PSoC 4 BLE – Updating Connection Parameters

Objective

This example demonstrates how to update the Connection Parameters in a BLE connection using the PSoC 4 BLE device.

Overview

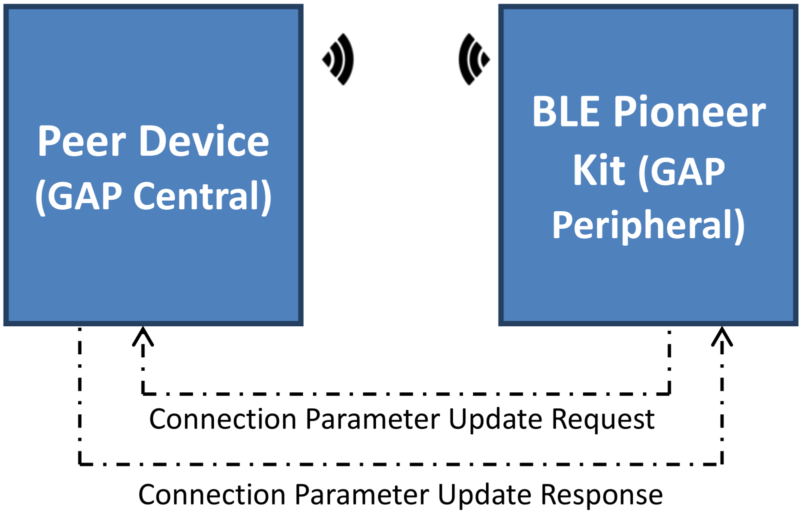
This example uses the BLE Pioneer Kit to implement a GAP Peripheral with a custom Profile. Once this device connects to a peer device, a Connection Parameter Update Request can be sent from the GAP Peripheral when the user presses the switch (SW2) on the kit.

The Connection Parameters requested are:

- Minimum Connection Interval - 500 ms
- Maximum Connection Interval - 500 ms
- Slave Latency - 1
- Supervision Timeout - 5000 ms

For more details about this BLE operation, refer to the Bluetooth 4.1 Specification, Volume 3, Part A, Section 4.20.

Figure 1. Connection Parameter Update


Peer Device (GAP Central)
BLE Pioneer Kit (GAP Peripheral)
Connection Parameter Update Request
Connection Parameter Update Response

Requirements

Design Tool: PSoC Creator 3.1 CP1, CySmart 1.0

Programming Language: C (GCC 4.8.4 – included with PSoC Creator)

Associated Devices: All PSoC 4 BLE devices

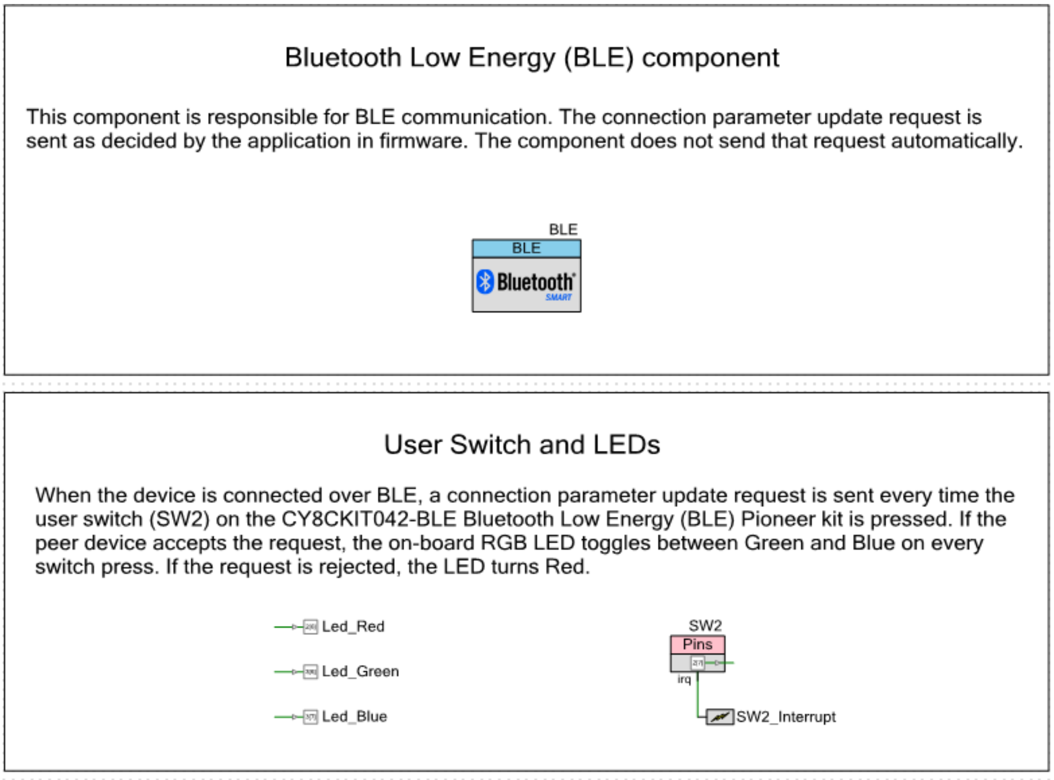
Required Hardware: CY8CKIT-042-BLE Bluetooth® Low Energy (BLE) Pioneer Kit

