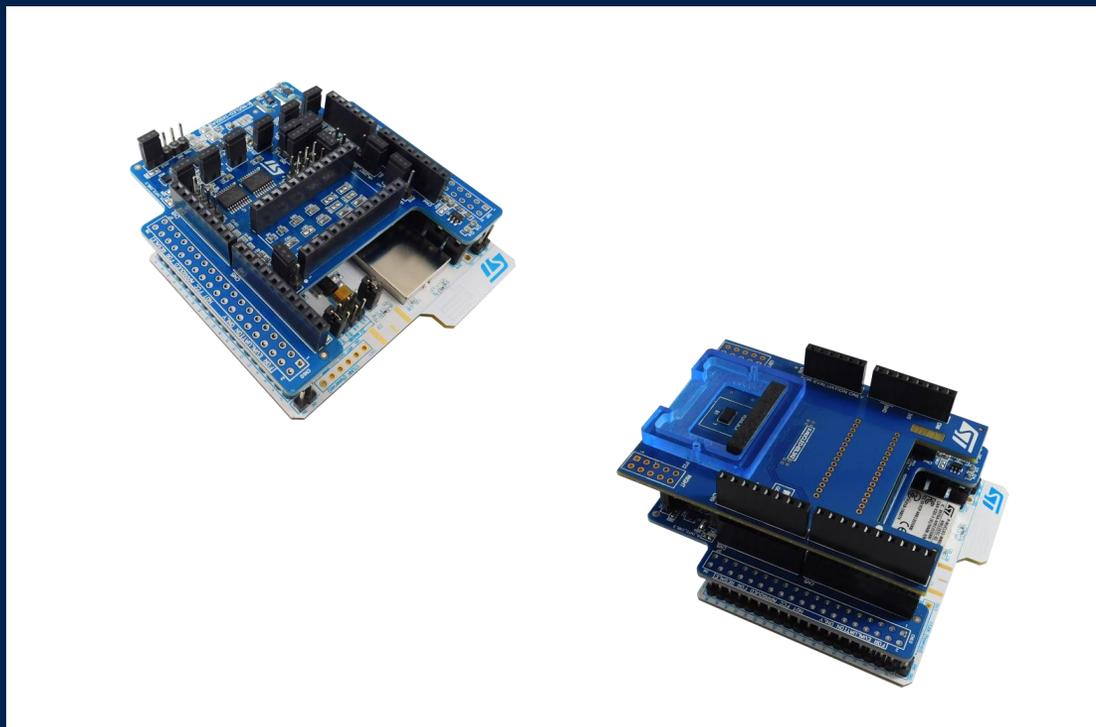




life.augmented



# Quick Start Guide

STM32Cube expansion software package with  
BLE connectivity.  
(FP-SNS-MOTENVWB1)

Version 1.4 (July 14, 2023)

# Agenda

1 Hardware and Software overview

2 Setup & Demo Examples

3 Documents & Related Resources

4 STM32 Open Development Environment: Overview

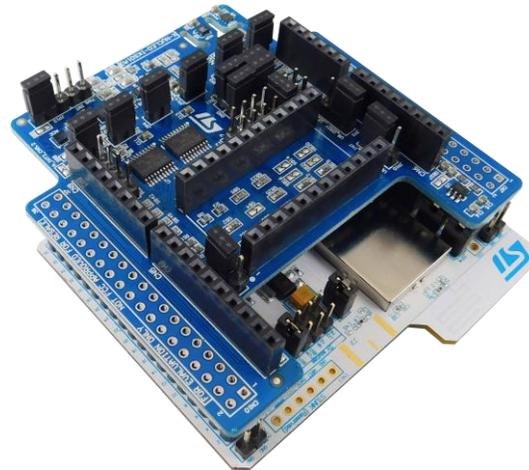
# 1- Hardware and Software overview



# Hardware Overview

Sample implementations are available for STM32WB Nucleo development boards plugged on STM32 Nucleo expansion boards:

- P-NUCLEO-WB55 + X-NUCLEO-IKS01A3 (or X-NUCLEO-IKS4A1)+ X-NUCLEO-53L3A2 (optional)



# P-NUCLEO-WB55

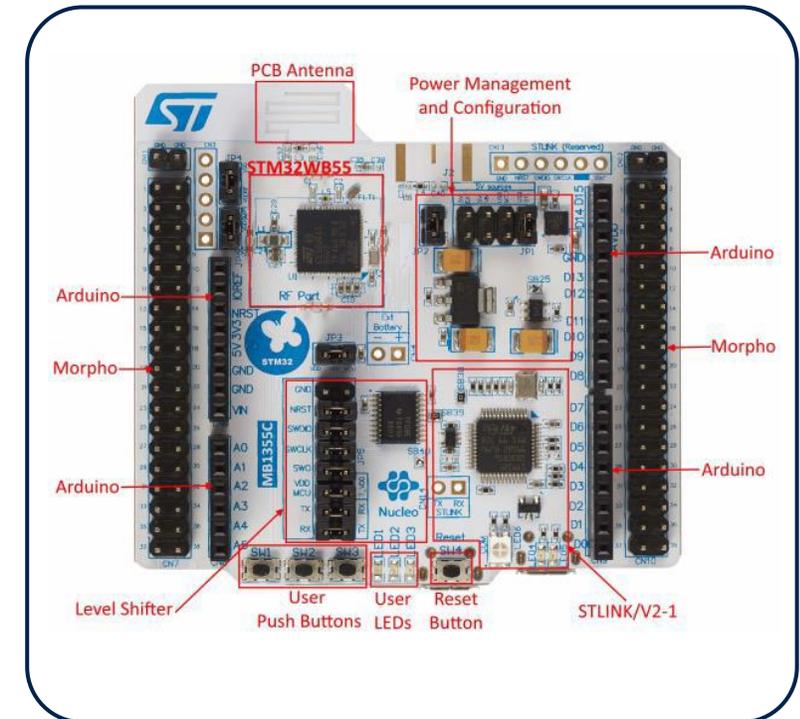
## Hardware Overview (1/5)

### P-NUCLEO-WB55 Hardware Description

- The P-NUCLEO-WB55 is designed around the STM32WB55RG microcontroller in a 68-pin VFQFPN68 package.

#### Key Product on board

- 2.4 GHz RF transceiver supporting Bluetooth® specification v5.0 and IEEE802.15.4-2011 PHY and MAC
- Dedicated Arm® 32-bit Cortex® M0+ CPU for real-time Radio layer
- Three user LEDs
- Three user buttons and one reset button
- Board connector: USB user with Micro-B
- Board expansion connectors:
  - Arduino™ UnoV3
  - Stmorpho
- Integrated PCB antenna or footprint for SMA connector
- Flexible power-supply options: ST-LINK USB VBUS or external sources
- On-board socket for CR2032 battery
- On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, virtual COM port and debug port



