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Android: The Possibilities are Endless

Kavita Sharma
Student (PhD)
Singhania University, Rajasthan (INDIA)
kavita_sharma22@rediffmail.com

Abstract: This paper gives brief information about the new operating system from Google called as Android .The study highlights the growth and comparison of Android with other existing OS which have ruled the mobile market in past years and today are facing a downfall just because of the introduction of this new OS. Android with its new and extraordinary features is being loved by all and is promising various amendments and introduction of newer applications to give the best to its users. I have done the comparison on the basis of some key points that differentiate android from others.

***Keywords*:** android ,DVK, platform independence, market share ,openness, notifications, tethering, endless

I. INTRODUCTION

The mobile market is using a variety of platforms these days, with advancement of technology we have new and better versions of mobile operating systems such as Symbian OS, Microsoft's Windows Mobile, Mobile Linux, iPhone (based on Mac OS X), Moblin (from Intel), and many other proprietary operating systems(OS). Today the operating systems present in the market provide various features to run large amount of applications on our mobile sets. The major role of an OS is to act as a user interface and help the users to operate the devices properly and make the interaction easier with attractive features such as multiprogramming, multitasking, time sharing and many more. Today with wide range of options available and each operating system having its own hits and miss we have another OS in the limelight as Google's Android OS**.**

Android is a free mobile platform built on linux kernel giving the authorities to customize any software layer - operating system, middleware and applications. The software development kit (SDK) is available for free to download and use and includes components such as emulator, libraries, debugging tools and source codes. Its architecture allows the developer to construct a high quality application for the best experience of the consumer.

Android is an open source concept and a majority of the source is licensed under Apache2. It came into limelight after November 5, 2007 a date when Open Source Alliance marked the history when more than 30 members including mobile handset makers, application developers, some mobile carriers and chip makers gathered together. It is changing the scenario in the world wide market as it is being adopted by major players in smartphone market like HTC, Samsung, Motorola, and Samsung and not to forget Google's Nexus One. Android, because of its highlighting features is competing against mobile platforms from Apple, Microsoft, Nokia, Palm, Research in Motion and Symbian.

II. NEED FOR AN OS LIKE ANDROID

In this technical boom scenario everyone is aiming towards achieving the best and reach the top, with so many options available in the market even a single negativity results in the drawback in the sales of a product thus resulting in a tough competition between the producers according to the consumer's desires. The available APIs and environments for developing mobile applications are too restrictive and seem to fall behind when compared to desktop frameworks. Mobile users want more functions and features in their mobile phones. There are still several limitations for the current mobile Operating Systems. First, some of these, like iPhone and BlackBerry OS, are designed for and can be used only in specific types of mobile devices. Second, expert users may need to develop their own applications that require an open platform. Closed source systems such as Windows Mobile are not flexible enough for this purpose. Finally, another important reason is that people want their cell phone functioning like a PC in that whatever they can access on a desktop; they should also be able to access on their cell phones. Therefore, an operating system running on a cell phone should be similar to a common desktop operating system. For all above reasons, on 21 Oct 2008, Google released Android, an open source software platform and operating system, which can run on every mobile with the hope of reaching as many mobile users as possible

III. INTERNAL ARCHITECTURE AND WORKING

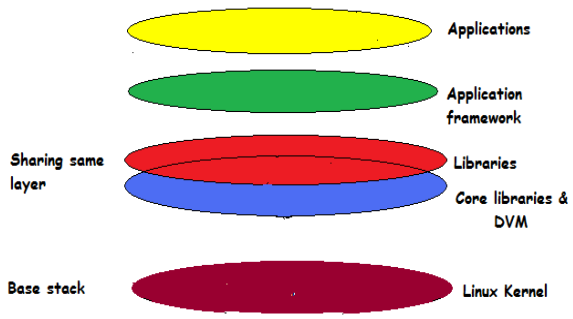

Figure 1: Android architecture

We all are familiar to Google as search engines and launching some applications used in several mobile operating systems such as Google Maps, Google Mail, Google waves, Google Earth, Google Images, Google Chrome, etc. Google sees a big opportunity in telecom world to create an operating system for mobile phones that have the ease of managing in one package hence brought Android in the market. Android is developed under Linux and in accordance with the Open Handset Alliance (OHA), which means anyone can develop Android on their hardware. The internal structure of Android OS consists of software stacks. The base of the stack is the kernel.

Google used the Linux version 2.6 OS to build Android's kernel, which includes Android's memory management programs, security settings, power management software and several hardware drivers. Drivers are programs that control hardware devices. For example, the Nexus One has a camera. The Android kernel includes a camera driver, which allows the user to send commands to the camera hardware. The next level of software includes Android's libraries. You can think of libraries as a set of instructions that tell the device how to handle different kinds of data. For example, the media framework library supports playback and recording of various audio, video and picture formats. Other libraries include a three-dimensional acceleration library (for devices with accelerometers) and a Web browser library. Located on the same level as the libraries layer, the Android runtime layer includes a set of core Java libraries -- Android application programmers build their apps using the Java programming language. It also includes the Dalvik Virtual Machine (DVK).

