



**Actility ThingPark
Adeunis LoRaWAN Demonstrator
Configuration GUI application**

June 2016

Confidential document

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Headquarters

Actility Lannion,

Actility S.A 4 rue Ampère BP 30225

22300 Lannion France

www.actility.com

VERSIONS

<u>Version</u>	<u>Date</u>	<u>Author</u>	<u>Details</u>
01	3/4/2016	AFP	Initial Version
02	3/20/2016	AFP	Updated with software version 1.6.0
03	3/22/2016	AFP	Updated with software version 1.6.1
04	3/23/2016	AFP	Updated with software version 1.6.2 that includes more logs, and whose icons are different.
05	6/16/2016	AFP	Updated with software version 1.6.4: all section 4.4 is updated.
06	6/24/2016	AFP	Updated with software version 1.6.5: section 4.4 updated, as the "BOOT mode" button starts (if available) the FlashLoader GUI software automatically after the device has been put in BOOT mode.

REFERENCE DOCUMENTS

	<u>Documents</u>	<u>Author</u>
01	UG_LoRaWAN_Demonstrator_PROVIDER_V1.2	Adeunis

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DEFINITIONS AND ACRONYMS

ABP	Activation By Personalization
ADR	Automatic Data Rate
AES	Advanced Encryption Standard
AS	Application Server
BPM	Business Process Management
BSS	Billing Support Systems
CSP	Communication Service Provider
DC	Duty Cycle
End Device	A sensor or actuator
ESP	Estimated Signal Power
ETSI	European Telecommunications Standards Institute
HAN	Home Area Network
HSM	Hardware Security Module
IaaS	Infrastructure As A Service
IEC	International Electrotechnical Commission
IoT	Internet of Things
ISM	Industrial Scientific Medical
GSCL	Gateway Service Capability Layer
GTM	Go To Market
KPI	Key Performance Indicator
LC	Logical Channel
LoRa®	Long Range
LoRaWAN™	Long Range Wide Area NW
LPWAN	Low Power Wide Area Network
LRC	Long Range Controller
LRR	Long Range Relay
MAC	Media Access Control
M2M	Machine-2-Machine
MTBF	Mean Time Before Failure
NAT	Network Address Translation
NW	Network
NSCL	Network Service Capability Layer
OBIX	Open Building Information Exchange
OSS	Operations Support Systems

OTA	Over The Air
PER	Packet Error Rate
PKI	Public Key Infrastructure
POC	Proof Of Concept
REST	REpresentational State Transfer
RF	Radio Frequency
RIT	Receiver Initiated Transmit
RSSI	Received Signal Strength Indicator
SaaS	Software As A Service
SF	Spreading Factor
SLRC	Secured LRC (VPN Concentrator)
SMP	System Management Platform
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SNR	Signal to Noise Ratio
SSH	Secure SHell
SSO	Single Sign On
TLS	Transport Layer Security
TWA	ThingPark Wireless Application
UNB	Ultra Narrow Band
VM	Virtual Machine
VPN	Virtual Private Network

1 SCOPE

This document is a user-guide for the LoRaWAN Demonstrator device configuration application GUI.

This application helps

- configuring the device behavior
- flashing a firmware into the device

The current document is based on the GUI version 1.6.4.

Requirements:

Loading and saving configuration parameters is done through a serial connection: therefore, to use the GUI, the user needs to

- Install on his computer the Adeunis driver to communicate through serial interface:
http://www.adeunis-rf.com/media/downloads/148/trad_file/fre/virtualserialarf.zip
- connect a LoRa Demonstrator device to a computer using a USB cable (mini <-> regular).

Flashing such device requires the STMFlashLoader software.

The Application GUI needs this software to perform the firmware flash task: the ST:FlashLoader software version used is version 2.8.0.

2 HOW TO INSTALL THE APPLICATION

1. Get the Windows installer from Activity.

The current one, for version 1.6.4, is

setup-lorawan-demonstrator-configtool-1.6.4.exe

2. Run this installer.

The tools install the GUI into C:\Activity\LoRaWANDemoConfig.

A shortcut is available in the Start Menu, into folder Activity:

