



Equilibrium Scheduling of Dynamic Supply Chain Network Resources Under Carbon Tax Policy

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Abstract. The supply chain network is usually composed of multiple nodes and paths, and the energy consumption and carbon emissions of each node will change, leading to dynamic changes in the network structure and resource demand. In order to improve the utilization rate and accuracy of dynamic supply chain network resource balanced scheduling, under the current carbon tax policy, a comprehensive study on dynamic supply chain network resource balanced scheduling was carried out. Firstly, the RSUC dynamic supply chain network model is constructed to reflect the operation changes of the dynamic supply chain network under the carbon tax policy in real time through the iterative operation of the model. Secondly, a multi-path link routing algorithm for dynamic supply chain network resource balanced scheduling is designed, and the one with the highest success rate is selected as the transmission path for dynamic supply chain network resource balanced scheduling. Calculate the use of resources in dynamic supply chain network nodes, obtain the use and surplus of dynamic supply chain network resources under the carbon tax policy, and make every node's resources be used as far as possible. On this basis, according to the actual situation and characteristics of the supply chain network operation, the dynamic quota of network resource balanced scheduling is designed in an all-round way, so as to achieve the goal of dynamic supply chain network resource balanced scheduling under the carbon tax policy. Experimental analysis shows that after the application of the new method, the network resource utilization rate is high under different network workload data segments.

Keywords: Carbon Tax Policy · Dynamic · Supply Chain · Network · Resources · Equilibrium · Dispatch

1 Introduction

Carbon tax refers to the tax levied on carbon dioxide emissions. It aims at environmental protection and hopes to slow down global warming [1] by reducing carbon dioxide emissions. The carbon tax reduces fossil fuel consumption and carbon dioxide emissions [2] by taxing fossil fuel products such as gasoline, aviation fuel and natural gas

downstream of coal and oil in proportion to their carbon content. Different from the greenhouse gas emission reduction mechanism based on market competition such as total emission control and emission trade, carbon tax can be achieved by adding very little additional management cost [3]. Because of its connection with global climate change, carbon tax is theoretically set to require a global international management system to achieve optimal output, but this is not inevitable. When a country or region determines emission limits and emission reduction targets, it has considerable advantages to implement carbon taxes at the national or regional level. The impact of carbon tax is extensive and far-reaching, involving many aspects of social economy and people's life. The carbon tax should not only consider environmental effects and economic efficiency, but also consider social benefits and international competitiveness. The implementation effect of carbon tax varies greatly in different countries and regions at different stages of economic and social development. But in the long run, carbon tax is an effective environmental and economic policy tool, which can effectively reduce CO₂ emissions. Reducing energy consumption, changing the energy consumption structure, and inhibiting economic growth in the short term will be conducive to the healthy development of the economy in the medium and long term. However, it will expand the income distribution gap between capital and labor and intensify social injustice [4].

Resource scheduling schemes have different classification methods according to different focuses. In specific applications, different schemes can be selected according to different needs and optimization objectives of the system [5]. According to the number of available channels, it can be divided into single channel and multi-channel resource scheduling; According to whether the network topology information needs to be obtained, it can be divided into topology transparent and topology related resource scheduling; According to whether the centralized controller is set to assist resource allocation, it can be divided into centralized, distributed and centralized/distributed hybrid resource scheduling. According to the way of resource allocation, it can be divided into fixed, competitive and mixed resource scheduling. As the premise and foundation of data transmission and management of the Internet of Things system, resource balanced scheduling plays an important role in ensuring the performance of the dynamic supply chain network and effectively avoiding transmission interference [6]. However, many IoT resource scheduling schemes do not consider the "energy hole" problem of nodes near the base station, and ignore the problem of timely recovery and reuse of network resources when nodes fail. Generally, priority based resource scheduling sets the priority of data in advance, and cannot detect multiple types of emergency data at the same time. In some data monitoring applications, data priority is difficult to set in advance. In some heterogeneous IoT resource scheduling, slot reuse rate is difficult to improve, and network resource utilization rate is low. The clustering technology of the Internet of Things divides the network into different clusters. By managing other member nodes through cluster head nodes, it can effectively reduce the energy consumption of the Internet of Things and extend its life cycle. Affected by the carbon tax policy, there are certain risks and hidden dangers in the balanced scheduling process of dynamic supply chain network resources, and the scheduling timeliness is poor, which cannot ensure the efficient operation of the dynamic supply chain network [7].

