

A Comprehensive Study of Technologies and Trends used in Latest Mobile Computing Environment

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ABSTRACT

The present study discussed about all the basic components of mobile devices which are being used in the development of mobile phones. The author focused on client server architecture and mobile computing. Various types of operating systems which are used very frequently in the mobile devices are Window CE and Symbian OS, these are the two very frequently used operating systems which we used in the mobile devices.

Key words: Mobile Computing Environment, Client Server architecture.

INTRODUCTION

In this paper we discuss about all the basic components of mobile devices which are being used in the development of mobile phones. In this topic we basically focused on which type of client server architecture we used in the mobile computing. We also discuss various types of operating systems which we use very frequently in the mobile devices such as Window CE and Symbian OS these are the two very frequently used operating systems which we used in the mobile devices. Except these we also discuss about BREW, WAP and the J2ME here BREW refers to the binary run time environment for wireless. BREW can be viewed as a set of APIs that enable developers to create software applications for wireless devices. The WAP refers to the wireless application protocol and WAP specification defines a set of protocols to bring internet content to mobile devices like cellular phones, pagers, and personal digital assistants. and J2ME refers to the Java 2 micro edition Java is becoming a standard across wireless devices because of its application portability, endorsement by virtually all wireless technology vendors, integrated safeguards for Network delivery, sandboxing, and it's a powerful object oriented programming language.

Latest Technologies used in Mobile Computing

There are various technologies we use in the case of mobile computing some of them are:

Bluetooth

Bluetooth is an exciting new technology that allows devices such as mobile phones, laptops computers, digital cameras, PDAS and other portable devices to communicate with each other without using a cable to connect them. The Bluetooth is a technology by which communication between two devices is possible by using short range radio waves.

DRM

The DRM is a short-term for Digital Right Management. This is a generic term for access control technology that can be used by the hardware manufacturers and individuals to limit the usage of digital content and devices.

Short Message Service

The SMS allows the transmissions of messages up to 160 characters from one device to another device.

Multimedia Message Service

The MMS service improves the use of the

SMS service. By using the MMS service we can send text as well as a picture, an audio or video. Multimedia Messaging Service (MMS) is a store for forward messaging service that allows mobile subscribers to exchange multimedia messages with other mobile subscribers. As such it can be seen as an evolution of SMS, with MMS supporting the transmission of additional media types:

- (i) Text
- (ii) Picture
- (iii) Audio
- (iv) Video
- (v) Combinations of the above.

GPS

GPS is terms as the Global Positing System. Basically this is a technology that supports a system which allows us to figure out the location of our destination.

GSM

The GSM refers to the Global System for Mobile Communication. This is a digital transmission technique that is widely adopted in Europe and supported in North America. GSM uses 900 MHz and 1800 MHz in Europe.

CDMA

Code Division Multiple Access is one of the several digital wireless transmission methods in which signals are encoded using a pseudo random sequence which corresponds to a different communication channel that the receiver also knows and can use to decode the received signal.

GPRS

The GPRS refers to the general packet Radio Service. It provides the packet mode transfer for applications that show traffic patterns such as frequent transmission of small volumes or infrequent transmission of small or medium volumes according to the requirement specification.

WAP

WAP refers to the wireless application protocol it is a protocol that is developed to allow intelligent transmission of optimized internet content to wireless phones. WAP or wireless Application Protocol, adds a new dimension to the Internet i.e. mobility. By using the WAP enabled mobile phones

and laptops we can book tickets check there bank accounts at any time. By using WAP services we can also play the games while stuck in traffic we can find the news updates in the elevator. The WAP products are required to access WAP servises. The WAP products have a large full graphic display and include a micro browser. The main function of the WAP in the mobile phones is to establish the communication with a server installed in the mobile phone network. It is used to join together the web and telecommunications. The mobile WAP device is attached to the mobile network such as GSM, or Remote Access Service. This server gives the WAP device access to the protocols it needs. These are the same lower level protocols as a normal Internet Service Provider will give you. We call this the PPP or Point-to-Point Protocol. Here is a diagram showing the basic working system of the WAP.

