Acta Technica *62* No. 2B/2017, 849–858

Application and design of mobile intelligent terminal security protection system based on android platform

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Abstract. With the rapid development of mobile Internet information technology, a large number of mobile systems are surging up just like the waves, and people's daily life is also increasingly inseparable from these mobile systems. However, at the same time of that the mobile system brings convenience to people, it can't be ignored that it may reveal people's personal privacy information and even endanger people's lives and property. Therefore, how to improve the security of the mobile phone system has become an urgent need to solve the problem. In this paper, the application of the mobile intelligent terminal security protection system based on Android platform was devised, and then, a system with perfect function, good interface and excellent performance was formed by constantly updating the system version and repairing some loopholes and defects of the system.

Key words. Mobile intelligent terminal, security protection, system application.

1. Introduction

As we all know, with the development and popularization of smart phones, the mobile phone security management functions are becoming more and more important. Based on the actual needs, this paper designs and implements an application of mobile intelligent terminal security protection system based on Android platform. Android is a system platform and operating system based on the Linux kernel [1]. As an open source operating system, Android's technical architecture is easy to master, and furthermore, it is easy to implement the system solutions. At the same time, Android platform open source promotes that the application system based on the Android platform in the smart phone market is increasing [2]. Therefore, there are various problems that need to be solved in security and experience, for example:

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some illegal systems may threaten the performance and security of mobile phones, and ultimately cause time and economic losses to the mobile phone users whose guard consciousness is weak [3]. Based on the above reasons, it is imperative to design an application of the mobile intelligent terminal security protection system based on application with better performance.

2. State of the art

At present, the domestic Android phone security protection system is 360 security protection system, the proportion of users is far ahead, which ranks first in the industry, and furthermore, it continues to lead the mobile security market [4]. 360 security protection system's main features include: mobile phone antivirus, mobile phone physical examination, mobile phone acceleration, harassing SMS / phone interception, personal privacy protection, call attribution display and query, mobile phone physical examination, commonly used number inquiries. In the statistics of Ai media, Tencent mobile housekeeper has the second largest number of users. Tencent QQ mobile phone management is a mobile phone security protection system launched by Tencent for users [5]. At first, the purpose of designing Tencent mobile phone housekeeper is to protect the user's QQ account Internet security. Then, this system is widely praised by people because of its superior performance, and it gradually develops into a versatile antivirus system. At the same time, from the user's point of view, some small functions that are close to the actual needs of users are developed, which are fit for the pursuit of the fashion of users. Tencent mobile phone housekeeper is not only a security expert, and moreover, it is also the user's intimate butler.

In contrast, foreign applications do better in users' privacy. However, it is inevitable that many malicious systems run secretly in the background, steal the traffic and information. Therefore, foreign countries also attach great importance to mobile phone security, which release a variety of security applications [6]. AVG is currently an anti-virus system widely used on the Android platform, it has a powerful virus scanning capabilities, provides personalized security information services, at the same time, it also has GPS function, which can carry out the reverse tracking to the mobile phones lost, and then protect users' mobile phone security from all aspects. Kaspersky Anti-Virus System is the leader in foreign security systems. At present, it has been extended to the mobile field [7]. Whether it is in the antivirus or privacy protection, the system shows a very good advantage, which is a very professional antivirus system.

3. Methodology

3.1. System architecture design

MVC is a system design pattern. MVC is divided into three levels, and the three letters of MVC are the abbreviation of three words, which are respectively the Model

layer, View layer, Control layer. The first is the Model layer, which is primarily the core functionality of the packaging system. The second is the View layer, which is mainly responsible for the human-computer interactive part, processing the user's request and displaying the processing results [8]. And then, the main business logic processing is encapsulated in the Controller layer, the users' related requests are implemented in this layer. The design idea advocates to respectively realizing the system interface, data processing, business logic processing, etc., so as to achieve that the system will not cause the tedious change works and make mistakes because of the complexity of the system code association when it needs to modify or extend the relevant functions in the development or even the latter part of the maintenance process [9]. In addition, the business logic functions and the program interfaces are separated, which can also allow developers to focus more on achieving the customization of system function business, rather than rigidly adhering to the redundant and complex configuration of the framework. The system logical architecture diagram is shown in Fig. 1 below.

