New Era of Android Platform – An Operational Method

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Abstract – Introduced the Android platform and the chacteristics of Android applications, gave a comprehensive explanation of Android relevance structure from the potential of developers. This document could make available assistance to understanding the operation method of Android applications and to rising applications on Android platform.

Keywords — SDK Features; 7.2 Android NDK/JNI; XML; Intent

I.   INTRODUCTION

In recent years, the emergence of smart phones has changed the definition of mobile phones. Phone is no longer just a communication tool, but also an essential part of the people's communication and daily life. Various applications added unlimited fun for people's lives. It is certain that the future of the network will be the mobile terminal. Now the Android system in the electronics market is becoming more and more popular, especially in the smartphone market. Because of the open source, some of the development tools are free, so there are plenty of applications generated. This greatly inspired the people to International Journal of Multimedia and Ubiquitous Engineering Vol.9, No.4 (2014) 188 Copyright © 2014 SERSC use the Android system. In addition, it provides a very convenient hardware platform for developers so that they can spend less effort to realize their ideas. This makes Android can get further development [1-4]. As the smart phones and Android system getting popular, the operations like listening to music, watching videos, tweeting and some others can be moved from the computer to a phone now. The applications on the market today are mostly commercial applications, and contain a large number of built-in advertising. If the user prefers to remove the built-in advertising, a certain price must be paid to reach that and this is not convenient. Meanwhile, because of the unfair competition of IT, many applications built illegal program to steal user information and cause some damage to user's personal privacy. Sometimes, users will pay more attention to the user experience of software. Therefore, the development of the application can not only be limited to the function, more attention should be paid to the user's experience. After studying some previous Android applications and access to large amounts of materials, we utilize the Java language, the Eclipse platform, Android ADT and the Android SDK to develop these three mobile applications. These systems have a nice interface and smooth operation. These Apps won't steal any personal information, but can exclude useless information and bring a wonderful user experience.

A.   Features of Mobile Phones

All mobile phones have a number of features in common, but manufacturers also try to differentiate their own products by implementing additional functions to make them more attractive to consumers. This has led to great innovation in mobile phone development over the past 20 years.

The common components found on all phones are:

- A battery, providing the power source for the phone functions.
- An input mechanism to allow the user to interact with the phone. The most common input mechanism is a keypad, but touch screens are also found in some high-end smart phones.

- Basic mobile phone services to allow users to make calls and send text messages.
- All GSM phones use a SIM card to allow an account to be swapped among devices. Some CDMA devices also have a similar card called an R-UIM.
- Individual GSM, WCDMA, iDEN and some satellite phone devices are uniquely identified by an International Mobile Equipment Identity (IMEI) number.

Low-end mobile phones are often referred to as feature phones, and offer basic telephony. Handsets with more advanced computing ability through the use of native software applications became known as smart phones.

II.   FUTURE EVOLUTION

5G is a technology used in research papers and projects to denote the next major phase of mobile telecommunication standards beyond the 4G/IMT-Advanced standards. 5G is not officially used for any specification or official document yet made public by telecommunication companies or standardization bodies such as 3GPP, WiMAX Forum, or ITU-R. New standard releases beyond 4G are in progress by standardization bodies, but at this time not considered as new mobile generations but under the 4G umbrella.

III.   MOBILE PHONES AND NETWORKS

G in 2G, 3G and 4G stands for the "Generation" of the mobile network. Today, mobile operators have started offering 4G services in the country. A higher number before the 'G' means more power to send out and receive more information and therefore the ability to achieve a higher efficiency through the wireless network.

As the name would suggest, 1G was the first generation of mobile networks. Here basically, radio signals were transmitted in 'Analogue' form and expectedly, one was not able to do much other than sending text messaging and making calls [1]. But the biggest disadvantage, however came in the form of limited network availability, as in the network was available only within the country.

2G networks on the other hand, were based on narrow band digital networks. Signals were transmitted in the digital format and this dramatically improved the quality of calls and also reduced the complexity of data transmission. The other advantage of the 2G network came in the form of Semi Global Roaming System, which enabled the connectivity all over the world.

The 3G has become more popular on devices like mobiles and tablets. The speed of data transmission on a 3G network ranges between 300 kbps to 2 mbps. This means a 3G network actually allows for more data transmission and therefore the network enables voice and video calling, file transmission, internet surfing, online TV, viewing of high definition videos, playing games online and much more [2].

IV.   SMARTPHONE'S OS

There are many operating systems available for smart phones. The main mobile operating systems which are used by modern smart phones include the following:

- Google's Android
- Apple's iOS
- Microsoft's Windows Phones
- RIM's BlackBerry OS
- Nokia's Asha and Nokia's Symbian
- Samsung's Bada

Such operating systems can be installed on many different phone models, and typically each device can receive multiple OS software updates over its lifetime.

A.   Manufacturers

Till 2010, market leader was Nokia. Then various companies came in market like Samsung, Motorola, Intex, XOLO, etc. in Asia. These companies chipped away Nokia's market. All these companies are powered by Android operating system. Later Nokia has come with Microsoft Windows phone.

