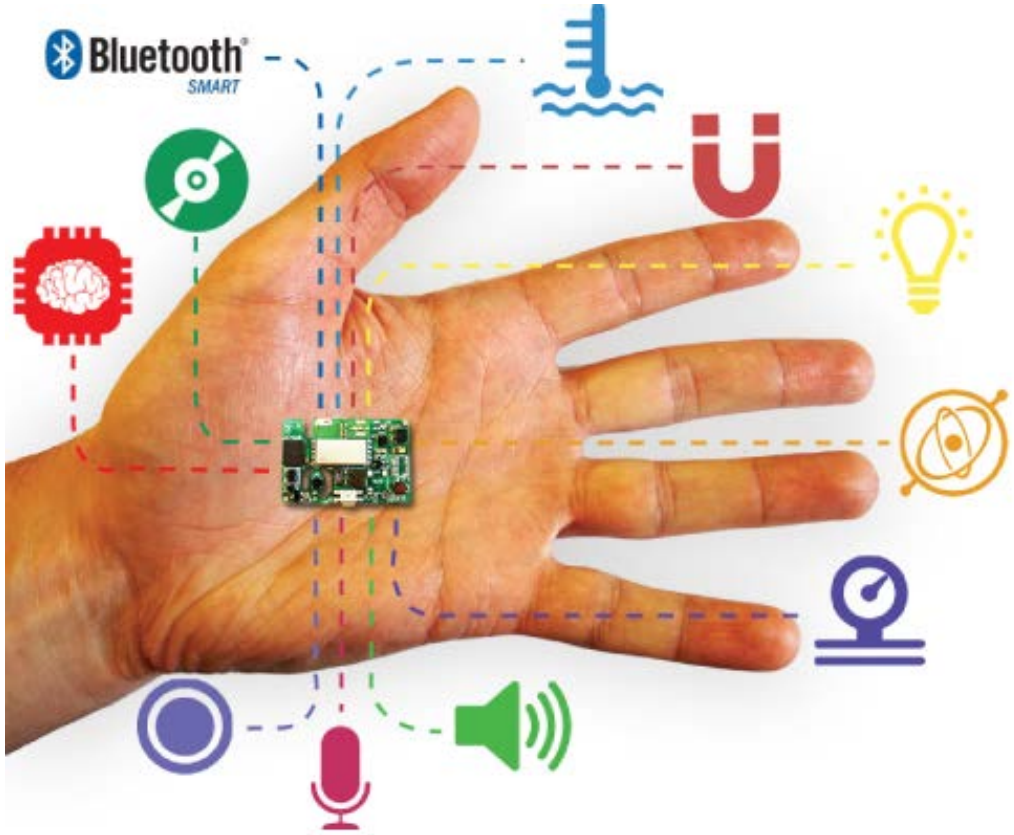
*Sensi*BLE Getting Started



Your Idea - Worth come true

SensiEDGE
Simplify & Accelerate

From Idea to Form Factor Device

The building blocks | Your need | Prototype | Form Factor

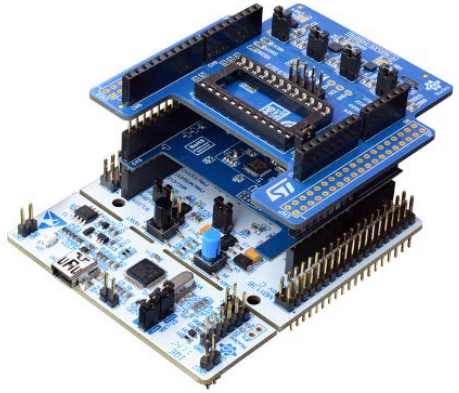
- Sensors
- Connectivity
- Audio
- Actuators
- Power
- Processing
- Software

- Motion & Environ. Sensors
- Bluetooth Low Energy
- Wi-Fi
- Sub-GHZ
- NFC
- Microphone
- Motor control
- Microcontroller

Integrated Development Environment and Middleware

Processor Boards
Expansion Boards

STM32 Open Development Environment



*Sensi*BLE

Every Idea
Worth Come True

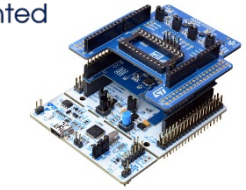
SensiEDGE
Simplify & Accelerate

www.st.com/stm32ode

From Prototype to Final Product

ST Partnership with Diolan - Form factor devices and customization

life.augmented



Modular Blocks
Prototyping

*Sensi*BLE

Form Factor
Field testing

*Sensi*BLE

Optimized Design
Volume Production

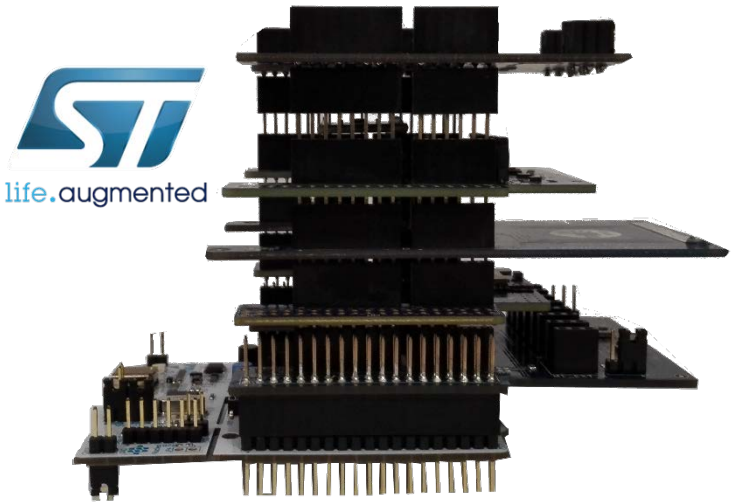
Final Device

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

SensiEDGE
Simplify & Accelerate

Honey, I Shrunk the Prototype!



*Sensi*BLE

Final Device

Customize the HW and reuse the same SW!!!

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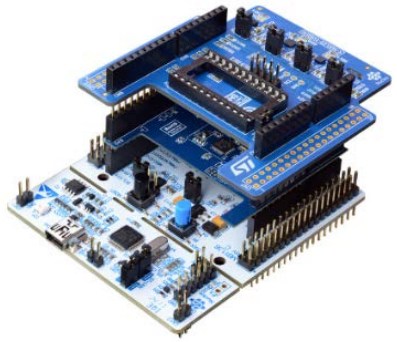
Simplify & Accelerate

Lowering the Barriers for Developers

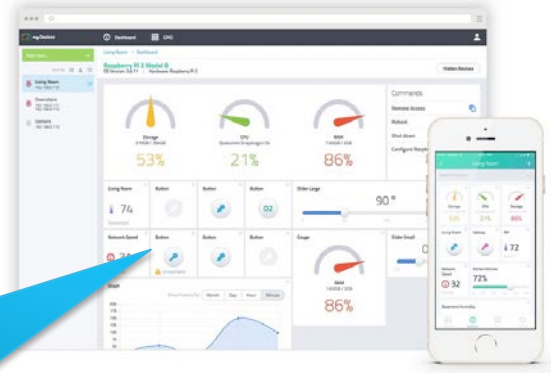
Idea → The building blocks → Prototype → Optimized Design → Final product

Idea

- Sensors
- Connectivity
- Audio
- Actuators
- Power
- Processing
- Software



*Sensi*BLE



Market

SensiEDGE
Simplify & Accelerate

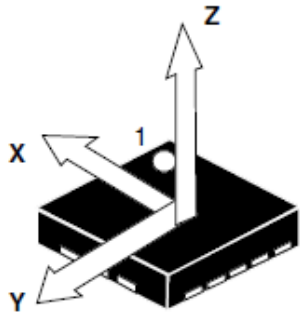
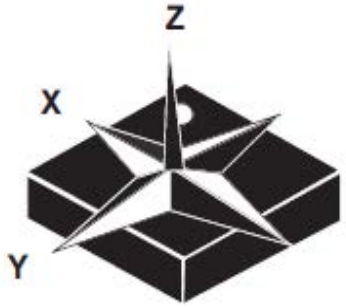
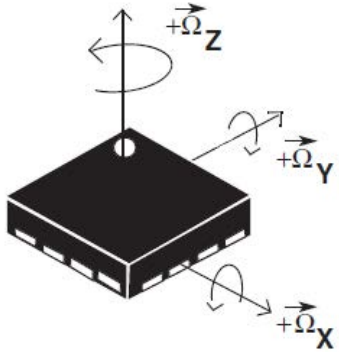
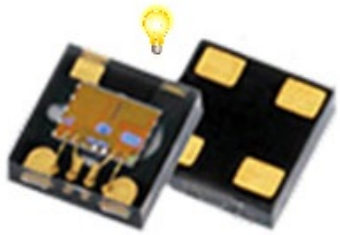
Make or Buy

