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FIRMWARE DESIGNING FOR ANDROID MOBILE

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Abstract: The Android mobile platform has developed from its first phone in October 2008 to being the most popular smart phone operating system in the world by 2012. The explosive growth of the platform has been a significant win for consumers with respect to competition and features. The market has been booming in the past few years that, there are now over 1 million applications on the Android market. Due to the wide usage, it is necessary to provide users with security applications to manage the data in their personal smart phones. The Android platform has become one of the most popular operating system with millions of new users each year. If you don't like the firmware the device manufacturer has installed on your Android device, you are free to replace it with your own custom firmware. Custom firmware is also the only way you can install newer versions of Android on devices that are no longer supported by their manufacturers.

KEYWORDS— Dalvik - VM, OHA, AOSP , System Design ,firmware, Android.

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I INTRODUCTION

Today's most of mobile phones are Android based (on basis of Linux Operating system). The platform was originally created by Android Inc., which was then later bought by Google and released as the AOSP (Android Open Source Project) in 2007. This announcement was accompanied by the founding of the OHA (Open Handset Alliance) [4][5], Android phones accounted for 82% of globally sold smart phones in 2nd Quarter of 2020.

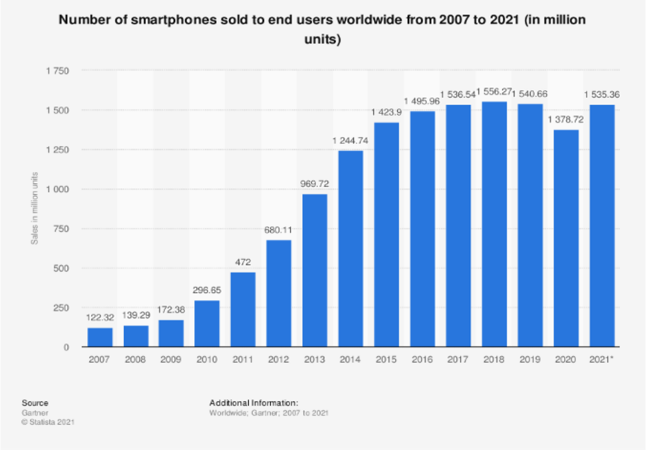


Fig. 1. Smartphone sold in 2020

Linux is an open source operating system. This can be modified (customized) as per different user. The code of Linux is freely available on internet. So most of mobile manufactures like Samsung, HTC, Motorola, Micromax etc. designing android phones Originally, firmware was a term used to refer to tiny, mission-critical programs installed in the read- only memory, or ROM, of an electronic device. Modifying firmware was either impossible or required special equipment that was usually out of the reach of ordinary end users. Android firmware, however, is very different. It includes the entire Android operating system and it is stored in a writable form of memory called NAND flash memory, the same type of memory that is used in storage devices, such as USB sticks and SD cards. The word firmware is used only because device manufacturers didn't bother to come up with a new word forit.

II.RELATEDWORK

Android consists of a UNIX-like operating system based on a 2.6 Linux kernel. The platform has been of course enriched with all necessary elements in order to provide basic functions including network connectivity like GSM and UMTS cellular systems [1].

Unlike other mobile operating systems such as Windows Phone or iOS, Android applications are written in Java and run in a Dalvik VM (Virtual Machine). This virtual machine is a core component, because all Android applications and the application framework are executed by it. Similar to other platforms, applications can be obtained from a dedicated place called Google Play [5].

Major improvements in each release of Android Firmware:

•Cupcake – UI (User Interface) refinement updates of all core elements, accelerometer based application rotations, on-screen soft keyboard, video recording and playback, stereo Bluetooth support;

•Donut – quick search box, VPN (Virtual Private Network) and 802.1x support, battery usage indicator;

•Éclair – Bluetooth 2.1 support, additional camera modes, multiple e-mail and account support;

•Froyo – tethering and Wi-Fi hotspot capability, JIT (Just In Time) compiler, Adobe Flashsupport;

•Gingerbread – NFC (Near Field Communications), additional sensor support (gyroscope, rotation vector, linear acceleration, gravity, barometer), multiple camera support, large screen resolution support (tablets), Google Talk;

•Honeycomb – tablet-only android update, connectivity for USB (Universal Serial Bus) accessories, high-performance Wi-Filock;

•Ice Cream Sandwich – Wi-Fi Direct, Face Unlock, numerous improvements (stability, optimization, screen rotation,graphics);

