Research on the Architecture and Application of Smart City Based on Big Data

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Abstract. The construction of Smart City is faced with technical issues and innovative concept challenges such as data island, information fragmentation, large amount of data "sleeping". In this paper, on the basis of macro-demand and industrial practice analysis, the framework of Smart City platform based on Big Data is proposed. The structural design of the platform includes Data Access Layer, Data Management Layer, Data Analysis Layer and Release Management Layer. The application architecture design includes People's Livelihood Service, Citizen Big Data, Urban Operation and Big Data Map. The platform can digitize and analyze a large number of government business activities and provide support for fine governance decisions.

1. Introduction
By 2020, China's urban population is about 873 millions, accounting for 61.9% of the total population. The urban transportation, the environment and the infrastructure are facing great challenges. In order to solve the above problems, the Smart City has been developed. The construction and development of Smart City has become an important method for the state and governments at all levels to improve urban management and realize intelligent service operation. According to the current situation of the development of smart cities in China, it is concluded that the development of smart cities is closely related to data acquisition and data management [1]. How to make good use of the data that runs through all levels of smart cities to achieve full data collection, comprehensive data integration, and in-depth utilization of data has become a hot and difficult point in the industry [2].

In this paper, the Smart City platform based on Big Data is proposed, which is analyzed from three aspects: platform architecture, application architecture design and data architecture design. This platform can realize the digitization of urban activities and transfer them to the platform data processing center through the data interface. The platform analyzes the data, and the use model and prediction model are established to realize cross departmental, cross regional and cross industry exchanges and optimize urban fine governance.

2. Macro-demand and Industry Practice Analysis

2.1 Smart city policy analysis
In 2008, IBM put forward the concept of "smart earth", among which the concept of "smart city" has received extensive attention from domestic governments at all levels and the industry, and related action plans have been released. In 2014, the "National New Urbanization Plan (2014-2020)" was...
released, and the construction of smart cities formally became a national strategic plan. Especially in July 2017, in the "New Generation Artificial Intelligence Development Plan", it is clear that build an urban big data platform, build a city operation management system that integrates multiple heterogeneous data, and realize a comprehensive perception of important ecological elements such as urban infrastructure, urban green space and wetland, as well as a deep understanding of the operation of complex urban systems. Research and construction of a community public service information system to promote collaboration between the community service system and the smart home system of residents. Promote the intelligentization of the entire life cycle of urban planning, construction, management, and operation [3].

The policy system for smart city construction is gradually improving, the core is to carry out in-depth applications on the basis of data intensive and maximize the value of data, thereby contributing to improving the level of urban governance and enhancing the sense of acquisition of urban enterprises and residents.

2.2 Industry practice analysis
The industrial practice of smart cities has formed certain experience, such as the “Six Ones” thinking of China Telecom, Huawei’s “One Cloud, Two Networks and Three Platforms” smart city solutions, and ZTE’s smart city solutions based on big data. City 3.0 and so on. The core elements of domestic related industry practice include four aspects.

First, build a complete basic network, including fixed broadband networks, mobile communication networks, radio and television networks, urban Wifi networks, and IoT private networks. Second, establish an integrated and open data system, integrate multi-source data, form a basic urban big data platform, and achieve open applications as much as possible. On the one hand, build better applications in various fields such as government governance and people-benefit services, and on the other hand, more comprehensive data collection can be achieved [4]. Third, establish a universal functional platform. Based on a common functional platform, it realizes the scheduling management and service-oriented packaging of various information resources, thereby supporting the intelligentization of urban management and public services. Fourth, establish an efficient city operation command center to effectively grasp and manage the city’s municipal facilities, public safety, ecological environment, macroeconomics, and people’s livelihood and public opinion [5].

3. Framework Design of Smart City Platform

3.1 Platform architecture design
Smart city big data analysis platform is one of the core systems of smart city. It mainly includes four functions: big data access, data management, data analysis and release management. The complete process from external data collection to analysis and display is realized.

In Figure 1, the platform mainly includes Data Access Layer, Data Management Layer, Data Analysis Layer and Release Management Layer. The Data Access Layer includes service-oriented interface design to reduce the coupling between systems. The Data Management Layer establishes a special database through the collection, cleaning, storage and quality control of various data of the Smart City system, and realizes the multi scene and multi-mode Big Data display through the visual display component of the mined and analyzed data. The Data Analysis Layer uses the data analysis module to mine and analyze the collected government service data, and establishes a data analysis model to provide three-dimensional and all-round service data for urban development. The publishing management can meet the big data analysis and display needs of different application scenarios by customizing the mode. And through the intelligent release control system, realize the rapid release and transformation of various display contents and display styles.
3.2 Application architecture design

Smart City has planned and built different smart application systems according to different application fields, and generated data on different topics, mainly including people's livelihood Big Data, citizen Big Data, urban operation Big Data and Big Data map. For the overall operation of the city, it is necessary to analyze the key operation indicators of the city based on urban Big Data to assist the city's senior managers in making decisions and understand the overall operation situation of the whole city.

In Figure 2, people's livelihood data includes five thematic databases closely related to people's lives: urban transportation, residents' health, public culture, public welfare services and government services. Citizen data carries out portrait analysis on the overall situation of citizens and individual citizens, and carries out the group division and analysis according to the label of user portrait. It can help the government further improve the level of fine service and management, and provide scientific basis for auxiliary decision-making for social governance [6]. Urban operation Big Data is visualized through urban key operation indicators. It realizes the panoramic analysis of the city's people's livelihood and public welfare, residents' health, public safety, transportation and government affairs. Big Data map is an important part of Big Data analysis and display. The Big Data map is connected to the map component of the support platform to convert the data analysis results into map thematic data layers to form a Big Data interactive display map.
3.3 Data architecture design

From the perspective of data source, data comes from data exchange and the sharing platform, departmental systems, Internet of things and Internet. From the perspective of theme, economic innovation is built, people's livelihood and public welfare, general health, public safety, transportation and public utilities. The data of platform application has the characteristics of complex structure, many application dimensions and large amount of data. From the perspective of data structure, it can be divided into three categories: overall macro data, meso local data and detailed data. The data architecture design provides data support for the whole smart city platform.

4. Conclusion

In this paper, a smart city platform architecture based on big data is proposed. Smart city platform architecture mainly includes the platform of application architecture and the data architecture. Smart city big data analysis platform can collect all data of the city. Through artificial intelligence algorithm, data security protection and distributed workflow engine, an intelligent data mining, analysis and prediction model is established. This platform can solve the outstanding problems of urban governance, realize intelligent urban management service operation, and improve the level of urban precision management.

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