



Fixed-Mobile
Convergence Alliance

Convergence Services using SIP over Wi-Fi[®]

Product Requirement Definitions (PRD)
Release 3.0

Technical Handset Requirements
FMCA Priority Programme #2
Converged Devices and Access Points

31st October 2007

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TIA technical specifications and abbreviations have been referenced in this document.

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3GPP (Third Generation Partnership Project):

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ETSI (European Telecommunications Standards Institute):

ETSI-TISPAN NGN Release 1 and 2 technical specifications, definitions, terms and abbreviations have been referenced in this document.

3GPP2 (Third Generation Partnership Project 2):

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UMA Technology:

This document bases some of its UE requirements on those originally recommended by the UMA Architecture specification. The use of UMA recommendations is acknowledged and referenced within the document. It is acknowledged that this material may be copyright of the participating partners of UMA Technology.

ITU-T (ITU Telecommunication Standardisation Sector):

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Open Mobile Alliance (OMA):

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OMTP (Open Mobile Terminal Platform):

OMTP technical specifications and abbreviations have been referenced in this document.

MPEG (Moving Picture Experts Group):

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GSMA (GSM Association):

GSMA technical specifications and abbreviations have been referenced in this document.

JCP (Java Community Process):

JCP technical specifications and abbreviations have been referenced in this document.

IETF (Internet Engineering Task Force):

IETF technical specifications and abbreviations have been referenced in this document.

ISO (International Organisation for Standardisation):

ISO technical specifications and abbreviations have been referenced in this document.

CTIA (Cellular Telecommunications and Internet Association):

CTIA technical specifications and abbreviations have been referenced in this document.

PKCS (Public Key Cryptography Standards):

PKCS technical specifications and abbreviations have been referenced in this document.

W3C (World Wide Web Consortium):

W3C technical specifications and abbreviations have been referenced in this document.

OpenAjax Alliance:

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3 Introduction

The Fixed-Mobile Convergence Alliance (FMCA) is a global, non-profit organisation, focused on providing customers with high-quality, seamless and easy-to-use Convergence products and services.

Representing a global base of over 700 million customers who stand to benefit from the development of Convergence products and services, its objective is to ensure that devices, access points, applications and underlying networks interoperate to deliver the best user experience possible.

As a customer-led organisation, the FMCA is focused on creating an environment for joint telecom operator and vendor collaboration in key Convergence areas, to identify as well as address product and service requirements through the timely generation and delivery to industry of Product Requirements Definition (PRD) releases and other publishable technical materials.

The FMCA's objective is therefore to accelerate the development, availability and launch by leading industry players of Convergent products and services.

The Alliance is not a Standards Development Organisation (SDO). It therefore does not aim to create standards but rather to accelerate the adoption of the Convergence technologies by producing common telecom operator requirements for products and services in areas such as Devices, Access Point and Gateway, Roaming & Authentication and Converged Applications.

The FMCA Product Requirements Definition, PRD Releases, reflect collaborative input by FMCA Members and Associates, and joint requirements reviews with Standards Development, Specifications & Certification Organisations with which the FMCA has formal liaison agreements.

The FMCA PRD Release 3.0, Convergence Services Using SIP Over Wi-Fi, builds on the previous PRD Releases 1.0 and 2.0, demonstrating telecom operators' commitment to the increased availability of fit for purpose dual-mode, Wi-Fi®-enabled Convergence devices and interoperable access points and gateways.

The FMCA has specified a clear PRD development roadmap, with PRD Release 4.0 covering requirements for Wireless Broadband Access scheduled for late 2008.

Contacts:

For further information on the FMCA and its PRDs please contact: prd_info@thefmca.com

Enquiries will be reviewed by the FMCA Programme Office and, where relevant, passed to the relevant FMCA Priority Programme and Technical Leads.

More information is also available from <http://www.thefmca.com>

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4 How to Read This FMCA PRD

This document defines the Technical Handset requirements for the FMCA Convergence Services using SIP over Wi-Fi® PRD Release 3.0 and should be read in conjunction with the following PRD Release 3.0 document:

- Convergence Services using SIP over Wi-Fi® PRD, Release 3.0, Access Point and Gateway Requirements, October 2007.

Standards Development Organisations (SDOs), Industry Alliances and vendors wishing to review this document, should take notice of the following:

- sections of the document are cross-referenced, where necessary, to indicate correlations in the various requirements and to facilitate the review process,
- technical, product and service requirements reference, where possible, standards, specifications and certifications defined by the leading SDOs and Industry Alliances (the References section provides a table summarising all the standards, specifications and certifications referenced in the document).

Within this PRD the word 'shall' denotes a mandatory requirement and the word 'should' denotes a desirable requirement.

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5 User Equipment

5.1 Battery Life and Power Management

- 5.1.1 As a minimum, the standard UE battery life shall last for 150 hours of stand-by and five hours of talk time when the UE switches between cellular and Wi-Fi® any number of times.
- 5.1.1.1 In 3GPP networks, power consumption measurement techniques specified in GSMA DG.09 version 4.5 shall be used to measure stand-by, talk and connection times. All scenarios supported by the hardware and software characteristics of the UE should be tested.
- 5.1.2 The operator shall be able to configure the UE such that when the UE is in Wi-Fi®-only mode, the cellular mode shall be powered off. Similarly, when the UE is in cellular-only mode, the Wi-Fi® mode shall be powered off.
- 5.1.2.1 During emergency calls, the UE shall have the capability to override this operator configuration and adhere to the requirements in Section 5.25 – Emergency Calls.
- 5.1.3 The UE shall be compliant with Wi-Fi Alliance WMM™ Power Save Certification.

5.2 Universal Integrated Circuit Card (UICC)

- 5.2.1 The UICC shall support the SIM/USIM application.
- 5.2.2 The UICC should support the ISIM application.
- 5.2.3 The UICC should support a 'Dual-Network' capability, i.e. one UICC supporting multiple independent Network Access Applications (NAAs) with different profiles. One or more of the following NAAs shall be supported: EAP-AKA, EAP-MD5, EAP-SIM, EAP-TLS, GBA-U, GSM-SIM, HTTP Digest, IMS-ISIM, UMTS-USIM.
- 5.2.4 The UICC shall support the capability for two NAAs to be active simultaneously on different logical channels. One of the two active NAAs shall be UMTS-USIM or GSM-SIM.
- 5.2.5 Where Dual-Network UICCs are supported, the UE shall support an application to select the appropriate NAA, for cellular and Wi-Fi® access, on an appropriate logical channel on the UICC.

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- 5.2.6 Where the UE supports standardised OTA and toolkit functionality, this shall operate consistently and correctly from any of the connected networks and should be in compliance with OMTP UICC/(U)SIM UICC0 & UICC1 v1.1.
- 5.2.7 Where the NAA on the UICC is an EAP application, it shall conform to ETSI TS 102 310. It shall support one or more of EAP-SIM, EAP-AKA, EAP-MD5 and EAP-TLS methods. That type of UE shall support an EAP supplicant that is compatible with this type of EAP working.
- 5.2.8 The UE should support a UICC that supports an ISIM application as per 3GPP TS 31.103. That ISIM shall support the following authentication methods: IMS AKA, HTTP Digest, GBA-U (including bootstrapping and NAF derivation modes).
- 5.2.9 UE that are compatible with UICCs that support EAP functions as per ETSI TS 102 310 shall be backward-compatible with UICCs that do not support those EAP functions.
- 5.2.10 UE that are compatible with Dual-Network UICCs shall be backward-compatible with UICCs that do not support those functions.
- 5.2.11 UE that support Java functionality should support a JSR177 interface to the UICC. This should include the following APIs: APDU, PKI, RMI, crypto.
- 5.2.12 UE that support Java functionality should support a JSR118 interface to the UICC for certificates that are used in the validation of trusted Java applets on the handset.
- 5.2.13 The UE should support a UICC that supports PKCS#7 and PKCS#15 functionality.
- 5.2.14 The UE shall support UICC interfacing functions as per ETSI TS 102 221 including interface speed-up and power-saving modes and at least two non-zero logical channels.
- 5.2.15 The UE should support a USB High-Speed Protocol (HSP) interface to an HSP-capable UICC, as specified by ETSI TS 102 600. The HSP interface shall support the encapsulation of conventional UICC APDUs for backward compatibility with existing UICC applications. Where HSP is supported, the conventional ISO7816 interface to the UICC shall also be supported, but switching between ISO7816 protocol and HSP shall require a reset of the UICC, as described in ETSI TS 102 600.
- 5.2.16 The UE should support High Density Memory UICCs, the stage 1 requirements for which are described in ETSI TS 102 412. Where such UICCs are supported, the HSP interface shall also be supported. Note: at the time of writing, stage 2 requirements for support of High Density Memory UICCs are being developed by ETSI for incorporation into new versions of ETSI TS 102 221 and ETSI TS 102 600.
- 5.2.17 The UE should support a non-removable Identity Capable Platform (ICP) supporting multiple, independent, downloadable, managed NAAs with different profiles. It shall

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be possible for these NAAs to be active concurrently. One or more of the following NAAs shall be supported: EAP-AKA, EAP-MD5, EAP-SIM, EAP-TLS, GBA-U, GBA-ME, GSM-SIM, HTTP Digest, IMS-ISIM, UMTS-USIM.

