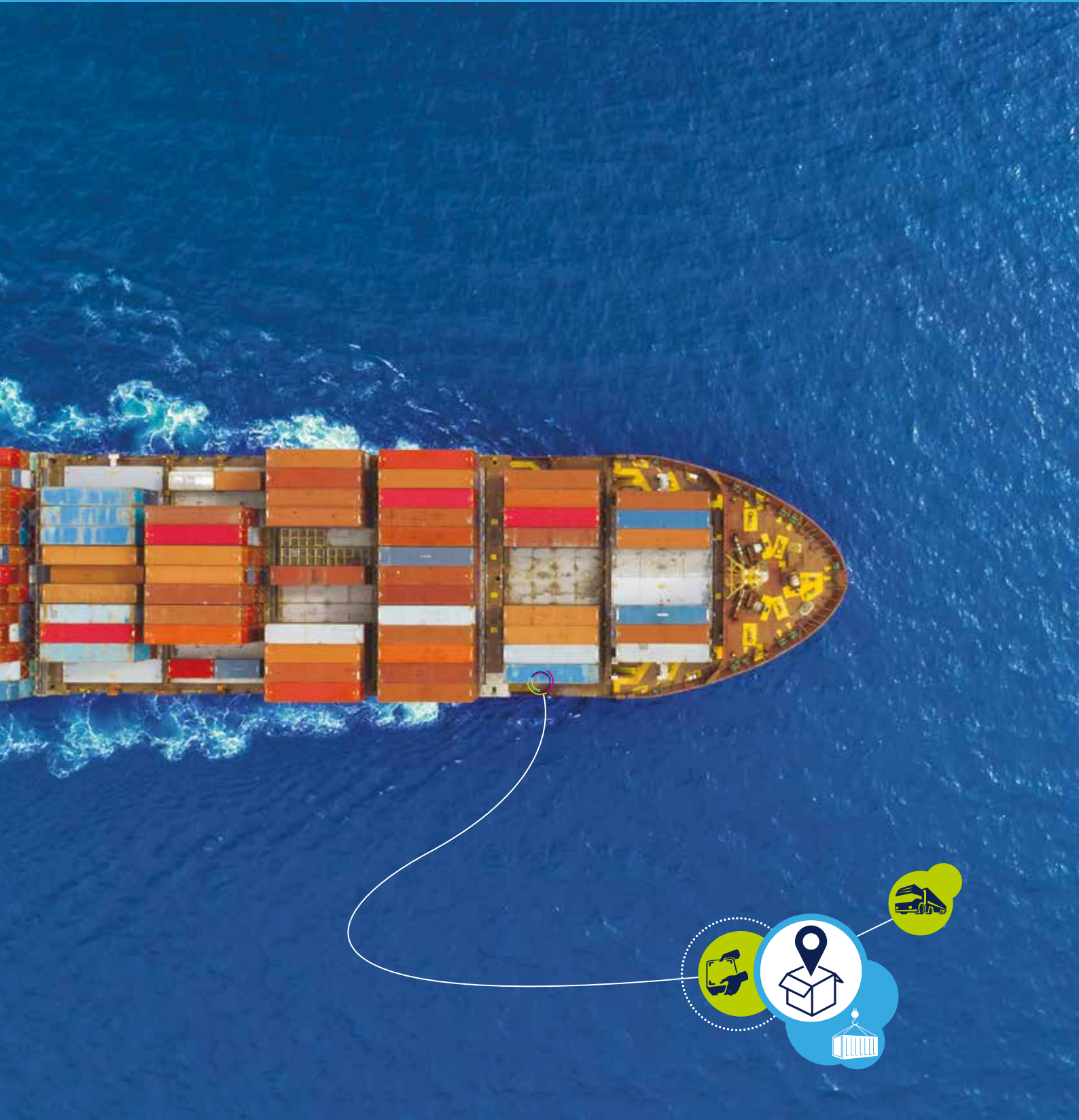




life.augmented

# Asset Tracking a Complete Solution from ST




















# Introduction

In global manufacturing and commerce, raw materials, components and final goods travel long distances before arriving at the final destination. More than often, the value – direct or indirect – of any particular item warrants the cost associated with monitoring its condition – like detecting shocks or recording temperatures in a cold-chain for food storage and transportation – and track it all along the logistics chain.

