

Android – Origin to Mass Expansion

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Abstract— The paper highlights the journey of android from its early days of origin to mass expansion in today's world. In today's world, android is the most famous operating system, It has captured the whole market. Android is mobile operating system based on which was developed by Android Inc. and marketed by Google and OHA. With time, various versions of android were released which are discussed in paper. There are various features of android which has made it so popular in few years. Voice search and nice to halves are the some of the special features which makes it so special. Architecture of android is also discussed in the document in which Dalvik VM functioning is also described. All java classes are compiled into "Dalvik" executables and run on Dalvik . There are various advantages of android associated with it, because of which it had become so popular. There are also some disadvantages of android OS but it is believed that these will be overcome in the coming year upto much extent.

Keywords— Android, Dalvik virtual machine, Linux Kernel,

I Introduction

Android is a Linux based adaptable operating arrangement which was developed by Android Inc. and now, marketed by Google. Google and added associates of Open Handset Alliance collaborated on Android development and Google was released. It is acclimated by several acute phones, like Motorola Droid, the Samsung Galaxy, and Google's own Nexus One.

Android is based on Linux atom with a Java programming interface advised primarily for touch screen adaptable accessories such as smart phones and book computers. It is an accessible source operating arrangement which agency that the developers can adapt and adapt the OS for anniversary phone. Therefore, altered Android-based phones may accept altered graphical user interfaces GUIs even if they use the aforementioned OS.

Android applications abide of altered apparatus and can as well re-use apparatus of some added applications. The Android Software Development Kit (Android SDK) provides all accoutrement that are necessary to advance Android applications. This includes a compiler, debugger and a accessory emulator, as able-bodied as its own basic apparatus (Davlik) to run Android programs.

We can download Android "apps" from the online Android Market.

1 The Birth of Android

In 2003 Android, Inc. was founded in Palo Alto by Andy Rubin (co-founder of Danger), Rich Miner (co-founder of Wildfire Communications, Inc.), Once the VP at T-mobile was found by Nick Sears and Chris White (headed design and interface development at WebTV) to develop, in Rubin's words "smarter mobile devices that are more aware of its owner's location and preferences". At this time android started working secretly revealing to develop software for mobile phones.

Google Acquired Android Inc.

Android Inc. was absolutely overtaken by the Google with its accessory rights on August 17, 2005. Google acquired Android Inc. on August 17, 2005. Even afterwards accretion of the Android Inc. by the Google, the Key advisers of Android Inc., including Rubin, Miner and White, continued at the company. At that time Masses were not abounding acquainted of about android Inc. However, bodies were adventurous that Google is abuse at the adjustable industry. At this time with the anterior admiral of android Google developed a adjustable accent anchor based on Linux kernel. Google acknowledgment the anchor to handset makers and carriers with a affiance of accoutrement a flexible, upgradable system.

Open Handset Alliance Founded

Open handset accord includes assorted companies Google, HTC, Intel, Motorola, Qualcomm, T-Mobile, Sprint Nextel and NVIDIA. The capital ambition of Open Handset Accord was to advance accessible standards for adaptable devices. Along with the accumulation of the Open Handset Accord on 5th November 2007, it as well apparent its aboriginal artefact Android, a adaptable accessory belvedere congenital on the Linux atom adaptation 2.6. The aboriginal commercially accessible buzz to run Android was the HTC Dream, appear on October 22, 2008.

2 Hardware



On Feb 12th, 2008 at the mobile world congress Google showcased three prototypes

for Android. The first prototype at the ARM booth displayed several basic Google applications. A 'd-pad' is a control capable of zooming items in the dock with a relatively quick response.

On May 28, 2008, at the Google IO conference, a prototype had a 528 MHz Qualcomm processor and a capacitive touch screen, using the UMTS cellular standard. Its 128 MB of RAM and 256 MB of flash, shows that Android's memory requirements are reasonable. The demo was carried out using a 3.6 Mbit/s HSDPA connection.

3 Updates

Since 2008, Android has apparent abundant updates by improving the operating system, adding up new features and acclimation bugs in the antecedent releases. Each above absolute is called in alphabetical adjustment afterwards a ambrosia or bathetic treat; for example, adaptation 1.5 Cupcake was followed by 1.6 Donut. The latest absolute is 4.2 Jelly Bean. Google launched its Nexus alternation of accessories in 2010, which is a alternation of Smartphone and tablets active the Android operating system, and congenital by a architect partner (HTC), which collaborated with Google to absolute the aboriginal Nexus Smartphone, the Nexus One. Afterwards this, the alternation has been adapted with newer devices, such as the Nexus 4 buzz and Nexus 10 tablet, fabricated by companies such as LG and Samsung, respectively. Google releases the Nexus phones and tablets to act as their flagship Android devices, which shows Android's latest software and accouterments features

II Android Versions

Android is appear its above alternation of Versions. Google name these versions with some aliment items like ice cream, bean, sandwich etc. which is one of the specialty of android versions. Here are some of the Versions appear by android.



