Water Management Platform Construction of Zhejiang Province

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Abstract: Based on the full deployment of the government's digital transformation work, and the needs of "smart water conservancy" construction, Zhejiang Province has launched the construction of a water management platform. By constructing a unified water conservancy data warehouse across the province, it solves the problem of the isolation of various types of information resources in the digital transformation of water conservancy, and realizes the collection, exchange and sharing of water conservancy data resources; By constructing a unified water resources comprehensive application portal, a decentralized, independent and single business system is integrated to realize cross department, cross system, cross region and cross level business collaborative processing. The results show that the Zhejiang Water Management Platform has laid the foundation for the digital transformation and modernization of water conservancy in Zhejiang Province, and has accelerated the development of high-quality water conservancy in Zhejiang Province.

1. Preface
There are both hills and plains in Zhejiang [¹], with full water conservancy element, lots of water conservancy project types and heavily water conservancy task. In this situation, in order to decrease the implementation of water conservancy projects, increase the supervision of the water sectors, and realize the modernization of water management systems and governance capacity, on the basis of overall deployment to promote the digital transformation of the Zhejiang Province government [²], carries out comprehensive and in-depth integration of water conservancy business and digital, focuses on water conservancy data sharing and business collaboration, and constructs a digital, networked and intelligent integrated application system of human-computer collaboration -- Zhejiang water management platform.

2. Key Technologies for Water Management Platform Construction
(1) Middleware technology. Middleware products are a kind of independent mature commercial software, which is independent from hardware, operating system, database system. Water management platform mainly used of message queue(MQ) and REDIS, where message queue is an application-to-application communication method; REDIS is a Remote memory database, and a fast speed non-relational database.

(2) Cloud Service Bus(CSB). CSB is an open service Application Program Interface(API) platform based on the high availability of distributed cluster technology, which helps to open up new and old systems inside and outside, and realize the interworking of service capability across
technology platform, application system and enterprise organization.

(3) Uniform identity authentication. The same identity authentication system provided by unified authentication is for each application system to use, supporting password verification, certificate identification, biometric identification, multi-account login and so on.

(4) Data mining. Data mining is to extract implicit information and knowledge from a large number of practical application data, which is a kind of deep data analysis method.

3. Water Management Platform Demand Analysis

(1) Carding demand for core business. Focusing on the six aspects of water resources protection, protection of rivers, lakes and reservoirs, water disaster prevention, water development planning, water affairs supervision and water government coordination, the core business of water conservancy is comprehensively combed. Platform builder need to compile the three lists and one set of maps: the list of items, the list of indicators, the list of data and the business flow chart. The "three lists and one set of maps" support for business application construction.

(2) Monitoring perceived needs. Improve the perception ability of water conservancy elements, and provide the basic support for the digitization of water conservancy business.

(3) Data resource requirements. In view of the problems such as scattered data resources, lack of update mechanism, low development and utilization rate, and "information island" in water conservancy department, etc, promote the integration of data resources; realize vertical data sharing with provincial; municipal and county water conservancy departments; as well as horizontal data sharing and efficient utilization across industries; regions and departments.

(4) Business application requirements. For the established business application system, the application module is integrated, and the cooperative working mechanism is established to form the vertical linkage and horizontal cooperative working mechanism.

(5) Performance requirements. Respond to the user's operation in a timely manner, without obvious stagnation to the normal operation; provide progress bar or icon to tell the user the waiting time for the response beyond the response time requirements; no waiting time for data entry operation; display the response time for daily operation.

(6) Security requirements. Including information confidentiality, operation security, data security, data integrity, server security, application system security, etc.

4. System Architecture and Implementation

4.1 Overall Platform Architecture

Zhejiang water management platform is based on the framework of "four horizontal and three vertical". "Four horizontal" are infrastructure system, data resource system, application support system and business application system from bottom to top; "three vertical" are policy system, standard specification system and organization guarantee system respectively. The overall architecture is shown in Figure 4-1.
Infrastructure system. Infrastructure system includes water conservancy perception system and government cloud resources. The water conservancy perception system realizes the dynamic perception of river system, water conservancy project and management activities by constructing an integrated water conservancy perception system.

Data resource system. Based on the existing data resources in Zhejiang Province, the provincial government cloud data sharing and exchange platform is connected, and the construction of Zhejiang water conservancy data warehouse is carried out to realize vertical cross level and horizontal cross industry sharing and exchange of water conservancy industry data.

Application support system. Based on the application support capacity provided by the public application support platform of Zhejiang provincial government, build the general application support capacity of unified map center, monitoring and early warning center, unified user, water conservancy model, intelligent application, carry out self built water conservancy model and intelligent application construction, and build the water conservancy business application support system.

Business application system. Comprehensively combing the core business of water conservancy, relying on the general business collaboration model, and based on the unified business application, carrying out the integration of the built application system and self built application construction, and building six business application systems covering water resources guarantee, river and lake reservoir protection, water disaster prevention, water development planning, water affairs supervision and water affairs coordination.

Policy system. Under the framework of the provincial government's digital transformation policy system, implement the water management platform construction policy system, formulate the rules for the management of data resources, application-operation and maintenance, application-construction management and other provisions of the digital transformation of water conservancy, coordinate the construction of the water management platform, and ensure the coordinated promotion of the digital transformation of water conservancy.

Standard specification system. According to the data sharing standards, technology application
standards, government service standards, safety operation and maintenance standards, system integration standards and other relevant standards and specifications, government digital transformation standard system framework, we carry out the construction, operation, maintenance and other work of water management platform.

