

Author:	Sierra Wireless				Date:	June 11, 2020			
APN Content Level	BASIC	INTERMEDIATE	✓	ADVANCED	Confidentiality	Public	✓	Private	
Hardware Compatibility	Product Line	AirPrime	Series	HL7xxx	MC7xxx				
				WP7xxx	EM7xxx				
				RC7xxx					
Software Compatibility	ALL			Document Type	Application Note	Technical Note	✓		

## 1 Version

These documents may be updated over their lifetime. To ensure you design with the correct version, please check The Source page on [www.sierrawireless.com](http://www.sierrawireless.com) for latest versions.

## 2 Introduction

This document is provided to Sierra Wireless distributors and clients to aid more rapid development of embedded applications using the Sierra Wireless portfolio of cellular solutions. This document outlines the necessary details to meet GSMA Device Connection Efficiency requirements.

A series of lab conformance tests must be performed by the Host device, to validate that the Device Connection Efficiency requirements are being met. The requirements and tests outlined in this document apply to all Host devices that operate on any cellular carrier utilizing GSMA test cases:

- Cat 1+ and Cat-M1/NB-IoT Host Devices based on a carrier approved embedded module
- Cat 1+ and Cat-M1/NB-IoT Host Devices based on a carrier approved embedded modem
- Cat 1+ and Cat-M1/NB-IoT Host Devices based on a carrier approved cellular chipset

These requirements are in line with the GSMA TS.34 guidelines. The subset of the GSMA TS.35 test book is used to validate these requirements. A particular MNO GSMA test plan might contain a subset of test cases that need to be executed for the MNO's compliance.

## 3 Glossary

Term/Initials	Definition
GSMA	Global System for Mobile Communications Association
IoT Host Device	OEM device based on the embedded cellular module, modem, or cellular chipset
MNO	Mobile Network Operator
IoT Device Application	The application software component of the IoT Device that controls the cellular module and interacts with an IoT Service Platform via the cellular module

## 4 Description

RF connection attempts, both mobile originated and mobile terminated, should not be excessive. Applications should be optimized to reduce the number of network access attempts. The number of connection attempts needs to be restricted and should follow Data Retry back-off intervals. In the event of a network or server outage, devices within the same cell sector should register with the network in a staggered manner. This requirement document aims to limit the number of connection attempts from the device to the network. The implementation details are left up to the Host device vendor.

Previously, some Host applications relied on a keep-alive transmission to the network and used it as an application's heartbeat. Such technique should be avoided and will be counted as network connection attempts which could result in violation of the Device Connection Efficiency requirements.

## 5 GSMA Device Connection Efficiency Requirements

### 5.1 REQ\_1

The IoT Device Applications should always be prepared to handle situations when the communication requests fail. Communication retry mechanisms implemented within an IoT Device Application can vary and will depend on the importance and volume of downloaded/uploaded data. Depending upon the IoT Service, no communication request by the IoT Device Application should ever be retried indefinitely – the request should eventually timeout and be abandoned.

When provisioned devices experience connectivity issues, the applications should retry network access using Data Retry back-off intervals. Initially the retries are more frequent, but over time the frequency of the retries should be reduced.

Below is the example of application retry back-off. This should be used as a recommendation, and not an absolute requirement. Refer to the specific MNO requirements for the specific back-off interval requirements:

- Two immediate connection attempts, followed by
- One attempt after 1 minute
- One attempt after 2 minutes
- One attempt after 8 minutes

This requirement describes the functionality that ensures a proper retry mechanism implementation within the IoT Device Application, and which does not prevent the normal operation of the cellular network or Host device.

As such, it is required for the IoT Device Application to monitor the number of failed network connection attempts within a certain period. In case the data connection is lost more than **N** times within an hour, the connection requests should be suspended, and then tried infrequently.

---

*Note: The application retry intervals above are separate from any modem retries that may be occurring as per Mobile Network Operator LTE Data Retry requirements.*

---

#### 5.1.1 Recommended Implementation Algorithm

The customer application must limit the call numbers with a back off timer as suggested in the below example:

```
set backoff_timer value [0, 0, 1, 2, 8]
Attempt# = 0
Loop:
  Make data session;
  If fail Then
    execute backoff timer using value[Attempt#]
    Attempt# = Attempt# + 1
    If Attempt# > 5 Then
      Attempt# = 0
  Else
    get out of the loop
```

---

*Note: Refer to the specific MNO requirements for the specific back-off interval requirements.*

---

### 5.2 REQ\_2

In the case the Host device needs to send data very frequently, the IoT Device Application should either use an “always-on” connectivity mechanism, or to aggregate multiple connection attempts into the one attempt. A frequent network connection activation and deactivation should be avoided.

