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Android based Mobile Application Development by Kotlin Language

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ABSTRACT

Mobile phone is considered an important role that has changed the human life in several aspects. Android has emerged as the most widely used operating system in Smart Phones because operating system is open source and freely accessible to everyone. On Android operating system, many applications (apps) are available for learning as well as entertainment. The present paper discusses the design and development of an Android based app that can help everyone. This paper also highlights various challenges faced by developers in Android App Development.

Keywords: Android SDK, ADT Plug-in, Android studio, JDK SE 7, Android Apps Development.

I. INTRODUCTION

Android:

Android is a platform it consists of Linux based operating system, middleware and its key components, designed especially for touch screen mobile devices and smart phones and tablet computers .This project is Initially developed by Android, Inc., which Google backed financially later .

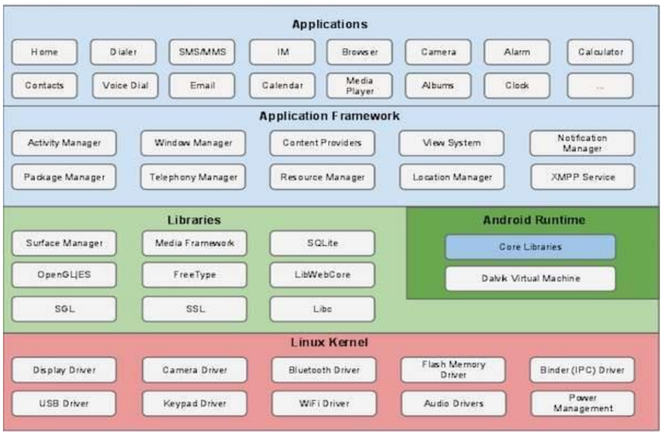

Figure 1. Android architecture

(SDK) is an application frame work and key applications. Android is an open source. Most parts of the Android application code are released by the Google under apache license. This open source code and permissive license make users allow modifying the software and is distributed by the device manufactures, and also allows building new versions of android. One of those modified versions called Cyanogens mod. The first commercially available phone to run android was HTC dream.

The process of developing an application is

step1: install android studio 3.0
step2: make design for an application using xml (UI) user interface.
Step3: write code for user interface by using kotlin language.
Step4: connect the database by using SQLite database
Step5: finally deploy the app in Google play store.

Software requirements:

Android SDK

Software development kit, For a new developer, downloading the ADT Bundle.

ADT bundle includes the following

• Eclipse + ADT plug-in

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- Android SDK Tools
- Android Platform-tools
- The latest Android platform
- The latest Android system image for the emulator

The entire application written on Android may not consists of the native code (programming code that is configured to run on a specific processor). Most parts of the Android API can be accessed through only java code. We need java skeleton for invoking the native functions .These functions can be invoked only through JNI(Java native interface) .JNI allows you to load shared C/ C++ libraries into Java applications at run time .In the application body you have to specify the signature of the methods without their body. The method has to be marked with a native keyword if it is not implemented in java, but in native code.

Android uses the Dalvik virtual machine with just-in-time compilation to run Dalvik byte code, which is usually translated from Java byte code (JVM). Dalvik virtual machine with the extension of .dex

Advantages:

- ➢ It's an open source
- ➢ Application framework provides infrastructure (Wi-Fi manager, Location Manager)
- ➢ DVM is optimized for mobile devices.
- ➢ SQLite database is used to maintain structured data.

II. BACKGROUND STUDY

Android components

Application components are the essential building blocks of an android application .These components are loosely coupled by the application manifest file androidmanifest.xml that describes each component of the application and how they interact.

They are mainly four components in android

Activities: They dictate the UI and handle the user interaction to the Smartphone screen

Services: They handle background processing associated with an application.

Broadcast receivers: They handle communication between android os and applications

Content provider: They handle data and database management issues.

Android XML layout

XML is termed as Extensible Mark-up language.

- ➢ Every xml have a root element
- ➢ Every xml element must be properly nested.
- ➢ Shouldn't start a number, and not contain any spaces between the tags.

