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TECHNICAL SPECIFICATION

**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
Unstructured Supplementary Service Data (USSD);
Stage 2
(3GPP TS 23.090 version 19.0.0 Release 19)**

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Contents

Foreword

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

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

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document gives the stage 2 description of Unstructured Supplementary Service Data (USSD).

The unstructured supplementary service data (USSD) mechanism allows the Mobile Station (MS) user and a PLMN operator defined application to communicate in a way which is transparent to the MS and to intermediate network entities. The mechanism allows development of PLMN specific supplementary services. The following diagram shows how handling of USSD is carried out, independently of the applications.

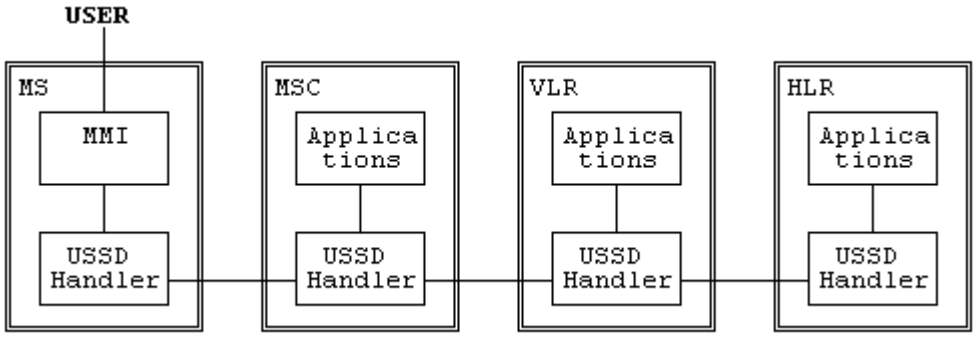


Figure 1.1: Handling of USSD

The present document defines the requirements for handling USSD at the MS and network entities. It does not include specification of particular applications, nor does it specify how a particular application is selected. Where more than one application exists at a network entity, routing of messages to the correct application is carried out by the USSD handler. The MMI for USSD is specified in TS 22.030 and TS 22.090. The alphabet indicator and the data coding scheme are defined in TS 23.038.

USSD may be initiated by the MS user, or by the network in the following ways:

- Network initiated USSD (clause 1);
- Mobile initiated USSD (clause 2).

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 TR 21.905: "3G Vocabulary".

[2] 3GPP TS 22.030: "Man-Machine Interface (MMI) of the User Equipment (UE)".

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

[4] 3GPP TS 23.038: "Alphabets and language-specific information".

3 Abbreviations

In addition to those below, abbreviations used in the present document are listed in TR 21.905 [1].

AI	Application Initiated
MI	Mobile Initiated
USSD	Unstructured Supplementary Service Data

4 Cross phase compatibility

The Phase 1 series of GSM specifications defined the signalling protocol which may be used, but they did not specify the operation of USSD as a service.

The main body of the present document assumes that the MS and all network entities comply with this phase of USSD. In order to minimize any possible problems between a Phase 1 implementation of USSD and this phase, clauses 5.6 and 6.6 define the additional requirements for when one or more entity complies with the Phase 1 USSD specification for network initiated and mobile initiated USSD respectively.

5 Network initiated unstructured supplementary service

5.1 Handling of network initiated USSD

The network (MSC, VLR or HLR) can at any time send a USSD operation towards an MS. This operation may be either a request (asking the MS to provide information) or a notification (requiring no information in the response from the MS). No prior provision of USSD is required, although provision of services which make use of USSD may be required. All USSD requests, notifications and responses (except responses to notifications) contain the USSD string, an alphabet indicator and language indicator.

5.2 Functions and information flows

The following text describes the handling of network initiated USSD. Diagrammatic representations are as follows:

Figure 5.1 SDL for USSD invocation (HLR, VLR, MSC);

Figure 5.2 SDL for forwarding of USSD operations (VLR, MSC);

Figure 5.3 SDL for MS;

Figure 5.4 Information flow for successful single USSD request;

Figure 5.5 Information flow for successful single USSD notification;

Figure 5.6 Information flow for successful multiple USSD requests;

Figure 5.7 Information flow for failed USSD request.

5.2.1 Invoking unstructured SS operation from the HLR

When an application in the HLR is to send a USSD request or notification to an MS, it shall set up a transaction to the VLR where the subscriber is currently registered and send the operation to the VLR. It shall then await a response. The HLR is responsible for controlling the transaction, and shall therefore normally release the transaction when it receives a response from the VLR. The HLR may also release the transaction before receiving a response if necessary (e.g. if an application timer expires).

If an application in the HLR needs to send further operations to the same MS as part of the same application, it may continue to use the same transaction until all operations are completed (see figure 5.6). If a different transaction is to be used for a subsequent operation, the HLR shall release the first transaction before starting the next.

If the VLR releases the transaction at any time (e.g. due to user clearing), the HLR shall inform the application and terminate the USSD operation.

See clause 5.2.4 for forwarding of an HLR invoked operation by the VLR and MSC.

5.2.2 Invoking unstructured SS operation from the VLR

When an application in the VLR is to send a USSD request or notification to an MS, it shall set up a transaction to the MSC where the subscriber is currently registered and send the operation to the MSC. It shall then await a response. The VLR is responsible for controlling the transaction, and shall therefore normally release the transaction when it receives a response from the MSC. The VLR may also release the transaction before receiving a response if necessary (e.g. if an application timer expires).

If an application in the VLR needs to send further operations to the same MS as part of the same application, it may continue to use the same transaction until all operations are completed. If a different transaction is to be used for a subsequent operation, the VLR shall release the first transaction before starting the next.

See clause 5.2.4 for forwarding of a VLR invoked operation by the MSC.

If the MSC releases the transaction at any time (e.g. due to the user clearing), the VLR shall inform the application and terminate the USSD operation.

5.2.3 Invoking unstructured SS operation from the MSC

When an application in the MSC is to send a USSD request or notification to an MS, it shall set up a transaction to the MS where the subscriber is currently registered and send the operation to the MS. It shall then await a response. The MSC is responsible for controlling the transaction, and shall therefore normally release the transaction when it receives a response from the MS. The MSC may also release the transaction before receiving a response if necessary (e.g. if an application timer expires).

If an application in the MSC needs to send further operations to the same MS as part of the same application, it may continue to use the same transaction until all operations are completed. If a different transaction is to be used for a subsequent operation, the VLR shall release the first transaction before starting the next.

If the MS releases the transaction at any time (e.g. due to the user clearing), the MSC shall inform the application and terminate the USSD operation.

NOTE: MSC invoked USSD is only likely to be used for call related operations, where the application is controlling a call to or from the MS.

5.2.4 Forwarding USSD operations

The VLR may any time receive a USSD operation from the HLR. If the subscriber can be contacted, the VLR shall set up a transaction to the MSC and forward the operation unchanged. Any further information exchange between the HLR and MSC shall be transparent to the VLR. When one transaction is released, the VLR shall release the other.

The MSC may at any time receive an USSD operation from the VLR. If the subscriber can be contacted, the MSC shall set up a transaction to the MS and forward the operation unchanged. Any further information exchange between the VLR and MS shall be transparent to the MSC. When one transaction is released, the MSC shall release the other.

5.2.5 Handling of unstructured SS operation at the MS

The MS may at any time receive a USSD operation (request or notification) from the MSC.

If the MS receives a USSD transaction while another USSD transaction (network or mobile initiated) or a non-call related supplementary service transaction is in progress, the MS shall reject the new transaction.

If the MS receives a USSD operation when it is in a state where the MMI required is not possible (e.g. during dialling) it shall reject the operation.

If the MS does not support the alphabet indicated in the USSD operation, it shall inform the network.

If the MS is in a state where it can handle the operation, it shall process the operation as follows:

- The MS shall analyse the data coding scheme and decides whether the USSD operation is MMI mode or application mode. See 3GPP TS 22. 030 [2] for details of codes.

If the data coding scheme corresponds to the MMI mode :

- For a USSD request, the MS shall display the text provided and await user input. If the user enters a response, the MS shall return the response to the MSC, maintaining the transaction. If the user requests release of the transaction, the MS shall release the transaction.

- For a USSD notification, the MS shall display the text provided and send back a response.

If the data coding schemes corresponds to the application mode :

- For a USSD request, the MS shall pass the message to the application addressed in the ME, SIM or TE, and await application response . If the application responds, the MS shall pass the response to the MSC, maintaining the transaction. If the application releases the transaction, the MS shall release the transaction.

- For a USSD notification, the MS shall pass the message to the application addressed in the ME, SIM or TE, and send back a response.

After sending the response to a USSD operation, the MS shall wait for the network to release the transaction. If, while awaiting this release, the MS receives any further USSD operations, it shall process them in the normal way.

