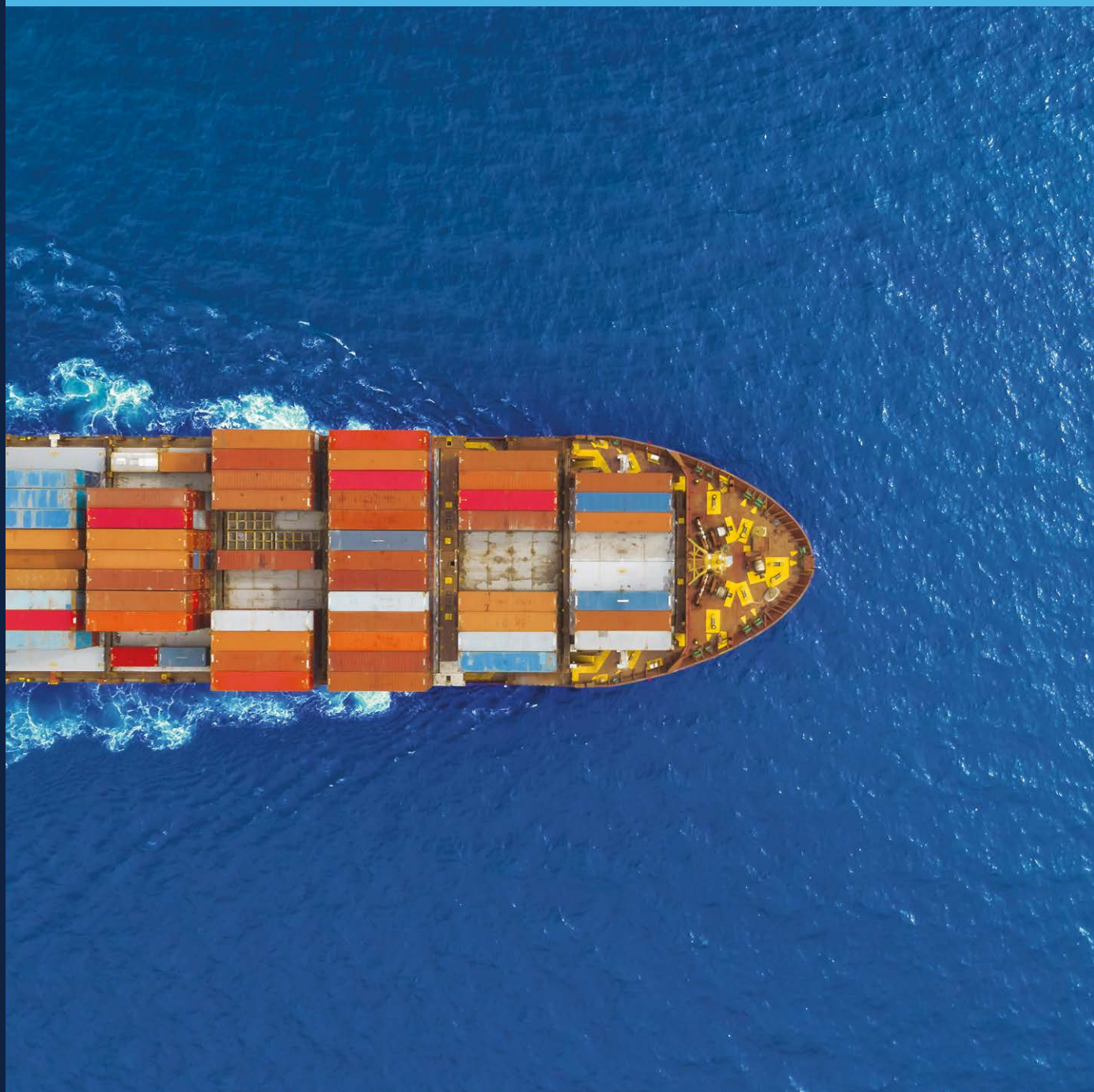




life.augmented

# 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	 Fleet management	 Livestock monitoring	 Mobility sharing	 Tractor
 <b>Indoor localization &amp; Warehouse logistics</b>	 RTLS	 Mobile Assets	 Pallet	 Smart parcels	 Employ Safety
 <b>Good Guarantee</b>	 Cold chain	 Food	 Medical		
 <b>Disposable</b>	 Letters	 Packages	 Parcels		

