Inclusive Analysis of Mobile OS Features, Capabilities, Performance

Mr. Hiren H. Patel, Ms. Kamini P. Patel, Mr. Jitendra Nasriwala, Mr. Jitendra Upadhyay

ABSTRACT

Mobile phones have made a bigger difference to the lives of people, more quickly, than any previous communications technology. They have spread the fastest and proved the easiest and cheapest to adopt. It is estimated that more than 5 billion people currently have mobile phones and more than 6 billion will have them in 2013. Mobile phones have already started functioning as more than just communications devices. Mobiles serve various functionalities like watch, alarm, calculator, calendar, reminder, games etc. Smartphones are fastest and becoming a feasible alternative to PDAs and laptops, offering phone features such as voice and SMS coupled with mobile internet applications, multimedia functionality, high speed data processing capabilities, and inbuilt GPS capabilities. Indeed, there is a wealth of operating systems for smart phones and each provider has its own download platform and applications. One reason for increasing popularity of mobile devices is the gain in productivity and efficiency, particularly for professional on the go. From health care workers to sales people in the field to workers who simply move from their office to conference room, mobile devices enable seamless access to full range of corporate.

In early 2011, five major operating systems emerged on the international stage.When choosing a smart phone or mobile phone; it will be equipped with a certain operating system. An operating system is a platform that structures the functionalities of a mobile device and makes them accessible for its user. Some OS are linked to specific phone brands, other OS can be installed on several phone brands. These devices connect to a wide spectrum of networks including the internet and intranets and transmit secure data across the network. The popularity of these devices expected to make them secure.

There are number of platform and lack of repository that describes these platforms, developer and user may not know which is best for them. This paper explores functionality and includes inclusive analysis of mobile operating system on the bases of functionalities, performances, security. This paper provides what functionalities OS manufacturer can implemented on various hardware platform and what security they can provide with various operating systems versions for attracting various customers of each kind.

Keyword: Mobile Operating System, Android, Windows OS, i-Phone OS, Feature of OS, Security in OS.

1. INTRODUCTION

You go to the nearest mobile shop and you find yourself in front of a decision; which brand to buy? Nokia, Apple, HTC, Sony Ericsson, Motorola and so on. They almost have the same functions, a slightly different user interface. But this is not the only choice that today's mobile users have to face, they can decide

whether they want to go with Apple's iOS, Microsoft's Windows Phone 7, Google's Android and even the famous Blackberry or Symbian.

But what is the difference between all of those? Which is better? Which is more user-friendly? They might be the same but they all look different. Their performance, features are differ with each other.

In this paper we are going to compare the following OS in terms of their major functions and tackle all their pros and cons in order to provide you with a comprehensive guide that will allow you to make an educated decision when you want to choose which mobile platform you want to have:

- Apple – IOS
- Microsoft – Windows Phone 7
- Google – Android
- Research in Motion (RIM) – Blackberry OS
- Nokia – Symbian

1.1 Background

The mobile operating system is platform for mobile device which structures functionalities of mobile device and make them accessible for user. The mobile operating system movement has grown to include competitors such as Google, Microsoft, RIM, Apple, Symbian, and Palm.

So far, a few producers of OS lead the global and national markets. Their supremacy varies from continent to continent and even from country to country. Some OS are linked to specific phone brands, other OS can be installed on several phone brands. Generally, mobile platforms are still in the emerging stage, and any projection regarding the market growth is hard to make at the present time. Competition and the composition of OS and phone brands are changing constantly. New OS become developed, and established OS capture market shares from each other.

As more and more mobile device vendors adopt cross-platform OS's--such as Linux kernels including Google's Android, the Java OS pushed by Sun Microsystems, and web OS in the upcoming Palm the Mobile OS will play a much more significant role in the decision-making process of the end-user. At one point, IBM, Sun, and SGI/Cray dominated with their computing platforms whereas now we see the computing environments of Google, Microsoft, and Linux. Similarly, as mobile technologies and user communities evolve to catch up with the mature personal computer paradigm, the shift from computing

platform (hardware) to computing environment (software) within the breadth of consumer markets is expected. [1]

General trends are:

- End-users become more and more involved as co-developers
- Phone brands open in a higher degree to installation of different types of OS
- Development of new OS inclines to build on Linux-technology (open source)

The functionalities of all kind of mobile devices become more and more similar, allowing OS versions to be installed on several types of devices [2].

