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Retraction

Retracted: Application Exploration of Scenario Logistics Ecosystem Based on beyond 5G and IoT Architecture

Security and Communication Networks

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] W. Yao and Y. Li, "Application Exploration of Scenario Logistics Ecosystem Based on beyond 5G and IoT Architecture," *Security and Communication Networks*, vol. 2022, Article ID 5797503, 11 pages, 2022.

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Research Article

Application Exploration of Scenario Logistics Ecosystem Based on beyond 5G and IoT Architecture

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With the continuous expansion of my country's logistics market, the business scale and management scale of logistics enterprises are increasing day by day. Smart logistics enterprises realize the "three streams in one" of the logistics industry through informatization and intelligent management, which greatly improves the service efficiency and quality of logistics enterprises. However, there are still many problems in this intelligent logistics mode. In this context, we conduct research experiments on the logistics ecosystem of IoT architecture scenarios and draw conclusions through experiments: (1) logistics development in IoT building scenarios. The environment includes natural environment, economic environment, political environment, etc. The economic environment plays an important role in driving logistics demand and promoting logistics growth. The political environment helps to improve the logistics infrastructure and ensure the healthy development of logistics. (2) The most important cost of the logistics industry is that transportation costs account for 67% of the entire logistics cost, followed by cargo storage accounting for 16% of the cost, and smart express cabinets accounting for 13% of the cost. From this, we can see the highest cost out of the logistics system under the Internet of Things is the transportation cost. As a unity is closely linked to the economy and interdependent, logistics is the driving force to promote the development of economic integration. In order to ensure the sustainable development of the economy, it is necessary to continuously improve the service level of logistics, reduce logistics costs, improve operation efficiency, strengthen the linkage development with other industries, and enhance the competitiveness of logistics. We launched an investigation against this background and researched the logistics system under the scenario logistics ecosystem of beyond 5G and IoT architecture.

1. Introduction

Self-interference cancellation invalidates a long-standing fundamental assumption in wireless, network design that radios can only operate in half-duplex mode on the same channel. This is a serious global problem that will only get worse with 5G. Self-interference suppression complements and supports the development of 5G technologies for denser heterogeneous networks and can be used in wireless communication systems in a variety of ways, including increased channel capacity, virtualized spectrum, random division duplex (ADD), new relay solution, and enhanced interference coordination. Due to its core nature, eliminating self-interference will have a huge impact on 5G networks and beyond [1]. A computationally efficient multi-carrier waveform for next-generation wireless communication systems is introduced. In the proposed technique, we first divide resource blocks (RBs) into two groups, namely, odd and even groups. The filter operation will then be applied to only these two groups, whereas the standard UFMC system will apply the filter operation to each individual RB. This reduces the number of inverse Fourier transforms and filtered convolutions, thereby reducing complexity, which is especially important for a large number of subcarriers. The results show that the proposed scheme outperforms the OFDM system while maintaining the same performance level as the standard UFMC system [2]. Driven by the rapidly escalating wireless capacity requirements of advanced multimedia applications and the dramatic increase in user access requirements required by the Internet of Things

