Research and Practice on Experimental Teaching of Mobile Network Security Course

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Abstract: According to the research and practice of mobile network security experimental teaching of emerging courses, construct a mobile network security technology experimental teaching system, design the experimental teaching objectives and content hierarchically, and explain how to use the open network attack and defense online experimental platform to enable the development of experimental teaching Not limited by time and space. Finally, it shows that through the teaching reform, the initiative and exploratory ability of students' experiments have been significantly enhanced, and the teaching quality of the courses has been improved.

1. Introduction

Generally, the core courses of information security majors mostly involve boring and abstract theoretical knowledge. Students have a certain degree of difficulty in understanding the knowledge points in the learning process. As the difficulties accumulate, the interest in learning will gradually diminish or even disappear. The learning effect of students will naturally be greatly reduced. At the same time, when teachers teach professional core courses, if they focus purely on theoretical knowledge, students will feel that this knowledge is too abstract and too far away from practical application, which will lead to the view of “knowledge uselessness”. Practical courses apply abstract and difficult theories in certain specific scenarios, which not only deepen their understanding of knowledge points, but also enable students to understand the specific application of theories in practice, and better link theory with practice.

Information security profession itself has distinct technical and practical characteristics. As the core course of information security major, network security has more prominent practical requirements. However, the network security experiment environment requires many hardware and software configurations and high deployment costs. Many colleges and universities currently have network security experiments based on simulation and simulation, lacking a real operating platform, and the professional practice activities that students can carry out are very limited. At the same time, the existing simulation experiment platform has a relatively big defect: all the experimental steps are set in the system in advance, and the students' experiment content is actually to reproduce the experiment according to the established steps. This kind of simulation platform not only lacks flexibility in the setting of experimental content, but also the immutable things easily lead to students' slack and lack of thinking. Many students still have a little understanding of the experimental principles even after reproducing the experimental content. This article first analyzes the goals of network security experiment teaching, and then, in response to these established goals, designs the corresponding network security experiment teaching content.

2. The Goal of Network Security Experiment Teaching

Network security experiment teaching is an aid and supplement to network security theory teaching and has an irreplaceable important position. On the one hand, experimental teaching reproduces the key points and difficulties of relevant theoretical teaching in the form of specific application scenarios or detailed operating steps, making the originally profound and difficult knowledge points concrete, and students will be much easier to understand. Naturally, it deepens the

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understanding and mastery of relevant theoretical knowledge points. On the other hand, experimental teaching takes practical application problems as an example to comprehensively use various theoretical knowledge points in network security, which can examine students' mastery and flexible application of relevant knowledge points, and feedback the results to the theoretical teaching of network security to promote each other .

2.1 Deepen the Understanding of Network Security Theoretical Knowledge Points.

Theoretical knowledge of network security generally involves principles, algorithms, etc., and is often abstract and profound and difficult to understand. Through experimental teaching, profound and difficult theoretical knowledge can be transformed into specific examples, operating steps or implementation code sentences, which can give students intuitive experience and deepen their understanding of original theoretical knowledge. At the same time, students are familiar with the specific implementation and application scenarios of relevant theoretical knowledge points through experimental teaching. The mastery of knowledge points not only stays at the theoretical level, but also better connects theory and practice, achieving a three-dimensional network security knowledge point. understanding.

For example, when introducing two common methods of host port scanning: full connection scan (referred to as full scan) and TCP SYN scan (also called half scan), it is difficult for students to figure out the essential difference between the two methods. Although the students can roughly understand that the full connection is the full process of completing the three-way handshake of the TCP connection, and the semi-connection mode only performs half of the TCP connection process, but because they do not understand the specific implementation methods of these two methods, the full connection The understanding of the essential difference between scanning and semi-connected scanning is only based on the principles and concepts, and the impression in my mind is not deep. In experimental teaching, you can further deepen your understanding of these two scanning methods by analyzing the core source code of them. In the full connection mode, the connect() function can be called in the user mode system to stimulate the three-way handshake process of the TCP connection, and the port status can be judged by the return value of this function. The semi-connected mode needs to send a TCP packet with a SYN flag to the port detection party, which must be implemented by creating a raw socket with root privileges.

