STUDENTS ATTENDANCE SYSTEM AND NOTIFICATION OF COLLEGE SUBJECT SCHEDULE BASED ON CLASSROOM USING IBEACON

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Abstract—Attendance is a must for students. Without the attendance process, the lecturer or teacher cannot assess the participation of a student. But in the process now, attendance is still done manually using paper. Where later the paper will be signed by students. But this will cause problems. The first problem is the use of excess paper and the second problem is the difficulty for the administration to recapitulate student attendance results. This is because so many attendance papers must be analyzed by the administration. Therefore, a student attendance system is needed that can collect data quickly, efficiently and accurately. This student attendance system is done by conducting data collection, system analysis, system design, and system implementation. This system is created using the PHP and Java Android programming languages. The System is also using Ibeacon as classroom identifier. The purpose of this study is to make attendance system applications of students and class schedule notifications based on IBEACON, it is expected that the attendance process will be more efficient and can be easily monitored by lecturers and by the central administration.
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Keywords—Attendance, Application, Ibeacon, Schedule

I. INTRODUCTION

iBeacon is a name for Apple technology standards, which allows Mobile Apps (running on both iOS and Android devices) to listen to signals from beacons in the physical world. Basically, iBeacon technology allows Mobile Apps to understand their position on the micro-local scale, and deliver hyper-contextual content to users based on location. The underlying communication technology is Bluetooth Low Energy or commonly called Bluetooth beacon. Attendance is an activity of data retrieval in order to find out the number of attendance in a course. Every activity that requires information about students will attend attendance. This also happens in the learning process. The usefulness of this attendance happens to students and parties to the teaching and learning process. One of the uses of this attendance system to students is, among other things, in calculating the likelihood that students will take exams and one of the uses of this attendance information to those who are teaching and learning activities, among others, to evaluate students' satisfaction with a subject and create benchmarks for the future. giving better knowledge. Retrieval of attendance data itself is done manually has many shortcomings, Another disadvantage of manually retrieving data is the loss or damage of existing data. Another disadvantage is the lack of efficiency and effectiveness in data processing [2]. The use of mobile and web applications is said to be more effective and efficient because of the ease in accessing and retrieving information. In addition, with the addition of IBeacon technology that has location-based features, we can base the attendance process on classrooms and subject schedules on the class, so the information submitted is not only limited to attendance but also information about class schedules and lecturers who teach the course.

II. LITERATURE REVIEW

A. API

The Application Programming Interface (API) is a set of visible code elements provided by a framework or library, and such libraries or frameworks are called API libraries. API libraries are also referred to as API codes [5]. Client Code is an application code that reuses or expands the code elements provided by the API library [5]. API Usage is a way to call the API code, which includes the sequence of calls or invariants [5]. So it can be said that the Library API is called by the code or script provided by the user, in this case, the author of the application by using the methods or procedures that exist in the API Usage. the REST API is based on REST architectural style, which is using text-based JSON message over HTTP transport [6]. Application Programming Interface (API) is defined as interfaces used by the software component to communicate with each other [7].

B. IBeacon

iBeacon works with Bluetooth Low Energy (BLE), also known as Bluetooth 4.0 or intelligent Bluetooth. Through iBeacons, we can identify our position in a shop and it could send us notifications about things that are going to be sold or we are interested in. Besides, we could pay without

coming up with the money from the wallet or without using a credit card. So, it could be a possible rival of the Near Field Communication [3].

C. Line Messaging API

Messaging API allows data to be sent to your bot's app server and the LINE Platform. When a user sends a bot you have with a message, a Webhook will be triggered and the LINE Platform sends a request to your Webhook URL. Your server then sends a request to the LINE Platform to respond to user requests. Request sent via HTTPS in JSON format [8].

D. Smart Campus

A smart campus is similar to the smart city and same solutions can be used in smart campus applications. "Smart campuses are built to benefit the faculty and students, manage the available resources and enhance user experience with proactive services [1]. Smart campus refers to integrating all kinds of application services systems, setting up a wise, intelligent teaching, learning, and living environment, which is suitable for: management, teaching, scientific research, and campus life unity, as well as based on the Internet of things [2].