(IoT), fifth-generation (5G) networks face challenges in supporting large-scale heterogeneous data traffic. Nonorthogonal multiple access (NOMA), recently proposed for the 3rd Generation Partnership Project Long-Term Evolution Advanced (3GPP-LTE-A), constitutes a promising technology that can address the above challenges in 5G networks [3]. Wireless engineers and business planners often ask questions about where, when, and how mmWave will be used for 5G and beyond. Since next-generation networks are not just a new wireless access standard, but network integration for vertical markets with multiple applications, the answer to this question depends on the scenarios and use cases to be deployed. Four examples of 5G mmWave deployments are presented, along with a chronological description of possible deployment scenarios and use cases, including expected system architectures and hardware prototypes. A third example is a millimeter-wave mesh network used as a micro-Ra [4]. Nonorthogonal multiple access (NOMA) is expected to play a key role in heterogeneous networks beyond fifth-generation (5G) wireless systems. The unparalleled advantages of NOMA and the multi-layered architecture of HetNets have the potential to significantly improve the performance of cellular networks. Inspired by this possibility, a new resource optimization scheme is presented for efficient cellular device association and optimal power control in NOMA-enabled HetNet, so a joint solution is difficult to obtain [5]. The Internet of Things (IoT) technology permeates diverse application areas, relying on sensing and actuating devices that share, process, and present meaningful real-world information. This paper focuses on one of the main functions of IoT, that is, virtualization, and proposes an IoT solution for wide-area measurement systems, which introduces virtualized phasor measurement resources. Such solutions aim to create a programmable intelligent environment that promotes interoperability, reusability, and flexibility of 5G services. The performance of the system is evaluated against generated traffic and latency to understand which scenarios can benefit from its deployment [6]. An integrated IoT architecture is introduced to deal with cyber-attacks, based on the developed deep neural network (DNN) with rectified linear units. The developed DNN-based IoT architecture introduces a new approach. For online monitoring of AGVs to defend against cyber-attacks, it is inexpensive and easy to implement, rather than traditional cyber-attack detection schemes in the literature. The proposed DNN is trained based on experimental AGV data representing the true state of the AGV and different types of network attacks, including random attacks, ramp attacks, impulse attacks, and sinusoidal attacks in which the attacker injects the Internet network [7]. The penetration of the Internet of Things (IoT) has grown significantly, along with increased capacity and reduced communication costs, as well as rapid technological advancements. At the same time, big data and real-time data analytics are becoming increasingly important, and this growth in data and infrastructure must be accompanied by software architectures that allow it to be exploited. While there are various proposals focused on leveraging IoT at the edge, fog, and/or cloud level, it is not easy to find a software solution that leverages all three layers, not only maximizing the use of context and contextual analysis of each layer data, but also bidirectional communication between adjacent layers [8]. In order to improve the utilization efficiency of Internet of Things (IoT) and cyber-physical system technologies, it is recommended to strengthen collaboration in data transmission. These applications receive data from multiple sensors; therefore, efficient data acquisition systems must be added. The research work proposes the use of a reconfigurable FIFO design for data acquisition. The optimal algorithms for FIFO tasks in offline situations are first provided, and then the architecture is synthesized using an FPGA board [9]. Firstly, the architecture of direct control of IoT devices through mobile phones and the characteristics of IoT architecture, based on independent background services, are analyzed, and the core content of IoT scenario evolution is proposed, namely, independent servers and independent services. Then, on this basis, we developed a WeChat-based smart equipment platform and IoT architecture, and elaborated its implementation process and working mechanism of its components [10]. Take logistics students as the experimental objects, after three years of exploration and practice, through the construction of multi-dimensional ecological experience field, a large number of teaching activities, the construction of talent pool, and the implementation of the sophomore tutor system. This reform has successfully resolved students' misunderstandings about logistics, activated students learning potential, improved students' logistics skills and various soft powers, and improved the satisfaction of enterprises. At the same time, the reform has also greatly enhanced the strength of the teaching staff [11]. The article introduces the concept of GPS in the logistics ecosystem, summarizes the current application of GPS in small and medium-sized logistics enterprises, analyzes the problems existing in the application of GPS technology in small and medium-sized logistics enterprises, puts forward the application of GPS in small and medium-sized logistics enterprises in the future, and made some suggestions [12]. Logistics agents shoulder the mission of logistics development in their respective market segments and jointly form an industrial ecosystem of mutual benefit and coexistence through the connection of the logistics ecological chain. Based on the ecosystem metaphor, the concept of logistics ecosystem is proposed, the evolution equation of logistics growth curve is established, and the characteristic mechanism of self-organization evolution under the combined action of internal and external forces and positive and negative feedback is analyzed, and has established the complex logistics development equation and analyzed the evolution mechanism and curve of the scientific understanding and management of regional logistics [13]. Ecosystem theory provides a new perspective for the study of logistics market and third-party logistics enterprises. By studying the basic theory of ecosystem, it analyzes the competition and synergy between the integrated logistics market, regional logistics market, and specialized logistics market, as well as the optimal distribution of third-party logistics activities in the logistics market. Based on the ecosystem theory, this paper studies the evolution of competition and cooperation among third-party logistics companies, and proposes an ecosystem structure model for third-party logistics companies' competition and partnership management [14]. With the global economic integration and the development of Internet technology, the traditional logistics ecosystem has encountered problems such as low level of industrialization and backward management methods. Through a series of studies and investigations, the application of Internet technology to the logistics ecosystem of short-cycle products will help to solve the above problems. Therefore, in the research process, the NSGA-II algorithm is used to optimize the traditional logistics ecosystem, and the Internet technology is used to build a new intelligent short-cycle agricultural product supply chain logistics system, which verifies the necessity and importance of its construction. In order to promote the development of the bioflow ecosystem, some Internet technologies need to be introduced [15].

2. Scenarios of IoT Architecture

2.1. Proposition and Demand of IoT Service Grid Architecture

(1) The "Internet of Things system microservice abstraction model" is proposed, including the overall abstraction of the Internet of Things system and the abstraction of the internal structure of microservices. The specification for the Internet of Things system defines the abstract model of microservices.

(2) Integrating microservices in IoT systems requires the description of service APIs at the syntactic and semantic levels, and its microservice description model is used for writing new microservices or for microservice discovery and recommendation.

Different IoT devices, different connection methods, multiple platforms, poor interoperability of devices and products from different manufacturers, and lack of compatible design and development models in application development are the reasons for the differences in IoT services. Furthermore, with the proliferation of IoT devices, the scope and complexity of services increase significantly, making it difficult to manage the interaction of different microservices in an IoT system. Current high-performance design and development models for centralized cloud services and management models for network services are not suitable for true IoT infrastructure. These factors have led to the proposal and creation of an IoT service network architecture. In an IoT-centric service network architecture, the distribution model and abstraction of microservices, service description and detection methods, and security requirements are all different from traditional service networks.

2.1.1. IoT Microservice Abstraction. In the field of traditional Web, all microservices are located in the cloud, which is an abstraction of modular applications. In the Internet of Things system, devices can display their capabilities through service interfaces, and microservices can be connected to devices, cloud peripherals or gateway components, and the larger Internet cloud. Improve the flexibility of system development, improve the interaction between services, simplify the development of Internet of Things applications, clarify the concept of "Internet of Things" integrated microservices, and finally form "Internet of Things Microservices Network." It requires the integration of "Internet of Things" and "Microservices." "Microservice abstraction model grid" is widely available for download via the Internet and free from internal microservices, and the IoT traditional abstract microservice system is the basis for developing IoT prototype services.

2.1.2. IoT Microservice Description and Discovery. By providing a survey processing service, the caller of the service knows the process by which we invoke the shortcut when it is removed from the list of available services on the registry. When a service is called, the back of the call is also called a microservice. Therefore, the service description is very simple and usually only includes the name of the required service tool and the information provided by the service provider, which can only be used to find the work place of the service, but cannot be used.. Microintegration of IoT systems requires the definition of an API service in terms of integration and interpretation, while microservices define a new way of writing or discovering and suggesting small services. The identity and nature of IoT micro-employees correspond to service characteristics based on information from customers and the performance, description, and quality of the requested service.

