WEB-BASED COURSE REGISTRATION SYSTEM USING BLUETOOTH TECHNOLOGY

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Despite my exhaustion after grinding through the arduous schedule for this project, I have looked forward to writing this page. It gave me an opportunity to thank Universiti Malaysia Sarawak that gives me the opportunity to do this project.

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ABSTRACT

This web-based system is designed to facilitate Universiti Malaysia Sarawak student for registering their courses according to the current semester by using Bluetooth technology. Besides, the purpose of this project is to enhance the security level towards the system in Bluetooth technology. The research made shows that the Bluetooth technology still lacks of security measures. Thus, one security mechanisms is required to protect the system. That security is Secure Socket Layer (SSL). SSL can secure the data travel wirelessly. This web-based system will implement the SSL as a solution to solve the current weaknesses of Bluetooth technology. Besides providing the registration facilitation, this project can give significant to people outside. The development of this project will become a basic prototype to expand the Bluetooth technology widely and to improve the security level.
ABSTRAK

CHAPTER 1
INTRODUCTION

1.0 An Overview

This section will introduce the main elements of the project include the problem statement, objectives, project scope, methodology, the expected outcome and significant of the project.

1.1 Introduction

People are living in a new era of technology. The rapid development of technologies has provided a lot of services. Therefore, a lot of system developer involve in different aspect of technology in producing a great application and technology that can contribute towards a work more efficient and effective. Among these, the most popularity growing technologies in the market today are smart phones, notebook, personal digital assistants (PDA) and Pocket PC. People such as engineer, officer and even a student uses these devices for daily activities such as downloading files from internet, exchanging data and transferring to other devices. Most of these devices are equipped with wireless connectivity such as Bluetooth, WAP and GPRS where user can connect either in long distance and short distance communication based on it requirements.

Bluetooth is one of the wireless technologies that support short-range communication. Bluetooth wireless technology makes it possible to transmit signals over short distances between telephones, computers and other devices and thereby simplify communication and synchronization between devices [1]. This project is proposed to develop web-based course registration which can be accessed through Bluetooth devices. This web facilitate for students who have the devices with build-in Bluetooth. The security added in this project will be
measured in how the web-based system accessible in Bluetooth can protect each single of data. Secure Socket Layer (SSL) protocol will be used as part of enhancement in application layer for encryption and authentication.

SSL uses a program layer which located between Hypertext Transfer Protocol (HTTP) and Transport Control Protocol (TCP) layers. It provides several securities for all users of a web server. One of the potential securities is that it can authenticate the clients that are connecting to a web server. SSL uses the public-and-private key encryption system from RSA, which also includes the use of a digital certificate [2].

1.2 Problem Statements

The main problem in existing Bluetooth application is only used in non-secure application such as user can send or download the data from other devices once the connection established. Bluetooth technology only can detect devices but not user who is going to use the application. According to Computerworld (2005), Bluetooth security configuration is set at Security Level 1 which means no encryption or authentication [3].

Since the Bluetooth technology is quite similar as 802.11b standards, it must be taken into a consideration in term of security measures. When the data move over the wireless, it must be encrypted or protected from being altered. Authenticity also is required to determine the identity of both sender and receiver. Trusting each other is important to verify that the communication is valid. To solve this problem, one mechanism is needed to improve security for web-based system. SSL is an appropriate encryption method that can provide in term of data integrity, accountability and authenticity.
1.3 Project Objectives

The today’s technology is changing very fast. People demand for newest technologies that can challenge others to help them for activities purpose. From the experience, students facing problem when it’s come to register their course. The system cannot be relied on due to technical problem such as slow and temporary of down. Registration system in University Malaysia Sarawak (UNIMAS) allowed every student from all faculties to use the same registration system in order to register the course. To accommodate the current system, there is a need for new technology to overcome the problems stated above.

The primary objectives to develop this project are:-

1. To provide student with the another system for registration process
2. To enhance the security mechanism for web-based system in Bluetooth technology
3. To make the registration process easier and faster

1.4 Project Scopes

The proper scope is needed to make sure that the project is following the right area and direction. Based on its objectives, this project will focus on Bluetooth technology and security added. The first scope of this project is to develop web-based system and make connection between web pages (client) and to the server using wired connection.

The second scope is to establish the Bluetooth connection using the existing application in order to access the web-based system from the server.

The third scope is to adapt security for web-based to secure the communication in Bluetooth environment. Within this connection, SSL will be implemented at application layer
to protect data travel from devices to a web server. As a result, each student intends to use it because in term of security level added. The main software tool will be used to develop this project is using **Macromedia Dreamweaver 8**.

