

Mobile-PC Suite: Using Mobile Phone as Remote to Control PC Operations

R.S.S.Vishnu Priya , P.Panini Sai, K.Ruth Ramya, N.Chandra Sekhar, K.Venkata Prasad, P.D.Nageswara Rao
Dept. of CSE, KLCE
Vaddeswaram, India

Abstract-- The ever increasing functionality in the mobile devices has become the driving force for developing innovative mobile applications that enrich our daily life. This paper is mainly concerned with how traditional application development on desktop platforms is viewed from a different perspective and some of the strategies in mobile application development are applied to this area. The current work envisages the utilization of these Mobile Phones as remote controls to Personal Computers. We focused on developing a software application, based on client-server architecture, that enables a mobile phone user to access the features (which include file navigation, command execution, virtual display, file pusher etc.) of his/her own PC using Bluetooth by the creation of virtual display of PC. The implementation is done using MIDP of Java 2 Platform Micro Edition (J2ME) and deployed using an emulator.

Keywords---*Bluetooth, MIDP, CLDC, remote control, home networking, PAN, wireless networks, J2SE, J2ME, Java, handheld devices.*

I. INTRODUCTION

Today, wireless technologies like Bluetooth are reshaping the way we live and work. Wireless devices such as cell phones and two-way pagers keep their owners connected to the outside world at anytime from anywhere. They offer great connectivity that other types of devices couldn't offer. Application development for these wireless devices is going to be in great demand for the upcoming years also. Network programming plays an important role in wireless application development to take advantage of the connectivity these devices have to offer.

Many things that required to be operated from PC, can now be done from a mobile. The J2ME has made it possible to do many things remotely and is now a fact of life. The Java 2 Platform, Micro Edition (J2ME) and Bluetooth technology are two of the most exciting offerings in the wireless industry today. J2ME, most compact of the three

Java platforms, is inherently portable because it shares the Java "write once run anywhere" philosophy and thus enhances developer productivity. Bluetooth is a short-range universal wireless connectivity standard for electronic appliances and mobile devices.

Sun's Java 2 Micro Edition (J2ME) offers a great development platform for developing applications for the embedded electronics and mobile devices. In Java 2 Micro Edition (J2ME), the Connected Limited Device Configuration (CLDC) defines a generic "configuration" for a broad range of handheld devices. On top of CLDC, the Mobile Information Device Profile (MIDP) is defined specifically for wireless devices such as cell phones and two-way pagers. Wireless device manufacturers need to implement MIDP in order to support Java applications on their devices. Thus, any mobile application can be built using Mobile Information Device Profile MIDP of the Java 2 Platform Micro Edition (J2ME) , combined with the Connected Limited Device configuration (CLDC), which serves as a Java runtime environment for today's mobile information devices (MIDs) such as phones and entry level PDAs. The current work envisages the utilization of mobile phones as remote controls to PC's.

II. OBJECTIVE

The primary objective of the application remote controlled mobile-PC suite is to manage the computer applications executing in the Personal Computer or Laptop using Mobile Phone and to provide all possible means of communication between Mobile Phone and PC. This Mobile Phone should be Bluetooth enabled and the Personal Computer or Laptop should have the Bluetooth Dongle or any other Bluetooth hardware installed.

Once the basic hardware setup is done, a client side application is deployed over the Mobile Phone and server side application is deployed over Personal Computer. The Client application

searches for the Personal Computer and after the Connection establishment and Authorization, application on Mobile Phone starts controlling the applications on the Personal Computer. ARC will also include the capability of displaying the Personal Computer screen on the Mobile Phone using object push service. It could also control the serial port and USB of the computer system.

III. MOBILE-PC SUITE: SYSTEM DESIGN

This application was supposed to provide the features that derive from the connection. They include- Application Remote Control Using Bluetooth, File Sharing & File management, URL-tracking, command execution, Bluetooth Chat. In order to provide these features the connection setup was made possible using JSR-82 and the communication procedure can be explained by the Fig 1.

Fig. 1 Data Flow between Computer and Mobile phone

A. Application Remote Control Using Bluetooth

This feature makes the mobile efficient enough in controlling the PC remotely. This utility provides the desktop/Laptop virtual screen displayed on the mobile screen also. Thus the mobile itself is appeared to be PC. Thus making the mobile having a multimedia capability virtually equivalent to the PC.

