Data Changed request including all the stored data to the process in the gsmSCF, and waits for a response. The Subscriber Data Changed request contains the parameters received in the MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service indication. If the "All Information Sent" indicator is not set, the received data is stored and the MAP process constructs an empty MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service response, sends it to the HLR and returns to the Wait for response state.~~

~~If the process in the gsmSCF returns a negative response, the MAP process constructs a MAP_NOTE_SUBSCRIBER_DATA_MODIFIED service response, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.~~

~~**Failure of dialogue opening with the HLR**~~

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

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

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

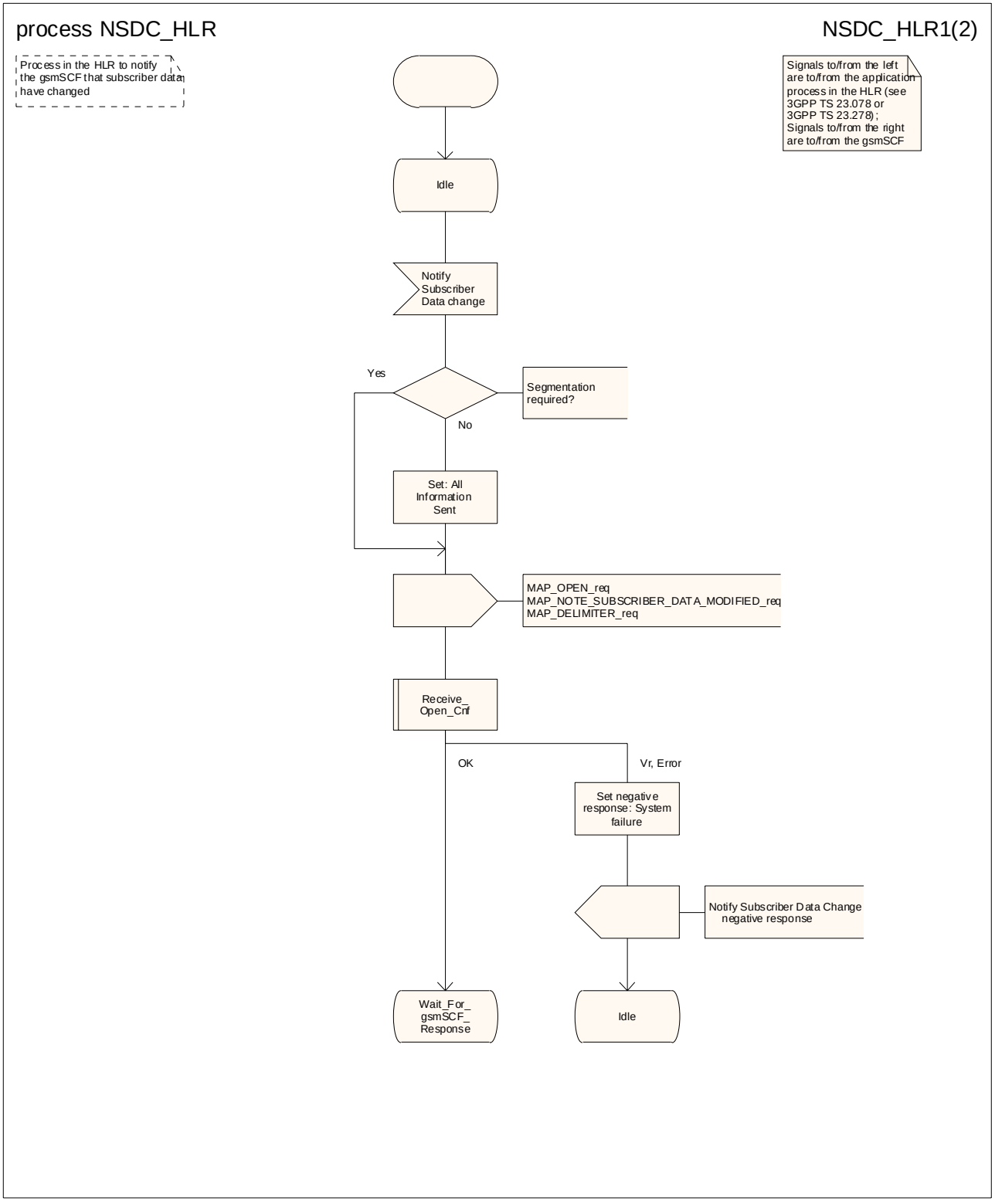


Figure 24A.4/2 (sheet 1 of 2): Process NS_DC_HLR

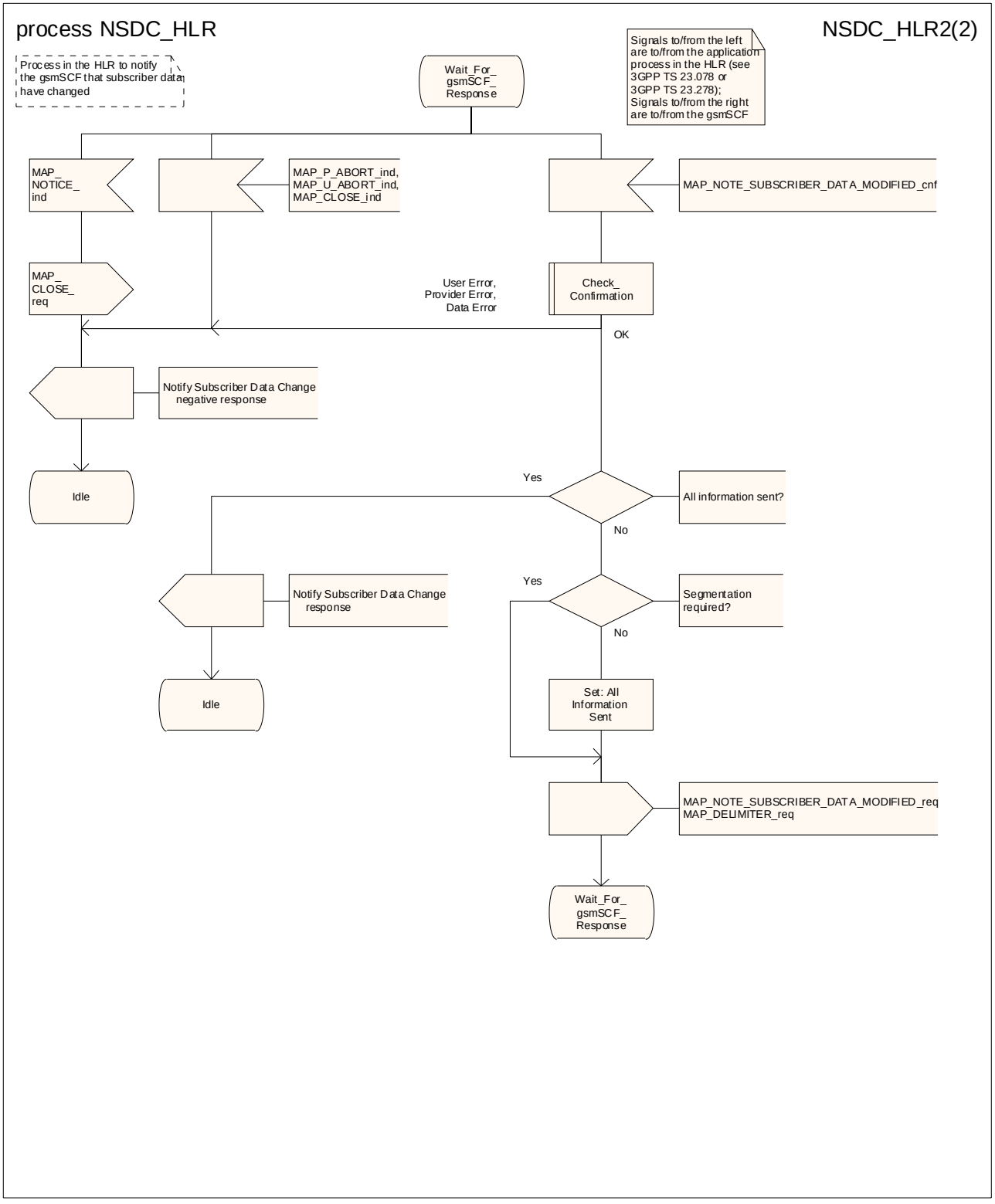
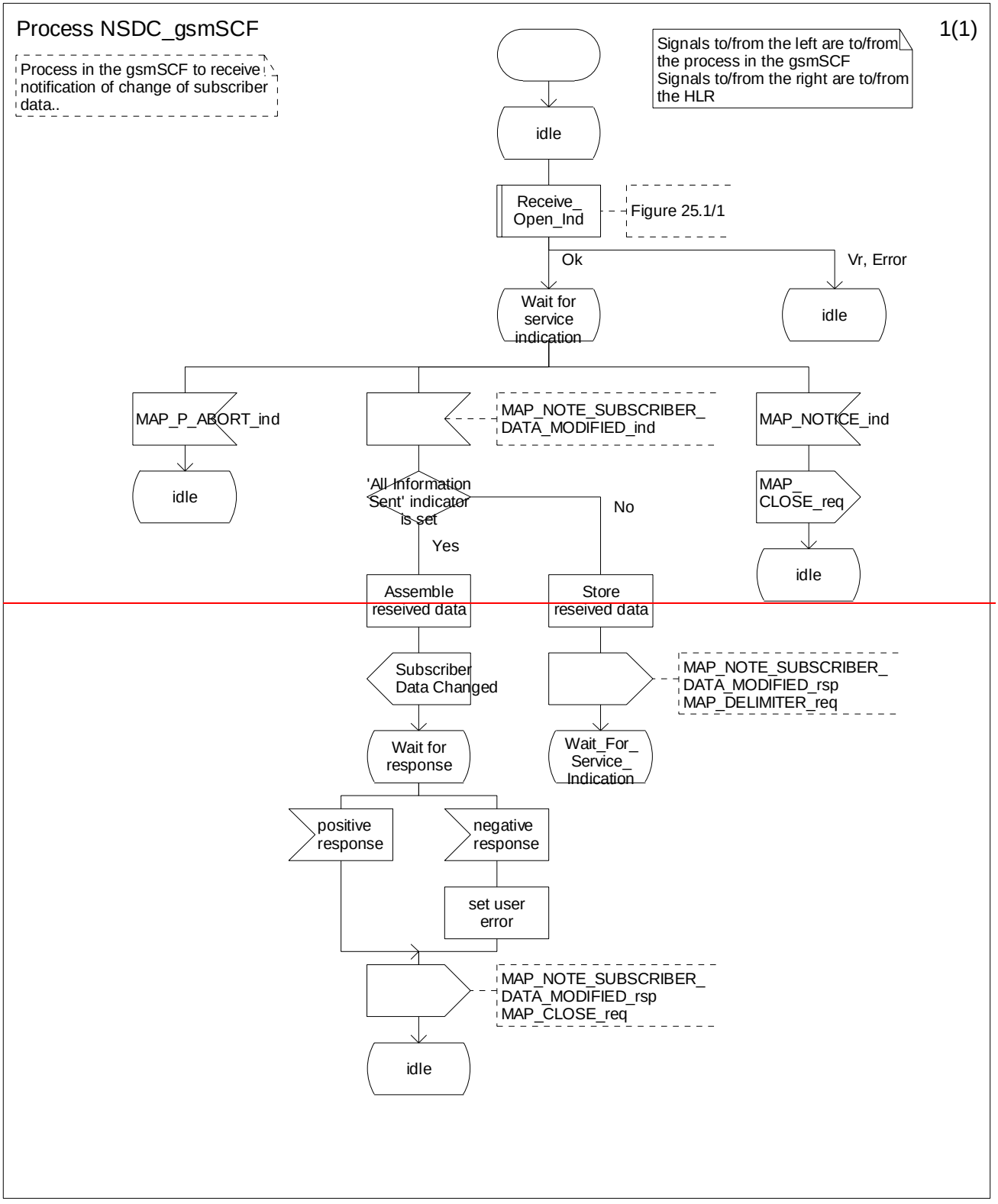


Figure 24A.4/2 (sheet 2 of 2): Process NSDC_HLR


Process NSDC_gsmSCF
1(1)
Process in the gsmSCF to receive notification of change of subscriber data..
Signals to/from the left are to/from the process in the gsmSCF
Signals to/from the right are to/from the HLR
idle
Receive_ Open_Ind
Figure 25.1/1
Ok
Vr, Error
Wait for service indication
idle
MAP_P_ABORT_ind
MAP_NOTE_SUBSCRIBER_ DATA_MODIFIED_ind
MAP_NOTICE_ind
idle
'All Information Sent' indicator is set
No
Yes
MAP_ CLOSE_req
idle
Assemble reseived data
Store reseived data
Subscriber Data Changed
MAP_NOTE_SUBSCRIBER_ DATA_MODIFIED_rsp MAP_DELIMITER_req
Wait for response
Wait_For_ Service_ Indication
positive response
negative response
set user error
MAP_NOTE_SUBSCRIBER_ DATA_MODIFIED_rsp MAP_CLOSE_req
idle

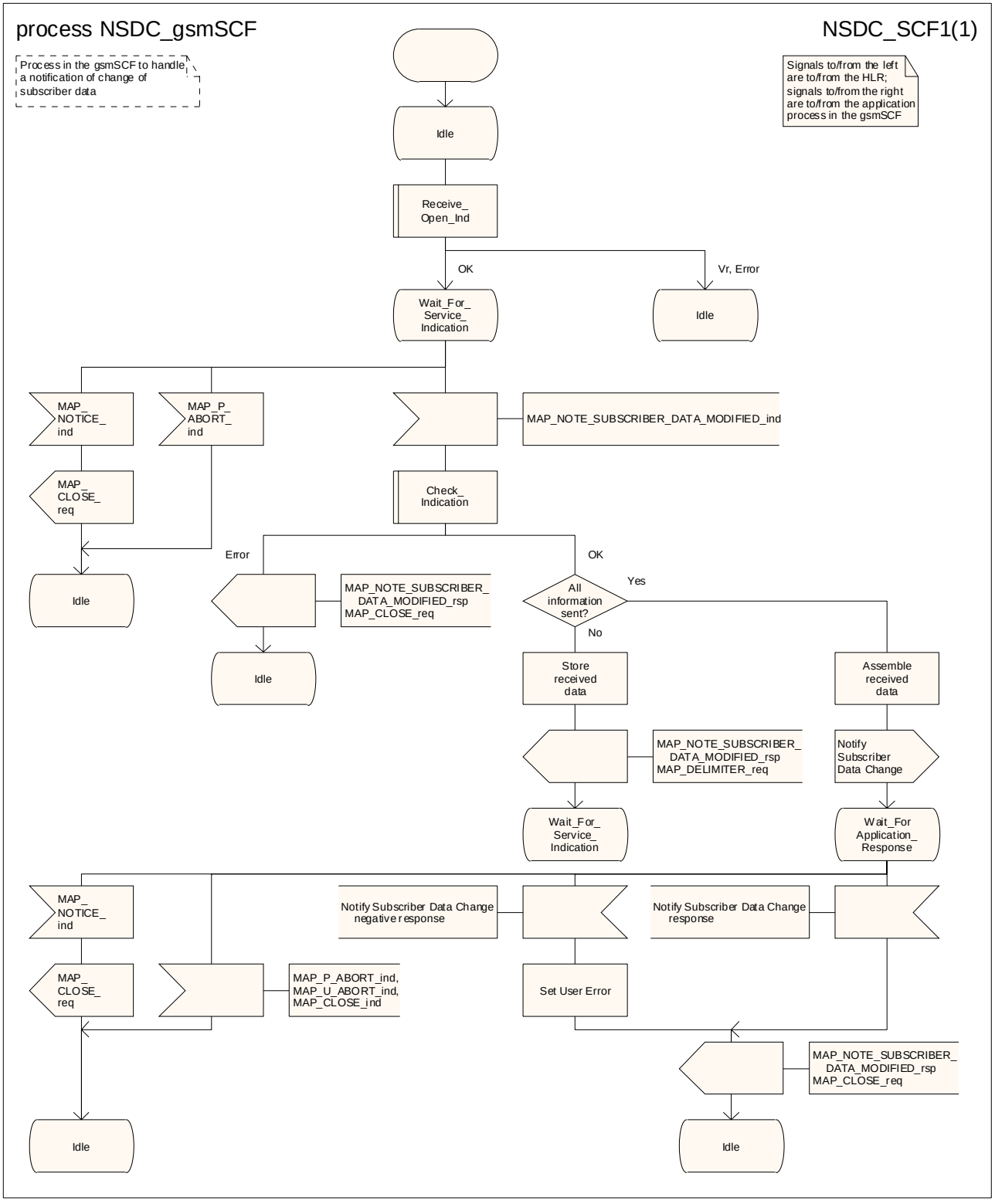


Figure 24A.43/3: Process ~~Subscriber_Data_Modification_Notification~~NSDC_gsmSCF ~~(sheet 1 of 1)~~

3GPP TSG CN WG4 Meeting #19
San Diego, CA, USA, 19th – 23rd May 2003

N4-030670
(Revision of N4-030432)

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **593** ⌘ **rev** **2** ⌘ Current version: **5.5.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Provision of SDL diagrams and removal of redundant text in chapter 24
Source:	⌘	Vodafone
Work item code:	⌘	TEI5
Date:	⌘	21/05/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	There are no source files available for the SDL diagrams in 29.002 chapter 24. Many SDL diagrams are poorly laid out. The SDL for the responding entity omits the handling for dialogue abort while the process is waiting for the response from the application in the responding entity. The SDL description of the processes SRI_GPRS_GGSN and SRI_GPRS_HLR omits the possibility of protocol version dropback; the application context is now defined at V4 and V3. Most of the text is a (not completely accurate) reflection of the information in the SDL diagrams
Summary of change:	⌘	Redraw SDL diagrams to a consistent style. Add missing error handling. Add the possibility of protocol version dropback in processes SRI_GPRS_GGSN and SRI_GPRS_HLR. Remove redundant text.
Consequences if not approved:	⌘	Poor readability. Incomplete description of error handling. Unnecessary bulk in the specification.

Clauses affected:	⌘	24			
Other specs affected:	⌘	**Y**	**N**		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	The subclauses have been rearranged into a more logical order: the description of the behaviour in the dialogue initiator (the GGSN in subclauses 24.1 & 24.2, the HLR in subclause 24.3) is placed before the description of the behaviour in the dialogue responder (the HLR in subclauses 24.1 & 24.2, the GGSN in subclause 24.3). The material in the "General" subclause has been promoted to clause 24, because it applies to the whole clause. Second level subclause headings have been added for each of the procedures: retrieval of routeing information, failure reporting and reporting of MS reachability. The text description of the processes in the GGSN and the HLR has been grouped together in each of subclauses 24.1, 24.2 & 24.3. This editorial rearrangement has not been revision marked; only the changes to subclause numbers and figure numbers are marked.			

24 GPRS process description

~~24.1 General~~

The MAP GPRS procedures are used for the Network Requested PDP ~~-~~Context Activation procedures.

The stage 2 specification for General Packet Radio Service (GPRS) is in 3GPP TS 23.060 [104]~~ [100]~~.

24.1 Procedure for retrieval of routeing information for GPRS

24.1.1~~2~~ Process in the GGSN~~ for Send Routing Information for GPRS~~

The MAP process in the GGSN to request routeing information for a network requested PDP context activation is shown in figure 24.1/2. The MAP process invokes macros not defined in this clause; the definition 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 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.~~

24.1.21 Process in the HLR for Send Routing Information for GPRS

The MAP process in the HLR to provide routeing information for a network requested PDP context activation is shown in figure 24.1/1. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see 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 waits for a response. The Send Routing Info For Gprs request contains the parameter received in the MAP_SEND_ROUTING_INFO_FOR_GPRS service indication.

If the GPRS application process in the HLR returns a positive response containing the routing information, the MAP process constructs a MAP_SEND_ROUTING_INFO_FOR_GPRS service response containing the routing info, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Negative response from HLR GPRS application process

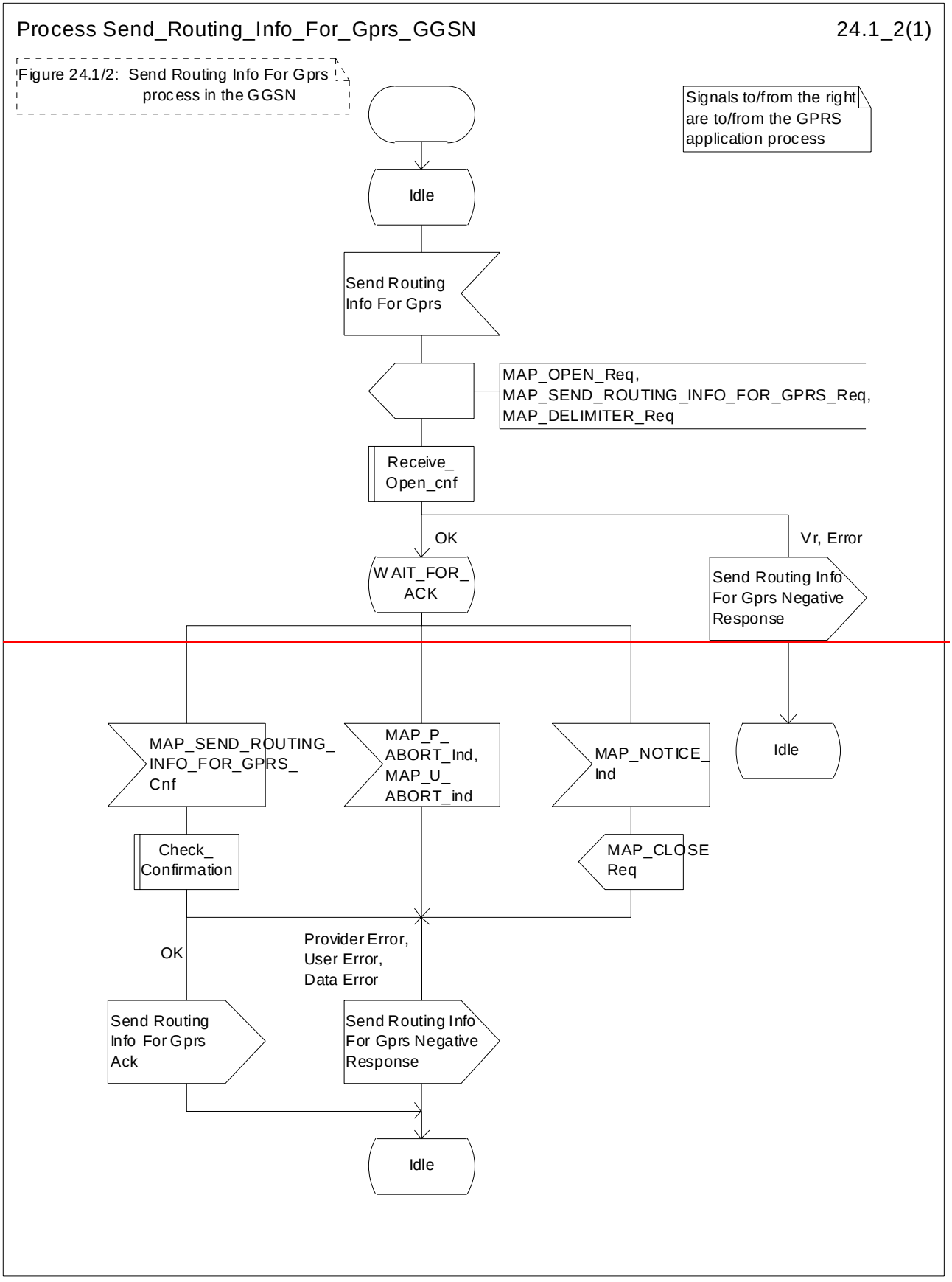
If the GPRS application process in the HLR returns a negative response, the MAP process constructs a MAP_SEND_ROUTING_INFO_FOR_GPRS service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Failure of dialogue opening with the GGSN

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

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

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


Process Send_Routing_Info_For_Gprs_GGSN
24.1_2(1)
Figure 24.1/2: Send Routing Info For Gprs process in the GGSN
Signals to/from the right are to/from the GPRS application process
Idle
Send Routing Info For Gprs
MAP_OPEN_Req,
MAP_SEND_ROUTING_INFO_FOR_GPRS_Req,
MAP_DELIMITER_Req
Receive_ Open_cnf
OK
Vr, Error
WAIT_FOR_ ACK
Send Routing Info For Gprs Negative Response
MAP_SEND_ROUTING_ INFO_FOR_GPRS_ Cnf
MAP_P_ ABORT_Ind, MAP_U_ ABORT_ind
MAP_NOTICE_ Ind
Idle
Check_ Confirmation
MAP_CLOSE Req
OK
Provider Error, User Error, Data Error
Send Routing Info For Gprs Ack
Send Routing Info For Gprs Negative Response
Idle

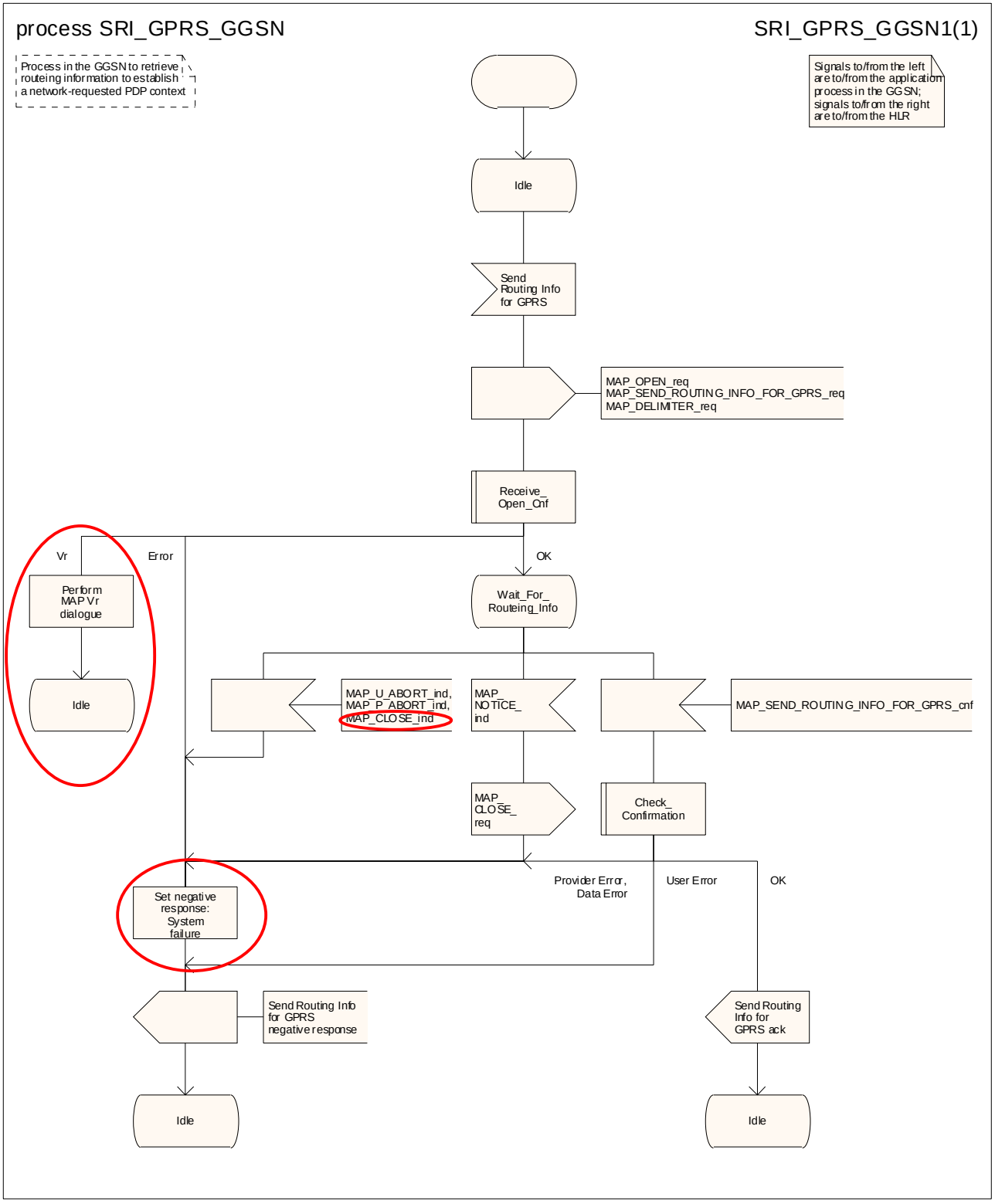
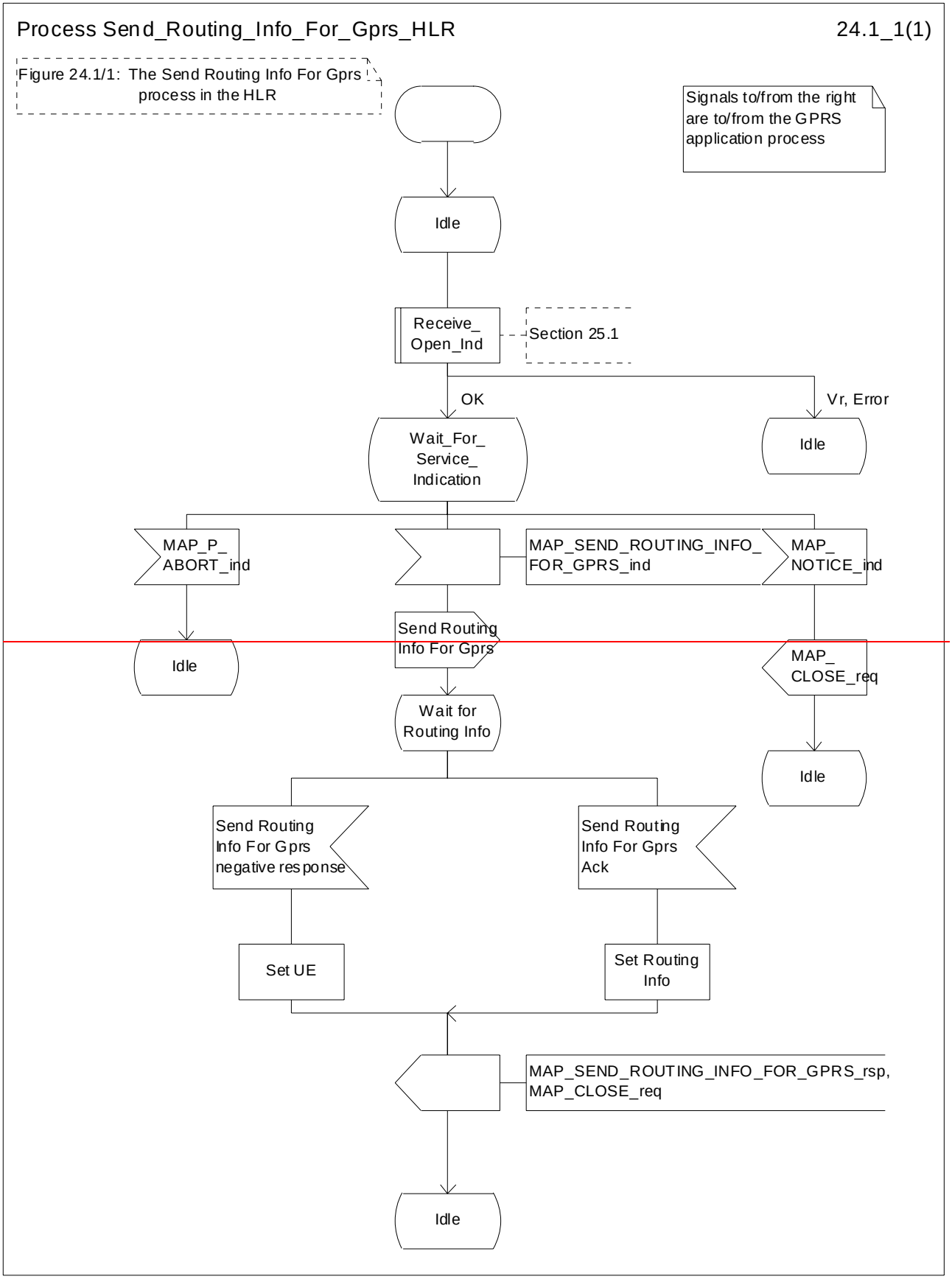


Figure 24.1/12: Process ~~Send_Routing_Info_For_Gprs~~SRI_GPRS_GGSN


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
Send Routing Info For Gprs
Idle
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

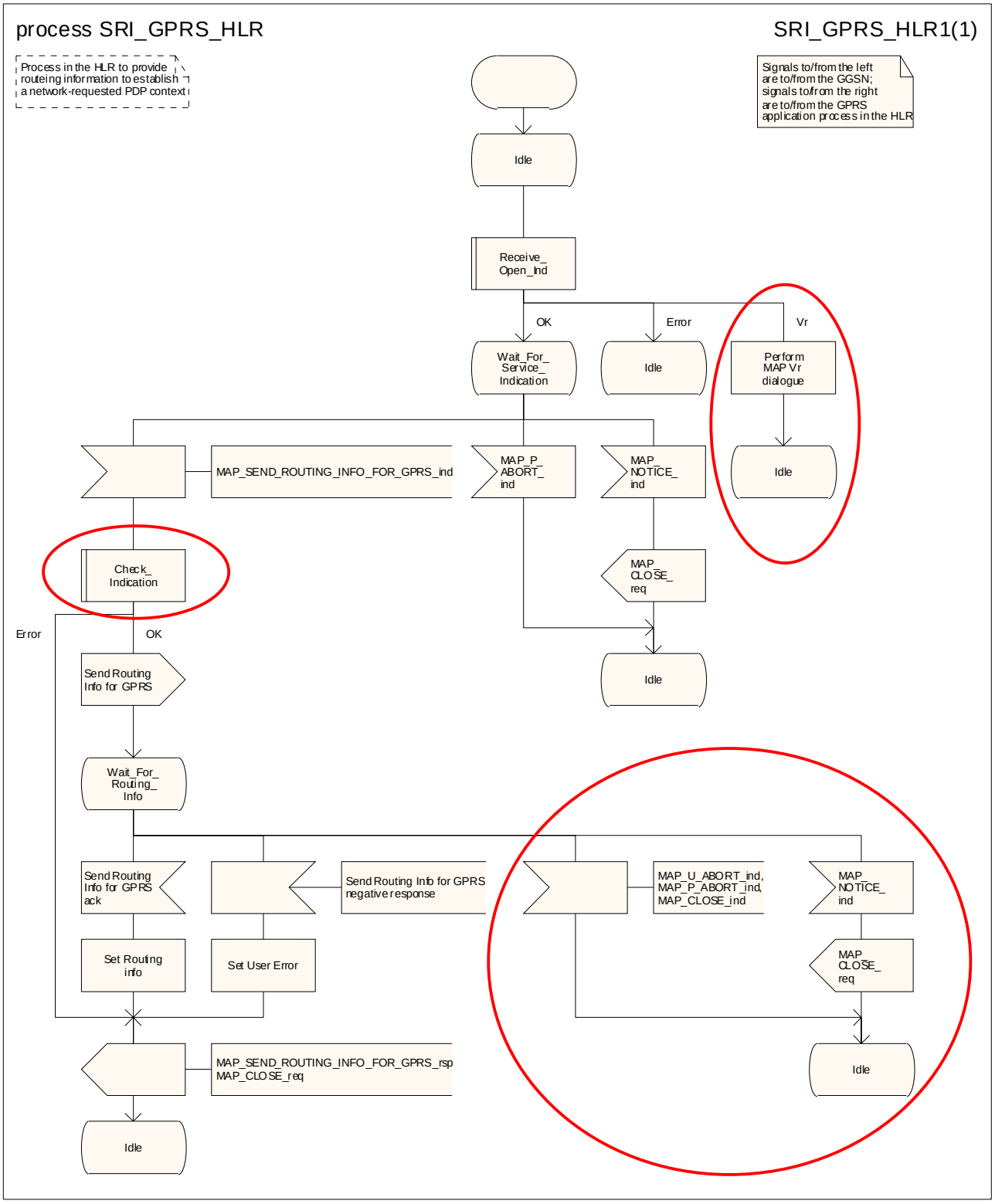


Figure 24.1/21: Process ~~Send Routing Info For Gprs~~SRI_GPRS_HLR

24.2 Procedure for reporting failure to establish a network requested PDP context

24.2.12 Process in the GGSN for Failure Report

The MAP process in the GGSN to report the failure to establish a network requested PDP context is shown in figure 24.2/2. The MAP process invokes macros not defined in this clause; the definition 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 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.

24.2.21 Process in the HLR for Failure Report

***** CR editor's note: The MAP process does not set the MNRG; the application process in the HLR does it. *****

The MAP process in the HLR to set the MNRG (Mobile station Not Reachable for GPRS) flag for the subscriber handle a notification from the GGSN that a network requested PDP context could not be established is shown in figure 24.2/1. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see 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 waits for a response. The Failure Report request contains the parameter received in the MAP_FAILURE_REPORT service indication.~~

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

~~**Negative response from HLR GPRS application process**~~

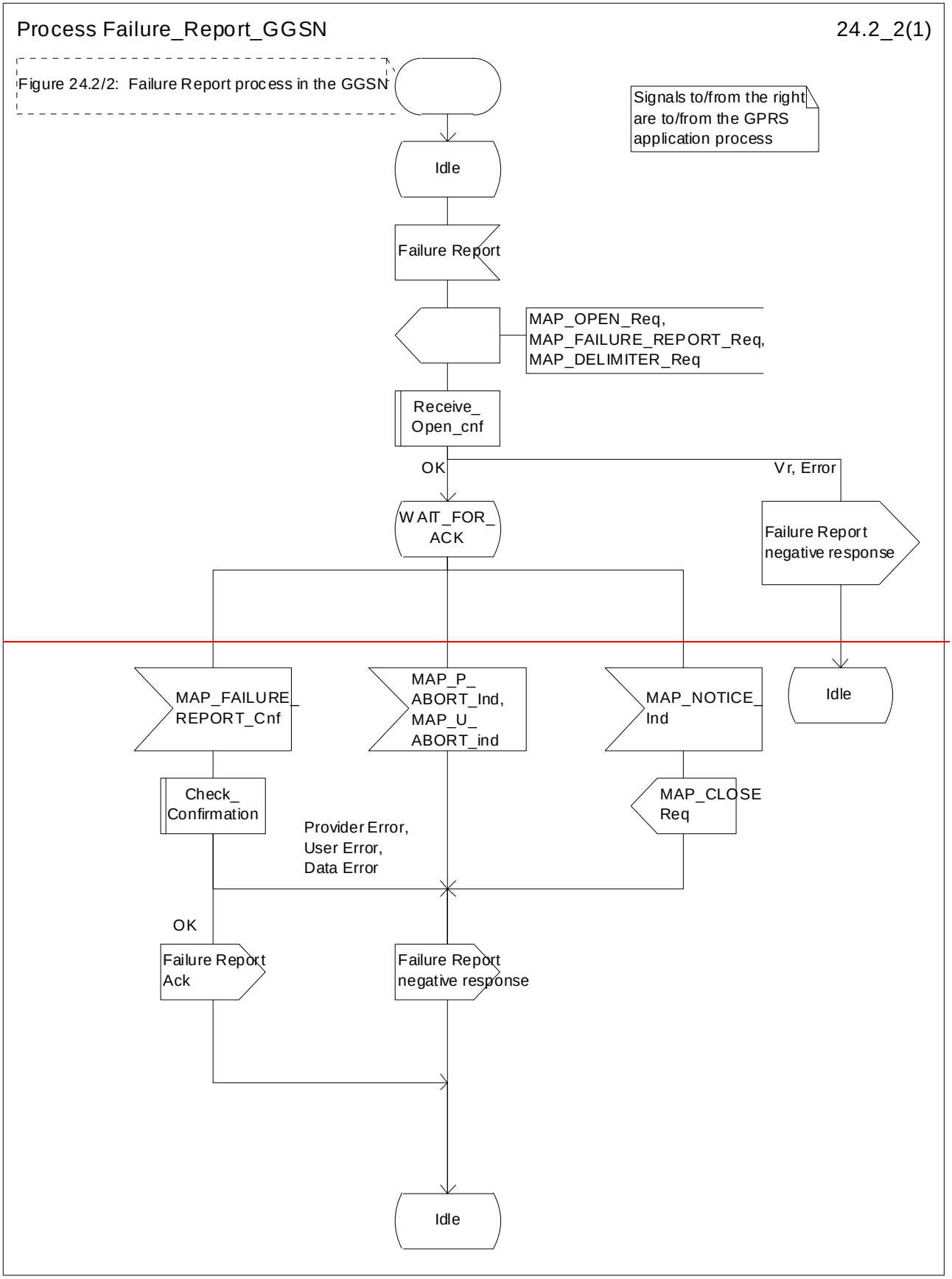
~~If the GPRS application process in the HLR returns a negative response, the MAP process constructs a MAP_FAILURE_REPORT service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.~~

~~**Failure of dialogue opening with the GGSN**~~

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

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

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


Process Failure_Report_GGSN
24.2_2(1)
Figure 24.2/2: Failure Report process in the GGSN
Signals to/from the right are to/from the GPRS application process
Idle
Failure Report
MAP_OPEN_Req,
MAP_FAILURE_REPORT_Req,
MAP_DELIMITER_Req
Receive_
Open_cnf
OK
Vr, Error
WAIT_FOR_
ACK
Failure Report
negative response
MAP_FAILURE_
REPORT_Cnf
MAP_P_
ABORT_Ind,
MAP_U_
ABORT_ind
MAP_NOTICE_
Ind
Idle
Check_
Confirmation
MAP_CLOSE
Req
Provider Error,
User Error,
Data Error
OK
Failure Report
Ack
Failure Report
negative response
Idle

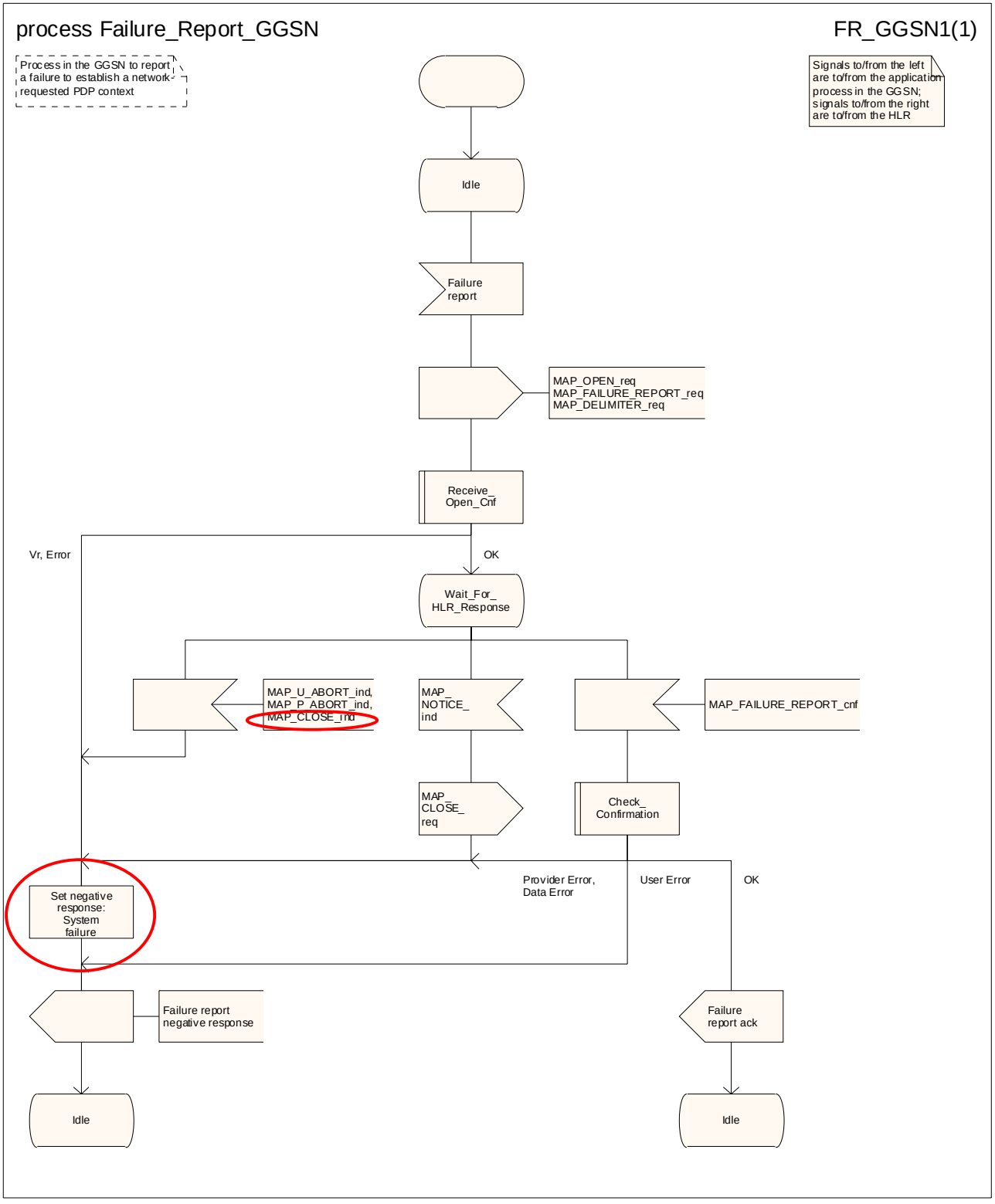
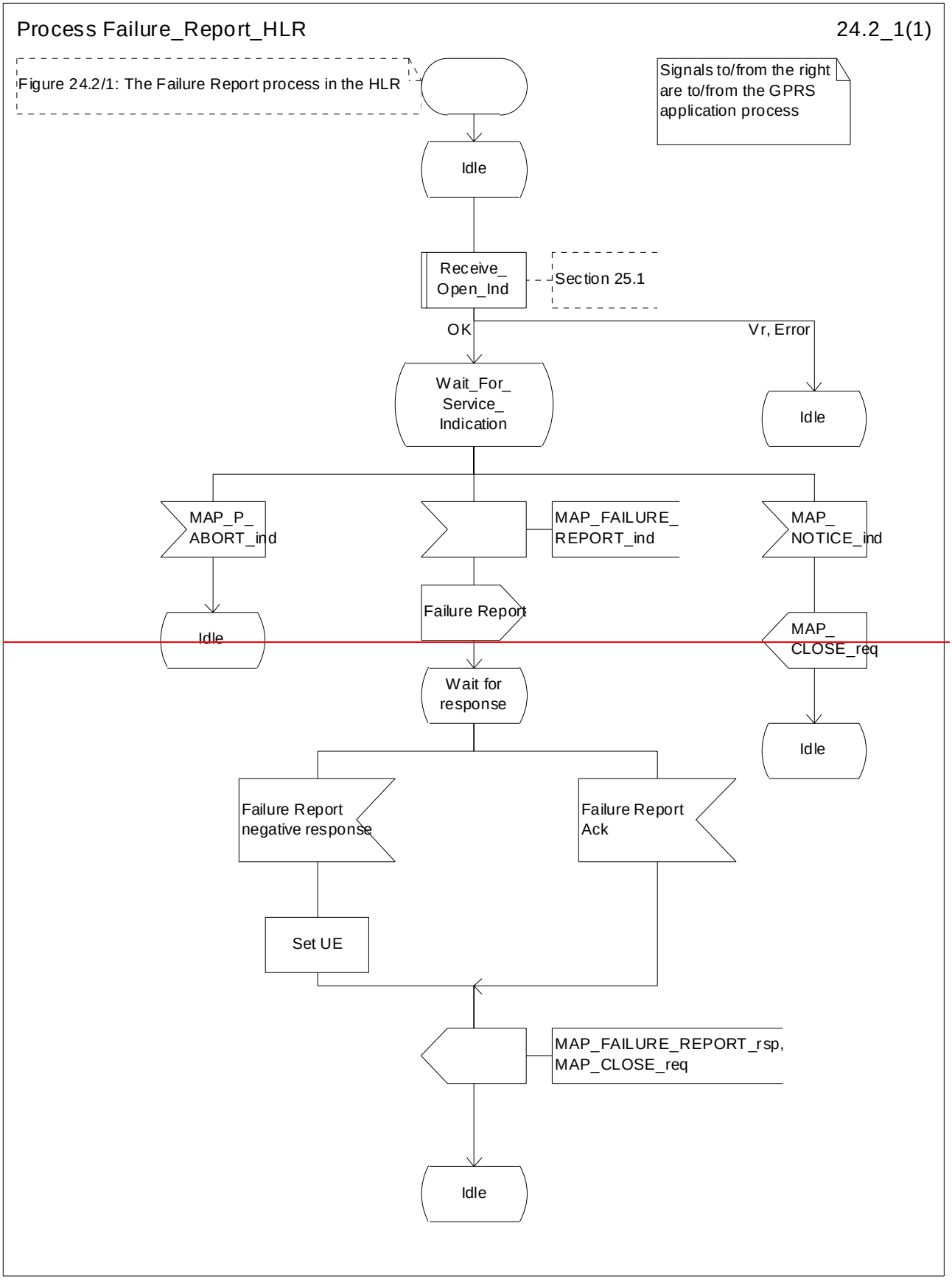


Figure 24.2/12: Process Failure_Report_GGSN


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
Failure Report
Idle
MAP_ CLOSE_req
Wait for response
Idle
Failure Report negative response
Failure Report Ack
Set UE
MAP_FAILURE_REPORT_rsp, MAP_CLOSE_req
Idle

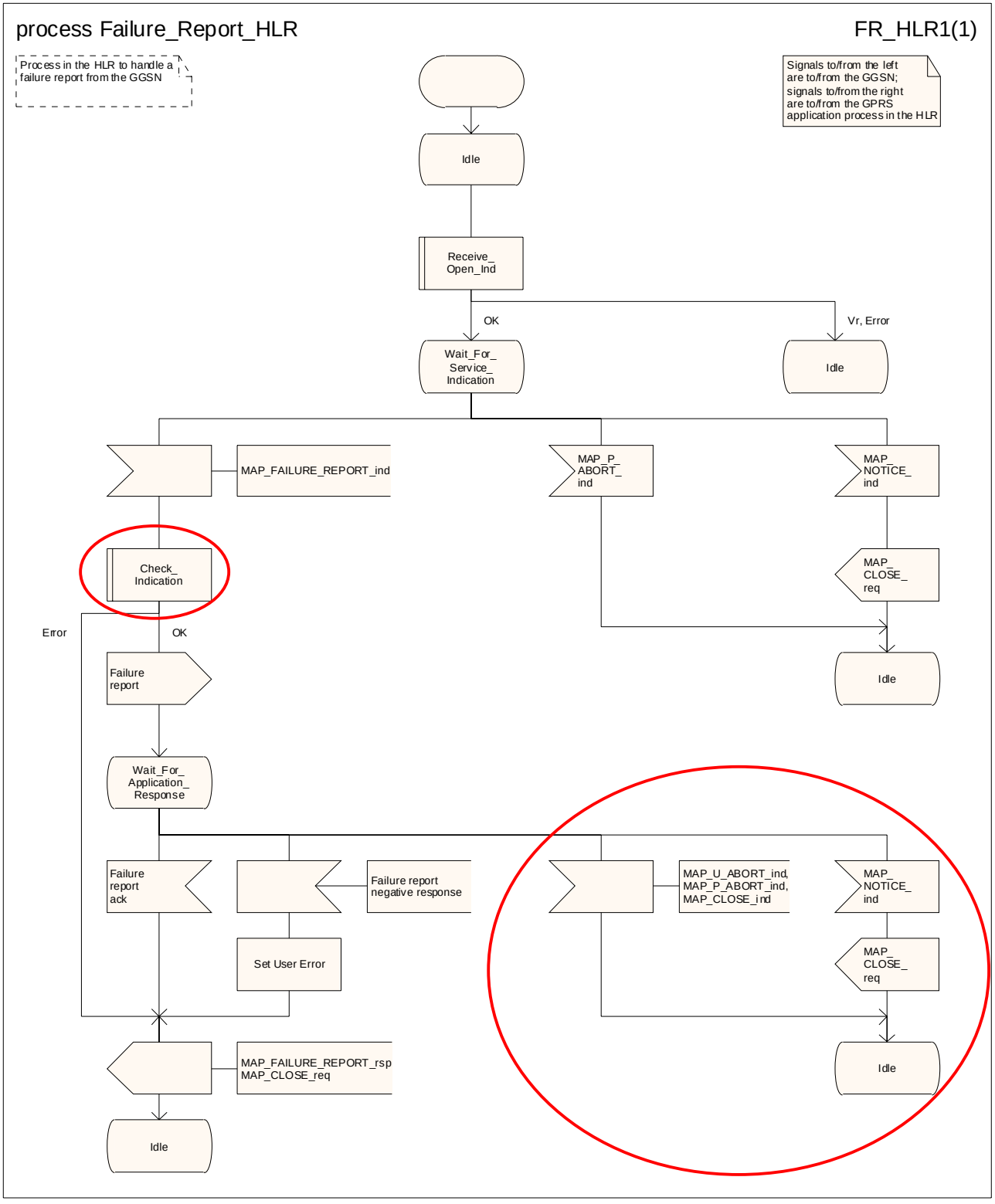


Figure 24.2/21: Process Failure_Report_HLR

24.3 Procedure for reporting that an MS has become reachable for GPRS

24.3.12 Process in the HLR ~~for Note Ms Present For Gprs~~

The MAP process in the HLR to report that an MS is reachable for GPRS is shown in figure 24.3/2. The MAP process invokes macros not defined in this clause; the definition 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 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.~~

24.3.21 Process in the GGSN ~~for Note Ms Present For Gprs~~

The MAP process in the GGSN to ~~inform~~ that the subscriber is present for GPRS again is shown in figure 24.3/1. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see 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 waits for a response. The Note Ms Present For Gprs request contains the parameter received in the MAP_NOTE_MS_PRESENT_FOR_GPRS service indication.~~

~~If the GPRS application process in the GGSN returns a positive response, the MAP process constructs a MAP_NOTE_MS_PRESENT_FOR_GPRS service response, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.~~

~~**Negative response from GGSN GPRS application process**~~

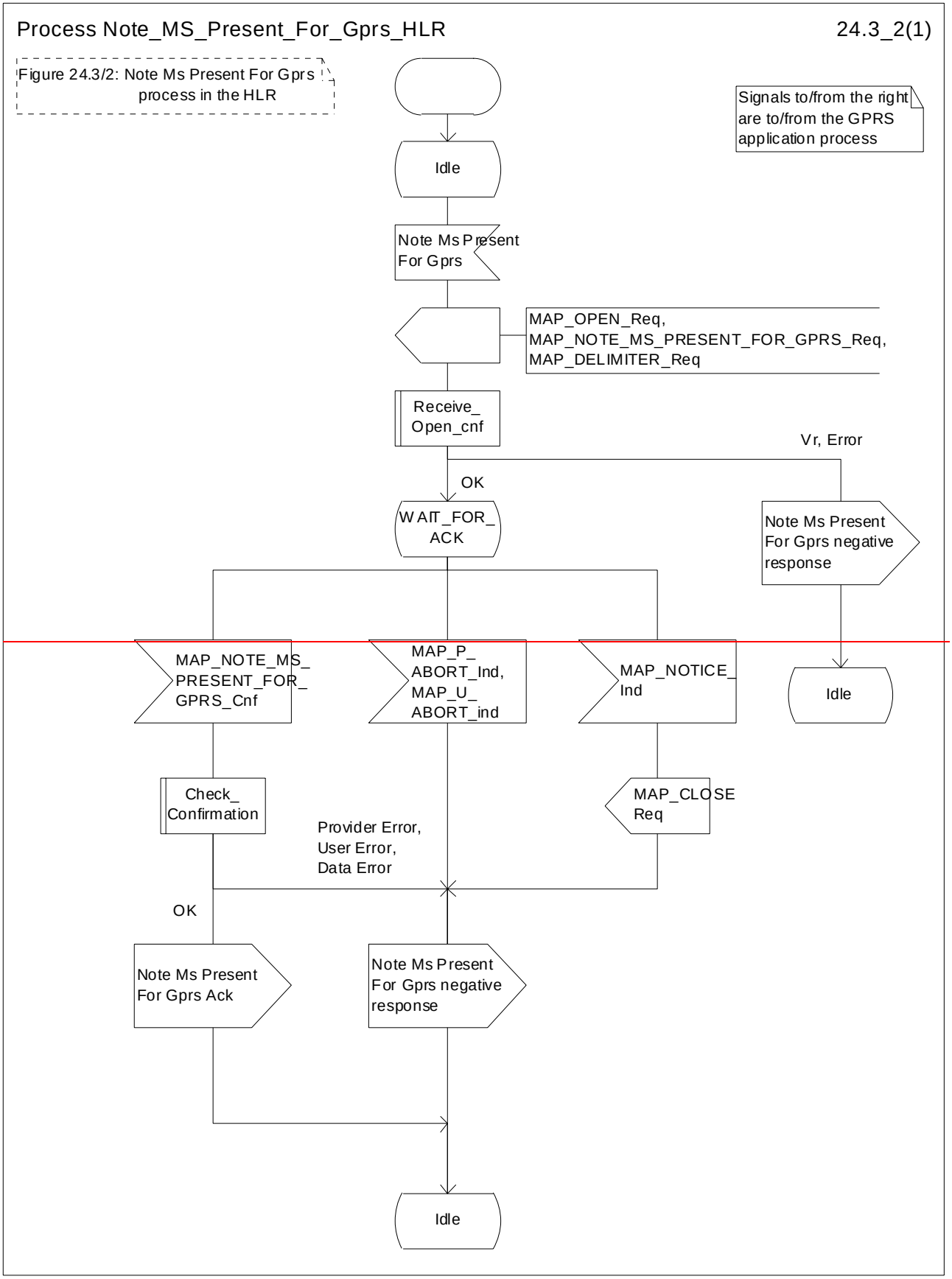
~~If the GPRS application process in the GGSN returns a negative response, the MAP process constructs a MAP_NOTE_MS_PRESENT_FOR_GPRS service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.~~

~~**Failure of dialogue opening with the HLR**~~

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

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

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


Process Note_MS_Present_For_Gprs_HLR
24.3_2(1)
Figure 24.3/2: Note Ms Present For Gprs process in the HLR
Signals to/from the right are to/from the GPRS application process
Idle
Note Ms Present For Gprs
MAP_OPEN_Req,
MAP_NOTE_MS_PRESENT_FOR_GPRS_Req,
MAP_DELIMITER_Req
Receive_ Open_cnf
Vr, Error
OK
WAIT_FOR_ ACK
Note Ms Present For Gprs negative response
MAP_NOTE_MS_ PRESENT_FOR_ GPRS_Cnf
MAP_P_ ABORT_Ind, MAP_U_ ABORT_ind
MAP_NOTICE_ Ind
Idle
Check_ Confirmation
MAP_CLOSE Req
Provider Error,
User Error,
Data Error
OK
Note Ms Present For Gprs Ack
Note Ms Present For Gprs negative response
Idle

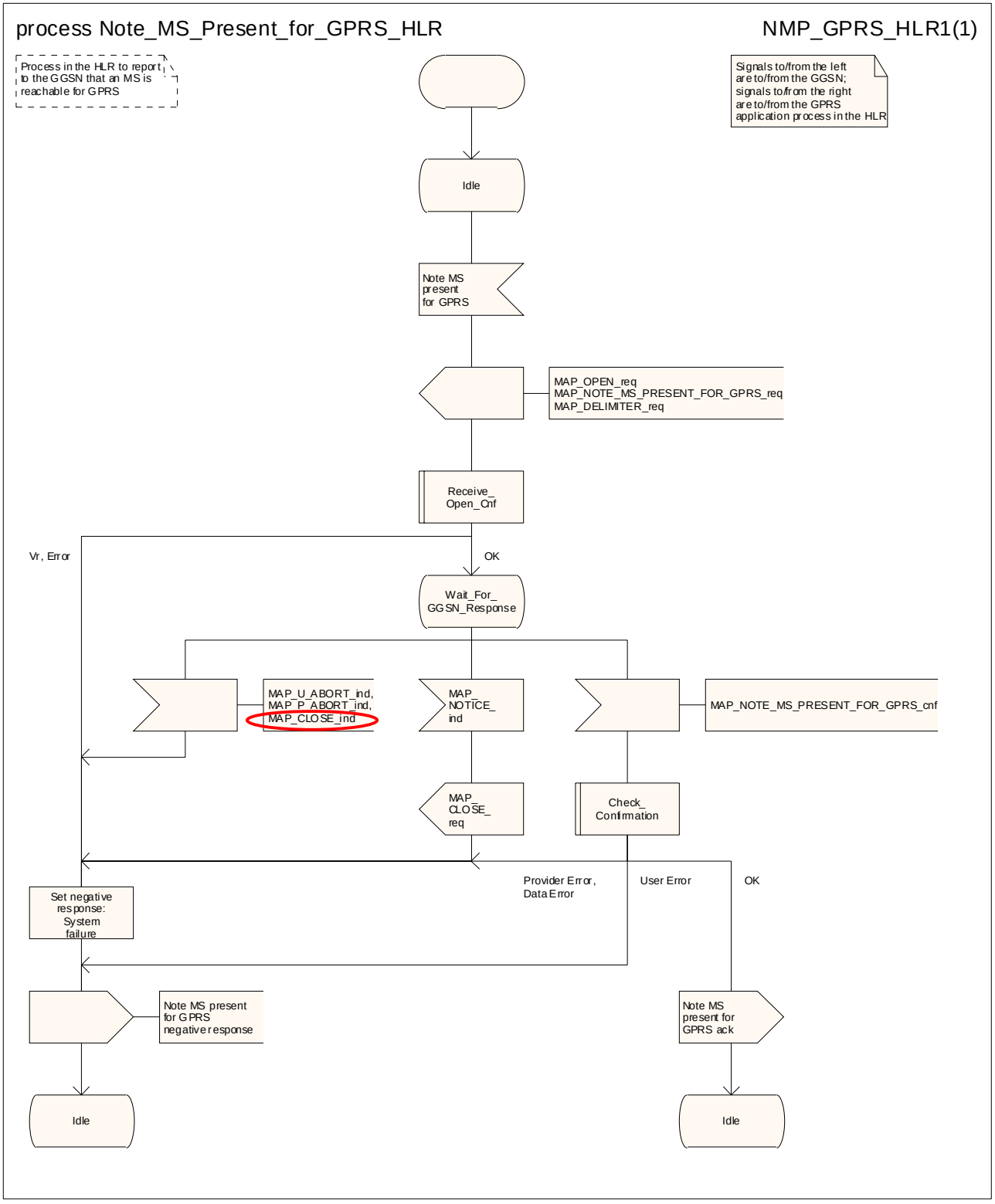
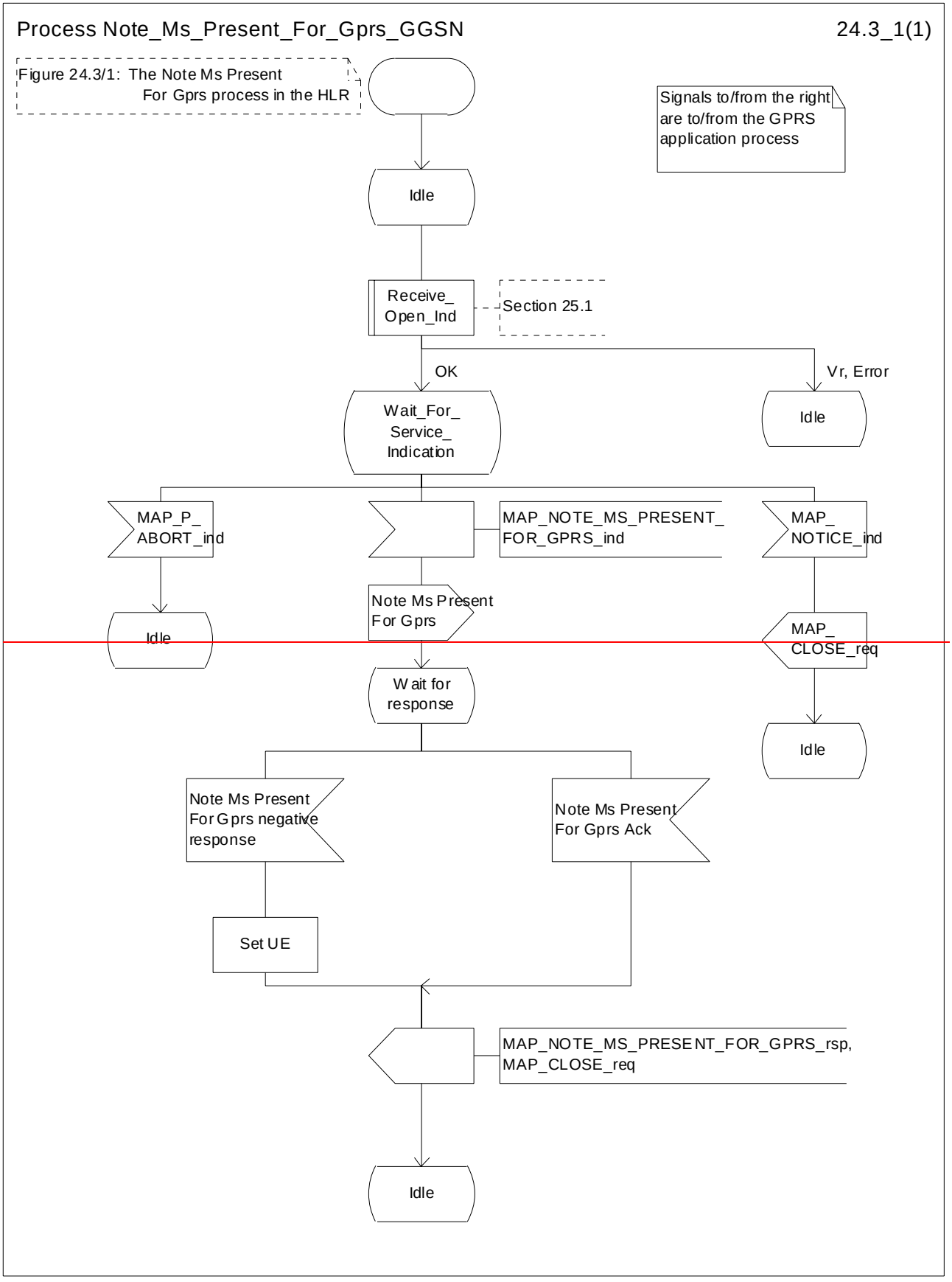


Figure 24.3/12: Process Note_MSs_Present_For_GPRSprs_HLR


Process Note_Ms_Present_For_Gprs_GGSN
24.3_1(1)
Figure 24.3/1: The Note Ms Present For Gprs process in the HLR
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
Note Ms Present For Gprs
Idle
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

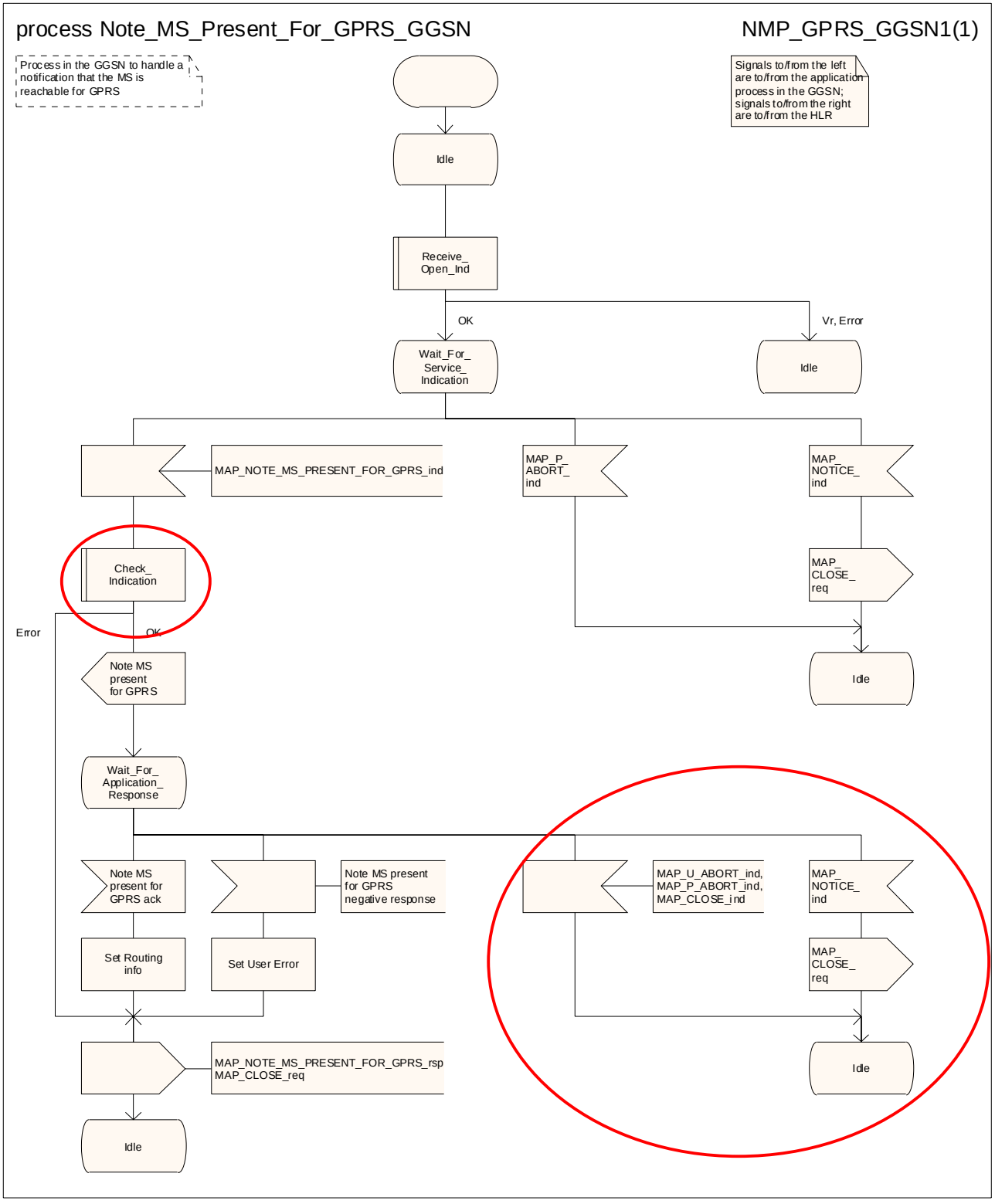


Figure 24.3/21: Process Note_MSs_Present_For_GPRSprs_GGSN

3GPP TSG CN WG4 Meeting #19
San Diego, CA, USA, 19th – 23rd May 2003

N4-030671
(Revision of N4-030433

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **594** ⌘ **rev** **2** ⌘ Current version: **6.1.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Provision of SDL diagrams and removal of redundant text in chapter 24	
Source:	⌘	Vodafone	
Work item code:	⌘	TEI5	***Date:*** ⌘ 21/05/2003
Category:	⌘	**A**	***Release:*** ⌘ Rel-6

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	There are no source files available for the SDL diagrams in 29.002 chapter 24. Many SDL diagrams are poorly laid out. The SDL for the responding entity omits the handling for dialogue abort while the process is waiting for the response from the application in the responding entity. The SDL description of the processes SRI_GPRS_GGSN and SRI_GPRS_HLR omits the possibility of protocol version dropback; the application context is now defined at V4 and V3. Most of the text is a (not completely accurate) reflection of the information in the SDL diagrams
Summary of change:	⌘	Redraw SDL diagrams to a consistent style. Add missing error handling. Add the possibility of protocol version dropback in processes SRI_GPRS_GGSN and SRI_GPRS_HLR. Remove redundant text.
Consequences if not approved:	⌘	Poor readability. Incomplete description of error handling. Unnecessary bulk in the specification.

Clauses affected:	⌘	24			
Other specs affected:	⌘	**Y**	**N**		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	The subclauses have been rearranged into a more logical order: the description of the behaviour in the dialogue initiator (the GGSN in subclauses 24.1 & 24.2, the HLR in subclause 24.3) is placed before the description of the behaviour in the dialogue responder (the HLR in subclauses 24.1 & 24.2, the GGSN in subclause 24.3). The material in the "General" subclause has been promoted to clause 24, because it applies to the whole clause. Second level subclause headings have been added for each of the procedures: retrieval of routeing information, failure reporting and reporting of MS reachability. The text description of the processes in the GGSN and the HLR has been grouped together in each of subclauses 24.1, 24.2 & 24.3. This editorial rearrangement has not been revision marked; only the changes to subclause numbers and figure numbers are marked.			

24 GPRS process description

~~24.1 General~~

The MAP GPRS procedures are used for the Network Requested PDP ~~-~~Context Activation procedures.

The stage 2 specification for General Packet Radio Service (GPRS) is in 3GPP TS 23.060 [104]~~ [100]~~.

24.1 Procedure for retrieval of routeing information for GPRS

24.1.1~~2~~ Process in the GGSN~~ for Send Routing Information for GPRS~~

The MAP process in the GGSN to request routeing information for a network requested PDP context activation is shown in figure 24.1/2. The MAP process invokes macros not defined in this clause; the definition 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 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.~~

24.1.21 Process in the HLR for Send Routing Information for GPRS

The MAP process in the HLR to provide routeing information for a network requested PDP context activation is shown in figure 24.1/1. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see 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 waits for a response. The Send Routing Info For Gprs request contains the parameter received in the MAP_SEND_ROUTING_INFO_FOR_GPRS service indication.

If the GPRS application process in the HLR returns a positive response containing the routing information, the MAP process constructs a MAP_SEND_ROUTING_INFO_FOR_GPRS service response containing the routing info, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Negative response from HLR GPRS application process

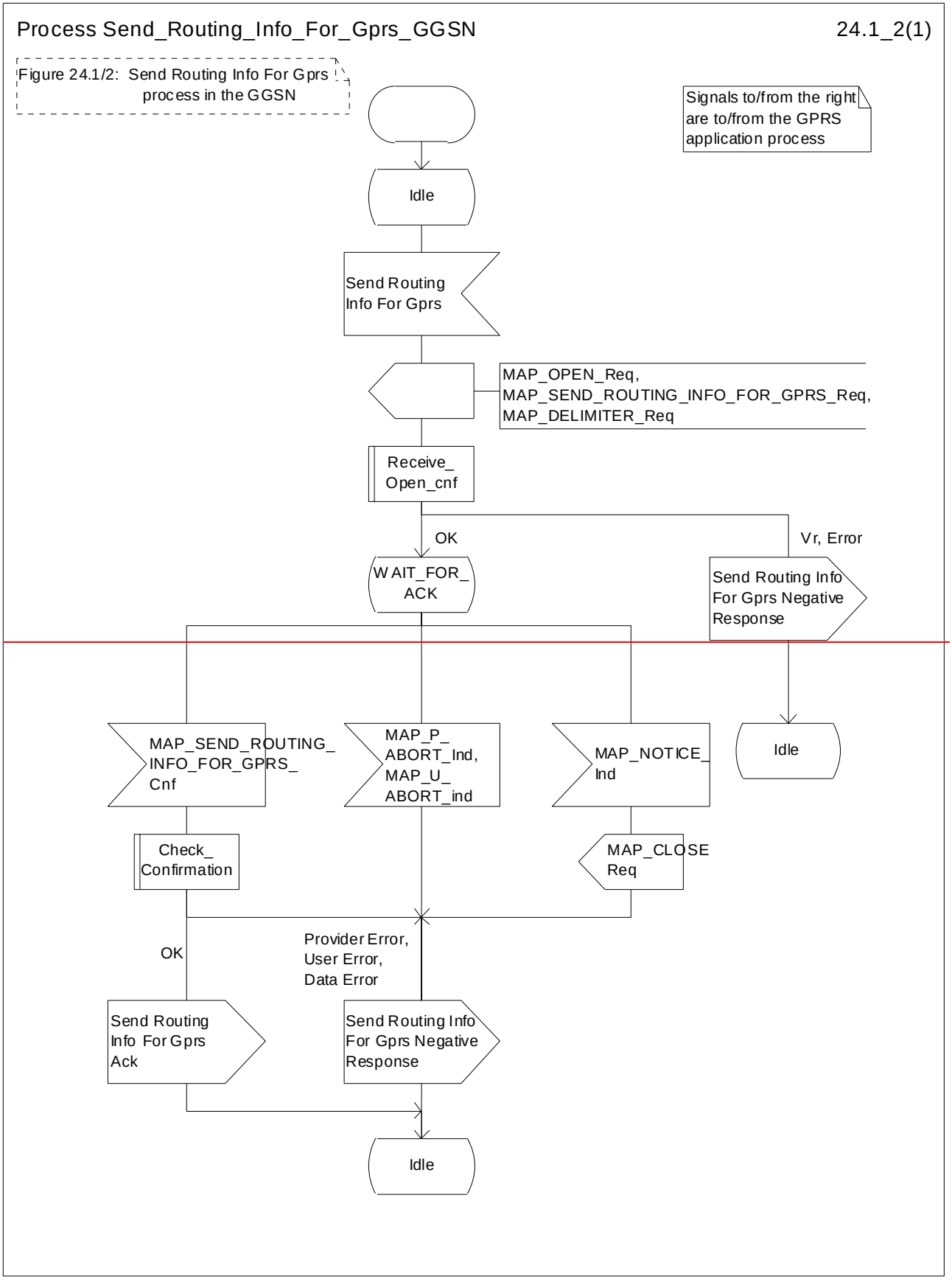
If the GPRS application process in the HLR returns a negative response, the MAP process constructs a MAP_SEND_ROUTING_INFO_FOR_GPRS service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Failure of dialogue opening with the GGSN

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

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

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


Process Send_Routing_Info_For_Gprs_GGSN
24.1_2(1)
Figure 24.1/2: Send Routing Info For Gprs process in the GGSN
Signals to/from the right are to/from the GPRS application process
Idle
Send Routing Info For Gprs
MAP_OPEN_Req,
MAP_SEND_ROUTING_INFO_FOR_GPRS_Req,
MAP_DELIMITER_Req
Receive_ Open_cnf
OK
Vr, Error
WAIT_FOR_ ACK
Send Routing Info For Gprs Negative Response
MAP_SEND_ROUTING_ INFO_FOR_GPRS_ Cnf
MAP_P_ ABORT_Ind, MAP_U_ ABORT_ind
MAP_NOTICE_ Ind
Idle
Check_ Confirmation
MAP_CLOSE Req
OK
Provider Error, User Error, Data Error
Send Routing Info For Gprs Ack
Send Routing Info For Gprs Negative Response
Idle

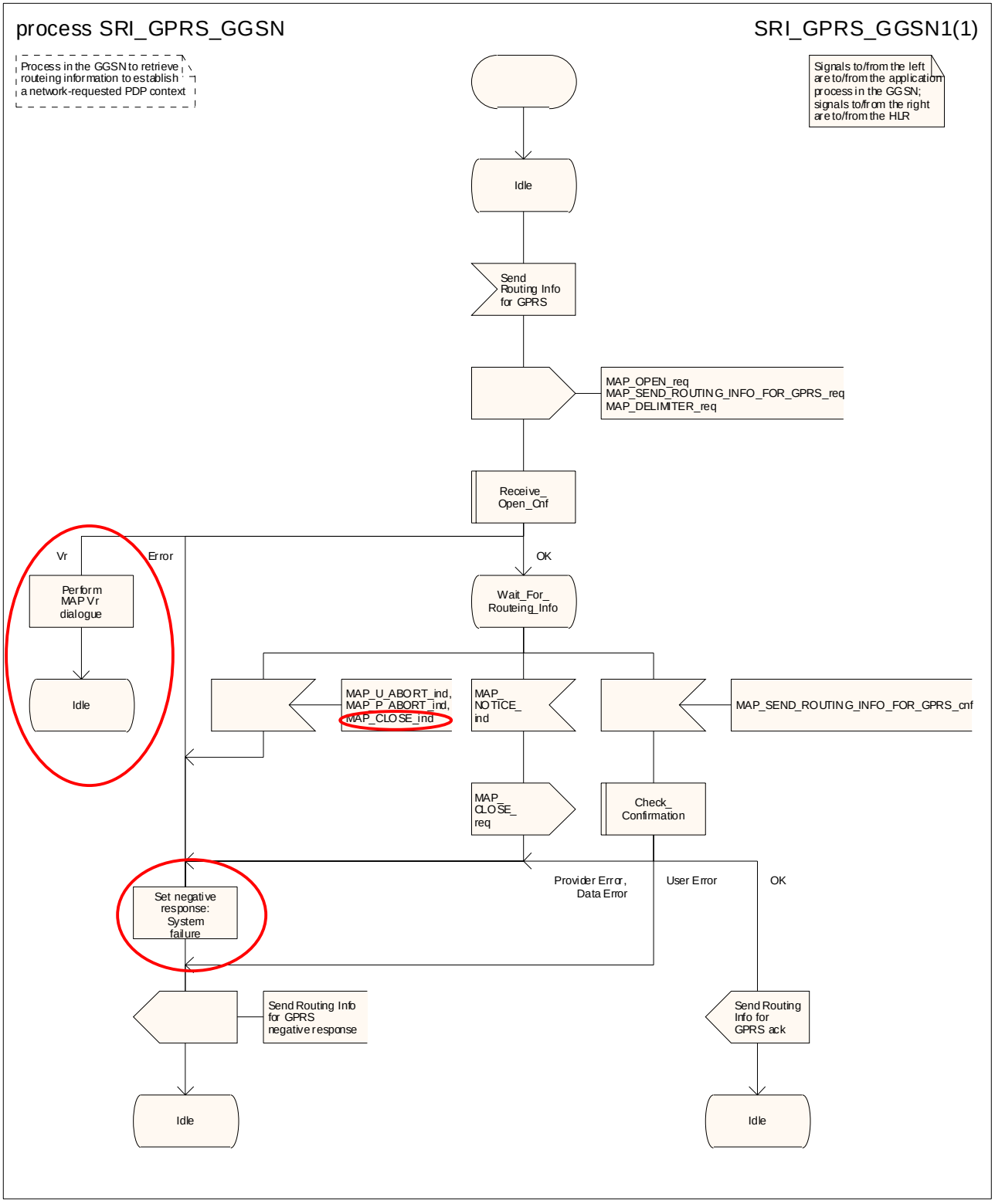
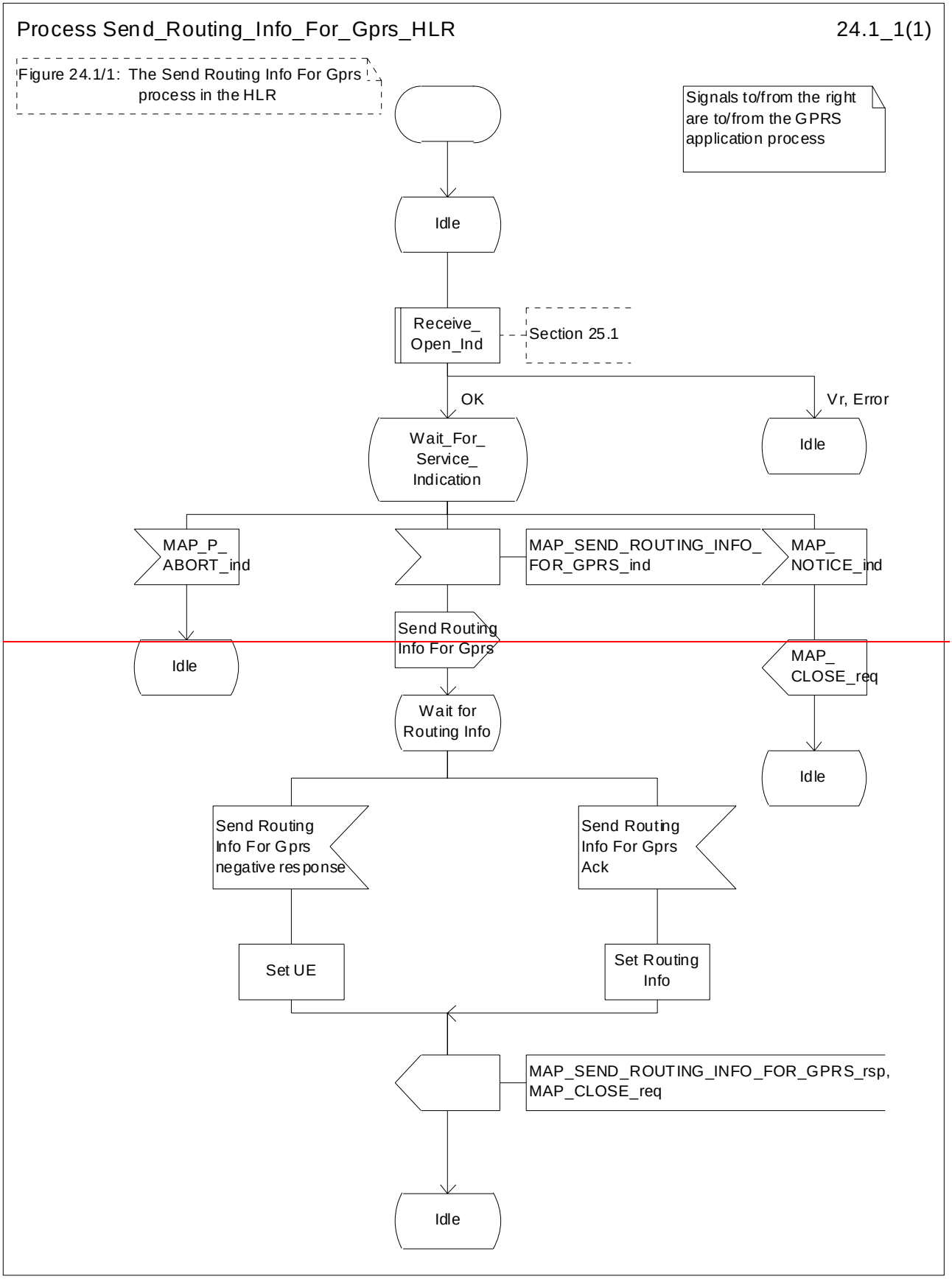


Figure 24.1/12: Process ~~Send_Routing_Info_For_Gprs~~SRI_GPRS_GGSN


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
Send Routing Info For Gprs
Idle
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

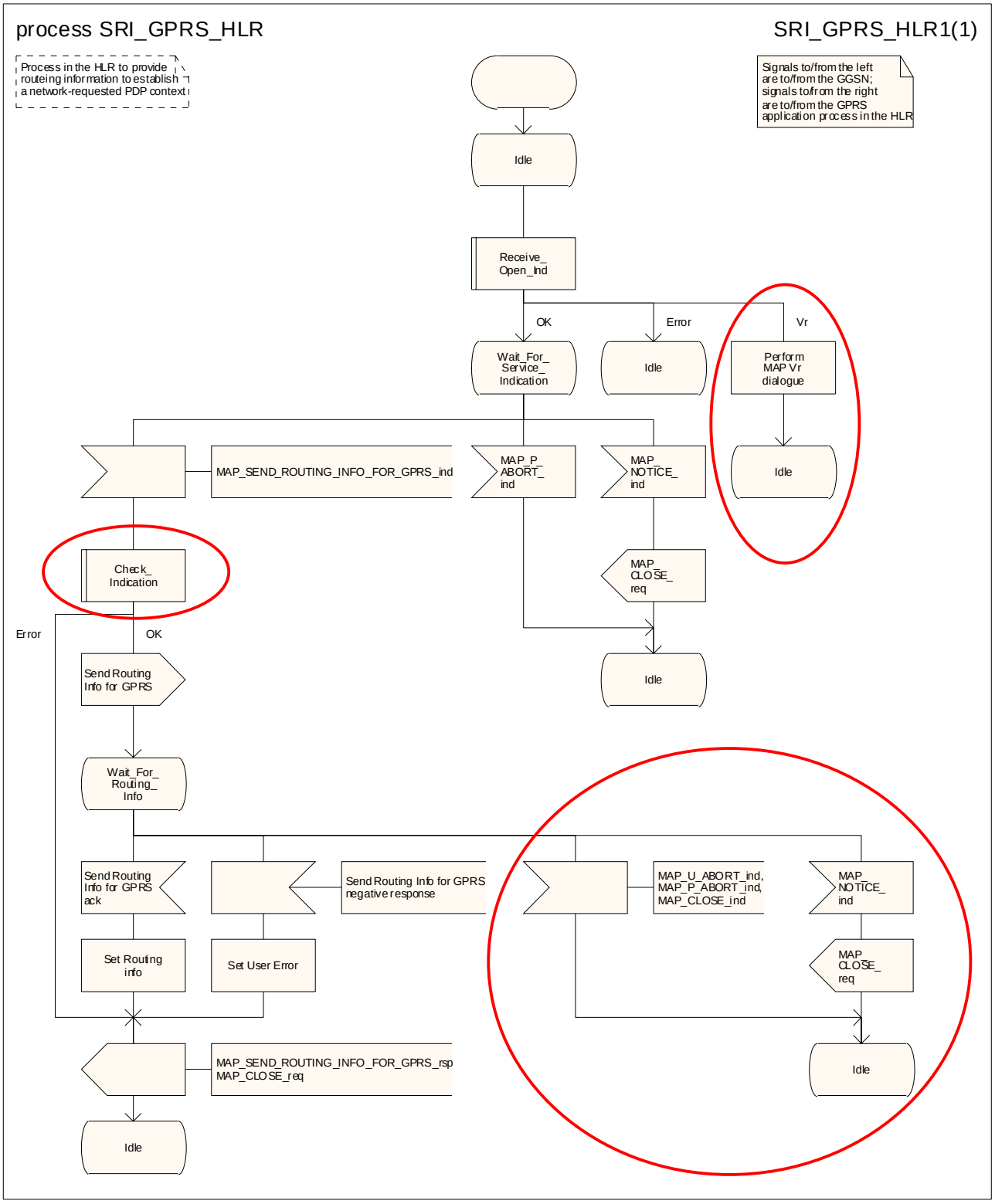


Figure 24.1/21: Process ~~Send Routing Info For Gprs~~SRI_GPRS_HLR

24.2 Procedure for reporting failure to establish a network requested PDP context

24.2.12 Process in the GGSN for Failure Report

The MAP process in the GGSN to report the failure to establish a network requested PDP context is shown in figure 24.2/2. The MAP process invokes macros not defined in this clause; the definition 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 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.

24.2.21 Process in the HLR for Failure Report

***** CR editor's note: The MAP process does not set the MNRG; the application process in the HLR does it. *****

The MAP process in the HLR to set the MNRG (Mobile station Not Reachable for GPRS) flag for the subscriber handle a notification from the GGSN that a network requested PDP context could not be established is shown in figure 24.2/1. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see 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 waits for a response. The Failure Report request contains the parameter received in the MAP_FAILURE_REPORT service indication.

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

Negative response from HLR GPRS application process

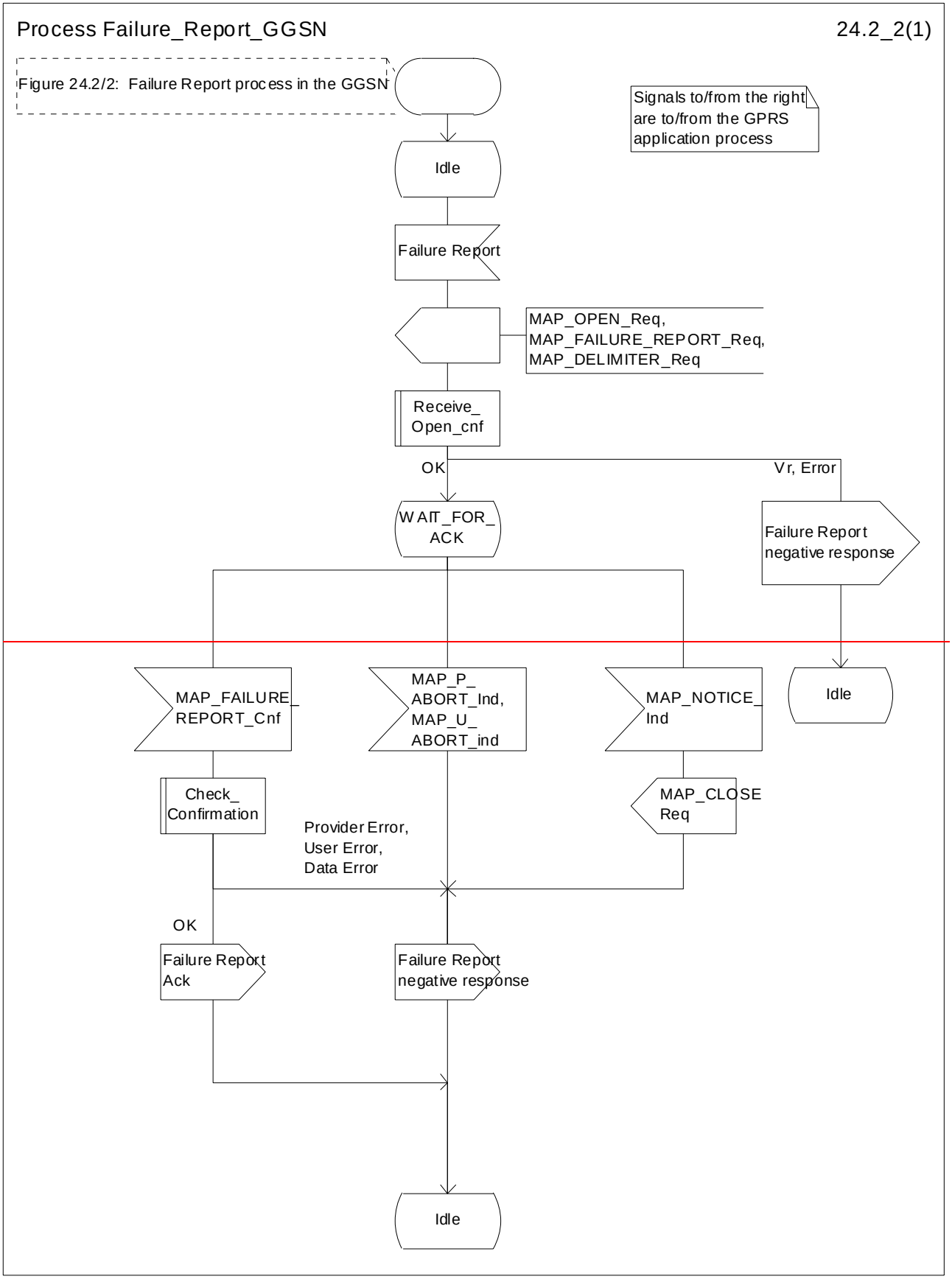
If the GPRS application process in the HLR returns a negative response, the MAP process constructs a MAP_FAILURE_REPORT service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the GGSN and returns to the idle state.

Failure of dialogue opening with the GGSN

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

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

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


Process Failure_Report_GGSN
24.2_2(1)
Figure 24.2/2: Failure Report process in the GGSN
Signals to/from the right are to/from the GPRS application process
Idle
Failure Report
MAP_OPEN_Req,
MAP_FAILURE_REPORT_Req,
MAP_DELIMITER_Req
Receive_
Open_cnf
OK
Vr, Error
WAIT_FOR_
ACK
Failure Report
negative response
MAP_FAILURE_
REPORT_Cnf
MAP_P_
ABORT_Ind,
MAP_U_
ABORT_ind
MAP_NOTICE_
Ind
Idle
Check_
Confirmation
MAP_CLOSE
Req
Provider Error,
User Error,
Data Error
OK
Failure Report
Ack
Failure Report
negative response
Idle

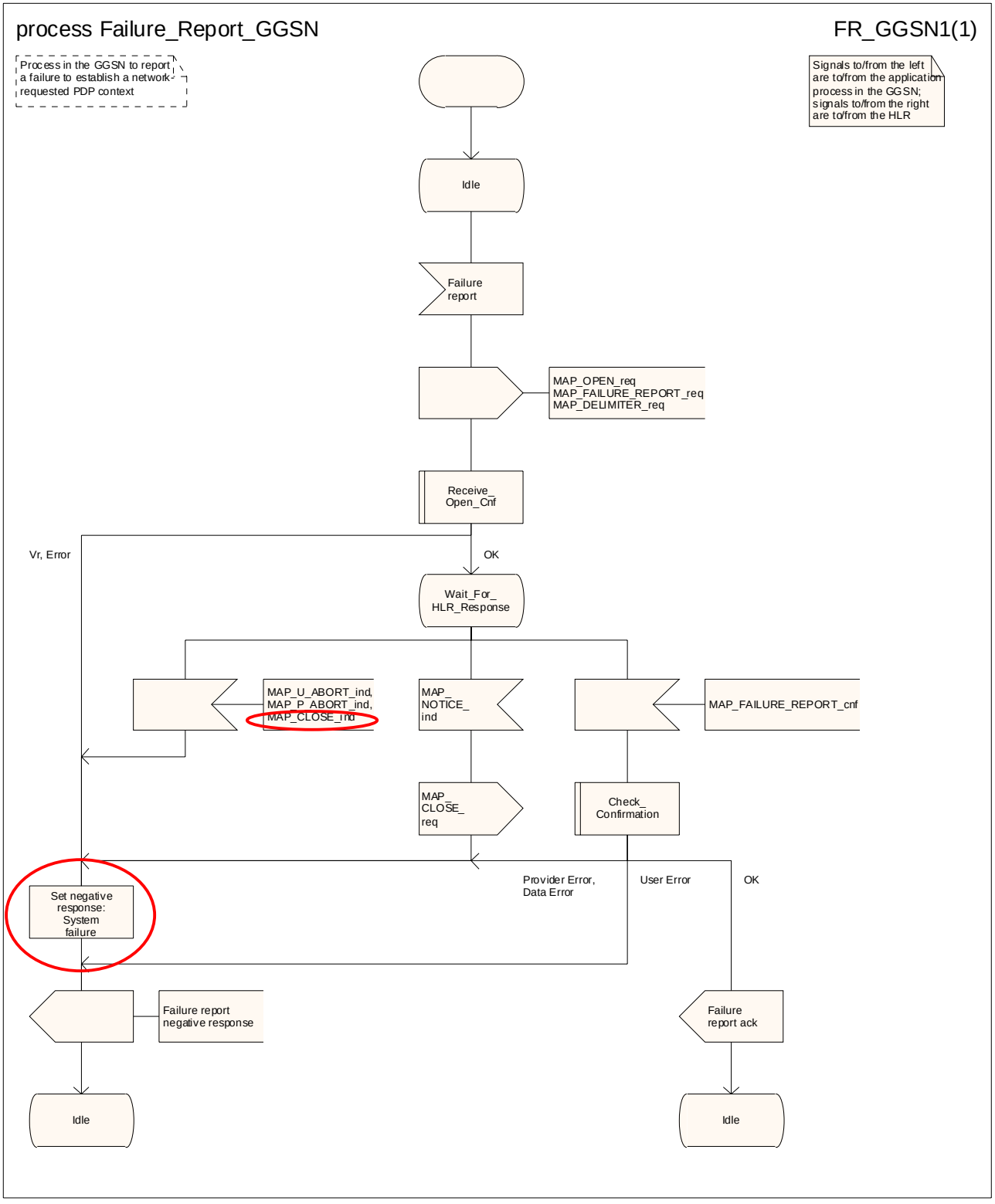
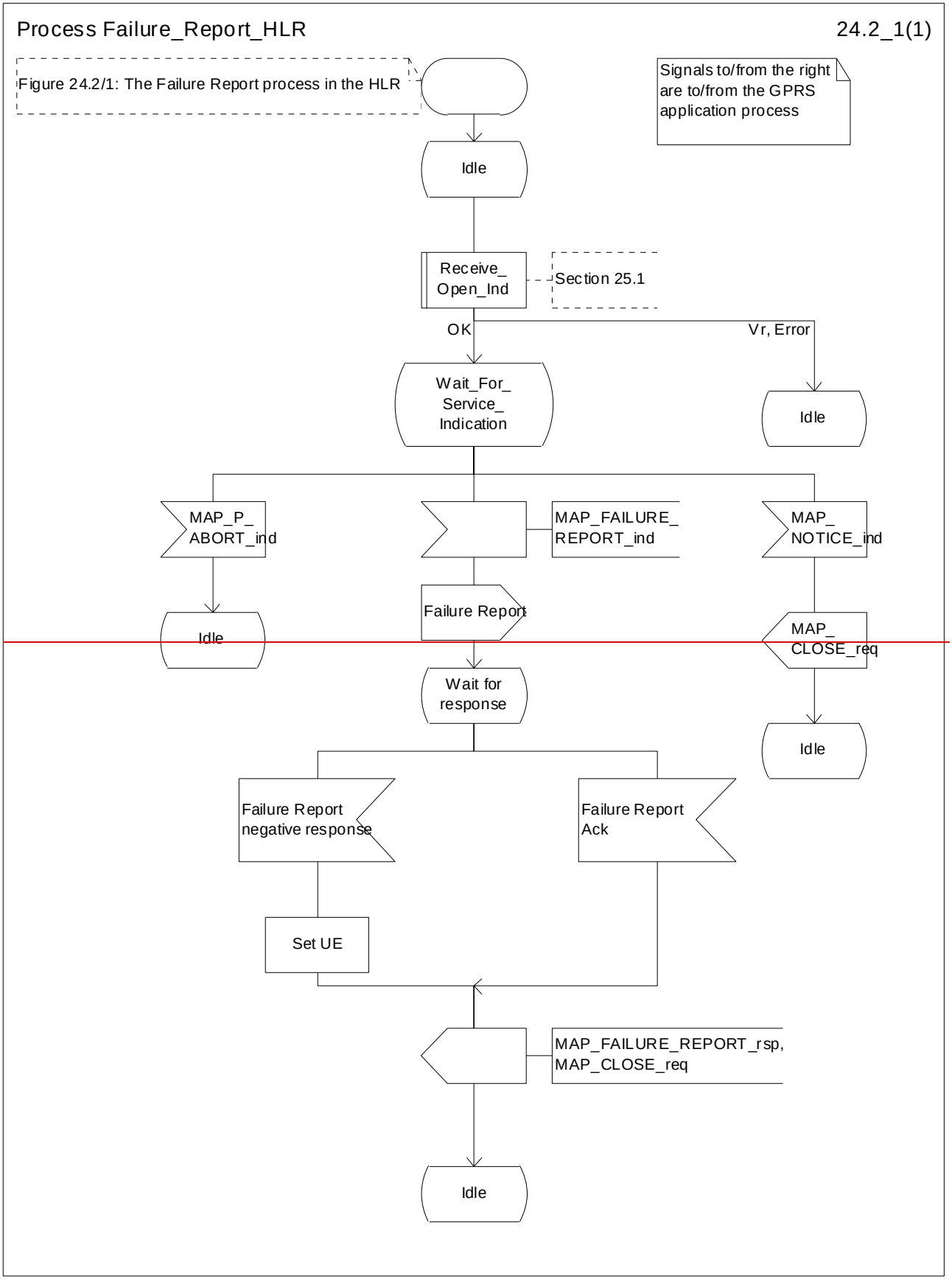


Figure 24.2/12: Process Failure_Report_GGSN


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
Failure Report
Idle
MAP_ CLOSE_req
Wait for response
Idle
Failure Report negative response
Failure Report Ack
Set UE
MAP_FAILURE_REPORT_rsp, MAP_CLOSE_req
Idle

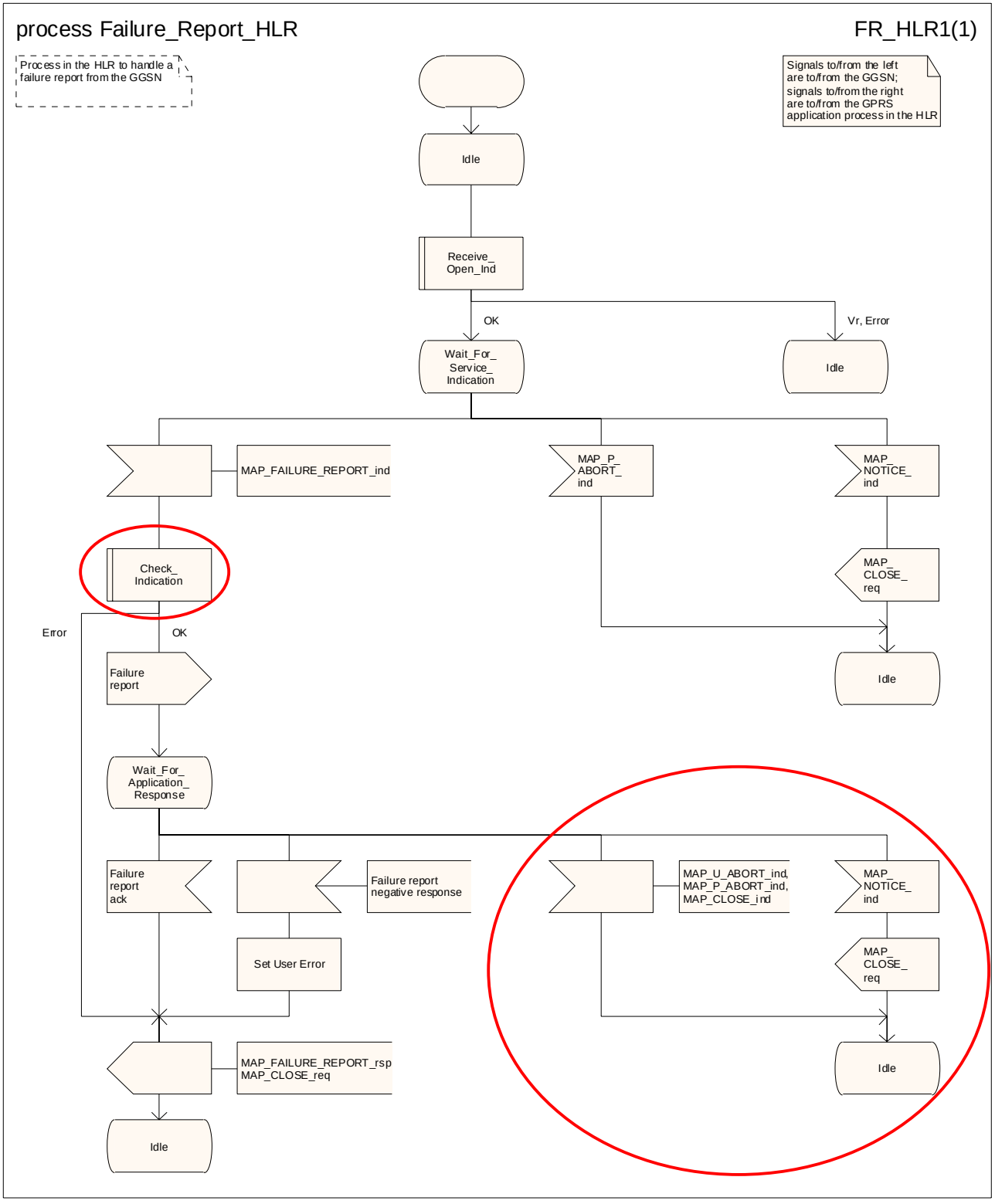


Figure 24.2/21: Process Failure_Report_HLR

24.3 Procedure for reporting that an MS has become reachable for GPRS

24.3.12 Process in the HLR ~~for Note Ms Present For Gprs~~

The MAP process in the HLR to report that an MS is reachable for GPRS is shown in figure 24.3/2. The MAP process invokes macros not defined in this clause; the definition 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 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.~~

24.3.21 Process in the GGSN ~~for Note Ms Present For Gprs~~

The MAP process in the GGSN to ~~inform~~ that the subscriber is present for GPRS again is shown in figure 24.3/1. The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind see 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 waits for a response. The Note Ms Present For Gprs request contains the parameter received in the MAP_NOTE_MS_PRESENT_FOR_GPRS service indication.

If the GPRS application process in the GGSN returns a positive response, the MAP process constructs a MAP_NOTE_MS_PRESENT_FOR_GPRS service response, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Negative response from GGSN GPRS application process

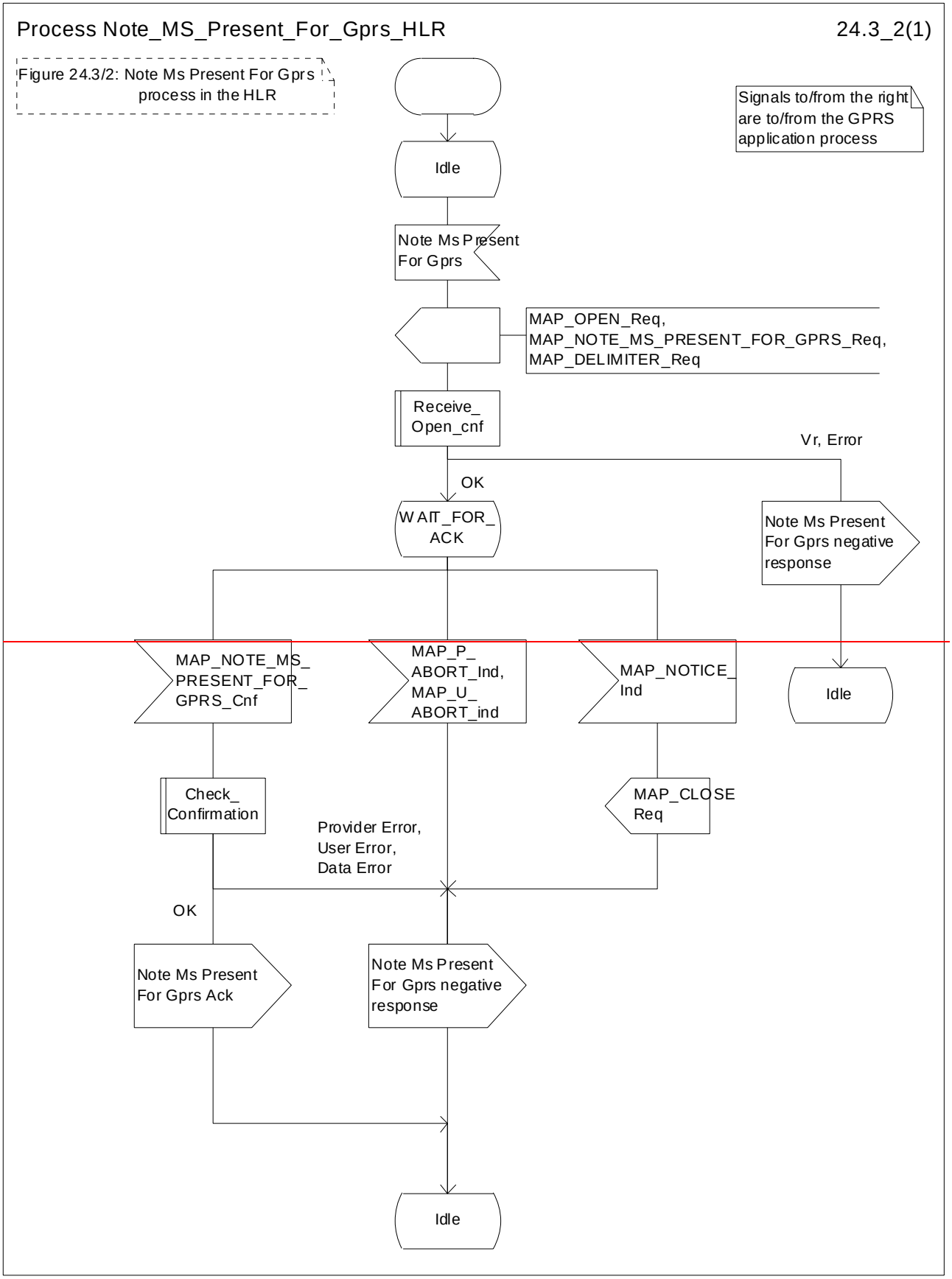
If the GPRS application process in the GGSN returns a negative response, the MAP process constructs a MAP_NOTE_MS_PRESENT_FOR_GPRS service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the HLR and returns to the idle state.

Failure of dialogue opening with the HLR

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

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

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


Process Note_MS_Present_For_Gprs_HLR
24.3_2(1)
Figure 24.3/2: Note Ms Present For Gprs process in the HLR
Signals to/from the right are to/from the GPRS application process
Idle
Note Ms Present For Gprs
MAP_OPEN_Req,
MAP_NOTE_MS_PRESENT_FOR_GPRS_Req,
MAP_DELIMITER_Req
Receive_ Open_cnf
Vr, Error
OK
WAIT_FOR_ ACK
Note Ms Present For Gprs negative response
MAP_NOTE_MS_ PRESENT_FOR_ GPRS_Cnf
MAP_P_ ABORT_Ind, MAP_U_ ABORT_ind
MAP_NOTICE_ Ind
Idle
Check_ Confirmation
MAP_CLOSE Req
Provider Error,
User Error,
Data Error
OK
Note Ms Present For Gprs Ack
Note Ms Present For Gprs negative response
Idle

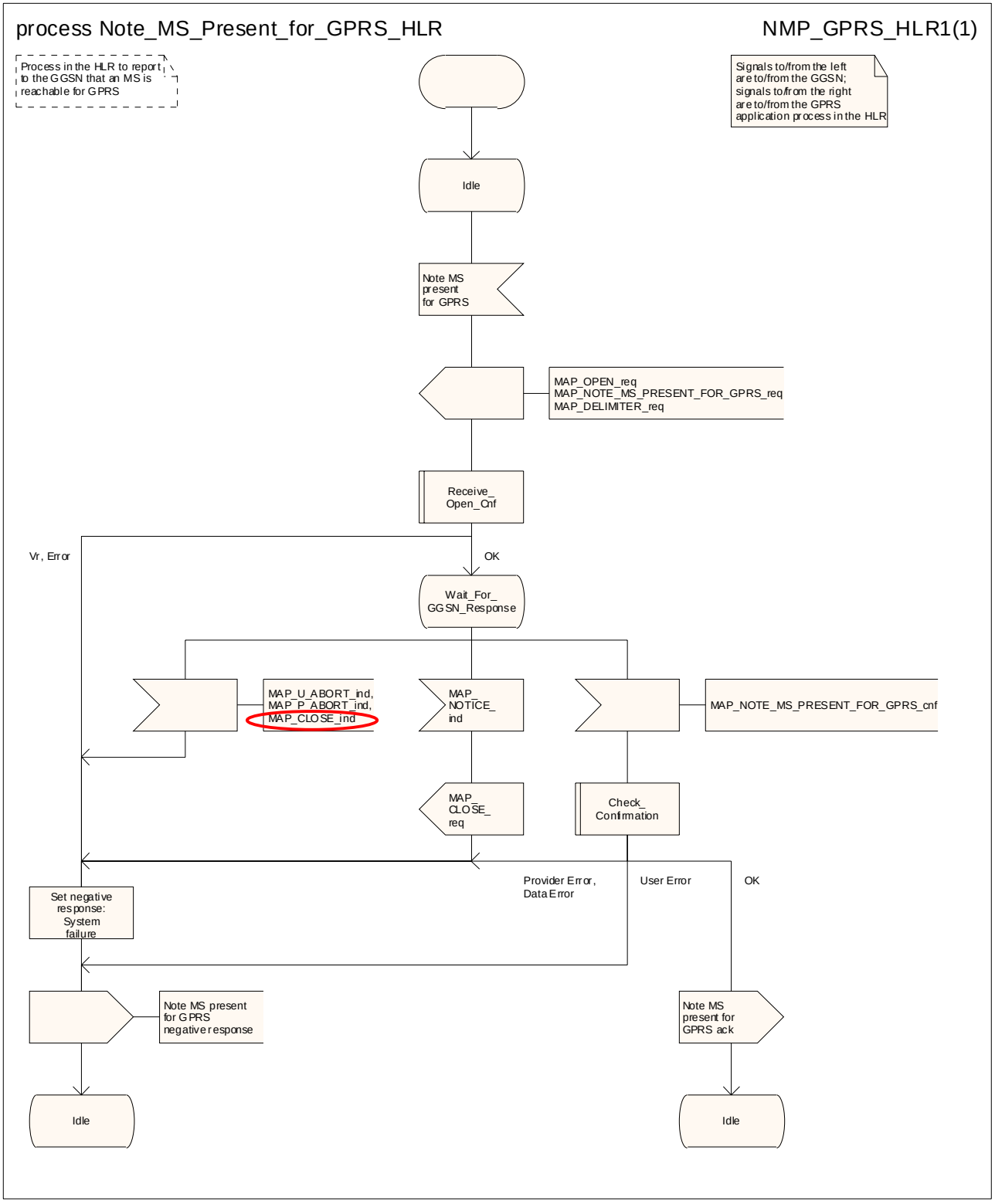
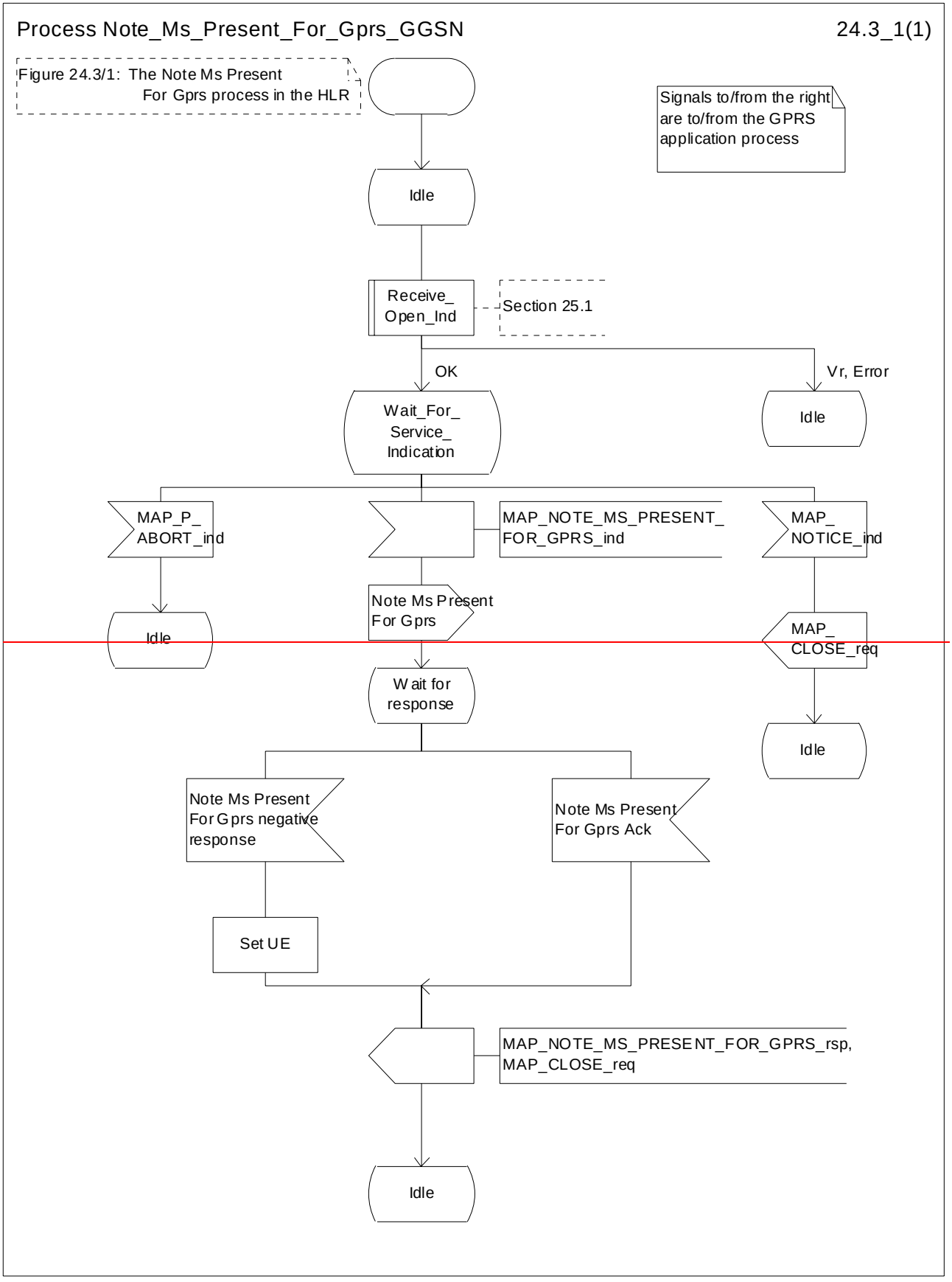


Figure 24.3/12: Process Note_MSs_Present_For_GPRSprs_HLR


Process Note_Ms_Present_For_Gprs_GGSN
24.3_1(1)
Figure 24.3/1: The Note Ms Present For Gprs process in the HLR
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
Note Ms Present For Gprs
Idle
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

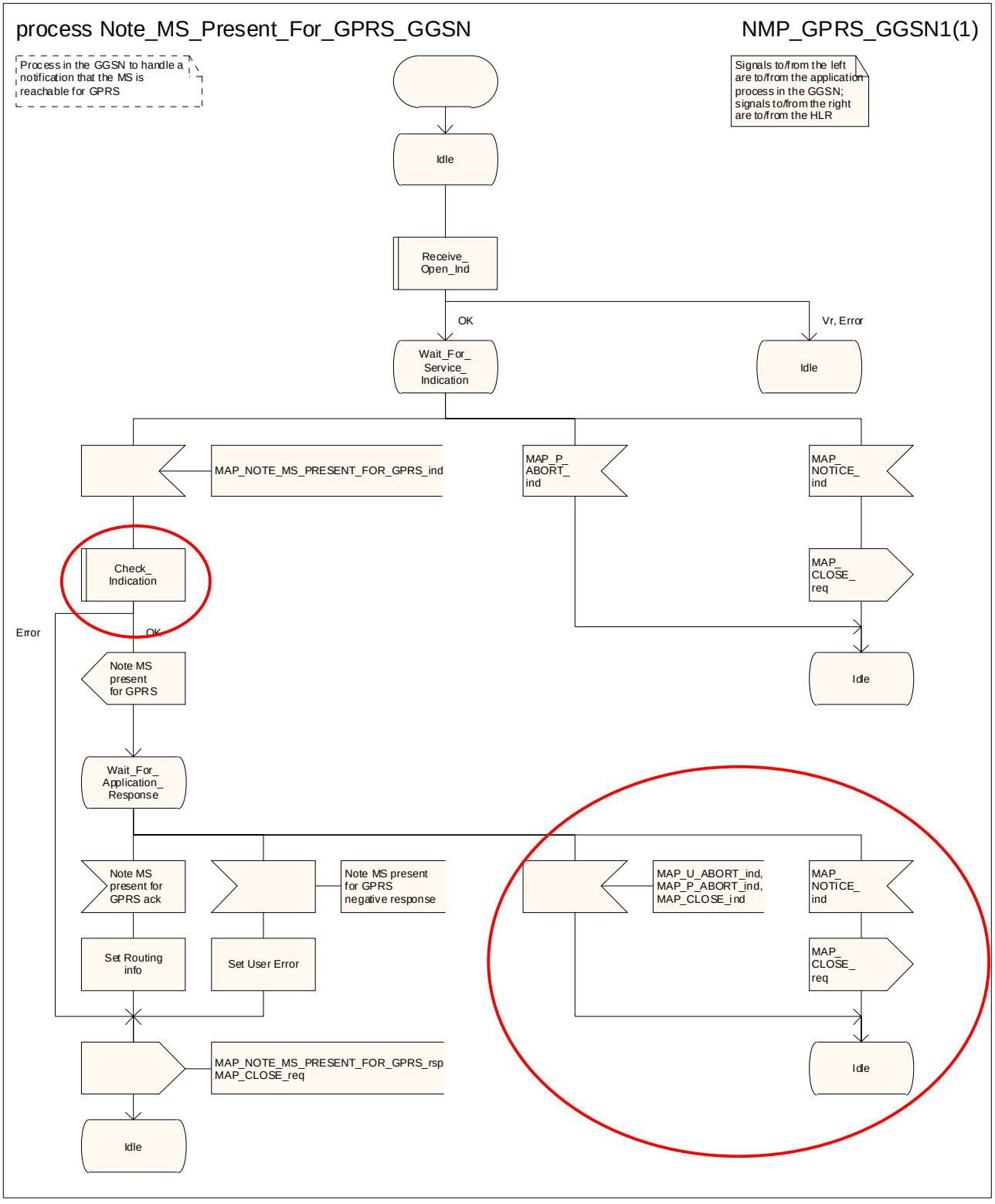


Figure 24.3/21: Process Note_MSs_Present_For_GPRSprs_GGSN

3GPP TSG CN WG4 Meeting #19
San Diego, CA, USA, 19th – 23rd May 2003

N4-030681
(Revision of N4-030467)

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **606** ⌘**rev** **1** ⌘ Current version: **5.5.0** ⌘

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

Proposed change affects: UICC apps⌘ [ ] ME [ ] Radio Access Network [ ] Core Network [X]

Title:	⌘	Provision of SDL diagrams and removal of redundant text in chapter 22
Source:	⌘	Vodafone
Work item code:	⌘	TEI5
Date:	⌘	22/05/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	There are no source files available for the SDL diagrams in 29.002 chapter 24. Many SDL diagrams are poorly laid out. Many message flow diagrams are drawn using MS linedraw characters, which do not display properly in Word 2000. The descriptive text is not properly aligned with the SDL diagrams. Signal names for signals to/from processes in 23.011 are not aligned with those in 23.011. Many procedure descriptions omit error handling There are lurking references to specifications 04.10, 04.8x and 04.9x. The description of SS invocation (subclauses 11.6 & 22.7) is purely interworking between the MSC & the VLR, and includes no MAP signalling. The interworking is described in 23.018, 23.083 & 23.084. The macros Receive_Errors_MSC, Receive_ErrorFrom_HLR, Receive_Error_From_VLR and Receive_Error_From_Next_Node fail the SDL editor syntax check. The macro Start_USSD_VLR invokes a macro, Search_VLR, which has not existed since GSM phase 2! Most of the text inaccurately repeats the information in the SDL diagrams; the useful additional information is buried in superfluous verbiage. The misalignment between text and SDL has led to different interpretations, and interworking problems. It was this which led to the style used in GSM 03.18/23.018, where the text is a **supplement to** the SDL. It should be noted that other chapters in 29.002 (e.g. 24B) do not have text which attempts to replicate the SDL.

Summary of change:	⌘	Redraw SDL diagrams to a consistent style. Redraw message flow diagrams. Align text and SDL. Align signal names with 23.011. Update references to 04 series specifications Make subclauses 11.6 & 22.7 void. Add error handling where required Replace the calls on the error handling macros with the explicit input signal handling for MAP_U_ABORT, MAP_P_ABORT, MAP_NOTICE and MAP_CLOSE. Remove text which replicates the information in SDL diagrams.
Consequences if not approved:	⌘	Poor readability. Misalignment between text and SDL will lead to different interpretations, and hence the potential for interworking problems.

Clauses affected:	⌘	11.6; 22			
Other specs affected:	⌘	**Y** / **N** **N**	Other core specifications	⌘	
		X	Test specifications		
		X	O&M Specifications		
Other comments:	⌘	Following the example approved in CR 29.002-523 & CR 29.002-524, the pretence of MAP signalling between the MSC and the VLR has been reduced; references to application contexts and the need for a supplementary service co-ordinating process in the VLR when it responds to a dialogue opening request from the MSC have been removed. The consequence is that the processes in the VLR to handle supplementary service registration, erasure, activation, deactivation, interrogation and password registration being modified to return to the idle state rather than terminating when the handling is complete. The handling of protocol dropback, MAP_P_ABORT and MAP_NOTICE on the B interface has been removed. The SS co-ordinating process in the MSC to handle a CM Service request with CM service type SS activation has been extended to handle an A_PROCESS_UNSTRUCTURED_SS_REQUEST input, and invoke the process MS_Init_USSD_MSC. The consequence is that the process MS_Init_USSD_MSC now terminates when it has finished its processing, instead of returning to the Null state. The descriptive text for the behaviour of the network entities in each second level subclause has been grouped together, before the SDL diagrams. This editorial rearrangement has not been revision marked.		

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

11.6 ~~MAP_INVOKE_SS service~~Void

~~11.6.1 Definitions~~

~~This service is used between the MSC and the VLR to check the subscriber's subscription to a given supplementary service in the VLR, in connection with in call invocation of that supplementary service, i.e. after the call set up phase is finished. For supplementary service invocation during call set up phase, please refer to the call handling descriptions.~~

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

~~11.6.2 Service primitives~~

~~The service primitives are shown in table 11.6/1.~~

~~Table 11.6/1: MAP_INVOKE_SS parameters~~

~~Parameter name~~	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~
~~Invoke id~~	~~M~~	~~M(=)~~	~~M(=)~~	~~M(=)~~
~~SS-Code~~	~~M~~	~~M(=)~~		
~~Basic service~~	~~C~~	~~C(=)~~		
~~User error~~			~~C~~	~~C(=)~~
~~Provider error~~				~~O~~

~~11.6.3 Parameter use~~

~~Invoke id~~

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

~~SS-Code~~

~~This SS-Code can only refer to a single supplementary service, e.g. the Call Hold or Multi Party supplementary services.~~

~~Basic service~~

~~This parameter indicates for which basic service the supplementary service invocation is required.~~

~~User error~~

~~This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values:~~

- ~~System Failure;~~
- ~~Data Missing;~~
- ~~Unexpected data value;~~
- ~~Call Barred;~~
- ~~Illegal SS operation;~~
- ~~SS error status;~~
- ~~SS not available.~~

~~Provider error~~

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

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

22 Supplementary services procedures

~~The following application contexts exist for handling of supplementary services:~~

- ~~accessUnstructuredSsContext;~~
- ~~accessFunctionalSsContext.~~

~~The accessUnstructuredSsContext refers to a simple MAP user, 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 s~~Supplementary service co-ordinator processes

22.1.1 Functional supplementary service process co-ordinator for the 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 3GPP TS 29.011 [59].~~

~~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~~

The co-ordinating process in the MSC to handle a CM connection request with CM service type Supplementary service activation is shown in figure 22.1/1. The process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Process_Access_Request_MSC see subclause 25.4.1.

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

22.1.2 ~~Functional supplementary service process co-ordinator for VLR~~Void

~~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.~~

22.1.3 Functional supplementary service process co-ordinator for the 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~~

The MAP co-ordinating process in the HLR to handle a dialogue opened with the networkFunctionalSS application context is shown in figure 22.1/3. The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

~~Figure 22.1/3 shows the co-ordinating process in the 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 clause; the definition of this macro can be found as follows:~~

~~Receive_Open_Ind see clause 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~~

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 clause; the definition of this macro can be found as follows:

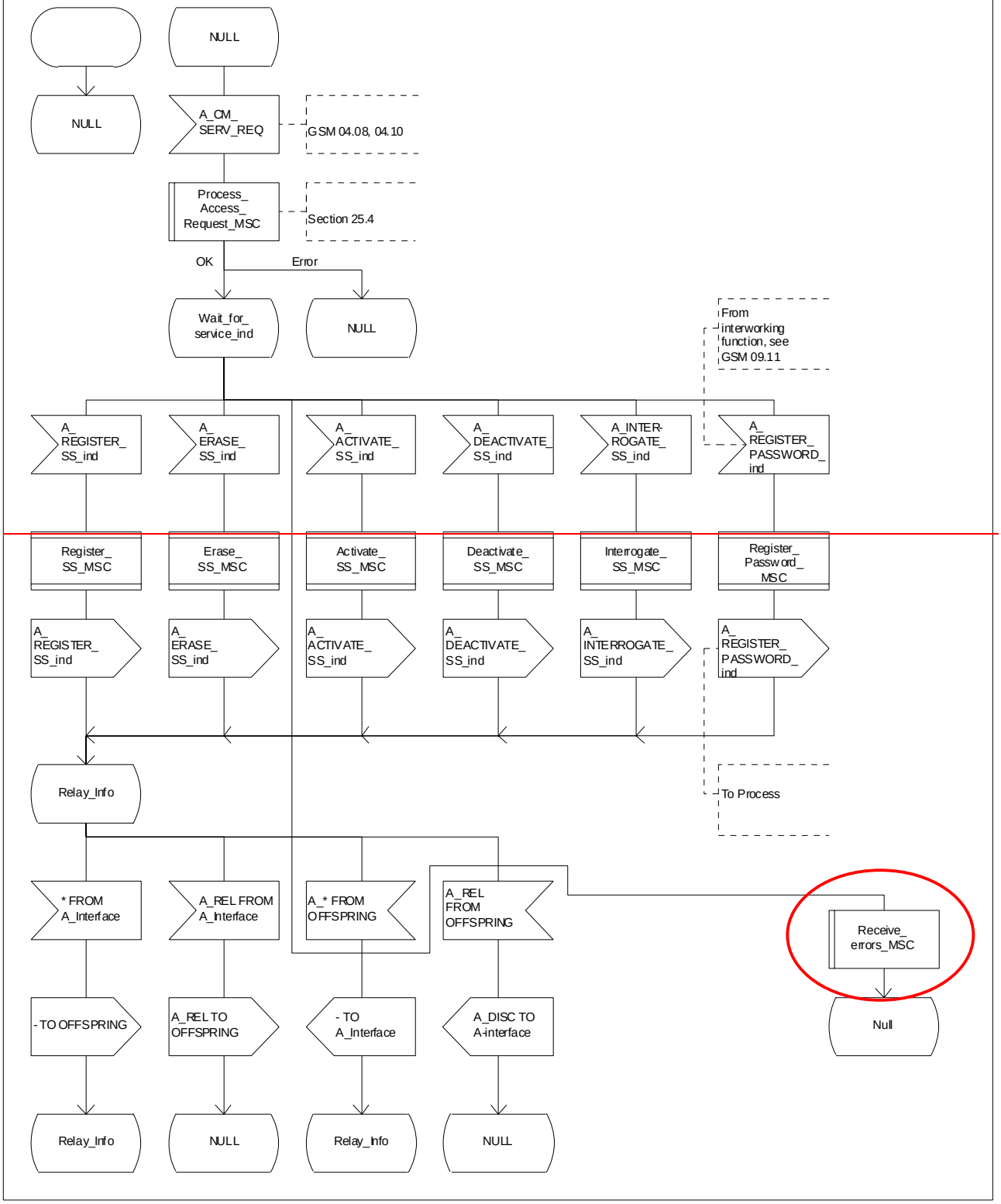
Receive_Open_Ind see subclause 25.1.1.

~~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.~~

Process SS_Coordinator_MSC 22.1_1(1)

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



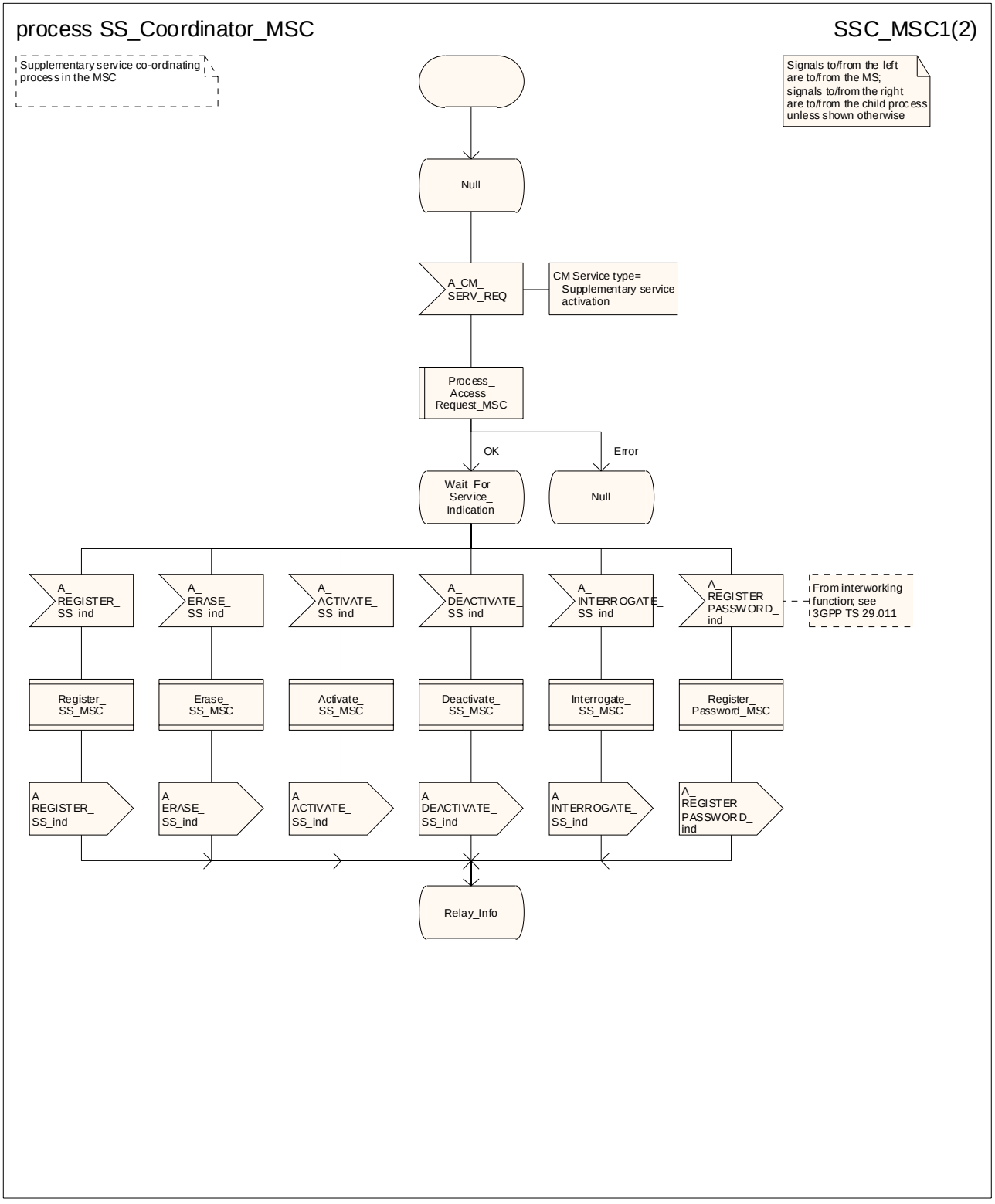


Figure 22.1/1 (sheet 1 of 2): Process SS_Coordinator_MSC

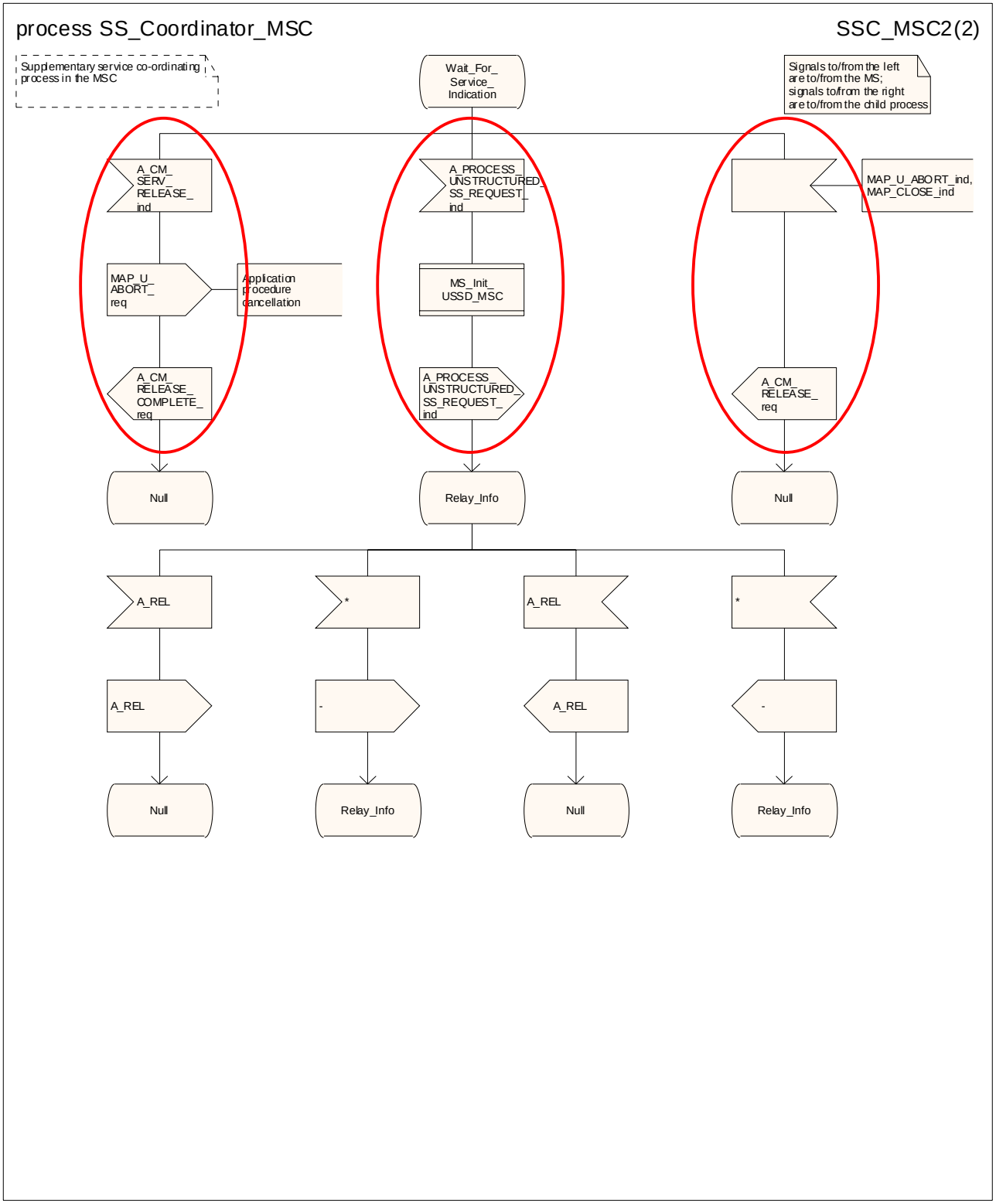
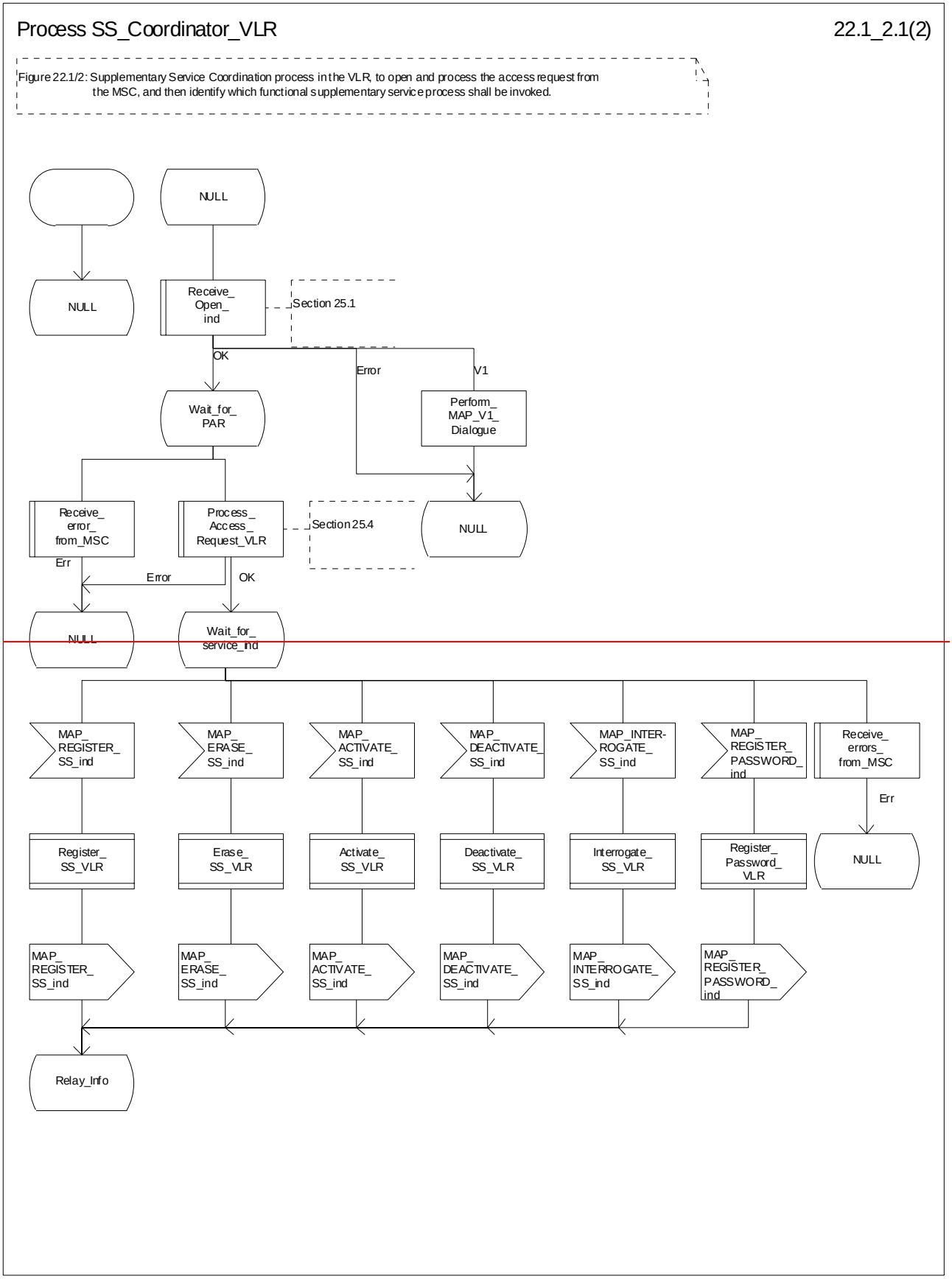
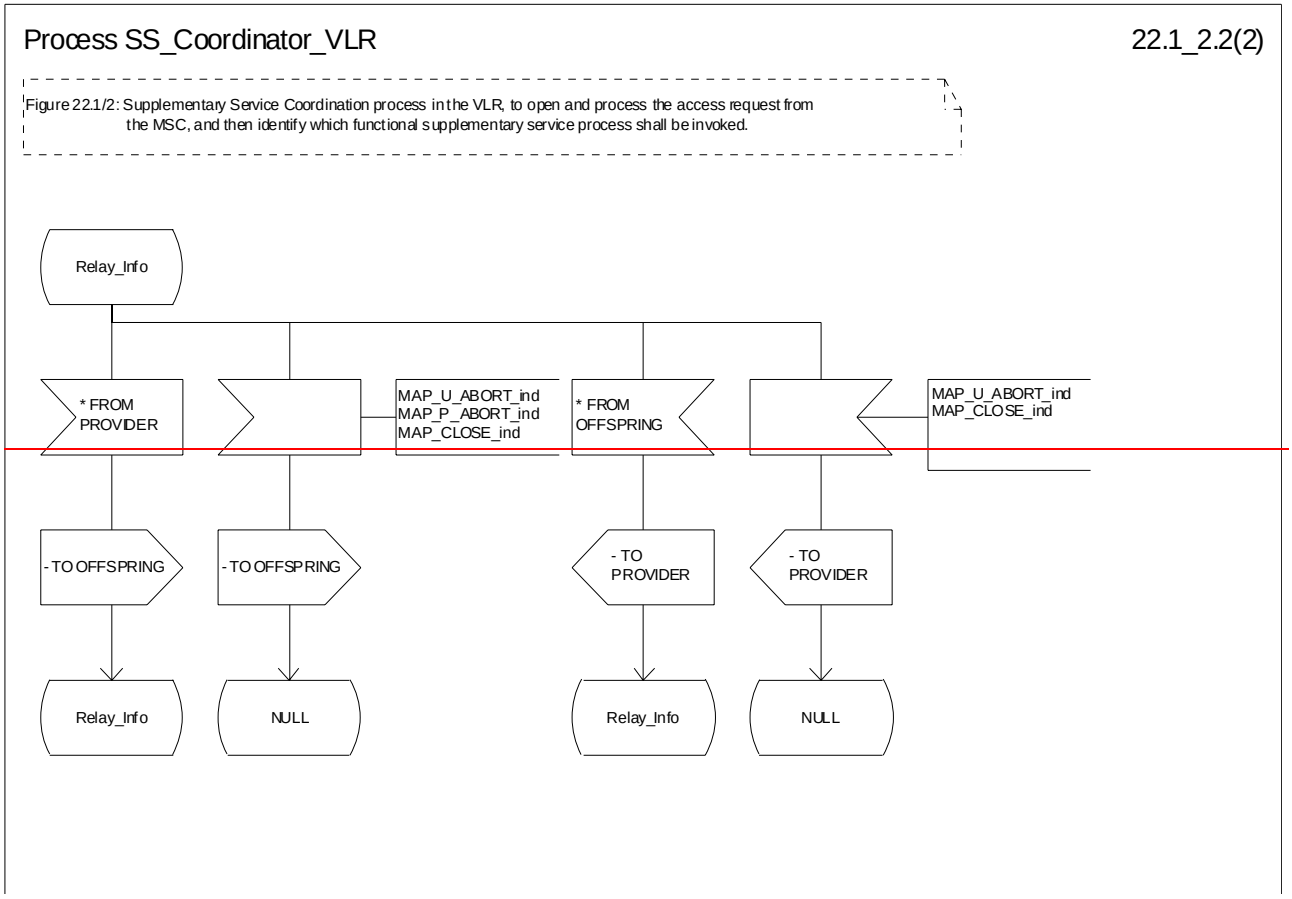


Figure 22.1/1 (sheet 2 of 2): Process SS_Coordinator_MSC



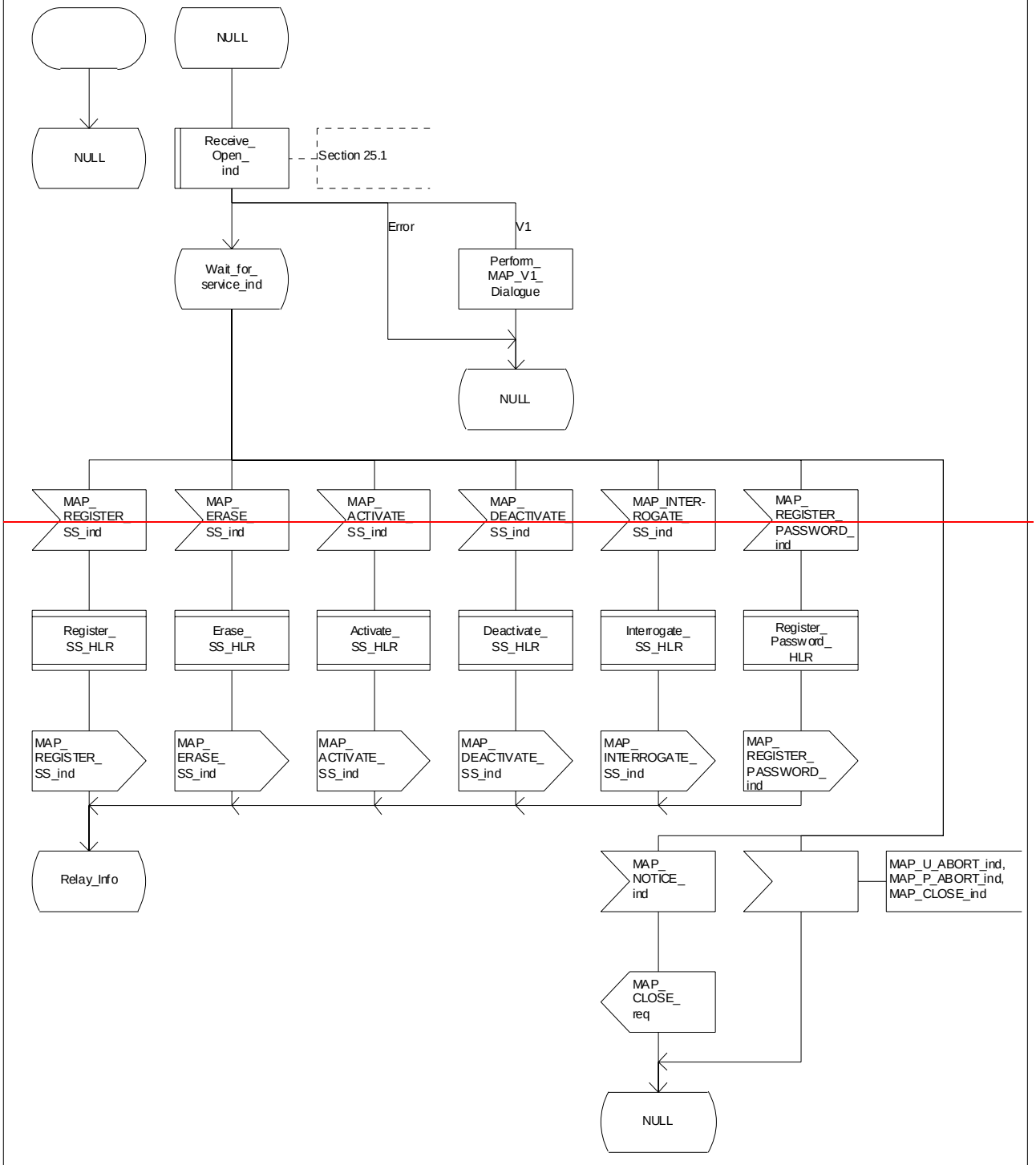
~~Figure 22.1/2 (sheet 1 of 2): Process SS_Coordinator_VLR~~



~~Figure 22.1/2 (sheet 2 of 2): Process SS_Coordinator_VLR~~

Process SS_Coordinator_HLR 22.1_3.1(2)

Figure 22.1/3: Supplementary Service Coordination process in the HLR, to identify which functional supplementary service process shall be invoked.



