

# GEOGRAPHICAL INFORMATION SYSTEMS AND THE DURABLE CONSTRUCTION OF URBAN AND RURAL ENVIRONMENTS

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## Abstract

The idea of basis is the present condition and developing trend of cadastral management Valcea. The paper expatiates on the construction status of the Cadastral Management Information System on Integration of Urban and Rural area of Valcea. For a long time, urban and rural area is managed separately, and their database is established respectively, so it's very hard to update data synchronously. These problems can't be solved until cadastral management information system is established, which also makes cadastral product accord with new land classification system of urban and rural integration. Several issues are discussed: the objective, idea, principle of system design, the hardware and software environment, overall framework design, cadastral database structure design and function design.

**Keywords:** Geographical Informatics Systems, Database, Cadastral Management Information System.

## 1. INTRODUCTION

For the future the trend for our cities is to extend to country, and the difference between city and country is to decrease. As a result, it is important for cadastral offices to pay more attention to urban and rural integrative cadastral management. According to actuality and trend of cadastral management, we must to analyse the construction of modern urban and rural integrative cadastral management information system. For a long time, city and country are managed separately, and their database is established individually, so it's hard to update data synchronously. This problem can't be solved until urban and rural integrative modern cadastral management information system is established to accord with new land classification system both for city and country.

## 2. SYSTEM DESIGN OBJECTIVE

The system design objective includes: the need of cadastral information management; enhance decision-making ability, quicken decision-making; frequent and dynamic state monitor realization; society applications, Bai et al. (2005).

***A. The Need of Cadastral Information Management.***

The completion of the system construction will construct government affair management system, and accordingly regulate current organization functional division. So resource configuration will be much more optimized and the work efficiency and work quality will raise significantly.

***B. Enhance Decision-making Ability.***

During economic construction and social development, the cadastres usually need relevant abundant information when analyzing macroscopically to make an administrative policy decision, and that the cadastre information is its basic data. The construction of cadastral management information system on integration of urban and rural area will establish data foundation on the depth development, extensive usage of land resource and offering information resource services towards the community.

***C. Frequent and Dynamic State Monitor Realization.***

The land dynamic monitor is an important task of land management. There are a lot of troubles to manage the alteration data by traditional techniques. After the construction of cadastral management information system on integration of urban and rural area is set up, the cadastre will become very convenient and everyday land dynamic land monitor can be implemented quickly and accurately. On the premise of collecting the relating information duly, the application system can quickly follow the progress condition of the land construction items, and check up the execution condition of the land leasing contract, punish illegal phenomena in time. Which is much significant for the criterion of land market and real estate, the maintenance of the serious land law and carry out land policy.

***D. Society Applications.***

After the construction of cadastral management information system on integration of urban and rural area is set up, the system will be open to the public and provide the real estate information for the public. With the extension of information collection and more and more extensive application, the system comes into effect gradually to city management, social progress and economic development.

**3. THE PRINCIPLE OF SYSTEM DESIGN**

In the time of system construction, several elements have be adequately considered: the advanced characteristics of hardware and software technique, the scientific of model, the completeness of system, the flexibility of operation, the practicability of system, the openness and the extendibility, Jankowski (1995).

**A. General Design Idea.**

On the basis of the fact of cadastral information management, what are adequately considered includes the advanced characteristics of hardware and software technique, the scientific of model, the information ,the rationality of structure, the completeness of system, the flexibility of operation, the practicability of system, the openness and the extendibility. The system construction lay scientific, real-time, and practical as leading idea.

