

# *Design of Distributed Database System Based on Improved DES Algorithm*

**Hirsch Manohar\***

*Warsaw Univ Technol, Inst Elect Syst, Nowowiejska 15-19, PL-00665 Warsaw, Poland*

*\*corresponding author*

**Keywords:** DES Improved Algorithm, Distributed Data, Database System, System Design

**Abstract:** With the development of information technology, distributed storage, as an advanced and efficient data processing technology, plays an important role in information management system. This paper designs a visualization system based on DES algorithm. This system manages and allocates resources to users. First, analyze the requirements from the database, and then classify them into users, administrators and other roles according to the actual situation and establish the corresponding structure to realize the control of role permissions. Finally, through the establishment of the corresponding model, the function of the distributed database system is improved, and the security of the system is tested through the simulation experiment. The experimental results show that the distributed database system based on the improved DES algorithm can read the requested data within 10s, and the success rate of intercepting and decrypting operations is more than 90%. This shows that the algorithm performs well in the security of the protection system.

## **1. Introduction**

With the continuous development of modern information technology, the storage, transmission and processing of information are inseparable from information. In the traditional database management system, users can only query data through the system login interface [1-2]. However, when users need to modify or delete a certain content, they can not easily access the relevant records, and then they can directly use this function to obtain the required objects and realize their management and maintenance. At the same time, due to the lack of corresponding permission settings and management mechanisms, the information of certain roles can not be effectively used and shared, resulting in resource waste and large repetitive workload [3-4].

Many scholars have done relevant research on database technology. In foreign countries, with the development of information technology, information storage and transmission technology has

become more and more mature. However, China is still in the developing stage [5-6]. Domestic scholars have conducted research and Analysis on cloud computing. Firstly, they discussed the concept of cloud platform, and then proposed how to integrate the data content and required services in the distributed database by using the DES algorithm to improve the information retrieval efficiency and solve the user needs. Finally, in theory, combining the characteristics of big data, they built a storage and processing system model based on the DES algorithm [7-8]. Some scholars proposed to build a perfect, reliable, safe, stable and highly scalable system based on DES algorithm. Other scholars use the B / S principle to study the distributed database and apply it to government agencies to maximize the information sharing and data exchange functions [9-10]. Therefore, this paper designs the distributed database system based on the improved DES algorithm.

With the continuous development of computer technology, the database system has been greatly improved, but there are still many problems. The traditional storage method is to access in character units. In the information age, people need to use more, more advanced and convenient to obtain data. For distributed database, it is more and more important. This paper mainly introduces a kind of data flow management and control based on DES algorithm. Firstly, it expounds the research of related concepts and its development status, and then proposes corresponding solutions to the problems in the system and designs a complete cloud storage platform.

## **2. Discussion of Distributed Database System Based on Improved DES Algorithm**

### **2.1. Distributed Database**

The traditional database is mainly composed of users and servers. The distributed system collects data through the database and then transmits it to the computer. In this case, a large amount of storage space is required [11-12]. Therefore, the capacity requirement is high. At the same time, the network transmission speed is slow and the transmission quality is poor, which restricts its development prospects and application scope. The shortcomings and suggestions in the research, design and implementation of database management system based on DES algorithm. The establishment of distributed database is mainly to improve the efficiency of data storage and retrieval, and at the same time, avoid unnecessary losses due to too many users. In the traditional database, the "multi-level" method is used to query users. However, for different types and different gender customer groups, one-to-one targeted maintenance and management cannot be realized. Moreover, with the increasing scale of the network and the rapid development of Internet technology, this single and isolated model is no longer applicable. In Des database, the data storage of distributed system is based on field encryption algorithm. Because the original information is shared in time and space. Therefore, in order to prevent some important contents from being damaged and causing unnecessary loss or repeated use, it is necessary to save these key parts for viewing, calling and retrieving the application requirements of other relevant functional modules in the future query. At the same time, It ensures that users can safely access and process the required information [13-14]. Figure 1 is a distributed database structure.

