



High Level Design Document

Extended Handling of Network Initiated USSD

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0 Document Control

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0.2 Document History

Date	Version	Status	Author
2005-11-02	001	Draft	Karthik Ramamurthy

0.3 References, Abbreviations, Terms

Abbreviations:

USSD Unstructured Supplementary Service Data

MS Mobile Station

MMI Man Machine Interface

Dcs Data Coding Scheme

References:

1. 3GPP TS 24.080: "Mobile radio Layer 3 supplementary services specification; Formats and coding".
2. 3GPP TS 24.090: " Unstructured Supplementary Service Data (USSD) - Stage 3".

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1 Introduction

This document provides a high level design overview of the interface required to be provided to handle the MMI's response for an unsolicited result code +CUSD: ... sent to it. This interface support is implemented in the ACI module of the protocol stack.

A new AT command will be implemented in order to allow the MMI to convey its response for the above said +CUSD unsolicited result code.

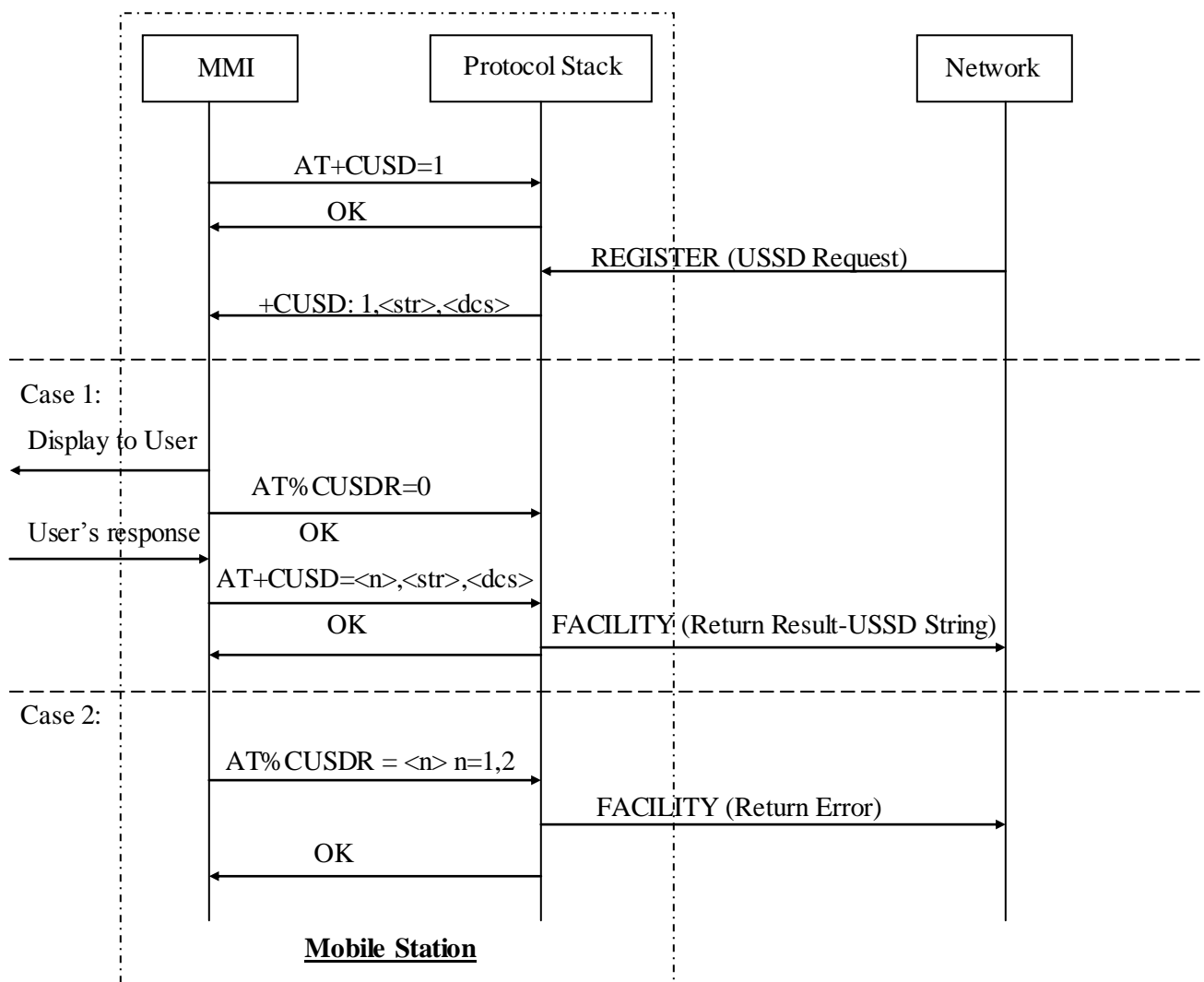
Furthermore, this interface to the MMI will be provided as a customized implementation. To enable the new implementation, the customization has to be enabled using %CUST command. Otherwise the behavior will continue as it is currently.

