



Bluetooth 4.0 Solutions for Apple iOS Devices

Bluegiga Technologies

Agenda

- Introduction
- How to build Bluetooth 4.0 applications
- Compatible Bluegiga products
- What is *Bluetooth* low energy?
- Summary

Introduction

Compatible Apple products

- **Bluetooth 2.1 + EDR compatible devices are:**
 - iPhone 3G, 3GS, 4 and original
 - iPod Touch 2nd generation and later
 - iPad and iPad2
- **Bluetooth 4.0 compatible devices are**
 - iPhone 4S
 - MacBook Air
 - Mac Mini



Supported *Bluetooth* profiles

Bluetooth 2.1 + EDR

Device	Hands-Free Profile (HFP 1.5)	Phone Book Access Profile (PBAP)	Advanced Audio Distribution Profile (A2DP)	Audio/Video Remote Control Profile (AVRCP)	Personal Area Network Profile (PAN)	Human Interface Device Profile (HID)
iPhone 3GS and later	✓	✓	✓	✓	✓	✓
iPhone 3G	✓	✓	✓	✓	✓	-
Original iPhone	✓	✓	-	-	-	-
iPad 2	✓	-	✓	✓	✓	✓
iPad	-	-	✓	✓	✓	✓
iPod touch (4th generation)	✓	-	✓	✓	✓	✓
iPod touch (2nd and 3rd generation)	-	-	✓	✓	✓	✓



Bluetooth 4.0

- Profiles are developed as Apps available from App Store

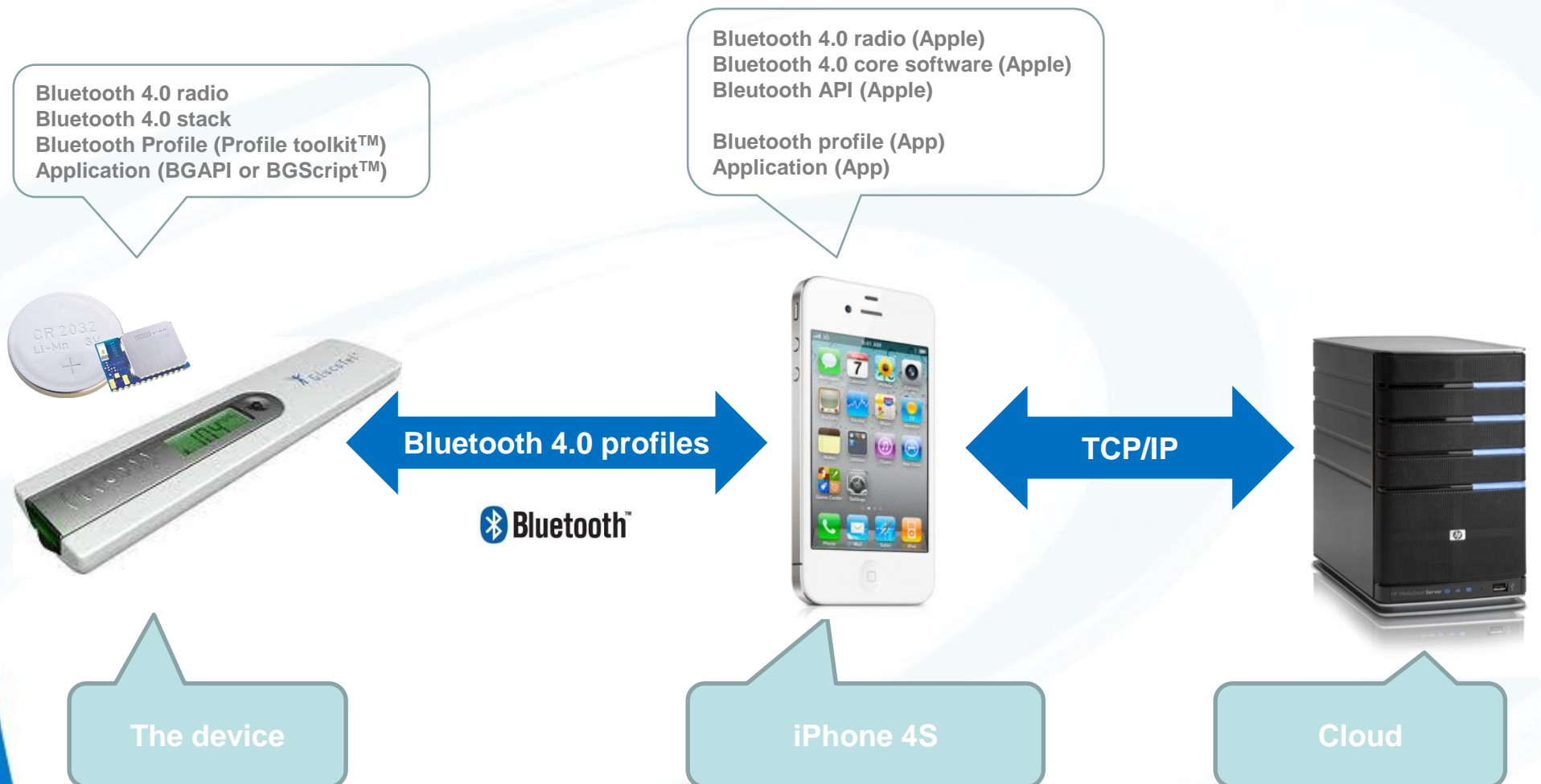
Supported *Bluetooth* 4.0 profiles

- On iOS devices the profiles are implemented as Applications
 - Downloaded from App Store
- Profiles are developed with Apple xCode SDK
 - Provides CoreBluetoothFramework APIs
- API provides access to
 - Discover devices
 - Connect devices
 - Exchange data
- No authentication chip, no license fee to Apple