Tracking relies mostly GNSS location technologies or wireless communications triangulation positioning, while the continuous monitoring of storage conditions is based on an array of sensors depending on the physical variables involved.

## APPLICATIONS AND SEGMENTATION

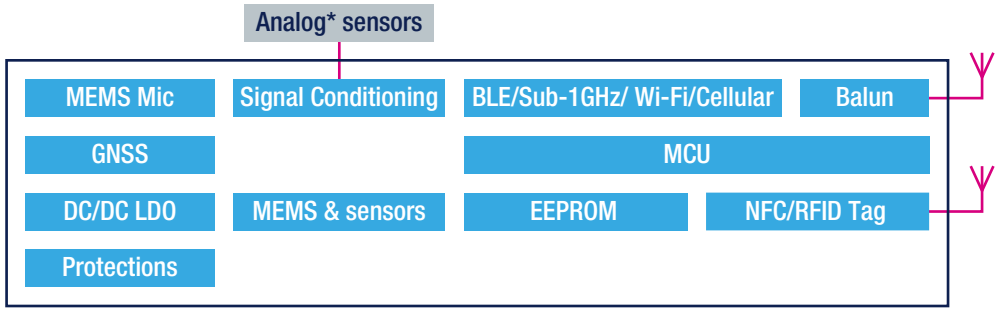
<b>Outdoor Real-Time Monitoring</b>		Containers		Livestock monitoring		e-bike		Fleet management		Pet tracking
<b>Industrial Logistic</b>		Pallets		Racks		Luggage		Smart parcels		
<b>Good Guarantee</b>		Cold chain		Food		Medical				
<b>Disposable</b>		Letters		Packages		Parcels				

2

## ST 360° PORTFOLIO DELIVERS 100% FLEXIBILITY

 <b>Sensing &amp; Actuating</b>	 <b>Signal Conditioning &amp; Protection</b>	 <b>Processing</b>	 <b>Connectivity</b>	 <b>Power &amp; Energy Management</b>
<b>Accelerometers</b>  Vibration Orientation Free Fall detection	<b>Analog</b>  Including Signal Conditioning, Protections, ...	<b>STM32</b>  Computation by STM32 Family	<b>BLE</b>  Bluetooth Low Energy Connectivity to gateway/tablet	<b>Power Management</b>  DC/DC, LDO
<b>Temperature &amp; Humidity</b>  Shipping Environment Goods Status			<b>Sub-1GHz</b>  Long Range Connectivity to base stations/gateway Sigfox/LoRa	
<b>Pressure</b>  Take off and landing detection			 Long Range Connectivity to base stations/gateway Sigfox/LoRa	
<b>Ranging sensor</b>  Objects presence detection and counting			 NFC Short Connectivity to handheld devices	
			<b>Positioning</b>  Localization	

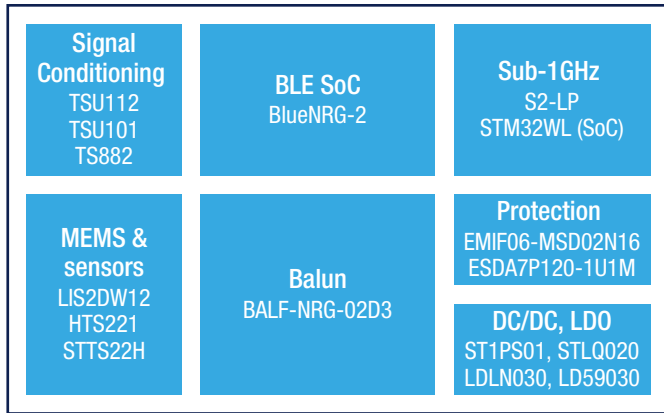
# TYPICAL ASSET TRACKING APPLICATION DIAGRAM



