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Construction of Urban IOT Infrastructure Platform from the Perspective of Low Carbon Smart City Construction

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Abstract: *Under the promotion of technology and people's requirements, the construction of smart city in the new era has become a new trend of urban development. Intelligent means are used to improve the urban environment, enhance the safety factor of the city, meet the needs of urban traffic and other aspects, and realize the efficient, green and sustainable development of the city. This paper mainly introduces the research on the basic platform of urban Internet of things from the perspective of low-carbon smart city construction. Firstly, this paper discusses the role of the basic platform of the Internet of things to promote the low-carbon smart city, introduces the basic theory of the Internet of things, and builds the basic platform of the Internet of things based on the perspective of low-carbon smart city. This paper takes the intelligent gateway of the Internet of things as the communication core to realize the upload of data and the execution of control instructions. This paper proposes a method of automatic gateway configuration information, which can send configuration information from cloud to gateway. Gateway completes automatic configuration, reduces the workload of technical personnel. The terminal equipment connects to the cloud through mqtt protocol and carries out data communication. In this paper, the function and performance of the platform are tested. The experimental results show that the communication success rate of the Internet of things basic platform built in this paper reaches 100% when the communication distance is less than 150 meters, and 90% when the communication distance is 300 meters. The communication protocol used in this paper only takes 1ms to process a single message. In this paper, the street lamp control experiment is carried out, and the joint debugging test is carried out on the basic platform of the Internet of things. The results show that the control efficiency of the three control modes is the lowest of 98%. Through the implementation of this platform, we can reasonably monitor and manage urban energy use, improve the safety of energy use process, and promote the construction of low-carbon smart city.*

Keywords: *Smart City, Internet of Things, Platform Architecture, MQTT Protocol*

1. Introduction

With the continuous development of Internet of things, cloud computing, big data, mobile Internet and other popular technologies, the research of smart city and intelligent park has become the focus of scientific research. Smart video monitoring, intelligent transportation, intelligent environment monitoring and intelligent logistics have become the hot topics of scientific research and commercial application. With the continuous development of technology, the construction of smart city has become a livelihood issue. Its development is directly related to people's work and life in all aspects. Smart city aims to comprehensively improve the management level, operation efficiency and service level of the city through comprehensive sensing, extensive transmission, in-depth analysis and intelligent integration of information [1]. Based on this, a new urban development model is constructed to enable the city to carry out intelligent perception and realize that the city can speak, so as to make effective decisions and reasonable regulation and control, so that people can realize that the smart city is around. Driven by the trend of the Internet of things, building a smart city with the Internet of things technology as the center, and management innovation supported by the Internet of things technology is an important way to realize the management of smart city [2]. The Internet of things has the technical advantages of the Internet of things and information exchange. The use of the Internet of things technology can realize the dynamic automatic management of the smart city, improve the management efficiency, so as to promote the development of the city to the advanced stage of intelligence, optimize available resources, equal public services, promote regional social progress, and vigorously promote the construction of smart city.

The concept of smart city originated from the smart earth, which emphasizes the basic concept of wisdom and Internet. IBM believes that smart city is based on the use of advanced technology to realize the integration of the city's internal system, improve the systematization degree of the whole city, achieve better development, provide better living environment for urban residents, and promote the harmonious development of the city. Chang et al. Believe that smart city is a means to improve the quality of life of residents and optimize urban operation by using information and communication technology. Smart city involves transportation, energy conservation, disaster management, environment, education, health care and safety. Joachim believes that as a popular concept, smart city is used by managers, researchers and technical service providers of various countries in the world. However, there is no accurate definition of what smart city needs, how to manage it, and how to transform a city into a smart city [4]. Byun thinks that the Internet of things business is the foundation of building a smart city, and the Internet of things is one of the technologies to realize the creative economy and smart city, but he did not put forward specific practical cases [5]. Through the analysis of the current situation of smart city construction, it can be seen that the construction of smart city in different countries has different characteristics. However, in the process of construction, the cooperation of multiple departments is emphasized, the power of enterprises is introduced, and the high management ability of enterprises is used to carry out management activities, and the construction mode is optimized.

The purpose of this study is to study and propose an effective information fusion solution based on the informatization and intelligence of smart city. By using the Internet of things, big data and cloud computing technology, through the intelligent construction of urban environmental monitoring, traffic, security and information fusion, it provides reliable software and hardware solutions, wireless networking solutions, intelligent video solutions, basic System architecture design, effective solutions for the use of vertical information, etc., to achieve high cost performance, high intelligence, high computing power of modern intelligent city information service and management.

