Design and Development of Magical Mobile Updater for Automatic Information Synchronization

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ABSTRACT

Today wireless technologies have become more and more popular in our daily life, the most popular being in telecommunication and networking. Wireless technology has turned out to be convenient and widely uses as it is becoming an inexpensive option to replace fixed cables. There are many different wireless technologies around the world and they are implemented into different wireless devices for our daily use. In this paper, the state-of-art of Bluetooth technology is first reviewed. It aims to demonstrate use of Bluetooth wireless technology including its protocol and functionality by building an application to connect and communicate between wired and wireless devices. The key of this research is to evaluate whether utilization of Bluetooth technology can synchronize contents between a mobile phone and a server computer. The paper no only focuses on developing an application prototype of Magic Mobile Updater (MMU) for Bluetooth enabled devices, which addresses its security and connectivity, but also studies how wireless Bluetooth technology affects and improves our daily life in the near future.

KEYWORDS

Bluetooth, Synchronization, Nokia, Mobile, Magical Mobile Updater (MMU).

1. INTRODUCTION

Bluetooth is one of the leading wireless technologies and also the fastest growing standard wireless data communication technology in the world with the benefit of low power consumption at a low cost. Bluetooth is supported by many ICT (Information and Communication Technologies) companies, therefore a large number of Bluetooth applications and products have been introduced commercially. In recent years, Bluetooth has become a standard incorporated in a large number of Bluetooth devices ranging from keyboards, mice, and printers to handhelds, laptops, and mobile phones.

The objective of this paper is to demonstrate how Bluetooth technology establishes communication between devices. It starts off by researching Bluetooth technology background, protocol and compares with other wireless technologies, then design an application which can perform an automatic Bluetooth connectivity task between a mobile phone and a computer/server. The study focuses on using Bluetooth open-source code from Nokia PC connectivity API, to develop a Bluetooth-enabled application using Microsoft .NET. This application synchronizes files between mobile phone and a computer/server automatically.

The paper is organized in five Sections. In Section 2, wireless data communication technologies are presented and a review on Bluetooth technology is conducted. Then the system requirements for Magical Mobile Updater (MMU) are discussed in Section 3. In Section 4, the system design and development of the proposed MMU is presented. Finally conclusion is drawn and potential of the technology is discussed.

2. WIRELESS TECHNOLOGIES AND BLUETOOTH APPLICATIONS

2.1 Wireless Technologies

Wireless communication technologies have existed and been utilized for more than a hundred years. It traditionally utilizes radio wave frequency and/or microwaves to maintain communication channels between two or more devices [1]. A WPAN (wireless personal area network) is a personal area network, which is a network for interconnecting devices centered on an individual person's workspace, in which the connections are wireless. Typically, a wireless personal area network uses a technology that permits communication within about 10-100 meters. Example of such technologies are Zigbee, Infrared (IrDA), Radio-frequency identification (RFID), Ultra-Wideband (UWB), and Bluetooth as shown in Figure 1.
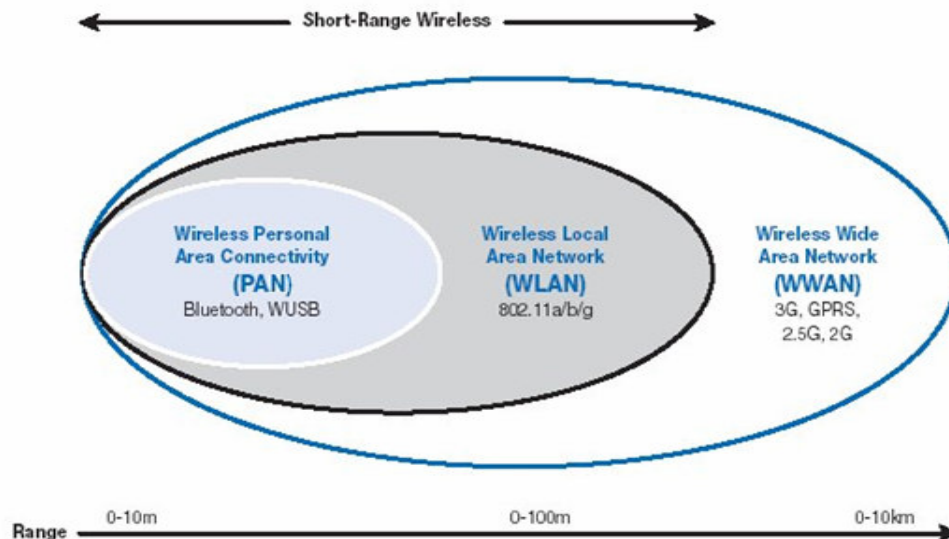