Hardware Setup

The BLE Pioneer Kit has all of the necessary hardware required for this lab. There is no special setup required.

PSoC Creator Schematic

Figure 2. PSoC Creator Schematic



Bluetooth Low Energy (BLE) component

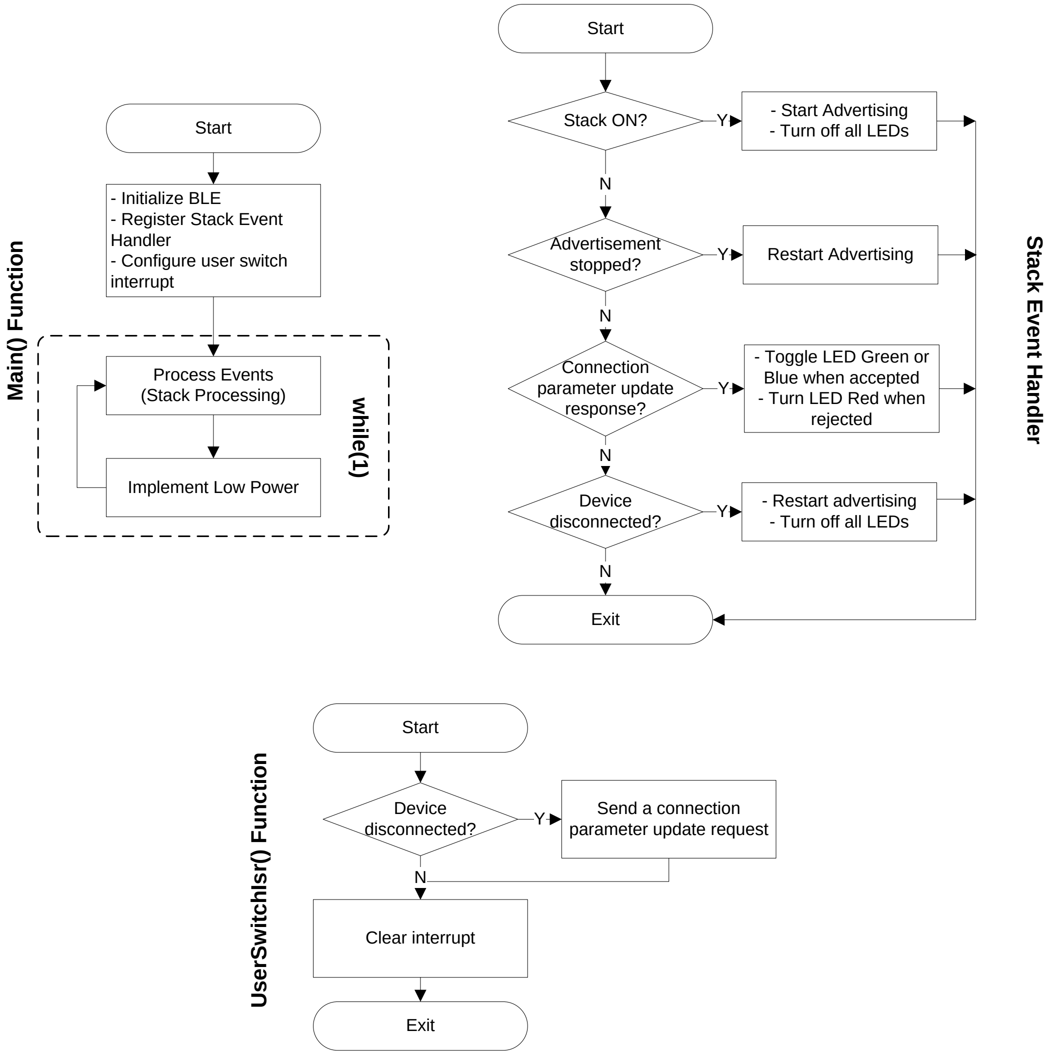
This component is responsible for BLE communication. The connection parameter update request is sent as decided by the application in firmware. The component does not send that request automatically.

