Quick Start Guide
STM32Cube function pack for IoT sensor node with telemetry and device management applications for Microsoft Azure cloud (FP-CLD-AZURE1)

Version 5.2 (March 08, 2021)
Agenda

1. Hardware and Software overview
2. Setup & Demo Examples
3. Documents & Related Resources
4. STM32 Open Development Environment: Overview
1- Hardware and Software overview
STM32L4 Discovery Board for IoT node Hardware Description

The STM32L4 Discovery kit for the IoT node (B-L475E-IOT01A) allows users to develop applications with direct connection to cloud servers. The STM32L4 Discovery kit enables a wide diversity of applications by exploiting low-power multilink communication (BLE, Sub-GHz), multiway sensing (detection, environmental awareness) and ARM® Cortex®-M4 core-based STM32L4 Series features. Arduino™ Uno V3 and PMOD connectivity provide unlimited expansion capabilities with a large choice of specialized add-on boards.

Key Product on board

- Ultra-low-power STM32L4 Series MCUs based on ARM® Cortex®-M4 core with 1 Mbyte of Flash memory and 128 Kbytes of SRAM, in LQFP100 package
- Bluetooth® V4.1 module (SPBTLE-RF)
- Sub-GHz (868 or 915 MHz) low-power-programmable RF module (SPSGRF-868 or SPSGRF-915)
- Wi-Fi® module Inventek ISM43362-M3G-L44 (802.11 b/g/n compliant)
- Dynamic NFC tag based on M24SR with its printed NFC antenna
- 2 digital omnidirectional microphones (MP34DT01)
- Capacitive digital sensor for relative humidity and temperature (HTS221)
- High-performance 3-axis magnetometer (LIS3MDL), 3D accelerometer and 3D gyroscope (LSM6DSL), 260-1260 hPa absolute digital output barometer (LPS22HB), Time-of-Flight and gesture-detection sensor (VL53L0X)
- USB OTG FS with Micro-AB connector
- Expansion connectors: Arduino™ Uno V3, PMOD
- Flexible power-supply options: ST LINK USB VBUS or external sources
- On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, virtual COM port and debug port

Latest info available at www.st.com B-L475E-IOT01A
STWIN SensorTile Wireless Industrial Node development kit (STEVAL-STWINKT1)

Hardware Overview

The STWIN SensorTile wireless industrial node (STEVAL-STWINKT1) is a development kit and reference design that simplifies prototyping and testing of advanced industrial IoT applications such as condition monitoring and predictive maintenance. The kit supports BLE wireless connectivity through an on-board module, and Wi-Fi connectivity through a special plugin expansion board (STEVAL-STWINWFV1).

Key Product on board

- Multi-sensing wireless platform implementing vibration monitoring and ultrasound detection
- Built around STWIN core system board with processing, sensing, connectivity and expansion capabilities
- Micro SD Card slot for standalone data logging applications
- Wireless BLE4.2 (on-board) and Wi-Fi (with STEVAL-STWINWFV1 expansion board), and wired RS485 and USB OTG connectivity
- Option to implement Authentication and Brand protection secure solution with STSAFE-A110 (footprint)
- Wide range of industrial IoT sensors: ultra-wide bandwidth (up to 6 kHz), low-noise, 3-axis digital vibration sensor (IIS3DWB), 3D accelerometer + 3D Gyro iNEMO inertial measurement unit (ISM330DHCX) with machine learning core, ultra-low-power high performance MEMS motion sensor (IIS2DH), 3-axis magnetometer (IIS2MDC), digital absolute pressure sensor (LPS22HH), relative humidity and temperature sensor (HTS221) and low-voltage digital local temperature sensor (STTS751)
- Industrial grade digital MEMS microphone (IMP34DT05) and wideband analog MEMS microphone (MP23ABS1)
- Modular architecture, expandable via on-board connectors: STMOD+ and 40-pin flex general purpose expansions, 12-pin male plug for connectivity expansions and 12-pin female plug for sensing expansions
- Other kit components: Li-Po battery 480 mAh, STLINK-V3MINI debugger with programming cable and Plastic box

Latest info available at www.st.com
STEVAL-STWINKT1
FP-CLD-AZURE1 Software Description

FP-CLD-AZURE1 is an STM32Cube Function Pack. Thanks to this package you can directly connect your IoT sensor node to the Microsoft Azure IoT, transmit sensor data, and receive commands from Cloud applications.