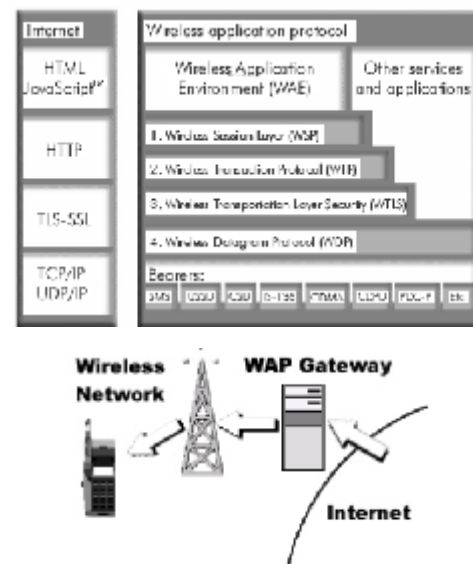


Fig. 1: Layered architecture of WAP

Generations of Mobile phones

There are various generations of mobile phones that define the technology improvement in the present day's mobile computing environment. To name some of the technologies:

0G

This is defined as the zeroth generation of mobile telephony technology. This refers to the pre-cell phone mobile telephony technology, such as radio phones. This is frequently used in cars.

This generation was launched in the early 1970s in Finland.

1G

1G refers to the first generation wireless telephone technology. This technology was introduced in the early of 80s and refers as the analogue cell phones standards this technology was used until it was replaced by 2G digital phones.

2G

The 2G refers to the second generation wireless telephony technology. The 2G services are frequently referred as Personal Communication Service or PCS in the US. The 2G technology was divided in to the TDMA based and CDMA based standards depending on the type of multiplexing. It cannot normally transfer data, such as email or software, other than the digital voice calls itself, and other basic ancillary data such as time and date. Nevertheless, SMS messaging is also available as a form of data transmission for some standards.

2.5G

The concept of the 2.5G technology came in existence after development of 2G technologies and before development of 3G technology. In the 2.5G technology we use the concept of Packet switch domain as well as the circuit switch domain. One of the commonly known 2.5G technologies is GPRS.

3G

The 3G technology is frequently used in the present day's mobile environment. This service provides the ability to transfer two voices, (telephone call and non voice data) such as downloading information, exchanging Emails, and instant messaging.

3.5G

The high speed Downlink Packet Access (HSDPA) is a packet based data service in W-CDMA downlink with data transmission up to 8-10Mbps/s over a 5MHz bandwidth in WCDMA downlink. This High Speed Downlink Packet Access is a mobile telephony protocol and also called as 3.5G.

4G

The 4G refers to the fourth generation mobile computing technologies. It describes two different ideas. The first one is High-speed mobile

wireless access with a very high data transmission speed, of the same order of magnitude as a local area network connection (10 M bits/s and up). The second one is Pervasive networks. An amorphous entirely hypothetical concept where the user can be simultaneously connected to several wireless access technologies which can seamlessly move between them. These access technologies can be Wi-Fi, UMTS, EDGE or any other future access technology.

Various Platforms Used In Mobile

Mobile solutions on various kind of devices like Window CE, Symbian OS, IOS, etc. and Built the complete expertise in the following Operating System platforms:

Microsoft Windows CE

One of the most frequently used operating system in the mobile development is Windows CE or Windows Embedded Compact operating system developed by Microsoft for use with hand held devices such as the Pocket PC and other equipment .Like Linux, Windows the Windows CE (CE stands for embedded compact) is an operating system ,which are being developed for using in the mobile devices. However, it is used only in portable systems like cell phones or pdas. It is ideal for embedded systems, where memory is a constraint and processors Windows CE is an operating system adopted by small devices and based on window 95. The development for this operating system under the code name Pegasus began in 1995. Specially designed for micro-computers, the abbreviation CE stands informal for "Compact Edition". These microcomputers are known as handheld computer or Personal Digital Assistant (PDA). The first version of Windows CE requires as a minimum 4 MB of ROM, 2 MB of RAM and a processor of the SuperH3, MIPS 3000 or MIPS 4000 architecture. One of the first devices for Windows CE 1.0 which was the HP 300 LX came on the market on 16th November 1996. The resolution of the touch screen is 640 × 240 pixels and corresponds to the half-VGA resolution. For synchronising data between mobile device and desktop computer, the software "Handheld PC Explorer" is used.

Field of Application

- (a) Handhelds and similar mobile devices.
- (b) Data exchange between stationary and

- mobile computers.
- (c) Dates mobile available, management of tasks and contacts.

Symbian OS

The Symbian Operating System is developed by the Symbian, software licensing company. This is a global open industry standard operating system for advanced, data-enabled mobile phones. Symbian has licensed mobile phone manufacturers including Motorola, Nokia, Samsung, Siemens and Sony Ericsson. Publicly announced Symbian OS to the world's leading products based on Symbian OS include the Benq P30, Motorola A920 for 3, Samsung SGH-D700, Siemens SX-1, NTT Do Como FOMA F2102V and F2051 built by Fujitsu, Sony Ericsson P800 Smartphone, Nokia 9200 Communicator range. This is one of the powerful platforms that are being used in the development of palmtop and wireless applications. Its robust object orientated architecture makes efficient use of the reduced processing power and memory available on portable devices. There are three options to exploit EPOCs power these are OPL, JAVA and C++ the developer can choose any of them. From these languages each language has ability to develop and deliver fully featured robust applications; but from these languages each language involves a compromise between the access to EPOC functionality, performance and development time. One of the basic languages that appeared on the Psion Organizer in 1991 is the OPL. The OPL is the best choice of the developer where development time need to be minimized; optimal performance is not critical and direct access to all of EPOCs functionality is not essential. However, despite its limitations OPL is capable of delivering rich and functional applications.

