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Retraction

Retracted: Application of the Logistics Management System Based on Cloud Computing Technology

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets 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 own 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] S. Zhang, "Application of the Logistics Management System Based on Cloud Computing Technology," *Journal of Control Science and Engineering*, vol. 2022, Article ID 1143624, 8 pages, 2022.

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Research Article

Application of the Logistics Management System Based on Cloud Computing Technology

Shuai Zhang

Panjin Vocational & Technical College, Panjin 124000, Liaoning, China

Correspondence should be addressed to Shuai Zhang; 2018070500156@jlxy.nju.edu.cn

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In order to solve the vehicle routing optimization problem of cold chain logistics distribution, this paper proposes a vehicle routing optimization method of cold chain logistics distribution based on cloud computing technology. This paper analyzes the advantages of processing the real-time routing of distribution vehicles under the cloud computing mode and establishes the application service architecture of vehicle routing optimization in cold chain logistics; under this architecture, multisource real-time traffic information is obtained, the vehicle distribution time and comprehensive cost are analyzed, the vehicle routing optimization model of cold chain logistics distribution is constructed, and the coarse-grained parallel genetic algorithm is used to solve the model in the cloud computing environment. The experimental results show that if $W_1 = 0, W_2 = 1$, the optimal path is 0-6-7-3-1-4-2-8-5, the total cost is 1620 yuan, the total mileage is 72 km, the vehicle driving time is 2.17 hours, and the calculation time is 10.79 s; let $W_1 = 1, W_2 = 0$, the optimal path is 0-5-6-7-2-4-3-1-8, the vehicle travel time is 1.84 hours, the total cost is 1736 yuan, the total mileage is 76 km, and the calculation time is 11.56 s. The optimal path is obtained in the effective time range. *Conclusion*. The real-time route optimization method of refrigerated vehicles in the cloud computing environment is effective. This method has practical significance to realize fine control of cold chain logistics distribution cost and improve distribution service efficiency.

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1. Introduction

Due to the high requirements for equipment and transportation timeliness of fresh food, the cost of cold chain logistics remains high. Due to the high cost of cold chain logistics, in order to reduce the logistics cost, some businesses will choose to add preservatives, food additives, and other low-cost ways to prolong the preservation period, resulting in the continuous emergence of products such as "whitening pig feet" and "zombie chicken feet" [1], which have a bad impact on the whole society; some businesses will choose some small or even informal cold chain logistics enterprises to transport fresh products. The scale of cold storage of these enterprises is relatively small, and the facilities such as temperature detection and incubator are relatively backward. Most refrigerated trucks cannot meet the standard of cold chain transportation. Therefore, the problem of cold chain logistics transportation will follow [2] because the temperature monitoring, incubator, and other facilities cannot meet the cold chain transportation standards, and bacteria and enzymes balance heat and cold during transport to reduce food quality and to ensure food safety. At the same time, it consumes a lot of capital, which almost increases the cost of distributing the cooling energy. We should improve cold chain logistics to ensure fresh food, reduce the cost of cold chain logistics, and increase the speed of cold chain transportation. During the distribution, we should send the vehicle to research, prepare a good transportation plan, reduce the shipping cost, improve the timeliness, and strengthen the monitoring of fresh products in the transportation process. Therefore, delivering new products to customers at low cost and on time is very important for improving refrigeration network logistics [3]. Figure 1 shows the logistics management system and process based on cloud computing.

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2. Literature Review

Creating an optimization model for a dynamic vehicle distribution method and developing an algorithm solution are a difficult task. From the point of view of application, the actual supply chain is shipped to the ship after the manufacturer or customer meets the requirements of the shipment. There is little comprehensive consideration in saving cost, reducing resource waste, and improving service quality. At the same time, due to the complexity of dynamic vehicle scheduling, the existing theoretical research is difficult to put into practice, resulting in low efficiency of vehicle distribution. Zhang et al. took the nearest distance of TSP as the basis of the heuristic algorithm and constructed the evaluation function of the algorithm for solution [4]. Han et al. proposed an optimization method considering transportation distance constraints and solved the VRP problem with the simulated annealing algorithm [5]. Jarupan et al. studied the optimization of fresh meat distribution in Athens, considered multiple distribution centers in the model, and gave a solution model of the random search method [6]. Xing et al. The VRPTW model is designed to take into account the randomness of the process of classifying perishable products. The goal of the model is to reduce transportation costs, stable vehicle costs, electricity costs, inventory costs, and total penalties [7]. Wang and Xing In order to reduce stable vehicle costs, air conditioning costs, and transportation costs, cold delivery models of damaged products have been developed, and cost research has been developed locally [8]. Tai et al. proposed the research on the line problem of the multitemperature codistribution system. In the literature, the multitemperature codistribution system with full temperature layer preservation is taken as the research object, and the minimization of line cost is taken as the objective function [9].

