Quick Start Guide

Sub-1 GHz RF expansion board based on SPSGRF modules for STM32 Nucleo

X-NUCLEO-IDS01A4 (based on SPSGRF-868)

X-NUCLEO-IDS01A5 (based on SPSGRF-915)

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Version 1.0 (June 15, 2015)

Overview

1. Introduction to the STM32 Open Development Environment
2. STM32 Nucleo Sub-1 GHz RF expansion boards
   - Hardware overview
   - Software overview
3. Documents & related resources
4. Setup & demo examples

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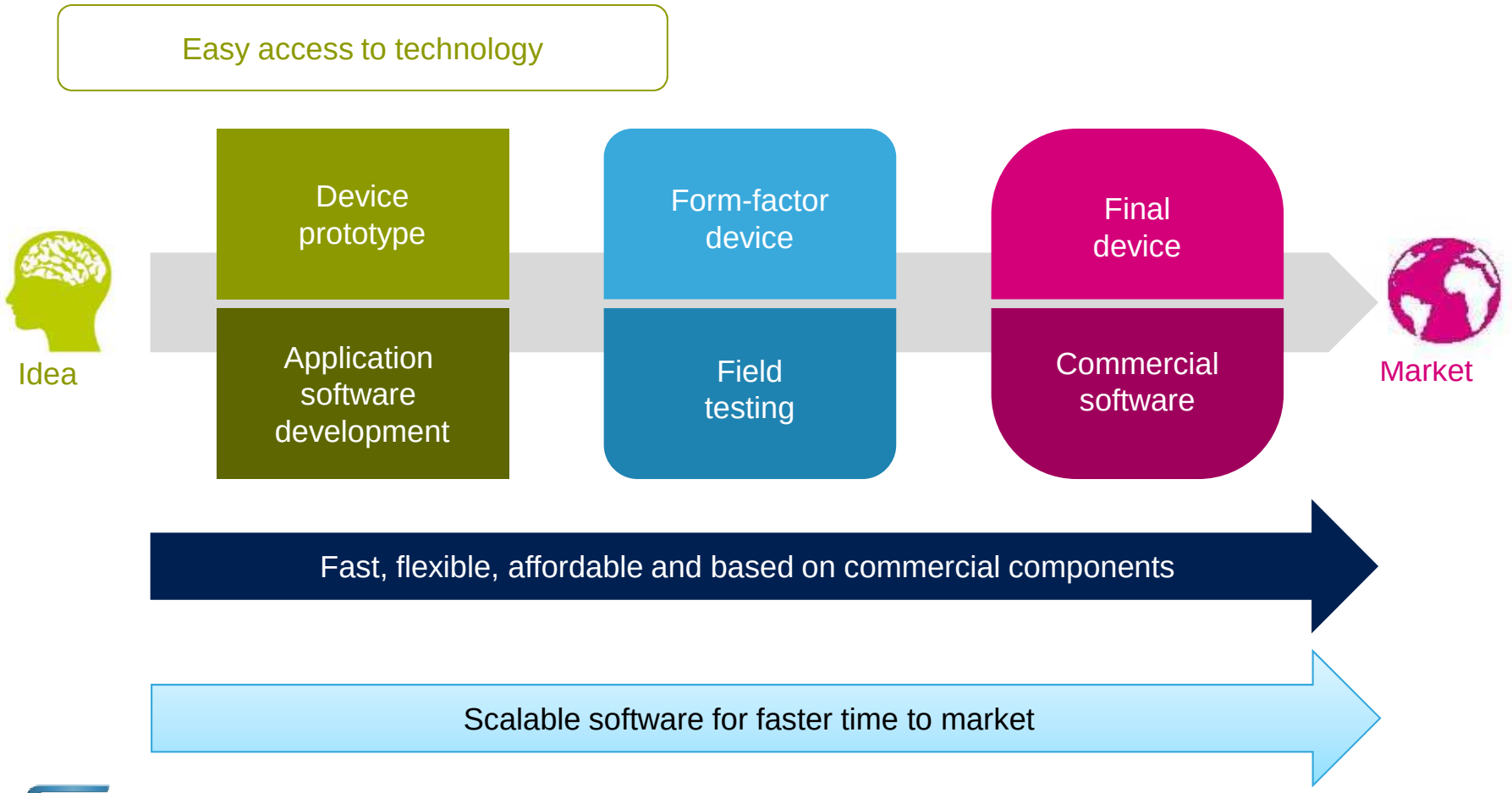
STM32 Open Development Environment

