android

The Business Perspective

LifeMichael
www.LifeMichael.com

Introduction

Introduction

- The Android™ platform delivers a complete set of software for mobile devices. An operating system, middle-ware and key mobile applications.
- The Android platform is available as a free open source project developed by the Open Handsets Alliance. www.openhandsetalliance.com

Introduction

- The android platform is been deployed on a variety of handsets types including mobile telephones, tablets, appliances and e-readers.

  www.android.com

Android Native Applications

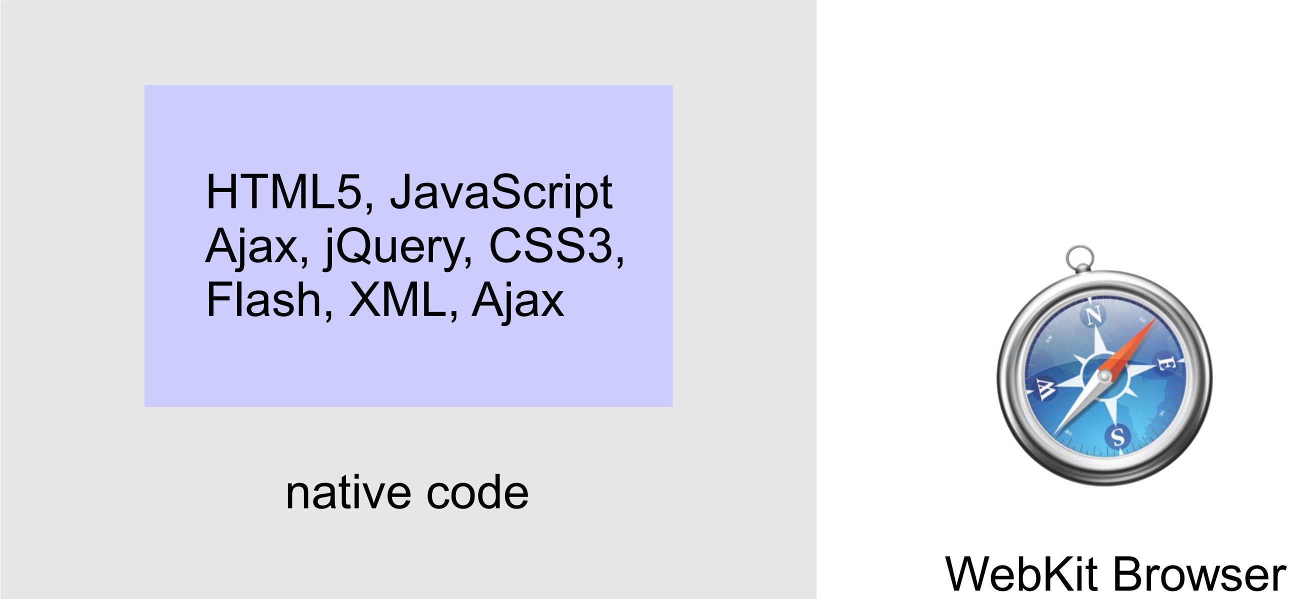
- Native applications for the android platform are primarily developed in Java.
- It is possible to develop using other software programming languages as well (C\C++, Python and Perl).

Android Web Applications

- The android web browser is based on Safari webkit.
- The same well known user experience when using desktop web browsers such as Chrome and Safari.

Android Hybrid Applications

- Hybrid applications are usually based on a WebView object, implemented based on the mobile phone WebKit browser, that renders the web based content.



HTML5, JavaScript
Ajax, jQuery, CSS3,
Flash, XML, Ajax

native code

WebKit Browser

Android Flash Applications

- As of Android SDK 2.2 it is possible to use the Adobe Flash technology.
- Flash, Flex and Air. All sorts of Adobe Flash content is supported on the android platform.