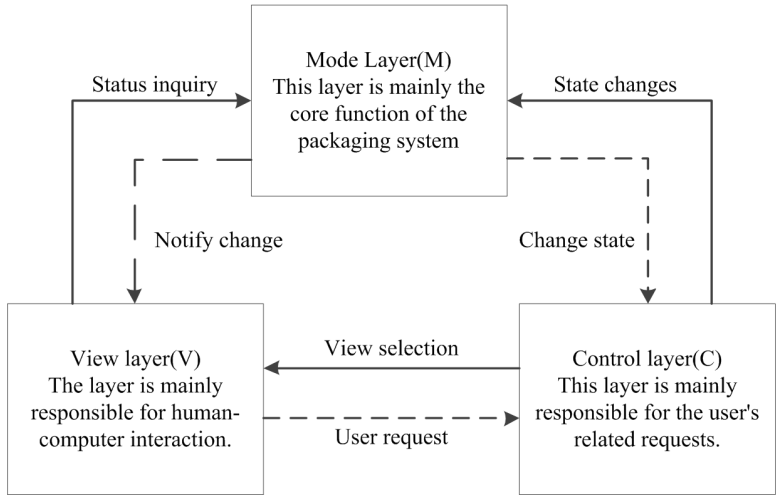

Fig. 1. System logic architecture diagram

The system client of the system adopts the Android program written by Java language, while the server uses the ThinkPHP framework to conduct design. Then, Nginx + Apache architecture builds a distributed cluster server by coordinating with keepalived [10]. This distributed master-slave server architecture can transfer the failure point to the backup server, so that the corresponding system functions can be directly transferred to the backup server when the system function failure appears, thus ensuring that the system can run properly. Moreover, in order to improve the overall data privacy security of the system and the reliability of the system data transmission, for some critical data of the system, the RSS encryption algorithm is used to carry out the encrypted transmission. In addition, in the design process of the system, it is necessary to strictly follow the RBAC access authority design principles, strictly control the system access operation authority among different roles, so as to

ensure that the user permissions between different user roles in the system operation process are not the same, thereby achieving the fundamental purpose of protecting the system data information security. The physical architecture diagram of the system is shown in Fig. 2 below.

