# Research and Analysis on Optimization Algorithm of Computer Network Information Resource Transmission

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**Keywords:** Computer network; Information resources; Transmission optimization algorithm

**Abstract:** With the continuous development of network technology, the cost of network bandwidth is decreasing and the types and methods of network access devices are increasing, which makes multi-homed terminals with multiple network interfaces more and more popular. However, the effective detection of threat information in the transmission of network communication resources is conducive to improving the security of network information and reducing the transmission and storage overhead of the system. Because threat information usually contains a variety of noise spectrum characteristics, and its spectrum characteristics are highly dynamic, it is difficult for existing algorithms to obtain accurate threat information data characteristics. Therefore, a multi-level self-adjusting notch threat information optimization detection method is proposed. In order to improve the transmission efficiency of encrypted information in ship computer networks, this article proposes a WART ship network resource transmission method. Firstly, construct a network transmission control matrix for ship encrypted information resources, generate a computer multi-angle network control access model, and achieve resource transmission control between multiple users in the regional network. By utilizing the principles of statistical concepts, the maximum statistical probability of user access to information resources and the upper limit of multimedia access to ship information can be determined. Based on the inherent relationship between the two, the commonality calculation is carried out to optimize the transmission of encrypted information resources in computer networks.

## 1. Introduction

With the development of information technology, people need to share and exchange information in regional organizations and around the world. Especially in the field of large-scale scientific research, engineering and economic application, a very large-scale application problem needs the cooperation of multiple institutions and the sharing of information resources [1]. In order to solve such application requirements, grid technology has been produced. With the rapid development of network computer technology, the communication mode of ship wireless network has changed greatly [2]. Computer network refers to a system that connects multiple computers distributed in different places with communication equipment and lines, and is equipped with corresponding software to realize resource sharing. Geographically, computer networks can be divided into wide area networks (such as Internet), local area networks (such as campus networks) and metropolitan networks (ranging from several kilometers to hundreds of kilometers) between them [3].

Through information networks, ships and control centers can achieve network transmission of ship navigation data, navigation parameters, and other information. In order to ensure the reliability of encrypted information transmission in computer networks, it is necessary to design a secure transmission method for ship network resources [4]. The grid utilizes the Internet to connect various geographically distributed resources into a logical whole, forming a super virtual computer that provides users with integrated information and application services (such as computing, storage, access, etc.). Computing resources, storage resources, bandwidth resources, software resources, data resources, information resources, knowledge resources, and other resources are shared and collaborated in this virtual environment, completely eliminating resource "islands". Threat

information is usually persistent, nonlinear, and the spectrum components are complex and changeable, so other information detection methods cannot be directly cited. With the development of network technology, the problem of effective threat information detection has attracted great attention of experts and scholars in recent years [6]. However, the traditional TCP protocol can only transmit data through a single stream between two terminals, and cannot transmit data through other redundant network paths, which leads to a serious waste of network resources. With the increasing demand of users for high-quality network services such as web page response speed, high-definition online video playback, high-definition video conferencing, etc., in the face of huge network throughput and high-response applications, if the delay and packet loss rate of the current transmission path are too high, the user experience will be seriously affected. Old data transmission protocols have begun to hinder the rapid development of the Internet [7].

The current challenge in detecting threat information in network communication resource transmission is how to effectively solve the problem of noise spectrum disturbance and nonlinearity of threat information. Due to the inability of existing methods to effectively filter various frequency noises in network communication resource transmission, the detection performance will be severely affected when the noise spectrum composition changes. Therefore, this paper proposes a multi-level self-adjusting notch detection method. Firstly, data signal analysis and modeling were conducted on network communication resources. Based on existing literature research, an envelope based noise frequency feature model was established. Then, based on the model, a multi-level self adjusting notch filter was proposed and designed to filter various types of noise doped in the original signal; Finally, the matching projection method is introduced to calculate the matching feature point pairs of the output signal of the notch filter, achieving effective detection of threat information.

## 2. Method for Secure Transmission of Computer Network Resources

### 2.1. Multi angle network control access model

The encryption information resource transmission model designed by the traditional encryption resource transmission method can be divided into N, A and D/A types according to the purpose of information resource transmission and access [8]. Among them, the N-type model and the A-type model mainly refer to the transmission model using network sharing services, and these two models are mostly applied to solid-state network transmission and linear transmission [9]. The designed multi-angle network control access model can extract the user's access purpose and account authority for ship information resources during directional security access and directional transmission of ship security encrypted files, and generate a multi-angle analysis model of information network by simplifying the method of eliminating the access characteristics of transmission network and administrator based on the positive and negative attributes of modern network transmission, and its generation steps are shown in Figure 1 [10].