	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

SensiEDGE
Simplify & Accelerate

Reduce price- remove unused sensors (FoC)

3-axis accelerometer 	3-axis magnetometer 	Humidity sensor 	Microphone 
3-axis gyroscope 	Pressure Sensor 	Temperature 	Ambient Light 

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Simplify & Accelerate

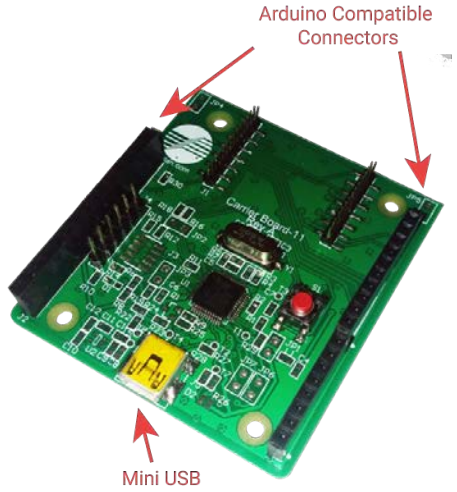
Setup *Sensi*BLE HW & SW

Hardware

*Sensi*BLE Development Kit
with ST-LINK debugger

*Sensi*BLE
Module

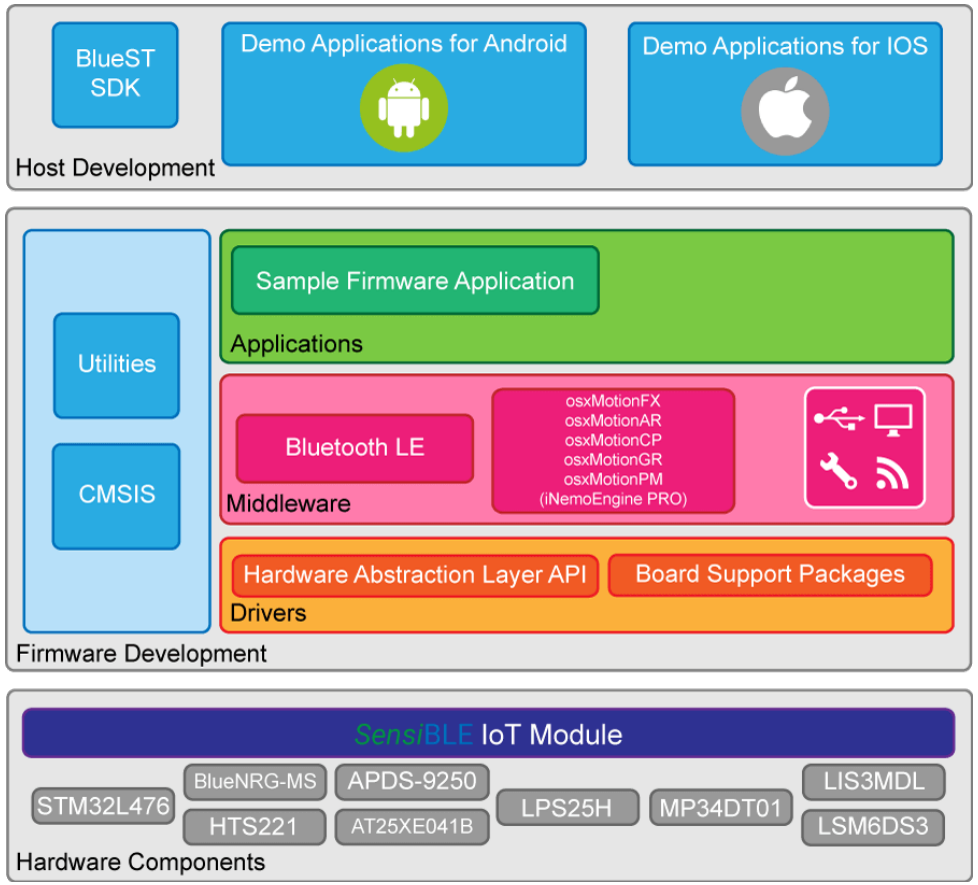
+



Development Board
with ST-LINK debugger

Software

BlueMicrosystem1



SensiEDGE
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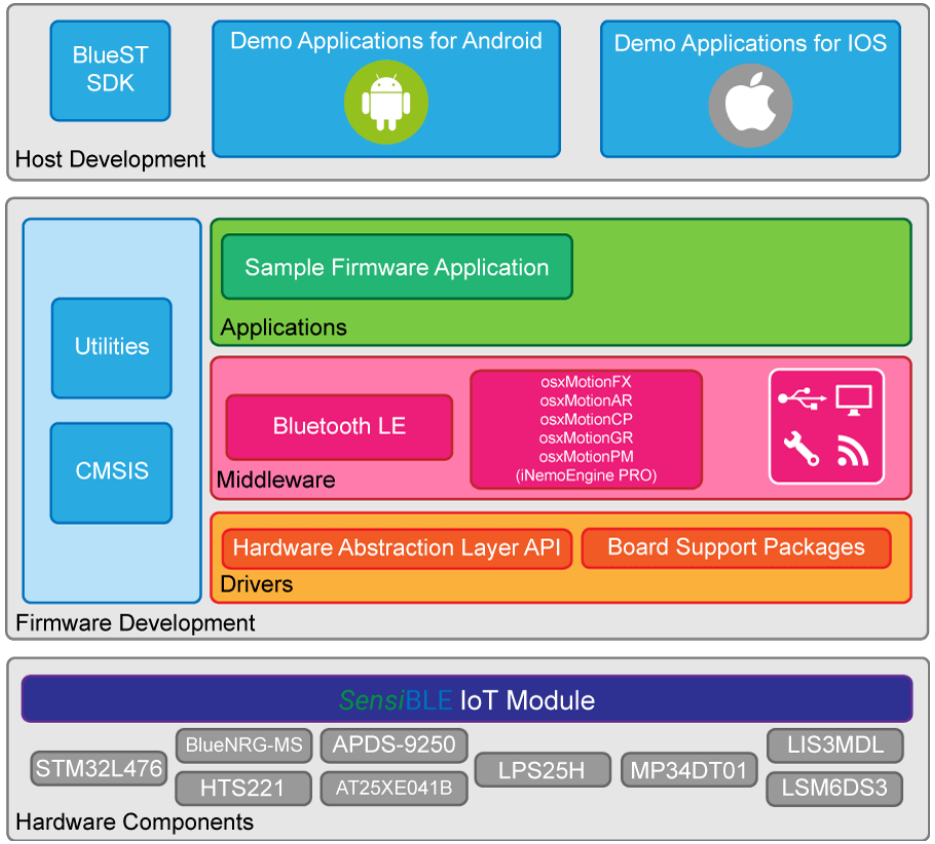
Software Compatible



Transform *Sensi*BLE to Your Product

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

SensiEDGE
Simplify & Accelerate

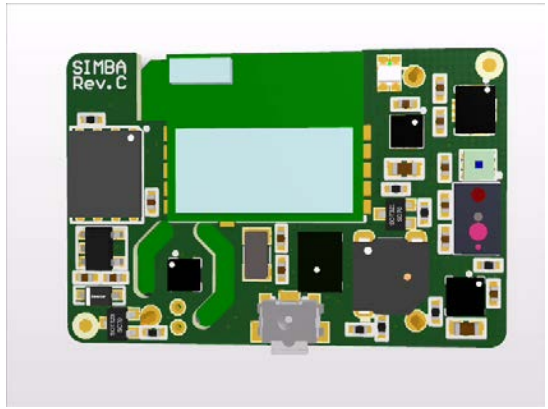
What is inside?