Lowering the barriers for “developers”



STM32 Open Development Environment

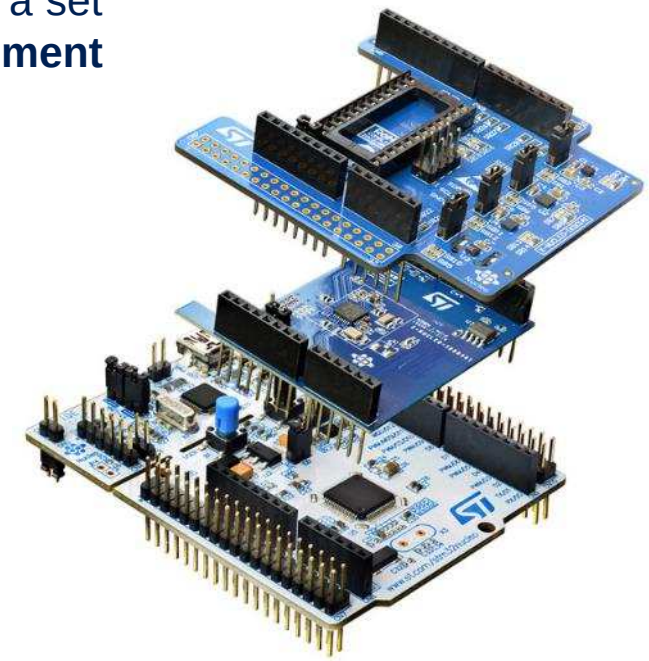
The STM32 Open Development Environment consists of a set of **modular developer boards** and a **software environment** designed around the **STM32 microcontroller** family

