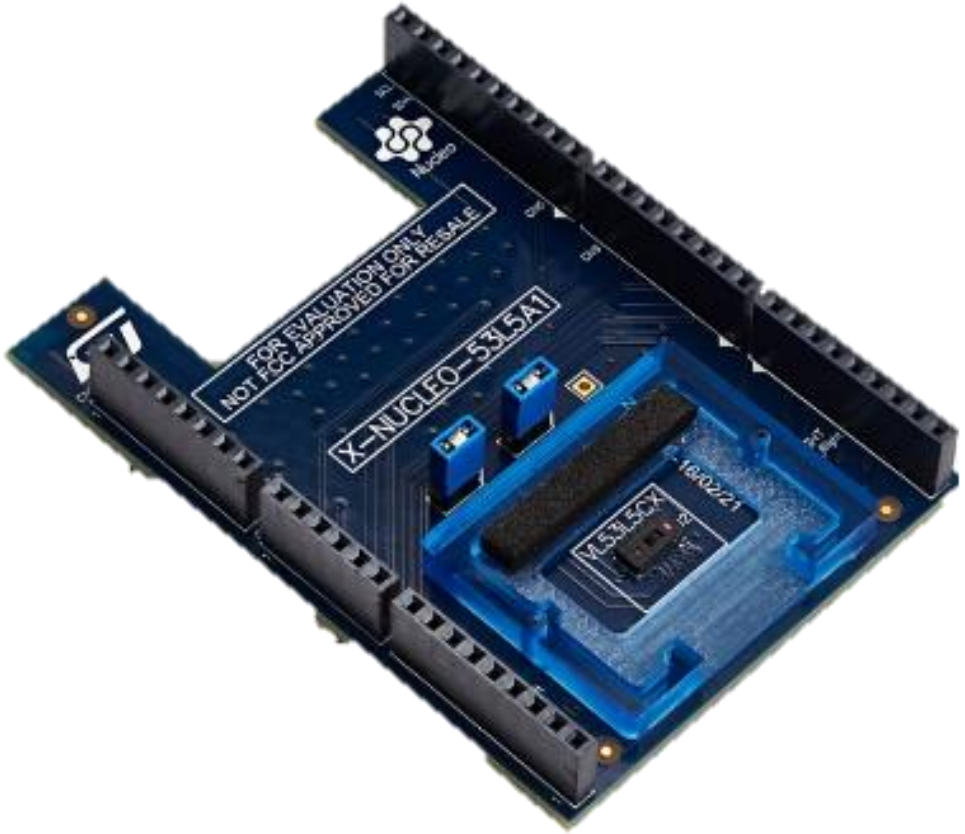


Quick Start Guide

Time-of-Flight 8x8 multizone ranging sensor with wide field of view
expansion board based on VL53L5CX for STM32 Nucleo

Version 1.0 (June 16th, 2021)

Agenda

1. Hardware and Software overview
2. Documents & Related Resources
3. STM32 Open Development Environment: Overview

1- Hardware and Software overview

8x8 Multi-zone Time-of-Flight Sensor expansion board
Hardware Overview (1/2)

X-NUCLEO-53L5A1 Hardware Description

- The X-NUCLEO-53L5A1 is a Time-of-Flight 8x8 multizone ranging sensor with wide field of view and development board designed around the VL53L5CX sensor based on ST F**light**Sense™ patented technology
- The VL53L5CX communicates with the STM32 Nucleo developer board host microcontroller through an I^2C link available on the Arduino UNO R3 connector.

