E-Beacon Card Training-Based Application
Internet of Things (IoT) in the School Environment

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Abstract

At that time, SMK Yadika 11 Jatirangga Bekasi still needed help communicating announcements within the school. In addition to being expensive, buying an intercom is also less effective during the teaching and learning process due to noise pollution. Therefore the PPM Team at Mercu Buana University wanted to provide a solution by introducing Internet of Things (IoT) technology on one of the Bluetooth ebacon devices. eBeacon Card is a Bluetooth Low Energy transmitter connected to various electronic devices. This device will be connected via a short message to each person's cell phone, such as an SMS notification. In this training, two eBeacon Cards uses, which should be applicable in two rooms with a radius of 20 m. However, due to space limitations, both are installed in one room. So that the target information announcement target can receive data from both eBeacon cards with the same announcement display twice. Some of the outputs used in evaluating this training were that they understood the IoT process, how to install and create eBeacon, and could use it for other needs such as announcements, advertisements, etc.

Keywords: Internet of Things (IoT), Intercom, eBeacon Card, Bluetooth Low Energy

INTRODUCTION

To facilitate teaching and learning activities in the classroom, every educational institution requires technology that is user-friendly for its users. Recently, the term Internet of Things (IoT) is no longer foreign to our ears, starting from smart homes (Simanjuntak et al., 2020), innovative schools (Rukmana & Mulyanti, 2020), smart industry (Jung & Choi, 2017) (Baek et al., 2017), and retail (Adkar et al., 2018). If the study room facilitates by Internet of Things (IoT) devices, it will teach students and deliver learning material. Of course, this is a new paradigm in the world of education that should be followed up by relevant agencies because, in addition to helping teaching and learning activities in the classroom, IoT facilities also facilitate monitoring and management processes. IoT innovations in Indonesia have emerged through startups, including the eBeacon Card. The following Figure 1 shows the physical form of the eBeacon Card.

Figure 1. The Physical of the eBeacon Card (Pratama et al., 2017)

eBeacon is an IoT product from a startup from Surabaya in 2014 named Tiyo Avianto and two of his colleagues at PT. Eyro Digital Technology is owned by Indonesian citizens, including company leaders (VIVA.co.id, 2016). Some publications on the application of eBeacon are as follows: Yesnida Apriliantari et al. (2019) implemented eBeacon for student attendance at a university. eBeacon is used to record students' position and time of attendance every day via

mobile Android and the website. They used Firebase Cloud Messaging to send messages from websites to Android devices as notifications. (Oktaviana & Apriliantari, 2019).

Furthermore, Fahrudin Mukti Wibowo (2020) applies eBeacon to large parking areas without instructions. Therefore a guide or navigation system is needed to make it easier for people to find empty parking areas. BLE (Bluetooth Low Energy) is a Bluetooth navigation system technology with a data transfer rate of up to 1 Mbps, a signal range of up to 100 m, and low power consumption. The result is that the RSSI value received is small, with an average distance error of 0.92 meters. (Wibowo & Syifa, 2020). Fanda Lyta Suzanayanti et al. (2021) research shows that they performed RSSI optimization on BLE beacons in indoor rooms with Gaussian Filters (Suzanayanti & Alaydrus, 2021). Yosua Umbu Datu Kadiwanu et al. (2020) utilize beacons and smartphones to provide information stored in an information media database at UK Petra (Kadiwanu et al., 2020). Desmira (2021) implemented eBeacon in the minimarket room in the main lobby of Serang Raya University, intending to promote products for the various needs of campus students at Nightmare (Mira, 2021).

Based on information from the Mercu Buana University PPM team, the Yadika 11 Jatirangga Bekasi school is still using conventional techniques in disseminating information, namely using an intercom during teaching and learning activities. That was the problem that the PPM team took to find a solution because it disturbed the concentration of teachers and students in class. To convey various important announcements to teachers and students, they are still in paper form on bulletin boards or school walls. Apart from being counterproductive because only some advertising targets always pay attention to the contents of the bulletin board, it is also less effective because it litters the school's walls, and the information dissemination process takes place slowly. It does not support the government's paperless printing program. The proposed solution is the implementation of eBeacon technology.