Parameters in android

1. Match parent

Fill the full screen upto the width and height

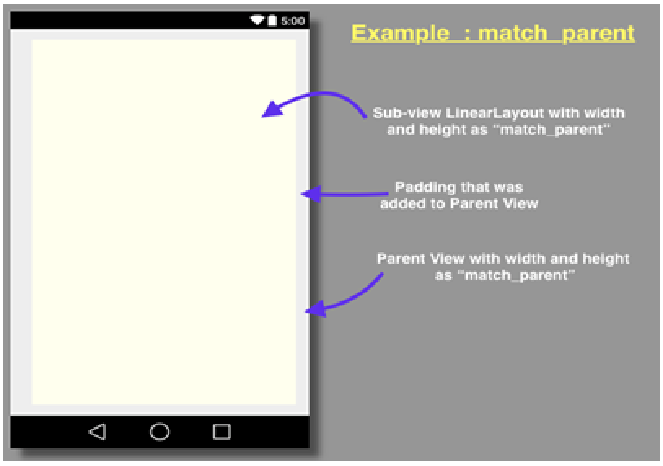

5:00
Example : match_parent
Sub-view LinearLayout with width and height as "match_parent"
Padding that was added to Parent View
Parent View with width and height as "match_parent"

Figure 2

```
xmlns:tools="http://schemas.android.com/tools"
 android:                    layout_width="match_parent"
 android:layout_height="match_parent"
android:paddingBottom="@dimen/activity_vertical_
margin"
android:paddingLeft="@dimen/activity_horizontal_
margin"
android:paddingRight="@dimen/activity_horizontal_
margin"
android:paddingTop="@dimen/activity_vertical_mar
gin"
tools:context="com.code2care.android.togglebuttone
xample.MainActivity"                                  >
<linearlayout
 android:                    layout_width="match_parent"
```

```
android:layout_height="match_parent"
android:layout_alignParentLeft="true"
android:layout_alignParentTop="true"
android:layout_marginLeft="11dp"
android: background="#FFFFEE"
android: orientation="vertical" >
</linearlayout
```

2. Fill_parent:

This is same as match parent; So if you are using API level 8 or above you must avoid using fill_parent.

3. Wrap_content

upto the content is called the wrap content. Lets create a new activity.xml file, with Relative Layout parent View, now let's add a Linear Layout and set, android: layout_width="wrap_content" android: layout height="wrap_content"

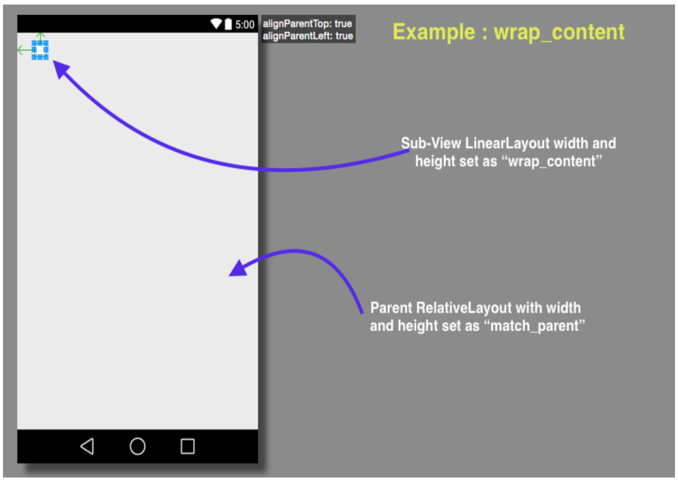

5:00
alignParentTop: true
alignParentLeft: true
Example : wrap_content
Sub-View LinearLayout width and height set as "wrap_content"
Parent RelativeLayout with width and height set as "match_parent"

Figure 3

Fill_parent and **match parent** are the same, used when we want the height or width of a view to be as big as its parent view, fill_parent being deprecated.

1. Kotlin

Kotlin (Android_and_Kotlin) is a statically-typed programming language that runs on the Java Virtual Machine and also can be compiled to JavaScript source code. Its primary development is from a team of Jet Brains programmers based in Saint Petersburg, Russia (the name comes from Kotlin Island, near St. Petersburg).

While Java is one of the world's most widely used programming languages and the official language of Android development, there are many reasons why Java might not always be the best option for your Android projects. Java was one of the most usable languages, back in its heyday. But today, and the Java I use on Android doesn't even have support for lambdas, method references, streams, try-with-resources (min SDK ≥ 19). I still have to use the java time APIs from the old Java 6/7 worlds. One of the biggest flaws in Java is the way it handles "null," leading to the dreaded NullPointerException (NPE), popularly known as The Billion Dollar Mistake).

Developers love clean, concise code. Less code takes less time to write, less time to read, and is less susceptible to bugs. But with Java, you must write a lot of code to get even the simplest things done. You've probably already experienced this if you're an Android developer but Kotlin is exactly opposite to java. Advantages of Kotlin

1. Interchange ability With Java

You can do java and Kotlin code existing side by side in the same project. Compiler support both cord to compile. User will able to know which part of your project is written in java and which parts are written in kotlin.

