Quick Start Guide

GNSS expansion board based on Teseo-LIV3F module for STM32 Nucleo

(X-NUCLEO-GNSS1A1)

Version 3.0 (April, 2019)

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Quick Start Guide Contents

GNSS expansion board
Hardware Overview

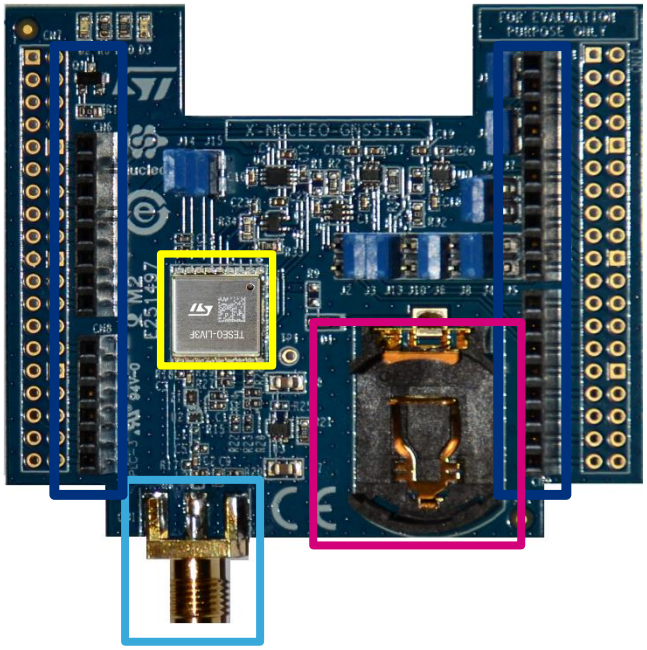
X-NUCLEO-GNSS1A1 Hardware Description

- The X-NUCLEO-GNSS1A1 expansion board is based on the Teseo-LIV3F tiny GNSS module.
- It represents an affordable, easy-to-use, global navigation satellite system (GNSS) module, embedding a Teseo III single die standalone positioning receiver IC, usable in different configurations in your STM32 Nucleo project.
- The Teseo-LIV3F is a compact (9.7x10.1 mm) module that provides superior accuracy thanks to the on-board 26 MHz temperature compensated crystal oscillator (TCXO) and a reduced time-to-first fix (TTFF) with its dedicated 32 KHz real-time clock (RTC) oscillator.
- The Teseo-LIV3F module runs complete GNSS firmware (X-CUBE-GNSS1) to perform all GNSS operations including acquisition, tracking, navigation and data output without external memory support.
- The X-NUCLEO-GNSS1A1 expansion board is compatible with the Arduino™ UNO R3 connector and the ST morpho connector, so it can be plugged to the STM32 Nucleo development board and stacked with additional STM32 Nucleo expansion boards.

Key Products on board

Teseo-LIV3F: Single die standalone positioning receiver IC working on multiple constellations, 10x10mm compact size.

26MHz Temperature Compensated Crystal Oscillator (TCXO) and reduced Time To First Fix (TTFF) relying to a 32KHz Real Time Clock (RTC) oscillator for superior accuracy.



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X-NUCLEO-GNSS1A1

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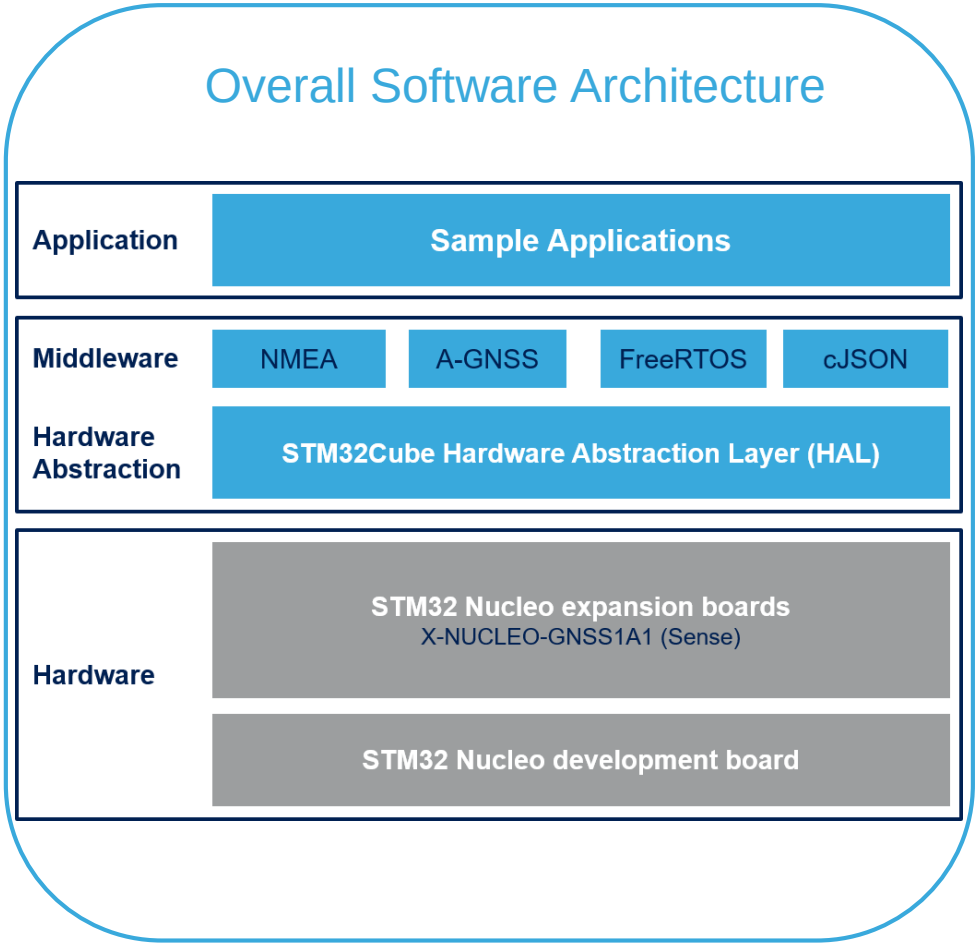
GNSS expansion board
Software overview