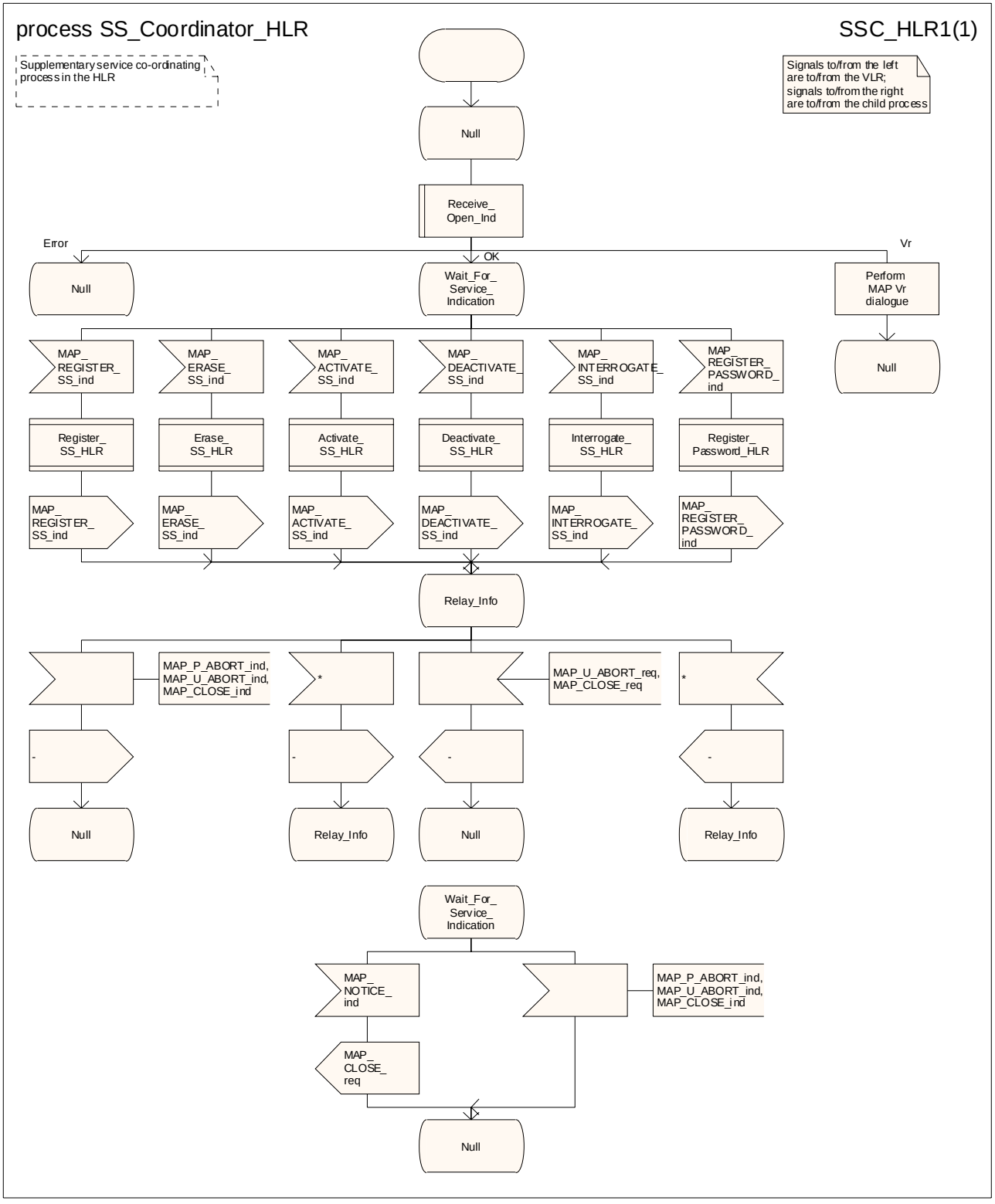
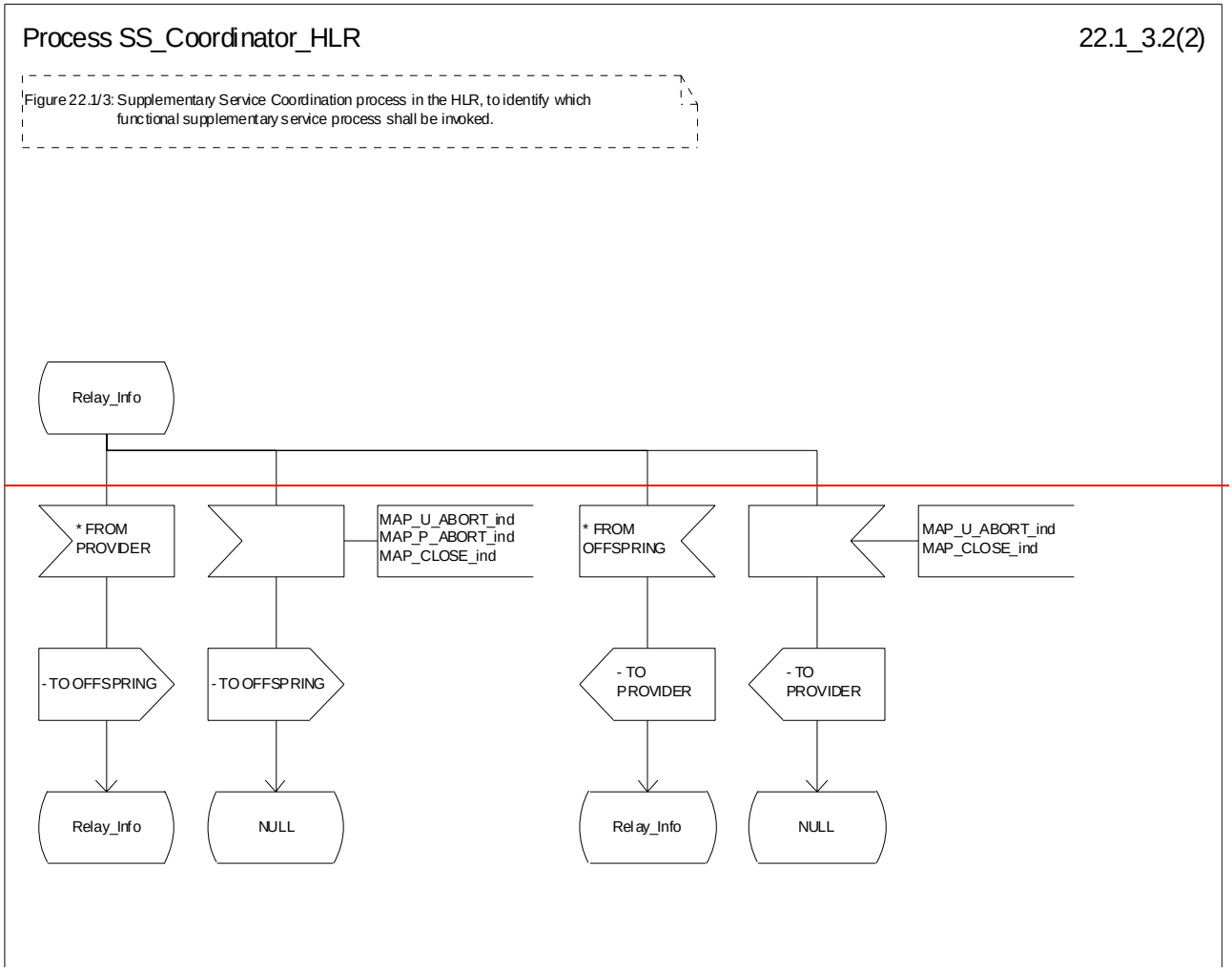
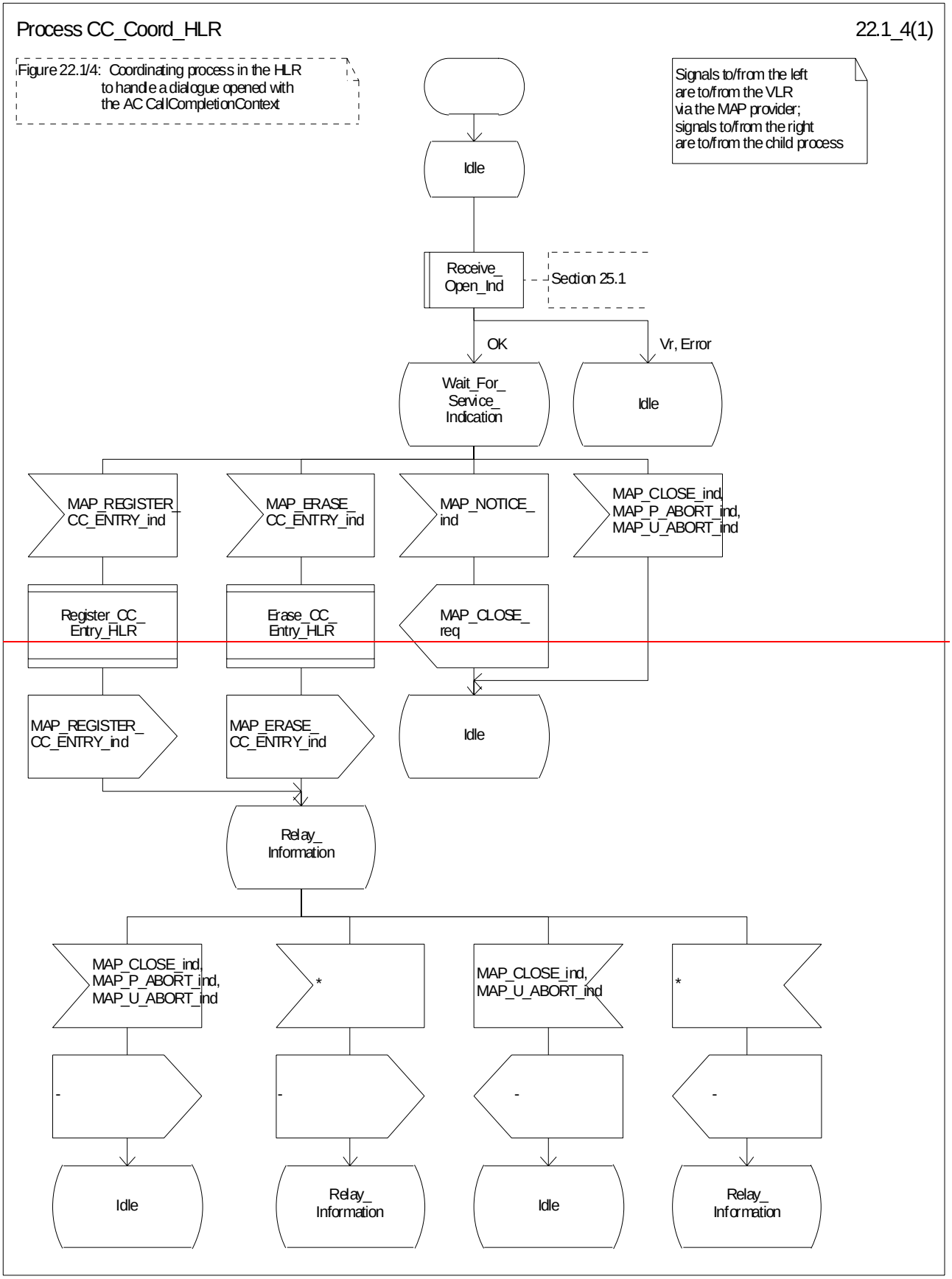


Figure 22.1/3 ~~(sheet 1 of 2)~~: Process SS_Coordinator_HLR



~~Figure 22.1/3 (sheet 2 of 2): Process SS_Coordinator_HLR~~


Process CC_Coord_HLR
22.1_4(1)
Figure 22.1/4: Coordinating process in the HLR to handle a dialogue opened with the AC CallCompletionContext
Signals to/from the left are to/from the VLR via the MAP provider; signals to/from the right are to/from the child process
Idle
Receive_ Open_Ind
Section 25.1
OK
Vr, Error
Wait_For_ Service_ Indication
Idle
MAP_REGISTER_ CC_ENTRY_ind
MAP_ERASE_ CC_ENTRY_ind
MAP_NOTICE_ ind
MAP_CLOSE_ind, MAP_P_ABORT_ind, MAP_U_ABORT_ind
Register_CC_ Entry_HLR
Erase_CC_ Entry_HLR
MAP_CLOSE_ req
MAP_REGISTER_ CC_ENTRY_ind
MAP_ERASE_ CC_ENTRY_ind
Idle
Relay_ Information
MAP_CLOSE_ind, MAP_P_ABORT_ind, MAP_U_ABORT_ind
*
MAP_CLOSE_ind, MAP_U_ABORT_ind
*
-
-
-
-
Idle
Relay_ Information
Idle
Relay_ Information

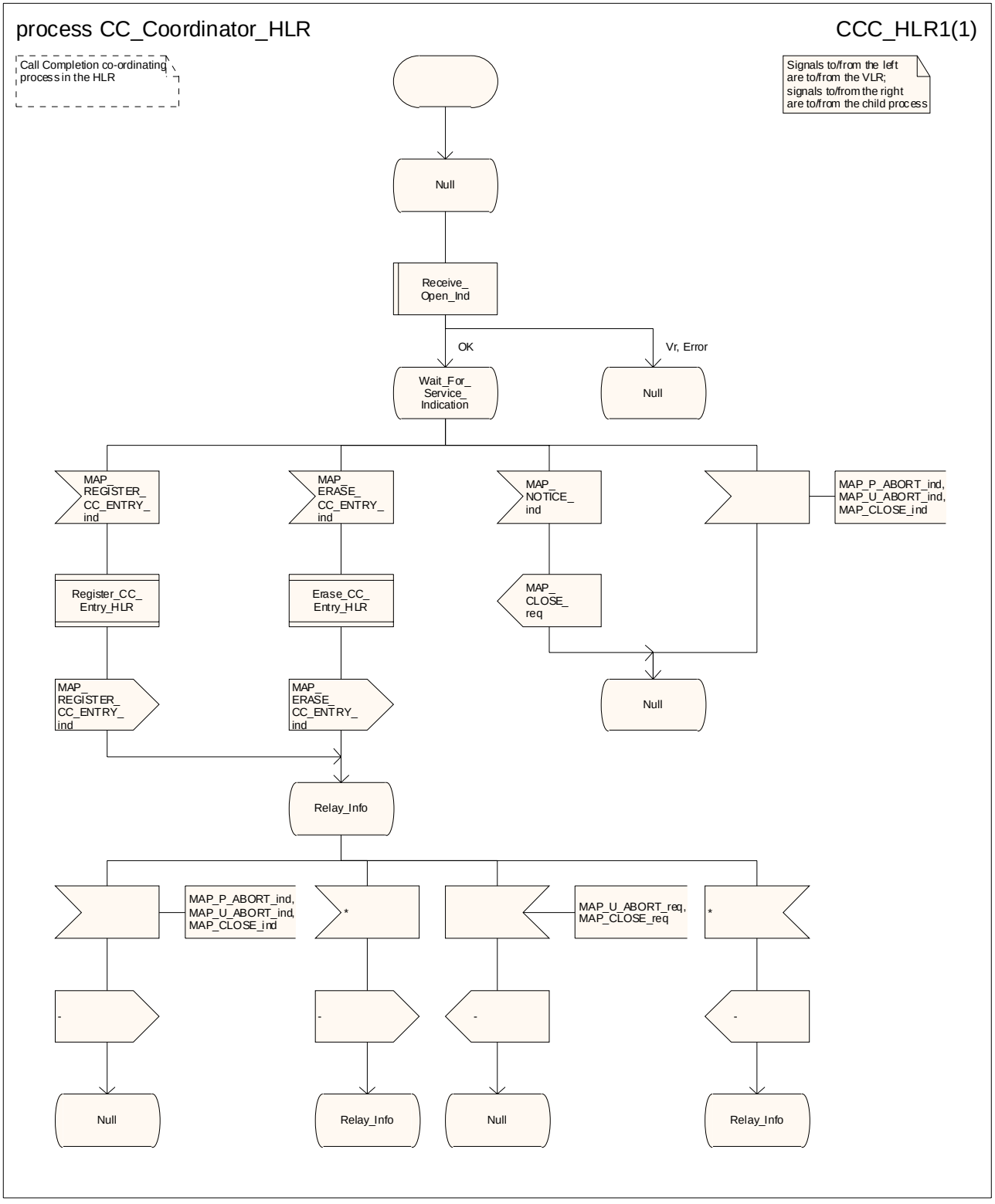


Figure 22.1/4: Process –CC_Coordinator_HLR

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 clauses below.

The registration procedure is shown in figure 22.2.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

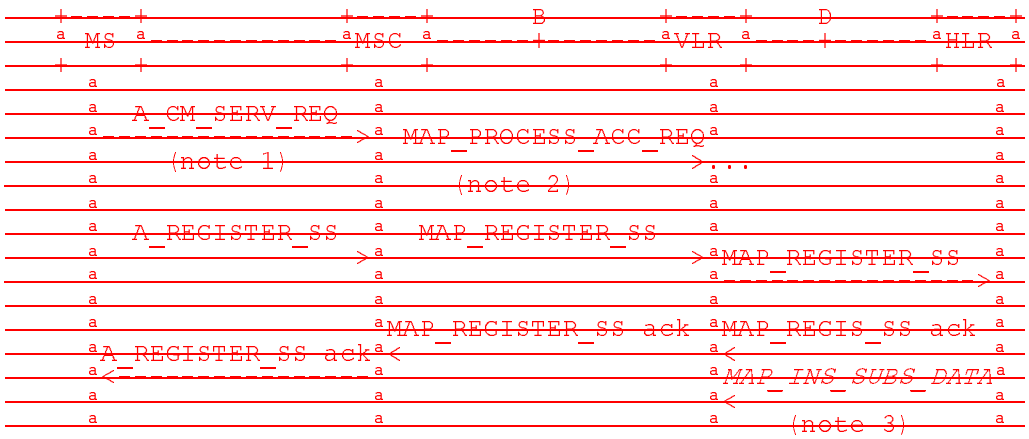
MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

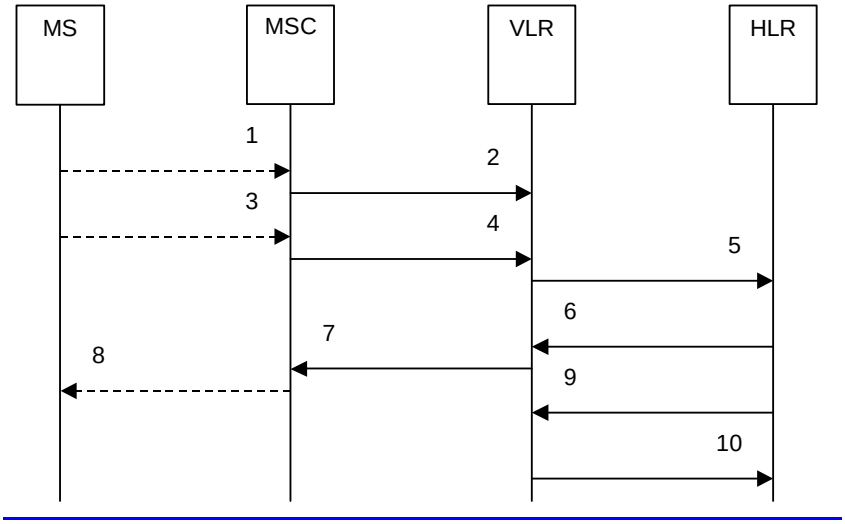
MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25);

MAP_INSERT_SUBSCRIBER_DATA (see ~~defined in~~ clauses 8 and 25).~~;~~

The following service is certainly used:

MAP_REGISTER_SS (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_REGISTER_SS (Note 1)
4) MAP_REGISTER_SS_req/ind
5) MAP_REGISTER_SS_req/ind
6) MAP_REGISTER_SS_rsp/cnf
7) MAP_REGISTER_SS_rsp/cnf
8) A_REGISTER_SS ack (Note 1)
9) *MAP_INSERT_SUBSCRIBER_DATA_req/ind* (Note 3)
10) *MAP_INSERT_SUBSCRIBER_DATA_rsp/cnf* (Note 3)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.2.1/1: ~~Interfaces and services~~Message flow for supplementary service registration

22.2.2 Procedure~~s~~ in the MSC

~~**Supplementary service registration**~~

The A_REGISTER_SS service indication received by the MAP ~~user~~ process 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 3GPP TS 29.011 [59].

The information in ~~MSC then awaits the receipt of~~ the MAP_REGISTER_SS confirm from the VLR~~. The outcome of the procedure~~ is ~~reported~~ relayed to the MS in the A_REGISTER_SS response message as described in ~~GSM 04.8x, 04.9x and 09.11~~3GPP TS 24.08x, 3GPP TS 24.08x and 3GPP TS 29.011~~. Finally the SS-connection is released.~~

For call independent SS operations, each message shall ~~only~~ contain only a single component. Messages which contain more than one component will be stopped at the air interface (as specified in 3GPP TS 29.011 [59]).

~~**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 3GPP TS 29.011 [59]). 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 proces~~sdure~~ in the MSC is shown in figure 22.2.2/1.

22.2.3 Procedure~~s~~ in the VLR

~~**Supplementary service registration**~~

The MAP process invokes macros not defined in this clause; the definition 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;
Process_Access_Request_VLR	see subclause 25.4.2.

~~When receiving the MAP_REGISTER_SS indication, the~~ The MAP ~~user~~ process in the VLR transfers the information received in the MAP_REGISTER_SS indication to the HLR in the MAP_REGISTER_SS request without checking the contents ~~of the service indication~~. The MAP_OPEN request includes the IMSI of the subscriber as the destination reference and the VLR number as the originating reference.

~~The VLR then awaits the receipt of the MAP_REGISTER_SS confirm from the HLR.~~ If the MAP_REGISTER_SS confirm is properly formed and contains a result or a user error, ~~T~~the MAP ~~user~~ process 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 3GPP TS 29.011 [59]).

~~**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 proces~~sdure~~ in the VLR is shown in figure 22.2.3/1.

22.2.4 Procedure~~s~~ in the HLR

The MAP process invokes a macro and a process not defined in this clause; the definition of this macro and process can be found as follows:

Check_Indication	see subclause 25.2.1;
Insert_Subs_Data_Stand_Alone_HLR	see subclause 25.7.3.

~~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 3GPP TS 23.011 [22] and the ~~0~~23.08x and ~~0~~23.09x -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 3GPP TS 29.011 [59]).~~:~~

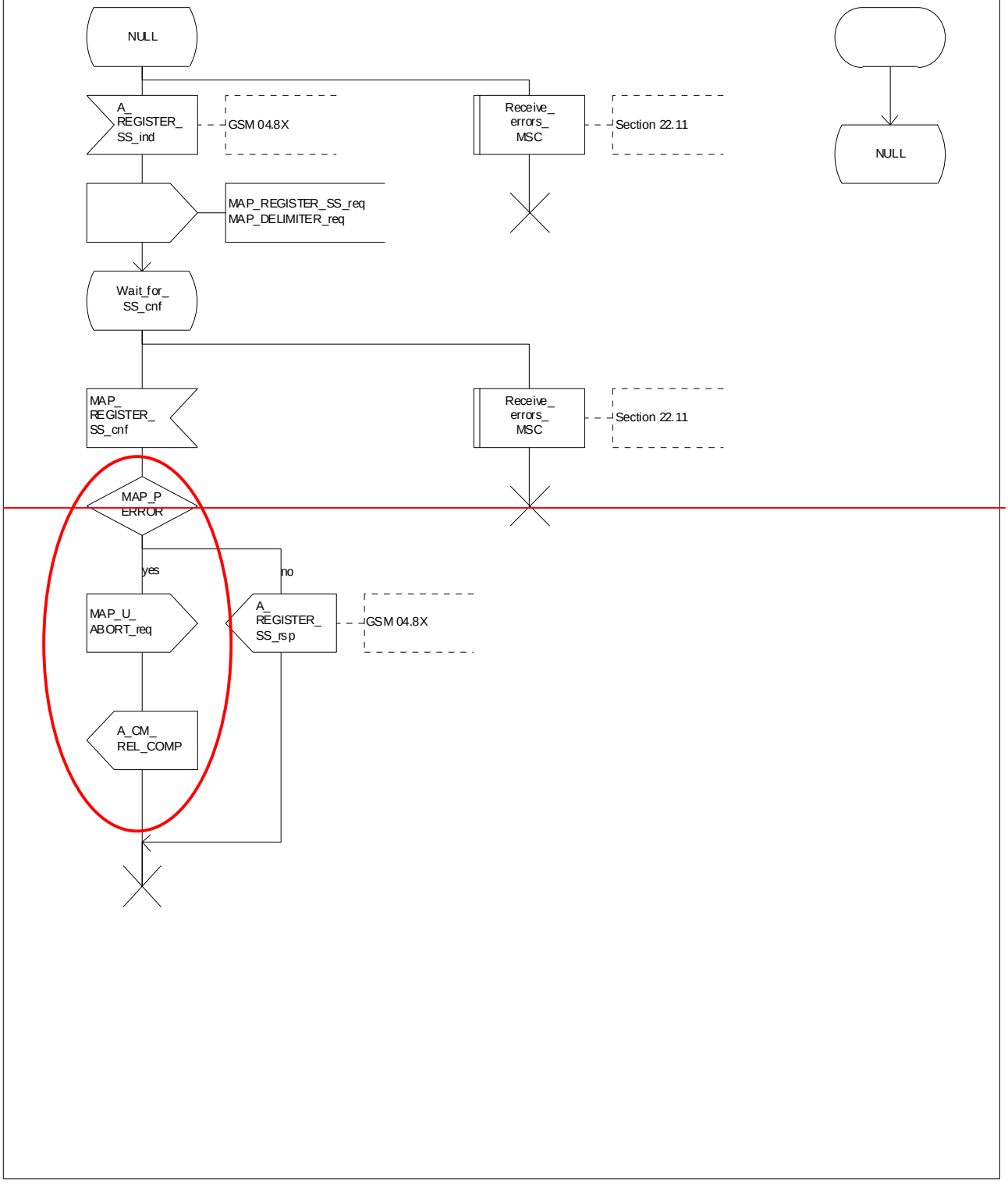
~~- if the VLR is to be updated after the supplementary service registration, the MAP_INSERT_SUBS_DATA_HLR process shall be initiated;~~

~~- 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 is sent towards the VLR.~~

The registration proces~~sdure~~ in the HLR is shown in figure 22.2.4/1.

Process SS_REGISTER_MSC 22.2.2_1(1)

Figure 22.2.2/1 :Mobile intiated registration of supplementary service in the MSC



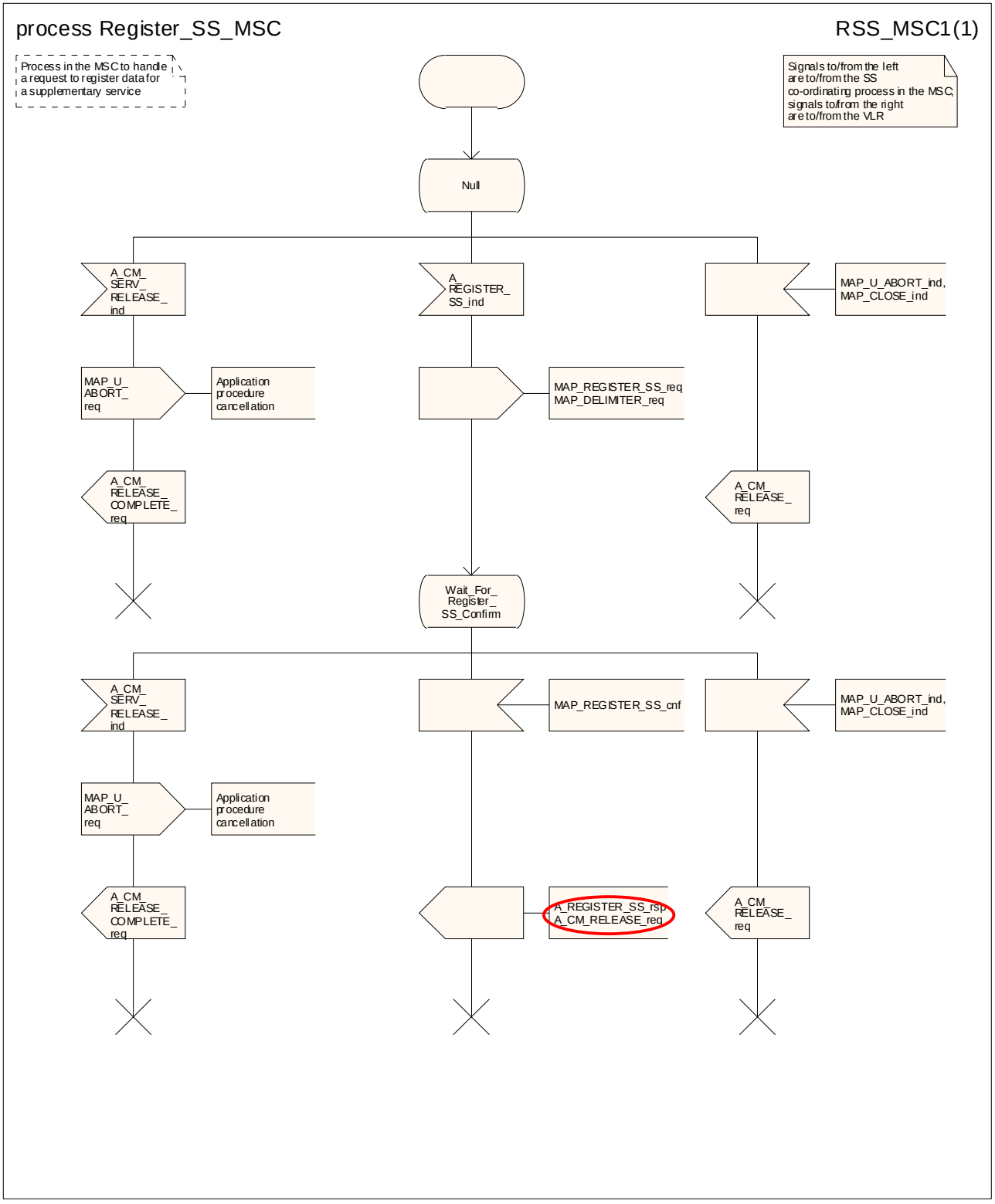
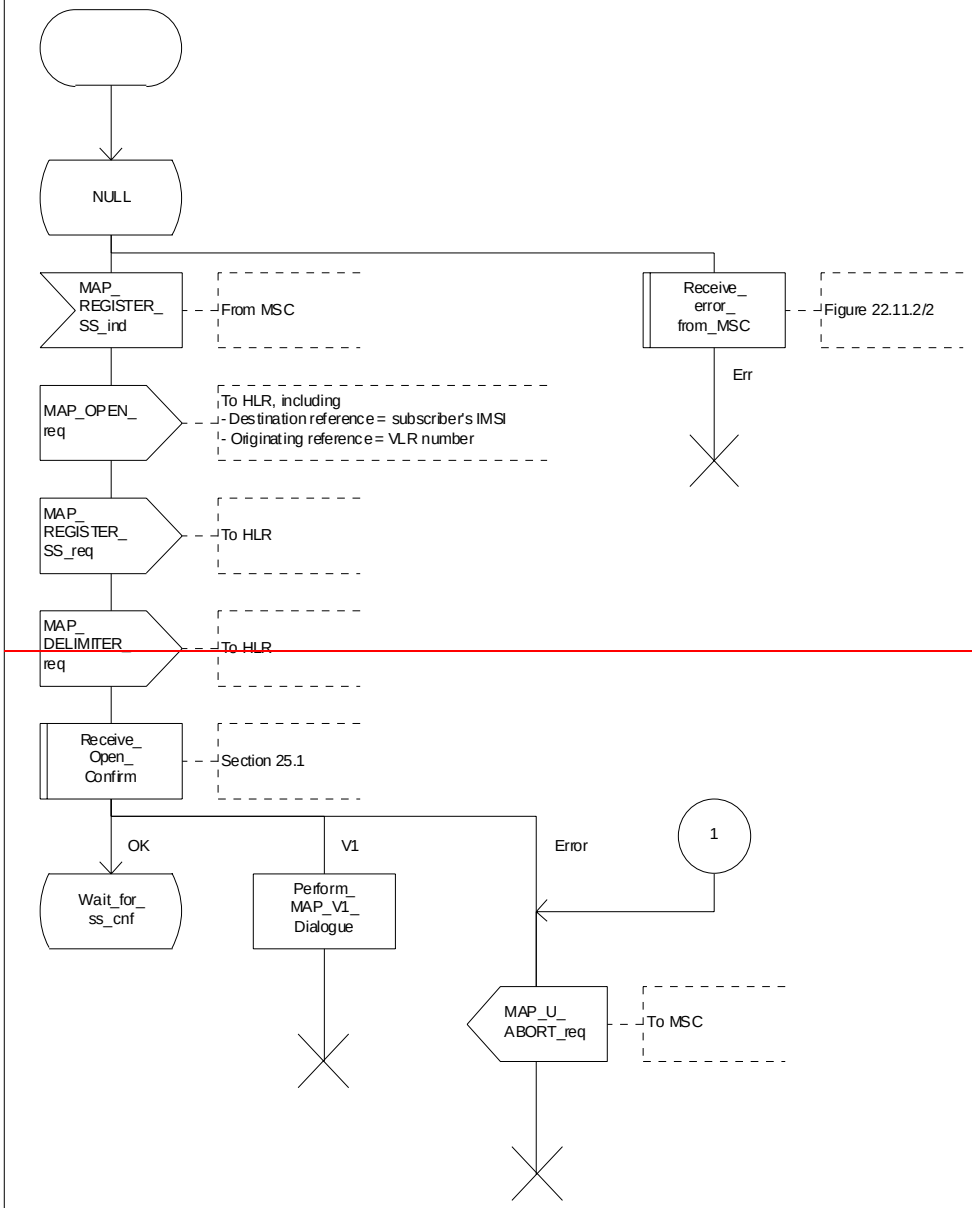


Figure 22.2.2/1: Proces~~sdure SS~~ Register_SS_MSC

Process SS_REGISTER_VLR 22.2.3_1.1(2)

Figure 22.2.3/1: Mobile initated registration of supplementarty services in the VLR



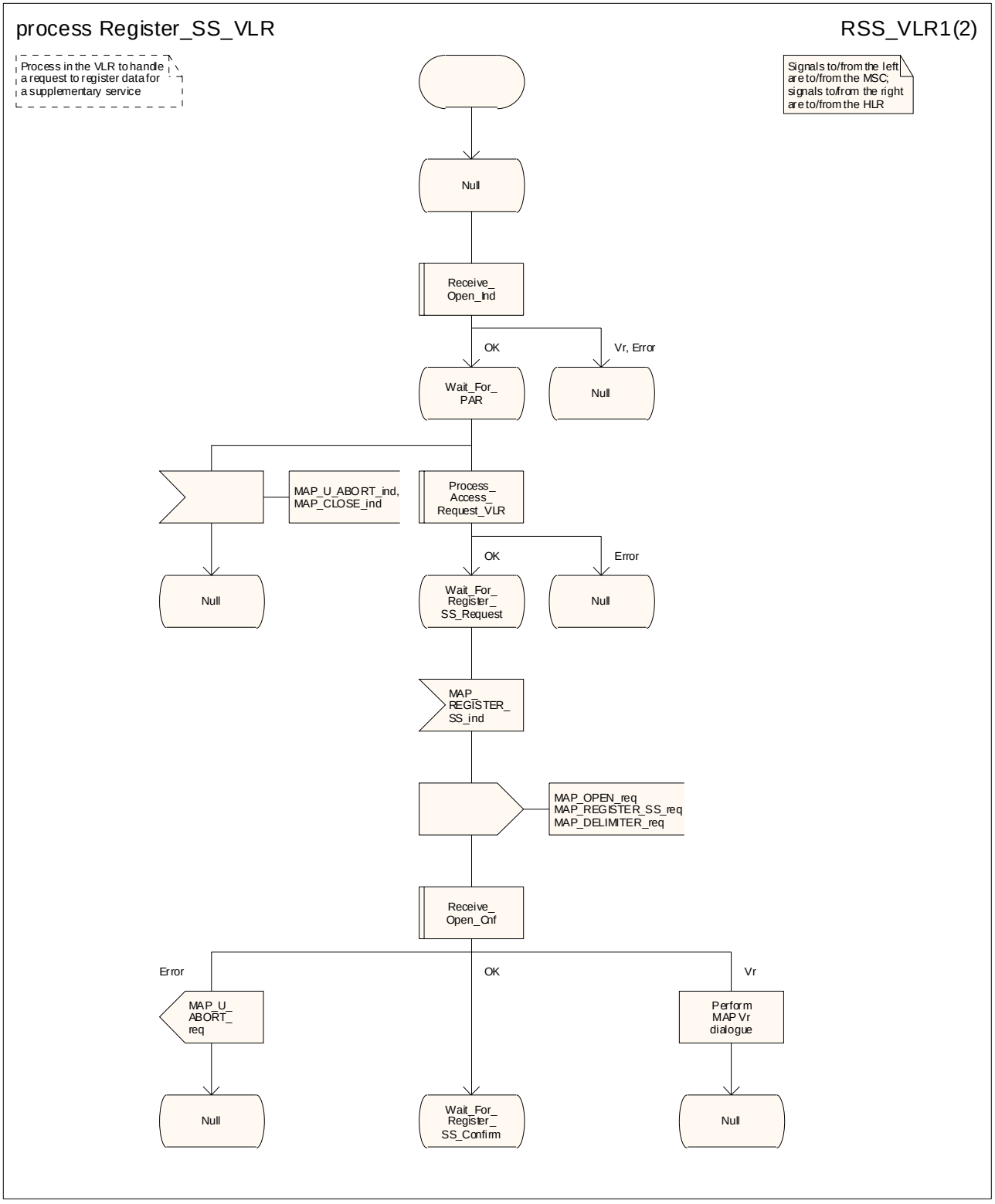
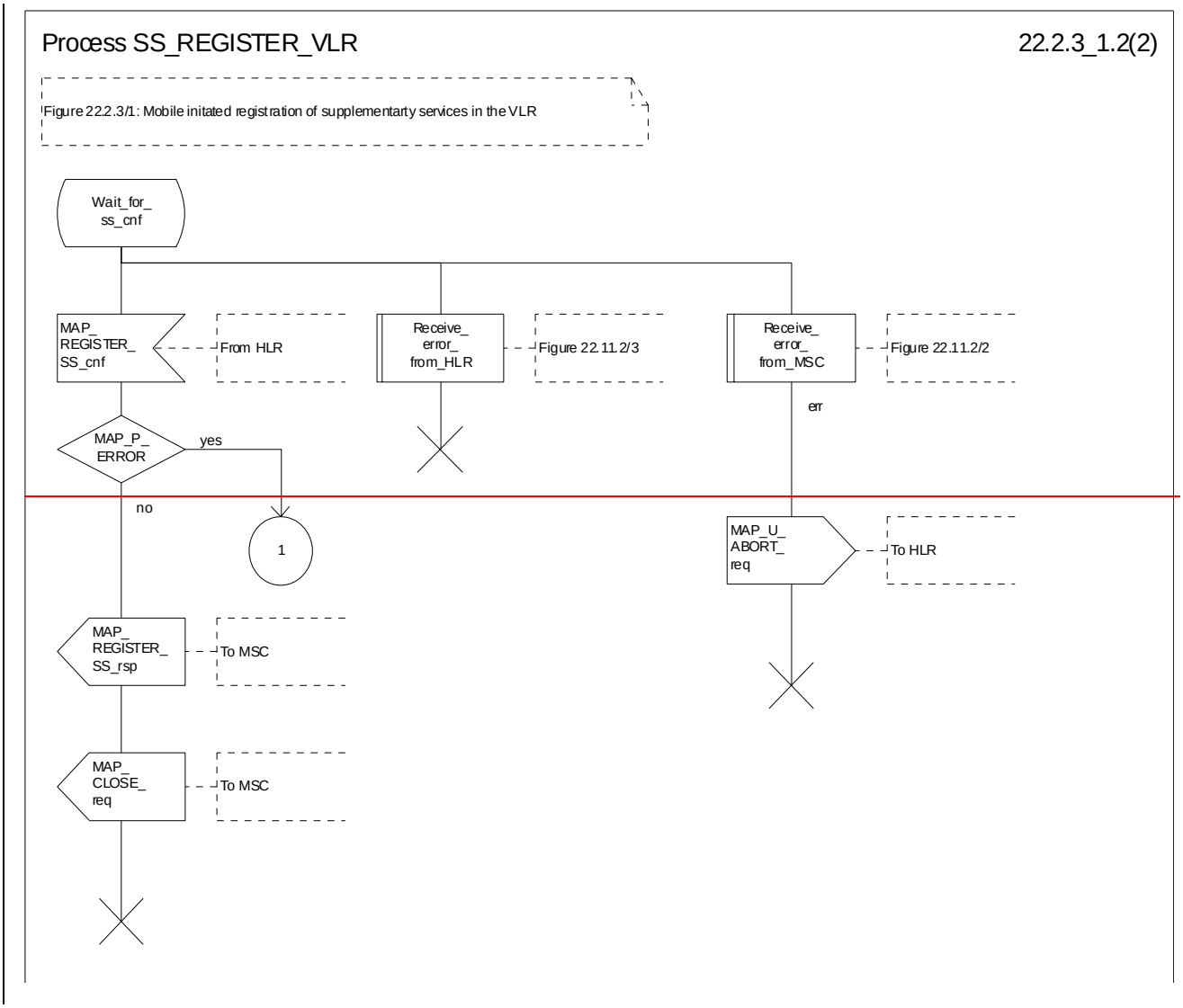


Figure 22.2.3/1 (sheet 1 of 2): Proces~~sdure SS~~ Register_SS_VLR


Process SS_REGISTER_VLR
22.2.3_1.2(2)
Figure 22.2.3/1: Mobile initated registration of supplementarty services in the VLR
Wait_for_ ss_cnf
MAP_ REGISTER_ SS_cnf
From HLR
Receive_ error_ from_HLR
Figure 22.11.2/3
Receive_ error_ from_MSC
Figure 22.11.2/2
err
MAP_P_ ERROR
yes
no
1
MAP_U_ ABORT_ req
To HLR
MAP_ REGISTER_ SS_rsp
To MSC
MAP_ CLOSE_ req
To MSC

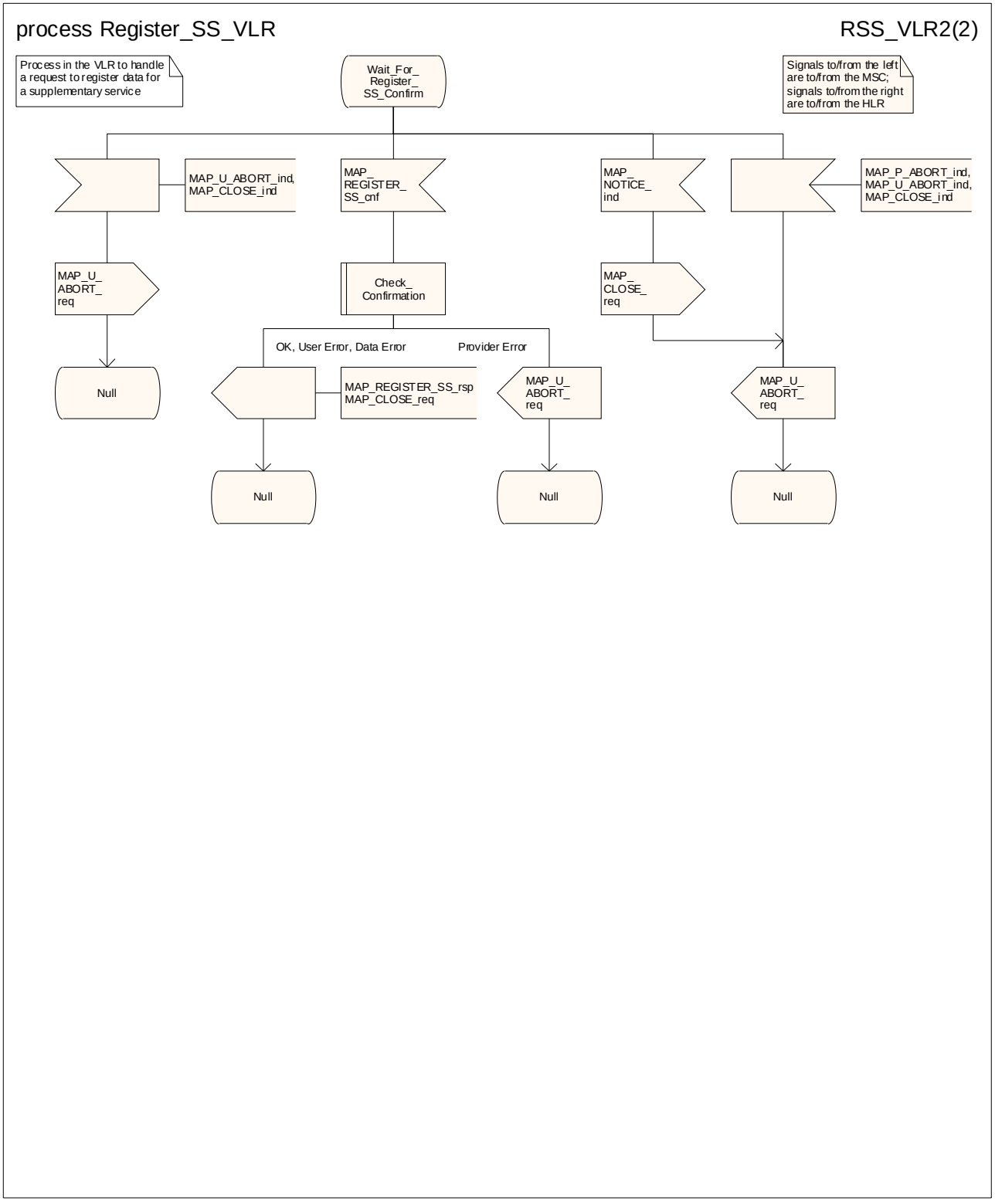
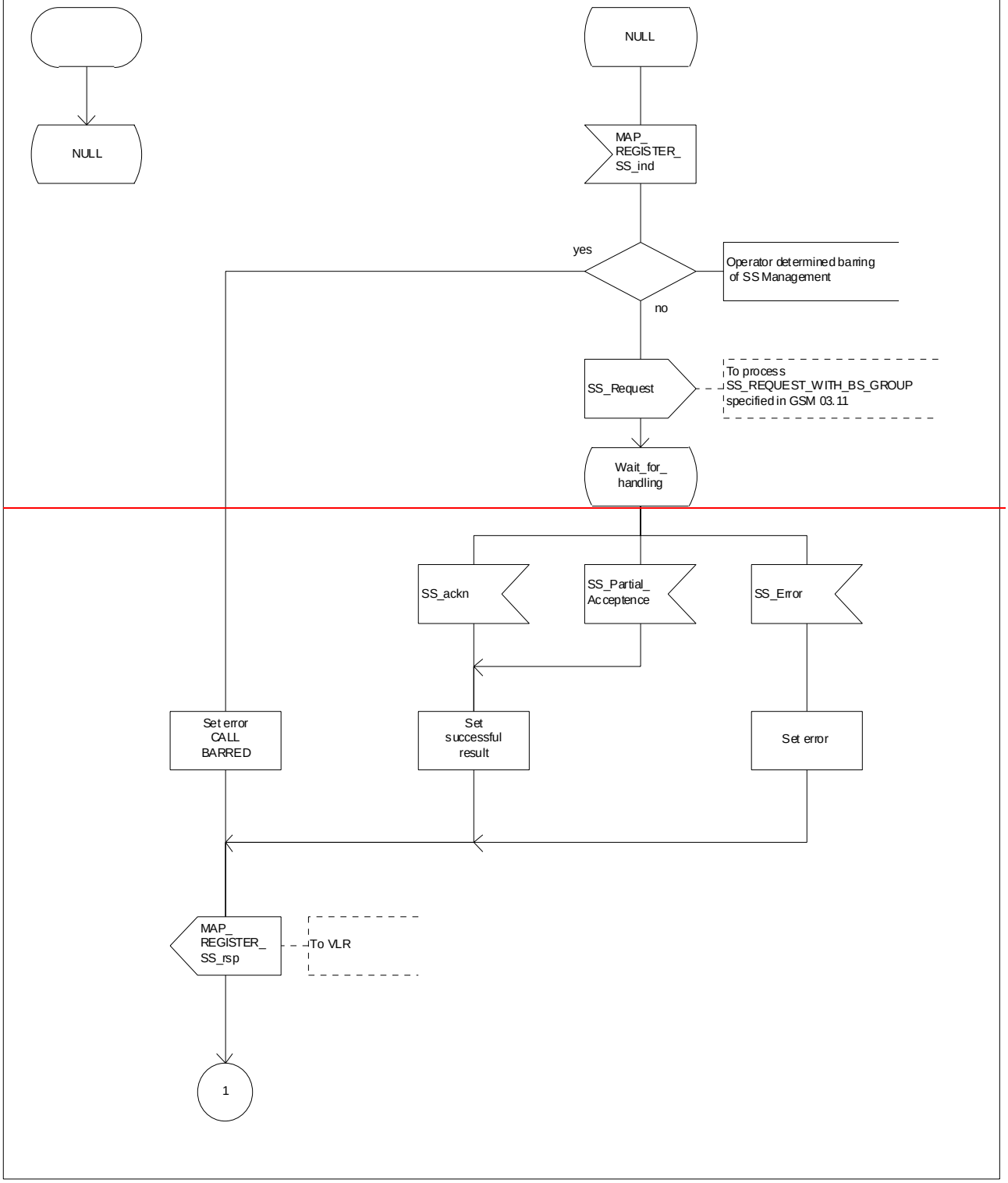


Figure 22.2.3/1 (sheet 2 of 2): Proces~~sdure SS~~ Register_SS_VLR

Process SS_REGISTER_HLR 22.2.4_1.1(2)

Figure 22.2.4/1: Registration of supplementary services procedure in HLR



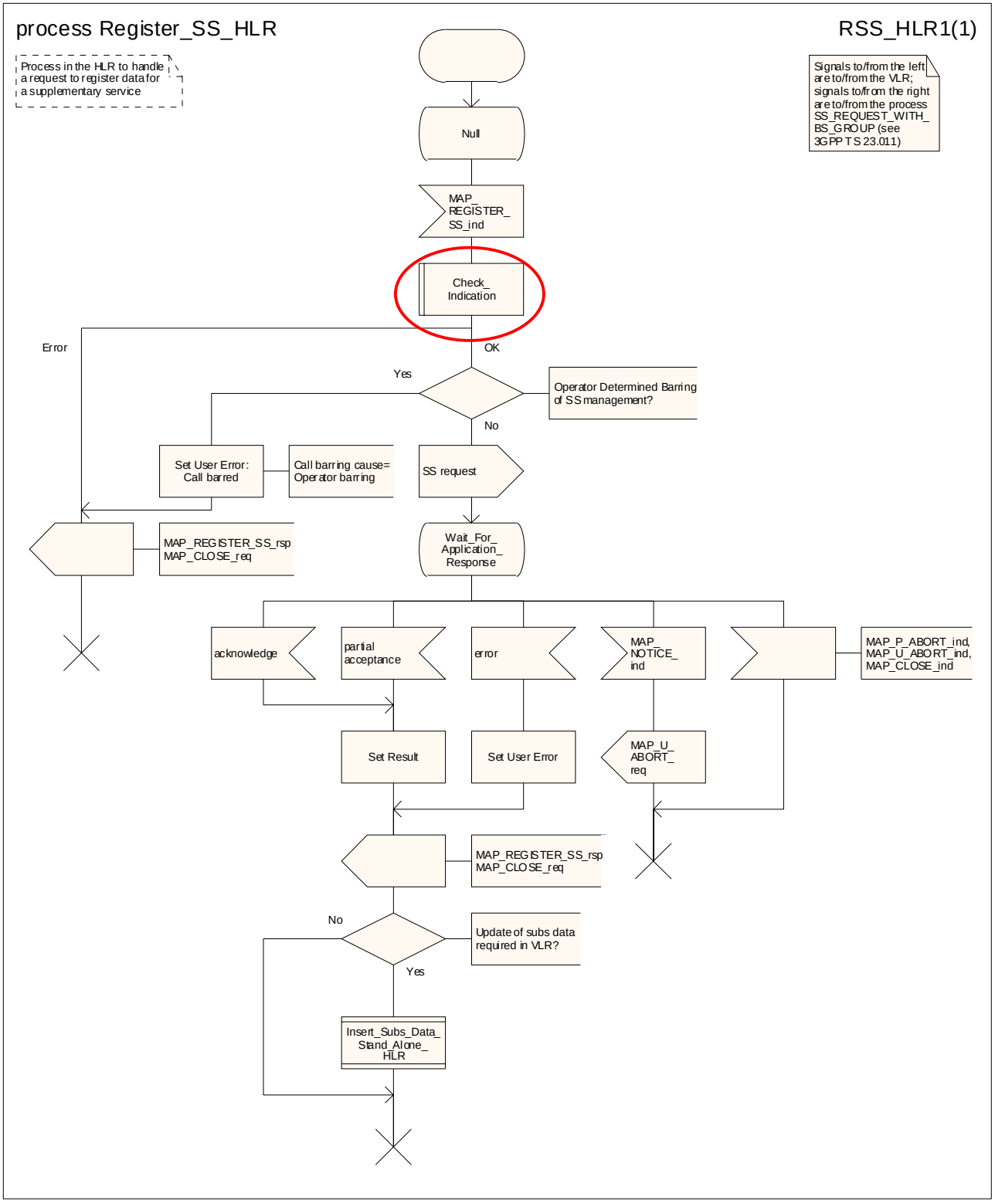
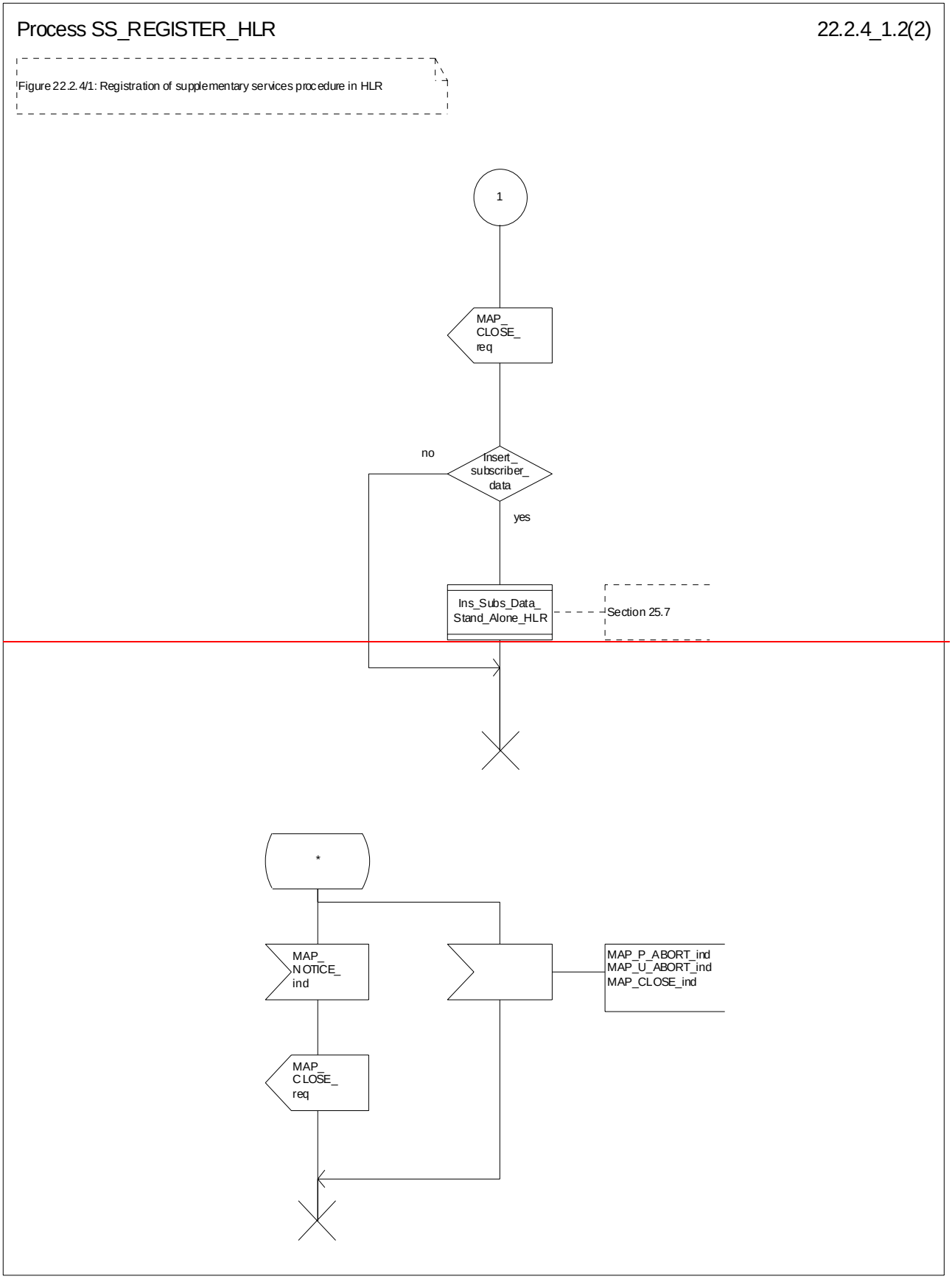


Figure 22.2.4/1 ~~(sheet 1 of 2)~~: Proces~~sdure SS~~ Register_SS_HLR



~~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 clauses below.

The erasure procedure is shown in figure 22.3.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

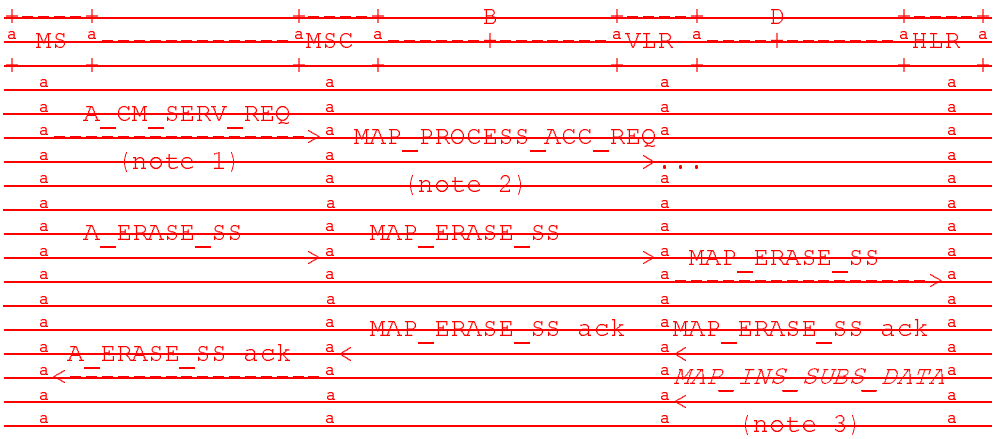
MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

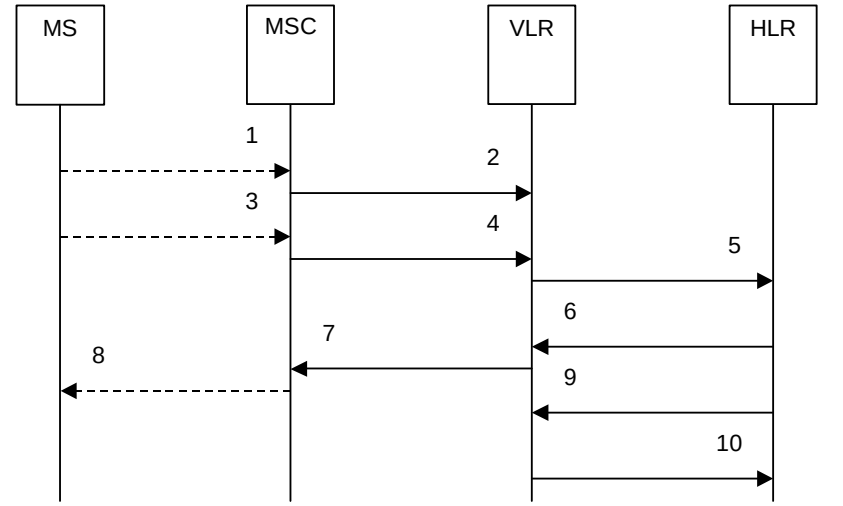
MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25);

MAP_INSERT_SUBSCRIBER_DATA (see ~~defined in~~ clauses 8 and 25).~~;~~

The following service is certainly used:

MAP_ERASE_SS (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_ERASE_SS (Note 1)
4) MAP_ERASE_SS_req/ind
5) MAP_ERASE_SS_req/ind
6) MAP_ERASE_SS_rsp/cnf
7) MAP_ERASE_SS_rsp/cnf
8) A_ERASE_SS ack (Note 1)
9) *MAP_INSERT_SUBSCRIBER_DATA_req/ind* (Note 3)
10) *MAP_INSERT_SUBSCRIBER_DATA_rsp/cnf* (Note 3)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.3.1/1: Message flow ~~Interfaces and services~~ for supplementary service erasure

22.3.2 Procedure~~s~~ in the MSC

The MSC procedure~~s~~ for erasure ~~are~~ is identical to ~~those~~ that 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 Procedure~~s~~ in the VLR

The VLR procedure~~s~~ for erasure ~~are~~ is identical to ~~those~~ that 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 Procedure~~s~~ in the HLR

The HLR procedure for erasure is identical to ~~those~~ that 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 clauses below.

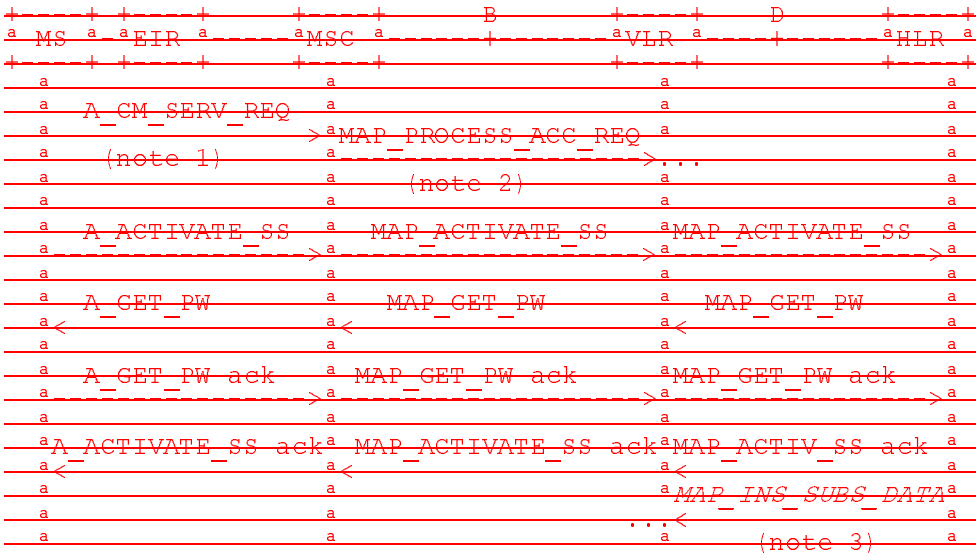
The activation procedure is shown in figure 22.4.1/1.

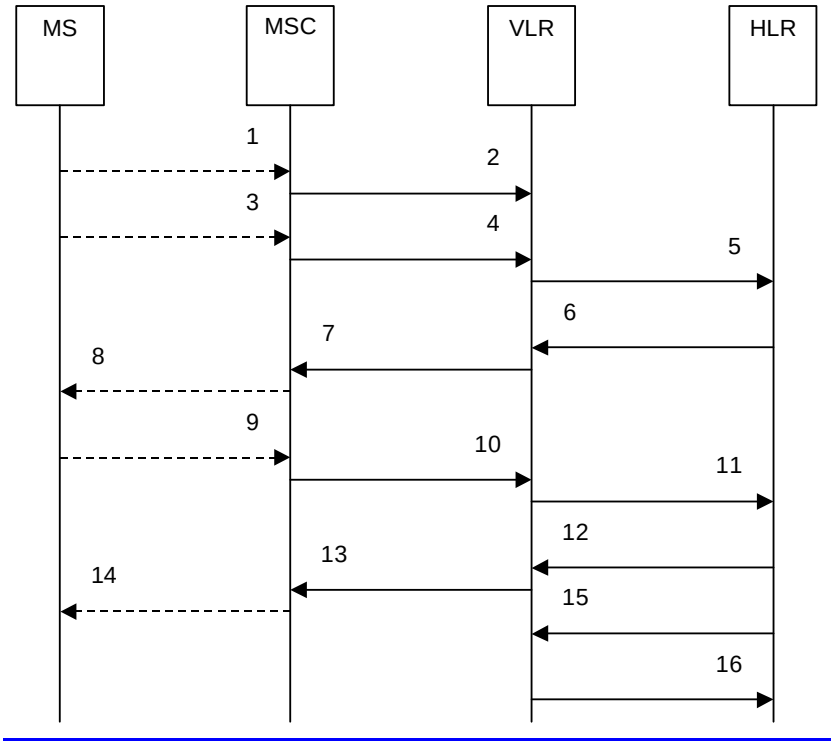
The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(see ~~defined in~~ clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see ~~defined in~~ clauses 9 and 25);
MAP_PROVIDE_IMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_AUTHENTICATE	(see ~~defined in~~ clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(see ~~defined in~~ clauses 8 and 25);
MAP_CHECK_IMEI	(see ~~defined in~~ clauses 8 and 25);
MAP_READY_FOR_SM	(see ~~defined in~~ clauses 12 and 25);
MAP_GET_PASSWORD	(defined in clause 11);
MAP_INSERT_SUBSCRIBER_DATA	(see ~~defined in~~ clauses 8 and 25).~~;~~

The following service is certainly used:

MAP_ACTIVATE_SS	(defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_ACTIVATE_SS (Note 1)
4) MAP_ACTIVATE_SS req/ind
5) MAP_ACTIVATE_SS req/ind
6) *MAP_GET_PASSWORD req/ind* (Note 3)
7) *MAP_GET_PASSWORD req/ind* (Note 3)
8) *A_GET_PASSWORD* (Note 1, Note 3)
9) *A_GET_PASSWORD ack* (Note 1, Note 3)
10) *MAP_GET_PASSWORD rsp/cnf* (Note 3)
11) *MAP_GET_PASSWORD rsp/cnf* (Note 3)
12) MAP_ACTIVATE_SS rsp/cnf
13) MAP_ACTIVATE_SS rsp/cnf
14) A_ACTIVATE_SS ack (Note 1)
15) *MAP_INSERT_SUBSCRIBER_DATA req/ind* (Note 3)
16) *MAP_INSERT_SUBSCRIBER_DATA rsp/cnf* (Note 3)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 of this document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.4.1/1: Message flow ~~Interfaces and services~~ for supplementary service activation

22.4.2 Procedure~~s~~ 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 3GPP TS 29.011 [59].

~~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 3GPP TS 29.011 [59].~~

The information in the ~~MSC will receive a~~ MAP_ACTIVATE_SS confirm from the VLR~~. The outcome of the procedure~~ is ~~reported~~ relayed to the MS in the A_ACTIVATE_SS response message~~, see~~ as described in 3GPP TS 24.08x, 3GPP TS 24.08x and 3GPP TS 29.011~~GSM 04.8x, 04.9x and 09.11~~. ~~Finally the SS connection is released.~~

For call independent SS operations, each message shall ~~only~~ contain only a single component. Messages which contain more than one component will be stopped at the air interface (as specified in 3GPP TS 29.011 [59]).

~~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 clause 22.2.2 of the present document.~~

~~Th~~e activation proces~~sdure~~ in the MSC is shown in figure 22.4.2/1.

22.4.3 Procedure~~s~~ in the VLR

~~**Supplementary service activation**~~

The MAP process invokes macros not defined in this clause; the definition 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;
Process_Access_Request_VLR	see subclause 25.4.2.

~~When receiving the MAP_ACTIVATE_SS indication, the~~ The MAP ~~user~~ process in the VLR transfers the information received in the MAP_ACTIVATE_SS indication to the HLR in the MAP_ACTIVATE_SS request without checking the contents~~ of the service indication~~. The MAP_OPEN request includes the IMSI of the subscriber as the destination reference and the VLR number as the originating reference.

~~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.~~ If the MAP_REGISTER_SS confirm is properly formed and contains a result or a user error, ~~T~~the MAP ~~user~~ process 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 3GPP TS 29.011 [59]).

~~**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 clause 22.2.3 of the present document.~~

The activation process~~dure~~ in the VLR is shown in figure 22.4.3/1.

22.4.4 Procedure~~s~~ in the HLR

The MAP process invokes a macro and a process not defined in this clause; the definition of the macro and process can be found as follows:

Check_Indication see subclause 25.2.1;

Insert_Subs_Data_Stand_Alone_HLR see subclause 25.7.3.

~~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 3GPP TS 23.011 [22] and the ~~0~~23.08x and ~~0~~23.09x ~~-~~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 3GPP TS 23.011 [22]). This will involve the sending of a MAP_GET_PASSWORD request to the VLR.~~

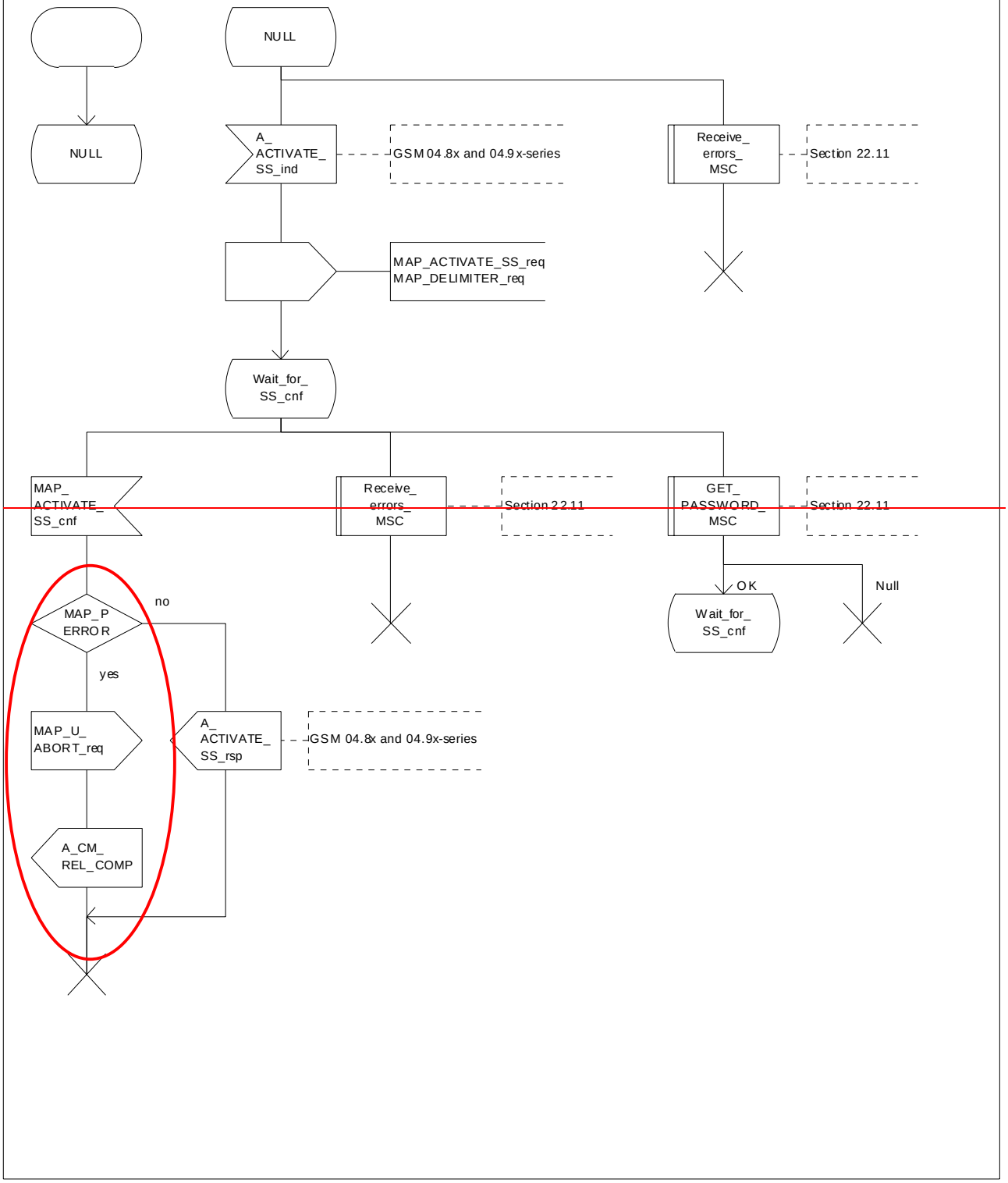
For call independent SS operations, each message shall only contain a single component. Messages which contain more than one component will be stopped at the air interface (as specified in 3GPP TS 29.011 [59]):

- ~~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 clause 22.2.4 above.~~

The activation process~~dure~~ in the HLR is shown in figure 22.4.4/1.

Process ACTIVATE_SS_MSC 22.4.2_1(1)

Figure 22.4.2/1: Mobile intiated activation of supplementary service in the MSC



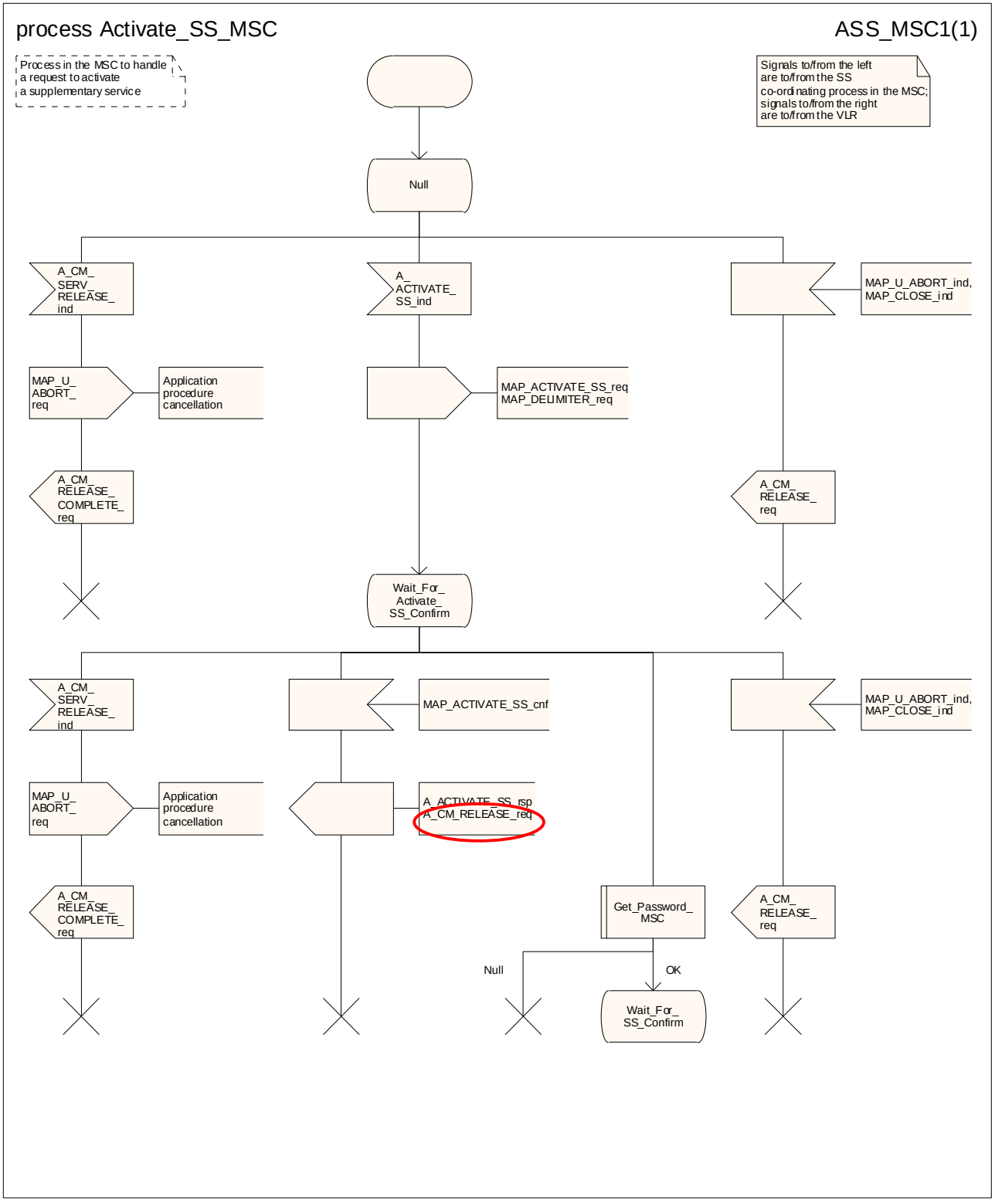
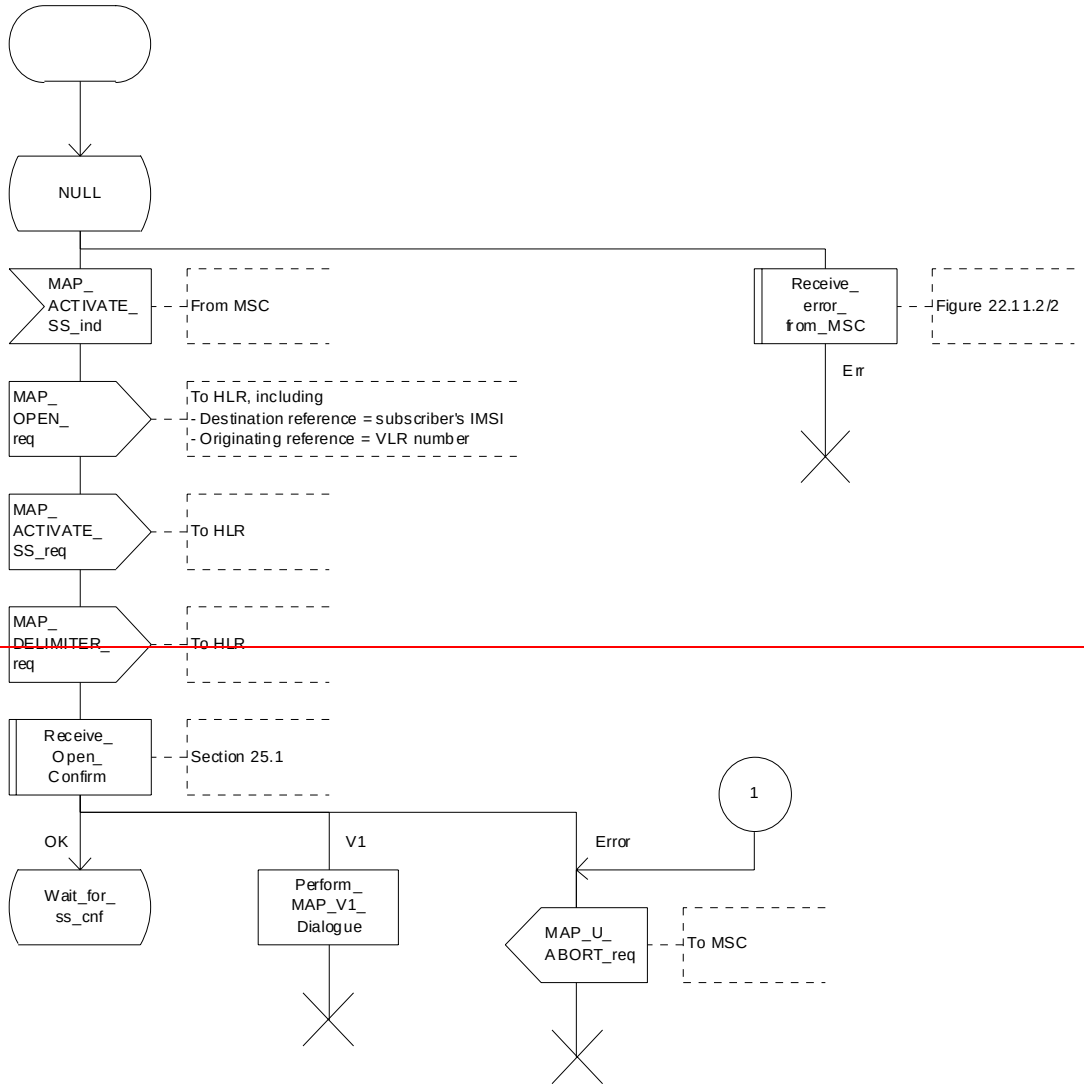


Figure 22.4.2/1: Proces~~s~~dure Activate_SS_MSC

Process ACTIVATE_SS_VLR 22.4.3_1.1(2)

Figure 22.4.3/1: Activation of supplementary service procedure in the VLR



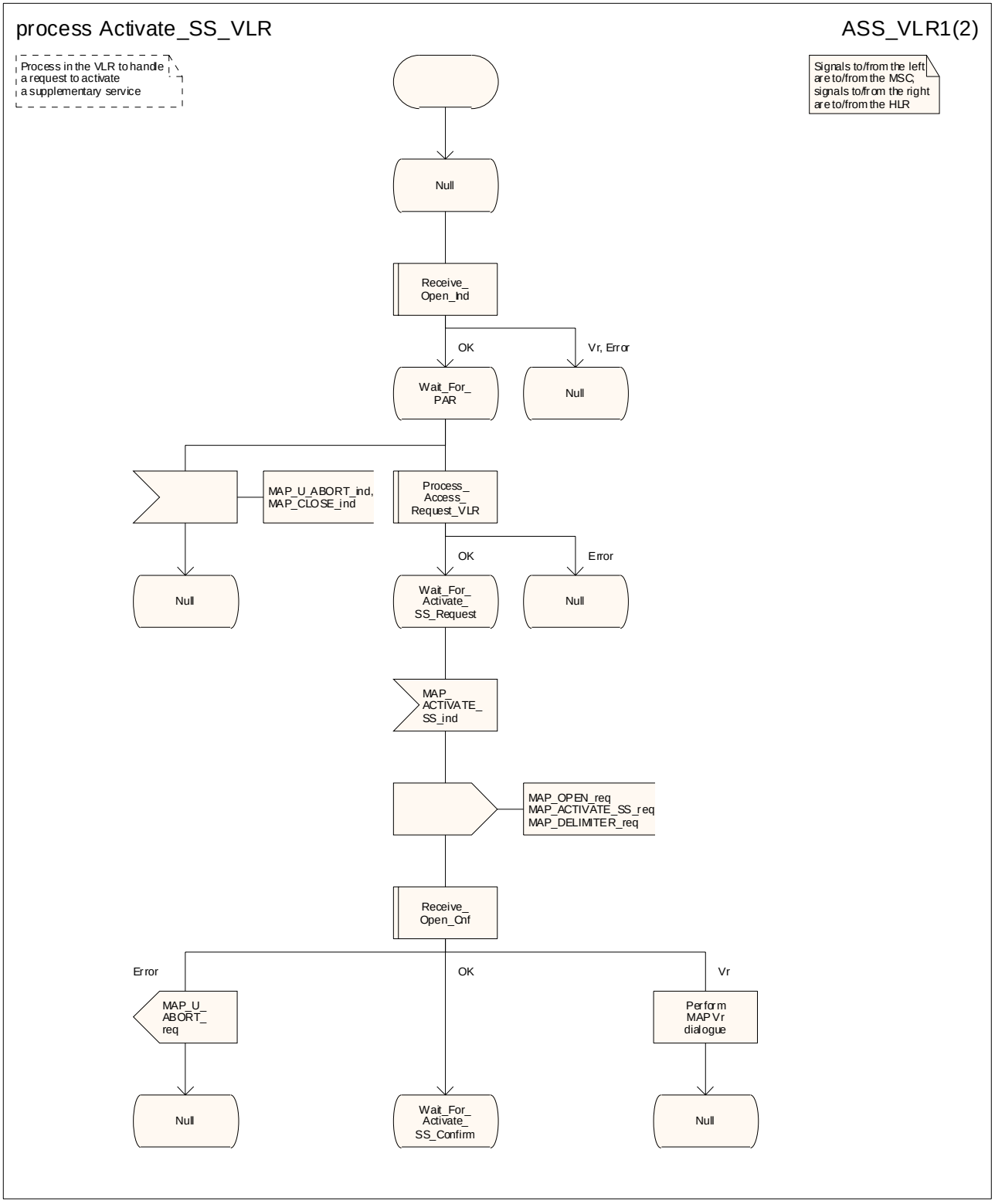
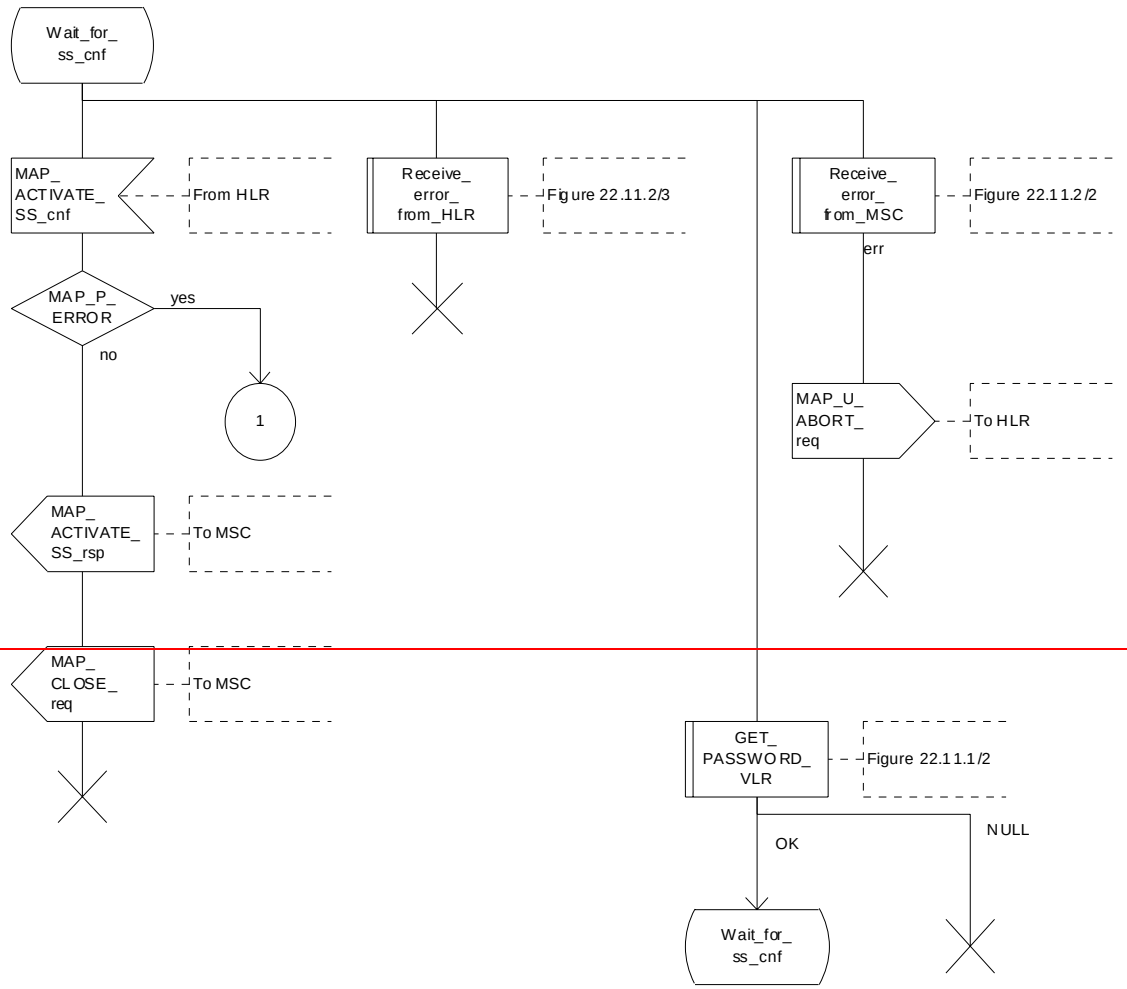


Figure 22.4.3/1 (sheet 1 of 2): Proces~~dure~~ Activate_SS_VLR

Process ACTIVATE_SS_VLR 22.4.3_1.2(2)

Figure 22.4.3/1: Activation of supplementary service procedure in the VLR



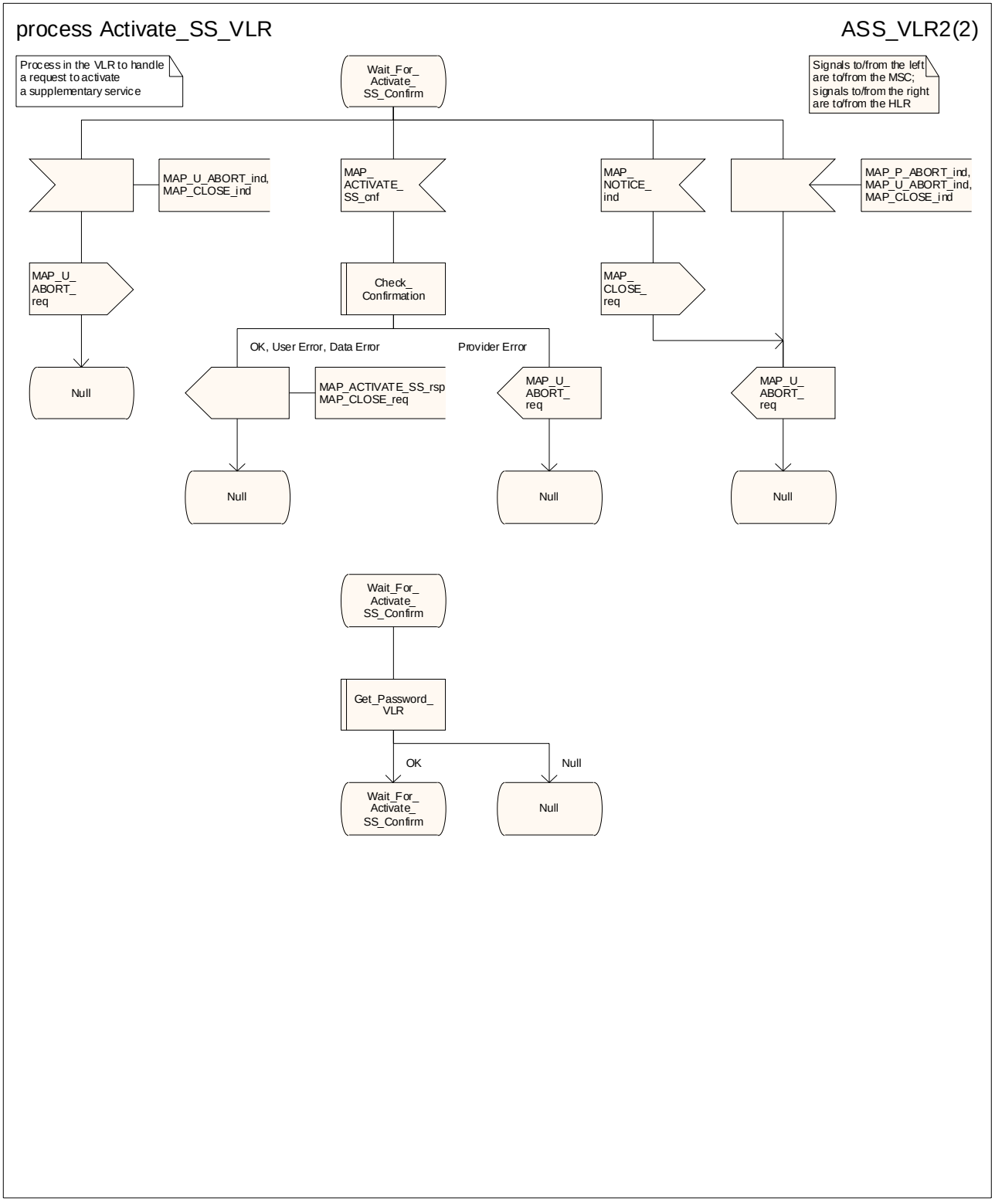
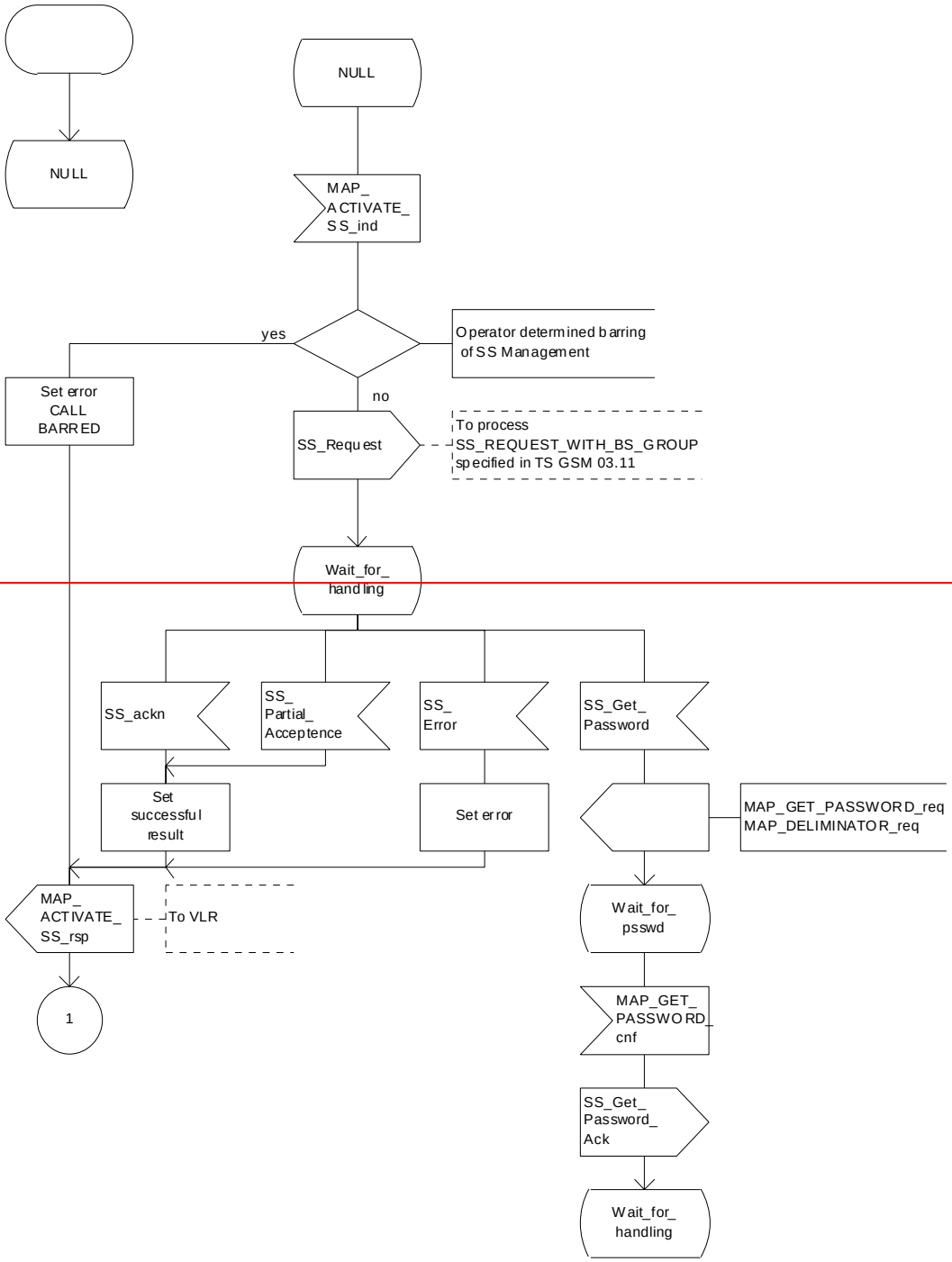


Figure 22.4.3/1 (sheet 2 of 2): Proces~~s~~s~~dure SS~~ Activate_SS_VLR

Process ACTIVATE_SS_HLR 22.4.4_1.1(2)

Figure 22.4.4/1: Activation of supplementary services procedure in HLR.



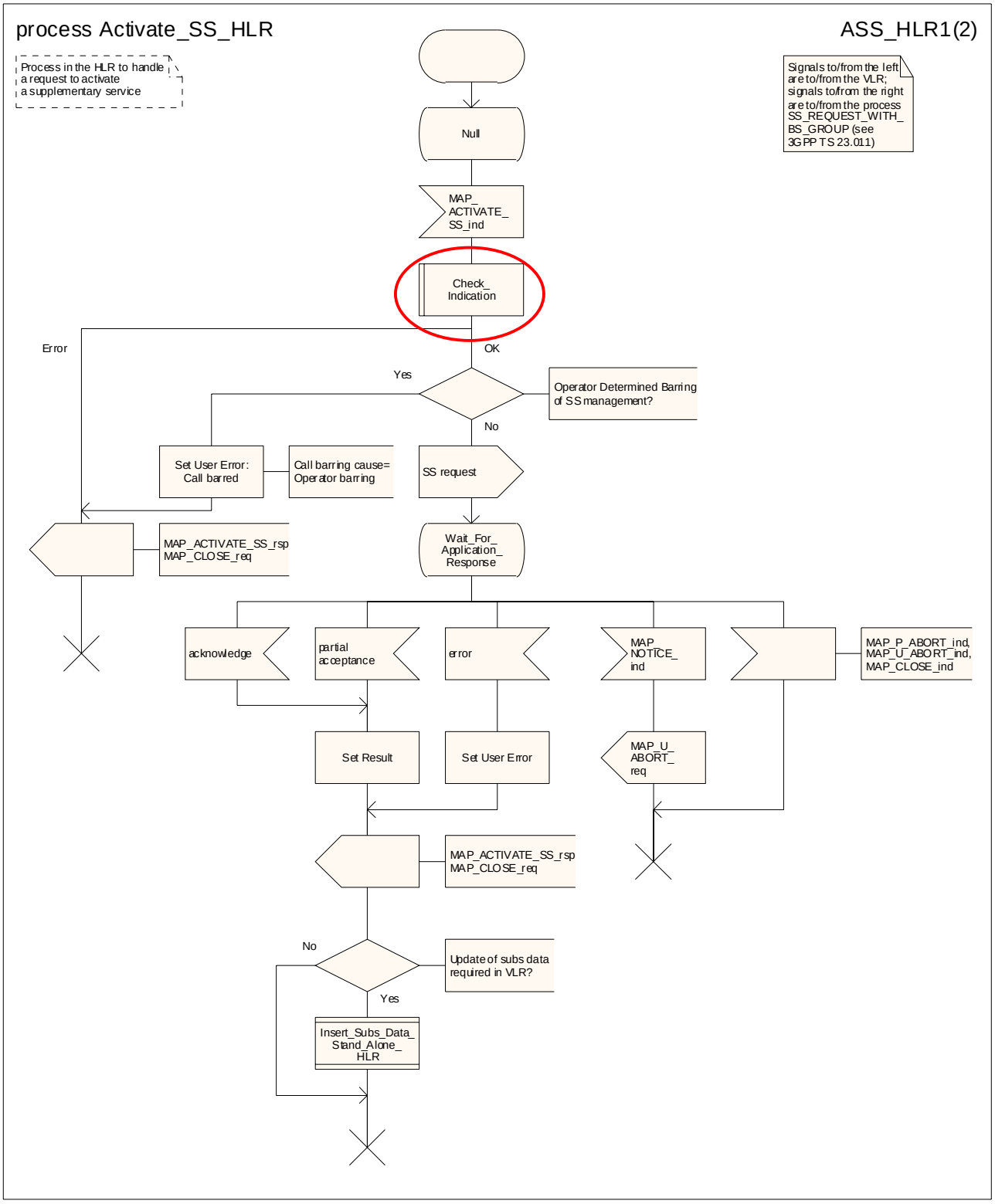
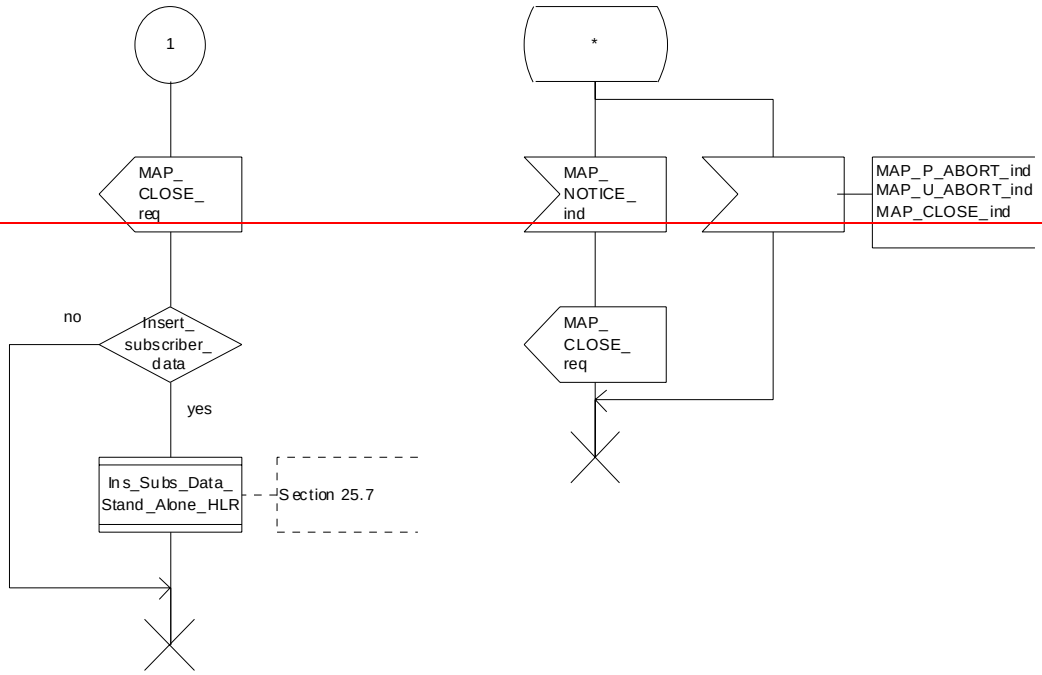


Figure 22.4.4/1 (sheet 1 of 2): Proces~~sdure~~ Activate_SS_HLR

Process ACTIVATE_SS_HLR 22.4.4_1.2(2)

Figure 22.4.4/1: Activation of supplementary services procedure in HLR.



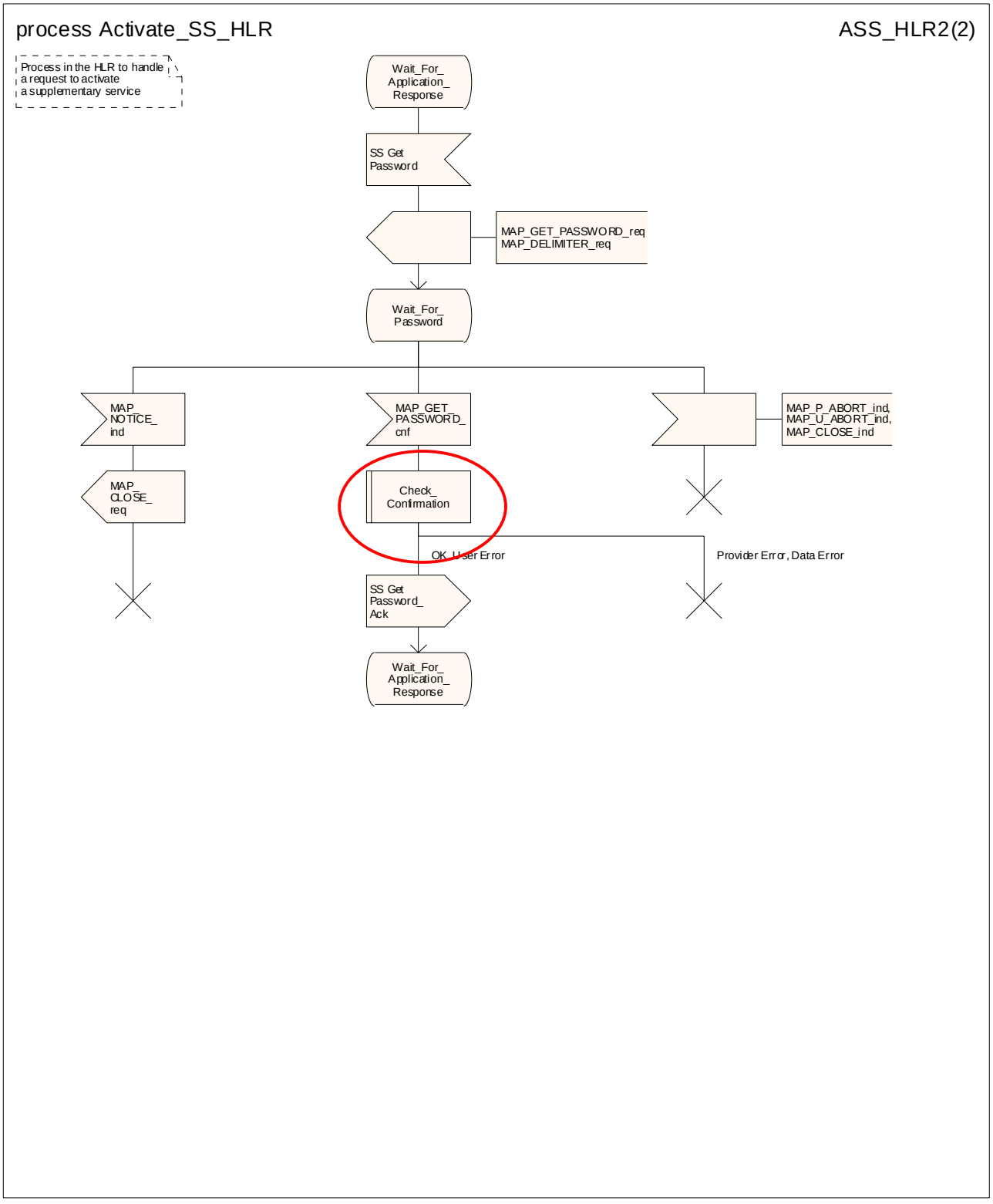


Figure 22.4.4/1 (sheet 2 of 2): Proces~~sdure~~ Activate_SS_HLR

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 clauses below.

The deactivation procedure is shown in figure 22.5.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

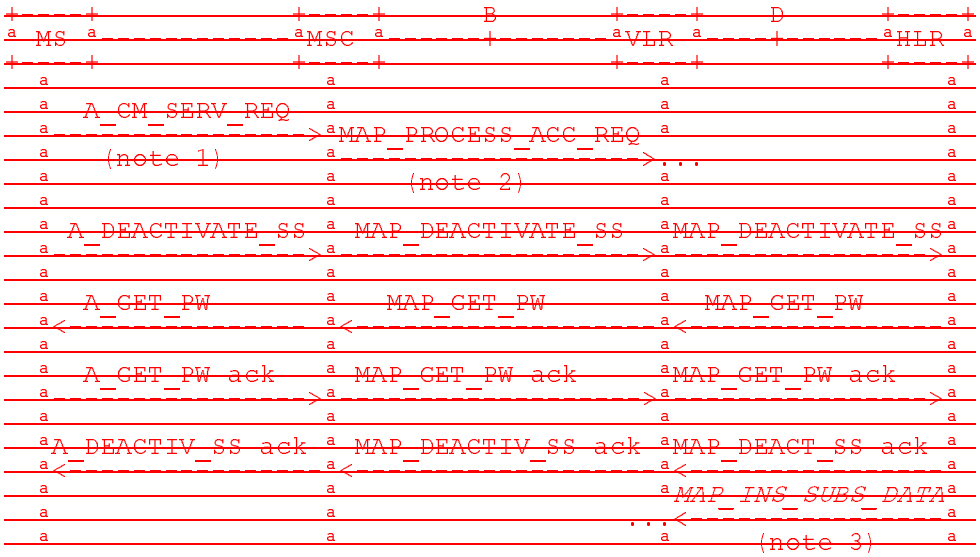
MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25);

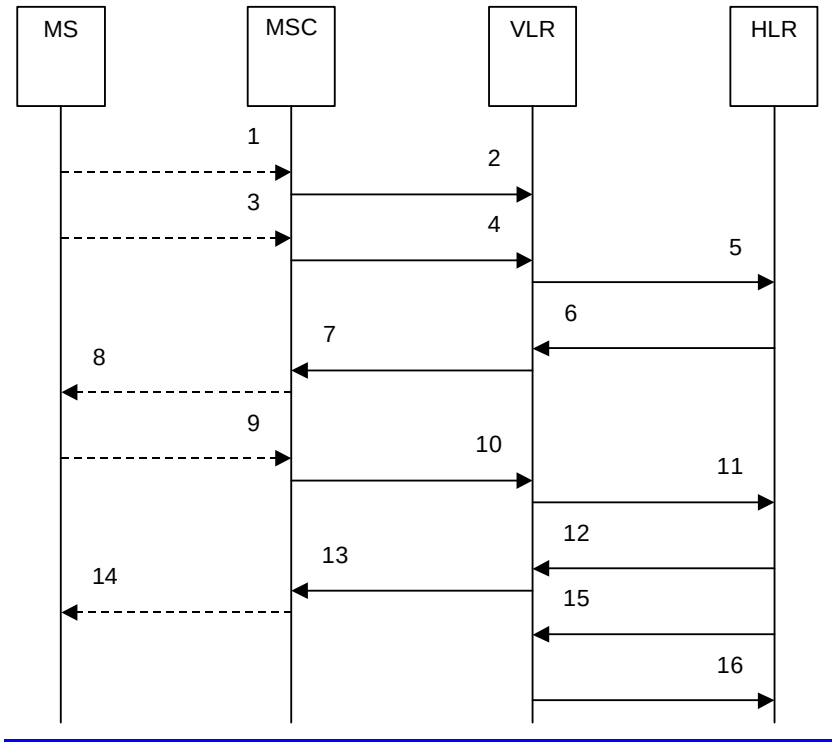
MAP_GET_PASSWORD (defined in clause 11);

MAP_INSERT_SUBSCRIBER_DATA (see ~~defined in~~ clauses 8 and 25).~~;~~

The following service is certainly used:

MAP_DEACTIVATE_SS (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_DEACTIVATE_SS (Note 1)
4) MAP_DEACTIVATE_SS_req/ind
5) MAP_DEACTIVATE_SS_req/ind
6) *MAP_GET_PASSWORD_req/ind* (Note 3)
7) *MAP_GET_PASSWORD_req/ind* (Note 3)
8) *A_GET_PASSWORD* (Note 1, Note 3)
9) *A_GET_PASSWORD ack* (Note 1, Note 3)
10) *MAP_GET_PASSWORD_rsp/cnf* (Note 3)
11) *MAP_GET_PASSWORD_rsp/cnf* (Note 3)
12) MAP_DEACTIVATE_SS_rsp/cnf
13) MAP_DEACTIVATE_SS_rsp/cnf
14) A_DEACTIVATE_SS ack (Note 1)
15) *MAP_INSERT_SUBSCRIBER_DATA_req/ind* (Note 3)
16) *MAP_INSERT_SUBSCRIBER_DATA_rsp/cnf* (Note 3)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.5.1/1: Message flow ~~Interfaces and services~~ for supplementary service deactivation

22.5.2 Procedure~~s~~ in the MSC

The MSC procedure~~s~~ for deactivation ~~are~~ is identical to ~~those~~ that 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 Procedure~~s~~ in the VLR

The VLR procedure~~s~~ for deactivation ~~are~~ is identical to ~~those~~ that 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 procedure~~s~~ for deactivation ~~are~~ is identical to ~~those~~ that 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 clauses below.

The interrogation procedure is shown in figure 22.6.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

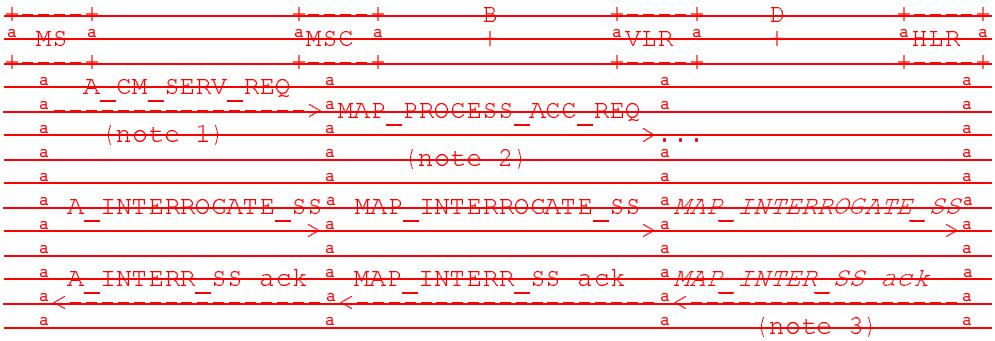
MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

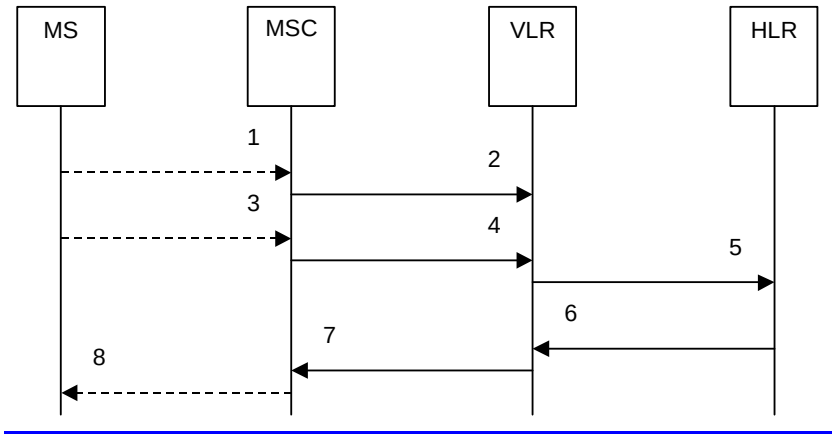
MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25).~~;~~

The following service is certainly used:

MAP_INTERROGATE_SS (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_INTERROGATE_SS (Note 1)
4) MAP_INTERROGATE_SS_req/ind
5) *MAP_INTERROGATE_SS_req/ind*
6) *MAP_INTERROGATE_SS_rsp/cnf*
7) MAP_INTERROGATE_SS_rsp/cnf
8) A_INTERROGATE_SS ack (Note 1)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.6.1/1: ~~Interfaces and services~~Message flow for supplementary service interrogation

22.6.2 Procedure~~s~~ in the MSC

The MSC procedure~~s~~ for interrogation ~~are~~ is identical to ~~those~~ that 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 Procedure~~s~~ in the VLR

~~**Supplementary service interrogation**~~

The MAP process invokes macros not defined in this clause; the definition 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;
Process_Access_Request_VLR	see subclause 25.4.2.

~~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 either 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 3GPP TS 23.011 [22] and the ~~0~~23.08x and ~~0~~23.09x ~~-~~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 3GPP TS 29.011 [59]).

b) Interrogation to be handled by the HLR

If the interrogation is to be handled by the HLR, ~~on receiving the MAP_INTERROGATE_SS indication,~~ the MAP ~~user~~ process in the VLR transfers the information received in the MAP_INTERROGATE_SS indication to the HLR in the MAP_INTERROGATE_SS request without further checking the contents of the service indication. The MAP_OPEN request includes the IMSI of the subscriber as the destination reference and the VLR number as the originating reference.

~~The VLR will receive the MAP_INTERROGATE_SS confirm from the HLR.~~ If the MAP_INTERROGATE_SS confirm is properly formed and contains a result or a user error, ~~T~~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 3GPP TS 29.011 [59]).

~~**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, clause 22.2.3.~~ The Interrogation process~~s~~dure in the VLR is ~~described~~ shown in figure 22.6.3/1.

22.6.4 Procedure~~s~~ in the HLR

The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Indication see subclause 25.2.1.

~~When receiving the MAP_INTERROGATE_SS indication, the MAP user~~The HLR 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 the HLR, the error Unexpected Data Value is returned to the VLR.~~

The interrogation is ~~either~~ answered either 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.

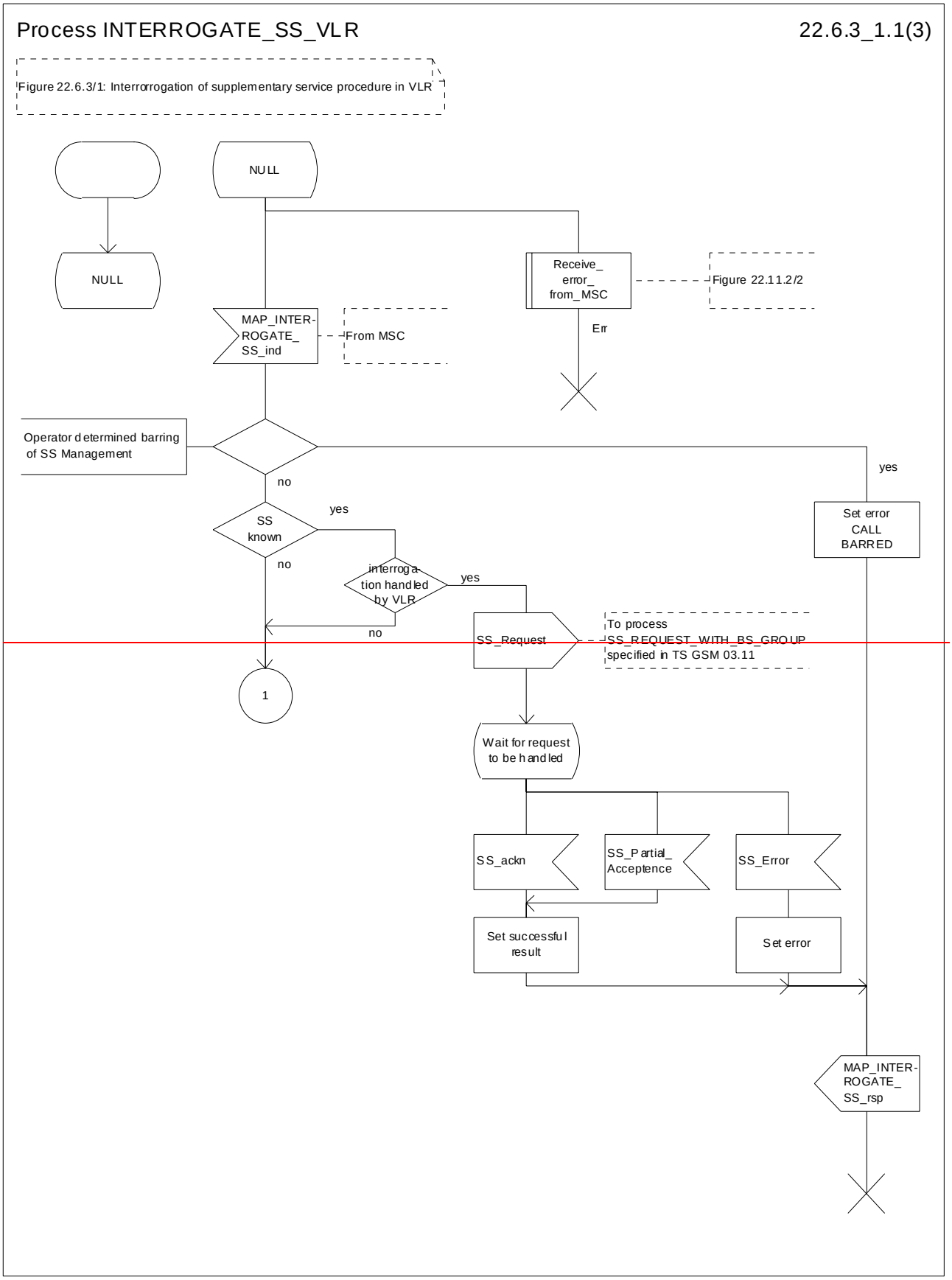
b) Interrogation to be handled by the HLR

The supplementary service request shall be processed according to 3GPP TS 23.011 [22] and the ~~0~~23.08x and ~~0~~23.09x ~~-~~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. Messages which contain more than one component will be stopped at the air interface (as specified in 3GPP TS 29.011 [59]).

~~**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, clause 22.2.3.~~ The Interrogation process~~s~~dure in the HLR is ~~described~~ shown in figure 22.6.4/1.


Process INTERROGATE_SS_VLR
22.6.3_1.1(3)
Figure 22.6.3/1: Interrorrogation of supplementary service procedure in VLR
NULL
NULL
Receive_ error_ from_MSC
Figure 22.11.2/2
MAP_INTER-ROGATE_ SS_ind
From MSC
Err
Operator determined barring of SS Management
yes
no
SS known
yes
no
interroga-tion handled by VLR
yes
no
Set error CALL BARRED
SS_Request
To process SS_REQUEST_WITH_BS_GROUP specified in TS GSM 03.11
1
Wait for request to be handled
SS_ackn
SS_Partial_ Acceptence
SS_Error
Set successful result
Set error
MAP_INTER-ROGATE_ SS_rsp

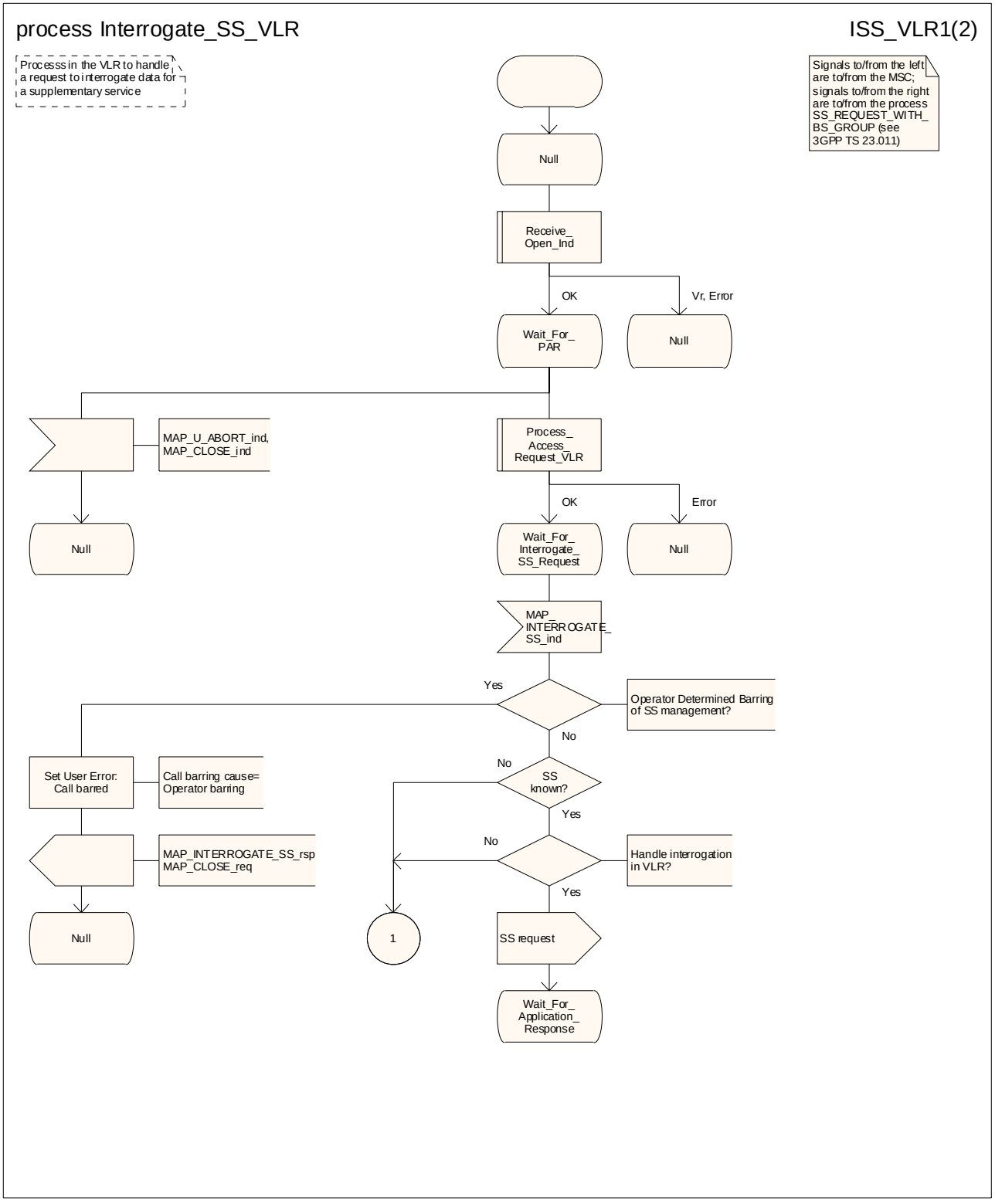
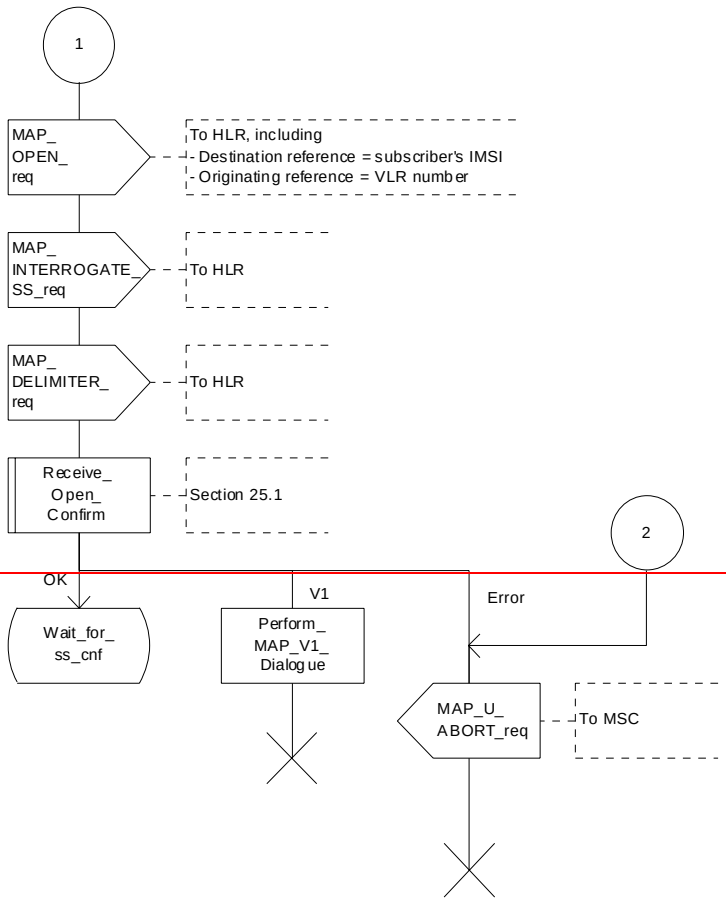


Figure 22.6.3/1 (sheet 1 of 2~~3~~): Procedure Interrogate_SS_VLR

Process INTERROGATE_SS_VLR 22.6.3_1.2(3)

Figure 22.6.3/1: Interrorrogation of supplementary service procedure in VLR



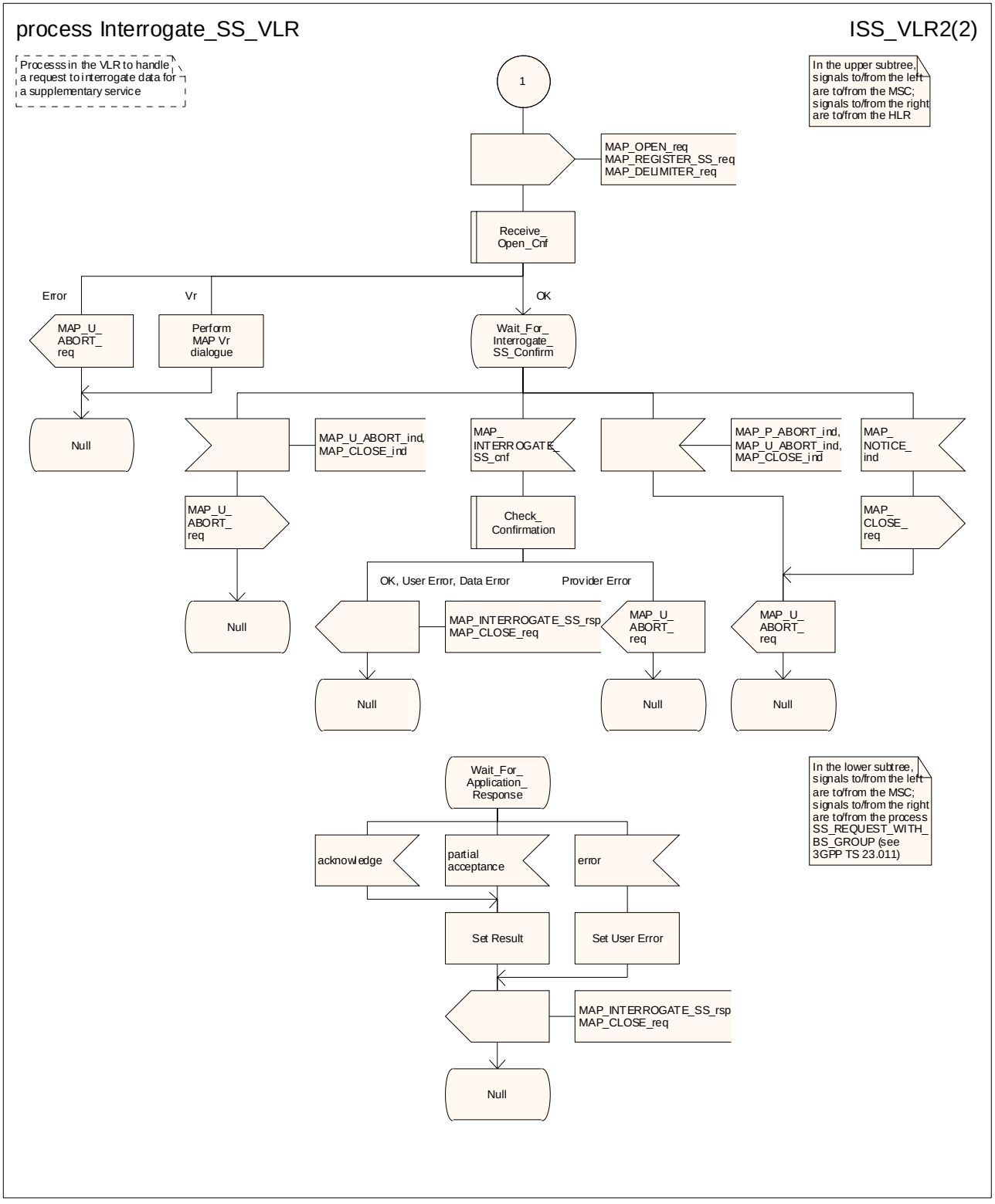
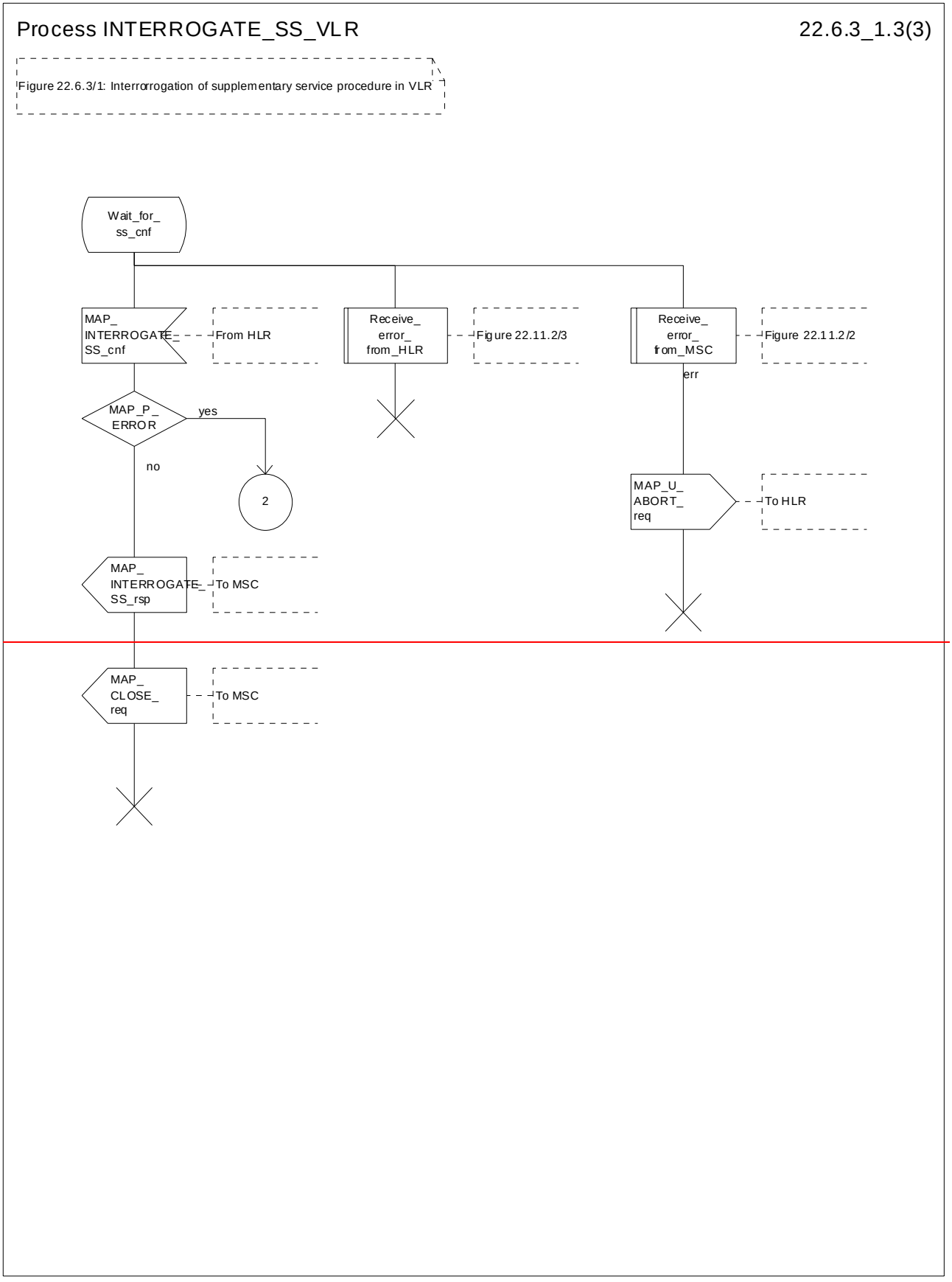


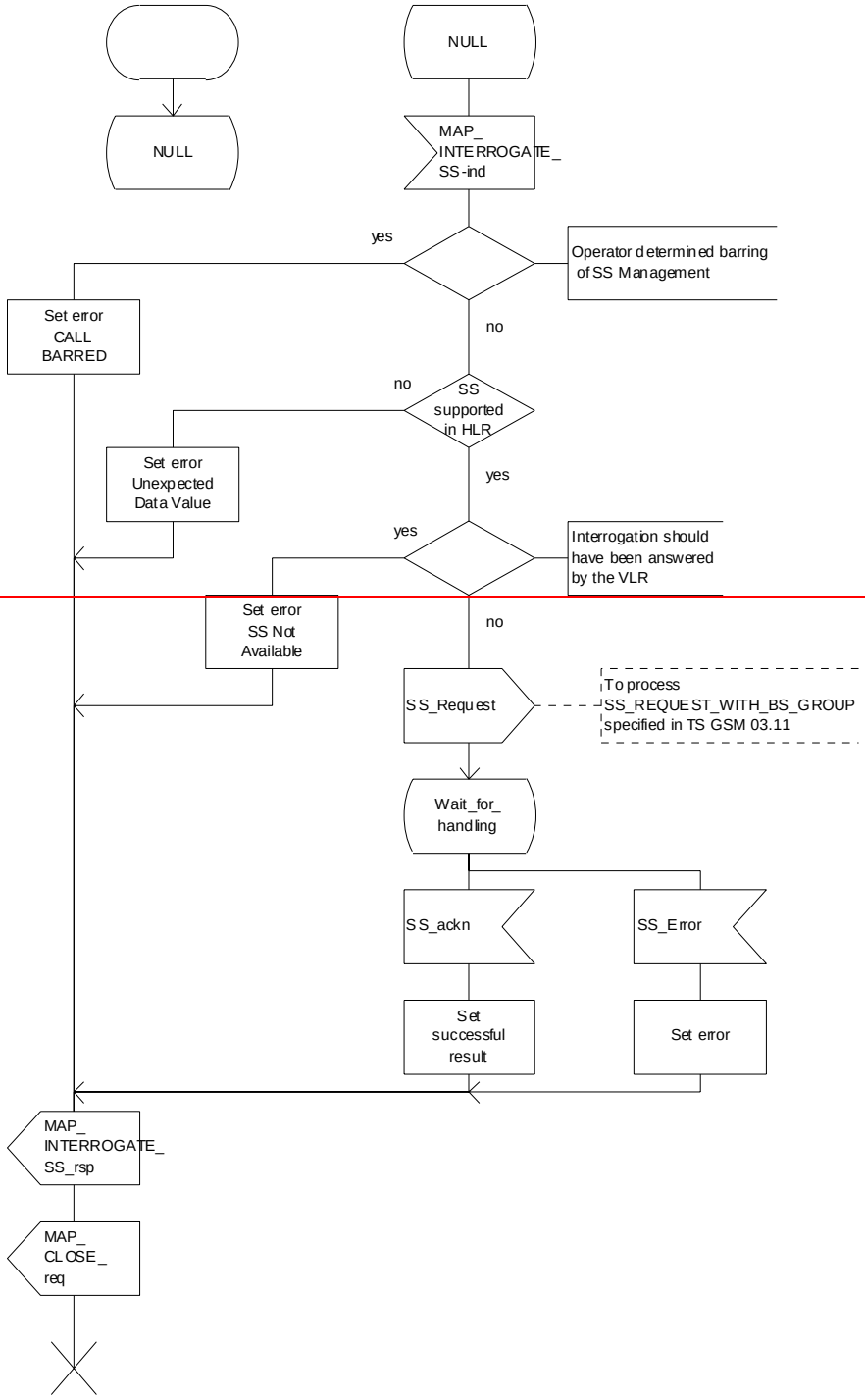
Figure 22.6.3/1 (sheet 2 of 2~~3~~): Procedure Interrogate_SS_VLR



~~Figure 22.6.3/1 (sheet 3 of 3): Procedure Interrogate_SS_VLR~~

Process INTERROGATE_SS_HLR 22.6.4_1(1)

Figure 22.6.4/1: Interrogation of supplementary services procedure in HLR



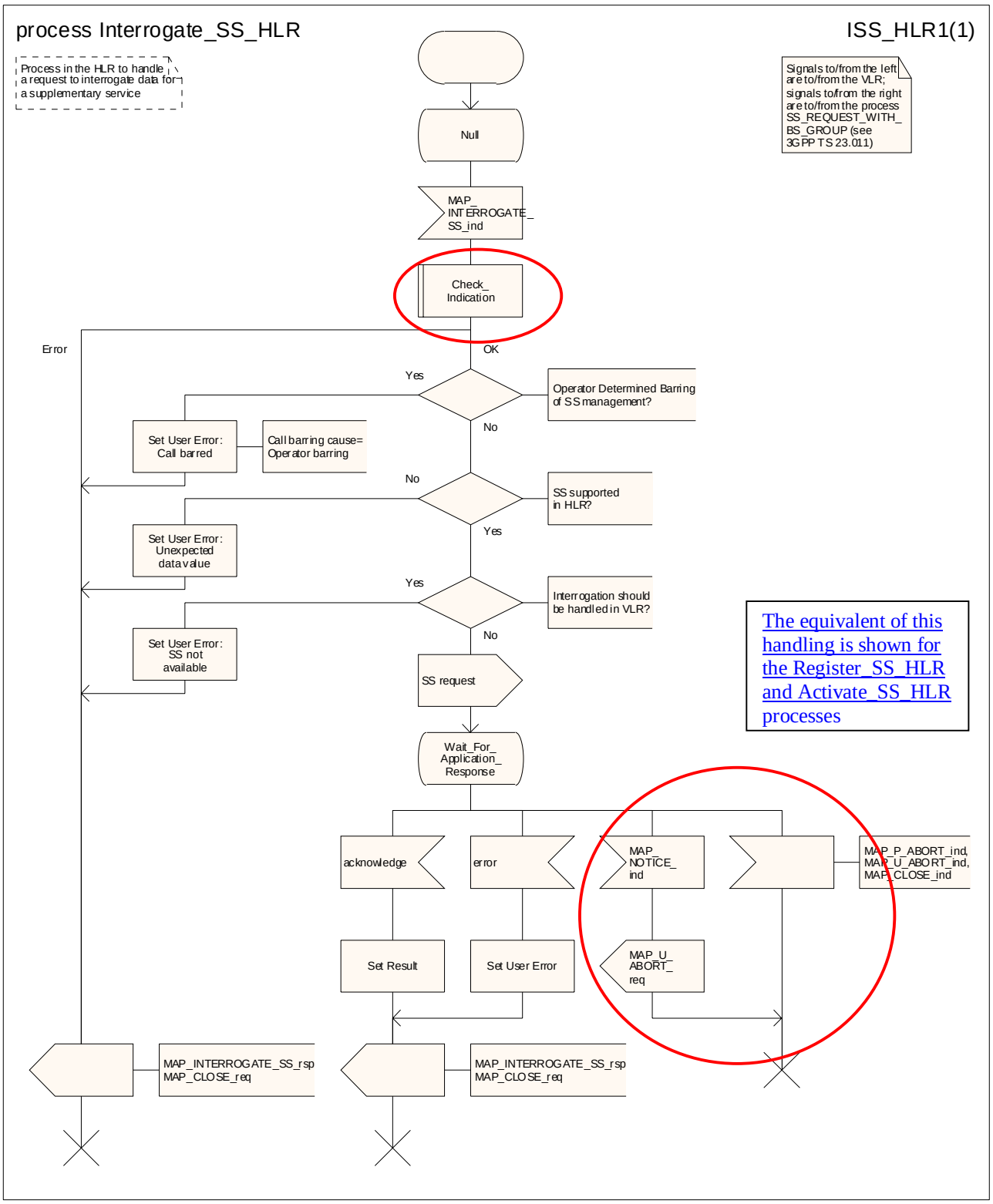


Figure 22.6.4/1: Procedure Interrogate_SS_HLR

22.7 ~~Invocation procedure~~Void

***** CR editor's note: This procedure describes interworking between the MSC and the VLR, which does not involve any MAP signalling. The interworking is described in 3GPP TS 23.018, 3GPP TS 23.083 and 3GPP TS 23.084. *****

~~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 clause 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);~~

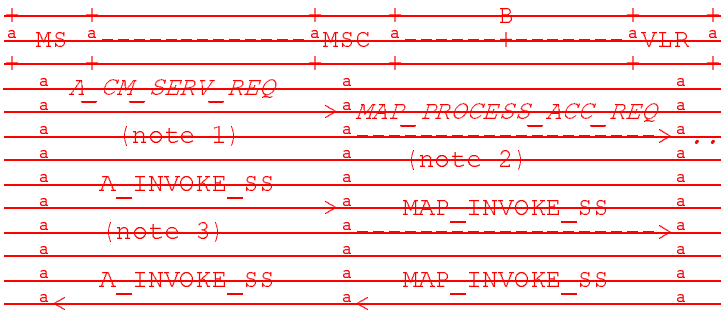
~~MAP_AUTHENTICATE (defined in clauses 8 and 25);~~

~~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 3GPP TS 24.008 [35], 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 3GPP TS 24.080 [38].~~

~~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 3GPP TS 24.008 [35] 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 3GPP TS 24.010 [36], 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 3GPP TS 29.011 [59].

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 3GPP TS 29.011 [59] 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 3GPP TS 24.010 [36].

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.

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

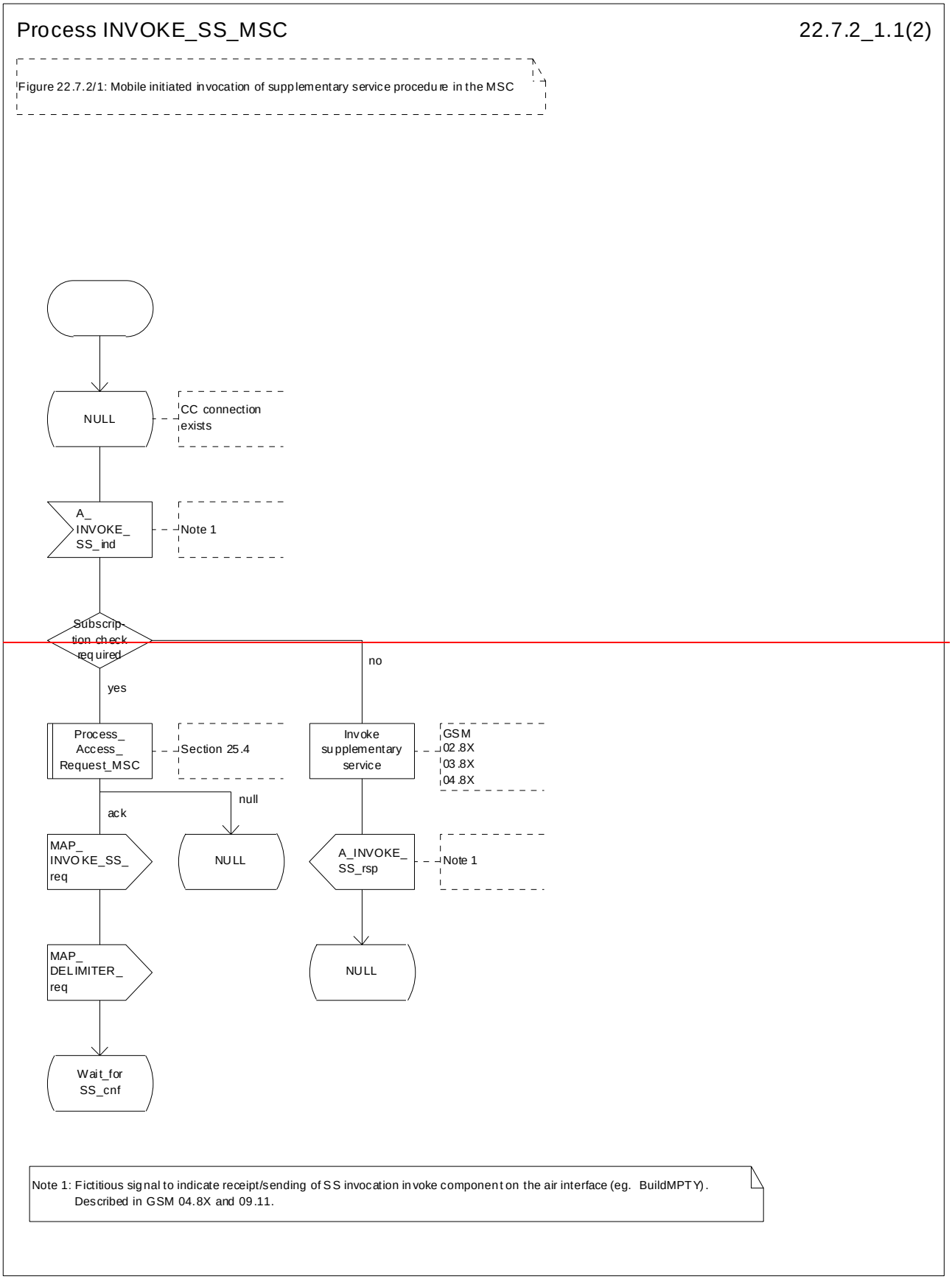
When receiving the MAP_INVOKE_SS indication, the MAP user acts as follows:

- 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.

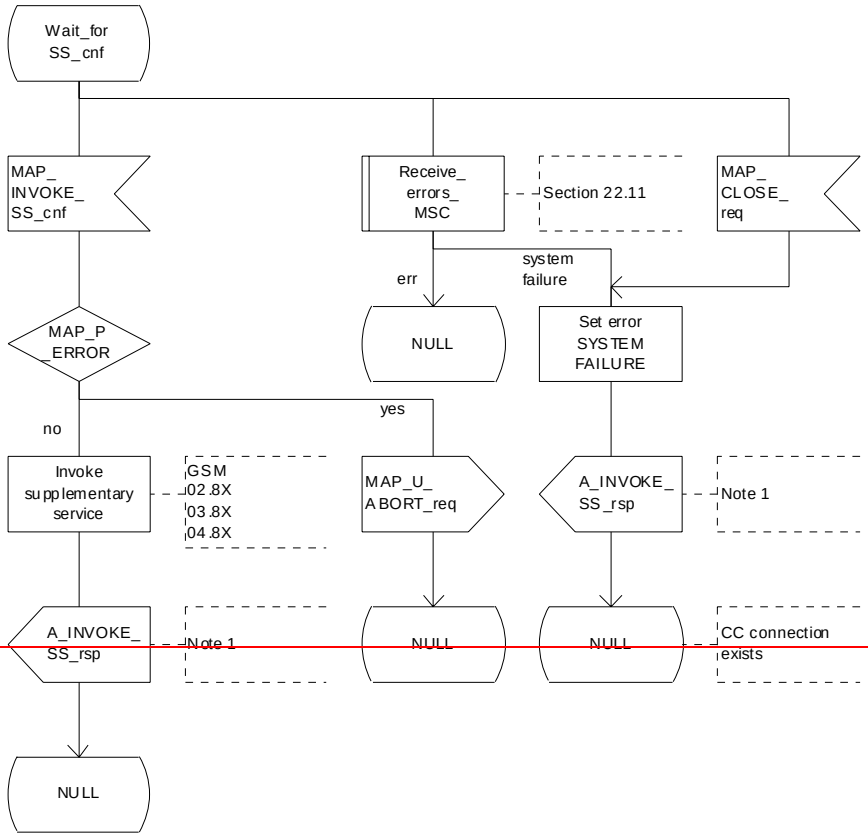
~~The invocation procedure in the VLR is shown in figure 22.7.3/1.~~



~~**Figure 22.7.2/1 (sheet 1 of 2): Procedure Invoke_SS_MSC**~~

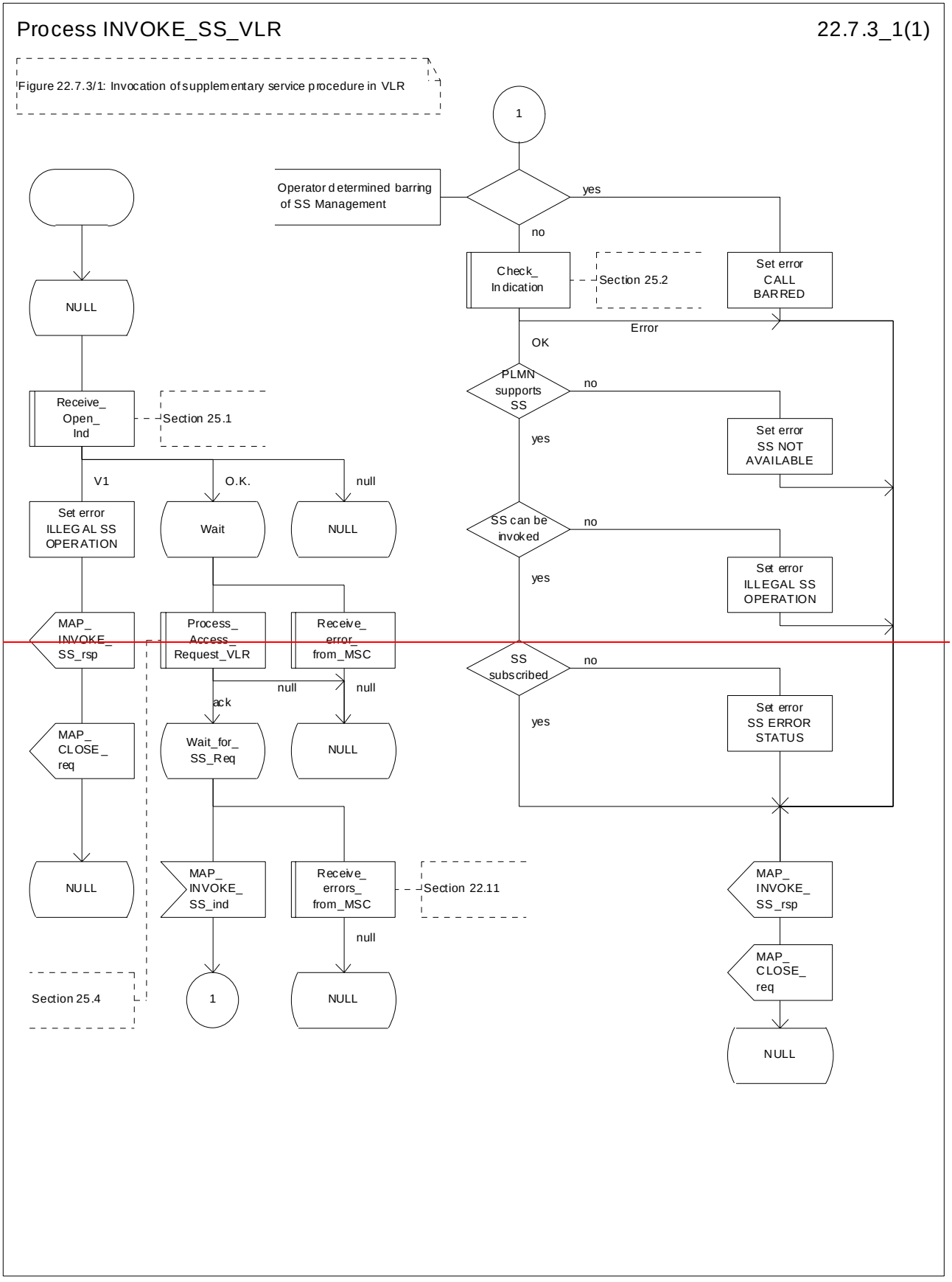
Process INVOKE_SS_MSC 22.7.2_1.2(2)

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. Build MPTY). Described in GSM 04.8X and 09.11.

