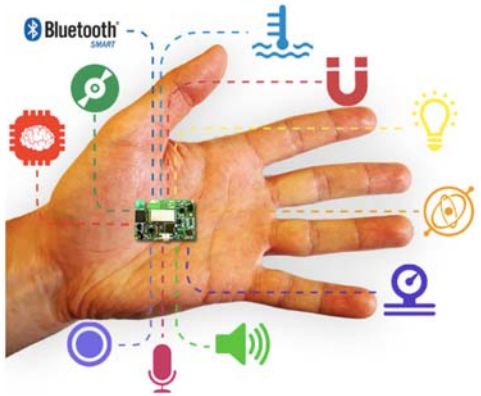
Quick Start Guide

Bluetooth low energy and sensor software for *SensiBLE* (BLUEMICROSYSTEM1)



Version 1.0.1 (September 3, 2016)

Quick Start Guide Contents

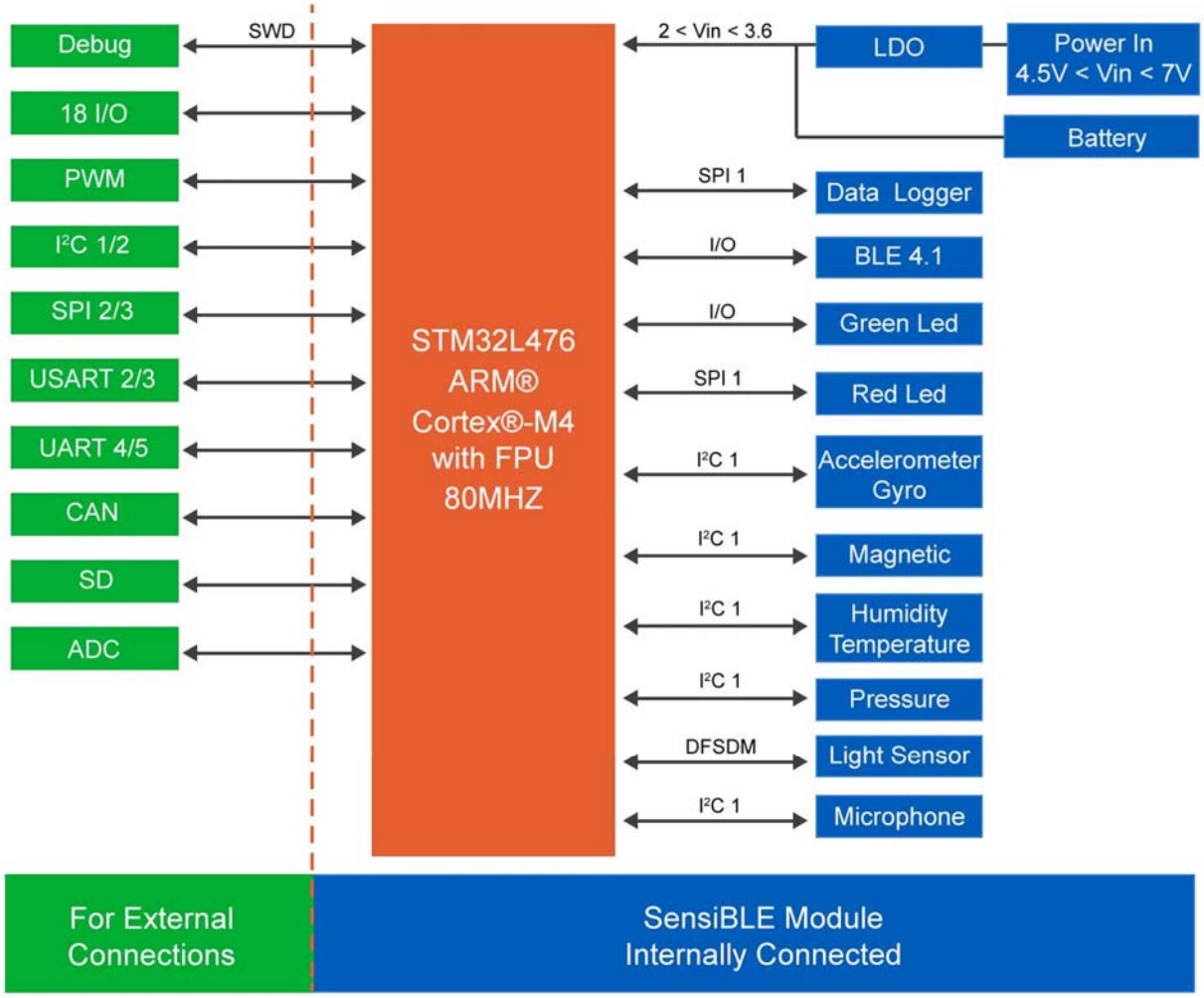
BLUEMICROSYSTEM1: Bluetooth low energy and sensor software Hardware and Software overview

