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Transactional database design information system web-based tracer study integrated telegram bot

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Abstract. A database is a software that is used to store data. Data stored is generally in the form of text. Database functions are not only for storing data but also used to speed up access to information systems. Optimal database management can increase access to information systems. One management that can improve performance is the appropriate relational data design. Relational is a relationship between tables. The design of the relational database must pay attention to the selection of data types, data type values, and constraints that will be selected. This study will examine the optimization of the MariaDB database on information systems in tracer studies. Database design will accommodate data from two application sources, namely web-based applications and telegram bots. Using two paths to the database to make it easier for users to register via a telegram bot, users can then access the tracer study questionnaire on web-based applications. The MariaDB database performance test shows that the highest performance average query is 6501 microsecond.

1. Background

Educational institutions must ensure the quality of education. In the current era, vocational secondary education is a favorite compared to secondary schools. It appears that the government fully supports the implementation of vocational secondary schools by providing various supporting facilities [1]. Evaluation is necessary to see the extent to which the quality of quality improvement for vocational school students is improved. One tool to measure the quality of graduates through tracer study. Tracer study as a means to ensure the quality of education by the needs of educational institutions [2]. In the Industrial Revolution 4.0 era, tracer study must follow information technology. Tracer study can be more effective if you use the application. Various applications can refer to online systems, such as web-based applications [3–5]. In addition to other alternative web applications, you can use social media networking. Chat based social media network. The types of chat applications include WhatsApp, BBM, Line, Telegram, and many others.

Integration of information systems with chat applications has been implemented, such as credit bill applications, PLN electricity, tickets. This integration is done to link many users who like the social media chat service a lot, one of them is a telegram. Telegram is a popular chat application that functions for integration. The user used telegram widely because of the open source and open source API support. One of the telegram features used for integration is Bot. Bot is a third party application that runs inside the Telegram Application [6]. A combination of telegram bots with various useful applications as messenger assistants for users [7]. The creation of a tracer study application needs to be considered the

data storage design. Data storage of Information data system software is a database. The database is a collection of data in an application that is connected that describes the data design to meet the information needs of an organization [8]. Database applications include MariaDB, PostgreSQL, Oracle, MongoDB, and others. In this study, the researcher uses MariaDB because it adapts to the server used in the research institution. MariaDB is one of a group of DBMS (Database Management systems). Based on several studies, using MariaDB is quite capable of being applied to various applications[9,10].

Design is an essential factor in making information systems. The optimal database design information system will speed up application access. Some of the researches on information system design are carried out by Olalere Modupeola E in 2018 entitled Design, Implementation and Evaluation of a Web-Based Physical Fitness Consultation System. The study designed web-based applications consisting of PHP, HTML, and Javascript programming with MySQL databases. The use of the application shows a tremendous increase in the existing system in terms of cost-effectiveness [11]. Other research was conducted by Satria Abadi in 2018 entitled Design of online transaction models on traditional industries to increase turnover and benefits. The study discusses the design of application development models using PHP web programming and MySQL databases. The application developed to increase trust based on app access accuracy [12]. The next study was carried out by Muhamad Irfan Kurniawan in 2018 entitled Internet of Things: Raspberry Pi and Telegram Messenger-based Home Security Systems. The research combines devices with Telegram Bot for notification purposes. The use of telegram makes it easy to deliver information about home security [13].

The design of the tracer study application uses two input data lines using two applications, namely telegram and web-based applications. The purpose of the research is to design an optimal database design so that it can overcome input from the two applications.

2. Literature Review

The database used in this study is the MariaDB database. MariaDB is a Database Management system originally known as MySQL. Many developer communities developed MariaDB in the database field, which previously also contributed to the MySQL database. MySQL was acquired by Oracle, causing MySQL to become a proprietary licensed product. The acquisition carried out by Oracle caused the development of MySQL not to be free caused the MySQL developer community to build MariaDB [14]. Even though MySQL changed to MariaDB, but still able to maintain compatibility and API. New products from MariaDB are XtraDB and Aria, which are new storage machines. The new Machine feature is used to support transactional and non-transactional databases.

