Modification of ISONER Framework as Enterprise Service Bus to Build Consultation Robot Using External Engine

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Abstract - **Balinese Calendar, the result of astronomy development, is the foundation for Balinese religious implementation as one of the key elements of tourism industry in Bali. In addition to the printed and electronic versions, an engine that can be used to function as a service for advanced application development is not yet available. Balinese calendar is one of the complementary materials commonly used by *Sulinggih* in giving consultations about days considered to be the most appropriate to perform ceremonies.**
***Sulinggih* is a figure considered to have expertise in Balinese Calendar and its uses. This research will transfer the basic knowledge of Balinese Calendar into an engine on MySQL machine. After the engine undergoes a test, a text-based dialogue model will be designed to form a *Sulinggih* robot with various natural language algorithms so that it can be accessed through social media messenger services, namely telegram.**
In order to successfully conduct this research, a phase of system development will be carried out by referring to the System Development Life Cycle model. The process of developing dialog model will involve the use of ISONER framework which will be modified to function as an Enterprise Service Bus(ESB)

Keyword - consulting robot, bali calendar, tele consultation, natural language, ISONER, ESB

I. Introduction.

Balinese calendar is one of Bali's original cultural heritages compiled based on astronomy. Balinese calendar has become one of the important foundations for the application of Hindu life in Bali which is one of the key elements of tourism industry in Bali. The Balinese calendar is a product that has long-term value in its use because it will always play important role as long as Hinduism and Balinese Culture exist. Some examples of its routine function are when it is used to find information on dates of when to conduct *rerahinan* (holy days), the fall of *piodalan* in a temple, *otonan* (birth day), *purnama*, *tilem* and various calendar functions.

In order to access information contained in Bali Calendar, users can make direct reading or consult with a *Sulinggih*. In the structure of Hinduism, *Sulinggih* is considered as an all-knowing person about *Padewasan* (good days) including knowledge about Balinese Calendar. With the development of database technology, knowledge of Bali Calendar can be transferred into an open engine and can further function as a service provider to be integrated with various future application models. One of them is an application model that can interact with users using everyday conversations, known as Natural Language Processing in IT term. Until now, there has been no development of Balinese Calendar application with the NLP approach.

In this study, a robot will be developed to be able to play a role like the figure of *Sulinggih* in providing consultation to the community with a Balinese Calendar knowledge as the basis. This robot will be developed based on the ISONER framework [1] which allows for two-way dialogue in Indonesian. Interactions can be done via IM such as telegrams or other media by utilizing the available API services. IM usage is expected to be able to improve access speed, to increase its practical use and to provide affordable connection.

The ISONER Framework can only perform the process of converting the existing applications with a simple business process which only requires 1 query. ISONER does not have the ability to convert complex business processes as well as calculating various elements in Balinese Calendar. ISONER must be modified as ESB that can communicate with various SOA (*Service Oriented Architecture*) based service systems.

II. RELATED WORK

Many studies on Balinese Calendar have been carried out and have produced outcomes in the form of Balinese Calendar application. This application can run on various platforms including Android, Web, Mac OS and Windows phones. Prawira[2] developed features of information on *dewasa ayu* and religious ceremonies on Mac OS platform. Suwintana [3] developed application containing *wariga* information such as *wuku, wewaran, sasih, ingkel*, on Android platform. Putri [4], provided information on *padewasan*, and dates on *padewasan* on Web application services. Application developed by Destra[5], contained information about *wewaran, sasih*, *purnama, tilem*, the search for B.C. dates and the search for *otonan* on blackberry platform. Ardianti [6] displayed information on *Pedewasan, wewaran*, sasih, penanggal panglong dan *otonan* on Windows Phone platform. Pradnyani [7], displayed calendar, holiday, national day, *otonan* information on Android platform.

In addition to those researches, there are also a product of Balinese Calendar which can be accessed through website services such as kalenderbali.org, babadbali.com and Google Playstore services. All the results of the above researches are available in the form of ready-to-use applications. However, there has not been found Balinese Calendar engine used as a service with universal and reusable traits and uses natural language dialogue in service interactions like a smart robot. Results on several researches indicate there has never been found Balinese Calendar service that can be accessed through social media messenger. To enable such services, several studies on information system access with NLP have been carried out.

