



USSD Interworking Guidelines

Version 1.0

10 July 2013

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1 Introduction

1.1 Overview

This document introduces guidelines for usage of Unstructured Supplementary Service Data (USSD) inter-Public Land Mobile Network (PLMN) connections and requirements for establishing USSD interworking between PLMN operators.

1.2 Scope

This document gives guidance to USSD related issues such as addressing and routing to ensure interoperable USSD services and networks concerning interworking cases between different PLMN operators.

Definitions given in this document are considered as the prerequisites for interoperable USSD interworking scenarios.

Radio interface, core network backbone and billing issues are not in the scope of this document. Aim of this document is not to give an elementary level introduction to USSD, see for example, 3GPP TS 22.090 [1], 3GPP TS 23.090 [2] and 3GPP TS 24.090 [3] documents for this purpose.

1.3 Abbreviations

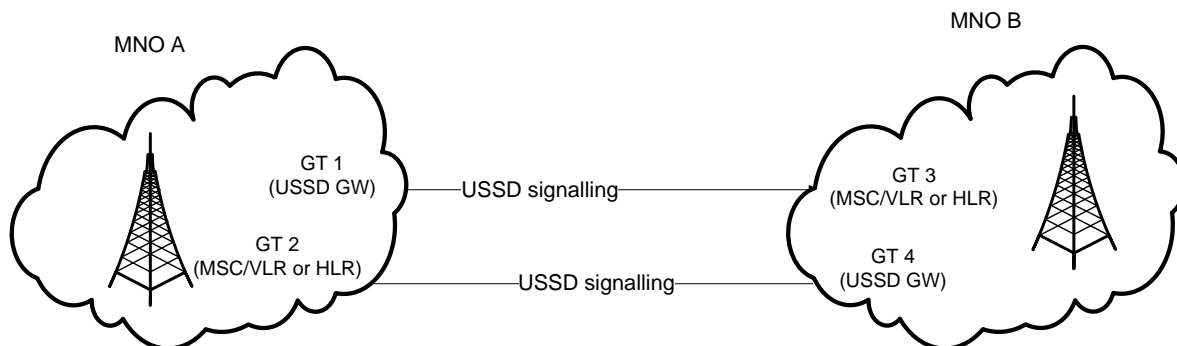
Term	Description
ACK	Acknowledgment
GT	Global Title
HLR	Home Location Register
MNO	Mobile Network Operator
MS	Mobile Station
MSC	Mobile Switching Center
MSU	Message Signal Unit
PLMN	Public Land Mobile Network
PSSR	Process Supplementary Service Request
SCCP	Signalling Connection Control Part
USSD	Unstructured Supplementary Service Data
USSN	Unstructured Supplementary Service Notify
USSR	Unstructured Supplementary Service Request
VLR	Visiting Location Register

1.4 References

Ref	Doc Number	Title
[1]	3GPP TS 22.090	Unstructured Supplementary Service Data (USSD) - Stage 1
[2]	3GPP TS 23.090	Unstructured Supplementary Service Data (USSD) - Stage 2
[3]	3GPP TS 24.090	Unstructured Supplementary Service Data (USSD) - Stage 3

2 USSD Interworking Scenarios

Figure 1 describes how Mobile Network Operators (MNO) exchange USSD messages, whether mobile or network initiated.



GT	Description
GT 1 (USSD GW)	MNO A USSD Interworking service origination Global Title
GT 2 (MSC/VLR or HLR)	MNO A USSD Interworking service termination Global Title
GT 3 (MSC/VLR or HLR)	MNO B USSD Interworking service termination Global Title
GT 4 (USSD GW)	MNO B USSD Interworking service origination Global Title

Figure 1: USSD Interworking overview

Basic idea for USSD interworking is to exchange USSD related Signalling Connection Control Part (SCCP) Message Signal Units (MSU) using separate Global Titles (GT) for USSD service origination and termination. In the example above, MNO A uses GT 1 for USSD service origination and GT 2 for USSD service termination. Analogously, MNO B uses GT 3 for USSD service termination and GT 4 for USSD service origination.

Reason behind using two (2) separate GTs is for the MNO's ability to actually count the MSUs exchanged for either mobile or network initiated USSD service so that the interworking service can be charged.

