

IMS Profile for Voice, Video and Messaging over Untrusted WLAN Connected to 5GC

Version 2.0

07 July 2021

This Industry Specification 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

Copyright © 2021 GSM Association

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 4
1.1 Overview 4
1.2 Relationship to existing standards 4
1.2.1 3GPP Specifications 4
1.3 Scope 5
1.4 Definitions 5
1.5 References 7
2 IMS feature set 8
2.1 General 8
2.2 Support of generic IMS functions 8
2.2.1 SIP Registration Procedures 8
2.2.2 Addressing 9
2.2.3 Call Establishment and Termination 9
2.2.4 Forking 9
2.2.5 The use of Signalling Compression 9
2.2.6 Early Media and announcements 9
2.2.7 SIP Session Timer 9
2.3 Supplementary Services 9
2.4 Call Set-up Considerations 9
2.4.1 SIP Precondition Considerations 9
2.4.2 Loss of Radio Connection 10
2.4.3 Voice Media Considerations 10
2.4.4 Video Media Considerations 10
2.4.5 SMS over IP 10
2.5 SMS over NAS 10
3 IMS media 10
4 Radio and packet core feature set 10
4.1 Radio capabilities 10
4.2 WLAN Access Network (N3IWF / ePDG) Selection 10
4.3 Non-3GPP Access Authentication and Security 11
4.4 Support for Multiple PDU Sessions/PDN Connections 11
4.5 APN/DNN Considerations for SIP Signalling and XCAP 11
4.6 Connectivity Service 12
4.6.1 General 12
4.6.2 Registration in the 5GC 12
4.6.3 PDU Connection Establishment 12
4.6.4 PDU Session Release 13
4.6.5 UE initiated deregistration 14
4.6.6 Network initiated deregistration 14
4.6.7 Support for Service Request 14
4.6.8 Liveness check 14
4.7 Mobility Management 14
4.7.1 Handover Scenarios 14

4.7.2 Control of Handover Procedures 16
4.8 UE Route Selection Policy 16
4.9 P-CSCF Discovery 16
4.10 Support of Network Slicing 16
4.11 Support of Access Traffic Steering, Switching and Splitting 17
5 Common Functionalities 17
5.1 IP Version 17
5.2 IP Address Allocation 18
5.3 Emergency Service 18
5.4 Roaming Considerations 19
Annex A Using WLAN access not connected to the 5GC 20
A.1 General 20
A.2 Architecture Overview 20
A.3 Support of IMS based services 20
Annex B MNO Provisioning and Late Customization 21
B.1 General 21
B.2 Configuration Methods 21
B.3 Configuration Parameters 21
Annex C USSI 23
Annex D Document Management 24
D.1 Document History 24
D.2 Other Information 24

1 Introduction

1.1 Overview

The IP Multimedia Subsystem (IMS) Profile for Voice, Video and Messaging, documented in this Permanent Reference Document (PRD), identifies a minimum mandatory set of features defined in the 3GPP specifications that a wireless device (the User Equipment (UE)) and the network are required to implement in order to guarantee interoperable, high quality IMS-based telephony and conversational video services as well as messaging services over WLAN (Wireless Local Area Network) access.

"Wi-Fi" is a trademark of the Wi-Fi Alliance (WFA) and the brand name for products using WFA certifications based on the IEEE 802.11 family of standards.

In this document, WLAN access refers to an Untrusted WLAN access (as an Untrusted non-3GPP access per 3GPP) supporting Wi-Fi and connected to the 5GC (5G Core), using N2/N3 interfaces, as defined in 3GPP TS 23.501 [24], 23.502 [5], 24.501 [6] and 24.502 [11].

The content includes the following aspects:

- IMS basic capabilities and supplementary services for telephony [Chapter 2]
- Real-time media negotiation, transport, and codecs [Chapter 3]
- WLAN radio and 5GC capabilities [Chapter 4]
- Functionality that is relevant across the protocol stack and subsystems [Chapter 5]
- Using WLAN access not connected to 5GC [Annex A].
- UE configuration to provide all necessary information to connect to, and receive, service from a specific IMS telephony operator [Annex B].
- Support of USSI (Unstructured Supplementary Service Data (USSD) Simulation Service in IMS) [Annex C].

A UE and a network compliant to this profile must support IMS-based telephony. A UE and a network compliant to this profile may support conversational video 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. 3GPP Release 15 is taken as a basis. It should be noted, however that not all the features specified in 3GPP Release 15 are required for compliance with this profile.

Conversely, some features required for compliance with this profile are based on the functionalities defined in higher 3GPP releases than the one taken as basis. All such exceptions are explicitly mentioned in the following sections along with the relevant 3GPP Release.

Unless otherwise stated, the latest version (prior to the date of issue of this profile) of the referenced specifications for the relevant 3GPP release applies.

1.3 Scope

This document defines voice, video and messaging over the WLAN IMS profile by profiling a number of WLAN, 5GC, IMS core, and UE features which are considered essential to launch interoperable IMS based voice, video and messaging via WLAN access. This document is based and dependent on the IMS Voice, Video and Messaging profile as described in GSMA PRD NG.114 [1]. The defined profile is compliant with the 3GPP specifications. The scope of this version of the profile is the interface between the UE and the network.

