

BLUETOOTH SMART

GETTING STARTED

Saturday, 13 October 2012

Version 1.5



Copyright © 2001 - 2012 Bluegiga Technologies

Bluegiga Technologies reserves the right to alter the hardware, software, and/or specifications detailed herein at any time without notice, and does not make any commitment to update the information contained herein. Bluegiga Technologies assumes no responsibility for any errors which may appear in this manual. Bluegiga Technologies' products are not authorized for use as critical components in life support devices or systems.

Bluegiga Access Server, Access Point, AX4, BSM, iWRAP, BGScript and WRAP THOR are trademarks of Bluegiga Technologies.

The *Bluetooth* trademark and logo are registered trademarks and are owned by the Bluetooth SIG, Inc.

ARM and ARM9 are trademarks of ARM Ltd.

Linux is a trademark of Linus Torvalds.

All other trademarks listed herein belong to their respective owners.

TABLE OF CONTENTS

1. Introduction	4
2. What is Bluetooth Smart	5
2.1 Classic Bluetooth vs. Bluetooth low energy	6
2.2 Backwards compatibility	7
2.3 Bluetooth Smart branding	8
2.4 More information	10
3. Bluegiga's Bluetooth 4.0 products	11
3.1 BLE112 - Bluetooth Smart Module	11
3.2 BLED112 - Bluetooth 4.0 single mode USB dongle	13
3.3 DKBLE112 - BLE112 Development Kit	14
3.4 Bluetooth Smart software	15
3.4.1 <i>Bluetooth</i> Smart software	15
3.4.2 BGAPI protocol	16
3.4.3 BGLib library	16
3.4.4 BGScript scripting language	17
3.4.5 Profile Toolkit	18
3.5 More information	18
4. Getting started with Bluetooth 4.0 development	19
4.1 Documentation and Tools	20
5. Contact information	21

1 Introduction

This document is meant to provide a short introduction to *Bluetooth* Smart technology and to Bluegiga's *Bluetooth* Smart products. The purpose of this document is not to give a deep technology or product overview, but should act more as an introduction to both of them and give the necessary information to continue studying.

The document is organized into two sections. Firstly a quick introduction to *Bluetooth* Smart technology is given and then the Bluegiga's *Bluetooth* Smart product family is discussed.

2 What is Bluetooth Smart

Bluetooth low energy (*Bluetooth* 4.0) is a new, open standard developed by the *Bluetooth* SIG. It's targeted to address the needs of new modern wireless applications such as ultra-low power consumption, fast connection times, reliability and security. *Bluetooth* low energy consumes 10-20 times less power and is able to transmit data 50 times quicker than classical *Bluetooth* solutions.

Link: [How Bluetooth low energy technology works?](#)

Bluetooth low energy is designed for new emerging applications and markets, but it still embraces the very same benefits we already know from the classical, well established *Bluetooth* technology:

- **Robustness and reliability** - The adaptive frequency hopping technology used by *Bluetooth* low energy allows the device to quickly hop within a wide frequency band, not just to reduce interference but also to identify crowded frequencies and avoid them. On addition to broadcasting *Bluetooth* low energy also provides a reliable, connection oriented way of transmitting data.
- **Security** - Data privacy and integrity is always a concern in wireless, mission critical applications. Therefore *Bluetooth* low energy technology is designed to incorporate high level of security including authentication, authorization, encryption and man-in-the-middle protection.
- **Interoperability** - *Bluetooth* low energy technology is an open standard maintained and developed by the *Bluetooth* SIG. Strong qualification and interoperability testing processes are included in the development of technology so that wireless device manufacturers can enjoy the benefit of many solution providers and consumers can feel confident that equipment will communicate with other devices regardless of manufacturer.
- **Global availability** - Based on the open, license free 2.4GHz frequency band, *Bluetooth* low energy technology can be used in world wide applications.

There are two types of *Bluetooth* low energy devices:

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

Key features of *Bluetooth* low energy wireless technology include:

- Ultra-low peak, average and idle mode power consumption
- Ability to run for years on standard, coin-cell batteries
- Low cost
- Multi-vendor interoperability
- Enhanced range

Bluetooth low energy is also meant for markets and applications, such as:

- [Automotive](#)
- [Consumer electronics](#)
- [Smart energy](#)
- [Entertainment](#)
- [Home automation](#)
- [Security & proximity](#)
- [Sports & fitness](#)

2.1 Classic Bluetooth vs. Bluetooth low energy

The table below shows a high level comparison between classic *Bluetooth* (also known as *Bluetooth BR/EDR*) and *Bluetooth* low energy technologies.

