

# Architecture and Simulation of a Social Management Service System Based on the Internet of Things Information Model

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Due to the continuous growth of computer technology and the progress of network technology, there has been a positive trend in the development and construction of urban informatization. The informatization construction of the community requires a foundation of powerful support software. The community electronic service system is an important part of the community informatization support software, and the entire service process is completed in an electronic form. Therefore, there is an urgent need to develop a community social management service system with superior performance, powerful functions, and that is convenient for community use. First, this article adopts an object-oriented analysis method, focusing on analyzing and collecting the business requirements of the system, and uses unified modeling language to establish the system use case model; secondly, the analysis is used to formulate the overall design plan of the system, including the software architecture design, functional module design and database design. Through the design of the system's flowchart and other graphic models, the core functions of the system are described in detail, laying the foundation for the realization of the system; finally, using the B/S system architecture and Visio 2010 drawing tools to establish a corresponding data model diagram, a system suitable for the needs of the social management service industry is designed. The system realizes the main functions of the population management and community information management modules.

Keywords: Community information management; Internet of Things; Information system management

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## 1. INTRODUCTION

The so-called Internet of Things (IoT) is a type of information technology that uses Internet technology to connect people to objects not normally connected to the Internet. It is an extension and development of the Internet and a new product under the reform of information technology [1]. The technology involves multiple industries and is based on the nature and needs of the industry. The application is also different, as it mainly covers network communication technology and computer and service technology [2]. In the late 1990s, after a long period of development, the Internet

of Things was fully incorporated into various industries and now plays an irreplaceable role in people's lives and work [3]. The Internet of Things information management system has fully adopted advanced information. Technology, following the principles of intensive and large-scale, provides corresponding services for various industries. It mainly consists of two parts: a platform and modules. Through the platform of the IoT information management system, the development and deployment of related services can be realized, and running a module is the basic purpose of all Internet of Things software [4]. While the platform and module are independent of each other, they need to co-operate under the operation of the platform to complete tasks. The Internet of Things information management system has the

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following three functions; firstly, to form corresponding data according to certain rules; secondly, to effectively analyze this data; and finally to accomplish the consolidated management of the data.

The role of the Internet of Things in public services includes: Basic public services, smart grids, and intelligent transportation services using the application of this technology. IoT technology is applied to the public transportation system of urban transportation, this can use the positioning function of the on-board equipment to monitor the operational capacity of the public transportation in real time [5]; the vehicle management expert system can use global satellite positioning technology and wireless communication technology, geographic information system technology, and other high-tech various media information such as images and videos inside the vehicle, and other vehicle parameters, effectively satisfying users to realize intelligent transportation services for various needs of vehicle management [6]. Social public services are used to meet the unique social needs for survival, life, and development, including education, science popularization, social security, and environmental protection. IoT is also applied in the medical and health field, which can realize the management of mobile drug testing, mobile test specimen management, data storage and recall, baby anti-theft, nursing processes, clinical paths, etc. [7]. The “electronic medical” system constructed by the combination of Internet of Things technology and IC cards will realize telemedicine and self-service medical treatment, reduce the cost of medical treatment for the public, and realize the integration of personal ID information, social insurance, medical insurance, medical treatment, and financial services [8]. The “all-in-one card” solves the problem of settlement by credit card for medical treatment in other places. The “Smart pension” based on the application of the Internet of Things is expected to become a path for China to respond to the problem of an aging population and realize a new model of pension. The technology can be used in aged care by installing a global positioning system (GPS) tag on the elderly, with various sensors being used to keep their daily life under remote monitoring [9]. Smart pension is an IoT platform for home care call assistance and remote health management. It will effectively integrate technological means, such as communication networks, smart calls, vital signs monitoring, and the IoT. Smart pension will also establish an information database for the elderly, provide emergency rescue, life care, housekeeping services, spiritual care, health management, value-added services, rely on the community, effectively integrate social service resources, establish a complete home care service system, and create a real nursing home without walls. In terms of social and economic development, the development of a new generation of information technology such as the Internet of Things has promoted the further optimization and balance of the industrial structure, and in the development process, advanced technologies will penetrate into many fields to improve their management efficiency while also reducing social operating costs [10]. It will further promote the transformation of the entire social economy from the original extensive and high-consumption model to an intensive and efficient model. Industry is an important field for IoT applications. Various computing models, based