Haller [8] successfully developed Chat-bot that can reply to messages sent by users. Chat bots used data taken from Wikipedia and DBPedia sources. The application worked by accepting user input and then gives a reply based on a certain pattern. Elisabet [9] developed an application to find out information about tourist attractions with input in the form of text to the bot system. This model worked by utilizing the text mining process in the phases of processing and matching between input and output. Voice-based teleconsultation development was published by Jadhav[10] by creating an application with the Text to Speech feature. The object of their research was the processing of SMS messages based on Android mobile using Google Speech to Text. Sung [11] at Hanyang Cyber University, South Korea developed applications with voice interaction using text to speech for the purpose of voice-based navigation for people with visual impairments.

Robot models are generally developed on chat / short message platforms. Some robots have been considered capable of understanding user desires and have been tested in Loebner's annual computations in the field of artificial intelligence. The robots are designed to be able to interact with various natural languages for special cases to represent certain figures such as imaginary figures, certain professions and character figures with historical values. The knowledge base on the robot is implemented at the programming level so that it is static [12], [13],[14],[15],[16],[17]

In its development, AIML (Artificial Intelligence Markup Language) is one of the modeling platforms that are widely used for the development of robots. The use of Latent Semantic Analysis has been done to develop robots to replace the FAQ function on E-commerce services on the AIML platform [18]. The AIML platform has also been used to build robots in Indonesian. Improvements in the ability to recognize various patterns have been carried out to enrich the variation of input patterns [19]. Trial of the AIML platform has also been conducted on the website platform [20]

Sukarsa [1] established a framework to develop access services to information systems by building interactions using a variety of natural languages. This framework can be connected to the database layer on the OLTP side which has been equipped with transaction handling including select, insert, update, delete and master detail transaction. All of these functions can be converted into services using the ISONER framework.

Efforts to integrate various services into an integrated platform have been carried out by designing ESB. ESB has been used as a middleware to integrate various functions in providing educational services in Indonesia [21]. The integration model in ESB generally applies message-based exchanges. Various web service models are one of the most popular models being used in this process [22]

III. METHOD

There are several steps that will be carried out in conducting this research as shown in Figure 1, with the following description:

1. Library and field studies
   This study is conducted to comprehend the various rules regarding the making of Balinese Calendar with various aspects. Library studies are also directed to determine the dialog model that will be used to form Sulinggih figure using various NLP algorithms.
2. Making an application design
   The process of designing the model will include several sub-activities, including:
   a. The process of designing the system architecture is used to illustrate the application model being developed. This includes blog integration between

Bali Calendar engine services and text-based teleconsultation services on IM telegram

b. Database design using data normalization techniques and ERD (Entity Relationship Diagram)

c. Designing GUI to give an overview of interaction model and application display

3. Implementation of calendar engine. The implementation of Balinese Calendar engine is carried out at the level of PL/SQL programming language by transferring the database design results to MySQL database engine

4. Migrating and integrating the existing services into robotic services. This migration is done to transfer all services in Balinese Calendar engine into services that can be accessed through robots (chat bots) by using the natural language, namely Indonesian. The integration process is done by converting ISONER to ESB

5. Testing. Tests are carried out to ascertain whether the model designs that have been implemented can provide correct results in accordance with existing rules

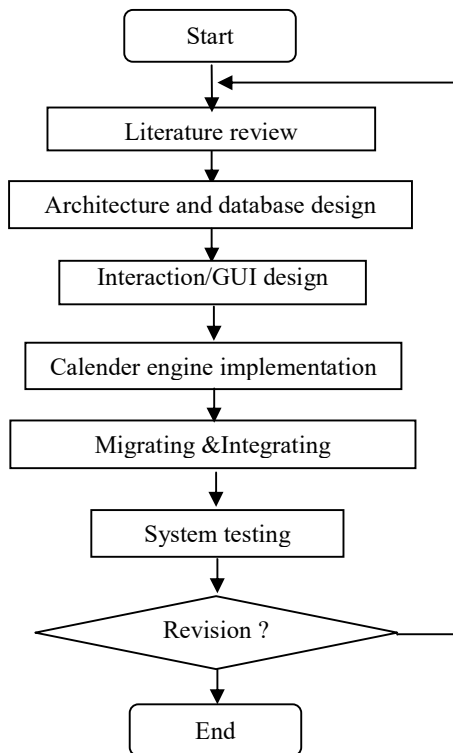6. Repairmen. In order to maximize the results, improvements will be made based on the test results

Figure 1 Research Flowchart

IV. IMPLEMENTATION AND ANALYSIS

4.1 Balinese Calendar Engine

Service features have been developed using PL/SQL to build a service block that provides all calendar services. The development of PL/SQL engine is done by combining the use of procedures and triggers in MySQL and can be accessed using the date parameter

4.2. Design of Consultation Robot

4.2.1 ISONER modification

To build a two-way interaction between *Sulinggih* and robot, this research will develop a model based on the ISONER framework [1]. The results of the calendar engine development will be placed in the database layer on ISONER framework.