Although there have been some achievements in the research of the logistics vehicle routing problem, the research is still in the primary stage and is still a problem of further research and discussion, mainly in the following aspects [10]:

(1) ost of the problems studied are deterministic problems; that is, the cold chain logistics center, the demand of refrigerated products, and the location of vehicles are determined, and there is little research on the path problem in complex situations.

(2) For a variety of uncertainties in the distribution of cooling chains, the current study focuses on the evolution of automobiles, mostly for one reason or another, and less comprehensive consideration is given to the actual refrigerated vehicle location, traffic conditions, weather, and other factors.

(3) The dynamic vehicle routing problem of cold chain logistics requires high real-time performance. It needs to deal with various changing information in an effective time range and provide calculation results, so the parallel algorithm to deal with this kind of problem needs further analysis and research.

On the basis of this research, this paper uses the multisource massive information in the cloud center and adopts the cloud processing method to study the real-time vehicle path optimization problem of cold chain logistics distribution. The results show that the real-time path optimization method of refrigerated vehicles in the cloud computing environment is effective, and the method has practical significance for realizing refined control of cold chain logistics distribution costs and improving the efficiency of distribution services.

3. Research Methods

3.1. Discussion on Vehicle Routing Optimization of Cold Chain Logistics Distribution

3.1.1. Characteristics of Cold Chain Logistics. Compared with temperature logistics, the cold chain has the following characteristics.

(1) The products are perishable. The goods distributed by cold chain logistics are fresh products, quick-frozen food, drugs, etc. The product quality will gradually decline due to various reasons in the distribution process.

(2) The products have timeliness. Because the cold field products are easy to corrode and have a short life cycle, their production, storage, distribution, and sales should be completed in a short time.

(3) There are special requirements for transportation equipment. Because the temperature will change with time in a day, in order to maintain the product in a suitable low-temperature environment under different temperatures, the distribution vehicle must be a refrigerated vehicle.

Following the above characteristics, the purpose of the study on the improvement of refrigeration equipment delivery to the truck is to provide the refrigeration equipment with the approval of the real time, reduce distribution costs, and improve product quality [11].

3.1.2. Advantages of Vehicle Routing Optimization of Cold Chain Logistics Distribution in the Cloud Computing Environment. The mathematical model of the cold chain logistics distribution vehicle routing optimization problem based on cloud computing is essentially the same as that of the traditional cold chain logistics distribution vehicle routing optimization problem, which makes the objective function optimal by reasonably arranging the vehicle distribution route and driving time, that is, the shortest delivery time and the lowest cost. The difference lies in the construction of the preconditions of the model [12].

(1) Cloud computing concentrates various decentralized and independent application resources under the same platform. There are abundant and massive information resources in the cloud center, such as real-time traffic information, weather information,