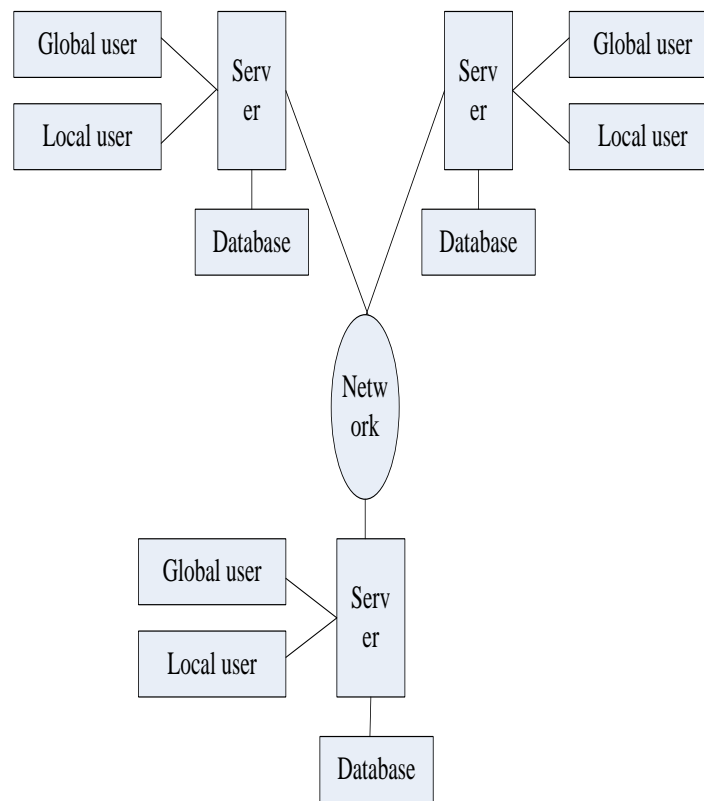


Figure 1. Distributed data base

## 2.2. Characteristics of Distributed Database

(1) The distributed database has a huge amount of information and strong data retrieval ability. Since users can query in different areas, the storage space is also large. Therefore, for large capacity storage system, it is one of the platforms that are very easy to use, have broad development prospects and high potential, and can be fully applied and promoted without a large number of database maintenance. However, traditionally, the decentralized processing method is adopted for massive data to realize the advantages of information sharing and rapid retrieval [15-16].

(2) Distributed database has strong readability, and users can choose the information they need according to their own needs. It has high security when the data volume is large. In case of problems, measures will be taken to protect personal privacy and business secrets from being infringed to ensure the stable, reliable, efficient and convenient operation of the system, and also to ensure that internal personnel of the enterprise will not have an impact on business operations, It avoids the economic losses caused by unnecessary losses and troubles, and some human factors may cause irreparable errors or uncontrollable results in case of normal use or failure.

(3) Distributed database has high storage capacity. When users use the computer system to work, they need to operate the data information, which is often stored through the distributed file system. Therefore, all storage spaces can be divided into several areas according to requirements. In this way, resource sharing is realized. Moreover, due to the adoption of unified standards and standardized management mode, its characteristics of strong scalability, wide application and strong adaptability are fully reflected [17-18].

### 2.3. DES Improved Algorithm

The improvement of DES algorithm in user authority information divides different users into different categories and divides modules according to data types. For administrators and ordinary members, they do not have the requirements of setting permissions and operating methods for database management under the same attributes. For super administrators, they need to have higher-level functions such as maintenance and management of their roles. Therefore, the password can be added to reduce the occurrence of unnecessary information errors in the system, resulting in system crash or data loss, so as to ensure that users have more security and reliability when using. At the same time, it initializes the data, establishes the connection between the original user and the administrator role, and realizes the identity authentication through the serial port. After logging in, users can view the information in all database tables in the system. If there is a new password or an account ID that has been entered, return to the request function to enter the corresponding page. On the contrary, return to the corresponding interface to display the account number, password, unique permission and other attribute information, so that the administrator can use the data type and related parameters needed in the modification operation, so that it can update and maintain the database. Figure 2 is a general flow of the des improved algorithm.

