Research on Heterogeneous Converged Network Resource Management Algorithm Based on Information Security Transmission

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Keywords: Information security transmission; Heterogeneous converged network; Resource management; Management algorithm

Abstract: Because traditional algorithms manage heterogeneous network resources, there are problems such as large error and low security. Therefore, a heterogeneous converged network resource management algorithm based on information security transmission is proposed. The algorithm utilizes the advantages of information security transmission technology to collect resources in heterogeneous converged networks, then optimizes resource management algorithms, and establishes a resource management algorithm model based on information security transmission, thereby implementing the management process of heterogeneous converged network resources. Through the method of experimental argumentation and analysis, the effectiveness of the resource management algorithm based on information security transmission is determined, which can reduce the resource management error and improve the security performance and management accuracy in the resource management process.

1. Introduction

The goal of heterogeneous converged network resource management is to provide quality of service guarantees for wireless terminals within the network in the case of limited network resources. The main idea is to flexibly and dynamically allocate and adjust the available resources in the heterogeneous converged network under the condition that the heterogeneous converged network resources are unevenly distributed or the channel characteristics are fluctuating due to channel weakness and interference. Thereby maximizing the utilization of heterogeneous converged network resources [1], preventing network congestion and keeping the signaling load as small as possible. Although resource management algorithms can solve the problem of resource management and allocation in traditional networks. However, for heterogeneous converged networks, due to the dense deployment of heterogeneous networks, different open access mechanisms of converged networks, and cross-layer co-channel interference between heterogeneous networks, there is no clear mathematical modeling [2]. Therefore, there are many deficiencies in the mobility management, resource allocation, and access control of users in heterogeneous converged networks, and it is impossible to perform relatively flexible resource management processes according to heterogeneity in heterogeneous converged networks.

As a kind of resource management method with high security performance, information security transmission technology can transmit the obtained management results securely, and obtain better management results than traditional algorithms. The research on resource management algorithms based on information security transmission technology has been intensive in recent years [3], which has aroused widespread concern from all walks of life. However, how to produce optimal management results and select the best computing strategy is still an unsolved problem [4]. Therefore, it is necessary to conduct research on the application of information security transmission technology and heterogeneous converged network resource management to obtain the best resource management results.

This paper proposes a heterogeneous converged network resource management algorithm based

  DOI: 10.25236/iciss.2019.060

on information security transmission, and gives a management method and strategy for heterogeneous converged network resources. First, the resources in the heterogeneous converged network are collected according to attributes, parameters, and values, and the original heterogeneous converged network resources are obtained. Then, by continuously adjusting the resource management algorithm, simplifying the calculation steps, and re-establishing the resource management algorithm model based on information security transmission. And a resource management deduction is carried out in the heterogeneous converged network to realize the information security transmission management process of resources. In order to verify the effectiveness of the heterogeneous converged network resource management algorithm based on information security transmission designed in this paper, the experimental demonstration is carried out. The experimental results show that the resource management algorithm based on information security transmission can effectively reduce management errors, improve the quality of resource management, and ensure the accuracy and security of management results, and has extremely high effectiveness.

2. Design of Network Resource Management Algorithm based on Information Security Transmission

Collect and integrate all the resources with management features in the heterogeneous converged network, and continuously optimize the resource management algorithm, make full use of the advantages of information security transmission technology, and re-establish the resource management algorithm model. By simplifying the management algorithm, the management process of heterogeneous converged network resources is realized most rapidly. The structure of heterogeneous converged network resource management algorithm based on information security transmission technology is shown in Fig. 1.

