Building the Internet of Things

Sierra Wireless Device requirements

Version 4.0

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1. Introduction

This document contains the device requirements for users of the Sierra Wireless Connectivity Services. Depending on the features and services being used, not all requirements are mandatory.

Devices are not considered "compliant" until a formal "approval notice" has been received by the applicant.

Devices that do not meet requirements tagged as 'optional' in this document can still be considered compliant.

2. Regulatory and Industry Approvals

2.1   Regulatory requirements

Devices must meet all the regulatory requirements applicable to the country/region targeted for the deployment (e.g. FCC for United States, IC for Canada, CE for EU, RCM for Australia, etc..).

Proofs of regulatory compliance shall be provided as a pre-requisite.

2.2   Industry Requirements

Devices must meet all applicable 3GPP requirements and proofs of the relevant Industry approval (PTCRB for deployments in Americas and GCF for deployments in EMEA/APAC) shall be provided as a pre-requisite.

3. Bands

3.1 Americas

Recommended RF bands to be supported in device to ensure best coverage

3.1.1 North America

For Cat 1+ Devices:

- Minimum requirement: 2,4,12
- Preferred:2,4,5,12,13, 14, 66, 71

For LPWA devices:

- Minimum requirement: 2, 4, 12
- Preferred: 2, 4, 12, 13, 71, 85

3.1.2 South America

- TBD

3.2 EMEA

For Cat 1+ Devices:

- Minimum requirement: 3,8,20
- Preferred:1,3,7,8,20,28

For LPWA devices:

- Minimum requirement: 1, 3, 8, 20
- Preferred: 1, 3, 8, 20, 28

3.3 APAC

3.3.1 Australia/New Zealand

- TBD

3.3.2 **Japan**

- TBD

3.3.3 **Korea**

- TBD

4. Network Selection

Devices **SHALL NOT** interfere or interact with the Network Selection algorithms in the Cellular Chipset/Module Stack.

Interferring or manually selecting networks or bands can have a significant detrimental affect on the service.

5. SIM Card

Devices MUST support the following commands that are defined by the ETSI TS 102 223 [3] release 6 document:

5.1 Envelope Events

5.1.1 ENVELOPE (EVENT DOWNLOAD - Location Status)

5.1.2 ENVELOPE (SMS-PP DOWNLOAD)

5.1.3 ENVELOPE (Timer Expiration)

5.1.4 ENVELOPE (EVENT DOWNLOAD - Call Connected)

5.1.5 ENVELOPE (EVENT DOWNLOAD - Call Disconnected)

5.2 List of used Proactive Toolkit Commands

Proactive commands sent from the SIM Card to the Terminal.

The structure of Proactive commands is described by the ETSI TS 102 223 [3] release 6 document and the coding of the command details data object is specified in section 8.6.

5.2.1 Set Up Event List

The Proactive command SET-UP-EVENT-LIST is defined in section 6.6.16 with command details set to '8103010500'.

The Event list data object contains the following values:

- Call Connected   = '01'
- Call Disconnected   = '02'
- Location Status   = '03'
- Data available   = '09'
- Channel status   = '0A'

5.2.2 Refresh

The Proactive command REFRESH is defined in section 6.6.13 with command details set to '81030101mm' where 'mm' represents the refresh mode.

The Applet uses the following modes of refresh (byte mm):

- 02: NAA Initialization and File Change Notification for the access technology GERAN (2G).
- 06: NAA Session Reset for access technologies UTRAN (PS / 3G) and EUTRAN (4G).
- 04: UICC Reset otherwise.

5.2.3 Timer Management

The Proactive command TIMER-MANAGEMENT is defined in section 6.6.21 with command details set to '81030127cc' where 'cc' represents the command type.

The Applet uses the following types of command (byte cc):

- 00: Start Timer
- 01: Stop Timer

The 'Timer Identifier' data object is set to 'A40101' (identifier = 1).

The 'Timer Value' data object is set to '001000' (value = 1 minute).

5.2.4 Send USSD

The Proactive command SEND-USSD is defined by the ETSI TS 131 111 [56] release 6 document, section 6.6.11, with command details set to '8103011200'.

The USSD string is coded as described in the section 8.17.

