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Project Report

Version 1

CENG 407

Innovative System Design and Development I

Smart Attendance Tracking and Monitoring System Using BLE Beacon

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Abstract

It is time-consuming for teachers to keep track of students' attendance.

This system aims to control students' status in the class with the help of

Bluetooth low energy (BLE) 4.0. iBeacon is the preferred BLE device for the

project. This device communicates with students' smartphones. The mobile

application on the smartphone detects that the student enters the lecture

hall and records this information for follow-up. For registration to occur,

the student must have a certain amount of time in class coordinates. After that student’s can

check-in. According to the preferred option, the information of the students is sent to the web

application through database. The web application is designed for use by teachers. Teachers

have the right to open lessons, delete lessons and access student

absenteeism through web application. The system consists of three basic

components: (1) iBeacon, (2) Web application, (3) iOS mobile application.

Application Key words:

The Bluetooth Low Energy, iBeacon, Web Application, Mobile Application, iOS, Web Services

Özet:

Öğrencilerin derse devam durumunu takip etmek, öğretmenler için zaman alıcı bir faaliyetdir. Bu sistem öğrencilerin sınıfta olma durumunu bluetooth düşük enerji (BLE) 4.0 yardımıyla kontrol etmeyi amaçlar. Proje için BLE cihazı olarak iBeacon tercih edilmiştir. Bu cihaz öğrencilerin akıllı telefonları ile iletişim kurar. Akıllı telefonda bulunan mobil uygulama öğrencinin ders salonuna girdiğini tespit eder ve takip için bu bilgiyi kayıt altında tutar. Kayıt işleminin gerçekleşmesi için ,öğrenci sınıf kordinatları içinde belirli bir süre bulunmalıdır. Bu şartlar sağlandığında öğrenciye kayıt işlemi yapabilir. Öğrencilerin bilgisi database aracılığıyla web uygulamasına gönderilir. Web uygulaması öğretmenlerin kullanımı için tasarlanmıştır. Öğretmenler web uygulaması araclığı ile ders açma, ders silme ve öğrenci devamsızlık bilgilerine erişme hakkına sahiptir. Sistem üç temel bileşenden meydana gelir : (1) iBeacon, (2) Web uygulaması, (3) iOS mobil uygulama.

Anahtar Kelimeler:

Düşük Enerjili Bluetooth, iBeacon, Web Uygulaması, Mobil Uygulama , iOS , Web Servis.

1.1 Introduction

The terms smart devices, smart phones, smart cars, smart homes, smart cities - a smart world have been supported for many years. The achievement of these objectives has so far been examined by many different and often disjoint research communities. Five of these prominent research communities are: Internet of Things (IoT), Mobile Computing (MC), Pervasive Computing (PC), wireless sensor networks (WSN) and recently Cyber-Physical Systems (CPS). However, with the increasing development of technology and solutions in each of these areas, there is an increasing overlap and consolidation of principles and research questions. Narrow definitions for each of these fields are no longer appropriate. In addition, IoT, PC, MC, WSN and CPS research are often based on underlying technologies such as real-time computing, machine learning, security, data protection, signal processing, big data and others. The intelligent vision of the world therefore includes a large part of computer science, computer technology and electrical engineering. Larger interactions between these communities will accelerate progress [1].

1.1 Problem Statement

Our school is designed to prevent the loss of time for students to attend school. Generally, the students and teachers have some problem with tracking attendance in the traditional ways. The

traditional method ends with teacher control when students sign off on attendance paper. However, this method can cause students to sign on attendance paper if they do not attend the class. As you can see, the traditional method can cause non-solution errors. Nowadays, we decided to design a mobile application for student tracking system, thinking that the students are intertwined with technology. Furthermore, the mobile application will get the participation information of students in connection with BLE. However, this system has some problems. The first problem is that student's check-in by receiving a signal from the BLE when they are not in class. The second problem is related to the security problem that will arise if the application is used in extracurricular areas. Finally, students can check in by taking a signal from the BLE when they are not available for a certain period of time during the course. The system will be much more useful than traditional methods when problems are reached.

1.2 Related Works

1.2.1 An Automated Attendance Management System

An automated presence management system using both a stationary RFID reader with four circular antennas and a portable RFID reader has been implemented in a mobile or electronic platform. A system comprising an antenna placed at the entrance of the classroom and a student database is represented by the presence management system in the electronic platform. When students visit their class, their names are displayed on the screen to ensure their presence is highlighted in the professor's database. However, a major disadvantage of this system is that since the distance between the RFID tags and the electronic device reduces the reading speeds of the RFID tags enormously. Another type of automatic attendance system has been proposed that uses a fingerprint verification technique. The technique of extracting an abnormal point on the ridge of the fingerprint or minutiae of the user made the verification of the fingerprinting process achievable. This check is used to confirm the authenticity of an authorized user by comparing the captured fingerprint template with the stored templates in the database. Another system is based on the actual or false value of a prior verification of the person's authenticity. The authors also reviewed and proposed a biometric system for the presence automation of employees in an organization that used fingerprint identification. In an RFID-based system, identifies and identifies tags and is used to highlight the presence of students. A computer was used as a medium to perform this task. The RFID reader recognizes the presence of a label and the system processes this information

on the computer according to the programmed instructions. The manageability, availability and absorption capacity of the technology have a great influence on the ease with which RFID systems can be integrated into the current operating sequences. The system provides an effective solution to the presence problem by organizing the design of software and hardware as well as an efficient data exchange between the RFID tag and the reader connected to the computer [14].

1.2.1.1 Proposed Model and Working

In the case of RFID-based systems, in the case of scanning the label, the label must be near or in contact with the RFID reader in order to transmit the information to an established database which interprets the data stored on this label. This process needs to be monitored who is scanning the tag to avoid proxies. The scan time is approximately equal to the time taken to manually count the students in the class. The development of industrial wireless sensors has led to important requirements for wireless technologies, such as low energy consumption and a resource-saving simple protocol stack [15]. Bluetooth Smart is a fairly new radio standard that fully meets these basic requirements. The proposed Bluetooth smart system offers many advantages, as electronic tags can be embedded in student IDs (student ID); has low power consumption; the electronic tag can also be read during the movement, and there is no visual link required for wireless communication between the tag and the reader. Tags can be read, even if they are submerged or covered with dirt, are almost indestructible and have invariable permanent serial code, which prevents manipulations. A Bluetooth smart chip is programmed and configured to work with the Android application via Bluetooth. Each student will receive a special day, which can then be recognized by the application via Bluetooth Low Energy. If he attends the lecture, a serial number (referring to the SAP number of the respective student) of the tag is assigned to the student database entry. Therefore, each time a student carries his / her card and attends the lecture, the entries are entered into the database with the time stamp when the lecturer moves in the class and the application recognizes the tags. In addition, the application is configured to recognize tags only within a specific range to avoid the detection of tags that are outside the class .

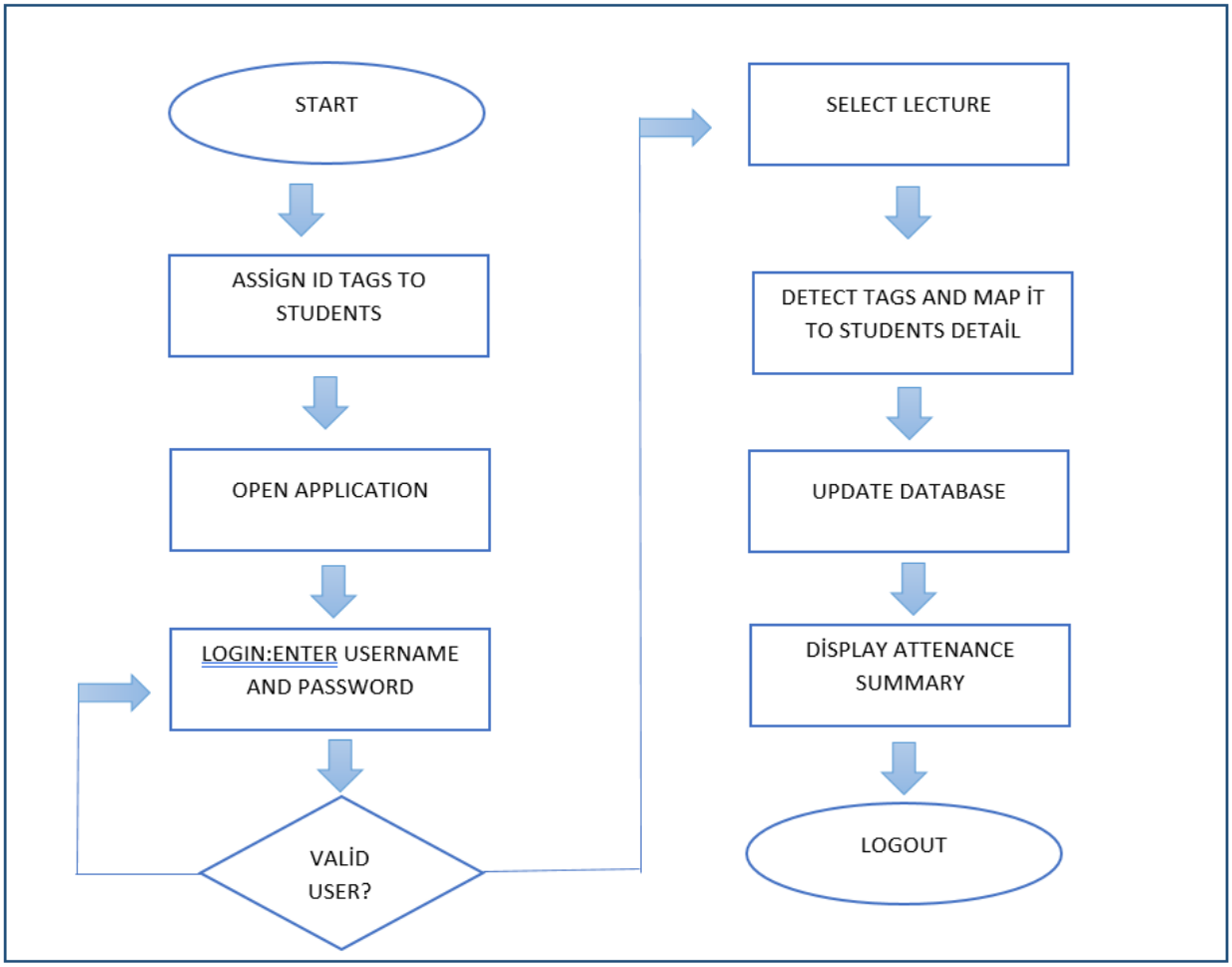

Fig.2. Flowchart showing the mode of operation of the student attendance management system