Figure 1. RF wireless data communications coverage range [1]

In principle, Bluetooth is a short-range wireless technology which can quickly synchronize devices such as mobile phone, laptop, PC, printer, digital camera, etc without using cables. Bluetooth is intended to replace the cables connecting to portable or fixed devices while maintaining a high level of security. It provides a better way to connect and exchange information between devices over a secure short-range radio frequency. Bluetooth wireless technology is mainly based on RF transceiver, baseband and protocol stack, which offer services, establish connections and communication between devices when they are in the range.

Bluetooth is also a low power and low processing wireless technology with an overhead protocol, which means it ideal for integration into small battery powered devices, therefore Bluetooth wireless technology could be implemented in every device including machinery and robots that are bound with cables. Applications and devices with build-in Bluetooth wireless technology are virtually endless.
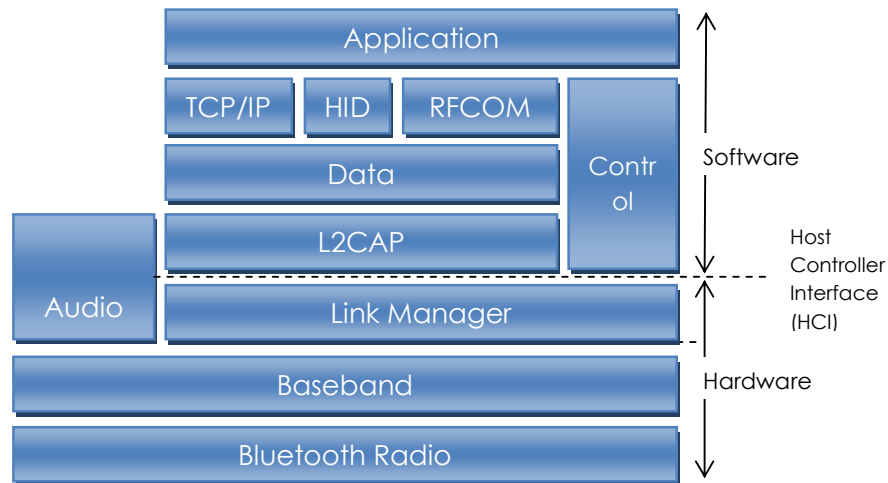

Figure 2. Bluetooth Protocol [2]

Bluetooth is a radio system that consists of three parts, hardware, software framework, and interoperability requirements as illustrated in Figure 2. The end result is a low-cost, low-power, short-range radio link for mobile devices and for WAN/LAN access points. Bluetooth's technical details are fairly basic. The radios operate in the 2.4-GHz ISM (Industrial, Scientific and Medical) Band. Bluetooth uses frequency-hopping techniques to keep communication flowing even in spaces that are "noisy". Calling for support of both synchronous and asynchronous communication, Bluetooth's synchronous bands are geared to carry relatively high-quality voice while the asynchronous communication support data at slightly more than 700 Kbps. Distance is limited to about 10 meters. Advanced error-correction methods are used to protect data, encryption and authentication routines for user's privacy and the technology provides a high transmission rate. The Bluetooth wireless technology supports both point-to-point and point-to-multipoint connections. With the current specification, up to seven 'slave' devices can be set to communicate with a 'master' radio in one device.

Bluetooth wireless technology is considered as the most popular short range wireless technology. With Bluetooth wireless technology, devices connecting within a short distance can be established quite easily and conveniently. Being widely used around the world with its unique concept, Bluetooth products no longer require the installation of software drivers. The Bluetooth wireless technology is available now in its fifth generation, and continues with its inherent advantages of small radio, low power, low cost, built-in security, easy to use and have instant networking abilities.

