# BLE Running Speed and Cadence Profile Example Project

1.0

## Features

- BLE Running Speed and Cadence Service GATT Server (Sensor) role operation in GAP Peripheral role
- Support “Running” and “Walking” profiles
- DeepSleep mode support
- Reporting the workflow status through UART
- LED status indication

## General Description

This example project demonstrates the Running Speed and Cadence Sensor operation of the BLE PSoC Creator Component. The device simulates running/walking data measurements and sends it over the BLE Running Speed and Cadence Service.

## Development Kit Configuration

Configure your device as follows:

- The UART RX pin is connected to port 1 pin 4.
- The UART TX pin is connected to port 1 pin 5.
- A mechanical button (port 2 pin 7) is used to wake up the device and start re-advertising.
- The red LED (port 2 pin 6) is used to indicate the BLE disconnection state.
- The green LED (port 3 pin 6) is used to indicate the advertising state.
- The blue LED (port 3 pin 7) is used to indicate “Running” or “Walking” profile.

## Project Configuration

The top design schematic is shown in **Figure 1**.

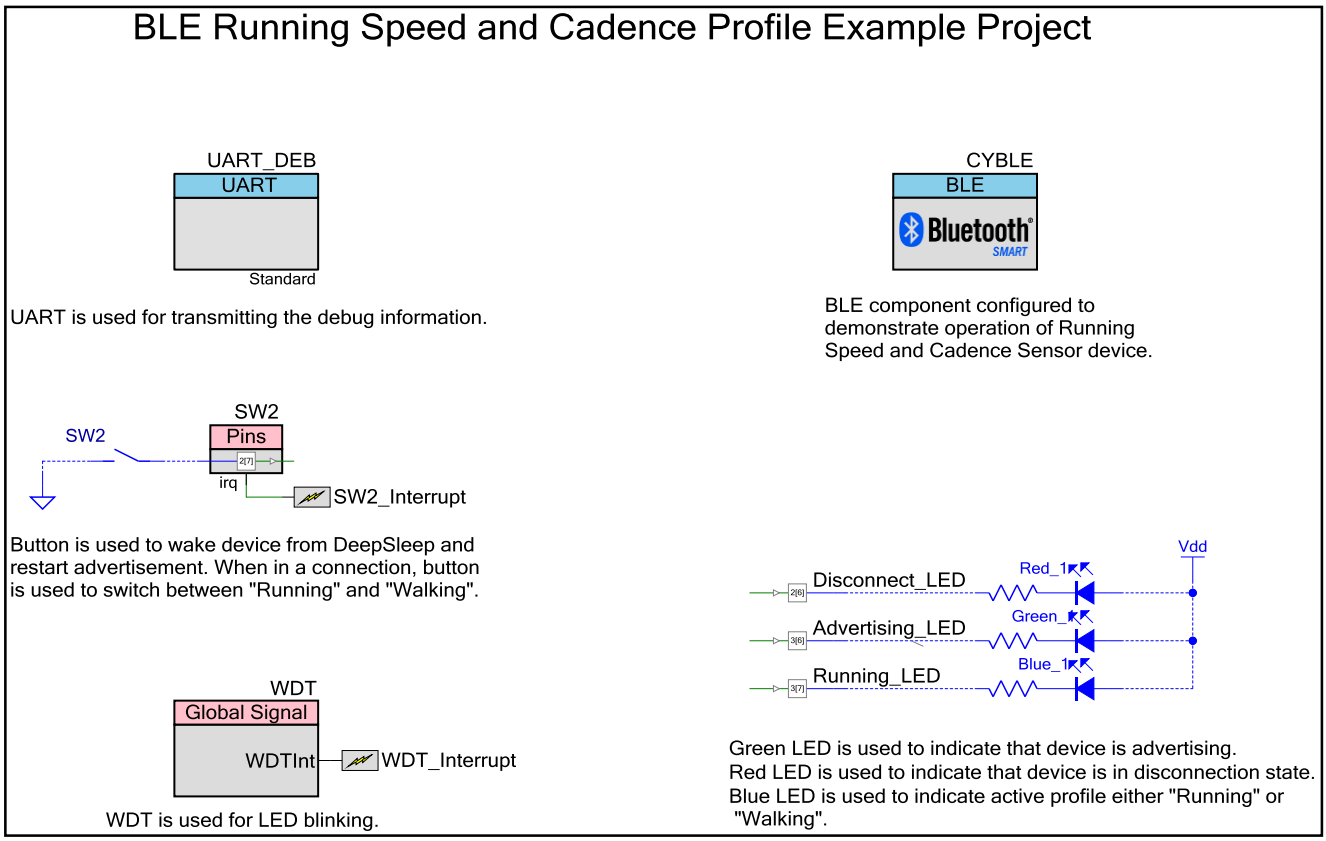


Figure 1. Top design schematic

The BLE (CYBLE) component is configured as Running Speed and Cadence Sensor in the GAP Peripheral role.

