Implementation of Web Service Fingerprint Attendance Machine on Employee Attendance Information System

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Abstract

The OKI District Population and Civil Registration Service have implemented the employee attendance information system by utilizing a fingerprint machine. This system is quite helpful in recording employee attendance properly. However, several obstacles are found in the implementation of the system. Namely, calculating the attendance percentage is still done manually because the data must be further processed using additional applications. Based on these obstacles, this study aims to implement web service technology using the protocol SOAP to integrate the system currently used. The system will automatically download fingerprint machine data and process it into attendance percentage reports, so that it can be more optimal and increase efficiency. The data obtained will be used by the staffing department, including one of the factors for measuring employee performance and determining Additional Employee Income (TPP).

Keywords: Employee Attendance, Fingerprint, Web Service, SOAP, TPP

1. INTRODUCTION

Public service is a series of activities to meet the needs of services for every citizen that must be carried out optimally [1]. One of the essential factors that influence public services is the presence of employees. The Population and Civil Registration Service (Disdukcapil) of OKI Regency is a public service agency that provides population administration document services. To improve performance, Civil Servants in the OKI District Disdukcapil are given additional income as Additional Employee Income (TPP). One of the basic calculations for the provision of TPP is based on employee attendance, calculated from the percentage of attendance timeliness following predetermined rules [2].

Disdukcapil OKI District has implemented employee presence by utilizing fingerprint attendance machines [3]. This system is quite helpful in recording employee attendance, but several obstacles are found in implementing the plan. All employees cannot access namely attendance data, and only certain employees have access to the system, so it does not provide transparency in attendance assessment. Besides that, the process of calculating the percentage of

attendance for TPP calculations is still done manually. Data attendance must be further processed using additional applications outside the system. This data processing takes a long time, so it is considered less effective and efficient. For this reason, a method is needed to process attendance data quickly and accurately so all employees can access that.

Using web-based information systems provides easy access to information [4]. The attendance machine used by the OKI District Disdukcapil provides a web service that a web-based information system can utilize. The web service attendance engine provides XML data using the SOAP protocol [5]. The system can access and process the attendance machine data into attendance information that can be displayed in realtime and become an attendance percentage report for the basis of TPP calculations. Direct employee attendance data can be processed in the system without needing additional applications. With the ease of access to a web-based information system, all employees can access attendance information to provide transparency in attendance assessments. Based on this method, the author tries to implement web service technology in the employee attendance information system to facilitate the processing of attendance data to increase efficiency and efficiency.

2. METHODS

The method used in this study is a qualitative descriptive method with stages, namely data collection, analysis, and explaining the results of observations where the researcher conducts research. Data sources are obtained from primary data through observation and interviews, and secondary data are taken from documents and archives related to the attendance system that has been created. Software development was carried out using the RAD (Rapid Application Development) method. RAD is a software development process that emphasizes cycles in a short time [6].
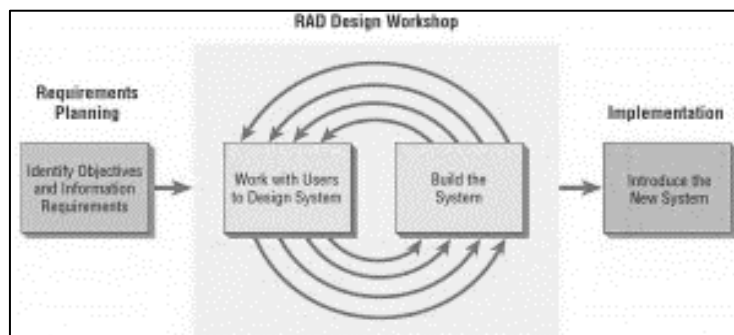

Figure 1. Phases of RAD

There are three stages in the RAD method, namely:

1. Requirement Plan, this step identifies the system's purpose and the conditions imposed. The orientation in this phase is to solve the problems in the OKI District Dissdukcapil.
2. Design Process, this design and repair process if there is a design discrepancy. The output of this stage is software specifications that include the organization of the system in general, data structures, and others.
3. Implementation, this stage develops the agreed program design. Before being applied to the OKI District Disdukcapil, a process of testing the program is first carried out to determine whether there are errors.

