Volume 6, Issue 2, February 2016 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Management System using Service UUID of BLE Transmission Device

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Abstract— Goal of this project is to broaden range of service UUID and to give manager convenience for managing by dividing devices for each. On this invention, if manager subdivide service UUID and manage them based on Physical Web concept, they are able to handle devices effectively. Therefore, devices can be subdivided for managing and manager can make better security about registration and change of users.

Keywords— BLE, iBeacon, Eddystone, Management, service UUID

I. INTRODUCTION

A Recently, according to rapid spread of smart device based on smartphone, it is increasing that interest about utilization planning between IoT (Internet of Things) [1] and smart device. Also IoT interconnected internet network and M2M concept which allows human to things communication and things to things communication using mobile communication and it is evolving into concept that interacts with information between real-world and cyber world. [2]. Such IoT included location data is developing the new technique for LBS (Location-based Service). Previous technology that measure the smart device's location in LBS are using outdoor GPS technology that have 5m~10m's observational error. [3-5]. But GPS technology may have non-measured location, because it occur the shaded area not to receive satellite signals. Therefore new location measurement technology method are required.

iBeacon of the IoT technologies is that technology measures the user's location data using the transmitter. [6-8]. This technology based on Bluetooth LE is low energy consumption, and transmitter can be used for a long time by the once charge.

If the smart device that supports Bluetooth 4.0 or higher, it can use this technology. The relative position measurement of the user is possible with advantage, and it can be measured with a recognition rate of at least several scores of cm up to 49m in the indoor as well as outdoor. The principle of this technique is that iBeacon transmitter broadcast a radio signal about once per second. It knows the relative proximity to calculate the distance between the transmitter and the smart device using the transmission power and signal information. Through it is possible to measure the exact location of the outside and inside of the smart devices. iBeacon technology has a high usage than other LBS technology thereby the indoor location measurement as well as the outdoor location measurement is possible.

This is a similar technology is Eddystone. The difference between the iBeacon and Eddystone is data specification. iBeacon's data specification is supported on iOS and announced by Apple Inc. Eddystone's data specification is supported on Android and iOS and announced by Google Inc.[9]. And also Eddystone extends the Physical Web by in introducing a URL standard. Physical Web is a technology that can get additional information through the received Beacon message using the EddyStone via a URL. Beacon has the disadvantage of having a small amount of payload 49 Byte, to solve this problem, it can show the data that user want through the server using the web. This technology is that smart device receives the hardware information from the beacon device and sends it to the Eddystone web server and then the server may support the beacon integrated management.

Chapter 2 of this paper is described the operating principle of iBeacon and Eddystone. Chapter 3 of this paper is described the proposed ~. Chapter 4 is described the conclusion.

II. PAGE LAYOUT

A. iBeacon

iBeacon is the location detection technology based on BLE. iBeacon system consists of iBeacon devices, a respond server and smart-device which can support Bluetooth communication [6-8]. iBeacon devices broadcast the beacon messages to unknown smart devices at regular intervals. If a user with smart phone is going to broadcasting area of iBeacon, he can receive the message from iBeacon devices. The iBeacon message is like data format of Bluetooth packet and total 47 bytes. Payload of the data format consists of UUID, Major, Minor and TX Power values. UUID can identify iBeacons. Major and Minor can find the goal of iBeacons. TX Power means transmission power which can be used to calculate distance between iBeacon devices and smart devices.

iBeacon's area can be classified into three groups: immediate, near and far. The distance between iBeacons and smart phone can be calculated into RSSI and TX power value.

B. iBeacon

Eddystone is the BLE based new location measurement technologies.[9]. Operation method is similar to the iBeacon, it is different from the data format to broadcast. It consists of all three formats: Eddystone-UID, Eddystone-URL, and Eddystone-TLM. Eddystone-UID broadcasts Beacon ID of a 16-byte. It consists of 10-byte namespace to specify a group of beacon and 6-byte instance to distinguish each beacon of the group. This is similar to the existing iBeacon. Whereas the Major and Minor each 4byte, Eddystone is size of 10, 6byte, it may facilitate managing a large amount of the Beacon. Eddystone-URL broadcast the encoded URL on Beacon messages. When smart device receives it, we can see the additional data of the beacon by accessing the URL through the web. The Eddystone-URL frame forms the backbone of the Physical Web. Eddystone-TLM broadcasts the battery level, temperature, and the number of transmissions, the operating time of beacon's hardware information. It is to monitor the hardware state and operation of beacon status.