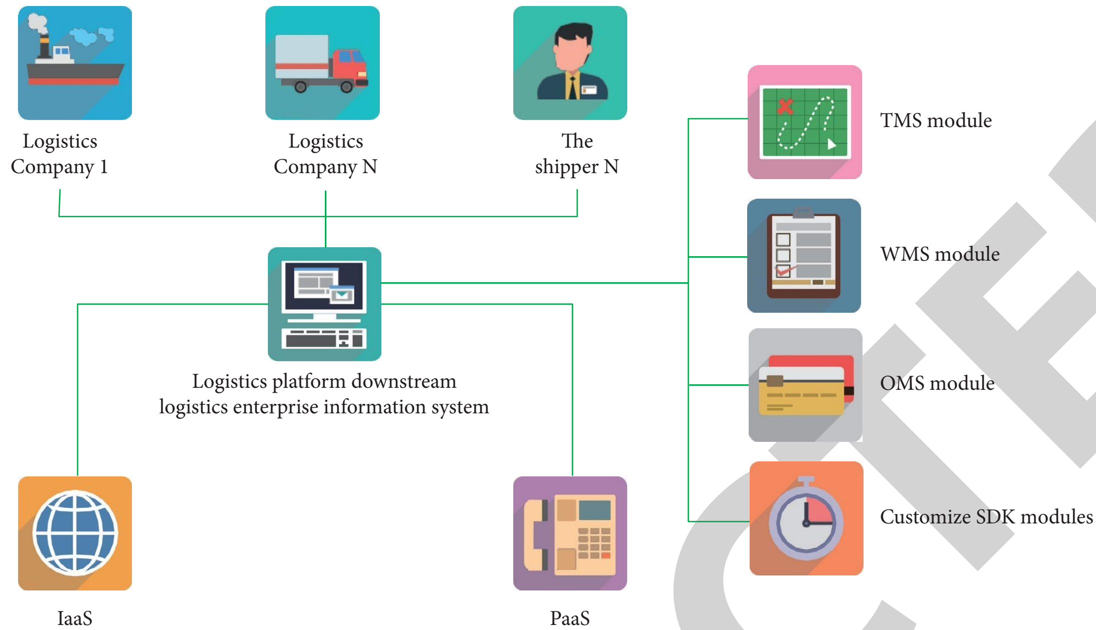

FIGURE 1: The logistics management system and process based on cloud computing.

and logistics information required for building the optimization model of refrigerated trucks adapt.

(2) All resources are automatically provided to users in the form of software and hardware management through the cloud computing mode. Cold chain logistics enterprises obtain the required services through the SaaS (software as a service) mode. They do not need to buy expensive hardware equipment or bear the frequent upgrade and maintenance costs. They only need to pay low service fees to provide the required services and improve the efficiency of logistics distribution services.

(3) Cloud computing realizes resource opening and unified access and builds cold chain logistics vehicle routing optimization application service on cloud computing, so users can obtain logistics distribution information resources and build their own applications through a unified interface [13].

3.1.3. Application Mode of Cold Chain Logistics Distribution in Cloud Computing. Cloud Data Center contains a variety of data from multiple sources, including traffic data, weather data, route information, and geographic information. These data are used to create a cold chain logistics distribution vehicle routing optimization service platform based on cloud computing (its design model is shown in Figure 2).

The underlying infrastructure is shown in Figure 2, including multiple servers, networks, and other hardware components, as well as the various external financial resources of the interconnected devices, such as transportation and weather. We should enable virtualization, network virtualization, and virtualization services through the use of technology to maximize capabilities [14]. The service platform for route optimization of cold chain logistics distribution vehicles realizes the dynamic route optimization of cold chain logistics distribution vehicles through the solution of the optimization model. The platform connects the resource layer downward, aggregates all resources dynamically, and provides users with reliable optimal solutions through the interface upward path.

3.2. Distribution Vehicle Routing Optimization Model Based on Cloud Computing

3.2.1. Description of the Vehicle Distribution Routing Problem in Cold Chain Logistics. As can be seen from Figure 2, the cold chain logistics distribution vehicle routing optimization architecture has been developed. The ultimate goal of optimal performance models is to improve overall travel time and vehicle delivery costs. However, the optimization model will vary as the data receive changes. Here is an example of a real-time optimization model for a cold chain logistics distribution vehicle, using real-time cloud traffic data and showing the following limitations [15]:

(1) eceive quick and accurate information on the way in which the refrigerator is located;

(2) he total demand of each consumer should not exceed the maximum capacity of the vehicle;

(3) he total length of each distribution and transportation shall not exceed the maximum length of driving in a distribution;

(4) f the goods arrive within a certain time limit, a certain penalty will be paid if it exceeds the time limit;

(5) uring delivery, the temperature and humidity in the wheelchair should be within certain limits, otherwise it will affect the user satisfaction with the product;