Latest info available at [www.st.com](http://www.st.com)  
P-NUCLEO-WB55

# Motion MEMS and environmental sensors expansion board

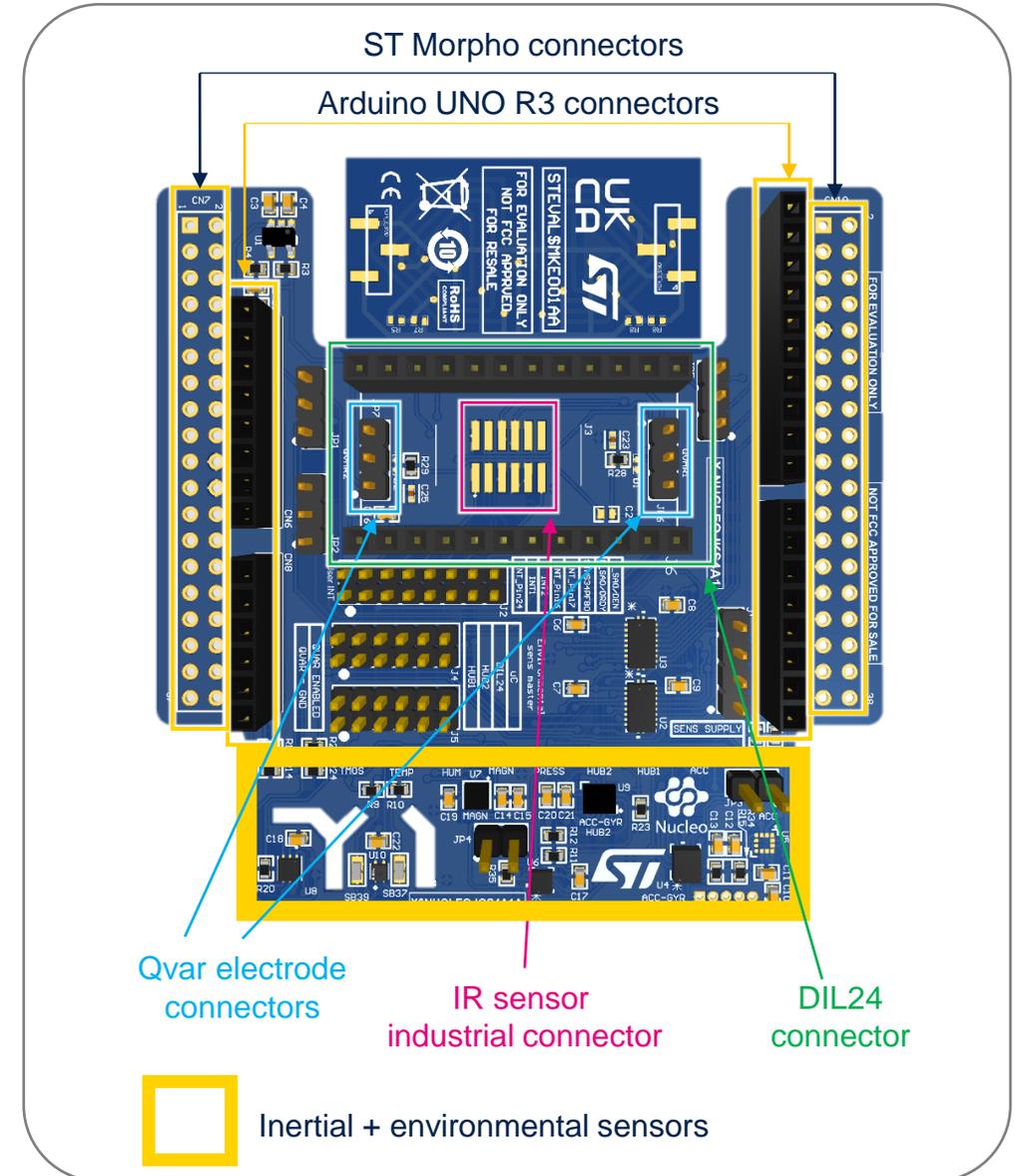
## Hardware Overview (2/5)

### X-NUCLEO-IKS4A1 Hardware Description (1/2)

- The X-NUCLEO-IKS4A1 is a motion MEMS and environmental sensor evaluation board system.
- This expansion board allows application development with features like Sensor HUB, camera module integration and QVAR touch/ swipe gestures.
- It is compatible with the Arduino UNO R3 connector layout, and is designed around ST's latest sensors.

### Key Product on board

- LMS6DSO16IS: MEMS 3D accelerometer ( $\pm 2/\pm 4/\pm 8/\pm 16$  g) + 3D gyroscope ( $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000$  dps) with ISPU (Intelligent Processing)
- LIS2MDL: MEMS 3D magnetometer ( $\pm 50$  gauss)
- LIS2DUXS12: Ultra low-power MEMS 3D accelerometer ( $\pm 2/\pm 4/\pm 8/\pm 16$  g) with Qvar, AI, & anti-aliasing
- LPS22DF: Low-power and high-precision MEMS pressure sensor, 260-1260 hPa absolute digital output barometer
- SHT40AD1B: humidity sensor from Sensirion
- STTS22H: Low-voltage, ultralow-power, 0.5 °C accuracy temperature sensor ( $-40$  °C to  $+125$  °C)
- LSM6DSV16X: MEMS 3D accelerometer ( $\pm 2/\pm 4/\pm 8/\pm 16$  g) + 3D gyroscope ( $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000/\pm 4000$  dps) with embedded sensor fusion, AI, Qvar