In view of the above problems, this paper has carried out an in-depth study on the balanced scheduling of dynamic supply chain network resources under the current carbon tax policy, to ensure the efficient and high-quality operation of the dynamic supply chain network.

2 Research on Network Resource Equilibrium Scheduling of Dynamic Supply Chain

2.1 Build RSUC Dynamic Supply Chain Network Model

In the dynamic supply chain network resource balanced scheduling method under the carbon tax policy designed in this paper, first, the power supply problem of dynamic supply chain network data acquisition equipment needs to be solved.

One of the obstacles to the application of dynamic supply chain network is the power supply of data acquisition equipment. For many applications of the Internet of Things, wired power supply is impractical, and regular battery replacement will cause more complex operation and maintenance. In the multi hop communication of the Internet of Things, nodes near the base station undertake more data forwarding work, which will lead to the rapid depletion of battery energy and the “energy hole” phenomenon. This problem can be alleviated by non-uniform clustering strategy. Many resource scheduling schemes do not consider the “energy hole” problem, and ignore the problem of resource recovery and reuse of failed nodes. This chapter proposes IoTResourceScheduling based on Unequal Clustering (RSUC) [8]. The structural framework of RSUC dynamic supply chain network model is shown in Fig. 1.

As shown in Fig. 1, a non-uniform clustering strategy based on dynamic topology is proposed to alleviate the “energy hole” problem in the multi hop IoT; Then we study the routing selection and layering mechanism based on non-uniform clustering, establish the multi hop routing constraint criteria, find the optimal relay node, and layer the cluster heads according to the data transmission chain routing. Finally, we propose resource scheduling for intra cluster communication and inter cluster communication based on non-uniform clustering. In the resource scheduling of intra cluster communication, the cluster head node dynamically reclaims the resources of the failed node according to the threshold of the number of members of the cluster. In the resource scheduling of inter cluster communication, the cluster head node obtains different sending and receiving timeslots according to different layers of the transmission chain. In RSUC based resource scheduling, clusters near the base station are allocated fewer intra cluster communication slots and more inter cluster communication slots. The farther the cluster is from the base station, the earlier the inter cluster communication ends and enters the intra cluster communication, rather than waiting for all cluster heads to complete the inter cluster communication, thus improving the utilization of resources. Experiments show that through reasonable joint resource allocation of channels and timeslots for intra cluster and inter cluster communication, data can be transmitted in parallel as far as possible to reduce network energy consumption and improve network throughput [9].

In the dynamic supply chain network model, the dynamic heterogeneous clustering and multi hop routing are comprehensively considered. IoT equipment mainly includes:

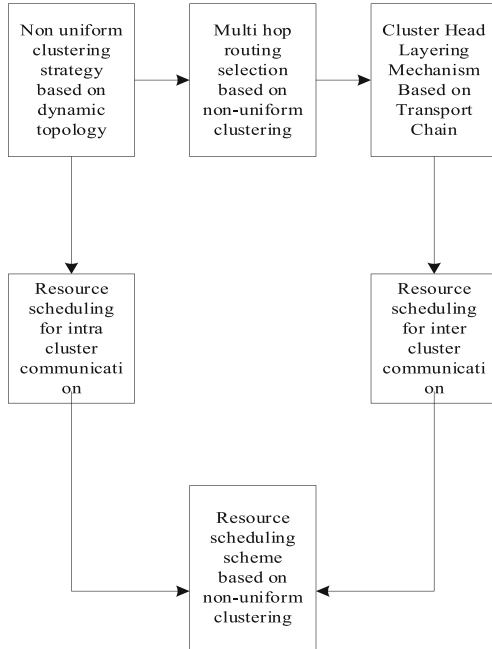


Fig. 1. Structure framework of RSUC dynamic supply chain network model

data collection node, cluster head node, base station and master control equipment. Each cluster has a cluster head node, which collects the data of nodes in the cluster and transmits the data to the base station in a multi hop manner. Set the specific functions of each node as follows:

1. Data collection node

The data acquisition node is mainly responsible for sensing and collecting environmental and equipment information in the monitoring area, such as humidity, temperature, noise, vibration, infrared sensing and other data. After clustering, the data collection node will become a cluster member (CM) node and send the collected data to the cluster head node [10] in one hop mode.

