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CLIENT-SERVER APPLICATION OF A GEOGRAPHIC INFORMATION SYSTEM FOR ISLAMIC BOARDING SCHOOL (*PONDOK PESANTREN*) REGISTRATION IN EAST JAVA

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ABSTRACT

A *pondok pesantren* (Islamic boarding school) is a form of traditional education in which students, known as *santri*, live together in a dormitory under the guidance of teachers called *kiai*. Most pesantren still use a manual registration system, which makes the process ineffective. Many pesantren are scattered across East Java, and because their locations are hard to find and registration is done manually, prospective students must visit in person, which slows down the process of choosing a pesantren that meets their criteria. This study therefore aims to address the problem by building a client-server geographic information system application for online pesantren registration. The application was designed and built using Android Studio with the Java programming language as the client and PHP as the web server, connected to a MySQL database for data storage. The result of this research is an application that makes it easier for santri to find information about pesantren and to register anytime and anywhere through an Android smartphone, without having to visit the pesantren in person. The application can also help pesantren increase student admissions and expand the reach of their locations.

1. INTRODUCTION

A new development has emerged in the way people discover things, and it has become the foundation of progress: technology. Technology covers several aspects that are important to a country's economy and to the people who live in it. A country serves as the place and container for the whole process of the technological development that is in greatest demand today. One such technology is a simple and practical tool that supports many activities and jobs: the smartphone, or mobile device. A *smartphone* is an advanced technological device that can manage almost every kind of task with a near-perfect result.

A *smartphone* is a *mobile* device with an advanced operating system, whether *Android*, *Windows Phone*, or *iOS*. Smartphones, or mobile devices, were once used mainly as a means of communication between individuals or groups. As new ideas have been implemented in these devices, however, smartphones have gained greater importance in offering goods and services and in managing scheduled activities.

Rapid progress has been made not only in hardware and software technology but also in

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computing methods. One computing method that is developing quite fast today is the presentation of geographic information.

People today have busy schedules, so leaving home or the office has become difficult because everyone is occupied with their own affairs. Visiting a *pondok* in person is even harder because there is no time. From this case study came the idea of building an Android application that meets public needs, since Android is the operating system on mobile phones that is increasingly used to complete the lifestyle and needs of people who enjoy technological developments. Android-based technology is now used by almost everyone, and geographic information systems can show every location we want to visit.

Building an Android-based client-server geographic information system application for pondok pesantren registration in East Java is therefore the right answer to help people, especially in East Java, find a pondok that meets their criteria. With such an application, people need only a mobile phone to register easily at a pesantren that matches their criteria; they only have to register through the application, and this service also helps raise the profile of pesantren.

Until now, finding out about pondok pesantren in East Java has meant visiting them in person, which is ineffective and time-consuming. East Java has approximately 3,265 pondok pesantren, and they continue to grow rapidly over time. An Android-based application is therefore needed to give the public information about all pondok pesantren in East Java, to make it easier for *santri* to register at the pondok they are interested in, and to provide information about each pondok based on supporting data.

1.1. Research Questions

This study addresses the following research questions:

a. How can an Android-based client-server geographic information system application for pondok pesantren registration in East Java be designed and built?
b. How can the client-server geographic information system application for pondok pesantren registration in East Java be implemented so that it makes registration easier for *santri*?

1.2. Research Objectives

The objectives of this study, which are the targets to be achieved, are as follows:

a. To design and build a client-server geographic information system application for pondok pesantren registration in East Java that can be used by the people of East Java.
b. To implement the client-server geographic information system application for pondok pesantren registration in East Java so that it makes registration easier for *santri*.
c. To make it easier for *santri* to register at a pondok pesantren anywhere and anytime through an Android smartphone, without having to visit the pondok pesantren in person.