User Switch and LEDs

When the device is connected over BLE, a connection parameter update request is sent every time the user switch (SW2) on the CY8CKIT042-BLE Bluetooth Low Energy (BLE) Pioneer kit is pressed. If the peer device accepts the request, the on-board RGB LED toggles between Green and Blue on every switch press. If the request is rejected, the LED turns Red.

Firmware Flow

Figure 3. Firmware Flow



1. **main() function**: This is the main function which performs the initialization of the BLE Stack and the user switch interrupt. It then executes the necessary routines to process the BLE Stack events and maintain the connection. It also implements low-power modes in the system by first requesting the BLE block to enter Deep-Sleep and then putting the entire system into Deep-Sleep.
   In the initial section of the *main()* function, the API function *CyBle_Start(StackEventHandler)* is called to start the BLE Component and register a callback to the Stack event handler. Note that the callback function can have any name – in this project, we used StackEventHandler. Once the system is initialized, *main()* continuously operates in a *while(1)* loop executing *CyBle_ProcessEvents()* and the system low-power implementation. This function processes the events received by the BLE Stack and enables the application layer to use them and take the appropriate action.

2. **StackEventHandler() function**: This function handles the common events generated for the BLE Stack. For example, the event *CYBLE_EVT_STACK_ON* is received when the Stack is initialized and turned ON. The event *CYBLE_EVT_GAP_DEVICE_DISCONNECTED* is received when the BLE connection is disconnected.

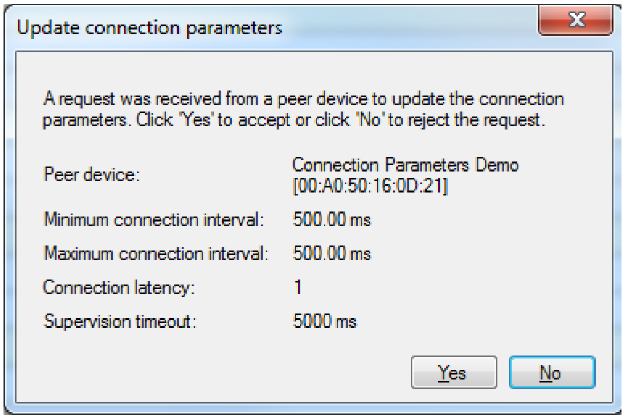
3. **UserSwitchIsr() function**: This function serves as the Interrupt Service Routine (ISR) for the user switch. When the user presses switch SW2 on the BLE Pioneer Kit, this interrupt is triggered. If the device is connected to a peer device, the ISR initiates a Connection Parameter Update Request.

Every time the user presses the switch SW2, a new request is sent, and every time that request is accepted by the GAP Central device, the RGB LED on the Pioneer Kit switches from Green to Blue or vice-versa. If the request is rejected, the LED turns Red.

Expected Results

Plug in the Pioneer Kit and program the example project to it. Open the CySmart Windows tool and connect to your device. Once you are connected, press the switch SW2 on the kit and observe the popup window on the CySmart tool, indicating an incoming Connection Parameter Update Request. See Figure 4.

Figure 4. Incoming Connection Parameter Update Request in CySmart



Update connection parameters

A request was received from a peer device to update the connection parameters. Click 'Yes' to accept or click 'No' to reject the request.

Peer device: Connection Parameters Demo [00:A0:50:16:0D:21]

Minimum connection interval: 500.00 ms

Maximum connection interval: 500.00 ms

Connection latency: 1

Supervision timeout: 5000 ms

When you accept this request, the LED turns Green. The next time you press the switch and accept the new request, the LED turns Blue. If you reject this request, the LED turns Red.

Related Documents

Table 1 lists all relevant application notes, code examples, knowledge base articles, device datasheets, and Component / user module datasheets.

Table 1. Related Documents

Document	Title	Comment
AN91267	Getting Started with PSoC 4 BLE	Provides an introduction to PSoC 4 BLE device that integrates a Bluetooth Low Energy radio system along with programmable analog and digital resources.
AN91445	Antenna Design Guide	Provides guidelines on how to design an antenna for BLE applications.