Implementation of Service Oriented Architecture in Cloud Computing for Periodic Salary Increment

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***Abstract*— Technological advances are used to help improve government performance in matters relating to the use of technology in the process of Periodic Salary Increment, which is the task of the sub-division of staffing at the Regional Government Forestry Service Office of West Java Province. Judging from the document for Standard Operating Procedures (SOP) for the subdivision of the West Java Provincial Government Forestry Service office in 2018, in the work process section of periodic salary increases with stages that require time and energy so that the performance process appears less effective. So that it implements a system that can complete the periodic salary work process using the Cloud Computing-based Service-Oriented Architecture (SOA) method. The purpose of using cloud computing is to increase reliability and flexibility without increasing computing costs. Cloud computing has become a solution and opportunity for the development of the Information and Communication Technology (ICT) industry to get better advantages over other technologies. On the other hand, the user does not need to see or have knowledge of the physical location and system configuration of the service. This research resulted in the performance of the sub-division of the staffing of the West Java Provincial Government Forestry Service in the process of making regular salary increases more effective. And from the test can prove that 74.74% of the questions answered "Yes" are successful.**

Keywords—component; Service Oriented Architecture (SOA); Cloud Computing; Periodic Salary Increases; Usability Testing

INTRODUCTION

In the current industrial revolution era, local governments are required to carry out and create innovations, especially those related to public service innovation based on information and communication technology [1]. This is related to the use of technology in the process of Periodic Salary Increment which is the task of the staffing subsection of the Regional Government Forestry Service Office of West Java Province. The meaning of periodic salary increase is the salary increase given to Civil Servants (PNS) who have reached the working hours of the group specified for the periodic salary increase once every two years and when they have met the requirement [2]. Submission of Periodic Salary Increment at the Regional Government Forestry Service Office of West Java Province is one of the main tasks of the staffing subsection and general subsection. From the Standard Operating Procedures (SOP) of the Administrative Subdivision in the process of making Periodic Salary Increment proposals, based on the results of an interview with one of the staffing subsection has several shortcomings, namely 1) Requires time and effort to compile documents for proposals for Periodic Salary Increment; 2) There is a possibility that the file data is not suitable so that you have to repeat the initial file preparation process which will increase the time for the process of proposing a Periodic Salary Increment; 3) During the data storage process there may be errors or even deletion of data without realizing it. Based on these shortcomings, the Service Oriented Architecture (SOA) model is one of the development methods that will be used in designing information systems in the process of Periodic Salary Increment. The method can be independent by dividing the problem into several services which is a way of solving the SOA model. This SOA method is one of the best choices in overcoming various problems, especially regarding integration between systems and platforms for both systems that are already running or systems that are in the development stage [3]. So that SOA can connect to the internet network, take advantage of internet-based computer technology such as cloud computing. Cloud computing is known for its flexibility and low cost. That is the most basic reason for many companies to use this technology. The company does not need to bother setting up their own infrastructure and server maintenance, which means cutting costs for the company. The company can also freely choose the appropriate service and can be changed as needed at any time.

Actually, there have been many examples of journals that use the SOA method with Cloud Computing, such as the research conducted by Muhammad Zulficar, but this research is applied to a system of periodic salary increases. The purpose of conducting this research is to apply the SOA method to be used in a system of Periodic Salary Increment. Design a system of Periodic Salary Increment using SOA with an object-oriented approach. And implementing a system of Periodic Salary Increment with the SOA method based on cloud computing.

SERVICE ORIENTED ARCHITECTURE (SOA)

In the SOA perspective, services are the building blocks of enterprises. A company is defined by its collection of services, both internally and publicly available, and the patterns of interaction between services. Service interactions are not tied up internally within the company, but the

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business landscape or business environment also consists of interacting services among various organizations. Thus, the welfare of a company and the business environment is determined by the quality of the implementation of this service [4].

SOA is an information technology architecture that defines an interaction model between the three main functional units [5].

Figure 1 SOA Methodologies in Design Stage by Suhardi

SOA methods can render functions as services and independent. Problem solving by dividing into several services is a way of solving the SOA model [6].

The Service Oriented Architecture (SOA) method is able to logically translate problems into more detailed and interconnected units. This method can be used on a large scale with a distributed computing approach, thus providing efficiency in system development. In addition, SOA can be translated as an arrangement of architectural rules that are arranged based on several elements in which each element can be related to various different architectural designs and styles [7].

