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Quick Start Guide

STM32Cube function pack for IoT node with dynamic NFC tag, environmental and motion sensors (FP-SNS-SMARTAG1)

Version 1.5 (July 12, 2021)

Agenda

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

1- Hardware and Software overview

NFC Dynamic Tag sensor node evaluation board (STEVAL-SMARTAG1)

Hardware Overview

STEVAL-SMARTAG1 Hardware Description

- STEVAL-SMARTAG1 is a flexible NFC Tracker evaluation board with sensors includes a comprehensive software library and a sample application to monitor and log sensor data over NFC from an Android or iOS device. Ultra-low power sensor node evaluation board mounts an ST25DV NFC Tag, an STM32L0 ARM Cortex M0+, environment sensors (temperature, humidity and pressure) and motion (accelerometer) sensor.
- The evaluation board features NFC harvesting to supply power and a battery cradle for a CR2032 battery.

Key Product on board

- ST25DV64K dynamic NFC tag solution based on 64K-bit (8K-Byte) EEPROM and with I²C interface, Fast Transfer Mode and Energy Harvesting features
- STM32L031K6 ultra-low-power ARM Cortex-M0+ MCU running at 32 MHz with 32-Kbytes Flash and 8-Kbytes RAM
- LIS2DW12 ultra-low-power high-performance three-axis linear accelerometer
- LPS22HB ultra-compact piezo-resistive absolute pressure sensor which functions as a digital output barometer: 260-1260 hPa
- HTS221 capacitive digital sensor for relative humidity and temperature
- STLQ015 low drop linear regulator power management
- CR2032 Battery powered (not included)



Latest info available at www.st.com
STEVAL-SMARTAG1

Software Description

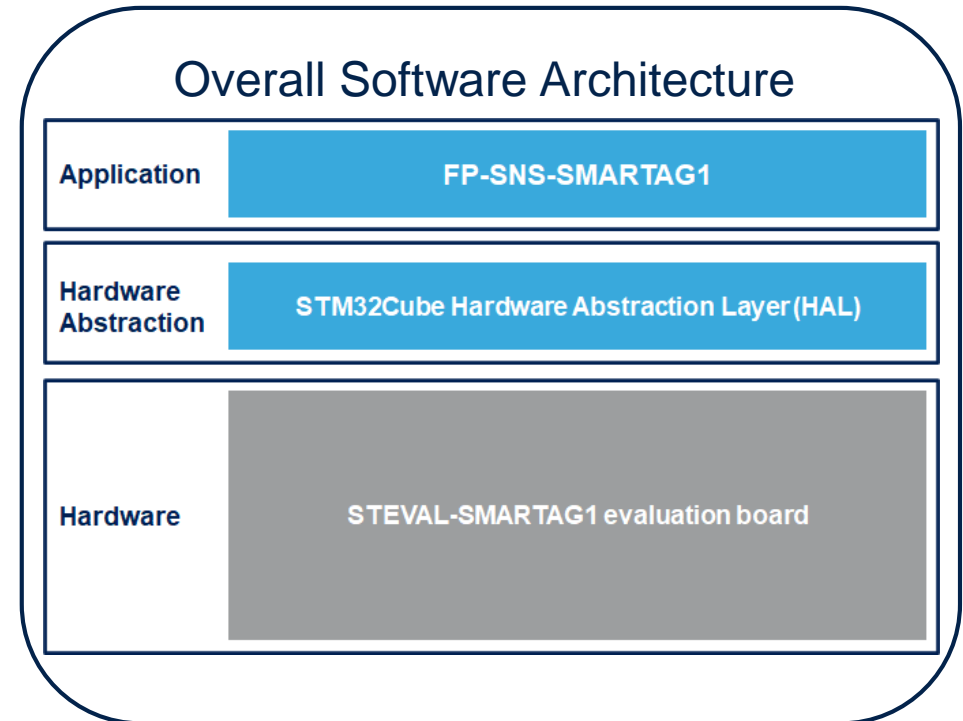
- FP-SNS-SMARTAG1 is an STM32Cube function pack which allows you to read the motion and environmental sensor data on your IoT node via an NFC enabled reader such as a mobile phone or a tablet. The package supports energy harvesting (enabled by NFC) and battery-operated use cases.
- This software, together with the suggested combination of STM32 and ST devices can be used, for example, to develop tracking, cold chain, medical, smart sensing, and smart home, city and building applications.
- The software runs on an ultra-low power STM32L0 microcontroller and includes Product summary drivers for the Dynamic NFC tag and for the motion and environmental sensors.
- You can register the NFC Sensor Tag node on the DSH-ASSETTRACKING web application for asset tracking that stores and monitors on-board sensor data as well as the geolocalization of the smartphone used to read the IoT node data.

Key features

- Complete firmware to access data from an IoT node with dynamic NFC tag, environmental and motion sensors
- Ultra-low power operations, with support of both energy harvesting and battery-operated use cases
- Compatible, in single-shot mode only, with the ST NFC Sensor application for Android/iOS, to read and display sensor data
- Compatible with the ST Asset Tracking application for Android/iOS for reading data logs from the NFC tag and for sending them to the DSH-ASSETTRACKING cloud-based dashboard
- Sample implementation available for the STEVAL-SMARTAG1 evaluation board
- Easy portability across different MCU families thanks to STM32Cube
- Free user-friendly license term

FP-SNS-SMARTAG1

Software Overview



Latest info available at www.st.com
FP-IND-SMARTAG1

2- Setup and demo examples

Setup & Demo Examples

Software and Other prerequisites

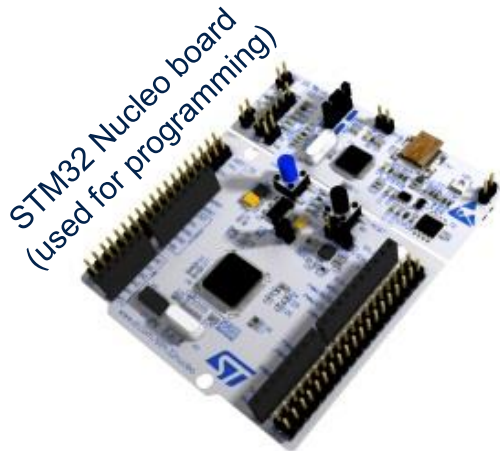
- **STSW-LINK009**
 - ST-LINK/V2-1 USB driver
- **STSW-LINK007**
 - ST-LINK/V2-1 firmware upgrade
- **FP-SNS-SMARTAG1**
 - Copy the .zip file content into a folder on your PC. The package will contain source code example (Keil, IAR, STM32CubeIDE) based only on **STEVAL-SMARTAG1**
- **ST Asset Tracking** and **ST NFC Sensor** (for single-shot mode only) applications for **Android/iOS** available from Google Store / iTunes