X-CUBE-GNSS1 software description

- The X-CUBE-GNSS1 expansion package for STM32Cube runs on STM32 and includes drivers for the Teseo-LIV3F global navigation satellite system (GNSS) device as well as middleware for the NMEA protocol support and FreeRTOS for task scheduling ensuring better asynchronous message parsing.
- It is built on top of STM32Cube software technology for easy portability across different STM32 microcontrollers.
- The software comes with sample implementations for the drivers running on the X-NUCLEO-GNSS1A1 expansion board, when connected to a NUCLEO-F401RE, NUCLEO-L476RG, or NUCLEO-L073RZ board.
- The software includes also a sample application for Assisted GNSS provided by the Teseo-LIV3F GNSS device. The application is tailored for the B-L475E-IOT01A Discovery kit for IOT node.

Key features

- Complete software to build applications using Teseo-LIV3F GNSS device
- Middleware for the NMEA protocol, and Assisted GNSS (A-GNSS) support
- FreeRTOS task scheduling
- Sample applications to transmit GNSS data to a PC, and for A-GNSS support
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms



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X-CUBE-GNSS1

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X-NUCLEO-GNSS1A1: STM32 Nucleo GNSS expansion board
Hardware and Software overview

Setup & Demo Examples
Documents & Related Resources

STM32 Open Development Environment: Overview

Setup & demo examples
HW prerequisites

- 1 x STM32 Nucleo GNSS expansion board (**X-NUCLEO-GNSS1A1**)
- 1 x STM32 Nucleo development board (**NUCLEO-F401RE / NUCLEO-L476RG / NUCLEO-L073RZ / B-L475E-IOT01**)
- 1x Laptop/PC with Microsoft Windows 7 (or above)
- 1x GPS/GLONASS/Beidou Antenna
- 1x USB type A to Mini-B USB cable

Setup & demo examples
SW prerequisites

- **STSW-LINK009**: ST-LINK/V2-1 USB driver
- **STSW-LINK007**: ST-LINK/V2-1 firmware upgrade
- **X-CUBE-GNSS1:** expansion software for STM32Cube
  - Copy the .zip file content into the “c:\Program Files (x86)\STMicroelectronics\” folder on your PC
  - The package contains the source code examples (Keil, IAR EWARM, System Workbench for STM32) based on NUCLEO-F401RE, NUCLEO-L476RG, NUCLEO-L073RZ, B-L475E-IOT1

Global Navigation Satellite System expansion board

Start coding in just a few minutes with X-CUBE-GNSS1

1 Go to www.st.com/x-nucleo

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2 Select X-NUCLEO-GNSS1A1

3 Download and unpack X-CUBE-GNSS1

X-CUBE-GNSS1 package

- _htmresc
- CubeMX ← CubeMX configuration files
- Documentation ← GNSS package docs
- Drivers ← GNSS UART and I2C drivers
- Middlewares ← NMEA, A-GNSS & FreeRTOS Libraries
- Projects ← Application examples
- Utilities
- en.DM00367782.pdf
- readme.txt
- Release_Notes.html
- STMicroelectronics.X-CUBE-GNSS1.pdsc