3. RESULTS AND DISCUSSION

3.1 Requirement Planning

This stage is the first stage of the RAD method, where an analysis is carried out regarding the presence of employees in the OKI District Disdukcapil to get a clear picture of the existing problems so that the system needs to overcome these problems are known.
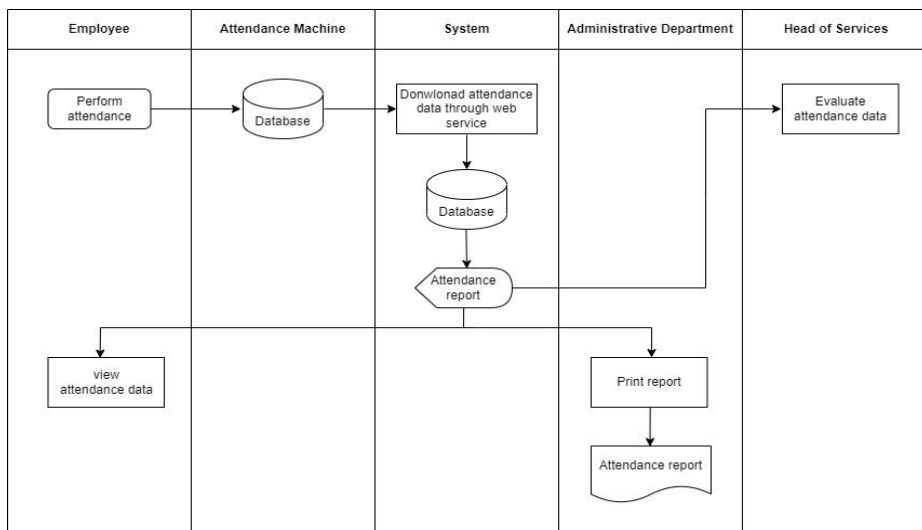
3.1.1 System Analysis

System analysis is depicted using a flow chart. A flowchart is a process workflow described with symbols to describe the order of the system [7]. The following is an overview of the architecture of the employee attendance system used by the OKI District Disdukcapil.
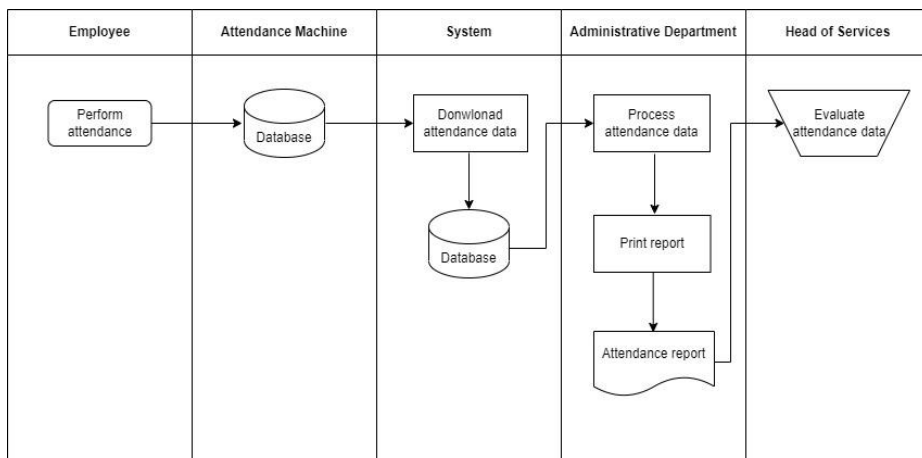
Figure 2. Analysis of the running system

Arsitektur of the attendance system used by the OKI District Disdukcapil currently performs attendance using a fingerprint, where attendance data is stored in the attendance machine database. Then the data from the attendance machine is downloaded by the system and saved into the system database. The downloaded data is then processed manually by the administrative department using additional applications for the basis of TPP calculations. After the attendance data is processed, it is submitted to the Head of Service for evaluation. Here it can be seen that the Head of the Service cannot directly evaluate attendance data but must be processed manually by the administrative department first. In addition, not all employees have access to attendance information in the system, and only the executive department can access the information.