2.1- Setup Overview: STEVAL-SMARTAG1 evaluation boards

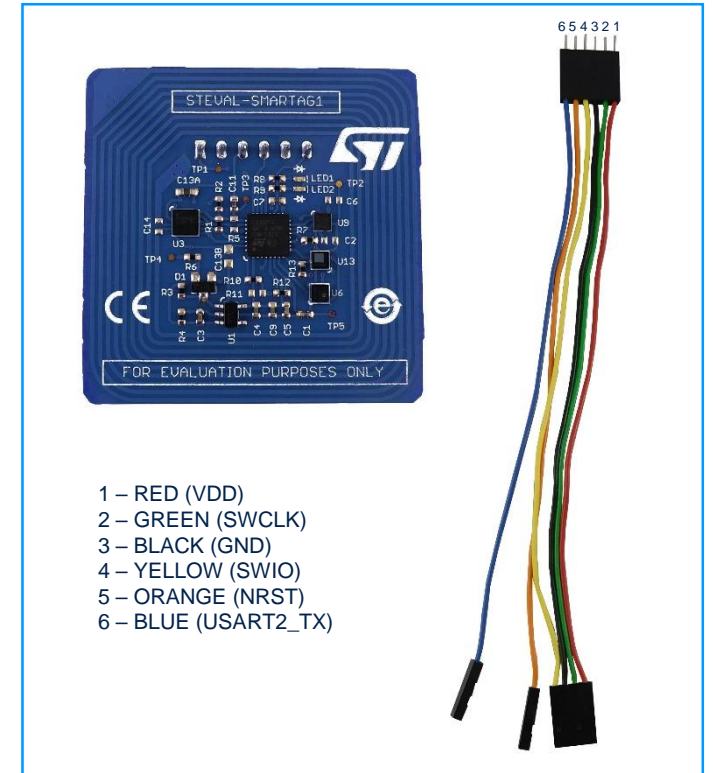
Setup Overview

HW prerequisites and setup with ST NFC SensorTag (1/2)

- 1x ST NFC SensorTag kit (**STEVAL-SMARTAG1**)
 - It includes SWD connector with a 6pin flat
- 1x Android™ or iOS™ device with **ST Asset Tracking** and **ST NFC Sensor** apps installed
- 1x PC with Windows 7 and above
- 1x STM32-Nucleo or ST-Link programmer
- 1x USB type A to Mini-B USB cable for the ST-Link



Mini USB

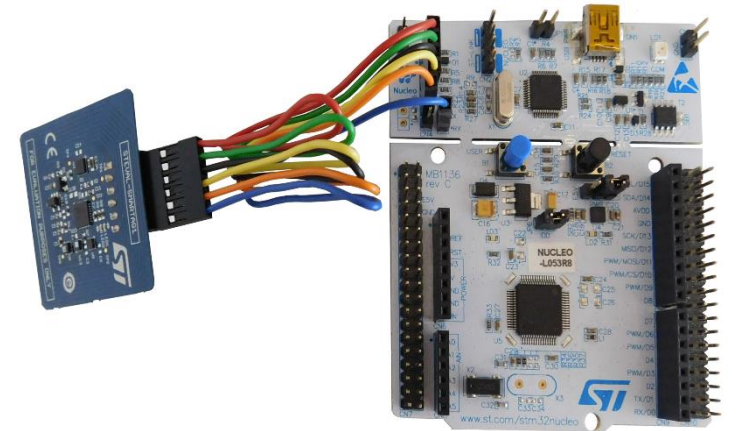


ST NFC Dynamic Tag sensor node evaluation board

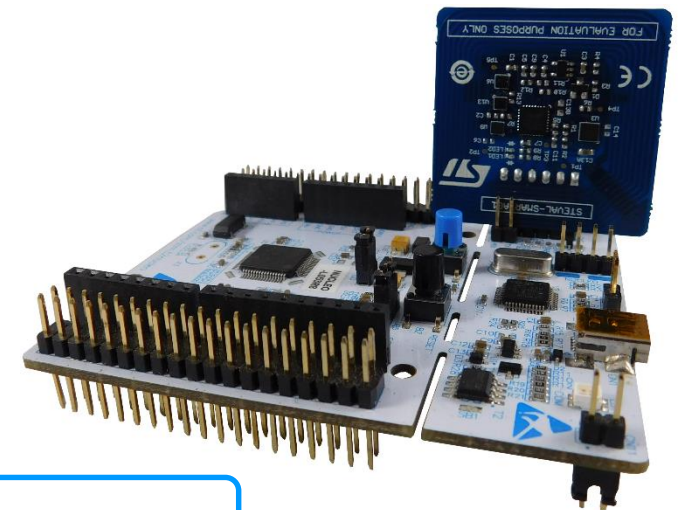
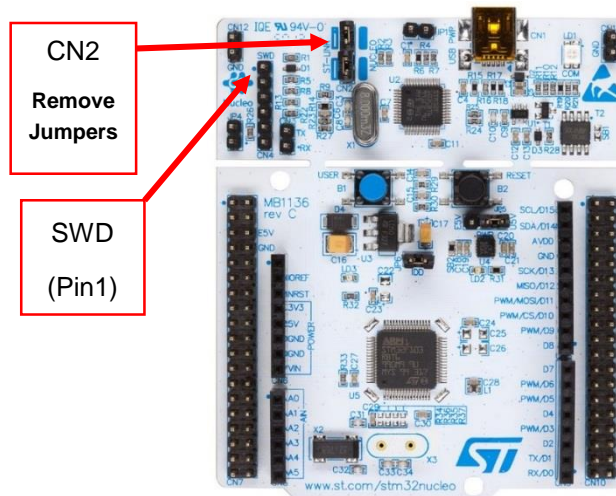
Setup Overview

HW prerequisites and setup with ST NFC SensorTag (2/2)

- In order to program the board you need to connect an external ST-Link to the SWD connector on the cradles with a 6pin flat cable or directly.
- The easiest way is to get an STM32-Nucleo board which includes an ST-Link V2.1 programmer
- Be sure that CN2 Jumpers are OFF and connect your STM32 Nucleo board to the ST NFC SensorTag through the provided cable paying attention to the polarity of the connectors. Pin 1 can be identified by a little circle on the PCB silkscreen (STM32 Nucleo and ST NFC SensorTag board).



SWD connections with 6-pin flat cable

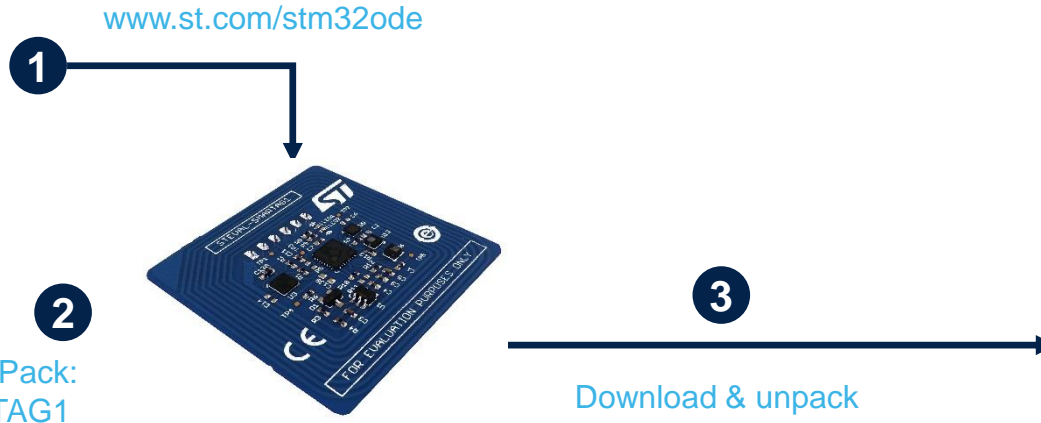


NOTE

The battery must be present in order to use the ST-Link features (programming, debugging and serial communication)