Service Oriented Modeling Architecture (SOMA) methodology is a software development lifecycle method for developing a solution to a business problem using the SOA concept [3].

The process of implementing SOA in various information systems will run well and be able to provide significant benefits if supported by regulations in the SOA implementation process [8].

Making web applications using the SOA method, namely by creating service packages in the form of small units that can be developed continuously. This SOA method will also be able to integrate various other package services that have been made [9].

RESEARCH METHODS

A. Research Activity Process

The research steps are described in outline as follows.

Fig. 2. Research Activity Process

Starting from the research preparation stage by looking for literature studies and conducting interviews with related parties. The second stage of the needs analysis is determining the services needed and determining the system requirements. The three stages of SOA identification by looking at the company's workflow process. The four stages of the SOA specification are analysis of the services to be provided and an overview of the services. Then the five stages of SOA implementation are implementation and application deployment.

B. Design Tools

System planning is an initial stage in making a system that requires a processor stage. In carrying out this research, the tool used to make system design was the Unified Modeling Language (UML) which consists of a use-case diagram to describe the system model, an activity diagram for program design, and a class diagram for database design.

C. Service Oriented Architecture (SOA) Design

The system model used in the design of Periodic Salary Increment at the Regional Government Forestry Service Office of West Java Province is described in the following use-case diagram.

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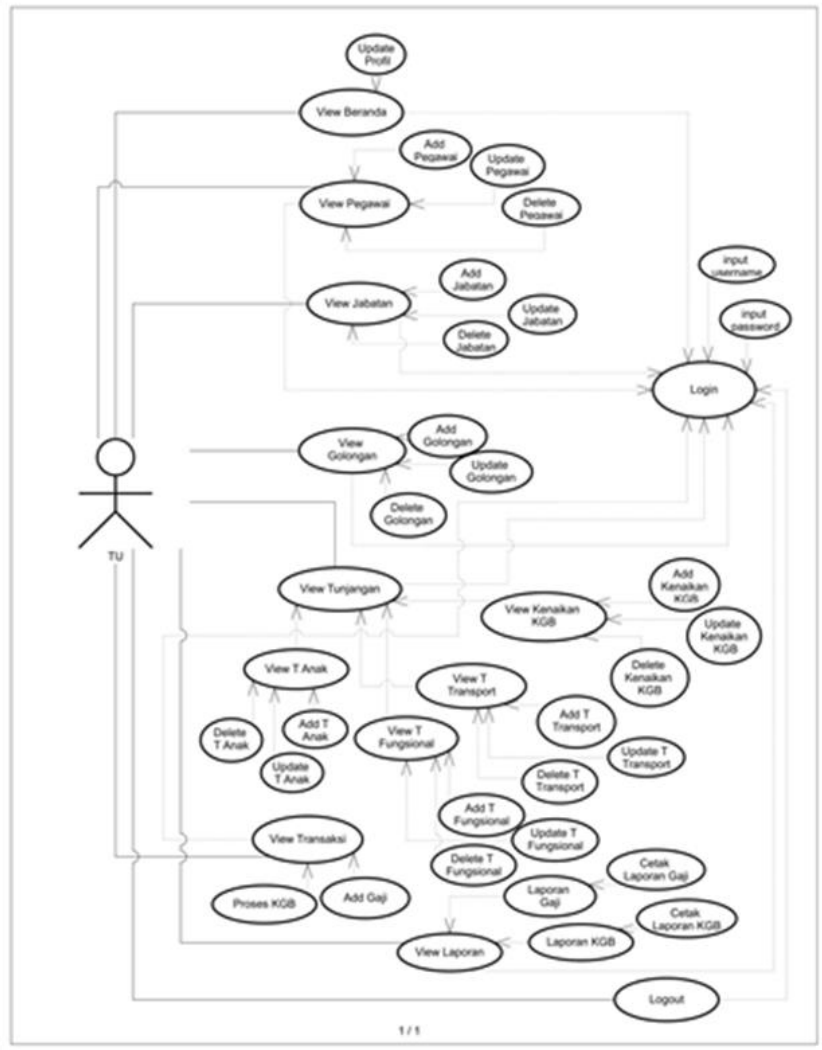

Figure 3 Usecase Diagram

As in the usecase image above. It can be seen that the actor is Administration (TU). TU can view, change and delete data on the web application. To be able to access TU, you must log in first. If the login is successful, the user can enter the application, and if not, it will return to the login page.