Technical specification	Classic <i>Bluetooth</i> technology	<i>Bluetooth</i> low energy technology
Radio frequency	2.4GHz	2.4GHz
Distance/Range	~10-100 meters	~10-100 meters
Symbol rate	1-3Mbps	1Mbps
Application throughput	0.9 – 2.1Mbps	0 - 250 kbps
Nodes/Active slaves	7	Theoretically unlimited
Security	56 to 128 bit	128-bit AES
Robustness	FHSS	FHSS
Latency (from not connected state to send data)	100+ ms	as low as 6ms
Government regulation	Worldwide	Worldwide
Certification body	Bluetooth SIG	Bluetooth SIG
Voice capable	Yes	No
Network topology	Point-to-point, scatternet	Point-to-point, star
Power consumption	1 (reference value)	0.01 to 0.5 (use case dependent)
Service discover	Yes	Yes
Profile concept	Yes	Yes
Primary use cases	Mobile phones, headsets, stereo audio, automotive, PCs etc.	Mobile phones, gaming, PCs, sport & fitness, medical, automotive, industrial, automation, home electronics etc.
Profiles	Serial Port, Hands-Free, OBEX, A2DP etc.	Proximity profile, Battery status, Weight scale, Heart rate monitor, Humidity etc.

2.2 Backwards compatibility

Bluetooth 4.0 single mode (*Bluetooth Smart*) devices are not inter-operable with classic *Bluetooth* devices such as *Bluetooth 2.1 + EDR* devices. Single mode devices are only compliant with other *Bluetooth 4.0* devices.

The *Bluetooth 4.0 dual mode (Bluetooth Smart Ready)* devices on the other hand are backwards compatible and can be connected to all other *Bluetooth* devices, even those supporting the very old 1.0 standard. The dual mode devices typically are mobile phones and PCs which are not as power constrained as the single mode devices and need to support uses cases like hands-free or stereo headset connectivity.

If specification versions are used, then all *Bluetooth v.4.0* are inter-operable with each other, but NOT all *Bluetooth v.4.0* devices are inter-operable with older specification versions.

2.3 Bluetooth Smart branding

Bluetooth Smart Ready devices are the most effective way to connect to billions of *Bluetooth* devices in the market today, and the over 5 million *Bluetooth* enabled devices commercialized every single day. Examples include phones, tablets, PCs, TVs, even set-top boxes and game consoles that sit at the center of the consumers' connected world. These devices efficiently receive data sent from Classic *Bluetooth* devices and *Bluetooth*Smart devices and feed it into applications that turn data into useful information. These are the hub devices of the *Bluetooth* ecosystem. [Source : [Bluetooth SIG](#)]



To bear *Bluetooth* Smart Ready mark, a device must meet three criteria:

- Be built to *Bluetooth* v4.0 specifications with GATT-based architecture
- Feature a dual-mode low energy radio
- Allow consumers to update the device software










Bluetooth Smart devices are designed to gather a specific type of information – are all the windows on my house locked, what is my blood glucose level, how much do I weigh today? – and send it to a *Bluetooth* Smart Ready device. Examples include heart-rate monitors, blood-glucose meters, smart watches, window and door security sensors, car key fobs, and blood-pressure cuffs – the opportunities are endless. [Source : [Bluetooth SIG](#)]



To bear the *Bluetooth* Smart mark, the device must meet these three criteria:

- Be built to *Bluetooth* v4.0 specifications with GATT-based architecture
- Feature a single-mode low energy radio
- Use the GATT-based architecture to enable particular functionality of the device

Compatibility

If your product bears this logo...	It's compatible with products bearing any of these logos...
	  
	 
	

More information:

- https://www.bluetooth.org/apps/content/default.aspx?doc_id=242825

2.4 More information

Want to learn more about *Bluetooth* low energy technology? Please have a look at the following material and links:

How it works (video):

- <http://www.youtube.com/watch?v=r6Re7-kldhs>

Bluetooth specifications:

- <https://www.bluetooth.org/Technical/Specifications/adopted.htm>

Bluetooth developer web site

- <http://developer.bluetooth.org/>

Bluetooth SIG's Bluetooth low energy web sites:

- <https://www.bluetooth.org/Events/Training/LowEnergyTraining.htm>
- <http://bluetooth.com/Pages/Low-Energy.aspx>

Bluetooth low energy at Wikipedia:

- http://en.wikipedia.org/wiki/Bluetooth_low_energy