Design and Implement Large Mobile-Commerce System Based on WEB Services

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Abstract: Many enterprises hope to develop Mobile-Commerce system by wireless network. This article gives a design about huge Mobile-Commerce system that is based on WEB service, and offers a realization of the design by J2ME_J2EE technology. It gives a framework and an original shape of Mobile-Commerce system, and introduces the web service’s architecture and constructional method. It gives solutions in detail for data transmission between mobile clients and WEB server and XML Data Parsing in mobile client. Besides, this article can help enterprises deal with some important problems which commonly lie in the construction of huge mobile-commerce system, such as mobile equipments’ memory capacity is small, the using cost of wireless network is high, and the resources for mobile terminate is limited etc.

Keywords: Mobile-Commerce, WEB Service, SOA, J2ME_J2EE

1. Introduction

Nowadays, 3G Broad Band wireless network come to our life. It has fast data transmitting speed and wide bandwidth. It makes wireless equipments to build large enterprise units become true, and further applications in wireless equipments were asked. Today, many enterprises want to build large wireless web services with mobile equipments. Hence, Mobile-Commerce model emerges as the times require. According to Statistic data, Mobile-Commerce users in universe reached five hundred million in 2005, and total incomes reached nearly 200 billion US dollars.

Though there is a good-looking foreground in Mobile-Commerce, there are still some problems which disturb the Mobile-Commerce farther development:
1. There are limited Information resources, which almost based on database building only for Mobile-Commerce.
2. Display Screen and Memory’s capacity of mobile equipments is small.
3. Charges on date flow, and it bring high cost to use Mobile-Commerce

Therefore, this article gives a method to settle these matters in effect. That is using J2ME_J2EE technology and WEB services to build a Large Mobile-Commerce System model.

2. Configuration of Large Mobile-Commerce System

2.1 Mobile-Commerce applying system's architecture

Mobile-Commerce System’s architecture is built on integration of mixed various applications. Traditional commercial applications, such as ERP, CRM, SCM, gather in the Server with J2EE multilayer B/S structure. And the Clients are application terminals based on J2ME. Both the Server and Client can sustain XML on HTTP, wireless TCP/IP, alternation of online and offline, synchronous of wireless communication, and so on. From the technology implementation point of view, Mobile-Commerce System’s architecture is shown in Figure 1 as follow.
2.2 Original shape of Mobile-Commerce applying system

However, the key implementation of Mobile-Commerce System lies in how to use and establish application program or components in existence extend to Web Service, and how to use open standards and common base equipments to describe, discover and visit objects in order to advance incompact coincidence which exist in application integration and exploiture.

Based on this Mobile-Commerce model and Web Service-Oriented Architecture (SOA) methods, we use J2ME technique to exploit Mobile applications, and rebuild corporation traditional integrated mobile management information system (mobile-MIS). After this, we found Original Shape of Mobile-Commerce Applying System in Figure 2 as shown.
3. Realization of Web Service Applying System in Mobile-Commerce

3.1 Web service architecture

According to the Web Service-Oriented Architecture (SOA) methods, it is easily to analyze subsystems, and describe relationship and process among subsystems. We also can allocate services to the subsystems, and give the users the power to point out servings components are chosen or rebuilt. There are three primary steps in building the Configuration of Web Service: Service Identification, Service Appointment and Service Realization.

**Step 1 Service Identification**

This Web Service Applying System adopts from-bottom-to-top method. First, analyze present system, and find out the service realization components. Then, define the service interface. At last, change the present components or applications to web service as feasible choice to support operation course.

**Step 2 Service Appointment**

Service Appointment includes grading, classifying, and appointing components. Grading and Classifying can help to compound and stratify the service, and make it based on different levels. Components appointment defines data, rules, service, variation, information and time in components. All of the web services are composed by suitable size components.

**Step 3 Service Realization**

Service Realization means allocate services to the present identified subsystems. That include service appointment, distribution of the components in SOA layer, web Service of integration, transformation, subscription, and purchases of various functions.

This Web Service Architecture is shown in Figure 3 as follow.

