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Android Operating System : A Review

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ABSTRACT

The android operating system is basically an operating system for cell phones and one of the most contributor in the shares of market, including the number of smart phones and tablets which are either released or set to be released. It is an operating system that is utilized a modified version of the Linux kernel 2.6. Androids are developed by Google as the component of the open handset alliance which is a group of approximately mobile and technology companies who are performing to open up the mobile handset environment. The Androids progress kit supports most of the support many of the standard packages used by jetty, because of this fact and lightweight foot print, it was plausible to port jetty to it as it can run on the android platform.

Keywords: Android, Version History, Android Security, SSL, Features, Service.

I. INTRODUCTION

Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touch screen mobile devices such as smart phones and tablets. Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input. In addition to touch screen devices, Google has further developed Android TV for televisions, Android Auto for cars, and Android Wear for wrist watches, each with a specialized user interface. Variants of Android are also used on game consoles, digital cameras, PCs and other electronics.

Initially developed by Android Inc., which Google bought in 2005, Android was unveiled in 2007, along with the founding of the Open Handset Alliance – a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. Beginning with the first commercial Android device in September 2008, the operating system has gone through multiple major releases, with the current version being 8.0 "Oreo", released in August 2017. Android applications ("apps") can be downloaded from the Google Play store, which features over 2.7 million apps as of February 2017. Android has been the best-selling OS on tablets since 2013, and runs on the vast majority[a] of smart phones. As of May 2017, Android has two billion monthly active users, and it has the largest installed base of any operating system.

Figure 1. Evolution of android

II. VERSION HISTORY

Android is updating day by day since its release. These updates to the base operating system mainly focusing on fixing bugs as well as adding new features to provide more comfortable environment. Generally each new version of the Android operating system is developed under a code name based on a dessert item. Past updates included Cupcake and Donut. The most recent released versions of Android are:

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 multi core processors and hardware acceleration for graphics. The Honeycomb SDK has been released and the first device featuring this version, the Motorola Xoom tablet, went on sale in February 2011. Google has chosen to withhold the development source code, which calls into question the "openness" of this Android release. Google claims this is done to eliminate manufacturers putting a tablet-specific OS on phones, much like the previous autumn, where tablet manufacturers put a non-tablet optimized phone OS (Android 2.x) on their Tablets resulting in bad user experiences.

4.0 (Ice Cream), a combination of Gingerbread and Honeycomb into a "cohesive whole. This version had new features added to the Smartphone's Such as photo enhancements, offline email searching, facial recognition unlock, network data, and usage monitoring.

4.0 (Ice Cream Sandwich) is a version of the Android mobile operating system developed by Google. Unveiled on October 19, 2011, Android 4.0 builds upon the significant changes made by the tablet only release Android 3.0 "Honeycomb", in an effort to create a unified platform for both smart phones and tablets, whilst simplifying and modernizing the overall Android experience around a new set of human interface guidelines. As part of these efforts, Android 4.0 introduced a new visual appearance codenamed "Holo", which is built around a cleaner, minimalistic design, and a new default typeface named Robot.

4.1,4.2,4.3(Jelly Bean) is the name given to three major point releases of the Android mobile operating system developed by Google, spanning versions between 4.1 and 4.3.1.The first of these three, 4.1, was unveiled at Google's I/O developer conference in June 2012, focusing on performance improvements designed to give the operating system a smoother and more responsive feel, improvements to the notification system allowing for "expandable" notifications with action buttons, and other internal changes. Two more releases were made under the Jelly Bean name in October 2012 and July 2013 respectively, including 4.2—which included further optimizations, multi-user
Support for tablets, lock screen widgets, quick settings, and screen savers, and 4.3—contained further improvements and updates to the underlying Android platform.

4.4 (Kit Kat) is a version of the Android mobile operating system developed by Google. Google announced Android 4.4 Kit Kat 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. Kit Kat debuted on Google's Nexus 5 on October 31, 2013, and was optimized 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) is a version of the Android mobile operating system developed by Google, spanning versions between 5.0 and 5.1.1.Unveiled on June 25, 2014, during the Google I/O conference, it became available through official lover-the-air(OTA) updates on November 12, 2014, for select devices that run distributions of Android serviced by Google. Its source code was made available on November 3, 2014.

6.0 (Marshmallow) is an upcoming up to date to the Android mobile operating system, most likely to be released in Q3 2015 ("tentatively slated for September"),with its third and final preview released on August 17, 2015.Marshmallow will primarily focus on improving the overall user experience, and will bring a few features such as a redesigned permission model in which applications are no longer automatically granted all of their specified permissions at installation time, Doze power scheme for extended battery life when a device is not manipulated by the user, and native support for fingerprint recognition.

