Research on the Computer Network Protocol Test Model based on Genetic and Random Walk Algorithm

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Abstract

In this paper, we conduct research on the computer network protocol test model based on genetic and random walk algorithm. Network protocol is the abstract concept, is important in the process of the development of network system. Fully understand and grasp of the network protocols for managers is there is a big difficult. Network covert channel is the evaluation of intrusion detection system and firewall security performance of an important means, the paper will start from the angle of the attacker, the flaws of the research, and use this kind of defect to realize network covert channel, the random walk algorithm will be feasible for dealing with this issue. For achieving this, we integrate the genetic and random walk algorithm for systematic optimization.

Keywords: Computer Network, Protocol Test Model, Genetic and Random Walk, Algorithm.

Introduction

Network protocol is the abstract concept, is important in the process of the development of network system. Fully understand and grasp of the network protocols for managers is there is a big difficult. Therefore, to build a perfect network protocol management simulation system is required. Network protocol management can describe agreement by adopting the method of visual simulation system of connotation and workflow to make the managers through observation process for packet delivery protocol in the network operation mechanism, to promote the master degree of network protocol.

SimpliciTI network protocol is mainly divided into hardware logic layer, network layer, application layer three layers, hardware logic layer including RF (radio) and board level driver package (BSP), in the network layer encryption processing. The deal does not exist in the traditional network physical layer (PHY) and the data link layer (MAC/LLC), so the sending and receiving data is carried out by radio frequency (RF) layer, and the board level driver package mainly provide the RF communication interface between layer and network layer. In this network, extended equipment not routed network management and it is just as the data transceiver relay station. Through extension of the equipment, therefore, we can realize the jump function, so that the data remote transmission ability. Before then optimizing the system, we list the traditional ones as the follows [1-3].

• S-MAC protocol. Through the message segmentation and sudden passing mechanism to reduce the overhead of control messages and message transmission delay. S-MAC protocol reduces the energy consumed by a free to listen to, but not in: node work cycle began to work has been identified in the agreement cannot be adjusted according to the change of network.

• Sift the agreement. Sift protocol is a novel and simple different from the traditional MAC protocol based on the window, but for the receiving node idle less, to maintain the clock synchronization between nodes, so is suitable for use in the local area of sensor network. In clustering network within the cluster nodes in the area is close, multiple nodes are often easy to detect the same event at the same time, and only need some nodes to transmit a message to the cluster head and the related qualities.

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The collision avoid carrier listening multiple access MAC layer protocol. The IEEE 802.11 MAC protocol defines three basic inter-frame spacing, to provide access to the priority of the wireless channel. Respectively is: the shortest inter-frame spacing SIFS for need immediate response services such as the ACK frame. PCF mode using the inter-frame spacing (PIFS), in order to gain access cycle starts when there is no competition priority access channel. DCF model mode using inter-frame spacing, used to send data frame and the management frame.

Figure 1. The Demonstration of the Random Walk.

In this paper, we conduct research on the computer network protocol test model based on genetic and random walk algorithm. Network covert channel is the evaluation of intrusion detection system and firewall security performance of an important means, the paper will start from the angle of the attacker, the flaws of the research, and use this kind of defect to realize network covert channel, the random walk algorithm will be feasible for dealing with this issue.

The Proposed Methodology

The Review of the Network Protocol. Network protocol conformance testing is a kind of functional black box testing, it according to the agreement describes an implementation of protocol testing, to identify this implementation are consistent with the corresponding agreement standard. Conformance testing includes two categories, static testing and dynamic testing. Formalization is the foundation of conformance test. Based on strict mathematical formalization method that can be accurate and fully express agreement of the function, performance and behavior, etc., it for protocol analysis, validation, implementation, testing, and other activities of systematic, automation provides a good foundation.

Dynamic analysis method has the advantage that can accurately track the execution process, but also causes fairly granular analysis, makes the whole analysis process is very complex. To this end, we take the dynamic analysis based on the virtual environment is given priority to static analysis is complementary way to carry out the analysis. At the same time, we found that the software when dealing with network data often involves a large number of the operating system library function, therefore, we through the intercept related library function call to obtain its parameters and return values, avoid internal instructions to these library functions is analyzed, so as to simplify the analysis process and abstract test methods described by the tester, test apparatus and test on the coordinated process consisting of abstract test structure and their relationship with the test system and SUT.

- Relay system IUT of abstract test methods. Open relay system of abstract test method includes two categories: loopback test method and through the test method. Coordination between the various test systems is the difficulties to realize through the test method, through the test
method is tested relay system in normal operation mode gets tested, behavior can be observed at both ends [4-5].

- End systems IUT of abstract test methods. Remote control test method is to test events and observations only with the terms of tester activity, and coordination of the test process of some of the requirements may in ATS implied or expressed informally, but no assumptions made about the feasibility of these requirements or implementation of the abstract test methods.

The Network Authentication Model. P2P authentication system based on the CDN network is composed of CDN network, ids server and P2P network. CDN network including EPG server and the BOSS server, EPG server used for each program to produce a limitation of the token, and will be the token of the corresponding effective P2P URL address together, in order to generate the client support link URL and the procedures could be organized as the follows.

