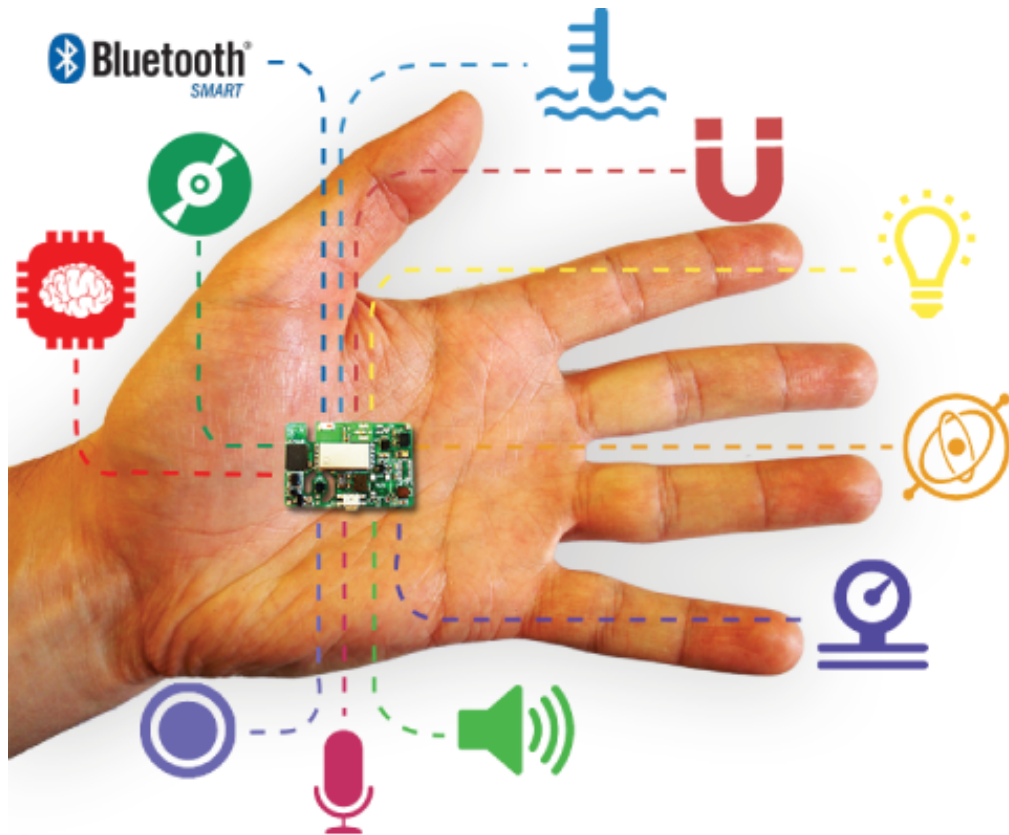


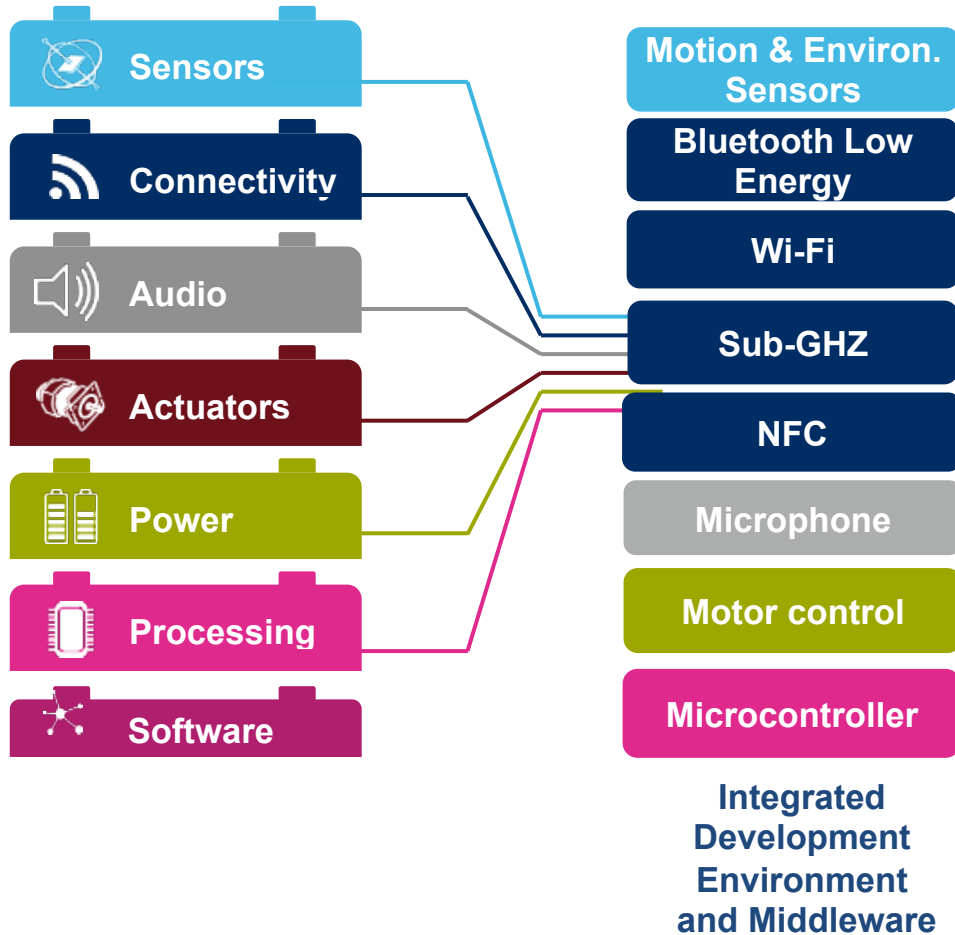
*Sensi*BLE Getting Started



Your Idea - Worth come true

From Idea to Form Factor Device

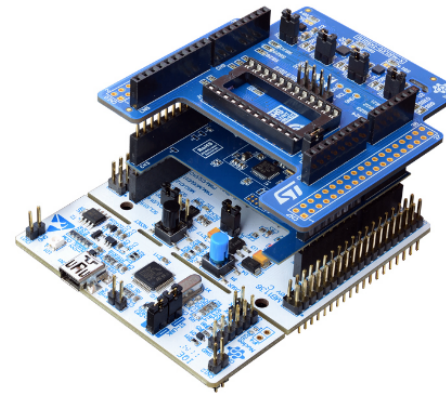
2



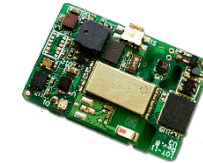
Processor Boards
Expansion Boards



STM32 Open
Development
Environment



SensiBLE

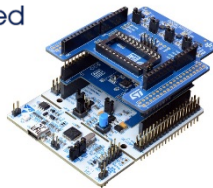


Every Idea
Worth Come True

From Prototype to Final Product

3

ST Partnership with Diolan - Form factor devices and customization



Modular Blocks
Prototyping

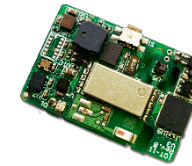


SensiBLE



Form Factor
Field testing

SensiBLE



Optimized Design
Volume Production

Final
Device

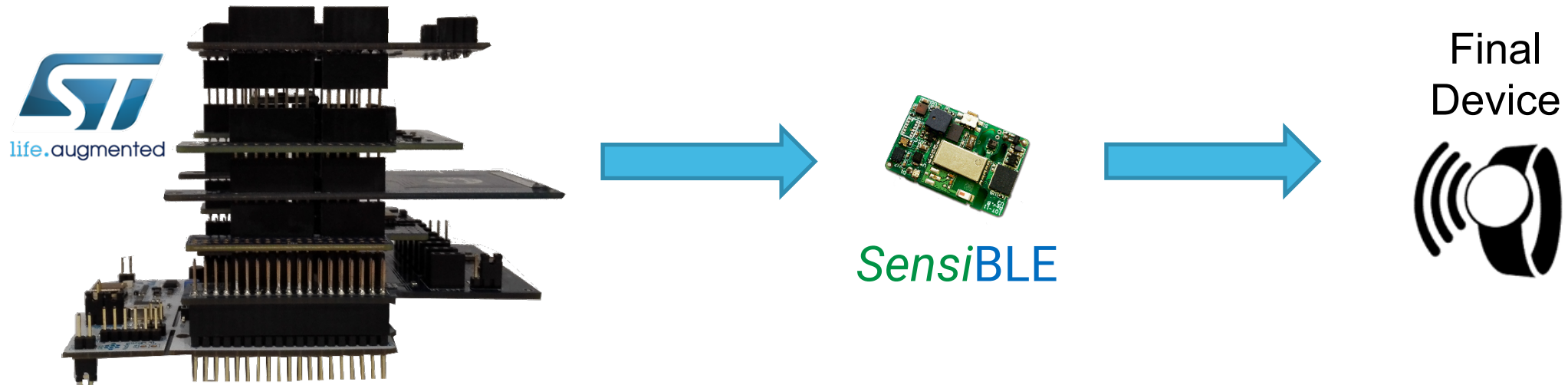


STMicroelectronics Partnership with Diolan
Form factor devices and customization

- Easy Porting of developed software to final product
- HW/SW optimization and support for production
- Small series Production

Honey, I Shrunk the Prototype!

4



Customize the HW and reuse the same SW!!!