2. Effect of Internet of Things on Low Carbon Smart City and Construction of Urban Internet of Things Platform

2.1. Development Factors of Low Carbon Smart City

(1) Smart City

The concept of smart city was first put forward by IBM. The company defined smart city as: it can use various advanced technologies to integrate various information of the city's internal system, so as to timely respond to various needs of the city. These needs include people's livelihood needs, environmental protection needs, enterprise development needs, etc. through comprehensive attention and targeted problem-solving, the company's smart city is defined as "smart city" human beings create better urban life [6-7]. After IBM put forward the concept of smart city, governments and scholars all over the world have paid close attention to it. Based on different perspectives and research methods, different definitions of smart city are made. The definition of smart city in China is as follows: smart city is the product of urban development to a certain stage, is a new form of city, and creates an intelligent environment. By using advanced technologies such as computer cloud and optical network, independent systems can be integrated with each other, thus improving the coordination and integrity of the system, paying attention to various requirements, and making positive response to specific requirements [8].

(2) Low Carbon City

Low carbon city refers to urban planning and development adhering to the concept of low-carbon, including low-carbon industry and economic development with enterprises as the practice subject and low-carbon society with urban residents as the practice subject. Under the premise of stable economic growth, urban entities use low-carbon technology to vigorously develop low-carbon economy, infiltrate low-carbon environmental protection concept into urban infrastructure construction, and advocate residents' low-carbon life concept and consumption mode, so as to realize low-carbon urban economy and society in all fields. As an administrative body, the government plays a leading role in the construction of low-carbon cities. At the same time, enterprises and the public should be mobilized to actively participate in promoting the construction of low-carbon cities. Low carbon city construction is different from low carbon city. Low carbon city is a state of urban development, and the construction of

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low-carbon city is the stage to achieve this state. Only under the premise of ensuring sustained and stable economic development and realizing low-carbon economic development and low-carbon living and consumption of urban residents, can it be called a low-carbon city [10]. In the process of reaching the final state, the progress made in any field is called low-carbon city construction.

(3) Impact of Science and Technology

The interactive innovation of science and technology and low-carbon economy can promote the industrial development and economic growth of smart low-carbon cities, improve and enhance the social infrastructure and management, and promote the intelligent low-carbon of urban physical space and human social environment, which is the core factor for the birth of smart low-carbon cities [11]. As shown in Figure 1, from the perspective of action level, the impact mainly comes from three aspects:

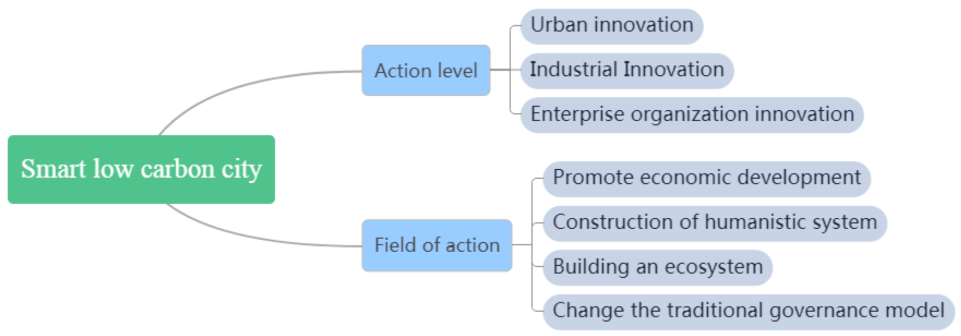

Figure1: Science and technology influence low carbon smart city

1) Interactive innovation at the overall level of the city can promote the comprehensive formation of smart low-carbon city through the cross interaction of various fields;

2) Interactive innovation at the industrial level can provide a good industrial material guarantee for the development of smart low-carbon cities;

3) Interactive innovation at the level of enterprises and institutions can guide and promote the development of smart low-carbon cities, and consolidate the necessary technology and product foundation for the development of smart low-carbon cities.

From the perspective of the field of action, its impact is mainly reflected in four aspects:

1) Promote the optimization and upgrading of urban economic and industrial structure, expand the city's investment attraction and financial market, and build a convenient and efficient intelligent low-carbon urban economic and financial system;

2) Gradually realize the multiple coordination of urban development goals, and form a smart low-carbon city social and humanistic system with rich characteristics;

3) Reduce the damage to the urban ecosystem, and establish a harmonious and appropriate intelligent low-carbon urban ecological environment system;

4) Change the traditional urban governance mode, promote cross sectoral collaboration and resource integration, and form a long-term and coordinated smart low-carbon city functional structure and governance model.