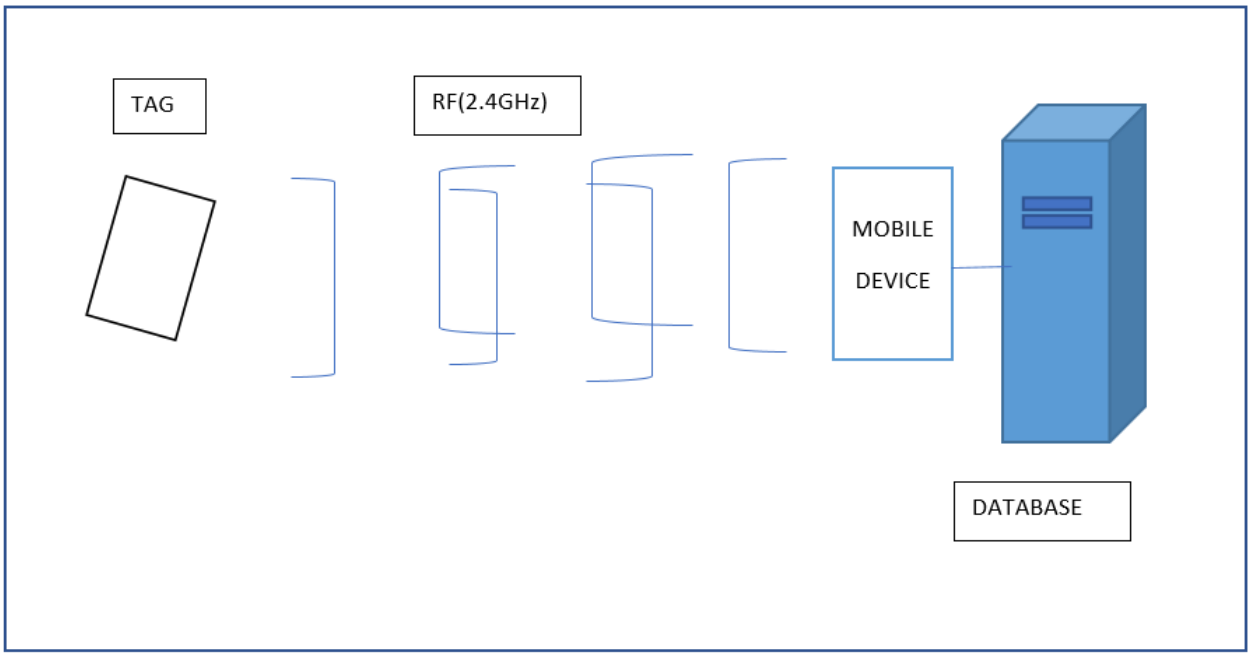

Fig.3. Depiction of Bluetooth Smart system operation

1.2.1.2 Result

In this paper, we have discussed an automatic presence recording system that utilizes the capabilities of Bluetooth Smart technology. The main advantages of a Bluetooth smart-based system are: low power consumption, high data transfer rate, low chip size and low cost, easy implementation of Bluetooth smart-based radio sensors with the development of Bluetooth Smart technology, demanding applications in various areas such as healthcare, inventory management and sports can use this technology to develop simpler, more cost-effective and more efficient solutions.

1.2.2 SITA Common-Use Beacon Registry

American Airlines undertakes industry's biggest deployment of iBeacons at DFW Airport American Airlines has announced the industry's largest launch of iBeacons and launched a six-month pilot project at Dallas / Fort Worth International Airport to enable a lasting implementation. American Airlines is also the first airline to use the new SITA Common-Use Beacon Registry launched this week. The installation of devices that use Bluetooth Low Energy (BLE) and geofencing to trigger the display of location-relevant information on passenger equipment is mainly used to improve the wayfinding in the terminal. iBeacons can

also be used to show aisles to gates, to provide access to the lounge and to inform passengers in real time about on-board updates. Selected users of the American Airlines app will test an updated version of the app, which syncs with the iBeacons. This will allow them to automatically receive information and directions to their gate via their iPhone or iPad when they are in the terminal. If passengers have not already installed the app, they will automatically receive a request to download it when they arrive at DFW Airport Terminal D. Phillip Easter, Director of Mobile Apps and Wearable's at American Airlines, said the iBeacons help passengers orientate themselves, which can sometimes be a confusing terminal. "65% of our DFW passengers arrive early at the gate" because they are often "nervous" about being at the right gate. "They get up early, so I can tell them what's going on around them with iBeacon technology, which will make it easier, less stressful, less stressful and exploring customers," he continued. "With Beacon technology, I can tell you that you are at the right goal or goal and how much time you will need to get to the right goal."

1.2.2.1 Beacon common use registry

Easter also explained the relevance of the decision to use SITA's new Common Use Register. "The use of SITA's registration will allow us to offer the same great user experience to our passengers who use our app not just in North America but across our global network, and beacons offer a fantastic opportunity to improve the passenger experience, but need it they are used consistently at all airports. Jim Peters, Chief Technology Officer of SITA, explains the experience of working with American Airlines in DFW and San Francisco International Airport, as well as with Virgin Atlantic at London Heathrow and other airlines in Shanghai. Hongqiao and Copenhagen Airport stressed the need for a common industry approach. "We introduced the SITA Common-Use Beacon Registry to provide industry with a single point of contact for common-use beacons used at every airport in the world," he said. "It allows airports to control and share metadata - the exact location, including gate, terminal, and so on

- with airlines and other partners, and allow passengers to get accurate and relevant information."

Fig.4.Beacon common use registry

1.2.3 Patient Tracking System

The purpose of the Bluetooth Low Energy project is to ensure that people with to be able to follow all kinds of negative developments in the computer environment and to take precautions. In this case, if the health of the patients is adversely affected, the doctor or the patient is informed by sending an information mail. Pick up on this number necessary measures are taken early. In this project, Beacon module will be connected to the Android phone via Bluetooth with a little energy consumption. We program on the Android device that we use to measure patient tension and the blood pressure value will be automatically sent to the phone and recorded. Through this program, the blood pressure value via Wi-Fi can be synchronized to the patient's or doctor's computer's C / C ++ program will be sent to the Patient Tracking System (HTS). The patient's blood pressures the computer will be notified and if the doctor is below or above the critical values will know.

Fig.5. Patient Tracking System

1.2.4 RFID Based Automated Attendance and Absence System is a System

Attendance and absence management in the conventional manner has used the method of directly entering student attendance status for each classroom in handwriting with the inconvenience of creating a separate attendance book for each corresponding class [16]. In the case of an initial electronic presence and absence system that was introduced to implement such inconvenience, the teacher had to enter the handwritten details for each classroom in the attendance and absence management system to indicate the presence or absence status or to print the attendance book. It was a quarrel that required a double job. Recently, through the development of auto-recognition technology such as RFID, label, card, etc. and biometric technology such as fingerprint recognition, face recognition an automated attendance management system that automatically manages the presence and absence of students using such technologies are widely explored and developed. RFID Based Automated Attendance and Absence System is a system that automatically aggregates attendance and absence status when the RFID tagged student's smart card is recognized by the in-door reader and provides efficient attendance and absence management. previous attendance book, which was handwritten. The system, however, is expensive to manufacture and involves problems such as the ability to lend, steal, dishonest presence of the smart card and the disadvantage that the presence is not recognized when the smart card is lost or unowned and performs presence control, the classroom without actually visiting the class. An automated on-and-off fingerprint based system is a system that combines the presence and absence status by recognizing the

fingerprint of students with the fingerprint reader. This is a trusted method to uniquely identify the person. Borrowed or stolen, but like the RFID-based system, it has the disadvantage of being expensive to build. In the student presence and absence management system, which uses the self-organized type of face recognition to enhance the actual checking of the actual cardholder in the former smart card based electronic presence and absence system, automatically becomes a client server System used. manages the presence status of the corresponding course by recognizing the person's face information using the neural network of self-organization. The Clicker is a bidirectional wireless reading system consisting of a student responder the size of a remote control and the receiver, which is connected to the computer. It is a useful support system that enables effective questions and answers between teachers and students. as automatic verification of presence and absence. However, the clicker involves costly problems because the clicker is a separate terminal that must be deployed equally with the number of students and operational issues due to the method of management by lending the clicker after the bulk purchase by the college. Such an automated on-and-off system shortens the time of presence and absence checking due to unmanned operation, and has the advantage that the presence status itself can be checked over the Internet. However, to structure the automated system, there is a costly installation cost problem to introduce the system because it requires separate equipment such as RFID reader, fingerprint reader, clicker, and so on. In addition, there could be problems, such. if the chip card has been lost or is not in possession, cards or dishonest presence with stolen cards are denied and there is a difficult situation to check the presence and absence due to a device failure such as reader error and damaged cards. The system proposed in this document allows a quick attendance check, provides various methods in which the presence can be recognized in any situation, and offers convenience such as attendance bookkeeping. The study also proposed and implemented a smartphone-based automated switching system that uses BLE beacons that have the advantage of low cost.

1.2.5 An Analysis of the Accuracy of Bluetooth Low Energy for Indoor Positioning Applications

The introduction of cost-effective, energy-efficient Bluetooth Low Energy (BLE) proximity detection beacons also provide a new signal for the ability to fine-grained. This paper offers a comparison of Wi-Fi and BLE fingerprinting with representative hardware in a large interior with a high precision (3 cm in 3D at 95% confidence) ultrasonic ground truth reference

system [17-18]. Home positioning systems based on Wi-Fi fingerprinting schemes are now well established due to the ubiquity of Wi-Fi signals and offer a few meters positioning accuracy in a well-supervised environment and dense Wi-Fi coverage. However, access points are rarely used with the ideal density and geometry for positioning, and Wi-Fi is a performance-hungry protocol. Bluetooth Low Energy (BLE) uses the same 2.4GHz ISM wireless band as Wi-Fi and fixes many of these shortcomings. It is designed primarily as a short-range, energy efficient machine to machine communication protocol that features very short messages with minimal overhead. The standard defines many core capabilities, including simple approximation. Targeted advertising and simple on me applications already use these capabilities. However, for most traditional indoor positioning applications, such as asset tracking, route guidance, unrestricted navigation, and rapid localization, the indoor positioning system must be available at any location in the area, not just near BLE beacons. Therefore, the effects of unrestricted indoor positioning when introducing BLE beacons into an environment must be assessed to determine if BLE can have a significant impact on solving the larger "indoor GPS" problem.

1.2.5.1 Result

This article is about using Bluetooth Low Energy (BLE) beacons for fingerprint positioning. We have shown that a significant positional improvement over the existing Wi-Fi infrastructure is possible, even using a relatively sparse use of beacons when taking into account the characteristics of BLE signals [19].