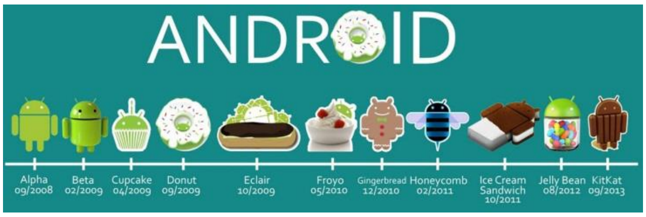

Figure 2. versions of android

A. **Secure Sockets Layer (SSL)**

This class extends Sockets and provides secure socket using protocols such as the "Secure Sockets Layer" (SSL) or IETF "Transport Layer Security" (TLS) protocols. Such sockets are normal stream sockets, but they add a layer of security protections over the underlying network transport protocol, such as TCP. Those protections include:

- ✓ **Integrity Protection.** SSL protects against modification of messages by an active wire tapper.
- ✓ **Authentication.** In most modes, SSL provides peer authentication. Servers are usually authenticated, and clients may be authenticated as requested by servers.
- ✓ **Confidentiality (Privacy Protection).** In most modes, SSL encrypts data being sent between client and server. This protects the confidentiality of data, so that passive wire tappers won't see sensitive data such as financial information or personal information of many kinds.

These kinds of protection are specified by a "cipher suite", which is a combination of cryptographic algorithms used by a given SSL connection. During the negotiation process, the two endpoints must agree on a cipher suite that is available in both environments. If there is no such suite in common, no SSL connection can be established, and no data can be exchanged. The cipher suite used is established by a negotiation process called "handshaking". The goal of this process is to create or rejoin a "session", which may protect many connections over time. After handshaking has completed, you can access session attributes by using the *get Session* method. The initial handshake on this connection can be initiated in one of three ways:

- ✓ calling **start Handshake** which explicitly begins handshakes
- ✓ any attempt to read or write application data on this socket causes an implicit handshake
- ✓ a call to **get Session** tries to set up a session if there is no currently valid session, and an implicit handshake is done.

If handshaking fails for any reason, the **SSL Socket** is closed, and no further communications can be done.

There are two groups of cipher suites which you will need to know about when managing cipher suites:

- ✓ Supported cipher suites: all the suites which are supported by the SSL implementation. This list is reported using getSupportedCipherSuites.
- ✓ Enabled cipher suites, which may be fewer than the full set of supported suites. This group is set using the setEnabledCipherSuites method, and queried using the get Enabled CipherSuites method. Initially, a default set of cipher suites will be enabled on a new socket that represents the minimum suggested configuration.

Implementation defaults require that only cipher suites which authenticate servers and provide confidentiality be enabled by default. Only if both sides explicitly agree to unauthenticated and/or non-private (unencrypted) communications will such a cipher suite be selected.

When SSLSockets are first created, no handshaking is done so that applications may first set their communication preferences: what cipher suites to use, whether the socket should be in client or server mode, etc. However, security is always provided by the time that application data is sent over the connection.

You may register to receive event notification of handshake completion. This involves the use of two additional classes. Hand shake Completed Event objects are passed to Hand shake Completed Listener instances, which are registered by users of this API. SSL Sockets are created by SSL Socket Factories, or by accepting a connection from a SSL Server Socket.

A SSL socket must choose to operate in the client or server mode. This will determine who begins the handshaking process, as well as which messages should be sent by each party. Each connection must have one client and one server, or handshaking will not progress properly. Once the initial handshaking has started, a socket cannot switch between client and server modes, even when performing renegotiations.

B. Android Security

The open nature of Android and its large user base have made it an attractive and profitable platform to attack. Common exploits and tool kits on the OS can be utilized across a wide number of devices, meaning that attackers can perform exploits en masse and re-use attack vectors. Google did take measures in the development of the Android kernel to build security measures in; the OS is sandboxed, preventing malicious processes from crossing between applications. Whilst this attempt to eliminate the concept of infection is admirable in some regards, it fails to address the issue of infection altogether.

Android is a victim of its own success, not just in the way it has attracted malicious attention, but in its very nature. One of the reasons the OS has succeeded in gaining market share so rapidly is that it is open source. It is essentially free for manufacturers to implement. Additionally this has led to substantial fragmentation of Android versions between devices and means that vendors have been reluctant to roll-out updates, presumably out of some concern regarding driving demand for future devices.