B. File Sharing

The practice of distributing or providing access to digitally stored information, such as computer programs, multimedia (audio, images, and video), documents, or electronic books from a mobile device to PC and vice-versa in a most efficient and easy manner. This feature also includes the File Navigation. RSA algorithm is being used for providing the security during the data transfer.

C. URL-tracking

Tracking of URL'S visited from the Users System on request from the administrator with a simple sms. This has its importance in the domains like home, work place etc.

D. Command Execution

This utility includes the remote command execution, where the mobile user is provided with a

text field where he will enter the command that need to be executed on the remote system.

E. Bluetooth Chat

Bluetooth relay chat is the utility that provides the application to chat with different mobiles from the pc. This appears as the online relay chat application but with more advances features like file sharing also from the pc with the users in the chat.

Fig. 2 Remote Controlled Mobile-PC suite architecture

For this system, Fig. 2 shows the flow of the Remote Controlled Mobile-PC suite architecture. The Remote accessible Mobile-PC suite involves the development of the J2ME application for the mobile device and the J2SE application on the server side. The MOBILE-PC SUITE system is developed based on the flow above where the Midlet with various functions acts as the client and it is the J2SE desktop application that accesses the sqlite database on the server side. The complete data access between the mobile and PC is encrypted using RSA algorithm making the system secured. The Midlet residing on the Bluetooth-enabled mobile device provides for access to an authorized users database.

IV. MOBILE-PC SUITE APPLICATION: IMPLEMENTATION

The application was developed by using NetBeans IDE 7.0 as the development tool as it includes Visual Mobile Designer (VMD), a graphical user interface, that enables to design mobile applications using Drag and drop components for wait screens, login screens, menu, file navigator, PC screen viewer etc. The VMD also makes GUI localization easier. Fig. 3 shows the flow of the mobile application and components includes in the Midlet.

The mobile application flow starts from

the Mobile Device. When the application on the mobile device runs, the main screen (svgSplashScreen) is loaded. The next screen is the loading screen (splashScreen). The difference between the svgSplashScreen and splashScreen is that the svgSplashScreen support the display of image using the minimal phone memory. At the same instance the Server side application should also start. Once the server gets started, it will inquire about the nearby Bluetooth devices available. After inquiry, it will ask the device to pair with. Then, LoginScreen comes after the 'splashScreen' and inquiry by the server completed where the login for user ID takes part. As the 'loginCommand' takes action, the next screen is the waitScreen which will act as intermediary screen. When the login is correct, the success command is redirected to the alertSuccess and then redirected to the form where the main page of the midlet is loaded. If the waitScreen accept the loginFailed, the midlet will be redirected to the alertFailure and user will be redirected to the login page again. On the Form screen, there are mainly 3 commands that can be executed by the user. They are - 'ARC', 'BTChat' (Bluetooth Relay Chat), 'FilePusher'. Additionally 2 commands - 'helpCommand' and 'exitCommand' are also provided.

The ARC in turn includes the features like Screen viewer, URLtracker and Command Executor. Screen Viewer includes the Desktop or Laptop screen access. URLtracker includes the mailing of sites viewed on particular browser basing on user interest. Command execution, acts like a 'Run' option in laptops and PC's, asks for command and sends it to the system, using object push service, where it will execute the command. BTChat is the utility that provides the server (Desktop/PC) to chat with client (mobile). The 'helpCommand' shows the reference for the terms in the form screen and also the manual to use the mobile application.

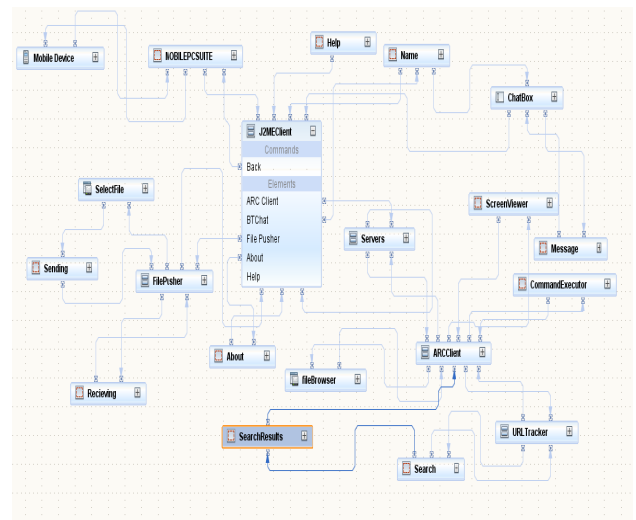


Fig. 3 Flow Layout

If the 'ARC' is selected, the next screen will be the 'waitScreen'. If the information requested exists, then the 'waitScreen' redirect the screen back to the form screen with the menu displaying utilities possible with the ARC and so on. On the other hand, if the input is invalid at any stage the screen will redirect to the 'alertScreen' with error alert and give error feedback at the form screen.

