MOBILE COMPUTING MODEL TO IMPROVE
E-GOVERNMENT SERVICE IN VILLAGE LEVEL
(Case Study: Sumbermulyo Village Jogoroto District Jombang Regency
East Java Province)

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Abstract. Presidential Instruction No. 3 of 2003 on National Policy and Strategy Development of e-Government is the legal basis and the first step in the implementation of e-Government in all sectors of the public services provided by government agencies throughout Indonesia. Along with the implementation of e-Government in governmental agencies, affecting more easily promote transparency and accountability on access to information and services provided by agencies of the government. Currently the implementation of e-Government is only to the extent of government at the district level and not comprehensive reach village government. In some villages it has been implementing an information system that is specifically used to handle the administration of the village but performed administrative services is still conventional. The process flow of services that the applicant came directly to the local village hall to make the request will service the village administration. Disadvantages of this process is that if the official endorsement letter (village head) is not in place then the applicant will return to the village hall later. It would be very waste time, the applicant and also the service is only valid during office hours only. It also reflects that the services provided are not yet fully effective and qualified. A concept that can be designed to be able to provide solutions to these problems is the e-Government services based mobile computing.

Key-words : *e-government, SOA, mobile computing, REST*

1.   Introduction

Act of Public Service No. 14 of 2008 on Public Information that can be assumed as a technical support will *e-Government* services in order to create good governance in Indonesia. One factor that allows for the implementation of *e-Government* in the field is due to the development of information and communication technology, or known as ICT (*Information Communication Technology*) more rapid and widespread use. It is characterized by increasing complexity of ICT devices developed by various vendors. A device that is quite popular today is the mobile device. The mobile device is virtually owned by the whole society and can accommodate the various needs of users ranging from phone calls, SMS (*Short Message Service*), browsing and other services that require a data package.

Currently the implementation of *e-Government* is only to the extent of government at the district level and not comprehensive reach village government. In some villages it has been implementing an information system that is specifically used to handle the administration of the village but performed administrative services is still conventional. The process flow of services that the applicant came directly to the local village hall to make the request will service the village administration. Disadvantages of this process is that if the official endorsement letter (village head) is not in place then the applicant will return to the village hall later. It would be very waste time, the applicant and also the service is only valid during office hours only. It also reflects that the services provided are not yet fully effective and qualified. A concept that can be designed to be able to provide solutions to these problems is the *e-Government* services based mobile computing. This service will be supported with a web service infrastructure which is the realization of SOA (*Service Oriented Architecture*) to increase effectiveness of *mobile* government services for the public.

2.   Theory
E-Government

According Heeks (1999) E-Government is "*Government activities which use of Information Technology (IT) to provide public services*" [1]. According to Forman (2005) E-Government can be defined as the application of ICT to improve the performance of traditional government functions and services [2]. According to The World Bank Groups provide an explanation that: "*E-Government Refers to the use by government agencies of information technologies (such as Wide*

Area Networks, the Internet and mobile computing) that have the ability to transform relations with citizens, businesses and other arms of government" [3].

Component of E-Government

In the E-Government concept, there are several components that mutually affect one another. The first component is the interaction between the government and the [4]

a.   Community to provide access to public services quickly and easily
b.   Private sector to reduce operational costs by government agencies
c.   Government institutions to reduce operational costs, improve service quality and obtain accurate data in a specific period.

The second component is a focus on improving internal efficiencies will be government institutions.

Category of E-Government

E-Government can be classified into five categories [5]:

a.   Citizen to Government and Government to Citizen (G2C and C2G). Provided services to the public through the Internet or other electronic media which facilitates the exchange of information and communication.
b.   Business to Government and Government to Business (B2G and G2B). The example is auction system and government purchases through electronic media.
c.   Government to Employee (G2E). Job is informed via the internet or other electronic media.
d.   Government to Government (G2G) Provide cooperation and communication with other government agencies.
e.   Non-Profit to Government and Government to Non Profit (N2G & G2N) Cooperation between the public sector and the private sector (non-profit).

