# I-CUBE-LRWAN

## STM32 LoRa® software expansion for STM32Cube

**Data brief**

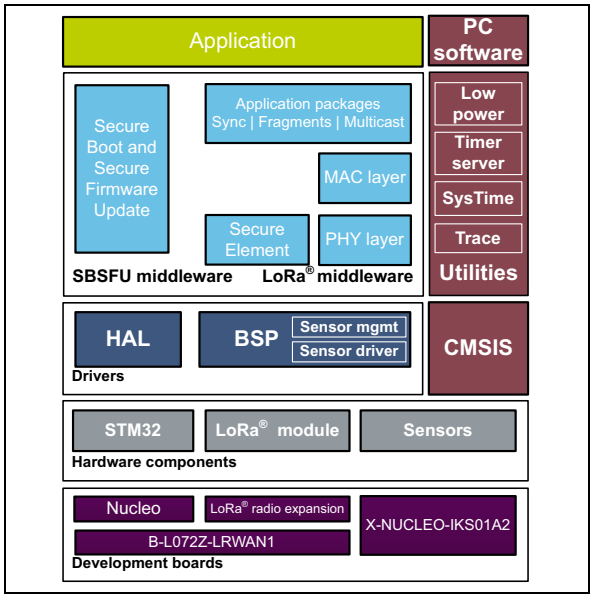
## Features

- Compliant with the LoRa Alliance® specification protocol, named LoRaWAN® version V1.0.3 March 2018
- Compliant with the LoRa Alliance TS-003-Application Layer Clock Synchronization V1.0.0
- Compliant with the LoRa Alliance TS-004-Fragmented Data Block Transport V1.0.0
- Compliant with the LoRa Alliance TS-005-Remote Multicast Setup V1.0.0
- Bidirectional end-devices with class A, class B and class C protocol support
- EU 868 MHz ISM band ETSI (European telecommunications standards institute) compliant
- EU 433 MHz ISM band ETSI compliant
- US 915 MHz ISM band FCC (federal communications commission) compliant
- End-device activation either through OTAA (over-the-air activation) or ABP (activation-by-personalization)
- End-device FUOTA class C mode application running on NUCLEO-L476 RG
- Adaptive data rate support
- LoRaWAN test application for certification tests included
- Low-power optimized
- Full STM32 portfolio compatibility
- Compliant with the CMWX1ZZABZ-091 LoRa module from Murata
- Compliant with the WM-SG-SM-42 LoRa module from USI®
- Compliant with the RHF0M003 modem from RisingHF
- Easy secure element integration

## Description

LoRa is a long-range wireless area network allowing low-power sensors to report over ranges of up to a dozen kilometers.

The I-CUBE-LRWAN Expansion Package consists of a set of libraries and application examples for STM32L0, STM32L1, and STM32L4 Series microcontrollers acting as end-devices.




This package supports the Semtech LoRa radio expansion boards SX1276MB1MAS, SX1276MB1LAS, SX1272MB2DAS and the new generation sx126x mounted on SX1262DVK1DAS, SX1262DVK1CAS and SX1262DVK1BAS.

This package includes an application running on NUCLEO-L053R8, NUCLEO-L073RZ, NUCLEO-L152RE, NUCLEO-L476RG and B-L072Z-LRWAN1 embedding the CMWX1ZZABZ-091 LoRa module (Murata).

It also supports a USI LoRaWAN technology module through the I-NUCLEO-LRWAN1 expansion board (available standalone or included in P-NUCLEO-LRWAN2) and the RisingHF modem RHF0M003 mounted on LRWAN-NS1 expansion board available in P-NUCLEO-LRWAN3. The application reads sensor data from the X-NUCLEO-IKS01A2 expansion board and sends the sensor data to the LoRa network in class A.



For further information contact your local STMicroelectronics sales office. www.st.com

# Package naming convention

The table below shows the I-CUBE-LRWAN package naming convention.

**Table 1. I-CUBE-LRWAN package naming convention**

| Package | x | y | z |
|---|---|---|---|
| I-CUBE-LRWAN package x.y.z | Major feature support:<br>x = 1: LoRa application only | Supported version of the LoRa stack:<br>y = 0:LoRa stack v1.0.1<br>y = 1:LoRa stack v1.0.2<br>y = 2:LoRa stack v1.0.3<br>y = 3:LoRa stack v1.1 | z: FW/SW changes based on a defined package (z = 0,....,9). |

# Ordering information

I-CUBE-LRWAN is available for free download from the *www.st.com* website.

# License

I-CUBE-LRWAN is delivered under the *Mix Ultimate Liberty+OSS+3rd-party V1* software license agreement (SLA0048).

The software components provided in this package come with different license schemes as shown in the table below.

For further details about licenses, refer to the license agreement of each component.

**Table 2. Software component license agreements**

| Software component | Owner | License |
|---|---|---|
| Cortex®-M CMSIS | Arm®(1) | Open source BSD<br>or<br>Apache License 2.0(2) |
| HAL STM32L0/L1/L4 | STMicroelectronics | Open source BSD |
| LoRaWAN stack | Semtech | Open source BSD |
| mbedTLS | Arm®(1) | Apache License 2.0 |
| Project examples | STMicroelectronics | Ultimate Liberty (source release) |

1. Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.
2. The license depends on the CMSIS version.

# Revision history

**Table 3. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 28-Jun-2016 | 1 | Initial release. |
| 29-Aug-2016 | 2 | Updated *Features*:<br>– Updated compliance of LoRaWAN version from V1.0 January 2015 to V1.0.1 February 2016<br>– Specified “V1.0” for class A certification. |
| 10-Nov-2016 | 3 | Updated *Features*. |
| 22-Dec-2016 | 4 | Updated *Features* and reference to the CMWX1ZZABZ-xxx LoRa module from Murata |
| 7-Feb-2017 | 5 | Updated *Features* and reference to the CMWX1ZZABZ-091 LoRa module from Murata |
| 16-Mar-2017 | 6 | Updated *Features* and *Description* to introduce support of the USI LoRaWAN technology module |
| 14-Dec-2017 | 7 | Updated *Features* and *Description* to introduce support of the RISINGHF modem RHF0M003 |
| 4-Jul-2018 | 8 | Updated *Features*, *Description* and diagram for new version with class B protocol, secure element and new expansion boards |
| 9-Jul-2019 | 9 | Updated *Features*, *Description* and *License* |
| 4-Nov-2019 | 10 | Updated diagram, *Features* with three LoRa Alliance compliances and FUOTA application, and *Table 2* with mbedTLS software component |

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