The design and realization of function in Yunnan provincial Geographic information common service platform

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Abstract: Yunnan provincial Geographic information common service platform was the Yunnan provincial key e-government project, which was constructed by Yunnan Provincial Bureau of Surveying, Mapping and Geoinformation and Yunnan Provincial Industry and information technology commission, in 2010. The platform provides the foundational geographic information data of multi-type, multi-scale, multiple data sources, and multiple precision. The platform is made up of five layers that are operation support layer, data layer, management layer, service layer and application layer. In order to ensure the platform to run stably, the platform is deployed in two nodes. Three ways is used to realize Data Synchronization between double nodes. In every node, the platform adopts the advanced technology, the cluster and the intelligent load balance, to ensure the platform to run efficiently. After built, the platform will create a new mode of geographic information service, and decrease the repeated construction among all departments of Yunnan provincial government.

Key words: Geographic, information, platform, construction

1. Preface

As a result of the joint effort of many people who work on surveying, mapping and geographic information in many years, Yunnan Bureau of Surveying, Mapping and Geo-information (YNBSMG) has possessed abundant geographic information resources with the features of multi-type, multi-scale, multiple data sources, and multiple precision. According to the traditional way of geographic information data service, YNBSMG provides mainly the ‘paper’ topographic map and ‘4D’ digital product for society. But the traditional map service way had not met the need of nowadays society.

Along with the rapid development of geographic information technology, geographic information data would be applied in various industries more and more. So much as the daily managements in some industries are obliged to depend on geographic information technology and data. In geographic information product, the higher and higher quality is required by various industries. They demand more abundant, more diversifiable, and timely update geographic information data resources to promote the development of e-government.

Both in the past and at present, every industry has been keen on the fundamental geographic information data using. But the procedure, the strict examine and approval from the related department is very complex and can spend too much time. More than that, as soon as other industries gain the data, the related department isn’t responsible for updating the data any more.

Every industry has their thematic geographic data that other industries can need too. But due to the absence of Yunnan Provincial Geographic information common service platform (the platform), many industries always produce these data repeatedly.

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The said reasons, the construction of the platform not only changes the way of geographic information data service but also provides a tool with which all industries can build and update the thematic geographic information database. So in 2010 YNBSMG and Yunnan Provincial Industry and Information Technology Commission (YNPIITC) took on together the Yunnan provincial key e-government project – Yunnan provincial geographic information common service platform and application demonstration project.

2. Construction aim and content of the platform

2.1 Construction aim of platform

After completed, Yunnan provincial geographic information common service platform and application demonstration project will be applied in all kinds of departments, such as the territory resource management, environment protection, urban and rural construction planning and management, transportation, landscape, water resource, agriculture, and industry and so on, and can supply the support for the daily management and information construction in these departments. Meanwhile it also plays an important role in the government making macro-policies and decisions, earthquake prevention and disaster reduction, and disposing the emergency. The construction aim of platform includes as follow:

1) Yunnan province will make the province-level data standard and classification coding system about geographic information resource and build the province-level natural resource centre and geographic information resource centre to promote the development of Yunnan provincial e-government.
2) The platform will provide the service of information exchanging, which will be shared in more domains too, for all government departments.
3) In order to show that the platform can provide the basic function service and application supporting for the government departments, basing on the database of Geographic information, four e-government application systems have been developed. They are Grassroots party organization Geo-information service system, Industrial economy Geo-information service system, new rural construction Geo-information service system and Yunnan province Emergency Geo-information service system and so on.

2.2 Construction content of platform

The geographic information common service platform, whose general framework was designed by the National Bureau of Surveying, Mapping and Geo-information (NBSMG), is one of three priority projects planed by NBSMG in the twelfth five – year plan. Basing on the general framework with Yunnan provincial reality, YBSMG cooperates with YNPIITC to research and develop Yunnan provincial Geographic information common service platform.