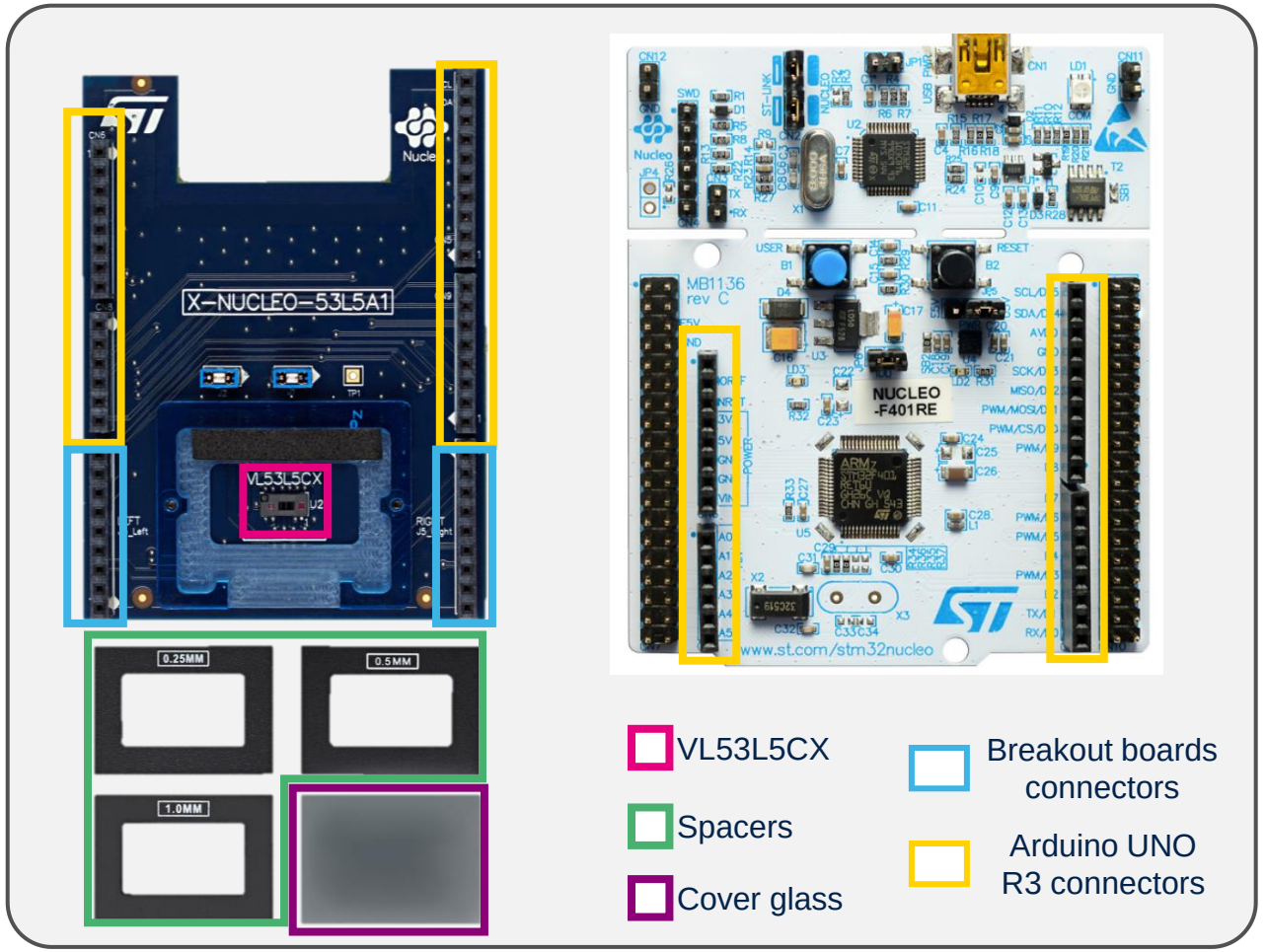
Key Products on board

VL53L5CX Time-of-Flight (ToF) 8x8 multizone ranging sensor with wide field of view

0.25, 0.5 and 1mm spacers to simulate air gaps, with the cover glass

Breakout boards

VL53L5CX-SATEL breakout boards can be purchased separately

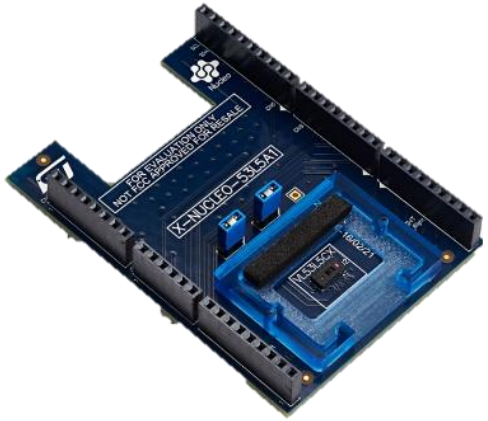


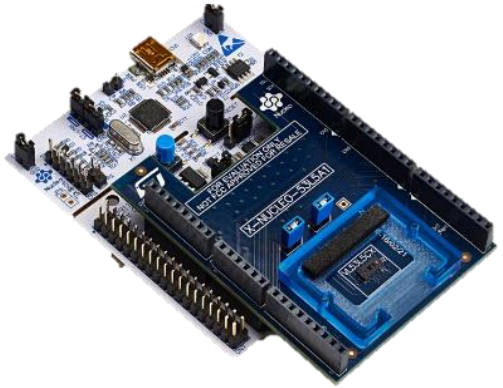
Order Code: **X-NUCLEO-53L5A1**

Latest info available at www.st.com
X-NUCLEO-53L5A1

8x8 Multi-zone Time-of-Flight Sensor expansion board
Hardware Overview (2/2)

- X-NUCLEO-53L5A1 expansion board
  - VL53L5CX devices in custom applications can be integrated with expansion board, or external VL53L5CX breakout.
  - The breakout boards are delivered separately.
- X-NUCLEO-53L5A1 is also available as a NUCLEO Pack (P-NUCLEO-53L5A1)
  - The X-NUCLEO-53L5A1 expansion board can also be ordered on www.st.com as part of a NUCLEO Pack with expansion board and STM32 NUCLEO board.
  - Order code: **P-NUCLEO-53L5A1**:
    X-NUCLEO-53L5A1 expansion board and NUCLEO-F401RE full features board.
- VL53L5CX breakout boards can be ordered separately
  - Order code: **VL53L5CX-SATEL**
  - The pack carry **two** breakout boards





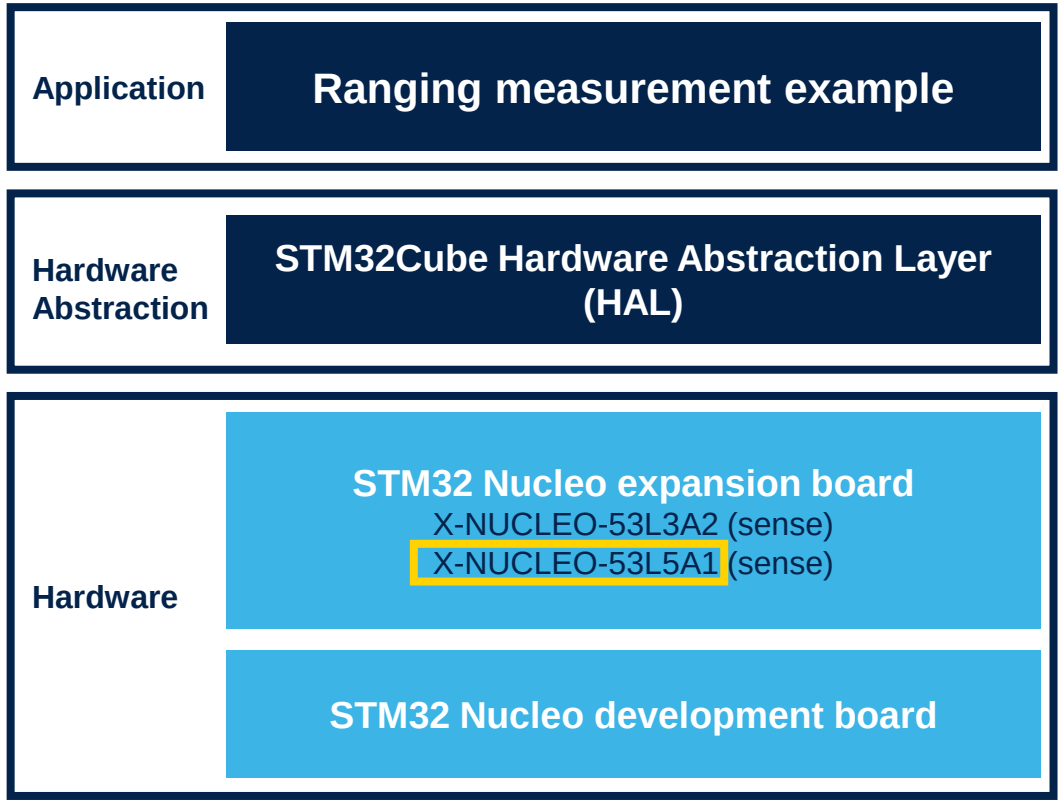
Time-of-Flight sensors Software Environment
STM32Cube Software Overview

X-CUBE-TOF1 software description

- The X-CUBE-TOF1 software package is a STM32Cube expansion for the expansion boards of the Time-of-Flight product family (including the X-NUCLEO-53L5A1) for STM32. The source code is based on STM32Cube to ease portability and code sharing across different STM32 MCU families. A sample implementation is available for the STM32 Nucleo ranging sensor expansion board (X-NUCLEO-53L5A1) plugged on top of an STM32 Nucleo development board (NUCLEO-F401RE or NUCLEO-L476RG).

