IMS Profile for Converged IP Communications

Version 7.0

05 April 2020

This is a Non-binding Permanent Reference Document of the GSMA

Security Classification: Non-confidential

Access to and distribution of this document is restricted to the persons permitted by the security classification. This document is confidential to the Association and is subject to copyright protection. This document is to be used only for the purposes for which it has been supplied and information contained in it must not be disclosed or in any other way made available, in whole or in part, to persons other than those permitted under the security classification without the prior written approval of the Association.

Copyright Notice

Disclaimer

The GSM Association ("Association") makes no representation, warranty or undertaking (express or implied) with respect to and does not accept any responsibility for, and hereby disclaims liability for the accuracy or completeness or timeliness of the information contained in this document. The information contained in this document may be subject to change without prior notice.

Antitrust Notice

The information contain herein is in full compliance with the GSM Association's antitrust compliance policy.

Table of Contents

1 Introduction

1.1 Overview

This Permanent Reference Document (PRD) defines a profile that identifies a minimum mandatory set of common IMS (IP multimedia subsystem) functionalities that are defined in 3GPP specifications and other GSMA PRDs that a wireless device (the User Equipment (UE)) and the network are required to support in order to guarantee interoperable, high quality IMS-based and Mobile Operator provided Converged IP (Internet Protocol) Communications Services (as defined in section 1.4).

The service and access specific functionality for Converged IP Communications is defined within the following related PRDs:

- GSMA PRD IR.92 [1] - IMS Profile for Voice and SMS (Short Message Service) (over LTE).
- GSMA PRD IR.94 [2] – IMS Profile for Conversational Video Service
- GSMA PRD IR.64 [17] - IMS Service Centralization and Continuity Guidelines
- GSMA PRD RCC.07 [3] - Rich Communication Suite - Advanced Communications Services and Client Specification
- GSMA PRD IR.51 [5] – IMS Profile for Voice, Video and SMS over untrusted Wi-Fi access
- GSMA PRD RCC.20 [20] – Enriched Calling Technical Specification.

This document defines the normative requirements for the UE and the network to support Converged IP Communication Services.

The following network deployments are supported:

- a converged IMS core network (i.e. supporting all Converged IP Communications Services), or
- two separate IMS core networks (i.e. all Converged IP Communications Services supported via respective sub-sets provided via two IMS core networks).

Note: In the two separate IMS core networks scenario each core network contains its own HSS (Home Subscriber Server).

The network deployments described above require the UE to support:

a single IMS registration to a single IMS core network; and

- two separate IMS registrations, either to a single IMS core network or to two separate IMS core networks.

Table 1 provides an overview of all allowed and prohibited combinations for single registration and two registrations.

	Single IMS Core Network	Two separate IMS Core Networks
UE performs single IMS Registration	Allowed	Prohibited (see Note 2)
UE performs two IMS Registrations	Allowed	Allowed

Table 1 IMS Registration / IMS Core Combinations

Note: In the prohibited case in Table 1, the UE must perform two separate IMS registrations since a single IMS registration would only cover a sub-set of Converged IP Communication Services.

All of the different combinations for the UE implementation and the network deployment are able to provide a solution for Converged IP Communication Services. The UE implementations must support both single and two separate registrations, whereas networks can choose which approach to use. A single IMS registration on the UE to a single IMS core network provides the most efficient and optimised solution and has a number of benefits:

- single IMS Registration to be maintained,
- Security Association based on USIM (Universal Subscriber Identity Module) or ISIM (IMS Subscriber Identity Module) credentials for all access types,
- single APN (Access Point Name) to better manage radio and network resources,
- optimised traffic load management, more efficient memory usage, increased battery lifetime on the UE,
- common Network-to-Network Interface (NNI) without the need for discrimination when selecting the NNI,
- reduced OPEX/CAPEX associated with managing two core networks,
- more efficient subscriber data management,
- easier capability to combine Converged IP Communication Services together and with future IMS-based services.

1.2 Relationship to Existing Standards

1.2.1 3GPP Specifications

This profile is based on the open and published 3GPP specifications as listed in section 1.5. If the referenced GSMA PRDs have a basis, e.g. 3GPP Release 8, or reference a particular 3GPP release, then this is taken as a basis for the referenced parts. It should be noted, however that not all the features mandatory in the respective base 3GPP Release are required for compliance with this profile.

When reference is made to a particular 3GPP specification in the following sections, then either the 3GPP release is explicitly mentioned or 3GPP Rel-8 is assumed.

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

1.3 Scope

This document defines a profile for the common IMS functionality to enable Converged IP Communications Services; it profiles UE and IMS core network capabilities that are considered essential to launch interoperable, high quality IMS-based and Mobile Operator provided Converged IP Communications Services. The defined profile is compliant with 3GPP specifications (see section 1.2 for more information). The scope of this profile is the interface between UE and network (also known as the User-Network Interface (UNI)).

In the context of this PRD, the UE is a wireless device containing a USIM (and optionally also an ISIM) on a UICC. The Mobile Operator providing the Converged IP Communication Services is the HPMN as identified via the Mobile Country Code (MCC) and Mobile Network Code (MNC) portions of the IMSI on the USIM.

UEs accessing IMS via GERAN (GSM EDGE Terrestrial Radio Access Network), UTRAN (UMTS Terrestrial Radio Access Network), E-UTRAN (Evolved Universal Terrestrial Radio Access Network) and EPC (Evolved Packet Core) integrated Wi-Fi are considered within the scope of this document. UE access to IMS via other accesses (including Non EPC integrated Wi-Fi) for Multimedia telephony and SMS is considered out of scope; such UE access to IMS can be used for RCS services excluding Multimedia telephony and SMS.

This document does not limit anybody, by any means, to deploy other standardized features or optional features, in addition to the defined profile.

