© 2014 IJIRT | Volume 1 Issue 7 | ISSN: 2349-6002

ANDROID OS EXPLOITS: THE ROBUST

Lalit Kumar, Gourav Agghi, Nishant Malik, Ajay Anand

***Abstract*- Android is a software stack for mobile device that includes an operating system, middleware and key applications. The research plan involves essentially surveying the policies of the android operating system, including scheduling, memory management, multitasking on android, newest android versions. Smartphones devices such as Samsung, and those supporting android operating system are progressively making an impact on the society. Primarily the research paper examine how the android OS differs from the Linux2.6 upon which it was based, though if time permits, the research paper plan to compare stress tests between android and other OS. 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. The first android is launched in HTC dream (GI) which is even far good then other operating systems at that time. The history of the android OS. The different versions launched by the "GOOGLE" for android OS till 2014 and new versions which will be launched in next year.**

***Index Terms*- Android operating system, Android Architecture, multitasking, memory management, newest versions, history, comparison**

I. INTRODUCTION

Android is a software stack for mobile devices that includes an operating system, middleware and key applications. Google Inc. purchased the initial developer of the software, Android Inc., in 2005. Android's mobile operating system is based on a modified version of the Linux kernel. Google and other members of the Open Handset Alliance collaborated on Android's development and release. The Android Open Source Project (AOSP) is tasked with the maintenance and further development of Android. The Android operating system is the world's best-selling Smartphone platform. Android has a large community of developers writing applications that extend the functionality of the devices. There are currently over 150,000 apps available for Android. Android Market is the online app store run by Google, though apps can also be downloaded from third-party sites. Developers write primarily in the Java language, controlling the device via Google-developed Java libraries. The unveiling of the Android distribution on 5 November 2007 was announced with the founding of the Open Handset Alliance, a consortium of 80 hardware, software, and telecom companies devoted to advancing open standards for mobile devices. Google released most of the Android code under the Apache License, a free software and open source license [1]. The Android open-source software stack consists of Java applications running on a Java-based, object-oriented application. Libraries written in C include the surface manager, Open Core media framework, SQLite relational database management system, OpenGL ES 2.0 3D graphics API, Web Kit layout engine, SGL graphics engine. **The Android operating system, including the Linux kernel, consists of roughly 12 million lines of code including 3 million lines of XML, 2.8 million lines of C, 2.1 million lines of Java, and 1.75 million lines of C++.**

II. HISTORY

1. 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." Despite the obvious past accomplishments of the founders and early employees, Android Inc. operated secretively, admitting only that it was working on software for mobile phones.

2. 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. Not much was known about Android Inc. at the time of the acquisition, but many assumed that Google was planning to enter the mobile phone market with this move. Google published the entire source code under an Apache License. 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 .The versions of Android released by Google are: 2.0/2.1 (Éclair), 2.2 (Frodo) , 2.3 (Gingerbread), 3.0 (Honeycomb), (Ice Cream), 4.1/4.2 (jellybean), 4.4 (kit Kat) .

III. ANDROID MARKET

Android Market is the online software store developed by Google for Android devices. An application program ("app") called "Market" is preinstalled on most Android devices and allows users to browse and download apps published by third-party developers, hosted on Android Market. As of December 2013 there were about 400,000 games, applications and widgets available on the Android Market, with an estimated 2.5 billion total downloads. Only devices that comply with Google's compatibility requirements are allowed to preinstall Google's closed-source Android Market app and access the Market .The Market filters the list of applications presented by the Market app to those that are compatible with the user's device, and developers may restrict their applications to particular carriers or countries for business reasons. Google announced the Android Market on 28 August 2008, and it was available to users on 22 October 2008. Support for paid applications was available from 13 February 2009 for US and UK developers, with additional support from 29 countries on 30 September 2010.In February 2011, the Android Market was made fully accessible on the web, allowing users to browse and pick up applications using their PCs, send them to their mobile phone and make comments on them. All this functionality was previously accessible only from mobile phone devices. Users can install apps directly using APK files, or from alternative

app.

