xE910 – WE866 Bundling Application Note

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TELIT
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DOCUMENTATION

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The AZ C project integrates the lwIP stack. lwIP is a small independent implementation of the TCP/IP protocol suite that has been initially developed by Adam Dunkels. lwIP is licenced under the BSD licence:

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APPLICABILITY TABLE

PRODUCTS

- UE910 SERIES
- HE910 SERIES
- LE910 V2 SERIES
- WE866

SW Version

AZWE866_00.03

CONTENTS

1. INTRODUCTION

1.1. Scope

This document gives an overview of xE910 in bundle with WE866 It explains how to connect a xE910 module + WE866 Short range module

1.2. Audience

This document is intended only for Telit customers that wants to set up a bundling application between xE910 + WE866.

1.3. Contact Information, Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com

Alternatively, use:

http://www.telit.com/support

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

http://www.telit.com

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

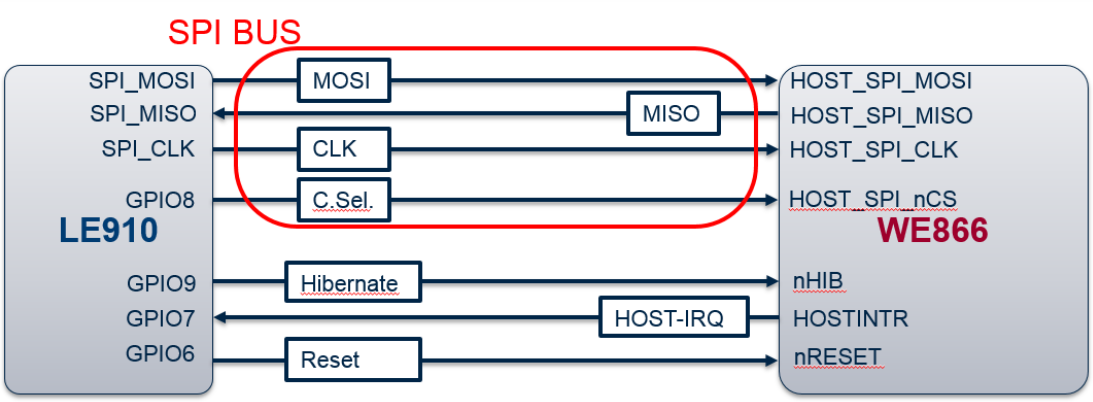
1.5. Related Documents

- Telit AppZone C User Guide, 80496ST10722A
- Telit EVK2 User Guide, 1VV0300704 Rev. 19
- WE866 Hardware user guide
- Telit USB Driver Installer User Guide, 1V0301164 Rev. 7

2. BUNDLE OVERVIEW

2.1. Overview

Telit Bundle solution integrates Cellular and WiFi technologies, allowing customers to manage both of them through a single module, with a single communication port and a single communication protocol.



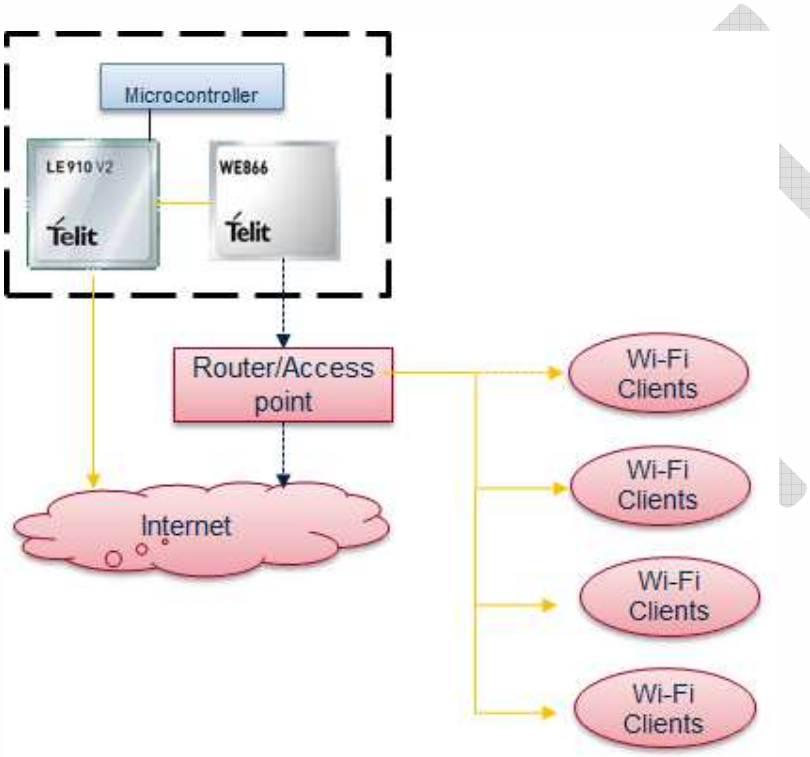
Telit WE866 Bundle will make the connection between Cellular and WiFi easy.

3. SW ARCHITECTURE

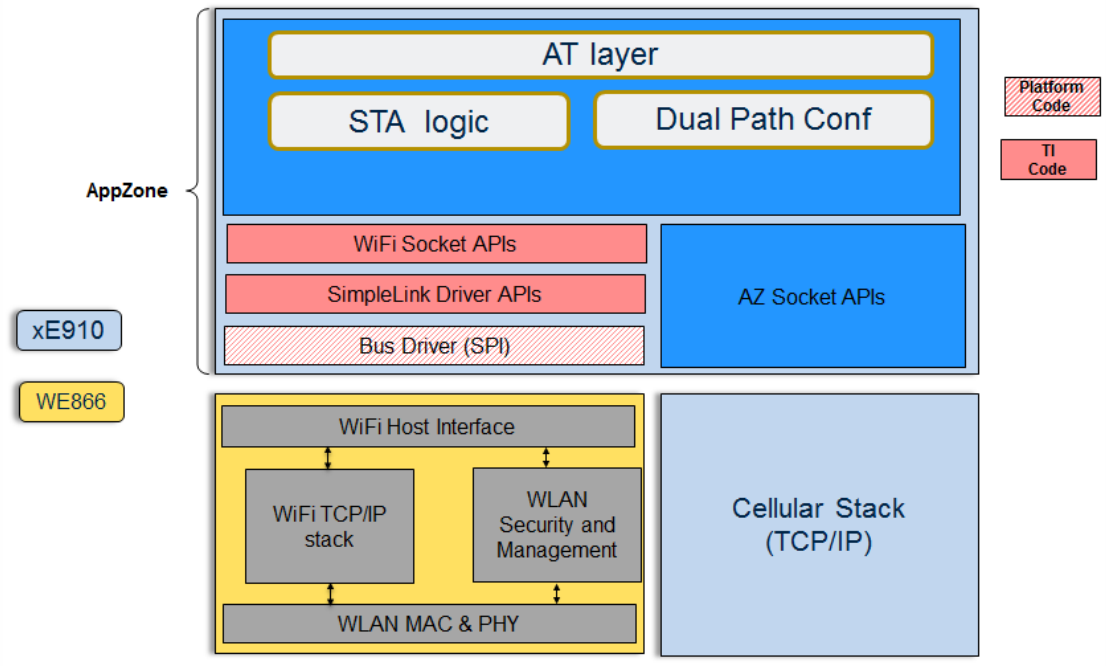
3.1. STATION

In this scenario the external MCU can select if the data can be sent to WiFi network or the cellular one.