life.augmented

Connect

Sense

Motion sensor
Environmental sensor
Microphone
LightSensor



Control

STM32 L4

Translate

Led
Button
Buzzer

Power

Battery
Management

Data
Logger

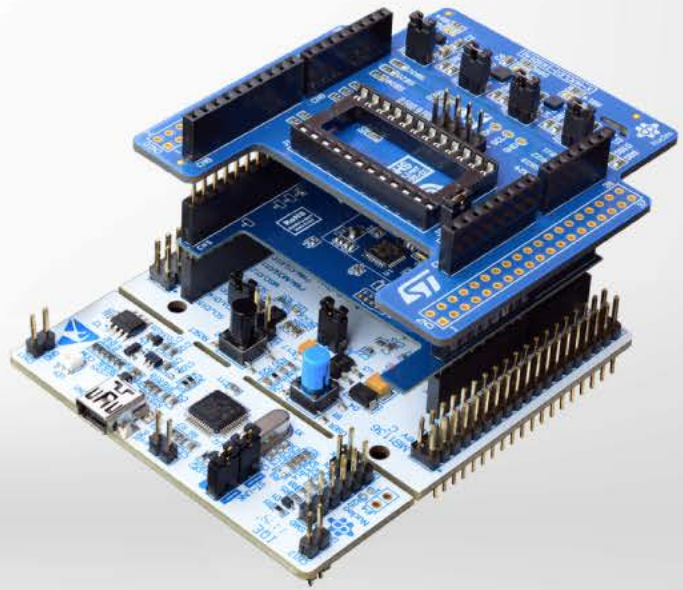
Serial
Flash

SensiEDGE
Simplify & Accelerate

STM32 Open Development Environment

Jump start your project

Develop and prototype innovative devices



SensiEDGE
Simplify & Accelerate

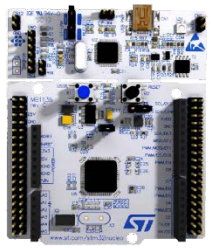
Same STM32 Nucleo Development Boards – But Much Smaller

X-NUCLEO-IDB05A1

Bluetooth® SMART Bluetooth LE

+

NUCLEO-L476RG



STM32Nucleo
(ARM M4 Core)

+

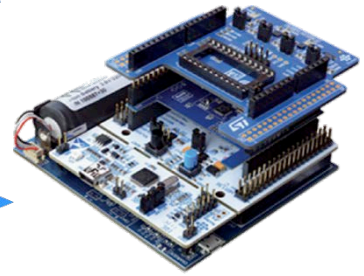
X-NUCLEO-IKS01A1

- 3D accelerometer & 3D gyroscope
- Temperature & Humidity
- Pressure
- Magnetic

+

X-NUCLEO-CCA02M1

- Digital Microphone



STM32 Cube

+

- Data Logger
- Light & Color Detection
- Buzzer

=

*Sensi*BLE IoT Module

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

*Sensi*EDGE
Simplify & Accelerate

ST BLUEMS App Installation – Step by Step

Download App

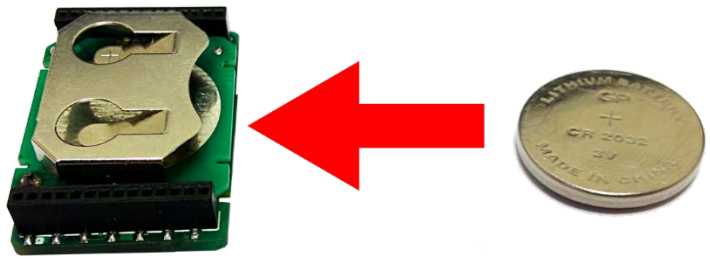
ANDROID APP ON Google play

Available on the App Store

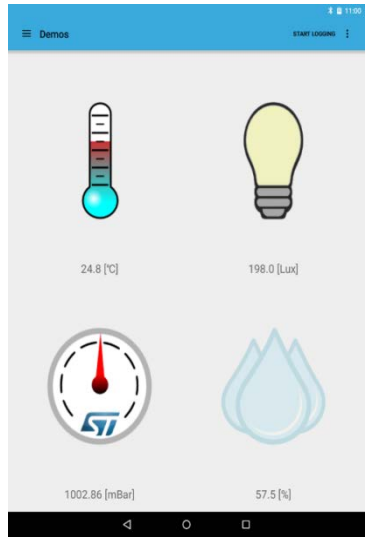
Download the ST BLUEMS app from the Apple App Store or Google Play, and start the app on you smartphone/tablet

Insert Battery

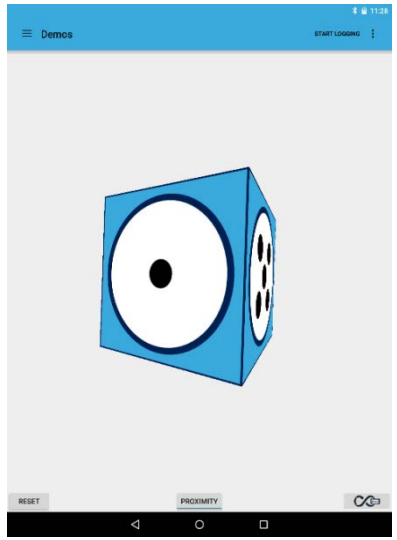
*Sensi*BLE



Explore ST BLUEMS App



Environmental Page



Sensor Fusion

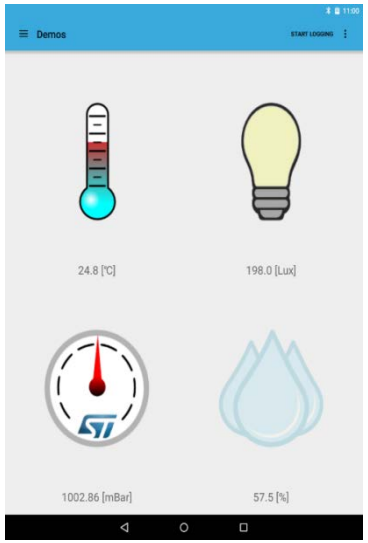
Start Scanning. Select your SensiBLE from the device list. Choose sensor view page to see the sensor reading