The MariaDB database engine consists of MyISAM and InnoDB. Each table has a different machine. InnoDB supports relationships between tables or is called a transactional database. MyISAM is a non-transactional type that can use three access priorities., including LOW_PRIORITY, DELAYED, and HIGH_PRIORITY. The MariaDB server must decide which statement will be processed first. Statements that change data (INSERT, UPDATE, and DELETE) are a priority compared to the SELECT statement [14].

PHP is an open source web programming language that is server-side. PHP can be part of the HTML programming language. PHP has connection capabilities with various types of databases. PHP is the language of interpreters that has a condition in the declaration of code commands. PHP can be used to update databases, create databases, and work on mathematical calculations. PHP released the latest version, namely version 7. Some functions including Linked List, Stacks, Queues, Trees, Heaps, Graph, Sorting, Searching, Dynamic Programming and Others, Numbers, and Maths - PHP Big Integer Implementation - Prime number generation – Sieve [15].

Telegram is a free and non-profit social media multiplatform instant messaging sender media application. The multiplatform telegram that works on various mobile devices or computers devices includes Android, iOS, Windows, Linux. Telegram can be used to send messages and exchange photos, videos, stickers, audio, and other types of files. Telegram also provides optional encrypted end-to-end message sending [16].

One of the telegram features is Bot. Telegram bots are the easiest modern bots to make compared to similar bots. Telegram bot supports a variety of programming languages, one of which is PHP. Bot API is an official bot provided by the developer telegram, which is a separate entity. The main function of the Bot is to help provide information. Bots help with Work and Daily Activities including calculators that calculate difficult jobs, unit conversions, calculate exchange rates, check certain status (expired,

domain, ping, traceroute on computer networks), check the expedition receipts of JNE, Tiki, POS, check train schedules, check the price of goods, compare. Check automatic e-mail [17].
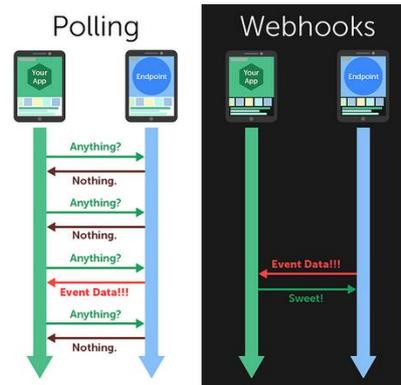

Figure 1. API Bot Method

There are two of the most popular bot management methods, as in Figure 1, namely long-polling and webhooks. Bot management function to share data efficiently between applications and application users. Both methods have advantages and disadvantages. Long-Polling is the default Telegram method that is portable, which means that the method can run on various devices, including computers, HP, IoT devices, and routers. This method is not required to use an online server. The disadvantages of this method include the process of reading it for quite a long time. The update process is not in real time. Webhook has the advantage of the process of reading chat faster than long-polling. This method can be run full 24 hours because it is run on an online server that has an SSL certificate. This method can update scripts in real time [6].

3. Research Method

The methodology in this study is to conduct a theory review of 5 pioneering SQL groups in database programming and previous research studies with literature studies explained in the previous chapter. The research method uses the waterfall model. This model approaches systematically and sequentially. The stages of this model, as illustrated in Figure 2, must step by step in each process [18].
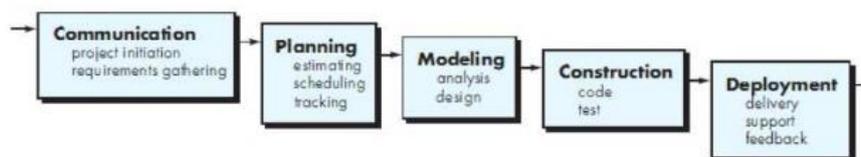
Figure 2. Waterfall Model

There are five stages in the model carried out in this study. At the first stage, there is Communication that is carried out before starting technical work done based on the goal of improving the performance of information systems in tracer studies. The Communication Phase has been carried out with stakeholders. Stakeholders in this study included several vocational schools and provincial service branches in Kediri. The next stage is Planning. At the Planning stage, schedule planning is carried out based on the tasks to be carried out until the testing phase. After that, it goes to the Modelling stage. In the Modelling stage, the database model adjusts the design according to the planning stage. The model selection is adjusted to the database engine in this study using the MariaDB database.