5.3 Interfaces

5.3.1 Network Interface (cellular, Wi-Fi®)

5.3.1.1 The UE shall have a Wi-Fi® interface and shall support the requirements detailed in Section 5.5 – Wi-Fi® Interface.

5.3.1.2 The UE shall have a cellular radio interface.

5.3.1.3 The UE should support the simultaneous connection of both Wi-Fi® and cellular radio interfaces. Both Wi-Fi® and cellular receiver sensitivities should be certified using the WFA/CTIA RF Performance Test Plan which establishes measurements of (a) TRP and TIS and (b) Wi-Fi® receiver sensitivity degradation due to cellular as well as cellular receiver sensitivity degradation due to Wi-Fi®. Limits on performance degradation may be established in later PRDs, after sufficient experience with the RF Performance Test Plan has been obtained and anonymous test results are made available by WFA/CTIA.

5.3.1.4 The UE should support the capability to be used as a modem, in both cellular and Wi-Fi® modes, via a 'tethered' data port connection to another device, e.g. a PC.

5.3.2 I/O Interface (USB, Bluetooth®, Infrared)

5.3.2.1 The UE should have a USB 2.0 interface and the connector should be a Mini-USB or Micro-USB type. This should be in compliance with OMTP Local Connectivity: Data Connectivity.

5.3.2.2 If the UE USB connector is Mini-USB, the UE should be supplied with either a Mini-USB to USB A connector cable or a Mini-USB to USB B connector adapter.

5.3.2.3 If the UE USB connector is Micro-USB, the UE should be supplied with either a Micro-USB to USB A connector cable or a Micro-USB to USB B connector adapter.

5.3.2.4 The UE should support a standardised capability to be powered or recharged via a USB connection.

5.3.2.5 The UE should have a Bluetooth® interface that supports at least two simultaneous active connections.

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- 5.3.2.6 The UE shall support the following Bluetooth® profiles: Serial port, OBEX, Generic OBEX, PAN, LAN Access Profile, File Transfer, Synchronisation, Dial-Up Networking, Headset, Handsfree, Service Discovery, Phonebook Access Profile, Object Push and SIM Access Profile.
- 5.3.2.7 The UE should support the following Bluetooth® profiles: Advanced Audio, HID, DeviceID, Local Positioning, Extended Service Discovery, Advanced Audio & Video, Generic AV Distribution, Advanced Audio distribution, Audio Video remote, Video Conferencing Profile, WAP, FAX, Basic Printing, Basic Imaging and Unrestricted Digital Information Profile.
- 5.3.2.8 If the UE has a Bluetooth® interface, it shall support the simultaneous operation of Bluetooth® accessories (e.g. headset) and Wi-Fi®.
- 5.3.2.9 If the UE has a Bluetooth® interface, it shall not degrade the performance of the Wi-Fi® interface.
- 5.3.2.10 The UE should have an Infrared interface that can support file transfers.
- 5.3.3 **Accessories (camera, memory card, etc)**
 - 5.3.3.1 The UE should have a camera to support video services.
 - 5.3.3.2 The UE should have a memory card slot. Extra memory can be used to store and transfer photos, videos, music, data files, and backups, e.g. phone book and calendar.

5.4 User Interface

5.4.1 Visible/Audible Indications

- 5.4.1.1 The UE shall have the capability to display to the user the available access networks it can connect to.
- 5.4.1.2 The UE shall provide a visible indication of mode (Wi-Fi® or cellular). By default, the indication should change automatically when the mode changes. This feature shall be operator configurable.
- 5.4.1.3 The UE shall provide information on cellular connectivity and access type (e.g. EDGE, HSDPA) and Wi-Fi® connectivity and access type (e.g. IEEE 802.11b, 802.11g).
- 5.4.1.4 The UE shall show an indication of SIP registration in both Wi-Fi® and cellular mode.

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- 5.4.1.5 The UE shall provide an indication of both Wi-Fi® signal strength and cellular signal strength.
- 5.4.1.6 An audible and/or visible indication should be provided to the user when the UE performs a handover to/from the cellular network. The actual indication shall be different depending on the direction of the mode change.
- 5.4.1.7 The UE should support the capability to provide an audible and/or visible warning that the Wi-Fi® signal quality is deteriorating prior to handover. This is to give users an early indication of a potential network/tariff change. This feature should be operator and/or user configurable (enabled/disabled).
- 5.4.2 **Call Related**
- 5.4.2.1 By default, the user action to make and receive calls shall be the same, regardless of mode. This feature should be operator configurable.
- 5.4.2.2 Caller display information for incoming calls in both Wi-Fi® and cellular modes shall be supported.
- 5.4.2.3 The UE shall indicate which access network is being used for any incoming or outgoing call, if this is not implicit from the mode indication.
- 5.4.2.4 In Wi-Fi® mode, the UE should support the option for both the SIP Public User Identity and SIP Display Name to be presented on the UE display as part of the caller display information for incoming calls.
- 5.4.3 **Configuration**
- 5.4.3.1 The UE shall be able to provide either consistent or different ring tones and volumes based upon mode of operation. This feature shall be operator/user configurable.
- 5.4.3.2 The UE shall be configurable by the user in any of the following four selection modes: Wi-Fi®-only, Wi-Fi®-preferred, cellular-preferred, cellular-only. It is recognised that, in some scenarios, this may result in users being connected to both access networks at the same time.
- 5.4.3.3 Use of the audible indication on handover shall be both user and operator configurable (on/off).
- 5.4.3.4 The UE should be configurable by the user in either of the following two handover preferences: automatic handover, manual handover.
- 5.4.3.5 The UE shall provide the user with the capability to enable/disable any specific radio.

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- 5.4.3.6 The UE shall provide a call history and the call history shall indicate which access network was used for any incoming or outgoing call.
- 5.4.3.7 The UE shall have a simple user interface to allow the user to configure Wi-Fi® profiles, e.g. addition, deletion. These profiles shall also be able to be modified over the air.
- 5.4.4 **Applications**
 - 5.4.4.1 The UE shall provide a common user interface in Wi-Fi® and cellular modes, which shall be simple and consistent between all applications. It should be noted that there may be minor user and/or operator configurable differences between modes.
 - 5.4.4.2 User procedures to activate/de-activate applications such as SMS, MMS, email and Internet browsing in Wi-Fi® and cellular modes shall be harmonised, except for differences that may result from specific user or operator configurations.
 - 5.4.4.3 Access to personal content such as address books, agendas, configuration data and stored files shall be mode-independent.

5.5 Wi-Fi® Interface

- 5.5.1 The UE shall be certified by the Wi-Fi Alliance for compliance to IEEE 802.11g.
- 5.5.2 The UE Total Radiated Power (TRP) shall be measured according to the WFA/CTIA RF Performance Test Plan. The minimum FMCA TRP values shall be +5 dBm for IEEE 802.11g and +7 dBm for IEEE 802.11b and the target FMCA TRP values should be +8 dBm and +10 dBm respectively.
- 5.5.3 The UE Total Isotropic Sensitivity (TIS) shall be measured according to the WFA/CTIA RF Performance Test Plan. The minimum FMCA TIS values shall be -78 dBm for the 12 Mb/s IEEE 802.11g rate and -77 dBm for the 11 Mb/s IEEE 802.11b rate and the target FMCA TIS values should be -81 dBm and -80 dBm respectively.
- 5.5.4 When the UE has attached to the cellular network and is not in cellular-only mode, it should periodically search for Wi-Fi® coverage, subject to user preferences. The interval for probing or scanning should be implementation-specific, depending on power conservation strategies. The interval probe/scan shall be operator and/or user configurable and should be configurable over the air (Wi-Fi® and cellular), e.g. through use of OMA DM v1.2.