V. SIMULATION RESULTS

The IDE provides a variety of target device emulators by leading device manufacturer to emulate mobile applications on the computer. Throughout the development process the system was continuously tested on the default target emulator. Below are results obtained from the final emulation of the system. At the server side on running the application desktop/laptop internally searches for devices and displays verified and ready to pair devices as shown in the Fig 4.

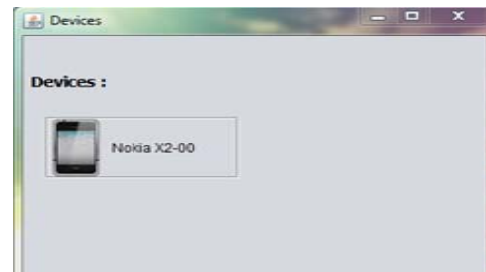


Fig. 4 List of devices that are ready to pair with PC

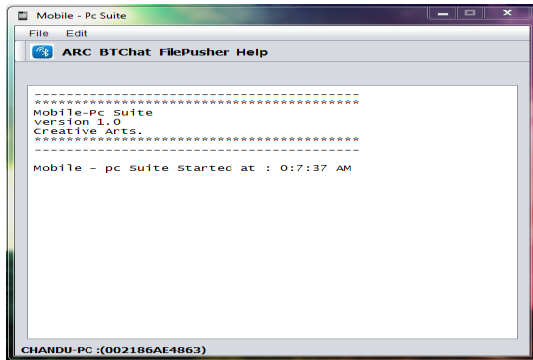


Fig. 5 J2SE server side program running

When the application is launched, the user is directed to the welcome page of Fig.5. For this application, the target users are the mobile users.

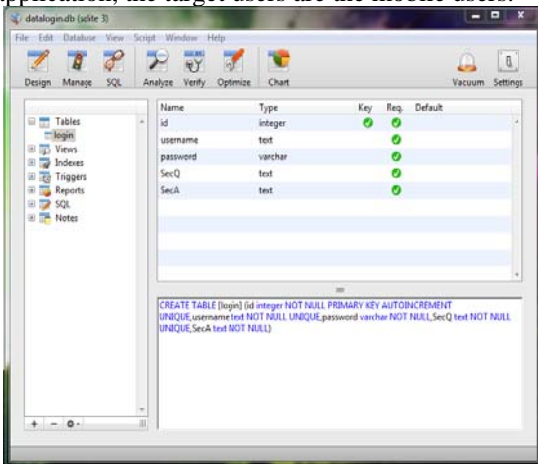


Fig. 6 Table description for Sqlite database - registered users



Fig. 7 Login Screen

The login page is one way to make the system secure by which access is limited to specified users only. Fig. 7&8 shows the authorized users sqlite database file and login screen. After the user's login id and password were authenticated, the next screen is the form screen or the main page for accessing utilities of the suite as show in Fig. 8.

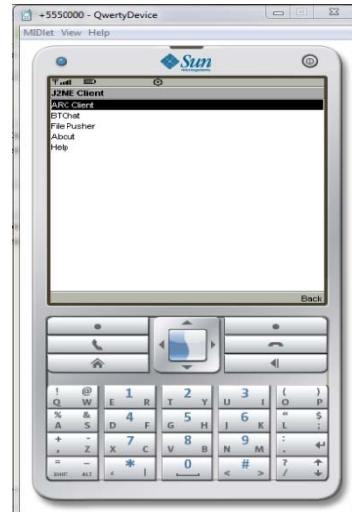


Fig. 8 Menu showing the utilities of suite



Fig. 9 PC Screen displayed on the Mobile Emulator Screen

Whenever ARC server is activated and screen access was requested by the mobile client the screen of PC will be transferred to the mobile as an image and when ever mouse arrow keys on the mobile were pressed the mouse events will get generated on the server side making the user feel that mobile itself is a computer. Thus the Fig. shows the PC screen access by mobile.