According to the principle of information subset exchange rate of information transmission control access model, through the above feature subset information parameters, each information transmission access user can directly go to the effective feature information source.

The spatial unit of this data model is artificially defined according to the spatial position, regardless of the complete entity boundary. This spatial unit is a square grid with equal size and has a unified positioning reference system. For each space unit, only its attribute value is recorded, but its coordinate value is not recorded. Each space unit has 8 fixed adjacent units. Grid sets with the same attributes and adjacent positions can produce expressions of spatial entities. A grid plane can be circularly decomposed into infinite secondary grids with equal size and unchanged shape according to dichotomy in this plane to increase the spatial resolution. Of course, it can also be synthesized according to the reverse process to make the grid data model have a hierarchical structure. The storage of spatial data is based on a certain regional framework and is stored in a layer structure, which means that there are multiple attributes in a certain spatial unit. Therefore, there may be two situations during data operations: one is the processing of spatial position and attribute data on a layer; The second is the processing operation of spatial position and attribute data

for two or more layers. Based on the size of the transmitted data and the current throughput, eMPTCP uses a subflow management algorithm to determine whether to use both the WIFI interface and the 3G/4G interface when transmitting data. When the transmission data volume is small and the network throughput is low, eMPTCP only uses the WIFI interface for transmission to achieve the goal of energy conservation as much as possible. When the transmission data flow is large and the network throughput is high, EMPTCP uses both WIFI and 3G/4G interfaces for data transmission to achieve the highest possible energy efficiency ratio. The calculation process usually involves calculating the intersection point between a line and a polygon. As long as it intersects, a node is generated, dividing the original line into arc segments and assigning the attribute information of the original line and polygon to the new arc segment. The superposition results in a new layer - a layer where each line is divided into new arc segments by the polygons it passes through.
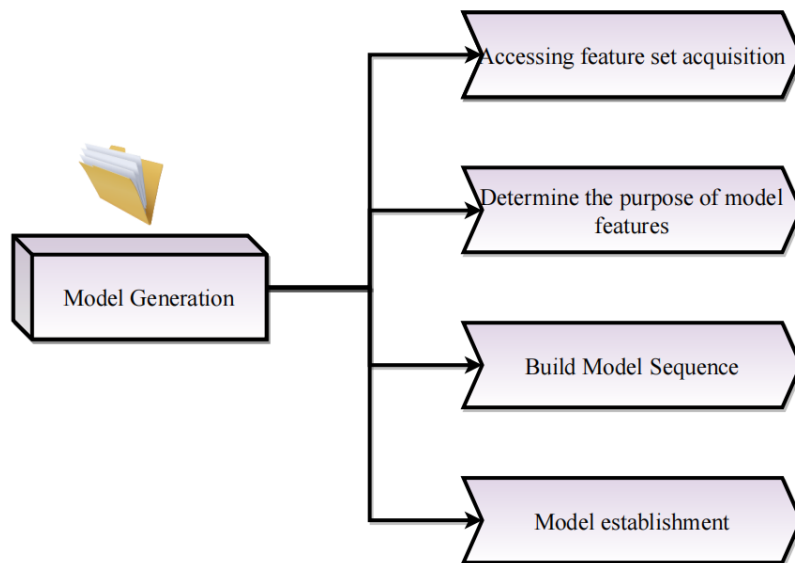


Figure 1 Analysis Model Generation Step Diagram

## 2.2. Encrypted Information Access Algorithm and Transmission

Using multi-angle network control access model in the process of encrypted resource control access and transmission of computer network information resources, it is necessary to use model control principle to implement network control for all ship information resources that need to be transmitted. In order to improve the security and controllability of transmission, a new encryption information resource transmission and access algorithm is designed and proposed. The massive data in the information grid are distributed on the grid nodes which are scattered in space, and shared by the scattered grid users. The processing of each raster task often requires moving and copying a large amount of data. In order to improve the service efficiency of grid system and facilitate users to use grid for information processing, efficient, reliable and convenient transmission tools are needed to realize the time transparency of information and data access of spatial information grid. The security levels required by users in the spatial information grid are different, and the information transmission system should be able to provide users with grid security infrastructure and identity authentication at different data security levels. At the same time, different transmission strategies should be adopted to flexibly meet the needs of users in data transmission security. At the same time, transmission failure is caused by transmission interruptions, network paralysis, and other reasons during the transmission process. Data retransmission and data breakpoint continuation service mechanisms must be introduced in the transmission service. The formulation of transmission task transmission strategies will select appropriate processing nodes and routes based on bandwidth resources, node computing power, link security level, and user transmission requirements, and allocate resources related to transmission tasks in advance.