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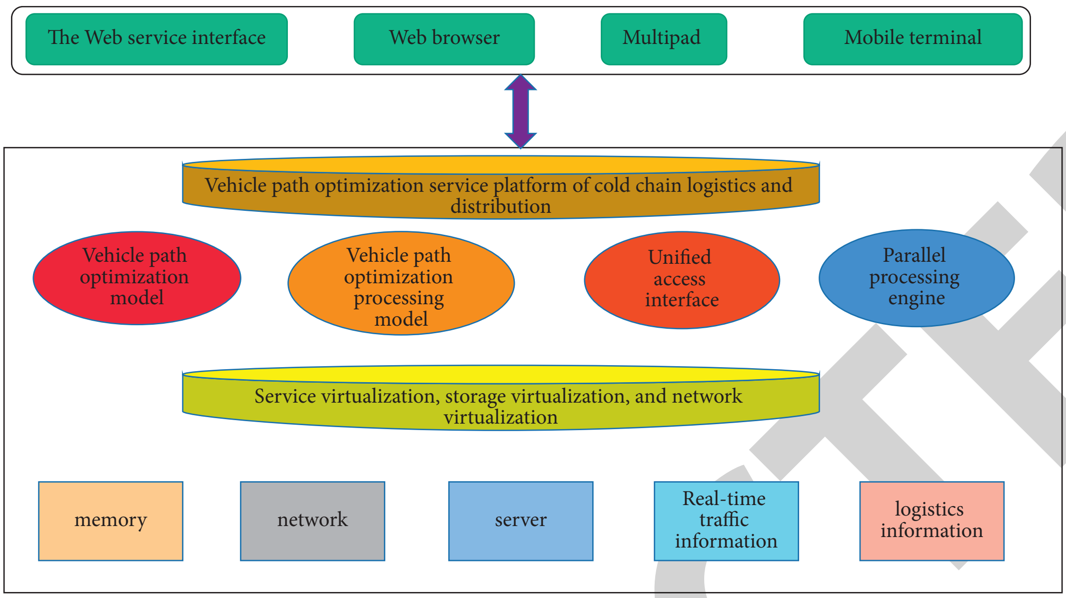

Figure 2: Vehicle routing optimization architecture of cold chain logistics distribution based on cloud computing.

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(6) he width of the road is greater than the width of the vehicle.

Set R_k represents the k-th path. Here, the set element r_{ki} is the order of the customer r_{ki} in the path k, and we let r_{k0} represent the distribution center where the vehicle starts, the real-time speed of the vehicle on the k-th path is V_k, and the real-time road network information L_k obtained by the cloud computing center takes the vehicle distribution time and cost as the objective function.

3.2.2. Vehicle Routing Optimization Model of Cold Chain Logistics Distribution. The analysis of the route optimization model of refrigerated vehicles includes the analysis of distribution time and distribution cost. In the architecture, the traffic information cloud is accessed through a unified interface, and the traffic information of the vehicle location is obtained for distribution time analysis. The comprehensive distribution cost analysis includes fixed cost, transportation analysis of cost, cargo damage cost, energy cost, and penalty cost. The total travel time T of the vehicles to complete the distribution is shown in formula (1) [16].

$$T = \sum_{j=1}^{N} t_{j(j-1)}, \tag{1}$$

Analysis of the comprehensive distribution cost is as follows:

(1) ixed cost of the transport vehicle C_1 includes the salary of the driver and escort and the cost of vehicle loss, and $C_1 = f$ is a constant.

(2) Transportation cost C_2 of the vehicle includes the fuel consumption and repair and maintenance cost of the vehicle, which is directly proportional to the mileage of the vehicle, as shown in formula (2).

$$c_z = \sum_{i=0}^{n} \sum_{j=0}^{n} c_{ij} x_{ij}, \tag{2}$$

c_{ij} is the transportation cost of the refrigerated vehicle on section (v_i, v_j), and $c_{ij} = c_{ji}$, where x_{ij} is represented by 0 and 1, and $x_{ij} = 1$ is the refrigerated vehicle passing section (v_i, v_j), otherwise $x_{ij} = 0$.

(3) Cold collection damages include three following cases [17]: first, freight damage due to shipping time and unloading time; second, the constant opening of the room door during customer service causes alternating flow of cold air in the room and outside air, increasing the room temperature and damaging the cold collection; third, the cold collection was broken due to bad road conditions. The damage cost of the cold collection is expressed as shown in Equation (3)

$$C_3 = r \sum_{i=0}^{n} \lambda_j \left(\alpha_1 t_{ij} + \alpha_2 \beta_j + \alpha_3 s_{ij} \right), \tag{3}$$

where r represents the unit price of the product, λ_j is a 0,1 variable, $\lambda_j = 1$ represents the customer j served by the refrigerator truck, otherwise $\lambda_j = 0$; α_1 is the proportion of damage during product transportation; t_{ij} refers to the time spent from the customer to the customer; α_2 refers to the proportion of products damaged during the opening and loading and unloading of carriage doors; β_j is the quantity of the customer jɿs goods; α_3 represents the proportion of product damage caused by vehicle transportation; s_{ij} represents the mileage from customer to customer.

