Android Studio Usage on Developing E-SIM Ticketing Application

The Case Study

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Abstract—**In Indonesia, corruption is one of the most major problems, which is found in almost every aspects in life in the country. Act of corruption is also founded in Indonesian Police Force's Traffic Unit, where in this unit violation ticketing is the main source of income for the Force. The corruption activity is often found in bribery activities conducted by the violators for avoiding the legal hearing in court. Is there a way to solve this specific problem? On this paper, the author proposes a solution by developing a mobile application, developed with Android Studio, that can scan E-SIM, which most likely be developed with Radio Frequency Identification technology. With this application, the author hopes that police officers will not conduct any bribery regarding violation ticketing in the future, and to reduce corruption activities in the countrys.**

Keywords—android; application; mobile; E-SIM; RFID; NFC; corruption

I. Introduction

In Indonesia, corruption is an issue that is inevitable on the country's government. The issue is found not only in executive, legislative, and judicative institution of the government, but also found in the law-enforcement staff in the country, such as Indonesian Police Force, or we can call it Polri. Polri's Traffic Unit (Satlantas Polri) has a big amount of money flowing inside the unit, mostly because of the tickets issued for violating the law regarding traffic laws and safety rules, such as speeding. In default, the unit will give the violation tickets to the violators. But in reality, they often asked for a bribe, and let the violators go. This bribing activity is quite common in almost of all regions of Indonesia, and can be called as an act of corruption.

To avoid this issue of corruption, the author wanted to make a mobile application that using E-SIM (Electronic Driver's License) as the new technology of SIM in Indonesia. This technology uses Radio Frequency Identification (RFID) for the E-SIM, and NFC in Android devices as the reader of the information stored in the E-SIM. E-SIM is currently unavailable in the country, and is substituted with a card containing a RFID chip. The application will be developed in Android platform, and with Android Studio as its Integrated Development Environment.

II. Definitions

In this section, the author will describe the definitions of technology used for the development of the E-SIM Ticketing application.

A. Android

Android is an open source operating system primarily used in mobile devices. This operating system is primarily written in Java and based on the Linux operating system. The operating system was initially developed Android Inc. and was eventually purchased by Google in 2005. The Android operating system is symbolized by a green colored Android robot logo.

B. Android Studio

Android Studio is an Integrated Development Environment (IDE) created by Google Inc. This IDE is based on IntelliJ IDEA. Android Studio provides developers with tools needed to build applications for the Android OS platform. Android Studio is intended to be used by development teams, either it is small or large teams. This IDE can be linked by GIT or other version control services for large teams. Android Studio can develop Android applications using Java or C++ as the development language. The features of this IDE are :

- Gradle-based build support
- Android-specific refactoring and quick fixes
- Lint tools to catch performance, usability, version compatibility and other problems
- ProGuard integration and app-signing capabilities
- Template-based wizards to create common Android designs and components
- A rich layout editor that allows users to drag-and-drop UI components, option to preview

layouts on multiple screen configurations
- Support for building Android Wear apps
- Built-in support for Google Cloud Platform, enabling integration with Firebase Cloud Messaging (Earlier 'Google Cloud Messaging') and Google App Engine
- Android Virtual Device (Emulator) to run and debug apps

C. Radio Frequency Identification

Radio Frequency Identification (abbreviated RFID) is a technology which digital data is encoded in RFID tags or smart labels. These tags are captured by a reader via radio waves. RFID is similar to barcoding, where the data in the tag or label captured by a device that stores the data in a database. RFID utilizes radio to accomplish AIDC methods, which containing object identification, data collection, and direct data entry into computer systems without any human intervention. RFID systems consist of three components: an RFID tag or label, an RFID reader, and an antenna. A RFID tag contains an integrated circuit and an antenna, which are used to transmit data into the RFID reader. RFID reader then converts the signal wave into a more usable form of data. The information collected from the tag is then transferred directly into a communication interface to the computer system, where the information can be stored in a database and analyzed later.

D. Near Field Communication

Near Field Communication (abbreviated NFC) is a set of short-range wireless technologies. This technology requiring a distance of 4cm or less to initiate a connection. NFC allows users to share small payloads of data between an NFC tag and an Android-powered device, or between two Android-powered devices. Android-powered devices with NFC simultaneously support three main modes of operation:

1. Reader/writer mode: this mode allows the NFC device to read or write passive NFC tags and labels.
2. P2P mode: this mode allows the NFC device to exchange data with other NFC peers, this process is called Android Beam.
3. Card Emulation mode: this mode allows the NFC device itself to act as an NFC card. The emulated NFC card can then be accessed by an external NFC reader.

III. IMPLEMENTATION

In this section, the author will explain the implementation of the entire system and the specific application.