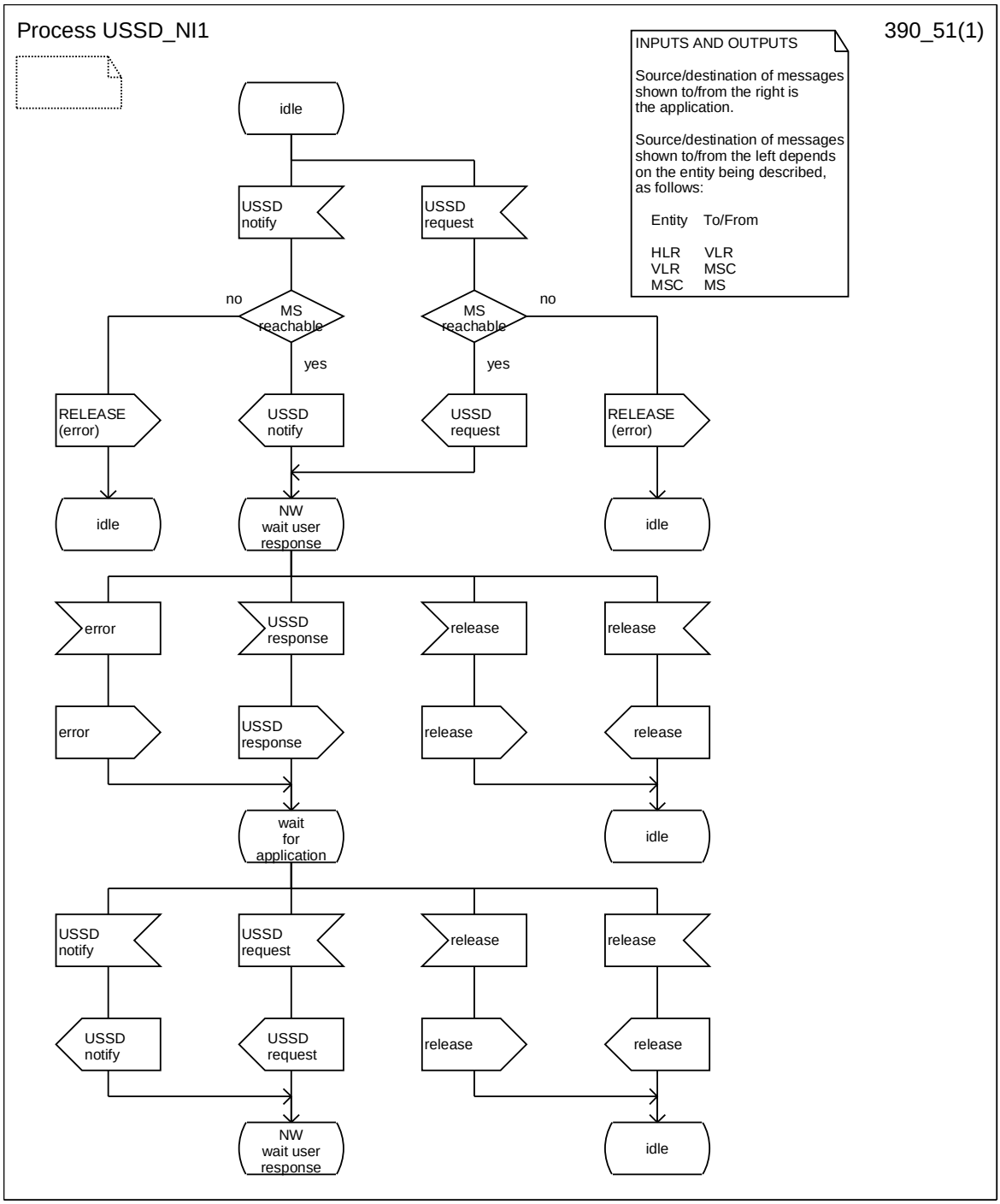


Figure 5.1: Network initiated USSD invoked at HLR, VLR or MSC

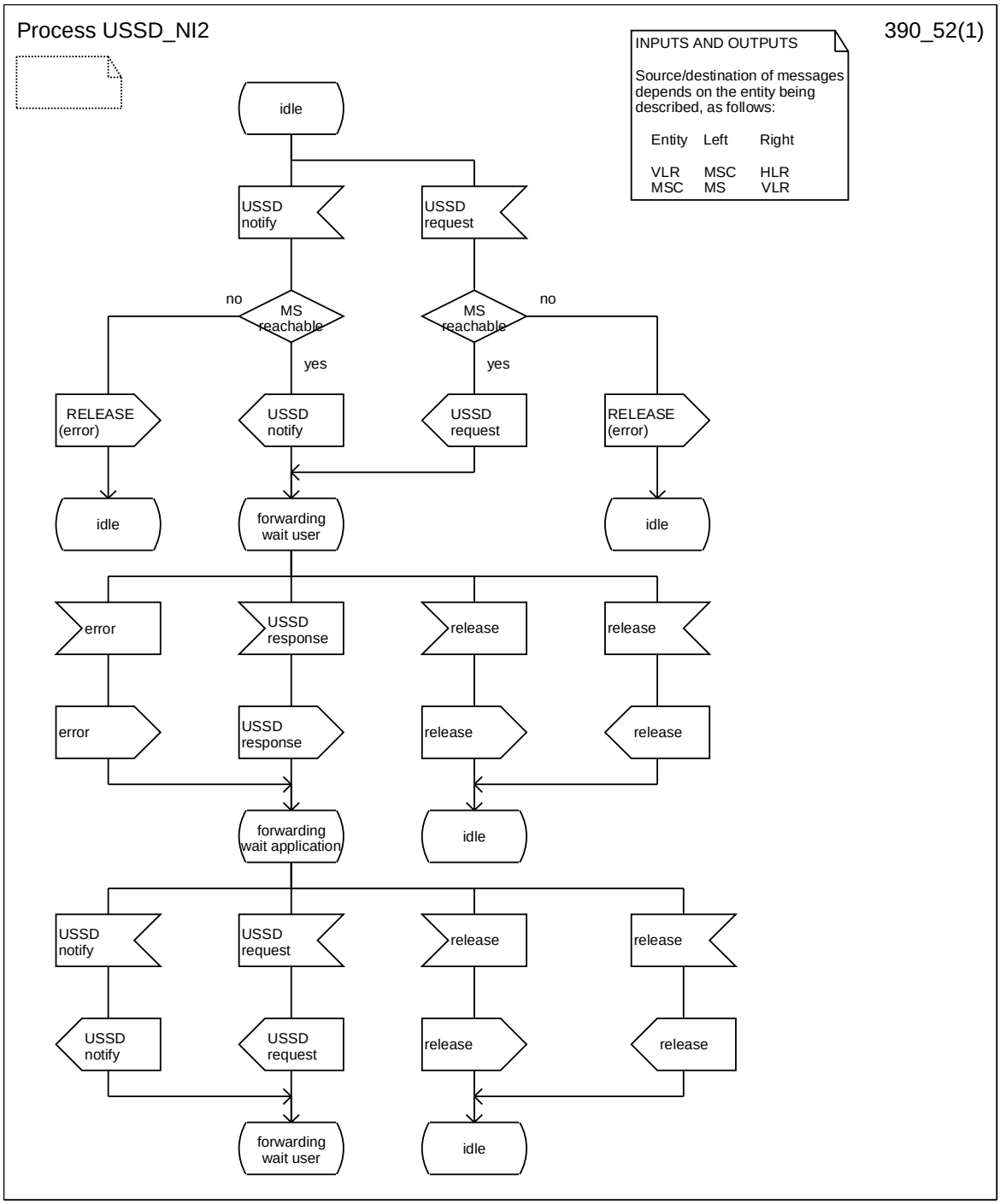


Figure 5.2: Network initiated USSD forwarding at VLR or MSC

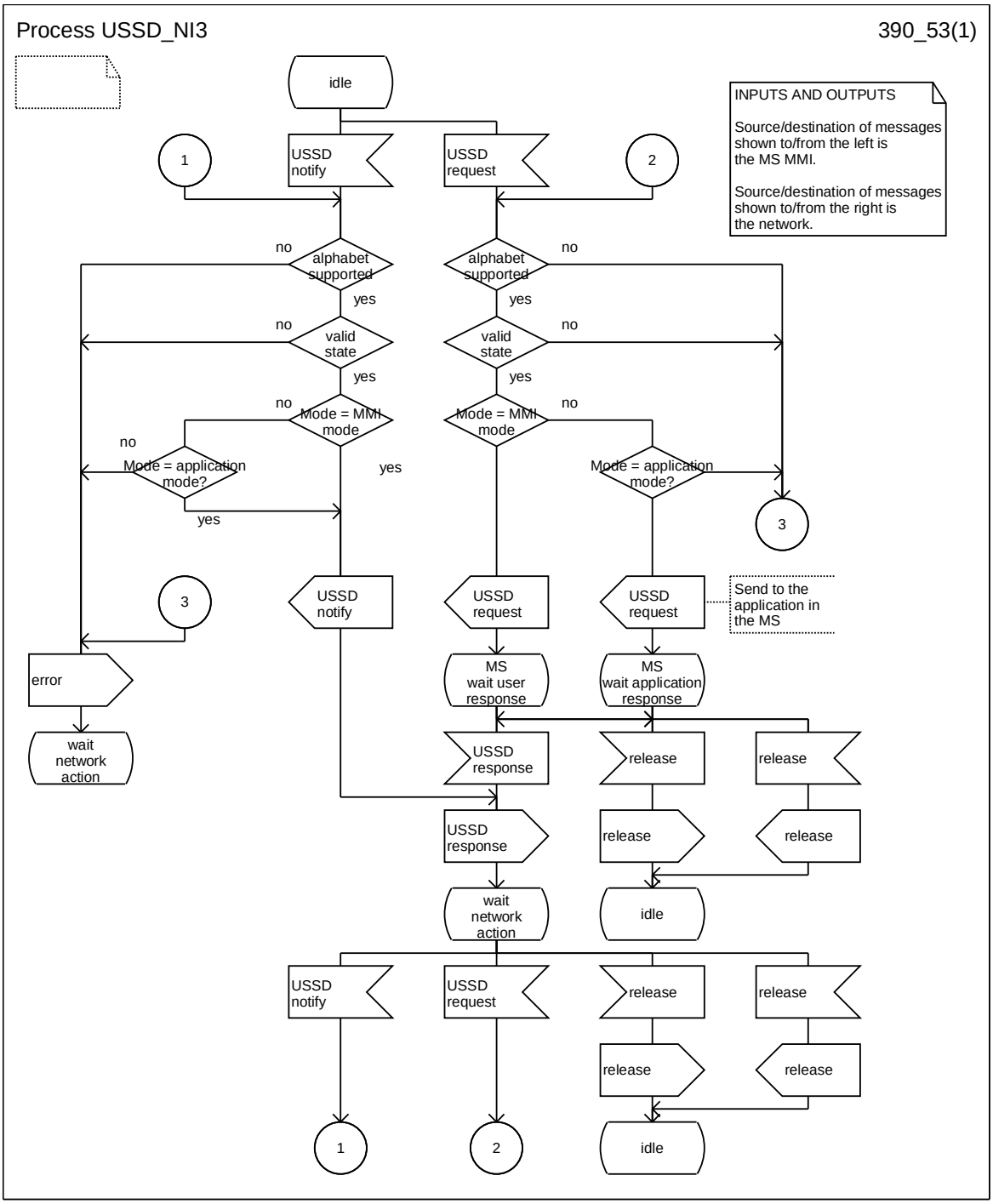


Figure 5.3: Network initiated USSD at MS

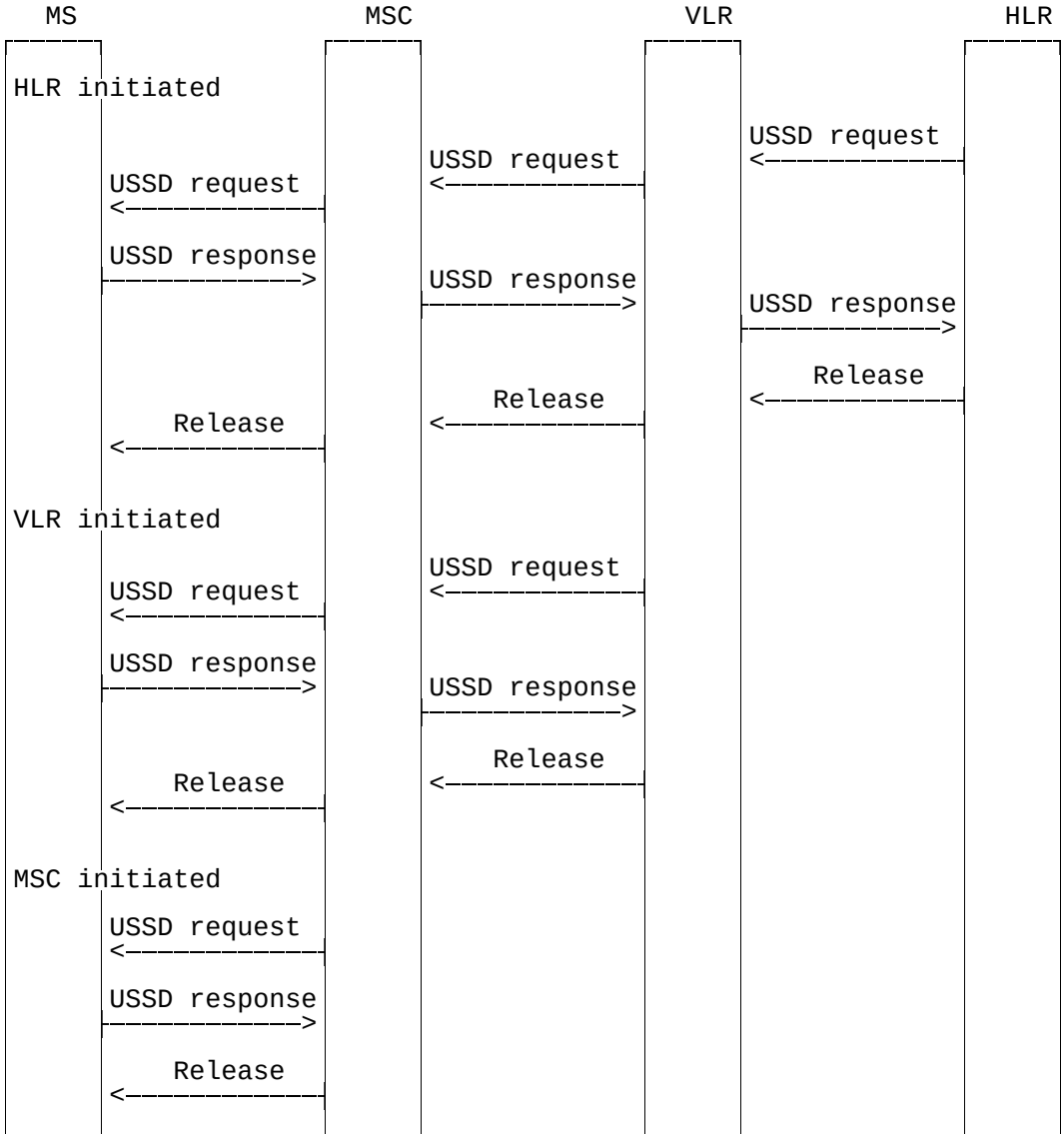


Figure 5.4: Information flow for USSD request (Single Operation)