This main body of this PRD is restricted to the N3IWF (Non-3GPP Interworking Function) access network to the 5GC. In support of IMS service continuity, interworking aspects with the EPC are also covered in this profile. The support of IMS services without connecting to the 5GC ("non-seamless offload") is described in Annex A.

Network Slicing is applicable to the UEs under non-3GPP access (see section 4.10).

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

The architecture, functional overview and the scenarios related to this document are described in GSMA PRD IR.61 [2].

1.4 Definitions

Term	Description
3GPP	3rd Generation Partnership Project
5G-AKA	5G Authentication and Key Agreement
5GC(N)	5G Core (Network) (as described in 3GPP TS 23.501)
5GS	5G System
AMF	Access and Mobility management Function
AN	Access Network
ANDSF	Access Network Discovery & Selection Function
ANDSP	Access Network & Discovery & Selection Policy
APN	Access Point Name
ATSSS	Access Traffic Steering, Switching and Splitting
CN	Core Network
DN(N)	Data Network (Name)
DNS	Domain Name System
EAP-AKA	Extensible Authentication Protocol – Authentication and Key Agreement
E-UTRAN	Evolved Universal Terrestrial RAN
ePDG	Evolved Packet Data Gateway
EPC	Evolved Packet Core
EPS	Evolved Packet System
FQDN	Fully Qualified Domain Name
GST	Generic Slice Template

Term	Description
HPLMN	Home PLMN (used as such in 3GPP; often referred to as HPMN by GSMA)
HPMN	Home PMN (referred to as HPLMN by 3GPP)
HTTP	Hyper Text Transfer Protocol
IKE	Internet Key Exchange
IKEv2	IKE version 2
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPsec	IP Security
IPv4	IP version 4
IPv6	IP version 6
MA	Multi-Access (PDU)
MAC	Media Access Control
N3IWF	Non-3GPP InterWorking Function
NAS	Non-Access Stratum
NAT	Network Address Translation
NEST	NEtwork Slice Template
NG-RAN	Next Generation RAN
NR	New Radio
NSSAI	Network Slice Selection Assistance Information
P-CSCF	Proxy - Call Session Control Function
PCF	Policy & Charging Function
PDN	Packet Data Network
PDU	Protocol Data Unit
PGW	PDN Gateway
PGW-C	PGW Control plane
PGW-U	PGW User plane
PLMN	Public Land Mobile Network (used as such in 3GPP; often referred to as PMN by GSMA)
PMF	Performance Monitoring Functionality
PMN	Public Mobile Network (referred to as PLMN by 3GPP and sometimes also by GSMA). PMN is used in this PRD.
PRD	Permanent Reference Document
RAN	Radio Access Network
RCS	Rich Communications Suite
RTCP	RTP Control Protocol
RTP	Real Time Protocol
SA	Security Association
SDP	Session Description Protocol

Term	Description
SMS	Short Message Service
SIGCOMP	SIGnalling COMPression
SIP	Session Initiation Protocol
SMF	Session Management Function
SPI	Security Parameter Index
UE	User Equipment
UPF	User Plane Function
URSP	UE Route Selection Policy
USSI	Unstructured Supplementary Service Data (USSD) Simulation Service in IMS
UTRAN	UMTS Terrestrial Radio Access Network
VPLMN	Visited PLMN (used as such in 3GPP; often referred to as VPMN by GSMA)
VPMN	Visited PMN (referred to as VPLMN by 3GPP)
WFA	Wi-Fi Alliance
Wi-Fi	IEEE 802.11 family of standards (sometimes referred to as WiFi)
WLAN	Wireless Local Area Network (refers in this document to the AN supporting Wi-Fi)
XCAP	XML Configuration Access Protocol
XML	eXtensible Markup Language

1.5 References

Ref	Doc Number	Title
[1]	GSMA PRD NG.114	IMS Profile for Voice , Video and Messaging over 5GS.
[2]	GSMA PRD IR.61	WLAN Roaming Guidelines (Inter-Operator Handbook)
[3]	GSMA PRD TS.22	Recommendations for Minimal Wi-Fi Capabilities of Terminals
[4]	3GPP TS 24.229	IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
[5]	3GPP TS 23.502	Procedures for the 5G System; Stage 2
[6]	3GPP TS 24.501	Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3
[7]	GSMA PRD NG.113	5GS Roaming Guidelines
[8]	3GPP TS 23.003	Numbering, addressing and identification
[9]	3GPP TS 33.501	Security aspects and procedures for 5G system
[10]	IETF RFC 4187	Extensible Authentication Protocol Method for 3rd Generation Authentication and Key Agreement (EAP-AKA)
[11]	3GPP TS 24.502	Access to the 3GPP 5G Core Network (5GCN) via non-3GPP access networks; Stage 3
[12]	IETF RFC 5996	Internet Key Exchange Protocol Version 2 (IKEv2)
[13]	3GPP TS 23.228	IP Multimedia Subsystem (IMS); Stage 2
[14]	3GPP TS 23.503	Policy and Charging Control Framework for the 5G System, Stage 2
[15]	3GPP TS 23.237	IP Multimedia Subsystem (IMS) Service Continuity; Stage 2