2. Cluster head node

The cluster head node (CH) is mainly responsible for generating the resource scheduling table for intra cluster communication, receiving the data from the data collection node in the cluster, merging the data, forwarding the data to the base station in a multi hop manner, and broadcasting time synchronization information, channel and slot scheduling table updates and other information in the cluster.

3. Base station

The base station (BS) is mainly responsible for generating the resource scheduling table of inter cluster communication, collecting the data information of cluster head nodes, finally transmitting the data to the master control equipment, and broadcasting time synchronization information, channel allocation table, inter cluster timeslot scheduling table and other information throughout the network.

4. Main control equipment

All data is finally transmitted to the master control equipment. The master control equipment manages and processes the collected data uniformly, and provides real-time information for users.

The RSUC dynamic supply chain network model established in this paper needs to meet the following constraints, as shown in Table 1.

Table 1. Constraints of RSUC dynamic supply chain network model

number	constraint condition
1	Each node of the Internet of Things can indicate the received signal strength according to the received signal strength Indicator, RSSI) to calculate the distance
2	The transmission power of each node of the Internet of Things is adjustable
3	Generated by periodic data collection of data collection node
4	The cluster head node collects the data of the cluster members in the communication within the cluster and fuses them However, in the process of inter cluster communication, the received information is not fused considering the differences of data in each cluster
5	The base station supports multi interface and multi-channel communication
6	In the intra cluster communication, the data collection node can complete the current week of the node in one unit time slot Data transmission of periodic collection. The size of the unit timeslot can be adjusted according to the application environment
7	In a time slot, a node can only communicate with one neighbor node at most. Node in one The time slot is only in the sending state or receiving state

According to the constraints described in Table 1, the RSUC dynamic supply chain network model is established. Through the iterative operation of the model, the operation changes of the dynamic supply chain network under the carbon tax policy are reflected in real time, laying the foundation for the balanced scheduling of network resources in the following text.

2.2 Design a Dynamic Supply Chain Network Resource Balanced Scheduling Multi-path Link Routing Algorithm

The reasonable scheduling of multi-path links can effectively improve the reliability of data transmission, and the more multi-path links, the more obvious the improvement of reliability. Therefore, the number of multi-path links can be reasonably increased when generating data flow graph routes. It should be noted that the existence of multi-path links will lead to more communication conflicts and larger data transmission delay. In order to ensure effective data transmission, while increasing multi-path links to improve

reliability, it is necessary to ensure that the data transmission delay is within the super-frame range. In addition, the existence of multipath links can improve the reliability of data transmission. For a single data stream, the overlap of paths between different data streams will not affect the transmission success rate.

Therefore, the multi-path link routing algorithm designed in this chapter generates routes for each data stream in turn according to the priority order of the data stream. The design idea of the algorithm is described in detail below.

- (1) Generation of the main path: When generating the main path, the data stream will not generate multi-path links, so only the length of the path needs to be considered at this time. You can directly use the single source shortest path algorithm to generate the main path of the data stream. If multiple shortest paths with the same length appear, select the path with the least overlap with other paths as the final main path.
- (2) Generation of secondary path: when generating the secondary path, it is necessary to consider both the path length and the number of multi-path links, and there is no unified relationship between the two factors. You can use the method of generating alternative paths, and then compare the transmission success rate to select the final secondary path. The schematic diagram of generation of secondary path for balanced scheduling of dynamic supply chain network resources is shown in Fig. 2.