Development Complexity Comparison

Development Learning Curve

	Low	High
Difficult		Native Applications
Easy	Flash Applications Web Applications Hybrid Applications	

Development Complexity

Fragmentation Problem Comparison

Fragmentation Problem		Fast	Slow
	Big		Native Applications
	Small	Flash Applications Web Applications Hybrid Applications	
		Development Speed	

Exploiting Device Capabilities Comparison

Fragmentation Problem

	Good	Bad
Big	Native Applications	
Small	Hybrid Applications	Web Applications Flash Applications

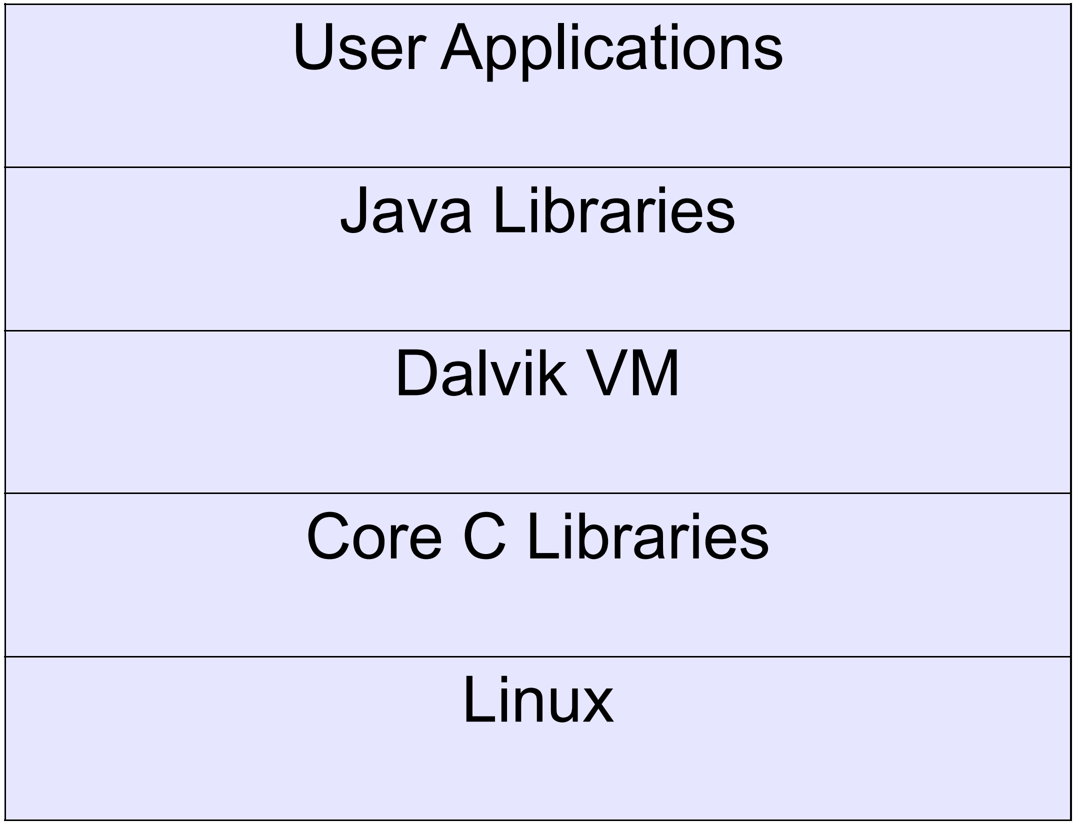
Exploiting Device Capabilities

Maintenance Possibilities Comparison

		Keeping Apps Up To Date	
		Good	Bad
Piracy Prevention	Difficult		Native Applications
	Possible	Hybrid Applications Web Applications	

Platform Capabilities

The Android Software Stack



User Applications

Java Libraries

Dalvik VM

Core C Libraries

Linux

Activity

- Each application is composed of one activity at the minimum.

```
public class GestureDemoActivity extends Activity
{
    ...
    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        ...
    }

}
```

Application Resources

- When developing an android application the resources (graphics, texts and even XML files) are kept organized with ids assigned to each one of them.
- The `R.java` auto generated class holds the resources ids.

