



The Android - A Widely Growing Mobile Operating System With its Mobile based Applications

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Abstract-

Android operating system is one of the most widely used mobile Operating System these days and also enhancing its use for making betterment in different areas of life. Android mobile operating system is based on the Linux kernel and is developed by Google and primarily designed for smartphones and tablets. Android Operating System consist of four main layers, the specifying architecture is given in this paper. The advanced Smart applications of android in mobile, real-time and wireless sensor network are widening their service areas. Android is a disruptive technology, which was introduced initially on mobile handsets, but has much wider potential. In this paper we are studying, one of the smart and enhancing Android operating system application which are based on Automated and tracking from remote distance. These application helps students, teachers, parents, patients and users of home appliance as anytime and anywhere basis. Being part of today's advance world, using fastest acceptable and mobile Android Operating System it's possible to develop automated attendance system, secure transferring of medical data and automated home appliance monitoring system.

Keywords – Android Operating System, Dalvik Virtual Machine, Linux kernel, Automated attendance, Secure transferring of EMR, remote monitoring.

I. Introduction

Android is a mobile operating system (OS) based on the Linux kernel and is currently developed by Google, with a user interface based on direct manipulation. Android is designed primarily for touchscreen mobile devices such as smartphones and tablets. It also provides specialized user interfaces for televisions, cars, and wrist watches. The OS uses touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. Android's source code is released by Google under open source licenses, although most Android devices ultimately ship with a combination of open source and Proprietary software [1]. 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 [3].

Android, Inc. was founded in Palo Alto, California in October 2003 by Andy Rubin, Rich Miner, Nick Sears and Chris White to develop, in Rubin's words, "smarter mobile devices that are more aware of its owner's location and preferences" [2]. At google, the team lead by Rubin developed a mobile device platform powered by Linux kernel, which provide flexible and upgradable system. Since 2008, Android has seen numerous updates which have incrementally improved the operating system, adding new features and fixing bugs in previous releases. Each major release is named in alphabetical order after a dessert or sugary treat; for example, version 1.5 *Cupcake* was followed by 1.6 *Donut*. Version 4.4.4 *KitKat* appeared as a security-only update; it was

released on June 19, 2014, shortly after 4.4.3 was released [4] [5]. As of November 2014, the newest version of the Android operating system, Android 5.0 "Lollipop", is available for selected devices [6].

The Android is one of the only bestselling Operating System today, In the third quarter of 2013, Android's share of the global smartphone shipment market was 81.3%, the highest ever [7], During this time period over 261 million smartphones were sold globally. As smart phones and tablets become more popular, the operating systems for those devices become more important Android is such an operating system for low powered devices that run on battery and are full of hardware like Global Positioning System (GPS) receivers, cameras, light and orientation sensors, Wi-Fi and UMTS (3G telephony) connectivity and a touch screen. Like all

operating systems Android consists of a kernel application framework which includes Java-compatible libraries based on Apache Harmony. Android uses the Dalvik virtual machine with just-in-time compilation to run compiled Java code. Android has a large community of developers writing applications ("apps") that extend the functionality of the device.

Android was originally designed to be used in mobile computing applications, from handsets to tablets to e-books. But developers are also looking to employ Android in a variety of other embedded systems. In this paper, we presents the applications about Android's real-time behavior and performance based on experimental measurements which are working in different fields. We also present Android Architecture which mainly consist of four layers. In this paper we are studying about the development using Android in various sectors like Mobile Attendance, Electrical Home Appliances, Robot Control form Remote distance, in Healthcare field, etc. which shows us how it can be used in many fields worldwide. Finally, we conclude the paper.

II. Android OS architecture

Android operating system is a stack of software components which is roughly divided into four main layers: the Linux kernel, Native libraries, applications framework, and applications. The kernel is mostly as like as Linux Kernel. The libraries that come with Android provide much of the graphics, data storage, and media capabilities, etc. Within the libraries layer, there is the Android runtime which contains the Dalvik virtual machine, which powers the applications. Android is thought as being yet another operating system! In reality, it is a software platform rather than just an OS; in practical terms, it is an application framework on top of Linux, which facilitates its rapid deployment in many domains. Following figure shows the Android architecture and the details of its four layer below it.