(4) Ecological Environment Impact

The healthy development of the city needs good ecological environment and sustainable resources as a solid material foundation and necessary support. The increasingly serious environmental crisis and resource consumption pressure have become the main driving force for the development of smart low-carbon cities [12]. As shown in Figure 2, the impact is mainly reflected in four aspects:

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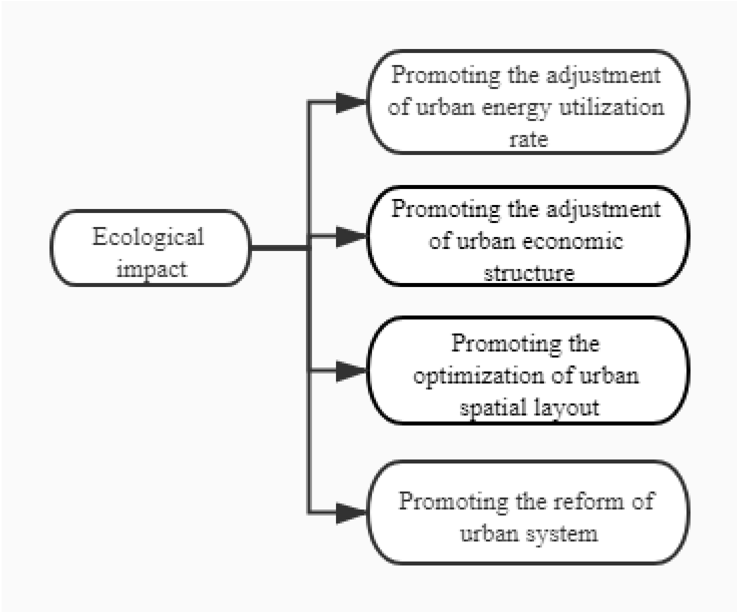

Figure2: Ecological environment impact

1) Promote the adjustment of urban energy utilization structure and realize the sustainable energy resources of smart low carbon city;

2) Promote the city's economic and industrial structure, and realize the sustainable economic production and financial development of smart low-carbon city;

3) Promote the optimization of urban spatial structure layout and realize the sustainability of the overall environmental space system of smart low-carbon city;

4) Promote the value culture and system reform of the city, form the characteristic value culture and stable and efficient system of smart low-carbon city, and realize the sustainable social life of smart low-carbon city.

2.2. Related Theories of Urban Internet of Things Platform

(1) Basic Technology of Internet of Things

The Internet of things is based on the Internet, through modern network transmission technology, information processing technology, cognitive learning technology to achieve automatic identification of objects, automatic data transmission and information exchange technology [14]. At present, the Internet of things has three key technologies in information technology, namely: data detection technology, communication technology and information processing technology. The key technologies are as follows:

1) Radio Frequency Identification Technology

Radio frequency identification (RFID), also known as electronic tag, is the core and foundation of Internet of things technology. Its principle is to use radio frequency signal to carry on the information non-contact transmission through the space link, in order to achieve the purpose of identifying information. The technology consists of tag, reader and antenna [15].

2) Sensor Technology

The sensor has a specific detection function for the tested object, which can be converted into the corresponding signal output device or component according to certain rules and regulations. The accuracy and accuracy of the data received by the sensor become the main factor of its work.

3) Video Capture and Processing Technology

The traditional video management system is difficult to play the role of early warning and alarm, and its operation is limited. Smart city needs intelligent video technology, such as detection of abnormal behavior, identification of abnormal behavior, prediction of abnormal behavior, abnormal state alarm technology, to help managers complete various tasks.

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4) Network Communication Technology

M2M (Machine to Machine) communication is the basis for the effective operation of the Internet of things. M2M refers to the means of establishing connections among users, systems and machines, including the connection and communication between machines and users, the connection between mobile networks and machines, etc. In addition, it can also be combined with XML and CORBA, GPS, Beidou, wireless terminal and other technologies to carry out target positioning, security monitoring, object and other work area identification [16-17].

(2) TSN Scheduling Algorithm Based on Ant Colony System

Time sensitive networks are growing rapidly due to their high data transmission capacity and priority setting function. TSN technology is being developed to extend the performance of AVB technology through seamless redundancy mechanism to ensure the worst delay behavior, reliability and fault tolerance.