Lowering the Barriers for Developers

Idea

The building blocks

Prototype

Optimized Design

Final product



Make or Buy



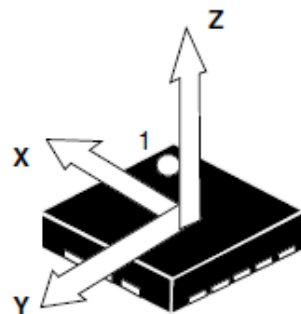
	MAKE (\$)	BUY (\$)
Engineering Costs	50k-100k	0
Yearly Maintenance Costs	5-10k	0
Cost per Unit (10K pcs)	40*10,000	49*10,000
Total	510000	490000
Breakeven in units	10,000 units	

Buy Fast Time to Market

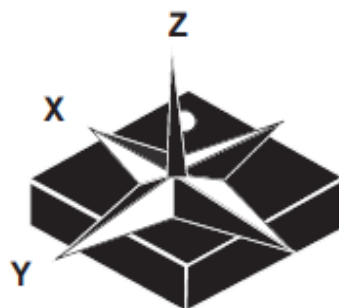
Reduce price- remove unused sensors (FoC)



3-axis
accelerometer



3-axis
magnetometer



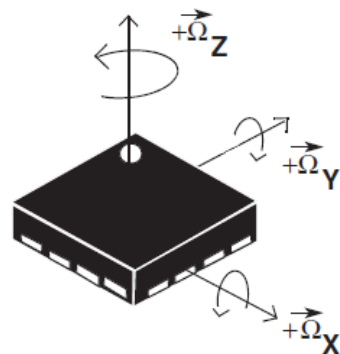
Humidity sensor



Microphone



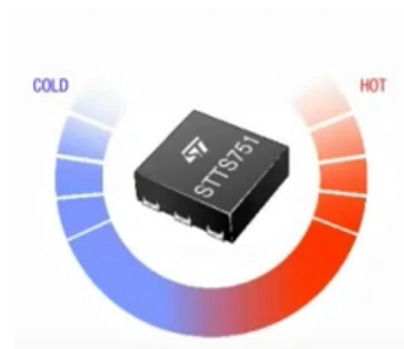
3-axis gyroscope



Pressure Sensor



Temperature



Ambient Light

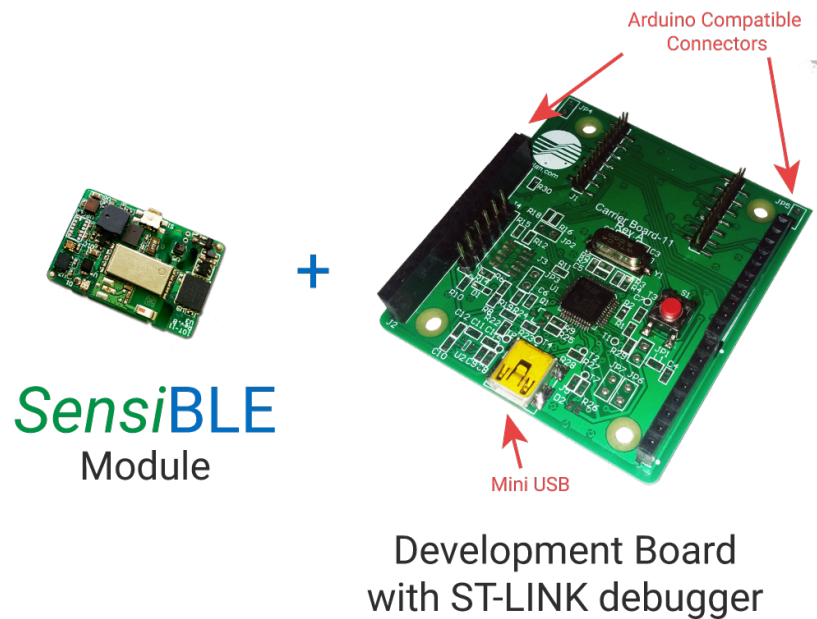


Setup *SensiBLE* HW & SW

8

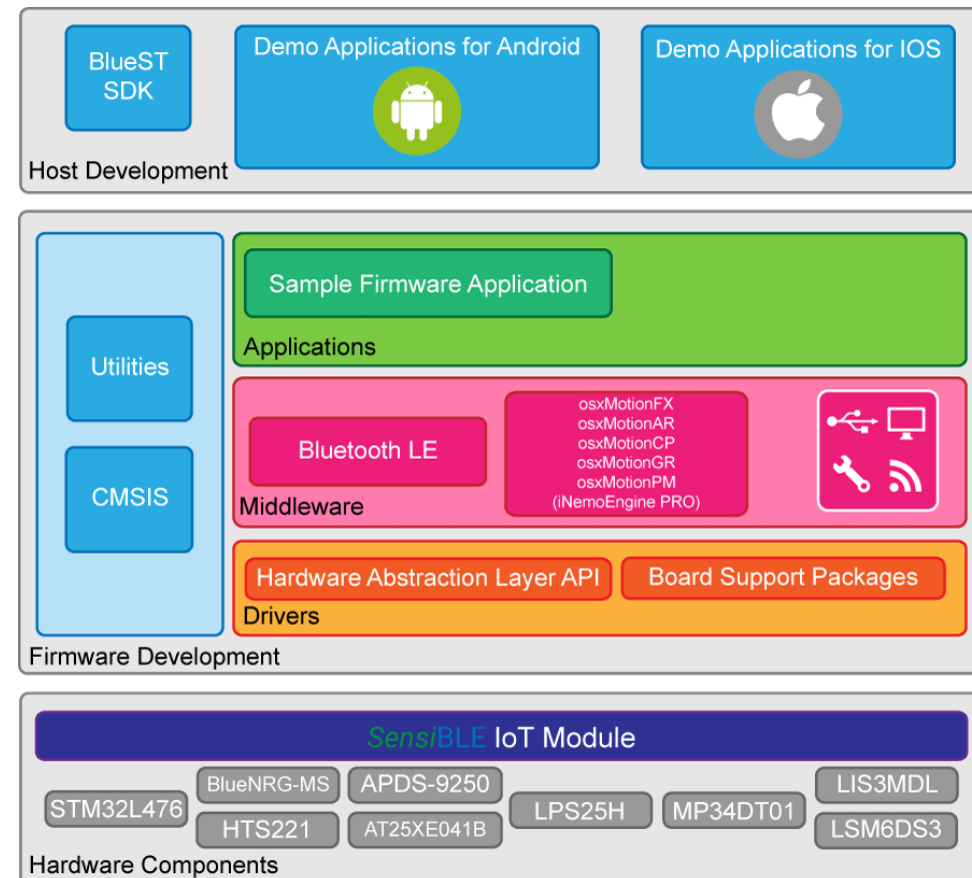
Hardware

SensiBLE Development Kit
with ST-LINK debugger

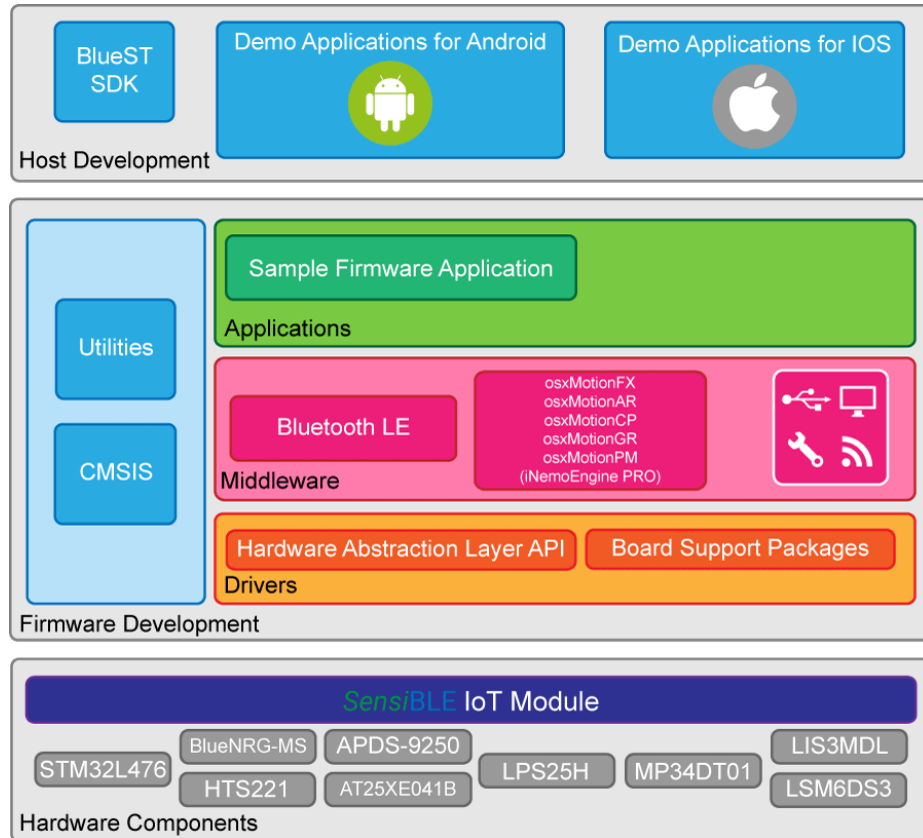


Software

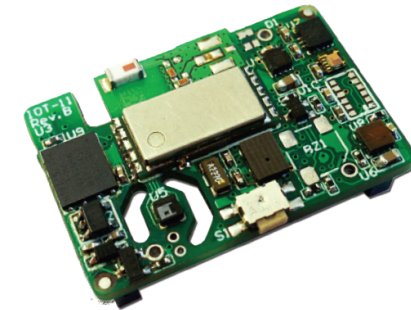
BlueMicrosystem1



Software Compatible



Transform *SensiBLE*
to
Your Product



- Download expansion software package, API and examples from STM Website, Compile, Program SensiBLE and start to:

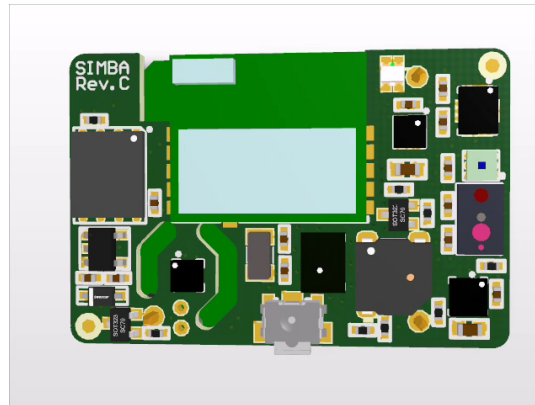
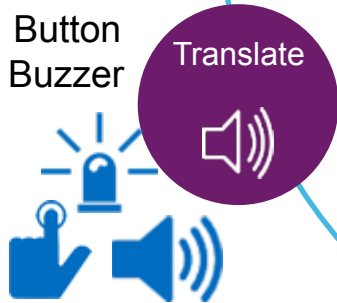
What is inside?