lorawan-demonstrator-configtools

3 THE APPLICATION DESCRIPTION

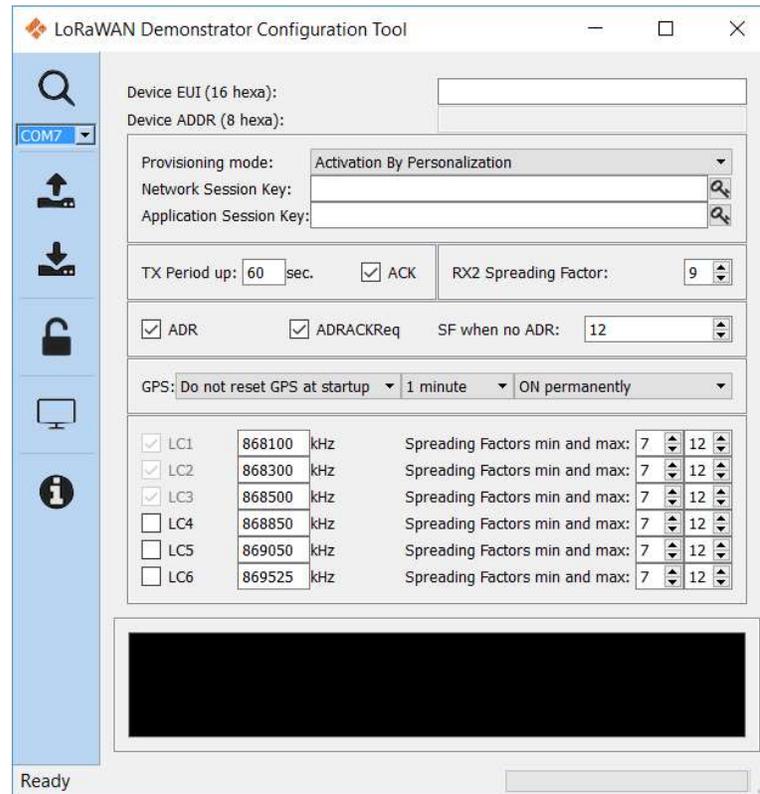


Figure 1 : The Application GUI at startup.

3.1 Features

Reading/Writing configuration settings consists in sending AT commands to the device through the serial connection.

Flashing a device consists in using the STFlashLoader.exe software from Microchips to write a binary file into the device circuits.

The Application is a user-friendly way to perform those tasks.

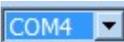
3.2 Description

3.2.1 Toolbar

This Application shows a toolbar where:



Serial ports can be scanned on the local system, in order to refresh the Combobox listing the detected serial ports.



One serial port can be selected, to perform.



Configuration settings are read from the device into the GUI panel, using the serial port connection.



Configuration settings are written from the GUI panel to the device, using the serial port connection.



The device is set to Boot mode, in order to be ready to be flashed. Then, if available, the STMicroelectronics FlashLoader GUI is started to let the user accomplish the device flashing.



Logging console can be hidden or shown.



Shows the About dialog, containing several information such as the software version, short release-notes, etc.

Besides, a Status bar at the bottom of the GUI shows:

- A text zone information: its indicates information about the current/last action performed.
- A progress bar: it indicates how far an action runtime goes.

3.2.2 Logging Console

The logging Console displays messages to track down the Application activities. Depending on the log level of a message, this message is shown in several color:

- DEBUG: light blue
- INFO: green
- WARNING: yellow
- ERROR: orange-red
- CRITICAL: violet
- FATAL: violet

The application loglevel is hardcoded to INFO: DEBUG logs won't be shown on the Console

3.2.3 Configuration to apply panel

The main panel is the *Configuration to apply* one where the end user can edit the behavior he intends to apply to the device.

The parameters to configure are:

- Device EUI
- Provisioning mode
 - Activation By Personalization (ABP)
 - Over The Air Activation (OTAA)
- Pairs of keys:

The buttons generate random keys with the correct expected length

 - In case of ABP
 - Network Session Key (32 hexadecimal length)
 - Application Session Key (32 hexadecimal length)
 - In case of OTAA
 - Application EUI (16 hexadecimal length)
 - Application Key (32 hexadecimal length)
- Frame TX settings:
 - Periodicity, in seconds
 - Using ACK mode or not
- Frame RX settings:
 - Spreading Factor to use (between 7 and 12)

- Adaptive Data Request capabilities
 - Using ADR mode or not
 - Using ADR Acknowledgment Request or not
 - Spreading factor to use if not using ADR (between 7 and 12)
- GPS Settings:
 - Reset or not GPS at startup
 - Startup time (1 to 10 minutes)
 - Mode (Off, On, every 5s, every 10s, every 15s)
- Channels configuration:
 - The 3 firsts channels are mandatory, so the matching checkboxes are selected and disabled.
 - The 3 others channels are optional: enabled checkboxes allow to select them
 - Each channel frequency can be changed (in kHz)
 - Each channel minimum spreading factor can be changed (from 7 to 12)
 - Each channel maximum spreading factor can be changer (from 7 to 12)

SAMPLE

4 HOW TO USE THE APPLICATION

4.1 How to start?

	Connect physically a LoRa Demonstrator device to your computer, using a (mini-to-regular) USB cable.
	Perform a “Refresh/scan serial ports”
	Select from the combobox the serial port the device is connected to

Hint: if you have several serial ports on your system, and need to find out which serial port you shall use, you could

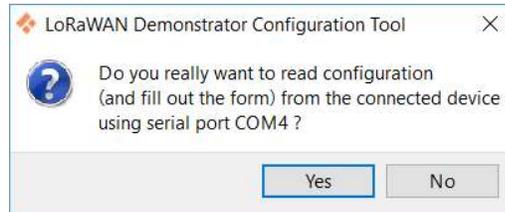
- Unplug the device from your computer
- press the “refresh/scan” button,
- open the combobox listing the detected serial ports, to have a view
- plug the device to your computer
- Press the “refres/scan”button,
- Open the combobox to find out which serial port is the new one, compared to the previous view.

4.2 How to load current configuration from the device into the GUI?



Click on the **Read configuration** button.

A dialog asks for confirmation



Press button **No** to abort.

Press button **Yes** to continue¹

The GUI toolbar is disabled to prevent the user interfering with the current process.

The application opens the serial port and sends a set of AT commands to the device to retrieve the configuration settings from it.

