Design Of WLAN Network Assistant System Based On Android

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Abstract

With the rapid development of Internet applications, portable machines and other the growing use of mobile intelligent terminal, Wireless LANs have also been developing rapidly, and become new generation of wireless access networks. Based on the study of the wireless network coverage and the theory of wireless signal road test, we propose a platform of Android WLAN network system assistant's design scheme. Through the study of wireless network coverage quality and network performance, determine the standard parameters to be tested and other related parameters.

The developed hardware platform of entire system contained the Wi-Fi function part, can be used at the terminal with Android operating system. Software section includes application software function's design and user interface's achievement.

Keywords: Android; WLAN; road test terminal; Socket Communications

1. Background

With the popularity of WLAN, Wi-Fi applications has been everywhere. Using WLAN as a short range wireless access means, the first and foremost purpose is to provide service access. However, the WLAN can be networked with their own, besides providing services of access, it can also provide a variety of exclusive services for the network, such as applications for e-government of the city, government security, urban's information and entertainment information.

With the development of Wi-Fi technology and improvement of "wireless city" networks, mobile operators will be able to provide more service in future, such as distance education, police system's real-time inquiry, the remote monitoring public for city's safety, emergency communications, the control of municipal facilities system For industry production, retail trade and other field's operations, Wi-Fi is a more effective meaning to access broadband. Meanwhile, based on the wireless city networks, mobile operators will develop a variety of Premium services to increase the amount of its own business.

What's more，with the deepening development of 3G technology in the field of mobile communications around the world , the transmission rate of the mobile terminals of the network faster and faster, greatly promoted the development of mobile terminals. Currently, the mainstream smart mobile terminal operating system includes: Windows CE, Mac OS, Symbian, and Android. Win CE's version has not changed since 2010,and its market share is decreased gradually, although Symbian lying on Nokia's powerful sales volumes occupy a lot of market share, but the disadvantages of its application is hindering its further development. In the field of smart PDA its share of less and less, Mac OS with its excellent performance and excellent operating experience firmly occupy the market of high-quality smart mobile terminals, have become various intelligent terminal design companies' direction indicator. Android has Google Inc. and the world's leading manufacturers, operators, chip manufacturers and other companies' support, based on the Linux 2.6 kernel, is completely open source and free to use, Android has excellent performance and great experience comparable to the Mac OS, makes its share straight up, and now has become one of the mainstream operating platform.

At the same time, in order to promote the implementation of the "wireless city" program and improve the quality and coverage of network performance, network coverage , eliminate blind spots and quality's black spots, providing a test basis for the networks of "wireless city" program's planning and optimization This paper proposed and designed a WLAN network assistant based on Android platform. This terminal can be used to help users founding the network and solve the error automatically, and help user make communication and collaboration with network Maintenance Company in order to resolve trouble quickly and provide better user experience.

2. Current domestic and international Situation

At present, the telecommunications industry standards about the Wi-Fi wireless network testing and evaluation in china, which is announced by People's Republic of China Ministry of Information Industry contain: "the mobile user terminal wireless LAN specifications and test methods", "WLAN test norms ", CTIA and Wi-Fi Alliance raised" Test Plan for RF Performance Evaluation of Wi-Fi Mobile Converged Devicesa_Version1.1 ", and" acceptance test specifications of Wireless LAN (WLAN), "and so on.

These rules provide standards for wireless network in air at physical layer interface. Try to formulate standards about the wireless network's function, including basic functions, security features, performance requirements, electromagnetic compatibility and other requirements; at It provide standards for the test methods for wireless networks: including test conditions, the physical layer interface testing in air, functional testing , performance testing ,electromagnetic compatibility testing, electrical safety testing, code testing, electromagnetic radiation tests and reliability tests, as well. These standards provide a scientific guarantee for whom engaged in wireless product development and wireless network test.

As for testing the wireless network, traditional instruments are mainly divided into two types. These two types of instruments are mainly used in road test.