~~Figure 22.7.2/1 (sheet 2 of 2): Procedure Invoke_SS_MSC~~



~~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 (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

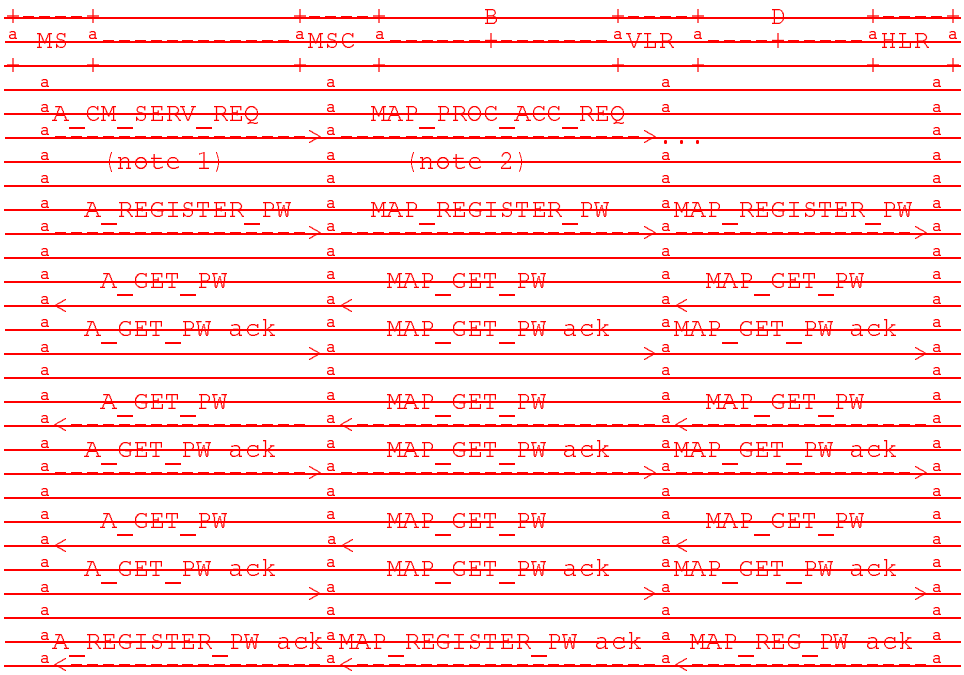
MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

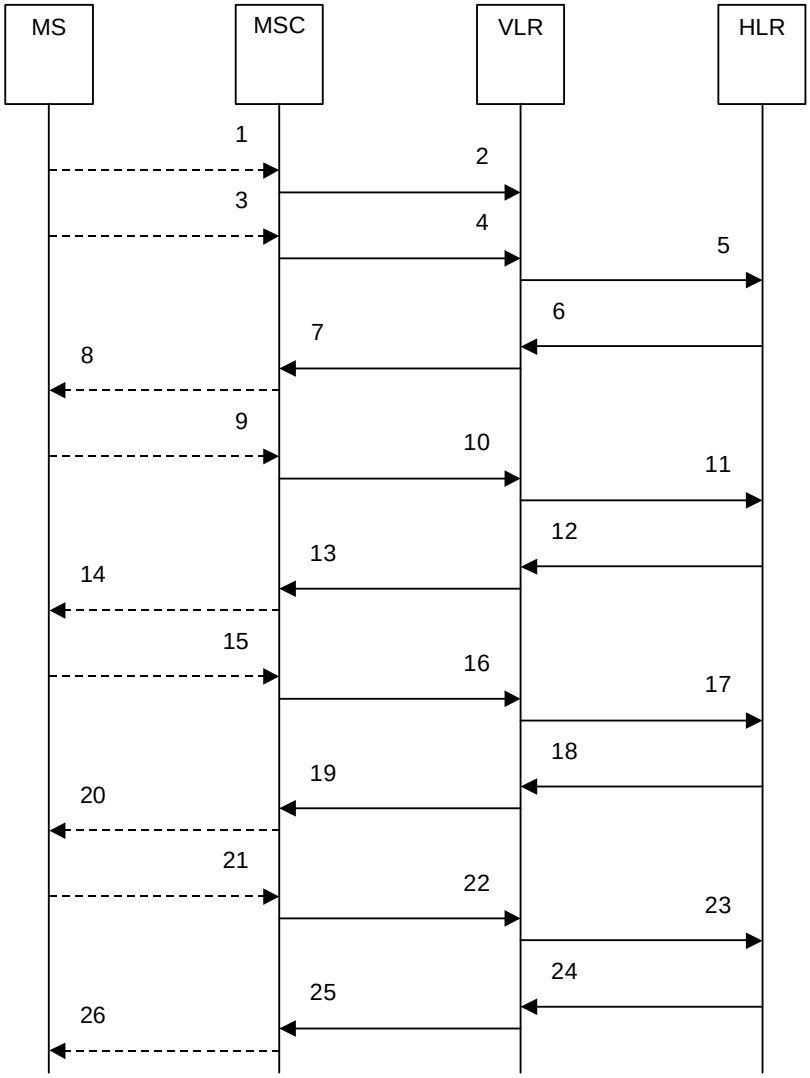
MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25).~~;~~

The following services are certainly used:

MAP_REGISTER_PASSWORD (defined in clause 11);

MAP_GET_PASSWORD (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_REGISTER_PASSWORD (Note 1)
4) MAP_REGISTER_PASSWORD_req/ind
5) MAP_REGISTER_PASSWORD_req/ind
6) MAP_GET_PASSWORD_req/ind (Note 3)
7) MAP_GET_PASSWORD_req/ind (Note 3)
8) A_GET_PASSWORD (Note 1, Note 3)
9) A_GET_PASSWORD ack (Note 1, Note 3)
10) MAP_GET_PASSWORD_rsp/cnf (Note 3)
11) MAP_GET_PASSWORD_rsp/cnf (Note 3)
12) MAP_GET_PASSWORD_req/ind (Note 3)
13) MAP_GET_PASSWORD_req/ind (Note 3)
14) A_GET_PASSWORD (Note 1, Note 3)
15) A_GET_PASSWORD ack (Note 1, Note 3)
16) MAP_GET_PASSWORD_rsp/cnf (Note 3)
17) MAP_GET_PASSWORD_rsp/cnf (Note 3)
18) MAP_GET_PASSWORD_req/ind (Note 3)
19) MAP_GET_PASSWORD_req/ind (Note 3)
20) A_GET_PASSWORD (Note 1, Note 3)
21) A_GET_PASSWORD ack (Note 1, Note 3)
22) MAP_GET_PASSWORD_rsp/cnf (Note 3)
23) MAP_GET_PASSWORD_rsp/cnf (Note 3)
24) MAP_REGISTER_PASSWORD_rsp/cnf
25) MAP_REGISTER_PASSWORD_rsp/cnf
26) A_REGISTER_PASSWORD (Note 1)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~04.10, 04.8x and 04.9x~~. Services shown in dotted lines are triggers/ triggered signalling on the radio path.
NOTE 2: For details of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: The ~~U~~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~~Message flow for supplementary service password registration

22.8.2 Procedure~~s~~ 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 Procedure~~s~~ 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 Procedure~~s~~ in the HLR

The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Indication see subclause 25.2.1.

~~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.~~

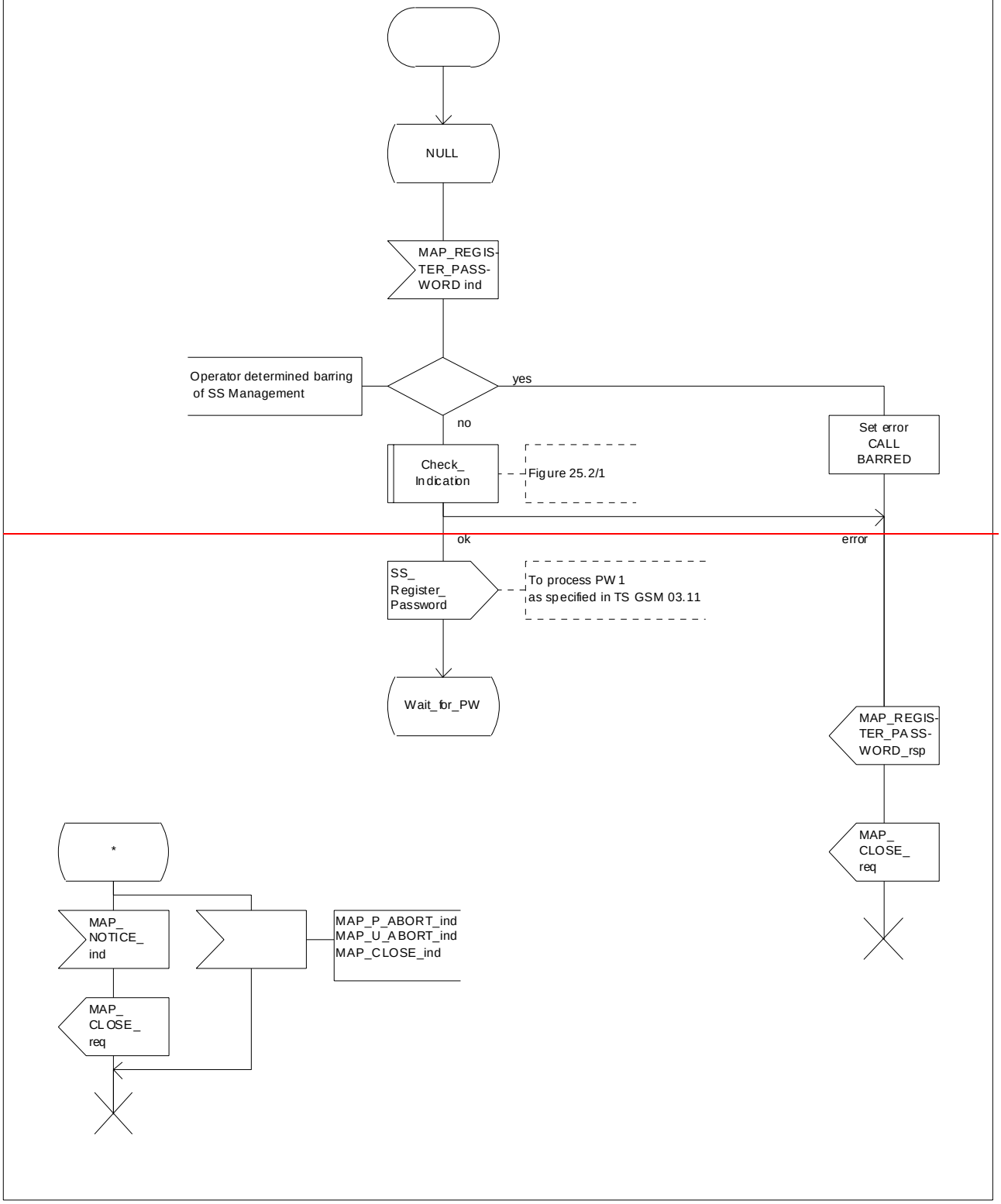
The HLR shall ~~then~~ process the MAP_REGISTER_PASSWORD indication as specified in 3GPP TS 23.011 [22]. During the handling of password registration, the password procedure ~~will be~~ is initiated (as specified in 3GPP TS 23.011 [22]) This ~~will~~ involves the sending of MAP_GET_PASSWORD requests 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 clause 22.2.4 above.~~

The password registration proces~~sdure~~ in the HLR is shown in figure 22.8.4/1.

Process REGISTER_PASSWORD_HLR 22.8.4_1.1(2)

Figure 22.8.4/1: Registration of supplementary service password procedure in HLR



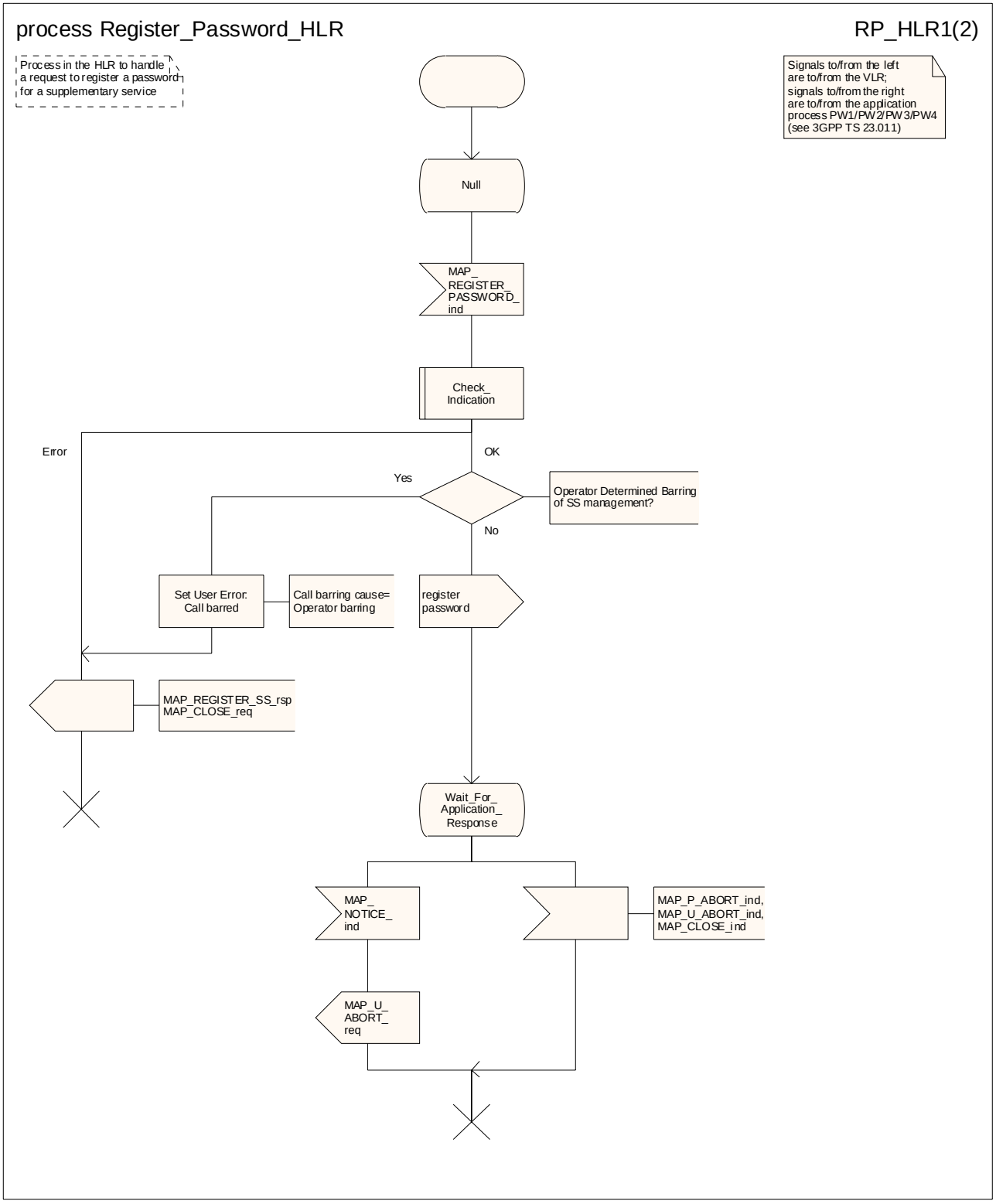
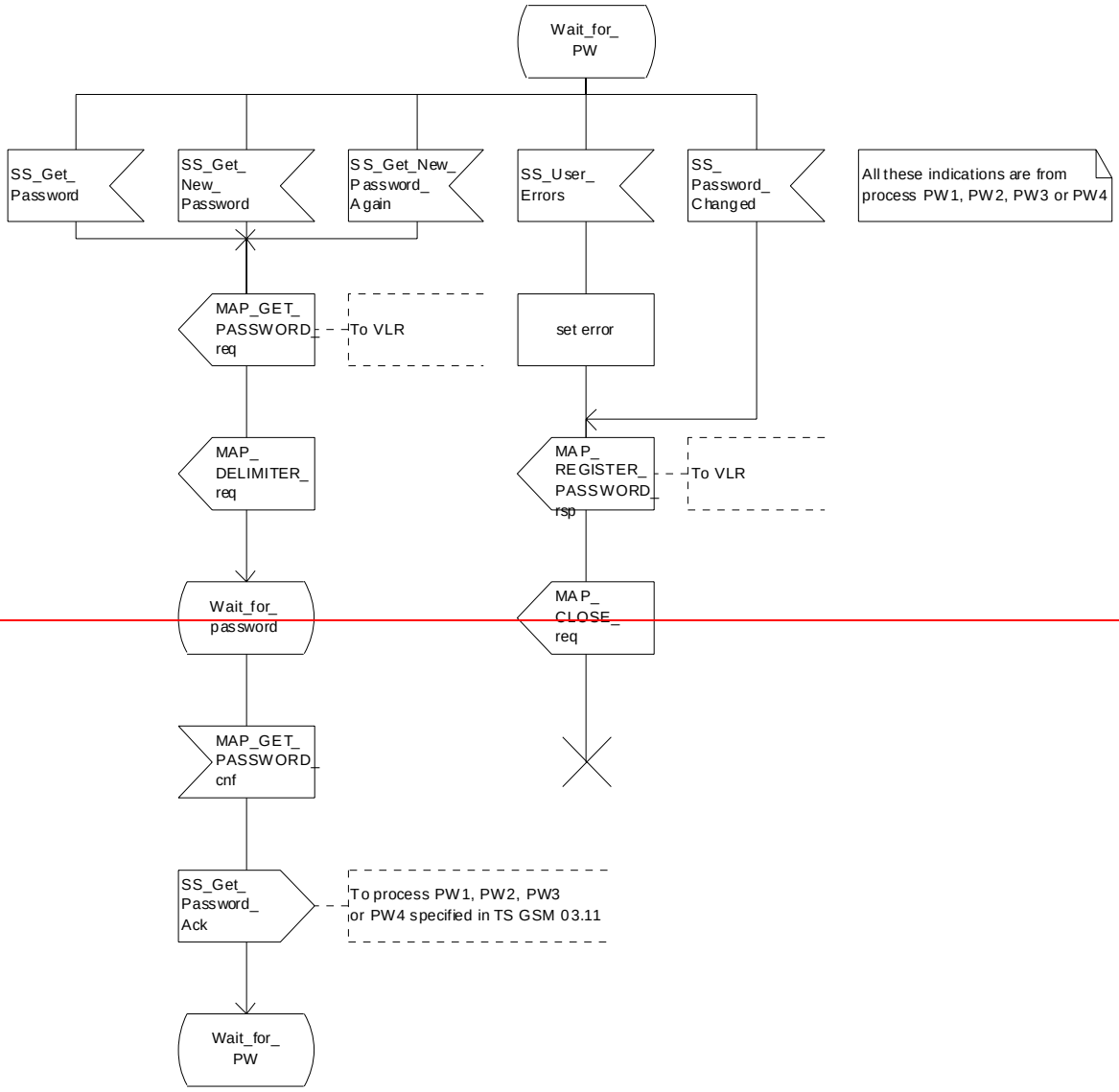


Figure 22.8.4/1 (sheet 1 of 2): Procedure Register_PW_HLR

Process REGISTER_PASSWORD_HLR 22.8.4_1.2(2)

Figure 22.8.4/1: Registration of supplementary service password procedure in HLR



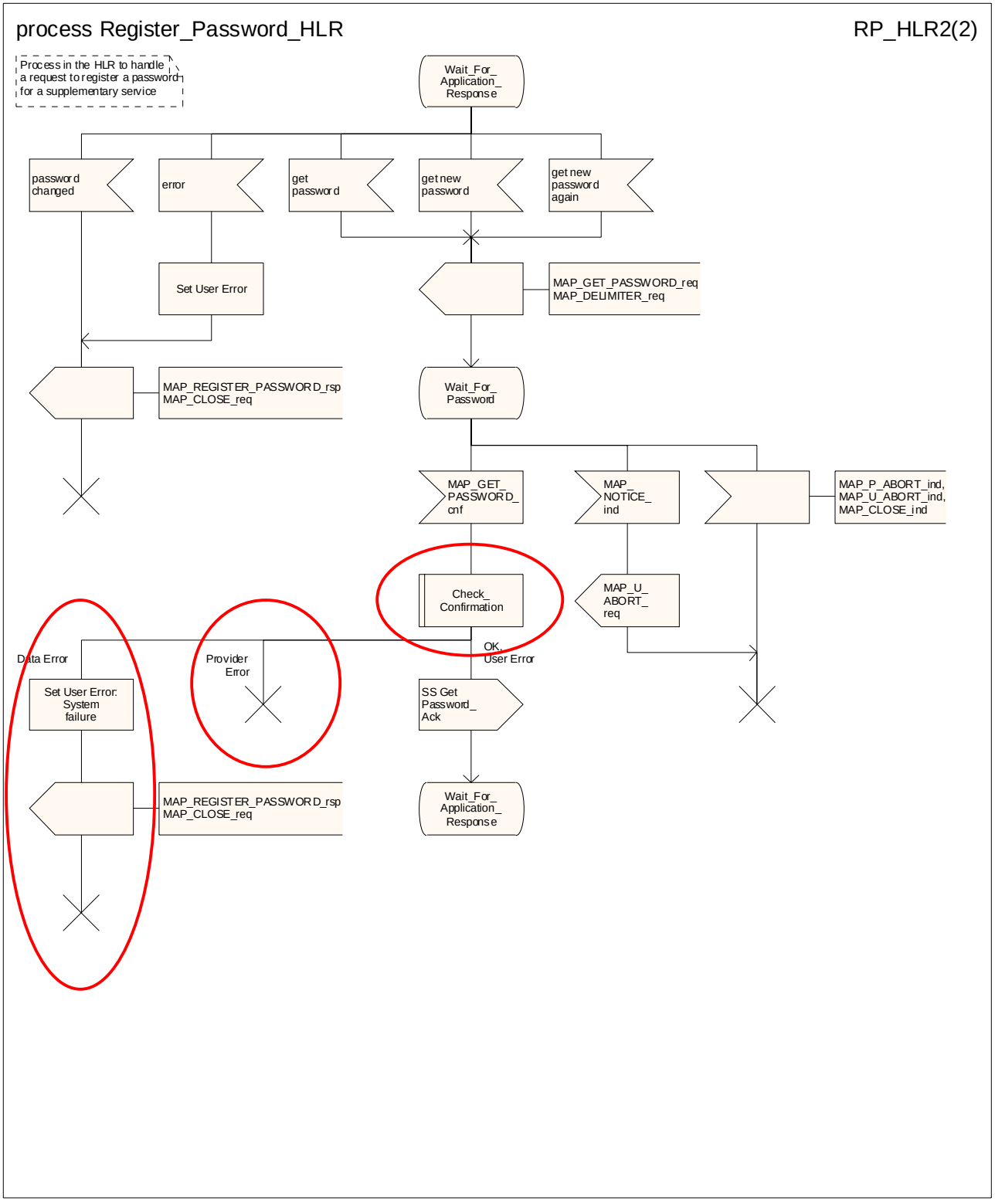


Figure 22.8.4/1 (sheet 2 of 2): Procedure Register_PW_HLR

22.9 Mobile Initiated USSD procedure

22.9.1 General

The procedure supports supplementary service signalling procedures which ~~can~~ allow PLMN specific services to be introduced.

The message flow for the procedure can be found in 3GPP TS 23.090 [34].

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(see ~~defined in~~ clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see ~~defined in~~ clauses 9 and 25);
MAP_PROVIDE_IMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_AUTHENTICATE	(see ~~defined in~~ clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(see ~~defined in~~ clauses 8 and 25);
MAP_CHECK_IMEI	(see ~~defined in~~ clauses 8 and 25);
MAP_READY_FOR_SM	(see ~~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 Procedure~~s~~ in the MSC

The process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Confirmation see subclause 25.2.2.

~~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 t~~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 3GPP TS 23.090 [34].

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 3GPP TS 29.011 [59].

~~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 information contained in 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 process~~dure~~ in the MSC is shown in figure 22.9.2/1.

22.9.3 Procedure~~s~~ in the VLR

The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2;

Process_Access_Request_VLR see subclause 25.4.2.

~~The initiation of the process is shown in clause 22.1.2.~~

~~Once a MAP dialogue is established, the VLR may handle the~~ 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 3GPP TS 23.090 [34].

1) 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.~~

2) Message Destined for Local Application

If the message is destined for the local USSD application then the VLR shall transfer the information contained in 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 process~~dure~~ in the VLR is shown in figure~~s~~ 22.9.3/1~~ and 22.9.3/2~~.

22.9.4 Procedures in the HLR

The MAP process invokes macros not defined in this clause; the definition 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.

~~The Mobile initiated USSD Procedure in the HLR starts by the HLR receiving a MAP-OPEN service indication from the VLR.~~

~~Once a MAP dialogue is established, the HLR may handle the~~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 or ~~to~~ a secondary HLR where the USSD application is located. ~~If the alphabet is not understood then the error "UnknownAlphabet" shall be returned.~~

1) Message Destined for Local Application

If the message is destined for the local USSD application then the HLR shall transfer the information contained in 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.~~

2) Message Destined for gsmSCF or secondary HLR

If the message is destined for the gsmSCF or secondary HLR then the primary HLR shall transfer the information contained in the message transparently to the next node.

~~The primary 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 primary 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**~~

~~The VLR, the USSD Application and the gsmSCF or secondary HLR may initiate release of the MAP service at any time. This is handled as shown in the diagrams.~~

The proces~~sdure~~ in the primary HLR is shown in figure 22.9.4/1.

22.9.5 Procedures in the gsmSCF/secondary HLR

The MAP process invokes a macro not defined in this clause; the definition of this macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

~~The Mobile initiated USSD Procedure in the gsmSCF/secondary HLR starts by the gsmSCF/secondary HLR receiving a MAP-OPEN service indication from the HLR.~~

~~Once a MAP dialogue is established, the gsmSCF/secondary HLR may handle the MAP_PROCESS_UNSTRUCTURED_SS_REQUEST from the HLR.~~

~~The gsmSCF/secondary HLR shall transfer the message to the local application.~~

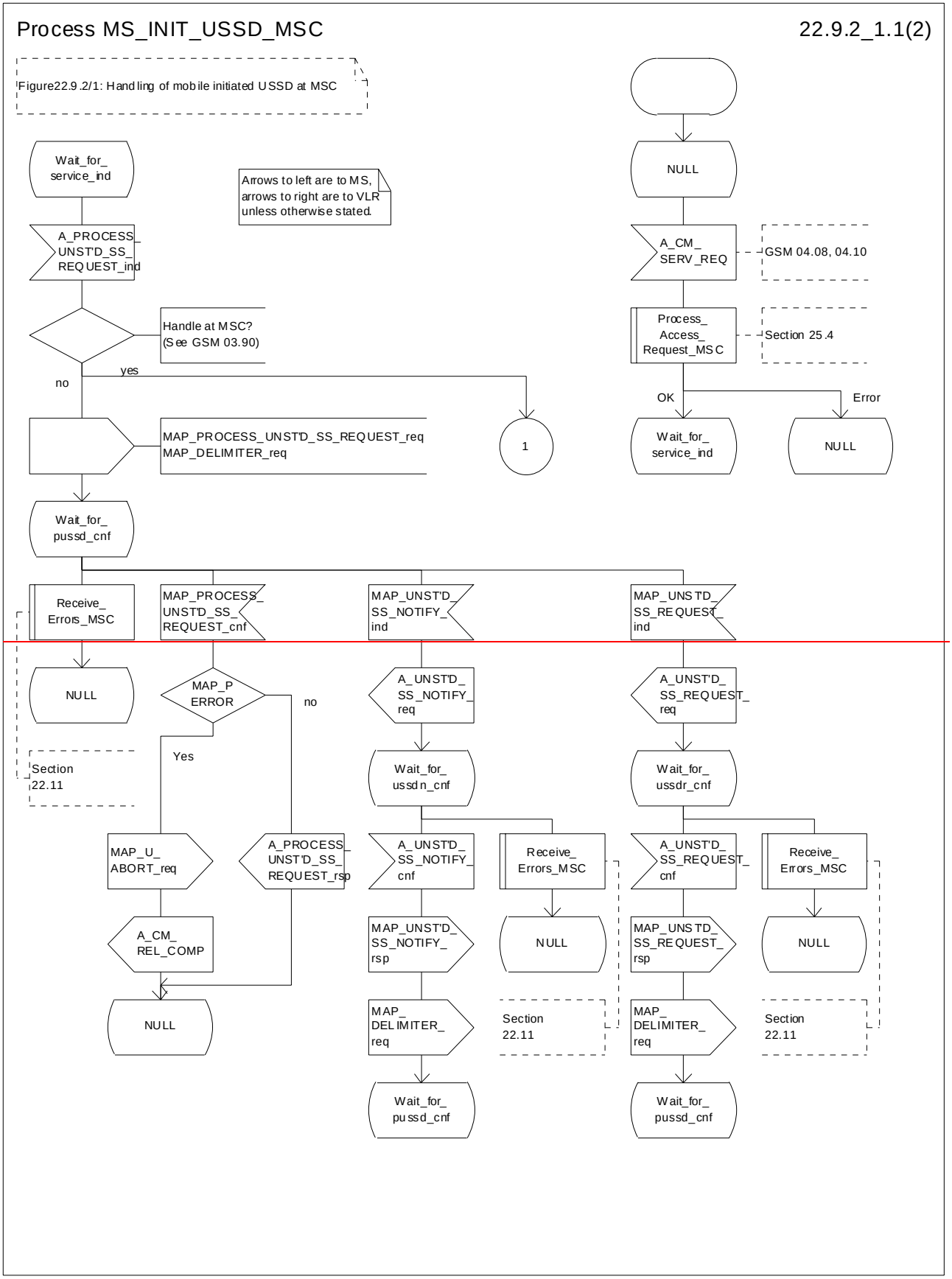
~~The gsmSCF/secondary HLR may subsequently receive one or more requests from the application which correspond to the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications. These shall be sent transparently to the HLR. When a confirmation is received from the HLR this shall be returned to the application.~~

~~When the gsmSCF/secondary HLR receives the result of the original operation from the application then it shall pass this to the HLR and initiate release of the CM connection.~~

~~**Error Handling**~~

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

The proces[s]~~sdure~~ in the gsmSCF ~~and~~ [or] secondary HLR is shown in figure 22.9.5/1.


Process MS_INIT_USSD_MSC
22.9.2_1.1(2)
Figure22.9 .2/1: Handling of mobile initiated USSD at MSC
Wait_for_ service_ind
Arrows to left are to MS, arrows to right are to VLR unless otherwise stated.
A_PROCESS_ UNST'D_SS_ REQUEST_ind
Handle at MSC? (See GSM 03.90)
no
yes
MAP_PROCESS_UNST'D_SS_REQUEST_req
MAP_DELIMITER_req
1
Wait_for_ pussd_cnf
Receive_ Errors_MSC
MAP_PROCESS_ UNST'D_SS_ REQUEST_cnf
MAP_UNST'D_ SS_NOTIFY_ ind
MAP_UNST'D_ SS_REQUEST_ ind
NULL
MAP_P ERROR
no
Yes
Section 22.11
MAP_U_ ABORT_req
A_PROCESS_ UNST'D_SS_ REQUEST_rsp
A_CM_ REL_COMP
NULL
A_UNST'D_ SS_NOTIFY_ req
Wait_for_ ussdn_cnf
A_UNST'D_ SS_NOTIFY_ cnf
Receive_ Errors_MSC
MAP_UNST'D_ SS_NOTIFY_ rsp
NULL
MAP_ DELIMITER_ req
Section 22.11
Wait_for_ pussd_cnf
A_UNST'D_ SS_REQUEST_ req
Wait_for_ ussdr_cnf
A_UNST'D_ SS_REQUEST_ cnf
Receive_ Errors_MSC
MAP_UNST'D_ SS_REQUEST_ rsp
NULL
MAP_ DELIMITER_ req
Section 22.11
Wait_for_ pussd_cnf
NULL
A_CM_ SERV_REQ
GSM 04.08, 04.10
Process_ Access_ Request_MSC
Section 25.4
OK
Error
Wait_for_ service_ind
NULL

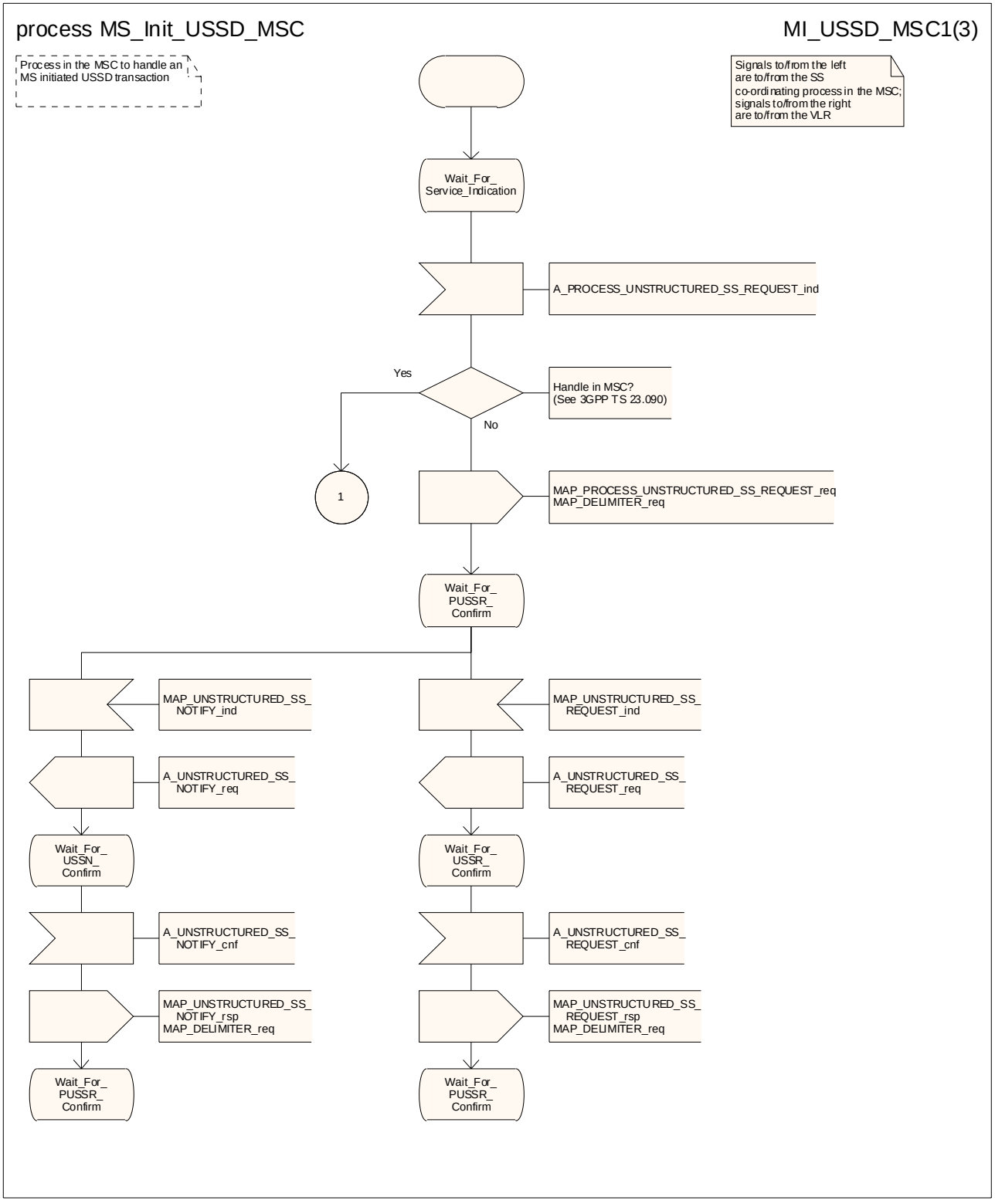
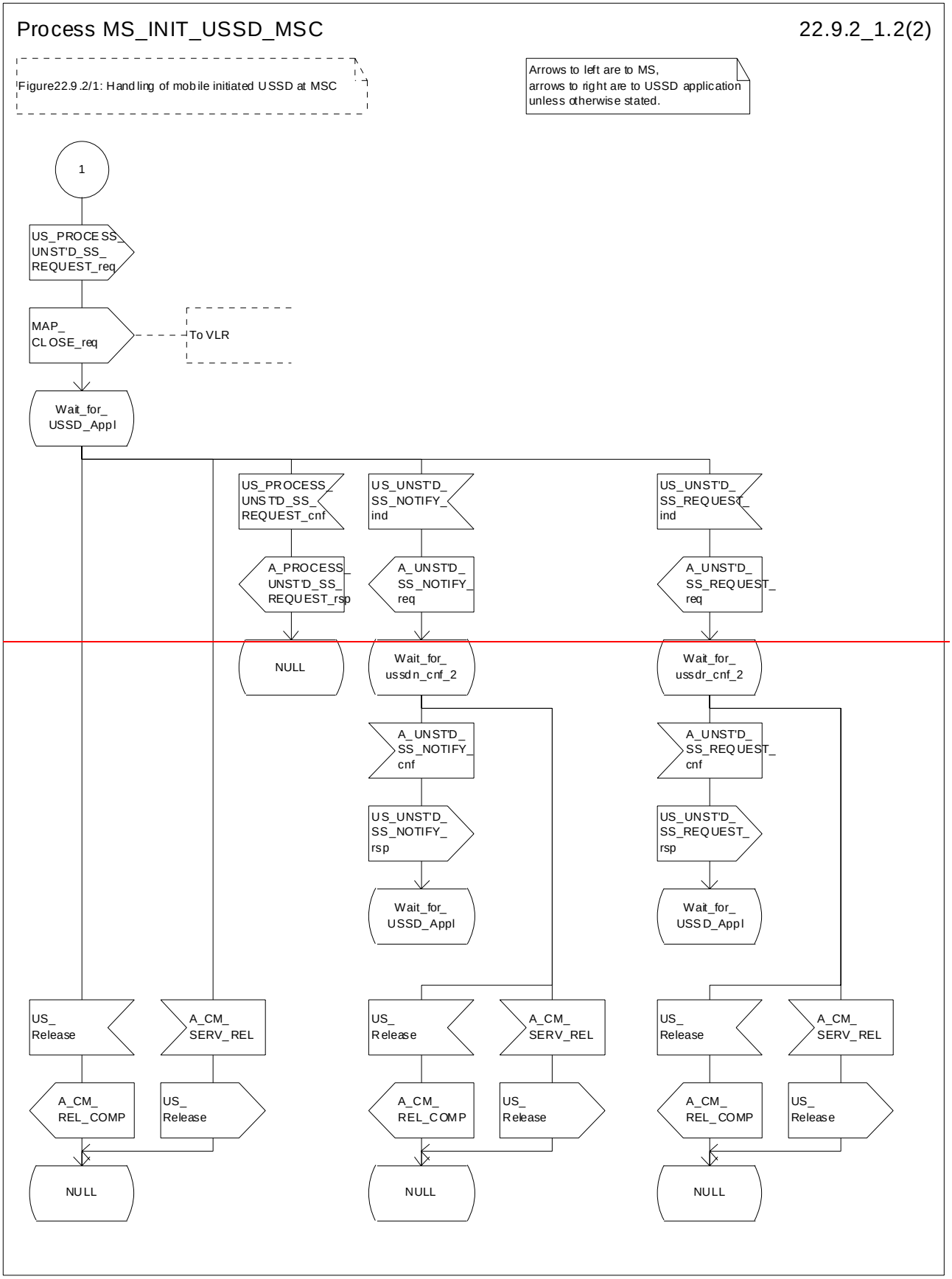


Figure 22.9.2/1 (sheet 1 of 32): Processdure MS_Init_USSD_MSC


Process MS_INIT_USSD_MSC
22.9.2_1.2(2)
Figure22.9.2/1: Handling of mobile initiated USSD at MSC
Arrows to left are to MS,
arrows to right are to USSD application
unless otherwise stated.
1
US_PROCESS_
UNST'D_SS_
REQUEST_req
MAP_
CLOSE_req
To VLR
Wait_for_
USSD_Appl
US_PROCESS_
UNST'D_SS_
REQUEST_cnf
US_UNST'D_
SS_NOTIFY_
ind
US_UNST'D_
SS_REQUEST_
ind
A_PROCESS_
UNST'D_SS_
REQUEST_rsp
A_UNST'D_
SS_NOTIFY_
req
A_UNST'D_
SS_REQUEST_
req
NULL
Wait_for_
ussdn_cnf_2
Wait_for_
ussdr_cnf_2
A_UNST'D_
SS_NOTIFY_
cnf
A_UNST'D_
SS_REQUEST_
cnf
US_UNST'D_
SS_NOTIFY_
rsp
US_UNST'D_
SS_REQUEST_
rsp
Wait_for_
USSD_Appl
Wait_for_
USSD_Appl
US_
Release
A_CM_
SERV_REL
US_
Release
A_CM_
SERV_REL
US_
Release
A_CM_
SERV_REL
A_CM_
REL_COMP
US_
Release
A_CM_
REL_COMP
US_
Release
A_CM_
REL_COMP
US_
Release
NULL
NULL
NULL

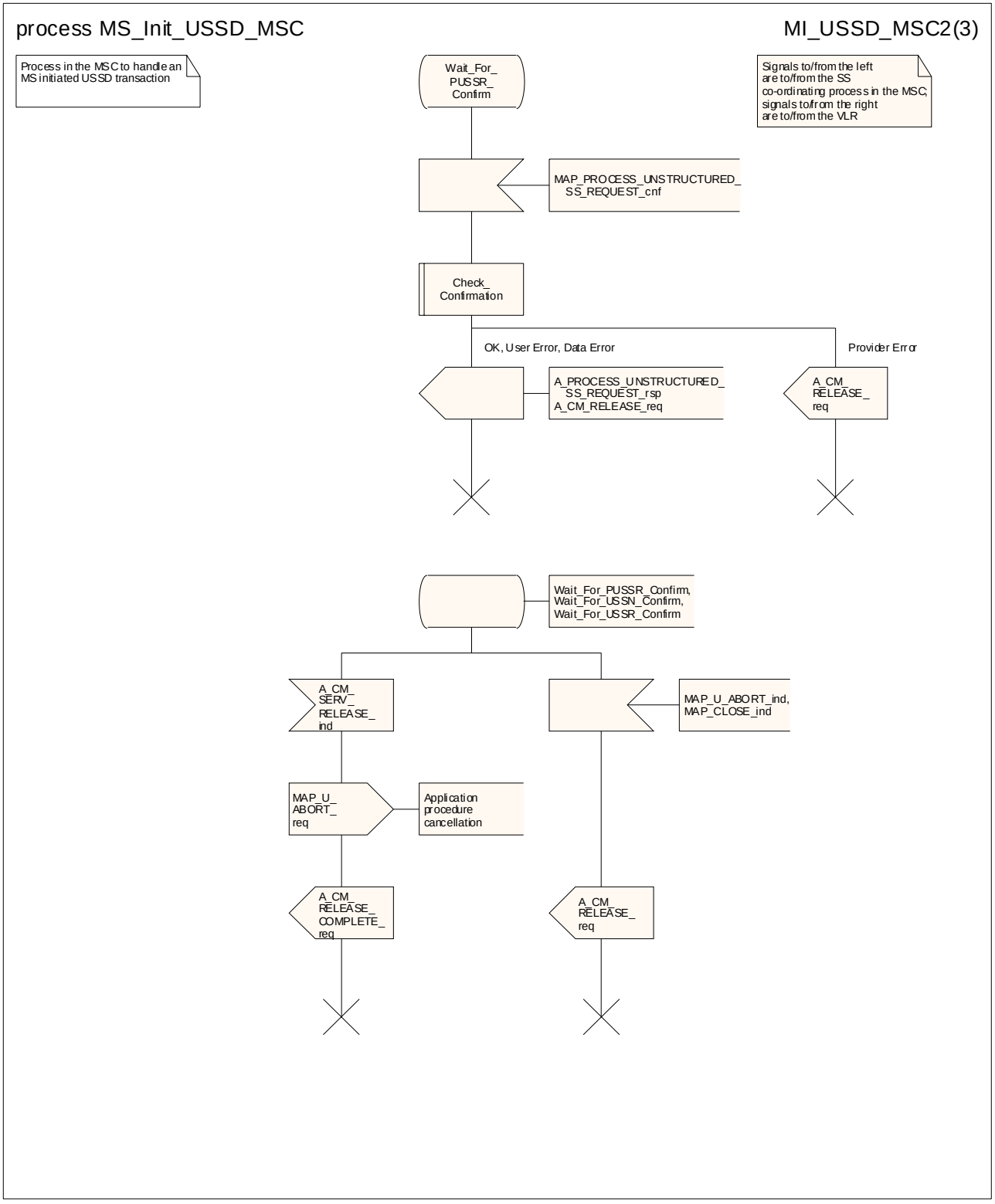


Figure 22.9.2/1 (sheet 2 of 32): Processdure MS_Init_USSD_MSC

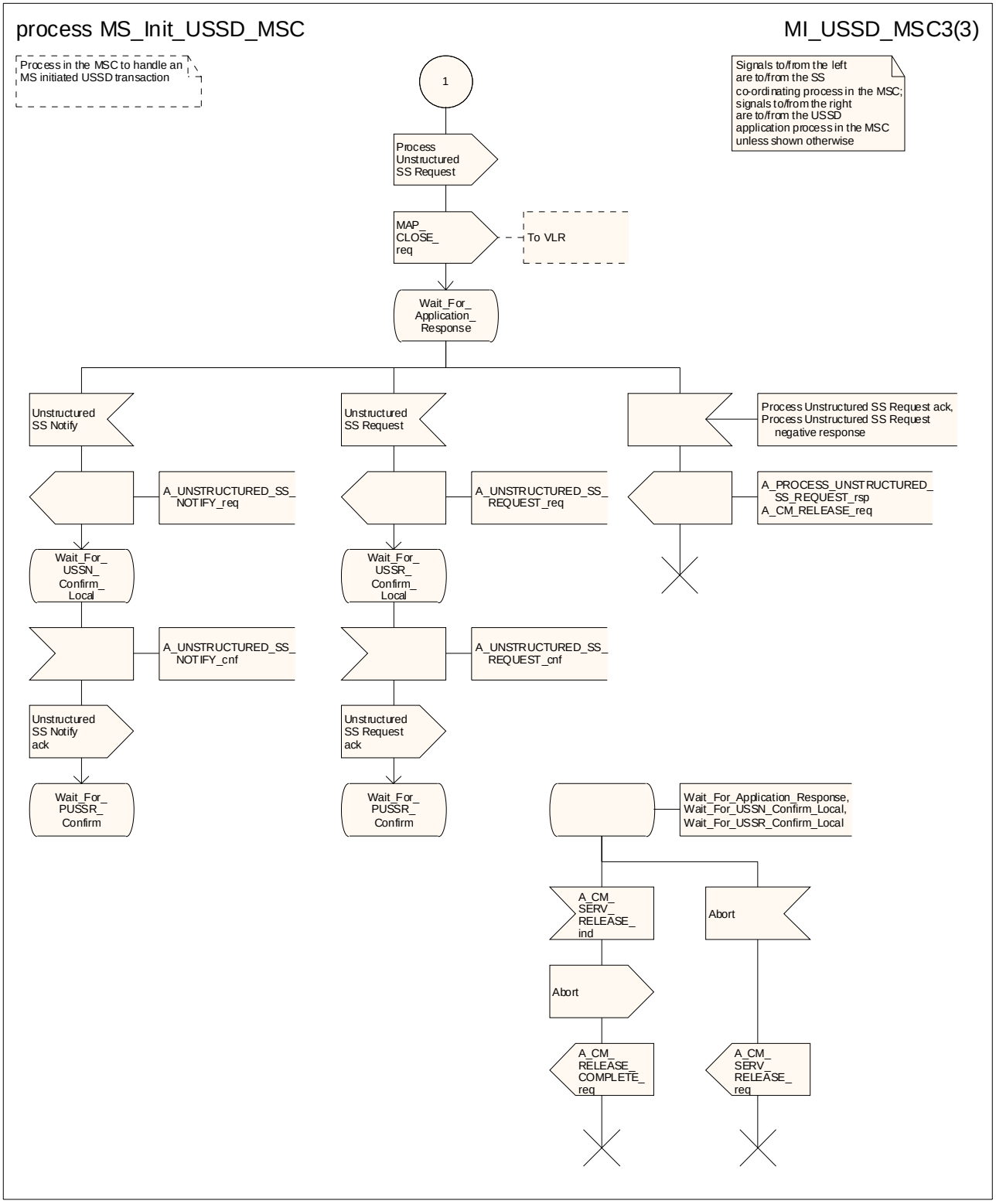
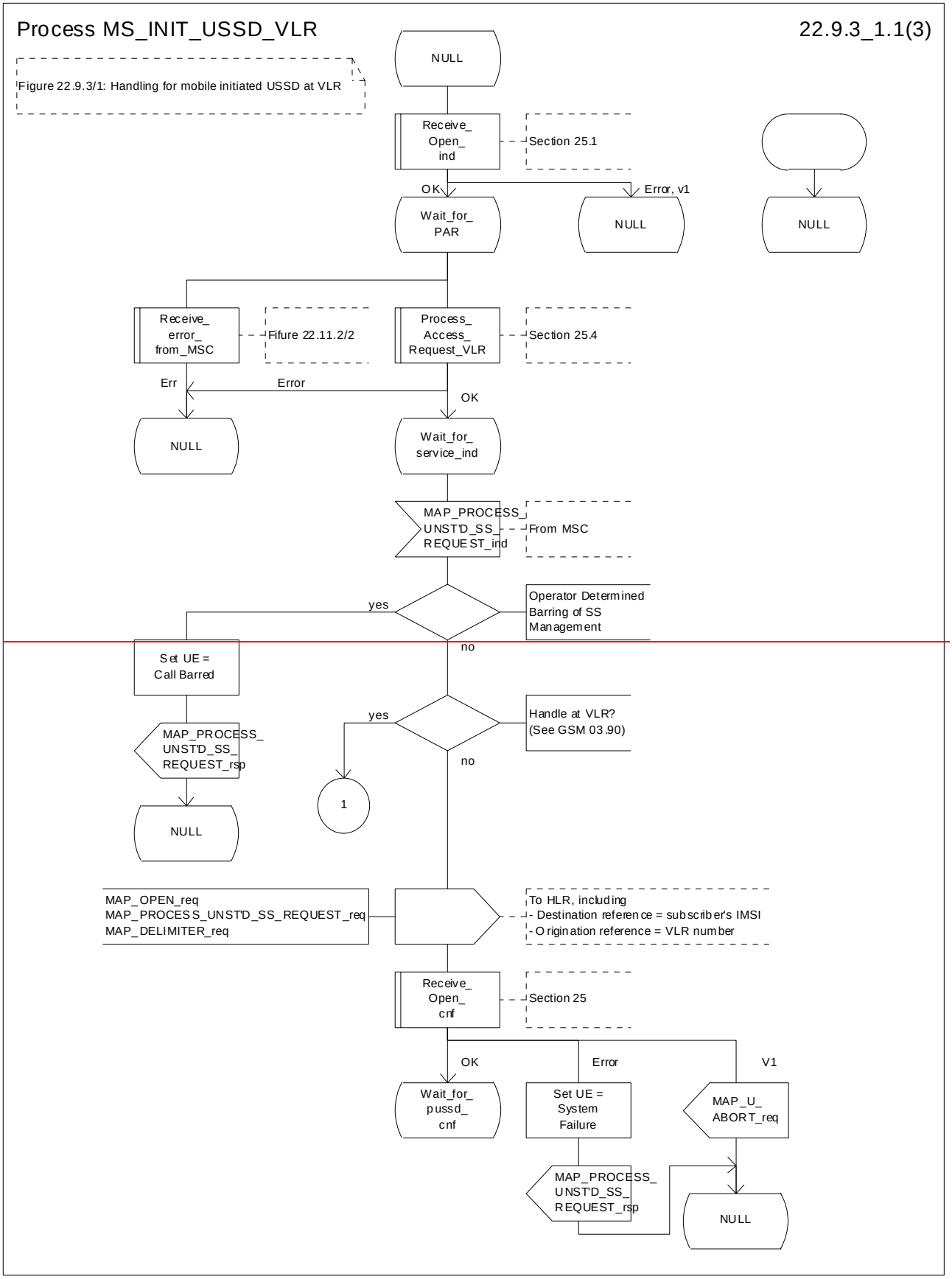


Figure 22.9.2/1 (sheet 3 of 3): Process MS_Init_USSD_MSC


Process MS_INIT_USSD_VLR
22.9.3_1.1(3)
Figure 22.9.3/1: Handling for mobile initiated USSD at VLR
NULL
Receive_ Open_ ind
Section 25.1
OK
Error, v1
Wait_for_ PAR
NULL
NULL
Receive_ error_ from_MSC
Fifure 22.11.2/2
Process_ Access_ Request_VLR
Section 25.4
Err
Error
OK
NULL
Wait_for_ service_ind
MAP_PROCESS_ UNST'D_SS_ REQUEST_ind
From MSC
yes
Operator Determined Barring of SS Management
no
Set UE = Call Barred
yes
Handle at VLR? (See GSM 03.90)
MAP_PROCESS_ UNST'D_SS_ REQUEST_rsp
no
1
NULL
MAP_OPEN_req
MAP_PROCESS_UNST'D_SS_REQUEST_req
MAP_DELIMITER_req
To HLR, including
- Destination reference = subscriber's IMSI
- Origination reference = VLR number
Receive_ Open_ cnf
Section 25
OK
Error
V1
Wait_for_ pussd_ cnf
Set UE = System Failure
MAP_U_ ABORT_req
MAP_PROCESS_ UNST'D_SS_ REQUEST_rsp
NULL

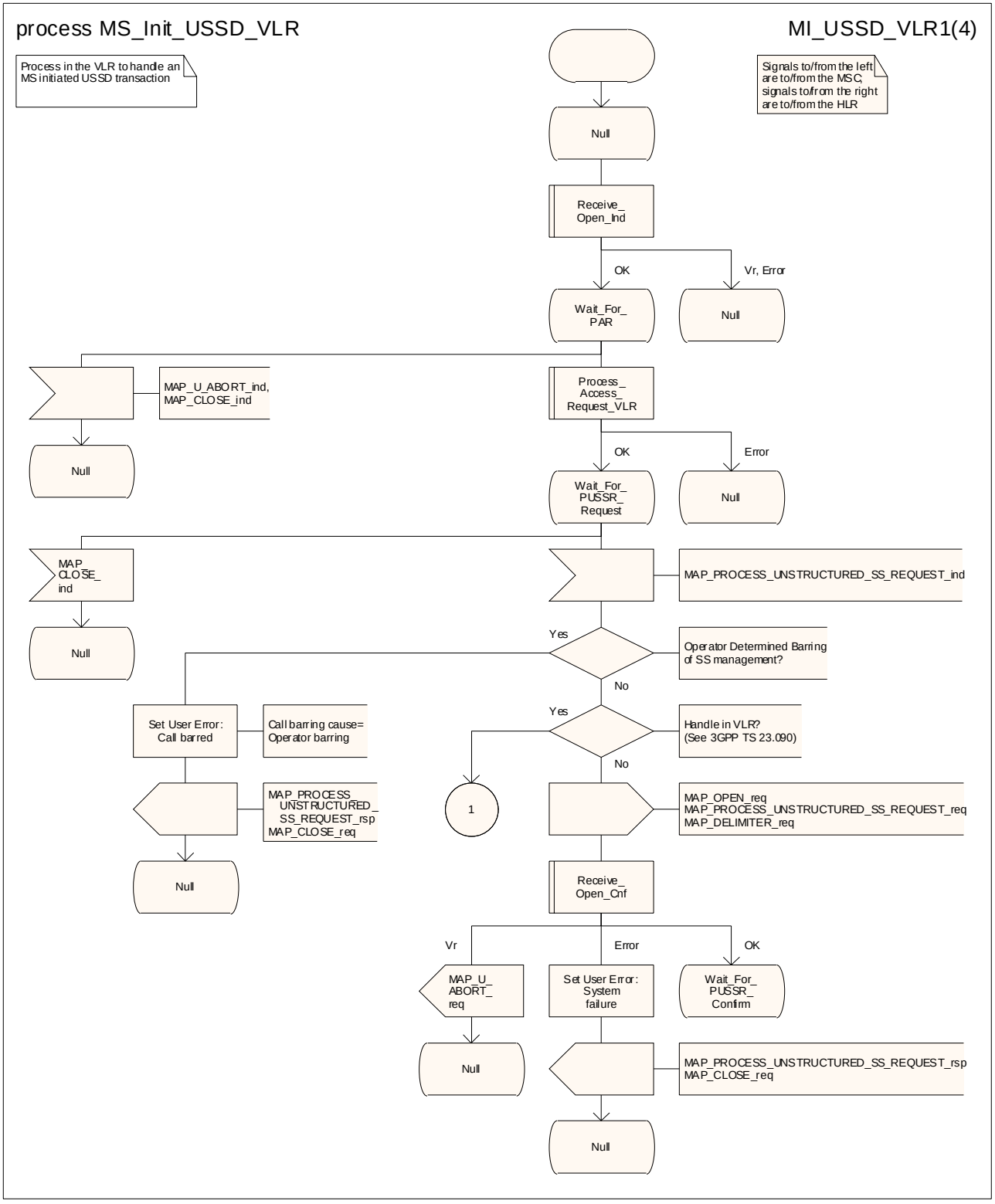
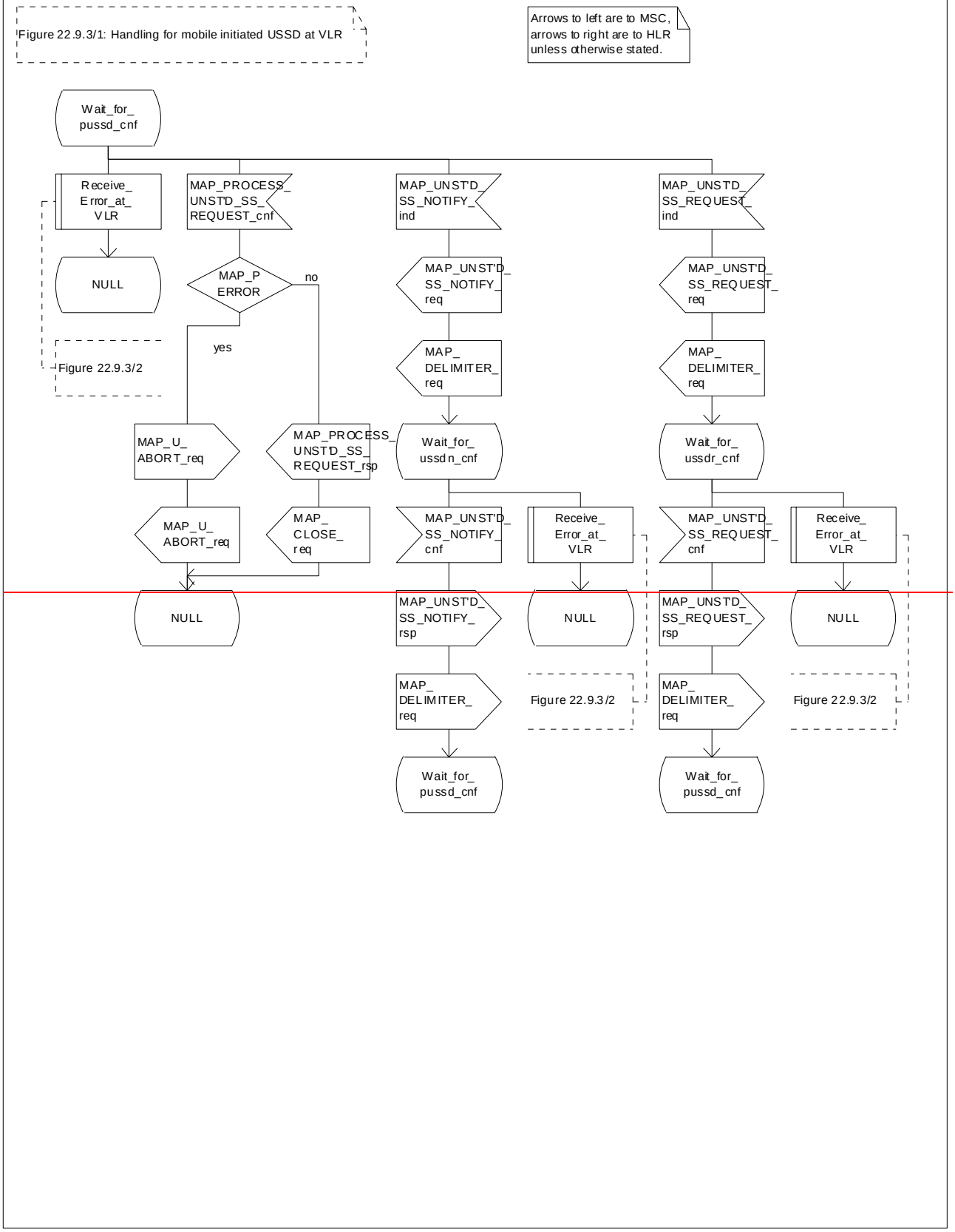


Figure 22.9.3/1 (sheet 1 of 43): Processdure MS_Init_USSD_VLR

Process MS_INIT_USSD_VLR 22.9.3_1.2(3)

Figure 22.9.3/1: Handling for mobile initiated USSD at VLR



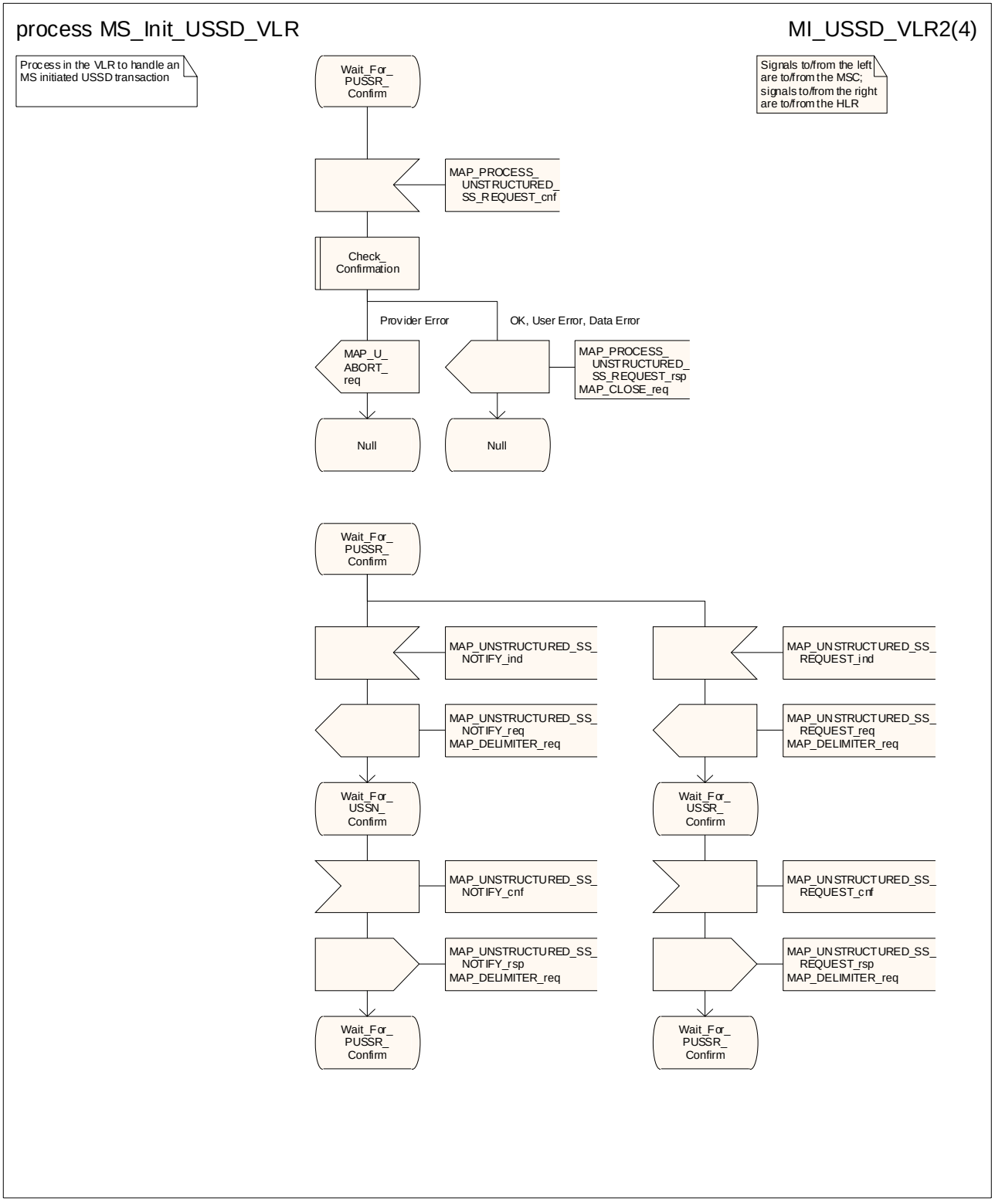
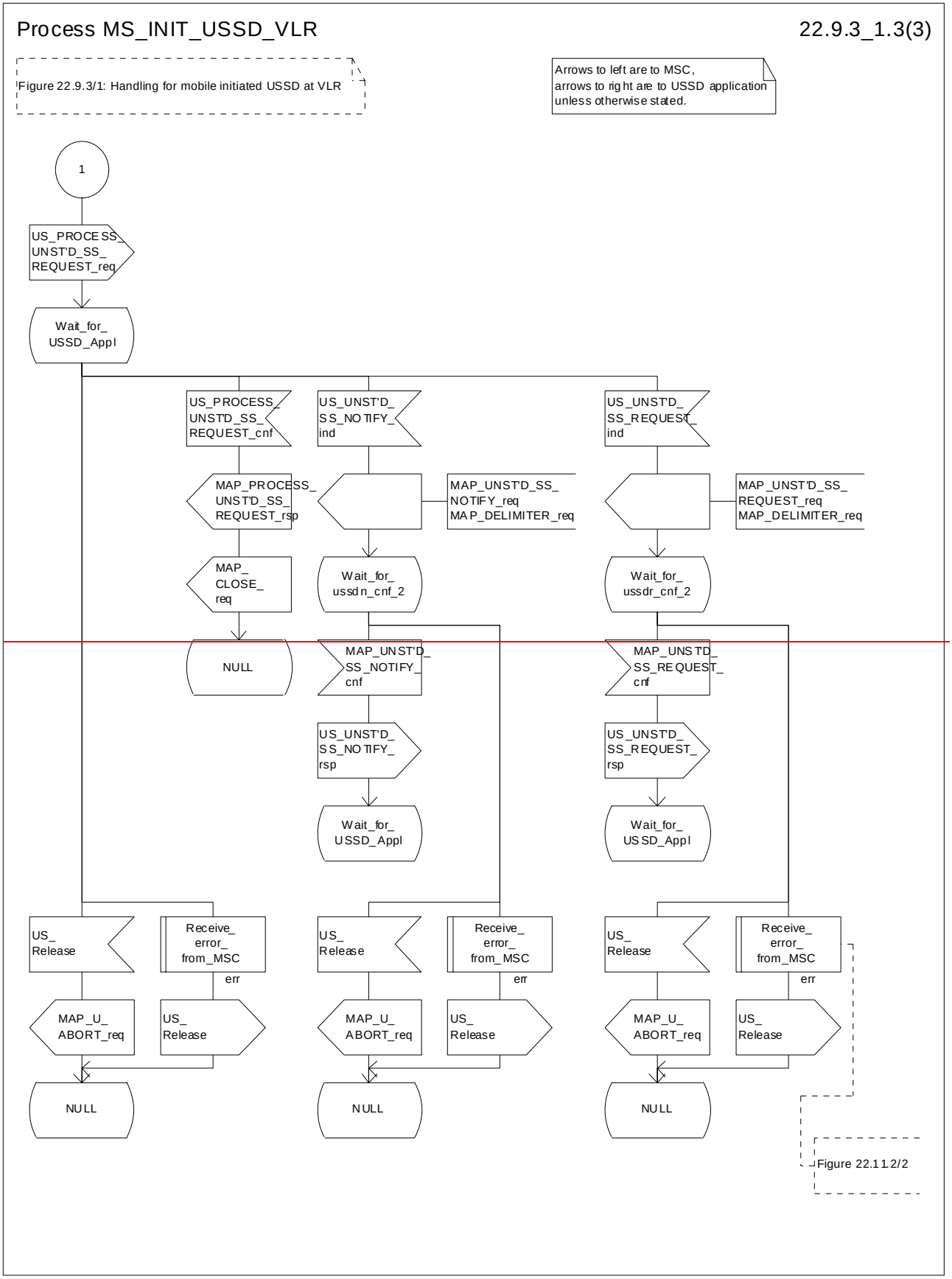


Figure 22.9.3/1 (sheet 2 of 4~~3~~): Process~~dure~~ MS_Init_USSD_VLR


Process MS_INIT_USSD_VLR
22.9.3_1.3(3)
Figure 22.9.3/1: Handling for mobile initiated USSD at VLR
Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.
1
US_PROCESS_ UNST'D_SS_ REQUEST_req
Wait_for_ USSD_Appl
US_PROCESS_ UNST'D_SS_ REQUEST_cnf
US_UNST'D_ SS_NOTIFY_ ind
US_UNST'D_ SS_REQUEST_ ind
MAP_PROCESS_ UNST'D_SS_ REQUEST_rsp
MAP_UNST'D_SS_ NOTIFY_req MAP_DELIMITER_req
MAP_UNST'D_SS_ REQUEST_req MAP_DELIMITER_req
MAP_ CLOSE_ req
Wait_for_ ussdn_cnf_2
Wait_for_ ussdr_cnf_2
NULL
MAP_UNST'D_ SS_NOTIFY_ cnf
MAP_UNST'D_ SS_REQUEST_ cnf
US_UNST'D_ SS_NOTIFY_ rsp
US_UNST'D_ SS_REQUEST_ rsp
Wait_for_ USSD_Appl
Wait_for_ USSD_Appl
US_ Release
Receive_ error_ from_MSC
err
US_ Release
Receive_ error_ from_MSC
err
US_ Release
Receive_ error_ from_MSC
err
MAP_U_ ABORT_req
US_ Release
MAP_U_ ABORT_req
US_ Release
MAP_U_ ABORT_req
US_ Release
NULL
NULL
NULL
Figure 22.11.2/2

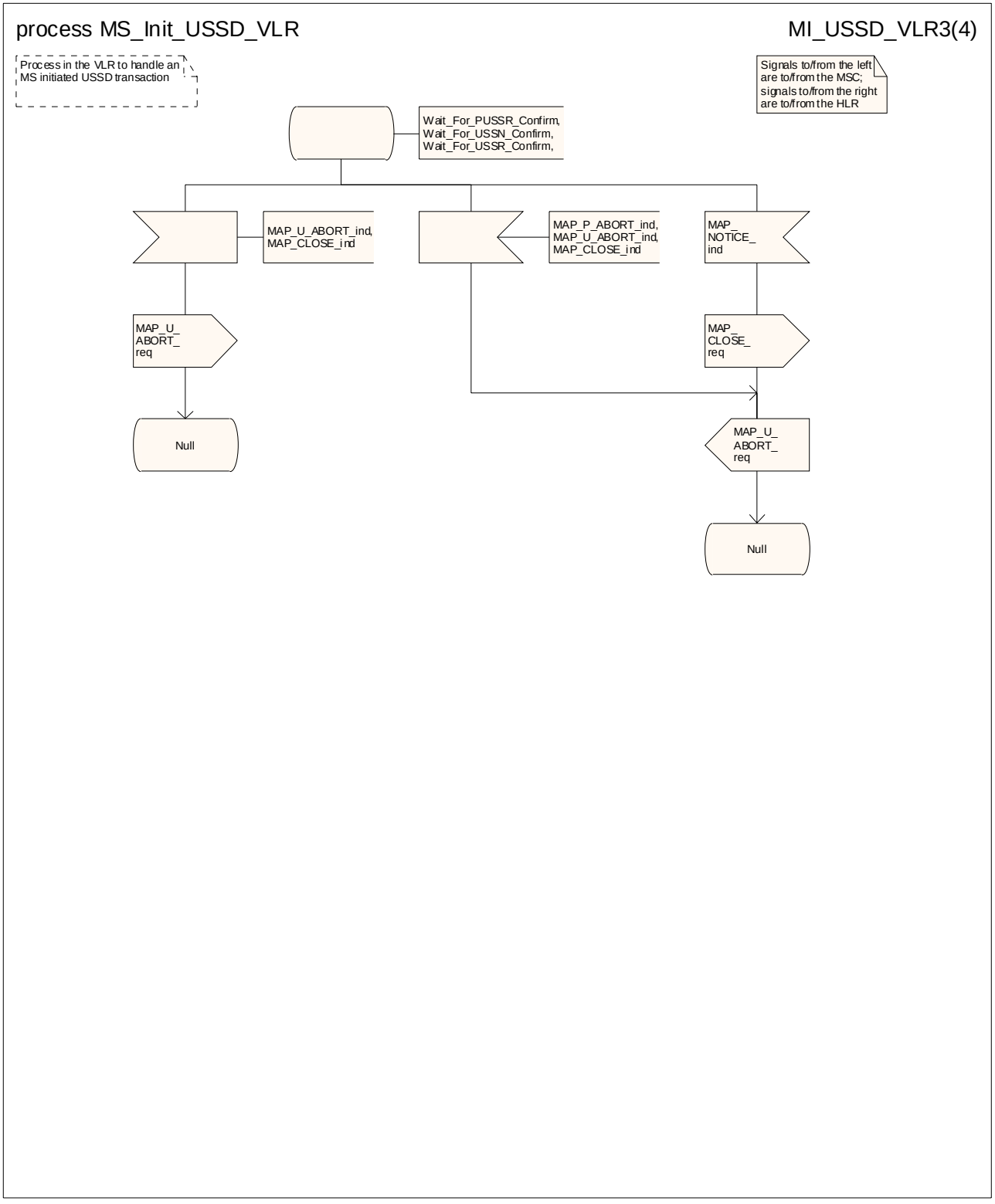


Figure 22.9.3/1 (sheet 3 of 4~~3~~): Proces~~sdure~~_MS_Init_USSD_VLR

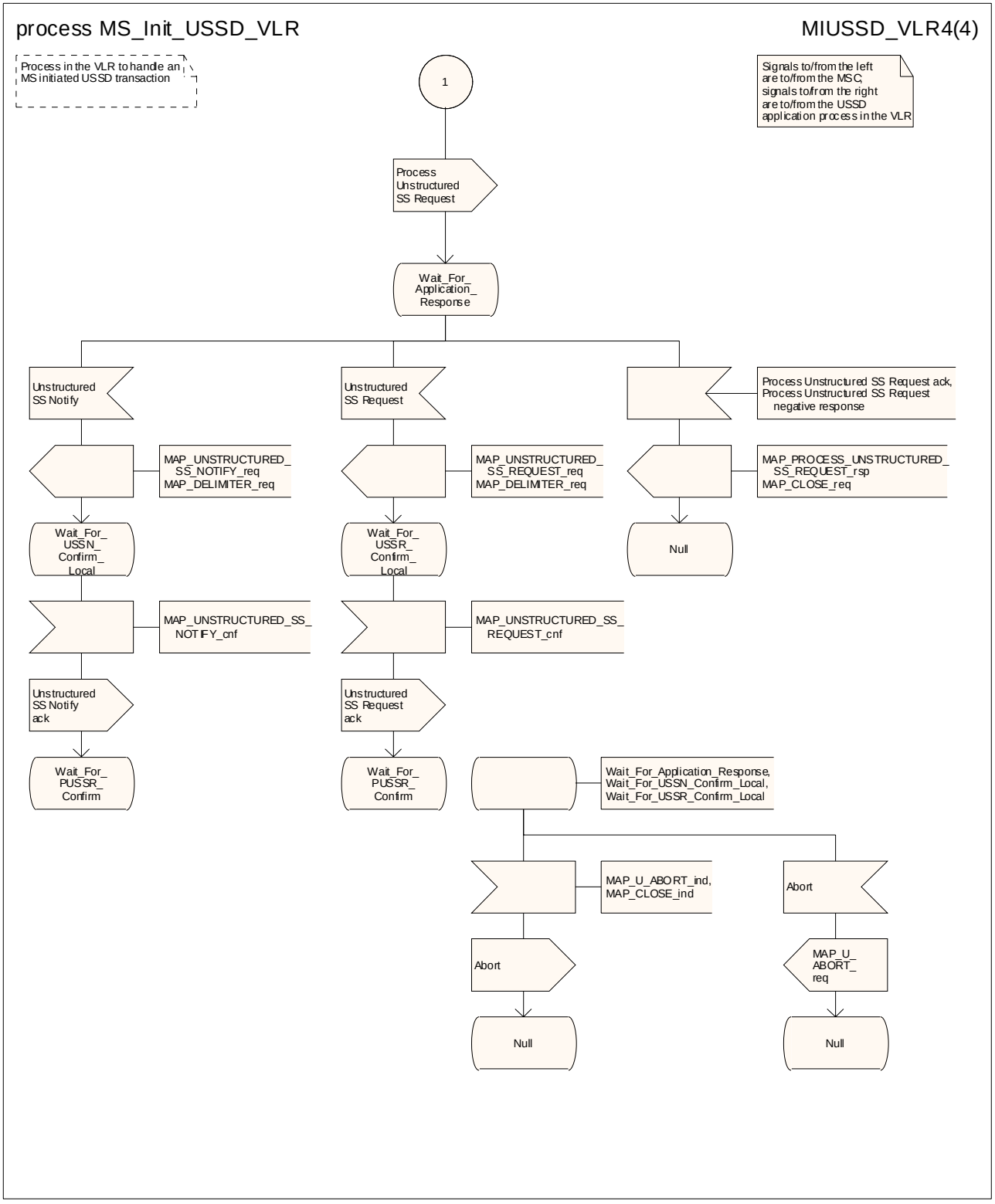


Figure 22.9.3/1 (sheet 4 of 4): Process_MS_Init_USSD_VLR

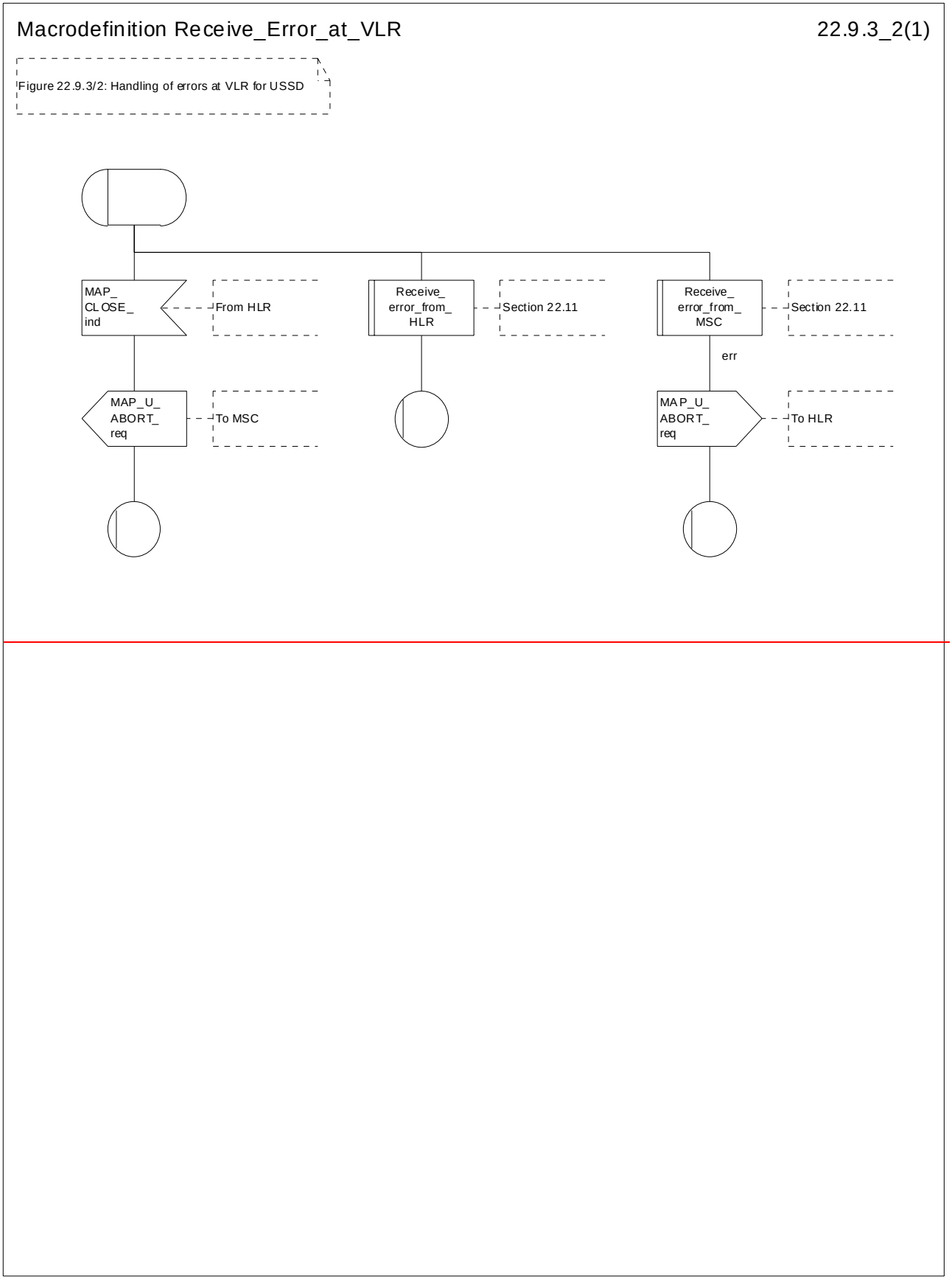
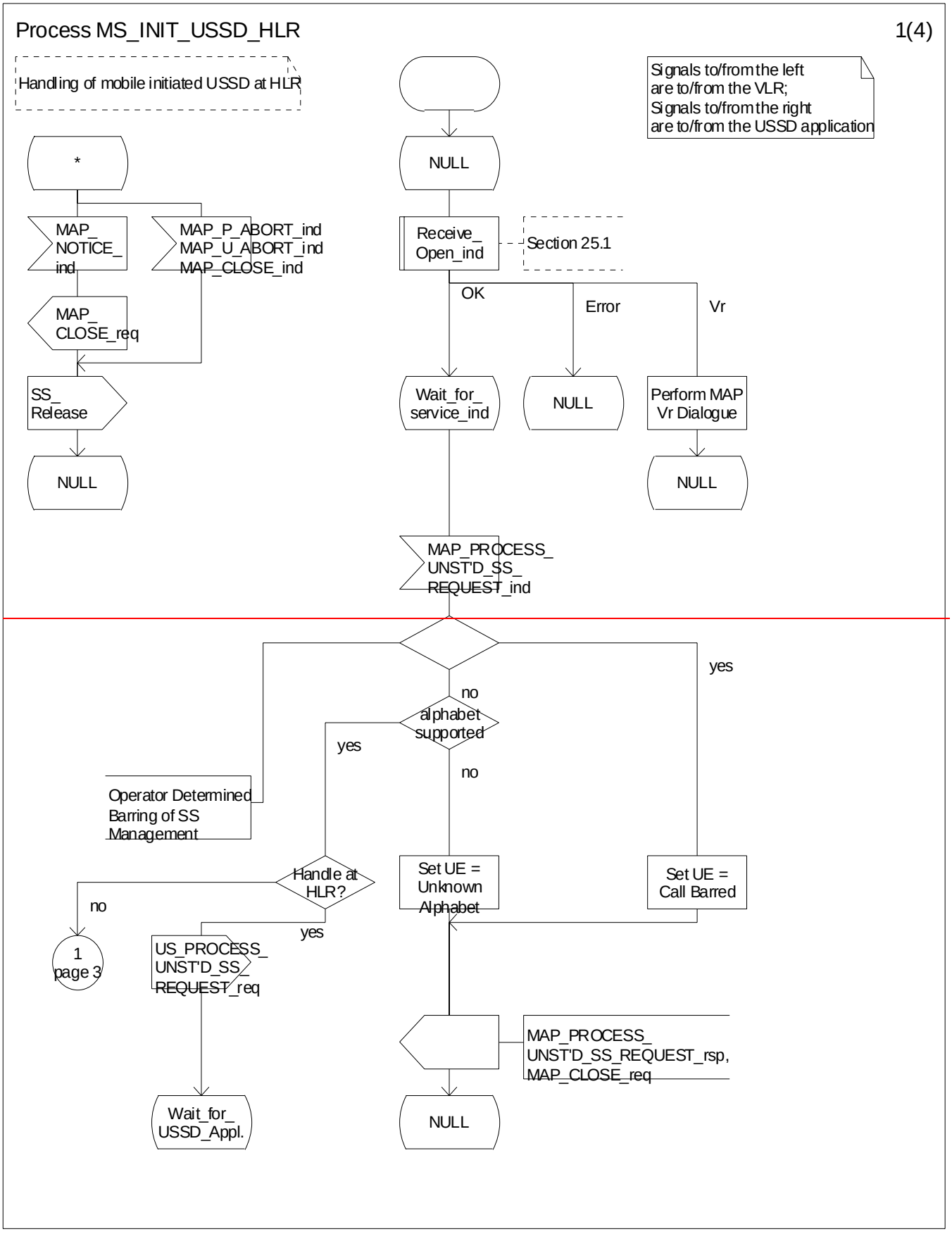


Figure 22.9.3/2: ~~Macro Receive_Error_at_VLR~~Void


Process MS_INIT_USSD_HLR
1(4)
Handling of mobile initiated USSD at HLR
Signals to/from the left
are to/from the VLR;
Signals to/from the right
are to/from the USSD application
*
NULL
MAP_
NOTICE_
ind
MAP_P_ABORT_ind
MAP_U_ABORT_ind
MAP_CLOSE_ind
Receive_
Open_ind
Section 25.1
OK
Error
Vr
MAP_
CLOSE_req
SS_
Release
Wait_for_
service_ind
NULL
Perform MAP
Vr Dialogue
NULL
NULL
MAP_PROCESS_
UNST'D_SS_
REQUEST_ind
yes
no
alphabet
supported
yes
no
Operator Determined
Barring of SS
Management
Handle at
HLR?
Set UE =
Unknown
Alphabet
Set UE =
Call Barred
no
yes
1
page 3
US_PROCESS_
UNST'D_SS_
REQUEST_req
MAP_PROCESS_
UNST'D_SS_REQUEST_rsp,
MAP_CLOSE_req
Wait_for_
USSD_Appl.
NULL

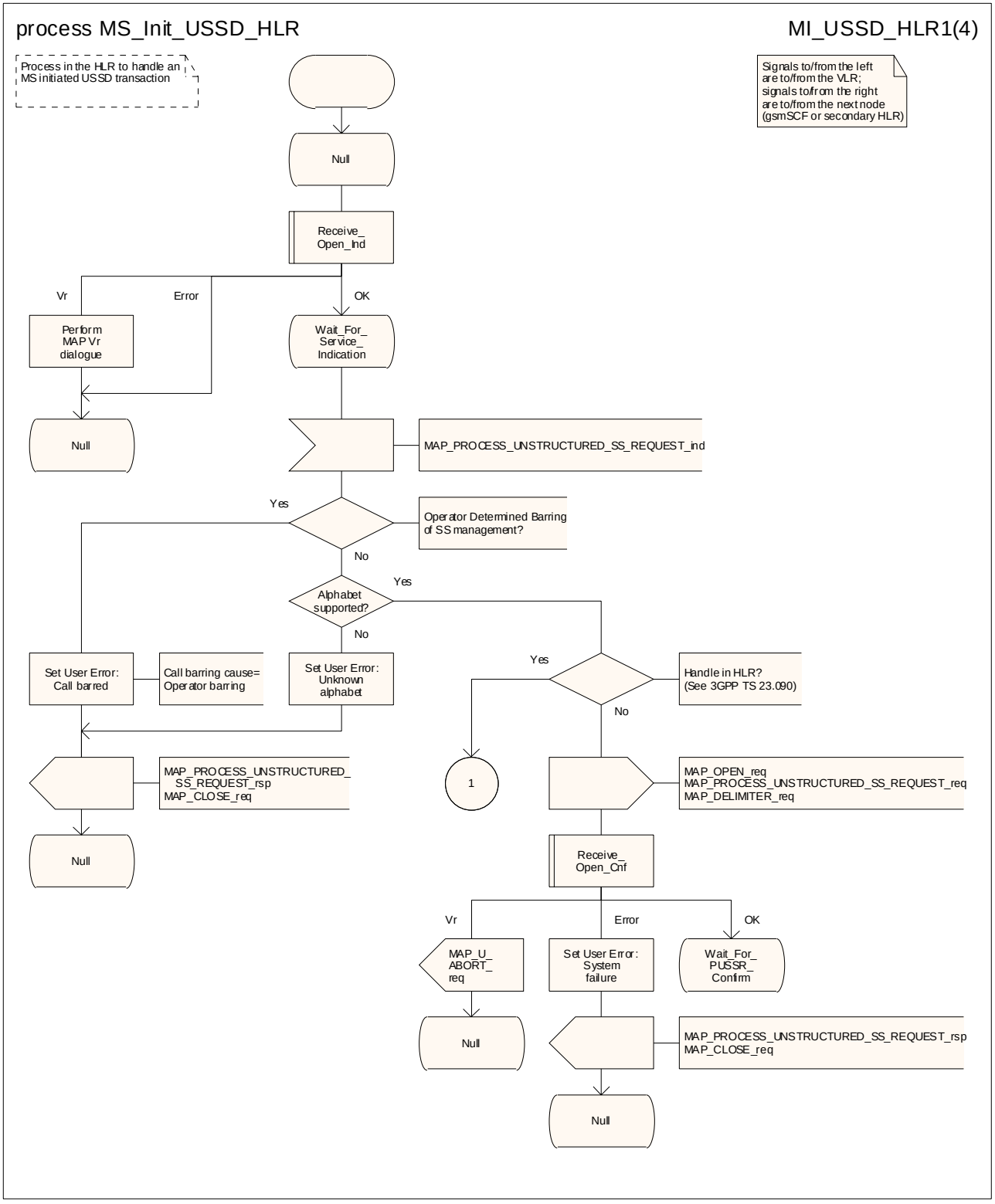
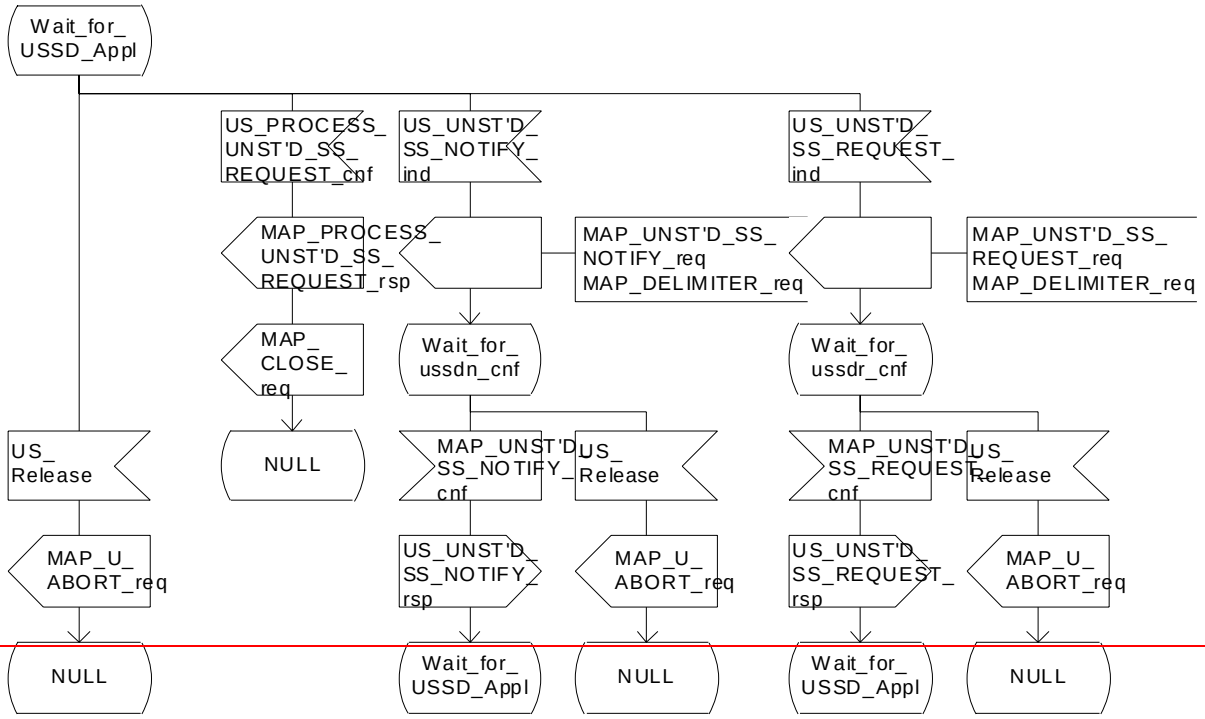


Figure 22.9.4/1 (sheet 1 of 4): Proces~~sdure~~ MS_Init_USSD_HLR

Process MS_INIT_USSD_HLR 22.9.4_1.2(4)

Figure 22.9.4/1: Handling of mobile intiated USSD at HLR.

Arrows to left are to VLR,
arrows to right are to USSD application
unless otherwise stated.



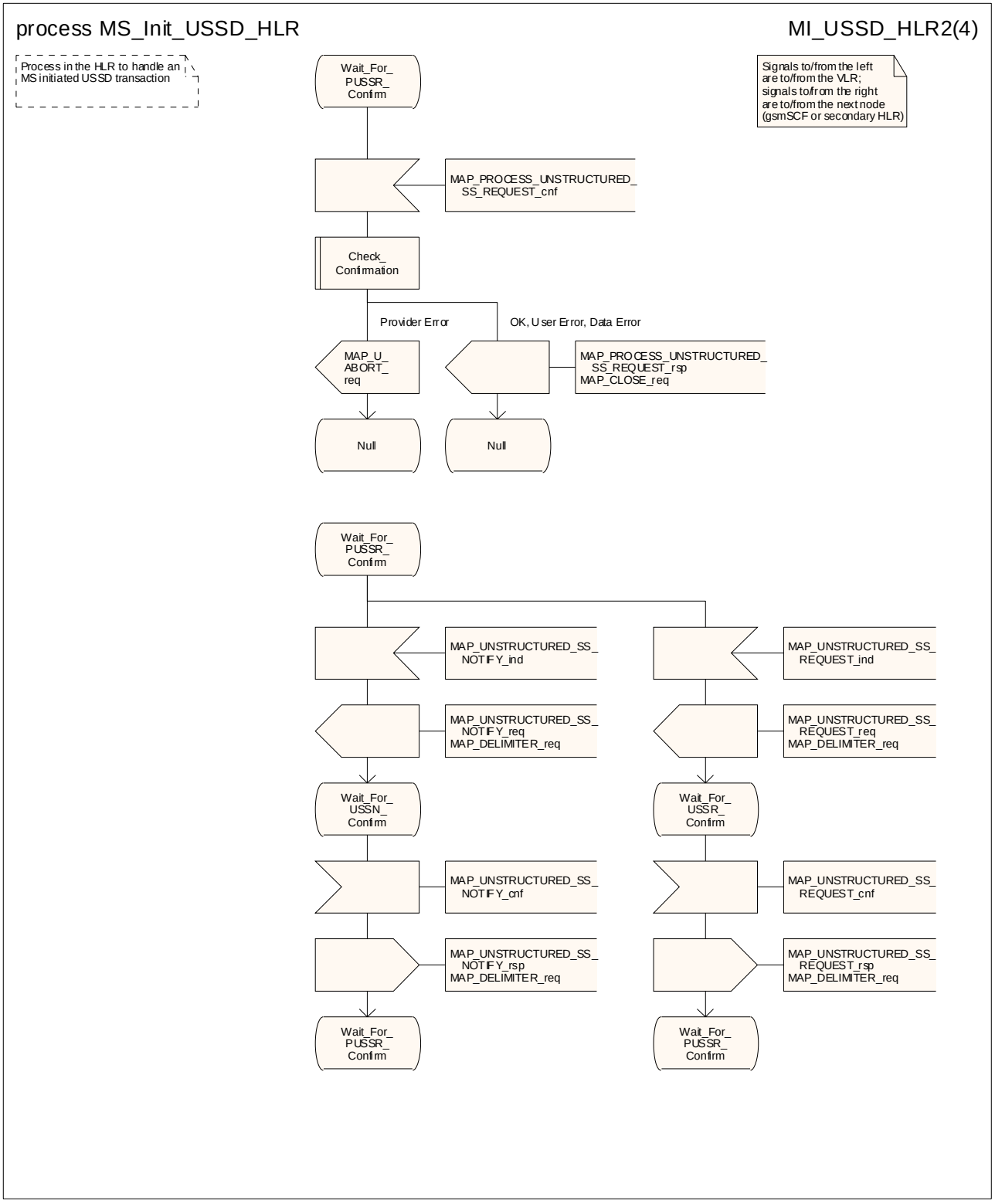
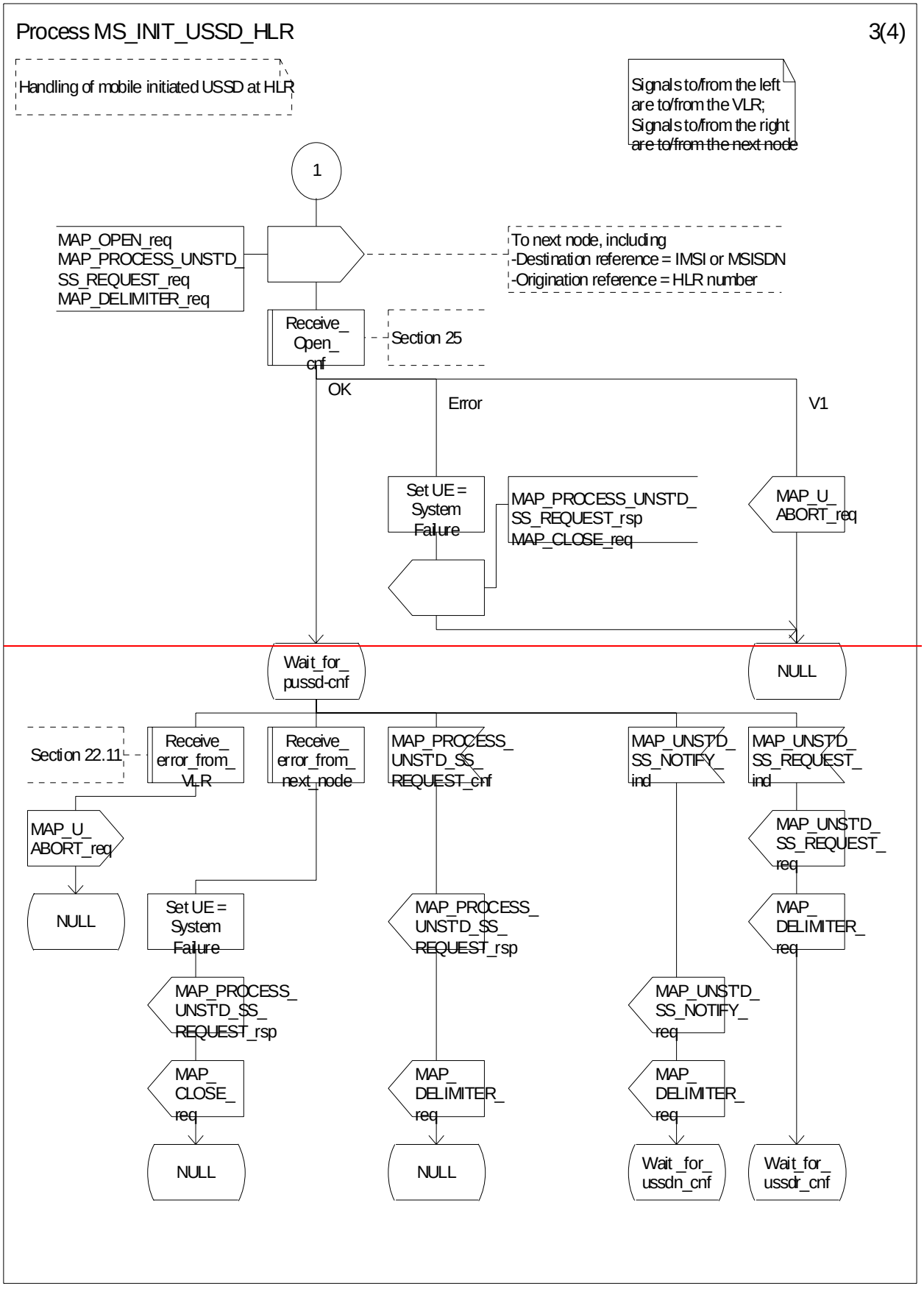


Figure 22.9.4/1 (sheet 2 of 4): Proces~~sdure~~ MS_Init_USSD_HLR


Process MS_INIT_USSD_HLR
3(4)
Handling of mobile initiated USSD at HLR
Signals to/from the left are to/from the VLR;
Signals to/from the right are to/from the next node
1
MAP_OPEN_req
MAP_PROCESS_UNST'D_SS_REQUEST_req
MAP_DELIMITER_req
To next node, including
-Destination reference = IMSI or MSISDN
-Origination reference = HLR number
Receive_Open_cnf
Section 25
OK
Error
V1
Set UE = System Failure
MAP_PROCESS_UNST'D_SS_REQUEST_rsp
MAP_CLOSE_req
MAP_U_ABORT_req
Wait_for_pussd-cnf
NULL
Section 22.11
Receive_error_from_VLR
Receive_error_from_next_node
MAP_PROCESS_UNST'D_SS_REQUEST_cnf
MAP_UNST'D_SS_NOTIFY_ind
MAP_UNST'D_SS_REQUEST_ind
MAP_U_ABORT_req
MAP_UNST'D_SS_REQUEST_req
NULL
Set UE = System Failure
MAP_PROCESS_UNST'D_SS_REQUEST_rsp
MAP_DELIMITER_req
MAP_PROCESS_UNST'D_SS_REQUEST_rsp
MAP_UNST'D_SS_NOTIFY_req
MAP_CLOSE_req
MAP_DELIMITER_req
MAP_DELIMITER_req
NULL
NULL
Wait_for_ussdn_cnf
Wait_for_ussdr_cnf

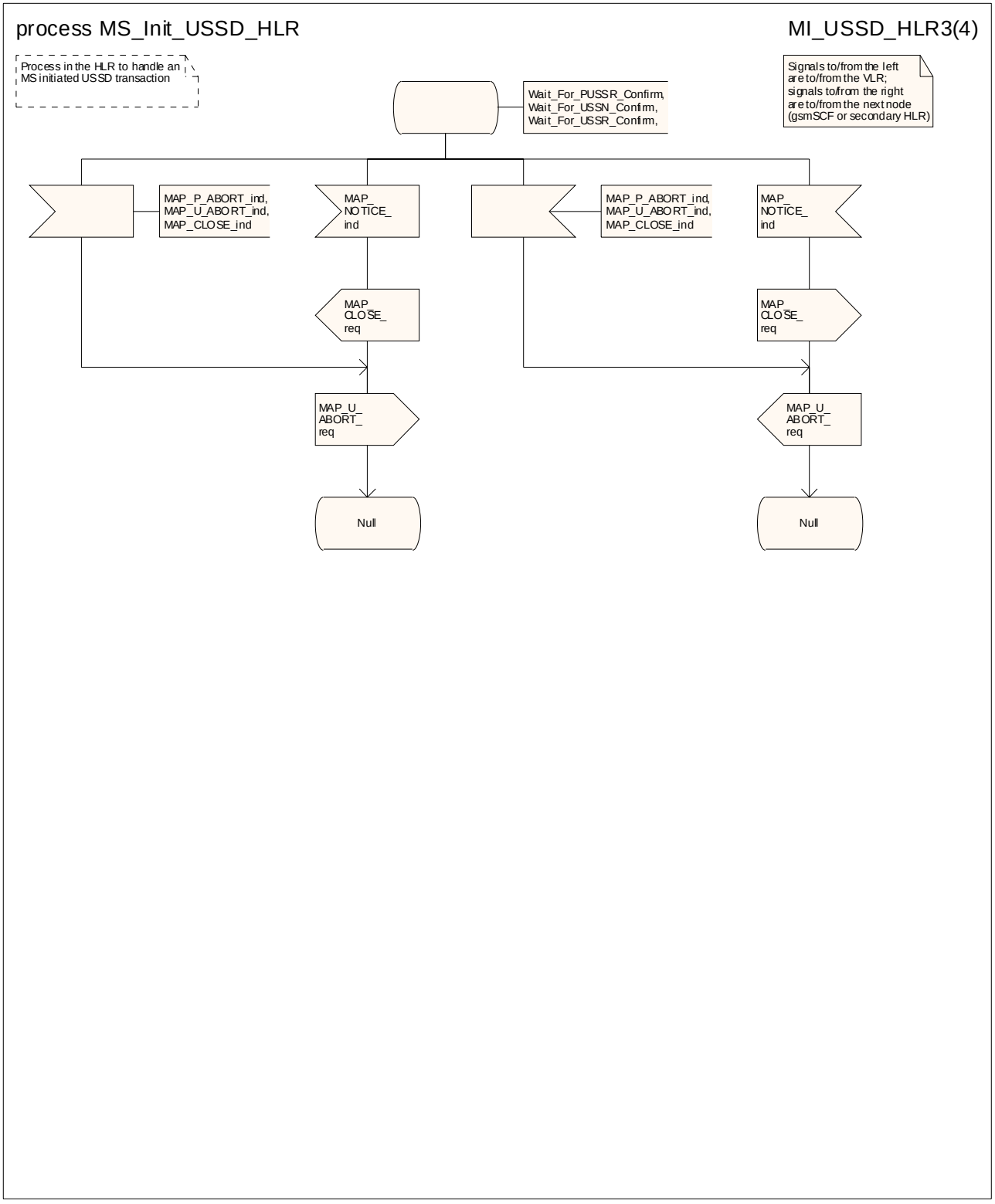
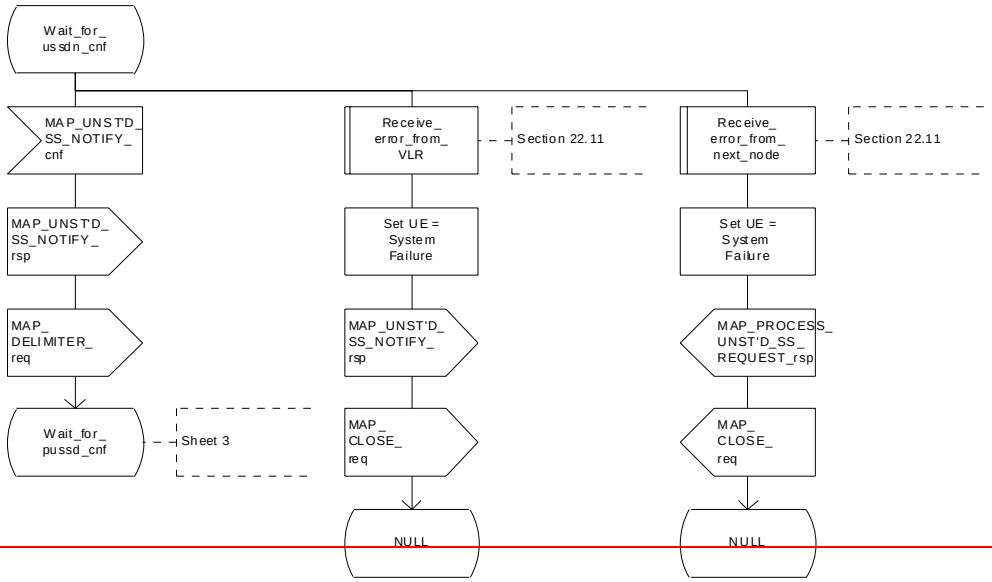
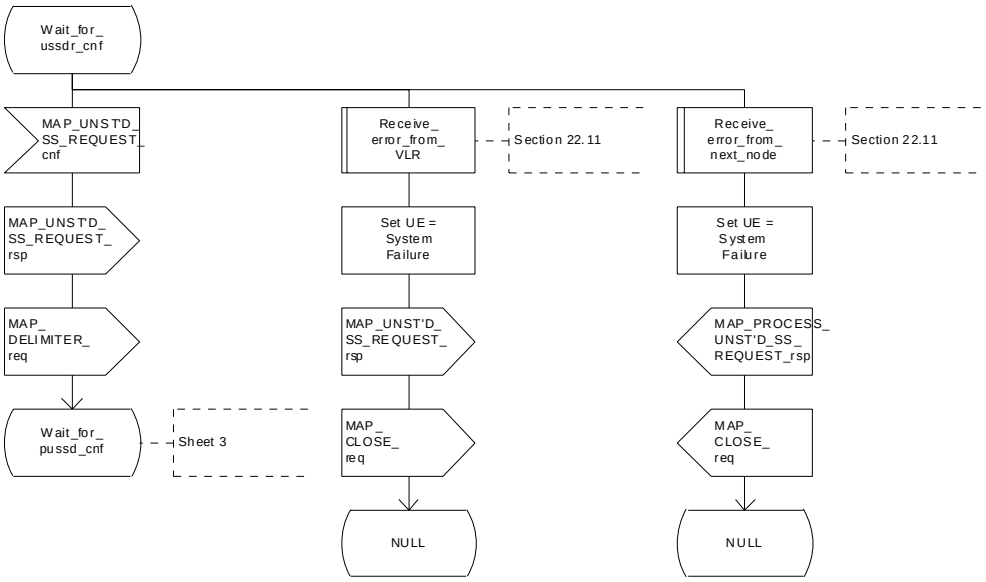


Figure 22.9.4/1 (sheet 3 of 4): Proces~~sdure~~ MS_Init_USSD_HLR

Process MS_INIT_USSD_HLR 22.9.4_1.4(4)

Figure 22.9.4/1: Handling of mobile intiated USSD at HLR.





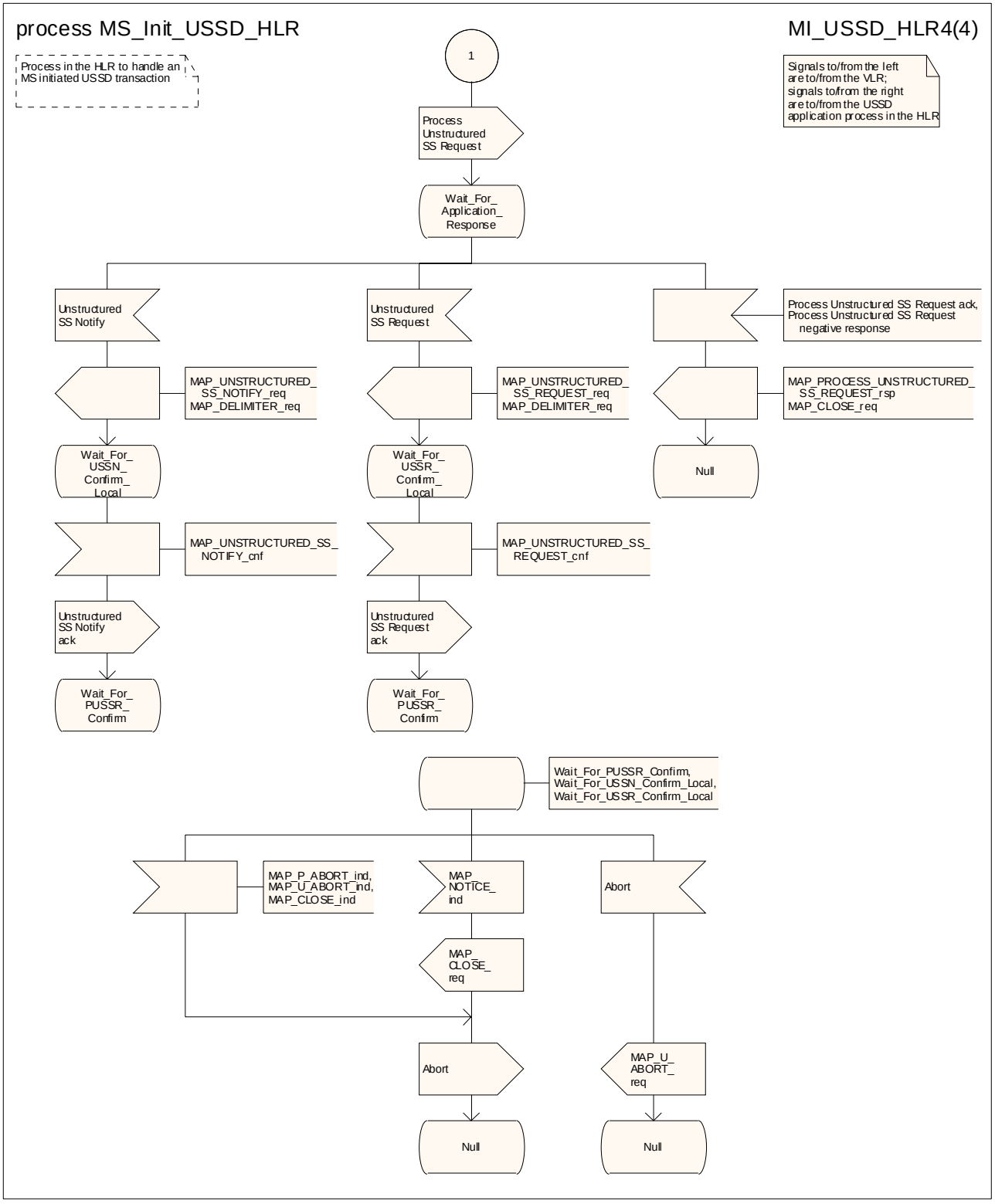
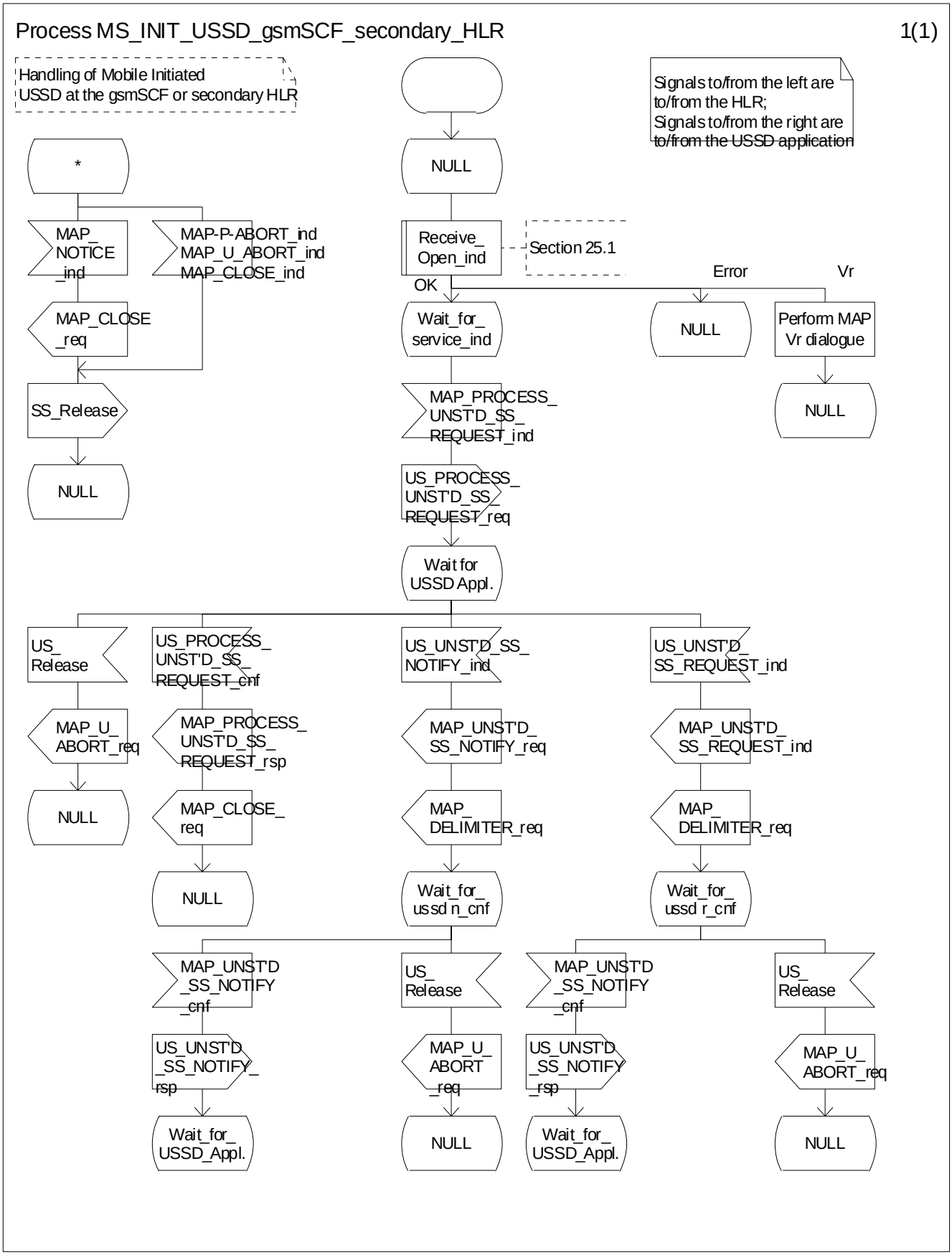


Figure 22.9.4/1 (sheet 4 of 4): Proces~~sdure~~ MS_Init_USSD_HLR


Process MS_INIT_USSD_gsmSCF_secondary_HLR
1(1)
Handling of Mobile Initiated USSD at the gsmSCF or secondary HLR
Signals to/from the left are to/from the HLR; Signals to/from the right are to/from the USSD application
*
NULL
MAP_ NOTICE _ind
MAP-P-ABORT_ind
MAP_U_ABORT_ind
MAP_CLOSE_ind
Receive_ Open_ind
Section 25.1
OK
Error
Vr
MAP_CLOSE _req
Wait_for_ service_ind
NULL
Perform MAP Vr dialogue
SS_Release
MAP_PROCESS_ UNST'D_SS_ REQUEST_ind
NULL
US_PROCESS_ UNST'D_SS_ REQUEST_req
Wait for USSD Appl.
US_ Release
US_PROCESS_ UNST'D_SS_ REQUEST_cnf
US_UNST'D_SS_ NOTIFY_ind
US_UNST'D_ SS_REQUEST_ind
MAP_U_ ABORT_req
MAP_PROCESS_ UNST'D_SS_ REQUEST_rsp
MAP_UNST'D_ SS_NOTIFY_req
MAP_UNST'D_ SS_REQUEST_ind
NULL
MAP_CLOSE_ req
MAP_ DELIMITER_req
MAP_ DELIMITER_req
NULL
Wait_for_ ussd n_cnf
Wait_for_ ussd r_cnf
MAP_UNST'D _SS_NOTIFY _cnf
US_ Release
MAP_UNST'D _SS_NOTIFY _cnf
US_ Release
US_UNST'D _SS_NOTIFY_ rsp
MAP_U_ ABORT _req
US_UNST'D _SS_NOTIFY _rsp
MAP_U_ ABORT_req
Wait_for_ USSD_Appl.
NULL
Wait_for_ USSD_Appl.
NULL

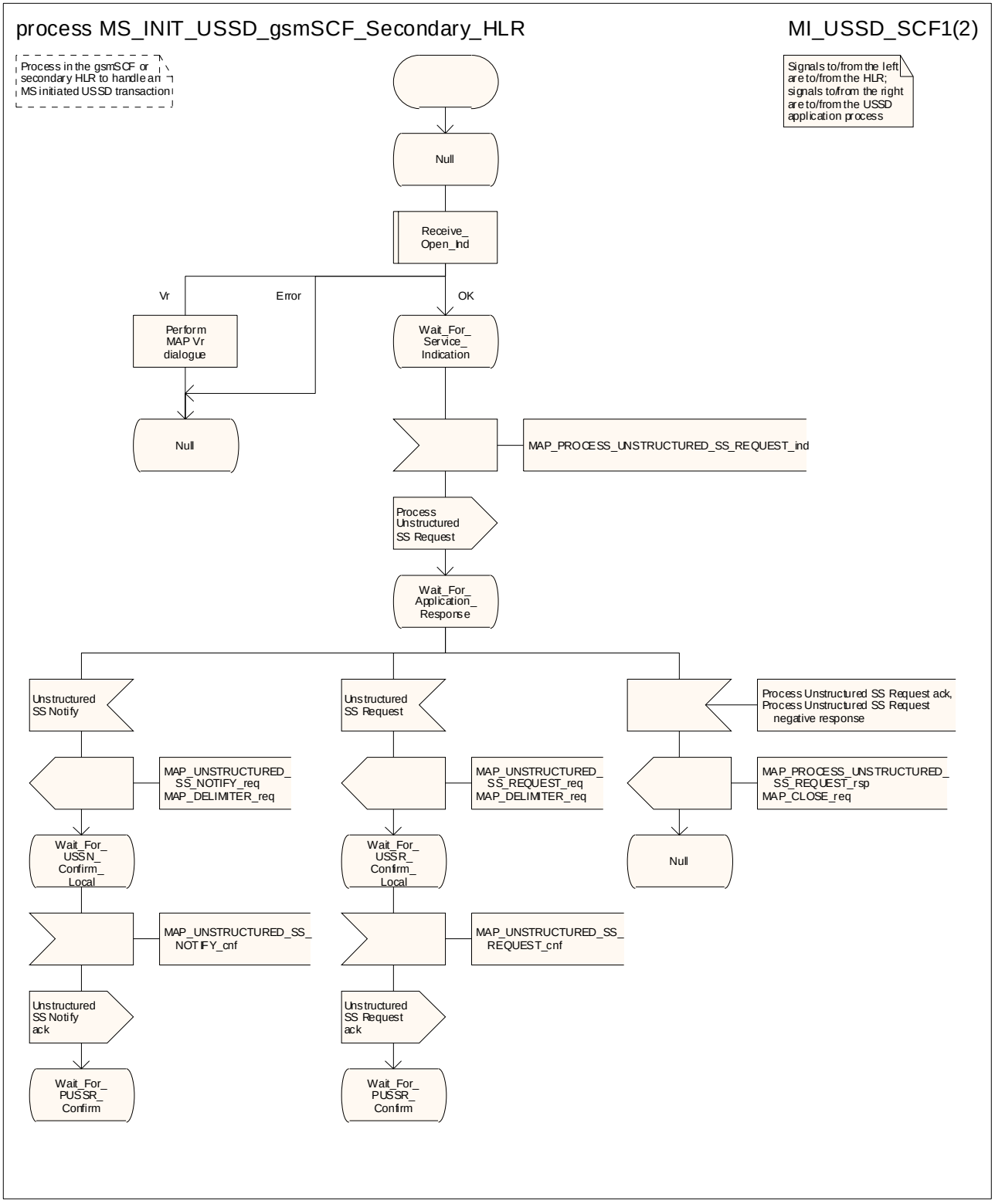


Figure 22.9.5/1 (sheet 1 of 2): Process MS_InitNIT_USSD_gsmSCF_sSecondary_HLR

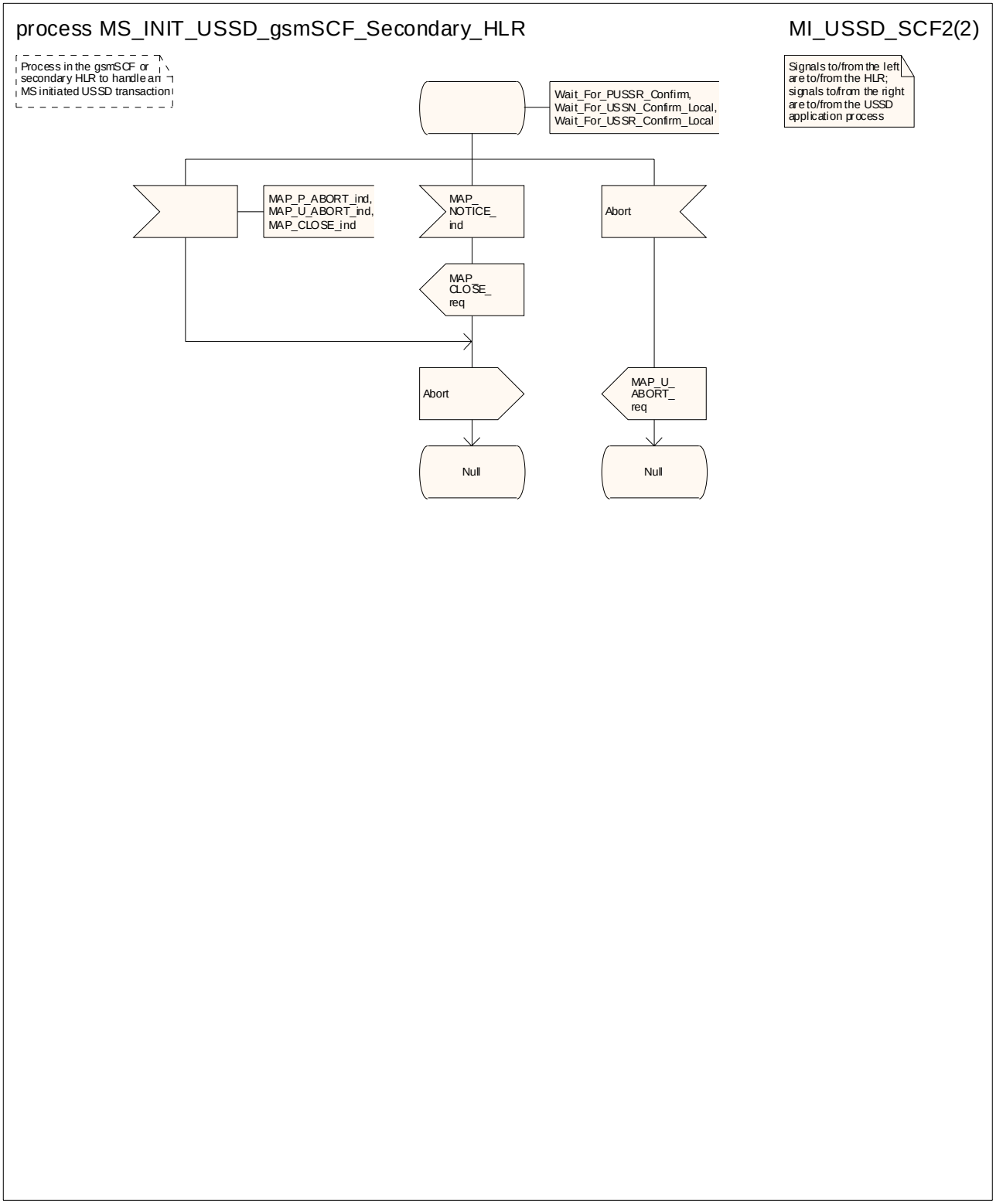


Figure 22.9.5/1 (sheet 2 of 2): Process MS_Init_USSD_gsmSCF_Secondary_HLR

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 3GPP TS 23.090 [34].

The following services may be used:

MAP_PAGE	(see ~~defined in~~ clauses 8 and 25);
MAP_SEARCH_FOR_MOBILE_SUBSCRIBER	(see ~~defined in~~ clauses 8 and 25);
MAP_PROCESS_ACCESS_REQUEST	(see ~~defined in~~ clauses 8 and 25);
MAP_AUTHENTICATE	(see ~~defined in~~ clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(see ~~defined in~~ clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_READY_FOR_SM	(see ~~defined in~~ clauses 12 and 25).

At least one of the following services ~~will~~ is 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 process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Receive_Open_Cnf	see subclause 25.1.2;
Page_MSC	see subclause 25.3.1;
Search_For_MS_MSC	see subclause 25.3.2;
Process_Access_Request_MSC	see subclause 25.4.1.

~~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 VLR.~~

~~In both cases the MSC will initiate a CM connection to the MS (using the page or search macros defined in clause 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 3GPP TS 29.011 [59].~~

~~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 process~~dure~~ in the MSC is shown in figure 22.10.2/1.

22.10.3 Procedure in the VLR

The MAP process invokes macros not defined in this clause; the definition 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_Indication	see subclause 25.2.1;
Check_Confirmation	see subclause 25.2.2.

~~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 proces~~sdure~~ 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~~the MSC opens a dialogue ~~to~~ with the VLR. This dialogue ~~will automatically~~ leads to the VLR performing page and search using the macro Start_USSD_VLR.

Macro Start_USSD_VLR

The macro invokes macros not defined in this clause; the definition of these macros can be found as follows:

Check_Confirmation	see subclause 25.2.1;
Process_Access_Request_VLR	see subclause 25.4.2.

~~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 clause 25.4 will be used to handle the CM connection establishment.~~

The macro is shown in figure 22.10.3/2.

22.10.4 Procedure in the HLR

The MAP process invokes macros not defined in this clause; the definition 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_Indication	see subclause 25.2.1;
Check_Confirmation	see subclause 25.2.2.

~~The procedure may be invoked either by a gsmSCF, a secondary HLR or by a USSD application local to the primary HLR. It may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.~~

~~In both cases the primary HLR will first check whether the MS is reachable .~~

~~If the MS is reachable, the primary HLR will initiate a MAP dialogue with the VLR and send the message received from the gsmSCF or secondary HLR or USSD application to the VLR.~~

~~Following transfer of the message the primary HLR will wait for a confirmation from the VLR. This will be sent to the gsmSCF or secondary HLR or USSD application as appropriate.~~

~~Following this, the primary 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 or secondary HLR shall be aborted, as shown in the diagram.~~

~~**Message Originated by gsmSCF or secondary HLR**~~

~~If the message is originated by the gsmSCF or a secondary HLR then the primary HLR shall transfer the message transparently to the VLR.~~

~~The primary HLR may subsequently receive one or more MAP_UNSTRUCTURED_SS_REQUEST_ind or MAP_UNSTRUCTURED_SS_NOTIFY_ind indications from the gsmSCF or secondary HLR. These shall be sent transparently to the VLR. When a confirmation is received from the VLR this shall be returned to the next node as appropriate.~~

~~When the primary HLR receives a MAP_CLOSE_ind from the gsmSCF or secondary HLR then it shall pass this to the VLR and close the MAP dialogue.~~

The proces~~sdure~~ in the primary HLR is shown in figures 22.10.4/1 and 22.10.4/2.

22.10.5 Procedure in the gsmSCF ~~and~~ or secondary HLR

The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

~~The procedure is invoked by an USSD application local to the gsmSCF/secondary HLR. It may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.~~

~~In both cases the gsmSCF will initiate a MAP dialogue with the HLR and send the message received from the USSD application to the HLR.~~

~~Following transfer of the message the gsmSCF will wait for a confirmation from the HLR. This will be relayed to the USSD application..~~

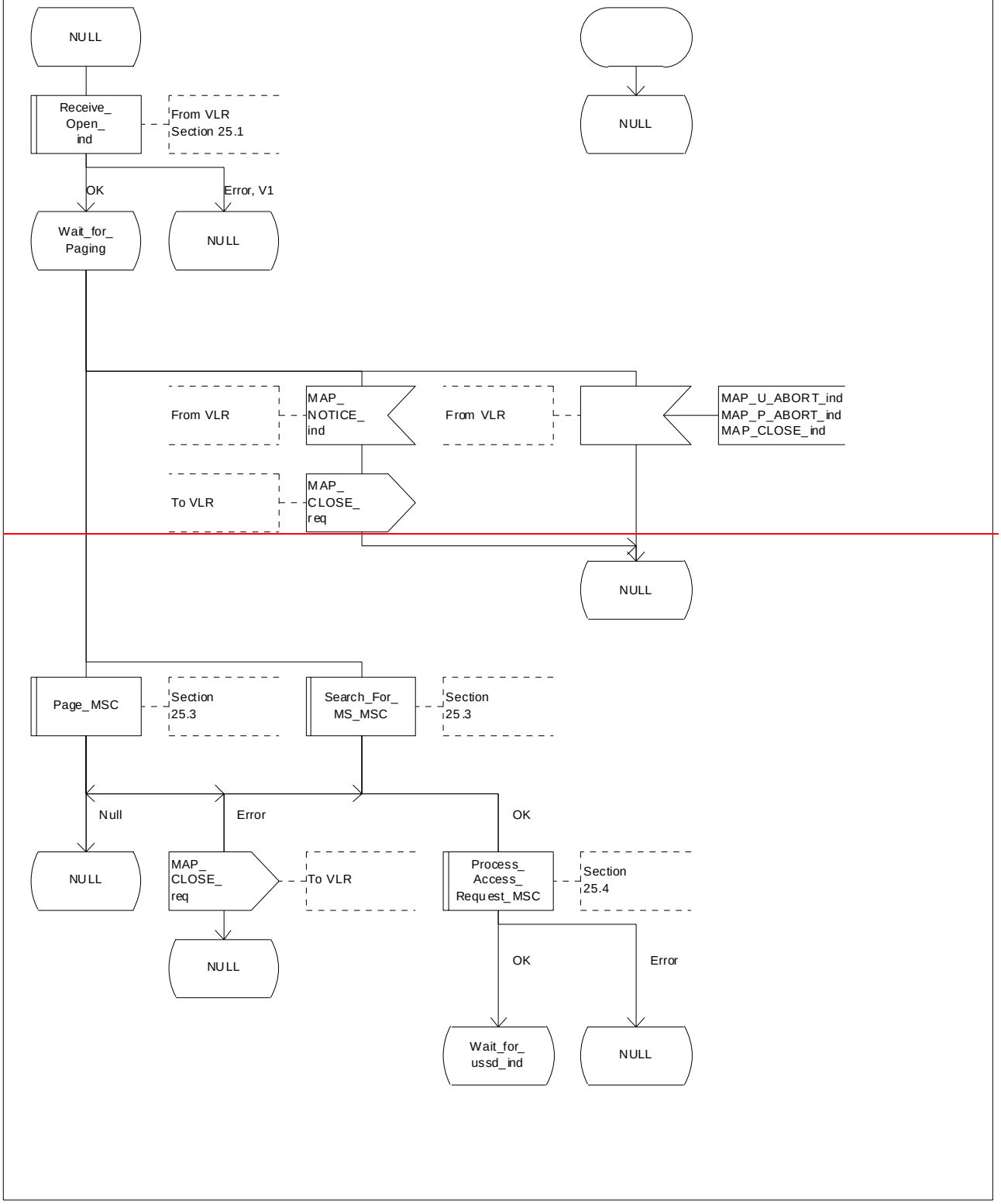
~~Following this, the gsmSCF/secondary HLR may receive further UNSTRUCTURED_SS_REQUEST or UNSTRUCTURED_SS_NOTIFY requests, or may receive a Release from the USSD application.~~

~~In the event of an error, the MAP dialogue with the HLR shall be released as shown in the diagram.~~

The proces~~sdure~~ in the gsmSCF and secondary HLR ~~-~~is shown in figure 22.10.5/1.