5.3 List of SIM Elementary Files expected to be updated by the Terminal

If the Terminal uses the SIM file system, it is required to update the following Elementary Files:

- MF/GSM/LOCI (when registered for CS services)
- MF/GSM/LOCIGPRS (when registered for PS services)

If the terminal uses the USIM file system, it is required to update the following Elementary Files:

- USIM/LOCI (when registered for CS services)
- USIM/PSLOCI (when 2G/3G Terminal is registered for PS services)
- USIM/EPSLOCI, if present (when 4G Terminal is registered for EPS services)

Updates of the SIM EF shall be done according related clauses of the specification 3GPP 24.008 and 23.122

5.4 List of Terminal Profile facilities checked by the Applet

The SIM Applet checks that the following SIM Card Application Toolkit are supported by the Terminal:

- Proactive UICC command REFRESH
- Proactive UICC command SEND-USSD

5.5 List of AT commands expected to be supported by device

The Device shall support from the [35] the following commands for all generic purposes:

- AT+CRSM (Restricted SIM access)
- AT+CSIM

6. eSIM (eUICC)

6.1 Functional Device Requirements

Functional Device Requirements No.	Requirement

DEV1	For connectivity the Device shall support:
	• At least one of the network access technologies defined by 3GPP in the non-exhaustive following list:
	   o GERAN,
	   o UTRAN
	   o E-UTRAN.
	• UDP over IP [32] (subject to the right support of access network technology)
	• TCP over IP [33] (subject to the right support of access network technology)
	• Non-IP Data?

DEV2	For Network connection control the Device shall support: • RPLMN details (LAC/TAC, NMR). • QoS (failures, duration, power, location). • SMS management. • New network selection after SIM/USIM update.
DEV3	For reporting to a server the Device shall support: • SMS-PP MO as defined in [3] and SMS-PP MO as defined [33] or [29] BIP as defined in DEV4 The Device should support: • USSD

DEV4	For Profile and Platform Management the Device shall support:
	• SMS-PP MT as defined in [3], and SMS-PP MT as defined [33] or [29]
	• BIP (subject to the support of the right network access technology) as defined in [3] including support of commands:
	   o OPEN CHANNEL (UPD and TCP over IP)
	   o CLOSE CHANNEL
	   o RECEIVE DATA
	   o SEND DATA
	   o GET CHANNEL STATUS
	   o ENVELOPE (EVENT DOWNLOAD - Data available)
	   o ENVELOPE (EVENT DOWNLOAD – Channel status)

DEV5	The Device shall contain a unique IMEI (International Mobile Equipment Identity) value compliant with the format defined in ETSI TS 123 003 [31]. The value of IMEI shall be directly copied from TERMINAL RESPONSE of the Provide Local Information command (see ETSI TS 102 223 [3] and ETSI TS 124 008[20]).

DEV6	• The Device shall support, as a minimum, the following set of commands (in addition to BIP commands) as defined in ETSI TS 102 223 [3] and 3GPP TS 31.111 [27]. Basic SAT commands (TERMINAL PROFILE, FETCH, TERMINAL RESPONSE) • PROVIDE LOCAL INFORMATION (location information, IMEI, NMR, date and time, access technology, at least) • SEND SHORT MESSAGE • POLL INTERVAL, POLLING OFF, TIMER MANAGEMENT [at least one timer], ENVELOPE (TIMER EXPIRATION) • SET UP EVENT LIST and ENVELOPE (EVENT DOWNLOAD – location status, call connected, call disconnected, Access Technology Changed, Network Rejection) • ENVELOPE (SMS-PP DOWNLOAD) • REFRESH Command (At least mode 4 - "UICC reset")
DEV7	The Device shall comply with the GSMA-EICTA document "Security Principles Related to Handset Theft" [30]
DEV8	The Device may retrieve the EID (defined in section 2.2.2 of references document [57]) from the eUICC and shall support the following commands as described in [35]: • AT+CCHO (Open Logical Channel) • AT+CCHC (Close Logical Channel) • AT+CGLA (Generic UICC Logical Channel Access)
DEV9	The Device shall support from the [35] the following commands for all generic purposes: • AT+CRSM (Restricted SIM access)

7. Firmware and application logic

The device firmware and the application logic on the customer device are not allowed to modify any files on the SIM or the eSIM except from those explicitly mentioned as allowed in this document. It is not allowed to modify or control the network selection process, this is handled by the provided SIM applet.

The device must be set to "automatic" network selection mode. And auto-GPRS attachment mode must be enabled for data failure prevention functionality when using the Advanced SIM.

8. Device Aggression Management

Devices should not be aggressive and cause excessive signaling to the network.

It is recommended that devices follow the GSMA's TS.34 IoT Connection Efficiency Guidelines:

https://www.gsma.com/newsroom/resources/ts-34-iot-device-connection-efficiency-guidelines/ Test cases to validate compliance are located in GSMA's TS.35 IoT Device Connection Efficiency Test Book:

https://www.gsma.com/newsroom/resources/ts-35-iot-device-connection-efficiency-test-book-version/

Compliance towards GSMA's TS.34 can be established as part of the Industry certification on the device (refer to section 2.2 for Industry requirements applicable to the device) whereby validated.