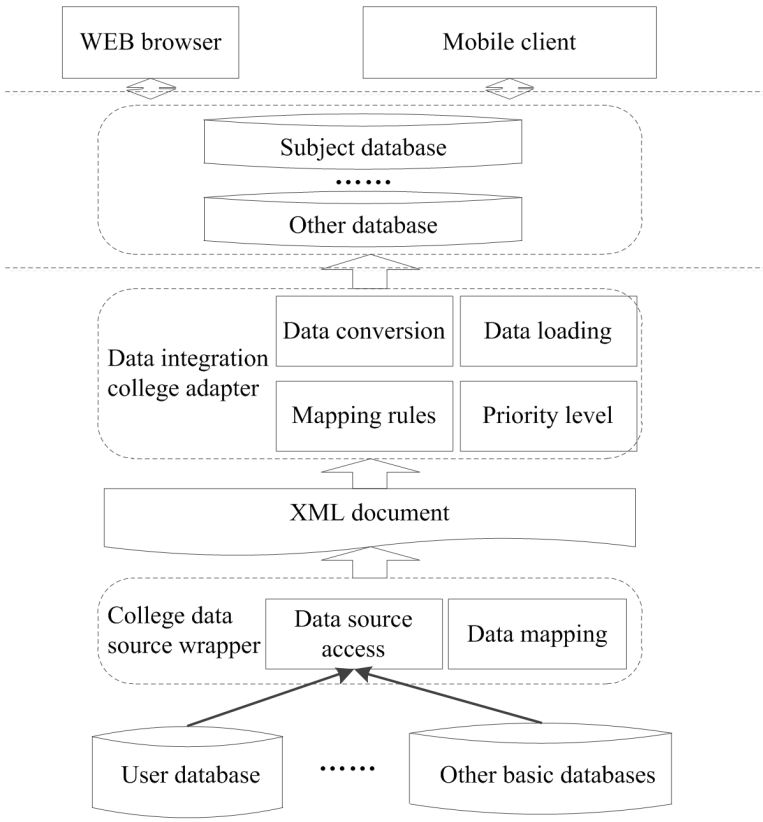

Fig. 2. System physical architecture diagrams

3.2. System database design

The database is used to store data and provide support for the business functions of the system. Therefore, in the final analysis, the database design is to achieve two goals: the first is to meet the requirements of system transaction processing, that is, to meet the function that the system needs to achieve. However, it is still not enough to be satisfied with the functions that the system needs to meet, because the business system needs to achieve a certain processing efficiency. If the access to the database makes that the system performance is greatly reduced, it can only indicate that the design of the database is unreasonable; the second is to store the data. Business systems will produce a lot of data every day, these data do not have a big effect currently, but a lot of regular data are hided there, which can be found

by a large number of data. Therefore, the E-R modeling method needs to be used to build the basic model architecture of the database. The mobile intelligent terminal security protection system based on the Android platform includes five major functional modules: mobile phone anti-theft function, remote command control function, mobile phone antivirus function, process management functions, system upgrades. At present, the mobile phone anti-theft function is the core function of the security system, and the main purpose for designing this function is to protect that the user's personal information will not be leaked because the cell phone was stolen. When the mobile phone is lost, the user can directly send the appropriate operation instructions to destroy the remaining data information in the phone through this function.

When a user discovers that his cell phone is stolen or lost, he can directly send the appropriate command to the lost phone to remotely control the phone to destroy personal information through the remote command function. Mobile antivirus function is mainly to use Pack Manager to compile all of the program packages in the system. According to compare the package name digital signature of different procedures with the virus digital signature in database, when the match is successful, the program can be identified as a virus program, and then it is unloaded from the mobile phone system. System upgrade function is mainly to conduct the phased upgrade for the anti-virus database information in the system, so as to ensure that the system's virus killing ability can maintain long-term effective. The system interface implementation diagram is shown in Fig. 3.

Fig. 3. System interface implementation diagram (Chinese version)

4. Result analysis and discussion

4.1. Test overview

Software testing is one of the important aspects of project construction, which is a comprehensive and complete detection to the code developed before. According to test the system that has been developed, the existing problems or hidden problems of the code can be found. And then, after timely repairing the problems found, the regression testing is carried out, so as to make the code keep constantly robust and stable in the test again and again.

The system of the software developed is tested through the corresponding test method. During the testing process, some errors are obtained and the bugs are fixed, so as to ensure that the system can maintain long-time stable operation. At the same time, people also hope to be able to find some subtle loopholes that are not found or even not noticed in the software development process at the time of testing, and then rapidly repair them. The software test needs to first simulate a set of data, the data should cover all possible situations as much as possible, and then enter them into the system. If the desired output can be obtained, it indicates that the software system is correct; if the desired output can't be obtained, it indicates that the software system is wrong and the software needs to be modified. After the modification is complete, the data needs to be tested again, thereby ensuring that the final software system is correct.

4.2. Test content

At present, the software testing process has several common test methods. The first is white box and black box test method: white box test refers to the tester is very clear about the internal structure of the software, the white box testing is generally carried out through the exhaustive path. Black box testing is also known as functional testing, while its meaning is the opposite of the white box test, the tester is not clear about the internal structure of the software, which tests the software functions completely in accordance with the requirements specification and detailed design specifications. Gray box testing is based on the white box testing and the black box testing, which not only pays attention to the internal structure of the program, but also concerns about the specific function of the software. The second is static test method: static method checks the source code syntax, structure, process, interface, so as to identify the software defects. While the dynamic test method does not care about the source program itself, which only concerns about the difference between the operation results and the expected results of the program. The third is unit test method: this method is also known as the module test. The integrated test is also known as assembly test or joint test, it is the test after assembling all software modules into a system. Before the final deployment of the software, the acceptance test is conducted. The acceptance test is the last test link after completing the unit test, the integration test and the validation test. After the acceptance test is completed, the product can be released and used. The task of the acceptance test is

to ensure that the software has entered the ready state, and then to verify whether the functionality of the software is consistent with the user's requirements. The regression test is to carry out the second after modifying the error of the software test. Alpha testing and beta testing are software testing during the commissioning.