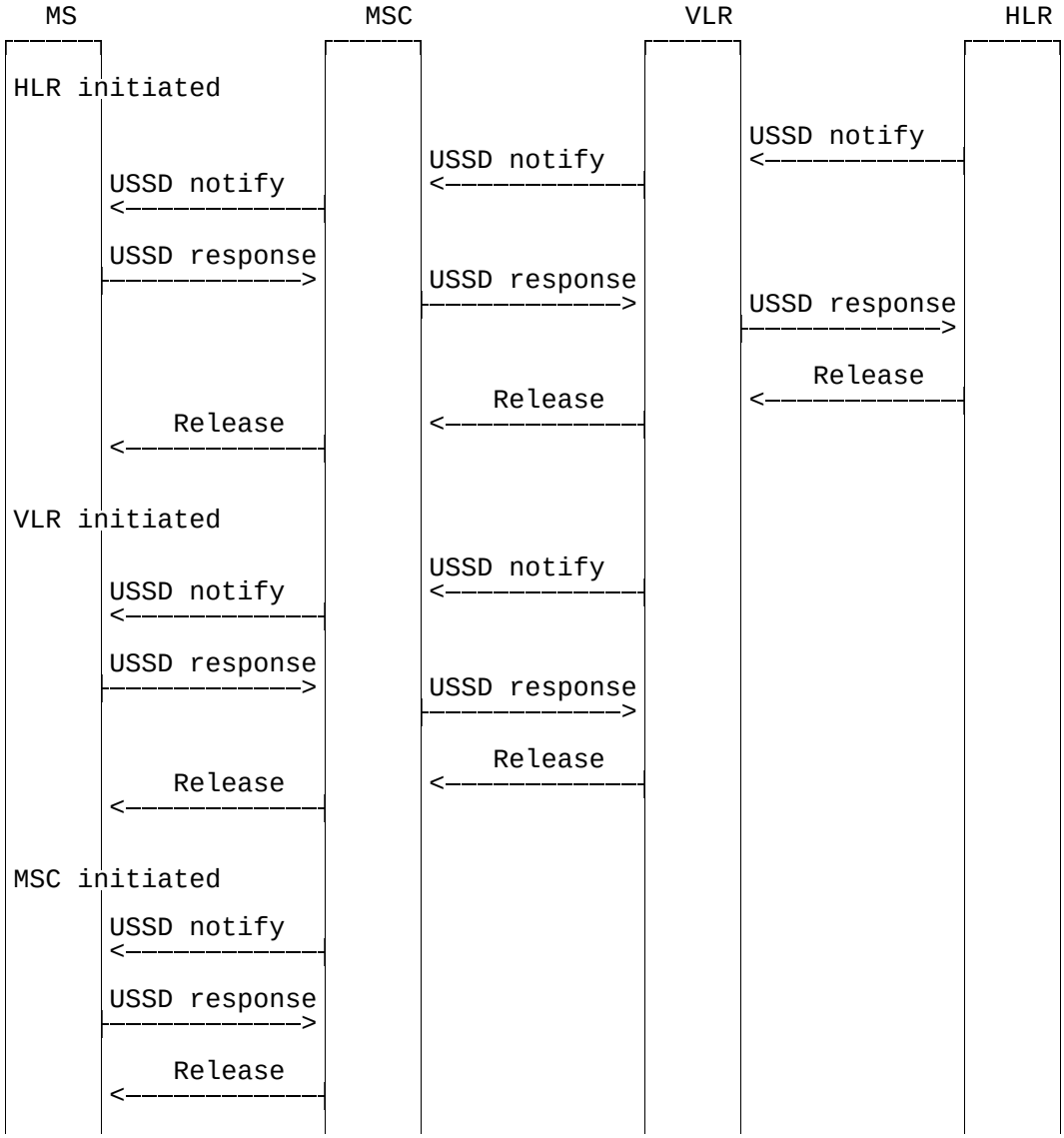


Figure 5.5: Information flow for USSD notification (Single Operation)

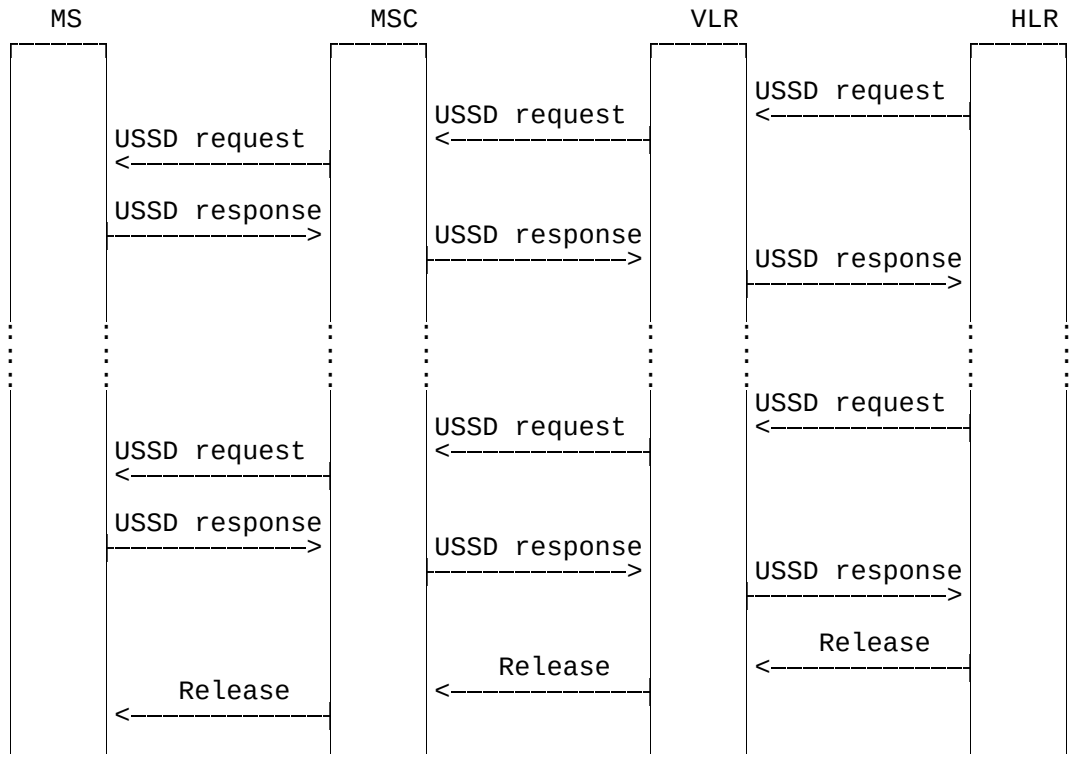


Figure 5.6: Information flow for HLR initiated USSD request (Multiple Operation On Same Transaction)

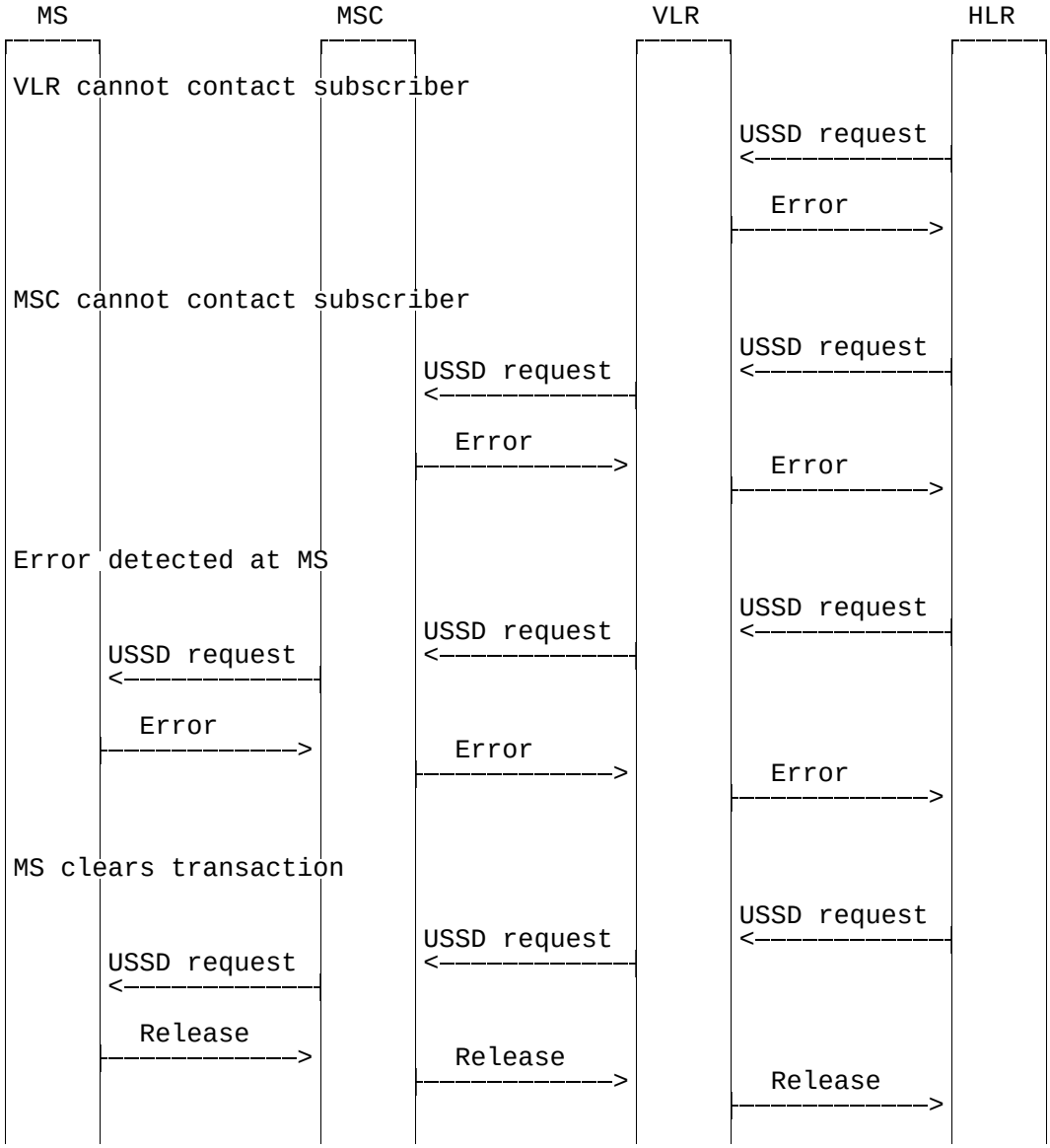


Figure 5.7: Information flow for failed USSD request

5.3 Information stored in the HLR

The HLR shall not store any information specific to the use of USSD, although information may be stored for services which are offered by USSD applications.