STM32 Nucleo development boards

STM32Cube development software

STM32 Nucleo expansion boards

STM32Cube expansion software



Compatibility with multiple development environments

STM32 Open Development Environment

Building block approach

The building blocks	Your need	Our answer

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

Sense — COLLECT

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

Connect — TRANSMIT

Audio amplifier, Touch controller, Operational amplifier

Translate — ACCESS

Stepper motor driver, DC & BLDC motor driver

Move / Actuate — CREATE

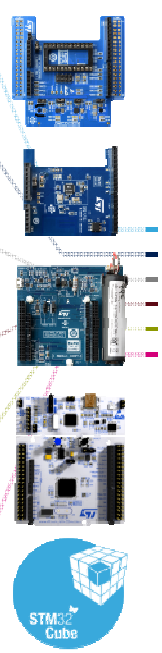
Energy management & battery

Power — POWER

General-purpose microcontrollers, Secure microcontrollers

Process — PROCESS

Software

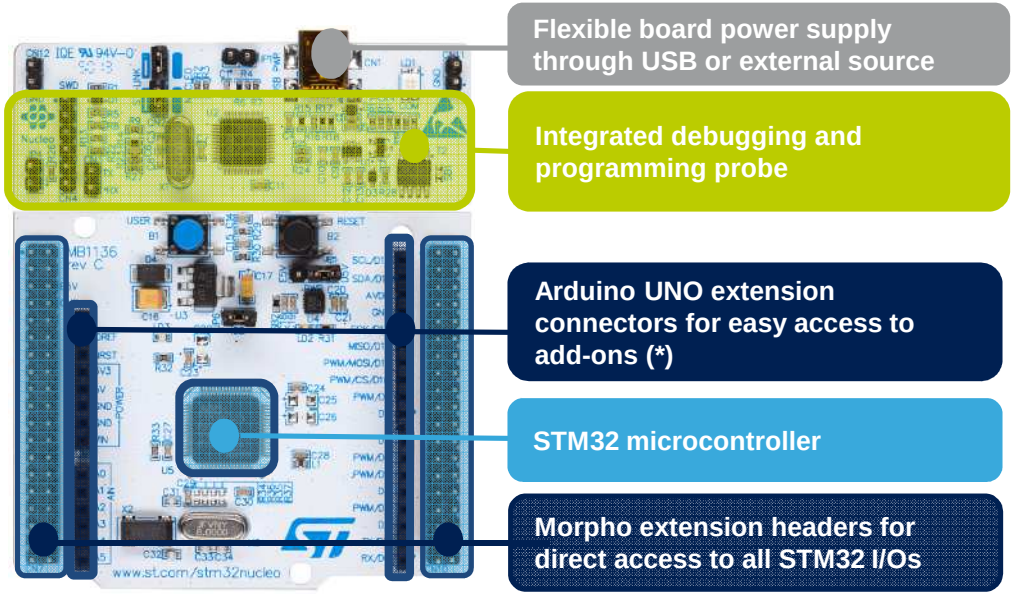


STM32 Open Development Environment

www.st.com/stm32ode

STM32 Nucleo development board

- Based on ST's 32-bit ARM Cortex-M based STM32 microprocessors
  - Development board with 1 MCU and hardware to program/debug
- Two connectors for companion chip boards
- For all STM32 families



STM32 L0 STM32 L1 STM32 F0 STM32 F1 STM32 F2 STM32 F3 STM32 F4 STM32 F7

Complete product range
from ultra-low power to high-performance

(*) Thanks to its electrical compatibility, it can be used as a shield for Arduino UNO R3 or similar.

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Sub-1 GHz RF expansion boards

Hardware overview

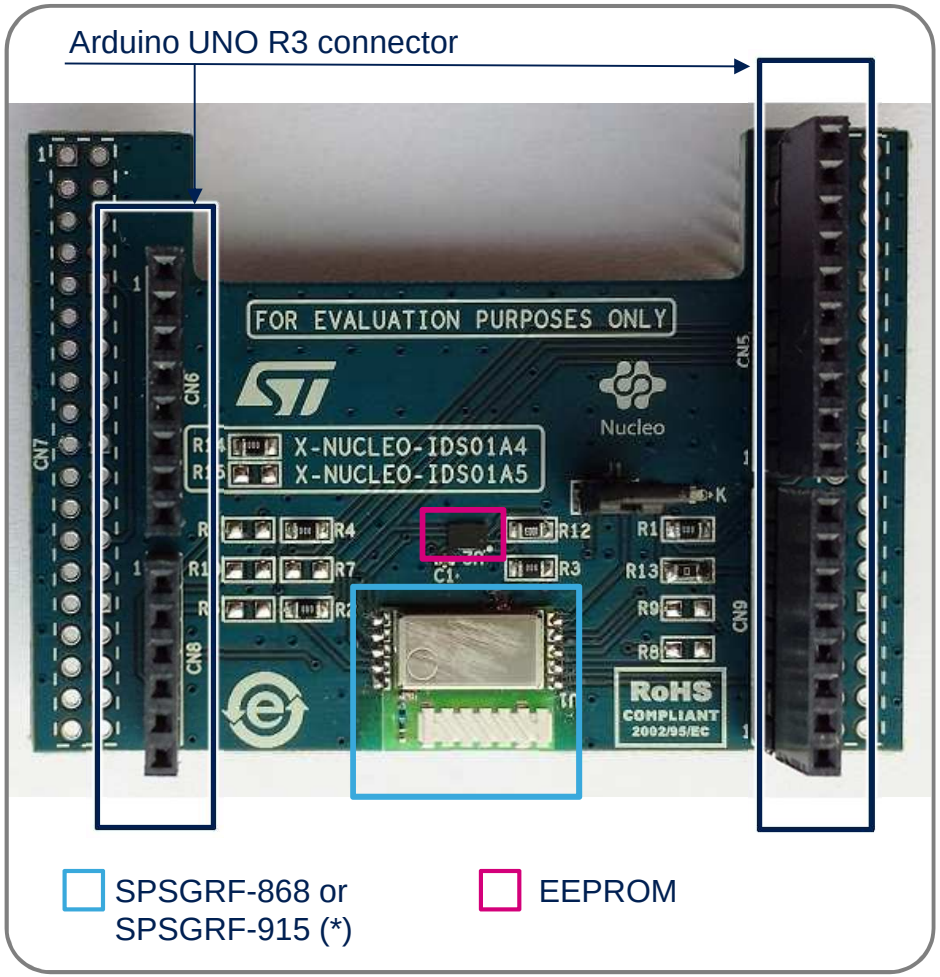
Hardware description

- The X-NUCLEO-IDS01A4, X-NUCLEO-IDS01A5 are evaluation boards based on the SPIRIT1 RF modules SPSGRF-868 and SPSGRF-915
- The SPIRIT1 module communicates with the STM32 Nucleo developer board host microcontroller though an SPI link available on the Arduino UNO R3 connector.

