

# Research on the Application of edge Computing in new smart cities

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**Abstract:** In recent years, with the rapid development of the Internet of Things and 5G network, edge computing has gradually become a “flash point” of new technology research and development, which has received attention from all walks of life. At the same time, it is accelerating the change of people’s lives. Edge computing, with its significant advantages of reducing the delay of data transmission and improving the data processing speed, is gradually penetrating into the construction of new smart cities and providing a variety of possibilities and directions for the construction of new smart cities. This paper takes this as the starting point, and on the basis of briefly explaining edge computing and its application advantages in new smart cities, focuses on the specific application of edge computing in new smart cities to launch an in-depth exploration, in order to provide some useful references and enlightenment for promoting the construction of smart cities.

**Key words:** Edge computing; New smart city; applications

## Introduction

Smart city, as the development model of a new generation of cities, aims to integrate various types of urban resources, optimize resource allocation, improve the overall operation efficiency of the city, and comprehensively improve the quality of life of the people by using a variety of emerging technologies. In recent years, the construction of smart cities has been continuously promoted in China, and a large amount of social capital has been invested in it, which has promoted the large-scale development of the smart city industry. In recent years, China’s smart city market has been growing at an annual rate of 30%. By 2022, the market size has reached 21.08 trillion yuan, in 2023, the value is about 24.3 trillion yuan, and it is expected that in 2024, the value will further increase to 28.6 trillion yuan. With the rapid development of cities, a large amount of data will be generated in the process to be analyzed and processed, which will provide strong data support for rapid decision-making. However, most of the traditional computing models need to transfer the data to the central server for unified analysis and processing, which is not only time-consuming and labor-intensive, but also difficult to ensure the security of the data in the transmission process. Under this background, edge computing came into being. How to realize efficient processing of large amounts of data with the help of edge computing and boost the construction of new smart cities is one of the important directions of this paper.

## I. The edge computing concept and the advantages of its application in the construction of new smart cities

### 1. Overview of edge Computing

Edge computing is an important product of the rapid development of today’s information technology. It is gradually becoming one of the key technologies in data processing, intelligent analysis and network response, affecting people’s lives and social development. Edge computing aims to move computing power forward to the source point of data generation, that is, the user end. This calculation method close to the user greatly reduces the extra delay caused by data transmission through the traditional network, and is conducive to rapid data capture and accurate processing and analysis. By directly deploying the data processing logic, storage and core service capabilities near the user, it can provide users with fast and accurate services in the shortest time, greatly improving the overall response speed and data processing capability of the system, so as to effectively ensure the privacy and security of users. From the level of architecture design, edge computing is mainly through the network slicing method, PaaS, IaaS data center functions are reasonably divided, among which, the key data processing tasks can be separately divided and deployed to different levels of edge computing nodes, such as special chips, special industrial computer, etc., and then form a smaller capacity unit. Such a capability unit is easier to manage and more flexible. Today, many factors are driving the growth of edge computing, such as the blue ocean of data generated by the Internet of Things, and the response of SDN architecture to system agility and dynamic services. The following table □

**Table 1. The number of publications on edge computing Knownet at home and abroad from 2019 to 2023**

Year	Domestic	abroad
2019	1235	1668
2020	1894	2143
2021	2274	1529
2022	2441	1376
2023	1845	1139

## 2. Advantages of edge computing in the application of new smart cities

(1) Greatly improve the response speed and efficiency of smart city applications. Traditional smart city applications mainly store and analyze data through a central server. The disadvantage of this method is that there is a huge amount of data, which may cause high processing delay. At this time, the use of edge computing technology can truly transfer data processing from the cloud to the edge of the network, which greatly reduces the data transmission delay, and data processing and analysis are faster. Take traffic flow control system as an example, the application of edge computing can receive and analyze the massive information from a variety of sensors such as road cameras, traffic light sensors, vehicle GPS and so on in real time. On this basis, according to the conclusions drawn from the data analysis, the change period of the specific intersection signal light can be quickly adjusted, which can effectively alleviate traffic congestion. Improve the utilization rate of the road. Especially in the event of an emergency, a series of relevant response procedures will be launched quickly, resources will be rationally deployed, and timely assistance will be provided, which highlights the value of edge computing applications in smart cities and is of great significance to improving the convenience of residents' lives.

(2) Effectively improve the security and reliability of data and information. The data generated during the operation of smart cities may be extremely important and sensitive. If edge computing is applied to video surveillance, traffic guidance and other links, it is bound to pay attention to protecting people's personal data privacy. Different from the traditional cloud computing model, edge computing can immediately encrypt and pre-process the data near the data generation point to ensure that sensitive information has been properly processed before leaving the place, which effectively weakens the possibility of sensitive data being stolen, and at the same time, ensures the integrity of the data. In addition, edge computing has decentralized data processing nodes, which further reduces the dependence of data processing on a single data center, which is conducive to enhancing the reliability of the entire system. Even if a network failure occurs at one node, other nodes can still operate normally, which is crucial to ensure the continuity of critical services.