5.4 Information stored in the VLR

The VLR shall not store any information specific to the use of USSD, although information may be stored for services which are offered by USSD applications.

5.5 Handover

Handover will have no impact on the operation of this service.

5.6 Cross-phase compatibility

Network initiated USSD shall not be permitted if the MS or any network entity involved in the operation is of Phase 1. If, when setting up a transaction, a network entity discovers that the other end is of Phase 1, it shall reject the request and release the transaction being set up.

6 Mobile initiated unstructured supplementary service data

6.1 Handling of mobile initiated USSD

A MS can at any time initiate a USSD request to the network. No prior provision of the service is required, although provisioning of services which make use of USSD may be required. All USSD messages (requests and responses), contain the USSD string, an alphabet indicator and language indicator.

6.2 Functions and information flows

The following text describes the handling of mobile network initiated USSD. Diagrammatic representations are as follows:

Figure 6.1 SDL, request from user at MS;

Figure 6.2 SDL, request from MS at MSC;

Figure 6.3 SDL, request from application at MSC;

Figure 6.4 SDL, request from MSC at VLR;

Figure 6.5 SDL, request from application at VLR;

Figure 6.6 SDL, request from VLR at HLR;

Figure 6.7 Information flow, no further information required;

Figure 6.8 Information flow, further information required;

Figure 6.9 Information flow for failed USSD request.

6.2.1 Handling of USSD request at MS

When the user or the application in the MS makes a request which the MS determines is to make use of USSD, the MS shall set up a transaction to the network, send the request to the MSC and await a response. When the MS receives the response, it shall display the information contained to the user or relay the message to the application in the MS.

While awaiting the response, the MS may receive a network initiated USSD request or notification on the same transaction. If this occurs, the MS shall process that operation (see clause 1) and continue to await the response to the mobile initiated request.

If, when the MS determines that a user request is to make use of USSD, the MS is already involved in a USSD or a non-call related supplementary service transaction, the MS shall reject the request.

6.2.2 Handling of USSD request at MSC

When an MSC receives a USSD request containing an HPLMN service code, it shall set up a transaction to the VLR and forward the request unchanged. If this forwarding fails, an error shall be returned to the MS. The MSC shall be transparent to any further requests or responses (in either direction) for that transaction, passing them between the MS and VLR without taking any action. When one transaction is released (MS-MSC or MSC-VLR), the MSC shall release the other.

If an HPLMN service code is not included, the MSC shall process the request locally (see clause 6.2.5).

If the MSC does not support the alphabet used in a USSD request, it shall set up a transaction to the VLR and forward the request unchanged, in the same way as when a HPLMN service code is received.

6.2.3 Handling of USSD request at VLR

When a VLR receives a USSD request containing an HPLMN service code and the user is not in the HPLMN, it shall set up a transaction to the HLR and forward the request unchanged. If this forwarding fails, an error shall be returned to the MS. The VLR shall be transparent to any further requests or responses (in either direction) for that transaction, passing them between the MSC and HLR without taking any action. When one transaction is released (MSC-VLR or VLR-HLR), the VLR shall release the other.

If an HPLMN service code is not included, or the user is in the HPLMN, the VLR shall process the request locally (see clause 6.2.5).

If the VLR does not support the alphabet used in a USSD request, it shall set up a transaction to the HLR and forward the request unchanged, in the same way as when a HPLMN service code is received and the user is not in the HPLMN.

6.2.4 Handling of USSD request at HLR

An HLR shall always process a USSD request locally (see clause 6.2.5).

If the HLR does not support the alphabet used in a USSD request, it shall inform the MS and release the transaction.

6.2.5 Processing the USSD request

When a network entity is to process a USSD request locally, the request shall be handled by an appropriate application. The location, nature and contents of USSD applications is, by definition, service provider and network operator dependent, but may include:

- Setting up or releasing signalling and/or speech channels;
- Passing the request to another network entity (unchanged or changed);
- Passing a different USSD request to another network entity;

  and/or

- Requesting further information from the MS (one or more times).

Upon completion of handling the request, the network entity shall respond to the request and release the transaction.

