Examine the way in which bluetooth integration functions with wi-fi modems

Entertainment

Introduction

Bluetooth™ is a revolution in wirelesstechnologyspecially short-range digitalcommunicationamong computing and communications devices. It is a latest wireless communication technology for exchanging data over short distances, and is an attempt to get rid of computer's jungle of wiring. Using a special radio frequency to transmit data, it creates a short range network. It is very secure and can connect up to eight devices. Bluetooth wireless technology enables robust, secure, wireless connections between portable and fixed devices. So the main features of Bluetooth technology are robustness, low power, and low cost. Bluetooth can improve in any short distance communication system like medical instrument, end to end data transfer etc. It has high mobility which means it can be moved anywhere, long life battery which means it lasts longer than any other equipment and it has no infrastructure to support model.

This project consists of building a remotehealthmonitoring system which provide a autonomous system for regular patients. The project is designed to meet its aim to provide a plug-and-play system which run over router and transmit data through Bluetooth. A Bluetooth adaptor will be built whose has input from Bluetooth and output via Ethernet/Wireless device. The Tele-health (TH) technology has invented so many systems so far which are helping patients cope, manage and improve their health condition. It has been also used to reduce the workload of healthcare practitioners specially for those patients whose need to visit practitioners regularly basis. However, current TH systems often require patients to actively interact with the technology and this is major drawback of all current TH technologies. " The

reason being that the elderly patients who are suffering from chronic condition, may find it difficult to interact with new TH technologies. Therefore, our proposal aims to provide a plug-and-play system which permits all ever-present connectivity between different components of the TH system with requiring minimal input from patients” [1].

As stated before, this project intends to develop an end-to-end TH system that permits monitoring and feedback solution which uses every-possible technology, e. g: mobile phone technology (GSM, 3/4G), IEEE (Institute of Electrical and Electronic Engineers) Bluetooth Wi-Fi, xDSL (Broadband) communication standards and even in POTS (Plain Old telephone service) as well. “ Furthermore, an automatic feedback mechanism on the reading of patients’ health parameter will be embedded in the system. Thus, if a location has limited or no mobile phone network coverage, especially in rural areas, then the access point approach to data transmission would be adopted” [1].

Currently, there are already so many TH systems exist in the market. TH system currently developing and different health organizer are adopting new TH systems. Moreover, so many universities are researching about new technologies TH systems. Let’s consider a scenario where this TH system would be use for: With this TH system, patients will take their blood pressure measurements at home using a Bluetooth enabled or adaptable specific kind of monitoring device. In this project, an extra mobile will take place instead of that monitoring device which is enable to send the reading of specific measurement, taken by patients. This mobile is Bluetooth enabled and have

a special designed software that helps to connect another Bluetooth enabled device (patient mobile) and transmits data to that device. The patient mobile is a remote device that uses for building connection with PC and whatever data come from the first mobile (monitoring device), passes to PC automatically. The patients mobile also capable to receive any feedback from thedoctoras well. The PC works as an end-to-end device in this project which is connected with internet. The PC is capable and send any data received from patient mobile to a particular email address. The whole mechanism will be designed and build to transmit and response automatically. On the other hand, The doctor receives readings of a particular patients and send the feedback for that readings via PC and Internet. The patient mobile has a special kind of software which is enable to receive a feedback coming from the doctor. The whole system is represented graphically in figure 1.

Aim

The aim is to design and build a plug-and-play Bluetooth interface (within laptop)that connects Bluetooth enabled phones with a doctors surgery using a designated patients email address. The patients phone sends his/her latest results using Bluetooth to the interface which then sends an email to the surgery. This avoids expensive text messaging (multiple users increase cost). The doctor then has daily information on patients condition allowing them to make more appropriate decisions regarding their healthcare. It importantly also allows patients to carry on their daily life as normal, knowing that their latest results are being considered rather than intermittent results while visiting the doctors surgery.

Although this work is demonstrated using Wi-Fi, it could easily be done with a simple ADSL modem connection via a network cable. The system works in both equally. What’s important is that there is an internet connection and a PC within the home or a phone with internet connection.

Objectives

To do background reading and investigation about Bluetooth technology, Ethernet/IEEE standard 802. 11 and Wi-Fi modem.

To design a Bluetooth interface which makes connection between two Bluetooth enabled mobiles and a PC.