4 Download and install STM32 Nucleo ST-LINK/V2-1 USB driver

5 Open project example GetPos

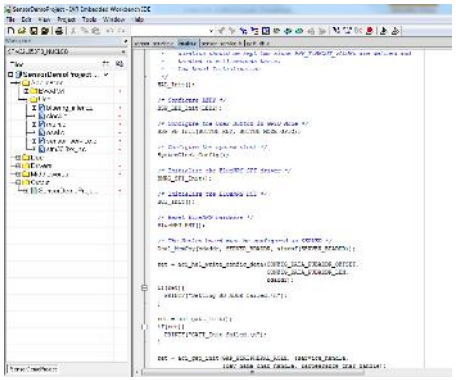
KEIL™ Tools by ARM

IAR SYSTEMS

ac6

Open STM32 Tools

6 Modify and build application

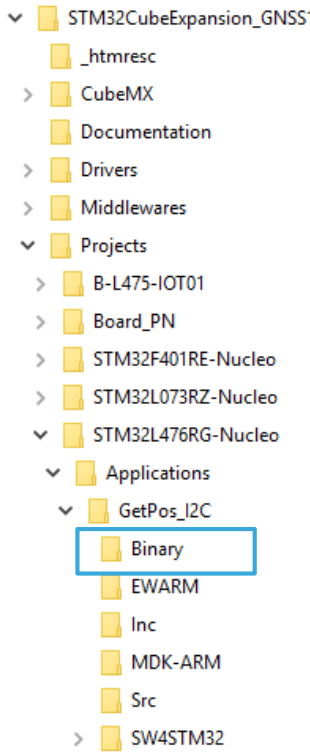


Evaluate using X-CUBE-GNSS1 (1/2)

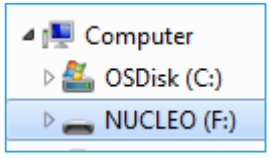
1

- Connect the STM32 Nucleo board and the X-NUCLEO-GNSS1A1 expansion board
- Connect the GPS/GLONASS antenna to the connector on the X-NUCLEO-GNSS1A1 expansion board
- Connect the STM32 Nucleo board to your PC

2

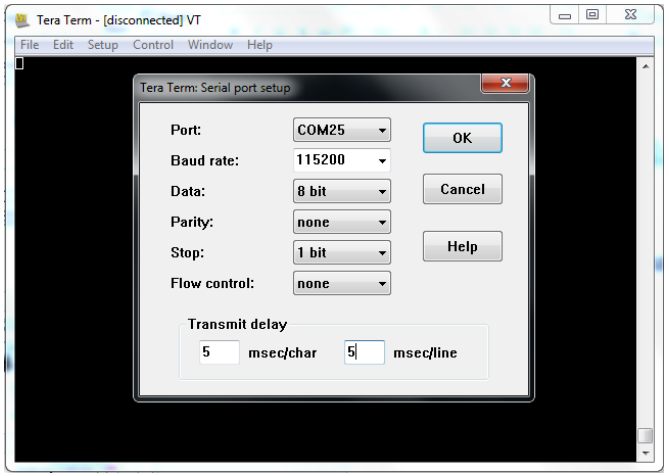


From X-CUBE-GNSS1 software resource package drag and drop GetPos_*.bin **(in Binary folder) on Nucleo drive**

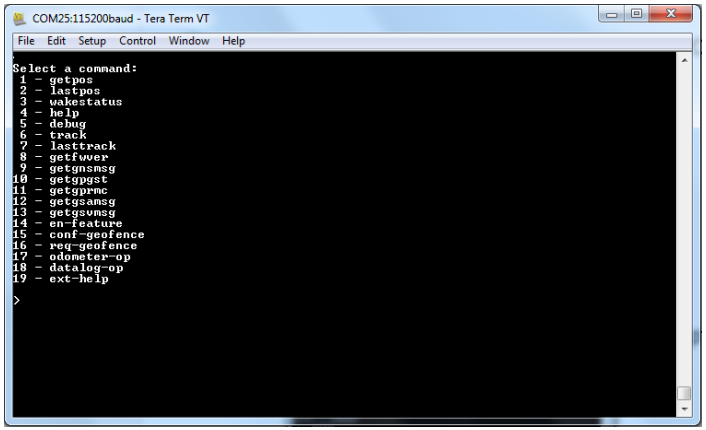


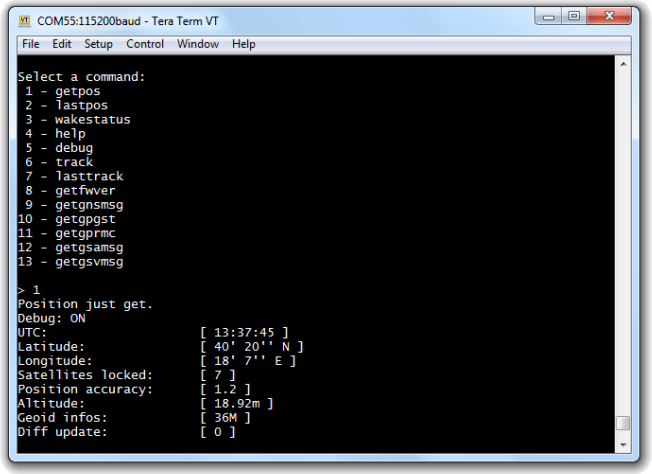
Global Navigation Satellite System expansion board
Evaluate using X-CUBE-GNSS1 (2/2)