Motion sensor
Environmental sensor
Microphone
LightSensor



Led
Button
Buzzer



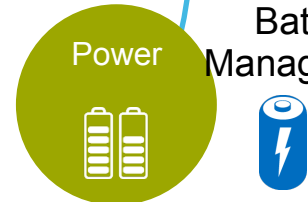
Connect



Control



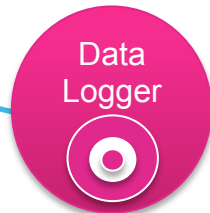
Power



Battery
Management

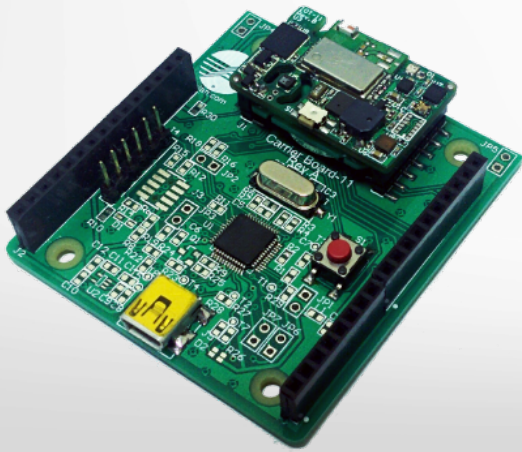


Data
Logger



Serial
Flash

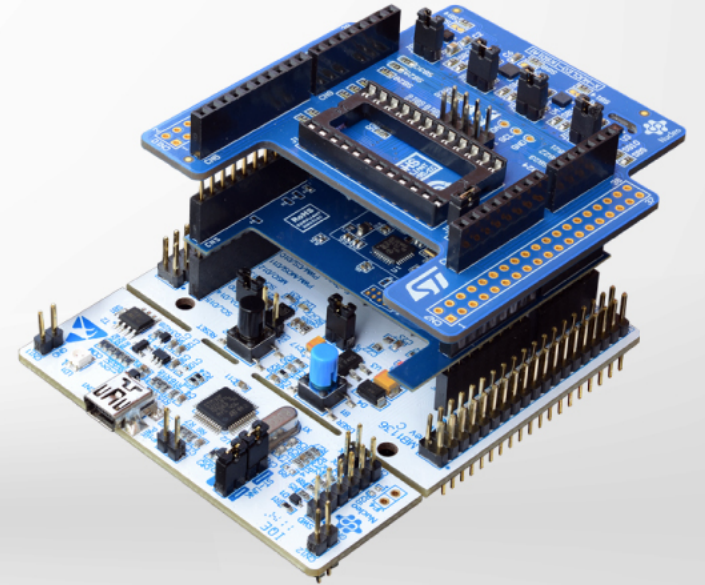




STM32 Open
Development
Environment

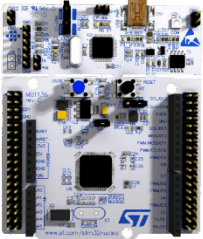
Jump start
your project

Develop and prototype innovative devices



Same STM32 Nucleo Development Boards – But Much Smaller


NUCLEO-L476RG



STM32Nucleo
(ARM M4 Core)



X-NUCLEO-IDB05A1



Bluetooth LE



X-NUCLEO-IKS01A1



3D accelerometer &
3D gyroscope



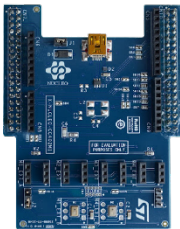
Temperature &
Humidity



Pressure



Magnetic



X-NUCLEO-CCA02M1



Digital Microphone



Data Logger



Light & Color
Detection



Buzzer

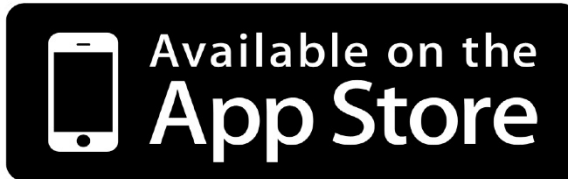
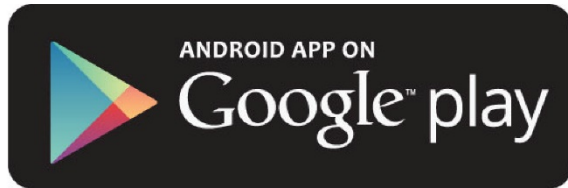
SensiBLE
IoT Module



**No soldering.
No components purchasing.
No hardware production plan.**

ST BLUEEMS App Installation – Step by Step

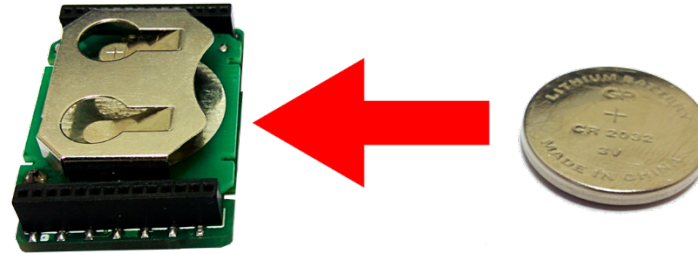
Download App



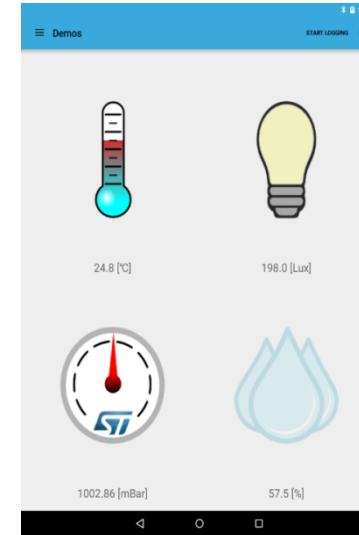
Download the ST BLUEEMS app from the Apple App Store or Google Play, and start the app on you smartphone/tablet

Insert Battery

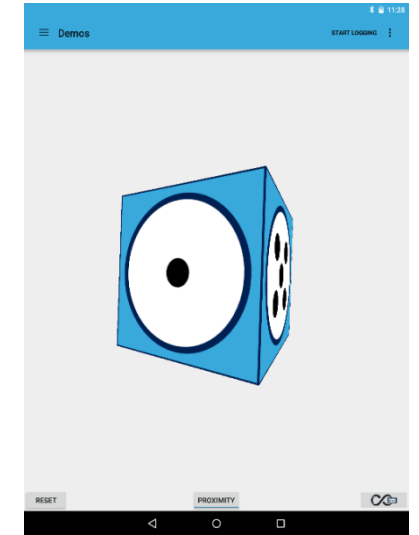
SensiBLE



Explore ST BLUEEMS App



Environmental Page



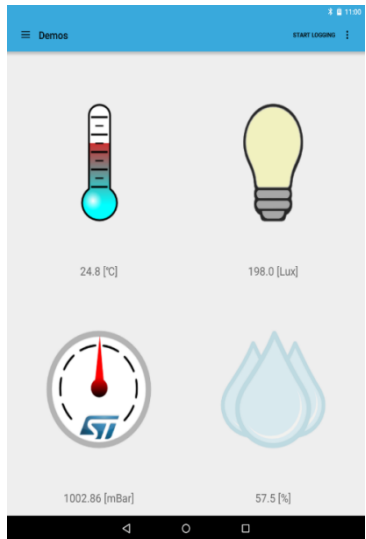
Sensor Fusion

Start Scanning. Select your SensiBLE from the device list. Choose sensor view page to see the sensor reading