The Android OS uses virtual machines to run each application as its own process. First, no application is dependent upon another. Second, if an application crashes, it shouldn't affect any other applications running on the device. Third, it simplifies memory management.

The next layer is the application framework. This includes the programs that manage the phone's basic functions like resource allocation, telephone applications, switching between processes or programs and keeping track of the phone's physical location. Application developers have full access to Android's application framework. At the top of the stack are the applications themselves. This is where we find the basic functions of the device such as making phone calls, accessing the Web browser and accessing your contacts list.

IV. ANDROID AGAINST OTHERS

Today mobile market provides us with so many options that it makes difficult for us to choose the best but as the saying goes “that what is wanted more is the best” and the same goes with our favorite Android. This Google’s OS came into market in the year 2008 and before completing two years it has shown a remarkable growth in the market. This is all because of some reasons that I will try to elaborate in the following discussion. These are the points that are the most important that creates such a difference in my opinion.

A. Arrival

Most mobile phones will remain almost similar to what they were when they were first come into existence. This is due to the various reasons that may be an inflexible design or may be due to complexity that exists in developing new applications. While android ships with some extra features such as standard set of application that an advance user wants from a handheld device or most importantly the ability to the users of completely replacing or changing the look and feel of their devices Android allows and encourages drastic changes since when it first unwrapped..

Android gives developers a great opportunity by giving them full freedom of writing small-screen versions of software that can change the way people use their phones. With providing an open source framework Android is competing with existing and future mobile development platforms, by the use of which the development environment is strongly in its favour. Definitely its free and open approach to mobile application development, with total access to the phone’s resources, is a huge step. Latest versions of Android platform also supports cloud computing model offered by web resources and also the support for relational databases on the handsets are also reason behind its early adoption. Whereas, The BlackBerry and iPhone are having high-volume mobile platforms, are pointing to the opposite direction. The BlackBerry is especially for the enterprise business user. On the other hand iPhone is providing the ease of use. Android platform has the potential to work at both ends of the mobile-phone spectrum.

Windows Mobile and Apple’s iPhone came with a built on proprietary operating systems that often prioritize native applications over those created by third parties and restrict communication among applications and native phone data.

Android sits alongside a new wave of mobile operating systems designed for progressively more influential mobile hardware.

B. Platform Independence (Openness)

Openness to all is the essentials of the core system that always leads to its adoption. The same is happens with the development environment and platform of the android OS. This openness and power ensure that anyone can be attracted to Android for the level of control it offers. Android offers an excellent enterprise platform and a popular enterprise programming language Java with no licensing fees providing the level of access and control to user’s demand.Windows Mobile has been around for a long time. It fails to innovate anything new effectively. Apple came along the ease and cool features of its iPhone. But quietly Google's Android came out with something remarkable that is its platform independence (openness).its hardware and OS both is open. iphone take a head during the start but now this is the right time to compare their moves. Surely It will standout them all in the long run. Its openness will make a big difference.

C. Growth: in Terms of Users

Android in true sense could have been the most social mobile OS in the world. Google’s focuses on improving the user experience. Google creates a deep connection between the OS and the user. That seems obviously true because it create social communication and combine it with Android-to-Android messaging and for data sharing thus enables flawless interaction across different platforms. The network integration would have made android mobile OS the ultimate one. Android market with integrated carrier billing, gives consumers the ability to charge applications to their

phone bill. Google market roadmap is the ability for publishers to offer subscription purchases.

D. Growth (in terms of market share)

Gartner (Information Technology research and advisory company providing technology related insight) gave the following data to show the position of different OS in the mobile market.

The pie chart given clearly illustrates the rise and fall of the shares of different OS in the years 2009 and 2010. The market overall grew by 95% from 41m to 80.5m, but only Android was able to grew their market shares at faster rate.