To construct a Java program using J2ME for first mobile (monitoring device) to create a connection with second mobile and sending message over that phone.

To construct a Java program using J2ME for second mobile (Patients mobile) to form a bridge connection between first mobile and PC to transmit data via that mobile.

To construct a Java program using Java SE for PC to create connection with webmail server and send data in that mail address automatically.

To test the connections using two mobiles and check for errors and limitations.

To build a PC application using Java SE to give feedback from that webmail server remotely to any mail server.

To construct a mobile application using J2ME for second mobile to have access in an inbox of a mail address to receive a feedback.

To test PC application and mobile application and check errors and limitations.

To integrate and test whole interface and all programs.

To investigate the limitation and problems of the whole system and find solutions about them.

To investigate the implementation of that Bluetooth interface for future purposes.

Deliverables

Project arrangement form:

To be completed by Friday 8th October 2010

Interim Report:

This report explains the aims and objectives of this project. The requirement for the project and planned technical approach also is included. This report will be submitted by Friday 5th November 2010 and received feedback from supervisor by Friday 19th November 2010.

Draft Final report to supervisor:

A draft version of the final project report must be submitted for feedback to the supervisor by Friday 25th March 2011.

Final project report:

Final Project e-Report must be submitted by Tuesday 3rd May 2011 through TURNITIN for plagiarism checking and Final Project Report and log book must be submitted to Faculty office by Thursday 5th May 2011 as mentioned in the Unit Guide.

Project Viva and Presentation:

Project Viva and Hardware/software Demonstrations will take place in 2nd Semester Examination Period.

Constructed Hardware/Software:

This project contains both hardware and software part which need constructed. A network adaptor need to design and build and a program which support this adaptor need put together as well.

Technical Background and Context

Bluetooth

The term Bluetooth TMrefers to an open specification for a technology to enable short-range wireless voice and data communications anywhere in the world [2]. Bluetooth technology also uses radio waves like all other communication medium. Bluetooth technology sends information within your own personal space, which is called Personal Area Network (PAN) at distance up to 10 meters. Now-a-days every single communication device has Bluetooth built-in.

The Bluetooth Special Interest Group (SIG) has produced an open specification for Bluetooth wireless communication. The reason behind being open specification, this is publicly available and royalty free. To help advance extensive acceptance of this technology, an open specification has been a primary objective of the SIG (The explanation of SIG will be later on).

Bluetooth technology is a short-range communication technology that is simple, secure, and everywhere [3]. It is planned for replacing the cables connecting devices. It also maintains high level of security. That’s why Bluetooth wireless technology is widely accepted by public so much that this technology is built into a wide range of products, from cars and mobile phones to medical devices and computers. With Bluetooth technology, these devices can communicate without having any wire over a single air-interface, using special kind of radio waves or frequency to transmit and receive data. So Bluetooth is a way of exchanging data wirelessly over short distances, and is an attempt to do away with your computer’s jungle of wiring. Bluetooth is a piece of hardware or a small computer chip that contains the Bluetooth radio, and some software that lets the users, connect devices using Bluetooth technology. That’s why Bluetooth is very cheap and a very small sized chip which can fit in any kind of device. Even with Bluetooth technology, making connections is as easy as just powering up the device.

“ The Bluetooth radio transceivers operate in the globally available unlicensed ISM radio band of 2. 4 GHz. The ISM (Industrial, Scientific, and medical) bands include the frequency ranges at 902 MHz to 928 MHz and 2. 4 GHz to 2. 484 GHz, which do not require an operator’s license from a regulatory agency” [4].

Now, the question arouse: why do we need one more wireless technologyBy comparing all other existing wireless technology with Bluetooth, it can be much more clear about why we need one more wireless technology where

there is so many successful wireless technologies. It is also going to give much more details about Bluetooth technology.

If infrared and Bluetooth devices can support many of the same applications, why do we need both technologiesInfrared transceiver must need to see each other “ eye to eye” and devices must be in a few feet apart, otherwise transmission will fail. Bluetooth overcomes the distance limitation by having a nominal range of about 30 feet (as stated above). Another sense is Bluetooth works like radio, so transmissions are Omni-directional. Bluetooth can penetrate solid objects and its capability to communicate with other devices in a network called “ piconet” allows for data exchange opportunities that are very hard or impossible with infrared. When it comes to data transfer speed, Infrared can transmit data at very high speed of 4 Mbps while Bluetooth can only at 721 Kbps though new versions of Bluetooth technologies are coming.

