DESIGN AND IMPLEMENTATION OF A MOBILE MANAGEMENT SYSTEM FOR CAMPUS SERVER

Shijue Zheng, Zhenhua Zheng[*]

Department of Computer Science, Huazhong Normal University, Wuhan, China，430079
[*] *Corresponding author, Address: Department of Computer Science, Huazhong Normal University, Wuhan, China, 430079，Email: wjzzh2002@yahoo.com.cn*

Abstract: Server Management plays an important role in Campus Network Management which is crucial to build an effective campus network. However, if the server makes some small mistakes while he doesn't stay in the server room, he should come back quickly from another place which is far from the server room to solve just a small problem. The authors design a mobile management system for campus servers, and implement it with Microsoft .NET Mobile Web SDK and SQL Server 2000. The system is based on B/S structure and WAP (Wireless Application Protocol), and it has been proved to be effective and reliable through the software testing.

Key words: Microsoft .NET; mobile management system; WAP; campus server

1.   INTRODUCTION

In our department, someone is put in the charge of Server Management. He should stay in the narrow server room to monitor the server all day. The job is dull but not effective, because it is not necessary to keep your eye on a server which makes few mistakes. However, if the server makes some small mistakes while he doesn't stay in the server room, he should come back quickly from another place which is far from the server room to solve just a small problem, e.g. restart the server. So it is a waste of human resources. Somebody else has developed a system which can be used to manage the

server in a distance place through Web. However the network manager still needs a PC which connects to the Internet to use the system, so it is lack of mobility. To solve the problem we design a mobile management system for campus servers, and implement it with Microsoft.NET Mobile Web SDK and Microsoft SQL Server 2000. The system is based on B/S structure and WAP (Wireless Application Protocol), and it has been proved to be effective and reliable through the software testing (Microsoft MSDN, 2001). If the server has installed the mobile management system, the network manager can manage it in anywhere with a mobile phone or PDA which supports WAP. After signed in, the network manager can submit any command lines to manage the server, even shut down it (Jiang. A, 2002).

2.   SYSTEM DESIGN

2.1   Preliminary Design

The mobile management system is based on B/S structure. The client can be any mobile devices which has a browser that supports WAP. On the server-side there is the mobile web application built by the authors and the Microsoft SQL Server. In normal condition, the mobile web application runs quietly on the server-side. When the network manager wants to manage the server, he just uses his mobile device to download the server's pages which are produced by the mobile web application (3Com, 2002). When he has signed in, he can see the management center page. To complete a certain mission he just inputs the corresponding command lines and then submits them to the server. Then the mobile web application receives the command lines and transmits them to the SQL Server. The SQL Server executes these command lines with an extended stored procedure called xp_cmdshell which has the ability to execute operating-system commands and then returns the result as a dataset. After that the mobile web application captures the result dataset, and then transforms it to a certain format (e.g. WML) which is decided by the client-side device, and finally sends it to the browser. Now, the manager has completed his mission and seen the results of his operating to the server. As figure1 shows, is the infrastructure of the mobile management system (Antinisca, 2007).
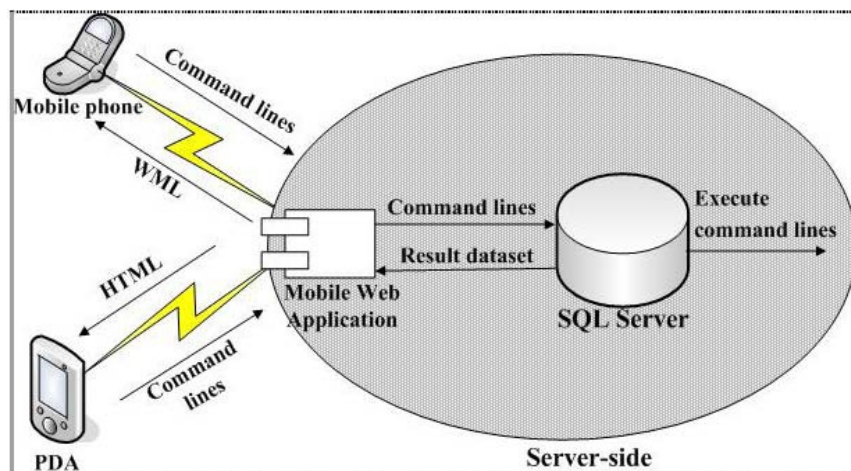
Figure 1. Infrastructure of the Mobile Management System