2.2. IoT Service Grid Architecture Design. The IoT-centric service network architecture aims to establish IoT as a core block of services and service brokers, implement a consistent microservice management system, and reap the benefits of microservices deployed in the cloud. The consistent architecture agent forms a service management grid, connects, protects, manages, and controls complex and efficient microservice distribution, and introduces inter-service communication management for deployed microservices, allowing developers to focus only on basic service functions.Microservices themselves are not common services management problem such as service discovery and secure communication. Extensive and advanced microservices will link broker organizations, enabling IoT systems to integrate cloud, connectivity, applications, and services to provide IoT services. Develop and explain the general and secure architecture of IoT service networks. The IoT service network architecture is shown in Figure 1. At the level, the architecture is divided into edge layer, edge cloud layer, middle cloud layer, and infrastructure layer. The infrastructure layer is divided into a data layer and a control layer. A system based on this architecture consists of microservices and microservice agents with different functions. The features and characteristics of the IoT service network architecture are described below.

2.3. IoT Microservice Description and Discovery. The descriptive service model is used to map and use IoT e-replication terminology for microservices. During the standard service search process, when a service receives a service call through

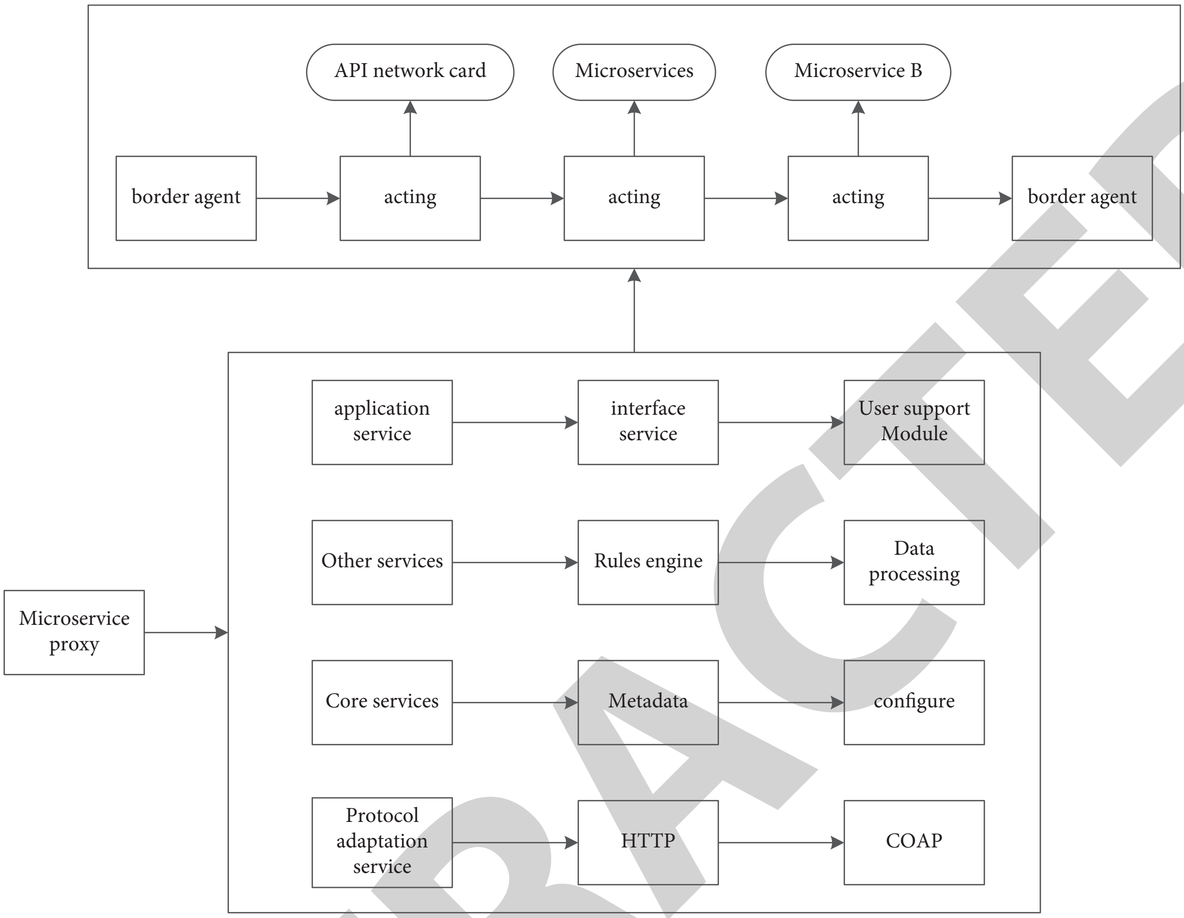

FIGURE 1: The overall architecture of the Internet of Things network.

the service log, the server preidentifies the process. When a service is invoked, the billing solution is determined and the handler is identified by the server. Therefore, the described copy of the service is simple and often contains so much information that the name and location of the media service network resource are required. For example, a project advisor (see Service Registration) includes a service description model, network number, and service (service name, serial number, and version number). Some lists can be deleted in SOW, but other files cannot be added. In IoT systems, the integration of API microservices requires the development of syntax and semantics. Service descriptions can also be used to investigate and approve or author new existing services. The descriptive service model is used to map and use IoT e-replication terminology for microservices. In the standard service search process, when a service receives a service call through the service log, the server preidentifies the process, when a service is called, the billing solution is determined, and the processor is identified by the server. Therefore, the described copy of the service is simple and often contains so much information that the name and location of the media service network resource are required. For example, a project advisor (see Service Registration) includes a service description model, network number, and service (service name, serial number, and version number). Some lists can be deleted in SOW, but other files cannot be added.. In IoT systems, the integration of API microservices requires the development of syntax and semantics. Service descriptions can also be used to investigate and approve or author new existing services. The description model of IoT services is shown in Figure 2.