Key features

- Driver layer (VL53L5CX ULD) for complete management of the VL53L5CX 8x8 multi-zone ranging sensor integrated in the X-NUCLEO- 53L5A1 expansion board.
- Easy portability across different MCU families, thanks to STM32Cube.
- Free, user-friendly license terms.
- Sample code for ranging measurement.



Latest SW available at www.st.com
X-CUBE-TOF1

2- Setup & Demo Example

Setup & Demo Examples
HW prerequisites

- 1x Multi-zone ToF sensor expansion board based on VL53L5CX (**X-NUCLEO-53L5A1**).

X-NUCLEO-53L5A1

- 1x STM32 Nucleo development board (**NUCLEO-F401RE for example**)

NUCLEO-F401RE

- 1x Laptop/PC with Windows
- 1x USB type A to Mini-B USB cable
- If you don’t have an STM32 Nucleo development board, you can order a Nucleo pack (**P-NUCLEO-53L5A1)**:
  - X-NUCLEO-53L5A1 expansion board and NUCLEO-F401RE full features board delivered together.

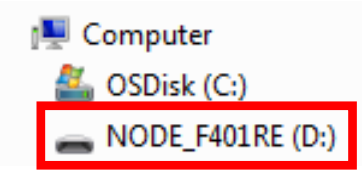
P-NUCLEO-53L5A1

Setup & Demo Examples
SW prerequisites

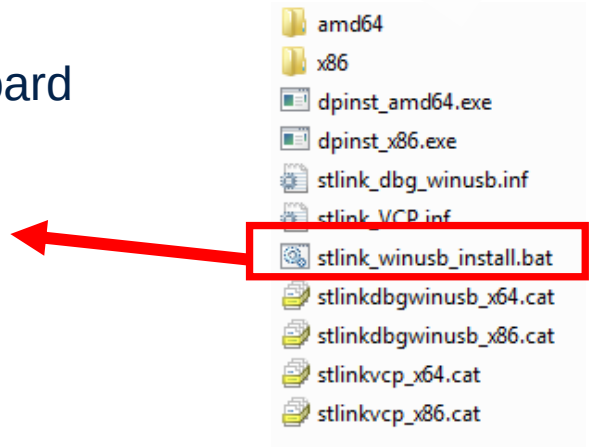
- **STSW-IMG023**: Ultra Lite Driver (ULD) for VL53L5CX
- **STSW-IMG024**: P-NUCLEO-53L5A1 Graphical User Interface (GUI) on Windows 7 and 10
- **STSW-IMG025**: Linux driver for VL53L5CX
- **X-CUBE-TOF1**: Time-of-Flight sensors software expansion for STM32Cube.
  - When you install the X-CUBE-TOF1 the installer install the directory containing the example projects here for instance :
    - C:\Users\john\STM32Cube\Repository\Packs\STMicroelectronics\X-CUBE-TOF1\2.0.0-B1\Projects\STM32F401RE-Nucleo\Examples\53L5A1\53L5A1_SimpleRanging.

Setup & Demo Examples
NUCLEO Kit driver installation

1. Connect the Nucleo pack to the PC through USB
   - Wait for the board to be recognized; the drivers are installed automatically)
   - If Windows cannot install automatically the STLINK driver, please follow step 2



2. Install the PC USB port driver to detect the Nucleo board
   - Called **STSW-LINK009**, downloaded from www.st.com
   - Unzip, extract the docs, and install "stlink_winusb_install.bat"



=> VL53L5CX nucleo kit is ready for GUI installation

VL53L5CX GUI software installation

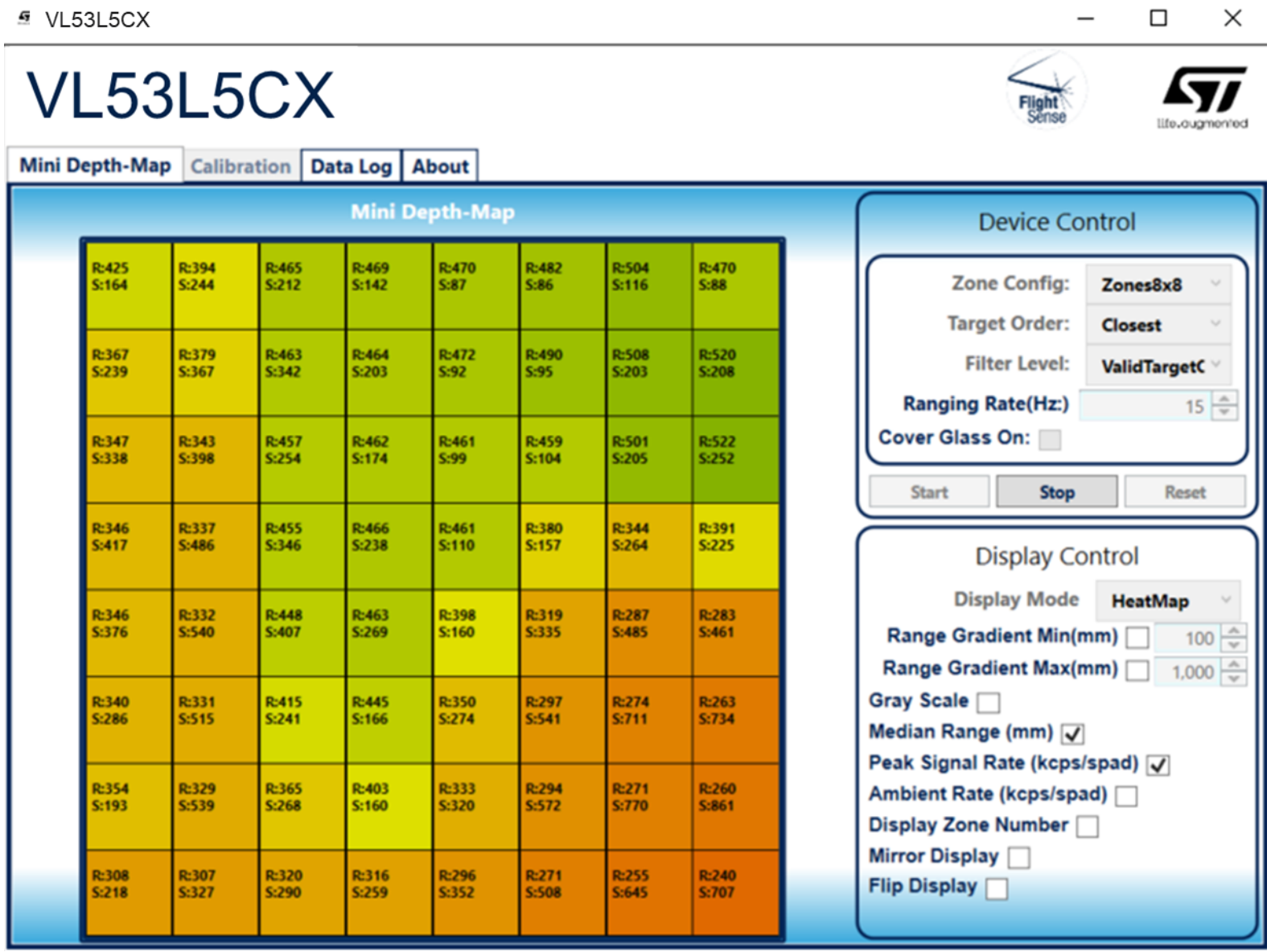
GUI is generally the first step to evaluate the device