2.2 Realize the Extended Application of Network Security Theoretical Knowledge Points.

The network security theory class is limited, and it is impossible to explain all the knowledge points. The

correspondingexperimental teaching can expand and extend the theoretical teaching content to a certain extent, and strengthen the depth and breadth of students' grasp of relevant knowledge points. Experimental teaching, from the perspective of the practical application of technology, stimulates students' new analysis and thinking on problems. Theoretical teaching and experimental teaching complement each other, while consolidating the basic knowledge of network security, it also enhances students' practical and innovative abilities.

When learning firewall technology, because hardware firewalls are expensive, experiments and configurations are rarely performed directly on hardware firewalls, and software firewalls are generally used. iptables is a Linux firewall management program that is more commonly used, and is a traditional management software. The teaching experiment of iptables-based software firewall can be carried out from the aspects of its installation, configuration, and use, such as: iptables syntax, startup and shutdown of common TCP services, and trace records of incoming/outgoing data packets. Through experimental teaching, students can have a more systematic and comprehensive understanding of iptables.

2.3 Realize the Comprehensive Application of Various Theoretical Knowledge Points of Network Security.

Cybersecurity is a core professional course for undergraduates majoring in information security. It is generally offered in the upper grades and involves core courses in many other majors.

Therefore, network security experiment teaching emphasizes the integration of multiple knowledge points, and examines students' proficiency, flexible application and connection of knowledge points in different courses. For example, when analyzing the security of a target server, it is necessary to identify the operating system of the server, which ports are open, which services are provided, the possible vulnerabilities of these services, and the cracking of server account passwords. This experiment almost covers most of the safety knowledge learned, and can examine the rigor, logical, and systematic aspects of students' analysis of safety issues. Experimental teaching can train and cultivate students' problem analysis ability and hands-on practical ability through comprehensive safety application problems, and effectively combine theory and practice.

3. Experimental Teaching System Construction

Mobile network security technology is not only a highly comprehensive cross-discipline, involving computer networks, communication technology, cryptography, information security, operating systems, etc.; at the same time, it is also a course that requires very strong practical ability. The primary task of curriculum construction is to first establish a curriculum system and put the cultivation of practical ability in an important position.

3.1 Stratification of Experimental Teaching Objectives

The experimental teaching objectives are divided into four levels: knowledge learning, problem solving, innovative thinking and practical ability. Knowledge learning is the foundation, emphasizing the use of common network security and related tools; problem solving is the core, emphasizing the ability to comprehensively use mobile network security technology to solve problems; innovative thinking is the soul, emphasizing the discovery of new problems or discovering new ways to solve problems. As for actual combat capabilities, it is a concentrated expression of the other three capabilities. Learning network security technology must be able to be flexibly applied to the complex network security environment in the end, so as to understandBoth offensive and defensive, offensive and defensive, can solve practical problems. Therefore, the four are gradual, organically combined and integrated.

3.2 The Experimental Teaching Content is Layered.

The experimental teaching content is divided into 4 content levels: verification experiment, comprehensive experiment, research experiment and professional experiment, corresponding to the 4 objectives of experimental teaching in turn. The difficulty ranges from simple to complex, focusing on the practical application and interest guidance of discovering and solving problems.

3.3 The Experimental Teaching Method is Based on Task-Driven Deep Learning.

Through task driving, experimental teaching can be transformed from basic knowledge learning to problem solving and innovative thinking, so that students can actively explore solutions to experimental tasks. In deep learning, students can actively participate in challenging experiments under the guidance of teachers. In order to stimulate the ability of subjective and active learning and exploration, for the experimental tasks, generally only macro-guidance is used to avoid the weakening of the students' independent exploration ability due to excessive details. In the process of completing experimental tasks independently, students can seek guidance from teachers if they encounter difficulties. Such guidance can provide students with clues to solve problems; at the same time, discussions and exchanges between students and between teachers and students are encouraged to enrich, To correct and deepen the solutions to current experimental problems, students should make more use of network resources, read related literature, and even refer to technical articles on blogs and forums.

4. Conclusion

Network security experiment teaching is a supplement and extension to the corresponding

theoretical courses, focusing on cultivating students' hands-on practical ability, and to a certain extent, training students' ability to analyze and solve problems. This article analyzes the objectives of the network security experimental teaching course, and designs corresponding experimental teaching contents according to these objectives.

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