1. The low bandwidth of BLE makes it more prone to fast fading and therefore large RSS fluctuations than Wi-Fi. The use of three ad channels through a BLE beacon, combined with frequency dependent fading, can cause RSS measurements to vary over a much wider range than measurement noise with very small signal path length changes. This was confirmed in simulated and experimental tests.

2. Smoothing BLE-RSS measurements by batch-filtering multiple beacon measurements per fingerprint is required to address bandwidth and channel change issues. The stack window is determined by the user speed, and the best performance is provided by collecting a stack of measurements over one meter of user movement. Assuming a typical step speed, this results in batch windows of 0.5 to 1 second in length.

3. The positioning accuracy increases with the number of beacons per fingerprint up to a threshold of about 6-8. In addition, there is no further improvement in the positioning accuracy. Combining this information with the desired bake power level controls the bake density required for maximum positioning performance.

4. A rule of thumb has been provided to allow users to estimate their beacon ranges depending on transmit power and the number of interior walls.

5. There is some evidence that active WLAN scanning and Wi-Fi network access can cause errors in BLE signal strength measurements. BLE fingerprinting requires careful consideration of the use of Wi-Fi radio in a smartphone.

1.3 Solution Statement

Smart attendance system is designed to prevent time loss for students and teachers in schools. However, this system has some problems. The first problem is that students can check in if they are not in class. As a solution to this problem, the mobile application will not accept signals outside the classroom, and students will not be able to check in. The second problem is security concerns. In order to overcome this security problem, it is necessary to send photographs for students depending on the teacher's request. The last problem is that students check in for a certain period of time. As a solution to this problem, the mobile application will not allow students to check in without receiving a signal for a certain period of time. The system will work perfect if we solve these problems.

2. Literature Search

2.1 Related Technologies

2.1.1 Introduction

The terms smart devices, smart phones, smart cars, smart homes, smart cities - a smart world - have been supported for many years. The achievement of these objectives has so far been examined by many different and often disjoint research communities. Five of these prominent research communities are: Internet of Things (IoT), Mobile Computing (MC), Pervasive Computing (PC), wireless sensor networks (WSN) and recently Cyber-Physical Systems

(CPS). However, with the increasing development of technology and solutions in each of these areas, there is an increasing overlap and consolidation of principles and research questions. Narrow definitions for each of these fields are no longer appropriate. In addition, IoT, PC, MC, WSN and CPS research are often based on underlying technologies such as real-time computing, machine learning, security, data protection, signal processing, big data and others. The intelligent vision of the world therefore includes a large part of computer science, computer technology and electrical engineering. Larger interactions between these communities will accelerate progress [1].

2.1.2 BLE Network Devices

Bluetooth Low Energy (BLE) is an emerging wireless technology developed by the Bluetooth Special Interest Group (SIG) for short-range communication [2]. In contrast with previous Bluetooth flavors, BLE has been designed as a low-power solution for control and monitoring applications. BLE is the distinctive feature of the Bluetooth 4.0 specification. The advent of BLE has occurred while other low-power wireless solutions, such as ZigBee, 6LoWPAN or Z-Wave, have been steadily gaining momentum in application domains that require multi-hop networking [3, 4]. However, BLE constitutes a single-hop solution applicable to a different space of use cases in areas such as healthcare, consumer electronics, smart energy and security. The widespread use of Bluetooth technology (e.g., in mobile phones, laptops, automobiles, etc.) may fuel adoption of BLE, since implementation of the latter can leverage similarities with classic Bluetooth. According to published forecasts [5], BLE is expected to be used in billions of devices in the near future. In fact, the IETF 6LoWPAN Working Group (WG) has already recognized the importance of BLE for the Internet of Things. As of the writing of this article, the 6LoWPAN WG is developing a specification for the transmission of IPv6 packets over BLE.

2.1.2.1 ZigBee

ZigBee has taken its name from the zig-zag complex movements of bears between flowers. This zig-zag structure symbolizes inter-node communication in the mesh (complex) network. Network components represent queen bees, male bees and worker bees. Wireless communication technologies such as Wi-Fi and Bluetooth have been starting to work on ZigBee-style networks since 1998 due to some applications being unfavorable. The goal was to create products that are highly reliable, low cost, energy-saving, and suitable for networking for imaging and management purposes. The standard IEEE 802.15.4 standard

required by ZigBee technology was completed in May 2003. On December 14, 2004, ZigBee specifications were certified. Important features of ZigBee:

·Reliability ·Support for a large number of nodes

· Quick and easy installation

· Long battery life

· Security

· Lower costs

· Manufacturer / provider independence

2.1.2.2 What are the usage areas of ZigBee?

1.Commercial Building and Home Automation:

HVAC (Heating, Ventilation and Air Conditioning Systems) Lighting control, Door - window - shutter - lock controls, Control of music and cinema systems in home automation, It is used for in-house entrance-exit controls.

2.Security:

Security Alarm, Fire-gas-water detector systems, It is used in input-output controls.

3.Health Sector:

It is used to monitor and control the body functions of patients and athletes.

4.in vehicles:

The control of the mechanisms in the vehicle is used, for example, in the places where the cables cannot reach, for example the pressure of the tires.

5.Agriculture:

Humidity, water, temperature, fertilizer status, etc. ensuring that the product is monitored and optimized.

6.Industry:

It is used for production control, energy management, control of industrial devices. It is also used in online payments, online control systems of portable services and devices.

2.1.2.3 ZigBee Why Low Power Consumption?

• No large data transfers,

• The use of smaller devices in this technology compared to other technologies, • In the absence of data exchange, routers and devices outside the coordinator must remain in sleep mode,

• The BPSK and O-QPSK modulation types used do not consume too much power,

• Short duty cycle (low duty cycle): the duration of receiving and broadcasting is very short and the time interval between these two processes is kept long, so the active working time of the device is shortened so less power is consumed in ZigBee.

2.1.3 What are BLE Beacons

BLE beacons are usually no more than small computers with Bluetooth radios that cost under $ 20. However, more complex devices such as smartphones and tablets can also become BLE beacons. BLE beacons send out a signal that can be received by a BLE enabled device in a narrow range. Apps can be designed to trigger events within an instant of a device within the detectable range of the beacon. In addition, the device can calculate how close or far away it is from the beacon, which means that different events can be triggered depending on whether a device is within, for example, 5, 25, or 100 meters of a BLE beacon [6]. A device can simultaneously identify multiple beacons, and by calculating the relative distance from each of the beacons, the device can gain an element of location awareness .

2.1.4 Why are BLE Beacons Important?

BLE beacons are important because they address a number of challenges that marketers have been trying to solve for years: Secure and approach-based communication - Two devices can safely communicate when they are in close proximity [6] . This is the business challenge that the NFC technology tries to solve. BLE beacons can also solve this challenge, but with the additional advantage that the device does not have to be physically held against a sensor since it can remain in the pocket or wallet all the time. Indoor Geo-Location - GPS technology is ideal for outdoor use, but satellite signals are much less effective in a building. BLE-Beacons offer a cost-effective solution for location services with the additional advantage that they can be used at low cost and discharge the battery of a smartphone much less than the GPS technology. Broad Distribution - The vast majority of smartphones produced over the last two years support BLE technology, which means that the critical mass of users required for the success of a new technology is already. For marketers, it is always important to stick to the latest technology. BLE beacons have the potential to improve the way smartphones are used by consumers and businesses. The firstmover advantage is given for the use, and with an almost everywhere available device support, which is already on the market, is the only challenge, which must be overcome the data protection debate with the consumer. Marketers should think about how they can complement and expand a physical space to make it more

comfortable or stress-free rather than assume that the distribution of site-based content will be successful. This is a whole new dimension of customer experience.

2.1.5 What is iBeacon?

Apple launches its version iBeacon is a term used by Apple to describe its own implementation of the BLE beacon technology in iOS7. The term iBeacon quickly becomes a synonym for the generic term BLE Beacon (which is good for Apple), but the technology is also supported by Android and BlackBerry devices, with Windows Phone support likely coming soon. (This article uses the generic term BLE beacons instead of IBeacon) [6].

2.1.6 Mobile Application Platforms

2.1.6.1 IOS Application (SWIFT)

At Apple's annual World-Wide Developer Conference (WWDC) in June 2014, Apple announced a new programming language called Swift, which the company had developed since 2010. This was a great announcement; Objective-C has been the primary language for many Mac and iOS apps for many years [7] . The excitement surrounding this language was palpable. Twitter appeared with tweets about Swift, domain names with Swift in the title were purchased left and right and within 24 hours of the announcement, more than 300,000 copies of Apple's Swift iBook were downloaded. The people were ready to change. Objective-to finally replace Objective-C as Apple's language of choice, Swift has to convince developers to switch to the new language. Apple has promised that Swift will be faster than Objective-C, as well as provide more modern voice features, be very safe, and easy to learn and use. In this work, I test these claims by compiling an iOS application entirely in Swift and comparing two different algorithms. I think that Swift is faster than Objective-C, but the acceleration projected by Apple does not see. I also conclude that Swift offers many advantages over Objective-C and is easy for learners to learn and use. However, there are some weak areas of Swift that involve interactions with Objective-C and the severity of the compiler, which can make the language difficult. Despite these difficulties, Swift is a successful project for Apple and should attract new developers for their platform [8]. A new language brings not only syntactic differences, but also idiomatic differences and new conventions. Swift is not only an object-oriented language, but also introduces features derived from other languages such as C #, Haskell, Ruby, and so on. Swift has developed so much in the past year that it is sometimes

difficult to recognize similarities. Swift builds upon familiar concepts of Objective-C, but incorporates a more modern, safer syntax and multiple paradigms such as object-oriented, functional, imperative, and block-structured, as well as reintroducing it as a protocol-oriented programming language at WWDC 2015.

2.1.6.2 Android Application

In the advancing world of technology, mobile applications are a fast-growing segment of the global mobile market. Mobile apps are evolving rapidly to provide users with a complete and fast user experience [9]. This article discusses the mobile Android platform for mobile application development, the tiered approach, and the details of Android security information. Google releases Android, an open source operating system for mobile phones with Linux based platform. It consists of the operating system, the middleware as well as the user interface and the application software. Certainly, Android will be the most widely used operating system for mobile phones, but with Android comes a vulnerability that only a few users consider. In Android Market, where you can download thousands of applications for Android, anyone can upload their programs without a thorough security check. This makes Android a prime target for computer criminals. In this article, we discuss a multi-layered approach to developing Android applications, where we can develop an application that downloads data from the server. An Android Application Sandbox (AAS) that can run both static and dynamic analysis on Android programs to automatically detect suspicious applications is also discussed. Android is a new next-generation mobile operating system running on the Linux kernel. Android Mobile Application Development is based on Java language code because it allows developers to write code in the Java language. These codes can control mobile devices through Google-enabled Java libraries. It is an important platform for developing mobile applications using the software stack provided in the Google Android SDK. Android Mobile OS provides a flexible environment for Android Mobile Application Development, as developers can not only use Android Java Libraries, but can also use standard Java IDEs. Mobile Development India software developers have expertise in developing applications based on Android Java Libraries and other key tools. Android Mobile Application Development can be used to create innovative and dynamic third-party applications. Mobile Development India has been working hard on projects ranging from gaming software, event organizers, media players, image editing programs to go-karting and more.