- Perform HW installation and connect the VL53L5CX expansion board + Nucleo F401RE to the PC
- Install the GUI SW for VL53L5CX Demo and configuration settings
  - **STSW-IMG024**, downloaded from www.st.com
  - **Run the installer with Admin privileges**

The Graphical User Interface can:

- Perform the Xtalk calibration and visualize calibration data
- Change key parameters of VL53L5CX
- Display real time mini-depth map data (distance, signal, ambient rate)
- Get data logging and replay a datalog (.csv file)

Setup & Demo Examples
VL53L5CX GUI software installation

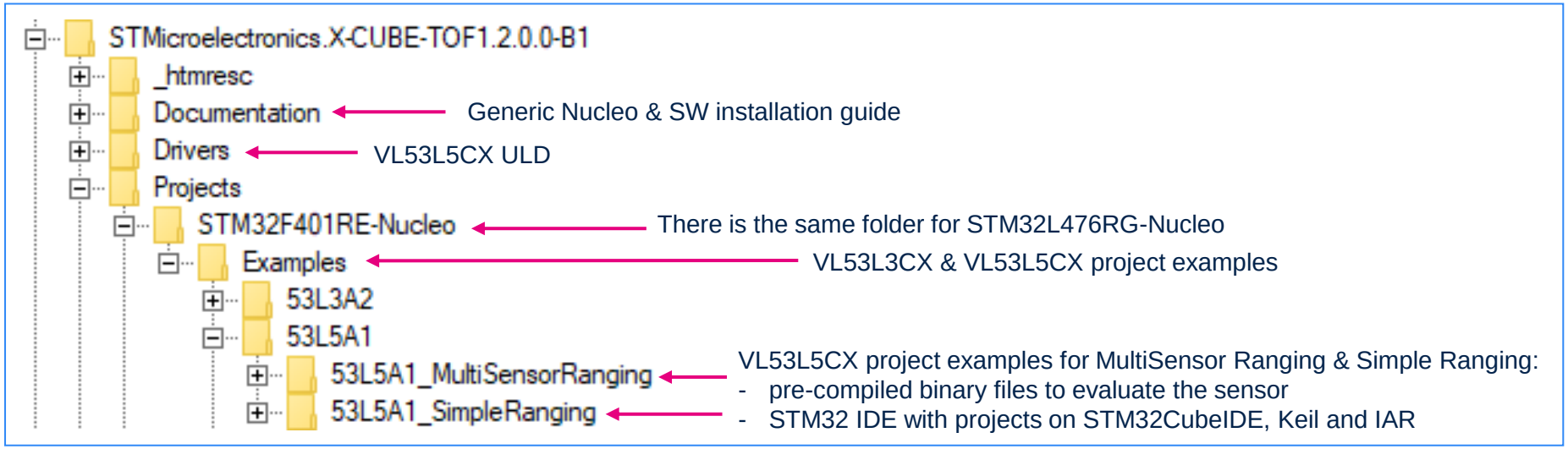


Setup & Demo Examples
X-CUBE-TOF1 software installation

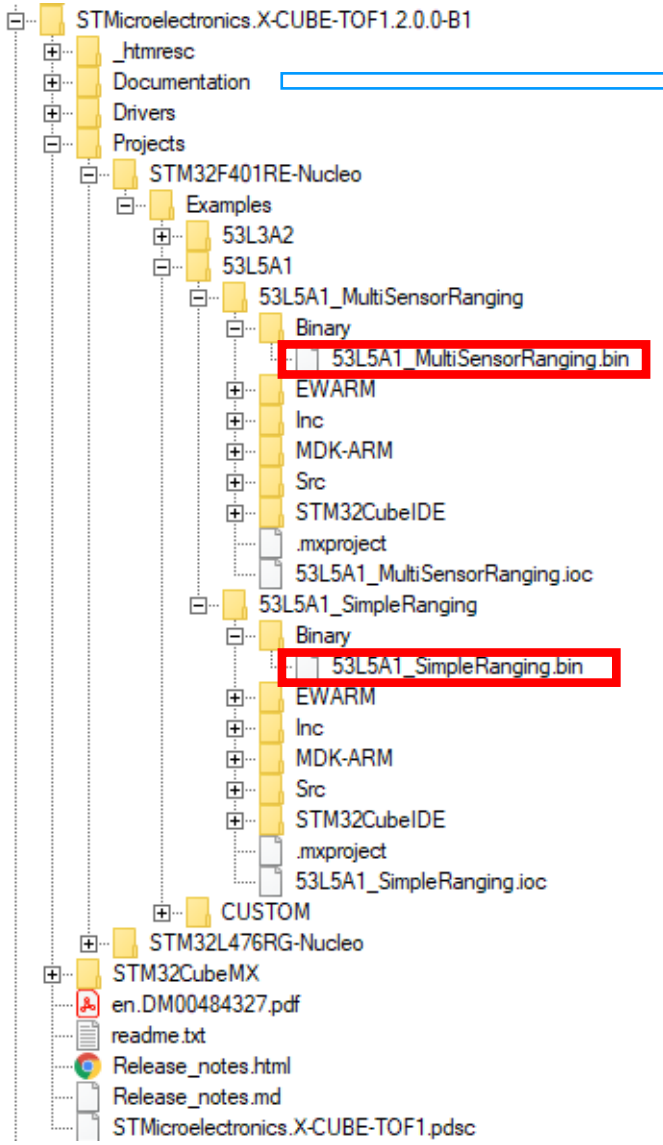
- Perform HW installation and connect the NUCLEO kit (P-NUCLEO-53L5A1) to the PC

