Use of SOA Framework and Web Service in Development Mobile Application of Public Services in Surakarta City

1st Sopingi
Duta Bangsa University
Surakarta, Indonesia
sopingi@udb.ac.id

2nd Nurohman
Duta Bangsa University
Surakarta, Indonesia
nurohman@udb.ac.id

***Abstract*— The existence of Law of the Republic of Indonesia number 14 of 2008 concerning Openness of Public Information and Regional Regulation of Surakarta City Number 11 of 2013 concerning Openness of Public Information. So it is very important for the city of Surakarta to convey information to the public. Village as the spearhead of service, must be able to provide the best service to the community. The public has the right to get information quickly and accurately. To realize this, we need an online information system that can be accessed by all people. Android application is the most appropriate solution for the implementation of the information system, because most people already have an Android device. With the information system installed on Android, people can access profile information, news, activities, services, galleries and RT cover services online. In this study the author uses the Service Oriented Architecture (SOA) Framework with service-oriented available in Tipes village as a data sample. To develop Android applications that have good user experience (UX) capabilities and high performance, the writer uses the Kotlin and AppCompat Library programming languages. The results of the study are architectural designs and Android applications that have access rights as citizens, head of RT and head of RW, while administrator access rights using web-based applications are equipped with web services that bridge the android application with the database. Test results show the application does not experience an error except when the server has a problem. The statistical data obtained are 365 devices that have been installed and 113 residents gave ratings of applications with an average rating of 4.98**

***Keywords*— Public Services, Android, SOA, Web Service**

I. INTRODUCTION

Based on Law number 14 of 2008 by the Central Government regarding Openness of Public Information and has been followed up by the Surakarta City Government by issuing Regional Regulation Number 11 of 2013 on Public Information Openness, the City of Surakarta seeks to strengthen information technology-based public services in implementing Smart Cities [1]. The use of information technology as a support for public services has long been pioneered by the Office of Transportation Communication and Information. Initially information technology was used for traffic engineering management, but now information technology is used to provide public services in the form of tourist information, culinary, hotels, food prices, events and other information.

Public services in the city of Surakarta that have not been touched by information technology are community services at the Village, RW and RT levels. At present the services at the Village, RW and RT level still use paper as a means of information and a means of covering RT and RW.

In connection with this, the authors intend to play a role in the design and implementation of Tipes Village public service application in the city of Surakarta that is able to convey information and provide cover letter from RT and RW online.

One alternative is to develop mobile-based applications in the form of android and web applications. Android is a Linux-based mobile operating system developed by Google and is an open platform for developers. The selection of Android as a basic platform so that applications built can be easily used by users and can be implemented in many types of mobile phones that support the Android platform [7]. The trend of the use of gadgets continues to develop in Indonesia, the sophistication of gadget technology is increasingly developing along with the increasing needs of humans with modern and practical media [3].

As a bridge between applications and databases web services can be used. Web service can help interaction between different application platforms both applications, operating systems and programming languages [4]. Whereas to maintain the quality of performance based on previous research, it was conveyed that the data exchange method on web services has an influence on the speed of the process of sending data and the Representational State Transfer (REST) method is the method with the best latency value for the data integration process [5].

Android application development using Kotlin programming language. Kotlin is a static typing programming language that runs on Java Virtual Machines. Web application development uses the Webix Framework for creating user interfaces and user experiences. Development of web services using the Laravel framework with database storage using MySQL.

II. METHOD

The analysis and design that the author did to build a public service mobile application in the city of Surakarta by taking a sample of cases in Tipes village, in this case the author uses the Service Oriented Architecture (SOA) approach. SOA is a framework that integrates business processes and supports secure information technology infrastructure, with standardized components that can be reused and included in changing business processes [2]. The stages of the research that the author did as in Figure 1 below.