In this case for the WiFi interface the module is acting as a station

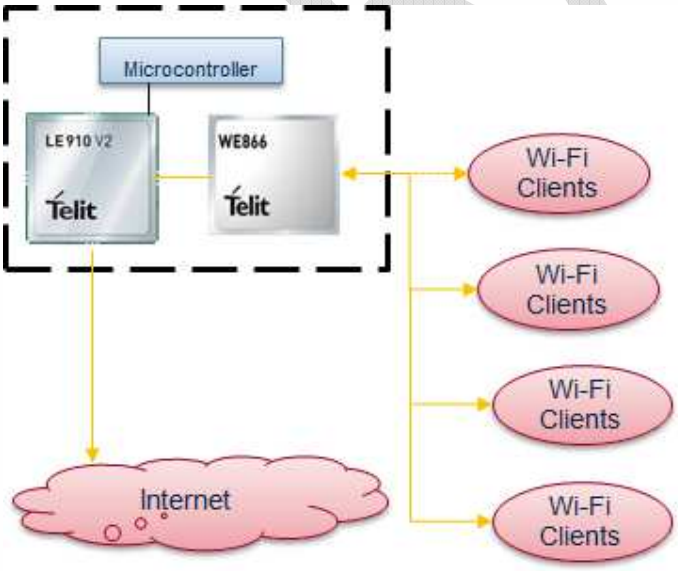


Below it is described the SW architecture running on the xEmodule

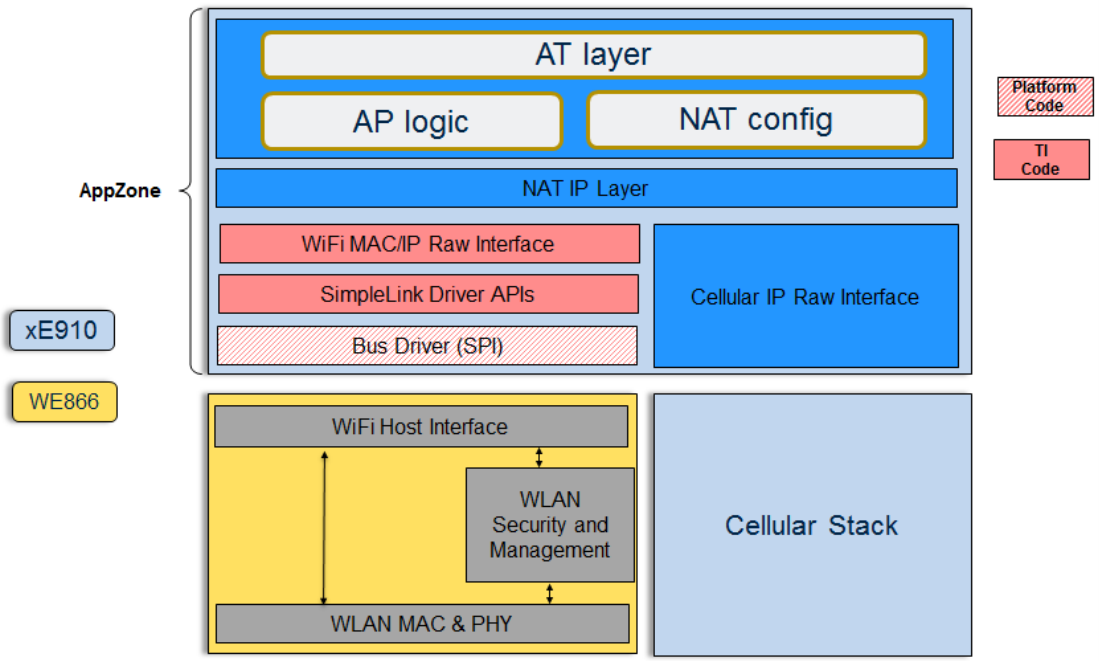


3.2. HOTSPOT

The WiFi module broadcasts a local network for stations to connect to. Stations can open connections (e.g. HTTP, SMTP, …) and send data. The cellular forward the IP packets to the cellular radio (NAT). **AZ C example in under inplementation for HE910 and LE910 V2.**



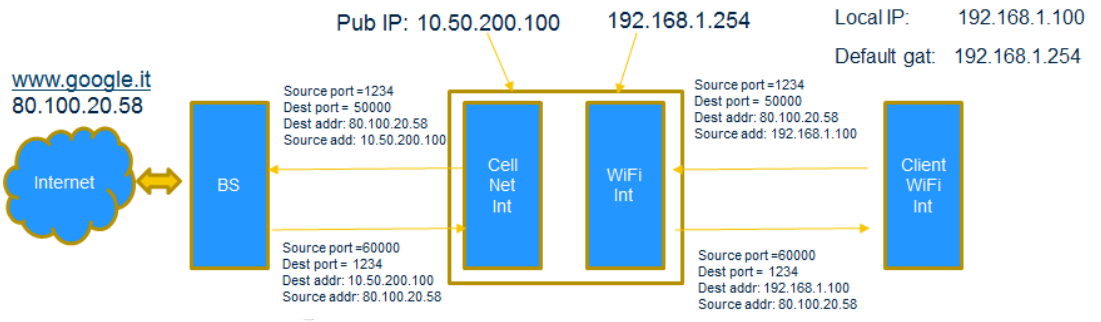
In this case the SW architecture is below



The WE866 is configured in MAC raw mode. All the packet MAC header include will be routed to the cellular module.

On AppZone framework a NAT layer of the IP packet has been implemented and they are routed through the cellular network. On the AppZone layer an AT layer has been implemented in order to manage both cellular and WiFi interface in order to enable/disable the HOTSPOT functionality.

Below an example of natting has been showed



4. SOFTWARE SETUP

Before starting any of the next steps please download from download zone the XFP and TATC tool.

Moreover it is strongly suggest to read the AppZone user guide at the below link

http://www.telit.com/fileadmin/AppZone_Guide/az-c-user-guide-V3/index.html

4.1. Module firmware flashing

Before start the flashing you have to install the USB module drivers.

Download the XFP tool and the USB driver from download zone

To flash the module, you will need the XFP tool, and possibly the USB drivers if you want to flash using USB cable.

