ANDROID A LATEST TECHNOLOGY FOR MOBILE PHONES A REVIEW

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Abstract: Android is an open source Linux based operating system. In this paper, I concerned on android operating system, history, licensing, architecture, and boot up process, applications and services provided by an android device. I hereby state that it is a review paper and the whole information in this paper is gathered from various resources by me.

Keywords: Operating system, android, bootup process, licensing, service, applications.

I. INTRODUCTION

The World today is contracting with the growth of mobile phone technology. As the number of user's increases day by day, technologies are also getting advanced.

In beginning, the handsets i.e. the mobile phone were used only for making calls, but now a days, they're performing innumerable functions due to the advancement in technology . The basis of working of a handset is its operating system. It may be android, symbian, Java, windows etc.

An operating system can be defined as an interface between the user and the hardware of a system. OS have developed a lot in last 15 years. Android is the most popular mobile phone operating system.

Android is a free and open source operating system that's why there are a plenty of android phone applications. It is a Linux based OS designed for touch screen mobile devices.

Figure 1: Android Logo

II. LITERATURE SURVEY

Bhardwaj et al. present android operating system. They discussed versions of android, architecture of android, android security and services [8].

Li Ma et al. surveyed on mobile application for Android platform and presented a review paper, Research and development of mobile app for android platform. In that paper, they described development base of android on java and android SDK [9].

Sarkania and Bhalla presented their research paper on Android Internals. In that paper, they discussed how the android bootup process differs from Linux [10].

Jose et al. presented a research paper on challenges and issues in Android App Development – An overview. In which they described an overview of issues and

challenges faced by android app development [11].

Tiwari et al. presented a review paper on Android and Smartphone security this paper described the security system of android, issues of security and need of improvement in it [12].

III. HISTORY

Android, Inc. was founded by Andy Rubin in Palo Alto, California in October 2003. Google acquired it on August 17, 2005 as Rubin ran out of money. Google made it wholly owned subsidiary of Google. Rubin Miner and white, after acquisition stayed at the company. The team led by Rubin developed mobile device platform powered by Linux Kernel at Google.

On Nov 5, 2007, the OMA, with goal to developed open standards for mobile devices, unveiled android a mobile device platform on Linux Kernel V2.6, Ist commercially available phone to run Android was the HTC Dream launched on October 22, 2008.

Licensing

Source code for Android is freely available under open source software licenses. Most of the code, published by Google under Apache license version 2.0. Google's android trademark can't be used by device manufacture unless Google certifies that the device compiles with their compatibility Definition Document (CDD).

Applications

There's is a growing selection of third party apps for android, which are acquired by the user from Google play store.

The play store app allows the user to browse, download and update apps by Google and third party. Play store is pre-installed on devices.

On September 2012, these were more than 675000 apps for android.

Apps are developed in java language using Android SDK i.e. developed kit that contains a set of developed tools (debuggers. s/w libraries, handset emulator based on QEMU, documentation, sample code and tutorials). The officially supported integrated dev environment (IDE) is Eclipse that uses Android Developed tools (ADT) plugins.

IV. ANDROID ARCHITECTURE

Android has an open-source software architecture provided by the Open Handset Alliance (OHA). OHA is a group of 71 technology and mobile companies whose objective is to provide a mobile software platform. It includes an operating system, middleware and applications. As for the features, Android incorporates the common features found in-these-days in any mobile device platform, such as: application framework, Reusing, integrated browser, optimised graphics, media support, network technologies, etc.

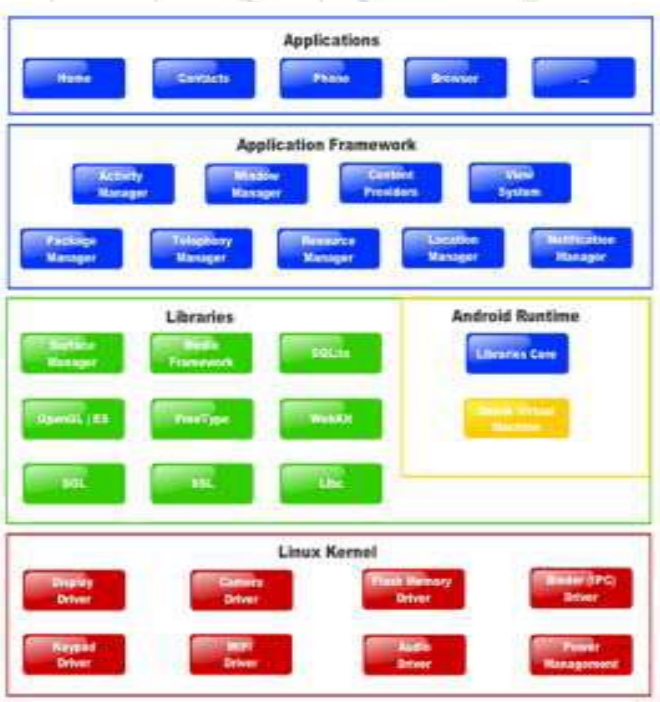

Figure 2: Architecture of Android

The Android architecture, as shown in Figure 2, is composed of five layers:

Applications, Application Framework, Libraries, Android Runtime and finally the Linux kernel.

