The basic business platform construction of national sea area dynamic monitoring management system for service

Derui Song[1,2,a], Jianhua Zhao[1,2,b], Yun Zhang[1,2,c],Dan Li[3,d],Ke Cao[1,2,e]

[1]National Marine Environmental Monitoring Center, DaLian, LiaoNing, China, 116023

[2]Key Laboratory of Sea Areas Management Technology,SOA,DaLian,LiaoNing,China,116023

[3]National Ocean Technology Center, TianJin, China,300112

[a]drsong@nmemc.org.cn,[b]jhzhao@nmemc.org.cn,[c]yunzhang@nmemc.org.cn,[d]nancy071@163.com, [e]kcao@nmemc.org.cn

Keywords: data sharing; service; sea area; monitoring; platform;

Abstract: This paper focuses on the construction of national sea area dynamic monitoring management system platform. Firstly, according to the analysis of two main tasks between sea area usage management and dynamic monitoring, a constructive idea utilizing shared service is proposed. Secondly, we elaborate on the system framework, the design of the main functions, platform realization process and key technology application. Data foundation and scientific basis for usage are provided to grasp sea resources and sea usage condition for nation. The basic business platform construction has achieved good application effects. Finally, the prospective study of platform technology and application are discussed.

Introduction

The sea area usage refers to continuous use of a specific area for more than three months of exclusive use of sea, excluding sailing, fishing and other activities. The jurisdiction of the sea area of China is about 3000000 square kilometers. The mainland coastline is about 18000 km. In order to grasp the sea resource and present situation of our country, country and coastal areas have built several marine information systems [1-6]. The establishment of these systems for scientific management of the sea plays an important role. At the same time, some problems are also exposed. First of all, mutual local systems are basically isolated from each other, under no sharing of resources and difficult interoperability. The duplication of information acquisition, processing, system repeating construction phenomenon often occurs, which causes lots of waste in human and finance. Secondly, the sea area resource information is given prior to spatial information. Visualization of sea resources usage situation and dynamic monitoring of sea usage status are needed.

For the macro grasp of marine resources and the use of sea areas, State Oceanic Administration in 2005 started construction of national sea area dynamic monitoring management system (Hereinafter referred to as the system). In the sea area of the management of business data as the basis, in the near shore waters development and utilization activities as the focus, using satellite remote sensing, aerial remote sensing, remote video and site monitoring as a tool, to provide a basis for the rational allocation of the waters, the sustainable utilization of resources and macro decision, the sea area under the jurisdiction of China high precision, three-dimensional, normal surveillance monitoring are conducted.

system architecture

According to the sea integrated management business needs, system platform around the management of sea area use and dynamic monitoring includes two big main businesses. The technologies including database, data mining, information sharing and integration of spatial information, and computer network and communication technology are comprehensively utilized. In order to achieve the business data collection, exchange, share based, the whole process of intelligent management has the function of user management, monitoring results of flow production, remote sensing monitoring doubt zone automatic interpretation and the integration of business information display functions with integrated platform. At the same time, quality control management system of data from production to apply and extinction, and information security system are established. Sea area management and monitoring of business management decision support service are completed.

The system function design

Design and implementation is composed of four main application function, which include waters administrative management, dynamic monitoring, decision support and visualization, and system maintenance management.

Sea use administrative management

Administrative management subsystem based on the approval process of the sea has the function of administrative business information management responsibilities waters within the department. It mainly includes the regional division of marine functional zonation, the use of sea reclamation planning, management authority in the management of sea area, the royalties for using sea areas management, the use of sea, sea use assessment of statistical qualification management, and the use of law enforcement regulation repair and coastal sea areas etc.

Dynamic monitoring

The supervision center responsibilities within the monitoring business management functions are mainly implemented. It mainly includes the remote sensing image data management, regional planning, monitoring, monitoring of the sea use project focused on areas with sea monitoring, doubt suspect area monitoring, key projects etc.

Decision support and visualization

Multiple sources data visualization, multi class achievement are realized. In visual expression of two or three dimensional integration ways, interactive query through the graphic and attribute, data management is visually displayed. The rapid generation of thematic maps includes the current situation of the use of sea areas, remote sensing images, suspect areas, marine functional zoning and regional sea use planning etc.

System maintenance management

Auxiliary business support platform running function is implemented, which includes platform operation monitoring (distribution of monitoring, mobile terminal monitoring, database monitoring), business organization management (personnel, equipment management), auxiliary Office Management (document management, email) and data processing auxiliary tool (data check) etc.

System design and Implementation

Design and implementation of communication environment

The system adopts Ethernet networking technology. The backbone network is with MSTP (Multi-Service Transfer Platform) technology. Four stage star network structure is constructed by 1

Organization Center, 3 business centers and 61 subordinate business centers. The branch network adopts SDH（Synchronous Digital Hierarchy） line network and VPDN（Virtual Private Dial-up Networks）virtual dial-up networking technology. The middle business center and the underlying business branch center are respectively realized.