on ubiquitous technologies and communications, are continuously integrated into all aspects of industrial production; this can greatly increase manufacturing efficiency, improve product quality, reduce costs and environment consumption, and integrate traditional industrial upgrades into a new stage of smart industry. Through the deep integration of IoT and traditional service industries, high-end productive service industries such as e-commerce, modern logistics, and online finance can be developed. IoT is applied to various fields of the financial industry; for example, mobile payment is a new type of service that uses a mobile phone embedded with a chip to operate bank card accounts to complete payment transactions. By promoting the integrated application of the Internet of Things in various industries and fields of the national economy, the government can continuously create and cultivate new business formats and form new economic growth points for the national economy [11]. IoT can also be applied to the monitoring of environmental safety. The integration of the Internet of Things and environmental protection equipment realizes real-time monitoring of various pollution sources and indicators of pollution control in the industrial production process. The installation of wireless sensing equipment at the sewage outlets of sewage companies can not only monitor the company’s sewage data in real time, but can also remotely close sewage outlets to prevent sudden environmental pollution accidents. This article will discuss the development and design of the information management system of the Internet of Things.

## 2. CHARACTERISTICS OF IOT TECHNOLOGY

### 2.1 Technical Characteristics of the IoTs

Figure 1 shows the framework diagram of the integrated information management platform for the Internet of Things designed for the current problems of the Internet of Things platform and the network characteristics of the Internet of Things. Based on the general network management idea, this platform regards various sensing devices as nodes in the network to realize the five major functions of network management, and provides safe, controllable and even personalized real-time online monitoring, alarm linkage, dispatch command, remote control, management and service functions such as safety protection, statistical reports, decision support, etc., in order to realize the integration of management, control, and operation of high efficiency, energy saving, safety and environmental protection of everything [12]. A comprehensive information management platform for the Internet of Things has been designed according to the three-tier architecture of the Internet of Things.

The support system and the other four subsystems have different influences and interactions. This part will analyze the corresponding relationships from the following four aspects: the relationship between the support system and the strategic system is that the strategic system clarifies the information technology system, information infrastructure system, and infrastructure informationization of the support system by

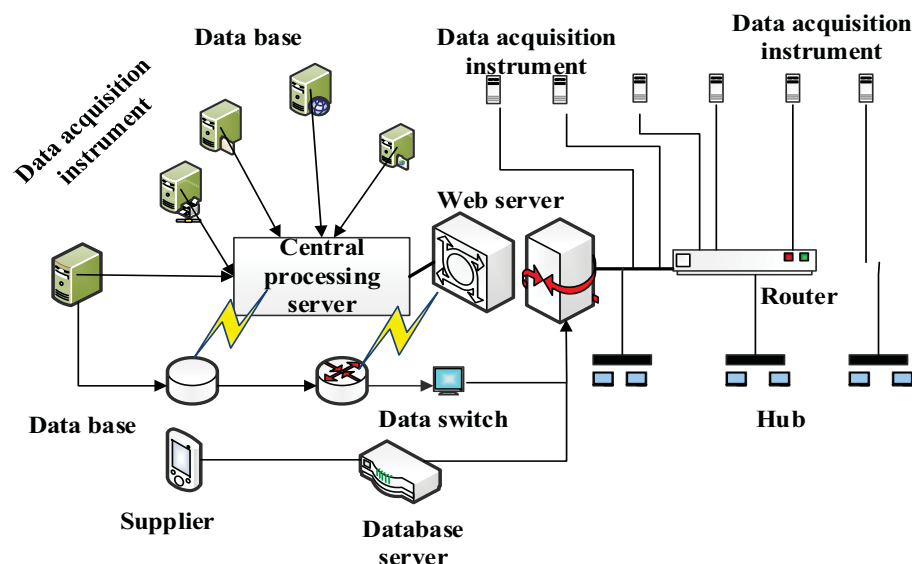


Figure 1 Physical structure of the IoT management platform.

formulating the information technology development tasks and information infrastructure construction tasks within the strategic tasks. The construction and development tasks of related content in the system, at the same time, through strategic execution and implementation, aid the establishment and improvement of the supporting system to promote the achievement of information technology development goals and infrastructure construction goals, and then realize the city's environmental development vision.

## 2.2 The Impact of the Core Technology of the IoT on the Social Management Service System

The comprehensive information management platform of the Internet of Things selects different networking methods, such as wired or wireless networking, according to the different collection objects. Different sensor planting points can be selected according to needs, such as temperature and humidity sensors, pressure sensors, etc. The data collection terminal of the comprehensive information management platform of the Internet of Things is composed of hardware and software. The collection terminal can process and store the data collected from the sensor node, and transmit it when the network layer sends a request. The integrated information management platform of the Internet of Things can use middleware technology to parse and encode data in the perception layer based on the TCP/IP protocol, and transmit it to the network layer. It is also compatible with communication modes such as wired and wireless networks to achieve different communications with access to and from heterogeneous IoT networks based on common protocols [13]. The specific situation is shown in Figure 2.

