WebGIS Role in the Indonesian General Election in 2014

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Key words: Geoinformation/GI, WebGIS, Geospatial, Election

Spatial Information Management (SIM)

SUMMARY

The General Election Commission (KPU) is an institution established by the Government of Indonesia to organize all the process of general elections in Indonesia. KPU WebGIS is a system used to support the success of Indonesia's general election in 2014. This system helps to monitor the distribution of ballot boxes, ballot papers, stamps, forms and other election materials, from central government in Jakarta to provinces and districts in Indonesia, to be forwarded to the polling stations in the villages. With this system it is easier for general users and the General Election Commission to monitor the distribution of logistics quickly and accurately.

SUMMARY

KPU (Komisi Pemilihan Umum) adalah suatu institusi yang didirikan oleh Pemerintah Indonesia untuk melaksanakan proses pemilihan umum di Indonesia. WebGIS KPU adalah sistem yang digunakan untuk mendukung keberhasilan pemilihan umum di Indonesia tahun 2014. Sistem ini membantu untuk memantau distribusi kotak suara, surat suara, stampel, formulir dan bahan pemilu lainnya, mulai dari pemerintah pusat di Jakarta kemudian distribusinya ke provinsi dan kabupaten di Indonesia, untuk diteruskan ke TPS di desa. Dengan sistem ini lebih mudah bagi siapa saja baik pengguna umum dan komisi pemilihan komite untuk memantau distribusi dan logistik cepat dan akurat.

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1. BACKGROUND

A general election is a democratic event in Indonesia which is highly anticipated by all Indonesian people. The democratic event happens once every 5 years, similar to general elections in most other countries. The numbers and names of all political parties that will take part in the upcoming democratic event have been announced on September 7, 2012. KPU announced the list of 46 political parties who have signed up for the 2014 election. Indonesia is a vast country and has many islands, having 34 provinces, 6,793 districts, and 79,075 villages. The polling stations (TPS) will be located in the villages, and there may be more than 1 polling station in a village depending on the population. Therefore we need a system that can easily inform and monitor in real time the distribution of logistics for the elections.

Geographic Information System (GIS) is a system that can be used for capturing, storing, analyzing, and managing data and their associated characteristics, that are spatially take a reference to the earth. Furthermore, this system can be defined as a computer system to integrate, store, share, and display geographic information taking reference. GIS technologies use digital information obtained from digital data generation method. Commonly used method of manufacture is digitization, which is a printed map or survey plan is transferred into digital media in the form of a computer program (Computer aided drafting, CAD) and geo-referencing capabilities. GIS can be used to describe the characteristics of the surface, subsurface, and atmosphere from information points in two or three dimensional views. For example, GIS can make a map isopleth or contour lines that indicate differences in rainfall. GIS can recognize and analyze the spatial relationships that exist between the spatial data stored digitally. The relation of this topology makes spatial modeling and complex analysis can be done. Topological relations that are modeled with GIS topology can include adjacency, containment, and proximity. With this topology modeling we can detect the location of the Election Commission, position of polling stations (TPS), or anything related to logistics and distribution needs of the Commission. In addition, GIS can also be used for cartographic modeling. Cartographic modeling can be defined as a process in which the thematic layer is created, processed, and analyzed, on an area of the same scope. Operations on the map as a result of cartography modeling can then be combined with algorithms to simulate or optimize a model.

A WebGIS application is an application of Geographic Information System (GIS) which can be accessed online via internet. Configuration of a WebGIS includes a server that has functionality as a MapServer which processes a map request from the client and then send the map back to the client. In this case the user/client does not need to have a specific GIS software, just use any internet browsers such as Internet Explorer, Mozilla Firefox, or Google Chrome to access GIS information on the server.

The KPU WebGIS is an application that serves to assist common users as well as the General

Election Commission (KPU) in monitoring the distribution of ballot boxes, ballot papers, ink, forms, and other election materials from the central KPU to the provincial KPU, then to the villages up to the polling stations throughout Indonesia. With this system distribution of logistics for the election can be easily monitored and informed to any authorities including general communities who may need the information.

