Research on the Application of Computer P2P Network Technology in Local Area Network

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Abstract—This article analyzes the basic content, application advantages, and infrastructure of computer P2P network technology. The author studies the specific application of computer P2P network technology in application structure, download mode, node function design, overlay network protocol, network data distribution, multiple copy redundancy processing, node failure detection, and copy repair processing. The author studied the countermeasures against hacker attacks, virus transmission problems, and transmission speed problems in the process of technology application. The purpose of this article is to give full play to the application effects of computer P2P network technology and improve the security of the local area network operation process.

1. INTRODUCTION
In the application process of computer P2P network technology, it can be classified as a kind of peer-to-peer Internet technology. Programmers can perform network data exchange, file information sharing and other processing according to actual needs, thereby improving the application value of data information. In the context of the continuous development of science and technology, the P2P network technology system is also continuously optimized, and its advantages in local area network applications have gradually become prominent. By sorting out the key points of the application of computer P2P network technology in local area networks, and sorting out common problems and solutions, it is of positive significance to better display the value of technology applications.

2. AN OVERVIEW OF RELATED CONTENTS OF COMPUTER P2P NETWORK TECHNOLOGY

2.1. Fundamental Contents
The P2P structure is a peer-to-peer network. This network structure has received widespread attention when it was first born because of its own advantages. In the past few years, this structural technology has developed very rapidly. At present, the industry does not have a standard definition of P2P. Intel defines P2P technology as "the sharing of computer resources and information through direct exchange between systems." The computer resources and services we are talking about here include multiple aspects, such as information exchange, processor clock and disk space, and cache. The American IBM company has given a broader definition of this structure. They regard P2P as a structured system composed of multiple computers with Internet protocols. The characteristic of this structured system is that the system does not rely on the central or serial server, but on the active writing of edge devices. These member resources are obtained from other member users in the network instead of the server provided by the network.
2.2. Application Advantage
In practical applications, the technology has the following application advantages. (1) An important goal of P2P networks is to allow all clients to provide resources, including bandwidth, storage space and computing power. Therefore, when a node joins and requests for the system increase, the capacity of the entire system also increases. This is not possible with a C/S structure with a set of fixed servers. The increase of clients in this structure means slower data transmission for all users. (2) The distributed nature of the P2P network also increases the robustness of failure prevention by replicating data on multiple nodes. Moreover, in a pure P2P network, nodes do not need to rely on a central index server to discover data. In the latter case, the system will not have a single point of crash. (3) When P2P is used to describe the Napster network, the peer-to-peer protocol is considered important. However, the actual achievement of the Napster network is that the peer nodes (just like the end of the network) are combined with a central index. This allows it to locate available content quickly and efficiently. The peer-to-peer protocol is just a general method to achieve this.

2.3. Basic Structure

2.3.1. Ring Topology
In the application process of computer P2P network technology, the ring topology is an important part, as shown in Figure 1. In the ring structure, each workstation will act as a separate working node with a unique node ID. Moreover, the node ID is also processed by a hash function during use, and the number of bits is 128, which has strong uniqueness. In the application process of the ring topology, each application node will save the ID of the two node workstations in the routing table during use to facilitate the smooth interaction of work data. Moreover, this can also accurately find other nodes in a shorter time, and the recognition accuracy is above 99.6%. In practical applications, this type of structure is often used in file sharing processing, multimedia transmission and other links. It has a good application effect.

Figure 1. Schematic Diagram of Ring Topology
2.3.2. Tree Structure

The tree structure of computer P2P network technology is an important part in the application process. As shown in Figure 2, in the tree structure, each workstation will spread from the same reference point to the outside world as a separate work branch node. These work branch nodes will also be classified into a certain node based on their mutual affiliation. They maintain independence and relevance to each other. In the design of the branch node ID, a hash function is also used for processing. The lowest-level node only records the ID information of the previous level, and the highest-level node only records the first-level affiliation node ID. Other levels of nodes will record the home node ID and branch node ID, thereby improving the orderliness of the work process. In practical applications, this type of structure is often used in multimedia transmission links, and it has good application effects.

