

# *Exploitation and Utilization of Marine Resources and Sustainable Development of Environment Based on Edge Computing*

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**Abstract:** The development and utilization of marine resources can not only promote economic, social and ecological development, but also promote the improvement of human living standards and create more wealth for the country. With the increasingly prominent problems of marine environment, people pay more attention to the protection of marine organisms and algae. Based on the edge computing method, this paper analyzes the development and utilization of marine resources in the sea area, and puts forward reasonable suggestions and measures to achieve its sustainable development goal. The development and utilization of marine resources can effectively alleviate the pollution of coastal waters, improve the ecological oxygen status and the coastal ecological environment. Therefore, this paper tests the sustainable model of marine resources development and utilization of edge computing. The test results show that the smaller the number of turnover wheels of edge computing, the higher the applicability and compatibility of the calculation.

## **1. Introduction**

The ocean is a very complex ecosystem. It not only has huge, non renewable and sustainable use value, but also is a valuable resource derived from marine organisms [1-2]. With the acceleration of economic globalization, the continuous improvement of China's scientific and technological level, the deepening of social civilization and the improvement of people's quality of life, it has become an inevitable trend for us to develop and utilize seafood. However, there are also some unreasonable situations in the process of development and utilization, such as the destruction of the marine environment and the deterioration of water quality caused by the pollution of seawater [3-4].

Many scholars have studied the exploitation of marine resources. Domestic research on the

development and utilization of marine resources and environmental issues started late, but some achievements have been made in practice. Some scholars have investigated and analyzed China's coastal waters and concluded that the sustainable development of marine resources is a coordinated and unified goal of social economy and environmental protection. It is of positive significance to achieve common progress, promote regional sustainable and stable construction, and promote the improvement of national comprehensive strength [5-6]. Other scholars found that with the continuous improvement of scientific and technological level and the continuous improvement of development technology, human use of natural resources can be more fully and rationally protected through the establishment of dynamic models. In addition, some scholars have studied the coordinated development between resources and environment from different angles. Some scholars take the US coastline as an example to analyze the spatial distribution and variation characteristics of tidal abundance in China's coastal waters, and discuss its action mechanism and regularity in the region [7-8]. Therefore, based on edge computing, this paper studies the development and utilization of marine resources and the sustainable development of the environment.

As one of the important components of the earth's life chain system, the marine ecosystem itself has a variety of functions and values to maintain the balance of the terrestrial ecological environment and promote the healthy development of human beings. However, with the increase of the development of the marine economy, it has caused a certain degree of damage and pollution to the marine biological resources, resulting in the depletion of a large number of precious sea areas. In addition, the scarcity and high price of freshwater shellfish is one of the main causes of seawater pollution. The ecological deterioration of the marine environment directly restricts and changes the development speed and quality of China's national economy. Therefore, this paper starts with the principle of edge computing and puts forward corresponding solutions.

## **2. Discussion on the Exploitation and Utilization of Marine Resources and Sustainable Development of Environment Based on Edge Computing**

### **2.1. Existing Problems in the Development and Utilization of Marine Resources**

Marine resources are the important material basis for human survival. With the increase of development, marine environmental pollution is becoming more and more serious, which poses a great threat to marine life *and* natural resources such as seabed oil and natural gas. The development and utilization of marine resources is based on the premise of protecting the ecological environment of the coastal zone. Through the comprehensive management of the sea area and the improvement of the quality of the coastline, the destruction of biodiversity and non-human factors on the land can be realized. In China's coastal areas, due to the lack of necessary and reasonable planning and protection measures, there are also some problems in the protection of marine ecological environment in our coastal areas. As an important economic activity, the development and utilization of marine resources is very common in China's coastal areas [9-10]. Because it involves many disciplines and many local scientific problems, its research methods are also complex, diverse and complex to a certain extent. At present, there is no relatively mature and unified theoretical system to fully describe or analyze the power and ecological value in seawater. Moreover, due to the limited capacity of the marine environment, there are some unreasonable phenomena in the development and utilization of resources. One is the waste caused by blind exploitation. In order to achieve sustainable development, we have the responsibility and obligation to protect the sea area through various means, establish and improve the relevant laws and regulations system. At present, China has not formulated special legislative documents or promulgated some relevant rules and regulations for marine fisheries, and there is also a lack of corresponding professionals to manage and enforce the law [11-12]. Within a certain range, the

existing or damaged parts in the existing sea area are re divided into a limited number of water sections or space units and treated by corresponding technical means to form a complete development and utilization period. At the same time, it is also necessary to strengthen the management of marine resources and strictly control the occurrence probability and impact degree of new construction occupation and repeated mining.

