Mobile Operating Systems

Vipin Kamboj  
Lecturer  
Guru Nanak Khalsa Inst. of Tech. & Mgt. Studies, Yamuna Nagar  
Email: vipsmmaxoffice@gmail.com  
Mobile: 9996377888

Hitesh Gupta  
Lecturer  
Guru Nanak Khalsa Inst. of Tech. & Mgt. Studies, Yamuna Nagar  
Email: hitesh_gupta@live.com  
Mobile: 9896343333

Abstract - Mobile phones are used by every person in today's life. We use mobile phones without knowing the different factors that a mobile used including its technology, operating system, CPU, RAM etc. Many types of operating system are used by different mobile. Every operating system has its advantage & disadvantage. Some of the operating system include many advanced features like multitasking, live wallpaper, messaging, internet browsing etc. This paper discuss the features of various mobile OS start from their emergence and a small history of mobile phones which show how mobile phones are introduced from scrap.

Key Words - GPS, Hexagonal, Radio, Pocket PC Smartphone.

I. INTRODUCTION

In today world the mobile phones becomes a part of our life. A few years ago the mobiles are used only for voice call and text messages. But now mobiles started playing a big role in our life due to the various features like accessing internet, send e-mails, receive emails automatically by synchronize the email account with mobile device. Mobile device is also used for playing music, videos & games online as well as offline. Mobiles are also having a vital use in business like reminders for meetings. Online mobile stores which provide various kinds of software for different applications increase the use of mobiles in daily life. All this happens due to the various operating systems available for mobile from different companies. It starts a race between the various mobile manufactures. In today scenario the mobiles runs very good operating system on an impressive hardware in terms of CPU speed and RAM.

II. HISTORY OF MOBILE PHONES

Hexagonal cells which are used by mobile phone stations are invented by bell labs engineers. During the World War II radio phones are initially used. In 1930s it is possible to make call by a telephone customer on ship. Such types of call are very costly. During 1940s Motorola developed a two way Walkie-Talkie and a two way radio for military which is very big in size.

<table>
<thead>
<tr>
<th>Gen.</th>
<th>Developed Year</th>
<th>Developed by</th>
<th>Type</th>
<th>Frequency</th>
<th>Standards</th>
<th>services</th>
<th>Data Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0G</td>
<td>1940</td>
<td>-</td>
<td>Voice</td>
<td>Analogue VHF (35-44 MHz), VHF (152-158 MHz) &amp; UHF (454-460 MHz)</td>
<td>Voice call</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>1G</td>
<td>1979</td>
<td>Nippon Telegraph and Telephone, Japan</td>
<td>Voice</td>
<td>Digital 150 - 900 MHz</td>
<td>NMT, AMPS, Hicap, CDPD</td>
<td>Voice call</td>
<td>600 - 1200 bps</td>
</tr>
<tr>
<td>2G</td>
<td>1991</td>
<td>RadioLingua (Elsa Oyj), Finland</td>
<td>Voice &amp; Data</td>
<td>Digital 400 &amp; 450 MHz, 900 &amp; 1800 MHz or 850 &amp; 1900 MHz</td>
<td>GSM, GPRS, EDGE, HSCSD, iDEN, D-AMPS, IS-95, PDC, PHS, WIDEN, CDMA2000</td>
<td>Voice Call SMS, WAP, MMS</td>
<td>9.6, 56 or 236.8 kbps</td>
</tr>
<tr>
<td>3G</td>
<td>2001</td>
<td>NTT Docomo, Japan</td>
<td>Voice &amp; Data</td>
<td>Digital 400 &amp; 450 MHz, 900 &amp; 1800 MHz or 850 &amp; 1900 MHz</td>
<td>UMTS, HSPDA, W-CDMA, FOMA, 1xEV-DO/IS-856, TD-SCDMA, GAN/UMA, HSPA</td>
<td>Voice Call SMS, WAP, MMS</td>
<td>384 kbps, 1.8 or 3.6 Mbps, 14 Mpbs</td>
</tr>
<tr>
<td>4G</td>
<td></td>
<td></td>
<td>Digital</td>
<td>400 &amp; 450 MHz, 900 &amp; 1800 MHz or 850 &amp; 1900 MHz</td>
<td>3GPP, WiMax, WiBro</td>
<td>Voice Call SMS, WAP, MMS</td>
<td>Up to 100 Mbps</td>
</tr>
</tbody>
</table>