Ref	Doc Number	Title
[16]	GSMA PRD IR.65	IMS Roaming and Interworking Guidelines
[17]	3GPP TS 23.167	IP Multimedia Subsystem (IMS) emergency sessions
[18]	3GPP TS 24.216	Communication Continuity Management Object (MO)
[19]	3GPP TS 24.368	Non-Access Stratum (NAS) configuration Management Object (MO)
[20]	3GPP TS 24.167	3GPP IMS Management Object (MO)
[21]	3GPP TS 24.424	Management Object (MO) for Extensible Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating Supplementary Services
[22]	3GPP TS 24.623	Extensible Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating Supplementary Services
[23]	GSMA PRD TS.32	Technical Adaptation of Devices through Late Customisation
[24]	3GPP TS 23.501	System Architecture for the 5G System, Stage 2
[25]	GSMA PRD IR.51	IMS Profile for Voice, Video and SMS over untrusted Wi-Fi access (note: WLAN access connected to EPC)
[26]	GSMA PRD NG.116	Generic Network Slice Template
[27]	3GPP TS 24.193	Access Traffic Steering, Switching and Splitting (ATSSS), Stage 3

2 IMS feature set

2.1 General

The IMS profile part lists the mandatory capabilities required over the Gm and Ut reference points.

2.2 Support of generic IMS functions

2.2.1 SIP Registration Procedures

The UE and the network must conform to section 2.2.1 of GSMA PRD NG.114 [1], with the exception of section L.3.1.2 of 3GPP TS 24.229 [4] which is not applicable.

Note: GSMA PRD NG.114 [1] contains explicit statements of when the UE must register with the IMS. Currently 3GPP specifications do not have similar statements regarding this profile. It is for further study if explicit statements can be created for this profile (in addition to what is specified in section 2.4.2).

The home operator can configure the UE with the Media_type_restriction_policy and the PreferredAccessNetworks parameters as specified in Annex B.3.

The UE must support and use access-type in P-Access-Network-Info as specified in 3GPP TS 24.229 [4] section 7.2A.4.2. The P-Access-Network-Info header must contain one or more access-info, one of them being the i-wlan-node-id parameter as specified in 3GPP TS

24.229 [4] section 7.2A.4.2. The i-wlan-node-id shall be set to the value of the MAC (Media Access Control) address of the WLAN Access Point. Furthermore, the UE must include the Cellular-Network-Info header field, as specified in section R.3.1.1A of 3GPP TS 24.229 [4].

If moving the PDU (Protocol Data Unit) Session to the IMS well-known DNN (Data Network Name) between the WLAN and the cellular access as described in section 4.7 of this document, the UE must

- Initiate a re-registration procedure as specified in 3GPP TS 24.229 [4], section 5.1.1.4 and 3GPP TS 23.228 [13] in section 5.2.2.4,
- update the P-Access-Network-Info header field, Authentication

The UE and the network must conform to section 2.2.2 of GSMA PRD NG.114 [1].

2.2.2 Addressing

The UE and the network must conform to section 2.2.3 of GSMA PRD NG.114 [1].

2.2.3 Call Establishment and Termination

The UE and the network must conform to section 2.2.4 of GSMA PRD NG.114 [1].

The UE must include the Cellular-Network-Info header field if the information is available, as specified in section R.3.1.1A of 3GPP Release 13 TS 24.229 [4].

2.2.4 Forking

The UE and the network must conform to section 2.2.7 of GSMA PRD NG.114 [1].

2.2.5 The use of Signalling Compression

The UE must not use SIGCOMP (Signalling Compression) when the initial IMS registration is performed over the WLAN.

2.2.6 Early Media and announcements

The UE must conform to section 2.2.6 of GSMA PRD NG.114 [1].

2.2.7 SIP Session Timer

The UE must conform to section 2.2.9 of GSMA PRD NG.114 [1].

2.3 Supplementary Services

The UE and the network must conform to section 2.3 of GSMA PRD NG.114 [1].

2.4 Call Set-up Considerations

2.4.1 SIP Precondition Considerations

The UE and the network must conform to section 2.2.5 of GSMA PRD NG.114 [1].

Note: Even though resources are available, the UE uses preconditions and sets the local preconditions accordingly in the SDP (Session Description Protocol) offer and answer.

2.4.2 Loss of Radio Connection

If the UE loses radio connectivity and the IMS registration has expired prior to regaining the radio connectivity, then upon regaining radio connectivity the UE must perform a new initial registration to IMS.

2.4.3 Voice Media Considerations

The UE and the network must conform to section 3.2 of GSMA PRD NG.114 [1].

2.4.4 Video Media Considerations

The UE and the network must conform to section 3.3 of GSMA PRD NG.114 [1].

2.4.5 SMS over IP

The UE and network must conform to section 2.4 of GSMA PRD NG.114 [1].

2.5 SMS over NAS

The UE and network must conform to section 2.4 of GSMA PRD NG.114 [1].

The UE and the network must support SMS (Short Message Service) over NAS (Non-Access Stratum) over the WLAN access, as specified in 3GPP TS 23.501 [24] section 5.16.2 and 3GPP TS 23.502 [5] section 4.13.3.8.

