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❧ CONTENTS OF PART - III ❧

∽ CONTENTS OF PART - III ∾

❧ CONTENTS OF COMMERCE ❧

Android Based Mobile Application Development and its Security

9

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Abstract

In the advancing world of technology, Mobile applications are a rapidly gr
segment of the global mobile market. Mobile applications are evolving at a meteor pa
give users a rich and fast user experience. In this paper, Android mobile platform fo
mobile application development, layered approach and the details of security informatio
Android is discussed.

Google released Android which is an open-source mobile phone oper
system with Linux-based platform. It consists of the operating system, middleware, and
interface and application software. Certainly, Android is about to become the most w
used OS on mobile phones, but with Android comes a security vulnerability that few
take into account. On Android Market, where you can download thousands of applic
for Android, anyone can upload their programs without having to submit them to c
security checks. This makes Android a prime target for computer criminals. In this pape
discuss a layered approach for android application development where we can de
application which downloads data from the server. Also an Android Application San
(AASandbox) which is able to perform both static and dynamic analysis on An
programs to automatically detect suspicious applications is also discussed.

Keywords: Android, application framework, android runtime, layered appr
AASandbox

I. Introduction

Android is a new, next-gen mobile operating system that runs on the Linux Ke
Android Mobile Application Development is based on Java language codes, as it a
developers to write codes in the Java language. These codes can control mobile devi
Google-enabled Java libraries. It is an important platform to develop mobile applic
using the software stack provided in the Google Android SDK. Android mobile OS pro
a flexible environment for Android Mobile Application Development as the develope

not only make use of Android Java Libraries but it is also possible to use normal Java IDEs. The software developers at Mobile Development India have expertise in developing applications based on Android Java Libraries and other important tools. Android Mobile Application Development can be used to create innovative and dynamic third party applications. Mobile Development India has worked extensively on projects ranging from gaming software, organizers, media players, picture editors to go-cart devices and more.

II. Background Study

The platform was officially announced and the SDK tools were available in October 2008. Currently there is only one mobile phone that runs the Android OS, the G1 from T-Mobile. According to the official Android website (Android 2008) the platform is based into the four core features as shown in the Fig 1:
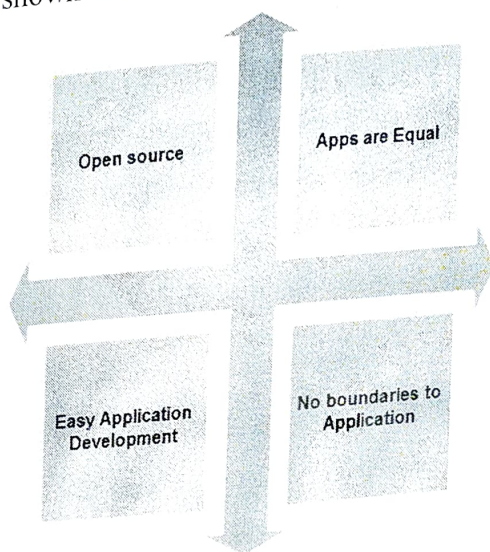
Fig. 1 Four core features of the android platform

A. Application Fundamentals

Android applications are written in Java programming language. However, it is important to remember that they are not executed using the standard Java Virtual Machine (JVM). Instead, Google has created a custom VM called Dalvik which is responsible for converting and executing Java byte code. All custom Java classes must be converted (this is done automatically but can also be done manually) into a Dalvik compatible instruction set before being executed into an Android operating system. Dalvik VM takes the generated Java class files and combines them into one or more Dalvik Executable (.dex) files. It reuses duplicate information from multiple class files, effectively reducing the space requirement (uncompressed) by half from a traditional .jar file. Dalvik was created to support the nature of

lightweight mobile operating systems require because of the limited hardware capabi compared to conventional desktops or laptops.