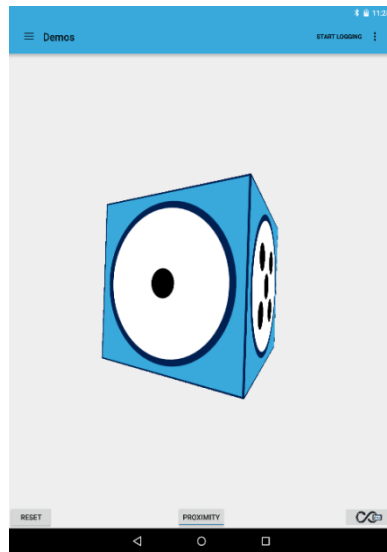
BLUEMICROSYSTEM2

BlueMS Application for Android/iOS

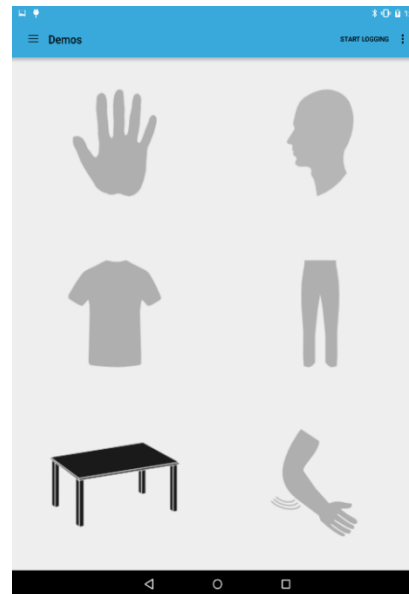
Environmental Page



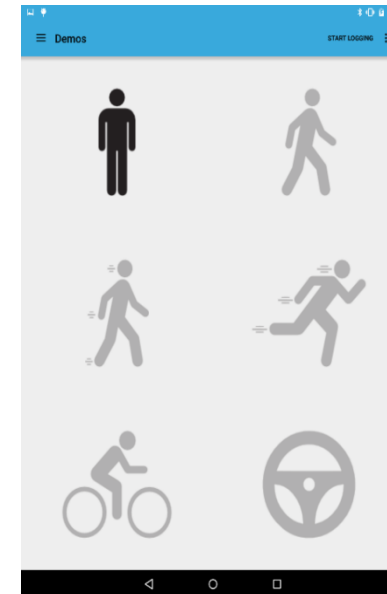
Sensor Fusion



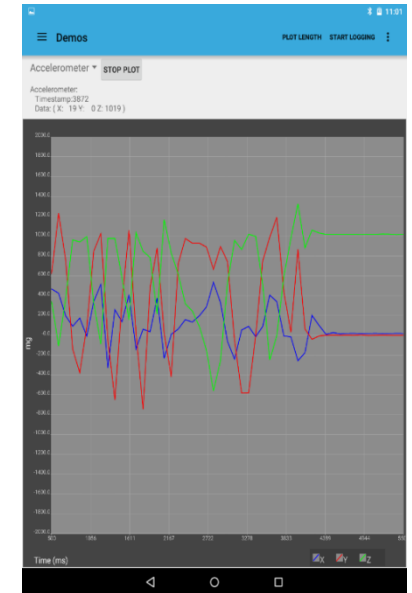
Carry Position



Activity Recognition

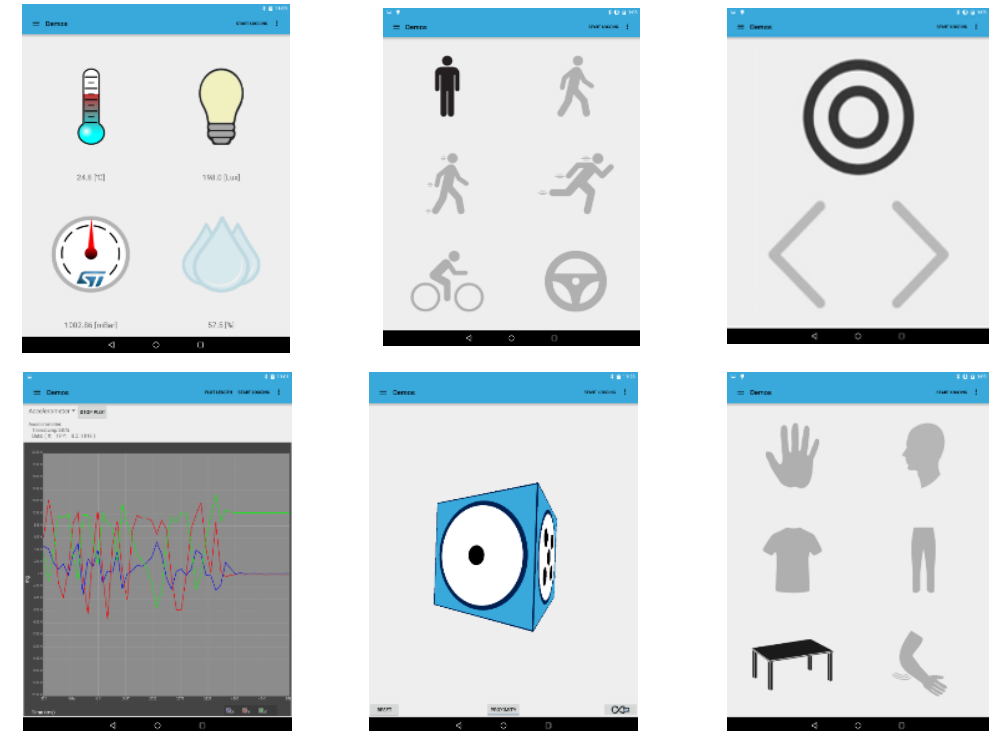
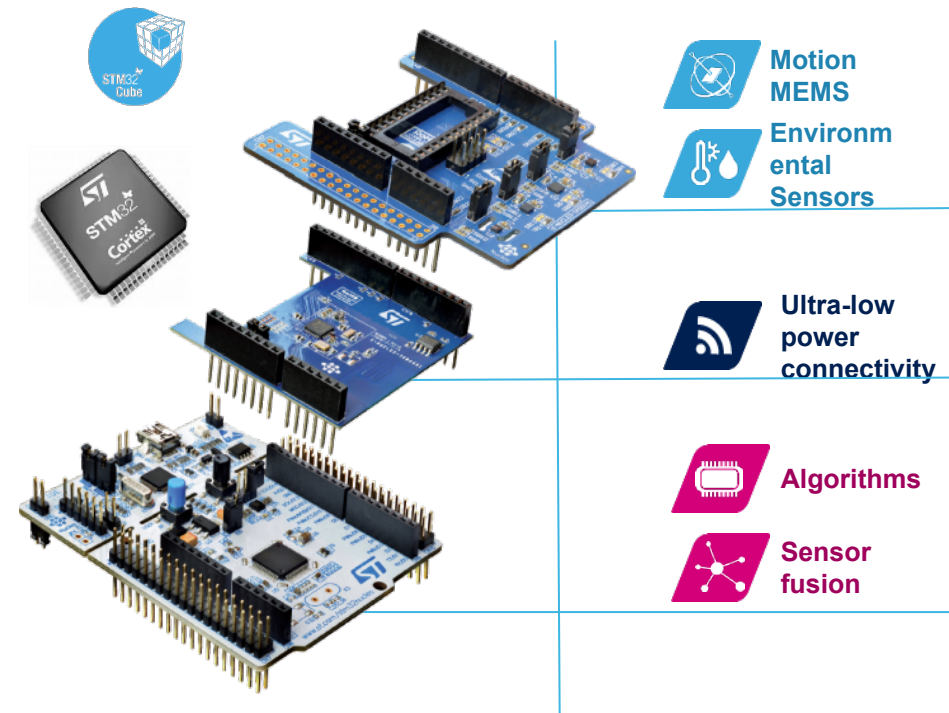


Plot Capability



BLUEMICROSYSTEM

Simplified development of BLE applications for smartphones



Simplified development of BLE applications for smartphones

- Very low power Bluetooth Low Energy (BlueNRG) single-mode network processor
- Embedded software for real-time motion sensor data fusion, activity and gesture recognition, free fall detection
- Companion App freely available in source code for iOS and Android

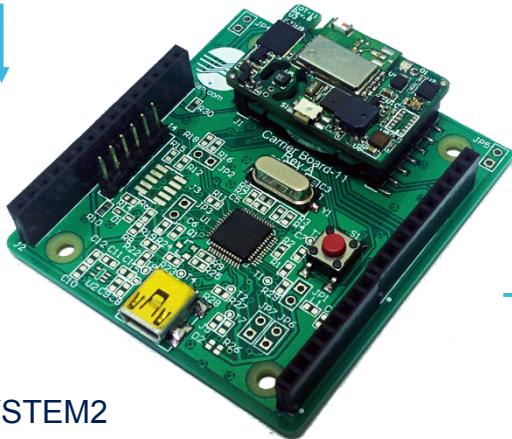
BlueMicrosystem1 or 2 Download & Install



1 st.com/bluemicrosystem2

life.augmented
www.st.com

2
Select
BLUEMICROSYSTEM2
BLUEMICROSYSTEM1



3
Download & Unpack

BLUEMICROSYSTEM2 Package Structure

Name	
_htmresc	
Documentation	← Docs
Drivers	← BSP, HAL and drivers
Middlewares	← BlueNRG, OSX Library
Projects	← Application example
Utilities	← Boot loader binary
package.xml	
Release_Notes.html	4

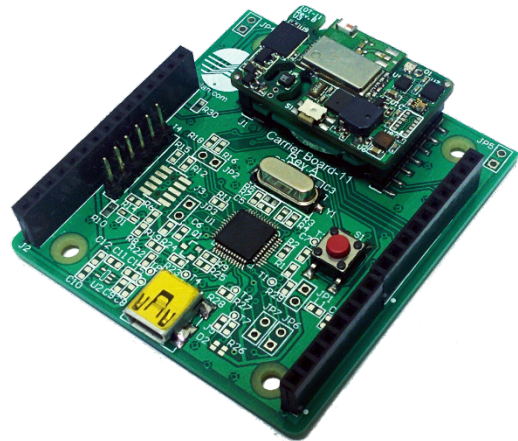
.\Projects\Multi\Applications\BlueMicrosystem2\EWARM\STM32F476RE-Nucleo

6
Android™/iOS™
smartphone and
BlueMS application





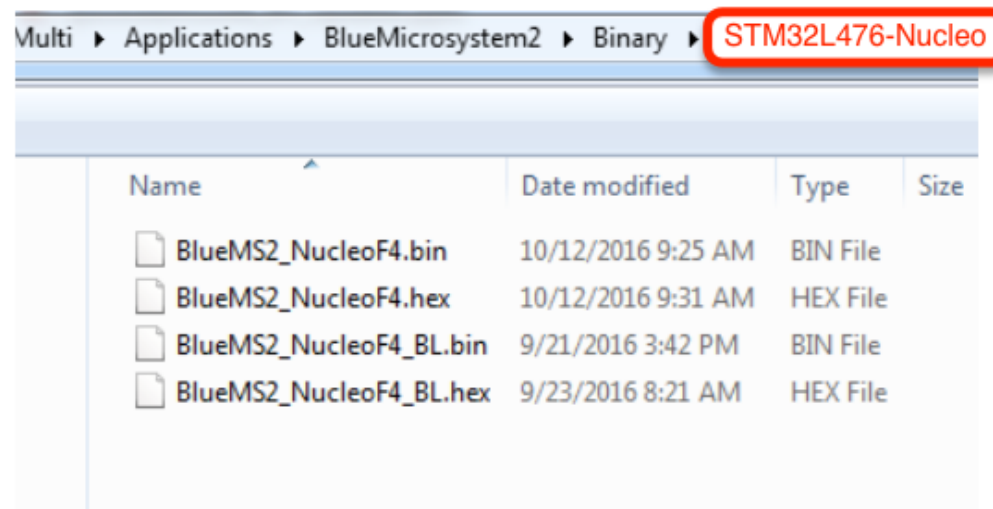
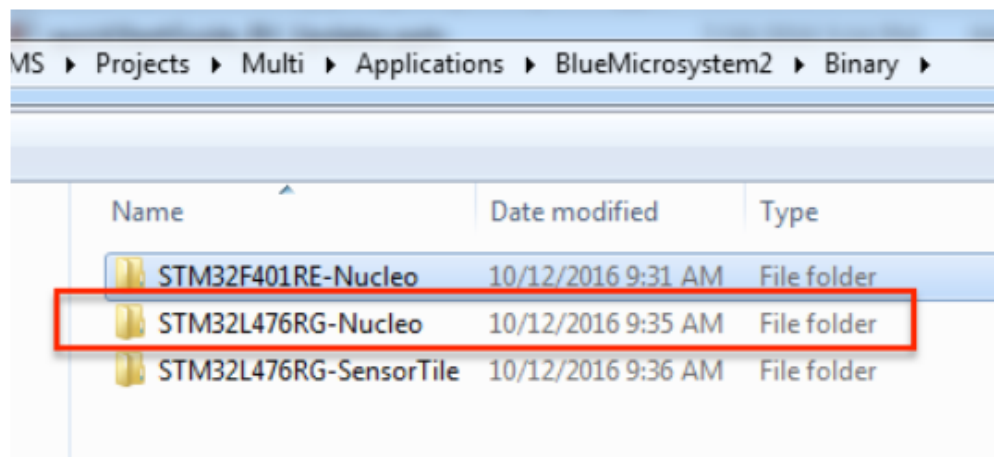
5
Compile/Flash and
Run the project