IV. APP INVENTOR FOR ANDROID

On 12 July 2010 Google announced the availability of App Inventor for Android, a Web-based visual development environment for novice programmers, based on MIT's Open Blocks Java library and providing access to Android devices' GPS, accelerometer and orientation data, phone functions, text messaging, speech-to-text conversion, contact data, persistent storage, and Web services, initially including Amazon and Twitter ."We could only have done this because Android's architecture is so open" .Under development for over a year, the block-editing tool has been taught to non-majors in computer science at Harvard, MIT, Wellesley, and the University of San Francisco, where Professor David Wolber developed an introductory computer science course and tutorial book for non-computer science students based on App Inventor for Android.

V. ANDROID OPERATING SYSTEM

The Android OS can be used as an operating system for cell phones, netbooks and tablets, including the Dell Streak, Samsung Galaxy Tab, TV and other devices .The first commercially available phone to run the Android operating system was the HTC Dream, released on 22 October 2008.

VI. ANDROID ARCHITECTURE

Figure 1 outlines the current (layered) Android Architecture.[3] The modified Linux kernel operates as the HAL, and provides device driver, memory management, process management, as well as networking functionalities, respectively. The library layer is interfaced through Java (which deviates from the traditional Linux design). It is in this layer that the Android specific lib (Bionic) is located. The surface manager handles the user interface (UI) windows. The Android runtime layer holds the Dalvik Virtual Machine (DVM) and the core libraries (such as Java or IO). Most of the functionalities available in Android are provided via the core libraries. The application framework houses the API interface. In this layer, the activity manager governs the application life cycle. The content providers enable applications to either access data from other applications or to share their own data. The resource manager provides access to non-code resources (such as graphics), while the notification manager enables applications to display custom alerts. On top of the application framework are the built-in, as well as the user applications, respectively. It has to be pointed out that a user application can replace a built-in application, and that each Android application runs in its own process space, within its own DVM instance.

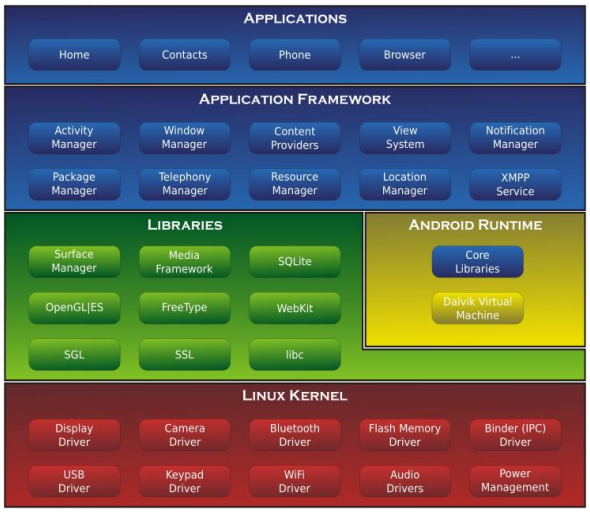


Figure 1: Framework

VII. MEMORY MANAGEMENT

Since Android devices are usually battery-powered, Android is designed to manage memory to keep power consumption at a minimum, in contrast to desktop operating systems which generally assume they are connected to unlimited main electricity. When an Android app is no longer in use, the system will automatically suspend it in memory – while the app is still technically "open", suspended apps consume no resources (e.g. battery power or processing power) and sit idly in the background until needed again. This has the dual benefit of increasing the general responsiveness of Android devices, since apps don't need to be closed and reopened from scratch each time, but also ensuring background apps do not consume power needlessly. Android manages the apps stored in memory automatically when memory is low, the system will begin killing apps and processes that have been inactive for a while, in reverse order since they were last used (i.e. oldest first). This process is designed to be invisible to the user, such that users do not need to manage memory or the killing of apps themselves. However, confusion over Android memory management has resulted in third-party task killers becoming popular on the Google play store; these third-party task killers are generally regarded as doing more harm than good.