2.2 Bluetooth Applications

Figure 3. Wireless technologies widely used in our daily life [3]

As shown in Figure 3, the following list represents the possibility of Bluetooth potential applications in the near future, some of these applications already exist and some will come along soon:

- At Home

With the help of modern technology, more and more people are living freely and efficiently. They will also integrate into the technical fields outside their home, and technology applications will be extended to other aspects of family life. By using Bluetooth wireless technology, people can and would love to work from home under wireless environment, such as Bluetooth enabled Mouse, keyboards, printers, laptops, headsets and other consumer products. With these Bluetooth enabled devices, they are not only increasing the regional office of the beauty, but also for decoration and provide a more creative freedom of living. In addition, Bluetooth devices not only make it easier for home office, but also can make home entertainment more convenient.

- In Office

Usually, offices are full of clutter wires, and sometimes this can become a safety hazard. With Bluetooth wireless technology, offices would operate in orderly manner. PDA can be synchronized with a computer to share calendars or contact lists, peripheral equipment and computer communication can be direct, an officer would answer the call with Bluetooth headset, and all of which are connected without wires. However, Bluetooth wireless technology is not limited to the use of technology to solve the mess in office environment, but also create one's own instant network, enabling users to share files or help with conducting meetings.

- On move

People often shuttle between workplace, family and other destinations, and all kinds of new equipment and new technology are constantly influx of the market and ensure a mobile connectivity. Bluetooth wireless technology is now reliable to provide access to important information or personal communications connectivity. For example, with Bluetooth enabled mobile phones, PDAs, laptops, headphones and cars on the road, people are able to achieve hands-free communication conveniently.

3. SYSTEM CONFIGURATION AND REQUIREMENTS

3.1 System Requirements

- **Hardware Requirements**
  - 256MB of RAM minimum
  - 1GHz or faster Pentium class processor
  - 200MB of free disk space
  - A PC with Bluetooth device enabled or dongle
  - Mobile Phone with Bluetooth enabled

- **Software requirements**
  - Nokia PC Suit 6.84 or later, or Nokia PC connectivity Solution
  - Nokia PC connectivity API 3.2
  - Microsoft Window XP SP2/SP3
  - Microsoft Visual Studio 2005

Microsoft Window Vista is not recommending in this application, as it is not compactable with Nokia PC connectivity.

3.2 Development Platforms

There are no particular PC suit programs compatible with all mobile phones, because mobile phones are embedded with different devices and operating systems, and made by different companies. Even within the same company, it still needs different PC suit software for different mobile phone models. To study a Bluetooth connectivity which allows us to access all the paths and directories, it is hard to study all different brands of mobile phones, but the concept of paring Bluetooth devices should be the same. Thus, in this stage, the brand of Nokia would be the one we focus on.

3.3 Nokia PC Connectivity API

As the world's largest manufacturer of mobile telephone, Nokia's global device market share was about 40% in Q4 of 2007. It is a Finish multinational communication corporation, which is focused on wired and wireless telecommunications [1]. Nokia provides a range of open tools and SDKs that help developers to create applications for mobile platforms and devices by using Visual Studio .NET platform. With Nokia PC Connectivity API (PCCAPI), it enables application developers to add PC connectivity capabilities to applications for most series devices. PCCAPI is part of its PC Suite and takes advantage of the suite's existing capabilities.

It aims to deal directly with the complexities of the connectivity and transmission protocols for connected devices.
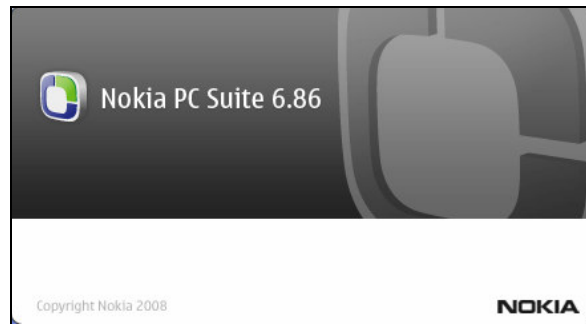