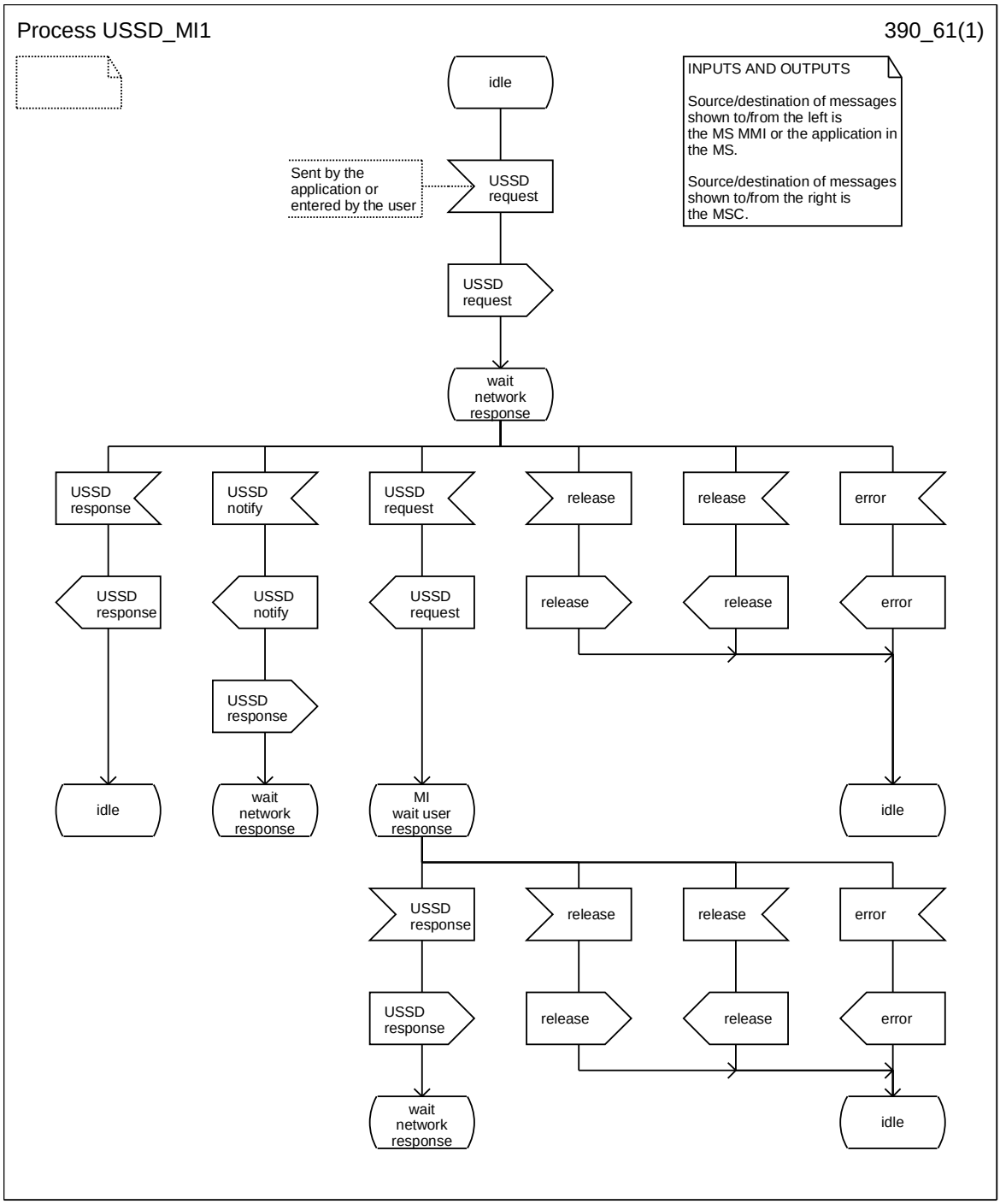


Figure 6.1: Mobile initiated USSD at MS

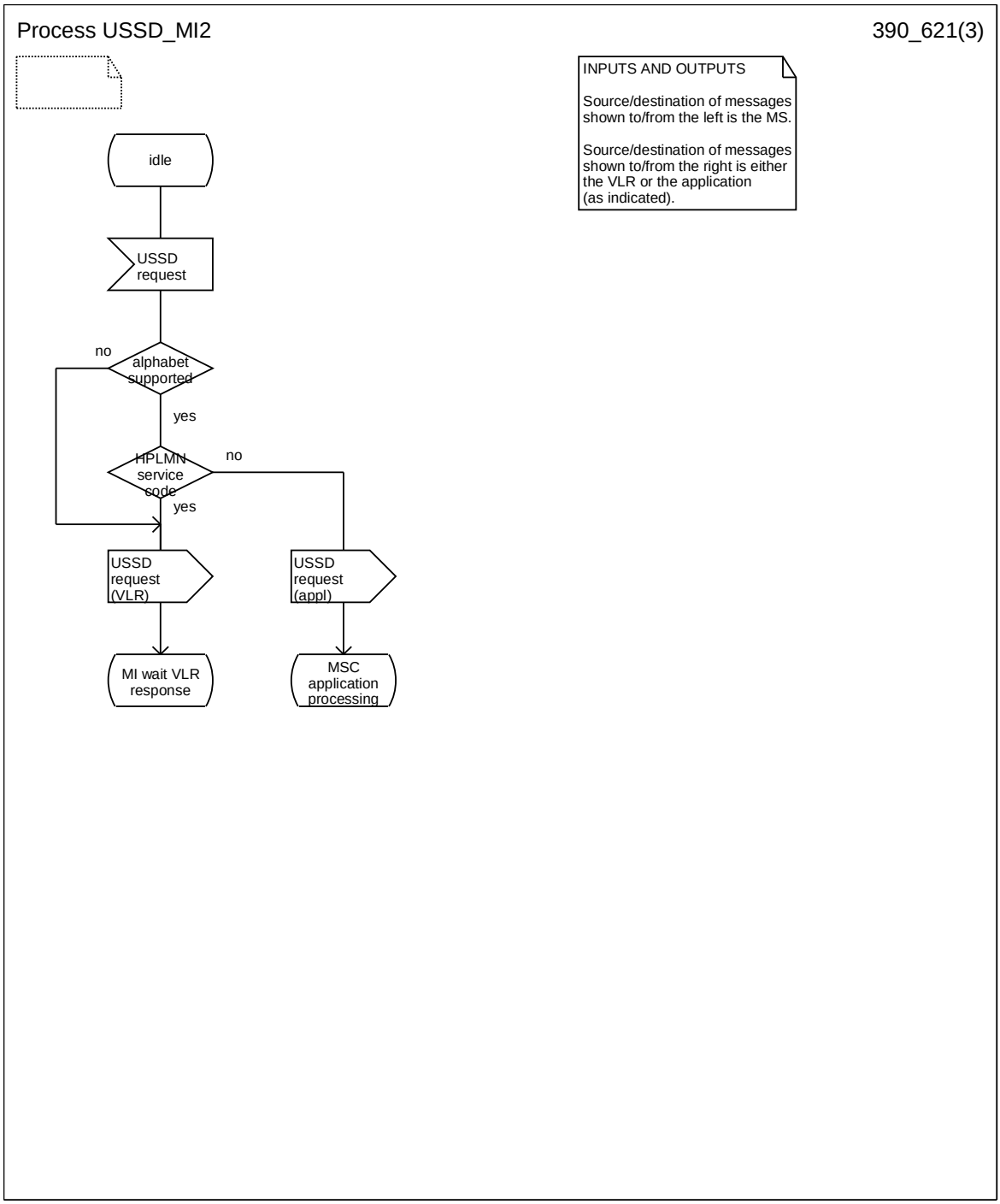


Figure 6.2 (sheet 1 of 3): Mobile initiated USSD at MSC

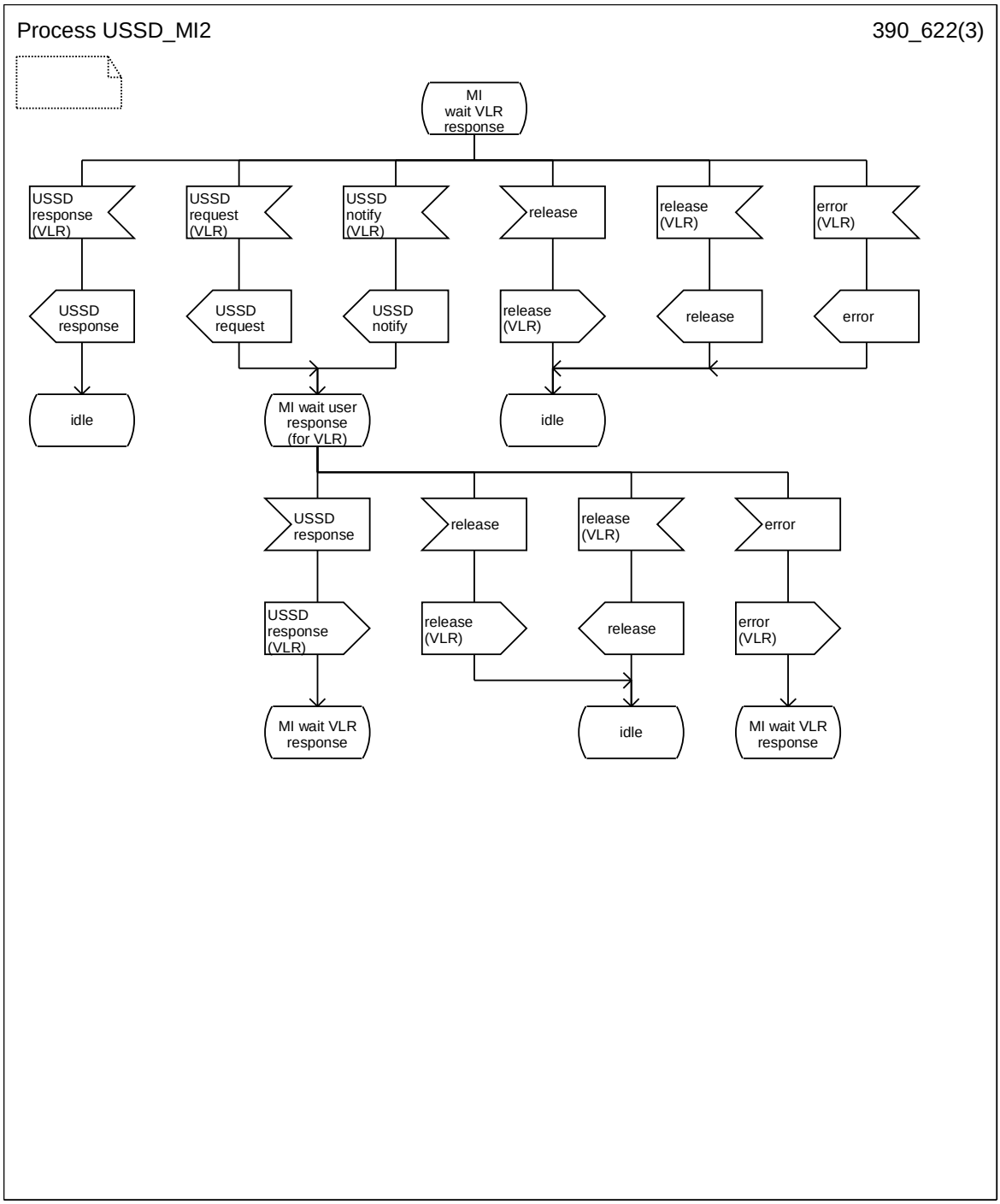


Figure 6.2 (sheet 2 of 3): Mobile initiated USSD at MSC

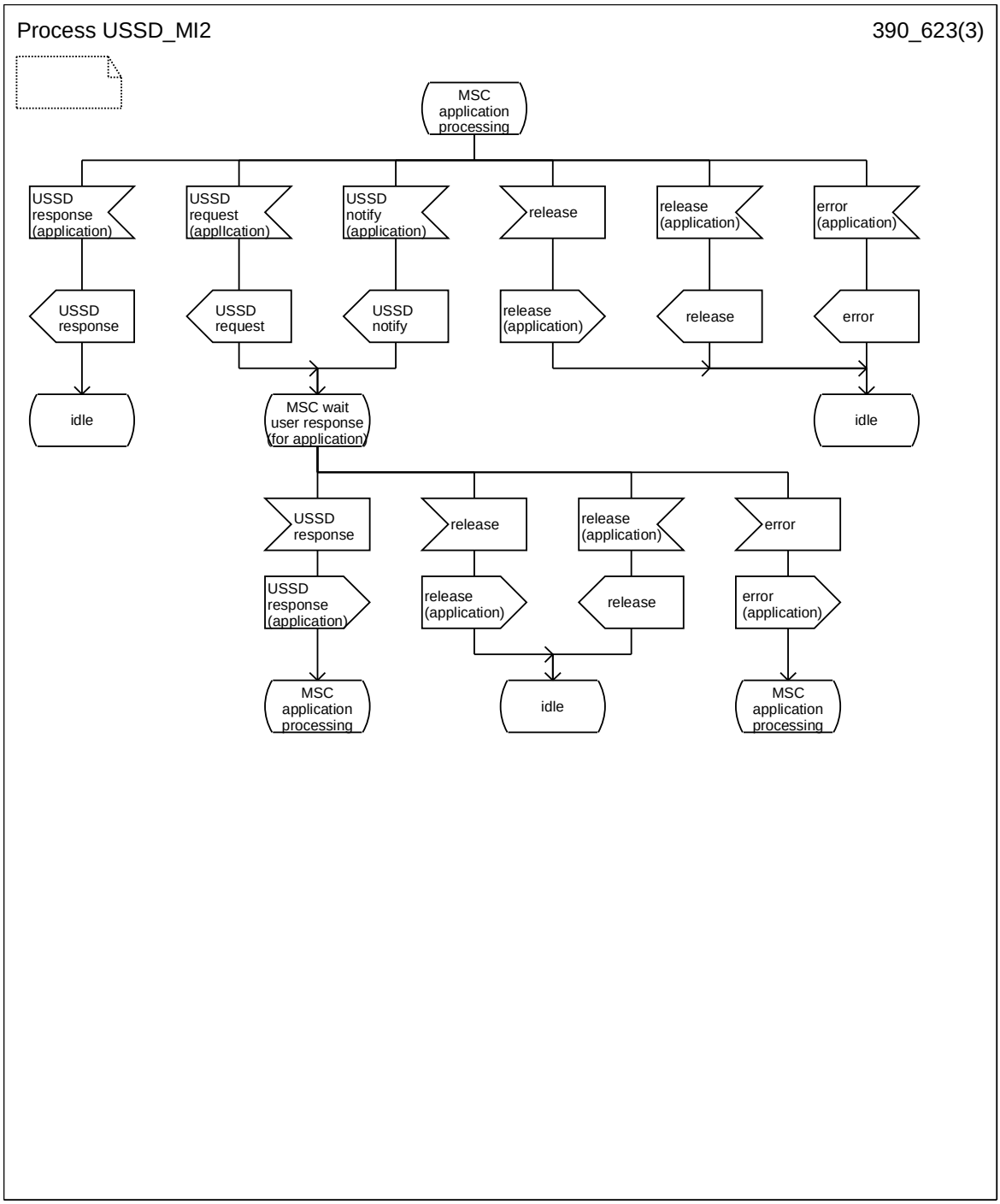


