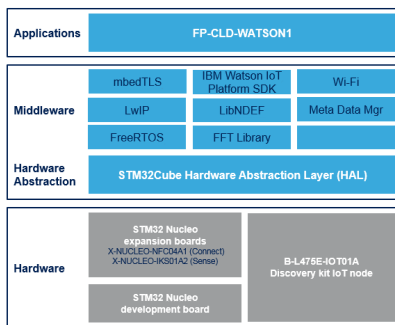


## STM32Cube function pack for IoT node with Wi-Fi, NFC and sensors for vibration analysis, connected to IBM Watson IoT Cloud



### Features

- Complete middleware to build applications based on Wi-Fi/Ethernet connectivity, inertial and environmental sensors, and to connect an STM32 Nucleo-144 development board with [STM32F429ZI](#) MCU, or an STM32L4 Discovery kit IoT node ([B-L475E-IOT01A](#)) to IBM Watson IoT Cloud
- Software interface to access temperature and humidity sensor ([HTS221](#)), pressure sensor ([LPS25HB](#)), motion sensors ([LIS3MDL](#), [LSM303AGR](#), [LSM6DSL](#)) and to write and read the RFID/NFC tag ([ST25DV04K](#))
- Integrated mbedTLS and MQTT protocol middleware
- Integrated Fast Fourier Transform (FFT) algorithm for vibration analysis
- Sample implementation based on Wi-Fi connectivity available for STM32L4 Discovery kit IoT node ([B-L475E-IOT01A](#)), based on Ethernet connectivity available for [X-NUCLEO-IKS01A2](#), and [X-NUCLEO-NFC04A1](#), when both connected to a [NUCLEO-F429ZI](#)
- Easy access to IBM Watson IoT Cloud services for sensor data visualization and processing (refer to <http://www.ibm.com/internet-of-things/trial/> for details on license terms)
- Easy portability across different MCU families, thanks to [STM32Cube](#)
- Free, user-friendly license terms

### Description

**FP-CLD-WATSON1** is an [STM32Cube](#) function pack. It can connect an IoT node based on the STM32L4 Discovery kit IoT node ([B-L475E-IOT01A](#)) or the [NUCLEO-F429ZI](#) to IBM Watson IoT, transmit sensor data and receive commands from remote applications.

This package lets you jump-start end-to-end IoT development so that you can focus on adding desired functions.

The software includes a middleware package implementing the MQTT protocol to facilitate interaction between the featured boards and Cloud services.

The package is further extended with pre-integrated algorithms for the processing of accelerometer data which can be used to detect vibration from devices such as motors, fans and pumps. Maximum frequencies and tear/wear conditions of the device under test are reported together with raw sensor data to IBM Watson IoT thus enabling and speeding up development of solutions for industrial condition monitoring and predictive maintenance.

IBM Watson IoT parameter configuration is greatly simplified thanks to the use of NFC. The software runs on the STM32 microcontroller and includes drivers for the featured sensor devices and dynamic NFC/RFID tag.

Product summary	
STM32 ODE function pack for IoT node with Wi-Fi, NFC and sensors for vibration analysis, connected to IBM Watson IoT Cloud	<a href="#">FP-CLD-WATSON1</a>
Motion MEMS and environmental sensor expansion board	<a href="#">X-NUCLEO-IKS01A2</a>
Dynamic NFC/RFID tag IC expansion board	<a href="#">X-NUCLEO-NFC04A1</a>
Dynamic NFC/RFID tag NFC with I <sup>2</sup> C interface	<a href="#">ST25DV04K</a>
STM32L4 Discovery kit IoT node	<a href="#">B-L475E-IOT01A</a>

## 1 Detailed description

### 1.1 What can you do with STM32Cube function packs?

The [STM32Cube](#) function packs leverage the modularity and interoperability of STM32 Nucleo and X-NUCLEO boards, and STM32Cube and X-CUBE software, to create function examples, embodying some of the most common use cases, for each application area.

These software function packs are designed to exploit as much as possible the underlying [STM32 ODE](#) hardware and software components to best fit the requirements of final users' applications.

Moreover, function packs may include additional libraries and frameworks which do not present the original X-CUBE packages, thus enabling new functionalities and creating a real and usable system for developers.

### 1.2 What is STM32Cube?

STM32Cube™ is designed by STMicroelectronics to reduce development effort, time and cost across the entire STM32 portfolio.

STM32Cube version 1.x includes:

- STM32CubeMX, a graphical software configuration tool that allows the generation of C initialization code using graphical wizards.
- A comprehensive embedded software platform specific to each series (such as the STM32Cube for the STM32 series), which includes:
  - the STM32Cube HAL embedded abstraction-layer software, ensuring maximized portability across the STM32 portfolio
  - a consistent set of middleware components such as RTOS, USB, TCP/IP and graphics
  - all embedded software utilities with a full set of examples

#### 1.2.1 How does this STM32Cube function pack complement STM32Cube?

The proposed software is based on the STM32CubeHAL, the hardware abstraction layer for the STM32 microcontroller. The package extends [STM32Cube](#) by providing a board support package (BSP) for the NFC and sensor expansion boards. The drivers abstract low-level details of the hardware and allow the middleware components and applications to access sensor data in a hardware-independent manner and to read/write information from/to NFC/RFID tag.

The package also includes middleware components implementing application level network protocol (MQ Telemetry Transport, MQTT) for communication with Cloud services and vibration analysis algorithms.

A sample application to experiment connectivity with IBM Watson IoT is provided on top of the middleware stacks. Developers can use it to prototype end-to-end IoT applications, by registering the STM32 Nucleo based development kit in IBM Watson IoT and start transmitting real-time sensor data and vibration analysis results. Vibration analysis application is only available when the [X-NUCLEO-IKS01A2](#) is used.

Thanks to NFC dynamic tag, users can configure Wi-Fi access point and IBM Watson IoT credentials via an NFC enabled mobile phone, as well as use it to open the IBM Quickstart web page for rapid sensor data visualization.

## Revision history

**Table 1. Document revision history**

Date	Version	Changes
19-Dec-2016	1	Initial release.
02-Jul-2018	2	Updated cover page image, features and description.

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