Process NW_INIT_USSD_MSC 22.10.2_1.1(4)

Figure 22.10.2/1: Handling of network initiated USSD in MSC



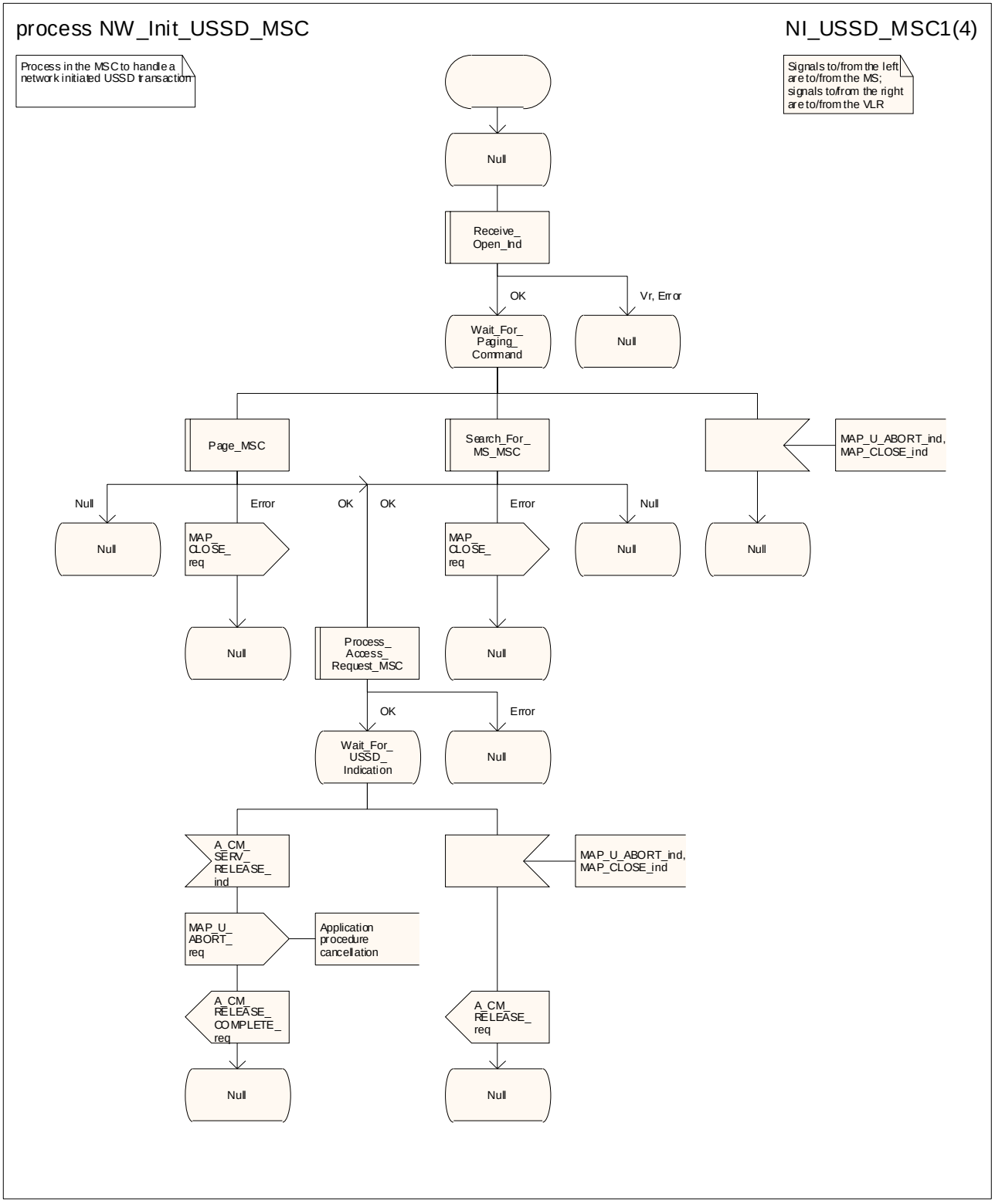
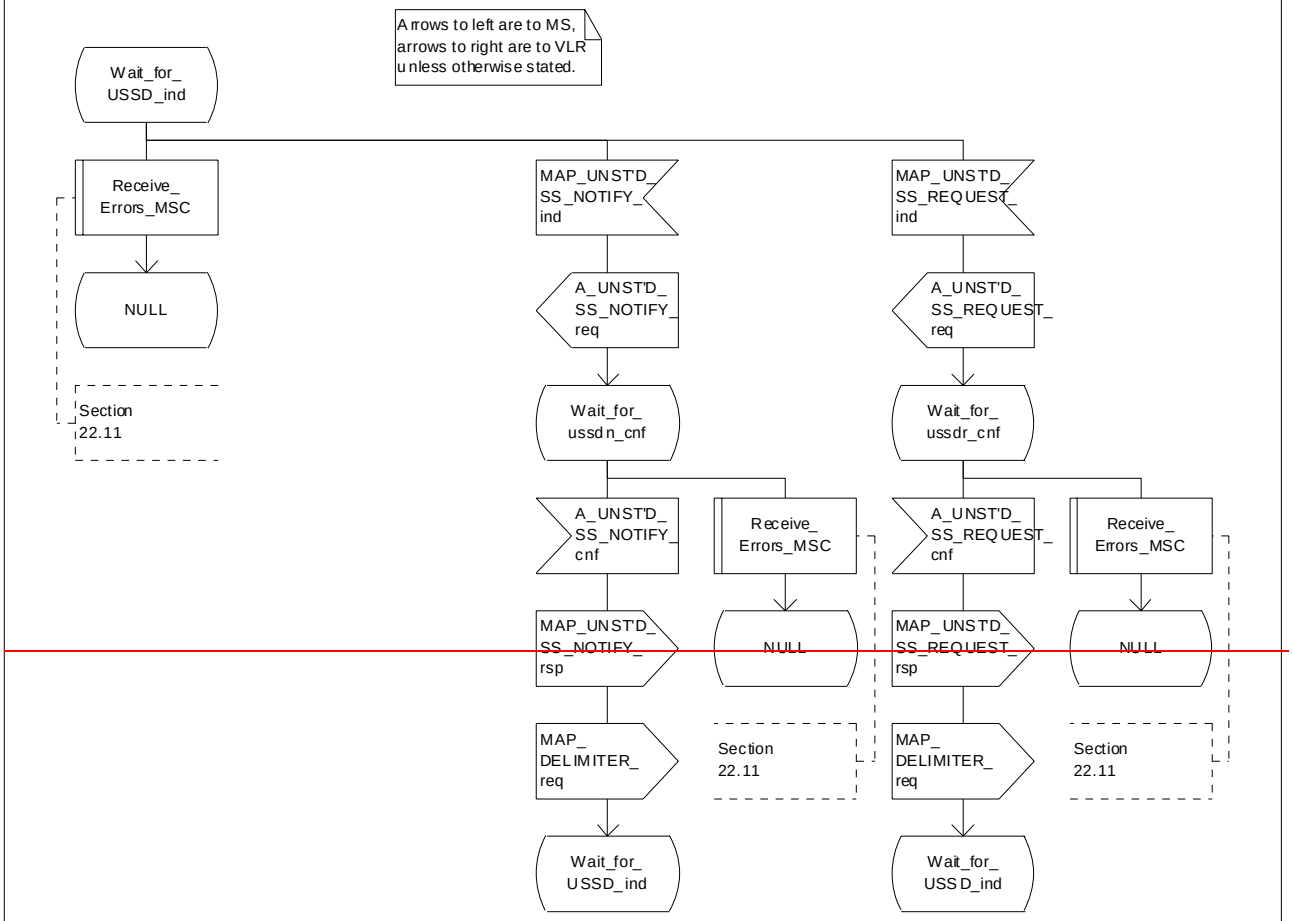


Figure 22.10.2/1 (sheet 1 of 4): Proces~~dure~~ NW_Init_USSD_MSC

Process NW_INIT_USSD_MSC 22.10.2_1.2(4)

Figure 22.10.2/1: Handling of network initiated USSD in MSC



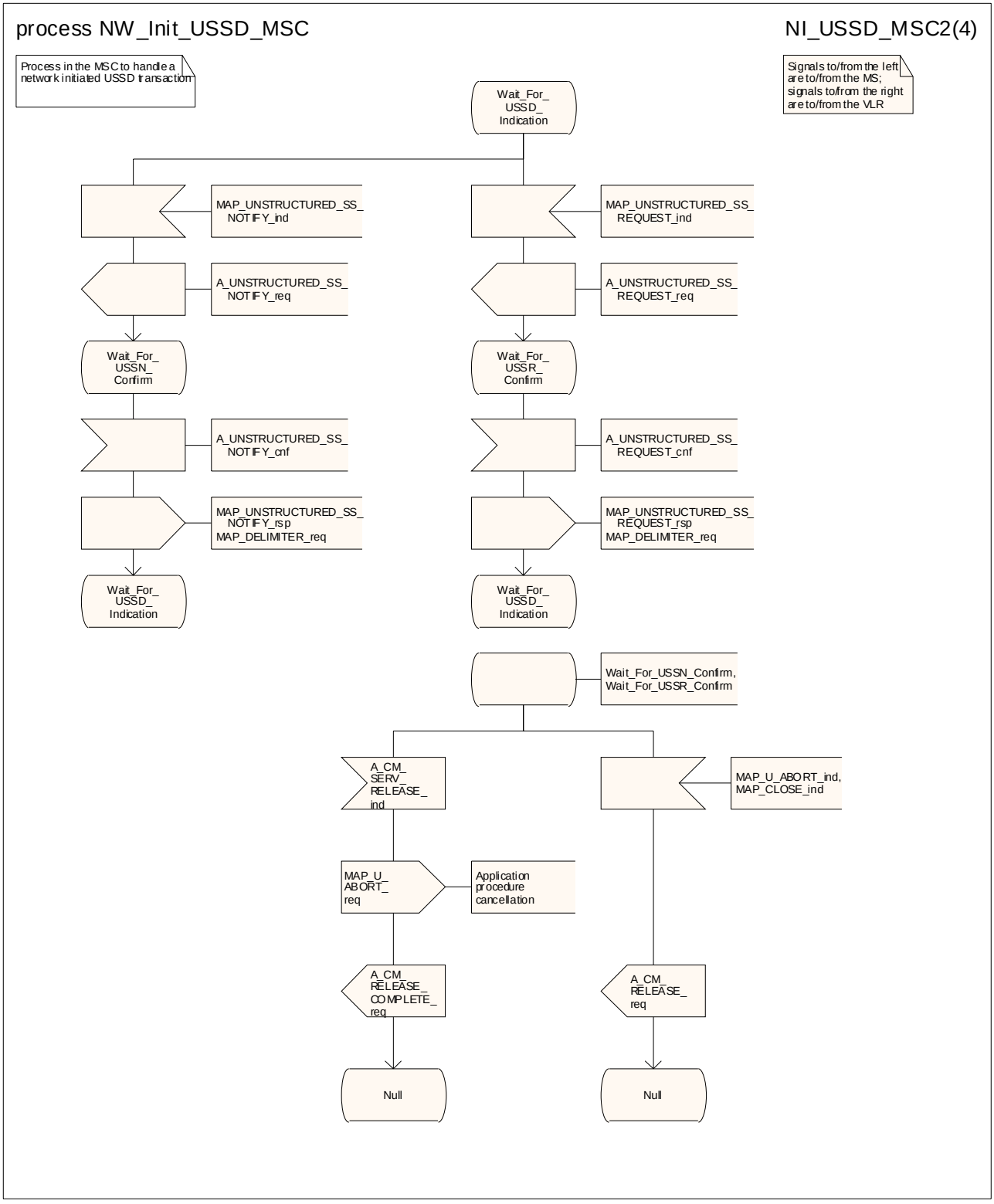
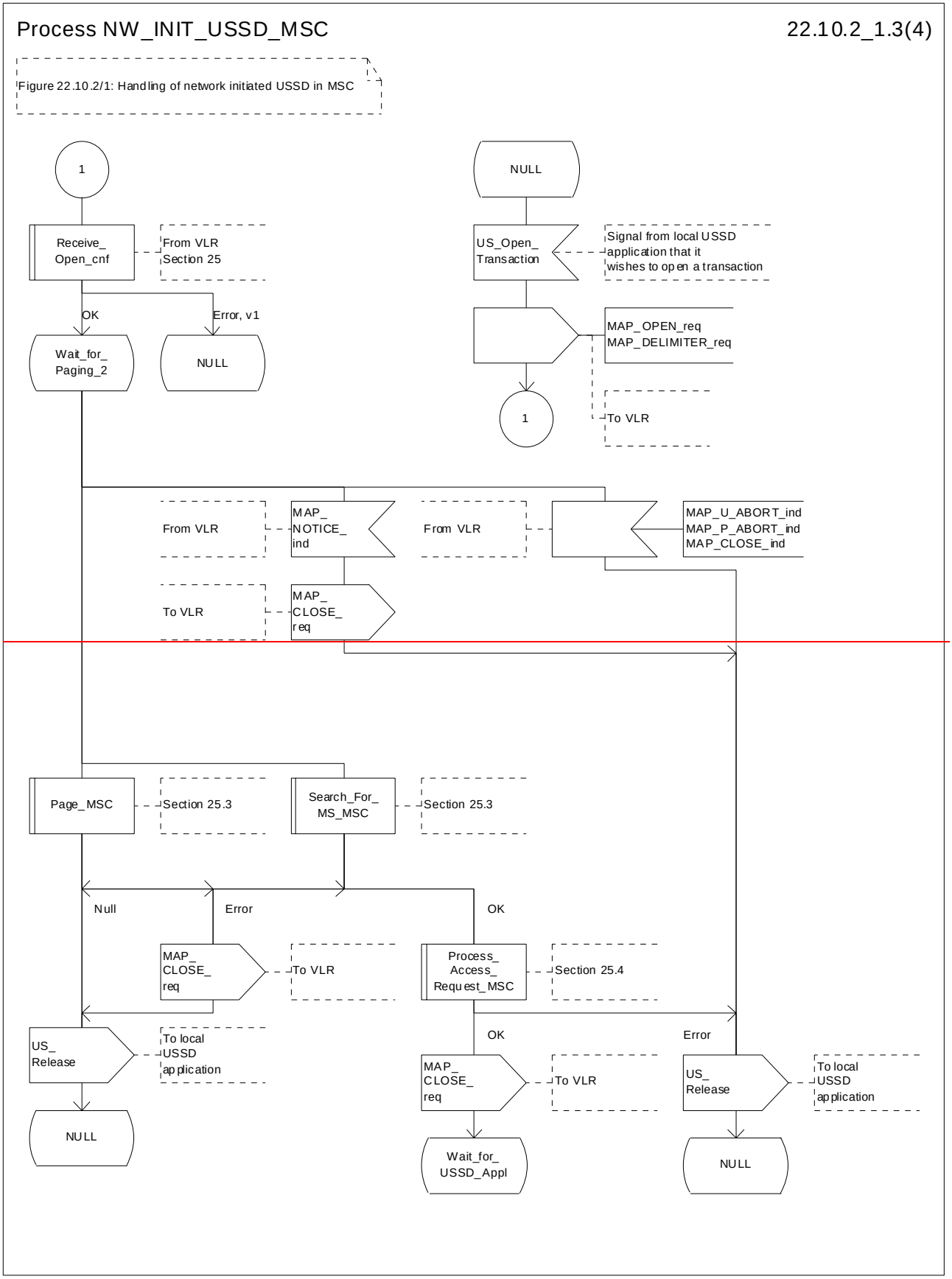


Figure 22.10.2/1 (sheet 2 of 4): Proces~~sdure~~ NW_Init_USSD_MSC


Process NW_INIT_USSD_MSC
22.10.2_1.3(4)
Figure 22.10.2/1: Handling of network initiated USSD in MSC
1
Receive_ Open_cnf
From VLR Section 25
OK
Error, v1
Wait_for_ Paging_2
NULL
NULL
US_Open_ Transaction
Signal from local USSD application that it wishes to open a transaction
MAP_OPEN_req
MAP_DELIMITER_req
1
To VLR
From VLR
MAP_ NOTICE_ ind
From VLR
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
To VLR
MAP_ CLOSE_ req
Page_MSC
Section 25.3
Search_For_ MS_MSC
Section 25.3
Null
Error
OK
MAP_ CLOSE_ req
To VLR
Process_ Access_ Request_MSC
Section 25.4
US_ Release
To local USSD application
OK
Error
MAP_ CLOSE_ req
To VLR
US_ Release
To local USSD application
NULL
Wait_for_ USSD_Appl
NULL

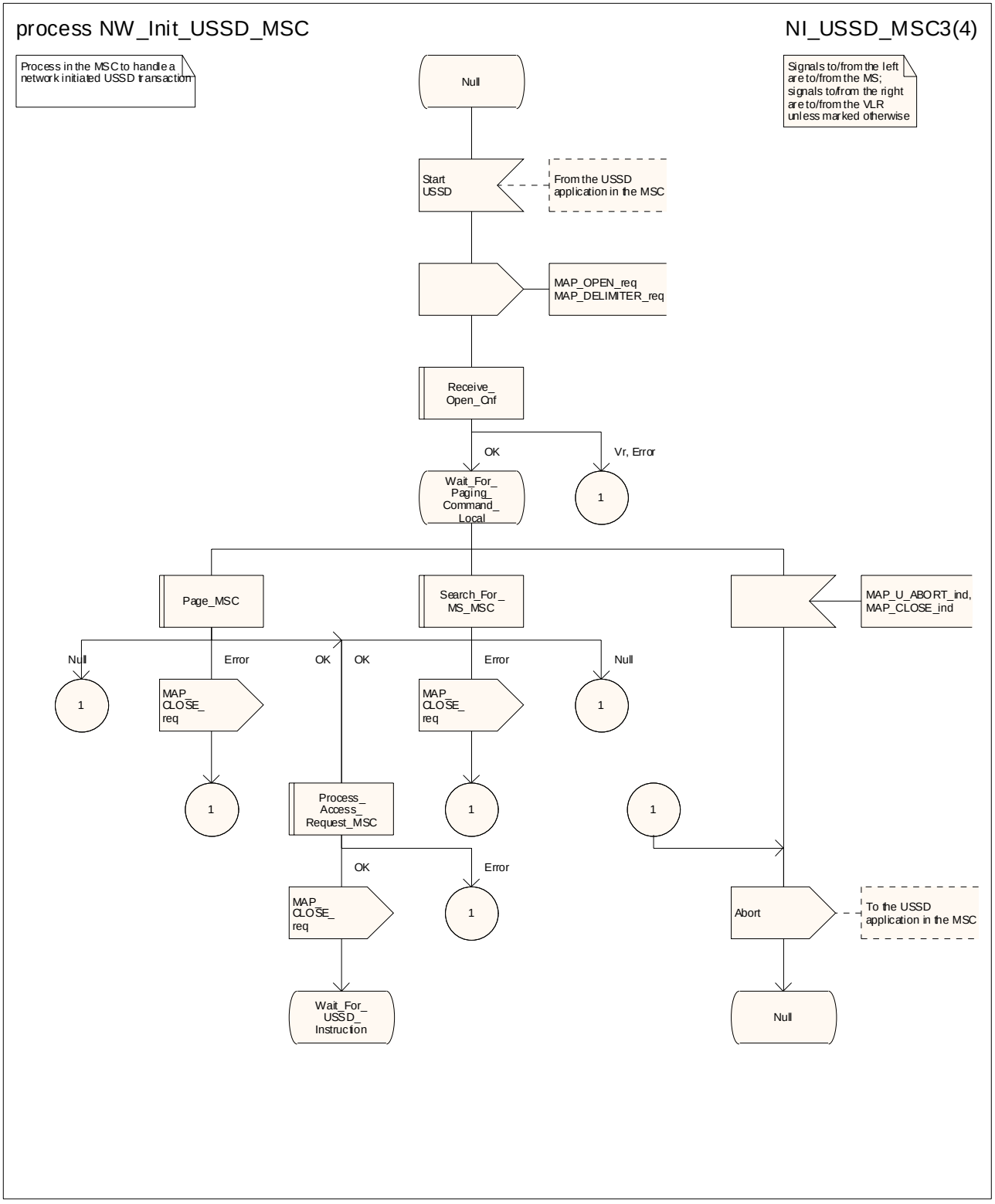
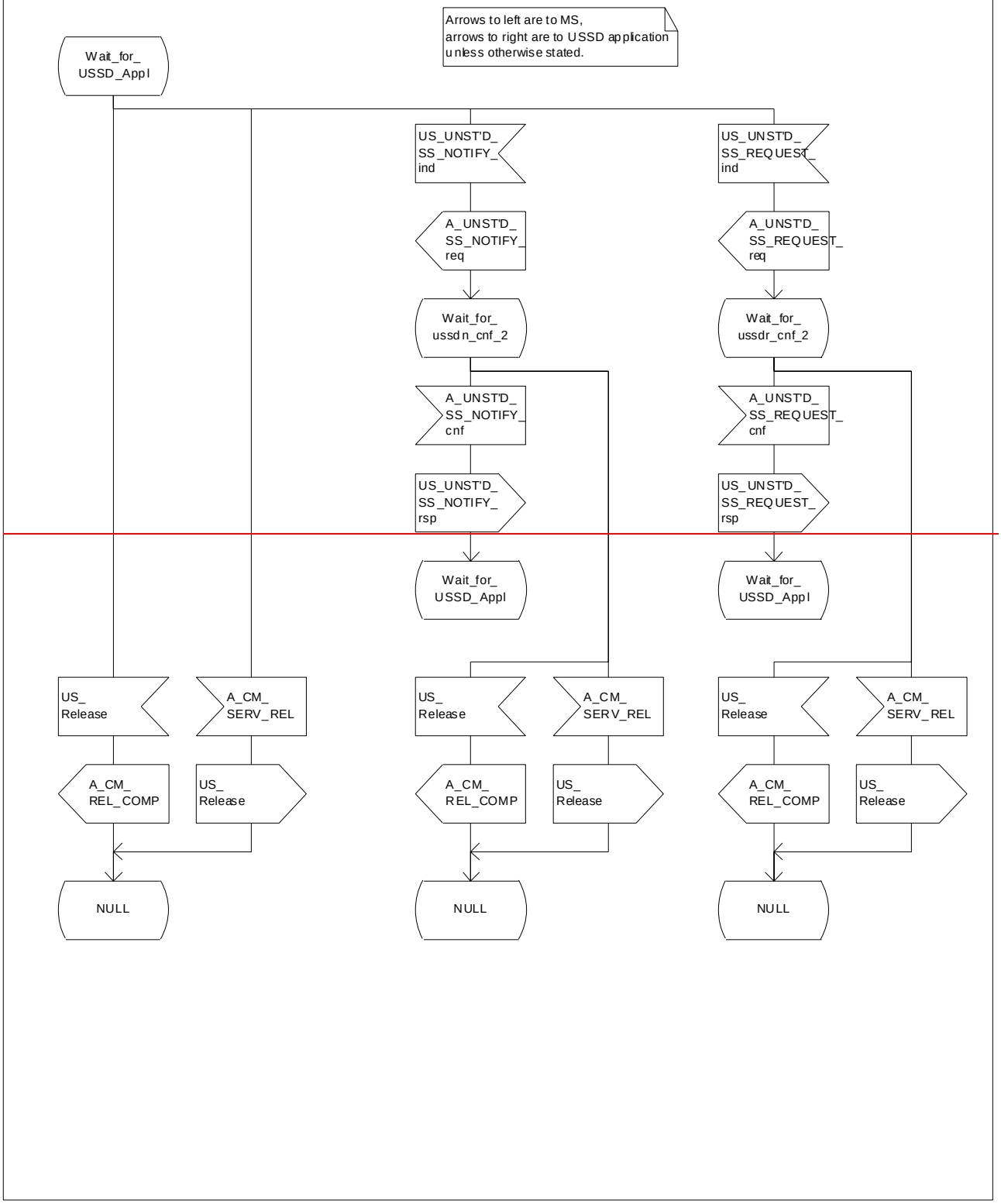


Figure 22.10.2/1 (sheet 3 of 4): Proces~~sdure~~ NW_Init_USSD_MSC

Process NW_INIT_USSD_MSC 22.10.2_1.4(4)

Figure 22.10.2/1: Handling of network initiated USSD in MSC



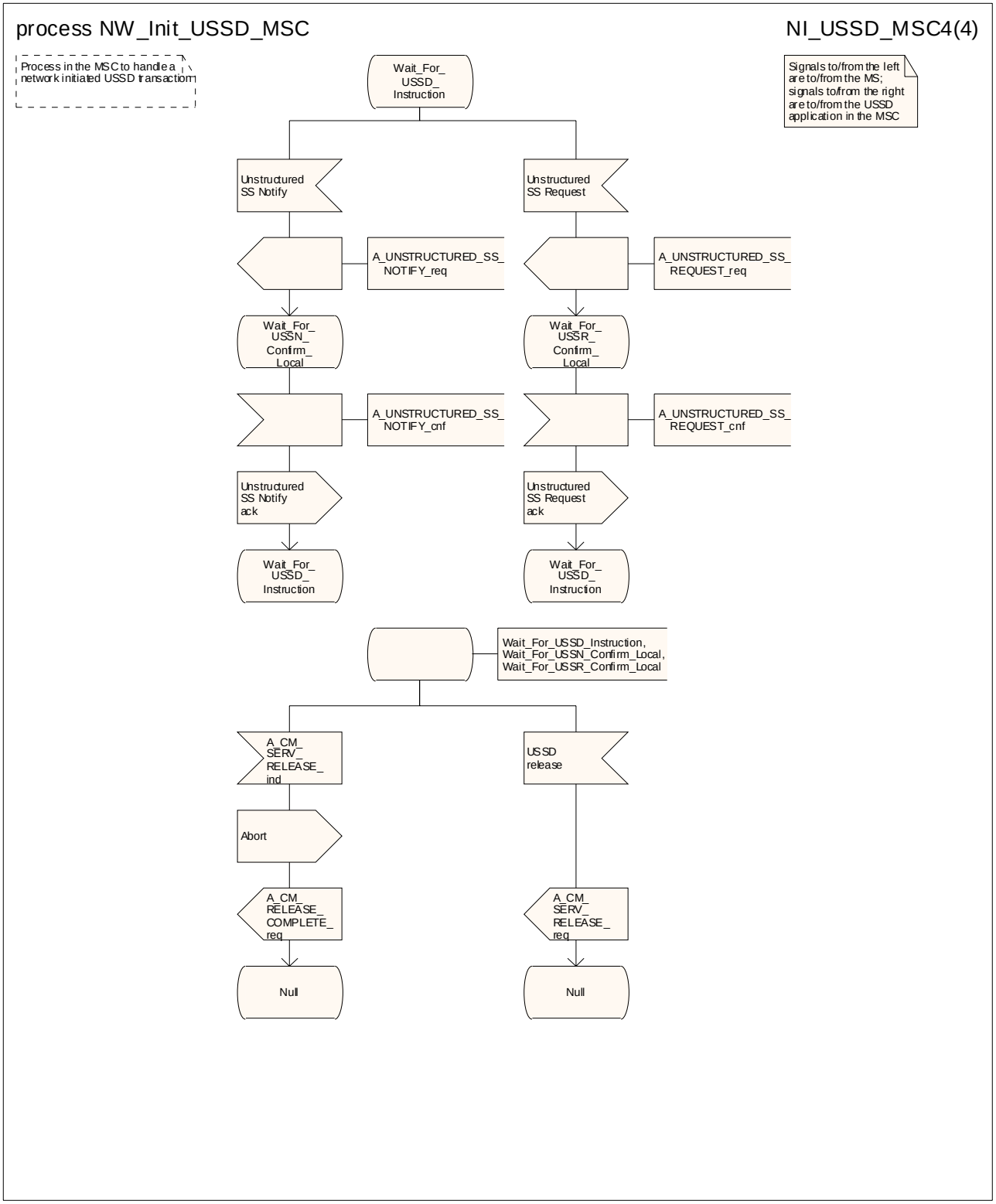
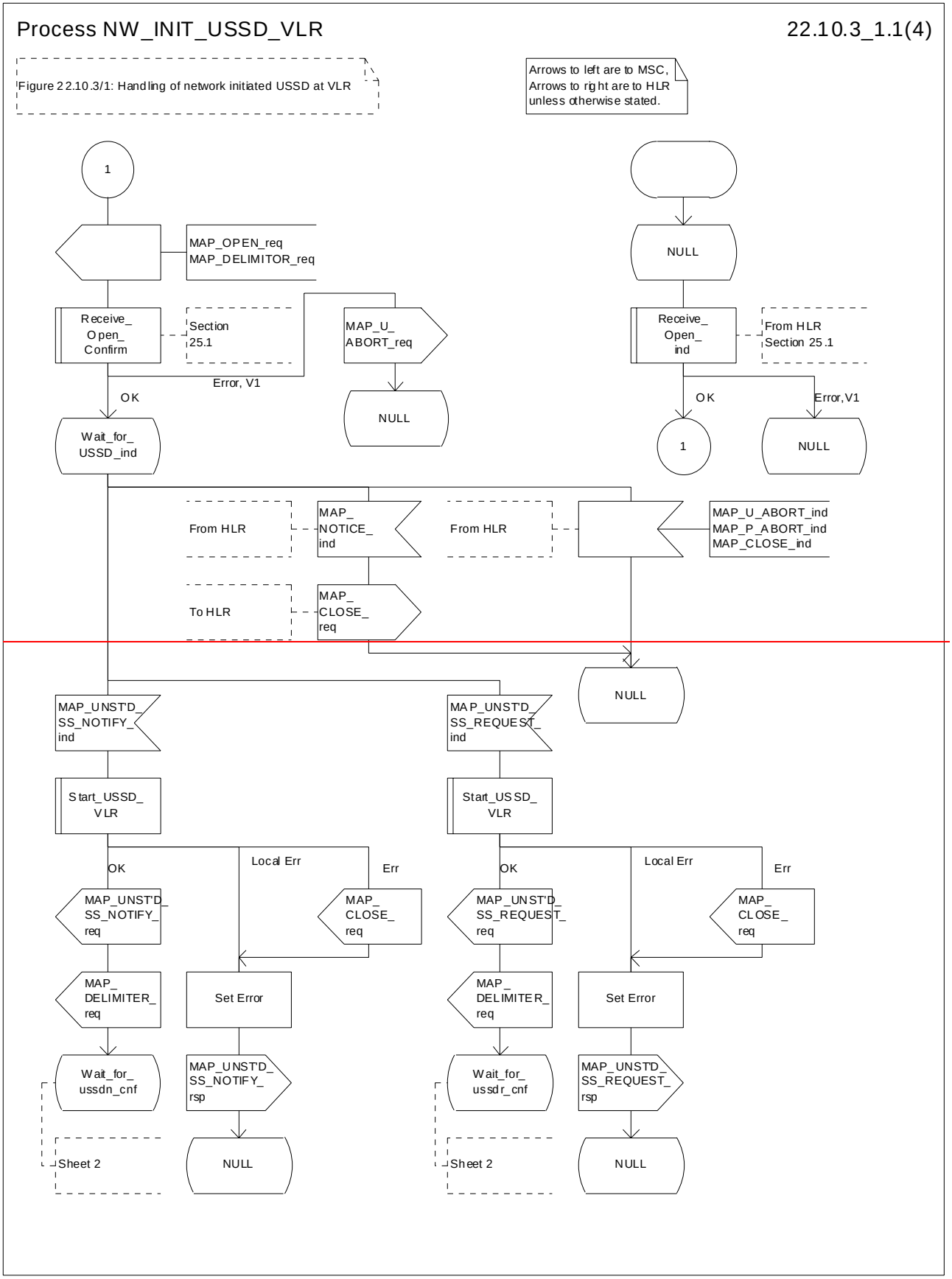


Figure 22.10.2/1 (sheet 4 of 4): Proces~~sdure~~ NW_Init_USSD_MSC


Process NW_INIT_USSD_VLR
22.10.3_1.1(4)
Figure 22.10.3/1: Handling of network initiated USSD at VLR
Arrows to left are to MSC, Arrows to right are to HLR unless otherwise stated.
1
MAP_OPEN_req
MAP_DELIMITOR_req
Receive_ Open_ Confirm
Section 25.1
MAP_U_ ABORT_req
Error, V1
OK
NULL
Wait_for_ USSD_ind
NULL
Receive_ Open_ ind
From HLR Section 25.1
OK
Error,V1
1
NULL
From HLR
MAP_ NOTICE_ ind
From HLR
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
To HLR
MAP_ CLOSE_ req
NULL
MAP_UNST'D_ SS_NOTIFY_ ind
Start_USSD_ VLR
OK
Local Err
Err
MAP_UNST'D_ SS_NOTIFY_ req
MAP_ CLOSE_ req
MAP_ DELIMITER_ req
Set Error
Wait_for_ ussdn_cnf
MAP_UNST'D_ SS_NOTIFY_ rsp
Sheet 2
NULL
MAP_UNST'D_ SS_REQUEST_ ind
Start_USSD_ VLR
OK
Local Err
Err
MAP_UNST'D_ SS_REQUEST_ req
MAP_ CLOSE_ req
MAP_ DELIMITER_ req
Set Error
Wait_for_ ussdr_cnf
MAP_UNST'D_ SS_REQUEST_ rsp
Sheet 2
NULL

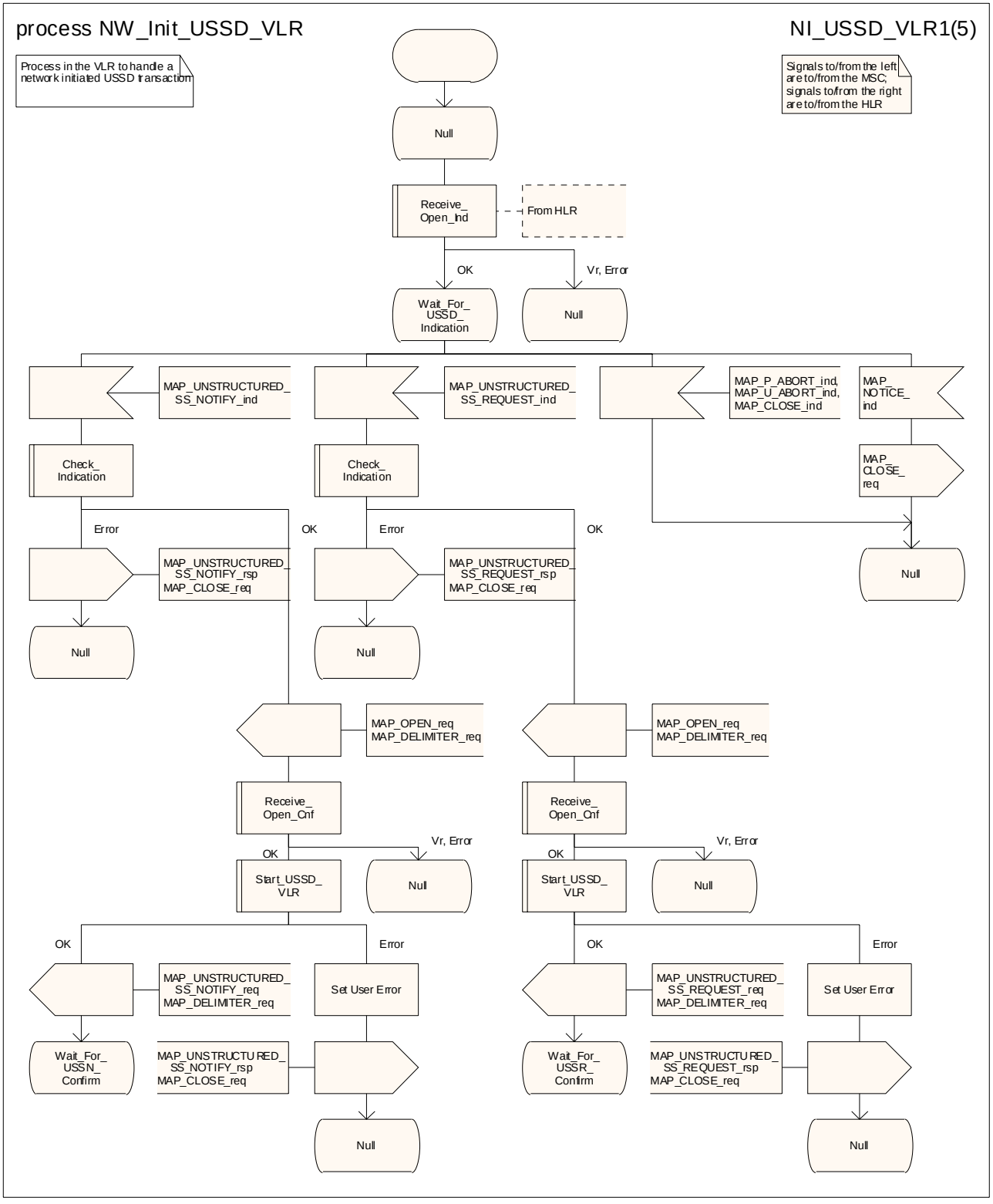
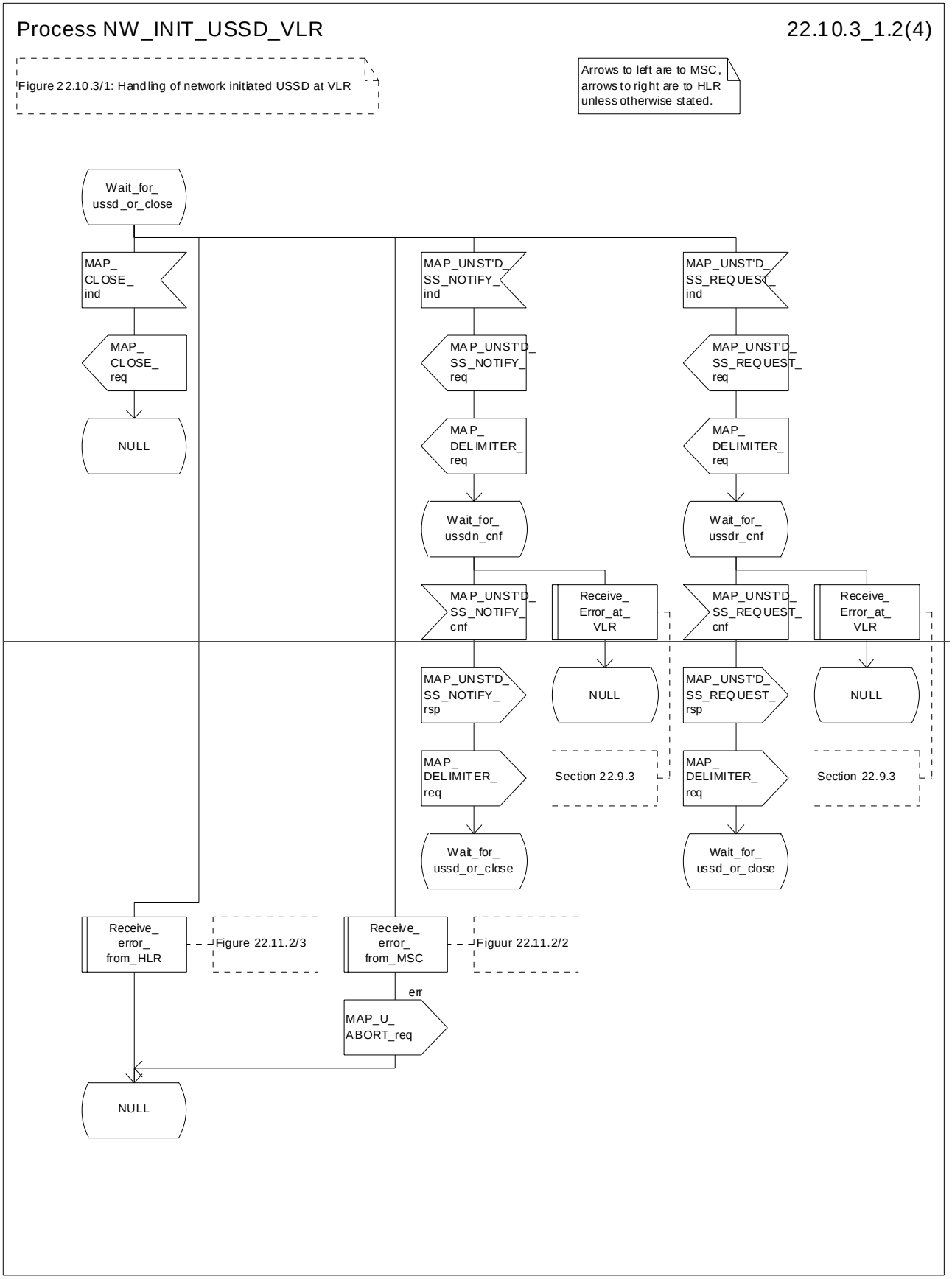


Figure 22.10.3/1 (sheet 1 of 54): Processdure NW_Init_USSD_VLR


Process NW_INIT_USSD_VLR
22.10.3_1.2(4)
Figure 22.10.3/1: Handling of network initiated USSD at VLR
Arrows to left are to MSC, arrows to right are to HLR unless otherwise stated.
Wait_for_ ussd_or_close
MAP_ CLOSE_ ind
MAP_ CLOSE_ req
NULL
MAP_UNST'D_ SS_NOTIFY_ ind
MAP_UNST'D_ SS_NOTIFY_ req
MAP_ DELIMITER_ req
Wait_for_ ussdn_cnf
MAP_UNST'D_ SS_NOTIFY_ cnf
Receive_ Error_at_ VLR
MAP_UNST'D_ SS_NOTIFY_ rsp
NULL
MAP_ DELIMITER_ req
Section 22.9.3
Wait_for_ ussd_or_close
MAP_UNST'D_ SS_REQUEST_ ind
MAP_UNST'D_ SS_REQUEST_ req
MAP_ DELIMITER_ req
Wait_for_ ussdr_cnf
MAP_UNST'D_ SS_REQUEST_ cnf
Receive_ Error_at_ VLR
MAP_UNST'D_ SS_REQUEST_ rsp
NULL
MAP_ DELIMITER_ req
Section 22.9.3
Wait_for_ ussd_or_close
Receive_ error_ from_HLR
Figure 22.11.2/3
Receive_ error_ from_MSC
Figuur 22.11.2/2
err
MAP_U_ ABORT_req
NULL

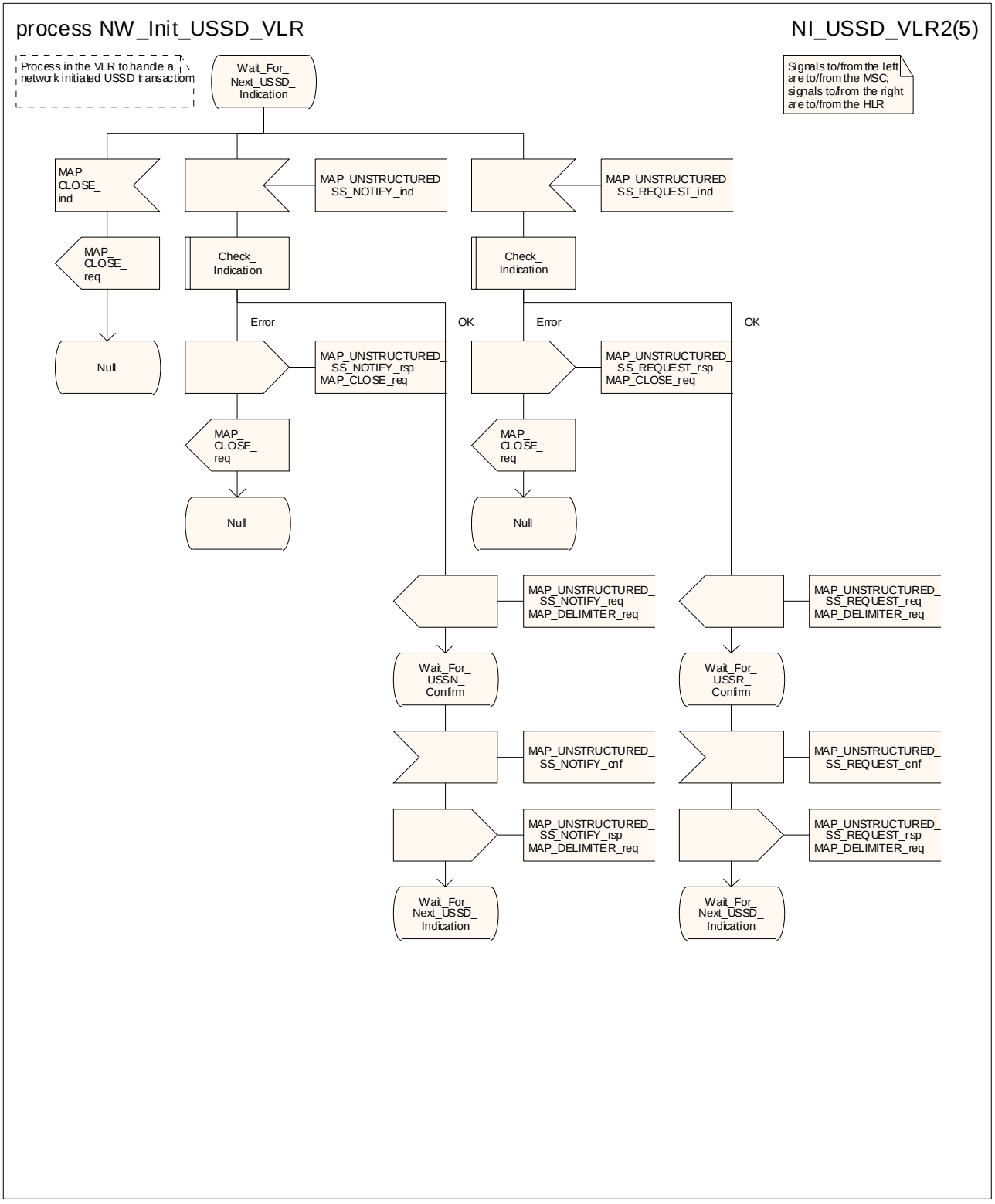
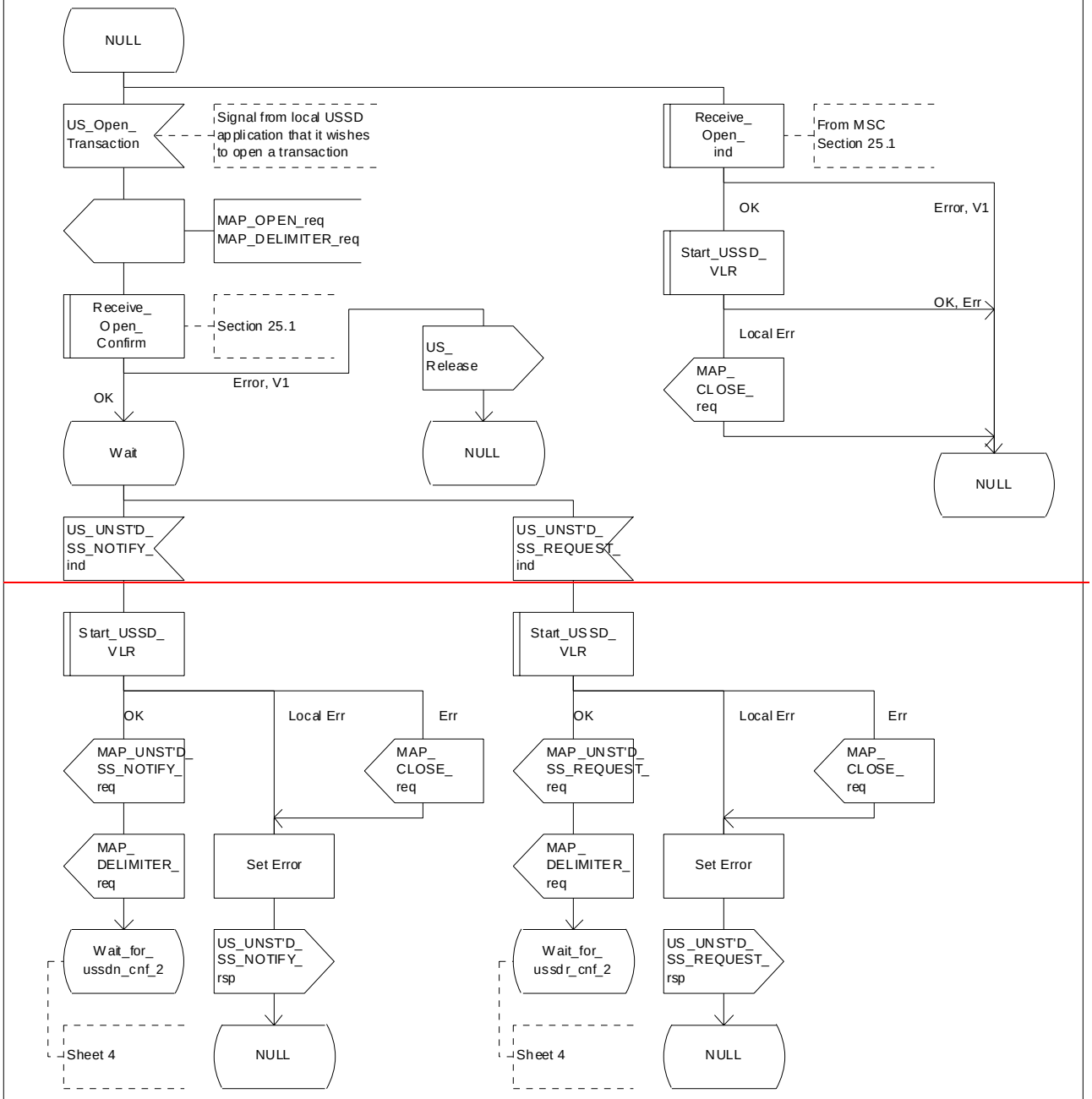


Figure 22.10.3/1 (sheet 2 of 54): Processdure NW_Init_USSD_VLR

Process NW_INIT_USSD_VLR 22.10.3_1.3(4)

Figure 22.10.3/1: Handling of network initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.



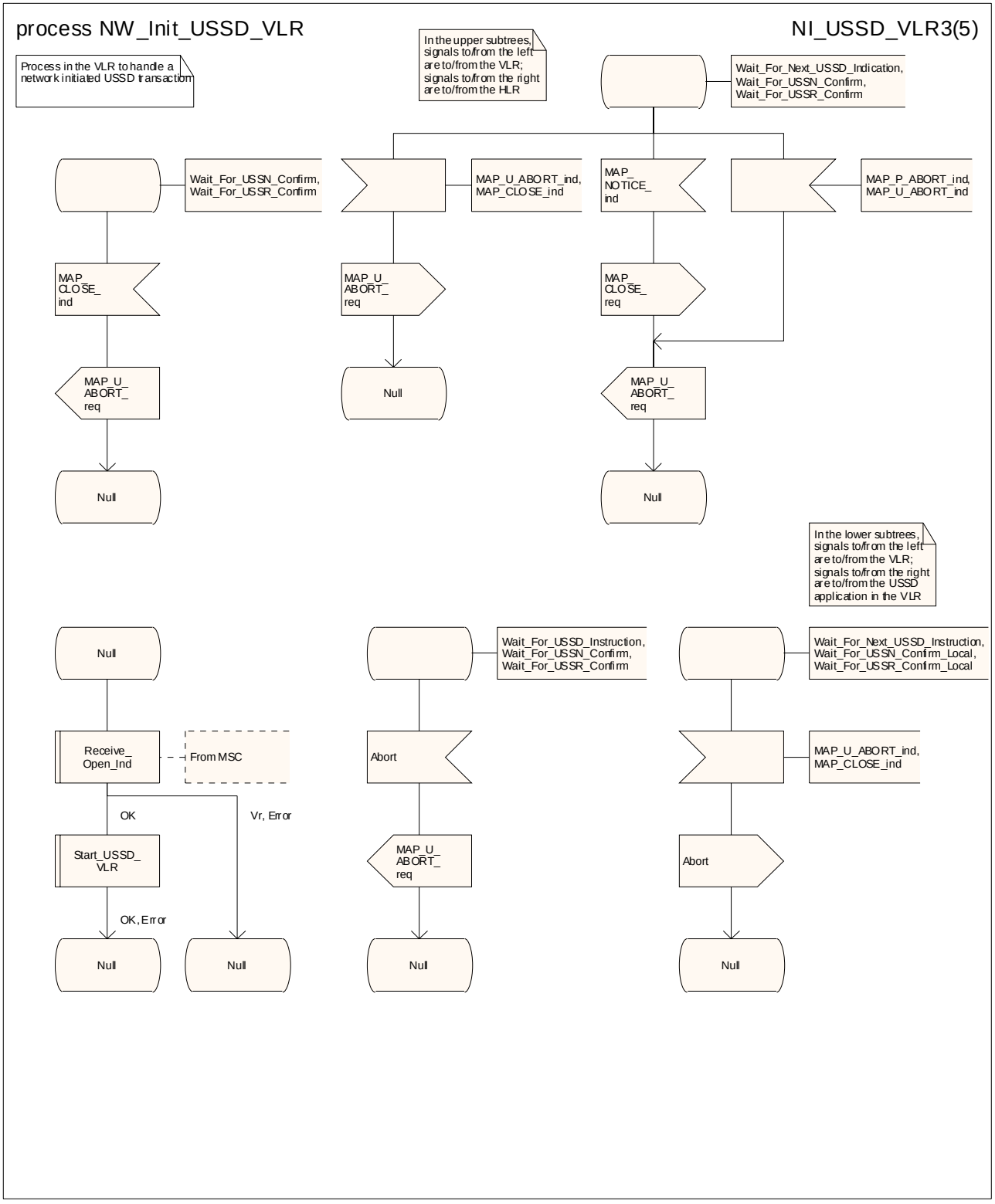
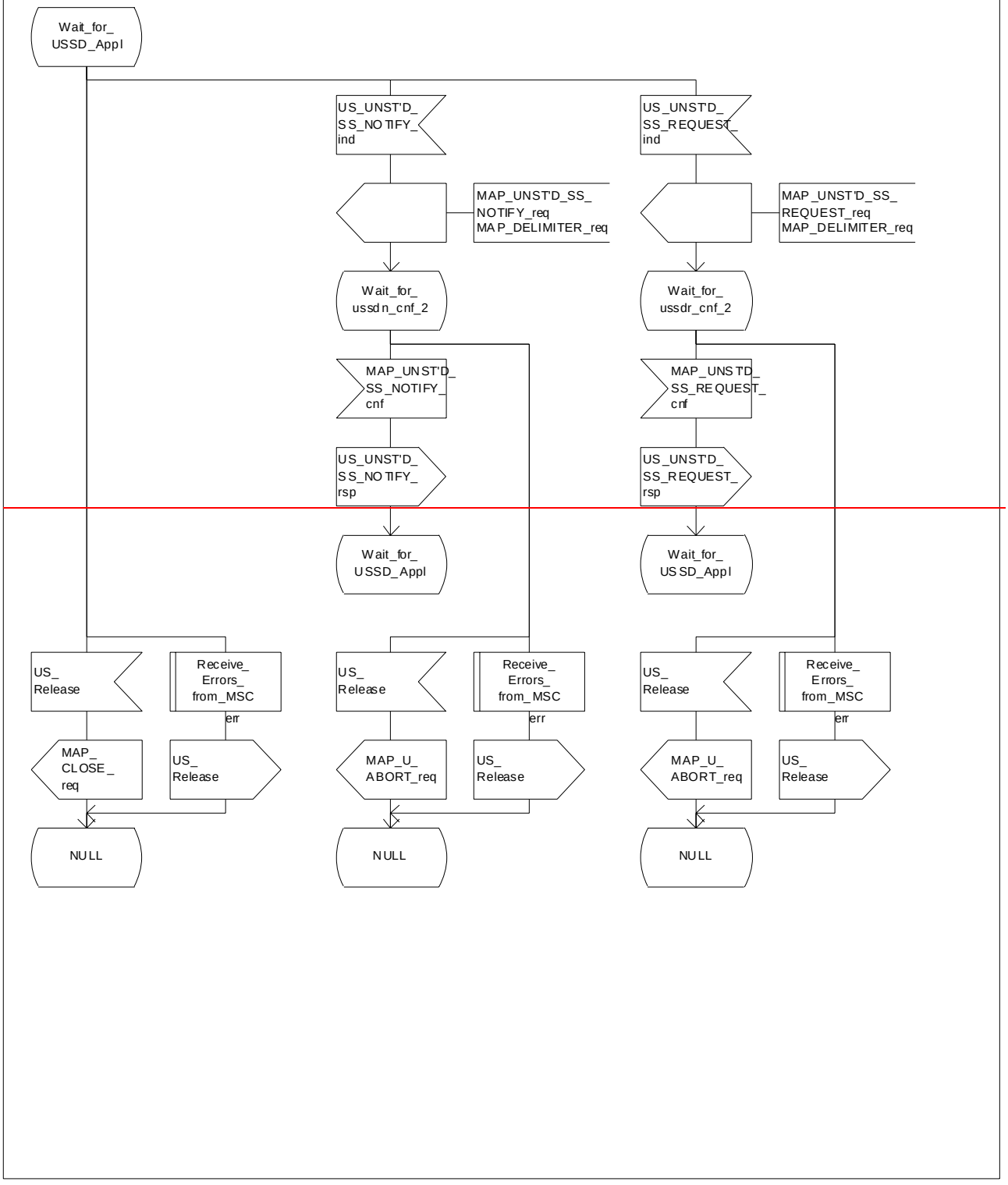


Figure 22.10.3/1 (sheet 3 of 54): Process~~dure~~ NW_Init_USSD_VLR

Process NW_INIT_USSD_VLR 22.10.3_1.4(4)

Figure 22.10.3/1: Handling of network initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.



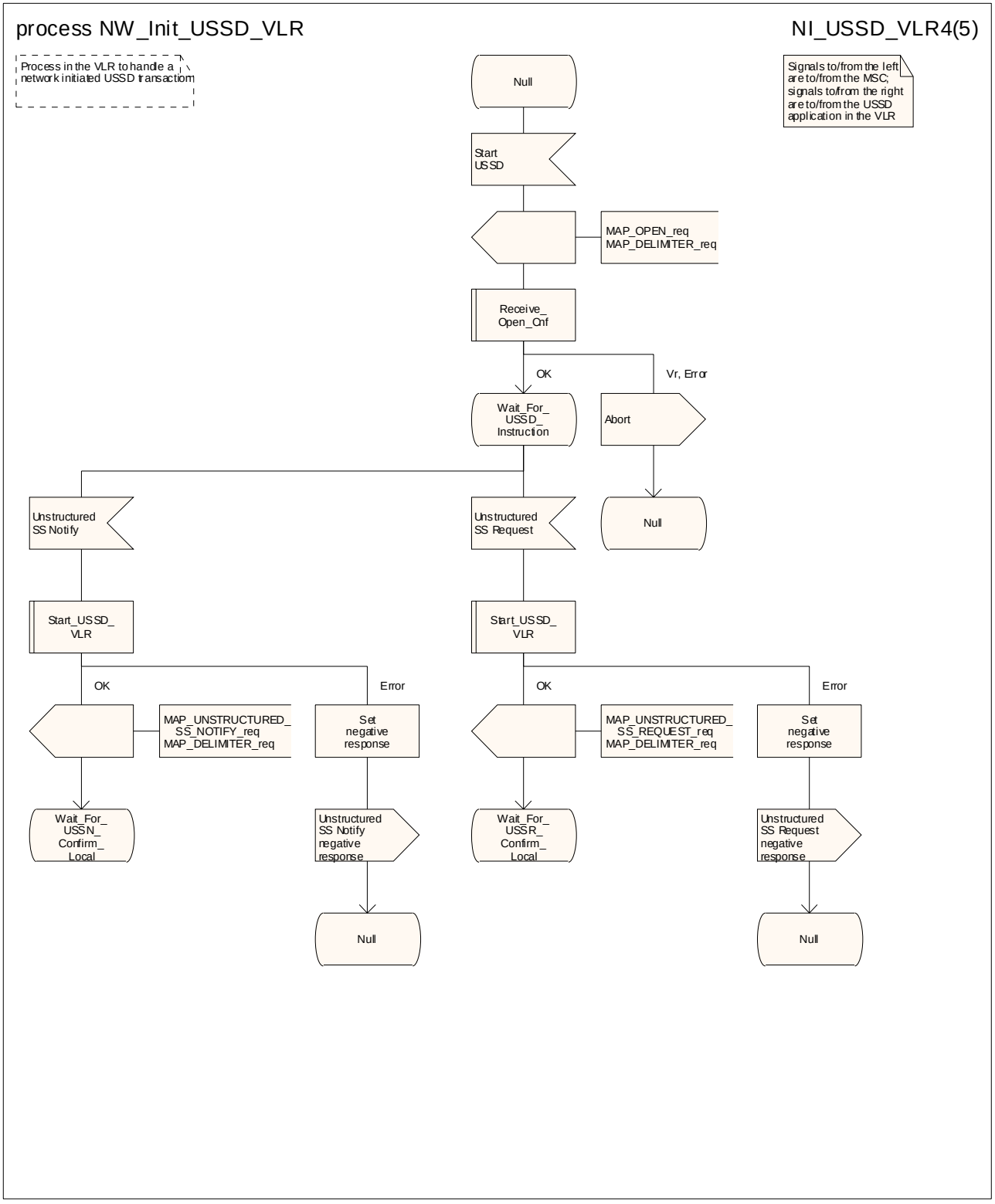


Figure 22.10.3/1 (sheet 4 of 54): Processdure NW_Init_USSD_VLR

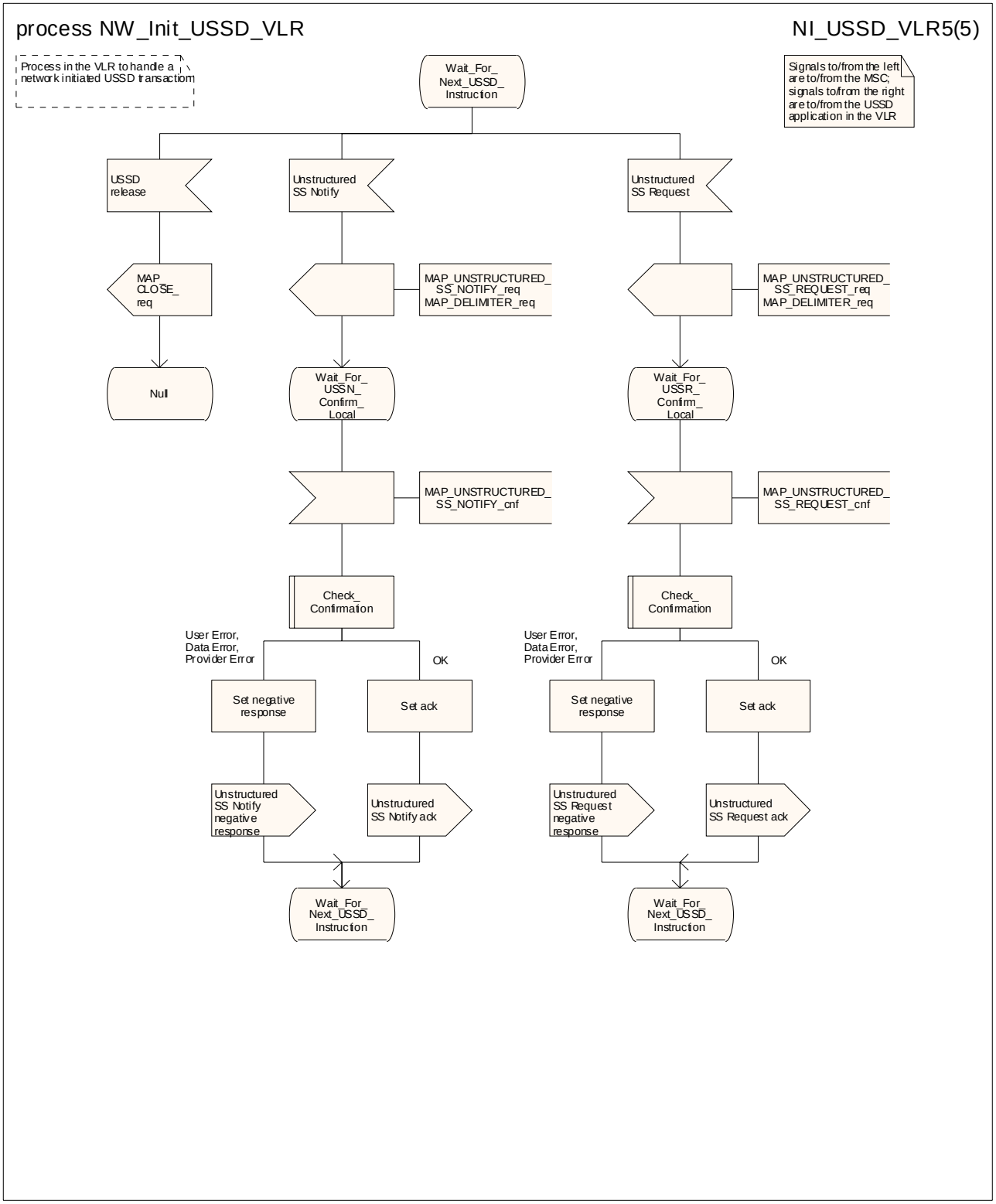
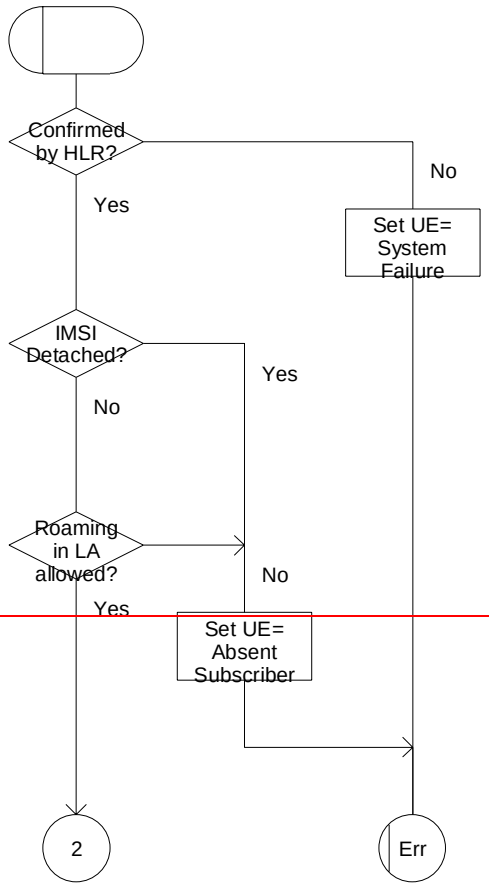


Figure 22.10.3/1 (sheet 5 of 5): Process NW_Init_USSD_VLR

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



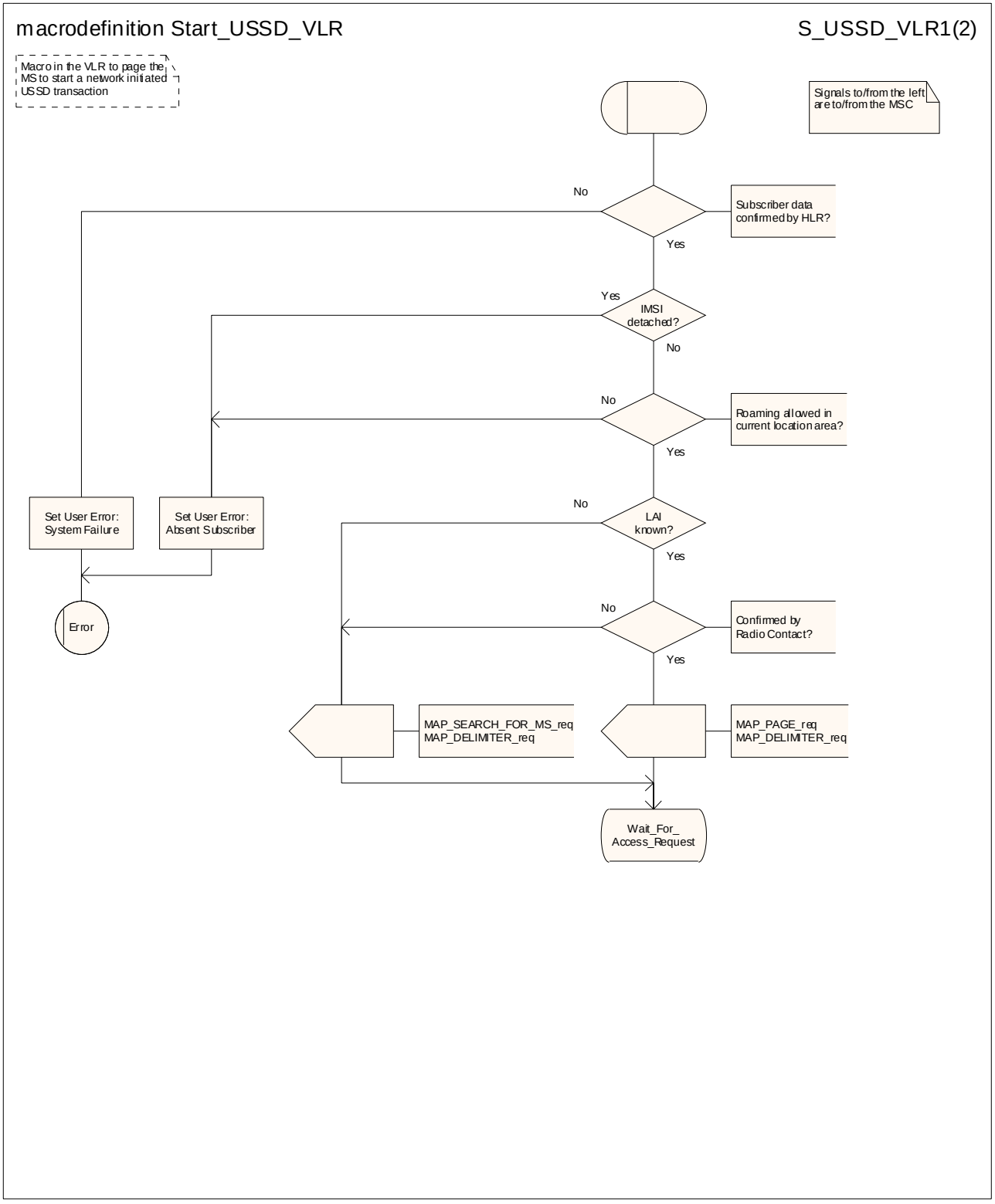
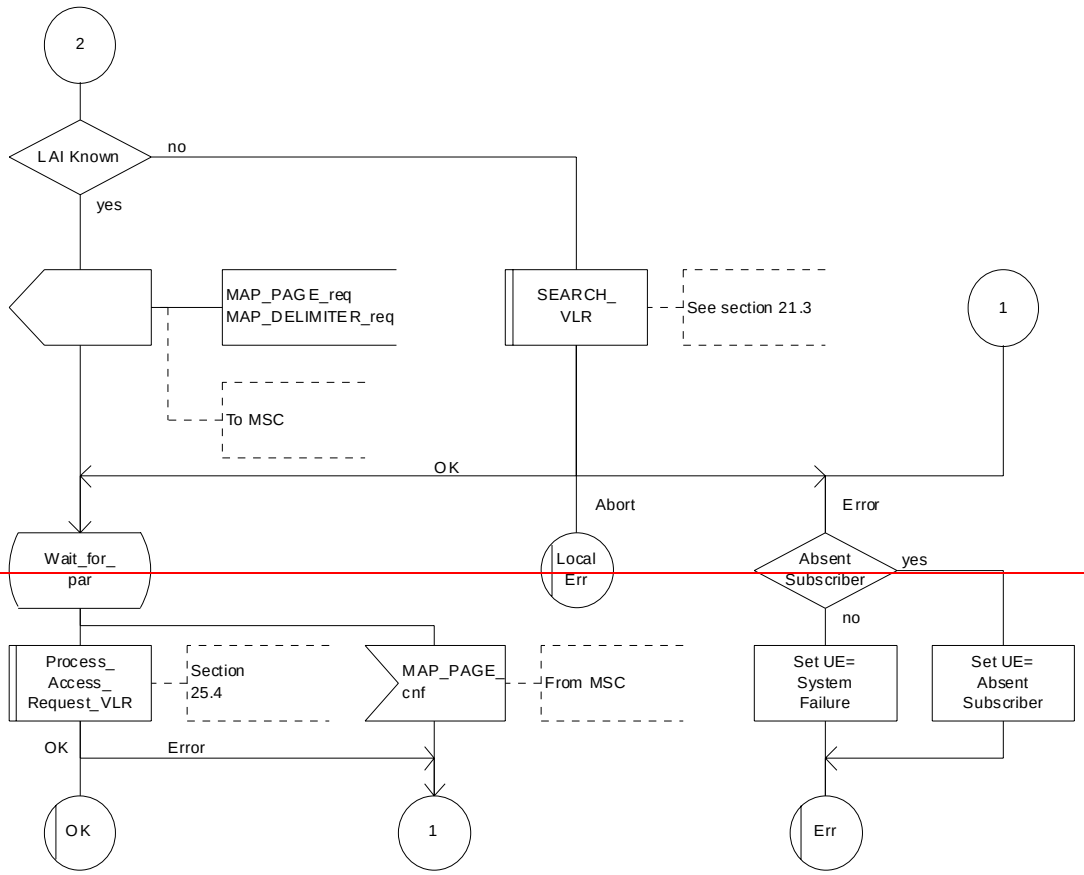


Figure 22.10.3/2 (sheet 1 of 2): Macro Start_USSD_VLR

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.



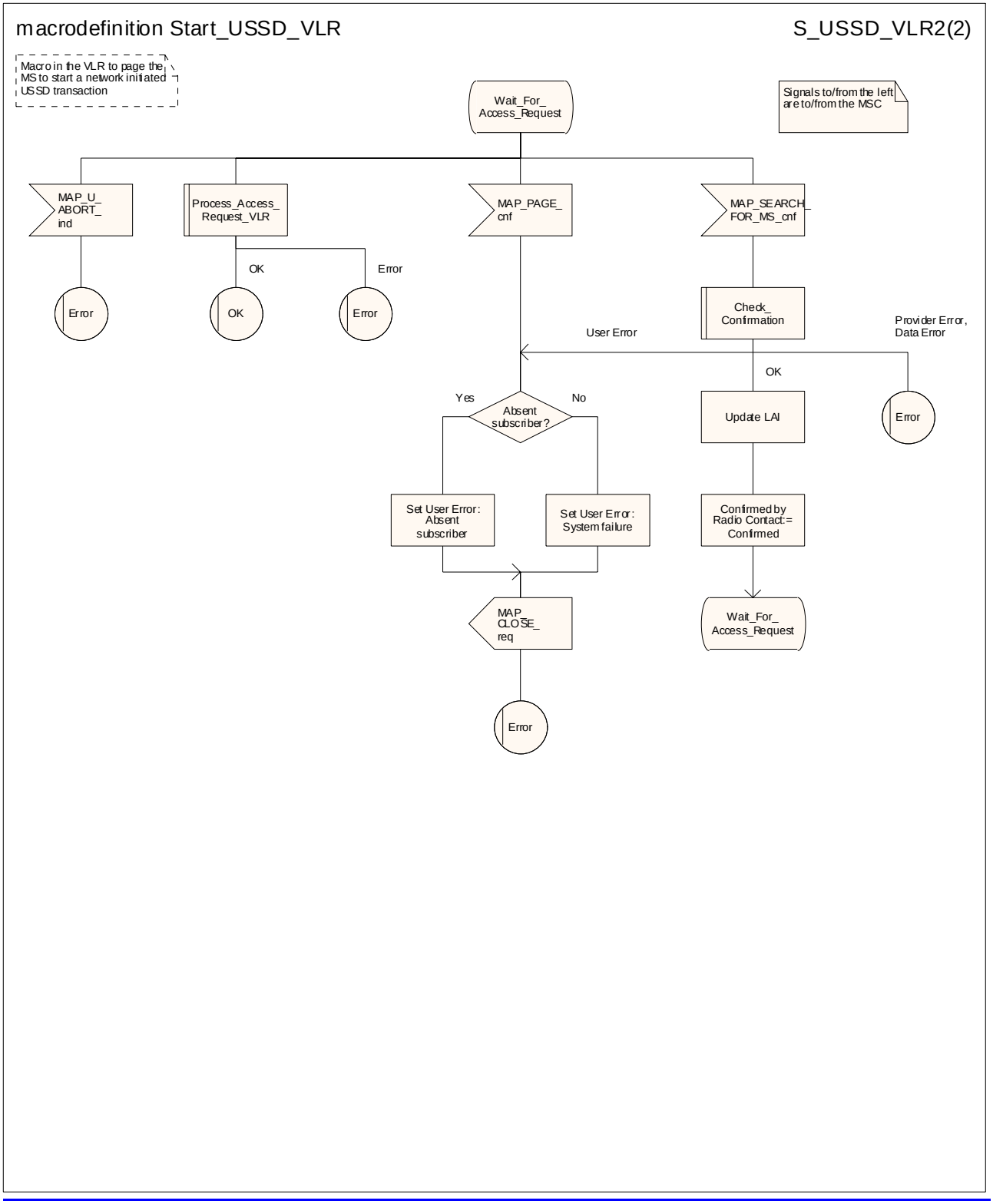
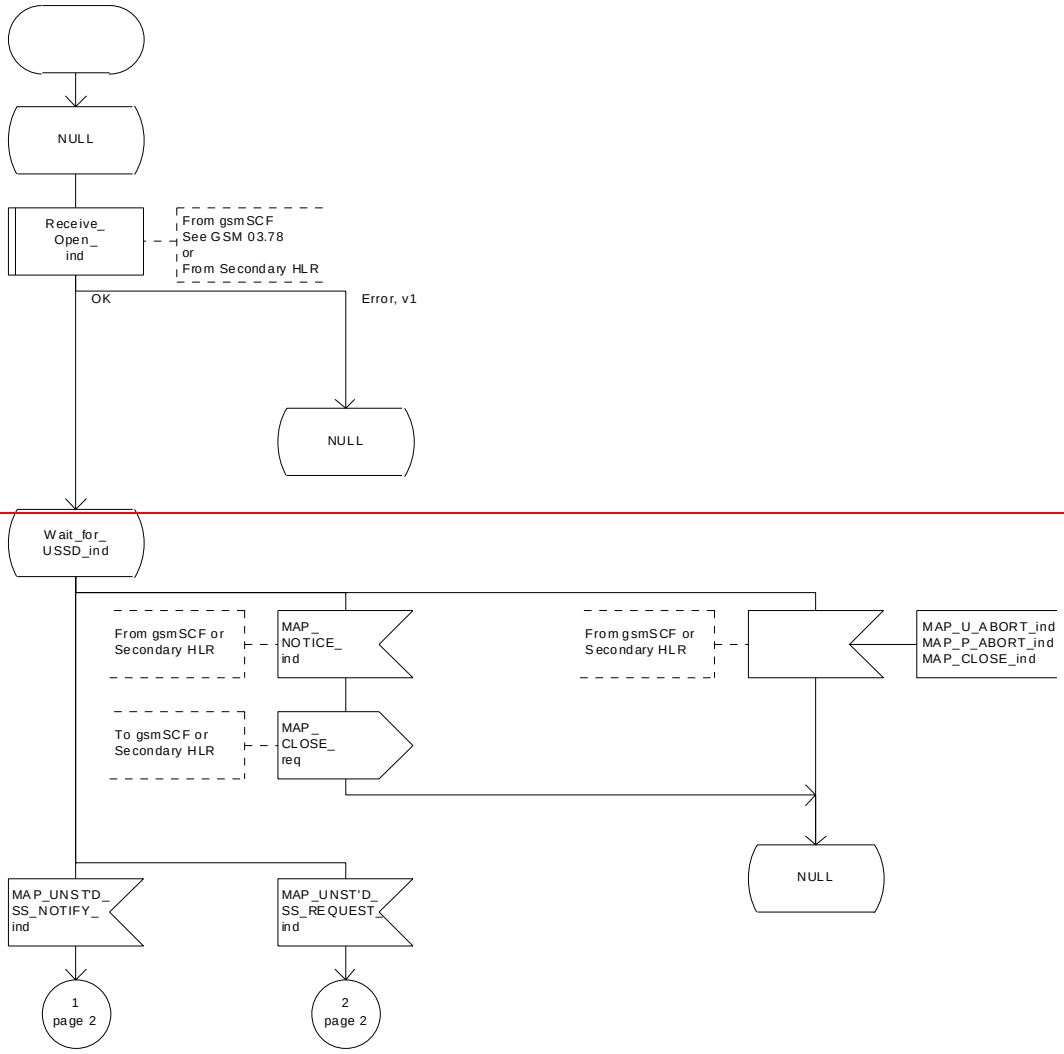


Figure 22.10.3/2 (sheet 2 of 2): Macro Start_USSD_VLR

Process NW_INIT_USSD_HLR 22.10.4_1.1(5)

Figure 22.10.4/1 Handling of network initiated USSD at HLR

Arrows to left are to VLR,
Arrows to right are to the next node
unless otherwise stated.



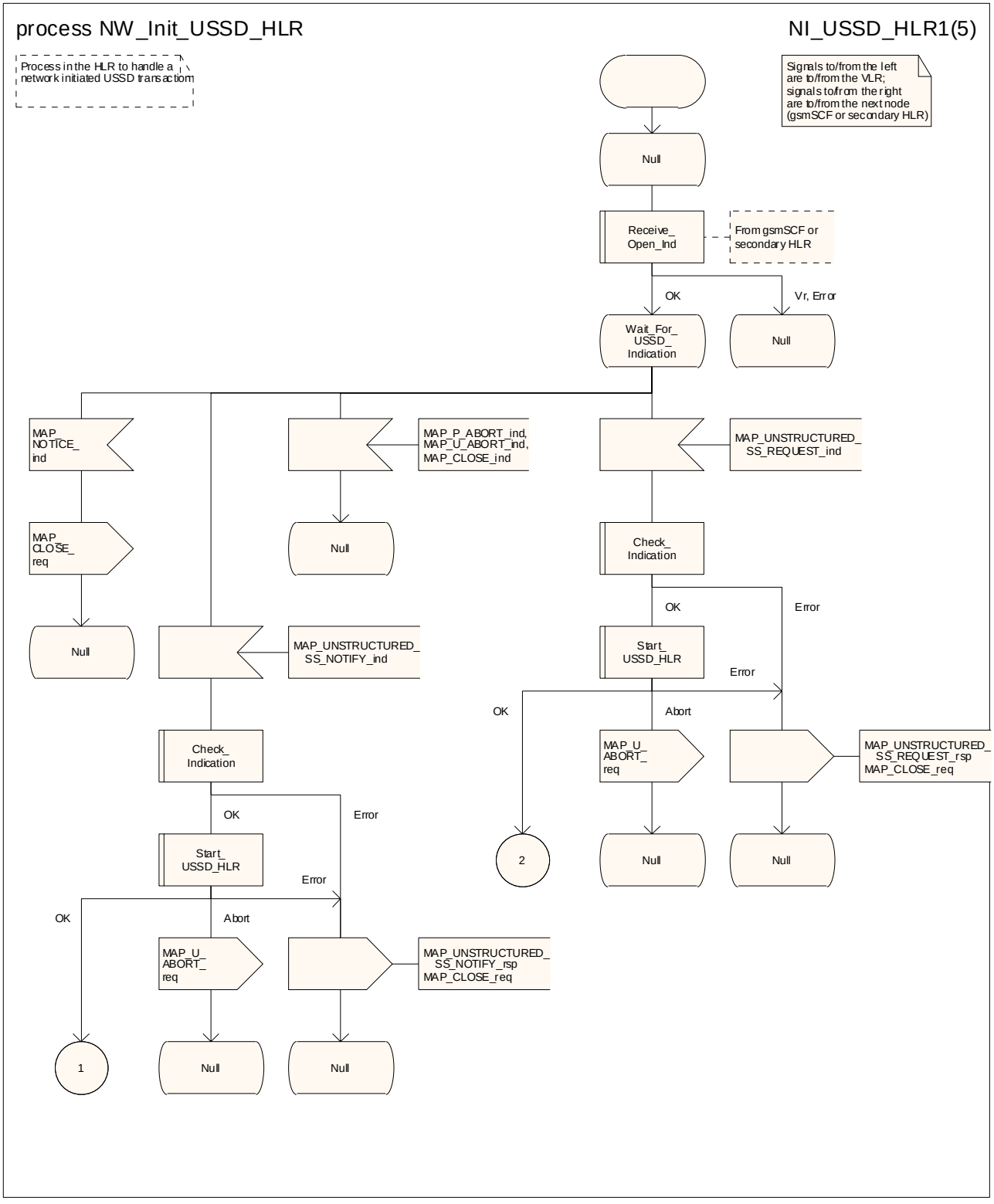
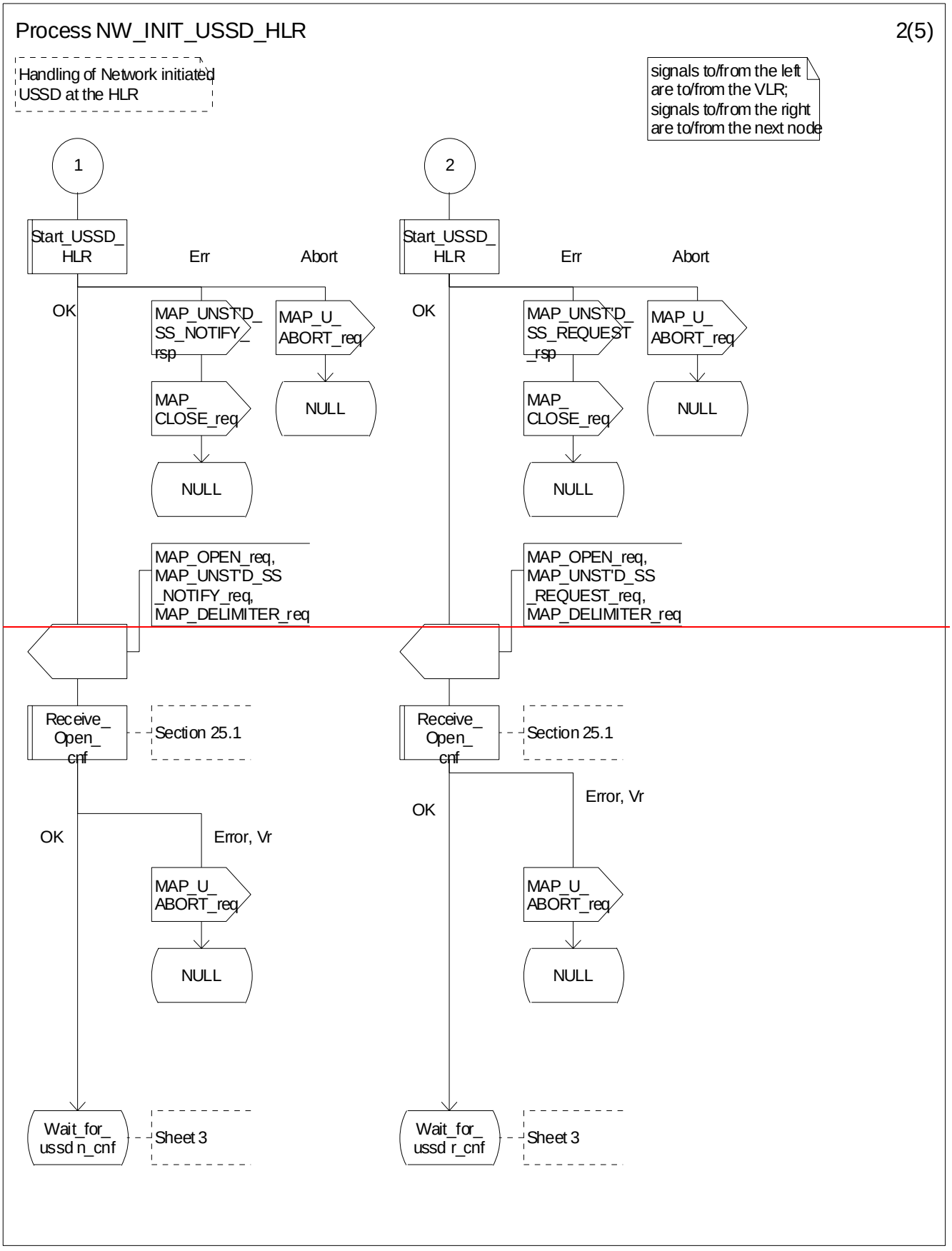


Figure 22.10.4/1 (sheet 1 of 5): Proces~~sdure~~ NW_Init_USSD_HLR


Process NW_INIT_USSD_HLR
2(5)
Handling of Network initiated USSD at the HLR
signals to/from the left are to/from the VLR; signals to/from the right are to/from the next node
1
Start_USSD_ HLR
Err
Abort
OK
MAP_UNST'D_ SS_NOTIFY_ rsp
MAP_U_ ABORT_req
MAP_ CLOSE_req
NULL
NULL
MAP_OPEN_req, MAP_UNST'D_SS _NOTIFY_req, MAP_DELIMITER_req
Receive_ Open_ cnf
Section 25.1
OK
Error, Vr
MAP_U_ ABORT_req
NULL
Wait_for_ ussd n_cnf
Sheet 3
2
Start_USSD_ HLR
Err
Abort
OK
MAP_UNST'D_ SS_REQUEST _rsp
MAP_U_ ABORT_req
MAP_ CLOSE_req
NULL
NULL
MAP_OPEN_req, MAP_UNST'D_SS _REQUEST_req, MAP_DELIMITER_req
Receive_ Open_ cnf
Section 25.1
OK
Error, Vr
MAP_U_ ABORT_req
NULL
Wait_for_ ussd r_cnf
Sheet 3

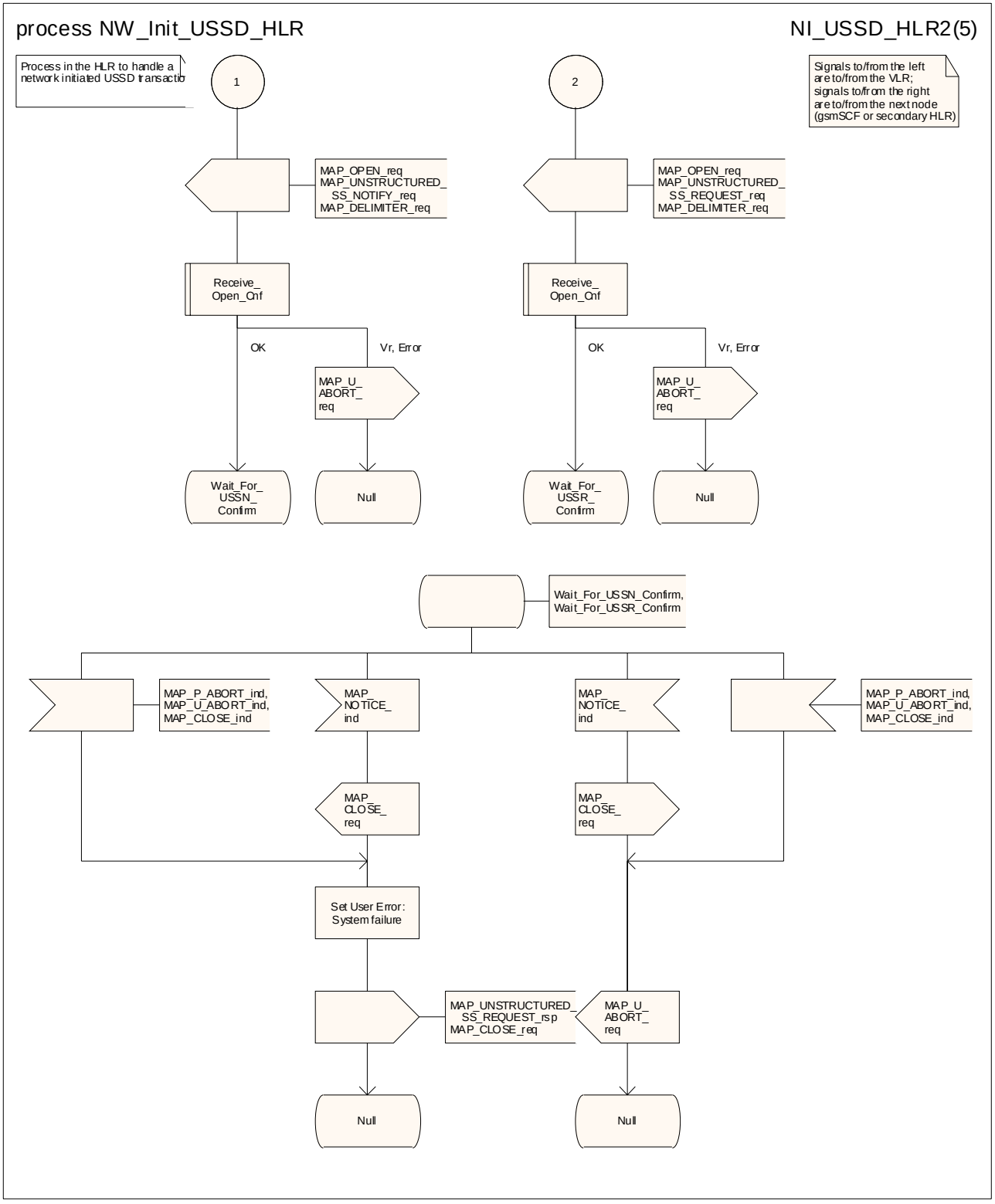
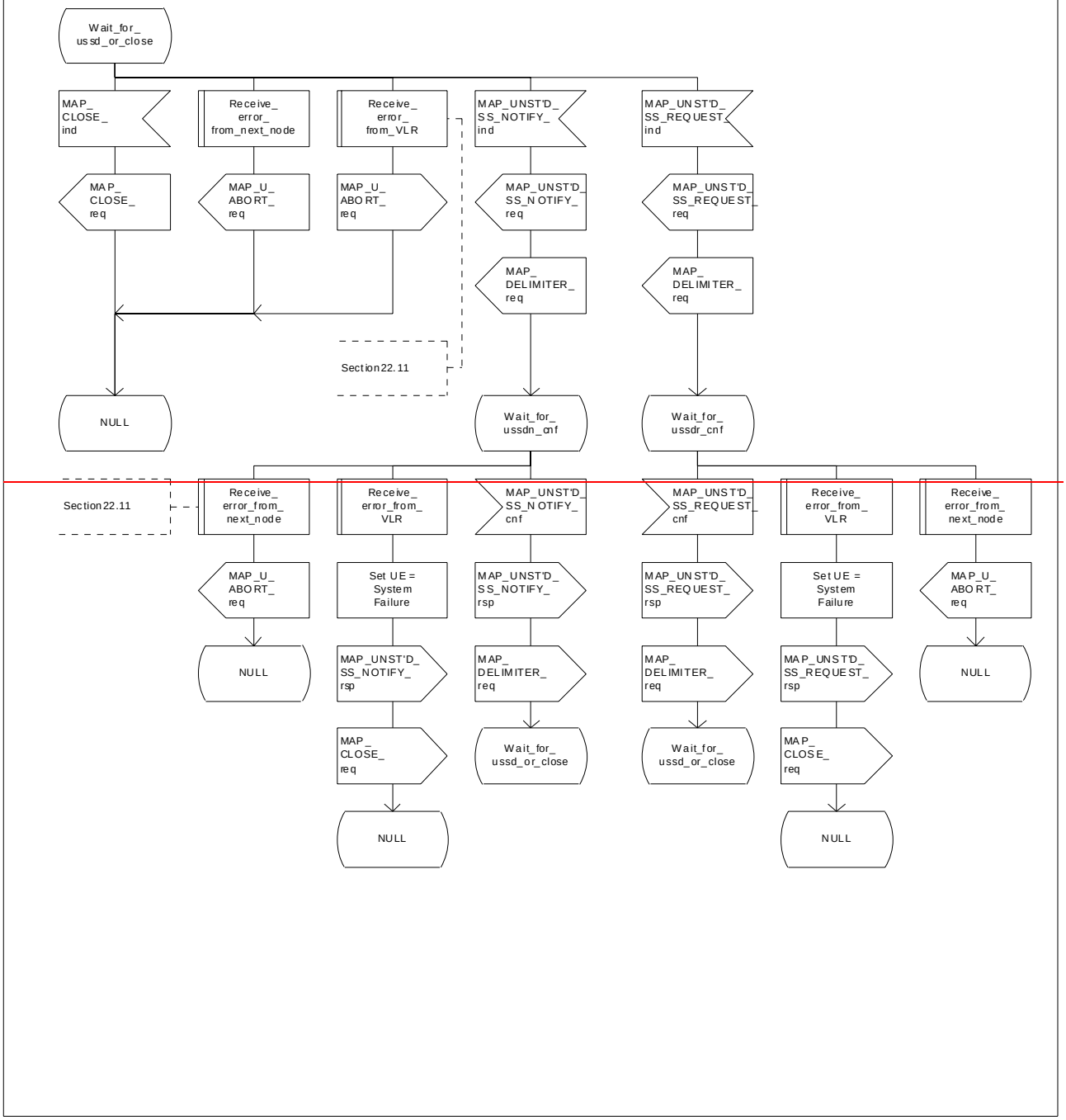


Figure 22.10.4/1 (sheet 2 of 5): Proces~~sdure~~ NW_Init_USSD_HLR

Process NW_INIT_USSD_HLR 22.10.4_1.3(5)

Figure 22.10.4/1 Handling of network initiated USSD at HLR

Arrows to left are to VLR,
Arrows to right are to the next node
unless otherwise stated.



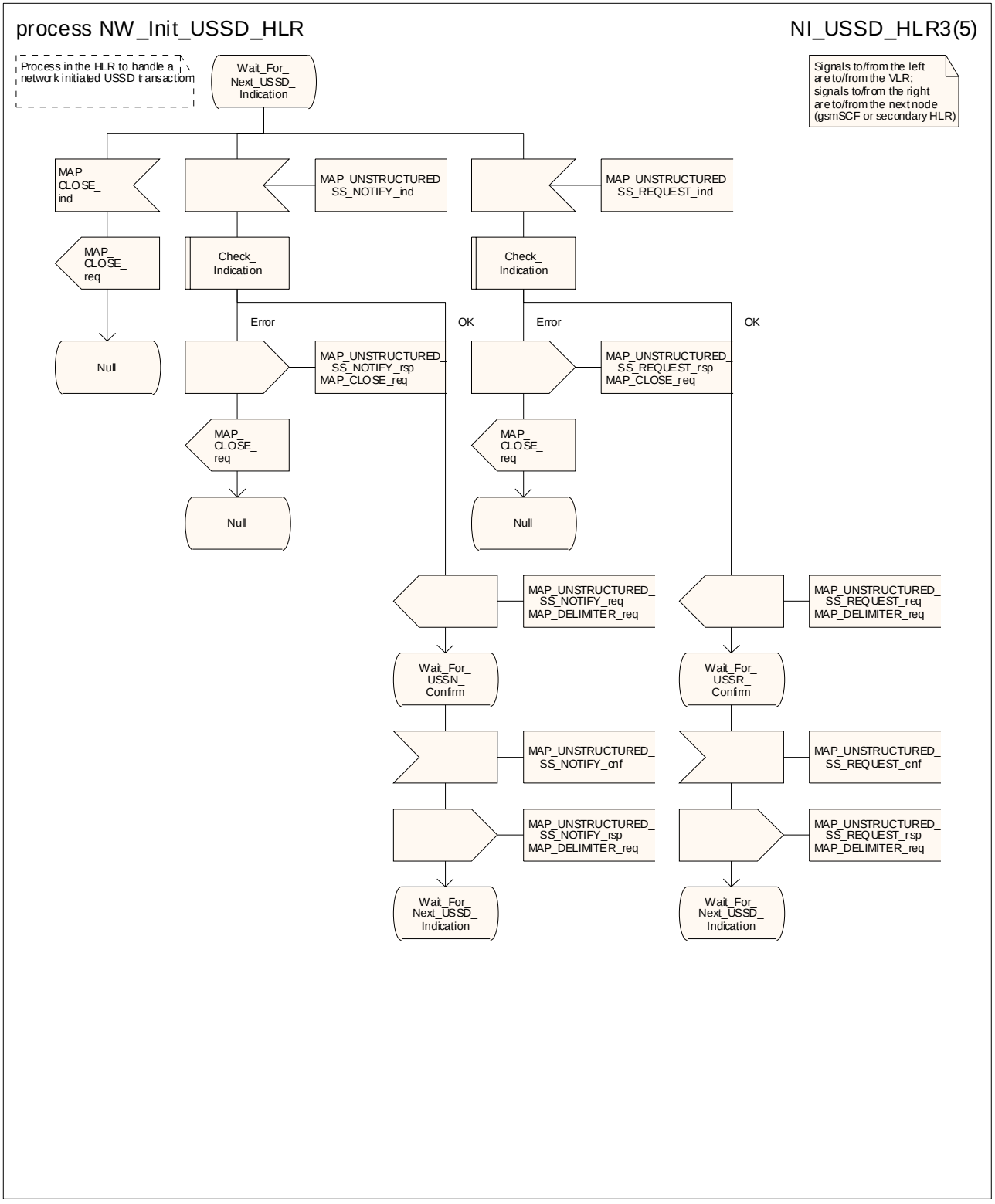
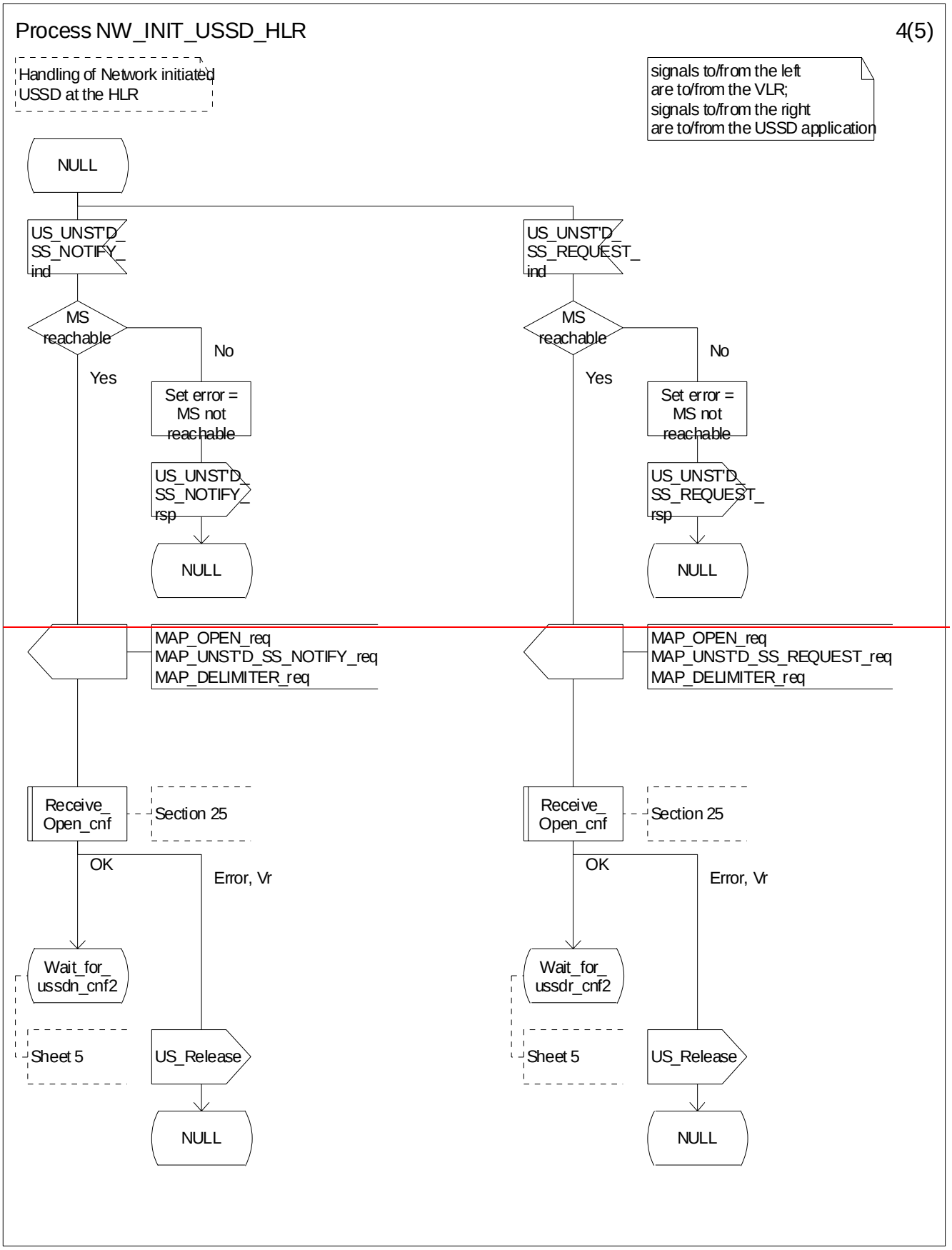


Figure 22.10.4/1 (sheet 3 of 5): Proces~~sdure~~ NW_Init_USSD_HLR

Process NW_INIT_USSD_HLR 4(5)



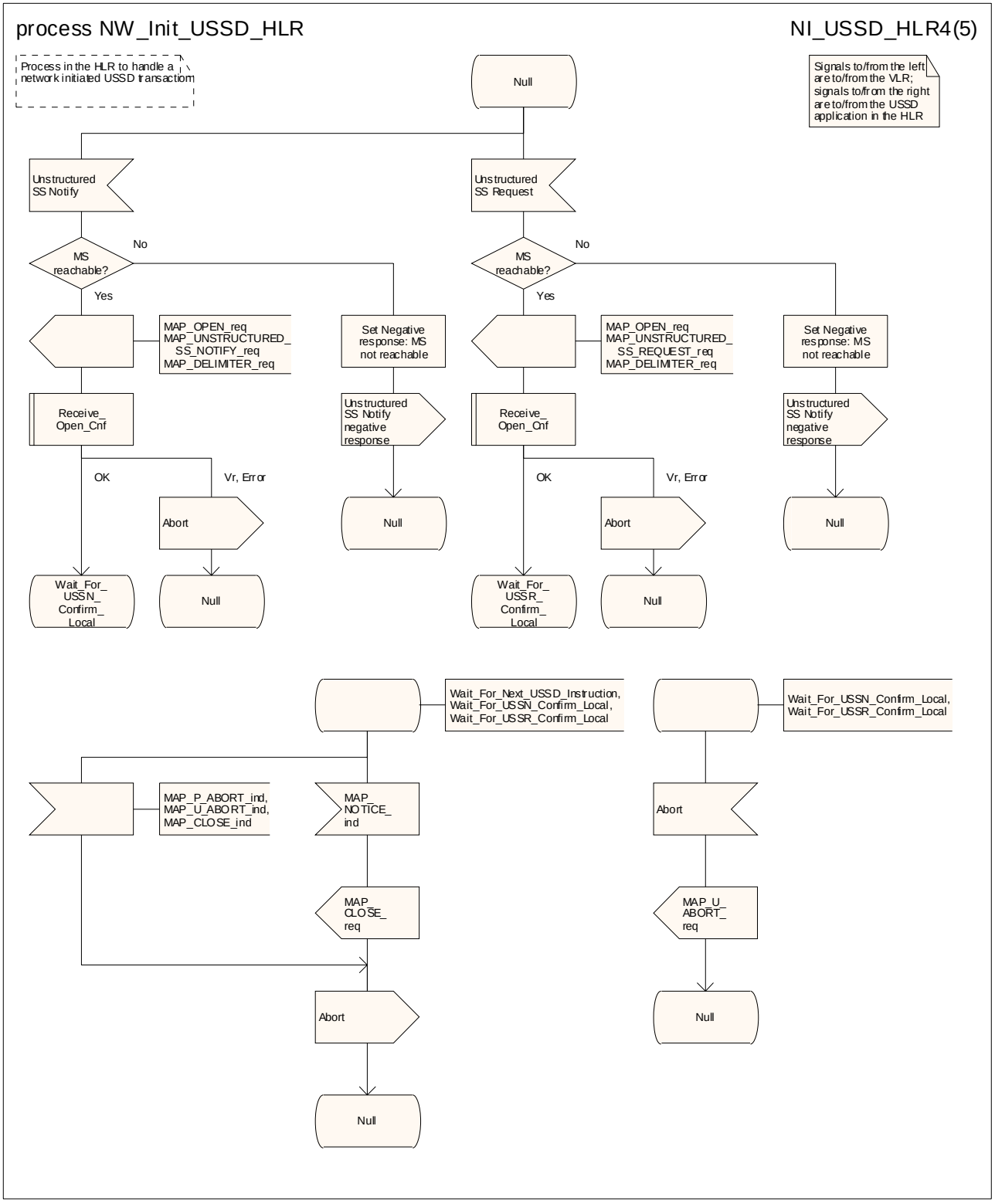
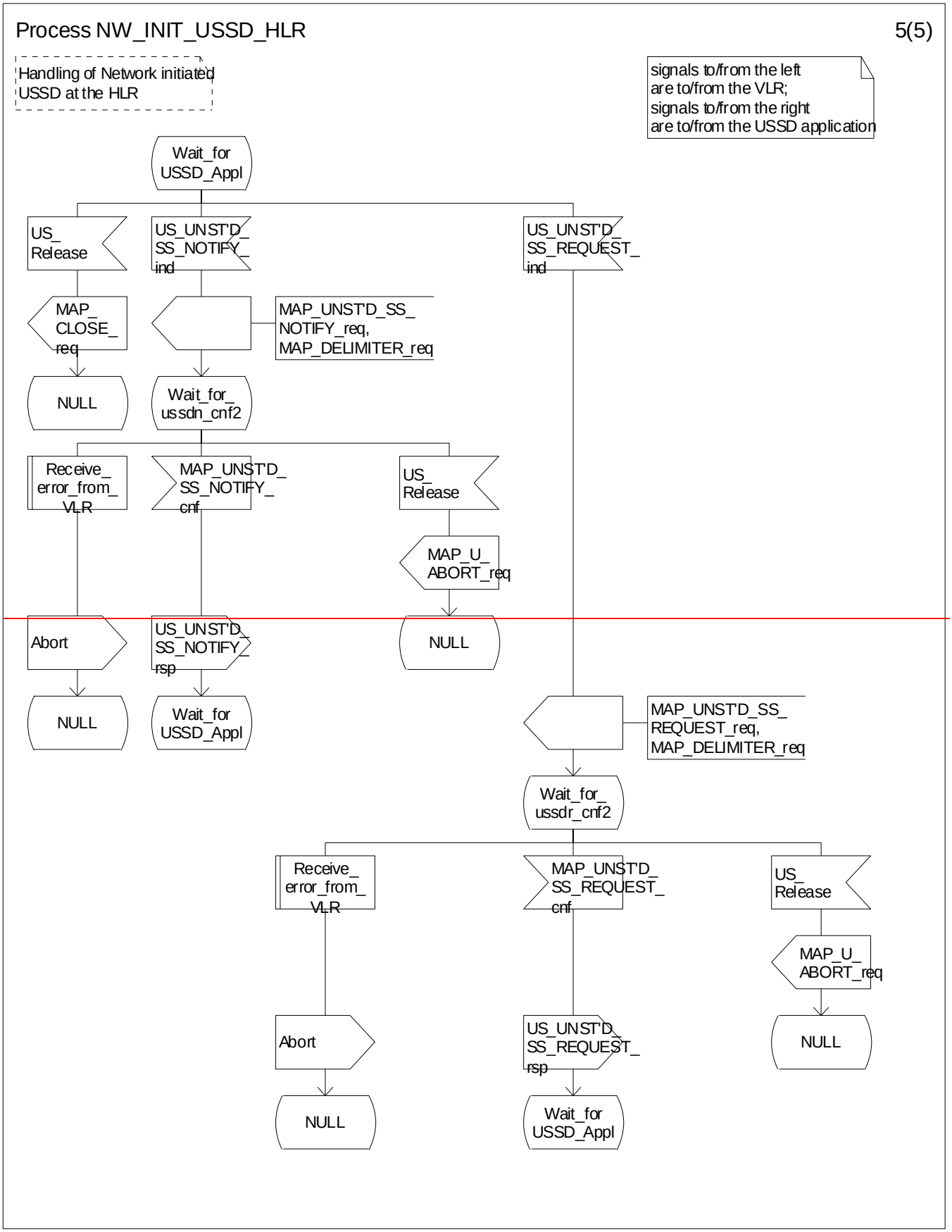


Figure 22.10.4/1 (sheet 4 of 5): Proces~~s~~~~dure~~ NW_Init_USSD_HLR

Process NW_INIT_USSD_HLR 5(5)



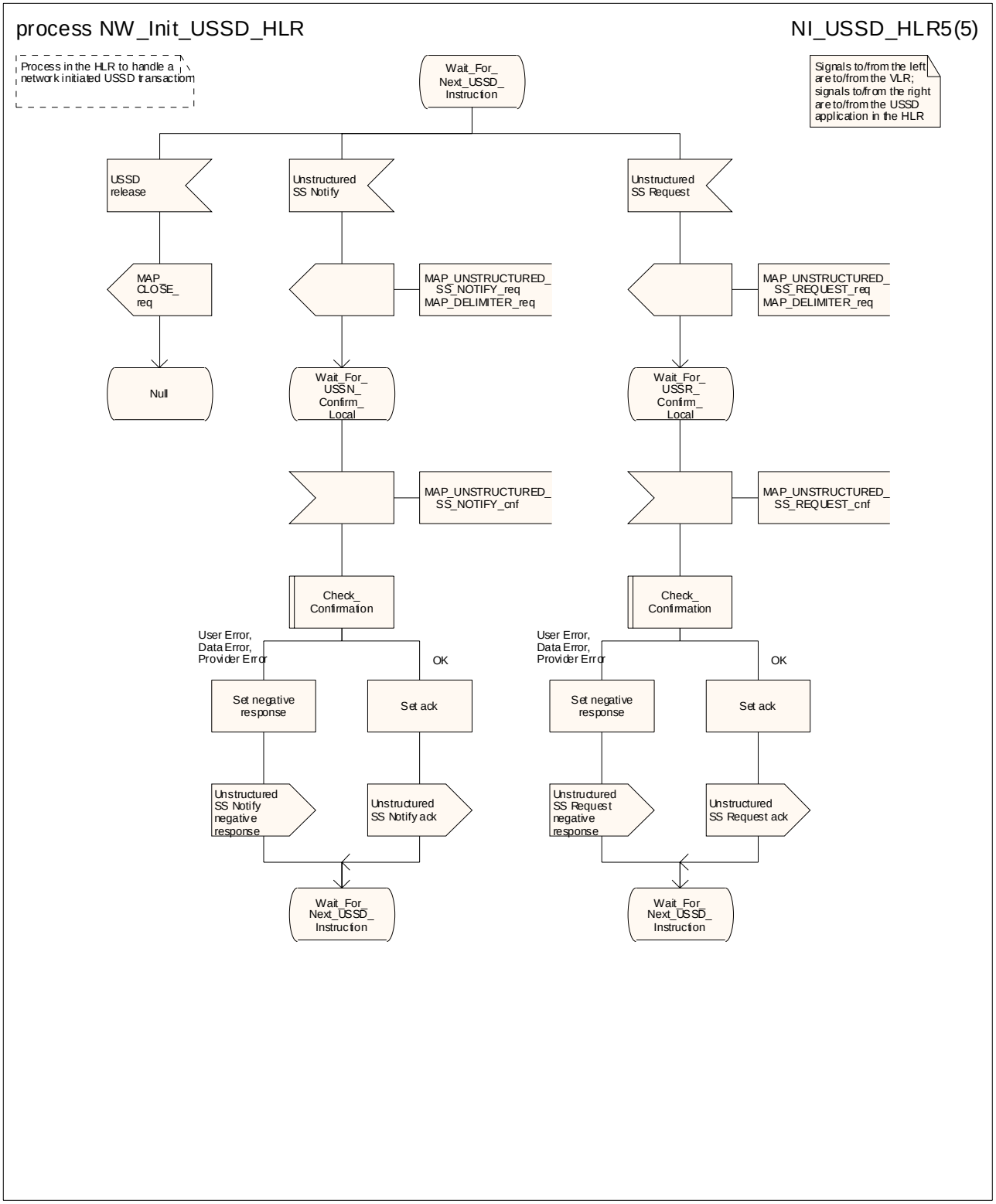
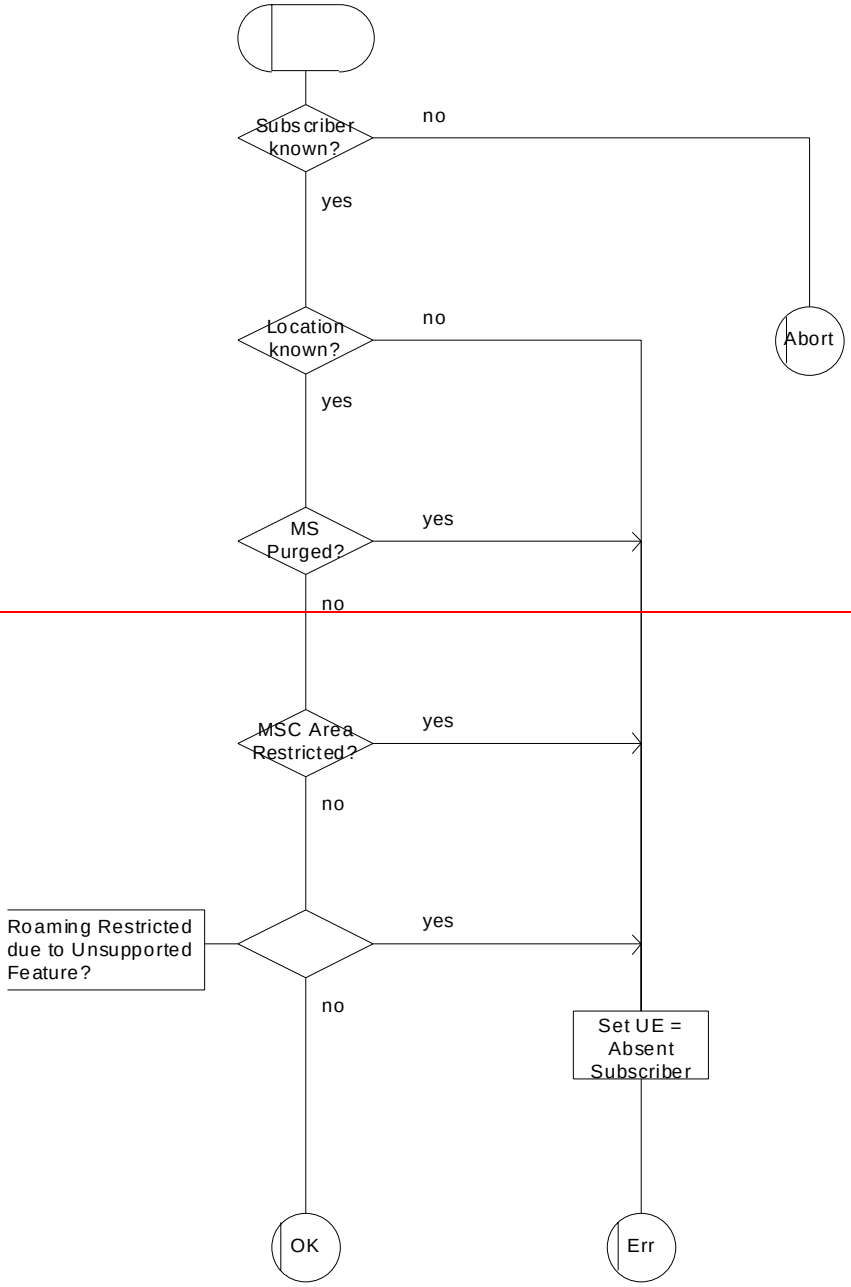


Figure 22.10.4/1 (sheet 5 of 5): Proces~~sdure~~ NW_Init_USSD_HLR

Macrodefinition Start_USSD_HLR 22.10.4_2.1(1)

Figure 22.10.4/2: Macro to check MS is reachable at the HLR for a network initiated USSD operation



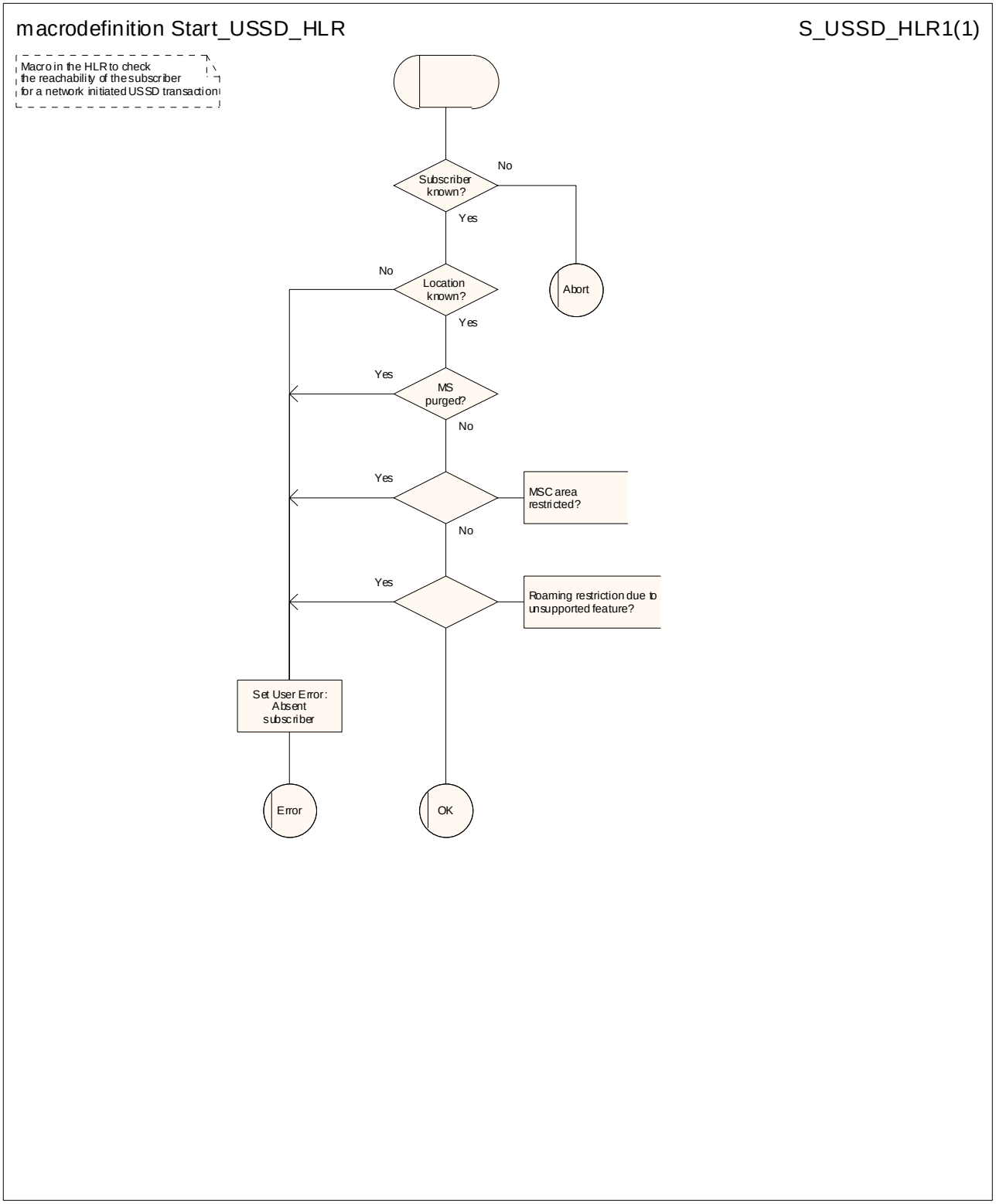
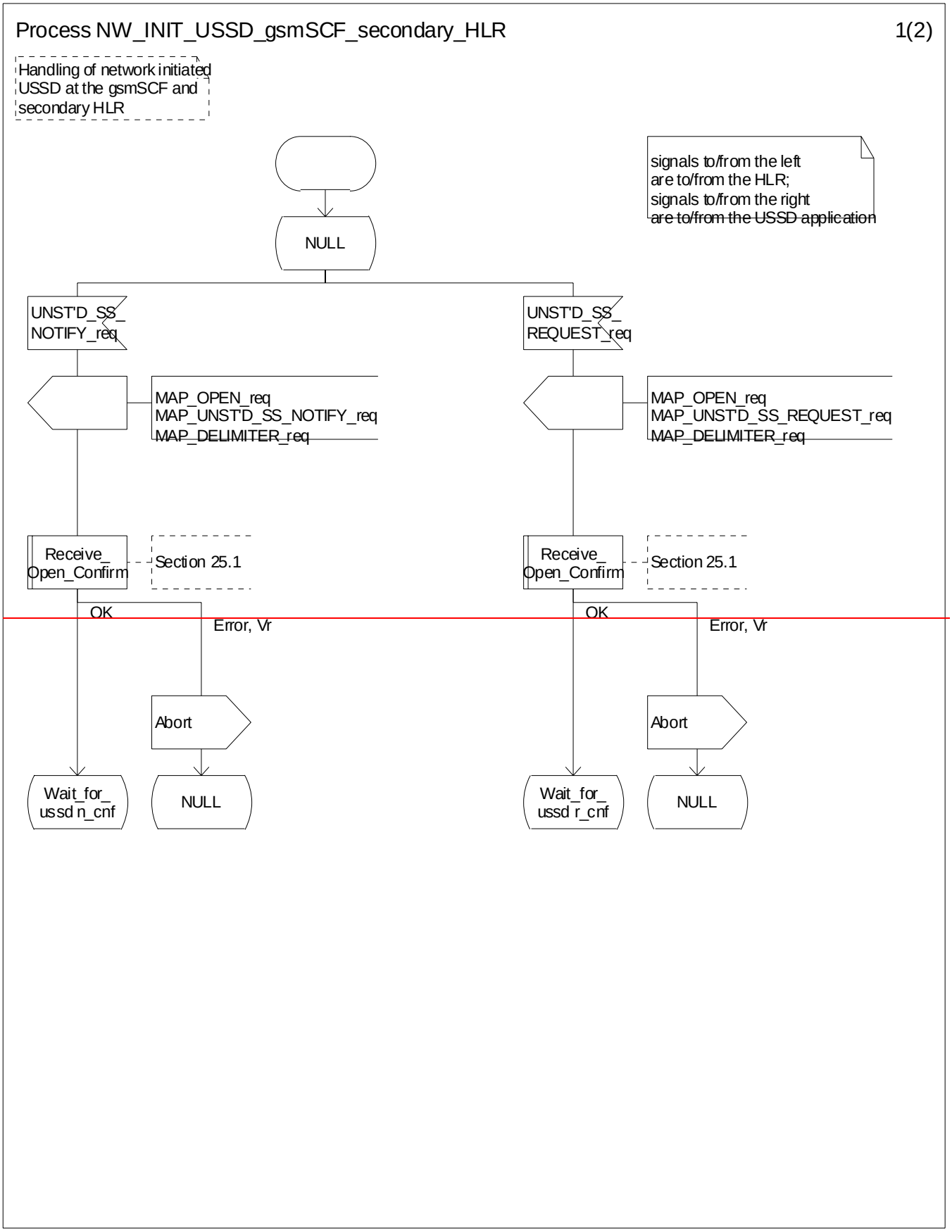


Figure 22.10.4/2: Macro Start_USSD_HLR


Process NW_INIT_USSD_gsmSCF_secondary_HLR
1(2)
Handling of network initiated USSD at the gsmSCF and secondary HLR
signals to/from the left are to/from the HLR; signals to/from the right are to/from the USSD application
NULL
UNST'D_SS_ NOTIFY_req
UNST'D_SS_ REQUEST_req
MAP_OPEN_req
MAP_UNST'D_SS_NOTIFY_req
MAP_DELIMITER_req
MAP_OPEN_req
MAP_UNST'D_SS_REQUEST_req
MAP_DELIMITER_req
Receive_ Open_Confirm
Section 25.1
Receive_ Open_Confirm
Section 25.1
OK
Error, Vr
OK
Error, Vr
Abort
Abort
Wait_for_ ussd n_cnf
NULL
Wait_for_ ussd r_cnf
NULL

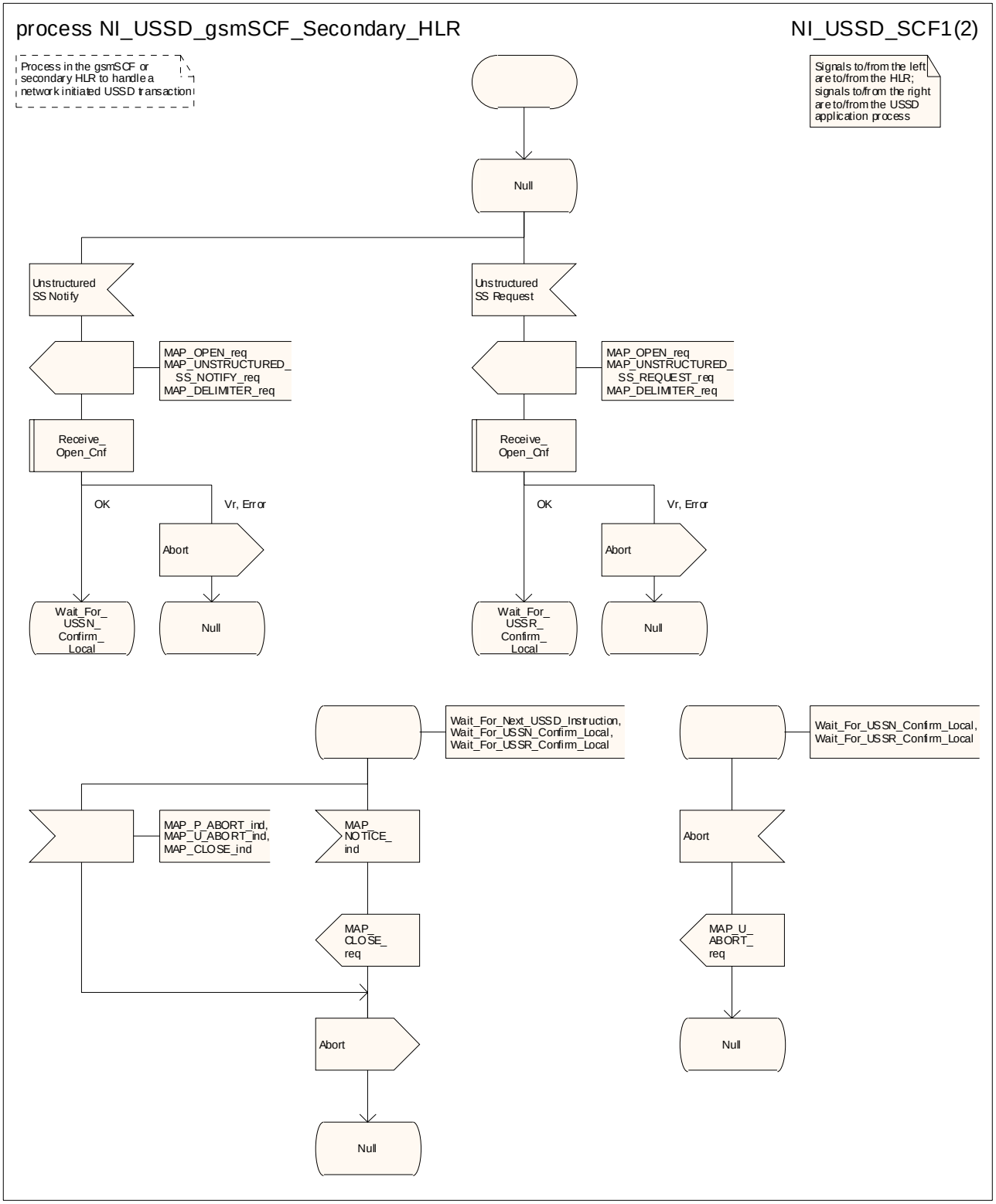
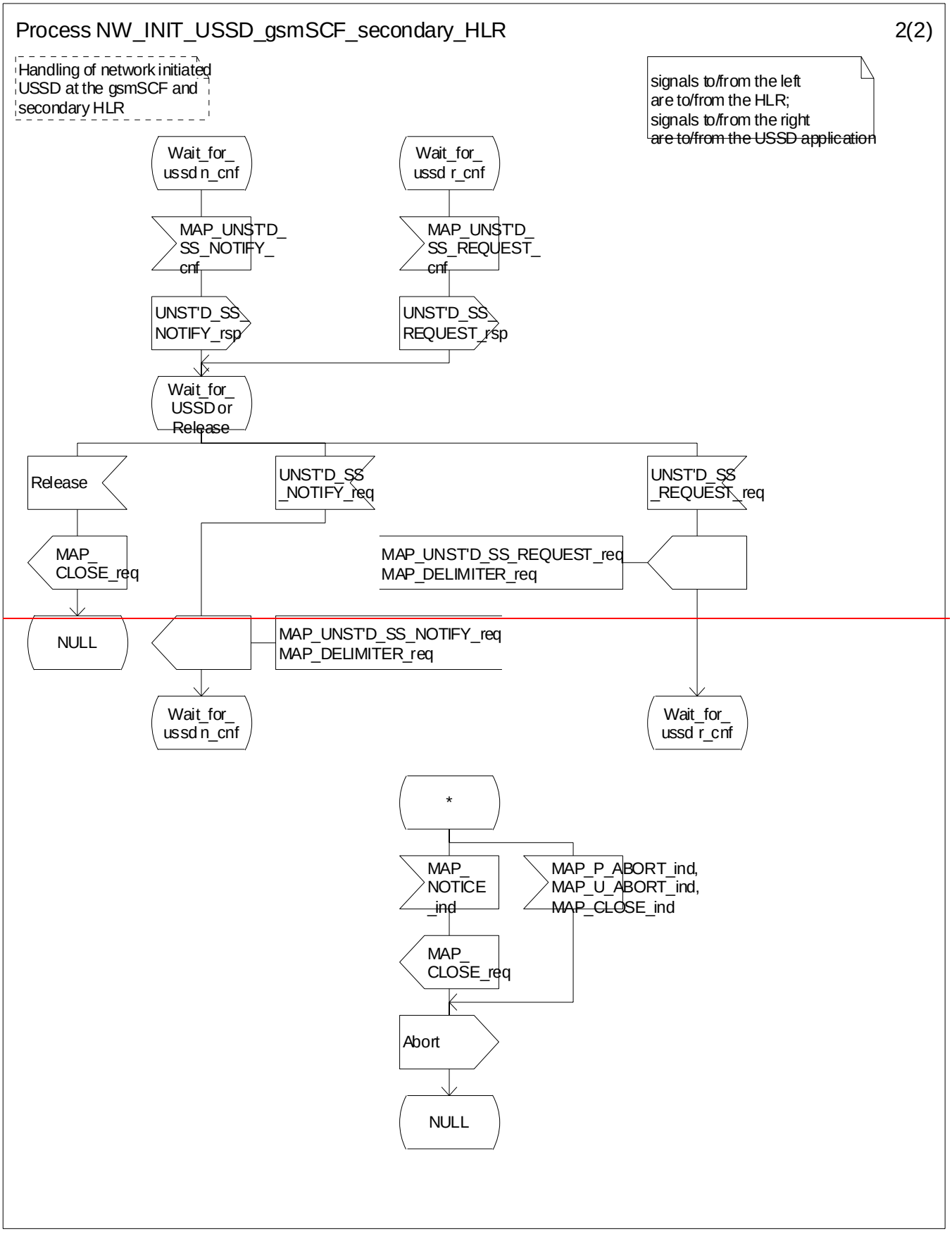


Figure 22.10.5/1 (sheet 1 of 2): Proces~~sdure~~ NW_Init_USSD_gsmSCF_secondary_HLR

Process NW_INIT_USSD_gsmSCF_secondary_HLR 2(2)



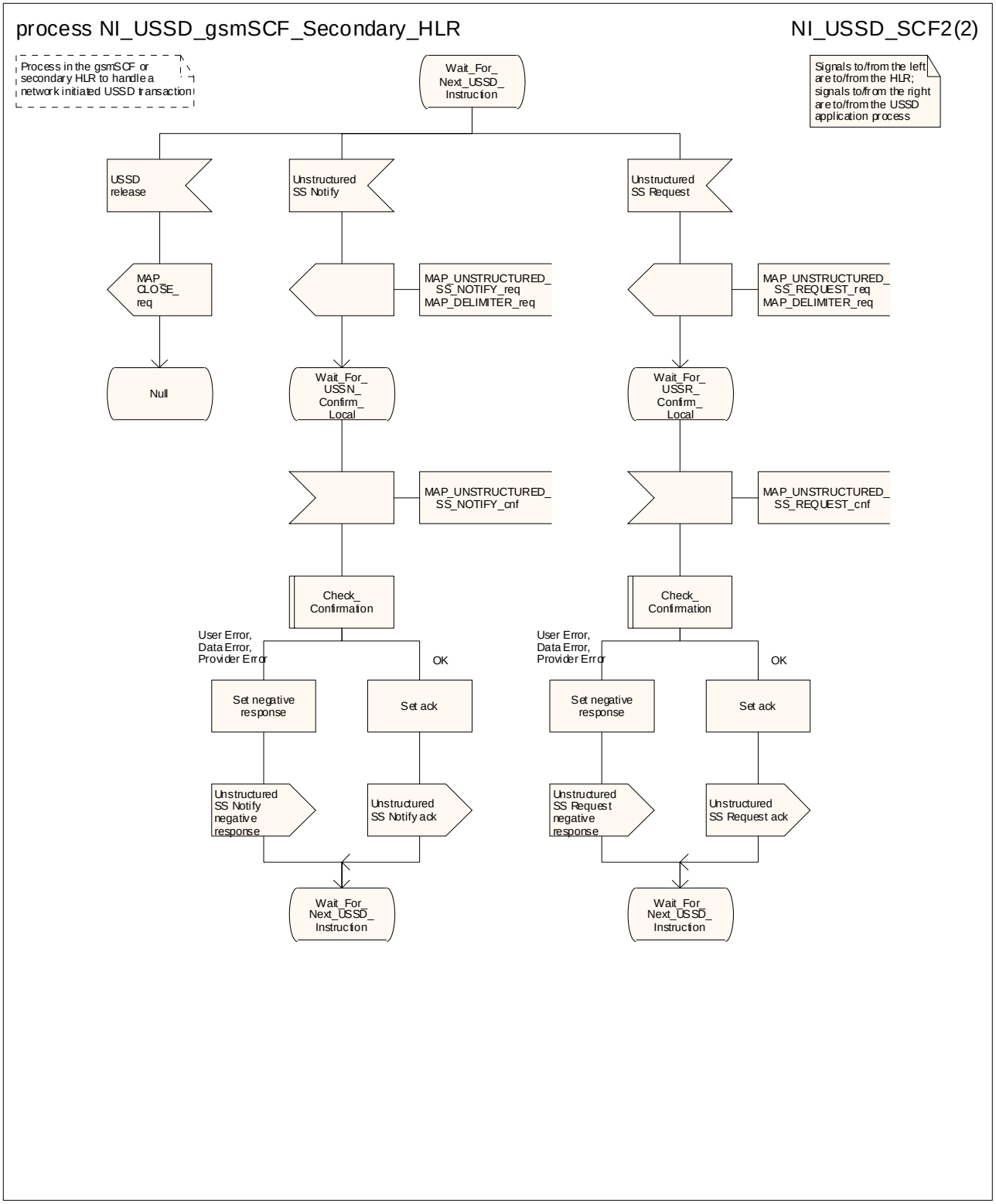


Figure 22.10.5/1 (sheet 2 of 2): Proces~~sdure~~ NW_Init_USSD_gsmSCF_secondary_HLR

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~~ shown 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 invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Indication	see subclause 25.2.1.

The macro is ~~described~~ shown in figure 22.11.1/2.

22.11.2 ~~SS Error handling macros~~Void

***** CR editor's note: the SDL diagrams for most of these macros cannot be drawn with the current version of SDT, because they fail the syntax checking. The macro invocations have therefore been replaced by direct expansions in the relevant SDL process and macro diagrams (which, incidentally, leads to a net reduction in the size of this chapter!) *****

~~**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**~~

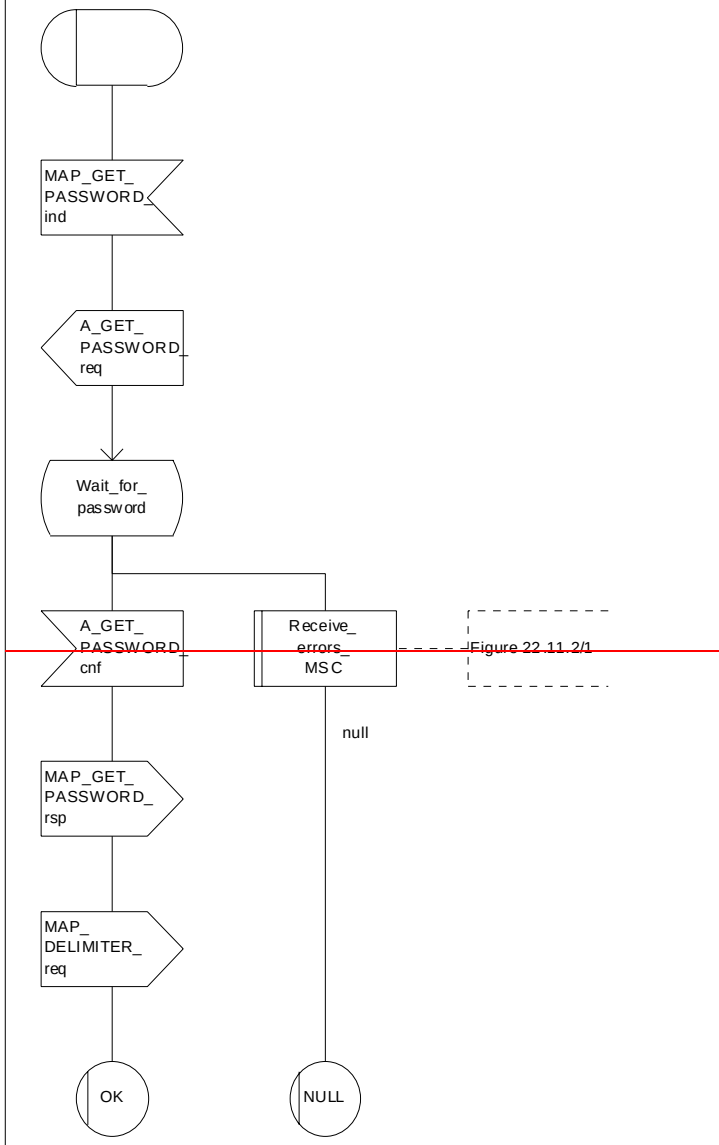
~~This macro is used by the HLR to receive signals from the VLR that should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the VLR, that connection is closed before the only outcome of the macro, "err" is reported back to the calling process. The macro is described in figure 22.11.2/4.~~

~~**Macro Receive_error_from_next_node**~~

~~This macro is used by the primary HLR to receive signals from the gsmSCF or secondary HLR that should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the next node, that connection is closed. The macro is described in figure 22.11.2/5.~~

Macrodefinition GET_PASSWORD_MSC 22.11.1_1(1)

Figure 22.11.1/1: Macro which relays a GetPassword request from the VLR to the MS and relays the GetPassword response from the MS to the VLR



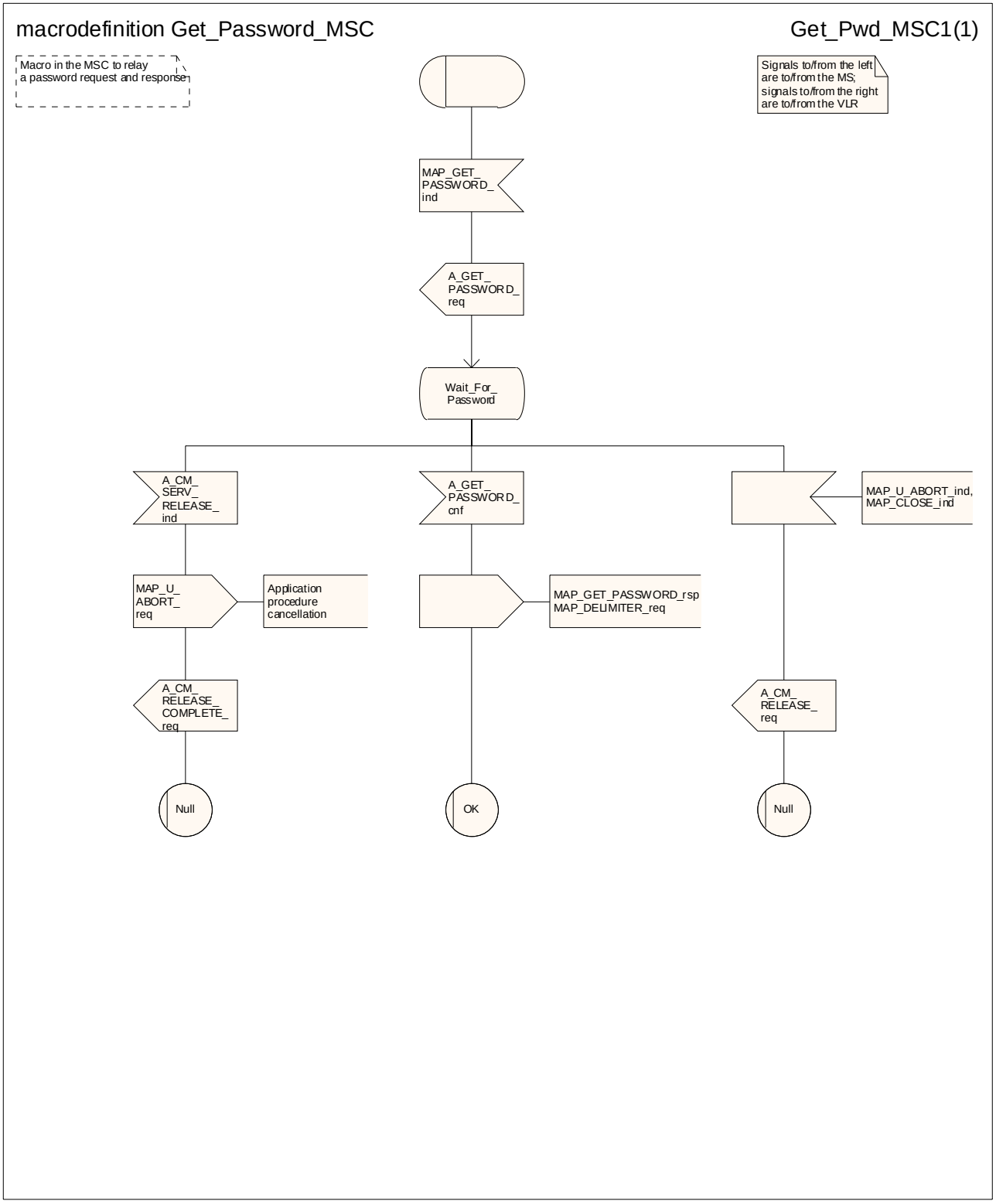
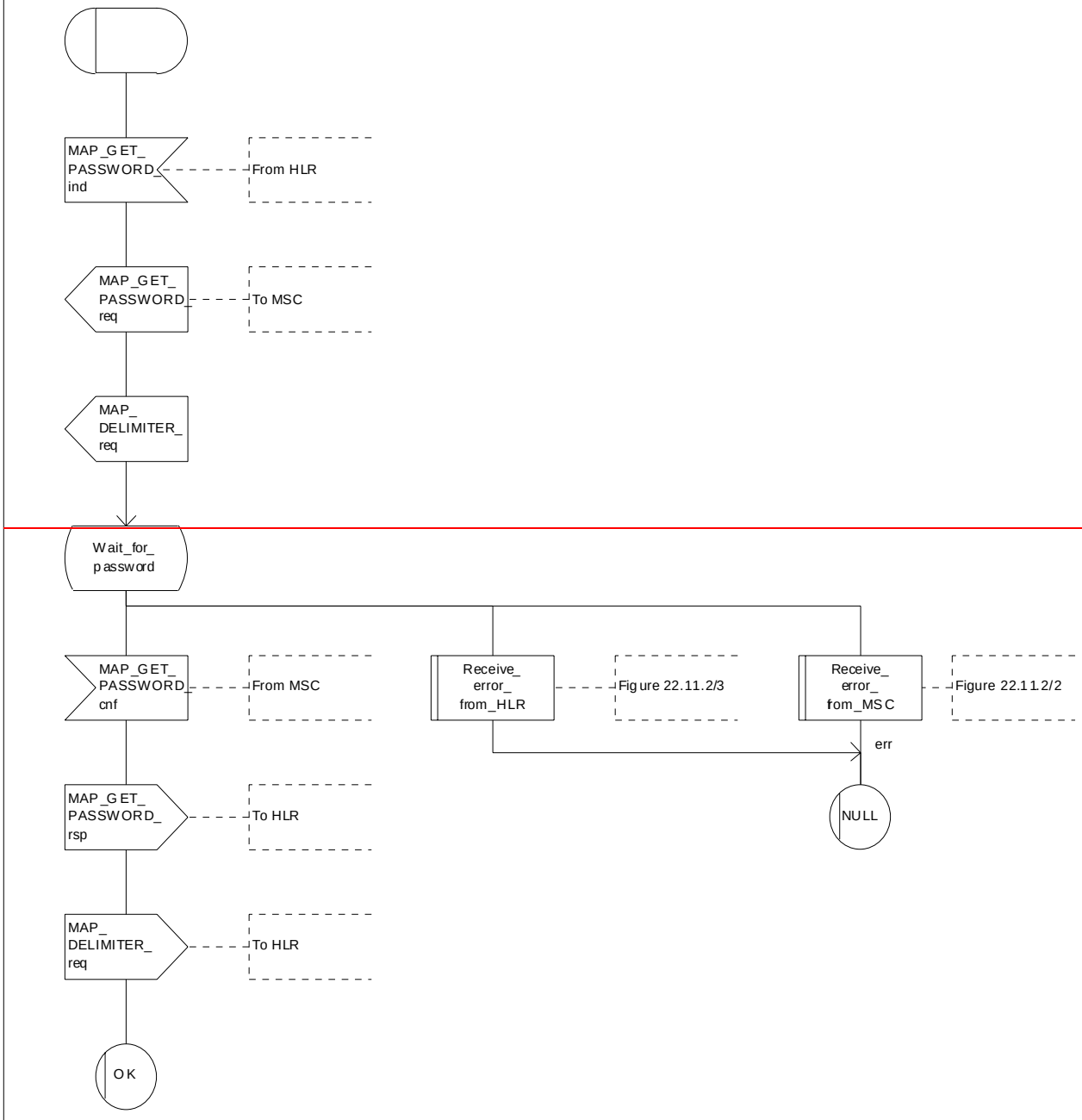


Figure 22.11.1/1: Macro Get_Password~~W~~_MSC

Macrodefinition GET_PASSWORD_VLR 22.11.1_2(1)

Figure 22.11.1/2: Macro which relay a GetPassword request from the HLR to the VLR and relays the GetPassword response from the VLR to the HLR



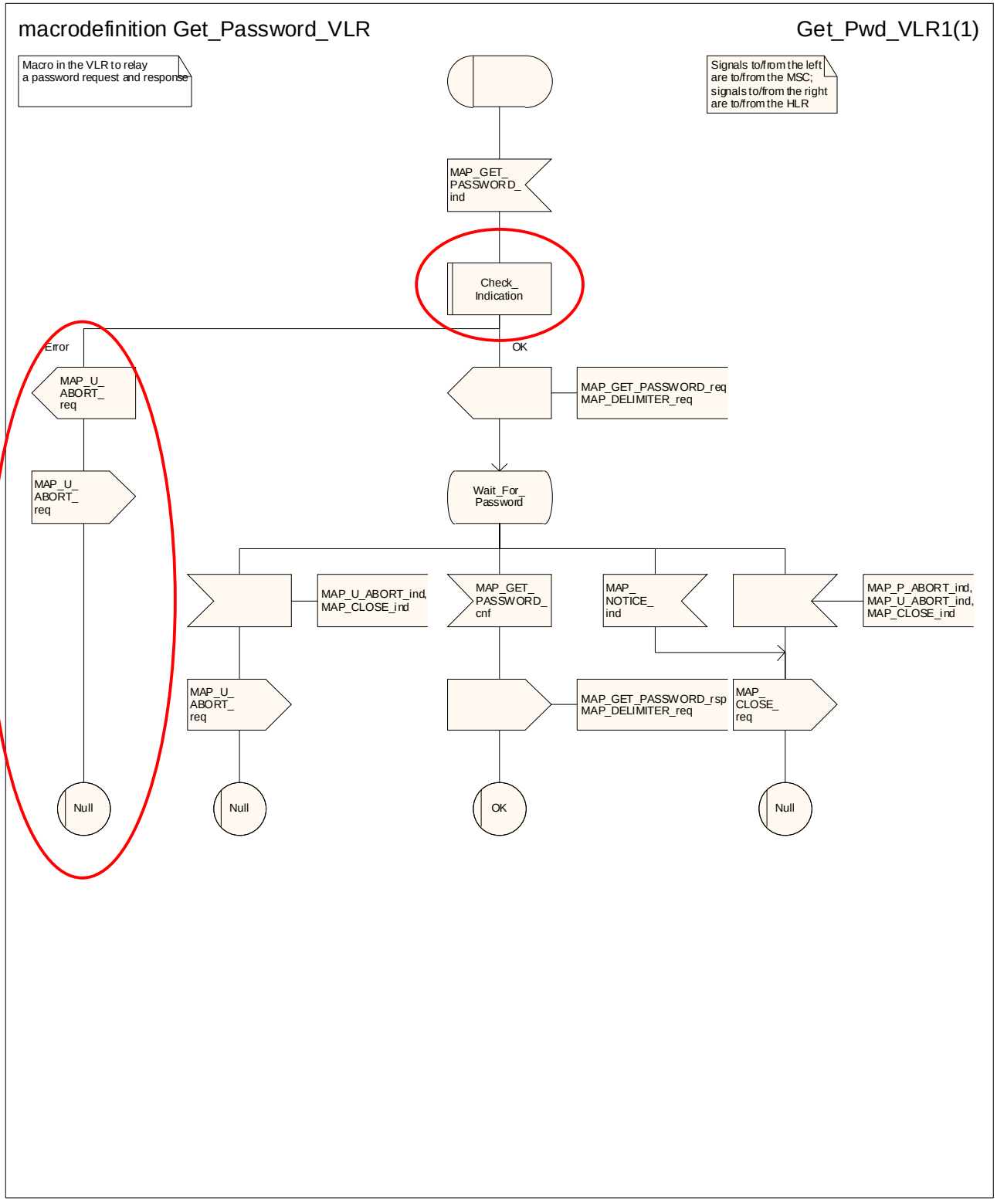
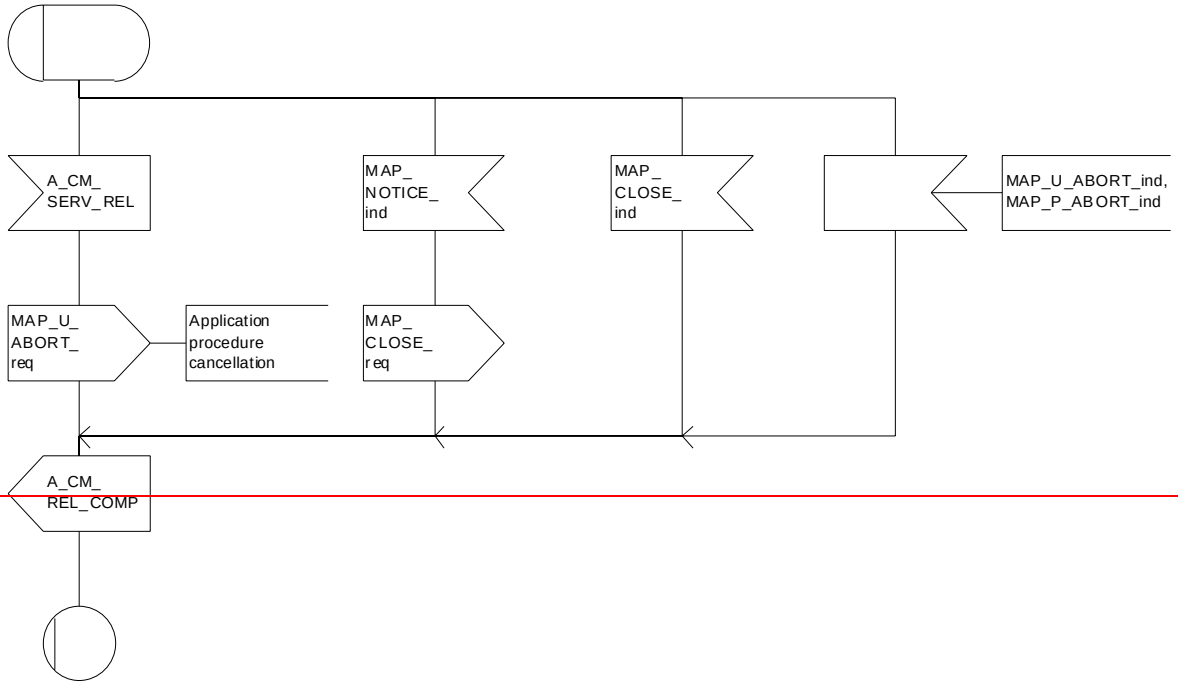


Figure 22.11.1/2: Macro Get_Password~~W~~_VLR

Macrodefinition Receive_errors_MSC 22.11.2_1(1)

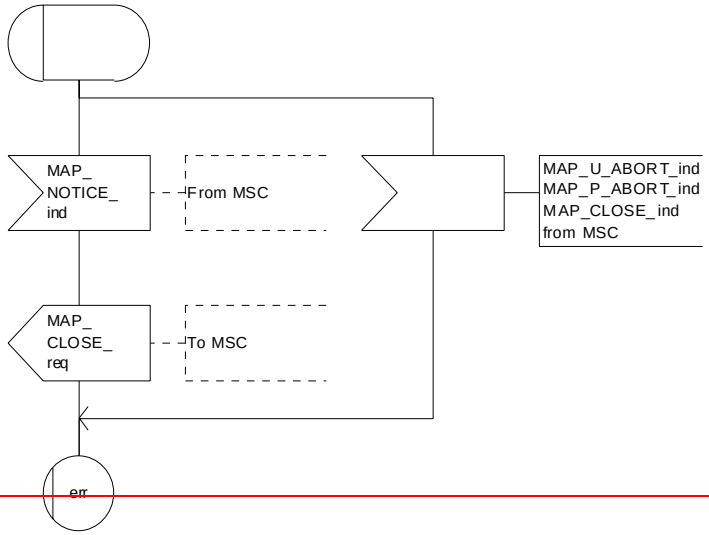
Figure 22.11.2/1: Macro which handles possible error situations while the MSC is waiting for a confirmation of a supplementary service request to the VLR



~~Figure 22.11.2/1: Macro Receive_Errors_MSC~~

Macrodefinition Receive_error_from_MSC 22.11.2_2(1)

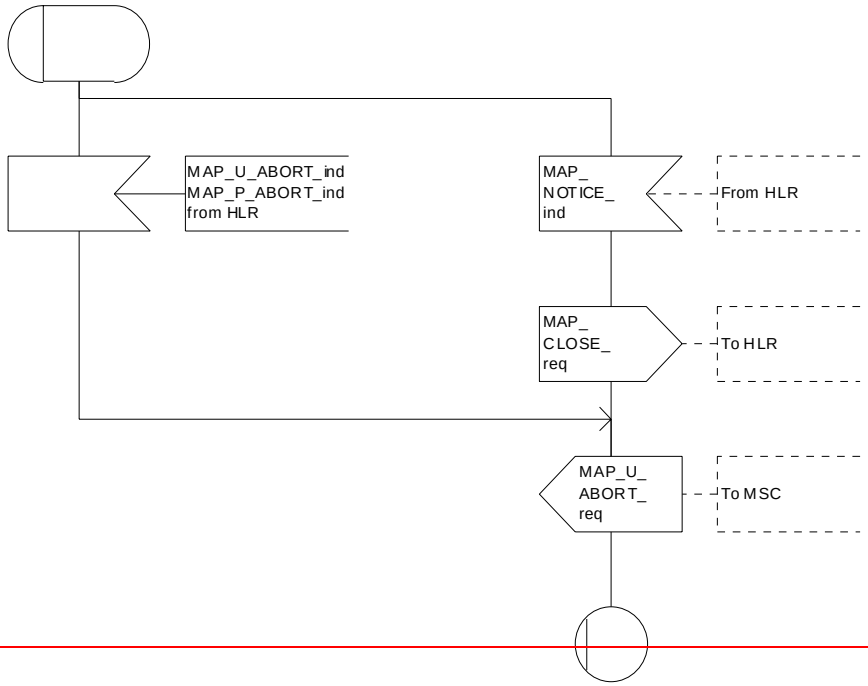
Figure 22.11.2/2: Macro to receive errors from the MSC during supplementary services procedures in the VLR



~~Figure 22.11.2/2: Macro Receive_Error_from_MSC~~

Macrodefinition Receive_error_from_HLR 22.11.2_3(1)

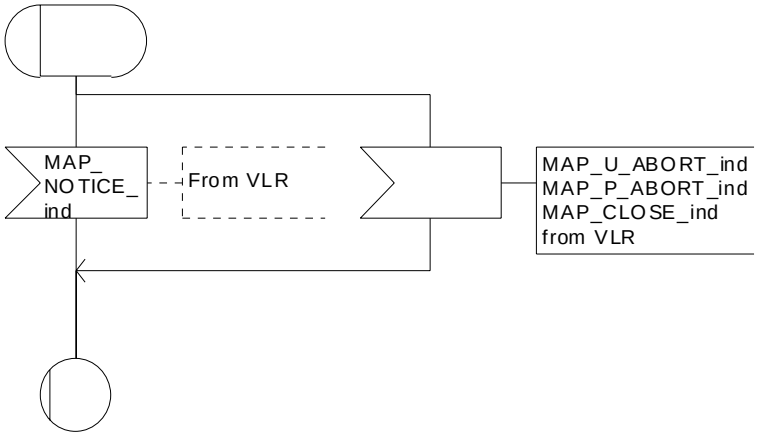
Figure 22.11.2/3: Macro to receive errors from the HLR while the VLR is waiting for a confirmation of a supplementary service request sent to the HLR



~~Figure 22.11.2/3: Macro Receive_Errors_HLR~~

Macrodefinition Receive_error_from_VLR 22.11.2_4(1)

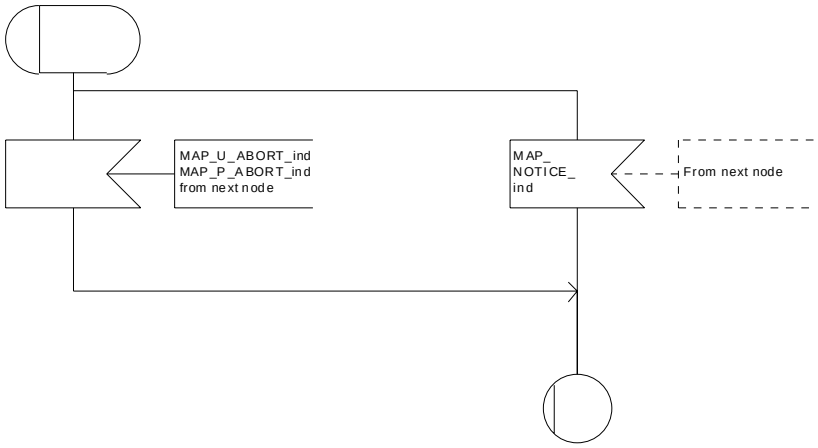
Figure 22.11.2/4: Macro to receive errors from the VLR during supplementary services procedures in the HLR



~~Figure 22.11.2/4: Macro Receive_error_from_VLR~~

Macrodefinition Receive_error_from_next_node 22.11.2_5(1)

Figure 22.11.2/5: Macro to receive errors from the next node while the HLR is waiting for a confirmation of a supplementary service request sent to the next node



~~Figure 22.11.2/5: Macro Receive_error_from_next_node~~

22.12 Supplementary Service Invocation Notification procedure

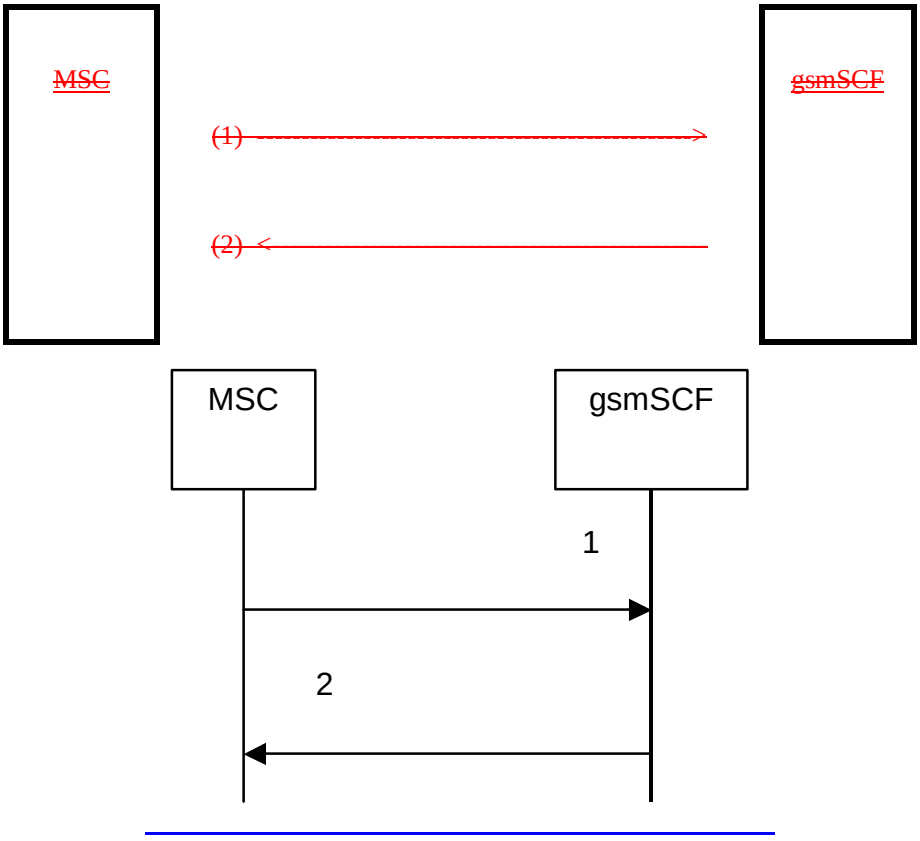
22.12.1 General

The Supplementary Service Invocation Notification procedure is used to notify a gsmSCF about the invocation of a GSM Supplementary Service.

The supplementary service invocation notification password registration procedure is shown in figure 22.12.1/1.