Modifications to the ISONER framework were carried out by developing listener blocks in the ISONER layer that can communicate with external business process services built in programming languages including PL/SQL and Python as shown in Figure 2.
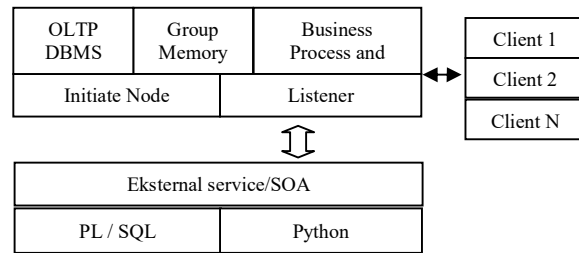

Figure 2 ISONER framework modification as ESB

In the ISONER layer, a listener block was added to handle communication and integration with complex services built with PL/SQL and Python programming languages. Listener contained a module used to call the service and returned the results to be managed further by the section of message display on ISONER.

4.2.2 Metadata Integration

In order to enable the integration process of external applications on the existing ISONER framework, integration will be carried out at the metadata level with dictionary of data such as shown in table 1 and table 2.

Table 1 Operation table

No	Field Name	Data Type	Note
1	operation_id	bigint(20)	auto number
2	operation_name	varchar(225)	Operation name
3	operation_type	enum('insert','update','delete','select','call','python'	Simple Business Process (insert,update,delete,select), Advanced/external application (call, python)
4	keyword	text	Full keyword
5	sql	text	SQL syntax to execute/display the result
6	operation_db	int(11)	database used as source of operation

Table 2 Sequence table

No	Field Name	Data Type	Note
1	sequence_id	bigint(20)	auto number
2	operation_id	bigint(20)	FK to operation table
3	short_keyword	text	Part of full keyword
4	order	tinyint(4)	Order to display
5	data_type	varchar(225)	Data type for this operation part
6	size	int(11)	Size of parameter
7	param	text	Value for data field and criteria for value after where
8	alias	text	Displayed command to user
9	criteria_column_name	varchar(255)	Field in WHERE clause (if exist)
10	Table_name	varchar(255)	Name of tabel as source in where clause

4.2.3 Business Process Migration

Business process migration is carried out for each service that is available on the existing system. The stages of migration are carried out in two main process as shown in figure 3

a. Simple Business Process. Business migration process has the order shown in figure 3. As for the first step, user must determine the type of existing operation (select, insert, update or delete) that will be migrated, followed by registration of related data sources starting from the database, tables, fields and their equivalents. After that, the sequence of operations (dialog) must be determined to establish interactions according to the needs of the existing operations along with the validation rules (data type and size) related to the tables used in the operating service. The last step is to determine the equivalent of the SQL conversion and if the operation is a master detail type, then a similar migration process must be done at the level of detail. Simple Business Process is the stage for moving the existing services into an ISONER service and then all related processes will be handled by ISONER

b. Advanced Business Process. This section will function if the existing business processes does not include the business process that can be solved with 1 SQL command. Each process has to be rebuilt in PL/SQL / Python, and then it is registered in the listener section. The configuration process takes place in the SQL Conversion section to set its interaction model on ISONER framework
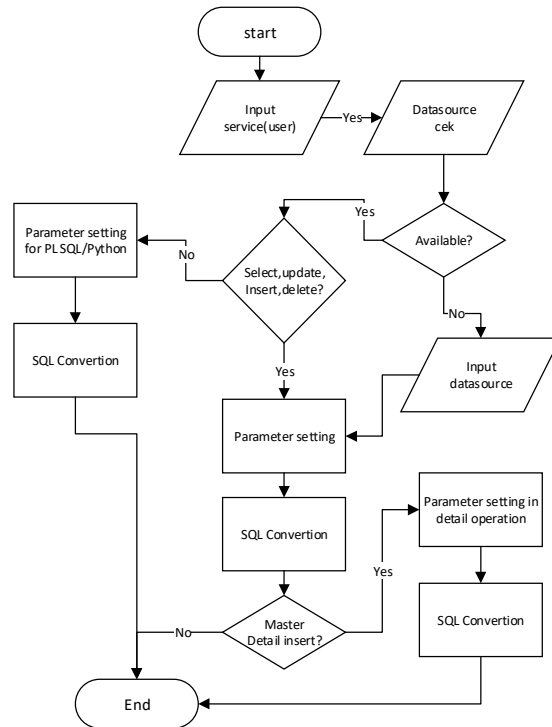