You can find the XFP tool here:

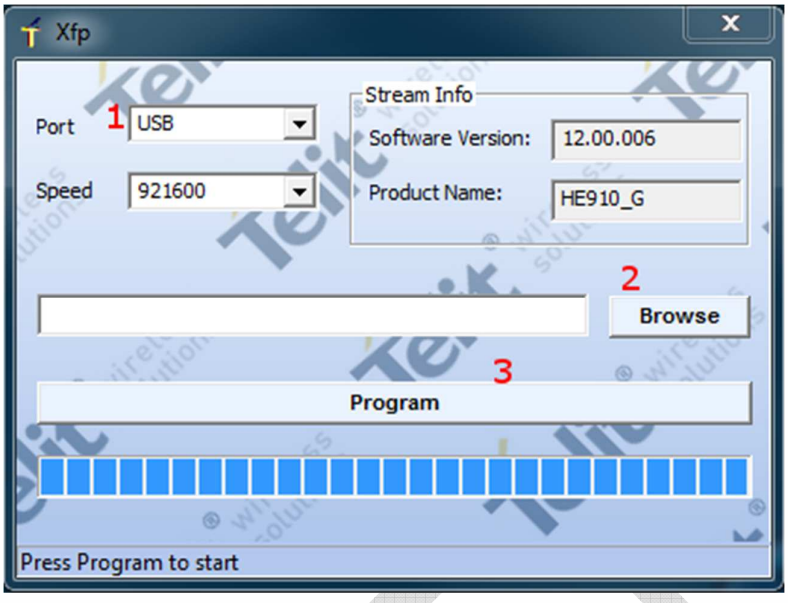
https://tcloud.telit.com/public.php?service=files&t=8f9a292cfedeebf88de75816167548b5

And the Telit_USB_Driver_Win_Desktop_UF.00.05 here:

https://tcloud.telit.com/public.php?service=files&t=56ee1f87e5eb1f3ef45e81143b64a5b1

(You can select to install the drivers for all devices from the installer prompt, or just the family of the module you are using)

Once you have the software installed, you can run XFP. You will see something like below



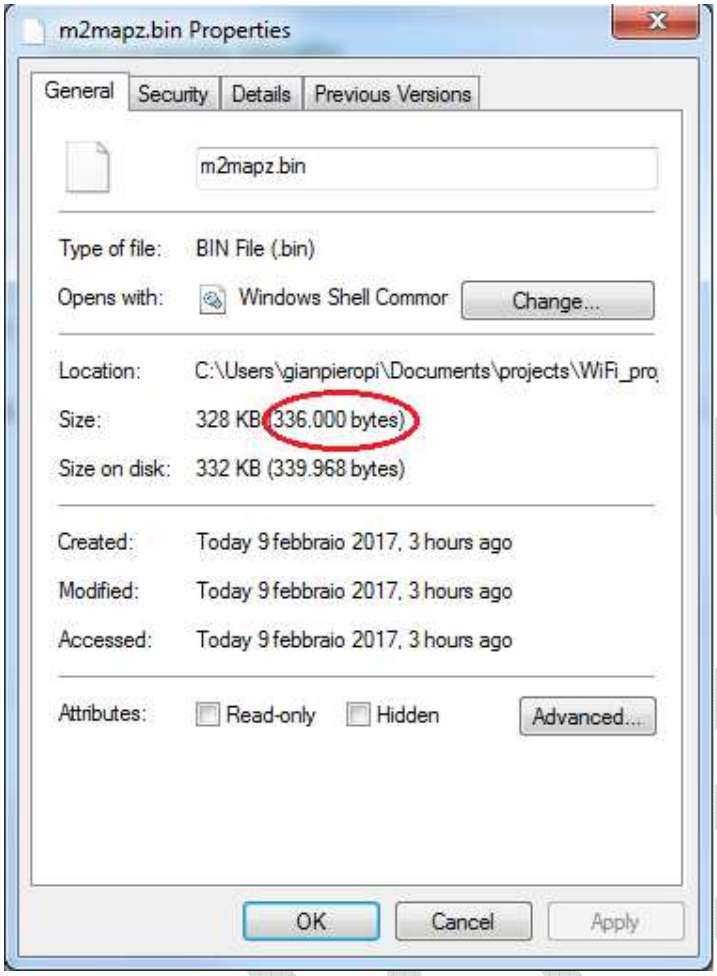
Steps to follow (refer to the image above):

1) Select the USB connection and 921600 bps speed (if not present, simply type it manually)
2) Browse to the .bin file of the firmware stream.
2bis) Be sure that the module is turned OFF (for example, press the Reset/Hw shutdown button, or unplug the power supply) and the USB cable is connected to the interface
3) Click on the Program button, the tool will search for the module USB interface.
4) Turn on the module pressing the **ON OFF** button; the tool will link it and start the flashing procedure. It will take a few minutes.
5) Once it is finished, the module will turn off. Turn it on again, its memory will be formatted on the first startup, and then the module will turn OFF again.
6) Turn the module on again. It is now ready.

4.2. WiFi AppZone Application programming.

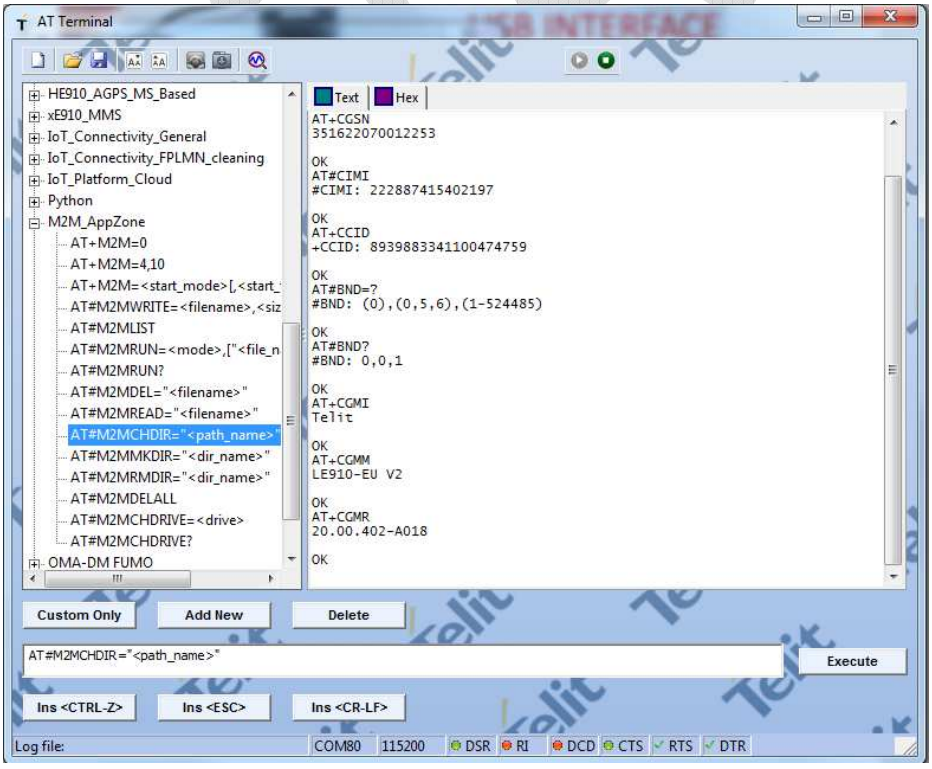
Before starting the load of the application the first step is to have the dimension of the application firmware in bytes.

