



life.augmented



# Quick Start Guide

**SensorTile.box PRO:** the new programmable wireless box kit flexible to your expertise

# Agenda

- 1 Hardware and Software overview
- 2 Setup & Demo Application
- 3 Documents & Related Resources
- 4 STM32 Open Development Environment: Overview

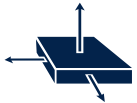
# 1- Hardware and Software overview

# Sense, process and connect

## Motion sensors



6-axis inertial measurement unit  
**LSM6DSV16X**



3-axis low-power accelerometer  
**LIS2DU12**



3-axis magnetometer  
**LIS2MDL**



## Motion sensors

Low-voltage local digital  
temperature sensor  
**STTS22H**



Altimeter / pressure sensor  
**LPS22DF**



Digital microphone / audio sensor  
**MP23DB01HP**



## Processing & memory



Ultra-low-power with FPU Arm  
Cortex-M33 with Trust Zone  
**STM32U585AI**



Micro SD card slot

## Connectivity

Bluetooth Low Energy 5.2 SoC  
**BlueNRG355AC**



NFC tag on board  
**ST25DV04K**



# Power options and user interface

## Power options



USB-C charging port



Wireless charging



480 mAh long life battery



## User interface

4 Programmable LEDs



2 Programmable buttons  
+ Reset button



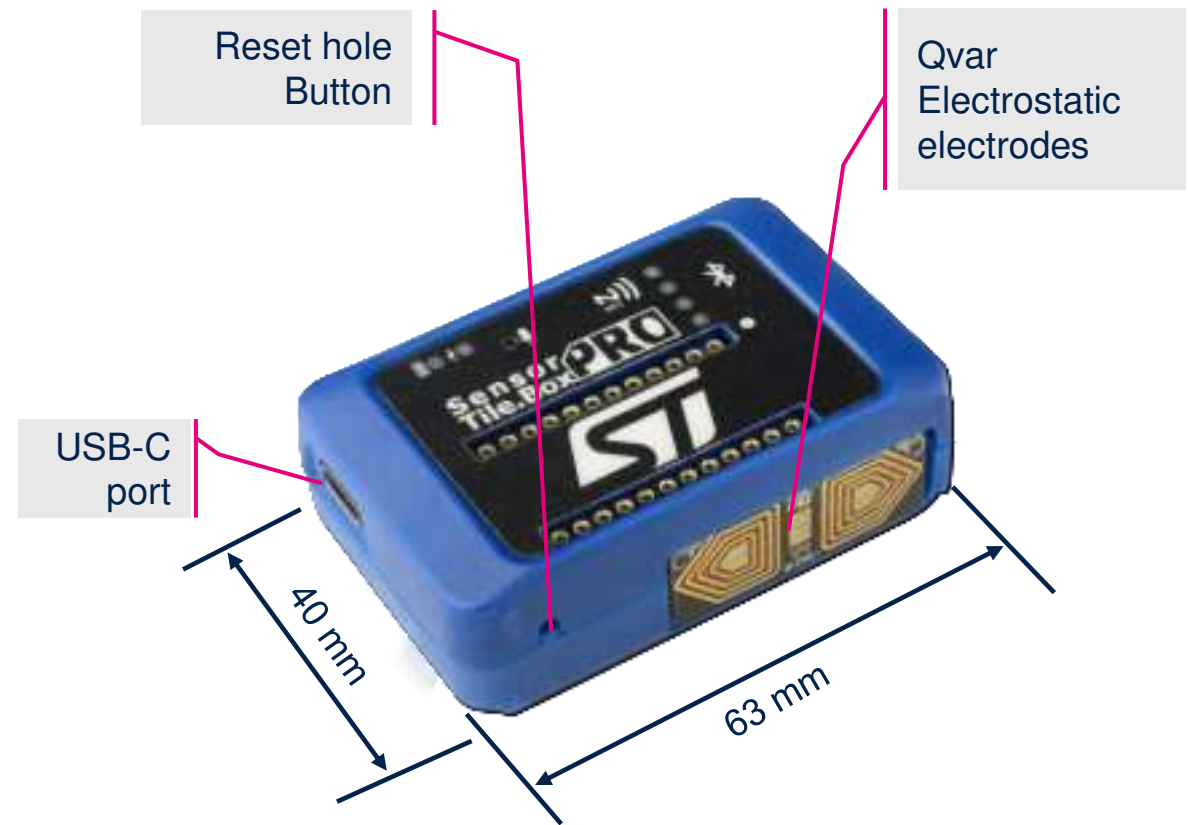
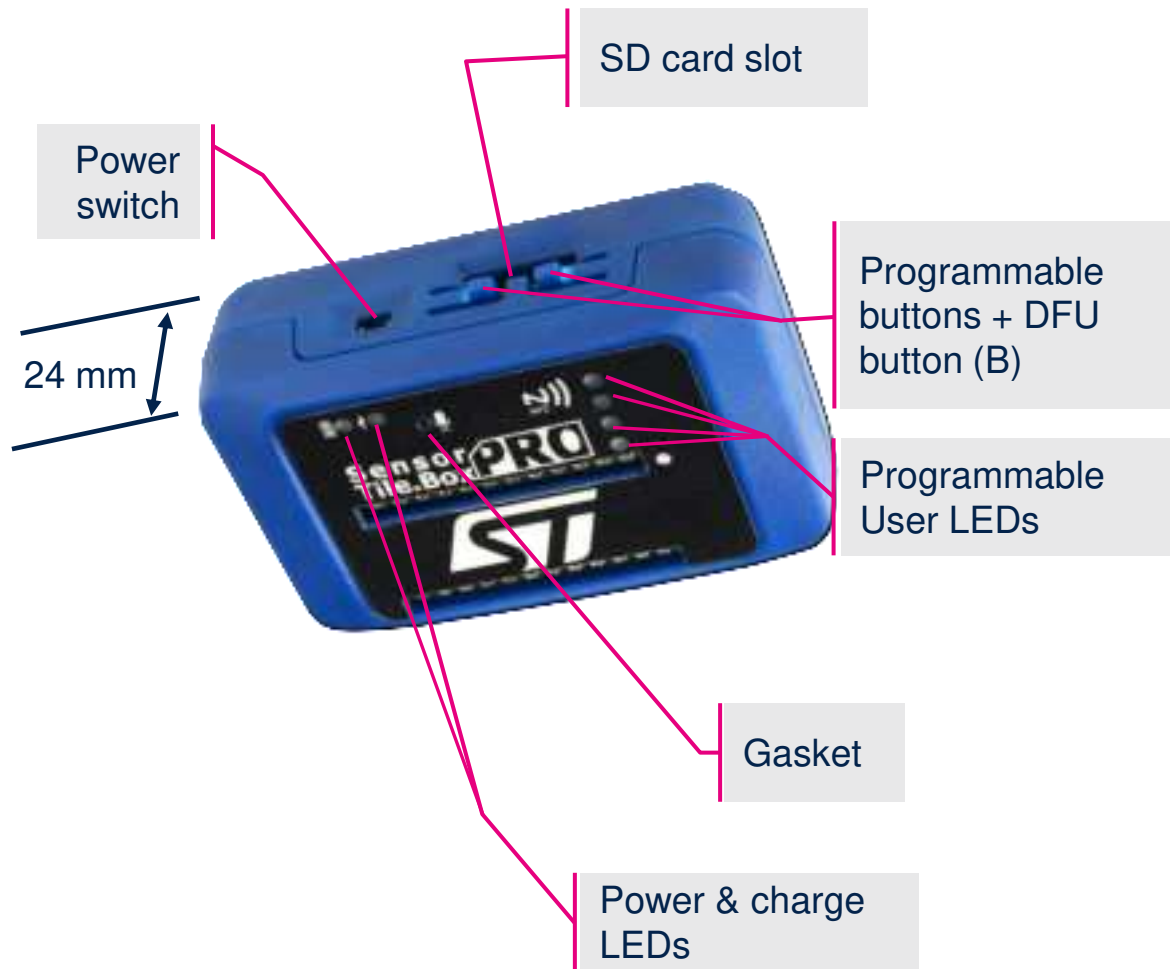
Programmable Audio Buzzer