1.5 **Project Methodology**

After defining the project scope and requirements, the best methodology to suit this project is using System Development Life Cycle (SDLC). The SDLC development model consists of five phases which are:-

- **Planning**

  This is a first stage in SDLC which focuses on identifying the problems, project scopes and the clearly objectives to develop the project. At this level, a formal schedule needs to be produced to ensure the project can be done in timeline given.

- **Analysis**

  Analysis part will analyze what the specification required of this project. It will be more on researching, comparison, surveying and more. The good specifications on analysis part will contribute a precise data flow and as well as its requirement approach.

- **Design**

  This phase will start to produce the entire process flow including database, layout and interface using any diagram or flow chart. At this level, the system should be clearly understood in term of how it works.

- **Implementation**
Implementation will convert from what producing in design stage to the actual system. At this level, the system should be ready to be used by user.

- **Maintenance and Support**

  Maintenance and Support is the last phase where it will evaluate and test all the system function in the real Bluetooth environment. Maintenance is really important to ensure that the system will be in optimum level.

### 1.6 Project Significant

The research of this project is important to search a new solution to adapt security in Bluetooth application. Therefore, the development of this project can be benefited to student as well as UNIMAS. This project will improve lots of weaknesses in the real life application. Besides, this project will give a systematic registration process because only particular student can register as long as the devices is owned and registered by the right person.

To be able to access the web pages in wireless environment, Bluetooth offer the best solution. Firstly, Bluetooth is not requiring student to do anything in order to make it works. Once the device found the other devices, it will begin the conversation of data without need to be entered any information. Secondly, the Bluetooth is inexpensive. A lot of student has a personal laptop even a smart phone. So, student can make it really useful for working in Bluetooth environment.

### 1.7 Project Potential Outcomes

The expected outcome from this project is to develop a Bluetooth prototype web-based registration system in UNIMAS. This project also expected to provide web pages
services between client and server in Bluetooth environment for 24 hours per day. This project allows student to update their information directly from the own devices without going to the other services or workstation. The potential of this project is to ensure the user is authenticated in term of security

1.8 Overview Of Project Report
This section will describe shortly of what topic will be discussed in the overall chapters. The table 1.1 below shows the short overview for each chapter.

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<td>Implementation and Testing</td>
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Table 1.1: Overview of project report
CHAPTER 2
BACKGROUND

2.0 Introduction

There are a lot of available applications are used in Bluetooth technology. For example wireless sensor network with Bluetooth, file transfer using Bluetooth and web browsing on wireless PDAs. These kinds of applications have it own features and drawbacks.

To be more clearly, the background part will focus on research to existing application. Identifying problem statements occurred and gain more knowledge is required to ensure this project can be done successfully. Therefore, this section also will introduce the overview of Bluetooth technology. The reviewed of existing applications will be divided into specific of part by each category of applications in order to compare with proposed application precisely.

2.1 Overview Of Bluetooth Technology

What is Bluetooth? Bluetooth is considered as short-range technology, point-to-point and point-to-multi-point voice and data transfer. Bluetooth is organized by Bluetooth SIG (Special Interest Group) which is the core industry group that manages the growth of Bluetooth technology and the market part.

Bluetooth also is categorized into Wireless Personal Area Network (WPAN) which offers fast and reliable transmission of data and voices. This technology doesn’t require a specific of hardware and software to work. Once the both of parties have Bluetooth built-in devices, it can connect simultaneously. For instance, a notebook computer can be enabled to wireless connectivity with a cellular phone.

Bluetooth technology can provide a transmission range around 10 meters. It uses a Radio Frequency (RF) which operates at 2.4 GHz (ISM range) which is quite same as
frequency used by wireless LAN 802.11b product. Bluetooth uses a frequency-hopping spread-spectrum (FHSS) technology.

Bluetooth can be implemented easily without having to connect to the additional wired. Therefore, today’s technologies such as PDA or notebook have been provided a Bluetooth built-in. So that, people don’t need to think and worry about what the required specification need to buy. According to Kansal (2001), he stressed that the main key features of Bluetooth technology are robustness, low complexity, low power and low cost.

Bluetooth also called as ad hoc networks. What is an ad hoc network? Bluetooth can enable electronic devices to connect and communicate wirelessly which called piconets. There are 8 data devices can be connected in a piconet and meanwhile can be up to 10 piconets able to be used. Bluetooth can support different type of devices that could be used within the same time.

Nowadays, Bluetooth is become quite popular technology which is used in various type of sectors. This technology offers several of benefits to users. One of the benefits is it can replace the cable. No more implementation of wired. Clearly, it same as other wireless technology that operates without wired. Therefore, this kind of technology is suitable to be used by various kinds of users.