The main contents of the platform include:

1) Infrastructure construction
    a) Network constructions
    b) Hardware constructions
    c) Software constructions
2) The geographic information resource database
    a) Foundational geographic information database
    b) Common geography framework database
    c) Thematic application database
3) The Geo-information common service platform

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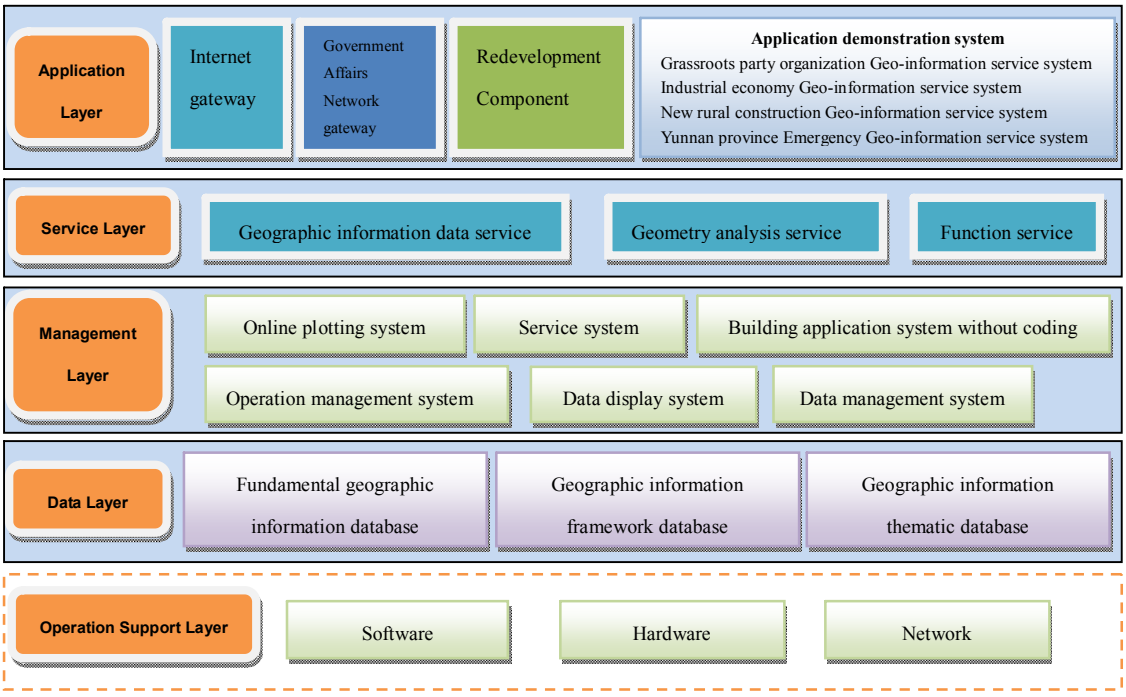
a) Database management system
b) Platform service system
c) Platform gate system
d) Operation Maintenance System
e) Thematic database management system
f) The subsystem of zero code constructing application system and so on.

4) The application system of departments
a) The grassroots party organization geographic information service system
b) The industrial economy geographic information service system
c) The new rural construction geographic information service system
d) Yunnan province Emergency Geographic information service system

5) The policy, law and standard's specification
6) Information Security Management Systems

3. The framework of the platform

The platform is comprised of operation support layer, data layer, management layer, service layer and application layer.



Operation support layer is the operation environment system of the platform. It includes the hardware, network, basic software.

Data layer is in charge of organizing and managing all data in the platform. These data include foundational geo-information data, common geographic framework data, and government thematic application data. The foundational geo-information date is the most important data in the platform.

Management business layer is composed of the database management system, the plotting on line and auditing system, the operation and maintenance management system of the platform. It

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mainly charges of generating all kinds of data in the platform, plotting and auditing the thematic data online, inputting the thematic data to the thematic database and updating, managing and maintaining the common framework data, moreover directs the data exchange, the user permission, the platform security, the service registering, the service managing and monitoring, the service log management and so on. So management business layer is a core and key what keep the platform to run securely, efficiently and steadily.

Service layer mainly provides all kinds of interface services that include the function service interface and data service interface based geographic information resource database. Through composing all kinds of interface services provided by service layer, all departments can set up their application system quickly on which their geographic information sharing service, including the identity authentication service, the metadata and directory service, the directory service of the past data, the thematic data service, the remote image service, the geography code service, the full text search service, the ordering layer service, the layer service about governmental information, the multimedia service, the spatial analysis service, the DEM analysis service, the public electronic map service, the 3-Dimensional view service, the past layer service, and the plotting data service and so on, can be distributed, shared and exchanged.