Fig. History of Mobile Phones

III. MOBILE OPERATING SYSTEM

3.1 Symbian

The Symbian OS is created by team of software developers at a company called Psion. Psion generate the software for handheld devices. The team at psion created an object-oriented operating system called EPOC, which was designed basically to fulfill the requirements of mobile computing devices. At that time, a good operating system is required for the mobile phones which can be used by many mobile devices based on different hardware. EPOC is one which fulfill all the requirement of mobile
industry at that time which give born to the operating System named Symbian in June 1998. Symbian is jointly owned by Nokia, Panasonic, Psion, Samsung, Siemens and Sony Ericsson which, together, represent a major portion of the mobile phone industry.

Symbian is an OS which is mainly designed for mobile phones from ground up i.e. it can run on very low resources instead of Microsoft smartphone OS. Symbian OS is a multitasking operating system with features that include a file system, a graphical user interface framework, multimediasupport, a TCP/IP stack and libraries for all the communication features found on smartphones. Symbian OS also offers a software development kit used by third party software developer which develop application software for Symbian OS.

3.1.1 Features of Symbian OS

1. Generally, the language C++ is used in most of the symbian operating systems. But in many Symbian Operating System the operating system can also use languages like Python, Visual Basic, OPL and Perl.

2. Symbian Operating System was built in such a way that it follows the three basic design rules.
   - The integrity and security of user data is of paramount importance.
   - Response time must not be as small as possible.
   - All resources are scarce.

3. Symbian OS programming is said to be event-based, and the Central Processing Unit is switched off when the running applications and programs are not linked to the event. This is achieved through a programming logic called active objects.

4. The Symbian Operating system is compatible with all kinds of devices, mostly removable media file systems.

5. Symbian Operating system 9.x which is one of the latest models has adopted a better model.

6. The Symbian system is not an Open Source software. Cell phone manufacturers, though have some parts of its source code

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**Fig: Evolution of Symbian OS**
3.2 Microsoft Windows Mobile OS

The Windows Mobile operating system is available on multiple platforms, but the first devices to use Windows Mobile were Pocket PC’s. Driven by Pocket PC 2000 operating system and powered by Windows CE 3.0 which was launched in april 2000. Pocket PC 2000’s can support only screens with a resolution of 240 x 320. It was designed for early PDA’s like the HP jornada and iPaq’s. It was a CPU specific OS so all the software created for these devices had to be targetted at specific platforms.

Following Pocket PC 2000 came the enhanced operability and Smartphone compatibility of Pocket PC 2002 launched in October 2001. It includes the many enhanced features . While Pocket PC 2002 still didn’t resolve the issue of only being able to run at 240 x 320 resolution it did have improved navigability and slicker operability. This enhanced user interface also incorporated greater configurability, GSM communications and enhanced Pocket Office tools, bringing it more in-line with desktop versions. There was also an extension to the services on Pocket PC 2000, including virtual private networking, synchronization, MSN messenger and digital rights management.

![Windows Mobile 2000](image)

Windows Mobile 2003 introduced the first multi-version consumer choice mobile operating system platforms launched in June 2003. It came in 4 editions, Premium, Professional, Smartphone and Phone for PDA. Catering for such a wide range of handheld devices, the Windows Mobile operating system was making considerable strides into the handheld market. With such a range of operating systems flexibility came enhanced communication support, keyboard facilities, games, image delivery,

MIDI file support, messaging and further enhancements to the Pocket Office suite.

With the added diversity of hardware manufacturers, Microsoft then released the 2nd edition of Windows Mobile 2003. This brought enhanced viewing on VGA screens of 240 x 240 and 480 x 480 resolution, Wi-Fi security and an enhanced look and feel which included for the first time portrait or landscape viewing options.

Windows Mobile 2003 SE launched in March 2004. This was WinMo 2003 second edition, reminiscent of Windows 98 SE. Included some improvements including allowing users to backup and restore an entire device through ActiveSync.

In May 2005 Microsoft launched Windows Mobile 5.0. Driven be Windows CE 5.0 and incorporating a .Net compact framework it delivered further compatibility with communications infrastructures and the first breakthrough cooperation with Microsoft Exchange Server architecture. This created tremendous potential for data synchronization, compatibility and greater capacity for storage. Which in turn saw major upgrades in improved battery life through Persistent Storage capacity where flash memory is used for primary storage as opposed to the previous memory intensive volatile RAM which had been used in the past.