During the use of the cache in data transmission, the data stored in the cache shall not be deleted

until it is determined that the information correctly reaches the destination node and returns the transmission completion response; According to the priority of different tasks, node load management adopts appropriate resource allocation strategies such as first come, first served, task priority, etc. The information transmission module mainly accesses information data resources according to the requirements of users, and then transmits the data to the client. The information transmission module mainly includes client, request analysis module, data processing module and data transmission module. As shown in figure 2.
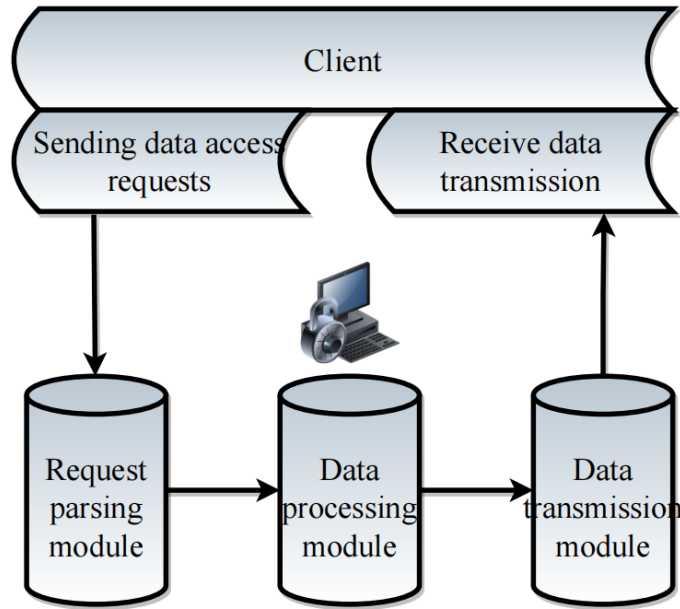


Figure 2 Structure of Information Transmission Module

Information transmission strategy is a set of transmission rules formulated to provide users with different Qo S services according to the needs of users' transmission tasks, which mainly includes policy routing and transmission control strategy and resource allocation control. Users with different identities need to provide transmissions with different security levels, and different types of services require different transmission time delays. At the same time, corresponding strategies need to be formulated for resource occupation and priority issues in the transmission process. Generally speaking, the parameters required by Qo S in the transmission process are mainly reflected in the information security level, delay requirements, bandwidth requirements and reliability requirements. When the ship information resources are transmitted, the estimated probability that the user queuing sequence can guarantee a stable state is represented by $P_n$. $P_n$ can also represent the probability that the total amount of data transmitted by the ship's computer network is n. Based on the theory of directional traffic consumption in the stable transmission of ship network information resources, the formula can be obtained by recursive calculation at both ends of the equation:

$$P_n = (1-\rho)\rho^n \tag{1}$$

$$\rho = \frac{\lambda}{m\mu} \tag{2}$$

By using the above relationship, the statistical probability of the maximum allowed access time d for access requests can be obtained, along with the total number of concurrent multimedia transmissions in the ship information transmission network N. This is a secure access algorithm for ship encrypted information resource transmission based on network transmission and statistical principles, achieving the optimization of transmission efficiency.

# 3. Research and Analysis on Optimization Algorithms for Information Resource Transmission in Computer Networks

## 3.1. Implementation of Optimization Algorithm for Information Resource Transmission

Because the deployment of real grid environment needs a lot of manpower, material resources and financial resources, the resources in grid are distributed in different regions and belong to different organizations, and the availability and load of resources change dynamically with time, which makes it difficult to study in real grid environment, so simulation is adopted. Adding, updating, querying and deleting records in the working process of the information directory server requires frequent connection to the database, resulting in inefficient use of the database. Here, database connection pool technology is used to allocate, manage and release database connections. The characteristics of this technology are: allowing applications to reuse an existing database connection without re-establishing each one; After the application's database connection is used, the connection is put into the connection pool for reuse; Release the database connection whose idle time exceeds the maximum idle time, which improves the operational performance of the database. If the frequency of the notch filter is approximately equal to the frequency of the input observation signal, the signal corresponding to this frequency is taken as a state parameter in the filtering process.

