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Free FWA CPE Choice Specification Document

Description of the prerequisites for a Customer Premises Equipment (CPE) intended to establish a connection with the DIGI's RAN network.

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Abbreviations

CPE	Customer Premises Equipment
NSA/SA	Non-Standalone/Standalone
MIMO	Multiple input - Multiple output
DL/UL	Downlink/Uplink
FWA	Fixed Wireless Access
3GPP	3rd Generation Partnership Project
ETSI	European Telecommunications Standards Institute
4G/ LTE	Long Term Evolution
5G/NR	New Radio
APN	Access Point Name

Summary List of Technical Modem Requirements

R-1	The end user shall select a CPE using the same technology as used by DIGI for his line.
R-2	The end user CPE shall comply with the CE Certification (“Conformité Européenne”) under RED 2014/53/EU with proper test standards applied (ETSI/3GPP).
R-3	The end user CPE must comply with 3GPP Release 16 or later.
R-4	The CPE must be technically compliant with global 4G/5G standards.
R-5	The device should support automatic fallback from 5G to 4G.
R-6	Handling carrier aggregation is a must.
R-7	For 5G, both NSA and SA options should be supported.
R-8	Support of all bands used by DIGI network.
R-9	Correct handling of SIM profiles, provisioning, and authentication is essential. SIM Compatibility must be checked.
R-10	Software used must always be signed.
R-11	Secure firmware and remote management support is a must.
R-12	The FWA CPE must have at least 1× Gigabit Ethernet.
R-13	The device should support 802.11ax (Wi-Fi 6 / 6E), WPA3-Personal and Wi-Fi auto Optimization
R-14	APN configuration must match operator settings and support dual LTE/5G attach.
R-15	Is recommended to have a complete user documentation (EU languages).
R-16	An external antenna is nice to have.

1. Introduction

The present document is part of the DIGI technical specifications for its end users within the framework of the BIPT Decision of 26 September 2023 regarding the identification of the network termination point for broadband services. The information contained herein pertains to DIGI's network specifications and is intended exclusively for DIGI end users.

The purpose of this document is to provide insights into the current state of information and network specifications of CPEs that might be freely deployed by end users of DIGI.

Scope:

This document provides a simplified version of the DIGI CPE specification of third-party CPEs when connected to the DIGI network and a description of the main possible services.

It outlines the standards and the DIGI restrictions and specific points in the standards that must be adhered to by the third-party CPEs to ensure proper interoperability with the DIGI network.

Usage Considerations:

The information presented in this document is based on the current state of information and network specifications, subject to change. It is recommended to regularly check for updates and revisions.

The information presented in this document may be changed at any time and may break backward compatibility with previous versions.

The publication of a new version of this document renders all prior versions null and void, in accordance with any applicable delay periods.

Disclaimer: The specifications outlined in this document are provided on an "as-is" basis. While every effort has been made to ensure accuracy, DIGI shall not be liable for any direct, indirect, incidental, consequential, or special damages arising out of the use of this information.

2. Summary

The present document lists the requirements for a CPE that an end user may choose to use on the DIGI network to deliver his data services.

The document refers in first instance to state-of-the-art standards and details additional requirements to ensure the CPE operation on the DIGI network.

The document also provides information on DIGI's technical roles and responsibilities and its right to intervene to ensure the correct network operation for all end users.

3. Compliance with 3GPP and ETSI standards

Below is a clean, standards-focused checklist of the 3GPP and ETSI standards that a 4G-5G Fixed Wireless Access (FWA) CPE (home router) is expected to comply with in DIGI network.

3.1. 3GPP STANDARDS

3.1.1. Radio & RF (UE Requirements)

4G / LTE
TS 36.101 – LTE UE radio transmission & reception
TS 36.104 – BS reference (for RF behavior alignment)

5G / NR
TS 38.101-1 – NR UE RF (FR1 – sub-6 GHz)
TS 38.104 – NR BS reference

3.1.2. Protocol & Architecture

4G / LTE
TS 23.401 – LTE/EPC architecture
TS 24.301 – LTE NAS signaling

5G / NR
TS 23.501 – 5G system architecture
TS 23.502 – 5G procedures
TS 24.501 – 5G NAS signaling

3.1.3. Interworking & Mobility (Critical for FWA)

TS 23.402 – EPC interworking
TS 23.501 §4.9 – LTE–NR interworking
TS 38.300 – NR overall description
TS 37.340 – Multi-connectivity (EN-DC)

3.1.4. SIM / UICC

TS 31.101 / 31.102 – UICC interface
TS 31.121 – USIM

3.1.5. Security (Mandatory)

TS 33.401 – LTE security
TS 33.501 – 5G security architecture

3.1.6. Conformance & Testing

TS 36.521-1 / -3 – LTE RF & protocol conformance
TS 38.521-1 / -3 – NR RF & protocol conformance