The program algorithm is described in the form of an activity diagram as follows.

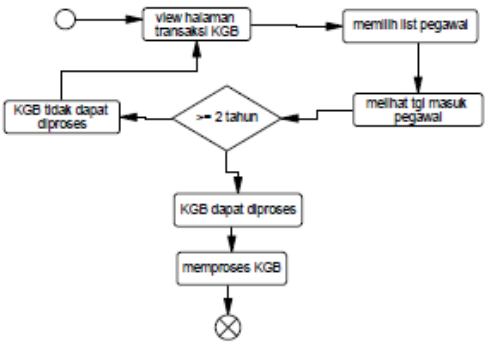

Figure 4 Activity Diagram

Starting from the start, the user will see the KGB application transaction page. Then choose a list of employees who will experience a periodic salary increase process. After seeing the data on the year of entry for the employee, if the employee has worked for at least 2 years, the process of periodic salary increases can be continued.

The following class diagram is to show the relationship between one table and another in the database processing process. Figure 4 below is a description of the class diagram.

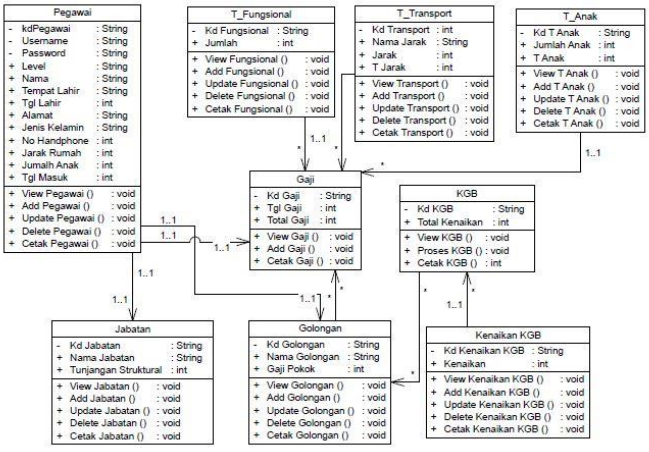

Figure 5 Activity Diagramz

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In this study, nine tables are used, namely employee tables for employee data, salary tables for employee salary data, position tables for job data, class tables for group data, KGB tables for periodic salary increase processes, KGB increase tables for data on nominal amounts of periodic salary increases. , table T_Anak for child support data, table T_Transport for employee transportation allowance data, and table T_Functional for employee functional allowance data.

When designing SOA, it also describes the form of service implementation as shown in Figure 6 Here.

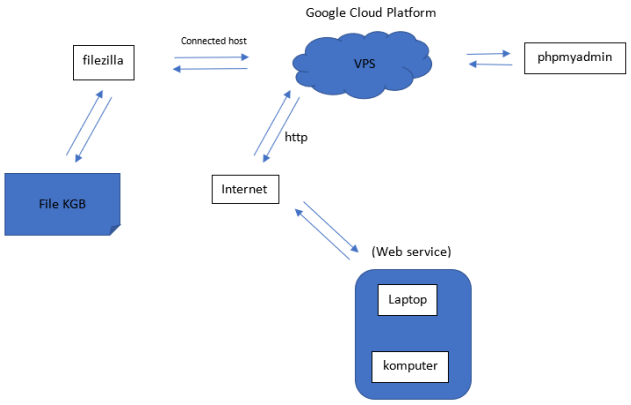

Figure 6 Service Implementasi

D. Cloud Computing Design

Cloud computing has several types. This research uses Platform as Service (PaaS) type. PaaS service is a service from a cloud provider platform that is ready to use. Which means that the cloud service provider is fully responsible for the running of the application so that it is perfect when used.

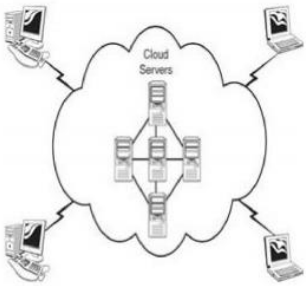

Figure 7 Cloud Computing Architecture (Shivaji P Mirashe, Dr. N.V. Kalyankar, 2010)

The stages in planning a cloud hosting system are the system analysis stage and the specification of system requirements. To create a cloud service, we need a server and a system that can provide self-service services. Server devices such as Google Cloud Platform. The reason for using the Google Cloud Platform is that users can innovate coding easily with services that are available on the google cloud platform.