9. Voice / VoLTE

Devices that support VoLTE must pass 3GPP GCF or PTCRB voice test cases including roaming.

This requirement can be waived if the device is using a pre-certified module that has received this certification.

It is recommended that devices still perform a field test with multiple MNOs to confirm satisfactory operation.

10. RF Performance Requirements

10.1 RF Performances (3GPP Requirements)

Devices shall comply with Industry requirements set forth in Section 2.2 of this document which covers compliance to 3GPP RF conformance specifications:

- 3GPP TS 51.010-1 for devices supporting 2G
- 3GPP TS 34.121-1 for devices supporting WCDMA
- 3GPP TS 36.521-1 for devices supporting E-UTRA
- 3GPP TS 38.521-1 for devices supporting 5G

The applicability of tests is defined as part of the GCF-CC and NAPRD.03 rules.

10.2 OTA Performances

10.2.1 Test Requirements

The device manufacturer shall conduct measurements of Total Radiated Power (TRP) and Total Isotropic Sensitivity (TIS) for all supported bands and RATs.

Those tests are part of the Industry requirements for end-devices in both GCF and PTCRB,

Measurements shall be conducted using test methods defined in any of the below standards:

Organisation	Reference Specification
3GPP	TR 25914: Measurements of radio performances for UMTS terminals in speech mode
3GPP	TS 37.544 User Equipment (UE) Over The Air (OTA) performance; Conformance testing
CTIA	Test Plan for Wireless Device Over the-Air Performance

In case a band is referenced in both 3GPP and CTIA standards, the test method used is at the discretion of the device manufacturer.

The test configuration used for the measurements depends on the device type

- If the device supports voice against the head, the device shall use "Beside Head" (Left or Right) configuration
- In any other cases, measurements shall be performed with a "Free Space" configuration

10.2.2 Results presentation and Indicative Acceptance criteria

Sierra does not currently have predefined OTA requirements but we advise manufacturer to refer to existing acceptance criteria from 3GPP (TS 34.114), CTIA (Test Plan for Wireless Device Over the-Air Performance) or GSMA (TS.24 for Legacy technologies and TS.51 for LPWA technologies).

Test results shall be provided with numerical values against the applicable standards requirements:

- 3GPP: the measurements provided must cover the "average" and "minimum" value for each band tested
- CTIA: the measurements provided must done again low-, mid- and high-channel for each band tested

The format for results presentation shall be as below:

Radio Access Technology (e.g 2G, 3G, 4G,…)	Operating Band (use the 3GPP format)	Specification / configuration (e.g. 3GPP/BHR or CTIA/FS…)	Total Radiated Power (e.g. CTIA: Low / Mid / High or 3GPP: Average / Min)	Total Isotropic Sensitivity (e.g. CTIA: Low / Mid / High or 3GPP: Average / Min)

Failures to meet the acceptance criteria defined in the standards above will not prevent the device from being approved for Sierra Wireless Connectivity services. However, it may warrant a conditional approval requiring the manufacturer to improve the measurements over a pre-defined period of time.

11. 5G NR

To Be Documented in a future revision

12. References

References Ref	Document Number	Title
[3]	ETSI TS 102 223	Smart Cards; Card Application Toolkit (CAT) ; Release 6
[20]	ETSI TS 124 008	Mobile radio interface Layer 3 specification; Core network protocols; Release 9
[27]	3GPP TS 31.111	Universal Subscriber Identity Module (USIM) Application Toolkit (USAT) ; Release 9
[29]	3GPP TS 24.341	Support of SMS over IP networks; Release 9
[30]	GSMA Security Principles Related to Handset Theft	GSMA Doc Reference: Security Principles Related to Handset Theft 3.0.0 EICTA CCIG Doc Reference: EICTA Doc: 04cc100
[31]	ETSI TS 123 003	Universal Mobile Telecommunications System (UMTS); Numbering, addressing and identification; Release 9
[32]	RFC 768	User Datagram Protocol, Aug 1980.
[33]	RFC 793	Transmission Control Protocol, DARPA Internet Program, Protocol specification, Sept 1981.
[35]	3GPP TS 27.007	Technical Specification Group Core Network and Terminals; AT command set for User Equipment (UE) ; Release 9
[56]	ETSI TS 131 111	Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)
[57]	SGP.02 - Remote Provisioning Architecture for Embedded UICC Technical Specification	GSMA Remote Provisioning Architecture for Embedded UICC Technical Specification Version 3.1