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(4) Energy cost of refrigerated vehicles

The cost of a refrigerated vehicle is usually the cost of using a refrigeration unit. The use of cooling depends on the difference between the temperature of the machine, the temperature inside the machine, the inside and outside of the machine body, and the outside temperature. The formula for counting cold water is given in Equation (4) [18].

$$G = a \times b \times S \times \Delta t. \tag{4}$$

Then, the cooling cost of the vehicle during driving is expressed in C_4, as shown in formula (5).

$$C_4 = \sum_{i=0}^{n} \sum_{i=0}^{n} r_1 \times G \times t_{ij} \times x_{ij}, \tag{5}$$

where r_1 is the price of refrigerant, t_{ij} is the time from customer i to customer j, and x_{ij} is the variable of 0 and 1.

When opening the door, the outside air directly convects with the air in the refrigerator car, alternating cold and heat [19,20]. Therefore, to calculate the refrigeration cost of opening the compartment door, only the cost of refrigerant consumed by the heat exchange of the door needs to be calculated, expressed in C_5, as shown in formula (6).

$$C_5 = \sum_{i=1}^{n} r_1 \times a \times S \times \Delta t \times t_i, \tag{6}$$

where t_i is the time for the vehicle to stay and wait at customer i, and S is the area of the door.

(5) Penalty cost for exceeding customer delivery time

There is a time limit for delivering goods to customers. Here, the restriction method of soft time window is adopted; that is, the goods required by customers arrive within a certain time range. If they fail to arrive on time, the logistics distribution enterprise will be given a certain fine. Then, the penalty cost caused by not delivering the product to the customer point within the time window is expressed by C_6, as shown in formula (7).

$$\begin{aligned} C_6 = {} & \omega_1 \sum_{j=1}^{n} \max\left[\left(a_j - s_j - t_j\right), 0\right] \\ & + \omega_2 \sum_{j=1}^{n} \max\left[\left(s_j - b_j\right), 0\right], \end{aligned} \tag{7}$$

(6) Other costs

In the process of cold collection distribution, other costs will be incurred under time constraints, such as the charging cost of driving on the highway. It is expressed in C_7, as shown in formula (8).

$$C_7 = \sum_{i=1}^{m} g_i m \leq n, \quad \text{where } m \leq n. \tag{8}$$

To sum up, the real-time route optimization model of multiobjective cold chain logistics distribution vehicles is constructed as follows (9):

$$\text{Min}\{W_1 B + W_2 C\}, \tag{9}$$

where

$$B = \sum_{j=1}^{N} t_{j(j-1)} + \sum_{j=1}^{N} t_j, \tag{10}$$

$$\begin{aligned} C = {} & C_1 + C_2 + C_3 + C_4 \\ & + C_5 + C_6 + C_7, \end{aligned} \tag{11}$$

$$S.\text{t.} \sum_{i=1}^{N} q_i \leq Q, \tag{12}$$

$$\sum_{i=1}^{N} d_{i(i-1)} \leq S, \tag{13}$$

$$S_{i-1} + l_{i-1} + t_a q_{i-1} + l_{i(i-1)} = s_i, \quad i = 1, 2, \ldots, N \tag{14}$$

$$t_i = \max\{a_i - s_i, 0\}, \tag{15}$$

$$\sum_{i=0}^{n} \sum_{j=0}^{n} x_{ij} = N, \tag{16}$$

$$R_i \cap R_j \neq \varnothing (i, j \in \{1, 2, 3, 4 \ldots N\} i \neq j) \tag{17}$$

$$L_{ij} < L. \tag{18}$$

4. Result Analysis

Figure 3 shows the process improvement in the air-cooled chain logistics distribution vehicle optimization service platform based on the design using traffic data in real time.

In order to verify the effectiveness of the solution in the cloud computing environment, this paper takes the refrigerated potato chips delivered by the refrigerated truck of a logistics company to customers as an example. The number of distribution center is "0," the demand of customer i is q_i, the unloading time is s_i, the location between customers is shown in Table 1, and the required service time range is shown in Table 2.

According to the different types of attention of the distribution center to the vehicle distribution cost and distribution time, different proportions are set to simulate the real-time road condition information of the cloud center. The experimental environment is composed of four