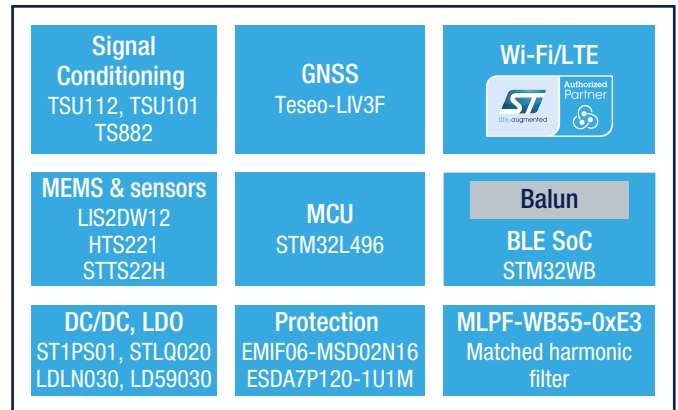
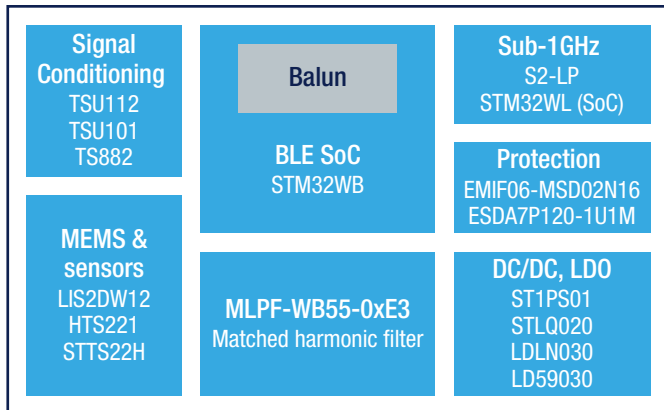
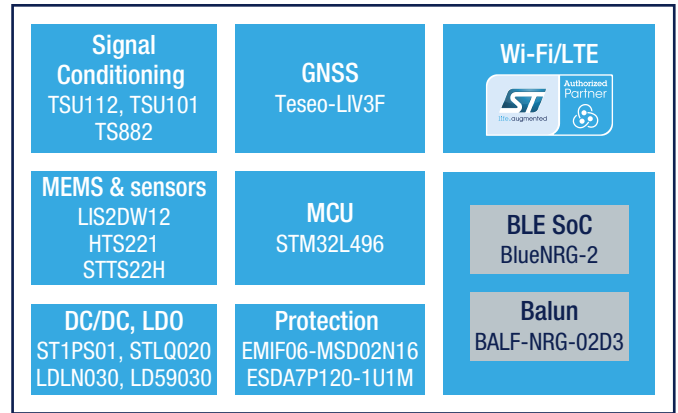
ST offering a wide extensive range of environmental sensors(temperature, humidity and pressure), inertial sensors (accelerometers, gyroscopes and magnetometers), proximity sensors. Besides ST provides a huge product portfolio for low-power wireless connectivity such as Bluetooth Low Energy and NFC as short range solution, UHF Reader, and for Low Power Wide Area Network (LPWAN) as LoRa and Sigfox, and easy to use solution for GNSS positioning receiver, that in addition to a wide range of motion, environmental and proximity sensors, low-power microcontrollers, EEPROM memories and high efficiency power management ICs, allow easily to build ultra low-power tracking solutions for pallets and containers.

## PALLETS AND CONTAINER TRACKING END-NODE - APPLICATION EXAMPLES

### Tracking Bluetooth Low energy and SigFox



### Tracking LTE



Note: \* Also parts not available in ST portfolio  
BLE = Bluetooth Low Energy



# Key Products

## SENSORS

To support the design of ultra-low-power tracking and monitoring solutions, ST offers an extensive range of temperature, humidity and pressure sensors, inertial measurement units (accelerometers, gyroscopes and magnetometers), proximity sensors.