One of the test instruments is a scanner. This instrument is designed to test field intensity which can be used to measure the wireless network radio signal strength more accurately and comprehensive. As for CDMA technology for wireless signal, the scanner can also measure and analyze code domain power. Partial scan frequency instrument can capture a full and complete signaling information. While in the signal acquisition process, a preliminary analysis of the collected information can reduce the burden of latter analysis of data. Different road test terminals have different functions. Road test instrument can also produce road test graphs, reports and tables, and other. Cost of such instruments is quite high, adapted to large-scale mobile network operators which can design and provide network layout.

The other kind of test instrument is reference terminal coupled with road test software. The reference terminal has been rigorous tested and has accurate performance, such reference terminal is very close to actual working conditions, and the work status is more steady. The reference terminal with road test software can catch all air interface signaling messages and it's very convenient for latter data analysis works. Just like TEMS Ericsson and Qualcomm CAIT series is its early representatives.

Such instrument has two mainly drawbacks:

First, as the development of mobile communications equipment, systems and terminals, reference terminals' exploit should raise more attention. Secondly, three standard terminal for 3G is at the stage of development, 3G business is rapidly exploit, so the development of reference terminal should be improved

In summary, for wireless network's optimization and the implementation of road test software,

our choice of configure the device should depend on the actual demand. Among the network construction and maintenance of the road, we usually use road test software and reference terminal, which is a more economical and viable option. As for making construction of the upgrading new technical standard, optimizing advanced Network and to troubleshoot problems require high road test instrument complete.

To test the wireless network, there are two kind of method we always use of road test method:

The first step: the definition of the quality index, which is supposed to be end to end, according to different business's

performance indicators, we can set the relevant key performance indicators. Through a variety of ways to collect performance data of the network, including network management system, road test equipment and protocol analyzer even the user declaration etc. By using quality statistics and pre analysis data which provided through the network reporting tool, and then we can get analysis of the method to improving the quality.

Step two: analyze statistical data .and determine which area need network optimization , including coverage blind, multi-pilot Cover area, problem areas with many customer complaints and switching areas, etc. Do some related tests in problem areas. When testing ，do comprehensive and effective record for valuable data . And then use this record for analysis, find out the cause of the problem, given feasible solution. For coverage blind, multi-pilot coverage area, we can use the road test system, to find its sphere of influence. For switching tests, it's supposed to be as precise as possible to point where the failure occurs.

Step three: Make network optimization. The main tasks of network optimization include: finding the best system coverage, the smallest drop off and access failure, reasonable hand-off (Hard Hand-off Soft Hand-off, Softer Hand-off and Baton Handover), uniform and reasonable base station load, optimal pilot distribution, etc. The optimized parameters include: the launch power of each sector, the position of the antenna (azimuth angle, the inclination angle and height), the neighbor zoon table and the pilot priority, the size of the neighbor zoon's pilot frequency set search window, the switching threshold value and so on.

Network optimization is an iterative process. Only by making up for mistakes and solve new problems in the process of continuous network optimization, can we eventually reach or close to the best quality of service.

3. The purpose and significance of the research

We design and the development of the Android WLAN network assistant in order to fulfill the Wi-Fi networking and network security operation's demand which can improve the network user experience as well. This platform is suitable for the 802.11 a/b/g/n network and can be used at the increasingly complex wireless LAN (WLAN), providing fast, visual and convenient fault handling function. It can easily detect the performance of the current network to help users find the network, discovery automatically fault faced by user and give a solution. It can also help the user to communicate with the network maintenance operations to quickly repair the network, improve the user's network experience. Because of its intuitive interface, the operator, can quickly master the use of methods without WLAN training and professional use experience.