As soon as the device is not sending frames (in nominal mode or during its initialization - the LED #1 is not lit **RED**), the AT commands are sent:

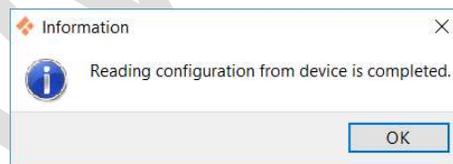
- On the device, both leds are lit **RED** during the process;
- the progress bar within the status bar is filling out.
- The logging console displays the information (see Appendix for details)

When the task is done:

- The status bar indicates the configuration is written

Configuration read.

- A dialog pops up.



- The logging Console shows:

Reading configuration from device is completed.

¹ Switch OFF then ON the device right before pressing the YES button from the GUI.

At least, be sure that the device is not busy, i.e. sending a TX frame or in a Cycle check (LED #1 lit **RED**)

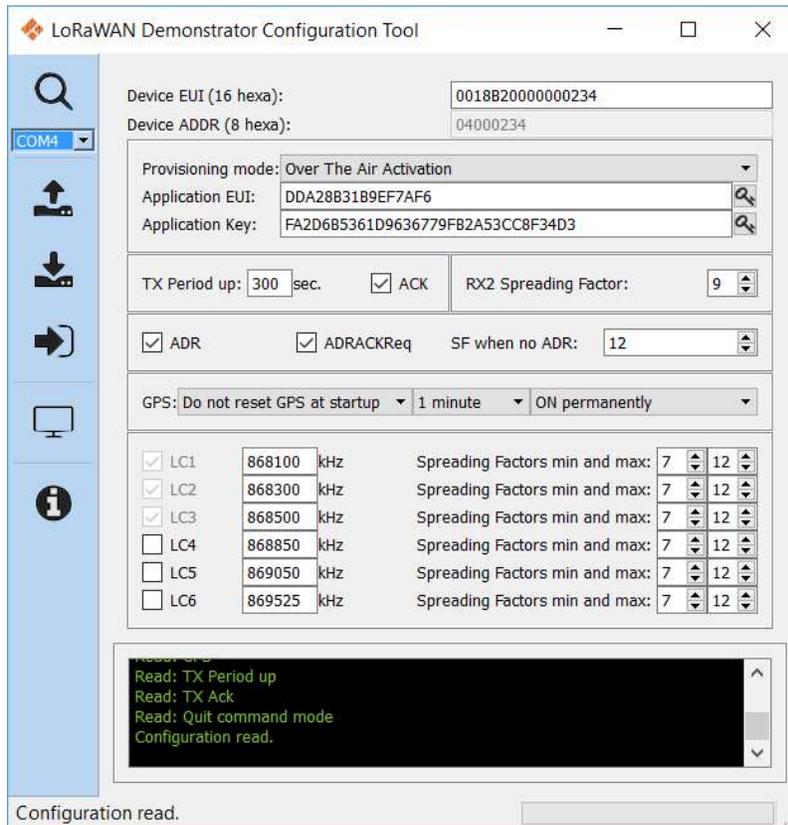


Figure 2 : An example of the Application GUI after reading configuration settings. (screenshot from version 1.6.2)

4.3 How to write configuration settings to the device from the GUI?

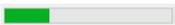
Fill out the *Configuration to apply* panel

Click on the *Write configuration* button.
A dialog asks for confirmation

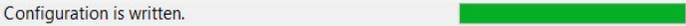


Press button *No* to abort.
Press button *Yes* to continue²

The GUI toolbar is disabled to prevent the user interfering with the current process.
The application opens the serial port and sends a set of AT commands to the device to write the configuration settings into it.
As soon as the device is not sending frames (in nominal mode or during its initialization - the LED #1 is not lit RED), the AT commands are sent:

- On the device, both LEDs are lit **RED** during the process;
- On the GUI, the progress bar within the status bar is filling out. 
- The logging console displays information (see Appendix for details)

When the task is done:

- The status bar indicates the configuration is written

- A dialog pops up.



- The Console ends with the log entry
`Configuration is written.`

² Switch OFF then ON the device right before pressing the YES button from the GUI.

At least, be sure that the device is not busy, i.e. sending a TX frame or in a Cycle check (LED #1 lit **RED**)