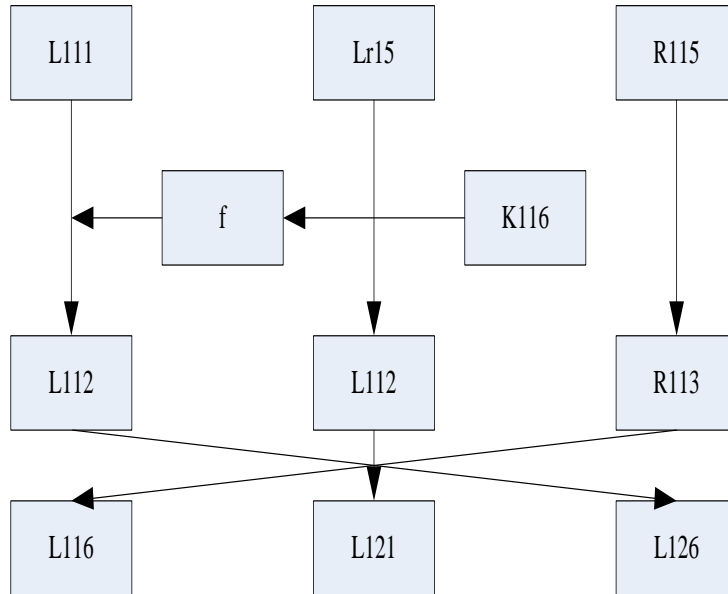


Figure 2. DES improves the algorithm process

$$CLRsum(T_k, F_i, S_j) = CLR(T_k, F_i, S_j) * FREQLR(T_k, F_i, S_j) * SizeF(F_i) \quad (1)$$

This value is equal to the search generation value per unit data amount in the site  $S_i$  multiplied by the number of local searches and then multiplied by the data segment size (FI).

$$CRUsum(T_k, F_i, S_j) = \sum_{k=1}^M CLU(T_k, F_i, S_j) \quad (2)$$

The algorithm combines the distributed storage system with the traditional data warehouse, and will be distributed in different places to solve the existing or possible problems in the existing

system, and provide a complete and visual display for users.

### 3. Experimental Process of Distributed Database System Based on Improved DES Algorithm

#### 3.1. Distributed Database System Structure Based on DES Improved Algorithm

In the traditional database system, the distribution is composed of multiple tables. There is a unique index in each table. When accessing data, all fields are divided into n nodes and n records. When the user uses the computer to query, modify information or delete related files, it needs to generate corresponding level requests for them, and retrieve or store these data in the memory through the database management system, And a buffer is established in each row field to meet the system requirements to form a new table name and other indexes. As can be seen from Figure 3, the system mainly includes global modules and local modules. In the user operation, you need to log in to the client to register and then enter the main interface. Secondly, the data information and password modification functions are displayed on the home page, and then they are stored in the database and saved to the background system as before. Finally, different roles are assigned according to the permissions to complete all the work, view the current login status, add or delete permissions, change and query history, and add, delete and query the database.

