American Journal of Engineering Research (AJER)
e-ISSN: 2320-0847 p-ISSN : 2320-0936
Volume-9, Issue-11, pp-01-06
www.ajer.org
Research Paper Open Access

Analysis of Operating System: Android

Dr.Alhamali Masoud Alfrgani .Ali
Department of Computer Sciences& Information Technology, Technology College of Civil Aviation & Meterology,aspaia, Libya.

Abstract
Android is an open source and Linux-based Operating System for mobile devices such as smart phones and tablet computers. Android was developed by the Open Handset Alliance, led by Google, and other companies. This paper gives information about the Android operating system, its existence, different versions, its features and its development. The first beta version of the Android Software Development Kit (SDK) was released by Google in 2007 where as the first commercial version, Android 1.0, was released in September 2008. Unlike iOS, Android is an open source platform based on LINUX kernel, made available to everyone for development purpose to use it freely which was announced by Google. Hence, there are lots of things that can be done on this OS platform as per the user requirement. Different mobile companies uses Android as their OS platform and have their own custom ROM and GUI for consumer attraction and easy to use. The source code for Android is available under free and open source software licenses. Google publishes most of the code under the Apache License version 2.0 and the rest, Linux kernel changes, under the GNU General Public License version 2. Unlike on other mobile operating systems like Apple's iOS, Palm's webOS or Symbian, Android applications are written in Java and run in virtual machines. For this purpose Android features the Dalvik virtual machine which executes its own byte code. Dalvik is a core component, as all Android user applications and the application framework are written in Java and executed by Dalvik. Like on other platforms, applications for Android can be obtained from a central place called Android Market.
Keywords: *Android, Google, iOS, Linux, Windows, software, operating system (OS), Java, Dalvik.*

Date of Submission: 20-10-2020 Date of acceptance: 04-11-2020

I. INTRODUCTION

Android is described as a mobile operating system, initially developed by Android Inc. Android was sold to Google in 2005. Android is based on a modified Linux 2.6 kernel. Google, as well as other members of the Open Handset Alliance (OHA) collaborated on Android (design, development, distribution). Currently, the Android Open Source Project (AOSP) is governing the Android maintenance and development cycle.

Android is mainly designed for touch screen mobile devices. Touches are used as an input to the application to perform certain function. Touches are real- world actions such as tapping, swiping, panning, pinching, reverse pinching, etc with a virtual keyboard to use text and special characters. The devices are mainly smart phones and tablets but now with advanced technology there are designed for televisions, cars, smart gears-watches, etc.

Android was officially available to consumer at the end of 2008. It is always updated and improved its technology regularly in the form of features or firmware. Android as a whole is holding a good market in the mobile industry and other industries with different hardware architectures. Industries have raised their interest towards Android mainly due to two main reasons. First, Android is an Open source and second of its Architectural model.

Another important aspect of Android is that it has its own Virtual Machine (VM) environment. Android applications are Java based and this enables to use of Virtual Machine environment, with both its advantages and its known problems. After version 2.6.23, the standard that Linux kernel uses is Completely Fair Scheduler (CFS). This implies that the way CPU time is assigned to different task. This ensures that equal time sharing of CPU is assigned to all tasks and if there is any sort of unfairness that is verified then the algorithm assures that task re-balancing is performed. As the scheduling operations are delegated by Linux kernel,

although fairness is most of the time achieved but the algorithm does not guarantee to the task and so thus the Android.

Android, as we discussed earlier, has its own Virtual Machine (VM) named Dalvik, which was specifically designed for mobile devices for performance such as memory optimization, battery power saving and low frequency CPU. As the system is based on Linux kernel, it relies on the core and main operating system features such as memory management and scheduling and thus also gives the drawback of not taking any temporal guarantees into consideration.