1.4 Definition of Terms

Term	Description
3GPP	3rd Generation Partnership Project
APN	Access Point Name
BSF	Bootstrapping Security Function
B-TID	Bootstrapping Transaction Identifier
CAPEX	CAPital EXpense
Converged IP Comms Multi-device	An operator offering where the user can use a set of devices that share the same (public) identity, which can be an MSISDN, where only the primary device is a Converged IP Communications Services UE, and the secondary device(s) support RCS services excluding both Multimedia Telephony and SMSoIP.
Converged IP Communications Services	Multimedia Telephony, SMSoIP and other RCS Services.
CS	Circuit Switched
EDGE	Enhanced Data rates for Global Evolution
EPC	Evolved Packet Core
EPC-integrated Wi-Fi	A Wi-Fi access as defined in GSMA PRD IR.51 [5].
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
GAA	Generic Authentication Architecture
GBR	Guaranteed Bit Rate

Term	Description
GERAN	GSM EDGE Terrestrial Radio Access Network
GPRS	General Packet Relay Service
GRUU	Globally Routable User Agent URI
GSM	Global System for Mobile communication
HOS	Home Operator Services
HPMN	Home Public Mobile Network
HSS	Home Subscriber Server
HTTP	Hyper Text Transfer Protocol
IARI	IMS Application Reference Identifier
IARP	Inter APN Routing Policy
ICSI	IMS Communication Service Identifier
IM	IP Multimedia
IMAP	Internet Mail Access Protocol
IMEI	International Mobile Equipment Identity
IMPI	IP Multimedia Private User Identity
IMPU	IP Multimedia Public User Identity
IMS	IP Multimedia Subsystem
IMS-AKA	IMS Authentication and Key Agreement
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISIM	IM Services Identity Module
Legacy 3GPP Access	GERAN or UTRAN
LTE	Long Term Evolution
MCC	Mobile Country Code
MMTEL Enriched Calling Call Composer	The "Call Composer service using the Multimedia Telephony session" as defined in section 2.4.4 of GSMA PRD RCC.20 [20] and included in GSMA PRDs IR.92 [1] and IR.51 [5].
MNC	Mobile Network Code
MNO	Mobile Network Operator
MO	Management Object
MSISDN	Mobile Station International Subscriber Directory Number
MSRP	Message Sending Relay Protocol
MTU	Maximum Transmission Unit
Multimedia Telephony	Voice/Conversational Video
NAT	Network Address Translation

Term	Description
NNI	Network-Network Interface
Non EPC integrated Wi-Fi	Wi-Fi access as described in GSMA PRD RCC.07 [3] i.e. the UE connects over Wi-Fi access directly to the configured P-CSCF by selecting the transport to be used based on the transport parameters defined in GSMA PRD RCC.15 [4].
OPEX	OPerating EXpense
P-CSCF	Proxy - Call Session Control Function
PDN	Packet Data Network
PDP	Packet Data Protocol
PRD	Permanent Reference Document
PS	Packet Switched
QCI	Quality of Service (QoS) Class Identifier
RAT	Radio Access Technology
RCS	Rich Communication Services
RFC	Request For Comments
SDP	Session Description Protocol
SIGCOMP	SIGnalling COMPression
SIM	Subscriber Identity Module
SIMPLE	Session Initiation Protocol for Instant Messaging and Presence Leveraging Extensions
SIP	Session Initiation Protocol
SMS	Short Messaging Service
SMSoIP	SMS over IP
SRVCC	Single Radio Voice Call Continuity
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
UE	User Equipment
UICC	Universal Integrated Circuit Card
UMTS	Universal Telecommunications Mobile System
UNI	User-Network Interface
URI	Uniform Resource Identifier
URN	Uniform Resource Name
USIM	Universal Subscriber Identity Module
UTRAN	UMTS Terrestrial Radio Access Network
UUID	Universal Unique Identifier
VoIP	Voice Over IP
VoLTE	Voice over LTE
VPMN	Visited Public Mobile Network
Wi-Fi	Wireless Fidelity
WLAN	Wireless Local Area Network

Term	Description
XCAP	XML Configuration Access Protocol
XML	eXtensible Markup Language

1.5 Document Cross-References

Ref	Doc Number	Title
[1]	GSMA PRD IR.92	IMS Profile for Voice and SMS
[2]	GSMA PRD IR.94	IMS Profile for Conversational Video Service
[3]	GSMA PRD RCC.07	Rich Communication Services - Advanced Communications Services and Client Specification
[4]	GSMA PRD RCC.15	IMS Device Configuration and Supporting Services
[5]	GSMA PRD IR.51	IMS Profile for Voice, Video and SMS over untrusted Wi-Fi access
[6]	IETF RFC 2119	Key words for use in RFCs to Indicate Requirement Levels
[7]	3GPP TS 23.003	Numbering, addressing and identification
[8]	3GPP TS 24.229	IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
[9]	3GPP TS 24.623	Extensible Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating Supplementary Services
[10]	3GPP TS 31.103	Characteristics of the IP Multimedia Services Identity Module (ISIM) application
[11]	IETF RFC 3261	SIP: Session Initiation Protocol
[12]	GSMA PRD IR.65	IMS Roaming and Interworking Guidelines
[13]	GSMA PRD IR.88	LTE Roaming Guidelines
[14]	GSMA PRD IR.61	Wi-Fi Roaming Guidelines
[15]	3GPP TS 23.402	Architecture Enhancements for non-3GPP accesses
[16]	3GPP TS 23.401	General Packet Radio Service (GPRS) enhancement for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access
[17]	GSMA PRD IR.64	IMS Service Centralization and Continuity Guidelines
[18]	XDM 2.0_Core	XML Document Management (XDM) Specification, Candidate Version 2.0, 16 September 2008
[19]	GSMA PRD TS.32	Technical Adaptation of Devices through Late Customisation
[20]	GSMA PRD RCC.20	Enriched Calling Technical Specification

1.6 Conventions

The key words “must”, “must not”, “required”, “shall”, “shall not”, “should”, “should not”, “recommended”, “may”, and “optional” in this document are to be interpreted as described in IETF RFC 2119 [6].