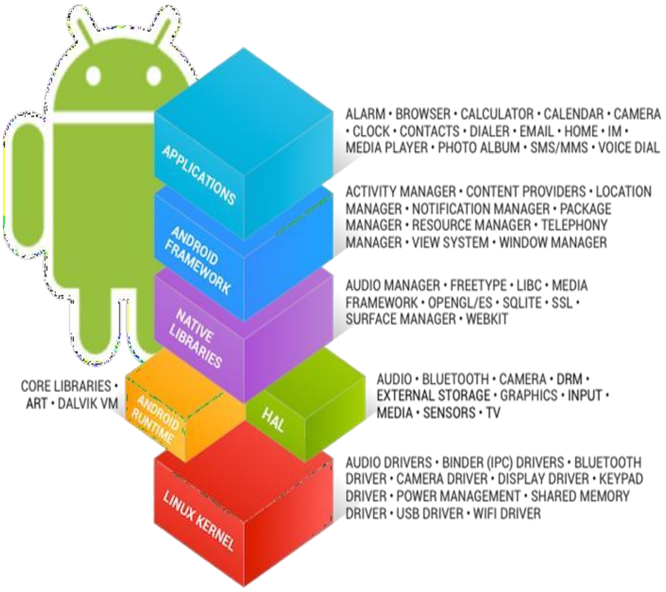
•Jelly Bean – Google Wallet, Google Now, USB audio, Photo Sphere panorama photos, multiple user accounts, Miracast wireless display support;

•KitKat – NFC host card emulation, new experimental runtime virtual machine (ART), Bluetooth MAP (Message Access Profile) support;

•Lollipop – Dalvik replaced with ART with AOT (Ahead-Of-Time) compilation, support for 64-bit CPUs, OpenGL ES 3.1 support, recent activities screen with tasks instead of applications, project Volta (battery life improvements), audio input and output through USBdevices.[1]

III.EXISTINGSYSTEM

The Android system architecture shown in Fig. 2.consists of five layers: Linux kernel, libraries, Android runtime, application framework and application.


APPLICATIONS
ALARM • BROWSER • CALCULATOR • CALENDAR • CAMERA • CLOCK • CONTACTS • DIALER • EMAIL • HOME • IM • MEDIA PLAYER • PHOTO ALBUM • SMS/MMS • VOICE DIAL
ANDROID FRAMEWORK
ACTIVITY MANAGER • CONTENT PROVIDERS • LOCATION MANAGER • NOTIFICATION MANAGER • PACKAGE MANAGER • RESOURCE MANAGER • TELEPHONY MANAGER • VIEW SYSTEM • WINDOW MANAGER
NATIVE LIBRARIES
AUDIO MANAGER • FREETYPE • LIBC • MEDIA FRAMEWORK • OPENGL/ES • SQLITE • SSL • SURFACE MANAGER • WEBKIT
CORE LIBRARIES • ART • DALVIK VM
ANDROID RUNTIME
HAL
AUDIO • BLUETOOTH • CAMERA • DRM • EXTERNAL STORAGE • GRAPHICS • INPUT • MEDIA • SENSORS • TV
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AUDIO DRIVERS • BINDER (IPC) DRIVERS • BLUETOOTH DRIVER • CAMERA DRIVER • DISPLAY DRIVER • KEYPAD DRIVER • POWER MANAGEMENT • SHARED MEMORY DRIVER • USB DRIVER • WIFI DRIVER

Fig. 2. Architecture of Android OS

The kernel is a 2.6 series Linux kernel device driver modified mainly for power and memory management purposes. The next level consists of native libraries written in C or C++. Due to the fact that Android was designed to run on low powered CPU (Central Processing Unit) and GPU (Graphics Processing Unit) devices with limited memory, the main libraries like libc or libm were developed to ensure low memory consumption. This layer contains also a Surface Manager responsible for screen access, a Media Framework optimized for handling audio and videocodecs,

e.g.MP3, MPEG-4 (Moving Picture Experts Group), H.264, a SQL (Structured Query Language) database and a native web browser engine (WebKit).

The Android Runtime includes the Dalvik Virtual Machine and Java Core Libraries. This VM is an interpreter for byte codes that have been converted from standard Java jar files into dex files, which are more compact and efficient than class files considering the limited memory and battery power of an Android mobile device. The most important part of the Application Framework layer is the Activity Manager, responsible for controlling the life cycle of applications. Any Android application runs in its own sandboxed Dalvik VM and can consist of multiple components, e.g. services, activities, content providers, which can interact with each other within one single or many different applications on demand. Additionally to the actual Java class library, the Android SDK contains all tools necessary to build anapplication.