How to build *Bluetooth* 4.0 applications

The Architecture



The Device

- **Integrate BLE112 *Bluetooth* 4.0 single mode module**
 - Contains *Bluetooth* 4.0 single mode radio
 - Peripheral interfaces (I²C, GPIO, ADC, SPI, USB, UART etc.)
- **Integrate BLE112 *Bluetooth* 4.0 single mode software**
 - BLE112 contains *Bluetooth* 4.0 single mode stack
 - Develop profile with Profile Toolkit™
 - If you have external MCU
 - Use BGLib library to control BLE112
 - No external MCU in the product
 - Develop the application into BLE112 with BGScript™
 - Examples exists for several applications
- **No *Bluetooth* qualification for parts Bluegiga has qualified**
- **No authentication processor needed**

iPhone 4S

- **Develop the *Bluetooth* profile as application**
 - Profiles are very simple and require little specification
 - Specs available at : www.bluetooth.org/spec
- **Develop the user interface and other application functionality**
 - Use xCode SDK and APIs from Apple
- **Use Bluegiga's example application as a starting point**
 - Shows how to discover and connect Bluetooth 4.0 devices
 - Basic data transfer examples
- **No *Bluetooth* qualification needed for applications**



Compatible Bluegiga products

Bluetooth 4.0 single mode module

- **Bluetooth v.4.0, single mode compliant**
 - Supports master and slave modes
 - 4+ connections in master mode*
- **Integrated Bluetooth low energy stack**
 - GAP, GATT, L2CAP, SMP
 - Bluetooth low energy profiles
- **Radio performance**
 - Transmit power: +3 dBm to -23dBm
 - Receiver sensitivity: -87dBm to -93dBm
- **Ultra low current consumption**
 - Transmit: 27mA (0 dBm)
 - Receive: 19.6mA
 - Sleep mode 3: 0.5uA
- **Programmable 8051 processor for embedding full applications**
- **Bluetooth end product, CE, FCC and IC qualified***





Bluetooth 4.0 single mode USB dongle

- ***Bluetooth v.4.0, single mode compliant***
 - Supports master and slave modes
 - 4+ connections in master mode
- ***Integrated Bluetooth low energy stack***
 - GAP, GATT, L2CAP, SMP
 - *Bluetooth* low energy profiles
- ***Radio performance***
 - Transmit power: +3 dBm to -23dBm
 - Receiver sensitivity: -87dBm to -93dBm
- ***Integrated USB device classes***
 - USB communications device class
 - USB HID device class*
- ***Bluetooth end product, CE, FCC and IC, South-Korea and Telec qualified****



* In progress



Bluetooth 4.0 single mode stack software

- ***Bluetooth v.4.0, single mode compliant***
 - Supports master and slave modes in a single firmware
 - 4+ connections in master mode
- ***Supports following protocols***
 - SMP, ATT, L2CAP signalling
- ***Supports following profiles***
 - GAP, GATT
 - Any standard *Bluetooth* GATT profile (with Profile toolkit)
 - Any manufacturer specific GATT profile (with Profile toolkit)
- ***Integration options***
 - BGAPI binary host protocol over UART, USB or SPI
 - BGLib host library (ANSI C) – implements BGAPI
 - BGScript™ scripting language for application on-board BLE112
- ***Ultra low memory requirements***
 - RAM: 2kB
 - Flash: 40-50kB
- ***Bluetooth v4.0 host subsystem qualified***

Summary

Summary

Bluegiga's solution enables quick development

- No *Bluetooth* hardware development required
- Very little *Bluetooth* software development needed
- No *Bluetooth* qualification needed for Bluegiga qualified parts
- Development time : 1-3 months



Bluegiga's solution enables simple development

- Profiles are developed with simple XML schema
- Simple BGAPI protocol and BGLib C-library for the host exist
- For standalone applications simple BGScript scripting can be used
- Development time : 1-4 weeks

Summary

Quick development of Apps and *Bluetooth* profiles

- Profile can be developed as App - No need to wait for the profile to be supported by the phone manufacturer
- Profiles are very simple
- Sample application available for Bluegiga
- Development time : 1-3 weeks



Bluegiga enables fast time to market for accessory vendors

- Short hardware and software development times
- Very little – if no qualification needed at all

Bluegiga lowers the development costs

- Development costs in the range of \$5-20k

Summary

- Join MFi program
 - <http://developer.apple.com/programs/mfi/>
 - Gives you access to Apple documents and tools
- Buy Bluegiga's *Bluetooth* 4.0 products
 - <http://www.bluegiga.com/oem-module-distributors>
- Develop the product
 - <http://techforum.bluegiga.com>
 - support@bluegiga.com
- Go to production



What is *Bluetooth* low energy?

***Bluetooth* low energy (*Bluetooth* 4.0)** is designed for new emerging applications such as:

- Health and fitness
- Consumer medical
- Smart energy
- Security
- Proximity and presence

It still embraces the same features we already know from the classical, well established *Bluetooth* technology:

- Robustness and reliability
- Security
- Global availability
- Interoperability

***Bluetooth* low energy devices come in two flavours:**

- ***Single-mode*** - devices that only support *Bluetooth* low energy and are optimized for low-power, low-cost and small size solutions.
- ***Dual-mode*** - devices that support *Bluetooth* low energy and classical *Bluetooth* technologies and are interoperable with all the previously *Bluetooth* specification versions.



Thank you!

www.bluegiga.com