The Community Service Team at Mercu Buana University continues collaborating with the surrounding community in developing electronics-related human resources. Here are some of them. Reference (Simanjuntak, Rahmawati, et al., 2022) optimizes the access point in the school library and teaches proper concepts and installation. Reference (Simanjuntak, Agustina, et al., 2022) socializes using a digital Smith chart to optimize transmission channels, etc.

eBeacon is a Bluetooth low-energy transmitter built with nRF 51822 technology (Muhtadin et al., 2017). Its functions vary in many sectors, from digital advertising to solutions for intelligent buildings such as schools, offices, and others. While there is a trend for schools to take attendance by fingerprint, bacon can scan en masse simultaneously and in real-time. Another advantage is that it is paperless. The need for information dissemination in the school environment can be easily, quickly, and efficiently achieved. Announcements regarding teacher meetings, student council, foundation staff, and even sales promotions from companies that produce various schools can arrive quickly, precisely, and efficiently. Regarding school entrepreneurship, it can promote various food and beverage companies and other school products whose promotion targets are students, teachers, and school staff and foundations.

Based on the reasons above, the Mercu Buana University PPM team offers the eBeacon card as a practical solution to know and learn about its use and process. The process is uncomplicated, and affordable prices can implement at the Yadika 11 Jatirangga Bekasi school. In this training, two eBeacon card points practics should have been implemented in two rooms with a radius of 20 m. However, due to space limitations, both are installed in one room so that the targets for information announcements can receive data from both eBeacon cards with two displays of the same announcement.

METHOD

The method used in this activity is to transfer knowledge about the application, then install it and how to use it, as done in the following reference activity (Prasetyaningrum et al., 2022; Simarmata et al., 2022). The target output of this activity is that the training participants know what eBeacon technology is, understand the eBeacon work process, understand how to use and install it in schools through practice, and get a training certificate as a participant. To run eBeacon,

participants (target recipients of information) must activate Bluetooth on their respective smartphones, then download and install it. Then open the application that has been installed, and a broadcast message will arrive on the phone screen. One person only holds the host point to refrain from disseminating excellent and accurate information. eBeacon can connect to all smartphone operating systems, both Apple and Android products version 4.3 and above. Applying BLE for industry, housing, office buildings, transportation, museums, schools, and all IoT (Internet of Things) needs is very appropriate. Figures 2 and figure 3, show the topology and architecture of eBeacon in general.
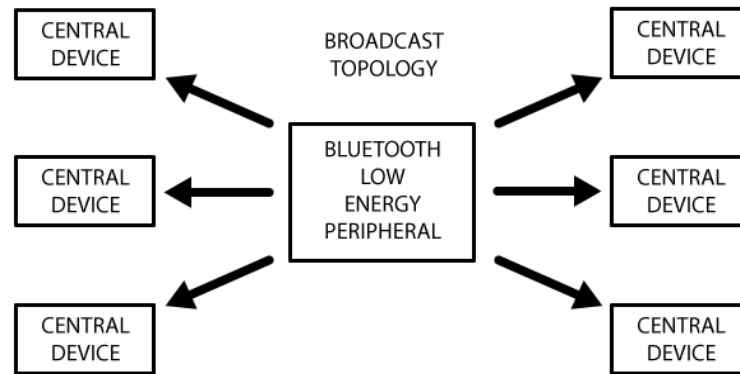

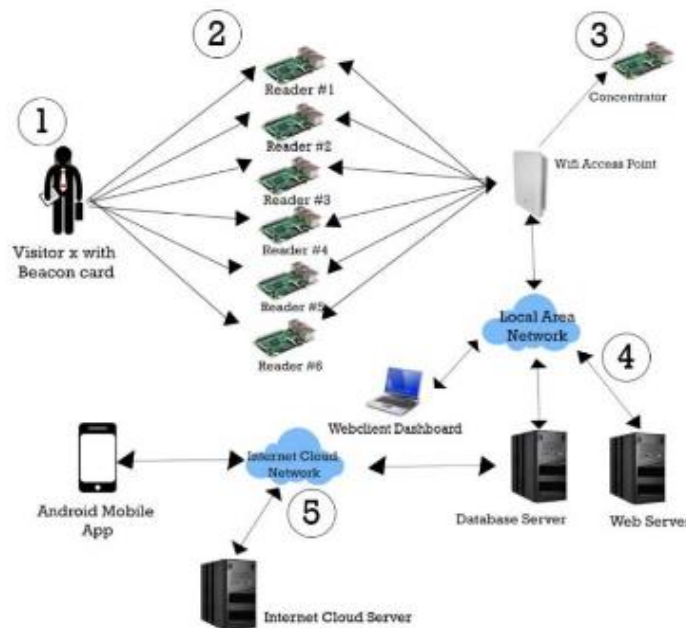**Figure 2**. Broadcast Topology (Noertjahyana et al., 2017)