Setup & Demo Examples

Documents & Related Resources

*Sensi*BLE System Block Diagram

- Part of the Connectivity used by the SensiBLE module for internal connection between MCU and Sensors.
- Microphone using DFSDM interface, Sensors connected to MCU using I^2C1, while BLE module and Data Logger connected via SPI1.
- Rest of unused Interfaces is free for user to interconnect with external world:
  - 18 I/O
  - PWM
  - I^2C1, I^2C2
  - SPI2, SPI3
  - USART 2, USART3
  - UART4, UART5
  - CAN
  - SD
  - ADC



Motion MEMS, Environmental, Microphone and Light Sensors

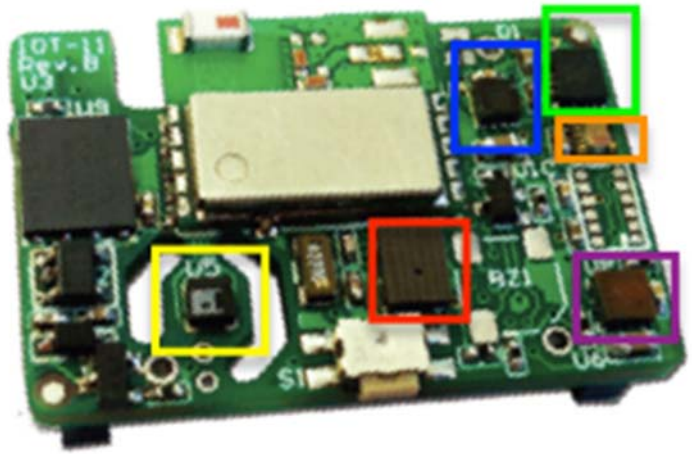
Hardware Overview (1/4)

Hardware Description

- The *Sensi*BLE integrating motion MEMS and environmental sensor.
- It is compatible with X-NUCLEO-IKS01A1 layout, and is designed around ST's latest sensors.

Key Features

- The *Sensi*BLE is a motion MEMS and environmental sensor.
- All sensor sensors are connected on a single I²C bus
- Sensor I²C address selection
- Each sensor has separate power supply lines allowing power consumption measurement
- Sensor disconnection (disconnect the I²C bus as well as the power supply)
- Interrupt and DRDY signals from sensors



Key Product on board

LSM6DS0: MEMS 3D accelerometer (±2/±4/±8 g) + 3D gyroscope (±245/±500/±2000 dps)

LIS3MDL: MEMS 3D magnetometer (±4/ ±8/ ±12/ 16 gauss)

LPS25HB MEMS pressure sensor, 260-1260 hPa absolute digital output barometer

HTS221: capacitive digital relative humidity and temperature

MP34DT01-M: Digital MEMS Microphone acoustic overload point of 61 dB signal-to-noise ratio and –26 dBFS sensitivity

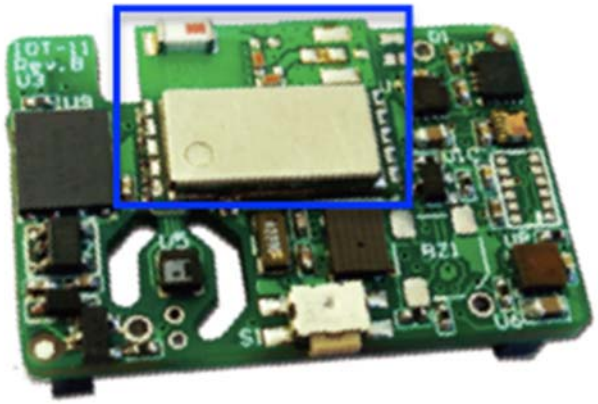
APDS-925(: Digital RGB, IR and Ambient Light Sensor

Bluetooth Low Energy

Hardware Overview (4/4)

Hardware Description

- The *Sensi*BLE integrates a Bluetooth Low Energy (BLE) designed around ST's SPBTLE-RF Bluetooth Low Energy module based on BlueNRG-MS.
- It is compatable with X-NUCLEO-IDB05A1 layout
- The BlueNRG-MS processor hosted in the SPBTLE-RF module communicates with the STM32L476 host microcontroller though an SPI link.



Key Products on board

SPBTLE-RF

Bluetooth Low Energy, FCC and IC certified, module based on Bluetooth® Low Energy wireless network processor BlueNRG-MS, BLE4.1 compliant.

SPBTLE-RF integrates a BALF-NRG-01D3 balun and a chip antenna. It embeds 32 MHz and 32.768 kHz crystal oscillators for the BlueNRG-MS.