2 Design

This support for MMI's response is designed to cover two network initiated USSD transactions namely, USSD-Request and USSD-Notify. The newly introduced AT command is discussed in detail in the next chapter.

2.1 USSD-Request

For an USSD-Request, upon receiving a USSD Request from the network, the MS shall respond to the request by sending a FACILITY message containing the user's mobile subscriber's response in a return result component, if the MS is able to process the USSD-Request successfully. If the MS is unable to process the request received from the network, it will return an error indication by sending a FACILITY message containing a return error component. The MMI can convey the error, to be sent to the network, to the protocol stack using the new AT command AT% CUSDR while it continues to use the AT+CUSD command to convey the user's mobile subscriber's response to the protocol stack which in turn is to be sent to the network.



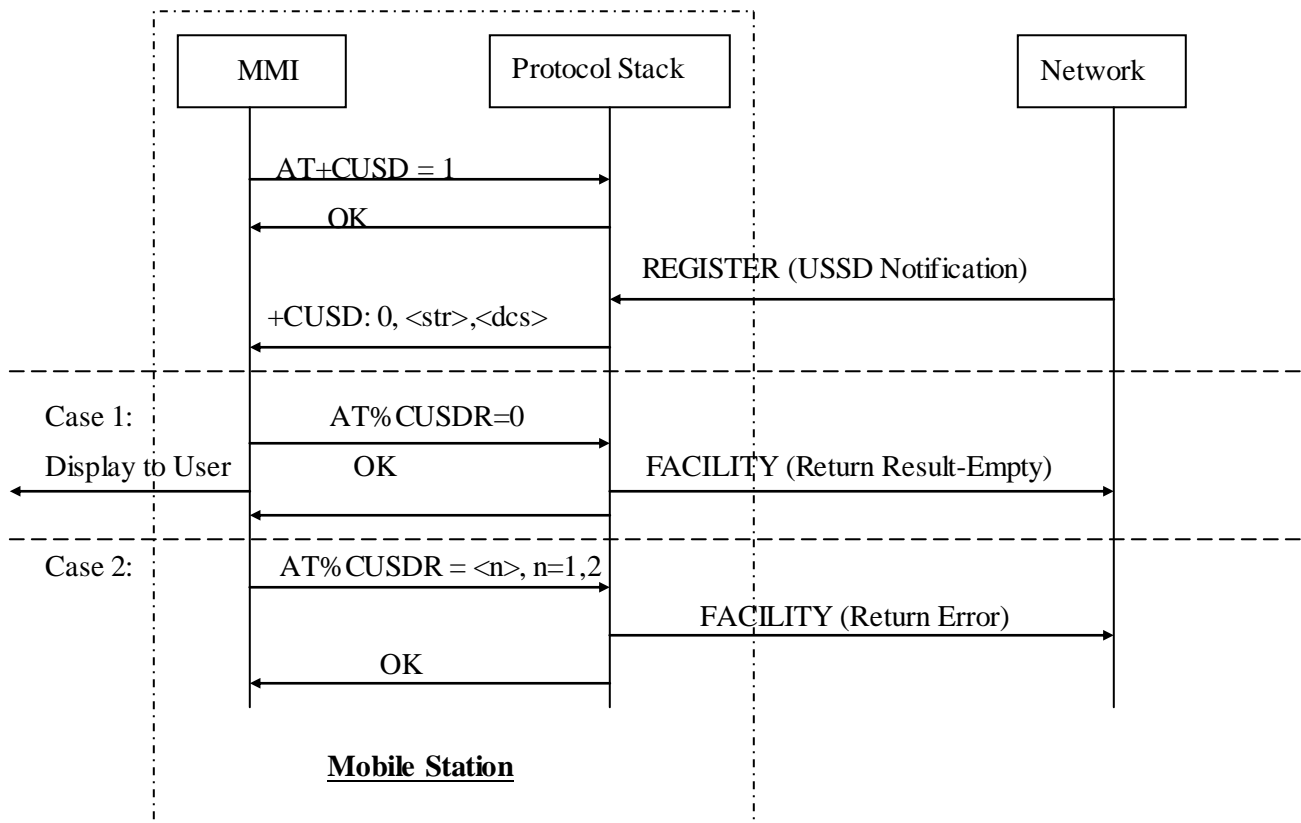
Case 1: USSD-Request processed successfully by the MMI. It is displayed to the user. The user responds. The user's response is sent to the network as a FACILITY message.