The following service is mcertainly be used:

MAP_SS_INVOCATION_NOTIFY (defined in clause 11).



1) MAP_SS_INVOCATION_NOTIFY_req/ind
2) MAP_SS_INVOCATION_NOTIFY_rsp/cnf

(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 servicesMessage flow for supplementary service invocation notification

22.12.2 Procedures in the MSC

The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

The supplementary service invocation notification processdure 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 via the MAP_SUPPLEMENTARY_SERVICE_INVOCATION_NOTIFICATION service. This is sent in a TCAP TC-BEGIN primitive. The MSC then awaits a positive or negative acknowledgement from the gsmSCF to the MAP-SUPPLEMENTARY_SERVICE_INVOCATION_NOTIFICATION. This is received in a TCAP TC_END primitive, and upon receipt the relationship between the MSC and the gsmSCF is terminated. Similarly, the relationship is terminated at the MSC by the sending of or receipt of a TCAP P_ABORT primitive. This is illustrated~~shown in figure 22.12.2/1.

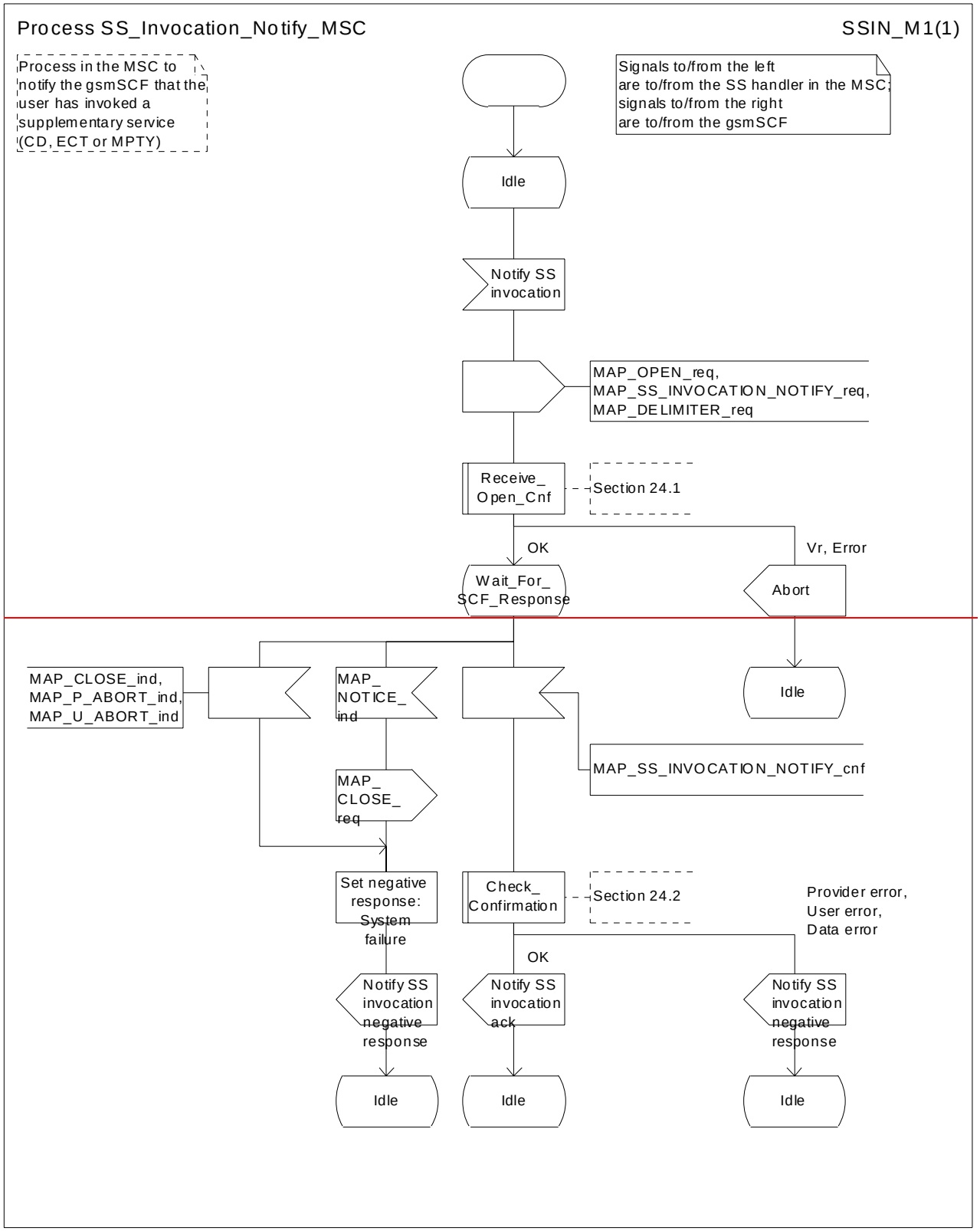
22.12.3 Procedures in the gsmSCF

The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

~~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 MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION service then it returns a positive acknowledgement to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION, indicating the success of the service. This is returned in a TCAP TC-END primitive, using the basic end procedure.~~

~~Otherwise, a negative acknowledgement to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION is returned. This is also returned in a TCAP TC-END primitive, again using the basic end procedure. The gsmSCF TCAP service may also choose to abort the relationship to the MSC by sending a TCAP P-ABORT primitive. It will immediately terminate processing of a MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION should a TCAP P-ABORT primitive be received from the MSC. This is illustrated~~The supplementary service invocation notification process in thegsmSCF is shown in figure 22.12.3/1.


Process SS_Invocation_Notify_MSC
SSIN_M1(1)
Process in the MSC to notify the gsmSCF that the user has invoked a supplementary service (CD, ECT or MPTY)
Signals to/from the left are to/from the SS handler in the MSC; signals to/from the right are to/from the gsmSCF
Idle
Notify SS invocation
MAP_OPEN_req, MAP_SS_INVOCATION_NOTIFY_req, MAP_DELIMITER_req
Receive_ Open_Cnf
Section 24.1
OK
Vr, Error
Wait_For_ SCF_Response
Abort
MAP_CLOSE_ind, MAP_P_ABORT_ind, MAP_U_ABORT_ind
MAP_ NOTICE_ ind
Idle
MAP_SS_INVOCATION_NOTIFY_cnf
MAP_ CLOSE_ req
Set negative response: System failure
Check_ Confirmation
Section 24.2
Provider error, User error, Data error
OK
Notify SS invocation negative response
Notify SS invocation ack
Notify SS invocation negative response
Idle
Idle
Idle

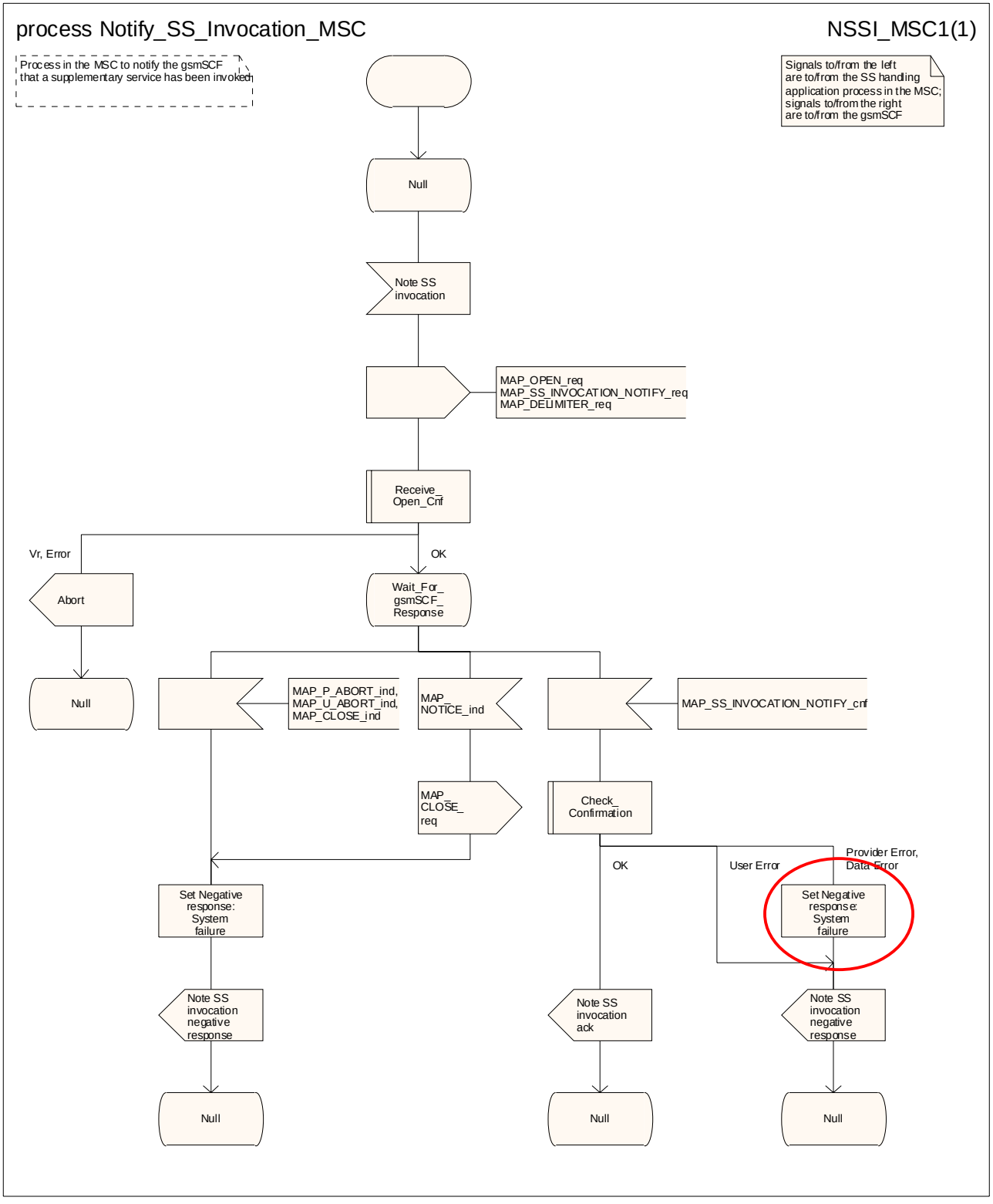
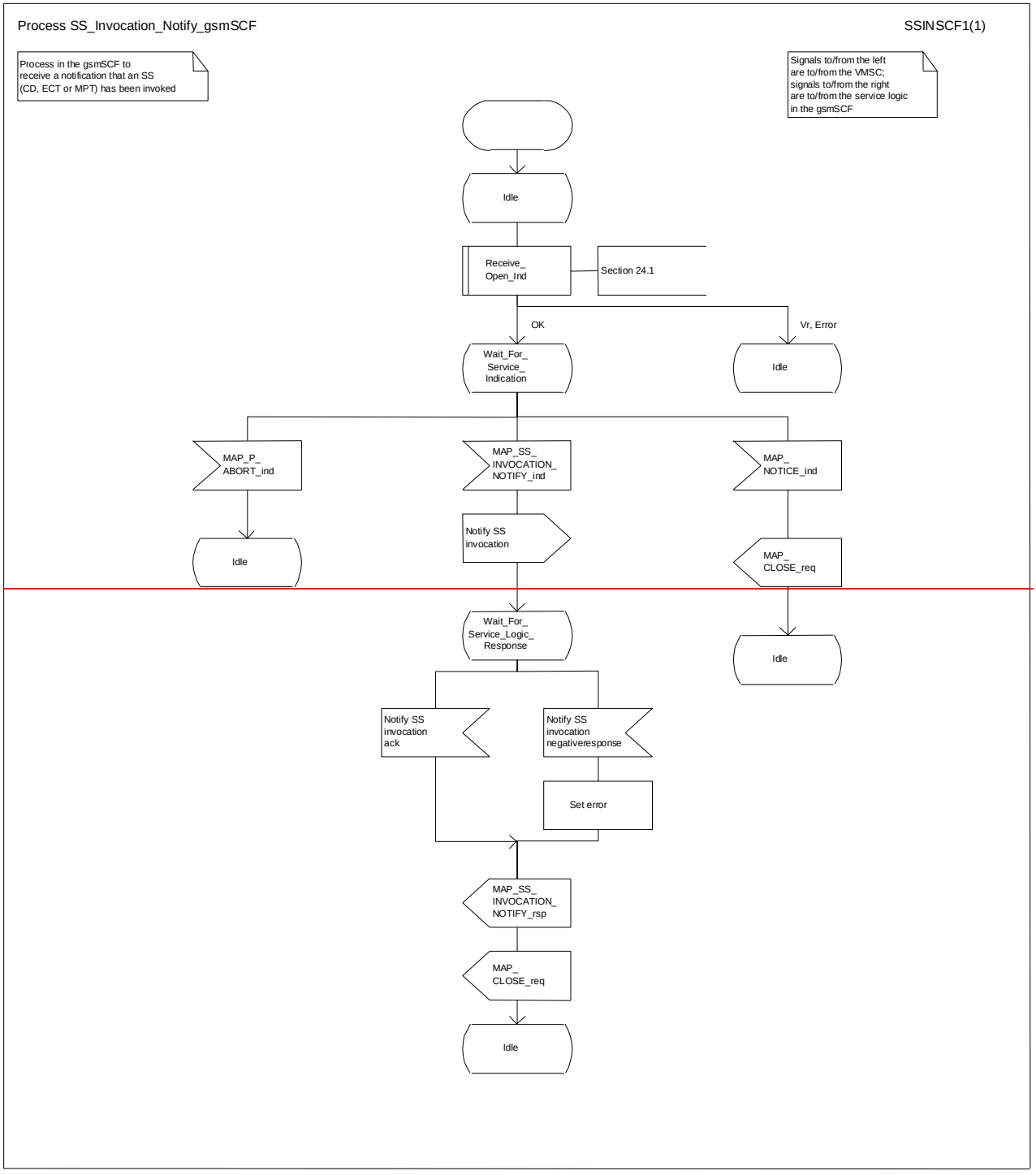


Figure 22.12.2/1: Process Notify_SS_Invocation_~~Notify_~~MSC (sheet 1 of 1)


Process SS_Invocation_Notify_gsmSCF
SSINSCF1(1)
Process in the gsmSCF to receive a notification that an SS (CD, ECT or MPT) has been invoked
Signals to/from the left are to/from the VMSC; signals to/from the right are to/from the service logic in the gsmSCF
Idle
Receive_ Open_Ind
Section 24.1
OK
Vr, Error
Wait_For_ Service_ Indication
Idle
MAP_P_ ABORT_ind
MAP_SS_ INVOCATION_ NOTIFY_ind
MAP_ NOTICE_ind
Idle
Notify SS invocation
MAP_ CLOSE_req
Wait_For_ Service_Logic_ Response
Idle
Notify SS invocation ack
Notify SS invocation negativeresponse
Set error
MAP_SS_ INVOCATION_ NOTIFY_rsp
MAP_ CLOSE_req
Idle

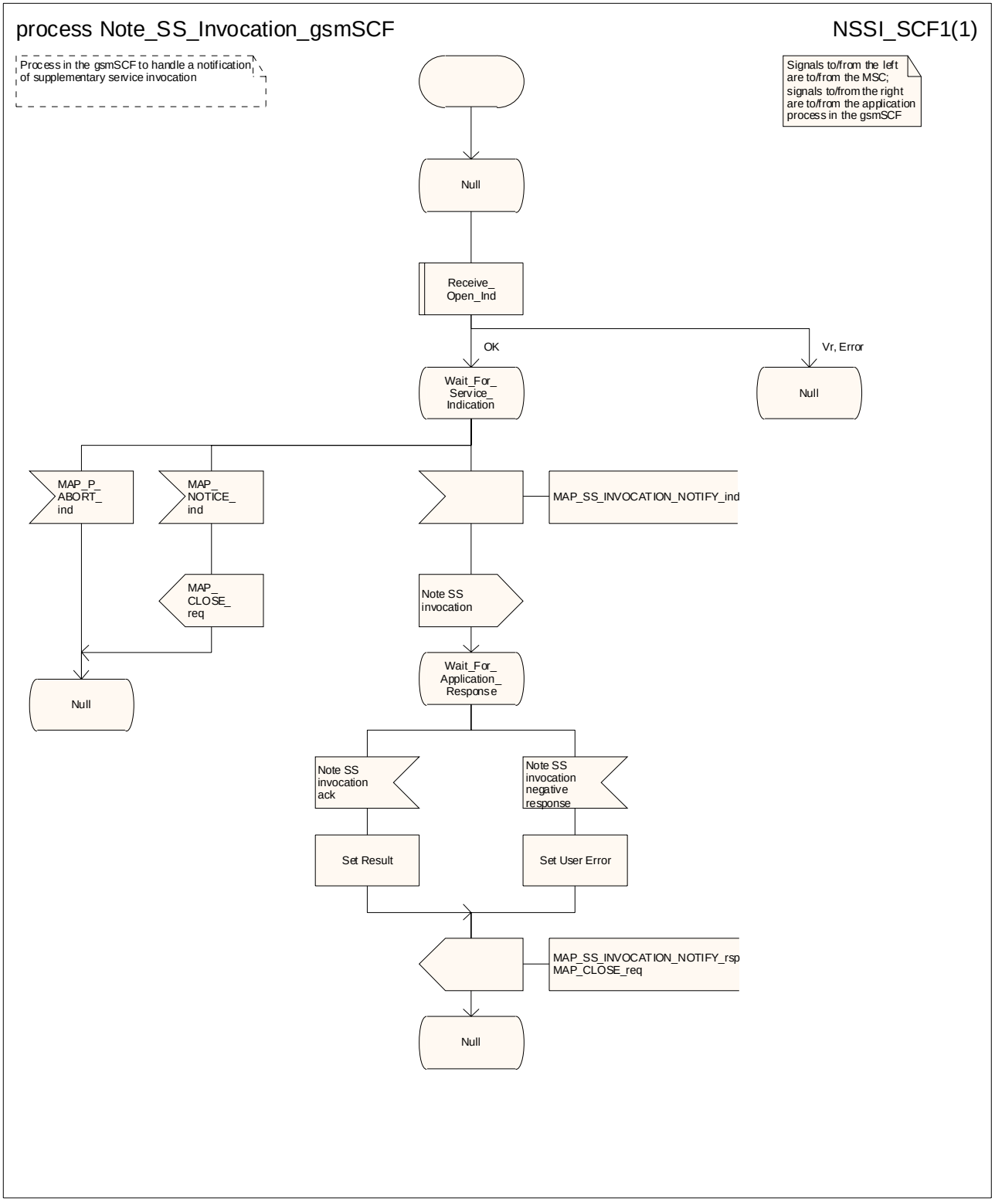
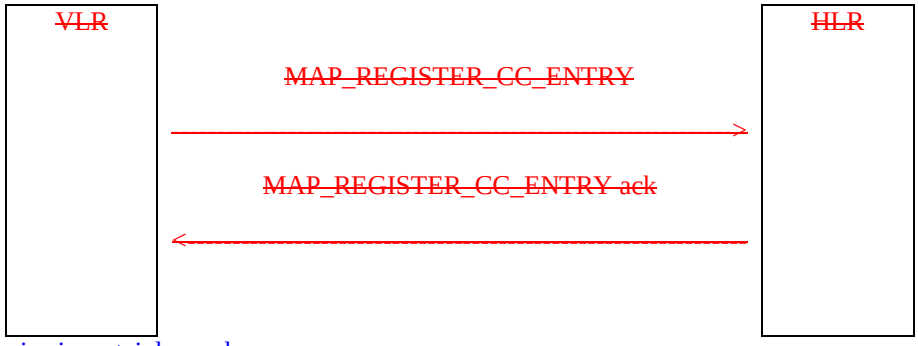


Figure 22.12.3/1: Process Note_SS_Invocation_~~Notify_~~gsmSCF (sheet 1 of 1)

22.13 Activation of a CCBS request

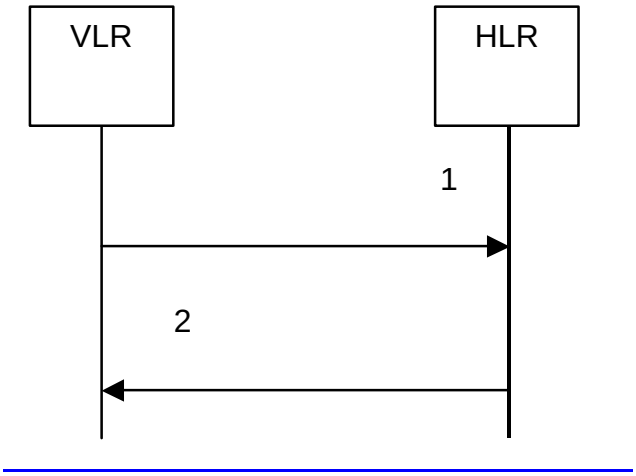
22.13.1 General

The message flow to activate a CCBS request is shown in figure 22.13.1/1.



The following service is certainly used:

MAP_REGISTER_CC_ENTRY (defined in clause 11).



1) MAP_REGISTER_CC_ENTRY req/ind
2) MAP_REGISTER_CC_ENTRY rsp/cnf

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 clause; 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.~~

22.13.3 Procedure in the HLR

The MAP process in the HLR to activate a CCBS request is shown in figure 22.13.2/1.

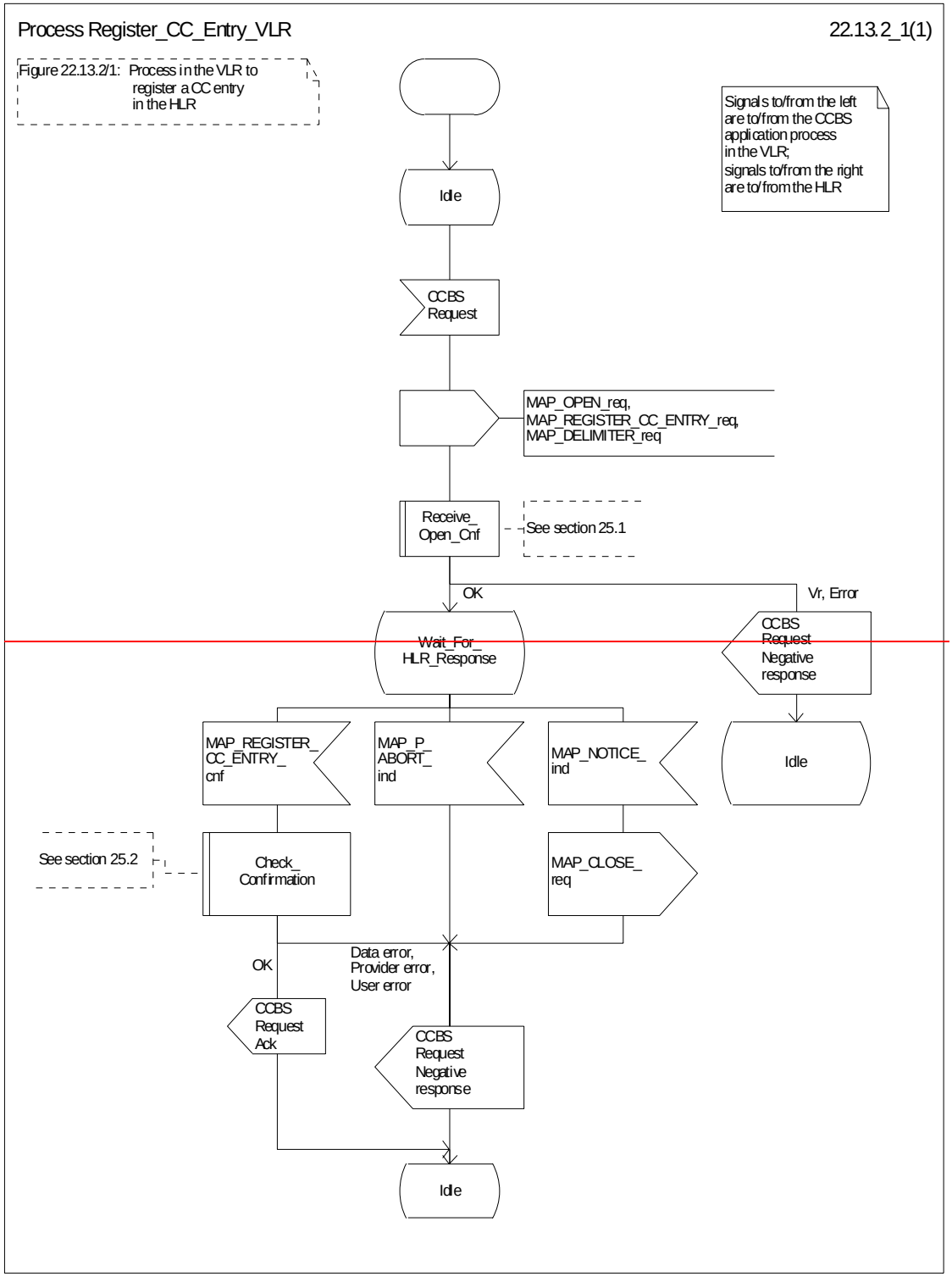
~~**Successful outcome**~~

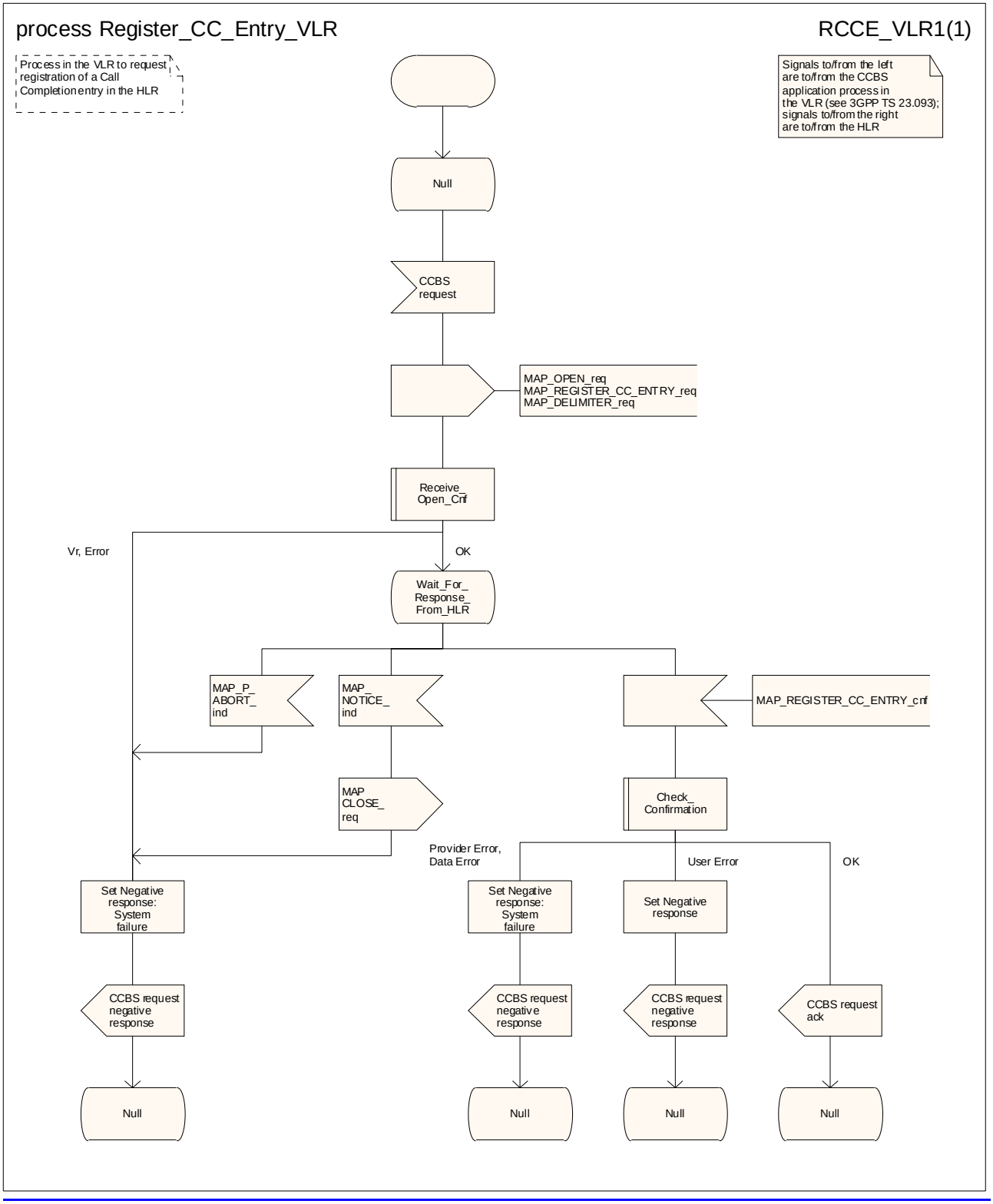
~~When the MAP process receives a MAP_REGISTER_CC_ENTRY_indication from the co-ordinating process, it sends a CCBS Request message to the CCBS application process in the HLR, and waits for a response. The request contains the parameters received in the MAP_REGISTER_CC_ENTRY service indication.~~

~~If the CCBS application process in the HLR returns a positive response, the MAP process constructs a MAP_REGISTER_CC_ENTRY service response, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.~~

~~**Negative response from HLR CCBS application process**~~

~~If the CCBS application process in the HLR returns a negative response, the MAP process constructs a MAP_REGISTER_CC_ENTRY service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.~~


Process Register_CC_Entry_VLR
22.13.2_1(1)
Figure 22.13.2/1: Process in the VLR to register a CC entry in the HLR
Signals to/from the left are to/from the CCBS application process in the VLR;
signals to/from the right are to/from the HLR
Idle
CCBS Request
MAP_OPEN_req,
MAP_REGISTER_CC_ENTRY_req,
MAP_DELIMITER_req
Receive_ Open_Cnf
See section 25.1
OK
Vr, Error
Wait_For_ HLR_Response
CCBS Request Negative response
MAP_REGISTER_ CC_ENTRY_ cnf
MAP_P_ ABORT_ ind
MAP_NOTICE_ ind
Idle
See section 25.2
Check_ Confirmation
MAP_CLOSE_ req
OK
Data error, Provider error, User error
CCBS Request Ack
CCBS Request Negative response
Idle


process Register_CC_Entry_VLR
RCCE_VLR1(1)
Process in the VLR to request registration of a Call Completion entry in the HLR
Signals to/from the left are to/from the CCBS application process in the VLR (see 3GPP TS 23.093); signals to/from the right are to/from the HLR
Null
CCBS request
MAP_OPEN_req
MAP_REGISTER_CC_ENTRY_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Vr, Error
OK
Wait_For_ Response_ From_HLR
MAP_P_ ABORT_ ind
MAP_ NOTICE_ ind
MAP_REGISTER_CC_ENTRY_cnf
MAP CLOSE_ req
Check_ Confirmation
Provider Error, Data Error
User Error
OK
Set Negative response: System failure
Set Negative response: System failure
Set Negative response
CCBS request negative response
CCBS request negative response
CCBS request negative response
CCBS request ack
Null
Null
Null
Null

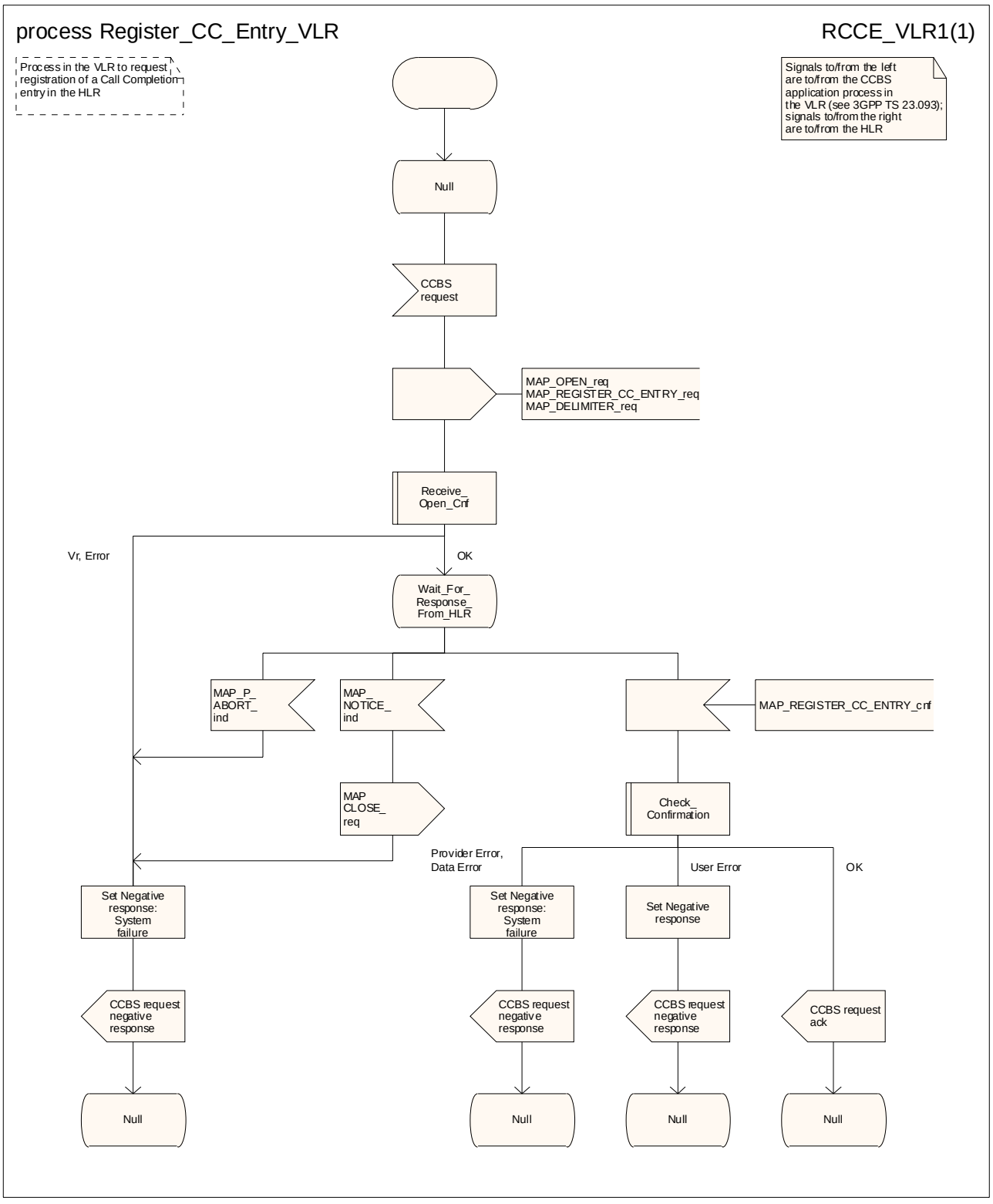
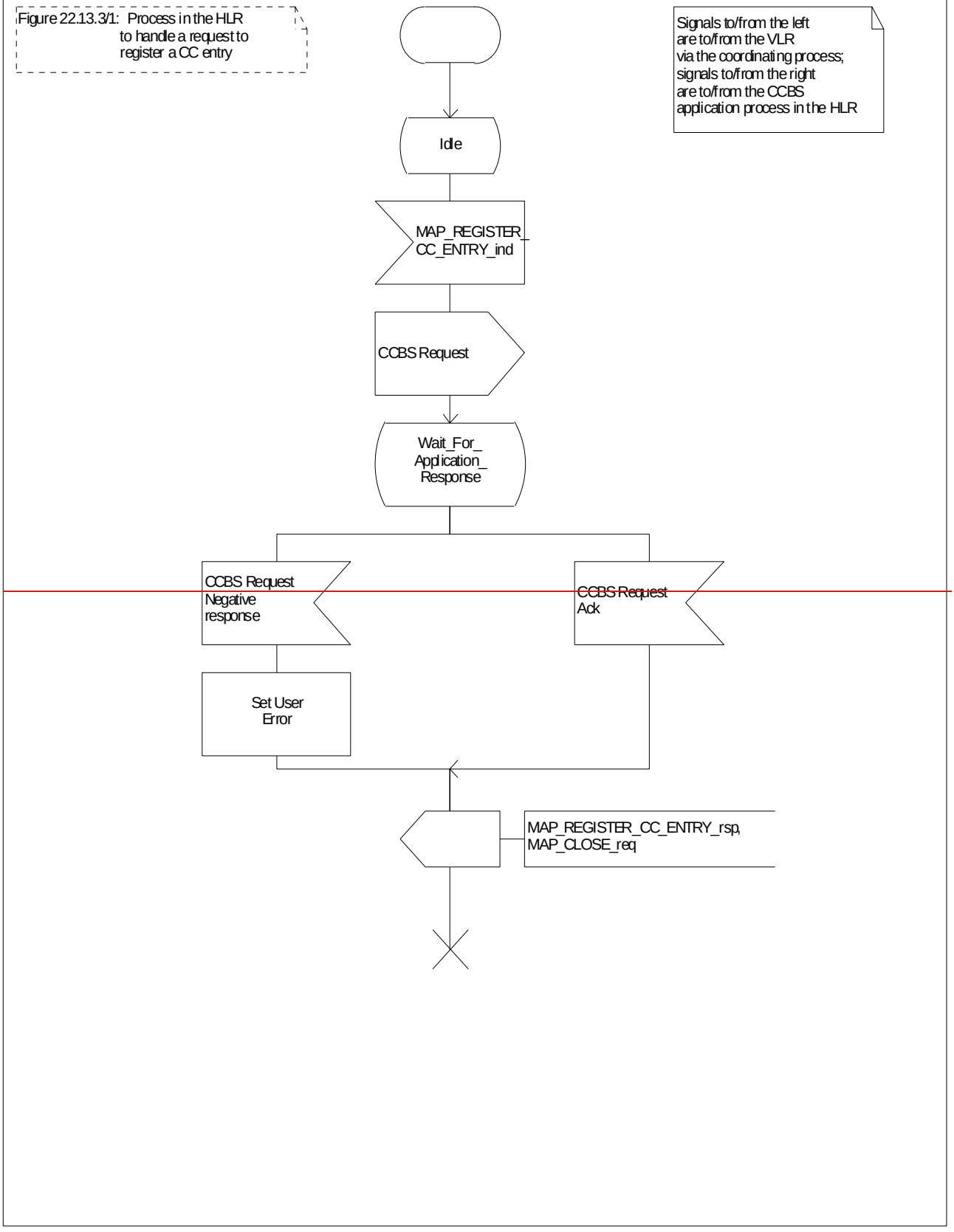


Figure 22.13.2/1: Process Register_CC_Entry_VLR

Process Register_CC_Entry_HLR 22.13.3_1(1)

Figure 22.13.3/1: Process in the HLR to handle a request to register a CC entry



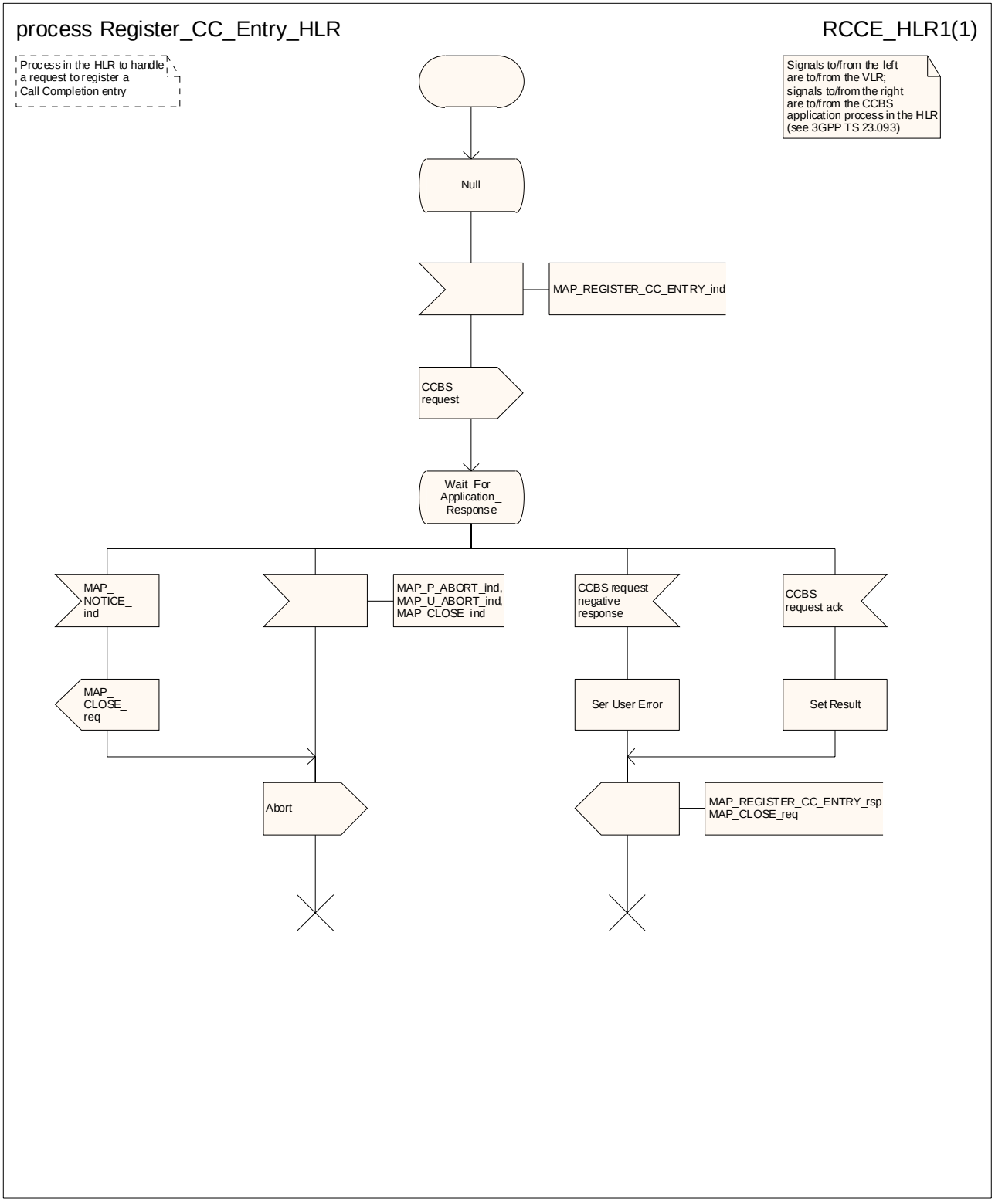
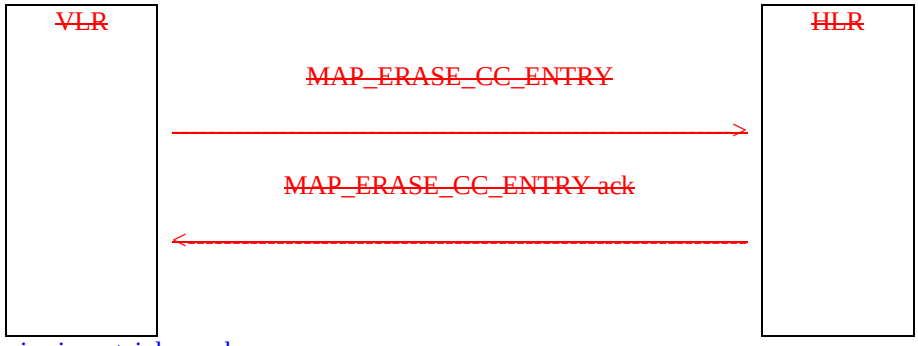


Figure 22.13.3/1: Process Register_CC_Entry_HLR

22.14 Deactivation of a CCBS request

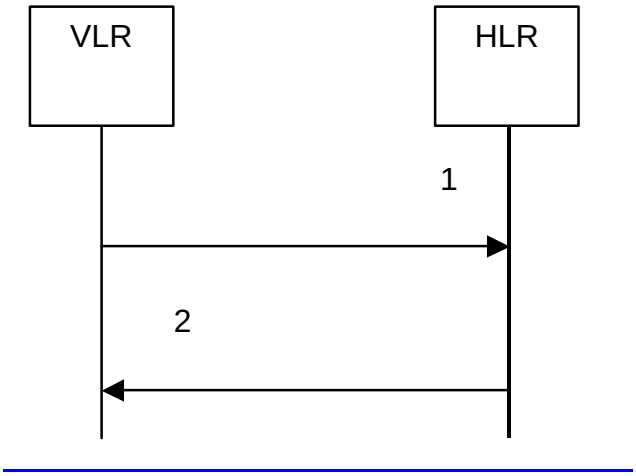
22.14.1 General

The message flow to deactivate a CCBS request is shown in figure 22.14.1/1.



The following service is certainly used:

MAP_ERASE_CC_ENTRY (defined in clause 11).



1) MAP_ERASE_CC_ENTRY req/ind
2) MAP_ERASE_CC_ENTRY rsp/cnf

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 clause; 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.~~

22.14.3 Procedure in the HLR

The MAP process in the HLR to deactivate a CCBS request is shown in figure 22.14.2/1.

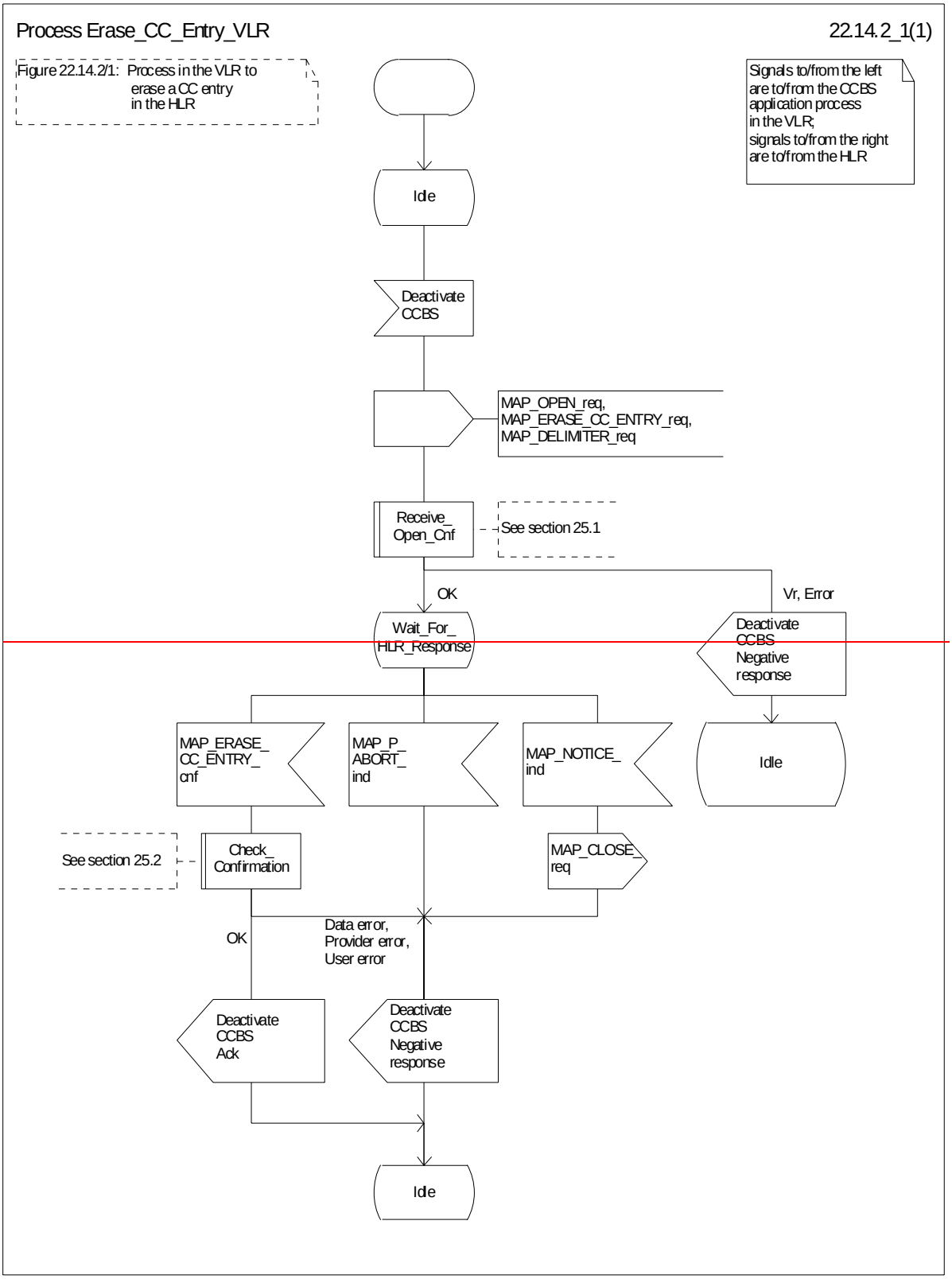
~~**Successful outcome**~~

~~When the MAP process receives a MAP_ERASE_CC_ENTRY_indication from the co-ordinating process, it sends a Deactivate CCBS message to the CCBS application process in the HLR, and waits for a response. The message contains the parameters received in the MAP_ERASE_CC_ENTRY service indication.~~

~~If the CCBS application process in the HLR returns a positive response, the MAP process constructs a MAP_ERASE_CC_ENTRY service response, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.~~

~~**Negative response from HLR CCBS application process**~~

~~If the CCBS application process in the HLR returns a negative response, the MAP process constructs a MAP_ERASE_CC_ENTRY service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.~~


Process Erase_CC_Entry_VLR
22.14.2_1(1)
Figure 22.14.2/1: Process in the VLR to erase a CC entry in the HLR
Signals to/from the left are to/from the CCBS application process in the VLR; signals to/from the right are to/from the HLR
Idle
Deactivate CCBS
MAP_OPEN_req, MAP_ERASE_CC_ENTRY_req, MAP_DELIMITER_req
Receive_ Open_Cnf
See section 25.1
OK
Vr, Error
Wait_For_ HLR_Response
Deactivate CCBS Negative response
MAP_ERASE_ CC_ENTRY_ cnf
MAP_P_ ABORT_ ind
MAP_NOTICE_ ind
Idle
See section 25.2
Check_ Confirmation
MAP_CLOSE_ req
OK
Data error, Provider error, User error
Deactivate CCBS Ack
Deactivate CCBS Negative response
Idle

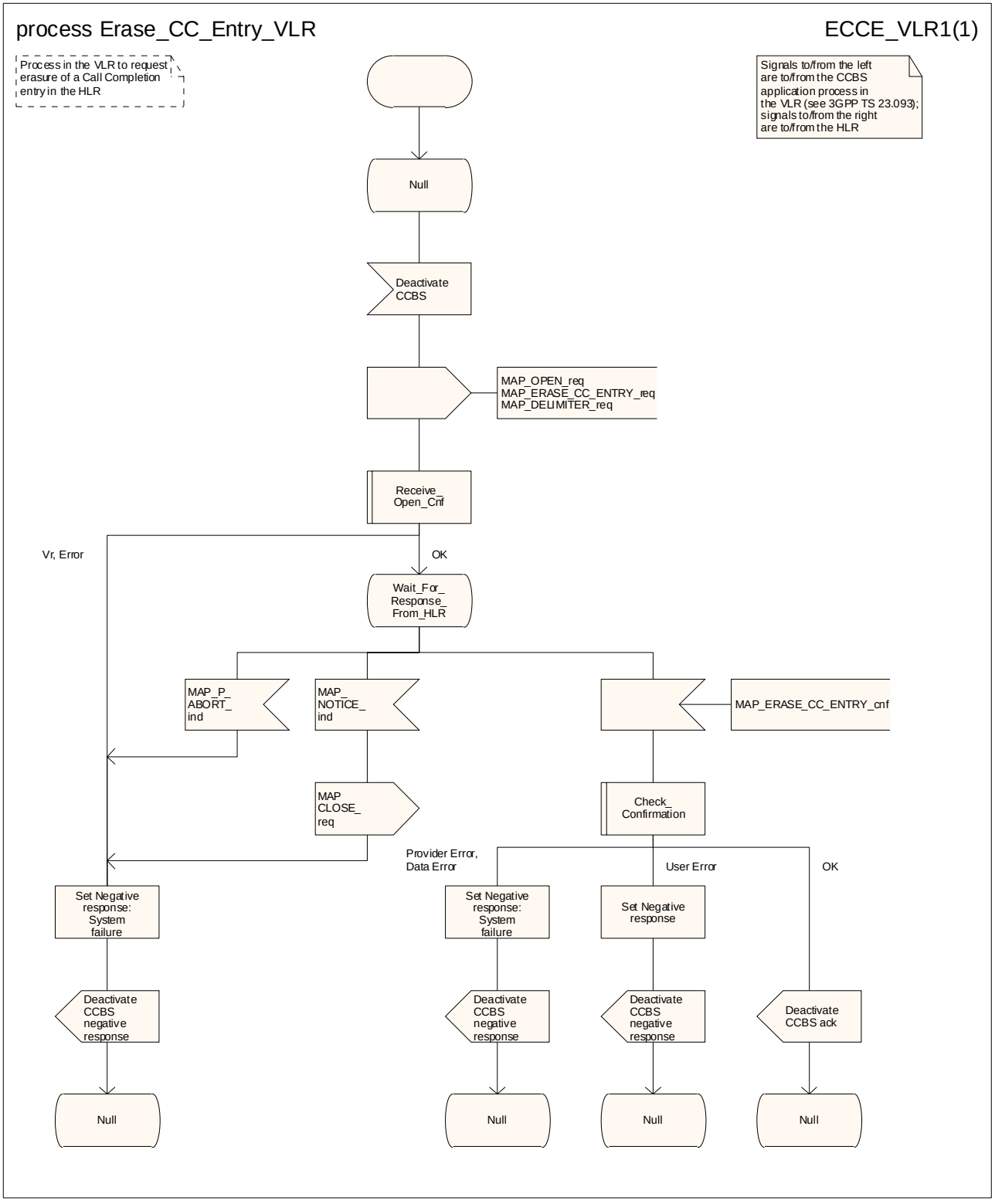
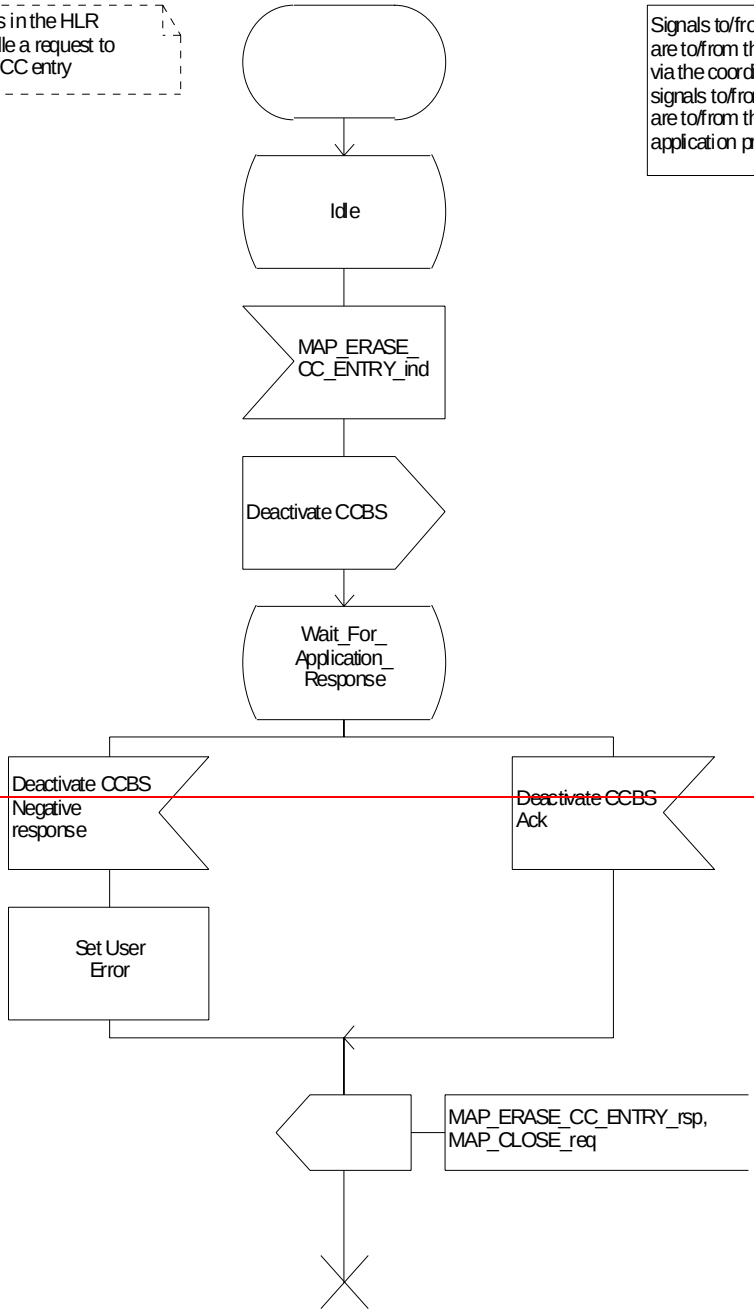


Figure 22.14.2/1: Process Erase_CC_Entry_VLR

Process Erase_CC_Entry_HLR 22.14.3_1(1)

Figure 22.14.3/1: Process in the HLR to handle a request to erase a CC entry



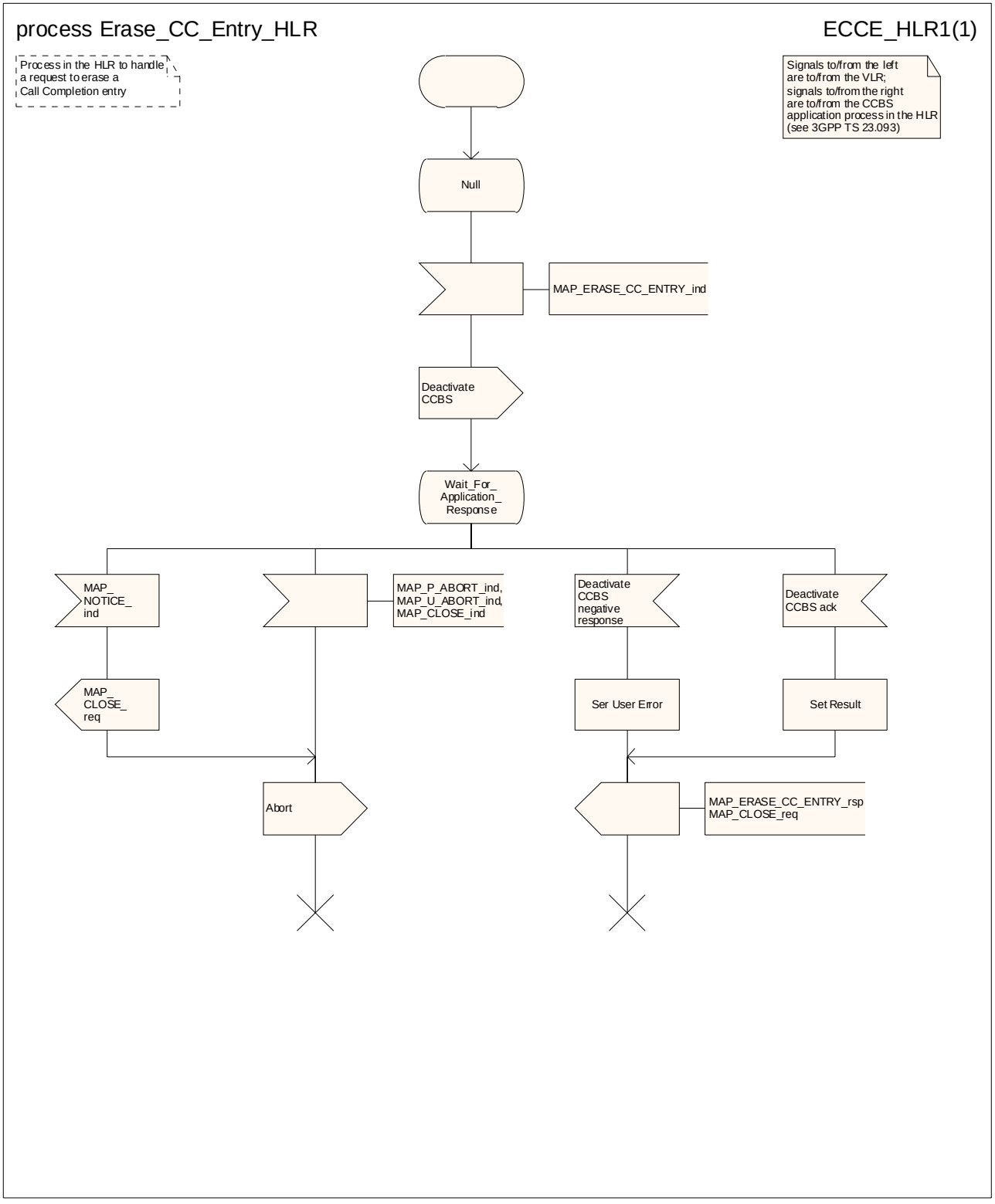


Figure 22.14.3/1: Process Erase_CC_Entry_HLR

***** End of document *****

3GPP TSG CN WG4 Meeting #19 **N4-030468~~0~~2**
San Diego, CA, USA, 19th – 23rd May 2003 **(Revision of N4-030468)**

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **607** ⌘ **rev** **1-** ⌘ Current version: **6.1.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Provision of SDL diagrams and removal of redundant text in chapter 22
Source:	⌘	Vodafone
Work item code:	⌘	TEI5
Date:	⌘	~~09~~22/05/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change: ⌘

There are no source files available for the SDL diagrams in 29.002 chapter 24.
Many SDL diagrams are poorly laid out.
Many message flow diagrams are drawn using MS linedraw characters, which do not display properly in Word 2000.
The descriptive text is not properly aligned with the SDL diagrams.
Signal names for signals to/from processes in 23.011 are not aligned with those in 23.011.
Many procedure descriptions omit error handling
There are lurking references to specifications 04.10, 04.8x and 04.9x.
The description of SS invocation (subclauses 11.6 & 22.7) is purely interworking between the MSC & the VLR, and includes no MAP signalling. The interworking is described in 23.018, 23.083 & 23.084.
The macros Receive_Errors_MSC, Receive_ErrorFrom_HLR, Receive_Error_From_VLR and Receive_Error_From_Next_Node fail the SDL editor syntax check.
The macro Start_USSD_VLR invokes a macro, Search_VLR, which has not existed since GSM phase 2!
The handling in the HLR for SS activation does not take account of the possible need to transfer updated subscriber data for SS barring to the SGSN
Most of the text inaccurately repeats the information in the SDL diagrams; the useful additional information is buried in superfluous verbiage. The misalignment between text and SDL has led to different interpretations, and interworking problems. It was this which led to the style used in GSM 03.18/23.018, where the text is a **supplement to** the SDL. It should be noted that other chapters in 29.002 (e.g. 24B) do not have text which attempts to replicate the SDL.

Summary of change:	⌘	Redraw SDL diagrams to a consistent style. Redraw message flow diagrams. Align text and SDL. Align signal names with 23.011. Update references to 04 series specifications Make subclauses 11.6 & 22.7 void. Add error handling where required Replace the calls on the error handling macros with the explicit input signal handling for MAP_U_ABORT, MAP_P_ABORT, MAP_NOTICE and MAP_CLOSE. Add possible update of SGSN data after SS activation Remove text which replicates the information in SDL diagrams.
Consequences if not approved:	⌘	Poor readability. Misalignment between text and SDL will lead to different interpretations, and hence the potential for interworking problems.

Clauses affected:	⌘	11.6; 22			
Other specs affected:	⌘	**Y** / **N** **N**	Other core specifications	⌘	
		X	Test specifications		
		X	O&M Specifications		
Other comments:	⌘	Following the example approved in CR 29.002-523 & CR 29.002-524, the pretence of MAP signalling between the MSC and the VLR has been reduced; references to application contexts and the need for a supplementary service co-ordinating process in the VLR when it responds to a dialogue opening request from the MSC have been removed. The consequence is that the processes in the VLR to handle supplementary service registration, erasure, activation, deactivation, interrogation and password registration being modified to return to the idle state rather than terminating when the handling is complete. The handling of protocol dropback, MAP_P_ABORT and MAP_NOTICE on the B interface has been removed. The SS co-ordinating process in the MSC to handle a CM Service request with CM service type SS activation has been extended to handle an A_PROCESS_UNSTRUCTURED_SS_REQUEST input, and invoke the process MS_Init_USSD_MSC. The consequence is that the process MS_Init_USSD_MSC now terminates when it has finished its processing, instead of returning to the Null state. The descriptive text for the behaviour of the network entities in each second level subclause has been grouped together, before the SDL diagrams. This editorial rearrangement has not been revision marked.		

*** First modified section ***

11.6 ~~MAP_INVOKE_SS service~~Void

~~11.6.1 Definitions~~

~~This service is used between the MSC and the VLR to check the subscriber's subscription to a given supplementary service in the VLR, in connection with in-call invocation of that supplementary service, i.e. after the call set-up phase is finished. For supplementary service invocation during call set-up phase, please refer to the call handling descriptions.~~

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

~~11.6.2 Service primitives~~

~~The service primitives are shown in table 11.6/1.~~

~~Table 11.6/1: MAP_INVOKE_SS parameters~~

~~Parameter name~~	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~
~~Invoke id~~	~~M~~	~~M(=)~~	~~M(=)~~	~~M(=)~~
~~SS-Code~~	~~M~~	~~M(=)~~		
~~Basic service~~	~~C~~	~~C(=)~~		
~~User error~~			~~C~~	~~C(=)~~
~~Provider error~~				~~O~~

~~11.6.3 Parameter use~~

~~Invoke id~~

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

~~SS-Code~~

~~This SS-Code can only refer to a single supplementary service, e.g. the Call Hold or Multi-Party supplementary services.~~

~~Basic service~~

~~This parameter indicates for which basic service the supplementary service invocation is required.~~

~~User error~~

~~This parameter is sent by the responder upon unsuccessful outcome of the service, and then takes one of the following values:~~

- ~~System Failure;~~
- ~~Data Missing;~~
- ~~Unexpected data value;~~
- ~~Call Barred;~~
- ~~Illegal SS operation;~~
- ~~SS error status;~~
- ~~SS not available.~~

~~Provider error~~

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

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

22 Supplementary services procedures

~~The following application contexts exist for handling of supplementary services:~~

- ~~accessUnstructuredSsContext;~~
- ~~accessFunctionalSsContext.~~

~~The accessUnstructuredSsContext refers to a simple MAP user, 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 s~~Supplementary service co-ordinator processes

22.1.1 Functional supplementary service process co-ordinator for the 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 3GPP TS 29.011 [59].~~

~~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~~

The co-ordinating process in the MSC to handle a CM connection request with CM service type Supplementary service activation is shown in figure 22.1/1. The process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Process_Access_Request_MSC see subclause 25.4.1.

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

22.1.2 ~~Functional supplementary service process co-ordinator for VLR~~Void

~~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.~~

22.1.3 Functional supplementary service process co-ordinator for the 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~~

The MAP co-ordinating process in the HLR to handle a dialogue opened with the networkFunctionalSS application context is shown in figure 22.1/3. The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

~~Figure 22.1/3 shows the co-ordinating process in the 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 clause; the definition of this macro can be found as follows:~~

~~Receive_Open_Ind see clause 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~~

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 clause; the definition of this macro can be found as follows:

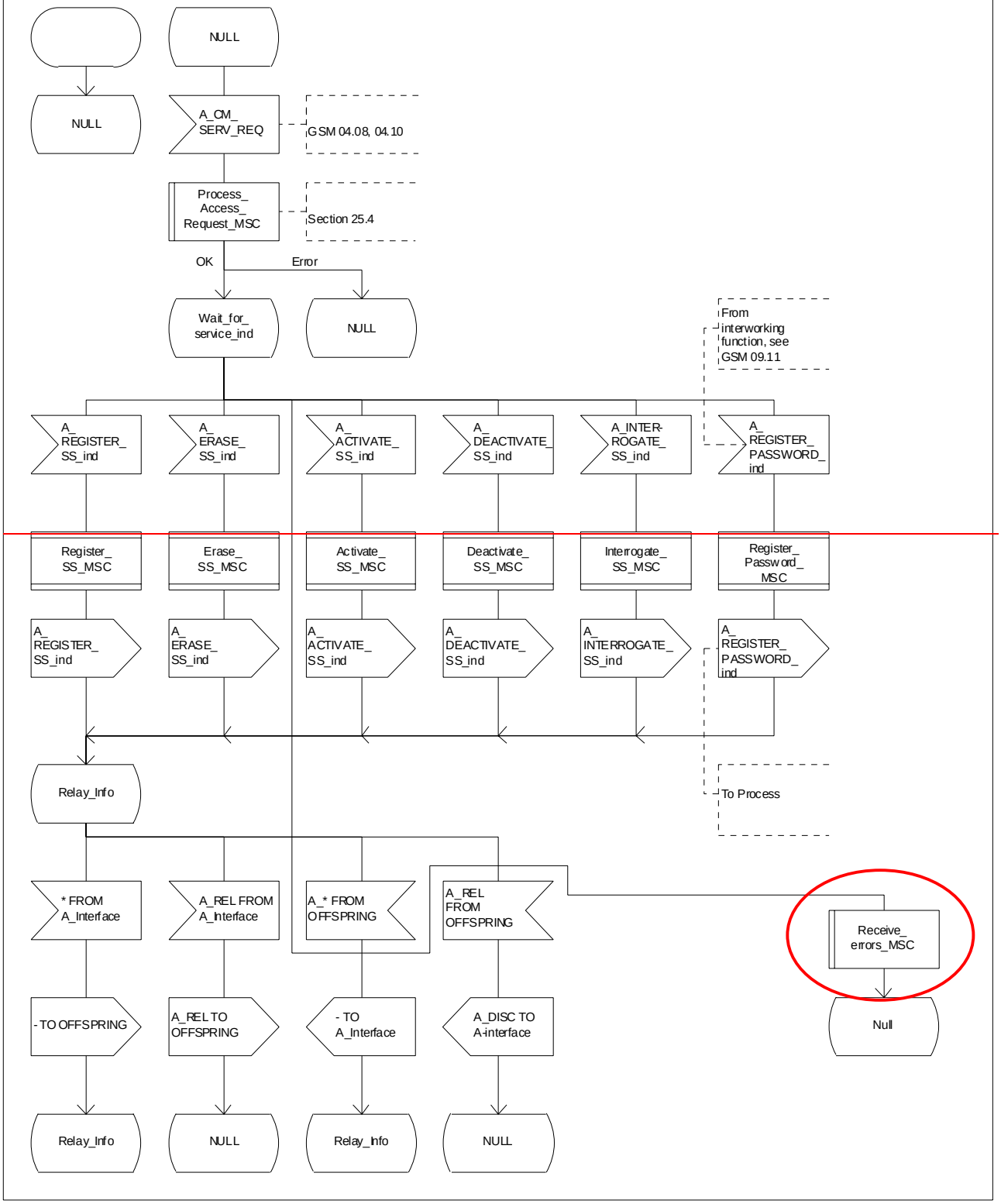
Receive_Open_Ind see subclause 25.1.1.

~~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.~~

Process SS_Coordinator_MSC 22.1_1(1)

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



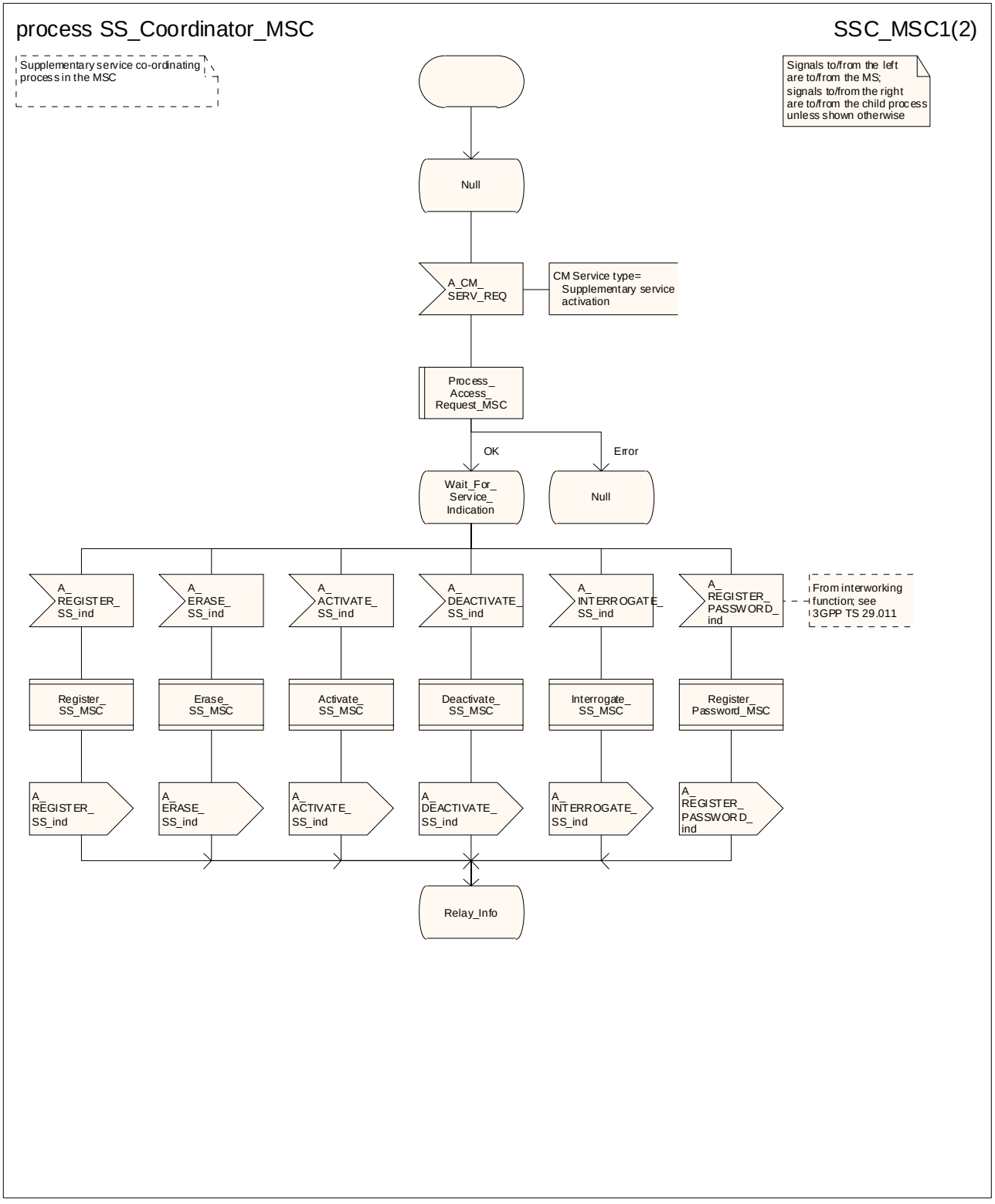


Figure 22.1/1 (sheet 1 of 2): Process SS_Coordinator_MSC

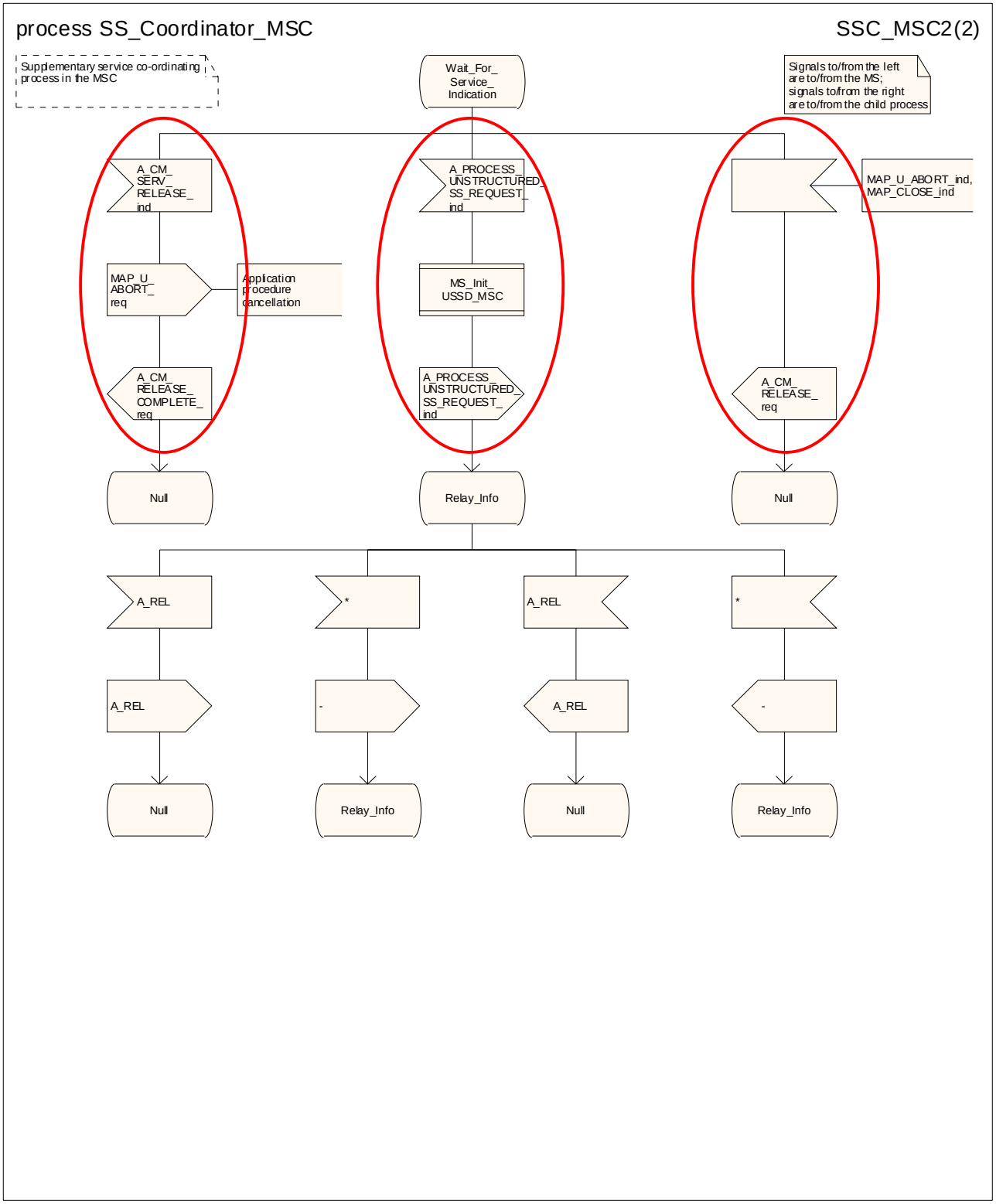
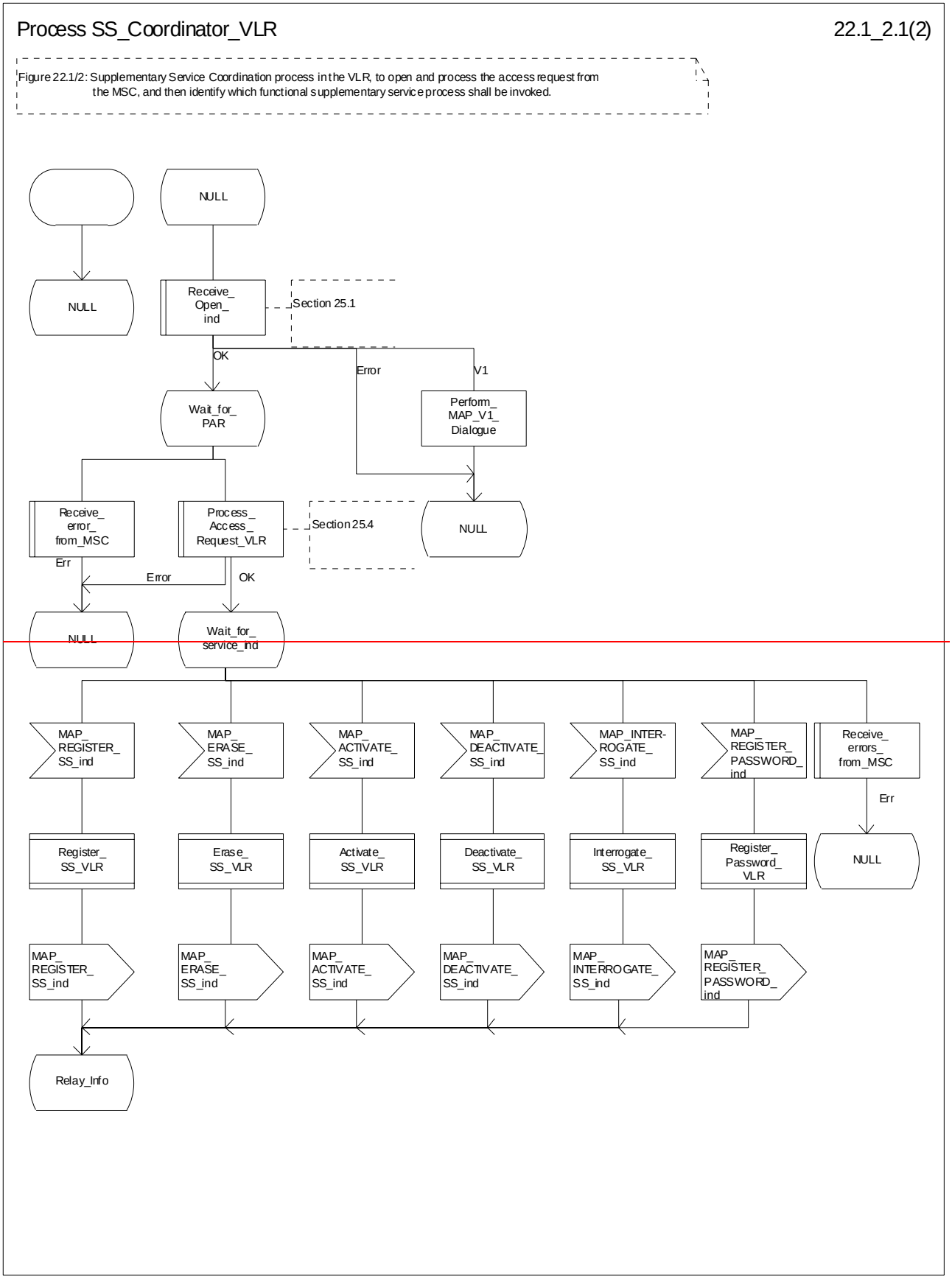
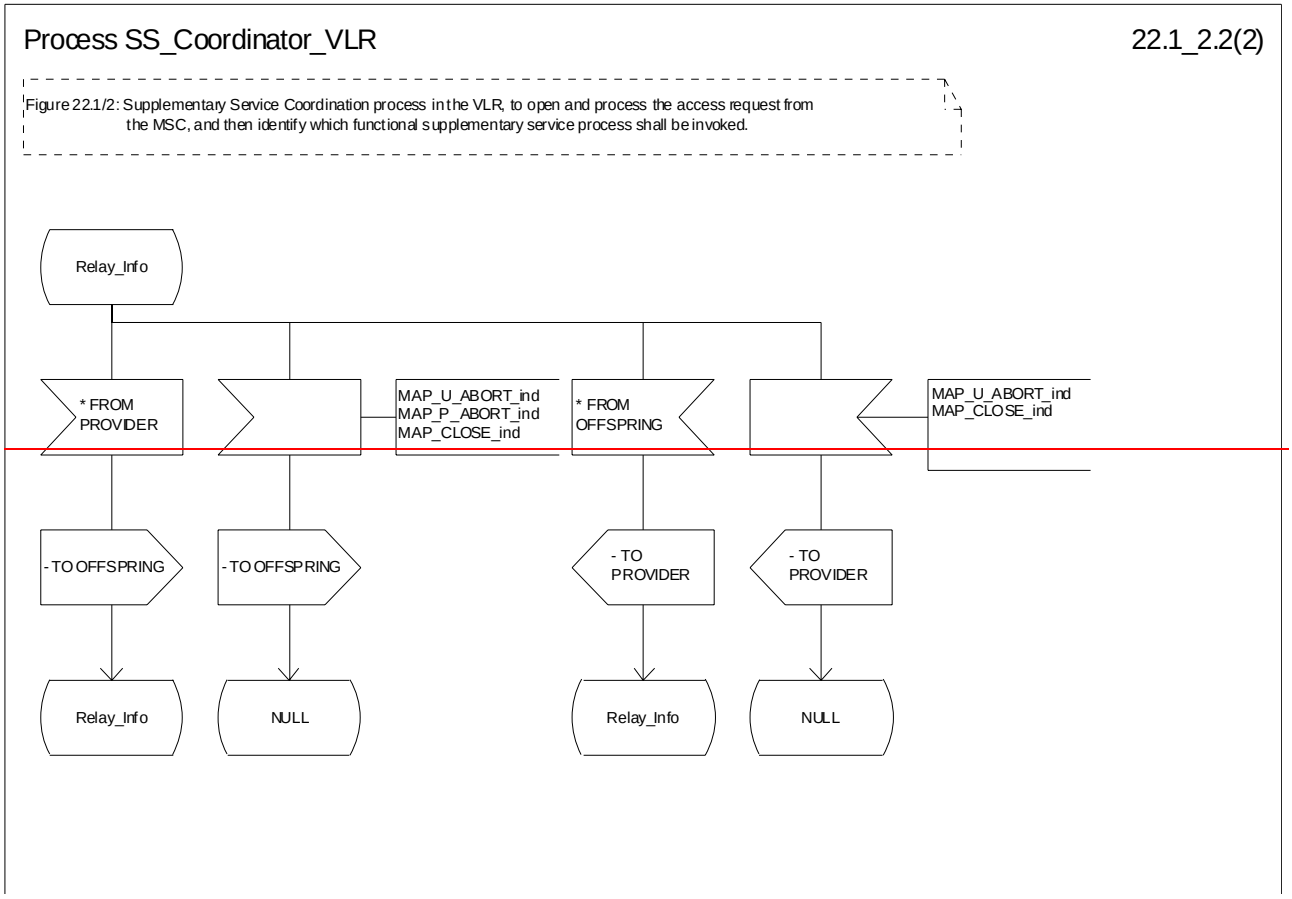


Figure 22.1/1 (sheet 2 of 2): Process SS_Coordinator_MSC



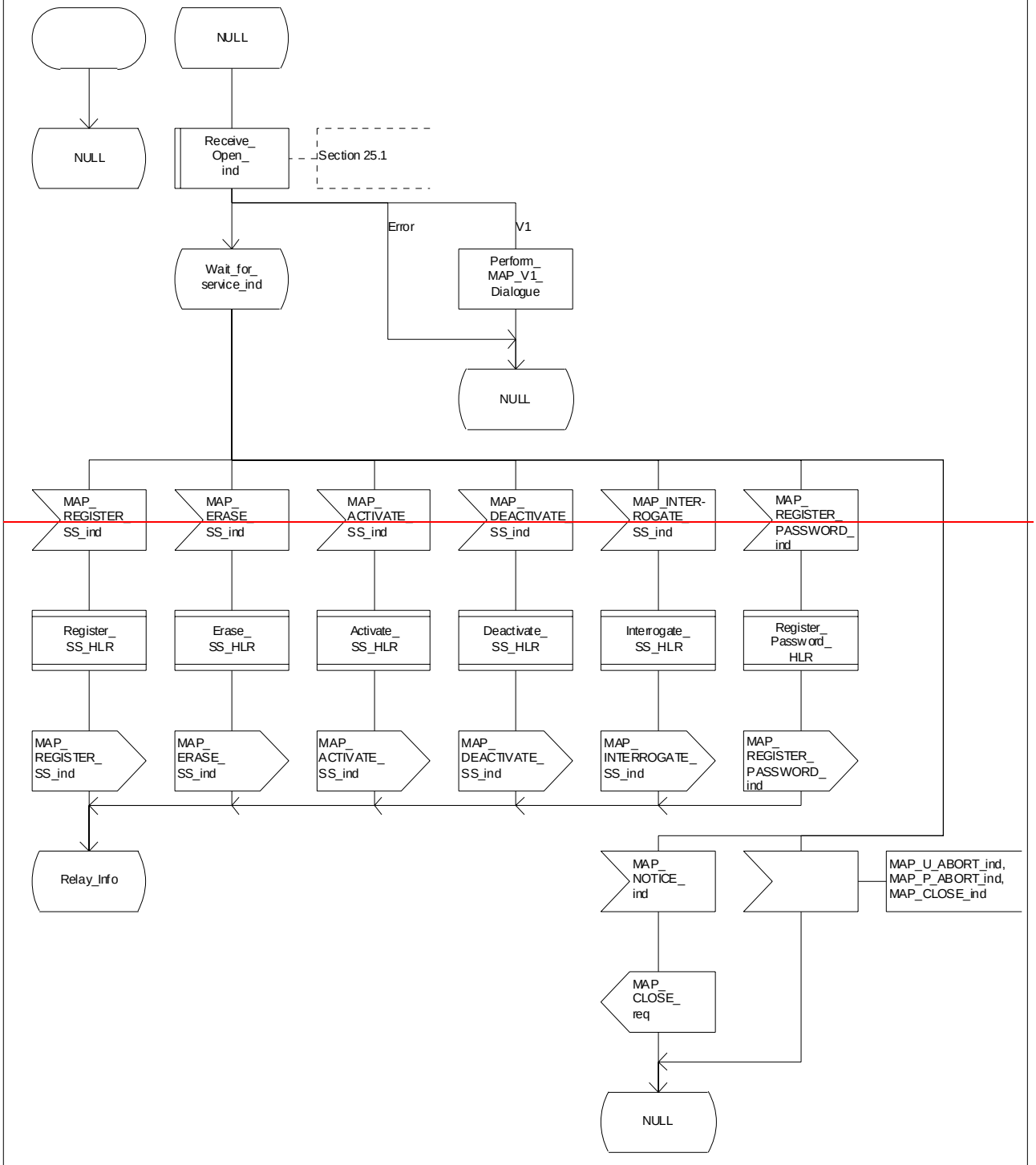
~~Figure 22.1/2 (sheet 1 of 2): Process SS_Coordinator_VLR~~



~~Figure 22.1/2 (sheet 2 of 2): Process SS_Coordinator_VLR~~

Process SS_Coordinator_HLR 22.1_3.1(2)

Figure 22.1/3: Supplementary Service Coordination process in the HLR, to identify which functional supplementary service process shall be invoked.



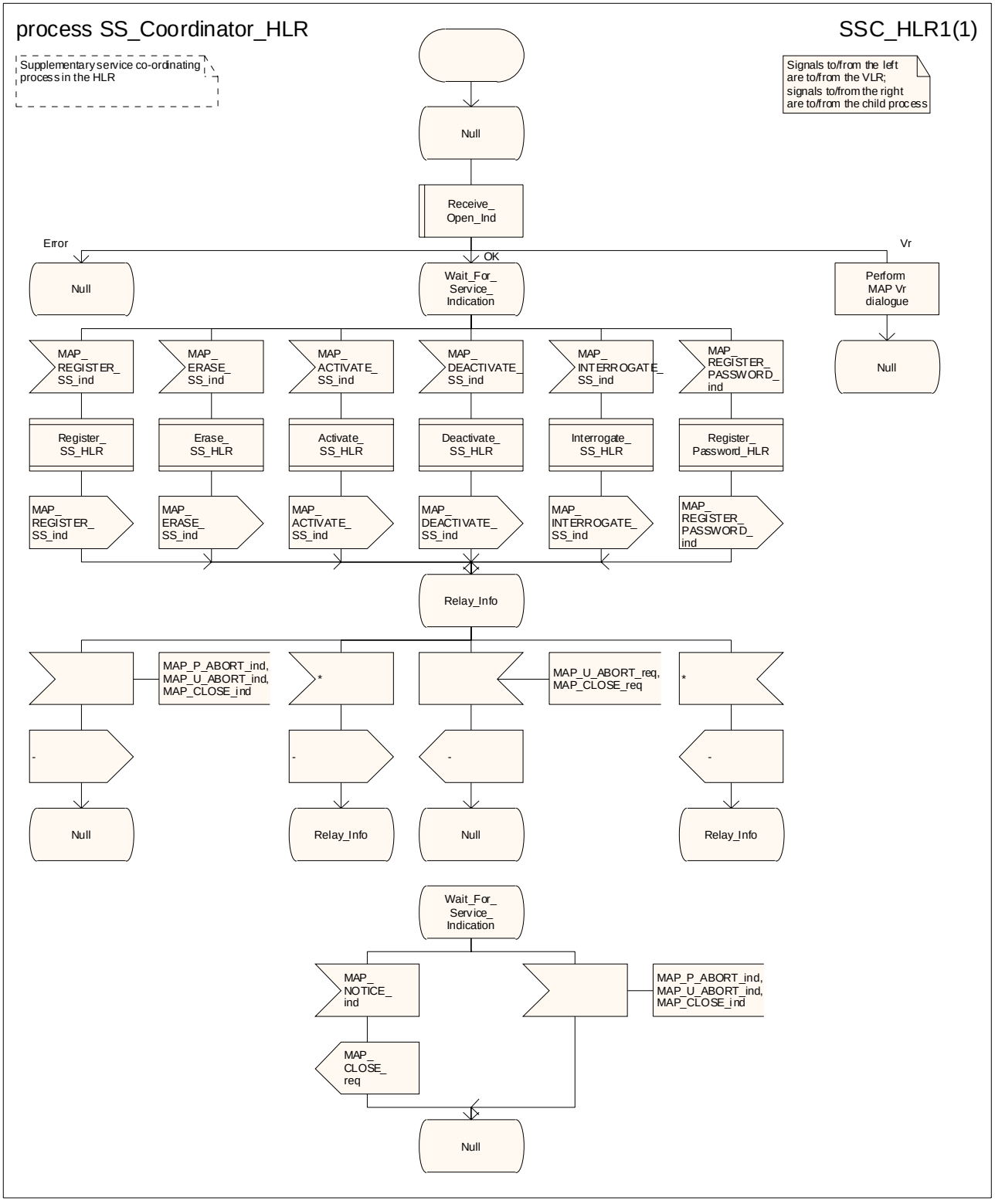
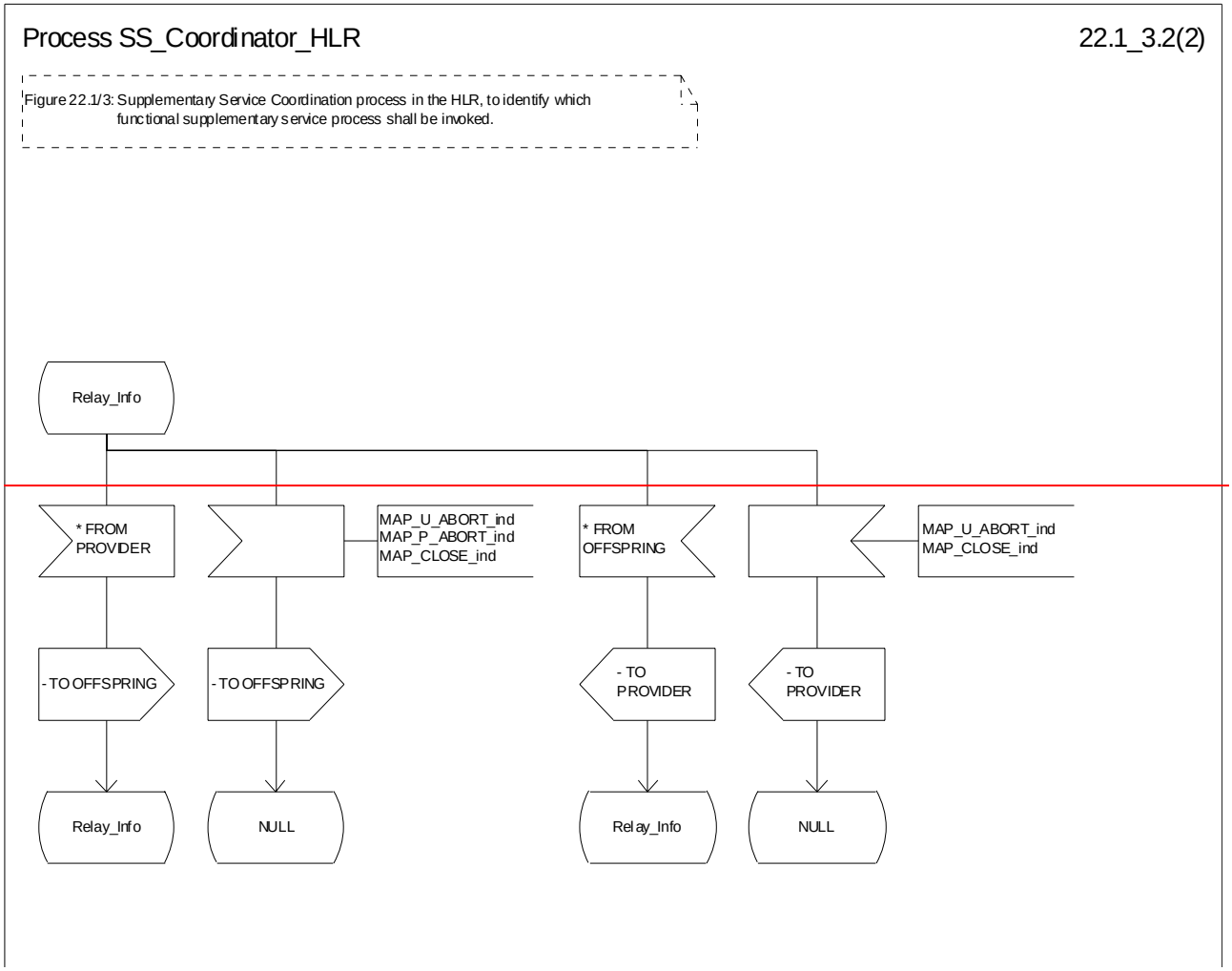
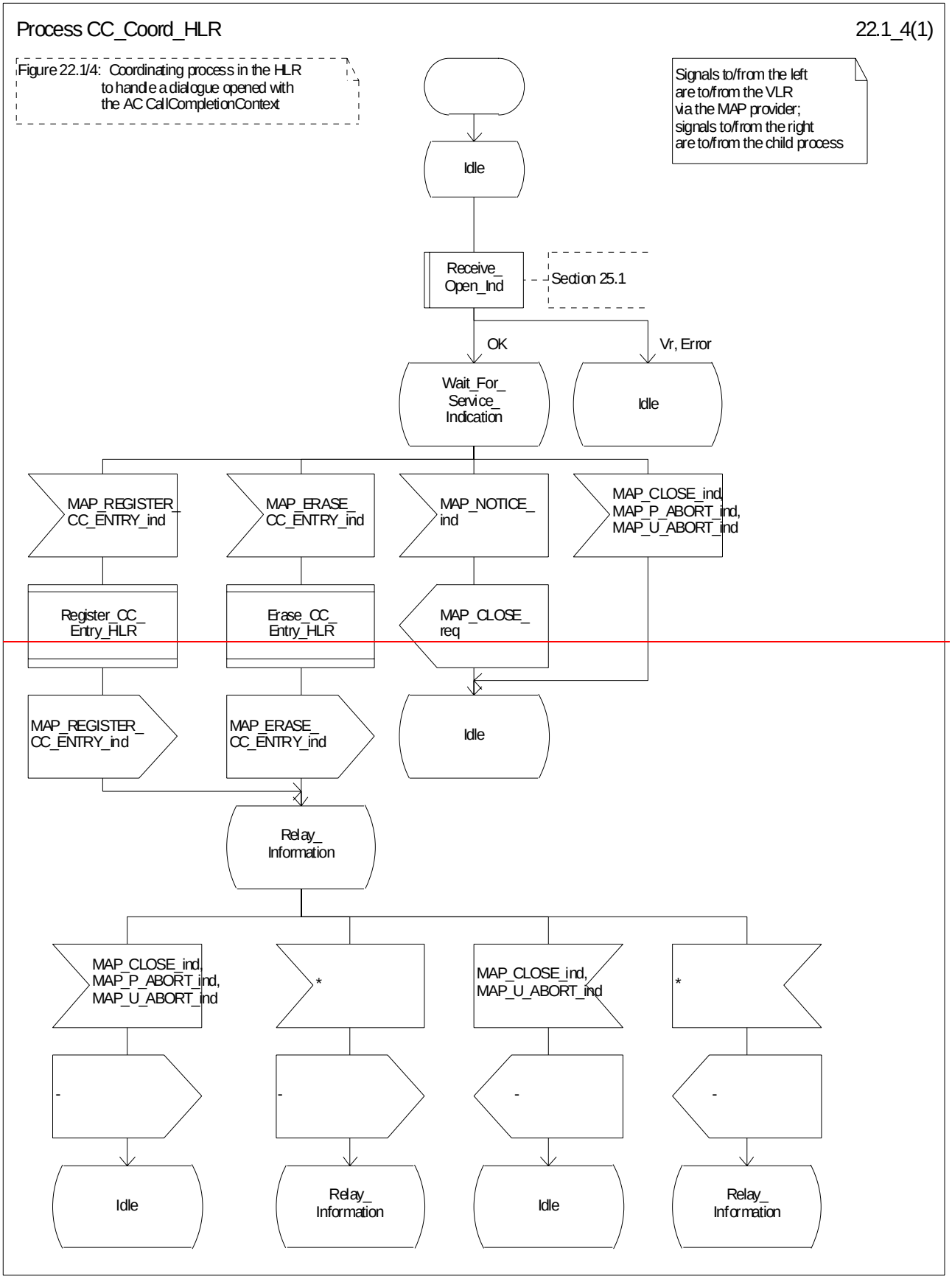


Figure 22.1/3 ~~(sheet 1 of 2)~~: Process SS_Coordinator_HLR



~~Figure 22.1/3 (sheet 2 of 2): Process SS_Coordinator_HLR~~


Process CC_Coord_HLR
22.1_4(1)
Figure 22.1/4: Coordinating process in the HLR to handle a dialogue opened with the AC CallCompletionContext
Signals to/from the left are to/from the VLR via the MAP provider; signals to/from the right are to/from the child process
Idle
Receive_ Open_Ind
Section 25.1
OK
Vr, Error
Wait_For_ Service_ Indication
Idle
MAP_REGISTER_ CC_ENTRY_ind
MAP_ERASE_ CC_ENTRY_ind
MAP_NOTICE_ ind
MAP_CLOSE_ind, MAP_P_ABORT_ind, MAP_U_ABORT_ind
Register_CC_ Entry_HLR
Erase_CC_ Entry_HLR
MAP_CLOSE_ req
MAP_REGISTER_ CC_ENTRY_ind
MAP_ERASE_ CC_ENTRY_ind
Idle
Relay_ Information
MAP_CLOSE_ind, MAP_P_ABORT_ind, MAP_U_ABORT_ind
*
MAP_CLOSE_ind, MAP_U_ABORT_ind
*
-
-
-
-
Idle
Relay_ Information
Idle
Relay_ Information

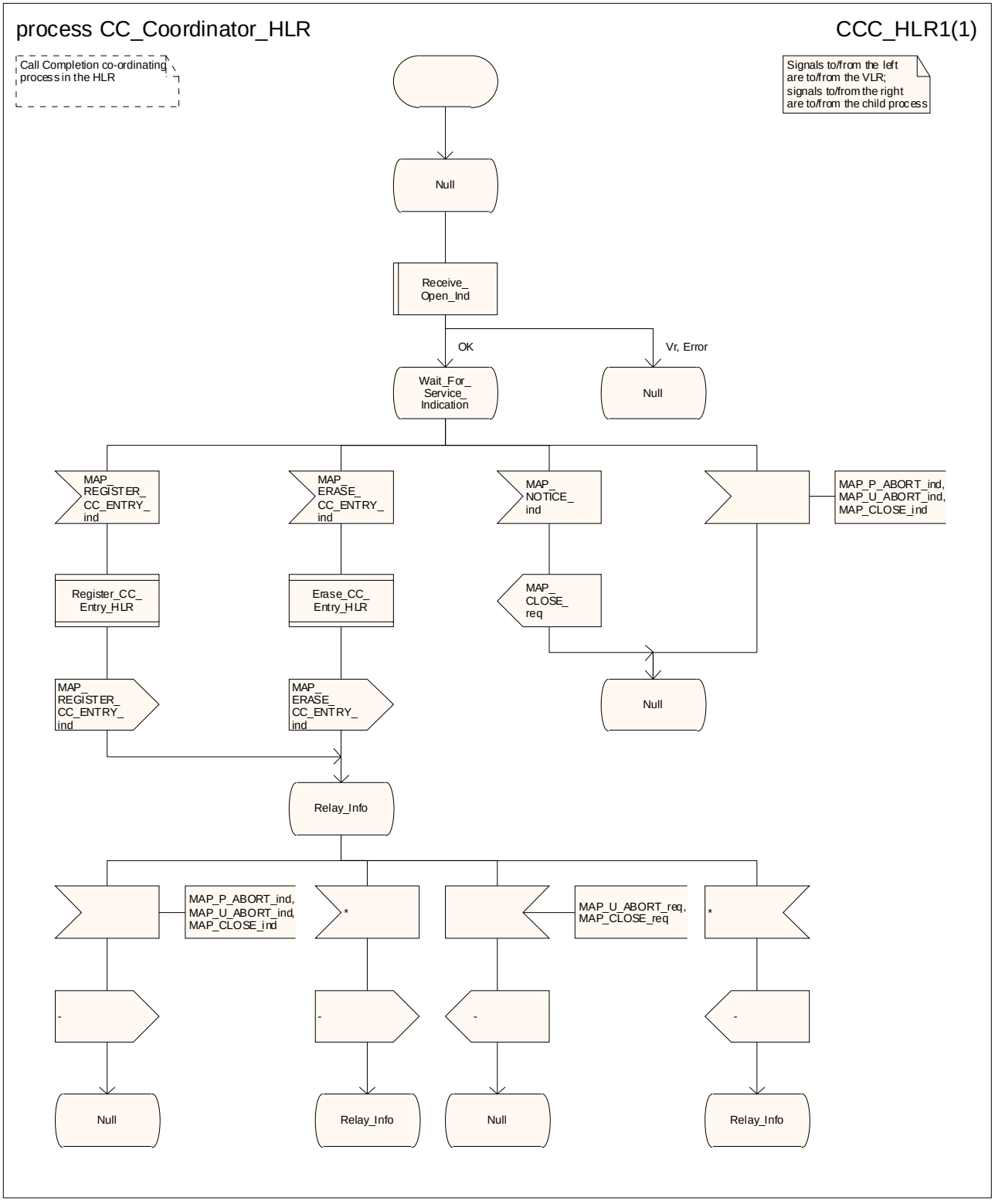


Figure 22.1/4: Process –CC_Coordinator_HLR

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 clauses below.

The registration procedure is shown in figure 22.2.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

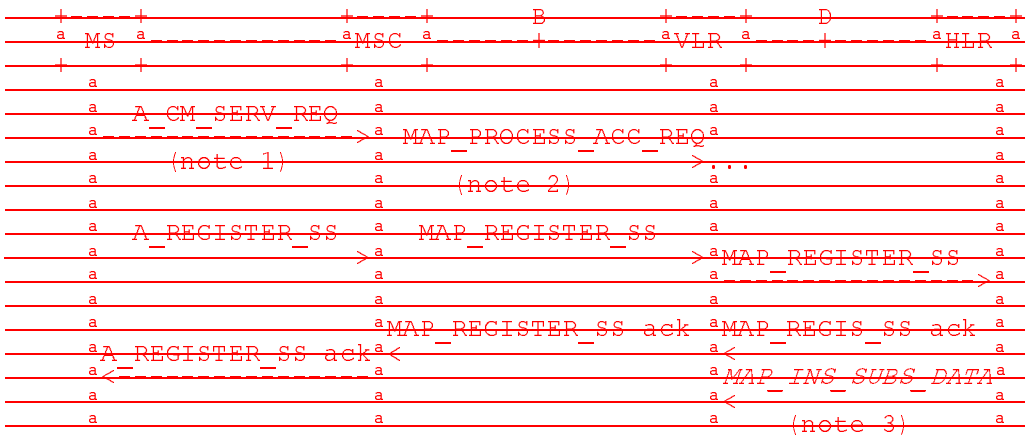
MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

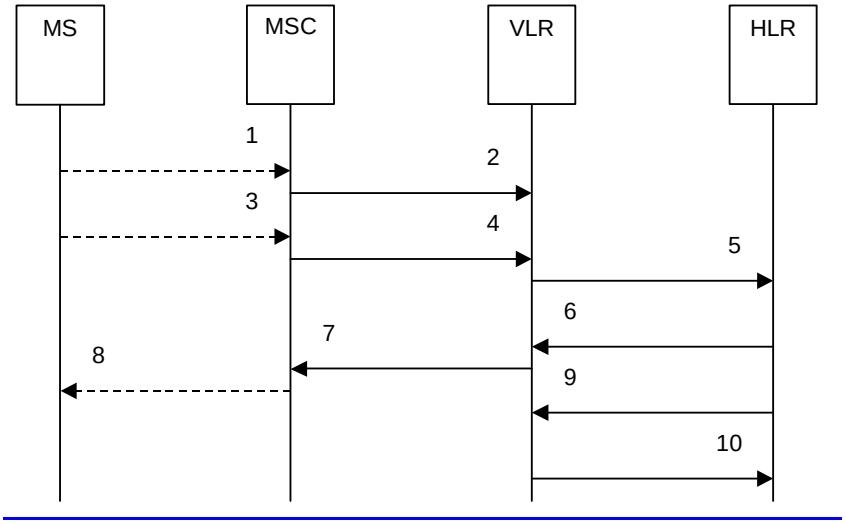
MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25);

MAP_INSERT_SUBSCRIBER_DATA (see ~~defined in~~ clauses 8 and 25).~~;~~

The following service is certainly used:

MAP_REGISTER_SS (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_REGISTER_SS (Note 1)
4) MAP_REGISTER_SS_req/ind
5) MAP_REGISTER_SS_req/ind
6) MAP_REGISTER_SS_rsp/cnf
7) MAP_REGISTER_SS_rsp/cnf
8) A_REGISTER_SS ack (Note 1)
9) *MAP_INSERT_SUBSCRIBER_DATA_req/ind* (Note 3)
10) *MAP_INSERT_SUBSCRIBER_DATA_rsp/cnf* (Note 3)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.2.1/1: ~~Interfaces and services~~Message flow for supplementary service registration

22.2.2 Procedure~~s~~ in the MSC

~~**Supplementary service registration**~~

The A_REGISTER_SS service indication received by the MAP ~~user~~ process 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 3GPP TS 29.011 [59].

The information in ~~MSC then awaits the receipt of~~ the MAP_REGISTER_SS confirm from the VLR~~. The outcome of the procedure~~ is ~~reported~~ relayed to the MS in the A_REGISTER_SS response message as described in ~~GSM 04.8x, 04.9x and 09.11~~3GPP TS 24.08x, 3GPP TS 24.08x and 3GPP TS 29.011~~. Finally the SS-connection is released.~~

For call independent SS operations, each message shall ~~only~~ contain only a single component. Messages which contain more than one component will be stopped at the air interface (as specified in 3GPP TS 29.011 [59]).

~~**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 3GPP TS 29.011 [59]). 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 proces~~sdure~~ in the MSC is shown in figure 22.2.2/1.

22.2.3 Procedure~~s~~ in the VLR

~~**Supplementary service registration**~~

The MAP process invokes macros not defined in this clause; the definition 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;
Process_Access_Request_VLR	see subclause 25.4.2.

~~When receiving the MAP_REGISTER_SS indication, the~~ The MAP ~~user~~ process in the VLR transfers the information received in the MAP_REGISTER_SS indication to the HLR in the MAP_REGISTER_SS request without checking the contents ~~of the service indication~~. The MAP_OPEN request includes the IMSI of the subscriber as the destination reference and the VLR number as the originating reference.

~~The VLR then awaits the receipt of the MAP_REGISTER_SS confirm from the HLR.~~ If the MAP_REGISTER_SS confirm is properly formed and contains a result or a user error, ~~T~~the MAP ~~user~~ process 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 3GPP TS 29.011 [59]).

~~**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 proces~~sdure~~ in the VLR is shown in figure 22.2.3/1.

22.2.4 Procedure~~s~~ in the HLR

The MAP process invokes a macro and a process not defined in this clause; the definition of the macro and process can be found as follows:

Check_Indication	see subclause 25.2.1;
Insert_Subs_Data_Stand_Alone_HLR	see subclause 25.7.3.

~~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 3GPP TS 23.011 [22] and the ~~0~~23.0~~8~~x and ~~0~~23.0~~9~~x ~~-~~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 3GPP TS 29.011 [59]).~~:~~

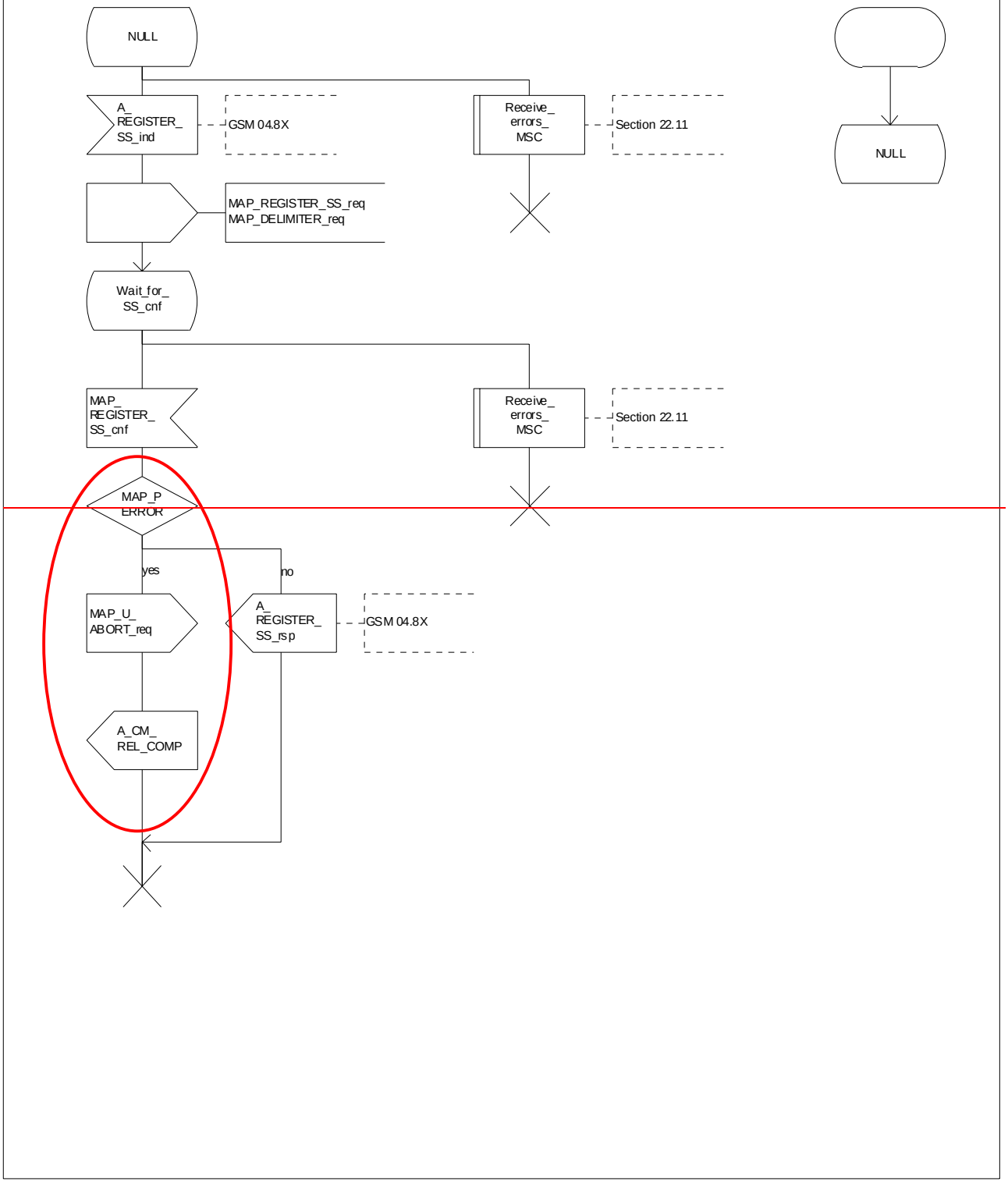
~~- if the VLR is to be updated after the supplementary service registration, the MAP_INSERT_SUBS_DATA_HLR process shall be initiated;~~

~~- 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 is sent towards the VLR.~~

The registration proces~~sdure~~ in the HLR is shown in figure 22.2.4/1.

Process SS_REGISTER_MSC 22.2.2_1(1)

Figure 22.2.2/1 :Mobile intiated registration of supplementary service in the MSC



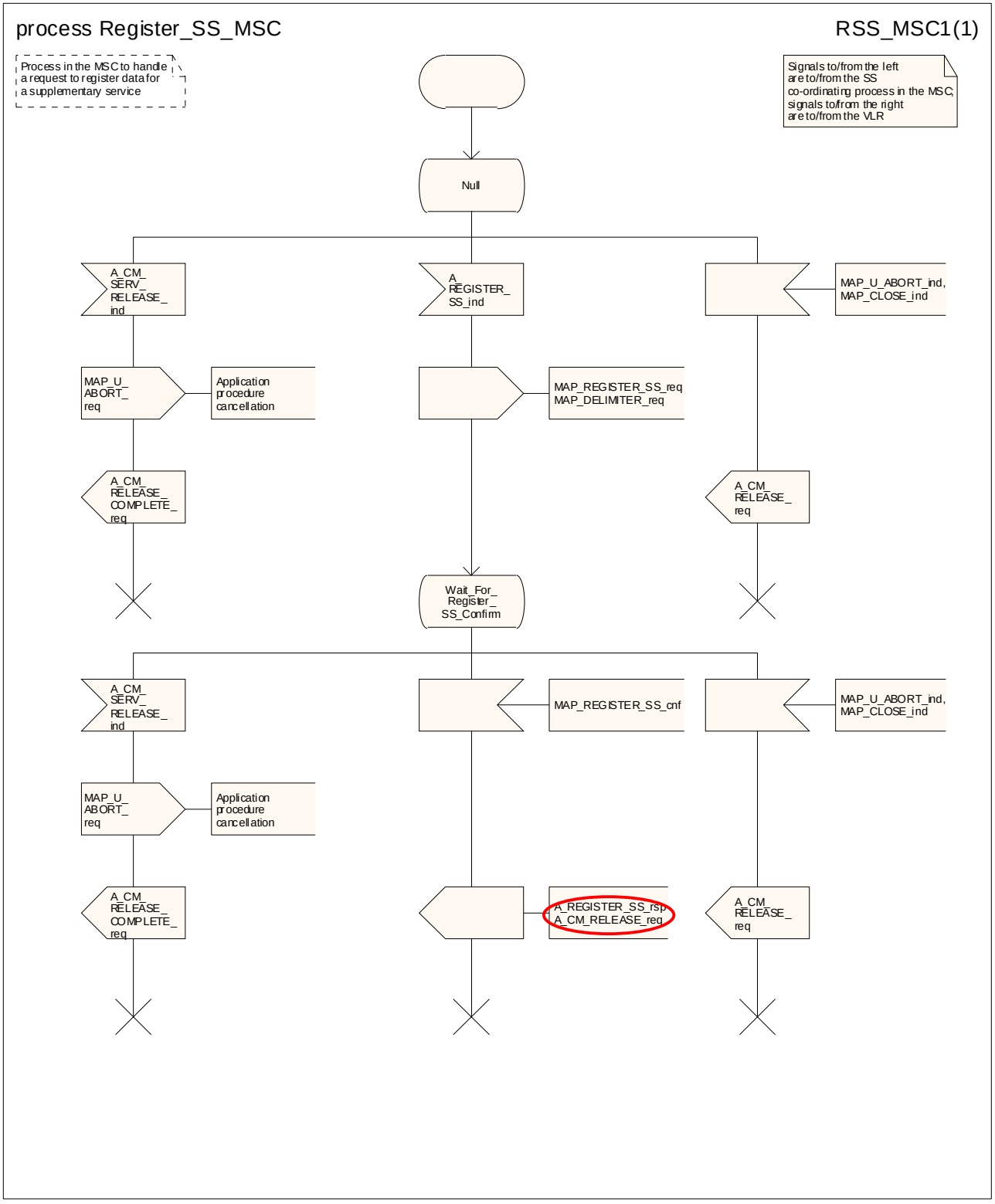
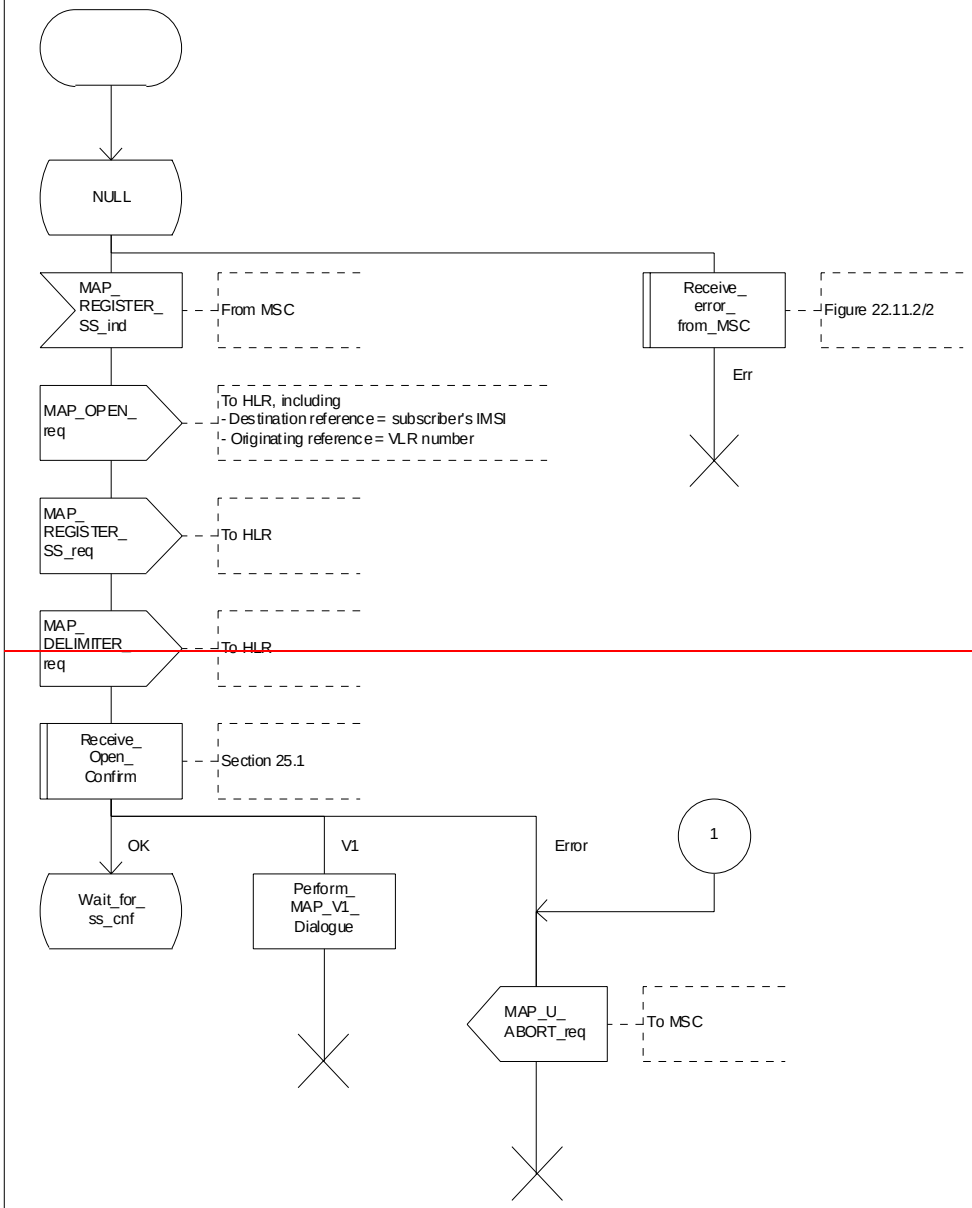


Figure 22.2.2/1: Proces~~sdure SS~~ Register_SS_MSC

Process SS_REGISTER_VLR 22.2.3_1.1(2)

Figure 22.2.3/1: Mobile initated registration of supplementarty services in the VLR



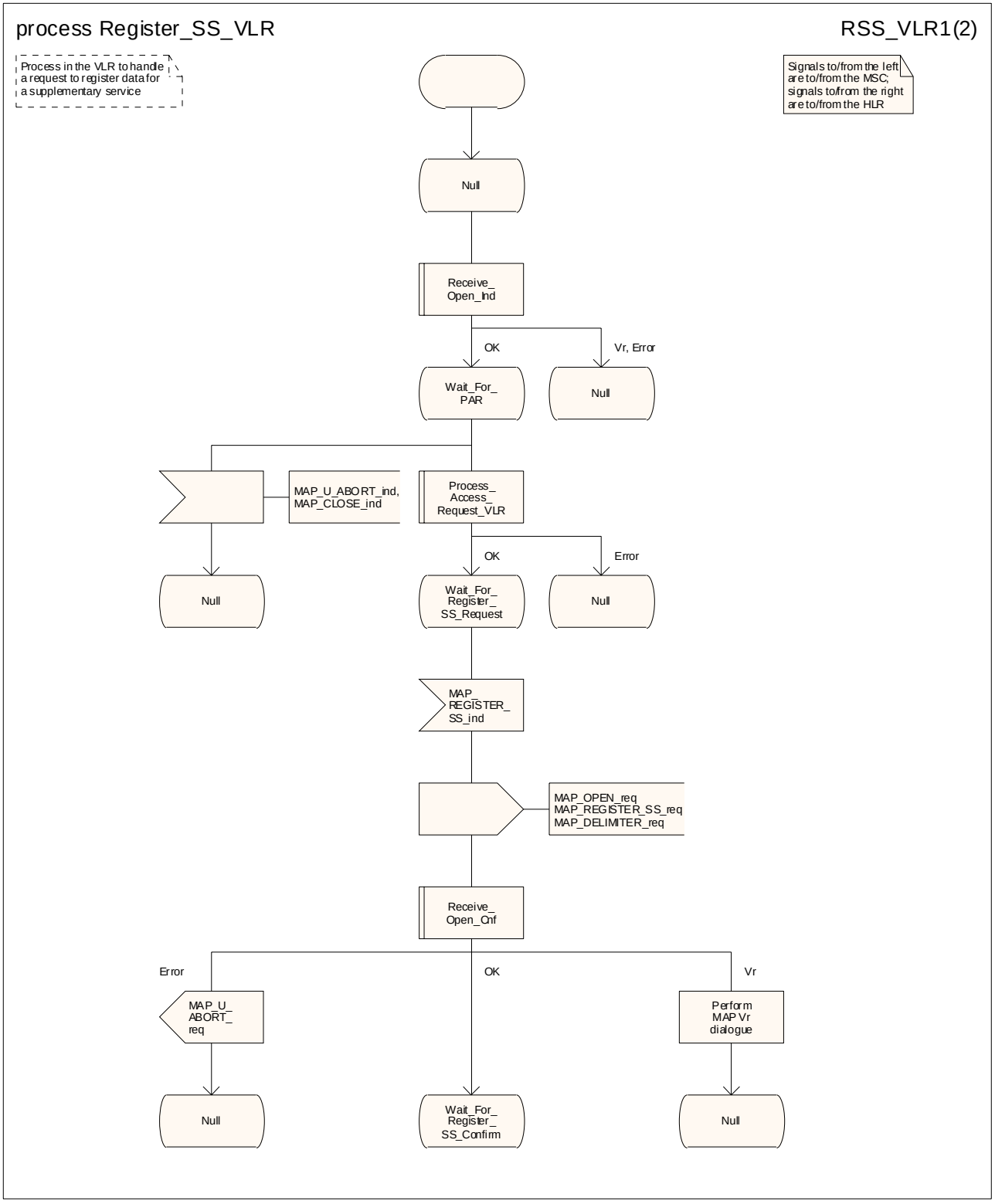
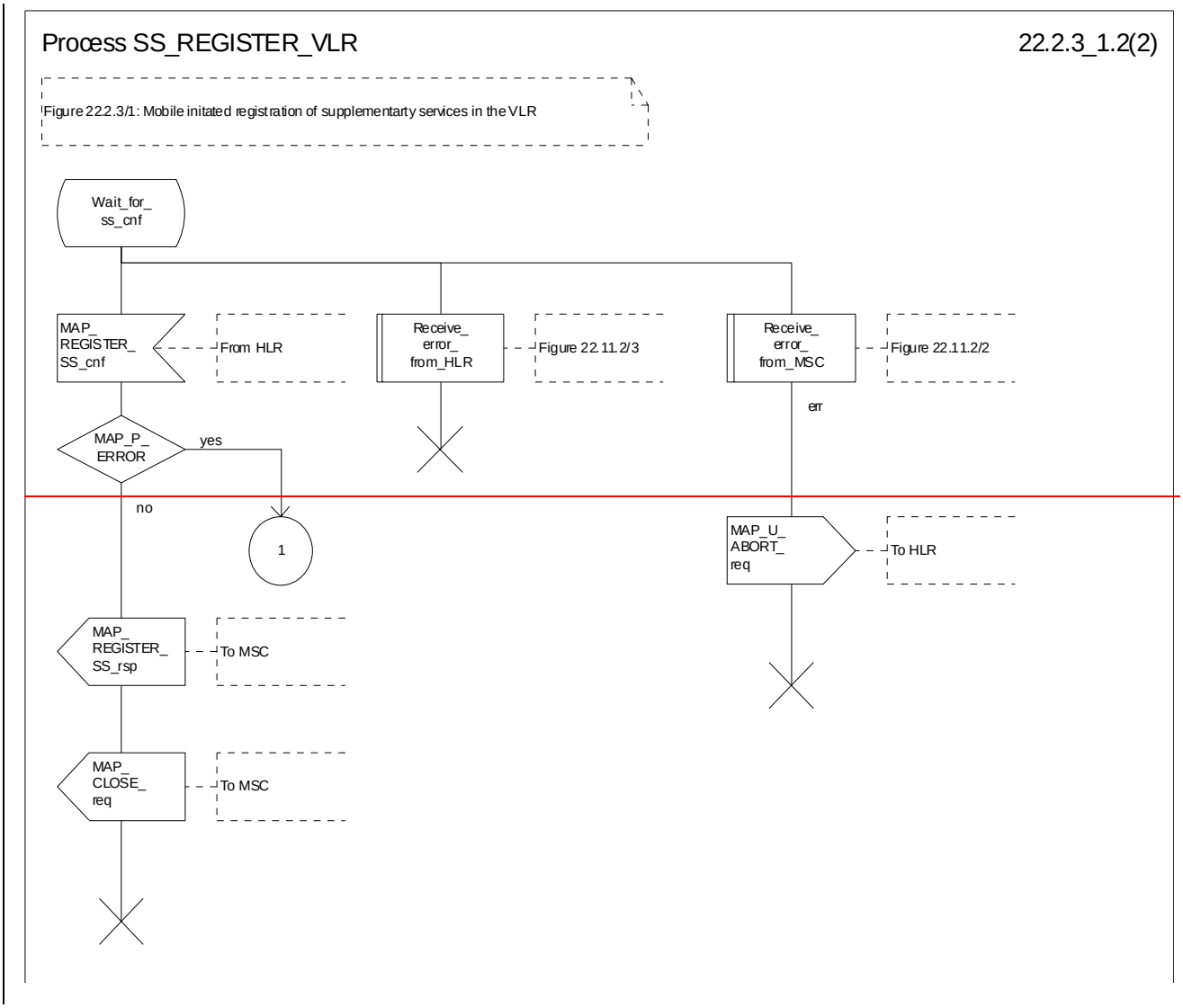


Figure 22.2.3/1 (sheet 1 of 2): Proces~~sdure SS~~ Register_SS_VLR


Process SS_REGISTER_VLR
22.2.3_1.2(2)
Figure 22.2.3/1: Mobile initated registration of supplementarty services in the VLR
Wait_for_ ss_cnf
MAP_ REGISTER_ SS_cnf
From HLR
Receive_ error_ from_HLR
Figure 22.11.2/3
Receive_ error_ from_MSC
Figure 22.11.2/2
err
MAP_P_ ERROR
yes
no
1
MAP_U_ ABORT_ req
To HLR
MAP_ REGISTER_ SS_rsp
To MSC
MAP_ CLOSE_ req
To MSC

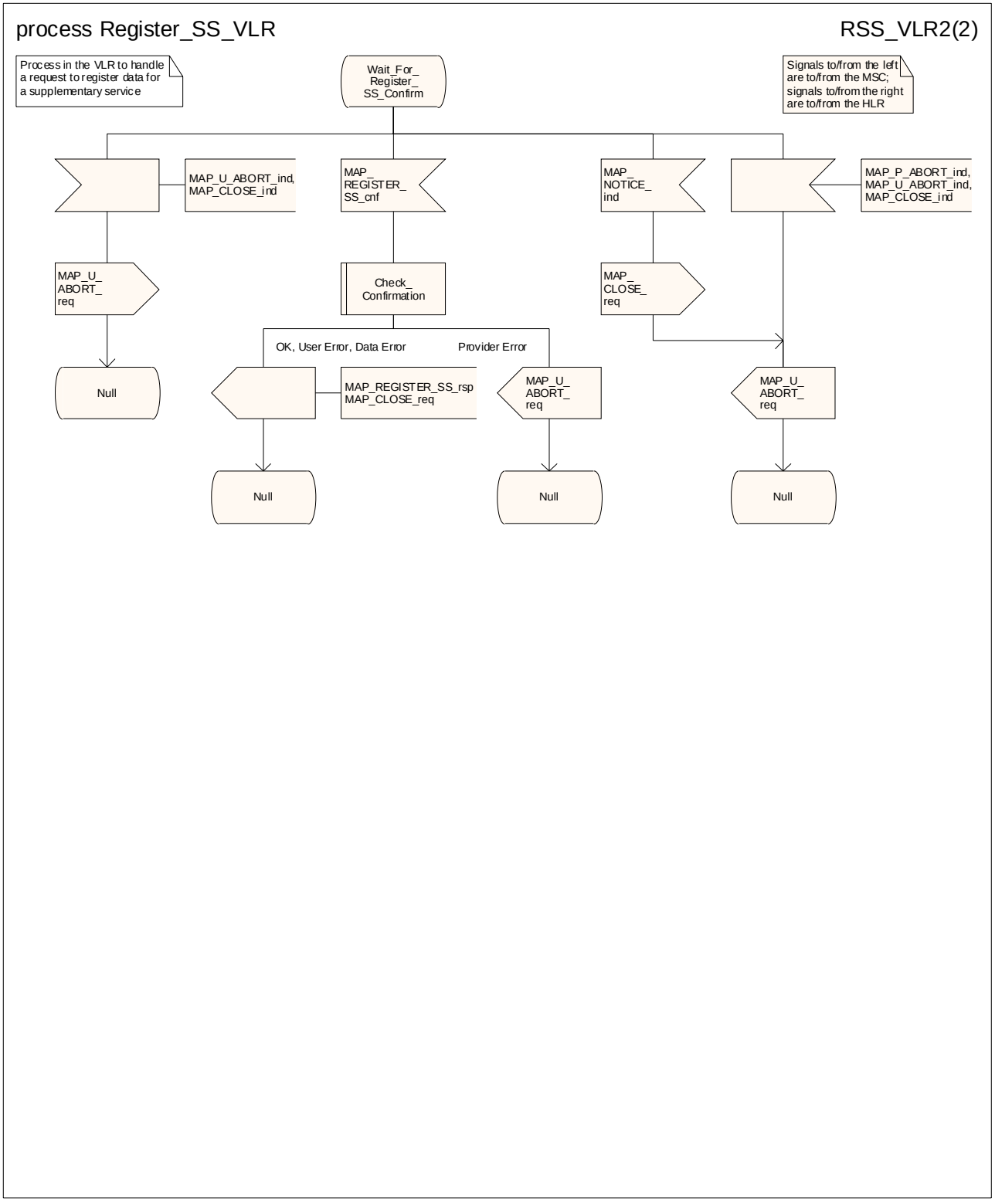
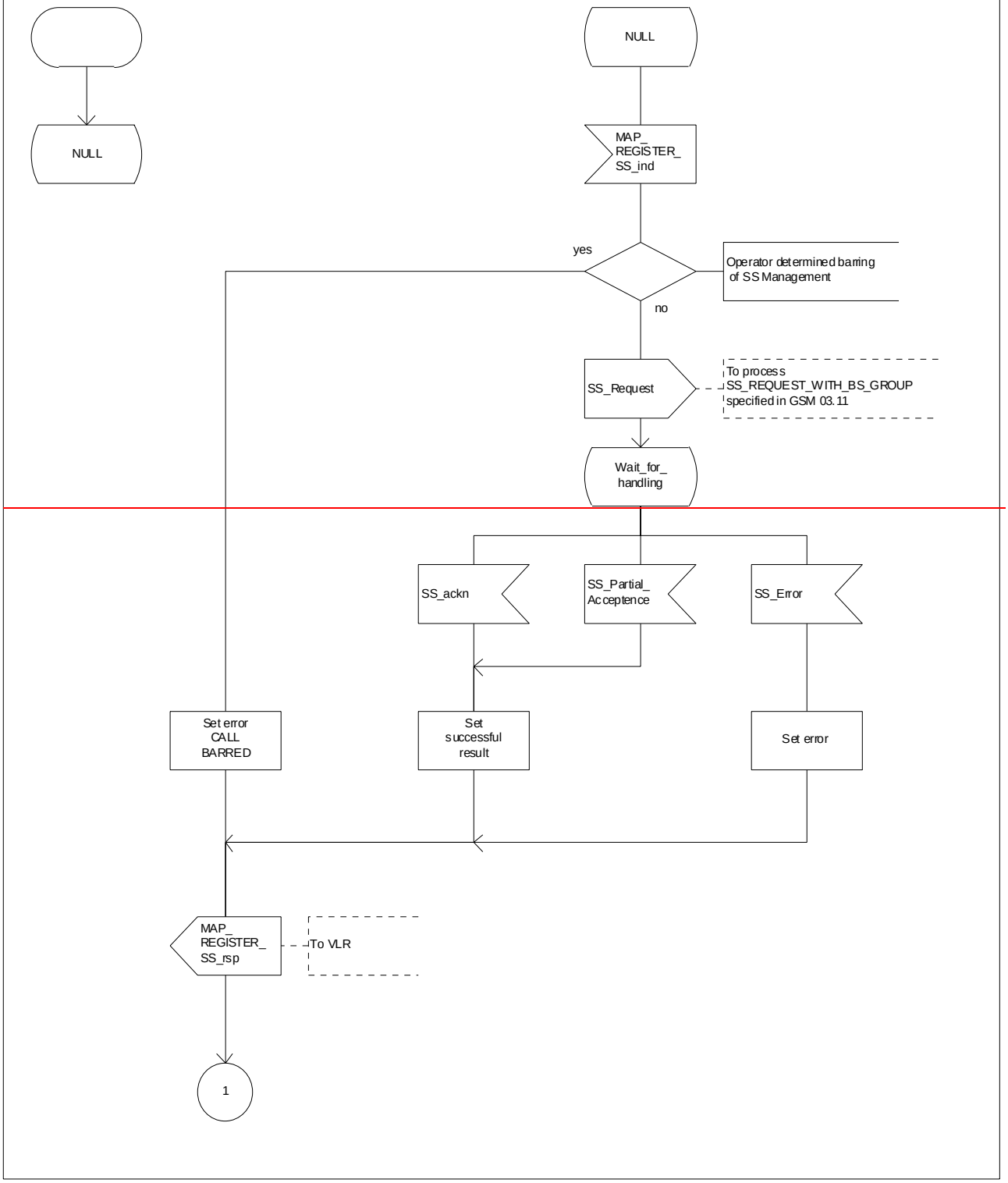


Figure 22.2.3/1 (sheet 2 of 2): Proces~~sdure SS~~ Register_SS_VLR

Process SS_REGISTER_HLR 22.2.4_1.1(2)

Figure 22.2.4/1: Registration of supplementary services procedure in HLR



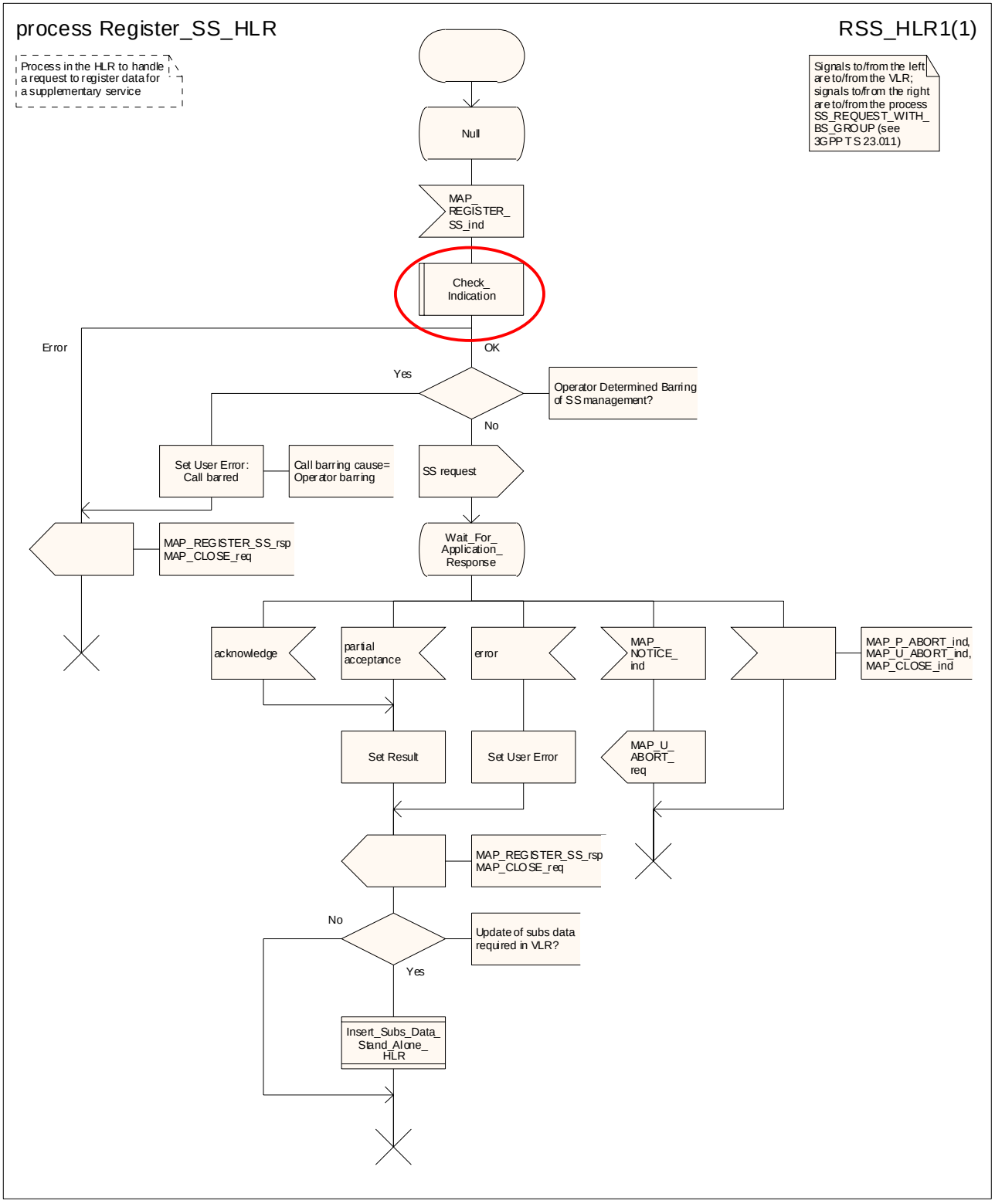
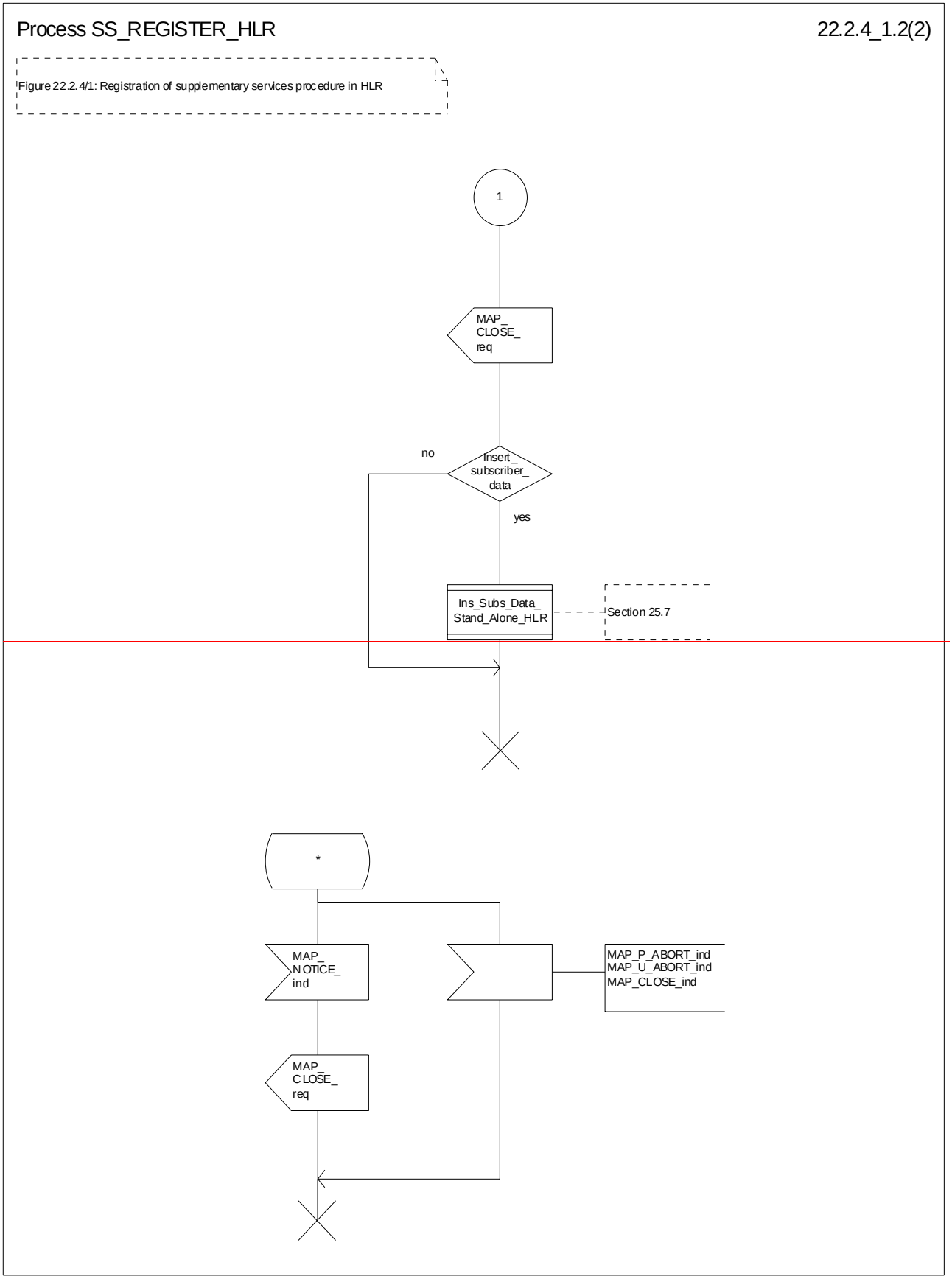


Figure 22.2.4/1 ~~(sheet 1 of 2)~~: Proces~~sdure SS~~ Register_SS_HLR



~~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 clauses below.

The erasure procedure is shown in figure 22.3.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

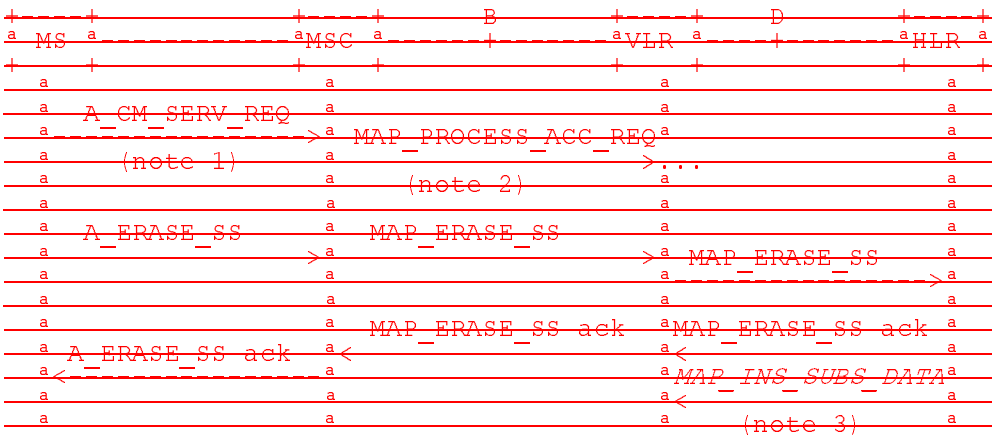
MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

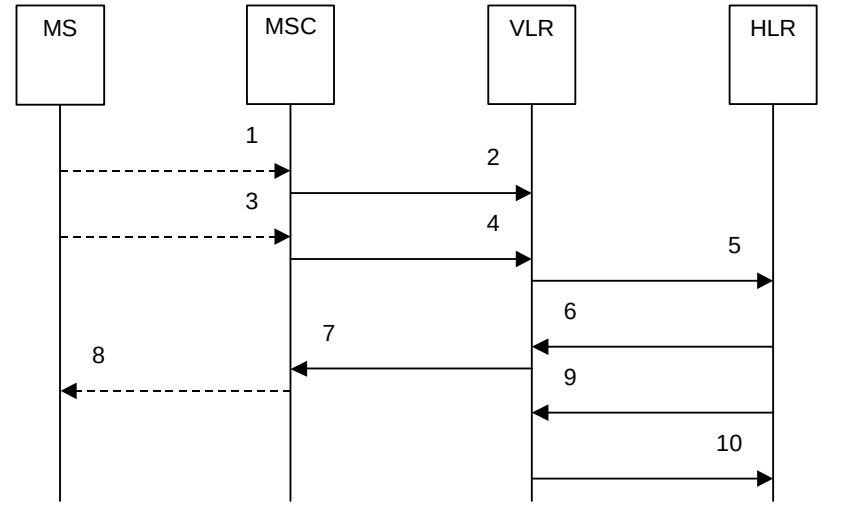
MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25);

MAP_INSERT_SUBSCRIBER_DATA (see ~~defined in~~ clauses 8 and 25).~~;~~

The following service is certainly used:

MAP_ERASE_SS (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_ERASE_SS (Note 1)
4) MAP_ERASE_SS_req/ind
5) MAP_ERASE_SS_req/ind
6) MAP_ERASE_SS_rsp/cnf
7) MAP_ERASE_SS_rsp/cnf
8) A_ERASE_SS ack (Note 1)
9) *MAP_INSERT_SUBSCRIBER_DATA_req/ind* (Note 3)
10) *MAP_INSERT_SUBSCRIBER_DATA_rsp/cnf* (Note 3)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.3.1/1: Message flow ~~Interfaces and services~~ for supplementary service erasure

22.3.2 Procedure~~s~~ in the MSC

The MSC procedure~~s~~ for erasure ~~are~~ is identical to ~~those~~ that 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 Procedure~~s~~ in the VLR

The VLR procedure~~s~~ for erasure ~~are~~ is identical to ~~those~~ that 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 Procedure~~s~~ in the HLR

The HLR procedure for erasure is identical to ~~those~~ that 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 clauses below.