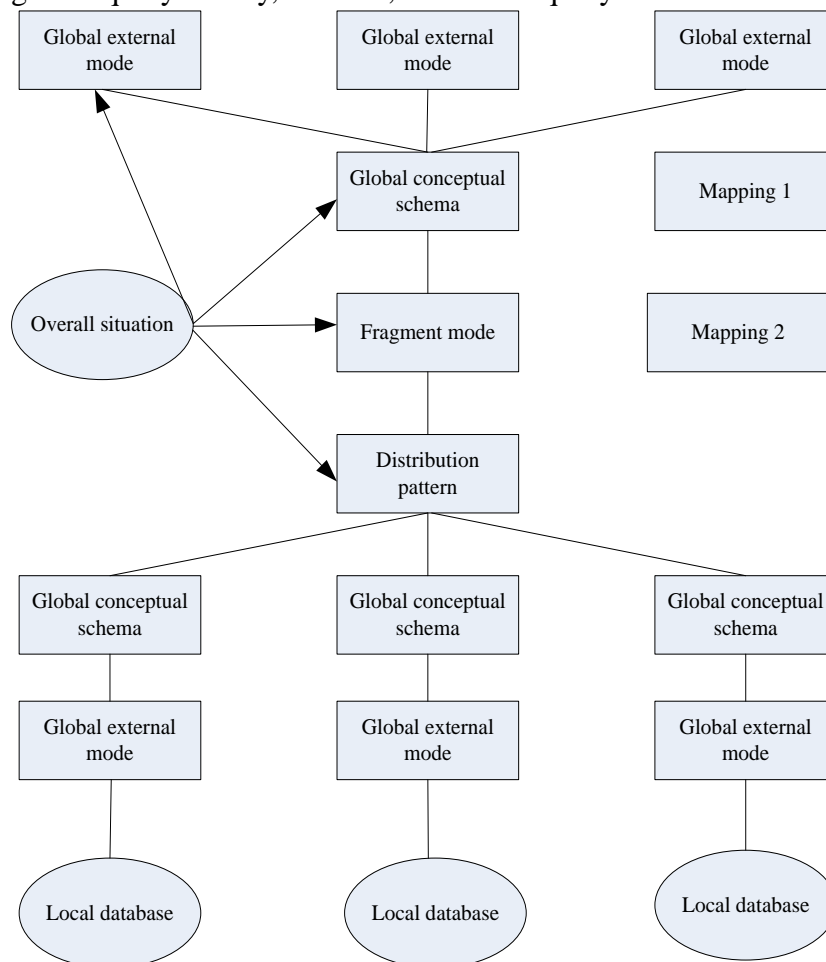


Figure 3. Distributed database system structure based on DES algorithm

### 3.2. Distributed Database System Security Test Based on DES Improved Algorithm

At the beginning of the system design, I have determined the security performance of the database, and judge whether it can operate normally according to the test results. In the process of encrypting data, in order to ensure the security of the system, we need to select different types, levels and scale levels to adopt different types of classification. For ordinary users. Firstly, verify whether the password is correct; secondly, check whether the ciphertext result can be obtained after inputting the information through the keyboard; finally, enter the function of viewing and modifying the corresponding key value after determining the login mode and identity authentication of the person through LabVIEW program; at the same time, establish the corresponding data verification mechanism and encryption algorithm in the system. For a complete information system, security is very important and there must be a complete and reliable data protection mechanism. Therefore, this paper uses DES algorithm to study the system security problem and gives the corresponding solutions and guarantee measures. It uses B / sql syntax language to write a complete and effective database security module, and then adds some necessary elements on this basis to enhance its operability.

## 4. Experimental Analysis of Distributed Database System Based on Improved DES Algorithm

### 4.1. Security Test and Analysis of Distributed Database System

Table 1 is the security test data of distributed database system based on DES improved algorithm.

Table 1. Safety test

Test times	The CPU Usage Rate(%)	Read the number of requests	Read request response time size(s)	Interception and decryption operation success rate(%)
1	20	1222	7	95
2	15	1566	9	93
3	14	1346	6	90
4	17	1453	7	94
5	19	1624	9	95

The security test of the system is mainly to ensure the security of data, prevent the user from leaking information due to improper operation during use, so as to ensure that the network is not used by hackers or illegal visitors. The most important thing for this system is whether the database can operate normally. If this function cannot be realized, data loss or damage will occur. Therefore, the encryption processing shall be carried out to ensure that it can be transmitted and saved correctly. It can be seen from the results in Figure 4 that the distributed database system based on the DES improved algorithm reads the requested data within 10s, and the success rate of intercepting and decrypting operations is over 90%. This shows that the algorithm performs well in the security of the protection system.

