



A Comparative Performance Analysis on GIS based Web Development using Geoserver versus without using Geoserver

Sushil Chandra¹; Udai Raj²; Rajeev Sonkar³; Ujjwal Yadav⁴; Pragati Srivastava⁵; Rishikesh Gond⁶

¹Scientist-SF, Head, CIP & DM, Remote Sensing Application Centre, Uttar Pradesh, Lucknow,
sushil.chandra@rsacup.org.in

²Scientist-SE, CIP & DM, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, udairaj.7765@gov.in

³Project scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, errajeevsonkar@gmail.com

⁴Ex.Project Scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, ujjwal.yadav096@gmail.com

⁵Project Scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, sripragati103@gmail.com

⁶Project Scientist, Remote Sensing Application Centre, Uttar Pradesh, Lucknow, rgond1991@gmail.com

DOI: 10.47760/ijcsma.2022.v10i04.001

Abstract:

The main objective of this paper is to use of open source geospatial and software development technologies. Technologies emerging day by day, Internet make this possible, to connect across the world from one point and collect information of whole world. We can also collect data of earth through satellite imagery. GIS played a vital role in development, it make data visualize, store, analyze and helps in making of maps. It is able to analyses past data and present data based on that make future predictions. Now a day, All the data is collected with its geographical extents, this data is prepared as Geo-spatial data, it can be easily show on maps. The portal developed based on GIS makes better experience and interactive for users. We can easily make planning and other decision making.

Keywords: GeoServer, PostgreSQL, API, GeoJSON, Open Layers

Introduction:

The motive of this paper is to introduce ways of development of GIS based Web Application using Open- Source technology. This software is able to store, analyze, process and visualize the spatial data. We are developing a web portal for Uttar Pradesh, the data is shape file of Village boundary is used. Our challenge is to access the map layers how much easily and fast in Web Pages as services. For that, we use GeoServer as an intermediate application between Web Portal and the database. In the second way we develop web application without using GeoServer, for this we access data directly from the database.

Study Area: We have used Village boundary of Uttar Pradesh in this paper. Uttar Pradesh is the state of country India. There are 107768 villages in Uttar Pradesh.

Geographical extent of Uttar Pradesh is 23°52'N and 31°28'N latitudes and 77°3'E and 84°39'E longitudes.





Tools and Methodology

i. Tools used in Development

Geoserver: It is an open-source, platform independent software. Development of Geoserver is done using Java. In this study, we are using Geoserver version 2.19.1. It is used as middle ware in GIS based web development and we can access data from Geoserver as Web Map Services, Web Feature Services, Web Coverage Services. We can also modify, delete Geospatial data. We can directly publish shapefile from folder or access data from database. In this paper we are using PostgreSQL database.

Postgresql: It is also an open-source software. It is a Relational database. We can store, create, modify, delete data in this database. It supports tabular data as well as Spatial data and also able to import many formats of spatial data like sshapefile, geoJson, .csv files. It is also rich in spatial data type GEOM, for this an extension need to be installed.

PostGIS: It is an extension of PostgreSQL. It supports spatial data types and many spatial queries.

For enabling postgis extension in query tool.

Type: Create PostGIS EXTENSION;

PostGIS Bundle: It is used to import shapefiles into postgresql Database.

JSP: JSP stands for Java Server Pages. It used to develop dynamic web applications, used for server side. JSP is parsed on web-server and this web-server generates HTML which is run on clients browser

Tomcat: It is a web-server created using Java. It is used to run Java Server Pages and to host Web Applications.

GeoJSON: It is like JSON data used to store spatial data. GeoJson comes under vector type data.

Open Layers: It is javascript library used for web mapping applications. It is able to display dynamic maps on GIS based web pages. Open layer is also support both types of data: Vector as well as Raster data on web pages.

ii. Methodology

For this paper, we are using Village shapefile of Uttar Pradesh, imported into database.

Open layer helps to display maps on web pages in two ways:

- a. **Using Geoserver:** Geoserver access spatial data from postgresQL database and provides WMS and WFS layers as web services, Openlayers displays these services on web pages as Tiled and non-tiled layer. Geoserver acts as middleware between web server and the database.



Architecture of GIS based web development using Geoserver:



Fig:A is showing output.