E. Android

Android is a mobile platform developed by OHA "Open Handset Software Alliance", whose most influential member is Google. It is open-source software, meaning that anyone can download the source code from AOSP (Android Open Source Project) and use or modify it. Android can be roughly separated into the following major components: Applications, Application Framework, Libraries, Runtime, and Linux Kernel [4].

F. BLE

Due to the feature of low energy consumption, it is widely used for IoT services. The specification of the Bluetooth system defines three channels used for BLE Advertisement. This leads to high signal collision rate when there is a large number of BLE devices in a narrow area. As a consequence, the discovery latency for all surrounding BLE devices is extended. Meanwhile, the signal density increases with the increasing of BLE devices which leads to a short delay in capturing a Signal [9]. BLE inherits a majority of the design of classic Bluetooth in terms of the protocol stack, data structure, and working band, while BLE involves several important changes towards a simple short-range radio network [10], [11].

III. PROPOSED METHOD

The analysis is the first step for developing an application because the design and even the development of an application implementation will not run well without an

analysis of the application to be used. Analysis can also be defined as the stage of explanation of a complete application with a view to identifying and evaluating problems and obstacles that occur as well as the expected needs so that there are proposals for improvement. In this analysis, the phase has the purpose of knowing the system of the application that has been made, the processes involved in the application and the relationship between processes. The system analysis stage is a critical stage which is very important because errors in this stage will result in the next stage. A study proves that errors that are corrected after the analysis phase will have a greater cost than if corrected during the analysis.

The first step is to do an analysis of the ongoing process. At this time, the student attendance process is still done manually. Students must sign an attendance form that has been provided by the campus or university. This raises two problems, namely:

1) The student attendance calculation process is longer. This is because, the administration department must calculate one by one the number of student attendance by the department, by faculty and overall.

2) Wasteful paper, this manual attendance process is not environmentally friendly and wasteful of paper because of a large number of papers used to be as attendance forms.
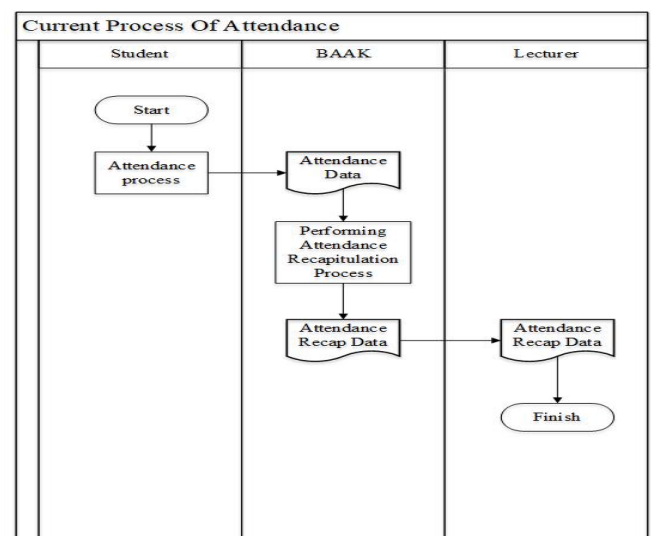

Fig. 1. Current Process Of Attendance

Figure 1 explains the current student attendance process, this process starts when students enter the class. After that students will be given an attendance form, students will then sign the form, after that the lecturer will check and verify by calling one by one of the students who are present. The attendance form will be used to calculate attendance for each student. After the calculation process is carried out, the administration will input the recapitulation data into an excel file, where the file will be used as a reference to show the student attendance level. In the current attendance process, there are 3 actors, namely students who attend the attendance process, BAAK or the