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- 5.5.5 The UE should use SSID, security settings and RSSI, among other parameters, to select which AP to join.
- 5.5.6 The operator shall be able to set an Inter-AP 'scanning threshold' to trigger the UE to search for other APs such that there is reasonable opportunity to discover another suitable AP when the signal from the current AP drops (before the UE is forced to switch to cellular mode).
- 5.5.7 The operator shall be able to set an Inter-AP 'roaming threshold' to trigger the UE to execute a handover.
- 5.5.8 The UE should be able to (internally) measure RSSI values between -45 dBm and -86 dBm with a step size of 1 dB – *Source: based on UMA recommendations.*
- 5.5.9 The UE IEEE 802.11 driver shall keep upper layers unaffected by change of AP (provided the IP address does not change).

5.6 Local Synchronisation

- 5.6.1 The UE shall support UE to PC synchronisation software, e.g. for email, file transfer applications, configuration updates. Synchronisation should be supported via USB, Wi-Fi®, Bluetooth® or docking station interfaces.

5.7 Remote Synchronisation

- 5.7.1 The UE should support remote UE network synchronisation for applications such as email, file transfer, configuration updates, address books, etc, using OMA DS.

5.8 Outgoing Call Routing

- 5.8.1 The UE shall support outgoing call network selection capabilities, e.g. the ability to route calls on parameters such as network availability, network selection options/UE mode and dialled number.
- 5.8.2 The UE should allow a user to dial a number that will be routed through the cellular network when the UE is in Wi-Fi® mode but not in Wi-Fi®-only mode.
- 5.8.3 The UE should allow a user to dial a number that will be routed through the Wi-Fi® network when the UE is in cellular mode but not in cellular-only mode.

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5.9 Number Management

- 5.9.1 The UE shall use the same number management facilities, e.g. address book, dialling capability, call history, for both modes.
- 5.9.2 The UE shall support short code dialling and translation of calls prefixed with '+' for international country code in both modes.
- 5.9.3 The UE shall provide an initial SIP identity check to verify that the domain is valid, e.g. contains @, 1.level and 2.level domain name has a length of at least 2 characters.

5.10 IMS Framework

Statement: FMCA PRD Release 3.0 assumes network architecture compliance with: (i) 3GPP IMS (part of 3GPP Release 7) or 3GPP2 MMD, (ii) 3GPP VCC between CS and IMS (including I-WLAN) (part of 3GPP Release 7) or 3GPP2 DTF and DRF, and (iii) ETSI TISPAN NGN (Releases 1 and 2).

- 5.10.1 The UE shall support IMS functions and an active IMS subscription that can be provisioned over the air and/or via smart cards, e.g. use of OMA CP and OMA DM v1.2.
- 5.10.2 The UE shall support VCC functions and an active VCC subscription that can be provisioned over the air and/or via smart cards, e.g. use of OMA CP and OMA DM v1.2.
- 5.10.3 The UE shall not allow internal IMS and VCC subscription information to be altered by the user directly. Other means of modifying subscription information (e.g. self-care portal), which would in turn re-provision IMS and VCC subscription information in the UE, should be provided for this purpose.
- 5.10.4 The UE shall conform with 3GPP TS 23.228, 3GPP TS 24.229, ETSI ES 283 003 and TIA-873 IMS standards.

5.11 Security

5.11.1 General

- 5.11.1.1 The UE shall support WEP (RC4), WPA™ (TKIP) Personal, and WPA2™ Personal at the minimum.

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- 5.11.1.2 The UE shall be certified by the Wi-Fi Alliance for compliance to WPA2™ Enterprise.
- 5.11.1.2.1 The UE shall support one or more of: EAP-SIM, EAP-AKA, EAP-TLS, EAP-TTLS.
- 5.11.1.3 A user friendly mechanism shall be supported for first-time residential association. This shall provide a secure way to configure WPA™ / WPA2™ without the need for the user to enter a pass phrase into the UE. It shall not be possible for a third party to crack the WPA™ / WPA2™ security by eavesdropping the user friendly set-up process. The user friendly mechanism shall be certified against Wi-Fi Protected Setup™ Certification (PIN/PBC). The WPA™ / WPA2™ pre-shared key provisioned by the user friendly mechanism should be at least eight characters, pseudo-random and consisting of digits 0-9 and characters a-z.
- 5.11.1.4 The PMK should be derived by the UE using GAA/GBA as specified in 3GPP TS 33.220.
- 5.11.2 **Link Layer**
 - 5.11.2.1 **Common requirements (independent of convergence architecture)**
 - 5.11.2.1.1 The UE shall support open access, i.e. no link layer encryption. This feature shall be operator configurable via an Elementary File (EF) in the NAA being used for access to the current network.
 - 5.11.2.1.2 The UE shall provide a visible indication of the status of the link layer encryption. The indication should change automatically when the status changes. This feature shall be operator configurable via an EF in the NAA being used for access to the current network.
 - 5.11.2.2 **SIP^{Convergence}**
 - 5.11.2.2.1 The UE should support mutual authentication according to the IEEE 802.1X standard, using EAP-TLS and digital certificate.
- 5.11.3 **Network Layer**
 - 5.11.3.1 **Common requirements (independent of convergence architecture)**
 - 5.11.3.1.1 The UE shall provide a visible indication of status of the network layer encryption. The indication should change automatically when the status changes. This feature shall be operator configurable via an EF in the NAA being used for access to the current network.

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5.11.3.2 **IMS**^{Convergence}

- 5.11.3.2.1 The UE shall support mutual authentication using IMS AKA as specified in 3GPP TS 33.203.
- 5.11.3.2.2 The UE shall support SIP signalling integrity using IPsec which terminates in the P-CSCF as specified in 3GPP TS 33.203.
- 5.11.3.2.3 The UE shall support network authentication using certificates on the gateway in the network that encapsulates the call and signalling data in secure IPsec tunnels (equivalent to the PDG in 3GPP TS 33.234).
- 5.11.3.2.4 The UE shall support network encryption using IPsec which terminates in the network (equivalent to the PDG in 3GPP TS 33.234).

5.11.3.3 **SIP**^{Convergence}

- 5.11.3.3.1 The UE shall authenticate the network certificate against the embedded root Certificate Authority (CA) certificate.
- 5.11.3.3.2 The UE shall support network encryption using IPsec which terminates in the network gateway.

5.11.4 **Application Layer**

5.11.4.1 **Common requirements (independent of convergence architecture)**

- 5.11.4.1.1 The UE shall provide a visible indication of status of the application layer encryption. The indication should change automatically when the status changes. This feature shall be operator configurable via an EF in the NAA being used for access to the current network (this requirement is likely to be fulfilled by the standard 'padlock' on the Web browser).
- 5.11.4.1.2 The UE shall support authentication and encryption using HTTPS TLS which terminates at the application server.
- 5.11.4.1.3 The UE shall support GAA/GBA for the distribution of application layer keys and certificates as specified in 3GPP TS 33.220, TS 33.221 and TS 33.222.

5.12 Quality of Service

- 5.12.1 For 3GPP networks, the UE shall support QoS profiles as per 3GPP TS 23.107.
- 5.12.2 For 3GPP2 networks, the UE shall support QoS profiles as per IS-835.4.

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- 5.12.3 The UE shall provide the ability to separately mark different traffic types (e.g. voice, signalling, data) using DiffServ code points in accordance with IETF RFC 2474, in a manner which can only be altered by the operator.
- 5.12.4 When the UE sends outgoing traffic via an IPsec tunnel, the DSCP marking from the inner IP header shall be copied to the outer IP header.
- 5.12.5 The Wi-Fi® air interface shall be optimised for voice and associated signalling traffic, i.e. voice delay shall be minimised and the UE should internally prioritise voice and signalling packets ahead of any other data packets that are to be transmitted.
- 5.12.6 The UE shall be certified by the Wi-Fi Alliance for compliance to WMM® (Wi-Fi Multimedia™).
- 5.12.7 The UE shall classify outgoing traffic into WMM® Access Categories based on the DSCP value in the IP header.
 - 5.12.7.1 The mapping between DSCP values and WMM® Access Categories shall be configurable by the operator.

5.13 Connection Establishment

- 5.13.1 The UE boot-up time (power-on to PIN prompt) should be consistent with the need for a good user experience. Time from successful PIN entry to ability to make or receive call should also be consistent with the need for a good user experience.
- 5.13.2 If the UE is in Wi-Fi®-preferred or Wi-Fi®-only mode, the UE shall automatically associate to the best available Wi-Fi® AP according to user and operator customised preferences and to network quality (e.g. Wi-Fi® signal strength, available QoS, bandwidth).
- 5.13.3 The UE shall automatically attach to a cellular network if it is not in range of a Wi-Fi® AP and if not in Wi-Fi®-only mode.
- 5.13.4 The UE shall automatically attach to a cellular network if it is in cellular-only mode.
- 5.13.5 If the UE is put into a stand-by mode (e.g. no active calls), the UE should maintain Wi-Fi® and/or cellular interfaces such that an incoming or outgoing event can be quickly established.
- 5.13.6 The UE shall support a de-registration process to detach from the IMS network.
- 5.13.7 The UE shall support SIP session set-up and tear-down in Wi-Fi® mode.