3 Run a Serial Terminal (e.g. TeraTerm) on your PC and open a serial connection



4 Reset the STM32 Nucleo board and select an option from the menu appearing on Serial Terminal



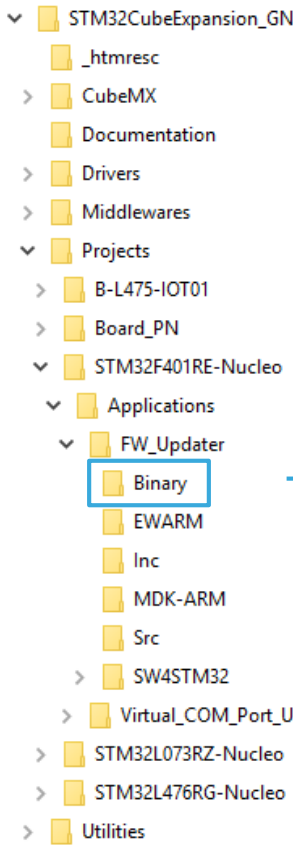


Update Teseo-LIV3F FW using X-CUBE-GNSS1 (1/2)

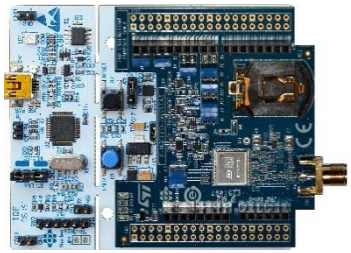
1

- Connect the STM32 Nucleo board and the X-NUCLEO-GNSS1A1 expansion board
- Connect the STM32 Nucleo board to your PC
  - Note: This application has been tested on Nucelo-F401RE only

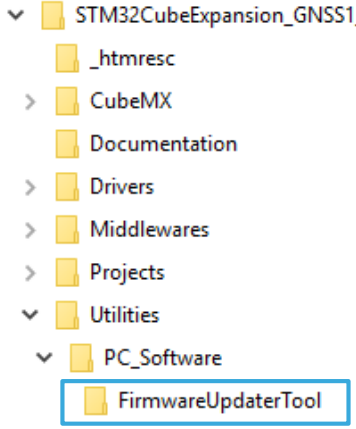
2



From X-CUBE-GNSS1 software resource package drag and drop FW_Updater.bin (in Binary folder) on Nucleo drive

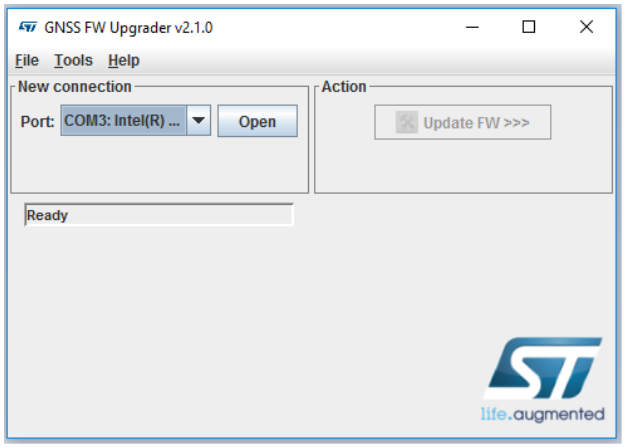


Update Teseo-LIV3F FW using X-CUBE-GNSS1 (2/2)



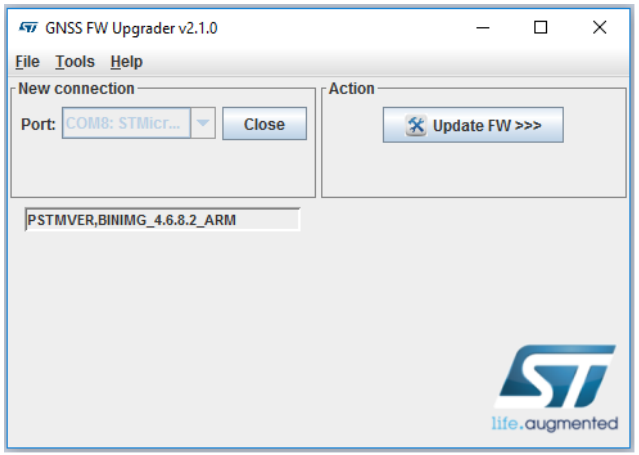
3

From X-CUBE-GNSS1 software resource package open the java tool FWUPG.jar (in FirmwareUpdaterTool folder)



4

After selecting the right serial port, click **Open** to start a connection with your STM32 Nucleo and X-NUCLEO-GNSS1A1 expansion boards.



