The Framework Design of the Construction of a Comprehensive Information Management Service Platform at the Township

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Abstract: This article makes full use of geographic information and other industry thematic data, builds a township-level database and informational integrated management service platform, develops mobile APP and multiple characteristic applications, and deeply promotes the guarantee service of geographic information at the township level (sub-district office) and below, helping rural revitalization, building beautiful villages, deepening the promotion and application, and forming a township information service system that integrates government decision-making, department management, and public application, in order to promote grassroots information management, improve grassroots human settlements, scientific planning and construction, strengthen ecological and environmental protection services to provide useful references.

1. Introduction

The report of the 19th National Congress of the Communist Party of China pointed out that the issue of agricultural and rural farmers is a fundamental issue related to the national economy and the people's livelihood. We must always make the resolution of the "three rural" issues the top priority of the party's work and implement the rural revitalization strategy. The countryside is a regional complex with natural, social, and economic characteristics. It has multiple functions such as production, life, ecology, and culture. It promotes mutual advancement and coexistence with cities and towns, and together constitutes the main space for human activities. On December 29, 2017, the Central Rural Work Conference proposed for the first time to take the path of socialist rural revitalization with Chinese characteristics. On January 2, 2018, the No. 1 Central Document of 2018 was announced that "the Opinions of the Central Committee of the Communist Party of China and the State Council on the Implementation of the Rural Revitalization Strategy". In September 2018, the Central Committee of the Communist Party of China and the State Council issued "the Strategic Plan for Rural Revitalization (2018-2022)", scientific planning, high-standard farmland, efficient water-saving irrigation, land contract and ownership, balance of arable land occupation and compensation, poverty alleviation, infrastructure construction etc. are all important tasks for rural revitalization, and rural areas will become the beauty of living and
working.

The township-level networked integrated geographic information management service platform is based on the principle of "demand-driven, overall coordination; focus on innovation, economic efficiency, integration of resources, and information sharing", closely combining the needs of rural grassroots governments and the people, and making full use of local existing information resources, geographic information and thematic data develop a universal township-level information integrated management service platform, develop mobile apps available to farmers in rural areas, create a map, a library, a platform, an APP, and multiple application systems, exploring and practicing the mode, the method and technical route of rural grid-based comprehensive management[1].

2. Overall framework of township-level information integrated management service platform

2.1 Construction content

2.1.1 Acquisition and update of rural geographic information. Based on the results of digital cities and smart cities, 3S technology is used to improve geographic information data, complete rapid update of urban and rural geographic information, and collect place names and addresses and a certain number of points of interest to form image data, map data, and three-dimensional data that can provide public use, to ensure that the current situation meets the needs of the public, planning, construction, and engineering.

2.1.2 Thematic information acquisition of "agriculture". Collect professional or special materials closely related to the department and the public, including: planning information, land management information, crop fine management information, environmental monitoring and governance information, village ownership boundaries and rural real estate information, underground pipeline information, and rural houses with personnel information, precise poverty alleviation information, convenience service information, economic data information, tourism and sightseeing information, public security management information, event management information, special management, geocoding and geographic information, integrate to form comprehensive information with detailed content and convenient application.

2.1.3 Construction of a comprehensive information management service platform at the township level. The design and research and development of general software for the township-level information integrated management service platform, includes building the integrated management service platform and mobile client, realizing the functions of data import, integration, call, display, release, management, and application. Through the development and application of platform functions, it realizes the one-stop management and service model of "a thousand lines above, a needle below" by the township-level government, which is convenient for promotion.

2.1.4 The construction of beautiful rural characteristic system. Comprehensive analysis to meet the main needs of rural urbanization construction, with the goal of providing rich and diverse, multi-level geographic information security services for grassroots governments, departments, and the public, it can research and develop beautiful rural characteristics systems, and expand the application of surveying and mapping geographic information in grassroots areas. Each project implementation area can focus on the application according to local needs, and provide grass-roots government departments and the public with rich, diverse and multi-level surveying and mapping geographic information security services. Featured systems can involve: planning and layout, resource utilization, environmental protection, infrastructure construction, land management, underground pipe networks, precision poverty alleviation, convenience services management, green industry, agricultural modernization, eco-tourism, etc. The system can be assembled and
expanded.