2. OBJECTIVES

The KPU WebGIS was developed with the following objectives:

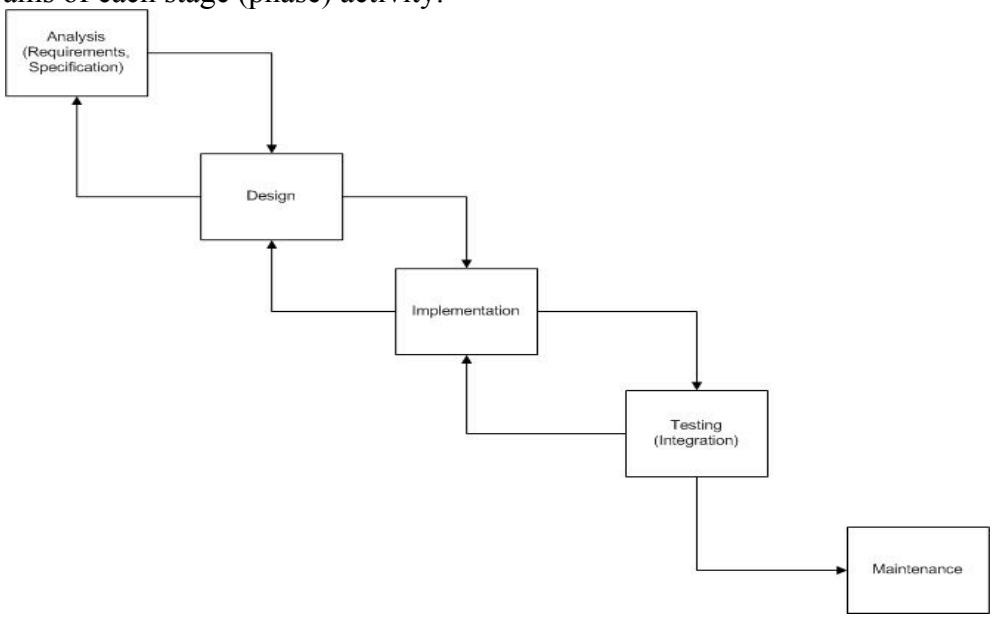
- Internal committee of KPU can easily check and report on specific needs as required.
- Decision makers at KPU can quickly take necessary policies with regards to the distribution of election logistics.
- Disclosure of information to the Indonesian people about condition of logistics distribution.
- Public involvement in providing real time information to the Commission in case there are constraints or logistics has not been delivered to a certain location.

3. SYSTEM DEVELOPMENT

The system was developed based on the waterfall methodology consisting of the following phases:

- Planning Phase
- Requirement Analysis Phase
- Design Phase
- Implementation and Testing Phase
- Usage and Maintenance

Diagrams of each stage (phase) activity.

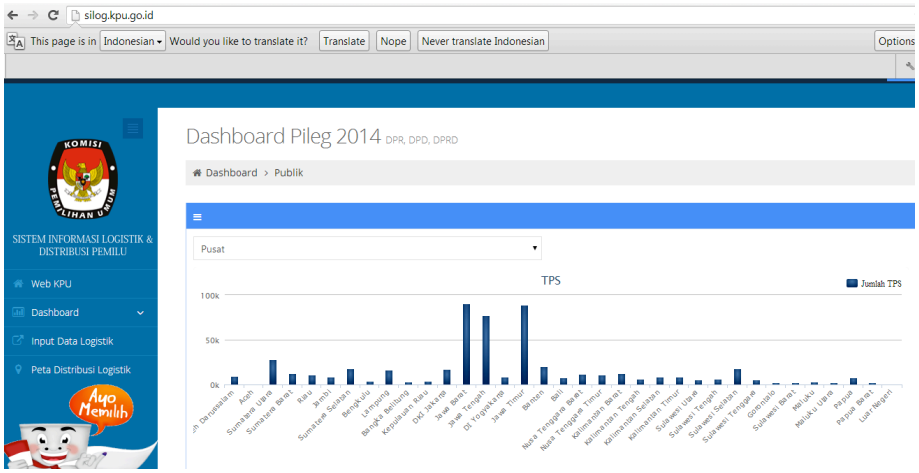


The following table details the expected activities at each stage.

No	Phase	Activities
1	**Analysis**	• Identifying the needs of application users and the ability of existing SILOG system (Logistics Information System) which will be combined with the WebGIS to be developed.
2	**Design** **Conceptual design** **Detailed design**	• Evaluate various design options. • Design enumerating • Design description • Evaluate each design option. • Preparation of design specifications. • Discussion • Presentation to get approval from the project management
3	**Implementation**	• Review detailed • Coding (programming) • Testing, Demo.
4	**Testing and Disemination**	• Presentation to the top level managers of KPU • Training and workshops for middle-level managers and technical team work units who will be the main users of the application.
5	**Support & Maintenance**	• Handle problems and prototype applications. • Answering the question if the lack of clarity on design, standardization and guidelines that have been made.