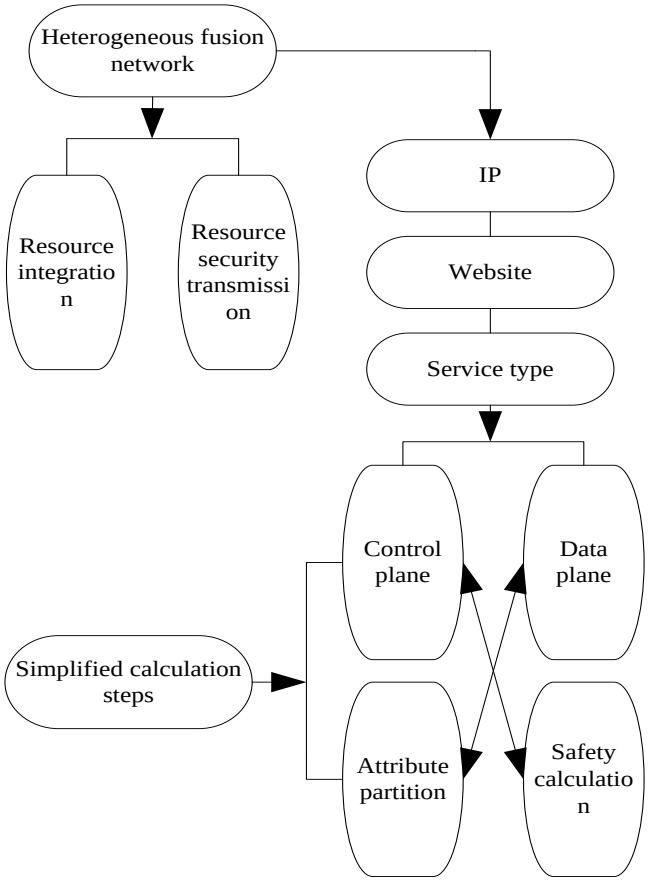

Fig 1. Structure diagram of management algorithm based on information security transmission

2.1 Heterogeneous Converged Network Resource Collection.

Assuming that there are n resource points in the heterogeneous fusion network, the feature collection function of the n-th resource point is:

$$\max\left[U_s\left(x_n - x_{n-1}\right)\right], U_s \geq 0 \tag{1}$$

Where U_s represents the characteristic function of the n-th heterogeneous converged network resource of the collection result.

Inspired by the literature [5], the resources on each attribute are used as an collection criterion, then the collection process of n resource points is as follows:

The most basic level of resources is collected in the highest priority, and the user equipment is allowed to obtain the services provided by the visited network by using the access rights of the local network after accessing the most basic service access features of the network. Within this level, the heterogeneous converged network will be able to share user authentication resource data. The user is authenticated and accessed in the visited network. Therefore, n resource points are unified in the level.

Based on the most basic level, the basic level increases the service access process between heterogeneous network systems, and the terminal connected to the visited network can obtain the services provided by the local network [6]. Continue to use the above collection process to obtain shared resource data of basic level users and provide interactive multimedia business resource management requirements.

The resource collection of general-level users is extended on the basis of the basic level to meet the business continuity guarantee between heterogeneous converged network systems, that is, $U_s \geq 0$. When a user moves between two heterogeneous converged networks, there is no need to re-establish active resources, but there will be temporary resource points dropping during the transition period. At the same time, users who download large files in a heterogeneous converged network will be removed from the network resource coverage and will stop all resource sharing and management functions.

The resource collection of harder-level users is based on the highest level of heterogeneous network convergence resource collection of information security transmission [7], ensuring seamless service continuity and service quality between users. Users can also have a seamless business experience when they move, as long as u is satisfied, it can be achieved through seamless switching between networks. Therefore, this level has the highest requirements for inter-network interworking mechanisms, and the matrix of collected resource points is the most.

The collected heterogeneous converged network resources are merged and processed as standard parameters into the design process of the resource management algorithm, which lays a solid and accurate resource base for simplifying the calculation steps.