2 Converged IMS UNI Requirements

2.1 MNO Provisioning and Late Customization

2.1.1 General

This section describes the capabilities to support MNO provisioning and late customization.

2.1.2 Configuration Methods

The UE and the network must support remote client configuration as per GSMA PRD RCC.07 [3] with the additions as specified in Annex C.2 in GSMA PRD IR.92 [1].

2.1.3 Configuration Parameters

The UE and network must support the configuration parameters as defined in in GSMA PRD IR.92 [1], IR.94 [2], IR.51 [5] and RCC.07 [3]. The UE must use the default value for each parameter unless configured differently by any of the methods as described in section 2.1.2.

Table 2 contains the configuration parameters with their default values that are used to determine the number of IMS registrations as defined in section 2.2.

Note: The parameters in Table 2 are a subset of parameters in section 3.8 of GSMA PRD TS.32 [19].

Parameter	Default value	Defined in	See also clause
RCS VOLTE SINGLE REGISTRATION	1 (single registration)	RCC.07 [3]	2.2.1

Table 2 Configuration parameters controlling IMS registrations and their default values.

2.2 IMS Registrations and APN Usage

2.2.1 General

This section describes the number of required IMS Registrations, related APN usage and mapping of Converged IP Communication Services to each IMS registration.

The number of IMS registrations to be used for the Converged IP Communication services depend on the RCS VOLTE SINGLE REGISTRATION parameter as defined in annexes A.1.6.2 of GSMA PRD RCC.07 [3]. Table 3 illustrates the usage of this parameter for a UE.

RCS VOLTE SINGLE REGISTRATION (see GSMA PRD RCC.07 [3])	UE roaming outside of HPMN?	UE behavior
0	Not relevant	Two registrations as described in section 2.2.3.
1	Not relevant	Single registration as described in section 2.2.2.
2	No	Single registration as described in section 2.2.2.
	Yes	Two registrations as described in section 2.2.3.

Table 3 Summary of parameters controlling IMS Registrations for IP Communication Services

2.2.2 Single Registration via IMS well-known APN

The UE determines that one registration is used as described in section 2.2.1. This registration shall use the IMS well-known APN.

If the UE receives a PDN Connectivity Reject, then section 4.3.1 of GSMA PRD IR.92 [1] applies.

2.2.3 Two Registrations via IMS well-known APN and HOS APN/Non EPC Integrated Wi-Fi

The UE determines that two registrations are used (as specified in section 2.2.1).

The two registrations shall use the: -

- IMS well-known APN, and
- Home Operator Services (HOS) APN (for cellular access) or Non EPC integrated Wi-Fi (see section 2.2A).

If the UE receives a PDN Connectivity Reject, then:

- For the IMS well-known APN, section 4.3.1 of GSMA PRD IR.92 [1] applies;
- For the HOS APN, if each of

  - the use of Non EPC integrated Wi-Fi is not possible, and
  - the UE is not able to establish a PDN connection to the HOS APN, and
  - the HOS APN is not the same as the Internet APN,

then the UE must use a PDN Connection to the Internet APN and perform the P-CSCF discovery mechanism as defined in section 2.3. In this case, if the UE successfully establishes a PDN connection to the Internet APN, the UE must apply the registration procedure for RCS services excluding both Multimedia Telephony and SMSoIP as defined in sections 2.5 and 2.6 over the Internet APN.

2.2.4 Registration(s) and Converged IP Communication Services

As indicated in Table 3, the UE provides Converged IP Communication Services via:

- a single IMS registration, or
- two separate registrations

Table 4 describes the service registration on the IMS well-known APN and HOS APN/Non EPC integrated Wi-Fi for both single and two registration scenarios.

For details regarding the IMS well-known APN, the HOS APN, and their use see GSMA PRD IR.92 [1] and GSMA PRD IR.88 [13].

For details regarding PDN connection establishment to the IMS well-known APN, see section 4.3.1 of GSMA PRD IR.92 [1] and section 4.5 of GSMA PRD IR.51 [5].

The UE must register its services as described in Table 4.

Functionality supported by UE	APN/Non EPC integrated Wi-Fi to be used for registration for a given functionality	
	Single Registration as per Table 3	Two Separate Registrations as per Table 3
IR.92 / IR.51 voice	IMS well-known APN	IMS well-known APN
IR.92 / IR.51 SMSoIP (Note 1)	IMS well-known APN	IMS well-known APN
IR.94/IR.51 conversational video (Note 2)	IMS well-known APN	IMS well-known APN
RCS Chat (Note 2)	IMS well-known APN (Note 3)	HOS APN/Non EPC integrated Wi-Fi (Note 3)
MMTEL Enriched Calling Call Composer	IMS well-known APN	IMS well-known APN
Other RCS Services (Note 2)	IMS well-known APN (Note 3)	HOS APN/Non EPC integrated Wi-Fi (Note 3)

Table 4 Service Registrations on IMS well-known APN and HOS APN/Non EPC Integrated Wi-Fi

Note 1: The UE registers this service only if the service is activated in the UE by configuration, as described in Annex A.7 of GSMA PRD IR.92 [1].

Note 2: The UE shall register this service only if the service is activated in the UE by configuration, as described in section 2.1.

Note 3: See also section 2.2.2, Annex A.2 and Annex A.3.