Qvar sensor electrodes

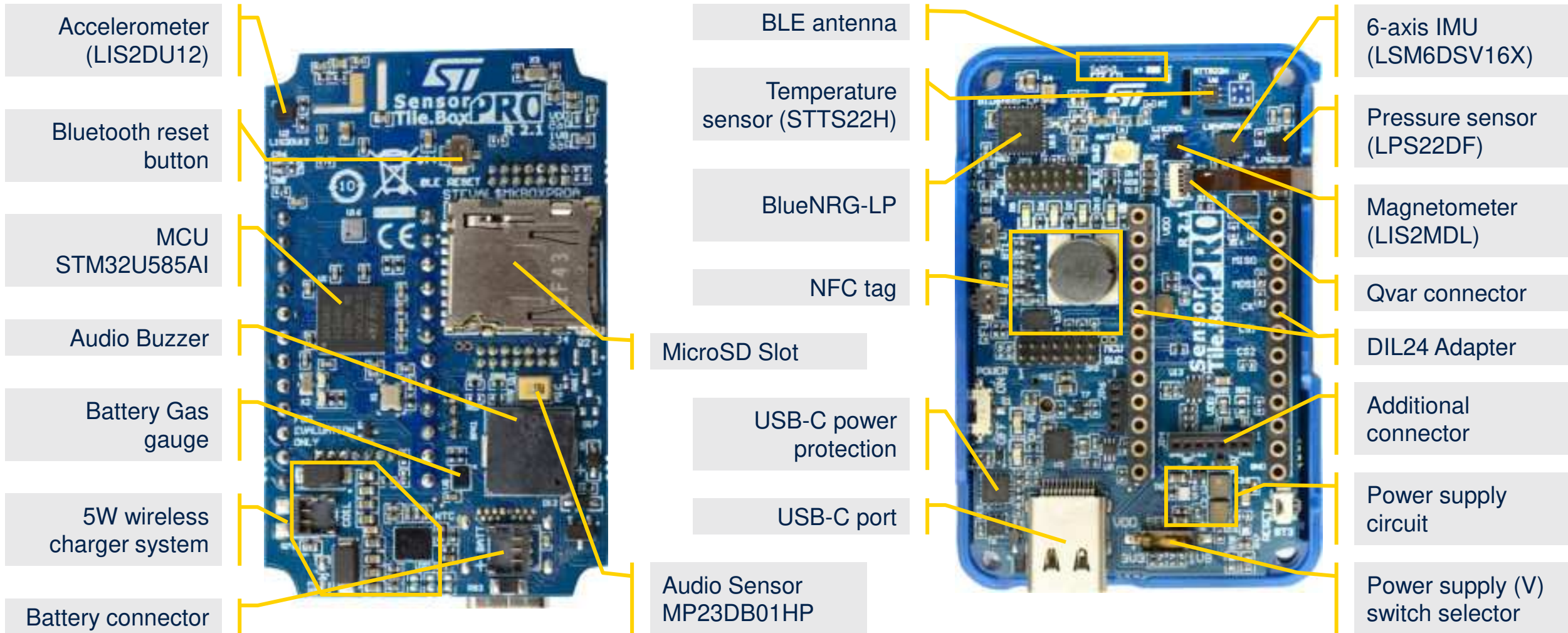


# Meeting the SensorTile.box PRO from the outside





# Meeting the SensorTile.box PRO from the inside



# The kit overview: all with you!



Blister with quick  
starting guide

STEVAL-MKIGIBV4  
STLINK adapter with  
programming cable

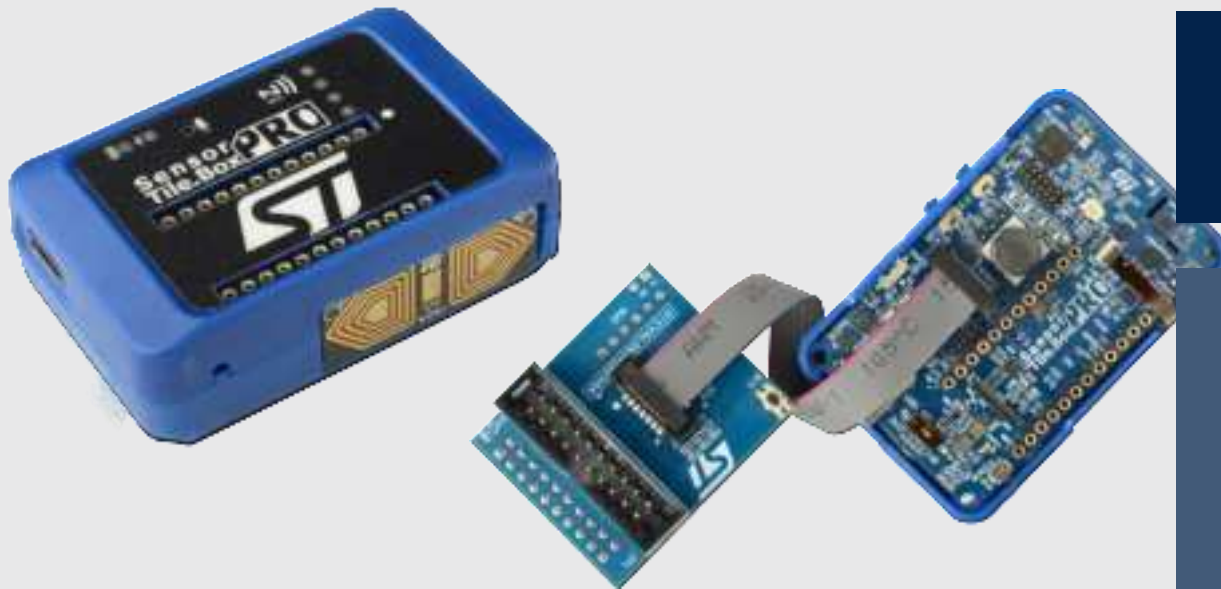
SensorTile.box PRO





# ST ecosystem supporting learning and prototyping

## SensorTile.box PRO ready-to-go IoT node



**STEVAL-MKBOXPRO**

40 x 63 x 20 mm (L x l x h)

[www.st.com/sensortileboxpro](http://www.st.com/sensortileboxpro)