**B. Overall Design principle.**

The construction of cadastral management information system on integration of urban and rural area of Valcea includes software development, database construction, and network design and system maintenance and so on. It is an engineering-enormous and complicated information system project. All kinds of factors need be comprehensively considered, and need manage such problems as the relation of advancement and practicality, standardization and flexibility. The following principles, Han (2004), have been followed when designed:

1. **Standardization:** The system bases on the existing technique regulations of The Ministry of Land and Resources, and accords with criterion on working flow, accords with industry criterion on input and output, accords with industry criterion on software engineering and database construction.
2. **Practicability:** The implementation of work without paper, accord with the working custom, operates simplicity, and offer complicated and strong operation function for the system vindicator.
3. **Advancement:** the advancement of hardware equipments, software and technique means.
4. **Security:** The system security is the important principle of system design. The system adopts authority management and network control, which assures that the whole software system is not illegally accessed and the subsystem is not illegally used.
5. **Dependability:** Includes the dependability of data and system run.
6. **Expansibility and Openness:** The system has friendly interface, optimized system structure and flexible database system in order that all kinds of function modules can operate and run independently to the utmost, and implements the maintenance and joins of such database as topographic map, present land-use map, Cadastral map etc. The system should have

strong compatibility on output aspect, and can make conversions among different data formats.

#### 4. HARDWARE AND SOFTWARE ENVIRONMENT

##### *A. Software Environment Analysis*

###### *GIS Software*

For the moment, the platform which Cadastral information system, Piotr (2006), depends on include the following several kinds: ARC/INFO, MAPINFO, GENAMAP, MAPGIS, and so on. MAPINFO is a desktop GIS, which is not good at Support of huge data set and its capability is also limited enough on spatial analysis. ARC/INFO is famous GIS product internationally, its capability of huge data set management and all kinds of spatial analysis are strong, but high price and the request to English level and operation ability is the huge obstacle to use widely. MAPGIS, the home-grown excellent GIS software, get people more and more favor.

The construction of cadastral management information system on integration of urban and rural, Burrough (1992), area should walk along the way of home-grown GIS, and take on right GIS software as the platform. It is very significant to construct function-perfect multi-user network management information system. No matter what on economy, technology, and information security, we all must depend on ourselves GIS software. So it is the demand of constructing cadastral management information system to select MAPGIS as developing platform. MAPGIS is a GIS that the map and data is important comparably. It has strong map function and can satisfy all kinds of strict request of map edit and output, and its spatial analysis capability is also strong as ARC/INFO. Owing to MAPGIS is home-grown GIS software, its interface is Romanian, so operation is simple, and moreover, it is expensive.

In view of the software technique advancement, system structure, the data management model, function, capability, supporting platform and the software corporation development and other factors, MAPGIS is chosen as software platform.

###### *The storage structure of cadastral data based on relational database*

The relational storage structure of cadastral data has the following advantages: perfect data security, easiness to transmit and share data; the strong ability of record lock and security recovery etc. These advantages provide cadastral data an efficient management and overcome the demerits in developed cadastral management systems. To store cadastral data in relational database is actually feasible.

Spatial ware and Oracle 10i are a data storage solution based on relational database, and have the ability to store cadastral data integrate. Of all the cadastral spatial data, the data about boundary nodes and property parcels is the most important; they should be stored in relational database. For the others', because they are less important and usually treated as backgrounds, they may be stored in GIS files. However, you can store them in relational database if necessary, Yang et al. (2005).

Oracle Enterprise Edition Release 10.0i is relational database management system which was developed by Oracle Corporation. It has a history of nearly twenty years, and it is mainstream relational database management system. Oracle PSTN/ISDN/ADSL Enterprise Edition Release 10.0i offers efficient credible secure data management which is the same as all kinds of application, including the on-line transaction processing OLTP system of big charge and data-ware application system which takes query as primary function. At one time, based on object-relational design Oracle Enterprise Edition Release 10.0i makes managing complicated data (multimedia data, spatial data) possible. Oracle 10i provides system management tools, and can distribute data to all kinds of user availably and flexibly. Oracle 10i has needful refractivity of obtaining optimal capability from all practicable computer resources.

The access mode of database is multi-formal (e.g. ODBC, RDO and ADO etc.).Here the construction employs ODBC to connect database and MAPGIS OLE function to make a reality of map interaction. In fact, the above two key techniques involve a series of map object operations (e.g. inserting, deleting, updating, keeping map object and its spatial storage data synchronous etc.).