Setup Overview

Start coding in just a few minutes



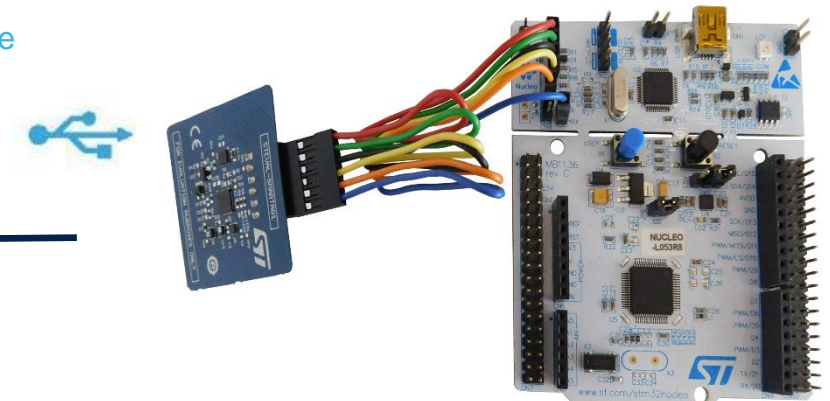
Android™/iOS™ smartphone with ST Asset Tracking and ST NFC Sensor applications



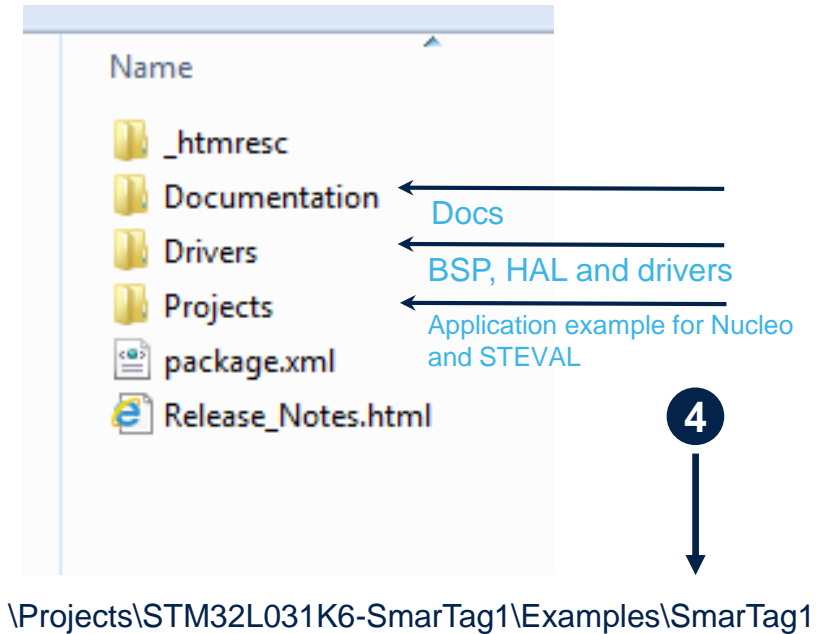
Use the pre-compiled binaries for registering your device, or alternative re-compile the code adding your device certificate



5



FP-SNS-SMARTAG1 package structure



Setup Overview

Using serial line monitor – e.g. Tera Term

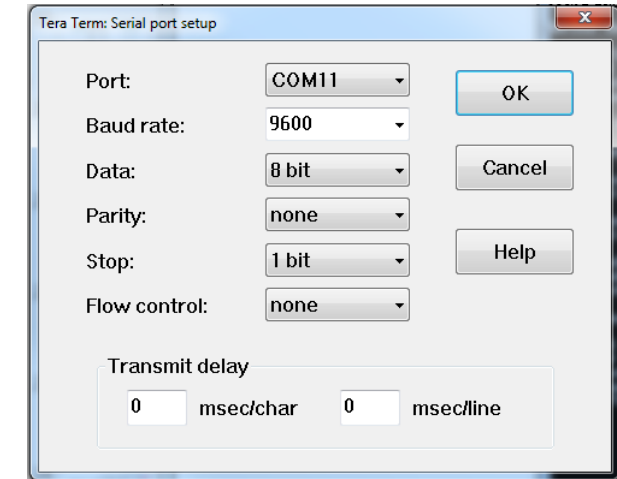
FP-SNS-SMARTAG1 for STEVAL-SMARTAG1

- After the **RESET** you could see the initialization phase
- After autostart the sensor data are logged
- These messages are written when getting (before) and removing (after) the smartphone from the NFC tag. In particular, the new config is written if a new one it is set. After the sensor data are logged (Sync and Async events).

```
COM5 - Tera Term VT
File Edit Setup Control Window Help
UART Initialized
STMicroelectronics FP-SNS-SMARTAG1:
  Version 3.1.0
  STEVAL-SMARTAG1 board
  (HAL 1.10.4.0)
  Compiled Jul 13 2021 12:09:58 (IAR)

Power On NFC
SmarTagUID= e00227004474e32
NDEF External record for saving log data
Read New Config: Sec=60 LogMode=1 EnableFlags=0x3f
Configuration Present on NFC
Init RTC
Set NFC Behavior
Set WakeUp timer
5 sec before autostart in default config
AutoStart
-> Save Sync Event: Sample #1
-> Save Sync Event: Sample #2
-> Save Sync Event: Sample #3
-> Save Sync Event: Sample #4
Detected NFC FIELD_RISING
Detected NFC FIELD_RISING
Detected NFC FIELD_RISING
Detected NFC FIELD_RISING
Detected NFC FIELD_FALLING
Read New Config: Sec=60 LogMode=3 EnableFlags=0x3f
Init Accelerometer Events
Acc_Th_Max= 1024 WakeUpTH= 4
-> Save Sync Event with TH: Sample #1
Async Event Detected:
  6D Orientation= 3
  AccEventUmax= 1280
-> Save Async Event: Sample #2
Async Event Detected:
  6D Orientation= 2
  AccEventUmax= 1280
-> Save Async Event: Sample #3
Async Event Detected:
  6D Orientation= 5
  AccEventUmax= 1280
-> Save Async Event: Sample #4
Async Event Detected:
  6D Orientation= 2
  AccEventUmax= 1024
-> Save Async Event: Sample #5
```

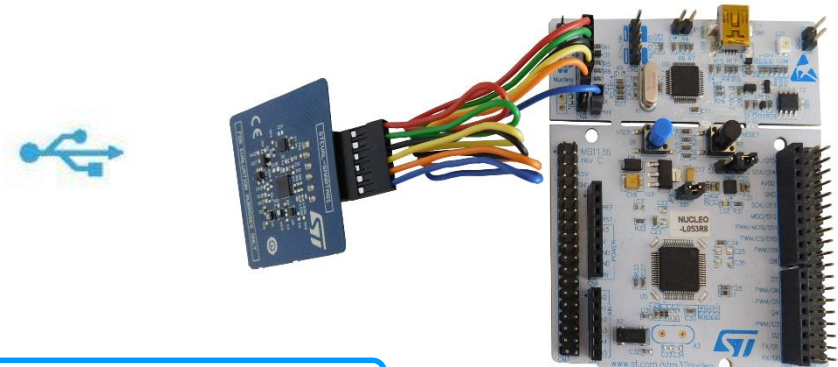
Serial line monitor for STEVAL-SMARTAG1 board



Configure the serial line monitor (speed, LF)