2.1.5 Mobile Internet applications. Using mobile GIS technology, relying on the Internet, based on open version data services, integrating various types of public information in the region, developing mobile clients, it can provide the public with open version of township maps and navigation services, convenience services, investment promotion, tourism, navigation information, hand in hand, the hottest activities, one township, one industry, one village, one product, travel for travel friends, farmhouse food court, investment attraction etc. It can realize the convenience of public, increase the utilization rate of surveying and mapping geographic information industry.

2.1.6 Operation and Maintenance Mode. Geographic information data implements multi-level linkage update and sharing; the thematic data is updated and exchanged by professional departments, realizing data from bottom to top, services from top to bottom; for daily management, places with conditions and capabilities can be self-managed, unconditional can be entrusted and managed centrally at the county level and above.

2.2 Overall framework
Service-oriented architecture (SOA) is currently one of the main service architectures for data sharing construction at home and abroad. It is a distributed computing technology based on an object/component model. It follows a loosely coupled architecture and is defined by using Web Services. Interfaces can conceal the differences between different implementation technologies and the heterogeneity among various connected systems. In Web Services technology, the entire network becomes an open component platform. By combining different Web components, applications can be extended almost infinitely to meet the various functional needs of users. In order to make full use of the construction results of digital counties, realize seamless docking with digital counties, and fully integrate the data resources of the existing business systems of towns, exchanged and shared on the same platform. The township-level information integrated management service platform will adopt SOA. The architecture is based on the basic layer, data layer, application layer, standard specification and safety assurance system [2-4].
2.2.1 **Basic layer.** The infrastructure layer mainly includes network platforms, servers, storage and other equipment. It is an important infrastructure that constitutes the service platform and supports the operation of various application systems.

2.2.2 **Data layer.** The data layer is built on the infrastructure layer and provides various information resources for the upper application layer, which is the basic link of the system. The township-level information integrated management service platform can integrate information network service resources to realize data sharing and exchange, providing support for users to conduct distributed integration of their business information on the platform services and quickly build business application systems.

2.2.3 **Application layer.** Set up clients in the face of township government management units to solve public service and business process problems. At the same time, it is oriented to the mobile terminal and combined with the actual development of various mobile terminal applications in the township to meet the individual needs of the public. It encourages the deployment of servers, database construction, and system operation and maintenance above the county level, and only clients below the county level. Various resource services are also released uniformly based on the geographic information public platform of the city and county.

2.2.4 **Standard and specification system.** Platform construction must follow unified standards and specifications, which is a guarantee system for the smooth construction and normal operation of the platform's various systems.

2.2.5 **Security assurance system.** A security system ensures the safe operation of the platform. Information security runs through all levels of the platform. The construction of each system of...
the platform must have corresponding software and hardware security assurance measures to ensure the security of the external network and support e-government business system reliable operation.

2.2.6 Network topology and operation services. The township-level information integrated management service platform serves as an application demonstration access standard interface for digital counties and provides unified services. The operation service network of the network township-level grid integrated geographic information management service platform is divided into secret-related and non-secret-related network environments, which mainly relies on the existing network environment to achieve horizontal and vertical connectivity.

3. Construction plan

3.1 Geographic Information Database
The construction of the geographic information database will make full use of existing resources and consist of multiple data sub-databases to store and manage geographic information data. The current database stored in the inventory is divided into: image, road, water system, residential area and other element data sub-databases. The historical database adopts the method of combining data with time marking and version management. The data update is stored in a difference, which is established by adding additional association relationships between historical data and current data.

![Figure 2. Logical diagram of geographic information database](image)

3.2 Thematic geographic information database
Thematic geographic information database as the core shares and exchanges thematic geographic information data source for subsequent application system construction, it provides data support for various professional applications around this project. The industry thematic geographic information database is stored data of planning, transportation, land, urban management, education, health and other industry data according to the industry.

![Figure 3. Logical diagram of thematic information database](image)

3.3 Township-level information integrated management service platform functions
The functions of the township-level grided geographic information integrated management service platform are mainly composed of ten modules including land management, population management, housing management, event management, community services, comprehensive governance and stability...
maintenance, environmental monitoring, tourism, investment promotion, and precision agriculture.