### 5.3 REQ\_3

The host device shall adhere to not more than 30 retries per hour when requesting the network resources. This includes all attempts to reach an IoT server, modem connection retries and the application-initiated connection attempts. This usually may translate to the number of RRC Connections being requested by the device and may be a combination of connections requested by multiple applications and due to the data retries from the modem itself.

## 6 GSMA Device Connection Efficiency Application Test

- **TS35\_5.1\_TC\_001** Basic RRC and data connection establishment / release, ensuring connection request are not excessive [VZ\_TC\_GSMA\_8703641]
- **2TS35\_5.1\_TC\_008d** Failure scenario (wrong APN) [VZ\_TC\_GSMA\_8703642]
- **TS35\_5.1\_TC\_008g** Failure scenario (IoT server not reachable) [VZ\_TC\_GSMA\_8703643]
- **TS35\_5.1\_TC\_008h** Failure scenario (SMSC not reachable) [VZ\_TC\_GSMA\_8703651]

## 7 Reference Documents

	Filename	Comment
[1]	GSMA TS.34 IoT Device Connection Efficiency Guidelines	
[2]	GSMA TS.35 IoT Device Connection Efficiency Test Book	

## 8 Support

For direct clients: contact your Sierra Wireless FAE

For distributor clients: contact your distributor FAE

For distributors: contact your Sierra Wireless FAE

## 9 Document History

Level	Date	History
1.0	June 11, 2020	Creation

## 10 Legal Notice

### Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

### Safety and Hazards

Do not operate the Sierra Wireless modem in areas where cellular modems are not advised without proper device certifications. These areas include environments where cellular radio can interfere such as explosive atmospheres, medical equipment, or any other equipment which may be susceptible to any form of radio interference. The Sierra Wireless modem can transmit signals that could interfere with this equipment. Do not operate the Sierra Wireless modem in any aircraft, whether the aircraft is on the ground or in flight. In aircraft, the Sierra Wireless modem **MUST BE POWERED OFF**. When operating, the Sierra Wireless modem can transmit signals that could interfere with various onboard systems.

*Note: Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. Sierra Wireless modems may be used at this time.*

The driver or operator of any vehicle should not operate the Sierra Wireless modem while in control of a vehicle. Doing so will detract from the driver or operator's control and operation of that vehicle. In some states and provinces, operating such communications devices while in control of a vehicle is an offence.

### Limitations of Liability

This manual is provided "as is". Sierra Wireless makes no warranties of any kind, either expressed or implied, including any implied warranties of merchantability, fitness for a particular purpose, or noninfringement. The recipient of the manual shall endorse all risks arising from its use.

The information in this manual is subject to change without notice and does not represent a commitment on the part of Sierra Wireless. SIERRA WIRELESS AND ITS AFFILIATES SPECIFICALLY DISCLAIM LIABILITY FOR ANY AND ALL DIRECT, INDIRECT, SPECIAL, GENERAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR REVENUE OR



ANTICIPATED PROFITS OR REVENUE ARISING OUT OF THE USE OR INABILITY TO USE ANY SIERRA WIRELESS PRODUCT, EVEN IF SIERRA WIRELESS AND/OR ITS AFFILIATES HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR THEY ARE FORESEEABLE OR FOR CLAIMS BY ANY THIRD PARTY.

Notwithstanding the foregoing, in no event shall Sierra Wireless and/or its affiliates aggregate liability arising under or in connection with the Sierra Wireless product, regardless of the number of events, occurrences, or claims giving rise to liability, be in excess of the price paid by the purchaser for the Sierra Wireless product.

**Patents**

This product may contain technology developed by or for Sierra Wireless Inc.

This product includes technology licensed from QUALCOMM®.

This product is manufactured or sold by Sierra Wireless Inc. or its affiliates under one or more patents licensed from InterDigital Group and MMP Portfolio Licensing.

**Copyright**

© 2016 Sierra Wireless. All rights reserved.

**Trademarks**

Sierra Wireless®, AirPrime®, AirLink®, AirVantage®, WISMO®, ALEOS® and the Sierra Wireless and Open AT logos are registered trademarks of Sierra Wireless, Inc. or one of its subsidiaries.

Watcher® is a registered trademark of Netgear, Inc., used under license.

Windows® and Windows Vista® are registered trademarks of Microsoft Corporation.

Macintosh® and Mac OS X® are registered trademarks of Apple Inc., registered in the U.S. and other countries.

QUALCOMM® is a registered trademark of QUALCOMM Incorporated. Used under license.

Other trademarks are the property of their respective owners.