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The Design and Implementation of Mobile Monitoring System of Transmitting Station Based on Android Platform

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Abstract

In view of the high speed development of current mobile platform related technology and wireless telecommunication technology, this paper designs and realized a radio and television launching pad mobile monitoring system based on Android platform. The system as expansion of the present scene monitoring system to receive real-time data on transmitters and control their states by wireless network at any time and place, thus further improve the operation efficiency of transmitting station.

Keywords: Mobile monitor, Android, Security hardening, Data push

1. Introduction

As forefront of national publicity, radio and television launching pad take the extremely important responsibility to radio and TV launch task[1]. The transmitter is the core of the transmitting station , the normal operation of the transmitter can affects to the transmitting station broadcast quality. Therefore, set up a set of

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perfect monitoring management system to assist workers overall control of the transmitter, fast response and improve the security have a very important role.

Along with the development of mobile hand-held devices, Google's Android system as a representative of a new generation of mobile operating system is able to wide attention, which appears take more opportunities and challenges to intelligent mobile field. Android based on Linux kernel quickly get enthusiast and support of many manufacturers because the characteristics of free and open source.

In this background, this paper combine the computer technology, network technology and mobile communication technology with the transmitter monitor technology design a mobile monitoring system based on the Android platform. The system take full advantages of the characteristics and advantages of Android platform to realize more flexible full-time monitor based on the original scene transmitter monitoring system.

2. Android Development

Google has developed open source Android operating system for mobile platform which is also used in the netbook. The system structure of Android can be divided into four layers: application layer, application framework layer, systems runtime layer and Linux kernel layer. Android runs a custom JVM on top of linux kernel. It allows developers to write Android applications with Google developed JAVA libraries. Each application has an independent Dalvik virtual machine example. This example lives in a Linux kernel by the process of management. Dalvik support Java Native Interface (JNI) program mode, Android applications can be through the JNI call of Shared library of development by C/C + + to realize "Java + C" programming method[6]. Installation Android SDK and Eclipse IDE is the most convenient way to development Android application. Eclipse provides a rich Java environment, Android Developer Tools will pack and install it after Java code be compiled. Android system structure as show in Fig.1.

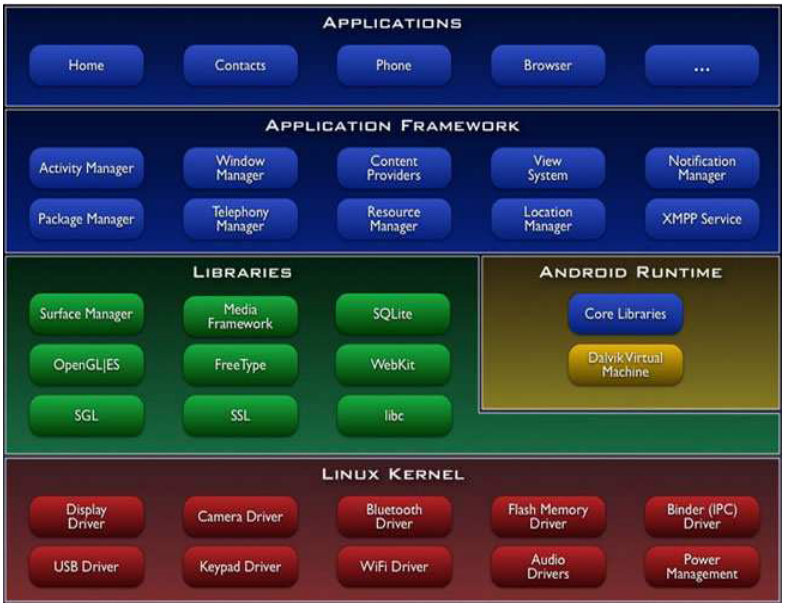

Fig.1. Android system structure

3. System Overview

The client-side of the system applied to the Android operating system (Version 2.3) and developed by Eclipse that combined with ADT (a java plug-in). The Server environment is Windows Server2003 operating system and use ASP.NET 3.5 as development tools. The back database is Microsoft SQL Server 2005. The whole system realizes the user login, user management , transmitter monitoring and control.

The smart phone mobile monitor system under Android system is a supplementary role for original scene monitoring system. It for us to inquire transmitter state under the condition that unmanned. The wireless data needs to be transmitted through GPRS networks or 3G network. The monitoring center server-sise of transmitting station must be connected to the Internet and should have fixed or dynamic public IP address.

Mobile monitor system based on Android can be researched and designed through four aspects.

- Software interface design development. Through friendly user interface on smart phone to realize the remote login transmitting station center server, getting parameters of each of the transmitter accurately and dynamic display on mobile phones. Control some state of transmitter to a certain degree.
- Terminal security module.Security is the most important of the system. Mobile monitor management system transmits data through the public mobile communication network, so the system should strengthen the data security through the multiple ways.
- Data push module between monitor center server and Android mobile phone. Program the server and the Android mobile phone client. Customize proper data transmission mechanism. Realize the whole process of client request from mobile phones, transmitter extract relevant data by this request and response it. The whole process is completed through wireless network and the data transmission efficiently.
- Data analytical module. All transmitter data are packaged by JSON format.