III. PAGE STYLE

There are many kinds of device such as BLE transmission device, smart device, managing service UUID server, and managing service UUID server for each maker. Here is the introduction about invention. It adds step for managing service UUID extracted from server compared to previous model. It also has process to register and manage service UUID following Physical Web concept. First step, manage smart device and BLE transmission device by using Service UUID Management Server. Then, it suggests that manager get service UUID from SMS server instead of each brand server. Suggestion is on figure 1.

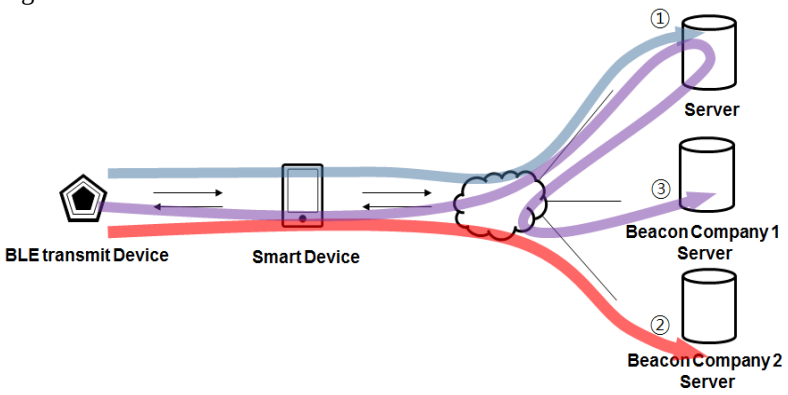

Figure 1. Overview of proposed model

In contrast with first way, second method manages smart devices and BLE transmission devices accord in the the manufacture. Service UUID carries out a role of metadata because each services are provided by the specific manufacture. Third method is SMS server manages mart devices and BLE transmission devices, and method of this proposed system. It is much more comfortable to manage the status of all devices. Because the server of each manages service, UUIDs manufacture instead of SMS server among if self. Over all management method of service UUID is composed of enrollment, modification detection, and classification. In this paper, service UUIs are managed by the concept of physical web.

Smart devices take a role of gateway that exchange the information between smart devices and BLE transmission devices. Requirements of user are transmitted through the physical web in single integrated application. The Third method that manages the service UUID by each SMS manufacturer explains the flow of enrollment, modification, and deletion.

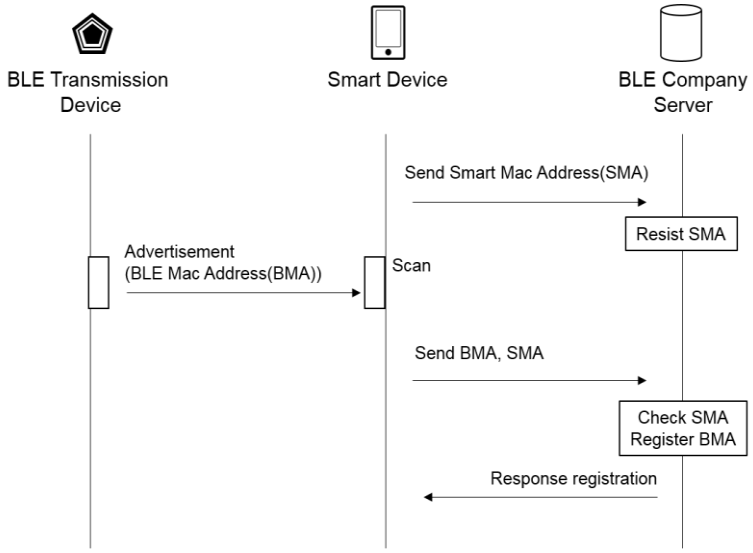

Figure 2 procedure of BLE transmission device, and smart device enrollment

Figure 2. Show the procedure of enrollment. Firstly, it checks whether the device is enrolled in the SMS. if not, enrollment process of smart device to SMS would be done. After the enrollment, it receives the advertisement message form BLE transmission devices. Information of BLE transmission device is come out by receiving the advertisement message. Then smart device save that information to the SMS. SMS enrolls the information based on that of smart device and send finishing message to the smart device.