In order to have it, using the file browser go in the folder where the application is located and push right click on the application and as show in the picture memorize the size of the binary. In the example it is 336000 and filename is m2mapz.bin



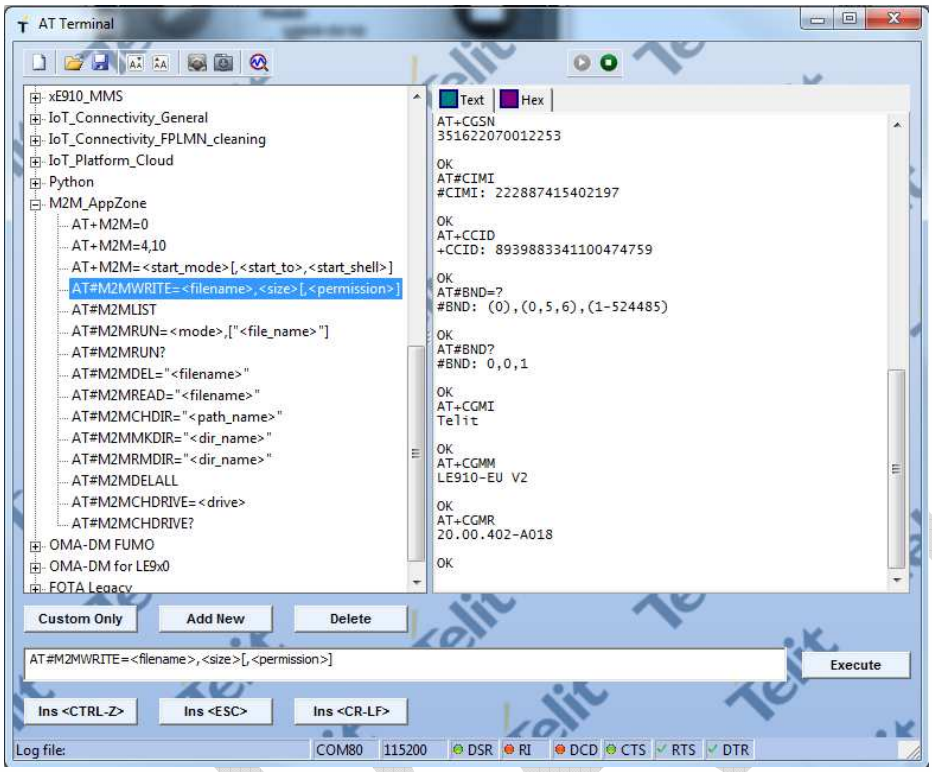
After that, open TATC tool and connect it to the USB0 of the module and go to the tab M2M_AppZone. See below

Select the AT#M2MCHDIR and complete the command with AT#M2MCHDIR="MOD". This will mode in the MOD directory of the file system

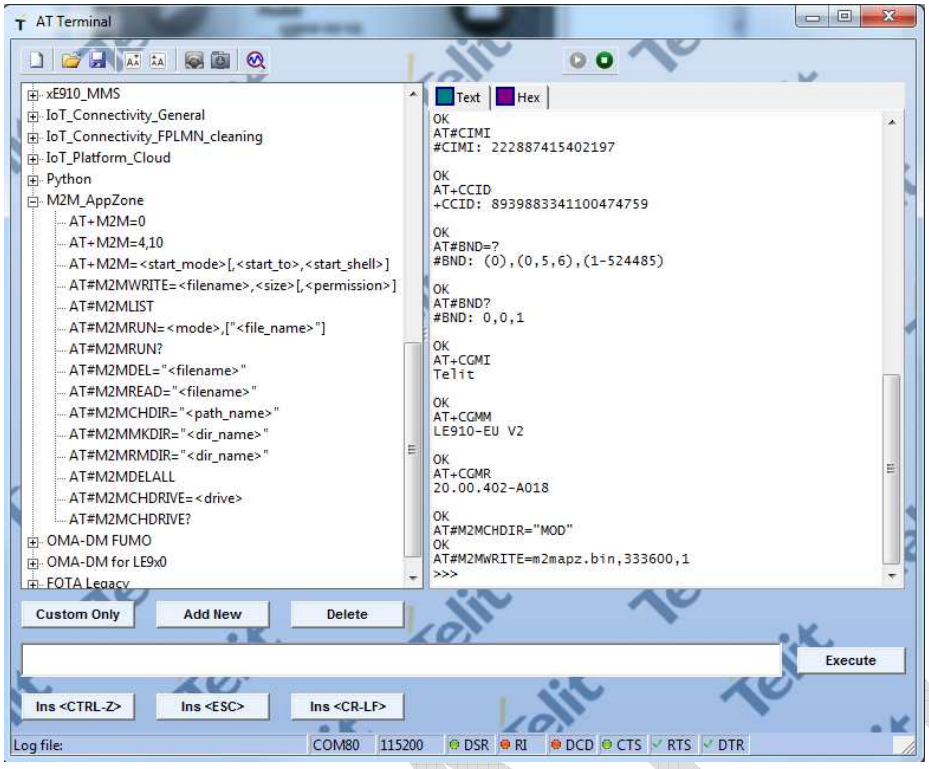


Now select the AT#M2MWRITE command and complete with AT#M2MWRITE=<file name>,<size>,<permission>.

