

# Evolution of Android and its Impact on Mobile Application Development

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## Abstract

In this mobile world, when everything is made available anytime and anyplace thus many applications are developed every now and then to make it possible. A need arises to understand how the mobile OS works and how its architecture and framework is designed to make it efficient so that it is continuously evolved. The most used mobile OS is Android powered by Google and after its launch the demand of mobile apps has increased significantly and in the very short span of 3 years Android's 8 versions are launched which are loaded with extra features and thus it makes great impact on mobile application development.

Keywords

Android 1.6, Android 2.1, Android 2.2, Android 2.3, Android 3.0, Android 4.0, Android 4.0.3, Android versions, History of android, Platform versions

## Introduction

The recent times have seen increased activities in the mobile space, be it evolution of mobile devices, mobile applications or mobile based business solutions. However the most profound has been the evolution of mobile operating systems. The mobile operating system has been the key enabler of the current mobile revolution. The mobile operating system is defined as:

*"The operating system that controls a smartphone, tablet, PDA, or other mobile device. Modern mobile operating systems combine the features of a personal computer operating system with touchscreen, cellular, Bluetooth, WiFi, GPS mobile navigation, camera, video camera, speech recognition, voice recorder, music player, Near field communication, personal digital assistant (PDA), and other features"*<sup>1</sup>

1

Wikipedia. (2012, April 28). *Mobile Operating System*. Retrieved April 28, 2012, from Wikipedia: [http://en.wikipedia.org/wiki/Mobile\\_operating\\_system](http://en.wikipedia.org/wiki/Mobile_operating_system)

The prevalent mobile operating systems in the market are: Apple iOS, Android, Symbian, Bada, Windows mobile, RIM, WebOS, MeeGo etc.

The market share split of the mobile OS is depicted as below:

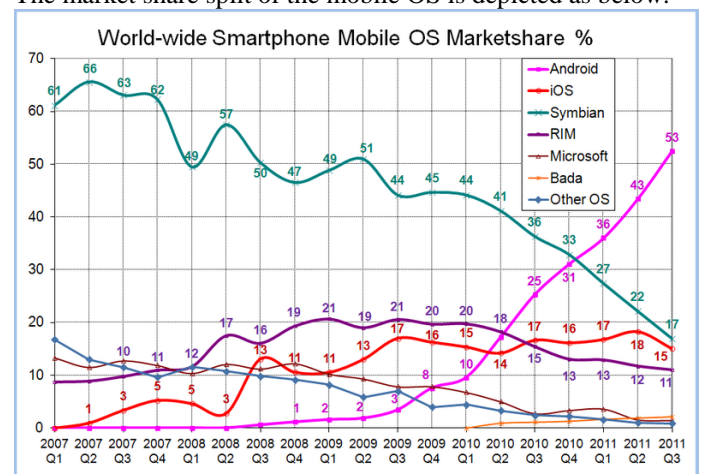


Figure 1: Mobile OS market share split<sup>2</sup>

As seen in the market share trend, the most amazing journey in the mobile operating system is of Android. This extraordinary performance inspires this paper in which we trace the Evolution of Android from being just another mobile operating system to the world most used mobile operating system as of today.

## About Android

Android is defined as a software stack for the mobile devices, which includes an operating system, middleware and key applications. The Android software development kit provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language.

The key feature of android includes:

2

Wikipedia. (2012, April 28). *Mobile Operating System*. Retrieved April 28, 2012, from Wikipedia: [http://en.wikipedia.org/wiki/Mobile\\_operating\\_system](http://en.wikipedia.org/wiki/Mobile_operating_system)

Application framework enabling reuse and replacement of components

Dalvik virtual machine optimized for mobile devices

Integrated browser based on the open source WebKit engine

Optimized graphics powered by a custom 2D graphics library;  
3D graphics based on the OpenGL ES 1.0 specification (hardware acceleration optional)

SQLite for structured data storage

Media support for common audio, video, and still image formats (MPEG4, H.264, MP3, AAC, AMR, JPG, PNG, GIF)