SensiEDGE
Simplify & Accelerate

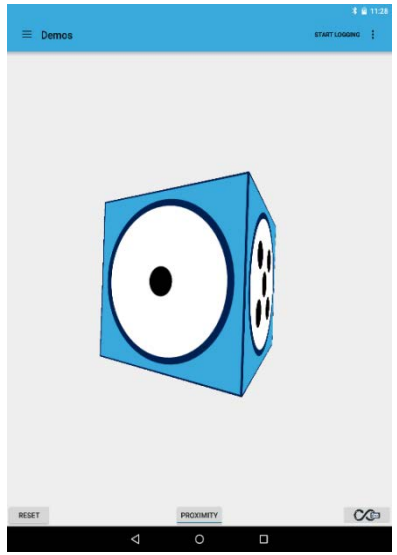
BLUEMICROSYSTEM2

BlueMS Application for for **Android**/**iOS**

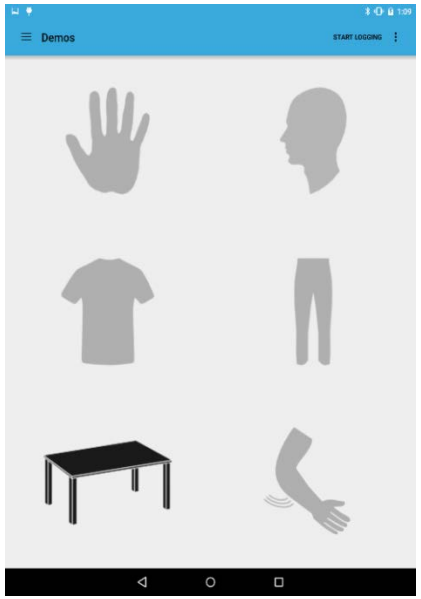
Environmental Page



Sensor Fusion

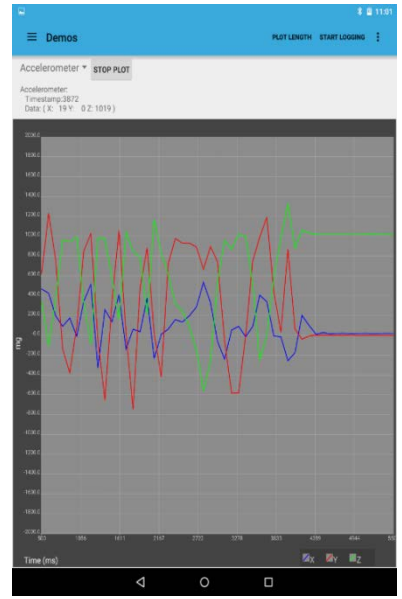


Carry Position



Activity Recognition

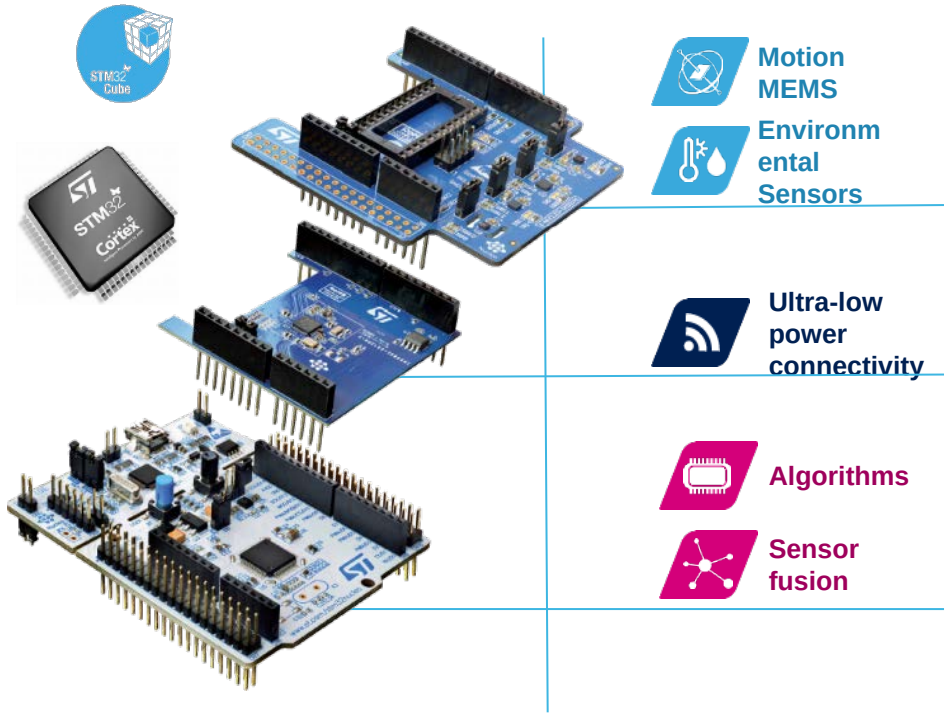
Plot Capability

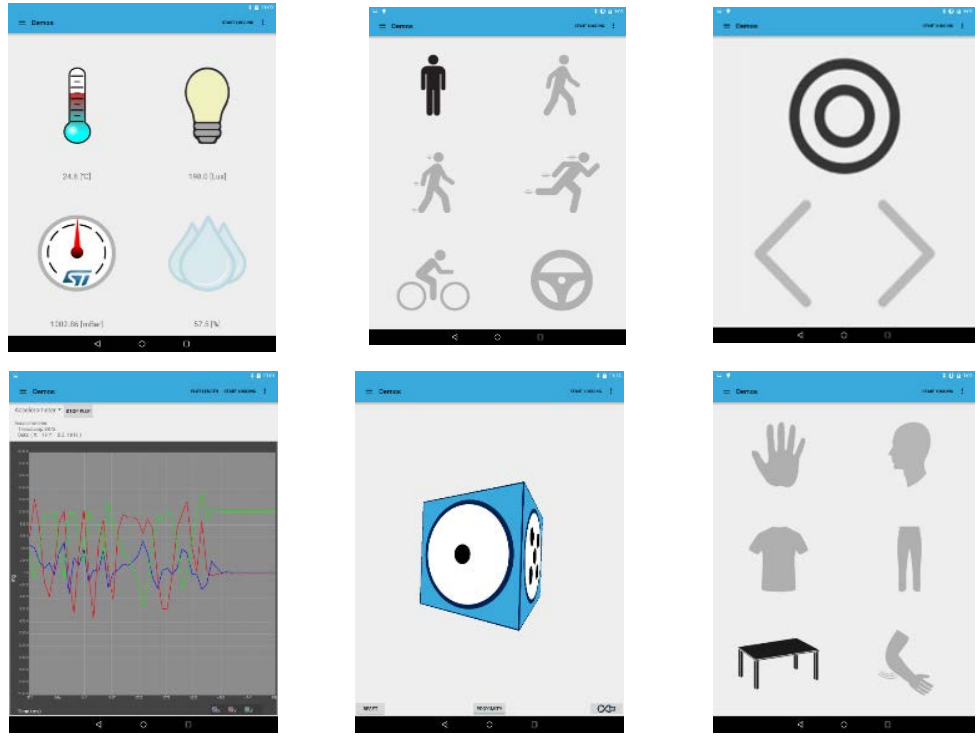


SensiEDGE
Simplify & Accelerate

BLUEMICROSYSTEM

Simplified development of BLE applications for smartphones





SensiEDGE
Simplify & Accelerate

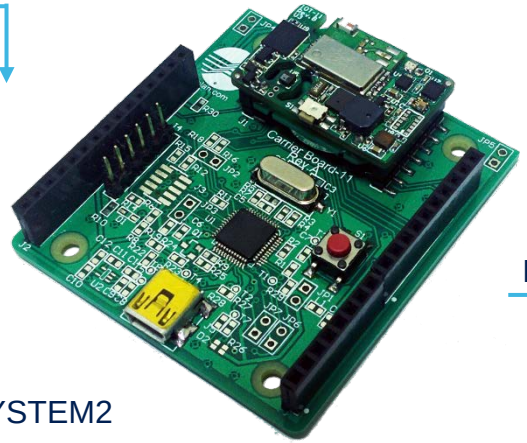
Simplified development of BLE applications for smartphones

- 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

life.augmented
www.st.com

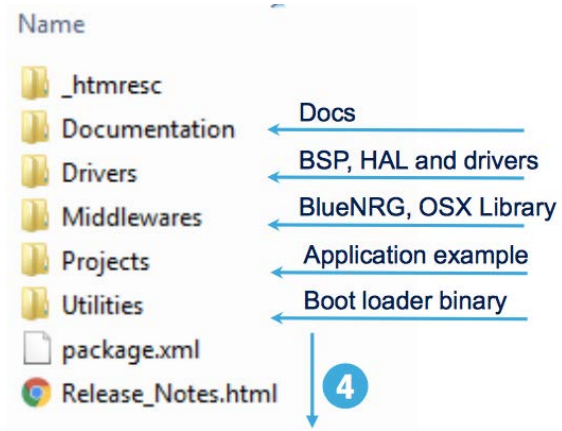
1 st.com/bluemicrosystem2



2 Select
BLUEMICROSYSTEM2
BLUEMICROSYSTEM1

3 Download & Unpack

BLUEMICROSYSTEM2 Package Structure



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

KEIL Tools by ARM
IAR SYSTEMS

Compile/Flash and
Run the project 5

6

Android™/iOS™
smartphone and
BlueMS application

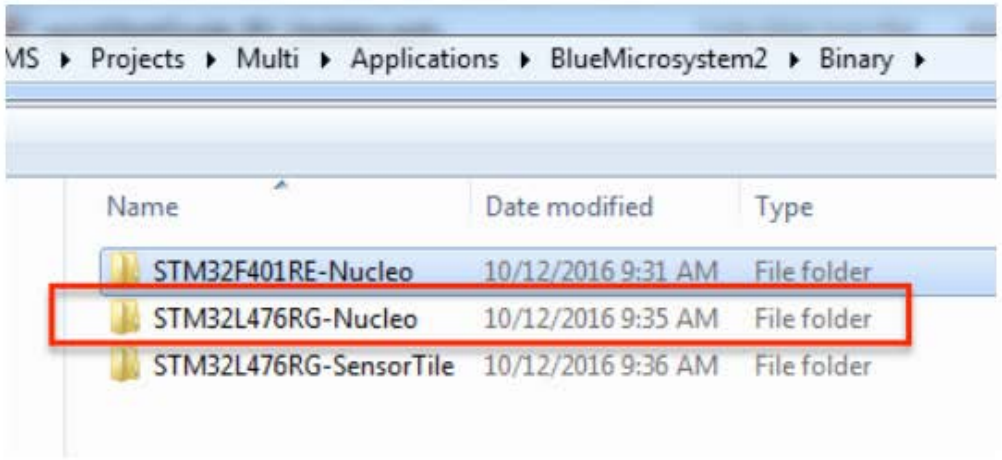
IMPORTANT:
Read the chapter **"The Boot Process"** on user manual for understanding how to install the Boot Loader on the board