2.2   Detailed Design

One of the advantages of B/S structure is that there is no need to develop software for client-side, so the user has only to own a mobile device which supports WAP. We put more emphasis on the design and implementation of the mobile web application because it's the interface between the mobile device and the server (Gianluig, 2004). The mobile web application consists of three functional modules, which are the sign-in module, the execute-cmd module and the show-result module. The sign-in module can be used to provide safety for the server by refusing disabled users' accessing. The execute-cmd module is responsible for the executing of the command lines. However he can't do it separately, he must call the SQL Server's stored procedure (Volker, 2004). And then the show-result module receives the result as a dataset from the SQL Server. Finally the show-result module uses the dataset to produce a page with certain format and sends it to the client-side browser (Amar, 2004). The whole mobile web application works as Figure 2 illustrates.
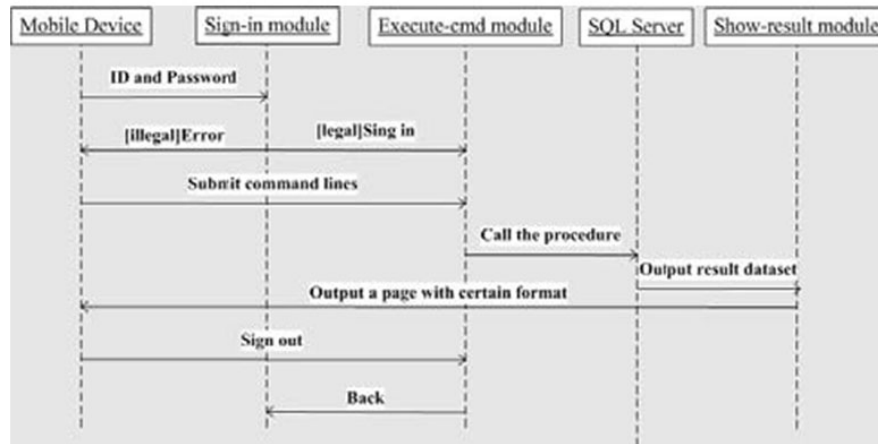
Figure 2. How the Mobile Web Application Works

3.   SYSTEM IMPLEMENTATION

3.1   System Environment Configuration

(1) Hardware requirements for the server (see table 1) .

Table 1. Hardware requirements for the server

Level	Hardware configuration
Lower	P4 2.8G/512M RAM 80G Hard disk
Middle	2*P4 2.8G/1G RAM /72G SCSI Hard disk
Higher	4*P4 2.8G/2G RAM /2*72G SCSI Hard disk

(2) Software requirements for the server. The operation system should be Windows 2000/2003 Server with IIS5.0 (or higher) and with Microsoft .Net Framework 1.1 installed (Fredrik, 2000).

(3) Requirements for the client. Any mobile device with the browser which supports WAP.

3.2   Configuration of SQL Server

The system uses the extended stored procedure named xp_cmdshell in SQL Server, which is a command shell of windows operation system. It has the ability to execute any command of operation systems, such as "copy", "del", "md" and even "format" or "tsshutdn" (the command to shutdown the computer in Windows Server 2003). So only the role that belongs to the System Administrators Group can use this procedure. We

have created a role called MobAdmin which belongs to such a group. We use it to login the SQL Server (Openwave Systems Inc, 2003).

