Profile for USSI
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1 Introduction

1.1 Overview

The IP Multimedia Subsystem (IMS) Profile for Unstructured Supplementary Service Data (USSD) Simulation Service in IMS (USSI), documented in this Permanent Reference Document (PRD), defines a profile that identifies a minimum mandatory set of features which are defined in 3GPP specifications that a wireless device (the User Equipment (UE)) and network are required to implement in order to guarantee an interoperable, high-quality USSI. The UE and the network may support USSI on one or a combination of Long Term Evolution (LTE) / Evolved UMTS Terrestrial Radio Access Network (E-UTRAN) access, UMTS Terrestrial Radio Access Network (UTRAN) access, and Wireless Local Area Network (WLAN) access. The scope includes the following aspects:

- IMS basic capabilities [Chapter 2]
- E-UTRAN, UTRAN and WLAN radio and (evolved) packet core capabilities [Chapter 4]
- Functionality that is relevant across the protocol stack and subsystems [Chapter 5]
- Additional features that need to be implemented for the UEs and networks that wish to support concurrent Circuit Switched (CS) coverage [Annex A]

The main body of this PRD is applicable for a scenario where IMS telephony is deployed over E-UTRAN, UTRAN (Packet Switched (PS)-only) or WLAN in a standalone fashion or in a combination with a multitude of those accesses without relying on any circuit switched infrastructure. In this case the UEs and networks must be compliant with all of the normative statements in the main body.

Annex A defines the profile for an alternative approach where USSD is deployed with a certain degree of reliance on an existing 3GPP circuit switched network infrastructure. Whenever there are additional requirements to the main profile, these are explicitly stated. In order to be compliant with the functionality described in Annex A, UEs and networks must be compliant with all of the normative statements in Annex A including all of the normative statements in the main body of the PRD that are unaltered by Annex A.

In this version of the PRD, only voice-capable UEs and networks are considered.

1.2 Relationship to 3GPP specifications

This profile is solely based on the open and published 3GPP specifications as listed in Section 1.6. 3GPP Release 12, the first release supporting both UE-initiated USSI and network-initiated USSI, is taken as a basis. It should be noted, however, that not all the features mandatory in 3GPP Release 12 are required for compliance with this profile.

Unless otherwise stated, the latest version of the referenced specifications for the relevant 3GPP release applies.

1.3 Scope

This document defines an IMS profile by listing a number of E-UTRAN, UTRAN, WLAN, Evolved Packet Core, IMS core, and User Equipment (UE) features that are considered

essential to launch interoperable IMS based USSD service as defined in the introduction in section 1.1. The scope of this profile is the interface between UE and network.

Note: Although, this version of the specification focuses on E-UTRAN, UTRAN and WLAN, the defined IMS functionalities can be applied to other IP Connectivity Accesses.

1.4 Definitions

Term	Description
Data Off	As defined in GSMA PRD IR.92 [3].
Data Off Enabled Service	As defined in GSMA PRD IR.92 [3].

1.5 Abbreviations

Term	Description
3GPP	3rd Generation Partnership Project
APN	Access Point Name
CSFB	Circuit Switched Fall-Back
DRB	Data Radio Bearer
E-UTRAN	Evolved UTRAN
EPC	Evolved Packet Core
EPS	Evolved Packet System
FDD	Frequency-Division Duplexing
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
HSPA	High-Speed Packet Access
IMS	IP Multimedia Subsystem
ISR	Idle-mode Signalling Reduction
LTE	Long Term Evolution
P-CSCF	Proxy Call/Session Control Function
PGW	PDN Gateway
PDN	Packet Data Network
PDP	Packet Data Protocol
QCI	Quality of Service Class Indicator
RAB	Radio Access Bearer
RLC	Radio Link Control
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SMS	Short Message Service
TDD	Time-Division Duplexing
THP	Traffic Handling Priority
UMTS	Universal Mobile Telephony System

USSD	Unstructured Supplementary Service Data
USSI	USSD Simulation Service in IMS
UTRAN	UMTS Terrestrial Radio Access Network
WLAN	Wireless Local Area Network