Key products on board

SPSGRF
SPIRIT1 (Low data-rate, low-power sub-1GHz transceiver) module

M95640-RMC6TG
64-Kbit serial SPI bus EEPROM



Latest info available at
X-NUCLEO-IDS01A4
X-NUCLEO-IDS01A5

Order code: **X-NUCLEO-IDS01A4, X-NUCLEO-IDS01A5**

(*) Identification of the operating frequency of the X-NUCLEO-IDS01Ax (x=4 or 5) is performed through two resistors (R14 and R15).

Sub-1 GHz RF expansion boards
STM32Cube expansion software

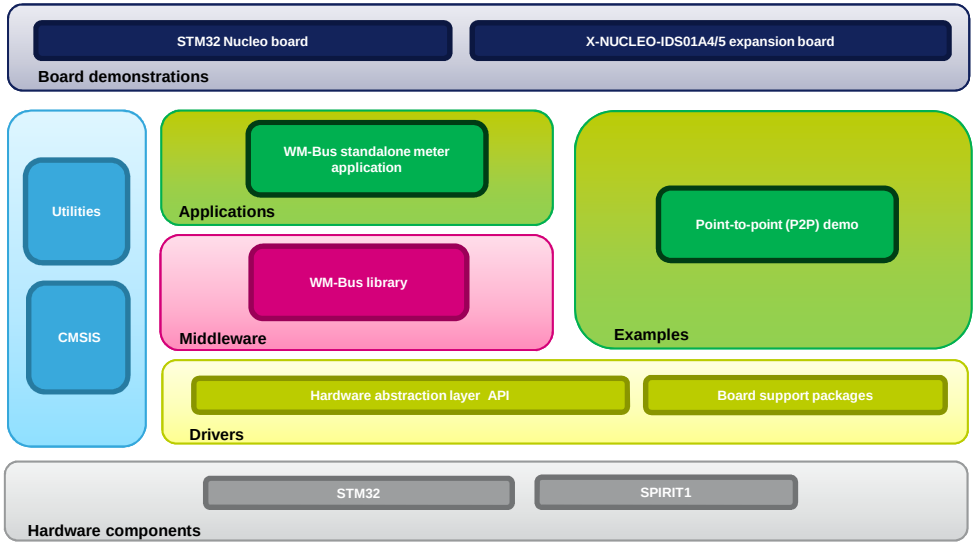
X-CUBE-SUBG1 software description

- The X-CUBE-SUBG1 is a software package that provides drivers running on the STM32 MCU for the SPIRIT1 device. It is expansion software for the STM32Cube tool that eases portability across different STM32 series
- Implementation examples are available for the Sub-1 GHz RF expansion board (X-NUCLEO-IDS01A4, X-NUCLEO-IDS01A5) plugged on top of an STM32 Nucleo board (NUCLEO-F401RE or NUCLEO-L053R8)

Key features

- Point-to-point communication firmware example to build applications using the SPIRIT1 device
- Middleware application example such as WM-Bus available for X-NUCLEO-IDS01A4 (868 MHz)
- WM-Bus physical and link library in binary format.
- Sample applications that the developer can use to start experimenting with the code
- Easy portability across different MCU families thanks to STM32Cube
- Free user-friendly license terms

Overall system architecture



Latest software available at
X-CUBE-SUBG1

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X-NUCLEO-IDS01A4
Documents & related resources