Now the leading companies in world are Apple, HTC, Samsung, BlackBerry, Nokia, LG, Motorola and some others. Apple has its unique operating system known as iOS. Similarly BlackBerry has BlackBerry OS.

B.   Mobile Subscribers Worldwide

There are nearly 7 billion mobile subscriptions worldwide, estimates The International Telecommunication Union (May 2014). This is equivalent to 95.5 percent of the world population [3].

That's a billion extra mobile subscriptions in three years, but growth is slowing – 2011: 5.9 billion; 2012: 6.2 billion; 2013: 6.7 billion; 2014: 6.9 billion.

Mobile subscriptions in the developed world is rapidly reaching saturation point. There are 1.5 billion subscriptions in developed nations, which is similar to 2013. With 120.8 percent mobile penetration, there is already more than one mobile subscription per person in developed nations, leaving little room for growth

Market growth is being driven by demand from the developing world, led by rapid mobile adoption in China and India, the world's most populous nations. There are 5.4 billion mobile subscriptions in the developing world – that's 78 percent of global subscriptions – compared with 5.2 billion in 2013, according to the ITU. Mobile penetration in the developing world now is 90.2 percent, but there is still potential for growth, particularly in Africa which has the lowest mobile penetration worldwide at 69.3 percent.

Portio Research – in the excellent free Mobile Factbook 2013 predicts that mobile subscribers worldwide will reach 7.5 billion by the end of 2014 and 8.5 billion by the end of 2016.

More than half of the world's mobile subscribers are in Asia Pacific. With 3.6 billion subscriptions, according to the ITU, Asia Pacific accounts for 52.1 percent of the global number. This share is expected to rise – Portio estimates that Asia Pacific's share of the mobile subscribers will be 54.3 percent in 2016. Portio also predicts that by 2016 Africa and Middle East will overtake Europe as the second largest region for mobile subscribers.

Top Smartphone Operating Systems, Forecast Market Share and CAGR, 2013–2017

Smartphone OS	2013 Market Share	2017 Market Share
Android	75.3%	68.3%
iOS	16.9%	17.9%
Windows Phone	3.9%	10.2%
BlackBerry OS	2.7%	1.7%
Others	1.2%	1.9%
Totals	100.0%	100.0%

Fig 1. Worldwide share of companies between 2013- 17 by IDC

V.   TOOLS RESEARCH REVIEW

Android is an open source operating system developed by Google and the Open Handset Alliance on which interesting and powerful new applications can be quickly developed and distributed to many mobile devices. There is a large, growing community of Android developers and a vast selection of Android devices, which includes smartphones, tablets, and TV setup boxes. The OS was created by the start-up of the same name, which is owned by Google since 2005.

Stylish, small and versatile, modern mobile devices have become powerful tools that incorporate Touch screens, cameras, media players, Global Positioning System (GPS) receivers, and Near Field Communications (NFC) hardware. With the introduction of tablets and Google TV, Android has expanded beyond its roots as a mobile phone operating system, providing a consistent platform for application development across an increasingly wide range of hardware. As technology has evolved, mobile phones have become about much more than simply making calls.

In Android, native and third-party applications are written with the same APIs and executed on the same run time. These APIs feature hardware access, video recording, location-based services, and support for background services, relational databases, map-based activities, inter-application communication, Bluetooth, NFC, and 2D and 3D graphics [6].

Android SDK and NDK are the main development tools for the Android applications. Android SDK provides the necessary tools and APIs for the Android applications development. The development will be conducted in modified Java programming language.

VI. FEATURES OF ANDROID

An operating system based on Linux kernel that provides a low-level interface with the hardware, memory management, and process control, all optimized for mobile and embedded devices [17]. Open-source libraries for application development, including SQLite, WebKit, OpenGL, and a media manager.

A run time used to execute and host Android applications, including the Dalvik Virtual Machine (VM) and the core libraries that provide Android-specific functionality. A set of core pre-installed applications. A user interface framework used to host and launch applications. A Software Development Kit (SDK) is used to create applications, including the related tools, plug-ins, and documentation. Here we will be using NDK also.
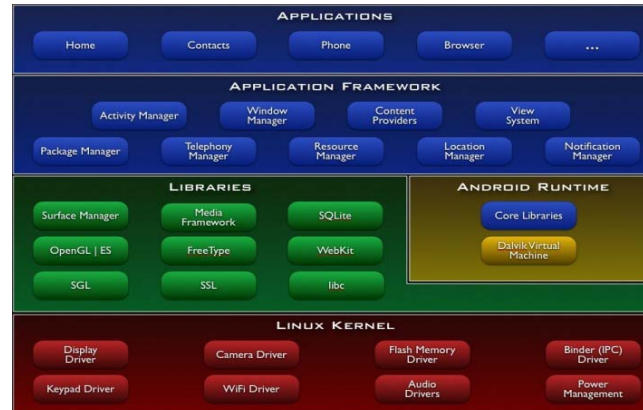
VII. ARCHITECTURE OF ANDROID

Fig 2. Architecture of Android OS

A. Architecture Details

The architecture of Android consists of five layers: The Linux kernel 2.6 which includes useful drivers that allows for example WiFi or Bluetooth. The library written in C and C++ that provides higher level functionality such as an HTML engine, or a database (SQLite).