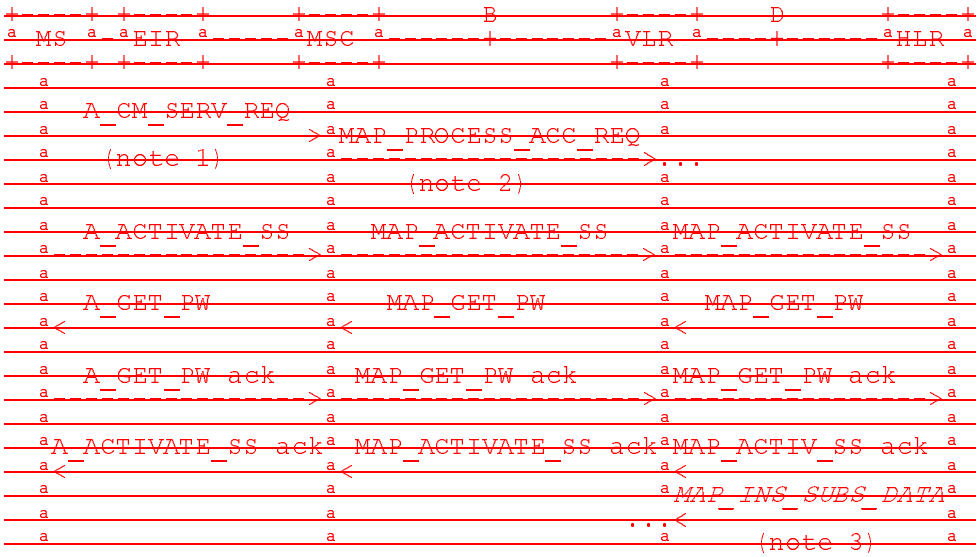
The activation procedure is shown in figure 22.4.1/1.

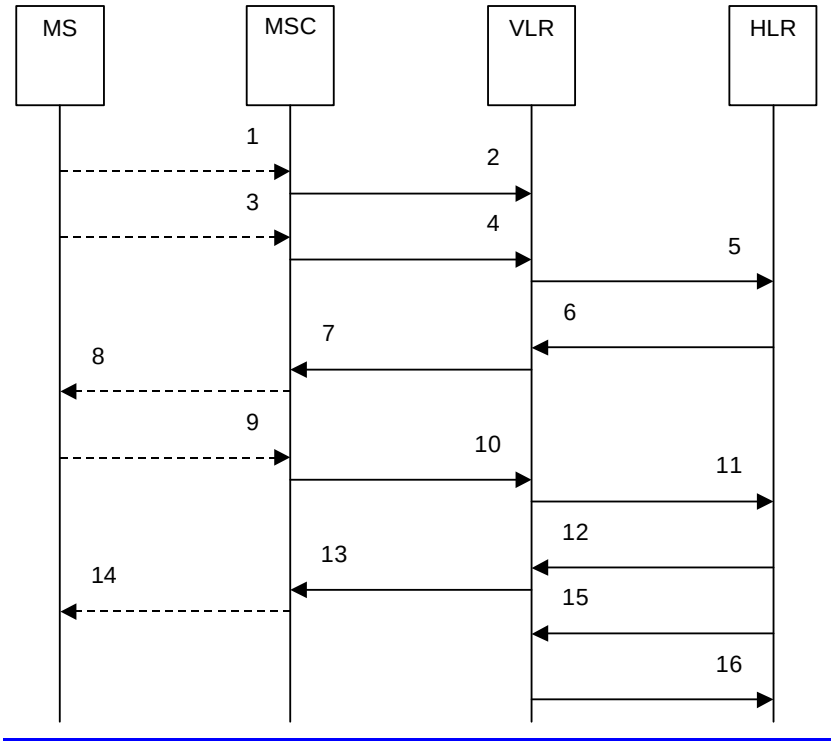
The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(see ~~defined in~~ clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see ~~defined in~~ clauses 9 and 25);
MAP_PROVIDE_IMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_AUTHENTICATE	(see ~~defined in~~ clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(see ~~defined in~~ clauses 8 and 25);
MAP_CHECK_IMEI	(see ~~defined in~~ clauses 8 and 25);
MAP_READY_FOR_SM	(see ~~defined in~~ clauses 12 and 25);
MAP_GET_PASSWORD	(defined in clause 11);
MAP_INSERT_SUBSCRIBER_DATA	(see ~~defined in~~ clauses 8 and 25).~~;~~

The following service is certainly used:

MAP_ACTIVATE_SS	(defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_ACTIVATE_SS (Note 1)
4) MAP_ACTIVATE_SS req/ind
5) MAP_ACTIVATE_SS req/ind
6) *MAP_GET_PASSWORD req/ind* (Note 3)
7) *MAP_GET_PASSWORD req/ind* (Note 3)
8) *A_GET_PASSWORD* (Note 1, Note 3)
9) *A_GET_PASSWORD ack* (Note 1, Note 3)
10) *MAP_GET_PASSWORD rsp/cnf* (Note 3)
11) *MAP_GET_PASSWORD rsp/cnf* (Note 3)
12) MAP_ACTIVATE_SS rsp/cnf
13) MAP_ACTIVATE_SS rsp/cnf
14) A_ACTIVATE_SS ack (Note 1)
15) *MAP_INSERT_SUBSCRIBER_DATA req/ind* (Note 3)
16) *MAP_INSERT_SUBSCRIBER_DATA rsp/cnf* (Note 3)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 of this document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.4.1/1: Message flow ~~Interfaces and services~~ for supplementary service activation

22.4.2 Procedure~~s~~ 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 3GPP TS 29.011 [59].

~~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 3GPP TS 29.011 [59].~~

The information in the ~~MSC will receive a~~ MAP_ACTIVATE_SS confirm from the VLR~~. The outcome of the procedure~~ is ~~reported~~ relayed to the MS in the A_ACTIVATE_SS response message~~, see~~ as described in 3GPP TS 24.08x, 3GPP TS 24.08x and 3GPP TS 29.011~~GSM 04.8x, 04.9x and 09.11~~. ~~Finally the SS connection is released.~~

For call independent SS operations, each message shall ~~only~~ contain only a single component. Messages which contain more than one component will be stopped at the air interface (as specified in 3GPP TS 29.011 [59]).

~~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 clause 22.2.2 of the present document.~~

~~Th~~e activation proces~~sdure~~ in the MSC is shown in figure 22.4.2/1.

22.4.3 Procedure~~s~~ in the VLR

~~**Supplementary service activation**~~

The MAP process invokes macros not defined in this clause; the definition 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;
Process_Access_Request_VLR	see subclause 25.4.2.

~~When receiving the MAP_ACTIVATE_SS indication, the~~ The MAP ~~user~~ process in the VLR transfers the information received in the MAP_ACTIVATE_SS indication to the HLR in the MAP_ACTIVATE_SS request without checking the contents~~ of the service indication~~. The MAP_OPEN request includes the IMSI of the subscriber as the destination reference and the VLR number as the originating reference.

~~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.~~ If the MAP_REGISTER_SS confirm is properly formed and contains a result or a user error, ~~T~~the MAP ~~user~~ process 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 3GPP TS 29.011 [59]).

~~**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 clause 22.2.3 of the present document.~~

The activation proces~~s~~sdure in the VLR is shown in figure 22.4.3/1.

22.4.4 Procedure~~s~~ in the HLR

The MAP process invokes a macro and a process not defined in this clause; the definition of the macro and process can be found as follows:

Check_Indication	see subclause 25.2.1;
Insert_Subs_Data_Stand_Alone_HLR	see subclause 25.7.3;
Insert_GPRS_Subs_Data_Stand_Alone_HLR	see subclause 25.7.4.

~~.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 3GPP TS 23.011 [22] and the ~~0~~23.0~~8~~x and ~~0~~23.0~~9~~x ~~-~~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 3GPP TS 23.011 [22]). 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 3GPP TS 29.011 [59]):

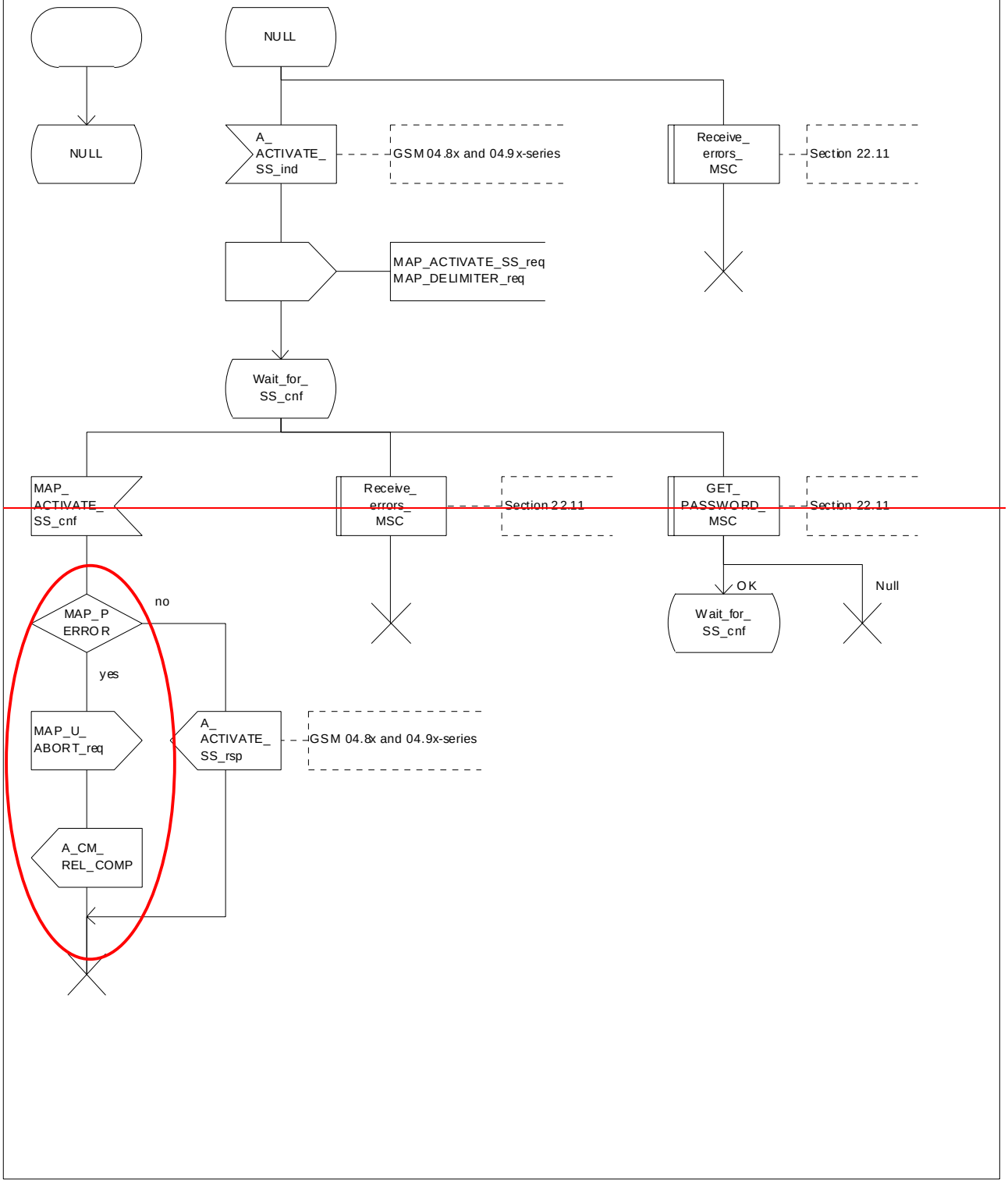
- ~~if the VLR is to be updated after the supplementary service activation, the MAP_INSERT_SUBS_DATA_HLR process is initiated;~~

- ~~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 clause 22.2.4 above.~~

The activation proces~~s~~sdure in the HLR is shown in figure 22.4.4/1.

Process ACTIVATE_SS_MSC 22.4.2_1(1)

Figure 22.4.2/1: Mobile intiated activation of supplementary service in the MSC



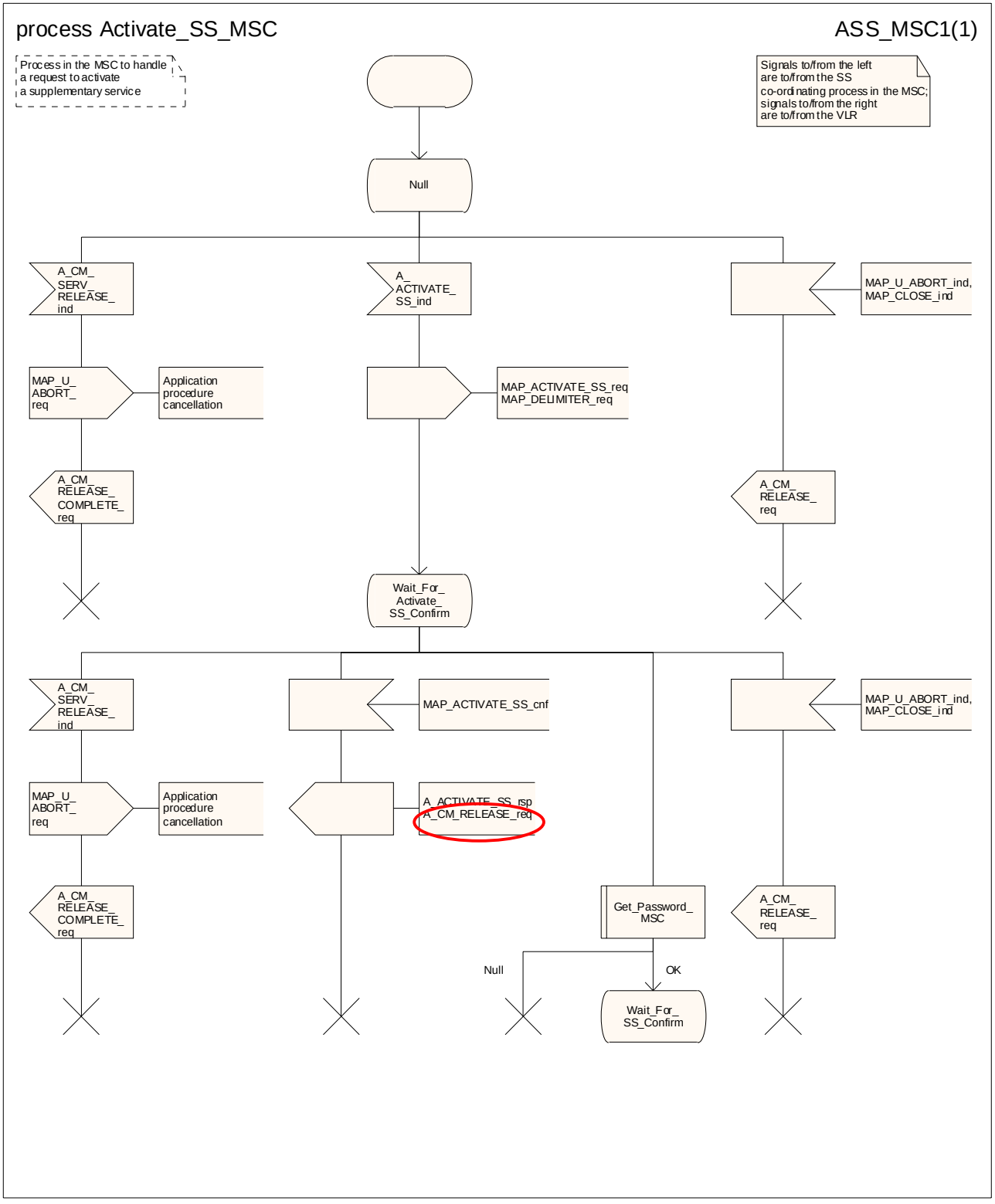
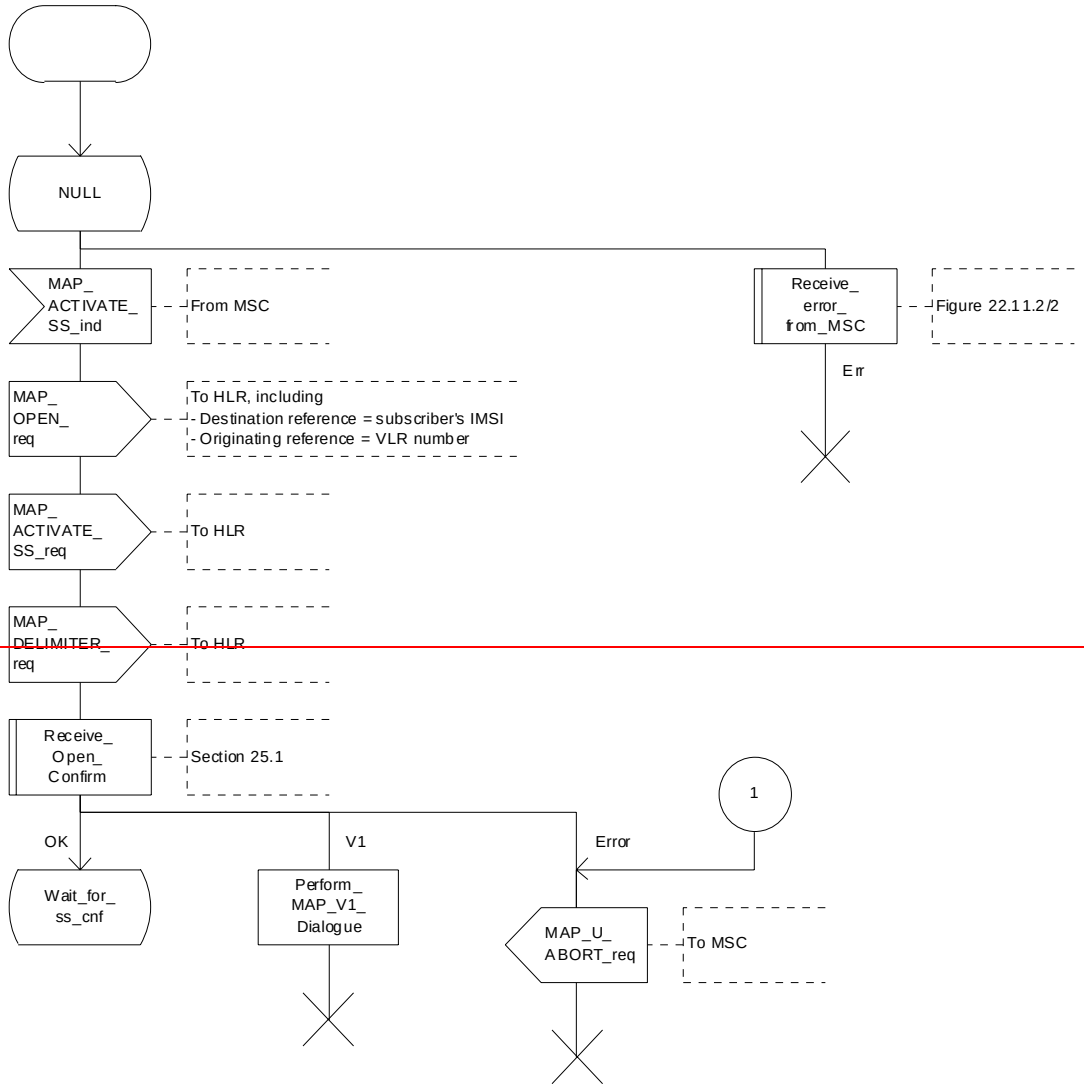


Figure 22.4.2/1: Proces~~s~~dure Activate_SS_MSC

Process ACTIVATE_SS_VLR 22.4.3_1.1(2)

Figure 22.4.3/1: Activation of supplementary service procedure in the VLR



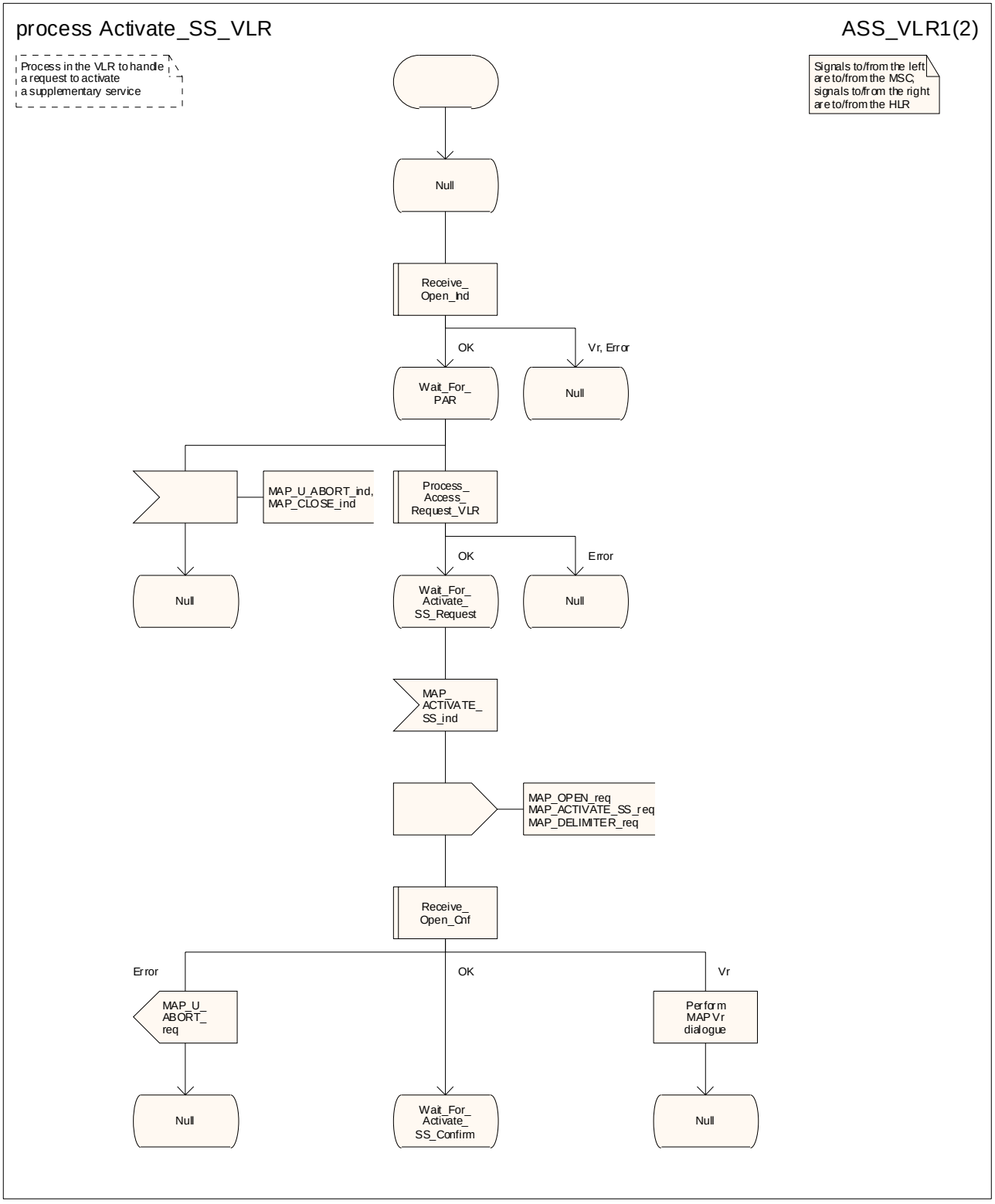
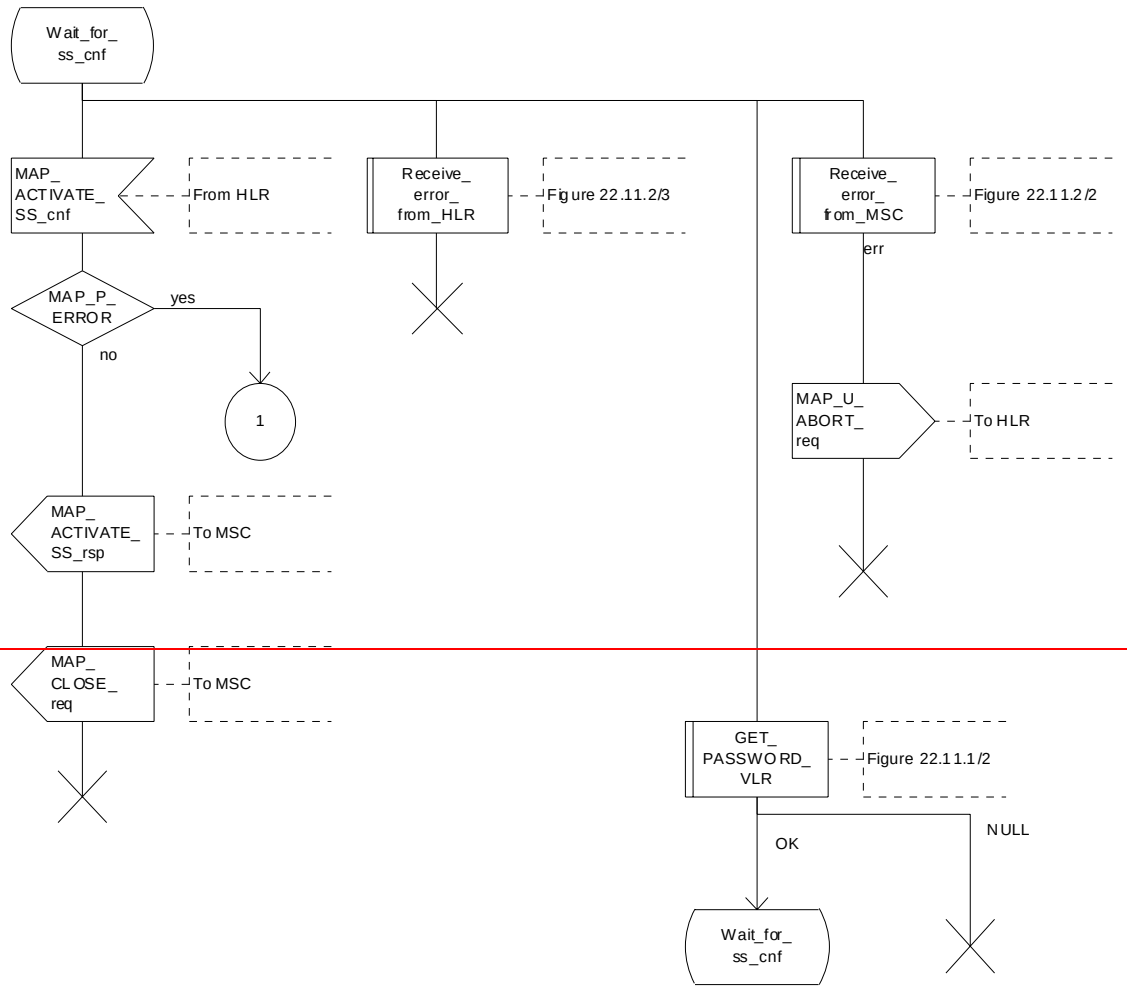


Figure 22.4.3/1 (sheet 1 of 2): Proces~~dure~~ Activate_SS_VLR

Process ACTIVATE_SS_VLR 22.4.3_1.2(2)

Figure 22.4.3/1: Activation of supplementary service procedure in the VLR



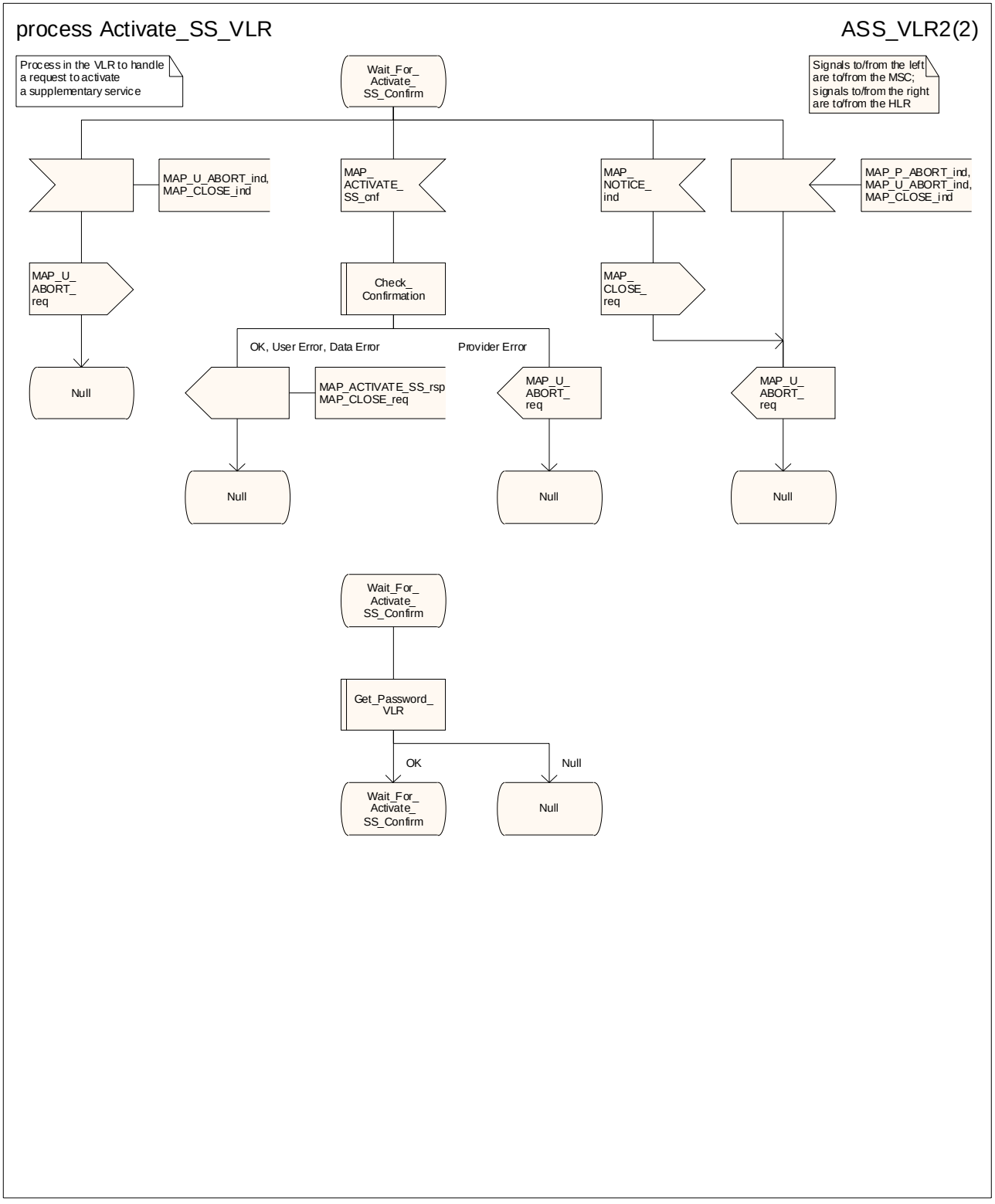
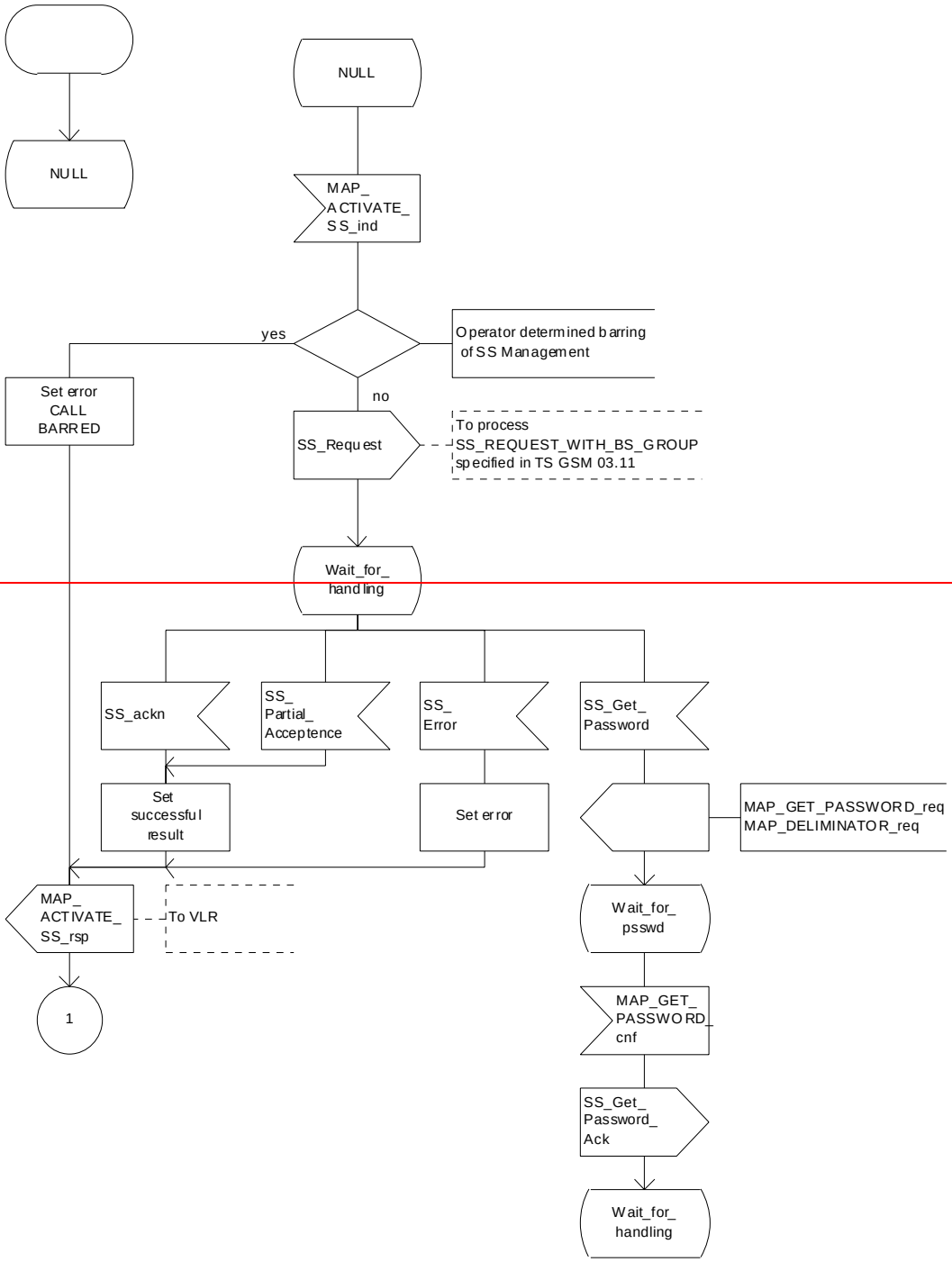


Figure 22.4.3/1 (sheet 2 of 2): Proces~~s~~s~~dure SS~~ Activate_SS_VLR

Process ACTIVATE_SS_HLR 22.4.4_1.1(2)

Figure 22.4.4/1: Activation of supplementary services procedure in HLR.



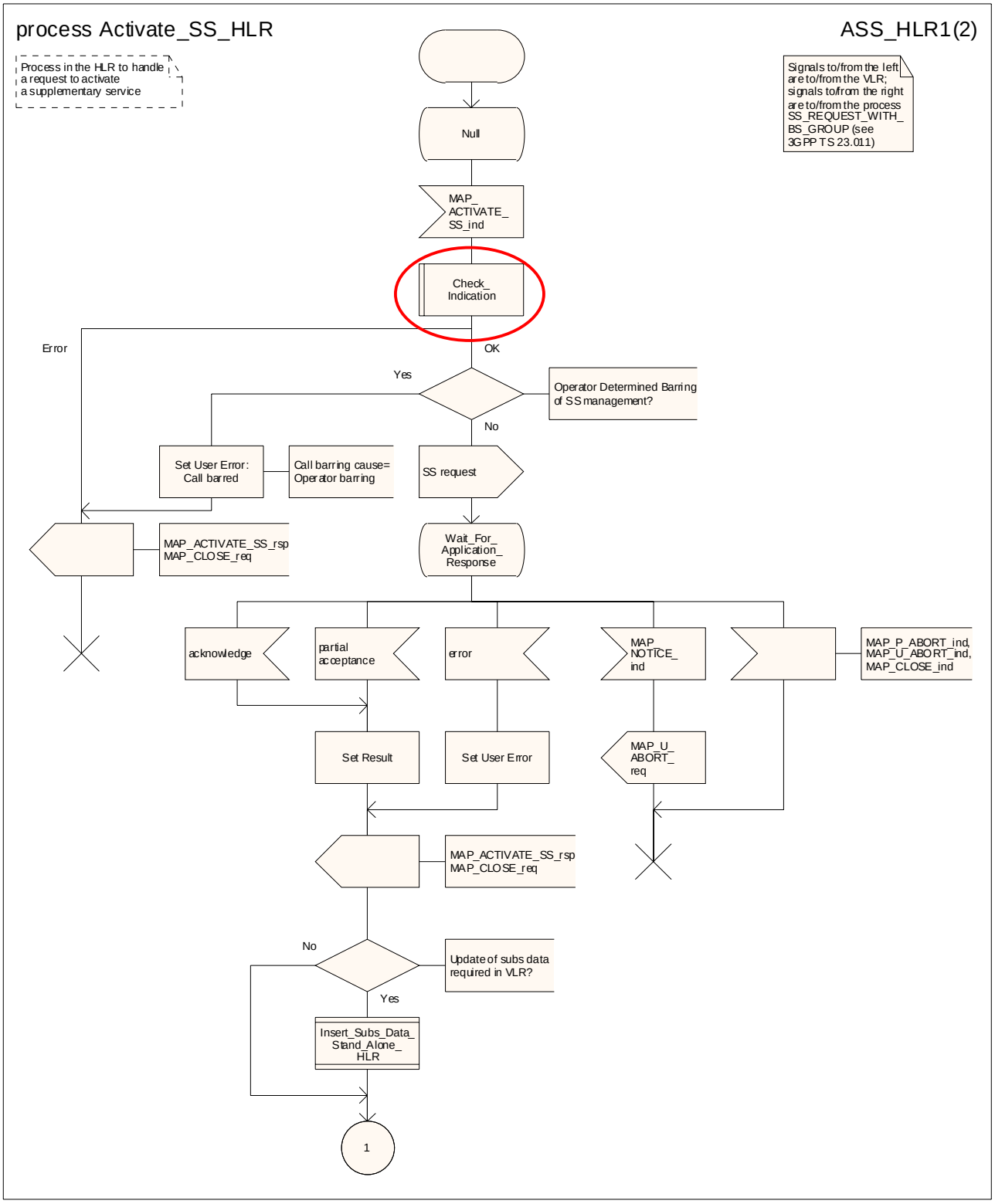
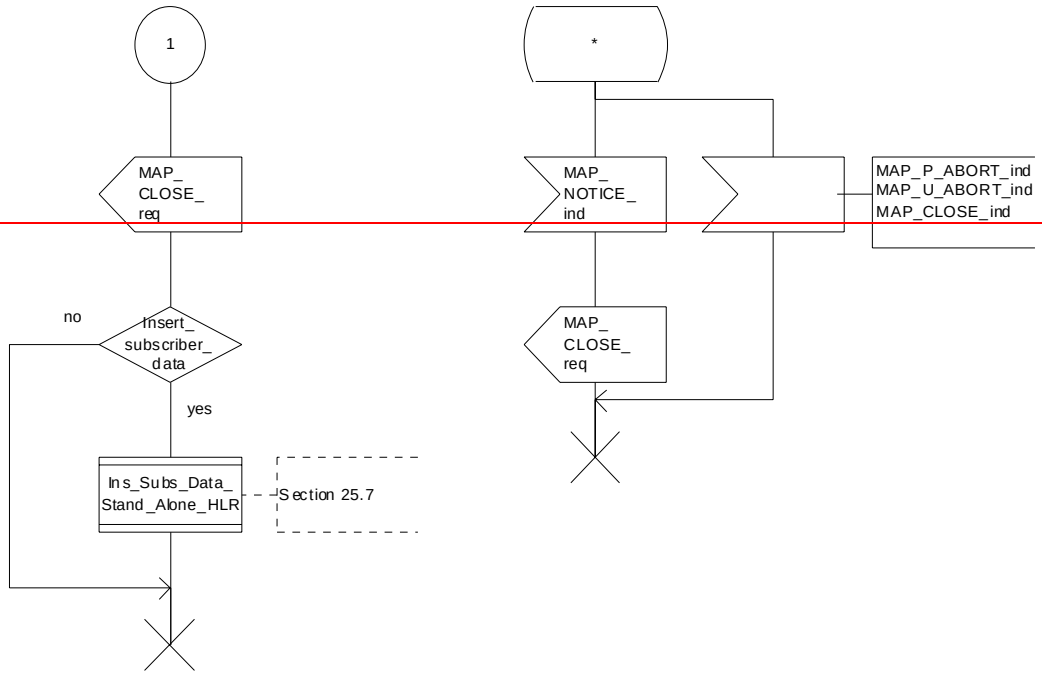


Figure 22.4.4/1 (sheet 1 of 2): Proces~~sdure~~ Activate_SS_HLR

Process ACTIVATE_SS_HLR 22.4.4_1.2(2)

Figure 22.4.4/1: Activation of supplementary services procedure in HLR.



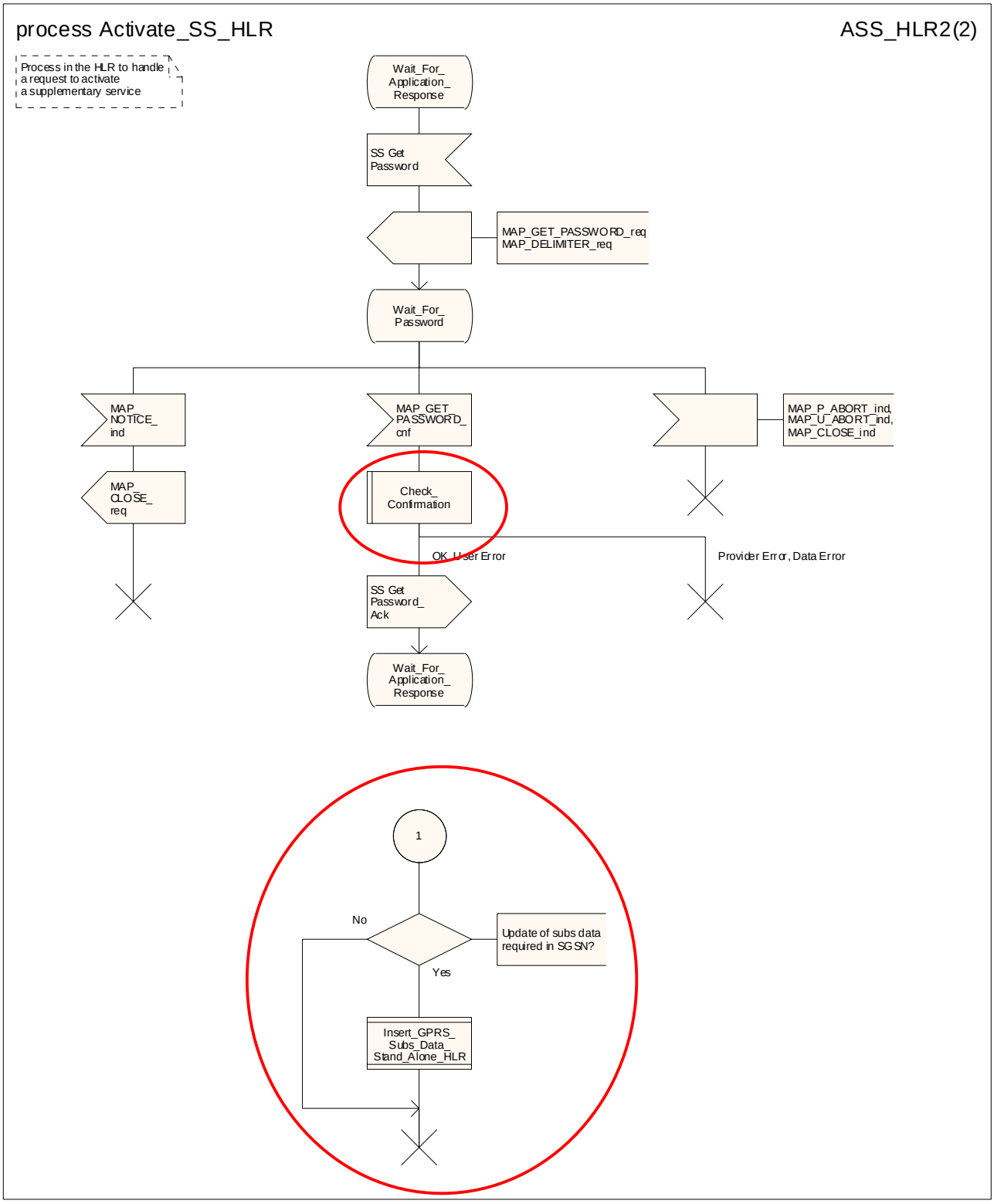


Figure 22.4.4/1 (sheet 2 of 2): Proces~~sdure~~ Activate_SS_HLR

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 clauses below.

The deactivation procedure is shown in figure 22.5.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

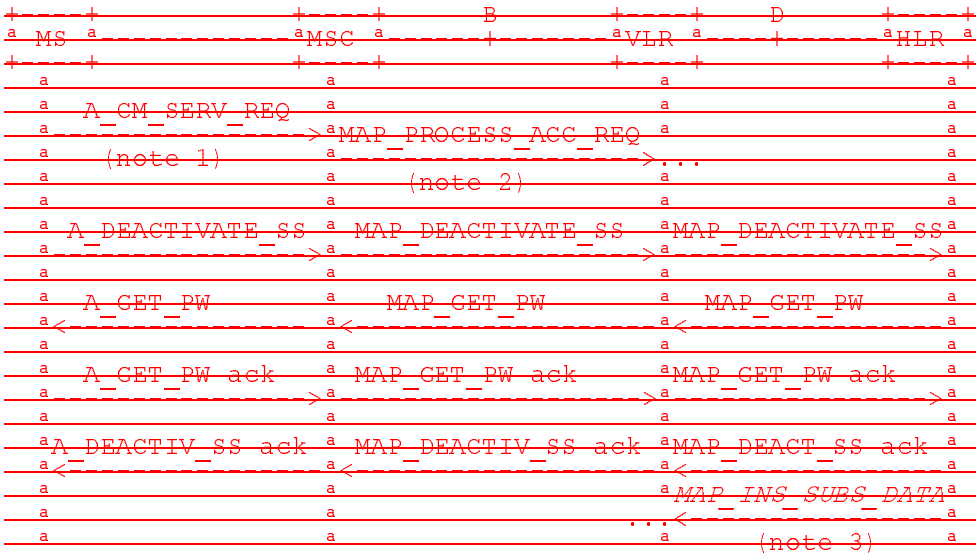
MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25);

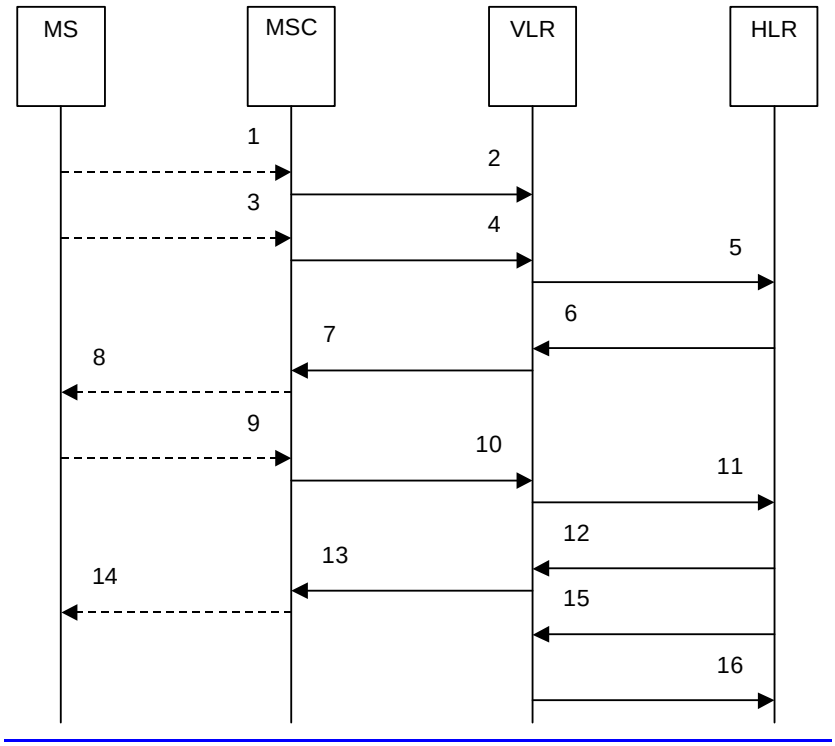
MAP_GET_PASSWORD (defined in clause 11);

MAP_INSERT_SUBSCRIBER_DATA (see ~~defined in~~ clauses 8 and 25).~~;~~

The following service is certainly used:

MAP_DEACTIVATE_SS (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_DEACTIVATE_SS (Note 1)
4) MAP_DEACTIVATE_SS_req/ind
5) MAP_DEACTIVATE_SS_req/ind
6) *MAP_GET_PASSWORD_req/ind* (Note 3)
7) *MAP_GET_PASSWORD_req/ind* (Note 3)
8) *A_GET_PASSWORD* (Note 1, Note 3)
9) *A_GET_PASSWORD ack* (Note 1, Note 3)
10) *MAP_GET_PASSWORD_rsp/cnf* (Note 3)
11) *MAP_GET_PASSWORD_rsp/cnf* (Note 3)
12) MAP_DEACTIVATE_SS_rsp/cnf
13) MAP_DEACTIVATE_SS_rsp/cnf
14) A_DEACTIVATE_SS ack (Note 1)
15) *MAP_INSERT_SUBSCRIBER_DATA_req/ind* (Note 3)
16) *MAP_INSERT_SUBSCRIBER_DATA_rsp/cnf* (Note 3)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.5.1/1: Message flow ~~Interfaces and services~~ for supplementary service deactivation

22.5.2 Procedure~~s~~ in the MSC

The MSC procedure~~s~~ for deactivation ~~are~~ is identical to ~~those~~ that 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 Procedure~~s~~ in the VLR

The VLR procedure~~s~~ for deactivation ~~are~~ is identical to ~~those~~ that 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 procedure~~s~~ for deactivation ~~are~~ is identical to ~~those~~ that 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 clauses below.

The interrogation procedure is shown in figure 22.6.1/1.

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

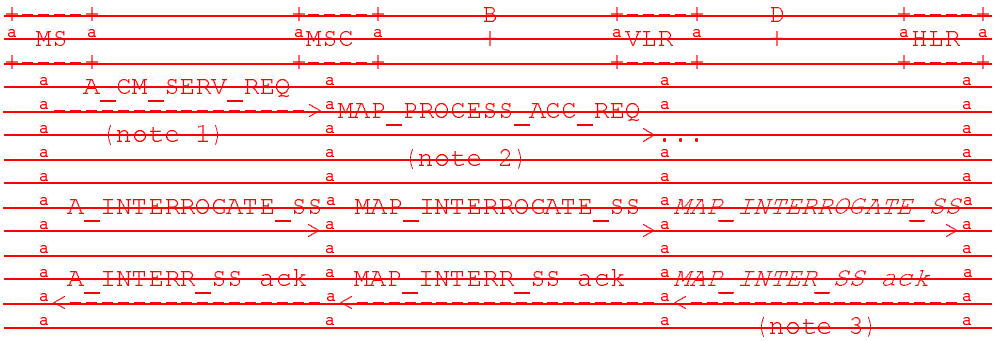
MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

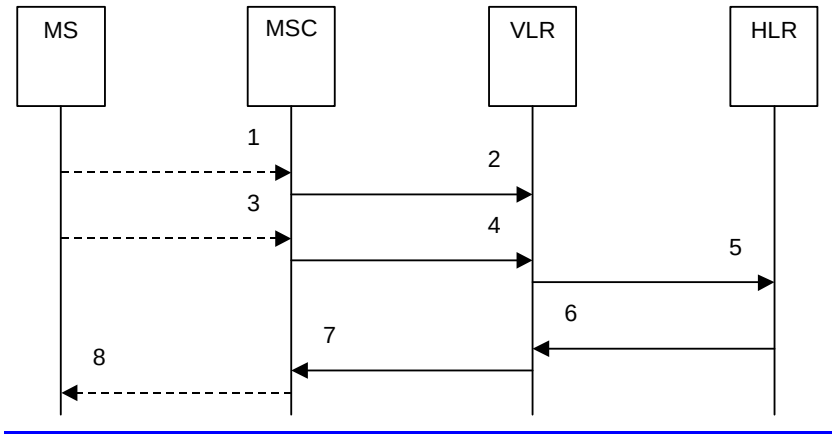
MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25).~~;~~

The following service is certainly used:

MAP_INTERROGATE_SS (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_INTERROGATE_SS (Note 1)
4) MAP_INTERROGATE_SS_req/ind
5) *MAP_INTERROGATE_SS_req/ind*
6) *MAP_INTERROGATE_SS_rsp/cnf*
7) MAP_INTERROGATE_SS_rsp/cnf
8) A_INTERROGATE_SS ack (Note 1)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~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 of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: Services printed in *italics* are optional.

Figure 22.6.1/1: ~~Interfaces and services~~Message flow for supplementary service interrogation

22.6.2 Procedure~~s~~ in the MSC

The MSC procedure~~s~~ for interrogation ~~are~~ is identical to ~~those~~ that 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 Procedure~~s~~ in the VLR

~~**Supplementary service interrogation**~~

The MAP process invokes macros not defined in this clause; the definition 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;
Process_Access_Request_VLR	see subclause 25.4.2.

~~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 either 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 3GPP TS 23.011 [22] and the ~~0~~23.08x and ~~0~~23.09x ~~-~~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 3GPP TS 29.011 [59]).

b) Interrogation to be handled by the HLR

If the interrogation is to be handled by the HLR, ~~on receiving the MAP_INTERROGATE_SS indication,~~ the MAP ~~user~~ process in the VLR transfers the information received in the MAP_INTERROGATE_SS indication to the HLR in the MAP_INTERROGATE_SS request without further checking the contents of the service indication. The MAP_OPEN request includes the IMSI of the subscriber as the destination reference and the VLR number as the originating reference.

~~The VLR will receive the MAP_INTERROGATE_SS confirm from the HLR.~~ If the MAP_INTERROGATE_SS confirm is properly formed and contains a result or a user error, ~~T~~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 3GPP TS 29.011 [59]).

~~**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, clause 22.2.3.~~ The Interrogation process~~s~~dure in the VLR is ~~described~~ shown in figure 22.6.3/1.

22.6.4 Procedure~~s~~ in the HLR

The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Indication see subclause 25.2.1.

~~When receiving the MAP_INTERROGATE_SS indication, the MAP user~~The HLR 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 the HLR, the error Unexpected Data Value is returned to the VLR.~~

The interrogation is ~~either~~ answered either 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.

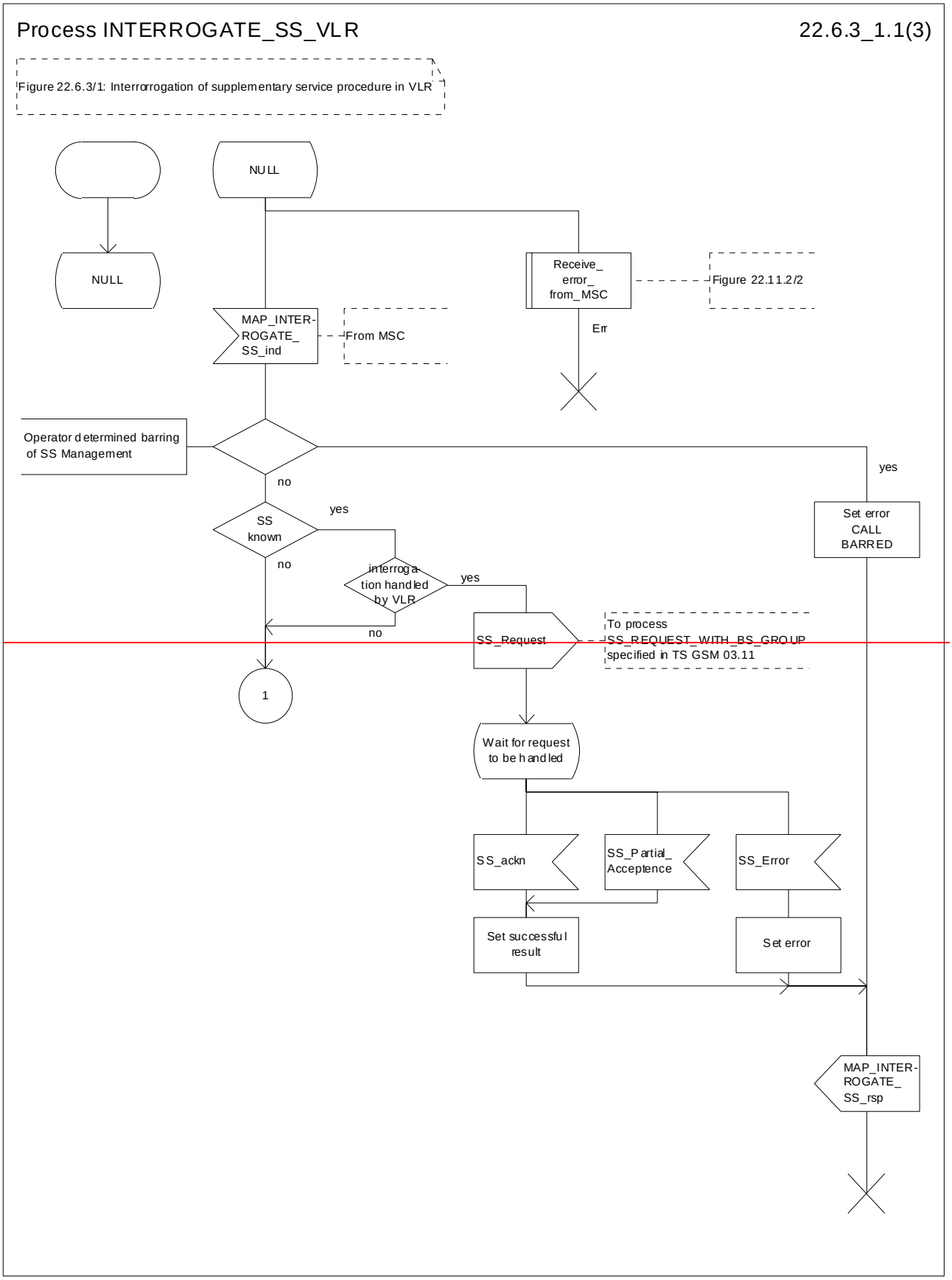
b) Interrogation to be handled by the HLR

The supplementary service request shall be processed according to 3GPP TS 23.011 [22] and the ~~0~~23.08x and ~~0~~23.09x ~~-~~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. Messages which contain more than one component will be stopped at the air interface (as specified in 3GPP TS 29.011 [59]).

~~**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, clause 22.2.3.~~ The Interrogation process~~s~~dure in the HLR is ~~described~~ shown in figure 22.6.4/1.


Process INTERROGATE_SS_VLR
22.6.3_1.1(3)
Figure 22.6.3/1: Interrorrogation of supplementary service procedure in VLR
NULL
NULL
Receive_ error_ from_MSC
Figure 22.11.2/2
MAP_INTER-ROGATE_ SS_ind
From MSC
Err
Operator determined barring of SS Management
yes
no
SS known
yes
no
interroga-tion handled by VLR
yes
no
Set error CALL BARRED
SS_Request
To process SS_REQUEST_WITH_BS_GROUP specified in TS GSM 03.11
1
Wait for request to be handled
SS_ackn
SS_Partial_ Acceptence
SS_Error
Set successful result
Set error
MAP_INTER-ROGATE_ SS_rsp

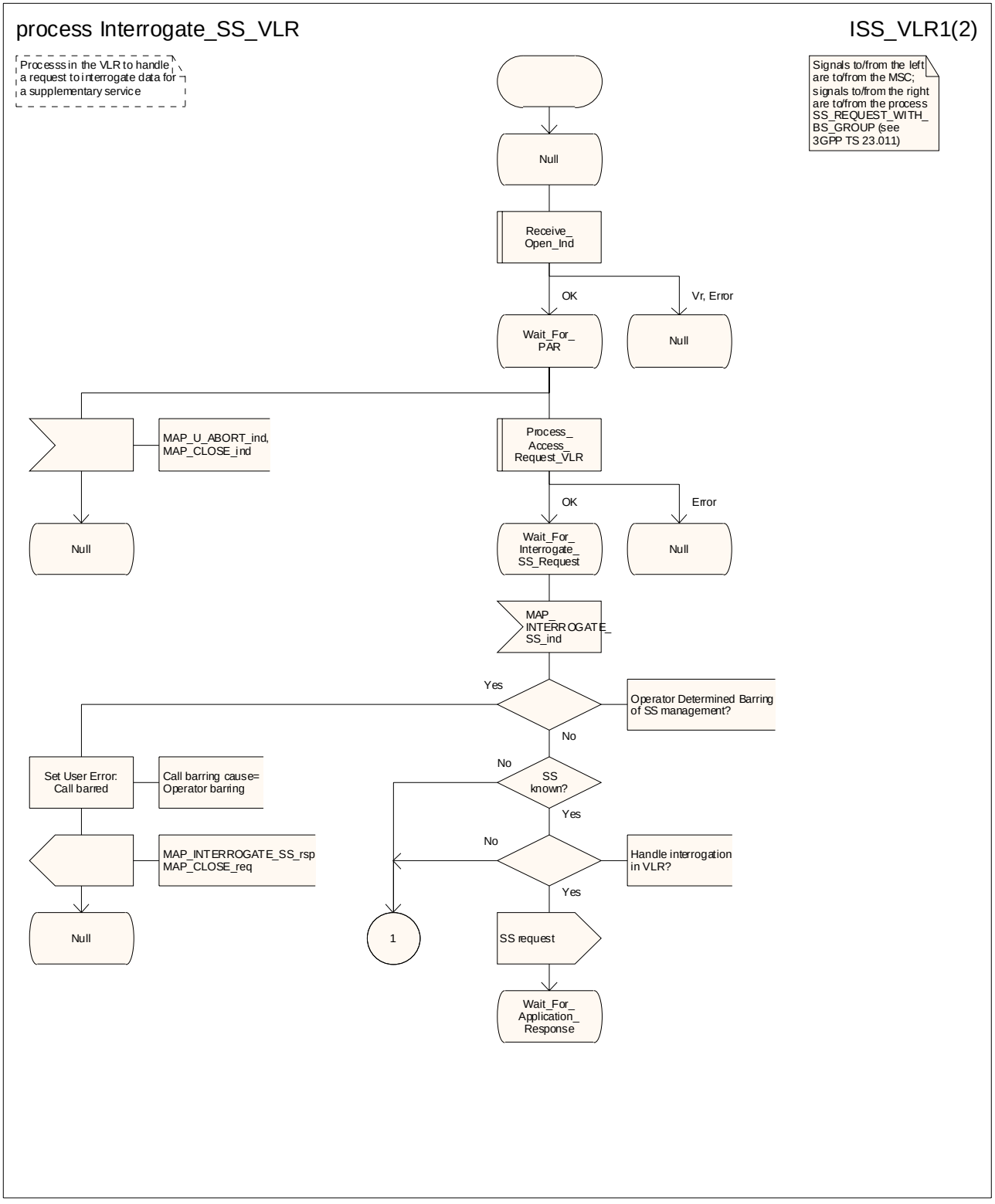
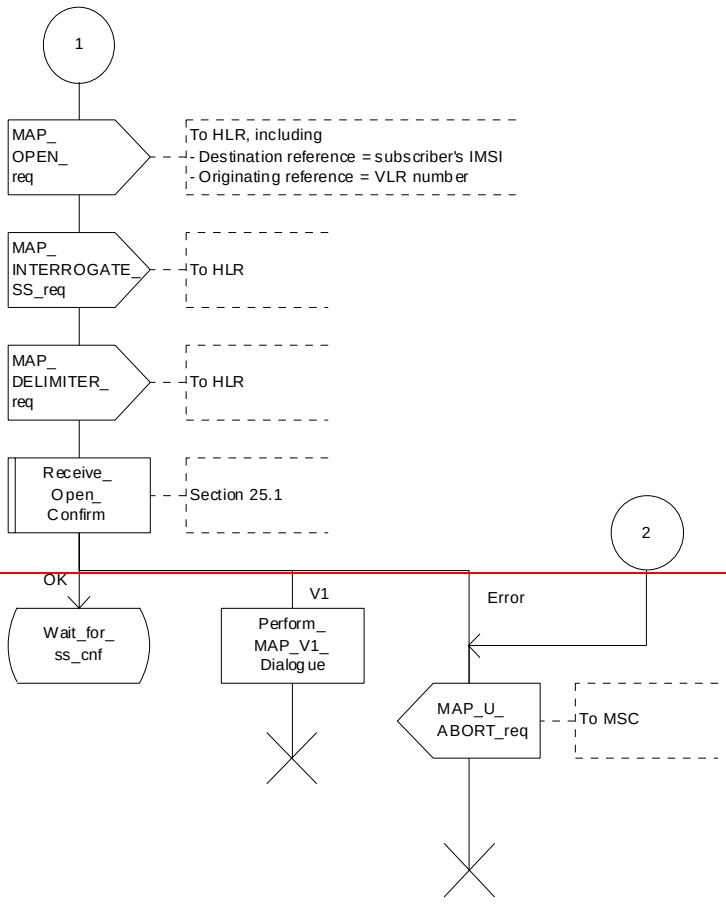


Figure 22.6.3/1 (sheet 1 of 2~~3~~): Procedure Interrogate_SS_VLR

Process INTERROGATE_SS_VLR 22.6.3_1.2(3)

Figure 22.6.3/1: Interrorrogation of supplementary service procedure in VLR



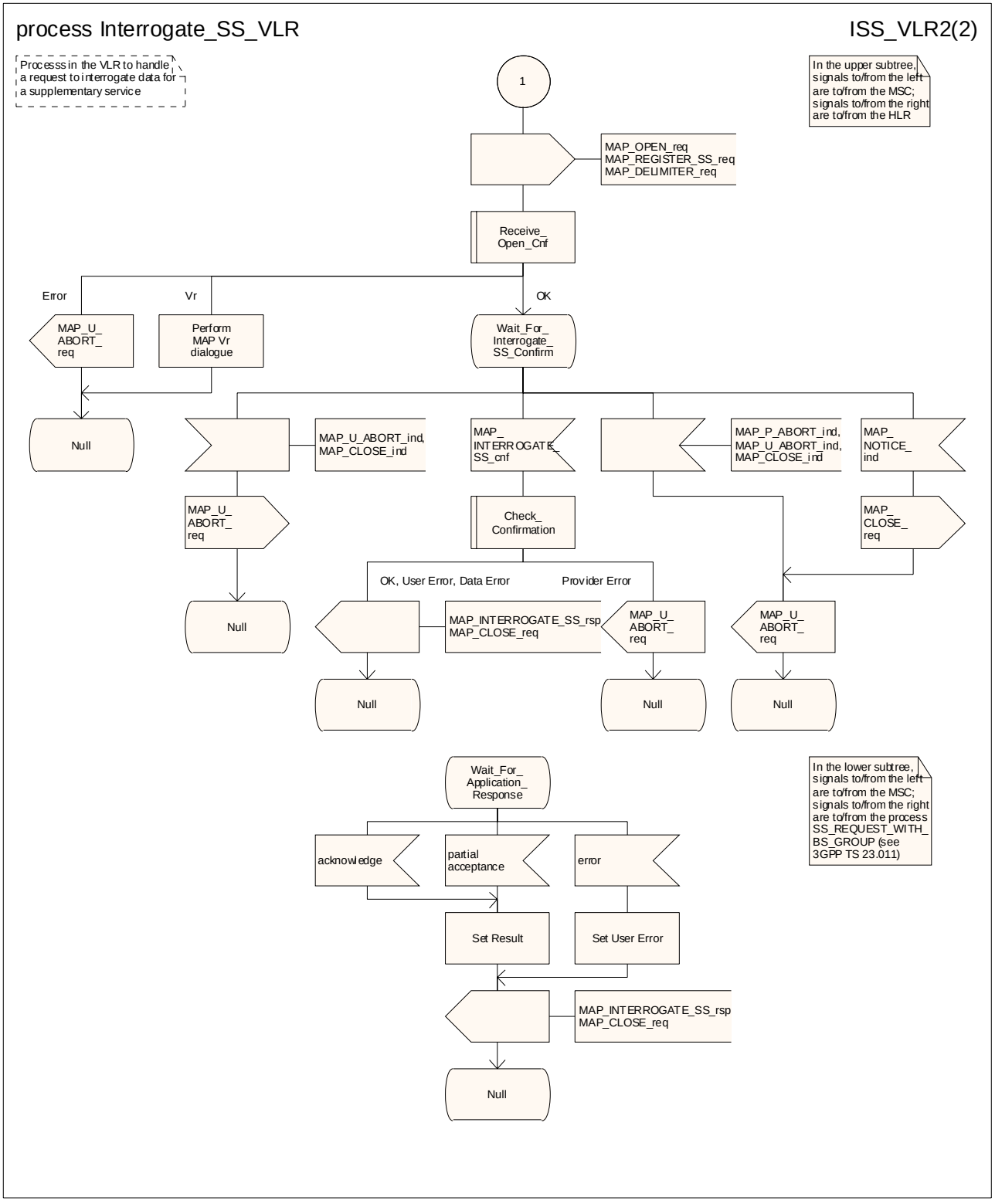
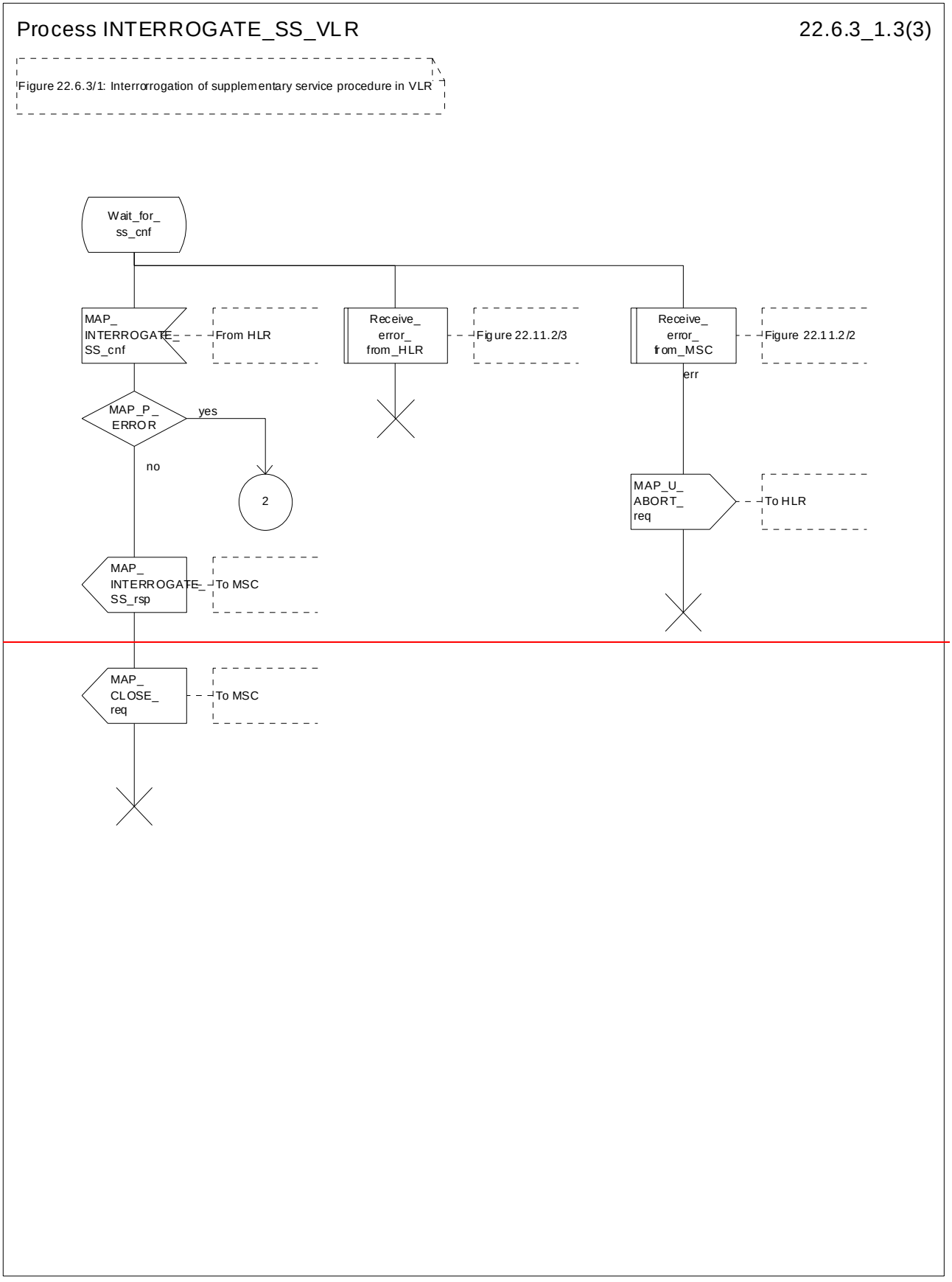


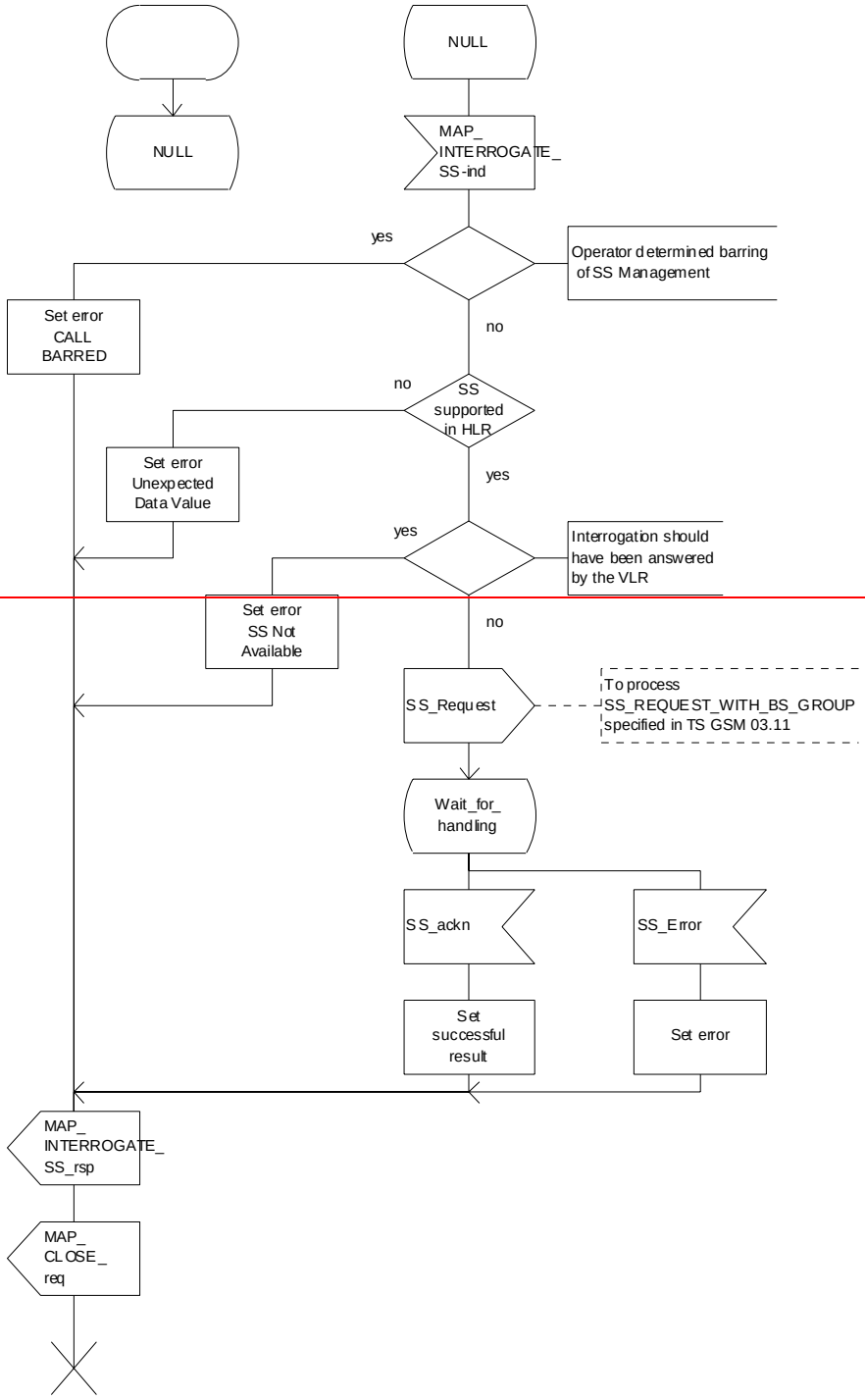
Figure 22.6.3/1 (sheet 2 of 2~~3~~): Procedure Interrogate_SS_VLR



~~Figure 22.6.3/1 (sheet 3 of 3): Procedure Interrogate_SS_VLR~~

Process INTERROGATE_SS_HLR 22.6.4_1(1)

Figure 22.6.4/1: Interrogation of supplementary services procedure in HLR



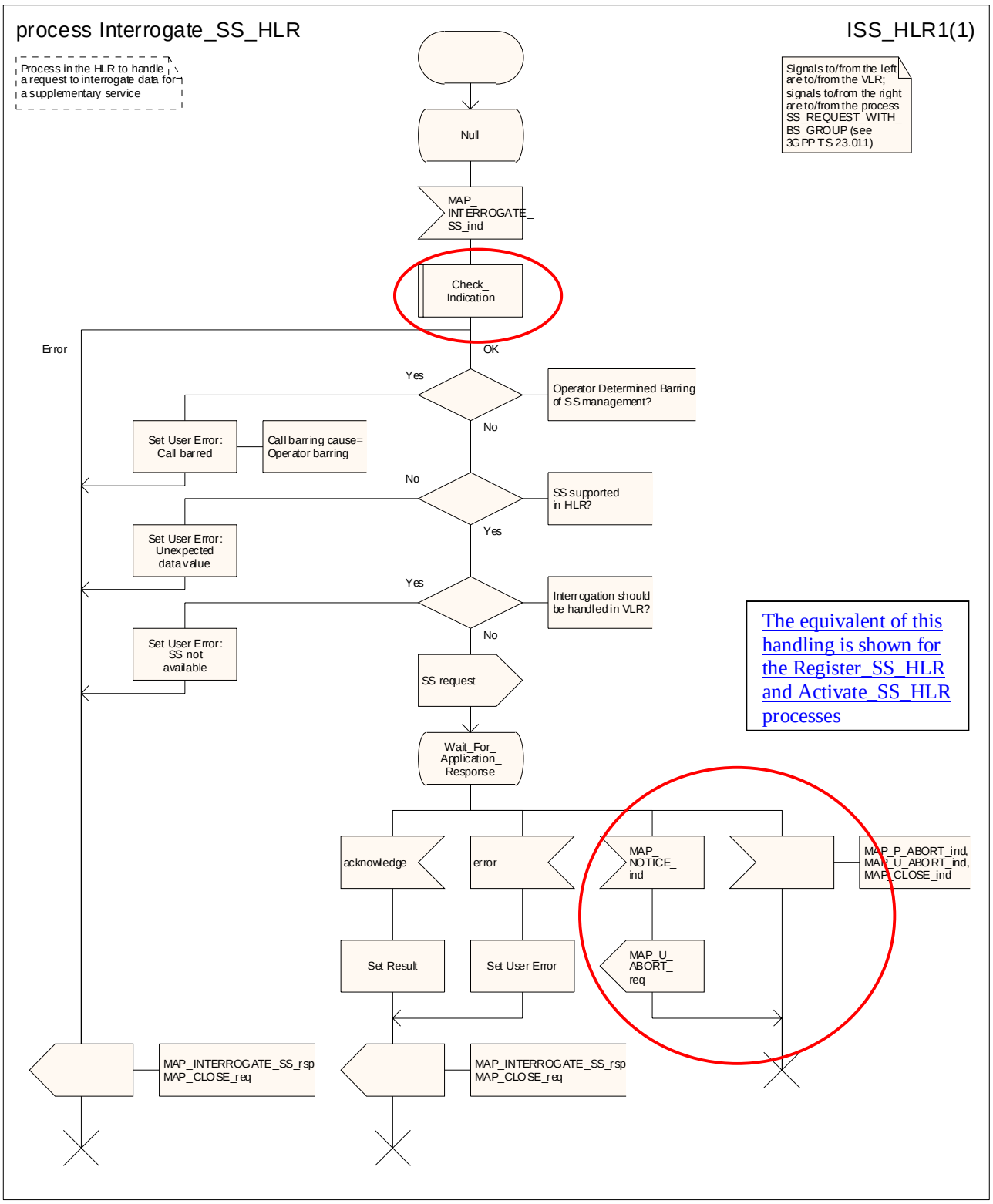


Figure 22.6.4/1: Procedure Interrogate_SS_HLR

22.7 ~~Invocation procedure~~Void

***** CR editor's note: This procedure describes interworking between the MSC and the VLR, which does not involve any MAP signalling. The interworking is described in 3GPP TS 23.018, 3GPP TS 23.083 and 3GPP TS 23.084. *****

~~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 clause 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);~~

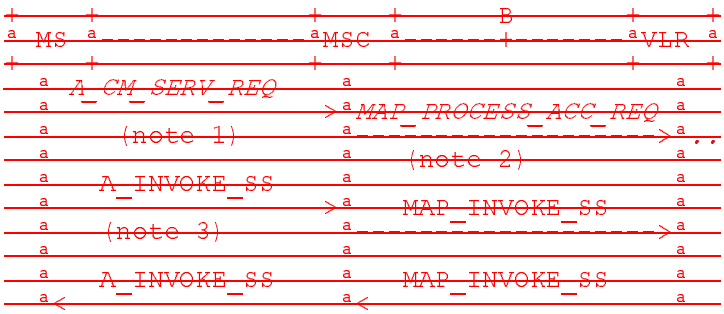
~~MAP_AUTHENTICATE (defined in clauses 8 and 25);~~

~~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 3GPP TS 24.008 [35], 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 3GPP TS 24.080 [38].~~

~~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 3GPP TS 24.008 [35] 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 3GPP TS 24.010 [36], 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 3GPP TS 29.011 [59].

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 3GPP TS 29.011 [59] 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 3GPP TS 24.010 [36].

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.

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

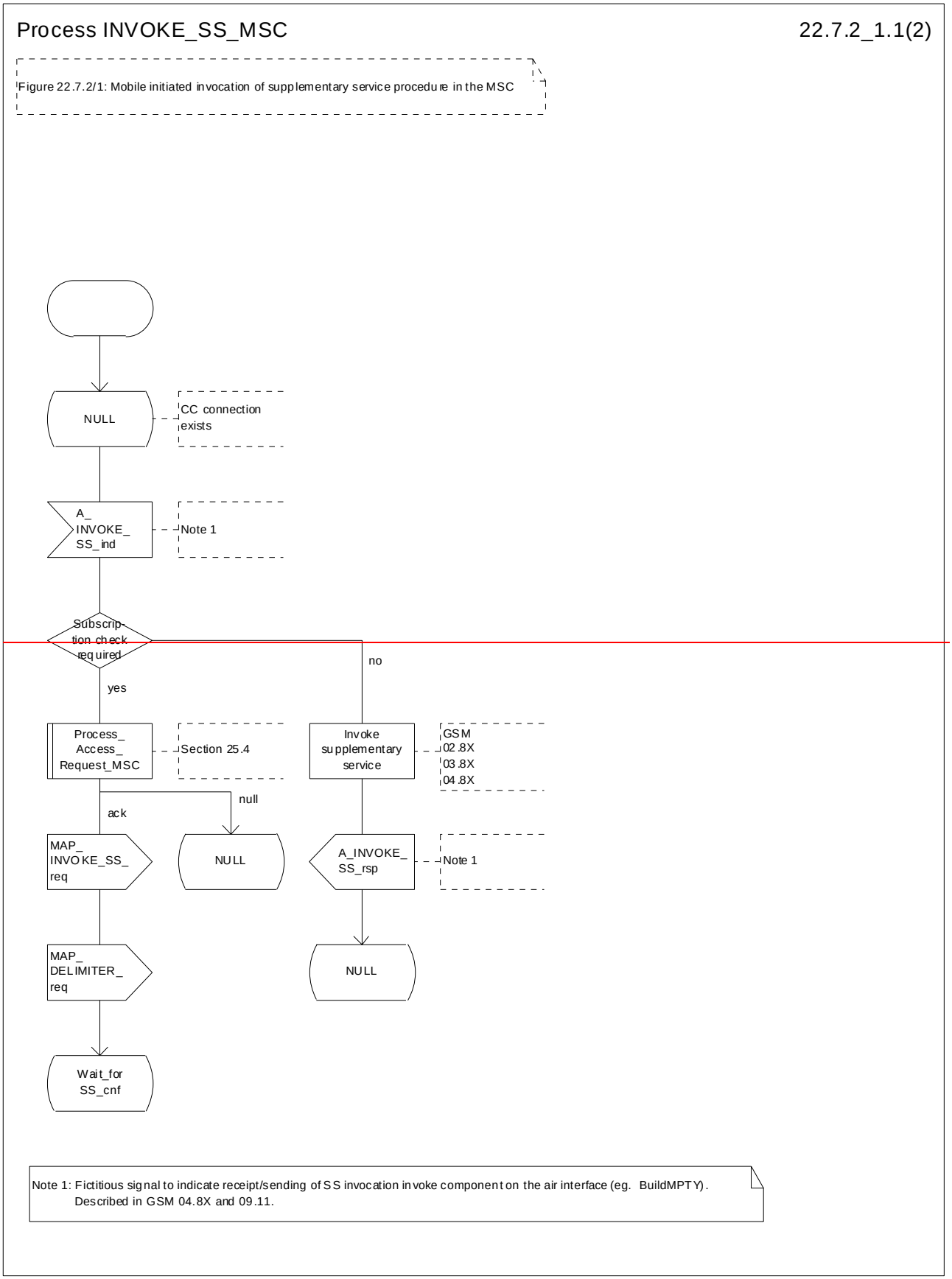
When receiving the MAP_INVOKE_SS indication, the MAP user acts as follows:

- 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.

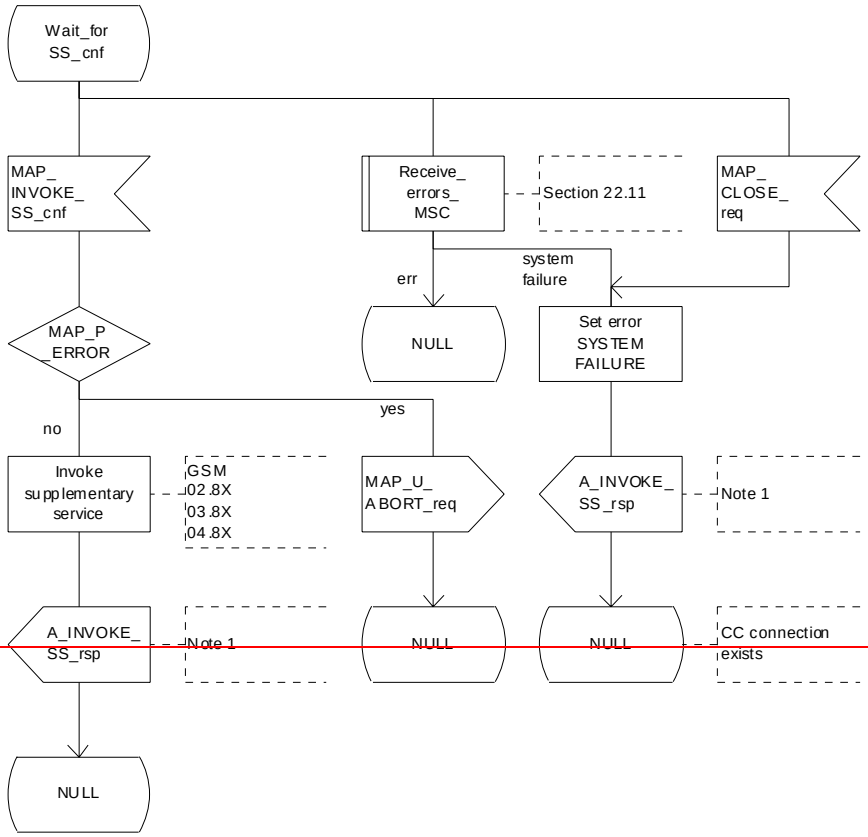
~~The invocation procedure in the VLR is shown in figure 22.7.3/1.~~



~~**Figure 22.7.2/1 (sheet 1 of 2): Procedure Invoke_SS_MSC**~~

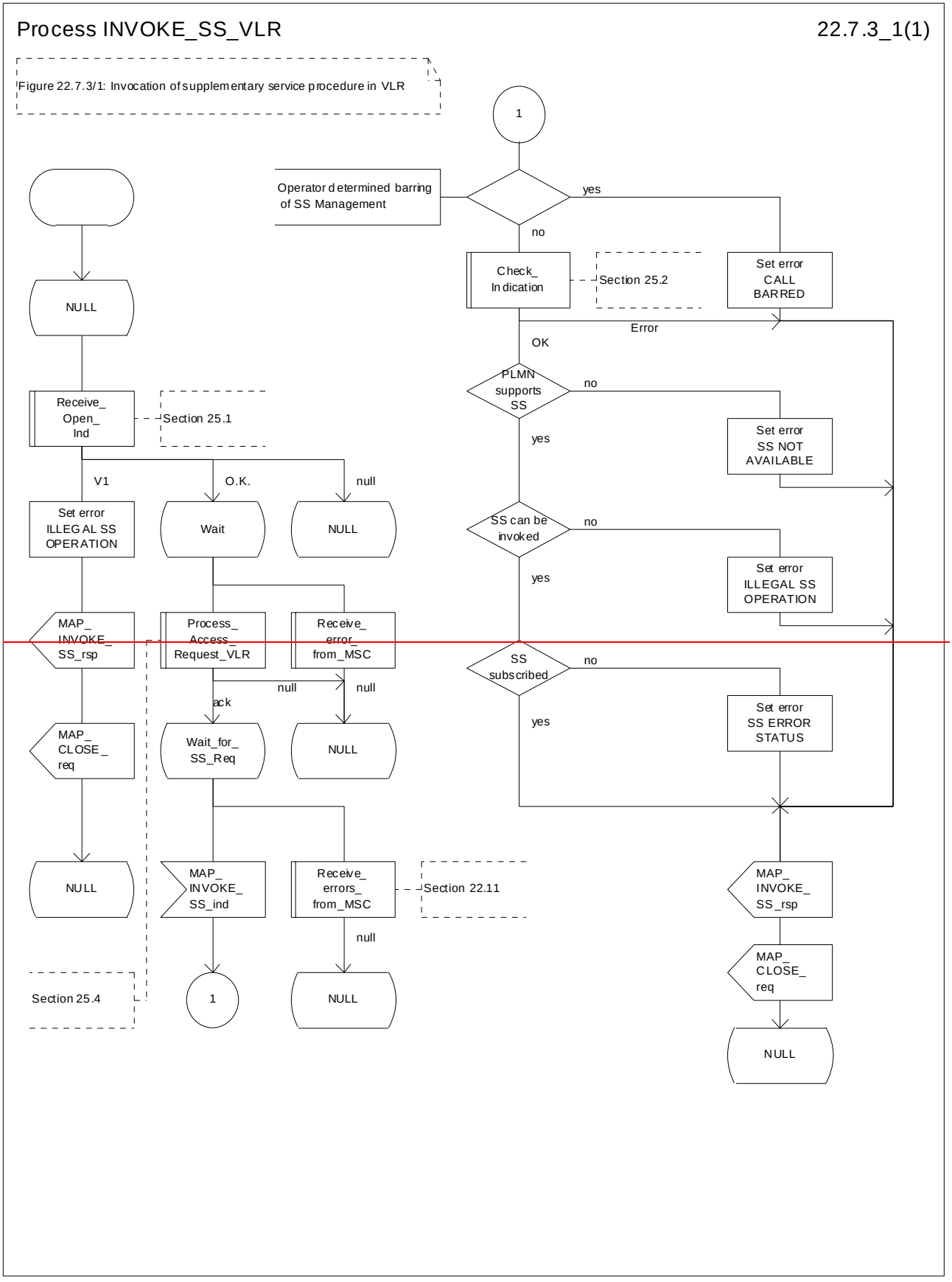
Process INVOKE_SS_MSC 22.7.2_1.2(2)

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. Build MPTY). Described in GSM 04.8X and 09.11.

~~Figure 22.7.2/1 (sheet 2 of 2): Procedure Invoke_SS_MSC~~



~~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 (see ~~defined in~~ clauses 8 and 25);

MAP_TRACE_SUBSCRIBER_ACTIVITY (see ~~defined in~~ clauses 9 and 25);

MAP_PROVIDE_IMSI (see ~~defined in~~ clauses 8 and 25);

MAP_FORWARD_NEW_TMSI (see ~~defined in~~ clauses 8 and 25);

MAP_AUTHENTICATE (see ~~defined in~~ clauses 8 and 25);

MAP_SET_CIPHERING_MODE (see ~~defined in~~ clauses 8 and 25);

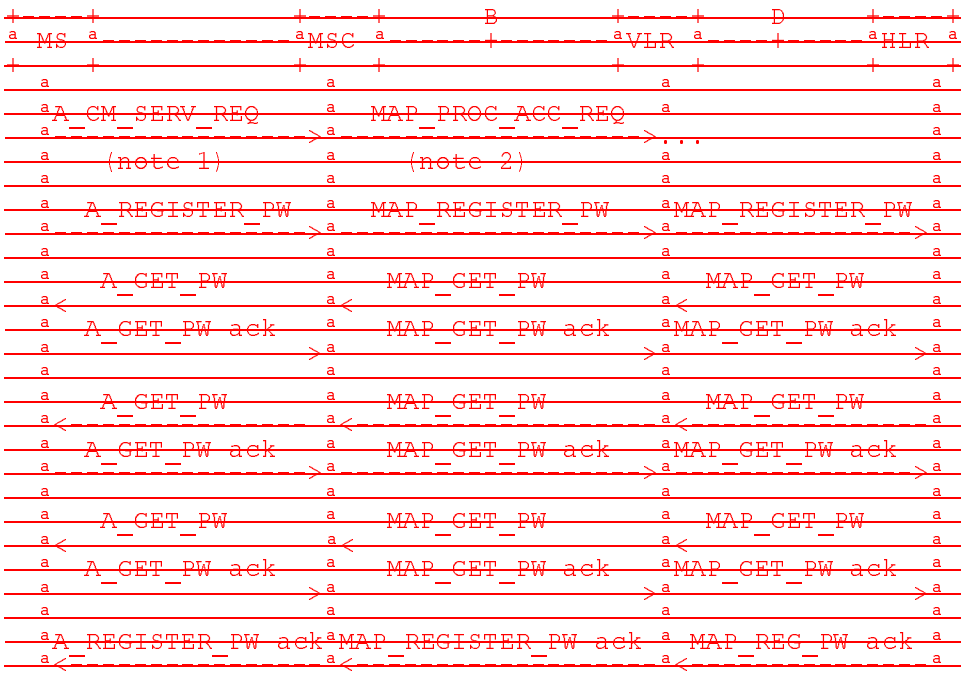
MAP_CHECK_IMEI (see ~~defined in~~ clauses 8 and 25);

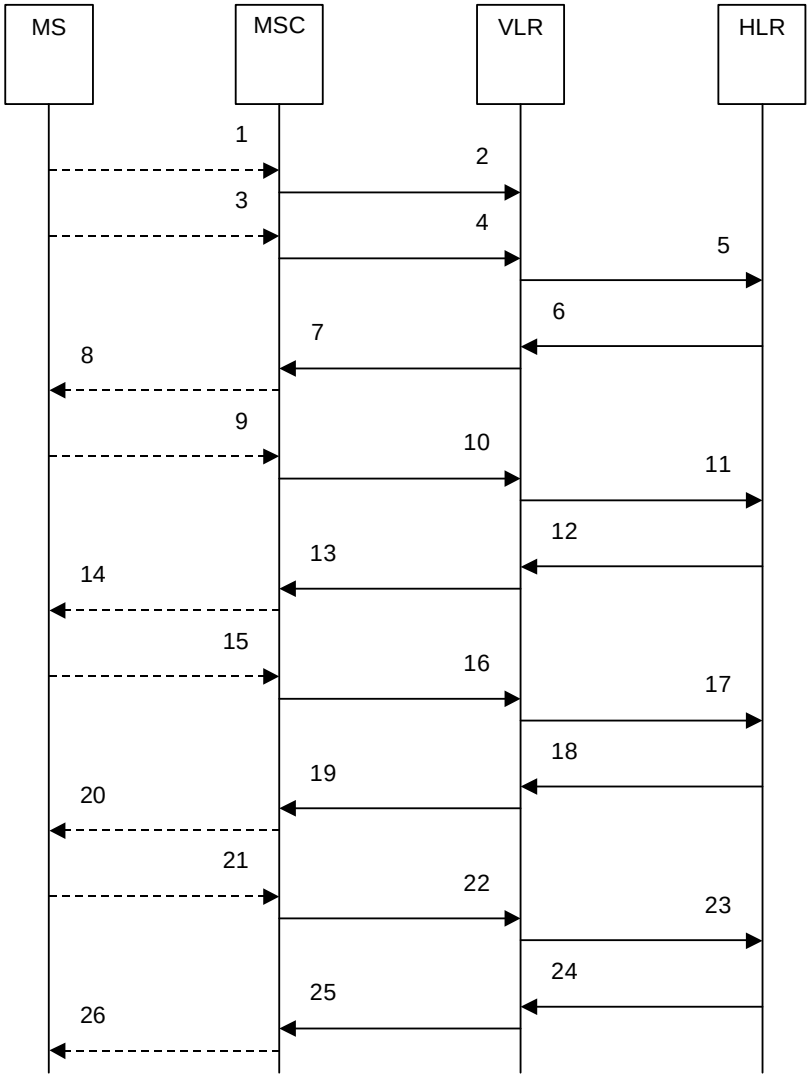
MAP_READY_FOR_SM (see ~~defined in~~ clauses 12 and 25).~~;~~

The following services are certainly used:

MAP_REGISTER_PASSWORD (defined in clause 11);

MAP_GET_PASSWORD (defined in clause 11).





1) A_CM_SERV_REQ (Note 1)
2) MAP_PROCESS_ACCESS_REQUEST (Note 2)
3) A_REGISTER_PASSWORD (Note 1)
4) MAP_REGISTER_PASSWORD_req/ind
5) MAP_REGISTER_PASSWORD_req/ind
6) MAP_GET_PASSWORD_req/ind (Note 3)
7) MAP_GET_PASSWORD_req/ind (Note 3)
8) A_GET_PASSWORD (Note 1, Note 3)
9) A_GET_PASSWORD ack (Note 1, Note 3)
10) MAP_GET_PASSWORD_rsp/cnf (Note 3)
11) MAP_GET_PASSWORD_rsp/cnf (Note 3)
12) MAP_GET_PASSWORD_req/ind (Note 3)
13) MAP_GET_PASSWORD_req/ind (Note 3)
14) A_GET_PASSWORD (Note 1, Note 3)
15) A_GET_PASSWORD ack (Note 1, Note 3)
16) MAP_GET_PASSWORD_rsp/cnf (Note 3)
17) MAP_GET_PASSWORD_rsp/cnf (Note 3)
18) MAP_GET_PASSWORD_req/ind (Note 3)
19) MAP_GET_PASSWORD_req/ind (Note 3)
20) A_GET_PASSWORD (Note 1, Note 3)
21) A_GET_PASSWORD ack (Note 1, Note 3)
22) MAP_GET_PASSWORD_rsp/cnf (Note 3)
23) MAP_GET_PASSWORD_rsp/cnf (Note 3)
24) MAP_REGISTER_PASSWORD_rsp/cnf
25) MAP_REGISTER_PASSWORD_rsp/cnf
26) A_REGISTER_PASSWORD (Note 1)

NOTE 1: For details of the procedure on the radio path, see 3GPP TS 24.008 [35], 3GPP TS 24.010 [36], 3GPP TS 24.08x and 3GPP TS 24.09x~~04.10, 04.8x and 04.9x~~. Services shown in dotted lines are triggers/ triggered signalling on the radio path.
NOTE 2: For details of~~n~~ the Process Access Request procedure, ~~please~~ refer to subclause 25.4 in the present document.
NOTE 3: The ~~U~~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~~Message flow for supplementary service password registration

22.8.2 Procedure~~s~~ 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 Procedure~~s~~ 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 Procedure~~s~~ in the HLR

The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Indication see subclause 25.2.1.

~~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.~~

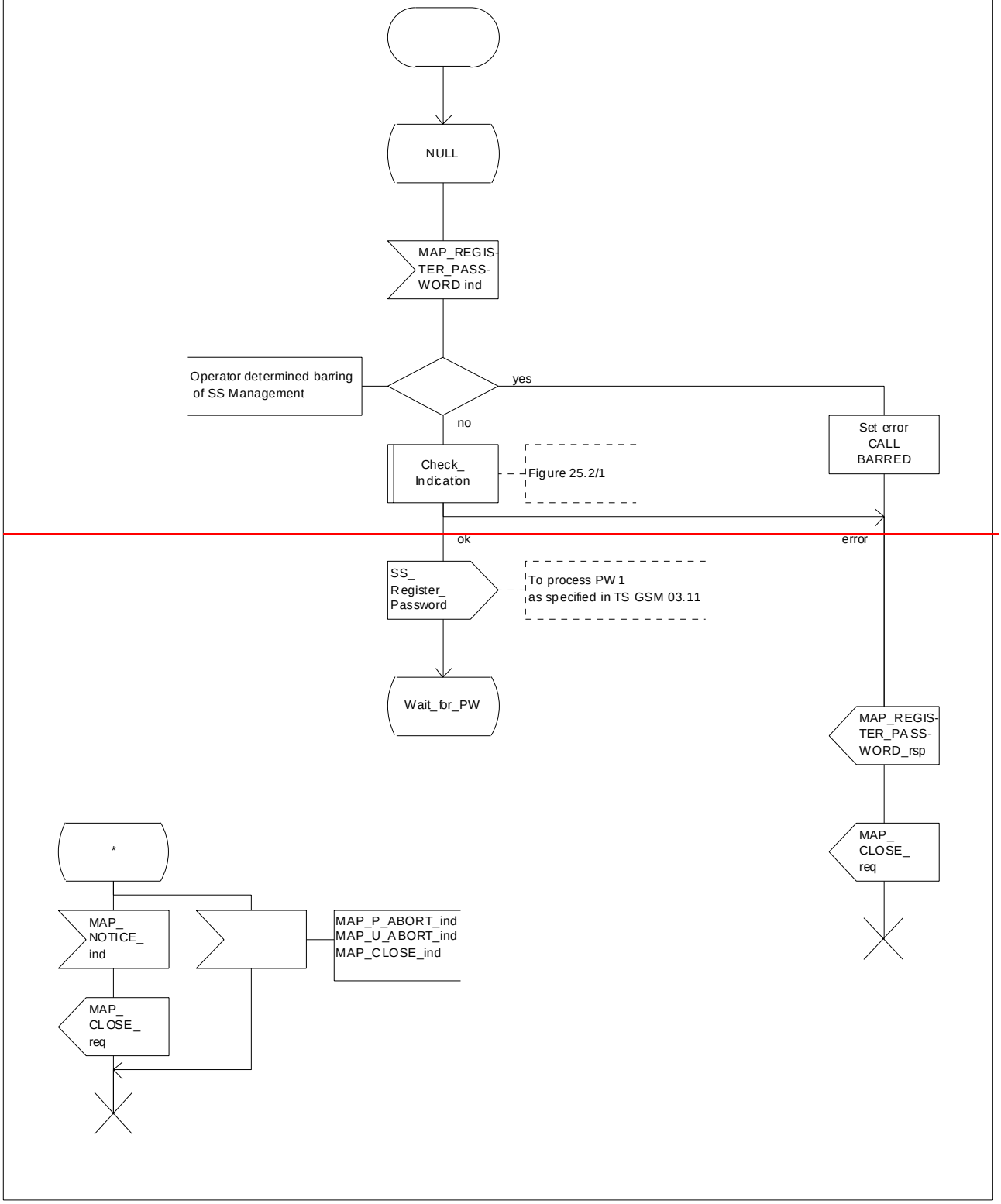
The HLR shall ~~then~~ process the MAP_REGISTER_PASSWORD indication as specified in 3GPP TS 23.011 [22]. During the handling of password registration, the password procedure ~~will be~~ is initiated (as specified in 3GPP TS 23.011 [22]) This ~~will~~ involves the sending of MAP_GET_PASSWORD requests 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 clause 22.2.4 above.~~

The password registration proces~~sdure~~ in the HLR is shown in figure 22.8.4/1.

Process REGISTER_PASSWORD_HLR 22.8.4_1.1(2)

Figure 22.8.4/1: Registration of supplementary service password procedure in HLR



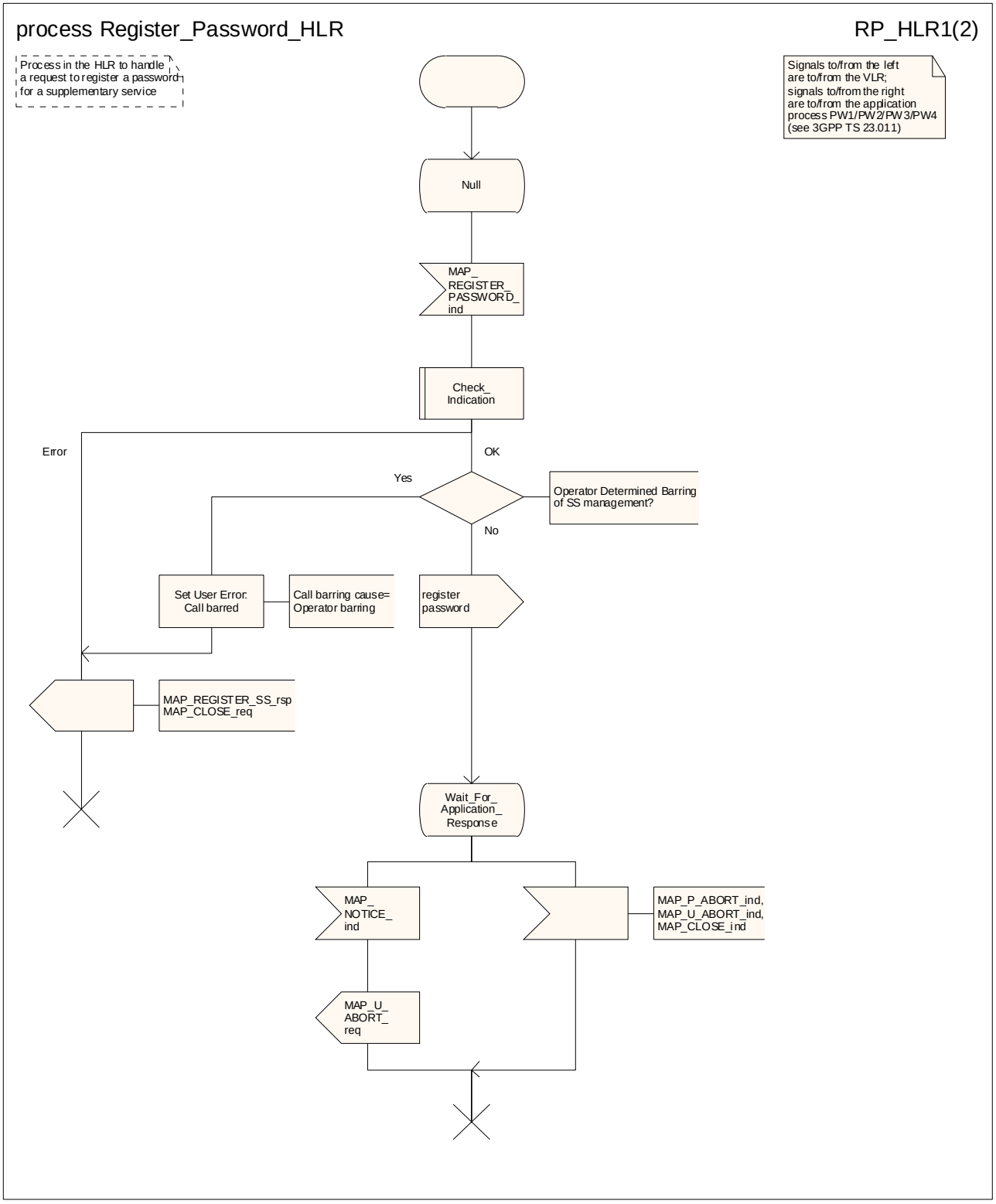
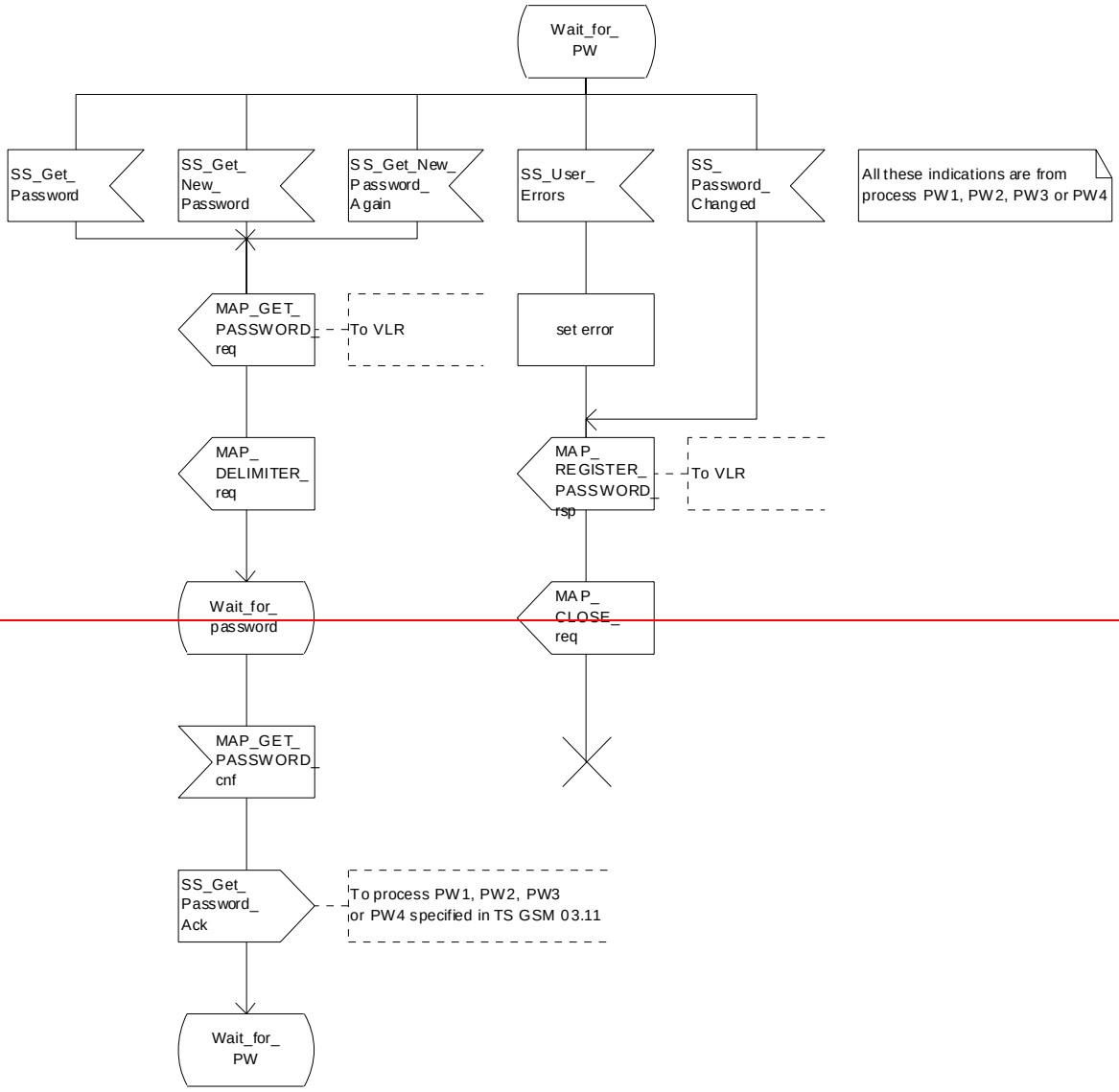


Figure 22.8.4/1 (sheet 1 of 2): Procedure Register_PW_HLR

Process REGISTER_PASSWORD_HLR 22.8.4_1.2(2)

Figure 22.8.4/1: Registration of supplementary service password procedure in HLR



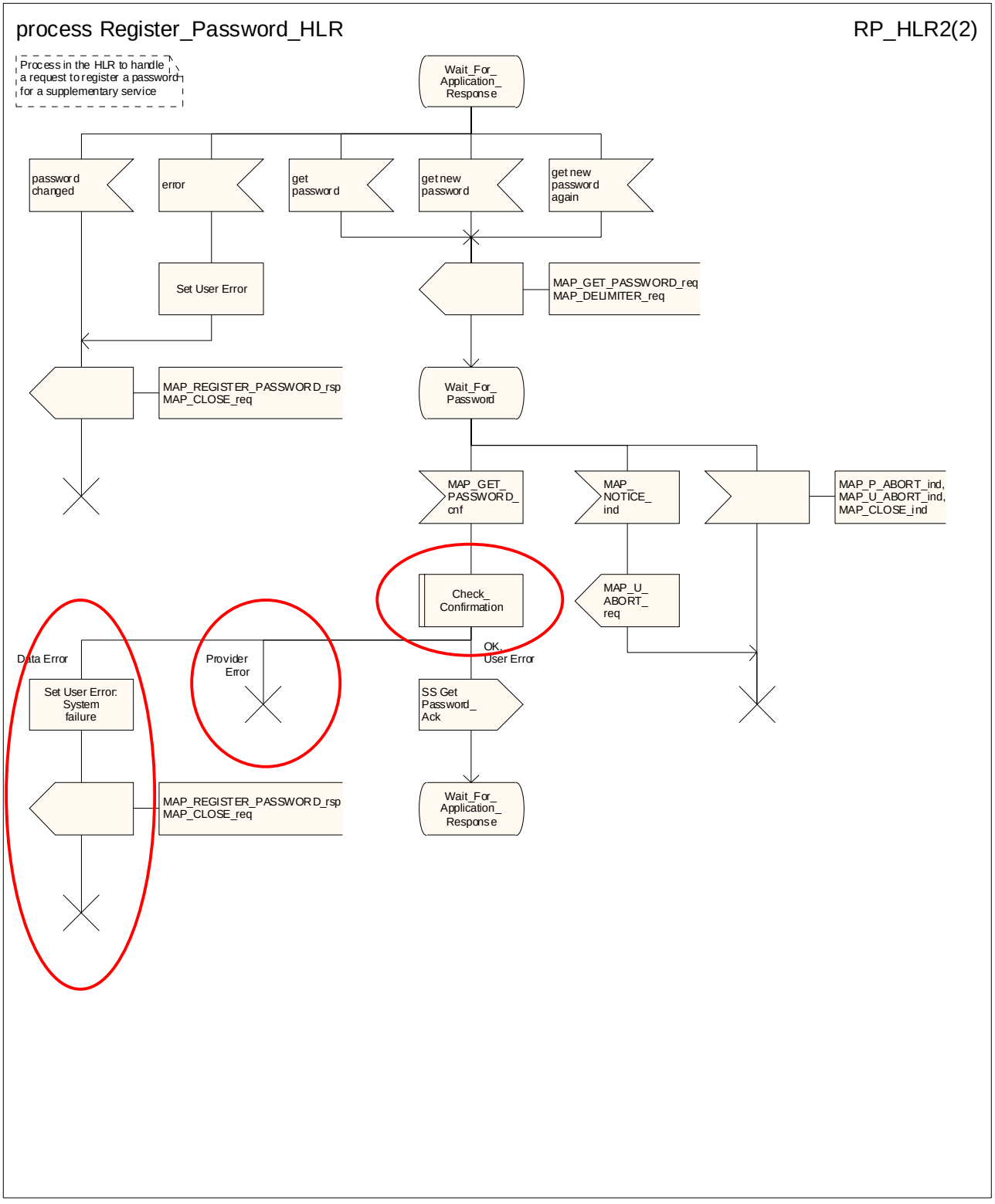


Figure 22.8.4/1 (sheet 2 of 2): Procedure Register_PW_HLR

22.9 Mobile Initiated USSD procedure

22.9.1 General

The procedure supports supplementary service signalling procedures which ~~can~~ allow PLMN specific services to be introduced.

The message flow for the procedure can be found in 3GPP TS 23.090 [34].

The following services may be used:

MAP_PROCESS_ACCESS_REQUEST	(see ~~defined in~~ clauses 8 and 25);
MAP_TRACE_SUBSCRIBER_ACTIVITY	(see ~~defined in~~ clauses 9 and 25);
MAP_PROVIDE_IMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_AUTHENTICATE	(see ~~defined in~~ clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(see ~~defined in~~ clauses 8 and 25);
MAP_CHECK_IMEI	(see ~~defined in~~ clauses 8 and 25);
MAP_READY_FOR_SM	(see ~~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 Procedure~~s~~ in the MSC

The process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Confirmation see subclause 25.2.2.

~~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 t~~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 3GPP TS 23.090 [34].

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 3GPP TS 29.011 [59].

~~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 information contained in 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 process~~dure~~ in the MSC is shown in figure 22.9.2/1.

22.9.3 Procedure~~s~~ in the VLR

The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2;

Process_Access_Request_VLR see subclause 25.4.2.

~~The initiation of the process is shown in clause 22.1.2.~~

~~Once a MAP dialogue is established, the VLR may handle the~~ 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 3GPP TS 23.090 [34].

1) 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.~~

2) Message Destined for Local Application

If the message is destined for the local USSD application then the VLR shall transfer the information contained in 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 process~~dure~~ in the VLR is shown in figure~~s~~ 22.9.3/1~~ and 22.9.3/2~~.

22.9.4 Procedures in the HLR

The MAP process invokes macros not defined in this clause; the definition 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.

~~The Mobile initiated USSD Procedure in the HLR starts by the HLR receiving a MAP-OPEN service indication from the VLR.~~

~~Once a MAP dialogue is established, the HLR may handle the~~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 or ~~to~~ a secondary HLR where the USSD application is located. ~~If the alphabet is not understood then the error "UnknownAlphabet" shall be returned.~~

1) Message Destined for Local Application

If the message is destined for the local USSD application then the HLR shall transfer the information contained in 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.~~

2) Message Destined for gsmSCF or secondary HLR

If the message is destined for the gsmSCF or secondary HLR then the primary HLR shall transfer the information contained in the message transparently to the next node.

~~The primary 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 primary 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**~~

~~The VLR, the USSD Application and the gsmSCF or secondary HLR may initiate release of the MAP service at any time. This is handled as shown in the diagrams.~~

The proces~~sdure~~ in the primary HLR is shown in figure 22.9.4/1.

22.9.5 Procedures in the gsmSCF/secondary HLR

The MAP process invokes a macro not defined in this clause; the definition of this macros can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

~~The Mobile initiated USSD Procedure in the gsmSCF/secondary HLR starts by the gsmSCF/secondary HLR receiving a MAP-OPEN service indication from the HLR.~~

~~Once a MAP dialogue is established, the gsmSCF/secondary HLR may handle the MAP_PROCESS_UNSTRUCTURED_SS_REQUEST from the HLR.~~

~~The gsmSCF/secondary HLR shall transfer the message to the local application.~~

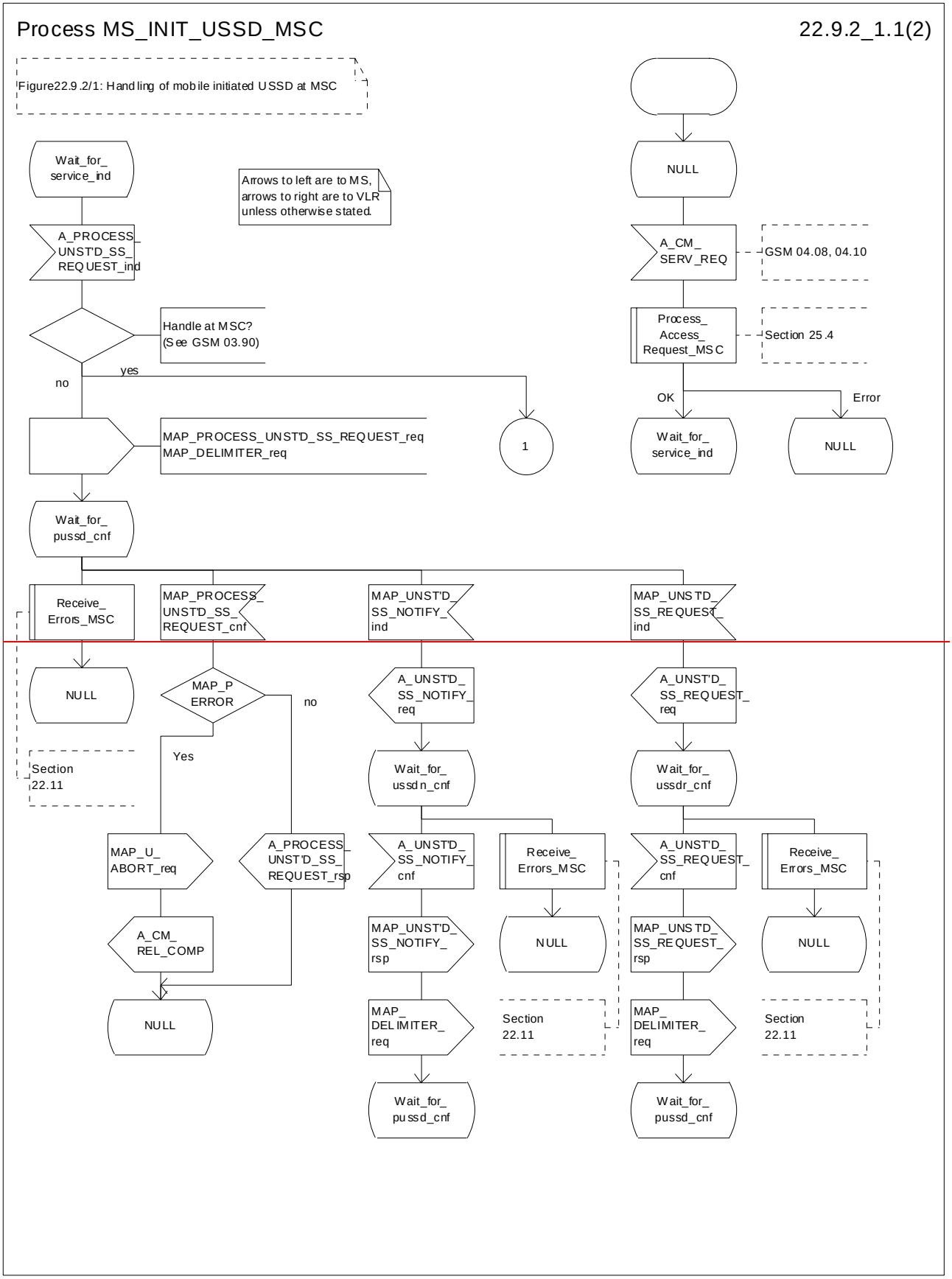
~~The gsmSCF/secondary HLR may subsequently receive one or more requests from the application which correspond to the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY indications. These shall be sent transparently to the HLR. When a confirmation is received from the HLR this shall be returned to the application.~~

~~When the gsmSCF/secondary HLR receives the result of the original operation from the application then it shall pass this to the HLR and initiate release of the CM connection.~~

~~**Error Handling**~~

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

The proces[s]~~sdure~~ in the gsmSCF ~~and~~ [or] secondary HLR is shown in figure 22.9.5/1.


Process MS_INIT_USSD_MSC
22.9.2_1.1(2)
Figure22.9 .2/1: Handling of mobile initiated USSD at MSC
Wait_for_ service_ind
Arrows to left are to MS, arrows to right are to VLR unless otherwise stated.
A_PROCESS_ UNST'D_SS_ REQUEST_ind
Handle at MSC? (See GSM 03.90)
no
yes
MAP_PROCESS_UNST'D_SS_REQUEST_req
MAP_DELIMITER_req
1
Wait_for_ pussd_cnf
Receive_ Errors_MSC
MAP_PROCESS_ UNST'D_SS_ REQUEST_cnf
MAP_UNST'D_ SS_NOTIFY_ ind
MAP_UNST'D_ SS_REQUEST_ ind
NULL
MAP_P ERROR
no
Yes
Section 22.11
MAP_U_ ABORT_req
A_PROCESS_ UNST'D_SS_ REQUEST_rsp
A_CM_ REL_COMP
NULL
A_UNST'D_ SS_NOTIFY_ req
Wait_for_ ussdn_cnf
A_UNST'D_ SS_NOTIFY_ cnf
Receive_ Errors_MSC
MAP_UNST'D_ SS_NOTIFY_ rsp
NULL
MAP_ DELIMITER_ req
Section 22.11
Wait_for_ pussd_cnf
A_UNST'D_ SS_REQUEST_ req
Wait_for_ ussdr_cnf
A_UNST'D_ SS_REQUEST_ cnf
Receive_ Errors_MSC
MAP_UNST'D_ SS_REQUEST_ rsp
NULL
MAP_ DELIMITER_ req
Section 22.11
Wait_for_ pussd_cnf
NULL
A_CM_ SERV_REQ
GSM 04.08, 04.10
Process_ Access_ Request_MSC
Section 25.4
OK
Error
Wait_for_ service_ind
NULL

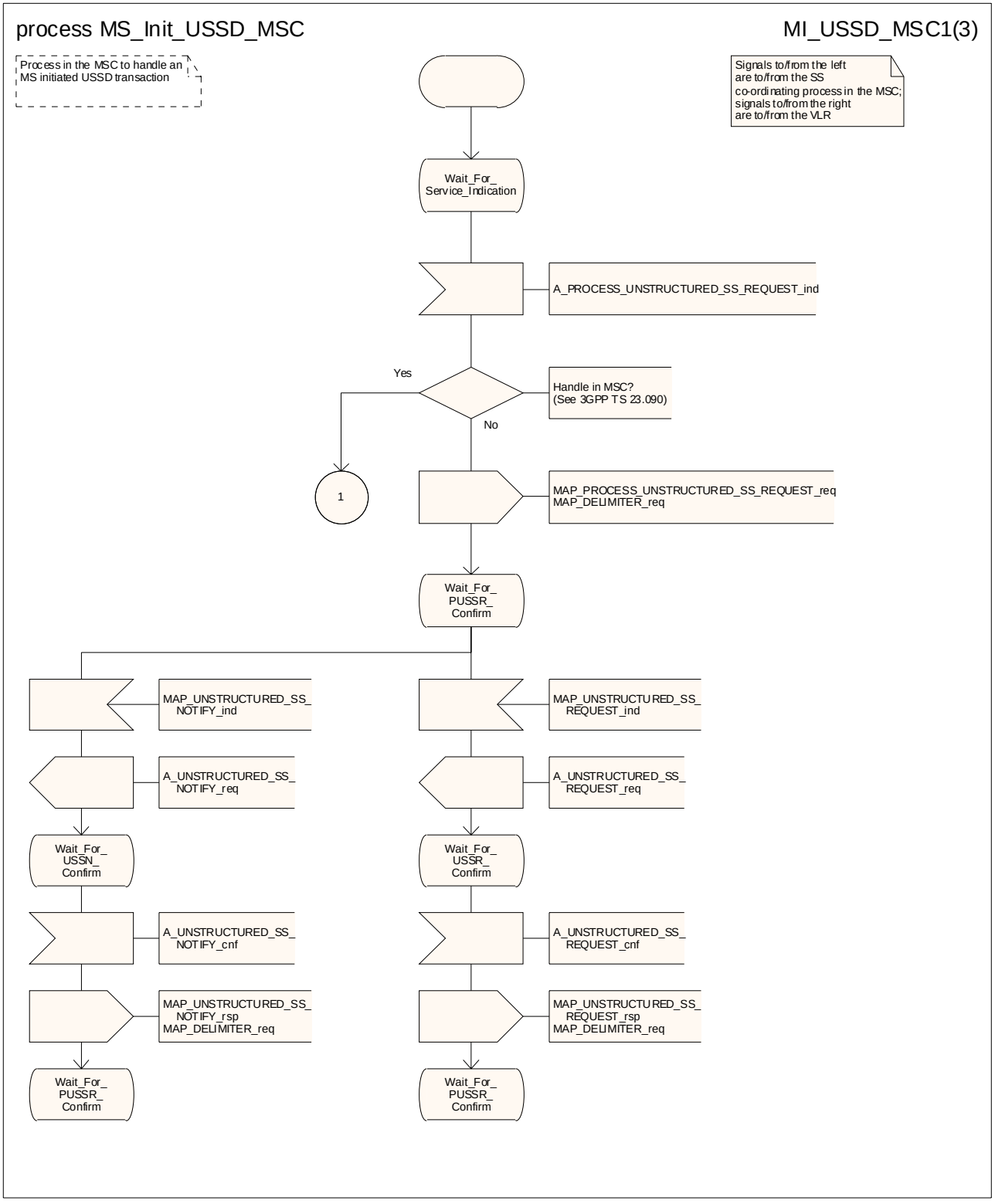
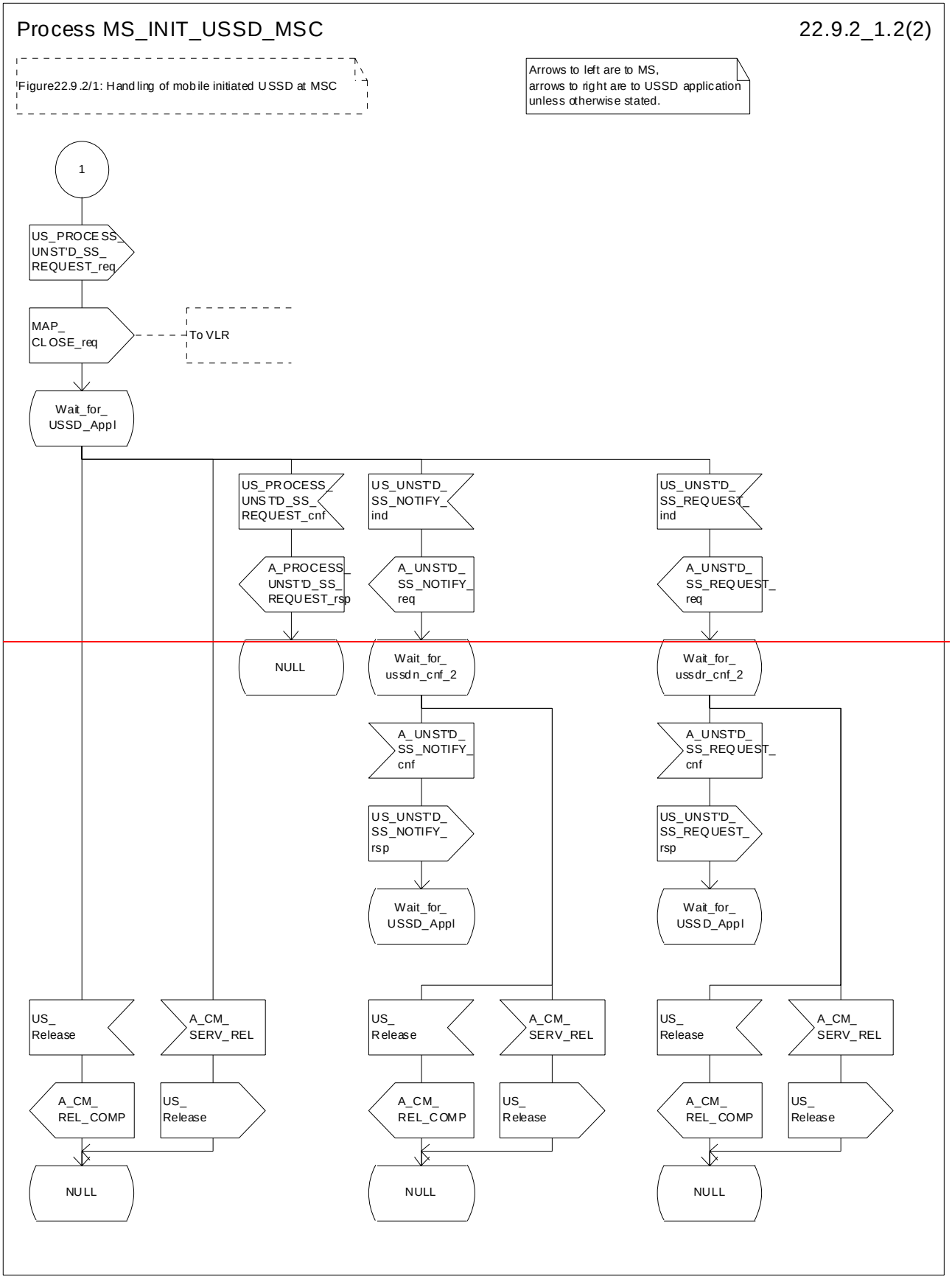


Figure 22.9.2/1 (sheet 1 of 32): Processdure MS_Init_USSD_MSC


Process MS_INIT_USSD_MSC
22.9.2_1.2(2)
Figure22.9.2/1: Handling of mobile initiated USSD at MSC
Arrows to left are to MS,
arrows to right are to USSD application
unless otherwise stated.
1
US_PROCESS_
UNST'D_SS_
REQUEST_req
MAP_
CLOSE_req
To VLR
Wait_for_
USSD_Appl
US_PROCESS_
UNST'D_SS_
REQUEST_cnf
US_UNST'D_
SS_NOTIFY_
ind
US_UNST'D_
SS_REQUEST_
ind
A_PROCESS_
UNST'D_SS_
REQUEST_rsp
A_UNST'D_
SS_NOTIFY_
req
A_UNST'D_
SS_REQUEST_
req
NULL
Wait_for_
ussdn_cnf_2
Wait_for_
ussdr_cnf_2
A_UNST'D_
SS_NOTIFY_
cnf
A_UNST'D_
SS_REQUEST_
cnf
US_UNST'D_
SS_NOTIFY_
rsp
US_UNST'D_
SS_REQUEST_
rsp
Wait_for_
USSD_Appl
Wait_for_
USSD_Appl
US_
Release
A_CM_
SERV_REL
US_
Release
A_CM_
SERV_REL
US_
Release
A_CM_
SERV_REL
A_CM_
REL_COMP
US_
Release
A_CM_
REL_COMP
US_
Release
A_CM_
REL_COMP
US_
Release
NULL
NULL
NULL

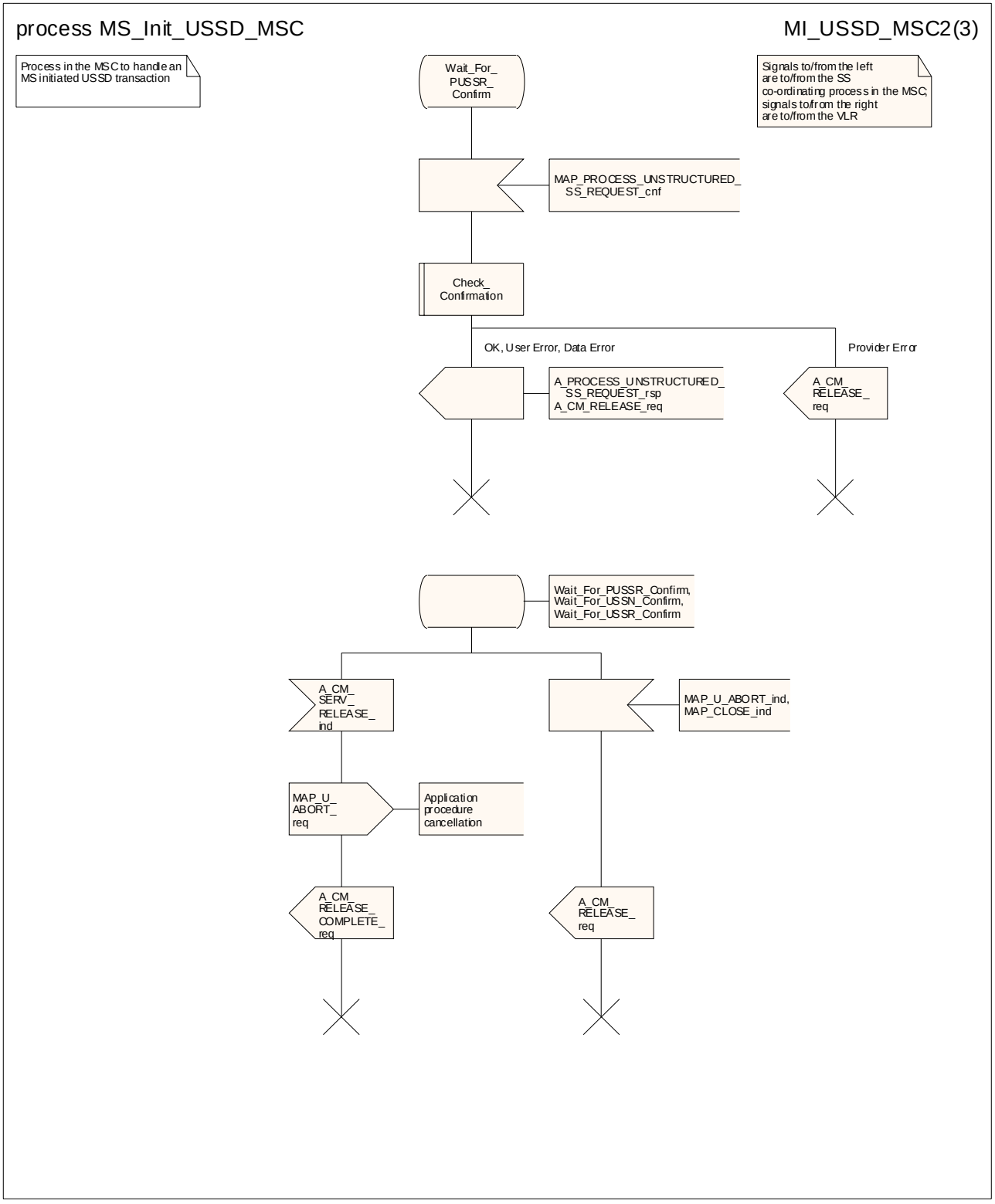


Figure 22.9.2/1 (sheet 2 of 32): Processdure MS_Init_USSD_MSC

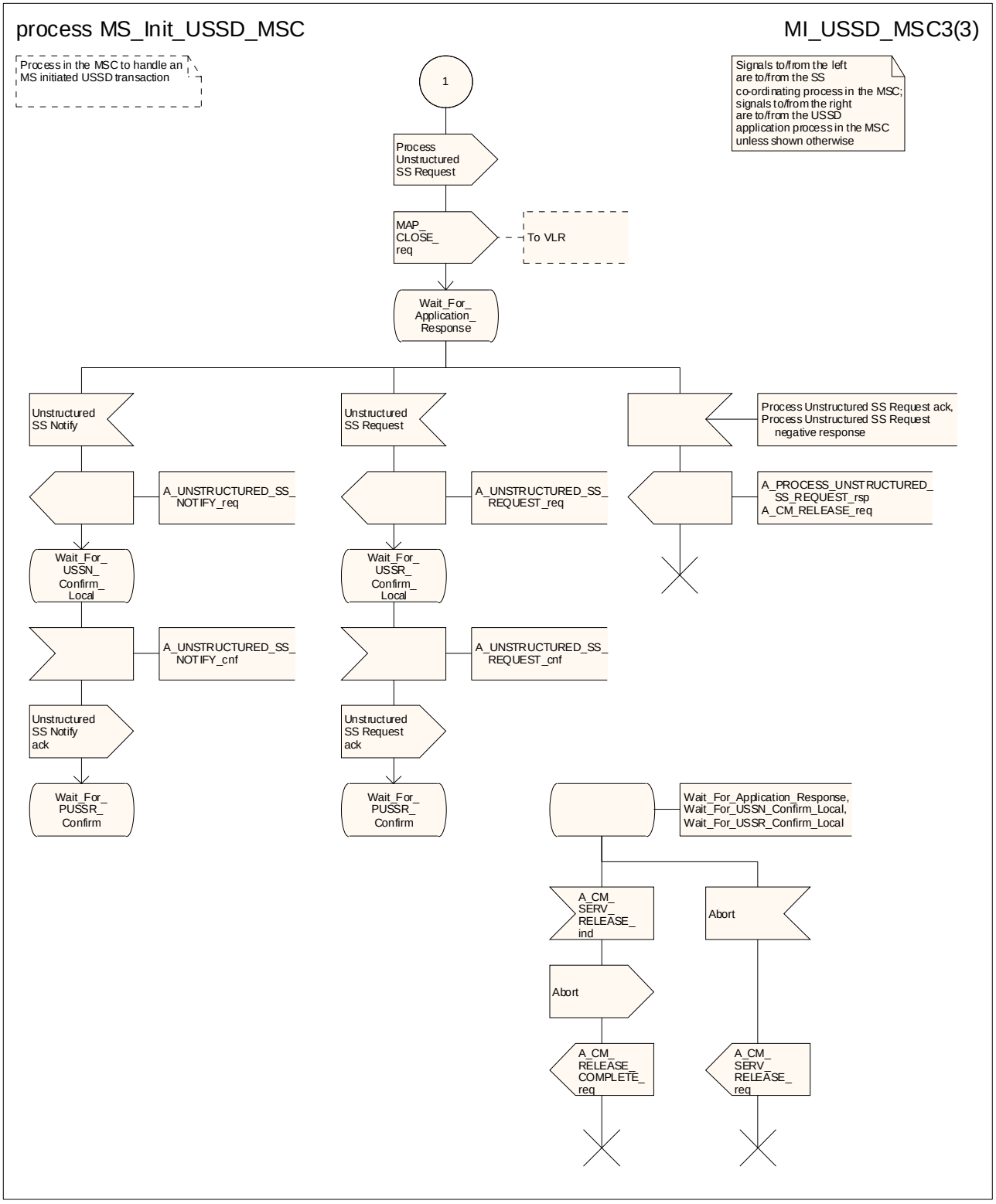
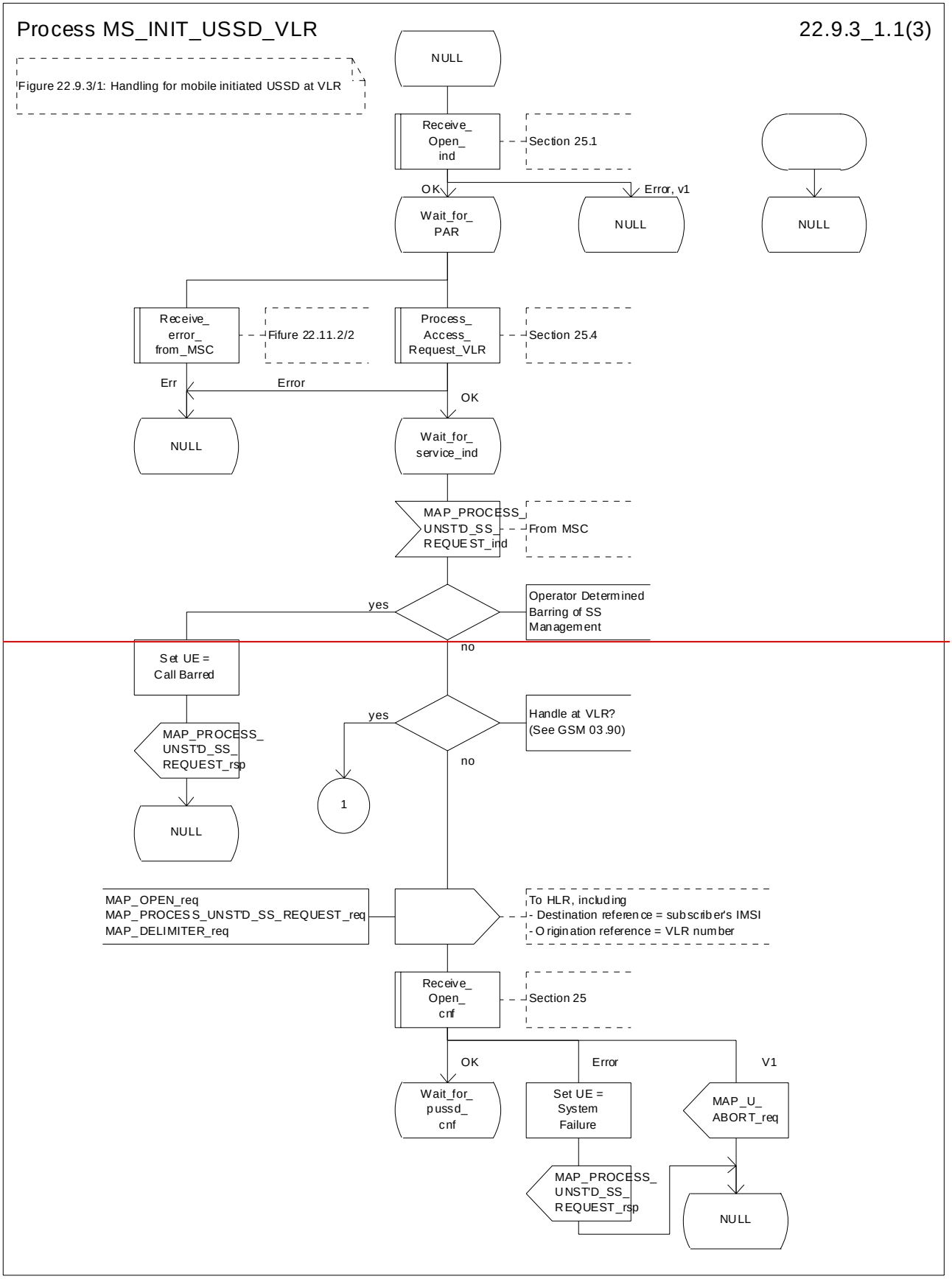


Figure 22.9.2/1 (sheet 3 of 3): Process MS_Init_USSD_MSC


Process MS_INIT_USSD_VLR
22.9.3_1.1(3)
Figure 22.9.3/1: Handling for mobile initiated USSD at VLR
NULL
Receive_ Open_ ind
Section 25.1
OK
Error, v1
Wait_for_ PAR
NULL
NULL
Receive_ error_ from_MSC
Fifure 22.11.2/2
Process_ Access_ Request_VLR
Section 25.4
Err
Error
OK
NULL
Wait_for_ service_ind
MAP_PROCESS_ UNST'D_SS_ REQUEST_ind
From MSC
yes
Operator Determined Barring of SS Management
no
Set UE = Call Barred
yes
Handle at VLR? (See GSM 03.90)
MAP_PROCESS_ UNST'D_SS_ REQUEST_rsp
no
1
NULL
MAP_OPEN_req
MAP_PROCESS_UNST'D_SS_REQUEST_req
MAP_DELIMITER_req
To HLR, including
- Destination reference = subscriber's IMSI
- Origination reference = VLR number
Receive_ Open_ cnf
Section 25
OK
Error
V1
Wait_for_ pussd_ cnf
Set UE = System Failure
MAP_U_ ABORT_req
MAP_PROCESS_ UNST'D_SS_ REQUEST_rsp
NULL

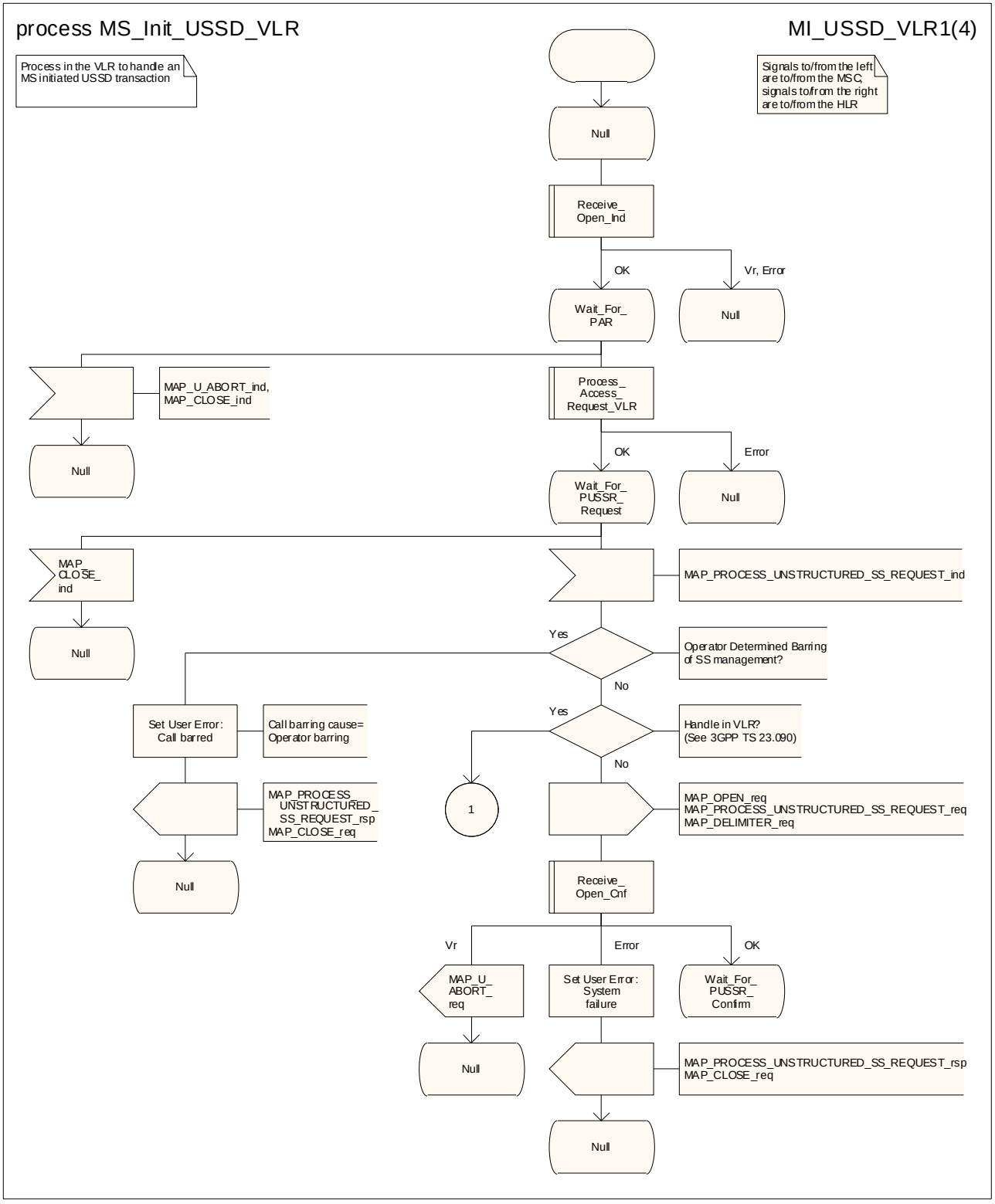
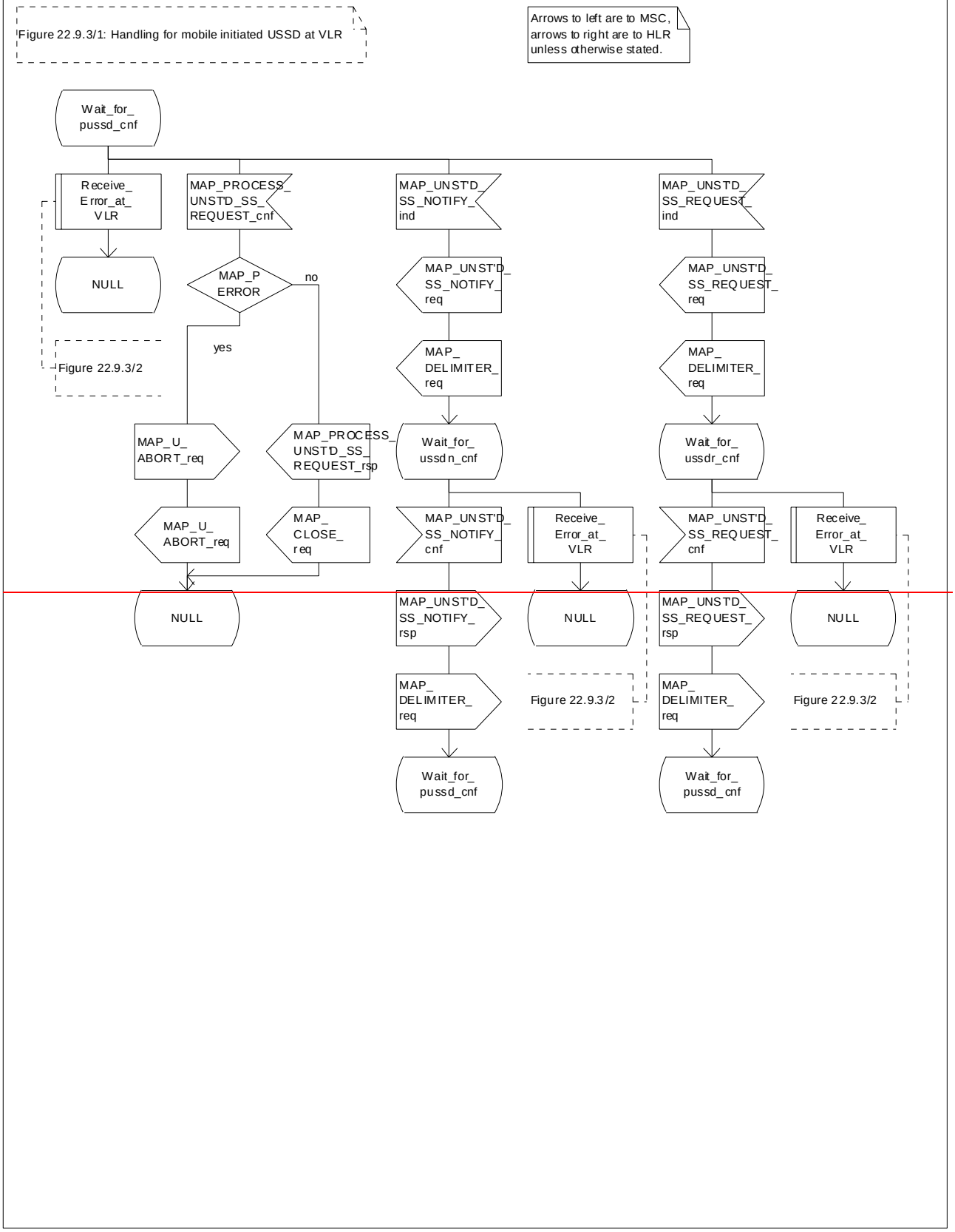


