Connected Products — Medtech by Example

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Check out the Supportive Technology project update for information about ECG filtering and heart-beat detection, and more on ECG recording, with BioAmp EXG Pill.
Strap-free Heart Rate Monitor for Sports

4 ★ ★ ★ ★ 41 reviews | 11 questions

$76.99 USD

- Specially designed for sports.
- Tracks and records real-time Heart Rate. Note: The data are for reference only and not for any medical use.
- The device reminds you of vibration to get your target heart rate.
- Continuous Heart Rate tracking for up to 24
VisualBeat™
Heart Rate Monitor
Model ER1

User Manual (EN)
Benutzerhandbuch (DE)
Manuale d'uso (IT)
Manual de usuario (ES)
Manuel de l'utilisateur (FR)
BLE reference model

Device

Sensor or Actuator

Bluetooth Low Energy

Physical Interaction

Virtual Interaction

User

App

TCP/IP

Cloud Backend

Device

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Cloud Backend
BLE scan

A peripheral *advertises* its BLE services by broadcast.

A central *scans* for services and gets device addresses.
BLE read and write

A central connects to a peripheral using its BLE address, then reads or writes a characteristic value.
BLE notifications

A central connects to a peripheral, then asks to be notified, to get a feed of characteristic values.
No filter

nRF52840
D7:76:54:22:BE:B1
NOT BONDED  -59 dBm  ↔ 124 ms

N/A
08:BD:05:05:22:74
NOT BONDED  -100 dBm  ↔ N/A

N/A
NOT BONDED  -76 dBm  ↔ 368 ms

N/A
C8:D0:83:BB:18:8B
NOT BONDED  -81 dBm  ↔ N/A

N/A
57:33:74:25:39:5F
NOT BONDED  -87 dBm  ↔ N/A

Generic Access
UUID: 0x1800
PRIMARY SERVICE

Generic Attribute
UUID: 0x1801
PRIMARY SERVICE

Device Firmware Update Service
UUID: 00001530-1212-efde-1523-785feabcd123
PRIMARY SERVICE

Device Information
UUID: 0x180A
PRIMARY SERVICE

Battery Service
UUID: 0x180F
PRIMARY SERVICE

Heart Rate
UUID: 0x180D
PRIMARY SERVICE

Heart Rate Measurement
UUID: 0x2A37
Properties: NOTIFY
Value: Heart Rate Measurement: 53 bpm, Contact is Detected
Descriptors:
Client Characteristic Configuration
UUID: 0x2902
Value: Notifications enabled

Body Sensor Location
UUID: 0x2A38
Properties: READ
BLE heart rate service

This service is intended for fitness heart rate sensors:

**Heart Rate Service** UUID (16-bit): 0x180D

This service includes the following characteristics:

- **Heart Rate Measurement** UUID: 0x2A37 [N]
- **Body Sensor Location** UUID: 0x2A38 [R]
- **Heart Rate Control Point** UUID: 0x2A39 [W]

It's a standard service, defined by Bluetooth SIG.
BLE heart rate service in Arduino C

```cpp
hrmSvc = BLEService(0x180D); // See HRM spec
hrmChr = BLECharacteristic(0x2A37); // UUIDs
hrmSvc.begin(); // to add characteristics
hrmChr.setProperties(CHR_PROPS_NOTIFY); ... 
hrmChr.begin(); // adds characteristic
uint8_t hrmData[2] = { 0b00000110, value }; 
hrmChr.notify(hrmData, sizeof(hrmData));
```

Here's the full example.
A gateway connects devices in the local network to a backend, were their data is accessible from the Web.
Remote BLE scan from Web client

Device ← Gateway (BLE Scan) ← ... ← Client (GET)

$ curl -v https://LOCAL_IP/devices?uuid=...
{
  "devices": [
    {
      "bt_addr":"2c-41-a1-14-2e-b1"
    },
    {
      "bt_addr":"d7-76-54-22-b4-b1"
    }
  ]
}
Remote BLE read from Web client

Device ← Gateway (BLE Read) ← ... ← Client (GET)

$ curl -v https://LOCAL_IP/devices\nd7-76-54-22-b4-b1/0x180d/0x2a37/value
{
   "value": 180
}
IoT reference model

Device
Sensor or Actuator

Local Gateway

Cloud Backend

3rd-party Service

Client

User

Physical Interaction

Virtual Interaction

IoT reference model diagram showing the interaction between a device (sensor or actuator), local gateway, cloud backend, 3rd-party service, client, and user, highlighting physical and virtual interactions.
Features & Specifications

- 32Bit Dual Core 240MHz
- RISC-V ultra low power core
- 2.4GHz Wifi - 802.11b/g/n
- Bluetooth 5, BLE + Mesh
- 16MB QSPI Flash
- 8MB Extra QSPI PSRAM
- USB-C Connector
- Reverse USB back-feed protection
- 2x 700mA 3.3V LDO Regulator
- Ultra low deep sleep current
- 2x STEMMA connectors
- Low Power RGB LED
- VBAT voltage check and 5V presence detection
- LiPo Battery Charging
- Power (red), Charge (orange) LEDs
- 21x GPIO broken out
- USB Serial JTAG
- 3D High Gain Antenna
- Compatible with FeatherWings
#include <WiFi.h>  // or similar

void setup() {
    Serial.begin(115200);  // for debug output
    WiFi.begin("MY_SSID", "MY_PASSWORD");
    while (WiFi.status() != WL_CONNECTED) {
        delay(500);
    }
    Serial.println(WiFi.localIP());
}

Here's the full example.
An IoT device with Wi-Fi can send data to a backend. The Wi-Fi router acts as a transparent local gateway.
Heart rate monitor

Channel ID: 609513
Author: dexter
Access: Public

Field 1 Chart

06:00 06:05 06:10
0 100 200

thingSpeak.com