5

If the FW version on the Teseo-LIV3F module is not the latest one, click the **Update FW >>>** button to start the firmware upgrading process.
Note: keep the Reset button on Nucleo board pressed until the updating procedure is started.

Evaluate Teseo-LIV3F using X-CUBE-GNSS1 and Teseo-Suite

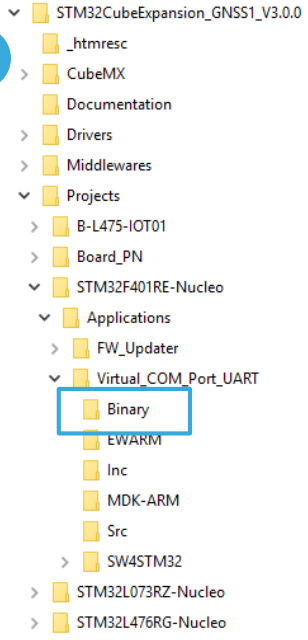
1

- Download and install on your PC the ST Teseo-Suite software tool from st.com

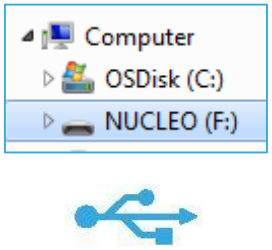
2

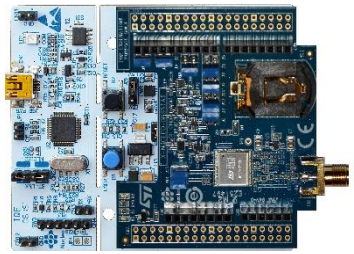
- Connect the STM32 Nucleo board and the X-NUCLEO-GNSS1A1 expansion board
- Connect the GPS/GLONASS antenna to the connector on the X-NUCLEO-GNSS1A1 expansion board
- Connect the STM32 Nucleo board to your PC

3



From X-CUBE-GNSS1 software resource package drag and drop
Virtual_COM_Port_*.bin **(in Binary folder) on Nucleo drive**





4

- Launch the ST Teseo-Suite on your PC
- To start managing, configuring and evaluating the Teseo GNSS device follow the Quick Training Guide available at the Teseo-Suite web page on st.com

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Documents & related resources

All documents are available in the DESIGN tab of the related products webpage

X-NUCLEO-GNSS1A1:

- Gerber files, BOM, and schematics
- **DB3458:** GNSS expansion board based on Teseo-LIV3F module for STM32 Nucleo – **Data brief**
- **UM2327:** Getting started with X-NUCLEO-GNSS1A1 Global Navigation Satellite System expansion board based on Teseo-LIV3F module for STM32 Nucleo – **User Manual**

X-CUBE-GNSS1:

- **DB3444**: Global navigation satellite system software expansion for STM32Cube – **Data brief**
- **UM2334**: Getting started with the X-CUBE-GNSS1 Global Navigation Satellite System software expansion for STM32Cube **– User Manual**
- **Software setup file**