Figure 22.9.3/1 (sheet 1 of 43): Processdure MS_Init_USSD_VLR

Process MS_INIT_USSD_VLR 22.9.3_1.2(3)

Figure 22.9.3/1: Handling for mobile initiated USSD at VLR



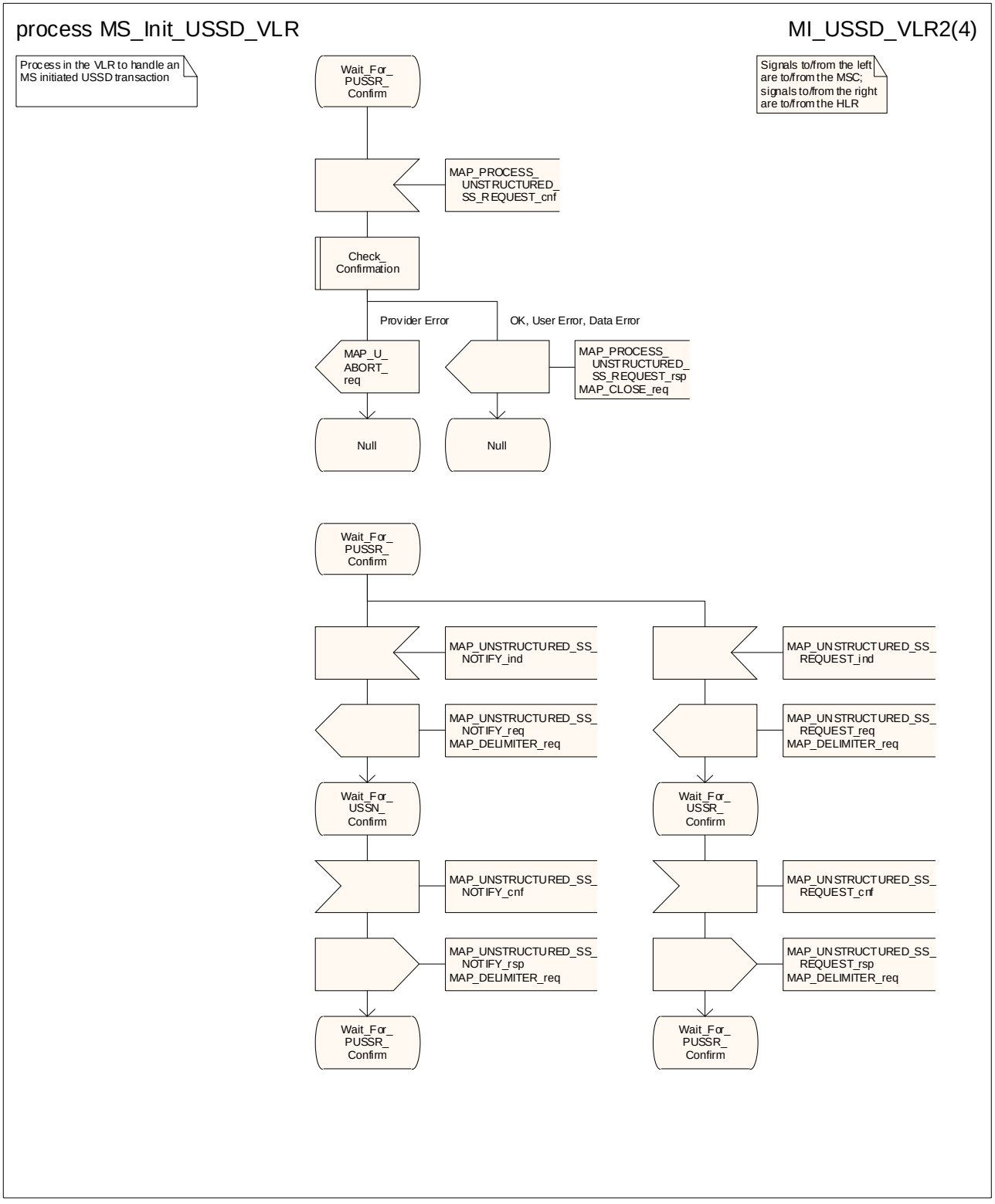
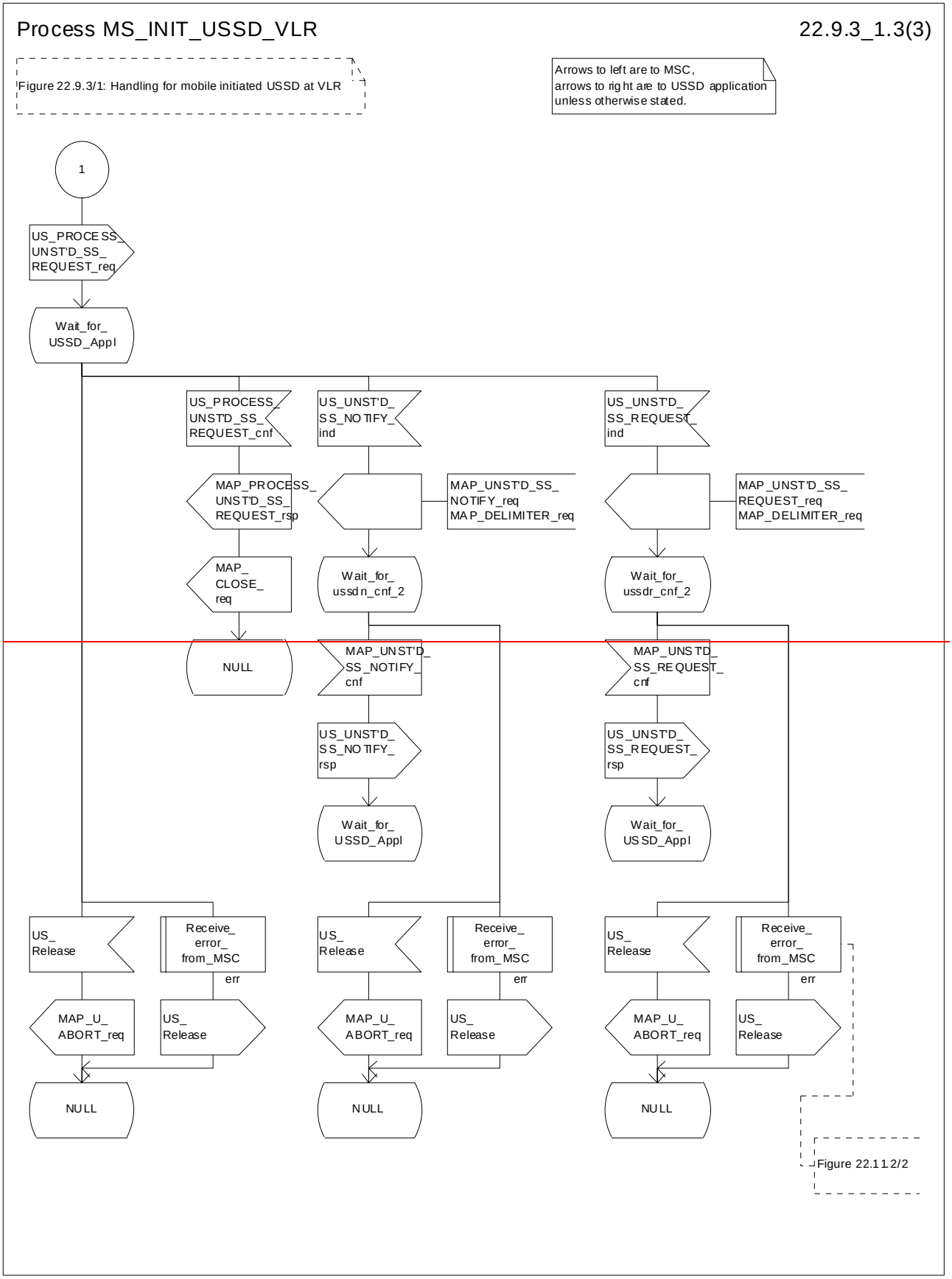


Figure 22.9.3/1 (sheet 2 of 4~~3~~): Process~~dure~~ MS_Init_USSD_VLR


Process MS_INIT_USSD_VLR
22.9.3_1.3(3)
Figure 22.9.3/1: Handling for mobile initiated USSD at VLR
Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.
1
US_PROCESS_ UNST'D_SS_ REQUEST_req
Wait_for_ USSD_Appl
US_PROCESS_ UNST'D_SS_ REQUEST_cnf
US_UNST'D_ SS_NOTIFY_ ind
US_UNST'D_ SS_REQUEST_ ind
MAP_PROCESS_ UNST'D_SS_ REQUEST_rsp
MAP_UNST'D_SS_ NOTIFY_req MAP_DELIMITER_req
MAP_UNST'D_SS_ REQUEST_req MAP_DELIMITER_req
MAP_ CLOSE_ req
Wait_for_ ussdn_cnf_2
Wait_for_ ussdr_cnf_2
NULL
MAP_UNST'D_ SS_NOTIFY_ cnf
MAP_UNST'D_ SS_REQUEST_ cnf
US_UNST'D_ SS_NOTIFY_ rsp
US_UNST'D_ SS_REQUEST_ rsp
Wait_for_ USSD_Appl
Wait_for_ USSD_Appl
US_ Release
Receive_ error_ from_MSC
err
US_ Release
Receive_ error_ from_MSC
err
US_ Release
Receive_ error_ from_MSC
err
MAP_U_ ABORT_req
US_ Release
MAP_U_ ABORT_req
US_ Release
MAP_U_ ABORT_req
US_ Release
NULL
NULL
NULL
Figure 22.11.2/2

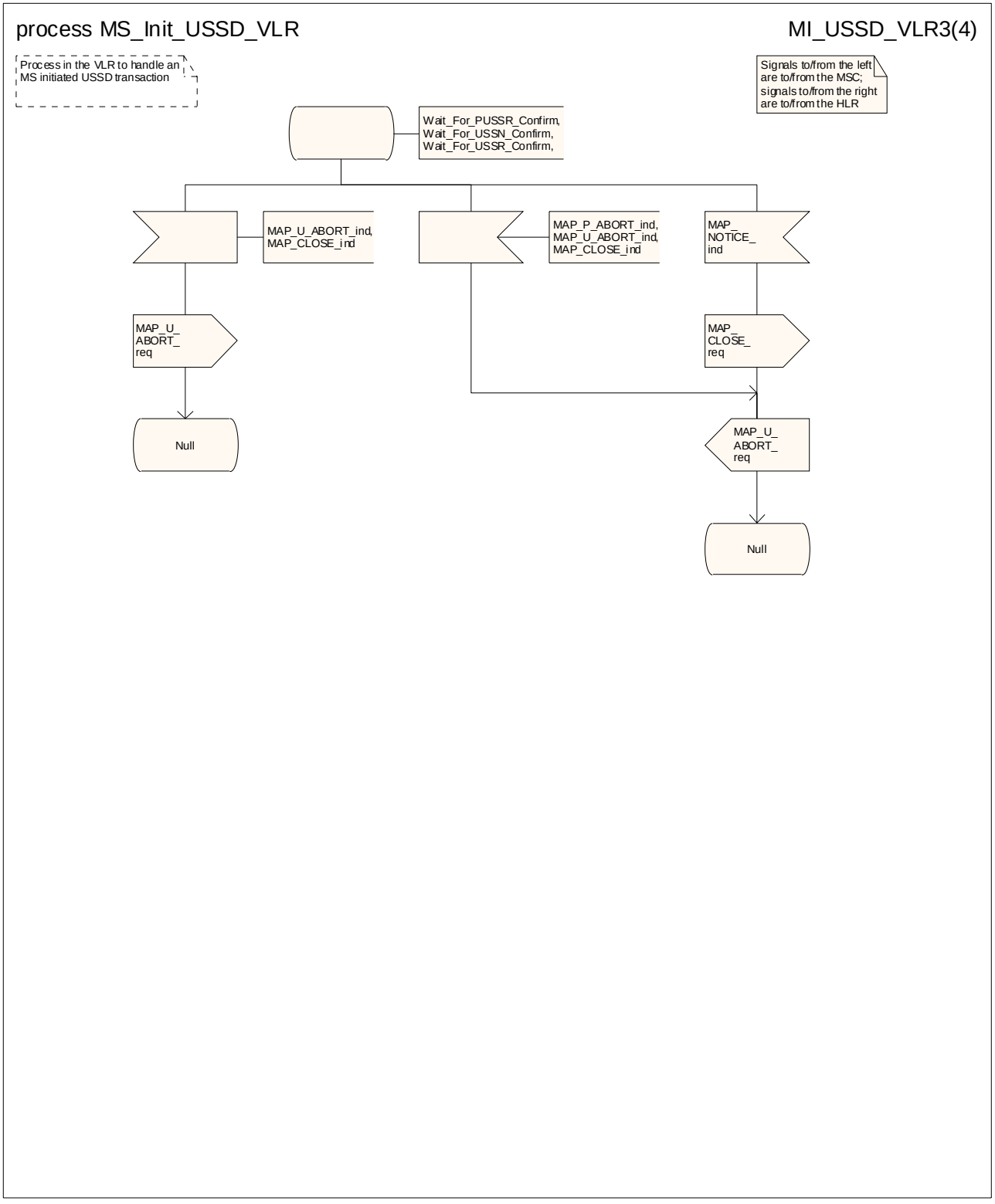


Figure 22.9.3/1 (sheet 3 of 4~~3~~): Proces~~sdure~~_MS_Init_USSD_VLR

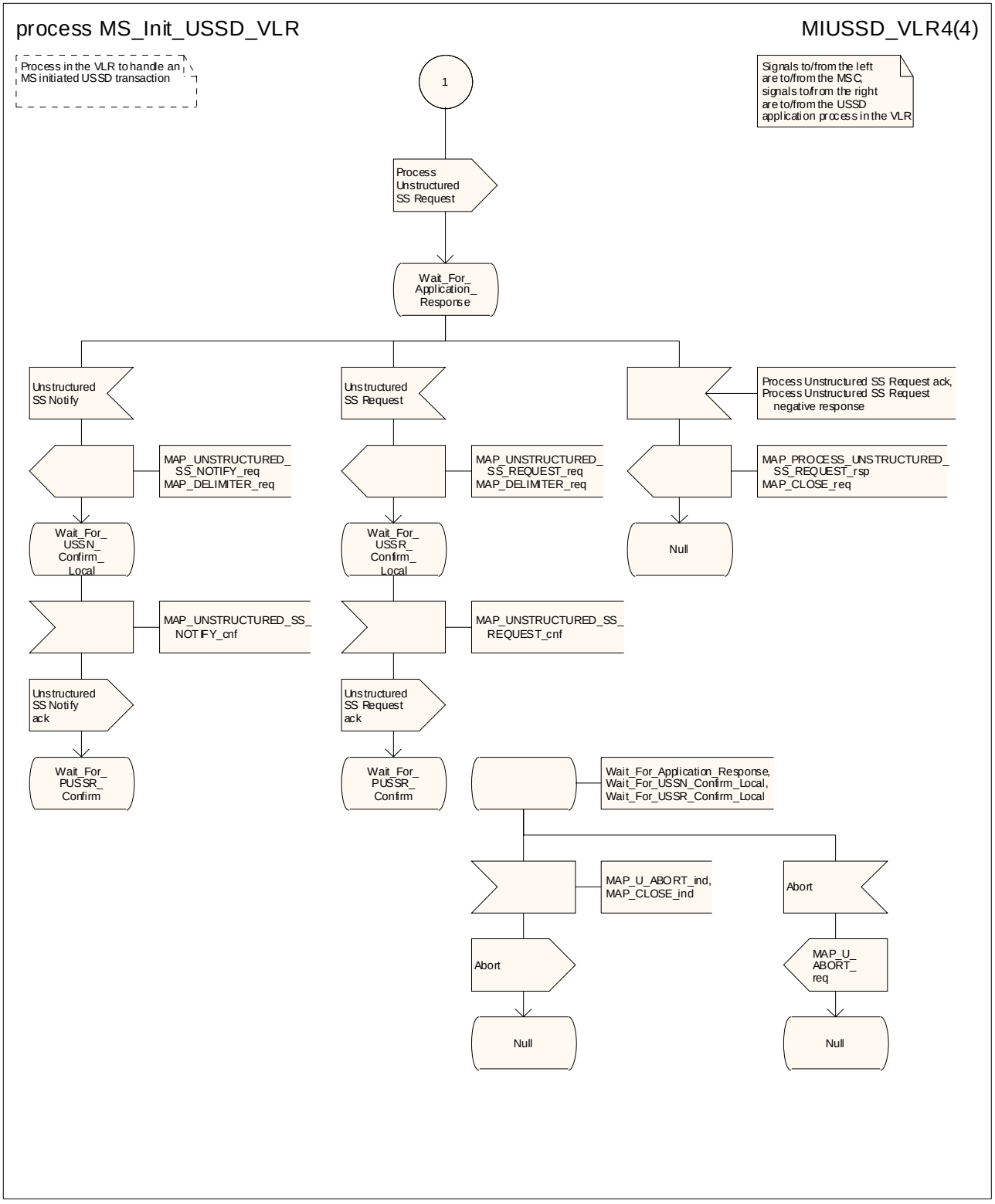


Figure 22.9.3/1 (sheet 4 of 4): Process_MS_Init_USSD_VLR

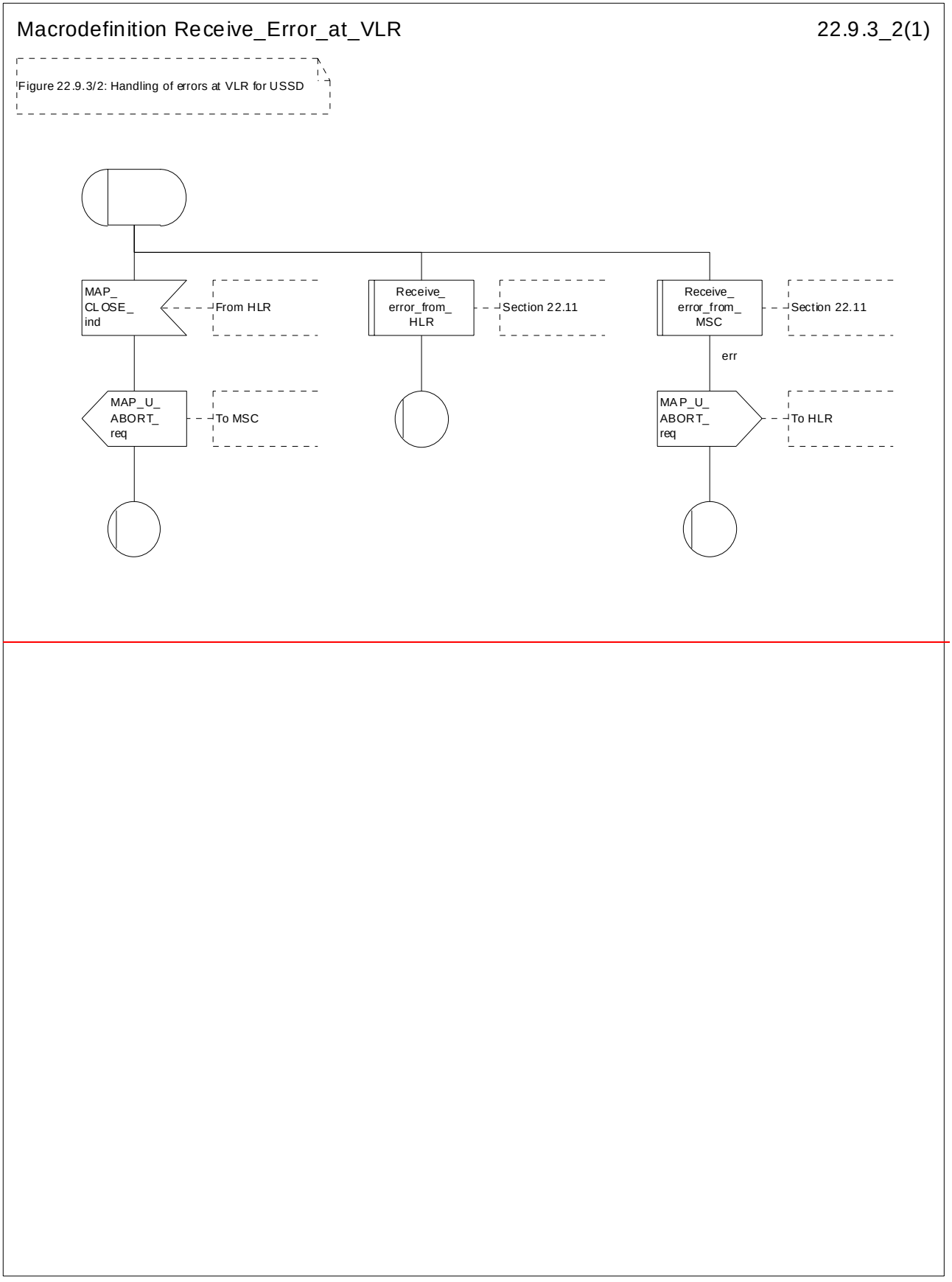
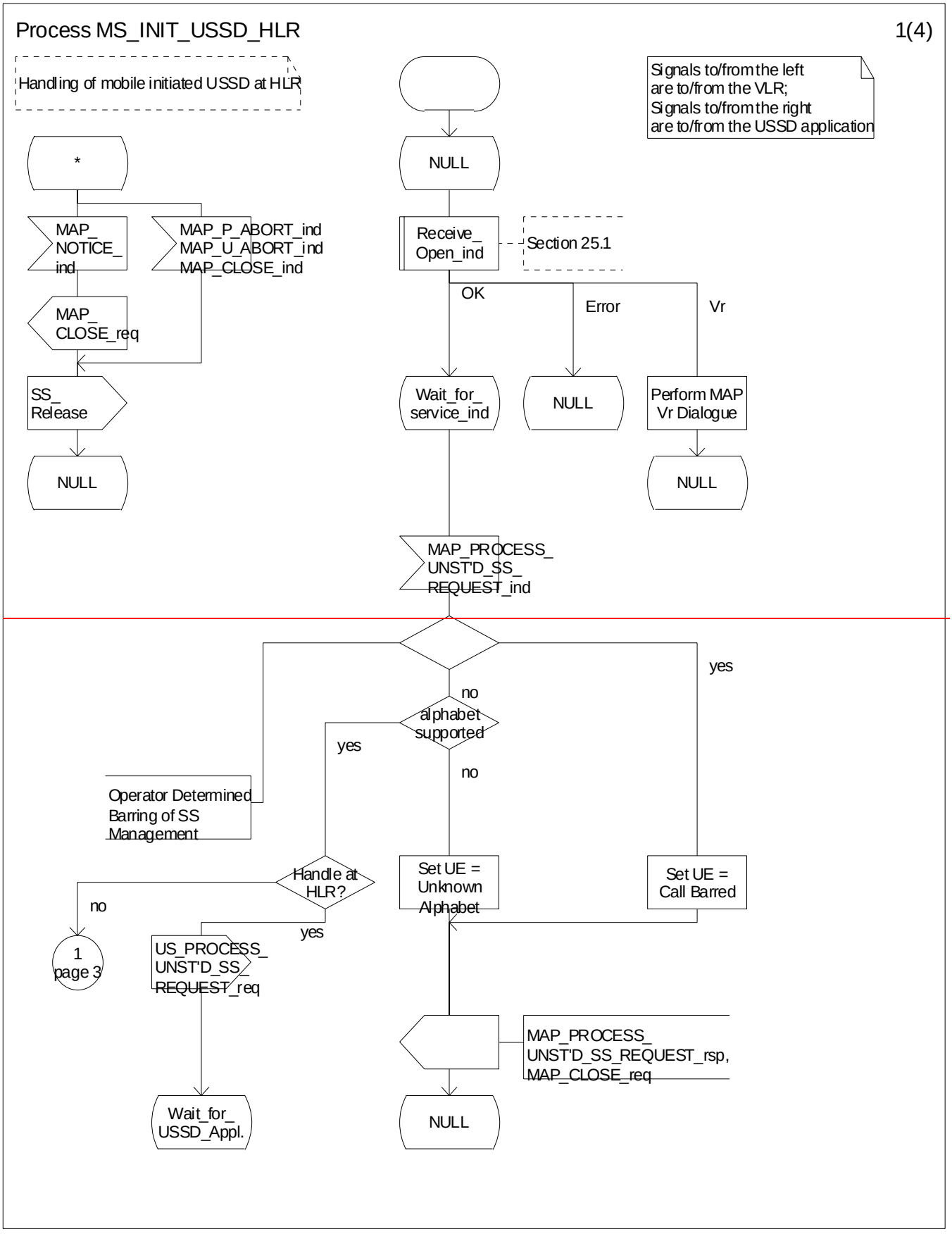


Figure 22.9.3/2: ~~Macro Receive_Error_at_VLR~~Void


Process MS_INIT_USSD_HLR
1(4)
Handling of mobile initiated USSD at HLR
Signals to/from the left
are to/from the VLR;
Signals to/from the right
are to/from the USSD application
*
NULL
MAP_
NOTICE_
ind
MAP_P_ABORT_ind
MAP_U_ABORT_ind
MAP_CLOSE_ind
Receive_
Open_ind
Section 25.1
OK
Error
Vr
MAP_
CLOSE_req
SS_
Release
Wait_for_
service_ind
NULL
Perform MAP
Vr Dialogue
NULL
NULL
MAP_PROCESS_
UNST'D_SS_
REQUEST_ind
yes
no
alphabet
supported
yes
no
Operator Determined
Barring of SS
Management
Handle at
HLR?
Set UE =
Unknown
Alphabet
Set UE =
Call Barred
no
yes
1
page 3
US_PROCESS_
UNST'D_SS_
REQUEST_req
MAP_PROCESS_
UNST'D_SS_REQUEST_rsp,
MAP_CLOSE_req
Wait_for_
USSD_Appl.
NULL

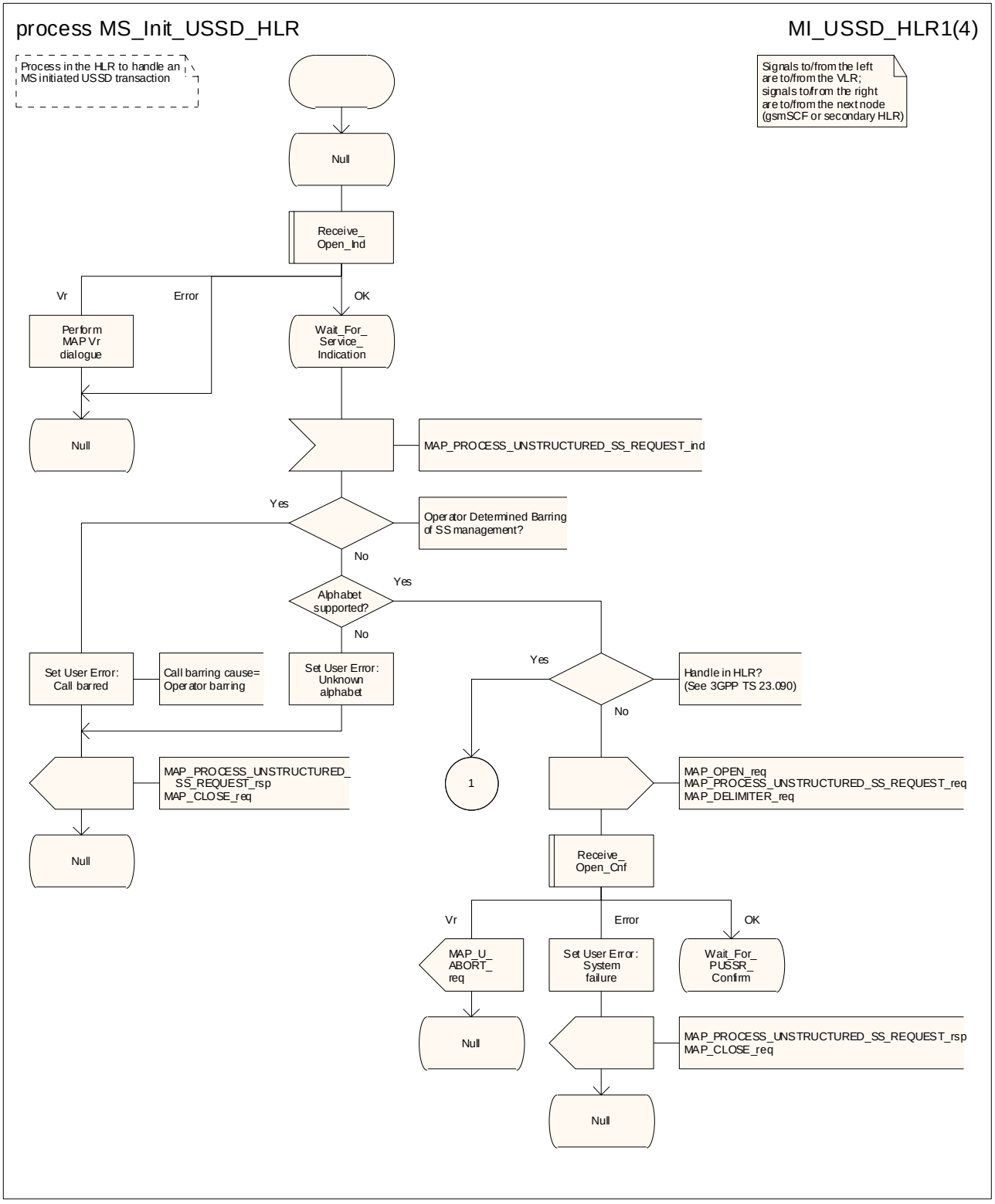
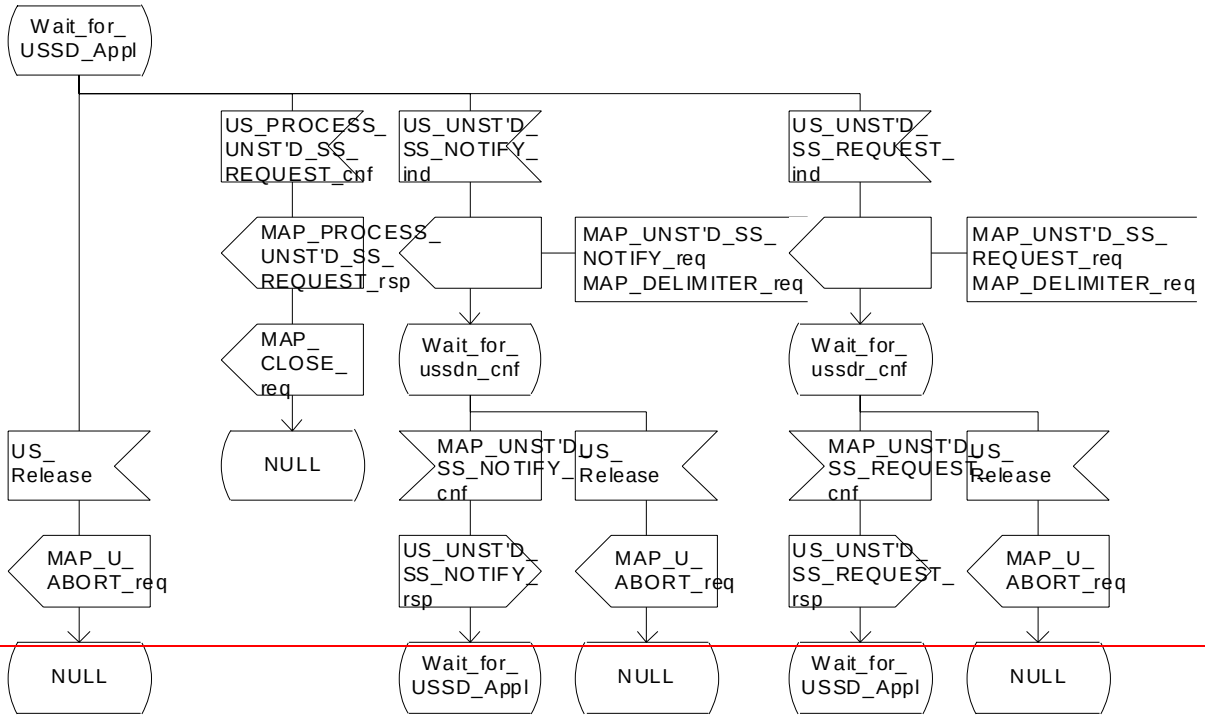


Figure 22.9.4/1 (sheet 1 of 4): Proces~~sdure~~ MS_Init_USSD_HLR

Process MS_INIT_USSD_HLR 22.9.4_1.2(4)

Figure 22.9.4/1: Handling of mobile intiated USSD at HLR.

Arrows to left are to VLR,
arrows to right are to USSD application
unless otherwise stated.



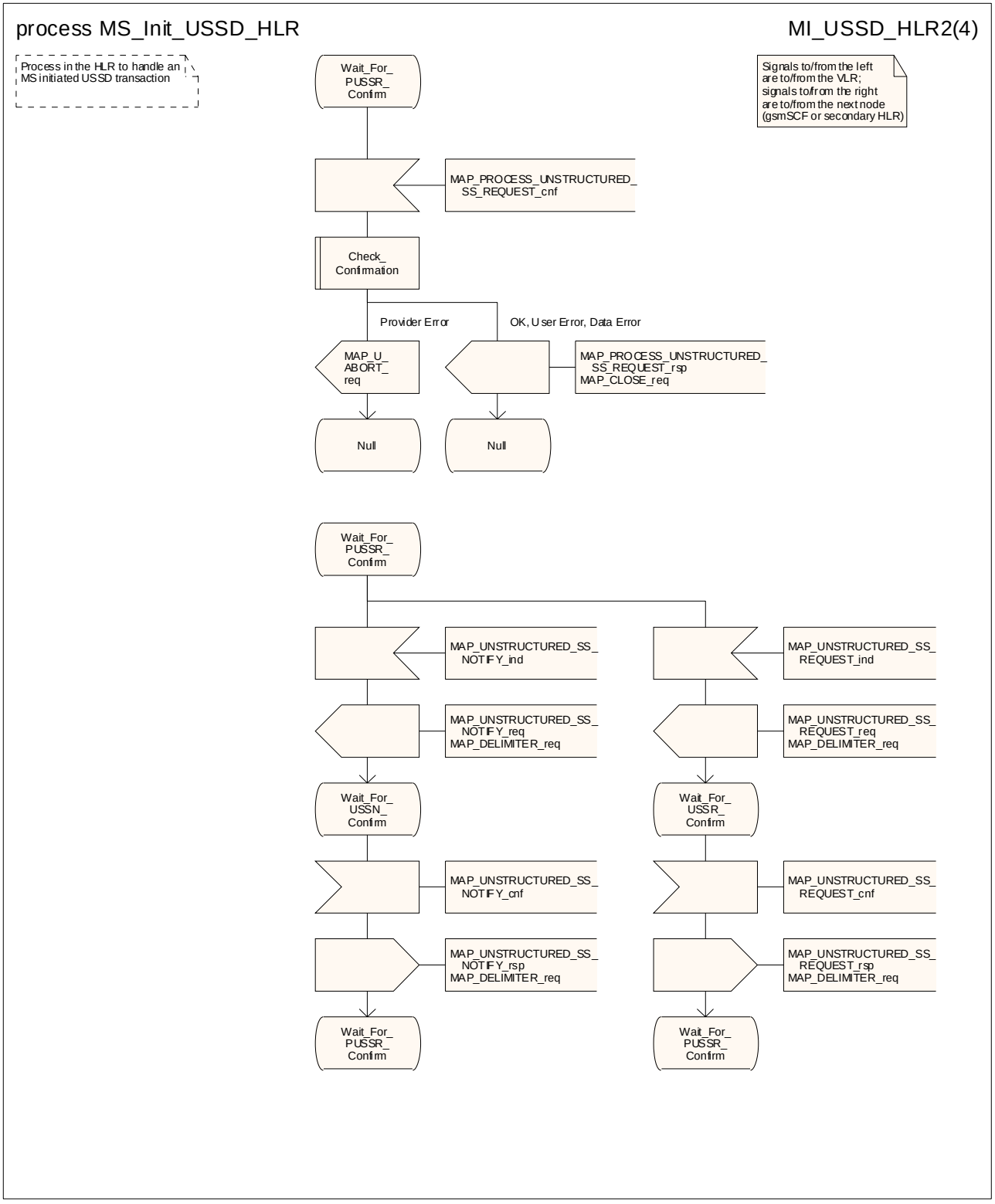
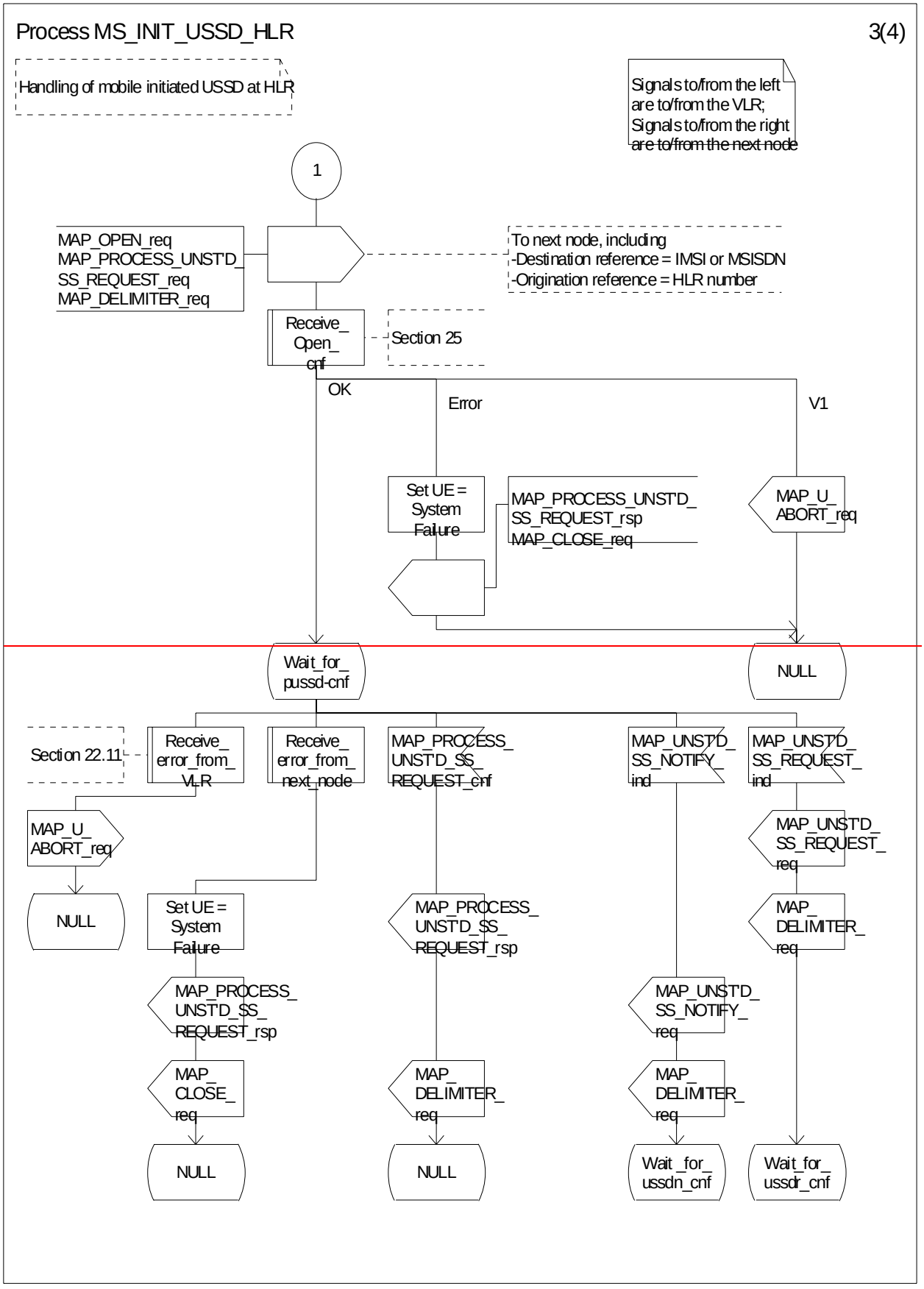


Figure 22.9.4/1 (sheet 2 of 4): Proces~~sdure~~ MS_Init_USSD_HLR


Process MS_INIT_USSD_HLR
3(4)
Handling of mobile initiated USSD at HLR
Signals to/from the left are to/from the VLR;
Signals to/from the right are to/from the next node
1
MAP_OPEN_req
MAP_PROCESS_UNST'D_SS_REQUEST_req
MAP_DELIMITER_req
To next node, including
-Destination reference = IMSI or MSISDN
-Origination reference = HLR number
Receive_Open_cnf
Section 25
OK
Error
V1
Set UE = System Failure
MAP_PROCESS_UNST'D_SS_REQUEST_rsp
MAP_CLOSE_req
MAP_U_ABORT_req
Wait_for_pussd-cnf
NULL
Section 22.11
Receive_error_from_VLR
Receive_error_from_next_node
MAP_PROCESS_UNST'D_SS_REQUEST_cnf
MAP_UNST'D_SS_NOTIFY_ind
MAP_UNST'D_SS_REQUEST_ind
MAP_U_ABORT_req
MAP_UNST'D_SS_REQUEST_req
NULL
Set UE = System Failure
MAP_PROCESS_UNST'D_SS_REQUEST_rsp
MAP_DELIMITER_req
MAP_PROCESS_UNST'D_SS_REQUEST_rsp
MAP_UNST'D_SS_NOTIFY_req
MAP_CLOSE_req
MAP_DELIMITER_req
MAP_DELIMITER_req
NULL
NULL
Wait_for_ussdn_cnf
Wait_for_ussdr_cnf

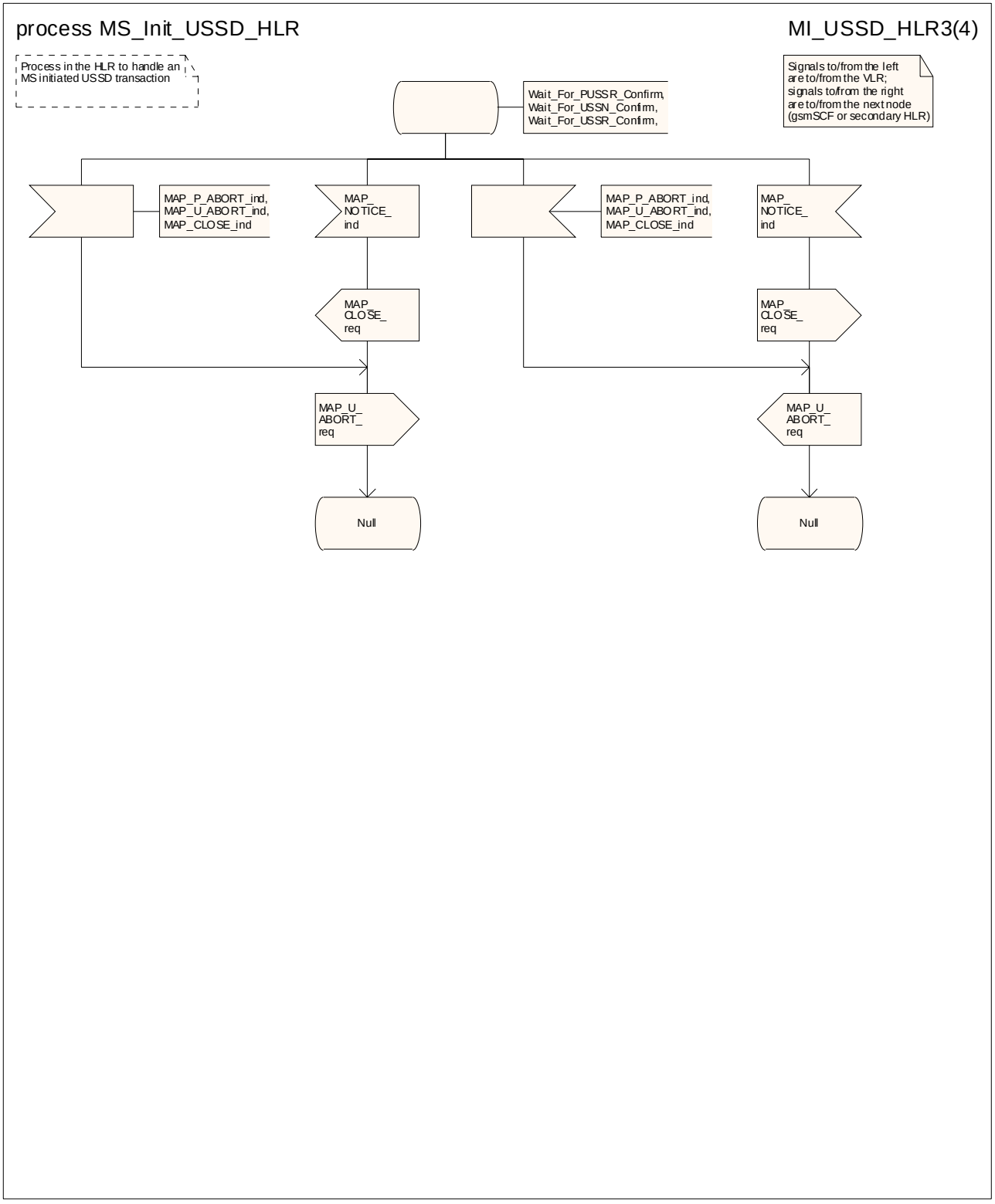
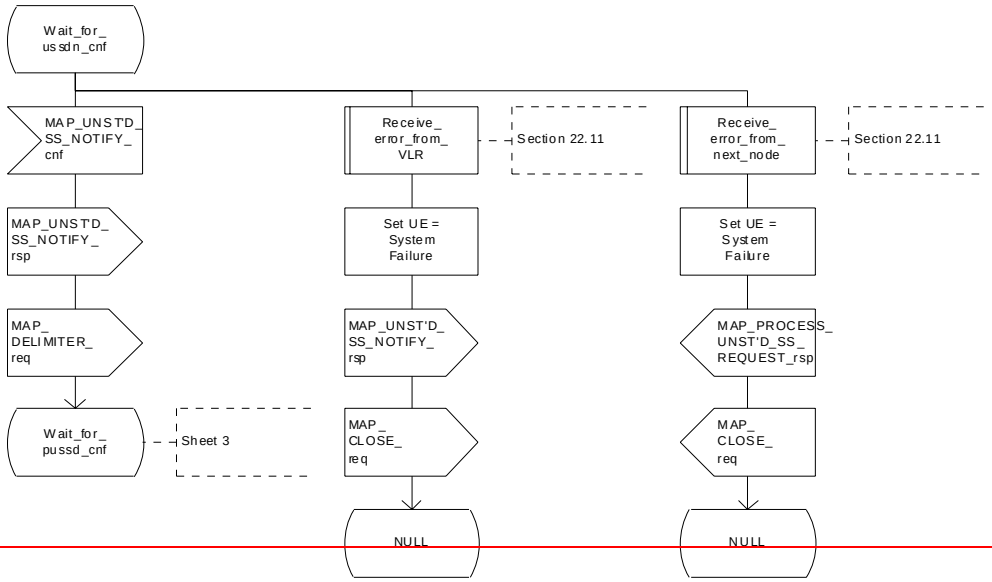
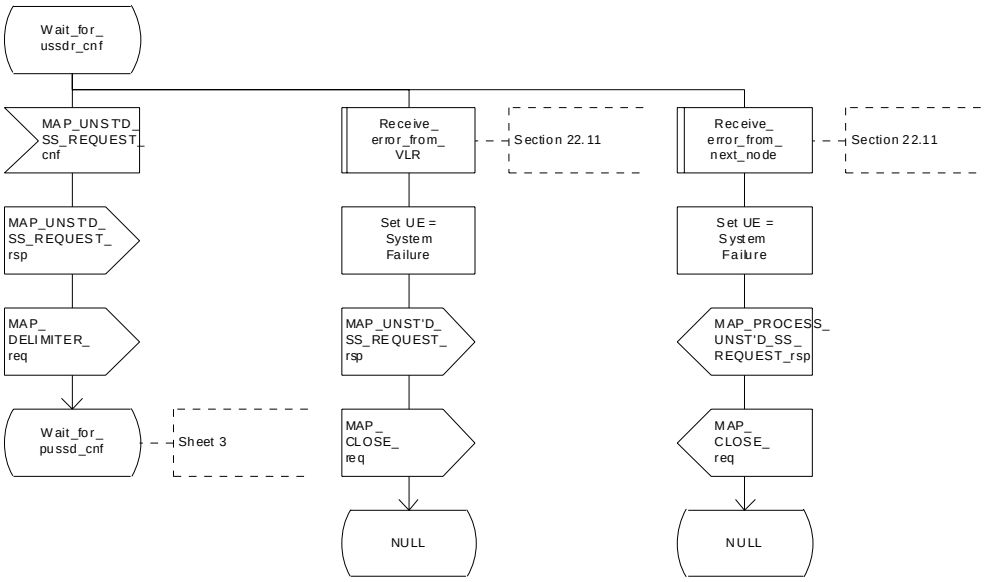


Figure 22.9.4/1 (sheet 3 of 4): Proces~~sdure~~ MS_Init_USSD_HLR

Process MS_INIT_USSD_HLR 22.9.4_1.4(4)

Figure 22.9.4/1: Handling of mobile intiated USSD at HLR.





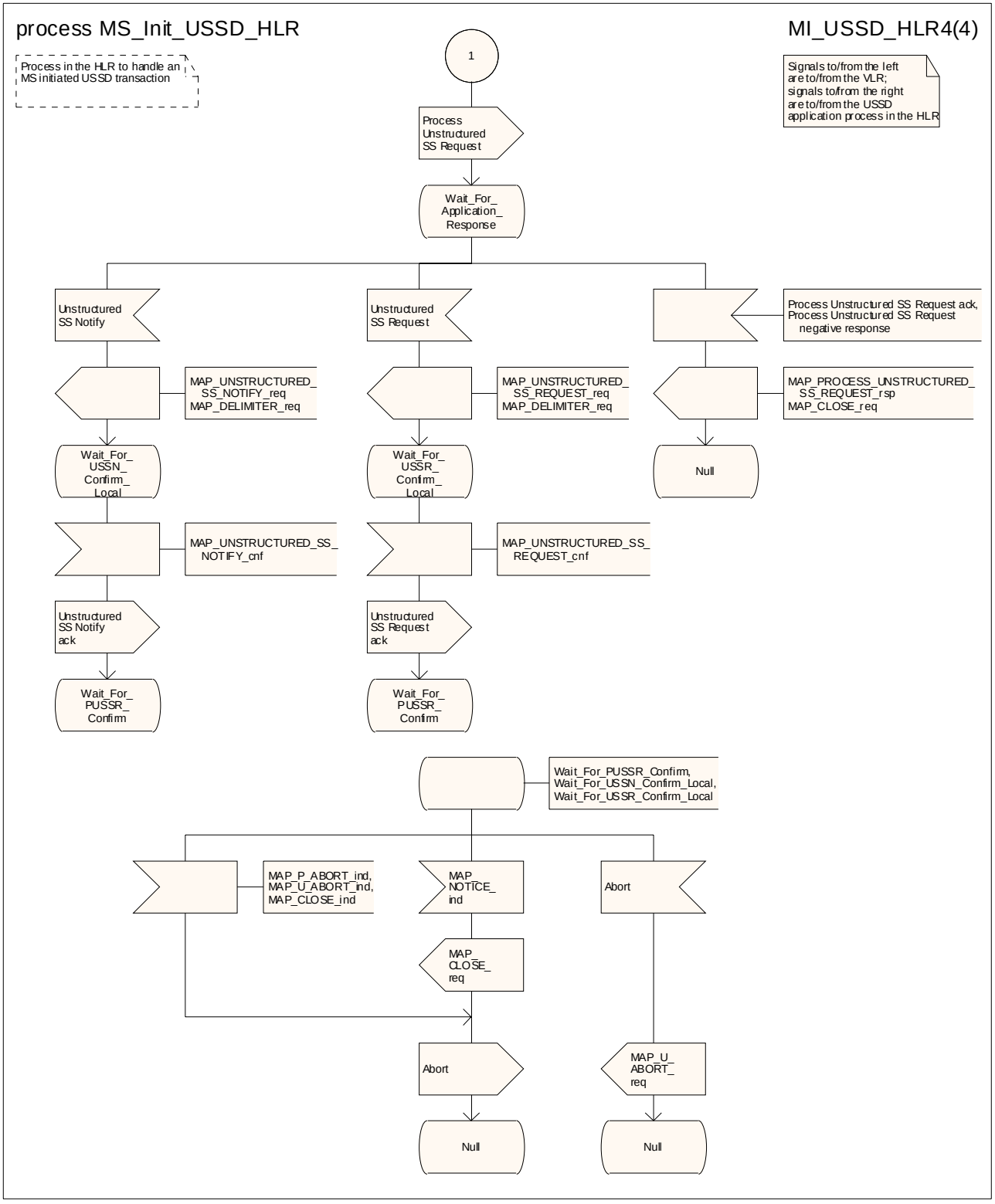
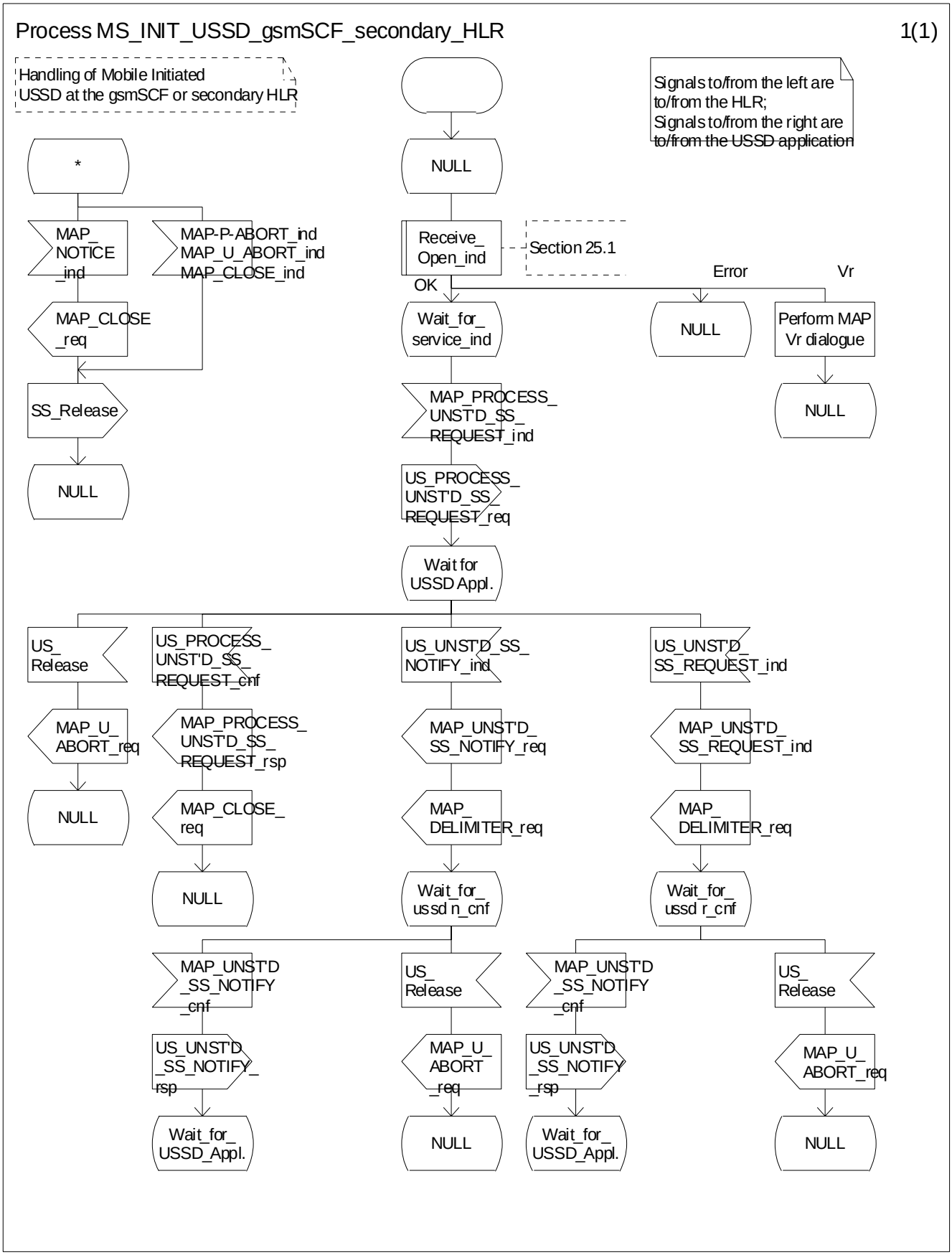


Figure 22.9.4/1 (sheet 4 of 4): Proces~~sdure~~ MS_Init_USSD_HLR


Process MS_INIT_USSD_gsmSCF_secondary_HLR
1(1)
Handling of Mobile Initiated USSD at the gsmSCF or secondary HLR
Signals to/from the left are to/from the HLR; Signals to/from the right are to/from the USSD application
*
NULL
MAP_ NOTICE _ind
MAP-P-ABORT_ind
MAP_U_ABORT_ind
MAP_CLOSE_ind
Receive_ Open_ind
Section 25.1
OK
Error
Vr
MAP_CLOSE _req
Wait_for_ service_ind
NULL
Perform MAP Vr dialogue
SS_Release
MAP_PROCESS_ UNST'D_SS_ REQUEST_ind
NULL
US_PROCESS_ UNST'D_SS_ REQUEST_req
Wait for USSD Appl.
US_ Release
US_PROCESS_ UNST'D_SS_ REQUEST_cnf
US_UNST'D_SS_ NOTIFY_ind
US_UNST'D_ SS_REQUEST_ind
MAP_U_ ABORT_req
MAP_PROCESS_ UNST'D_SS_ REQUEST_rsp
MAP_UNST'D_ SS_NOTIFY_req
MAP_UNST'D_ SS_REQUEST_ind
NULL
MAP_CLOSE_ req
MAP_ DELIMITER_req
MAP_ DELIMITER_req
NULL
Wait_for_ ussd n_cnf
Wait_for_ ussd r_cnf
MAP_UNST'D _SS_NOTIFY _cnf
US_ Release
MAP_UNST'D _SS_NOTIFY _cnf
US_ Release
US_UNST'D _SS_NOTIFY_ rsp
MAP_U_ ABORT _req
US_UNST'D _SS_NOTIFY _rsp
MAP_U_ ABORT_req
Wait_for_ USSD_Appl.
NULL
Wait_for_ USSD_Appl.
NULL

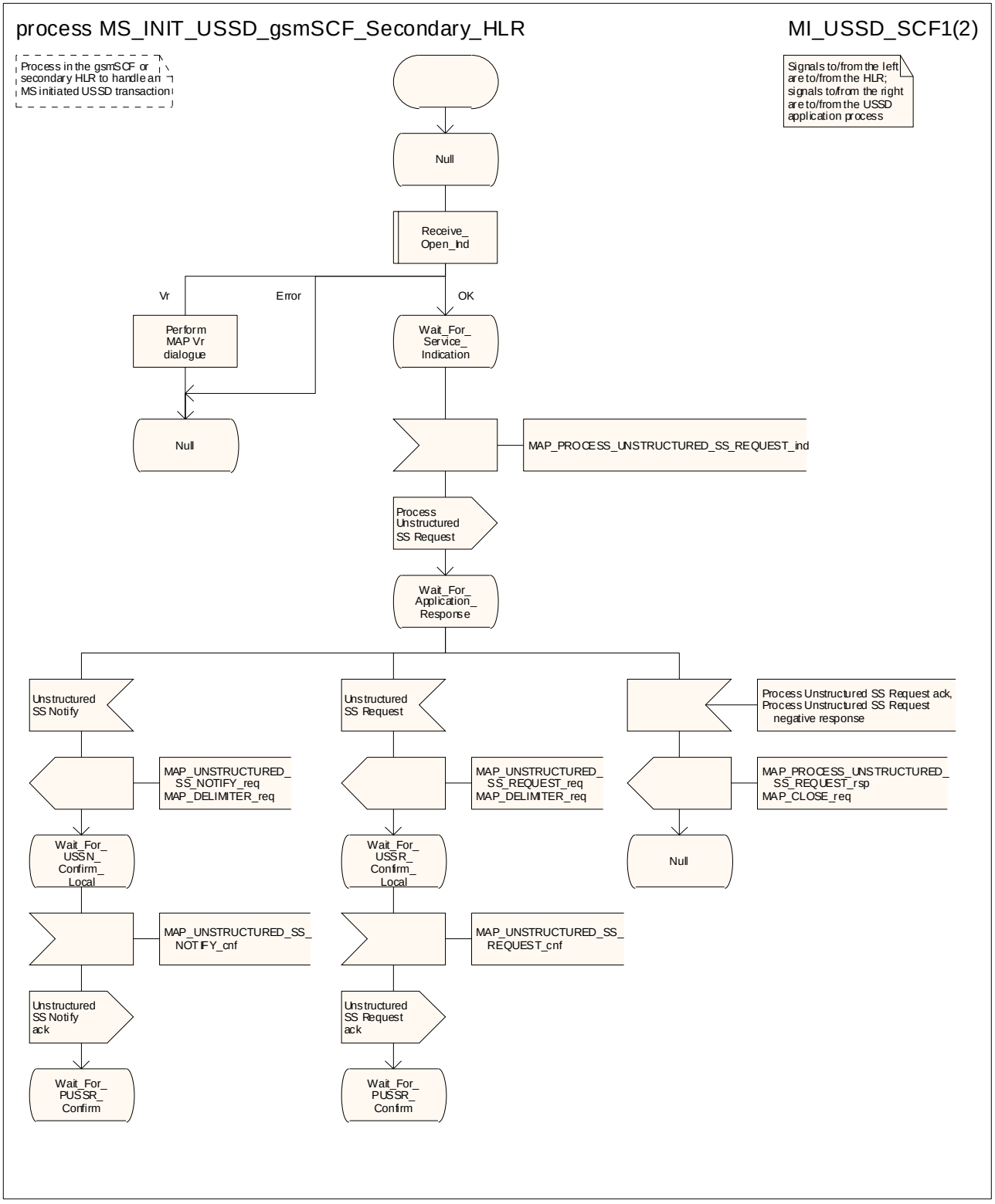


Figure 22.9.5/1 (sheet 1 of 2): Process MS_InitNIT_USSD_gsmSCF_sSecondary_HLR

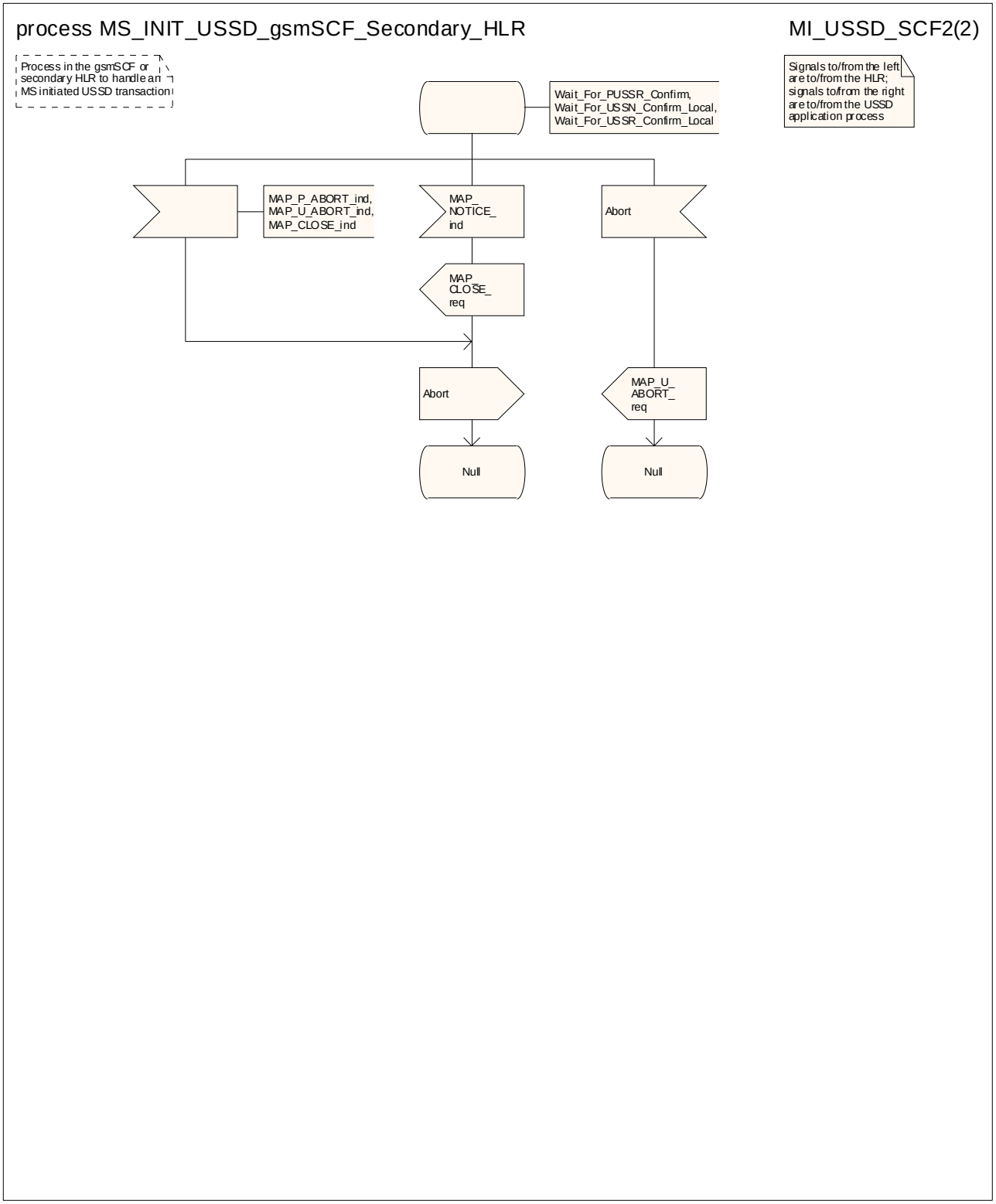


Figure 22.9.5/1 (sheet 2 of 2): Process MS_Init_USSD_gsmSCF_Secondary_HLR

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 3GPP TS 23.090 [34].

The following services may be used:

MAP_PAGE	(see ~~defined in~~ clauses 8 and 25);
MAP_SEARCH_FOR_MOBILE_SUBSCRIBER	(see ~~defined in~~ clauses 8 and 25);
MAP_PROCESS_ACCESS_REQUEST	(see ~~defined in~~ clauses 8 and 25);
MAP_AUTHENTICATE	(see ~~defined in~~ clauses 8 and 25);
MAP_SET_CIPHERING_MODE	(see ~~defined in~~ clauses 8 and 25);
MAP_FORWARD_NEW_TMSI	(see ~~defined in~~ clauses 8 and 25);
MAP_READY_FOR_SM	(see ~~defined in~~ clauses 12 and 25).

At least one of the following services ~~will~~ is 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 process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Ind	see subclause 25.1.1;
Receive_Open_Cnf	see subclause 25.1.2;
Page_MSC	see subclause 25.3.1;
Search_For_MS_MSC	see subclause 25.3.2;
Process_Access_Request_MSC	see subclause 25.4.1.

~~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 VLR.~~

~~In both cases the MSC will initiate a CM connection to the MS (using the page or search macros defined in clause 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 3GPP TS 29.011 [59].~~

~~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 process~~dure~~ in the MSC is shown in figure 22.10.2/1.

22.10.3 Procedure in the VLR

The MAP process invokes macros not defined in this clause; the definition 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_Indication	see subclause 25.2.1;
Check_Confirmation	see subclause 25.2.2.

~~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 proces~~sdure~~ 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~~the MSC opens a dialogue ~~to~~ with the VLR. This dialogue ~~will automatically~~ leads to the VLR performing page and search using the macro Start_USSD_VLR.

Macro Start_USSD_VLR

The macro invokes macros not defined in this clause; the definition of these macros can be found as follows:

Check_Confirmation	see subclause 25.2.1;
Process_Access_Request_VLR	see subclause 25.4.2.

~~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 clause 25.4 will be used to handle the CM connection establishment.~~

The macro is shown in figure 22.10.3/2.

22.10.4 Procedure in the HLR

The MAP process invokes macros not defined in this clause; the definition 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_Indication	see subclause 25.2.1;
Check_Confirmation	see subclause 25.2.2.

~~The procedure may be invoked either by a gsmSCF, a secondary HLR or by a USSD application local to the primary HLR. It may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.~~

~~In both cases the primary HLR will first check whether the MS is reachable .~~

~~If the MS is reachable, the primary HLR will initiate a MAP dialogue with the VLR and send the message received from the gsmSCF or secondary HLR or USSD application to the VLR.~~

~~Following transfer of the message the primary HLR will wait for a confirmation from the VLR. This will be sent to the gsmSCF or secondary HLR or USSD application as appropriate.~~

~~Following this, the primary 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 or secondary HLR shall be aborted, as shown in the diagram.~~

~~**Message Originated by gsmSCF or secondary HLR**~~

~~If the message is originated by the gsmSCF or a secondary HLR then the primary HLR shall transfer the message transparently to the VLR.~~

~~The primary HLR may subsequently receive one or more MAP_UNSTRUCTURED_SS_REQUEST_ind or MAP_UNSTRUCTURED_SS_NOTIFY_ind indications from the gsmSCF or secondary HLR. These shall be sent transparently to the VLR. When a confirmation is received from the VLR this shall be returned to the next node as appropriate.~~

~~When the primary HLR receives a MAP_CLOSE_ind from the gsmSCF or secondary HLR then it shall pass this to the VLR and close the MAP dialogue.~~

The proces~~sdure~~ in the primary HLR is shown in figures 22.10.4/1 and 22.10.4/2.

22.10.5 Procedure in the gsmSCF ~~and~~ or secondary HLR

The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

~~The procedure is invoked by an USSD application local to the gsmSCF/secondary HLR. It may start by using either the MAP_UNSTRUCTURED_SS_REQUEST or MAP_UNSTRUCTURED_SS_NOTIFY service.~~

~~In both cases the gsmSCF will initiate a MAP dialogue with the HLR and send the message received from the USSD application to the HLR.~~

~~Following transfer of the message the gsmSCF will wait for a confirmation from the HLR. This will be relayed to the USSD application..~~

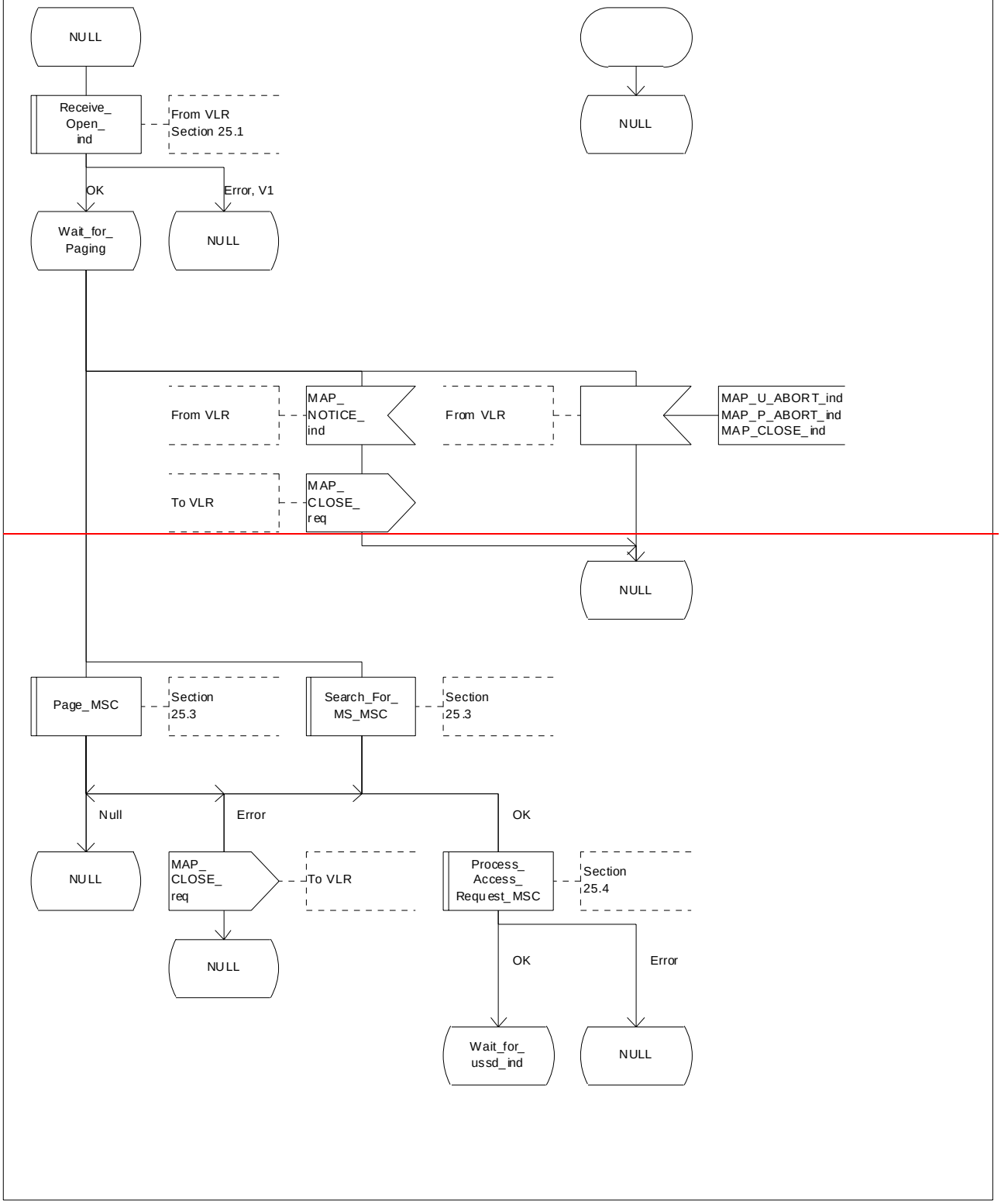
~~Following this, the gsmSCF/secondary HLR may receive further UNSTRUCTURED_SS_REQUEST or UNSTRUCTURED_SS_NOTIFY requests, or may receive a Release from the USSD application.~~

~~In the event of an error, the MAP dialogue with the HLR shall be released as shown in the diagram.~~

The proces~~sdure~~ in the gsmSCF and secondary HLR ~~-~~is shown in figure 22.10.5/1.

Process NW_INIT_USSD_MSC 22.10.2_1.1(4)

Figure 22.10.2/1: Handling of network initiated USSD in MSC



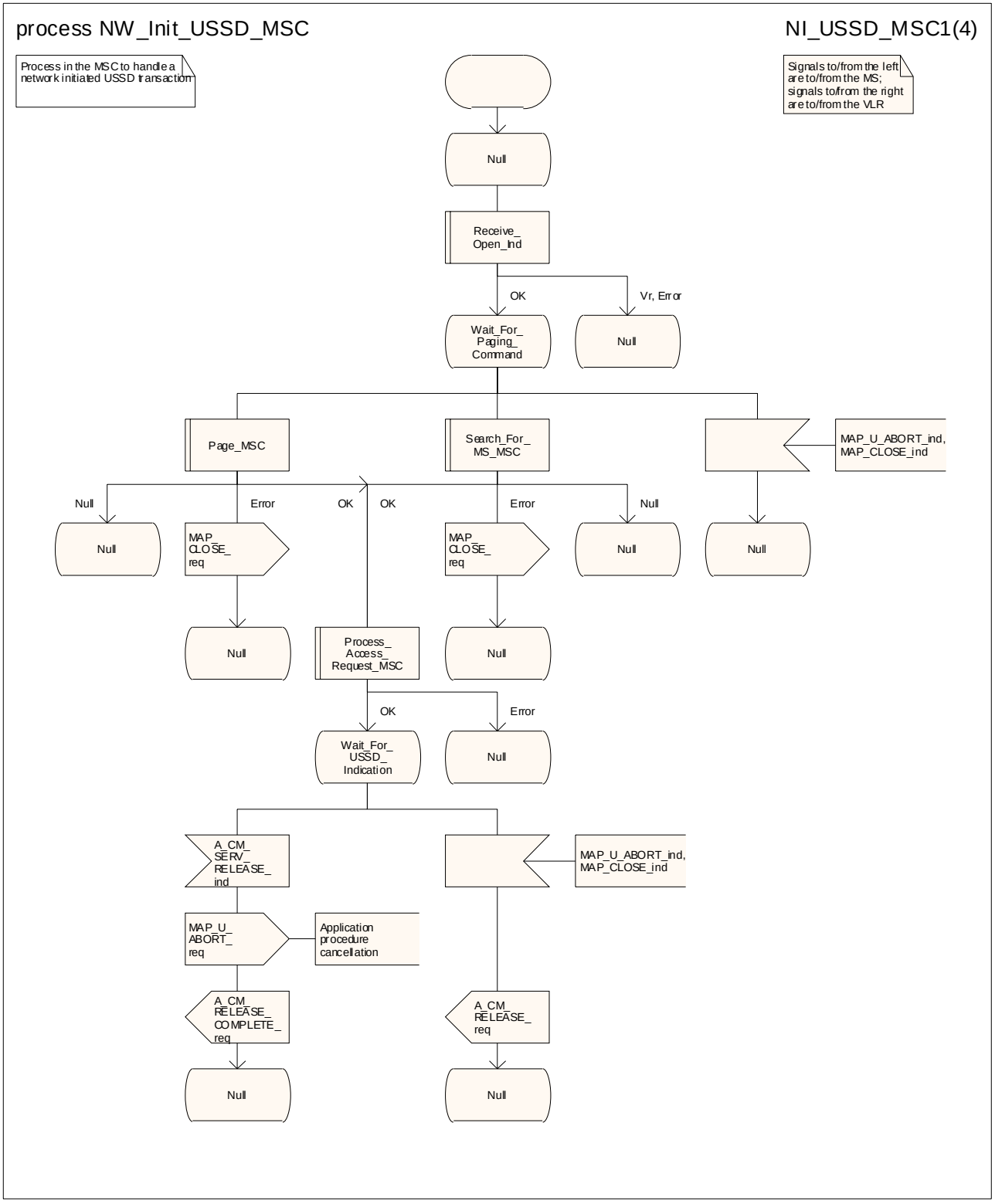
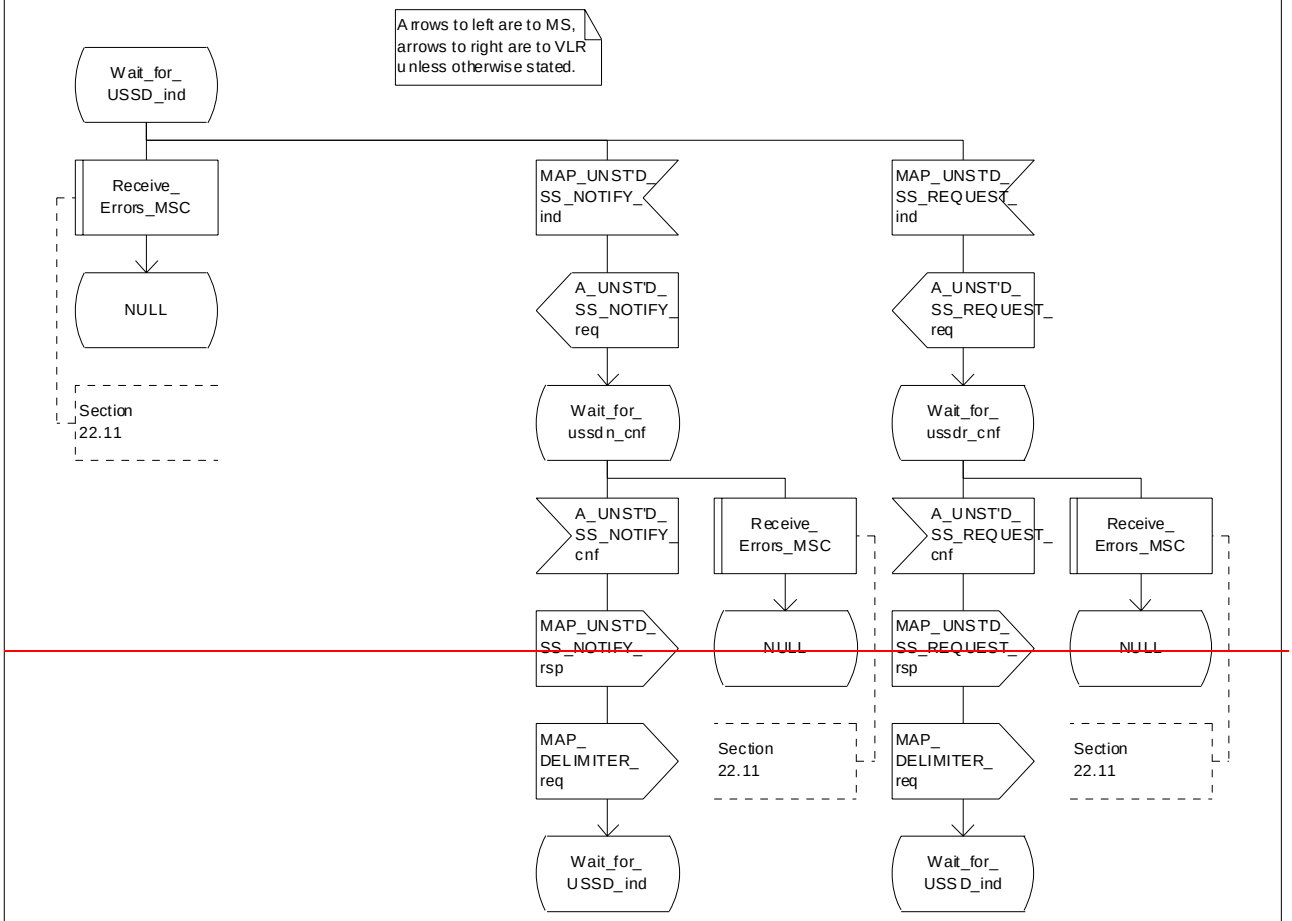


Figure 22.10.2/1 (sheet 1 of 4): Proces~~dure~~ NW_Init_USSD_MSC

Process NW_INIT_USSD_MSC 22.10.2_1.2(4)

Figure 22.10.2/1: Handling of network initiated USSD in MSC



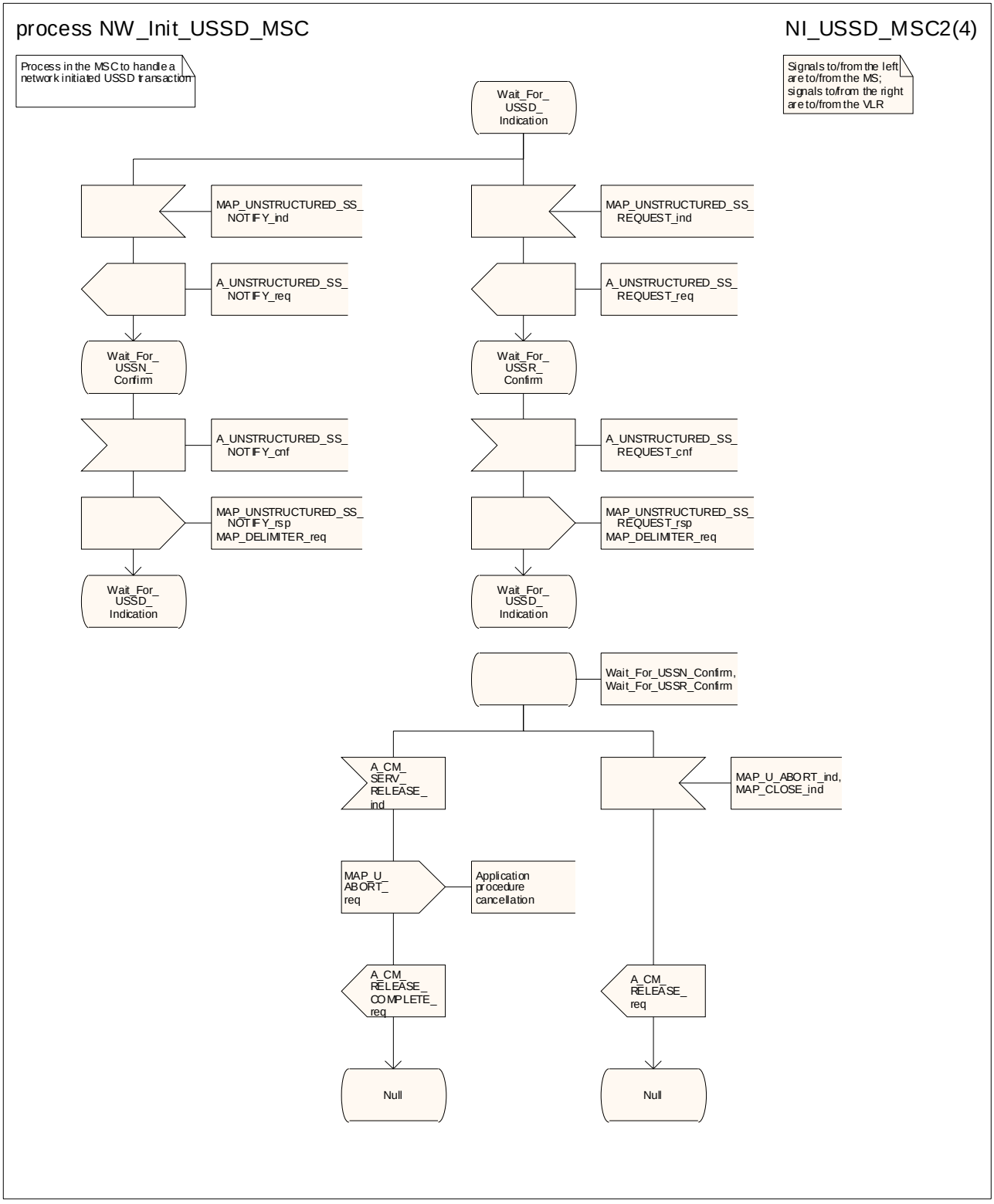
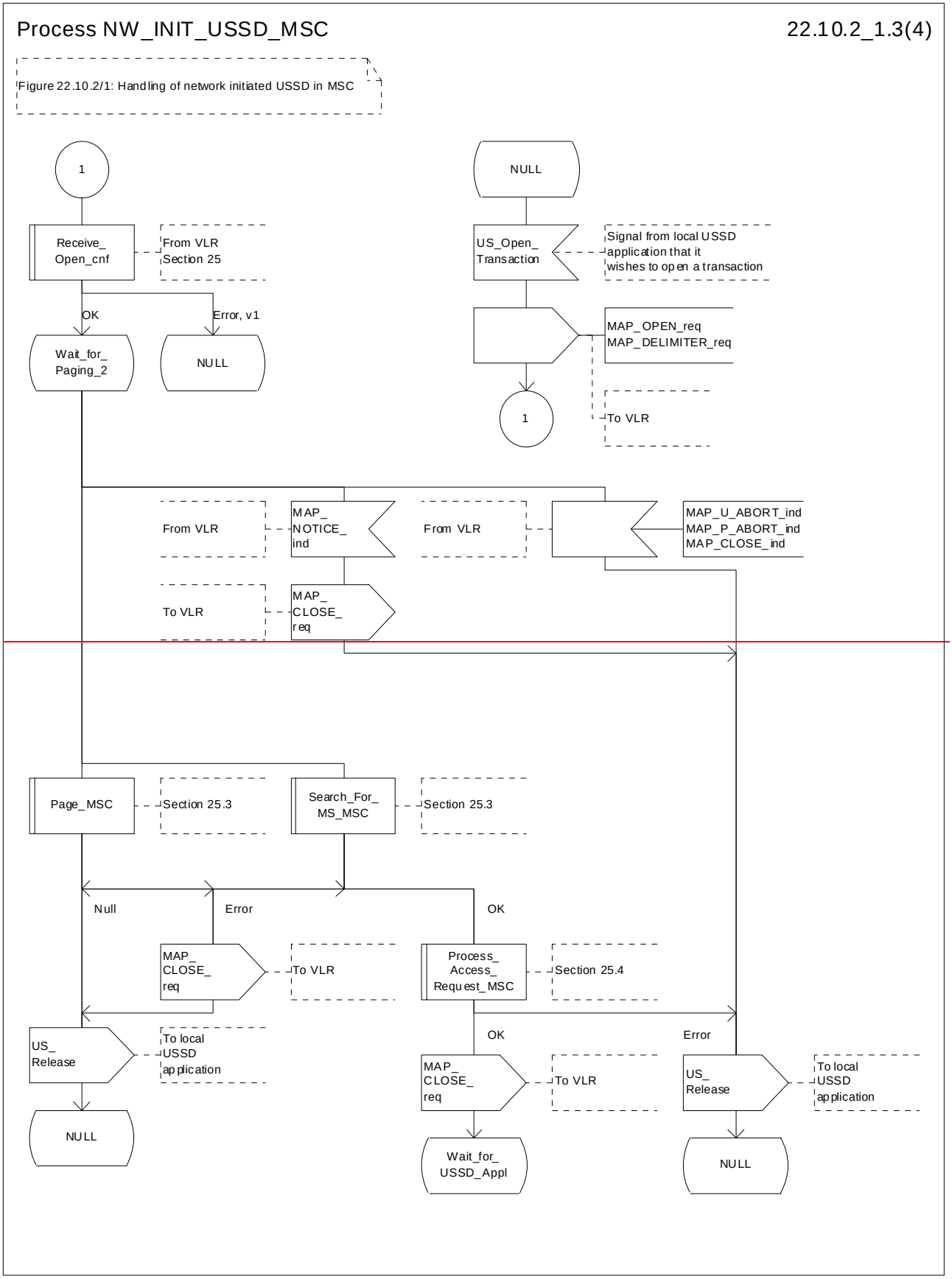


Figure 22.10.2/1 (sheet 2 of 4): Proces~~sdure~~ NW_Init_USSD_MSC


Process NW_INIT_USSD_MSC
22.10.2_1.3(4)
Figure 22.10.2/1: Handling of network initiated USSD in MSC
1
Receive_ Open_cnf
From VLR Section 25
OK
Error, v1
Wait_for_ Paging_2
NULL
NULL
US_Open_ Transaction
Signal from local USSD application that it wishes to open a transaction
MAP_OPEN_req
MAP_DELIMITER_req
1
To VLR
From VLR
MAP_ NOTICE_ ind
From VLR
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
To VLR
MAP_ CLOSE_ req
Page_MSC
Section 25.3
Search_For_ MS_MSC
Section 25.3
Null
Error
OK
MAP_ CLOSE_ req
To VLR
Process_ Access_ Request_MSC
Section 25.4
US_ Release
To local USSD application
OK
Error
MAP_ CLOSE_ req
To VLR
US_ Release
To local USSD application
NULL
Wait_for_ USSD_Appl
NULL

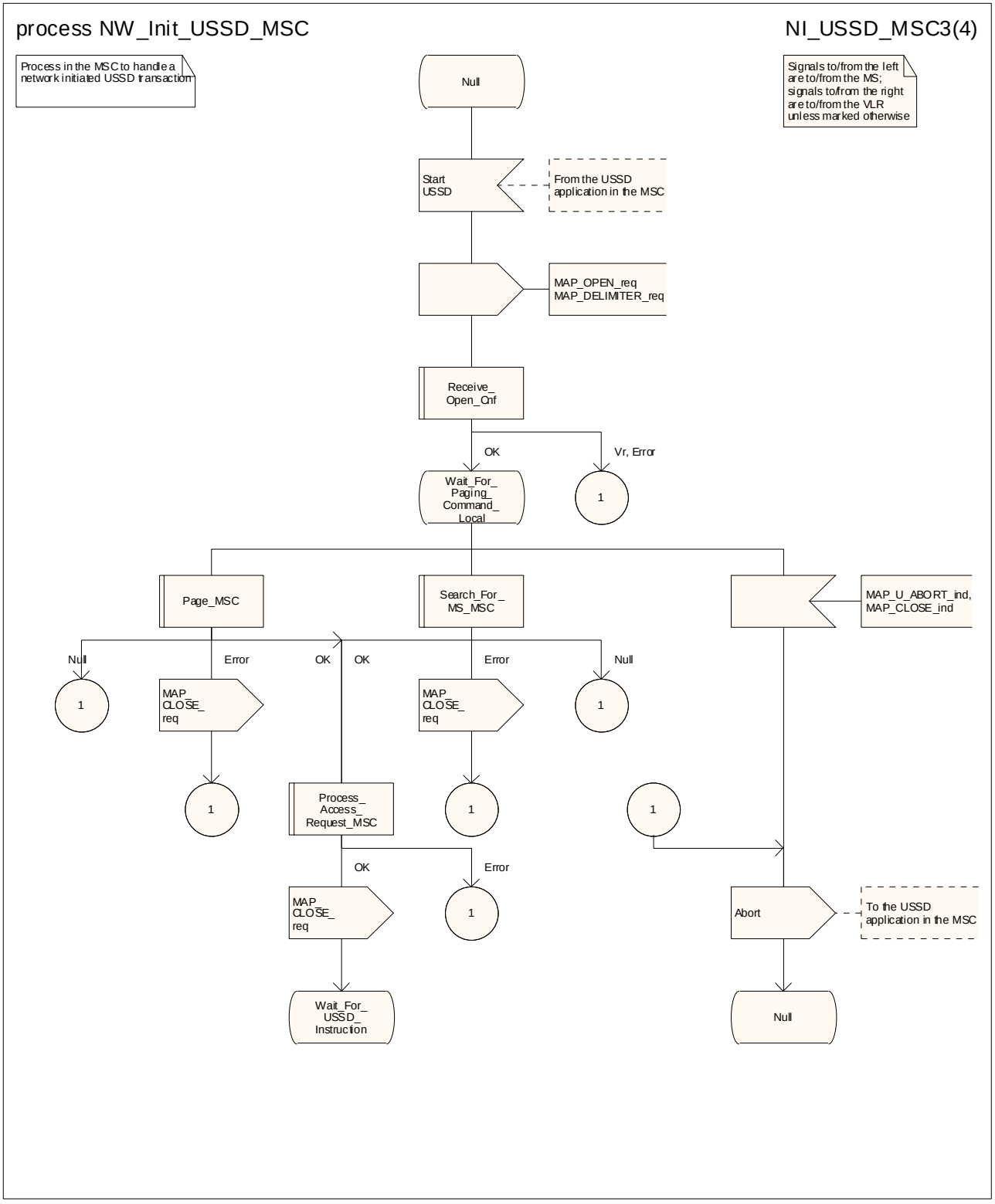
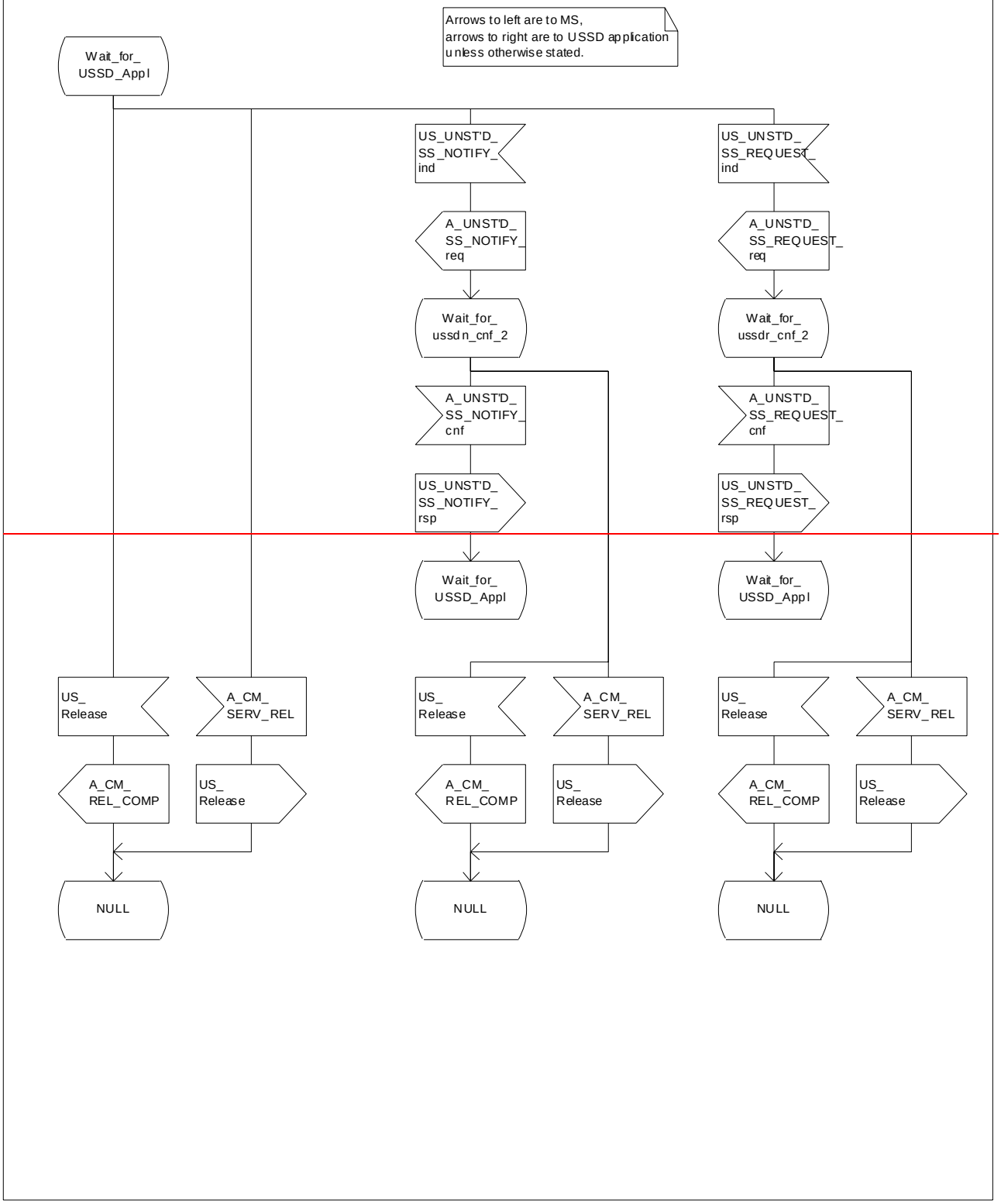


Figure 22.10.2/1 (sheet 3 of 4): Proces~~sdure~~ NW_Init_USSD_MSC

Process NW_INIT_USSD_MSC 22.10.2_1.4(4)

Figure 22.10.2/1: Handling of network initiated USSD in MSC



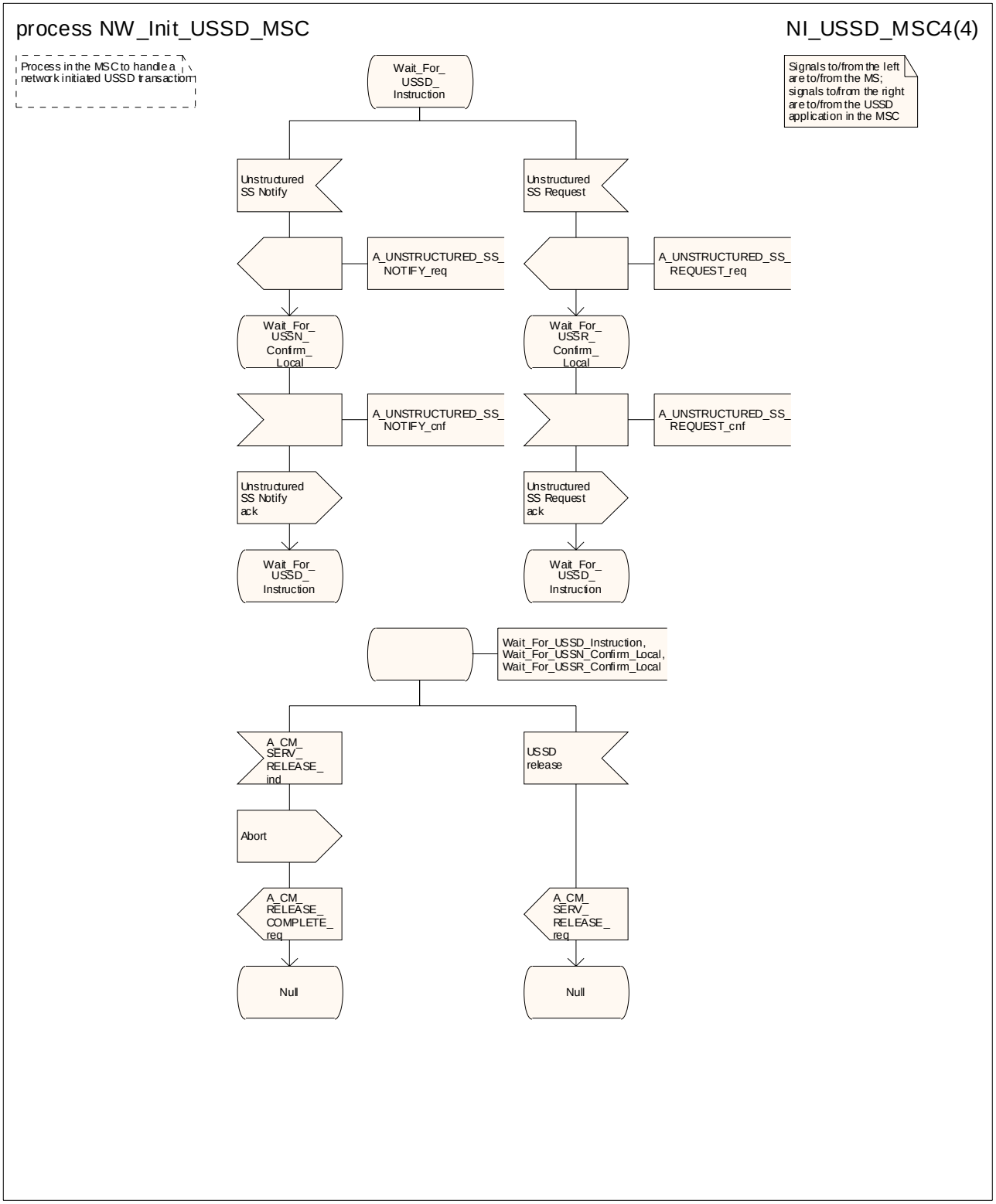
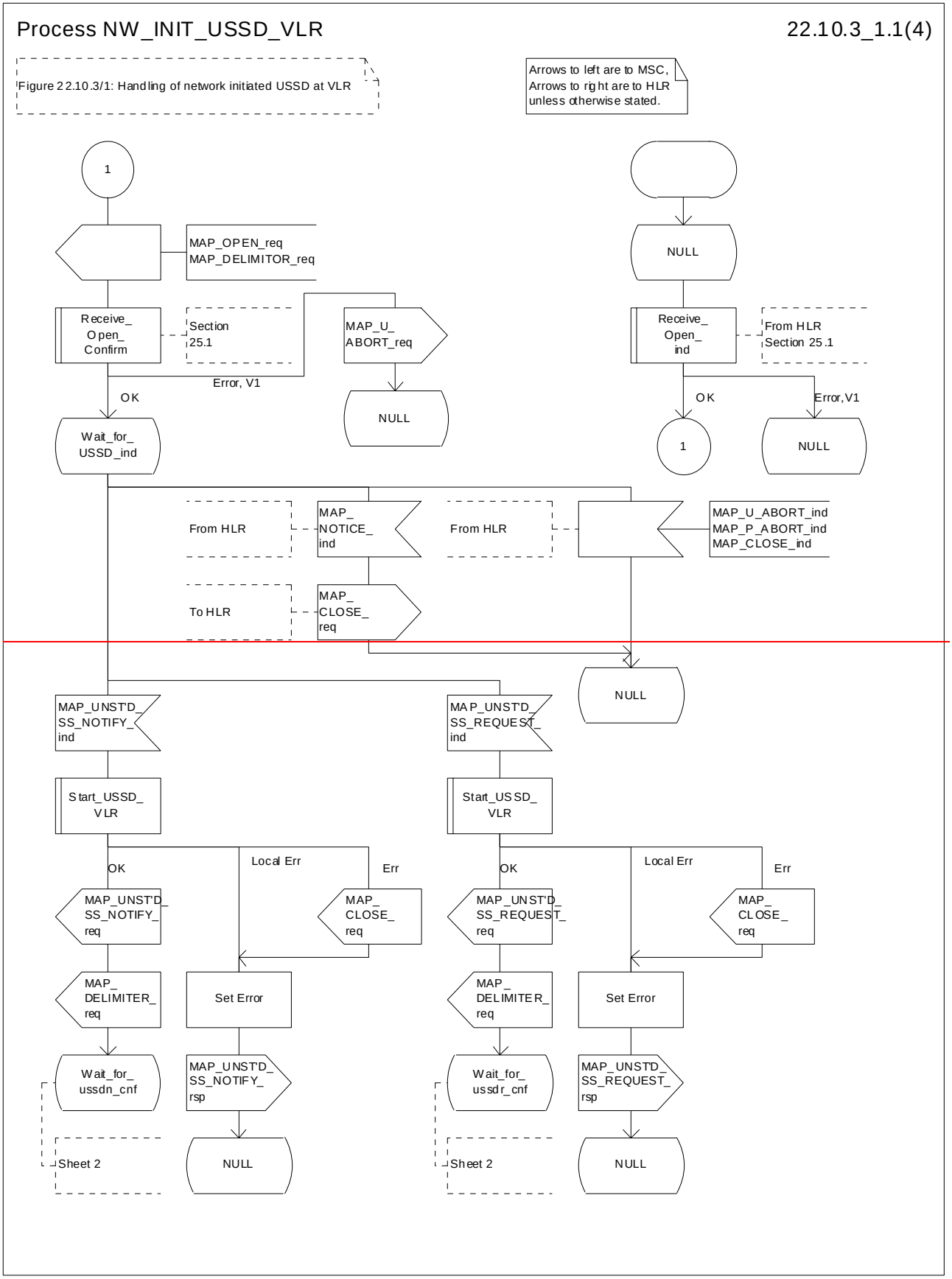


Figure 22.10.2/1 (sheet 4 of 4): Proces~~sdure~~ NW_Init_USSD_MSC


Process NW_INIT_USSD_VLR
22.10.3_1.1(4)
Figure 22.10.3/1: Handling of network initiated USSD at VLR
Arrows to left are to MSC, Arrows to right are to HLR unless otherwise stated.
1
MAP_OPEN_req
MAP_DELIMITOR_req
Receive_ Open_ Confirm
Section 25.1
MAP_U_ ABORT_req
Error, V1
OK
NULL
Wait_for_ USSD_ind
NULL
Receive_ Open_ ind
From HLR Section 25.1
OK
Error,V1
1
NULL
From HLR
MAP_ NOTICE_ ind
From HLR
MAP_U_ABORT_ind
MAP_P_ABORT_ind
MAP_CLOSE_ind
To HLR
MAP_ CLOSE_ req
NULL
MAP_UNST'D_ SS_NOTIFY_ ind
Start_USSD_ VLR
OK
Local Err
Err
MAP_UNST'D_ SS_NOTIFY_ req
MAP_ CLOSE_ req
MAP_ DELIMITER_ req
Set Error
Wait_for_ ussdn_cnf
MAP_UNST'D_ SS_NOTIFY_ rsp
Sheet 2
NULL
MAP_UNST'D_ SS_REQUEST_ ind
Start_USSD_ VLR
OK
Local Err
Err
MAP_UNST'D_ SS_REQUEST_ req
MAP_ CLOSE_ req
MAP_ DELIMITER_ req
Set Error
Wait_for_ ussdr_cnf
MAP_UNST'D_ SS_REQUEST_ rsp
Sheet 2
NULL

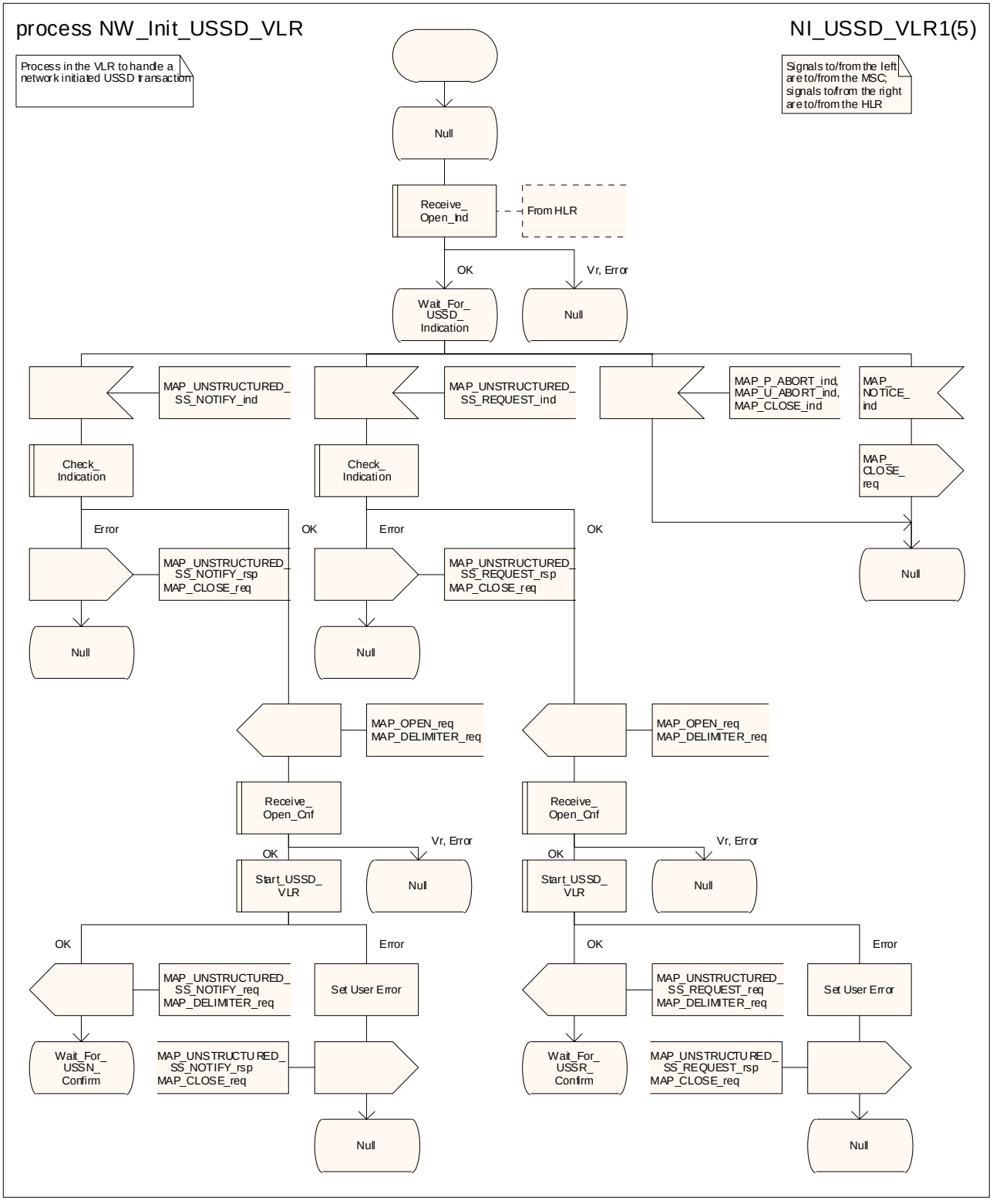
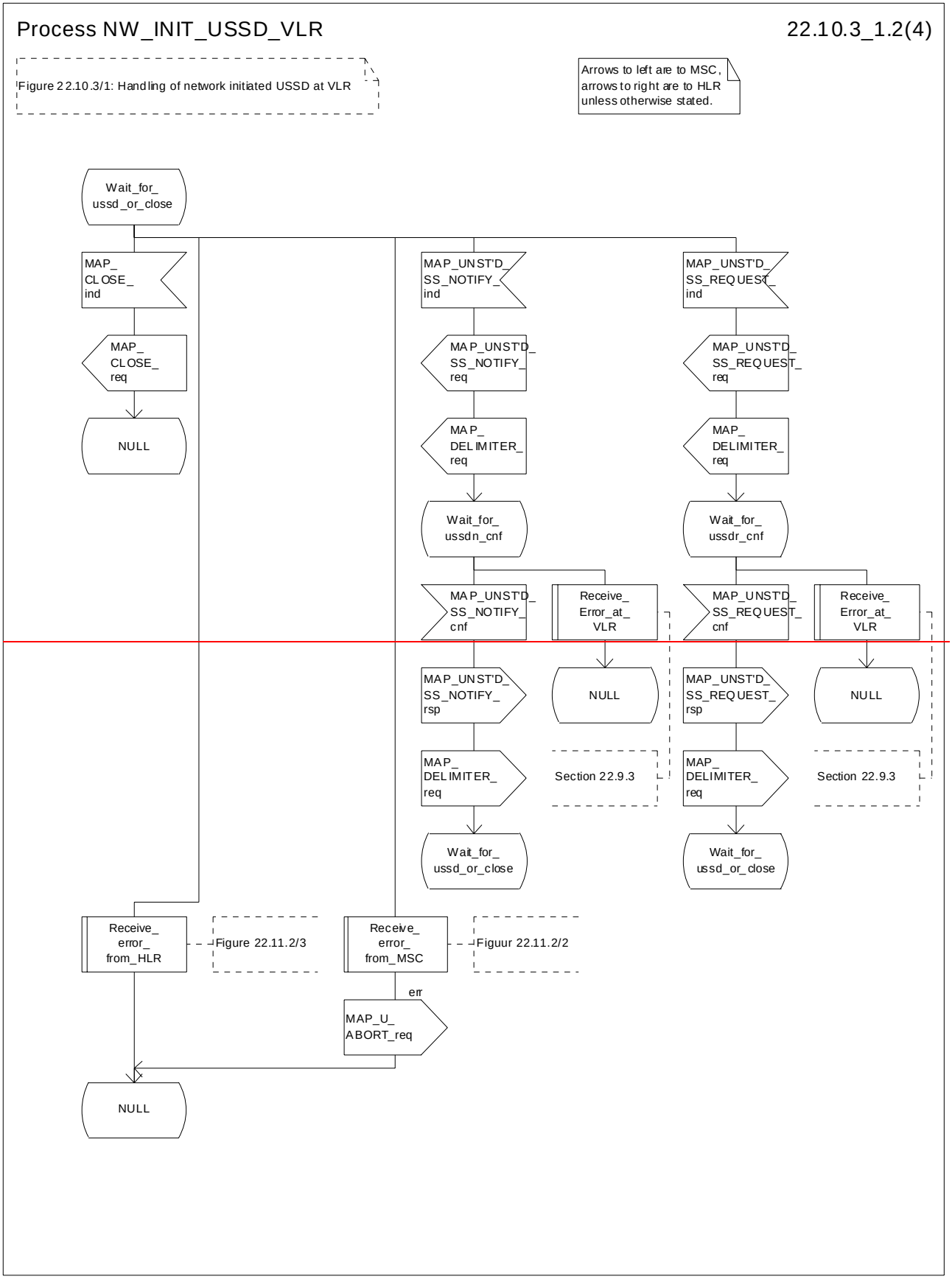


Figure 22.10.3/1 (sheet 1 of 54): Processdure NW_Init_USSD_VLR


Process NW_INIT_USSD_VLR
22.10.3_1.2(4)
Figure 22.10.3/1: Handling of network initiated USSD at VLR
Arrows to left are to MSC, arrows to right are to HLR unless otherwise stated.
Wait_for_ ussd_or_close
MAP_ CLOSE_ ind
MAP_ CLOSE_ req
NULL
MAP_UNST'D_ SS_NOTIFY_ ind
MAP_UNST'D_ SS_NOTIFY_ req
MAP_ DELIMITER_ req
Wait_for_ ussdn_cnf
MAP_UNST'D_ SS_NOTIFY_ cnf
Receive_ Error_at_ VLR
MAP_UNST'D_ SS_NOTIFY_ rsp
NULL
MAP_ DELIMITER_ req
Section 22.9.3
Wait_for_ ussd_or_close
MAP_UNST'D_ SS_REQUEST_ ind
MAP_UNST'D_ SS_REQUEST_ req
MAP_ DELIMITER_ req
Wait_for_ ussdr_cnf
MAP_UNST'D_ SS_REQUEST_ cnf
Receive_ Error_at_ VLR
MAP_UNST'D_ SS_REQUEST_ rsp
NULL
MAP_ DELIMITER_ req
Section 22.9.3
Wait_for_ ussd_or_close
Receive_ error_ from_HLR
Figure 22.11.2/3
Receive_ error_ from_MSC
Figuur 22.11.2/2
err
MAP_U_ ABORT_req
NULL

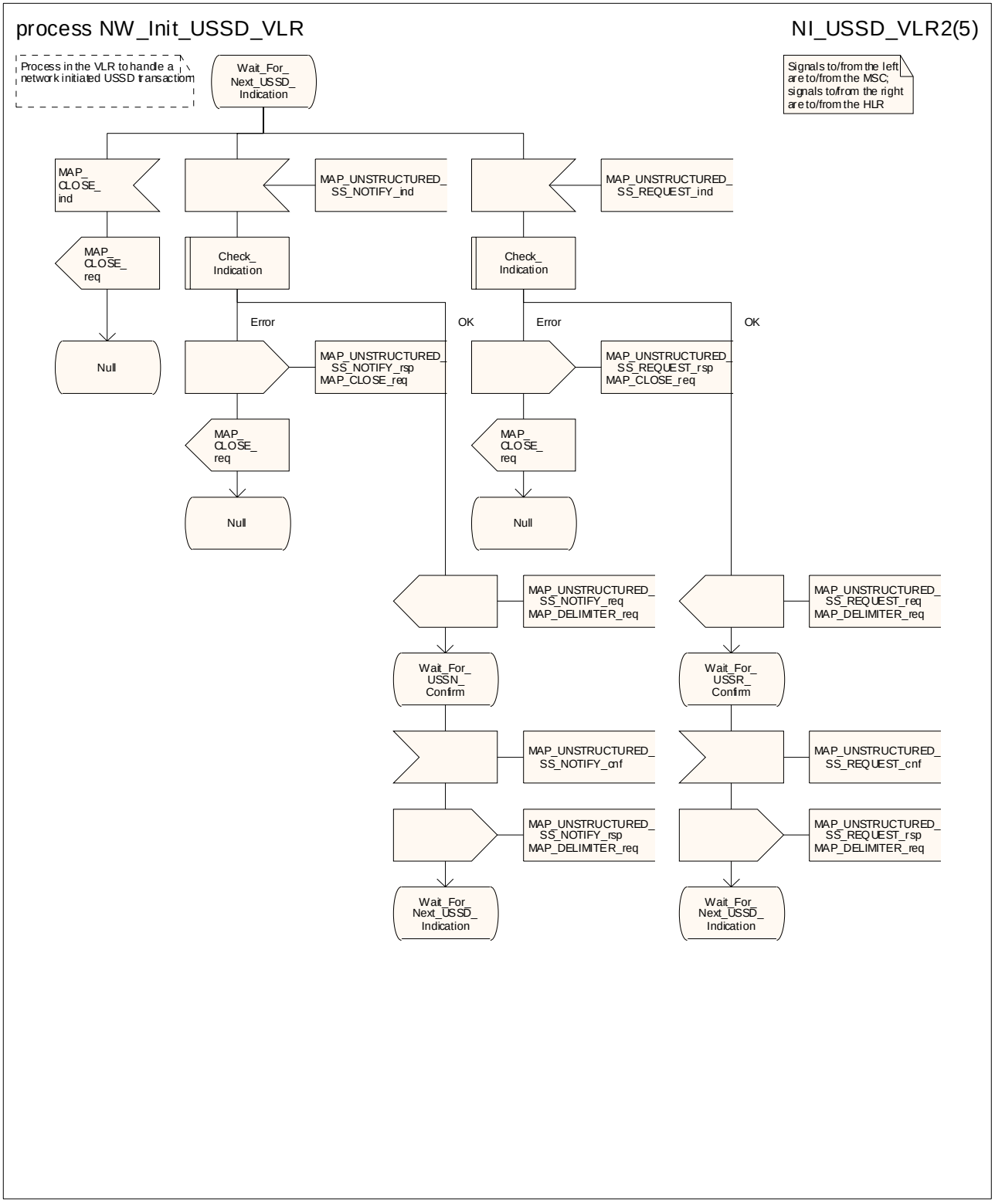
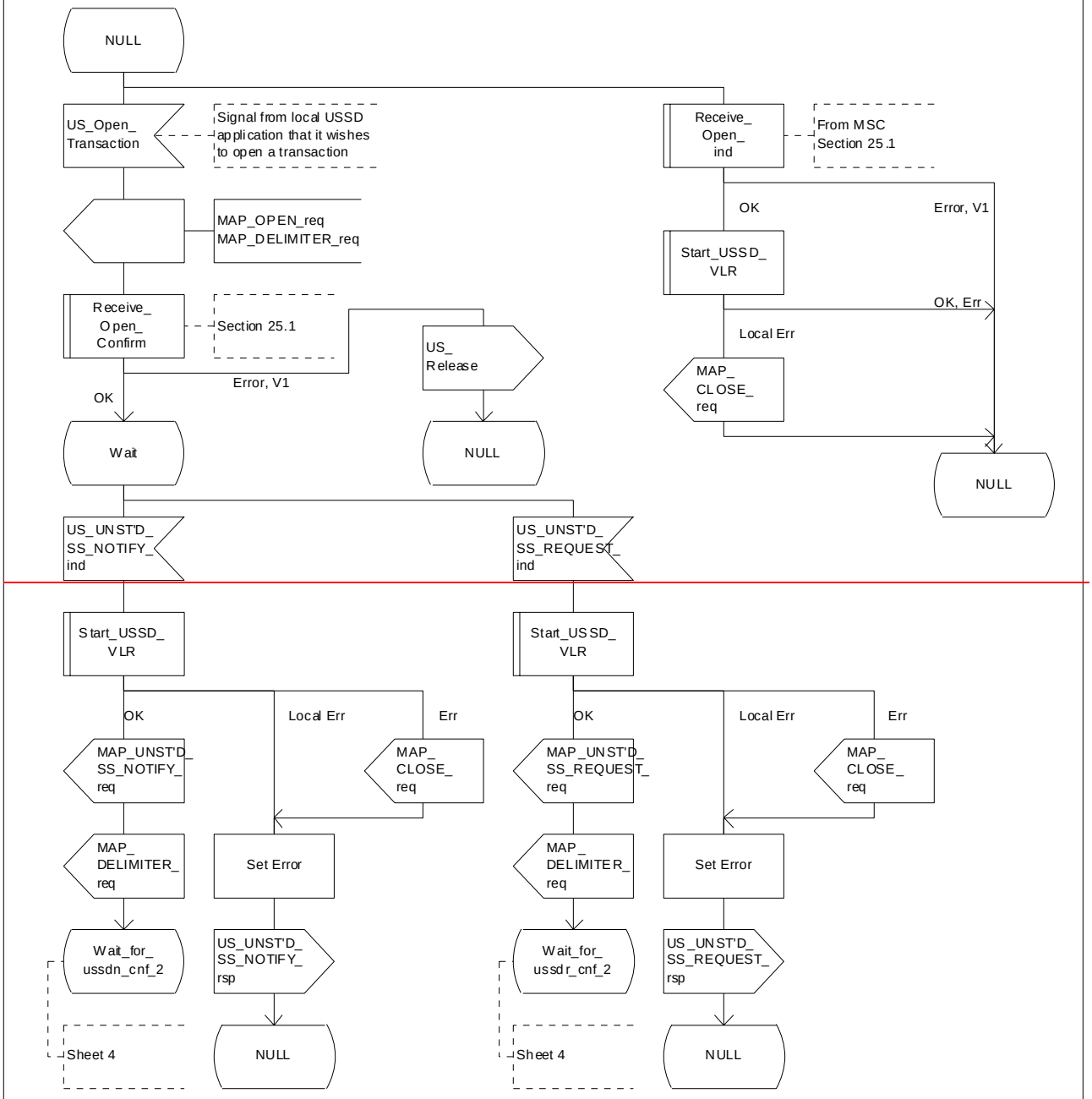


Figure 22.10.3/1 (sheet 2 of 54): Processdure NW_Init_USSD_VLR

Process NW_INIT_USSD_VLR 22.10.3_1.3(4)

Figure 22.10.3/1: Handling of network initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.



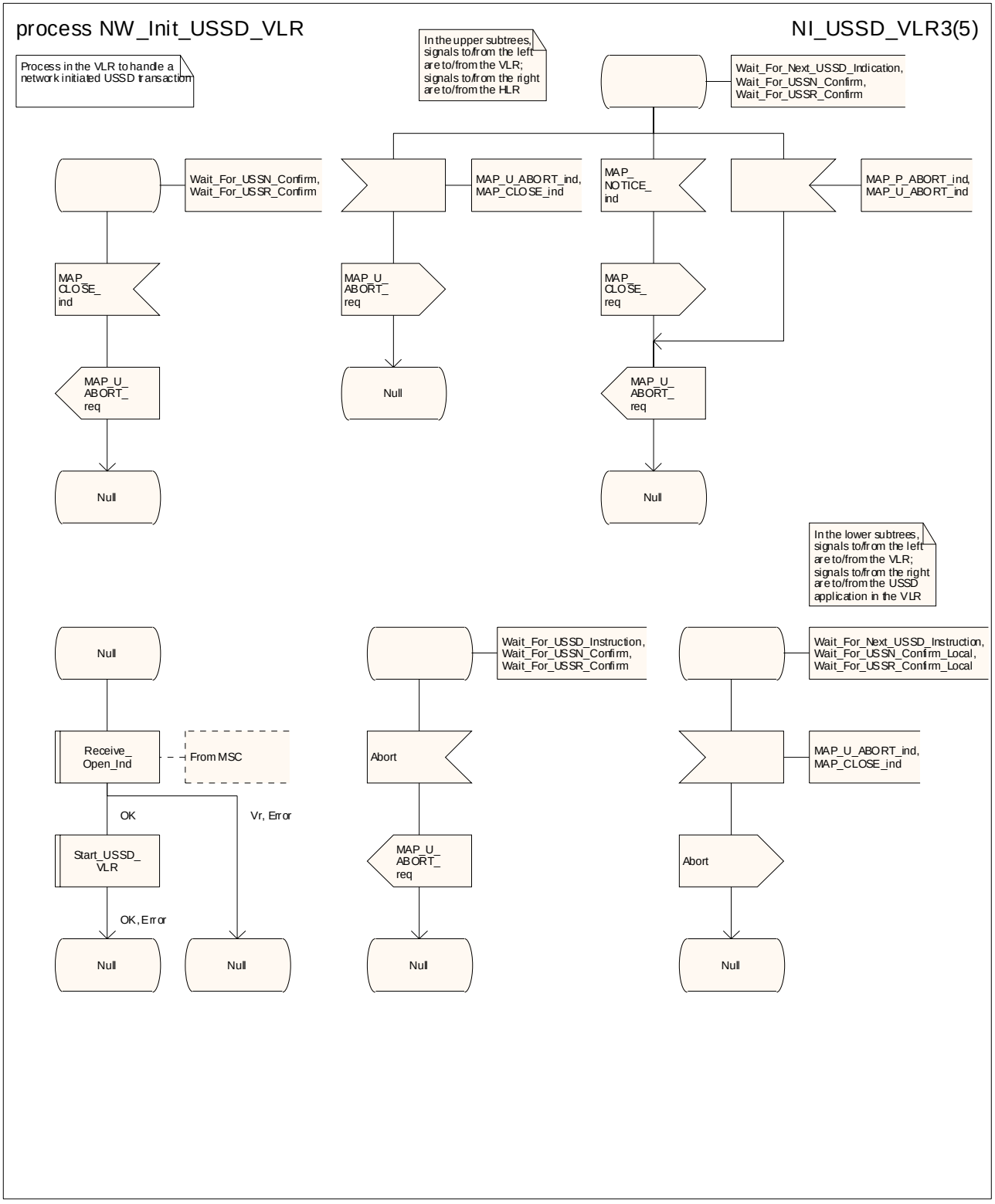
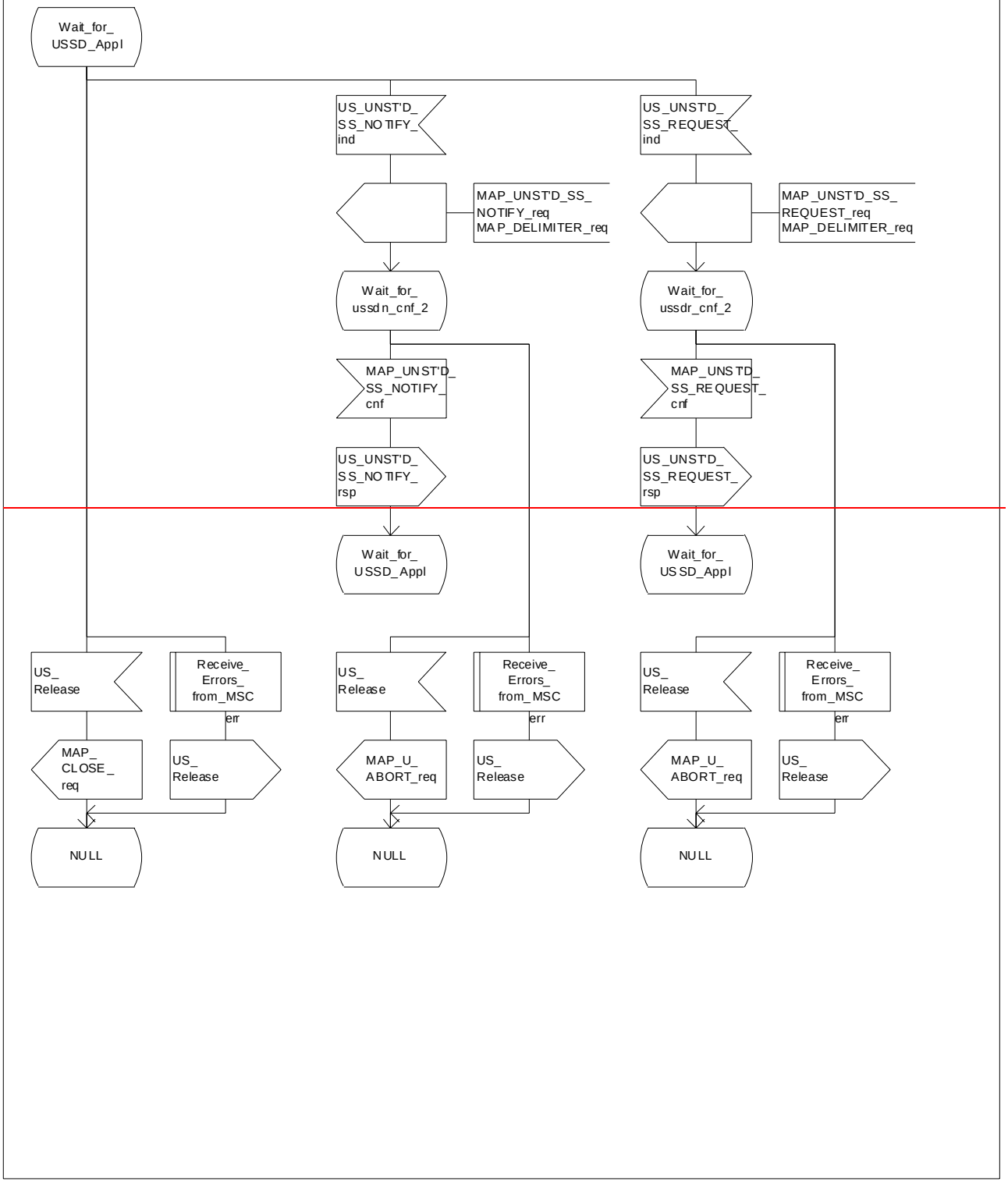


Figure 22.10.3/1 (sheet 3 of 54): Process~~dure~~ NW_Init_USSD_VLR

Process NW_INIT_USSD_VLR 22.10.3_1.4(4)

Figure 22.10.3/1: Handling of network initiated USSD at VLR

Arrows to left are to MSC, arrows to right are to USSD application unless otherwise stated.



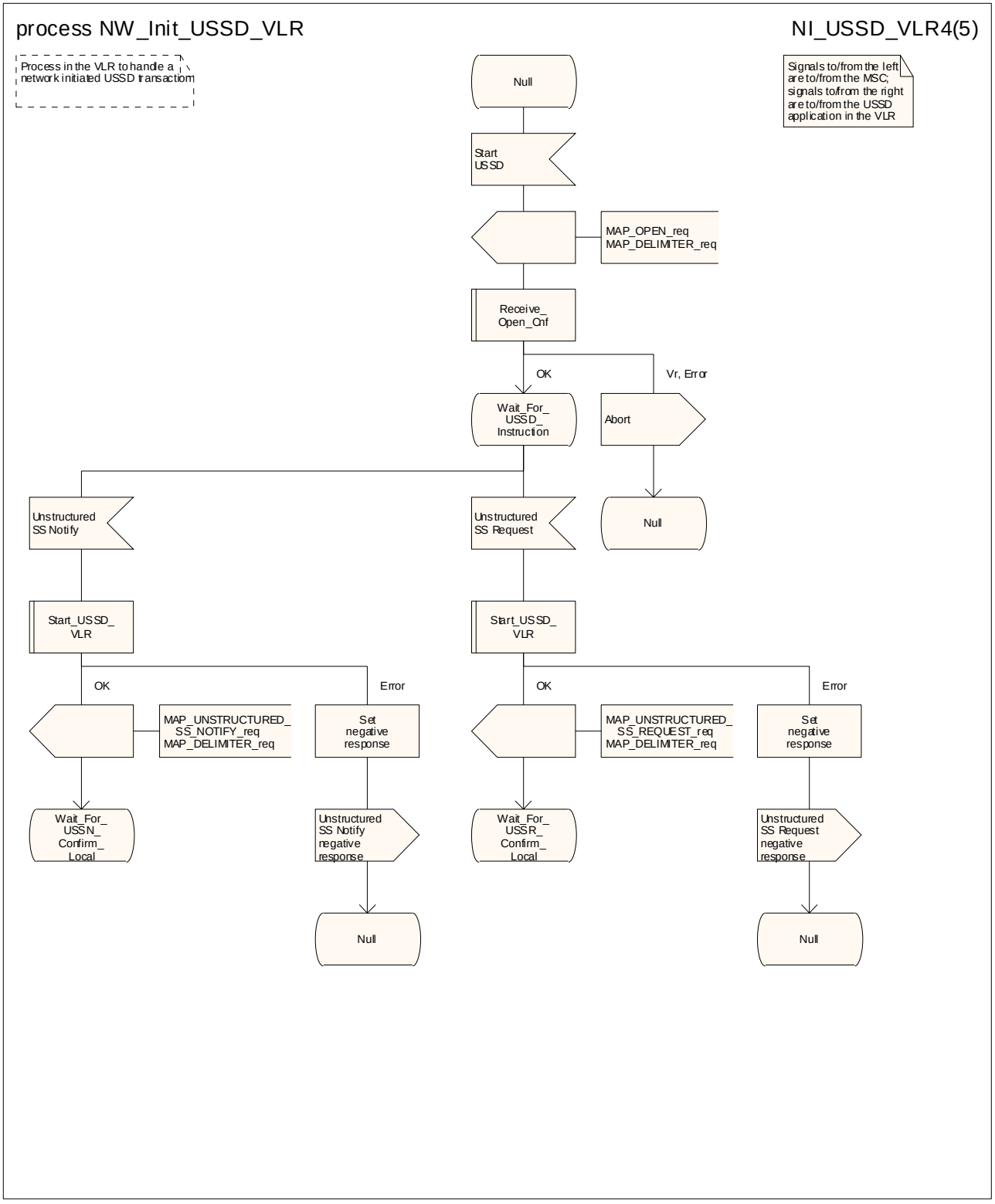


Figure 22.10.3/1 (sheet 4 of 54): Processdure NW_Init_USSD_VLR

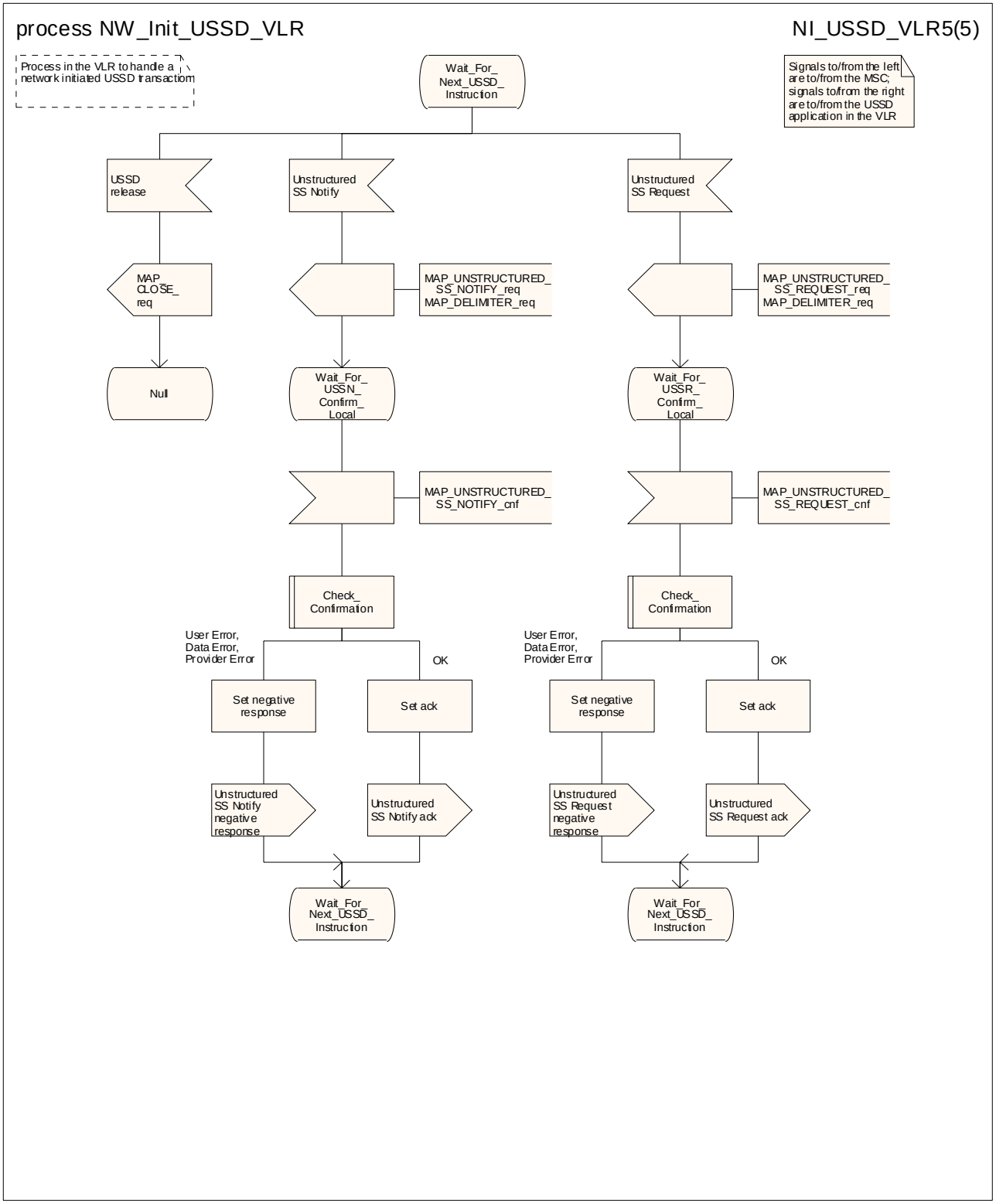
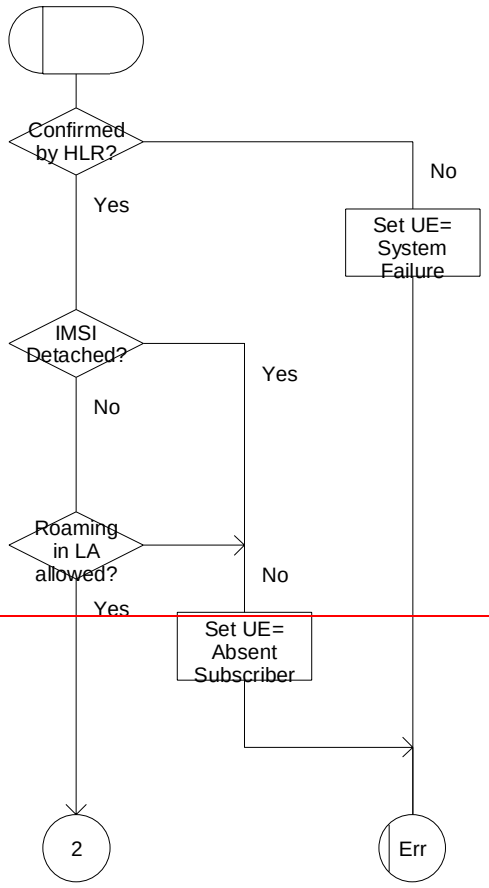


Figure 22.10.3/1 (sheet 5 of 5): Process NW_Init_USSD_VLR

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



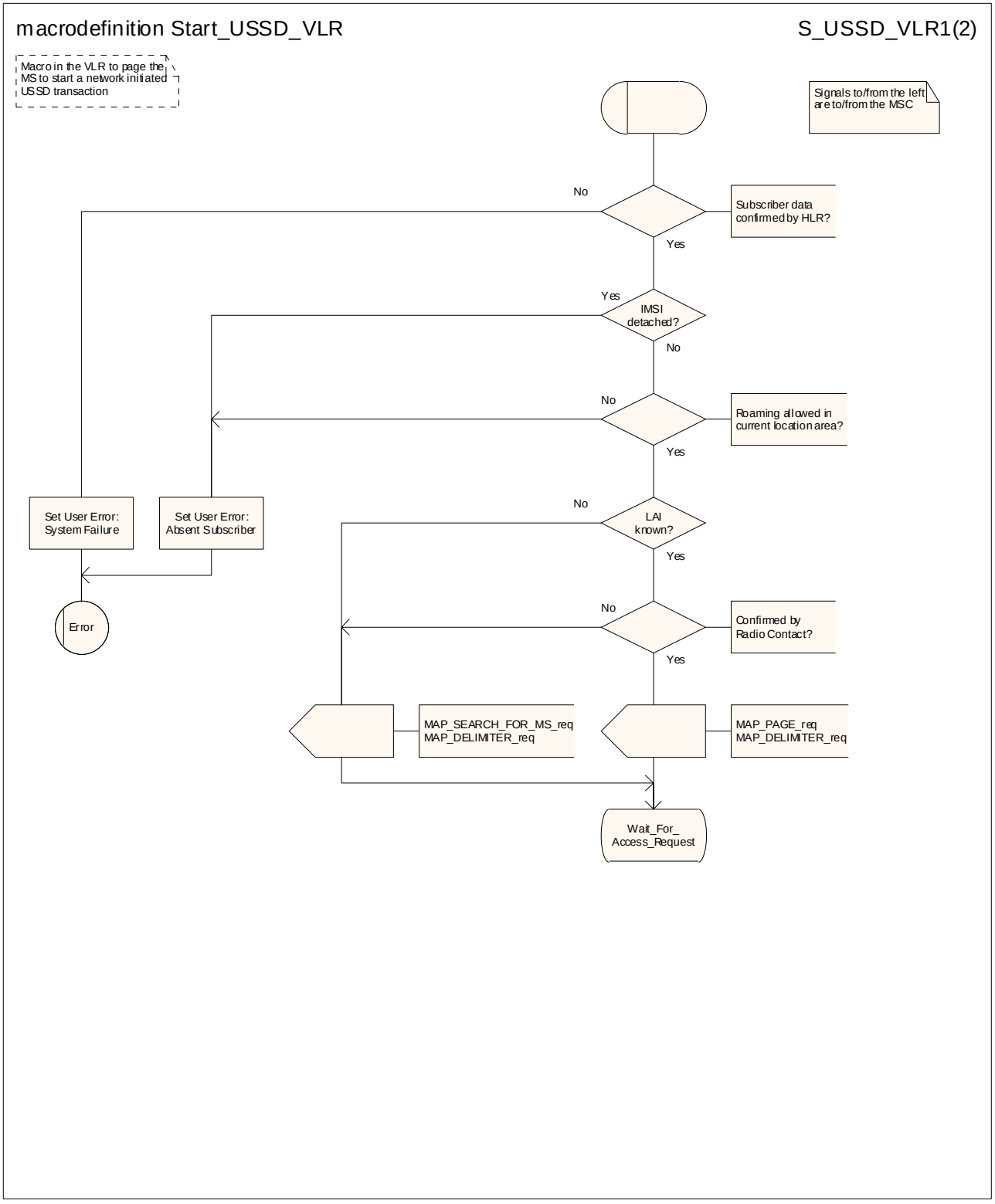
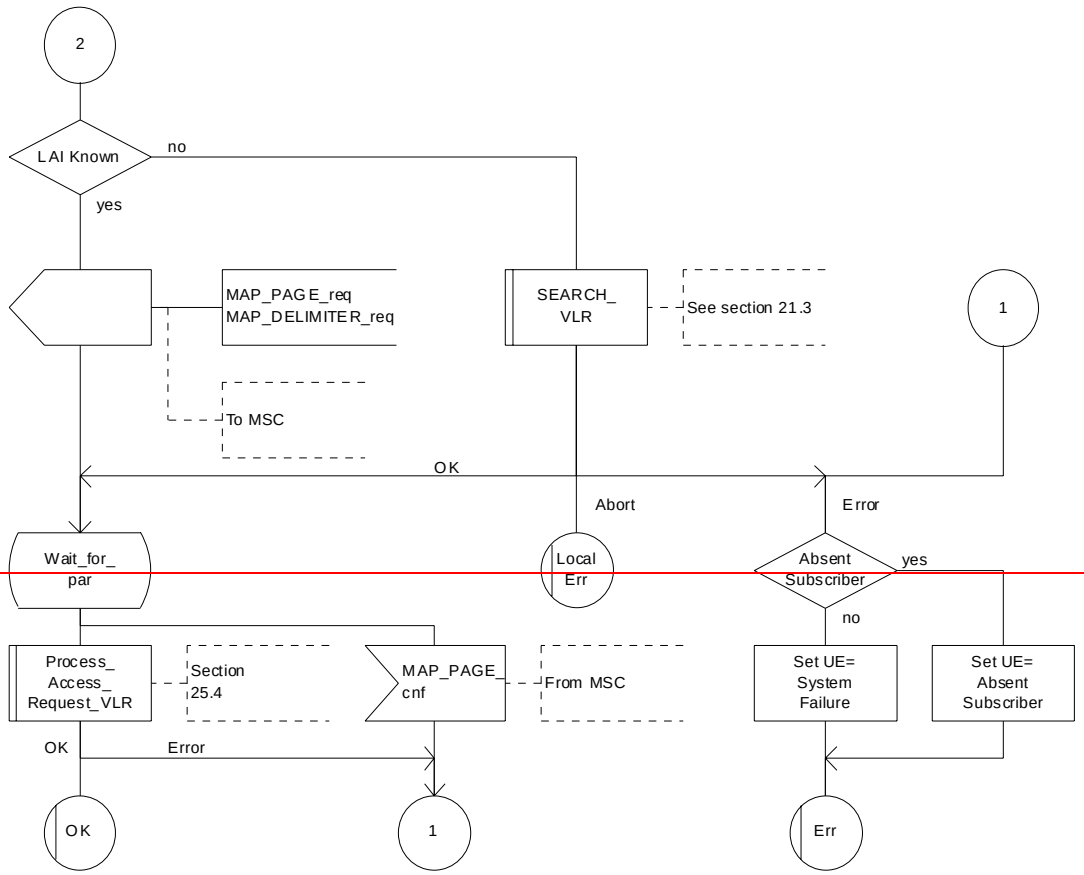


Figure 22.10.3/2 (sheet 1 of 2): Macro Start_USSD_VLR

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.