Application layer includes the web portal and the application system of all departments. The users may visit all subsystems of the platform and make use of the secondary development components, user guide and all kinds of services, which are provided by the platform, to build the application system for their departments with the web portal, the entrance of the platform.

4. The feature of the platform

In order to make the platform run stably, the following technology is used mainly.

1) The double nodes are laid out

Because of built by YBSMG and YPIITC together, the platform is separately laid out in Yunnan Geographic information centre and Yunnan Provincial information and technology development centre. Yunnan Geographic information centre, a part of YNSMG, is in charge of collecting, updating the foundational geographic date and making the electronic map. Yunnan Provincial information and technology development centre, which attaches to YPIITC, develop the platform and extend the application system to other departments.

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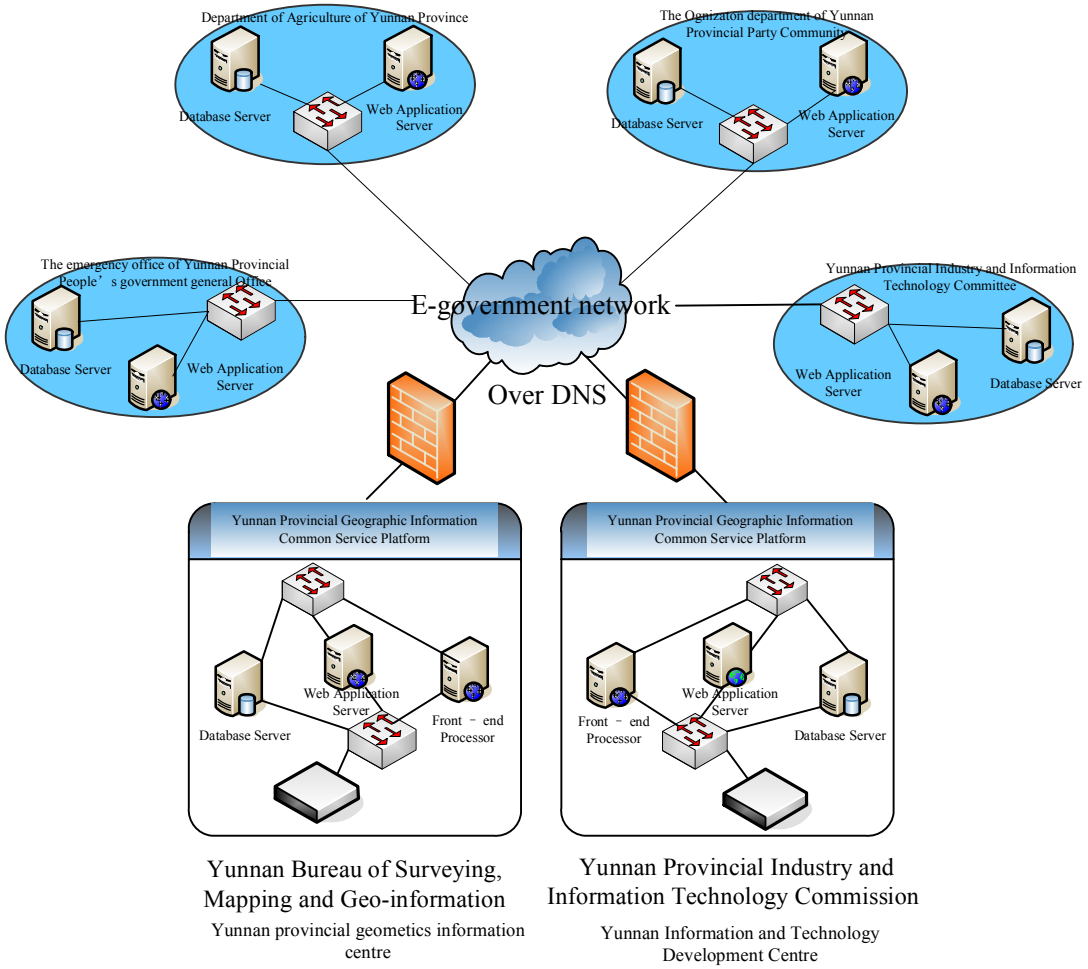

2) Three clusters in a node

Three clusters that the platform includes are separately in the application server layer, GIS server layer and the data server layer. The Apache HTTP server and JBoss server are deployed in application server layer. To setup Apache HTTP is for intelligent load balance among Web servers, the JBoss server directs to assign the business logic among the sub-systems; to configure SOM (Server Object Management) and SOC (Server Object Container) is in GIS business layer. The requests about GIS service are allocated to the server on which SOM is installed, but the server must be available and is processing the least task. SOM server that has received the request distributes the request to other server on which SOC (Server Object Container) is installed, and the server is available and has minimum tasks. Oracle database cluster as the data service layer is composed of two Oracle data servers and a San storage arrays.

