

## STM32Cube function pack for STM32WB with BLE connectivity and environmental and motion sensors

Application	FP-SNS-MOTENVWB1		
Middleware	BLE	MotionAR	MotionCP
	MotionFX	MotionGR	MotionID
	MotionPM		
Hardware Abstraction	STM32Cube Hardware Abstraction Layer (HAL)		
Hardware	STM32 Nucleo expansion boards X-NUCLEO-IKS01A3 (Sense) X-NUCLEO-53L3A2 (Sense)		
	STM32 Nucleo development board P-NUCLEO-WB55 Nucleo		



### Features

- Complete firmware to develop an IoT node with Bluetooth® Low Energy 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 [STBLESensor](#) applications for Android/iOS to perform sensor data reading, motion algorithm feature demo, and firmware update (FOTA)
- Sample implementation available for the [X-NUCLEO-IKS01A3](#) and [X-NUCLEO-53L3A2](#) (optional) connected to a [P-NUCLEO-WB55](#)
- Easy portability across different MCU families, thanks to [STM32Cube](#)

### 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, pressure and relative humidity), and Time-of-Flight sensor data.

The package also enables advanced functions such as the sensor data fusion, accelerometer-based real-time activity recognition, carry position, gesture recognition, pedometer, motion intensity, compass, and object distance.

Together with the suggested combination of [STM32WB](#) and other 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](#) and [X-NUCLEO-53L3A2](#) (optional) expansion board.

Product summary	
STM32Cube function pack for STM32WB with BLE connectivity and MEMS sensors	<a href="#">FP-SNS-MOTENVWB1</a>
Motion MEMS and environmental sensor expansion board for STM32 Nucleo	<a href="#">X-NUCLEO-IKS01A3</a>
Multi-targets ranging sensor expansion board based on VL53L3CX for STM32 Nucleo	<a href="#">X-NUCLEO-53L3A2</a>
Bluetooth 5 and 802.15.4 Nucleo Pack including USB dongle and Nucleo-68 with STM32WB55 MCUs	<a href="#">P-NUCLEO-WB55</a>
BLE sensor application for Android and iOS	<a href="#">STBLESensor</a>

# 1 Detailed description

## 1.1 What can you do with STM32Cube function packs?

STM32Cube function packs leverage the modularity and interoperability of STM32 Nucleo and X-NUCLEO boards together with STM32Cube and X-CUBE software to create function examples for some of the most common use cases of different application technologies.

These software function packs are designed to exploit the underlying STM32 ODE hardware and software components as much as possible to best satisfy the requirements of final user applications.

Moreover, function packs may include additional libraries and frameworks that are not present in the original X-CUBE packages, thus enabling new functionalities allowing real and usable system for developers.

## 1.2 What is STM32Cube?

STM32Cube is a combination of a full set of PC software tools and embedded software blocks running on STM32 microcontrollers and microprocessors:

- [STM32CubeMX](#) configuration tool for any STM32 device; it generates initialization C code for Cortex-M cores and the Linux device tree source for Cortex-A cores
- [STM32CubeIDE](#) integrated development environment based on open-source solutions like Eclipse or the GNU C/C++ toolchain, including compilation reporting features and advanced debug features
- [STM32CubeProgrammer](#) programming tool that provides an easy-to-use and efficient environment for reading, writing and verifying devices and external memories via a wide variety of available communication media (JTAG, SWD, UART, USB DFU, I2C, SPI, CAN, etc.)
- STM32CubeMonitor family of tools ([STM32CubeMonRF](#), [STM32CubeMonUCPD](#), [STM32CubeMonPwr](#)) to help developers customize their applications in real-time
- [STM32Cube MCU and MPU packages](#) specific to each STM32 series with drivers (HAL, low-layer, etc.), middleware, and lots of example code used in a wide variety of real-world use cases
- [STM32Cube expansion packages](#) for application-oriented solutions.

## 1.3 How does this function pack complement STM32Cube?

This software is based on the STM32CubeHAL. It extends [STM32Cube](#) by providing a board support package (BSP) for the [X-NUCLEO-IKS01A3](#) expansion board, [X-NUCLEO-53L3A2](#) (optional) sensor expansion boards and, middleware components for communication with other Bluetooth® Low Energy devices and for sensor data fusion.

This package also contains motion sensor libraries useful for sensing applications based on Bluetooth® Low Energy communication: MotionFX, MotionAR, MotionCP, MotionGR, MotionID, MotionPM.

Their algorithms work with accelerometer data only that facilitate the low power consumption strategies commonly required in these applications, in compliance with Bluetooth specifications core 5.0 embedded in the [P-NUCLEO-WB55](#).

The provided drivers abstract low-level hardware details, so middleware components and applications can access the sensors in a hardware-independent manner.

The package includes a sample application to transmit the values read from all the sensors (temperature, humidity, pressure, accelerometer, magnetometer, gyroscope, objects distances) to a Bluetooth low energy-enabled device, such as an Android™ or iOS™-based smartphone.

The application also includes the OTA capability for firmware upgrade via Bluetooth® Low Energy protocol.

The STBLESensor Android/iOS application (available at their respective stores) displays the values read from accelerometer, magnetometer, gyroscope, temperature, humidity, pressure, and Time-of-Flight sensors.

## Revision history

**Table 1. Document revision history**

Date	Version	Changes
09-Jul-2019	1	Initial release.
19-Oct-2021	2	Updated cover page features and description.
05-Sep-2022	3	Updated cover image, cover page features, description and <a href="#">Section 1.3 How does this function pack complement STM32Cube?</a> .

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