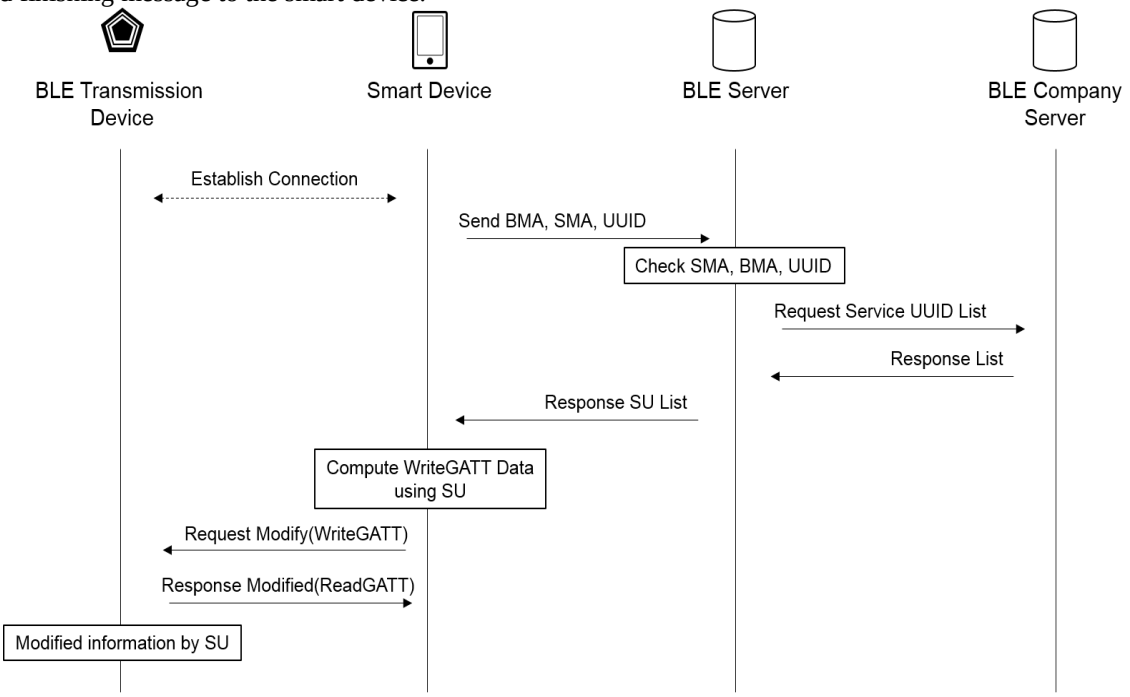

Figure 3 procedure of BLE transmission device modification

Figure 3 show the procedure of modification. First BLE transmission device is connection to smart device. After then, smart device is request to Smart Device information (SMA), and BLE transmission device information (BMA) with modification request message. SMS is search SMA, and BMA based on received by smart device. In addition, SMS is request the service UUID information using by Device manufacture information. BLE manufacture information server is send the list of service UUID in BLE transmission device for SMS. Smart device is request to modification for BLE transmission device using by GATT. After then, BLE transmission device is modify the devise information.