1.3. Theoretical Background

According to Sutariyani and Imam Choirul Arifin (2014), in the client-server model an application is divided into two separate parts that nevertheless form a single whole: a client component and a server component. The client component of the application runs on a *workstation*, receives data input from the user using certain processing technology, and sends it to the server component running on a server machine, generally in the form of a *request* for one of the services the server provides. [1]

Rhind states that “a geographic information system is a computer system that can store and use data describing places on the surface of the earth.” Burrough, in the same book and on the same page, defines a geographic information system as a set of tools for collecting, storing, checking, integrating, manipulating, analyzing, and displaying real-world data for a particular set of purposes (Heywood, 2011, p. 18). [2]

The concept of a geographic information system has become a new kind of system that is able to read locations validly. According to Irwansyah (2013), the real-world concept has five stages:

1. *Physical Reality*: the stage of analyzing the real world that will be turned into a geographic information system.
2. *Real World Model*: the stage of converting the objects that exist in the real world into a model.
3. *Data Model*: the stage of converting the models of real-world objects into data types.
4. *Database*: storing the entire data model in a database system.
5. *Maps / Reports*: the final result, in which the real world has been converted into a geographic information system. [3]

According to H. Amin (2007), *pondok* and *pesantren* are two terms that refer to a single meaning. In its basic sense, a pesantren is a place where *santri* study, while a pondok means a simple house or dwelling made of bamboo. The word pondok may also derive from the Arabic *funduq*, meaning a dormitory or hotel. In Java, including Sunda and Madura, the terms pondok and pesantren are generally used, whereas in Aceh the institution is known as *dayah*, *rangkang*, or *menuasa*. In religious education and teaching, generally by a non-classical method, a *kiai* teaches Islamic knowledge to the santri based on books written in Arabic by medieval scholars, and the santri usually live in a pondok (dormitory) within the pesantren. [4]

According to Ade Hodijah (2014), a *mobile* application is application software that runs on smartphones, tablet computers, and other mobile devices. Based on mobile device usage in 2013, 97% of the world's population used mobile phones, and Indonesia ranked 6th. [5]

According to Widianto (2015), Android is an operating system for mobile phones such as smartphones and tablet computers. The Android operating system is Linux-based and open source, allowing developers to create applications or extend Android with the provided tools, namely the Android SDK (Software Development Kit) and the API (Application Programming Interface), using the Java programming language. [6]

2. METHODS

2.1. System Design Analysis

System design analysis describes the program structure step by step, using Sybase PowerDesigner as the software for designing the system, which consists of a Context Diagram, a *Data Flow Diagram*, a CDM, and a PDM. It describes how the program runs, from the relationship between the news writer application and the news reader, through to the program display and what the user will choose.

Figure 1 shows the context diagram. The context diagram contains two entities, the admin and the user. The admin logs in and, after logging in, enters pondok data, pondok quality data, and pondok map data into the system. The system then processes these data and sends messages to the admin about pondok information, pondok map location information, and registration information. The user, in turn, enters registration data into the system, and the system returns the registration result, pondok location information, and pondok information to the user.

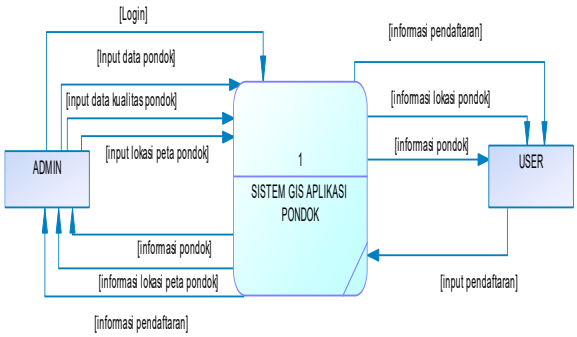


Figure 1. Context Diagram

Figure 2 shows the Data Flow Diagram. This level 0 diagram contains two entities, the admin and the user. In the first process, the admin logs in to the system; the system verifies the login, and the admin data enters the system. In the second process, the admin enters pondok data into the system, the system saves the data to the pondok database and provides information to the admin and to the user. The admin also enters map location data into the system, the system saves the data to the pondok database and provides information to the admin. In the third process, the user enters registration data into the system, the system saves the data to the registration database and provides information to the admin and to the user.