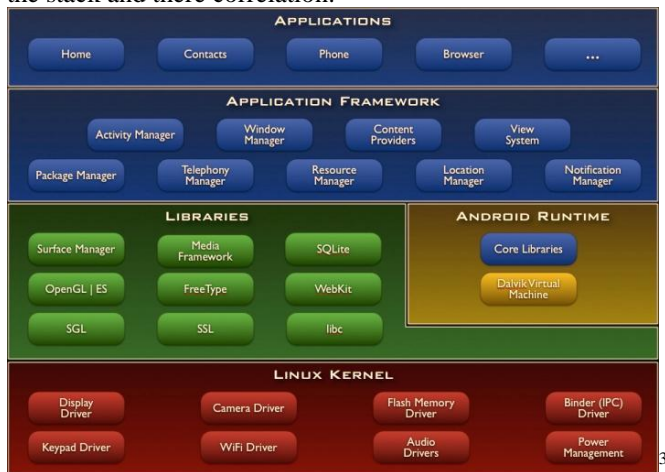
Support for GSM Telephony (hardware dependent)

Support for Bluetooth, EDGE, 3G, and WiFi (hardware dependent)

Support for Camera, GPS, compass, and accelerometer (hardware dependent)

Rich development environment including a device emulator, tools for debugging, memory and performance profiling, and a plugin for the Eclipse IDE.

The architecture of Android depicts the major components of the stack and their correlation:



Before reaching this stage Android has evolved a lot, the evolution of Android has taken the following path:

### The Beginning

Android Incorporation was founded in Palo Alto, California, United States in October, 2003 by Andy Rubin, Rich Miner, Nick Sears and Chris White. From starting Android Incorporation operated secretly, expose only that it was working on mobile software's.

Google took over Android Incorporation in August 2005, making Android Incorporation an entire owned property of Google Incorporation main employees of Android Incorporation, including Andy Rubin, Rich Miner and Chris White, stayed at the company after the possession of Google. Not much was known about Android Incorporation at the time of the acquisition, but people conclude that Google was

planning to penetrate the mobile phone market with their weapon i.e Android.

After that in November 2007 Android gave platform to make new applications, games and other softwares by launching Android beta software development kit.

The first android device was launched on 23 September, 2008, that is HTC Dream G1 which operates Android 1.0, and after that android shows 1.1 update which was released for T-Mobile G1 only.

On November 5, 2007, the Open Handset Alliance, several companies such as Broadcom Corporation, Google, HTC, Intel, LG, Marvell Technology Group, Motorola, Nvidia, Qualcomm, Samsung Electronics, Sprint Nextel, T-Mobile and Texas Instruments altogether developed open standards for mobile devices and their first product was Android, a mobile device platform which is built on the Linux kernel (version 2.6). After the successful run of Android 1.0, 14 new members accompany, including ARM Holdings, Asustek Computer Inc, Garmin Ltd, Huawei Technologies, PacketVideo, Atheros Communications, Vodafone, Sony Ericsson, Toshiba Corp.

## Android 1.0

The first Android device which runs on Android 1.0 is HTC Dream (G1), incorporated the following features:

Web Browser to show, zoom and pan full HTML and XHTML web pages, multiple pages show as windows, supporting POP3, IMAP4, and SMTP and Android Market app downloads and updates

Multitasking, instant messaging, GPS, Wi-Fi and Bluetooth

No Microsoft Exchange Server, no camcorder, youtube video player

Camera Support : lacked in change of camera's resolution, quality, white balance etc

Folder permits for the grouping of bunch of application icons into a single folder icon on the home screen

Notification alert in the status bar optioned with ringtone, vibration alert or by LED

Google synchronization to many applications

Google Maps with Latitude (Street View as well as in satellite imagery), driving directions using GPS

Voice Dialer allows dialing and placing of phone calls without typing a name or number

Other apps include: Alarm Clock, Calculator, Dialer (Phone), Home screen (launcher), Pictures (Gallery), and Settings

## Android 1.1

This update was released for the T-Mobile G1 only. The update resolved bugs, changed the API and added a number of other features including the features of android 1.0 version :

Details and reviews available when a user searches for businesses on Maps

Longer in-call screen timeout default when using the speakerphone, plus ability to show/hide dial pad

<sup>3</sup>(Google, 2012)

Ability to save attachments in messages

### Evolution Begins

Android has grown with higher efficiency. After its launch with version 1.0, it has been evolved continuously with every new version and added features. It also began to have an innovative naming convention as well. The Google internal project names for the subsequent major releases began to be named after deserts, but strictly in alphabetical order. This made tracking the Android evolution much interesting !