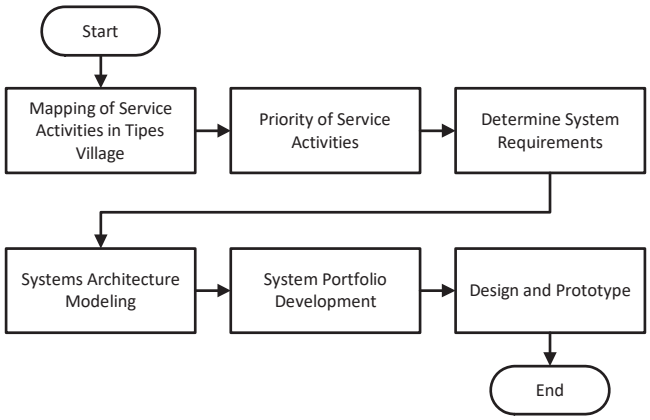

Fig 1. Research Steps

A. Mapping of Service Activities

At this stage a mapping of service activities in Tipes village is carried out and will be included in the Android-based and web-based mobile applications. At the end of this stage a list of service activities that is integrated between the android application and the web application is generated.

B. Priority of Service Activities

At this stage a priority sequence of service activities is carried out at the village, RW and RT levels. At this stage a map of service activity pathways is produced that is in accordance with the existing rules in Tipes Village.

C. Determine System Requirements

Based on service activities that already have priority order, then a collection of needs will be made that will have to be available in the system. At this stage, a list of needs must be produced.

D. System Architecture Modeling

At this stage the architecture is made based on a list of service activities included in the mobile application both android based and web based. The system architecture model is used to determine the hardware, software and infrastructure requirements of public service applications in Tipes village.

E. Compilation of System Portfolios

The system portfolio was created to describe the overall public service system in Tipes Village based on the previous stages of analysis.

F. Design and Prototype

This stage is carried out designing use cases, activity diagrams, class diagrams and sequence diagrams of public service mobile applications in Tipes Village. This design is used to understand the application process from the logical side. The author also made a prototype of a web service and android application to test whether the application is ready to be implemented and integrated. Tests carried out using the blackbox method to find out whether the application runs according to system requirements analysis. The author also monitors input and ratings from Tipes Village community who participated in the application testing

III. RESULT

Before conducting the research stage, the writer had a discussion with Tipes Village management regarding the identification of problems related to public services. The main problem of concern is that the information submitted by Tipes Village management to the community is still not fast enough. During this time the information through head of RW is then passed on to head of RT, while head of RT will deliver it to residents at monthly meetings. In addition to these problems, the management of Tipes Village also wishes to provide an online-based RT and RW cover letter service, so as to reduce the use of paper and speed up the service process at Tipes Village office. After identifying the problem, the next step is to conduct an analysis and the need to model and build android applications to facilitate public services. The stages of analysis that have been carried out are as follows:

A. Mapping of Service Activities

Public service activities in Tipes Village consist of one-way services and two-way services as described in Table 1. One way is services in the form of information delivered to the community while two-way services are those that require direct interaction with the community.

TABLE 1. MAPPING OF SERVICE ACTIVITIES

No	Service Activities
1	**Profile Information** The profile of Tipes Village is one of the contents that needs to be conveyed to the community to know the history or development of Tipes Village
2	**Program Service Information** Information on procedures and conditions related to program services in Tipes Village
3	**Event Information** Information on Tipes Village activity agenda in the form of name, description, time and place of activity
4	**News Information** News about activities, achievements or other information about Tipes Village
5	**Gallery Information** Photos and videos of Tipes Village activities
6	**Citizen Data Collection** Data collection on residents including head of RT and RW
7	**Cover Letter** Cover letter services from RT and RW

B. Priority of Service Activities

Service activities that have been mapped are then sorted by priority as shown in Figure 2. The purpose of sorting priorities is to establish a service activity pathway that has a relationship between activities.