At the same time, this system with intuitive interface can easily verify the availability of 802.11a/b/g/n network, connectivity, channel usage and security settings and solve trouble quickly. Mobile terminal WLAN network assistant has WLAN network signal reminder, City Hotspot map, business using feedback and other functions. It can do signal scanning and neighborhood frequency interference testing and other basic network quality testing, what's more it can do FTP download, WEB browsing and other basic business allocation test ,it also can have support test data upload.
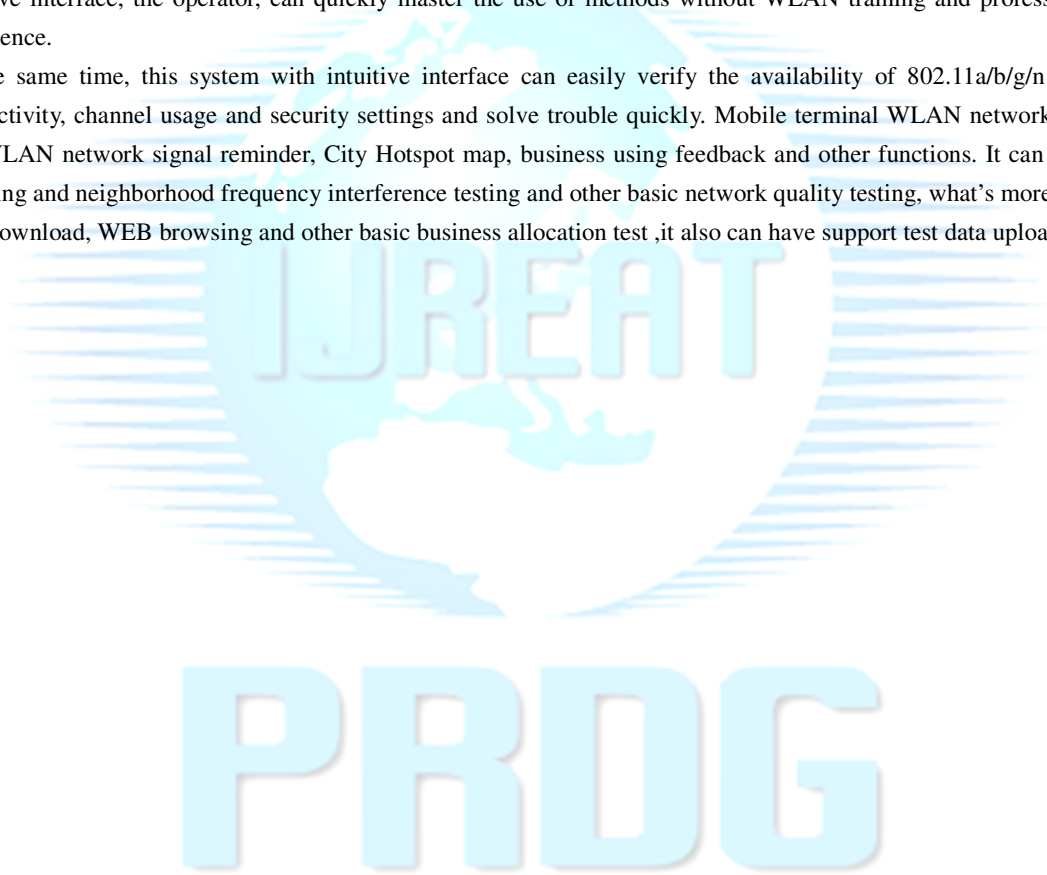
4. WLAN testing principle

According to the instability of WLAN signal transmission and the diversity of network distribution, the WLAN test can divide in to four aspects:

Channel test. It is different from testing of the cable signal, that the wireless signal's noise ratio and signal intensity is an important indicator of the channel. The wireless signal is transmitted by microwave, and we can get the signal attenuation state by detecting the change of signal intensity. The size of the wireless signal attenuation and the transmit power, distance and barrier of the wireless access point. Signal strength decide whether the WLAN can be connected or not which is related to the function of using Internet.

Since the WLAN 802.11 protocol uses the public channel, it can be used by other industrial equipment and communications equipment in the public channel, such as mobile phones, microwave ovens and other equipment. As long as the 2.4G/5.8G microwave transmission equipment running, it will bring noise to the WLAN network and bring a great deal of interference.