2.2 Resource Management Algorithm Modeling.

The concept of Nash bargaining equilibrium in the reference [8], and introduce this concept into the definition of user resource fairness in heterogeneous converged networks. A security definition based on data security transmission is proposed. Under the definition of data security transmission security, the optimization goal of the security algorithm is:

$$\max \int_{i}^{n} (R_i - R_i^{\min}) = 0 \tag{2}$$

Where $R_i^{\min}$ is the minimum resource management security that user i needs to meet. The data transmission security algorithm first needs to ensure the minimum data transmission security requirements of each user. Then, the remaining data transmission security is allocated according to the channel state of each user and the like, and the data transmission security is the promotion of the

$$\max \int_{i}^{n} (R_i - R_i^{\min}) = 0$$

proportional fair algorithm. That is, when , the management security of heterogeneous converged network resources is optimal. Data transmission security overcomes the shortcomings of the proportional fair algorithm that cannot meet the specific data transmission security requirements of each user.

In this paper, the data transmission security method is used to mathematically model and analyze the heterogeneous fusion network data studied [9]. The resource management algorithm model based on information security transmission is as follows:

$$\begin{cases} s.tR_k \geq R_k^{\min}, \forall k \in V \\ R_k = R_k^{\min}, \forall k \in F \\ \sum_{i=0}^{k} k \in R_k \leq P_F \\ R_k \leq \lambda_k \log_2 P_k, \forall k \in K \end{cases} \tag{3}$$

Among them, in order to meet the data transmission security requirements of different users, the minimum transmission security threshold of the k-th algorithm is $R_k^{\min}$, and $R_k^{\min} \geq 0$. Because the data transmission security requirements are different for different users, while ensuring the security of each user's data transmission, the data security value exceeding the variable security user $R_k^{\min}$ should be fairly distributed. Therefore, the objective function of the corresponding k th variable security user is $R_k - R_k^{\min}$.

For variable security user $k \in V$, the security indicator assigned to it should be such that the data transmission security it obtains is greater than or equal to the minimum transmission security threshold $R_k^{\min}$; For fixed security user $k \in F$, the transmission security assigned to it should be a fixed value, ie $R_k = R_k^{\min}$.

Since the resource allocation in the heterogeneous converged network should take into account the heterogeneous converged network for cross-layer co-channel interference using the same frequency band resources [10], the tolerance threshold of cross-layer co-channel interference for security users is given, that is, $\sum_{i=0}^{k} k$. The threshold is set by the security user to meet its resource management requirements. That is, the threshold of cross-layer co-channel interference for real-time services should be smaller than the threshold when non-real-time services are used.

So far, the construction of a heterogeneous converged network resource management algorithm model based on information security transmission is completed, which prepares for the next step of resource management algorithm derivation[11].

2.3 Implementation of Heterogeneous Converged Network Resource Management Algorithm.

The implementation flow of the heterogeneous converged network data management algorithm based on information security transmission is shown in Fig. 2.

