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Review Paper on Android Operating System

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Abstract
Today, as the developing of hardware of mobile is getting better, the performance index is much higher than the actual requirements of the software configuration Phone's features more depend on software. As the Android operating system is getting more popular, the application based on Android SDK attracts much more attention. Android is a Linux-based operating system for mobile devices such as smart phones and tablet computers. It is developed by the Open Handset Alliance, led by Google, and other companies. In addition to their support for voice and text exchange, smart phones are capable of executing sophisticated embedded software applications, as well as provide a simple link to the Internet and its resources.
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1. Introduction

Android is a software stack for mobile devices that includes an operating system, middleware and key applications. Android's mobile operating system is based on a modified version of the Linux kernel. Android system in the electronics market is becoming more and more popular, especially in the smart phone market Because of the open source, some of the development tools are free, and so there are plenty of applications generated. This greatly inspired the people to use the Android system. In addition, it provides very convenient hardware platform for developers so that they can spend less effort to realize their ideas. This makes Android can get further development. Android applications are Java-based and this factor entails the use of a VM environment, with both its advantages and known problems. The Android open-source software stack consists of Java applications running on a Java-based, Object-oriented application framework on top of Java core libraries running on a Dalvik virtual machine featuring JIT compilation.

2. History

Android Inc. founded in 2003

Android, Inc. was founded in Palo Alto, California, United States in October, 2003 by Andy Rubin(co-founder of Danger), Rich Miner(co-founder of Wildfire Communications, Inc.), Nick Sears(once VP at T-Mobile), 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."
Android Inc. acquired by Google:
Google acquired Android Inc. in August, 2005, making Android Inc. a wholly owned subsidiary of Google Inc. Key employees of Android Inc., including Andy Rubin, Rich Miner and Chris White, stayed at the company after the acquisition. Version history Android has seen a number of updates since its original release. These updates to the base operating system typically focus on fixing bugs as well as adding new features. Generally each new version of the Android operating system is

developed under a code name Based on a dessert item.

The most recent released versions of Android are:

Android 1.5 (Cupcake)

Android 1.6 (Donut):- (features) Most of the changes in 1.6 are behind the scenes, but users will be able to notice a few updates: Analysis of Android 1.6: The new Android 1.6 Market could be a game changer for users and developers alike. In 1.5, paid applications were hidden from users behind an obscure menu option. But in 1.6 they will be brought to the forefront. By exposing users to high-quality paid applications, the Market should see a surge in revenue which will encourage developers to produce even more and better content. For months the Android Market has lagged the iPhone app store, but 1.6 could put it on a path to change that.

2.0/2.1 (Eclair), which revamped the user interface and introduced HTML5 and Exchange ActiveSync 2.5 support.

2.2 (Froyo), which introduced speed improvements with JIT optimization and the Chrome V8 JavaScript Engine, and added Wi-Fi hotspot tethering and Adobe Flash support.

2.3 (Gingerbread), which refined the user interface, improved the soft keyboard and copy/paste features, and added support for Near field Communication.

3.0 (Honeycomb), a tablet-oriented release which supports larger screen devices and introduces many new user interface features, and supports multicore processors and hardware acceleration for graphic. The Honeycomb SDK has been released and the first device featuring this version, the Motorola Xoom tablet, went on sale in February 2011.

This is the first closed source version of Android.

4.0-4.0.4 (Ice Cream Sandwich), The SDK for Android 4.0.1 (Ice Cream Sandwich), based on Linux kernel 3.0.1, was publicly released on October 19, 2011. Google's Gabe Cohen stated that Android 4.0 was "theoretically compatible" with any Android 2.3.x device in production at that time. The source code for Android 4.0 became available on November 14, 2011. Ice Cream Sandwich was the last version to officially support Adobe Systems' Flash player.

4.1-4.3.1 (Jelly Bean), Google announced Android 4.1 (Jelly Bean) at the Google I/O conference on June 27, 2012. Based on Linux kernel 3.0.31, Jelly Bean was an incremental update 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. Android 4.1 Jelly Bean was released to the Android Open Source Project on July 9, 2012, and the Nexus 7 tablet, the first device to run Jelly Bean, was released on July 13, 2012.