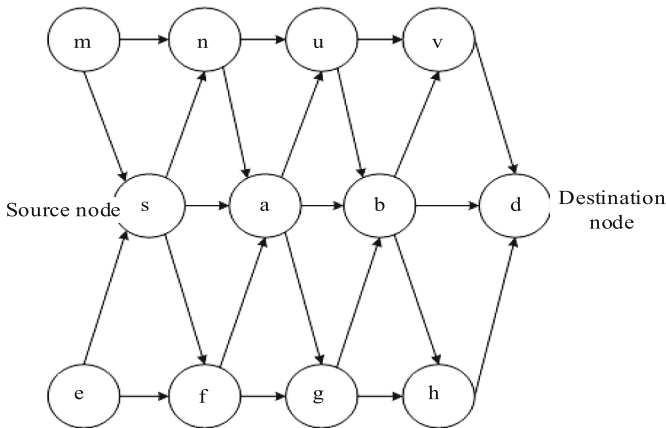


Fig. 2. Schematic diagram of dynamic supply chain network resource balanced scheduling secondary path generation

As shown in Fig. 2, it is the schematic diagram of generation of secondary path for dynamic supply chain network resource balanced scheduling designed in this paper. The specific generation process is as follows:

1. Determine the source node of the secondary path according to the primary path, generate the first alternative path through the shortest path algorithm, and represent it with C, representing the jth alternative secondary path of the ith secondary path of the data flow f. If there are shortest paths of equal length, they are all regarded as alternative paths.

2. Generate the shortest path containing multi-path links as an alternative path. The main path of the data stream is $s \rightarrow a \rightarrow b \rightarrow d$, so it can be determined that the source node of its first secondary path is s and the destination node is d . The shortest path from node s to node a is generated through the shortest path algorithm, and then it reaches the destination node through links (a, b) and (b, d) to generate the shortest path containing two multi-path links: similarly, the shortest path is generated from node s to node b , Then it reaches the destination node through links (b, d) , and generates the shortest path containing a multipath link. Note that the primary path and the secondary path cannot be identical.
3. Calculate the transmission success rate under different alternative paths. The formula is:

$$g(n, s[n]) = \prod_{i=1}^{i=n} [1 - (1 - p)^{s[i]}] \quad (1)$$

Among them, $g(n, s[n])$ Indicates the success rate of path transmission; p Represents the average transmission success rate of data stream sets in the entire network; $s[i]$ It indicates the number of link transmissions of data transmission. Through calculation, the one with the highest success rate is selected as the final secondary transmission path for balanced scheduling of dynamic supply chain network resources.

2.3 Calculating the Resource Usage of Network Nodes

After completing the design of multi-path link routing algorithm for balanced scheduling of dynamic supply chain network resources, next, calculate the resource usage of dynamic supply chain network nodes.

For the resource scheduling problem of network intensive applications, this paper combines the ideas of NodeResources LeastAllocated and NodeResourcesB balanced Allocation algorithms in the Kubernetes default scheduler, and proposes a optimal scheduling algorithm BWNA. When scheduling pods, this algorithm not only considers whether the resource scheduling among multiple nodes in the cluster is balanced, And considering whether the use of different resources on a single node is balanced, the most important thing is that this algorithm can comprehensively consider the three indicators of CPU, memory and network bandwidth, and then calculate the resource usage of network nodes to meet the scheduling requirements of network intensive applications in all directions.

The algorithm design is as follows: Assume there is k Nodes $N_1, N_2, N_3, \dots, N_k$; node N_i The CPU capacity of is recorded as C_{cpu}^i , the memory capacity is recorded as C_{mem}^i , the network capacity is C_{net}^i Capacity represents the total amount of resources that a node can provide. Resource usage of nodes U The CPU usage is recorded as U_{cpu}^i , the memory usage is recorded as U_{mem}^i , network usage is U_{net}^i , and we set the weights of CPU, Memory, and Net to $W_c \setminus W_m \setminus W_n$. When a Pod needs to be scheduled, assume that the CPU, Memory, and Net requests of the Pod are $R_{cpu} \setminus R_{mem} \setminus R_{net}$ The scheduling process is as follows:

- 1) Calculate each node N_i Usage of Pod resources running on $U_{cpu}^i \setminus U_{mem}^i \setminus U_{net}^i$.