Accelerometers	
H3LIS331DL	High-g shock accelerometer
IIS3DHC IIS2ICLX	Inclinometer
IIS2DH*	Vibration
LIS2DW12	Ultra-low power
LIS2DTW12	With embedded temperature sensor

iNEMO® Inertial Module	
LSM6DSx	6x IMU

Pressure Sensors	
LPS22HH	Precision pressure sensor
LPS27HHW	Waterproof pressure sensor

Temperature & Humidity Sensors	
HTS221	Humidity & temperature sensor
STTS751 STTS22H	Digital temperature sensor
LM235 STLM20	Analog temperature sensor

MEMS Microphones	
MP34DT05-A	Digital microphone

FlightSense™ Ranging sensor	
VL6180X	Proximity sensor and ALS
VL53L0X	Ranging sensor
VL53L1X	Long distance ranging sensor

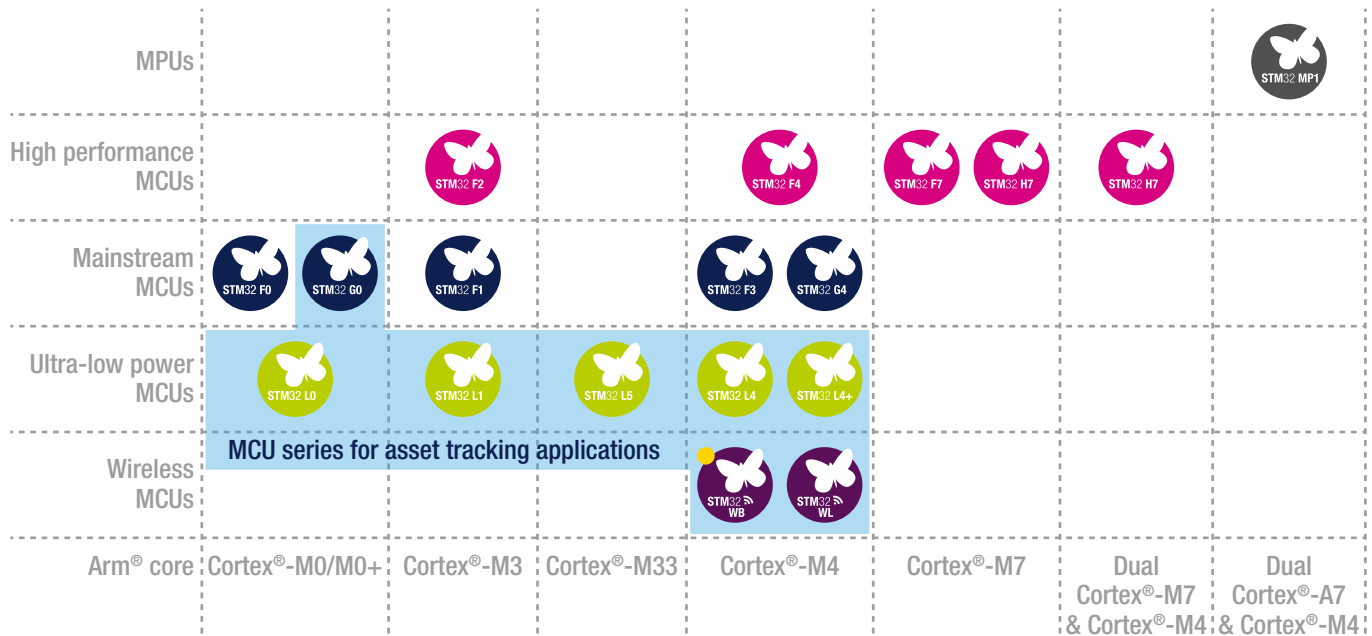
Note: \* Coming soon

## 4 MICROCONTROLLERS & MICROPROCESSORS



The STM32 family of 32-bit microcontrollers based on the Arm® Cortex®-M processor is designed to offer new degrees of freedom to MCU users. It offers products combining very high performance, real-time capabilities, digital signal processing, low-power and low-voltage operation, as well as wireless connectivity, while maintaining full integration and ease of development.