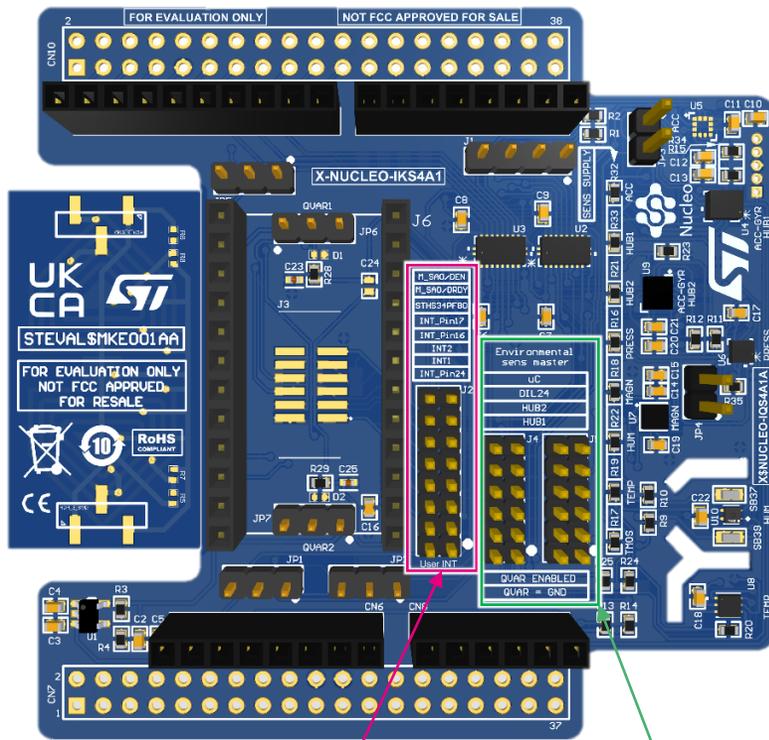


# Motion MEMS and environmental sensors expansion board

## Hardware Overview (3/5)

### X-NUCLEO-IKS4A1 Hardware Description (2/2)

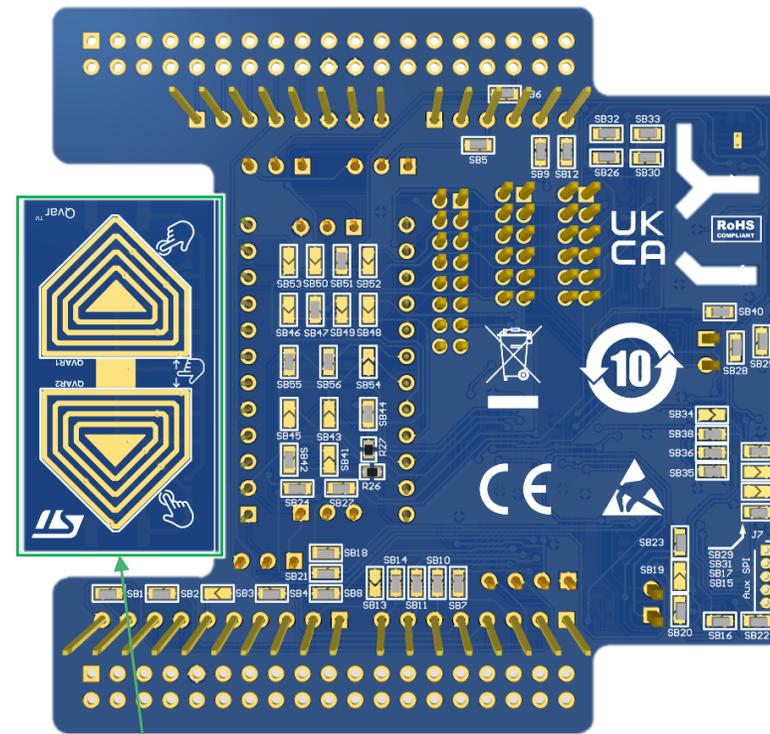
Top view



DIL24 + humidity sensor  
INT selector

I2C bus + Qvar enable  
selector

Bottom view



Detachable Qvar electrode

Latest info available at [www.st.com](http://www.st.com)  
X-NUCLEO-IKS4A1

# Motion MEMS and environmental sensors expansion board

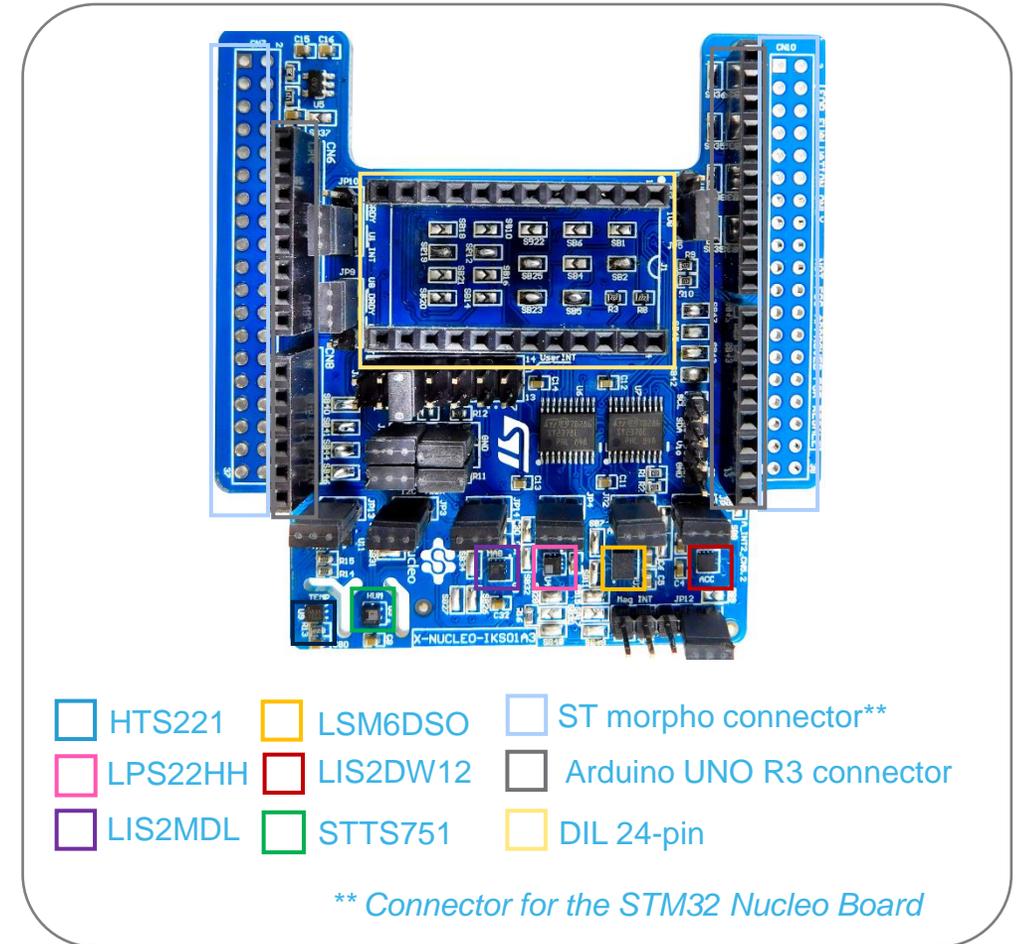
## Hardware Overview (4/5)

### X-NUCLEO-IKS01A3 Hardware Description

- The X-NUCLEO-IKS01A3 is a motion MEMS and environmental sensor evaluation board system.
- It is compatible with the Arduino UNO R3 connector layout and is designed around ST's latest sensors.

### Key Product on board

- LSM6DSO MEMS 3D accelerometer ( $\pm 2/\pm 4/\pm 8/\pm 16$  g) + 3D gyroscope ( $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000$  dps)
- LIS2DW12 MEMS 3D accelerometer ( $\pm 2/\pm 4/\pm 8/\pm 16$  g)
- LIS2MDL MEMS 3D magnetometer ( $\pm 50$  gauss)
- LPS22HH MEMS pressure sensor, 260-1260 hPa absolute digital output barometer
- HTS221: Capacitive digital relative humidity and temperature
- STTS751 Digital Temperature sensor
- DIL 24-pin Socket available for additional MEMS adapters and other sensors (UV index)



Latest info available at [www.st.com](http://www.st.com)  
X-NUCLEO-IKS01A3

# VL53L3CX Nucleo expansion board (X-NUCLEO-53L3A2)

## Hardware Overview (5/5)

### X-NUCLEO-53L3A2 Hardware Description

- The X-NUCLEO-53L3A2 is a ranging sensor with multi target detection evaluation and development board designed around the VL53L3CX sensor based on ST FlightSense™ Time-of-Flight technology.
- The VL53L3CX communicates with the STM32 Nucleo developer board host microcontroller through an I2C link available on the Arduino UNO R3 connector.

### Key Product on board

- VL53L3CX Time-of-Flight (ToF) ranging sensor with multi target detection
- 0.25, 0.5 and 1mm spacers to simulate air gaps, with the cover glass
- Cover window (made by Hornix) sample with low cross-talk ready to use / clipable on VL53L3CX
- Two VL53L3CX breakout boards



Latest info available at [www.st.com](http://www.st.com)  
X-NUCLEO-53L3A2

# FP-SNS-MOTENVWB1

## Software Overview

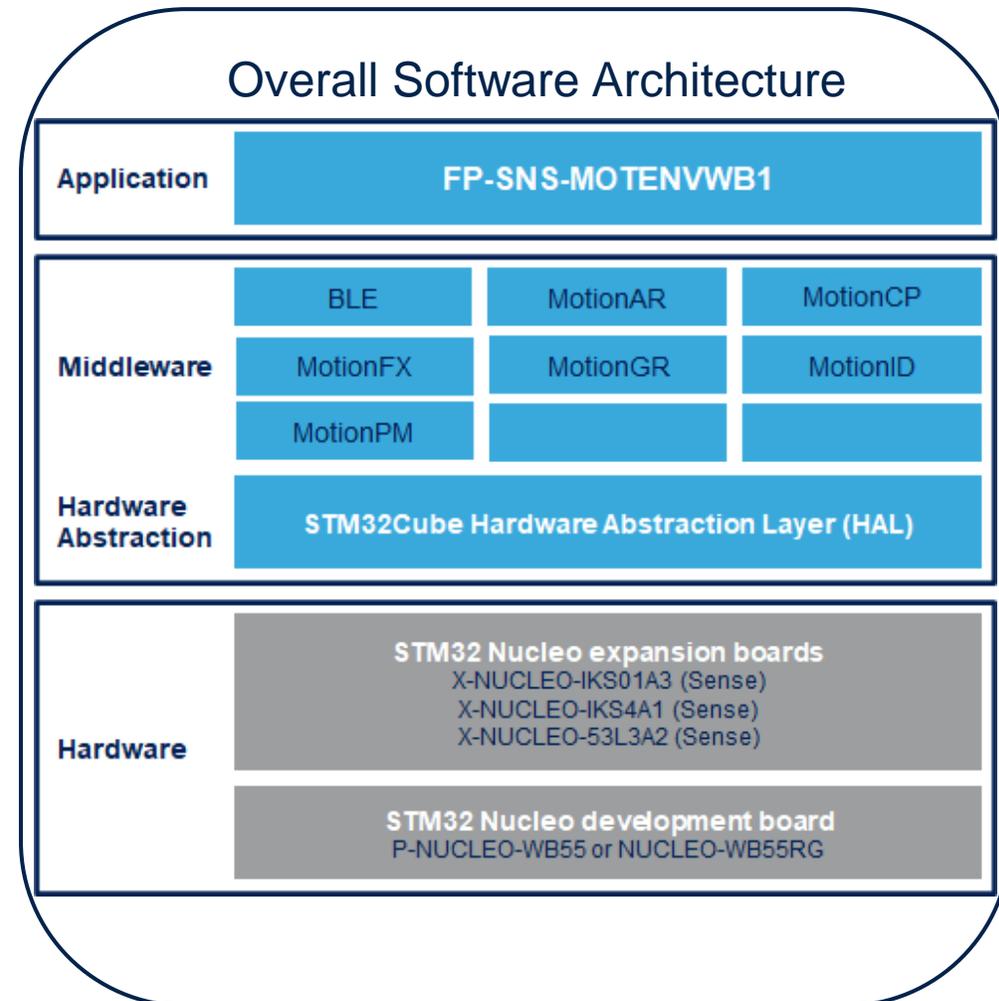
### Software Description

- The FP-SNS-MOTENVWB1 function pack for STM32Cube lets you connect your IoT node to a smartphone via Bluetooth Low Energy (BLE) and use a suitable Android or iOS application such as the STBLESensor app to view real-time motion, environmental (temperature, relative humidity) and time-of-flight sensor data.
- The package also enables advanced functionality such as sensor data fusion, accelerometer-based real-time activity recognition, carry position, gesture recognition, pedometer, motion Intensity, compass and objects distance.
- Together with the suggested combination of STM32WB and ST devices, it can be used to develop specific wearable and environmental applications, or smart things applications in general.
- The software runs on the STM32WB microcontroller and includes all the necessary drivers to recognize the devices on the STM32WB55 Nucleo development board (P-NUCLEO-WB55), X-NUCLEO-IKS01A3 (or X-NUCLEO-IKS4A1) and X-NUCLEO-53L3A2 (optional) expansion boards.