### Firmware

**STSW-MKBOXPRO-FS**

**STSW-MKBOX-BLEDK**

### Pre-integrated application example

**FP-SNS-DATALOG2**

**FP-ATR-BLE1**

**FP-SNS-BLEMESH1**

**FP-SNS-STBOX1**

### BLE applications

**ST BLE Sensor Classic**

**ST asset tracking**

## 2- Setup & Demo Applications

# Setup

## HW prerequisites

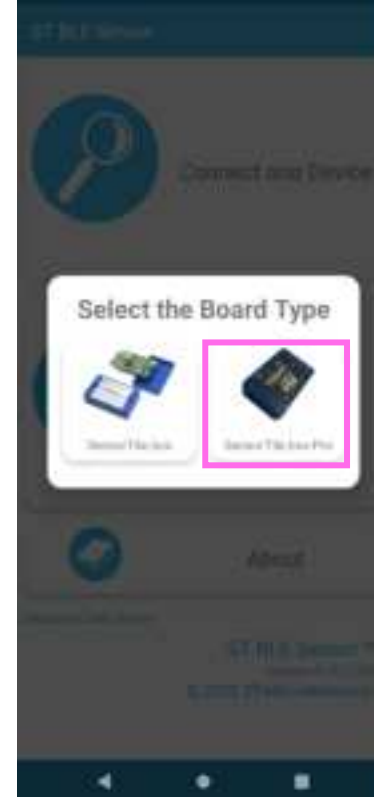
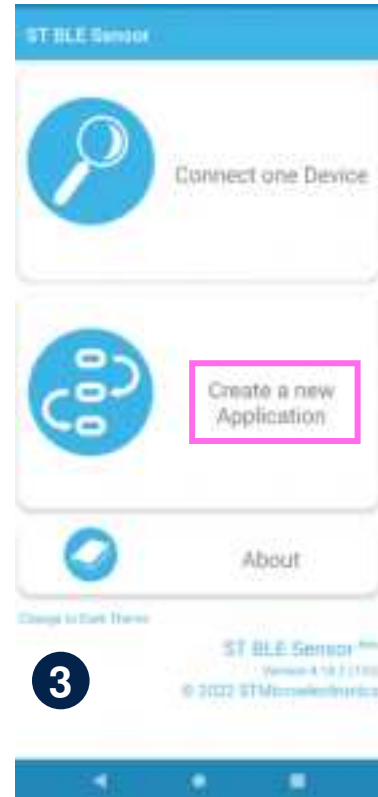
- **STEVAL-MKBOXPRO**
- **ST BLE Sensor Classic Application** for Android/iOS to be downloaded from Google Play Store / App Store.



