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A New Framework on Regional Smart Water

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Abstract

Smart water is the development trend of water information. After analysis of the current key issues of water information, such as construction is not intensive, data resources need to be integrated, business collaboration is not enough, a new overall framework of regional smart water is designed. From bottom to top, it can be divided into sensing layer, transport layer, processing layer, application layer and unified portal layer. In order to share resources and data, the processing layer is further subdivided into the virtual resource management layer, data center layer and service component library layer.

Keywords: Regional Smart Water; Overall Framework; Resource Sharing;

1. The concept and practice of smart water

Water is the source of human life. With the increase of population and urban development, the shortage of water resources is becoming increasingly prominent. Water pollution is also becoming more and more serious. Because of the serious influence caused by the flood, the drought and terrible weather all over the world, supervision and management of the water resources become a big problem for urban development. As an important part of Smart City[1], smart water[2] is expected to help human being by a new generation of information technology and communication technology, which can solve several problems, like the global climate change, the shortage of water resources due to people's overuse, and the complicated water resources situation such as severe flood and drought disaster, the deterioration of ecological environment[3]. It is also expected to improve the efficiency of water resources and promote the construction of water-saving society. Thus, promoting the water conservancy modernization with the water conservancy informationization.

Smart water is also called Smart Water Grid (SWG[4]), Internet of Water[5], Smart Water Management and etc. Some of these definitions focus on the smart water target[4], some highlight the application of information technology

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tools[5], and also some emphasize on mechanism innovation, resource integration and business collaboration from the view of practice[6]. Literature[7] has extracted the characteristics of the smart water with 7 "more", which can embody the concept of smart water.

Countries around the world have invested a lot of money in smart water construction. According to their own conditions, they implement it in stages with scientific and technological means and focus on different parts of it[8]. In the United States, IBM has built a comprehensive real-time sensing network and a real-time online monitoring system for the Hudson River[4]; In Brazil, IBM has established a three-dimensional prediction model which is based on geographic information system. It can effectively evaluate the utilization efficiency of water resources and land development[4]. In the Netherlands, IBM has worked on a project of monitoring the condition of flood inundation, which changed moment by moment, furthermore, they constructed smart levees that would respond accordingly on a real-time basis[4]. The SEQ smart water network in Australian[9] and the recycling water project in Singaporean[9] are two successful models of smart water construction project. Many cities in China have also developed the construction of smart water. Take Wuxi[10], Shenzhen[10], Shanghai[6] for example, according to the status of their water conservancy informationization and the most urgent water problem, they made full use of information technology, broke through the traditional concept, updated system, improved infrastructure, standardized service, embodied the intelligence, attention sharing and collaboration, and then provided a model of smart water construction.

However, there are still a lot of problems in the process of transformation from water conservancy informationization to smart.

First, both the concept and implement of the smart water have different expressions, and different strategies. The smart water concept definition is not uniformed or clear, and its structure has no unified standard.

Second, although the information automatic monitoring has already been implemented in the aspects of hydrology, rainfall, disaster, water resources development, production management, project construction and so on, the information collection cannot fully meet the needs of water management. The monitoring site layout, layout density and the timeliness of data acquisition, normative and reliability need to be further optimized.

Third, due to the lack of top-level design, construction of water conservancy informationization has many more subjects and different sources of investment, the degree of coordination in construction projects is insufficient, and the intensive degree of informationization construction is not high. Thus in some degree causing infrastructure duplication of investment, information separatism and waste of resources, lack of unified management mechanism of information resources.

Fourth, at present most of the water conservancy informationization application is still in the information release stage, information among applications lack regulate circulation, inter departmental coordination is not enough, the development and utilization level of information resources is not high, lack of effective analysis and processing of data, business decision support ability is not strong enough.

Therefore, to define smart water and design its overall framework are two basic tasks for the smart water.

We consider that smart water should have the following 3 characteristics:

- Comprehensive and detailed data collection:

Smart water can achieve a more thorough perception and obtain more comprehensive and complete information through the technology of Internet-of-things. Meanwhile, relying on the perfect control system, smart water can control the bottom intelligent terminal more accurately and automatically.

- Intelligent and real-time data processing:

By taking full advantage of cloud computing, data analysis, data mining, three nets fusion technology, the smart water system can integrate the existing isolated data, mine the newly collected data deeply, thus enhancing the efficiency and effectiveness of water management, and making more scientific decision and more timely reaction.

- Specification and coordination of business applications:

Smart water is a system which realizes the whole process of management of the water cycle. This covers all aspects of water-involved affairs, including drainage, flood and drought control, water resources management, rural water conservancy and other wading things. Besides, the service standards of each business department are strict,