BUILDING AN ENTERPRISE GIS IN POSTAL AND TELECOMMUNICATIONS INFRASTRUCTURE MANAGEMENT

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ABSTRACT

Vietnam has had a huge increase in postal and telecommunications infrastructure to meet the growing demands for using services in information and communications in recent years. Storing, managing, and distributing large quantities of data related postal and telecommunications infrastructure from diverse sources are becoming a challenge for local government. Consequently, implementing an information management system provides data management, analysis, and visualization; supports multi-user and decision making is being concerned.

This paper provides a case study of the postal and telecommunications infrastructure management system in Khanh Hoa province, Vietnam. This system was built based on client-server GIS technology. A centralized SQL Server 2008 based ArcSDE 10 geodatabase is created for using everywhere to maximize efficiency, standardize usage and avoid data duplication. In addition, GIS services are published from the publication geodatabase by ArcGIS Server 10. Web ADF for .NET and ArcEngine 10 was used to develop web-based GIS application and Desktop application that include visualization tools, editing tools, and analysis tools with Vietnamese language interfaces. The system has brought great efficiency and simplicity in management and monitoring of the postal and telecommunications infrastructure.

1. INTRODUCTION

Vietnam's postal and telecommunications infrastructure has expanded rapidly to meet the growing demands for using services, especially in mobile-telephone and internet services in recent years. The General Statistics Office (GSO) reported that there were 172.6 million fixed- and mobile-telephone subscribers in Vietnam at the end of February 2011, an increase of 32.5% compared to the same period in 2010. And, there were 3.83 million broadband subscribers, increase of 25.5% from February 2010.

Khanh Hoa, is a coastal province of South Central Vietnam, has a very good infrastructure, network of post and telecommunications that has been also been strongly developing and expanding to rural areas, far, and remote areas and constantly adding modern technical equipment. Currently, three are many telecommunications network services in Khanh Hoa such as VNPT, Viettel, EVN, VietnamMobile, S-PHONE, and GTEL. And there are one provincial central post, and districts, and wards' posts which have been equipped modern technical equipment. With the investment and deployment on Post and Telecom infrastructure growing quickly, the traditional current facilities management in post and

telecom is manual in Khanh Hoa, and most of technicians use MS Offices for it. Data and information are fragmented and scattered across various ministries and sectors in different forms that did not follow a data content standard for the data itself. So it is very difficult for management, planning, and making statistical and reports. So, selecting a technology to build an enterprise system for facilities management in Post and Telecom has being concerned by the local departments, especially department of Information and Communications of Khanh Hoa province (DIC-KH). In the design of the system, the share and management of large quantities of the resources especially the geographic information from diverse sources is very important. Geographic information systems (GISs) technology can meet this requirement.

2. SYSTEM ARCHITECTURE

The system proposed is based on ArcGIS Server technology developed by ESRI designed to provide an enterprise environment by allowing users to access, manage, process large and public sets of GIS data, maps, and reports through the support of several web services such as WMS, WFS, WCS, and WPS, and provide a strong support to operators looking for decision support.

The architecture of this system is in figure 1. It was developed consist of four main components: database server, GIS server, web application server, and desktop client application.
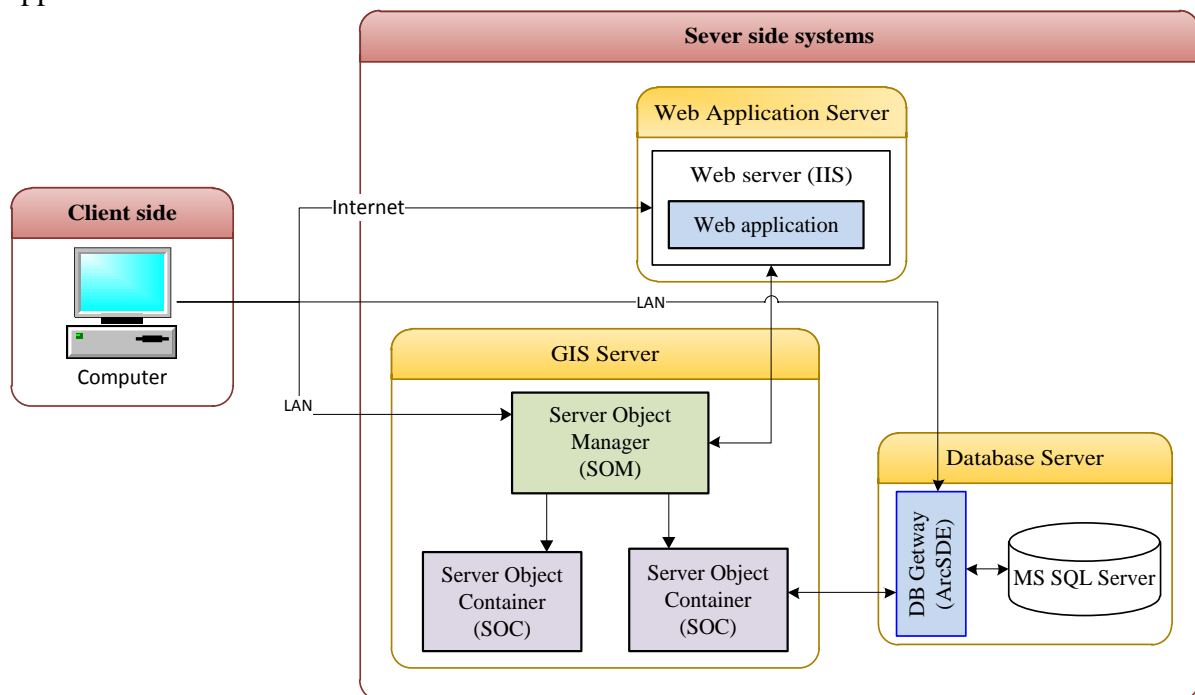