IMPORTANT:
Read the chapter “The Boot Process”
on user manual for understanding how
to install the Boot Loader on the board

Installation procedure (1/2) – Step by Step

1. How to install the pre-compiled binary:
 - There is inside the package one folder called “Binary”
 - For SensiBLE use STM32L476RG-Nucleo



- It contains:

1. pre-compiled BLUEMICROSYSTEM2 FW that could be flashed to a SensiBLE using SIM-DKL (0x08004000)

Important Note: this pre-compiled binary is compatible with the FOTA update procedure

2. pre-compiled BLUEMICROSYSTEM2+BootLoader FW that could be directly flashed to SensiBLE using “Drag & Drop”

Important Note: this pre-compiled binary is not compatible with the FOTA update procedure

Installation procedure (2/2) – Step by Step

2. How Install the code after compiling the project:

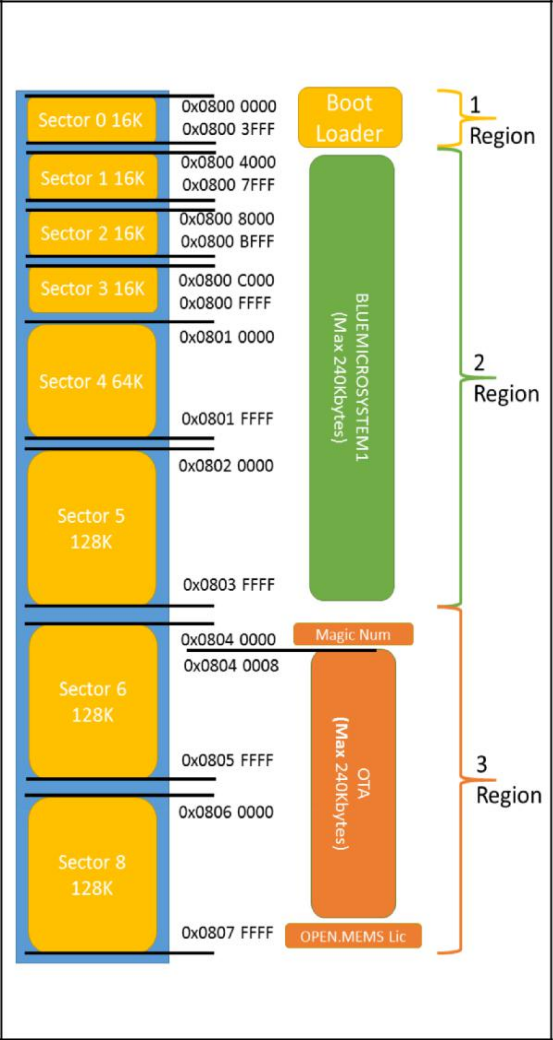


- Compile the project with your preferred IDE
- On Windows: for each IDE and for each platform there is one batch script:
 - IAR toolchain Embedded Workbench V7.70.1: (CleanBlueMS2_IAR_F4.bat, CleanBlueMS2_IAR_L4.bat CleanBlueMS2_IAR_ST.bat)
 - System Workbench for STM32 Version 1.10.0.201607261143: (CleanBlueMS2_SW4STM32_F4.bat, CleanBlueMS2_SW4STM32_L4.bat CleanBlueMS2_SW4STM32_ST.bat)
 - µVision toolchain - MDK-ARM Professional Version: 5.17.0: (CleanBlueMS2_MDK-ARM_F4.bat, CleanBlueMS2_MDK-ARM_L4.bat CleanBlueMS2_MDK-ARM_ST.bat)
- For Linux/iOS: only for Openstm32 IDE and for each platform there is one OpenOCD called:
 - CleanBlueMS2_SW4STM32_F4.sh
 - CleanBlueMS2_SW4STM32_L4.sh.
 - CleanBlueMS2_SW4STM32_ST.sh

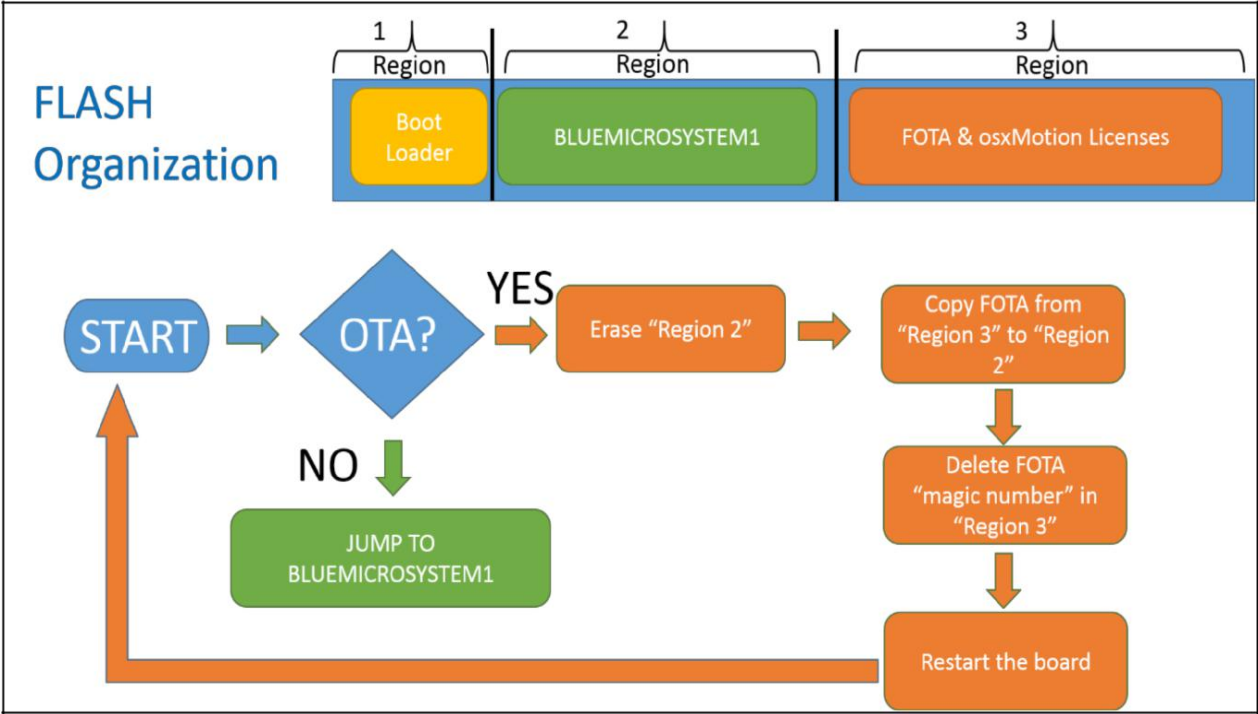
It's necessary to edit this file for setting the right installation and Library path

- These scripts perform the following steps:
 1. Full Flash Erase
 2. Flash the right BootLoader at the right position (0x08000000)
 3. Flash the BLUEMICROSYSTEM2 firmware at the right position (0x08004000)
 - This is the firmware that was compiled with the IDE
 - This firmware is compatible with the FOTA update procedure
 4. Save a complete Binary FW that includes both BLUEMICROSYSTEM2 and the BootLoader
 - This binary can be directly flashed to a supported SensiBLE by doing “Drag & Drop”
 - Important Note: this additional pre-compiled binary is not compatible with the FOTA update procedure

Flash Management and Boot Process



BLUEMICROSYSTEM2 Flash structure

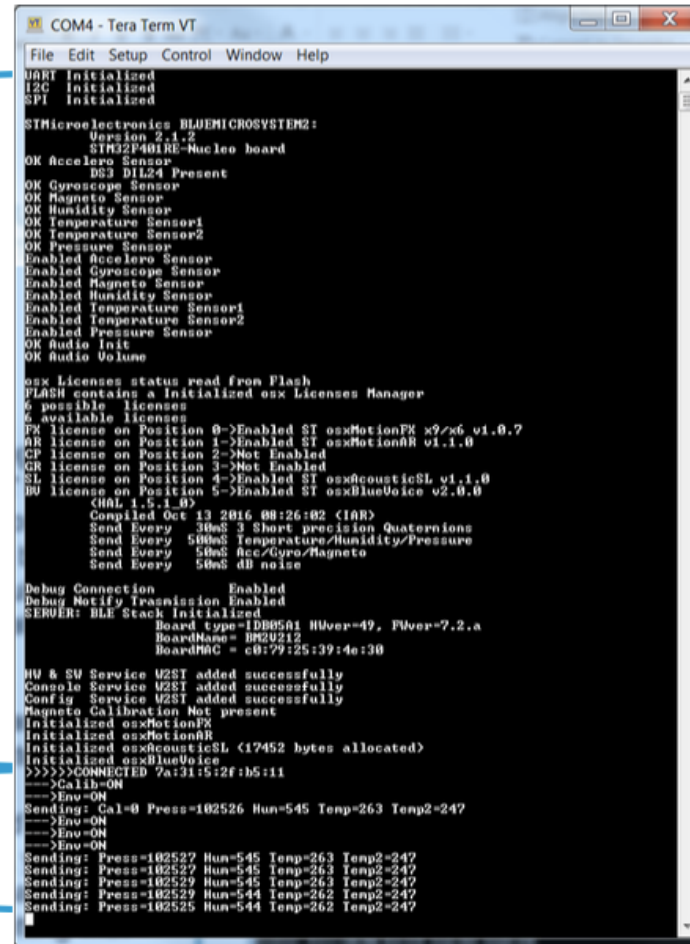


BLUEMICROSYSTEM2 boot sequence

Using serial line monitor – e.g. TeraTerm

Pressing the RESET User button on STM32 Nucleo board. You could see the initialization phase

When are connected with one Android™/iOS™ device, you could see what are you transmitting with BLE.