## 2.2. Environmental Sustainable Development

The sustainable development of marine resources means that, first, in the process of development and utilization, attention should be paid to ecological, economic and social benefits to promote the balance of regional ecological environment. The second is to protect and manage the carrying capacity of the marine environment, and to achieve its goal is to make the seaweed resources be rationally applied. We need to know what kind of environmental protection can be effectively managed. Because human beings have a certain cognitive ability to the pollution and harm degree of marine organisms, they will cause a lot of unnecessary damage, and even some behaviors may be uncontrollable, resulting in damage or failure of the ecosystem [13-14]. The development and utilization of marine resources is to meet the needs of human survival and development. However, with the enhancement of people's awareness of marine biodiversity protection and the increasing environmental pollution in recent years. Therefore, rational exploitation of marine resources is an inevitable choice. In terms of the current distribution of China's sea area, the vast land and the complex sea land crisscross have caused the narrow coastline of China's coastal areas, while the relatively inconvenient maritime traffic has caused damage to some water areas and even soil erosion. In addition, due to the low degree of development and utilization, some precious freshwater organisms will also cause serious harm due to unreasonable planning and uncontrolled fishing [15-16].

The maximum utilization of marine resources development and utilization is to make reasonable use of them to the maximum extent, so that they are not wasted and exploited rationally. Mining, processing, transportation and other links in the marine space must be strictly implemented in accordance with relevant regulations. The sea area must be divided into different areas, and then the hierarchical structure shall be divided according to the actual situation. Finally, detailed plans and implementation plans shall be formulated to ensure that all parts can be effectively utilized and developed, so as to minimize the damage to marine biological resources and the occurrence of pollution, improve its usability and economic benefits. Fig. 1 is a diagram of maximizing resource utilization.

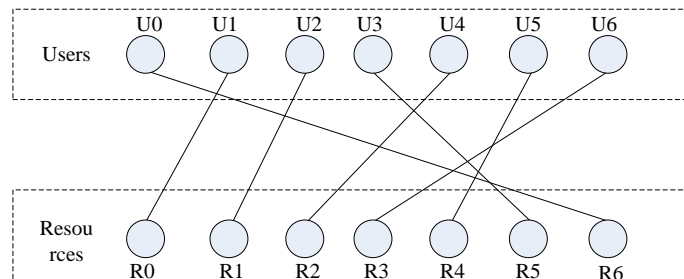


Figure 1. Maximize the resource utilization diagram

## 2.3. Edge Computing

Edge is a highly nonlinear quantity, and it is also called boundary, which is defined as: (1) within the region; (2) In a certain position in space. Based on the above two basic concepts, the edge has

two most important features. That is, the distance and direction between the "point" and the line segment, or the mutual restriction and mutual influence, and the number of elements in the adjacent area are determined. The research is on the marine resources of a region or a country, not just limited to a specific field. It can even be called the unique possession of a certain country or a certain type of marine biota. The marine resources are developed by using the method of edge computing, It is to take the actual or potential problems as an object and predict the consequences when they may change in the future through various means such as computer technology, theoretical and experimental research [17-18]. In this case, the concept of edge algorithm is proposed to solve this kind of complex problems. For problem P2, by adopting munkres' improved algorithm for KM algorithm, its time complexity can be estimated as:

$$O(p2) = O(|X^2||Y|) \tag{1}$$

For the problem P3, the optimal allocation scheme is obtained by the bubble like ranking of the remaining resources (which is actually reflected as the minimum value acquisition in a single time slice). Obviously, when n is limited, this problem is of time complexity  $O(N^3)$  P Such problems are:

$$O(p3) = O(n^3) = O(p2) \tag{2}$$

Calculate a new method to deal with these problems and turn it into an effective and feasible tool to solve this problem. Some data found in practice can be expressed by graph theory or mathematical geometric model, and the corresponding database can be well established by GIS and other software for recording and reporting.