Android™/iOS™ smartphone with ST BLE Sensor applications

# Demo 1: Sensor Fusion – Quaternion

## Entry mode (1/3)



Let's switch on the board [1], green LED switches on [2]. Open ST BLE Sensor Classic app on your smartphone. From the main page of the app, click on Create a new Application [3].

Select SensorTile.box Pro as the board type.

A list of Example Apps Categories appears, select for example Motion.

# Demo 1: Sensor Fusion – Quaternion

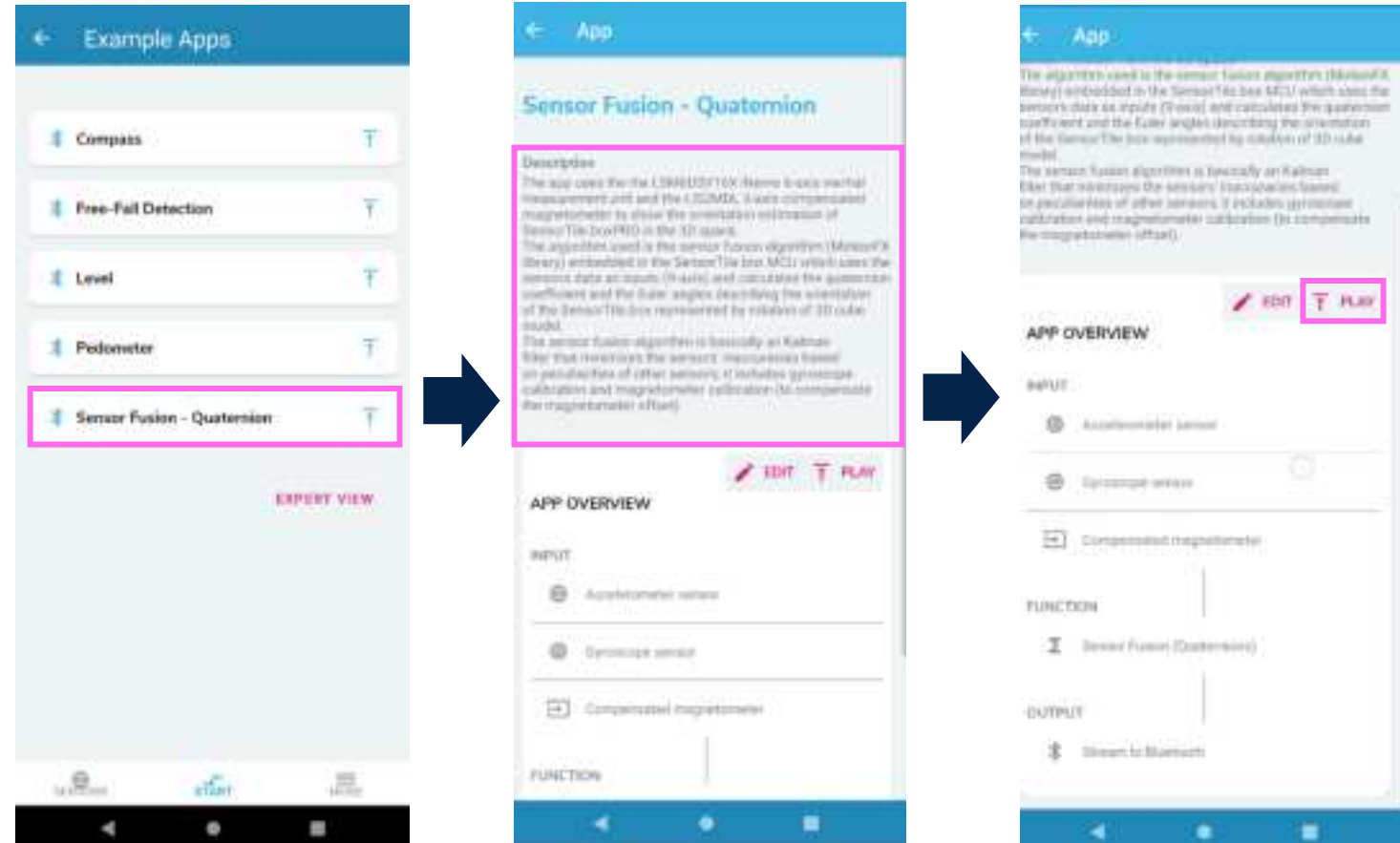
## Entry mode (2/3)

Then select Sensor Fusion – Quaternion among the Example applications.

A brief description of the application and an app overview, function, output, are provided for each example application.

If we focus on The Sensor Fusion – Quaternion application, the LSM6DSV16X iNemo 6-axis inertial measurement unit and the LIS2MDL 3-axis compensated magnetometer are used to show the orientation estimation of SensorTile.box PRO in the 3D space. If we look at the block diagram of this app, the accelerometer sensor, the gyroscope sensor and the compensated magnetometer are present. The Sensor Fusion (Quaternion) function is applied to these input data and the output is streamed to Bluetooth.

Now click on Play button, available in the application overview section.