USSD Interworking service origination GT is presumably always USSD Gateway (GW), while the USSD Interworking service termination GT is presumably either Mobile Switching Center/ Visiting Location Register (MSC/VLR) or Home Location Register (HLR).

2.1 Network Initiated USSD Interworking

Figure 2 describes the Network Initiated USSD interworking with MSC/VLR included.

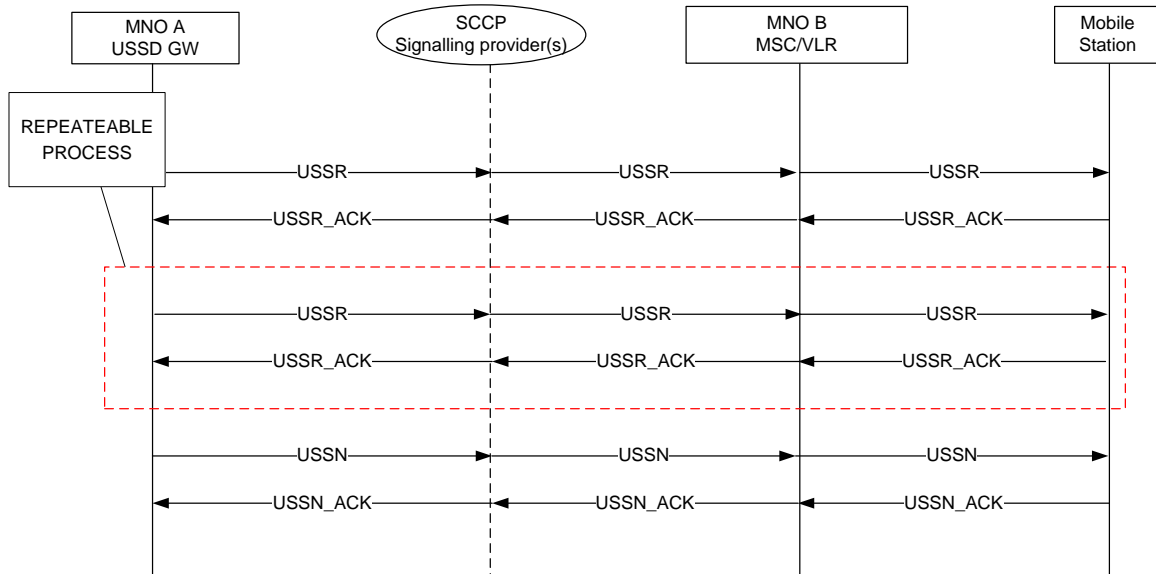


Figure 2: Network Initiated USSD Interworking - MSC/VLR

Figure 3 describes the Network Initiated USSD interworking with HLR included.