Consult www.st.com for the complete list

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X-NUCLEO-GNSS1A1: STM32 Nucleo GNSS expansion board
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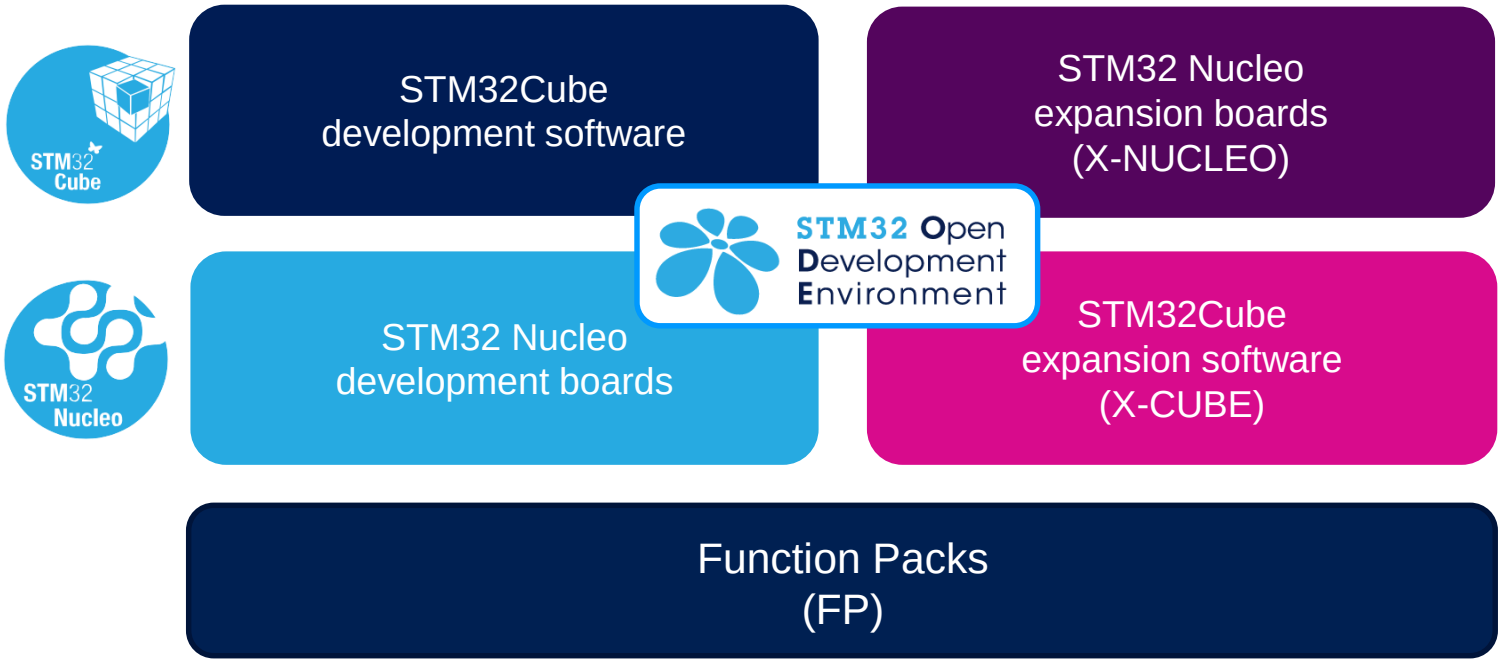
Documents & Related Resources

STM32 Open Development Environment: Overview

STM32 Open Development Environment
Fast, affordable Prototyping and Development

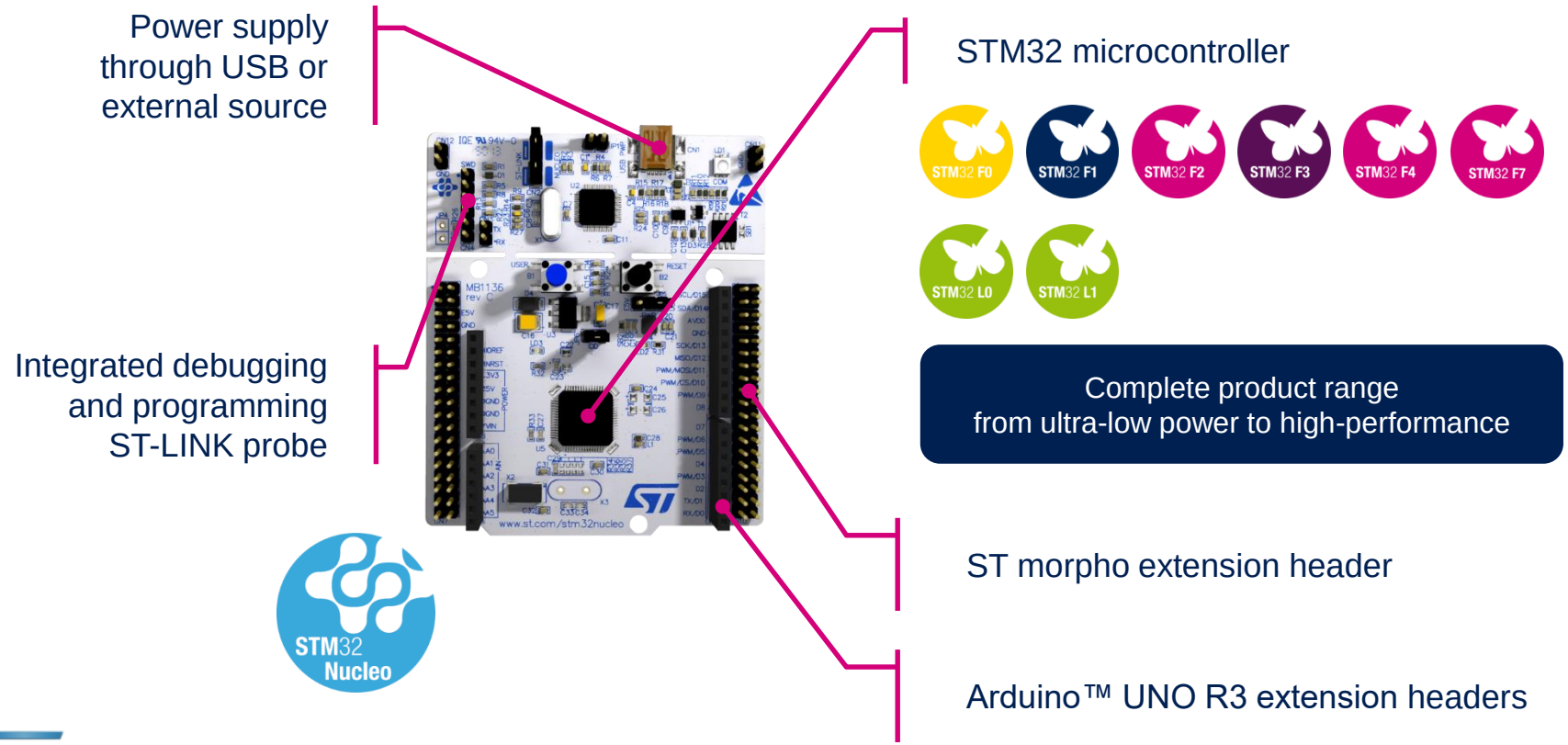
- The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.