In Indonesia category of E-Government has been realized as an example in the table below

Table 1 Indonesian Government Services

E-Government Category	Example Services
Citizen to Government & Government to Citizen (C2G & G2C)	Online tax services url : *https://djponline.pajak.go.id*
Business to Government & Government to Business (B2G & G2B)	Online government auction services url : *https://www.lelangdjkn.kemenku.go.id*
Government to Employee (G2E)	Online job for government employees url : *https://panselnas.menpan.go.id*
Government to Government (G2G)	Online citizen data between Indonesian ministry of internal affair through SIAK (*Sistem Informasi Administrasi Kependudukan*) and Indonesian ministry of religion affair through SIMKAH (*Sistem Informasi Manajemen Nikah*) **Figure1** Screenshoot of SIMKAH Application (Validasi KTP) Indonesian Ministry of Religion Affair
Non Profit to Government & Government to Non Profit (N2G & G2N)	Online KJS (*Kartu Jombang Sehat*) data between Indonesian ministry of Social Service and Hospital in Jombang Regency

Figure2 Screenshoot of KJS (Kartu Jombang Sehat) Application
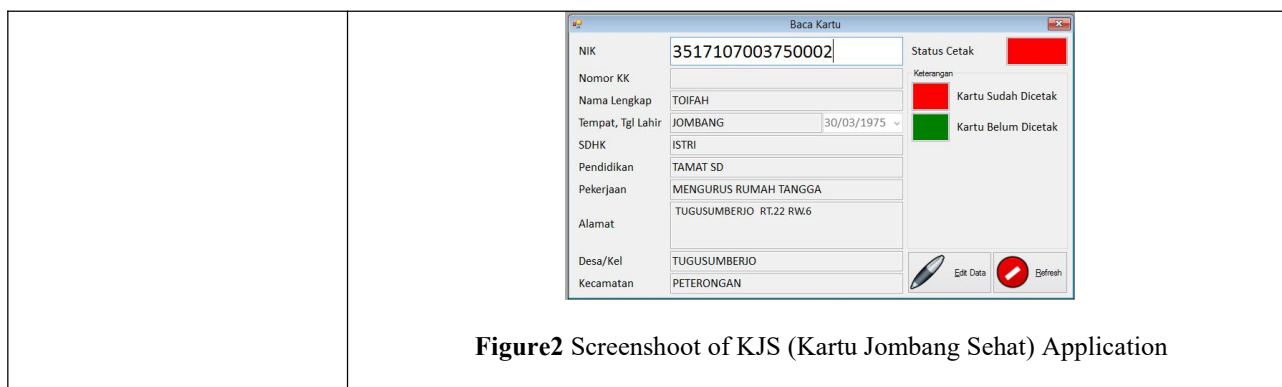
Village Administration

Minister Regulation No. 32 of 2006, the Village Administration is the "*whole process of data recording and information on the implementation of the Government in the village administration books*".

Mobile Computing

Mobile Computing is "*Human computer interaction by the which a computer is expected to be transported during normal usage*" [6]. The term mobile computing illustrates the use of a computational tool that is connected to a centralized information system model with wireless connectivity. Mobile Computing specially constructed based specification (hardware), systems and specific software.

Mobile Government

The application of mobile computing technology in the E-Government service called M-Government. M-Government is a strategy and implementation which involves the use of all types of mobile technology and wireless network, services, applications and equipment to enhance the benefits to all parties involved in the E-Government including citizens, businesses and all government units [7].

SOA

Service Oriented Architecture (SOA) is an approach that makes the application functions as a service which is packaged as a component that can be used repeatedly and independence [8].

SOA Principles

SOA is based on the principle of service orientation. There are: [9]
a.   Service Reusability means that the service can be recycled and redesigned (*reuse*) to improve services.
b.   Service Contract means that a service makes it possible to interact by providing a rule that contains information and forms of handles services.
c.   Service Loose Coupling means that the service doesn't have a dependency on the other services (independent)
d.   Service Abstraction is a principle of service that encapsulate logic that runs in a service.
e.   Service Composability means that services are built can be shaped and rearranged to form of new service.
f.   Service Autonomy means that the service has full control over its logic and if the development is finish, it can be done separately without dependence on the others.
g.   Service statelessness means that the service is not designed for storing information in a particular situation (*data parse*)
h.   Service Discoverability means that the service must be found by the requester.

Web Service

Web service is a method of communication between two electronic tools via the World Wide Web [10]. Web service is built based on the needs and with a particular programming language.