Case 2: USSD-request processing in MMI unsuccessful. MMI informs this to stack using the %CUSDR

command. The corresponding error code is sent to the network as a FACILITY message.

2.2 USSD-Notify

For an USSD-Notify, upon receiving a USSD Notification from the network, The MS will acknowledge the operation by sending a FACILITY message containing an empty result component to the network, if it is able to process the Notification successfully else, it will return an error indication by sending a FACILITY message containing a return error component. . The MMI can convey the response, to be sent to the network, to the protocol stack using the new AT command AT% CUSDR in both cases. An FACILITY message with an empty result component will be sent to the network, if the argument in the command indicates NO ERROR.



Case 1: USSD-Request processed successfully by the MMI. MMI informs this to stack using the %CUSDR command. A FACILITY message with empty result code is sent to the network.

Case 2: USSD-request processing in MMI unsuccessful. MMI informs this to stack using the %CUSDR command. The corresponding error code is sent to the network as a FACILITY message

3 Requirements in ACI Entity

The handling of the AT command discussed in previous chapters will be implemented in ACI module. The AT command is as discussed below.

3.1 %CUSDR AT Command Syntax

Command	Possible response(s)
%CUSDR=<n>	OK +CME ERROR: <err>
%CUSDR?	%CUSDR: Operation Invalid
%CUSDR=?	%CUSDR: (0-2)

Description

The set option will allow the MMI to convey its response, for a +CUSD unsolicited result code, to the protocol stack, which in turn will be sent to the network.

The query option is not implemented, as it is not a valid operation and hence shall respond accordingly.

The test option of the AT command will return the allowable options that can be used as the parameter with the set option of the %CUSDR command. Currently a standard “(0-2)” will be returned.

It is to be noted that %CUSDR=0 is a valid option on in case of a USSD Notification.

Defined Values: <n>

0 – OK

1 - Unknown Alphabet

2 – Busy

3.2 Internal Message Sequences

The internal message sequences between different modules corresponding to the message sequences between MS and network discussed in the previous chapter is as below.

3.2.1 USSD Request

In the case of USSD request the internal behavior of the ACI module and the interaction with SS module through MNSS SAP and also with MMI through AT interface is as given below. The following cases are considered.

Case 1: An MNSS_FACILITY_REQ is sent to SS Module by the ACI module with a Return Error as USSD_Busy in case of an already existing call independent Supplementary Service transaction.