www.st.com/stm32ode

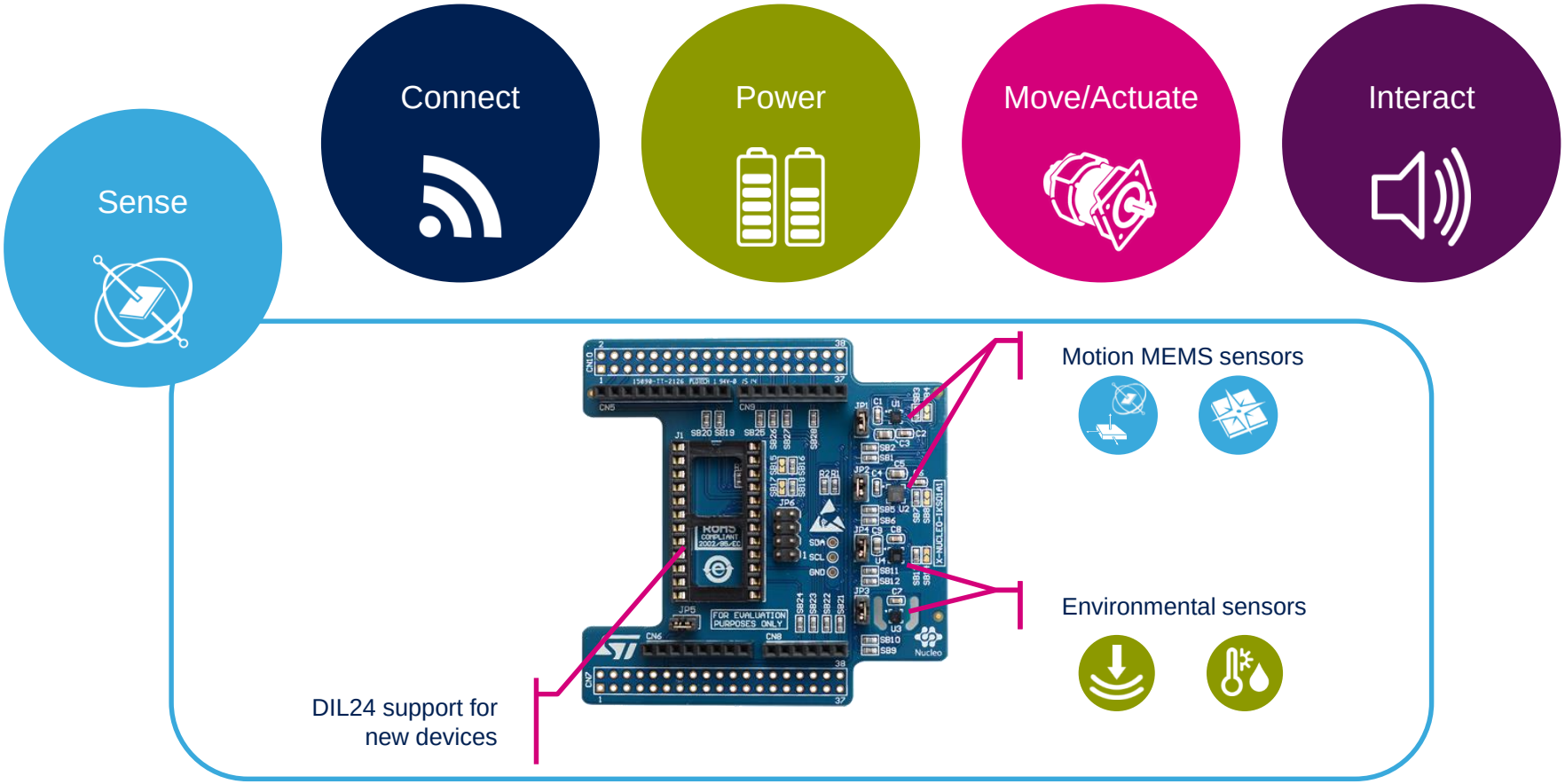
Development Boards (NUCLEO)