Figure 1. The general system architecture.

2.1 Database server

The central database server stores and serves the GIS resources. It uses ArcSDE for MS SQL Server for storing and retrieving GIS data. ArcSDE is an advanced database server, providing a gateway for storing, managing, and accessing spatial data.

2.2 GIS server

The GIS server is used to host GIS resources (data, map, functions) and explore them as

services to client applications. It consists of a server object manager (SOM) and one or more server object container (SOC) machines. The SOM manages the services running on the server while the SOC machines host the services that the SOM manages.

2.3 Web application server

The web application server acts as a bridge that connects web clients to spatial operation and analyzing functions through the HTTP protocol. The departments and branch companies can use browser to connect the data center and execute the permissible operations through Intranet. The web server hosts web applications and web services that use the resources running on the GIS server.

2.4 Desktop client application

Desktop client applications are Web and desktop applications. Web browsers connect to web applications running in web server. Desktop application connect over HTTP protocol to Web services or over a LAN or WAN for visualization and interactive editing and analysis.

3. DATABASE DEVELOPMENT

The system database consists of both spatial data and tabular attribute data. Spatial database was built from two main types of map: topographic map and thematic maps related post and telecom infrastructure. Topographic map was provided by the Department of Natural Resources and Environment of Khanh Hoa province (DoNRES-KH), included seven group layers in figure 2.
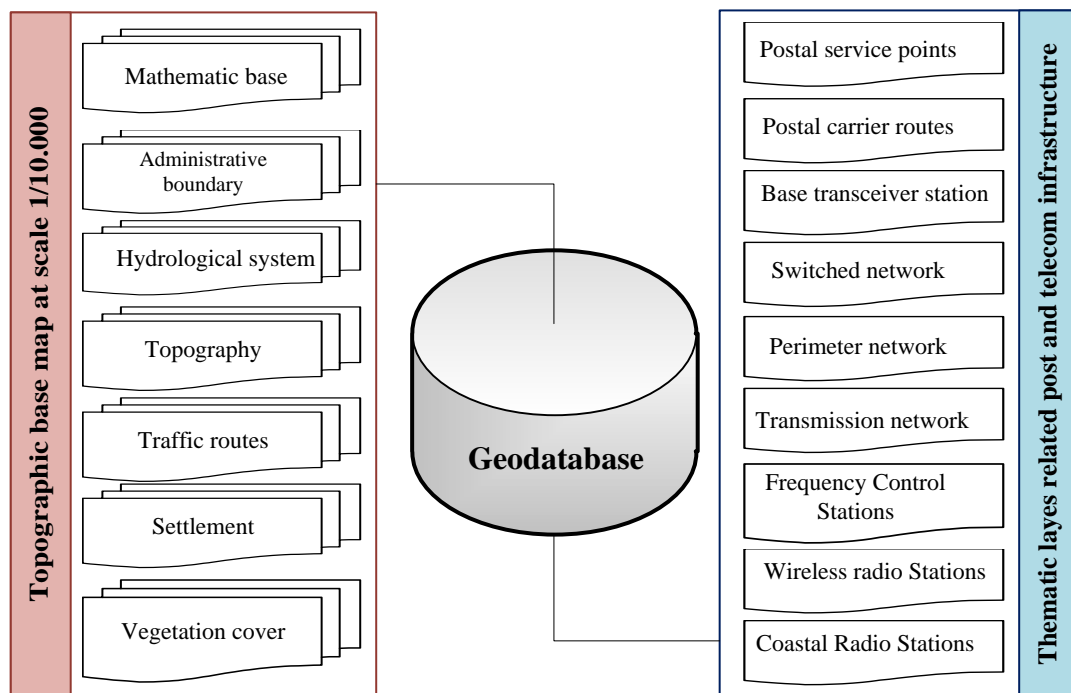

Figure 2.Spatial data layers of central geodatabase.