B. Android Platform overview

Android is a software stack for mobile devices that includes an operating sy middleware and key applications. The Android SDK provides the tools and APIs necessa begin developing applications on the Android platform using the Java programm language. Android based on Linux version 2.6. The system services such as secu memory management, process management are controlled by Linux. Fig 2 shows and architecture.
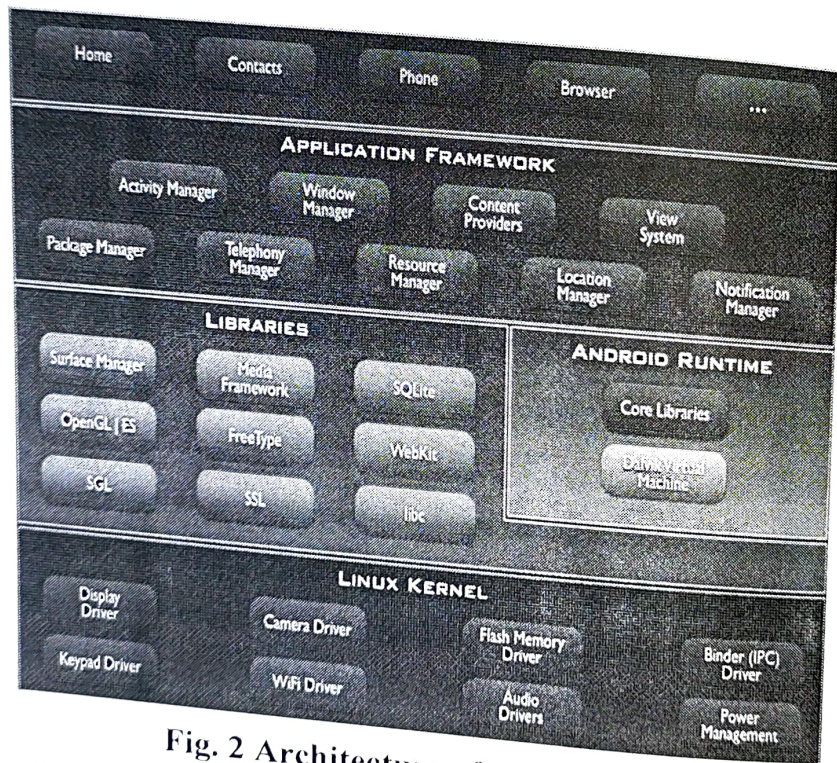
Fig. 2 Architecture of android [1]

C. Developing Android Applications

The Android SDK provides an extensive set of application programming interface (APIs) that is both modern and robust. Android handset core system services are exposed an accessible to all applications. When granted the appropriate permissions, Andro applications can share data among one another and access shared resources on the syste securely. Android applications are written in Java programming language.

D. Application Framework

By providing an open development platform, Android offers developers the ability to build extremely rich and innovative applications. Developers are free to take advantage of the

device hardware, access location information, run background services, set alarms, add notifications to the status bar, and much, much more.

Developers have full access to the same framework APIs used by the core applications. The application architecture is designed to simplify the reuse of components: any application can publish its capabilities and any other application may then make use of those capabilities (subject to security constraints enforced by the framework). This same mechanism allows components to be replaced by the user.

Underlying all applications is a set of services and systems, including:

A rich and extensible set of Views that can be used to build an application, including lists, grids, text boxes, buttons, and even an embeddable web browser Content Providers that enable applications to access data from other applications (such as Contacts), or to share their own data A Resource Manager, providing access to non-code resources such as localized strings, graphics, and layout files A Notification Manager that enables all applications to display custom alerts in the status bar An Activity Manager that manages the lifecycle of applications and provides a common navigation backstack.

E. Android Runtime

Android includes a set of core libraries that provides most of the functionality available in the core libraries of the Java programming language. Every Android application runs in its own process, with its own instance of the Dalvik virtual machine. Dalvik has been written so that a device can run multiple VMs efficiently. The Dalvik VM executes files in the Dalvik Executable (.dex) format which is optimized for minimal memory footprint. The VM is register-based, and runs classes compiled by a Java language compiler that have been transformed into the .dex format by the included "dx" tool. The Dalvik VM relies on the Linux kernel for underlying functionality such as threading and low-level memory management.