Windows Mobile 2005 also offered photo caller ID, greater communication support for Bluetooth and GPS, default keyboard support, error reporting, ActiveSync and the aforementioned persistent storage for enhanced battery life.

In February 2007 Microsoft launched the Windows Mobile 6 operating system for mobile devices. Windows Mobile 6.0, was an evolution rather than revolution and it came with all kinds of upgrades designed to support a range of device type. WM6 came in 3 flavours; classic for PDA’s, std for non touch screen smartphones, and Professional for touch screen smartphones. It supported a range of screen sizes, keyboard types and was buiilt on the CE.5/2 platform which tied it far better to the Exchange and office platforms.

The biggest advancement in Windows Mobile 6 is in the area of ‘Live’ cross-application interactivity. Combining services such as email, messaging, event management, and web space design, via one portable platform is very powerful. Users with vasty differing requirements can interrogate and manipulate data with ultimate freedom and confidence in security - be it multimedia in the form of video, audio or chat, running office products such as Word, Excel or PowerPoint, or administering accounts and server architecture remotely.

![Windows Mobile 2005](image)

Windows Mobile 6 comes in 3 different ‘flavors’ depending on the mobile device being used. The ‘Standard’ Edition is for use on Smartphone’s, ‘Professional’ is for use on Pocket PC’s with mobile phone capabilities and ‘Classic’ is for use on Pocket PC’s without mobile phone capabilities. All offer the same graphical user interface and application delivery, but differ in the range of connectivity options.
Windows Mobile 6.1 was announced April 1, 2008. It is a minor upgrade to the Windows Mobile 6 platform with various performance enhancements and a redesigned Home screen featuring horizontal tiles that expand on clicking to display more information, although this new home screen is featured only on Windows Mobile Standard edition. This was not supported in the Professional edition. Several other changes such as threaded SMS, full page zooming in Internet Explorer and Domain Enroll were also added, along with a "mobile" version of the Microsoft OneNote program and an interactive "Getting Started" wizard.

Windows mobile 6.5 was released to manufacturers on May 11, 2009. The first devices running the operating system appeared in late October 2009. This version has minor changes from 6.1 like home screen which is completely different. Steve Ballmer indicated that the company "screwed up with Windows Mobile", he lamented that Windows Mobile 7 was not yet available and that the Windows Mobile team needed to try to recoup losses.

Earlier, the Microsoft is working on the major project that is windows phone project and fixing the bugs and problems there in the existing windows phone which is coded with the code name of "photon" and in the year 2008, the Microsoft started a new project which is based on the windows phone and finally in the year 2009, this project on the mobile operating system is completed by the Microsoft, which lead to the development of the new release that is windows phone 7.

The windows phone 7 introduces a new interface for the design system that includes a codename which is known as "Metro", the screen itself provided with the links for the applications, features, functions and individual items that includes contacts, web pages, gaming applications or media items using the tiles which is click-able link. You can add, edit, rearrange and remove the links if any they’re using the updater that will update the user interface using the real time system.

3.3 Android

One of the famous mobile operating system these days is android introduced in 2008 which is a product of Google has many features that a mobile OS should have. Initially this OS was not so successful having many bugs like Bluetooth file transfer not supported. But developments are going on and now android is used by many mobile manufacture companies. A small history of android is shown by the following picture on next page.

Fig. Windows Mobile 7

Fig. History of Android
Ice Cream Sandwich (Android 4.0)

Ice Cream Sandwich combine the best of Honeycomb 3.0 for Android tablets and the Android Gingerbread 2.3 OS to create a single, united operating system that developers use for all Android devices going forward. Gone are the tiny incremental changes we saw from Froyo to Gingerbread. Ice Cream Sandwich heralds a dramatic. Despite its cutey name, Ice Cream Sandwich is all about strong lines, sharp corners, and darker colors.