Application Resources

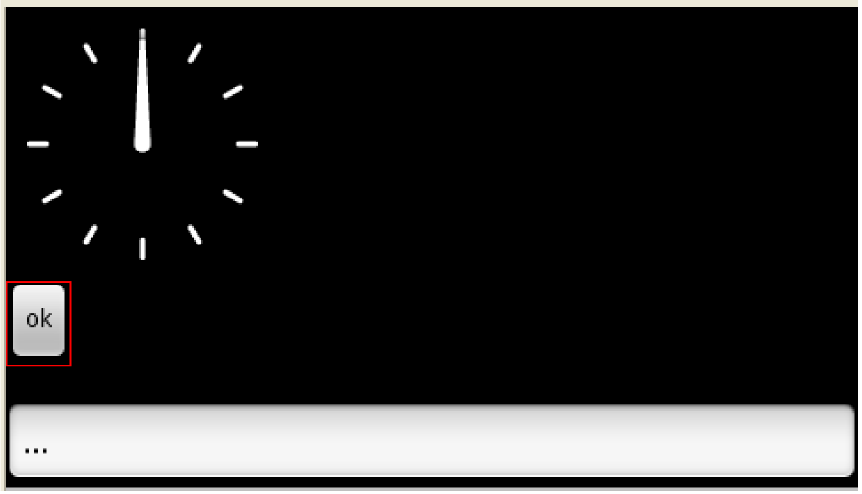
```
/* AUTO-GENERATED FILE.  DO NOT MODIFY. */

package com.abelski.samples;

public final class R
{
        public static final class attr
        {
        }
        public static final class drawable
        {
            public static final int icon=0x7f020000;
        }
        public static final class id
        {
            public static final int AnalogClock01=0x7f050000;
            public static final int Button01=0x7f050001;
            public static final int gesturesoverlay=0x7f050002;
            public static final int txt=0x7f050003;
        }
        ...
}
```

The Intent Concept

- Objects of the type Intent represent intentions. It can be the system intention to start executing a specific activity. It can be the application intention to start executing a specific activity.
- We use intents in order to start the execution of another activity. The other activity can be part of another application.
- We use intents as a mean for transferring information from one application to another.

User Interface Controls

- The android platform allows us to develop the user interface through XML documents that define the user interface we want our application to display. The base class is View.
- The XML documents can be edited using a visual editor.



View

ViewGroup

User Interface Controls

```
<?xml version="1.0" encoding="utf-8"?>

<LinearLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="fill_parent" android:layout_height="fill_parent"
    android:orientation="vertical">

    <AnalogClock android:id="@+id/AnalogClock01"
         android:layout_width="wrap_content" android:layout_height="wrap_content">
    </AnalogClock>

    <Button android:id="@+id/Button01" android:layout_width="wrap_content"
         android:layout_height="wrap_content" android:text="ok"></Button>

    <android.gesture.GestureOverlayView android:id="@+id/gesturesoverlay"
        android:layout_width="fill_parent" android:layout_height="0dip"
        android:layout_weight="1.0" android:gestureStrokeType="multiple" />

    <EditText android:text="..." android:id="@+id/txt"
         android:layout_width="fill_parent" android:layout_height="wrap_content">
    </EditText>

</LinearLayout>
```