III. Layered Approach For Application Development

In this paper we suggest layered approach for android application development. This can be used for web based application development.
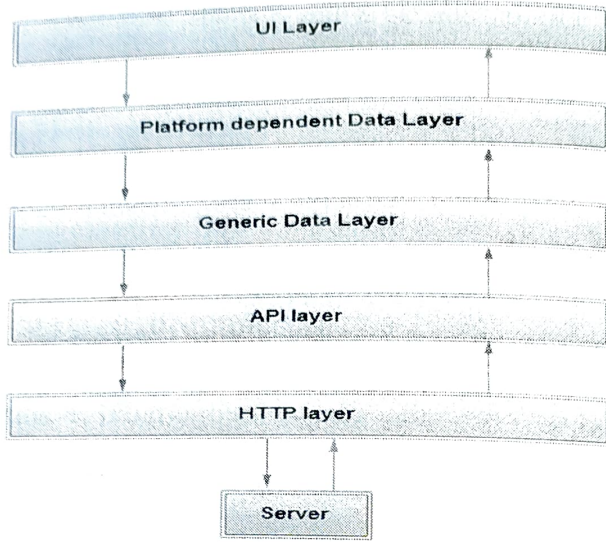
Fig. 3 Layered architecture

Figure 3 shows the layered approach for the android application developme... lowest level is HTTP layer which is responsible for sending HTTP get and post re... the server and receiving the response. Next layer is API layer. This is for parsing the ... from the server and formulating the query and passing it to the HTTP layer. The A... gets the response string from the HTTP layer and parses the string. It also helps in ... the necessary fields and passes it to the data layer. The Generic Data layer con... components that include designing business layers and implementing functionali... caching, exceptional management, logging and validation. Next is platform depend... layer which takes the data from the API layer and use it. It stores the data in the ... dependent way. Some classes like Adapter, Listview etc store the data depende... platform. Last one the UI layer. This helps in showing the data to the user and mana... interactions. It has two components user interface components and user process com... User interface components provide a way for users to interact with the applicatio... process components synchronize and organize user interactions. UI layer is respo... views in android. It has Views, buttons, layouts etc.

A. The application model

In Android's application model, an application is a package of components... which can be instantiated and run as necessary (possibly even by other appli... Components are of the following types:

Activity components form the basis of the user interface; usually, each windo... application is controlled by some activity. **Service components** run in the backgrou...

remain active even if windows are switched. Services can expose interfaces for communication with other applications. **Receiver** components react asynchronously to messages from other applications. **Provider** components store data relevant to the application, usually in a database. Such data can be shared across applications.

Consider. e.g., an online photo viewing application for an Android based phone. This application may have several components. There are activities for viewing the photos on the phone in the form of grid or list. There may be a service for downloading a photo in the background. There may be receivers for pausing a application when a call comes in. and for restarting the application when the call ends. The application should not affect the high priority functionality of the device like incoming call, incoming sms, battery low indication etc. Finally, there may be a provider for storing the photos and its details on the phone.

B. Component classes and methods

The Android SDK has a base class for each type of component (Activity. Service. Receiver, and Provider). with callback methods that are invoked at various points in the life cycle of the associated component. Each component has a life cycle. Each component of an application is defined by extending one of the base classes, and overriding the methods in that class. In particular:

The Activity class has methods that are run when activity is created. or activity calls some other activity, or returns to the activity.

The Service class has methods that are run when the service is started. or some component binds to this service or even combination of both.

The Receiver class has a method that is run when a message is sent to this receiver. The Provider class has methods to delete, query and update the data stored by this provider.

C. Component classes and methods

The Google Android mobile phone platform is one of the most anticipated smartphone operating systems. Smart phones can be used in place of Computers/Laptops. As mobile devices attain increasing capabilities, there are many more opportunities for novel applications development. Recent development of mobile application development has reached a high demand on today's cellular market. Android defines a new component-based framework for developing mobile applications, where each application is comprised of different numbers and types of components. Activity components are the basis of the user interface; each screen presented to the user is a different Activity [6]. Service components