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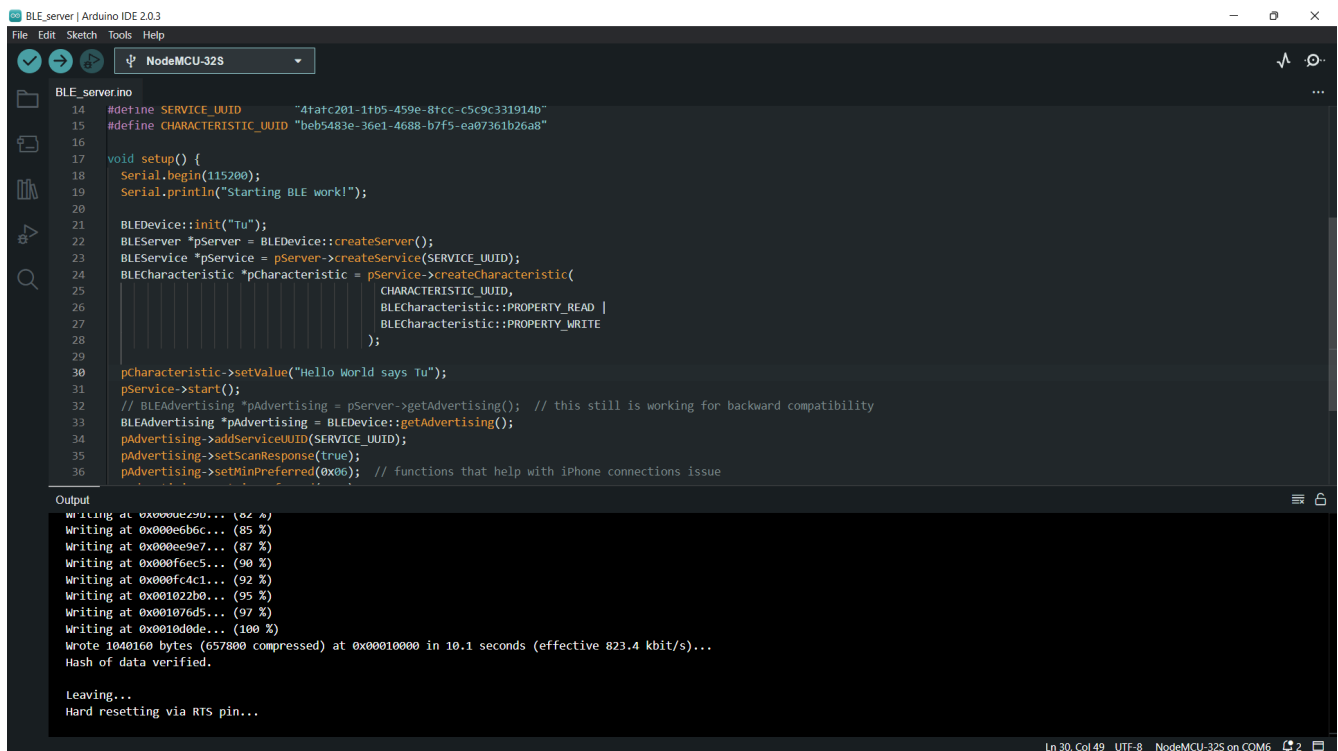
EMBEDDED SYSTEMS – CC01

LAB 4

ESP

BLE-SERVER

Source code:



The screenshot displays the Arduino IDE interface for a BLE server project. The top toolbar shows the upload button (a green arrow) is active. The target board is set to 'NodeMCU-32S'. The code editor shows the following code:

```
BLE_server.ino
14 #define SERVICE_UUID          "4fafc201-1fb5-459e-8fcc-c5c9c331914b"
15 #define CHARACTERISTIC_UUID    "beb5483e-36e1-4688-b7f5-ea07361b26a8"
16
17 void setup() {
18   Serial.begin(115200);
19   Serial.println("Starting BLE work!");
20
21   BLEDevice::init("Tu");
22   BLERemoteDevice *pServer = BLEDevice::createServer();
23   BLERemoteService *pService = pServer->createService(SERVICE_UUID);
24   BLECharacteristic *pCharacteristic = pService->createCharacteristic(
25     CHARACTERISTIC_UUID,
26     BLECharacteristic::PROPERTY_READ |
27     BLECharacteristic::PROPERTY_WRITE
28   );
29
30   pCharacteristic->setValue("Hello World says Tu");
31   pService->start();
32   // BLEAdvertising *pAdvertising = pServer->getAdvertising(); // this still is working for backward compatibility
33   BLEAdvertising *pAdvertising = BLEDevice::getAdvertising();
34   pAdvertising->addServiceUUID(SERVICE_UUID);
35   pAdvertising->setScanResponse(true);
36   pAdvertising->setMinPreferred(0x06); // functions that help with iPhone connections issue
```

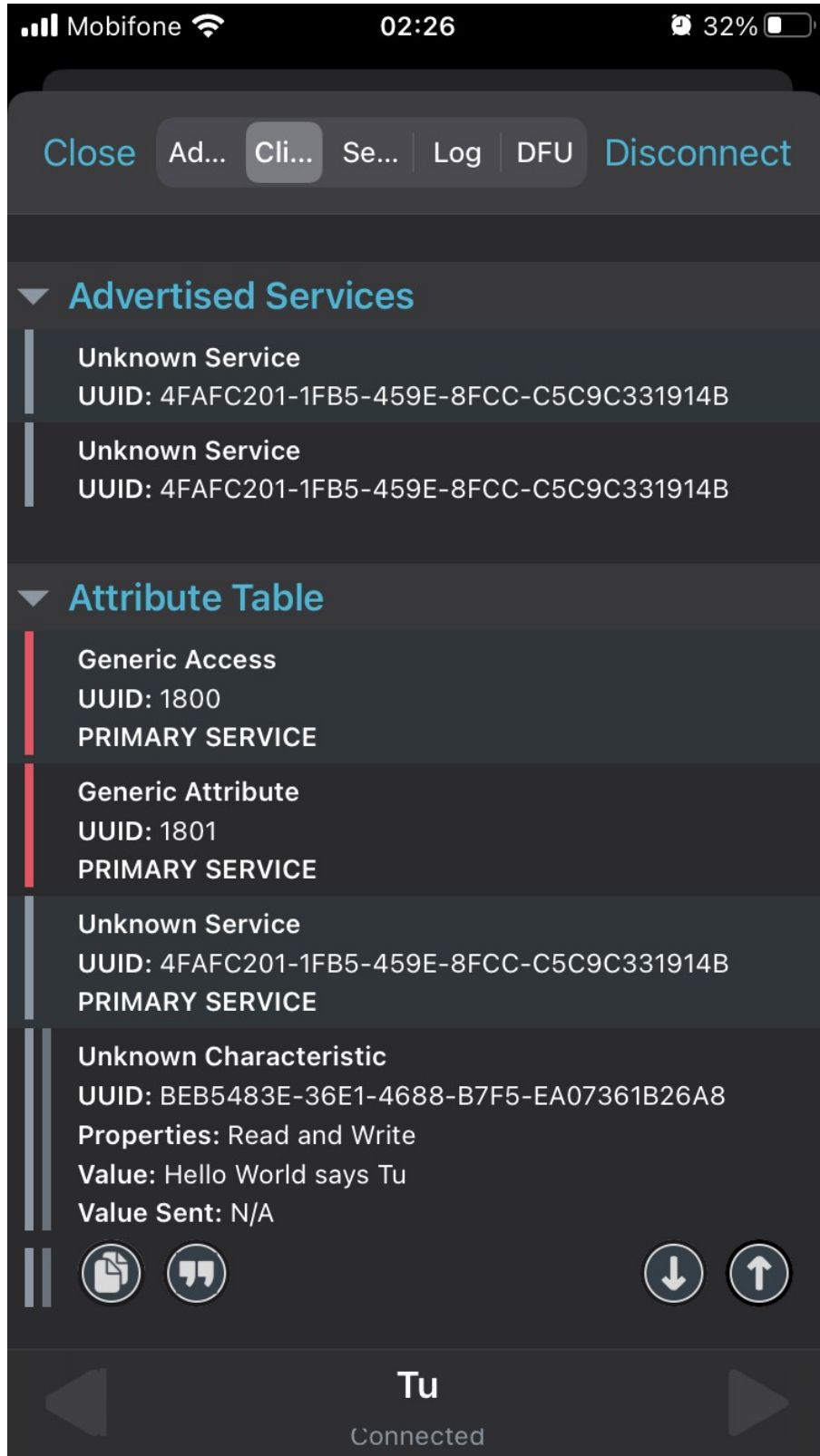
The output window shows the following messages:

```
Writing at 0x00000000... (0% /)
Writing at 0x00000001... (85 %)
Writing at 0x00000002... (87 %)
Writing at 0x00000003... (90 %)
Writing at 0x00000004... (92 %)
Writing at 0x00000005... (95 %)
Writing at 0x00000006... (97 %)
Writing at 0x00000007... (100 %)
Wrote 1040160 bytes (657800 compressed) at 0x00010000 in 10.1 seconds (effective 823.4 kbit/s)...
Hash of data verified.

Leaving...
Hard resetting via RTS pin...
```