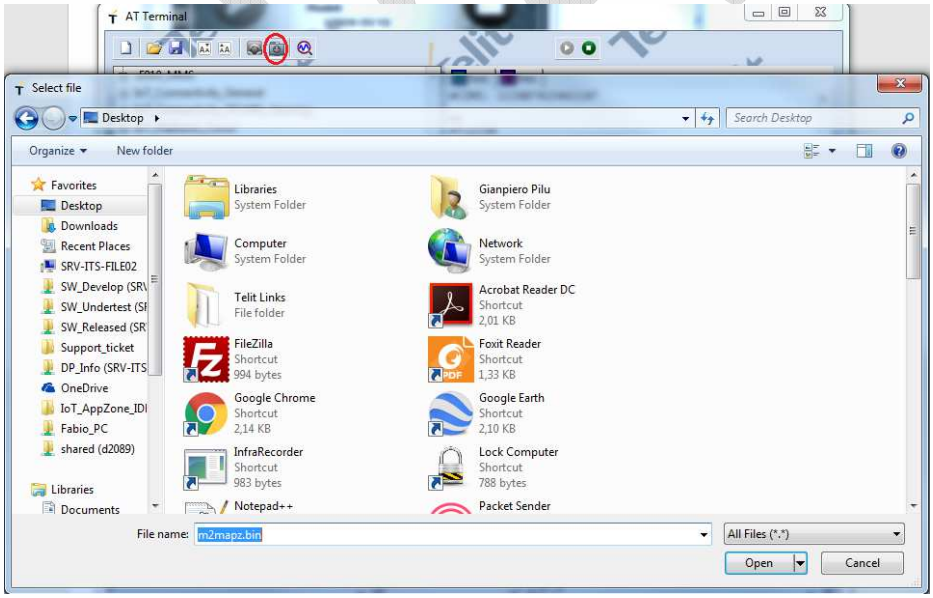
In this example AT#M2MWRITE=m2mapz.bin,336000,1



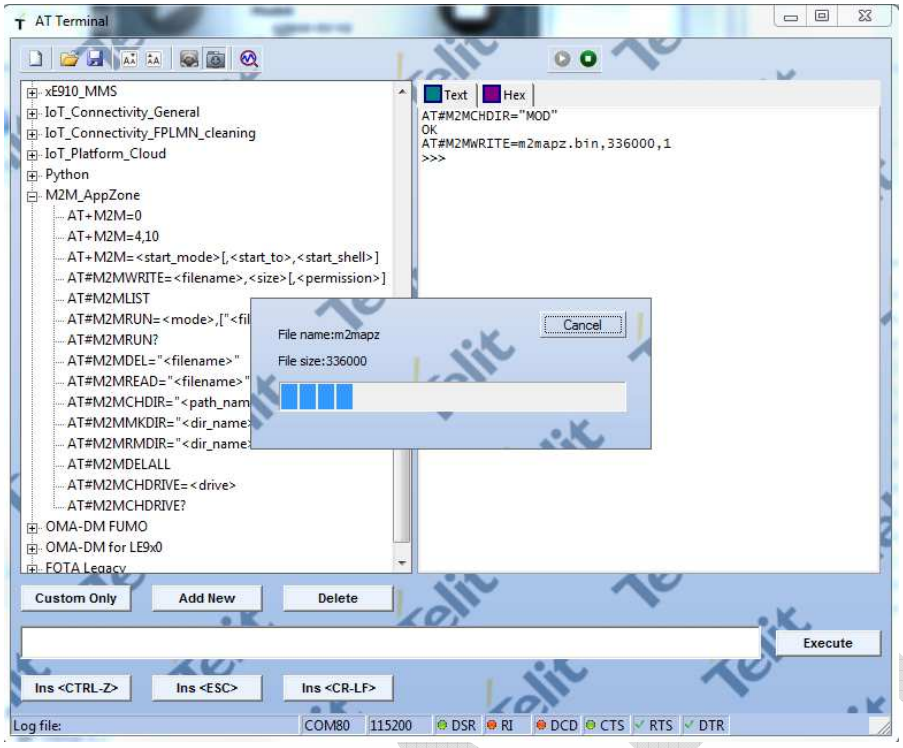
After you send the AT#M2MWRITE command a >>> prompt will be showed like the image below:



Push the transfer button indicated with a circle red in next image select the application to download and push ok and the transfer will start.