Figure 6.2 (sheet 3 of 3): Mobile initiated USSD at MSC

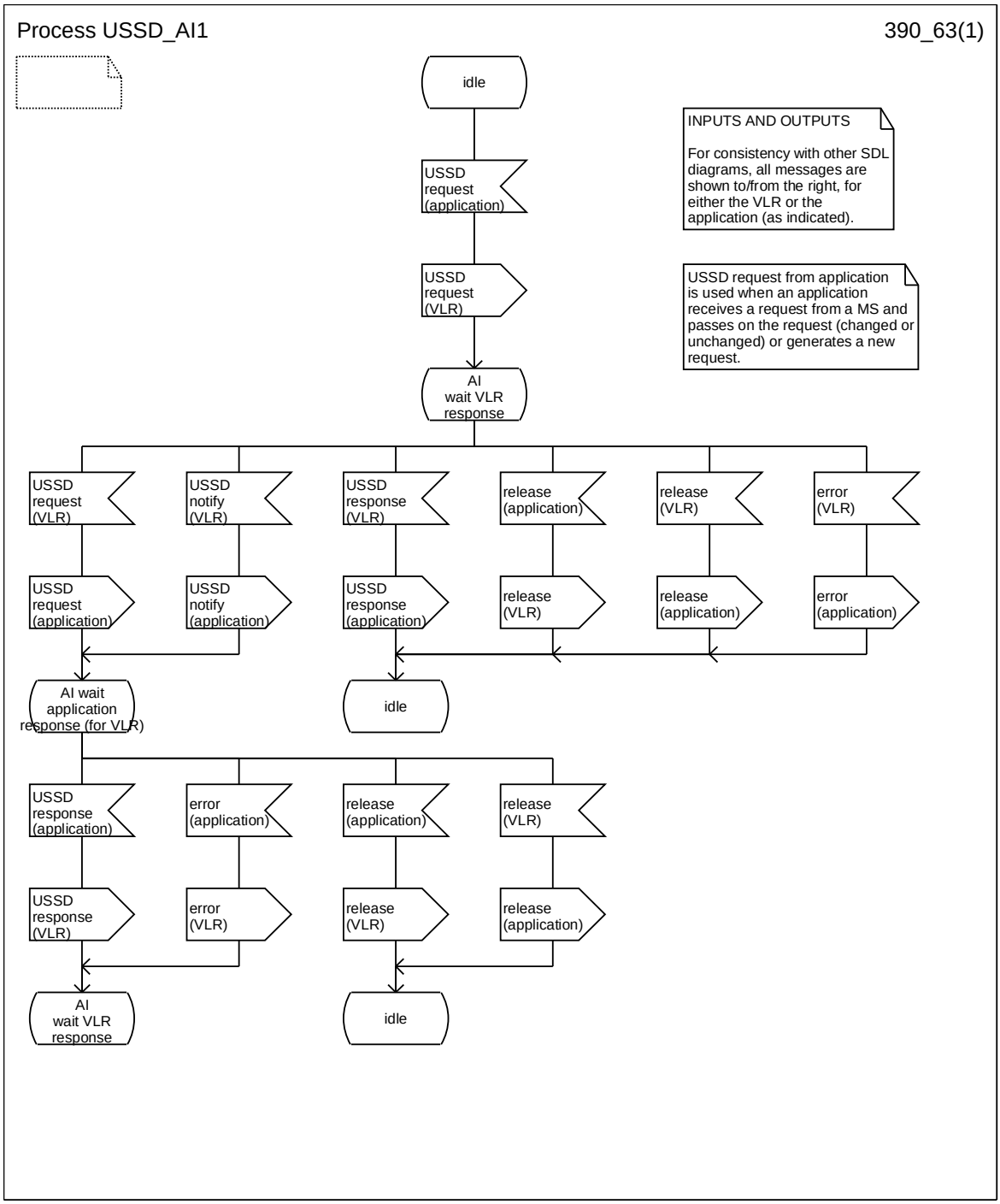


Figure 6.3: Application initiated USSD at MSC

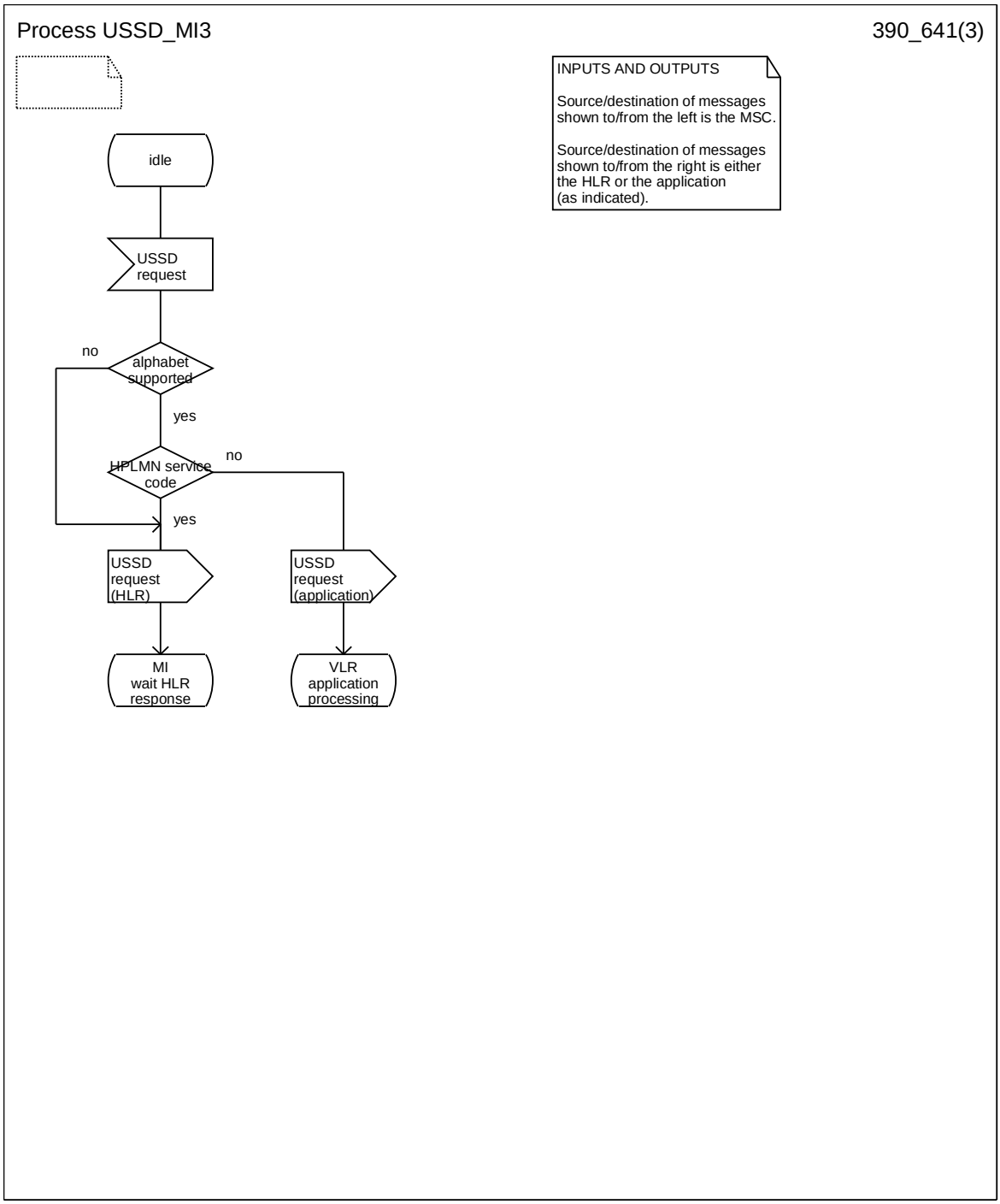


Figure 6.4 (sheet 1 of 3): Mobile initiated USSD at VLR

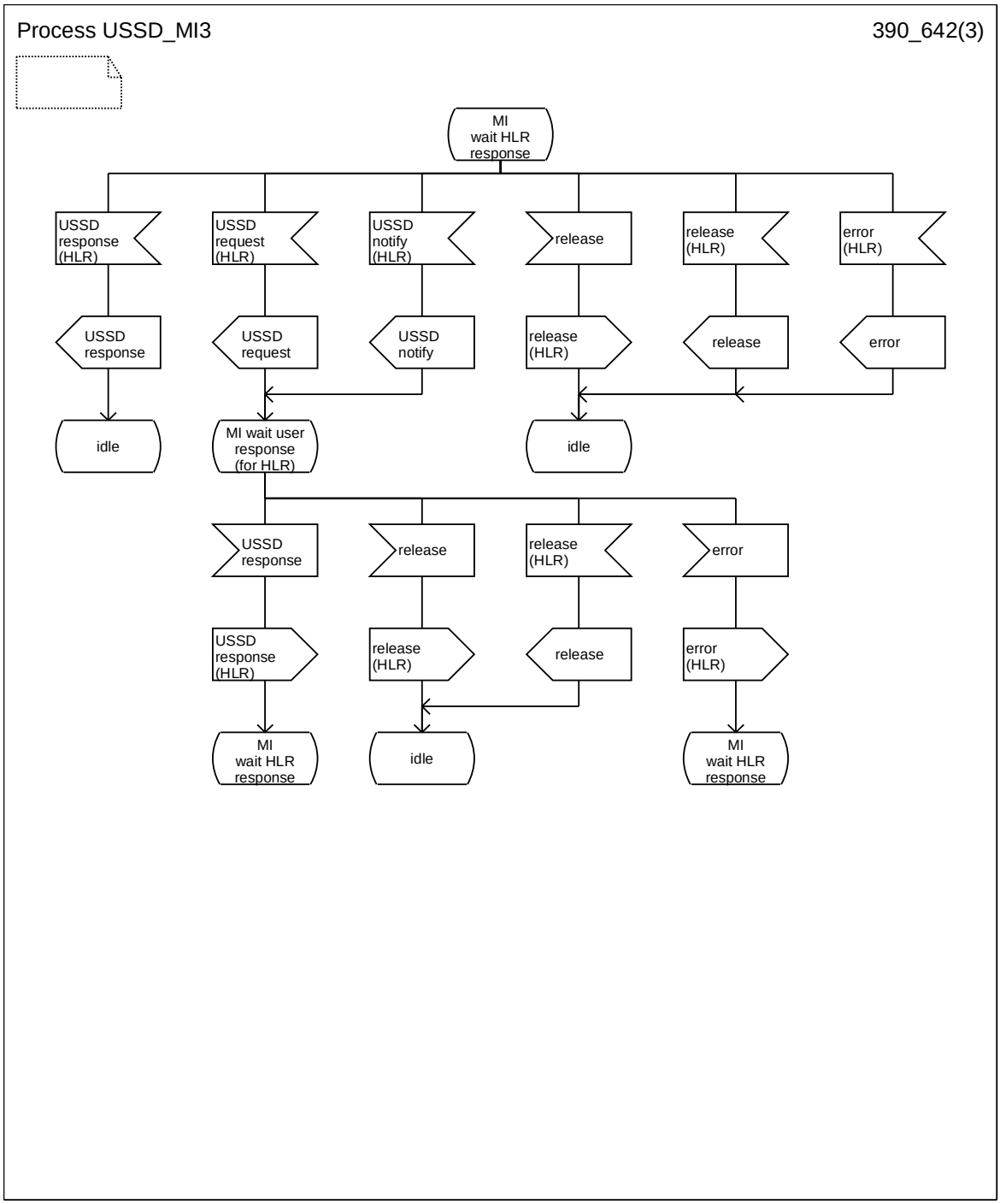