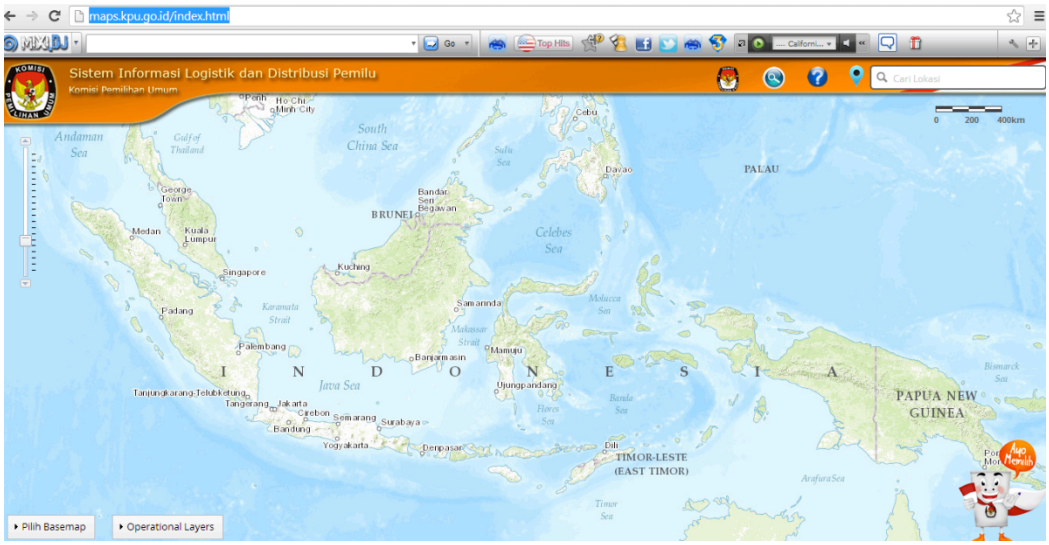
The election logistics monitoring system consists of 3 parts:

1. Logistics information systems (known as SILOG), which is used to enter tabular data and show results of tabular information that has been entered by certain KPU officers. This system was built using PHP programming language with MySQL database, then provides data in the form of service APIs to be consumed by KPU WebGIS. This SILOG can be accessed at http://silog.kpu.go.id/.

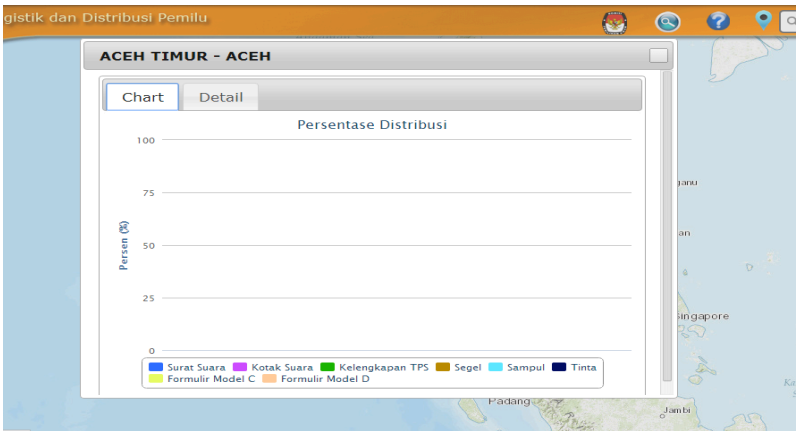


Other than used for entering data, the system can also be used to view the distribution of information in tabular or graph in real time, including information about polling stations (TPS), voting committees, voters, ballots, fingerprint ink, forms, ballot box, and voting booths.