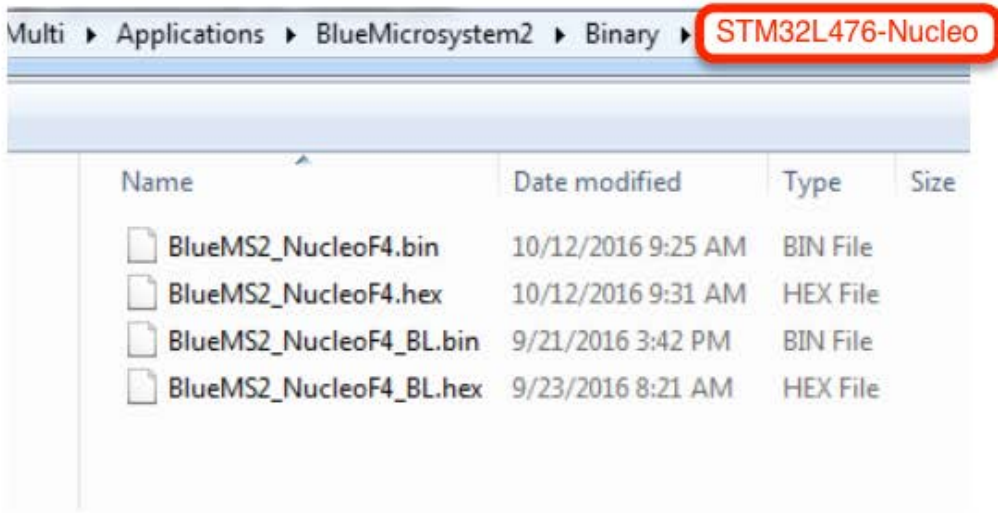
SensiEDGE
Simplify & Accelerate

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

SensiEDGE
Simplify & Accelerate

Installation procedure (2/2) – Step by Step

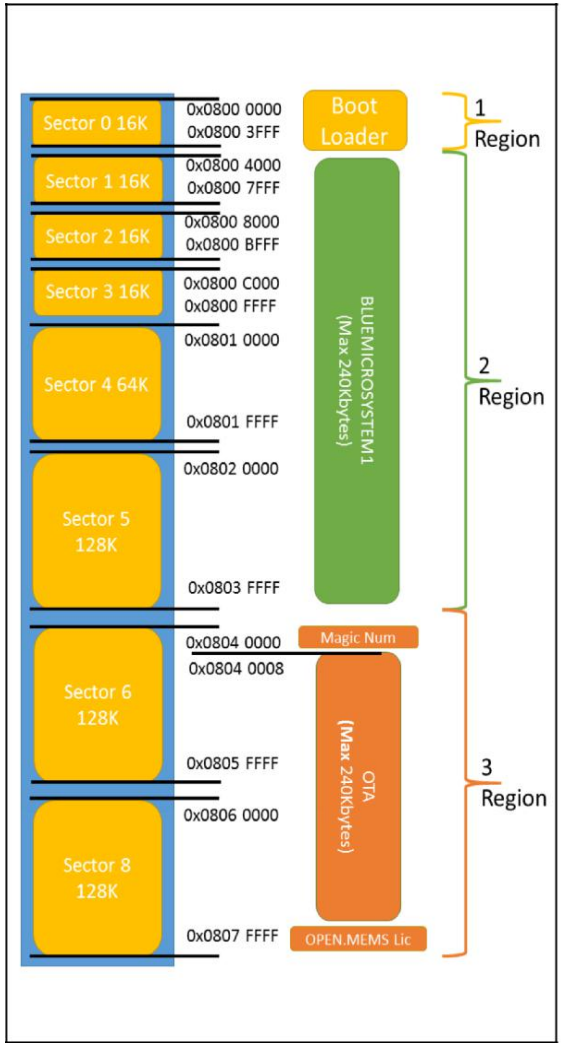
2. How Install the code after compiling the project:

- 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

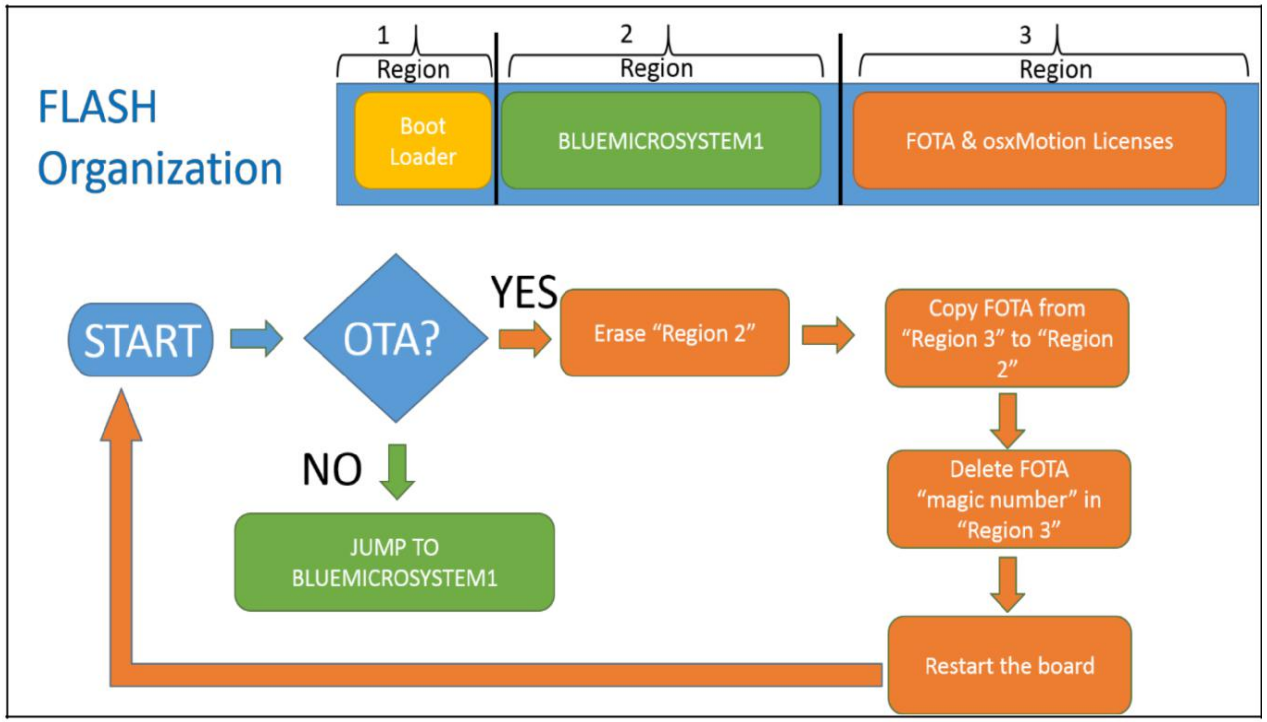
*It's necessary to edit this file for setting the right installation and Library pat*h

- 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

SensiEDGE
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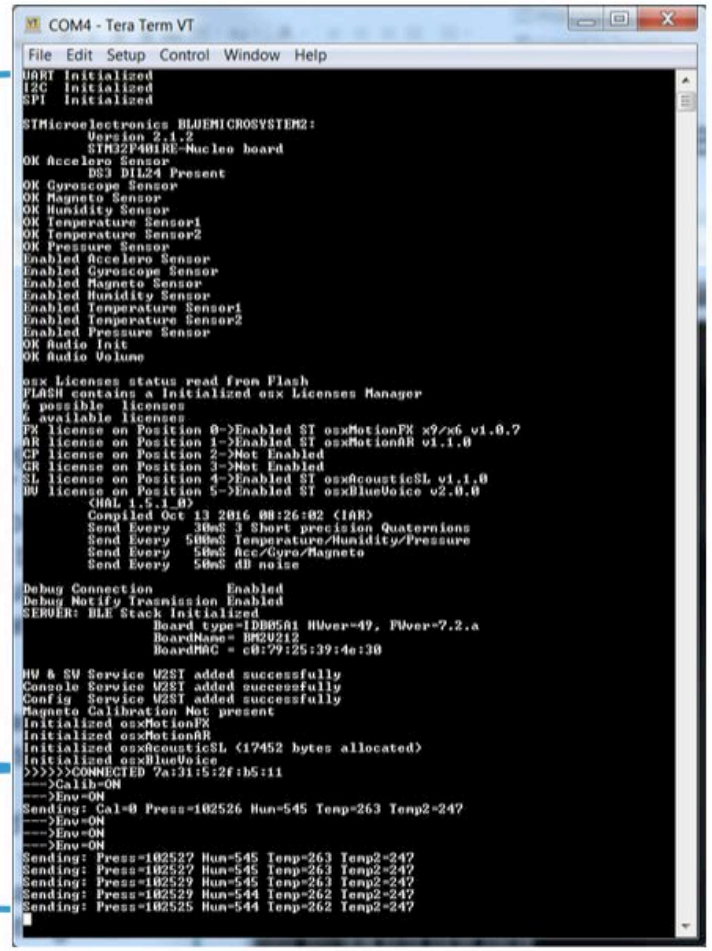
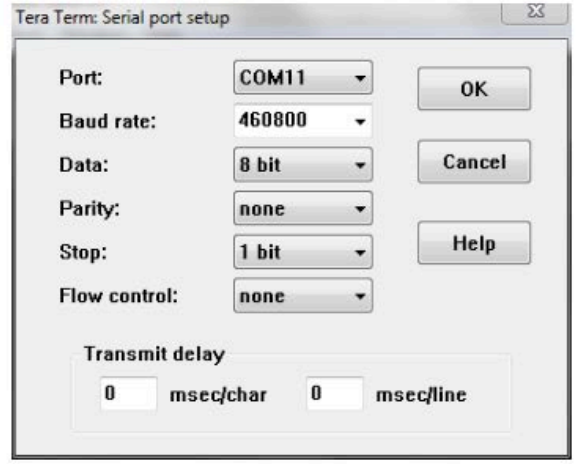
Using serial line monitor – e.g.TeraTerm