2.2A Wi-Fi access

The UE shall connect over Wi-Fi access as follows:

- Single Registration: Switch-over to/from EPC integrated Wi-Fi as described in GSMA PRD IR.51 [5]

- Two Registrations

    - Registration for Multimedia Telephony, MMTEL Enriched Calling Call Composer and SMSoIP: Switch-over to/from EPC integrated Wi-Fi as described in GSMA PRD IR.51 [5]
    - Registration for all other RCS- services excluding Multimedia Telephony, MMTEL Enriched Calling Call Composer and SMSoIP: Switch-over to/from Non EPC integrated Wi-Fi as described in GSMA PRD RCC.07 [3]

2.3 P-CSCF Discovery Mechanism and Utilisation

A UE must support the capability to connect to a single P-CSCF for the single registration case and the capability to connect to two P-CSCFs for the two registrations case. The UE must discover the P-CSCF prior to initial registration as follows:

- for a registration comprising functionality using the IMS well-known APN as defined in Table 3, the UE must support the P-CSCF discovery mechanism

    - over E-UTRAN, as described in section 4.4 of GSMA PRD IR.92 [1];
    - over EPC integrated Wi-Fi, as described in section 6.9 of GSMA PRD IR.51 [5]; and
    - over GERAN and UTRAN, as defined as option II in 3GPP TS 24.229 Annex B.2.2.2 [8].

- for a registration comprising functionality using the HOS APN as defined in Table 3, a UE must support the P-CSCF discovery mechanism via the RCS client configuration mechanism (IMS management object as described in section 2.4.5 of GSMA PRD RCC.07 [3] using the procedure for devices not enabled for VoLTE or VoWiFi).
- for a registration comprising functionality using Non EPC integrated Wi-Fi as defined in Table 3, the UE must support the P-CSCF discovery mechanism via the RCS client configuration mechanism (IMS management object as described in section 2.4.6 of GSMA PRD RCC.07 [3] sing the procedure for devices not enabled for VoLTE or VoWiFi).

The provisioning of P-CSCF address(es) is defined by the Home and/or Visited Mobile Operator(s) dependent on configuration of the IMS core network(s).

2.4 IMS Identities

2.4.1 IMS Public User Identity (IMPU)

2.4.1.1 General

The UE and IMS core network must support IMS Public User Identities (IMPUs) as specified in section 13.4 of 3GPP TS 23.003 [7]. For IMS registrations, the UE and IMS core network must support the IMPUs defined in the following sub-sections.

2.4.1.2 UICC obtained/derived IMPU

If an ISIM application is present on the UICC, the IMPU in the first (or only) record in the EF_{IMPU} Elementary File in the ISIM (see section 4.2.4 of 3GPP TS 31.103 [10]) must be used.

If the UICC does not contain a ISIM application, then a temporary IMPU derived from the USIM's IMSI as per section 13.4B of 3GPP TS 23.003 [7] must be used.

2.4.1.3 IMS Management Object obtained IMPU

The IMPU obtained from the configuration parameter Public_user_identity_List of the IMS Management Object as defined in section 2.2 of GSMA PRD RCC.15 [4] must be used.

2.4.2 IMS Private User Identity (IMPI)

2.4.2.1 General

The UE and IMS core network must support IMPIs in the format defined in section 13.3 of 3GPP TS 23.003 [7]. The UE and IMS core network must support the IMPIs defined in the following sub-sections.

2.4.2.2 UICC obtained/derived IMPI

If an ISIM application is present on the UICC, the IMPI in the EF_{IMPI} Elementary File in the ISIM (see section 4.2.2 of 3GPP TS 31.103 [10]) must be used.

If the UICC does not contain an ISIM application, then an IMPI derived from the USIM's IMSI as per section 13.3 of 3GPP TS 23.003 [7] must be used.

2.4.2.3 IMS Management Object (MO) obtained IMPI

The IMPI obtained from the IMS Management Object as defined in section 2.2 of GSMA PRD RCC.15 [4] must be used.

2.4.3 Addressing

The support in the UE and network of E.164 numbers, home-local numbers and geo-local numbers for Multimedia Telephony must be as defined in section 2.2.3 of GSMA PRD IR.92 [1].

The support in the UE and network of E.164 numbers and home-local numbers for RCS services excluding both Multimedia Telephony and SMSoIP must be as defined in section 2.5 of RCC.07 [3]. The support in the UE and the network of geo-local numbers for RCS in-call SIP requests must be as defined in section 2.5.3.2 of RCC.07 [3], except for the actual format of the geo-local phone-contact parameter which shall be as shown in section 2.2.3 of GSMA PRD IR.92 [1].

The support in the UE and network of the P-Called-Party-ID header field must be as defined in section 2.2.3 of GSMA PRD IR.92 [1].

2.5 IMS Registration Procedures

2.5.1 General

The UE and IMS core network must support the SIP registration procedures as follows (see Table 4).

For registration via the IMS well-known APN for the single registrations case:

- For voice, MMTEL Enriched Calling Call Composer and SMSoIP over LTE a UE must support the SIP registration procedures as defined in section 2.2.1 of GSMA PRD IR.92 [1].
- For conversational video services, a UE must support the SIP registration procedures as defined in section 2.2.1 of GSMA PRD IR.94 [2].
- For Multimedia Telephony, MMTEL Enriched Calling Call Composer and SMSoIP over EPC integrated Wi-Fi, a UE must support the SIP registration procedures as defined in section 4.2.1 of GSMA PRD IR.51 [5].
- The procedures for registration of the relevant services feature tags for RCS services excluding Multimedia Telephony, MMTEL Enriched Calling Call Composer and SMSoIP in section 2.4 of GSMA PRD RCC.07 [3].

