RESEARCH ARTICLE OPEN ACCESS

Design and Implementation of Anti Lost Bluetooth Low Energy Mobile Device for Mobile Phone

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ABSTRACT
Today mobile phone like smart phone, tablet are very costly ranging from 300 USD to 600 USD , to avoid them to get forget at any social places, we can have mobile device(gadget) which will warn us (beep)this device is left back .To make commercialize product which will act as mobile phone watchmen, with specification and characteristic like smallest device foot print, comfortable to carry along, ultra low power consumption to increase battery life and to avoid frequent charging, ultra low Sleep currents and efficient performance. As per this specification we will develop a mobile device (gadget) which will connect to mobile phone by Bluetooth connectivity if this gadget will go beyond 4 to 6 meters gadget will beep loud when Bluetooth connectivity breaks.

Keywords **-** Bluetooth low energy V4.0, BT Protocol, CC2540.

I. INTRODUCTION

Many times we forget to pickup our mobile phone from restaurant, library, canteen and other social places. Probability for device stolen from this place is also high. When we realize the portable device mobile, tablet or laptop is left back at restoring its quite late and device is pickup or stole by stranger, this smart phone and tablet device are very costly. According to crime statistics on mobile stolen cases from 2001 to 2013 graph goes on increasing and it is very difficult to search that mobile phone. So precaution is good than cure i.e. we must keep our mobile phone from any place, but there is chance to forget our mobile phone at any place. To avoid them to get forget at any social places, we can have mobile device (gadget) which will warn us (beep) this device is left back. The aim of this mobile device is to describe a Personnel Security System using Bluetooth Low Energy (BLE) Tag which operates on a coin cell battery that will discover all the available low energy devices in the vicinity and keep track of when it entered and when it left the zone. According to the objective of project, we develop hardware board for ultra low power microcontroller system which is the heart of the system and control the entire system then search from the various Bluetooth module systems and choose appropriate module that for our system CC2540 is the 2.4GHz Bluetooth low energy system-on-chip, which is having 8051 with Bluetooth stack and can run both applications and Bluetooth low energy protocol stack. [1]

II. PROPOSED METHOD FOR MOBILE DEVICE (GADGET)

CC2540 can run Both Application and BLE Protocol Stack includes Peripherals to Interface with wide range of Sensors. The CC2540 is a cost-effective, low-power, true system-on-chip (SoC) for Bluetooth low energy applications. [2] It enables robust BLE master or slave nodes to be built with very low total bill-of-material costs.

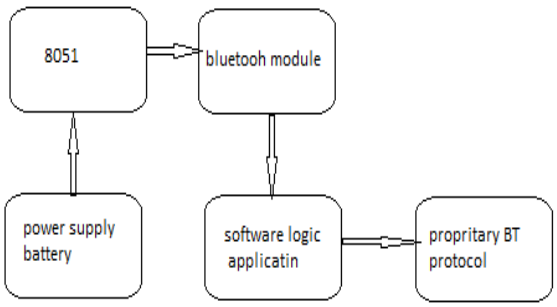

Fig.1.Block diagram of gadget

Bluetooth low energy solution. Version 4.0 of the Bluetooth standard allows for two systems of wireless technology: Basic Rate (BR; often referred to as "BR/EDR" for "Basic Rate / Enhanced Data Rate") and Bluetooth low energy (BLE). The BLE system was created for the purpose of transmitting very small packets of data at a time, while consuming significantly less power than BR/EDR devices.
Devices that can support BR and BLE are referred to as dual-mode devices and go under the branding Bluetooth Smart Ready. Typically in a Bluetooth

system, a mobile phone or laptop computer will be a dual-mode device. Devices that only support BLE are referred to as single-mode devices and go under the branding Bluetooth Smart. These single-mode devices are generally used for application in which low power consumption is a primary concern, such as those that run on coin cell batteries. [3]

III. SOFTWARE OVERVIEW

The controller and host are implemented together on the CC2540/41, while the profiles and application are implemented separately. The application and profiles communicate with the CC2540/41 by means of vendor-specific HCI commands using a SPI or UART interface, or using a virtual UART interface over USB. This configuration is useful for applications which execute on either another device (such as an external microcontroller) or a PC. In these cases, the application can be developed externally while still running the BLE stack on the CC2540/41.