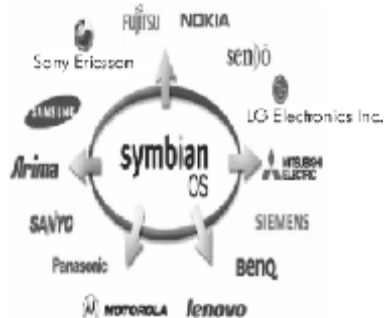


Fig. 2: Different use of Symbian OS in Laptops and Mobile Phones

IOS

The IOS is an official operating system that is being used in the iPod, iPod touch and iPhones. The IOS are commonly referred to the IOS (Apple). This is used in the iPhones very frequently. There are Cisco IOS which is originally internetwork OS.

Android

Android is an operating system developed by Google and is based upon the Linux kernel and GNU software. Android is used for mobile devices such as mobile phones, tablet computers and note books. It was initially developed by Android Inc. (a firm purchased by Google) and later positioned in the Open Handset Alliance according to NPD Group, unit sales for Android OS Smartphone ranked first among all smart phone OS handsets sold in the US in the second quarter of 2010, at 33%. BlackBerry OS is second at 28%, and IOS is ranked third with 22%.

BREW

- The BREW is a technology that is used in wireless communication. The BREW refers to the Binary Run Time Environment for wireless. The BREW can be referred as the set of APIs that enable developers to create software applications for wireless devices (wireless phones for now), and a means of selling and delivering applications to end-users.
- The Mobile phones BREW lies between a software application and the Application Specific Integrated Circuit (ASIC) level software working as a thin client in between these. The BREW provides the facilities to the developer that they can write BREW without knowing or charring about the device's chipset or air interface. The running capability of the BREW is equally capable of running on devices that employ other air interface standards. The figure shows the layered architecture of software on wireless devices.
- One of the major components of BREW is the BREW Distribution System (BDS). The BDS are used to maximize the end users ability to shop for, purchase, download, and install software over the wireless carrier's network.

- d) The BREW Shop lets users browse the carrier's Application Download Server to see what applications are available for purchase or trial. The carrier generates a billing record for each purchase and a corresponding charge appears on the subscriber's monthly phone bill.

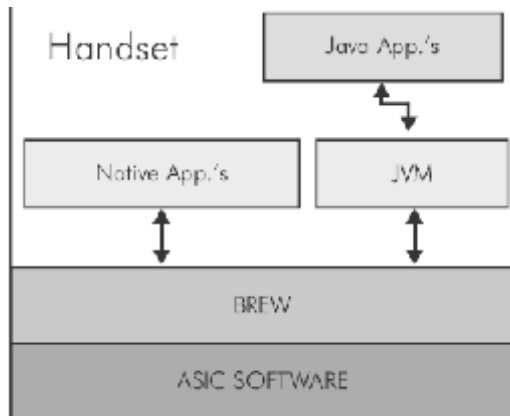


Fig. 3: Basic Layer Architecture of BREW

BREW is a platform developed by QUALCOMM for mobile phones. BREW can support GSM/GPRS, UMTS, and CDMA because it is air interface independent. When BREW was first introduced it was solely developed for CDMA handsets. Standing for Binary Runtime Environment for Wireless, basically BREW is a software platform that can download and run small programs for playing games, sending messages, sharing photos, etc. Main advantage of BREW platform is that the application developers can easily install their applications between all the Qualcomm Application Specific Integrated Circuits (ASICs). The BREW runs between the application and the wireless device's chip operating system; therefore, BREW enables a programmer to develop applications. Without needing to code for system interface or understand wireless applications. The software's that are used in the BREW enabled handsets are developed in C or C++ using the BREW SDK. The BREW SDK contains a BREW Emulator that can be used for testing during the development process. BREW applications must be digitally Signed unlike the Java ME platform, where any developer can upload and execute software on any supported handset. Only content providers or authenticated BREW developers have the tools necessary to

create a digital Signature because BREW gives complete control over the handset hardware. The BREW API is more standard across supported phones than the J2ME API, which can be considerably different depending on the phone model. Also graphics tricks are easier with Brew and have direct access to the screen buffer.