The uppermost layer, the Applications layer, provides the core set of applications that are commonly offered out of the box with any mobile device. The Application Framework layer

provides the framework. Application Programming Interfaces (APIs) used by the applications running on the uppermost layer. Besides the APIs, there is a set of services that enable the access to the Android's core features such as graphical components, information exchange managers, event managers and activity managers.

V. ANDROID BOOTUP PROCESS

5.1. Power On

Master boot record (MBR) is a boot sector which contains partition table which has the information about how the device is partitioned in a structure. There is no MBR or partition when the device is started for the first time. When the phone is switched on, CPU will be in non initialization state. Internal RAM is available and no internal clocks are set up. The device starts executing code located in the ROM and finds a specific block which has first Stage boot loader. The first boot loader points to a second stage boot loader, which is located in a known block. This "pointing" process is called raw partition table [6].

5.2. Boot loader

Boot loader is a code which is executed before android operating system runs. It loads kernel to the RAM and sets up the initial memories. Manufacturers use existing boot loaders or they create their own boot loaders.

The First stage boot loader will find and setup the external RAM.

Now Main boot loader is loaded and placed in external RAM as the RAM is available.
The First important program is in the second boot loader stage which contains code for file systems, additional memory and network support etc.

When the boot loader is done it goes to the Linux kernel [6].

5.3. Linux kernel

A kernel acts as a bridge between hardware and software. It setups cache protected memory, scheduling and loads drivers. After initializing Memory management units and caches, virtual memory can be used and user space processes can be launched by the system. After finishing the setup Kernel looks for init process which can found under system/core/init and launch it [1].

5.4. Init process

This process is the root process. Every process will be launched from this process. Init process mounts directories like /sys, /dev, /proc. It will run init.rc script and system service processes. This script is located in system/core/rootdir in the Android open source project and describes system services, file system and other parameters [1].

5.5. Zygote

After starting various daemons like Android Debug Bridge (adbd), Radio Interface Layer Daemon (rild), etc, Init process initiates a process called Zygote. In java there is a separate instance of a Virtual Machine for each application. In android Dalvik, virtual machine is used as VM. So there is high consumption of memory and time because of different instances of dalvik VM for every application. Now Zygotes comes into play. It enables shared code across Dalvik VM, lower memory footprint and minimal startup time. Zygote process starts at system boot up and it preloads and initializes core library classes. After initialization, zygote process waits for socket request coming from the runtime process. If any request comes then it forks starts processes with VM instances [6].

5.6. Runtime process

The next init initiates the Runtime process and this process starts the service manager. All the services should be registered with the service manager and it provides local lookup service and binds services given their name. The runtime requests zygote to start system server process. Zygote splits and starts up a new dalvik vm instance and starts the service. To control display device and audio output device the system server starts surface flinger and audio flinger. These services get registered with the service manager so that other applications can use display and audio. Now the system server will start all the core platform services and hardware services like activity manager, window manager and power manager etc. All of these services will get registered with the service manager [2].

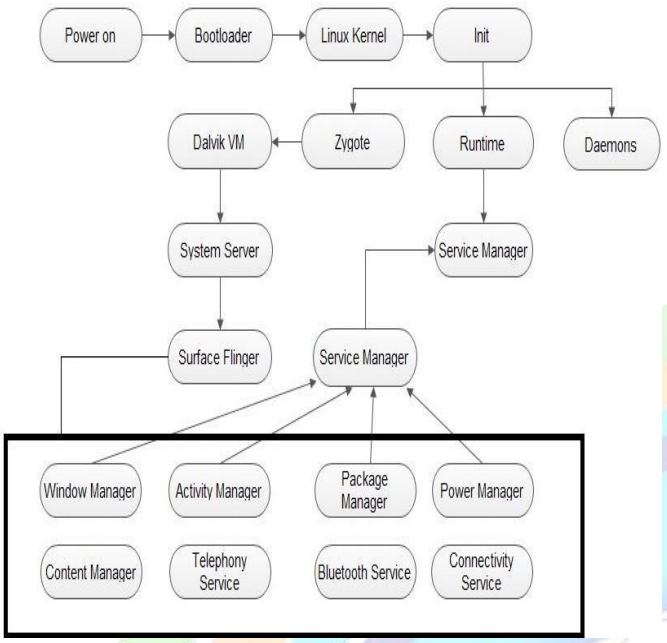

Figure 3: Android Bootup Process

VI. SERVICE

A Service is code that is long-lived and runs without a UI. An ANDROID DEVICE provides following services:-

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 Dalvik executables 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.

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