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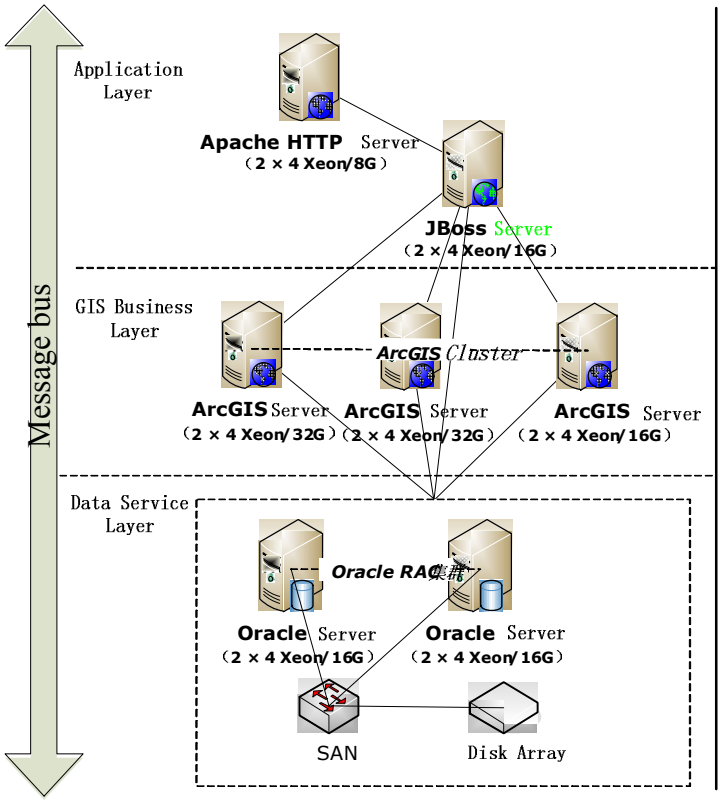
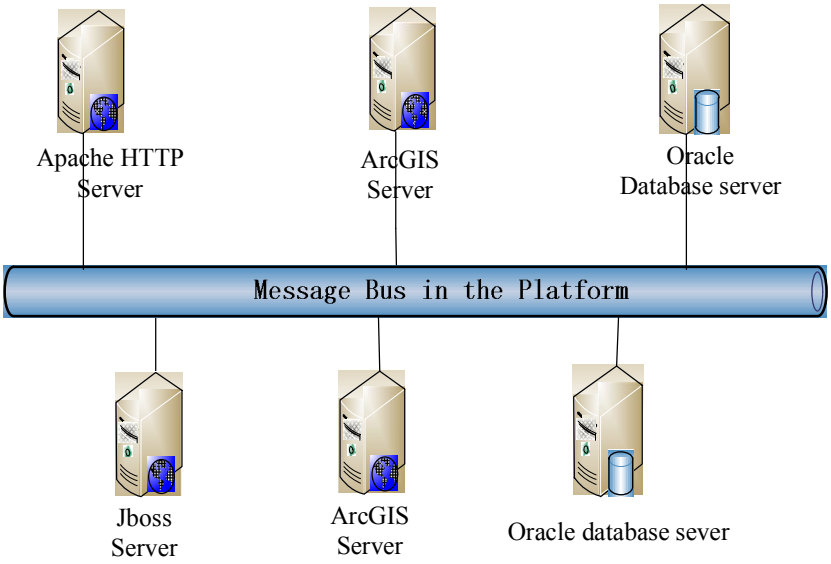


The deployment way can reduce each other influence among the layers, and help to meet the standardization and reuse the logic of all layers.

3) Intelligent load balance

A network load balancer is configured between two nodes. After sent, the request will get to the network load balancer firstly, and then the network load balancer will judge to send the request to the node which is available and is processing the least task.