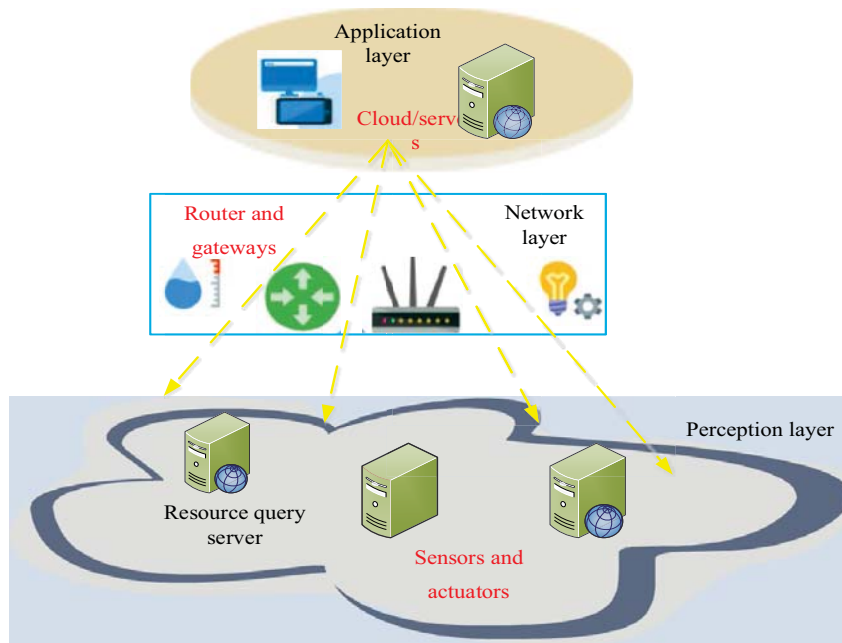
As shown in Figure 2, the application layer of the integrated information management platform of the Internet of Things is usually composed of hardware devices and application software. Among these, the hardware equipment adopts

the concept of cloud computing on the premise of meeting the requirements of network functions to complete the main functions on the server, including the data storage server, web server and central processing server, and also to be responsible for data storage and application program management and the processing of various functions. Administrators and operators access cloud data through the network to make the system more secure and reliable, so as to facilitate the expansion of system functions and scale. On the premise of satisfying the basic functions of network management, the application software realizes the management of most of the Internet of Things and its resources through general management templates. Users can also customize templates according to the special requirements of different industry applications. Most of the software systems are based on B/S structure and can provide remote maintenance support [14].

## 2.3 The Specific Impact of IoT Technology on Public Services and Management

With the increasing maturity of the environment of the Internet, the public's level of informatization has also steadily increased. The government must consider how to further improve the degree of public services and management under the new generation of information technology [15]. The Internet of Things is an even more powerful tool for e-government.

The Internet of Things improves the automatic monitoring and identification capabilities of management objects in various fields by integrating the construction of existing urban management system resources, while building a unified physical network architecture system to create a smart city. A "Smart city" can take full advantage of information technology to sense and integrate various pieces of information concerning the urban operation of the major system. It responds intelligently to the various needs within the city and creates a better life for citizens. A smart city is one



**Figure 2** The core technical architecture of the Internet of Things technology.

with unified monitoring of the digital management of the city and city safety. The digital management of cities develops and applies spatial information resources, constructs services for urban planning, urban construction and management, serves the government, enterprises, and the public, and serves infrastructure and systems for the sustainable development of resources and economic society. It can realize the unified monitoring, storage and management of urban safety, and provide urban management and builders with a brand-new, intuitive, and audio-visual extended management tool.