### Key features

- Complete firmware to develop an IoT node with BLE connectivity, environmental, motion and time-of-flight sensors
- Middleware libraries for sensor data fusion, accelerometer-based real-time activity recognition, carry position, gesture recognition, motion intensity recognition and pedometer.
- Compatible with ST BLE Sensor application for Android/iOS, to perform sensor data reading, motion algorithm features and firmware update (FOTA)
- Example implementation available for the X-NUCLEO-IKS01A3 (or X-NUCLEO-IKS4A1) and X-NUCLEO-53L3A2 (optional) connected to a P-NUCLEO-WB55.Nucleo
- Easy portability across different MCU families, thanks to STM32Cube

### Overall Software Architecture



Latest info available at [www.st.com](http://www.st.com)  
FP-SNS-MOTENVWB1

## 2- Setup & Demo Examples

# Setup & Demo Examples

## Software and Other prerequisites

- **STSW-LINK004**

- STM32 ST-LINK Utility (STSW-LINK004) is a full-featured software interface for programming STM32 microcontrollers

- **FP-SNS-MOTENVWB1**

- Copy the .zip file content of the firmware package into a folder on your PC.
- The package contains source code example (Keil, IAR, STM32CubeIDE) compatible with P-NUCLEO-WB55

- **ST BLE Sensor Application for Android/iOS to download from Google Play Store / iTunes**

## 2.1- Setup Overview: STM32 Nucleo with Expansion boards



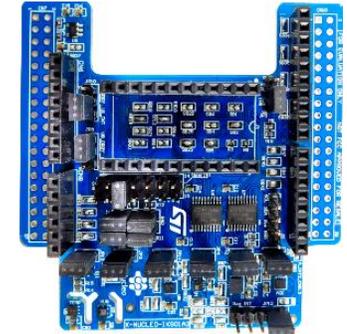
# Setup Overview

## HW prerequisites

- 1x Motion MEMS and Environmental Sensor Expansion Board (**X-NUCLEO-IKS01A3** or **X-NUCLEO-IKS4A1**)
- 1 x STM32 ranging sensor expansion board (**X-NUCLEO-53L3A2**) - *Optional*
- 1x STM32WB Nucleo Development Board (**P-NUCLEO-WB55**)
- 1x Android™ or iOS™ device
- 1x PC with Windows 7 and above
- 1x USB type A to Micro-B USB cable



P-NUCLEO-WB55



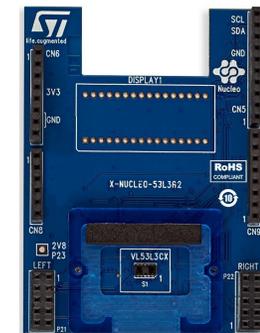
X-NUCLEO-IKS01A3



Micro USB



X-NUCLEO-IKS4A1



X-NUCLEO-53L3A2  
(Optional)

# Setup Overview

## Start coding in just a few minutes (1/2)



1 [www.st.com/stm32code](http://www.st.com/stm32code)



2 Select Expansion software :  
FP-SNS-MOTENVWB1

3 Download & unpack

### FP-SNS-MOTENVWB1 package structure

- \_htmresc ← Docs
- Documentation ← BSP, HAL and drivers
- Drivers ← STM32 WPAN BLE, Motion libs
- Middlewares ← Application
- Projects
- STM32CubeMX
- Utilities
- DM00751078.pdf
- Package\_License.html
- Package\_License.md
- Release\_Notes.html
- STMicroelectronics.FP-SNS-MOTENVWB1.pdsc

4

Android™/iOS™ smartphone and  
ST BLE Sensor application

6



Build/Flash and run the project



5



# Setup Overview

## Start coding in just a few minutes (2/2)

### 1. How to install the pre-compiled binary without FOTA:

- For each applications, there is inside the package one folder called “Binary”

STMicroelectronics.FP-SNS-MOTENVWB1.1.3.0 > Projects > P-NUCLEO-WB55-NUCLEO > Applications > IKS4A1 > MOTENV1 > Binary

Name	Date modified	Type	Size
 MOTENV1.bin	7/12/2023 1:00 PM	BIN File	185 KB

- Directly flash to a supported STM32WB Nucleo using the STM32CubeProgrammer or by doing “Drag & Drop”

### 2. How Install the code after compiling the project:

- Compile the project with your preferred IDE
- Download the binary to a supported STM32WB Nucleo

# Setup Overview

## Bluetooth low energy and sensors software

### FP-SNS-MOTENVWB1 - Serial line monitor (e.g.Tera Term)

- Pressing the **RESET** User button on STM32WB Nucleo board. You could see the initialization phase

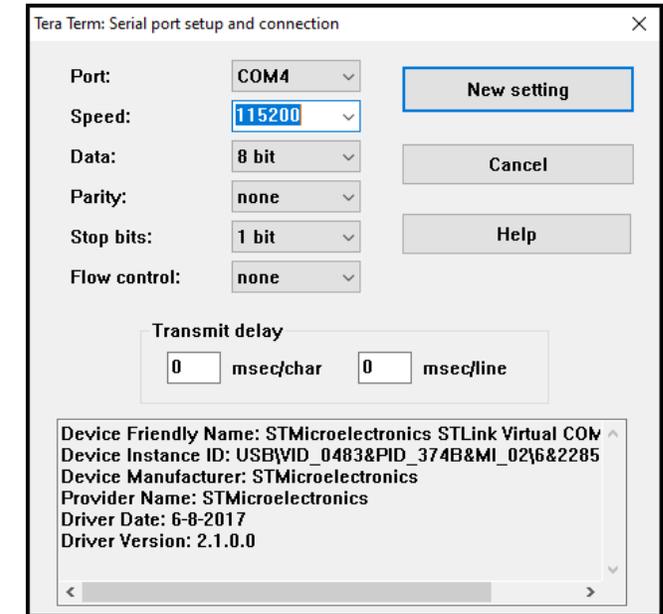
```
COM35 - Tera Term VT
File Edit Setup Control Window Help
X-NUCLEO-53L3A2 initialized
  Sensor Id: EAAA
  NumberOfZones: 1
  MaxNumberOfTargetsPerZone: 4
  CustomROI: 1
  ThresholdDetection: 0
  Set profile ok

-- ENU APPLICATION SERVER : MBR_ENU_INSTANCES=3
Wireless Firmware version 1.13.2
Wireless Firmware build 2
FUS version 1.2.0
>>== SHCI_SUB_EUT_CODE_READY
>>== WIRELESS_FW_RUNNING
>>== DBGMCU_GetRevisionID= 2003
>>== DBGMCU_GetDeviceID= 495
Success: SHCI_C2_BLE_Init command
=>> Start Ble_Hci_Gatt_Init function
Success: hci_reset command
Success: aci_hal_write_config_data command - CONFIG_DATA_PUBADDR_OFFSET
Public Bluetooth Address: 00:80:a1:27:b7:fc
Success: aci_hal_write_config_data command - CONFIG_DATA_IR_OFFSET
Success: aci_hal_set_tx_power_level command - CONFIG_DATA_ER_OFFSET
Success: aci_gatt_init command
Success: aci_gap_init command
Success: hci_le_set_default_phy command
Success: aci_gap_set_io_capability command
Success: aci_gap_set_authentication_requirement command
Success: aci_gap_configure_whitelist command
=>> End Ble_Hci_Gatt_Init function
Success: aci_hal_set_radio_activity_mask command
LED BLUE OFF
-- MOTION_EXT APPLICATION SERVER : ODR=120.00 [Hz]

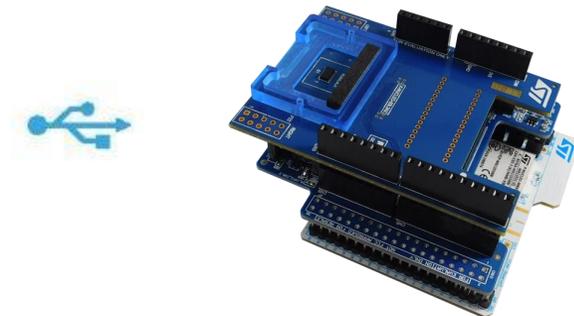
-- MOTION_FX APPLICATION SERVER : Magneto Calibration quality is not good
-- MOTION_AR APPLICATION SERVER : NOTIFY CLIENT WITH NEW PARAMETER VALUE
-- MOTION_CP APPLICATION SERVER : NOTIFY CLIENT WITH NEW PARAMETER VALUE
-- MOTION_GR APPLICATION SERVER : NOTIFY CLIENT WITH NEW PARAMETER VALUE
-- MOTION_PM APPLICATION SERVER : NOTIFY CLIENT WITH NEW PARAMETER VALUE
-- MOTION_ID APPLICATION SERVER : NOTIFY CLIENT WITH NEW PARAMETER VALUE

=>> aci_gap_set_discoverable - Success
=>> Success: Start Fast Advertising
>>== HCI_LE_CONNECTION_COMPLETE_SUBEVT_CODE - Connection handle: 0x801
- Connection established with Central: 0:71:c2:1c:4c:ef:93
- Connection Interval: 45.00 ms
- Connection latency: 0
- Supervision Timeout: 5000 ms
>>== HCI_LE_CONNECTION_UPDATE_COMPLETE_SUBEVT_CODE
- Connection Interval: 7.50 ms
- Connection latency: 0
- Supervision Timeout: 5000 ms
>>== HCI_LE_CONNECTION_UPDATE_COMPLETE_SUBEVT_CODE
- Connection Interval: 45.00 ms
- Connection latency: 0
- Supervision Timeout: 5000 ms
-- TEMPLATE APPLICATION SERVER : CONSOLE TERM NOTIFICATION ENABLED
-- TEMPLATE APPLICATION SERVER : CONSOLE STDERR NOTIFICATION ENABLED
-- TEMPLATE APPLICATION SERVER : ENU NOTIFICATION ENABLED
```

- When the boards are connected to an Android or iOS device, you can see what is transmitted via BLE



Configure the serial line monitor (speed, LF)



## 2.2- FOTA Support

# FOTA support

## Flash OTA and User application (1/3)

To make the OTA work, open STM32CubeProgrammer and connect to the board.