A. The System

The E-SIM ticketing system consists of the following devices: an Android device with NFC technology support as a reader, a card with an embedded RFID chip, and a database. The process is explained in the figure 1 below:
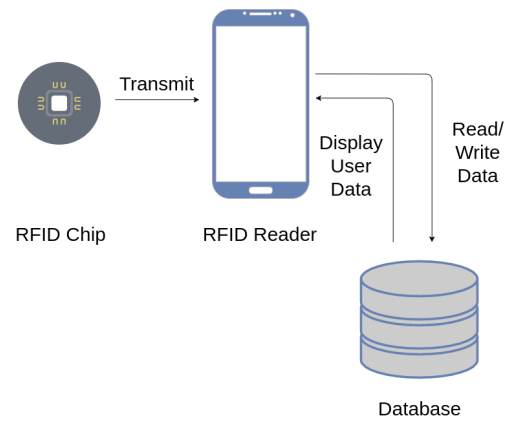

Figure 1. Process of the E-SIM Ticketing System

The card containing the embedded RFID chip is read by the NFC module on the Android device. Then the Android device looking for the corresponding RFID chip's unique tag ID from the database. When the corresponding tag ID is found, the database then send the E-SIM user data into the reader, and display the user data information into the interface of the reader. The reader can also write the ticketing information into the database. The information includes the violation of the user, and also the fine that must be paid according to the violation.

B. The Application

The application of this E-SIM Ticketing system has a workflow as follows:
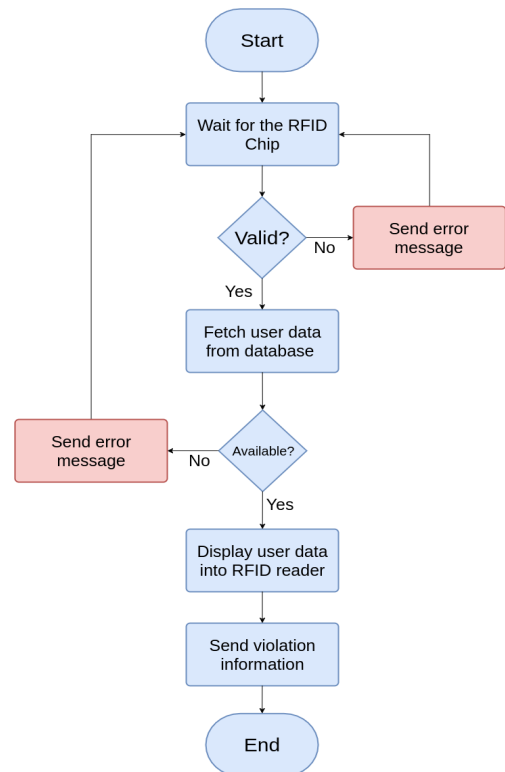

Figure 2. Simple Workflow of the E-SIM Ticketing

application

The workflow describes that the first process of the application is to wait the RFID chip to be detected by the reader. The reader can detect the RFID chip either the application is on the foreground process or on the background process. If a RFID chip is detected, the application will send a query into the database, which is finding the tag ID that is matching with the RFID tag ID. Then the database will display the user data which is corresponding with the tag ID. If the RFID chip tag ID is not available in the database, the application will send an error message. The application can send the violation information into the database. The information contains the violation description and the fine imposed to the user. The reporter (police) then can send the information by tapping the submit button. The application uses the Android's NFCAdapter library for the full functionality of the NFC module in the Android device.

IV.   RESULTS

The author has implemented the simple application prototype. The application prototype includes the usage of the NFC for the RFID chip reading, and display of the user data contained in it. The author using a testbed for testing with specification as follows :

- RFID Chip : simple RFID card
- RFID Reader : Samsung Galaxy J5

Figure 3. Testbed for Application Testing

Based on the testing conducted on the testbed, here are the results:

1. RFID tag reading

   The author tested the RFID reader's performance by taping the RFID chip into the NFC receiver. The testing gave excellent result, that the NFC receiver was running smoothly, and could detect the RFID tag without any serious problem. The result is indicated

by the RFID tag ID displayed in the user data activity.

Figure 4. NFC Module in RFID Reader Success in Reading RFID Chip

2. Displaying the user data

   After detecting the RFID chip, the RFID reader succeeded in displaying the user data contained in the RFID chip. The user data contains user's name, E-SIM registration number, RFID tag ID, user's address, user's place and date of birth, user's occupation, and expiration date of the E-SIM.

Figure 5. User Data Displayed in User Data Activity

V. CONCLUSION

Android, as we know it, is a operating system which is the one of the most used operating system on the planet. Easy to use, intuitive design, and also convenient for developing applications are a few advantages of this operating system. From this project, the author has succeeded creating an application prototype for E-SIM ticketing, which was developed with Android Studio as its IDE. The application uses NFC technology from Android devices to read RFID tags, which hopefully will be used as the technology for developing E-SIM in the future. According to the author, he results of the application prototype were satisfying, and the prototype is ready for the development process.

In Indonesia, RFID technology has spread in a quite amazing speed, and is implemented in many aspects of life in the country, such as e-money for highway toll payment, commuter payment, E-KTP, etc. With this project, the author has a great expectation for this technology to be implemented in Indonesian Police Force for E-SIM development. The author also hopes that this technology will be useful to reduce corruption rate in Indonesia.

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STATEMENT

With this statement, I hereby declare that the paper written by the author is written by the author's own consent, not a copy, other work's translation, or a plagiarism.

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