4.4-4.4.4, 4.4W-4.4W.2 (KitKat), Google announced Android 4.4 KitKat on September 3, 2013. Although initially under the "Key Lime Pie" ("KLP") codename, the name was changed because "very few people actually know the taste of a key lime pie."Some technology bloggers also expected the "Key Lime Pie" release to be Android 5.KitKat debuted on Google's Nexus 5 on October 31, 2013, and was optimised to run on a greater range of devices than earlier Android versions, having 512 MB of RAM as a recommended minimum; those improvements were known as "Project Svelte" internally at Google. The required minimum amount of RAM available to Android is 340 MB, and all devices with less than 512 MB of RAM must report themselves as "low RAM" devices

5.0–5.1.1 (Lollipop), Lollipop features a redesigned user interface built around a responsive design language referred to as "material design". Other changes include improvements to the notifications, which can be accessed from the lockscreen and displayed within applications as top-of-the-screen banners. Furthermore, Google made internal changes to the platform, with the Android Runtime (ART) officially replacing Dalvik for improved application performance, and with changes intended to improve and optimize battery usage, known internally as Project Volta.

3. Hardware Requirement

The main hardware platform for Android is the ARM architecture, with x86 and MIPS architectures also officially supported. Both 64-bit and 32-bit

variants of all three architectures are supported since the release of Android 5.0; unofficial Android-x86 project had provided support for the x86 and MIPS architectures ahead of the official support. Since 2012, Android devices with Intel processors began to appear, including phones and tablets. While gaining support for 64-bit platforms, Android was first made to run on 64-bit x86 and then on ARM64.

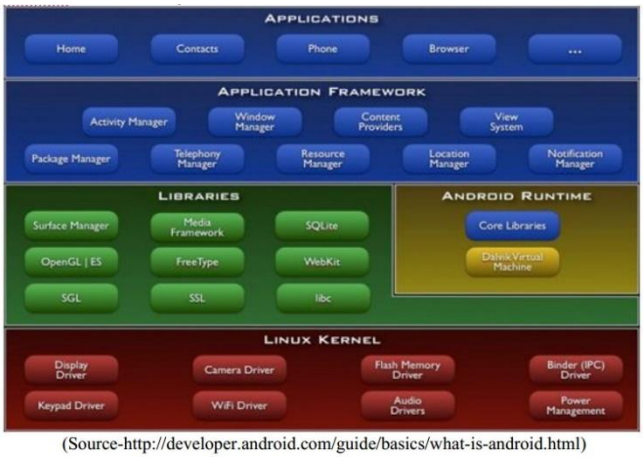
Minimum hardware requirements have been upgraded in steps over time, with the new Android version releases. Original minimums were 32 MB of RAM (but less than 128 MB was not recommended, with first phone HTC Dream ("flagship") phone using 192 MB), 32 MB of Flash memory, and a 200 MHz ARM architecture (ARMv5) processor. As of November 2013 and Android version 4.4, builds for ARM-based devices require an ARMv7 processor (Android 5.0 also supports ARMv8-A), while recommended minimum amount of RAM is 512 MB. The required minimum amount of RAM available to Android 4.4 is 340 MB (this amount does not include memory dedicated to various hardware components such as the baseband processor), and all devices with less than 512 MB of RAM must report themselves as "low RAM" devices.

With the release of Android 4.0 in October 2011, a graphics processing unit (GPU) supporting OpenGL ES 2.0 (and ES 1.0) hardware acceleration became mandatory, regardless of whether installed applications directly use the OpenGL ES or not. Later, Android 4.3 added support for OpenGL ES 3.0; if used, support for both older versions (ES 2.0 and 1.0) is still mandatory.

In addition to running directly on x86-based hardware, Android can also be run on x86 architecture by using official Android emulator as part of the Android SDK, or by using third-party emulators such as Blue Stacks or Andy

4. Android Architecture

The following diagram shows the major components of the Android operating system. Each section is described in more detail below. It consists of four layers: Application, Application framework, the layer below is divided in two parts: libraries and Android Run Time, and the last layer is Linux Kernel.



(Source-http://developer.android.com/guide/basics/what-is-android.html)

4.1 Application

Android will ship with a set of core applications including an email client, SMS program, calendar, maps, browser, contacts, and others. All applications are written using the Java programming language.

4.2 Application Framework

Android offers developers the ability to build extremely rich and innovative applications. Developers are free to take advantage of the device hardware, access location information, run background services, set alarms, add notifications to the status bar, and much, much more. Developers have full access to the same framework APIs used by the core applications. The application architecture is designed to simplify the reuse of components; any application can publish its capabilities and any other application may then make use of those capabilities (subject to security constraints enforced by the framework).