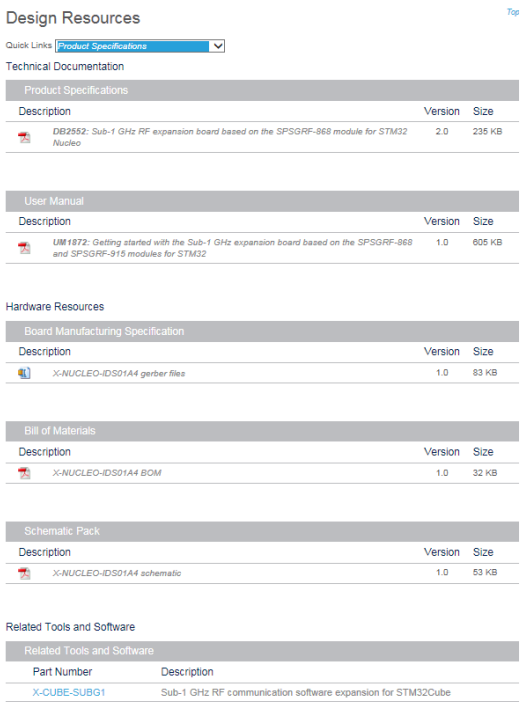
All documents are available in the Design Resources tab of the SPIRIT1 expansion board product webpage

X-NUCLEO-IDS01A4: Product webpage (**Link**)

- Gerber files, BOM, and schematics
- DB2552: Sub-1 GHz RF expansion board based on the SPSGRF-868 module for STM32 Nucleo - Databrief
- UM1872: Getting started with the Sub-1 GHz expansion board based on the SPSGRF-868 and SPSGRF-915 modules for STM32 – User manual

X-CUBE-SUBG1: Product webpage (**Link**)

- DB2556: Sub-1 GHz RF communication software expansion for STM32Cube - Databrief
- UM1892: Getting started with the X-CUBE-SUBG1 for WM-BUS communications based on Sub-1 GHz RF STM32 expansion board – User manual
- UM1904: Getting started with the software package for Point-to-Point communications using SPIRIT1 sub-1GHz modules in X-CUBE-SUBG1, Expansion for STM32Cube – User manual
- Software setup file



Design Resources

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Quick Links Product Specifications

Technical Documentation

Product Specifications

Description	Version	Size
DB2552: Sub-1 GHz RF expansion board based on the SPSGRF-868 module for STM32 Nucleo	2.0	235 KB

User Manual

Description	Version	Size
UM1872: Getting started with the Sub-1 GHz expansion board based on the SPSGRF-868 and SPSGRF-915 modules for STM32	1.0	605 KB

Hardware Resources

Board Manufacturing Specification

Description	Version	Size
X-NUCLEO-IDS01A4 gerber files	1.0	83 KB

Bill of Materials

Description	Version	Size
X-NUCLEO-IDS01A4 BOM	1.0	32 KB

Schematic Pack

Description	Version	Size
X-NUCLEO-IDS01A4 schematic	1.0	53 KB

Related Tools and Software

Related Tools and Software

Part Number	Description
X-CUBE-SUBG1	Sub-1 GHz RF communication software expansion for STM32Cube

X-NUCLEO-IDS01A5
Documents & related resources

All documents are available in the Design Resources tab of the SPIRIT1 expansion board product webpage

X-NUCLEO-IDS01A5**:** Product webpage **(Link)**

- Gerber files, BOM, Schematic
- DB2553: Sub-1 GHz RF expansion board based on the SPSGRF-915 module for STM32 Nucleo - Databrief
- UM1872: Getting started with the Sub-1 GHz expansion board based on the SPSGRF-868 and SPSGRF-915 modules for STM32 – User manual

X-CUBE-SUBG1: Product webpage **(Link)**

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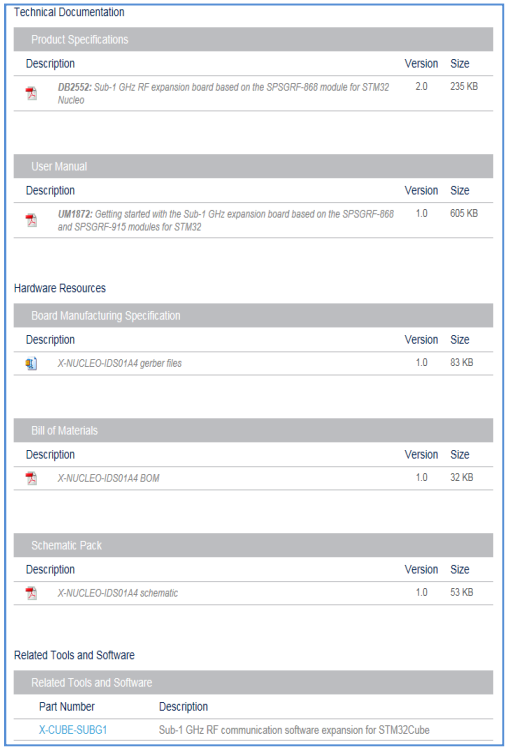
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Setup & demo examples

