# Research on Network Resource Management Technology in Multi Access Network Environment of Terminal Communication Access Network

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# Research on Network Resource Management Technology in Multi Access Network Environment of Terminal Communication Access Network

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**Abstract**：In view of the traditional electric power communication network terminal access to the lack of unified management and control of the situation, based on the analysis of heterogeneous network management technology and channel protection technology of current mainstream access network communication methods in resource dynamic changes of frequency, time slot and cyber source; smart grid multi services in heterogeneous network integration under the bearing design scheme and choose to create favorable conditions for the optimization of communication terminal access.

## 1. Introduction

The problem that traditional power terminal access network of communication lacked of unified management and control of the concept of networking, and often set up network according to their business needs which are different departments, maintain the network by themselves, and formed a number of networks, a variety of communication modes coexist power access network status, have caused a serious waste of communication resources and reduced the reliability of communication network and improved the costs of communication system network construction, operation and maintenance[1]. This paper studies the cyber source management technology communication terminal access network under network environment of the terminal access network of communication.

## 2. Network resource management architecture and requirement analysis in smart grid communication system

According to the characteristics of the distribution network, distribution network communication mainly includes the communication between the distribution master station and the distribution station, the electronic distribution station and the distribution terminal, which is defined as a wide range[2].Communication system is a key of distribution network automation, and it is also a difficult

point. The communication mode which chosen by the different region, different geographical environment and different conditions is various[3]. Communication can be divided into two categories: wired communication and wireless communication. In practice, they can be used alone or in combination. First of all, the cable communication includes: optical fiber communication, distribution carrier communication, communication cable, special line, local telephone network, paging, etc.. Second, Wireless communication includes GPRS/CDMA, wireless spread spectrum, microwave communication, satellite communication, etc.[4]. Because of the interference of clutter and the blocking of high-rise buildings in the city, wireless communication will cause many blind spots in communication, so it is not suitable to use wireless communication in urban power distribution communication, but mainly used in rural power distribution network, ground dispatching and county dispatching. At present, the application of the power system is mainly as a supplement to the wired communication.

## 3. Research on Network Discovery, Network Selection and Connection Management Mechanism for Smart Grid Communication System

The smart grid connects the client and different units through the access network to achieve intelligent measurement and control. When different cells in the access network are located in different heterogeneous networks, how to find and choose to access the network to achieve efficient data communication is extremely important.[5] As shown in the figure 1,this chapter focuses on the network discovery strategy and selection algorithm to carry out research to achieve the optimization of data communications, at the same time, with the current intelligent communication requirements for heterogeneous networks, the connection management mechanism of multi-media heterogeneous communication networks for smart grid environments and production needs is studied.

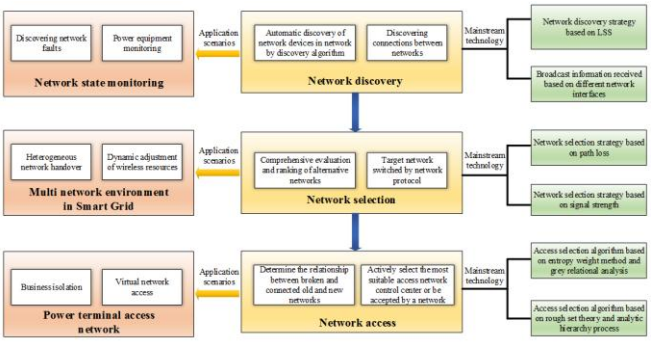


**Figure 1**:Discovery, Selection and Connection Method of Communication Networks in Data Sharing System

### *3.1 Analysis of Network Selection and Access Strategy in Public Communication*

In the network discovery phase of the smart grid communication system, the power mobile terminal searches and finds the currently available wireless network, existing network discovery strategies can be divided into two categories:

(1) Network Discovery Policy Based on Location Service Server (LSS). The LSS stores various wireless network information in different areas and provides the surrounding network system and its parameters, including bandwidth, delay and jitter, according to the geographical location of the mobile terminal (available from GPS)[6]. The mobile terminal opens the corresponding network interface according to the received information. Although this method can reduce the energy consumption well, it needs to save the precise data of each network in the LSS, and the cost of establishing and maintaining the database is relatively large, it's difficult to realize.

(2) Broadcast Messages Received based on Different Network Interfaces. Different wireless networks regularly send broadcast messages, and the mobile terminals of multi network interfaces know the current network environment according to the broadcast messages received on different interfaces.