If you have project in java which is already working on you can trial kotlin in a small part of the project without affecting the rest of your code base. If one you decide to continue with kotlin, you can either migrate the hold project existing java code to kotlin on file at a time.

2. No NULL Pointer Exceptions

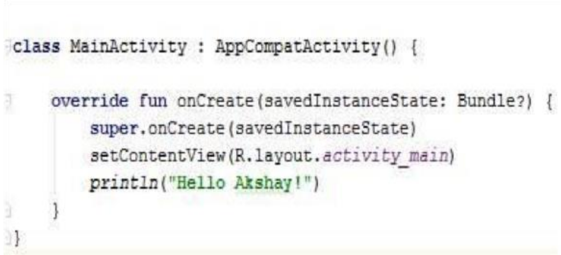
It's a most common reason for crashes in our application.

It's most time consuming process to fix all of the NullPointerException. It' can also boring task. In the kotlin you don't need to worry about null Pointer Exceptions because Null Safely is baked into kotlin type system.

3. Easy to Learning

Kotlin is an enhancement of Java.

If you want to create a new class in kotlin is very similar to java.



```
class MainActivity : AppCompatActivity() {

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContentView(R.layout.activity_main)
        println("Hello Akshay!")
    }
}
```

How to Install Kotlin in Android Studio

Step 1: Create Project

Step 2: Go To File Menu -> Select New Project Option. Following Screen is Appear.

Step 3: Click on Next Button after Give the Application Name and Project Location. Select the form

Factors your app will run on

Step 4: Click on Next Button. Select Activity Form The List.

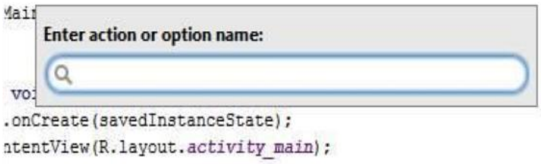
Step 5: Click on Next Button. Give the Activity Name.

Step 6: Click on Finish Button. Your Project is Create Successfully.

In Android Studio 3.0, you can choose to create the activity in Kotlin right away, so you can skip the "Converting Java code to Kotlin" step. Earlier versions will create an activity in Java, and you can use the automated converter tool to convert it.

Converting Java code to Kotlin

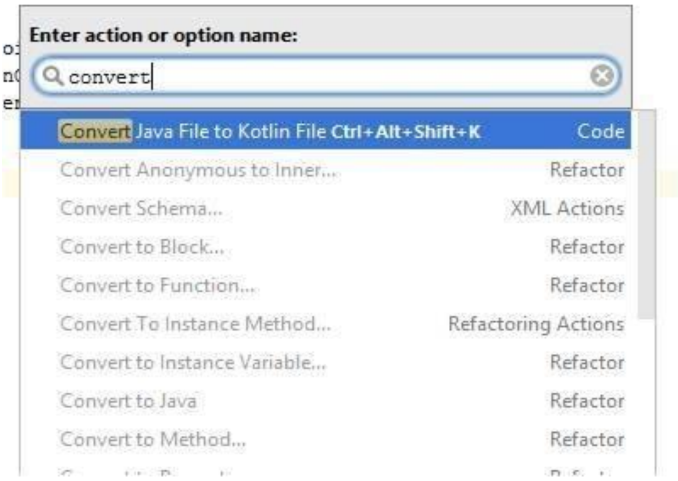
Open MainActivity.java file. Then invoke action Convert Java File to Kotlin File. There is multiple way but one is easiest way is Find Action (Ctrl + Shift + A). The pop-up window that opens, shows the suggestion list of matching names.



Enter action or option name:

```
Mai
vo
.onCreate(savedInstanceState);
ntentView(R.layout.activity_main);
```

Start typing the desired action name. As you type, the suggestion list displays the matching names of actions. The actions that are not valid in the current context are displayed gray.

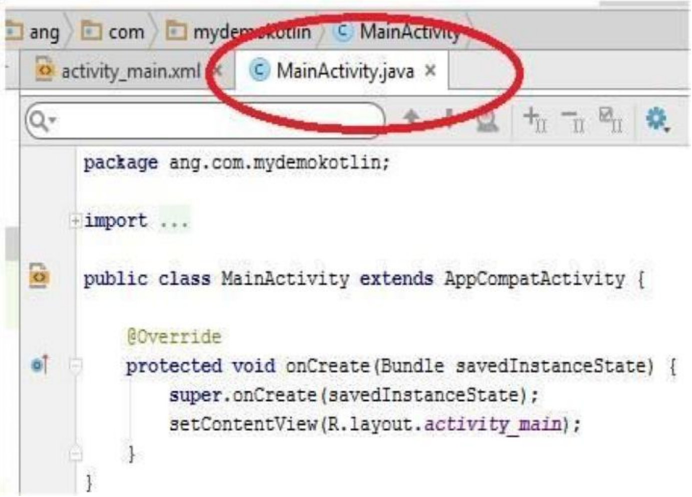


Enter action or option name:

convert

Convert Java File to Kotlin File Ctrl+Alt+Shift+K	Code
Convert Anonymous to Inner...	Refactor
Convert Schema...	XML Actions
Convert to Block...	Refactor
Convert to Function...	Refactor
Convert To Instance Method...	Refactoring Actions
Convert to Instance Variable...	Refactor
Convert to Java	Refactor
Convert to Method...	Refactor

You can also Press Ctrl + Alt + Shift + K option in state of Find Action. Before converting java to kotlin file extension of main activity is MainActivity.Java.



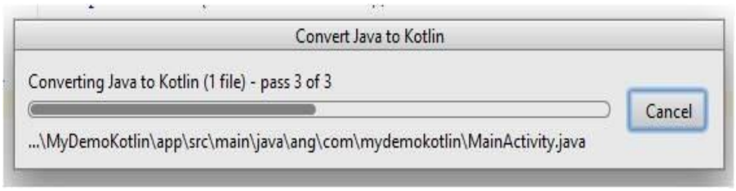
```
package ang.com.mydemokotlin;

import ...

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }
}
```

Now we can convert Java code to Kotlin using Ctrl + Alt + Shift + K option.

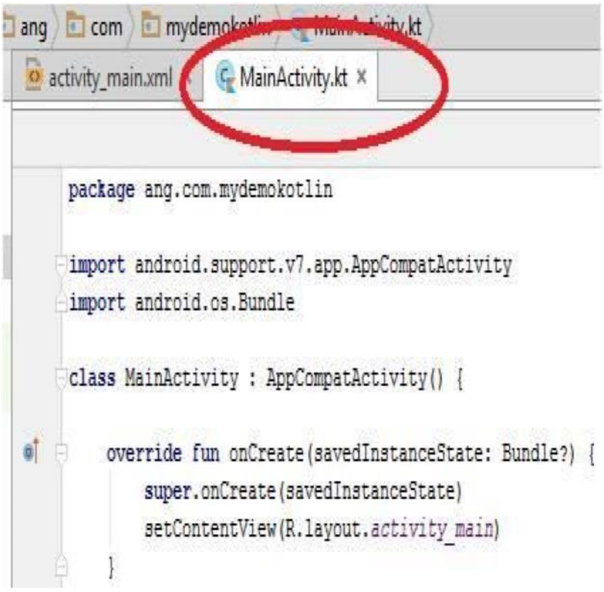


Convert Java to Kotlin

Converting Java to Kotlin (1 file) - pass 3 of 3

...\MyDemoKotlin\app\src\main\java\ang\com\mydemokotlin\MainActivity.java

Now you can see the extension of MainActivity.java is replaced by MainActivity.kt. After the conversion you should have an activity written in Kotlin.



```
package ang.com.mydemokotlin

import android.support.v7.app.AppCompatActivity
import android.os.Bundle

class MainActivity : AppCompatActivity() {

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContentView(R.layout.activity_main)
    }
```

Android Lifecycle

onCreate: Called when activity is first created.

onStart: Called when activity is becoming visible to the user.

onResume: Called when activity will start interacting with the user.

onPause: Called when activity is not visible to the user.

onStop: Called when activity is no longer visible to the user.

onRestart: Called after your activity is stopped, prior to start.

onDestroy: Called before the activity is destroyed.

