**ESP-32 BLE Configuration**

**Overview**

This project aims on the task of “Low Energy Bluetooth Services Broadcasting “.

This project focuses on "Low Energy Bluetooth Services Broadcasting." We simulate some hardware sensors that captures temperature and humidity with some variables and created a personalized ESP32 server. The server broadcasts weather-like data, providing clients with the temperature and humidity details from the environment.

**Installation Instructions**

1. **Setting Up Arduino IDE**
   * Download and install the Arduino IDE .
   * Open Arduino IDE and configure settings as necessary for the esp32(refer below for esp32 configuration).
2. **Installing Libraries**
   * Use the Arduino Library Manager to install the following libraries:
     + BLEDevice
     + BLEServer
     + BLE2902
     + BLE2901
3. **Including Libraries**
   * Include all the libraries from sketch🡪Include library🡪Ble(under esp32 section).

**Configuration**

 **Include Libraries:**

* The code starts by including necessary libraries for Bluetooth Low Energy (BLE) functionality:

#include <BLEDevice.h>

#include <BLEServer.h>

#include <BLE2902.h>

#include <BLE2901.h>

 **Define UUIDs:**

* UUIDs (Universally Unique Identifiers) uniquely identify services.

#define Service\_id "00000002-0000-0000-FDFD-FDFDFDFDFDFD"

#define Temp\_Char\_id "1efd327d-7caa-4dad-90d8-d2b87dfc4882"

#define Humidity\_Char\_id "18ad1902-ac57-488c-b5fe-c6c8b4041860"

 **Global Variables:**

* Initialize global variables to simulate sensor data (temperature and humidity) and Creating necessary pointers for characteristics and advertising.

BLECharacteristic \*pTemp;

BLECharacteristic \*pHumidity;

BLEAdvertising \*padvertising;

int Temp = 0;

int Humidity = 0;

 **Setup Function ():**

* Initialization part is here when the device boots up:

void setup() {

Serial.begin(115200);

Serial.println("BLE SERVICE BEGIN");

pinMode(2, OUTPUT);

BLEDevice::init("ESP32 SERVICE");

* + Serial.begin(115200): Initialize serial communication for debugging.
  + Serial.println("BLE SERVICE BEGIN"): Print message to serial monitor.
  + pinMode(2, OUTPUT): Set pin 2 as an output (used as an indicator).
  + BLEDevice::init("ESP32 SERVICE"): Initialize BLE with a device name.

 **Create BLE Server and Service:**

* Establish a BLE server and create a custom service similar to the creation of pointers for the chracteristics and advertising:

BLEServer \*pserver = BLEDevice::createServer();

BLEService \*pservice = pserver->createService(Service\_id);

 **Create BLE Characteristics:**

* Define and configure BLE characteristics (temperature and humidity) with read and notify operations as mentioned:

pTemp = pservice->createCharacteristic(Temp\_Char\_id,

BLECharacteristic::PROPERTY\_READ |

BLECharacteristic::PROPERTY\_NOTIFY);

pHumidity = pservice->createCharacteristic(Humidity\_Char\_id,

BLECharacteristic::PROPERTY\_READ |

BLECharacteristic::PROPERTY\_NOTIFY);

 **Set Initial Values and Descriptors:**

* Initialize characteristic values and add descriptors:

pTemp->setValue((uint8\_t\*)&Temp, sizeof(float));

pHumidity->setValue((uint8\_t\*)&Humidity, sizeof(float));

pTemp->addDescriptor(new BLE2902());

pTemp->addDescriptor(new BLE2901());

pHumidity->addDescriptor(new BLE2902());

pHumidity->addDescriptor(new BLE2901());

* + setValue(): Set initial sensor data values.
  + addDescriptor(): Add descriptors for client and user descriptions.

 **Start BLE Service and Advertising:**

* Start the BLE service and advertising:

pservice->start();

padvertising = BLEDevice::getAdvertising();

padvertising->addServiceUUID(Service\_id);

padvertising->start();

* + pservice->start(): Start the BLE service.
  + padvertising->start(): Start BLE advertising with the specified service UUID.

 **Indicate Setup Completion:**

* Use an LED or indicator to signal that setup is complete:

digitalWrite(2, HIGH);

 **Loop Function (loop()):**

* Continuously update sensor data and notify clients:

void loop() {

pTemp->setValue(Temp);

pTemp->notify();

Temp++;

delay(1000);

pHumidity->setValue(Humidity);

pHumidity->notify();

Humidity++;

delay(1000);

padvertising->start();

}

**Screenshots**