3. Beyond 5G Algorithms

3.1. 5G Network Soft Slicing. Network slicing is an intelligent connectivity service that provides customers with customized end-to-end 5G networks based on logical and physical resources, including slices of multiple subnets such as core subnets, transmission subnets, and wireless subnets. An example of a network segment is an end-to-end logical network that includes many network functions, resources, and connections. Depending on the required services and resources, network slicing can provide flexible network management. The network component management system can design network component models that meet network characteristics and SLA requirements, including slice implementation and tuning capabilities, and implement SLA through NSI runtime monitoring. Based on advanced cloud management technology, NSM has enhanced functions, supported network partitioning, and optimized operation and maintenance services. The description of the slice network can be transformed into a physical G network, which is defined as follows:

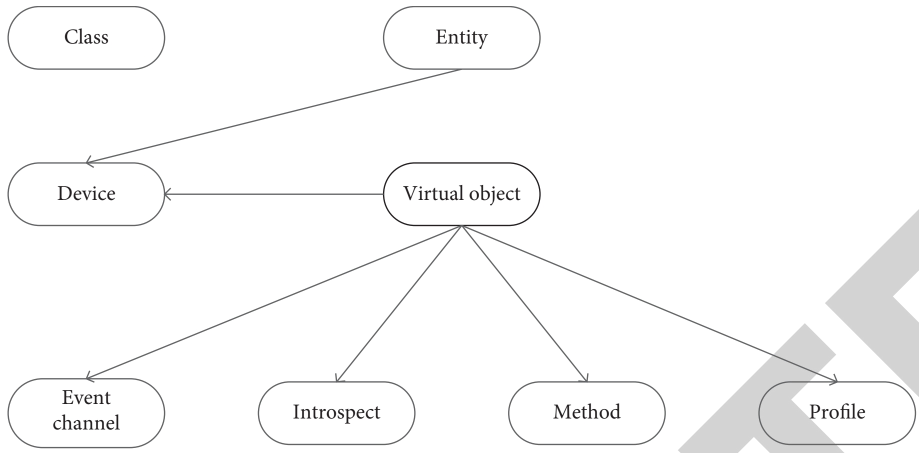

Figure 2: IoT service description model diagram.

$$SLICE_{MAP} = \left(N_{MAP}, E_{MAP}, R, B, D\right). \quad (1)$$

Network slicing is a multiobjective optimization problem. In order to reduce the UPF, it is necessary to organize as many hops as possible in the core network to make full use of network resources and increase revenue. Therefore, resource weights are proposed.

$$R\left(G^V, t\right)\alpha \sum_{n^v \in N^V} CPU\left(n^v\right) + \beta \sum_{l^v \in E^V} BW\left(L^V\right). \quad (2)$$

Orchestration overhead represents the cost of successfully orchestrating a network slice. Since it consumes the underlying resources of the physical network, it is calculated as follows:

$$C\left(G^V, t\right) = \gamma \sum_{n^v \in N^V} CPU\left(n^v\right) + \delta \sum_{l^v \in E^V} BW\left(L^V\right). \quad (3)$$

According to (2) and (3), the cost and benefit ratio of the underlying network can be obtained as follows:

$$\tau = \lim \frac{\sum_{t=0}^{T} R\left(G^V, t\right)}{\sum_{t=0}^{T} C\left(G^V, t\right)}. \quad (4)$$

The security and reliability of sliced networks depend on the isolation mechanism of slices. Each component can be thought of as a collection of individual resources provided by different network devices. Insulation grades and strengths vary depending on cutting requirements and operating conditions. In this paper, the Bayesian estimation method is used to calculate the insulation coefficient of the mesh wafer, and the calculated probability is

$$p\left(R_{IJ} \mid x, y\right) = \frac{p\left(R_{IJ} \mid x, y\right)}{p\,(x, y)}. \quad (5)$$

Then according to the density function,

$$B\,(x, y) = \int_0^1 R_{ij}^{x-1}\left(1 - R_{IJ}\right)^{y-1}. \quad (6)$$

Push

$$p\left(R_{IJ} \mid x+1, y\right) = \frac{R_{ij}^{x}\left(1 - R_{IJ}\right)^{y}}{B\,(x+1, y)}. \quad (7)$$

Then, its mathematical trust factor is

$$E\left(R_{IJ}\right) = \frac{x+1}{x+1+y}. \quad (8)$$

From this, it can be deduced that the calculation formula of the isolation factor of node G_i is

$$R_i = \frac{1}{n} \sum_{j=1}^{n} E\left(R_{IJ}\right). \quad (9)$$

The goal of the segment mapping algorithm is to dynamically configure the use of network shards to require limited network resources and reduce the impact of additional traffic changes on network performance. The specific steps of the synchronization strategy are as follows: consider providing a slice of K sources for each match. Step 2: randomly create an N-dimensional particle K as the initial population (the actual number of eye slices is used as a constant throughout the test). Step 3: calculate the fitness function value according to the speed and bandwidth resources of the vLink, and calculate the particle separation current as the limit. If the constraints are met, the maximum value of the conditional function is the current optimal decision, namely, H. The decision vector represents the current method of allocating resources to network segments that maximizes resource utilization while isolating the network. Step 4: update the properties of the particle according to the particle's velocity and position information, and then recalculate the value of the fitness function. Step 5: decrease the number of repetitions by one until the particle passes N times and recovers the optimal solution. If the network entity has completed the data transmission task, enter the next round of data transmission; otherwise return to Step 3.