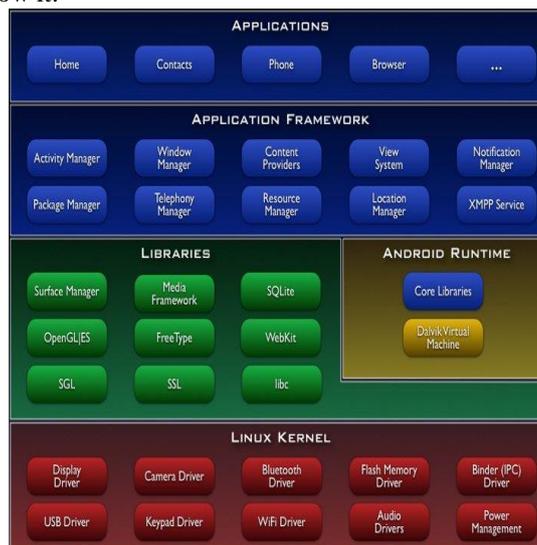


Fig 1. Architecture of Android OS

A. The Linux kernel Layer

The kernel in the Android is based on the Linux. As Linux has a proven track record in desktop systems and in many cases doesn't require drivers to be rewritten, same function benefits Android. Linux



provides you virtual memory, networking, drivers, and power management. Upon examining the kernel shipped with the Android source code, there are not any significant changes to the core functions of the kernel. Some of the core functions that kernel handles includes -

- Enforcement of application permissions and security
- Low-level memory management
- Process management and threading
- The network stack
- Display, keypad input, camera, WiFi, Flash memory, audio, and IPC driver access.

B. Libraries

On top of Linux kernel there is a set of libraries including open-source Web browser engine WebKit, well known library libc, SQLite database which is a useful repository for storage and sharing of application data, libraries to play and record audio and video, SSL libraries responsible for Internet security etc.

- Android is shipped with SGL which acts as the primary 2D graphics renderer. Its counterpart is OpenGL ES which provides 3D graphics support.
- Android comes packaged with SQLite which takes care of most data storage.
- The WebKit web rendering engine is also shipped with Android and has been tailored to render web pages for smaller screen sizes.

The main thing which is of particular interest is Dalvik virtual machine which is a part of this layer. The Dalvik virtual machine is a bytecode interpreter which is highly optimized for executing on the mobile platform. The bytecodes are converted Java binaries that are very quick and efficient to run on smaller processors. The core libraries are written in Java and provide much of the core classes which would normally be available in a Java virtual machine.

C. Applications framework layer

This layer and the layer above it i.e. the Application layer are written completely in Java. The applications framework provides all of the major APIs that the applications will use including things like sharing data, accessing the telephony system, and receiving notifications. The Android application framework provides everything necessary to implement your average application.

The Android application lifecycle involves the following key components:

- Activities are functions the application performs.
- Groups of views define the application's layout.
- Intents inform the system about an application's plans.
- Services allow for background processing without user interaction.
- Notifications alert the user when something interesting happens.

D. Applications layer

You will find all the Android application at the top layer [8]. You can write your application to be installed on this layer only. The most core features such as the phone and the contacts application also reside in this layer. This layer contains software written by the Android team as well as any third-party software that is installed on the device. An effect of allowing third-party developers access to this layer is that the user interface can be overhauled comparatively easily. Third party applications can handle any event that the Android team's application could see such as the phone ringing. Given this model we might expect that, as Android becomes more robust, the user will be able to specify what applications should handle which events.

III. Android OS and its Applications as Mobile OS

A mobile operating system, is an operating system that operates a smartphone, tablet, PDA, or other mobile device. Modern mobile operating systems combine the features of a personal computer operating system with other features, including a touchscreen, cellular, Bluetooth, Wi-Fi, GPS mobile navigation, camera, video camera, speech recognition, voice recorder, music player, near field communication and infrared blaster.



Android which is based on the Linux Kernel is from Google Inc..[9] It has the largest installed base worldwide on smartphones. Most of Android is free and open source, [10] but a large amount of software on Android devices such as Play Store, Google Search, Google Play Services, Google Music, and so on are proprietary, licensed proprietary, closed source applications [11].