Software developed using the BLE software development kit consists of five major sections: the OSAL, HAL, the BLE Protocol Stack, profiles, and the application. The BLE protocol stack is provided as object code, while the OSAL and HAL code is provided as full source. In addition, three GAP profiles (peripheral role, central role, and peripheral bond manager) are provided, as well as several sample GATT profiles and applications. The BLE protocol stack, the profiles, and all applications are all built around the Operating System Abstraction Layer (OSAL). The OSAL is not an actual operating system (OS) in the traditional sense, but rather a control loop that allows software to setup the execution of events. For each layer of software that requires this type of control, a task identifier (ID) must be created, a task initialization routine must be defined and added to the OSAL initialization, and an event processing routine must be defined. Optionally, a message processing routine may be defined as well. Several layers of the BLE stack, for example, are OSAL tasks, with the LL being the highest priority (since it has very strict timing requirements).The Hardware Abstraction Layer (HAL) of the CC2540/41 software provides an interface of abstraction between the physical hardware to and the application and protocol stack. This allows for the development of new hardware (such as a new PCB) without making changes to the protocol stack or application source code. The HAL includes software for the SPI and UART communication interfaces, ADC, keys, and LED's etc.[4]

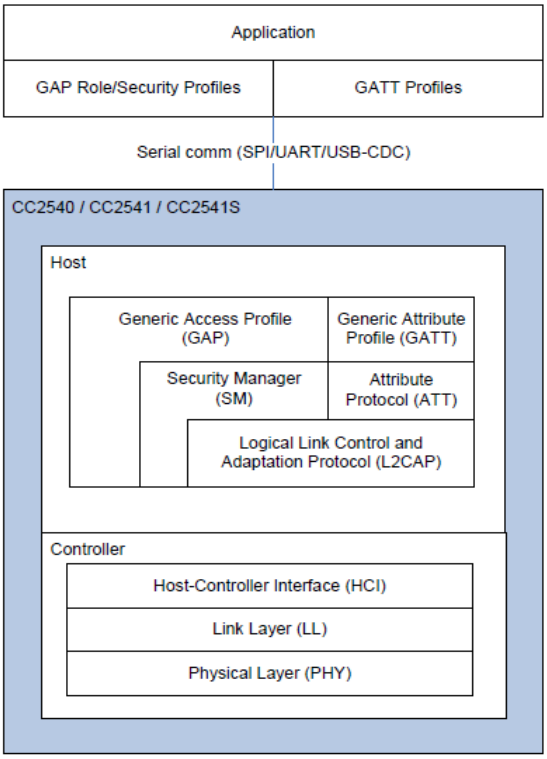

Fig2.Network processor configuration

IV. WORKING WITH IAR EMBEDDED WORKBENCH

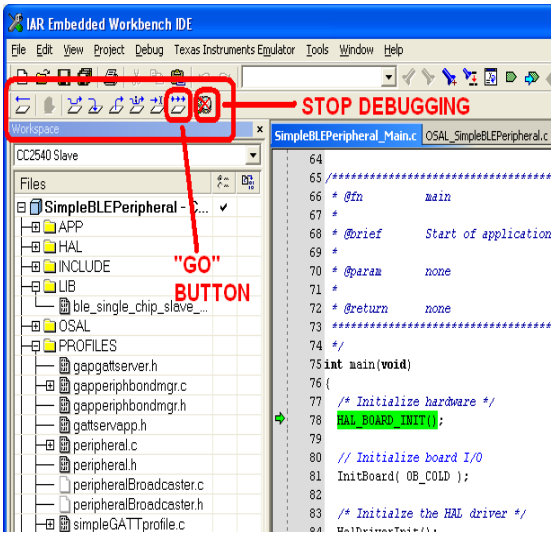

Fig.3. IAR Embedded workbench compile window

All embedded software for the CC2540 is developed using Embedded Workbench for 8051 from IAR Software. After installing IAR Embedded Workbench, be sure to download all of the latest patches from IAR, as they will be required in order to build and debug projects with the CC2540.[5]