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5.14 Wi-Fi® Association

- 5.14.1 At power on, the UE shall perform initial network selection according to the logic in the flowchart illustrated in Figure 1, Appendix I.
- 5.14.2 When the UE successfully associates and authenticates with the AP for the first time, it shall store the association/authentication details within a UE Wi-Fi® profile. For example, the Wi-Fi® profile could store details such as SSID, encryption (none, WEP, WPA™, WPA2™), network authentication, IP configuration.
 - 5.14.2.1 Subsequent UE to AP (with same stored Wi-Fi® profile) authentication on connection shall be automatic and shall not require any keystroke entry on the UE to attach to the service.
- 5.14.3 The UE shall support Wi-Fi® profiles and differentiate between them based on Wi-Fi® parameters such as SSID and MAC address.
 - 5.14.3.1 The UE shall be capable of storing a minimum of 32 Wi-Fi® profiles.
 - 5.14.3.2 Operators shall have the ability to restrict the maximum number of Wi-Fi® profiles.
 - 5.14.3.3 Users shall have the ability to label the Wi-Fi® profile; the default shall be the SSID.
 - 5.14.3.4 The UE shall prompt the user when all Wi-Fi® profiles are used up.
 - 5.14.3.5 The UE shall support user configurable options for new profiles when the UE maximum number of Wi-Fi® associations limit is reached, e.g. whether to automatically delete the least used profile, or to alert the user that an existing profile will need to be deleted before the new profile can be added.
 - 5.14.3.6 The UE shall be able to set an order of connection preference for the stored Wi-Fi® profiles.
 - 5.14.3.7 The UE shall support the capability to manage Wi-Fi® profiles over the air through the use of OMA DM v1.2 or OMA CP. It is optional whether or not the service provider uses this to overwrite the user preferences.
- 5.14.4 The UE shall automatically associate to the highest preference Wi-Fi® network available, subject to the Wi-Fi® signal being of sufficient quality to meet the service requirements and subject to the UE being in Wi-Fi®-preferred or Wi-Fi®-only mode.

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- 5.14.5 If a UE successfully associates to an AP but fails to register successfully to a SIP server (primary or any alternative SIP servers) after a number of registration attempts, the UE should attempt the registration via another AP. AP association and subsequent SIP registration attempts should be repeated until all available APs have been attempted.
- 5.14.6 If the Wi-Fi® signal quality falls below an operator-defined threshold, measured by the UE, then the UE shall disconnect from the AP.
- 5.14.7 The UE shall be certified by the Wi-Fi Alliance for compliance to Wi-Fi Protected Setup™ Certifications (PIN/PBC).
- 5.14.8 The first association between a UE and an AP should be initiated by the UE user, e.g. via menu selections or a user friendly mechanism. The user friendly mechanism shall provide a secure way to configure WEP/WPA™ /WPA2™ without the need for the user to enter a pass-phrase into the UE, e.g. Wi-Fi Alliance WPS PIN/PBC.
- 5.14.9 If the UE is in Wi-Fi®-only mode or Wi-Fi®-preferred mode, the UE shall have the option not to display a prompt to the user to initiate or accept an association to an SSID it has already associated with, i.e. any first association to an SSID shall be initiated by the user; subsequent associations to this SSID shall not require user intervention. Options shall be operator configurable through remote management, e.g. OMA DM v1.2.
- 5.14.10 For 3GPP2 networks, the UE should provide support for multiple profile slot capability in support of Mobile IP and Simple IP services. Wi-Fi® profiles should be in addition to cellular profiles.

5.15 Mobility and Service Continuity

- 5.15.1 The UE shall support AP-to-AP handovers within an enterprise site or a public Wi-Fi® hotspot.
- 5.15.2 The UE shall support voice and data session continuity in case of AP-to-AP handovers within an enterprise site or public Wi-Fi® hotspot, assuming the network address (e.g. IP address) of the UE remains the same.
- 5.15.3 The user experience of the AP-to-AP handover should be seamless with no loss of voice, no perceptible break and, where possible, a maximum voice break of no more than 100 ms.
- 5.15.4 The UE shall support voice call handover between cellular and Wi-Fi® networks, where the Wi-Fi® network could be an enterprise, private home or public hotspot network.

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- 5.15.5 In 3GPP2, the UE shall be compliant with IS-835 and IS-1050.200 that will support data session handover between cellular and Wi-Fi® networks.
- 5.15.6 The user experience of the handover between Wi-Fi® and cellular should be seamless with no loss of voice (call continuity) and, where possible, a maximum voice break of no more than 300 ms.
- 5.15.7 Any SIP-based data application, e.g. Instant Messaging, that is running shall not be affected, by a handover or rove, from a user's perspective.
- 5.15.8 For handover of a call from cellular to Wi-Fi®, the UE shall be capable of signalling to the IMS network using Wi-Fi® while the cellular call is ongoing according to 3GPP TS 23.206 Release 7.
- 5.15.9 For handover of a call from Wi-Fi® to cellular, the UE shall be capable of signalling to the IMS network using cellular while the Wi-Fi® call is ongoing according to 3GPP TS 23.206 Release 7.
- 5.15.10 The UE shall rove to/from Wi-Fi® and cellular networks, as required.
- 5.15.11 The maximum time to complete roving to/from a cellular network shall be no more than 300ms.
- 5.15.12 To maximise Wi-Fi® coverage, the UE shall initiate a switch to cellular mode before the user of the Wi-Fi® mode service starts to perceive a deterioration in the voice service.
- 5.15.13 The UE should be capable of initiating a handover/rove to/from Wi-Fi® and cellular networks based on a number of operator configurable parameters including downlink wireless signal strength, packet loss, jitter, etc.
- 5.15.14 The UE shall support roving timers to limit the number of consecutive network changes (e.g. 'ping-pong' effect) and hence reduce network signalling.
- 5.15.15 The UE shall support hand-in and hand-out timers to limit the number of consecutive network changes (e.g. 'ping-pong' effect) and hence reduce network signalling.
- 5.15.16 The UE shall send a presence and location update to the presence and location servers immediately after all rove-in/out and hand-in/out mode changes.
- 5.15.17 The UE should send a presence and location update to the presence and location servers immediately after all AP-to-AP handovers.
- 5.15.18 The UE shall be capable of initiating a switch to cellular or Wi-Fi® mode based on user preference and subject to operator policy.

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5.16 Location-Based Services

- 5.16.1 The UE should support value added Location-Based Services (LBS).
- 5.16.2 The UE shall support LBS according to OMA-SUPL (Secure User Plane Location) and 3GPP TS 23.271.
- 5.16.3 If the UE supports OMA-SUPL, the UE shall be able to send to the LBS server the subscriber identity (as authenticated) in a secure way.
- 5.16.4 The UE should use LBS to aid in the selection of access networks and facilitate handovers.
- 5.16.5 The UE should support LBS configuration via OMA DM v1.2.

5.17 Presence Services

- 5.17.1 The UE shall support OMA Presence SIMPLE (SIP for Instant Messaging and Leveraging Extensions) in both Wi-Fi® and cellular modes.
- 5.17.2 The UE shall support group list management.
 - 5.17.2.1 The UE shall support Generic XDMS (OMA-TS-XDM_Shared).
 - 5.17.2.2 The UE shall support Resource List Management (OMA-TS-Presence-SIMPLE_RLS_XMS).
- 5.17.3 The UE should support Contact/Buddy lists that are presence enabled, in both Wi-Fi® and cellular modes.
- 5.17.4 The UE shall support presence service configuration via OMA DM v1.2.

5.18 Applications and Multimedia Services

- 5.18.1 The UE shall enable the use of productivity applications such as enterprise email, calendar, and contacts (including speed dialling from the contacts list), in both Wi-Fi® and cellular modes.
- 5.18.2 The UE shall support the synchronisation of data (PIM, enterprise data) with a network server, in both Wi-Fi® and cellular modes.