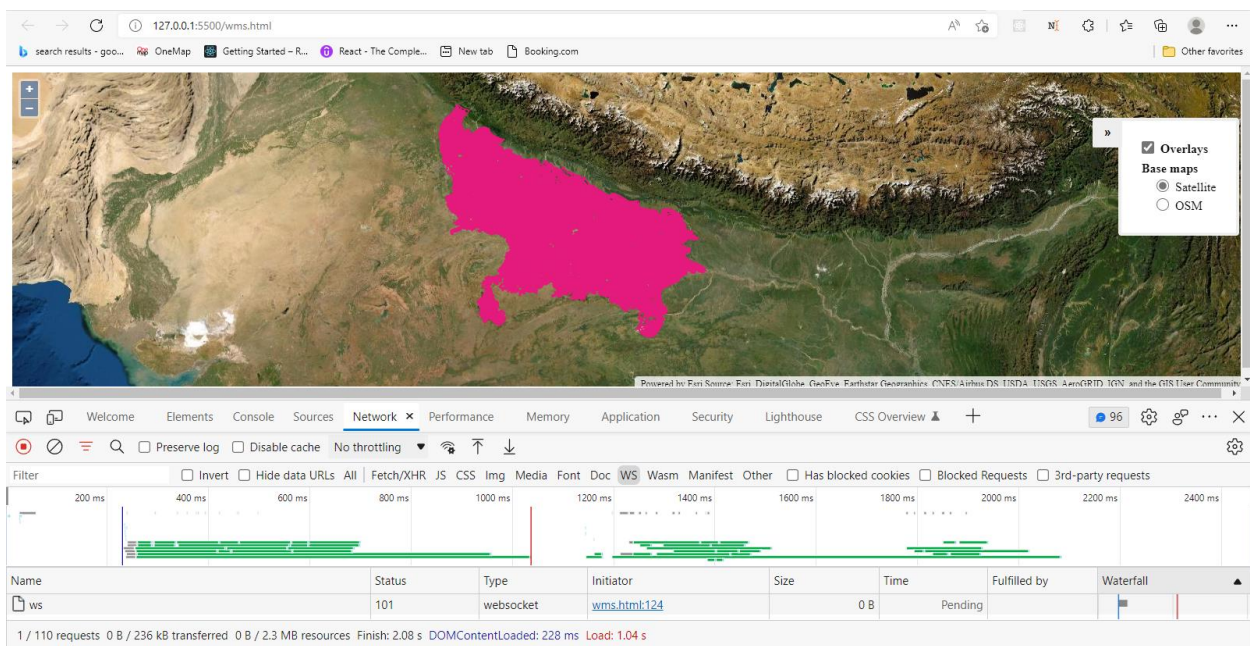


Fig: A

- b. Without Using Geoserver:** We can also displays maps on web pages without using geoserver. For this, Create a JSP files, it interacts with database to access spatial data in GeoJSON format. Then open layer display this GeoJSON data on web page.



Architecture of GIS based web development without using Geoserver:

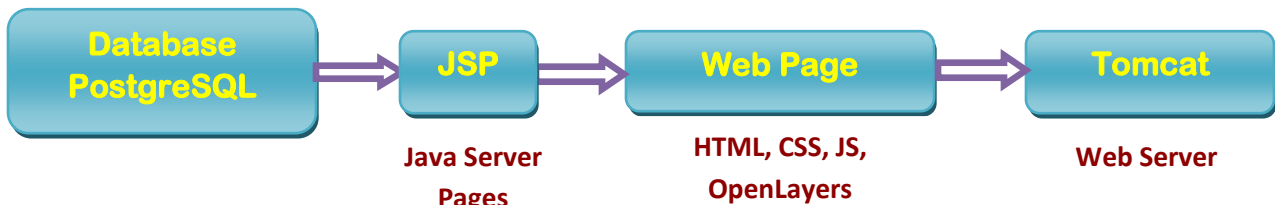


Fig: B is showing output.