- 2) When the Pod to be scheduled is scheduled to the node N_i ; Calculate the resource usage of the node after $T_{cpu}^i, T_{mem}^i, T_{net}^i$, the formula is as follows:

$$T_{cpu}^i = U_{cpu}^i + R_{cpu} \quad (2)$$

$$T_{mem}^i = U_{mem}^i + R_{mem} \quad (3)$$

$$T_{net}^i = U_{net}^i + R_{net} \quad (4)$$

- 3) Calculate the remaining available resource of the node $E_{cpu}^i, E_{mem}^i, E_{net}^i$, the formula is as follows:

$$E_{cpu}^i = C_{cpu}^i - T_{cpu}^i \quad (5)$$

$$E_{mem}^i = C_{mem}^i - T_{mem}^i \quad (6)$$

$$E_{net}^i = C_{net}^i - T_{net}^i \quad (7)$$

Through calculation, we can obtain the use and surplus of network resources in the dynamic supply chain under the carbon tax policy, so that the resources of each node can be used as far as possible, and lay a good foundation for the balanced scheduling of resources among multiple nodes in the subsequent network cluster.

2.4 Design Dynamic Quota for Balanced Scheduling of Network Resources

After obtaining the resource usage of dynamic supply chain network nodes, based on this, and according to the actual situation and characteristics of the supply chain network operation, the dynamic quota for balanced scheduling of network resources is comprehensively designed, so as to achieve the goal of balanced scheduling of dynamic supply chain network resources under the carbon tax policy.

To solve the problem that the supply chain network resource quota used by multiple users cannot change dynamically, this paper designs a DQ controller. This controller starts from the cluster resource change, listens to the increase and deletion of nodes in the cluster, calculates the proportion of resource quota that needs to be dynamically adjusted according to the ratio of cluster resource change, and finally modifies the resource quota data under multiple users. DQ is designed as follows:

- 1) DQ counts the total amount of CPU and memory resources of all available nodes of the cluster TotalCpu and TotalMem, and saves the NodeList of the node list of the current cluster.
- 2) Monitor the changes of resources such as nodes in the cluster through NodeInformer. When adding or deleting nodes in the cluster, perform step 3.
- 3) Update the node list in the NodeList. If the CPU and memory resources of the newly added/deleted nodes are NodeCpu and NodeMem, respectively, calculate the change rate of CPU and memory resources in the cluster. The calculation formulas are:

$$P_{cpu} = \frac{M_{cpu1} + M_{cpu}}{M_{cpu}} \quad (8)$$

$$P_{mem} = \frac{M_{mem1} + M_{mem}}{M_{mem}} \quad (9)$$

Among them, P_{cpu} Indicates the CPU change rate in the dynamic supply chain network cluster; P_{mem} Indicates the change rate of memory resources in the dynamic supply chain network cluster; M_{cpu1} Indicates the CPU of the new/deleted node; M_{mem1} Indicates the memory resources of new/deleted nodes; M_{cpu} Represents the total change of network CPU; M_{mem} Total changes in network memory resources.

- 4) Calculate the change rate of cluster resources according to different strategies. The DQ controller supports the mean and maximum values (Max) and minimum (Min) are calculated as follows.

$$P_{Mean} = \frac{P_{cpu} + P_{mem}}{2} \quad (10)$$

$$P_{Max} = \max(P_{cpu}, P_{mem}) \quad (11)$$

$$P_{Min} = \min(P_{cpu}, P_{mem}) \quad (12)$$

Through calculation, the change rate of dynamic supply chain network cluster resources under different strategies is obtained.

- 5) According to the change policy configured in the DQ, select one of Formula 3 to Formula 5 to get the final rate of change ratio, then traverse the namespaces in the configuration that need to dynamically change the resource quota, and finally dynamically change the resource quota items in the DQ under these namespaces according to the rate of change ratio.