At the Construction stage, code writing is carried out, including SQL DDL (Data Definition Language), and DML (Data Manipulation Language) commands. The choice of DDL and DML requests refers to the need for a tracer study. Then at the Deployment stage, the implementation of the three final coding steps of the DCL (Data Control Language), Transaction and Select steps are carried out. At this stage, an evaluation of the cost of load code will be carried out based on monitoring using the micro time command [19]. The micro time function is one of the PHP tools used to restore the current Unix timestamp with units of microseconds [19].

4. Discussion and Result

The researcher uses the waterfall model to conduct this research. The telegram bot application and information systems use a database design together for the case of information systems tracer studies. Database optimization aims to smooth access to information systems. The Communication stage has been carried out by retrieving information from research objects and central studies based on book literature and previous research. The research planning phase runs for one semester, which is about six months.

The needs of the tracer conduct modeling stages of the information system database of tracer study. The database used is MariaDB using the MyISAM and InnoDB machines. The database design of tracer study will contain some information including:

a. Student Data
b. Tracer Study Data
c. Message Data
d. Announcement Data
e. Login Data

Data allocation must refer to the results of the first stage, namely the communication stage. This stage will transform into a database. Table 1 is a description of the needs of a database information system of the tracer study table.

**Table 1.** Detailed Information on Tracer Study Data

No	Data	Information
1	Student	Information is used to hold student identity data.
2	Tracer Study	Information is used to hold data on tracer study works and lectures
3	Message	Information is used to accommodate messages from alumni
4	Announcement	Information is used for job vacancies and reunion information boards
5	Login	Information is used for alumni login status

Based on the requirements in table 1, figure 3 is the result of the design of the tracer study system flow. The stages of construction adapt to the design of drawing three. Database design follows the system flow in Figure 3. In Figure 3, there are two actors. The actor consists of administrators and alumni. In the telegram system, both actors will use a telegram application to access tracer study information. Access to information on bot telegram-based is limited, including registration, user information, and job information. The telegram bot access method uses the webhook method. This method does not overload the web server. The bot method will make it easy for users to access information system tracer studies [20]. Bot models are arranged based on chat-bots with "/" fundamental command interactions [21].
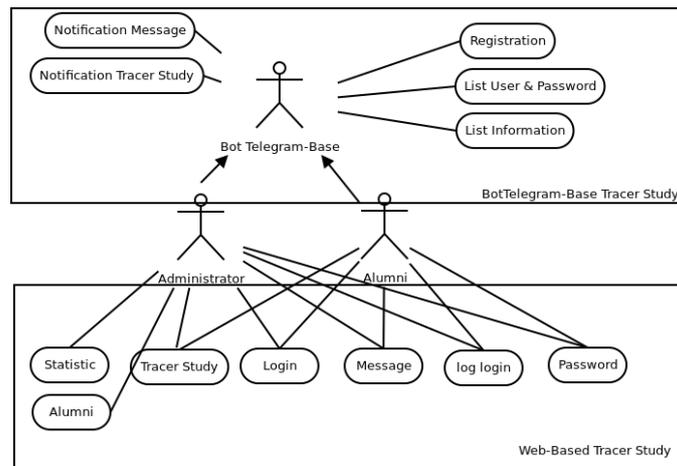
Figure 3. Use case of Diagram Tracer Study