1) Traditional Ant Colony Algorithm

Suppose that the number of nodes is n, the total number of ants in the ant colony is represented by m, the distance between nodes i and j is represented by d_{ij}(i,j=1,2,...,n), and the residual pheromone strength on the link between nodes I and j at time t is represented by $\tau_{ij}(t)$, after the ant selects the next path according to the residual pheromone intensity on each link, the probability of ant k moving from node i to j at t time is expressed by $p_{ij}^k(t)$, and the following are:

$$p_{ij}^k = \begin{cases} \dfrac{[\tau_{ij}(t)]^\alpha [\eta_{ij}(t)]^\beta}{\sum_{s \subset J_k(i)} [\tau_{is}(t)]^\alpha [\eta_{is}(t)]^\beta}, & j \in J_k(i) \\ 0, other \end{cases} \tag{1}$$

When the global traversal of each ant is completed, the global pheromone is updated once

$$\tau_{ij}(t+1) = (1-\rho)\tau_{ij}(t) + \Delta\tau_{ij} \tag{2}$$

$$\Delta\tau_{ij} = \sum_{k=1}^{m} \Delta\tau_{ij}^k \tag{3}$$

Since the information increment in the ant colony cycle model takes into account the global change and has good performance, it is usually used as the basic model of ant colony algorithm:

$$\Delta\tau_{ij}^k = \begin{cases} Q/L_k, \text{k and j links} \\ 0, other \end{cases} \tag{4}$$

TSN Scheduling Algorithm Based on Ant Colony System

Generally speaking, the initial pheromone is a stable value, but in the whole network, the direction of the ant will be very chaotic, so it may go into a dead end, which will lead to the subsequent ants can not find the optimal solution. In order to make the initial pheromone better guide ants forward and find the best solution, this paper improves the initial pheromone:

$$\tau_0 = \frac{1}{A + count(U_{j_k(i)})} \tag{5}$$

In order to improve the random search ability of ants, the adaptive pseudo-random ratio is used to select the next node, that is, for the ants located in the network node j, the next node is selected according to formula (6):

$$j = \begin{cases} \arg\max\{\tau_{ij}[\eta_{ij}]^\beta\}, q \le q_0 \\ s, q > q_0 \end{cases} \tag{6}$$

In ant colony system (ACS), the local pheromone information rule is defined as: in the process of constructing possible paths, when ants pass through a link (I, J), they will immediately call this rule to update the pheromone on the link:

$$\tau_{ij} = (1-\rho)\tau_{ij} + \xi\tau_0 \tag{7}$$

The global pheromone update rules of ACS are as follows:

$$\tau_{ij} = (1-\rho)\tau_{ij} + \rho\Delta_{ij}^{hs} \tag{8}$$

$$\Delta\tau_{ij}^{hs} = \frac{1}{T^{bs}}, \forall(i,j) \in T^{bs} \tag{9}$$

In order to avoid premature convergence to local optimal solution, the global pheromone updating rule is improved:

At that time $\tau > \tau_{\max}$:

$$\tau_{ij}(t+1) = (1-\rho)^{\frac{m+C}{m}} \tau_{ij}(t) + \Delta\tau_{ij}^{bs} \tag{10}$$

At that time $\tau < \tau_{\max}$:

$$\tau_{ij}(t+1) = (1-\rho)^{\frac{m-C}{m}} \tau_{ij}(t) + \Delta\tau_{ij}^{bs} \tag{11}$$

Among them,

$$\Delta\tau_{ij}^{bs} = \begin{cases} \frac{1}{L_{best}}, Gen \le \theta \\ \frac{1}{L_{best}}, Gen > \theta \end{cases} \tag{12}$$

When the optimal solution is not updated for a certain number of iterations, a certain number of links are randomly selected from the optimal solution to clear its pheromone, which will help to jump out of the local optimal solution to continue searching and avoid falling into the local optimum.

(3) MQTT Communication Protocol

MQTT is a lightweight communication protocol for machine to machine communication. The usage of MQTTt mainly includes three principals: message publisher, message subscriber and proxy server. The message sent by client includes subject and carrier. Proxy server is used for message interaction between publishers and subscribers. When a client sends a message of a specific topic to the proxy server, other clients subscribing to the topic will receive the topic message forwarded from the proxy server [18-19].

The control message of mqtt protocol determines the reliable communication between client and server. As shown in Table 1, the control message is mainly composed of three parts:

Table1: Control message structure

Message composition	Meaning
Fixed header	Contains all control messages
Variable header	Including some control messages
Payload	Including some control messages

1) Fixed Header

The fixed header defines the message type and some flag bits. All MQTT control messages will have a fixed header. The length of the fixed header is 2 bytes, and its structure is shown in Table 2.

Table2: Fixed header structure

Bit	7	6	5	4	3	2	1	0
Byte 1	Type of MQTT control message				Flag bit used to specify the type of control message			
Byte 2	Remaining length							

2) Variable Header

Some MQTT messages also contain a variable header identifier, which is located between the payload and the fixed header. The variable header content determines the message type. The subscriber and the publisher exchange messages through custom message identifier.

3) Payload

The last part of the MQTT control message is the payload. For publish, payloads are application specific messages. The format and content of the data must be sent according to the predefined rules, and the length of the payload is the part of the remaining length minus the variable header [20].