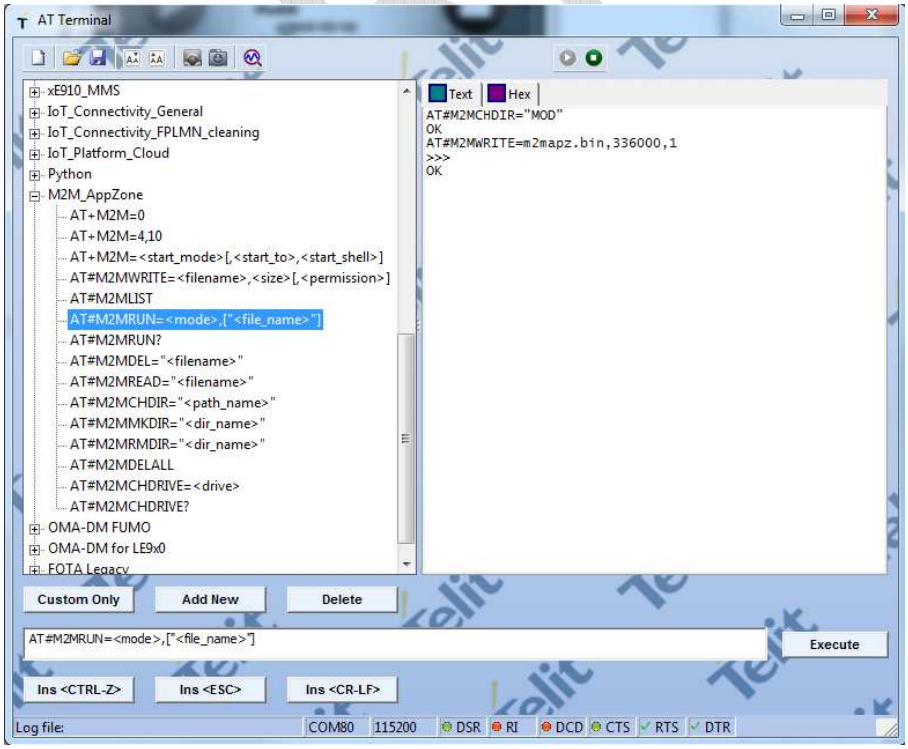


The transfer pop-up will appear



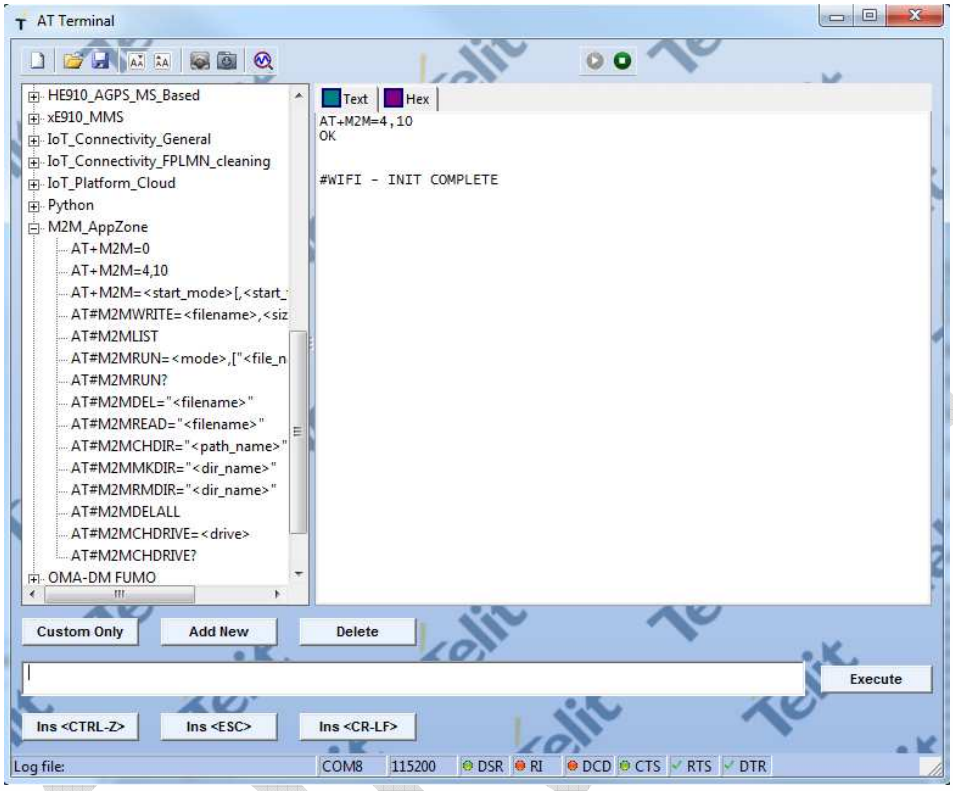
After the download will finish , the application need to be set as the application that need to start at the next start-up.

Select the AT#M2MRUN and complete with AT#M2MRUN=2, <filename> , in the example is AT#M2MRUN=2,m2mapz.bin



Now the application can start and for this select AT+M2M command and complete it with AT+M2M=4,10 this means that the application will start 10 seconds after start-up.

See below the next image.



Now the application started and you can use it in STATION or HOTSPOT module.

Follow the instruction in the next paragraph for the details

Note: The application trace outputs on USB3

5. AT COMMANDS

5.1. #WIFISTART

# **WIFISTART** – enable/disable WLAN	
AT#WIFISTART=[<mode>]	Set command enable/disable WLAN **Parameter:** **<mode> -** int type**,** status mode. 0 – disable 1 – enable Note: enable WLAN will start it as Station mode by default unless configure prior to start (**AT#WIFIMODE**). Note: The command will return OK immediately and generate URC messages depending on the configuration and events. AP Mode: #WIFI - A Station Connected to AP #WIFI - A Station disconnected from AP #WIFI – AP OFF Station Mode: #WIFI - STA Connected to external AP #WIFI – STA OFF
AT# WIFISTART?	Read command returns the currently WLAN status in the format: #WLANSTART: <mode> **Where:** **<mode>** 0 – WLAN off 1 – WLAN on
AT# WIFISTART=?	Test command returns the supported range of values for parameter **<mode>**.

5.2. #WIFIMODE

# **WIFIMODE** – change mode: access point/client	
AT#WIFIMODE=[<mode>]	Set command change WLAN mode **Parameter:** **<mode> -** operation mode. 0 – Access point mode 1 – Station mode
AT#WIFIMODE?	Read command returns the currently mode status in the format: #WIFIMODE: <mode> **Where:** **<mode>** 0 – Access point mode 1 – Client mode
AT# WIFIMODE=?	Test command returns the supported range of values for parameter <mode>.

5.3. #WIFISCAN

# **WIFISCAN**– Shows a list of available networks	
AT#WIFISCAN	Execution command returns the following parameters of available networks: SSID Security type MAC addresss RSSI Note: If the module is in Access Point mode, the command will return an ERROR.
AT# WIFISCAN=?	Test command returns **OK** result code .

5.4. #WIFIPWR

# **WIFIPWR** – Set Tx power level	
AT#WIFIPWR=[<mode>,<dB>]	Execution command sets the Tx power for either AP and STATION modes. **<mode> -** 0 – Access point mode 1 – Client (Station) mode <**dB**> - Number between 0-15, as dB offset from maximum power - 0 will set maximum power
AT# WIFIPWR?	Read command returns the current Tx power **# WIFIPWR**: < mode > ,< dB > **Where:** < mode > 0-1 < dB > 0-15
AT# WIFIPWR=?	Test command reports supported values for the parameters < mode > and < dB >. **#WIFIPWR (0-1),(0-15)**

5.5. #WIFIGPIO

# **WIFIGPIO** – change the Cellular -WiFi communication GPIOs	
AT#WIFIGPIO=<nHib>,<nReset>,<HIrq>,<SPI_nCS>[,<VCC_en>[,<WiFi_nCS>]]	Set command changes GPIOs configuration **Parameter:** **<nHib>** - WiFi module hibernate pin **<nReset>** - WiFi module reset pin **<HIrq>** - WiFi Host Interrupt signal **<SPI_nCS>** - SPI chip select signal **<VCC_en>** - WiFi module LDO enable signal **<WiFi_nCS>** -Level translator (between Cellular and WiFi modules) enable signal Notes: nHib, nReset, HIrq and SPI_nCS are mandatory. To keep the previous value, set a parameter to 0 e.g. to change SPI_nCS only: **AT#WIFIGPIO=0,0,0,3**

AT#WIFIGPIO?	Read command returns the currently GPIOs configuration in the format: **#WIFIGPIO:** nHib,nReset,HIrq,SPI_nCS,VCC_en, WiFi_nCS Default values: **#WIFIGPIO:** 9,6,7,8,3,4
AT# WIFIGPIO=?	Test command returns the supported range of values for all GPIOs.

5.6. #WIFIAPCLIENTS

# **WIFIAPCLIENTS**– List of connected clients	
AT#WIFIAPCLIENTS	Execution command retrieves the list of connected clients (up to 4 possible): IP – XXX.XXX.XXX.XXX MAC - XX:XX:XX:XX:XX:XX
AT# WIFIAPCLIENTS =?	Test command returns **OK** result code .

5.7. # WIFIAPMAC

# **WIFIAPMAC**– Retrieve the WiFi MAC address	
AT#WIFIAPMAC	Execution command retrieves the WiFi Module MAC address in the format: XX:XX:XX:XX:XX:XX
AT# WIFIAPMAC =?	Test command returns **OK** result code .