Android 1.0

It was appear on 23rd September 2008. This was the world's first aboriginal accessible antecedent adaptable OS which facilitates adorable user-interface designs, widgets and apps. It sported syncing versions of abounding acute Google apps (such as Gmail, Calendar, and Contacts), a full-featured media player, Wi-Fi and Bluetooth support, a acceptable cachet bar that displayed app notifications, and even a appropriate camera app (though you couldn't yet change the account superior or resolution).

Android 1.1

It was released on 9th February 2009. Google referred to this version internally as "Petit Four" though they never marketed or referred to it under that codename publicly. This amend didn't really bring many new stellar features to the table. It anchored some of 1.0's accepted bugs, and added a few new appearance of its own such as Google Maps provided data and reviews on businesses, the dial-pad included the advantage to show/hide during a call, and the SMS affairs accustomed users to save attachments.



Android 1.5 Cupcake

It was released on 30th April 2009. This was Google's first snack-themed OS codename. It brought several new features such as video recording capabilities, the uploading of videos and snaps to YouTube and Picasa, user-defined custom dictionary, home awning accoutrement support, time-stamped alarm logs, automated awning rotation, copy/paste affection for the banal web browser, Stereo Bluetooth (aka A2DP) so we can wirelessly stream music to compatible headphones or speakers, while the onscreen keyboard got text prediction. Cupcake also allowed users to display photos in their contact lists.

Android 1.6 Donut



Donut was released on 15th September 2009 with major features enhancements the biggest of which was Google Maps with turn-by-turn navigation for gratis. The Android Market became a friendly place to shop for "apps" while voice and universal searches expanded to include bookmarks and contacts. The camera and camcorder apps got a bit faster, and now OS supports higher screen resolutions. To boot, it gave us a speech synthesis engine, allowing Android to audibly relay text strings.

Android 2.0/2.1 Éclair

Éclair was released on 26th October 2010. It didn't serve too many headline features but there was still enough to get excited about. The UI and browser gives phone cameras which could now take snaps in lowlight, thanks to built flash support, digital zoom, white balance, and color effects. It also provides better Bluetooth support, provides a multi-account syncing option, and an enhanced calendar interface that displayed attendance status for various event invitees. Éclair was the version that introduced live wallpapers.



Android 2.2 Froyo

Froyo was released on 20th May 2010. Froyo, short for Frozen Yogurt. It came with improved OS speed and screen resolutions with hi-res, and hi-def support. The two key feature introduced were USB tethering and Wi-Fi hotspot plus support for Adobe Flash Player for watching videos from the phone's web browser. Froyo was also the first version of Android that let us installs apps to our SD cards, and it was also the first to support numeric and alphanumeric passwords. The first Android phone to receive the Froyo update was HTC Nexus One, which was Google's first flagship phone



Android 2.3 Gingerbread

Gingerbread was released on 6th December 2010. Even now, as we entered into 2013, Gingerbread still powers well over half the Android devices in use today. It was introduced via Google and Samsung's flagship Nexus Smartphone. It brought support for Near Field Communication, a convenient download manager that helps to keep track of and access downloaded files, multi-camera support (for devices with front-facing cameras), and an efficient power management system that helped to conserve battery life.



Android 3.0 Honeycomb

Honeycomb was released on 22nd February 2011. This was the first (and, so far, only) tablet-specific version of Android. It was debuted on the Motorola Xoom tablet. Honeycomb provides much more user-friendly keyboard, designed to be used with tablets. It also provides much-improved multitasking that introduced the option to quickly flip between background apps at the touch of a menu button, and a slew of hardware-related improvements (multi-core CPUs and hardware acceleration).

Android 4.0: Ice Cream Sandwich

This was introduced on 19th October 2011. Perhaps the biggest Android update Google's ever rolled out, Ice Cream Sandwich was showcase to the world by way of Google's most recent flagship phone, the Samsung Galaxy Nexus.

It was the first version of Android to introduce the super-convenient app dock at the bottom of the home screen, which allows an easy access to high-usage apps from any portion of the desktop. All installed widgets are kept in its app drawer, allowing for much easier browsing and sorting.