### **B. Network Running Environment**

Based on the existing status of hardware and network, the system adopts the existing LAN among the bureau and other substations. The system network environment is shown as in Figure 1, connecting the bureau and other substations by fiber, connecting the population consumer and the system by Internet in order to realize the resource sharing.

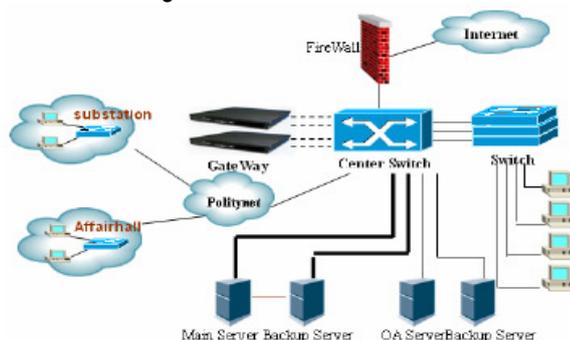


FIGURE 1 - NETWORK RUNNING ENVIRONMENT TOPOLOGY

## 5. HARDWARE AND SOFTWARE ENVIRONMENT

### A. System Framework Design

In view of the work characteristics of the bureau of land and resource of Valcea and the network connection request among the bureau, government and superior governing bureau, the system adopts the system framework of such network mode as principal B/S and adjective C/S (Figure 2). The interior function sections access information center by LAN and B/S mode, the information center manages data by C/S mode. The bureau and exterior network are separated physically, and connected by Internet, and firewalls are set up, which all assures the security of system. The substations access the information center by B/S mode, Ma et al. (2003).

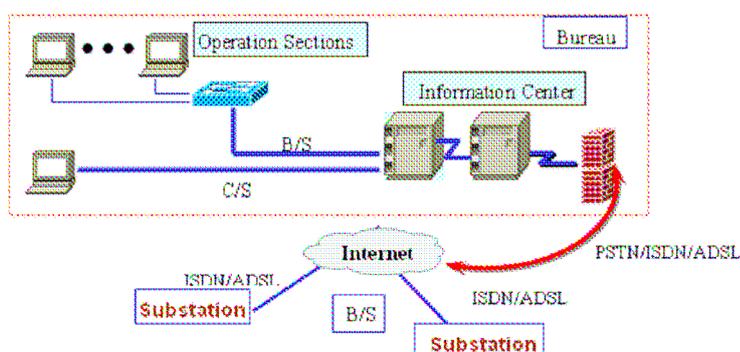


FIGURE 2 - THE SYSTEM FRAMEWORK

### B. Cadastral Database Design

Based on the existing status of data scale, organization setting and function dividing, the project adopts the concentrative data management mode, the system database can realize the following request:

- The data uniform management;
- Import data form other source to the system expediently;
- Manage spatial and attribute data by object-relational database, insure the integration of spatial and non-spatial data, and realize the seamless organization of spatial data;
- Solve the generation, storage and management of historical data;
- Assure output of data resource safely and communion conditionally.
- Cadastral database includes base topographic database, cadastral map database, and attribute database (Figure 3).

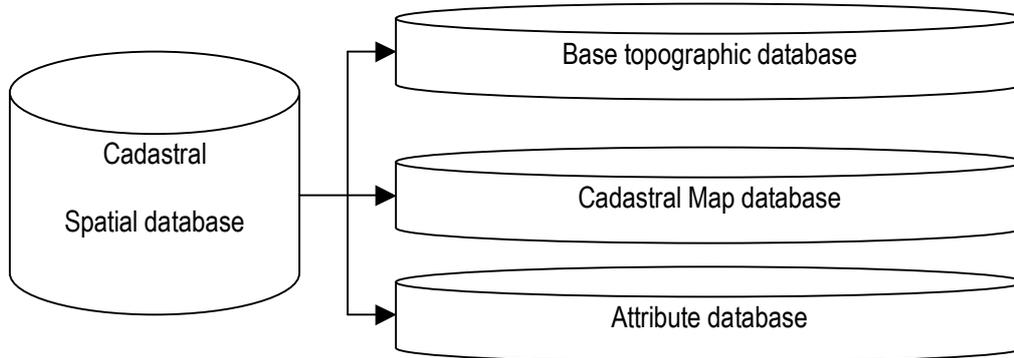


FIGURE 3 - THE CADASTRAL DATABASE STRUCTURE

**C. System Function Design**

The urban and rural integrative modern cadastral management information system of Valcea includes ten modules (Figure 4).