5.8. # WIFIAPPHYCFG

# **WIFIAPPHYCFG**– Set Physical configuration of AP	
AT#WIFIAPPHYCFG =<SSID>, <Security>, <PWD>, <Region>, <Channel>[,<Hidden>]	Execution command sets the Access Point's Physical Parameters: **< SSID > -** Alphanumeric string containing up to 32 bytes **< Security >** Integer values 0-2 0 – Open 1 – WEP 2 – WPA & WPA2 **< PWD > -** Alphanumeric characters **< Region > -** String. Available options:

	"US" "EU" "JP" **< Channel > -** Integer values 1-14 **<Hidden>** - AP SSID option 0 – Visible 1 – Hidden with length 0 2 – Hidden with original length
AT#WIFIAPPHYCFG?	Read command returns the current Physical Parameters: **# WIFIAPPHYCFG**: **< SSID** >,< **Security** >,< **PWD** >,< **Region** >,< **Channel** >,**<Hidden>**
AT# WIFIAPPHYCFG =?	Test command reports supported values for the parameters . **# WIFIAPPHYCFG** **(1-32 Bytes Alphanumeric), (0-2), (For WPA: 8 to 63 characters** **For WEP: 5 to 13 characters), ("US", "EU","JP"), ("US": 1-11 |** **"EU": 1-13 |** **"JP": 1-14), (0-2)**

5.9. #WIFIAPNETCFG

#WIFIAPNETCFG – Set Network configuration of AP (WiFi will reboot to complete configuration)	
AT#WIFIAPNETCFG =[<ip>, <Mask>, [<GateWay>, [<DNS>]]]	Execution command sets the Access Point's Network Parameters all in the format - xxx.xxx.xxx.xxx **< ip > -** IPV4 address **< DNS > -** IPV4 DNS Server **< ip_start> -** DHCP start address (last octect) **<ip_last> -** DHCP last address (last octect) **<ip_lease_time> -** IP address lease time (ms) **Note**: < DNS >- if not set, cellular DNS will be used WiFi Network mask is set to 255.255.255.0
AT#WIFIAPNETCFG?	Read command returns the current Network Parameters: **# WIFIAPNETCFG**: **< ip** > ,< **DNS** >,< **ip_start** >,< **ip_last** > ,< **ip_lease_time** >
AT# WIFIAPNETCFG =?	Test command reports supported values for the parameters . **# WIFIAPNETCFG** **(xxx.xxx.xxx.xxx), (xxx.xxx.xxx.xxx),(xx),(xx),(xx)**

5.10. #WIFIAPPDPCFG

# **WIFIAPPDPCFG** – Set AP mode	
AT# WIFIAPPDPCFG =<"apn">[, <"username">, <"password">]	Execution command set the following parameter in the AP mode: <**apn**> - PDP context APN to be used in the connection <**username**> - PDP context username to be used in the connection <**password**> - PDP context password to be used in the connection
AT# WIFIAPPDPCFG?	Read command returns the current remote server's parameters: **# WIFIAPPDPCFG**: <**apn**>,<**username**>,<****>
AT# WIFIAPPDPCFG =?	Test command reports supported values for the parameters . **# WIFIAPPDPCFG** **(150),(150),(150)**

5.11. #WIFISTAPHYCFG

#**WIFISTAPHYCFG**– Set Physical configuration of Station (WiFi will reboot to complete configuration)	
AT#WIFISTAPHYCFG =<SSID>, <Method>[, <PWD>]	Execution command sets the Access Point's Physical Parameters **< SSID > -** Alphanumeric string containing up to 32 bytes **< Method >** Integer values 0-2 0 – Open 1 – WEP 2 – WPA & WPA2 **< PWD > -** Alphanumeric characters. Len: 8-63 for WPA 5-13 for WEP
	Read command returns the current Physical Parameters: **# WIFISTAPHYCFG**: < **SSID** > < **PWD** > < **Method** >
AT# WIFISTAPHYCFG =?	Test command reports supported values for the parameters . **# WIFISTAPHYCFG**

	(1-32 Bytes Alphanumeric), (0-2), (For WPA: 8 to 63 characters For WEP: 5 to 13 characters)

5.12. #WIFISTANETCFG

# **WIFISTANETCFG** – Set Network configuration of Station (WiFi will reboot to complete configuration)	
AT#WIFISTANETCFG =[<Auto>[, <ip>, <Mask>, [<GateWay>, [<DNS>]]]	Execution command sets the Station's Network Parameters all in the format - xxx.xxx.xxx.xxx **< Auto > -** 0 – Automatic DHCP settings 1 – Manual DHCP settings with the following parameters: **< ip > -** IPV4 address **< Mask > -** IPV4 Net Mask **< GateWay > -** IPV4 GateWay **< DNS > -** IPV4 DNS Server **Note**: < Auto > - if '0', network layer parameters will be automatically retrieved < GateWay > - if not set, <ip> will be used < DNS >- if not set, <ip> will be used
AT#WIFISTANETCFG?	Read command returns the current Network Parameters: **# WIFISTANETCFG**: < **ip** > < **Mask** > < **GateWay** > < **DNS** >

AT# WIFISTANETCFG =?	Test command reports supported values for the parameters . **# WIFISTANETCFG (xxx.xxx.xxx.xxx), (xxx.xxx.xxx.xxx), (xxx.xxx.xxx.xxx), (xxx.xxx.xxx.xxx)**

5.13. #WIFISTAPING

#WIFISTAPING – Ping WiFi Gateway or remote server	
#WIFISTAPING=<type>[,<host>[,<interval[,<timeout>][,<attempts>]]]]	Execution command sets socket configuration: < **type** > - The ping type 0 - Ping the LAN Gateway 1 - Ping a remote host (using the following parameters) < **host** > - Address of the remote host: IPV4 or host name < **interval** > - Time interval between Pings in milliseconds <**timeout**> - Timeout for every ping. In milliseconds (0-65535) <**attempts**> - number of ping attempts **Note**: if the module is in AP mode, an ERROR will be returned.
AT#WIFISTAPING?	Read command returns OK
#WIFISTAPING=?	Test command reports supported values for the parameters. **#WIFISTAPING (0-1)[,(100),(0-65535),(0-65535),(0-65535)]**

5.14. #WIFISTASD

#**WIFISTASD** – Send /receive data to/from remote server	
AT#WIFISTASD =< socketId >,<protocol>, <rPort>, <rAddress>[, <closureType>,[<lPort>, [<connMode>]]]	Execution command send data to remote server according to the following parameters: **< socketId> -** Socket connection identifier 1..5 **< protocol > -** 1 – TCP 2 – UDP **< rPort > -** Port of the remote host **< rAddress > -** Address of the remote host: IPV4 or host name <**closureType**> - UNSUPPORTED **< lPort > -** local port to be used for UDP sockets (ignored for TCP connections) **<connMode> -** Connection mode 0 - online mode connection (default) 1 - command mode connection **Note**: <**connMode**> - only online mode supported < **lPort** > - Ignored for TCP connections. **< rAddress >** - No quotes are needed Note: When the command execution is successful the module will enter in online data mode. The intermediate result code CONNECT is received. After the CONNECT , the socket can be closed using the escape sequence (+++): the

	module moves back to command mode and a NO CARRIER is returned. Any data incoming from the AT interface will be sent through the socket, and any response from remote host will be showed on the AT interface until the socket is open.
AT#WIFISTASD=?	Test command reports supported values for the parameters. **#WIFISTASD** **(1-5),(0-1),(1-65535),(xxx.xxx.xxx.xxx),(0-1),(1-65535),(0-1)**