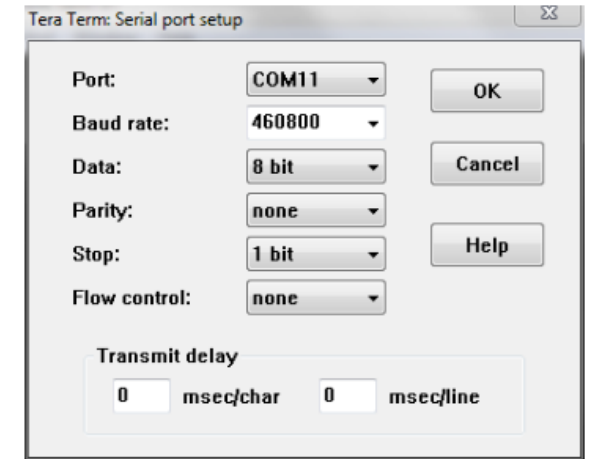
```
COM4 - Tera Term VT
File Edit Setup Control Window Help
UART Initialized
I2C Initialized
SPI Initialized

STMicroelectronics BLUEMICROSYSTEM2:
Version 2.1.2
STM32F401RE-Nucleo board
OK Accelerometer
DS3 D1L24 Present
OK Gyroscope Sensor
OK Magneto Sensor
OK Humidity Sensor
OK Temperature Sensor1
OK Temperature Sensor2
OK Pressure Sensor
Enabled Accelerometer Sensor
Enabled Gyroscope Sensor
Enabled Magneto Sensor
Enabled Humidity Sensor
Enabled Temperature Sensor1
Enabled Temperature Sensor2
Enabled Pressure Sensor
OK Audio Init
OK Audio Volume

osx Licenses status read from Flash
FLASH contains a initialized osx Licenses Manager
4 possible licenses
4 available licenses
FX license on Position 0->Enabled ST osxMotionFX v9/x6 v1.0.7
NR license on Position 1->Enabled ST osxMotionNR v1.1.0
GP license on Position 2->Not Enabled
GR license on Position 3->Not Enabled
SL license on Position 4->Enabled ST osxAcousticSL v1.1.0
BU license on Position 5->Enabled ST osxBlueVoice v2.0.0
(CHAL 1.5.1.0)
Compiled Oct 13 2016 08:26:02 (IAR)
Send Every 30ms 3 Short precision Quaternions
Send Every 500ms Temperature/Humidity/Pressure
Send Every 50ms Acc/Gyro/Magneto
Send Every 50ms dB noise

Debug Connection Enabled
Debug Notify Transmission Enabled
SERVER: BLE Stack initialized
Board type=IDB05A1 HWVer=49, FWVer=7.2.a
BoardName= BM2U212
BoardMAC= c0:79:25:39:4e:30

HW & SW Service U2ST added successfully
Console Service U2ST added successfully
Config Service U2ST added successfully
Magnetometer Calibration Not present
Initialized osxMotionFX
Initialized osxMotionNR
Initialized osxAcousticSL (17452 bytes allocated)
Initialized osxBlueVoice
>>>>>CONNECTED 7a:31:52:f:b5:11
-->Calib-ON
-->Env-ON
Sending: Cal=0 Press=102526 Hun=545 Temp=263 Temp2=247
-->Env-ON
-->Env-ON
Sending: Press=102527 Hun=545 Temp=263 Temp2=247
Sending: Press=102527 Hun=545 Temp=263 Temp2=247
Sending: Press=102529 Hun=545 Temp=263 Temp2=247
Sending: Press=102529 Hun=544 Temp=262 Temp2=247
Sending: Press=102525 Hun=544 Temp=262 Temp2=247
```



Tera Term: Serial port setup

Port: COM11 OK

Baud rate: 460800 Cancel

Data: 8 bit

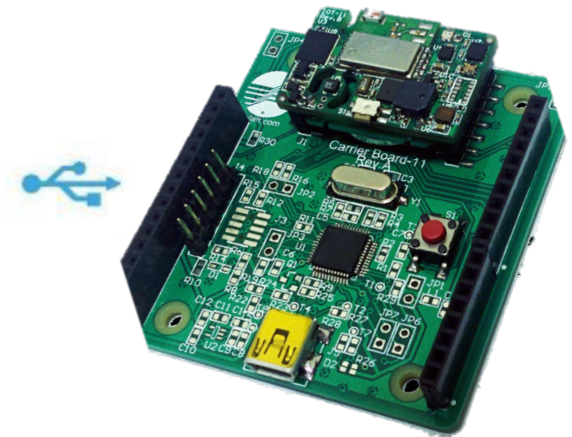
Parity: none Help

Stop: 1 bit

Flow control: none

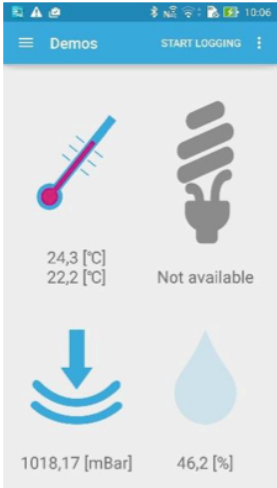
Transmit delay
0 msec/char 0 msec/line

Configure the serial line monitor (speed, LF)



BlueMS Application for Android/iOS (1/6)

Hardware Features – Android Version



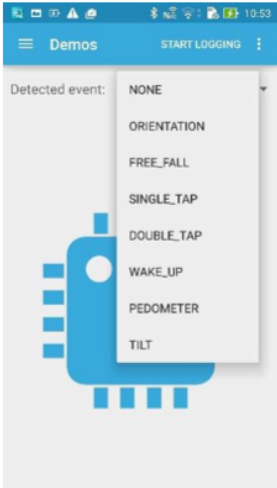
Environmental page



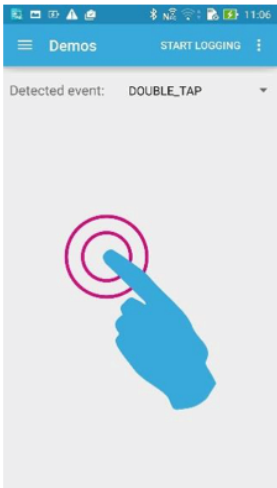
Accelerometer plot



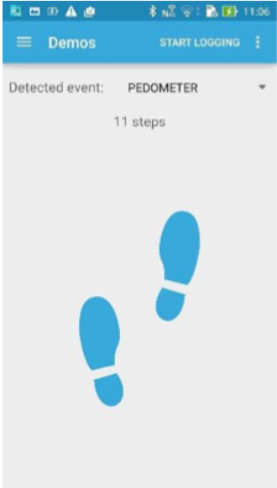
Microphones level plot



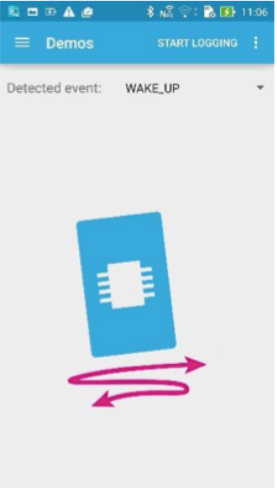
DS3/DSM Events



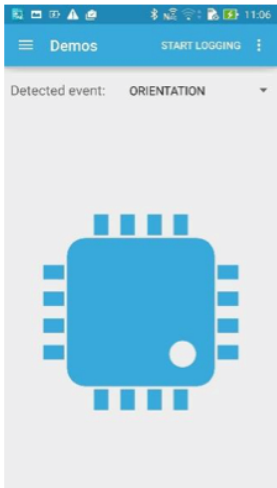
DS3/DSM Event: Double Tap



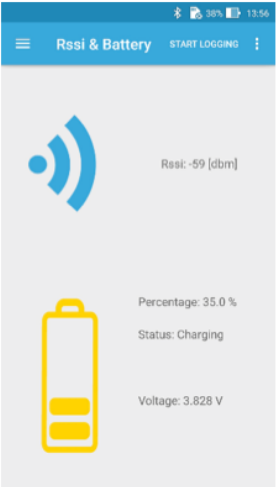
DS3/DSM Event: Pedometer



DS3/DSM Event: Wake Up



DS3/DSM Event: Orientation



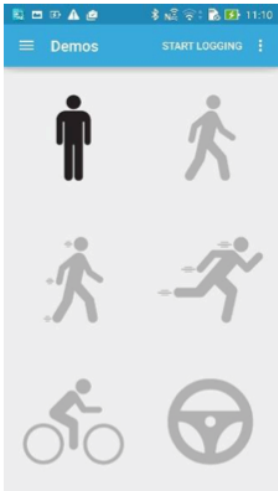
RSS & Battery Page

BlueMS Application for Android/iOS (2/6)