Figure 3. Logo of Android

C. Service

A Service is code that is long- lived and runs without a UI. A good example of this is a media player playing songs from a play list. In a media player application, there would probably be one or more activities that allow the user to choose songs and start playing them. However, the music playback itself should not be handled by an activity because the user will expect the music to keep playing even after navigating to a new screen. In this case, the media player activity could start a service using Context. Start Service () to run in the background to keep the music going. The system will then keep the music playback service running until it has finished. Note that you can connect to a service (and start it if it's not already running) with the Context. Bind Service () method. When connected to a service, you can communicate with it through an interface exposed by the service. For the music service, this might allow you to pause, rewind, etc.

III. FEATURES OF ANDROID OPERATING SYSTEM

1) Storage: SQLite, a lightweight relational database, is used for data storage purposes.

2**) Connectivity**: Android supports connectivity technologies including GSM EDGE, IDEN, CDMA, EVDO, UMTS, Bluetooth, WI-FI, LTE, NFC and WI MAX.

3) 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.

4**) Multiple language support**: Android supports multiple languages.

5) Web browser: The web browser available in Android is based on the open- source Web Kit layout engine, coupled with Chrome’s V8 JavaScript engine. The browser scores 100/100 on the Acid3 test on Android 4.0.

6) 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 Dalvikexecutables and run on Dalvik, a specialized virtual machine designed specifically for Android and optimized for battery powered mobile devices with limited memory and CPU. J2ME support can be provided via third party applications.

7) 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.

8) Bluetooth: Supports A2DP, AVRCP, sending files (OPP), accessing the phone book (PBAP), voice dialing and sending contacts between phones. Keyboard, mouse and joystick (HID) support is available in Android 3.1+, and in earlier versions through manufacturer customizations and third-party applications.

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

10**) Screen capture**: Android supports capturing a screenshot by pressing the power and volume-down buttons at the same time. Prior to Android 4.0, 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.

11) 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 (Gingerbread) and later. Gingerbread allows Nexus Sto place Internet calls with a SIP account. This allows for enhanced VoIP dialing 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.

Figure 4. Snapshot of Android Phone

IV. APPLICATIONS

Applications ("apps"), which extend the functionality of devices, are written using the Android software development kit (SDK) and, often, the Java programming language that has complete access to the Android APIs. Java may be combined with C/C++, together with a choice of non-default runtimes that allow better C++ support; the Go programming language is also supported since its version 1.4, which can also be used exclusively although with a restricted set of Android APIs. The SDK includes a comprehensive set of development tools, including a debugger, software libraries, a handset emulator based on QEMU, documentation, sample code, and tutorials. Initially, Google's supported integrated development environment (IDE) was Eclipse using the Android Development Tools (ADT) plug-in; in December 2014, Google released Android Studio, based on IntelliJ IDEA, as its primary IDE for Android application development. Other development tools are available, including a native development kit (NDK) for applications or extensions in C or C++, Google App Inventor, a visual environment for novice programmers, and various cross platform mobile web applications frameworks. In January 2014, Google unveiled an framework based on Apache Cordova for porting Chrome HTML 5 web applications to Android, wrapped in a native application shell.

Android has a growing selection of third-party applications, which can be acquired by users by downloading and installing the application's APK (Android application package) file, or by downloading them using an application store program that allows users to install, up- date, and remove applications from their devices. Google Play Store is the primary application store installed on Android devices that comply with Google's compatibility requirements and license the Google Mobile Services software. Google Play Store allows users to browse, download and update applications published by Google and third-party developers; As of July 2013, there are more than one million applications available for Android in Play Store. As of May 2013, 48 billion applications have been installed from Google Play Store and in July 2013, 50 billion applications were installed. Some carrier's offer direct carrier billing for Google Play application purchases, where the cost of the application is added to the user's monthly bill.

Figure 5. Android Application

V. CONCLUSION

I've learned through my research that Android is a much more diverse operating system than iOS and Windows Phone Mobile. Android has grown rapidly over the past 4 years becoming the most used smart phone operating system in the world. It's because Android doesn't release 1 phone from 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's ability to customize is unparalleled compared to Apple's and Microsoft's software allowing the user to change and customize nearly every aspect of Android which most iPhone and Windows 7 users wouldn't dream possible. I am not one to say that Android is better or worse than one OS, but is unique and incomparable to other mobile operating systems.

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