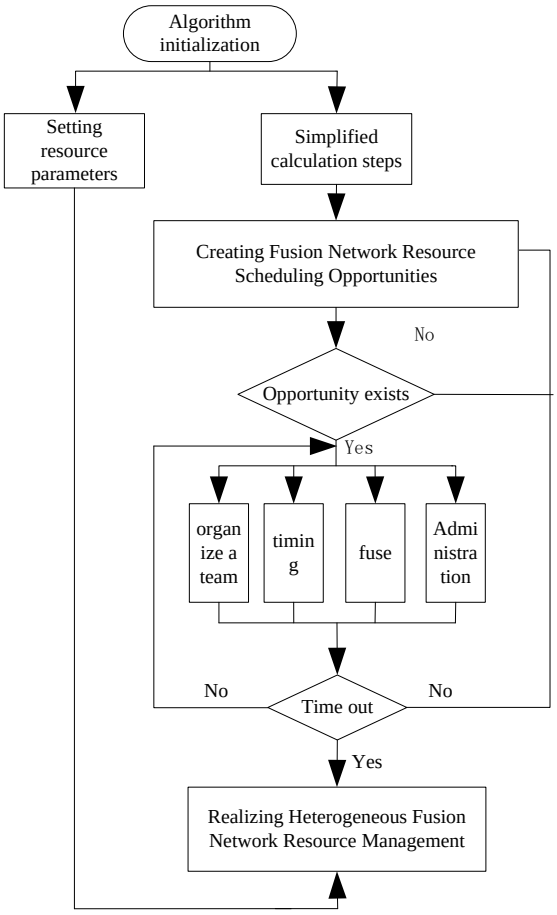

Fig 2. Data management algorithm implementation flow chart

The implementation process of heterogeneous converged network data management algorithm based on information security transmission is as follows:

Using the resource management algorithm model [12], the resource parameter a、b、c、d in the heterogeneous converged network is re-modified, and the scheduling opportunity of the heterogeneous converged network data is obtained by simplifying the calculation steps. The function expression is as follows:

$$Q\{a、\ b、\ c、\ d\} = \arg_{\max}\left[a_j \cdot \frac{W(t)}{R_k} \right] \tag{4}$$

Where $Q\{a、\ b、\ c、\ d\}$ represents the scheduling opportunity0-+-ty of the heterogeneous converged network data resource parameter a、b、c、d; $W(t)$ represents the packet group queue first group waiting time of the user i's j-type service; Where $a_j = -\frac{\log \lambda_i}{T}$.

It is assumed that two types of packet queues are denoted as Q and P, respectively, and the two queues respectively store the packet resources generated by the service sources S_Q and S_P. Next, the resource management algorithm based on information security transmission adopted in this paper is explained. Where j stands for the service queue, the maximum packet transmission security requirement allowed is $T_Q \geq T_P$.

By simplifying the algorithm steps [13], the business adjustment requirements are reduced, thereby increasing the security of the business distribution and the effect of reducing the error rate of the business resource management can also be achieved. The priority of the heterogeneous

converged network resources obtained by the management algorithm is used as a demand function to realize high-quality computing and management of heterogeneous converged network resources.

The resource management algorithm based on information security transmission performs a resource management derivation in the heterogeneous converged network to ensure the feasibility of the resource management algorithm based on information security transmission designed in this paper. So far, the design of resource management algorithm based on information security transmission is completed.

3. Simulation Experiment Demonstration and Analysis

In order to ensure the effectiveness of the heterogeneous converged network resource management algorithm based on information security transmission designed in this paper, the simulation experiment demonstration analysis is carried out.

Set the experimental object to the UCI resource storage set of a heterogeneous converged network, and manage it. During the experiment, the resource arrangement of the heterogeneous converged network is shown in Fig. 3.

