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The Interaction Mechanism based on JSON for Android Database Application

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Abstract: With the release of a new generation intelligent phone Android and global 3G network into operation, the communications between intelligent phone platform and database server become more and more important. But due to the constraints of the mobile phone platform memory capacity, friendly interface and transmission cost, the communication mechanism will be more stringent requirements. The framework of communication mechanism, which this paper studied, used the light-weight type JSON (JavaScript Object Notation) data format as the transmission medium and used the design patterns of MVC (model-view-controller). Then the mobile phone client will be a user interface to interact with the users and all the data processing will be done in the server, so that the communication mechanism will be optimized to achieve.

Key words: Android platform, JavaScript object notation, database, model-view-controller

INTRODUCTION

Along with the development of information technology, modern enterprise has begun to construct information platform. At present, part of the enterprise's information platform has been realized and we can do the corresponding operation on the logistics information in PC (personal computer) clients. But following the development of information industry, this kind of information operations which only use the computer terminals has been unable to satisfy the enterprise and the needs of the customers. As a result, it leads to the development of the information platform on mobile phone clients. And due to the wide application of the Android system, this makes it necessarily to be applied on the development of enterprise information platform (Hu, 2011).

The Android applications will develop toward the direction of the enterprise intelligence platform, but because the limit of Android system, such as memory, interfaces, communications efficiency. So, if you want to apply the Android platform to information construction, the interaction between Android application and enterprise database becomes a key problem.

This study is just about this point to study the theory of data exchange between Android application and database and how to improve the efficiency of data query. First, we will find a data format to exchange the data between android and web service. Second, we will use achieve the entire communication framework. At last, we will optimize improved the framework.

RELATED TECHNOLOGIES

Brief introduction and current situation of android system: Android is developed by Google and it is an open source operating system based on Linux. It is regarded as the true sense of the intelligent mobile equipment open platform. The same as other operating system, the architecture of Android system uses hierarchical framework. It includes four levels: from top to low, they are the level of application program, the level of application framework, the level of system operating base and the level of Linux's core (Jin and Yao, 2009).

Android is a mobile phone operating platform which takes Linux as the core. As an open operating system, with the rapid development of Android, now it already allows developers to use a variety of programming languages to develop Android applications which is different from the past situation that can only use Java. Thus, it has attracted many developers' welcome and became open operating system in its true sense (Jin and Yao, 2009).

Android system includes operating system and all components of mobile work which is used on interface and application. As a smart phone operating system which begun to emerge in 2007, although Android is as young as a newborn baby, its market share and influences are daily on the increase by means of the successful operation provided by the OHA (Open Handset Alliance) which is led by Google. At the same time, the development potential of its 3rd party application which

springs up like the mushrooms is optimistic estimated by more and more people (Jin and Yao, 2009).

But at present, most applications are some phone games, player tools and readers and so on; it is not really used on the intelligent office works. But along with the development direction of modern enterprise and the timeliness information communication requirements, Android application will inevitably play an important role in the enterprise intelligence information platform.

The Android applications will develop toward the direction of the enterprise intelligence platform, but because the limit of Android system, such as memory, interfaces, communications efficiency. So, if you want to apply the Android platform to information construction, the interaction between Android application and enterprise database becomes a key problem.

This research is just about this point to study the theory of data exchange between Android application and database and how to improve the efficiency of data query. First, we will find a data format to exchange the data between android and web service. Second, we will use achieve the entire communication framework. At last, we will optimize improved the framework.

Contrast of data exchange format between XML and JSON: At present, there are 2 main ways of data exchange between Android application and Web server: they are JSON and XML (Extensible Markup Language) (Xiaofeng, 2010).

A brief introduction of JSON: JSON is a lightweight format for exchange data. It is a subset of JavaScript. JSON uses a format, independent of language completely. But it also uses a habit which bears a resemblance to C language (including C, C++, Java, JavaScript, C #, Perl, Python etc.). These properties make JSON become an ideal format to exchange data which is easy to read and write and it is also easy to analysis and generation machines (Guo, 2007).