For registration via the IMS well-known APN for the two registrations case:

- For voice, MMTEL Enriched Calling Call Composer and SMSoIP over LTE a UE must support the SIP registration procedures as defined in section 2.2.1 of GSMA PRD IR.92 [1].
- For conversational video services, a UE must support the SIP registration procedures as defined in section 2.2.1 of GSMA PRD IR.94 [2].
- For Multimedia Telephony, MMTEL Enriched Calling Call Composer and SMSoIP over EPC integrated Wi-Fi, a UE must support the SIP registration procedures as defined in section 4.2.1 of GSMA PRD IR.51 [5].

For registration via the HOS APN or Non EPC Integrated WiFi for the two registrations case:

- The UE must register RCS services excluding Multimedia Telephony, MMTEL Enriched Calling Call Composer and SMSoIP using the SIP registration procedures as defined in section 2.4 of GSMA PRD RCC.07 [3].

Further requirements and clarifications are specified below.

The UE must be able to support all of the following registration options:

- A single IMS registration to a single converged IMS core,
- Two separate IMS registrations to a single converged IMS core, and
- Two separate registrations to two separate IMS cores.

In the two separate registrations case, the HPMN should ensure that the same IMS Public User Identities are registered as result of both registration procedures for user addressing consistency reasons.

The UE must subscribe to the registration event package as defined in section 5.1.1.3 of 3GPP TS 24.229 [8] for each registration.

On user initiated de-registration, the UE must de-register only the particular contact address being registered in an individual registration, as defined in section 5.1.1.6 of 3GPP TS 24.229 [8].

UE and IMS core network must support network-initiated de-registration as defined in section 5.1.1.7 of 3GPP TS 24.229 [8].

On being de-registered by the network, the UE must behave as specified in section 5.1.1.7 of 3GPP TS 24.229 [8].

Note: For the two registrations case, the subscription to registration event package as well as network initiated de-registration is not described in the current version of this document.

2.5.2 Single IMS Registration Header Values

For a single registration via the IMS well-known APN, the UE must include:

- the IMS Public User Identity (as specified in section 2.4.1.2),
- the IMS Private User Identity (as specified in section 2.4.2.2),
- the "+sip.instance" header field parameter (Instance ID) of the Contact address. The parameter must be encoded as the IMEI URN is specified in section 2.2.1 of GSMA PRD IR.92 [1].
- the ICSIs and/or IARIs and/or feature tags referenced in GSMA PRDs IR.92 [1], IR.94 [2] and RCC.07 [3] for the services supported by the UE on that registration (see Table 4).

2.5.3 Two Separate IMS Registrations Header Values

For each individual registration, the UE must include:

- the IMS Public User Identity as follows:
- For the registration via the IMS well-known APN as specified in section 2.4.1.2,
- For registration via the HOS APN or Non EPC Integrated WiFi as follows: -
    - if the client configuration parameter "IMS Mode Authentication Type" defined in section 2.2.1.2 of GSMA PRD RCC.15 [4] is set to "SIP DIGEST", then as specified in section 2.4.1.3.
    - if the client configuration parameter "IMS Mode Authentication Type" defined in section 2.2.1.2 of GSMA PRD RCC.15 [4] is set to "IMS Authentication and Key Agreement (AKA)", then as specified in section 2.4.1.2.
- the IMS Private User Identity, as follows:
    - for registration via the IMS well-known APN, as specified in section 2.4.2.2.
    - for registration via the HOS APN or Non EPC Integrated WiFi, as follows: -
        - if the client configuration parameter "IMS Mode Authentication Type" defined in section 2.2.1.2 of GSMA PRD RCC.15 [4] is set to "SIP DIGEST", then as specified in section 2.4.2.3.
        - if the client configuration parameter "IMS Mode Authentication Type" defined in section 2.2.1.2 of GSMA PRD RCC.15 [4] is set to "IMS Authentication and Key Agreement (AKA)", then as specified in section 2.4.2.2.

Note: In order to prevent a subsequent registration by a UE over-writing a previous registration in the IMS core network, the HPMN needs to ensure that the IMS Private User Identities used in the two registrations are different. However, the UE does not need to ensure that the IMS Private User Identities are different

- the "+sip.instance" header field parameter (Instance ID) of the Contact address, as follows:
    - for registration via the IMS well-known APN, the parameter must be encoded as the IMEI URN as specified in section 2.2.1 of GSMA PRD IR.92 [1].
    - for registration via the HOS APN or Non EPC Integrated WiFi, the parameter must be encoded as the UUID (Universal Unique Identifier) based on the rule defined in section 2.4.2 of GSMA PRD RCC.07 [3].

Note: If the same IMS Public User Identity is registered in two separate IMS core networks (see section 2.5.1), the procedures to select the correct IMS core network to forward a SIP request received over an NNI to the UE are out of scope of this document.

- the defined ICSIs and/or IARIs and/or feature tags for the services supported by the UE as defined in GSMA PRDs IR.92 [1], IR.94 [2] and RCC.07 [3] (see Table 4).

If there is a trigger for an initial registration, re-registration or de-registration and if there is a REGISTER request in progress for another registration, then the UE must only initiate a new REGISTER request when

- it has received a final response for the other REGISTER request, or
- there has been an interruption, due to failure and reconnect, of the underlying signalling transport mechanism used for the other REGISTER request, or
- the other REGISTER request has timed out.

If there is no other REGISTER request in progress the UE shall send the REGISTER request when the trigger occurs.

2.6 IMS Security

2.6.1 Security Procedures for Single IMS Registration

When a single IMS registration is used for Converged IP Communication Services, the UE and the network must follow the procedures for IMS Authentication and Key Agreement (IMS-AKA), Sec-Agree and IPSec as described in section 2.2.2 of GSMA PRD IR.92 [1].

2.6.2 Security Procedures for Two Separate IMS Registrations

When two separate IMS registrations are used for Converged IP Communication Services, each individual IMS registration registers the same IMS Public User Identity and includes authorisation and authentication procedures to establish the security relationship between the IMS User Agent and the core network.