### Android 1.5 (Cupcake)

Salient features of Android 1.5 are listed below :

- Universal search box
- Revamped Android market : Browsing categories and filters (Top free, Top paid, Just in)
- Toggle between camera and videos modes, Video recording and playback in MPEG-4 and 3GP formats
- Faster Camera start-up and image capture, integrated photo gallery
- Much faster acquisition of GPS location (powered by SUPL AGPS)
- Auto-pairing and stereo support for Bluetooth added (A2DP and AVRCP profiles)
- On-screen soft keyboard
- Directly upload videos to youtube and picassa

### Android 1.6 (Donut)

Next version of Android, 1.6, had following enhanced features:

- Virtual On-screen keyboard
- Camcorder mode for recording (and watching) video
- Stereo Bluetooth
- Expanded Gesture framework and new GestureBuilder development tool
- Home screen widgets and folders
- Quick Search Box and Voice Search
- Toggle between still and video captures modes, Support for WVGA screen resolutions
- Copy/Paste and search within the browser
- Direct upload to Youtube and Picasa
- User can select multiple photos for deletion
- Battery usage indicator
- Updated technology support for CDMA/EVDO, 802.1x, VPNs, and a text-to-speech engine
- Multilingual text-to-speech function

### Android 2.0 (Eclair)

Salient features of Android 2.0 are as follows:

- Multiple accounts for email and contact synchronization
- Microsoft Exchange Support for syncing of e-mail
- Quick Contact pop-up widget
- Search saved SMS and MMS messages

Camera improvement include support for flash and digital zoom, scene mode, white balance, color effect and macro focus

Keyboard improvement : Adaptive Dictionary

Bluetooth 2.1 support

New browser User Interface and support for HTML5

Improved Google Maps 3.1.2

Besides live wallpapers, it's allowing Home screen background images to be animated to show movement

Motion Event class enhanced to track multi-touch events

### Android 2.0.1

Minor API changes

Bug fixes and framework behavioral changes

### Android 2.1

This version had minor amendments to the API and few bug fixes

Android Matures

With the feature related to connectivity and enhanced mobile developments, android has also added growth in the technical aspect such as speed and performance increment.

### Android 2.2 (Froyo)

Multiple user account

Speed, memory, and performance optimizations

Android market update : Batch and automatic updates, installing apps to the SD card- New tips widget for homescreen

Support for the Android Cloud to Device Messaging (C2DM) service

File uploading in the browser

Improved Microsoft Exchange support

USB tethering and Hotspot support, Voice dialing and contact sharing over Bluetooth

Multiple keyboard languages

Adobe Flash 10.1

### Android 2.2.1

Bug fixes

Security updates

Performance improvements

### Android 2.2.2

This version of Android addressed minor bugs and fixed SMS routing issues that affected the Nexus One

### Android 2.2.3

This update consisted of two security patches

### Android 2.3 (Gingerbread)

Native support for more sensors

UI refinements for simplicity and speed

New keyboard for faster text input  
One-touch word selection and copy/paste  
Near Field Communication (NFC), Improved power management  
New Download Manager, Internet Calling  
New audio effects such as reverb, equalization etc.  
Support for WebM/VP8 video playback, and AAC audio encoding

**Android 2.3.3**  
This version included several improvements and API fixes

**Android 2.3.4**  
This upgrade involved support for voice or video chat using Google Talk

**Android 2.3.5**  
Improved network performance for Nexus S 4G  
Fixed Bluetooth bug on Samsung Galaxy S  
Shadow animations for list scrolling  
Camera software enhancements  
Improved battery efficiency

**Android 2.3.6**  
This upgrade fixed a voice search bug

**Android 2.3.7**  
This version introduced Google Wallet support for the Nexus S 4G  
**Rise of Android**  
Not only for speed and performance in small screen size devices, android has taken a step ahead for larger screen tablets and devices and has shown out of the bound progress in this kind of devices as well. Android 3 pointer series are developed for PDAs and larger screen devices.