Carrying out the application of the IoTs in the field of government affairs on a unified public platform framework and improving the government's administrative management capabilities will play a major role in changing the situation of decentralized and isolated development of various government departments and truly achieve information sharing [15]. With the support of modern computers, network communications and other technologies, more real, accurate, comprehensive, and instant social information can be obtained through the Internet of Things. The government can establish a large-scale special database to play a role in administrative decision-making, government instruction transmission, and regulation and management. The management function of an administrative organization has the basic requirements of modernization and high efficiency. The administrative organizations under the Internet of Things have established information exchange and interaction between government departments, government and society, and government and the public. The IoTs makes it possible to real-name the network (everyone has an accurate information to identify). It will help to promote the transformation of government management from "things to people" and realize people-oriented management. Online content is becoming increasingly multimedia focused. For example, the provision of online meeting video viewing services, the disclosure of government information containing a large number of pictures, and government portals

that need to process massive amounts of data, all of which need the Internet of Things and cloud computing platforms to improve the operating efficiency and reduce the construction cost of the government data center. With the popularization of mobile terminals and the application of high-capacity mobile communication technologies such as 5G, more and more mobile devices will enter the government application system [16]. The government application system will bear more load than before, and it also needs the help of cloud computing platforms to reduce response times. The Internet of Things can therefore be incorporated within the government to save resources. The Internet of Things makes it possible to update and share various government information resource databases in real time, and also enables these resources to be managed and utilized in a comprehensive manner, thereby avoiding resource idleness, waste and repeated construction. Realizing the internationalization of government procurement with the full support of the Internet of Things not only saves time, energy and financial resources, but also reduces the trouble caused by intermediate operations.

The Internet of Things can be used to enhance the government's social management capabilities, innovate social management models, and promote orderly and harmonious social management. In recent years, factors affecting national security and social stability have continued to increase, social conflicts and disputes have increased, and social public incidents, major criminal cases, and vicious accidents have occurred frequently, posing threats to economic and social development and people's safety. As the government lacks a unified information management platform and means for social management, basic data and resources cannot be fully shared, information on various unstable events in society cannot be reflected in a timely, comprehensive, and accurate manner, and leaders at all levels cannot control the overall situation. This technology can establish a social management platform, enhance the government's social management

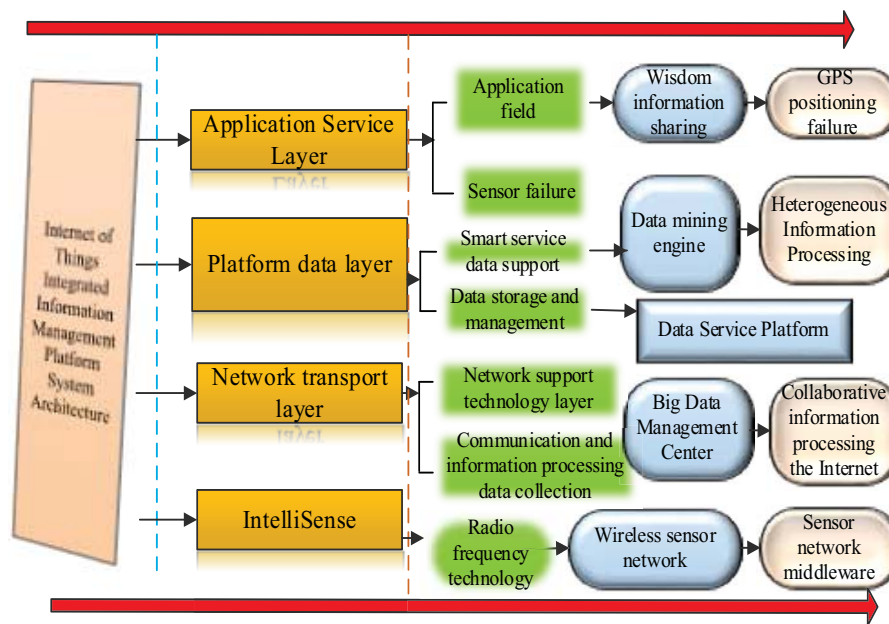


Figure 3 Thousand-units system architecture for comprehensive information management of the Internet of Things.

capabilities, and innovate social management models. The Internet of Things enhances government emergency management capabilities. The Internet of Things provides an effective platform to effectively control a crisis and establish a rapid crisis response mechanism. The application of the Internet of Things enables government departments to perceive and capture external feedback information in a timely manner to fully grasp the flow, processing, co-ordination and sharing of information. In addition to on-site handling of public emergencies, government emergency management has made full use of various technical means, including modern computer technology, network technology and satellite communication technology, to establish an emergency system to strengthen the monitoring, early warning, and notification of public emergencies. Indirect handling such as command, control, and co-ordination has greatly improved the ability and level of emergency management [17]. The social management platform system effectively integrates various information resources and basic data of the entire society in the region on a unified management platform, realizes the sharing of information and data, and provides a scientific basis for party and government agencies to lead social management work. The system can provide leaders at all levels with real-time, comprehensive and accurate information, including the dynamics and detailed information of various social instability events that occurred in various places at the time. It can sense and understand the latest happenings in various places quickly and easily. For major emergencies, the overall situation can be grasped in real time, contradictions can be discovered and resolved in a timely manner, preventive and control measures can be taken, and the hidden dangers of unstable events can be solved before they become disastrous. The system can also promptly call all parties' forces to co-ordinate and manage social stability work, supervise, manage and control the entire business process of handling various unstable events, and conduct timely risk assessments and correct judgments on common social problems; this is beneficial in avoiding risks,

resolving conflicts, and preventing and controlling major incidents from the source.