Figure 2. Tree Structure Diagram

2.3.3. Grid

Except to the first two application structures, the network structure of computer P2P network technology is also an important part of the application process. As shown in Figure 3, in the network structure, each workstation will act as a separate work branch node, maintaining a strong disorder and no stable subordination. It uses random connections to connect nodes together, which has strong tolerance and dynamic adaptability. As a result, it can be used as an important carrier for live streaming. In actual applications, if the network changes greatly, the relevant staff will also introduce the super node as an auxiliary structure to associate the independent nodes used. It has super compatibility, thereby enhancing the effect of structural application.

Figure 3. Schematic Diagram of Mesh Structure

3. THE SPECIFIC APPLICATION OF COMPUTER P2P NETWORK TECHNOLOGY IN LOCAL AREA NETWORK

3.1. Application Structure

Judging from the current application situation, the computer P2P structure it applies to is a composite application structure that can provide richer functional services. From the perspective of local area network applications, the scope of work is basically limited to the scope of office communications.
Based on this, it is necessary to make full use of the application advantages brought by the P2P network technology, which not only reduces the dependence of the system on the CPU, but also does not need to use a larger central processing unit during use. It can also provide a more convenient system operation on the basis of ensuring the rationality of the speed during use, thereby increasing the work efficiency by 30%-50%. For example, the office needs to use the local area network to establish an information exchange platform. It can realize the point-to-point exchange of information in the platform, and it can be used with a reliable central processing unit to achieve a stable assisting effect, thereby improving the reliability of the information exchange process.

3.2. Download Method
Judging from the past application situation, the text transfer protocol used in the selection of the download method is mainly HTTP protocol or FTP protocol. This is also the basic condition to ensure the efficient transmission of information. The smooth integration of P2P network technology can serve as two application functions in the information downloading process, namely server management function and customer service function. This kind of function can respond to the user's download request in a timely manner during the application process. The information content can also be shared in a short time, and users can also transfer some of their favorite resources to the local area network. This not only improves the richness of download resources, but also provides more convenience for the system network, and facilitates the smooth progress of subsequent download activities.

3.3. Node Function Design
When applying computer P2P network technology to the node function design link, it is necessary to make full use of the high scalability and high availability of the technology itself, so as to improve the durability of the information storage process on the basis of ensuring complete coverage of information. In practical applications, the peer node will be used for functional design. The schematic diagram of the structure is shown in Figure 4. Among them, the kademlia protocol is a basic carrier that assists the smooth operation of the network topology system, which has also been effectively applied in the local area network.

3.4. Overlay Network Protocol
When using computer P2P network technology to optimize the content of the local area network, it is also necessary to select a reasonable coverage network protocol to ensure the orderly delivery of structured data information. In the specific application process, the maintenance nodes will be associated at the logical application layer to ensure that any node can complete information interaction by relying on the network protocol to meet the information transmission needs. The structured P2P overlay network protocol established based on P2P network technology can sort out the connection status between nodes. Meanwhile, with the help of nodes, dynamic P2P network management can be successfully completed to serve the needs of local area network operation. Currently commonly used
3.5. Network Data Distribution

Computer P2P network technology also has good applications in network data distribution. The following points need to be done in specific applications. First, do a good job of organizing the P2P network team. Normally, nodes that are close in physical distance are divided based on the rules of up and down lines. Second, the data will be placed in the P2P network system in advance when the node is backed up. When the node meets the recovery operation, the application data can also be obtained directly from the network, which improves the work efficiency by more than 30%. Third, when using Peer nodes for data distribution processing, adjustments can be made according to user needs. At the same time, the system needs to use SHA1 to complete the identification calculation and output the corresponding calculation data [2].

3.6. Multi-copy Redundancy Processing

Computer P2P network technology also has a good application in multi-copy redundancy processing. Based on the basic advantages of P2P network technology, the redundant processing methods used include erasure code processing technology and multiple copy processing technology. In the application process of the former, its space overhead is relatively small, but the overhead cost that needs to be consumed is relatively large, so that the complexity of the system design process is also increasing. In the application process of the latter, the space overhead is relatively large, but the overhead cost required is low, and the content design is more convenient. In this regard, the two methods will be associated and used in the redundant processing of multiple copies, so as to reduce the overhead cost by 30%-50% on the basis of ensuring the smooth organization of the copy content. This is also conducive to improving the comprehensive benefits brought by the operation of the local area network [3].