**Android 3.0 (Honeycomb)**  
Specifically optimized for tablets and devices with larger screen sizes Hardware acceleration, Support for multi-core processors, Ability to encrypt all user data Refined multitasking, rich notifications, home screen customization, widgets, Redesigned keyboard Support for video chat, Multiple browser tabs, form auto fill, new "incognito" mode allowing anonymous browsing Bluetooth tethering Built-in support for Media/Picture Transfer Protocol New two plane contacts and Email UI Ability to view albums and other collections in full-screen mode

**Android 3.1**  
UI refinements  
Connectivity for USB accessories Expanded Recent Apps list Resizable Home screen widgets Support for external keyboards and pointing devices, joysticks and gamepads,

FLAC audio playback High-performance Wi-Fi lock, HTTP proxy for each connected Wi-Fi access point

**Android 3.2**  
This update first appear on Huawei's MediaPad tablet. Changes included:  
Improved hardware support, including optimizations for a wider range of tablets Increased ability of apps to access files on the SD card Compatibility display mode for apps

**Android 3.2.1**  
Bug fixes and minor security  
Stability and Wi-Fi improvements  
Update to Android Market with automatic updates and Google books  
Improved Adobe Flash support and Chinese handwriting prediction

**Android 3.2.2**  
This version included bug fixes and other minor improvements particularly for the Motorola Xoom 4G

**Android 4.0 (Ice-cream Sandwich)**  
Increase in speed and performance Virtual buttons in the UI Separation of widgets in a new tab Easier-to-create folders with a drag-and-drop style A customizable launcher, Resizeable widgets Improved visual voicemail with the ability to speed up or slow down voicemail messages Pinch-to-zoom functionality in the calendar Offline search, a two-line preview, and new action bar at the bottom of the Gmail app Ability to swipe left or right to switch between Gmail conversations, Automatic syncing of browser with users' Chrome bookmarks Integrated screenshot capture (accomplished by holding down the Power and Volume-Down buttons)  
Improved error correction on the keyboard, Real-time speech to text dictation Ability to access apps directly from lock screen Improved copy and paste functionality  
Face Unlock : New feature that allows users to unlock handsets using facial identification software  
New tabbed web browser (allowing up to 16 tabs)  
Data Usage section in settings that lets users set warnings when they approach a certain usage limit, and disable data use when the limit is exceeded  
New Ability to shut down apps that are using memory in the background  
Improved camera app with zero shutter lag, time lapse settings, panorama mode, ability to zoom while recording, 1080p video recording for basic Android devices  
New gallery layout, organized by location and person, Built-in photo editor  
Android Beam, a Near Field Communication (NFC)

### **Android 4.0.2**

This version fixed minor bugs for the Verizon Galaxy Nexus

### **Android 4.0.3**

Bug fixes and optimizations

Improvements to graphics, databases, spell-checking, Bluetooth functionality

Calendar provider enhancements, new camera apps enhancing video stabilization and QVGA resolution

Accessibility refinements such as improved content access for screen readers

**Android & Its impact on mobile Application Development**

As Android provides a solid platform to build applications, developers are using this platform to create robust applications that fulfils different needs of customers. There are many trends that produce a great impact on mobile application development.

### **Growing Business App Needs**

Though mobile app development has registered a steady growth in the area of social networking apps and mobile games, the demand for business applications have gone up, which has pushed developers to provide their focal attention on business apps. Android, looked upon as an ideal platform to create business apps, is emerging as a top platform that paves the way for development of business applications.