### 3. SOCIAL MANAGEMENT SERVICE SYSTEM

The relationship between the support system and the economic and social systems is mainly reflected in that the support system provides technology, facilities and platform support for the economic and social activities in the economic and social system. Firstly, the intelligent development of economic and social activities in social and economic systems requires technical and facility support in order to support the information technology, information network infrastructure, and informatization of infrastructure in the system. They are to promote economic and social activities to digital and networked, The basis for the evolution of intelligent forms. Secondly, economic and social activities in the economic and social systems can realize the leap from “intelligence” to “intelligence” mainly through public information platforms. Through the integration and sharing of data and information, the public information platform realizes the interconnection and intercommunication between different activity subjects and between the urban material space and the network virtual space, and promotes the collaborative operation and innovative applications in different fields. At the same time, the professional application services provided by the public information platform through its data analysis and mining technology provide an important basis for people to carry out economic and social activities more wisely and efficiently. Therefore, the “information sharing”, “coordinated operation” and “wise decision-making” supported by the public information platform have become key factors for the intelligent evolution of economic and social activities. The main impact is shown in Figure 3.

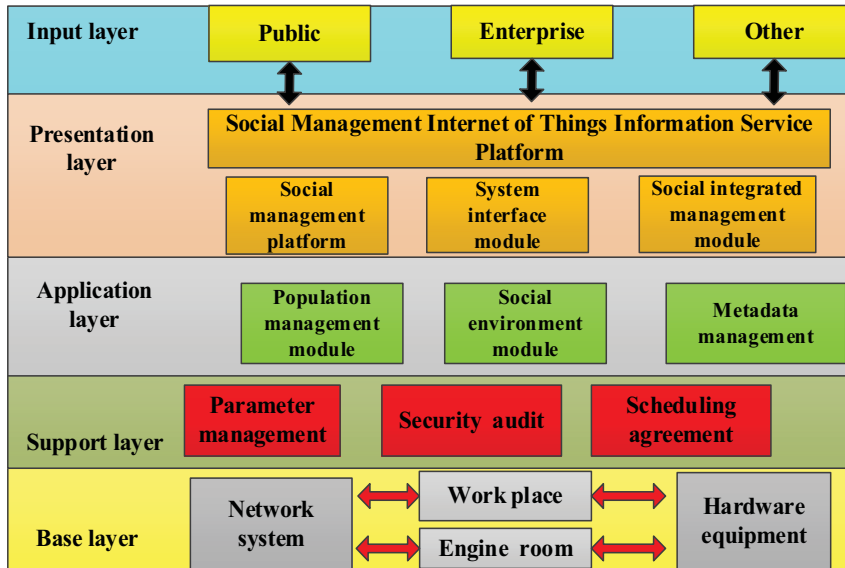


Figure 4 Software architecture design view.

### 3.1 Features of the Integrated Information Management Platform for the Internet of Things

The main features of this IoT integrated information management platform are manifested in the following five aspects:

- (1) It can be applied to various fields. This IoT comprehensive information management platform has no industry restrictions. The perception layer can access different sensor planting points (such as temperature and humidity sensors, pressure sensors, etc.) according to industry needs for information collection; the software management system can achieve different management functions for different objects, In order to build an expandable and visualized comprehensive management platform [18].
- (2) Compatible with multiple communication modes. The self-developed middleware can be compatible with multiple communication modes, and realize the access to the heterogeneous Internet of Things networks of different communication protocols, thereby truly forming an organic communication network platform that can connect various sensing terminals.
- (3) Unified agreement. This comprehensive information management platform for the Internet of Things manages equipment based on the standard network management protocol SNMP, can provide open interfaces to users, and is compatible with independently developed protocols and special industry protocols, and can also achieve inter-communication between different devices and networks. This will realize the management of different fields and different equipment [19].
- (4) Modular and distributed design. Based on the idea of general network management, on the basis of general management functions, it can provide management functions for specialized industries, and realize the

modularization and distribution of terminal equipment management. This platform can be large or small, deep or shallow, can be used alone or in combination, and can be easily tailored to an industry real-time management platform, such as industrial computer room management, grain storage management, pollution or energy consumption monitoring management, etc [20].