3.2. Distributed Edge Computing Network Slicing. 5G radio access network edge computing and core network edge computing are an important step in network slicing. According to the collaborative terminal call control feature of the police system, a distributed service cluster (MECS) should be used to provide simultaneous recording, and viewing and retrieval of audio, video, and video data streams. The integration of MECS is the key to realize group service. Based on the characteristics of group communication, the traditional centralized domain terminal is changed to a distributed MECS server group to realize group call fusion, signal management, and data synchronous transmission. Integrated control includes integrated technology and synchronous power distribution control technology. Integration technologies can use the best tools to perform tasks such as control, balancing, configuration, mode selection, and queuing. Parallel control ensures the cohesion of MECS states, i.e., a multi-agent network, and creates a distributed and consistent MECS model to manage operations. In a network of node size N, each node is represented as an n-dimensional first-order dynamic system, and nodes use an interactive state information mechanism to declare the dynamic behavior of the i-th node.

$$\begin{aligned} \frac{dx_i}{dt} &= c\sum_{j=1}^{n} a_{ij}\, I\left(x_j(t) - x_i(t)\right) + u_i(t),\\ u_i(t) &= -cd_i(t)\, I\left(x_j(t) - s(t)\right),\\ s(t) &= s_{mT}, mT \le t < (m+1)T. \end{aligned} \tag{10}$$

As reported in the literature, the network system achieves constrained coherence by feeding back to the input $u_i(t)$. When the system reaches coherent equilibrium, the system jointly reaches state $s(t)$, interconnecting all network nodes and controlling them simultaneously. Network segments of different types and users should be isolated as much as possible to ensure security. This form is disruptive and creates a security risk when virtual hosts are mapped to physical servers and multiple virtual hosts are mapped to the same physical server. Therefore, the insulation protection level for a specific part is the weighted sum of the operating insulation level and the insulation protection level, defined as

$$Eva = \alpha Per + \beta \text{Sec}. \tag{11}$$

Networks should be segmented and divided into different types of users to ensure as complete security as possible. When a virtual host is mapped to a physical server, if multiple virtual hosts are configured on the same physical server, the shards will be split.

Determining the performance isolation level, the ratio of the virtual resources is required by the network slice to the remaining resources of the physical server; that is, the more virtual resources required, the less resources remaining in the physical server, and the worse the performance level:

$$Per = \gamma\frac{B_i}{B_i^v} + \delta\frac{D_i}{D_i^v}. \tag{12}$$

For an INS, the more physical resources the INS shares with it, the greater the potential for security threats. Therefore, the security isolation level is defined as the ratio of link resources of virtual network fragment nodes to actual dedicated physical nodes and links; the higher the coefficient, the more resources the slice covers for physical nodes and channels, and the higher the security risk:

$$\text{Sec} = \varphi\frac{N_i}{N_i^v} + \varepsilon\frac{L_i}{L_i^v}. \tag{13}$$

Substitute (12) and (13) into (11) to obtain the calculation formula of the security isolation evaluation value of network slice:

$$Eva = \alpha\left(\gamma\frac{B_i}{B_i^v} + \delta\frac{D_i}{D_i^v}\right) + \beta\left(\varphi\frac{N_i}{N_i^v} + \varepsilon\frac{L_i}{L_i^v}\right). \tag{14}$$

3.3. M2M Scheduling Algorithm Based on Q-Learning.

(1) Preprocessing and query. The preprocessing is run only once to create the M2M data structure for path search. If the map changes slightly later, the M2M data structure can be updated.
(2) After preprocessing, once the search task is determined, the query program can be executed in a very short time.
(3) Summarize and synthesize the returned opinions, and then send them to relevant experts after quantitative statistical analysis. Each member receives a copy of the questionnaire results.
(4) After seeing the results, ask members to propose their proposals again. The results of the first round often inspire new proposals or change some people's original views.

The proposed distributed Q-learning uplink timing algorithm uses each capable group leader as an agent, interacts with the agent as a mobile network environment, and tries to maximize the overall performance. Each agent can independently select the agent whose RB resource sends information and captain. The function performed at each timing time t can be expressed as follows:

$$a_t = \{0\,(no-access), RB_1, RB_2 \cdots RB_m\}. \tag{15}$$

The learning algorithm only considers one state in the learning process, namely, time. The team leader actively learns based on one state at a time, and the learning process ends when the optimal scheduling policy is reached. Also, the state of the channel does not change. A number of learning processes can be used to derive optimal scheduling policies for different team leaders' access conditions. The additional cost function is defined as follows:

$$B_{RB_L}\log_2\left(1 + SINR_{RB_L}\right). \tag{16}$$

At design time t, function a is selected according to the activity selection strategy to obtain the reward ability of data r, and the Q value corresponding to function a in the Q value table is updated according to the reward value.

$$Q(a_t) = (1 - a)\, Q\,(a_t)^t + r_t. \tag{17}$$

Among them, AB represents the Q value of the group leader agent before and after performing action C, respectively. Throughout the learning process, the possibility of conflicting actions is reduced, the learning speed is increased, and the convergence speed is accelerated. Redefine the reward function using a conflict resolution mechanism:

$$r_t = \sum_{i=1}^{m} B_{RB_L}\log_2\left(1 + SINR_{RB_L}\right). \tag{18}$$

The global Q value at time T is a linear combination of each group length, as shown in the following formula:

$$Q_t\,(a_t) = \sum_{i=1}^{n} Q_t\,(a_t), \tag{19}$$

where a is a set of action vectors for all performed within training epoch t and the global value of Q represents the action selected by each team leader in a cell. The sum of the corresponding values Q is one of the Performance Indicators for the given algorithm. The set of strategic actions taken by all team leaders according to the total value of Q for each training period, and the set of actions for each team leader corresponds to the maximum global value of Q. The optimal resource allocation strategy RB is selected as follows:

$$V^{\pi} = \max_{a\in A}\left(Q(a_t)\right), \tag{20}$$

a is the set of all executed action vectors in the learning cycle t, and Q is the action selected by each team leader in the cell, which is one of the performance indicators of this algorithm, reflecting the set of strategic actions taken by all team leaders in the cell.