(2) Performance test of WLAN network. The performance testing of the cable network is the same as that of the cable network, which can be divided into two parts: the operation monitoring and basic testing. The basic testing includes the analysis of AP table, PING test, AP throughput test and so on. By these test results, we can get analysis of the basic situation of the WLAN network operation assessment. Based on the operation monitoring and the test, it can do the SSID packet analysis, real-time traffic analysis, real-time AP site performance analysis. And using the classification, composition, real-time network utilization rate and throughput of the 802.11 protocol, we can get the real-time work status of WLAN.

Analyze the WLAN protocol. Because of the big count of WLAN protocols' special frame format, that real-time capture and decoding is indispensable to test method of WLAN. The protocol is analyzed in order to better maintain the management of WLAN network. Therefore, in the decoding process, we just need to decode the three lowest layers that contains almost all of the basic information of the maintenance management of the network.

Diagnose WLAN network fault. Fault diagnosis in network operation and maintenance is very important application Fault diagnosis of the WLAN is depend on analyzing channel test result, network performance analysis, capture and decoding and other tests result.

WLAN's own characteristics made it divided into two parts: One is network performance's diagnosis (network performance assessment), including connectivity failure, low speed transmission, AP signal is weak and so on; the other is the network security's fault diagnosis (network security assessment), which is unique problem of WLAN network.

Since the microwave transmission is in the free space, all the devices in the space can receive the microwave signal, it causing the leakage of information easily. For the security protocol of WLAN network, IEEE has proposed WEP, MIC, LEAP, TKIP, 802.1X and WPA protocols, to improve the security of the network.

5．The design of the system

The WLAN network assistant of Mobile terminal running on normal Internet terminals, helping users to discover and use network, discovering the malfunction that users may face, providing recommendations to solve, and promoting the communication and collaboration between the users and network maintenance operator in order to fix problems

quickly and improve the user's network speed.

Network Assistant includes a PC client and mobile client.

5.1 Assist the Internet

After the Internet Assistant starts, it can automatically check the status of the switch: If the user's mobile phone does not support the function, the system prompts the user that the phone does not support, you can't access the network. If the user's mobile phone switch is not open, it automatically helps the user to open that.

5.1.1 Find the network signal and automatic certification

Support recording user's password of the network, and reminding users to achieve a key certification after the discovery of the network signal.

It can save your account automatically, and save password according to your settings. If the user settings are automatically saved password, the client will save your password, and don't require the user import again. Otherwise, every time a user logs on, all you need to manually enter a password. Account number and password needed to save the encryption algorithm to a safe area to avoid leaks or other malicious software to steal.

5.1.2 A key offline

When the user logs off, you can click on the "off" button to achieve from the network offline. When offline, the client will automatically initiate disconnection requests to the server, and the server will return the results to user.

5.1.3 The statistics of online time

You can use line charts, bar charts, etc. to show the use of the network in months, weeks, days.

5.1.4 Hot map

Support according to the user's city, discover the city hot spots distributed locations.

5.1.5 Indoor signal quality

Support quality real-time query hotspot signals, including signal coverage, interference, etc. Real-time download hot zone from back-end servers, signal quality indoor maps, quality of distribution.

5.1.6 AP automatic switching

When the AP or AP hanged number of users reaches the upper limit, the network will be a strong signal quality, but

can't be associated with the situation. Internet Assistant automatically associate another signal times stronger after associating the AP failed to prevent the problem perceived by the user of the AP.

5.1.7 AP manual switchover

It allows users to manually select an ID of each AP associate.

5.1.8 The indoor location

Support Downloads hotspot Map Park, indoor maps based on the hot spot;

Supports parks and indoor positioning information signal according to AP;

Support guide users to find the signal quality.

5.1.9 Software Upgrade

Client support for a new version of the test connection to the upgraded platform, and prompt the user whether to upgrade based on test results.

Upgrades the client supports two modes: automatic and manual upgrade.