Note: This is different from EPC (Evolved Packet Core) where the SMS over NAS is only supported over a 3GPP access.

3 IMS media

The UE and the network must conform to section 3 of GSMA PRD NG.114 [1].

4 Radio and packet core feature set

4.1 Radio capabilities

The UE must conform to sections 2.1, 2.2 and 2.3 of GSMA PRD TS.22 version 6 [4] for alignment with Wi-Fi Alliance (WFA) Certification programmes.

4.2 WLAN Access Network (N3IWF / ePDG) Selection

The UE and the network must support Stand-alone N3IWF selection as well as Combined N3IWF/ePDG (Evolved Packet Data Gateway) selection as specified in 3GPP TS 23.501 [24] section 6.3.6. The UE must be configured with the Non-3GPP access node selection information, the N3IWF identifier configuration (if N3IWF is deployed) and the ePDG identifier configuration (if ePDGs is deployed).

The UE must support PLMN Selection for emergency services as specified in 3GPP TS 23.501 [24] section 6.3.6.4.

The details for WLAN selection based on ANDSP (Access Network Discovery & Selection Policy) can be found in GSMA PRD IR.61 [2] section 5A.1.

4.3 Non-3GPP Access Authentication and Security

The UE and the network must conform to the requirements for supporting WLAN access as specified in section 5A.2 of GSMA PRD IR.61 [2].

The UE and the network must fulfil the following for the access to N3IWF:

- UE and serving network must support EAP-AKA' (Extensible Authentication Protocol - Authentication and Key Agreement') and 5G AKA (5G Authentication and Key Agreement) authentication methods as described in 3GPP TS 33.501 [9] and IETF RFC 4187 [10] and IKEv2 (Internet Key Exchange v2) as described in IETF RFC 5996 [12];
- Profile of version 2 of IKE as specified in 3GPP TS 33.501 [9] must be used;
- Profile of IP Security (IPsec) as specified in 3GPP TS 33.501 [9] must be used;
- Fast re-authentication procedure as described in 3GPP TS 33.501 [9] must be supported;
- UE shall support to receive from the Non3GPP Interworking Function (N3IWF) rekeying of both IKE_SA (Internet Key Exchange Security Association) and IPSEC_SA; and
- Network Address Translation (NAT) traversal of IKEv2 and IPsec packets must be supported. The home operator can configure the UE with the "NAT Keep Alive timer" parameter as specified in Annex B.3.
- The UE shall support rekeying of both IKE_SA and IPsec_SA, which shall be controlled by the mean-rekeying-time configuration parameter as specified in Annex B.3. The UE shall rekey both the IKE_SA and IPsec_SA after expiration of a timer with the initial value set to a random number of uniform distribution in the interval between the 75% of the mean-rekeying-time configuration parameter and 125% of the mean-rekeying-time configuration parameter. After each rekeying, the UE shall re-start the timer with a new random number. The mean-rekeying-time configuration parameter shall be configurable by the home operator. In the absence of a value being configured, the UE shall assume a (default) value of 18 hours.

Depending on operator policy, fast re-authentication shall be possible to be used in the following scenario:

- The UE is registered to non-3GPP access and has IPsec tunnel with the N3IWF. The UE moves to 3GPP access for a period and then moves back to WLAN and registers to a non-3GPP access again.

4.4 Support for Multiple PDU Sessions/PDN Connections

The UE must support multiple concurrently-active PDU Sessions over both 3GPP NR (New Radio) access and WLAN access.

PDU Session mobility is described in section 4.7.

4.5 APN/DNN Considerations for SIP Signalling and XCAP

For SIP (Session Initiation Protocol) signalling, the IMS application in the UE must use the IMS well-known Access Point Name APN/DNN (as defined in the PRD NG.113 [7]; the UE must prevent non-IMS applications from using this APN/DNN.

For XCAP (XML Configuration Access Protocol) requests, the UE must be preconfigured or provisioned by the home operator with the configuration parameter “Access for XCAP requests” as specified in Annex B.3 with one of the following options:

1. Using cellular access (value "1", "3GPP accesses only”);
2. Using 5GC-integrated WLAN (value "2", "5GC via WLAN IP-CAN only");
3. Using WLAN access without registration to the 5GC (value "3", "Non-seamless WLAN offload only");
4. Preferring cellular access, and using WLAN access without registration to the 5GC as secondary (value "4", "3GPP accesses preferred, non-seamless WLAN offload as secondary"); or
5. Preferring cellular access, and using 5GC-integrated WLAN as secondary (value "5", "3GPP accesses preferred, 5GC via WLAN IP-CAN as secondary").

If the UE is configured to use cellular access for XCAP requests, the UE must use the DNN as defined in GSMA PRD NG.114 [1].

If the UE is configured to use 5GC-integrated WLAN for XCAP requests, the UE must be preconfigured or provisioned by the home operator with the ToConRef parameter as specified in Annex B.3 with the DNN to be used for XCAP requests in 5GC- integrated WLAN access. The DNN for the PDU Session used for XCAP requests in WLAN Access may be either the same DNN as defined in GSMA PRD NG.114 [1] or a different DNN.