Web Service Component

The main components of web service based on the interaction of several main components [11]. There are:
a.   Service Provider. Service Provider is usually a network address that receives and executes the service request
b.   Service Consumer as service users (clients) who request the service through a URI (*Uniform Resource Identifier*) on the network. Service Consumer can be any application on the end user
c.   Service Registry is a special directory that can be accessed over a network that is used as a storage location for services.

REST

REST (*Representational State Transfer*) is a software application that refers to the architectural model for the implementation of the web service in the form of web standards [12]. REST was designed as a replacement for SOAP (*Simple Object Access Protocol*) that was first used in a web service concept. REST web service server accessible via HTTP Request then processed and returned via HTTP Response in a more diverse in addition to XML (*Extended Markup Language*), JSON (*JavaScript Object Notation*) or HTML (*Hypertext Markup Language*), plain text, media files, etc.

JSON

JSON (*JavaScript Object Notation*) is a light data representation models and data exchange format [13]. JSON format readable by humans, easily accessible by computer and faster than XML [14]. JSON composed by two main components, JSON Object and JSON Array. JSON Object representing the object and JSON Array represents the value/information.
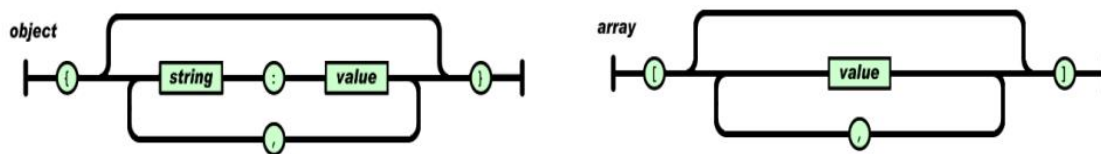

Figure 3. JSON Object Model and JSON Array Model.

3. **Discussion**

Functional System Requirement Analysis

a. Citizen data used for the login process and system identifier on the submission of service requests.
b. Services Administration used as an option for the user to do the service selection. The types of services are:
   1. Pengajuan Kartu Keluarga (KK)
   2. Pengajuan Kartu Tanda Penduduk (KTP)
   3. Surat Keterangan Catatan Kepolisian (SKCK)
   4. Surat Keterangan Domisili
   5. Surat Keterangan Usaha
   6. Surat Keterangan Kelahiran
   7. Surat Keterangan Kematian
   8. Surat Keterangan Kehilangan
   9. Surat Keterangan Miskin
   10. Surat Model N
c. Transaction Services Administration Data used as history data at the same time as a notification to the user.

Non Functional System Requirement Analysis

a. Systems Infrastructure is used to develop e-Government based mobile computing. This infrastructure are client and server. The Client Infrastructure is mobile devices used by users (citizens) to request administrative services. For server, the infrastructure is a PC that specifically used to process the request sent through the entire client infrastructure.
b. Minimum Requirement System is based on the minimum requirement on the client device. The minimum requirement is a smartphone with android operating system Ice Cream Sandwich (API 14). While on the server infrastructure using Apache Web Server 2.2, PHP 5.0 and MySQL 5.5
c. Flow Mechanism of Administrative Services.
   In the conventional services, people come directly to the village hall to apply. The application will be processed in accordance with SOP (*Standard Operating Procedure*). If the official endorsement letter (village head) is in the place, then the administration services can be resolved, but if it is not then the administrative services to be resolved until there is official approval. With this flow models for the people who have much business this is very waste time. Based on the conventional mechanism to increase administrative services quality at the village level, there will be changes in the flow of conventional administrative services through e-government system based on mobile. In the new model of public service, citizen don't need come directly to the village hall but it is appropriate request the service through a mobile device. The administrative service requests can be made at any time and you will be notified if the process has been completed. This new

administration service has several advantages, there are: don't waste time, a request can be made at any time, efficient validation process, etc.

Web Service Phase Analysis

The most common form used to realize the SOA (*Service Oriented Architecture*) Model is a web service. Web Service runs online on server side so it can be accessed by mobile devices anytime and anywhere.

Figure 4 Web Service Phases

Phase in the web service is started from service consumer. The request from service consumer sent to the service provider for processing. The next step is a service provider forward the request to the service registry. At the service registry, request translated and processed for execution.