5.15. #WIFISTASCFG

#WIFISTASCFG – Sockets configuration	
#WIFISTASCFG=<socketId>,<cid>[<packet_size>[,<max_idle_to>[,<conn_to>][,<tx_to>]]]]	Execution command sets socket configuration: **< socketId >** - Socket connection identifier 1..5 **< cid >** - Context Id – UNSUPPORTED <**packet_size**> - Sending max packet size. UNSUPPORTED **<max_idle_to> -** exchange timeout. If there is no data exchange within this period the connection will be closed. 0 - no timeout 1..65535 - timeout value in seconds (default: 90 seconds) **<conn_to>** - connection timeout. If a connection cannot be established within this timeout period, an error will be raised. UNSUPPORTED, defaults to 10 seconds < **tx_to>** - data sending timeout; UNSUPPORTED
AT#WIFISTASCFG?	Read command returns the current Sockets state: **# WIFISTASCFG**: < **socketId** >, < **cid**>, < **packet_size** >, < **max_idle_to**>, <**conn_to**>,

	<**tx_to**> For every socketId [1-5]
#WIFISTASCFG=?	Test command reports supported values for the parameters. **# WIFISTASCFG (1-5),0,(0/1-1500),(0/1-65535),(10-1200),(0/1-255)**

5.16. #WIFISWVER

#WIFISWVER – Sockets configuration	
AT#WIFISWVER	Execution command returns the WiFi application software version in format AZWE866_**MM.mm** Where **MM** is the major release number **mm** is the minor release number
AT#WIFISTASCFG?	Read command returns WiFi application software version, as the execution command

6. USE CASES EXAMPLES

6.1. HOT SPOT commands sequence

Remember that you need to have SIM connected in order to have the HOT SPOT working

- Set the AP Mode

AT#WIFIMODE=0

- Configure AP Physical parameters

AT#WIFIAPPHYCFG=<SSID>,<security>,<password>,<region>,<channel>

- Configure the AP network parameter. For security typical is 2

(OPTIONAL) AT#WIFIAPNETCFG=<ip> ,< DNS > ,< ip_start>,<ip_last>,<ip_lease_time>

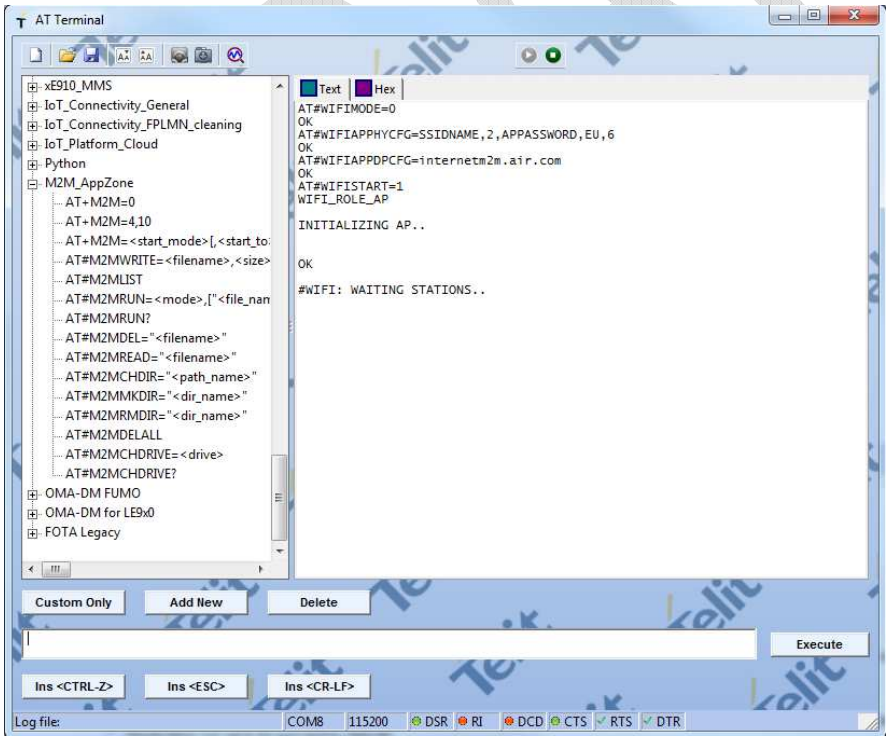
- Configure the AP Cellular interface.

AT# WIFIAPPDPCFG=[<"apn">], <username>, <password>

- Start the AP and wait for station to be connected.

AT#WIFISTART=1

After this command you will the message `#WIFI: WAITING STATIONS..`as the image below:



6.2. STATION AT commands sequence

- Set the Station Mode

AT#WIFIMODE=1

- Scan available networks

AT#WIFISCAN

- Configure Station Physical parameters

AT#WIFISTAPHYCFG=<external SSID>,2,<password>

- Configure the station in DHCP mode

AT#WIFISTANETCFG=0

- Start the Station and connect to the Access Point

AT#WIFISTART=1

- Open a TCP socket in online mode with remote server “modules.telit.com” on port 10510 (echo) and send/receive data

AT#WIFISTASD=1,1,10510,modules.telit.com

(Send +++ to close the socket)

- Additional feature: ping a remote server

AT#WIFISTAPING=1,"www.telit.com",300,2000,2

7. GLOSSARY AND ACRONYMS

	Description
TTSC	Telit Technical Support Centre
USB	Universal Serial Bus
HS	High Speed
DTE	Data Terminal Equipment
UMTS	Universal Mobile Telecommunication System
WCDMA	Wideband Code Division Multiple Access
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
UART	Universal Asynchronous Receiver Transmitter
HSIC	High Speed Inter Chip
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
ADC	Analog – Digital Converter
DAC	Digital – Analog Converter
I/O	Input Output
GPIO	General Purpose Input Output
CMOS	Complementary Metal – Oxide Semiconductor
MOSI	Master Output – Slave Input
MISO	Master Input – Slave Output
CLK	Clock
MRDY	Master Ready
SRDY	Slave Ready
CS	Chip Select
RTC	Real Time Clock
PCB	Printed Circuit Board
ESR	Equivalent Series Resistance
VSWR	Voltage Standing Wave Radio
VNA	Vector Network Analyzer

8. DOCUMENT HISTORY

Revision	Date	Changes
0	2017-01-02	First issue
1	2015-02-28	Various edits

SUPPORT INQUIRIES

Link to **www.telit.com** and contact our technical support team for any questions related to technical issues.

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