4) Data synchronization

Because the platform is deployed on two nodes, in order to ensure the data of the double – nodes to be consistent. Three ways in the platform are used to realize the data real – time synchronization.

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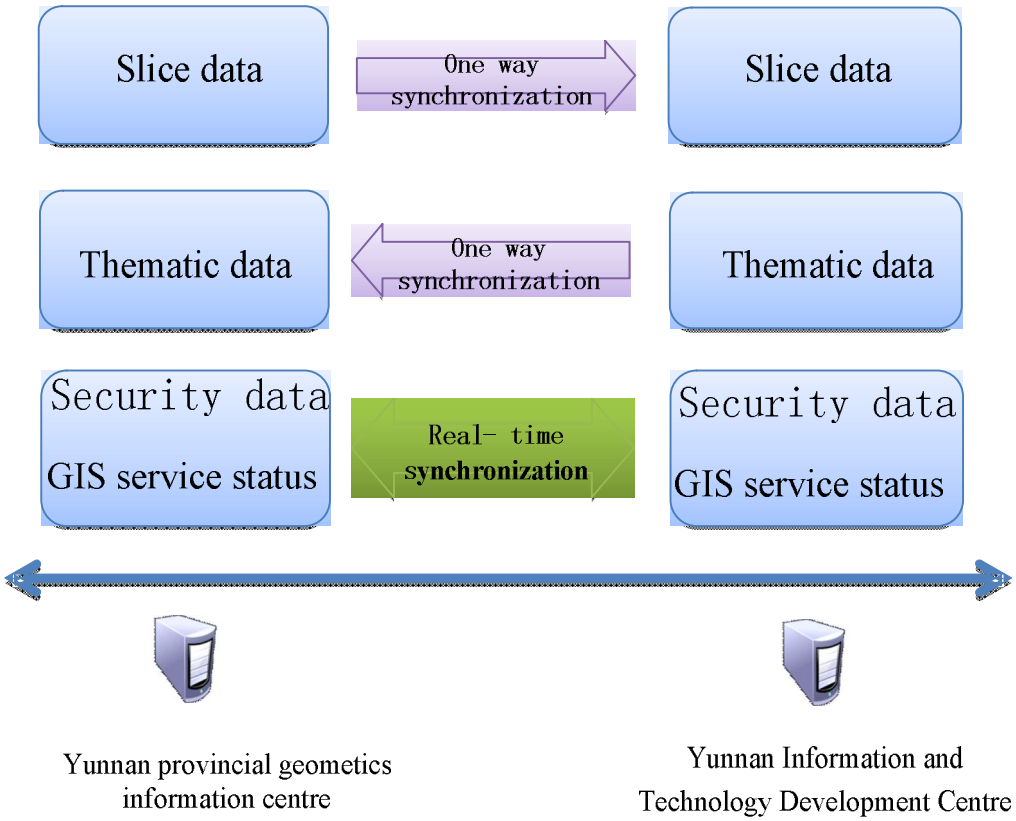

a) The slice data from the foundational geographic information data should be copied from Yunnan Geographic Information Centre to Yunnan Information and Technology Development Centre.

Produced by Yunnan Geographic Information centre that is responsible for keeping, producing and updating all kinds of scale - foundational geographic information data in Yunnan province, the slice data comes from the foundational geographic information data. If the foundational geographic information data is updated, the slice data should be updated too. In order to ensure two nodes' data to be consistent, the slice data has to be copied from Yunnan Geographic Information Centre to Yunnan Information and Technology Development Centre.

b) The thematic data was copied from Yunnan Information and Technology Development Centre to Yunnan Geographic Information Centre in the specified time

The thematic data updating subsystem and the thematic database server is deployed in Yunnan Information and Technology Development Centre. Because of updated frequently, the thematic data should be copied to Yunnan geographic information centre regularly.

c) The security data and the GIS service status are copied between two nodes in real time.

The security data and GIS service status is the key indicator of recording whether the services are security or not. So they should have been copied between the double – nodes in real time.

5. Conclusion

The platform is the provincial-level node of the national Geo-information Common Service platform. After built, it will provide the foundational geographic information services for the governmental departments in Yunnan province.

Through the platform, all departments of the government may register and release all kinds of thematic data and obtain all data services they need on the platform. Like this, it is not only avoided that the thematic data is constructed repeatedly, but also created to a new mode about the

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data application and save the funds.

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