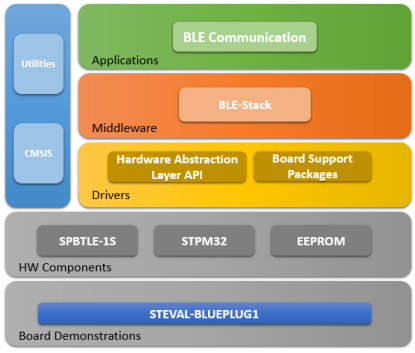
STSW-BLUEPLUG

Data brief

Firmware for the STEVAL-BLUEPLUG1 board



Features

- Implementation of the firmware for the STEVAL-BLUEPLUG1 board is based on SPBTLE-1S Module. It features:
  - Demonstrating wireless connectivity over BLE
  - Zero cross detection
  - Dimming using TRIAC
  - Metering: Measures energy parameters to send it to app through Bluetooth
  - Scheduling: Set the time of day for ON or OFF of the load
  - NFC interface: To configure the design, store the logs (RFU)
  - Android Application for energy parameters analysis
- The SPBTLE-1S is based on BlueNRG-1 system-on-chip and entire Bluetooth Low Energy stack and protocols are embedded into module
- Source code freely available with developer-friendly license terms

Description

STEVAL-BLUEPLUG1 is an evaluation board targeting any Internet of Things (IOT) application. It contains all the core functionality required for a secure communication. It has the capability of wireless connectivity over BLE and also able to measure energy parameters like power, voltage, current and power factor using STPM32 metering IC. With the help of the app the user can control the firing of the TRIAC which is acting as a switch to turn on/off the load and also controlling the firing angle for dimming. The dual EEPROM (M24LR) connector is available to communicate through NFC (Near Field Communication).

Android App is sending commands to SPBTLE-1S through Bluetooth and SPBTLE-1S is controlling the TRIAC on the basis of command received.

The user can also control the state of the load by using the manual control button provided on the board
The STPM32 measures the electrical parameters and sends it to SPBTLE-1S module over USART. After receiving the commands, SPBTLE-1S transmits it to the Android app to display the same on Metering panel over Bluetooth.

Product summary	
evaluation board	STEVAL-BLUEPLUG1
very low power application module for Bluetooth® Smart v4.2	SPBTLE-1S
ASSP for metering applications with up to four independent 24-bit 2nd order sigma-delta ADCs	STPM32

1 Detailed description

State Machine Description

State Machine describes the flow of the operations that will run in the program. Here, this state machine routine is divided into three parts:

1. Initialization and configuration of the peripherals
2. Metering data and BLE Stack Tick
3. Interrupt routine

Peripheral Initialization

It contains initialization of:

- System
- BlueNRG-1 platform
- GPIO pins
- STPM32
- Then configuration of Interrupt routine, SPBTLE-1S and RTC timer takes place.

  BLE Profiles Initialization:
- Initialization of MAC, GAP Role - Device is in Peripheral Role, GATT-Device is in Server mode
- Initialization of Services- One service with two characteristics: Notification is used to send metering data to android app and Write characteristics for getting commands form the android app, Authentication- Use for Bonding the Device and TX Power Set-Sets the output power level.

Metering data and BLE Stack Tick

The BLE Stack Tick function executes the processing of all Host Stack layers. This function has to be executed regularly to process incoming Link Layer packets and to process Host Layers procedures. This function is followed by the App tick, this function connects the app to the firmware and thus runs the application state machine.

If the app is connected to the SPBTLE-1S then every second, the following functions are executed:

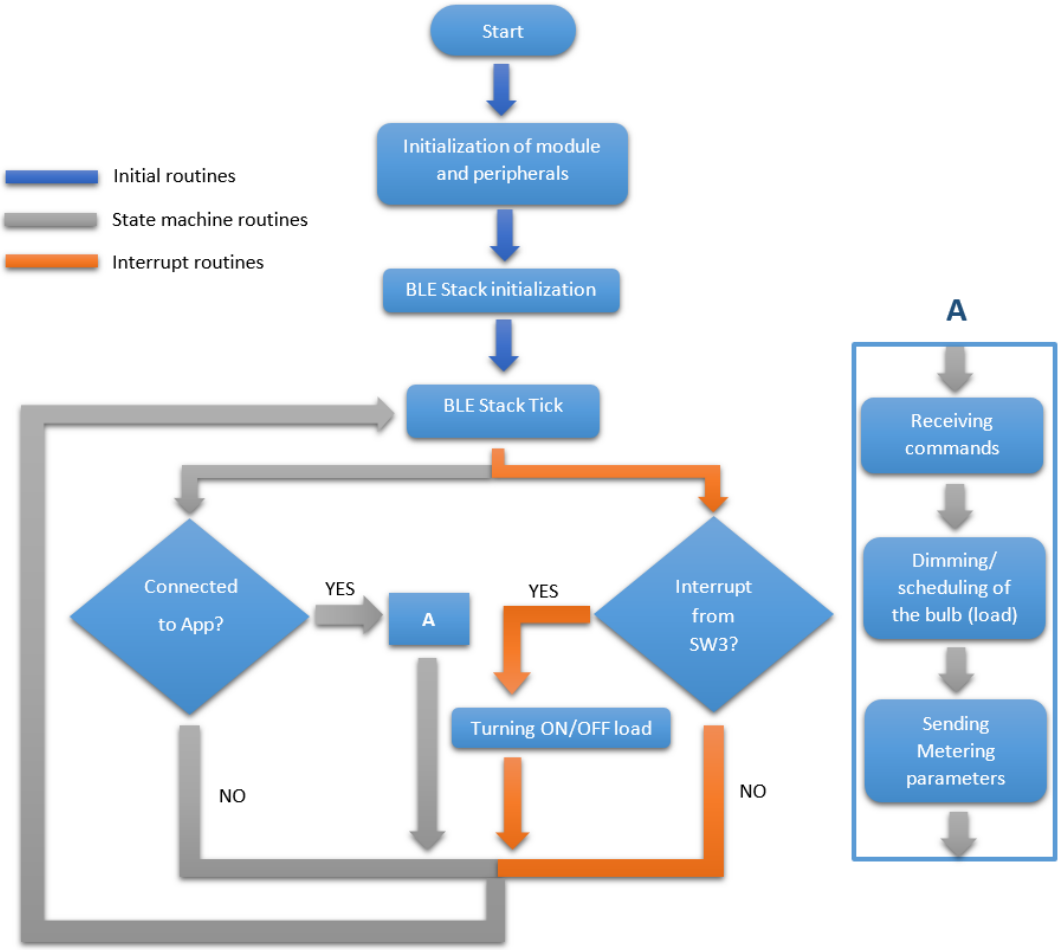
- Retrieving the metering data like energy parameters, voltage and current from STPM32 and processing the data for the app panel
- Arranging the data in packets and transmission through Bluetooth to the Android application

Interrupt routines

There are two interrupts that are used in the program.

- ZCR interrupt: Zero Crossing Rate defines the rate at which the signal crosses zero signal level, from positive to negative or back. Here ZCR triggers an interrupt routine in which the firing of the TRIAC for load diming is managed according to the user settings
- Manual mode: A button is provided on the board which acts as a manual control for turning ON/OFF the load using that button. This can be helpful when the user does not have the app. By pressing the button once the load will either turn ON at 100% intensity or it will be turned OFF.

Figure 1. State machine description



Revision history

Table 1. **Document revision history**

Date	Version	Changes
28-May-2018	1	Initial release.