VIII. POWER MANAGEMENT

In the mobile device arena, power management is obviously paramount. That does not imply though that power management should be neglected on any other system. Hence, power management in any IT system, with any operating system, is considered a necessity due to the ever increasing power demand of today's computer systems. To illustrate, to reduce and manage power consumption, Linux based systems provide power-saving features such as clock gating, voltage scaling, activating sleep modes, or disabling memory cache. Each of these features reduces the system's power consumption (normally at the expense of increased latency behaviour). Most Linux based systems manage power consumption via the Advanced Configuration and Power Interface (ACPI). Android based systems provide their own power management infrastructure (labelled Power Manager) that was designed based on the premise that a processor should not consume any power if no applications or services actually require power. Android demands that applications and services request CPU resources via wake locks through the Android application framework and native Linux

libraries. If there are no active wake locks, Android will shut down the processor.

Current Features and Specification:

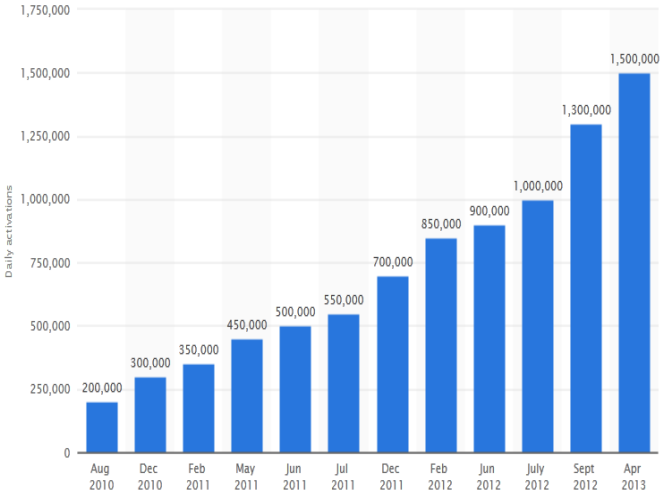
- **Messaging:**
  SMS and MMS are available forms of messaging, including threaded text messaging and Android Cloud To Device Messaging (C2DM) and now enhanced version of C2DM, Android Google Cloud Messaging (GCM) is also a part of Android Push Messaging service.
- **Web browser:**
  The web browser available in Android is based on the open-source Blink (previously Web Kit) layout engine, coupled with Chrome's V8 JavaScript engine. The browser scores 100/100 on the Acid3 test on Android 4.0.
- **Voice based features:**
  Google search through voice has been available since initial release. Voice actions for calling, texting, navigation etc. Are supported on Android 2.2 onwards. As of Android 4.1, Google has expanded Voice Actions with the ability to talk back and read answers from Google's Knowledge Graph when queried with specific commands. The ability to control hardware has not yet been implemented.
- **Multi-touch:**
  Android has native support for multi-touch which was initially made available in handsets such as the HTC Hero. The feature was originally disabled at the kernel level (possibly to avoid infringing Apple's patents on touch-screen technology at the time).Google has since released an update for the Nexus One and the Motorola Droid which enables multi-touch natively.
- **Multitasking:**
  Multitasking of applications, with unique handling of memory allocation, is available.
- **Screen capture:**
  Android supports capturing a screenshot by pressing the power and volume-down buttons at the same time. Prior to Android4.0, the only methods of capturing a screenshot were through manufacturer and third-party customizations or otherwise by using a PC connection (DDMS developer's tool). These alternative methods are still available with the latest Android.
- **Video calling:**
  Android does not support native video calling, but some handsets have a customized version of the operating system that supports it, either via the UMTS network (like the Samsung Galaxy S) or over IP. Video calling through Google Talk is available in Android 2.3.4 and later. Gingerbread allows Nexus S to place Internet calls with a SIP account. This allows for enhanced VoIP dialling to other SIP accounts and even phone numbers. Skype 2.1 offers video calling in Android 2.3, including front camera support. Users with the Google+ Android app can video chat with other google+ users through hangouts.
- **Accessibility:**
  Built in text to speech is provided by Talk back for people with low or no vision. Enhancements for people with hearing disabilities are available as is other aids.
- **Connectivity:**
  Android supports connectivity technologies including GSM / EDGE, Wi-Fi, Bluetooth, LTE, CDMA, EV-DO, UMTS, NFC, IDEN and Wi MAX.
- **Bluetooth:**
  Supports voice dialling and sending contacts between phones, sending files (OPP), accessing the phone book (PBAP), A2DP and AVRCP. Keyboard, mouse and joy stick (HID) support is available in Android 3.1+, and in earlier versions through manufacturer customizations and third-party applications.
- **Tethering:**