5.2 Network Testing

5.2.1 Signal Test

By scanning the card passive state support 802.11 a / b / g / n all the channels scanned the surrounding AP, and the given perimeter network signal is distributed to charts and graphics.

Support statistical and summary the number of AP, Ad Hoc devices, statistics of the new SSID network. You can set filters to display all or part of the parameters, also can query the AP the following parameters:

(1).SSID, including Chinese and English format SSID

(2) .BSSID

(3). MAC address

(4).Signal strength, in dB/m or percentage, the signal strength in different regions with different color-coded by the graphics, support for time-domain diagram displays the signal strength changes in AP

(5). Encryption

(6).Security Policy

(7). Device type, below 802.11 a / b / g / n devices

(8).Device supports data transfer rates

5.2.2 Business Test

Proactively support access to specified network card, conduct operational testing, to pre-operational testing of the parameters.

Test items include:

(1) .WEB authentication access test: access to specific network SSID, in the PORTAL page, enter the specified user name and password to test the success of the visit.

(2) .Delay Test authentication page pops up: access to the specified SSID network test page successfully ejected PORTAL delay. Delay in seconds, accurate to the millisecond.

(3) .WEB access delay certification test: access to the specified SSID network in PORTAL page, enter the specified user name and password to test the success of the access network delay. Delay in seconds, accurate to the millisecond.

(4) .WEB authentication access line test: access to specific network SSID, in the PORTAL page successfully access the network, the success offline

(5) .Visit the designated website Delay Test: Specifies the SSID of the access network, after the success of the access network, access to the specified site's delay, in seconds, accurate to the millisecond.

(6) .Network PING packet success rate test: Specifies the SSID of the access network, after the success of the access network, PING test success rate specified network address, the unit as a percentage.

(7) .Network PING packet delay testing, access to specific network SSID, after the success of the access network, PING the network address of the specified delay test, in seconds, accurate to the millisecond.

(8) .FTP uplink speed test: Specifies the SSID of the access network, after the success of the access network, to a designated FTP server uploads the prescribed speed test data file size, in units of k bits / s.

(9) .FTP downlink speed test: Specifies the SSID of the access network, after the success of the access network, to a designated FTP server download speed test prescribed size of the data file, in units of Kbits / s.

(10) .Establish testing video services: access to the specified SSID of the network, after the success of the access network, access video services to the designated test video site (optional).

(11) .Video Business delay test: Specifies the SSID of the access network, after the success of the access network, access video services to the designated test video sites, test playout delay, in seconds, accurate to the millisecond (optional).

5.3 Data Reporting

Support fault information and test results reported.

Support staging fault information and test results, when the network or other network is available, automatically reporting of data.

5.4 System Interface

5.4.1 Assistant test results reported to the interface

TABLE I Assistant Test Results

Test item type	Test content

Test content	Test Time	
	SSID	
	BSSID	
	Signal Strength	
	Associated AP's MAC address	
	Encryption	
	Security Policy	
	Device type, below 802.11 a / b / g / n devices	
	The device supports data transfer rates	
	ICMP network test	Delay (MS)
		Packet loss rate (%)
	Extranet ICMP test	Delay (MS)
		Packet loss rate (%)
	AP association	Related delay (MS)
		Associate success rate (%)
	DHCP Test	DHCP Delay (MS)
		DHCP Success rate (%)
	Push Portal	Page pop-up delay (MS)
		Pop success rate (%)
	web authentication	Web authentication Delay (MS)
		Authentication success rate (%)
		Exit Success rate (%)
	HTTP access the page test	Connection delay (MS)
		The first byte latency (MS)
		Download rate (kB / s)
		Access Success rate (%)
	FTP access page test	Connection delay (MS)
		The first byte latency (MS)
		Download rate (kB / s)
		Download Success rate (%)
		Upload rate (kB / s)
		Upload Success rate (%)
	DNS test	DNS delay
		DNS success rate
	SMTP test	SMTP connection delay (MS)
		SMTP negotiation delay (MS)
		SMTP rate (kB / s)
		SMTP success rate (%)
	POP3 test	POP3 connection delay (MS)
		POP3 authentication Delay (MS)