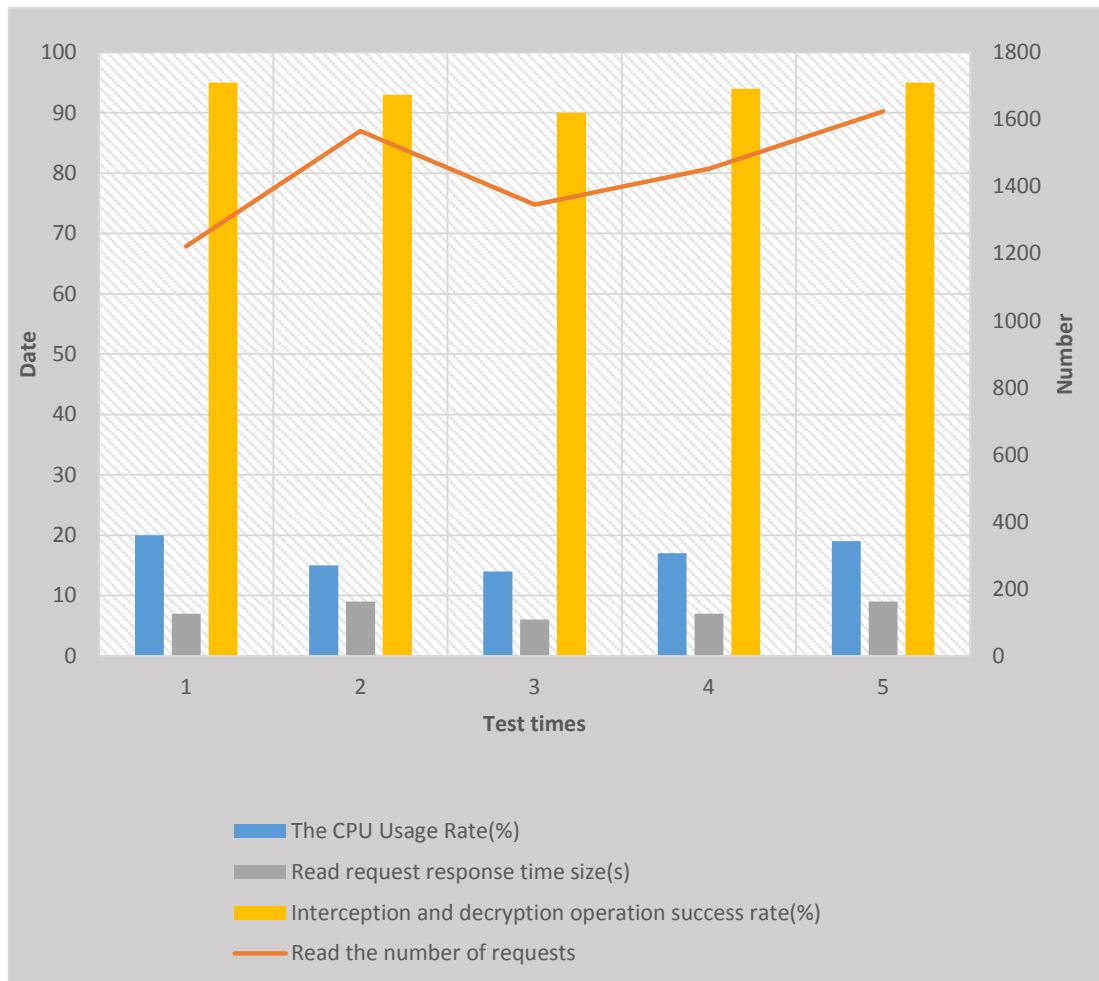


Figure 4. Distributed database system security test

## 5. Conclusion

With the popularity of the Internet and the rapid spread of information, the traditional database technology can not meet the requirements of users for data storage and retrieval, which puts forward higher-level and more diversified requirements for distributed file systems. Therefore, it is imperative to share resources among users based on DES algorithm in the cloud computing environment. This paper first introduces the research background and significance and analyzes its current situation, then analyzes and summarizes the problems existing in the existing system, and finally designs corresponding solutions to meet the data storage and retrieval requirements according to the series of problems found above.

## Funding

This article is not supported by any foundation.