Then, follow the procedure below:

- 1. Erase full Flash memory

The screenshot shows the STM32CubeProgrammer interface with the 'Memory & File edition' window open. The 'Device memory' tab is active, displaying a memory dump table. The table has columns for Address, 0, 4, 8, C, and ASCII. The address range shown is from 0x08000000 to 0x08000130. All data in the 0, 4, 8, and C columns is 'FFFFFFFF', and the ASCII column contains 'yyyyyyyyyyyyyyyy'. The 'Log' window at the bottom shows the following messages:

```
17:09:22 : Address : 0x08000000
17:09:22 : Read progress:
17:09:22 : Data read successfully
17:09:22 : Time elapsed during the read operation is: 00:00:00.007
17:09:28 : MASS ERASE ...
17:09:32 : Mass erase successfully achieved
17:09:32 : UPLOADING ...
17:09:32 : Size : 1024 Bytes
17:09:32 : Address : 0x08000000
17:09:32 : Read progress:
17:09:32 : Data read successfully
17:09:32 : Time elapsed during the read operation is: 00:00:00.008
```

The right-hand panel shows the 'ST-LINK' configuration and 'Target information' for a P-NUCLEO-WB55 board. The 'Firmware upgrade' button is visible.



# FOTA support

## Flash OTA and User application (2/3)

- 2. Open BLE\_Ota\_reference.hex (from the MOTENV1\_OTA/Binary directory)
- 3. Flash BLE\_Ota\_reference.hex at 0x8000000

STMicroelectronics.FP-SNS-MOTENVWB1.1.3.0 > Projects > P-NUCLEO-WB55-NUCLEO > Applications > IKS4A1 > MOTENV1\_OTA > Binary

**Memory & File edition**

Device memory: BLE\_Ota\_reference.hex

Address: 0x8000000 | Size: 0x40B1 | Data width: 32-bit | Find Data: 0x

Address	0	4	8	C	ASCII
0x08000000	200023F0	08003EF0	08003E05	08003E07	ð# . ý>...>...
0x08000010	08003F19	08003F1D	08003F21	00000000	.?...?.!?...>
0x08000020	00000000	00000000	00000000	08003E09	.....>...
0x08000030	08003E08	00000000	08003E0D	08003E0F	->.....>...
0x08000040	08003F25	08003F29	08003F2D	08003E1F	%?.??.?..?>...
0x08000050	08003F31	08003F35	08003F39	08003F3D	1?.??.??.?>...
0x08000060	08003F41	08003F45	08003F49	08003F4D	A?.??.??.?>...
0x08000070	08003F51	08003F55	08003F59	08003F5D	Q?.??.??.?>...
0x08000080	08003F61	08003F65	08003F69	08003F6D	a?.??.??.?>...
0x08000090	08003F71	08003F75	08003F79	08003F7D	q?.??.??.?>...
0x080000A0	08003F81	08003F85	08003F89	08003F8D	.?..?..?..?>...
0x080000B0	08003F91	08003F95	08003F99	08003F9D	.?..?..?..?>...
0x080000C0	08003FA1	08003FA5	08003FA9	08003FAD	i?.??.?..?>...
0x080000D0	08003E13	08003FB1	08003FB5	08003FB9	->..?..?..?>...
0x080000E0	08003FBD	08003FC1	08003FC5	08003FC9	%?.??.?..?>...
0x080000F0	08003E27	08003E23	08003FCD	08003FD1	'>..?..?..?>...
0x08000100	08003FD5	08003FD9	08003FDD	08003FE1	O?.??.?..?>...
0x08000110	08003FE5	08003FE9	08003FED	08003FF1	ã?.??.?..?>...
0x08000120	08003FF5	08003FF9	08003E19	08003FFD	õ?.??.?..?>...
0x08000130	08004001	08004005	08004009	0004B538	.@...@...@...>

**Log**

- 17:09:22 : Time elapsed during the read operation is: 00:00:00.007
- 17:09:28 : MASS ERASE ...
- 17:09:32 : Mass erase successfully achieved
- 17:09:32 : UPLOADING ...
- 17:09:32 : Size : 1024 Bytes
- 17:09:32 : Address : 0x8000000
- 17:09:32 : Read progress:
- 17:09:32 : Data read successfully
- 17:09:32 : Time elapsed during the read operation is: 00:00:00.008
- 17:16:10 : Read File: C:\Workspace\HUAWEI\STM32CubeFunctionPack\_MOTENVWB1\_V1.1.0\Projects\P-NUCLEO-WB55.Nucleo\Applications\MOTENV1\Binary\BLE\_Ota\_reference.hex
- 17:16:10 : Number of segments: 1
- 17:16:10 : segment[0]: address= 0x8000000, size= 0x40B1

**ST-LINK configuration**

- Serial number: 086CF...
- Port: SWD
- Frequency (kHz): 4000
- Mode: Normal
- Access port: 0
- Reset mode: Software reset
- Shared: Disabled
- Debug in Low Power mode:
- External loader: MX25LM51245G\_STM32F103
- Target voltage: 3.26 V
- Firmware version: V2J36M26
- Firmware upgrade: [Firmware upgrade](#)

**Target information**

- Board: P-NUCLEO-WB55
- Device: STM32WB5x
- Type: MCU
- Device ID: 0x495
- Revision ID: Rev Y
- Flash size: 1 MB
- CPU: Cortex-M4
- Bootloader Version: 0x05



# FOTA support

## Flash OTA and User application (3/3)

- 4. Open MOTENV1\_OTA.bin (from the MOTENV1\_OTA/Binary directory)
- 5. Flash MOTENV1\_OTA.bin at 0x8007000

The screenshot shows the STM32CubeProgrammer interface. The main window displays a memory table with columns for Address, 0, 4, 8, C, and ASCII. A context menu is open over the table, showing options: Download, Read, Save As..., Verify, Address (with a text input field containing 0x08007000), Compare memory with file, and Compare two files. The log window at the bottom shows the following entries:

```
09:44:23 : Time elapsed during download operation: 00:00:04.350
09:44:55 : Memory Programming ...
09:44:55 : Opening and parsing file: MOTENV1_OTA.bin
09:44:55 : File : MOTENV1_OTA.bin
09:44:55 : Size : 185.08 KB
09:44:55 : Address : 0x08007000
09:44:55 : Erasing memory corresponding to segment 0:
09:44:55 : Erasing internal memory sectors [7 53]
09:44:56 : Download in Progress:
09:44:59 : File download complete
09:44:59 : Time elapsed during download operation: 00:00:03.857
```

On the right side, the ST-LINK configuration panel shows the target information:

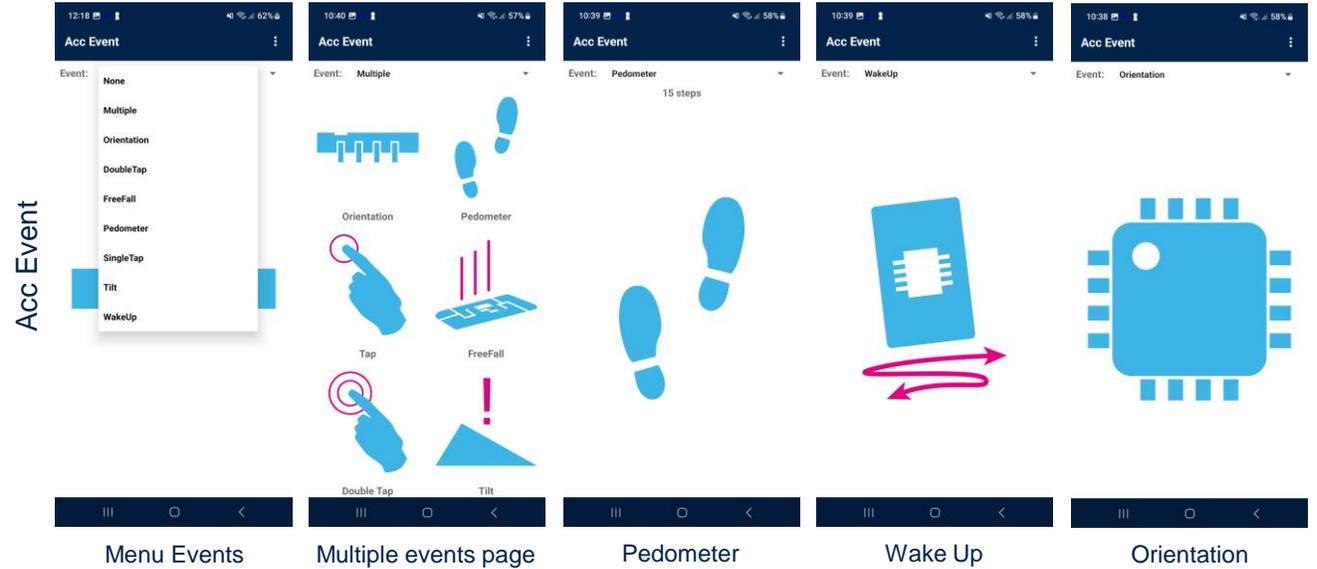
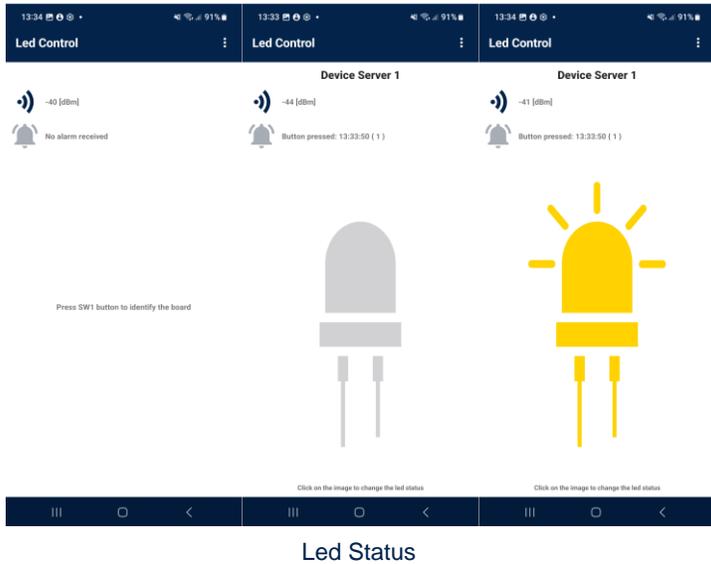
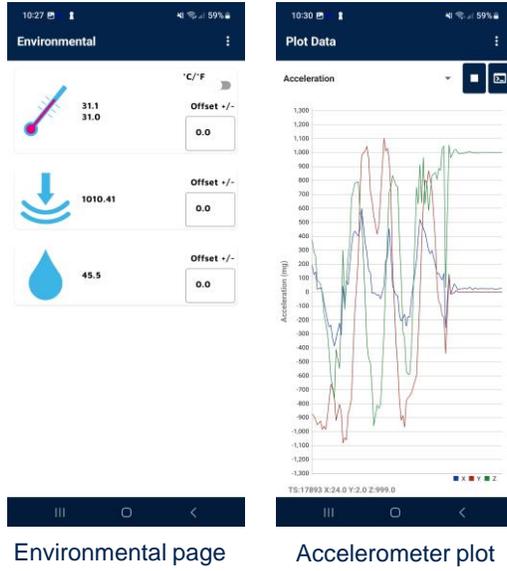
Target information	
Board	NUCLEO-WB55RG
Device	STM32WB5x
Type	MCU
Device ID	0x495
Revision ID	Rev X
Flash size	1 MB
CPU	Cortex-M4
Bootloader Version	0xD5

## **2.3- Demo Examples**

# **ST BLE Sensor Application Overview**

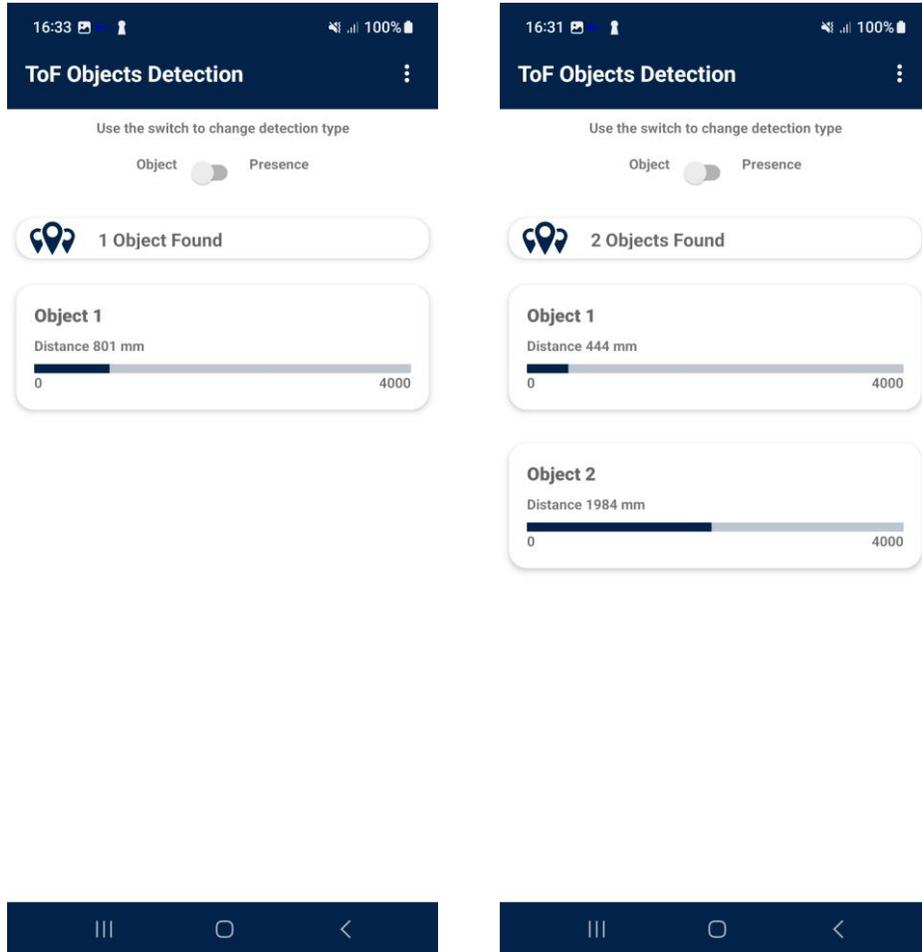


## ST BLE Sensor Application for Android/iOS (1/5)

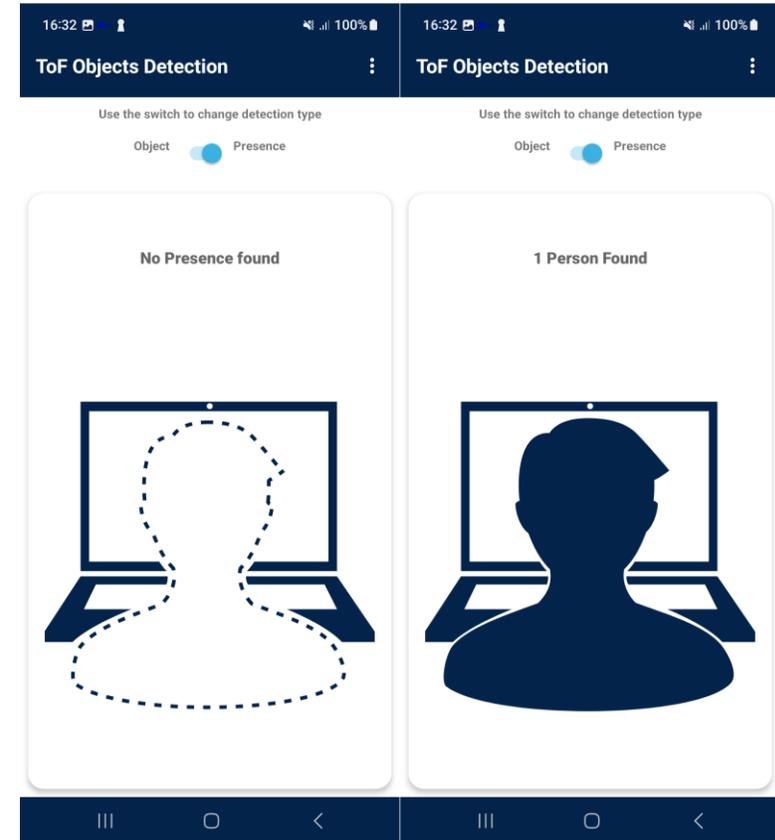


# Demo Examples

## ST BLE Sensor Application for Android/iOS (2/5)



Objects distances



Presence Detection

### NOTE

The presence is identified inside a fixed range distances that can be modified by these line code:

```
#define PRESENCE_MIN_DISTANCE_RANGE 300
#define PRESENCE_MAX_DISTANCE_RANGE 800
```

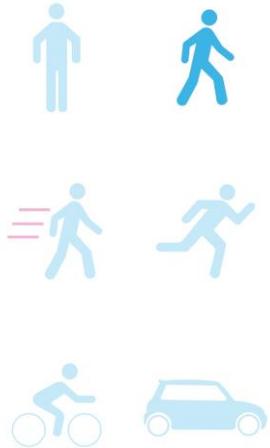
in the file FLIGHT1\_config.h that can find in the Inc users folder for each project.