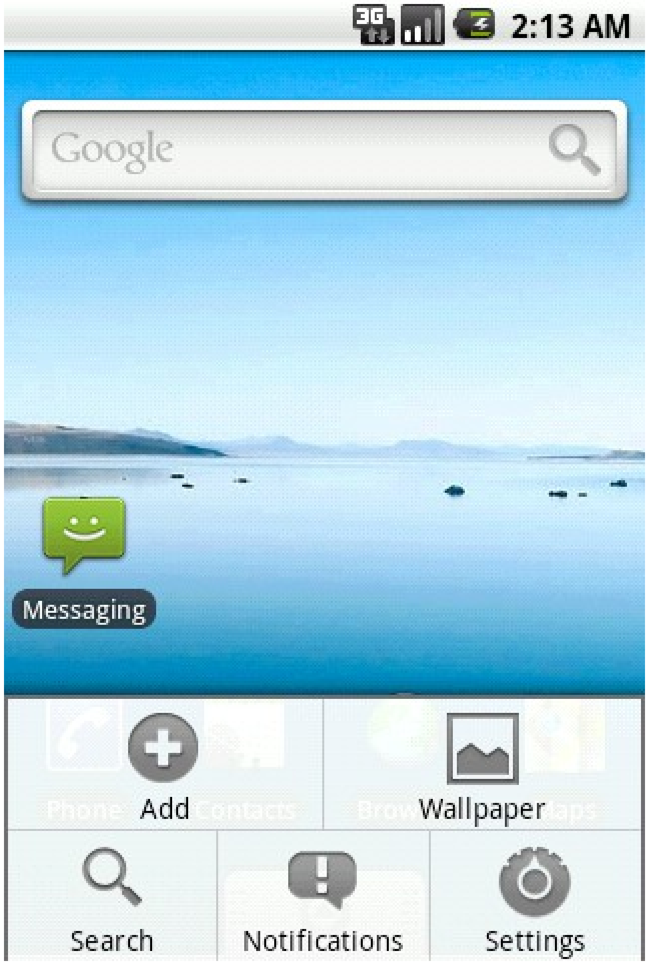
Layout Managers

- Unlike GUI development in Swing\AWT the objects that function as the containers also function as the layout managers.

```
<?xml version="1.0" encoding="utf-8"?>

<LinearLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="fill_parent" android:layout_height="fill_parent"
    android:orientation="vertical">

    <Button android:id="@+id/Button01" android:layout_width="wrap_content"
        android:layout_height="wrap_content" android:text="ok"></Button>

     <EditText android:text="..." android:id="@+id/txt"
        android:layout_width="fill_parent" android:layout_height="wrap_content">
     </EditText>

</LinearLayout>
```

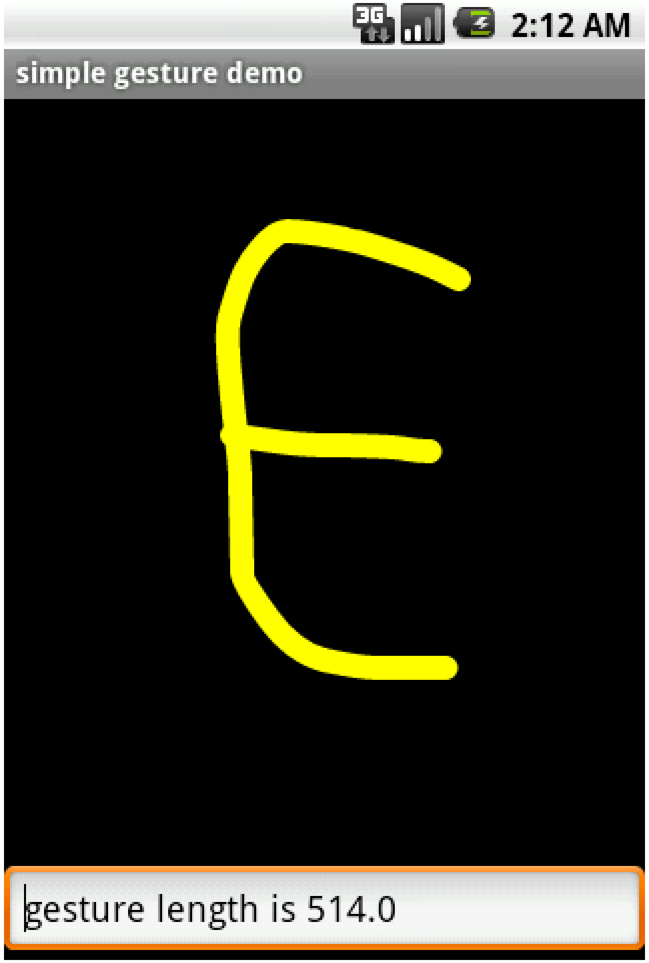
Menu

- Each activity already has a menu.
- We just need to set on its visibility.
- We can add menu items as well as new menus with more menu items on top of them.