Key features

• Complete firmware to safely connect an IoT node with sensors and actuators to Microsoft Azure IoT using Wi-Fi communication technology. One sample application for data telemetry/device management that can be connected to «Azure IoT Central PnP» (https://apps.azureiotcentral.com)

• Capability to setup Wi-Fi SSD/Passwd using UART console or Bluetooth with ST BLE Sensors application for Android/iOS (Version >4.7.1)

• Middleware libraries featuring the Microsoft Azure IoT software development kit, transport-level security (mbedTLS), and metadata management

• Ready-to-use binaries to connect the IoT node «Azure IoT Central PnP» (https://apps.azureiotcentral.com) for sensor data visualization, actuator control, and device management (FOTA)

• Sample implementations available for STM32L4 Discovery Kit for IoT node (B-L475E-IOT01A) and on STWIN SensorTile Wireless Industrial Node development kit (STEVAL-STWINKT1)

• Easy portability across different MCU families, thanks to STM32Cube

• Free, user-friendly license terms

• STM32 Nucleo is Microsoft Azure certified for IoT (for more information on Microsoft Azure Certification please visit http://azure.com/certifiedforiot)
2- Setup & Demo Examples
Setup & Application Examples

HW prerequisites for B-L475E-IOT01A

- 1x B-L475E-IOT01A development board
- Laptop/PC with Windows 7, 8 or 10
- 1 x microUSB cable
- Wi-Fi Router or access to a Wi-Fi network
- (optional) Android/iOS smartphone with ST BLE Sensor application (Version > 4.7.1)
Setup & Application Examples

HW prerequisites for STEVAL-STWINKT1

- 1x STEVAL-STWINKT1 development board
- Laptop/PC with Windows 7, 8 or 10
- 2 x microUSB cables
- STEVAL-STWINWFV1
- Wi-Fi Router or access to a Wi-Fi network
- (optional) Android/iOS smartphone with ST BLE Sensor application (Version > 4.7.1)
Setup & Application Examples
Software and Other prerequisites

- **STM32 ST-Link Utility**
  - Download and install STSW-LINK004 from www.st.com

- **FP-CLD-AZURE1**
  - Download the FP-CLD-AZURE1 package from www.st.com, copy the .zip file contents into a folder on your PC. The package contains binaries and source code with project files (Keil, IAR, STM32CubeIDE) based on B-L475E-IOT01A/STEVAL-STWINKT1.

- **Serial line monitor**, e.g. TeraTerm (https://ttssh2.osdn.jp/)

- To test FP-CLD-AZURE1 with IoT Central PnP, in order to use the application template, copy this link to your web browser: https://apps.azureiotcentral.com/build/new/9aee24e1-6f99-4123-9d7d-9d50d19302b2
  Then create your application starting from this application template.
FP-CLD-AZURE1. Sample applications
Start coding in just a few minutes

1. www.st.com/stm32ode
2. Select Function Pack: FP-CLD-AZURE1
3. Download & unpack

6. Visualize log of sensors data and control the device

4. Use the pre-compiled binaries for registering your devices

5. Microsoft Azure Client sample applications

FP-CLD-AZURE1 package structure
- Docs
- BSP, HAL drivers
- Azure IoT SDK, mbedTLS
- BootLoader