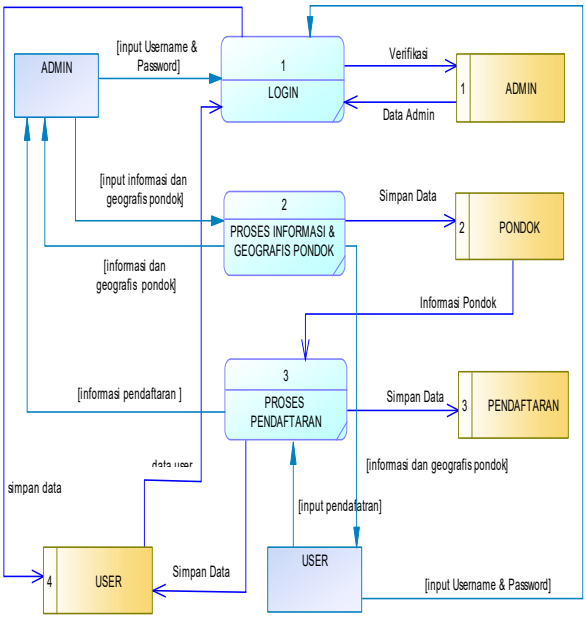


Figure 2. Data Flow Diagram

Figure 3 shows the Conceptual Data Model (CDM). The CDM contains four related data tables: the admin table, the pondok table, the registration table, and the user table. A user performs registration and chooses a pondok.

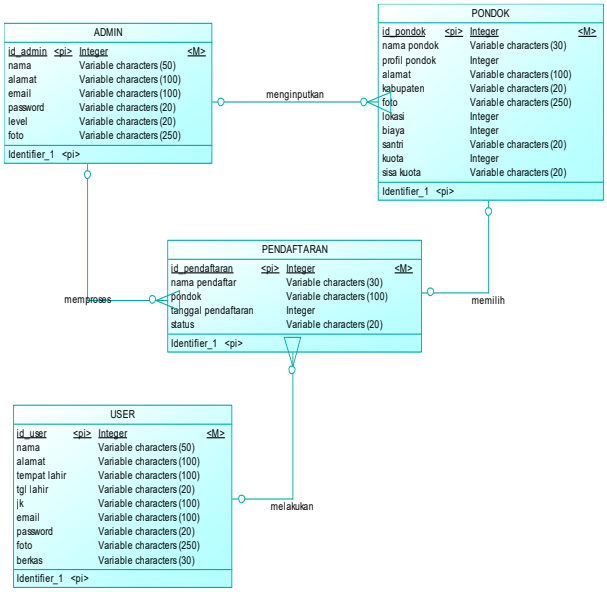


Figure 3. Conceptual Data Model

Figure 4 shows the Physical Data Model (PDM). The PDM contains four related data tables: the admin table, the pondok table, the registration table, and the user table. A user performs registration and chooses a pondok.

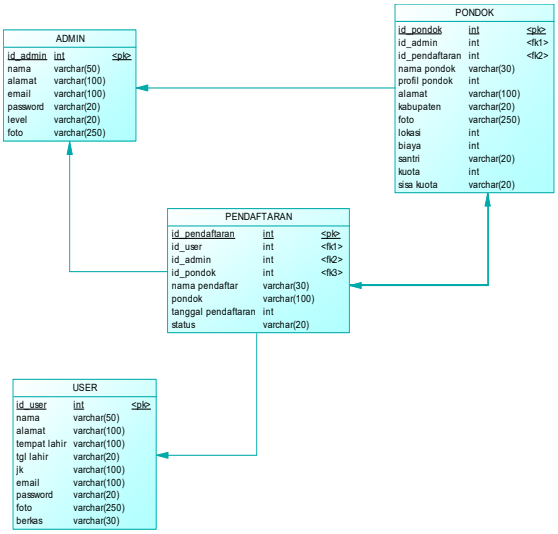


Figure 4. Physical Data Model

2.2. *Program Design Analysis*

Program design analysis is the design of the program interface that will be operated by the user. The interface design gives a general picture that most closely approximates the appearance of the application. The application design can be seen in Figure 5, Figure 6, Figure 7, Figure 8, and Figure 9.