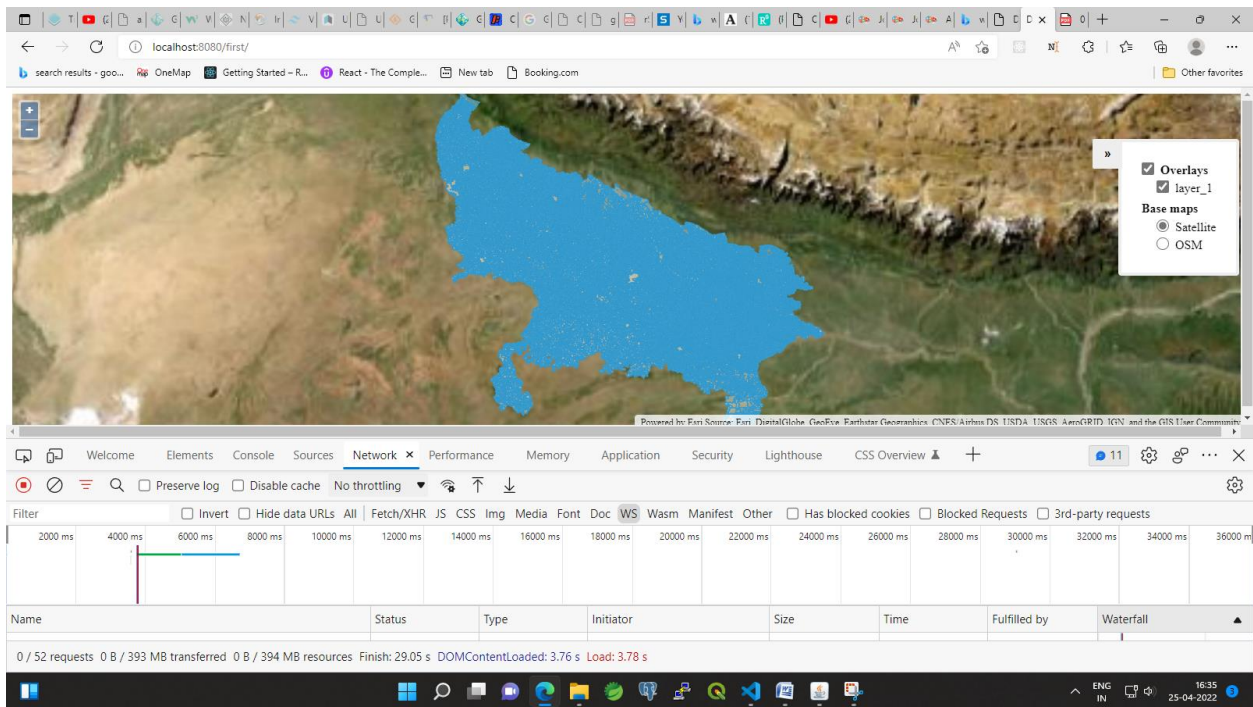


Fig :B





Outcomes:

GIS based Web development using Geoserver – It takes less time to display layer on web pages. DOM Content Loaded in 228 ms and finish whole process in 2.08 s as shown in figure A.

GIS based Web development without using Geoserver- It takes more time as compare to first method. DOM Content Loaded in 3.76 s and finish in 40.15 s as shown in figure B.

Conclusion: In the end, we get, light-weight data can directly access from database and display on the map but if data is heavy; it takes much time in accessing directly. For reducing this problem, we get Geoserver as intermediate between Database and the web-portal. Using geoserver, accessing of data as a services on the web page is fast. It makes better experience to user.

References

- [1]. Carver, S., Evans, A., Kingston, R., & Turton, I. (2005). Virtual Slaithwaite: A Web Based Public Participation 'Planning for Real'® System. Retrieved 06 24, 2013, from School of Geography: <http://www.geog.leeds.ac.uk/papers/99-8/#1>
- [2]. EPSG. (2012). Geomatics Guidance Note number 7, part 1. OGP Publication. Geoserver. (u.d.). Geoserver User Manual. Hämtat från <http://docs.geoserver.org/latest/en/user/> den 24 06 2013
- Hazzard, E. (2011). OpenLayers 2.10 .
- [3]. Hazzard, P. (2002). Web Map Service Implementation Specification. Hämtat från http://portal.opengeospatial.org/files/?artifact_id=1081&version=1&format=pdf den 24 06 2013
- [4]. Mitchell, T. (2005). Web Mapping Illustrated. Sebastopol, CA, USA: Oreilly & Associates Inc.
- [5]. Montagna. (2005). A Framework for the Assessment and Analysis of Electronic Government Proposals. *Electronic Commerce Research and Applications*, 4(3), 204-219.
- [6]. Nivala, A. M., Brewster, S., & L, T. (2008). Usability Evaluation of Web Mapping Sites. *The Cartographic Journal*, 129-138
- [7]. Schütze, E. (2007). Thesis - Smart Map rowsing. Hämtat från http://www.smartmapbrowsing.org/html/index_en_9.html#webmapping_tiling den 24 06 2013
- [8]. W3Schools. (u.d.). HTML Tutorial. Hämtat från W3Schools: <http://www.w3schools.com/html/default.asp> den 24 06 2013
- [9]. Beaujardiere,J., 2004. OGC web map service interface [online], version 1.3.0, OGC 03-109r1. Available from: http://portal.opengeospatial.org/files /index.php?artifact_id=4756 & passcode=b9mnkb 6rr7uc1hs1t1ue [Accessed 6 September 2009].





(An Open Accessible, Fully Refereed and Peer Reviewed Journal)

- [10].Chaowei (Phil) Yang Corresponding author , David W. Wong , Ruixin Yang , Menas Kafatos & Qi Li (2005) Performance-improving techniques in web- based GIS, International Journal of Geographical Information Science, 19:3, 319-342, DOI: 10.1080/13658810412331280202
- [11].Daniel Caldeweyher, Jinglan Zhang & Binh Pham (2006), OpenCIS—Open Source GIS-based web community information system, International Journal of Geographical Information Science, 20:8, 885-898, DOI: 10.1080/13658810600711378
- [12].Erik Hazzard, (2011). OpenLayers 2.10 Beginner’s Guide, First Edition. ISBN: 978-1-849514-12-5.
- [13].Harish Chandra Karnatak , Reedhi Shukla , Vinod Kumar Sharma , Y.V.S. Murthy & V. Bhanumurthy (2012) Spatial mashup technology and real time data integration in geo-web application using open source GIS – a case study for disaster management, Geocarto International, 27:6, 499-514, DOI: 10.1080/10106049.2011.650651
- [14].Herbert Schildt (2005). Java- A Beginners Guide. Third Edition. DOI: 10.1036/0071466509 7.
- [15].James Goodwill, (2002). Apache Jakarta-Tomcat. ISBN: 1-893115-36-4