2.3. Overall Framework Design of Platform

(1) Service Oriented Architecture

Service Oriented Architecture, also known as service-oriented architecture (SOA), is a component model that connects different functional units (called services) of applications through well-defined interfaces and contracts between these services. Interfaces are defined in a neutral manner and should be independent of the hardware platform, operating system, and programming language that implement the service [21-22].

SOA has the following five characteristics:

1) Reusable

Once created, services can be used for multiple applications and business processes;

2) Loose Coupling

The binding between the service requester and the service provider should be loosely coupled. Therefore, the service requester does not need to know the technical details of the service provider implementation, such as program language, underlying platform, etc;

3) Clearly Defined Interfaces

Service interactions must be clearly defined. Web Services Description Language (WSDL) is used to describe the binding details between service requester and service provider. WSDL does not contain the technical details of service implementation;

4) Stateless Service

Services should be independent, self-contained requests, and do not need to get information or status from one request to another. When creating dependencies, you can define them as generic business processes, functions, and data models;

5) Based on Open Standards

At present, the application form of SOA is Internet service based on open W3C and other recognized standards. The first generation Internet services defined by soap, WSDL and UDDI and the second generation Internet services defined by WS - * Implement SOA [23].

(2) Platform System Architecture

As shown in Figure 3, the platform is divided into four layers: perception layer, access layer, service layer and application layer according to the standard structure of the Internet of things. The service layer of the whole platform can be deployed to public cloud or private cloud according to user needs.

The first layer is the sensing layer, which is mainly responsible for data acquisition and equipment control, and transmits the collected information to the upper layer.

The second layer is the access layer, which is responsible for the authority authentication of the terminal equipment. The device can send the authentication request of the client to the cloud through GPRS wireless network or wired network, and give access permission to the legitimate equipment.

The third layer is the service layer, which is responsible for extracting data from the database, building business data service and historical statistical data service on the web side, verifying and storing the sensing data. The database of this layer uses SQL and infixdb to deal with business data and massive sensor data respectively.

The fourth layer is the application layer. The web client can request restful data interface to provide application services for users, such as real-time data visualization, product quick definition, device access, historical data statistics visualization, usage log and other functions.

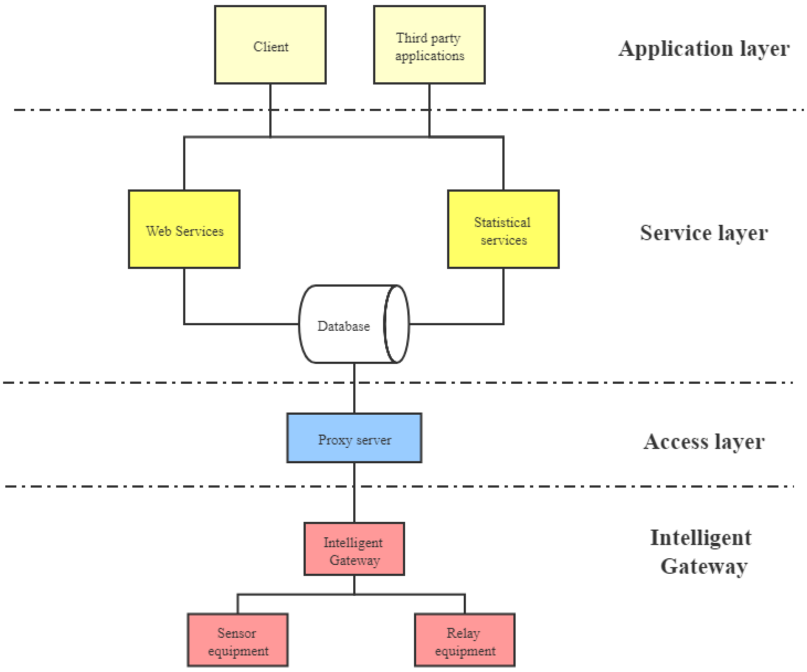

Figure3: Platform technology architecture

(3) Platform Workflow

1) Data Acquisition by Equipment

The data of human world and physical world are collected by sensors and other terminal devices, such as temperature / humidity digital sensor.

2) Embedded Host Gets Device Data

Through network communication, sensor network and other technologies to transmit data to the host installed with embedded operating system.

3) Data is Released Through Communication Protocol

The data collected by the embedded host is transmitted to the Internet by the target server through the communication protocol, which makes the underlying device independent of data collection and makes the data transmission from the underlying device to the application server more transparent [24].

4) Internet of Things Server Releases Data to Application Server

The basic data interaction module of the Internet of things processes the data in the form of XML, and then publishes the data service to the application server through the web service.

5) Management of Internet of Things Server by Application Server

The application server provides the service management function for all Internet of things servers. All application nodes only need to operate on the application server to obtain the corresponding data [25]. The server receives the new or updated data service from the Internet of things server, and notifies the application nodes that have subscribed to the service topic through the message mechanism.