Apps can be directly accessed from the lock screen. It brought Face Unlock, which uses facial recognition software to determine when to unlock the device. It was just a much smoother, prettier, faster version of Android and the foundation for its foreseeable future.



Android 4.1: Jelly Bean

Jelly Bean was released on 9 July 2012. The Asus Nexus 7 tablet was released on 13 July 2012 with the primary aim of improving the functionality and performance of the user interface. The performance improvement involved "Project Butter", which uses touch anticipation, triple buffering, extended vsync timing and a fixed frame rate of 60 fps to create a fluid and "buttery-smooth" UI.

It allows much more intuitive rearrangement of home screen apps and widgets, and includes Google Wallet support.

Android 4.2: Jelly Bean

Android has introduced the new version of Jelly Bean i.e. Jelly Bean 4.2 on November 13, 2012. It provides various new features like improved photo editing, lock screen widgets. It also introduced a new screensaver mode, activated while your device is charging or docked. But Google doesn't call them screensavers, they're called Daydreams. There are a total of five preinstalled Daydreams, with a sixth Daydream having to be unlocked through a top secret method

III Features of Android

Application Framework

Application Framework is used to write applications for Android. The framework is supported by numerous open source libraries such as open ssl, SQLite, libc and Android core libraries. UNIX file system permissions are used to implement security in this framework that assure applications have only those abilities that mobile phone owner gave them at install time.

Tethering



Tethering allows a phone to be used as a wireless/wired Wi-Fi hotspot. Before Android 2.2 this was supported by third-party applications or manufacturer customizations.

Video calling

Video calling is not supported by Android but some handsets have a customized version of the operating system that supports it, either via the UMTS network or over IP. In Android 2.3.4 video calling is available through Google Talk. Gingerbread allows Nexus S to place Internet calls with a SIP account. In Android 2.3, video calling and front camera support is provided by Skype 2.1.

Additional hardware support

Android can use video/still cameras, touch screens, GPS, accelerometers, gyroscopes, barometers, magnetometers, dedicated gaming controls, proximity and pressure sensors, thermometers, accelerated 2D bit (with hardware orientation, scaling, pixel format conversion) and accelerated 3D graphics.

Media support

Android supports audio/video/still media formats: WebM, H.263, H.264 (in 3GP or MP4 container), MPEG-4 SP, AMR, AMR-WB (in 3GP container), AAC, HE- AAC (in MP4 or 3GP container), MP3, MIDI, OggVorbis, FLAC, WAV, JPEG, PNG, GIF, BMP, WebP.

Java support

Most of the Android applications are written in Java, but there is no Java Virtual Machine in the platform and Java byte code is not executed. All java classes are compiled into "Dalvik" executables and run on Dalvik. Dalvik is a specialized virtual machine designed specifically for Android and optimized for battery-powered mobile devices with limited memory and CPU. Third-party applications provide J2ME support.

Nice-to-haves

Android automatically checks and repairs the file system on SD cards and allows third-party apps to indicate to the Android system what hardware features they require in order to function properly. When you download the app from the Android Market, Android checks these requirements and allows installation only if the required hardware is present.

Voice search

iPhone users were first treated with Google's mobile search with voice recognition technology as far back as November

of last year. When we speak your query aloud into the handset's microphone, the software uploads digital recording to Google's servers.

Integrated browser

Android's WebKit-based browser got a significant speed bump, thanks to a newer WebKit depicting engine and an optimized JavaScript interpreter dubbed SquirrelFish. As a result, user enjoy faster performance in complex web apps that rely heavily on the Javascript code. The latter also powers Apple's current desktop and Safari browsers, with desktop Safari 4 Beta and iPhone OS 3.0's mobile Safari running a newer, more optimized version called Squirrel Fish Extreme. Google made a right choice on choosing WebKit as open source web browser.

Besides speed gain, Android's browser now supports archetype and adhesive aural web pages, user-selectable text-encoding, unified Go and Seek box and the adeptness to seek for argument aural a page. Finally, a tweaked user interface makes allowance for called bookmarks, history and most-visited pages screens.

They added a two pass layout and frame pulling down. Two pass layout loads a page without waiting for blocking elements, such as external CSS or external JavaScript and after a while renders again with all resources downloaded to the device. The founded frames are converted into single one and loaded into the browser with the frame pulling down. Browsing of internet via mobile phone and speed is increased by these features.

SQLite

It is an extremely small (~500kb) relational database management system, integrated in Android. It is based on function calls and single file, where all definitions, tables and data are stored. This simple design is more than suitable for a platform such as Android.