Figure 3 Flowchart of business migration process

4.2.4 Robot Testing Results

The process of testing the listener's function and its integration with ISONER was done by registering a procedure (PL/SQL) in the listener service and

configuring it to build an interaction model on ISONER (figure 4).
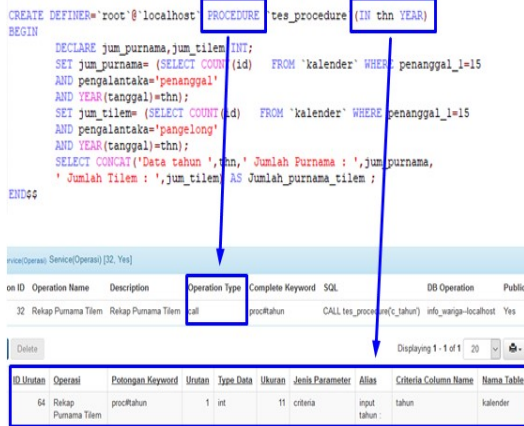

Figure 4 Registration Process on Listener

The interaction results have been going as well as the results of simple business process service shown in Figure 5
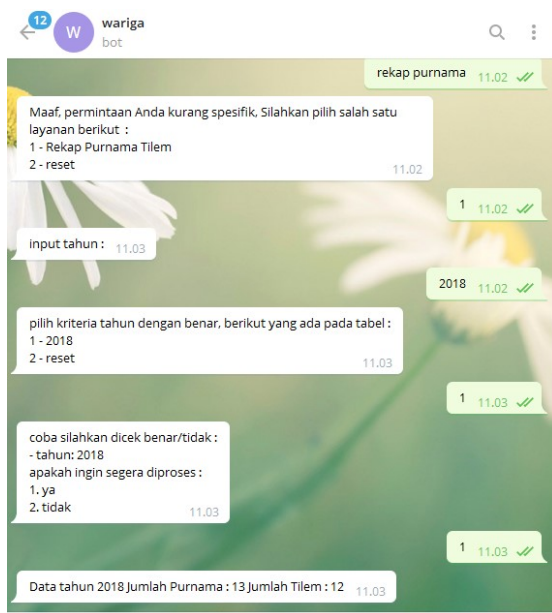

Figure 5 Testing service on telegram

To ensure that users get responses / answers as expected, then all listener based services must be registered as a service on the ISONER framework using the descriptions that describe the process being performed. The process of discovering the pattern will work as in Figure 6.
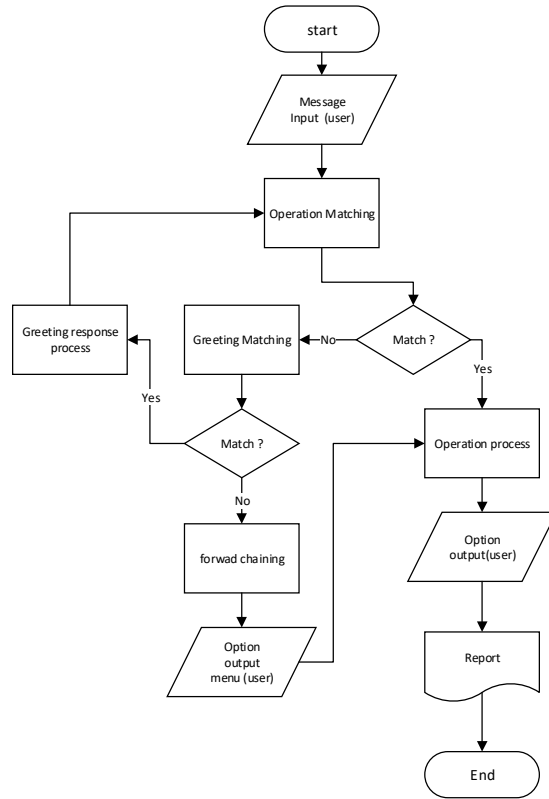

Figure 6 Matching process flowchart

V. CONCLUSION

Based on the discussion on the test results, the ISONER framework equipped with a listener has been successfully used as ESB to integrate services from complex external systems built using the PL/SQL or Python programming language as an external service outside of ISONER. The interaction model on ISONER also functions as well as simple services made directly on ISONER.

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