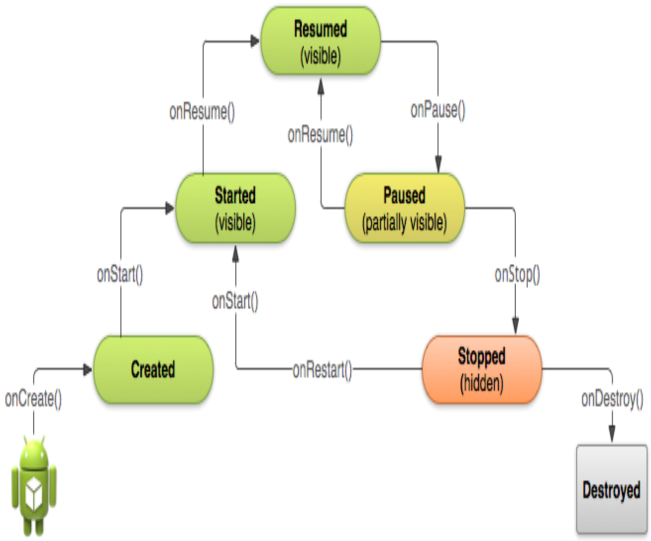


Figure 4. Android Lifecycle

File: MainActivity.java

```
package com.example.activitylifecycle;
import android.os.Bundle;
import android.app.Activity;
import android.util.Log;
import android.view.Menu;
public class MainActivity extends Activity {
  @Override
  protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);
    Log.d("lifecycle","onCreate invoked");
  }
  @Override
  protected void onStart() {
    super.onStart();
     Log.d("lifecycle","onStart invoked");
  }
  @Override
  protected void onResume() {
    super.onResume();
     Log.d("lifecycle","onResume invoked");

  }
  @Override
  protected void onPause() {
    super.onPause();
     Log.d("lifecycle","onPause invoked");
  }
  @Override
  protected void onStop() {
    super.onStop();
     Log.d("lifecycle","onStop invoked");
  }
   @Override
  protected void onRestart() {
    super.onRestart();
     Log.d("lifecycle","onRestart invoked");
  }
  @Override
  protected void onDestroy() {
        super.onDestroy();
         Log.d("lifecycle","onDestroy invoked");
    }
}
```

1) onCreate() in kotlin

```
lateinit var textView: TextView
// some transient state for the activity instance
var gameState: String? = null

override fun onCreate(savedInstanceState: Bundle?) {
    // call the super class onCreate to complete the creation of activity like
    // the view hierarchy
    super.onCreate(savedInstanceState)
```

ONRESUME()

```
class CameraComponent : LifecycleObserver {

    @OnLifecycleEvent(Lifecycle.Event.ON_RESUME)
    fun initializeCamera() {
        if (camera == null) {
            getCamera()
        }
    }

    ...
}
```

III. ANDROID MARKET ANALYSIS

The Android Market, an online software store, is developed by Google for Android devices. It was made available to users on October 22, 2008. Most of the Android devices come with preinstalled “Market” application which allows users to browse, buy, download, and rate different available applications and other content for mobile phones equipped with the open-source operating system.

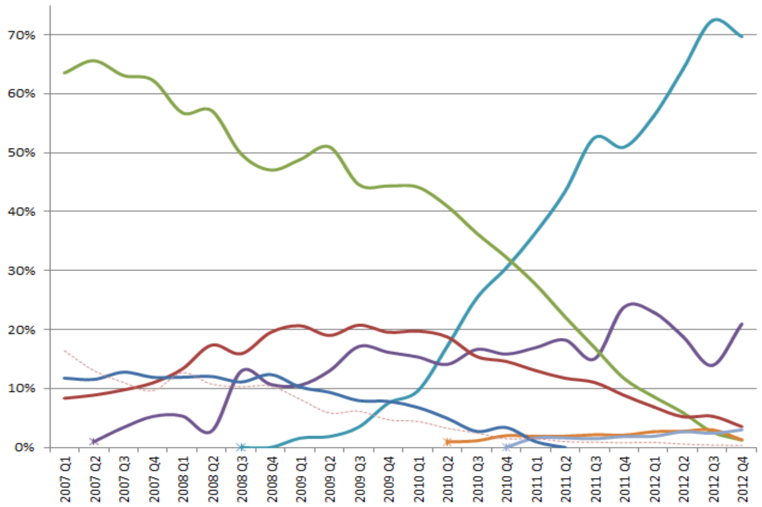


Figure 5. World-Wide Smartphone Sales (%)

IV. CONCLUSION

Smart Phones has changed the life of everyone. Along with other features, an App in Smart Phones allows to do almost everything, from playing games to do business. The development of app described in present paper has given a strong understanding of various challenges associated with design and development of apps. Development of mobile web application will be emphasized on following aspects:

1) More and more sensors will be added to mobile phones, so new APIs to use those capabilities will bring brand new applications to users.
2) Multimedia capabilities will be enhanced and engine will support more types of multimedia such as flash and svg .
3) The dedicated Integrated Development Environment (IDE) will be improved to accelerate the applications’ development.
4) Visualization programming and JavaScript debugging will be the most important functions of the IDE.

In this survey we have presented some details of Android, & studied features as well as suitability of android for mobile devices. We have also compared Android with Symbian, Windows Mobile, Windows Phone, Bada, RIM and iOS. Findings of this survey are that Android is superior compare to its competitive operating systems. It acts as an Emerging Software Platform for Mobile Devices. Android is Open source mobile platform. It is key feature of Android that will make it a leader in mobile Platform.

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