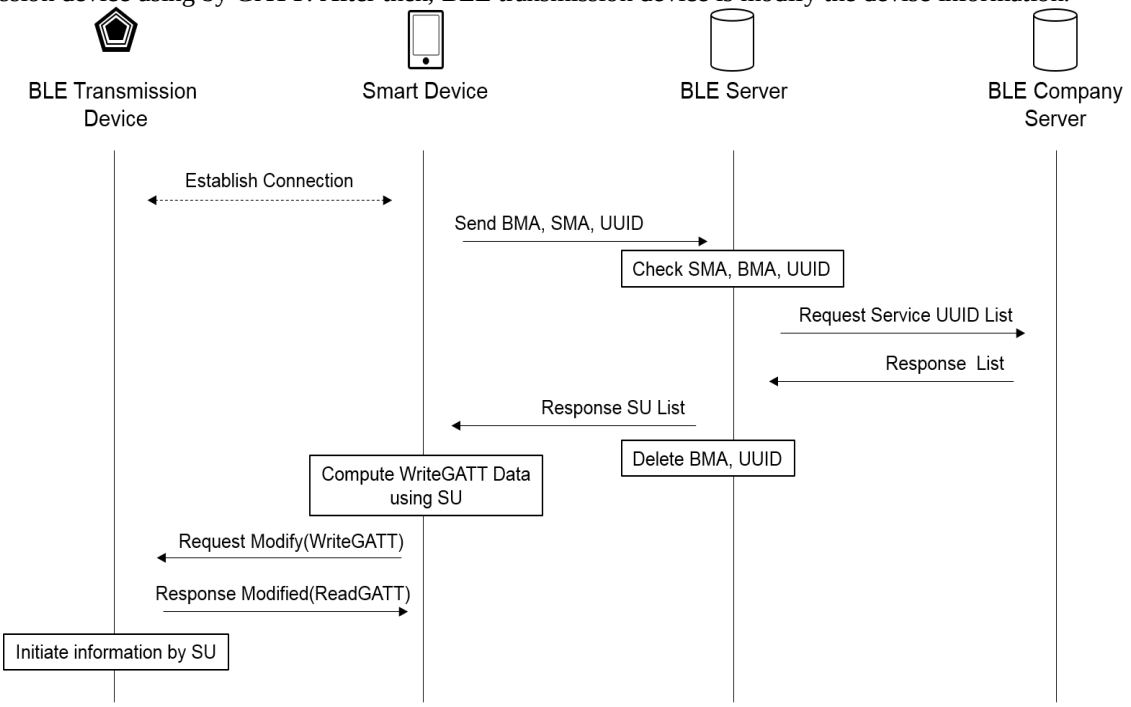

Figure 4 Procedure of deletion BLE transmission device

Initialization of BLE transmission device is also similar to the modification step. Some of different is not that modification request message but that just initialization request message (transmitting power, period, and count).

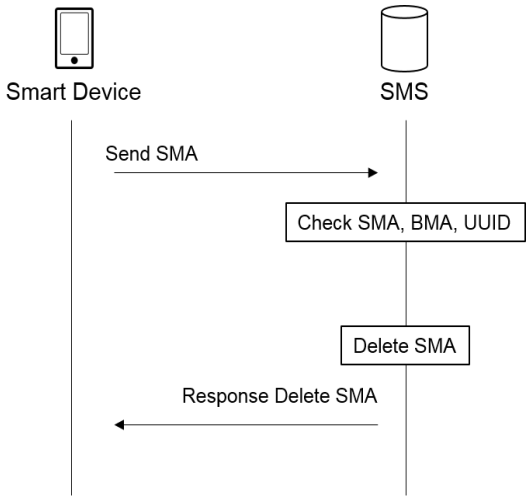

Figure 5 deletion of user information, and UUID

The smart device of information delete procedure is as same as. Smart device is send message to SMS. Information of message is smart device information and delete request information. In addition, SMS is find to smart device information and delete to smart device information. After the processing, SMS response to smart device about delete response message.

IV. CONCLUSIONS

In this paper, we proposed the total management system used BLE transmission device, and smart device.

ACKNOWLEDGMENT

This work (C0336905, Development of encryption technologies on wireless communication protocols for IoT devices) was supported by Business for Cooperative R&D between Industry, Academy, and Research Institute funded Korea Small and Medium Business Administration in 2016.

REFERENCES

[1] D.Y.Kim, S.H.Kim, at el., "Internet of Things Technology and Development Direction", KICS, Journal of Information and Communication, Vol. 28, No.9, pp.49-57. Sept 2011
[2] C.S.Pyo, H.Y.Kang. at el., "IoT(M2M) Technology Trends and Development Prospects", KICS, Journal of Information and Communication, Vol. 30, No.8, pp.3-10. Sept 2013
[3] Jean-Marie Zogg, "GPS Basics: Introduction to the system Application overview", u-blox ag, Mar. 2002
[4] M. A. Qadeer, A. Chandra, S. Jain, "Design and Implementation of Location Awareness and Sharing System using GPS and 3G/GPRS", International Journal of Multimedia and Ubiquitous Engineering, Vol. 7, No. 4, p124-140, Oct. 2012
[5] N. I. Ziedan, "GNSS Receiver for Weak Signals", Artech House, Inc., Norwood, MA, 2006
[6] Andy Cavallini, "iBeacons Bible 2.0", http://meetingofideas.wordpress.com/
[7] "Beacon, emerging as a critical infrastructure location-based services", Communication promation bureau Media industry promation department, Trend and prospect:broadcast·communication·propagation, No. 73, pp.30-40, April 2014
[8] "Specification of the bluetooth system core v4.0", Bluetooth SIG, June 2010, http://www.bluetooth.com
[9] "Eddystone Protocol Specification", URL: https://github.com/google/eddystone