Note: If a different DNN is used then the IP session continuity between 3GPP and non-3GPP IP access for the PDU Session used for XCAP requests is not provided.

4.6 Connectivity Service

4.6.1 General

The UE and the network must conform to the requirements for PDU Session Connectivity Service as specified in section 6.2.2 of GSMA PRD NG.113 [7].

4.6.2 Registration in the 5GC

In order to establish one or more PDU sessions over WLAN access, the UE must select N3IWF and then register to the 5GC over WLAN access as specified in 3GPP TS 23.501 [24] section 5.5.1 and 3GPP TS 23.502 [5] section 4.12.2.

If the UE has selected an ePDG, then it has to follow the procedures defined in GSMA PRD IR.51 [25].

4.6.3 PDU Connection Establishment

After being successfully registered in the 5GC over the WLAN access, if the UE needs IMS service, the UE must establish a PDU Session, as specified in 3GPP TS 23.502 [5] section 4.12.5, to the IMS well-known DNN and potentially another one to the DNN to be used for XCAP requests. The DNN shall be encoded as ID FQDN (ID Fully Qualified Domain Name) as defined in IETF RFC 5996 [12].

Note: When the UE provides the IMS well-known APN/DNN, the APN Operator Identifier is not included as defined in section 6.3 of GSMA PRD NG.113 [7].

4.6.4 PDU Session Release

The UE or the network may release a PDU Session for various reasons and the procedure is specified in 3GPP TS 23.502 [5] section 4.3.4.2. The release of a PDU Session does not imply a deregistration of the UE from the 5GC via non-3GPP access: the IPsec tunnel between the UE and the N3IWF is not released due to the PDU Session Release procedure.

4.6.5 UE initiated deregistration

The UE initiated deregistration procedure shall be used by the UE in the following scenarios:

- The UE is turned off and is registered to the 5GC over WLAN access;
- WLAN connection is turned off and the UE has one or more active PDU Sessions to the 5GC via WLAN access that according to the UE/operator policy should not be handed over to the cellular (i.e. depending on policies); and
- WLAN connection is turned off and UE has one or more active PDU Sessions to the 5GC via WLAN access and no cellular coverage.

The UE initiated deregistration procedure is specified in 3GPP TS 23.502 [5] section 4.12.3.

4.6.6 Network initiated deregistration

The network initiated deregistration procedure is specified in 3GPP TS 23.502 [5] section 4.12.3. The UE shall be able to receive an IKEv2 Informational request with Delete Payload, which contains the SPI (Security Parameter Index) of the IKEv2 SA established during the UE initiated registration to the 5GC via WLAN access. The UE shall reply with an IKEv2 Information response.

Note: The network that initiates the deregistration can be triggered by many reasons like subscription changes, maintenance in network etc.

4.6.7 Support for Service Request

The UE and the network must support the Service Request procedure as specified in 3GPP TS 23.502 [5] section 4.12.4.1 to request the re-establishment of the user plane for the PDU Session(s) which are associated to non-3GPP access.

4.6.8 Liveness check

The UE shall support the procedures for the tunnel liveness check as specified in section 7.3.2 and 7.8 of 3GPP TS 24.502 [11]. The home operator can configure the UE with the “Liveness check timer” in the absence of a network specified value parameter as specified in Annex B.3. The support for the network-configured liveness check timers is optional.

The network can support the procedures for the tunnel liveness check as specified in section 7.3.2 of 3GPP TS 24.502 [5].

4.7 Mobility Management

4.7.1 Handover Scenarios

The handover scenarios with NG-RAN (Next Generation RAN) described in GSMA PRD IR.61 [2] are applicable for this profile.

The interworking / handover scenarios described in GSMA PRD IR.61 [2] are applicable for this profile when the UE uses ePDG.

The UE must support the following combinations of PDU Sessions and PDN Connections connectivity:

- PDU Sessions using 3GPP access to the 5GC and PDN connections via Epdg using 3GPP access to EPC
- PDU Sessions via N3IWF to the 5GC and PDN connections via ePDG to the EPC

Note: These combinations require the support of a combined SMF+PGW-C (Session Management Function + PDN Data Gateway – Control plane) and PGW-U+UPF (PDN Data Gateway User Plane + User Plane Function) in the network (as described in GSMA PRD IR.61 [2]).

The UE must and the network can support PDU Session(s) mobility between the NR (New Radio) and WLAN/N3IWF for the following scenarios, as specified in 3GPP TS 23.502 [5] section 4.9.2.

- The handover of a PDU Session established over NR and anchored at a SMF-UPF to WLAN via N3IWF, in which the UE registers to the 5GC via the WLAN access, if not already registered, and then moves the PDU Session by using the PDU Session Establishment procedure, and
- The handover of a PDU Session established over WLAN via N3IWF and anchored at a SMF-UPF to NR, in which the UE registers to the NR access, if not already registered, and then moves the PDU Session by using the PDU Session Establishment procedure.

The UE must and the network can support PDU Session(s) mobility between EPS and WLAN/N3IWF for the following scenarios as specified in 3GPP TS 23.502 [5] section 4.11.3.