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- 5.18.2.1 The UE should provide a software API to allow applications read and write access to local data (e.g. PIM, files, multimedia). Where a UE supports only Java applications then this API should conform to the JSR75 File Connection and PIM API specification.
- 5.18.2.2 The UE should provide a SyncML client which conforms to the OMA DS v1.2.
- 5.18.3 The UE should provide a software API to the native SIP stack to support the efficient development of SIP-enabled applications. Where a UE supports only Java applications, then this SIP API should conform to the JSR180 specification.
- 5.18.4 The UE should include a Web browser application.
 - 5.18.4.1 The Web browser shall be compatible with XHTML Basic and XHTML Mobile Profile.
 - 5.18.4.2 The Web browser should support XHTML1.1 and HTML4.01.
 - 5.18.4.3 The Web browser should be AJAX compatible and conform to the standards issued by the OpenAjax Alliance.
- 5.18.5 The UE shall support the installation of applications to removable storage, e.g. memory cards.
- 5.18.6 The UE shall include support for Java Micro Edition applications.
 - 5.18.6.1 The Java platform shall be compliant with the JSR248 Subset.
 - 5.18.6.2 The Java platform should be compliant with the JSR248 Full API.
- 5.18.7 The UE should provide a software API to the UE IMS framework to support the efficient development of IMS applications. Where the UE supports only Java applications, then this IMS API should conform to the JSR281 specification.
- 5.18.8 The UE should notify applications of a handover between cellular and Wi-Fi® modes as they may wish to change their behaviour to exploit the increased network speed.
- 5.18.9 The UE should provide a software API to allow applications to determine the access network that is in use.

5.19 Voice Codecs

- 5.19.1 The UE shall support the following narrowband voice codecs: G.711, AMR.

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- 5.19.2 The UE should support the following narrowband voice codecs: G.729.A, EVRC/EVRC-B.
- 5.19.3 If the UE supports wideband voice codecs, it shall support the following voice codec: G.722.
- 5.19.4 If the UE supports wideband voice codecs, it should support the following voice codecs: AMR-WB (G.722.2), G.729.1, EVRC-WB, AAC-LD.
- 5.19.5 The UE shall support switching of codecs on call continuity in case of handover between cellular and Wi-Fi® modes or between Wi-Fi® APs.
- 5.19.6 If the UE is engaged on a voice call in Wi-Fi® mode and the bandwidth and/or signal quality needed to ensure a predefined voice quality drops below a defined threshold, then the UE should be capable of evoking an adaptive codec mode and maintain the call in Wi-Fi® mode.
- 5.19.7 The UE should be able to adapt the codec to maintain the highest possible voice quality. It should also be noted that it is conceivable that the codec should adapt up as well as down if the network improves.
- 5.19.8 The UE should support MP3 (MPEG 1 Audio Layer 3), and should support other advanced audio codecs for playing music.

5.20 Voice Services

- 5.20.1 The UE shall support the capability for Voice over IP (VoIP) in Wi-Fi® mode.
- 5.20.2 Users shall be able to use the UE to set any call diversion methods, as per current cellular functionality, e.g. divert when busy, divert when not reachable.
- 5.20.3 The UE shall support DTMF in cellular mode and in Wi-Fi® mode, e.g. IETF RFC 2833.
- 5.20.4 The UE shall support incoming and outgoing calls over cellular networks.
- 5.20.5 The UE shall support incoming and outgoing voice calls over Wi-Fi® networks.
- 5.20.6 The UE shall support RTP (IETF RFC 3550) for Wi-Fi® mode voice calls.
- 5.20.7 The UE shall support configurable voice packet sizes.
- 5.20.8 The UE should support three-way calling/call on hold functionality with one leg in Wi-Fi® mode and the other in cellular mode.

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- 5.20.9 Wi-Fi® mode voice quality, when in good coverage Wi-Fi® without significant interference, shall be comparable to or better than that obtained with good coverage cellular including delay and echo. This applies to both incoming and outgoing calls.
- 5.20.10 When in Wi-Fi® mode, the UE shall provide acoustic echo control that results in voice quality that is comparable to or better than that experienced with cellular networks.
- 5.20.11 When more than one telephone number is supported by the UE, the UE should be able to put an ongoing call on hold irrespective of mode when there is an indication that an additional call is received on one of the other numbers supported by the UE.
- 5.20.12 The UE should support VCC according to 3GPP TS 23.206 and TS 24.229.
- 5.20.13 The UE shall support Automatic Gain Control (AGC).
- 5.20.13.1 The UE AGC shall not cause the loss of any characters when a TTY (textphone) is used.
- 5.20.14 The UE shall support secure voice calls in accordance with the requirements defined in Section 5.11 – Security.
- 5.20.15 The UE should have the capability to record and playback voice services in accordance with in-country/regional regulatory requirements.
- 5.20.15.1 If the UE supports this capability, it shall also support the capability to notify to end user that their conversation is being recorded. This capability shall be configurable by the operator (enable/disable).

5.21 Video Codecs

- 5.21.1 If video services are supported, the UE shall support the H.263 baseline profile codec for videotelephony, and MPEG-4 part 2 or part 10 AVC (H.264) for video-streaming service. Operators shall have the capability to enable/disable specific codecs, specify the order of preference, and request additional codecs.

5.22 Video Services

- 5.22.1 The UE should support videotelephony and video-streaming services.
- 5.22.2 The image size should be limited to CIF (352 × 288 pels), QCIF (176 × 144 pels) or subQCIF (128 × 96 pels).
- 5.22.3 The UE should support a frame rate of at least 10 fps.

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5.22.4 Videotelephony

- 5.22.4.1 The UE shall support a forced Intra-MB update scheme to prevent the spatio-temporal error propagation in the reconstructed video frames for videotelephony.
- 5.22.4.2 Periodic transmission of Intra-frame shall not be used for videotelephony.
- 5.22.4.3 The UE should support at least 64 kb/s for videotelephony.
- 5.22.4.4 The video quality degradation due to packet loss should be recovered.
- 5.22.4.5 FIR (Full Intra-frame Request) should be used to prevent error propagation.

5.22.5 Video-streaming

- 5.22.5.1 The downstream bit rate for video-streaming should be able to support at least 384 kb/s in Wi-Fi® mode.

5.23 Data Services

- 5.23.1 The UE shall support data connectivity over both Wi-Fi® and cellular networks.
- 5.23.2 When in cellular mode, the UE shall use cellular data services to provide the same services at the best obtainable performance that is available in Wi-Fi® mode. It should be noted that operators may require facilities to be in place to manage customer expectations regarding difference in data rates between Wi-Fi® and cellular modes.
- 5.23.3 The UE shall support Unstructured Supplementary Service Data (USSD) in 3GPP networks.
- 5.23.4 The UE should support data and voice connectivity simultaneously in both Wi-Fi® and cellular modes. The UE shall be able to multi-task voice and data sessions. For example, when engaged on a voice call (in either mode), the user may access directories so the call may be transferred with the ability for a user to access live email at the same time as a voice call.
- 5.23.5 The UE shall support data rates when in Wi-Fi® mode that are at least as high as those supported in cellular mode and should take advantage of the higher data rates available from the Wi-Fi® network.
- 5.23.6 When the UE handover between APs is on an enterprise site, hotspot or in a home, data connectivity should not be dropped and an application that is running shall not be affected from a user's perspective.

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- 5.23.7 When the user leaves Wi-Fi® coverage and enters cellular coverage, data connectivity should be maintained and an application that is running shall not be affected from a user's perspective. This requirement is dependent on similar network resources being available.
- 5.23.8 The UE should support Circuit Switched Data (CSD) capabilities on the Wi-Fi® network. It should be noted that due to local regulatory requirements or existing services, some operators may mandate that the UE shall support CSD capabilities on the Wi-Fi® network.
- 5.23.9 A CSD-emulated call should not be dropped due to AP-to-AP handover.

5.24 Messaging Services

- 5.24.1 The UE should support Instant Messaging (IM) in Wi-Fi® and cellular modes.
 - 5.24.1.1 IM applications should conform to OMA Instant Messaging (OMA-TS-IM-SIMPLE) and Presence (OMA-TS-Presence-SIMPLE).
- 5.24.2 The UE shall support MMS and SMS in both Wi-Fi® and cellular modes, irrespective of being in-call/in-session (voice/data) or idle. These features shall be enabled/disabled based on operator policy.
- 5.24.3 The UE shall support SMS over IMS according to 3GPP TS 23.204 and TS 24.341.
- 5.24.4 CLIP on SMS messages sent/received in Wi-Fi® mode shall be as per the cellular service.
- 5.24.5 SMS messages shall be kept until the reception is confirmed by the SMS Centre.

5.25 Emergency Calls

- 5.25.1 The UE shall conform to the national regulations where the subscriber is located. Support for emergency call requirements shall be provided over both Wi-Fi® and cellular modes as per 3GPP/3GPP2/IETF relevant standards.
- 5.25.2 The UE shall support the functionality for operators to mandate that all emergency calls shall be made using the cellular network, if available.