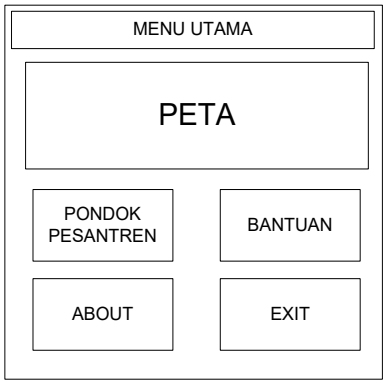


Figure 5. Main Menu Design



Figure 6. Select Pondok Menu Design

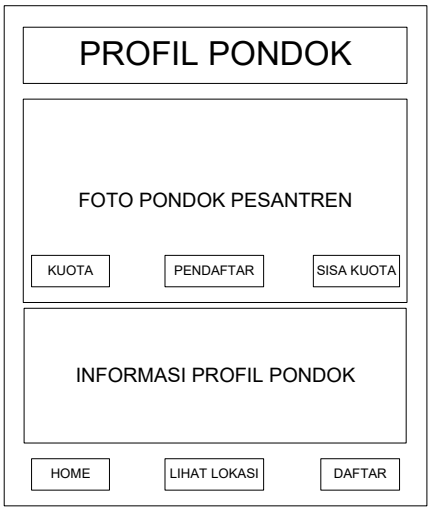


Figure 7. Pondok Profile Menu Design



Figure 8. View Location Menu Design



Figure 9. Confirmation Menu Design

3. RESULTS AND DISCUSSION

Based on the black box test results shown in the tables and figures in this section, the system

designed and built by the author meets the testing standard. It can therefore be concluded that the software is free of syntax errors and functionally produces the results that are expected.

In the test of the Register menu, if a user registers successfully and is validated by the admin, the user will be able to log in. The following figure shows the implementation of the black box test results for the Register menu.

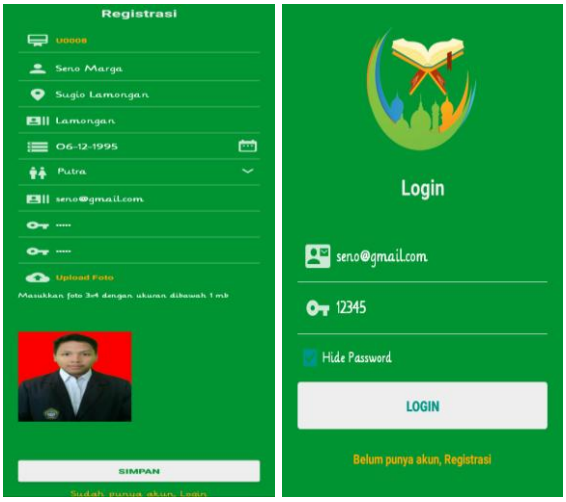


Figure 10. Black Box Test Display

a. Procedure
   - Select the register form to be used.
b. Input
   - Enter personal data according to the selected register form.
c. Designed output
   - The user waits for validation from the admin before being able to log in.
d. Criteria
   - If the admin approves, the user can log in; if not, the user cannot log in.
e. Goal
   - Registration succeeds and, once validated by the admin, the user can log in.

Figure 11 shows the Main Menu display. The main menu contains several menus: the pondok pesantren menu, the about menu, the help menu, and the exit menu.