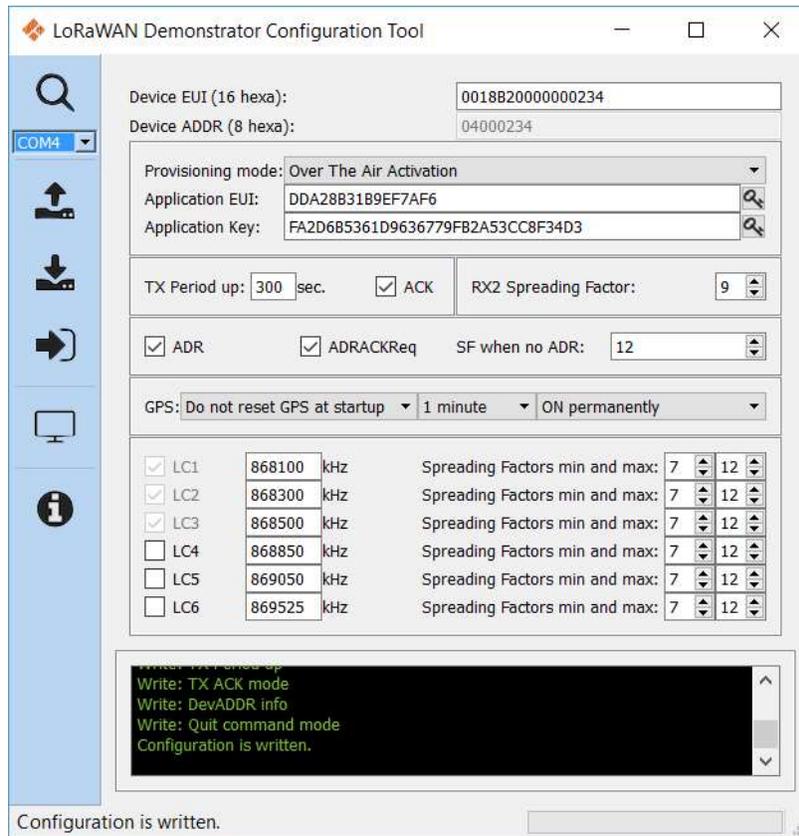


Figure 3 : An example of the application GUI once settings have been written to the device. (screenshot from version 1.6.2)

4.4 Updating the device firmware

This feature requires

- First, this software, to put the device in 'boot'mode;
- Then, the STMicroelectronics Lorademonstrator GUI, to flash a firmware to the device.

BEWARE: Flashing firmware (section 4.4.2) erase any customized configuration. Before flashing a device,

1. Do keep notes of the customized configuration the device has (for instance, read configuration from the device as in section 4.2, then keep a snapshot and finally note the keys)
2. Then proceed to flash the device (section 4.4.1 and 4.4.2)
3. Rewrite your customized configuration (section 4.3)

NOTA: This feature is dangerous (loose device?): be sure the targeted device battery is full (or well charged).

4.4.1 Putting the device in 'Boot' mode

	Connect the device to your computer using a USB cable
	Switch ON the device
	Select the serial port your device is connected to
	Make sure that the device is not sending and/or waiting back an ACK: <u>in other terms, make sure that LED1 is not lit at all.</u> ³
	Click on the <i>Boot mode</i> button.
	The GUI toolbar is disabled to prevent the user interfering with the current process. The application <ol style="list-style-type: none">1. opens the serial port to send AT commands to set the device in BOOT mode <p>Note: AT commands are sent as soon as the device is not sending frames (in nominal mode or during its initialization - the LED #1 is not lit RED)</p>

³ Switch OFF then ON the device right before pressing the button from the GUI.

At least, be sure that the device is not busy, i.e. sending a TX frame or in a Cycle check (LED #1 lit RED)

1. On the device, LED1 lits briefly in **RED**.
2. Then, both LEDs are lit **ORANGE** when the device is in BOOT mode

The logging console displays the following information (example):

```
Putting device in boot mode
Putting device in command mode
(Device busy)
Current firmware version: LORA-DEMO_v1.4
Device boot loader opened
Device in boot mode, ready to be flashed (both LED should lit ORANGE)
```

When the task is done:

- A dialog pops up, stating you can use now the STMicroelectronics Lorademonstrator GUI to flash your device.