The wide range of STM32 microcontrollers are based on an industry-standard core and come with a large choice of tools and software, making this product family ideal for both small projects or entire system platforms.



● With Cortex®-M0+ radio co-processor

# WIRELESS CONNECTIVITY SOLUTIONS

ST's portfolio includes a variety of transceivers, network processors ICs and fully certified modules that support major technologies currently available for wireless connectivity including sub-1GHz long-range networks (6LowPan, WMBUS, SigFox and LoRaWAN), Bluetooth-Smart®, 802.15.4 ZigBee and OpenThread.

NFC & RFID	
ST25TV	NFC/RFID tags
ST25DV	Dynamic NFC/RFID tags
ST25R	NFC Readers
ST25RU3993	NFC Readers for UHF

Sub-1 GHz	
S2-LP	Sub-1 GHz Transceiver Sigfox compatibility
BALF-SPI2-01D3 BALF-SPI2-02D3	Balun for S2-LP
STM32WL	STM32 Sub-GHz SoC

Positioning	
TESEO-LIV3	GNSS Module

 GNSS



Bluetooth Low Energy	
BlueNRG-2	Highly energy-efficient Bluetooth 5.0 Wireless SoC
BALF-NRG-02D3	Balun & Filter for BlueNRG
BlueNRG-M2	Bluetooth 5.0 Modules
STM32WB	Multi-protocol (BLE 5.0/802.15.4) Wireless SoC
MLPF-WB55-0xE3	STM32WB Filter

WPAN	
STM32WB	Multi-protocol (BLE 5.0 / 802.15.4) Wireless SOC (balun integrated)
BAL-UWB-x	Balun for UWB

Cellular	
Cellular connectivity In collaboration with several partners	







# Complementary Products

## POWER MANAGEMENT

ST is a leading supplier in power management and mixed-signal ICs for mobile applications, offering a wide range of products from simple power management ICs up to highly-integrated devices that mix power management blocks with advanced analog and digital functionalities.

 <b>DC/DC converters</b>	
<b>ST1PS01/02</b>	Synchronous converter, Output voltage flexibility, 400 mA output current, Nano-quiescent current (500 nA) for extended sensors battery life

 <b>Voltage regulators</b>	
<b>STLQ020</b>	200 mA ultra-low quiescent current LDO
<b>LDLN030</b>	Low Iq, ultra low noise 300 mA LDO with power good
<b>LDLN025</b>	Low Iq, ultra low noise 250 mA LDO
<b>LD59030</b>	Low Iq, ultra low drop 300 mA LDO

## SIGNAL CONDITIONING

STMicroelectronics offers a wide analog portfolio including high-performance amplifiers and comparators dedicated to the challenging industrial, automotive and consumer markets. The main features of our growing portfolio are low power, high precision and tiny packages. The range of products allows easy and fast integration of analog products. For more information visit [www.st.com/opamps](http://www.st.com/opamps)

6



<b>TSZ12 Series Zero Drift CMOS Amplifier</b>	<ul style="list-style-type: none"> <li>• Very low offset 5 <math>\mu\text{V}</math> max</li> <li>• Very low drift in Temperature 30 <math>\text{nV}/^\circ\text{C}</math></li> </ul>
<b>TSZ18 Series Zero Drift &amp; Speed Amplifier</b>	<ul style="list-style-type: none"> <li>• Very low offset 25 <math>\mu\text{V}</math> max</li> <li>• Very low drift in Temperature 0.1 <math>\mu\text{V}/^\circ\text{C}</math></li> <li>• Excellent Speed/power ratio 3 <math>\text{MHz}/1 \text{ mA}</math></li> </ul>
<b>TSU11 Series Nano-power Amplifiers Zero Drift</b>	<ul style="list-style-type: none"> <li>• 900 nA current Consumption</li> <li>• Only 150 <math>\mu\text{V}</math> max input offset Voltage</li> <li>• Operating from 1.5 V</li> </ul>
<b>TSU10 Series Nano-power Amplifiers</b>	<ul style="list-style-type: none"> <li>• 580 nA current consumption</li> <li>• Operating from 1.5 V</li> </ul>
<b>TS88 Series Nano-power Comparator</b>	<ul style="list-style-type: none"> <li>• 200 nA current Consumption</li> <li>• Operating from 0.9 V</li> <li>• Push Pull &amp; Open Drain</li> </ul>