Data storage design and Implementation

The data storage of system mainly includes sea area management database, dynamic monitoring database, basic geographic information database, remote sensing image database, office database and the corresponding metabase, with part of the non-structured data etc. Sea area management database is mainly used for the storage and management of sea areas integrated management data. Dynamic monitoring database is mainly used to save the monitoring information of monitoring data. Basic geographic information database adopts spatial database as storage management. Massive remote sensing data of remote sensing images are stored in database by long time sequence. Office database is composed of attribute database and file database.

The physical location of data storage consists of two entities. They are data production center and remote data backup center. In the design of data disaster tolerance, local backup and remote inter-provinces backup should function together. Backup capacity design is calculated with grade TB. To reduce the cost of backup by introduction of virtual technology, the best RTO（Recovery Time Objective）and RPO（Recovery Point Objective）objectives are implemented. Using local full backup, incremental backup and offline backup strategies, metropolitan area adopts network synchronization backup strategy. The dedicated backup software strategy execution is implemented, and able to carry out the backup log audit.

Key technology and implementation

The system is based on sharing and service concept as guidance. It is a business software platform development based on spatial information. The sharing function and GIS service function are a core function of subject system.

Sharing service design and implementation

Shared service integration platform utilizes B/S structure design. According to internet to publish data, the function of marine spatial data browsing, query and analysis for the user are provided. Application layer using JavaScript technology, various visualizations of ocean space information or multimedia information interactive operation is expressed. Data processing layer and data access layer are implemented by using Web Services, XML and metadata technologies. Middle business logic layer component design can connect with Oracle、MS SQL Server、MS Access databases. The integration and share of spatial data based on wide area network is realized. Online spatial analysis and multiple decisions are completed.

The request of application layer can be conducted by business logic of sea area dynamic monitoring information service platform with call and control or through the SOAP request to obtain the system Web service. The business logic layer receives, filters and schedules service requests to realize the registered services request. Page component is responsible for the page Jump, business or service request processing. Application logic component sends different components according to the type of requests. The database component design is mainly responsible for the database resource access control, with the remote database data access. Security and user access authentication component of comprehensive management.

GIS function design and implementation

GIS function realized by B/S framework is weaker than that of C/S architecture. The former has more complexity than the latter. But the Web GIS with its client, small amount of maintenance, easy popularization and Characteristics of high viscosity, is widely used. After considering the user

service level of technology and technical maturity, Web GIS mode，Web Control and GIS Control are utilized.

In Client, by combining HTML technology receiving from the Web server with XML, JSON, AMF and other data, are exhibited in the explore and provide interaction with users. In the presentation layer, layer user interface for display is presented. Web layer provides the unifying request and response functions from the interface driven by business layer. The Web layer receives the client browser through Internet and Web communication server request. Based on the initial processing, it sends the request to business layer. After ArcGIS server accepts the request, data access obtains space data and attributes data from database to Client according to space database engine-Arc SDE.

Conclusion

Sea area management system not only describes the temporal and spatial distribution of marine resources based on shared services model, and complete the changes variation of sea resources dynamically by real data support. The data sharing system for state, province, city, county with four classes' linkage is formulated. Each level is of data users, but also the data producer. User data can be shared between the levels to reach the goal of making full use of the data with each other. The system not only meets the development needs of the current business of the sea, but also provides data service for other system, avoiding the same set of data duplication of investment, redundant construction. Life system and user viscosity is finally increased.

Acknowledgement

In this paper, the research was sponsored by the Public Science and Technology Research Funds Projects of Ocean(Project No.201005011).

References

[1] Derui Song, Guanfeng Tao, Shuyan Sun, Hui Zhao, Marine environmental monitoring operation sharing platform construction and implementation[J], Marine environmental sciences, 2008.8，27(2),pp.114-116.

[2] Renqun Zhang, The construction of maritime management information system based on GIS[J], Marine information, 2004(1),pp.5-7.

[3] Yong Ao, GIS in the application of qingdao sea area management[J], Journal of Earth Sciences and environment, 2004，26（2）,pp.71-74.

[4] Jie Jiang,Ying Zhang,Dong Zhang, Maritime management information system exploitation based on MapX component in Jiangsu province [J]. Marine environmental sciences，2004，（3）,pp.55-57.

[5] Jiansheng Hong, Using the integrated management information system construction and marine management informatization in the sea area of Fujian province [J]. Fujian aquatic products，2004,（3）,pp.49-53.

[6] LiangYong Zhou,Qinfen Dai, The establishment of maritime usage management information system [J]. Marine geological dynamic，2003,19（3）,pp.34-37.