To sum up, DQ calculates the change rate of the node's CPU and memory resources, and then averages or compares them to get the final change rate. Finally, it adjusts the quota of the ResourceQuota under Namespace to achieve the goal that the ResourceQuota changes with the changes of cluster resources, and then achieves the goal of balanced scheduling of dynamic supply chain network resources under the carbon tax policy.

3 Experimental Analysis

3.1 Experiment Preparation

In order to objectively test the feasibility of the dynamic supply chain network resource balanced scheduling method proposed in this paper, the experimental analysis is carried out as shown below. Simulate the collaborative work of five cloud services, and take five data segments with the same length from the load tracking of Google dataset to evaluate the algorithm in this chapter.

Google cluster is a group of physical machines connected through a high bandwidth network. All clusters share a common cluster management system, which distributes work to machines and loads the cluster in the form of jobs. A job consists of one or more

tasks. Each task is accompanied by a set of resource requirements, which are used to schedule the task to the appropriate server. The resource requirements and usage data of the task come from the information provided by the cluster management system. The data set used in this article is Google's one month data tracking of Google clusters. Data appears in the form of a table and contains six data attributes: machine attributes, machine events, job events, task constraints, task events, and task attributes. Data is generated by various physical machines with different processing capacities in the cluster, and the workload in the data shows a high degree of heterogeneity and variability. It consists of jobs with different resource requests and processing priorities. Each job is divided into one or more tasks, and the data contains the demand information of each task and the physical machine information of processing tasks. There are difficulties in processing tracked big data. The amount of tracked data after compression is about 40G, and the size of all tables after decompression is about 300GB. It should be noted that all the data provided by Google cannot reflect the real value of tracking. For privacy purposes, Google standardizes the data so that researchers can use these data for analysis and experiments.

The use of real load tracking makes the results more realistic and reliable, and can better reflect the randomness and volatility of user requests. The data segment includes 200 5-min intervals, lasting more than 16 h in total. The selected workload data segments correspond to cloud service 0, cloud service 1, cloud service 2, cloud service 3, and cloud service 4, respectively. In addition, this chapter assumes that the general scheduling strategy is first come, first serve. IaaS providers provide four types of virtual machines: small, medium, large, and extra large. They have different capacities and costs. The specific parameter settings are shown in Table 2.

Table 2. Parameter Settings of Virtual Machines Used in Experiments

VM Type	Large	Medium	Small
Core	4	2	1
CPU (MIPS)	10000	5000	2500
RAM (GB)	75	37.5	17
Disk (GB)	8500	4100	1600
VM price (\$/h)	14	7	3.75
VM initiation price (\$)	0.13	0.06	0.025

Set the virtual machine according to the parameters shown in Table 2. Secondly, build the test environment for this experiment. For task data of different scales, this chapter simulates the establishment of different number of servers and server farms: 30 servers and 10 server farms are set. For each server, it is assumed that there are 21 CPU resources and 21 RAM resources, and some servers are connected together as a server farm. In fact, the number and structure of server farms are determined by CSPs. In each server, suppose there are three virtual machines, and each task can run on one of

them. In the resource balanced scheduling experiment designed in this paper, the non-uniform clustering strategy and resource scheduling of intra cluster and inter cluster communication are used to reduce network energy consumption. The initial battery voltage of nodes in the dynamic supply chain network is 3.3 V. Figure 3 shows the measured voltage values of 10 randomly selected nodes in the first and third layers after uneven clustering recorded on June 20, 2021 and July 20, 2021, respectively.

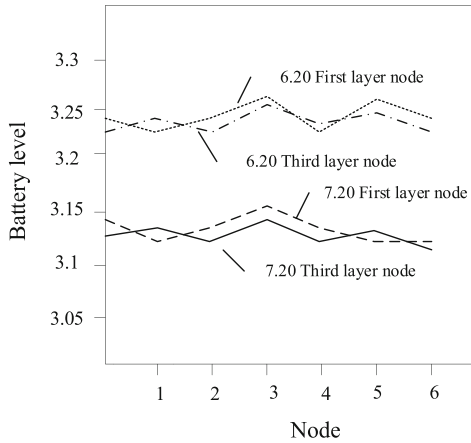


Fig. 3. Battery power corresponding to nodes at different layers in dynamic supply chain network resource balanced scheduling