3.7. Node Failure Detection

Relying on the computer P2P network technology, the nodes in the use process of the local area network are mainly related personnel in the local area network. In this process, nodes join and exit frequently during system operation, which also puts forward higher requirements for system compatibility and stability. If the main service node and the less important node of a certain data block exit the system, then the module will also be in a failed state. It needs to obtain the corresponding backup from the backup system to ensure the rationality of the system's working status. Moreover, in the inspection process of the failed node, it is also necessary to do the corresponding backup processing work and organize the information content with the Kademlia protocol. Workers can use the heartbeat mechanism to determine whether the node fails, and deal with it in time to improve the security of the local area network's working status [4].

3.8. Copy Repair Processing

If a node failure is encountered during the operation of the local area network, it needs to be repaired in time to ensure the smooth expression of the functionality of the local area network. Two sets of database tables are involved when storing data table information based on computer P2P network technology. One group of database tables is: chunkserverinfo.db, and the main content stored is the service node information corresponding to the data block. Another set of database tables is serverindex.db, and the main content stored is related content corresponding to a node. The system will simultaneously apply the data information of the two types of nodes when analyzing and processing the failed system, thereby improving the rationality and reliability of the copy repair process [5].
4. COMMON PROBLEMS AND COUNTERMEASURES DURING THE APPLICATION OF TECHNOLOGY IN LOCAL AREA NETWORK

4.1. Hacking Problem

Compared with the traditional C/S system, the local area network established by the computer P2P network technology has a stronger openness in the application process. In this way, the probability of being attacked by hackers during the operation of the system has also increased by 50%-70%. The negative effects brought about include the leakage of important information and the failure of LAN nodes. This will affect the normal operation of the local area network. When dealing with such problems, we need to do a good job in security management, encryption and identification. Currently, the most commonly used computer security technologies are as follows. First, cryptography. When the computer P2P network technology is used to optimize the local area network environment, the data circulating in the local area network will be classified in advance. According to its confidentiality level, perform corresponding encryption processing, assign access user permissions, and improve the degree of confidentiality of information. Second, identity authentication technology. The application of this technology can accurately judge the authenticity and validity of the user's identity, so as to understand the legitimacy of the user's application process. This will help correct illegal behaviors in a timely manner, with an accuracy rate of over 85% [6].

4.2. Virus Transmission Problem

The local area network established with the help of computer P2P network technology also has good application advantages in information transmission, and it also provides a good carrier for virus transmission. Compared with the previous C/S system, the newly established LAN virus transmission speed is 50% higher than the previous year, and its negative impact spread speed has also increased by more than 30%. Based on this type of problem, it is necessary to do a good job in the prevention and control of virus transmission when dealing with it. The specific protection measures are as follows. Firstly, match reasonable system protection software according to the actual situation of the LAN operation process to ensure the stability of the system operation process. Secondly, do a good job in network monitoring. In specific applications, we can directly associate the computer's P2P software with the operating network, so that the entire local area network's operating process can be monitored in real time. If the system finds some malicious access programs, unhealthy viruses, etc. during the operation, the anti-virus software installed at this time will also intercept and kill them in time. So as to control the negative impact within a reasonable range, and improve the safety and stability of the system operation process [7].

4.3. The Problem of Propagation Speed

Based on past application experience, the local area network mainly uses resource sharing and broadband association methods for content processing during operation. The continuous expansion of the coverage of computer P2P network technology has also led to the continuous expansion of the fields involved in the whole process, and the requirements for the technical level are also increasing. In this process, although the technology propagation speed has been increased, the file transfer speed has not been adjusted too much. This also makes more than 60% of the download resources occupy the LAN network, affecting the progress of other transmission work. Based on this type of application problem, when optimizing it, we need to control the flow of different content running processes to make the network distribution of the local area network in a reasonable state. In the specific operation, the computer will limit the system connection bandwidth, and the restriction condition is the user level. Users with higher levels have relatively more bandwidth resources to meet the related requirements of normal work. It should be noted that bandwidth resource allocation has been dynamically adjusted to ensure that the LAN operating environment can be in a dynamically balanced state [8].
5. CONCLUSION
In summary, computer P2P network technology has the advantages of high openness and fast transmission speed in application. For one thing, applying it to the construction of a local area network can improve the compatibility of the local area network and complete different types of data transmission in a short time. For another, it can bring more convenience to people's lives and increase the value of local area network services.

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