High speed data logging and other firmware examples for STEVAL-STWINKT1 evaluation kit for Industry 4.0

Features

- Set of firmware examples that show how to implement basic functions on the STWIN (STEVAL-STWINKT1) kit:
  - Sensor data streaming example via USB terminal (VCP)
  - Analog and digital microphone signal acquisition and streaming via USB
  - Wi-Fi network functionality using the connectivity framework (with Wi-Fi expansion board)
  - Sensor data streaming via BLE
  - High speed sensor data logger to SD card or via USB
  - Microphone array audio acquisition example (with microphone expansion board)
  - Ultrasound FFT analysis demonstration
  - Source code freely available from the ST website with developer-friendly license terms

- Embedded software, middleware and drivers:
  - FatFS third party FAT file system module for small embedded systems
  - FreeRTOS third party RTOS kernel for embedded devices
  - STWIN Low-Level BSP drivers

- Based on STM32Cube software development environment for STM32 microcontrollers

Description

The STSW-STWINKT01 firmware package for the SensorTile Wireless Industrial Node (STWIN) development kit provides sample projects that you can use to develop custom predictive maintenance, smart industry, IoT and remote monitoring applications. The package is based on our STM32Cube software technology, and includes all the low level drivers to manage the on-board devices and system-level interfaces.

The package features two projects that demonstrate data logging functionality. One involves streaming data via the USB Virtual COM Port class, which you can subsequently display directly on a PC terminal, and the other is for high speed data storage at maximum sensor sampling rates. In the second case, sensor data can be either stored on micro SD card or can be streamed via USB (WinUSB class).

There are also three projects regarding audio. The OnboardMics application streams audio signals from both the on-board analog and digital microphones via USB, so you can record and process them on a host PC. The MicArrayCoupon application instead requires the STEVAL-STWINMAV1 microphone array expansion board (not included in the kit), from which the application can simultaneously acquire up to four external microphone audio signals through a USB interface.

The UltrasoundFFT example calculates the FFT of the on-board analog microphone signal and streams the result to a PC GUI via USB. The microphone sampling rate is set by default to 192 kHz whereas the microphone bandwidth is up to 80 kHz.
Other two projects demonstrate wireless connectivity using Bluetooth and Wi-Fi. The Bluetooth project allows you to stream environmental sensor data via the Bluetooth Low Energy (BLE) protocol, and is compatible with our freely available ST BLE Sensor app on Android and iOS stores, so you can read and manipulate the data from your mobile device. The Wi-Fi project requires the STEVAL-STWINWFV1 Wi-Fi expansion board (not included in the kit) to implement basic network functionality including pinging a remote station, connecting to a TLS secure server, sending data to an echo server and verifying returned data, and running a server that a remote client can connect to.
1 System overview

The STSW-STWINKT01 firmware is designed to drive the STEVAL-STWINKT1 SensorTile Wireless Industrial Node Development Kit hardware with many of the features and functions underlying wireless predictive maintenance and condition monitoring technologies.

**Figure 1. STSW-STWINKT01 block diagram**

The kit features a battery-powered core system board with ultra-low power STM32L4R9ZI6 MCU that receives data reflecting the operating conditions of industrial machinery from a range of advanced ST environmental and motion sensors, including the state-of-the-art ISM330DHCX inertial measurement unit with machine learning capability.

The firmware contains an STM32Cube HAL for standard device interfacing and middleware libraries for security, wired and wireless communication, file system and operating system functionality. The software package comes complete with sample sensor data manipulation and streaming applications to help you understand the fundamental working mechanisms of the libraries so you can build on them with your own application functionality.

**RELATED LINKS**

Visit the ST Condition Monitoring / Predictive Maintenance application page for more information on relevant ST applications and solutions.
Revision history

Table 1. Document revision history

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<tr>
<th>Date</th>
<th>Version</th>
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<tr>
<td>18-Jul-2019</td>
<td>1</td>
<td>Initial release.</td>
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<tr>
<td>14-Nov-2019</td>
<td>2</td>
<td>Updated cover page product summary table, features and description.</td>
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<tr>
<td>10-Feb-2020</td>
<td>3</td>
<td>Added UltrasoundFFT application and STM32 Connect Library middleware references.</td>
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<tr>
<td>30-Mar-2020</td>
<td>4</td>
<td>Updated title.</td>
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