• AAPT (Android Asset Packaging Tool) is a build tool that Android Studio and Android Gradle Plugin use to compile and package your app’s resources. AAPT parses, indexes, and compiles the resources into a binary format that is optimized for the Android platform.

• ADB (Android Debug Bridge) – The Asian Development Bank (ADB) is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extremepoverty.

• AIDL (Android Interface Definition Language) – The Android Interface Definition Language (AIDL) is similar to otherIDLsyou might have worked with. It allows you to define the programming interface that both the client and service agree upon in order to communicate with each other using interprocess communication (IPC).

• DDMS (Dalvik Debug Monitor Service) –The (DDMS) is a debugging tool used in the Android platform. The Dalvik Debug Monitor Service is downloaded as part of the Android SDK. Some of the services provided by the DDMS are port forwarding, on-device screen capture, on-device thread and heap monitoring, and radio state information.

• DX (Dalvik cross-assembler) – converts byte code class files into binary dex files executed by DalvikVM.

Every Mobile manufacture have their own designed Firmware with their won skins and Pre-loaded application set (Bloatware).they provide some basic as well as unnecessary applications which consumes a lot of data as well as memory space available in mobile.

Most of manufactures have low application memory space. Today's applications are heavy which occupy high memory space, which make user's mobile slow and always popup like low space on storageetc.

The basic android firmware provided by manufactures is not easily modified. So some application and add-ons uses more data. It require data synchronization continuously which make system slow as well as effect on the Battery life. Continuous data synchronization require more power supply. So user always need continuous power supply. The battery life of mobile phone get low in just few hours or mobile phone get heat. This may slow the performance of mobile phone.

Here end-user is not have full access as per administrator in Linux. User is not able to control access of personal dada by application which may occur sometime security problem. He/she is not going to set permission like read, write, and access as per different application. Exiting system don't haveenough much modification as user requirement. The official firmware is like a closed box which is not customizable.

IV.PROPOSE SYSTEM

The important reason to design such a firmware is Customization. Many of user like to modify their own system as they want. They always need changes in system.

So in this firmware we are going to design and implement fallowing features like

Super User Access:

Root access in Android/Linux is like the administration permissions in Windows – you get permission to do almost anything in your phone/tablet. Isn't it wonderful? Many of the people get rid of the default firmware to enjoy root access – you become the master of your Android – you decide what apps will be installed, which services will run in the background and much other similarpermission.

Regular Updates:

Many of the times, a new Android release come in the market but your phone company don't provide the update for your phone. Then where you stand? Your mobile vendors forget about your phone and start focusing on its new models. Then in this firmware we are providing regular updates as per official firmware via.

Customizable GUI:

Here user can easily change i.e. they can customize themes (like Icons, Developer Options as well as various modes as per user).Modification is going to easy for end user.

Smooth Performance:

Underclocking can greatly affect your device's battery life. As mentioned, underclocking is only helpful if you're not a game freak and don't use your device that much. In that scenario you should probably underclock your device and restrict its CPU to a suitable low speed.

As the purpose of a CPU is to perform tasks on your Android device, higher is the CPU, faster it will perform the tasks and less will be the chances of lag. Overclocking is mostly useful on old devices having less CPU clockspeed. If you wish to play 3D/HD games or you want to run the games / apps lag free you may Overclock your device's CPU and it will work like a new device with higher clock speed.

Advantages of proposed system:

1. Customize skins to change your entire operating system look.

2. Change quick setting menu which include add your most of used setting shortcut.

3. Easily overclock/underclock to increase performance and battery life.

4. Easily enable root access by toggling a system setting.

V.CONLUSION

User always need Change, if change is not available then user focuses on new product rather than system. It takes a while for manufacturers to adopt a new version of Android to already released devices available on the market. Usually they do not provide a continuous support for all. We are providing a firmware which provide regular update for those mobile designed on specific configuration.

This firmware will improve the system performance as well as battery life. Customization is important part of our development which make user different experience good than default system firmware.

You now know what Android firmware is and how to replace it. I want you to understand that replacing firmware is a risky operation that can potentially make your device unusable. In most cases it also voids your device's warranty. Make sure that you have a backup of your data and a copy of your device's factory image handy before you go ahead and experiment with flashing custom firmware.

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