1.2 Objective

Since different mobile operating system platform beginning, none of these companies provide an OS that is ideal for all users or we can say that not a single user is fully satisfy with existing features provided by OS provider. The satisfaction of customer is depends on features & different applications in their mobile device. OS Providers claim that their platforms perform the best in all activities and will surely not advertise any weakness with their systems. This makes it difficult for end users to know which platform is best suited for their need. To address this problem, we perform a comprehensive analysis of each mobile operating system in order to identify its strengths and weaknesses. From these results, we can analyse what additional functionalities can be implemented in phone for third party development, gaming, business applications, and multimedia. Even mobile operating system provider analyse that what functionalities & security they can add at nominal cost. So have to get through idea about the architecture of different mobile operating system. We have to explore the security model of different OS platform.

1.3 Comparison Criteria For Mobile Operating System

For comparing the various mobile operating systems with respect to usage mode, we originated with a set of base categories in which we can rate them. These various categories are: Functionalities, Platform Supported, Development Environment, Software Features, Hardware Support, Power Management, and Multimedia Features. Now, we have to select a few categories from them that are especially important for a specific usage model and determine which features are suitable for particular hardware platform. Different mobile OS provider provides different level of security. Today mobile is cruises part of human life it must be secure because it includes many privacy for example mobile banking, personal data etc.

The Development Environment category describes how easy it is for third party developers to make applications for the platform. The Software Features category lists out the operating system features that are supported which demonstrate how well the operating system handles multitasking, system calls, and memory management. The Hardware Support category gives us information on what kind of hardware features are supported by the operating system such as GPS or Wi-Fi. The Power Management category shows what power saving features is available from the operating system. The Multimedia Features category enumerates the media applications and audio and video formats supported by the operating system. Based on the described categories, we selected a subset that is particularly important for each usage model. For third party developers, the most important categories would be software features, and development environment. For gaming, the essential categories are software features, multimedia features and power management. For business applications, the fundamental categories are software features, and hardware support. Lastly, for casual users, the most important categories are multimedia features, power management, and hardware support. [1]

We can also compare the different mobile operating system in different categories like Hardware, GUI, Contacts, Messaging, Multimedia, Features and Tweaking.

1.4 Problem Definition

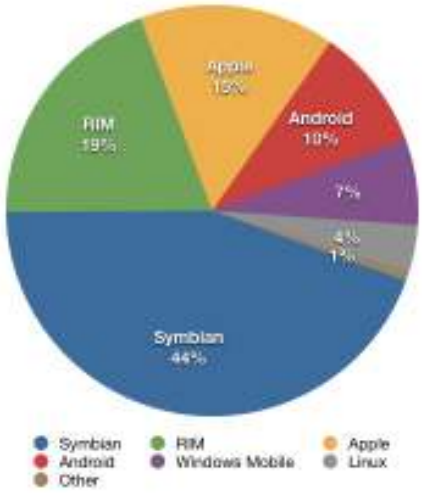
There are various issues occur in different Mobile OS. Main goal of mobile OS provider is satisfaction of customer. Customers are not satisfied with features provided by them so each provider has to increase their features according to various components that mobile OS supports.

Some of the important questions which a consumer would ask before purchasing a mobile device are:

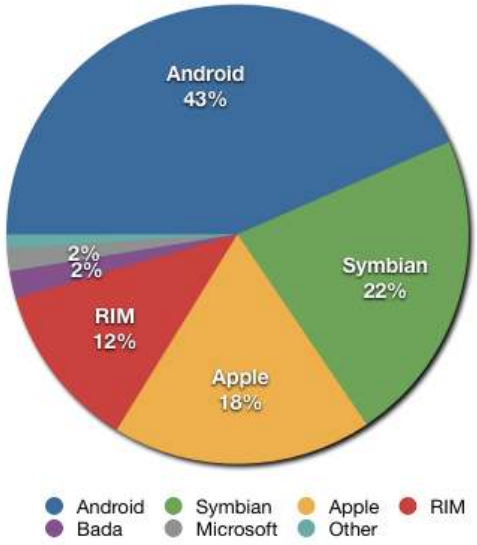
- What is best for me?
- What do I look for in a mobile device that would indicate suitable usability for my needs?
- What about the devices themselves, their attractiveness, and the extra features that make particular devices "unique"? [1]
- What feature can be included in different level of platforms?
- What additional security features can be implemented in mobile OS?
- How can architect the multi-platform OS?