NOTE

- For having the UART functionality on to STEVAL-SMARTAG1 board, it is necessary:
- To recompile the code uncommenting the line
//**#define SMARTAG_ENABLE_PRINTF**
on file: Projects\STM32L031K6-SmarTag1\Examples\SmarTag1\Inc\SMARTAG1_config.h
 - To connect the BLUE (USART2_TX) cable to the RX pin on the STM32 Nucleo board



NOTE

UART is not available on STEVAL-SMARTAG1 using binary generated by System Workbench for STM32 (due to flash size constraints)

2.3- Demo Examples: ST Asset Tracking Application Overview

Demo Examples

ST Asset Tracking Application for Android/iOS (1/2)

Android version

Settings

Enable/Disable the data to be logged

Writes the new settings

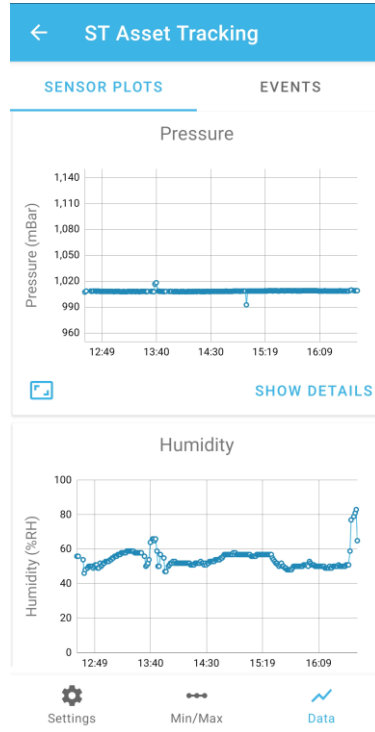
Settings: log only out of range and accelerometer events

Enable/Disable the accelerometer events

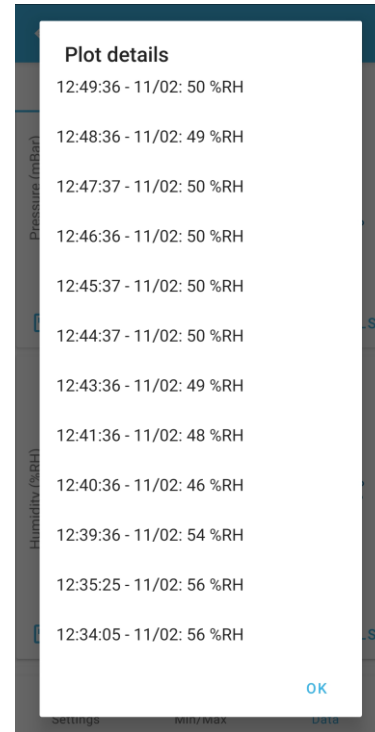
- **Settings:** it is open when getting the smartphone near the NFC tag
 - the data to be logged can be selected (Pressure, Temperature, Humidity and Vibration) together with the time interval.
 - In addition to the default mode, there are two different logging mode that can be chosen:
 - **Log only out of range [min, max] and accelerometer events:**
 - the selected data will be logged only if a minimum or maximum threshold value will be matched (sync events).
 - logging only if a wake up or change of orientation events occurs if enabled (async events)
 - **Force logging of one sample:**
 - the current value of the selected data will be logged, after that the data logging re-starts with the previous

Demo Examples

ST Asset Tracking Application for Android/iOS (2/2)



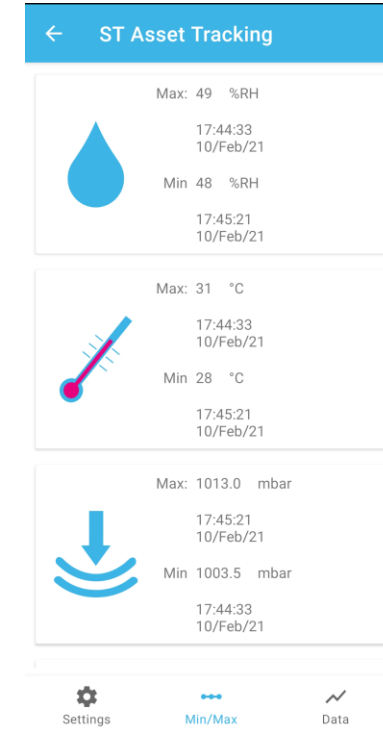
Data: Sensor plot



Data: Sensor plot details



Data: Events



Min/Max

- **Data:**
 - **Sensor Plot:**
 - the plots of the selected data for the logging are shown.
 - for any plot, when selecting "SHOW DETAILS" the values of the logged data are shown
 - **Events:**
 - if the "Log only out of range" option has been selected, the accelerometer events are shown, in case they have occurred.
- **Min/Max:**
 - shows the maximum and minimum value obtained during the data logging of the selected data.