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- 5.25.3 Emergency calls shall take precedence over the mode of the UE. This shall apply even if the device is in Wi-Fi®-only mode or Wi-Fi®-preferred mode and has its cellular radio interface turned off, i.e. if the cellular radio is turned off and the UE is configured to place emergency calls via the cellular network, the UE shall turn it on and proceed with the emergency call via the cellular network.
- 5.25.4 The UE shall support the ability to route emergency calls in a number of different ways.
 - 5.25.4.1 If Home cellular coverage is available, then the call shall be routed over the Home cellular network. The UE shall be registered with the Home cellular network (including performing a location update if this has not already been performed to the cellular network) when it initiates the emergency call.
 - 5.25.4.2 If Home cellular coverage is not available, then the emergency call should be routed over the Wi-Fi® network if in Wi-Fi® coverage, only in case of local regulatory and/or operator requirements.
 - 5.25.4.3 The UE shall contain a configurable list of country codes for which the above behaviour applies. If a country code is not in the configurable list then the UE shall attempt an emergency call over any cellular network if the Home cellular network is not available.
 - 5.25.4.4 The UE shall support configuration by the operator such that emergency calls will only be routed over Wi-Fi® if no cellular signal is available.
- 5.25.5 The UE shall recognise all international emergency call codes programmed on to the handset/device and/or on to the UICC.
- 5.25.6 The UE shall support at least eight emergency call codes from the device or UICC card. The assignment of emergency call codes are subject to regional/in-country regulations. It is acknowledged that some in-country operating restrictions may not permit emergency calls from UE without UICCs.
- 5.25.7 The UE should be updated on emergency call codes when roaming between networks.
- 5.25.8 The UE security mechanisms shall be overridden for emergency calls, e.g. if the UICC PIN has been enabled, the requirement to enter this PIN on power-up shall be waived for emergency calls.

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- 5.25.9 The UE shall support any local regulatory requirements regarding total time taken for a reselection from Wi-Fi® to cellular to facilitate an emergency call. During the reselection time, appropriate visual or audible information should be provided to the user to avoid them terminating the call attempt prematurely.
- 5.25.10 If required by the operator, the UE shall support handover from Wi-Fi® to cellular for emergency calls.
- 5.25.11 If emergency call is on cellular, the handover from cellular to Wi-Fi® shall be controlled by the operator.
- 5.25.12 The UE shall report the current AP information and GERAN/UTRAN or 3GPP2 cell information, if available, when making an emergency call in Wi-Fi® mode – if no UICC, show network searching.
- 5.25.13 The UE should support the appropriate handling of deaf service emergency call numbers. It should be noted that some operators may mandate this requirement as a 'shall' due to local regulatory requirements.

5.26 Regulatory Requirements

- 5.26.1 The UE shall meet relevant in-country/region mandatory cellular and Wi-Fi® Health and Safety requirements.
- 5.26.2 The UE shall meet relevant in-country/region requirements, e.g. CE marking and the EC WEEE directive.
- 5.26.3 The UE shall meet the ICNIRP guidelines
- 5.26.4 The UE shall support LAES encryption aspects.
- 5.26.5 The UE shall support local regulation for TTY in Wi-Fi® and cellular modes.
- 5.26.6 The UE shall support local regulation regarding disability services, e.g. visual and hearing.

5.27 Management

- 5.27.1 The UE shall support: OMA DM v1.2 capabilities as a minimum that are mutually authenticated, integrity, confidentiality and denial of service protected from any of the connected networks.

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- 5.27.1.1 The following OMA DM management objects (MO) shall be supported: Software Component, Firmware Update, Lock and Wipe, Device Characteristics, Connection, Diagnostics and Monitoring and Smart Card.
- 5.27.2 The UE shall support the capability for access to the Wi-Fi® SIP service to be disabled remotely by the operator. The UE should support OMTP Management of VoIP Settings v1.0.
- 5.27.3 The UE shall support necessary diagnostics, error codes and remote management capabilities. Example 1: a diagnostic log of at least the last 20 events (e.g. SIP signalling messages). Example 2: for failed SIP calls/registration attempts, the UE should support the option to display the relevant numeric SIP failure code on the UE display, along with a text explanation.
- 5.27.4 The failure/diagnostic information should be capable of being suppressed after a period of configurable interval, but should remain available to the user via a status menu option.
- 5.27.5 The UE shall support local diagnostics for both Wi-Fi® and cellular connectivity, e.g. success/failure of Wi-Fi® connection, DNS look-up, secure gateway connection, tunnel set-up, SIP registration, IP addressing.
- 5.27.6 The UE should support remote diagnostics (when connected and where authorised by the user) and file upload for Wi-Fi® and cellular modes.
- 5.27.7 The UE should support upload to the customer service centre of a single file containing complete UE configuration data. Any security keys, authentication certificate, passwords, or other security tokens shall be excluded from this file upload.
- 5.27.8 Regardless of mode (Wi-Fi® or cellular) the UE shall feature a software application allowing the download of files from operator back-end systems. The content of these files are data and software programmes allowing configuration of the UE network parameters and applications (e.g. access profiles, network AS addresses, roaming lists) and the ability to execute user features and services (e.g. routing tables, phone book). Once the download is performed, the application should be able to interact with the network and services depending on the context, without specific commands from the keypad.
- 5.27.9 The UE should support the capability for all applications, firewalls, antivirus software, etc, to be installed on the UE during manufacture or post manufacture. Both methods shall be supported.
- 5.27.10 The UE should support the capability for all applications, firewalls and antivirus software, etc, to be provisioned over the air using the OMA DM v1.2 software component management.

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- 5.27.11 The UE should support the capability to restrict over-the-air provision and locally-installed applications just to signed applications.
- 5.27.11.1 Application signing should include the use of operator-issued root certificate authorities installed in either the firmware or smart card. Such root authorities should have equivalent privileges to manufacturer certificates.
- 5.27.11.2 The UE should include the appropriate industry standard certificate authorities given the underlying OS, e.g. Java Verified, Symbian Signed, Microsoft mobile to market.

5.28 Roaming

- 5.28.1 The UE shall provide seamless support for international cellular and Wi-Fi® service provider roaming.
- 5.28.2 The UE shall support EAP extended key usage values and a public key certificate extension to carry Wi-Fi® SSIDs according to IETF RFC 4334.

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3GPP TS 31.103: Characteristics of the IP Multimedia Services Identity Module (ISIM) application	5.2.8
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Wi-Fi Alliance WMM® Power Save Certification	5.1.3
Wi-Fi Alliance WMM® Certification	5.12.6
Wi-Fi Alliance WPA2™ Enterprise Certification	5.11.1.2
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Definitions

For the purposes of this document, the following terms and definitions apply:

Access Network	The collection of network entities and interfaces that provides the underlying IP transport connectivity between the user equipment (UE) and the network entities.
Access Point	A Wi-Fi® base-station. An Access Point (AP) acts as the communication hub for Wi-Fi® device users to be able to connect to services such as the Internet, PSTN and PBX, backhauled typically via a wired fixed access network.
Application	An application is a service enabler deployed by service providers, manufacturers or users. Individual applications will often be enablers for a wide range of services.
Application Interface	Standardised interface used by applications to access service capability features.
Associate	The process of obtaining a registered connection (association) between a UE and a Wi-Fi® AP.
Attach	The process of obtaining a registered connection between a UE and a cellular base-station.
Cellular/cellular network	Use of 2G, 2.5G and 3G networks for voice and data services.
Cellular mode	The dual-mode (Wi-Fi®/cellular) UE has registered with a wide-area cellular network.
Cellular-only mode	When the UE is in cellular-only mode, the service can only be accessed via a wide-area cellular network.
Cellular-preferred mode	When the UE is in cellular-preferred mode, the UE shall provide service via the wide-area cellular network when in coverage. When there is no cellular coverage, the UE shall register and provide service via the Wi-Fi® network (if available). Note that the UE shall not automatically switch mode if this will terminate a voice call in progress.