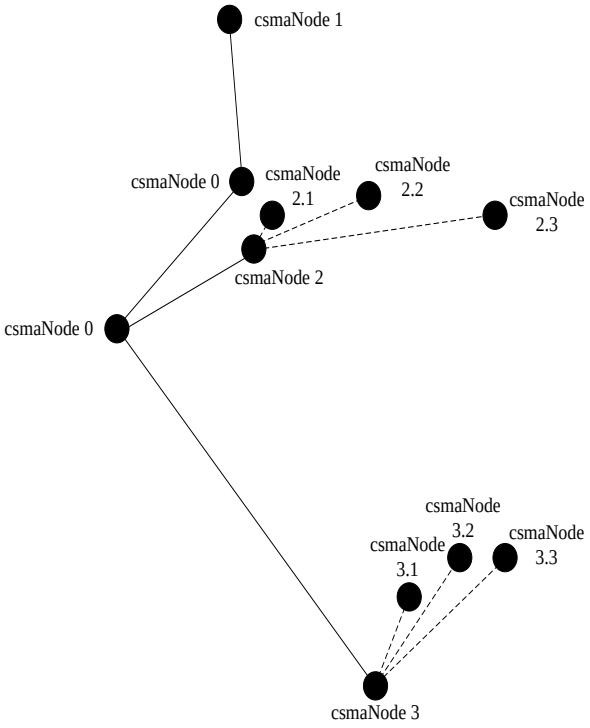

Fig 3. Resource arrangement

In order to ensure the effectiveness of the experiment, the traditional algorithm and the resource management algorithm based on information security transmission are compared to test and analyze the management error and security performance of the two algorithms. Since it is not feasible to directly compare the management error and safety performance of the two algorithms, the difference theory is used to represent the statistical results in the histogram. The experimental results are shown in Fig. 4.

According to the analysis of Figure 4, when the resource management algorithm based on information security transmission manages heterogeneous converged network resources, the error of the calculation result is less than 20%; The calculation error of the traditional algorithm is about 40%, so we can see that the resource management algorithm based on information security transmission designed in this paper has the advantage of reducing the calculation error. For the security performance of resource management results, according to the graph analysis, the security performance of the resource management algorithm based on information security transmission is maintained at more than 90%, and even the management security performance in the fifth column of the resource matrix reaches about 98%; The resource management security of traditional

algorithms is at least 60%, and the highest is only 85%, which is far from the requirements of heterogeneous converged network resource management; And the resource management algorithm based on information security transmission has certain stability. However, in the management process of traditional resource management algorithms, there are too many uncertain factors, resulting in low management stability and high volatility of resource management results, which leads to the low accuracy of heterogeneous converged network resource management. Therefore, it can be concluded that the resource management algorithm based on information security transmission designed in this paper not only improves the management precision of resources in heterogeneous fusion networks, but also improves the stability in the calculation process and the security of the management process. It gradually adjusts the management error to zero, with effectiveness and practical promotion.

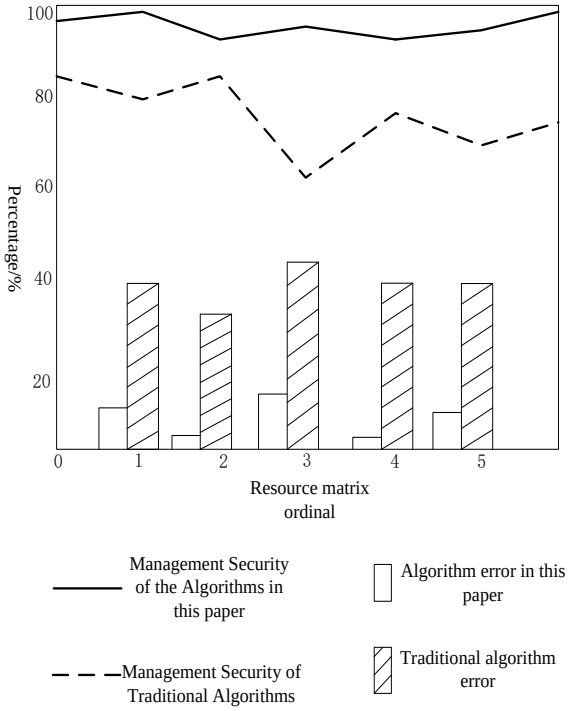

Fig 4. Comparison of experimental argumentation results

4. Conclusion

This paper analyzes and designs heterogeneous converged network resource management algorithms based on information security transmission, and collects and extracts all resources in heterogeneous converged networks based on the advantages of information security transmission technology. And establish a resource management model, and perform a heterogeneous converged network resource management calculation in the resource management algorithm based on information security transmission to realize the design of this paper. The experimental results show that the management algorithm based on information security transmission designed in this paper is extremely effective. When performing resource management calculation of heterogeneous fusion network, the management quality is greatly improved, and the resource management error can be effectively reduced, the calculation time is saved, and the working efficiency of the resource management algorithm is improved. It is hoped that the research in this paper can provide theoretical basis and reference for resource management algorithms of heterogeneous fusion networks in China.

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