Organizational security system. Under the framework of the digital transformation organization guarantee system of the provincial government, according to the task division of the water management platform, strengthen the organizational leadership and establish a working group headed by the main leaders. Establish and improve the construction and operation and maintenance mechanism, increase the training of digital skills, and improve the digital literacy of the personnel in charge of water administration.

4.2 Data Sharing Model

Water data sharing models include intra-industry sharing and out-of-industry sharing. External industry sharing realizes horizontal data exchange at the same level through the government public data sharing and exchange platform of E-Government Extranet and China Unicom. Public sharing within the industry realizes data sharing and exchange with cities and counties through the vertical collection module of hydraulic data. The data sharing model is shown in Figure 4-2.

Figure 4-2 Water data sharing model

4.3 Technical Routes

(1) Demand research and core business carding. Carry out a detailed review of the core business of water conservancy; focus on the core business; form the three lists and one set of maps.

(2) Construction of water conservancy data warehouse. Based on existing water resources data resources, construct provincial water data warehouses, and provide government water cloud data sharing and exchange platforms to provide water data sharing services to comprehensively support cross-level and cross-sector water data sharing exchanges; clarify water data responsibilities and establish a “number one and one”. The "source" and "one source and multiple uses" data sharing mechanism provides continuous, fast, accurate and effective data service support for industry applications.

(3) Management platform portal construction. Relying on the water conservancy data warehouse...
and application support system, a unified portal framework for water management platforms will be constructed, and a unified work platform at the provincial, city, and county levels will be established.

(4) Business application construction. For established applications, conduct assessments to confirm the subsequent operation of the application. For established applications that are determined to be integrated, use data integration, single sign-on, and module access as required for application integration; for new applications, based on water conservancy construction of data warehouse and water management platform portal started.

4.4 Deployment Method
The water management platform is deployed on the virtualization server provided by Zhejiang Government Cloud in accordance with the requirements of Zhejiang Government Ding. The government cloud provides the basic operating environment, including load balancing, server clusters, data caching, backup and recovery, object storage, and databases.

4.5 Infrastructure
After the water management platform is completed, it is planned to be deployed in the Zhejiang Government Affairs Cloud exclusive cloud area. The Government Affairs Cloud Center will provide network environment and server protection, intercept malicious attacks on the server, and ensure the network security of the platform deployment server[3].

The government cloud resources required for platform deployment include ECS server, container service, relational database (RDS), analysis database (ADS), object database (OSS), offline computing engine (Max Compute), and real-time computing engine (Blink). ECS server and container services are used to deploy platform business, data applications and microservices; relational database (RDS) is used to store data management platform operation data (MySQL), business application data and geospatial data (PostgreSQL), according to the amount of storage as needed Configuration; Analytical Database (ADS) is used for real-time analysis and storage of big data, and is configured as needed according to business usage; Object Database (OSS) is used for unstructured data storage, such as files, configured on demand according to the amount of data; Offline Computation Engine ) For data archiving and offline analysis and calculation; real-time calculation engine (Blink) for real-time data analysis and calculation.

4.6 Information Security Design
Network security. Government Affairs Cloud assumes the network security content of the water management platform. At present, the network boundary of Government Affairs Cloud has deployed firewalls, intrusion prevention, security auditing and other equipment for security protection. At the same time, it has strengthened cloud anti-DDoS attack defense capabilities, implemented network access control, and prohibited unauthorized access. Authorized service and protocol transmission[3].

Physical security. The water management platform utilizes the government environment cloud's physical environment and software and hardware resources to build, and relies on the government environment cloud's environmental monitoring and disaster recovery and backup mechanisms to eliminate the risk of data loss, destruction, and leakage.

Data Security. Implement strict data authorization access mechanism to prohibit unauthorized data transmission, storage and access; use data desensitization technology to achieve protection of sensitive data; through data auditing, monitor the entire process of operating data to improve abnormal behavior Probability of discovery and non-repudiation.

Application security. The platform generally meets the second-level guarantee requirements, and the application module can be deployed to the platform before it meets the guarantee requirements. Based on the unified user rights and authentication management, business application access is controlled. Web applications deployed by the Government Cloud ensure application security through firewall and code security testing.
5. Conclusion

Zhejiang water management platform is constructed according to the principle of sharing and coordination, and at the same time, it plays an obvious economic benefit in intensive construction, saving investment, reducing water disaster loss, optimizing water resource efficiency and improving the efficiency of water government affairs.

(1) Raise the level of sharing and avoid repeated construction. The construction of water management platform makes full use of the public support ability provided by the government's digital transformation, breaks down the isolated island of information to the maximum extent, applies the isolated island, greatly enhances the sharing level, avoids the repeated construction of water conservancy information, and saves the national investment.

(2) Strengthen the coordination and improve the efficiency of work. Through standard coordination, user coordination, data coordination, business coordination, and supervision coordination, we will achieve on-line and horizontal coordination of water conservancy work matters; and through unified data, unified users, unified portals, unified maps and unified security, we will realize on-line and vertical linkage of water conservancy core business, greatly enhance the standardization of water conservancy work and improve the efficiency of water conservancy work.

(3) Promote the deep integration of information technology and water conservancy operations, and promote the overall innovation of water conservancy science and technology. The construction of water management platform will make full use of cloud computing, Internet of things, big data, artificial intelligence and other new generation of information technology, and vigorously promote the overall innovation of water conservancy technology.

(4) Improving water conservancy service capacity based on application construction. Carry out platform constructions such as water resources protection, protection of rivers and lakes, defense against water disasters, water development planning, water affairs supervision, and coordination of water government affairs to improve water service capabilities.

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