2.3- Demo Examples: ST NFC Sensor Application Overview

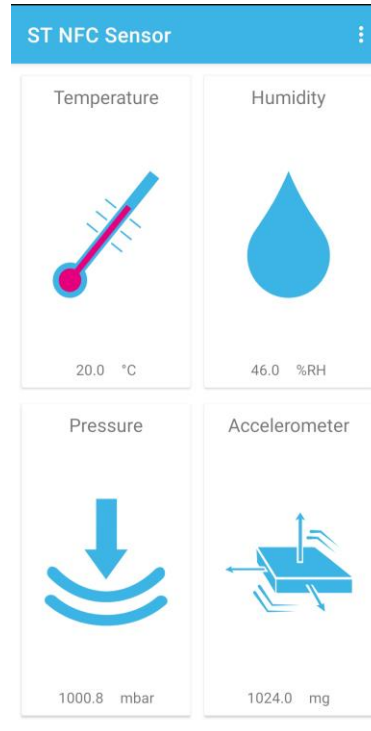
Demo Examples

ST NFC Sensor Application for Android/iOS

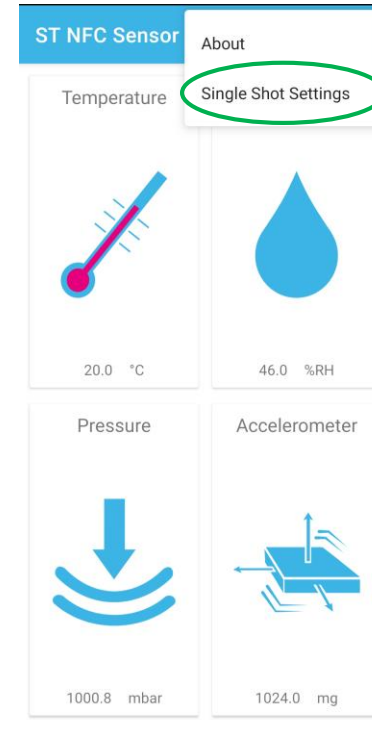
Android version



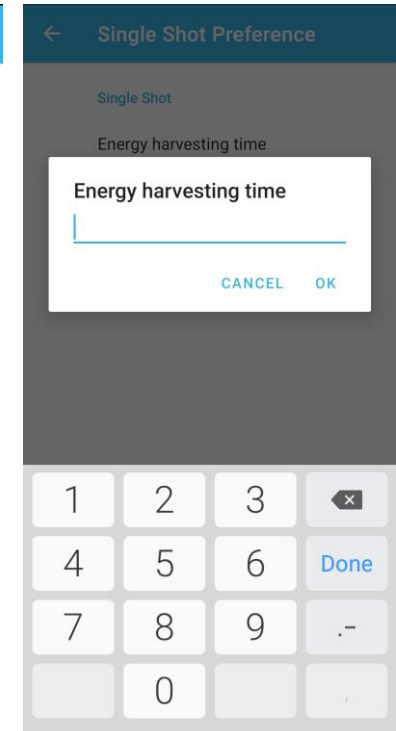
Reading Single Shot Data



Single Shot Data



Single Shot Settings



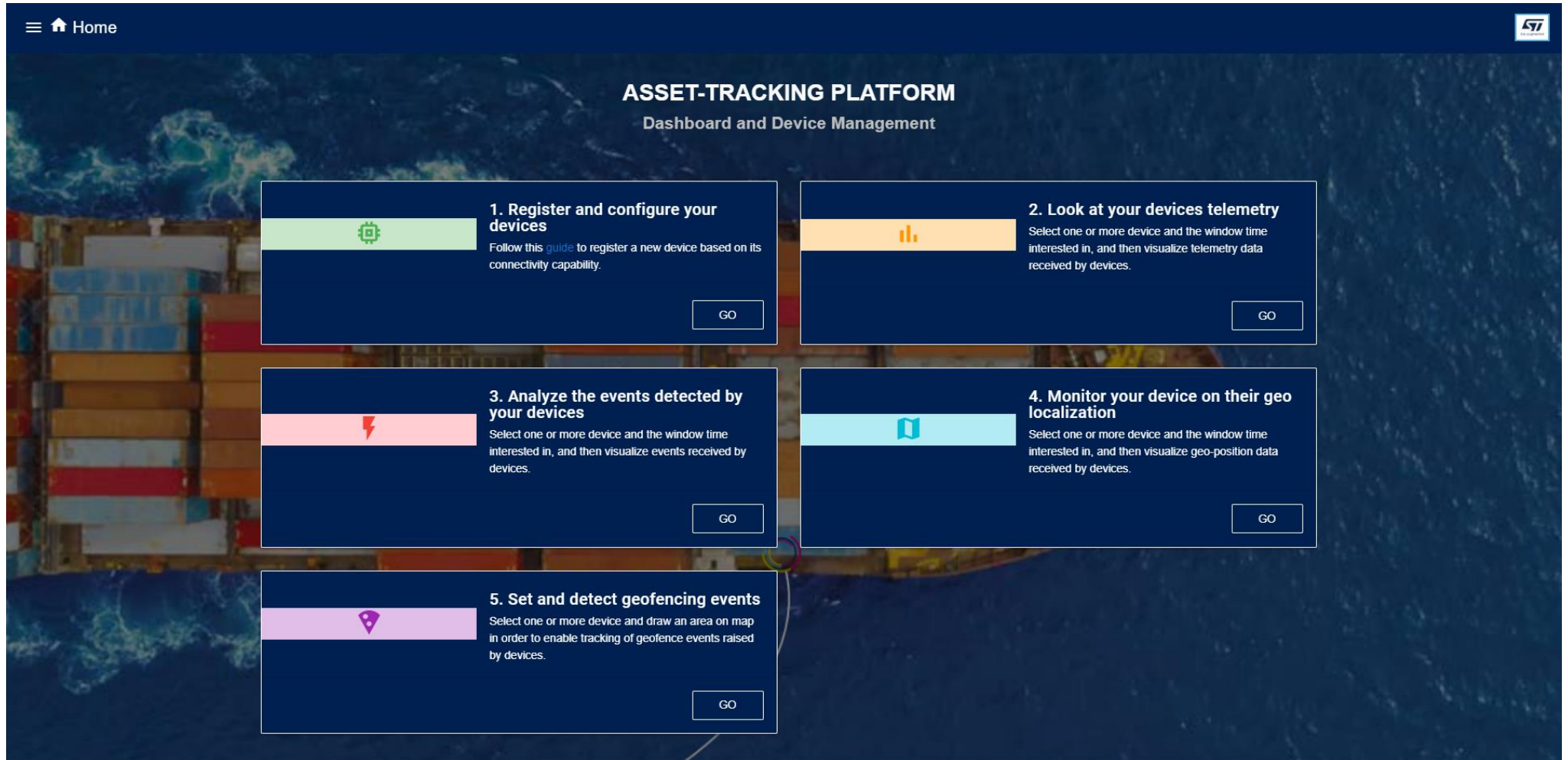
- **Single Shot (only in case the battery is not inserted):**
 - the current values of the data are read in energy harvesting mode from the tag and then displayed
 - with the single shot setting the energy harvesting time can be changed

2.4- Demo Examples: Using the Asset Tracking Web Dashboard

Demo Examples

Using the Asset Tracking Web Dashboard (1/6)

- Visit the home page of the DSH-ASSETTRACKING dashboard on ST site for information and web dashboard URL (Link), or go Go to DSH-ASSETTRACKING dashboard URL at <https://dsh-assettracking.st.com/#/home>



Demo Examples

Using the Asset Tracking Web Dashboard (2/6)

- Provide your username and password:
 - Select login and click GO button

DSH-ASSETTRACKING

The screenshot displays the ST Asset-tracking web dashboard. On the left, a blue sidebar contains the ST logo, a back arrow, and navigation links for Home, Login, and HowTo. The main content area features a dark blue header with the ST logo, a hamburger menu, and a 'Login' link. Below the header, the text 'ASSET-TRACKING PLATFORM' and 'Dashboard and Device Management' is displayed over a background image of a cargo ship. A central login modal is open, showing a pink bar with a person icon, the title 'Login', and the instruction 'Login with your ST.com account and start to track and monitor your devices!'. A 'GO' button is at the bottom of the modal. Below the modal, the main content area is divided into two sections: 'Welcome back!' and 'New user?'. The 'Welcome back!' section includes a prompt to enter email and password, input fields, a 'Remember me' checkbox, a 'Login' button, and a 'Forgot password?' link. The 'New user?' section lists personalized features and includes a 'Create Account' button. The footer contains the ST logo, 'life.augmented', and a navigation bar with links for Products, Applications, Solutions, Tools & Software, About ST, Sample & Buy, Support & Community, and Login.

Asset-tracking < Login

Home
Login
HowTo

ASSET-TRACKING PLATFORM
Dashboard and Device Management

Login
Login with your ST.com account and start to track and monitor your devices!
GO

ST life.augmented

Products Applications Solutions Tools & Software About ST

Search

Search

Products > Search

Search

Products Applications Solutions Tools & Software About ST

Sample & Buy Support & Community Login

Welcome back!

Enter your e-mail address and password to login your myST user.

E-mail address

Password

☐ Remember me on this computer.

Login

Forgot password?