Touchscreen

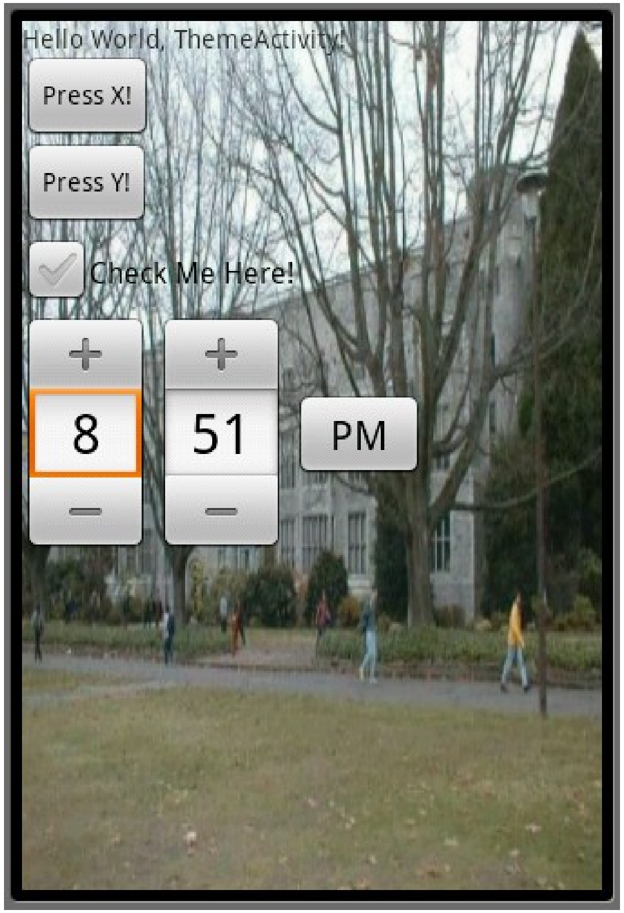
- The android platform supports handling the events related to the touchscreen.
- The android platform supports gestures.



gesture length is 514.0

Style Definition

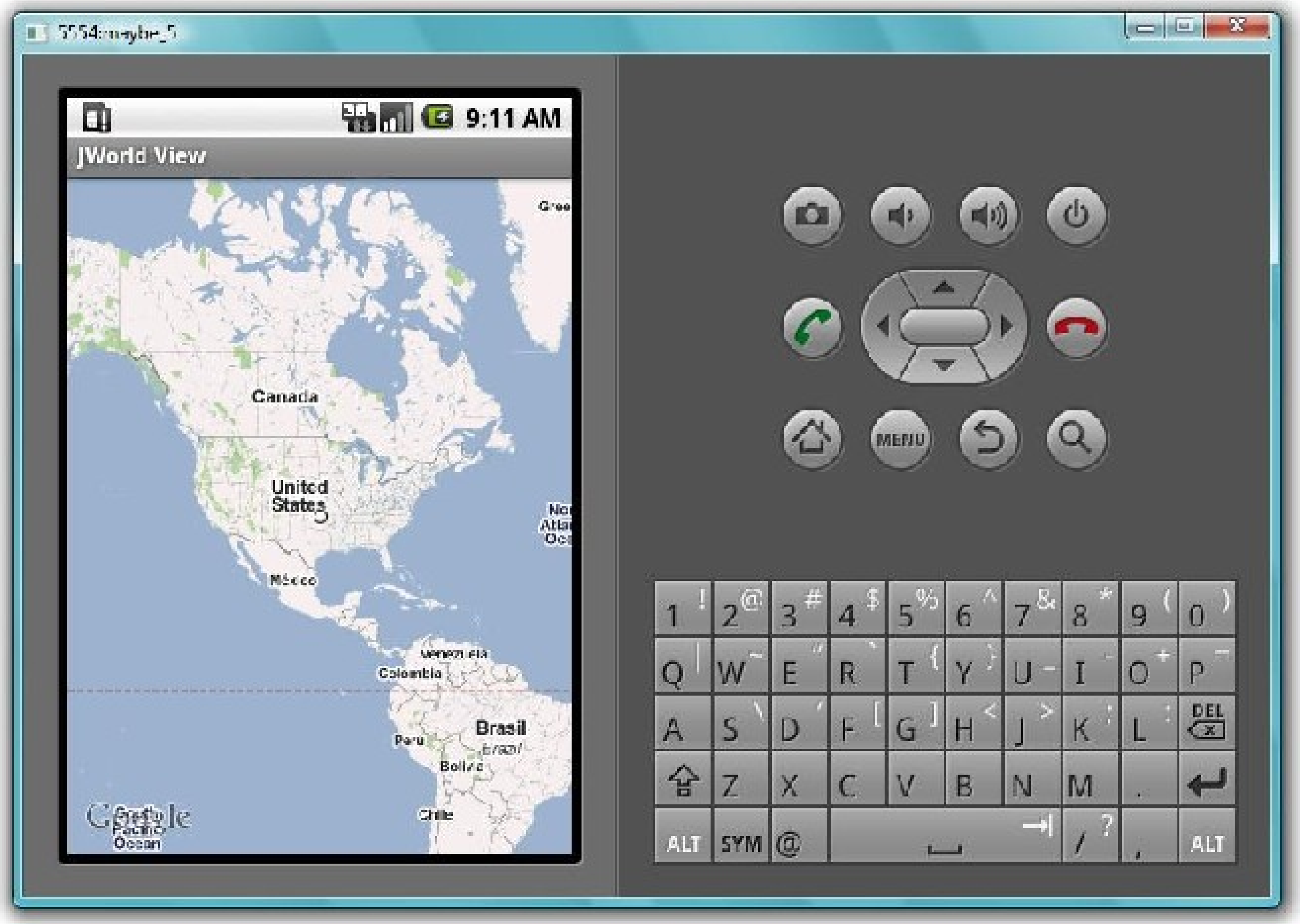
- We can define styles (similarly to CSS) and use them in our code.
- Theme is a style assigned to application.
- The android platform already includes styles we can use in our application.