Topographic map as base map and thematic maps were converted from many types of format files, and edited to geodatabase, and all nine layers of thematic data was co-registered to topographic map in the VN-2000 projection.

4. IMPLEMENTATION AND RESULT

The system was developed and implemented by following three phases. The first phase of the project was to survey need of management in Post and Telecom infrastructure, and then design and build central geodatabase which also permits multi-user access to. Editing capabilities can be controlled with many levels of users. The second one was developed the desktop application based on ArcGIS Engine to administer, update the central database through LAN. The final one was developed the web application server using Web ADF for .NET and ASP.NET as a portal for to visualize and update central database through internet.

The system was installed and configured in DIC-KH, where has already a server available for GIS implementation. The ESRI software was installed for the implementation included ArcGIS Server Advance 10, ArcSDE 10 for SQL Server, an MS SQL Server 2008.

4.1 Desktop application

The desktop application with Vietnamese interfaces in figure 3 has five main functions: user management, map management, finding data, updating data, and making reports and statistics.
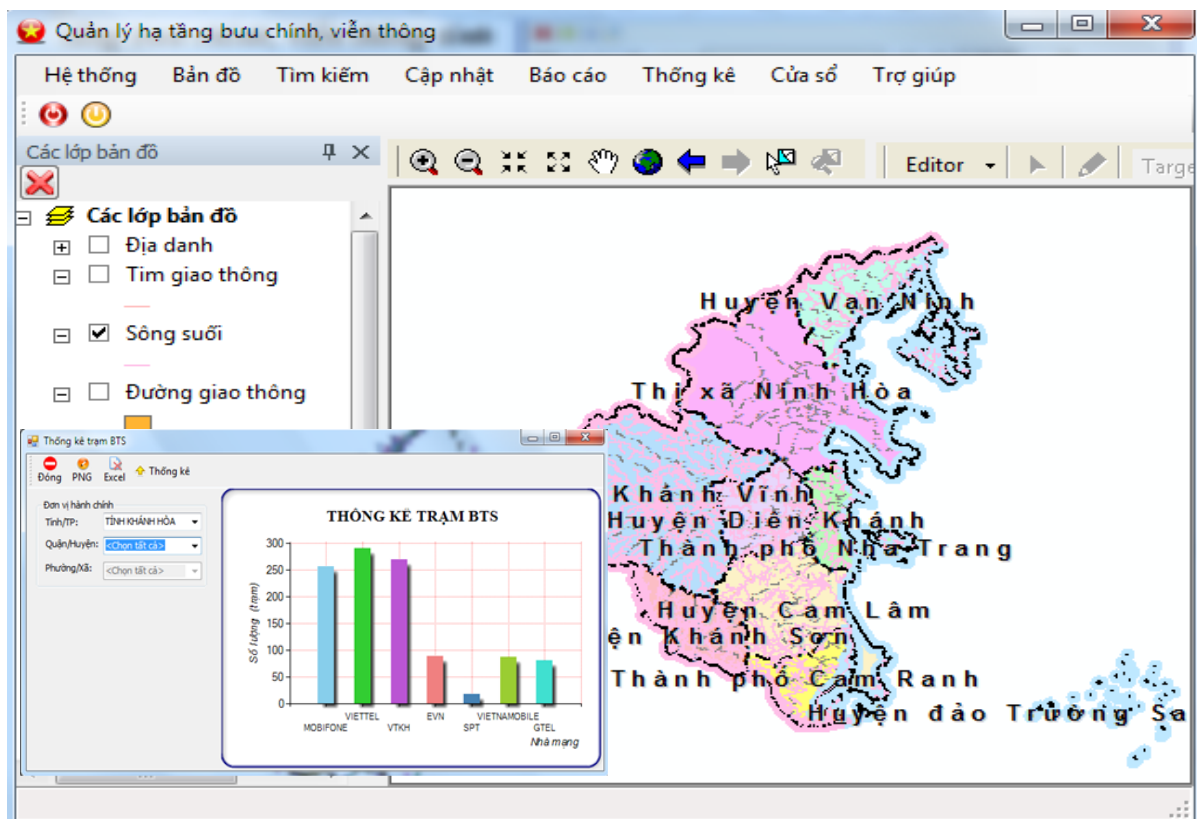

Figure 3. Main interface of desktop software.