- The handover of a PDN connection established over the EPS (Evolved Packet System) and anchored at a combined SMF+PGW-C and PGW-U+UPF to the 5GC connected to WLAN via N3IWF, in which the UE registers towards the 5GC via the WLAN access, if not already registered, and then establishes a PDU Session towards the combined SMF+PGW-C and PGW-U+UPF using the PDU Session Establishment procedure, and
- The handover of a PDU Session established over WLAN via N3IWF and anchored at a combined SMF+PGW-C and PGW-U+UPF towards EPS, in which the UE attaches to the EPC connected to E-UTRAN (UMTS Terrestrial Radio Access Network), if not already attached, and then moves the PDU Session by using the PDN connection establishment procedure.

The UE and the network must support PDU Session(s) mobility between EPC/ePDG and 5GS as specified in 3GPP TS 23.502 [5] section 4.11.4 for the following scenarios:

- The handover of a PDU Session established over 3GPP NR access and anchored at a combined SMF+PGW-C to WLAN via ePDG, the PDU session is moved from 5GS to EPC/ePDG access and

- The handover of a PDN connection established over WLAN via ePDG and anchored at a combined SMF+PGW-C to 3GPP NR access, the PDN connection is moved from EPC/ePDG to 5GS

Note: Handover with 3GPP systems prior to 4G/LTE (e.g. 2G/3G) are out of scope.

4.7.2 Control of Handover Procedures

To control the handover procedures of a PDN connection established over WLAN via ePDG, the home operator can configure the UE with the Allow_Handover_PDN_connection_non-3GPP_and_NG-RAN parameter as specified in Annex B.3.

To control the handover procedures of a PDU session established over WLAN via N3IWF, the home operator can configure the UE with the Allow_Handover_PDU_Session_non-3GPP_and_NG-RAN parameter as specified in Annex B.3.

4.8 UE Route Selection Policy

The UE must support the URSP (UE Route Selection Policy) rules (see GSMA PRD IR.61 [2] section 5A.1 for details), to determine how to route the outgoing traffic at an application level granularity, as specified in 3GPP TS 23.503 [14] section 6.6.2.

4.9 P-CSCF Discovery

The UE and the network must support the procedures for P-CSCF (Proxy - Call Session Control Function) discovery via the 5GC via WLAN, as described in method IV of Annex U.2.2.1 of 3GPP TS 24.229 [4].

When establishing a PDU Session to the IMS well-known APN via WLAN, the UE must discover the P-CSCF address(es) as described in method IV of Annex U.2.2.1 of 3GPP TS 24.229 [4].

If P-CSCF address(es) were discovered using the method IV, the UE must use the P-CSCF address(es) discovered using the method IV as defined in section 5.1 and 3GPP TS 24.229 [4].

After the UE has discovered the P-CSCF and registered to IMS, the UE must use this P-CSCF as long as the IMS registration is valid, as described in sections B.2.2.1, L.2.2.1 and R.2.2.1 of 3GPP TS 24.229 [4].

Note: The UE continues to use the selected P-CSCF also if the PDN connection to the IMS well-known APN is subject of handover from WLAN to 5GS (or EPS) and vice versa, see also section 4.8.

4.10 Support of Network Slicing

Network Slicing can be applicable to the UEs under non-3GPP access but is not supported by the WLAN access itself or by the N3IWF apart from the AMF selection by N3IWF which has to take into account the Requested NSSAI (Network Slice Selection Assistance Information) according to 3GPP TS 23.501 [24] section 5.15.5.

Note: For the time being there is no GST (Generic Slice Template) or NEST (Network Slice Template, which is a GST filled with specific values, representing a slice for a particular Use Case) defined in GSMA PRD NG.116 [26] to support Use Case(s) when a UE is using a Non-3GPP access (in the present case an untrusted WLAN access) connected to the 5GC.

4.11 Support of Access Traffic Steering, Switching and Splitting

ATSSS (Access Traffic Steering, Switching and Splitting) is about MA (Multi-Access) PDU connectivity service, where a (MA) PDU Session can be simultaneously associated with one 3GPP access and one non-3GPP access (i.e., user plane resources used on both Access Networks to exchange PDUs).

The support of MA PDU session is optional for both the UE and the Network. If supporting MA PDU session for all or a subset of PDU sessions established over both 3GPP and (untrusted) WLAN accesses, the UE and the network must support section 5.32 of 3GPP Release 16 TS 23.501 [24], section 4.22 of 3GPP Release 16 TS 23.502 [5], section 6.1.3.20 of 3GPP Release 16 TS 23.503 [14] and 3GPP Release 16 TS 24.193 [27].

The PDU session(s) subject of MA PDU connectivity service is based on user subscription and operator's policy.

If required by the network, the UE must provide (un)availability information on an access as described in 3GPP Release 16 TS 23.501 [24] and Release 16 TS 23.502 [5].

Note 1: When ATSSS applies for a PDU Session it is a MA PDU Session; PDU Session(s) mobility between non-3GPP and 3GPP access as described in section 4.7 does not apply (as it is not needed) because the application of ATSSS rules received from the 5GC guide traffic switch decisions in the UE and with the usage of PMF (Performance Measurement Functionality) as described in 3GPP Release 16 TS 24.193 [27] to signal the (un)availability of an access and ensure that data traffic is switched to appropriate access when applicable.