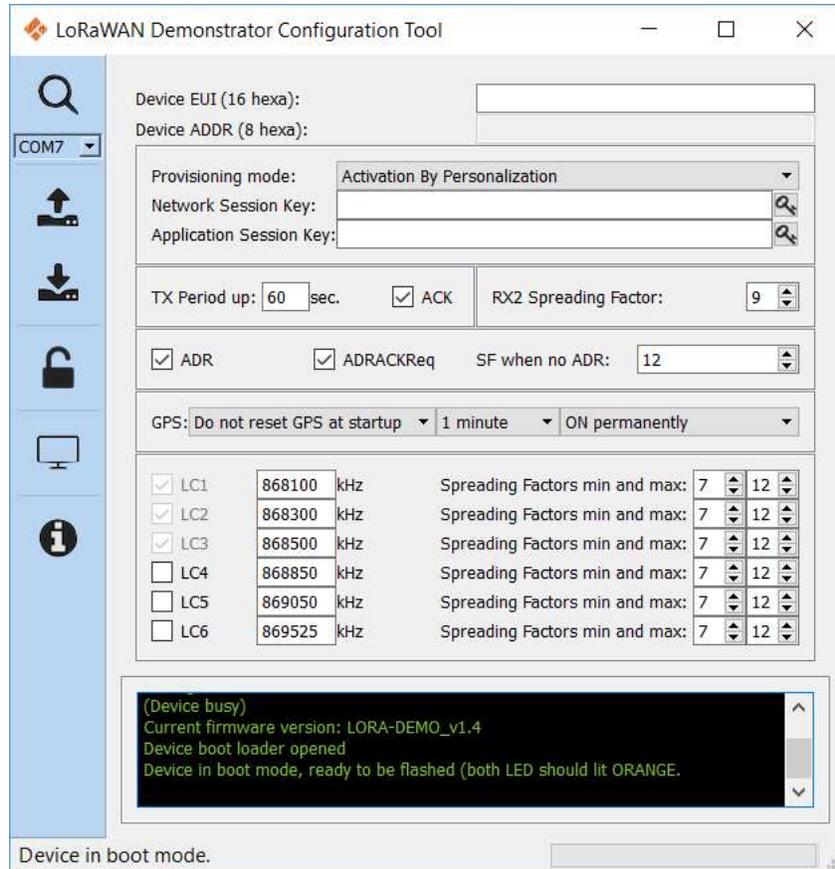


Figure 4: An example of the application GUI once the device has been updated

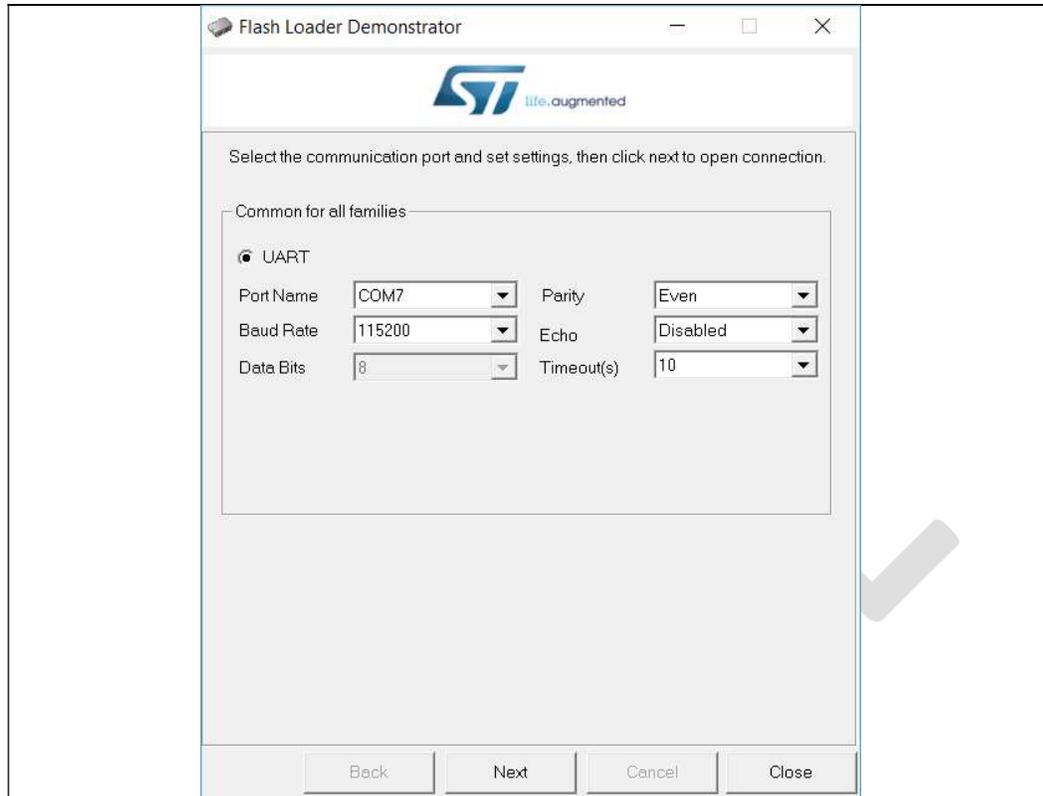
Click on OK button from the dialog to close it : the STMicroelectronics Lorademonstrator GUI starts.

DO NOT SWITCH OFF THE DEVICE
DO NOT UNPLUG THE DEVICE FROM YOUR COMPUTER

4.4.2 Flashing the device with a new file.

Your device is still plugged to your laptop, both LED lit in **ORANGE**.

The STMicroelectronics Lorademonstrator GUI wizard shows up:



Select in Port name field the serial port the device is connected to.

The other parameters must be:

Baud Rate: 115200

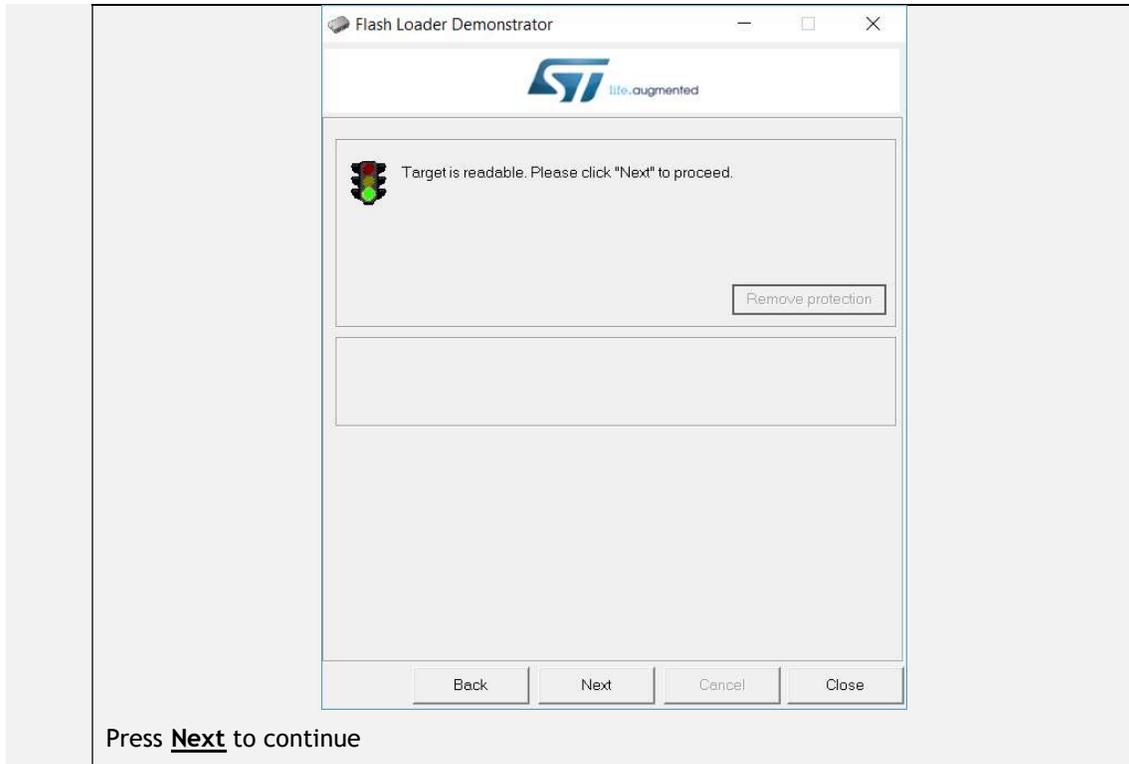
Parity: Even

Echo: Disabled

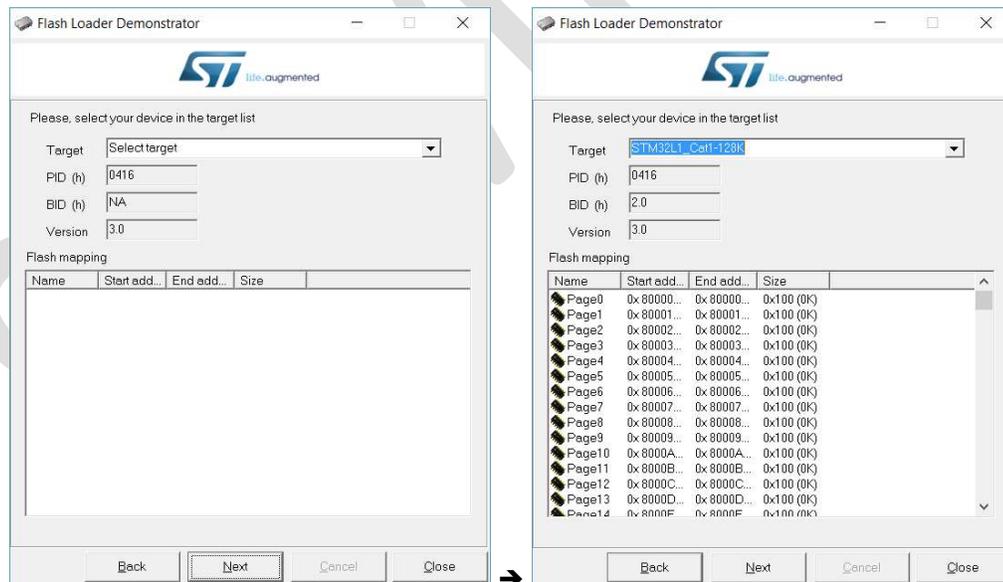
Timeout(s): 10

Press the Next button.

The next GUI stated it is ready to proceed.



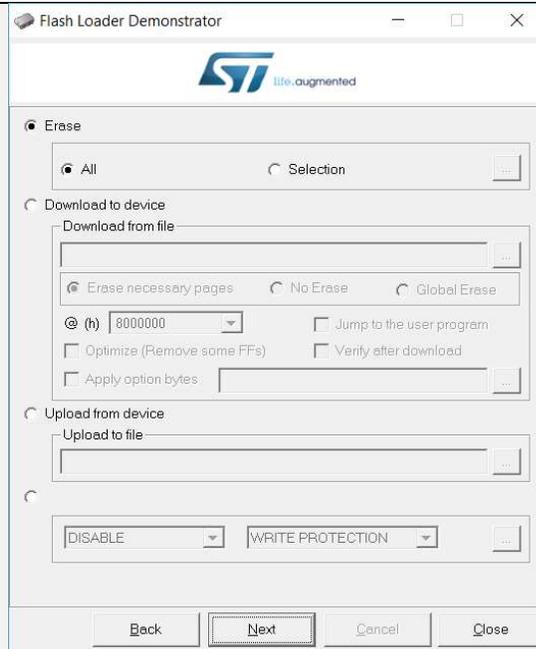
The next GUI asks for the target device profile



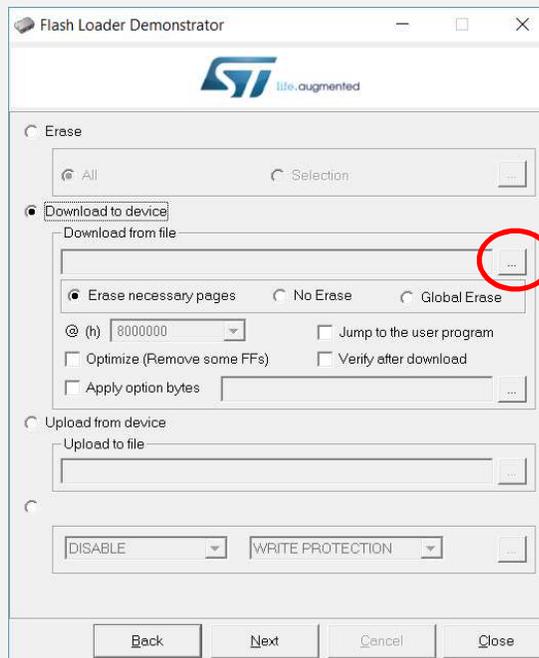
Select as target *STM32L1_Cat1-128K*.
the flash mapping loads automatically

Press **Next** to continue.