Apple IOS:

- CustomUI
- Multitasking banners
- Multitasking
- Slide
- (Share with Maps, Skype)
- IPad/Touch- compatibility
- New in iOS 5 features
- Notification centers
- Upgrades
- New Exchange support
- Battery life/ on and green
- San San, iPad
- (Google chrome view)
- (Reduce performance)
- Cut-out & paste
- Voice control
- Shift
- Spotlight
- iOS app stores for iPad
- (Location based on app data)
- (Multitasking)
- (Home screen folders)
- (Four-Home Video Ctrl)
- (UnRead email alerts)
- (Video Center)
- (TV Remotes)
- (PlayStation-Bossing)
- (Volume buttons)
- (Remived hotkeys)
- (AirPlay)
- (Notification center)
- (PC Screen Share) (Cloud)
- (Alarm)
- (Clock)

Fig. Evolution of Apple IOS

3.5 Blackberry OS

The operating system used by Blackberry devices is a proprietary multitasking environment developed by RIM. The operating system is designed for use of input devices such as the track wheel, track ball, and track pad. The OS provides support for Java MIDP 1.0 and WAP 1.2. Previous versions allowed wireless synchronization with Microsoft Exchange Server email and calendar, as well as with Lotus Domino email. OS 5.0 provides a subset of MIDP 2.0, and allows complete wireless activation and synchronization with Exchange email, calendar, tasks, notes and contacts, and adds support for Novell GroupWise and Lotus Notes. The Blackberry Curve 9360, Blackberry Torch 9810, Bold 9900/9930, and Torch 9850/9860 feature the most recent Blackberry OS 7 as of October 2011.

Third-party developers can write software using these APIs, and proprietary Blackberry APIs as well. Any application that makes use of certain restricted functionality must be digitally signed so that it can be associated to a developer account at RIM. This signing procedure guarantees the authorship of an application but does not guarantee the quality or security of the code. RIM provides tools for developing applications and themes for Blackberry. Applications and themes can be loaded onto Blackberry devices through Blackberry App World, Over The Air (OTA) through the Blackberry mobile browser, or throughBlackberry Desktop Manager.

CONCLUSION

A number of mobile OS are available in market with different types of facilities, every company upgrade their OS for the latest requirement of the user so that it can over a large part of market. In following picture market share is shown of different OS up to 2007 which shows a great change in market share. During 2007 Symbian take more than 60% of market but on till date android is leading. A big race starts between Mobile OS to take maximum share of market.

Some of the new OS which are not in picture now but can take over the market.

Fig. Smartphone Mobile OS Market Share
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AUTHOR’S PROFILE

Vipin Kamboj
Birth Place : Kanjnu, Yamuna Nagar, Haryana, India
D.O.B. 7th March 1983 Education: Gate-2012 Qualifie
with 90 percentile, M.C.A From TMT, Yamuna Nag
affiliated with Kurukshetra University, Kurukshetra with 67%
marks in year
2005. Working as a Lecturer in Guru Nanak Khalsa Institute of
Technology & Management Studies, Yamuna Nagar, Haryana.
Published Paper named “Replacement of Software Testing with
Software Inspection “in Journal named “International Journal of

Hitesh Gupta
Birth Place : Bathinda Punjab
D. O. B. 11th December 1984
Education : Ph. D. (Reg.) from Dravidian
University since 2009 M. Phil. from Vinayanka
Missions University in 2009, M.C.A. from Punjab
Technical University Jalandhar in 2008, B.C.A. from Kurukshetra
University Kurukshetra in 2006. Since 03-03-2010 Working a
LECTURER in Guru Nanak Khalsa Institute of Technology &
Management Studies, Yamuna Nagar, Haryana, Worked as a
LECTURER in Guru Nanak Khalsa College, Yamuna Nagar, Haryana
in the 2009-10 Session. Participated in "New Science Horizons"
Sponsored by Higher Education Commissioner Haryana on 24 Feb
2010 at Guru Nanak Khalsa College Yamuna Nagar. Participated in
"Ethical Issues in Teaching" Sponsored by Higher Education
Commissioner Haryana on 30-31 Oct 2010 at D.A.V College for Girls
Yamuna Nagar. Presented a Paper on the "Topic Role of Artificial
Neural Network in the Prediction of Earthquake" Sponsored by
University Grant Commissions on 14-15 Sept 2010 at Hindu Girls
College Jagadhitri. Presented a Paper on the "Web Services and Privacy"
Sponsored by Higher Education Commissioner Haryana on 29-30 Oct
2010 at Guru Nanak Girls College Yamuna Nagar.