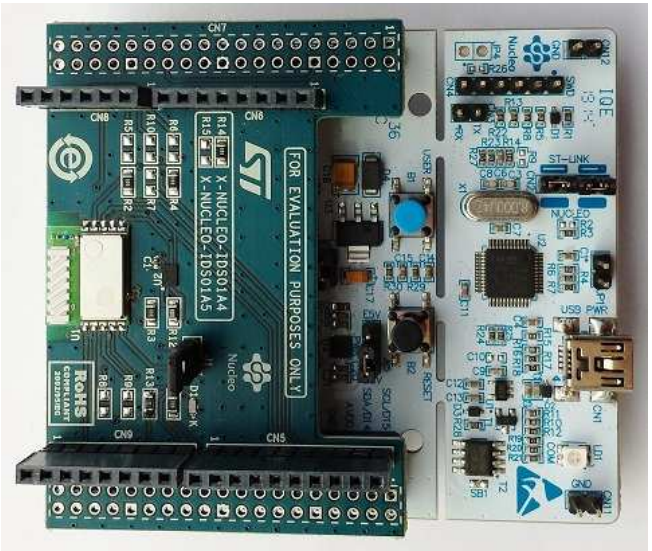
Hardware prerequisites

- STM32 Nucleo SPIRIT1 expansion board
- (X-NUCLEO-IDS01A4, X-NUCLEO-IDS01A5)

- STM32 Nucleo development board (NUCLEO-F401RE or NUCLEO-L053R8)

- For point-to-point demo: 2 sets of nodes X-NUCLEO-IDS01A4 and STM32 NUCLEO (NUCLEO-F401RE or NUCLEO-L053R8)

- Computer for running the graphical user interface of WM-Bus for testing the WM-Bus firmware example.
  - Only one set of STM32 NUCLEO board (NUCLEO-F401RE or NUCLEO-L053R8) with SPIRIT1 expansion board (X-NUCLEO-IDS01A4) required
  - For WM-Bus demo, the node acts as “meter”
  - For Concentrator, any of the STEVAL boards listed in the enclosed table can be used
  - The concentrator firmware is available in SPIRIT1 SDK STSW-CONNECT009 (Link)



Demo board	WM-Bus device type
STEVAL- IKR002V*	meter / concentrator
STEVAL- IDS001V*	concentrator
STEVAL- IKR001V*	meter / concentrator
X-NUCLEO-IDS01A4	meter

* Used as a wildcard character for related part number

Setup & demo examples

Software prerequisites

- ST-LINK/V2-1 USB driver (Link)
- ST-LINK/V2-1 firmware upgrade (Link)
- X-CUBE-SUBG1 (Link)
  - Copy the .zip file content into a folder on your PC
  - The package contains source code examples (Keil, IAR, SW4STM32) based on NUCLEO-F401RE or NUCLEO-L053R8

Sub-1 GHz RF expansion boards

Start coding in just a few minutes with X-CUBE-SUBG1

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

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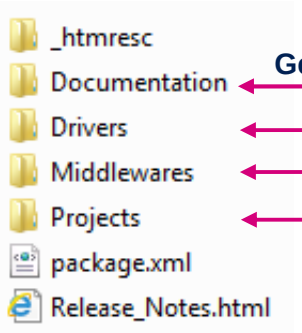
2 Select
X-NUCLEO-IDS01A4,
X-NUCLEO-IDS01A5

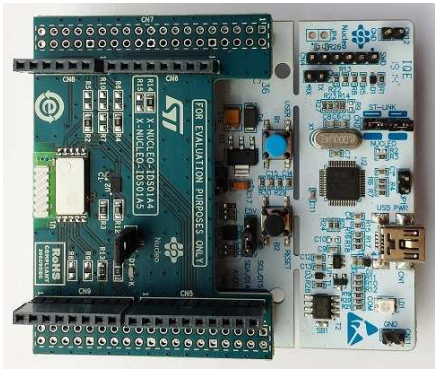
3 Download & unpack
X-CUBE-SUBG1

X-CUBE-SUBG1 package



Generic Nucleo docs & SPIRIT1 porting
SPIRIT1 SPI driver
wM-Bus middleware stack
Application examples