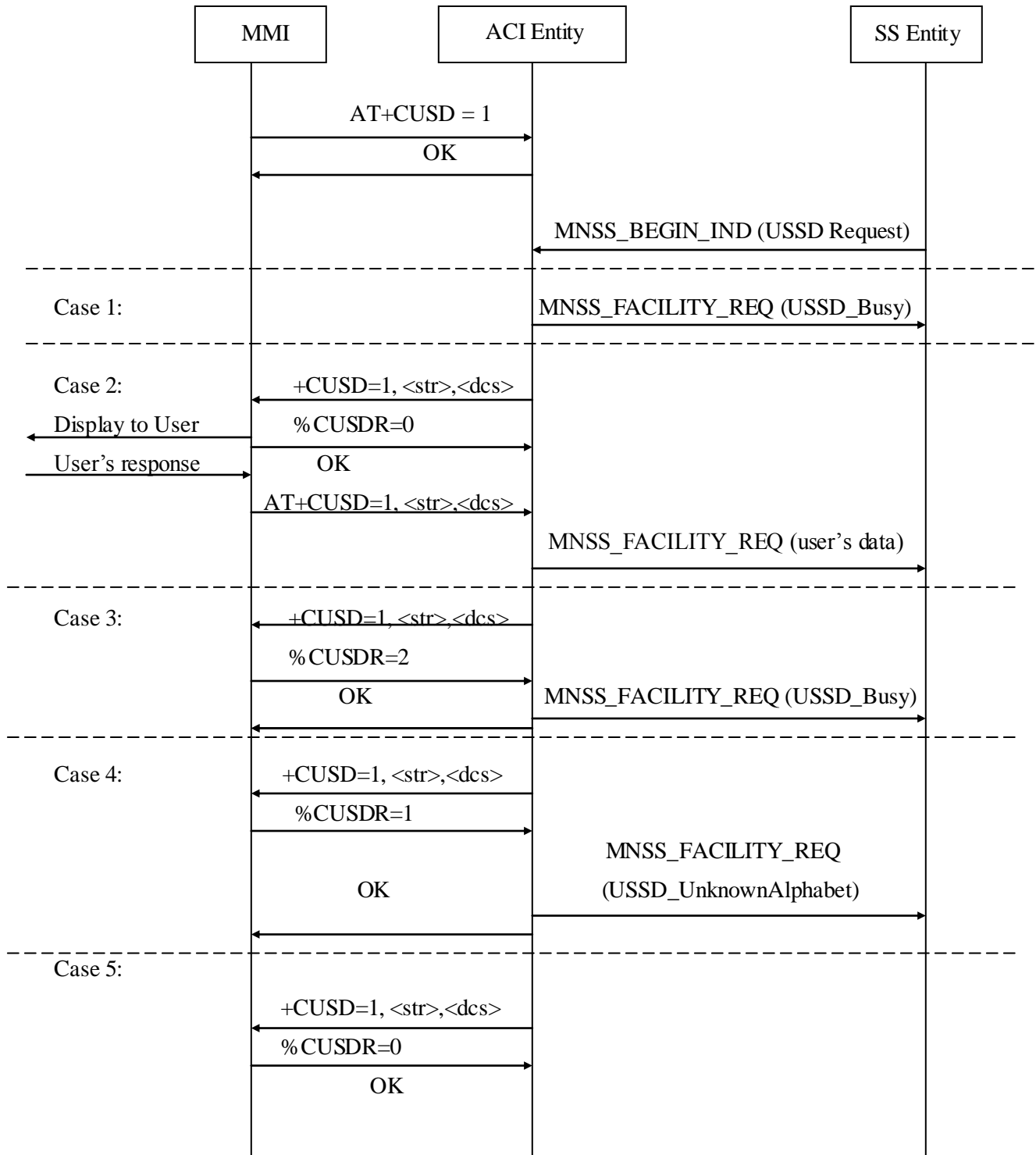
Case 2: ACI module receives User's response to a USSD request, from the MMI as parameter of +CUSD command. An MNSS_FACILITY_REQ is sent to SS Module by the ACI module with a Return Result containing the data received in the +CUSD command.

Case 3: ACI module receives response from MMI that USSD could not be displayed to the user since the display was busy as a parameter of %CUSDR command. An MNSS_FACILITY_REQ is sent to SS Module

by the ACI module with a Return Error as USSD_Busy.

Case 4: ACI module receives response from MMI that USSD could not be displayed to the user since the data coding scheme was not supported by it as a parameter of %CUSDR command. An MNSS_FACILITY_REQ is sent to SS Module by the ACI module with a Return Error as USSD_UnknownAlphabet.

Case 5: ACI module receives response from MMI that its processing of a +CUSD unsolicited result code was successful.