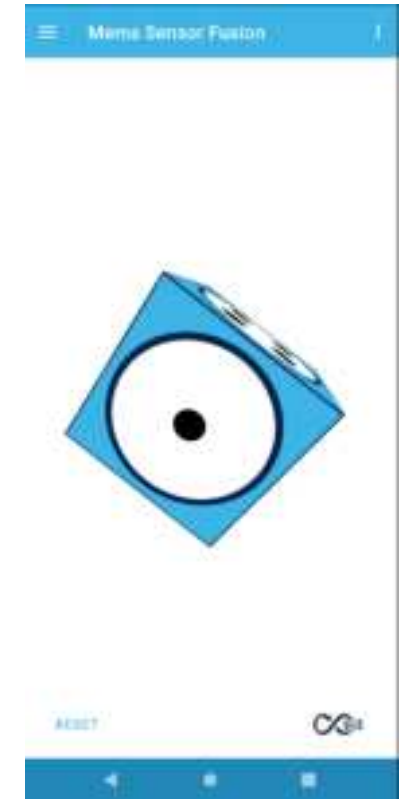
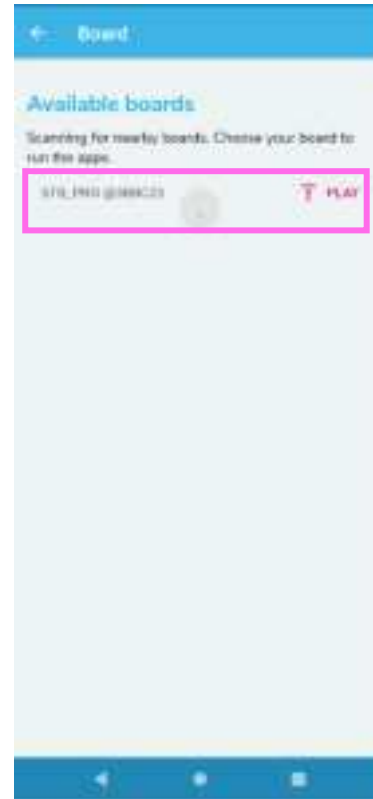


# Demo 1: Sensor Fusion – Quaternion

## Entry mode (3/3)

The available board list appears: the considered board is identified by its name (in this case, STB\_PRO).

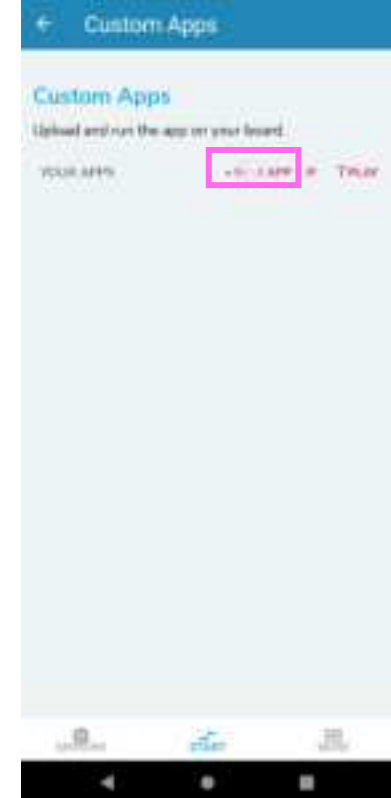
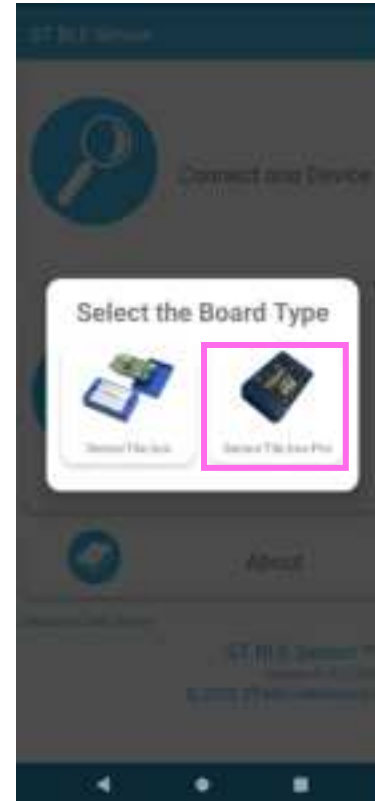
Click on Play. A pop-up window called Overwrite Board opens: to load the current application on the board, substituting the old one already present, click OK. The application is loaded, and the blue LED turns on: a pop-up window appears, if you click on Boards list, you can go to the list of the available boards and select yours, otherwise, by clicking on Auto Connect, you can directly connect to the board. Here it is MEMS Sensor Fusion - Quaternion demo: if you move the SensorTile.box PRO, the dice is moving accordingly.





# Demo 2: FFT

## Expert mode (1/5)



Let's switch on the board [1], green LED switches on [2]. Open ST BLE Sensor Classic app on your smartphone. From the main page of the app, click on Create a new Application [3].