The next screen let you choose the firmware file to apply to the device:

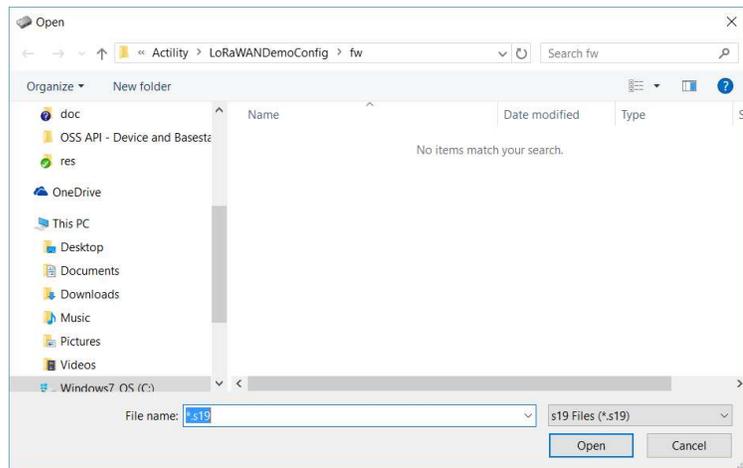


Click on Download to device radio button.



Press the File selector button.

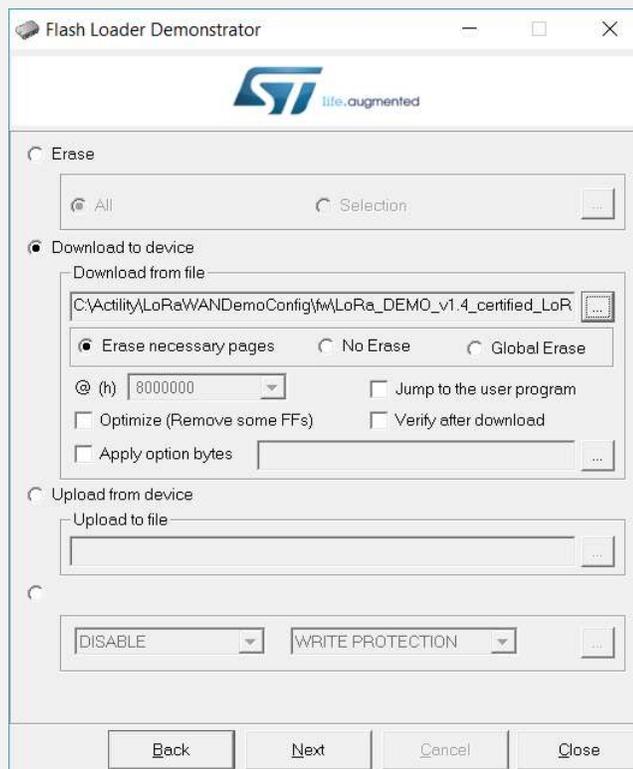
The OpenFile dialog opens.



1. Change type file to hex Files (*.hex)
2. Browse your filesystem to select the firmware.
3. Press **Open** to continue

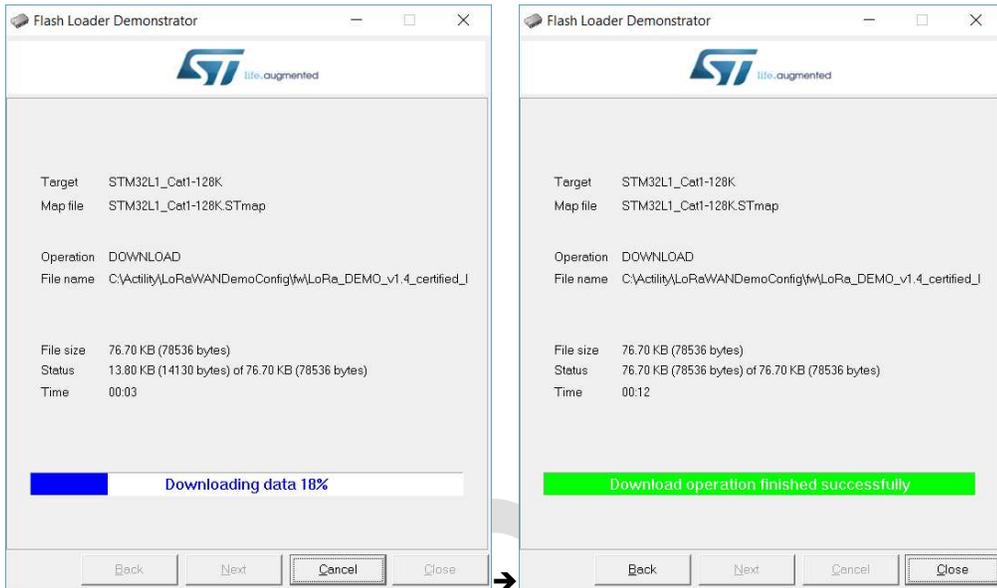
NB: The last firmware is *LoRa_DEMO_v1.4_certified_LoRaAlliance.hex*. It can be found in **C:\Activity\LoRaWANDemoConfig\fw**

The screen should be similar than the following one, in terms of settings:



Press **Next** to continue.