Figure 3. Analysis of the proposed system

The proposed attendance system structure implements a web service. In this system, after the attendance data is stored in the attendance engine database, the information system downloads it through the web service and then saves it in the system database. The data that has been downloaded is automatically processed into presence information that can be displayed in realtime and becomes a report for the basis of TPP calculations. The head of the service and all employees can directly evaluate employee attendance data in the system without having to be processed by the Administration department first.

The web service fingerprint attendance machine of OKI District Population and Civil Registration Service has two entities in its architecture, namely the fingerprint attendance machine as a service provider, which is the owner of a web service that provides various functions, and the employee attendance

information system as a service requester, namely Applications that interact with web services use the parts provided [8].
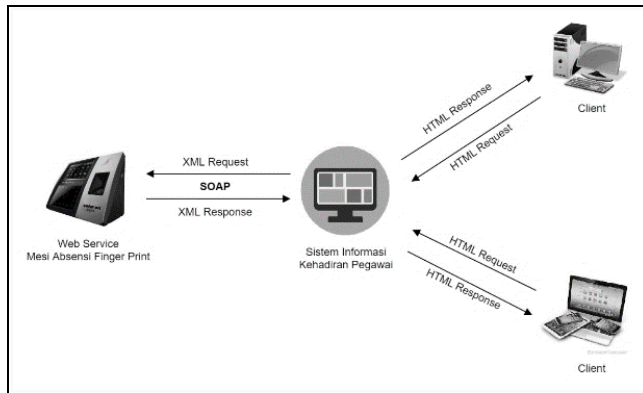
Figure 4. Web service architecture

The employee attendance information system sends XML data requests to the fingerprint attendance machine via the SOAP (Simple Object Access Protocol) protocol, a lightweight and simple version of the XML-based protocol [9]. SOAP allows the service requester to select several parameters regarding the request and provide it to the service provider. When the service provider responds to the request, a web service occurs. XML data responses are sent to the service requester with the SOAP protocol returned.

3.1.2   System Scope

The scope of the system is carried out to determine the boundaries of the area of the system to be built. The system to be made is a web-based employee attendance information system using a web service fingerprint attendance tool. This system aims to provide employee attendance information as the basis for calculating TPP.

3.1.3   Device Requirement

Device requirements are software specifications needed to support the system to be built. The employee attendance information system software is the Apache web server with the PHP programming language and the MySQL database [10].

3.1.4   Data Identification

Data identification aims to determine the data to be used in the system. The data used in the employee attendance information system is a report on the attendance percentage calculation.

HARI	TANGGAL	APEL	APEL/SCAN DATANG	APEL/SCAN PULANG	DL	DATANG TERLAMBAT				PULANG CEPAT				TDK APEL		TIDAK PRESENSI PAGI DAN SORE	TDK HADIR				TOTAL PENGURANGAN (%)	PERSENTASE TINGKAT KEHADIRAN PEGAWAI (%)
						10-31 (HARI)	31-61 (HARI)	61-91 (HARI)	>91 (HARI)	1-31 (HARI)	31-61 (HARI)	61-91 (HARI)	>91 (HARI)	PAGI HARIAN	BULANAN		CUTI (HARI)	DGN KET SAH (HARI)	TANPA KET (HARI)	DISPENSASI DILUAR KDNSN (HARI)		
						0.50%	1.00%	1.25%	1.50%	0.50%	1.00%	1.25%	1.50%	2.00%	2.00%	1.50%	1.50%	2.00%	3.00%	2.00%		
SENIN		APEL	7:32	16:13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
SELASA		APEL	7:31	16:03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
RABU		APEL	7:37	16:03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
KAMIS		APEL	7:33	16:01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
JUMAT			7:44	16:31	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	99.5
	Jumlah				0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	99.5

Figure 5. Attendance percentage calculation report

The attendance percentage calculation report format used by the OKI District Disdukcapil for the basis of TPP calculations.

Table 1. Attendance percentage calculation

No	Attendance	Reduction (%)
1	Come late 10-31 minutes	0,50
2	Come late 31-61 minutes	1,00
3	Come late 61-91 minutes	1,25
4	Come late >91 minutes	1,50
5	Leave early 1-31 minutes	0,50
6	Leave early 31-61 minutes	1,00
7	Leave early 61-91 minutes	1,25
8	Leave early >91 minutes	1,50
9	Not attend daily assembly	2,00
10	Not attend monthly assembly	2,00
11	Not perform one of attendance	1,50
12	Not present with off work	1,50
13	Not present with valid statement	2,00
14	Not present without valid statement	3,00
15	Not present with dispensation out of kdnsn	2,00

The percentage reduction in attendance is calculated based on the timeliness of attendance. The percentage reduction is from 0.50% to 3.00%.