# ST 360° PORTFOLIO DELIVERS 100% FLEXIBILITY

**Outdoor Real-Time Monitoring**  
Containers, livestock monitoring, e-bike, Fleet management, pet, tools management



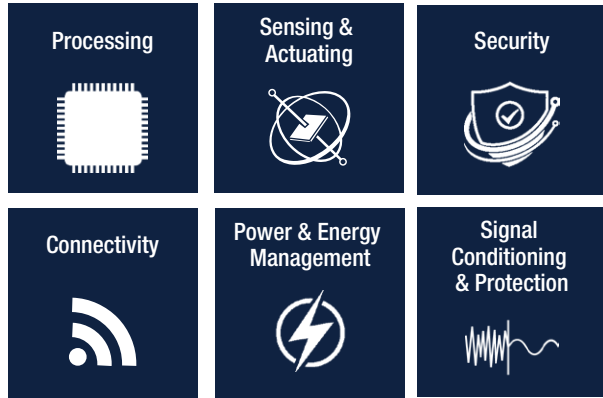
**Industrial Logistic**  
Pallets, racks, indoor / outdoor location



**Good Guarantee**  
Cold chain, food, medical, smart parcels



**Disposable**  
Letters, packages, parcels



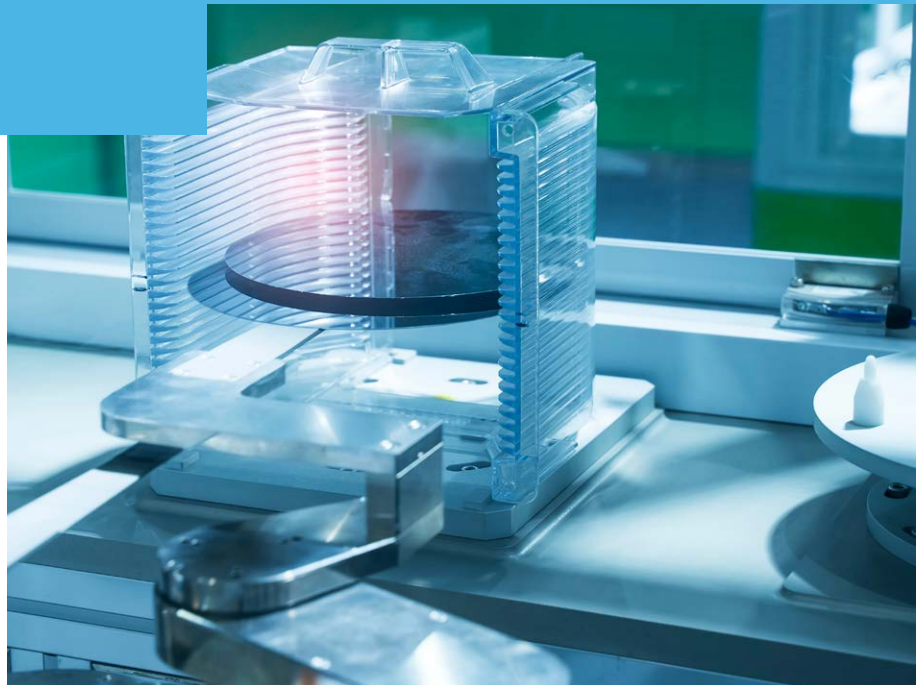
Multiple applications, one platform, one vendor

## ST OFFERS FOR ASSET TRACKING BY APPLICATIONS NEEDS

ST offering a wide extensive range of environmental sensors (temperature, humidity and pressure), inertial sensors (accelerometers, gyroscopes and magnetometers), smart sensors with machine learning core, proximity sensors. Besides ST provides a huge product portfolio for low-power wireless connectivity such as Bluetooth Low Energy and 802.15.4 technologies NFC as short range solution, UHF Reader, and for Low Power Wide Area Network (LPWAN) as LoRa, Sigfox and cellular connectivity Cat-M1 and NB-IoT easy to use solution for GNSS positioning receiver, low-power microcontrollers, EEPROM memories and high efficiency power management ICs.