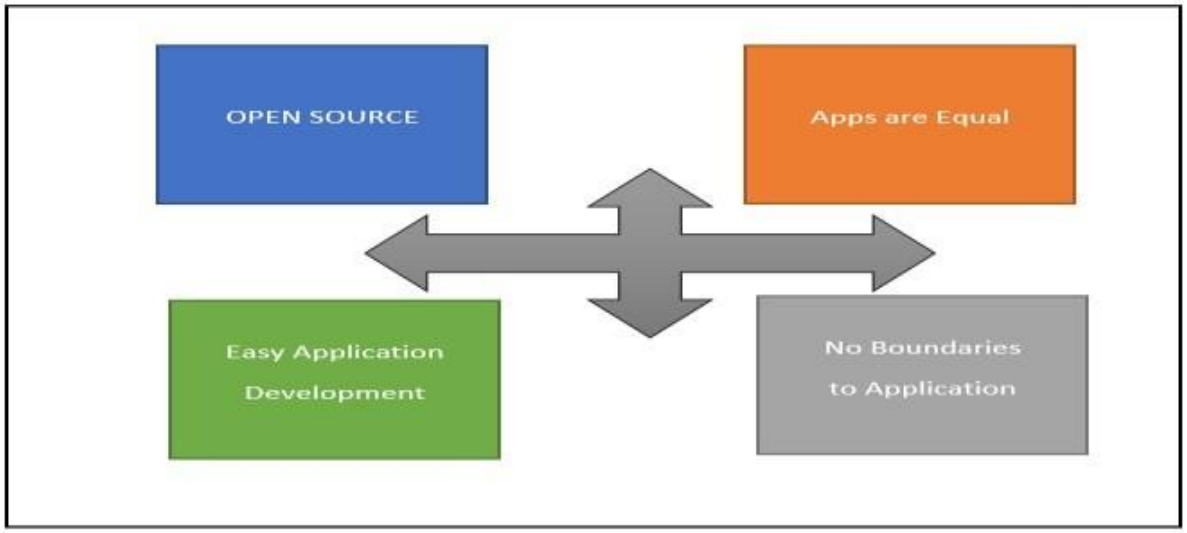

Fig.1. Four core features of the android platform

2.1.7 Web Services

2.1.7.1 .NET WCF Technology

Windows Communication Foundation (WCF) is a new Microsoft technology with which the software can communicate. COM / DCOM, .NET Remoting, ASP.NET Web Service and replacing all previous technologies like Web Services Enhancements for .NET WCF, interchanging data between software assets is always designed to be the best way to get a single solution [10]. WS- * serialization system for the new generation with a new specification also provides improved performance network infrastructure support and development of web service. WCF for IT professionals, businesses and software providers can use to reduce the operating costs of their solutions without writing a single line of code is an impressive set of management tools available. Most importantly, WCF provides the ultimate solution for modeling their executable language, the class library's low-level design repeated a new model-driven software factory approach with long latent promises to produce software development. Windows Communication Foundation Unleashed is designed to be your competent partner for software developers and architects to work with WCF. Book reader, WCF leads to a conceptual understanding of all possibilities and technology provides for step-by-step guidelines to apply to practical problems. We are introduced to Windows Workflow Foundation and the new .NET higher when you are WCF 'y with Windows and to begin deepening with WCF 'y in you technology you offer over 100 best practices for programming with WCF elsewhere detailed information about it, as to use the version of the service is not the exact scope of the optimizer data series to run the order, you will be safe,

reliable operation messaging and guide you through how to understand the available options. It will surely recognize you based on federation-based claims and show you how to assemble them. WS Trust and SAML security token service step by step guide to how to integrate every aspect of the WCF into their architecture. It shows how to add your own behaviors, communication channels, message encoders, and transport tools. Publish / Solutions Draw WCF How to Communicate Your Colleagues with the WCF Evangelist at Microsoft, Craig They show the way in which you communicate McMurtry, Marc Mercury, Nigel Watling, and Matt Winkler, in a unique position to write this book can. The product had access to the construction phase and the development team itself. Companies and foreign software vendors with their studies, they see how other software, enable them to learn how they are implemented and the difficulties they face. Preface Introduction Section II Windows Communication Foundation has 2 Basic Concepts 3 Data Representation 4 Sessions, Reliable Sessions Queues and Operation Section II Windows Workflow Foundation Introduction to Windows Workflow Foundation Basic 6 Windows Communication Foundation and Windows Section III Security 7 Security Basics 8 Windows CardSpace Information Cards and Identification Metasystem my 9 Data Provisioning Application of Security with Cards 10 Advanced Security Part IV Integration and Interoperability 11 Old Integration 12 Interoperability Section V Windows Communication Foundation Extension 13 Special Behavior 14 Individual Channels 15 Special Vehicles Section VI Exceptions 16 Publish / Subscribe-Peer Communication Systems 17 18 Representation State Transfer and XML Services Chapter VII of the Windows Communication Foundation Application Lifecycle Index Being.

2.1.7.2 PHP

Have you ever wondered why there are so many programming languages? A part of such "mainstream" languages as C, C ++, Pascal, and the like, there are others like Logo, Cobol, Fortran, Simulate and many more exotic languages [11] . Most software Developers do not really think about alternative programming languages when outlining a project; they have their preferred language (maybe a company-dictated language), know its advantages and disadvantages and adapt the project to the specific strengths and weaknesses of the language. But this could be unnecessary extra Workload to compensate for errors in the chosen language. Know how to use a language but lack the knowledge of their specific concepts is like a truck driver who wants to take part in a chariot race. Of course, he knows in general how to drive the car - he could even place well in the finish - but he will never an outstanding

driver until he is familiar with the specifics of his new vehicle. Similarly, when the OOP programmer is asked to write an application, it into objects, and the procedural programmer will treat the same task differently. Which approach is better? Every programmer will say that his method best, but only someone who is familiar with both concepts - OOP and procedural Programming-will be able to judge. Each language mentioned above represents another approach in a special way - mostly only problems of a certain kind, with special requirements. Since these languages focus on a very limited area of application, their success also limited to these fields. Languages such as C and Pascal have become so popular because of their broad focus that they omit special features for specific problems, but are satisfactory. the need for a tool that solves common problems. How does PHP fit into this schema? Although it's called a language, PHP is not Actually a separate language, but a mixture of different languages. It mainly uses the syntax that most C programmers know, but it's still very different; his interpreted. PHP also knows different types of variables, but no strict type checking. PHP knows classes, but not structured types. There are many examples like these, but you probably already understood the point: PHP melts many different conceptual approaches in a completely new, unique approach. To successfully create web applications with PHP, we recommend that you. First answer the following question: Is PHP the ideal language for my project? Good Question. But we would be stupid to say no. (Who would write a book about something they think is bad?) Let's rewrite the question: is there a better language? as PHP for my project? That's for sure to answer. When you run a web application Development is PHP the language for you .

2.1.8 Database Management Systems

2.1.8.1 MsSQL

Today's databases require database administrators (DBAs) who are responsible for optimizing performance. But, as the use of databases becomes ubiquitous, it is important that the databases be automatic focus on application needs and hardware capabilities instead of requiring external intervention by DBAs or applications [12]. Thus, self-optimizing databases would lead to a significant reduction in operating costs. Databases and would promote wider use in many non-traditional applications. However, do it Self-optimization of database management systems requires a thorough understanding of DBMS components and relationships among many of the "adjustment knobs" exposed to the application / user. Microsoft SQL Server is required to the vision of self-tuning databases. In this short review,

some of the recent progress in the Microsoft SQL Server Self-Tuning Section 2 describes a physical database design tool that is available with SQL Server 7.0, which automatically selects indexes that are appropriate for a SQL Server database. Section 3 and Section describe self-tuning proceeds in the query engine or Microsoft SQL Server 7.0 storage engine.

2.1.8.2 MySQL

MySQL is a very fast, robust relational database management system (RDBMS). With a database, you can efficiently store, search, sort, and retrieve data. The MySQL server controls access to your data to ensure that multiple users can work with it, provide quick access to it, and ensure that only authorized users gain access [13]. Therefore, MySQL is a multithreaded server with multiple users. It uses Structured Query Language (SQL), the database's default query language worldwide. MySQL has been publicly available since 1996, but has a history dating back to 1979. It has been awarded the Linux Journal Readers' Choice Award three years in a row. MySQL is now available under an open source license, but commercial licenses are also available if required. Some of MySQL's main competitors are PostgreSQL, Microsoft SQL Server and Oracle. MySQL has many strengths, including high performance, low cost, easy configuration and learning, portable and source code is available. A more detailed discussion of these strengths follows. MySQL is undeniably fast. You can see the developers' benchmark page at http://web.mysql.com/benchmark.html. Many of these benchmarks show that MySQL is orders of magnitude faster than the competition. MySQL is available for free under an open source license or at a low cost under a commercial license, if required by your application. Most modern databases use SQL. If you have used another RDBMS, you should have no difficulty adapting to it. MySQL is also easier to set up than many similar products. MySQL can be used on many different UNIX systems as well as Microsoft Windows. As with PHP, you can get and modify the source code for MySQL.

3. Software Requirements Specification

3.1 Introduction

3.1.1 Purpose

The Smart Attendance System aims to be a system of documenting student participation through mobile phone. The smart attendance system consists of three basic forms. These are the iBeacon device, the mobile application and the web application.

3.1.2 Product Scope

Today, although technology is advancing day by day, traditional techniques are being continued in some areas. This often leads to material and moral negative consequences. Nowadays, most of universities students are required to attend classes. However, in order to document this participation, students usually sign every course they attend. In a further method, the number of participants and the number of participants is determined by the instructor who teaches. This situation causes both loss of time and leads to some human errors. Therefore, we developed a smart attendance system on the grounds that a technology should be developed so that students and instructors would not suffer from such situations. The basic building block of this system is almost all of the smartphones available to students. Secondly, the Bluetooth low energy devices will be installed in the classrooms. There are many types of these devices. However, for security reasons, we chose the Ibeacon device, which we found to be successful in terms of price and performance. This device will be placed in the classroom. Students will check in to certify that they are there when they enter the classrooms. It is enough for smart devices to have Bluetooth turned on. Students will be able to certify their personal information through their application in the course of their registration. In addition, the teaching staff will be able to see the number of attendance at the lectures and the information of the participating students whenever they want. The lecturers will be able to add semester courses and view attendance in classes by logging in to the web application through personal information. We believe that the material and spiritual return of these technologies to schools will be positive.