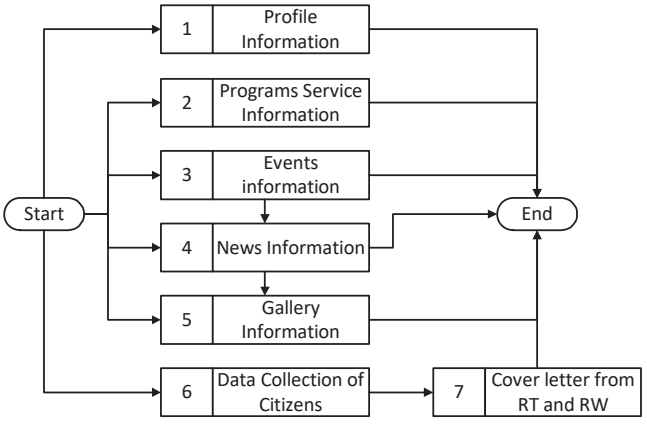

Fig 2. Priority of Service Activities

C. Determine System Requirements

Based on the results of the mapping and priority of service activities in Tipes Village the following system requirements have been determined to build Android and Web applications for public services.

1. Admin access rights with web-based applications. Admin can manage profiles, program services, events, news, gallery, head of RW account, head of RT account, citizen account, monitor and validate cover letters and cover letter reports
2. Head of RT access rights with the android application. Head of RT can verify the citizens' account, verify the application for a cover letter and fill in the cover letter.
3. Head of RW access rights with the android application. Head of RW can verify the application for cover letter.
4. Citizens' access rights with the android application. Citizens can register accounts, fill in cover forms and monitor the status of verification of cover letters from head of RT and RW.
5. Android and web applications can be accessed publicly to view profile information, news, events, galleries and the program services of Tipes Village.

D. System Architecture Modeling

As an illustration of public service applications in Tipes Village, which are Android-based and Web-based, the system architecture is depicted in Figure 3 below.

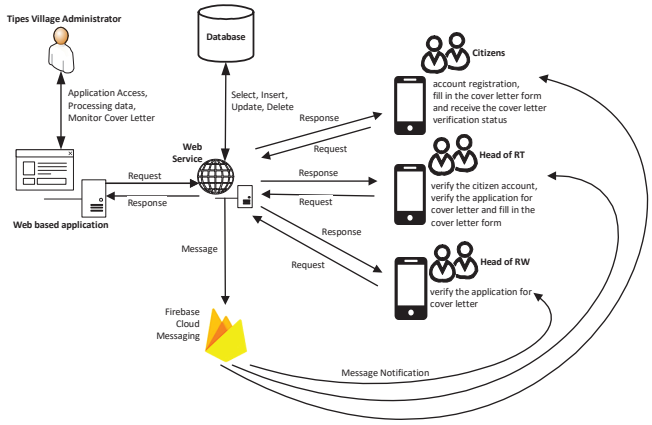

Fig 3. Systems Architecture Modeling

The communication method architecture that the author uses in developing web services is the Representative State Transfer (REST) method. REST is generally run via HTTP (Hypertext Transfer Protocol), involves the process of reading resources through URIs (Universal Resource Identifiers) and provides responses in the form of eXtensible Markup Language (XML) or JavaScript Object Notation (JSON).

Tipes Village administrator uses a web-based application to access web services while residents, head of RT and head of RW use android devices to access web services. Any changes that occur to the database made by the administrator via the web service will be sent to the android device via notification so that the updated information will soon reach the citizens. To support the notification process using a free service from Firebase Cloud Messaging.

E. Compilation of System Portfolios

The system portfolio in Figure 4 illustrates the data integration model of the Tipes Village public service application as a whole.