Figure 4. Nokia PC Connectivity 6.86

4. DESIGN AND DEVELOPMENT OF MAGICAL MOBILE UPDATER (MMU)

4.1 "MMU" Interface Design

As the program is aiming to save users' time, it means the interface should be kept simple and straight forward. A static GUI frame and a set of menu list would be allocated to the system, and all actions would be taken within this static GUI.
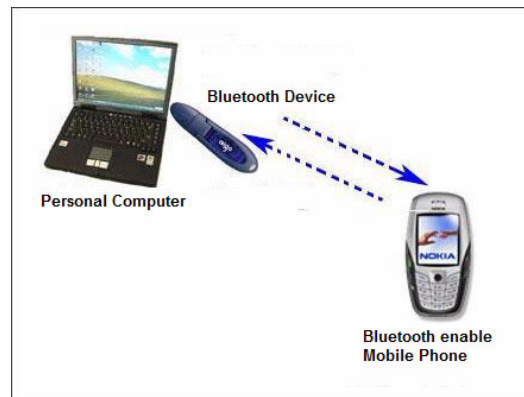

Figure 5. MMU GUI   Figure 6. Bluetooth-enabled Communication

MMU deals with certain actions, which is shown as Fig 5. A button of "Auto Update" allows users to update any new file(s) from their Mobile to Computer at once. As well as updating individual file one by one, either from Mobile to Computer or the other way around. A "Cancel" button for action canceling and a "Close" button for close program.

All these action buttons would be attached to the static GUI frame and indicated by different colors. Two picture icons will each present the two communication side of "Computer" and "Mobile". The text area will list out all directories and files that are contained in the allocated folder.

4.2 "MMU" System Design

The main issue of the MMU system is both computer and mobile must have Bluetooth device enabled to perform any action. As Figure 6 shows, a Bluetooth device need to plug into Computer before it can communicate with a mobile phone wirelessly, which requires the mobile also Bluetooth enabled.

4.3 System Functionality

As required, the MMU system needs to perform certain tasks: searching device(s), granting access, sending or receiving data. These interactions are shown in Figure 7.
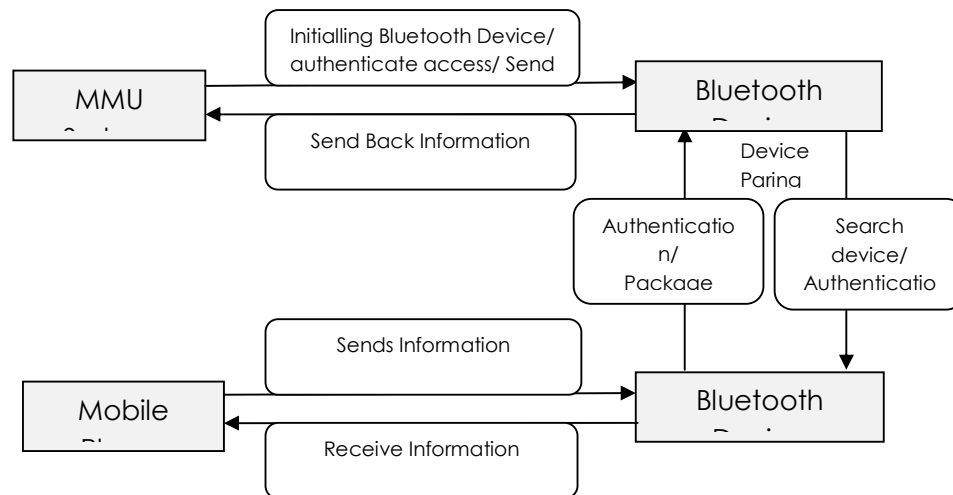

Figure 7. System Functionality

5. CONCLUSION AND FUTURE WORK

In this paper, the state-of-art of Bluetooth technology is reviewed and the development of the application prototype of Magic Mobile Updater (MMU) for Bluetooth enable devices is presented. The key research is not only to build a Bluetooth enabled application based on an existing open source, but also to study how Bluetooth establishes connection between devices, and how wireless technology of Bluetooth improves our daily life. After exploring the connectivity between a mobile phone and a computer/sever, both trusting and pairing have been established. The study has demonstrated that Bluetooth can achieve connectivity between devices quite easily.

There will be a potential for the MMU to be further improved in user interface and functionality. For examples, users could carry out tasks remotely without going to the physical location. Since Bluetooth technology is still improving and moves forward, it is impossible to predict how the technology will be advanced in the longer-term, but during this research, it is an exciting experience to develop such an application with Bluetooth technology, and it is expected that the improved system will find wide applications in the near future.

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