User management: this is the function that is used to create, edit, and delete information and role of users.

Map management: that is used to load selected data layers into the application. And it also uses to export current display map to printer or files.

Finding data: the huge database in Post and Telecom infrastructure of Khanh Hoa province contains a lot of information. To exploit information quickly, this function offers the finding and query tool by attribute and spatial information.

Updating data: This function is only used for the users have been granted update data. It is uses to fast update spatial data and attribute data.

Making reports and statistics: This function allows the uses have been granted the right to make reports and statistics of the data, and export the results to MS World and MS Excel.

4.2   Web application server

The web based data management portal was built using ArcGIS Server technology. The web component was developed using C# programming language. The web application's main page in figure 4 only allows users have been granted access to. In main interface, the user can perform functions such as select and load spatial data in central database, view metadata, find locations of data, update attributes of data in central database, upload spatial data into data server, and view and make reports and statistics.
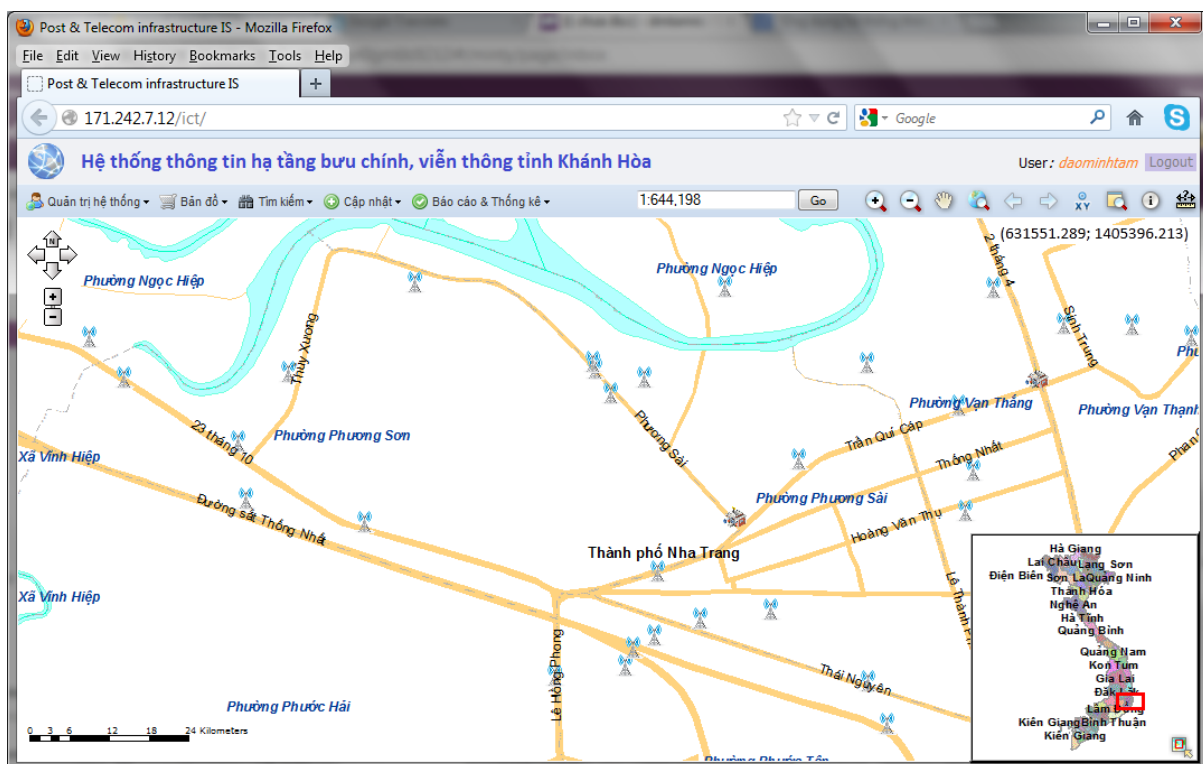

Figure 4. Main interface of web portal.

5.   CONCLUTIONS

This system was built meet a GIS enterprise in Post and Telecom infrastructure management, which provided the enterprise environment for users to visualize, publish and share business data, maps, update data, and make reports. The desktop application and web application provide great accessibility and were implemented with user-friendly interfaces. It is a highly efficient and reliable, practical and advanced tool for staff in different departments. The system also helps reduce the cost in management, updating data, and planning. The system will continue to improve as more functions in future.

6.   REFERENCES

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