Acquisition of Earthquake Emergency Information by Cloud Computing and Android Systems

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ABSTRACT

Earthquake emergency information is critical for accessing knowledge of first aid, evacuation and self-rescue from earthquakes. Developing the system for accessing earthquake emergency information by cloud computing and Android system shows great opportunities for getting the real-time earthquake information. This study overviewed the structure of the proposed system. The applications of cloud push, location system and mapping API in Android system were analyzed to explore the possibilities of establishing the earthquake emergency information system by cloud computing and Android system.

INTRODUCTION

According to the requirement of earthquake emergency information and the structure of Android system, the author discussed the acquisition of earthquake emergency information based on cloud computing and Android system by analyzing the characteristics of location services [1], cloud retrieval and Baidu map application program interface [2].

KEY TECHNOLOGY

The acquisition system of earthquake emergency information mainly includes three modules, message push, message retrieval, and message query. When the system receives the earthquake information release from the seismic network and the message push from the command center, the earthquake related materials will be collected by cloud retrieval to provide the emergency information, such as the earthquake location that can be accessed by mobile terminal devices at clients.

Earthquake Information Release System

Based on the principle of seismic detector and the simulation platform of pendulum effects, the earthquake automated information release system uses real-
time simulation technologies to generate the simulation algorithm for ensuring the three factors of earthquakes, along with the resources of seismic network. Through the automated EQIM server of National Seismological Network Center, the information is collected and transmitted to relevant persons by text messages.

**GSM MODEM**

GSM Modem is a device that transforming digital signals to GSM wireless signals at sending terminals through modulation, and transforming the wireless signals back to digital signals by demodulation at receiving terminals. Thus, GSM modulator-demodulator is also called GSM Modem or GSM-SM Modem. The text message communication platform based on GSM Modem is stable and reliable. It has high call completing rates and signal quality. The receiving loss rate and bit error rate is very low that provides excellent guarantee for communications.

This system is installed in 4-port GSM Modem based on private mobile SIM cards. Through wireless signals, it receives text messages from the earthquake information release system. On the other hand, this system is developed for being compatible with software system by the RS232 interface of GSM Modem.

**Earthquake Text Message Extract and Analysis Service**

The module of earthquake text message extract and analysis is used to process message for consequent steps. This service is functioned with sending and receiving messages, automated collecting program errors, automated restoring and log recording. It is presented as Windows service. The availability of this service is relying on the receiving of text message on GSM Modem. Since GSM Modem is a device that transforming wireless signals to digital signals, a further development of RS232 interface of GSM Modem is necessary to be compatible with other software systems. The digital signal information can be extract and analyze by AT command, and then is provided as services to the publication module of Weibo and Wechat.

**AT command**

AT is the abbreviation of Attention. AT instruction set is sent from the terminal equipment (TE) or data terminal equipment (DTE) to the terminal adapter (TA) or data circuit terminal equipment (DCTE). The development procedure of GSM Modem by AT command is shown as below:

- Open GSM MODEM serial;
- Initialize MODEM;
- Setup message echoing;
- Set receiving message as PDU format encapsulation;

**The procedure of earthquake message extraction and analysis service**

The receiving procedure of this service is initializing MODEM, real-time monitoring received PDU message, analyzing and integrating PDU messages for extracting text messages for sending to users. When text messages are extracted by service system, the message will be determined if it meets the text message format
as earthquake information release, and the relevant information will be extracted for sending to users.

Services sends information automatically based on Server. Information is sent in two different formats: text message and XML earthquake information release, with different TCP terminals. Data stream in XML format meets the XML Socket standard of Flash.

![Figure 1. Earthquake information extract and analysis System.](image)

**Information Receiving System of Cloud Push**

The cloud and client of Baidu cloud push is stable and reliable that can be used to provide real-time message push for clients. Since cloud push is functioned with information storage, information forwarding and information sending, multiple applications from the single terminal can share the same service process and long link, which can significantly reduce the usage of mobile cellular data. Thus, cloud push can serve as the configuration platform of rapid message push for developers, which enabled the directed pushes for target users.

**Design of receiving client**

Android SDK of Baidu push service is added into the items and the user’s application is connected to the push server by push SDK. Thus, the user’s application is interacted with the push server through the push Android SDK and Push HTTP/HTTPS API, which can significantly simplify the development of cloud push.

**Initial banding of push service**

In this design, account is not required for login. Userid can be requested by terminals through the API secret key from the server. The static push service can be provided by push Managr in SDK. The initialization and banding of push service is completed by tartWork member function. After the successful binding, information can be pushed from the service terminal to the clients.
Receiving the pushed information

Receiving messages at the clients can be accomplished by using broadcast receiver. During the design, receiver’s registration in Menilest.xml files is required to receive the pushed information. Message data is sent as string to the receiver, and then the information can be sent from the receiver to the client receiver through the network. The easiest way to receive the information is to call the bundled API in SDK.

Build the Query System

Since location cloud combines mapping API and SDK service, it contains sufficient location data storage. This is helpful for completing information retrieval and providing feasible solutions. By visiting Baidu cloud management server in computers, mapping location cloud can be served to store the related information which is mainly about the locations of emergency shelter. Finally, the information can be displayed at mobile terminal devices installed with Android system by using cloud retrieval.

Location information in cloud storage\(^3\)

It is possible to create, design and store the data tables in the management page at mapping location cloud to store the information of emergency shelter locations for earthquakes. The data table can be designed as entity basic field + extension field. The entity field includes the main information such as longitude and latitude, address. The extension field includes detailed information, such as shelter types and shelter capacity standards.

Data display

The emergency shelter information can be displayed in list or map modes. The list mode shows the addresses, names, photos and types of shelters as well as the distance from the terminal. The map mode shows shelters as location dots in the map. By using Baidu map SDK interface, Baidu map is called and assigned the special topic page for reporting details.

SYSTEM DESIGN

Analysis of Android System Structure

The structure of Android system mainly contains the following levels of items: Linux-based kernel system, libraries and Android operational environment, application framework and the related applications. In Android system, Java is the main software development environment and Eclipse is the developmental platform. After installing Android development tools, Eclipse can directly access the software development toolkit (SDK) of Android. The SDK of Android provides visualized simulator and virtual machine debug monitor service tool, which enabled real-time monitoring of software operations. Thus, the merits of Android system show the possibilities for accessing earthquake emergency information for users.
**Architecture Design**

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**System Processes**

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**REFERENCES**