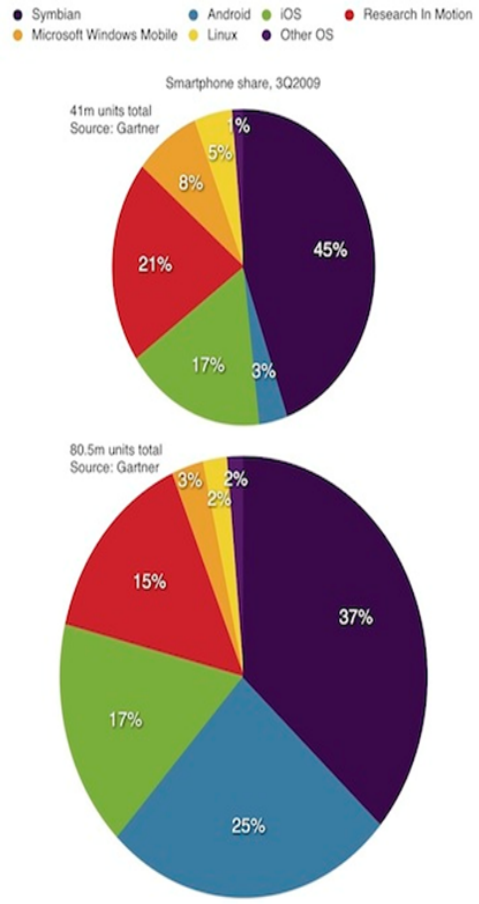

Figure 2: Smartphone shares for year 2009 and 2010

Apple saw the number of iPhones sold during the quarter grow by 91% year-on-year, fell back in market share from 17.1% to 16.7%.Nokia increased the number of phones it sold from 18.3m to 29.5m, yet lost share from 44.6% to 36.6% .

On the other hand when we study the growth charts of Android we can see that it has grew its sales and shown a leap in the market shares from 3.5% to 25.5% and has become the second biggest smartphone OS in a year replacing the ones like research in motion (RIM) which showed a fall from 20.7% to 14.8% in its shares.

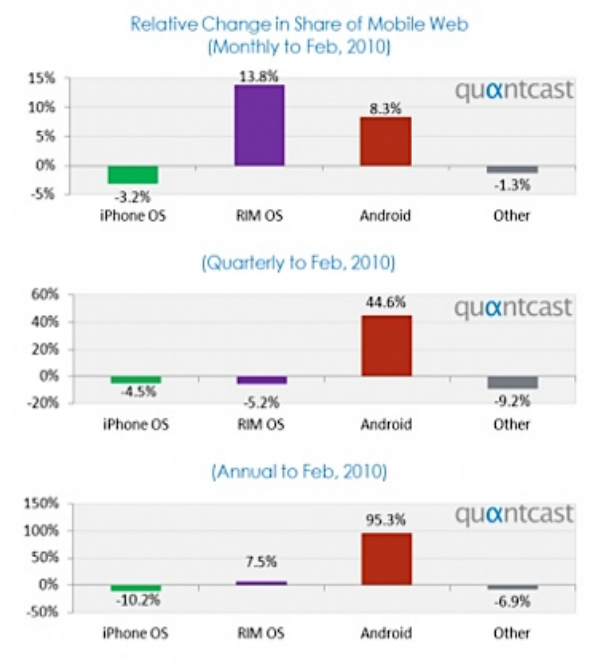

Figure: 3

Computerworld is reporting on some new figures from web analytics firm Quantcast, which shows that Google's Android is experiencing some "pretty spectacular" growth over the past few quarters, largely due to the open-source operating system being used on hardware from a number of different manufacturers, versus Apple's iPhone OS being strictly on the iPhone and iPod touch.

E. Growth (In terms of maintaining consistency)

Blackberry from RIM is without a doubt the most widely used smartphones today by mostly business users. It has been in the mobile business industry since 1999. But its popularity is steadily crumbling due to the rise of two competing forces from iPhone and Android phones. According to survey conducted last August, only 42% of current users are sticking it out with RIM's Blackberry, while the rest may jump ship to other OS platforms. According to Nielsen, in the 1st Quarter of 2010, Blackberry still owns 35% of the smartphone market. Apple has 28%, Microsoft Windows Mobile 19%, Android 9% while the rest are being shared by Palm, Linux and Symbian OS.

While Blackberry owns the majority of the smartphone market, iPhone is also very popular. The newest iPhone 4 units were sold by the millions on the first few days they were released to market. Until now, people are still craving to have their hands on the latest iPhone units.

But having the bigger share of the market doesn't mean you're already a winner. Today, NPD group announced that Android based phones edged out blackberry as the number one selling phones in the second quarter of 2010. Android phone accounted 33% of all smartphones purchases from April to June. Blackberry clinched 28% while iPhone only got 22% percent of smartphone purchase. According to the source, the most popular Android phone was the Motorola Droid, followed by the HTC Droid Incredible and the HTC Evo 4G.

Android currently sells 4.8 million phones a month. That's amazing, 20% more than iPhone4 which sells 4

million a month. The popularity of mobile phones running Android is steadily rising. And believe me, this is just the start. People are now beginning to see the advantage of owning an Android phone over other platforms.

It seems that Microsoft, HP, blackberry and Nokia are reducing their status now days. They have to try hard to win the hearts of developers. They have come with very good products but now there is not anything new from them. They all are very far from new innovations.