	Processing & Security	Sensing	Connectivity	Power Management	Complexity (number of sensors, connectivity)
<b>Outdoor Real-Time Monitoring</b> 	<ul style="list-style-type: none"> <li>Dedicated MCU</li> <li>Dedicated secure chip</li> </ul>	<ul style="list-style-type: none"> <li>HI-G</li> <li></li> <li></li> </ul>	<ul style="list-style-type: none"> <li>UHF</li> <li>LoRa</li> <li>Bluetooth</li> <li>4G</li> <li>5G</li> </ul>	<ul style="list-style-type: none"> <li></li> <li></li> </ul>	
<b>Indoor localization &amp; warehouse logistics</b> 	<ul style="list-style-type: none"> <li>Dedicated MCU</li> <li>Embedded security</li> </ul>	<ul style="list-style-type: none"> <li>HI-G</li> <li></li> <li></li> </ul>	<ul style="list-style-type: none"> <li>UHF</li> <li>LoRa</li> <li>Bluetooth</li> <li>4G</li> <li>5G</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>	
<b>Good guarantee</b> 	<ul style="list-style-type: none"> <li>Dedicated MCU</li> <li>Embedded security</li> </ul>	<ul style="list-style-type: none"> <li>HI-G</li> <li></li> <li></li> <li>ToF</li> </ul>	<ul style="list-style-type: none"> <li>UHF</li> <li>LoRa</li> <li>Bluetooth</li> <li>4G</li> <li>5G</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>	
<b>Disposable</b> 	<ul style="list-style-type: none"> <li>Sensor with processing</li> <li>Embedded security</li> </ul>	<ul style="list-style-type: none"> <li></li> <li></li> </ul>	<ul style="list-style-type: none"> <li>UHF</li> <li>LoRa</li> <li>Bluetooth</li> <li>4G</li> <li>5G</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>	

# 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	
<b>H3LIS331DL</b>	High-g shock accelerometer
<b>IIS2DH **</b> <b>IIS3DWB **</b>	Vibration
<b>LIS2DW12</b> <b>LIS2DH12</b> <b>IIS2DLPC **</b>	Ultra-low power
<b>LIS2DTW12</b>	With embedded temperature sensor
<b>IIS3DHHC **</b> <b>IIS2ICLX **</b>	Precise Inclinometer

iNEMO® Inertial Module	
<b>LSM6DSx</b> <b>LSM6DS032</b>	6x IMU
<b>LSM6DS0X</b> <b>LSM6DSRX</b> <b>ISM330DHCX **</b>	IMU with Machine Learning Core

Note: \* Available soon  
\*\* 10 years longevity

Pressure Sensors	
<b>LPS22HH</b>	Precision pressure sensor
<b>LPS33HW</b> <b>LPS27HHW</b> <b>LPS27HHTW *</b>	Waterproof pressure sensor

Temperature & Humidity Sensors	
<b>HTS221</b>	Humidity & temperature sensor
<b>STTS751 **</b> <b>STTS22H **</b>	Digital temperature sensor
<b>LM235 **</b> <b>STLM20 **</b>	Analog temperature sensor

MEMS Microphones	
<b>MP34DT05-A</b> <b>MP23DB01HP</b>	Digital high-performance Microphone
<b>MP23ABS1</b>	Analog high-bandwidth Microphone
<b>IMP23ABSU **</b>	Analog wide-bandwidth microphone