Web Service Analysis Model on System Infrastructure

Web Service as a realization of SOA built and designed to handle all administrative services. The model is:
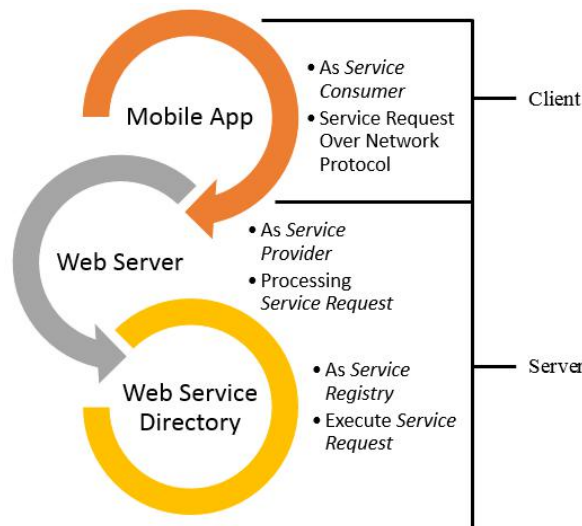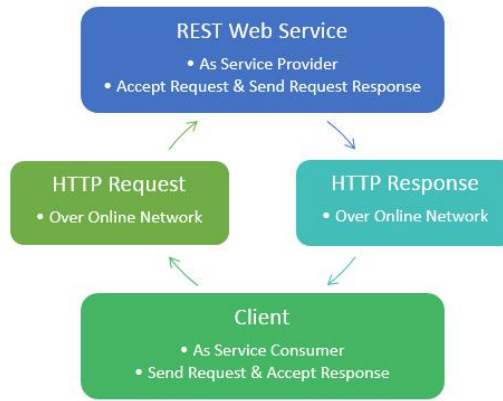

Figure 5. Web Service Model on System Infrastructure

REST Web Service Analysis Model

Web Service used in this research is based on REST. REST components are REST Server and Client. REST Server access through URI and is responsible for providing the path that will be used by the Client for accessing data or resources. Client will use a resource or data through the path provided by REST Server. REST Web Service using HTTP protocol both when accessing the resource or data and transmit the desired resource or data. REST Web Service works is simple. Client will send a request via HTTP Request over network. The request will be responded by the REST Web Service located on the server and the result of request are returned to the client via HTTP Response on the same network.

Figure 6 REST Web Service Model on System Infrastructure

Administration Service Mapping

Mapping service is performed to determine administrative services are to be used in business processes. The service at the business process can be categorized as a logic process with the potential to be encapsulated by the services. The category are

a.   The service doesn't include the manual process and shouldn't be done automatically.
b.   Service is already done by the existing system.

Table 2 Administration Service Mapping

No	Bussiness Process		Service
1	Submission	Kartu Keluarga (KK)	Service KK
2	Cancel		Service Pengelolaan Data Penduduk
3	Submission	Kartu Tanda Penduduk (KTP)	Service KTP
4	Revision		
5	Cancel		Service Pengelolaan Data Penduduk
6	Submission	Surat Keterangan Catatan Kepolisian (SKCK)	Service KTP
7	Revision		Service Pengelolaan Data Penduduk
8	Cancel		Service Data Surat
9	Submission	Surat Keterangan Domisili	Service KD
10	Revision		Service Pengelolaan Data Penduduk
11	Cancel		Service Data Surat
12	Submission	Surat Keterangan Usaha	Service KU
13	Revision		Service Pengelolaan Data Penduduk
14	Cancel		Service Data Surat
15	Submission	Surat Keterangan Kelahiran	Service KL
16	Revision		Service Pengelolaan Data Penduduk
17	Cancel		Service Data Surat
18	Submission	Surat Keterangan Kematian	Service KM
19	Revision		Service Pengelolaan Data Penduduk
20	Cancel		Service Data Surat
21	Submission	Surat Keterangan Kehilangan	Service KH
22	Revision		Service Pengelolaan Data Penduduk
23	Cancel		Service Data Surat
24	Submission	Surat Keterangan Miskin	Service KS
25	Revision		Service Pengelolaan Data Penduduk
26	Cancel		Service Data Surat
27	Submission	Surat Model N	Service N
28	Revision		Service Pengelolaan Data Penduduk
29	Cancel		Service Data Surat
30			Service Notif

