

Bluetooth Technology : An Overview

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ABSTRACT

Present paper describes the Bluetooth wireless technology which is a widely used standard for the replacement of cables. Simply stated, Bluetooth is a wireless communication protocol. Since it's a communication protocol, you can use Bluetooth to communicate to other Bluetooth-enabled devices. In this sense, Bluetooth is like any other communication protocol that you use every day, such as HTTP, FTP, SMTP, or IMAP. Between the principal characteristics, must be named the hardiness, low complexity, low consume and low cost. The Bluetooth is a small microchip that operates in a band of available frequency throughout the world. Communications can realize point to point and point multipoint. In the paper firstly detailed description of Bluetooth along with its history is given. Description also includes specifications of the Bluetooth and Bluetooth modules and architecture. Further applications of the Bluetooth wireless technology is described.

Keywords: Bluetooth, History, Specification, Application

I. INTRODUCTION

In recent years, wireless connectivity has been an active area of research as we have perceived a large number of government and industry initiatives, research efforts and standard activities that have aimed at enabling wireless and mobile networking technologies. As a result, today we have a diverse set of wireless access technologies from satellite networks, to wide area cellular systems, and from wireless local loop and PCS to wireless LANs [1]. Bluetooth is a recently proposed standard for short range, low power wireless communication. It is a way to connect and exchange information and data between mobile phones, laptops, digital cameras and video games. The communication is wireless and has the range of up to 10 meters. Imagine the situation. You go to your office. You connect your notebook to the LAN port. You switch it on [2]. Low cost and

low power consumption make it an attractive solution typically for the mobile devices [3].

II. HISTORY OF BLUETOOTH TECHNOLOGY

In the year 1994, the company of telecommunications ERICSSON, investigate the viability of a radio low cost interface between mobile telephones and the accessories. The objective was to eliminate the cables between the mobile telephones and cards of PCs, headsets, desktop devices, etc. At the beginning of 1997, Ericsson communicated with manufacturers of portable devices to increase the interest in this technology. The motive was simple: in order that the system was successful and really usable, a critical quantity of portable devices should use the same technology. In 1998, five companies, Ericsson, Nokia, IBM, Toshiba and Intel, founded a Group of Special Interest (SIG). The goal was to establish the creation of a global specification for

connectivity without wires of short scope. In 1998, Bluetooth's consortium was announced to the general public of London (England), San Jose (California) and Tokyo (Japan). That global announcement provokes the adoption of the technology for several companies. The objective of the association was to establish a standard device and software that controls it.

Why the name Bluetooth?: Harald I Bluetooth (Danish Harald Blatand) was the King of Denmark between 940 and 985 AD. The name "Blatand" was probably taken from two old Danish words, 'bla' meaning dark skinned and 'tan' meaning great man. He was born in 910 as the son of King Grom. (King of Jutland, the main peninsula of Denmark) and his wife Thyre Danebold (daughter of King Ethelred of England). Like many Vikings, Harald considered it honorable to fight for treasure in foreign lands. When Harald's sister Gunhild was widowed after the death of the violent Norwegian king Erik Blood Axe, she came to Denmark to seek Harald's help in securing control of Norway. Harald took the opportunity to seize control himself. By 960 he was at the height of his powers, ruling over both Denmark and Norway. He was baptized by a priest named Poppo, sent by the German emperor. He then created a monument that read: "King Harald raised this monument to the memory of Grom his father and Thyre his mother. Harald conquered all of Denmark and Norway and made the Danes Christian". These words were also carved in stone called rune stones. Harald was killed in a battle in 985. Harald completed the country's unification begun by his father, converted the Danes to Christianity, and conquered Norway. The expansion begun by Harald in Norway was continued by his son Sweyn I, who conquered England in 1013. Under Sweyn's son Canute there grew up a great Anglo-Scandinavian kingdom that included parts of Sweden.