2.2 Reviewing Of Existing Application
This section will evaluate all the important aspect to each application including technology specification, architecture and its security. It is really important to make an appropriate comparison between these kinds of application to find the similarities and drawbacks.
2.2.1 Existing Application 1: The Poket Doctor

2.2.1.1 Overview

The first application focuses on Poket Doctor application which is used in healthcare industry. The Poket Doctor is an application used to access a victim’s health information by paramedics. It was developed by one group of students from Brigham Young University. Basically, the Poket Doctos is a handled device that communicates with Bluetooth-enabled Smart Cards which containing vital medical information. This kind of application consists of three primary components which are a Bluetooth enabled Smart Card, a handled devices and a database located at hospital.

Figure 2.1 below is shown the entire flow of each part of components including its functionality. The Poket Doctor isn’t work only by itself but it can integrate more than one device at one time.

![Figure 2.1: Hardware/Software model of the Poket Doctor System](image)

2.2.1.2 How It Works

From the observation, The Poket Doctor application interface interact with Hospital Database Server using Microsoft Access database. Then, the Hospital server application will read and write data to medical Smart Cards. To integrate with both of devices, The Poket
Doctor uses Bluetooth technology as a medium to operate. As a result, this technology allows the Poket Doctor to scan a range around 300 square meters from medical smart cards.

Figure 2.2 below is shown the main interface of the Paket Doctor devices. User is allowed to select specific devices in the search box appeared. For example, after the user click on the Find Patients button on the Poket Doctor, the hospital server is identified and medical cards respond with the name of the card holder. The main point of security here it was required to enter a PIN number in order to make it works.

![Figure 2.2: The Poket Doctor Find/Select Patients Interface](image)

User can highlight which one to be used and click the *Select Patient* button. To establish the connection, use must click the *Connect* button. Once the connection established, then the Poket Doctor can be used to send and receive data.
Figure 2.3: User Interface for handled Poket Doctor Device

The Figure 2.3 above is shown the application interface for Poket Doctor Device after connecting. The Poket Doctor was designed totally based on a graphical user interface (GUI) that makes it more user-friendly. There have a lot of buttons provided to make the process easier. For example, after updating the patient information, user may click either to save data or send data to database.

Figure 2.4: Hospital Record Database using Microsoft Access

Figure 2.4 above is shown the interface of hospital sever application. The interface for hospital record database looks quite similar as interface in Poket Doctor devices. The Poket Doctor Hospital Database uses Data Access Object (DAO) extensions to connect to a
Microsoft Access. Therefore, management staffs could update this information by using the interface provided.

2.2.1.3 Security

The Poket Doctor had included a high level of security. Even though this application equipped with Bluetooth protocol security, this application had implemented additional security. The first security is using RSA public key encryption. All the information kept on Smart Cards is encrypted and only the authorized Poket Doctor devices can decipher it back. RSA encryption uses public and private numerical “keys” based on large prime numbers to convert text into a scrambled format [6]. Secondly, this application had included a secret PIN number to protect the handled devices from unauthorized access. Meaning that, only the valid PIN number is accepted to establish the connection between the Poket Doctor devices and Hospital Sever.

2.2.1.4 Conclusion

From the first existing application reviewed, The Poket Doctor had used additional of security level although the Bluetooth protocol includes some basic security feature to prevent unauthorized communication. This application also required a particular user to enter the PIN code before it can be used to connect to the database. So the overall Poket Doctor application security is divided into two types of security. It was designed to be secured to ensure that the all information process is safe. Deployment of Smart Cards user authentication also could maximize the security level. Therefore the application is designed based on GUI which provides user-friendly method for user to communicate. The Poket Doctor also provides a convenient way to be used by everyone. The simple client software interface with a great
security equipped give the rough idea of prototype required to implement the proposed project.

2.2.2 Existing Application 2: The BlueStar

2.2.2.1 Overview

The second application is about the BlueStar application which is used in financial transaction. A Bluetooth financial transactional system or BlueStar is a wireless transactional system developed by student of Young University's Electrical and Computer Engineering Department. It uses Bluetooth technology to integrate wireless financial transaction between user’s handled device and a Point of Sale (POS) terminal. The main components of this application consist of Client System, POS subsystem and Home System.

Figure 2.5 below is shown the connection flow performed by this application between it components. Same as the first application reviewed, this kind of application also connect to the two devices. All the transaction process is done through connection between client system and vendor system via wireless. Within the same time, the user’s record is controlled by Financial Management System.

![Figure 2.5: BlueStar Transaction](image-url)