3.2 Design Process

This stage is the second stage of the RAD method. The design process will describe the elements of system development used, namely designing system flows and databases.

3.2.1　System Flow Desing

The designing system flows using the Unified Modeling Language (UML) method, which consists of use case diagrams, activity diagrams, and class diagrams. UML is a method for describing the flow and workings of systems, functions, objectives, and control mechanisms of systems [11].

a) Use case diagram

A use case diagram is a diagram that illustrates the expected functionality of a system that represents the interaction between actors and the system [12].
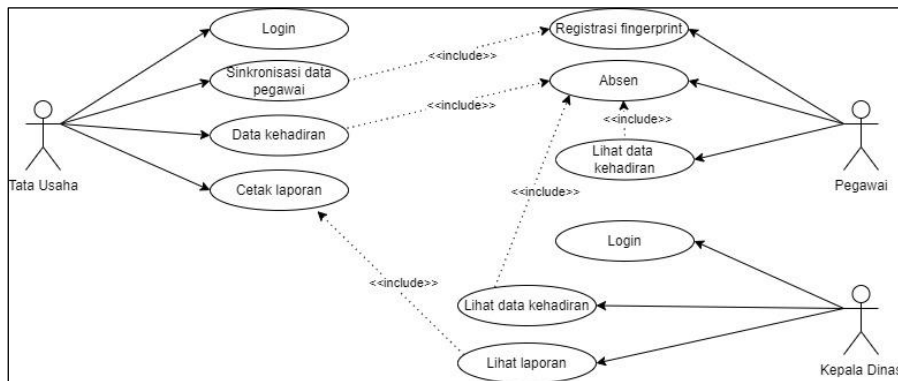
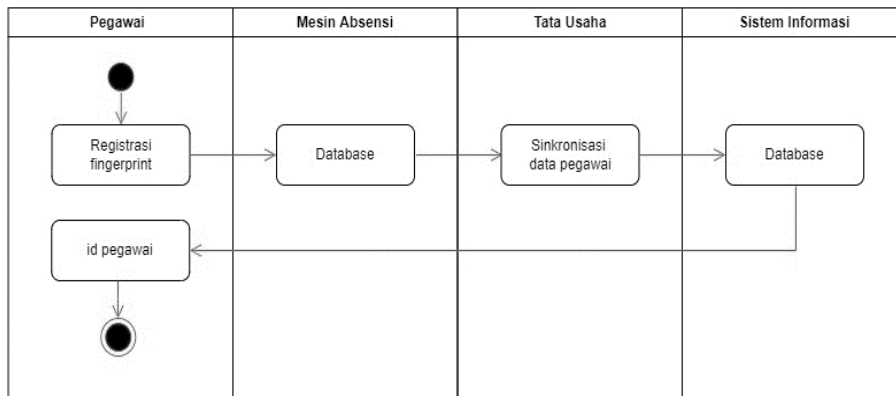**Figure 6**. Use case diagram of employee attendance information system

The use case diagram above describes the interactions between actors and employee attendance information systems.

   a. The Administrative Department can synchronize employee data, attendance data, and print reports. After the employee registers the fingerprint at the attendance machine, the Administration synchronizes the employee data in the attendance machine database with the information system database so that the employee absence data on the attendance machine can be accessed in the information system.
   b. Employees can view attendance data in the employee attendance information system without having to log in first.
   c. The Head of Service can view attendance data and employee attendance percentage reports.
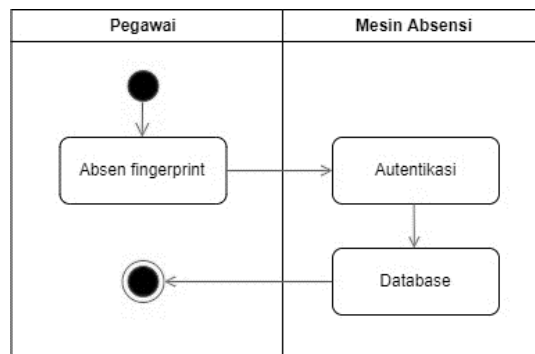
b) Activity Diagram

Activity diagrams are diagrams that focus on illustrating the execution and flow of the system [13]. There are 4 Activity Diagrams created, as follow.