E. Application Testing

Usability definition is the extent to which a product can be used by certain users to achieve the set targets with effectiveness, efficiency, and achieve user satisfaction, tasks, equipment. Based on this definition usability is measured based on components. Usability testing has 5 main components, namely learning ability, efficiency, memorability, errors, and satisfaction [10].

1) Learnability, namely how fast users are proficient in using the system and the learnability in using a function and what users want they can get.
2) Efficiency, namely as a resource expended to achieve accuracy and completeness of objectives.
3) Memorability, namely how the user's ability to retain his knowledge after a certain time, ability to remember is obtained from the placement of a menu that is always fixed.
4) Errors, namely how many errors the user makes including the discrepancy of what the user thinks with what the system presents.
5) Satisfaction, namely freedom from discomfort, and a positive attitude towards users or a subjective measure of how users feel about using the system.

The calculation of the percentage from the question table was done by changing into the numeric form of each answer with the rule of number 1 (one) if the answer from the respondent was "Yes" or check (√)) in the column "Yes" and the number 0 (zero) was given to the answer "No" or tick (√) on column no.

From each task point, the percentage was calculated, what percentage says "Yes" and what percentage says "No". From each task point in each subsection, the subtotal percentage was calculated, and what the respondent has given both the answers that can be answered or cannot be answered. According to Arikunto, quantitative tables for the calculation of the questionnaire on usability testing to measure the use of web applications.

TABLE I. SCORE CATEGORIES

Scor	Qualification	Result
85-100%	Very Good (VG)	Success
65-84%	Baik (B)	Success
55-64%	Good (G)	Unsuccess
0-54%	Less (L)	Unsuccess

The following is the calculation to get the value results from the test.

$$Value = \frac{Score}{Number\ of\ Respondents} \quad (1)$$

In equation (1) this can be seen to get the value results using the scores that have been obtained from the surveys that have been conducted then divided by the number of respondents who conducted the survey.

RESULTS AND DISCUSSION

The following was a display of the results of implementing the code for the application forPeriodic Salary Increment at the Regional Government Forestry Service Office of West Java Province.

A. Page Views

Results of implementing code for periodic salary increase applications. The login portal is used to separate user usage which is divided into three parts.

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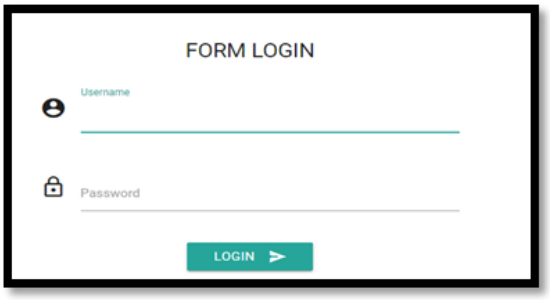

Figure 8 Login page

If the user is an ordinary employee, it will enter the application page for employees. Likewise, the display for employees of the subdivision of personnel who take care of proposing KGB and displays for the Head of Subdivision of Administration and the Head of CDK.

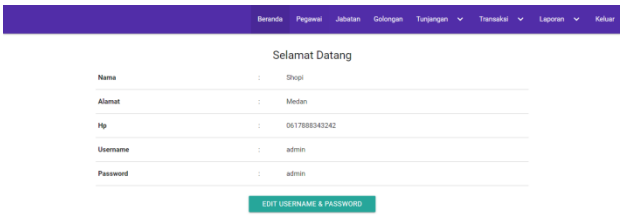

Figure 9 Home page

What distinguishes it from other user pages is the number of features and how the features work that has been provided according to individual needs. And for display when doing the KGB process as shown in Figure 8 below.