4. Exploration of Scenario Logistics Ecosystem Application of beyond 5G and IoT Architecture

4.1. Beyond 5G Smart Logistics Ecosystem. With the continuous improvement of the digitization, informatization, and intelligence of logistics enterprises, the China Federation of Logistics and Purchasing predicts that by 2025, the scale of my country's intelligent logistics industry will exceed one trillion yuan. For most intelligent logistics operations, with the help of retail terminal platforms, Internet, and other advantageous enterprises, in addition to intelligently upgrading traditional logistics enterprises, they also make use of intelligent industries. For example, JD.com and China Federation of Logistics and Purchasing jointly released the "2025 China Smart Logistics Blue Book," creating a new model of smart logistics by establishing logistics subgroups. In particular, several unmanned warehouses, drones, and unmanned vehicles will be deployed, and a new model of "unmanned commercialization" will be realized through the combination of artificial intelligence and robotics. In terms of transportation and distribution, JD.com has cooperated with the Beidou-6 satellite navigation system, and more than 6,000 self-driving cars use the Beidou navigation system smart bracelet to help salespeople. At the same time, JD.com signed a cooperation agreement with Xi'an Aerospace to build the country's largest comprehensive intelligent logistics base and develop a comprehensive system of all links of the intelligent supply chain. The development scale of 5G smart logistics is shown in Figure 3 and Table 1.

According to the experimental data in Figure 3, we can conclude that the scale of the 5G smart logistics market continues to expand, and the technical capabilities of participating institutions continue to increase. According to the statistics of China Association of Logistics and Purchasing, by the end of 2020, the total amount of social logistics in my country will reach 300.1 trillion yuan, an increase of 3.5% over last year. The revenue of logistics enterprises reached 10.5 trillion yuan, a year-on-year increase of 2.2 percentage points. Among them, the 5G smart logistics industry is in strong demand, with a market size of 590 billion yuan. We can also see that the scale of the 5G smart logistics industry is showing a steady growth trend.

According to the experimental data in Figure 4 and Table 2, we can get that in the 5G smart logistics system, the accuracy can reach 89.22%, the rate can reach 81.94%, and the error rate is only 34.56%; in the traditional logistics system, the accuracy can reach 68.33%, the rate can reach 65.67%%, and the error rate reached 53.41%. We can see that the 5G smart logistics system is faster than the traditional logistics system in terms of accuracy and speed, and the error rate is much more stable.

4.2. Scenario Logistics Ecosystem of IoT Architecture. The logistics development environment in the IoT architecture scenario includes natural environment, economic environment, political environment, etc. The economic environment plays an important role in stimulating logistics demand and facilitating its growth. Logistics Infrastructure and Logistics Delivery: This section describes the efficient development of the IoT in combination with the economic and political environment, and more intuitively reflects the logistics environment conditions within the IoT architecture.

From the experimental data in Figure 5, we can find that with the increase of time, the national IoT logistics GDP has been in a steady upward trend. In 2016, the logistics GDP reached 800 billion yuan, and in 2020, the logistics GDP reached a maximum of 1,600 billion yuan; and we found that the growth rate of GDP under the IoT architecture has been accelerating, reaching 23.06% in 2018. After 2018, the growth

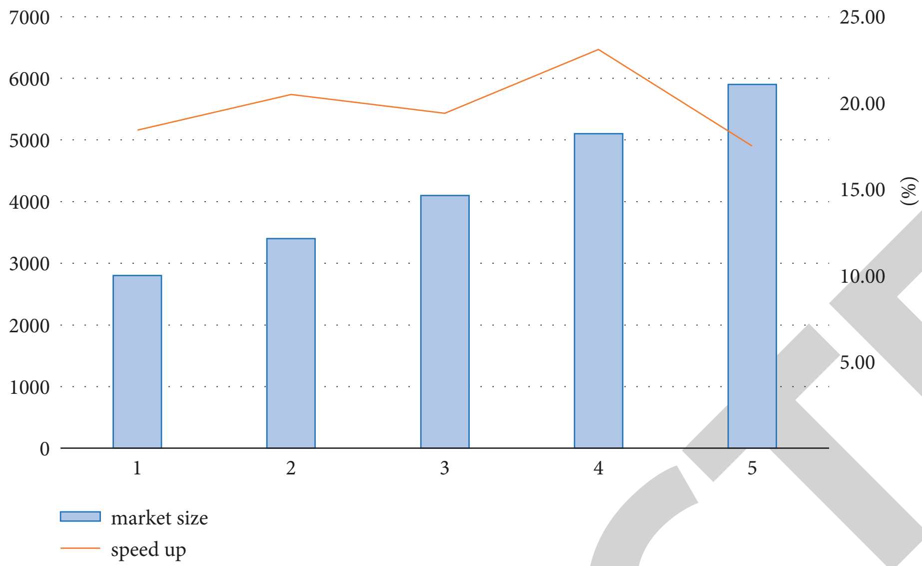

FIGURE 3: Market scale of my country's 5G smart logistics industry from 2016 to 2020.

TABLE 1: Market scale of my country's 5G Smart Logistics Industry from 2016 to 2020.