# Demo Examples

## ST BLE Sensor Application for Android/iOS (3/5)

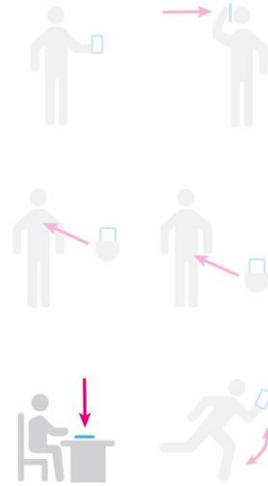
Middlewares – Android Version



Activity recognition



Mems Gesture



Carry position recognition



The intensity is proportional to the movement



The Motion intensity value is: 6

Intensity detection

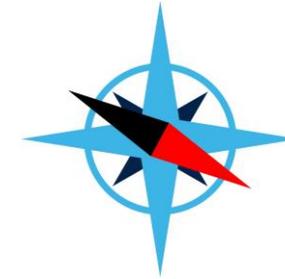


RESET

Sensor fusion



SE



Angle: 118.35°

ecompass



26 steps  
119 Steps/Min

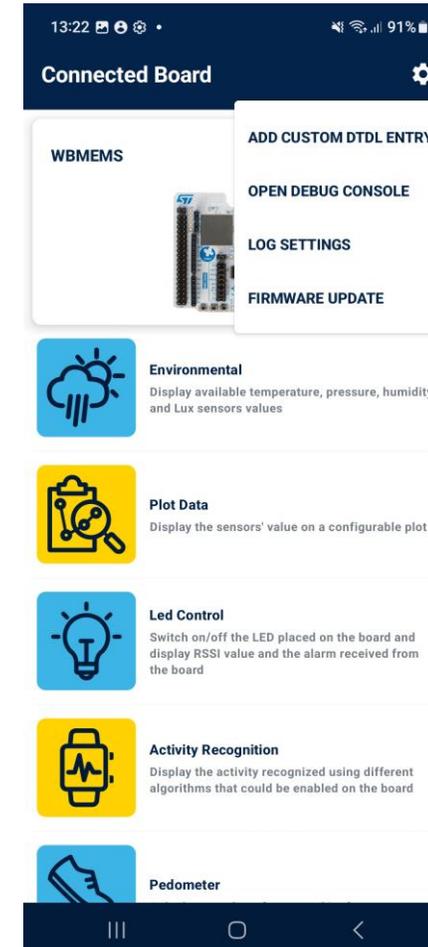
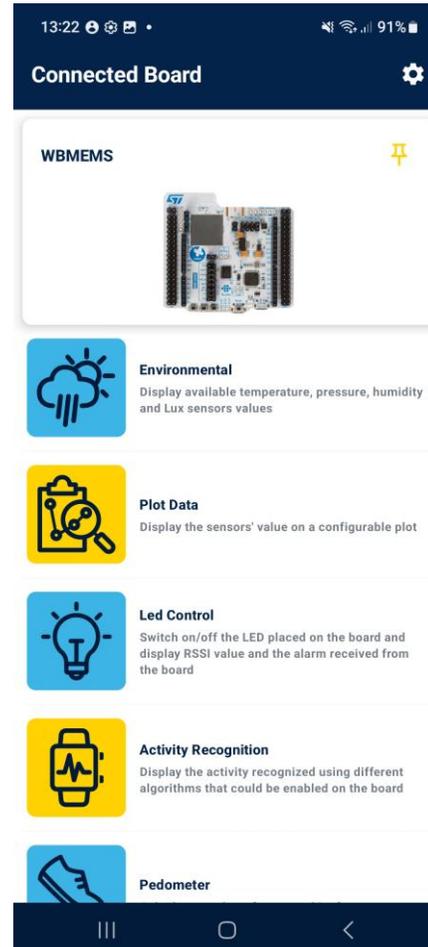
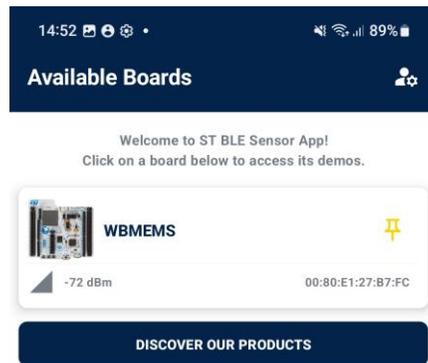
SW Pedometer

# Demo Examples

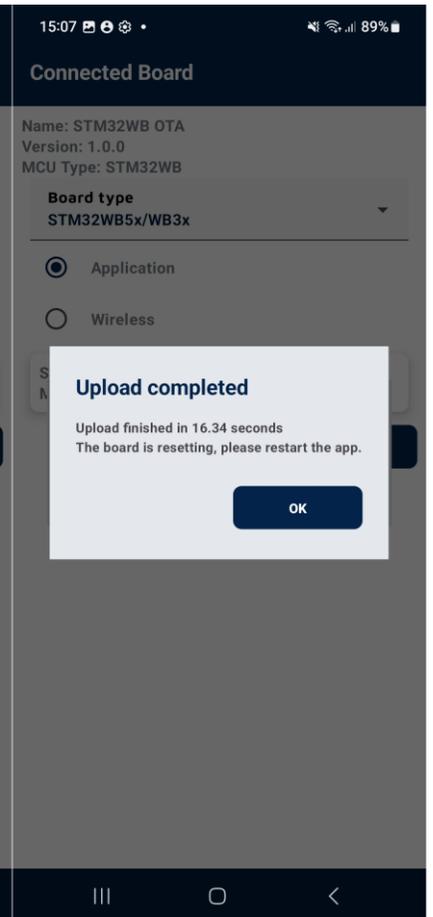
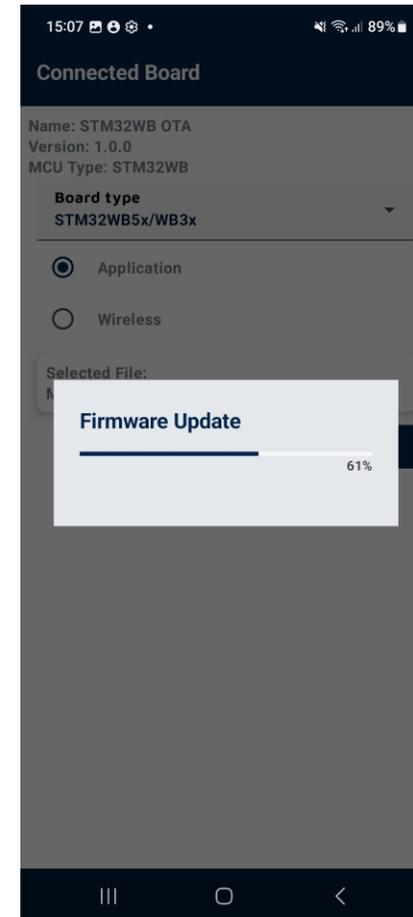
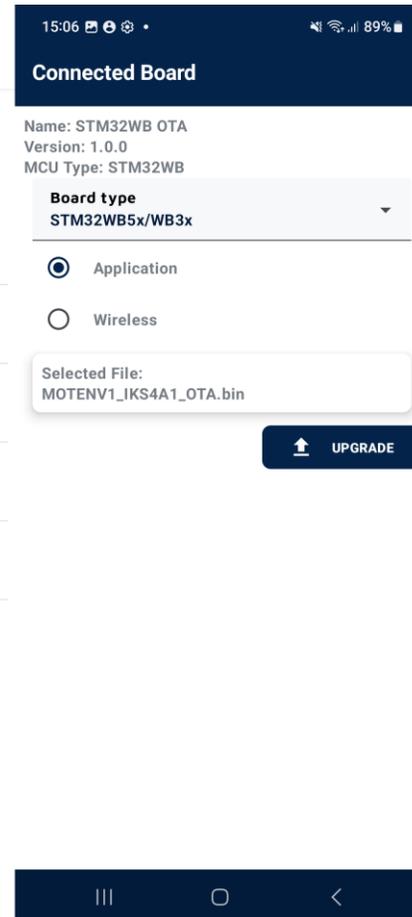
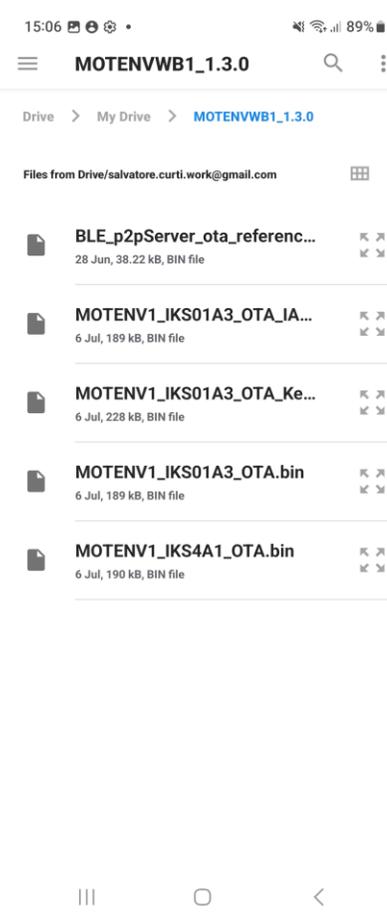
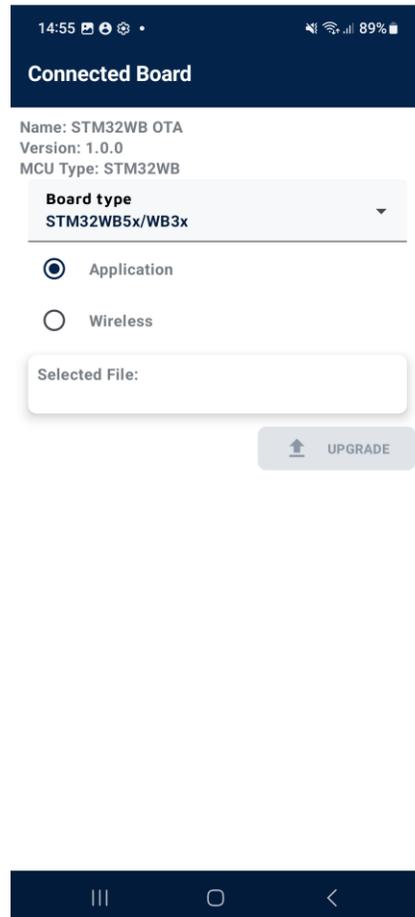
## ST BLE Sensor Application for Android/iOS (4/5)