administrative department that manages attendance data management, as well as lecturers who carry out verification of attendance by students.
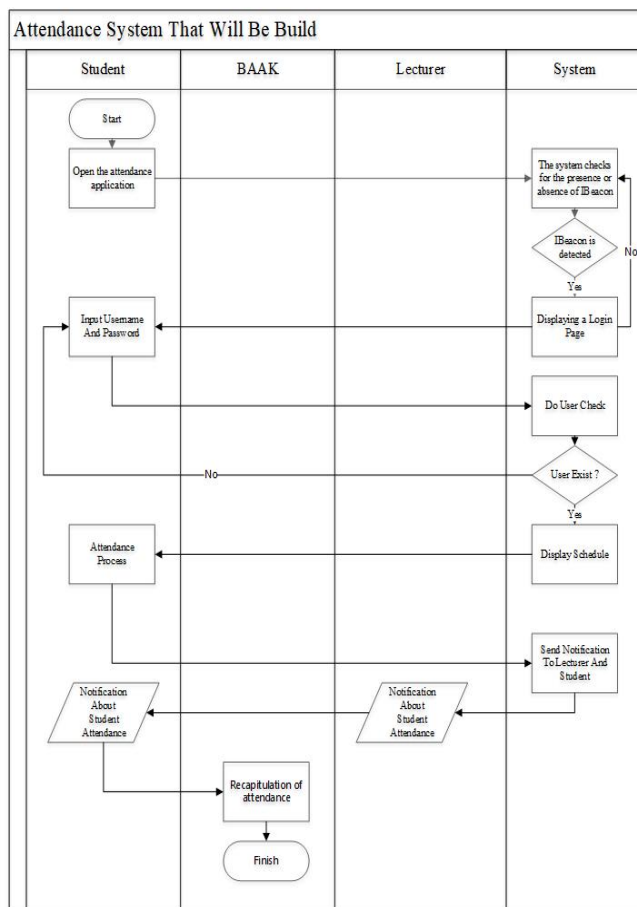

Fig. 2.   Attendance System That Will Be Build

figure 2 explains the system to be built, the process starts when the student opens the attendance application, after opening, the application will ask the user to activate Bluetooth. After Bluetooth is activated the application will check the existence of IBeacon. IBeacon functions as an identity for each classroom in the lecture building. Each existing IBeacon represents information about the name of the room, the room code, and what courses are registered in the room. If IBeacon is detected, a notification will appear on the user's smartphone, the notification contains information about the name of the room where the IBeacon is located. At the time the notification is clicked, the user will be directed to the course schedule page, on this page the user can view the course schedule and information in accordance with the classrooms that have previously been identified. After that students can do the attendance process by logging in first. After the login is successful, the user will be directed to the schedule page, on this page the user can choose a schedule that matches the classroom, day and hour, after selecting the schedule, the user will be directed to the attendance page. Users only need to press the attendance button, then the attendance process will be carried out. After the attendance process, the user will be directed back to the schedule page and will automatically log out of the system.

After that, the lecturer will receive a notification regarding the attendance process that has been done by the student. There are several criteria that must be met by users when they want to attend attendance, namely:

1) Attendance Process Can Only Be Done In Classrooms, Days, and Hours That Are In Accordance with the Time of the Day.

2) Users can only attend attendance at the subjects they have taken at the time they input KRS. So even though there are two-course schedules in certain classrooms, users cannot attend attendance if the user is not registered as a participant in the course.

3) Attendance Process Can Only Be Done One At The Time. Students who have been attended by today's schedule can no longer attend attendance.