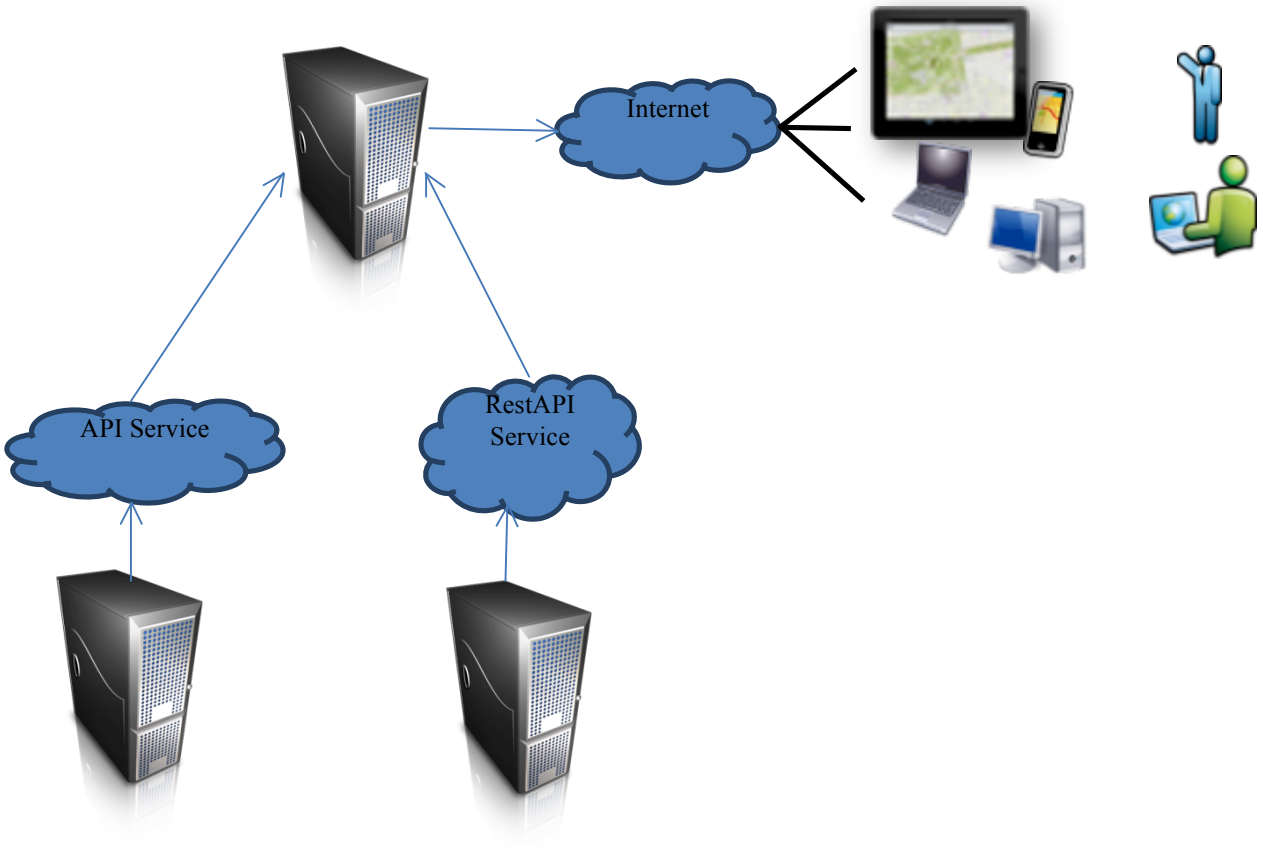
2. Spatial Services (as middleware), which contains spatial information. The data here using Map Service REST APIs, and publishing services using ArcGIS Server 10.1. The services can be accessed at the address http://geoservices.ina-sdi.or.id/ArcGIS/rest/services/KPU/KPU_WilayahAdministrasi/MapServer
3. WebGIS, which is a system that consumes spatial services above, then performed in a join query services for the region code on the base of each region. The KPU WebGIS can be accessed at the address: http://maps.kpu.go.id/index.html.



Screenshot analysis



Business illustration of the overall process of this system :



The KPU WebGIS has the following functionalities:

1. Basic functions, including
   - Selection of basemaps
   - Zoom in and zoom out
   - Show information of the selected objects on the map
   - Scale
2. Specific functions
   - Display operational layers

- Display data and location of KPU offices (points)
- Search information by regions and report the results in forms of graphs, pie charts, and tabular data
- More detailed information for authorized KPU internal users

3. Single sign-on, when an authoriThe KPU WebGIS is synchronised with the SILOG system at http://silog-data.kpu.go.id/

This system can be accessed by http protocol with any web browser, either through gadgets, PC or laptop as long as there is internet connectivity. With this system, users can view general information and geographical position of the Commission and the Election Commission office. Users can also see information such as total number of voters, election committee, population, election regions (Dapil), parliament seats, polling stations (TPS) in each area to provincial and district levels. KPU internal committee can see more detailed information up to the village level and some additional information.