- Contact management services for receiving the request that carries on the user's identity and validation of the administrative authority, validation by negotiation will be carried out after the service parameters.
- Through service consultation to management request at this time the sender contact response, return delay revised, and provide so the only contact id, indicate the relationship.
- Request the sender to contact management, and provide the necessary user information and the service parameters [6-7].
- The requestor to receive management response after the operation, whether to disconnect the service link or continue the determination of the management operations and the two contact maintenance within the prescribed time interval.
- Management the requestor in contact has been established on the basis of general management operations, using contact id and delay correction parameter structure PDU operation.

ID server mainly contains transceiver module, the module is used to receive the token is sent to the server to validate his the BOSS, and to send the verification results of BOSS returned from the server to NP to the client. In addition, the ids server also save the client sends to the information. In the figure 2, we show the inner connection procedures.

[Diagram of the Network Authentication Model]

Figure 2. The Demonstration of the Network Authentication Model.

Scheduling analysis is the purpose of computing the worst and the best response to the task execution time, but it is based on real-time scheduling theory model checking is less, the reason is that
the model test due to its complexity are often limited to abstract level, real-time scheduling theory model is usually a lack of formal semantics that can be expressed as the follows. 

\[ L(\text{src} | \text{Connect(e)} \subseteq L(\text{Dest})) \]  

(1)

**The Random Walk Algorithm.** Random walk is a kind of simple and very useful Markov chain model. At present, the random walk algorithm has get in-depth study on mathematics, and physics, chemistry, biology, finance and other applications in many fields. Many phenomena in real life can model with the random walk. Diffusion process, the movement of gas molecules in particular, the fluctuation of stock price and so on all is assumed to be the result of the continuous collision or some kind of random pulse function. Common method for generating hierarchical network could be then summarized as the follows. (1) Randomly choose strategy is to randomly selected in the network edge, and then connected to the selected edge node is selected, the nodes with the selected edge network reconstruction. (2) On the basis of random points method derived the choosing strategy of a kind of based on node degree, node degree to a certain extent, reflects the node and the strength of the correlation of adjacent nodes. (3) Stochastic collocation method, just as its name implies is selected at random in the original network nodes, and refer to the original of the selected node in the network relationship to rebuild the network. According to the number of original network node sampling ratio, choose a certain amount of random node, then form a network. The figure 3 shows the principle.

![Figure 3. The Random Walk Algorithm.](image)

**The Genetic Algorithm.** Although genetic algorithms has successful application in many fields, but also its own shortcomings, such as the poor local search ability and premature convergence and random walk wait for a phenomenon, the convergence of the algorithm is bad as take a long time to find the optimal solution. These deficiencies hindered the popularization and application of genetic algorithm. How to improve the search ability of genetic algorithm and improve the convergence speed of the algorithm and make it better applied to solve practical problems, as well as the main subject of the researchers have been exploring. Genetic algorithm is a kind of complex optimization problem. By simulating the evolution rules of the biological evolution and chromosome exchange mechanism, three basic operations using selection, crossover and mutation to seek the optimal individual has high robustness and corresponding extensive adaptability. Common practice is to define a score function, to judge the specific structure reflect the relationship between independent and the degree of match samples, choose suitable search algorithm is used to search for a network model of the highest score, namely the following formula one [8].

\[ Genetic = \arg \max_{G,D} f(G:D) \]  

(2)

The procedures of the algorithm could then be organized as the follows. (1) The general solution is to set initial population: 1) according to the problems inherent knowledge, trying to grasp the optimal solution of the space distribution in the whole problem space, and then, within the scope of this distribution set initial group; 2) the first randomly generated a certain number of individuals, then pick the best individuals added to the initial group. This process is iterative, until the individual number of
the initial population reached a predetermined scale. (2) Fitness function is the individual's ability to adapt to the environment as evaluation is to choose the basis for the operation the stand or fall of it can directly affect the performance of genetic algorithm. Fitness function is composed of the objective function transformation. The result of the fitness function is the only requirement is: as a negative. This makes algorithm can be applied to discrete, not derivation, greatly increased its applicability.

**The Computer Network Optimization.** Using feature can embody the computer network system in a limited amount of time and ability to complete the task within a certain range and the reliability of the computer network, computer network system in the whole process of vital, it about the whole process smoothly, and the effectiveness of the whole system. Technology continues to improve and the normal operation of the computer network system. So in today's Internet development condition, the research on it is more and more attention, and has been as the key of building computer network system. But in terms of the condition of the computer network system, and its reliability, security is still the important factors which restrict the development of the computer network system, so we must from set out actually, comprehensive analysis, the implementation of the computer network reliability optimization design, essentially processing to solve this problem. There are two main types of basic computer network reliability method, the first is to make computer network reliability improvement of related parts, and the second is to make the computer network additional redundant components reliability improvement to use the redundancy technology not only can effectively improve the computer network. With combination of prior discussed methods, we can propose countermeasures as follows. Computer network system fault tolerance is to promote the reliability of the computer network the most effect of the method. This method can largely reduce the computer network malfunction time and in the loss of failure data to avoid the computer network for such an emergency system paralysis caused by damage.

**Conclusion**

In this paper, we conduct research on the computer network protocol test model based on genetic and random walk algorithm. Fully understand and grasp of the network protocols for managers is there is the big difficult. Therefore, to build a perfect network protocol management simulation system is required. Network protocol management can describe agreement by adopting the method of visual simulation system of connotation and workflow to make the managers through observation process for packet delivery protocol in the network operation mechanism. This paper integrates the novel and new methodologies to propose the general countermeasures for the system that will enhance the performance of the traditional systems.

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