Years	Market size	Speed up (%)
2016	2800	18.43
2017	3400	20.49
2018	4100	19.41
2019	5100	23.10
2020	5900	17.50

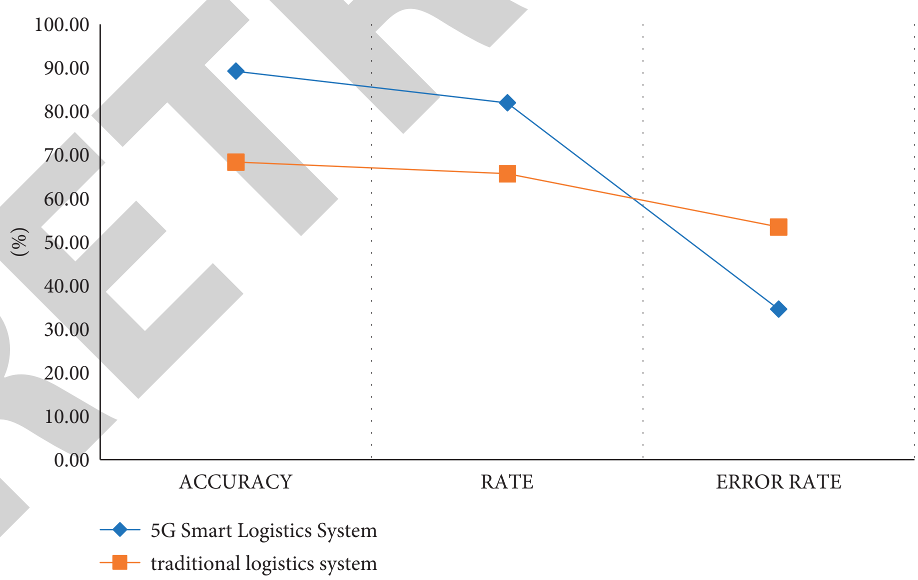

FIGURE 4: Comparison of different logistics models.

TABLE 2: Comparison of different logistics models.

Different logistics models	Accuracy (%)	Rate (%)	Error rate (%)
5G smart logistics system	89.22	81.94	34.56
Traditional logistics system	68.33	65.67	53.41

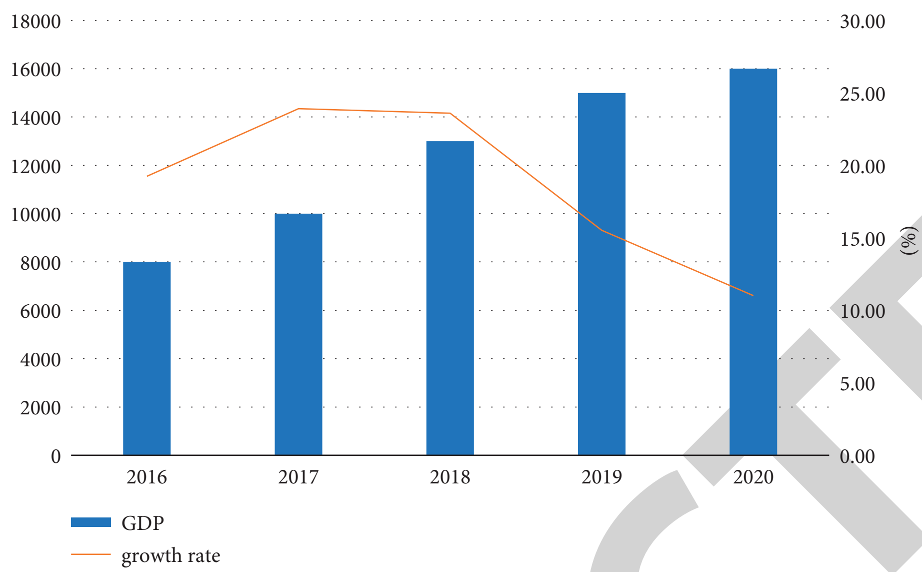

Figure 5: National IoT logistics GDP and growth rate from 2016 to 2020.

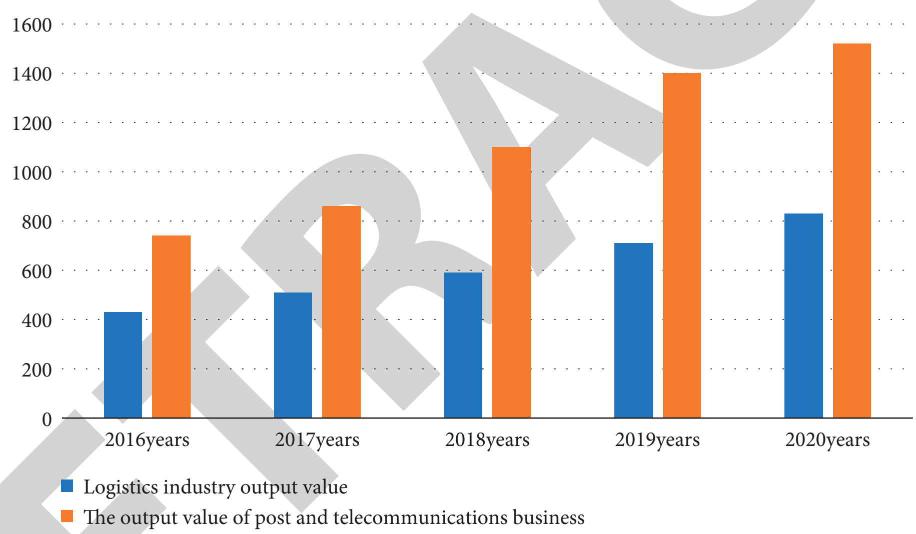

Figure 6: Logistics output value under the IoT architecture from 2016 to 2020.

rate began to decline. In 2020, the growth rate was only 11.01%.