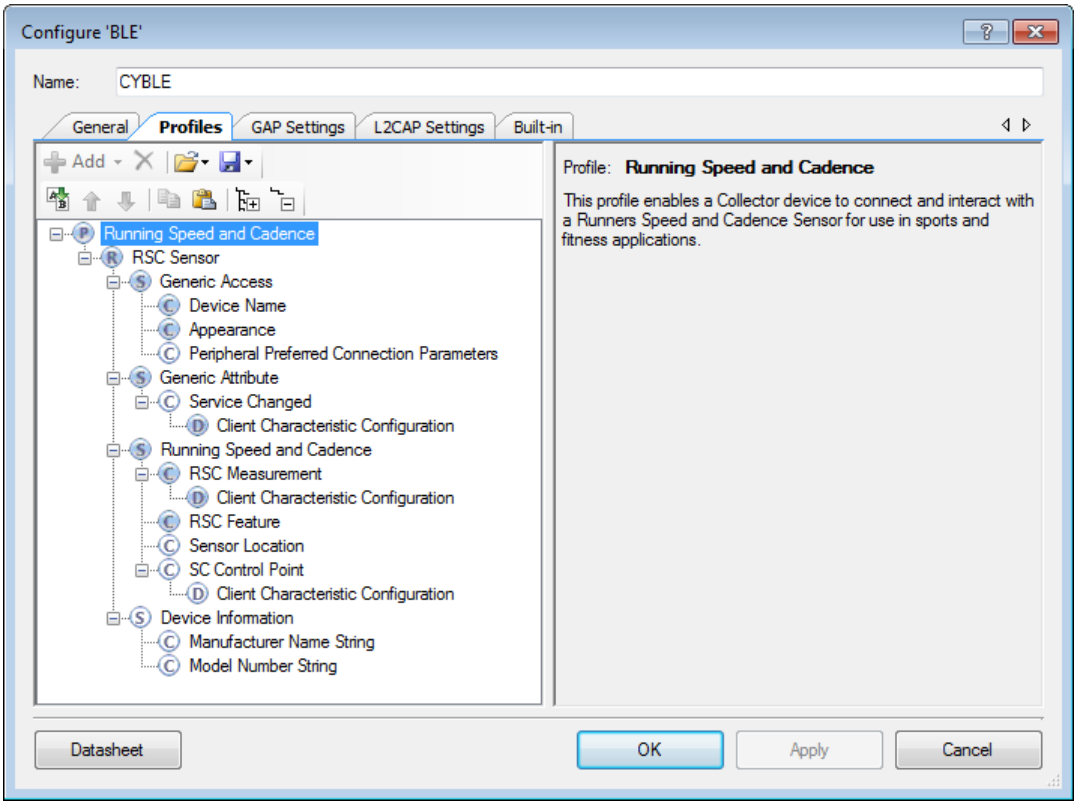


Figure 2. GATT settings

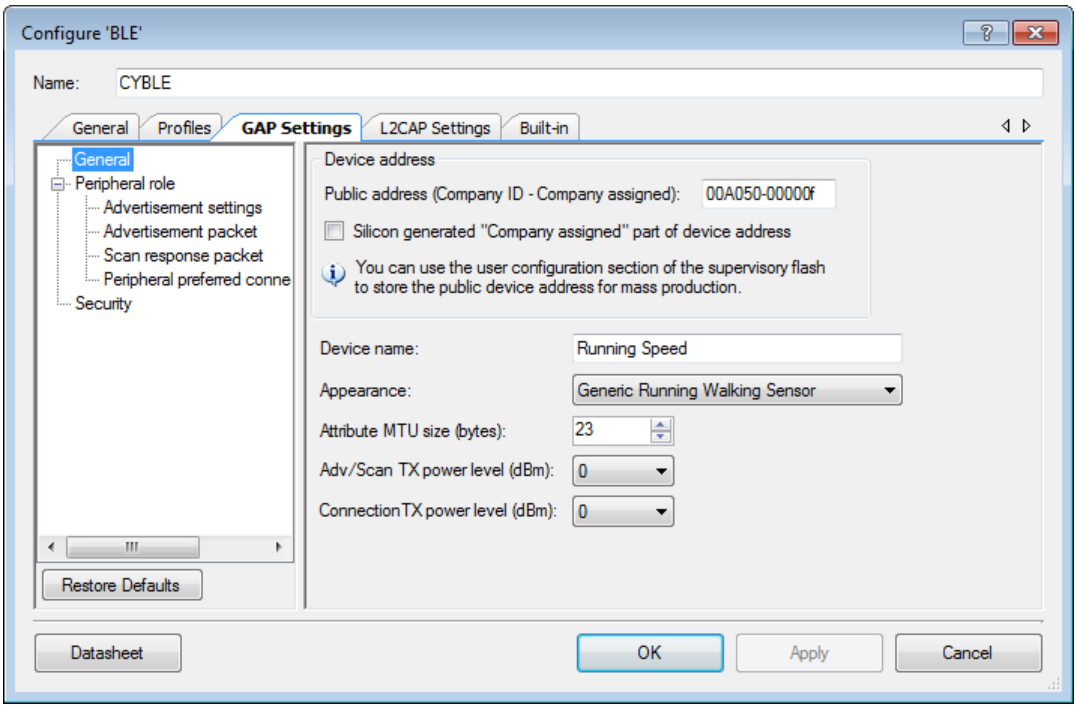


Figure 3. GAP settings

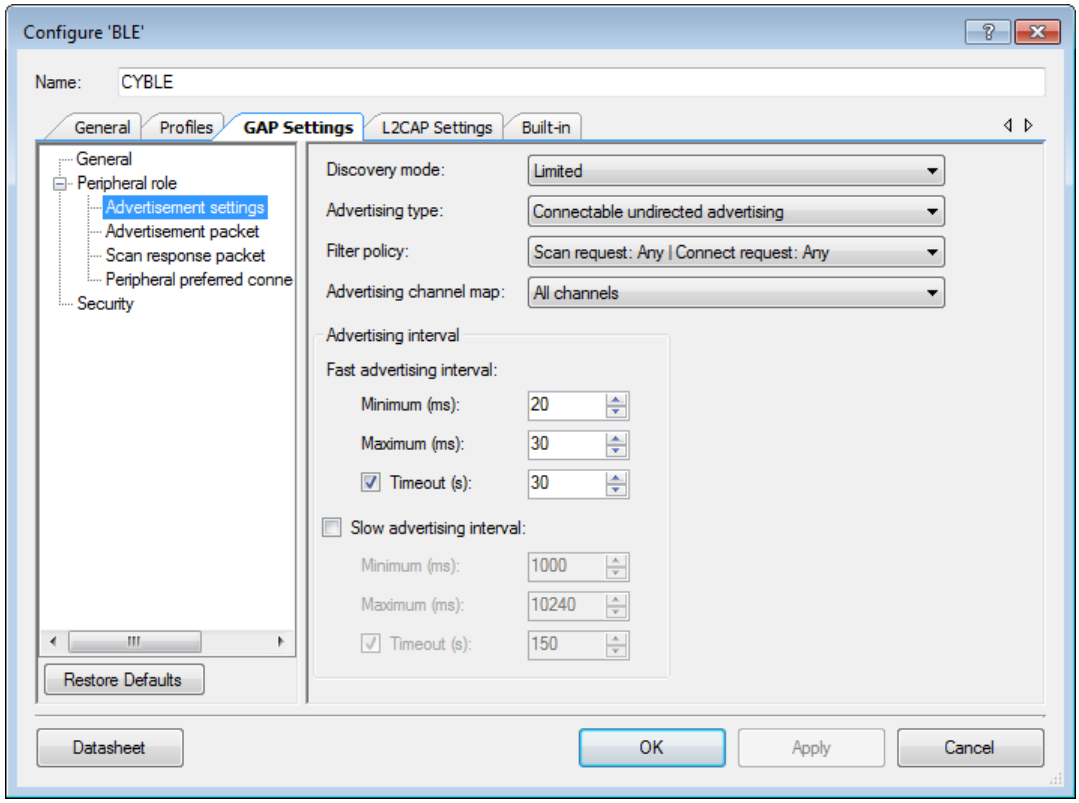


Figure 4. GAP settings -> Advertisement settings

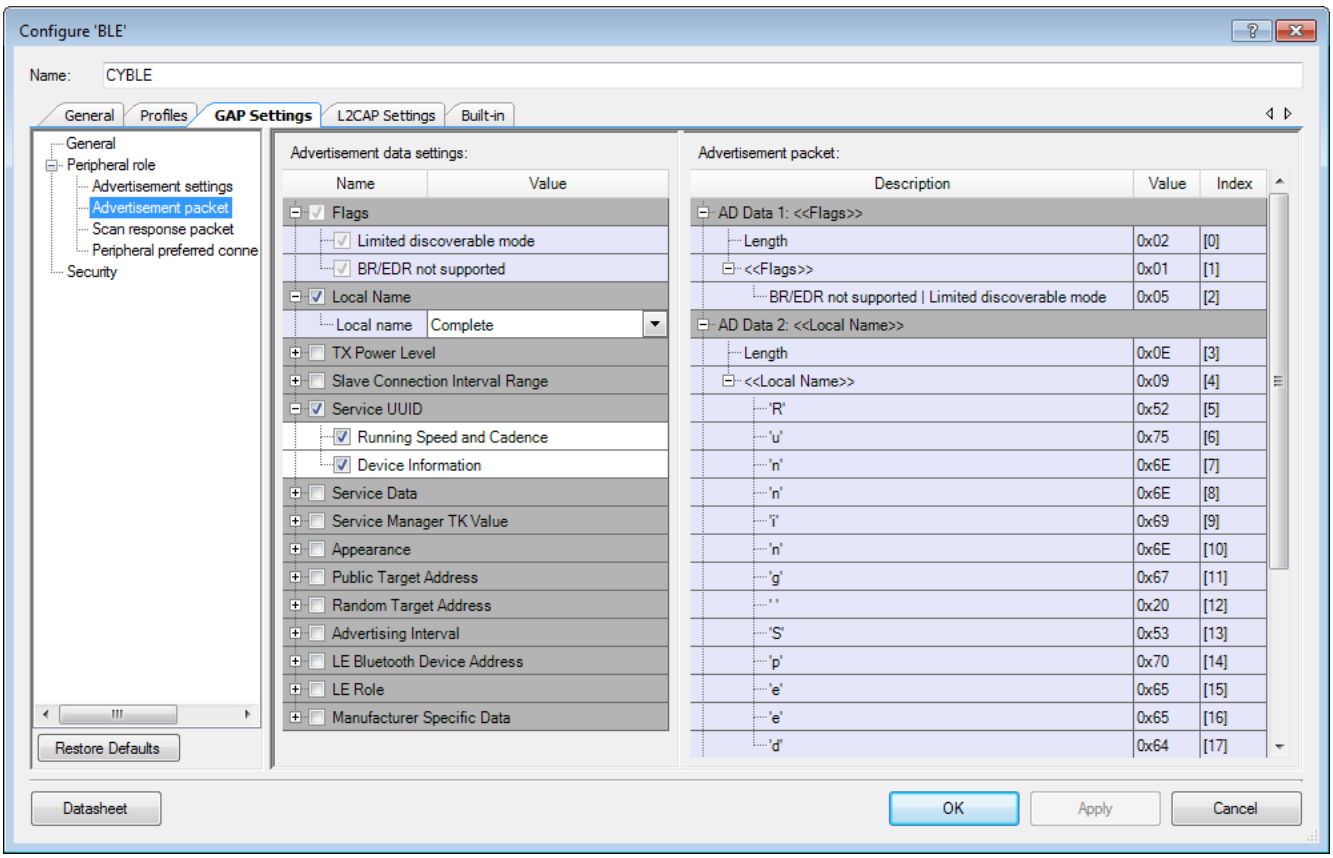


Figure 5. GAP settings->Advertisement packet

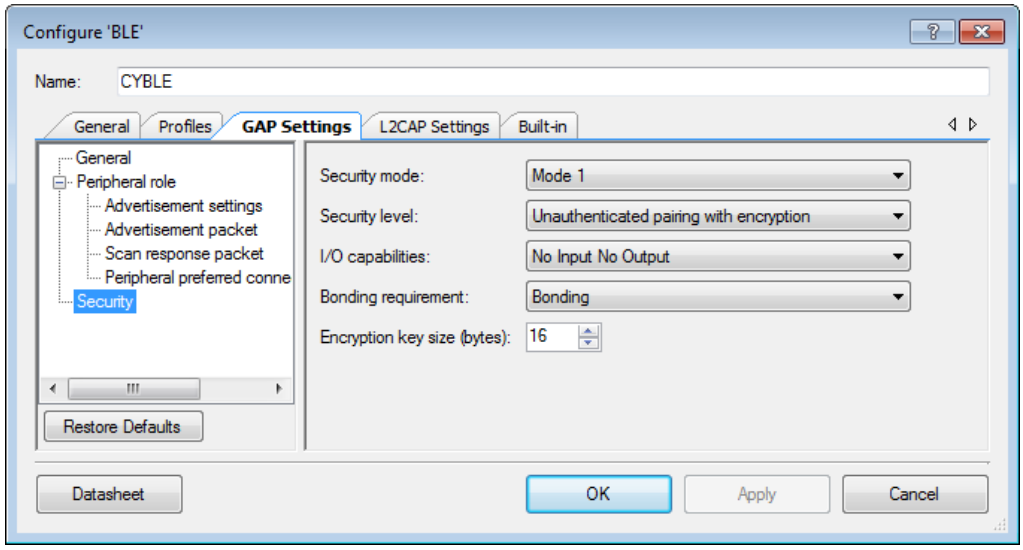


Figure 6. GAP Settings -> Security

# Project Description

The project demonstrates the core functionality of the BLE component configured as a Running Speed and Cadence Sensor. The example project requires CY8CKIT-042-BLE Pioneer Kit with PSoC 4100-BL, PSoC 4200-BL or PRoC BLE devices.

For operation the example project uses two callback functions: AppCallBack() and RscServiceAppEventHandler(). One callback function (AppCallBack()) is required for receiving the generic events from the BLE Stack, and the second (RscServiceAppEventHandler()) is required for receiving the events from the Running Speed and Cadence Service.

The example project uses UART component for displaying debug information.