## 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.

### Reference

- [1]Kun-Chih Jimmy Chen, Masoumeh Ebrahimi:Chapter Five - Routing algorithm design for power- and temperature-aware NoCs. *Adv. Comput.* 124: 117-150 (2022).
- [2]Jehad Ababneh, Majid Khodier:Design and Optimization of Enhanced Magnitude and Phase Response IIR Full-Band Digital Differentiator and Integrator Using the Cuckoo Search Algorithm. *IEEE Access* 10: 28938-28948 (2022).
- [3]Mohammad A. R. Abdeen, Mohamed Hossam Ahmed, Hafez Seliem, Tarek Rahil Sheltami, Turki M. Alghamdi, Mustafa El-Nainay:A Novel Smart Ambulance System - Algorithm Design, Modeling, and Performance Analysis. *IEEE Access* 10: 42656-42672 (2022).
- [4]Ehsan Akbari, Morteza Mollajafari, Hamza Mohammed Ridha Al-Khafaji, Hussein Alkattan, Mostafa Abotaleb, Mahdiyeh Eslami, Sivaprakasam Palani:Improved Salp Swarm Optimization Algorithm for Damping Controller Design for Multimachine Power System. *IEEE Access* 10: 82910-82922 (2022).
- [5]Ipek Çetinbaş, Bünyamin Tamyürek, Mehmet Demirtas:The Hybrid Harris Hawks Optimizer-Arithmetic Optimization Algorithm: A New Hybrid Algorithm for Sizing Optimization and Design of Microgrids. *IEEE Access* 10: 19254-19283 (2022).
- [6]B. Deepa, M. Murugappan, M. G. Sumithra, Mufti Mahmud, Mabrook S. Al-Rakhami:Pattern Descriptors Orientation and MAP Firefly Algorithm Based Brain Pathology Classification Using Hybridized Machine Learning Algorithm. *IEEE Access* 10: 3848-3863 (2022).
- [7] Abeer S. Desuky, Mehmet Akif Cifci, Samina Kausar, Sadiq Hussain, Lamiaa M. El Bakrawy:Mud Ring Algorithm: A New Meta-Heuristic Optimization Algorithm for Solving Mathematical and Engineering Challenges. *IEEE Access* 10: 50448-50466 (2022).
- [8]Bahram Mahjoob Karambasti, Mohamad Naghashzadegan, Maryam Ghodrat, Ghadir Ghorbani, Roy B. V. B. Simorangkir, Ali Lalbakhsh:Optimal Solar Greenhouses Design Using Multiobjective Genetic Algorithm. *IEEE Access* 10: 73728-73742 (2022).
- [9]Marcio Nunes De Miranda, Daniel Ratton Figueiredo, Daniel Frazão Luiz, Celso Barbosa Carvalho, Daniel Sadoc Menasché:Design and Analysis of Distributed Tree Growing Algorithms. *IEEE Access* 10: 26580-26602 (2022).
- [10]Kubilay Savci:A Limited Memory BFGS Based Unimodular Sequence Design Algorithm for Spectrum-Aware Sensing Systems. *IEEE Access* 10: 77011-77029 (2022).
- [11]Samuel A. Ajila, Chung-Horng Lung, Anurag Das:Analysis of error-based machine learning algorithms in network anomaly detection and categorization. *Ann. des Télécommunications* 77(5-6): 359-370 (2022).
- [12]Angeliki Koutsimpela, Konstantinos D. Koutroumbas:A new stochastic gradient descent possibilistic clustering algorithm. *AI Commun.* 35(2): 47-64 (2022).
- [13]Pamela Ugwudike:AI audits for assessing design logics and building ethical systems: the case of predictive policing algorithms. *AI Ethics* 2(1): 199-208 (2022).
- [14]Mahdi Azizi, Siamak Talatahari:Improved arithmetic optimization algorithm for design optimization of fuzzy controllers in steel building structures with nonlinear behavior considering near fault ground motion effects. *Artif. Intell. Rev.* 55(5): 4041-4075 (2022).



- [15]Antonin Descampe, Clément Massart, Simon Poelman, François-Xavier Standaert, Olivier Standaert:Automated news recommendation in front of adversarial examples and the technical limits of transparency in algorithmic accountability. *AI Soc.* 37(1): 67-80 (2022).
- [16]Mustapha Anwar Brahami, Mohammed Dahane, Mehdi Souier, M'Hammed Sahnoun:Sustainable capacitated facility location/network design problem: a Non-dominated Sorting Genetic Algorithm based multiobjective approach. *Ann. Oper. Res.* 311(2): 821-852 (2022).
- [17]Soheyl Khalilpourazari, Hossein Hashemi Doulabi:Designing a hybrid reinforcement learning based algorithm with application in prediction of the COVID-19 pandemic in Quebec. *Ann. Oper. Res.* 312(2): 1261-1305 (2022).
- [18]Rakesh Prakash, Jitamitra Desai, Rajesh Piplani:An optimal data-splitting algorithm for aircraft sequencing on a single runway. *Ann. Oper. Res.* 309(2): 587-610 (2022).