6) Application Node Request or Corresponding Service

The application node reviews the required data service, and the application server will process all the request messages of the application node. The platform conducts local distribution or routing processing according to the topic subscribed by the application node, and publishes the data to the application node subscribing to the topic.

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3. Simulation Experiment of Urban Internet of Things Platform

3.1. Testing Environment

According to the business and functional design requirements of the basic platform of Internet of things designed in this paper, in the test process, a data acquisition, processing and publishing network server is prepared, which is responsible for data collection and release. At the same time, the database and web server are also deployed on this server to ensure the stability and timeliness of data in the process of data warehousing and display.

The server configuration is as follows:

CPU: Xeon Bronze 3106

Memory: DDR4 16G*1

Main board: Intel C622

Disk array and SAS hard disk

Model: DELL PERC H170 SCSI Disk Device

Available storage: 1000GB

RAID：RAID 5

The main software installed and deployed on the system is:

IIS8.0

Operating system: Windows10

Database environment: SQLServer2016

In the test process, the test client is a common computer, and the configuration is shown in Table 3

Table3: System configuration

Configuration	Software and hardware
CPU	Intel Core i5
Frequency	2.5GHz
RAM	8G
Hard disk	256G
Operating system	Windows 10
Program development environment	Visual Studio 2015

3.2. System Platform Settings

The platform setting subsystem of the system includes user management, platform setting, video setting, detection setting, plan setting and communication setting.

(1) User Management

Using the root user login, the user's role can be set through the ― role setting ‖ function in the system settings. Generally, it can be divided into: administrator, enterprise user, temporary user, etc. the modules used by different users are different. The authority module is divided by user management.

(2) Platform Settings

Management of network, security key, version information, upgrade file, etc.

(3) Video Settings

It can manage the name, IP and code stream of the camera, and set up the algorithm of video analysis, behavior analysis and abnormal behavior, and the learning machine based on convolutional neural network.

(4) Detection Settings

Set the network, sensor, alarm threshold and some hardware.

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(5) Communication Settings

Manage and set up the digital trunking and communication channel.

4. Experimental Results

4.1. Communication Capability Test

The network transmission capability of the Internet of things platform directly determines the real-time operation speed and stability of the system. Therefore, the communication achievement rate is used to measure the reliability of transmission. The formula is defined as follows.

$$E = \frac{a}{b} \cdot \frac{T_1}{T_2} \times 100\% \tag{13}$$

Where: a is the number of data received by the system, b is the number of times the system actually sends (calculated according to the set frequency), T1 is the time interval between the sent data, and T2 is the time interval between the actual data stored by the system.

The platform was tested in different environments, such as indoor, open area, moving object, etc. at the same time, the distance between the terminal node and the coordination device was set as 50m, 100m, 150m, 200m and 300m respectively.

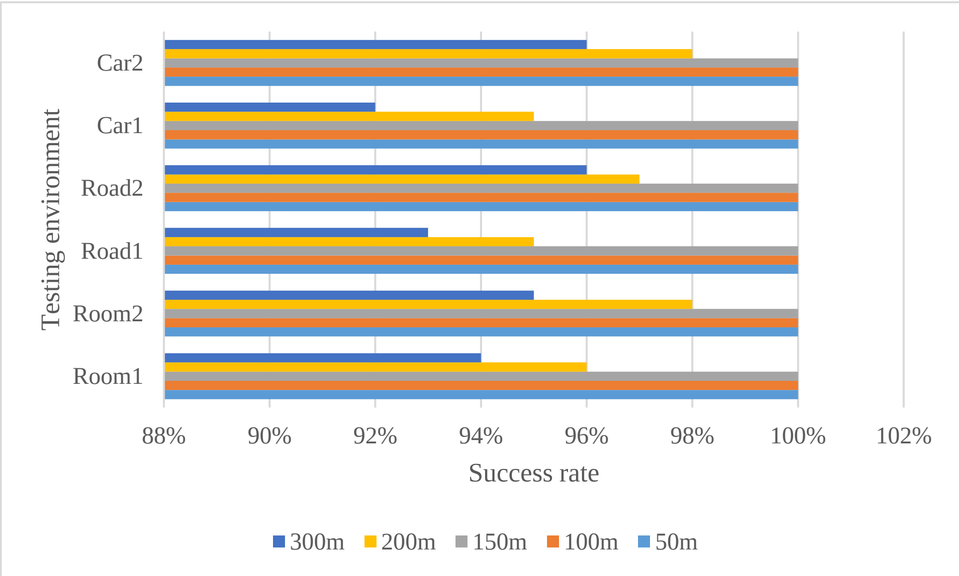

Figure4: Communication success rate in different environments

As shown in Figure 4, when the communication environment distance is less than or equal to 150 meters, the communication success rate of each environment reaches 100%; under the communication distance of 200 meters, the communication success rate of each environment exceeds 95%; under the condition of 300 meters communication distance, the communication success rate of each environment is higher than 90%.