To start the example project operation, build it and program onto CY8CKIT-042-BLE Pioneer Kit with PSoC 4100-BL, PSoC 4200-BL or PRoC BLE device. Right after the startup the BLE, UART and ISR components will be initialized. After the initialization the BLE component begins its operation that can be seen on the RGB LED which starts blinking with a green color. This indicates that the device has started advertising and it is available for the connection with a central device. For advertisement the example project uses the packet structure as shown in **Figure 5**. This example requires an external GAP Central device configured in GATT Client role for operation. To connect to the Running Speed and Cadence Sensor device, send a connection request when the device is advertising. After 30 seconds, if no central device has connected to the Running Speed and Cadence Sensor, the Sensor device will stop advertisement and red LED will be turned on indicating the disconnection state.

While connected to a Client and between connection intervals, the device is put into the DeepSleep mode.
After a Client device is connected to the Running Speed and Cadence Sensor, the Client device should enable notifications for the RSC Measurement Characteristic. When notifications are enabled, the Sensor will be sending notifications to the peer Client periodically. The period of

the notifications is dependent on the connection interval used by the Client. In case of 30 ms connection interval, the period of the notifications is approximately 3 seconds. The notifications sent from the Sensor contain “Instantaneous Speed”, “Instantaneous Cadence”, “Instantaneous Stride Length”, “Total Distance”, and “Walking or Running Status bit” fields. The example project also periodically increases the value of “Instantaneous Cadence”, “Instantaneous Stride Length”, and, therefore, “Instantaneous Speed”. The period of values increasing is approximately 10 seconds for 30 ms connection interval. After the “Instantaneous Cadence” and “Instantaneous Stride Length” reached their maximum allowed values, they will be reset back to minimum values. By default, the project simulates the “Walking” profile, but it can simulate the “Running” profile as well. To switch to the “Running” profile, press and hold SW2 button on CY8CKIT-042-BLE Pioneer Kit. When “Running” profile becomes active, the blue LED is turned on indicating this.

# Expected Results

The project is intended to work with any BLE-compatible device (e.g. phone, tablet). Appropriate software with Running Speed and Cadence Profile support should be installed on client OS. CySmart mobile app (available for Android and iOS) has support for this profile and can be used as a client for Running Speed and Cadence.

To use CySmart mobile app as a client for Running Speed and Cadence Service, launch it and swipe down the screen to refresh the list of BLE devices available nearby. Make sure that development kit is advertising (green LED is blinking): you may need to press SW1 button in order to wake up device from hibernate mode. Once “Running Speed” device appears in BLE devices list, you can connect to it and choose “Running Speed & Cadence Service” in service selector.