The reason of the name is that in the 10th century the king Harald II of Denmark, nicknamed "blue tooth" because of a disease that was giving him this

coloration to his denture, reunified under his reign numerous small kingdoms that existed in Denmark and Norway and that were working with different rules, the same thing that does the technology Bluetooth, promoted by Ericsson (Sweden) and Nokia (Finland), two Scandinavian countries [4, 5].

III. SPECIFICATION OF BLUETOOTH

The Bluetooth Specification defines the requirements ensuring interoperable operation between Bluetooth devices from different manufacturers. The Bluetooth Specification is work-in progress and any material presented here is preliminary and subject to change without notice. The Specification draft is composed of two sets of documents: the radio and protocol definitions, and the compliance requirements.

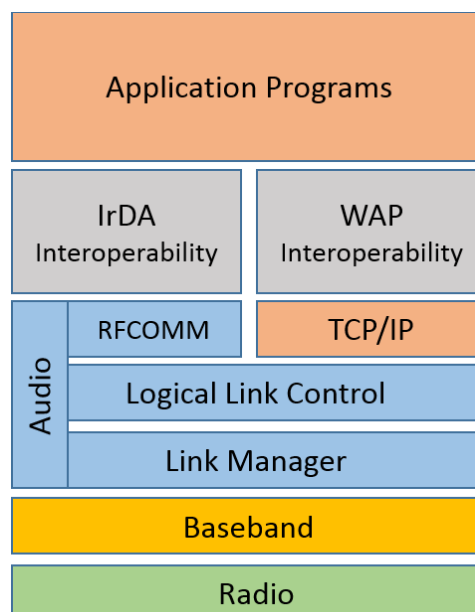


Figure 1. Application framework

Figure. 1 outlines the application framework in the context of the radio and protocol stack. The Radio takes care of sending and receiving modulated bit streams. The Baseband (BB) protocol defines the timing, framing, packets, and flow control on the link. The Link Manager (LM) assumes the responsibility of managing connection states, enforcing fairness among slaves, power management, and other management tasks. The Logical Link Control handles multiplexing of higher level

protocols, segmentation and reassembly of large packets, and device discovery. Audio data is mapped directly on to the Baseband while audio control is layered above the logical link control. Above the data link layer, RFCOMM and network level protocols provide different communication abstractions. RFCOMM provides serial cable emulation using a subset of the ETSI GSM 07.10 standard [6]. Other parts of the Bluetooth Specification deal with interoperability with other protocols and protocol stacks. Defining TCP/IP over Bluetooth requires that bridging, address resolution, MTU definition, and multicast/ broadcast mappings be solved. To accelerate the number of wireless-specific applications, the Bluetooth SIG is contemplating interoperability with higher layer IrDA _ and WAP_ protocol stacks._ For example, IrOBEX [7] defines a transport independent format and session protocol for object exchange and is used as the basis for a variety of applications from exchanging files and business cards to synchronizing address book and calendar schedules [8].

IV. VARIOUS BLUETOOTH MODULES

A. Parani BCD110

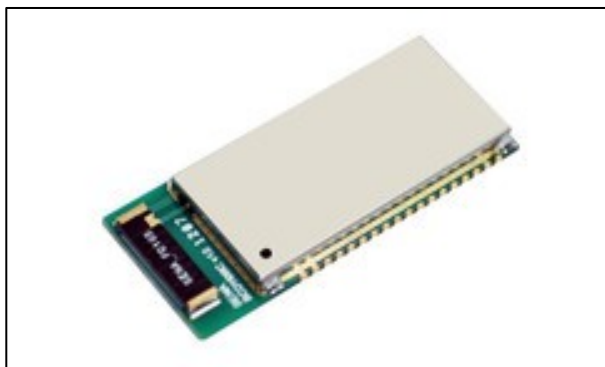


Figure 2. Image of Parani BCD110

Features of BCD110

- ✓ Bluetooth Class 1
- ✓ Supports Serial Port Profile (SPP)
- ✓ Bluetooth v2.0+EDR specification
- ✓ Standard HCI over Universal Asynchronous

Receiver/Transmitter (UART) or Universal Serial Bus (USB)