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



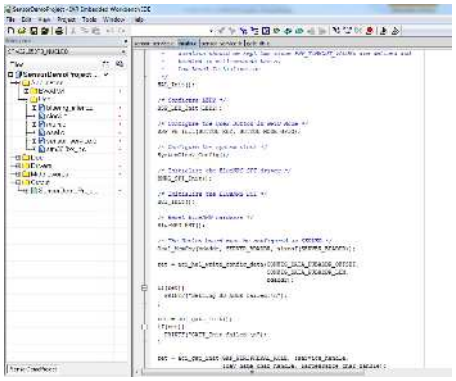
5 Open project example
P2P Demo
or
wMbusStandalone

KEIL Tools by ARM

IAR SYSTEMS

Open STM32 Tools

6 Modify and build application



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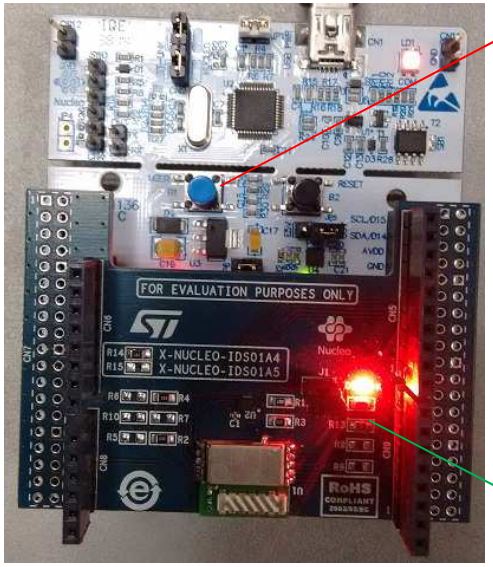
Sub-1 GHz RF expansion boards