OPEN.MEMS Library
Android version



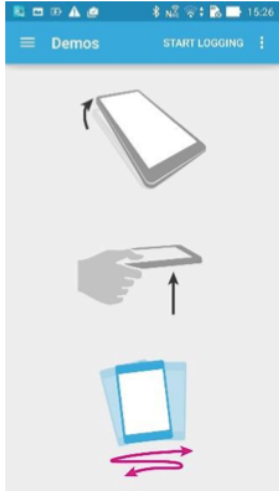
osxMotionFX sensor fusion page



osxMotionAR activity recognition page

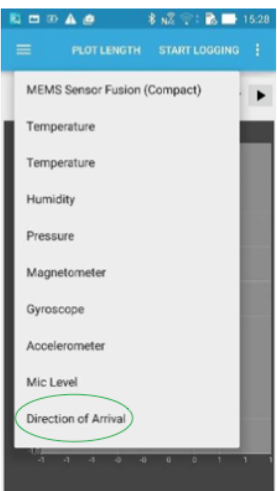


osxMotionCP carry position recognition page

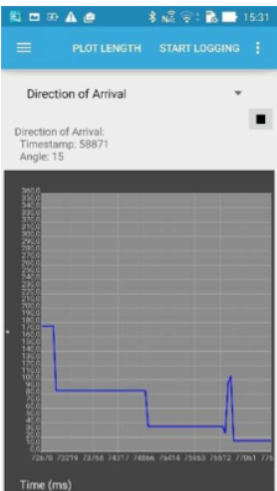


osxMotionGR gesture recognition page

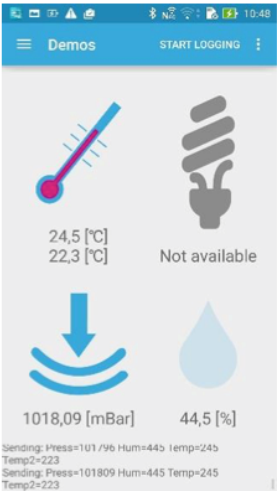
OPEN.AUDIO Library
Android version



osxAcousticSL - audio source localization plot value



Console
Android version



Serial Console (stdout/stderr)

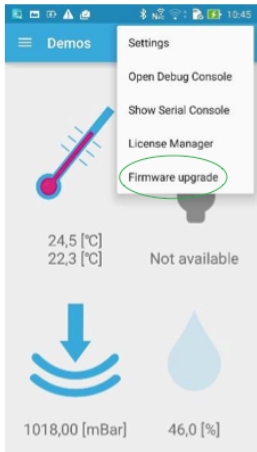


Debug Console (stdin/stdout/stderr)

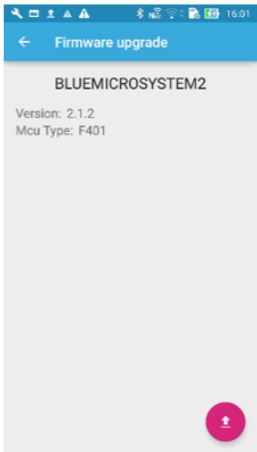
BlueMS Application for Android/iOS (3/6)

BlueMS Application for Android/iOS (3/6)

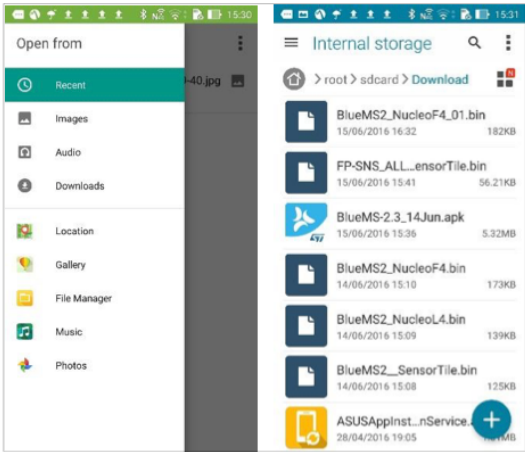
Firmware Upgrade – Android version



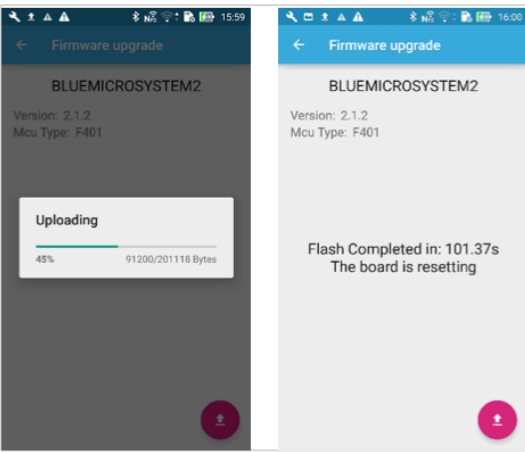
BlueMS: menu option



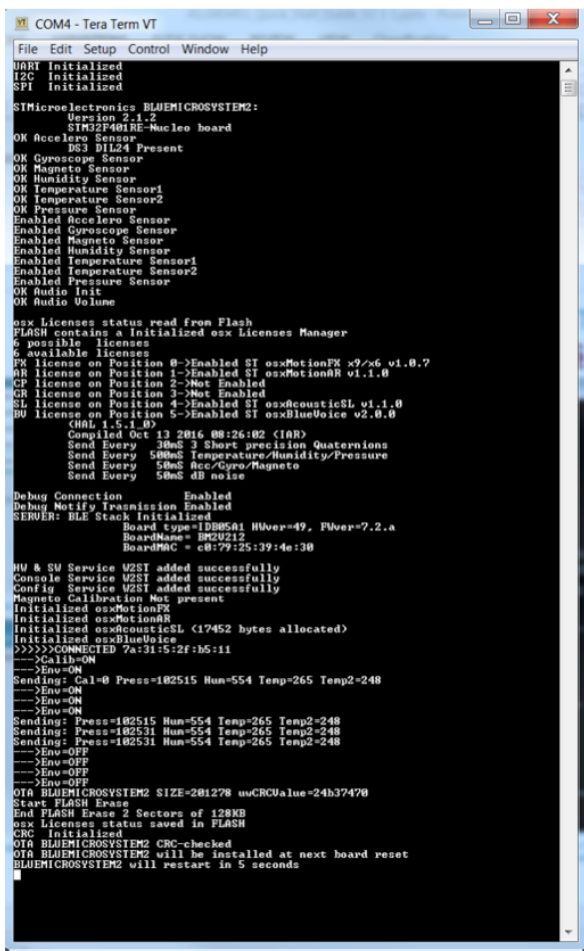
BlueMS: Firmware upgrade page



BlueMS: Firmware update file selection



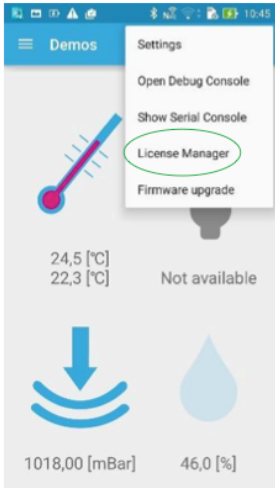
BlueMS: application page during FOTA and on completion



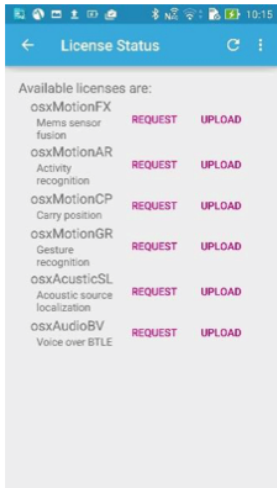
Terminal window information during FOTA for STM32 Nucleo F4/L4 (For SensorTile only if enabled the serial console)

BlueMS Application for Android/iOS (4/6)

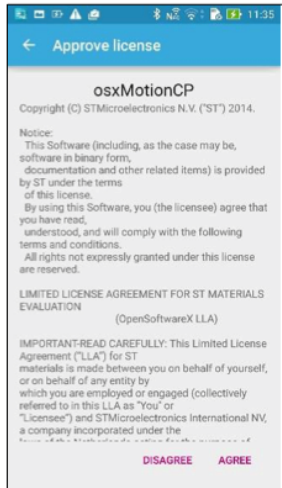
License Manager – Android version



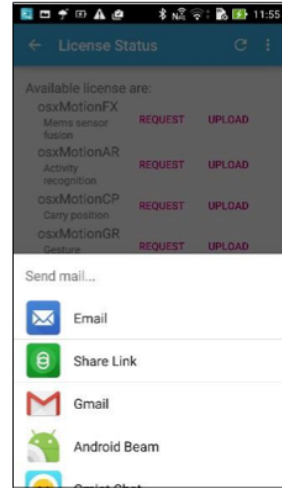
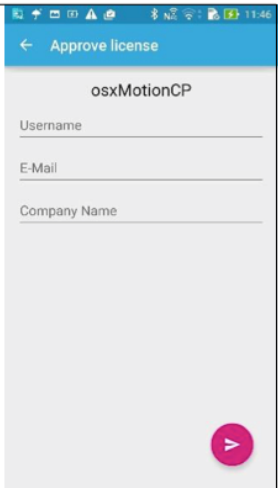
BlueMS: menu option



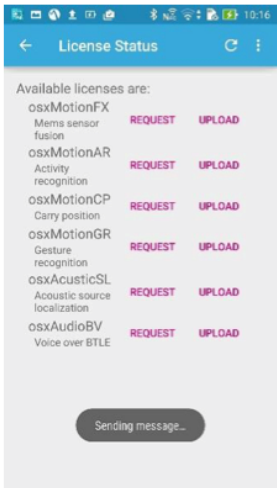
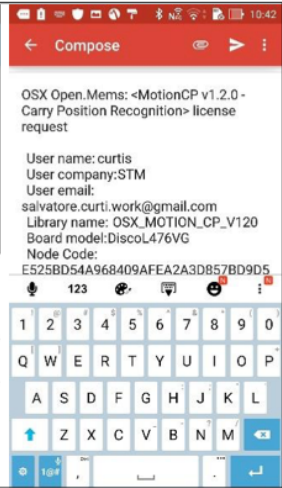
BlueMS: License status page