- Install the X-CUBE-TOF1 SW package
  - **X-CUBE-TOF1**, downloaded from www.st.com
  - The X-CUBE-TOF1 is installed through STM32CubeMx, manage software installation section.
  - Once the X-CUBE-TOF1 is installed. Go to
    - C:\Users\john\STM32Cube\Repository\Packs\STMicroelectronics\X-CUBE-TOF1\2.0.0-B1\Projects\STM32F401RE-Nucleo\Examples\53L5A1\53L5A1_SimpleRanging

X-CUBE software package contents: API SW + SW examples

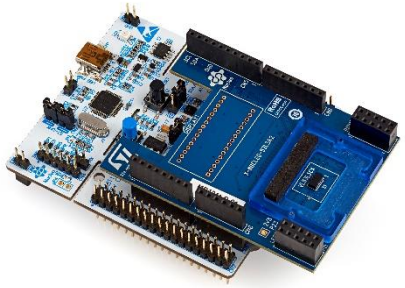


8x8 Multi-zone Time-of-Flight Sensor expansion board
Evaluation code example (.bin) using X-CUBE-TOF1 and a NUCLEO Pack

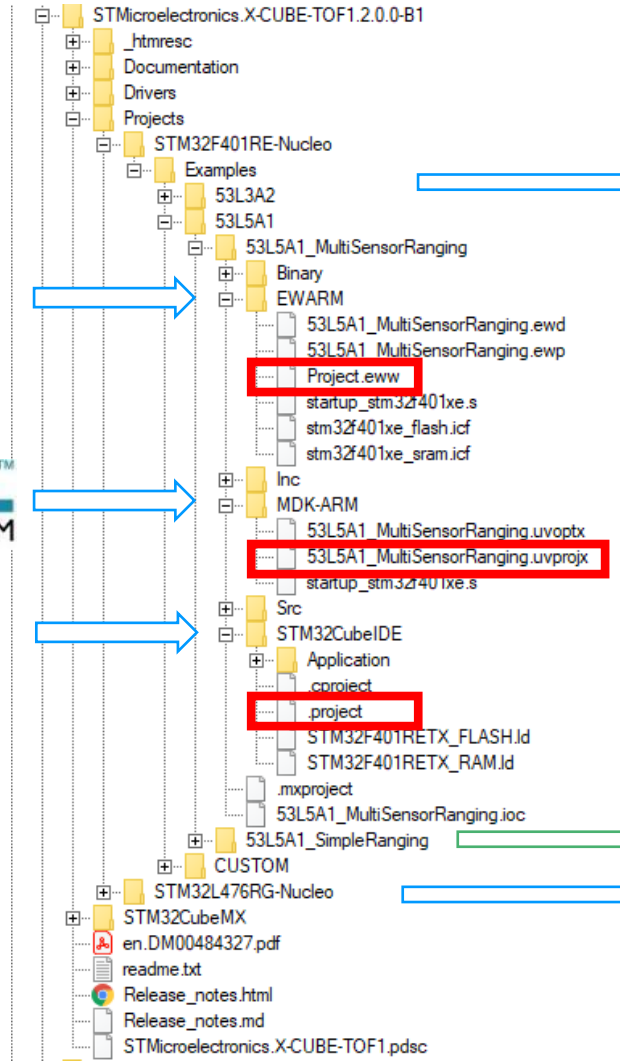


Open: **UM2853** (Getting started with the STMicroelectronics X-CUBE-TOF1, Time-of-Flight sensors, software package for STM32CubeMX) and follow the instructions

Drag and drop to



VL53L5CX 8x8 Multi-zone Time-of-Flight Sensor expansion board
Start programming with code examples using X-CUBE-TOF1 and a NUCLEO Pack



Open: **UM2853** (Getting started with the STMicroelectronics X-CUBE-TOF1, Time-of-Flight sensors, software package for STM32CubeMX) and **follow the instructions**

Open project example for
Multi Sensor ranging
And modify, build application SW

Same folders as above but for another project example

We find same folders and same files as above

3- Documents & Related Resources

Documents & Related Resources

Go to https://www.st.com/en/imaging-and-photonics-solutions/vl53l5cx
All documents are available in the Documentation tab of the related products webpage

VL53L5CX: Product Folder

- **DS13754**: Time-of-Flight 8x8 multizone ranging sensor with wide field of view - **data sheet**

X-NUCLEO-53L5A1: Product Folder

- **DB4505**: Time-of-Flight 8x8 multizone ranging sensor with wide field of view expansion board based on VL53L5CX for STM32 Nucleo – **data brief**
- **X-NUCLEO-53L5A1 Quick start guide :** Time-of-Flight 8x8 multizone ranging sensor with wide field of view - **this document**
- **UM2889:** Getting started with X-NUCLEO-53L5A1 Time-of-Flight 8x8 multi-zone ranging sensor with wide FoV based on the VL53L5CX for STM32 Nucleo - **user manual**

P-NUCLEO-53L5A1: Product Folder

- **DB4509**: VL53L5CX nucleo pack with X-NUCLEO-53L5A1 expansion board and STM32F401RE nucleo board– **data brief**

VL53L5CX-SATEL: Product Folder

- **DB4506** : VL53L5CX breakout board Time-of-Flight 8x8 multizone ranging sensor with wide field of view – **data brief**

STSW-IMG023: Ultra Lite Driver (ULD) for VL53L5CX folder

- **DB4499**: Ultra lite driver (ULD) application programming interface (API) for the VL53L5CX – **data brief**

STSW-IMG024: Graphical User Interface (GUI) Folder

- **DB4510**: P-NUCLEO-53L5A1 pack graphical user interface (GUI) – **data brief**
- **Software setup file**

