Bluetooth 4.0 Solutions for Apple iOS Devices

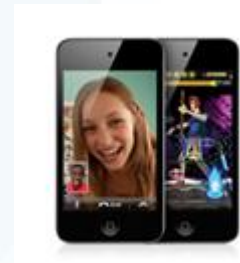**Bluegiga Technologies**

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

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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
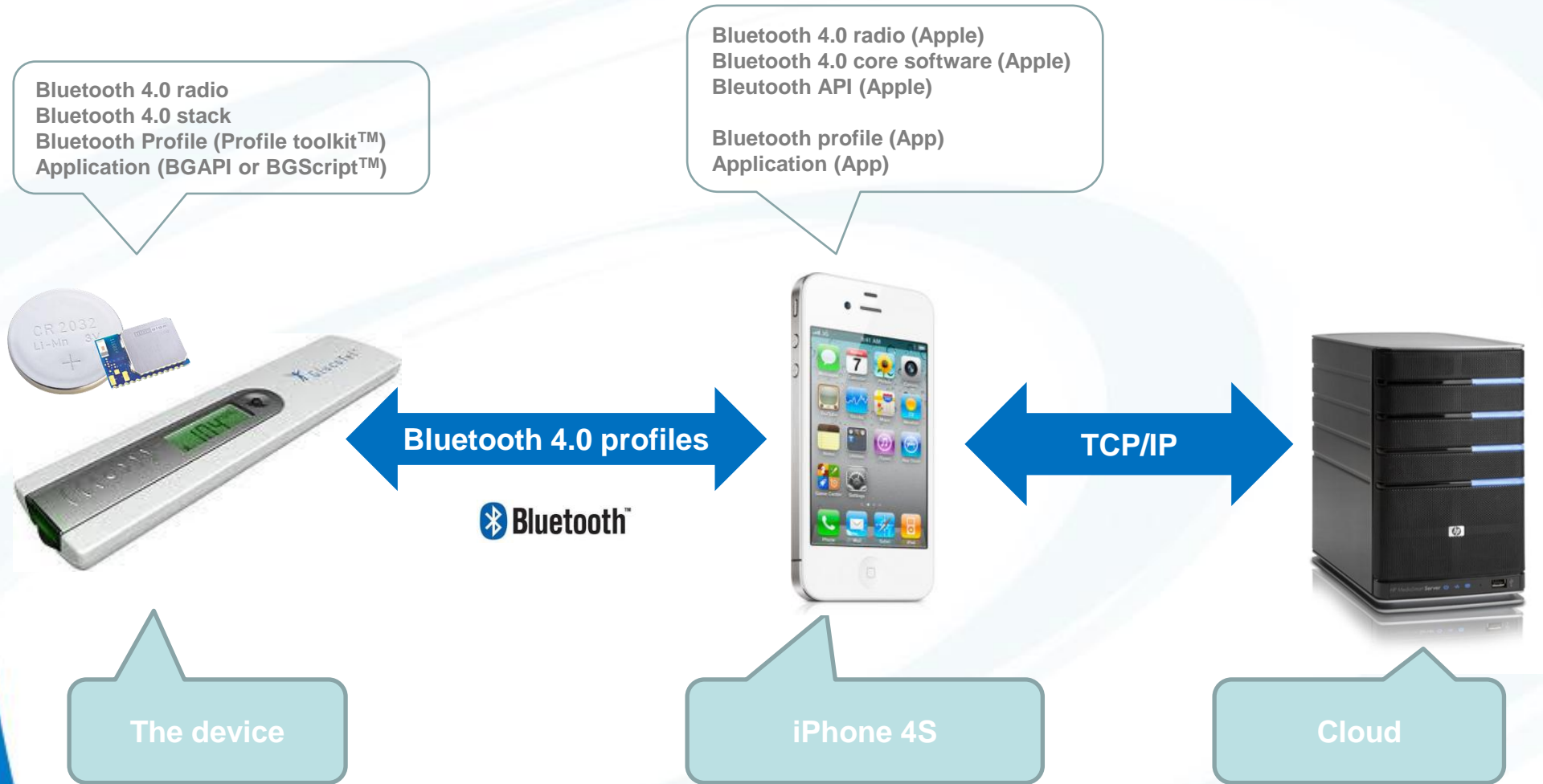
Supported *Bluetooth* 4.0 profiles

- **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

Bluetooth 4.0 radio
Bluetooth 4.0 stack
Bluetooth Profile (Profile toolkit™)
Application (BGAPI or BGScript™)

Bluetooth 4.0 radio (Apple)
Bluetooth 4.0 core software (Apple)
Bleutooth API (Apple)

Bluetooth profile (App)
Application (App)

Bluetooth 4.0 profiles

TCP/IP

The device

iPhone 4S

Cloud

The Device

- **Integrate BLE112 *Bluetooth* 4.0 single mode module**
  - Contains *Bluetooth* 4.0 single mode radio
  - Peripheral interfaces (I^{2}C, 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^{TM}
  - If you have external MCU
    - Use BGLib library to control BLE112
  - No external MCU in the prodcut
    - Develop the application into BLE112 with BGScript^{TM}
    - Examples exists for several applications

- **No *Bluetooth* qualification for parts Bluegiga has qualified**

- **No authentication processor needed**

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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 fuctionality**
  - 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 trasfer 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*

In progress

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 is 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 lanugage 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 manfacturer
- 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.

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Thank you!

www.bluegiga.com