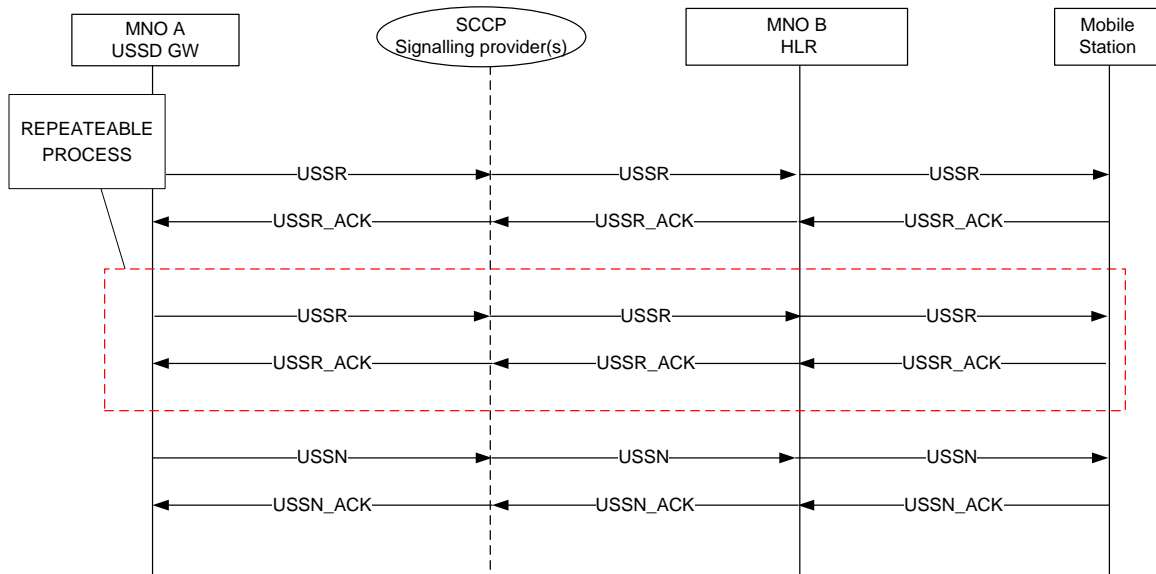


Figure 3: Network Initiated USSD Interworking - HLR

Clarification of Figure 2 and Figure 3 (specific application triggers a network initiated USSD session to a mobile user):

1. Application hosted on the USSD GW sends out a Unstructured Supplementary Service Request (USSR) to mobile user located in MNO B.
2. USSR origination is the GT of MNO A USSD GW.
3. USSR goes through the MNO A SCCP signalling provider to MNO B SCCP signalling provider.
4. USSR reaches MNO B and terminates on the destination GT that is, MSC/VLR or HLR and finally on the Mobile Station (MS) of the mobile user.
5. When the mobile user replies, USSR Acknowledgement (ACK) travels the same way back as described above.
6. Entire process of exchanging USSR and USSR ACK messages is repeatable and depends on network timers or length of the USSD session or user preference.
7. Final message going from the application that initiated the USSD session is Unstructured Supplementary Service Notify (USSN), with which the application sends the final USSD message to the mobile user and terminates the session.
8. When the mobile user acknowledges end of session it sends out USSN ACK to the application.

NOTE: Figure 2 and Figure 3 have been somewhat simplified.

2.2 Mobile Initiated USSD Interworking

Figure 4 describes the Mobile Initiated USSD interworking with MSC/VLR included.

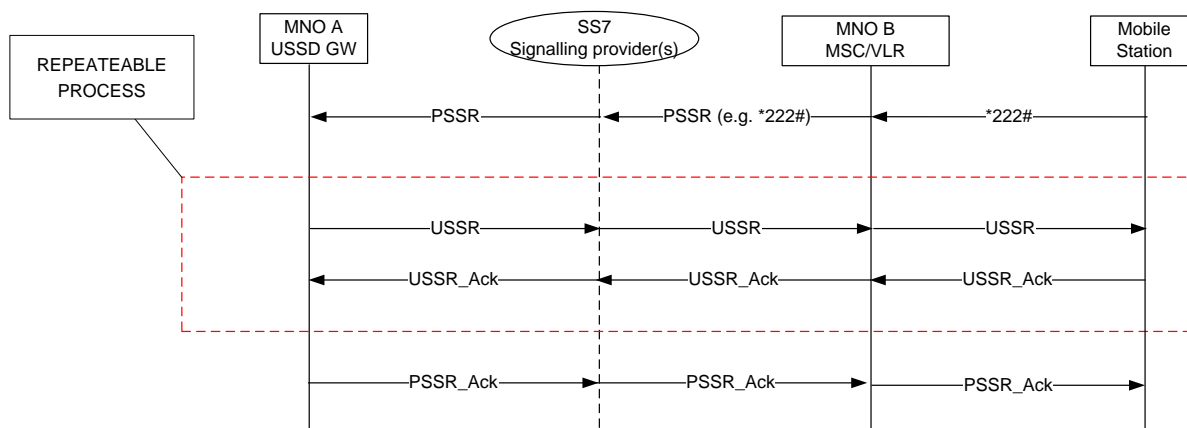


Figure 4: Mobile Initiated USSD Interworking - MSC/VLR

Figure 5 describes the Mobile Initiated USSD interworking with HLR included.