X-CUBE-TOF1: Software package for STM32Cube

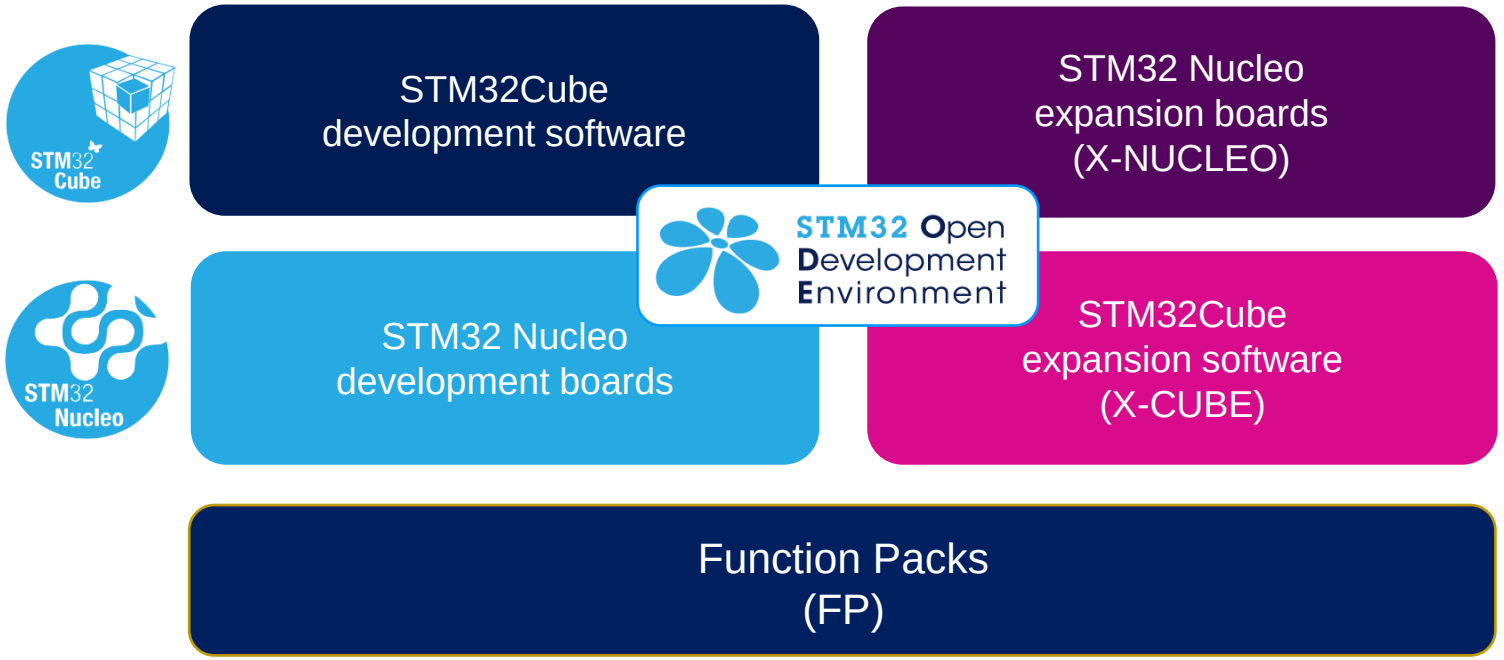
- **DB4449:** Time-of-Flight sensors software expansion for STM32Cube – **data brief**
- **UM2853:** Getting started with the STMicroelectronics X-CUBE-TOF1, Time-of-Flight sensors, software package for STM32CubeMX - **User Manual**
- **Software setup file**

4- STM32 Open Development Environment: Overview

life.augmented

STM32 Open Development Environment
Fast, affordable Prototyping and Development

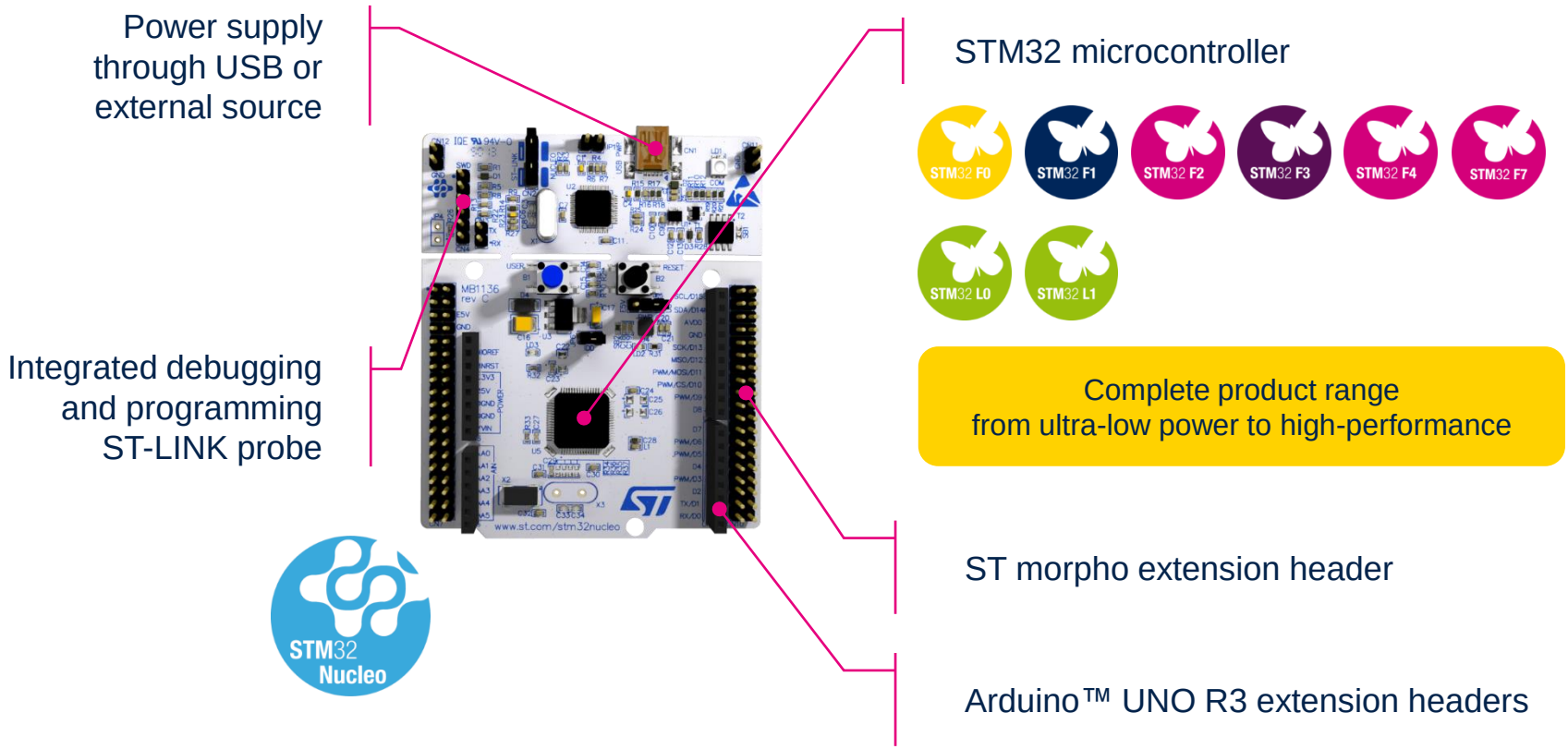
- The STM32 Open Development Environment (STM32 ODE) is an open, flexible, easy, and affordable way to develop innovative devices and applications based on the STM32 32-bit microcontroller family combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs



For further information, please visit www.st.com/stm32ode

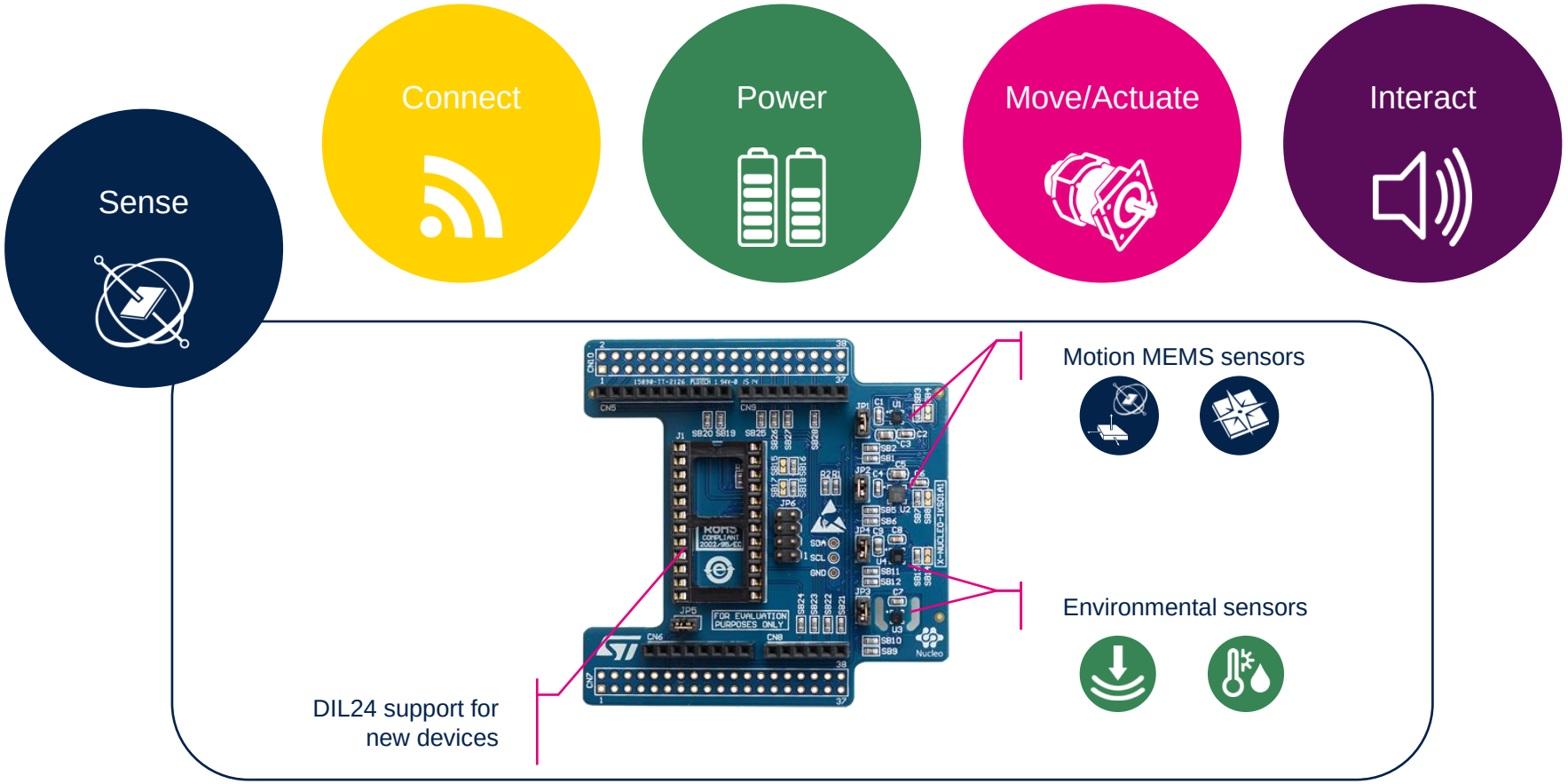
STM32 Nucleo
Development Boards (NUCLEO)

- A comprehensive range of affordable development boards for all the STM32 microcontroller series, with unlimited unified expansion capabilities and integrated debugger/programmer functionality.