New user?

myST brings you a set of personalized features:

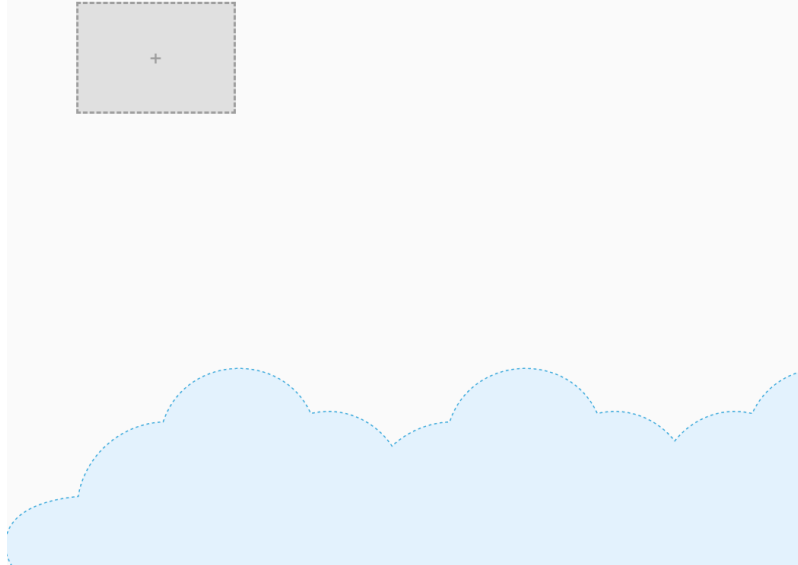
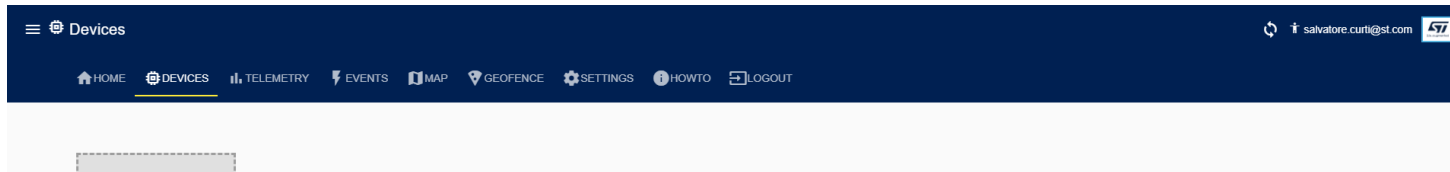
- Participate to ST Events
- Stay informed with ST eNewsletters
- Get help with ST Online Support
- Discuss on the ST Community
- Benefit from our Online Design Tools
- Download Software
- Order free samples
- Manage your weekly product updates
- Buy ST Products & Tools

Create Account

Demo Examples

Using the Asset Tracking Web Dashboard (3/6)

- Adding new the device:



This screenshot shows the 'New device' form in the Asset Tracking Web Dashboard. The form is titled 'New device' and contains the following fields and options:

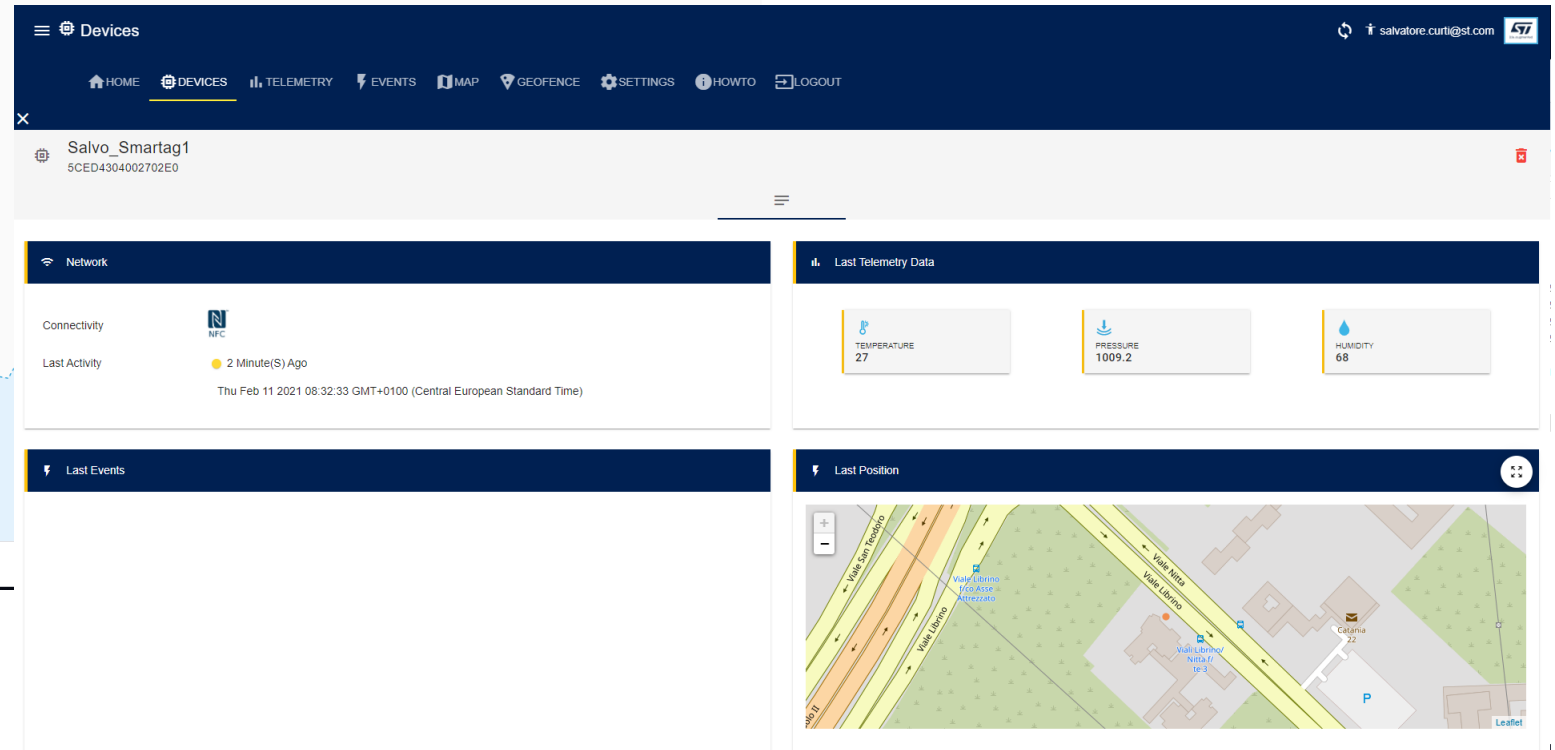
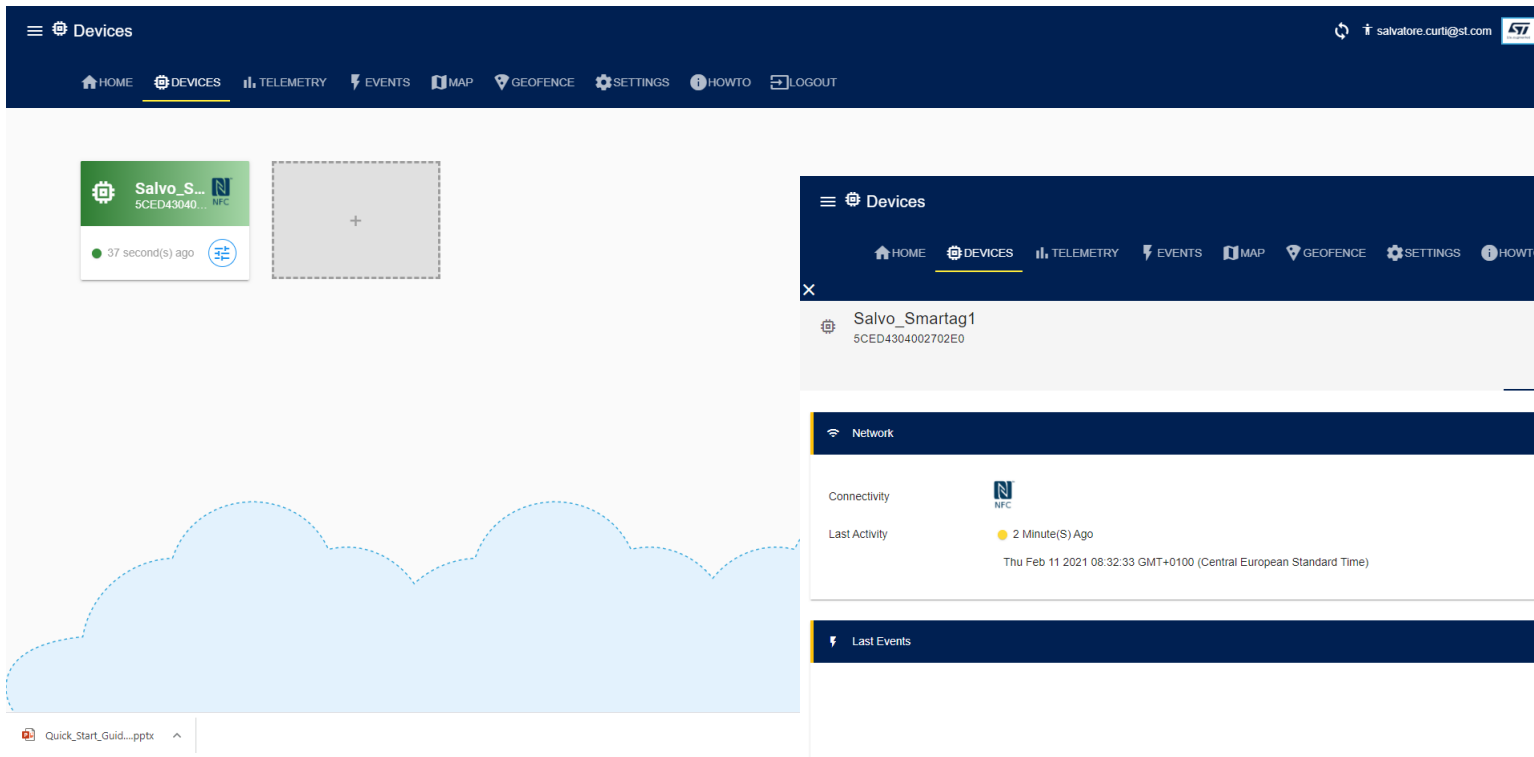
- Custom name:** Salvo_Smartag1 (14 / 16 characters)
- Device ID:** 5CED4304002702E0 (16 / 19 characters)
- It's a MAC address:** A toggle switch that is currently turned off.
- Technology:** A list of radio buttons for selecting the device technology:
 - ☐ WiFi
 - ☐ LTE - Cellular
 - ☐ LoRa (TTN)
 - ☐ Sigfox
 - ☐ Bluetooth Low Energy
 - ☒ NFC