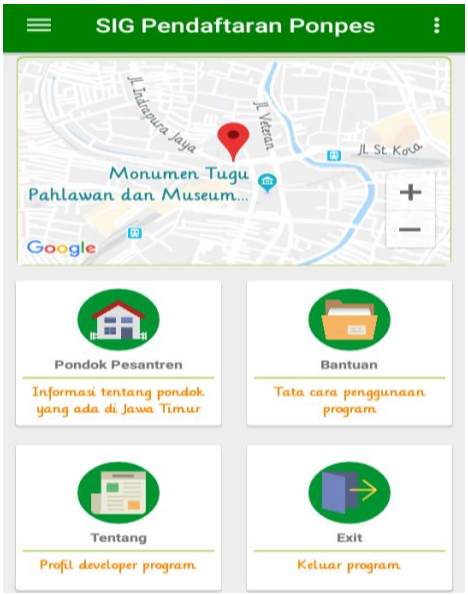


Figure 11. Main Menu Display

Figure 12 shows the Pondok Search Menu display. In the select pondok menu, a pondok search appears based on criteria consisting of regency, *santri* category, and monthly fee.

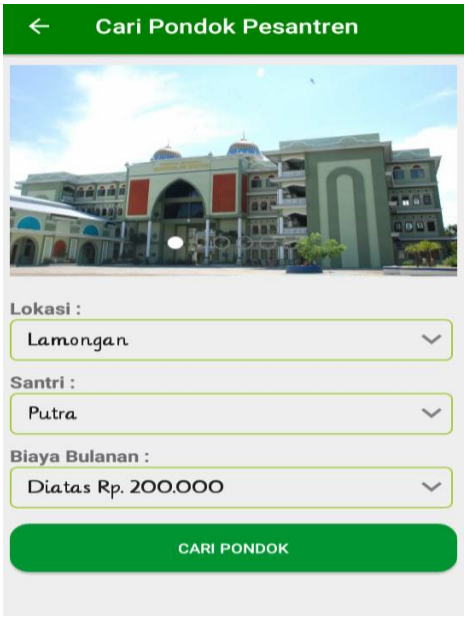


Figure 12. Pondok Search Menu Display

Figure 13 shows the Pondok Profile Menu display. The pondok profile menu displays pondok data, a menu for searching the pondok's location, and a registration menu used by the user.



Figure 13. Pondok Profile Menu Display

Figure 14 shows the View Location Menu display. The view location menu displays a map with the route for travelling from the user's location to the selected pondok. The view location menu is shown below.

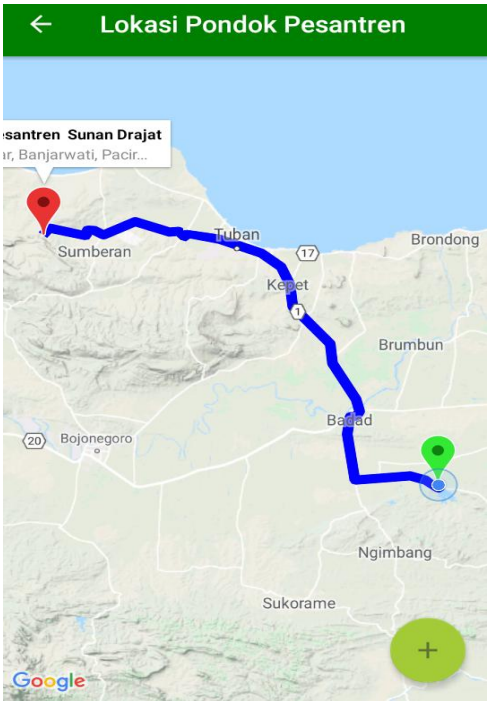


Figure 14. View Location Menu Display

Figure 15 shows the Registration Menu display. The registration page consists of various ID fields, and the registration menu also serves as the confirmation menu for the user's registration.