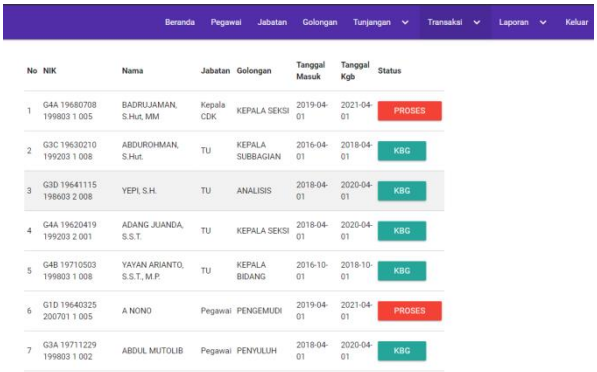

Figure 10 KGB Process page

B. Implementation of Cloud Computing

The following are the steps for implementing cloud computing using Google Cloud Platform (GCP). The steps taken are as follows:

1. First, enter your google account.
2. Access the URL "console.cloud.google.com".
3. After entering the GCP dashboard, then create a file for the new project.
4. Next, click the navigation menu, select a compute engine, and click VM instances.
5. Add manage access to create a new server. Then fill in the form listed.
6. Download and install the FileZilla application from the following URL https://filezilla-project.org/download.php?platform=win64
7. Connect the host, username, password, port according to the server on the Google Cloud.
8. Upload the PHP file
9. Connect SSH, install "xampp", start "xampp"
10. The web application can be used.

C. Testing

The following is the data of respondents who conducted the test.

TABLE II. RESPONDENT

Respondents	Job Level	Age	Gender	Testing Time
1	Employee	56	Man	± 5 minute
2	TU	49	Man	± 5 minute
3	TU	56	Woman	± 13 minute
4	TU	53	Man	± 7 minute
5	TU	50	Man	± 17 minute
6	TU	56	Man	± 13 minute
7	TU	49	Man	± 10 minute
8	TU	50	Man	± 7 minute
9	TU	48	Man	± 10 minute
10	TU	49	Man	± 10 minute
11	TU	57	Man	± 13 minute
12	TU	48	Man	± 15 minute
13	TU	53	Man	±10 minute
14	TU	59	Man	± 8 minute
15	TU	46	Man	± 10 minute
16	TU	50	Woman	± 13 minute
17	TU	58	Man	± 15 minute
18	TU	51	Man	± 10 minute
19	TU	50	Woman	± 15 minute
20	TU	50	Man	± 20 minute
21	TU	56	Man	± 16 minute
22	TU	50	Man	± 17 minute
23	TU	57	Man	± 13 minute
24	Employee	54	Woman	± 7 minute
25	The head of the TU	55	Woman	± 10 minute
26	Employee	47	Man	± 6 minute
27	Employee	53	Man	± 5 minute
28	Employee	60	Man	± 20 minute
29	Employee	39	Woman	± 10 minute
30	Employee	40	Woman	± 17 minute

After designing and implementing the system, the testing process was carried out. The test was carried out using usability testing by 30 employees of the Service Office.

From the calculation of the percentage of respondents' answers on usability testing to measure the use of the Periodic Salary Increase website, it can be concluded that 74.74% of the questions answered "Yes". And 25.26% of the questions answered "No". Then, seen from the number of percents who answered "Yes", based on Table 1, the qualification of the website is Good (B) and the results are declared successful.

Furthermore, the percent of the statement "Yes" is calculated using equation (1), and the value is obtained, namely

$$Value = \frac{Score}{}$$

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$$= \frac{\textit{Number of Renpondents}}{30} = \frac{74.74}{30} = 2.45$$

The questions that have been given to respondents, it is divided into two, namely:

1. Who answered "Yes"
   The Learnability component obtained 86.09%, the Efficiency component obtained 67.77%, the Memorability component obtained 75%, the Error component obtained 45.84%, and the Satisfaction component obtained 99%.
2. Who answered "No"
   The Learnability component obtained 13.91%, the Efficiency component obtained 32.23%, the Memorability component obtained 25%, the Error component obtained 54.16%, and the Satisfaction component obtained 1%.

TABLE III. TEST RESULTS

	Yes (%)	No (%)
Learnability	86.09	13.91
Efficiency	67.77	32.23
Memorability	75	25
Error	45.84	54.16
Satisfaction	99	1
Total (%)	**74.74**	**25,26**

CONCLUSION

The conclusion that can be obtained from this research is that using the service oriented architecture (SOA) method which is described using the Unified Modeling Language (UML) can be a solution to the problem of the periodic salary increase process, so that it can improve the performance of employees in the personnel department. Servers are done by the server, so that users only need to use the results anywhere and anytime. And the results of application testing are 74.74% which is seen from the score table getting good qualifications with the results declared successful.

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