The security protection system of the mobile intelligent terminal based on Android platform designed in this paper mainly used the black box to carry out test. According to use Load Runner software, a whole test was conducted to the performance of the system. Different levels of user access simulation for the system were mainly carried out, and then, the overall response time of the system was tested, so as to determine whether the system met the actual requirements of the actual bearing. According to carry out the systematic testing and other operations to the main functions of the program, the 10 minutes of testing was carried out in accordance with the 50, 100 and 200 concurrent number, the average user pass time and the pass time of 90 % users were recorded at each time. And the performance test situation of the partial operation obtained is shown in Table 1.

Table 1. A test table that is concurrent with some users of the system

Function	Test the user login process				
Purpose	Verify the concurrency of the system when the performance is reached 200 times				
Methods	Virtual maximum maximum limit of 250 concurrent, minimum 50 concurrent test scripts				
Concurrency	Average response time (seconds)	Transaction maximum response time (seconds)	Average transactions per second	Transaction success rate	Clicks per second
50	0.6	1.4	102.154	100%	50.00
100	0.9	1.6	117.941	100%	125.941
150	1.8	3.2	231.667	100%	154.742
200	2.8	4.7	292.173	100%	245.851
250	10.5	22.4	180.411	100%	271.212
Number of concurrent users	CPU utilization	Utilization rate of MEM	Disk I/O situation	DB parameter (M)	The other parameters not listed in the table
50	3 %	4.53	451.319	3500/400	3 %
100	21 %	8.16	579.951	3500/400	21 %
150	26 %	12.32	671.532	3500/400	26 %
200	35 %	19.21	785.435	3500/400	35 %
250	47 %	31.13	800.233	3500/400	47 %

According to the result display of the above test, the following conclusions are obtained: in the case of that the concurrent data was equal, the registration submission processing capacity was better than the login module home page display. And then, in the case of that the number of concurrent was 100, the system could support the normal use for about 150.000 online active users within 8 hours. After testing, all kinds of operations met the user response time requirements, which were mainly that at the time of browsing the tutorial course list, the loading speed did not affect the sense of experience for users to use this function.

4.3. Test result

Program function test cases covered multiple levels of functional testing. The most prominent was the function of security and protection system of mobile intelligent terminal based on Android platform. The functional test results are shown in Table 2.

Table 2. Functional test results table

Function module	The total number of cases	The total number of defect	Resolved	Unsolved
Mobile phone anti-theft function	134	25	18	0
Cell phone anti-virus function	156	27	19	0
Process management function	100	16	14	0
Remote command control	213	28	29	0

According to conduct the tracking debugging and regression testing to the design defects existing in the main function of the program, 45 numbers of Bug were solved ultimately. Therefore, the program function test was feasible. The test method used by the software program should be applied to the program management according to the standard, and the program development requirements should be pointed out according to the different test results. Then, the management level should be described in accordance with the general requirements, so that the function of the entire program can be achieved, and the normal operation of the program can be promoted stably and safely.

5. Conclusion

As we all know, with the development and popularization of smart phones, mobile phone security management functions become more and more important. This article is to develop a convenient, practical mobile phone security system based on the Android system to manage the mobile phone security, and then protect people's privacy to a certain extent, so that users can safely use the phone. The system

mainly includes several core functions: mobile phone anti-theft function, remote command control function, mobile phone antivirus function, process management function, system upgrade. These functions are designed primarily for the actual needs of the user's mobile phone, and the purpose is to protect the user's personal privacy information. At the same time, the system also has a function that is similar to system performance optimization, which is mainly to manage the system background process, and optimize the system cache file and background process, so as to make the system have certain safety protection function, as well as certain practicability. The function of the system is to choose the most valuable application function, so that users can quickly start using in the process, rather than too many functions of most anti-virus systems in the market, thus resulting in dazzling. In addition, the system also implements the open source free principle, which does not embed the advertising information forcibly, and this allows users to avoid the advertising troubles in the use process. At this stage, such an anti-virus system has a certain market prospect.

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Received October 12, 2017