Introducing the **SensorTile**
IoT design lab on the tip of a pencil
SensorTile
The connectable multi-sensor node

Sensing, Tracking and Monitoring Embedded Processing Unit

<table>
<thead>
<tr>
<th>Motion</th>
<th>Algorithms</th>
<th>Audio</th>
<th>Gaming</th>
<th>Augmented living</th>
</tr>
</thead>
</table>

- Motion
- Algorithms
- Audio
- Gaming
- Augmented living
SensorTile is a Bluetooth Smart sensorized development kit.

The miniaturized tile-shaped design includes all that is needed to remotely sense and measure motion, environmental and acoustical parameters.
SensorTile Architecture

Vin1 (1.9-5.5V) > LDO > VDD 1.8V
Vin2 >= Vin1 (Vin1-3.3V) > VDDIO2 > VDDUSB

- LSM6DSM acc+gyro
- LSM303AGR acc+mag
- LPS22HB barometer

STM32L4 Cortex-M4F 80MHz

MP34DT04 microphone

Integrated antenna
BALF-NRG-01D3 Integrated balun

BlueNRG-MS Bluetooth 4.1

Connections

Solderable Plugin
Bottom View
System Design with the SensorTile

- Evaluation, tracking & data collection
- Fast Prototyping
- Reference Design
- System Software Development
SensorTile
Simple, powerful, extendible

An all-ST Reference Design

Designed to fit your needs:

- Used as a **standalone sensor** node to MONITOR, TRACK and REMOTELY CONNECT to an iOS/Android Smartphone App
- Easily **plug into new designs** to add SENSING and CONNECTIVITY capabilities through a SMART HUB solution

Engineered for makers and developers:

- **Standalone mode:**
  Turn it on, configure it via BLE and start acquiring sensor data remotely on your Smartphone

- **Sensor and Connectivity HUB mode:**
  Plug the SensorTile into new designs and access all features through a convenient command interface (I2C/SPI/UART)

- **Programmable development kit:**
  Leverage on the on-board STM32 processing capability and provided software API to create your new BLE-connectable sensor node
SensorTile Firmware / Software
SensorTile Firmware for Design and Prototyping

Modular design environment to fast prototype your designs in all application domains

SensorTile Development Kit is built on STM32Cube and supported by the STM32 Open Development Environment
SensorTile

Hardware and Software Development Kit

- Basic Firmware
- BlueMicrosystem
- BlueVoice
- Function Pack
Starter Firmware: «Hello Sensor World!»

Starter Firmware is based on STM32Cube

It provides two example applications

- **DataLog**:
  - Sensors data streaming via USB (Virtual COM Port)
  - Sensors data storage on micro-SD card

- **AudioLoop**
  - Microphone acquisition, output via USB (Microphone class) or I2S
  - Record the sound on a PC or play it on loudspeakers/headphones
STM32 OTA Firmware upgrade

BMS Android and iOS App free download
BlueVoice + Mobile Devices

SensorTile Terminal

Platform ➔ Signals ➔ Comm Interface

Bluetooth

Mobile Device

Cloud-based Services

Audio ➔ Headphones ➔ Audio

Life augmented
SensorTile Kit: STEVAL-STLKT01V1

Programmable development kit:
- SensorTile Core System
  - STLCS01V1
- SensorTile Cradle eXpansion
  - STLCX01V1

Standalone mode bundle:
- SensorTile Cradle Board
  - STLCR01V1
- Plastic Box
- LiPo Battery
- Programming cable
SensorTile Cradle eXpansion Board
Host board for firmware development

- plug, program, unplug the Core System
- SensorTile Connector
- SWD programming i/f
- Use with any STM32 Nucleo ST-Link
- Reset button
- Audio DAC and 3.5mm Audio Jack
- Arduino Connectors
- bridging into developer communities
- Micro-USB i/f
SensorTile Cradle Board
Host board for Standalone Mode

- Solderable SensorTile Footprint
- Breakable SWD interface for programming
  - E.g. may use STLink on STM32Nucleo
- HTS221 Humidity and Temperature sensor

Bottom Side View

- SD Card
- Micro-USB interface
- HTS221 Humidity and Temperature sensor
- Battery Charger and Battery Connector
- ON/OFF Switch
**Hint: Customizing the ST Wearable Mockup**

Use the cradle as a reference design for other wearable solutions using the same SensorTile Core System.

- Cradle-mounted humidity and temperature sensor shows that not all the sensors must be on the Core System.
- The simple 2-layer Cradle can be easily redesigned to accommodate any ST sensor or actuator you may want to field-test.
- There is no need to modify the highly optimized SensorTile Core System to do that!
BLUEMICROSYSYSTEM Startup
with the eXpansion Cradle

Plug the SensorTile Core System on the eXpansion Cradle.

Power it via USB

Connect to your Android or iOS smartphone or tablet

Run the BlueMS App
BLUEMICROSYSYSTEM Startup with the SensorTileCradle

**Solder** the SensorTile Core System to the Cradle.

**Plug** the battery, protect it with the plastic cover.

**Connect** to your Android or iOS smartphone or tablet.

**Run** the BlueMS App
New Design Startup with the eXpansion Cradle

Plug the SensorTile Core System on the eXpansion Cradle.

Connect with your development environment

Open the USB starter project on your PC

Compile & Run the USB Audio or Datalogging example application

Design your custom application
New Design Startup with the SensorTile Cradle

**Solder** the SensorTile to its Cradle

**You better protect it with its plastic cover!**

**Setup** your PC programming environment

**SWD**

**Program** your data tracking application

**Field test** your application
One SDK fits all IoT Design Needs

- Evaluation, tracking & data collection
- Fast Prototyping
- Reference Design
- System Software Development
• **Evaluate** the most advanced ST sensors in an all-ST optimized **system architecture**

• **Field-test** Data-Fusion and Embedded Signal Processing **Algorithms**

• Use it for **Data collection** campaigns, to develop new customized algorithms
• Plug the SensorTile on your prototype motherboard to instantly add its embedded sensing and communication functionalities to your design

• Use the provided 3D CAD files to integrate it in your mechanical prototype
Software Developer’s Platform

- **Firmware** examples based on **STM32Cube**
- Supported by the **STM32 Open Development Environment**
- Host board supports **Arduino expansion connector** to bridge into most makers ecosystems from Arduino itself to the STM32ODE, and other developer communities.
• A complete **HW and SW example**, the starting point for your design

• **Freely download all design information:**

  • **HW:** Schematics, Gerber, BoM, 3D CAD
  
  • **FW:** from basic examples to the complete BlueMicroSystems application
SensorTile
IoT design lab on the tip of a pencil