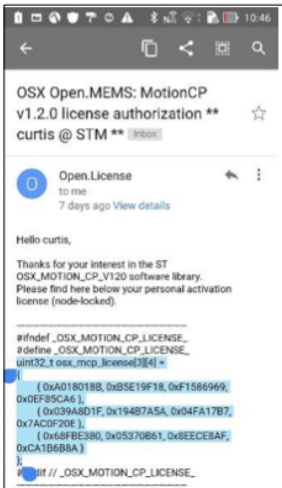
BlueMS: osxMotionCP license request



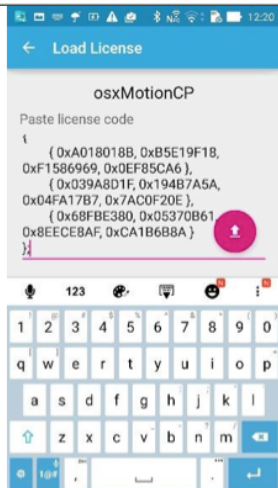
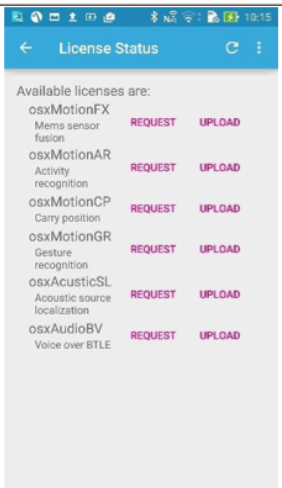
BlueMS: Generated license request email



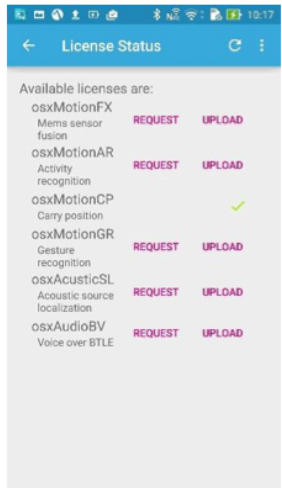
BlueMS: Send request email



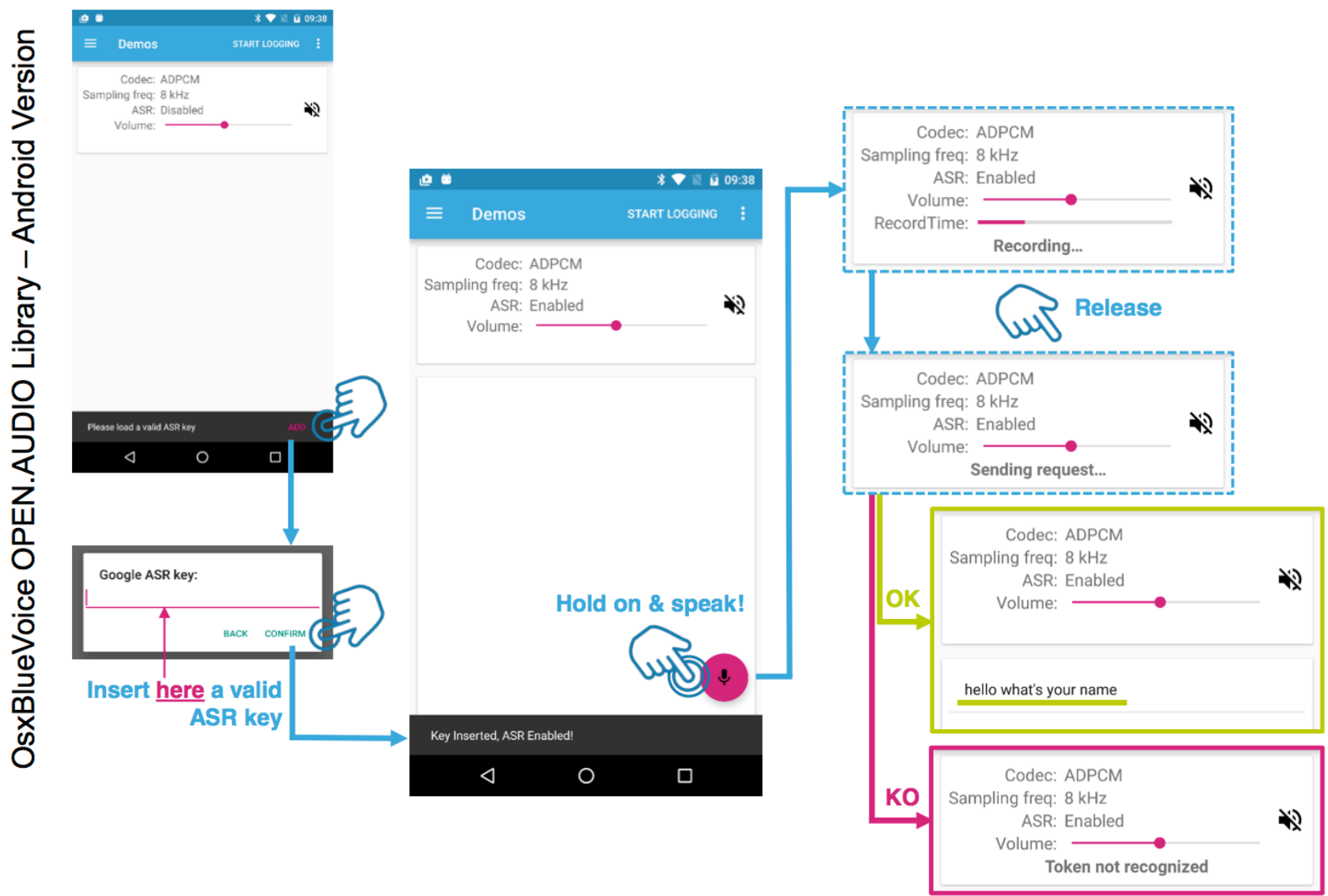
BlueMS: Copy license details, select UPLOAD and paste



BlueMS: osxMotionCP license enabled



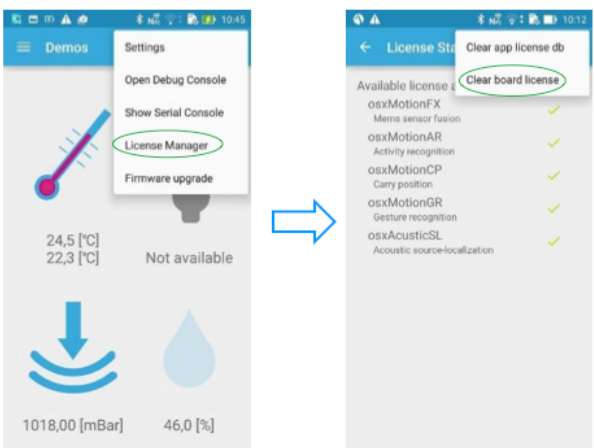
BlueMS Application for Android/iOS (5/6)



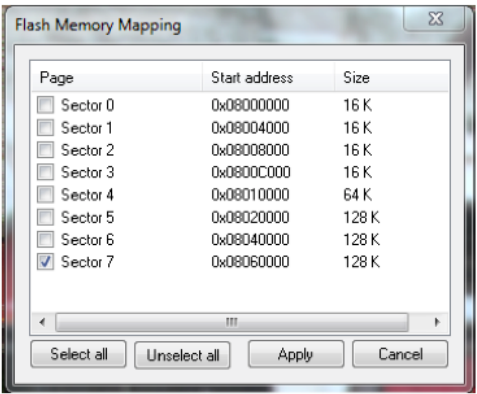
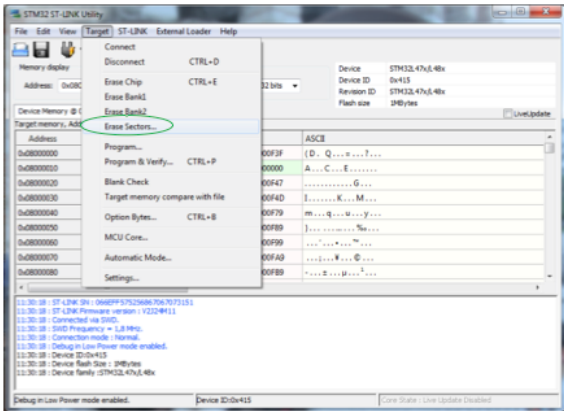
BlueMS Application for Android/iOS (6/6)

- Clear licenses before load a new firmware that uses the same license manager

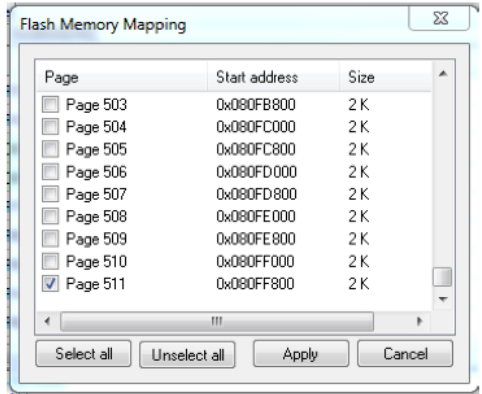
- Using BlueMS application



- Flash erase using ST-LINK:



Select sector 7 for F4

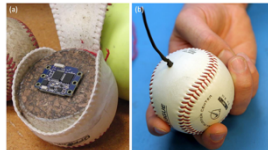
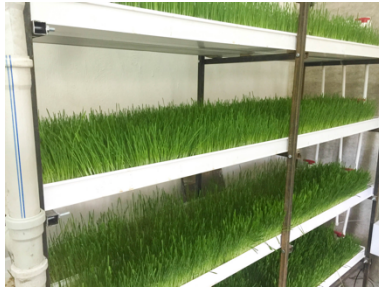


Select page 511 for L4

License Manager – Known Issue

SensiEDGE Vision

Simplify & Accelerate
the creation of Connected Sensors



For more information about

*Sensi*BLE

Contact : info@SensiEDGE.com