

## **ANDROID DEVELOPMENT**

The actuality of programming Android applications is confirmed by the figures. By the beginning of 2013 the 70% of smartphone users around the world have been equipped with the Android OS compared with 20% of users of iOS. A big range of products from Samsung, Acer, HTC, etc. are widely used now by different categories of population (from students to well-off people) at various prices. It contributes to the spreading of smartphones based on Android system. Android is conquering the planet, and every year the number of users of this system will increase.

But this is not the most important thing. It's not a competition between two giants - Apple and Google. Much more important is the fact that every year the number of people using smartphones and tablets for work, shopping and entertainment is growing exponentially. The gradual spread of cheap and affordable Internet in all parts of the world means one thing: more and more people begin to use mobile services to manage their own affairs, to learn the news, make purchases online, etc. All these things are possible with a help of the device that is always at hand, unlike a desktop computer and even a laptop [1].

Android is an operating system based on the Linux kernel. The project responsible for developing the Android system is called the Android Open Source Project (AOSP) and is primarily lead by Google.

The Android system supports background processing, provides a rich user interface library, supports 2-D and 3-D graphics using the OpenGL-ES (short OpenGL) standard and grants access to the file system as well as an embedded SQLite database.

The Android Software Development Kit (Android SDK) contains the necessary tools to create, compile and package Android applications. Most of these tools are command line based. The primary way to develop Android applications is based on the Java programming language. An Android application typically consists of different visual and non-visual components and can reuse components of other applications.

The Android SDK contains the Android debug bridge (adb), which is a tool that allows you to connect to a virtual or real Android device, for the purpose of managing the device or debugging your application.

Google provides two integrated development environments (IDEs) to develop new applications.

Google develops an IDE called Android Studio for creating Android applications. This IDE is based on the IntelliJ IDE.

The Android Developer Tools (ADT) are based on the Eclipse IDE. ADT is a set of components (plugins), which extend the Eclipse IDE with Android development capabilities [2].

In early 2013, Google announced Android Studio, a WYSIWYG (What You See Is What You Get) environment that'd help you create Android applications with a lot less hassle. Now, the company is finally ready to put Version 1.0 into the hands of would-be creators across the world. The package comes with plenty of helpful templates for the first-time developer, including example media recorders, notification systems and even an instant messaging platform. Given that Android is now found almost anywhere (phones, tablets, smartwatches, TV, Google Glass and cars), the software enables you to tailor the experience across every device. Fans of GitHub are also catered to, since Android Studio will let you import samples of code from the online repository straight into your project [3].

Android developers were desperate for a more stable IDE (Integrated development environment) and were quite optimistic when Google announced Android Studio. Eclipse slowly started to lose its market share and in less than one year it became obsolete, a relic of some older, "darker" times.

It couldn't rival Android Studio because it was designed differently, in different times. You can use Eclipse for a bunch of different programming languages and for a bunch of different platforms, but it couldn't adapt completely to the world of Android development. On the other hand, Android Studio is designed specifically for Android development and its main goal is to speed up the Android development process and make it easier and simpler [4].

Both IDEs contain all required functionality to create, compile, debug and deploy Android applications. They also allow the developer to create and start virtual Android devices for testing.

Android 5.0 uses the Android RunTime (ART) as runtime for all Android applications.

ART uses Ahead Of Time compilation. During the deployment process of an application on an Android device, the application code is translated into machine code. This results in approx. 30% larger compile code, but allows faster execution from the beginning of the application.

This also saves battery life, as the compilation is only done once, during the first start of the application.

The dex2oat tool takes the .dex (Dalvik Executable) file created by the Android tool chain and compiles that into an Executable and Linkable Format (ELF file). This file contains the dex code, compiled native code and meta-data. Keeping the .dex code allows that existing tools still work.

The garbage collection in ART has been optimized to reduce times in which the application freezes.

Android applications are primarily written in the Java programming language.

During development the developer creates the Android specific configuration files and writes the application logic in the Java programming language.

The ADT or the Android Studio tools convert these application files, transparently to the user, into an Android application. When developers trigger the deployment in their IDE, the whole Android application is compiled, packaged, deployed and started.

The Java source files are converted to Java class files by the Java compiler.

The Android SDK contains a tool called dx which converts Java class files into a .dex (Dalvik Executable) file. All class files of the application are placed in this .dex file. During this conversion process redundant information in the class files are optimized in the .dex file.

For example, if the same String is found in different class files, the .dex file contains only one reference of this String.

These .dex files are therefore much smaller in size than the corresponding class files.

The .dex file and the resources of an Android project, e.g., the images and XML files, are packed into an .apk (Android Package) file. The program aapt (Android Asset Packaging Tool) performs this step.

The resulting .apk file contains all necessary data to run the Android application and can be deployed to an Android device via the adb tool [2].

## LITERATURE

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