The UE and network must follow the security procedures for the registration via the IMS well-known APNas follows:

- as described in section 2.2.2 of GSMA PRD IR.92 [1] for registration over E-UTRAN; or
- as described in section 4.4 of GSMA PRD IR.51 [5] for registration over EPC integrated Wi-Fi.

The UE and network must follow the security procedures for the registration via the HOS APN or Non EPC Integrated WiFi as follows:

- If the client configuration parameter "IMS Mode Authentication Type" defined in Table 2 of GSMA PRD RCC.15 [4] is set to "SIP DIGEST" then the UE must follow procedures for SIP Digest Authentication as specified in section 2.12.1 of GSMA PRD RCC.07 [3] The digest credentials are retrieved by the UE via remote client configuration as described in section 2.12.1 of GSMA PRD RCC.07 [3]; or
- If the client configuration parameter "IMS Mode Authentication Type" defined in Table 2 of GSMA PRD RCC.15 [4] is set to "IMS Authentication and Key Agreement (AKA)" then the UE must follow procedures for IMS-AKA as specified in section 2.12.1.1.1 of GSMA PRD RCC.07 [3].

Note: Since only a single security association can be set up to a converged IMS core using the procedures of IMS-AKA, the case of "IMS Authentication and Key Agreement (AKA)" is only applicable to the two separate IMS core networks scenario. The HPMN needs to take this into account when setting the value of the configuration parameter "IMS Mode Authentication Type".

2.7 Non IMS Protocols APN Utilization and Security Mechanism

2.7.1 XCAP

For Multimedia Telephony services, the XCAP based Ut interface (see 3GPP TS 24.623 [9]) is used for configuration of Supplementary Services as described in section 2.3.2 of GSMA PRD IR.92 [1] and section 4.6 of GSMA PRD IR.51 [5]. The access type policy and the APN to be used for the Ut interface is controlled by the configuration parameters AccessForXCAP and ToConRef as described in GSMA PRD IR.92 [1] and GSMA PRD IR.51 [5].

2.7.2 HTTP

HTTP is used in RCS for accessing the auto configuration server, the content servers for File Transfer, the Common Message Store, the Chatbot Directory, Spam black-list and Chatbot Information functions (see section 2.7 of GSMA PRD RCC.07 [3]). The UE must use the HOS APN (as defined in section 6.3 of GSMA PRD IR.88 [13]) for HTTP. On Wi-Fi access, Non EPC integrated Wi-Fi is used for HTTP.

Note: RCC.07 [3] could include support for EPC integrated Wi-Fi in a future update in which case the HOS APN could be used for HTTP on Wi-Fi access as well.

2.8 SIP Preconditions

The UE must support and use SIP Preconditions as described in section 2.4.1 of GSMA PRD IR.92 [1] and section 2.4.1 of GSMA PRD IR.51 [5] for voice and conversational video sessions.

For RCS services using MSRP, the UE must not use SIP Preconditions.

2.9 Capability Exchange

The UE must support the Capability Exchange described in section 2.6 of GSMA PRD RCC.07 [3] to advertise/negotiate support of conversational video and RCS services.

The configuration of the default mechanism is defined by the configuration parameter CAPABILITY DISCOVERY MECHANISM as defined in annex A.1.9 of GSMA PRD RCC.07 [3].

In the two registration case, the capability exchange can take place over either registration, and a given capability exchange shall advertise only the services applicable to the related registration (see Table 4).

2.10 IP Transport

As stated in IETF RFC 3261 [11], clients must support SIP over both UDP and TCP. The UE must support the configuration parameters PSSignalling, PSSignallingRoaming or

WiFiSignalling as defined in section 2.2.1.2 of GSMA PRD RCC.15 [4] to determine the transport.

In order to avoid SIP message fragmentation due to MTU issues, the UE and the network must comply with 3GPP TS 24.229 [8] subclause 4.2A. As stated in IETF RFC 3261 [11], the transport must be selected on a per SIP message basis and not on a per SIP session basis.

2.11 SIP Timers

The UE and the network must support the SIP timers as defined in sections 7.7 and 7.8 of 3GPP TS 24.229 [8]. The UE must also support modification of the SIP timers via the IMS MO as defined in GSMA PRD RCC.15 [4].

It is recommended for Mobile Operators to use the values standardised in sections 7.7 and 7.8 of 3GPP TS 24.229 [8].

2.12 Multimedia Telephony Supplementary Services

The UE must support the supplementary services as described in section 2.3 of GSMA PRD IR.92 [1]. If the UE supports conversational video services as defined in GSMA PRD IR.94 [2], then the UE must support the supplementary services as described in section 2.3 of GSMA PRD IR.94 [2].

2.13 Converged IP Comms Multi-device Support

A user's subscription may include Converged IP Comms Multi-device support. Secondary device(s) may also perform an IMS registration (as described in section 2.4.2 of GSMA PRD RCC.07 [3]) over any allowed access technology (as described in section 2.8 of GSMA PRD RCC.07 [3]). By definition, the secondary device(s) must not be a Converged IP Communications Services UE.

Note: Multi SIM devices/services are out of scope of this document.

2.14 Forking

2.14.1 Outgoing Requests

The UE must be able to receive responses due to a forked request as described in section 2.2.5 of GSMA PRD IR.92 [1].

2.14.2 Incoming Requests

In the case of Converged IP Comms Multi-device support (see section 2.13), an incoming request to a registered public user identity must be forked to the multiple registered devices and handled as described in section 2.-10 of GSMA PRD RCC.07 [3].

2.15 The use of Signalling Compression (SIGCOMP)

The UE must not use SIGCOMP.

2.16 SIP Session Establishment and Termination

UE and IMS core network must follow 3GPP TS 24.229 [8] for establishment and termination of a session.