4. System Design Scheme

4.1. Software Interface Design

This module implements monitoring software interface design. In monitoring list interface, the system lists all the transmitter's frequency and display charts dynamically of transmitted power and reflected power (this two parameters are especially important in monitor system, Fig.2), click on the button not only can inquires all transmitter work parameters, including voltage, all kinds of alarm information, standing-wave ratio and so on but also control transmitter's status, such as the switch machine and reset operation, as show in Fig.2(the red dot represents current property out of order). Because of transmitting station may have many different types of transmitter, when a fat lot of parameters need to be monitored , the system takes way of sliding paging to display.All data in Fig.2 are test data.

Fig. 2. (a) Transmitter list; (b) Transmitter detail information

Due to the Android platform is very popular at present, we analysis the user usage on the Android platform through the investigation and study of similar software, combined with the strong function of Android SDK and multitouch characteristic of intelligent terminal to design a easy-to-use software interface for users to create a good experience.

4.2. Security Hardening Module

We mainly reinforce the security from the three aspects.

- Using data encryption algorithm to prevent wireless data intercepted.The system uses DES algorithm. The Data Encryption Standard (DES) algorithm, adopted by the U.S government in 1977, is a block cipher that transforms 64-bit data blocks under a 56-bit secret key, by means of permutation and substitution. It is officially described in FIPS PUB 46. The DES algorithm is used for many applications within the government and in the private sector. DES algorithm has extremely high security, so far, it's found no more efficient way unless use the method of exhaustion algorithm to attack the DES.
- Authorizing account by bind SIM card and IMEI. Mobile phone has a unique device ID, called the IMEI (International Mobile Equipment Identity). Intelligent terminal monitor software will bind SIM card number to IMEI. When the connection be required by client, through the database technology to check whether the cell phone users have already had authorized, and only after registered Mobile terminal and the SIM card can use software, without registration of Mobile phone and the SIM card are unable to start software. Based on this authentication mechanism, building user information database, separate different users of authorized from each other, so can prevent malicious users to login system through use illegal access account on their mobile phones.

- Using Nginx to hidden the real data server. Nginx is a high-performance HTTP server and reverse proxy, as well as an IMAP/POP3 proxy server. All clients will request data from Nginx proxy server which avoid the real server are exposed to the public,thus further strengthen the security of the system.

5. System Design Flowchart

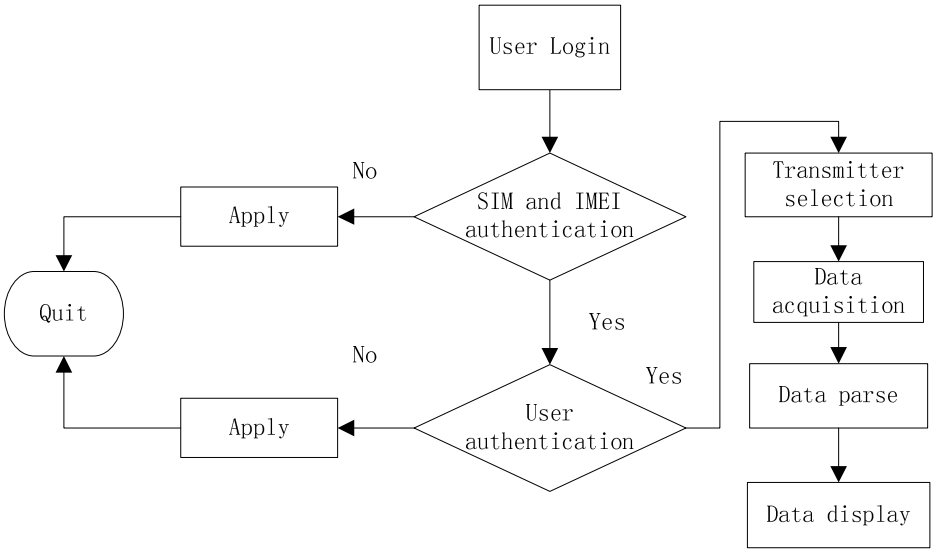

Fig.3. Client-side design flowchart

6. Summaries

Mobile monitoring system realized remote management to radio and television transmitting station by use of the powerful features of Android platform and brought daily work into the automation and networking process, so as to enhance operation efficiency of transmitting station.

The system takes full advantage of the characteristics of Android operating system, user interface intuitively and operation mode concisely, it's very suitable for the related workers and leadership to check the operation condition and adjust transmitter parameters at any time and place. Based on this, this system will have great potential and a good application prospect in radio and television field

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