4.2. Performance Testing

This performance test uses the platform communication protocol and the other two communication protocols to calculate the processing efficiency of RF messages. By observing the data reported by real terminal equipment, the processing time of 1000 RF messages gateway system is counted.

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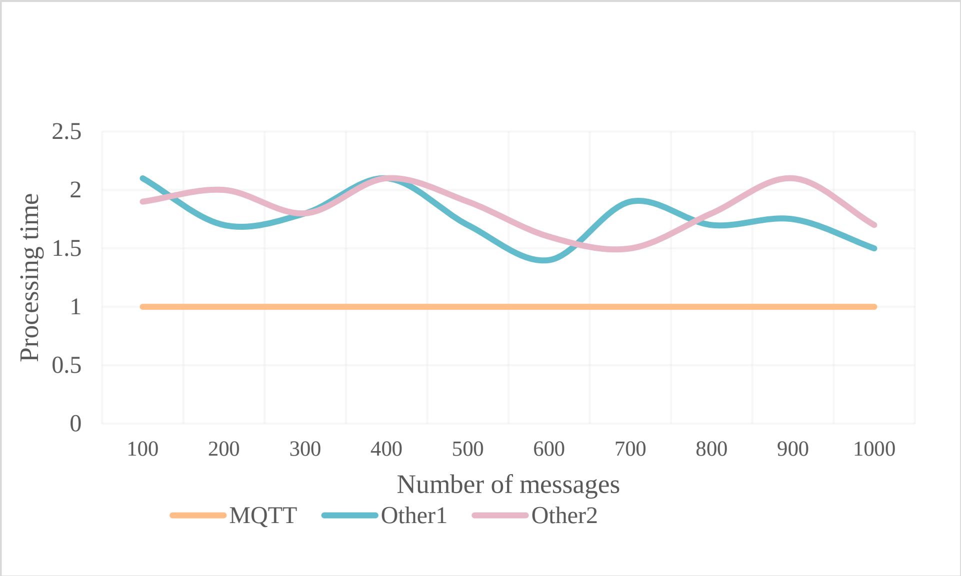

Figure5: Statistics of message processing time consumption

According to the statistical results, the average processing time of the communication protocol used in this paper is only 1ms (the highest time precision obtained is millisecond), while the average processing time of the other two communication protocols is between 1.4ms and 2.1ms. The comparison shows that the processing efficiency of the communication protocol used in this paper is slightly higher than that of other communication protocols.

4.3. Intelligent Environmental Monitoring and Disaster Warning Test

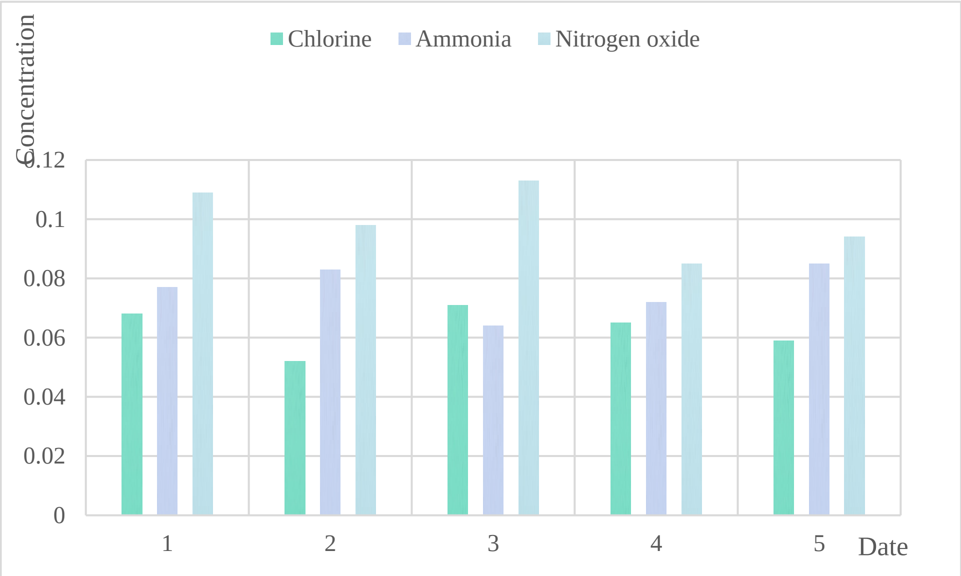

Figure6: Statistics of harmful substance concentration

As shown in Figure 6, the urban Internet of things platform carries out real-time data statistics through monitoring harmful substances in industrial parks. If the detected data is abnormal, that is, the data exceeds the threshold value; the system will give an alarm, display the location and abnormal objects of the abnormal data, retrieve the appropriate plan and provide it to the user. At the same time, the video monitoring and communication system on site will pop up for the management personnel to command. If necessary, the management personnel can start the emergency rescue function and call the resources in the park.