It can be seen from the monitoring values that the remaining battery power of the nodes on the first layer and the third layer is similar. This experiment shows that the non-uniform clustering strategy makes the energy consumption of nodes at different levels relatively balanced, thus avoiding the “energy hole” problem caused by the frequent forwarding of data by the first layer nodes near the base station. In the resource scheduling experiment, the convex optimization theory is used to obtain the regular data change rate that reflects the normal operation of the dynamic supply chain network. Based on the change rate of conventional data, real-time monitoring the temperature change of the supply chain network equipment bearing.

3.2 Result Analysis

After the dynamic supply chain network resource balanced scheduling is selected, the network resource utilization rate is used as the evaluation index of this experiment. Network resource utilization refers to any time interval Δt Internal, the utilization rate of the supply chain network cloud service CPU. The calculation expression is:

$$P(\Delta t) = \frac{M(\Delta t)}{T(\Delta t)} \quad (13)$$

Among them, $P(\Delta t)$ Represents any time interval Δt Internal, the utilization rate of the supply chain network cloud service CPU; $M(\Delta t)$ Represents any time interval Δt

The cloud service requests the allocated machine commands per second for users; $T(\Delta t)$ Represents any time interval Δt The total MIPS of the leased server. The higher the utilization rate of network resources, the better the balanced scheduling effect of dynamic supply chain network resources under the carbon tax policy, the higher the CPU utilization rate, and vice versa. Dynamic supply chain network delay includes transmission delay, propagation delay, processing delay and queuing delay. In this experimental test, the average network delay of the supply chain is shown in Fig. 4.

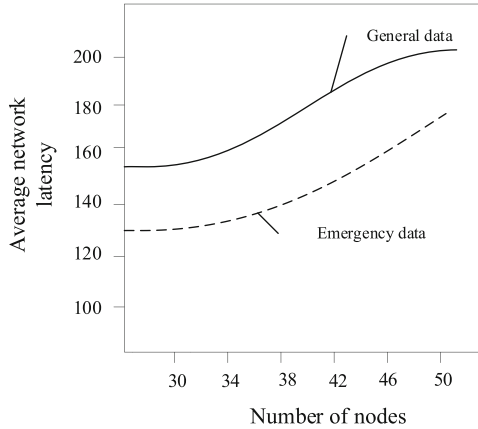


Fig. 4. Dynamic supply chain evaluation network delay

From Fig. 4, it can be seen that the supply chain network data monitoring system adopts the UCPDR scheduling scheme, which prioritizes the processing of emergency temperature data by allocating time slots and channels. The application of this scheduling scheme effectively reduces the average network delay of emergency data, keeping it within 160, which is significantly lower than the average network delay of general data. This scheduling strategy is of great significance for improving the real-time, reliability, and emergency response capabilities of data monitoring systems.

In order to make the experimental results more intuitive and convincing, the experimental method and principle of comparative analysis are introduced. Set the dynamic supply chain network resource balanced scheduling method proposed in this paper as the experimental group, and set the conventional network resource balanced scheduling method as the control group for comparative analysis. Under the selected supply chain network workload data segment, namely cloud service 0, cloud service 1, cloud service 2, cloud service 3, and cloud service 4, respectively measure the utilization rate of dynamic supply chain network resource balanced scheduling after the application of the two methods, and draw the comparison chart of evaluation indicators as shown in Fig. 5.