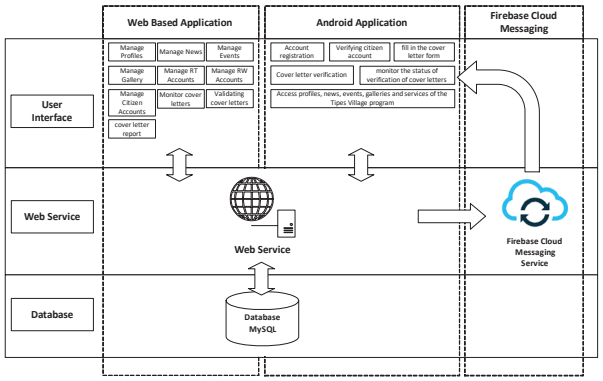

Fig 4. System Portfolio

Based on the design and prototype that the author made following examples of data structures, request and response structures of the web service that was built.

1. Data Structures

```
CREATE TABLE `pengantars` (
 `id` int(8) NOT NULL AUTO_INCREMENT,
 `nik` varchar(100) COLLATE utf8mb4_unicode_ci,
 `nomor` varchar(255) COLLATE utf8mb4_unicode_ci,
 `keperluan` varchar(255) COLLATE utf8mb4_unicode_ci,
 `keterangan` text COLLATE utf8mb4_unicode_ci,
 `acc_rt` int(1) DEFAULT '-1',
 `acc_rt_at` datetime DEFAULT NULL,
 `acc_rw` int(1) DEFAULT '-1',
 `acc_rw_at` datetime DEFAULT NULL,
 `diterima` int(1) DEFAULT '-1',
 `diterima_at` datetime DEFAULT NULL,
 `created_at` datetime DEFAULT NULL,
 `updated_at` datetime DEFAULT NULL,
 `deleted_at` datetime DEFAULT NULL,
 PRIMARY KEY (`id`),
 KEY `nik` (`nik`),
 CONSTRAINT `pengantars_ibfk_1` FOREIGN KEY (`nik`)
  REFERENCES `wargas` (`nik`)
)
```

2. Request Structures

```
{ nik:"value", keperluan:"value", keterangan:"value", acc_rt:"value",
  acc_rt_at: "value", acc_rw:"value", acc_rw_at:"value"}
```

3. Response Structures

```
{ status:boolean, pesan:"message", "data":
  {id:"value", nomor:"value", nik:"value", keperluan:"value",
   keterangan:"value", acc_rt:"value", acc_rt_at:"value",
   acc_rw:"value", acc_rw_at:"value" }
}
```

The author develops Android applications with native programming languages namely Kotlin and AppCompat Library. The use of native programming has good user experience (UX) capabilities and high performance [6]. Following Figure 5 are a display of Tipes Village public service applications that have been made.

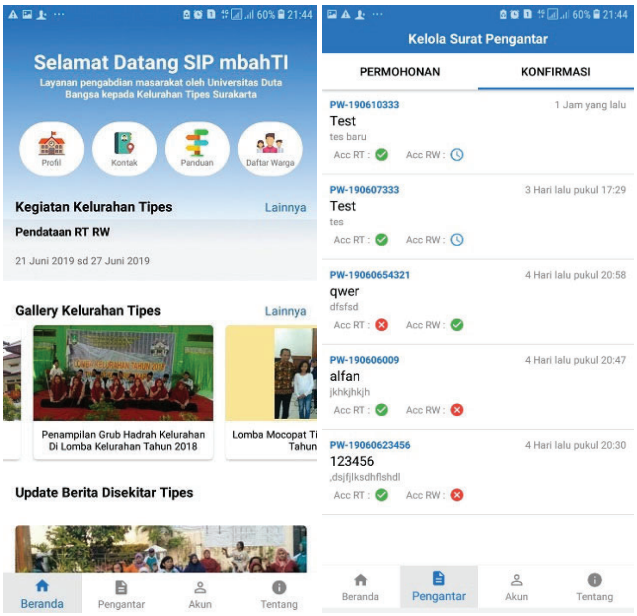

Fig 5. Android Application of Public Services in Tipes Village

The public service application in Tipes Village has been uploaded on Google Play with statistical data as shown in Figure 6.