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Convergence	<p>A converged fixed and mobile service is one that enables the user to access a wide variety of communications, information, and/or entertainment services, with consistent quality of service regardless of the end terminal used, the underlying network over which those applications run, or the user's location.</p> <p>SIP^{Convergence} is a shorthand notation used to indicate a SIP-based architectural framework for delivering convergence services.</p> <p>IMS^{Convergence} is a shorthand notation used to indicate an IMS architectural framework for delivering convergence services.</p>
Corporate/enterprise Wi-Fi access	A device accessing a corporate or enterprise Wi-Fi® network.
Coverage	Zone of coverage created by one or multiple Wi-Fi® APs.
Device	A UE which could take several form factors, e.g. a mobile handset, PC or a PDA.
Dual-mode device	A UE able to operate in cellular and Wi-Fi® modes, not necessarily simultaneously.
Dual-network UICC	A UICC that can support multiple independent Network Access Applications with different profiles.
Gateway	A combined DSL/cable modem, router and AP with additional capabilities such as NAT, NAPT, DHCP and personal firewall.
Handover	A case of mobility with service continuity, when the provision of services is preserved during the movement, but an impact on current communications may result in perception by the user (e.g. a short interruption in media exchange).
Incoming call	A call originating from the fixed or mobile network or another dual-mode (Wi-Fi®/cellular) UE towards the dual-mode (Wi-Fi®/cellular) UE receiving the call.
Instant messaging	Typically, the sender is aware of the availability of the recipient(s) (possibly through the use of the Presence service) before sending this type of message, as, if the recipient is not available, the message may be discarded or deferred. An instant message may be deferred by the recipient's network based on the message filtering settings defined by the recipient or by the recipient's service provider.
Internet service	A service provided via Internet protocols. Examples of these services include SIP telephony, multimedia, World Wide Web and email.

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IP multimedia application	An application that handles one or more media simultaneously, such as speech, audio, video and data (e.g. chat text, shared whiteboard) in a synchronised way from the user's point of view. A multimedia application may involve multiple parties, multiple connections, and the addition or deletion of resources within a single IP multimedia session. A user may invoke concurrent IP multimedia applications in an IP multimedia session.
IP multimedia service	An IP multimedia service is the user experience provided by one or more IP multimedia applications.
IP multimedia session	An IP multimedia session is a set of multimedia senders and receivers and the data streams flowing from senders to receivers. IP multimedia sessions are supported by the NGN and are enabled by IP connectivity bearers. A user may invoke concurrent IP multimedia sessions.
IP multimedia subsystem	The architecture and protocols defined in 3GPP Release 5 and higher to support IP multimedia applications and services. Note that 3GPP has an alignment with 3GPP2.
Location-Based Service (LBS)	May be considered as a network-provided technology consisting of standardised service capabilities, which enable the provision of location applications. The application(s) may be service provider specific. An LBS is specified by all the necessary network elements and entities, their functionalities, interface, as well as communication messages to implement the positioning functionality in a cellular network.
Messaging Services	An interactive service which offers user-to-user communication between individual users via storage units with store-and-forward, mailbox and/or message handling functions (e.g. information editing, processing and conversion).
Mobility	The ability for the user or other mobile entities to communicate and access services irrespective of changes of the location or technical environment. The degree of service availability may depend on several factors including the Access Network capabilities, service level agreements between the user's home network and the visited network (if applicable), etc. Mobility includes the ability of telecommunication with or without service continuity.
Multimedia service	Multimedia services combine two or more media components (e.g. voice, audio, data, video, pictures) within one call. Services that handle several types of media (voice, audio, data, video, pictures) in a synchronised way from the user's point of view. A multimedia service may involve multiple parties, multiple connections, and the addition or deletion of resources and users within a single communication session.

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Operator	The organisation responsible for providing telecommunication services to users.
Outgoing call	A call originating from the dual-mode (Wi-Fi®/cellular) UE towards a fixed or mobile network or another dual-mode (Wi-Fi®/cellular) UE.
Presence	Presence provides the ability to collate and expose information relating to a user, the services subscribed to by that user, the device over which the service is delivered, and the network responsible for delivering the service. The Presence information may relate to one of four areas – the user, the service, the device delivering the service, and the network over which the service is delivered. The presence information is held within attributes that can be used individually by other services, or as a service within their own right.
Public hotspot	A zone of continuous public access to IP networks owned by one or multiple operators via Wi-Fi® APs.
Quality of Service (QoS)	The collective effect of service performance which determines the degree of satisfaction of a user for this service.
Roaming	The ability of the users to access services while outside their subscribed home network, i.e. by using an access point of a visited network. This is usually supported by a roaming agreement between the respective network operators.
Router	A functional block that determines the next network point to which a data packet should be forwarded en route to its destination.
Roving	The action of re-selection between cellular access technology and Wi-Fi® access technology for a dual-mode (Wi-Fi®/cellular) UE in an idle mode. Roving occurs without any manual action required by the user.
Seamless Handover	A special case of mobility with service continuity, when the provision of services is preserved without any perceived impact on current communications during movement.
Security	The ability to prevent fraud as well as the protection of information availability, integrity and confidentiality.
Service(s)	A component of the portfolio of choices offered by service providers to a user, a functionality offered to a user. A service is the user experience provided by one or more applications.
Service Continuity	The ability for a user to maintain an ongoing service during mobility.

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Stand-by Mode	State of a UE such that no IP-session or voice call is actually in progress, but the UE is accessible for session/call set-up (in either direction).
UICC	A physically secure device, an IC card (or smart card), that can be inserted and removed from the terminal equipment. It may contain one or more applications. One of the applications may be a USIM.
Universal Subscriber Identity Module (USIM)	An application residing on the UICC used for accessing telecommunications services, whereby the application is able to register on the network with the appropriate security.
User	The person or organisation responsible for concluding contracts for the services subscribed to and for paying for these services.
User Equipment	A device allowing a user access to network services.
Trusted	A service in which the user has the firm belief in the competence of an entity to act dependably, securely and reliably within the context of service provisioning and billing.
Wireless Fidelity (Wi-Fi®)	A wireless LAN technology based on IEEE 802.11 specifications. Wi-Fi® is a registered trademark of the Wi-Fi Alliance.
Wi-Fi® association	The setting-up of signalling and handshaking between a device and a Wi-Fi® AP, e.g. SSID, security association, channel allocation, data rates, capabilities.
Wi-Fi® SIP Service	SIP protocol based services via a Wi-Fi® access network.
Wi-Fi® Profile	The Wi-Fi® Profile is a set of service-related parameters that facilitates a Wi-Fi® device to associate and then access a Wi-Fi® network, e.g. the profile could contain details associated with AP SSIDs, locations, supported protocols, security options.
Wi-Fi® mode	The dual-mode (Wi-Fi®/cellular) UE has registered with a network using Wi-Fi® access.
Wi-Fi®-only mode	When the UE is in Wi-Fi®-only mode – the service can only be accessed when in Wi-Fi® coverage.
Wi-Fi®-preferred mode	The UE shall register to the SIP server when in Wi-Fi® coverage and SIP will be the default means of making outgoing connections. The operator will define whether the cellular radio interface remains simultaneously active or not in this mode.

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Acronyms

This document uses the following acronyms:

3GPP	Third Generation Partnership Project
AAC-LD	Advanced Audio Coding Low Delay
AGC	Automatic Gain Control
AJAX	Asynchronous Javascript and XML
AKA	Authentication and Key Agreement
AMR	Adaptive Multi-Rate
AP	Access Point
APDU	Application Protocol Data Unit
API	Application Programming Interface
AS	Application Server
AVC	Advanced Video Coding
BSF	Bootstrapping Server Function
CA	Certificate Authority
CE	Conformité Européenne
CIF	Common Intermediate Format
CLIP	Calling Line Identification Presentation
CSD	Circuit Switched Data
CTIA	Cellular Telecommunications and Internet Association
DHCP	Dynamic Host Configuration Protocol
DiffServ	Differentiated Service
DNS	Domain Name Server
DSCP	Differentiated Services Code Point
DTMF	Dual Tone Multi-Frequency
EAP	Extensible Authentication Protocol
EC	European Community
EDGE	Enhanced Data rates for GSM Evolution
EF	Elementary File
EMSK	Extended Master Session Key
ETSI	European Telecommunications Standards Institute
EVRC	Enhanced Variable Rate Codec
FMCA	Fixed-Mobile Convergence Alliance
GAA	Generic Authentication Algorithm
GBA	Generic Bootstrapping Architecture
GBA-ME	GBA Mobile Equipment
GBA-U	GBA UICC
GERAN	GSM EDGE Radio Access Network
GSM	Global System for Mobile Communications
HID	Human Interface Device
HSDPA	High-Speed Downlink Packet Access
HSP	High-Speed Protocol
HTTP	Hypertext Transfer Protocol