Using this system, public users can also view information in geospatial all logistic distribution of the data in realtime, so the wider community can easily find out where to position the logistics are being brought it in real time, from here the user can see which information that has met the needs of Regional logistical and which ones have not. Everything presented is actual and can be easily accessed.

4. FEATURES OF KPU WEBGIS

A webGIS application currently becomes more commonly utilised because it has several advantages as follows:

- Users can reach the whole world wide, with a fairly low cost.
- Users do not need special software, just use the internet browser such as Internet Explorer, Mozilla Fire Fox, Google Chrome and others.
- Could present an interactive map in the similar manner as when using a desktop GIS software.
- Independent of the operating system so that it can be operated on all computers with different operating systems.
- Does not require special software and tools in operation because basically all you need is a browser which can be obtained free of charge.
- Having the ability equivalent operation with a user interface that was developed with web-based.
- System is online, so can be accessed by all users who have access to the internet.

5. FUTURE DEVELOPMENT USING GPS TRACKING TECHNOLOGY

The KPU WebGIS is prepared to be further developed by implementing GPS tracking functionality. GPS tracking technology is now more commonly used by various companies, not only to monitor current positions of their assets, but also to embed additional features necessary for management of the companies. For example vehicles are equipped with GPS tracking for security such that when stolen it will be easy to find. GPS tracking technology has also been developed to meet consumer needs analysis. Its development started from the GPS tracker tool features to application tracking supporters.

There are two kinds of GPS tracking. The first one is called manual tracking, which will send coordinate information if there is a request such as short messages or calls. The second one, which may be further implemented in the KPU WebGIS, is called an AVL (Automatic Vehicle Location) GPS tracking, which automatically sends data and coordinates of the vehicle continuously on a specified time. Type of data to be sent may include: point coordinate, time, directional indication, machine on /off, speed, odometer and then the application can process the data, combine with road name and put the vehicle icon on the map.

Due to the various terrain and contours of Indonesia, such as mountains, valleys, seas, etc. there is a possibility of delays in logistics delivery to the destination area. The GPS tracking system cen help KPU monitor the position of logistics in real time, thus can find out causes of the delays.

6. CONCLUSION

A WebGIS is an application of Geographic Information System (GIS) which can be accessed online via internet. There are a lot of software (commercial and Open Source) that can be used to build WebGIS applications such as ESRI ArcGIS Server, Demis, GeoMedia WebMap, MapInfo MapXtreme, SGeo Live 5.0, SAGA GIS, MS4W (MapServer For Windows), PostgreSQL, MapGuide Open Source, ALOV, GeoServer, Mapbender, and OpenLayer.

The KPU WebGIS was developed in order to facilitate data search and information of logistics distribution used for General Election in Indonesia. The WebGIS will also be used to update the logistics and general election data. With the use of this WebGIS, KPU will have an up-to-date information that is well structured, accurate, easy to understand even by general public, in the form of graphs and maps.

By using this WebGIS application, worldwide users can get information on the distribution of logistics used for election in a fairly low cost. The users do not need special software to run this application, just use the regular internet browsers such as Internet Explorer, Mozilla Firefox, Google Chrome and others. This WebGIS can present an interactive map in a similar manner as when using a desktop GIS software, and is independent of the operating system so that it can be operated on all computers with different operating systems.

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BIOGRAPHICAL NOTES

Benni Purwonegoro is completed his studies at Gadjah Mada University and received a Computer Science Degree 8 years ago. He worked as an engineer in an IT consultant company from 2006 to 2010, then in 2010 started working at the Geospatial Information Agency with specialization in WebGIS application. Some systems that have been developed, among others, is "Palapa", which is a system used for collaboration and sharing of geospatial data among various institutions. This system has been applied in a lot of areas in local governments throughout Indonesia.

Rizka Windiastuti is the Division Head of Geospatial Information Dissemination in Geospatial Information Agency. She received her Bachelor Degree in Computer Science from North Carolina State University, USA, in 1996, and her Master of Information Technology from University of Newcastle, Australia, in 2003. She is also a researcher in spatial information system and has developed several database and interactive multimedia applications.

Other than developing a system for the General Election Commission, the authors are now also developing a mobile-based system for topography and mobile tagging requirements for tagging boundaries by using special algorithms for offline and online to connect to the CORS system, so that the accuracy is less than 1 meter. In the future the authors will continue to develop and conduct researches related to both web-based GIS system and mobile GIS in Indonesia, so that the geospatial information can be more utilized and by Indonesian people.

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