At the end, I want to say that when we talk about growth than android is climbing the ladder day by day as a clear winner.

As you have already seen, Android has taken a comprehensive, dedicated, and focused approach to its mobile platform efforts that go beyond a simple JVM-based solution. The Android Platform comes with everything you need in a single package: the OS, device drivers, core libraries, JNI, optimized Dalvik VM, and the Java development environment. Developers can be assured that when they develop new applications, all key libraries will be available on the device.

The various other reasons why android stands out of all are:

[a] Source Code:

Android has an advantage of open source and a central control of a powerful and innovative company whereas none other operating system is marked with such a characteristic. Other OS such as Windows from Microsoft or apple's i-phone must be licensed per device. Android's licensing also allows other entities to create software for android without releasing their own source code.

[b] Phone Carrier/Network:

We can choose Android from all major networks T-mobile (GSM), sprint (CDMA), Verizon (CDMA), AT&T (GSM) or by any prepaid carrier but the ones from apple have only one choice that is AT&T (GSM).

[c] Hardware:

When talking about hardware Apple and RIM gives us no choices as these phones need their own hardware whereas Android provides many choices such as Sony, Motorola, Samsung, LG and the list is on.

[d] PC Connection:

When talking about PC connection, Unlike the phone, which needs iTunes to manage the phone, Android can mount the SD card so that it is usable (via drag and drop) by any operating system. On this we can add music and files, which will then be usable on the phone.

[e] Touch-Screen:

i-phones again doesn't gives any choice it only provides with a touch-screen virtual keyboard, along side when we talk about windows mobile or blackberry their traditionally used stylus-centric screens and are not very finger-friendly barring the windows mobile 6.5 version. Whereas with android we have the choice of having a touch screen finger-friendly virtual onscreen keyboard and also a slide out physical keyboard.

[f] Syncing:

i-phones are normally old fashioned when it comes to syncing requiring users to plug into their computers and connect to iTunes to do all sorts of syncing and activating that could be more conveniently done wirelessly. Android phones support pretty great over-the-air synchronization with our Google account, so much that if we lose our previous Android phone, simply entering our Google account into a new one can get us up and running with a usable phone.

***[g] Android Can Run Multiple Applications at the Same Time*:**

The current version of iPhone OS does offer limited multitasking, but only allows native applications such as Mail, iPod and Phone to run in the background. Android users benefit greatly from this option, as they can receive notifications, listen to music, or even record GPS data without keeping the application open.

[h] Flash Support:

Again the comparison arises between Apple and Google as Apple says it supports only two platforms HTML 5 and its application store whereas beta version of Flash player 10.1 is available on Android 2.2, Even Blackberry and Window's mobile 7 are not available with flash support.

[i] 4G Data Network:

4th generation cellular standard for digital data is much faster than the current 3G network ,Sprint provides with 4G network, Verizon will have its 4G "LTE" network by summer 2011,T-mobile uses high speed HSPA+(4G equivalent) where as others like i-phone or Symbian are only 3G capable.

[j] Web Browsers:

Android provides with excellent built in browser but in case if we don't like it we can always use another one, such as Opera, and eventually Firefox, among others. On other OS we have limited options such as Mozilla, or the internet explorer, on i-phone we have got only safari and opera.

[k] Wi-Fi Hotspot:

Android 2.2 allows us to turn our phone into a Wi-Fi hotspot with no USB cables required whereas this cannot be done on an i-phone.

[l] Tethering:

Another markable feature that Google provides is of tethering that is we can use our phones as a broadband modem for our computers with Android 2.2 but with i-phones this is not possible again.

[m] Notifications:

The iPhone has some trouble with notifications. Because it's restricted to pop-up notifications, it can only handle one at a time where as Android gives us better notifications.

Android is shining like a star in the mobile market and its sale is expected to rise in the coming years giving a tough competition to other OS .Its extraordinary features and support from Google is bringing it a huge appreciation and making it loved by the users. Predictions claim that Android is expected to be the top selling mobile operating system by the end of four-year period

V. THE ENDLESS JOURNEY

Android has made a very good start in the market and now is causing threat to other existing operating systems as the entry of Android has led to fall in share values of other OS in the market and has itself climbed the ladder with rise in share values from 3% to 25% in past 1 year itself.

Who could have thought that Google will move from search engine to Mobile OS that to such an operating system that is being liked by all because of its outstanding features Android has gained a great appreciation in a very short span of time and the credit goes to the openness of the environment and it feels that Android is not just a mobile operating system but is completely an open software development environment for mobile phones. Soon it will be completely customized and it will definitely be lucrative for application developers. It has been estimated that Android is going to be bigger in terms of consumer reach.

Over all it can be concluded that Google is still working to release more versions of Android with improvements in all coming in future and will definitely beat the other long term leaders of mobile market.

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