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4.4. Energy Control Test

The experimental prototype system is composed of the basic platform of the urban Internet of things, 2 centralized controllers, 10 measurement and control devices and 50 LED lamps and lanterns. The function and performance of the Internet of things are tested.

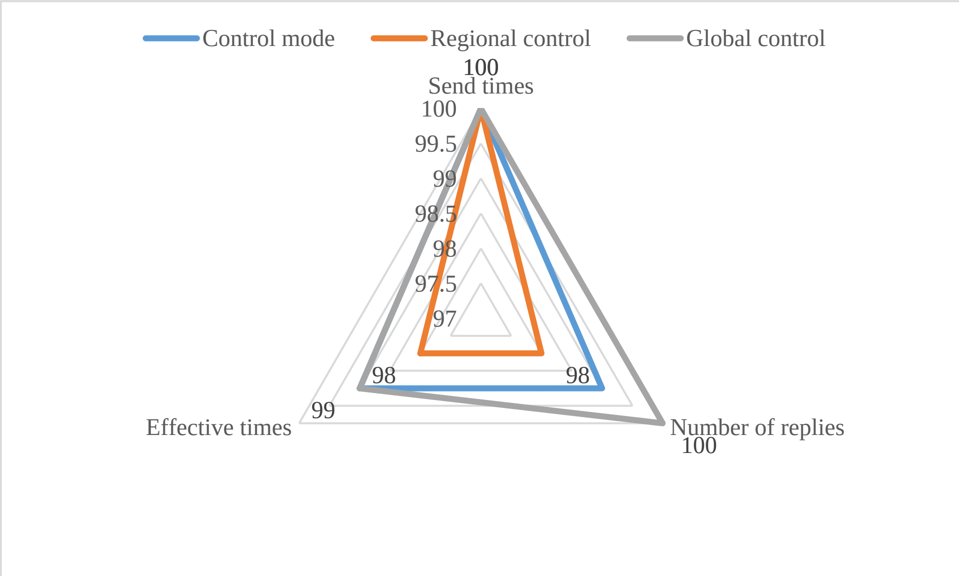

Figure7: Street lamp control command test

As shown in Figure 7, the control modes are divided into three types: single lamp control for any single street lamp node, 100 times of sending, 99 times of reply and 99 times of effective number; regional control of street lamp nodes within the specified road area, with 100 times of sending, 98 times of reply and 98 times of effective number; global control of all street lamp nodes, with 100 times of sending times and 1 time of reply 00 times, effective times 99 times.

5. Conclusions

Internet of things is one of the most promising high-tech industries in the 21st century. Through radio frequency identification technology, sensors, global positioning system and other technologies, we can collect real-time global targets, collect all types of required information about physical characteristics and access through various possible networks, and transmit them to the Cloud Computing Center for processing data, so as to realize the ubiquitous link between objects and objects, objects and people, and realize the intelligent perception, identification and management of objects and processes Management and control. Internet of things is known as the third world information industry development wave after computer and Internet through intelligent perception, pervasive network integrated application, identification technology and pervasive computing.

Based on the overview of low-carbon city and smart city, this paper analyzes the development of low-carbon smart city promoted by the basic platform of Internet of things. This paper introduces the research status and content organization structure of the basic sharing platform of the Internet of things at home and abroad, and then describes the basic theory, application field, architecture and web services related technologies of the Internet of things. This paper proposes the design and implementation of the basic platform of the Internet of things. By using the TSN scheduling algorithm and mqtt communication protocol, the basic platform of the Internet of things in the perspective of low-carbon smart city is built. The platform can be applied to many IOT application scenarios, such as intelligent environmental monitoring, energy control, etc. This platform has a certain significance for the rapid construction of general Internet of things applications, reducing development costs, and improving the development efficiency of Internet of things applications.

Although the general basic data platform of Internet of things designed in this paper can basically meet the needs of multiple scenarios of Internet of things, there are still many shortcomings: the platform only supports mqtt Protocol docking, in the future work, try to bring more communication protocols into the platform to meet the different access requirements of terminal equipment; ensure the reliability of data, improve the quality of data, and strengthen the research of data cleaning scheme for data quality problems in addition to incomplete data.

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