### 3.2 Social Management Service System Architecture

The user interface layer represents the objects that use the system, including the public, government enterprises and institutions, and other corporate institutions; the presentation layer is the operating environment and a good system interface must be provided by the system for the user interface layer, as it is the interface between the user and the computer. The software architecture design view is shown in Figure 4.

The application layer covers the management platform of the system, and mainly realizes the main functions of the system, including the main functional modules such as the system community comprehensive management module and population management module [22].

The support layer of the system provides an important guarantee for the operation of the system. It is a non-functional attribute of the system, which mainly includes the workflow, metadata management, electronic form generation and management, parameter management, identity authentication, security audit, and statistics during system operation. The basic layer is also the physical layer of the system. It mainly builds the operating platform for the system, including some software and hardware platforms, including hardware equipment, such as network system environment, computer room, hardware equipment, security equipment, etc. The software environment includes operating systems, and IoT information deployment platform software, etc.

**Table 1** System overall function test scenarios and test results.

Input/action	Pass event	Failure affairs	Average response time	Maximum response time	CPU utilization	Memory	Pass
System login	310	0	0.48	1.24	27.5%	30.4%	87%
Add personnel basic information	2400	0	1.21	1.97	36.4%	38.7%	90%
Community population information retrieval	2100	0	1.29	1.68	37.1%	40.1%	91%
Query information about permanent residents	1600	0	1.47	1.89	60.2%	50.3%	92%
Community population information retrieval	500	0	1.87	1.98	58.4%	50.4%	92%
Query information about permanent residents	540	0	2.19	3.87	58.7%	50.3%	93%
New community information	650	0	3.14	4.72	55.7%	60.2%	92%
Building information management	600	0	4.02	5.15	60.2%	40.7%	95%
Community alert management	140	0	8.74	5.38	60.3%	76.6%	94%
Community staff management	210	0	8.46	10.48	74.5%	63.2%	95%

## 4. EMPIRICAL RESEARCH – SYSTEM TEST CASES

### 4.1 Test Case Design

The main function of the IoTs information management system is to realize the effective management of data. From the formation of data to the analysis of data to the effective management of data, it embodies the superiority and versatility of the platform [22]. It can assist developers in designing software modules according to their own needs, not only to realize the design of the module interface and function, but also to effectively design the storage structure of the module, and then obtain business metadata and the main manager [23].

The function of the system is to publish the modules that have been designed, and to group scattered modules into a specific whole. The production runner to realize the software product provides an effective operating platform for the modules, which can be based on the different needs of the enterprise. This data can be interpreted to achieve effective operation. These three units co-operate and influence each other to form a complete Internet of Things information management system. From system management to work design to information query, there are corresponding units to the interface module composition that promote the realization of each part of the function [24].

In the social system, this paper promotes the construction of smart government applications, smart city management

applications, and smart public service applications. The level of informatization at the level of citizens, families, businesses, and communities has reached a high level, providing citizens with a new and smart life, better conditions and improved environment, and has created and perfected digital cultural communication channels that are compatible with modern citizen life. The test examples in this system are shown in Table 1 and Figures 5 and 6.

### 4.2 Community Information Management Module Test

Computer network technology grows more and more powerful, and the large amount of available information has brought a certain degree of difficulty to people's information retrieval. Therefore, in order to motivate people to make full use of information, Internet technology has effectively processed this information and divided it into different levels. Generally, when dealing with these events, the corresponding principles must be followed. The first is contextual relevance. Before making judgments and processing, it is necessary to analyze the actual situation and background, and to analyze specific information and data. When analyzing, first the semantic connection between information must be fully considered. Second, the processing of information must follow dynamic feedback and interactivity. This is generally used in monitoring systems. In the information processing process of the Internet of Things, physical nodes