Figure 3. eBeacon Architecture (Brunner et al., 2019)

eBeacon broadcasts data via Bluetooth to smartphones in its coverage area by forwarding unique data to the backend for translation. Then the backend returns the results of the data translation to the smartphone within eBeacon's reach. Furthermore, provide that notification on the backend. Some of the specifications of eBeacon include the following. (KKMSMART, 2008):
- One eBeacon point covers a radius of 80-100 meters, but the performance is better at a range of 15-20 meters.
- Recognized official software on ebeacon.com
- The eBeacon's built-in battery lasts up to 2 years of continuous operation.
- Easy access to other official applications has also been provided by google play and the app store for free.
- The datasheet is available on the eBeacon website and is free.

STAGES OF IMPLEMENTATION METHOD

Some things that need to be prepared before the Internet of Things (IoT)-based eBeacon application training is carried out, namely :

- Provide hardware eBeacon card.
- Because of the cellular phones owned by the participants, 80% used an Android base, and the software that the eBeacon company in the Play Store provided was not supported. Hence, the PPM team had to provide unique software to support the new Android-based platform.
- To provide this new platform, expertise in coding programs needs, including the mesosphere.com application and android studio.
- After process no. Three is complete; an eBeacon software is produced with a logo, as shown in Figure 4, and the results of running in figure 5.
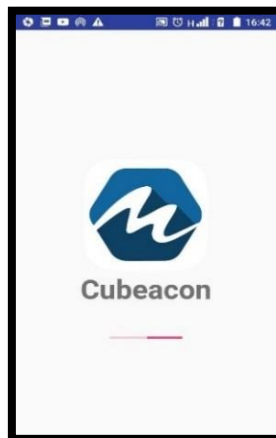

Figure 4. eBeacon Software Logo

Figure 5. Display of eBeacon Software Connected to eBeacon Card Hardware for Information Updates

Android Platform Software Application

The steps that must be taken to make the Android platform software are :

Setup eBeacon card hardware

The steps involved in setting up the hardware are as follows. Download the eBeacon tools application in the play store, then install it. Fill in UUID, principal, or minor data in the beacon list and beacon configuration. Scan and configure beacons. Then press the scan button, and connect Finally, change the data on the major and minor features

Backend setup

In the next stage, set up the backend at the URL link: https://cloud.mesosfer.com/#/login. Input the installed beacon data, then set the campaign value. Press the login button on the Mesosphere cloud portal.

Next, create apps by clicking continue, then change the name of the apps. Download the SDK feature on the newly created apps. Click the beacon menu, and enter UUID, primary, and minor data.

Make an Android application

- Run android studio
- Create a new project
- Include ebeacon sdk
- Enter the file properties
- Make class initialization
- Linking class initialization with manifest
- Adding permission settings
- Next, create the main activity
- Added the event beacon to the main activity
- Added storyline activity and service
- Create a launcher activity

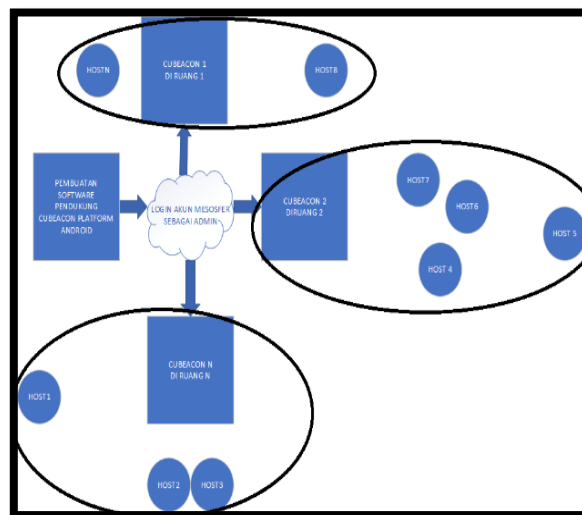The e-beacon transmission process is shown in figure 6.