Point-to-point demo application

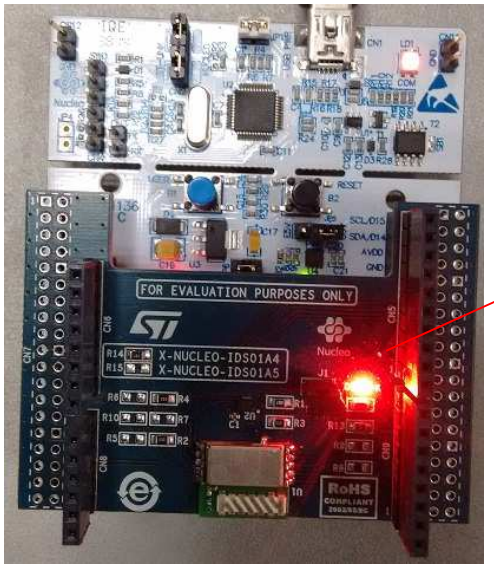


1 User presses button

2 Node sends the command to the other node

4 Acknowledgement of command

5 LED blinks when ACK received



3 LED blinks on Receiving node

Press User Switch B1 on STM32 Nucleo → LED blinks

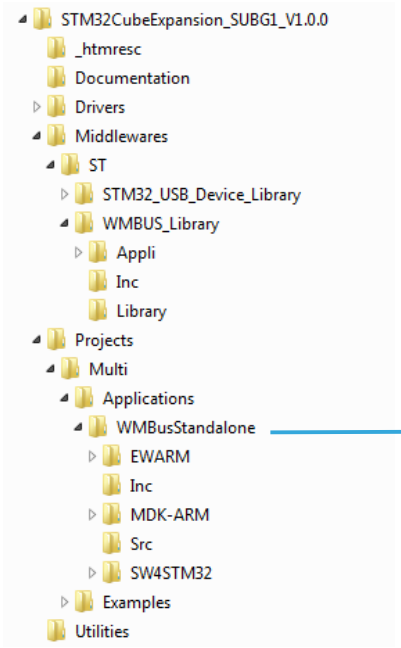
LED blinks ← ACK sent

LED blinks ← Press User Switch B1 on STM32 Nucleo

ACK sent → LED blinks

Sub-1 GHz RF expansion boards

Evaluate SPIRIT1 using a GUI



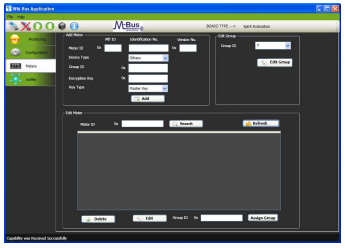
1

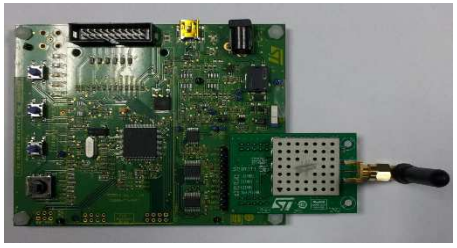
Program the WM-Bus firmware to STM32 NUCLEO equipped with X-NUCLEO-IDS01A4

2 Program the concentrator firmware on one of the boards suggested for running the concentrator firmware (see the hardware prerequisites slide)

Run the WM-Bus graphical user interface on a PC connected to STEVAL-IKR001Vx

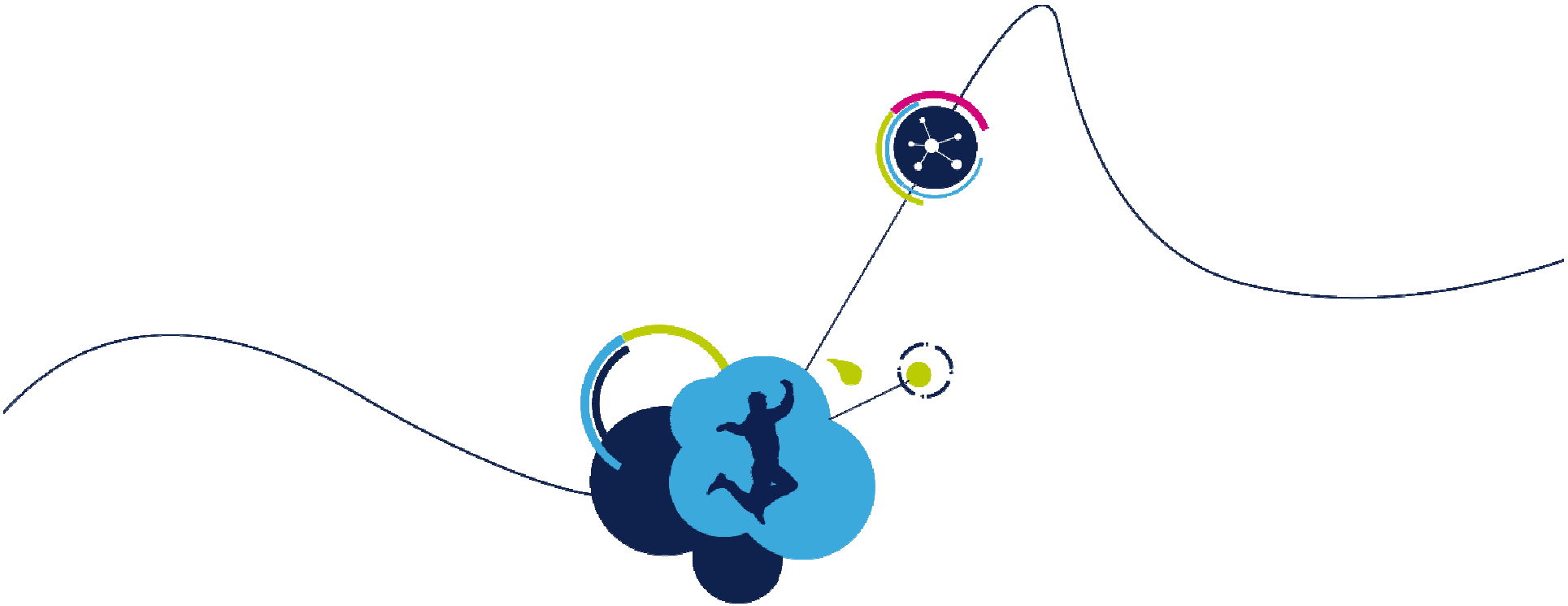
3





Concentrator

Meter



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