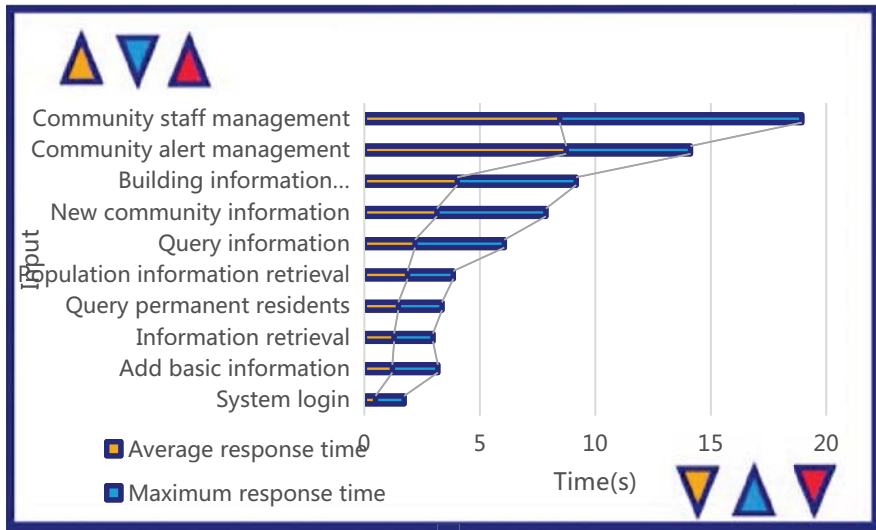


Figure 5 System overall functional test response time.

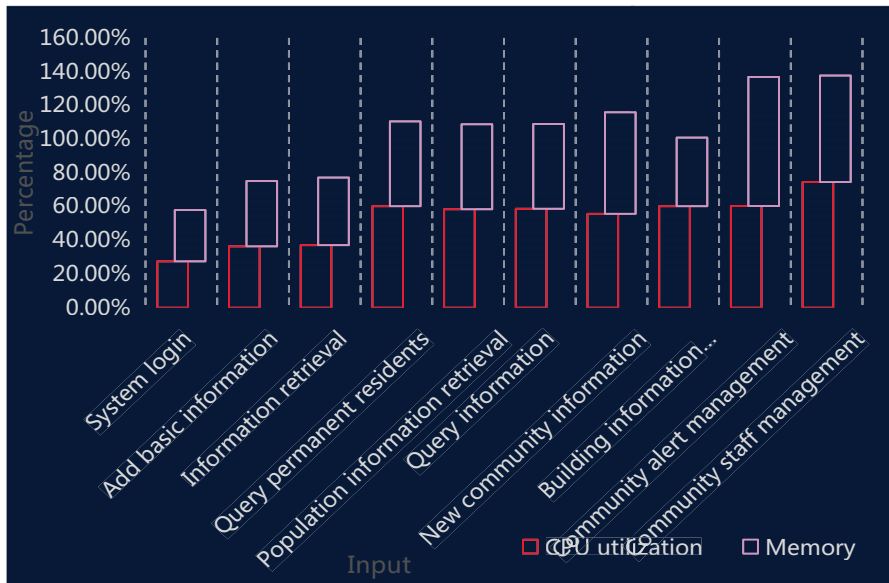


Figure 6 The overall function of the system CPU memory utilization.

and observing interactivity has a significantly important role [26]. In addition to considering the factors of the event itself, the interaction with the computer system should also be reflected through feedback to achieve an effective processing of information. The social information management module test is shown in Table 2 and Figure 7.

### 4.3 The security management of data

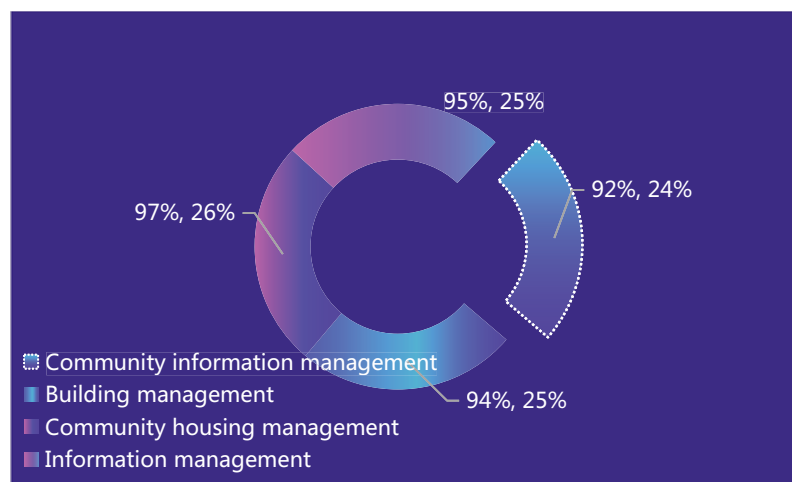
The security management of data has always been a problem to be solved by the Internet system. The security of information, when the Internet of Things is designing an information management system, data decentralized storage can be used for data security management. Decentralized encryption stored in this kind of information security management system mainly introduces a variety of different encryption algorithms to encrypt data. In addition, it also encrypts data information. Some management information

