





# Nerd Test

“Nerds like us are allowed to be unironically enthusiastic about stuff. Nerds are allowed to love stuff, like jump-up-and-down-in-the-chair-can’t-control-yourself love it. When people call people nerds, mostly what they’re saying is ‘you like stuff.’ Which is just not a good insult at all. Like, ‘you are too enthusiastic about the miracle of human consciousness’.”

—John Green

# Core Bluetooth

CocoaConf Columbus 2015

“Any sufficiently advanced technology is  
indistinguishable from magic.”

—Arthur C. Clarke

CocoaConfService Crashed

Crashlog generated in ~/Library/Logs/  
DiagnosticReports

Presentation functionality temporarily  
limited.

# Session Overview

- Bluetooth Classic
- Bluetooth Low Energy
- Core Bluetooth
- Demos
- Q&A

Bluetooth Classic

# Mac

- “Bluetooth Framework”
- IOBluetooth
- IOBluetoothDeviceInquiry

# iOS

- ExternalAccessory framework
- MFi authentication co-processor
- EAccessoryManager
- EASession

# Bluetooth Low Energy

# What is BLE?

- Not backwards compatible
- Low bandwidth
- Designed for low energy usage and low-cost radios
- New technology

# Data through thin air

- ISM band (2402 MHz to 2482 MHz)
- 40 channels, 2 MHz apart
- Channels 0 through 36 used for communication
- Channels 37, 38, 39 used for advertising

# Roles

- Central (“master”)
- Peripheral (“slave”)

# Central

- Cell phone, computer
- Discoverer
- Client
- Request initiator
- Non-exclusive connection

# Peripheral

- iBeacon, remote control, thermometer, wearable
- Advertiser
- Server
- Request responder
- Exclusive connection

# Attribute Protocol (ATT)

- Peripheral acts as an attribute server
- Central acts as an attribute client
- Similar to client-server model of the web

# Characteristic

- A piece of data
- Identified by UUID
- Reusable, no defined behavior

# Characteristic Operations

- Read
- Write (with or without response)
- Notify
- Indicate

# Notify vs Indicate

- Notifications are not acknowledged
- Indications are acknowledged
- (This is abstracted by Core Bluetooth)

# Example Characteristic

## Name: Body Sensor Location

Type: [org.bluetooth.characteristic.body\\_sensor\\_location](#) [Download](#) / [View](#)

Assigned Number: 0x2A38

### Value Fields

Names	Field Requirement	Format	Minimum Value	Maximum Value	Additional Information																		
Body Sensor Location	Mandatory	8bit	N/A	N/A	<p>Enumerations</p> <table border="1"><thead><tr><th>Key</th><th>Value</th></tr></thead><tbody><tr><td>0</td><td>Other</td></tr><tr><td>1</td><td>Chest</td></tr><tr><td>2</td><td>Wrist</td></tr><tr><td>3</td><td>Finger</td></tr><tr><td>4</td><td>Hand</td></tr><tr><td>5</td><td>Ear Lobe</td></tr><tr><td>6</td><td>Foot</td></tr><tr><td>7 - 255</td><td>Reserved for future use</td></tr></tbody></table>	Key	Value	0	Other	1	Chest	2	Wrist	3	Finger	4	Hand	5	Ear Lobe	6	Foot	7 - 255	Reserved for future use
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7 - 255	Reserved for future use																						

# Service

- A collection of characteristics and sub-services
- Defines behavior of characteristics on server
- Immutable: a published service should not be change

# Example: Heart Rate Service

- [https://developer.bluetooth.org/  
TechnologyOverview/Pages/HRS.aspx](https://developer.bluetooth.org/TechnologyOverview/Pages/HRS.aspx)

# Profile

- A profile is a use case or application
- Defines services the server must provide

# Example Profile: Heart Rate

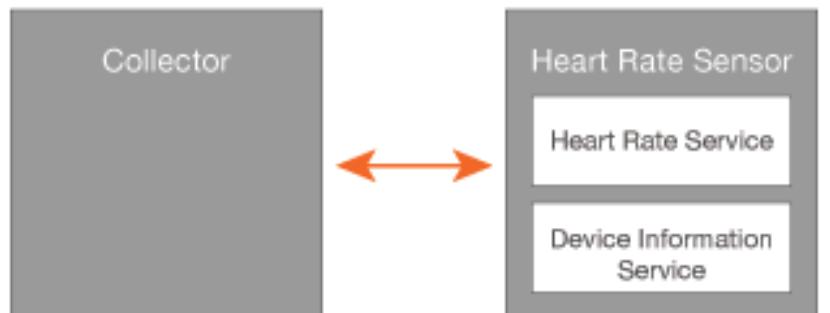
## Heart Rate Profile (HRP)

The Heart Rate Profile (HRP) enables a Collector device to connect and interact with a Heart Rate Sensor for use in fitness applications.