From the experimental data in Figure 6, it can be seen that the development of logistics under the IoT architecture mainly includes the production cost of the logistics industry, and the volume of the post and telecommunications industry is the volume of the logistics company. The business volume of the post and telecommunications company can be used to replace the business volume and quantity of the logistics company. With the growth of time, the output value of the logistics industry and the output value of post and telecommunications business are showing a steady upward trend. By 2020, the overall value of the logistics industry of the Internet of Things will reach 235 billion yuan, and the output value of the logistics industry will be 83 billion yuan. The output value is 152 billion yuan.

4.3. Application Exploration of Logistics Ecosystem. In traditional warehouse buildings, it is often necessary to manually scan goods and store data, resulting in low work efficiency. At the same time, storage sites are sometimes dominated by chaos and lack of process monitoring. As the industry enters the ecosystem, it will be possible to develop an intelligent inventory management system that improves the basic efficiency of goods, expands inventory capacity, reduces labor intensity and labor costs, and conducts real-time monitoring and monitoring of the in and out of goods time, improving delivery security and complete pickup. The system completes product warehousing, inventory allocation, selection, and delivery, as well as data query, backup, statistics, reporting, report management, and other system-wide tasks. The cost of logistics industry is shown in Figure 7.

According to the experimental data in Figure 7, we can conclude that the most important cost of the logistics

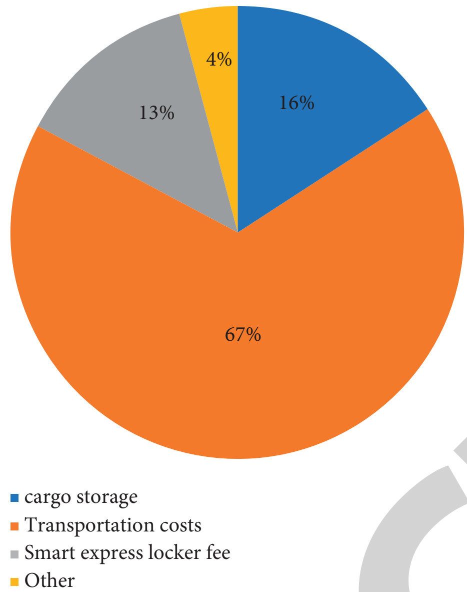

Figure 7: IoT logistics industry cost diagram.

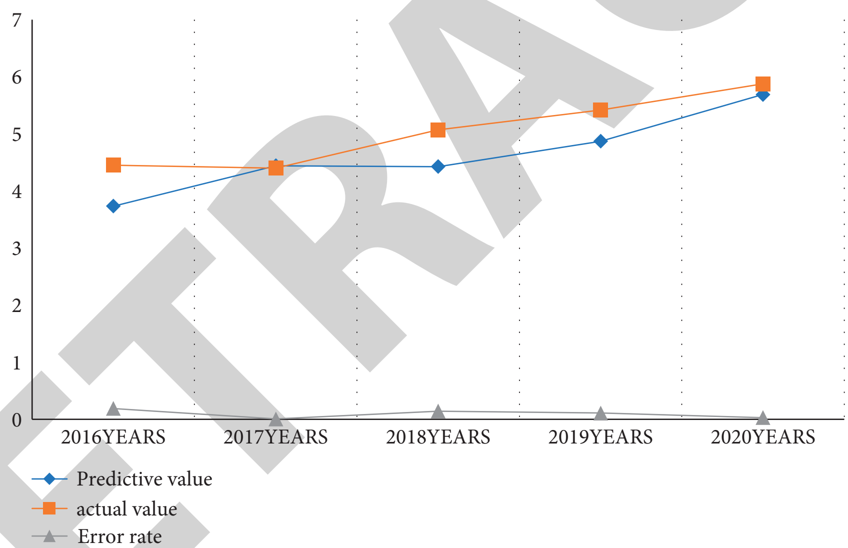

Figure 8: Comparison between the predicted value of logistics demand and the actual value.

Table 3: Comparison between the predicted value of logistics demand and the actual value.

Years	Predictive value	Actual value	Error rate
2016	3.7345	4.4518	0.1921
2017	4.4407	4.3998	0.0092
2018	4.4257	5.0703	0.1456
2019	4.8707	5.4139	0.1115
2020	5.6877	5.8757	0.0330

industry is that the transportation cost accounts for 67% of the entire logistics cost, followed by the cargo storage accounting for 16% of the cost, and the cost of smart express cabinets 13%; from this, we can see that the highest cost of the logistics system under the Internet of Things is the transportation cost.

According to the experimental data in Figure 8 and Table 3, we can see that the value of logistics demand shows a steady upward trend with the increase of time, the predicted value is also increasing, and the accuracy of the prediction is gradually improved. After 2018, the accuracy is relatively high. The five-year average error rate from 2016 to 2020 is

6.37% per year, which meets the requirements of predictive analytics.

5. Conclusion

Intelligent logistics is a new model of logistics industry based on Internet information technology and supported by Internet + and 5G development strategies. By introducing information technology and sensor technology, logistics enterprises can realize basic logistics functions such as logistics warehousing, loading and unloading, intelligent transportation, and distribution, and improve "smart" innovation and logistics. With the emergence of Internet information technology, a new supply chain logistics system has emerged. When developing a data transmission platform, logistics enterprises use RFID, bar code, and wireless network identification technology to realize real-time interaction between data and logistics data, speed up the flow of resources and logistics data, and achieve real-time tracking throughout the entire process. Through the training and learning of relevant data, the requirements of predictive analysis can be met.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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