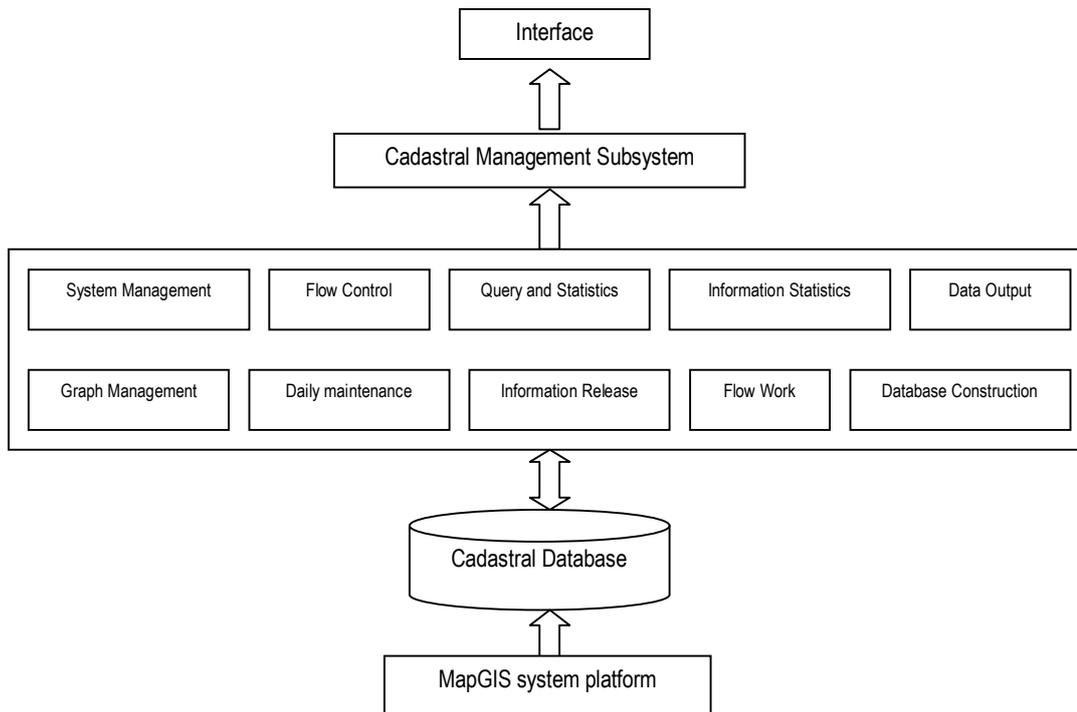


FIGURE 4 - THE SYSTEM OVERALL FUNCTION STRUCTURE

## 6. CONCLUSION

"Digital Land" is an important constitution of "Digital City", and "Digital Cadastral" is also the foundation of "Digital Land". The construction of urban and rural integrative modern cadastral management information system breaks the difference between city and country, advances the process of "Digital Cadastral" construction. Digital construction must consider the important development process of integration of urban and rural area. When "Digital Cadastral" is constructed, we must also consider constructing urban and rural integrative modern cadastral management information system. The construction product will offer abundant practice experience for the country wide, also offer demonstrations for the spatial data application and services of land resource industries, even correlative industries. At present, using a great volume of information calls for achieving a proper way of managing, attentively elaborated, suited totally to data structures. Thus, information used in public utilities networks administration can be divided in two categories: spatial information and descriptive information. Such types of data can be integrated in the same information managing system, by creating a Geographical Informatics System (GIS), Răduț et al. (2009).

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