BSP, HAL drivers
Azure IoT SDK, mbedTLS
Microsoft Azure Client sample applications
BootLoader
2.1- Test FP-CLD-AZURE1 with IoT Central PnP
FP-CLD-AZURE1. Step by step setup
Launch sample application. Configure Serial Terminal

• Open a serial terminal and then configure the baud rate speed to 115200 (Setup → Serial port in TeraTerm) and set the transmit delay:
FP-CLD-AZURE1. Step by step setup
Launch sample application. Use pre-compiled binary

• The pre-compiled binary are in AzurePnP\Binary folder (Example STEVAL-STWINKT1):
  • Projects\STWINCSV1\Applications\AzurePnP\Binary\Azure1_BL.bin (Program + BootLoader)
  • Projects\STWINCSV1\Applications\AzurePnP\Binary\Azure1.bin (Use Only for FOTA)

• To start the application:
  • Connect your board to your PC
  • Using Explorer, drag the binary to the board’s USB storage
FP-CLD-AZURE1. Step by step setup
Create one IoT Central PnP application

• Go to the following URL using your web browser:
  https://apps.azureiotcentral.com/build/new/9aee24e1-6f99-4123-9d7d-9d50d19302b2

• Select the application name

• Select the “Pricing plan”
FP-CLD-AZURE1. Step by step setup

Create one device

1. Devices
2. Select device template which matches your board
3. Add one Device
FP-CLD-AZURE1. Step by step setup
Retrieve Device Connection informations

1. Click on Connect
2. Take the:
   - ID Scope
   - Device ID
   - Primary key
• Open a serial terminal to visualize the log of messages
• Default values for Wi-Fi SSID and PWD can be modified by pressing the USER (blue) button within 3 seconds of boot:
  • pressing the button 1 time, the firmware will ask to add the credentials using the serial port
    • Press y for changing the Wi-Fi credentials
    • Then enter SSID, PWD and Encryption mode when requested
  • pressing the button 2 times, the firmware will start the Bluetooth and it will wait the Wi-Fi credentials from ST BLE sensors Android/iOS application
• This data will be saved in flash
After the Wi-Fi configuration, the board will ask you to add:

1) The **“ID scope”**
   (as shown in the previous slides)
   - Answer NO to the next question on Automatic Group enrollment Configured

2) The **“Device ID”**
   (as shown in the previous slides)

3) The **“Primary Key”**
   (as shown in the previous slide)
   - This data will be saved in flash
FP-CLD-AZURE1. Step by step setup
Visualize sensors data and control the board
3- Documents & Related Resources
FP-CLD-AZURE1:
- **DB2891**: STM32Cube function pack for wireless sensor node connected to Microsoft Azure Cloud – databrief
- **UM2043**: Getting started with the FP-CLD-AZURE1 software B-L475E-IOT01A/STEVAL-STWINKT1 node with Wi-Fi and sensors connected to Microsoft Azure cloud – user manual
- **Software setup file**

STEVAL-STWINKT1:
- **Gerber files, BOM, Schematic**
- **DB3969**: STWIN SensorTile Wireless Industrial Node development kit and reference design for industrial IoT applications – databrief
- **UM2622**: How to use the STEVAL-STWINKT1 SensorTile Wireless Industrial Node for condition monitoring and predictive maintenance applications – user manual

STEVAL-STWINWFV1:
- **Gerber files, BOM, Schematic**
- **DB3971**: Wi-Fi expansion for the SensorTile Wireless Industrial Node (STWIN) kit - databrief

B-L475E-IOT01A:
- **Gerber files, BOM, Schematic**
- **DB3143**: Discovery kit for IoT node, multi-channel communication with STM32L4 – databrief
- **UM2153**: Discovery kit for IoT node, multi-channel communication with STM32L4 – user manual
- **UM2052**: Getting started with STM32 MCU Discovery Kits software development tools – user manual

Consult www.st.com for the complete list
4- STM32 Open Development Environment: Overview
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](http://www.st.com/stm32ode)
Thank you