**FIGURE 3 Web Service Architecture**

3.2 Web services establishment

Analyzed the above Web Service Architecture, we can get the classes or components. Using JAVA technology we can turns the components to Web Service. Course is shown as follow:

1. Establish one item of Web Service, and register in UDDI Registration Centre. So that other application can send out message with JAXM (Java API for XML Messaging) in background, and inquire about the service functions by JAXR (Java API for XML Registries).
2. Establish a WSDL document. Use JAX-RPC(Java API for XML-based RPC) to get and analyze it. This document explains how clients communicate with Web Service.
3. Clients discover the Web Service, and determine to use it. Then, append it as one citation.
4. Check WSDL document automatically, and create a Deputy Class which allows clients communicate with Web Service transparently.
5. Clients use a method of Web Service. From clients’ point of view, it seems no difference with any other methods, but actually clients are communicating with Deputy Classes.

6. Deputy Classes (URLEndpoint Class) change parameters into SOAP messages, and send them to the Web Service.

7. Deputy Classes receive a SOAP reply, and turn it to proper type data, then, send it back to the clients.

8. Clients use received messages in applications.

In this way, the former Mobile-Commerce system architecture can be shown in Figure 4.

Figure 4  Mobile-Commerce System Architecture Based On Web Service

4. Realization of Data Transmission in Mobile-Commerce System

4.1 Date transmission between client and web server

The most important part in the mobile application is the connection between wireless network and wire network, and exchanging data from each other. HTTP which is widely used in the Internet is a request/response protocol, and almost all the realization of MIDP support HTTP, so the HTTPConnection is suitable for all kinds of the mobiles. This system mostly uses HTTP for network communications, and carries out data transmitting between client and Web server. The following part is a framework of Java codes in networks connection and exchange data.

```java
public static String mobileConnection(String request URL, String request string) {
    //build connections between HTTP and Web Server
    HttpConnection hc=(HttpConnection) Connector.open(requestURL+requestString, Connector.READ_WRITE);
    //set request methods as GET
    hc.setRequestMethod(HttpConnection.GET);
    //get data from server’s J2EE applications
    DataInputStream dis=new DataInputStream(hc.openInputStream());
    int ch;
    //check out the field and length of the received data, use FOR method to read data circularly
    long len=hc.getLength();
    for(int i = 0; i<len; i++)
        if((ch=dis.read())!=-1)
            messagebuffer.append((char)ch);
    return messagebuffer.toString();
}
```
dis.close();
   //close connections; return and read data that is get above
   return messagebuffer.toString();
}

mobileConnection() is a key method of getting data from Web Server. It can connect to server, send
out request message, operate data, and receive responded message which come from the server (XML
message). It carries out direct communications between mobile client and Web server by HTTP
protocol.

4.2 Praising of XML data in mobile client
The returned messages from server are all shown in XML format. When the mobile client receives
XML messages, it parses the data by XML parser according to the rules that are defined in advance.
Then, data is shown on the Client displaying interface by the displaying applications. Figure 5 describes
Mobile-Commerce Data Praising Mode.

![Figure 5 Mobile-Commerce Data Praising Mode](image)

Now, we give a framework of Java codes to show XML Data parsing course in the client.

   // create XmlParser objects and Document objects, “insr” represent obtained messages from server
   XmlParser parser = new XmlParser(insr);
   Document document = new Document();
   //regard XmlParser as a parameter and transmit it to Document.parse() method, returned Document
   objects contain result of XML Data Parsing from Web server
   document.parse(parser);
   //get useful message’s XML start node from XML string
   Element ContractElement = document.getElementById("Contract");
   Element personElement = ContractElement.getElementById("person");
   //get personElement node, use getTextFromElement() method to fetch messages from XML node, return
   relevant value
   String name = getTextFromElement(personElement, "name");
   String email = getTextFromElement(personElement, "email");

   **Attention:** getTextFromElement() method’s realization is
   String returnText = elementRoot.getElementById(elementName).getText();

   In this way, we can parse XML Data, and get message’s field like Name, Email or other business
data to show on the Client’s screen.

   Because of XML parser, we needn’t consider whether data format in mobile Client is consistent
with Web Server. It greatly reduces energy that consume in dealing with communication between
inconsistent data, in the past.

5. Conclusions

In this article, we introduced a common framework of huge mobile-commerce system which based on Web Service. It can help users to query messages and to do business by mobile terminal in time. Besides, this article put out an approach of implementing Web Service by J2EE_J2ME technology and SOA method in detail. In the mobile-commerce system, the data communication components are implemented by XML language, so, inconsistent data can be transmitted from different systems, and the success of connection between traditional website and mobile terminal prove the feasibility and efficiency of building mobile-commerce website. In the future, mobile-commerce intelligence network that based on Web Service will be the next research subject.

References