The status bar at the bottom indicates 'Ln 30, Col 49 UTF-8 NodeMCU-32S on COM6'.

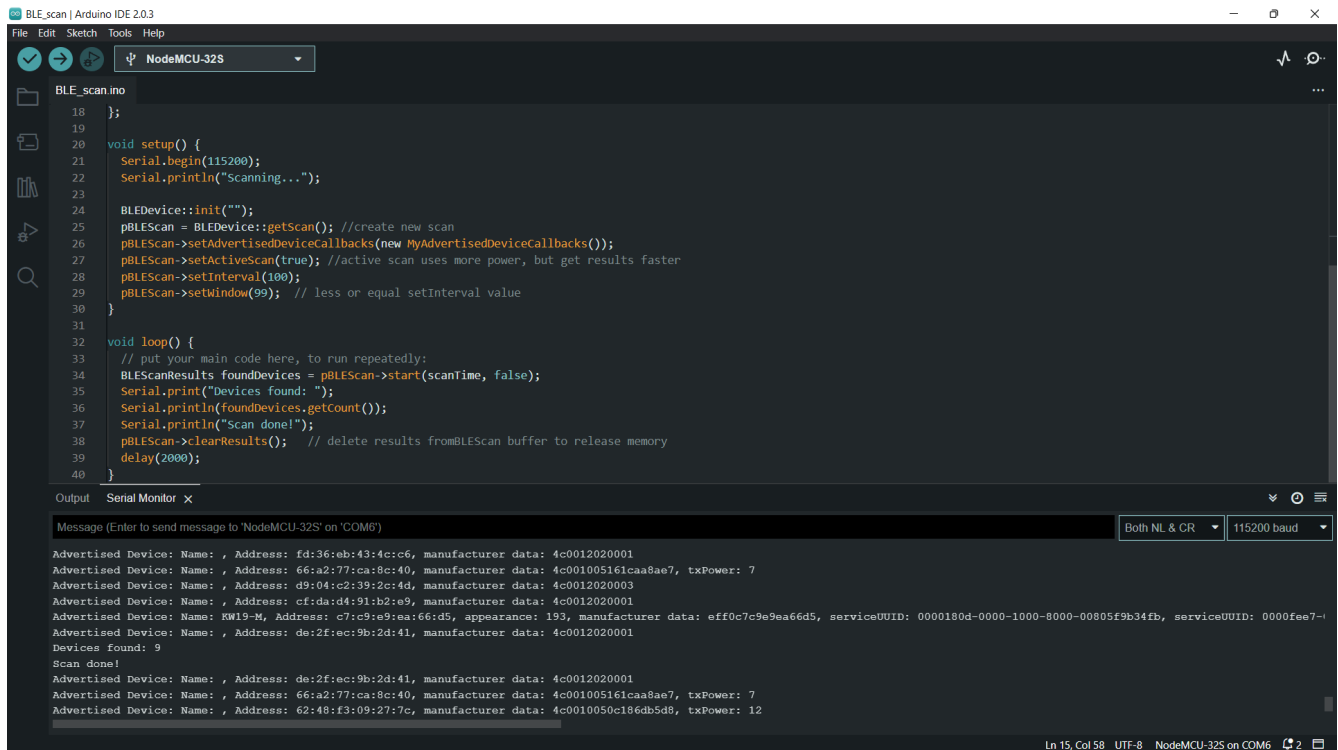
Results:



→ The result shows the service UUID, characteristic's UUID, properties and value just as expected.

BLE-SCANNER

Source code:



The screenshot shows the Arduino IDE interface with the file 'BLE_scanner.ino' open. The code is for a BLE scanner using the BLEDevice and BLEScan libraries. It initializes a BLE scanner, sets up a callback, and scans for devices. The Serial Monitor shows the output of the scan, listing 9 discovered devices with their names, addresses, and manufacturer data. The status bar at the bottom indicates the current line and column in the code.

```
18 };
19
20 void setup() {
21   Serial.begin(115200);
22   Serial.println("Scanning...");
23
24   BLEDevice::init("");
25   pBLEScan = BLEDevice::getScan(); //create new scan
26   pBLEScan->setAdvertisedDeviceCallbacks(new MyAdvertisedDeviceCallbacks());
27   pBLEScan->setActiveScan(true); //active scan uses more power, but get results faster
28   pBLEScan->setInterval(100);
29   pBLEScan->setWindow(99); // less or equal setInterval value
30 }
31
32 void loop() {
33   // put your main code here, to run repeatedly:
34   BLEScanResults foundDevices = pBLEScan->start(scanTime, false);
35   Serial.print("Devices found: ");
36   Serial.println(foundDevices.getCount());
37   Serial.println("Scan done!");
38   pBLEScan->clearResults(); // delete results from BLEScan buffer to release memory
39   delay(2000);
40 }
```

Output Serial Monitor

Message (Enter to send message to 'NodeMCU-32S' on 'COM6')

Both NL & CR 115200 baud

Advertised Device: Name: , Address: fd:36:eb:43:4c:c6, manufacturer data: 4c0012020001
Advertised Device: Name: , Address: 66:a2:77:ca:8c:40, manufacturer data: 4c001005161caa8ae7, txPower: 7
Advertised Device: Name: , Address: d9:04:c2:39:2c:4d, manufacturer data: 4c0012020003
Advertised Device: Name: , Address: cf:da:d4:91:b2:e9, manufacturer data: 4c0012020001
Advertised Device: Name: KW19-M, Address: c7:c9:e9:ea:66:d5, appearance: 193, manufacturer data: eff0c7c9e9ea66d5, serviceUUID: 0000180d-0000-1000-8000-00005f9b34fb, serviceUUID: 0000fee7-
Advertised Device: Name: , Address: de:2f:ec:9b:2d:41, manufacturer data: 4c0012020001
Devices found: 9
Scan done!
Advertised Device: Name: , Address: de:2f:ec:9b:2d:41, manufacturer data: 4c0012020001
Advertised Device: Name: , Address: 66:a2:77:ca:8c:40, manufacturer data: 4c001005161caa8ae7, txPower: 7
Advertised Device: Name: , Address: 62:48:f3:09:27:7c, manufacturer data: 4c0010050c186db5d8, txPower: 12

Ln 15, Col 58 UTF-8 NodeMCU-32S on COM6

Results:

→ From the serial monitor above, there are 9 devices scanned successfully, including KW19-M which is my smart watches.