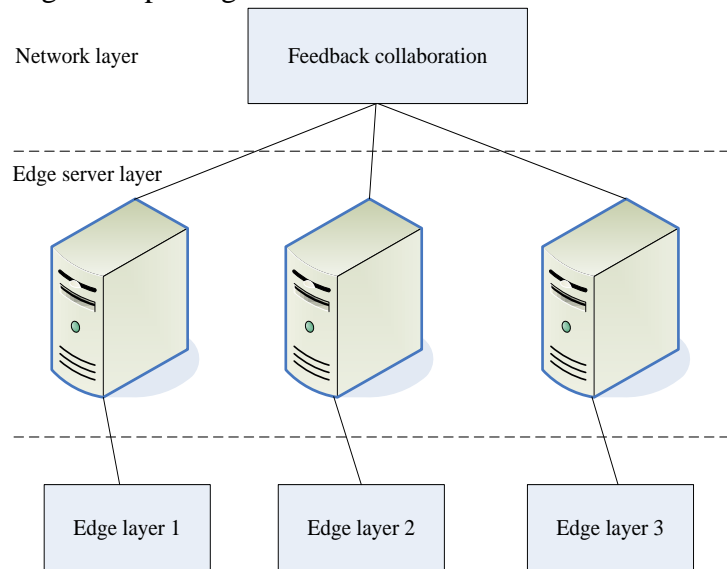


Figure 2. Edge layer architecture

In the process of development and utilization of marine resources, if we make reasonable planning for it, we can maximize the advantages of edge computing in practical application, and also promote the improvement of marine environment quality. Combine geographic information system with data processing technology. Through the establishment of a land map, coastline and land area model. The system can provide various types of charts, digital images and related analysis reports. In addition, it can effectively classify and manage marine resources, and formulate corresponding maintenance plans and measures according to different regions.

### 3. Experimental Process of Exploitation and Utilization of Marine Resources and Sustainable Development of Environment Based on Edge Computing

#### 3.1. Sustainable Development Model of Marine Resources Based on Edge Computing

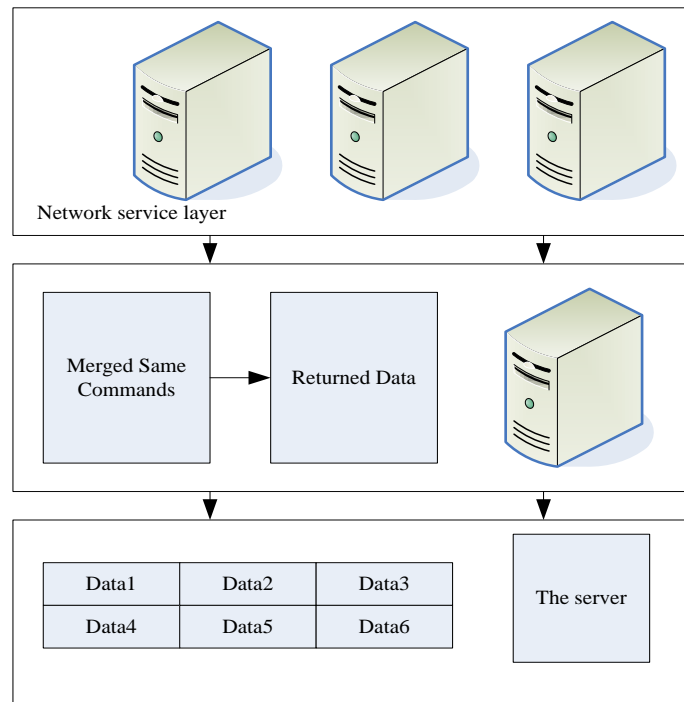


Figure 3. A model of Marine resource sustainability based on edge computing

The sustainable development model of marine resources is mainly composed of three parts (as shown in Fig. 3): development and utilization mode, development conditions and resource regeneration. These three parts constitute a complete system. Among them, the former refers to rationalization and integration of natural resources and relevant measures and plans to achieve this goal, while the latter refers to how to make better use of the limited natural resources and environment and other material wealth on the existing basis to promote the development of marine economy and protect the structure of marine biological communities. Therefore, we should have a good understanding of the community structure and species composition, species distribution and habitat environmental conditions of marine organisms in the land area, and at the same time, we should consider the differences and complexity of marine organisms in different sea areas, the speed of habitat change and the degree of environmental pollution.