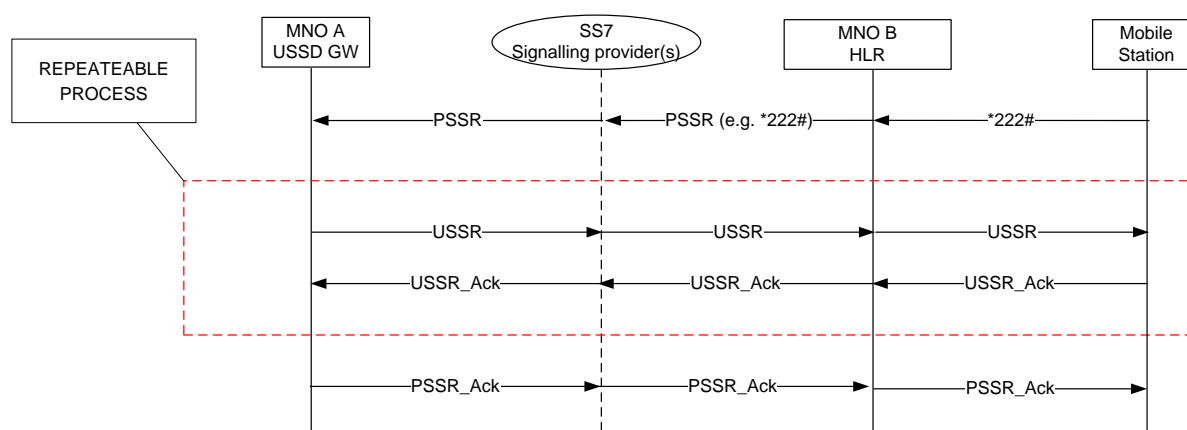


Figure 5: Mobile Initiated USSD Interworking - HLR

Clarification of Figure 4 and Figure 5 (user triggers the USSD session by using a USSD service code):

1. Mobile user initiates the USSD session by utilizing the USSD service code (for example, *222#).
1. MNO B sends a Process Unstructured Supplementary Service Request (PSSR) towards its SCCP signalling provider.
2. PSSR reaches MNO A and terminates on the destination GT that is, USSD GW.
3. When the application hosted on the USSD GW replies with USSR, the signalling MSU travels the same way as PSSR above.
4. At this moment the application hosted at the USSD GW and the mobile user enter into a repeatable process of exchanging USSR and USSR ACK signalling messages.
5. Final message going from the application hosted on the USSD GW is PSSR ACK, with which the application sends the final USSD message to the mobile user and terminates the session.

Note: Figure 4 and Figure 5 have been somewhat simplified.

3 Assignment and implementation of USSD service codes

For the mobile user to be able to initiate a USSD session, he needs to know the USSD service code for example *222#. These codes need to be known to both PLMN networks that will establish a USSD interworking relationship, so they know where to route a mobile initiated USSD request with a specific service code.

3GPP document TS 22.090 **Error! Reference source not found.** defines that codes from 100 - 149 are to be used by the home PLMN for internal services. This leaves all other service codes free to use for the interworking relationship.

4 Requirements for USSD Interworking

For the PLMN networks to be able to exchange USSD interworking traffic, they need to implement the following:

- USSD in their networks (phase 2 to be able to support network initiated USSD)
- Exchange information regarding the USSD service origination and termination GT's
- Assign and implement the USSD short codes that will be used for the USSD interworking

5 Instructions for completing the IR.21 document

In order to provide all information needed for USSD interworking, MNOs should provide USSD GW information in [IR.21](#) "Network Elements Information" part, Section ID: 13.

6 Conclusion

Successful interworking is crucial for better worldwide adoption of USSD. There is a huge potential for the use of USSD, but the PLMN networks haven't really utilized it for other services other than internal services.

USSD Interworking guidelines should outline and help PLMN networks to establish USSD service between themselves in a more easier fashion.

Document Management

Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
0.1	January 10 th , 2013	First draft of PRD document for IREG SIGNAL WP discussion		Renata Đurić / Infobip Tomislav Gojević / Infobip
1.0	April 9 th 2013	Submitted to DAG#104 and PSMC#112 for approval	IREG/PSMC	Tomislav Gojević / Infobip

Other Information

Type	Description
Document Owner	IREG
Editor / Company	Renata Đurić / Infobip Tomislav Gojević / Infobip

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