If these criteria are successfully met then the user will be able to attend the attendance process
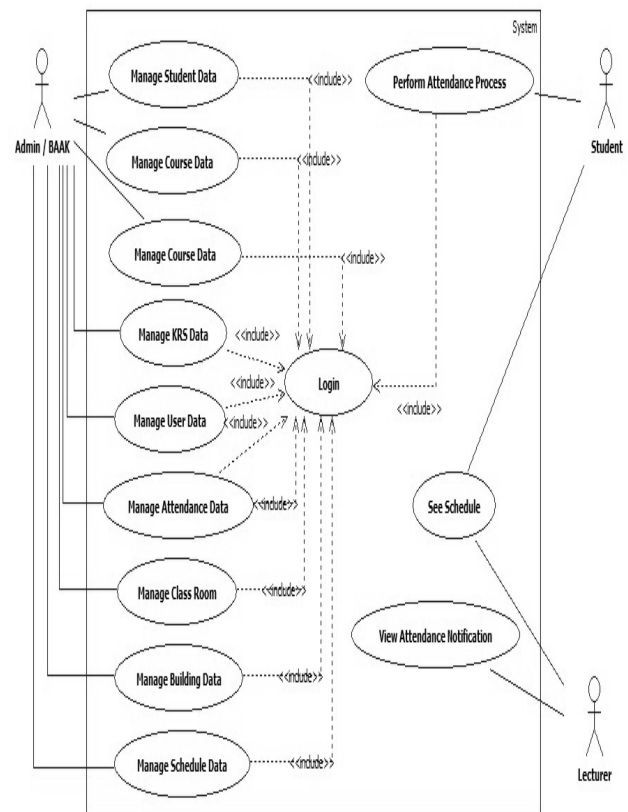

Fig. 3.   Use Case Attendance System

Figure 3 describes the use case of the system to be built, on the use case above there are 3 actors, namely lecturers, admin BAAK and student. For lecturers, they can only see notifications given by students and see schedules based on rooms and buildings where the lecturer teaches. For students, they can only log into the system and attend attendance processes based on the class in which they have been registered, besides that students can also view the

course schedule based on the room and building. For BAAK administrators, they can manage content in the form of subjects, classrooms, schedules, students, lecturers and attendance results that have been done by students.

The system to be built is divided into 4 parts, namely:

1. Bluetooth Detection Component

This section serves to detect the existence of IBeacon, this component includes android applications, CuBeacon and BLE (Bluetooth Low Energy) or Bluetooth 4.0.

2. Line WebHook Components

This section functions to handle requests sent from the application to the Line Messaging API, this section forwards notifications regarding the process of attendance from the web to the Line. This component consists of Line, Line Messaging API, and Line Webhook.

3. Website Administrator

This section serves as a place for managing data regarding attendance which will be used by the other 3 components. This component becomes the basic information's provider. This section is managed by admin or BAAK.

4. Front End Application

This section functions as the main application, in this section students, can see the schedule and do the attendance process. This component consists of WebView and Framework 7.
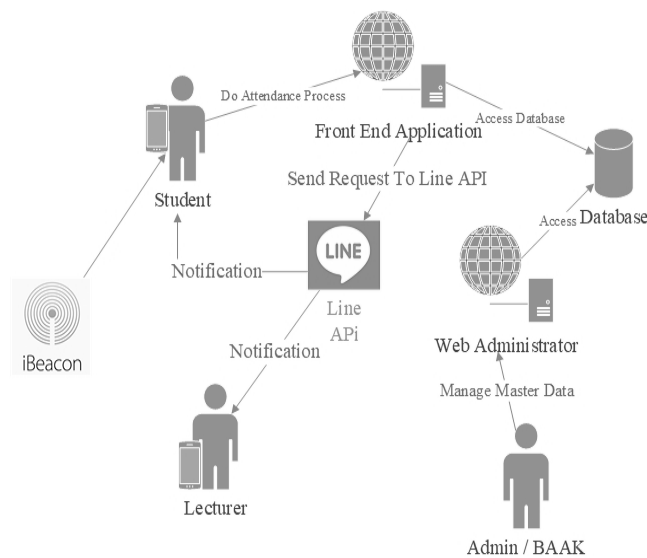

Fig. 4. System Architecture

Figure 4 describes the architecture of the system to be built, wherein the architecture BAAK admin manages content related to academic activities through web

administrators, the results of data management will be stored in the database, while students who have received notification from IBeacon will be directed to the frontend application to process attendance. All course schedule data that can be seen by students is the data that has been managed by the BAAK Admin, after the student attendance process, the front end application will send a request to the Line API to send notifications to lecturers and students.

In the system that will be built hardware that has been used is needed especially IBeacon, ibeacon that will be used is made by Estimote. Following are the specifications of the Beacon Estimote.