Mapping Service on Layer

After mapping service based business processes, the services have been placed in several layers are categorized by characteristic.
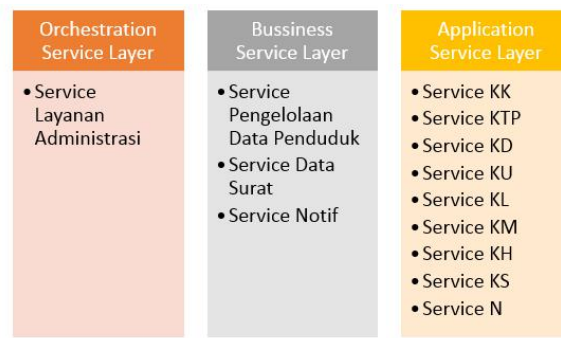

Figure7 Mapping Service based layer service categories

There are 3 layers in the layer service. Service orchestration layer contains a collection of some service that unified a service. Business Service Layer provides services running on the system while the Application Layer Service provides service that directly related to user.

Infrastructure System Analysis Model

Mobile device as Client request the service. REST Web Service located in online service accept the request and processing it. Both the infrastructure associated using the HTTP protocol over online network. HTTP protocol is divided into two type. They are HTTP Request and HTTP Response. HTTP Request is a delivery media from the client to the REST Web Service and HTTP Response is delivery media result from the REST Web Service to the client. With this system the request is processed by REST Web Service doesn't overload the server performance and demand data can be effective.
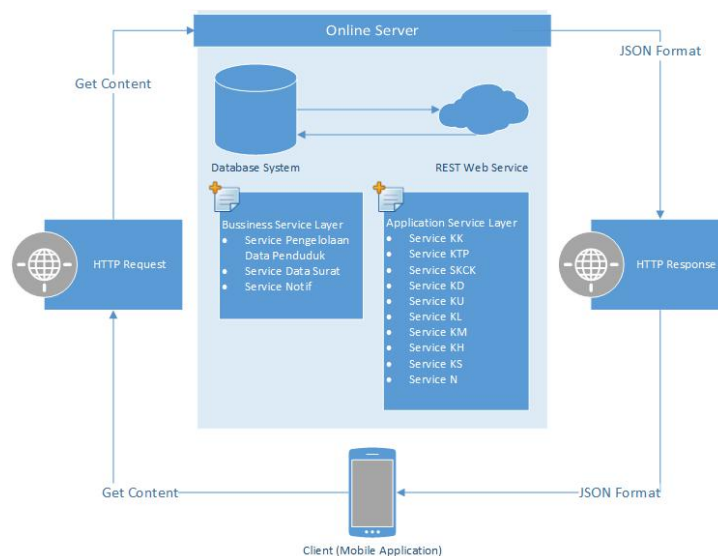
Figure8 REST Web Service Integrated with System Infrastructure

Prototype Mockup Mobile Application

Prototype mockup was built based e-Government mobile which will be used as client side (citizens) as tools to request administrative services. Prototype is automatically connected to the Sumbermulyo village service provider through the online network (internet).

Figure 9 Prototype Mockup e-Government based mobile

Service Testing

Service testing use black box techniques. Black box is a test technique which based on a scenario by insert parameter to a function or method then analyzing the result is expected or not.

Login Scenario (Valid Data)	
Input	NIK : 3517192007810005 Pass : maskur200
Expected	Push ok button then user will directly go to main menu
Observation	Show main menu on mobile application
Conclusion	Accept
Login Scenario (Invalid Data)	
Input	NIK : 3517142906860004 Pass : 12345
Expected	Push ok button then application will show message "*NIK atau Password anda Salah*"
Observation	Application show message "*NIK atau Password anda salah*"
Conclusion	Accept

4.   Conclusion

Starting from the phase of the analysis, design, implementation and testing of mobile computing on administrative services at the village level with the approach of SOA (*Service Oriented Architecture*) can be inferred

a. Administrative services that can be accommodated include Pengajuan Kartu Keluarga (KK), Pengajuan Kartu Tanda Penduduk (KTP), Surat Keterangan Catatan Kepolisian (SKCK), Surat Keterangan Domisili, Surat Keterangan Usaha, Surat Keterangan Kelahiran, Surat Keterangan Kematian, Surat Keterangan Kehilangan, Surat Keterangan Miskin, Surat Model N.

b. Implementation of Model SOA can be realized by the REST Web Service technologies. Some of the benefits are:

   - REST built using standard web technologies. This is making easy to build.
   - Support the format JSON (*JavaScript Object Notation*) is faster than XML (*Extended Markup Language*)

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