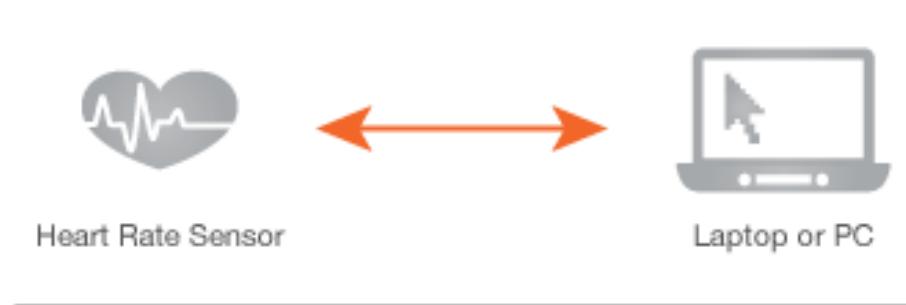
### Usage Scenarios

The Heart Rate Profile allows heart rate information to be sent from one sensor (heart rate monitor) to another device, such as at a doctor's office. A nurse or doctor could take a patient's heart rate and have that information automatically uploaded to the patient's file.

#### Role and Service Relationships



#### Example HRP



# Example Device: TiWi uB1

- Bluetooth 4.0 (TI CC2541)
- Integrated microprocessor
- 11.6 x 17.9 mm
- Full disclosure: My company made it



# Core Bluetooth

# Swift 2.0

```
enum NewSwiftFeatures {  
    case Guard  
    case ErrorHandling  
    case Availability  
    case ProtocolExtensions  
    case ObjcNullability  
    case ObjcGenerics  
}
```

# Wait for power-up

- CBCentralManager
- CBCentralManagerDelegate
  - centralManagerDidUpdateState:
- Wait for state to be .PoweredOn

# Scan for peripherals

- CBCentralManager
  - scanForPeripheralsWithServices:  
options:
- CBCentralManagerDelegate
  - centralManager:  
didDiscoverPeripheral:  
advertisementData:  
RSSI:

# Connect to peripheral

- Keep a strong reference to your peripheral
- CBCentralManager
  - connectPeripheral:  
options:
- CBCentralManagerDelegate
  - centralManager:  
didConnectPeripheral:

# Discover services

- Act as the peripheral's  
CBPeripheralDelegate
- CBPeripheral
  - discoverServices:
- CBCentralPeripheralDelegate:
  - peripheral:  
didDiscoverServices:

# Discover characteristics

- CBPeripheral
  - discoverCharacteristics:forService:
- CBCentralPeripheralDelegate
  - peripheral:  
didDiscoverCharacteristicsForService:  
error:

# Read a value

- CBPeripheral
  - readValueForCharacteristic:
- CBCentralPeripheralDelegate
  - peripheral:  
didUpdateValueForCharacteristic:  
error:

# Write a new value

- CBPeripheral
  - writeValue:  
forCharacteristic:  
type:
- If type is .WithResponse ...
- CBCentralPeripheralDelegate:
  - peripheral:  
didWriteValueForCharacteristic:  
error:

# Subscribe for notifications

- Core Bluetooth abstracts notification vs indication
- CBPeripheral
  - setNotifyValue:  
forCharacteristic:
- CBCentralPeripheralDelegate
  - peripheral:  
didUpdateValueForCharacteristic:  
error:

# Further Reading

- Bluetooth Low Energy: The Developer's Handbook (ISBN 978-0132888363)
- Bluetooth for Developers: <https://developer.apple.com/bluetooth/>
- Core Bluetooth Framework Reference
- Bluetooth Classic
  - ExternalAccessory Framework Reference
  - Bluetooth Framework Reference

# Demo: Swift State Machine

# Demo: Light Blue

Thanks for listening.  
Here's a kitten.



# Q&A

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[github.com/wjlafrance/cocoaconf](https://github.com/wjlafrance/cocoaconf)

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