requires multiple authentication methods. During the user login process, when using user accounts and passwords, the authenticated account and password must be successfully connected to the data before the corresponding operation can be performed. This can protect the information to a certain extent. This also includes a variety of key encryption algorithms, symmetric key algorithms and symmetric encryption algorithms, etc. In addition, in the information management system, some data is shared by multiple users, which puts forward higher requirements on the management of information security, and puts forward more changes in the encryption and decryption time. The encryption algorithm can include multiple modes, mainly counter mode, ciphertext grouping link mode and ciphertext grouping link mode, etc., which can effectively protect information. Table 3 and Figure 8 show the comparison between the social management service system based on the Internet of Things information model and the traditional information management system.



**Table 2** Social information management module test.

Steps	Data	Expected results/Detailed requirements	Test results (Percentage of pass)
1	Enter the community information management	Able to query the basic information of the community	95%
2	Enter the building management	Query building information based on building names, etc, display detailed building information.	94%
3	Entering the community housing management	Retrieving the house based on the house address and house type, enter the number of retrievals	97%
4	Enter the community information management	Realize the housing information and building information of the community	95%



**Figure 7** Test pass rate of social information management module.

**Table 3** Comparison between the social management service system based on the Internet of Things information model and the traditional information management system.

Groups	Pre-experiment	Post-experiment	F	t	P
Social management service system based on the Internet of Things	107.35 ± 5.54	116.58 ± 4.45	0.378	-5.151	0.000
Traditional information management system	104.25 ± 8.45	112.56 ± 1.51	0.845	-1.241	0.068

## 5. CONCLUSION

The currently designed community IoT stability maintenance information platform can effectively combine the functions of each system to make the system unified in operation and management, and realize a centralized system management mode. This will reduce the pressure of users to learn the software of multiple systems, reduce workload and improve work efficiency. The information system platform draws on the design style and layout advantages of various websites to make user operations simple, fast and improve the ease of use. The system as a whole uses the J2EE SSH framework, as well

as cache processing mechanism and page static processing, which improves the overall performance of the website and the stability of system operation. It provides a convenient, fast and effective information platform for community workers. This project mainly studied the design and implementation of a comprehensive information service system for community informatization based on Internet of Things technology, including user login and registration modules, Internet of Things topology diagrams, community environment monitoring and other data information display modules, community design and implementation of information control modules for electronic devices such as video cameras, sensors, population

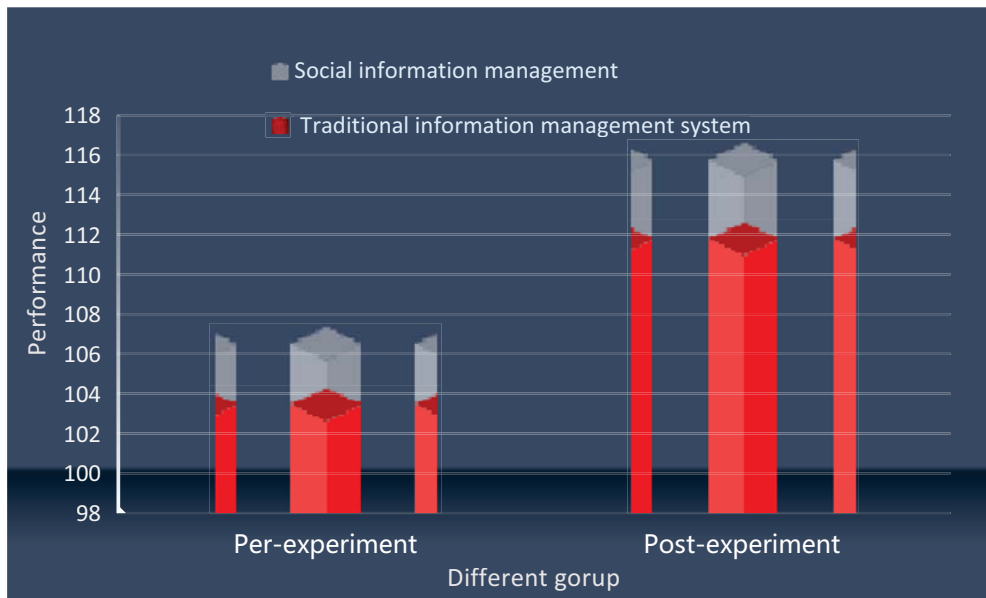


Figure 8 Data security comparison of social management service system.

management modules, community information management modules, community comprehensive management modules, community environmental management modules, and safe city modules.

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