www.st.com/stm32nucleo

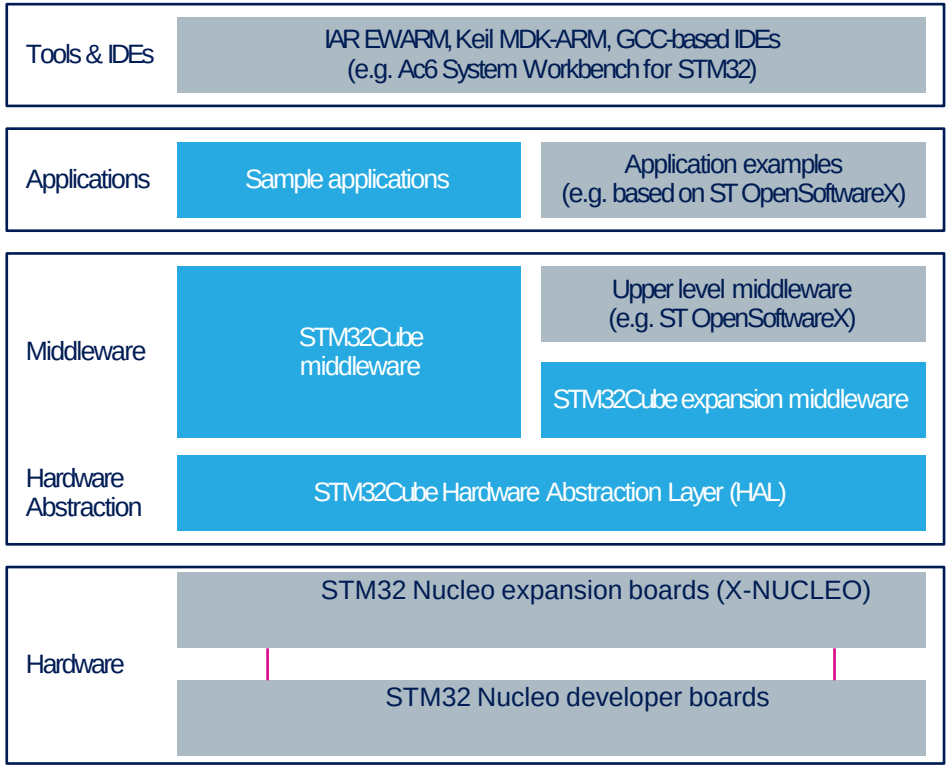
- Boards with additional functionality that can be plugged directly on top of the STM32 Nucleo development board directly or stacked on another expansion board.



Example of STM32 expansion board (X-NUCLEO-IKS01A1)

STM32 Open Development Environment
Software components

- **STM32Cube software (CUBE)** - A set of free tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer and middleware bricks.
- **STM32Cube expansion software (X-CUBE)** - Expansion software provided free for use with the STM32 Nucleo expansion board and fully compatible with the STM32Cube software framework. It provides abstracted access to expansion board functionality through high-level APIs and sample applications.



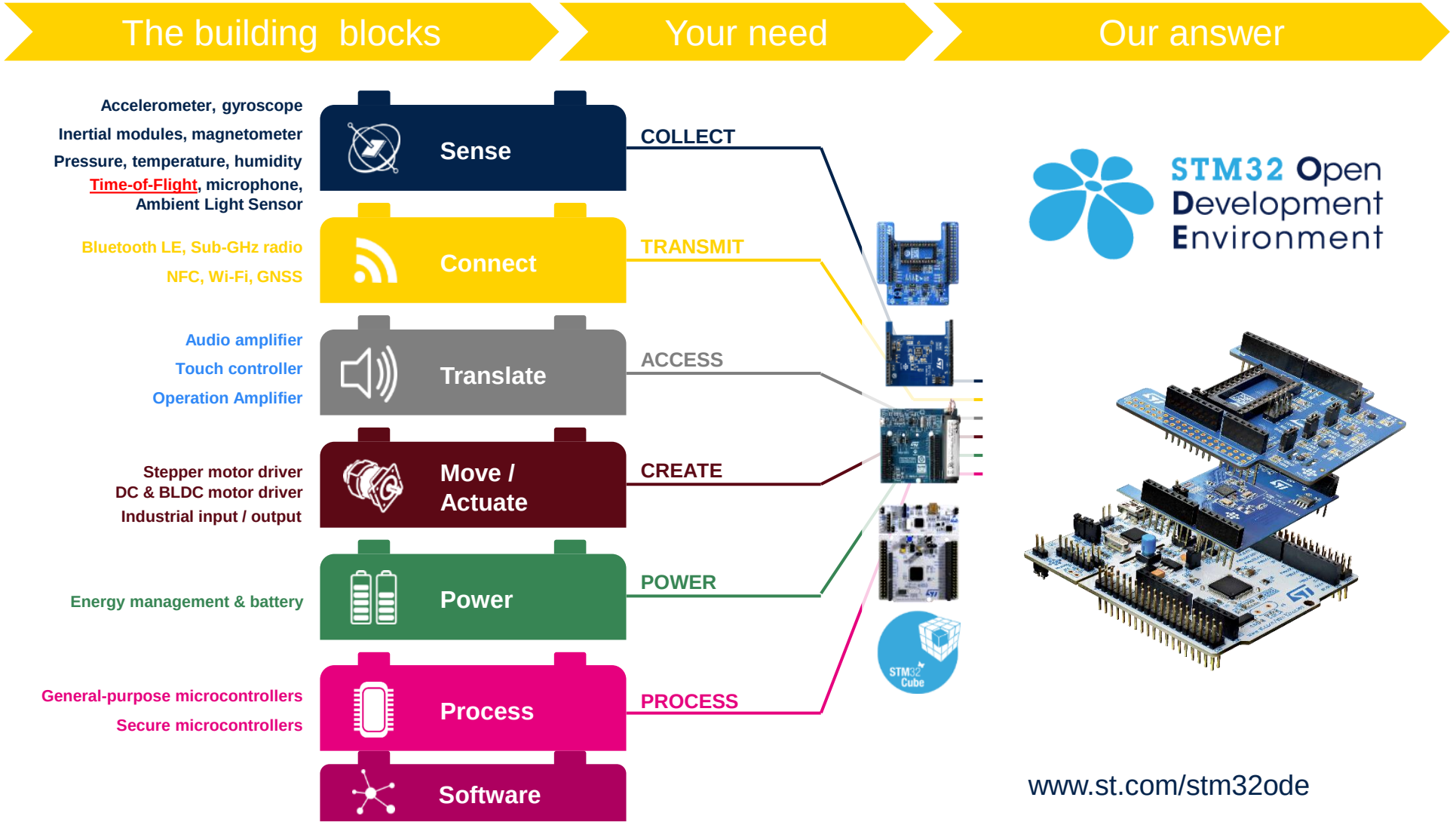
- **Compatibility with multiple Development Environments -** The STM32 Open Development Environment is compatible with a number of IDEs, including IAR EWARM, Keil MDK, and GCC-based environments. Users can choose from three IDEs from leading vendors; they are free of charge and deployed in close cooperation with ST. These include Eclipse-based IDEs such as Ac6 System Workbench for STM32 and the MDK-ARM environment.

OPEN LICENSE MODELS: STM32Cube software and sample applications are covered by a mix of fully open source BSD license and ST licenses with very permissive terms.

www.st.com/stm32cube

www.st.com/x-cube

STM32 Open Development Environment
Building block approach



www.st.com/stm32ode

Thank you

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