3.1.3 Glossary

Term	Definition
Participant	The user who interacts with the mobile application or web application. Generally students and teachers
Stakeholder	Any person who has contribution in the project

3.2 Overall Description

3.2.1 Product Perspective

The Smart attendance system can be thought of as a program that basically detects the location. However, it is now known that many systems utilize location determination. This and similar systems are used in many areas. such as parking system or product location detection system. This idea has been tried to be used in schools. Similar systems have been made with diverse devices, but has not been achieved common use.

3.2.1.1 Development Methodology

We used an iterative development model to build our system. Iterative development model starts with full system, then changes functionalities of each subsystem with each new release. Software life cycle consists of 6 steps: planning, requirements, analysis design, implementation, test, evaluation. Four step planning, requirements, analysis design, implementation creates a loop. This loop continues until the software has reached the required threshold. If these steps are completed, the test and evaluation steps can be taken. If a problem is encountered while continuing the steps, it is returned to the requirements step again. However, after the software reaches a certain degree, this cycle is exited. This model is more advantageous than the waterfall model with the return feature. In addition, we created a hybrid model by taking advantage of some features in the scrum model during the development process. In Scrum model, daily meetings are held. We have created our product development model by combining this feature of the Scrum model with the iterative model.

3.2.2 User Characteristic

3.2.2.1 Students

3.2.1.1.1 Student must be a student at Cankaya University.

3.2.1.1.2 Student must take the related courses in the semester.

3.2.1.1.3 Student must know how to use the mobile application.

3.2.2.2 Teachers

3.2.2.2.1Teacher must be a lecturer at Cankaya University.

3.2.2.2.2 Teacher must give the related courses in the semester.

3.2.2.2.3 Teacher must know how to use the web application.

3.2.2.3 Administrator

3.2.2.3.1 Administrator must be employee at Cankaya University.

3.2.2.3.2 Administrator must have knowledge of software life cycle.

3.2.2.3.3 Administrator must have knowledge of IOS.

3.2.3 Product Functions

The system is composed of three main components. The first component mobile application is designed for the use of students. The students will login for application. Students will be able to access the attendance list through the mobile application. The second component is web application. Teachers can login to the system and then add the lessons they have opened during the semester and make the necessary arrangements. In the meantime, students and teachers can access the attendance list via web application. The third component, the iBeacon device, will send a signal to the mobile application used by the students to determine the location. When the student receives a signal from the mobile application iBeacon the document will be kept on the web application and will be available to both the students and the teacher.

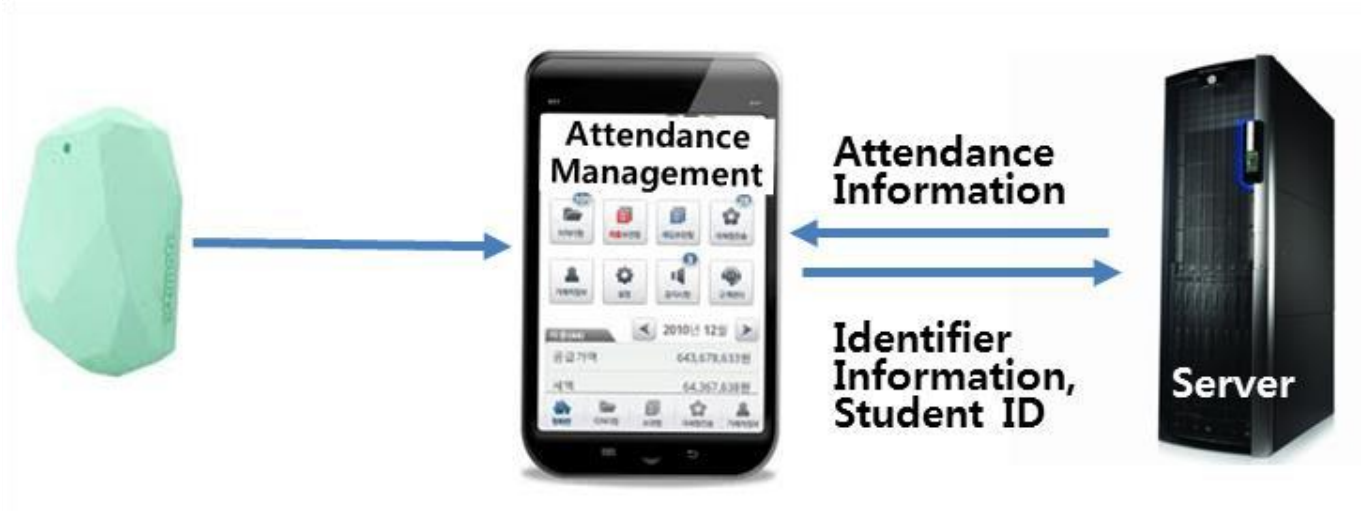

Figure 1 Components of System

3.3 Requirement Specification

3.3.1 External Interface Requirements

3.3.1.1 User Interfaces

The first user interface will be worked on any web browser for web application and second user interface which is mobile application will be worked on IOS 11.

3.3.1.2 Hardware Interfaces

The smart attendance system requires iBeacon, IPhone and any computer.

3.3.1.3 Software Interfaces

There are no external software interface requirements.

3.3.1.4 Software Interfaces

There are no external communications interface requirements.

3.3.2 Functional Requirements

3.3.2.1 Mobile Application Use Case

Use Case:

- Login
- Report Attendance
- Check-in
- Update Application

Diagram :

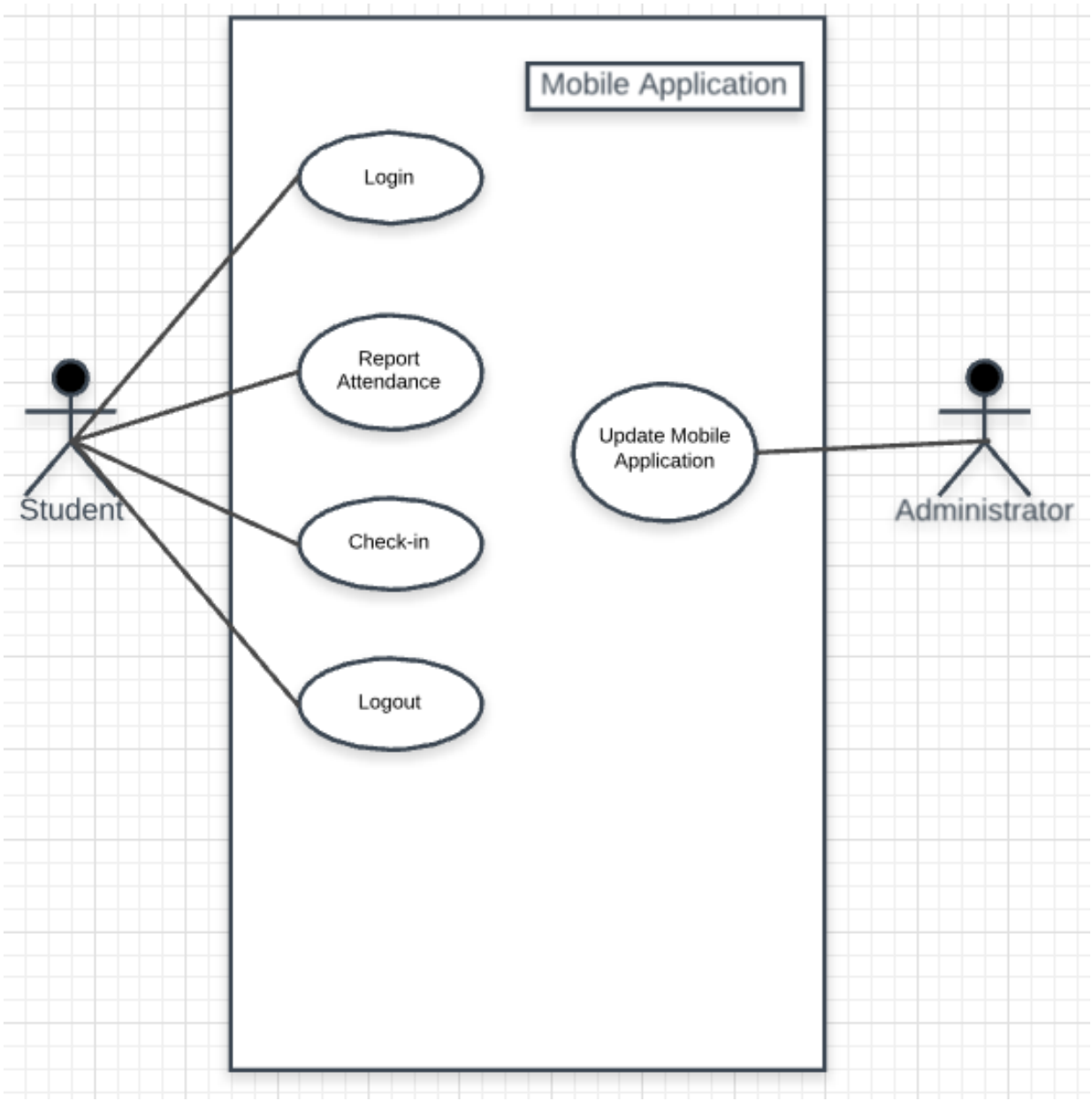

Figure 2 Mobile Application Use Case

Brief Description:

The operations that the student can perform are shown by the mobile application use case. Student and administrator are able to use the following function: students can Login , Check-in , Report Attendance and Administrator can use Update Mobile Application.

Initial Step by Step Description:

1.Students should open mobile application.

2.Students should login to the mobile application.

2.1 If the password is invalid for the student name, student should re-login.

3. Students can do check-in.

3.1 The students phone's Bluetooth devices should be open for check-in.

4.Students could list their attendance.

5.Adminstrator could update mobile application.