## PROTECTION

ST's large portfolio of protection devices and ICs have passed all certifications, meeting or exceeding international protection standards for electrical hazards on electronics boards found in the demanding, industrial market. Standard and advanced innovative packages (flow-through  $\mu\text{DFN}$ ,  $\text{WLCSP}$  and  $\text{PowerQFN}$ ) keep board space to a minimum, helping improve layout options. For more info refer to <https://www.st.com/en/protection-devices.html>

Protection	
<b>EMIF06-MSD02N16</b>	SD card protection
<b>ECMF02-4CMX8</b>	USB DATALINE
<b>ESDA7P120-1U1M</b>	DC-DC protection
<b>DSILC6-4P6</b>	ESD protection for NFC Tag
<b>EMIF03-SIM02M8</b>	SIM card ESD protection and filter



# Design support

ST provides different hardware and software solutions to help designers in their job. Starting from the Product Evaluation Boards, that can be used to perform a comprehensive evaluation of ST's products, arriving to the **Solution Evaluation Boards** tailored to exploit one or more features of the application. Between these two families of evaluation boards, ST offers a fast and modular prototyping system, namely **STM32 Open Development Environment (ODE)**, which permits to combine STM32 microcontroller with a broad range of expandable boards to reproduce the desired set of functions for sensing, connectivity, power, audio, motor control and more.

The ST Software Development Tools complement the ST hardware ecosystem adding programming tools, firmware libraries, middleware and stacks to reduce the design complexity.

## KEY PLATFORMS



### NFC & RFID



Smart and flexible NFC Tracker

#### Solution Board

STEVAL-SMARTAG1

#### Firmware Packs

FP-SNS-SMARTAG1  
ST NFC Sensor mobile app



#### STM32 ODE Approach

NUCLEO-L053R8  
X-NUCLEO-NFC04A1  
X-NUCLEO-IKS01A2

#### Target Applications



### Bluetooth Low Energy



BlueNRG-Tile - Bluetooth LE enabled sensor node

#### Solution Board

STEVAL-BCN002V1B

#### Firmware Packs

STSW-BLUETILE-DK  
STBLESensor

#### Target Applications



### Bluetooth Low Energy



SensorTile.box wireless multi sensor ready-to-go IoT Node

#### Solution Board

STEVAL-MKSBOX1V1

#### Firmware Packs

FP-SNS-STBOX1

#### Target Applications



Sub  
1GHz

Sub-1 GHz



Sigfox™ Tracker

#### Firmware Packs

FR-ATR-SIGFOX1

#### STM32 ODE Approach

NUCLEO-L053R8/L476RG  
X-NUCLEO-S2868A2/915A1  
X-NUCLEO-IKS01A2/3

#### Target Applications



Sub  
1GHz

Sub-1 GHz



IoT LoRa® Tracker

#### Solution Board

STEVAL-STRKT01

#### Firmware Packs

FP-ATR-LORA1

#### STM32 ODE Approach

B-L072Z-LRWAN1  
X-NUCLEO-GNSS1A1  
X-NUCLEO-IKS01A2

#### Target Applications



Cellular & GNSS



TOMTOM™ Tracker

#### Firmware Packs

FP-ATR-TOMTOM

#### STM32 ODE Approach

NUCLEO-F401RE  
P-L496G-CELL01 2G/3G  
P-L496G-CELL02 LTE

#### Target Applications