At the bottom right of the form, there are three buttons: CLOSE, RESET, and SUBMIT.

Demo Examples

Using the Asset Tracking Web Dashboard (4/6)

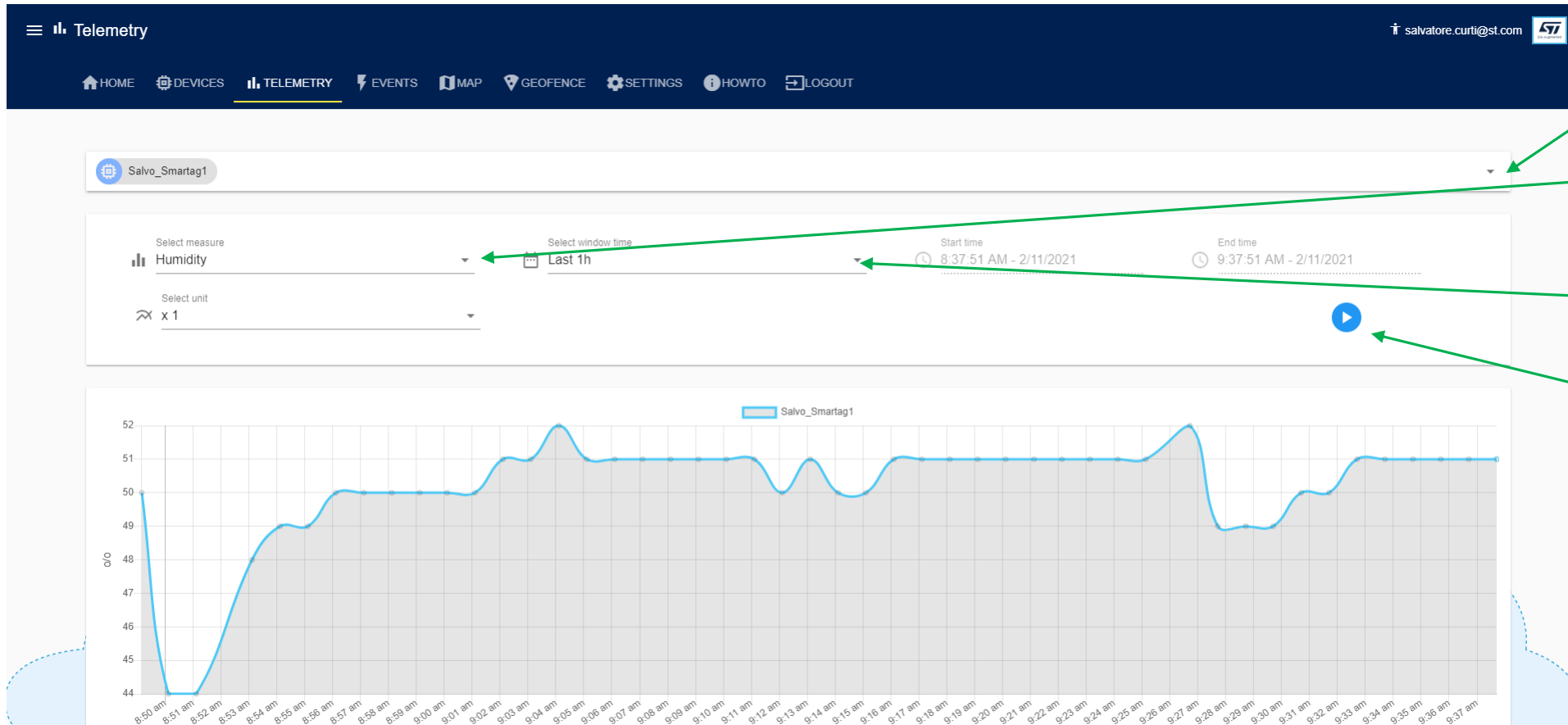
- Select the device you want to monitor :



Demo Examples

Using the Asset Tracking Web Dashboard (5/6)

- Selecting telemetry:



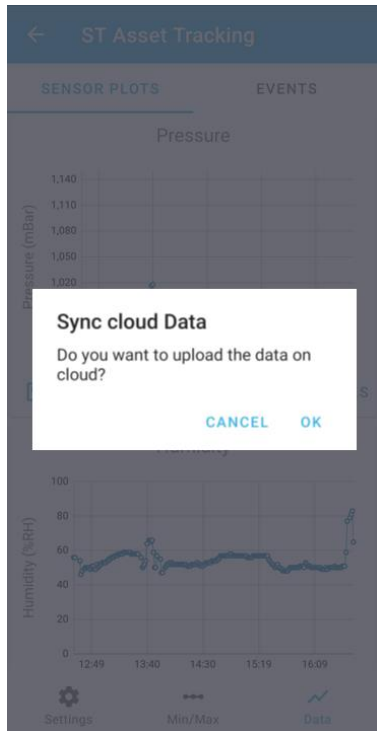
- Select the device you want to monitor.
- Select desired telemetry data to display
- Choose the amount of data to display
- Select Play Button