3.3   Development of the Mobile Web Application

We use Visual Studio .NET 2003 IDE to create a mobile web application project named MobSys. It consists of three forms. (See Figure 3).
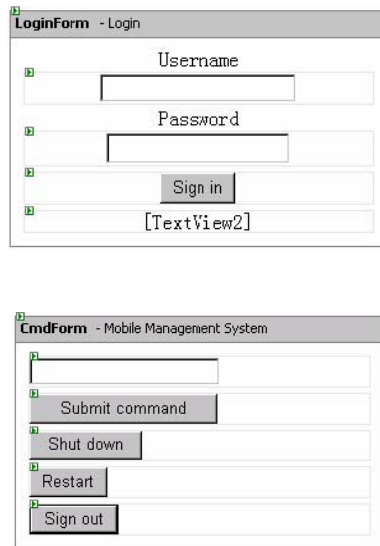

Figure 3. Forms of the Mobile Web Application

Before programming we should store some configuration information in a file called Web.Config. In order to make the system own good portability we store database connection string, username and password in the file Web.Config. The key codes are as follows.

```
<appSettings>
<!—Database connection string -->
<add                                         key="ConnectionString"
value="Server=(local);uid=MobAdmin;pwd=74138;Database=master;" />
<!—username and password -->
<add key="username" value="admin" />
<add key="password" value="123" />
</appSettings>
```

Then we write C# codes to implement three functional modules designed above. Some of the codes and notes are as follows.

```
//the method to receive command lines and output result as dataset
private SqlDataReader EXEC(string CmdStr)
{
//connect to SQL Server
```

```
   SqlConnection                                              conn=new
SqlConnection(ConfigurationSettings.AppSettings["ConnectionString"]);
   conn.Open();
   //call the stored procedure xp_cmdshell
   SqlCommand SqlCmd=new SqlCommand ("exec xp_cmdshell '"+CmdStr+"'",conn);
   return (SqlDataReader)SqlCmd.ExecuteReader();
   }
   // following codes are executed when the button "submit command" has been pressed
    private void Command1_Click(object sender, System.EventArgs e)
    {
    SqlDataReader rs;
    string ResultStr="Done.<br/>";
    try
    {
    rs=EXEC(TextBox1.Text.Trim());  //call the method "EXEC" defined before
     while(rs.Read())  //loop to receive result dataset
     {   ResultStr+=rs.GetValue(0).ToString()+"<br/>";
     }
    }
    catch
    {
     ResultStr="ERROR OCCURS<br/>";
    }
    finally
    {
     ActiveForm=ResultForm;     //Activate the show-result form
     TextView1.Text=ResultStr;
    }
   }
   //following codes are executed when the button "Shutdown" has been pressed
   private void Command2_Click(object sender, System.EventArgs e)
   {
    EXEC("tsshutdn ");  //tsshutdn is the command to shutdown the computer in Win2003
   }
```

4. INTEGRATED TESTING

In order to guarantee the stability and reliability of the system we have tested it in many mobile devices and simulators. In the following devices and simulators, the mobile management system runs well (Wireless Application Protocol Forum, 2004).

- Pocket PC
- Sony CMD-z5 with Microsoft Mobile Explorer Mitsubishi T250
- Nokia 7110
- Sprint Touchpoint
- Samsung Touchpoint
- Simulator for Microsoft Mobile Explorer version 2.01
- Simulator for Phone.com UP 3.2
- Simulator for Nokia 7110

• Simulator for Phone.com UP 4.0
• Personal computer with Microsoft Internet Explorer 5.5
• Openwave V7 Simulator

Figure 4 shows the interface of the system. Figure 5 shows the show-result form when the command to backup database files has been executed. Figure 6 shows what the server does when the button "Shut down" has been pressed.

Figure 4. The Interface of the System   *Figure 5.* The Result When the Command to Backup Files Has Been Executed

Figure 6. The Server's Response When the Button "Shut down" Has Been Pressed

5. CONLUSION

In order to manage the campus server in anywhere we have designed and implemented a mobile management system. It has been proved to be effective and reliable through the software testing. If the server has installed the mobile management system, the network manager can manage it in anywhere with a mobile phone or PDA which supports WAP (Library Management System, 2006). After signed in, the network manager can submit any command lines to manage the server, even shut down it.

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