BLUEMICROSYSTEM1 BLE and sensor software expansion
Software Overview

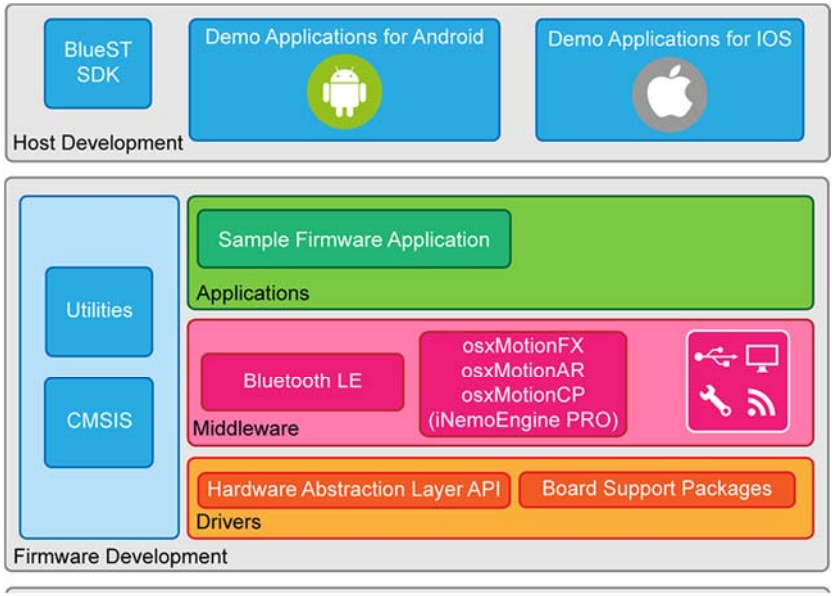
BLUEMICROSYSTEM1 Software Description

- BLUEMICROSYSTEM1 is an expansion software package for STM32Cube

Key features

- Complete middleware to build applications using temperature and humidity sensors (HTS221), pressure sensor (LPS25H) and motion sensors (LIS3MDL and LSM6DS0), Digital Microphone (MP34DT01-M) and light sensor (APDS-9250).
- Very low power Bluetooth Low Energy (BlueNRG-MS) single-mode network processor, compliant with Bluetooth specifications core 4.1 for transmitting information to one client
- osxMotionFX (iNEMOEngine PRO) real-time motion sensor data fusion (under OPEN.MEMS license) to combine the output from multiple MEMS sensors
- Gyroscope bias and magnetometer calibration routine
- osxMotionCP (iNEMOEngine PRO) activity-recognition algorithm (under OPEN.MEMS license) based only on accelerometer data
- osxMotionAR (iNEMOEngine PRO) real-time activity-recognition algorithm (under OPEN.MEMS license) based only on accelerometer data
- Easy portability across different MCU families, thanks to STM32Cube
- Compatible with BlueMS application for Android/iOS (Version >2.0.0) available on respective online markets (playstore/itunes)
- Free, user-friendly license terms
- Sample implementation available on board X-NUCLEO-IKS01A1 and X-NUCLEO-IDB05A1 when both connected to NUCLEO-L476RG

Overall Software Architecture



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Setup & Demo Examples

Documents & Related Resources

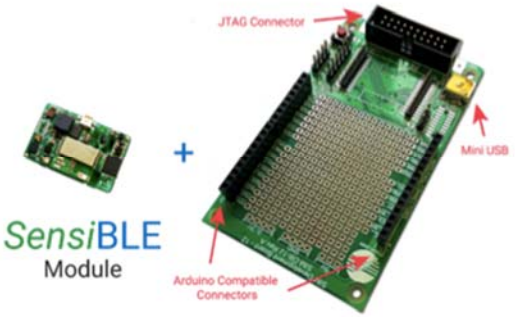
Setup & Demo Examples

• Hardware Setup (1/4) – Step by Step

1x *Sensi*BLE Module + CR2032 battery + Development Board

(PN: SIMBA-DKJ)

*Sensi*BLE Development Kit



SIM Development Board

OR

(PN: SIMBA-DKL)

*Sensi*BLE Development Kit
with ST-LINK debugger

Development Board
with ST-LINK debugger

*For this option you also need ST-LINK Debugger

- 1x Windows 10/8/7 - Laptop/PC
- 1 x USB type A to Mini-B USB cable

BlueMicrosystem1 Download & Install (2/4)

life.augmented
www.st.com

1 st.com/bluemicrosystem

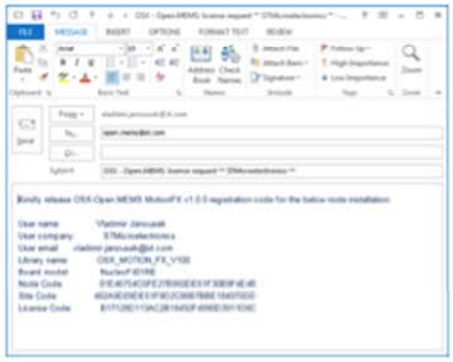
2 Select BLUEMICROSYSTEM1

3 Download & Install

4 Licenses Request (For each license)

- Select one osxMotionFX/osxMotionAR/ osxMotionCP license
- Click: Identify STM32Nucleo board
- Click: Generate License Request