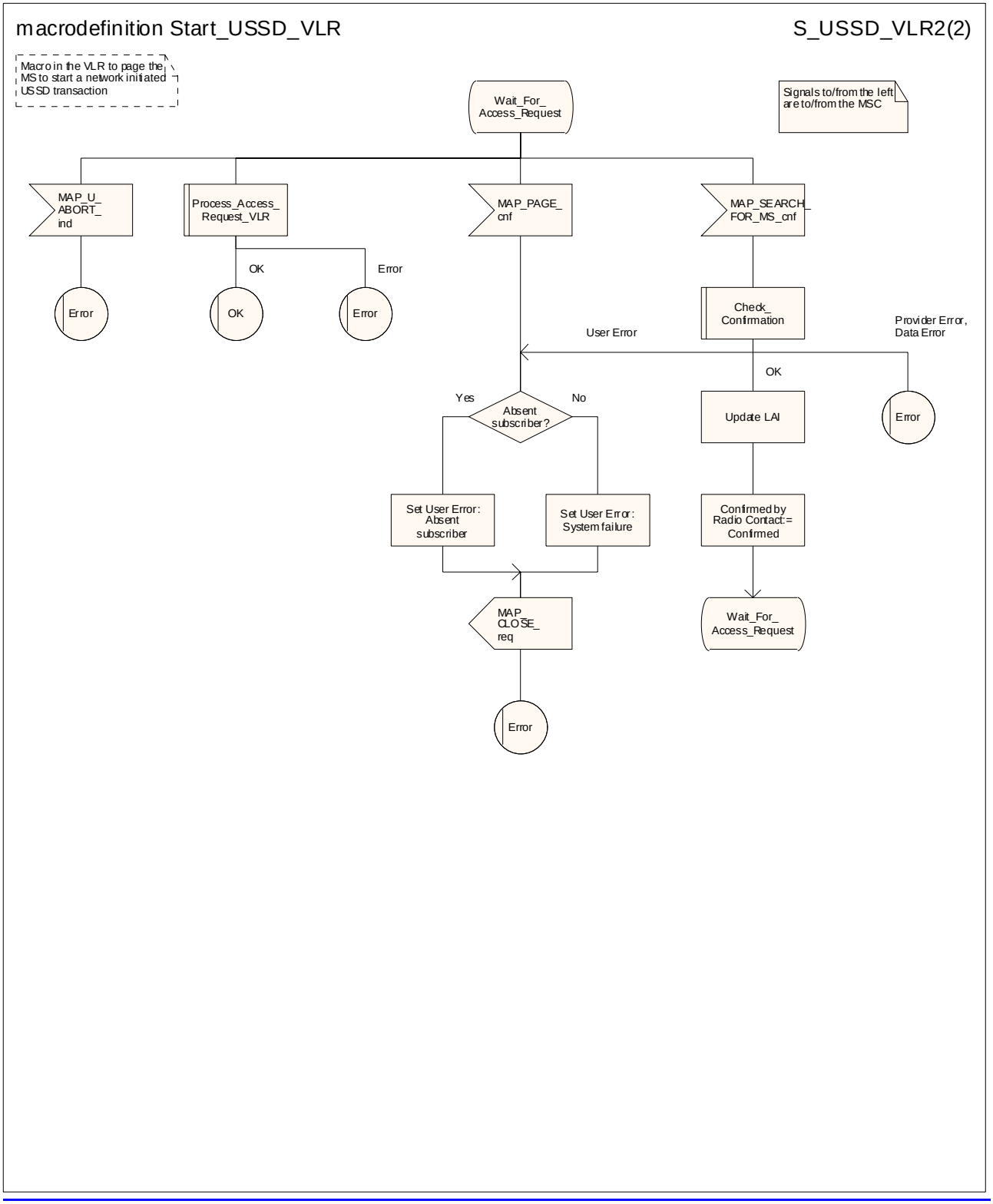
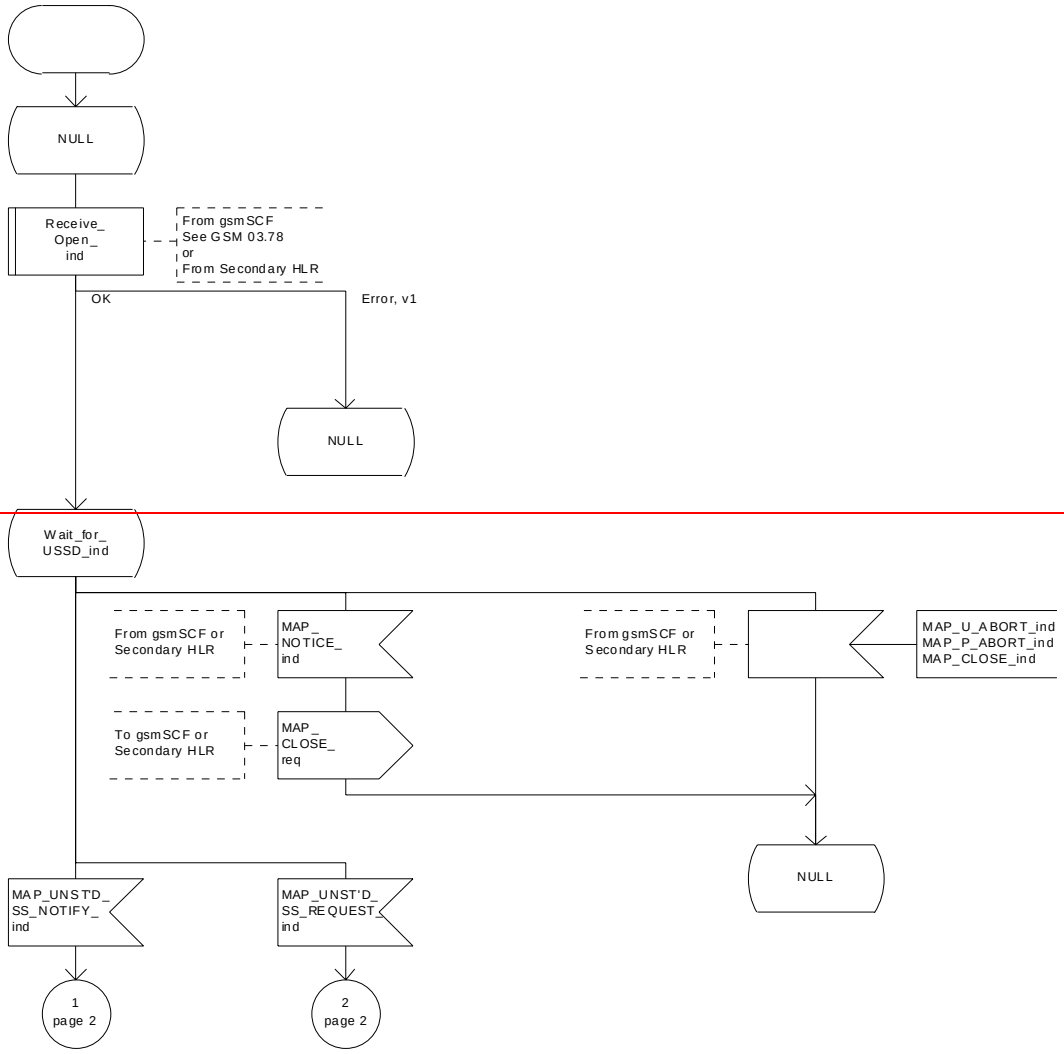


Figure 22.10.3/2 (sheet 2 of 2): Macro Start_USSD_VLR

Process NW_INIT_USSD_HLR 22.10.4_1.1(5)

Figure 22.10.4/1 Handling of network initiated USSD at HLR

Arrows to left are to VLR,
Arrows to right are to the next node
unless otherwise stated.



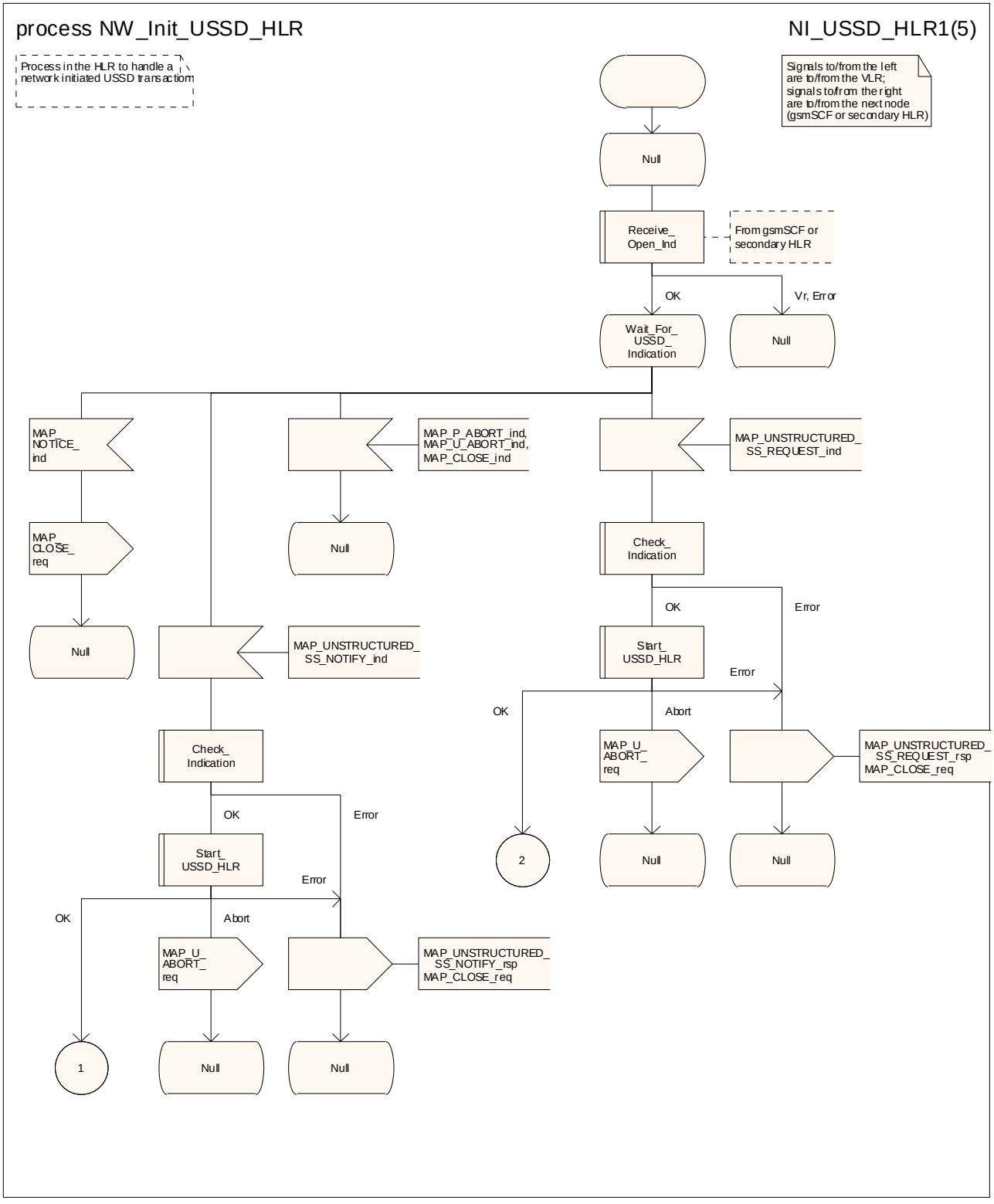
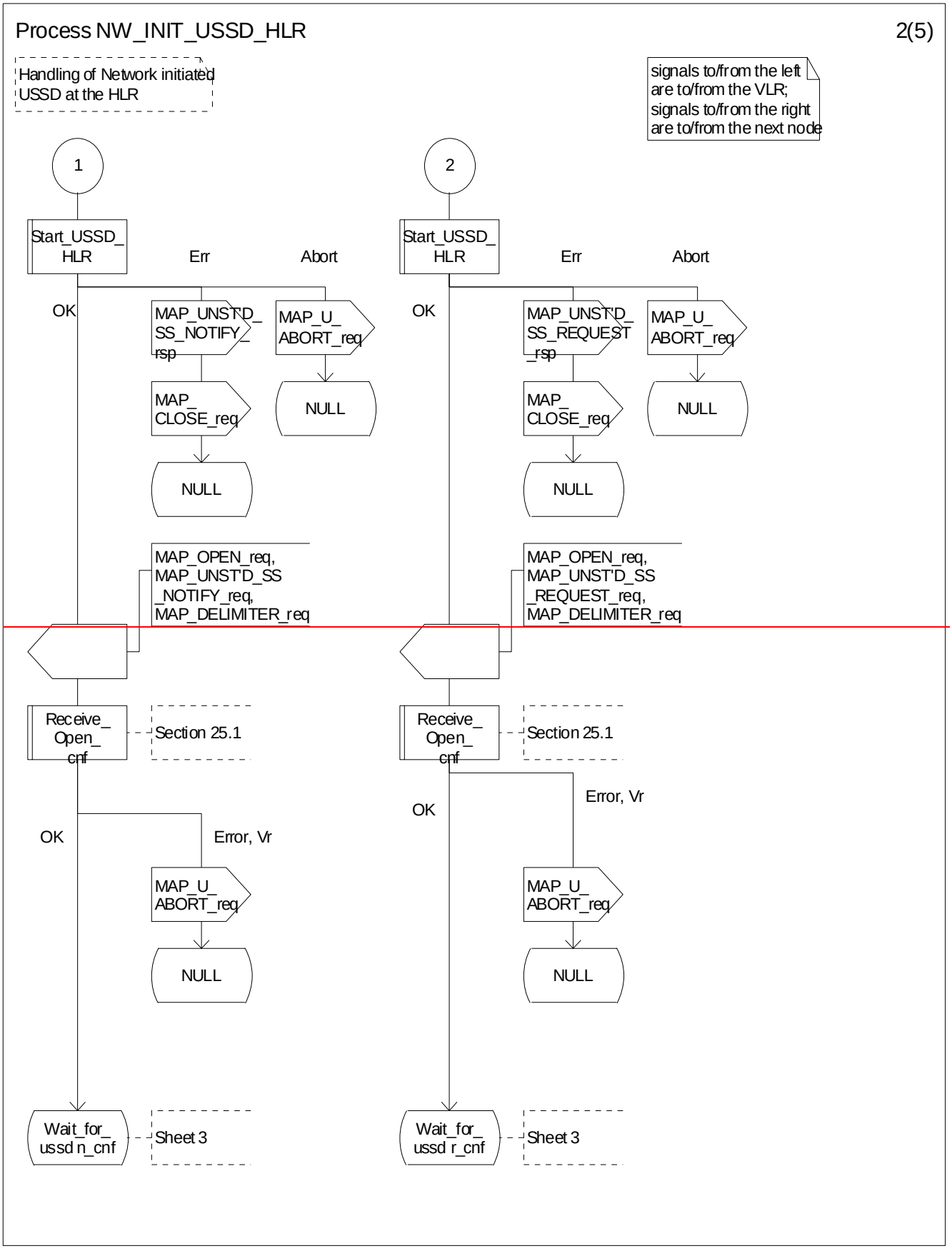


Figure 22.10.4/1 (sheet 1 of 5): Proces~~sdure~~ NW_Init_USSD_HLR


Process NW_INIT_USSD_HLR
2(5)
Handling of Network initiated USSD at the HLR
signals to/from the left are to/from the VLR; signals to/from the right are to/from the next node
1
Start_USSD_ HLR
Err
Abort
OK
MAP_UNST'D_ SS_NOTIFY_ rsp
MAP_U_ ABORT_req
MAP_ CLOSE_req
NULL
NULL
MAP_OPEN_req, MAP_UNST'D_SS _NOTIFY_req, MAP_DELIMITER_req
Receive_ Open_ cnf
Section 25.1
OK
Error, Vr
MAP_U_ ABORT_req
NULL
Wait_for_ ussd n_cnf
Sheet 3
2
Start_USSD_ HLR
Err
Abort
OK
MAP_UNST'D_ SS_REQUEST _rsp
MAP_U_ ABORT_req
MAP_ CLOSE_req
NULL
NULL
MAP_OPEN_req, MAP_UNST'D_SS _REQUEST_req, MAP_DELIMITER_req
Receive_ Open_ cnf
Section 25.1
OK
Error, Vr
MAP_U_ ABORT_req
NULL
Wait_for_ ussd r_cnf
Sheet 3

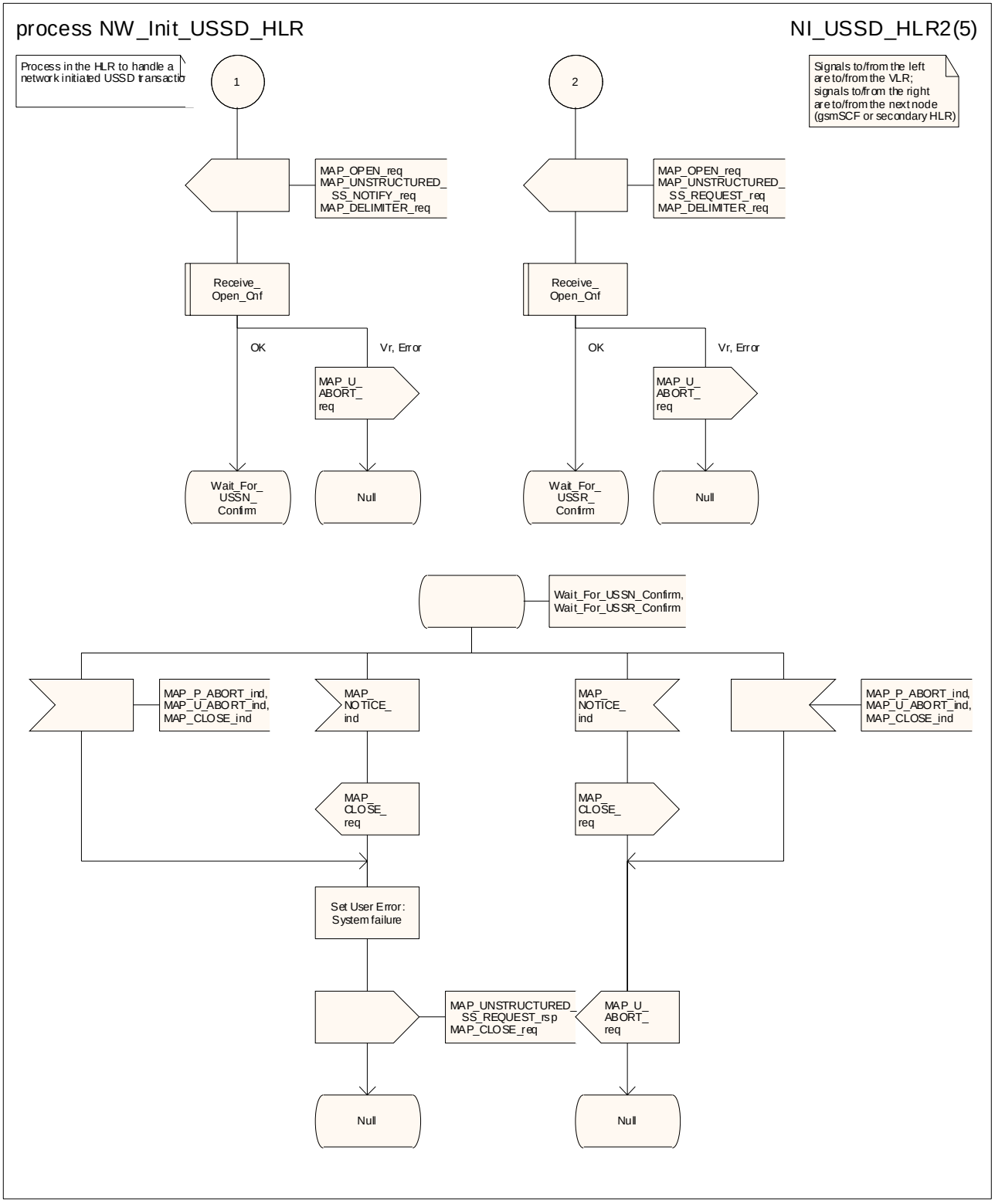
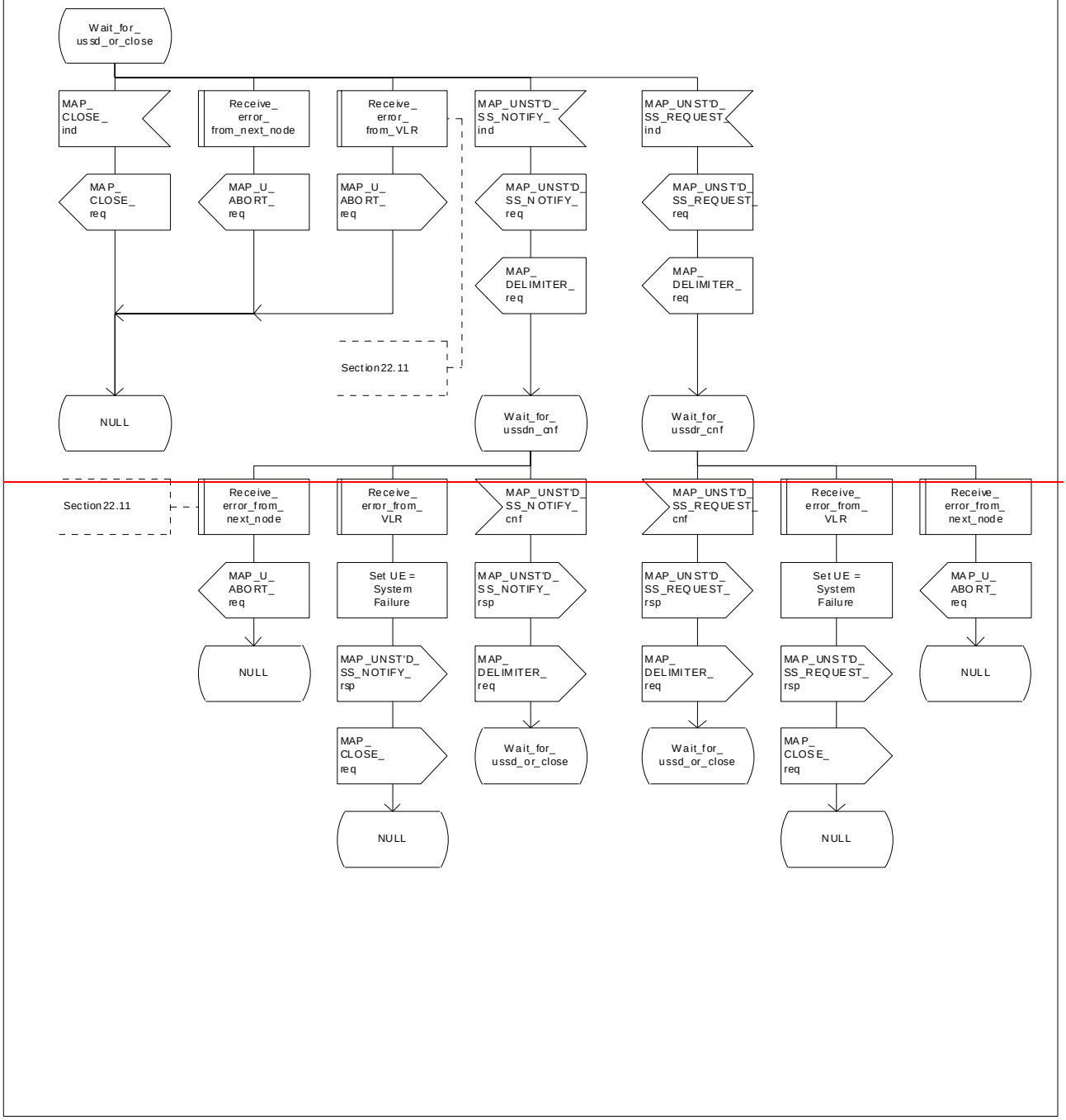


Figure 22.10.4/1 (sheet 2 of 5): Proces~~sdure~~ NW_Init_USSD_HLR

Process NW_INIT_USSD_HLR 22.10.4_1.3(5)

Figure 22.10.4/1 Handling of network initiated USSD at HLR

Arrows to left are to VLR,
Arrows to right are to the next node
unless otherwise stated.



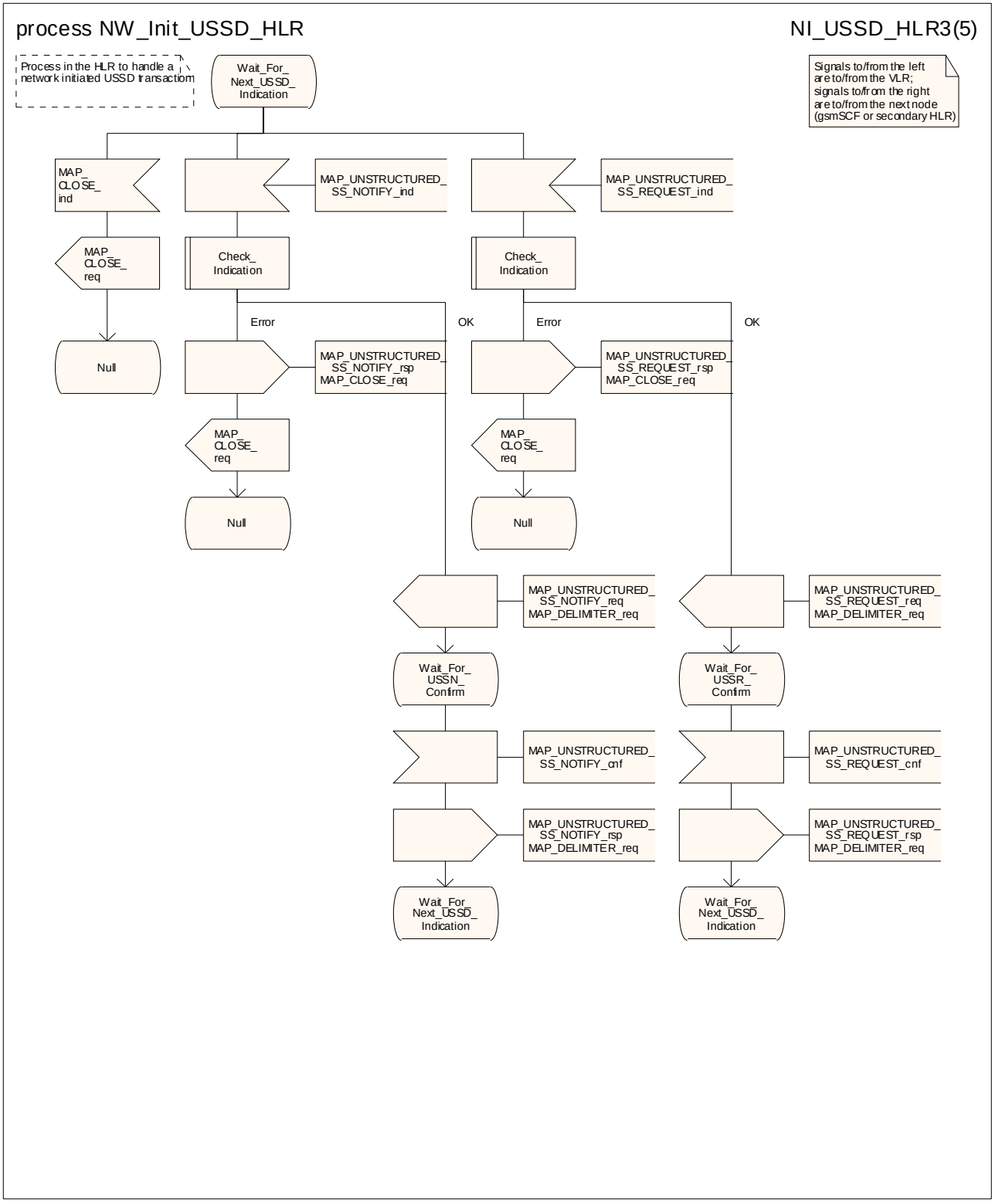
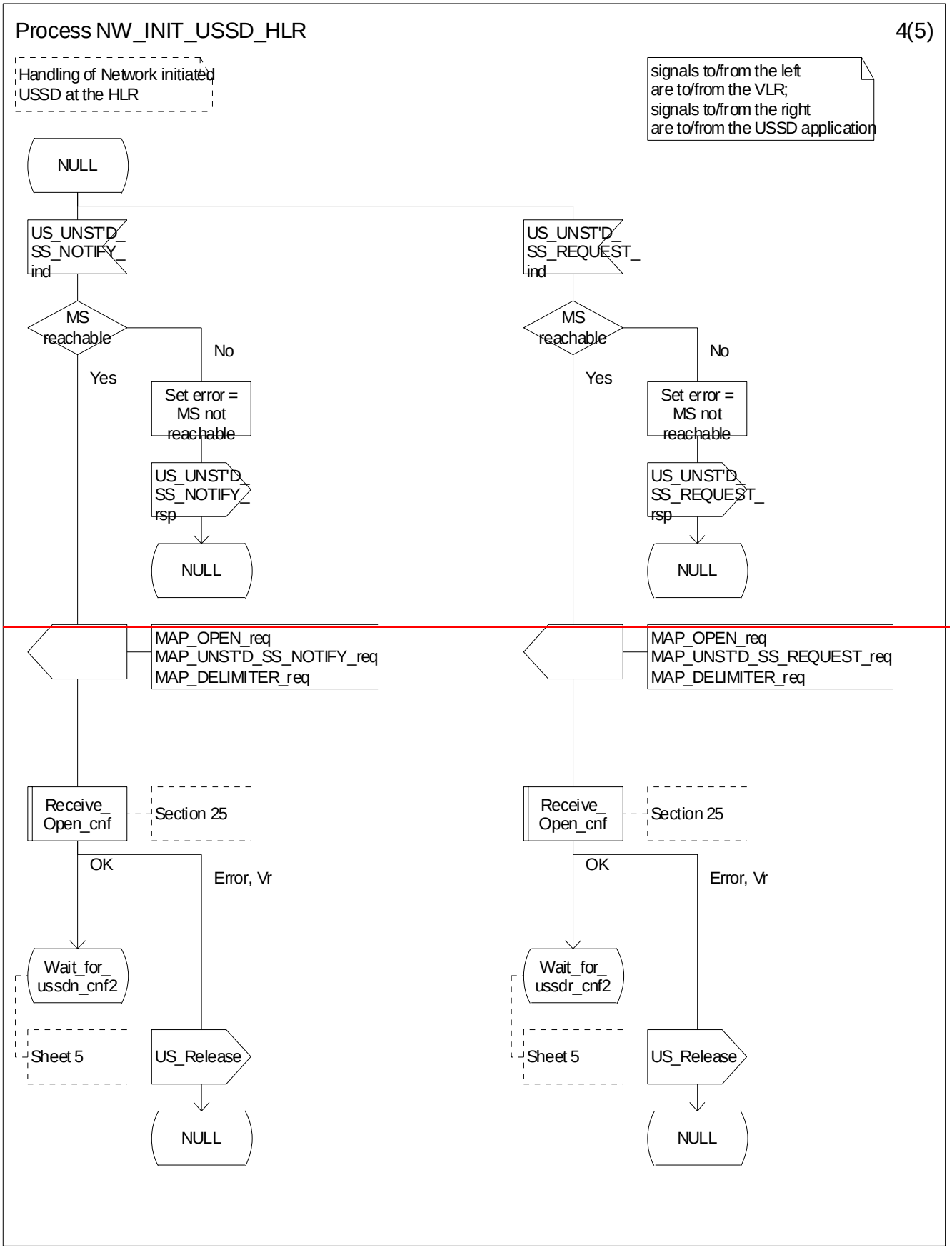


Figure 22.10.4/1 (sheet 3 of 5): Proces~~sdure~~ NW_Init_USSD_HLR

Process NW_INIT_USSD_HLR 4(5)



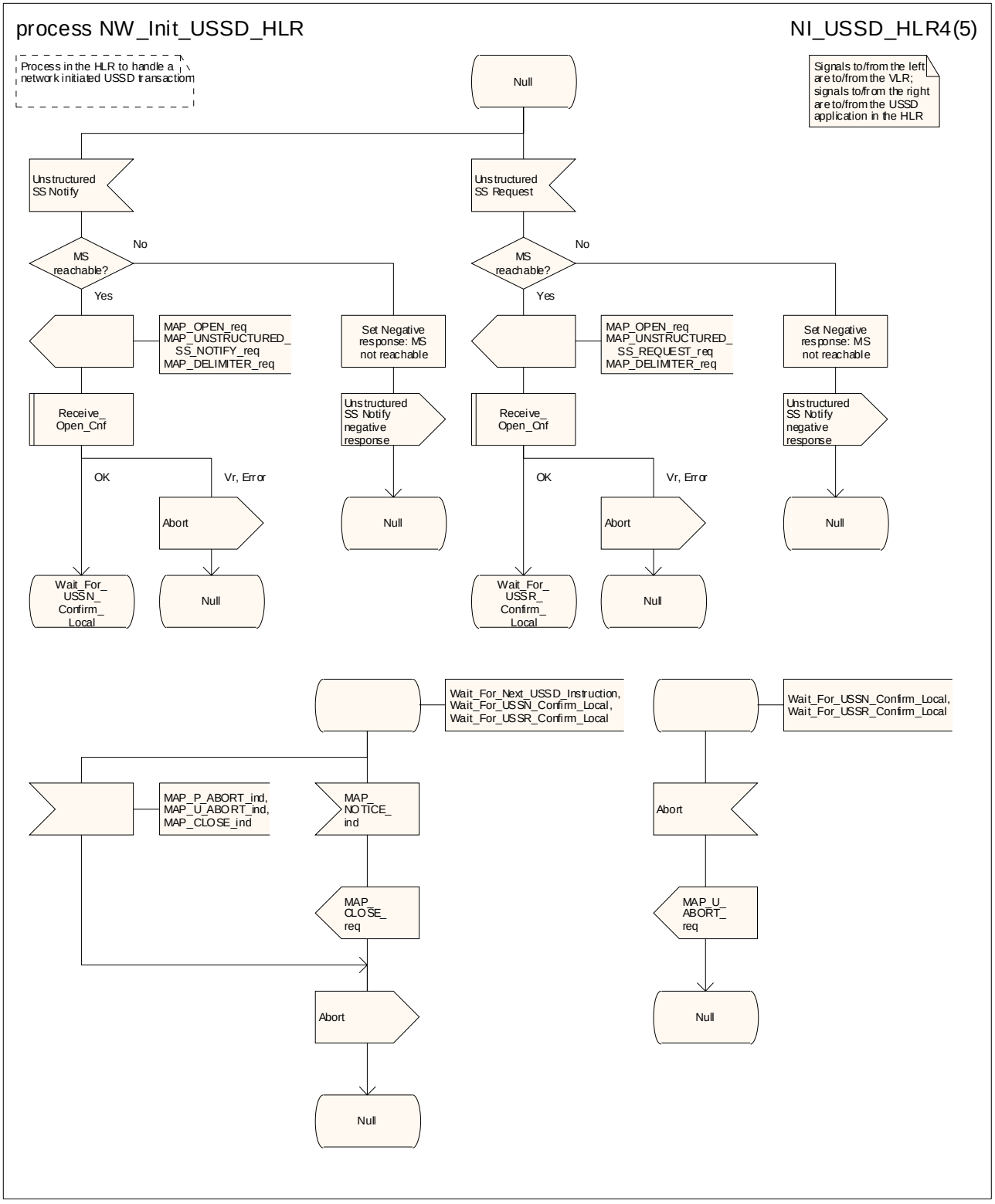
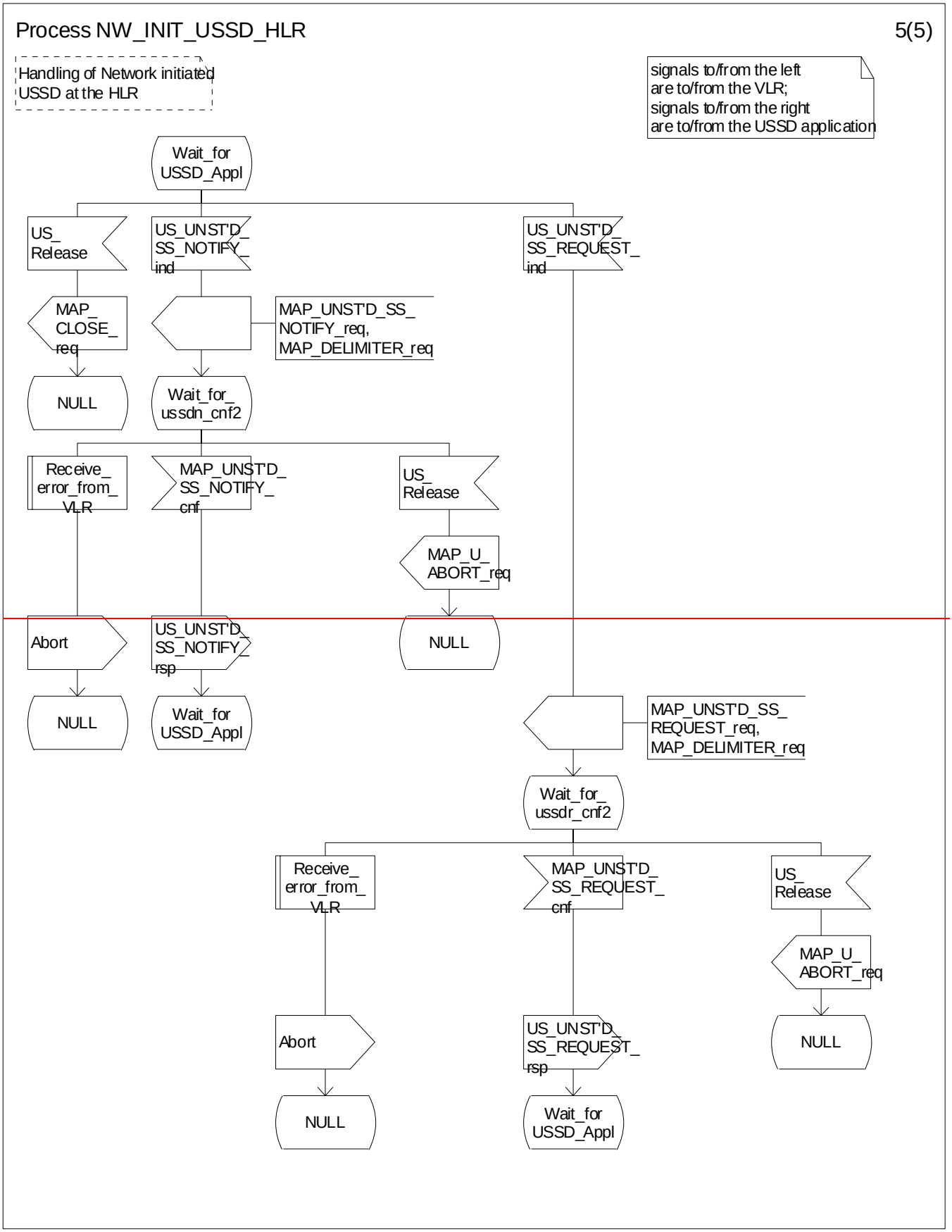


Figure 22.10.4/1 (sheet 4 of 5): Proces~~s~~~~dure~~ NW_Init_USSD_HLR

Process NW_INIT_USSD_HLR 5(5)



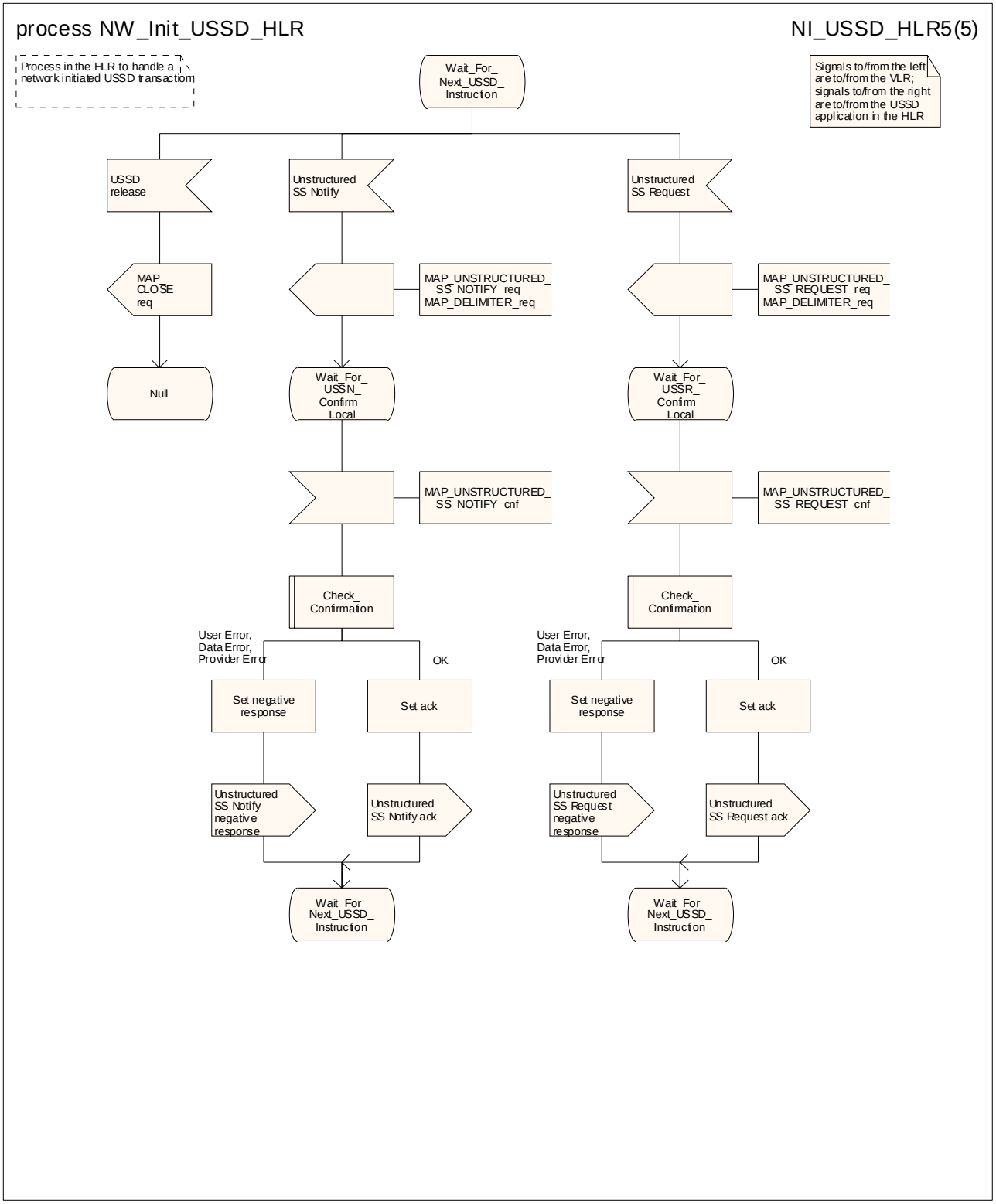
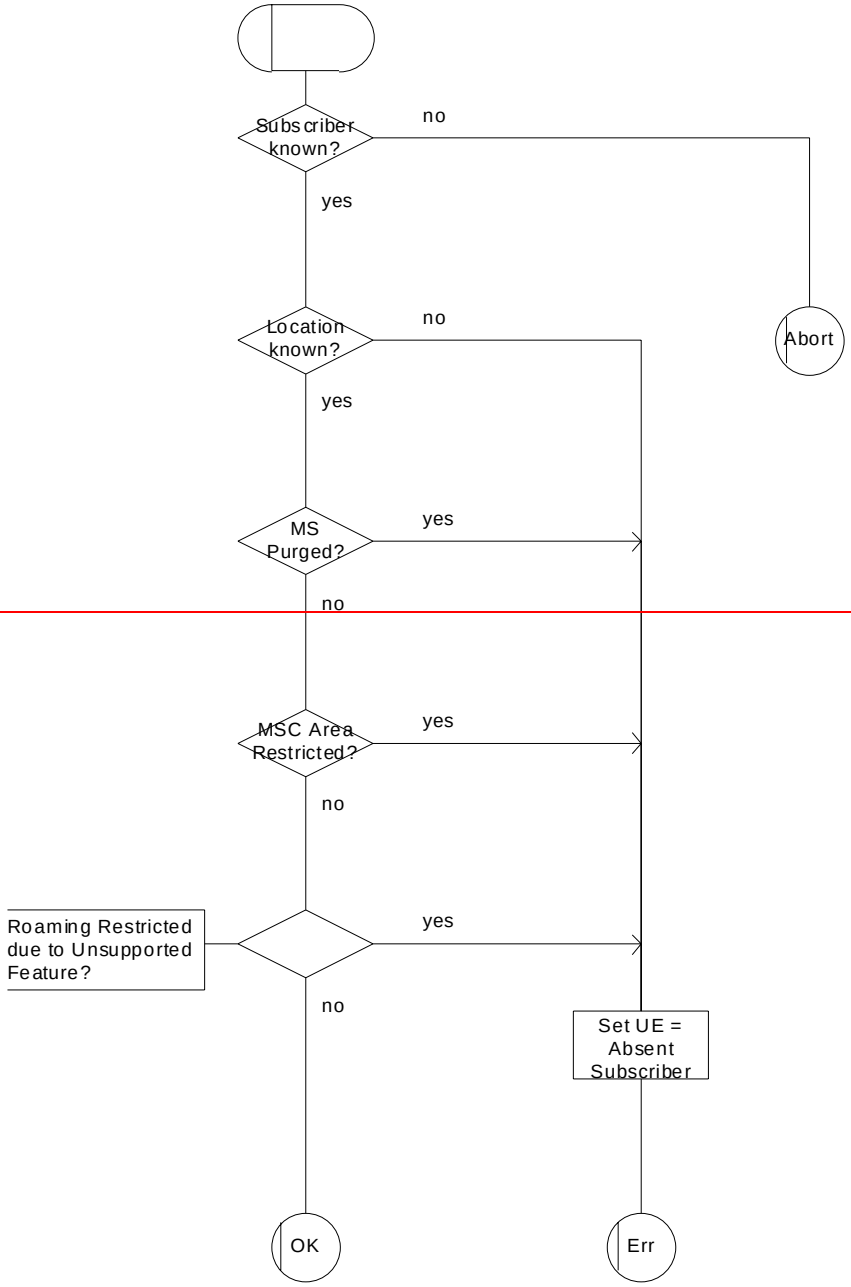


Figure 22.10.4/1 (sheet 5 of 5): Proces~~sdure~~ NW_Init_USSD_HLR

Macrodefinition Start_USSD_HLR 22.10.4_2.1(1)

Figure 22.10.4/2: Macro to check MS is reachable at the HLR for a network initiated USSD operation



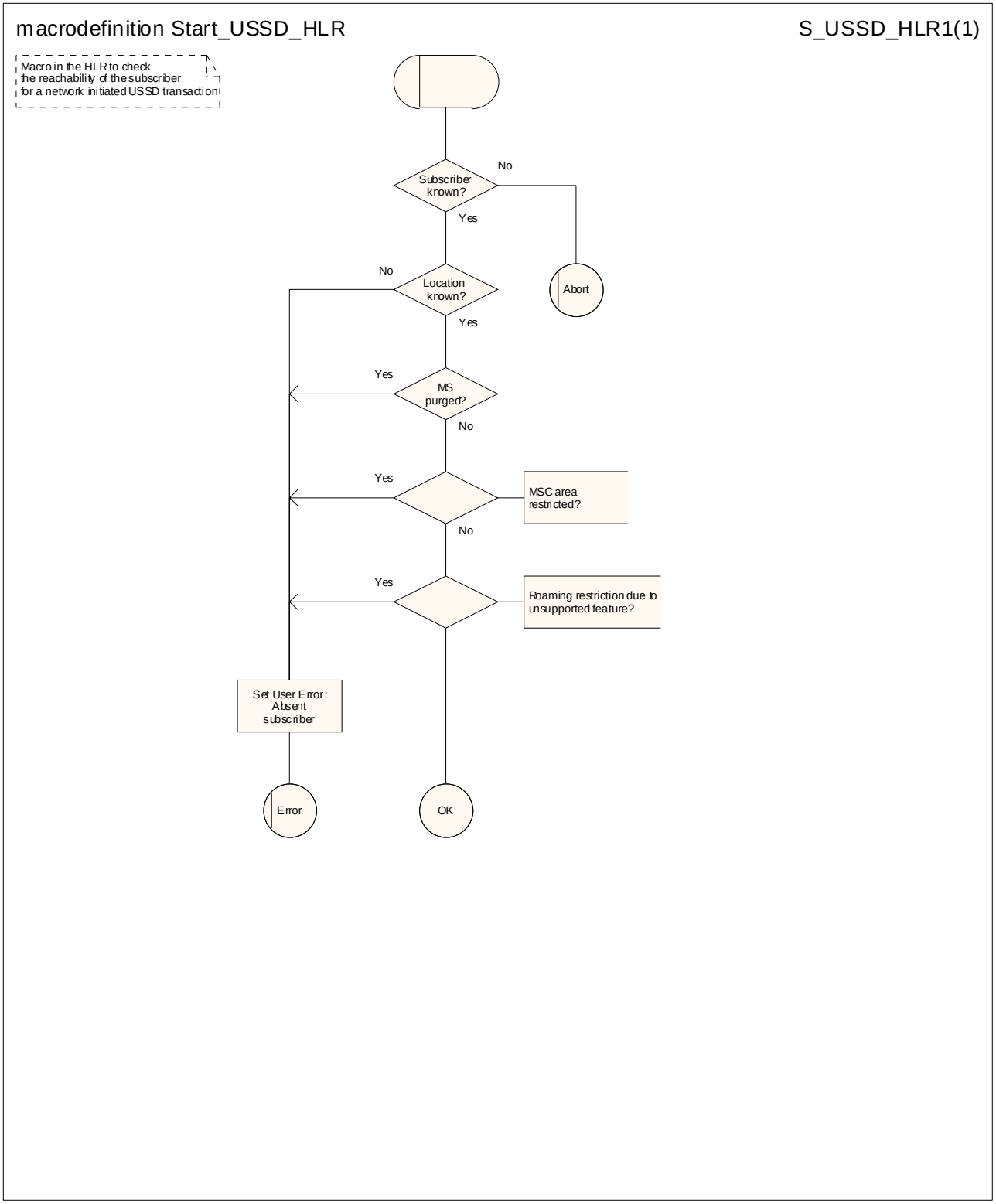
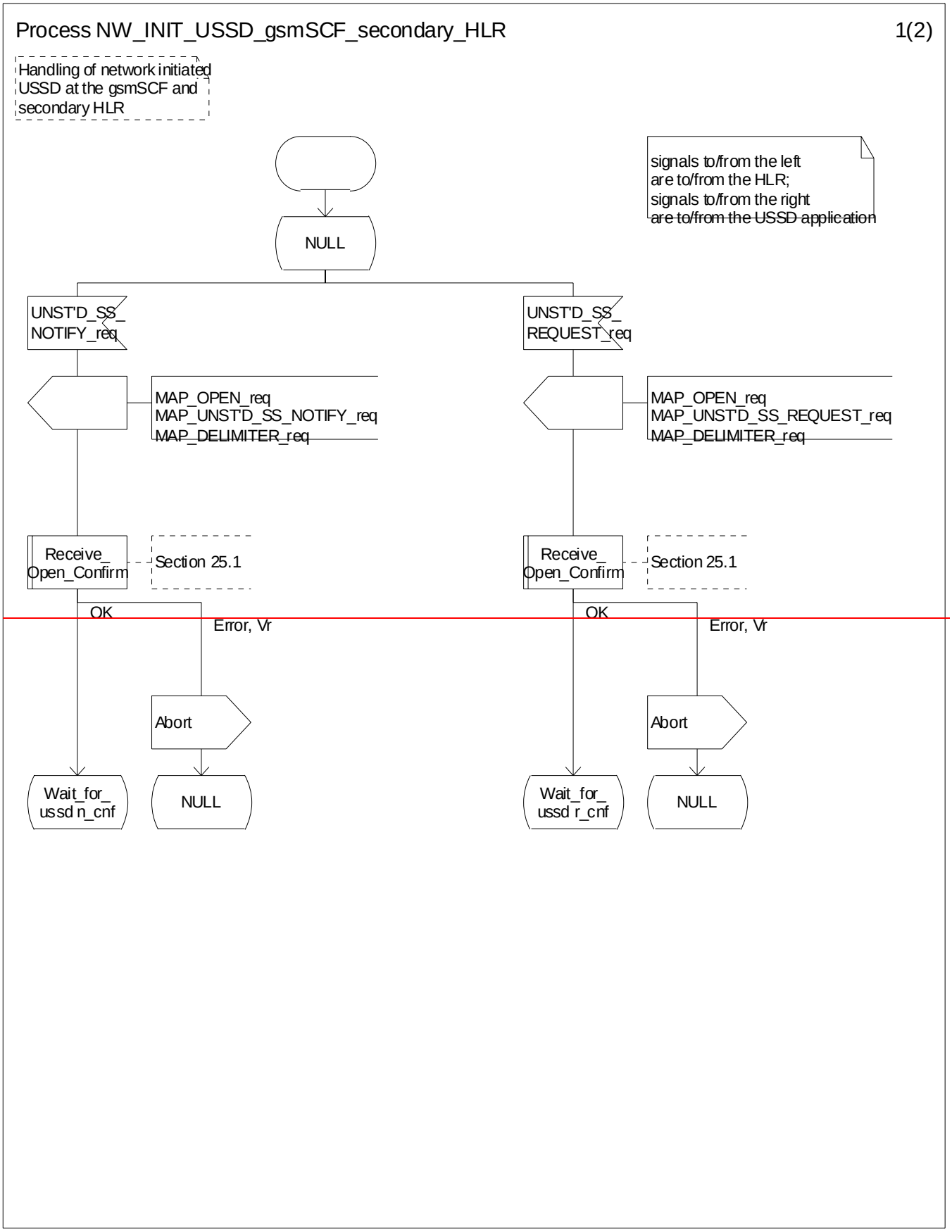


Figure 22.10.4/2: Macro Start_USSD_HLR


Process NW_INIT_USSD_gsmSCF_secondary_HLR
1(2)
Handling of network initiated USSD at the gsmSCF and secondary HLR
signals to/from the left are to/from the HLR; signals to/from the right are to/from the USSD application
NULL
UNST'D_SS_ NOTIFY_req
UNST'D_SS_ REQUEST_req
MAP_OPEN_req
MAP_UNST'D_SS_NOTIFY_req
MAP_DELIMITER_req
MAP_OPEN_req
MAP_UNST'D_SS_REQUEST_req
MAP_DELIMITER_req
Receive_ Open_Confirm
Section 25.1
Receive_ Open_Confirm
Section 25.1
OK
Error, Vr
OK
Error, Vr
Abort
Abort
Wait_for_ ussd n_cnf
NULL
Wait_for_ ussd r_cnf
NULL

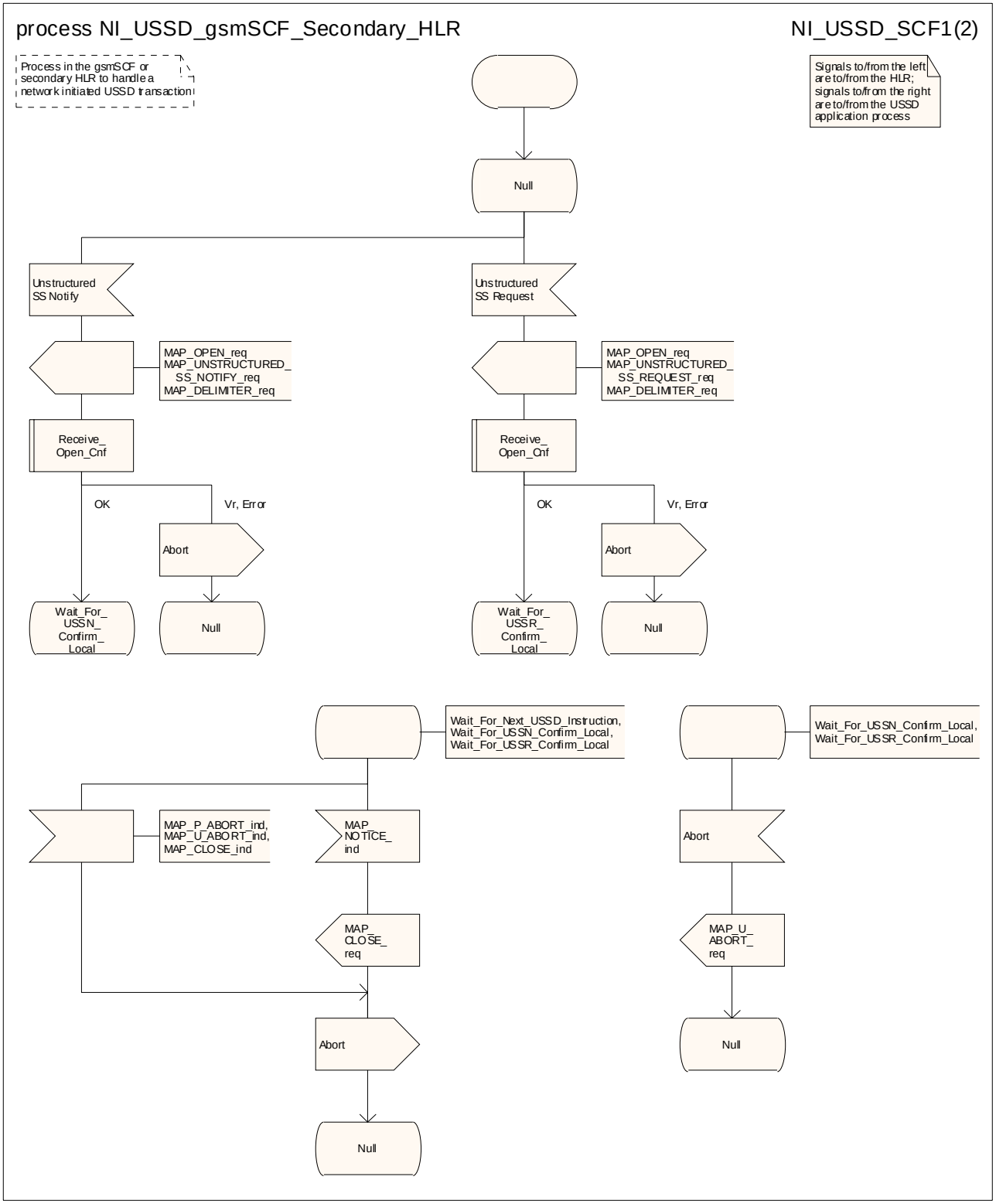
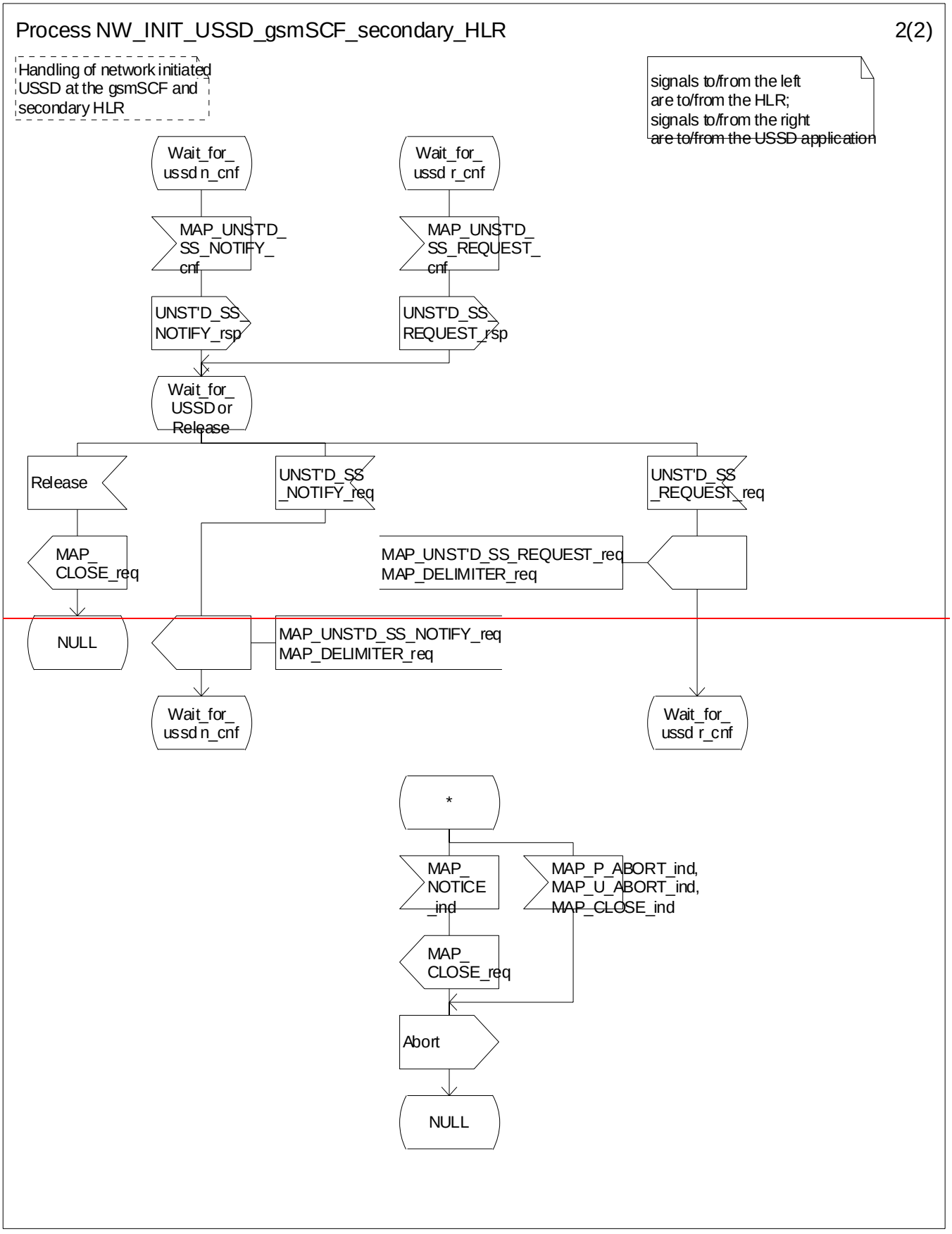


Figure 22.10.5/1 (sheet 1 of 2): Proces~~sdure~~ NW_Init_USSD_gsmSCF_secondary_HLR

Process NW_INIT_USSD_gsmSCF_secondary_HLR 2(2)



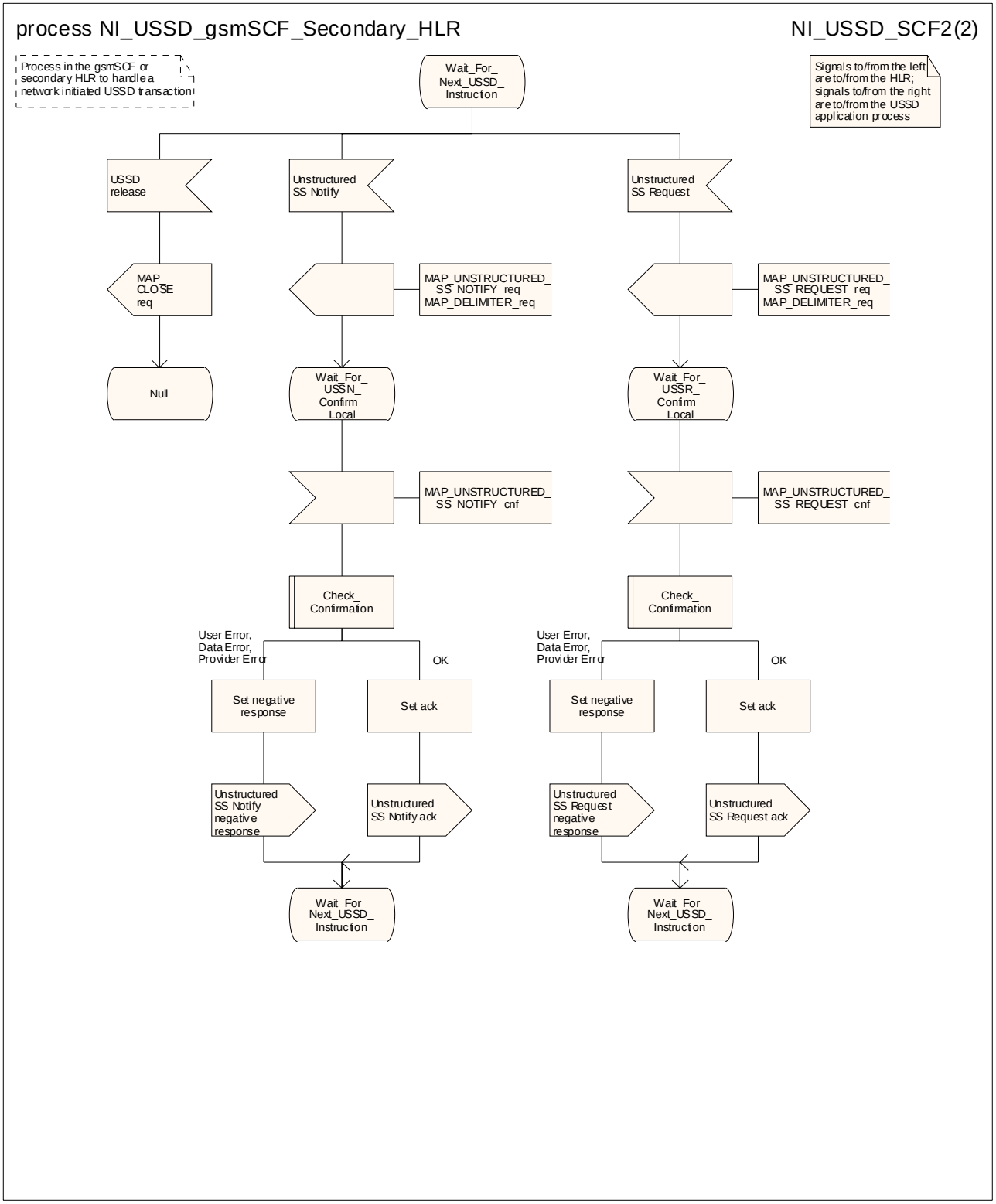


Figure 22.10.5/1 (sheet 2 of 2): Proces~~sdure~~ NW_Init_USSD_gsmSCF_secondary_HLR

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~~ shown 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 invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Check_Indication	see subclause 25.2.1.

The macro is ~~described~~ shown in figure 22.11.1/2.

22.11.2 ~~SS Error handling macros~~Void

***** CR editor's note: the SDL diagrams for most of these macros cannot be drawn with the current version of SDT, because they fail the syntax checking. The macro invocations have therefore been replaced by direct expansions in the relevant SDL process and macro diagrams (which, incidentally, leads to a net reduction in the size of this chapter!) *****

~~**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**~~

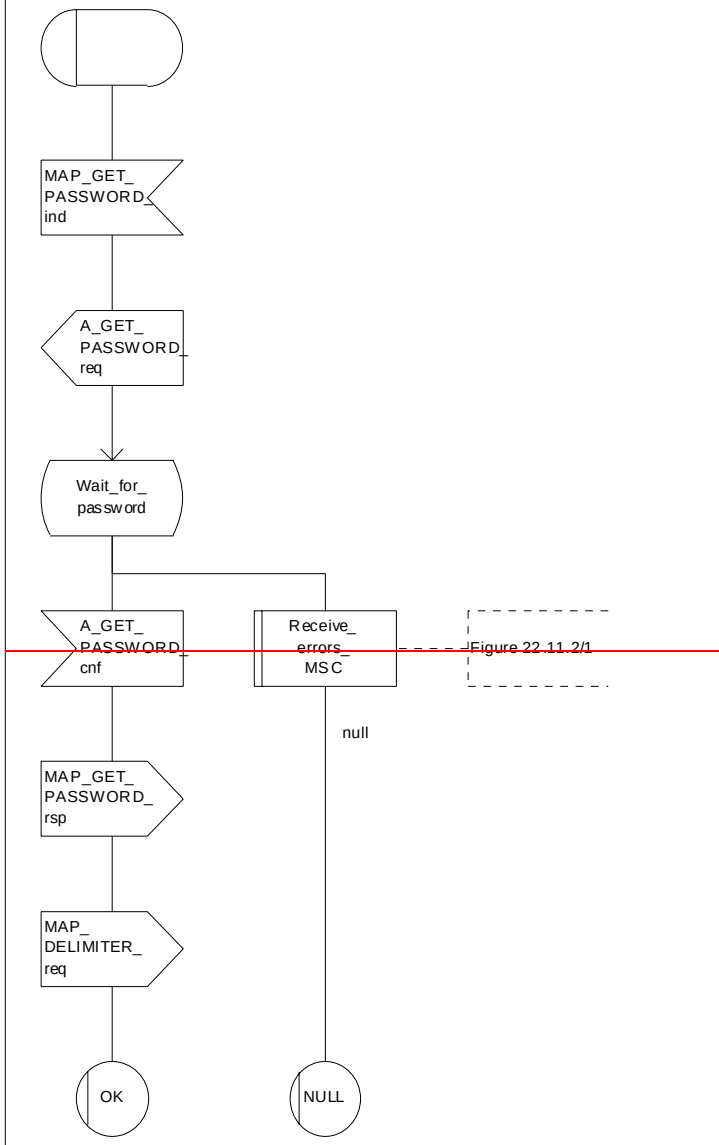
~~This macro is used by the HLR to receive signals from the VLR that should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the VLR, that connection is closed before the only outcome of the macro, "err" is reported back to the calling process. The macro is described in figure 22.11.2/4.~~

~~**Macro Receive_error_from_next_node**~~

~~This macro is used by the primary HLR to receive signals from the gsmSCF or secondary HLR that should lead to failure if received in any state of a supplementary service process. If a MAP_NOTICE indication is received from the next node, that connection is closed. The macro is described in figure 22.11.2/5.~~

Macrodefinition GET_PASSWORD_MSC 22.11.1_1(1)

Figure 22.11.1/1: Macro which relays a GetPassword request from the VLR to the MS and relays the GetPassword response from the MS to the VLR



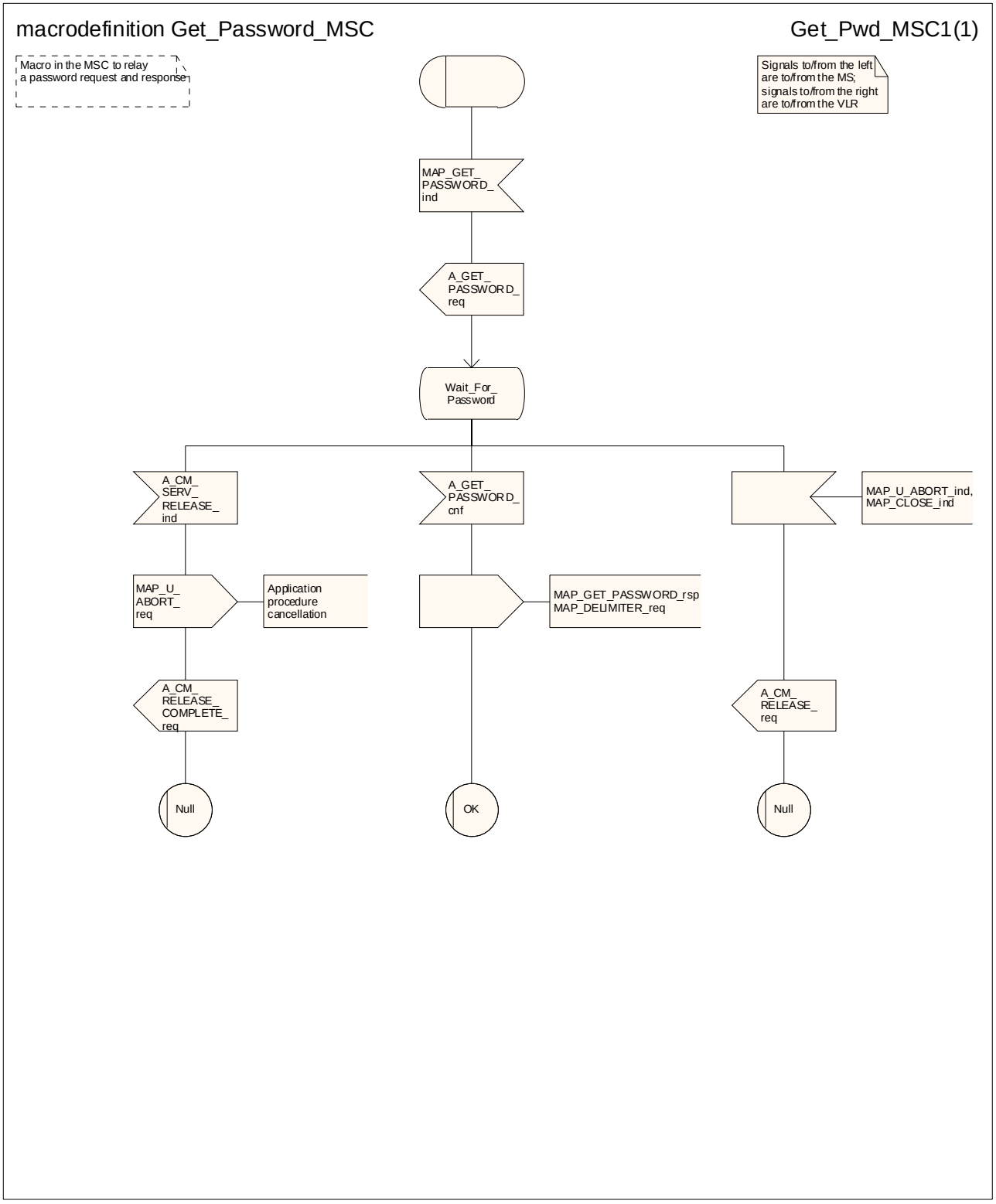
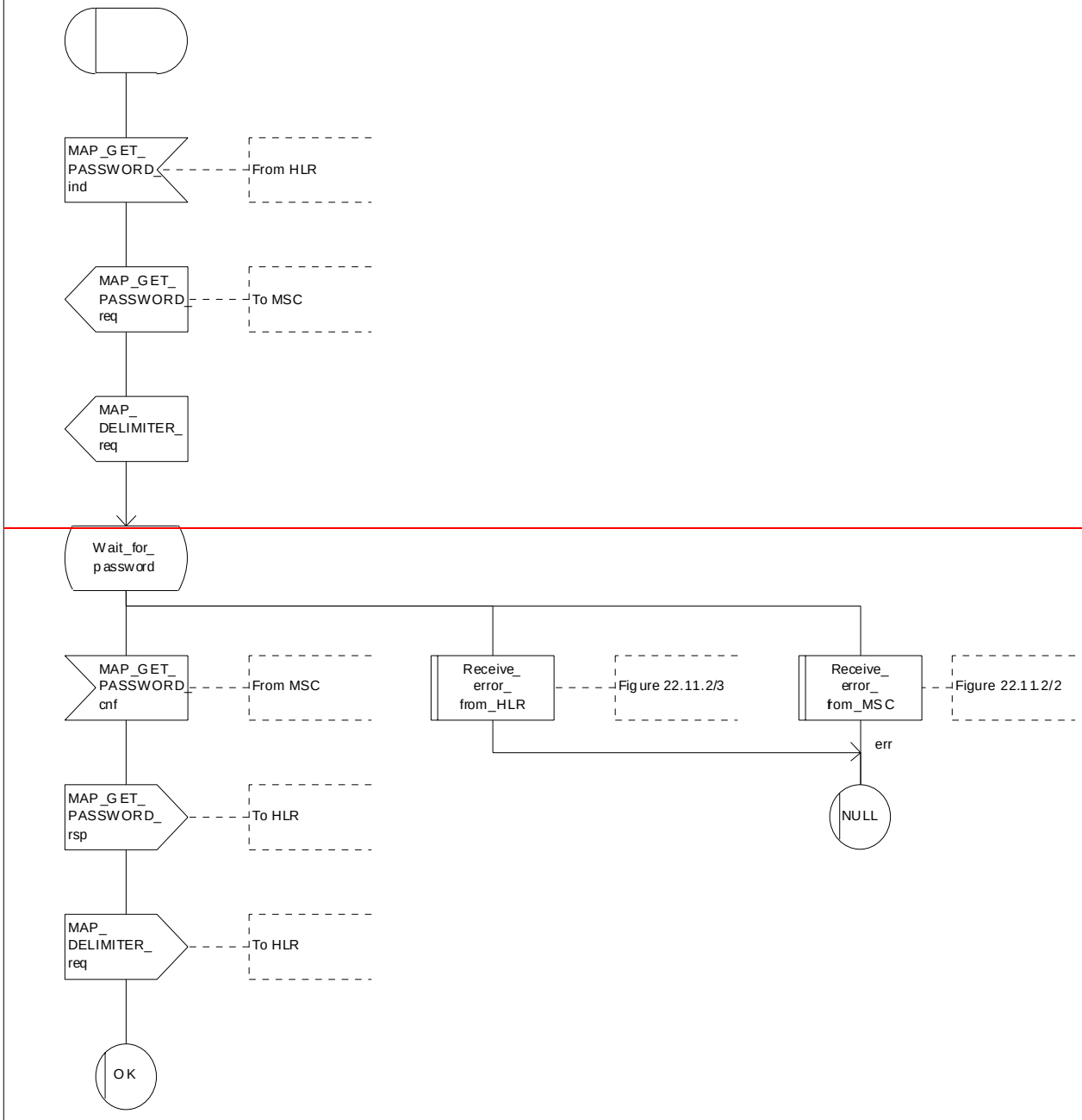


Figure 22.11.1/1: Macro Get_Password~~W~~_MSC

Macrodefinition GET_PASSWORD_VLR 22.11.1_2(1)

Figure 22.11.1/2: Macro which relay a GetPassword request from the HLR to the VLR and relays the GetPassword response from the VLR to the HLR



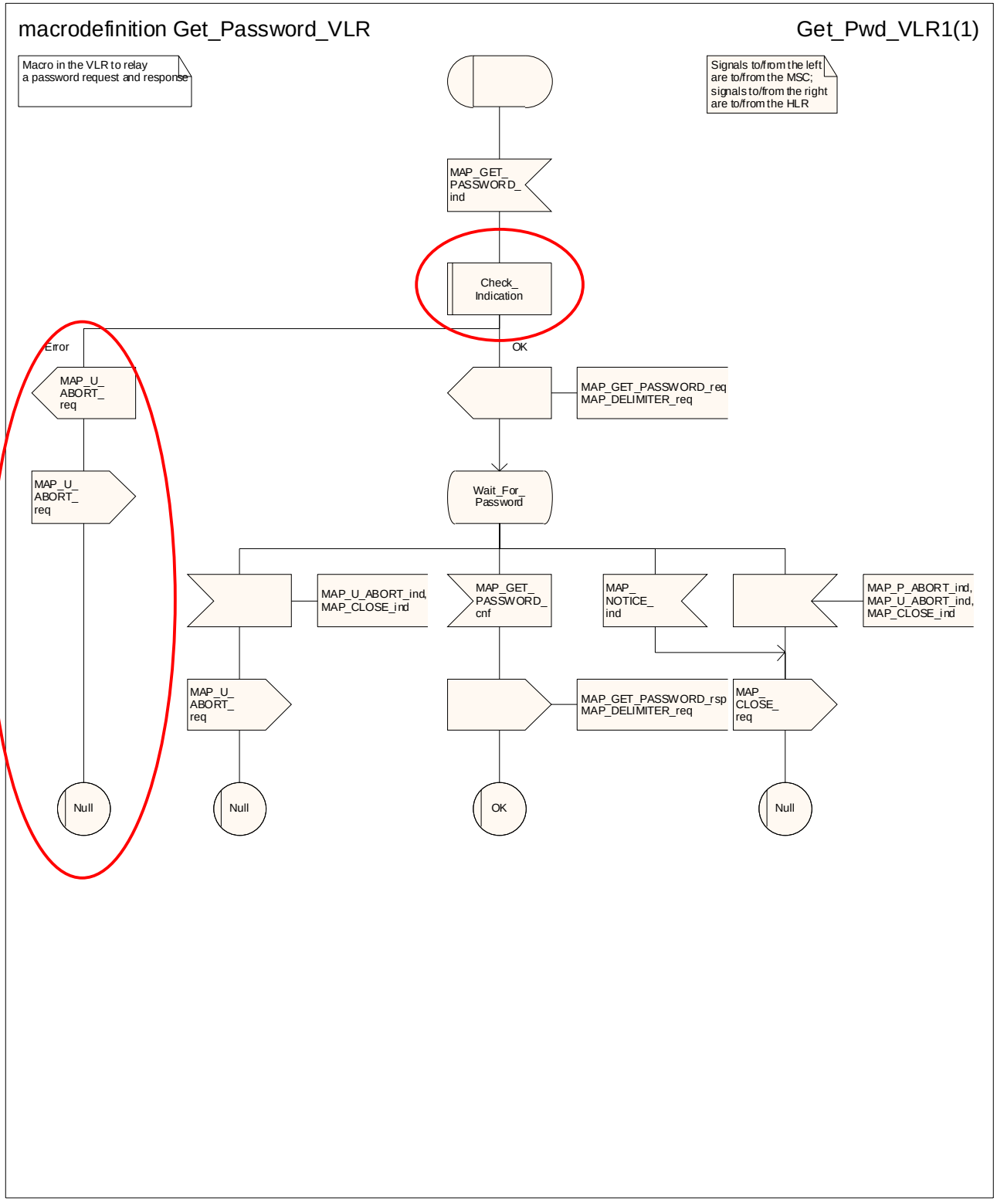
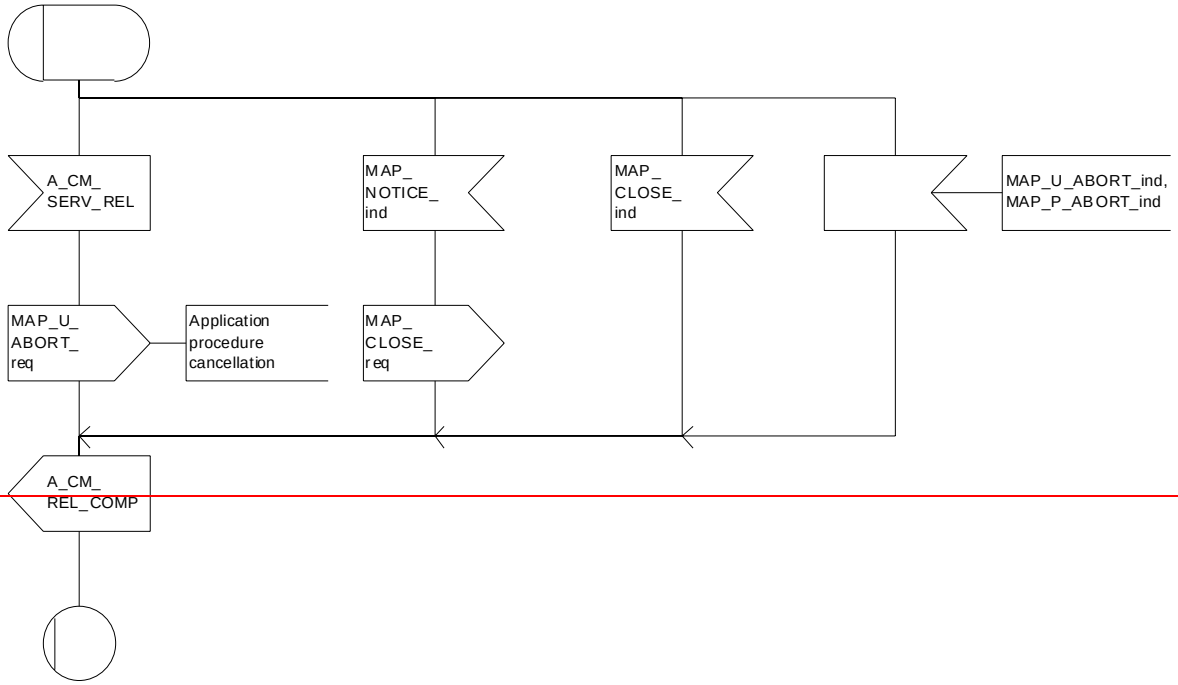


Figure 22.11.1/2: Macro Get_Password~~W~~_VLR

Macrodefinition Receive_errors_MSC 22.11.2_1(1)

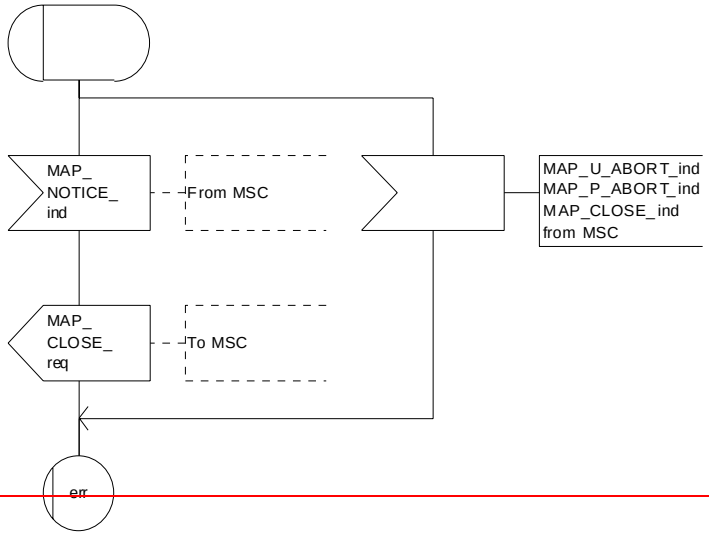
Figure 22.11.2/1: Macro which handles possible error situations while the MSC is waiting for a confirmation of a supplementary service request to the VLR



~~Figure 22.11.2/1: Macro Receive_Errors_MSC~~

Macrodefinition Receive_error_from_MSC 22.11.2_2(1)

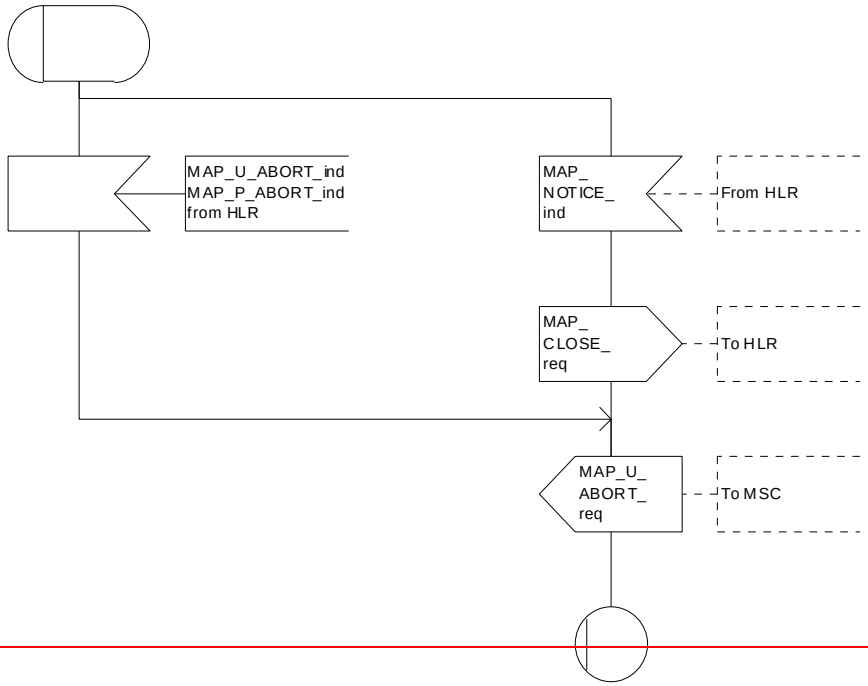
Figure 22.11.2/2: Macro to receive errors from the MSC during supplementary services procedures in the VLR



~~Figure 22.11.2/2: Macro Receive_Error_from_MSC~~

Macrodefinition Receive_error_from_HLR 22.11.2_3(1)

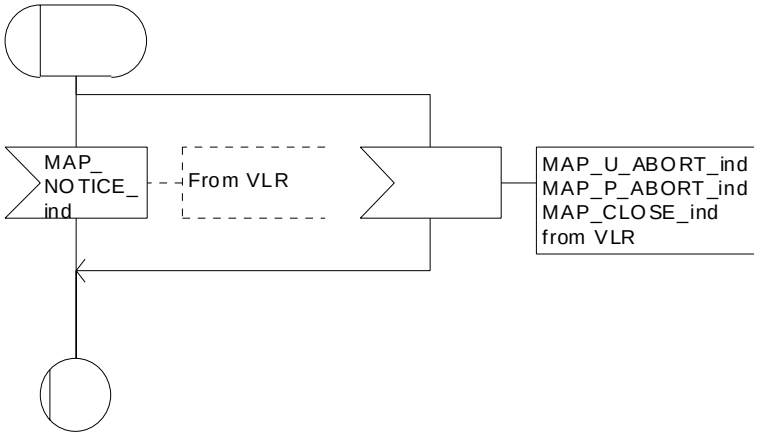
Figure 22.11.2/3: Macro to receive errors from the HLR while the VLR is waiting for a confirmation of a supplementary service request sent to the HLR



~~Figure 22.11.2/3: Macro Receive_Errors_HLR~~

Macrodefinition Receive_error_from_VLR 22.11.2_4(1)

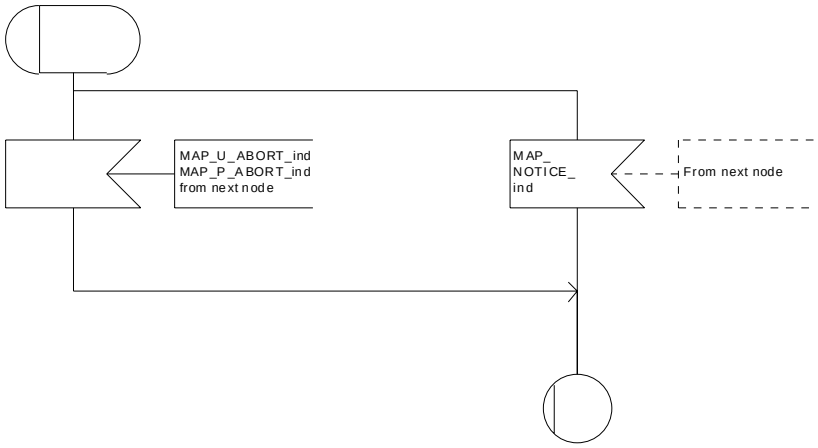
Figure 22.11.2/4: Macro to receive errors from the VLR during supplementary services procedures in the HLR



~~Figure 22.11.2/4: Macro Receive_error_from_VLR~~

Macrodefinition Receive_error_from_next_node 22.11.2_5(1)

Figure 22.11.2/5: Macro to receive errors from the next node while the HLR is waiting for a confirmation of a supplementary service request sent to the next node



~~Figure 22.11.2/5: Macro Receive_error_from_next_node~~

22.12 Supplementary Service Invocation Notification procedure

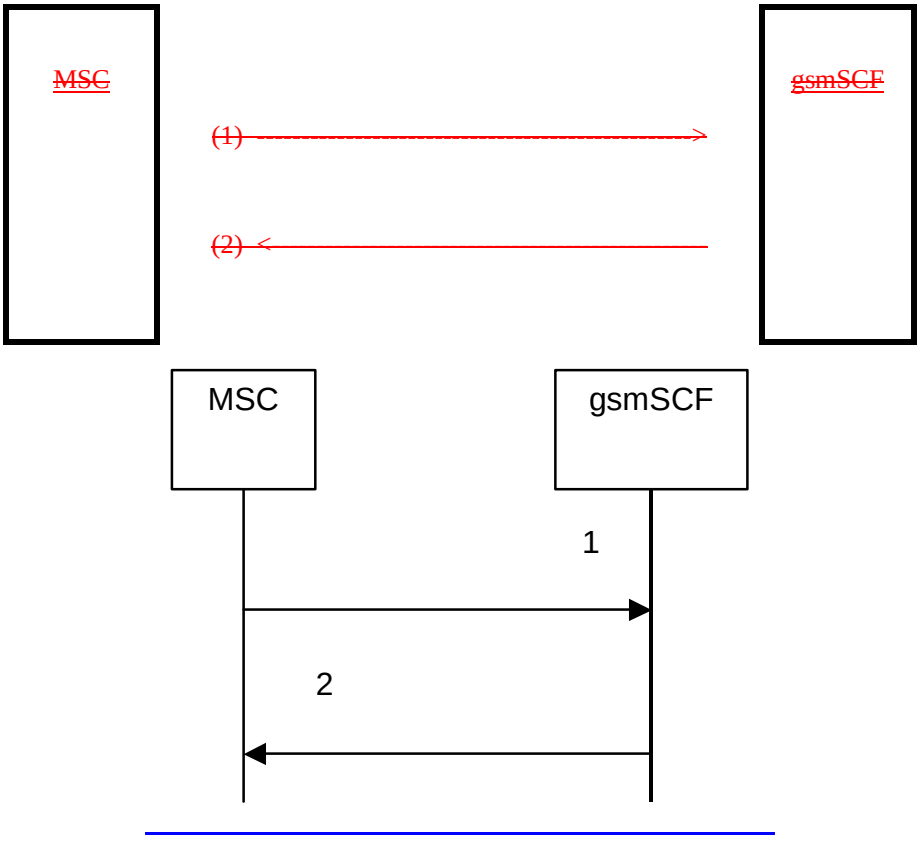
22.12.1 General

The Supplementary Service Invocation Notification procedure is used to notify a gsmSCF about the invocation of a GSM Supplementary Service.

The supplementary service invocation notification password registration procedure is shown in figure 22.12.1/1.

The following service is mcertainly be used:

MAP_SS_INVOCATION_NOTIFY (defined in clause 11).



1) MAP_SS_INVOCATION_NOTIFY_req/ind
2) MAP_SS_INVOCATION_NOTIFY_rsp/cnf

(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 servicesMessage flow for supplementary service invocation notification

22.12.2 Procedures in the MSC

The MAP process invokes macros not defined in this clause; the definition of these macros can be found as follows:

Receive_Open_Cnf see subclause 25.1.2;

Check_Confirmation see subclause 25.2.2.

The supplementary service invocation notification processdure 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 via the MAP_SUPPLEMENTARY_SERVICE_INVOCATION_NOTIFICATION service. This is sent in a TCAP TC-BEGIN primitive. The MSC then awaits a positive or negative acknowledgement from the gsmSCF to the MAP-SUPPLEMENTARY_SERVICE_INVOCATION_NOTIFICATION. This is received in a TCAP TC_END primitive, and upon receipt the relationship between the MSC and the gsmSCF is terminated. Similarly, the relationship is terminated at the MSC by the sending of or receipt of a TCAP P_ABORT primitive. This is illustrated~~shown in figure 22.12.2/1.

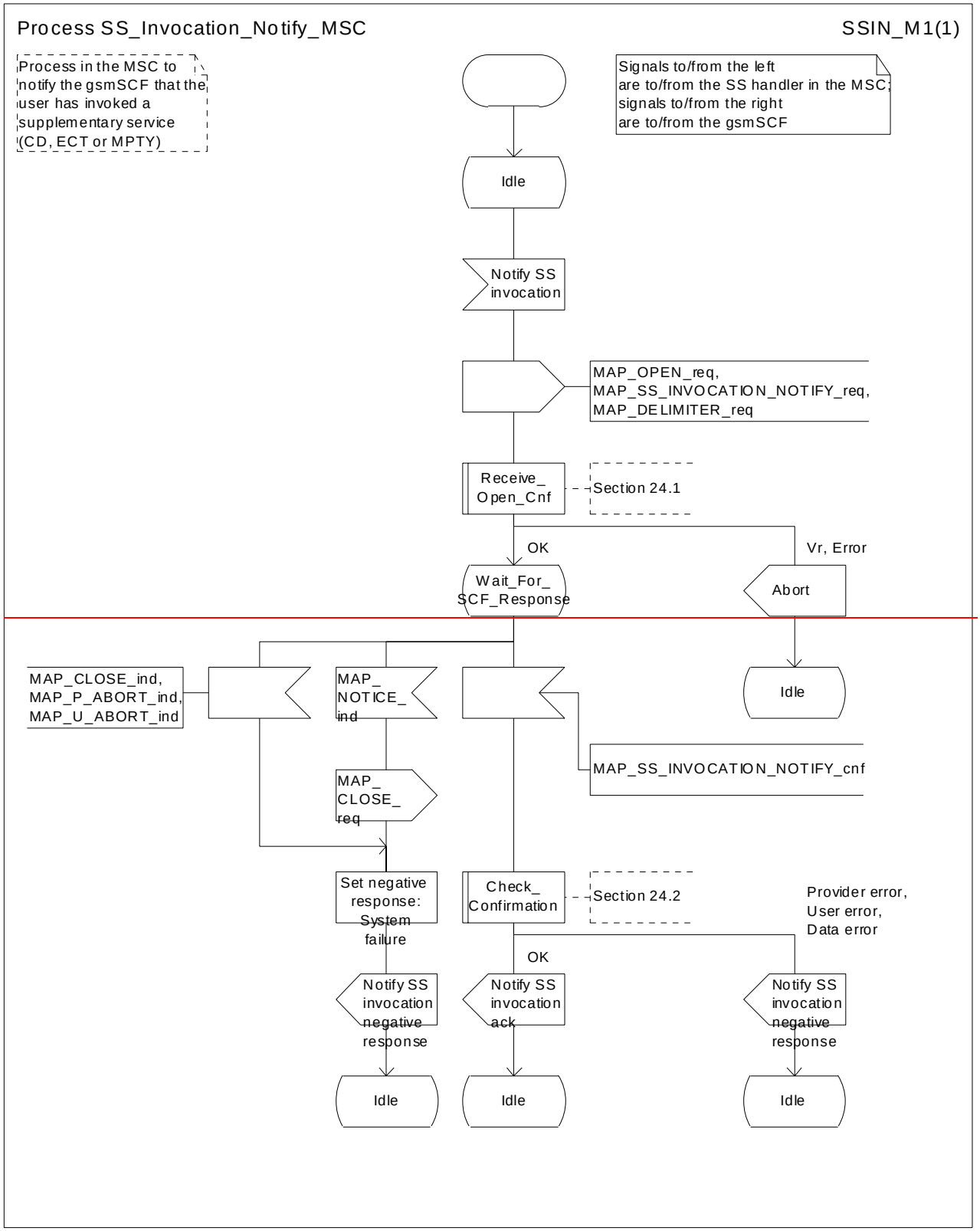
22.12.3 Procedures in the gsmSCF

The MAP process invokes a macro not defined in this clause; the definition of this macro can be found as follows:

Receive_Open_Ind see subclause 25.1.1.

~~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 MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION service then it returns a positive acknowledgement to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION, indicating the success of the service. This is returned in a TCAP TC-END primitive, using the basic end procedure.~~

~~Otherwise, a negative acknowledgement to the MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION is returned. This is also returned in a TCAP TC-END primitive, again using the basic end procedure. The gsmSCF TCAP service may also choose to abort the relationship to the MSC by sending a TCAP P-ABORT primitive. It will immediately terminate processing of a MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION should a TCAP P-ABORT primitive be received from the MSC. This is illustrated~~The supplementary service invocation notification process in thegsmSCF is shown in figure 22.12.3/1.


Process SS_Invocation_Notify_MSC
SSIN_M1(1)
Process in the MSC to notify the gsmSCF that the user has invoked a supplementary service (CD, ECT or MPTY)
Signals to/from the left are to/from the SS handler in the MSC; signals to/from the right are to/from the gsmSCF
Idle
Notify SS invocation
MAP_OPEN_req, MAP_SS_INVOCATION_NOTIFY_req, MAP_DELIMITER_req
Receive_ Open_Cnf
Section 24.1
OK
Vr, Error
Wait_For_ SCF_Response
Abort
MAP_CLOSE_ind, MAP_P_ABORT_ind, MAP_U_ABORT_ind
MAP_ NOTICE_ ind
Idle
MAP_SS_INVOCATION_NOTIFY_cnf
MAP_ CLOSE_ req
Set negative response: System failure
Check_ Confirmation
Section 24.2
Provider error, User error, Data error
OK
Notify SS invocation negative response
Notify SS invocation ack
Notify SS invocation negative response
Idle
Idle
Idle

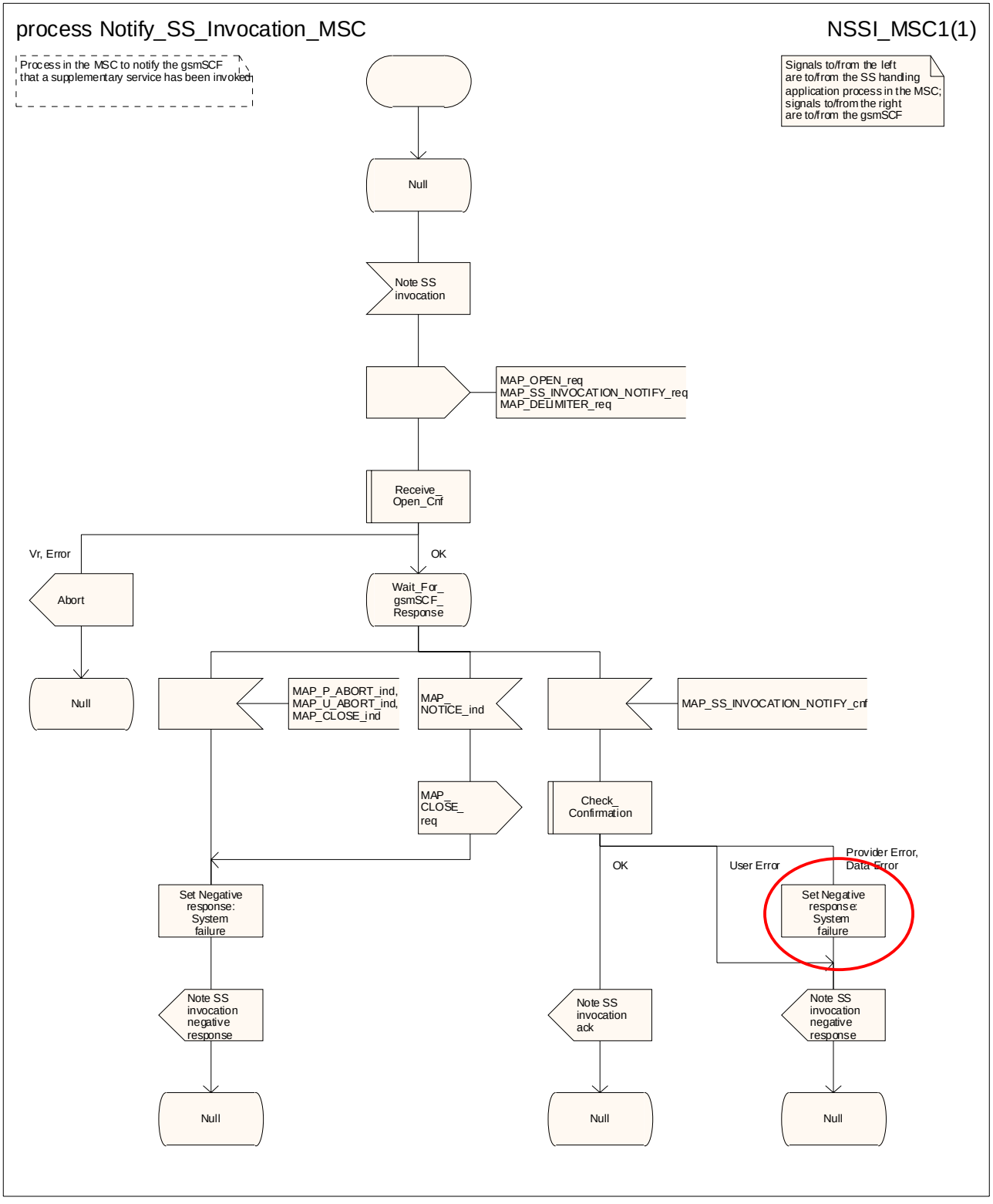
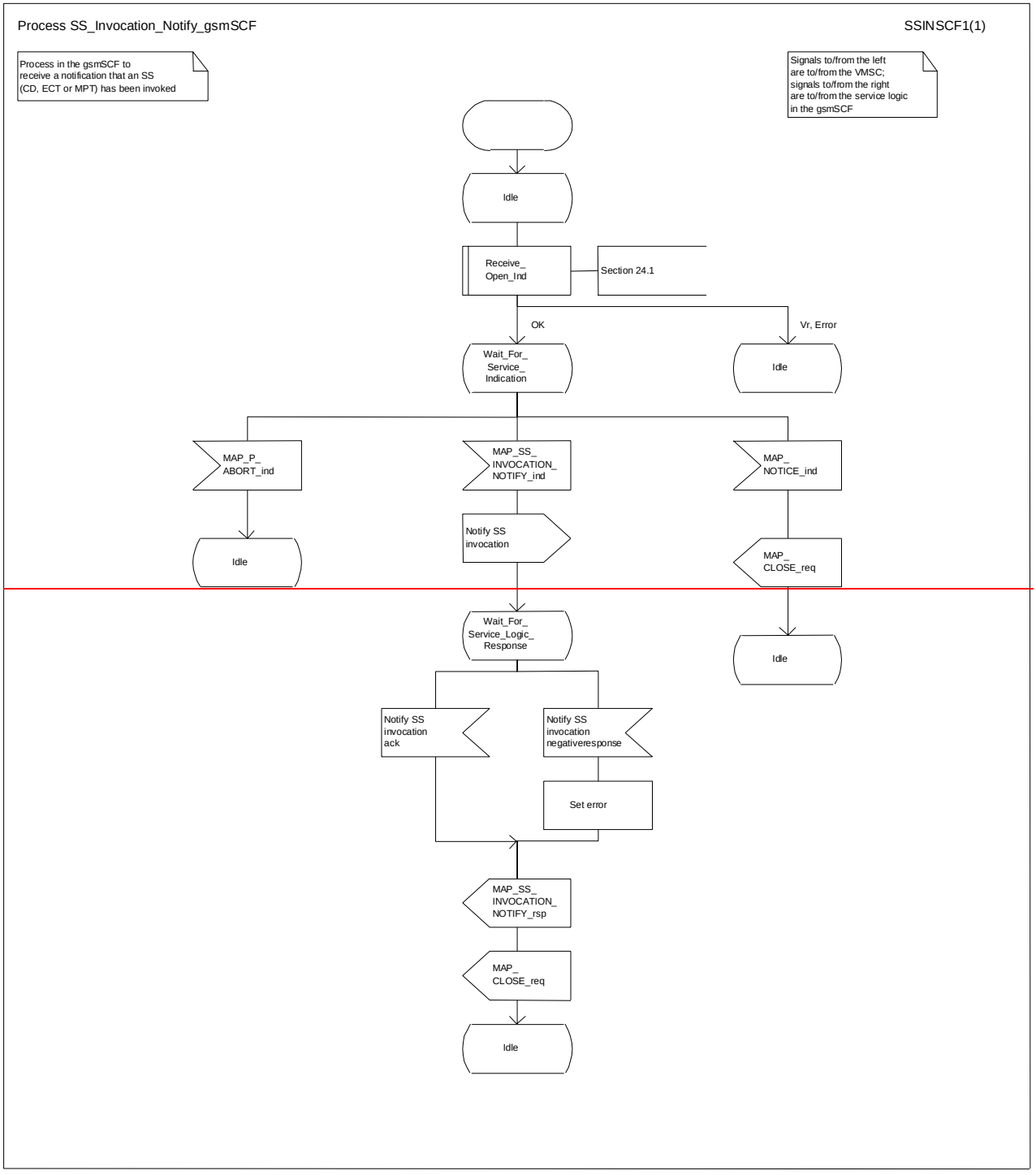


Figure 22.12.2/1: Process Notify_SS_Invocation_~~Notify_~~MSC (sheet 1 of 1)


Process SS_Invocation_Notify_gsmSCF
SSINSCF1(1)
Process in the gsmSCF to receive a notification that an SS (CD, ECT or MPT) has been invoked
Signals to/from the left are to/from the VMSC; signals to/from the right are to/from the service logic in the gsmSCF
Idle
Receive_ Open_Ind
Section 24.1
OK
Vr, Error
Wait_For_ Service_ Indication
Idle
MAP_P_ ABORT_ind
MAP_SS_ INVOCATION_ NOTIFY_ind
MAP_ NOTICE_ind
Idle
Notify SS invocation
MAP_ CLOSE_req
Wait_For_ Service_Logic_ Response
Idle
Notify SS invocation ack
Notify SS invocation negativeresponse
Set error
MAP_SS_ INVOCATION_ NOTIFY_rsp
MAP_ CLOSE_req
Idle

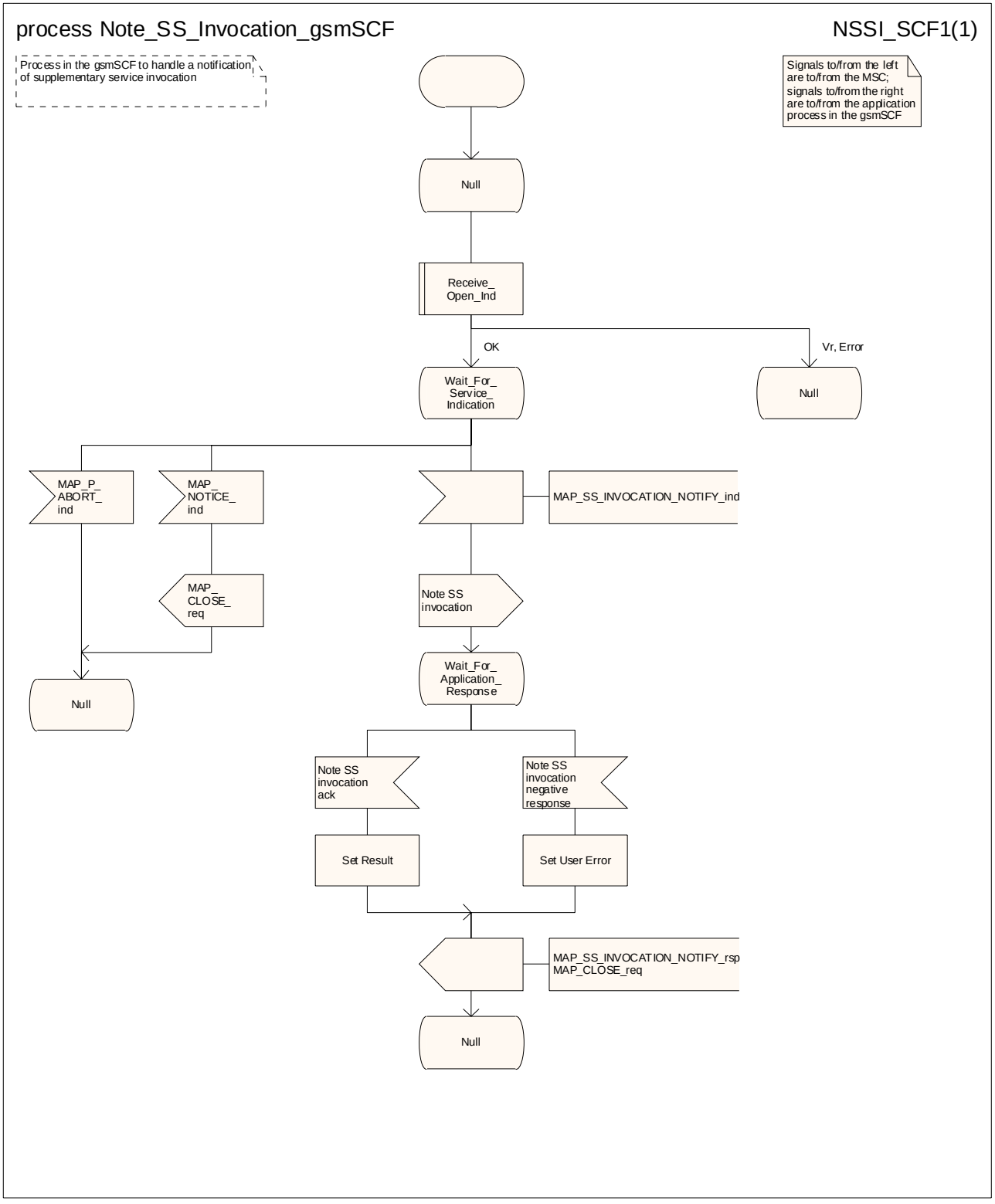
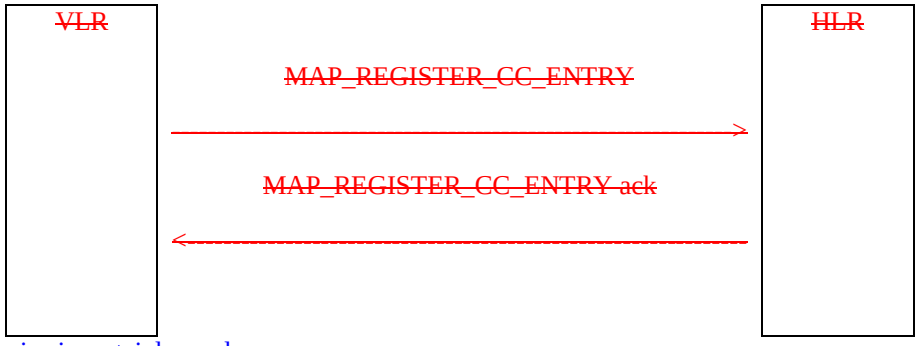


Figure 22.12.3/1: Process Note_SS_Invocation_~~Notify_~~gsmSCF (sheet 1 of 1)

22.13 Activation of a CCBS request

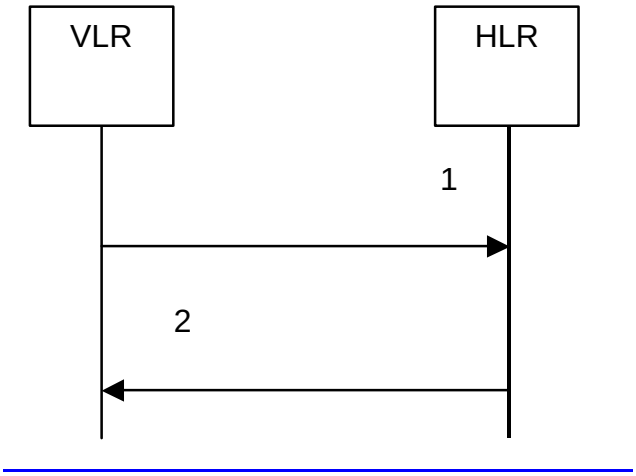
22.13.1 General

The message flow to activate a CCBS request is shown in figure 22.13.1/1.



The following service is certainly used:

MAP_REGISTER_CC_ENTRY (defined in clause 11).



1) MAP_REGISTER_CC_ENTRY req/ind
2) MAP_REGISTER_CC_ENTRY rsp/cnf

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 clause; 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.~~

22.13.3 Procedure in the HLR

The MAP process in the HLR to activate a CCBS request is shown in figure 22.13.2/1.

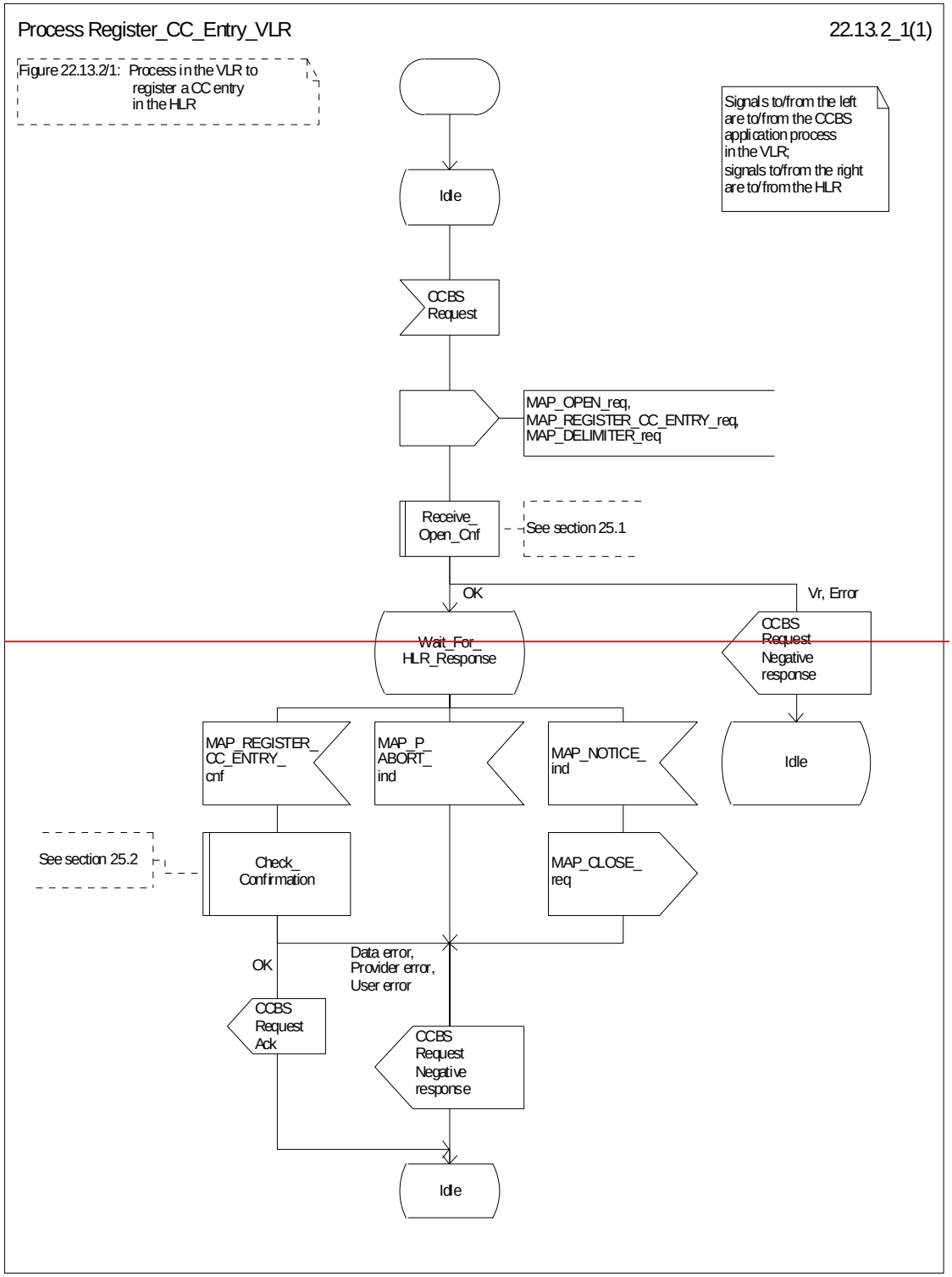
~~**Successful outcome**~~

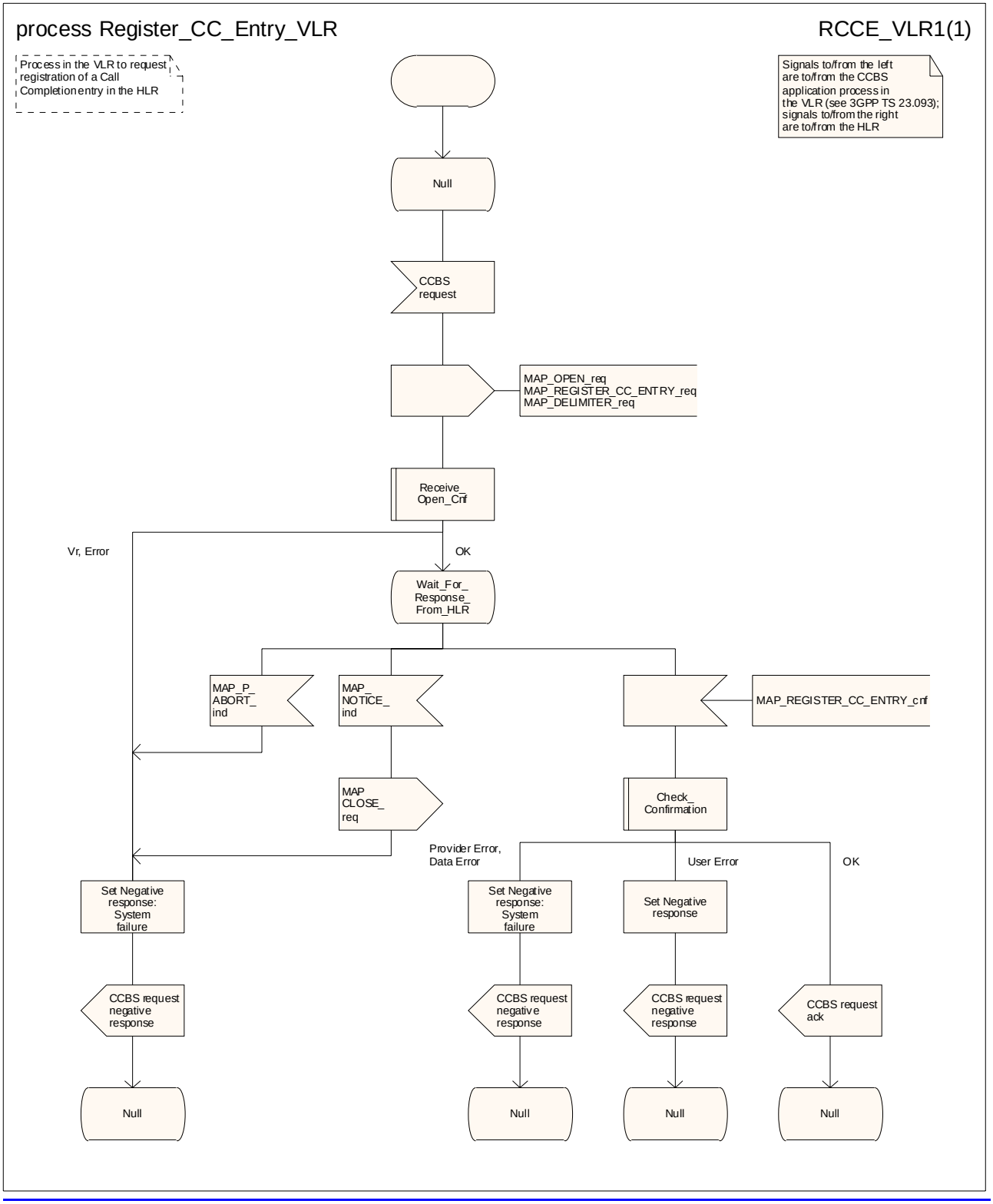
~~When the MAP process receives a MAP_REGISTER_CC_ENTRY_indication from the co-ordinating process, it sends a CCBS Request message to the CCBS application process in the HLR, and waits for a response. The request contains the parameters received in the MAP_REGISTER_CC_ENTRY service indication.~~

~~If the CCBS application process in the HLR returns a positive response, the MAP process constructs a MAP_REGISTER_CC_ENTRY service response, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.~~

~~**Negative response from HLR CCBS application process**~~

~~If the CCBS application process in the HLR returns a negative response, the MAP process constructs a MAP_REGISTER_CC_ENTRY service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.~~


Process Register_CC_Entry_VLR
22.13.2_1(1)
Figure 22.13.2/1: Process in the VLR to register a CC entry in the HLR
Signals to/from the left are to/from the CCBS application process in the VLR;
signals to/from the right are to/from the HLR
Idle
CCBS Request
MAP_OPEN_req,
MAP_REGISTER_CC_ENTRY_req,
MAP_DELIMITER_req
Receive_ Open_Cnf
See section 25.1
OK
Vr, Error
Wait_For_ HLR_Response
CCBS Request Negative response
MAP_REGISTER_ CC_ENTRY_ cnf
MAP_P_ ABORT_ ind
MAP_NOTICE_ ind
Idle
See section 25.2
Check_ Confirmation
MAP_CLOSE_ req
OK
Data error, Provider error, User error
CCBS Request Ack
CCBS Request Negative response
Idle


process Register_CC_Entry_VLR
RCCE_VLR1(1)
Process in the VLR to request registration of a Call Completion entry in the HLR
Signals to/from the left are to/from the CCBS application process in the VLR (see 3GPP TS 23.093); signals to/from the right are to/from the HLR
Null
CCBS request
MAP_OPEN_req
MAP_REGISTER_CC_ENTRY_req
MAP_DELIMITER_req
Receive_ Open_Cnf
Vr, Error
OK
Wait_For_ Response_ From_HLR
MAP_P_ ABORT_ ind
MAP_ NOTICE_ ind
MAP_REGISTER_CC_ENTRY_cnf
MAP CLOSE_ req
Check_ Confirmation
Provider Error, Data Error
User Error
OK
Set Negative response: System failure
Set Negative response: System failure
Set Negative response
CCBS request negative response
CCBS request negative response
CCBS request negative response
CCBS request ack
Null
Null
Null
Null

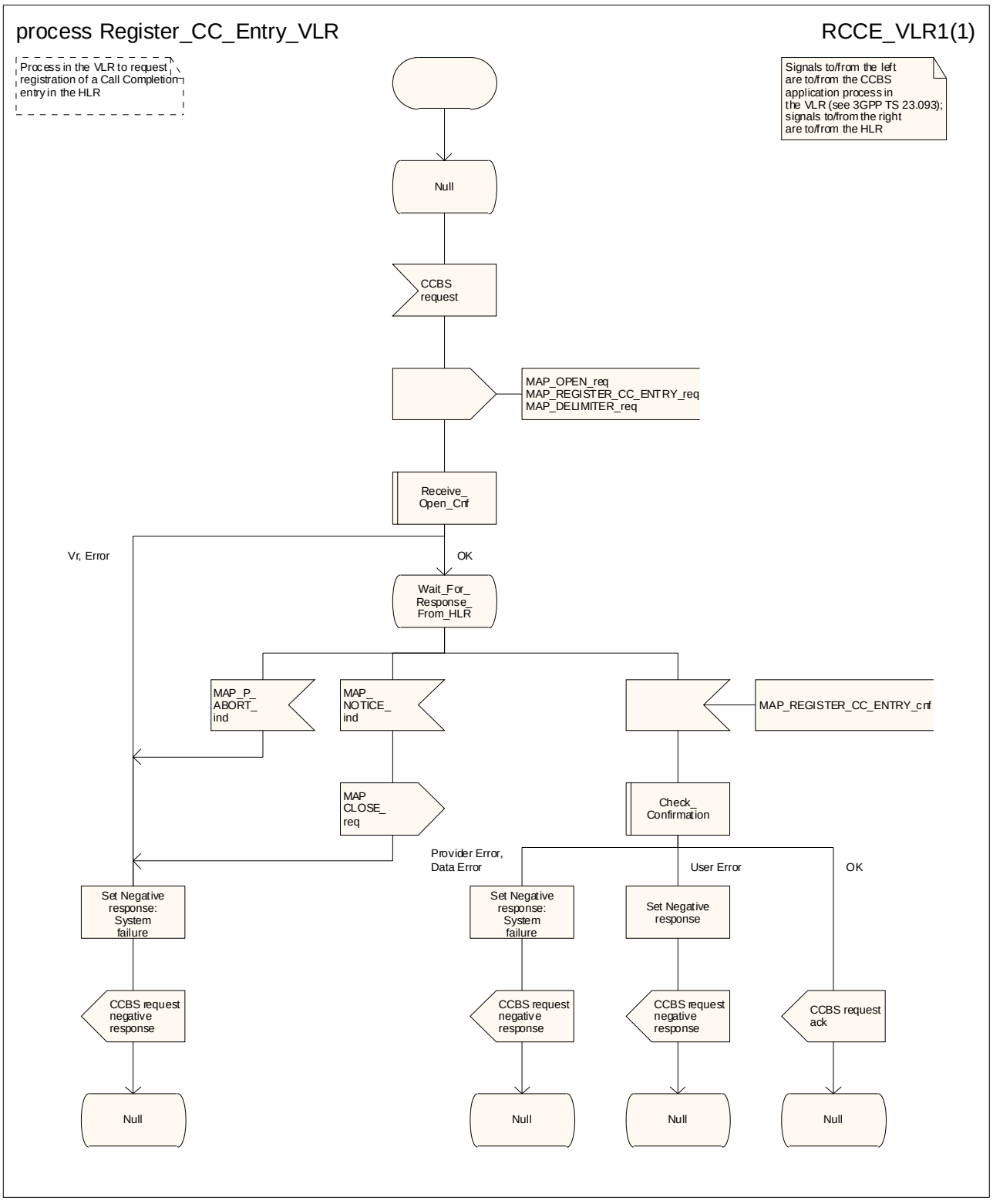
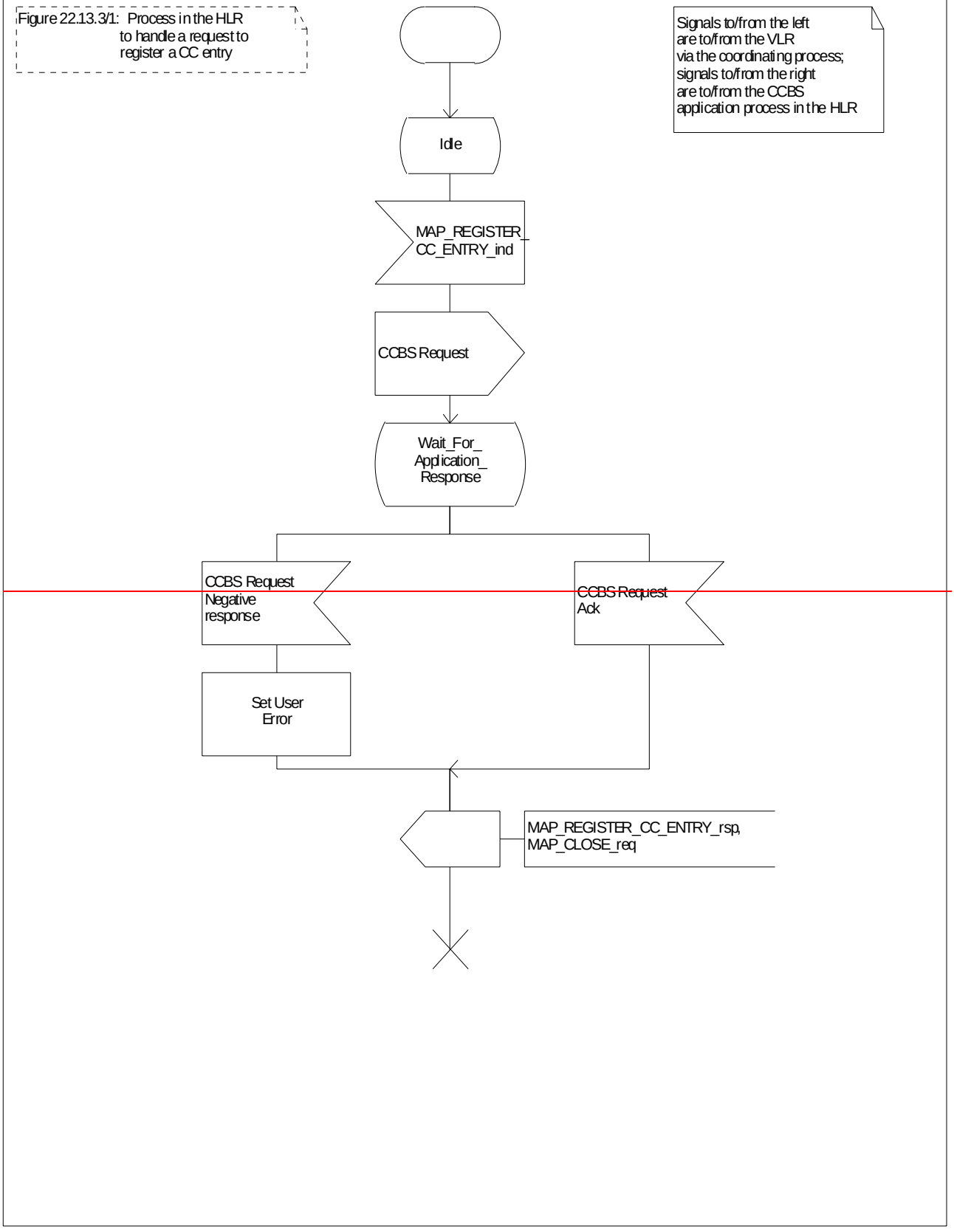


Figure 22.13.2/1: Process Register_CC_Entry_VLR

Process Register_CC_Entry_HLR 22.13.3_1(1)

Figure 22.13.3/1: Process in the HLR to handle a request to register a CC entry



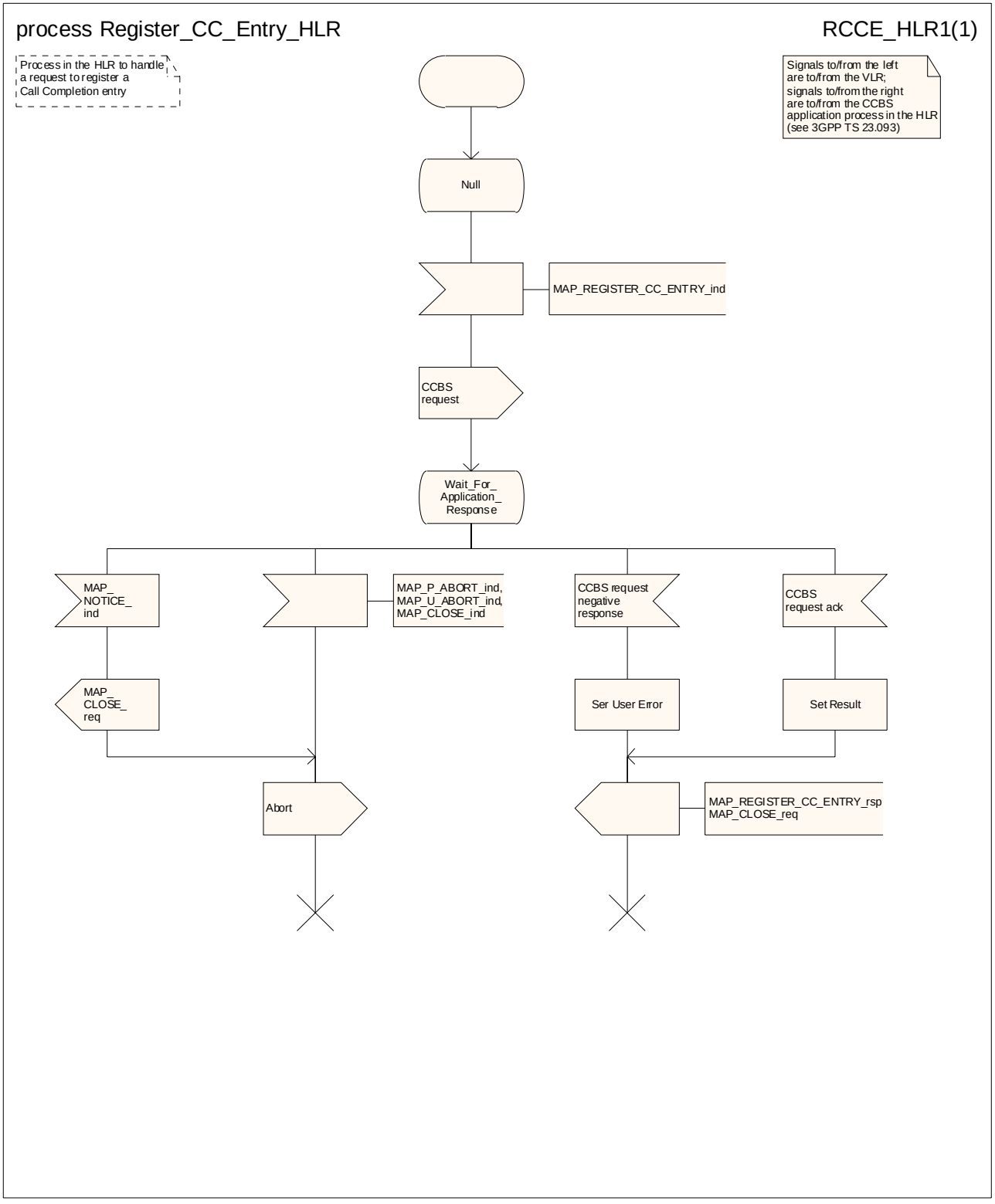
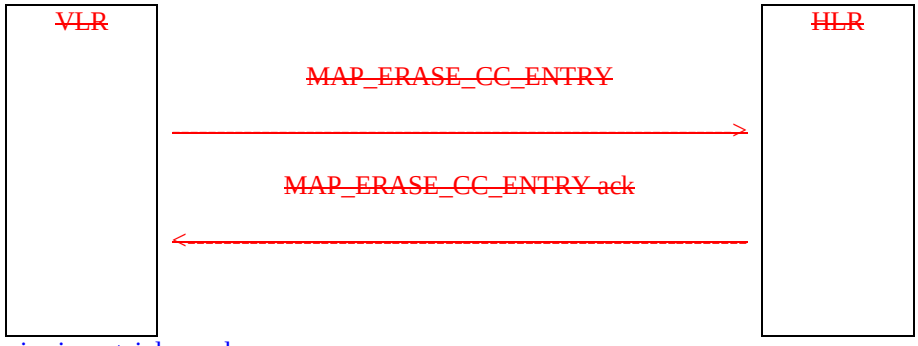


Figure 22.13.3/1: Process Register_CC_Entry_HLR

22.14 Deactivation of a CCBS request

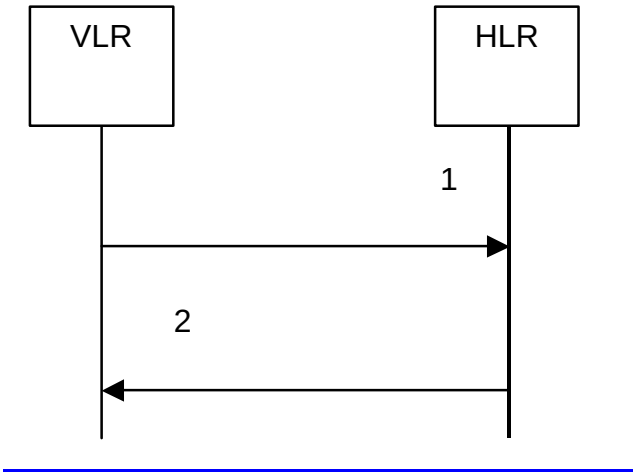
22.14.1 General

The message flow to deactivate a CCBS request is shown in figure 22.14.1/1.



The following service is certainly used:

MAP_ERASE_CC_ENTRY (defined in clause 11).



1) MAP_ERASE_CC_ENTRY req/ind
2) MAP_ERASE_CC_ENTRY rsp/cnf

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 clause; 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.~~

22.14.3 Procedure in the HLR

The MAP process in the HLR to deactivate a CCBS request is shown in figure 22.14.2/1.

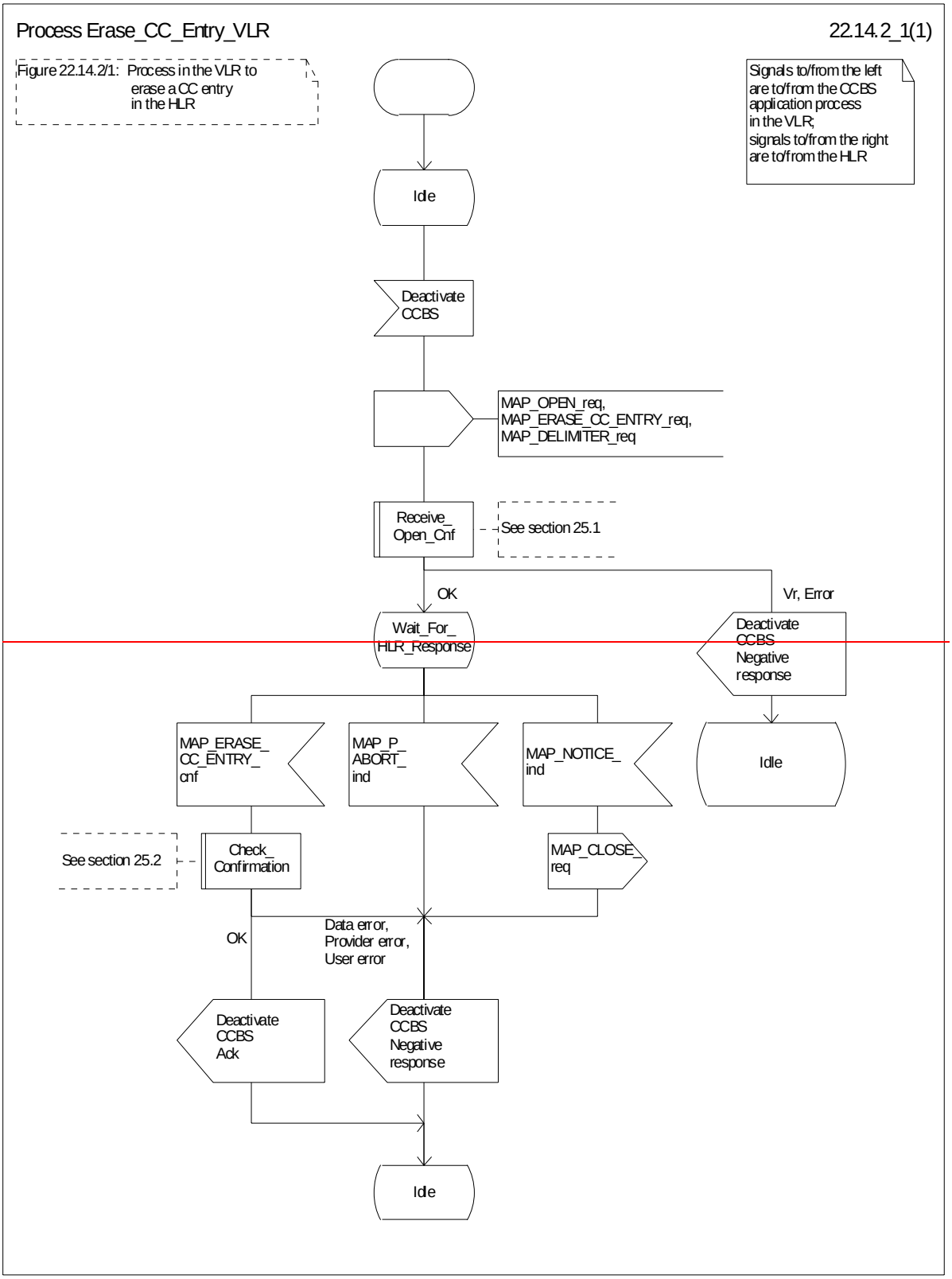
~~**Successful outcome**~~

~~When the MAP process receives a MAP_ERASE_CC_ENTRY_indication from the co-ordinating process, it sends a Deactivate CCBS message to the CCBS application process in the HLR, and waits for a response. The message contains the parameters received in the MAP_ERASE_CC_ENTRY service indication.~~

~~If the CCBS application process in the HLR returns a positive response, the MAP process constructs a MAP_ERASE_CC_ENTRY service response, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.~~

~~**Negative response from HLR CCBS application process**~~

~~If the CCBS application process in the HLR returns a negative response, the MAP process constructs a MAP_ERASE_CC_ENTRY service response containing the appropriate error, constructs a MAP_CLOSE service request, sends them to the co-ordinating process and terminates.~~


Process Erase_CC_Entry_VLR
22.14.2_1(1)
Figure 22.14.2/1: Process in the VLR to erase a CC entry in the HLR
Signals to/from the left are to/from the CCBS application process in the VLR; signals to/from the right are to/from the HLR
Idle
Deactivate CCBS
MAP_OPEN_req, MAP_ERASE_CC_ENTRY_req, MAP_DELIMITER_req
Receive_ Open_Cnf
See section 25.1
OK
Vr, Error
Wait_For_ HLR_Response
Deactivate CCBS Negative response
MAP_ERASE_ CC_ENTRY_ cnf
MAP_P_ ABORT_ ind
MAP_NOTICE_ ind
Idle
See section 25.2
Check_ Confirmation
MAP_CLOSE_ req
OK
Data error, Provider error, User error
Deactivate CCBS Ack
Deactivate CCBS Negative response
Idle

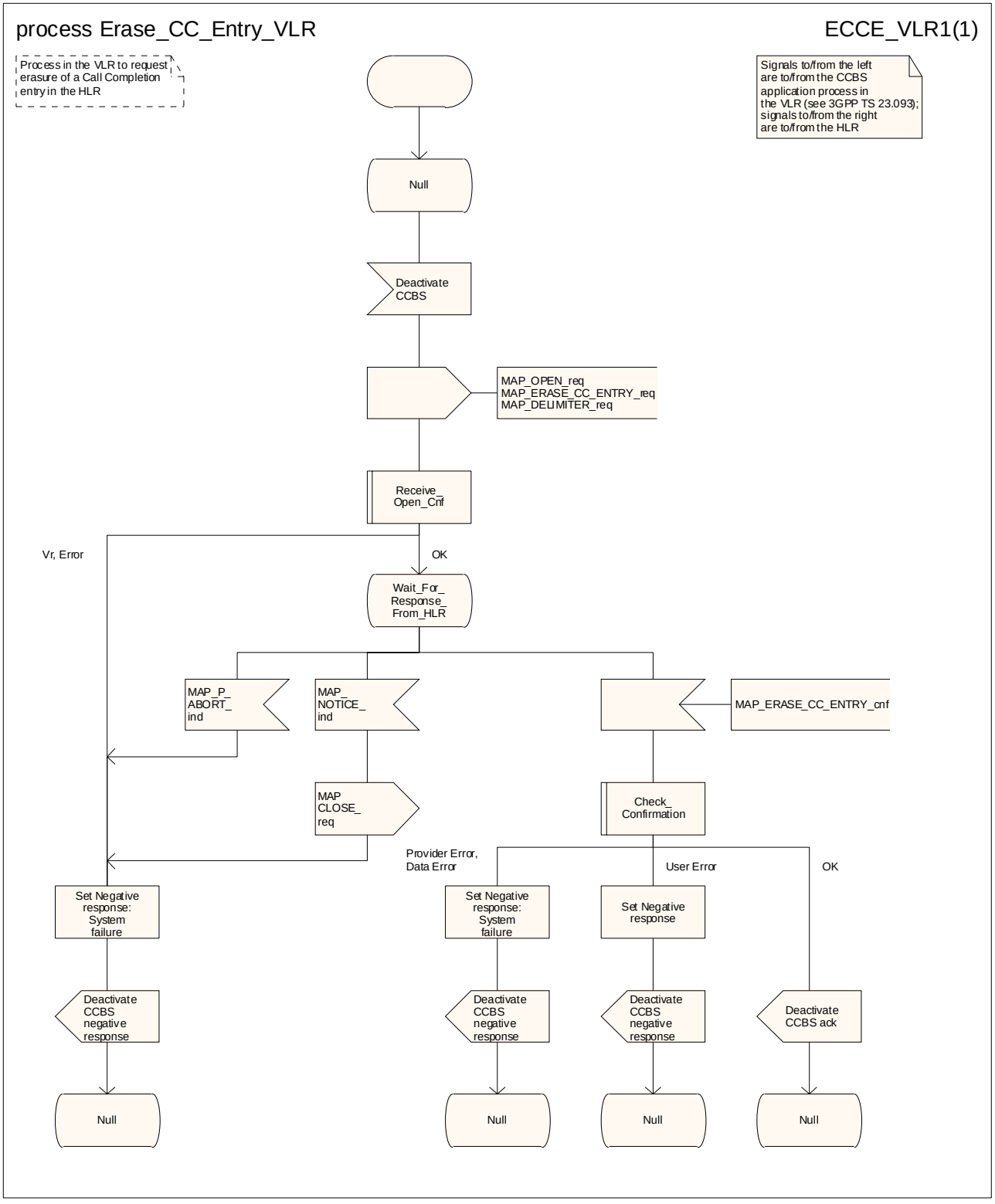
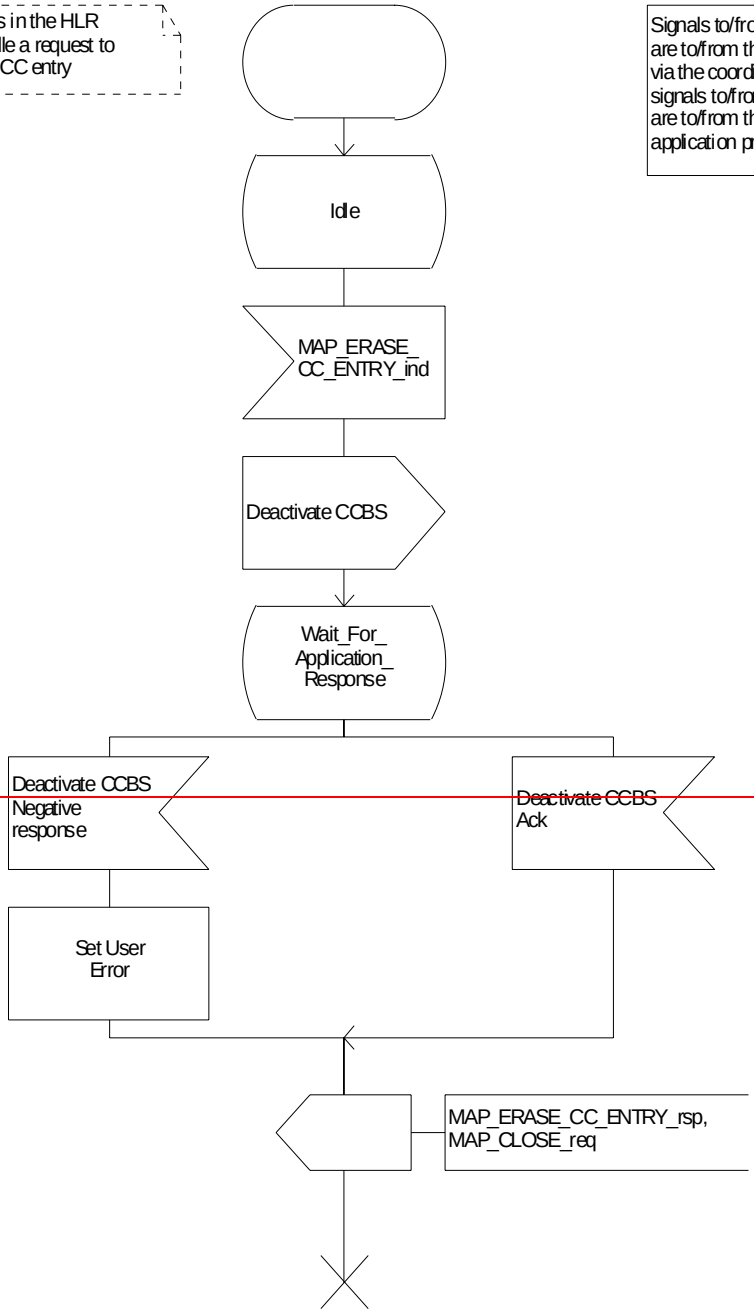


Figure 22.14.2/1: Process Erase_CC_Entry_VLR

Process Erase_CC_Entry_HLR 22.14.3_1(1)

Figure 22.14.3/1: Process in the HLR to handle a request to erase a CC entry



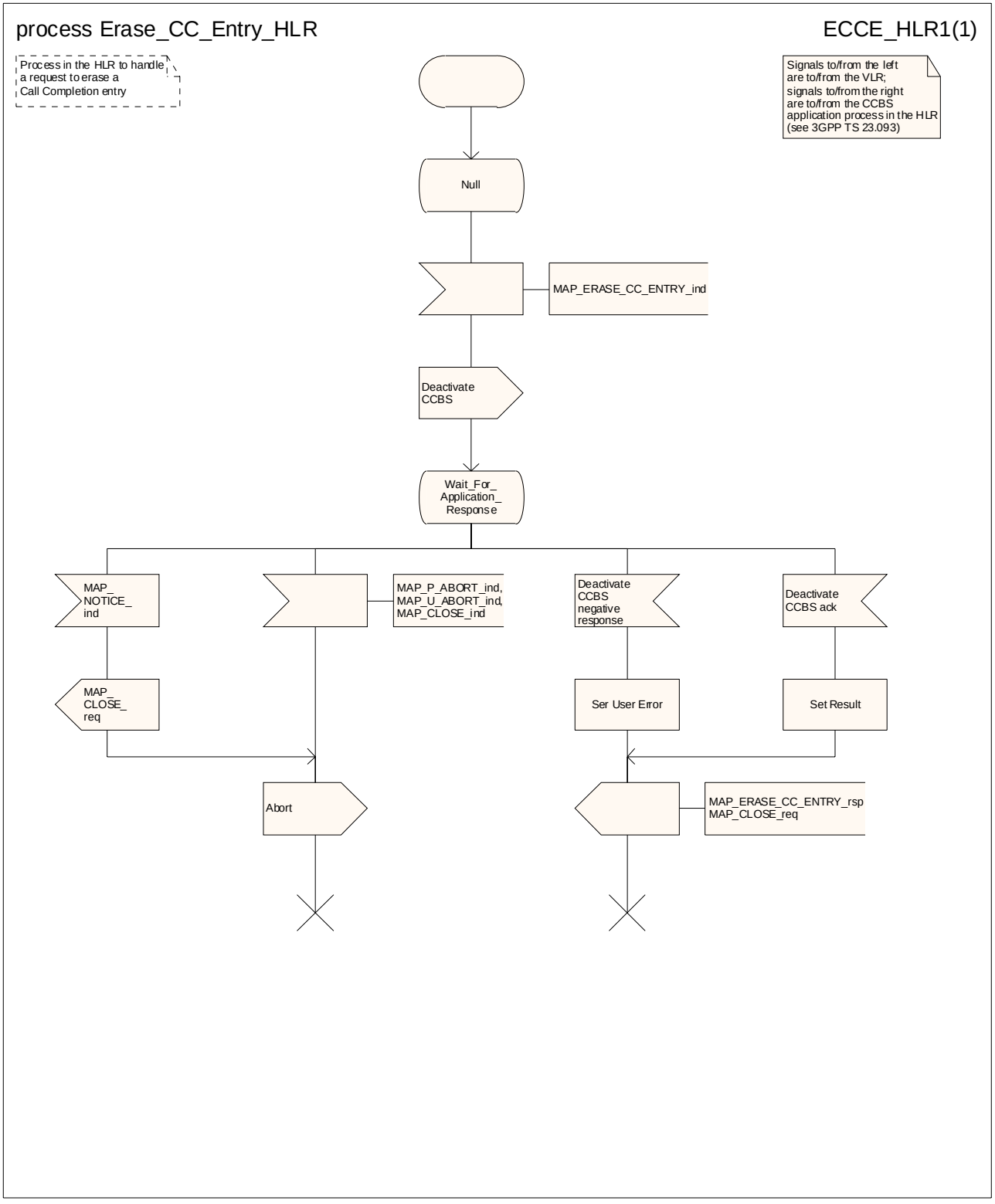


Figure 22.14.3/1: Process Erase_CC_Entry_HLR

***** End of document *****