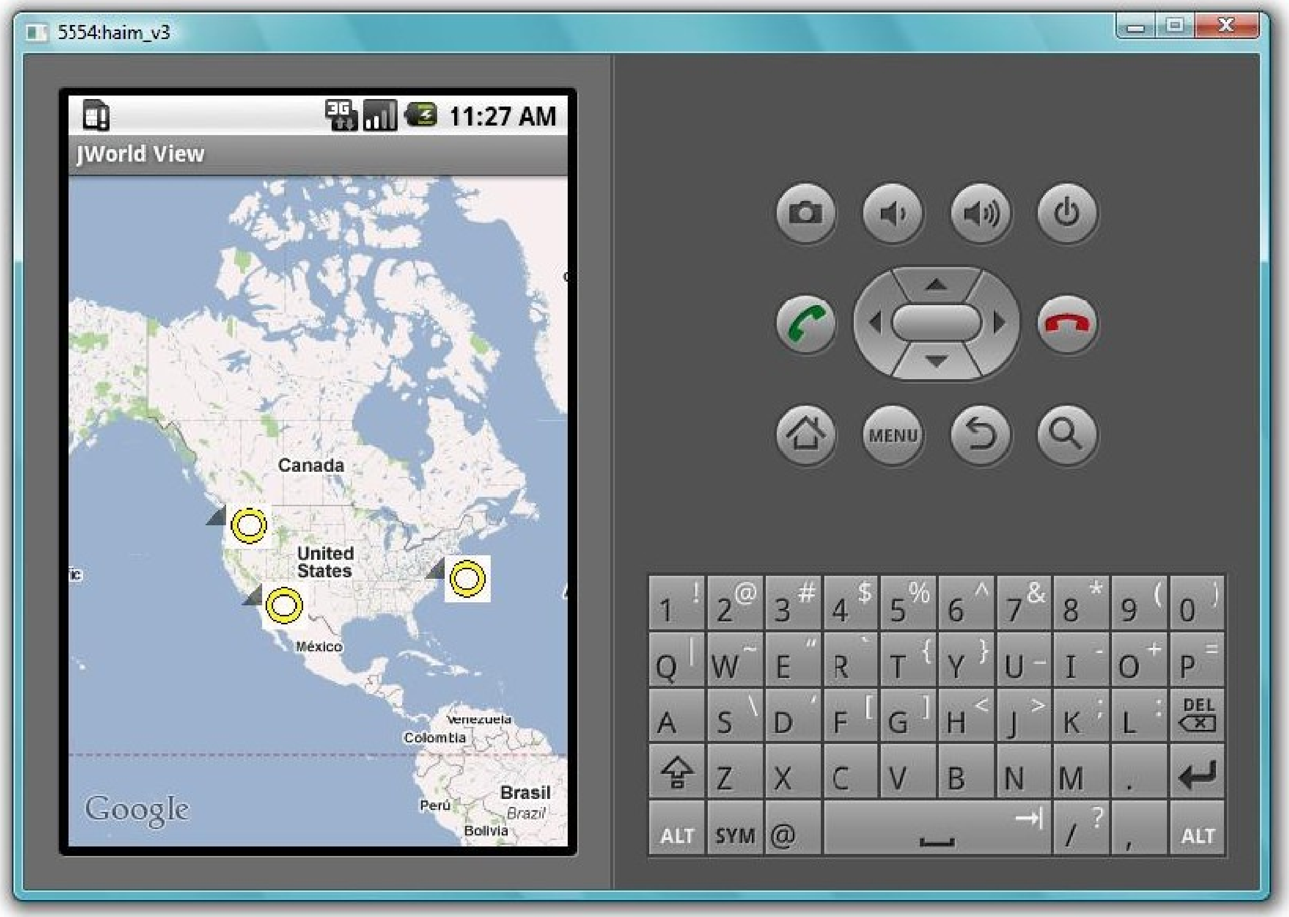
Location Based Services

- In order to use Google Maps service we should fill-in a special form on their web site and get a unique key.
- MapView is a unique view components that displays maps received from the server side.

Location Based Services



Maps Overlays



Web Services

- The android SDK is shipped with the Apache HttpClient. More info about the Apache HttpClient can be found at http://hc.apache.org/httpclient-3.x/.