The primary function of the web-based method in Figure 3 is as access to the charging tracker study. A long enough filling form is suitable for the web-based method. The registration module and user password list module are not available on the web-based method; the module can only be accessed by bot-telegram according to the telegram user id.
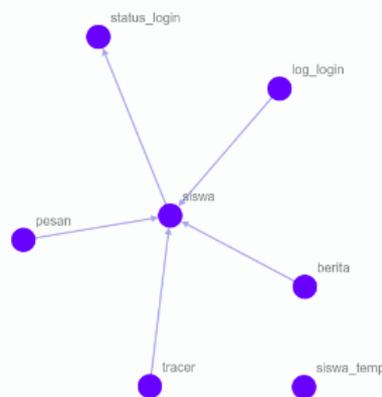
Figure 4. Database Relation

Figure 4 explains the information system database design. the accuracy of the relationship quality is measured to obtain data quality correctly so that it can work for data optimization in the table [22]. There are seven tables in the information system. Seven tables include the following:
a. Student table
b. Table of students temp
c. Tracer table
d. Message table
e. News table
f. Status_login table
g. Log_login table

The table in figure 3 consists of two different machines. The machines used are InnoDB and MyISAM. Only the student_temp table uses the MyISAM engine. The student_temp table functions as a temporary table of student tables when uploading data on a web-based system. In addition to the student_temp table, all other tables use the InnoDB engine which functions as a database relocation in the MariaDB database. The use of the MyISAM type machine can optimize the database with a non-relational model [12]. The use of the MyISAM engine can determine the DML priority, namely the command LOW_PRIORITY, DELAYED, and HIGH_PRIORITY [14].

The detailed structure of the database data type is adjusted to the needs of the data record — relations based on key consistency in the table.
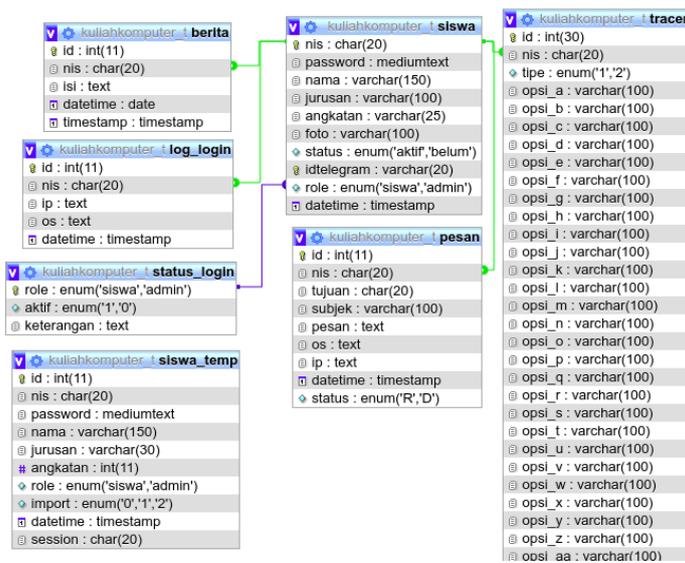
Figure 5. Structure Database

In the Deployment stage, Figure 5 shows the table design. Web-based applications and bot-based telegram applications will access the implementation of table designs in Figure 4. The key to being able to be integrated into the telegram bot application is in the student table, namely the telegram entity. The ID telegram entity is used to access information only accessible to certain alumni. The Log Table only works when used in the web-based method. Its function is to find out the activities of alumni who access information systems. Display bot interface on the telegram, as shown in figure 6.
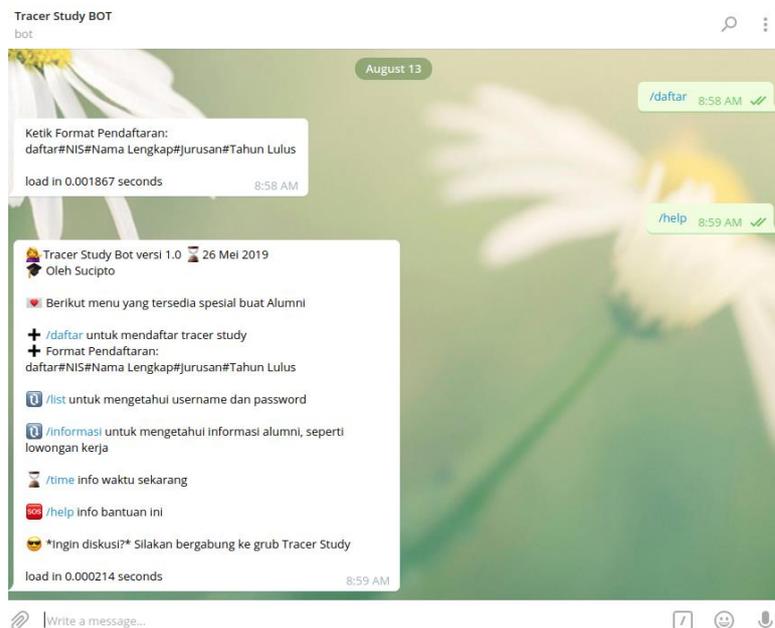