Messaging and Connectivity

SMS, MMS, and XMPP are available forms of messaging including threaded text messaging. GSM, CDMA, Bluetooth, EDGE, EVDO, 3G and Wi-Fi are wide variety of connectivity technologies supported by android.

IV. Architecture

The Android software stack is, divided into four parts;

- 1 Linux kernel

- 2 Collection of C/C++ libraries
- 3 Application framework that provides services and management
- 4 Applications.

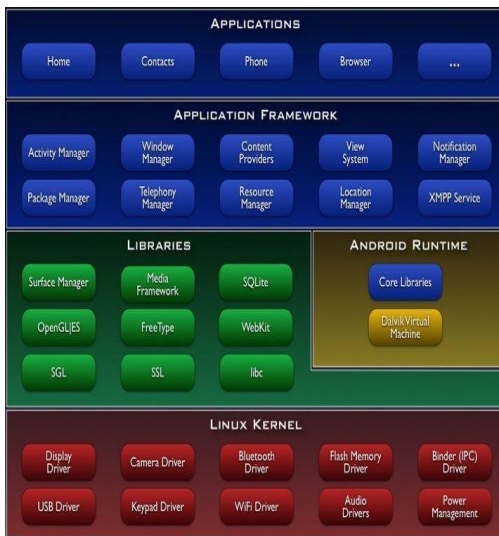


Figure 1.1 : Architecture Of Android

1. Linux Kernel

Linux 2.6 kernel handles the Core services (including process and memory management, hardware, security, network, drivers and power management). The kernel is an abstract layer between the hardware and the remainder of the android architecture stack..

2. Libraries

Set of native libraries written in C/C++, are responsible for stable performance of various components. Android includes various C/C++ core libraries described as the following:

- Libc: c standard lib.
- SSL: Secure Socket Layer
- SGL: 2D image engine
- OpenGL|ES: 3D image engine
- Media Framework: Android multi-media core part
- SQLite: Embedded database
- WebKit: Kernel of web browser
- Free Type: Bitmap and Vector
- Surface Manager: using this, different windows are managed by different applications

3. Android Runtime

At the same level there is Android Runtime, where the main components are:

- Core libraries
- Dalvik Virtual Machine

Core libraries— Most Android application development is written using the Java language, but Dalvik is not a Java VM. The Core Java libraries as well as the Android-specific libraries are available in android specific libraries which increases its functionality.

Dalvik VM — Dalvik is not a Java VM but it is register-based Virtual Machine that's been optimized to ensuring multiple instances are run efficiently by this device. Low-level memory management and function like threading is managed by Linux Kernel

Dalvik bytecode format is different from Java bytecode because of which Java class files cannot directly run on Android, they are converted in the Dalvik bytecode format. Android gives an integrated tool “dx”, using this generated byte code is converted from .jar to .dex file, doing this byte code becomes much more efficient to run on the small processors. The Dalvik VM executes its executable files, a format ensuring minimal memory footprint.

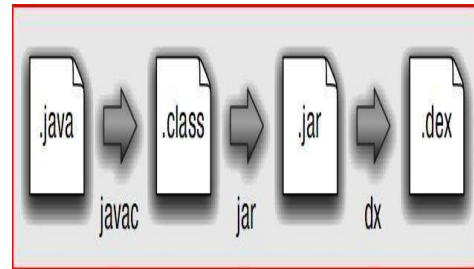


Figure 2.2 : Conversion from .java to .dex file

As the result, it is possible to have multiple instances of Dalvik virtual machine running on the single device at the same time. The Android run time is the engine that helps to run the applications and, when combined with the libraries, forms the basis for the application framework.

4. Application Framework

The application framework consists of various classes used to create Android applications. It also provides access to hardware and also helps in managing the user interface and application resource. Java language is used to write the application framework. All the applications use this toolkit, which come with mobile device like Contacts or SMS box, or applications which are written by Google and any Android developer. It has several features:

- No limited application
- Equality of each application.

•Easy to embedded web browser

5. Application Layer

At the top of Android Architecture we have all the applications, which are used by the final user. There are two types of application: native and third party applications. All applications, both native and third-party, are built by means of the same API libraries the user can turn his phone in to the unique optimized and smart mobile phone by installing different applications,, By the use of classes and services made available by the application framework, the application layer runs within the Android run time

V. Advantages of Android Operating System

Android OS has many advantages over other Operating Systems which allows for efficient working of the devices.

Android OS currently has over 600,000 finest applications that are built to meet user necessities. This and other factors add up to the benefits of Android OS when it comes to application usage. At present android has been on the stage of improvements that are going side by side that is making it much more user friendly and rich in multimedia capabilities and Bluetooth support.

