Analysis of dissemination methods for remote sensing information in maritime field to support the local government

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Abstract. The demand for remote sensing imagery data has been increasing in recent years in Remote Sensing Technology and Data Center LAPAN, especially the utilization of such data for the maritime field. Data request is recorded increasing trend from 808 scenes in 2015 to become 6773 scenes in 2016. Therefore, Remote Sensing Technology and Data Center should improve its services so that information provided to users could be delivered as fast as possible. The objective of this research was to find the best alternatives dissemination from the current method of data distribution and remote sensing information in terms of speed, scalability, functionality and data maintenance in order to support government program on maritime sectors. Alternative to be examined was based on Web-GIS which means that access to data and remote sensing information could be done online through internet. The used of Web-GIS in this study due to the utilization of the internet already prevalent in the present day. Through this method, users could have obtained data and information from anywhere and anytime. As an example, this paper uses mangrove distribution data in Banten as remote sensing data provided. Results are easily obtained mangrove information; the government can overcome the problems that has emerged as the reduced area of mangrove forest which resulted in causing chain actions such as floods and other disasters. Using Web-GIS can be an effective means of dissemination to speed up service.

1. Introduction

The demand for remote sensing imagery data has been increasing in recent years in Remote Sensing Technology and Data Center, especially the utilization of such data for the maritime field. Data request is recorded increasing trend from 808 scenes in 2015 to become 6773 scenes in 2016. Therefore, Remote Sensing Technology and Data Center should improve its services so that information provided to users can be delivered quickly. Existing condition, when users request remote sensing data and information, they should come to the office to obtain the data and information. Depend on how big the data, if the data size is not big, it can be send through email otherwise copied to other media. This dissemination method takes much time on the operational purpose, so the operational needs some improvement on the dissemination of data and information.

Geographic Information Systems (GIS) are tools for acquiring, managing, analyzing, and presenting spatially related information [1]. GIS convert diverse data into easy-to-read and easy-to-access maps and information [2]. In addition, the advantages of the world wide web are numerous, the two primaries being time and spatial independences. Distributing data over the Internet is more efficient than transmitting data through disks. Both Internet and GIS changed the processes of accessing, sharing, disseminating and analyzing data. Technology to share GIS data, such as Web GIS, Open GIS and

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distributed GIS on the Internet is rapidly progressing [3]. Spatial data can be processed through Web Map Servers and Web Servers (Figure 1). The difference between these two servers is only on the platform to be used by the client. The client can access the spatial data through the Desktop Application or Web Application. If the client uses the Desktop Application, then the Web Map Server is used. And if using a Web Application, then the Web Server that serves to provide the service. They provide a standard-based solution for serving digital maps, using predefined image tiles [6].

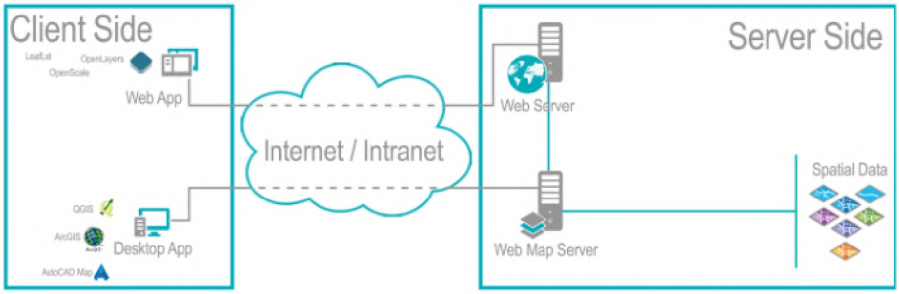

Figure 1. Server and client-side model standard

The objective of this research was to find the best alternatives dissemination from the current method of data distribution and remote sensing information in terms of speed, scalability, functionality and data maintenance in order to support government program on maritime sectors. Alternative to be examined was based on Web-GIS which means that access to data and remote sensing information could be done online through internet. The used of Web-GIS in this study due to the utilization of the internet already prevalent in the present day. Through this method, users could have obtained data and information from anywhere and anytime. As an example, this research use mangrove distribution data in Banten as remote sensing information provided. The results showed mangrove information easily to obtained, and the government could overcome the problems that has emerged as the reduced area of mangrove forest which resulted in causing chain actions such as floods and other disasters.