1.6 References

Ref	Doc Number	Title
[1]	GSMA PRD IR.51	IMS Profile for Voice, Video and SMS over Wi-Fi
[2]	GSMA PRD IR.58	IMS Profile for Voice over HSPA
[3]	GSMA PRD IR.92	IMS Profile for Voice and SMS
[4]	3GPP TS 23.090	Unstructured Supplementary Service Data (USSD); Stage 3
[5]	3GPP TS 23.221	Architectural requirements
[6]	3GPP TS 24.390	Unstructured Supplementary Service Data (USSD) using IP Multimedia (IM) Core Network (CN) subsystem IMS; Stage 3
[7]	3GPP TS 24.391	Unstructured Supplementary Service Data (USSD) using IP Multimedia (IM) Core Network (CN) subsystem (IMS) Management Object (MO)
[8]	GSMA PRD IR.65	IMS Roaming and Interworking Guidelines
[9]	GSMA PRD IR.88	LTE and EPC Roaming Guidelines

2 IMS Feature Set

2.1 General

The IMS profile part lists the mandatory capabilities that are required over the Gm reference point.

2.2 Support of generic IMS functions

2.2.1 General

The UE and the network must fulfil the requirements for authentication as specified in the section 2.2.2 of GSMA PRD IR.92 [3].

The UE and the network must fulfil the requirements for addressing as specified in section 2.2.3 of GSMA PRD IR.92 [3] and section 4.5.4.1 of 3GPP TS 24.390 [6].

Note: Geo-local numbering is not used in USSI.

2.2.2 SIP Registration Procedures

A UE that also implements and uses voice and/or SMS over LTE must perform a SIP Registration as specified in 2.2.1 of GSMA PRD IR.92 [3]. When performing a SIP Registration, the UE must include a g.3gpp.nw-init-ussi media feature tag in the Contact header field as specified in 3GPP TS 24.390 [6].

2.2.3 The use of Signalling Compression

2.2.3.1 E-UTRAN

The UE and the network must fulfil the requirements as specified in section 2.2.6 of GSMA PRD IR.92 [3].

2.2.3.2 UTRAN

The UE and the network must fulfil the requirements as specified in section 2.2.6 of GSMA PRD IR.58 [2].

2.2.3.3 WLAN

The UE and the network must fulfil the requirements as specified in section 2.2.6 of GSMA PRD IR.51 [1].

2.3 USSI Considerations

2.3.1 General

The following sub-sections provide considerations for the UE and network specific to USSI.

2.3.2 UE initiated

The UE must support the invocation and operation of user initiated USSI as defined in sections 4.5.4.1 and 4.5.3 of 3GPP TS 24.390 [6].

The USSI AS must support the actions defined in section 4.5.4.2 of 3GPP TS 24.390 [6].

2.3.3 Network initiated

The USSI AS may support the invocation and operation of network initiated USSI as defined in section 4.5.5.1 of 3GPP TS 24.390 [6].

The UE must support the actions defined in section 4.5.5.2 of 3GPP TS 24.390 [6].

2.3.4 Integration of resource management

2.3.4.1 Loss of PDN connectivity

The UE and the network must fulfil the requirements as specified in section 2.4.2.1 of GSMA PRD IR.92 [3].

3 SDP negotiation

The UE and the IMS core network must support the SDP negotiation to not use media resources for UE initiated USSI and network initiated USSI as described in sections 4.5.2 and 4.5.2A (respectively) of 3GPP TS 24.390 [6].

4 Radio and Packet Core Feature Set

4.1 General

UEs and networks supporting E-UTRAN, UTRAN and/or WLAN, must support the relevant subsections of those accesses within this section.

The LTE radio capabilities included in this specification are applicable to UE and network supporting FDD LTE only, TDD LTE only, or both FDD and TDD LTE.

Note: For UEs and networks already compliant with GSMA PRD IR.92 [3], GSMA PRD IR.58 [2] and/or GSMA PRD IR.51 [1], no further changes are required for the support of E-UTRAN and UTRAN, respectively; only a sub-set of the functionality is required.

4.2 E-UTRAN and UTRAN Radio Capabilities

4.2.1 E-UTRAN Radio Bearers

The UE and network must support at least one Acknowledged Mode (AM) Data Radio Bearer (DRB) as utilized for Evolved Packet System (EPS) bearer with Quality of Service Class Indicator (QCI) = 5, as specified in section 4.2.1 of GSMA PRD IR.92 [3].

EPS bearer usage is described in section 4.3.

4.2.2 UTRAN Radio Bearers

The UE and network must support at least one Acknowledged Mode (AM) Interactive PS RAB utilized for Universal Mobile Telecommunications System (UMTS) bearer with interactive traffic class associated with Traffic Handling Priority (THP) 1 and Signalling Indication, as specified in section 4.2.1 of GSMA PRD IR.58 [2].

PDP context usage is described in section 4.3.