II. HISTORY OF ANDROID OPERATING SYSTEM

In the year of 2003 Rich Miner, Nick Sears, Andy Rubin and Chris White founded Android.inc Palo Alto, California. The main intention of the company at the time was to build an advanced operating system for digital cameras. But soon the company realized that there is no big market for digital cameras so motive shifted to their intention to develop Android as a mobile operating system. Sembilan and Microsoft Windows Mobile were the main targets for them as rivals. But still, there were no investors for Android. A close friend of Rubin, Steve Perlman gave ten thousand dollars to him and this resulted in the growth of Android. In 2005 that Google acquired Android for 50 million dollars. Most of its key employees, including few founders, also joined Google as part of the deal. The team at Google started working on Android with Rubin as the team lead. At the time, Google did not reveal much about its Android project.

Figure 1: Android Logo

List of Android Versions in Order

- Android 1.0 (September 23, 2008)
- Android 1.1 (February 9, 2009)
- Android 1.5 Cupcake (Aprill 27, 2009)
- Android 1.6 Donut (September 15, 2009)
- Android 2.0-2.1 Eclair (October-26, 2009)
- Android 2.2 Froyor (May 20, 2010)
- Android 2.3 Gingerbead(December 6, 2010)
- Android 3.0 Honeycomb (February 22, 2011)
- Android 4.0 Ice cream sandwich(October 18, 2011)
- Android 4.1-4.3 Jelly Bean (July 9, 2012)
- Android 4.4 Kit kat (October 31, 2013)
- Android 5.0 Lollipop (November 12, 2014)
- Android 6.0 Marshmallow (October 5, 2015)
- Android 7.0 Nougat (August 22, 2016)

Recent Market survey of users of android over other os of mobile phone as follow:

Android	74.24%
Others	25.76%

Table 1: android users verses others

III. FEATURES OF ANDROID

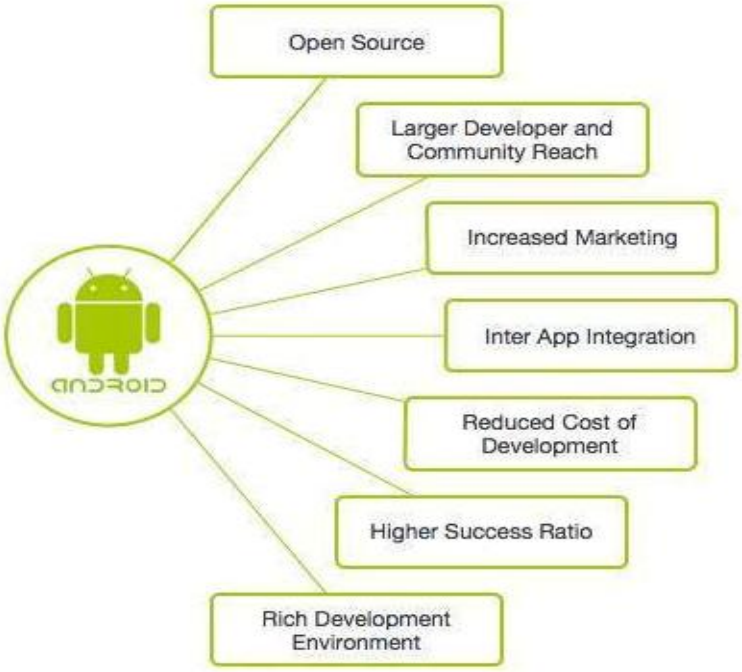

Figure 2: Waste area of android developers

Connectivity
GSM/EDGE, IDEN, CDMA, EV-DO, UMTS, Bluetooth, Wi-Fi, LTE, NFC and WiMAX.
Storage
SQLite, a lightweight relational database, is used for data storage purposes.
Media support
H.263, H.264, MPEG-4 SP, AMR, AMR-WB, AAC, HE-AAC, AAC 5.1, MP3, MIDI, Ogg Vorbis, WAV, JPEG, PNG, GIF, and BMP.
Messaging
SMS and MMS
Web browser
Based on the open-source WebKit layout engine, coupled with Chrome's V8 JavaScript engine supporting HTML5 and CSS3.
Multi-touch
Android has native support for multi-touch which was initially made available in handsets such as the HTC Hero.
Multi-tasking
User can jump from one task to another and same time various application can run simultaneously.
Resizable widgets
Widgets are resizable, so users can expand them to show more content or shrink them to save space.
Multi-Language
Supports single direction and bi-directional text.
GCM
Google Cloud Messaging (GCM) is a service that lets developers send short message data to their users on Android devices, without needing a proprietary sync solution.
Wi-Fi Direct
A technology that lets apps discover and pair directly, over a high-bandwidth peer-to-peer connection.

IV. ANDROID ARCHITECTURE

Following are the different layers in the Android stack:

- Linux Kernel Layer
- Native Layer
- Application Framework Layer
- Applications layer

Linux Kernel Layer

At the bottom of the Android stack is the Linux Kernel. It never really interacts with the users and developers, but is at the heart of the whole system. Its importance stems from the fact that it provides the following functions in the Android system:

Figure 3: Linux Kernel layer

- Hardware Abstraction
- Memory Management Programs
- Security Settings
- Power Management Software
- Other Hardware Drivers (Drivers are programs that control hardware devices.)
- Support for Shared Libraries
- Network Stack

Native Libraries Layer

The next layer in the Android architecture includes Android's native libraries. Libraries carry a set of instructions to guide the device in handling different types of data. For instance, the playback and recording of various audio and video formats is guided by the Media Framework Library.

Figure 4: Native Libraries Layer

Application Framework Layer

Our applications directly interact with these blocks of the Android architecture. These programs manage the basic functions of phone like resource management, voice call management etc.

Figure 5: Application Framework Layer

Application Layer

The applications are at the topmost layer of the Android stack. An average user of the Android device would mostly interact with this layer (for basic functions, such as making phone calls, accessing the Web browser etc.). The layers further down are accessed mostly by developers, programmers and the likes.

Figure 6: Application Layer

Security Issues in Android OS

Security has always been a major concern for consumers, but it's especially important for enterprise users. In far too many cases, malicious hackers are able to take control of a computer, steal sensitive information or use it against millions across the world. On the Web, hackers take every opportunity to try and take down sites or turn them into their own personal Trojan-delivering friends. However, in recent years, a new threat has emerged that, at least so far, few people know enough about: mobile security. From Android to Symbian and even, in some cases, iOS, operating systems across the mobile market are being targeted by malicious hackers. Users of those operating systems, meanwhile, do little to safeguard themselves from those threats. In a world where the trend to bring user's own device (BYOD) is becoming the norm, the worlds of consumer and business security are starting to collide. Interestingly, over the last year or so, Android has become the chief target for malicious hackers. According to several reports, cyber-crooks are targeting the Android operating system since it's essentially open and the sheer number of people using the platform makes it a worthwhile option. But there are still many people that don't believe Android security is a major threat to them.

Official Integrated Development Environment

The Eclipse Platform (or simply "the Platform" when there is no risk of confusion) is designed and built to meet the following requirements:

- Support the construction of a variety of tools for application development.
- Support an unrestricted set of tool providers, including independent software vendors (ISVs).
- Support tools to manipulate arbitrary content types (e.g., HTML, Java, C, JSP, EJB, XML, and GIF).
- Facilitate seamless integration of tools within and across different content types and tool providers.
- Support both GUI and non-GUI-based application development environments.
- Run on a wide range of operating systems, including Windows®, LinuxTM, Mac OS X, Solaris AIX, and HP-UX.
- Capitalize on the popularity of the Java programming language for writing tools.