This topic is intended to adopt network discovery strategy based on broadcast messages received from different network interfaces. Different wireless networks regularly send broadcast messages, and the mobile terminals of multi network interfaces know the current network environment according to the broadcast messages received on different interfaces.

### *3.2 Design of Multi - media Heterogeneous Network Selection for Smart Grid Business Requirements and Resource Characteristics*

Traditional network selection methods are aimed at wireless heterogeneous networks. At present, in the case of wireless and optical communication network discovery technology is very mature, when the wireless network discovery technology is applied to the heterogeneous network environment of power system, on the one hand, it needs to meet the needs of multi service communication, bandwidth demand, and communication reliability of the power grid[7]. On the other hand, it also needs to solve the technical problem that the time-varying PLC channel is strong.

In view of this, this paper analyzes the time-frequency characteristics of PLC based on Wigner distribution and utilizes the characteristics of fast convergence of family eugenics based evolution (FEBE) to combine real-time network communication parameters of various communication modes and select the real- Excellent communication method.

## 4. Performance Improvement of Smart Grid Mainstream Communication Technology

The mainstream communication access technologies of smart grid mainly include optical fiber communication technology, power line carrier technology and wireless communication technology. Optical fiber communication technology uses light as an information carrier. Currently, EPON technology and Industrial Ethernet technology are the most widely used on the access side. Different power services have different requirements on transmission bandwidth, rate and delay. This requires that the communication technology applicable to the automation of intelligent power distribution should possess the features of real-time and reliability, advanced technology, and independent intellectual property rights.

### *4.1 Improvement of Mainstream Communication Technology in Smart Grid*

In the current mainstream access network communication technology, in the optical fiber communication, due to the large difference in demand of each node in the power grid, the unreasonable allocation of bandwidth, and the difficulty in construction, EPON technology is adopted to dynamically allocate the uplink bandwidth so as to reasonably enable the bandwidth allocation is rationalized and the network utilization rate is improved. At present, the transmission distance and reliability of PLC communication are shortcomings. This paper proposes to adaptively aggregate the OFDM subcarriers based on the channel conditions to solve the problem of access to multiple communication modes of the power service terminal , Enabling the service to intelligently select among multiple communication modes or perform coordinated communication among multiple communication modes to improve the utilization efficiency of network resources and reduce the cost of network construction.

### *4.2 EPON network dynamic bandwidth optimization*

With the continuous development of smart grid, communication access is the key to supporting smart grid communication. EPON technology supports single-fiber bidirectional high-bandwidth service bearer and site-to-terminal 1 + 1 protection and 50ms protection switching, therefore, EPON technology networking is an ideal communication method for distribution links. In the distribution network automation system, digitalization substation and a series of applications will play an important role. In the current fiber-optic communications, due to the large differences in service requirements among nodes in the power grid, the unreasonable bandwidth allocation and the difficult construction, EPON technology is adopted to allocate the dynamic bandwidth of the network bandwidth[8].

By adopting a flexible period restriction policy and then using the prediction method to perform bandwidth authorization calculation for the high-priority services of different ONUs, the situation that

high-priority services occupy the medium-priority services when the ONU data is sent is reduced occurs[9]. Finally, by using the early sending strategy, Further improve network performance under heavy load. This article's bandwidth allocation scheme is as follows:

1)Authorization scheduling and periodicity determination: This article uses centralized authorization to complete the authorization of all ONUs to achieve the fairness and integrity of the bandwidth allocation. Under the centralized authorization mode, the OLT can allocate bandwidth to different levels according to the current overall status of the network. At the same time, the bandwidth allocation among the ONUs can obtain higher fairness.

2)Power Business Distribution: According to the different power services carried by the power grid communication network, the data can be divided into three priority services, corresponding to three types of services in the service differentiation. The first type of service is highly demanding in real time. It has the highest priority for expedited forwarding (EF) services. The second type is medium priority services called assured forwarding (AF) services. The lowest priority of the three types of business, known as best effort (BE, besteffort) business.

3)Early sending policy: The OLT needs to collect the bandwidth request information of all the ONUs before performing unified bandwidth allocation calculation, and then sends the authorization frame to all the ONUs.