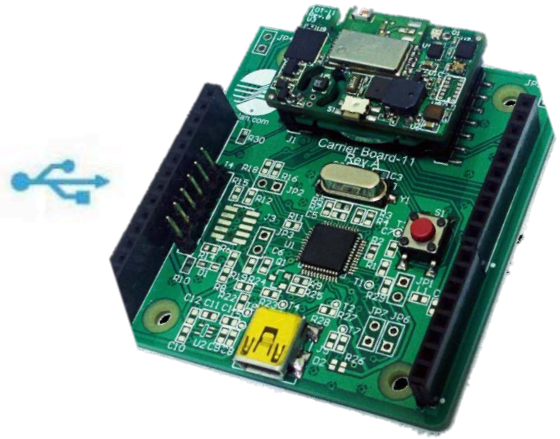
Pressing the RESET User button on STM32 Nucleo board. You could see the initialization phase

Whenare connected with one AndroidTM/iOSTM device, you could see what are you transmitting with BLE.





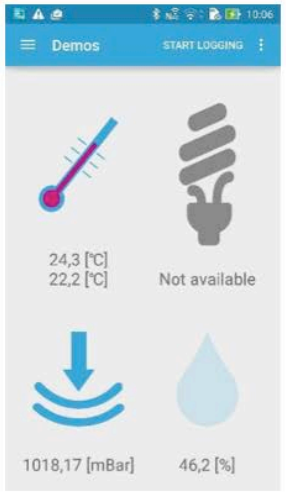
Configure the serial line monitor (speed, LF)



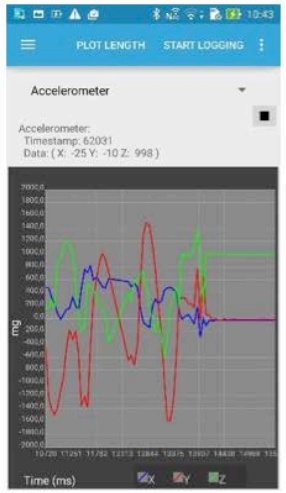
SensiEDGE
Simplify & Accelerate

BlueMS Application for Android/iOS (1/6)

Hardware Features – Android Version



Environmental page

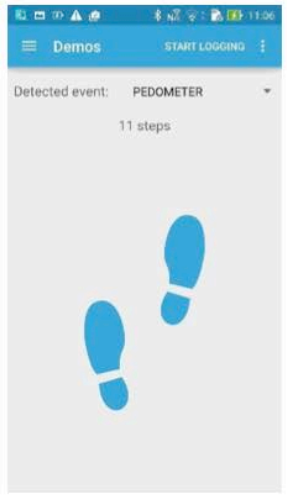


Accelerometer plot

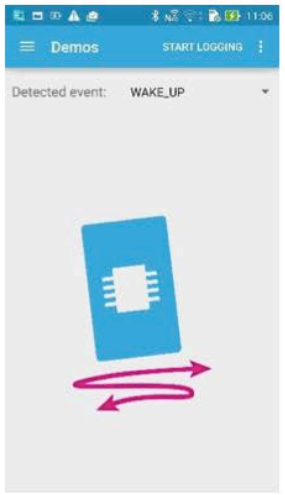
Microphones level plot

DS3/DSM Events

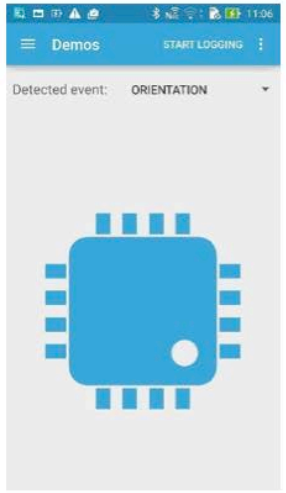
DS3/DSM Event: Double Tap



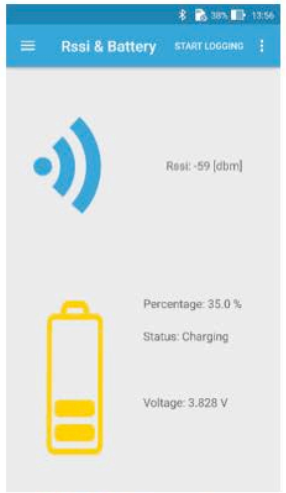
DS3/DSM Event: Pedometer



DS3/DSM Event: Wake Up



DS3/DSM Event: Orientation



RSS & Battery Page

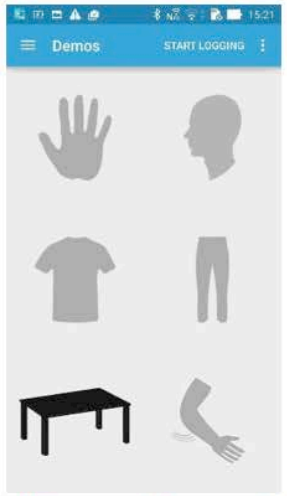
SensiEDGE
Simplify & Accelerate

BlueMS Application for Android/iOS (2/6)

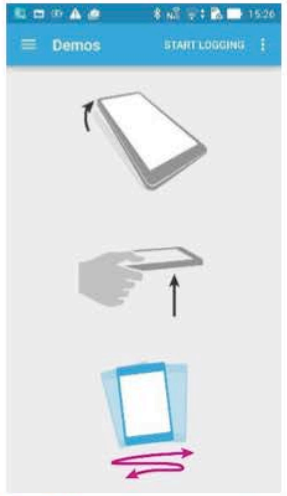
OPEN.MEMS Library
Android version

osxMotionFX sensor fusion page

osxMotionAR activity recognition page

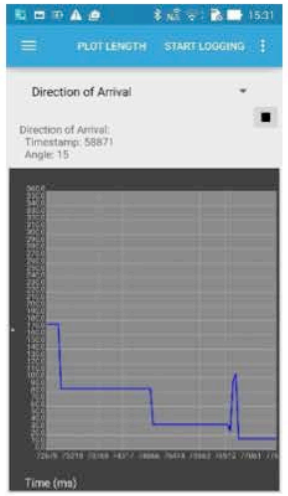


osxMotionCP carry position recognition page



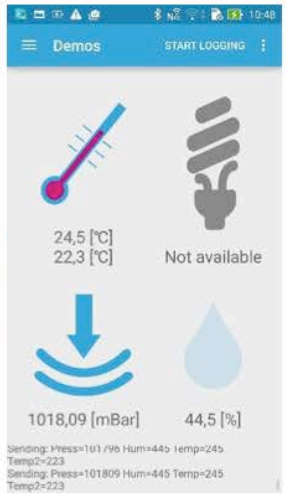
osxMotionGR gesture recognition page

OPEN.AUDIO Library
Android version



osxAcousticSL - audio source localization plot value

Console
Android version



Serial Console (stdout/stderr)

Debug Console (stdin/stdout/stderr)

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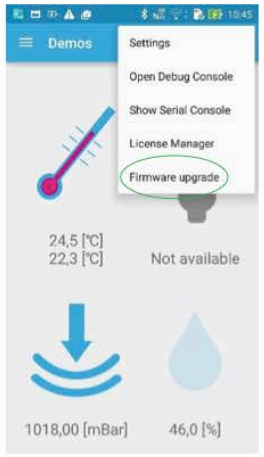
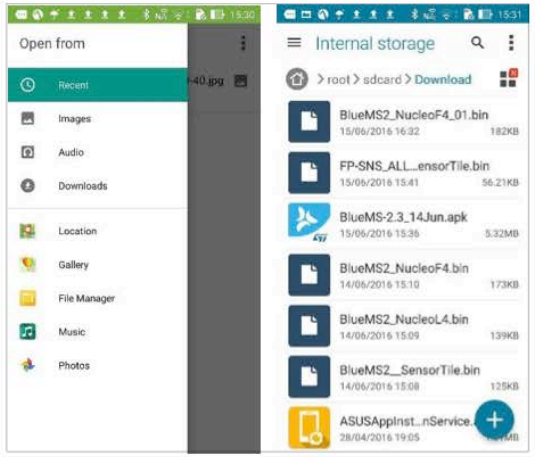
BlueMS Application for Android/iOS (3/6)