### **Localized Search**

The feature that has emerged as a trend and that has impacted application development programs is the growing need to introduce location-based technology as an inherent part of Android apps. Location based apps rule the roost, and location-based content brings wealth of benefits to mobile marketer, mobile advertiser and companies, which have pushed developers to look upon Android as an ideal platform to develop location-based applications.

### **Cloud Computing**

Yet another emerging trend that has impacted the mobile application development project takes the form of cloud computing, which has not only become a household name but has also become a solid platform for companies to offer cloud based services. With the growing demand for cloud computing services, developers are keen to make good use of Android to develop cloud-based applications to cater to the demands of clients.

## **Applications for Mobile Payments**

In the recent past, consumers have started to make diligent use of mobile devices to make payments, which has even outscored other payment modes that include debit cards, credit cards and net banking facilities. With customers looking to make mobile payments, financial institutions have started to offer mobile payment options, and are keen to develop software that would enable this mobile payment procedure. This is a growing trend that has impacted application development projects, and developers never fail to take note of this trend to build apps that cater to this specific demand of financial institutions.

## **Support for Social Networks**

Establishments have realized the potential of social platforms, and are eager to gain good mileage out of various social platforms. In effect, apps that support a wide range of social networks have attracted the attention of organizations, and the demand for such applications push developers to come out with applications that would offer support for various social networks.

Though mobile app development is growing at a rapid pace, there are 5 hot trends that impact this program, which arrest the attention of developers involved in this program.

## **Benefits of Android Application Development**

With Android application development creating mobile applications is very easy because number of free start-up tools and technologies are available for custom Android application development. The readymade SDK or software development kit available with the environment for writing, testing and debugging mobile apps available with Android makes it very easy for the mobile developers to develop customized applications. Moreover Android SDK is also very easy to understand and utilize, thus mobile developers can easily & quickly build innovative and customized applications using Android.

In mobile apps development on Android mainly the C, C++ and java languages are used therefore a programmer well versed in Java can very easily learn and work on Android apps. It also provides numerous other benefits such as availability of wide and comprehensive library for audio, video, image files, 2D/3D graphics, GPS, video camera and touch screen for applications. It is possible to create dynamic and attractive graphic works using Android's 2D and 3D graphics library. Even complex applications can be built easily and rapidly using Android because Android platform allows repetitive use of same code. This saves lot of developer's time too. The data storage is also much efficient and done in a structured way using the SQLite. Some of the best features of Android mobile application development include its ability

to collect the information fast, simple tools for application building, compatibility to audio, video and image formats and rich application development environment that enables effortless convenience to develop most attractive applications easily and in lesser time.

## Conclusion

This paper results in describing the features of every version of android OS. As Android has a great impact on mobile application development and android apps are easy to develop and are enhanced whenever required. In this mobile world, a need arises to know about the key features of android and its architecture as in today's scenario every information is provided anytime anywhere with the use of mobile devices and tablets. Being very developed and advanced android has frequently launched many versions which is a sign of inconsistency as compared to only two versions of apple's iOS. Though android has shown spectacular growth with the support of Google yet consistency is required with incremented features.

## Future Work

Android has many possibilities to be deal with, many features are yet to be leveraged on a mobile devices such as near field communication should be established, 3 d communication and projection is yet to be developed and still there is a need of great speed and efficiency despite of small size and further new generations of mobile apps are yet to be developed to provide more ease to users.

## References

- Google. (2012, April 28). *What is Android*. Retrieved April 28, 2012, from Android Developers: <http://developer.android.com/guide/basics/what-is-android.html>
- Wikipedia. (2012, April 28). *Mobile Operating System*. Retrieved April 28, 2012, from Wikipedia: [http://en.wikipedia.org/wiki/Mobile\\_operating\\_system](http://en.wikipedia.org/wiki/Mobile_operating_system)
- Yadav, M. (2011, Dec 30). *History of Android*. Retrieved Apr 28, 2012, from tech2crack: <http://www.tech2crack.com/history-android/>  
<http://001mobileappdevelopment.blogspot.in/2012/01/trends-that-impact-android-application.html>