A runtime environment for applications based on a virtual machine, made for inefficient machines such as telephones. The aim is to translate Java in machine language understood by Android. A Java framework that allows applications running on the virtual machine to organize and cooperate. The user applications written in Java.

A. Android SDK Features

As an application-neutral platform, Android gives us the opportunity to create applications that are as much a part of the phone as anything provided out-of-the-box [6]. Android SDK has supported accessing the built-in hardware camera on phones to capture images [16]. The following list highlights some of the most noteworthy Android features:

- GSM, EDGE, 3G, and 4G networks for telephony or data transfer, enabling you to make or receive calls or SMS messages, or to send and retrieve data across mobile networks
- Comprehensive APIs for location-based services such as GPS and network-based location detection.
- Full support for applications that integrate map controls as part of their user interfaces.
- Wi-Fi hardware access and peer-to-peer connections.
- Full multimedia hardware control, including playback and recording with the camera and microphone.
- Background Services, applications, and processes.
- Media libraries for playing and recording a variety of audio/video or still-image formats.
- IPC message passing
- APIs for using sensor hardware, including accelerometers, compasses, and barometers.
- Libraries for using Bluetooth and NFC hardware for peer-to-peer data transfer.
- Shared data stores and APIs for contacts, social networking, calendar, and multi-media.
- Home-screen Widgets and Live Wallpaper.
- An integrated open-source HTML5 WebKit-based browser.
- An application framework that encourages the reuse of application components and the replacement of native applications.
- Mobile-optimized, hardware-accelerated graphics, including a path-based 2D graphics library and support for 3D graphics using OpenGL ES 2.0.

B. 7.2 Android NDK/JNI

The Android Native Development Kit (NDK) works in conjunction with the Standard Development Kit (SDK) to allow developers to run native C/C++ code with their standard Java code. Native code is placed in the <root>/jni/ folder of the project directory and compiled using an Android.mk file. This makefile sets compiler flags and links any other libraries we are using in our code. The native C code will be compiled into a shared library, which can be imported into an Android project, and from there it is possible to call native functions from Java code. Java Native Interface (JNI) is used as a link between native code and the Android APIs [18]. JNI is also used for conversion of types between languages.

C. 7.3 Basic Components of an Android Application

While developing an Android application, one has to study these components in details.

D. Activity

An activity is a user interface that allows the user to interact with the screen, to perform any action.

For example, applications like Text Messaging app could have an activity that displays a list of contacts to send messages. Once a contact is selected, the activity sends information to a second activity that could serve to send the message to the contact.

When an application is launched, what it displays is the result of an activity. At the code level, for creating an activity, we must create a class that extends the Activity class. An activity has a required onCreate () method. It is the main method. To interact with the program, through the activity, there must be something displayed, that is why the activity, contains what is called views.

E. View

A View is the basic building block for user interface components. A View occupies a rectangular area on the screen. View is the base class for *widgets*, which are used to create interactive UI components (buttons, text fields, etc.).There are different kinds of views, for example a ListView is able to display only an interactive list of what we want to display, while a WebView allows you to to display a web page. As said before, a view occupies a rectangular area on the screen. To organise these rectangles on the screen, there is a text file written in XML for every different screen.

F. XML

XML means Extensible Markup Language. Android provides a straight forward XML vocabulary that corresponds to the View classes and subclasses. The goal of using Android's XML vocabulary is to quickly design UI layouts and the screen elements they contain, in the same way that we use in creating web pages in HTML, with a series of nested elements.

G. Intent

An activity can of course start another one, but to do this, it will need a special object called Intent. Intent is basic description of an operation to be performed. It can launch an Activity, send a broadcastIntent to any interested BroadcastReceiver components, and communicate with a background Service. Intent performs binding between the codes in different applications. It can be thought of as the link between activities.

H. Android Manifest

AndroidManifest.xml is necessary file for all android applications and must have this name in its root directory. In this manifest we've essential information about the application for the Android system, information that the system must have before it can run any of the application's code. Here is what we can find in the Android manifest:

- The name of the Java package for the application. The package name serves as a unique identifier for the application.
- The description of the components of the application such as activities, services, broadcast receivers, and content providers that the application is composed of and under what conditions they can be launched.
- The processes that will host application components.
- The permissions the application must have in order to access protected parts of the API and interact with other applications.
- The permissions that others are required to have in order to interact with the application's components.
- The list of the Instrumentation classes that provide profiling and other information as the application is running. These declarations are present in the manifest only while the application is being developed and tested; they're removed before the application is published.
- The minimum level of the Android API that the application requires.

- The list of the libraries that the application must be linked against.

VIII.   CONCLUSION

Android provides a very convenient hardware platform for developers so that they can spend less effort to realize their ideas. This makes Android can get further development [1-4]. As the smart phones and Android system getting popular, the operations like listening to music, watching videos, tweeting and some others can be moved from the computer to a phone The hypothesis development has covered mobile application development in the android Platform, basic components of android applications and showed the overall architecture of the android OS.

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