5 License Activation (For each License)

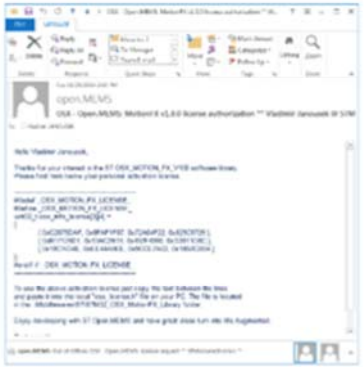


Click: Send License request email

OpenSoftwareX OSX License (3/4) – Step by Step

Example for osxMotionFX for SensiBLE Development Kit

License activation email received



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License Activation (For each License)

7 Copy the license key in osx_license.h located ir

.\OSX BlueMicrosystem\Middlewares\ST\STM32_OSX_MotionFX\

8 When you have requested and activated ALL the osxMotion licenses Open IAR project from

. \OSX BlueMicrosystem\Projects\Multi\Applications\BlueMicrosystem1\STM32L476RG-Nucleo

IAR SYSTEMS

Compile/Flash and Run the project

9

Start developing
(example project included)

ST BLUEMS App Installation (4/4) – 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

SensiBLE

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

Using serial line monitor

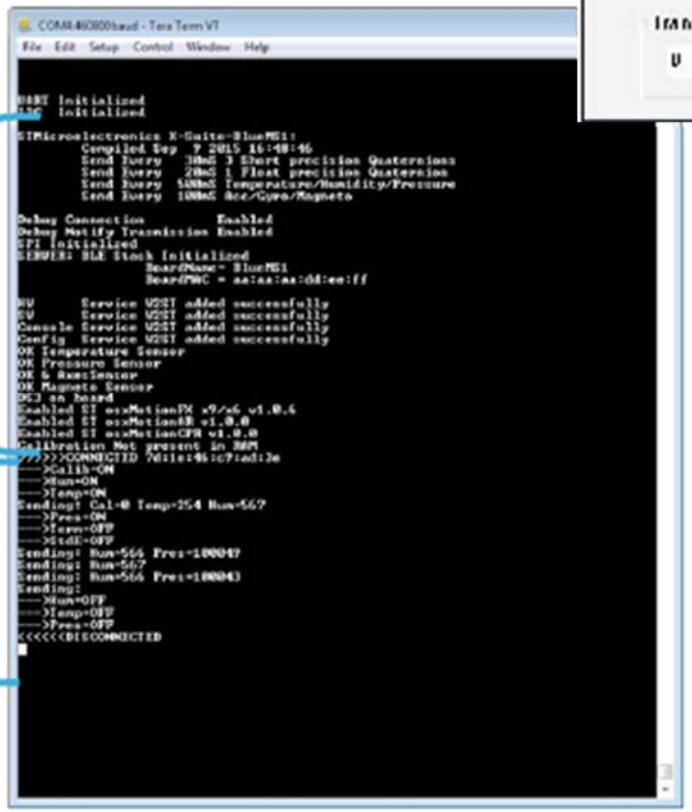
Using serial line monitor – e.g. TeraTerm

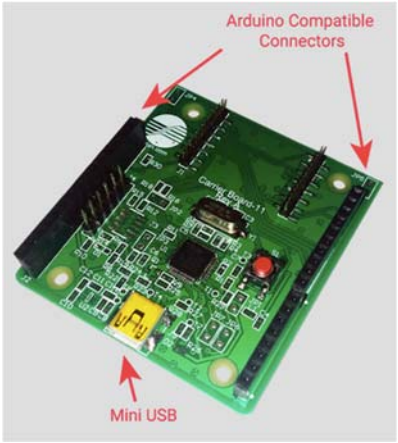
BLUEMICROSYTEM1 for SIMBA-DKL

- Configure the serial line monitor (speed, LF)

Pressing the **Reset** User button. You could see the initialization phase

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





Documents & Related Resources

All documents are available in the DESIGN tab of the related products webpage

BLUEMICROSYSTEM1:

- **DS2501**: Bluetooth low energy and sensor software expansion for STM32Cube – **data brief**
- **UM1863:** Getting started with the BLUEMICROSYSTEM1 Bluetooth low energy and sensor software expansion for STM32Cube – **user manual**

SIMBA-PRO:

- BOM, Schematic
- **Data Sheet** – *Sensi*BLE Preliminary Data Sheet

SIMBA-DKL:

- BOM, Schematic
- **Data Sheet** - Preliminary Data Sheet