Figure 6.4 (sheet 2 of 3): Mobile initiated USSD at VLR

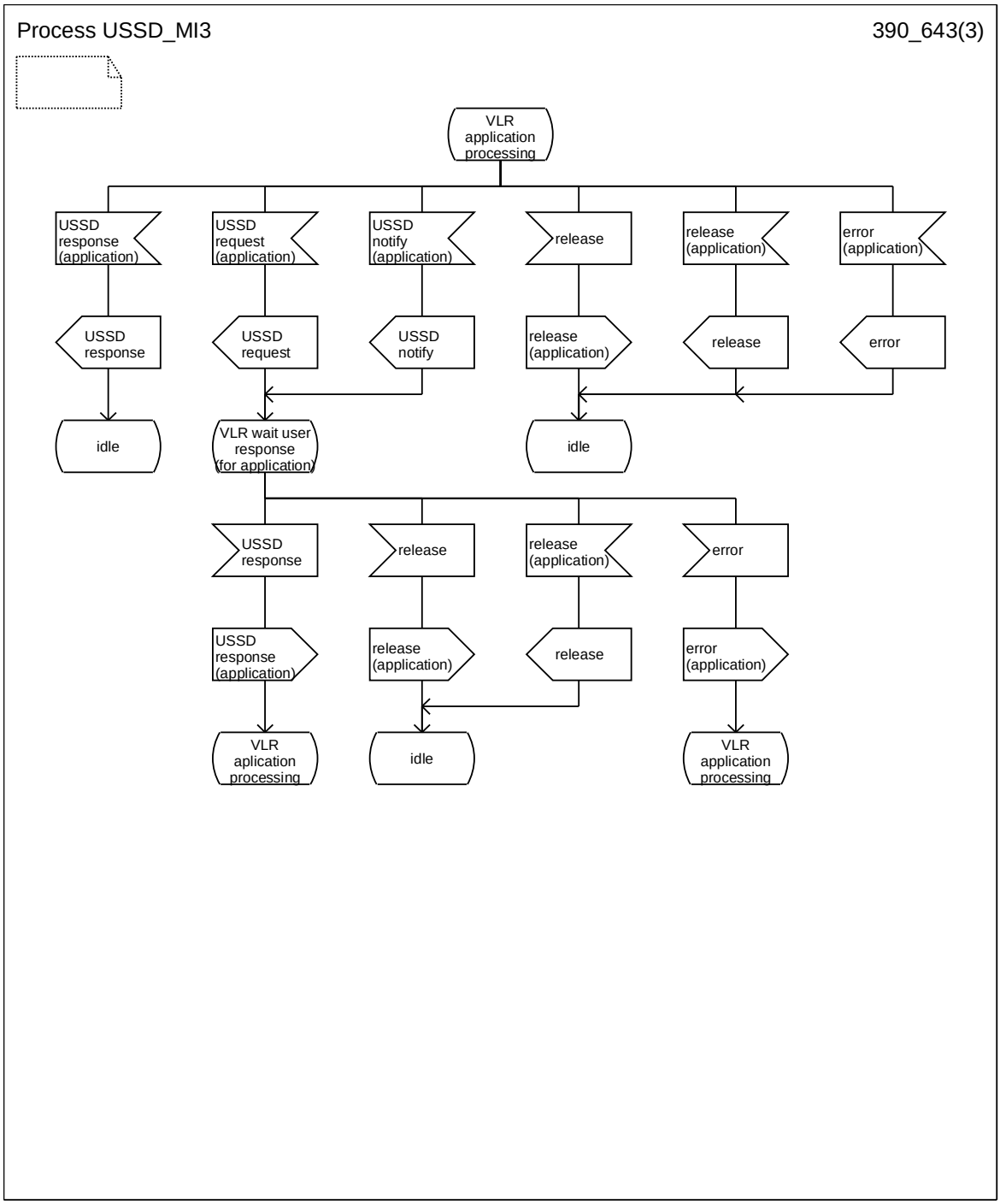


Figure 6.4 (sheet 3 of 3): Mobile initiated USSD at VLR

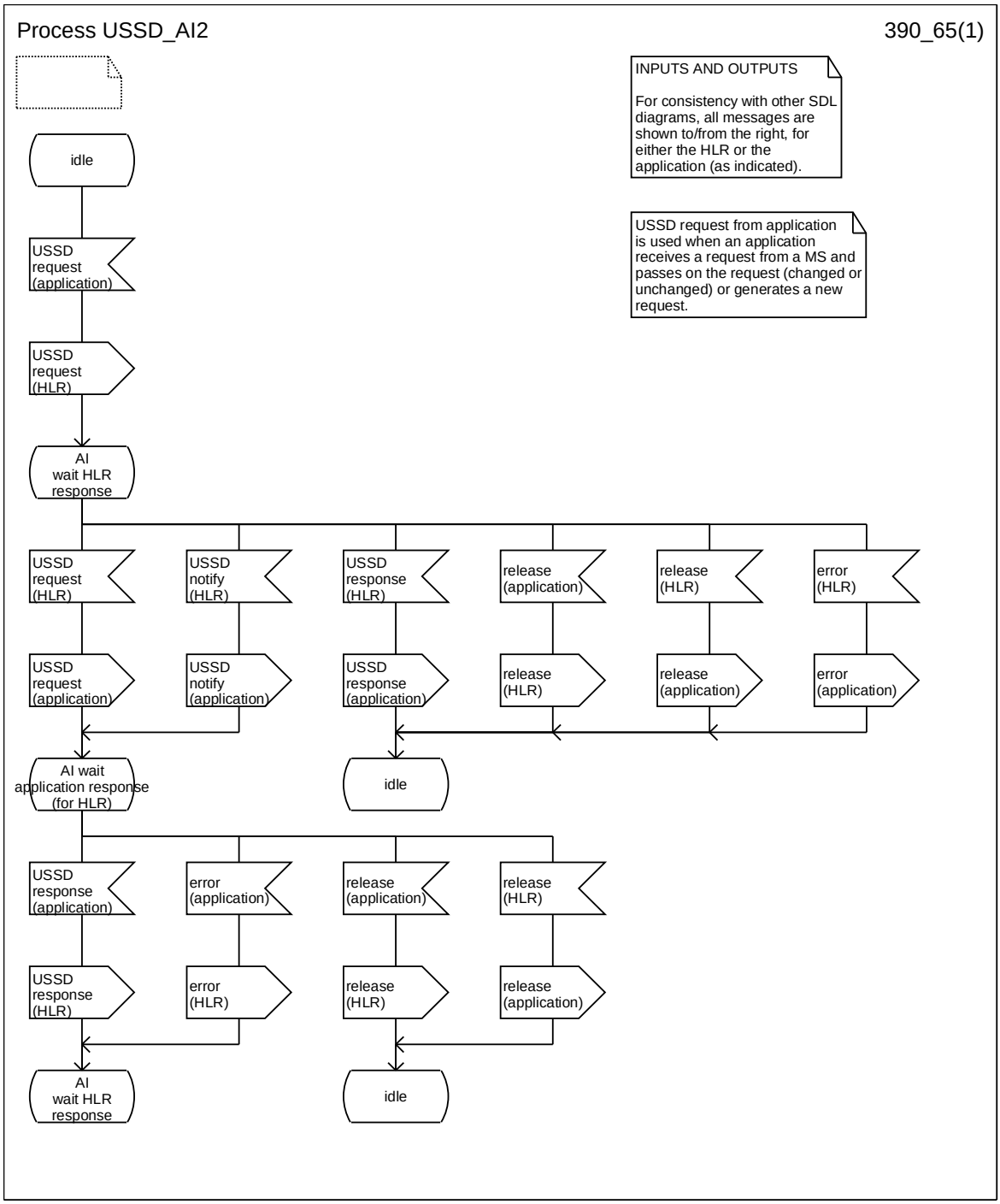


Figure 6.5: Application initiated USSD at VLR

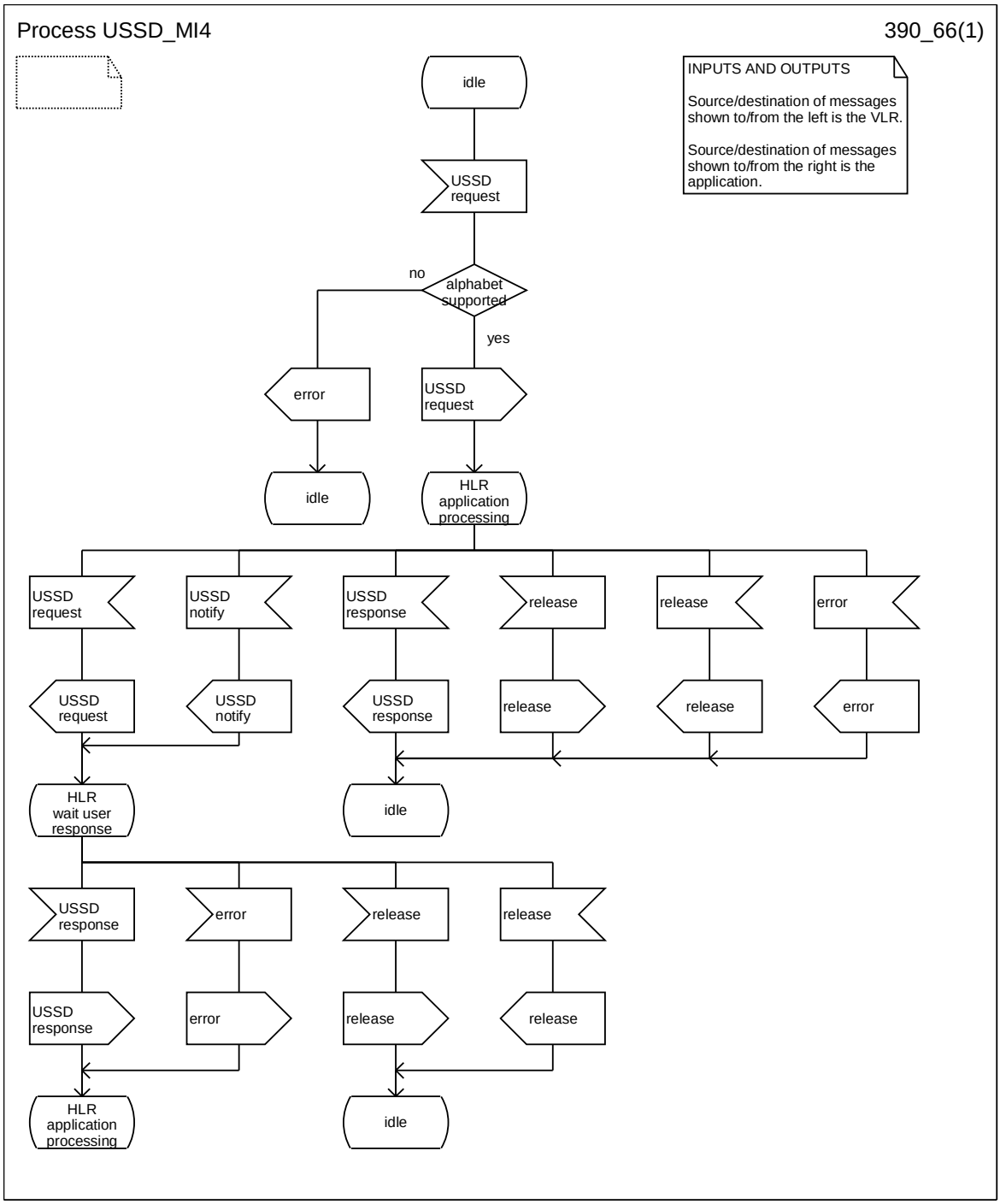
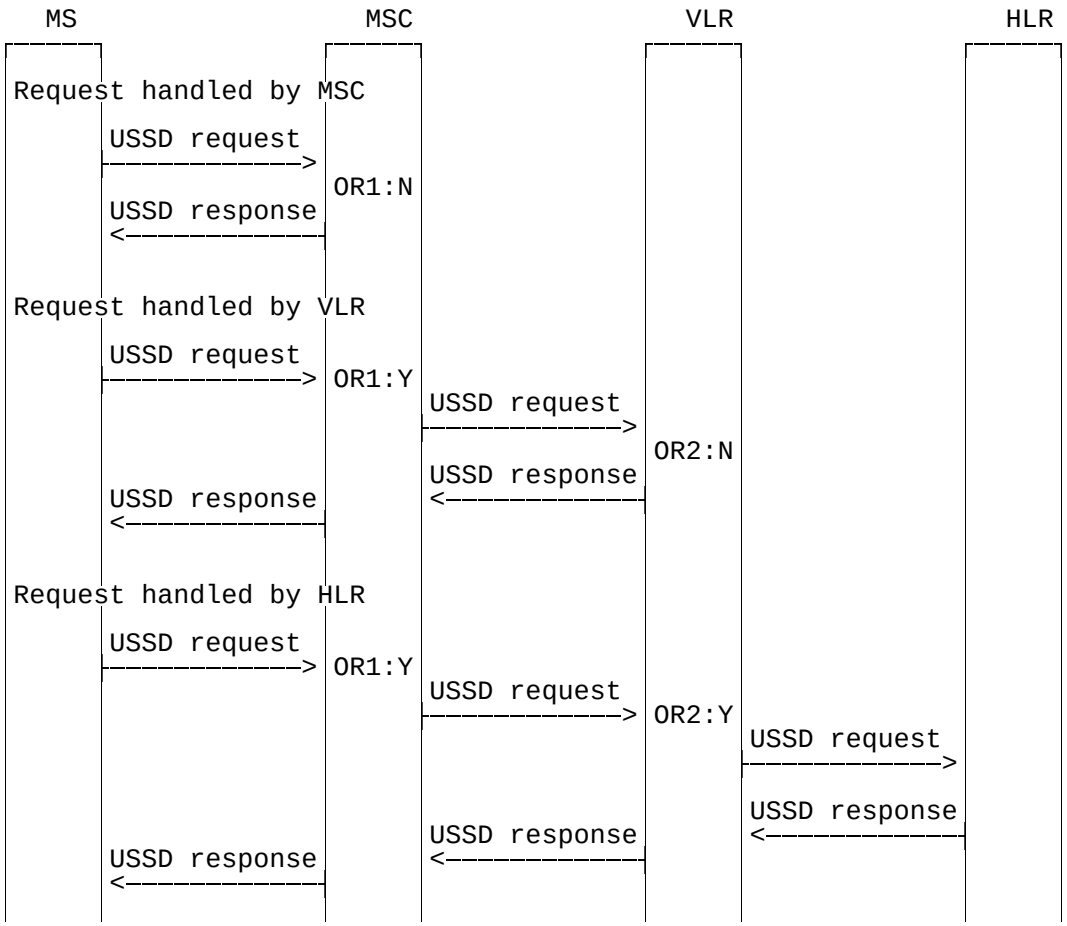