4.3 Libraries & Android Run Time

4.3.1 Libraries

Android includes a set of C/C++ libraries used by various components of the Android system. These capabilities are exposed to developers through the Android application framework. System C library: A BSD-derived implementation of the standard C system library (libc), tuned for embedded Linux-based devices Media Libraries - based on Packet Video's Open CORE; the libraries support playback

and recording of many popular audio and video formats, as well as static image files, including MPEG4, H.264, MP3, AAC, AMR, JPG, and PNG Surface Manager - manages access to the display subsystem and seamlessly composites 2D and 3D graphic layers from multiple applications LibWebCore - a modern web browser engine which powers both the Android browser and an embeddable web view SGL - the underlying 2D graphics engine 3D libraries - an implementation based on OpenGL ES 1.0 APIs; the libraries use either hardware 3D acceleration (where available) or the included, highly optimized 3D software rasterizer. Free Type - bitmap and vector font rendering SQLite - a powerful and lightweight relational database engine available to all applications Android Runtime Android includes a set of core libraries that provides most of the functionality available in the core libraries of the Java programming language.

4.3.2 Android RunTime

Android was evaluated considering the following topics: its VM environment, the underlying Linux kernel, and its resource management capabilities. Dalvik VM is capable of running multiple independent processes, each one with a separate address space and memory. Therefore, each Android application is mapped to a Linux process and able to use an inter-process communication mechanism, based on Open-Binder, to communicate with other processes in the system. The ability of separating each process is provided by Android‘s architectural model. During the device‘s boot time, there is a process responsible for starting up the Android‘s runtime, which implies the start up of the VM itself. Inherent to this step, there is a VM process, the Zygote, responsible for the pre-initialisation and pre-loading of the common Android‘s classes that will be used by most of the applications.

4.4 Linux Kernel

Android relies on Linux version 2.6 for core system services such as security, memory management, process management, network stack, and driver model. The kernel also acts as an abstraction layer between the hardware and the rest of the software stack.

5. Some new emerging areas

Medical application: physical sensor technology to provide a new type of application for human/computer interaction, one that can improve quality of life for people suffering from a variety of medical conditions. Android applications developed to improve the quality of life for patients suffering from chronic disease. Emerging smart phone devices with built-in accelerometers, GPS, camera, microphone, and other sensors provide a fundamentally new opportunity for early detection of AD. These devices, which are becoming commonly used, can be readily programmed to acquire necessary data with little additional cost; this makes much larger scale data acquisition feasible. More importantly, data acquisition can be conducted on a daily basis, providing data at a granularity to detect even subtle changes required for pre-clinical detection of AD.

Fall detection: Injuries due to falls are among the leading causes of hospitalization in elderly persons, often resulting in a rapid decline in functionality and potentially, death. iFall is an alert system for fall detection using common commercially available electronic devices to both detect the fall and alert authorities.

Sight for the blind: Voice [ref] is a mobile application that can offer a form of vision to individuals that are completely blind. Voice utilizes a digital camera to capture a series of images which are converted into a sound field, proving an auditory representation of the image. This is achieved by translating each pixel of the image into a sound frequency.

6. Advantages and Disadvantages of Android

Android is open source software. Some of the advantages include:

1. The ability for anyone to customize the Google Android platform will open up the applications playing field to small and new players who lack the financial muscle to negotiate with wireless carriers

like AT&T and Orange. The consumer will benefit from having a wide range of mobile applications.

2. Although this will depend on the carrier, one will be able to customize a mobile phones using Google Android platform like never before, right down to the screen. Features like weather details, opening screen, live RSS feeds and even the icons on the opening screen will be able to be customized.

3. Android, companies will come up with such innovative products like the location– aware services that will provide users with any information they might be in need of. This information could include knowing the location of a nearby convenience store or filling station.

7. Conclusion

Cell phone is the major part of everyone‘s life. Android making them more and more users interactive by providing lots of applications and services. Its large touch pad and sensor mode provide easy access to user. As all the mobile applications are build in java but android does not have any java virtual machine, there is a special virtual machine which is built for Android that is Dalvik virtual machine which compiles the code in .dev form. Android support for real time application, providing four different directions making it a real time system.

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