Android supports tethering, which 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.

IX. MEDIA

- **Streaming media support:**
  RTP/RTSP streaming (3GPP PSS, ISMA), HTML progressive download Adobe Flash Streaming (RTMP)and HTTP Dynamic Streaming are supported by the Flash plug-in. Apple HTTP Live Streaming is supported by RealPlayer for Android, and by the operating system since Android 3.0 (Honeycomb).
- **Media support:**
  Android supports the following audio/video/still media formats: Web M, H.263 , H.264 , AAC , HE-AAC (in 3GP or MP4 container), MPEG-4 SP , AMR , AMR-WB (in 3GP container), MP3 , MIDI , FLAC, WAV , JPEG , PNG , GIF , BMP , Web.
- **External storage:**
  Most Android devices include micro SD slot and can read micro SD cards formatted with FAT 32 , Ext3 or Ext4 file system. To allow use of high-capacity storage media such as USB flash drives and USB HDDs, many Android tablets also include USB 'A' receptacle. Storage formatted with FAT32 is handled by Linux Kernel VFAT driver, while 3rd party solutions are required to handle other popular file systems such as NTFS, HFS Plus and ex FAT .For more details on Android Support for Adaptive Bit rate video, Encoding.com has created a comprehensive reference. http://features.encoding.com/android/

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



X. OTHER

- **Java support:**
  While most Android applications are written in Java, there is no Java Virtual Machine in the platform and Java byte code is not executed. Java classes are compiled into Dalvik executable, a specialized virtual machine designed specifically for Android and optimized for battery-powered mobile devices with limited memory and CPU [6]. J2ME support can be provided via third-party applications.
- **Handset layouts:**
  The platform works for various screen sizes from Smartphone sizes and to tablet size, and can potentially connect to an external screen, e.g. through HDMI, or wirelessly with Mira cast. Portrait and landscape orientations are supported and usually switching between by turning. A 2D graphics library, 3D graphics library based on OpenGL ES 2.0 specifications is used.
- **Storage:**
- SQLite, a lightweight relational database, is used for data storage purposes.

XI. ANDROID SECURITY PROGRAM OVERVIEW

Early on in development, the core Android development team recognized that a robust security

model was required to enable a vigorous ecosystem of applications and devices built on and around the Android platform and supported by cloud services. As a result, through its entire development lifecycle, Android has been subjected to a professional security program. The Android team has had the opportunity to observe how other mobile, desktop, and server platforms prevented and reacted to security issues and built a security program to address weak points observed in other offerings.