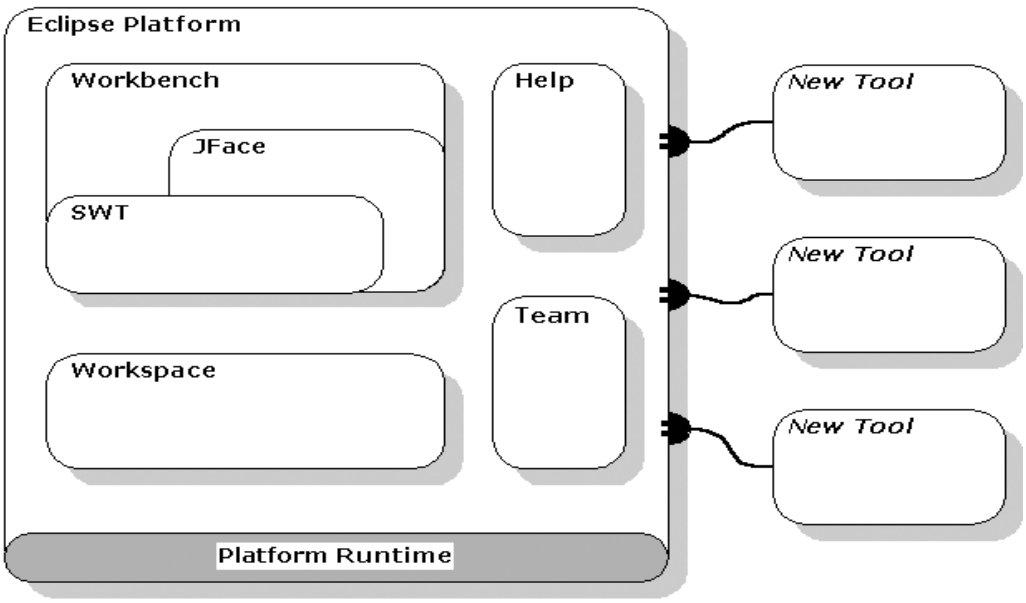

Figure 7: Eclipse Platform

The Eclipse Platform's principal role is to provide tool providers with mechanisms to use, and rules to follow, that lead to seamlessly-integrated tools. These mechanisms are exposed via well-defined API interfaces, classes, and methods. The Platform also provides useful building blocks and frameworks that facilitate developing new tools.

V. CONCLUSION

In these days, Android has become a very popular operating system for smart phones. In this paper it is understand the power of Android operating system in detail. We understood the origin of Android and how the Android came into existence. Its open features for all mobile manufacturers to use it and third party software developers to develop millions of software for the Android platform. The open source is the key for its development in the mobile and other industries. The architecture of Android is explained in detail with explanation all layers. The operating system forms the base for the billions of mobile devices in today's market with millions of Android applications. As discussed in this report, the android architecture has been discussed in a detail way and identified several security issues in using android devices and found some solutions for overcoming the security issues for both users and developers

REFERENCES

[1]. Johnson, "Performance Tuning for Linux Servers", IBM Press, 2005
[2]. Heger, D., "Quantifying IT Stability – 2nd Edition, Instant Publisher, 2010
[3]. Ryn Farmer, "A brief guide to Android"
[4]. M.T. Higuera –Toledano and V. Issarny, "Java embedded real time systems: An overview of existing solutions,"
[5]. C.Maia, L. Nogueira, and L. M. Pinho, "Experiences on the implementation of a cooperative embedded system framework,"

Dr.Alhamali Masoud Alfrgani .Ali ph.D in the computer Engineering From Sam Higginbotom University of Agriculture, Technology & Sciences(2018).M.Tech Computer Engineering From Sam Higginbotom University of Agriculture, Technology & Sciences(2013) , B.tech degree in computer Engineering from Technology College of Civil Aviation & Meterology (1992), Tripoli–Libya. faculty member at Technology College of Civil Aviation from(01-10-2018)

Dr.Alhamali Masoud Alfrgani .Ali. "Analysis of Operating System: Android." *American Journal of Engineering Research (AJER)*, vol. 9(11), 2020, pp. 01-06.