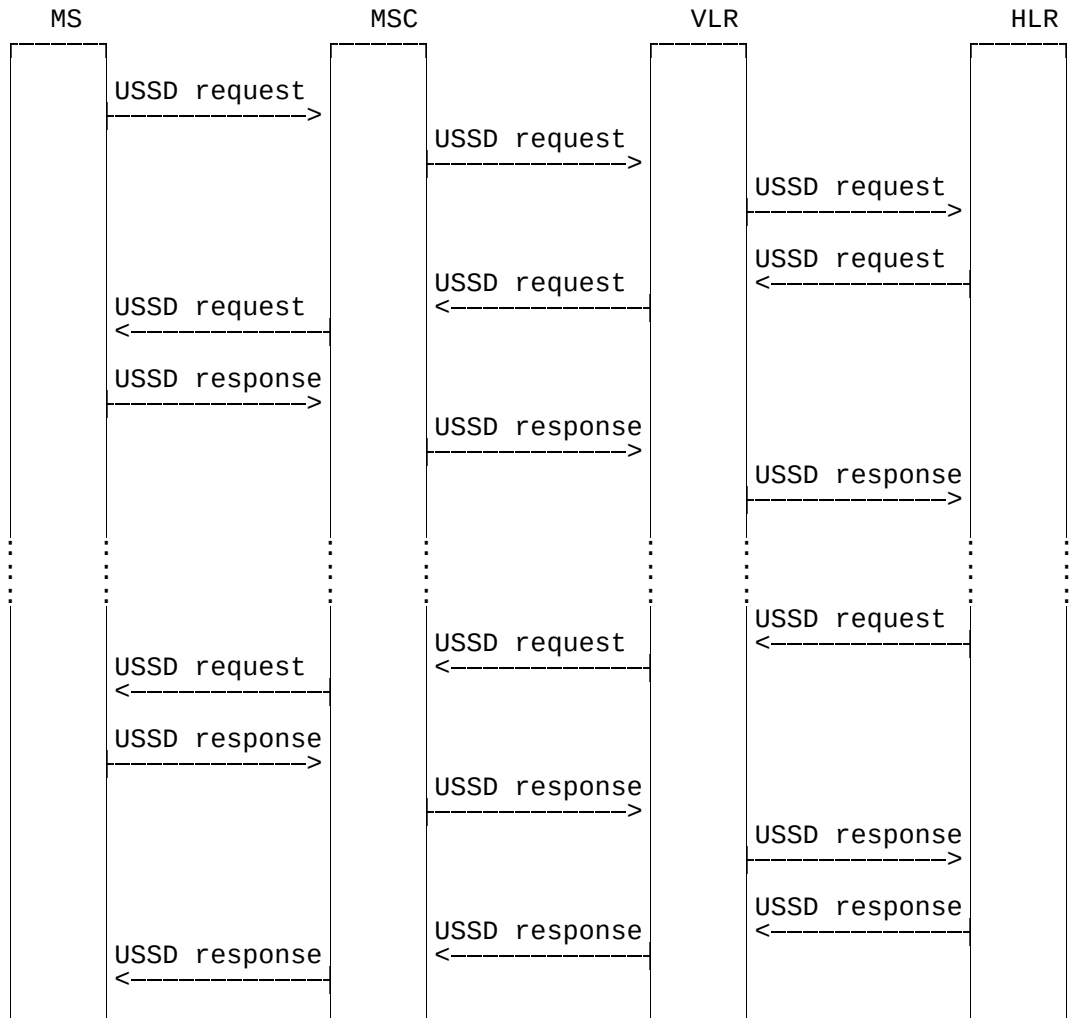
Figure 6.6: Mobile initiated USSD at HLR



NOTE: OR1: HPLMN service code Y: Yes
OR2: HPLMN service code and user not in HPLMN N: No

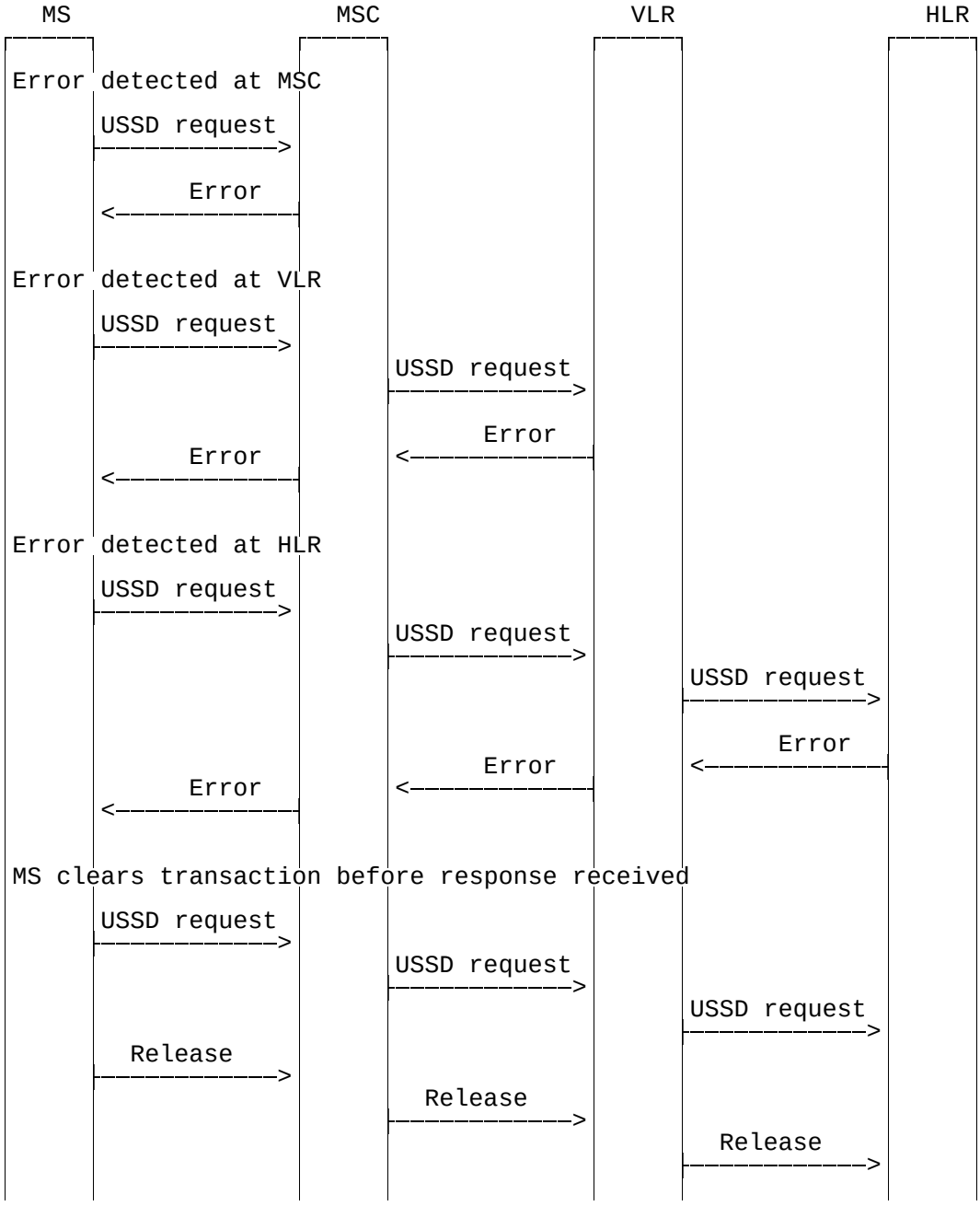
Note that the application at the MSC/VLR may pass the request on to another network entity. This is not shown here.

Figure 6.7: Information flow for mobile initiated USSD Request (No further information requested)



NOTE: Note that this call flow only shows one example to illustrate the possible scenarios. See the SDL diagrams for a complete description.

Figure 6.8: Information flow for mobile initiated USSD Request Handled by HLR, further information requested



NOTE: This call flow only shows a limited number of examples to illustrate the possible scenarios. See the SDL diagrams for a complete description.

Figure 6.9: Information flow for mobile initiated failed USSD Request

6.3 Information stored in the HLR

The HLR shall not store any information specific to the use of USSD, although information may be stored for services which are offered by USSD applications.

6.4 Information stored in the VLR

The VLR shall not store any information specific to the use of USSD, although information may be stored for services which are offered by USSD applications.

6.5 Handover

Handover will have no impact on the operation of this service.

6.6 Cross-phase compatibility

If, when a Phase 2 MS sends a mobile initiated USSD request, any network entity is of Phase 1, the request will be rejected. If it is possible to encode the content of the USSD request using the Phase 1 protocol, the MS shall repeat the request, using the Phase 1 protocol.

A Mobile initiated USSD request from a Phase 1 MS uses the Phase 1 protocol. On receipt of such a request, the application shall also use the Phase 1 protocol when sending the response.

A Phase 2 network shall not send network initiated requests or notifications during a mobile initiated USSD request if the MS or any network entity involved in the operation is of Phase 1.

Annex A (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
Apr 1999						Transferred to 3GPP CN1	
CN#03						Approved at CN#03	3.0.0
CN#06			001	1		USSD enhancement	3.1.0
CN#09			002	1		SDL refresh	3.2.0
CN#11						Release 4 after CN#11	4.0.0
CN#16						Release 5 after CN#16	5.0.0
CN#26						Release 6 after CN#26	6.0.0
CT#30			0003	1		Incorrect References	6.1.0
CT#36						Upgraded unchanged from Rel-6	7.0.0
CT#42						Upgraded unchanged from Rel-7	8.0.0
CT#42			-	-		Update to Rel-9 version (MCC)	9.0.0
2011-03			-	-		Update to Rel-10 version (MCC)	10.0.0
2012-09			-	-		Update to Rel-11 version (MCC)	11.0.0
2014-09			-	-		Update to Rel-12 version (MCC)	12.0.0
2015-12			-	-		Update to Rel-13 version (MCC)	13.0.0
2017-03			-	-		Update to Rel-14 version (MCC)	14.0.0
2018-06			-	-		Update to Rel-15 version (MCC)	15.0.0
2020-07			-	-		Update to Rel-16 version (MCC)	16.0.0
2022-03			-	-		Update to Rel-17 version (MCC)	17.0.0
2024-03	-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0
2025-10	-	-	-	-	-	Update to Rel-19 version (MCC)	**19.0.0**

History

Document history		
V19.0.0	October 2025	Publication