BlueMS Application for **Android/iOS (3/6)**

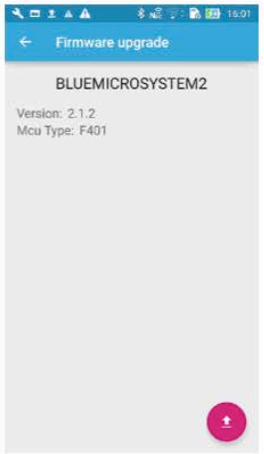
Firmware Upgrade – Android version



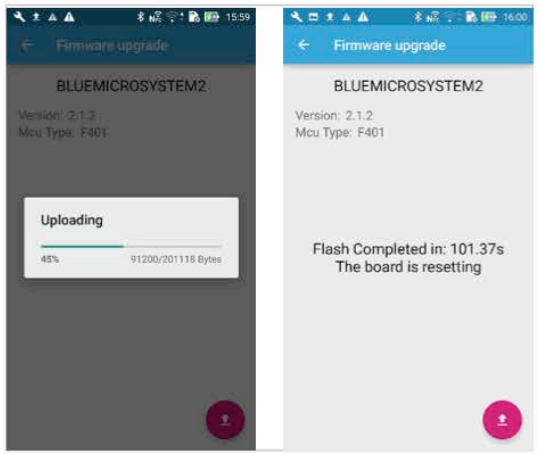
BlueMS: menu option



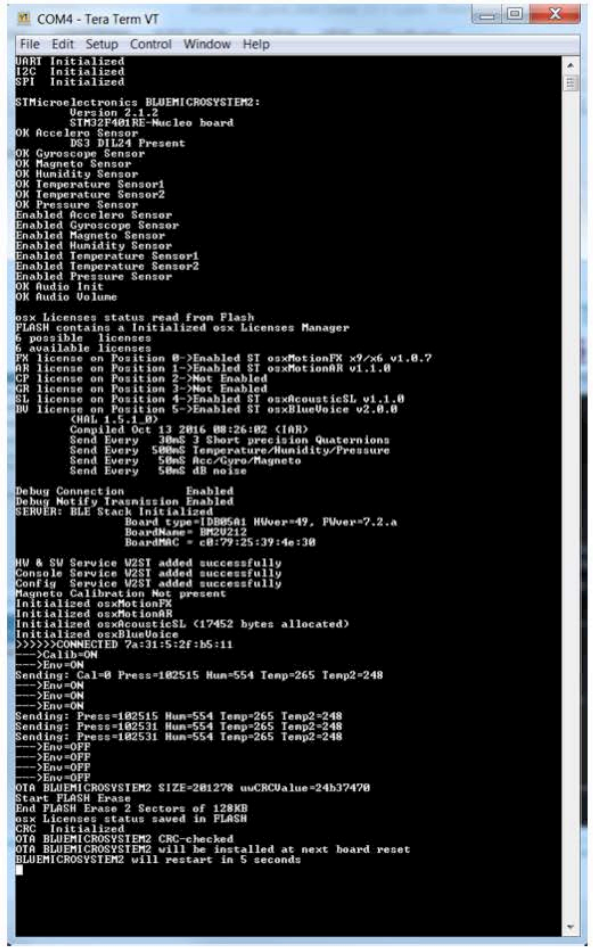
BlueMS: Firmware update file selection



BlueMS: Firmware upgrade page



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)

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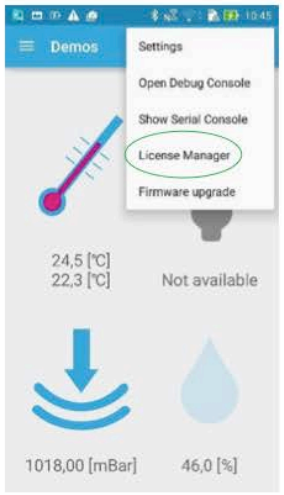
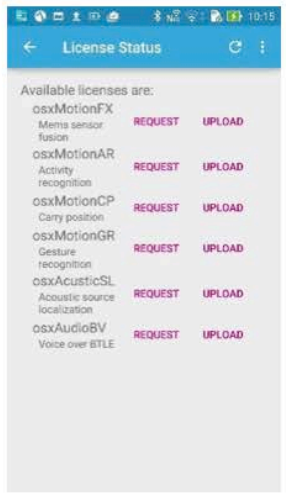
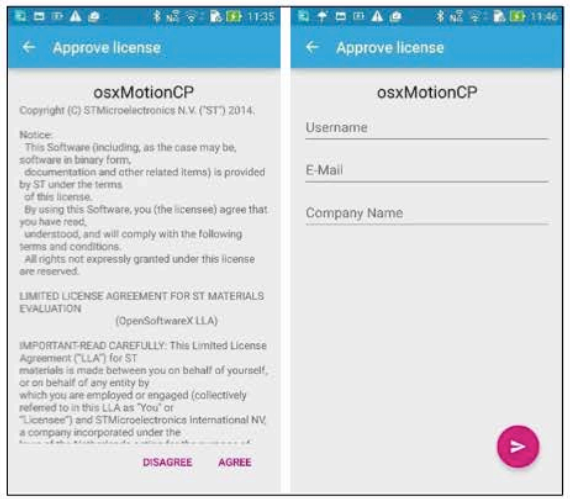
License Manager – Android version