A brief introduction of XML: Extensible markup language is language which is used to mark the electronic document, in order to make it structural. It is also used to flag data, define data types. It is a kind of original language which allows users to define their own markup language. XML is a subset of Standard Generalized Markup Language (SGML) and it is very suitable for Web transmission. XML provides a uniform method to describe and exchange structured data, independent of the application program or provider of structured data (Zhan *et al.*, 2012).

Contrast of data exchange format between XML and JSON in android: In the enterprise intelligence information platform, it is superior by using the JSON format to exchange data to the XML format. The lightweight type JSON data format has the following advantages (Baojun, 2009):

- Its data format is simple and it can be read and written easily. The format is compressed and the bandwidth it takes up is small. What's more, it has high efficiency and it is more suitable to the mobile phone application transmission in time
- It is easy to assemble and parse the data. Even without the help of the existing JSON assembly tools, the transmitters are easier to assemble and the same to the receivers
- Because of JSON format can be used directly by the servers' code, this makes the number of code development of the servers and the clients greatly simplifying. But the missions to be accomplished are constant. And it is easily to be maintained

But at present, the generalization of the JSON format in Web service is still in the primary stage, not like the XML format which is deeply rooted in everyone's mind and widely used. But based on the characteristics of the JSON format and the demand situation of enterprise intelligence information platform data transmission, JSON format will amount to something.

Android application and the database interaction principle based on JSON: In the Android system, the application and the database server can not interact directly only if use a Web server interaction. It is necessary to use the Web server to complete the operation on the database, such as addition, deletion, alteration and so on. And then exchange data between Android application and Web server, so as to achieve the purpose that Android application operates the database. And in this process, the data format is JSON (Qun, 2011). It works as shown in Fig. 1:

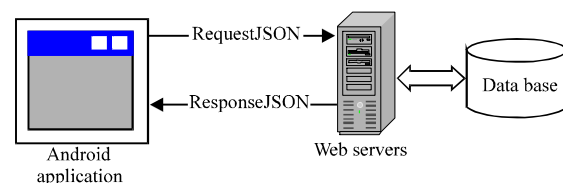


Fig. 1: Android application and the database interaction

Its job procedure is as follows:

- Android application gets some data inputted by users and some operating instructions through the interface and assembles data relative to operational database into RequestJSON by using the existing JSON assembly tools and then sends it to the Web server
- After the Web server received RequestJSON, by means of the existing JSON analytical tools for analysis, it can get the actual request data. Then use these data to do the corresponding operation on the database and at the same time, get operating results. The results data will be assembled into ResponseJSON and return to Android application
- After Android application received ResponseJSON, it can get the result data and show it to the users by using the existing JSON analytical tools for analytical

DESIGN AND IMPLEMENTATION OF DATA INTERACTIVE BY USING JSON

Architecture design

A brief introduction of MVC design pattern: MVC (model-view-controller) is present in the desktop program. M refers to the data model, v is the user interface and c is the controller. We can separate the code of m and v, in order to the same program can use a variety of forms. For example, we can indicate a batch of statistics by a bar chart or pie. The purpose of c is to ensure the sync between m and v. V should sync updates, once m change (Liyan and Qing, 2011).

Architecture description: According to the principle of JSON data transmission and system design, it is necessary that the Web server and the phones client cooperate with each other during designing the system architecture. And development mode should be the MVC

pattern. So the overall framework consists of two parts: the phones client and the Web server.