Activity Diagram Registration Fingerprint, Describes the process of squeezing employee fingerprint registration activities. Employees register fingerprints on the attendance machine, which are then saved into the machine database. The Administrative Department synchronizes employee data in the attendance machine database with the information system database. Once the data is in sync, the employee will have an id that will be used in the system.

**Figure 7**. Activity diagram of fingerprint registration

Activity Attendance Diagram, Illustrates the process of sequences of employee attendance activities in the attendance machine. Employees do fingerprint attendance at the attendance machine. The attendance engine will authenticate the employee data and save it into the database.

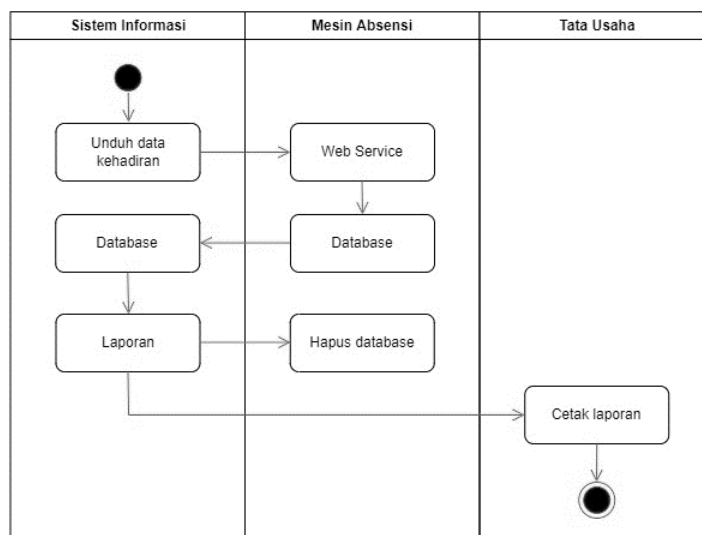**Figure 8**. Activity diagram of attendance

System Dashboard Menu Diagram Activity. This describes the sequence of activities in the system dashboard menu to display realtime attendance information. When employees access the dashboard menu in the system, the system will download attendance data from the attendance machine via web service, which is then saved into the system database and displayed as employee attendance data information. By using the web service, attendance information can be shown in realtime and accessed by all employees.
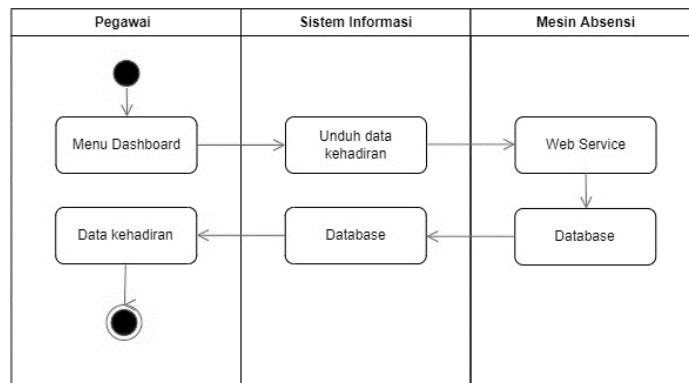
**Figure 9**. Activity diagram of the system dashboard menu

Attendance Report Activity Diagram. Describes the process of squeezing the activities of creating employee attendance reports in the system. The system will be scheduled one time every day, automatically downloading attendance data from the attendance engine database. The system downloads through a web service and is then saved into the system database. The downloaded data will be automatically processed into an employee attendance percentage report. After the download and report processing process is complete, the system will delete the database in the attendance engine to optimize the machine and system performance. The Administration department can print report data that has been processed by the system without having to be processed manually using additional applications first.