Android is basically an operating system for smart phones that is based on a modified version of Linux. Now the Android is a market-mover. Now is an exciting time for mobile developers. Mobile phones have never been more popular and powerful smart phones. With stylish and versatile phones packing hardware features like GPS, accelerometers and touch screens are an enticing platform upon which to create innovative mobile applications. Android developers are free to write applications that take full advantage of increasingly powerful mobile hardware. Android is important is because of its application model. For users of smart phones, Android provides easy access to social networking. Now, everyone having the Android smart phone, because it is cheapest because nowadays mobile companies are also develop the smart phone and provide it in low cost. Android devices come in all shapes and sizes. As of late 2014, the Android OS powers the following types of devices: Smartphone's, Tablets-reader devices, Notebook, MP4 players, Internet TVs. Android use, the recommended IDE is Eclipse, a multi-language software development Environment featuring an extensible plug-in system. It can be used to develop various types of applications, using languages such as Java, C, C++, COBOL, Python, are freely available on Internet. The packages contain the documentation and SDK specific to each version of the Android OS [12]. They also contain sample code and tools for the various platforms. All these are freely available on Internet hence we chose to develop Automated, mobile and real-time applications like Attendance Monitoring, Electronic medical record, Product recognition system, electronic home appliances tracking, etc, application in Android.

Until very recently, Android deployment has been very focused on mobile handsets. This was Google's target market and the available software IP and development tools are designed and configured with this in mind. The potential for Android is enormous in other market areas – anywhere that sophisticated software, including connectivity and a user interface, encapsulates the functionality of a device. Consumer, telecom, automotive, medical and home applications are all attractive candidates for the deployment of Android. Having a cool solution is great, but it is not useful unless it solves a real world problem. The challenge with electronic devices going forward is connectivity and interoperability. Android is well placed to address these issues. The Mentor Graphics approach to enabling Android to reach a wider market is to bring three key attributes to bear on the issue: the supply of development tools, software IP and professional services. The goal is to take Android and create specific editions, tailored to various markets, for various different applications.

To implement all of this and get it working needs extensive tool support for debugging, real time profiling, simulation, target device connection, tracking and so forth. An Android based mobile application for Attendance Monitoring is an example of that type. The application offers reliability, time savings and easy control. It can be used as a base for creating similar applications for tracking attendance, colleges and in offices or any workplace, tracking Health status of patient remotely, etc. And this will help the users to reduce their workload by reducing the time and calculations required to update the data manually. Users of such system will also view the details using the website at anytime and anywhere.

IV. Some Smart Applications of Android as Mobile and Real-time Operating System

Android is an open source platform built by Google that includes an operating system, middleware and applications for the development of devices employing cellular communications [13]. This session takes a look at the design of Android, how it works and how it may be deployed to accelerate the development of a connected device. Along with guidelines to getting started with Android, the Android SDK, its available tools and resources will be reviewed and consideration given to applications for Android beyond conventional mobile handsets such as medical devices, consumer electronics and military/aerospace systems. A brief review of how Android used for mobile and real-time application which are useful for remote tracking and monitoring of some application is studied below.

A. Android based smart home monitoring using wireless sensors

Although Android has many innovative features not available in existing mobile platforms, its designers many tried-and-true approaches proven to work in the wireless world [16]. Common electrical hazards that occur at home are usually associated with the usage of faulty home appliances and electrical distribution.



Also, increasing usage of appliances demands higher electrical power and can cause overloading. The existing electrical house distribution system does not normally offer enough protection and also does not provide adequate warning. The normal protection for residential homes when an over loading happens is that the circuit breaker gets tripped. The best method to improve this situation is to monitor continuously the usage characteristics of electrical power at every power point in real time. One most common application of WSN is in home monitoring which helps to optimally manage the 'well-being' of power distribution in home in order to minimize hazards caused by electrical faults. The study towards the use of WSN for monitoring electrical power and the consequent hazards with a view to ensure the welfare of residents at home using some smart operating system like Android is important [14]. Based on this idea, we have developed a real time power monitoring system that uses android mobile application and wireless sensor network. The android based smart home monitoring [15] (ABASH) system detects the threshold violation in power usage and produces an appropriate alert signal for homeowners to enable them to take proper remedial actions depending on the situation, much before the circuit breaker operates.

