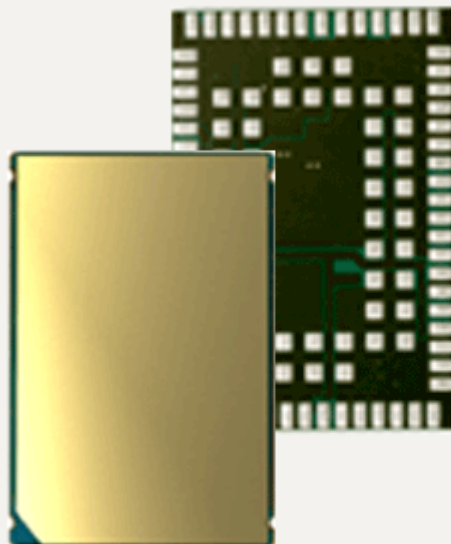# Over-the-Air Firmware Update

Application Note 17

Version: 01
DocId: EMS31x_AN17_FOTA_v01

Application Note 17:	**Over-the-Air Firmware Update**
Version:	**01**
Date:	**2018-02-13**
DocId:	**EMS31x_AN17_FOTA_v01**
Status:	**Confidential / Released**
Supported Products:	See Section 1.1

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Contents

0 Document History

New document: AN17: "Over-the-Air Firmware Update", Version 01

Chapter	What is new
--	Initial document setup.

1   Introduction

This Application Note[1] describes how to update a module's firmware over the air (so-called FOTA), i.e., via a wireless connection to an external FOTA server providing the firmware.

1.1   Supported Products

This Application Note applies to the following Gemalto M2M Cinterion® modules:
- Cinterion® EMS31-US
- Cinterion® EMS31-V

1.2   Related Documents

[1]   Hardware Interface Description for your Gemalto M2M product
[2]   AT Command Set for your Gemalto M2M product
[3]   Application Note 16: Upgrading Firmware

To visit the Gemalto M2M website you can use the following link:
http://m2m.gemalto.com

1.3   Abbreviations

Table 1: Abbreviations

Abbreviation	Description
FFS	Flash File System
FOTA	Firmware update over-the-air
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
FTP	File Transfer Protocol
FTPS	File Transfer Protocol Secure
PDP	Packet Data Protocol

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[1] The document is effective only if listed in the appropriate Release Notes as part of the technical documentation delivered with your Gemalto M2M product.

1.4　General Requirements and Precautions

- The firmware download over-the-air is only intended to install the same or a new firmware version. Installation of an older firmware version may lead to the module no longer being operational.
- Take every precaution to avoid disruption of the firmware download. Do not bend, stress or remove any cable. In case of update failure, the module should start the upgrade procedure automatically after reboot using already store update image.
- Two of the upgrading regions (SW Updater and File System) are not failsafe. In case of update failure, when FOTA is in finalizing state after reset, module may go into recovery mode waiting for update over the serial using gWinSwup tool. For more information see [3].
- For the download to be properly completed power saving must be switched off. Please take care that the module is set to AT+CFUN=1 before launching the firmware download.
- External application has to be able to determine if upgrade should be triggered and retrieve URL of firmware with any possible method like SMS or Internet Service: Socket, HTTP etc. FOTA service itself is not able to verify if new firmware is available and trigger update.

1.5　User Defined Settings

The download procedure has no impact on user defined parameters. All non-volatile user settings will be preserved.

2　Basic Concept

Over-the-air firmware update (FOTA) allows to update the module's firmware by downloading the new firmware to the module's flash file system and then replacing the previous software.

An over-the-air firmware download includes the following steps:
- Set up the internet connection
- Start FOTA download and update procedure
- Validate the update and restore normal operation

The basic update steps listed above are described in more detail in Chapter 3. The steps can be handled by means of AT commands from an external application.

2.1　Prerequisites

Prerequisites for FOTA are
- A server where the update files may be downloaded from, for example via http(s), ftp(s). Please note, that server is not provided by Gemalto.

3 FOTA Application Sample

This chapter gives a FOTA application sample, thereby explaining the basic steps as outlined in Chapter 2 in somewhat more detail.

Internet connection setup

In order to prepare for firmware download from web server PDP context has to be available or defined via AT+CGDCONT and activated via AT+CGACT commands.

```
AT+CFUN=1                              // Module is set to full functionality level.

OK
AT+COPS?                               // Check that UE is registered to network.
+CPOS: 0, 0, "Verizon Wireless" 7

OK


AT+CGACT=1,3                           // Activate PDP context for Internet.
OK
```

Start FOTA download and update procedure

To download a firmware package from the web server to the module's flash file system (FFS), the AT^SFDOA command can be used. This command connects to the web server at given URL and downloads new firmware. After download is finished the module will reboot to upgrade flash. During first boot the module verifies the upgrade firmware integrity and installs it. When upgrade is finished the module reboots and starts with latest firmware. For more details about AT^SINFO command please see [2].

```
AT^SFDOA="http://10. 0. 3. 224/firmware", 1, 1, 0    // Start FOTA download.

^SFDOA: "downloading", 0               // Firmware download progress (percentage)
^SFDOA: "downloading", 1
^SFDOA: "downloading", 2
^SFDOA: "downloading", 3
...                                    // Intermediate progress cut to shorten log
^SFDOA: "downloading", 98
^SFDOA: "downloading", 99
^SFDOA: "downloading", 100
^SFDOA: "updating"                     //Indication of firmware updating

^SYSSTART                              // Module starts with upgraded firmware.
```

Verify installed firmware

In order to verify if the firmware version is updated use ATI1 command, because there is a possibility that the upgrade failed and the module started with the old firmware version.

```
ATI1                              // Query current firmware version
                                  // and check for firmware update.

Cinterion
EMS31-V
REVISION 5.1.0.0c
A-REVISION 01.000.00              // Check if the firmware is upgraded to the latest
                                  version.

OK
```

3.1   FOTA and Internet Connection

FOTA, as a network related functionality, requires a working Internet connection.

The Internet connection has to be explicitly activated by the external FOTA application. If not activated, the AT^SFDOA command will report an error.

The FOTA application can only use connection context ID designed for Internet services. By default, for Verizon networks 3rd PDP context is defined as Internet context and should be activated via AT+CGACT=1, 3 or AT^SICA=1, 3.

3.2   Troubleshooting

Module does not upgrade the firmware after reset

In case the module does not upgrade firmware after reset and does not display the new firmware, please contact your supplier immediately.

After upgrade procedure module did not display ^SYSSTART URC and does not respond to any AT command at any baudrate

Please check if correct baudrate is selected. Try the latest used baudrate, as well as 115200bps and 921600bps. In case module does not respond to any AT command at different baudrates, then firmware upgrade most probably failed and the module is now running in RECOVERY MODE. If this is the case, proceed with upgrade using gWinSwup. For more information about gWinSwup upgrade procedure please see [3].

About Gemalto

Since 1996, Gemalto has been pioneering groundbreaking M2M and IoT products that keep our customers on the leading edge of innovation.

We work closely with global mobile network operators to ensure that Cinterion® modules evolve in sync with wireless networks, providing a seamless migration path to protect your IoT technology investment.

Cinterion products integrate seamlessly with Gemalto identity modules, security solutions and licensing and monetization solutions, to streamline development timelines and provide cost efficiencies that improve the bottom line.

As an experienced software provider, we help customers manage connectivity, security and quality of service for the long lifecycle of IoT solutions.

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