- ✓ Supports built-in chip, stub and dipole antennas
- ✓ Firmware upgrade via windows-based software (Parani Updater)
- ✓ Integrated 8Mbit Flash Memory
- ✓ Receive sensitivity: -90dBm (0.1% BER)

B. Connect blue: CB-OBS410x

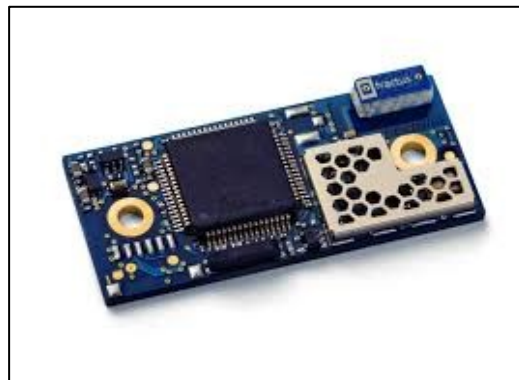


Fig. 3 Image of Connect blue: CB-OBS410x

Features of CB-OBS410x

- ✓ UART interface
- ✓ Compliant with Electromagnetic Compatibility (EMC), Safety and Medical standards
- ✓ Bluetooth v2.1 Qualified as End Product Easy configuration by AT commands
- ✓ Possible to load customer specific configuration in production Industrial and Automotive temperature range -30°C to +85°C
- ✓ Supports SPP Bluetooth connection to Google Android Operating System (OS) devices
- ✓ Maximum number of slaves: 1 (point-to-point)
- ✓ Configurable via AT commands (via Bluetooth or serial port)

C. Bluegiga WT41



Figure 4. Image of Bluegiga WT41

Features of Bluegiga WT41

- ✓ Exceptional radio performance having Transmit power : +20dBm and Receiver sensitivity: -90dBm
- ✓ Available with high efficiency chip antenna or connector
- ✓ Bluetooth 2.1+ EDR
- ✓ Interface Device Profile Audio/Video Remote Control Profile (AVRCP), Device Industrial temperature range -40°C to +85°C
- ✓ Supported Bluetooth profiles: SPP, DUN, profiles: SPP, DUN, Hands-Free Profile (HFP), Headset Profile

V. APPLICATIONS

1. Networking of PCs wirelessly in a very confined space where the requirement of bandwidth is less
2. Wireless communication between computer and its peripherals like keyboard, mouse, printer
3. Control and communication wirelessly of various devices
4. Transferring files, reminders, calendar appointments, details of contacts with Object Exchange (OBEX)
5. Places where low bandwidth and cable-free connection is desired
6. Two industrial Ethernet are bridged wirelessly
7. Transmission over short range of the data from the health sensor of the medical devices to set-top-box, mobile phone or dedicated telehealth devices

8. Wireless replacement of RS-232 serial cable used in variety of applications e.g. bar code scanners, traffic control devices, medical equipment
9. Real time identification of the location of objects to be tracked
10. Dial-up internet access using mobile phone as wireless modem
11. Bluetooth can be used in pole mounted Remote terminal units for the configuration and software updating purposes
12. Control Home Security Gadgets
13. A new wireless-type physiological signal measuring system using a Personal Digital Assistant (PDA) and the Bluetooth Technology
14. Use in wireless controllers of game consoles like Sony's Playstation3, Nintendo's Wii, PS vita and PSP Go [3, 11]

VI. CONCLUSION

This paper was intended to provide brief introduction to the Bluetooth technology. We have described many of the points including history of Bluetooth. Bluetooth is a standard used in links of radio of short scope, destined to replace wired connections between electronic devices like cellular telephones, Personal Digital Assistants (PDA), computers, and many other devices. Apart from this three different Bluetooth modules have been specified for their features and specifications and also comparison between the three is done on the basis of many parameters such as Bluetooth specification, operating voltage, receiver sensitivity, RF output power, supported Bluetooth profiles and last but not the least is cost which is a very significant parameter for selection of Bluetooth module.

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