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HTTPS	Hypertext Transfer Protocol over Secure Sockets Layer
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICP	Identity Capable Platform
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IM	Instant Messaging
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPsec	Internet Protocol Security
ISIM	Internet Protocol Multimedia Services Identity Module
ISO	International Organization for Standardization
ITU-T	ITU Telecommunication Standardization Sector
JSR	Java Specification Request
LAES	Lawfully Authorised Electronic Surveillance
LAN	Local Area Network
LBS	Location-Based Service
MAC	Medium Access Control
MD5	Message Digest 5
MMS	Multimedia Messaging Service
MO	Management Objects (OMA)
MP3	Moving Picture Experts Group-1 Audio Layer 3
MPEG	Moving Picture Experts Group
MSK	Master Session Key
NAA	Network Access Application
NAF	Network Application Function
NAPT	Network Address Port Translation
NAT	Network Address Translation
NGN	Next Generation Network
OBEX	Object Exchange
OMA	Open Mobile Alliance
OMA CP	OMA Client Provisioning
OMA DM	OMA Device Management
OMA DS	OMA Device Synchronisation
OMA-SUPL	OMA Secure User Plane Location
OMTP	Open Mobile Terminal Platform
OS	Operating System
OTA	Over The Air
PAN	Personal Area Network
PBC	Push Button Configuration
PBX	Private Branch Exchange
PC	Personal Computer
P-CSCF	Proxy Call State Control Function
PDA	Personal Digital Assistant
PDG	Packet Data Gateway
PIM	Personal Information Manager
PIN	Personal Identification Number
PKCS	Public Key Cryptography Standards
PKI	Public Key Infrastructure

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Technical Handset Document

PMK	Pairwise Master Key
PSTN	Public Switched Telephone Network
QCIF	Quarter Common Intermediate Format
QoS	Quality of Service
RC4	Ron's Code 4
RF	Radio Frequency
RFC	Request For Comments
RMI	Remote Method Invocation
RSSI	Receive Signal Strength Indicator
SIM	Subscriber Information Module
SIMPLE	SIP for Instant Messaging and Leveraging Extensions
SIP	Session Initiation Protocol
SMS	Short Message Service
SSID	Service Set Identifier
SUPL	Secure User Plane for Location
SyncML	Synchronisation Markup Language
TEK	Temporary Encryption Key
TIA	Telecommunications Industry Association
TIS	Total Isotropic Sensitivity
TISPAN	Telecoms and Internet Converged Services and Protocols for Advanced Networks
TKIP	Temporal Key Integrity Protocol
TLS	Transport Layer Security
TRP	Total Radiated Power
TTLS	Tunnelled Transport Layer Security
TTY	Teletype
UE	User Equipment
UICC	Universal Integrated Circuit Chip
UMA	Unlicensed Mobile Access
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
USSD	Unstructured Supplementary Services Data
UTRAN	Universal Terrestrial Radio Access Network
VCC	Voice Call Continuity
VoIP	Voice over IP
WAP	Wireless Application Protocol
WB	Wideband
WEEE	Waste Electrical and Electronic Equipment
WEP	Wired Equivalent Privacy
WFA	Wi-Fi Alliance
Wi-Fi®	Wireless Fidelity (registered trademark of the Wi-Fi Alliance)
WMM®	Wi-Fi Multimedia™
WPA™	Wi-Fi Protected Access™
XDMS	XML Data Management Server
XDSL	x Digital Subscriber Line (any type)
XHTML	Extensible Hypertext Markup Language
XML	Extensible Markup Language

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Appendix I – Initial network selection at power-on

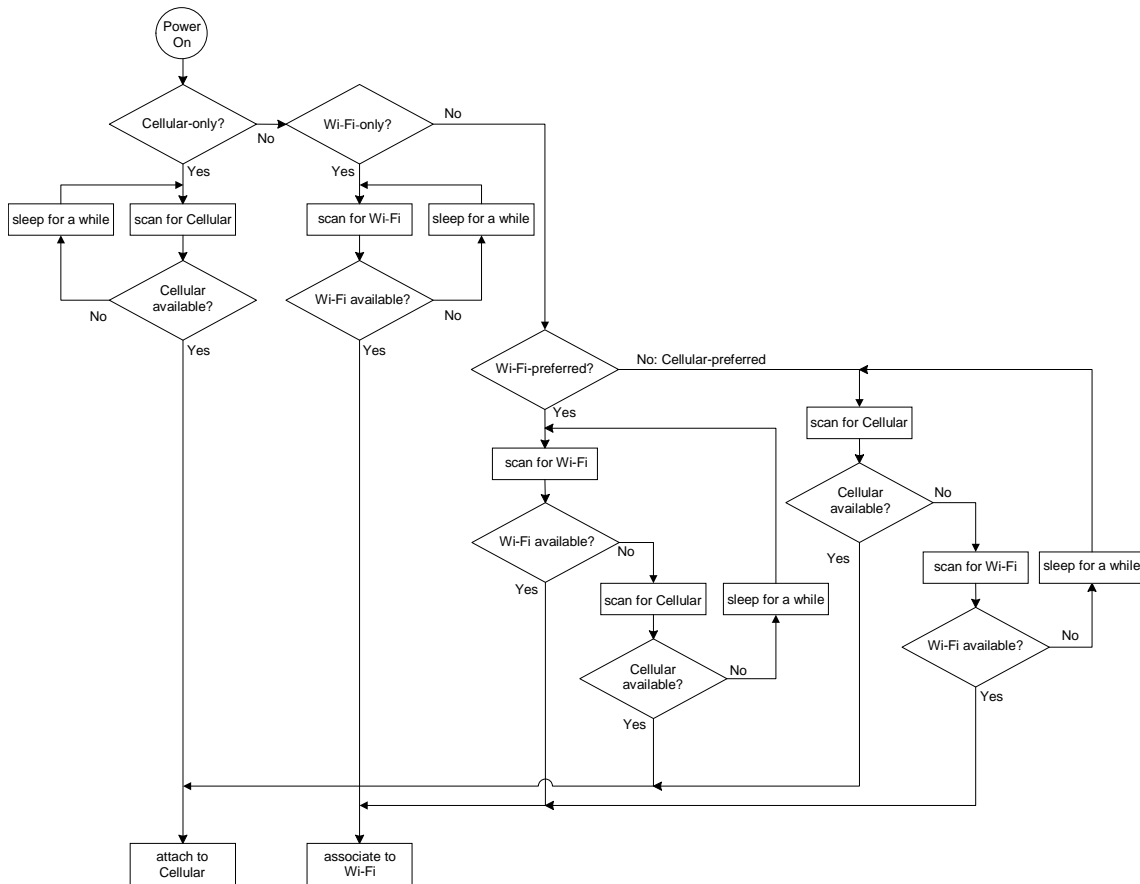


Figure 1: Initial network selection at power-on (note that the UE can only attach/associate to a single access technology at power-on. This figure has no intention to specify the technical details for the implementation of a network selection at power-on algorithm).

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Appendix II – Informative notes on usage of UICC applications (Section 5.3):

EAP-SIM, EAP-AKA and EAP-TLS on the UICC are used, where required by the access network, for mutual authentication and to establish EAP keys MSK and EMSK. MSK and EMSK are used by the ME in deriving EAP TEKs and in establishing WPA PMKs.

UMTS-AKA and GSM-SIM are used for access to mobile networks, including mutual authentication and the establishment of session keys. Furthermore, where required by an access network, these NAAs can be used by an EAP supplicant in the ME for EAP user authentication and the derivation of EAP keysets and WPA PMKs

EAP-MD5 supports weak user authentication. It would typically be tunnelled inside EAP-TTLS. EAP-TTLS is not included in the list of UICC NAAs, as it does not require UICC functionality in the current context of FMCA usage.

IMS-ISIM supports the IMS-AKA (also known as HTTP Digest AKA) process for authentication and key agreement for access to IMS. GBA-U can also be part of the ISIM application

GBA-U is not a freestanding application on the UICC; it can be a child of either the ISIM or the (Release 7 onwards) USIM. It leverages the pre-shared key and the AKA process of the parent NAA for mutual authentication and to generate session keys for accessing the Bootstrapping Server Function (BSF) and the Network Application Function (NAF). Furthermore, the NAF keys can also be used to establish a secure channel from UICC to ME and from UICC to an external server.

GBA-ME has the same purpose as GBA-U, but does not require any GBA functions on the UICC. The USIM or ISIM applications on the UICC are utilised by the GBA-ME client to provide the vectors for mutual authentication and from which the ME client derives the GBA keys.

HTTP Digest is not a freestanding NAA on the UICC; it is a function of the ISIM. It is a relatively weak user authentication method which would typically be tunnelled inside e.g. EAP-TTLS. (see note concerning EAP-MD5 above). It must not be confused with the much stronger HTTP Digest AKA, which is another name for IMS-AKA.

PKCS#7 and PKCS#15 functionality on the UICC support ME functions that require the storage of certificates on the UICC, e.g. EAP-TLS and EAP-TTLS. The latter does not currently require client certificates for FMCA usage but the UICC could be used to store root certificates and possibly to create and validate digital signatures.

END OF DOCUMENT

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