2. Methods

The development of this application, a WMS is needed that can serve imagery in a variety of coordinate systems, particularly WGS:84 latitude, longitude, and north as well as south polar stereographic. Other coordinate systems would be required in future development. Low latency is an important requirement to support interactive browsing of images on a draggable, zoomable dynamic map component [4]. This study was used Geoserver as a data publisher and remote sensing image information, loading and rendering of maps takes much longer compared to professional mapping services. It was the Java 2 Platform, Enterprise Edition (J2EE) realization of Open GIS Web server [7]. It is an open source platform that supports the OGC standards like Web Map Service (WMS), Web Coverage Service (WCS), Web Feature Service (WFS) and Web Feature Service Transactional protocols. It can work with a large range of data formats like Shapefile, ArcSDE, Oracle Spatial, PostGIS and other spatial formats. It has fully-featured Web administration interface [8]. This can be a result of limitation on powerful hardware or insufficient knowledge in efficient caching techniques, because those standard installations are normally not optimized [5].

There were two sides of activity: user and LAPAN activities (Figure 2). The user requests data or information through the data request mechanism. After the data was requested based on the desired area and level of data, LAPAN attempted to search and prepare according to the area and uploaded to Geoserver. In the Geoserver filter settings, styles and topology according to the method of cartography. System was processed to render the raster and vector data, and converted to image format, for example PNG, JPEG, GIF depends on user preferable. Three types of map service in this system were WCS, WMS, and WFS. This map service was depended on the form of data desired by the user. For example, if user need data only for layer base for digitization, then WMS was chosen. Users who test this system

are from college students (2 users/clients) and Banten local government (1 user/client). They just need to set up internet connection, Laptop / PC and Quantum GIS as GIS Desktop software.

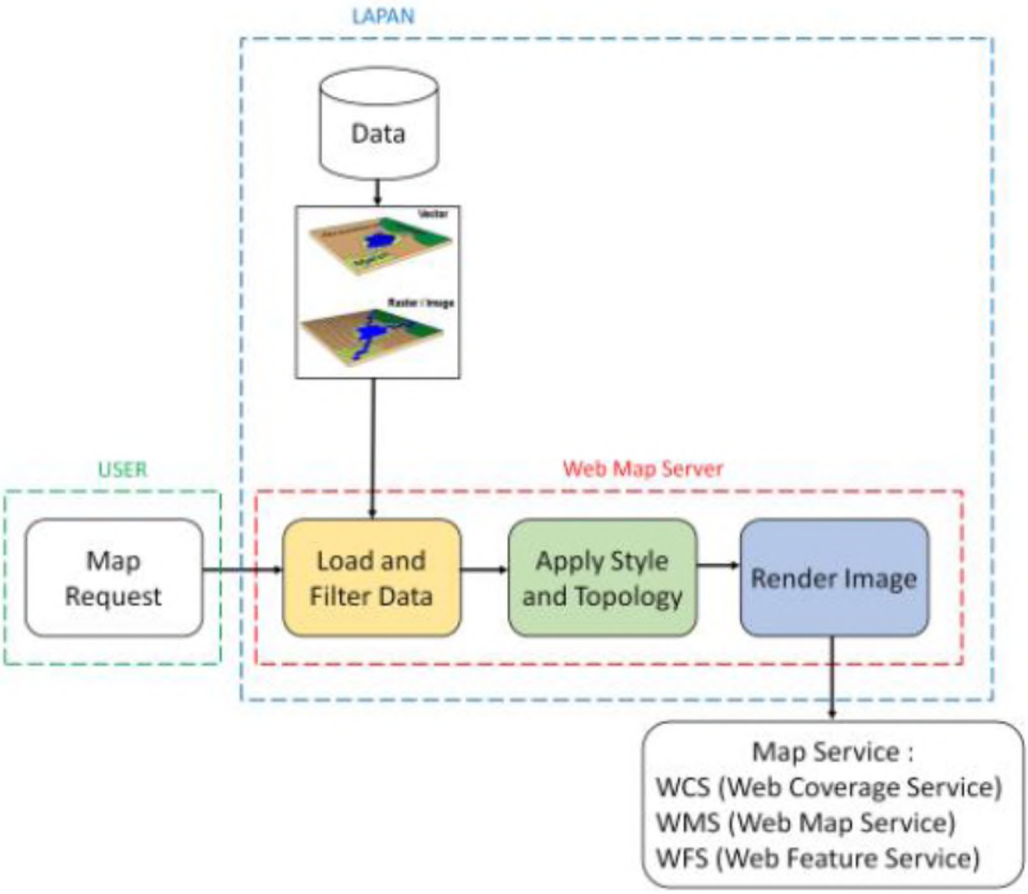

Figure 2. Server and client-side design model

3. Results and Discussion

3.1. Existing condition

Measurement of public satisfaction index on public service in Remote Sensing Technology and Data Center contains 8 elements of questions. That element should be finished when the user received of the data and information. Focus of the element of question to be used in this study such as certainty of service schedule, namely the implementation of service time, in accordance with the stipulated provisions; and the quality and appropriateness of remote sensing satellite data established by Technology Center and Remote Sensing Data. According to user satisfaction, the results was indicated less satisfy (i.e. B option) (Table 1). This condition need to be improve in order to satisfy the users.