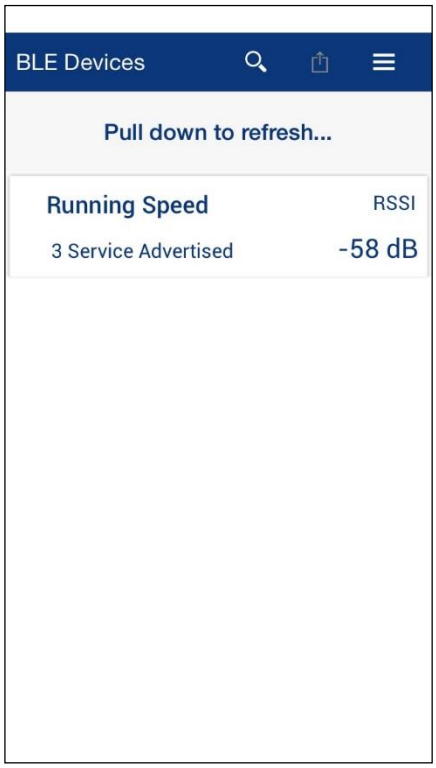


Figure 7. CySmart iOS app recognized BLE kit as Running Speed Reporter


Figure 8. CySmart Android app shows "Running Speed & Cadence Service" in service selector

Once connected, CySmart mobile application provides interface for measurement of distance being run, calories burnt and average speed based on running speed and cadence values obtained from development kit. To attain this functionality, please enter runner's weight into appropriate textbox and press "Start" button:

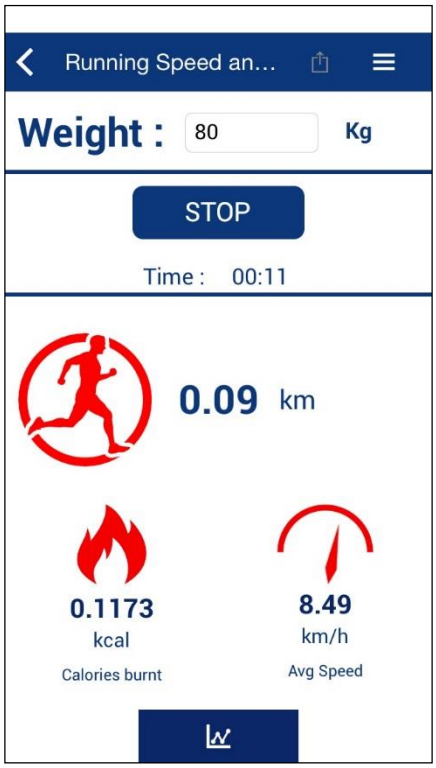


Figure 9. Running Speed and Cadence Service Interface on CySmart app provides possibility to enter runner's weight

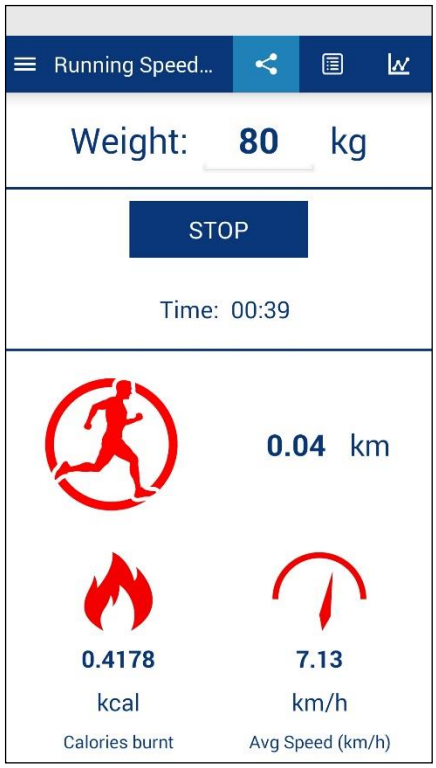


Figure 10. CySmart Android app simulates measurement of total distance being run, amount of calories burnt and average speed

Also, the project can be used together with CySmart app for Windows. To connect to Running Speed and Cadence Service, this application requires USB Bluetooth Low Energy dongle installed (included with CY8CKIT-042-BLE Pioneer Kit). For further instructions on how to use CySmart application, see CySmart User Guide.