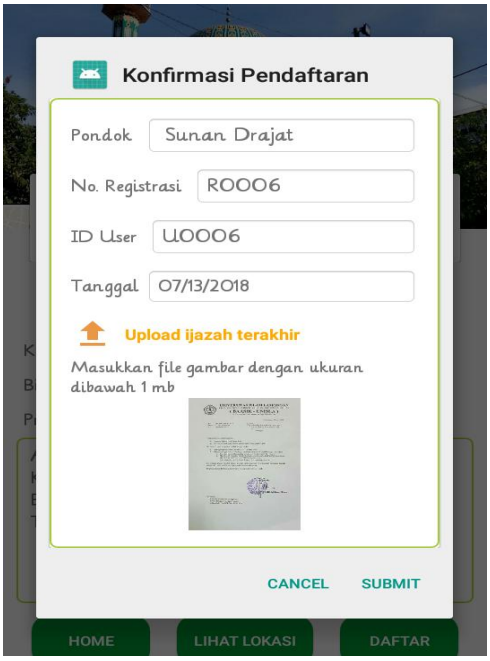


Figure 15. Registration Menu Display

Figure 16 shows the Admin Main Menu display. The admin main menu consists of pondok data, registration data, user data, and admin data.

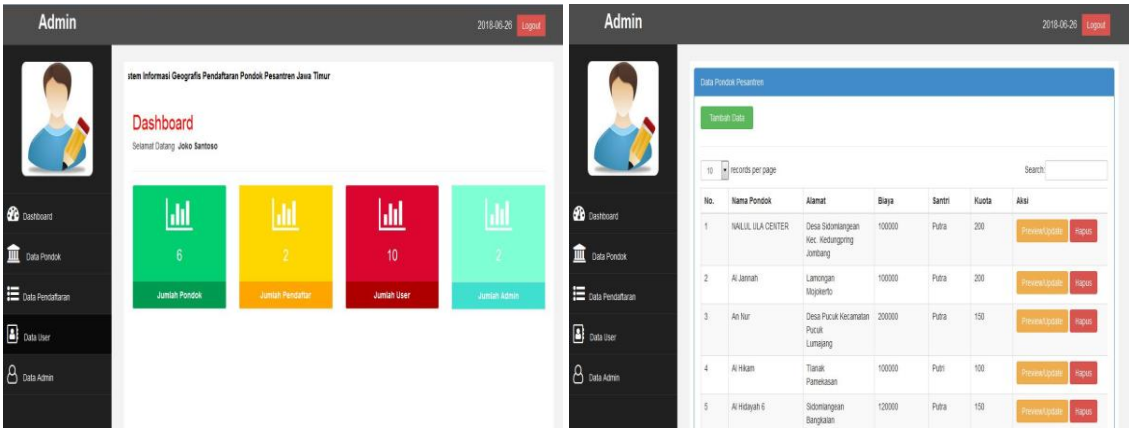


Figure 16. Admin Main Menu Display

Figure 17 shows the Pondok Data Menu display. It contains an add pondok data function for adding new pondok pesantren in East Java. This page also has update and delete menus.

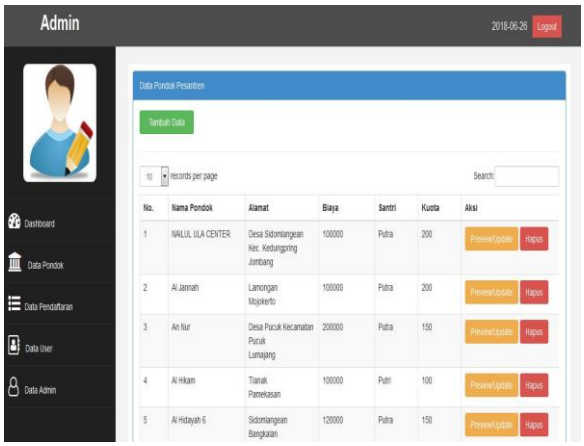


Figure 17. Pondok Data Menu Display

Figure 18 shows the Registration Data display. The registration data menu shows the users who have already registered.