Figure 10. Activity diagram of attendance report

c) Class diagram

A class diagram is a diagram that illustrates the structure as well as a description of the classes, attributes, methods, and relationships of each object [14]. Here's a class diagram of the employee attendance information system.
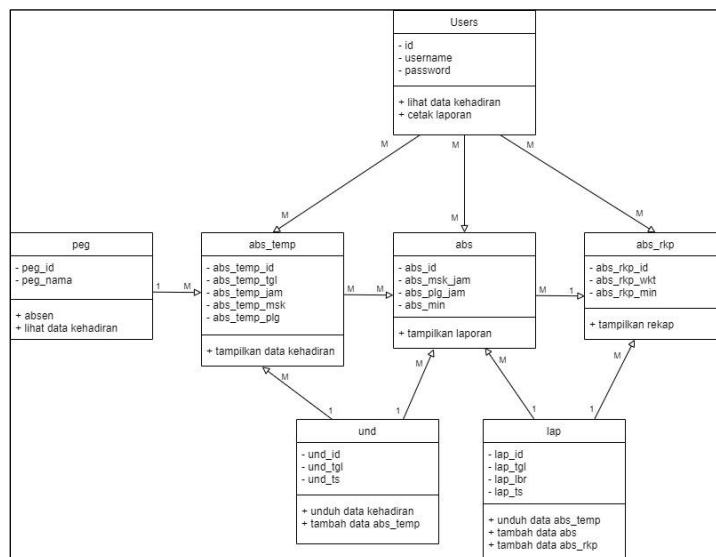
Figure 11. Class diagram of employee attendance information system

3.2.2 Entity Relationship Diagram

An entity Relationship Diagram (ERD) is a diagram that serves to provide an overview of how a database works that connects data [15].
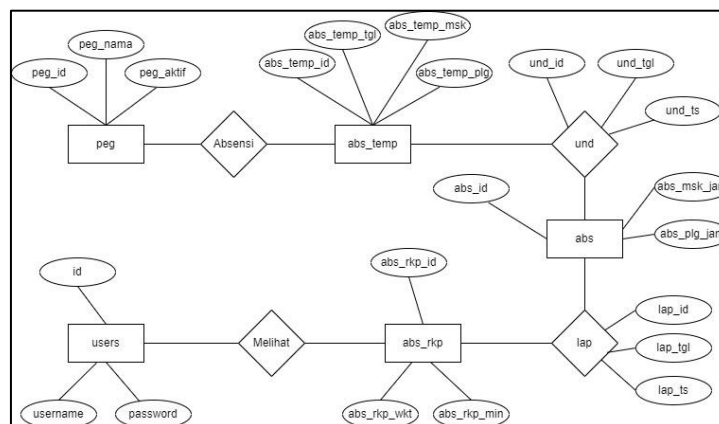
Figure 12. Entity Relationship Diagram

The ERD of the employee attendance information system consists of five entities, namely peg, abs_temp, abs, abs_rkp, and users. As for the process: attendance, und, wipe and viewing. The first process is when an employee performs an attendance process, and the data will be stored in the abs_temp entity, which is temporary attendance data. The second process is downloading provisional attendance data into permanent attendance, which will be used for processing attendance data. The third process is the lapping process which functions to process unlimited attendance data into report recap data. The last process is a viewing process that works when users see report recap data.

The peg table has a one-to-many relationship with the abs_temp—the table where one employee has many attendance data. The attendance data will be downloaded into the abs_temp table, which is temporary data. Once the data is downloaded, the und table will move the attendance data from the abs_temp table into the abs table, which is permanent data. The lap table will process the data in the abs table into a report and will be saved into an abs_rkp table. The users' table shows attendance data in abs_temp tables, abs tables, and abs_rkp tables.