Integration of Google products:

Integration is one of the advantages of Android as the other Google products and services into the platform. User synchronize the Google account with the device , by using the devices based on android OS, thus letting user an easy access to Google services like Google Calendar, Gmail, Google Docsetc and Google Maps and that makes it much more useable for the people.

Multitasking:

Android OS is known for its ability to run Multiple Apps at the same time. For example; you can browse, Facebook while listened to the song on Android phones.

App Store:

The App Store concept makes it easier for the users to use software ranging from games to office applications without wandering throughout the internet. There are many thousands of applications and games that are ready for download on Android phones without any cost.

Ability to synchronize with the phone:

Another benefit of Open Market Place is its ability to synchronize with the phone in such cases where devices may be changed. The type of Android OS version being run by the device is sensed by Google play thereby

fetching only those applications that are compatible to the device. As there is no time wastage through generalized market search, so user is benefitted a lot by this.

Ease of Notification:

Any latest articles from an RSS Reader, SMS or Email notification is provided on the Home Screen of Android phone. So we will not miss a single SMS, Email or even Missed-call.

Rich multimedia capabilities and Bluetooth support: It also contains rich multimedia capabilities ranging from streaming to transferring. One factor because of which an android user never get bored. The connectivity of android enabled devices is advanced with most of the latest devices running on 3G enabled networks. Bluetooth runs on A2DP with an ability to probe other devices' profiles before getting connected thereby making them even more secure to malicious attacks.

Multilanguage Support:

Users can also enjoy Multilanguage Support among other benefits such as Multitasking, Tethering and a Massive External Storage Capability.

VI. Disadvantage of Android Operating System

Continuous Internet connection:

Most Android phones require a 24 hour continues connection of internet.

Advertising:

However the users can add applications for free from play store of Google. But they have to face the consequences on the form of ads. That displays with the application running on the phone

Wasteful Battery –

Android mobile phones battery is drained more quickly than any other operating system, because in this operating system there are lots of "processess" in the background that lead to the battery quickly drains.

Many applications contain virus –

The virus inserted android applications including, Sexy Girls Photo Game, Puzzle Sexy Girls, Counter Strike Ground Force etc. Android Application contain virus also present in the Android Market.

VI. Future Scope of Android Operating System

The Android ecosystem has become a dominant force in 2012. The age of the Android phone is hypersonic blastoff... also exceptionally of the applications are freely available. With the time, Android has developed a lot of smart phones and has established itself in a way in this competing market. It has upgraded its various versions by adding new features and functionality to the existing ones. 2013 is upon us, and that means a whole new generation of Android devices, rumors, and a lot of new expectations. Android in the next few months will be littered with new smartphones and tablets. Let's have a glance at some of the trends we can expect in the Android space over the coming year. It is believed that quad core will multiply, It is believed that we will see big devices of this year will have quad- core 1.5GHz processors or higher, with some even hitting 2.0GHz by the year's end. The other in which may see improvement is in the phone's memory and storage. In the earlier year we saw 2GB RAM come into view for the top-of-the-line memory experience, but in the next year we may see android inching toward 3GB RAM.

In 2013, the storage capacity of Android phones may also increase as well, yielding 32GB as the standard for mid-range and 64GB becoming common among devices. This will be particularly true for those manufacturers who opt for internal batteries and removal of external storage, the other predictions of 2013 are:

First is the Project Glass which is still under research and development program commencing Google. It is a head-mounted display or HMD with information in smartphone like format. The HMD allows user to access certain features from smartphones such as, image search, apps and face recognition. Input could be as text, text to speech, audio signal, and possibly more. User can also perform contact look up, image searches, sending an email and editing documents It may take five to ten years for the final release.

Next prediction is the Flexi smartphones which are currently under research and development. The idea behind creating flexi phones comes from materials of its display and goals to prevent breakage in situations like being stepped on accidentally or a more common situation which is being sat down on. Different types of screens on various sets will be used by the various companies like LG, SAMSUNG, SONY which will offer flexible, rollable and bendable displays. Android will benefit greatly is it's the first OS to run flexi phones.

Lastly, is the upcoming new Android version 5.0 Key Lime Pie. The latest version of android is under development and is expected sometime in May 2013.

Looking ahead in this year, we expect to see more handsets come with internal and/or higher capacity batteries certainly, these future events will hit May 2013, unless a

real doomsday happens this year. 2013 will certainly be an exciting year for Android, with android gaining more popularity in this year.

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