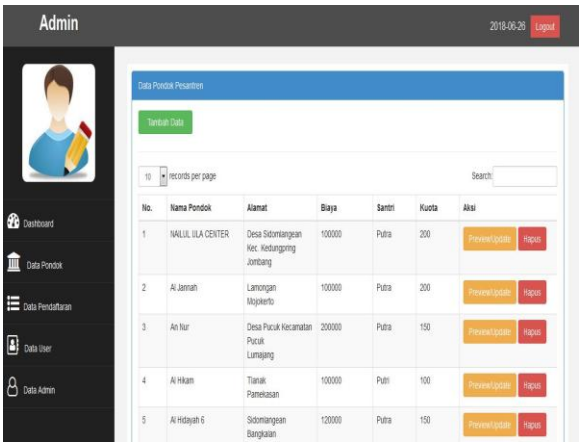


Figure 18. Registration Data Display

Figure 19 shows the User Data Menu display. The user data menu shows the users who have already registered and logged in.

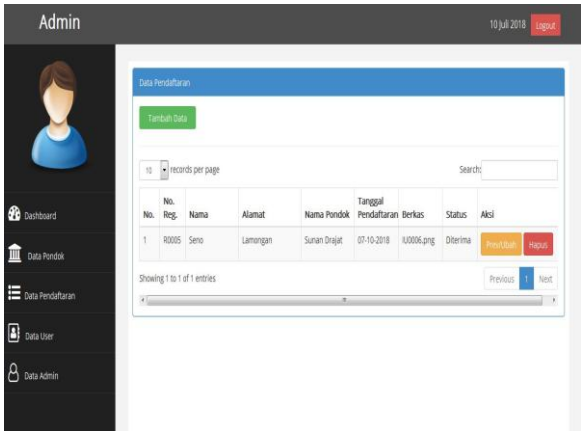


Figure 19. User Data Menu Display

System testing of an application is very necessary before the application is used. System testing is the testing stage carried out to check whether the application is compatible with the system in which it is implemented. The purpose of system testing is to ensure that all components in the system function properly, as expected in the plan.

Test cases are built around specifications and requirements; the *black box* testing method focuses on the functional requirements of the *software*. Black box testing therefore allows software developers to derive sets of input conditions that fully exercise all the functional requirements of a program.

To test the system that was built, a testing mechanism was created and listed in a test plan, combined by type of user. The test plan was carried out using the Mozilla Firefox *web browser*. The results of the device test are shown in Table 1.

Table 1. Device Testing

No	Phone Model	OS	Screen	RAM	Result
1	Smartfren C4G	Android 5.1 (Lollipop)	4 inches	1 GB	Successful
2	Xiaomi Note 4	Android 6.0 (Marshmallow)	5.5 inches	3 GB	Successful
3	Oppo Neo 7	Android 5.1 (Lollipop)	5 inches	1 GB	Successful
4	Samsung Young 1	Android 2.3.5 (Gingerbread)	3.0 inches	290 MB	Failed
5	Samsung Galaxy Tab 2	Android 4.0.3 (Ice Cream Sandwich)	7 inches	1 GB	Successful

The results of the device test of the client-server geographic information system application for pondok pesantren registration in East Java, shown in the table above, indicate that the application can only be used on Android devices running Jelly Bean or higher; devices running a version below Jelly Bean cannot use it. If the application is installed successfully, its features and menus run well; if it cannot be installed, an error occurs.

Based on a survey, or questionnaire, of 15 people consisting of 10 Informatics Engineering students and 5 members of the public, 8% rated the pondok pesantren registration GIS application as suitable for use, so the application can serve as a promotional medium to help introduce pondok pesantren in East Java.

4. CONCLUSION AND SUGGESTIONS

This Android-based client-server geographic information system application for pondok pesantren registration in East Java can only be used on Android Jelly Bean or higher; versions below Jelly Bean cannot run the application.

The application was designed and built using Android Studio with the Java programming language as the *client* and PHP as the web *server*, connected to a MySQL database for data storage.

Because the system that was built uses GIS, future research should use a system or application such as Waze. Waze offers more than online maps, GPS, and traffic information; it also displays real-

time reports from other Waze users along the routes they travel.

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