Research and Design of a Water Supply Dispatching System in a Certain Area Based on Big Data Technology

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Abstract. Water supply dispatching system is an important part of urban infrastructure. Water supply plays an indispensable role in people's daily life and plays an important role in social security, stability and development. Based on the existing GIS technology, SCADA technology, and water conservancy model technology, relying on the Internet, this paper establishes a water supply dispatching system in a certain area to realize the network work of water supply enterprises and the network cooperation among departments. It solves the problems of inaccurate operation data and low economic benefits that have puzzled the management departments for many years, realizes scientific decision-making and management automation, improves management level, work efficiency, economic and social benefits of water supply enterprises, and improves market competitiveness of water supply enterprises. Besides, it solves the problems of data sharing and interconnection between water supply business management system and external systems.

1. Introduction
Water supply dispatching system is an important part of urban infrastructure construction. Water supply plays an indispensable role in people's daily life. The traditional experience scheduling method is a waste of energy, which can not meet the needs of the development of modern society. Besides, when computers enter the Internet era, users are more willing to enjoy the services provided by water supply companies through the Internet. Therefore, in the face of these new demands, it will be a better choice for water supply enterprises to redesign a water supply dispatching system with perfect functions, excellent structure, easy reuse, long life cycle and low investment cost.

Through the establishment of a complete set of water supply scheduling system, it can effectively reduce the cost and increase the production efficiency for the water production unit. Through reasonable water supply scheduling, we can ensure that every household will use water as much as possible, and will not stop water due to unreasonable distribution of water pressure. In addition, the water supply dispatching system can monitor and control the remote field operation equipment, so as to realize the data transmission of pipeline pressure and water flow and the automatic control of valve switch, greatly reduce the failure rate, and realize the informatization and modernization of urban water supply.

2. System design scheme
By collecting the monitoring data of water supply information and dispatching business management data, the system will obtain a large number of data related to the safe operation of water supply, the operation energy consumption of water supply facilities and the operation performance of equipment, which lays the foundation for big data of water supply dispatching. The application of intelligent
dispatching operation platform can realize the intelligent management and control, which is of great significance to the security of urban water supply.

2.1 Overall system architecture
The system adopts three-tier architecture, and the overall architecture of the system is shown in Figure 1.

![Overall architecture of the system](image)

Figure 1. Overall architecture of the system

2.1.1 Presentation Layer. The presentation layer is the interface between the business management system and the external, including the components that need to interact with the user in the application. For system users, it provides convenient access interface; for external systems, it provides standard and scalable interface services.

2.1.2 Business logic layer. The business logic layer mainly includes data acquisition and management subsystem, operation and scheduling subsystem, water supply network GIS subsystem, and integrated management service subsystem, and also includes the internal interface between each subsystem.

2.1.3 Data layer. Data layer is the core of the whole system, which is divided into data access layer and data storage layer. It provides the application program interface for accessing and operating data, and realizes the storage and management of all kinds of data information generated by the system.

2.2 System Functional structure
According to the functional requirements of the system, the functional structure of the overall system is designed as shown in Figure 2.

In the company's office building, the relevant users of LAN can use the browser to realize the remote monitoring of the whole system. The operator can monitor the production process in the central control room, and the company leaders can monitor and inquire the operation of the water plant, pump station and water pipeline in the office or any place with internet connection, so as to grasp the production situation in time.

A basic standard to measure the water supply quality of a water supply pump station is that it must meet the water demand of the least used water point of the water system. That is to say, the least used water point must have appropriate water supply pressure. If it is too low, it will not meet the basic requirements of water supply reliability; if it is too high, it will not only cause unnecessary pressure waste, affect the economy of water supply operation, but also lead to pipe network rupture, resulting in
user water supply interruption and waste of water resources. The management module of large pump station mainly includes intake pump station management and water supply pump station management.

Water supply management business refers to the production, sale and transportation of tap water, covering all businesses of production department, operation Department and Management Department of the enterprise. According to the actual needs of water supply companies, in order to achieve the needs of business management of water supply companies, the basic needs of the system are proposed.

The functions of water supply network GIS subsystem include network query, network editing, network management, network operation, graphics processing and accident processing.

3. Network topology design
The system adopts B/S structure. It only needs browser to complete the customer management. Besides, because the client does not need to install and upgrade, the maintenance workload is greatly reduced. The network topology of the system is shown in Figure 3.

4. Summary
This paper is based on the integration of GIS tool software and visual development language. Through the implementation of the system, it realizes the automatic control of the local water supply, and ensures the normal operation and management of the water supply pipeline. More importantly, we can use the latest network and software technology to complete the integration of water source information data management and water supply dispatching, realize the monitoring of the control system in the company’s internal network and even through the Internet, and provide a large amount of information of the water supply dispatching monitoring system for the company’s management, so that the operation efficiency and management level of the whole enterprise steps onto a new level.

Figure 2. System Functional Structural Diagram

Figure 3. System Network Topology

Acknowledgement
This work is supported by the Education Department of Guangxi Zhuang Autonomous Region. The subject source is the 2019 project of improving the basic scientific research ability of young and middle-aged teachers in Guangxi universities, with the project number of 2019KY1124.

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