To update the user application, follow the steps below:

1. Copy the new user application to your phone
2. Open ST BLE Sensor mobile app
3. Search for and connect to the “WBMEMS” device
4. Tap the menu button (top right) to open the option window, scroll the menu option and selecting “FIRMWARE UPDATE”



5. select the board type and after Application Coprocessor reboot
6. select the binary file for OTA from your mobile phone folders
7. start OTA with the red button



# 3- Documents & Related Resources

# Documents & Related Resources

All documents are available in the Documentation tab of the related product webpage

## FP-SNS-MOTENVWB1:

- **DB3966:** STM32Cube function pack for STM32WB with BLE connectivity and environmental and motion sensors – [data brief](#)
- **UM2613:** Getting started with the STM32Cube function pack for STM32WB with BLE connectivity and environmental and motion sensors – [user manual](#)
- [Release Notes and README within the expansion package](#)

## P-NUCLEO-WB55:

- [Gerber files, BOM, Schematic](#)
- **DB3659:** STM32WB Nucleo-68 pack for wireless solutions – [data brief](#)
- **UM2453:** Bluetooth® Low Energy and 802.15.4 Nucleo pack based on STM32WB Series microcontrollers – [user manual](#)

## X-NUCLEO-IKS01A3:

- [Gerber files, BOM, Schematic](#)
- **DB3851:** Motion MEMS and environmental sensor expansion board for STM32 Nucleo – [data brief](#)
- **UM2559:** Getting started with the X-NUCLEO-IKS01A3 motion MEMS and environmental sensor expansion board for STM32 Nucleo – [user manual](#)

# Documents & Related Resources

All documents are available in the Documentation tab of the related product webpage

## X-NUCLEO-IKS4A1:

- [Gerber files, BOM, Schematic](#)
- **DB5091:** Motion MEMS and environmental sensor expansion board for STM32 Nucleo – [data brief](#)
- **UM3250:** Getting started with the X-NUCLEO-IKS01A3 motion MEMS and environmental sensor expansion board for STM32 Nucleo – [user manual](#)

## X-NUCLEO-53L3A2:

- [Gerber files, BOM, Schematic](#)
- **DB4226:** Time-of-Flight ranging sensor with multi target detection expansion board based on VL53L3CX for STM32 Nucleo – [data brief](#)
- **UM2757:** Getting started with X-NUCLEO-53L3A2 multi target ranging ToF sensor expansion board based on VL53L3CX for STM32 Nucleo – [user manual](#)

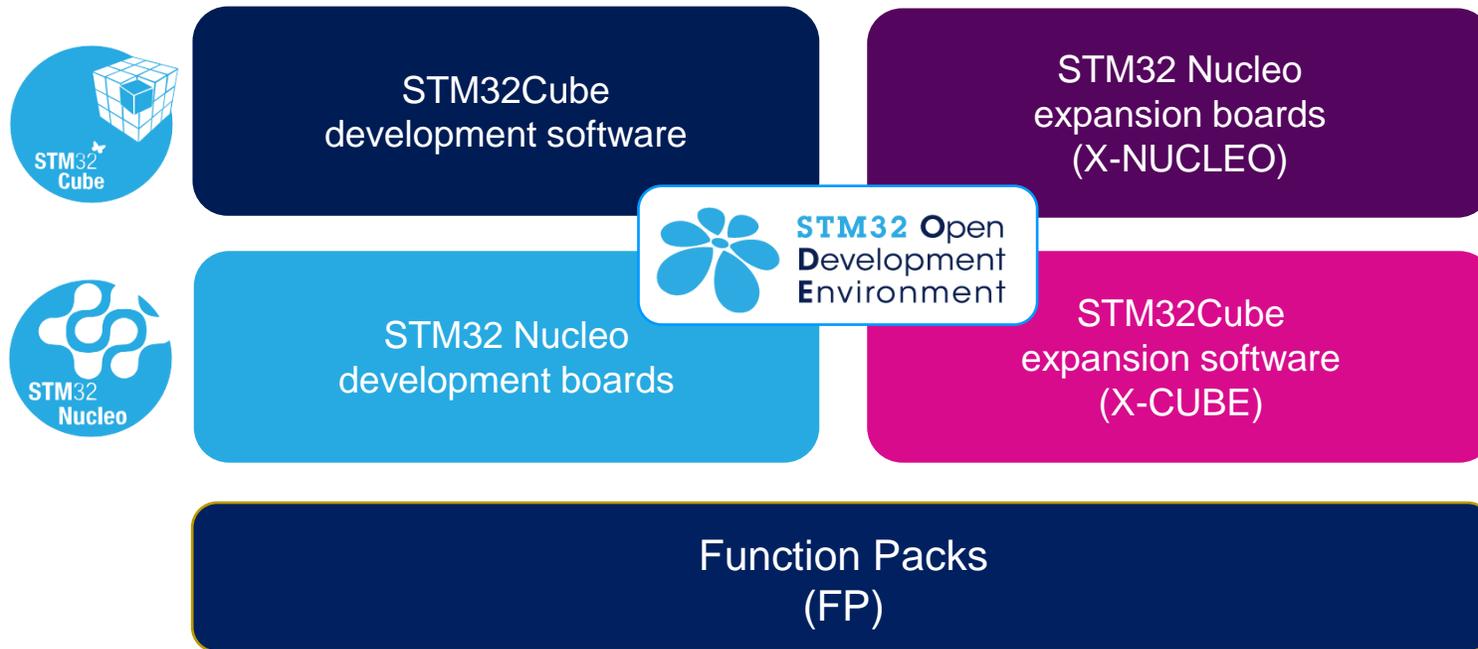
# 4- STM32 Open Development Environment: Overview



# STM32 Open Development Environment

## Fast, affordable Prototyping and Development

- The STM32 Open Development Environment (STM32 ODE) is an open, flexible, easy, and affordable way to develop innovative devices and applications based on the STM32 32-bit microcontroller family combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs



For further information, please visit [www.st.com/stm32ode](http://www.st.com/stm32ode)

# Thank you

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