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



Expansion Boards (X-NUCLEO)

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

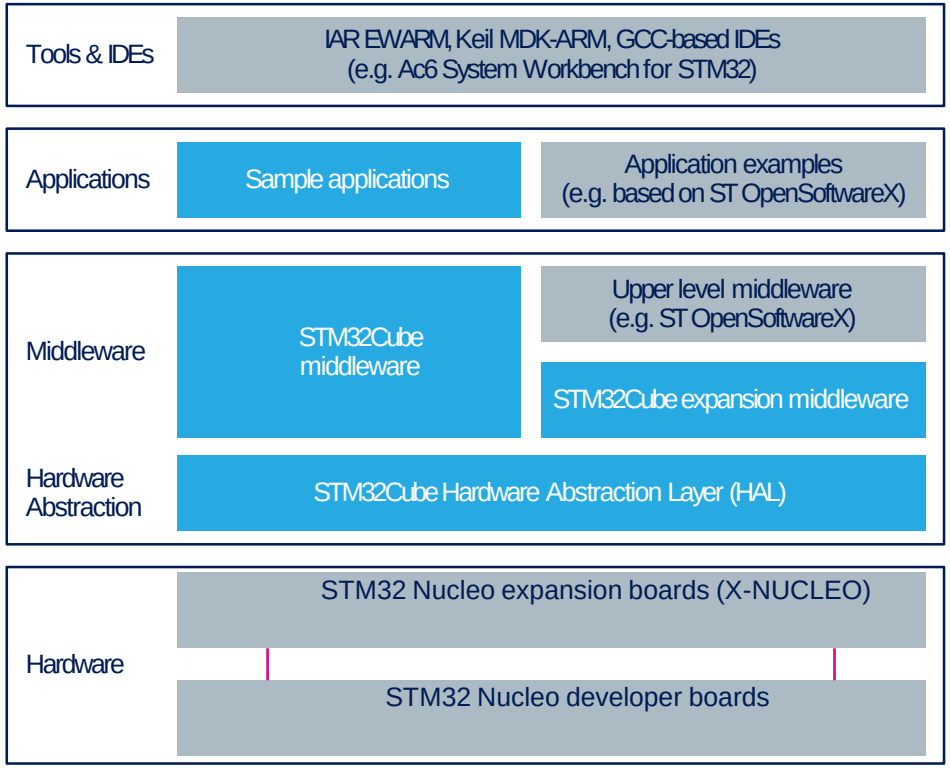


Example of STM32 expansion board (X-NUCLEO-IKS01A1)

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, which 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.

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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

The building blocks	Your need	Our answer

Accelerometer, gyroscope
Inertial modules, magnetometer
Pressure, temperature, humidity
Proximity, microphone

Sense — COLLECT

Bluetooth LE, Sub-GHz radio
NFC, Wi-Fi, GNSS

Connect — TRANSMIT

Audio amplifier
Touch controller
Operation Amplifier

Translate — ACCESS

Stepper motor driver
DC & BLDC motor driver
Industrial input / output

Move / Actuate — CREATE

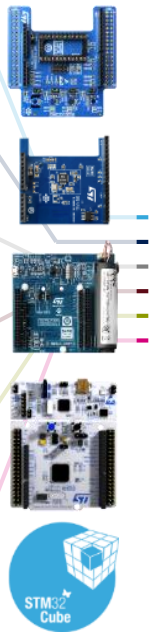
Energy management & battery

Power — POWER

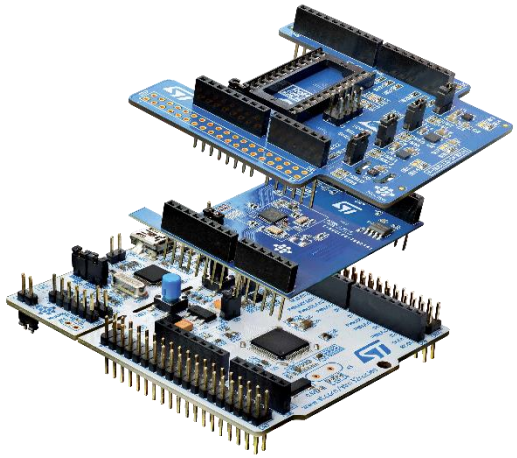
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



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