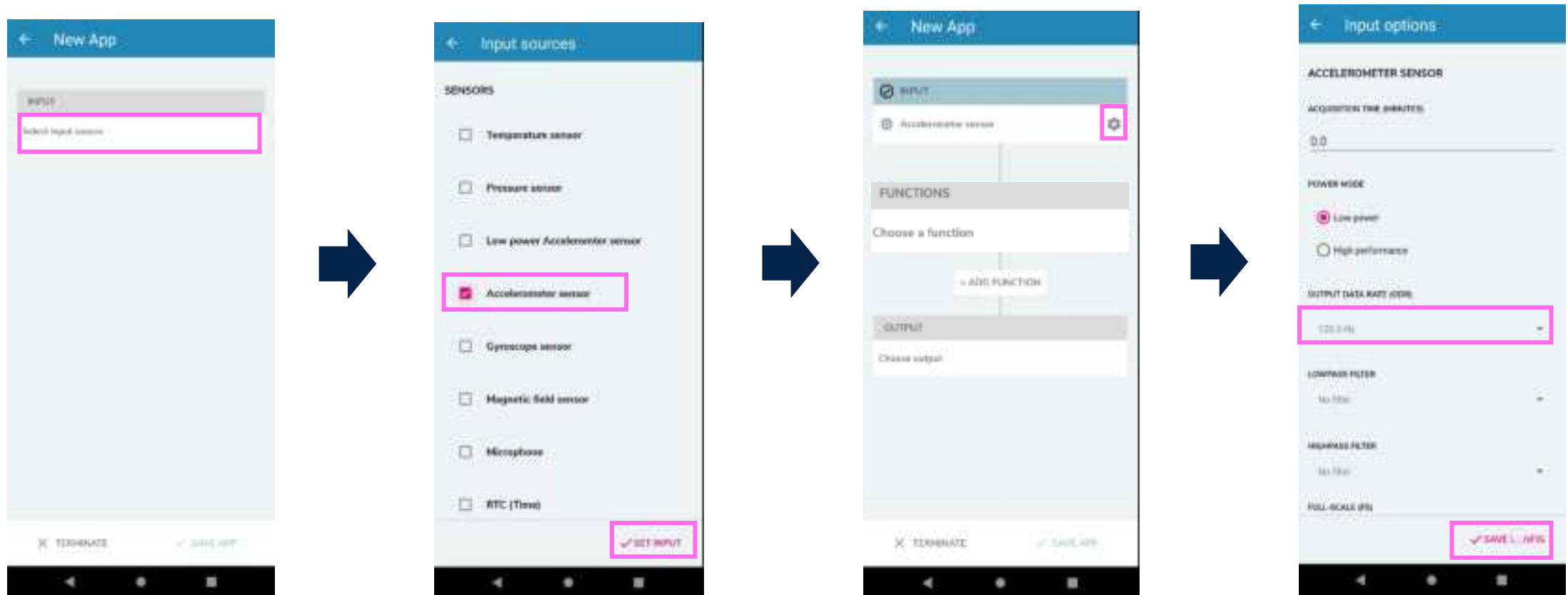
Select SensorTile.box Pro as the board type.

A list of sample application categories appears; click Expert View to create a new application.

Click New Application.

# Demo 2: FFT

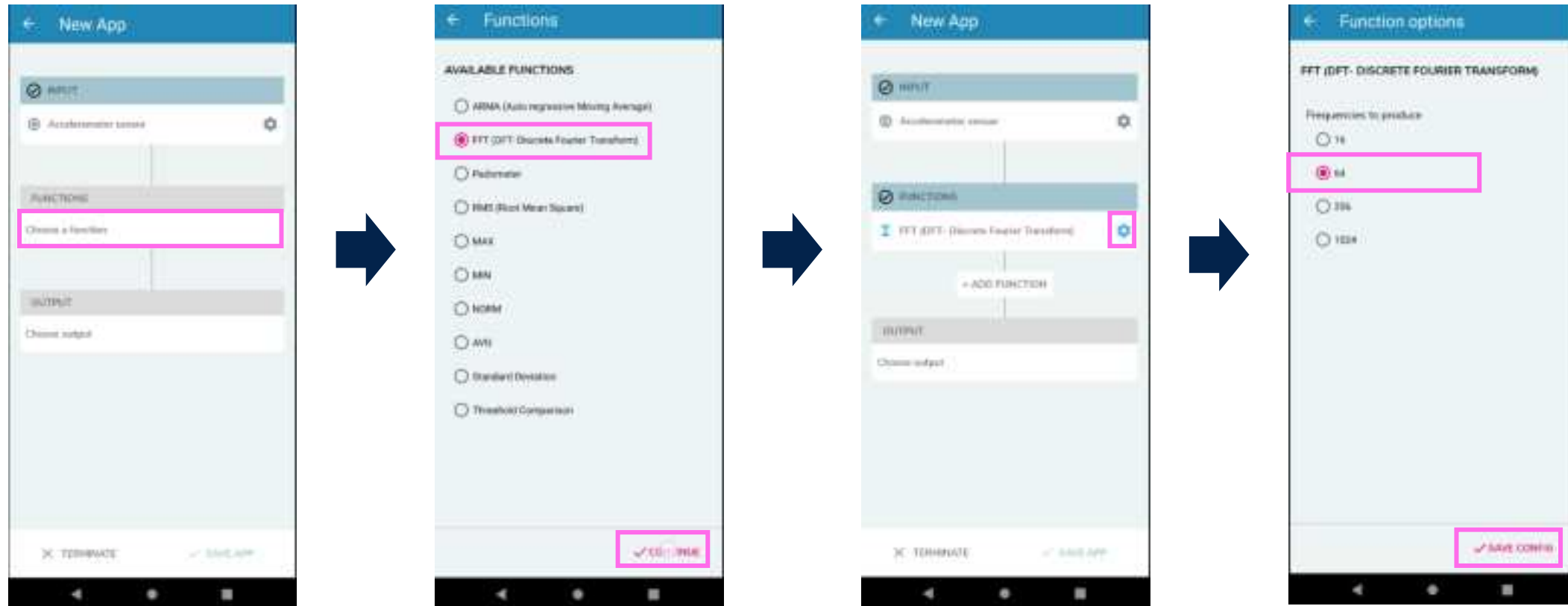
## Expert mode (2/5)



Select the accelerometer sensor as the input source and click Set Input. Now click on the gear to the right of the input section to change its parameters: for example, change the output data rate by setting it to 120 Hz. Click Save Configuration.