3.3.1 Land Management. The functions of the land management module include: basic data management, land contract transfer management, housing title certificate management, contract management, data query, summary analysis, archive management, chart analysis, etc. Basic data management realizes the maintenance of the system dictionary, the management of organization, farmer information, land parcel information, land parcel information, surveying and mapping, plot schematics and the import and view of GIS maps. Land contract and transfer management realizes household contract management, mobile land contract management, contracted land and self-preserved land homestead management, as well as subcontracting, transfer, leasing, shareholding, swap, borrowing and other forms of circulation, providing rural land contract management, review, print and record functions, automatically record the historical tracing relationship of the circulation information which is convenient for users to query and statistics. Warrant management realizes registration application management, management right certificate management, registration book management. Archive management is realized through the entry of various types of information, and the system automatically archives according to the farmer households, and establishes an independent file for each farmer household. The summary analysis provides classified land information, farmer information, household contract information, land contract information, land transfer information, management right application information, register information, land contract management right certificate information and management right change information. Chart analysis can visual display various information, such as land type ratio map, land contract type ratio map, land circulation type ratio map, farm household age structure ratio map etc.

3.3.2 Population Management. The functions of the population management module include: household registration population management, floating population management, poverty alleviation management, and statistical analysis. Population and poverty alleviation management: management of women of childbearing age, family planning classification management, pediatric status management, objects of pregnancy examination, special assistance objects, and rural awards and assistance objects. Floating population management: the information of the household registration place, track and process. Statistical analysis: statistical reports and data analysis of information.

3.3.3 Housing Management. The functions of the house management module include: visualizing abstract spatial information, reasonable geocoding, grid planning, layered and superimposed classification information, building basic information to count the population or unit information of each unit, building floor and room, realizing "Manage the house with pictures" and "Manage people with the house".

3.3.4 Incident Management. The main functions of event management include: dynamic event display, event list, closed event, application for withdrawal event, triage event, reported event, event registration, event statistics and department statistics.

3.3.5 Community Service. The main functions of community services include: community overview, public housing affairs, dynamic information, convenience services, social conditions and public opinion.

3.3.6 Comprehensive management and stability maintenance. The functions of the comprehensive stability maintenance module include: tracking key populations and locations, key areas and units, rental houses, key periods and routes, spot-checking the results of the coordinator's investigation and spot-checking the special investigation.

3.3.7 Environmental monitoring. The functions of the environmental monitoring module include:
spatial positioning of various pollution sources and environmental quality classification areas and online marking and drawing, visual management, monitoring and analysis of pollution sources, environmental quality, environmental pollution impacts.

3.3.8 **Tourism.** The functions of the tourism and sightseeing module include: scenic spot information query, positioning, display and route planning, as well as scenic spot related catering, accommodation, leisure, entertainment, shopping and other information query.

3.3.9 **Investment Promotion.** The functions of the investment module include: information management, project registration, project tracking, work assessment, supervision and coordination, status management and other information release.

3.3.10 **Precision Agriculture.** The functions of the precision agriculture module include: famous and high-quality products, demonstration bases, characteristic displays, agricultural units, natural resources, agricultural economy, agricultural basic information and other information display, statistical analysis.

3.4 **Mobile Client** [9-12]

By combining the township-level information integrated management service platform, the electronic system suitable for the Android system is developed, including one-stop convenience services, navigation information, palm upstream, hottest activities, one township, one industry, one village, one product, travel for friends, farmhouse food exchange, investment promotion, WeChat public account and other modules, which can realize online vector map and image map touch browsing, mobile positioning, POI search, surrounding query, route navigation, information release and other functions.

![Figure 4. Mobile client technical architecture](image)

**4. Concluding remarks**

Under the new situation of comprehensively deepening reforms, coordinating urban and rural development and advancing modern agriculture, in accordance with the rural natural resource endowment, social and economic development level, industrial development characteristics, folk culture inheritance characteristics and under existing conditions, it makes full use of geographic
information technology, integrates multi-source data from the industry, revitalizes the countryside according to local conditions, develops beautiful villages as needed, improves the level of information below the township level, narrows the gap between urban and rural areas, moves towards grid-based fine management, and strives to achieve modern countryside "beauty of production, beauty of life, beauty of ecology" which is a new development direction.

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