Note 2: Traffic splitting is not supported for GBR QoS flows because the QoS profile is provided to a single access network at a given time.

Note 3: When the UE is connected over the 2 accesses (3GPP and Untrusted WLAN) it is up to the UE implementation to determine on which access to request the establishment of the MA PDU session.

Editor's note: Whether the UE must only support indicating MA PDU session or also need to support modification of PDU session to use MA PDU connectivity service is FFS.

5 Common Functionalities

5.1 IP Version

The UE and the network shall support both IPv4 and IPv6 for all protocols that are used for the service: SIP (Session Initiation Protocol), SDP, RTP (Real Time Protocol), RTCP (RTP

Control Protocol) and XCAP/HTTP (XML Configuration Access Protocol/Hyper Text Transfer Protocol).

Upon registration over WLAN access, the UE shall include the proper attribute types in the CFG_REQUEST within the IKE_AUTH request message to request both IPv4 and IPv6 addresses used for the IPsec SA of the NAS Signalling as specified in section 7.3.2 of 3GPP TS 24.502 [5].

For PDU Sessions over WLAN access, if both IPv4 and IPv6 addresses are assigned for the UE, then the UE must prefer the IPv6 address type.

After the UE has discovered the P-CSCF and registered to IMS with a particular IPv4 or IPv6 address, the UE must use this IP address for all SIP communications, as long as the IMS registration is valid.

For all SDP and RTP/RTCP communications, the UE must use the assigned IPv4 address used for SIP communication or an IPv6 address with the assigned IPv6 prefix same as the IPv6 prefix of the IPv6 address used for the SIP communication.

Note: There are certain cases where the interworking between IP versions is required. These cases include, for instance, roaming and interconnection between networks using different IP versions. In those cases, the network needs to provide the interworking in a transparent manner to the UE.

5.2 IP Address Allocation

The UE and the network must support the IP address allocation as specified in section 5.8.2.2 of 3GPP TS 23.501 [24].

5.3 Emergency Service

The UE and the network must support the IMS emergency services as specified in 3GPP TS 24.229 [4], and in section 6 and Annex K of 3GPP TS 23.167 [17], and emergency procedures as specified in 3GPP TS 24.502 [5].

The UE must support the IMS emergency session as specified in section 5.1 of GSMA PRD NG.114 [1].

The UE must support Annex L of 3GPP TS 23.167 [17], Annex U of 3GPP TS 24.229 [4] (for SIP procedures), and section 5 and section 7.2 of 3GPP TS 24.502 [4] (for selection of PMN (Public Mobile Network) and N3IWF/ePDG for emergency services). The UE must also include the Cellular-Network-Info header field, if the information is available, as specified in section W.3.1.1A of 3GPP TS 24.229 [4].

Note: Emergency Information is configured in the AMF hence nothing specific is required for selection of a N3IWF apart from PMN selection for selecting a N3IWF in the visited country in case the visited country has legal requirements to do so (see 3GPP TS 23.501 [24] section 6.3.6.4). If an ePDG is selected for emergency services, the home operator can configure the UE with the ePDG parameter as specified in Annex B.3 of GSMA PRD IR.51 [25].

The UE must fulfil the requirements to convey its location, as defined in sections 5.1.6.8.2 and 5.1.6.8.3 of 3GPP TS 29.229 [5].

The UE must support the current location discovery during an emergency call as specified in section 5.1.6.8.2, section 5.1.6.8.3, section 5.1.6.8.4, and section 5.1.6.12 of 3GPP TS 24.229 [4].

The network can support the current location discovery during an emergency call as specified in section 5.11.5 of 3GPP TS 24.229 [4].

5.4 Roaming Considerations

This profile supports IMS roaming as described in GSMA PRD IR.65 [16] and GSMA PRD NG.113 [7].

Note: Further roaming considerations / guidelines for NG.115 considering the specificities of WLAN access, as Untrusted Non-3GPP access, may be introduced later. For example, recommendations on the PMN location of N3IWF when HR is applied (refer to IR.61 [2], section 4A.1.1 for associated scenarios) may be introduced.

Annex A Using WLAN access not connected to the 5GC

A.1 General

This annex describes the usage of the IMS related services when the Untrusted WLAN access is not connected to the 5GC, i.e. the WLAN access is directly connected to a DN bypassing the 5GC (i.e. user plane traffic accesses the DN without traversing either N3IWF or UPF).

This is an optional capability of a UE supporting WLAN access (as an Untrusted non-3GPP access) in addition to 3GPP radio access.

Note: This type of architectural configuration (also known as “non-seamless offload”) is sometimes referred to as “non (3GPP CN) integrated” or “outside a PDU connection / session traffic”. It is out of scope of the 3GPP specifications though it is mentioned (but not specified) for 4G (i.e. for bypass of the EPC) but not for 5G (i.e. for bypass of the 5GC). This main objective of this annex is to support RCS (Rich Communication Services) based services.