Table 1. Public satisfaction index on public service in 2016 and 2017

2016		**2017**	
Certainty of service schedule	*The quality and appropriateness of remote sensing satellite data*	*Certainty of service schedule*	*The quality and appropriateness of remote sensing satellite data*

Choice of answers	*Amount*	*Choice of answers*	*Amount*	*Choice of answers*	*Amount*	*Choice of answers*	*Amount*
A. Not on time	0	A. Not qualified	0	A. Not on time	0	A. Not qualified	0
B. Sometimes on time	2	B. Less qualified	1	B. Sometimes on time	10	B. Less qualified	1
C. On time	45	C. Qualified	44	C. On time	50	C. Qualified	65
D. Always on time	41	D. Highly qualified	43	D. Always on time	56	D. Highly qualified	50

Table 2. Service Speed Average on public service in 2015, 2016 and 2017

Year	Service Speed Average (days)
2017	10
2016	16
2015	17

Table 1 shows that there was some user answered option B on both elements. Users still complain about the service in terms of time and quality of data received. On the other hand, service speed was still more than 2 days. This condition need to be fix and find the best solution. Table 2 shows that average of service speed from 2015 to 2017 was improved. Significant changes occur in 2017, decreasing from 16 days to 10 days, however this need to be improve as much as possible in 2018. Because of this condition, Remote Sensing Technology and Data Center need to improve the services. Improvements focused on speed of service and data quality of remote sensing.

3.2. System development

We tested this service on college student and local government users. The users were requested the data of Banten area. We were used WMS for this system, which the users could access it using the Quantum GIS without having to go back to LAPAN to retrieve the data. At first, we choose the data of Banten and upload to Geoserver. After that, we create WMS link and gave it to users and ask them to open it on Quantum GIS (Figure 3), and the raster data could open normally (Figure 4 and 5). Quantum GIS provides features like map navigation, attribute table, vector symbolization, predefined point symbols, labelling of vector features by attribute, map editing, on-the-fly projection for vector layers, print composer, raster pyramids, spatial index, etc [9]. We ask to try to do some on the fly process like delineation. The result, with the internet connection under 2 Mbps, the image data access is less than 10 seconds and they can use very well. They can do delineation by overlaying the satellite imagery data provided.

The result can improve measurement of public satisfaction index especially element certainty of service schedule and the quality and appropriateness of remote sensing satellite data (Table 1) because if the data is ready, we can provide and publish directly without any waiting time. And also, for Table 2 can accelerate service time up to 50%.

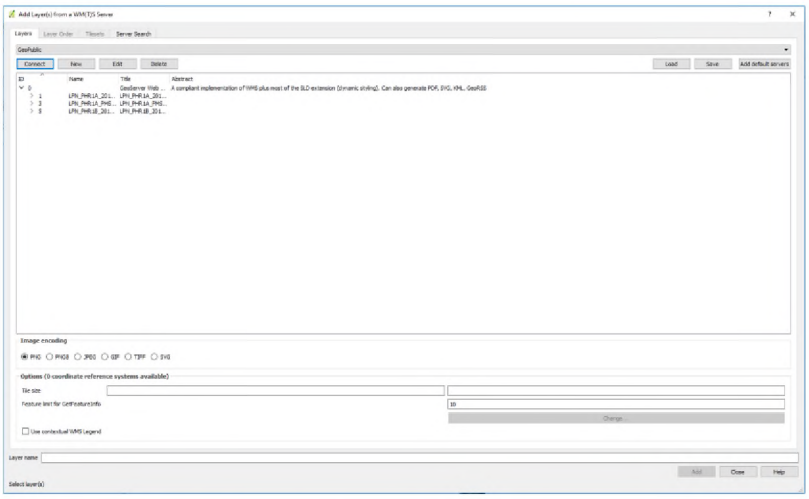

Figure 3. Connect to our WMS on QGIS (Banten data)