4.2.3 E-UTRAN RLC configurations

The Radio Link Control (RLC) entity must be configured to support at least Acknowledged Mode (AM) for EPS bearers with QCI = 5, as specified in section 4.2.3 of GSMA PRD IR.92 [3].

4.2.4 UTRAN RLC configurations

The Radio Link Control (RLC) entity must be configured to support at least Acknowledged Mode (AM) for UMTS bearers with interactive class associated with THP 1 and Signalling Indication, as specified in section 4.2.3 of GSMA PRD IR.58 [2].

4.2.5 Bearer Management

4.2.5.1 E-UTRAN EPS Bearer Considerations

The UE and the network must fulfil the requirements as specified in section 4.3.1 of GSMA PRD IR.92 [3] for at least SIP signalling.

4.2.5.2 UTRAN EPS Bearer/PDP Context Considerations

The UE and the network must fulfil the requirements as specified in section 4.2.2 of GSMA PRD IR.58 [2] for at least SIP signalling.

4.2.6 P-CSCF Discovery

4.2.6.1 E-UTRAN

The UE and the network must fulfil the requirements as specified in section 4.4 of GSMA PRD IR.92 [3].

4.2.6.2 UTRAN

The UE and the network must fulfil the requirements as specified in section 4.4 of GSMA PRD IR.58 [3].

4.2.6.3 WLAN

The UE and the network must fulfil the requirements as specified in section 4.9 of GSMA PRD IR.51 [1].

5 Common Functionalities

5.1 IP Version

5.1.1 E-UTRAN

The UE and the network must fulfil the requirements as specified in section 5.1 of GSMA PRD IR.92 [3].

5.1.2 UTRAN

The UE and the network must fulfil the requirements as specified in section 5.1 of GSMA PRD IR.58 [2].

5.1.3 WLAN

The UE and the network must fulfil the requirements as specified in section 5.1 of GSMA PRD IR.51 [1].

5.2 Roaming Considerations

This profile has been designed to support IMS roaming with both P-CSCF and PGW/GGSN in the visited network.

Which of the above are used depends on the routing of the IMS well-known APN and P-CSCF selection. For more information on these roaming models see GSMA PRD IR.65 [8] and GSMA PRD IR.88 [9].

5.3 Data Off

The UE must fulfil the requirements as specified in section 5.5.1 of GSMA PRD IR.92 [3].

The UE must be able to initiate and receive USSI messages as described in this document regardless of whether Data Off is activated i.e. the UE continues to use (does not disconnect) the PDN connection via the IMS well-known APN as described in section 4.2.5.

Annex A Complementing IMS with CS

A.1 General

In order to offer its customers a seamless service, the operator may wish to complement the USSI capable radio coverage by utilising the Circuit Switched (CS) radio access and/or the CS core network for USSD. The USSI capable radio coverage may be less or more extensive than the CS/USSD coverage. This Annex describes the additional features that need to be implemented for the UEs and networks that wish to support such a deployment scenario.

The UE and the network must support the necessary procedures as specified in 3GPP TS 23.090 [4].

A.2 Domain Selection

The UE must support the selection of an appropriate method for UE originating USSD request delivery as specified in section 7.2e of 3GPP TS 23.221 [5]. The support of the USSI MO as defined in 3GPP TS 24.391 [7] by the UE and network is not required.

Note: When the originating voice domain selection is PS, the absence of support in the UE of the MO defined in 3GPP TS 24.391 [7] results in the UE sending an originating USSD request using IMS according to 3GPP TS 24.390 [4]. If the home network does not support USSI, in order to ensure the correct delivery of UE initiated USSD requests (i.e. via CS), the home network needs to ensure that USSI requests are rejected with a 404 (Not found) response as specified in 3GPP TS 24.390 [4].

A.3 Roaming Considerations

Section 5.2 defines the allowed roaming models, but these models may not always be possible e.g. due to IMS roaming restrictions. When USSI is not possible then the UE must follow procedures defined in Annex A.2 to use USSD over CS.

Annex B Document Management

B.1 Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
1.0	5th May 2015	Minor updates and clarifications to resolve remaining editor's notes and section references to IR.51. First version for NG approval.	NG	Nick Russell / BlackBerry Ltd.
2.0	10th Nov 2016	CR to modify the referencing to IR.92 to remove requirements to geo-local numbering support for USSI.	NG	Nick Russell / BlackBerry Ltd.

B.2 Other Information

Type	Description
Document Owner	GSMA Networks Group RILTE
Editor / Company	Nick Russell / BlackBerry UK Ltd.

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