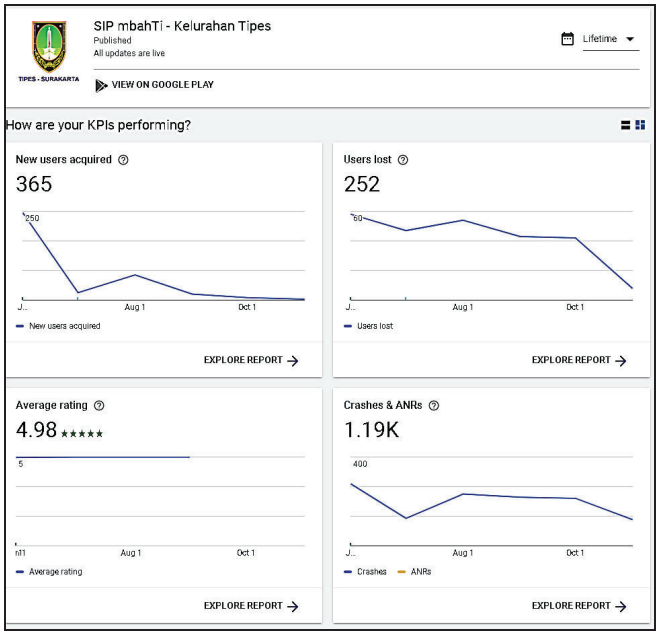

Fig 6. Application Statistics Data on Google Play

IV. CONCLUSION

The first step that the author did was to identify problems related to public services in Tipes Village. The main problem of concern is the information delivered by Tipes Village management to the community is still not fast enough. The identification results are used as a basis for designing and floating applications with the SOA Framework approach. The use of web services and Firebase Cloud Messaging is an alternative in the development of public service applications in Tipes Village, which provides speed of sending information to the Android devices of each citizen.

Based on testing using a prototype it can be concluded that the application is able to provide access to profile information, news, activities, program services, galleries and online cover letter service. However, when the connection is bad or there is no connection the application will fail and close forcefully, the application has not been able to handle the failure of the internet connection. Statistical data obtained from applications that have been uploaded on Google Play is 365 devices have installed and 113 residents gave ratings of applications with an average rating of 4.98.

REFERENCES

[1] Aosgi. "Wujudkan Solo Smart City, Pemkot Siapkan Integrasi Aplikasi ". Surakarta, December 2, 2018. [Online]. Available; https://surakarta.go.id/?p=12070 [Accessed: October 28, 2019]

[2] Bieberstein, et al. “Executing SOA: A Practical Guide for The Service Oriented Architecture”. IBM Press, Indiana. 2008

[3] Juric, M.B., et al. "SOA Approach to Integration". Packt Publishing, Birmingham, B27 6PA, UK. 2007

[4] Kapojos, F, et al. " Implementasi Service-Oriented Architecture dengan Web Service untuk Aplikasi Informasi Akademik ". Manado: Journal of Electrical and Computer Engineering Vol 1, No. 1 2012

[5] Sopingi, Prianto. " Aplikasi Penerimaan Siswa Baru Berbasis Mobile Menggunakan UX Markup dan Web Service (Studi Kasus di SMK Mandala Bhakti Surakarta)". Proceedings of the National Seminar on Information Technology and Business (SENATIB). pp. 131-138, November 4, 2017

[6] William, Jobe, "Paper Native Apps vs. Mobile Web Apps" Stockholm University, Stockholm, Sweden. International Journal of Interactive Mobile Technologies (IJIM) · October 2013.

[7] Yogiswara, et al. "Kinerja Web Service pada Proses Integrasi Data". EECCIS Journal Vol. 1, No. 1, June 2014