3.2. ETSI STANDARDS (CE / RED – MANDATORY IN EU)

3.2.1. Radio (RED Article 3.2)

ETSI EN 301 908-1 – IMT common requirements
ETSI EN 301 908-13 – LTE (E-UTRA)
ETSI EN 301 908-25 – 5G NR

3.2.2. EMC (RED Article 3.1(b))

ETSI EN 301 489-1 – EMC common
ETSI EN 301 489-52 – LTE & 5G UE EMC

3.2.3. Safety (RED Article 3.1(a))

EN IEC 62368-1 – Electrical safety
EN 50360 / EN 50566 – SAR (human exposure)
EN 62311 – EMF assessment

3.2.4. Cybersecurity

ETSI TS 103 701 – Security for consumer devices

4. QoS STANDARDS & References

Layer	Standard
5G QoS model	3GPP TS 23.501 / 23.503
LTE QoS	3GPP TS 23.401
NAS QoS signaling	TS 24.301 / 24.501
Interworking	TS 23.402
Wi-Fi QoS	IEEE 802.11e / WMM
Management	TR-069 / TR-369

5. Technical Specifications

The following minimum requirements must be met.

5.1. LTE

Frequencies: B1/B20/B28/B3/B7/B8/B38/B42
Bandwidth:

- TDD: 20/10MHz
- FDD: 20/15/10/5MHz

3GPP DL Category6, UL Category6
4x4 MIMO: B1/3/7/38/42
2x2 MIMO: B8/B20/B28
DL/UL modulation: 256QAM DL, 64QAM UL
Carrier aggregation: 3*CC

5.2. NR

Frequencies: n1/n20/n28/n3/n38/n7/n78/n8
Bandwidth:

- TDD: 70/50/40/20MHz
- FDD: 20/15/10/5MHz

3GPP Release 16
Supports both NSA and SA modes
4x4 MIMO: B1/3/7/38/42
2x2 MIMO: B8/B20/B28
DL/UL modulation: 256QAM DL, 64QAM UL
Carrier aggregation: 3*CC
Dual Connectivity: Combination LTE/5G 1NR + LTE 3CA

5.3. Antenna Gain (5G/4G)

- 700~960MHz: 1~1.5dBi
- 1450~2700MHz: 2~2.5dBi
- 3300~4200MHz: 4dBi

An external antenna for outdoor installation is nice to have.

5.4. Wi-Fi Technology

- Wi-Fi6, 802.11b/g/n/a/ac/ax, 2.4G&5G
- MIMO: 5GHz 2MIMO, 2.4GHz 2MIMO
- Security mode: WPA-PSK/WPA2-PSK, WPA2- PSK/WPA3-PSK,WPA2-PSK

5.5. Certification

- CE, WEEE, ROHS, REACH, Wi-Fi

5.6. IP Networking & Routing

- IPv4/IPv6 dual stack (NDP IPv6)
- DHCP server
- VPN client: L2TP\PPTP\IPSec \GRE
- VPN pass-through (L2TP/PPTP/IPSec)
- NAT/NAPT
- Sip ALG

5.7. Firewall

- Port Forwarding
- Port Filtering
- Port Mapping
- Domain Filtering
- MAC address Filtering

5.8. Ports and Slots

The FWA CPE must have a SIM slot and at least 1× Gigabit Ethernet.

6. Operational Aspects

- The end user CPE shall not disturb the existing infrastructure during its installation, its switch-on procedure, and the configuration of the end user services.
- The end user CPE shall implement state-of-the art security rules.
- The CPE Serial Number format shall be hard-coded.
- Any possibility to change or overwrite the Serial Number (e.g. via GUI or other) shall be restricted.

7. DIGI and End User's Roles & Responsibilities

7.1. DIGI Roles and Responsibilities

- DIGI regularly adapts its network by introducing new hardware and software and shall not be responsible of any service degradation following this network evolution.
- DIGI has the right to disconnect any CPE that is not compliant to the present specification.
- DIGI shall disconnect any CPE that would disturb the correct operation of the network. The disturbances could be for example generating abnormal numerous alarms, disturbing the monitoring system, or causing security incidents.
- DIGI will inform the end user in case it deems it necessary to disconnect the CPE.
- On demand of the end user, DIGI shall reconnect a CPE that was disturbing the network if the hardware or software root-cause has been eliminated by the end user.

7.2. End User Roles and Responsibilities

- The end user shall be the sole responsible for selecting its CPE hardware and software compliant to the present specification.
- The end user shall be the sole responsible for upgrading the software of its CPE.
- The end user shall only use software approved by the CPE manufacturer and shall not modify it by any mean.
- The end user shall comply with the instructions that DIGI may issue from time to time to ensure the security and correct operation of the DIGI network and of any other infrastructure used in any other manner by DIGI.