Fig. 5. Estimote Proximity Beacon

Figure 5 shows an overview of the types of IBeacon that will be used in this system.

TABLE I. ESTIMOTE BEACON SPESIFICATION

No	Spesification Parameter	Spesification
1	MCU	Bluetooth® SoC ARM® Cortex®-M4 32-bit processor with FPU 64 MHz Core speed 512 kB Flash memory 64 kB RAM memory
2	Radio: 2.4 GHz transceiver	Bluetooth® 4.2 LE standard Range: up to 70 meters (230 feet) Output Power: -20 to +4 dBm in 4 dB steps, "Whisper mode" -40 dBm Sensitivity: -96 dBm Frequency range: 2400 MHz to 2483.5 MHz No. of channels: 40 Adjacent channel separation: 2 MHz Modulation: GFSK (FHSS) Antenna: PCB Meander, Monopole Antenna Gain: 0 dBi Over-the-air data rate: 1 Mbps (2 Mbps supported)
3	Sensors	Motion sensor (Ultra-low-power, high-performance, 3-axis "femto" accelerometer) Temperature sensor
4	Power Supply	1 x CR2477 – 3.0V lithium primary cell battery (replaceable)
5	Material	non-flammable

6	Size And Weight	Length 55mm (2.16 inches) Width: 38 mm (1.49 inches) Height: 18 mm (0.71 inches) Weight: 30g (1.06 ounces)
		enclosure: silicone adhesive layer: double-sided adhesive tape

IV. RESULT

The results of this study are represented in the form of a Print screen display of the program interface that has been created. Following are the results of the program that has been made.

Fig. 6. Login Form

Figure 6 shows the administration web login view for the BAAK admin if the login process is successful, the admin will be directed to the admin main page.

Fig. 7. Page For Managing Data

Figure 7 shows the data management page for BAAK, on this page BAAK can change, add, and delete data content regarding campus academic activities. Where this data will be used as a master data for the attendance process.

Fig. 8. Front Application

Figure 8 shows the main page of the front end application, on this page, there are two choices, namely the class schedule and attendance. The lecture schedule menu shows the course data that will take place in the classroom, while attendance is a page for attendance.

Fig. 9. Course Schedule

Figure 8 shows the course schedule page. On this page, students can see information about the subject which consists of the course code, the name of the subject, the lecturer who teaches the subject, the description of the course, time and participants who take the course. However, the course schedule shown will only be based on the room where the course will be held or held.
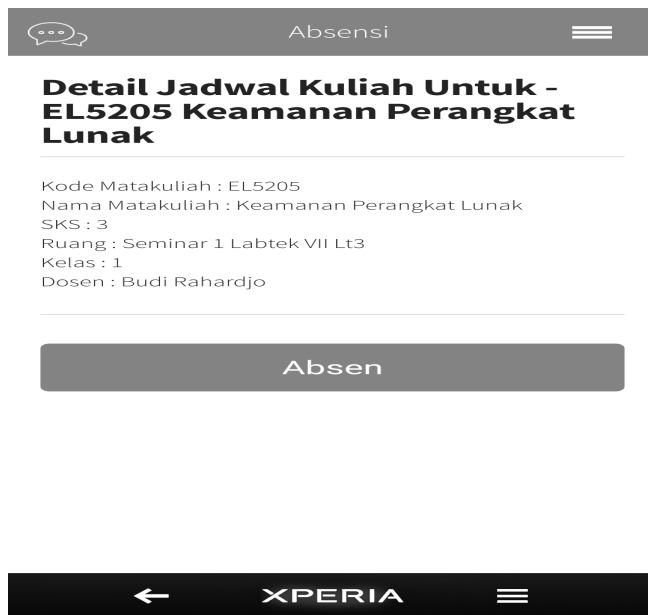
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Fig. 10. Attendance Page

Figure 10 shows the attendance page for students, the attendance button page will only appear if the previously mentioned criteria are met. The attendance process can only be done after the student enters the login process using their username and password, after the attendance process the student will automatically exit the system. When students log in again they can no longer attend attendance until the following week.

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