UE and IMS core network must support reliable provisional responses.

For the purpose of indicating a Converged IP Communications Service to the network, the UE must use an ICSI value and/or IARI value and/or feature tag in accordance with section 5.7.1.9 of 3GPP TS 24.229 [8]. The related ICSIs, IARIs and feature tags are specified in the related service level PRDs (see section 1.1).

When generating an outgoing non-REGISTER request, the UE may populate the P-Preferred-Identity header field in accordance with section 2.5.3.3 of GSMA PRD RCC.07 [3].

If the UE receives an incoming SIP request for a service that is not supported over the used IMS registration, the UE must reject that request with a 488 “Not Acceptable Here” error response.

Note: This may occur in the case of two IMS registrations using a converged IMS core network. When the network does not exclusively target the client(s) that have registered with the corresponding ICSI/feature tag for the service (i.e. no “explicit” and “require” parameters in the Accept-Contact header field) and the original targeted client(s) rejects or does not answer the SIP request.

2.17 Hosted NAT Traversal

The UE and network must support hosted NAT traversal as described in section 2.7 of GSMA PRD RCC.07 [3].

2.18 Handover (LTE <-> EPC Integrated Wi-Fi)

The UE must support seamless handover between LTE and EPC integrated Wi-Fi as described in section 4.8 of GSMA PRD IR.51 [5]. The network may fulfil the requirements for mobility management as specified in section 4.2 of GSMA PRD IR.51 [5].

Note: Only the PDN connection to the IMS well-known APN can be subject to seamless handover between LTE and EPC integrated Wi-Fi. The PDN connection to the HOS APN can only be subject to seamless handover if currently used for XCAP/Ut and if the APN used for XCAP/Ut on Wi-Fi is not changed due to configuration (as described in section 2.7.1).

2.19 Data Off and Services Availability

The UE must support Data Off and service availability as defined in section 5.5 of GSMA PRD IR.92 [1] , in section 5.1 of GSMA PRD IR.94 [2] and in section 2.8.1.5 of GSMA PRD RCC.07 [3].

Note: Data Off is defined only for PDN connections via a 3GPP access.

2.20 User-Agent and Server Headers

The UE and the network must support the User-Agent and Server headers for SIP and the User-Agent header for HTTP as defined in

- GSMA PRD IR.92 [1] for Multimedia Telephony and SMSoIP

- GSMA PRD RCC.07 [3] for RCS services excluding Multimedia Telephony and SMSoIP.

In the Single IMS registration case, the following product-list applies as an update of the ABNF defined in sections C.4.1 of PRD RCC.07 [3] and 2.2.9 of GSMA PRD IR.92 [1].

```
product-list =/ enabler 1*(LWS enabler) *(LWS service) [LWS terminal]
                    [LWS client] [LWS OS] [LWS mno-customization]
                    *(LWS list-extension)
```

3 Common functionalities

3.1 Roaming Considerations

This profile has been designed to support IMS roaming as per GSMA PRDs IR.65 [12], IR.88 [13] and IR.61 [14]. Other roaming models are out of the scope of this profile.

3.2 IP Version

The UE and the network must support both IPv4 and IPv6 as described in section 5.1 of GSMA PRD IR.92 [1] and section 5.1 of GSMA PRD IR.51 [5] for all protocols that are used for the Converged IP Services.

3.3 Emergency Service

The UE and the network must support Emergency Service as specified in section 5.2 of GSMA PRD IR.92 [1] and section 5.3 of GSMA PRD IR.51 [5].

Annex A Legacy 3GPP Access Considerations (Normative)

A.1 General

In most markets, there will not be ubiquitous LTE coverage for some time and thus consideration also needs to be given to any implications arising from Legacy 3GPP Access (GERAN or UTRAN) in terms of APN usage and mapping of bearers between Legacy 3GPP Access and LTE/EPC integrated Wi-Fi.

When under Legacy 3GPP Access coverage, the UE must use: -

- for voice services, the CS radio access,
- for SMS, the access technology configured as described in Annex C of GSMA PRD IR.92 [1], and
- for RCS services excluding both Multimedia Telephony and SMSoIP, the access technology as defined in section 2.4.2 and 2.8 of GSMA PRD RCC.07 [3].

A.2 Attachment and IMS Registration on Legacy 3GPP Access

A.2.1 General

For RCS services excluding both Multimedia Telephony and SMSoIP, the UE must perform a network attachment using the IMS well-known APN or the HOS APN – as indicated in section 2.2. The UE must then register for RCS services by omitting the ICSI, IARI and feature tags for Multimedia Telephony and SMSoIP in the IMS registration using the procedure described in section 2.5.

Note: If the PDN connection for the IMS well-known APN is established via Legacy 3GPP Access, then the SGSN in the VPMN may select a PGW in the HPMN even if the HPMN allows selecting a PGW in the VPMN. The PGW in the HPMN would be used also after performing handover to E-UTRAN, see section A.3.2.

To use voice services and SMS in Legacy 3GPP Access, the UE must perform a CS-attach. See also section 2 of GSMA PRD IR.64 [17].

A.2.2 IMS well-known APN

If the IMS well-known APN is used for RCS services excluding both Multimedia Telephony and SMSoIP on Legacy 3GPP Access, and the radio access technology changes from Legacy 3GPP Access to E-UTRAN or EPC integrated Wi-Fi, then the UE must re-register as per section 2.5.2 to add the ICSI, IARI and feature tags required for Multimedia Telephony and, if required, also for SMSoIP.

If the radio access technology changes from E-UTRAN or EPC integrated Wi-Fi to Legacy 3GPP Access, then the UE must re-register to remove, if required, the feature tag required for SMSoIP (see also Annex A.7 of GSMA PRD IR.92 [1]).