#### 3.2. Model Test of Sustainable Development of Marine Resources

By evaluating the development and utilization of marine resources and combining with the local actual situation, we can establish a sustainable development model. The method is a multi parameter, multi criteria or unstructured distributed system. Firstly, the physical state equation of the objective function that each sub module needs to achieve is determined according to the interdependence between them. Secondly, some key parts are selected in each sub module as test indicators and calculation units to evaluate the development and utilization of the whole marine resources. Finally, the results obtained are compared with the original data. If the results are the same, it indicates that the model has a high degree of sustainable development ability.

## 4. Experimental Analysis of Exploitation and Utilization of Marine Resources and Sustainable Development of Environment Based on Edge Computing

### 4.1. Edge Computing Test of Marine Resources Sustainable Development Model

Table 1 is the edge computing compatibility test data of marine resources sustainable development model.

Table 1. Edge calculation test

Test times	Call the number of rounds	Usability (%)	Compatibility (%)	Resource utilization rate (%)
1	341	83	97	96
2	234	95	95	94
3	265	91	96	93
4	211	94	97	95
5	203	98	93	94

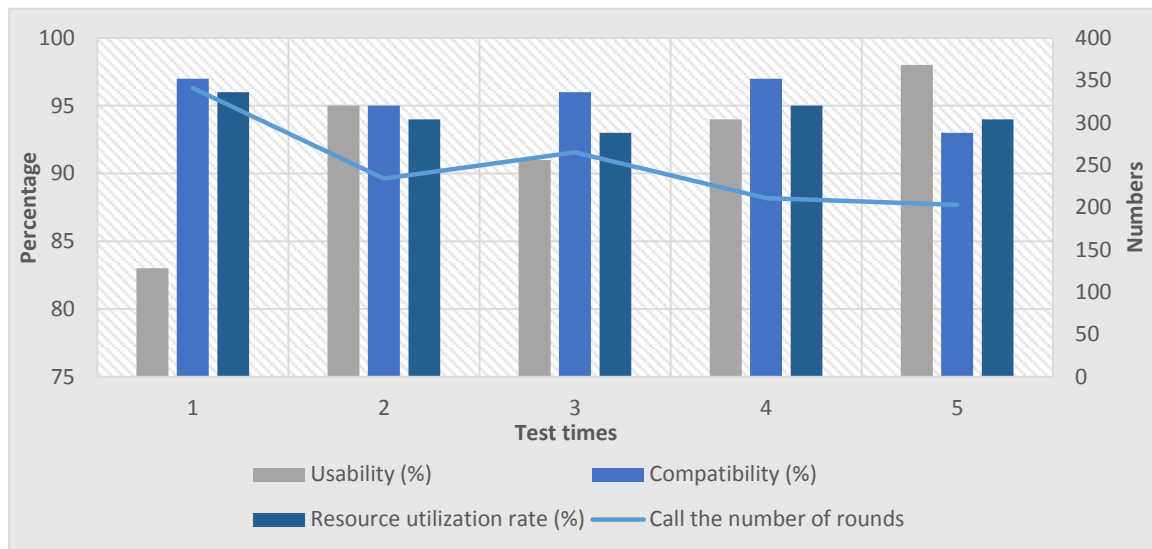


Figure 4. Edge calculation accuracy test

The sustainable development of marine resources mainly refers to the realization of its long-term stability on the premise of meeting human needs and conflicting economic, social and environmental benefits. Sustainability assessment not only considers the impact of biological and natural environmental factors on the objectives, but also determines the function of a project through system analysis. According to the above description, the benefits brought by the development and utilization of marine resources are greater than the expenditure on environmental protection. The development and utilization of marine resources will cause damage to the ecological environment and ecological pollution. Therefore, it is necessary to protect the environment economically and make reasonable planning and construction. It can be seen from Fig. 4 that the smaller the number of turnover wheels of edge computing, the higher the applicability and compatibility of the calculation.

## 5. Conclusion

The development and utilization of marine resources is an indispensable part of the development

process of a country and even the whole human society. The rational and effective utilization of marine resources can not only promote the improvement of the comprehensive level of economy and culture, but also provide more renewable products for marine organisms. This paper mainly introduces the problems of marine environment. Through the establishment of three-dimensional spatial model, the structure of marine biological ecological community and the division of functional areas, as well as the relationship and influence factors between the development and utilization of marine resources and the ecological environment are determined, and the corresponding solutions are proposed to achieve the protection and development objectives of marine ecosystem.

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## Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

## Conflict of Interest

The author states that this article has no conflict of interest.

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