Humidity data displayed

Demo Examples

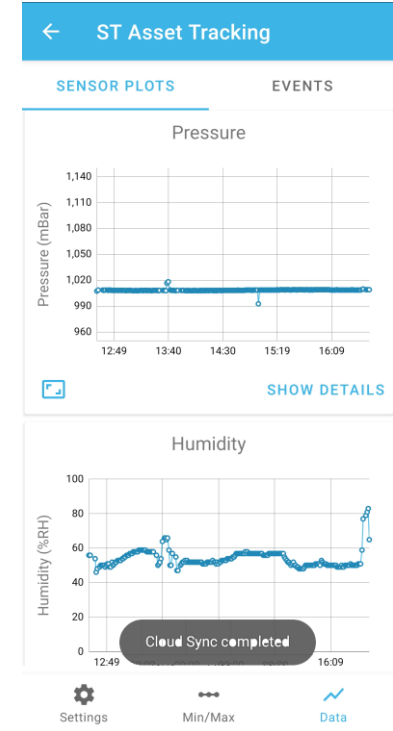
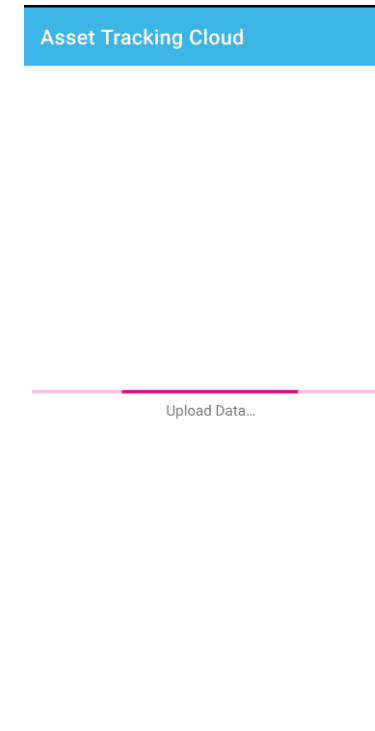
Using the Asset Tracking Web Dashboard (6/6)

- Register device from ST Asset Tracking Application and upload the data on cloud:



The screenshot shows the my.st.com web login page. It features a 'Welcome back!' message and instructions to enter an email address and password. There are input fields for 'E-mail address' and 'Password', a 'Remember me on this computer' checkbox, a 'Login' button, and a 'Forgot password?' link. The top navigation bar includes links for 'Products', 'Applications', 'Solutions', and 'Tools & Software'.

The screenshot shows the 'Asset Tracking Cloud' registration page. It displays the 'Device ID: 5CED4304002702E0' and a message stating 'Device already registered. Uploading data will start soon...'. There is a 'Device name' input field and a 'REGISTER DEVICE' button. A progress bar is visible at the bottom.



3- Documents & Related Resources

Documents and related resources (1/2)

All documents are available in the **RESOURCES** tab of the related products webpage

FP-SNS-SMARTAG1

- **DB3553:** STM32Cube function pack for IoT node with dynamic NFC tag, environmental and motion sensors for STM32Cube – [data brief](#)
- **UM2389:** Getting started with the FP-SNS-SMARTAG1 dynamic NFC tag, environmental and motion sensors for STM32Cube – [user manual](#)
- [Software setup file](#)

STEVAL-SMARTAG1

- [Gerber files, BOM, Schematic](#)
- **DB3533:** NFC Dynamic Tag sensor node evaluation board– [data brief](#)

DSH-ASSETTRACKING

- **DB4207:** Cloud Amazon-based web application for asset tracking – [data brief](#)

STNFCSensor

- **DB3666:** NFC Sensor TAG mobile application – [data brief](#)

STAssetTracking

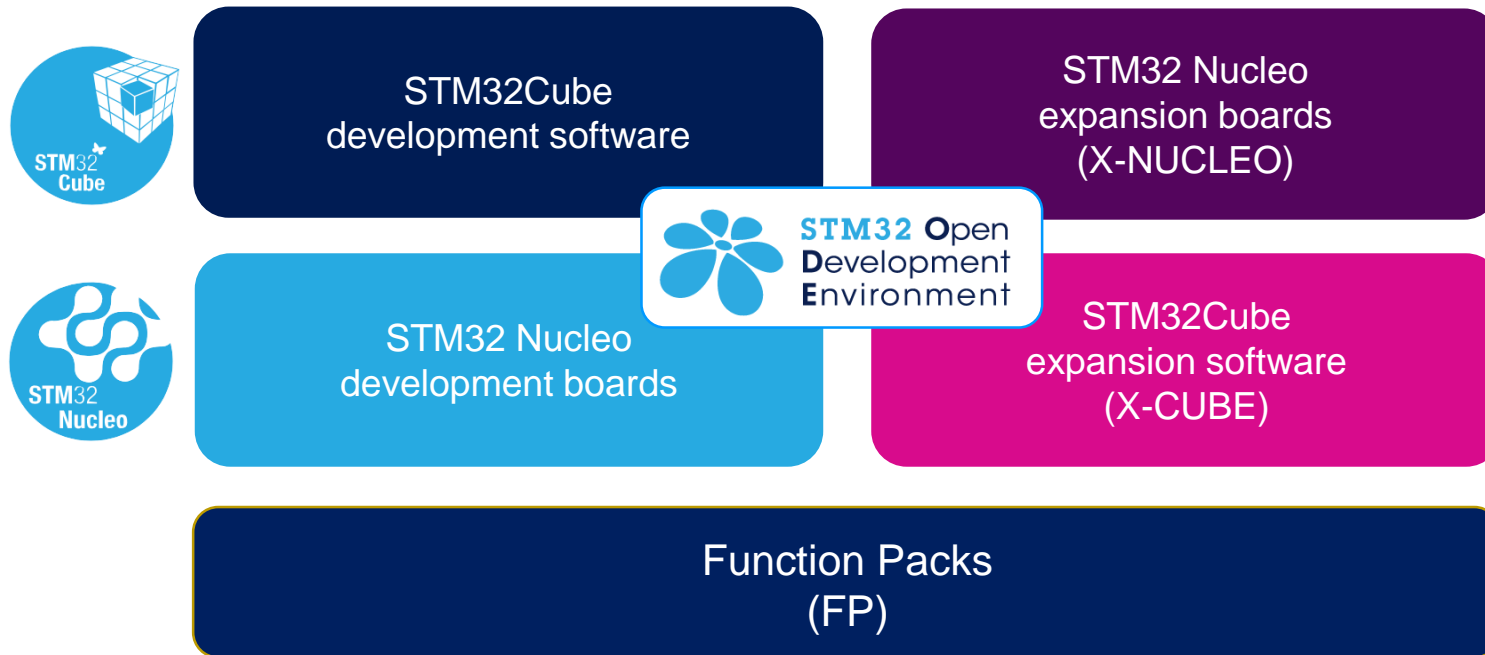
- **DB3951:** ST Asset Tracking app to configure a Sigfox node based on the FP-ATR-SIGFOX1 function pack 3.0 – [data brief](#)

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

Thank you

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