A.2 Architecture Overview

The architecture for using a WLAN access not connected to the 5GC (for non-seamless offload) is described in GSMA PRD IR.61 [2].

A UE supporting the bypass of the 5GC may, while connected to WLAN access, route specific IP flows via the WLAN access without traversing the 5GC. For such IP flows the UE uses the local IP address allocated by the WLAN access network and no IP address preservation is provided between WLAN and 3GPP accesses. It is not required to connect to a N3IWF

Also, in case the WLAN access is 5GC connected (for some IP flows), it is possible for a UE to also simultaneously support the bypass of the 5GC for some other IP flows simultaneously.

The method for authenticating the UE by the WLAN to access the DN directly (non-seamless offload) is not specified by 3GPP.

Policies for non-seamless offload must be either pre-defined by the home operator and reside on the UE or be provided using ANDSP / URSP (refer to GSMA PRD IR.61[2] section 5A.1) via PCF (Policy & Charging Function) according to 3GPP TS 23.503 [14] section 6.6.2 (Table 6.6.2.1-3).

A.3 Support of IMS based services

From a user perspective the support of IMS based (in the present case RCS) services is similar to when accessing IMS based services via the 5GC.

Annex B MNO Provisioning and Late Customization

B.1 General

This annex describes the capabilities to support MNO provisioning and late customization as defined in Annex C in GSMA PRD NG.114 [1].

B.2 Configuration Methods

See Annex C.1.1 in GSMA PRD NG.114 [1].

B.3 Configuration Parameters

Table B.3.1 contains the configuration parameters with their default values that must be supported by the UE, in addition to those defined in GSMA PRD NG.114 [1]. The UE must use the default value for each parameter in Table B.3.1 unless configured differently by any of the methods as described in section B.2.

Note: The parameters in Table B.3.1 are a subset of parameters in section 3.9 of GSMA PRD TS.32 [23].

Parameter	Default value	Defined in	See also section
Media_type_restriction_policy (Voice and/or video over WiFi enabled)	Voice and video allowed	Section 5.43 of 3GPP TS 24.167 [20] (interior node /<X>/Media_type_restriction_policy) and 3GPP TS 24.229 [4]	2.2.1
PreferredAccessNetworks (Voice over PS/WiFi Preference Indicator)	No default	Section 5.23 of 3GPP TS 24.216 [18] (/<X>/OperatorPolicy/<X>/MediaPref/PreferredAccessNetworks)	2.2.1
mean-rekeying-time (RekeyingTime)	18 h	Note 2	4.3
NAT Keep Alive timer (NATKeepAliveTime)	20 sec	Note 2	4.3
ToConRef (Network Identifier part of the XCAP APN on EPC-integrated WLAN)	No default	Section 5.9 of 3GPP TS 24.424 [21] (/<X>/XCAP_conn_params_policy/<X>/XDM_MO_ref) and 3GPP TS 24.623 [22]	4.5
AccessForXCAP (Access for XCAP requests)	1 – 3GPP accesses only (Note 3)	3GPP TS 24.424 [21] and section 5.2.1.3 of 3GPP TS 24.623 [22] (/<X>/AccessForXCAP)	4.5
Liveness check timer in the absence of a network specified value (LivenessCheckPeriod)	2 min (Note 1)	Section 7.8.2 of 3GPP TS 24.502 [11]	4.6.7

Parameter	Default value	Defined in	See also section
Allow_Handover_PDN_ connection_non-3GPP_and_NG-RAN	2 – Handover not allowed	Section 5.90 of 3GPP release-17 TS 24.167 [20] (interior node /<X>/Media_type_restriction_policy) and 3GPP Release 17 TS 24.229.[4].	4.7
Allow_Handover_PDU_ session_non3GPP_and_NG-RAN	2 – Handover not allowed	Section 5.89 of 3GPP TS 24.167 [20] (interior node /<X>/Media_type_restriction_policy) and 3GPP Release 17 TS 24.229.[4].	4.7

Table 1Table B.3.1 Configuration parameters and their default values

Note 1: The default value is not defined in the 3GPP specification.

Note 2: These 3GPP TS 24.312 4G ANDSF (Access Network Discovery & Selection Function) related configuration parameters are not in 5G ANDSP. They can be applicable only if the UE is both 4G and 5G capable.

Note 3: An appropriate value, depending on access preference, value (refer to section 4.5) if “Non-seamless offload” (as per Annex A) is supported.

Annex C USSI

The UE and the network must conform to Annex D of GSMA PRD NG.114 [1].

Annex D Document Management

D.1 Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
1.0	01/04/20	Global CR introducing first version	GSMA	Sajid Soormally / Nokia
2.0	25/06/20 24/02/21 26/04/21	CR1002 “Mobility for VoWiFi sessions” CR1003 “Configuration Parameters in 3GPP” (updates CR1002, with 3GPP updates introduced in Release 17) CR1004 “Introducing ATSSS” CR1005 “Emergency Call alignment” (aligns with all IMS profiles on Emergency Call)	GSMA ISIG	Sajid Soormally / Nokia

D.2 Other Information

Type	Description
Document Owner	GSMA NG
Editor / Company	Sajid Soormally / Nokia

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.