Once all of the patches have been installed, you are ready to develop software for the CC2540/41. This

section provides information on where to find this software. It also contains some basics on the usage of IAR, such as opening and building projects, as well as information on the configuration of projects using the BLE protocol stack. IAR contains many features that go beyond the scope of this document.
This will compile the source code, link the files, and build the project. Any compiler errors or warnings will appear in the messages window at the bottom of the screen. To download the compiled code into a CC2540 device and debug, connect the gadget using a hardware debugger (such as the CC Debugger) connected to the PC over USB. Find the "Debug" button in the upper right side of the IAR window.
Once the code is downloaded, a toolbar with the debug commands will appear in the upper left corner of the screen. Then start the program's execution by pressing the "Go" button on the toolbar. Once the program is running, we can get out of the debugging mode by pressing the "Stop Debugging" button.
Then download the code in CC2540 using CC debugger. At this point the program should be executing on its own. The hardware debugger can be disconnected from the CC2540/41 and will continue to run as long as the device remains powered-up.

V. EXPERIMENTAL RESULTS

Proposed work is satisfactory work with all Bluetooth low energy mobile phone. As the name suggests, Bluetooth Low Energy is designed for ultra low power consumption. It is a wireless protocol standard overseen by the Bluetooth Special Interest Group (BT-SIG). It is a feature of Bluetooth v4.0 wireless radio technology. Bluetooth Low Energy operates at 2.4 GHz in the ISM band. It is aimed at new, principally low-power, low-throughput and low-latency, application for wireless devices within the discoverable range. It uses a coin cell battery (CR 2032) which works on 3volt. It has a life time of more than a year without being recharged. Bluetooth Low Energy takes less time to make a connection when compared to conventional Bluetooth. It consumes approximately 98% less power compared to classic Bluetooth. It is primarily designed for mobile phones and PC ecosystems, but can be used for other applications as well. It is expected to be found in billions of devices over the years to come. BLE uses Gaussian Frequency Shift Keying (GFSK) modulation technique. It has 40 channels with a channel spacing of 2MHz in order to avoid the interference effects. BLE uses 3 fixed advertising channels (37, 38 and 39) for broadcasting and 37 adaptively frequency hopped dynamic data channels. One of the main reasons for low power consumption is that BLE minimizes times on air by employing only "3 advertising channels" to search for other devices or promote its own presence to devices that might be looking to make a connection whereas in a conventional Bluetooth Technology, it uses 32 channels for advertising.[6-8]

A. Hardware Setup

With CC2540 peripherals required for our gadget

1. Dual coloured Light Emitting Diode(LED)
2. Switch buttons(SW1,SW2)
3. Buzzer

Fig4.Hardware of gadget

With the LED on gadget gives the status of mobile phone or remote device connected or not. Using two switch buttons on Gadget one is used for advertise the gadget when scan with mobile phone and another button is used for disconnect the gadget with phone. First, we will need to power up the CC2540. When we insert the CR 2032 battery, the LED will be light green for one second.[6-8]We can toggle Advertisements on and off by pushing the right button on the CC2540.During advertisement, the LED will be blinking red. Connect mobile phone with gadget using the application on phone. To sound the buzzer located on the CC2540, writing the code value in the CC2540 code in the IAR Embedded workbench following value

- 01:00 for low Alert
- 02:00 for high Alert
- 00:00 to turn off

So the buzzer will sound for 10 seconds when Bluetooth connectivity breaks with mobile phone. Beep can also stop using right button on gadget.

VI. CONCLUSION

All methods until now made for the devices which are stolen by strangers that are after misplacing the device like, tracking. But for that device should be continually connected with internet and this is not reliable process. This project name as mobile watchman device work as really as a watchman for our devices like mobile phones, tablets, laptops, and don't misplace the device is better than searching the device after misplacing. So this project is very important.
It also has future work like make the product size variable as small as placed in wrist watch. So the cost

decreases. Add more functionality in the product such as add display in the device for display messages from mobile phone and display current location of device. Add up to 16 mobile devices like phone, laptop, and tablet at a time, and connect all to mobile watchman.

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