B. Automated Attendance Monitoring System

The use of Android in An Educational sector to make it fast, secure for students, their Parents and teachers staff, school management. Student Information Tracking System is an Android application to manage student attendance on mobile [17]. In many colleges teachers use to take attendance manually. Main objective of this application is to add mobility and automation in the existing attendance process. This system helps teachers to take attendance through mobile and also keep in touch with student in some aspect. This System allow teachers to take attendance, edit attendance, view student's bunks, send important notice to parents, send important documents to student such as exam time table, question bank, notice, and all the information can view through different representation format like numerical, graphical format. This system also helps students in, unable to bunk lectures, viewing their bunks and curriculum details. This system gives a prior intimation to student as soon as his attendance goes below the specified attendance deadline in the form of an alert, and SMS will be sent to parents to inform the status or performance of their ward whether the ward is present or absent in the institution. And Class teacher and H.O.D. can view the status of student. This attendance monitoring system based on the concept of web services which is implemented as an Android mobile application that communicates with the database residing on a remote server [18]. The mobile application would require connecting to the database using either General Packet Radio Service (GPRS) or Wi-Fi technology. Apart from that, the application would support strong user authentication and quick transmission of data via the web service. This system as based on Android which is available to most of the teachers as Android based Smartphones are most widely used.

C. Secure transmission medical data for pervasive healthcare system using android

Emerging technologies are transforming the workflows in pervasive healthcare enterprises. Pervasive Healthcare is a one of the developing technology within the pervasive computing paradigm. The presence of pervasive computing, consisting of wireless network gives innovative medium for data transmission of medical applications [19]. In the existing technology of e-Health has less security of Electronic Medical Records (EMR) and cannot access the medical records in wireless medium. An EMR is a digital version of the traditional paper-based medical record for an each patient's record. The EMR represents a medical record within a faculty can access the data, such as a doctor or a patient or administration. The accessing of information from the remote database should be of high security; it should be a secured access of data by authorized persons. It needs a Pervasive Mobile Healthcare solve these problems and provide user to access the multimedia medical record from anywhere and anytime with security, which includes authentication and access control. The authentication is allows the types of users who is authorized to use the application. Security is provided through the process of Encryption and decryption of data. This secured system will provide security in delivering the EMR of patients. Implementation here is done by using Android software and for any database like MySql or Oracal is used in Server system. A Wi-Fi enabled mobile is used to receive or transmit the secured medical data as well as image retrieval. The novelty of this application deals with mobility where the users can able to access the secure information. The mobile application develop for real world environment.



D. A prototype of Vegetarian product recognition system

Food industry for Vegetarians has been the fastest growing global business in Malaysia, therefore Malaysia has focused to set up the world's first development corporation in making Halal development business communities. Today, Muslim consumer still faces problem in identifying, verify or recognized Vegetarian products in the market. Today new technology would be one the advantage in verifying Vegetarian product. This research has presented a system to identify the vegetarian i.e. Halal product by using Smartphone which called MyHalal system. Smartphone scanner, camera and barcode readers are tested. This system is able to verify and recognized the information of products and confirmed their Vegetarians/Halal status in real time which has accessibility to its database while they do shopping. It operated on Android 2.1 open source operating system and can be used at higher application programming interface (API) level [20]. This prototype system is novel from others by having detailed information, large database and enable users to contact directly to product business market. Direct contact features also can be made to the Malaysian Islamic authority department (JAKIM) on recognition the products. The features of this application would ease, help and benefit Muslim consumers and Vegetarian Consumers to overcome the issue on Vegetarian (Halal) recognition products in the market.

V. Conclusion

As Mobile software development has evolved over time. From above discussion it is clear that Android Operating System has emerged as a new mobile development platform. Android was designed to empower the developer to write innovative applications and their own source code. The platform is open source, with no up-front fees, and developers enjoy many benefits over other competing platforms. We see the Android architecture which is most important to develop applications in different sectors of our life. When a developer install an application that run with its own instance of Dalvik VM. We see that Android is continuously growing and fastest acceptable platform. The time finally arrived when our Android OS would get a quick makeover and offer us with either some more simple or extravagant changes. Android is a truly open, free development platform based on Linux and open source and many application development tools are freely available on the internet. In this paper we see an Android based mobile application for Home monitoring, Attendance Monitoring, Health record monitoring system. The application offers reliability, time savings and easy control. It can be used as a base for creating similar applications for tracking attendance colleges and in offices or any workplace which also works for other sectors. These applications are used by many users on anytime and anywhere basis.

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