The input observation of the notch filter is composed of complex sine and complex noise. From the perspective of noise amplitude and phase response transfer function, the notch filter can filter out the noise components in order to detect and identify threat signals containing multiple frequency noises. In the filtering process of cascaded notch filters for threat information, the following self adjusting formula is used to update the filtering parameters, that is, the gradient signal and output update formula is

$$\varphi(k) = n_2(k) + AA_{HB}e^{i(\Omega k + \theta_{HB})} \quad (3)$$

$$y(k) = n_1(k) + AA_H e^{i(\Omega k + \theta_{HB})} \quad (4)$$

In the formula, $A_{HB}$ and $\theta_{HB}$ are the amplitude and phase response characteristics corresponding to the notch transfer function $H_B(z)$ in turn, and $A_H$ and $\theta_H$ are the corresponding amplitude and phase response characteristics in turn. The difference between the output results of the notch filter $H(z)$ and $y(k)$ is the high frequency component of the threat information.

File processing systems are the most common method of database management, but they have many drawbacks: firstly, each application program must directly access the data files used, and the application program completely depends on the storage structure of the data files. When the data files are modified, the application program also needs to be modified accordingly; Another issue is the sharing of data files. In order to achieve the goal of sharing distributed and heterogeneous information resources in the spatial information network in a grid environment, various information resources are first described and encapsulated to shield heterogeneity. Using XML to describe information resources, mainly describing the name, type, function, application, etc. of the information. In the storage space information grid XML document, Java language was used as a development tool to achieve the mapping of XML data to relational databases. Research has shown that this mapping method can flexibly access various types of nodes in XML, with minimal impact on other document structures during modification and deletion, providing maximum flexibility in managing spatial information resources.

## 3.2. Analysis of experimental data and results

In order to verify the effectiveness of the threat information detection method proposed in this paper, a simulation platform based on Matlab is built. The threat information in the experiment is provided by DAＲPA2014 network database. In the system simulation model, 5000 cloud nodes and 500,000 data samples are set to ensure that the scheduling performance of each node can be

arbitrarily selected between 1 and 5. The threat information spectral lines detected by literature method can well filter out the non-threat signal components in the original signal, but it can be clearly seen that the threat information spectral lines detected by this method are more refined and continuous, because the multi-level self-adjusting notch filter designed in this paper effectively suppresses the multi-frequency noise and has a remarkable filtering effect on the non-threat information components contained in the original signal, and then the threat information in the transmission of network communication resources can be further accurately separated by matching algorithm. Real time full dynamic or quasi real time semi dynamic interactive multimedia transmission is currently impossible due to its large amount of information. However, with the rapid development of telecommunications technology and computer data compression technology, not only can interactive multimedia network communication be achieved, but also virtual multimedia laboratories and even virtual universities can be established online, using various media forms such as graphics, images, sound, and text to simulate the entire process of various experiments, There are both detailed experimental steps and vivid human-machine interfaces, allowing a student to receive guidance from renowned professors from multiple universities. This will greatly promote the process of modern education.

Based on ArcObjects, you can use all the functions of ArcGIS to develop and customize according to your own needs, such as developing and customizing a geographic information system for your own needs. Developing using ArcObjects means using the objects and methods provided by the various objects contained in the ArcObjects component to complete the tasks you need. After referencing the ESRIObject Library (object library) of the ArcObjects component in the program, You can use the ArcObjects component to call the required objects, and use the properties and methods of these objects to complete the functions required by the geographic information system.

## 4. Conclusions

MPTCP (Multipath TCP) is a TCP extension protocol proposed and standardized by the IETF. MPTCP can divide a single TCP stream into multiple sub streams, fully utilizing the redundant paths provided by multi host terminals for data transmission. Develop principles for dividing dynamic information domains and algorithms for changing nodes between dynamic information domains. Analyzed the information registration, intra domain, and inter domain query processes of the information directory service. Unified description of various spatial information using XML eliminates the heterogeneity of information resources. By constructing the network transmission control matrix of ship's encrypted information resources, the computer multi-angle network control access model is generated, and then the access relationship is calculated by using the statistical concept principle to realize the security optimization of computer network encrypted information resources transmission in ships. In this paper, a multi-level self-adjusting notch detection method is proposed. In view of the fact that the existing detection methods can not effectively filter out various frequency noises in the network communication resource model, firstly, the data signal of the network communication resource is analyzed, and the noise frequency characteristic model based on envelope is established. Aiming at the problems encountered in the application of MPTCP in different networks, based on the congestion control optimization theory, an optimization scheme is proposed.

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