The key components of the Android Security Program include:

- **Design Review**:
  The Android security process begins early in the development lifecycle with the creation of a rich and configurable security model and design. Each major feature of the platform is reviewed by engineering and security resources, with appropriate security controls integrated into the architecture of the system.
- **Penetration Testing and Code Review**:
  During the development of the platform, Android-created and open-source components are subject to vigorous security reviews. These reviews are performed by the Android Security Team, Google's Information Security Engineering team, and independent security consultants. The goal of these reviews is to identify weaknesses and possible vulnerabilities well before the platform is open-sourced, and to simulate the types of analysis that will be performed by external security experts upon release.
- **Open Source and Community Review**:
  The Android Open Source Project enables broad security review by any interested party. Android also uses open source technologies that have undergone significant external security review, such as the Linux kernel. Google Play provides a forum for users and companies to provide information about specific applications directly to users [8].
- **Incident Response**: Even with all of these precautions, security issues may occur after shipping, which is why the Android project has created a comprehensive security response process.

A full-time Android security team constantly monitors Android specific and the general security community for discussion of potential vulnerabilities. Upon the discovery of legitimate issues, Android team has are response process that enables the rapid mitigation of vulnerabilities to ensure that potential risk to all Android users is minimized. These cloud-supported responses can include updating the Android platform (over-the-air updates), removing applications from Google

Graph [2]: Increase in Android in Market

SECURITY ARCHITECTURE:
Android seeks to be the most secure and usable operating system for mobile platforms by re-purposing traditional operating system security controls to:

- Protect user data
- Protect system resources (including the network)
- Provide application isolation

To achieve these objectives, Android provides these key security features:

- Robust security at the OS level through the Linux kernel
- Mandatory application sandbox for all applications
- Secure interposes communication
- Application signing
- Application-defined and user-granted permissions

Figure summarizes the security components and considerations of the various levels of the Android software stack. Each component assumes that the

components below are properly secured. With the exception of a small amount of Android OS code running as root, all code above the Linux Kernel is restricted by the Application Sandbox.

XII. CONCLUSION

We have learned through my research that Android is much more diverse operating system than iOS and Windows phone mobile. Android has grown rapidly over the past 4 years becoming the most used smartphone operating system in the world. It's because android doesn't release 1 phone for 1 company with 1 new OS every year, but countless phones from numerous companies, adding their own twist, throughout the year, developing gradually day-by-day. Android ability to customize is unparalleled compared to Apple's and Microsoft software allowing the user to change and customize nearly every aspect of Android which most iPhone and window 8 users wouldn't dream possible. We are not to say that Android is better or worse than one OS, but is unique and incomparable to other to the other mobile operating system.

REFERENCES

[1] Lextrait, Vincent (January 2010). "The Programming language (http://www.lextrait.com/Vincent/implementations) .

[2] Ashlee Vance and Brad Stone (24 March 2011). "Google Holds Honeycomb Tight" (http:/ / www. business week. com/ technology/ content/mar2011/ tc20110324_269784.htm).Bloomberg Business Week. Retrieved 27 March 2011.

[3] Asad, Taimur (24 February 2011). "Google Releases Android 3.0".Tom's Guide.

[4] http:/ / www. Android-x86. Org/

[5] "Licenses" (http:/ / source. android. com/ source/ licenses. html). Android Open Source Project. Open Handset Alliance. . Retrieved 2010-06-10.

[6] Liang, "System Integration for the Android Operating System", National Taipei University, 2010

[7]http://en.wikipedia.org/wiki/Android_(operating_system)

[8] Android Magazine UK –Issue 35, 2014

[9] Mochol, Malgorzata, Holger Wache, and Lyndon Nixon. "Improving the accuracy of job Search with semantic techniques." Berlin, Germany, 2007

[10] Frivolt, Gyorgy, and Maria Bielikov. Improving Job Search by Network of Professions and Companies. Bratislava, Slovakia: Institute of Informatics and Software Engineering, 2006

[11] Sugawara, Kenji. "Agent-Based Application for Supporting Job Matchmaking for Teleworkers. "Second IEEE International Conference on Cognitive Informatics (ICCI'03).2003. pp. 137

[12] Bogle, Salathiel, and Suresh Sankaranarayanan. "Intelligent Agent based Job Search System in Android Environment." 2011 IEEE International Conference on Electro/Information.