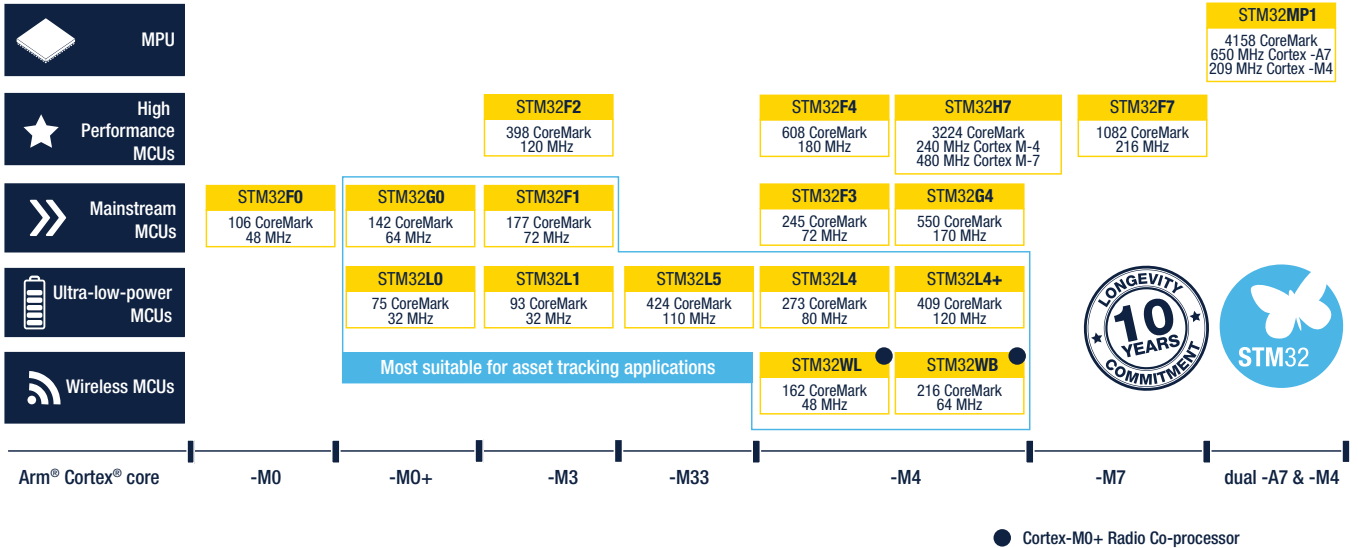
FlightSense™ Time-of-Flight sensor	
<b>VL6180X</b>	Proximity sensor with ALS (up to 20cm)
<b>VL6180</b>	Proximity sensor (up to 60cm)
<b>VL53L0X</b>	Ranging sensor (up to 2m)
<b>VL53L1X</b>	Long distance ranging sensor (up to 4m)
<b>VL53L3CX</b>	Proximity & Multi-target sensor (up to 5m)
<b>VL53L1CB</b>	Extra-long distance & Multi-target sensor (up to 8m)



## STM32 32-BIT MCUS AND MPUS

The STM32 family of 32-bit Flash microcontrollers and microprocessors based on the Arm® Cortex® M and Cortex-A processor is designed to offer new degrees of freedom to MCU users. It offers a 32-bit product range that combines very high performance, real-time capabilities, digital signal processing, and low power, low voltage operation, while maintaining full integration and ease of development.

The unparalleled and large range of STM32 devices, based on an industry-standard core and accompanied by a vast choice of tools and software makes this family of products the ideal choice, both for small projects and for entire platform decisions.