# Demo 2: FFT

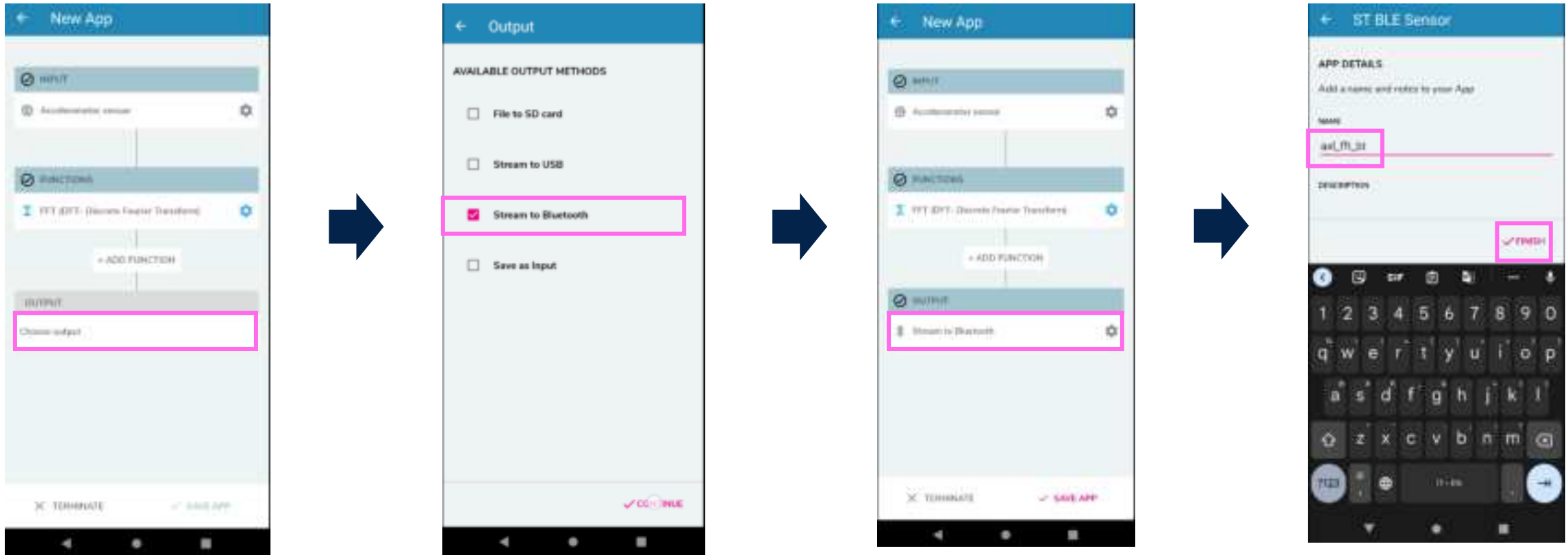
## Expert mode (3/5)



In the Functions section, click Choose a function and choose FFT (Discrete Fourier Transform DFT). By clicking on the gear on the right, you can change the number of frequencies to be produced. Here it is set to 64 and save it by clicking Save Configuration.

# Demo 2: FFT

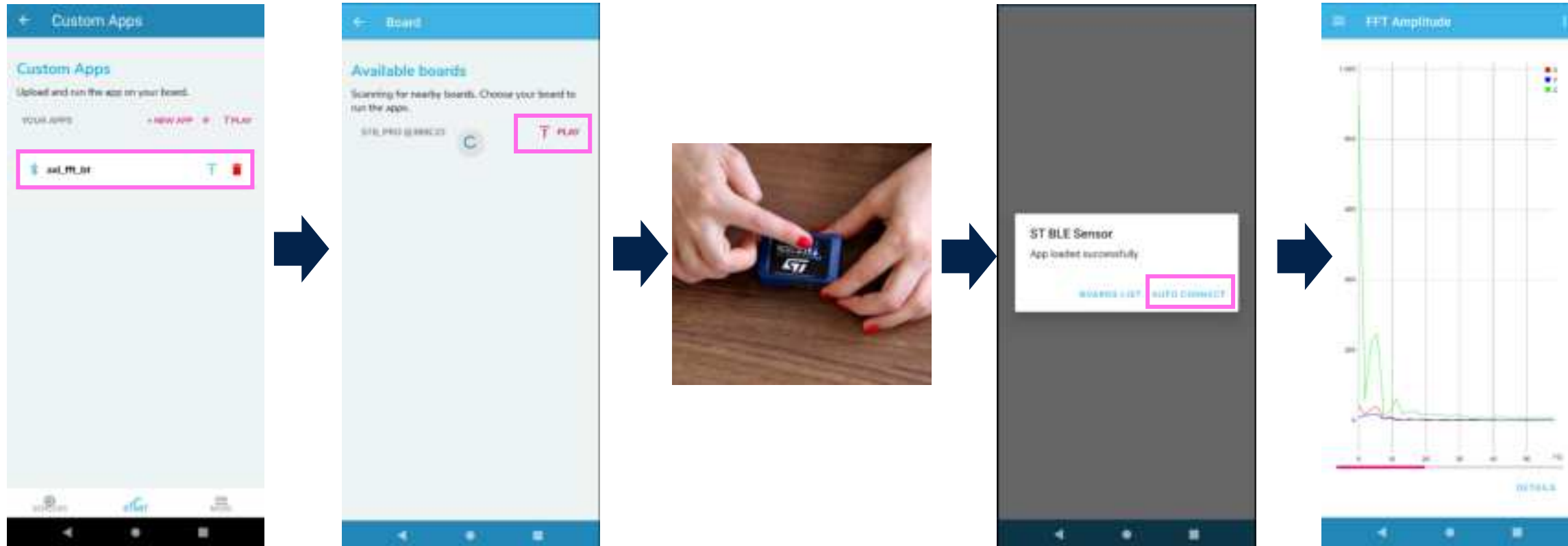
## Expert mode (4/5)