The firmware is flashed into the device: a progress bar indicates the progression of the process.



When the process is done, the software indicates it.

Press the Close button to continue/quit the software.

As flashing erase any customized configuration, you need to reconfigure the device (see section 4.3)

4.5 How to hide/show the logging Console?



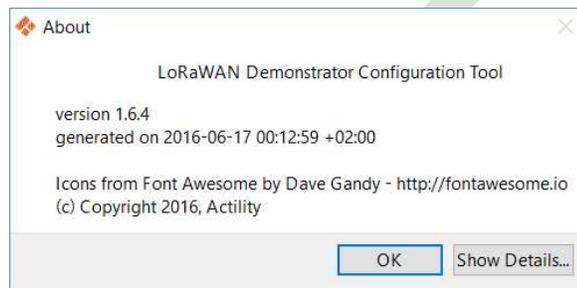
Simply press the **Hide/Show console** button from the toolbar.

4.6 The About box

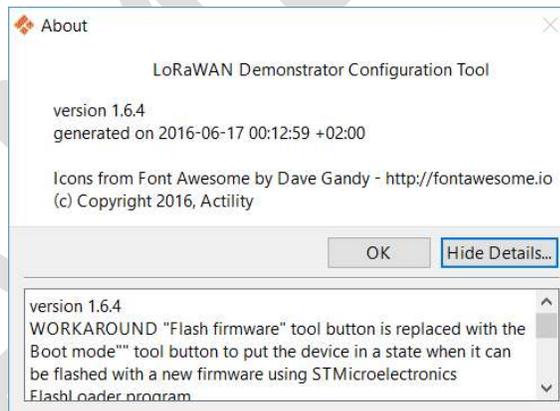


Simply press the **About** button from the toolbar.

The About Dialog shows the Product name, the version and the date this release was finalized.



The **Show Details** button expands the Dialog, showing a short release-note.



The **OK** button closes the Dialog

5 APPENDIX

Here are the logs from a typical scenario:

- **Plug in a LoRa Demonstrator**
- **Start the Application**
- **Press the “Read” button**
- **Switch OFF then ON the device**
- **Within the second, press Yes at the GUI confirmation dialog**

```
Reading configuration from device.
Waiting to enter command mode ...
(Device busy) Waiting to enter command mode
Read: Entered command mode
Read: Firmware version: LORA-DEMO_v1.3
Read: devaddr
Read: detect activation mode
Read: ABP mode
Read: keys
Read: TX channels
Read: RX2 channels
Read: SF w/o ADR mode
Read: Syncword
Read: ADR settings
Read: accelerometer
Read: GPS
Read: TX Period up
Read: TX Ack
Read: Quit command mode
Configuration read.
```

- **Press the “Write” button**
- **Switch OFF then ON the device**
- **Within the second, press Yes at the GUI confirmation dialog**

```
Writing configuration to device.
Waiting to enter command mode ...
(Device busy) Waiting to enter command mode
Write: Entered command mode
Write: Firmware version: LORA-DEMO_v1.3
Write: channels
Write: SF when no ADR
Write: ADR settings
Write: keys for ABP mode
Write: SF for RX2
Write: GPS
Write: TX Period up
Write: TX ACK mode
Write: DevADDR info
Write: Quit command mode
Configuration is written.
```

- Switch OFF then ON the device
- Press the “Boot mode” button

```
Putting device in boot mode
Putting device in command mode
(Device busy)
Current firmware version: LORA-DEMO_v1.4
Device boot loader opened
Device in boot mode, ready to be flashed (both LED should lit ORANGE)
```

SAMPLE

6 ABOUT ACTILITY

Actility is an industry leader in LPWAN (Low Power Wide Area) large scale infrastructure with ThingPark™, the new generation standard-based M2M communication platform. Actility's ThingPark Wireless™ network provides long-range coverage for low-power sensors used in SmartCity, SmartBuilding and SmartFactory applications. Actility also provides the ThingPark Cloud which provides big data storage for sensor data and exposes sensor function through an open API allowing developers to provide vertical applications on top of rolled out sensors. To help vendors transform their sensors, Actility provides the ThingPark IoT platform which include embedded software solutions and cloud solutions to help devices connect to innovative applications. Via the ThingPark Store™, an online marketplace engine dedicated to the IoT sensors, applications and network solutions, Actility enables the roll-out of new innovative IoT services for sensor vendors and network solution vendors. Actility is a founding member of the LoRa® Alliance: the largest, most powerful standards-based effort to enable the Internet of Things (IoT). Visit www.actility.com.

SAMPLE