Through the introduction of the preceding article, the design and implementation of this case will achieve the following three objectives:

- We will use the lightweight JSON data format for data exchange and it will be better for us to update and query the data and then the limitations of android platforms for data storage will be solved
- Using the extension and integration of MVC model, establish a remote database server for android platform. It will provide a solid background framework
- Through the control among the classes, we can complete the operation on the android client and the data model, by using the object-oriented programming mechanism

So the overall chart is shown in Fig. 2. Web server can use the existing server in the enterprise system (Gamma *et al.*, 2000). But after it combines with mobile phones client, it needs to use the mobile phones client to act as the View layer of the server instead of the JSP (Java Server Pages) interface. Due to the limit of mobile phones' interface and function, queries on the database will inevitably have some difference with the PC client. Difference is mainly displays in the following respects: the processing function of mobile phones is far less powerful than the PC client, the interface of mobile phones needs to be very simple and limits of mobile phones' transmission speed and so on. This requires that we need take some translation work for the data that mobile phone can transfer in the Web server and import JAR (Java Archive) bag assembled and analyzed by JSON in order to achieve the function which can adapt to mobile phone to take some operation on the database.

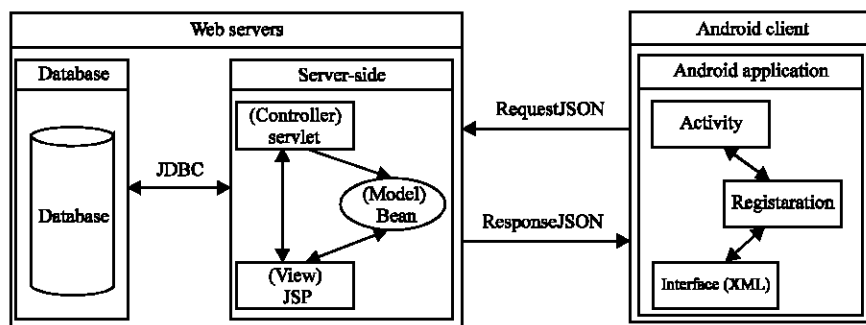


Fig. 2: Overall architecture chart

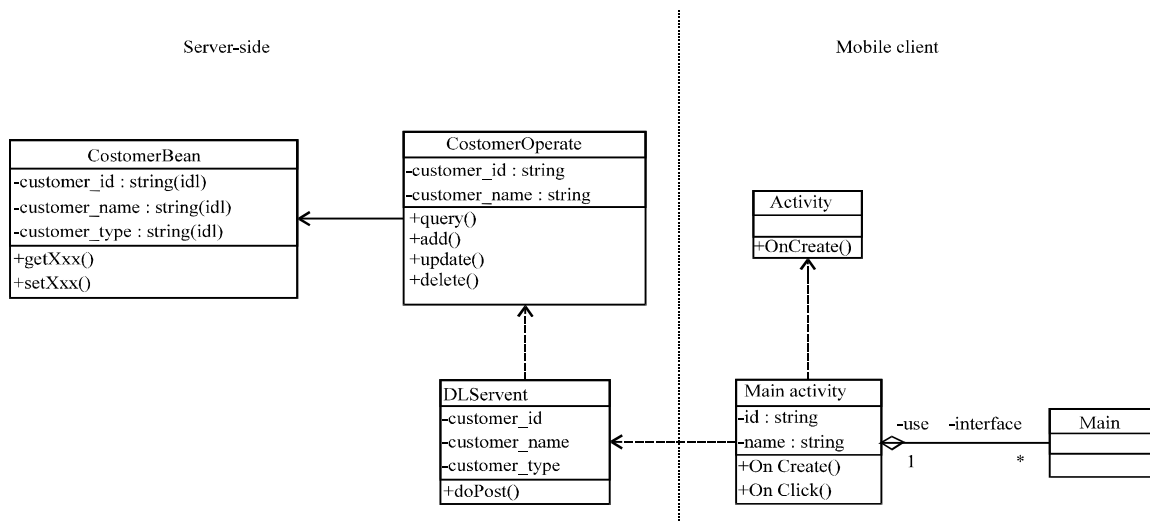


Fig. 3: Static structure diagram

Mobile phone client needs to pay attention to the following respects:

- The interface should be friendly, clear and concise and easy for customer to input
- The data displayed should be niche targeting. Due to the limit of the interface, it is necessary to screen the data and choose important data to show
- Note the adaptability of versions. Because Android version is backwards compatible, when choosing a low version, this issue needs to be considered