3.3 Implementation

This stage is the third stage in the RAD method, which is to implement a pre-designed system. Mesin attendance fingerprint provides several services or functions to access the database machine. This function will be used to be implemented in the system.
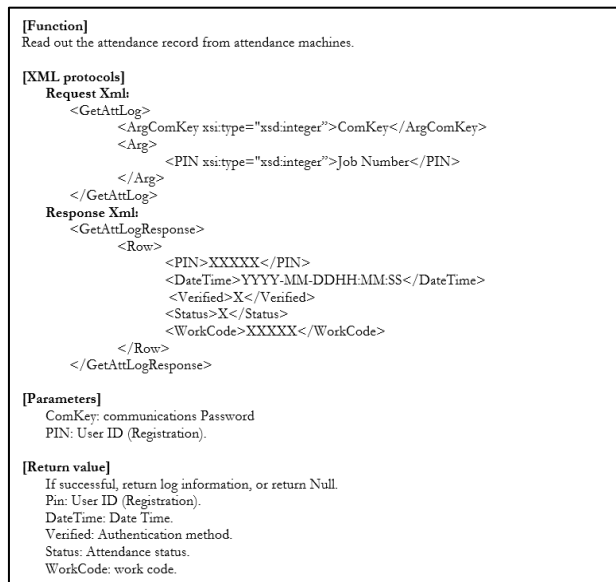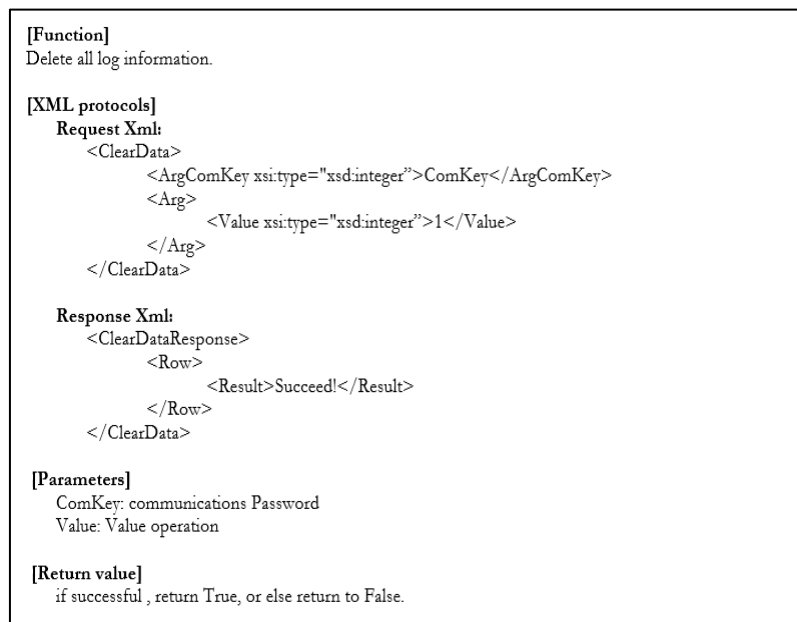


```
[Function]
Read out the attendance record from attendance machines.

[XML protocols]
    Request Xml:
        <GetAttLog>
                <ArgComKey xsi:type="xsd:integer">ComKey</ArgComKey>
                <Arg>
                        <PIN xsi:type="xsd:integer">Job Number</PIN>
                </Arg>
        </GetAttLog>
    Response Xml:
        <GetAttLogResponse>
                <Row>
                        <PIN>XXXXX</PIN>
                        <DateTime>YYYY-MM-DDHH:MM:SS</DateTime>
                        <Verified>X</Verified>
                        <Status>X</Status>
                        <WorkCode>XXXXX</WorkCode>
                </Row>
        </GetAttLogResponse>

[Parameters]
    ComKey: communications Password
    PIN: User ID (Registration).

[Return value]
    If successful, return log information, or return Null.
    Pin: User ID (Registration).
    DateTime: Date Time.
    Verified: Authentication method.
    Status: Attendance status.
    WorkCode: work code.
```

Figure 13. Get log function

Get log is a function to read all attendance data in the attendance machine. The data to be accessed is the user id, time of attendance, type of attendance, Status of presence, and section code, where the data is accessed in XML format. Here are the details of the XML data accessed: PIN is the user id, Date Time is the time of presence, verified is the attendance type, Status is the present state, and Work code is the section code. The system will access this function when it downloads attendance data from the attendance machine, which is then saved into the system database and processed into attendance information that can be displayed in realtime.

```
[Function]
Delete all log information.

[XML protocols]
    Request Xml:
        <ClearData>
                <ArgComKey xsi:type="xsd:integer">ComKey</ArgComKey>
                <Arg>
                        <Value xsi:type="xsd:integer">1</Value>
                </Arg>
        </ClearData>

    Response Xml:
        <ClearDataResponse>
                <Row>
                        <Result>Succeed!</Result>
                </Row>
        </ClearData>

[Parameters]
    ComKey: communications Password
    Value: Value operation

[Return value]
    if successful , return True, or else return to False.
```

Figure 14. Delete log function

Delete log is a function to delete attendance data in the attendance machine. This function removes all present data on the device. After the system accesses the get log function and the attendance data in the attendance machine has been stored in the system database, the system will access the delete log function to delete the attendance data in the attendance machine for optimal device and system performance.

a) Dashboard

The dashboard page is a page that displays data on attendance numbers and attendance details of today's employees.