The comparison results of the evaluation indicators in Fig. 5 show that the two network resource balanced scheduling methods show different performance effects after application. Among them, after the application of the dynamic supply chain network resource balance scheduling method under the carbon tax policy proposed in this article,

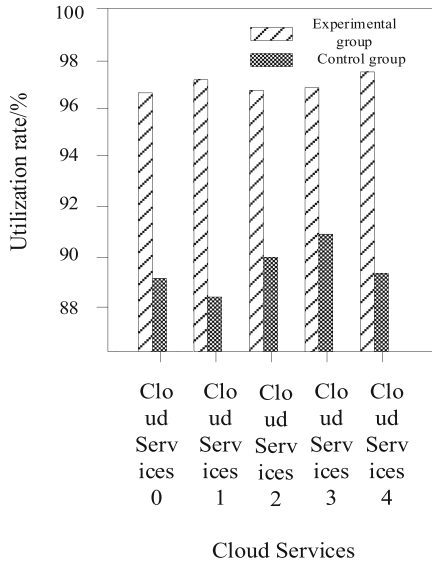


Fig. 5. Comparison Diagram of Experimental Evaluation Indicators

the resource utilization rate remains above 96% under different network workload data segments, while the overall resource utilization rate of the conventional method remains between 80% and 92%. Through comparison, it can be seen that the dynamic supply chain network resource balance scheduling method proposed in this article has always been higher than the conventional method under the carbon tax policy. It is not difficult to see that the resource balanced scheduling method proposed in this paper has high feasibility, can effectively reduce the resource waste generated in the operation of dynamic supply chain network, improve CPU utilization, and has significant advantages in the balanced scheduling effect.

In order to further validate the effectiveness of the method proposed in this paper, the methods of reference [6] and reference [7] in the introduction were used to compare with the method proposed in this paper. A random transmission path was randomly selected for testing in this method.

The network resource Transmission delay is selected as the evaluation index, which is one of the main indicators to show the load balance performance of each channel of the network interface. The smaller the Transmission delay of network resources, the faster the calculation speed of channel load, that is, the shortest time for channel load balancing, the shorter the waiting time of data queue, and the better the resource transmission performance. The experimental results are shown in Fig. 6.

From the experimental results in Fig. 6, we can see that the Transmission delay of network resources in this method is kept within 15 ms, while the Transmission delay of the other two methods is significantly higher than that in this method. This is because this method constructs the RSUC dynamic supply chain network model, and improves and optimizes it. This method can more accurately predict and schedule network resources to meet the needs of different nodes and reduce Transmission delay. Although this

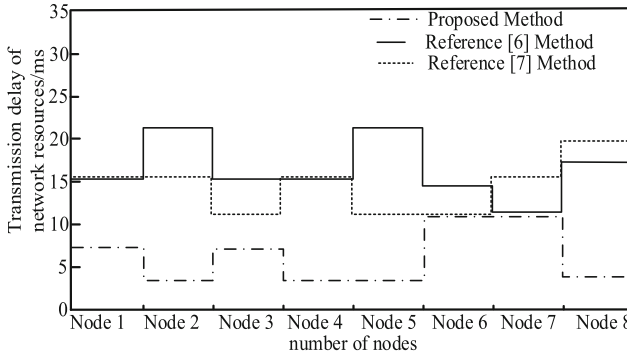


Fig. 6. Comparison of Transmission delay of Network Resources

method does not select the one with the highest success rate as the transmission path for dynamic supply chain network resource balanced scheduling, its Transmission delay is slightly lower than the other two methods, but it is still the lowest of all methods. It can be concluded that this method selects the one with the highest success rate as the transmission path for dynamic supply chain network resource balanced scheduling, which can ensure the rapid transmission and processing of data in the network, thus reducing Transmission delay.

4 Conclusion

To improve the overall performance of data transmission and resource scheduling in dynamic supply chain networks, this article studies the key technologies for optimizing resource balance scheduling in dynamic supply chain networks oriented towards carbon tax policies. Build an RSUC dynamic supply chain network model and design a dynamic supply chain network resource balance scheduling multi-path link routing algorithm to reflect the operational changes of the supply chain network under carbon tax policies in real time. By iteratively running the model, the usage of node resources in the dynamic supply chain network is calculated, and dynamic quotas are designed to achieve the goal of balanced scheduling of supply chain network resources under the carbon tax policy. The experimental results show that under different network workload data segments, the proposed method has a high utilization rate of network resources and can effectively solve task scheduling problems. However, in actual cloud environments, relying solely on task scheduling to achieve resource balance is not ideal and should be improved in future research.

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