Instance to achieve

Instance introduction: After understand the JSON working principle and the overall architecture of the system, we give an example to demonstrate the data interaction. Along with the development of the logistics industry, forwarder and shipping agent will also use the information platform. At present, part of logistics information platform which has been come true can take corresponding operation on logistics information in PC client (Liu and Zhang, 2011). But following the development of information industry, this kind of information operations which only use the computer terminals has been unable to satisfy the enterprise and the needs of the customers. As a result, it leads s the development of the information platform on mobile phone clients. This example uses a simple login system of logistics information platform to demonstrate the interaction between Android application and the database which use the JSON data format.

Static structure diagram: A simple customer table holds the customer’s ID, name and type in this freight forwarding system. We will take the query of this table as an instance. According to the MVC design pattern, we will store M layer and C layer in the server-side and store V layer in the Mobile client. The static structure diagram of this module is shown in Fig. 3 (Bing, 2011):

Annotation:

- **CustomerBean:** Data model which correspond to database; it belongs to M layer
- **CustomerOperate:** Elementary operation which corresponds to database; it belongs to M layer
- **DLServlet:** Control class consists of command acceptance, command execution and result dispatch on the server; it belongs to C layer
- **MainActivity:** Control class on the mobile phone client; it belongs to C layer in the phone client internal and in the whole system, together with mobile phone’s interface, composes the V layer. This class is the most important one in the mobile client-side. This class will assemble the data obtained from the phone interface into RequestJSON and send it to the server; It also can receive the result set returned from the server-side and parse the ResponseJSON into the appropriate data model. Then the result data will be displayed on the interface for users. This class can be seen as a bridge of communication between the android application and the server. Its main code is as follows:

```

PublicClass MainActivityextends Activity {
/** Called when the activity is first created. */
    Private static final String POST_URL =
"http://192.168.1.102:8080/CRM/servlet_users_query";// Determine the IP
address of the server and the associated control class
@Override
Public void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.main); // Determine the lay out file
final TextView testview = (TextView) findViewById(R.id.mytextview);
final EditText id = (EditText) findViewById(R.id.etaccount);
Button btnLogin = (Button) findViewById(R.id.btnlogin);
btnLogin.setOnClickListener(new OnClickListener() {
public void onClick(View v) {
String jobid = id.getText().toString();
System.out.println(jobid);
String result = HttpUtil.postRespString(POST_URL, "JobID",
jobid);
Log.e("XXXX", "result: " + result);
Gson gson = newGson();
List<ming.bean.CardoJobbean> vector = gson.fromJson(result,
NewTypeToken<List<ming.bean.CardoJobbean>>() {
}.getType()); // Assembly requestJson series
Log.e("XXXX", "size: " + vector.size());
for(ming.bean.CardoJobbean bean : vector){
testview.setText(bean.getAssistantNO());
Log.e("XXXX", bean.getJobID() + ", " +
bean.getETD()); } } });
}
}

```

This code gets the input data from the android interface and then the data will be assembled by gson class. Then assembled data will be transmitted to the data base server.

CONCLUSION

By using the MVC development mode and JSON data format, we have reached the purpose of data interaction between Android application and the database and made a simple optimization. This flexible interaction mechanism can be applied to every server of any architecture and then it will achieve the purpose of the Android system interacting with a database. By means of realizing the example, we have adequately demonstrated the entire process of the data interaction as well. Simultaneously, we can preliminary complete the purpose of enterprise information interaction. But also, this paper just briefly introduced the foundation problems of the whole data interaction and did not realize the higher level of the optimization. For example, the optimizations of a large number of data need to be improved, the optimization problems of the interface did not be further discussed and the methods about introducing the cache mechanism to further improve the efficiency of the optimized inquiry,

increase design of parallel processing and so on. Even if there are some mechanisms else for improvement, we can also take advantage of this mechanism in this study to achieve data transfer, so that we will implement the mobile office automation and make the enterprise information more perfect.

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