Figure 15. Dashboard page

When the dashboard page is accessed, the system will download the data from the machine by accessing the web service's get log function, save it into the system database, and then display it as presence information. Thus, today's attendance data can be shown in real-time. If the employee attends more than once, the system will only store the first attendance data for incoming attendance. The following attendance data will no longer be held. As for return attendance, the system will update the first and last attendance.

b) Download Page

The download page contains program code that functions to download data from the fingerprint attendance machine by accessing the web service's get log function and saving it into the system database. This page is run automatically one time a day at 23.50 WIB. The data stored in the system database will be automatically processed into attendance percentage calculation report data according to the report format, which will later be used for other pages in the system. After downloading, saving, and processing attendance report data, the system will automatically delete the data in the fingerprint attendance machine by accessing the web service log delete function. This aims to make the performance of the system and attendance machine more optimal.

c) Attendance Page

An attendance page is a page that displays data on the percentage of employee attendance in the current month.

Figure 16. Attendance page

Attendance percentage data is displayed in the top 5 (five) and bottom five rankings. This page is processed data from the download page. It is hoped that attendance percentage ranking information can increase the level of discipline of OIC District Disdukcapil employees.

d) Holiday Page

A holiday page is a page that displays holiday data. This page is used to process holiday data. When the day is determined to be a holiday, the system will not process attendance data on that day.

Figure 17. Holiday page

e) Report Page

A report page is a page that displays employee attendance report data in one month.

Figure 18. Report page

This page is used to process employee attendance data. This page is processed data from the download page. Attendance data will be automatically processed into attendance report data, except for absentee employee attendance data. Processing is required to determine the type of absence based on predetermined rules. Once the type of absence is selected, the system will automatically process the attendance percentage deduction.

3.4 Testing

The system is carried out using the black box method. The black box method is a direct test of the software without knowing the program's structure [16].

Table 2. Black Box Testing

No	Interface	Test	Expected result	Result
1	Fingerprint machine	Perform attendance	Attendance data stored into fingerprint machine	Success
2	Dashboard page	Access dashboard page	The system download data from machine and view the attendance information in realtime	Success
3	Download page	Automatically run download script	The system automatically download data from machine and store into database for processing into an attendance report	Success

No	Interface	Test	Expected result	Result
4	Attendance page	Access attendance page	The system view employee attendance ratings	Success
5	Holidays page	Define holidays	The system process attendance percentage data on specified holidays	Success
6	Report page	Edit attendance data	The system process attendance percentage data the edited employee attendance data	Success

The first test is employee attendance at the attendance machine, where employee attendance data will be stored in the machine database. The second test is to access the dashboard page to display employee attendance data in the first test. When the dashboard page is accessed, the system will download the data from the machine and display the attendance information in real-time. The third test is to run the download page automatically through the task scheduler. When this page is run, the system will download the data from the machine and process that data into an attendance percentage report according to the rule format. The fourth test is to access the attendance page to display employee attendance rankings. The fifth test determines holidays in the system so that attendance on that day is not displayed. The sixth test is to edit the attendance data on the report page, which is edited to determine the type of absence so that the system can automatically process the attendance percentage. All these tests were successfully carried out correctly, and the results were as expected.

3. CONCLUSION

Based on the research that has been carried out, it can be concluded that based on the analysis and implementation of the fingerprint attendance information system using machine web service, it has proven to be the right solution to overcome the problems faced in the employee attendance while data collection process, namely by integrating it with the employee attendance information system. This system makes it easier for managers to collect, process, and display employee attendance information in real-time. This implementation makes monitoring and processing employee attendance data for providing TPP in the OIC District Disdukcapil easier than before.

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