5.1 If there is something wrong or the mobile application need update administrator could update mobile application.

3.3.2.2 Web Application Use Case

Use Case:

- Login
- Add Course
- Report Attendances
- Add Teacher
- Update Teacher Status

Diagram:

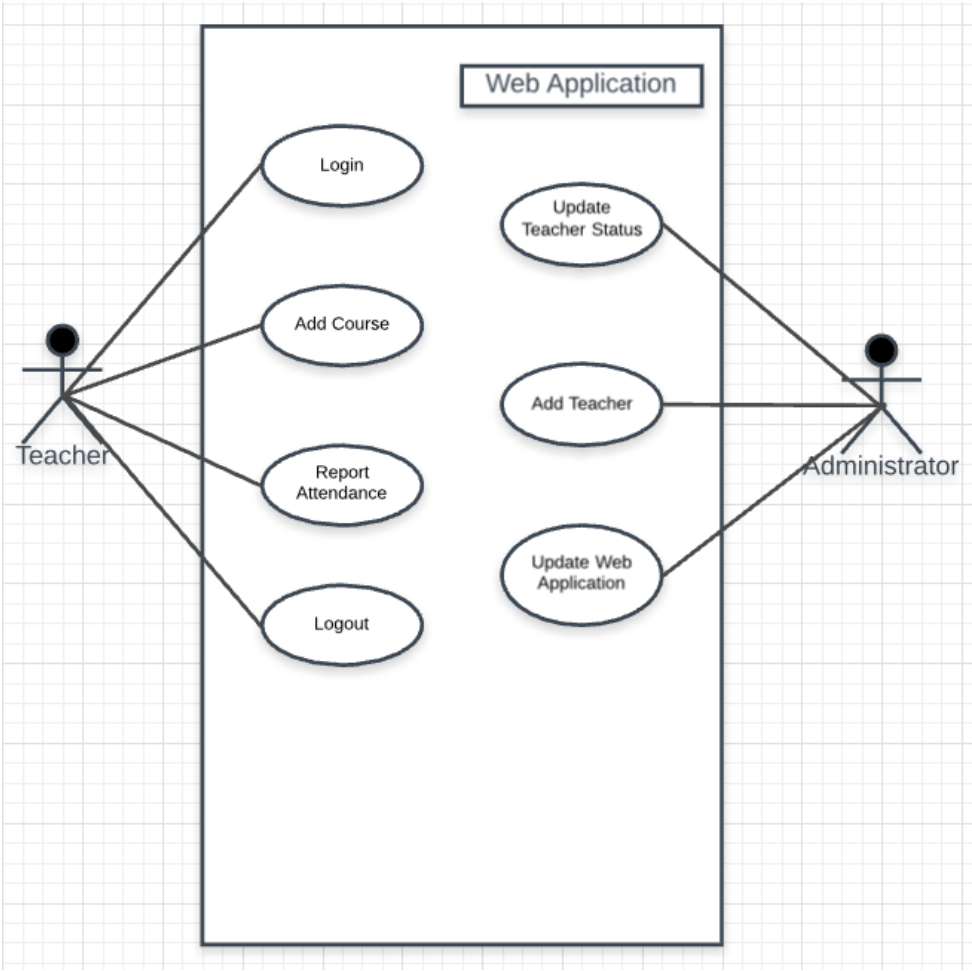

Figure 3 Web Application Use Case

Brief Description:

The operations that the teacher can perform are shown by the web application use case. Teacher and administrator are able to use the following function: teachers can use Login , Add Course , Report Attendance and administrator can use Update Teacher Status , Add Teacher.

Initial Step by Step Description:

1. Teachers should login with ID and password which is given by administrator.
   1.1 If the password is invalid for the teacher name, teacher should re-login.
2. Teacher could add course through the web application.
3. Teacher could report attendance through the web application.
   4.Adminstrator could update teacher status.
   4.1 If teacher give a lecture in that semester, administrator must change teacher status.
   5.Administrator could add teacher on the system.
   5.1 If a new teacher wants to use the system, administrator must add teacher on the system.

3.3.3 Non-Functional Requirements

3.3.3.1 Performance Requirements

For the smart attendance system to function properly, the student phone must be within range of the iBeacon device. Outside the coverage area, iBeacon signals can not be detected by the mobile application. For this reason the mobile application does not work properly.
The web application is designed as a desktop version. For this reason, web application users need to open applications on desktop-supported devices. In the worst case, user can not get full performance from application.

For running mobile application:

1.Operating System: Support IOS version 11.0 or later

2.Bluetooth: Support Bluetooth version 4.0 or later

For running web application:

1.Operating System: Any operating systems

3.3.3.2 Safety Requirements

The iBeacon device emits up to 100 meters of signal. However, the mobile application will accept signals up to a certain value. This value may change according to the size of the classroom. This limitation will prevent students from check-in in as long as they are not in the classroom. Students are required to be within the signal limit for check-in. Students are also required to receive a signal for a certain number of days or for a certain period of time during the course so that they can check in. Thus, students will be provided with classes during the course.

3.3.3.3 Adaptability Requirements

Since no data is collected and stored by the runtime, there is no adaptability request

3.3.3.4 Scalability Requirements

Since no data is collected and stored by the runtime, there is no adaptability request.

3.3.3.5 Usability Requirements

The mobile application will be easily detectable by any user. The user will be able to access the mobile application in a maximum of 3 steps.
The web application will be easily detectable by any user. The user will be able to reach the purpose in maximum 3 steps on the web application.

3.3.3.6 Security Requirements

Mobile application users will be login on the system with personal information. This information will be closed to end users. The hashing method will also be used when user passwords are stored. In addition, the iBeacon device will interact with phones in one direction. This means that the beacon device does not have access to the users' phones. Only the signal is obliged to send. Thus, there will be no problem with the security and sharing of the information of the users who are using mobile application.

4.Software Design Description

4.1 Introduction

4.1.1 Purpose

This software design document contains details of the smart attendance system project.

The target audience is teachers and students. Smart attendance system allows students to record their knowledge via phone. This project will provide teachers and students with time-saving opportunities in the lessons. The recorded data is more secure than the traditional methods because the external intervention will be closed.

The main purpose of the project is to introduce technological practice and safe new methods instead of traditional attendance methods. This project is designed with Bluetooth low energy technology and iBeacon device is used. This device will enable to communicate with students'

phones. For this reason, students must have a device that can communicate with the phone. they can download the mobile application, which is a part of it, and make use of the system. It is enough for the teachers who want to use the system to login to the web application which is a part of the project. When these requirements are met, users will be able to follow their attendance through applications.

This report is written to provide a better understanding of the project. This SDD contains the UML diagram, the activity diagram, and similar diagrams of the project.

4.1.2 Scope

This document will describe the design of the smart attendance system project. The project consists of three basic parts. The first part will be used to certify that users are in classrooms via mobile application. The mobile app is designed for use by students only. Through this application, students will be able to record which classroom they are in at what time. The mobile application will be developed using swift language. The mobile app will work on iOS 11 and above.

The second part of the smart attendance system is web application. The web application is designed to allow teachers to have lessons in the system to control students' absenteeism. However, teachers can perform different operations on the web application when necessary. Through this application, teachers can add and remove courses in the system. The web application will be developed with ASP.NET technology.

The third part of the smart attendance system is the iBeacon device. The iBeacon device is a low-energy Bluetooth device. This device signals to the mobile application. The signal includes signals defined in the mobile application.

The student who wishes to document the absentee status must be within the coverage area of the iBeacon device. So the signal from the iBeacon device will interact with the mobile application. The phone will be notified after certain conditions have occurred. The student will complete the transaction by approving the notification. The recording of the learner is sent to the web application through the json file. In the web application, the teacher can view this recording. The life cycle of the system is progressing in this way.

4.1.3 Glossary

Term	Definition
UML DIAGRAM	It is a modelling language which is used in Software Engineering.
BLOCK DIAGRAM	Schema type in which system components are displayed in blocks.
iBeacon	The device that sends Bluetooth signals with low energy.
SDD	Software Design Document.
Participant	The user who interacts with the mobile application or web application. Generally, students and teachers.

4.1.4 Overview of Document

The contents of the remaining sections are as listed. Chapter 2 describes the project development part of the architectural design of the system. It also includes the class diagram actors, exceptions, basic arrays, priorities and prerequisites. Also in this section is the activity diagram of the system. In the final chapter, section 3, there is a block diagram of the system which has been documented according to the usage conditions in the software requirement specifications document. In addition, this diagram is briefly explained.

4.1.5 Motivation

As computer students, we are interested in web and mobile application development areas. As a group, we took web application development lessons and swift language lessons. We received information about iBeacon within the scope of our project. Thus, we have acquired the necessary information to improve the system.

4.2. Architecture Design

4.2.1 Motivation

We used the iterative development model to develop the Smart Attendance System project. The iterative development model begins with the completion of the overall design of the system. Each subsystem is then designed. The process cycle of the software life cycle comes in six steps. These steps are planning, requirements, analysis design, implementation, testing,

maintenance. Planning, requirements, analysis design and implementation steps are repeated until the project reaches the desired level. Once these steps are completed, the test and maintenance steps can be taken. If any problems are encountered during the software development process, you can go back to the previous steps. This model is more advantageous than the waterfall model due to its ability to return. We also integrated the daily meeting feature applied in the scrum model into our own model. By combining the iterative model with the scrum model, we have created a hybrid product development model.

4.2.1.1 Class Diagram

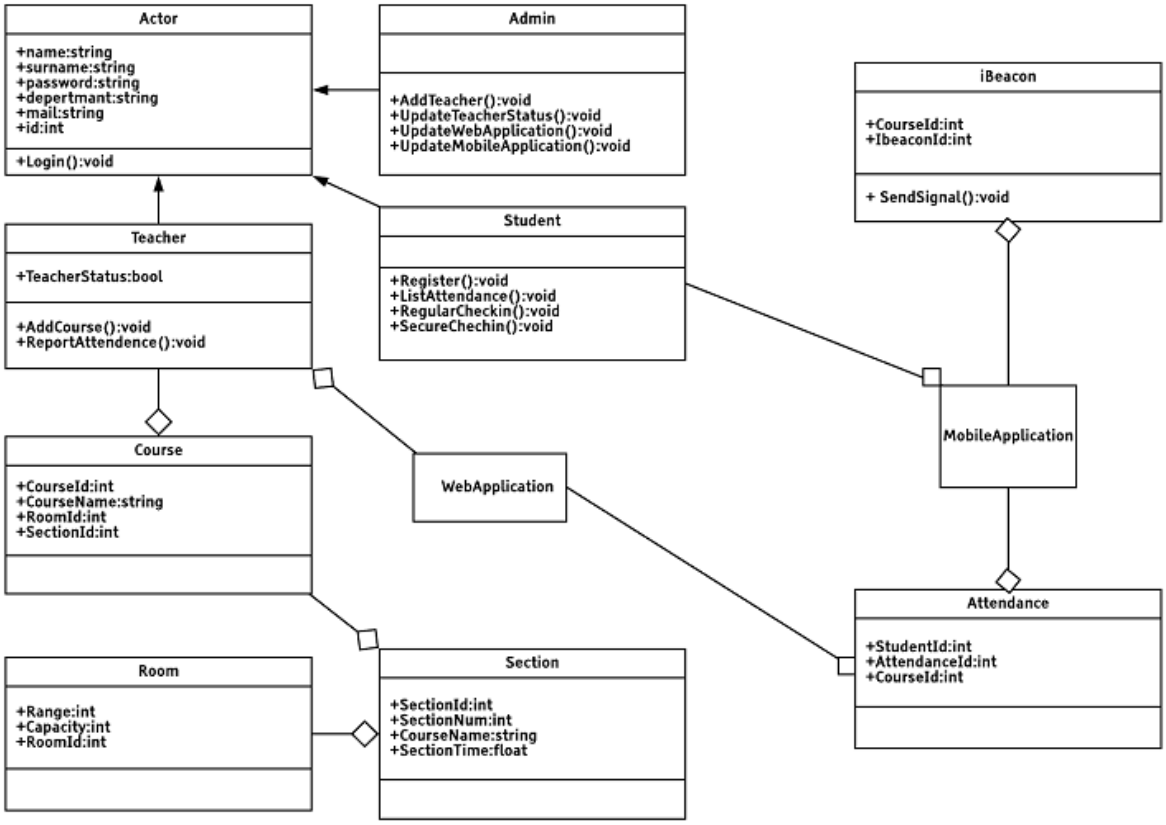

Figure 1 Class Diagram of Smart Attendance System

Figure 1 shows the classes of the smart attendance system and the connections between these classes. The actor represents all users who use the class system. The student represents the people who can use the system through the class mobile application. The teacher represents the people who can use the system through the class web application. The Admin class represents people who have authority over both the mobile application and the web application. Web application class represents the mobile application class user interface.