## 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 including NFC, RFID HF and UHF. UWB, Blue-tooth Low energy, BLE MESH, 802.15.4, ZigBee, OpenThread, sub-1GHz long-range networks (6LowPan), Low Power Wide Area Network (SigFox, LoRa, Cat-M1 and NB-IoT) and positioning

NFC & RFID	
ST25TV	NFC / RFID tags
ST25DV-I2C	Dynamic NFC / RFID tags
ST25R	NFC Readers
ST25RU	RFID UHF Readers for UHF

Sub-1 GHz	
S2-LP S2-LPTX	Sub-1 GHz Transceiver/ Transmitter Sigfox compatibility
BALF-SPI2-01D3	Balun for S2-LP
STM32WL	STM32 Sub-1 GHz SOC LoRa/Sigfox compatibility

Positioning	
TESEO-LIV3x	GNSS Module
TESEO-LIV4x*	GNSS Multi-Bands Module

Bluetooth Low Energy	
BlueNRG-2	Highly energy-efficient Bluetooth 5.2 Wireless SoC
BlueNRG-LP	
BlueNRG-M2	Bluetooth 5.0 Modules
STM32WB55 STM32WB50 STM32WB35 STM32WB30	Multi-protocol (Bluetooth 5.0 / 802.15.4) Wireless SOC with integrated balun
STM32WB5MMGH	Multi-protocol Module (Bluetooth 5.0 / 802.15.4)
BALF-NRG-02D3 MLPF-NRG-01D3 MLPF-WB55-0xE3	Balun & Filter

WPAN	
STM32WB	Bluetooth LE 5, Zigbee, Thread, proprietary Wireless SOC (integrated balun)
BAL-UWB-01E3	Balun for UWB
STM32WUX *	Ultra Wide Band connectivity


Cellular	
STM32WG4x*	Cellular MODEM
ST4SIM-00M	Basic SIM/eSIM for M2M connectivity
ST4SIM-110M	Crypto SIM/eSIM for M2M connectivity
ST4SIM-200M	GSMA eSIM for M2M connectivity


Note: \* Available soon

# 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.

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

 Voltage regulators	
<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)



<b>TSZ12 Series</b> Zero Drift CMOS Amplifiers	<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 nV/<math>^{\circ}\text{C}</math></li> </ul>
<b>TSZ18 Series</b> Zero Drift & Speed Amplifiers	<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 MHz/1 mA</li> </ul>
<b>TSU11 Series</b> Nano-power Amplifiers Zero Drift	<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</b> Nano-power Amplifiers	<ul style="list-style-type: none"> <li>• 580 nA current consumption</li> <li>• Operating from 1.5 V</li> </ul>
<b>TS88 Series</b> Nano-power comparators	<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  $\mu\text{DFN}$ , WLCSP and 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 2.0 dataline
<b>ESDA7P120-1U1M</b>	DC-DC protection
<b>USBULC6-2M6</b>	ESD protection for NFC Tag
<b>TCPP01-M12</b>	USB TYPE-C Power Delivery

# 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  
DSH-ASSETTRACKING  
STAssetTracking 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-ATR-BLE1  
STAssetTracking APP  
DSH-ASSETTRACKING

#### TARGET APPLICATIONS



## Sub-1 GHz



Sigfox™ Tracker

### Firmware Packs

FR-ATR-SIGFOX1  
STAssetTracking APP  
DSH-ASSETTRACKING

### STM32 ODE Approach

NUCLEO-L053R8/L476RG  
X-NUCLEO-S2868A2/915A1  
X-NUCLEO-IKS01A2/3  
X-NUCLEO-GNSS1A1

#### TARGET APPLICATIONS



## Sub-1 GHz



IoT LoRa® Tracker

### Solution Board

STEVAL-STRKT01

### Firmware Packs

FP-ATR-LORA1  
DSH-ASSETTRACKING

### STM32 ODE Approach

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

#### TARGET APPLICATIONS



## Cellular & GNSS



LTE Tracker

### Firmware Packs

FP-ATR-LTE1  
DSH-ASSETTRACKING

### STM32 ODE Approach

P-L496G-CELL02 LTE  
X-NUCLEO-GNSS1A1  
X-NUCLEO-IKS01A3

#### TARGET APPLICATIONS



Order code: BRASSTRACK1120

For more information on ST products and solutions, visit [www.st.com](http://www.st.com)

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