2. PLATFORM OVERVIEW

There are many platforms available for mobile operating system. Comparisons of market share for mobile operating system is as follows:



[Chart 2.1 - Taken from www.en.wikipedia.org for year Aug 2010]



[Chart 2.2 - Taken from www.en.wikipedia.org for year Aug 2011]

3 INCLUSIVE ANALYSIS OF DIFFERENT OS

3.1 Platform

MOBILE OS	Supported PHONES	Providers USING THE OS
Android	T-Mobile(G2, G1) HTC (Nexus, Eris, Dream, Dragon) Motorola(Droid, Motori, Milestone) LG(Eve, Amundsen) Samsung(Bigfoot, Spica) Google(G1, Nexus One) Dell(Streak, Mini3ix) And many more....	T-Mobile
IPHONE	iPhones, iPod touch, iPad, Apple TV	AT & T
SYMBIAN	Nokia Phones	AT & T, Verizon,
WINDOWS MOBILE	HTC(Arrive, Surround, HD7) Samsung FOCOS, Dell Venue Pro LG Quantum, Omnia And many more....	AT&T, Verizon, Sprint, TMobile
PALM	Palm Phones, Samsung SCH-i539, ITM Hagenuk S 200, GSPDA Xplore M68, PiTech Qool Qda- 700	AT&T, Verizon, Sprint, T-Mobile

[Table 4.1 Platforms Supported By Various Mobile Operating Systems] [1, 20, 23, 24, 26]

3.2 Supported Multimedia Features And Applications

Mobile OS	ANDROID	IPHONE	SYMBIAN	WINDOWS MOBILE	PALM
Office Support	Google Office Suite (mail, calendar) Third-party	3rd Party office applications	MS Office Suite	MS Office Suite	"Documents To Go" by DataViz
Media Player	Android MediaPlayer Third-party front-end	ITunes media player No third party access to library	Differs based on the device using Symbian.	WMP	Pocket Tunes by NormSoft Palm Media MMPlayer
Web Browser	Based on WebKit Library	Safari	Browser differs based on the device.	IE6	Blazer
Audio Support	3gp,mp4,m4a aac,mp3,midi ogg,wav,wma	Mp3,M4A, AAC	Audio and video codec interfaces compliant with OpenMax IL 1.0	ASF,AIFF, AU,avi, G.711, GSM6.10, MIDI,SND wave,mp3, wma	Mp3,MIDI, mp2,wav, wma,ACC, ACC+,AMR
Image Support	JPEG,GIF, PNG,BMP	GIF,JPG, PNG, BMP,TIF,WMF,EMF	BMP,DIB,FPX,PNG,RLE, TGA,WBMP GIF,JPEG, JPG,JPE,JIFF PCD,PCX, PDS,PSF, TIF,TIFF, EMF,WMF	JPG,PNG 1.1,TIFF, GIF,BMP, EXIF,ICO	BMP,DIB, FPX,PNG, RLE,TGA, WBMP,GIF JPEG,JPG, JPE,JIFF, PCD,PCX, PDS,PSF,TIFTIFF,EMF, WMF

[Table 4.2 Supported Multimedia Features And Applications] [1, 20, 23, 24, 26]

3.3 Development Environment

Mobile OS	SDK Available	SDK Language
ANDROID	Yes	Android (JAVA)
IPHONE	Yes	COCOA (Objective C)
SYMBIAN	Yes	C++, OPL, Python, Visual Basic, Simkin, and Perl–together with the Java ME and Personal Java Flavors of Java.
WINDOWS MOBILE	Yes	.NET framework, Visual C++, C#
PALM	yes	C/C++, Visual Basic, VB.Net, C#, Java, Pascal, Lua, Forth

[Table 4.3 Supported Development Environments] [1, 20, 23, 24, 26]

3.4 Hardware Supported

Mobile OS	Wireless support	Graphics	Memory Expansion Slot	GPS Support
ANDROID	Wi-Fi, 3G, Bluetooth	Custom 2D graphics library and OpenGL ES 1.0 for 3D	Supported	Provides GPS & Location Manager APIs allowing development that is not HW Specific
IPHONE	UMTS/HSDPA, GSM/EDGE, Bluetooth,Wi-Fi	Quartz, OpenGL ES, Core Animation	No Supported	Technology uses GPS, cell, or Wi-Fi signals to triangulate Position
SYMBIAN	Wi-Fi, 3G, Bluetooth	3D Graphics support with OpenGL ES API and reference Implementation	Supported	GPS, A-GPS and network-based Positioning
WINDOWS MOBILE	3G,EDGE/GPRS Wi-Fi,Bluetooth Infrared	Direct3D, DirectDraw	Supported	Provides an Intermediate GPS driver
PALM	GPRS, EDGE, 2.5G(RTT), 3G(EVDO), Wi-Fi, Bluetooth, IR	160x160 to 480-320 resolutions; All graphics based on Forms, Form Elements/Objects, and Gadgets	MMC, SD microSD Memory Cards only	External GPS sensor with Tom-tom Navigator Software

[Table 4.4 Hardware Supported By Mobile Operating Systems] [1, 20, 23, 24, 26]