Room class represents classrooms registered in the system. Course class represents lessons that are registered in the system or added to the system by the teacher. Section class represents the time information of the courses registered in the system. The iBeacon class represents the signals to go to mobile application. The attendance class represents attendance information on the system.

4.2.2 Architecture Design of Smart Attendance System

4.2.2.1 Profile Management

Summary: This system is used by teachers, student and admin. Users who are students can login and exit from the system. Users who are teachers can login and logout from the system. In addition to this, admin can add teacher and update teacher status to the login system.

Actor: Teachers, student, admin.

Precondition: Users must run the mobile application or web application.

Basic Sequence:

- User shall login to the mobile application or web application by entering his/her e-mail and password.
- Admin can add a teacher account from admin menu.
- Admin can update a teacher account which is registered recently by changing teacher status from admin menu.
- User can logout from the mobile application or web application by selecting logout button.

Exception: Database connection can be failed.

Post Conditions: None

Priority: High

4.2.2.1 Options Menu

4.2.2.2.1 Mobile Application Options Menu

Summary: Student can select check-in. In addition, student can list attendance. Actor: Student

Precondition: Student must be logged in mobile application and have selected options button

Basic Sequence:

- Student can check-in by selecting check-in button.
- Student can list your attendance by selecting list attendance button.
- Participant can logout from the mobile application by selecting logout button.

Exception: iBeacon failed to send signal.

Post Conditions: Must be signaled by iBeacon for check-in.

Priority: High

4.2.2.2.2 Web Application Options Menu

Summary: Teacher can add courses and can report attendance.

Actor: Teacher

Precondition: Teacher must be logged in web application and have selected options button.

Basic Sequence:

- Teacher can add courses by selecting add courses button.
- Teacher can report attendance by selecting report attendance button.
- Teacher can logout from the web application by selecting logout button.

Exception: Database connection can be failed.

Post Conditions: None.

Priority: Medium

4.2.3 Activity Diagram

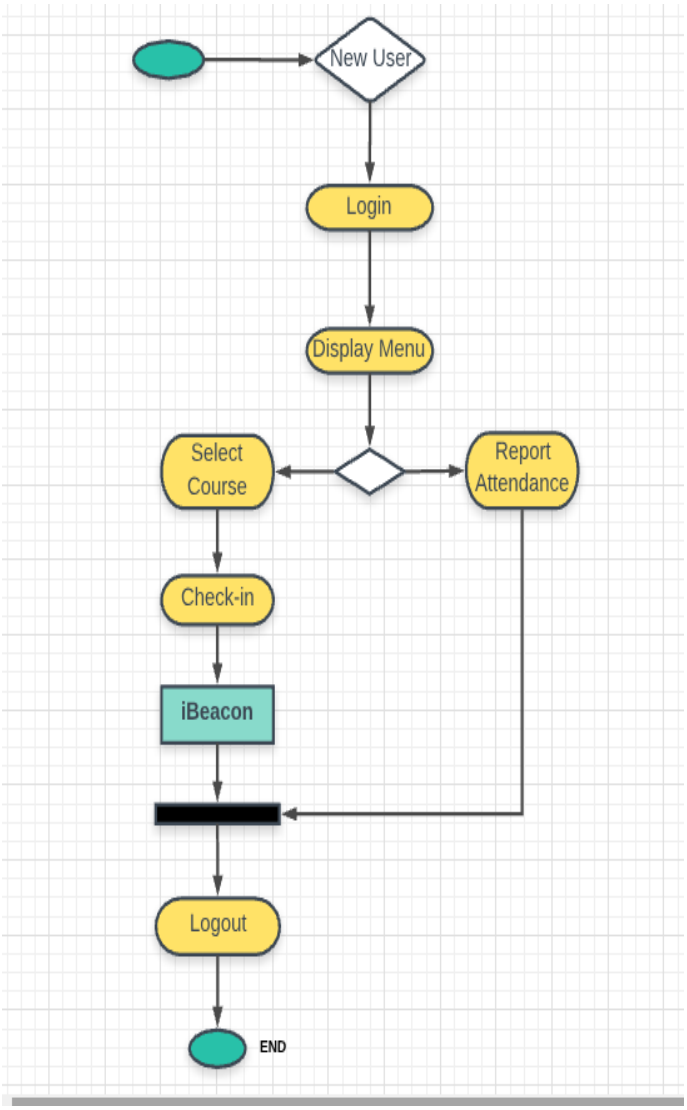

Figure 2 Activity Diagram of Mobile Application

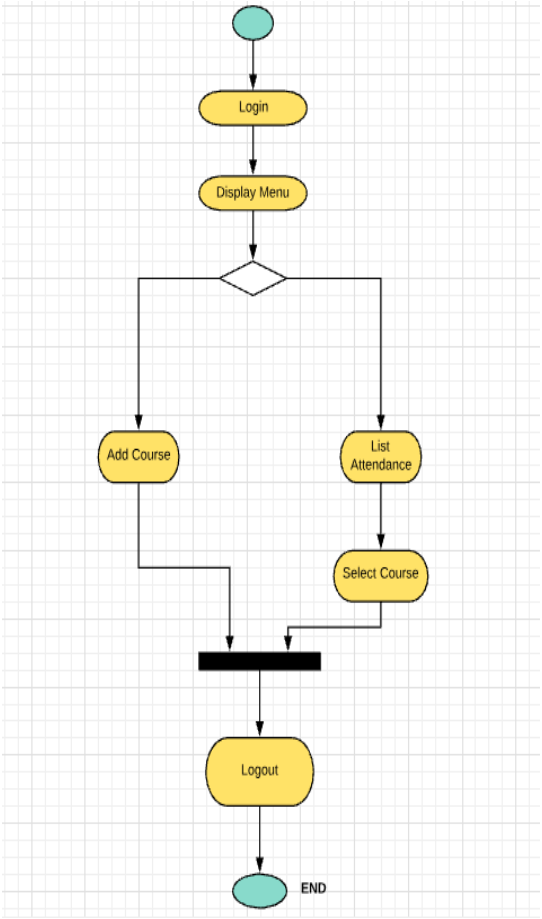

Figure 3 Activity Diagram of Web Application

Figure 2 shows activity diagram of mobile applications. Firstly, user can login and display menu. However, user can check-in through iBeacon. Finally, user can logout.

Figure 3 shows activity diagram of web application. Firstly, user who are he or she can login the web application and display menu. User can select options add course or report attendance. Finally, user can logout.

4.3 Use Case Realizations

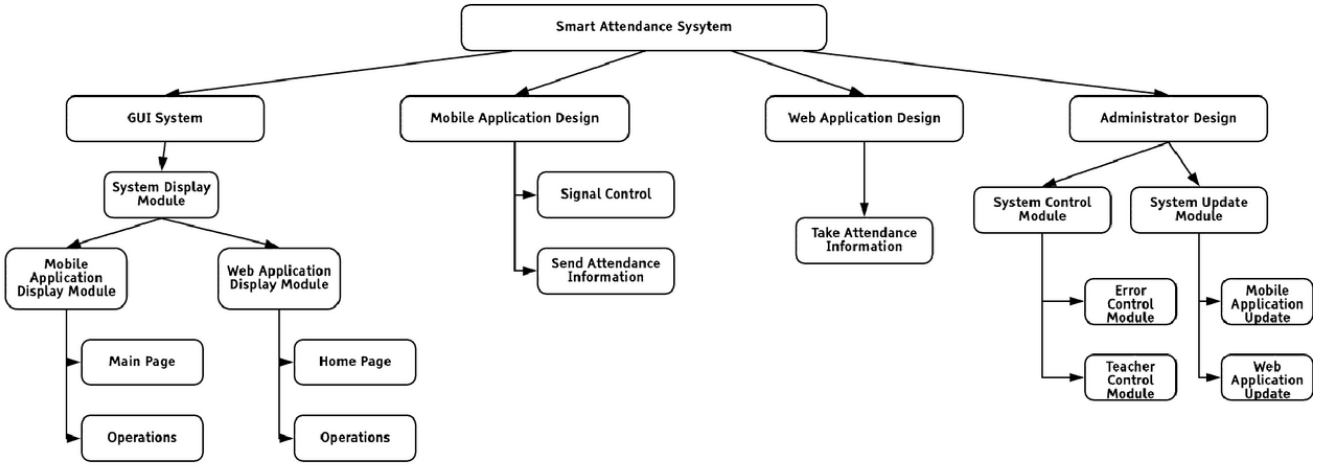

Figure 4 Project Components of Attendance System

4.3.1 Brief Description of Figure 4

The components of the Smart attendance system are shown in Figure 4. All subsystems designed for the system are included in the block diagram. The system has 4 main components.

4.3.1.1 GUI Design

GUI design is responsible for communication between system and actors. For actors who use mobile app, Main Page is a start page. In addition, these actors can access the operations they can do with the option of operations. For actors using a web application, homepage is a start page. Similarly, these actors can access operations that they can do with the option of operations.

4.3.1.2 Mobile Application Design

Mobile application design includes signal control system and information sending system. This allows the mobile application to run smoothly with subsystems.

4.3.1.3 Web Application Design

Web application design include taking information system. Through this subsystem, the web application communicates with the mobile application.

4.3.1.4 Administrator Design

Administrator Design include the system control module and the system update module. The system control module allows administrators to view errors via the error control module. In addition, the administrator gives the authority to add teachers to the system and update the teacher status through the teacher control module. The second subsystem of the system is the update module. The administrator can update the mobile application and web application via this module.