Whenever user wants to navigate through the directories present in the PC File system will be get from the server as shown in Fig.10 and the mobile user can easily view the files present in PC ,which can be send from PC to mobile further. Similarly all the remaining options were also developed and tested on the emulators and symbian OS mobiles.

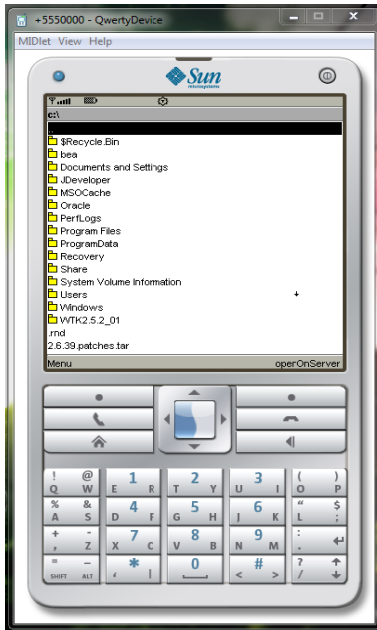


Fig. 10 File Navigation

VI. CONCLUSION

In this paper, the system developed has been emulated several times to ensure that the application will run properly on the mobile phone because the device screen is small and the memory of the phone is limited for displaying the information. For example, large image cannot be displayed properly in the mobile device. The mobile application using MIDP cannot handle large document. We have used NOKIA X2-00 as the Mobile Phone to run remote controlled Mobile-PC suite client application. The ARC server was tested over Hp laptop and Dell desktop with Microsoft Bluetooth stacks. Both the components of the suite worked as expected. The operations were executed in real time. All the work was tested on Microsoft Windows XP and Microsoft Windows-7 operating systems. Our application is expected to run over all multimedia supportable mobile phones with symbian OS.

REFERENCES

- [1] Diego Gachet, Manuel de Buenaga, Enrique Puertas, Mobile Access to Patient Clinical Records and Related Medical Documentation, Universidad Europea de Madrid – Escuela Superior Politécnica, 2005.
- [2] Bluetooth SIG, Inc. (2007), "Bluetooth.com Learn", Last retrieved on May 26, 2007, from <http://www.bluetooth.com/Bluetooth/Learn>.
- [3] Kim Zetter, "Security Cavities Ail Bluetooth", Modified on August 6, 2004, Retrieved on May 25, 2007 from <http://www.wired.com/politics/security/news/2004/08/64463>
- [4] Ho Hyun Kang, Sung Rim Kim, Sun K Yo0, Wired wireless Integrated Medical Information Prototype System Using Web Service, In Proceedings of 7th International Workshop on Enterprise Networking and Computing in Healthcare Industry. HEALTHCOM 2005, pages 41- 44. IEEE, 2005.
- [5] R. Mogha, and R. Bhargava, "Sun ONE Studio Programming". Indiana: John. Wiley, 2002.

- [6] Nokia Corporation (2006), "PC Connectivity over Bluetooth in Java Applications" Version 1.0; Publication date December 8, 2006, Retrieved on May 24, 2007 from http://forum.nokia.com/info/sw.nokia.com/id/85b9d2ee-83f1-4c7b8e71-0b1e35d0c1e9/PC_Connectivity_over_BT_in_Java_Apps_with_Example_v1_0_en.zip.html
- [7] Sun Microsystems, Inc. (2006), java.net: "J2ME Tutorial", Created on February 9, 2005, Retrieved on December 29, 2006 from <http://today.java.net/pub/a/today/2005/02/09/j2me1.html>
- C. Enrique Ortiz, "Using the Java APIs for Bluetooth Wireless Technology", Modified on January 17, 2007, retrieved on January 31, 2007, from <http://developers.sun.com/techtopics/mobility/apis/articles/bluetoothintr0/>
- [8] K. Siau, H. Sheng, and F. Nah, "Development of a Framework for Trust in Mobile Commerce", 2nd Pre-ICIS Annual Workshop on HCI Research in MIS (HCI/MIS' 03); pp.85-89, 2003.