3.2.2 USSD Notify

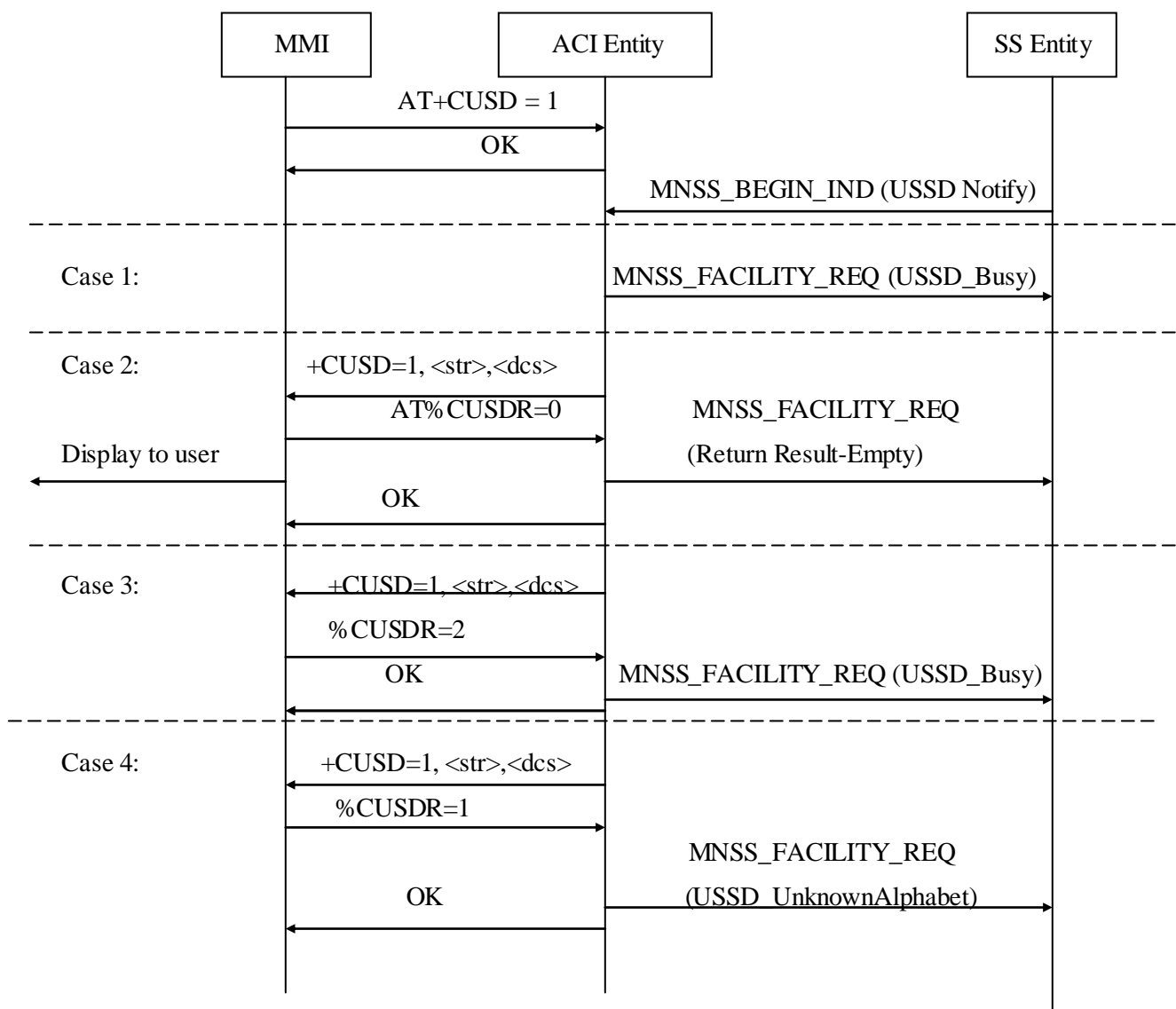
In the case of USSD notification received from the lower layer, the internal behavior of the ACI module and the interaction with SS module through MNSS SAP and also with MMI through AT interface is as given below. The following cases are considered.

Case 1: An MNSS_FACILITY_REQ is sent to SS Module by the ACI module with a Return Error as USSD_Busy in case of an already existing call independent Supplementary Service transaction.

Case 2: ACI module receives response from the MMI that it successfully displayed notification to User as a parameter of %CUSDR command. An MNSS_FACILITY_REQ is sent to SS Module by the ACI module with an empty Return Result.

Case 3: ACI module receives response from MMI that USSD could not be displayed to the user since the display was busy as a parameter of %CUSDR command. An MNSS_FACILITY_REQ is sent to SS Module by the ACI module with a Return Error as USSD_Busy.

Case 4: ACI module receives response from MMI that USSD could not be displayed to the user since the data coding scheme was not supported by it as a parameter of %CUSDR command. An MNSS_FACILITY_REQ is sent to SS Module by the ACI module with a Return Error as USSD_UnknownAlphabet.



4 Testing

Simulation test cases have to be written in the `aciss_test` test suite covering the various use case scenarios discussed in the previous chapters.