Figure 6. Block Diagram of eBeacon Card

After the eBeacon card hardware and Android supporting software have been installed on the host's cellular phone, the next step is to log in at mesosfer.com with an account registered as an admin. Then run the program set by entering the information "Hello Mrs. Imelda" in the storyline. The results shown in figure 7 are displayed on the host cell phone within the nearest eBeacon Card radius.
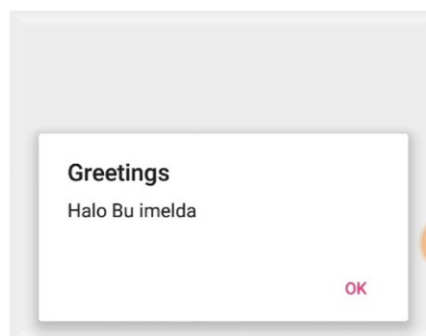

Figure 7. Trigger On Exit

RESULTS

The results of the PPM activities that were carried out on Friday, 22 February 2019, at the Computer Laboratory of Mercu Buana Kranggan University in Building B Floor 1 with 30

participants from the Yadika 11 Jatirangga Bekasi school who were in classes 11 and 12 majoring in computer, as figure 8.

Figure 8. The PPM Team Presents a Brief Theory About eBeacon

The implementation of PPM begins with a brief explanation of the basic BLE theory, architecture, and specifications (figure 8). Then the participants listened while reading the module to make it easier to understand the theory given by the tutor.

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Figure 9. The enthusiasm of the Participants to Listen to the Briefing and Read a Module

Furthermore, in Figure 10, students accompany participants to start the practice of downloading the eBeacon application and the process of installing it on each participant's smartphone.

Figure 10. Students Help Participants Activate the eBeacon Card Software

All participants have finished downloading and installing, then the host inputs data into the eBeacon host database and makes it to the participant's smartphone. Then another test is carried out so that participants are familiar with using the eBeacon application as a broadcast message at school, as shown in Figure 11.
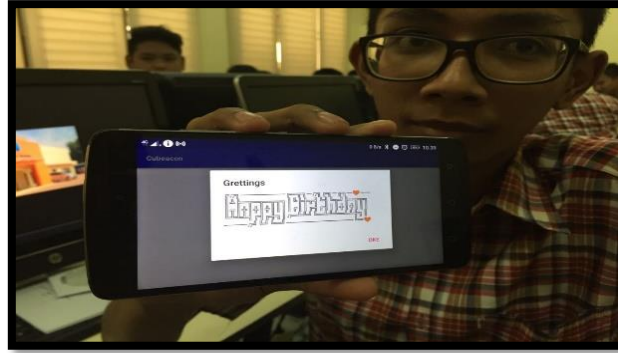
Figure 11. Participants Successfully Get Announcements on Their Cell Phones

In Figure 11, one of the participants shows that they have succeeded in getting a broadcast message from an eBeacon card close to the participant's position.

CONCLUSIONS

Several conclusions are drawn based on the results of implementing the eBeacon card training activities as the Application of the Internet of Things (IoT) in the School Environment at the Computer Laboratory of Mercu Buana Kranggan University. The participants (students) are enthusiastic about this educational training activity because they are interested in the function of the eBeacon card and it can apply in the school environment. The e-beacon card is here to help disseminate information by practicing three kinds of announcements: welcome to the eBeacon card training, announcing the implementation of the youth oath event, and sending pictures that read "Happy Birthday." By running the training process well, students can practice this technology to disseminate information quickly, precisely, and efficiently in the facilities and infrastructure of the school environment. The e-beacon card is here to support paperless programs. The e-beacon card is one of the solutions to increase partner entrepreneurship in disseminating product information. The e-beacon card can minimize the use of intercoms during the teaching and learning process.

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