## II. The specific application of edge computing in new smart cities

### 1. Smart transportation

Public transport is the key lifeline of a city, and promoting the intelligent construction of public transport has become one of the important goals of building a smart city. Through the close combination of edge computing, cloud computing and 5G communication, intelligent bus stops, intelligent traffic signal systems and intelligent express delivery have emerged, which not only helps realize the intelligent management of public transport, but more importantly, it can also bring a lot of convenience to people's travel and life by improving the efficiency of public transport, and increase the happiness of the people. Take the city of Shanghai as an example, Shanghai Metro used edge computing in the public transportation system, and successfully built intelligent bus stops and intelligent subway halls, providing the public with a variety of humanized functions such as voice navigation, public wireless, real-time passenger information query, and promoting the intelligent development of public transportation. Of course, It has also effectively alleviated the traffic pressure in Shanghai and brought satisfactory travel experience to the people. In addition, edge computing can also be used in the intelligent traffic signal system, with the assistance of vehicle positioning and intelligent identification technology, to achieve green wave switching and intelligent deceleration functions, which greatly reduces the waiting time of the masses, making the travel more smooth and convenient.

### 2. Smart medical treatment

Research data shows that traditional medical cloud has a variety of problems in the collection of edge data information, especially in the link of patient reception, including but not limited to the problem of information synchronization is not timely, regional data information summary speed is slow. Edge computing provides an effective solution to solve the above problems, highlighting its application value in the construction and development of smart medical treatment. Medical institutions can add edge computing-related devices to related diagnosis and treatment equipment systems and monitoring equipment, and realize the function of automatic data collection and analysis of equipment in a similar way. In order to be able to re-summarize and in-depth analyze the standardized aggregated data nationwide, the establishment of public cloud data centers is also crucial. In this way, a national medical information resource database and related disease model database can be formed, and then provide solid and powerful data support for disease treatment, health control and the construction of a systematic medical system. With these comprehensive and accurate data, the government and decision makers can better and faster respond to diversified disease challenges and formulate scientific and reasonable policy measures.

## III. Smart emergency response

The research focuses on the field of emergency management. As mentioned above, edge computing has the characteristics of high reliability, high broadband and low delay, which can meet the personalized needs of real-time, efficient and rapid response in diversified application scenarios such as monitoring, perception and emergency response in the field of emergency management, and promote the intelligent level of emergency management in China to achieve a significant improvement. At present, China's smart city smart emergency construction mainly exists monitoring and warning and risk perception system to be improved; There is a big gap in systematic, digital and visual combat capabilities; Edge computing, as an extension of cloud computing, can be combined with cloud computing to form a "cloud edge end" collaborative system, in collaboration with the two to complete a variety of workflows, and finally build a "cloud edge end"

intelligent emergency perception system, the specific architecture is shown in Figure 1 below.

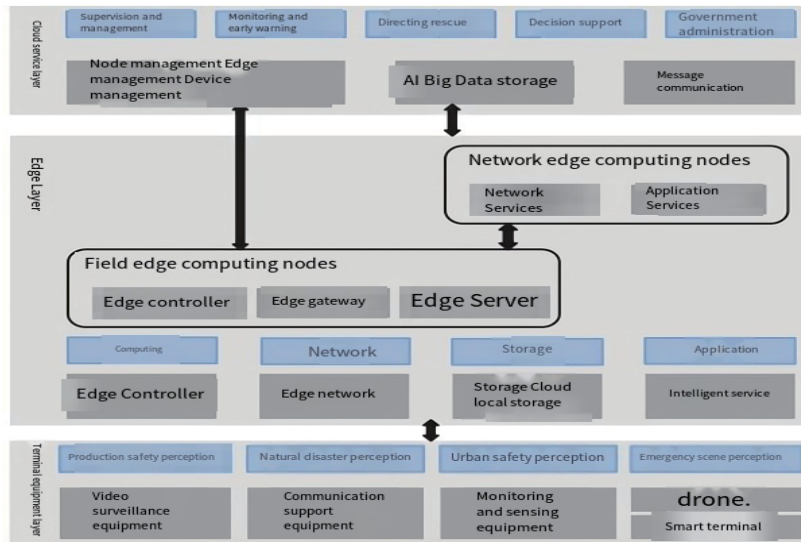


Figure 1. Architecture diagram of “cloud edge” intelligent emergency perception system

### Epilogue

Of course, the application of edge computing in addition to the above mentioned also includes a wide range of applications in smart government affairs, smart industrial production and other fields. The development of edge computing provides solid technical support for the construction of smart cities, which is conducive to significantly improving the service quality of cities and enhancing people’s happiness. In the future, with the rapid development of edge computing, it is believed that it will be fully and effectively applied in more fields, and the smart city based on edge computing will gradually develop in a smarter and more efficient direction, which is of great significance to the construction of a smarter, sustainable and green urban ecology.

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