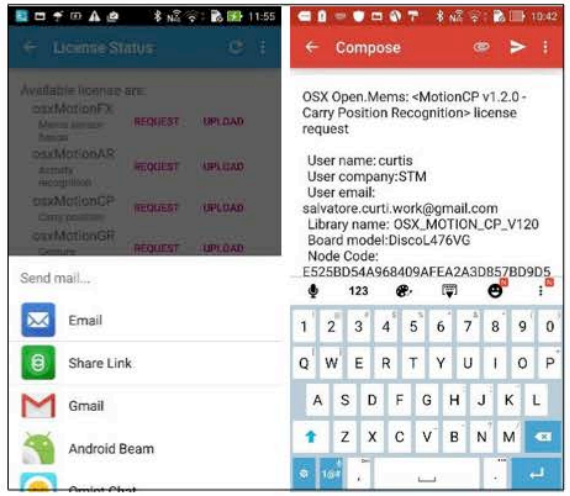
BlueMS: menu option



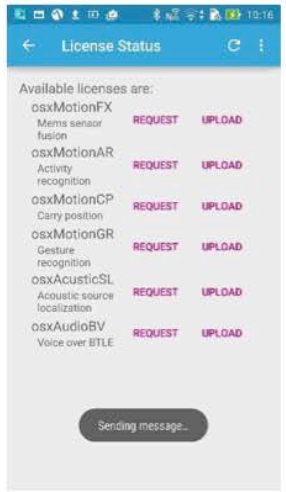
BlueMS: License status page



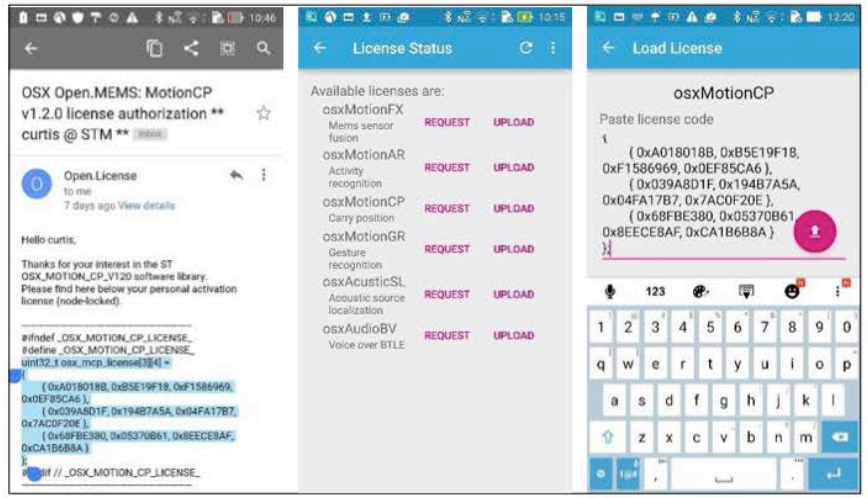
BlueMS: osxMotionCP license request



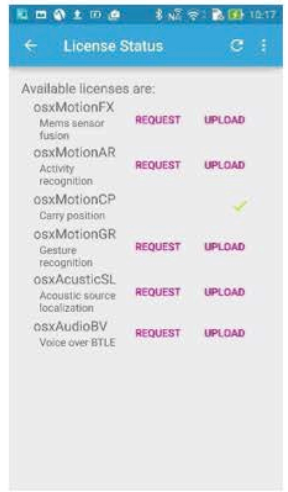
BlueMS: Generated license request email



BlueMS: Send request email



BlueMS: Copy license details, select UPLOAD and paste



BlueMS: osxMotionCP license enabled

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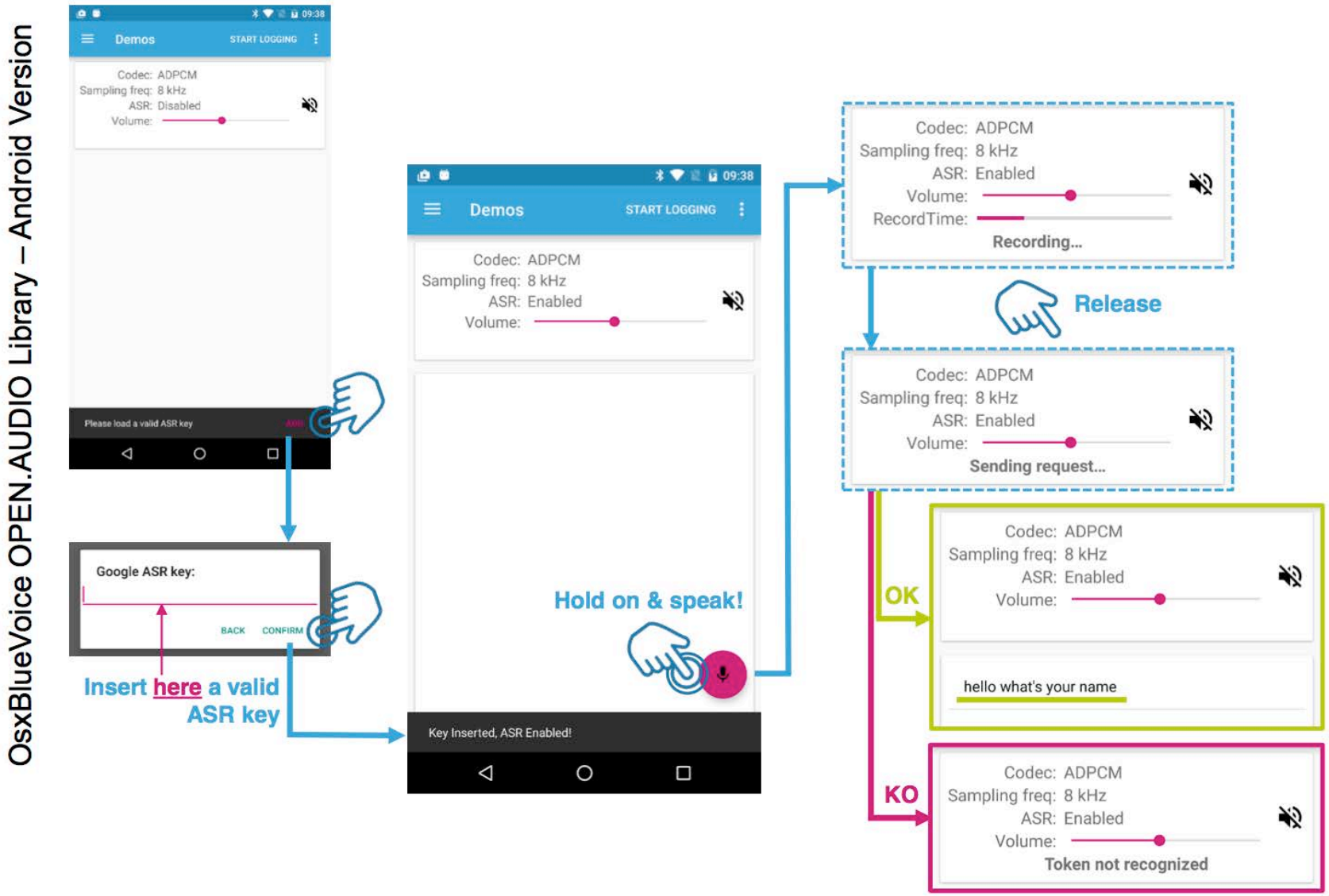
BlueMS Application for Android/iOS (5/6)



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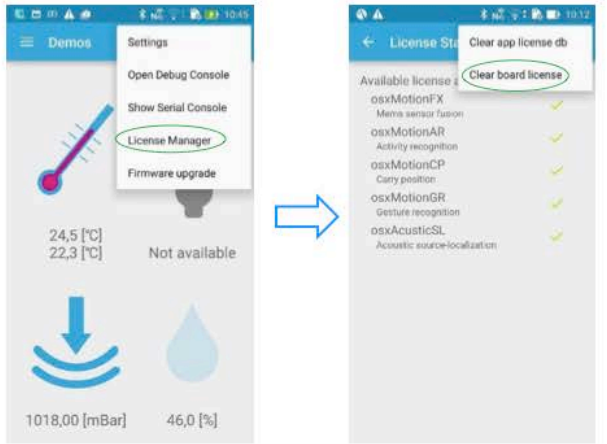
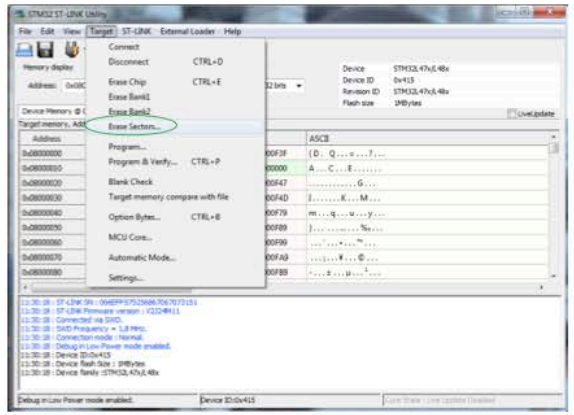
BlueMS Application for Android/iOS (6/6)

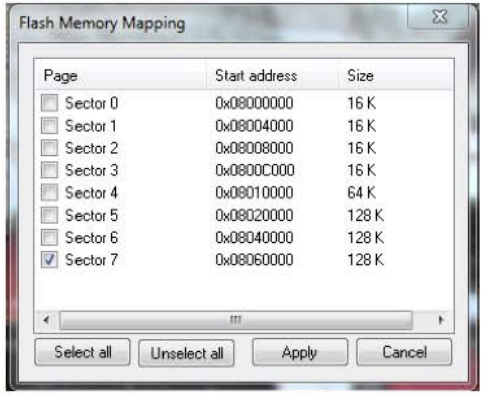
License Manager – Known Issue

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

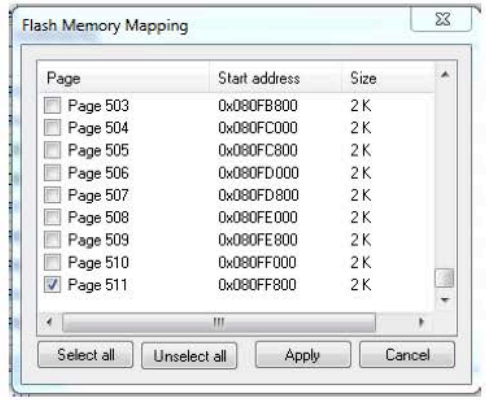


  - Flash erase using ST-LINK:





Select sector 7 for F4



Select page 511 for L4

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*Sensi*EDGE Vision

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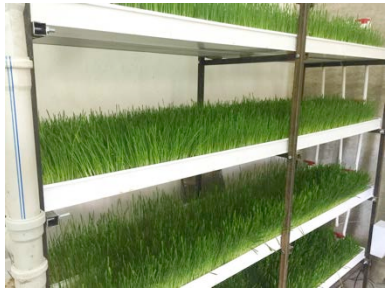
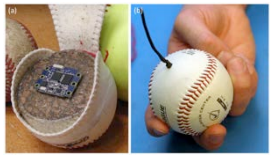
the creation of Connected Sensors





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For more information about

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Contact : info@SensiEDGE.com

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