At this point, click Choose output and select Stream to Bluetooth as the available output method: in this way, the data will be visible directly on the ST BLE Sensor app. Click Save app, assign a name to the app, e.g. axl\_fft\_bt (Bluetooth FFT accelerometer) and click Finish.

# Demo 2: FFT

## Expert mode (5/5)



The saved app is available in the list of custom apps. Now, click either the upload button or the name of the application and then the Play button to load the application on SensorTile.box Pro. The list of available boards appears, here we click play and then ok to overwrite the previously uploaded application. When the application has finished the uploading and the blue LED turns on. Now click Auto Connect to connect to the SensorTile.box Pro board. For example, move the board at 5Hz to stimulate the Z-axis of the accelerometer; the corresponding signal is plotted accordingly on the app.

# Troubleshooting for STEVAL-MKBOXPRO

When the board starts, for all the examples that use Bluetooth, the board will use the blinking of the Blue LED for showing that everything is well initialized and it's in discovery mode waiting the connection from ST BLE Sensor Android/iOS application.

In some rare situation, the board makes one automatic connection to the Smartphone, and so it's not visible during the board discovery procedure of ST BLE Android/iOS application. In this situation the Blue LED is not working because the board is already connected to the phone.

If it happens, close the ST BLE sensor application and Switch off and Switch on the phone Bluetooth in order to close the connection with the board, in this way the Blue LED will start blinking and it will be possible to reconnect to the board using the ST BLE Sensor Android/iOS application.





# **3- Documents & Related Resources**

Here are the main resources for SensorTile.box PRO



[st.com/sensortileboxPRO](https://st.com/sensortileboxPRO)



[DB, UM](#)

[CAD resources](#) (Gerber files, BOM, schematics)

[Tools & Software](#) (MCU Embedded Software, App)

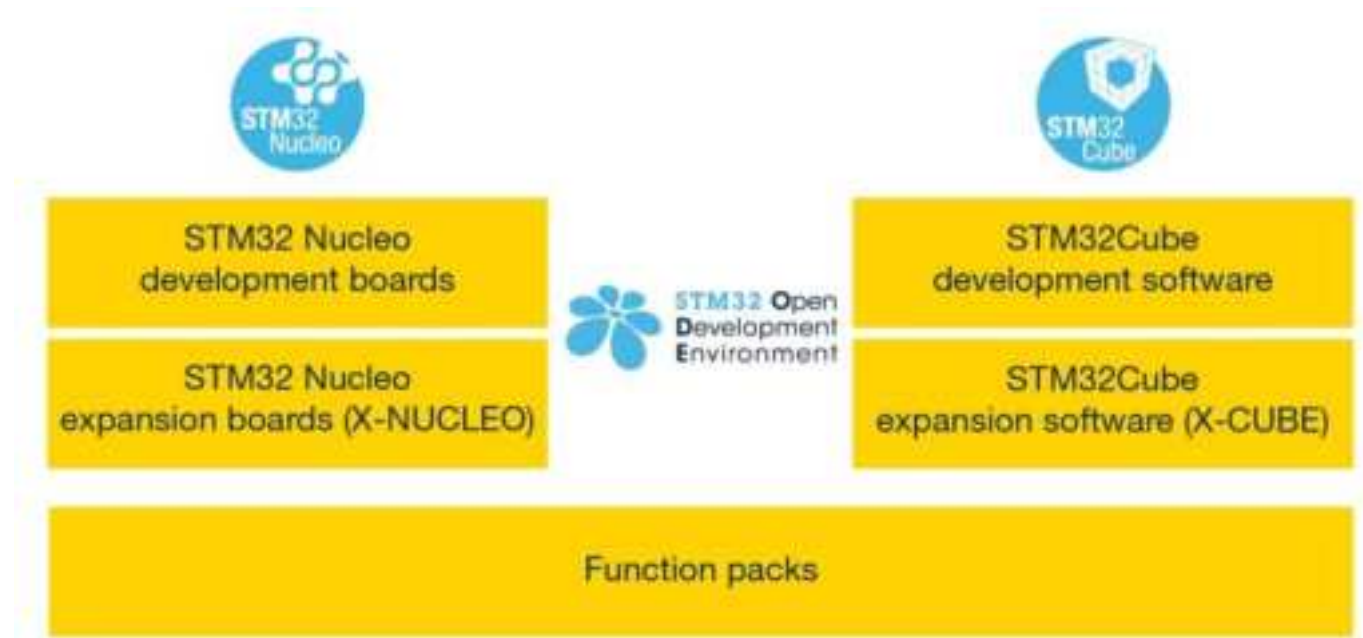
[Featured Videos and tutorials](#) and [ST MEMS & Sensors community](#)

# 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