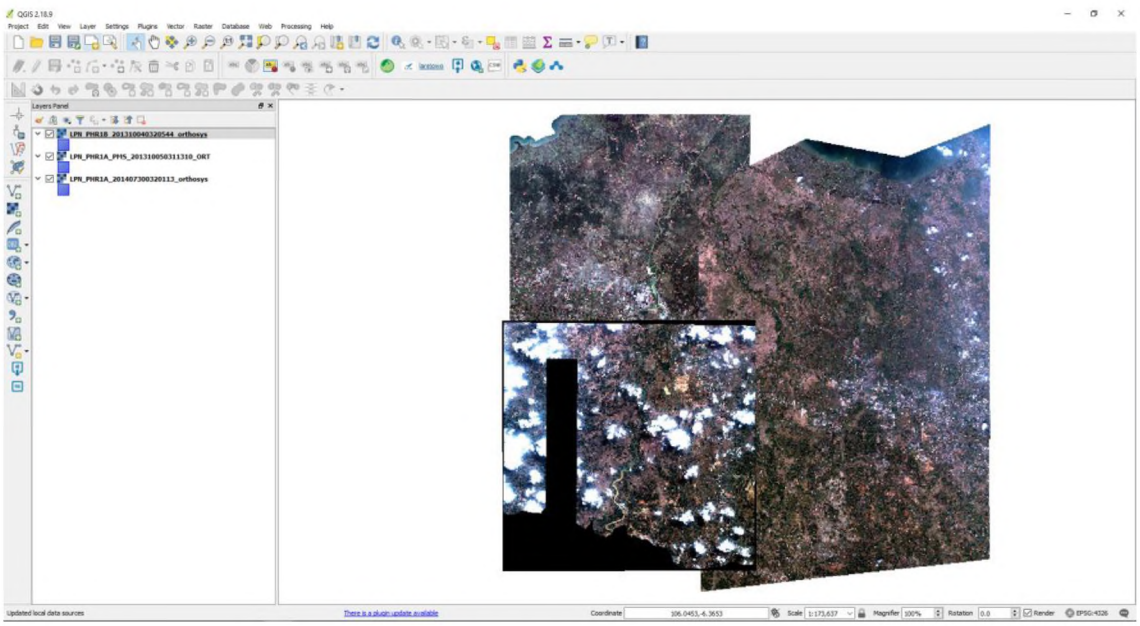

Figure 4. Open data results using WMS (Banten data)

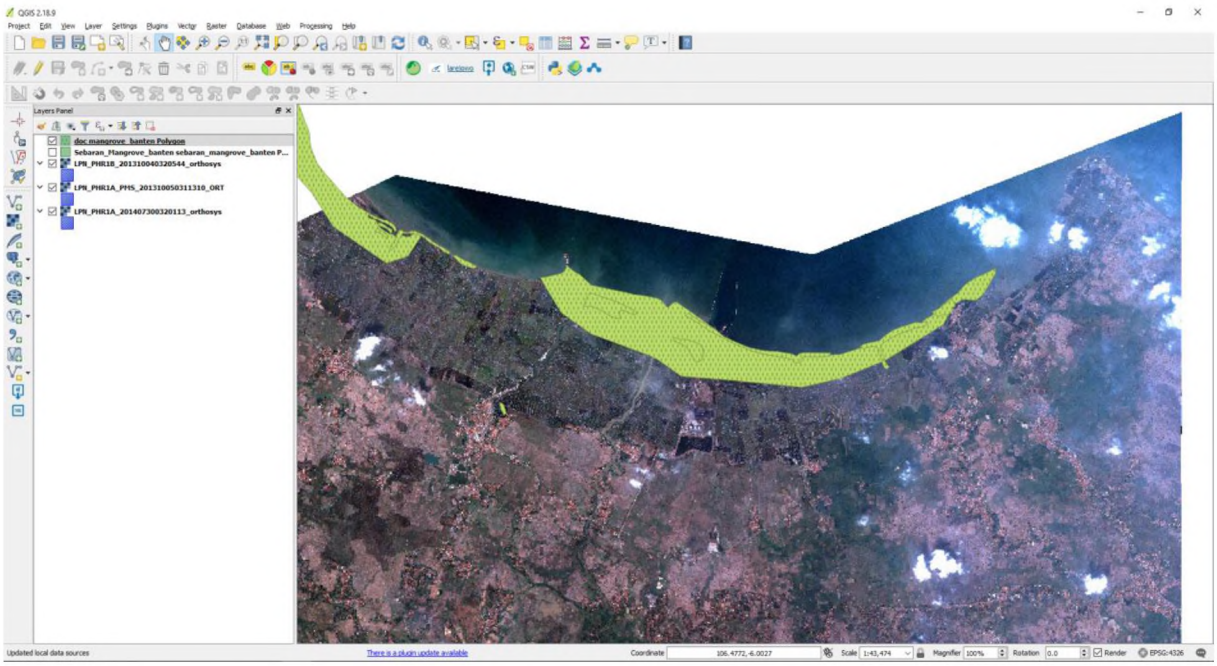

Figure 5. Open Mangrove data results using WMS (Banten data)

4. Conclusion

Utilization of Web-GIS could be an effective way of dissemination to speed up service because it has advantages such as (1) reduce lead times; (2) improve cross-collaboration; (3) low cost barrier to entry; (4) connect multiple structured data source; (5) support real-time spatial analysis; (6) access web maps from any device remotely; and (7) publish and share multi-layer features and points on a single web map. Web-GIS can solve the problems faced like speed of service, A definite schedule of when data is ready to take and data quality in accordance with applicable standards.

Acknowledgments

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