Now 802. 11b (wireless LAN) is to connect large devices that have lots of power at high speed typically 11 Mbps within distance of 300 feet. Though less distance and transmit speed, Bluetooth is to connect peripherals like PDAs and mobile phones and consume less power 500 times. So it’s not definitely replaced by 802. 11b (wireless LAN). 802. 11b (wireless LAN) can’t be use instead of Bluetooth for transmitting between peripherals. The radio uses 2. 5 mW of power. Bluetooth has been designed to have very low power consumption.

The Bluetooth Special Interest Group (SIG)

As previously described, Bluetooth wireless communication is personified as a technology specification. The body manages the development of Bluetooth standards and the licensing of the Bluetooth technologies and trademarks to manufacturers is called the Bluetooth Special Interest Group (SIG). The Sig is a privately held, not-for-profit trade association founded in September 1998 [5]. There was no Bluetooth SIG headquarter or no Bluetooth corporation or any sort of legally incorporated entity until 2001. The SIG built-in and is now officially recognized as the Bluetooth Special Interest Group, Inc in February 2001. Now the SIG is headquartered in Kirkland, Washington with Michael W. Foley presently its executive director [5]. Currently the SIG is comprised of more than 14000 member companies. The SIG has local offices in Hong Kong, Taiwan, China, Korea, Japan and Sweden. The SIG depends upon the contributions and participation of its member companies. Clearly a major task of the SIG has been to develop the specification, but other SIG activities include joint work with other consortia and standards and regulatory bodies, educational and promotional events such as developers' conferences and the definition of a testing and certification process [2].

Bluetooth technology was visualized by engineers at Swedish telecommunications manufacturer Telefonaktiebolaget LM Ericsson who realized the necessary of global short-range wireless communication. In 1994 Ericsson had begun a project to study the feasibility of a low-power, low-cost radio interface to eliminate cables between mobile phones and their accessories [2]. The Bluetooth SIG was formed to focus on developing open specification by the leading companies in computing and telecommunication

in early 1998. The founding companies of the SIG are Ericsson, Intel Corporation, International Business Machines Corporation (IBM), Nokia Corporation and Toshiba Corporation. These companies formed the original core group of the SIG, actually known as promoter companies.

History & the name Bluetooth

“ The engineers at Ericsson code named the new wireless technology Bluetooth to honor a 10th century Viking king in Denmark. Harald Bluetooth reigned from 940 to 985 and is credited not only with uniting that country, but with establishing Christianity there as well” [4]. Harald name was actually Blatand, which roughly translates in English as “ Bluetooth”. It seemed perfect to the SIG founders to name the organization that was intended to unify multinational companies after a Scandinavian kind who united countries. Thus the Bluetooth name was initially an unofficial code name for this project but today has become the trademark name of the technology and the SIG. Figure 2 is showing the logo, inspired by the initials “ H B” for Harald Bluetooth.

In 1994, Ericsson Mobile Communications, the global telecommunications company situated in Sweden, initiated a study to investigate the feasibility of a low-power, low-cost and wireless interface between mobile phones and their accessories. The main aim of this study was to find a way to get rid of the cables between mobile phones and their accessories.

Reference

1)Dr. S. Dudley-Mcevoy, “ Proposal for Synchronous Patient Reinforcement Incorporating Tele-medicalEnvironment(SPRITE)”, London: London South Bank University, November 2010.

2)B. A. Miller, C Bisdikian. Bluetooth Revealed, 2nd edition. New Jersey: Prentice Hall, 2002.

3)Bluetooth SIG, “ Bluetooth specification”, online, available from: http://www. bluetooth. com. [accessed 12th APR 2011]

4)N. J. Muller. Bluetooth Demystified. New York: McGraw-Hill Telecom, 2001.

5)Wikipedia, “ Bluetooth Special Interest Group”, online, available from: http://en. wikipedia. org/wiki/Bluetooth_Special_Interest_Group. [Accessed 13th APR 2011]

N. Eddy. Bluetooth SIG adopts Low Energy Version 4. 0, eWEEK Europe UK, 2010. [Online] Available from: http://www. eweekeurope. co. uk/news/bluetooth-sig-adopts-low-energy-version-40-8224 [Accessed 14 APR 2011