### *4.3 PLC sub-carrier frequency allocation scheme based on quantum genetic algorithm*

Quantum genetic algorithm (GGA) borrows some basic ideas of quantum computing and applies the probability amplitude representation of quantum bits to chromosome coding so that a chromosome can express the superposition of multiple states and use quantum logic gates to realize the chromosome updating operation, so as to achieve the goal Optimization.

(1) Quantum bit coding: In genetic algorithm, chromosomes are expressed as deterministic values, whereas in quantum genetic algorithms, chromosomes are represented by quantum bits.

(2) Quantum state measurement: Quantum state measurement measures a quantum superposition state from a random variable of 0 to 1, causing it to collapse from a probabilistic state to a specific state.

(3) Individual Evaluation: Set appropriate fitness function to evaluate the current individual's merits.

(4) Individual Evolution: By adopting quantum door evolutionary strategy, quantum gates act on the ground state of quantum superposition state or entangled state to change the probability magnitude of each ground state in order to maintain the diversity of population and objectively simplify the algorithm itself.

## 5. Protection Scheme of Heterogeneous Network Channel in Power Grid Emergency State

### *5.1 Optical Fiber 1+1 Protection Mechanism for Power Grid Business Requirements*

In order to solve the problem of false alarm of active fault alarm technology, this paper proposes an active fault alarm mechanism based on Bayesian model algorithm: firstly, an initial graph G0 is generated randomly, and the network Net0 is generated according to the initial graph, and the initialization parameters are set randomly; then the total iteration number of the external loop is set; the structure of Net0 is studied by EM algorithm, and the maximum likelihood function measure value V0 is calculated; then, the structure graph Gall, which is adjacent to the initial topological graph and is different from each other, is generated; then, the internal loop parameters are set to enter the inner loop, and the number of internal loops is the number of neighboring networks; the maximum likelihood function measure Vi of adjacent graphs is computed by traversing, and the graph Ghao with maximum value is searched; if Vi is greater than V0, the corresponding Gi and node order are recorded, and the Bayesian network Net0 and its parameters are retained, and then go to step 8; if Vi is less than V0, let Gi = G0, Vi = V0, go to step 10; then let Net0 = Neti, as the initial network when the next outer loop, go to step 3; at the end of the outer loop, the Gi is generated; finally, based on the network obtained by Gi, EM algorithm is used to study the parameters.

After the structure learning and parameter learning of the Bayesian model, the real-time network

state parameter feature set can be input into a sufficiently trained Bayesian model. Once it is determined that an impending failure occurs, a fault alarm is triggered, and the protection and restoration of the business connection will be carried out ahead of time, and the active fault alarm is implemented.

*5.2 Spectrum resource defragmentation algorithm based on OFDM*

In order to solve the existing spectrum fragmentation of power line communication OFDM technology and proposes a sorting method of OFDM power line communication based on spectrum fragmentation: first statistics of all subcarriers "continuous idle frequency band set", and are arranged according to size; then all the continuous idle frequency gap into the set S (Csub); set the threshold calculation of S (Csub) "spectrum fusion set"; in order to meet the request of new bandwidth, spectrum space given "continuous idle frequency gap" needs to be emptied as $\left[FSP_{MAX}, FSP_{MAX}-(B-CIFSS)\right]$ (where B is the service request, bandwidth) to check the use of the need to clear each sub carrier wave frequency according to the gap; status of frequency gap, select the new business location of maximum spectrum utilization rate of subcarrier to reach; business bandwidth is allocated in the adjacent spectrum position occupied by the "maximum frequency gap" or The "minimum frequency gap" is used as the starting or ending position; finally, the steps are carried out in accordance with the size of the continuous idle frequency gap until the newly arrived service is received, or all successive idle frequency gaps have been checked".

The advantages of this spectrum defragmentation method are as follows: 1) The combination of spectrum defragmentation and new arrival resource allocation is dynamically combined to achieve the dual functions of defragmentation and dynamic resource allocation. 2) The computational complexity of this method is low, easy to implement, enabling fast defragmentation and providing as much idle resources as possible for new arrivals.

## 6. Conclusion

This paper focuses on the research of heterogeneous network convergence in multi network environment. The characteristics of heterogeneous converged networks and their interconnection schemes are discussed. A heterogeneous converged network model and a resource management framework are established. Research on network discovery technology and network selection technology in multi network environment. On the basis of the existing programs, put forward a strategy of received signal strength based on the network, and put forward a network access algorithm based on family eugenics to realize the selection of access in heterogeneous converged networks.

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