Figure 6. Tracer Study Bot

Figure 5 has various menus to make it easy for alumni to access information. Each list is connected to the MySQL database using the webhook model. Integration of bot display in Figure 5 with table design in Figure 4. The database table is made based on the design in figure 4, then tested using the micro time function. The basic commands for micro time are as follows:

$ time_start = micro time (true);
asleep (100);
$ time_end = micro time (true);
$ time = $ time_end - $ time_start;

Microtime functions are available in telegram applications and web-based applications. This function is used to determine the access speed of the SQL query and PHP load coding. The following is a graph based on the results of micro time testing:
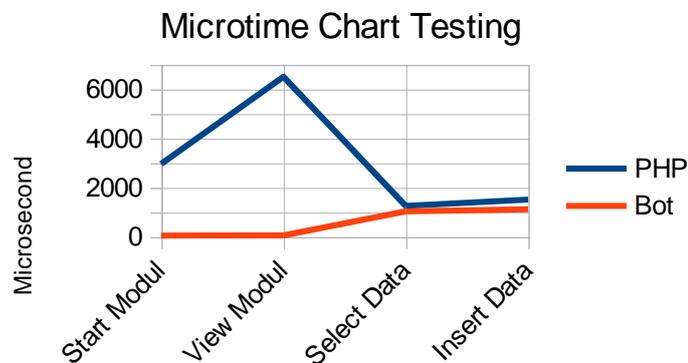
Figure 7. Chart Testing

Figure 6 shows the results of the access speed test performance. There are four tests performed. The initial test, namely "start module," is the module that runs at the beginning of the test. Start page on a bot with search bot then type command/start. Start a page on the web by accessing the website. The visit of "view module" is done when after the initial /start command on the bot then tests the bot with the / help command or after successfully logging in the web application. The test results of the two module start modules and module views show the results of the difference quite far between the two applications in microsecond units. The web application loads the database and web coding but on bots without database access.

Testing the next two modules is to select data and data insert. The test involves access to the database. Access the "select data" module on the bot with commands/information and / list. Access the module on the web application by clicking on the menu in the application. Access the last test module; the "data insert" module. In the bot application with the command "register" and on the web application by filling in the message and filling out the questionnaire.

The test results on the first two modules, namely the module start module and view module show a considerable time difference. At the start of the module, the difference is 2911 microseconds; the module view is 6449 microseconds. The results of testing the final two modules show a fairly thin difference in the "select data" module with a difference of 222 microseconds and the "view data" module with a difference of 394.

5. Conclusion

Based on the test results, the highest query average results in both applications amounted to 6501 microseconds on web-based applications. These results are still in access fast enough to be accessed by 30 users simultaneously. Information about tracker studies is fairly quickly accessed in the bot application because the telegram application directly accesses requests. Placement of information access and alumni registration on the bot application is entirely appropriate because access is quite fast compared to web applications. The placement of the questionnaire is placed on the web application because many constraints are difficult to apply to the bot application. Based on the results of testing and access to query design applications have provided satisfactory results.

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