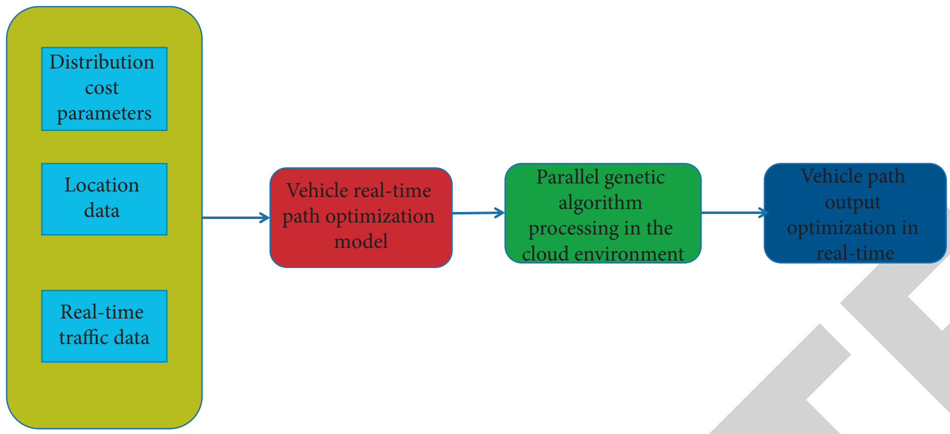

FIGURE 3: The schematic diagram of model simulation.

TABLE 1: Distance of each customer point.

Distribution point	Distance to each customer point (km)								
C_{ij}	0	1	2	3	4	5	6	7	8
0	0	15	12	13	11	10	15	19	12
1	15	0	14	7	10	13	12	11	18
2	12	14	0	13	8	14	15	9	11
3	13	7	13	0	9	13	12	10	15
4	11	10	8	9	0	18	12	15	11
5	10	13	14	13	18	0	7	14	13
6	15	12	15	12	12	7	0	8	11
7	19	11	9	10	15	14	8	0	15

TABLE 2: Customer time window range and demand.

Distribution point	Service time window	Service time	Demand (t)
0	(5–12)	—	—
1	(7–9)	30	0.65
2	(7–8)	15	0.3
3	(7–8)	30	0.23
4	(8–9)	30	0.5
5	(7–9)	30	0.55
6	(8–10)	15	0.42
7	(7–9)	15	0.5

TABLE 3: Comparison of execution efficiency of processors with different numbers.

Number of processors	Acceleration ratio (execution time of single processor/execution time of p processors)	Efficiency (speedup ratio/number of processors)
1	—	—
2	1.46	0.73
4	2.4	0.6
8	3.57	0.45

PCs in the same LAN. Case 1: let $W_1 = 0, W_2 = 1$, get the optimal path: 0-6-7-3-1-4-2-8-5, the total cost is 1620 yuan, the total mileage is 72 km, the vehicle driving time is 2.17 hours, and the calculation time is 10.79 s; Case 2: let $W_1 = 1, W_2 = 0$, the optimal path obtained is 0-5-6-7-2-4-3-1-8, the vehicle travel time is 1.84 hours, the total cost is 1736 yuan, the total mileage is 76 km, and the calculation time is 11.56 s. To a certain extent, the more the processors, the shorter the calculation time [21,22], as shown in Table 3 and Figure 4.

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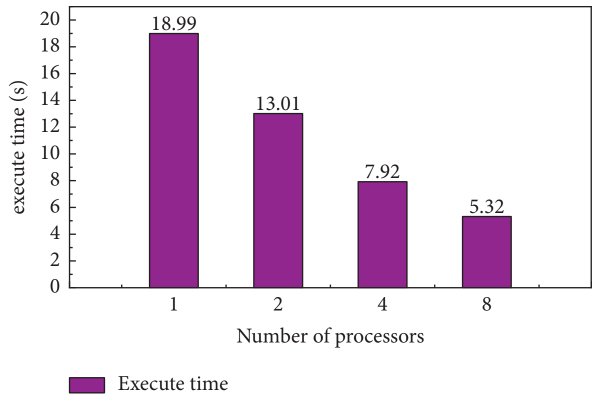

Figure 4: Comparison of execution time of processors with different numbers.

5. Conclusion

This paper compares cold logistics features with air temperature measurement and measures the importance of using cloud computing to optimize the real time of refrigeration vehicles. Using cloud computing technology to obtain the real-time multisource information required for real-time route optimization through a unified interface, an application service architecture for vehicle route optimization of cold chain logistics distribution is established. Under this framework, this paper obtains real-time traffic information, analyzes the driving speed and road conditions of refrigerated vehicles, calculates the total distribution time, analyzes the fixed cost, transportation cost, energy cost, cargo damage cost, and penalty cost of refrigerated distribution, and establishes the vehicle route optimization model of cold chain logistics distribution based on the total time and cost of distribution. As computation is an important technology for the use of weather applications, this line uses a rough-grained parallel genetic algorithm to solve the problem. The simulation results measure the efficiency of the air-cooled chain logistics vehicle method for the improvement and efficiency of the product distribution.

Data Availability

The 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.

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