JAVA 2 MICRO EDITION (J2ME)

Java is one of the most frequently used programming languages which are used in the mobile applications development. The JAVA is a powerful object oriented programming language and because of its application portability, endorsement by virtually all wireless technology vendors, integrated safeguards for network delivery, sandboxing it became a standard programming language across wireless devices. Java runtime environments are standard or readily available for Symbian (e.g., Nokia Communicator 9200), embedded Linux (Sharp Zaurus), Pocket (Compaq's iPAQ), Palm (KVMs from Sun, Esmertec, Kada, and IBM) and realtime operating systems. In the J2ME architecture the layers located above the native operating system collectively, referred to as the Connected Limited Device Configuration (CLDC). For the small computing devices the CLDC which is installed on the top of the operating system forms the run time environment for these computing devices. In the J2ME architecture there are three software layers. In these layers the first layer is the configuration layer that includes the Java Virtual Machines (JVM), which directly interacts with the native operating system. The interaction between the profile and the JVM is also handled by the configuration layer. On the other hand the minimum set of Application Programming Interface (APIs) for the small computing devices consist in the Profile layer which is the second layer in the architecture. Mobile Information Device Profile (MIDP) is the third layer in this architecture. The MIDP layer consists of Java APIs for user network connections, persistence storage and the user interface. It has access to CLDC libraries and MIDP libraries. Small Computing Device Requirements There are minimum resource requirements for a small computing device to run a J2ME application. First the device must have a minimum of 96 X 54 pixel display that can handle bitmapped graphics and have a way of users to input information, such as a

keypad, keyboard or touch screen. At least 128 kilobytes (KB) of non-volatile memory is necessary to run Mobile Information Device (MID), and 8 KB of nonvolatile memory is needed for storage of persistent application data. To run JVM, 32KB of volatile memory must be available. The device must provide a two way connectivity. A MID let is an application that requires a device that implements Java ME, MIDP to run. Like other Java programs, mildest have a "compile once, run anywhere" potential. All the files necessary to implement a MID let must be contained within a production package called the Java Archive (JAR) file. These files include MID let classes, graphic images and the manifest file. The manifest file contains a list of attributes and related definitions that are used by the application manager to install the files contained in the JAR file onto the small computing device. Along with this, a Java Application Descriptor (JAD) file can also be included within the JAR file. A JAD file is used to provide the application manager with additional content information about the JAR file to determine whether the MID let suite can be implemented on the device. Symbian are modules of java code that run in a server application to answer client requests. Since servlets are written in the highly portable Java language and follow a standard framework, they provide a means to create sophisticated server extensions in a server and operating system independent way. To create a wireless mobile application, the MID lets are deployed on a mobile phone (client) which supports java applications and The servlets are deployed on a server. The client application is then tied into the server via An HTTP connection. The application will send requests to the server for data and receive responses that will be mapped into the appropriate fields of the client application.

Summary

The key idea of this paper are expressed under the following points-

One of the most frequently used operating system in the mobile development is windows CE or Windows Embedded Compact operating system developed by Microsoft for use with hand held devices such as the Pocket PC and other equipment .Like Linux, Windows the Windows CE (CE stands for embedded compact) is an operating system,

which are being developed for using in the mobile devices.

The Symbian is an software licensing company that develops and licenses Symbian OS, which is used as an open industry standard operating system for data enabled mobile phones.

The BREW which is Binary Runtime Environment for Wireless may be defined as an application development platform created by Qualcomm, originally for CDMA mobile phones, but in present days mobile computing environment it is frequently used in GSM mobile phones also

The Wireless Application Protocol (WAP) is an open, global specification that empowers mobile users with wireless devices to easily access and interact with information and services instantly.

Java 2 Micro Edition J2ME is a set of technologies and specifications developed for small device like mobile phones. J2ME uses a subset of J2SE (Java 2 Standard Edition) components such as a smaller virtual machine and leaner APIs. These are similar to J2SE but with highly reduced functionality. Although it has some unique features not present in J2SE.

Key Terms

PDA

The PDA refers to the Personal Digital Assistance. It is a mobile device which works as a personal information manager

CDPD

The CDPD refers to the Cellular Digital Packet Data. Basically CDPD is a technique used for transmitting small chunks of data, commonly referred to as packets, over the cellular network.

TDMA

The TDMA refers to the Time Division Multiple Access. It is a multiple access method in which the band width is used as just one time shared channel.

CDMA

The CDMA refers to the Code Division Multiple Access .This is a multiple access method

in which one channel carries all transmission simultaneously.

PPP

The PPP refers to the point to point protocol this is a protocol for data transfer across a serial link

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