A.2.3 Failure to use the HOS APN and Recovery

If the HOS APN is not the same as the Internet APN, and if

- the establishment of a PDN connection to the HOS APN fails in Legacy 3GPP access or
- the PDN connection to the HOS APN is lost on change to Legacy 3GPP access, then the UE must use a PDN Connection to the Internet APN and perform the P-CSCF discovery mechanism as defined in section 2.3. The UE must apply the registration procedure for RCS services excluding both Multimedia Telephony and SMSoIP as defined in sections 2.5 and 2.6 over the Internet APN.

A.3 Handover to/from Legacy 3GPP Access

A.3.1 Handover between Legacy 3GPP Access and EPC Integrated Wi-Fi

A UE when handing over between Legacy 3GPP Access and EPC integrated Wi-Fi, must support the following:

- when moving into EPC-integrated Wi-Fi coverage:
    - leave voice call on CS network and the PDN Connection to the IMS well-known APN in GERAN/UTRAN until the voice call is terminated.
    - if performing handover packet bearers from GERAN/UTRAN to integrated Wi-Fi, proceed as described in sections 8.6.2 and 16.10.2 of 3GPP TS 23.402 [15] in conjunction with section 5.5.2.2, section 5.5.2.4 and annex D.3.4 of 3GPP TS 23.401 [16].
    - If HOS APN is used and the HOS APN is not the same as the Internet APN and if the PDN connection to the HOS APN is lost on changing to Wi-Fi access, then the UE must use Wi-Fi Internet access and perform the P-CSCF discovery mechanism as defined in section 2.3 for registrations. The UE must apply the registration procedure for RCS services excluding both Multimedia Telephony and SMSoIP as defined in sections 2.5 and 2.6 over the Wi-Fi Internet access.
- when moving out of EPC-integrated Wi-Fi coverage:
    - for RCS services excluding both Multimedia Telephony and SMSoIP on the IMS well-known APN, handover the packet bearers between EPC integrated Wi-Fi and GERAN/UTRAN as described in sections 8.2.1.3 (S2a) and 8.6.1.2 (S2b) of 3GPP TS 23.402 [15] and Annex A.2.3.

A.3.2 Handover between Legacy 3GPP Access and E-UTRAN

A UE when handing over between Legacy 3GPP Access and E-UTRAN, must support the following:

- when moving into E-UTRAN:
    - handover packet bearers between 2G/3G and E-UTRAN (as described in section 5.5.2.2, section 5.5.2.4 and annex D.3.4 of 3GPP TS 23.401 [16]).

- when moving out of E-UTRAN:
  - for voice services, perform SRVCC as described in section A.3 of GSMA PRD IR.92 [1]
  - for RCS services excluding both Multimedia Telephony and SMSoIP, handover the packet bearers between E-UTRAN and 2G/3G as described in section 5.5.2.1, section 5.5.2.3 and annex D.3.3 of 3GPP TS 23.401 [16]

Note 1: Only the default bearer of each PDN connection can be maintained on GERAN/UTRAN in deployments not supporting secondary PDP contexts. GBR bearers will be released during SRVCC procedure and all non GBR bearers other than the default bearer will be released during handover of the packet bearers between E-UTRAN and GERAN/UTRAN and hence all sessions associated with these released non GBR bearers will break. When moving from GERAN/UTRAN to E-UTRAN, traffic carried on the signalling bearer on GERAN/UTRAN would then be on the QCI=5 bearer on E-UTRAN.

Note 2: There is limited support for parallel PS radio access bearers in legacy 3GPP deployments. Typical limits are 3 PS bearers plus 1 CS bearer although there are some networks that support only 1 PS bearer plus 1 CS bearer. All PS bearers exceeding these limits will be released during handover of the packet bearers between E-UTRAN and GERAN/UTRAN and all sessions associated with these released non GBR bearers will break.

A.4 Media on Legacy 3GPP access

Even if a dedicated bearer for the media does not exist (i.e. no secondary PDP context), the UE must consider itself as having local resources and can send and receive media. See also section B.2.2.5.1B in 3GPP TS 24.229 [8].

Note: Considering itself as having local resources does not by itself grant the UE authority to send media. Other conditions need to be fulfilled.

Annex B Document Management

B.1 Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
1.0	19/05/2015	CR1001. New PRD approved by PSMC.	PSMC	David Hutton, GSMA Wayne Cutler, GSMA, Tom Van Pelt GSMA
2.0	04/01/2016	Application of the following CRs: - CR1002, CR1003, CR1004, CR1005, CR1006, CR1007, CR1008, CR1009, CR1010, CR1011, CR1012, CR1013, CR1014 & CR1015.	PSMC	Wayne Cutler, GSMA
3.0	17/05/2016	Application of the following CRs:- CR1016, CR1017, CR1018, CR1019, CR1020 & CR1021	PSMC	Wayne Cutler, GSMA
4.0	13/06/2017	Application of the following CRs: - CR1023, CR1024, CR1025, CR1026, CR1027, CR1028, CR1029 & CR1030.	PSMC	Wayne Cutler, GSMA
5.0	29/05/2018	Application of the following CRs: CR1031, CR1032, CR1033 & CR1034.	TG	Jianyin Zhang, China Mobile Limited
6.0	17/04/2019	Application of the following CRs: CR1035, CR1036, CR1037, CR1038, CR1039, CR1040 & CR1041.	TG	Jianyin Zhang, China Mobile Limited
7.0	02/04/2020	Application of the following CRs: CR1042, CR1043 & CR1044.	TG	Jianyin Zhang, China Mobile Limited

Other Information

Type	Description
Document Owner	NG RILTE
Editor / Company	Jianyin Zhang - China Mobile Limited

It is our intention to provide a quality product for your use. If you find any errors or omissions, please contact us with your comments. You may notify us at prd@gsma.com

Your comments or suggestions & questions are always welcome.