5.Test Plan

5.1 Introduction

5.1.1 Version Control

Version No	Description of Changes	Date
1.0	First Version	March13, 2018

5.1.2 Overview

The use case of Smart Attendance System: Smart Attendance Tracking and Monitoring System using BLE Beacon users namely participant and admin which had been determined in SRS document will be tested.

5.1.3 Scope

This document encapsulates the test plan of the use cases, test design specifications and the test cases correspond to test plan.

5.1.4 Terminology

Acronym	Definition
MA	Mobile Application
WA	Web Application
iBeacon	Bluetooth low energy devices

5.2 Features to be Tested

This section lists and gives a brief description of all the major features to be tested. For each major feature there will be a Test Design Specification added at the end of this document.

5.2.1 Mobile Application

Mobile application design includes signal control system and information sending system. This allows the mobile application to run smoothly with subsystems. Mobile application includes register system, login system, display menu option, check-in system, list attendance option, logout system. All component will be tested.

5.2.2 Web Application

Web application design include taking information system. Through this subsystem, the web application communicates with the mobile application. Web application includes login system, display menu option, add course option, report attendance option and logout system.

5.3 Item Pass/Fail Criteria

5.3.1 Exit Criteria

- 100% of the test cases are executed
- 99.9% of the test cases passed
- All High and Medium Priority test cases passed

5.4 Test Design Specification

5.4.1 Mobile Application (MA)

5.4.1.1 Sub Features to be tested

5.4.1.1.1 Login (MA.LG)

The participant has to login the mobile application system by entering email and password.

5.4.1.1.2 Display Menu (MA.DSP)

The participant can display list of attendance table through list attendance button.

5.4.1.1.3 Check-in (MA.CHK)

The participant can check-in through iBeacon devices.

5.4.1.1.4 List Attendance (MA.LST)

The participant can display list of attendance table through list attendance button.

5.4.1.1.5 Logout (MA.LGT)

The participant can logout the mobile application through logout button.

5.4.1.2 Test Cases

TC ID	Requirements	Priority	Scenario Description
MA.RG.01	3.2.1	H	Enter a valid user email and password.
MA.RG.02	3.2.1	H	Enter a invalid user email and password.

TC ID	Requirements	Priority	Scenario Description
MA.LG.01	3.2.1	H	Enter a valid user email and password.
MA.LG.02	3.2.1	H	Enter a valid user email and invalid password.

TC ID	Requirements	Priority	Scenario Description
MA.DSP.01	3.2.1	H	Select “Display Menu” button. After selecting, the application will be display menu.

TC ID	Requirements	Priority	Scenario Description
MA.CHK.01	3.2.2	H	Select “Check-in” button. After selecting, the application will be saved check-in.

TC ID	Requirements	Priority	Scenario Description
MA.LST.01	3.2.2	L	Select “List Attendance” button. After selecting, the simulation will display list of attendance.

TC ID	Requirements	Priority	Scenario Description
MA.LGT.01	3.2.2	L	Select “Logout” button. After selecting, the application will direct the home page.

5.4.2 Web Application (WA)

5.4.2.1 Subfeatures to be tested

5.4.2.1.1 Login (WA.LG)

The participant has to login the mobile application system by entering email and password.

5.4.2.1.2 Display Menu (WA.DSP)

The participant can display menu and select operation.

5.4.2.1.3 Add Course(WA.ADD)

The participant can add new course in the web application.

5.4.2.1.4 Report Attendance (WA.RPR)

The participant can display list of attendance table through report attendance button.

5.4.2.1.5 Logout(WA.LGT)

The participant can display list of attendance table through list attendance button.

5.4.2.2 Test Cases

TC ID	Requirements	Priority	Scenario Description
WA.ADD.01	3.2.3	H	Select “Add Course” button. After selecting, the application will be saved new course.

TC ID	Requirements	Priority	Scenario Description
WA.RPR.01	3.2.3	H	Select “Report Attendance” button. After selecting, the application will be display list of attendance.

TC ID	Requirements	Priority	Scenario Description
WA.LGT.01	3.2.3	L	Select “Logout” button. After selecting, the application will direct the home page.

TC ID	Requirements	Priority	Scenario Description
WA.LG.01	3.2.1	H	Enter a valid user email and password.
WA.LG.02	3.2.1	H	Enter a valid user email and invalid password.

TC ID	Requirements	Priority	Scenario Description
WA.DSP.01	3.2.3	H	Select “Display Menu” button. After selecting, the application will be display menu.

5.5 Detailed Test Cases

5.5.1 MA.LG.01

TC_ID	MA.LG.01
Purpose	Enter a valid email and password.
Requirements	3.2.1
Priority	High
Estimated Time Needed	1 Minutes
Dependency	Login page should be opened.
Setup	An user should be created.
Procedure	[A01] Go to Login page
	[A02] Enter a valid user email.
	[A03] Enter a valid user password.
	[A04] Click on the "Login" button.
	[V01] Observe that the Login is successfully and the display menu page appears.
Cleanup	Exit

5.5.2 MA.LG.02

TC_ID	MA.LG.02
Purpose	Enter a invalid email and password.
Requirements	3.2.1
Priority	High
Estimated Time Needed	1 Minutes
Dependency	Login page should be opened.
Setup	An user should be created.
Procedure	[A01] Go to Login page
	[A02] Enter a valid user email.
	[A03] Enter a invalid user password.
	[A04] Click on the "Login" button.
	[V01] Observe that the Login is unsuccessfully and the display error message.
Cleanup	Exit

5.5.3 MA.DSP.01

TC_ID	MA.DSP.01
Purpose	Display menu and select option.
Requirements	3.2.1
Priority	High.
Estimated Time Needed	2 Minutes
Dependency	User should be loginned.
Setup	The application should install on the mobile phone.
Procedure	[A01] Go to login page.
	[A02] User login successfully.
	[A03] Click on the “Display Menu” button.
	[V01] Observe that the display menu page appears.
Cleanup	Exit

5.5.4 MA.CHK.01

TC_ID	MA.CHK.01
Purpose	Check-in operation.
Requirements	3.2.1
Priority	High.
Estimated Time Needed	1 Minutes
Dependency	User should be loginned
Setup	User's bluetooth must be opened their mobile phone.
Procedure	[A01] Go to display menu page.
	[A02] Select “Check-in" button.
	[V01] Observe that check-in saved be successfully.
Cleanup	-

5.5.5. MA.LST.01

TC_ID	MA.LST.01
Purpose	Display list of attendance list.
Requirements	3.2.2
Priority	Low
Estimated Time Needed	1 Minutes
Dependency	User should be loginned
Setup	The application should install on the mobile phone.
Procedure	[A01] Go to display menu page.
	[A02] Select “List Attendance” button.
	[V01] Observe that mobile application display list of attendance.
Cleanup	Exit

5.5.6 MA.LGT.01

TC_ID	MA.LGT.01
Purpose	Logout the mobile application.
Requirements	3.2.2
Priority	Low
Estimated Time Needed	1 Minutes
Dependency	User should be loginned
Setup	The application should install on the mobile phone.
Procedure	[A01] Select “Logout” button.
	[V01] Observe that the mobile application will direct the home page.
Cleanup	-

5.5.7 WA.LG.01

TC_ID	WA.LG.01
Purpose	Enter a valid email and password.
Requirements	3.2.1
Priority	High
Estimated Time Needed	1 Minutes
Dependency	Login page should be opened.
Setup	An user should be created.
Procedure	[A01] Go to Login page
	[A02] Enter a valid user email.
	[A03] Enter a valid user password.
	[A04] Click on the "Login" button.
	[V01] Observe that the Login is successfully and the display menu page appears.
Cleanup	Exit

5.5.8 WA.LG.02

TC_ID	WA.LG.02
Purpose	Enter a invalid email and password.
Requirements	3.2.1
Priority	High
Estimated Time Needed	1 Minutes
Dependency	Login page should be opened.
Setup	An user should be created.
Procedure	[A01] Go to Login page
	[A02] Enter a valid user email.
	[A03] Enter a invalid user password.
	[A04] Click on the "Login" button.
	[V01] Observe that the Login is unsuccessfully and the display error message.
Cleanup	Exit

5.5.9 WA.DSP.01

TC_ID	WA.DSP.01
Purpose	Display menu and select option.
Requirements	3.2.1
Priority	High
Estimated Time Needed	1 Minutes
Dependency	User should be loginned.
Setup	The application should be opened.
Procedure	[A01] Go to login page.
	[A02] User login successfully.
	[A03] Click on the “Display Menu” button.
	[V01] Observe that the display menu page appears.
Cleanup	Exit

5.5.10 WA.ADD.01

TC_ID	WA.ADD.01
Purpose	Create and add new course in the web application.
Requirements	3.2.2
Priority	High
Estimated Time Needed	2 Minutes
Dependency	User should be loginned
Setup	The application should be opened.
Procedure	[A01] Go to display menu page.
	[A02] Select “Add course” button.
	[A03] Fill in the text box rightly.
	[V01] Observe that the web application saved new course.
Cleanup	Exit

5.5.11 WA.RPR.01

TC_ID	WA.RPR.01
Purpose	Display list of attendance list.
Requirements	3.2.2
Priority	High
Estimated Time Needed	1 Minutes
Dependency	User should be loginned
Setup	The application should be opened.
Procedure	[A01] Go to display menu page.
	[A02] Select “List Attendance” button.
	[V01] Observe that web application display list of attendance.
Cleanup	Exit

5.5.12 WA.LGT.01

TC_ID	WA.LGT.01
Purpose	Logout the web application.
Requirements	3.2.2
Priority	Low
Estimated Time Needed	1 Minutes
Dependency	User should be loginned.
Setup	The application should be opened.
Procedure	[A01] Select “Logout” button.
	[V01] Observe that the web application will direct the home page.
Cleanup	-

6. Conclusions

This document contains detailed information about the project called "Smart Attendance Tracking and Monitoring System using BLE Beacon". We aim to develop a project to solve the probing problem that we have identified as "Tracking the attendances". For this reason, we aim to use iBeacon, a Bluetooth Low Energy (BLE) Signal device that can be used by mobile applications. The iBeacon device is usually one of the best devices used for indoor positioning. In addition, iBeacon is highly secure for users because it transmits one-sided data.

We searched for similar work done before the project started. For this research, we have given priority to solutions that include related technologies. We have tried to understand how mobile application can be developed with BLE in the light of researches. After reviewing the work, we have determined the requirements of the project. We combined these requirements in the SRS document. We also used methodology to use it in the project development process. We combined the plan we made to improve the product in the SDD document.

We did not come across a similar study that matched the solution we found in all the studies. We have seen that the work is usually done on different BLE devices. However, we aim to develop our project by using the iBeacon device and the advantages it provides. The main aim of our project is to minimize the time spent on tracking the attendances in lessons. With this project, course attendance will become easier for both students and teachers.

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