	POP3 rate (kB / s)
	POP3 success rate (%)

5.4.2 Fault information reporting interfaces

TABLE II Fault information

Type		内容
Equipment Basic information		Test Time
		SSID
		BSSID
		Signal Strength
		Associated AP's MAC address
		Encryption
		Security Policy
		Device type, below 802.11 a / b / g / n devices
		The device supports data transfer rates
Fault information		Reporting period
		Fault description

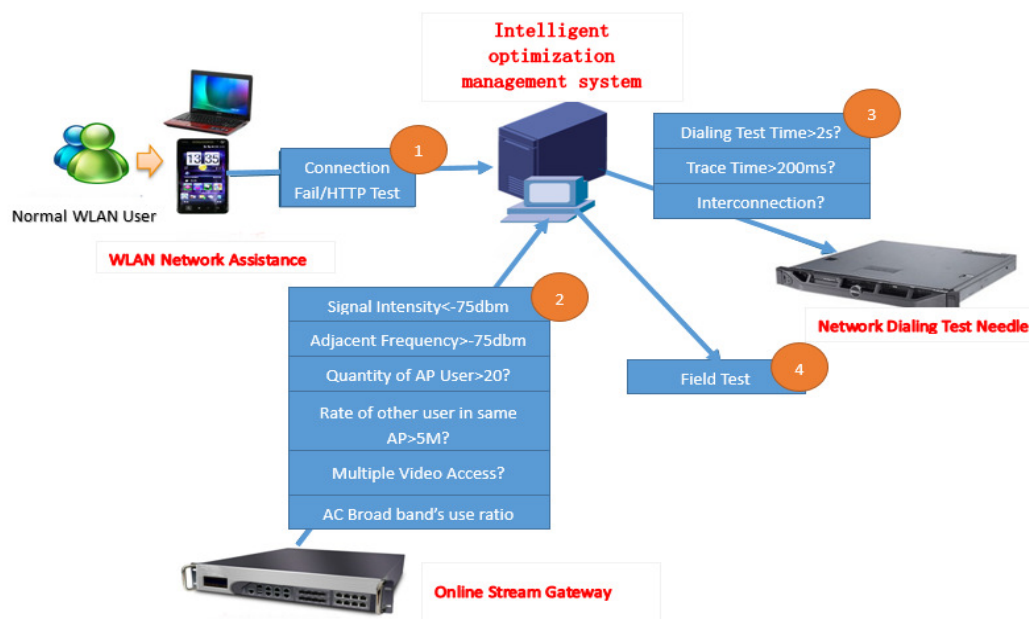## 6. Application Scenario Analysis

Fig.1.Application Scenario Analysis

When Internet users encounter problems when using a network, you can start Internet Assistant business network test function test:

The first step: ordinary Internet users open Internet Assistant for business test, the test can be associated, HTTP service test, FTP test.

Step Two: Internet Assistant According to test results, we recommend that users associated with other AP, switch the other means of communication and other connected to the network, or the network is busy and other low given the current network quality reasons.

The third step: to be successfully connected to the network, the Internet Assistant automatically reported to the background service network fault detection and reporting test results.

The fourth step: intelligent management system optimization preliminary fault diagnosis, if the network is busy, to start an online flow control gateway, network traffic control strategy adjustment. If the network fails, sends commands to the network dial test probes, start the network equipment, service platforms dial test.

The fifth step: Intelligent optimization management system based on network traffic and dial test results of the monitoring, combined with hotspots type, historical traffic, fault history and other factors, given the hot optimization recommendations. If necessary, give the site network optimization recommendations for administrators generate network optimization tasks.

7 .Conclusion

This is the combination of Android smart terminal and WLAN network application status quo. After considering the advantages of open Android platform and WLAN universal application and other factors, it presented Andrews assistant WLAN network system platform based on network performance WLAN signal detection, evaluation of the network, to enhance the user's network experience

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