3.5 Multimedia Feature

Mobile OS	System Call Handling	Multi-task Scheduling	Memory Management
ANDROID	User thread handles system calls with altered Permissions	Every application runs as single separated process. Multitask scheduling is done by Linux	Linux Memory management. In addition, it uses more compact Dalvik Executable (dex) files as the byte code format instead of conventional format to run applications with smaller memory use.
IPHONE	N/A	Only one 3rd party application can run at a time. - all applications runs with same priority	Memories for objects are freed based on reference counting.
SYMBIAN	Allowing low priority kernel Pre-emption	Provides five threads: Null(idles CPU, defrags RAM), supervisor, and Timer	Performs low-level memory management, context switching, and inter-process data transfers
WINDOWS MOBILE	Triggers an exception handled at the kernel level	Kernel keeps priority list for all threads, allows real-time interrupt re-prioritizing, scheduling allowed within threads, Kernel methods for synchronization	User access to memory states for custom memory management; and out of memory messages and forced automatic Shutdowns
PALM	Single-threaded Event-Driven Loop/Queue	Multi-task scheduling is only available to the OS;	No fragmentation allowed; allowing memory to be reorganized when allocating new chunks of Memory

[Table 4.5 Mobile Operating System Features] [1, 20, 23, 24, 26]

3.6 Power Management

Mobile OS	Power Management Capabilities
ANDROID	-Screen on/off -Toggle screen & keyboard back-light -Brightness -Sleep & standby CPU mode -RPC call -Battery state change event -Power Setting change event
IPHONE	-Third parties can turn off the screen power saving feature -OS manages hardware for power consumption
SYMBIAN	-Power mgr. -Power controller -Variant power controller for CPU and other hardware -Power handlers for peripherals -Wakeup events for each low power state -CPU idle mode -Power HAL API
WINDOWS MOBILE	-Power on reset -Cold boot -Warm boot -On-to-idle -Idle-to-On -On-to suspend -Suspend to- on -On-to- critical Off
PALM	-Sleep -Doze Mode -Running

[Table 4.6 Power Management Features] [1, 20, 23, 24, 26]

4 Conclusion and Future Direction

Apple has been continuously updating their IOS since 2007 and every year, in June, they announce a new updated iPhone with improved hardware as well as features. Currently, the mainstream IOS is version 4.2.1, with IOS 4.3 still in beta stages and with developers access only and expected to be released soon to the public. IOS 4.2.1 can be installed on older iPhone generation devices except for the first one.

Android OS has witnessed continuous support from Google, reaching now version 2.3 codename Gingerbread, which is only available on the Google Nexus

S. Users can unofficially update their OS to newer versions by rooting their phones and flashing custom ROMs. Android has currently launched latest version ice-cream sandwich.

Microsoft has been advertising for a much anticipated update to Windows Phone 7, which introduces the missing function of copy-paste and feature major system improvement in terms of speed as well as functionality.

As for Blackberry, it has been well-known for minor tweaking of its OS through basic updates, mostly depending on the network operators. Currently Blackberry OS is at version 6 and there is no known information on what the future holds for this OS, which apparently has been fighting its way to keep pace with the continuous battle in the Smartphones war.

Symbian isn't close to be dumped. It will rather be refreshed with multiple Service Packs this year. It will get better as for UI and UX. There are a number of new releases expected in a few months for the operating systems.

There are many avenues to choose from in regards to future work on mobile operating system performance. One such possible solution is make operating systems platform independent. So, Operating system can run on any hardware devices. This should provide more accurate data and allow better analysis of the different operating systems.

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AUTHOR'S PROFILE

Mr. Hiren Patel, MCA (Pursuing) is Student of Shrimad Rajchandra Institute of Management and Computer Application, affiliated to Gujarat Technological University, Ahmedabad. He is "IBM Tivoli Directory Server V6.1", "IBM DB2 9 Fundamental" and GIL [Gujarat Informatics Limited] core Java Training certified. He is Member of Computer Society of India.

Ms. Kamini Mistry, MCA (Pursuing) is Student of Shrimad Rajchandra Institute of Management and Computer Application, affiliated to Gujarat Technological University, Ahmedabad. She is "IBM Tivoli Directory Server V6.1" and "IBM DB2 9 Fundamental" certified. She is Member of Computer Society of India.

Mr. Jitendra Upadhyay is working as an Asst. Professor in B. V. Patel institute of Business Management Computer and Information Technology from the last 7 years. He is currently pursuing M.Phil from Veer Narmad South Gujarat University. His area of interest is in web development technology, System programming and Object Oriented technology.

Mr. Jitendra Nasriwala, is an Associate Professor of MCA programme at S. R. Institute of Management & Computer Application, Bardoli, Gujarat, India. He received his MCA degree from South Gujarat University in the year 2001. His research are includes image processing, object oriented analysis and design. He is having 10 years of teaching experience. He has published 4 papers in National Conferences and attended 2 winter/summer school. He is life member of Computer Society of India.