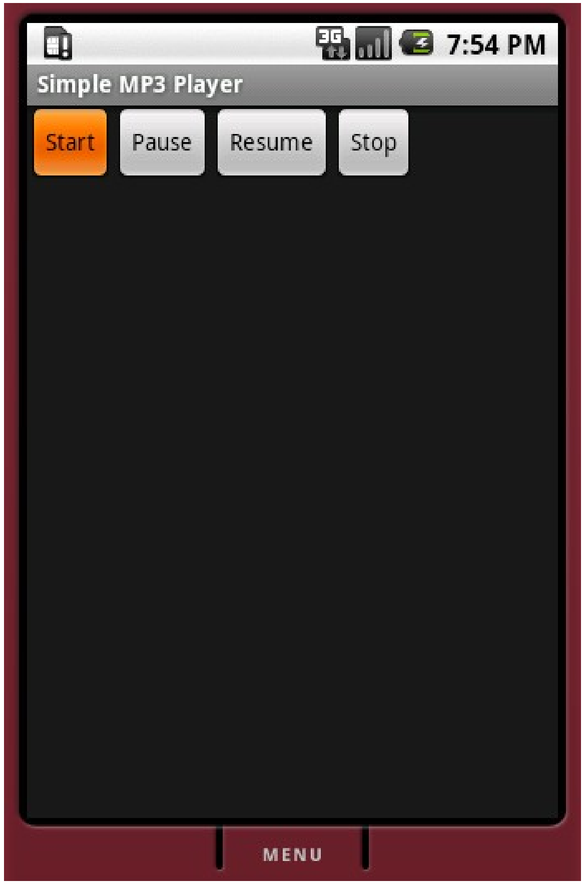
- Most of the Java networking classes are available on the android platform as well.

Android Services

- The android platform allows us to develop local services (be used by the application that owns them) and remote services (be used by other applications as well).

Media Framework

- Out of the box support for playing and recording media, including both audio and video.

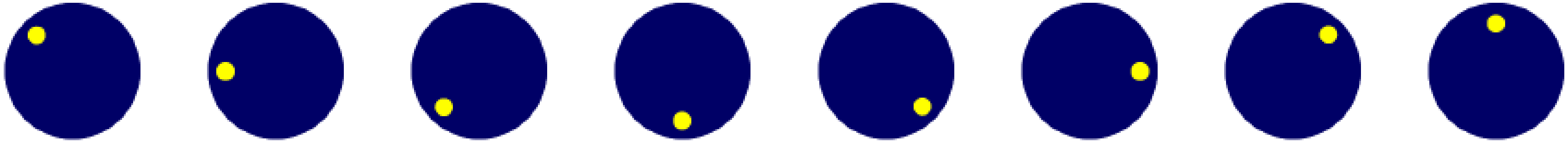


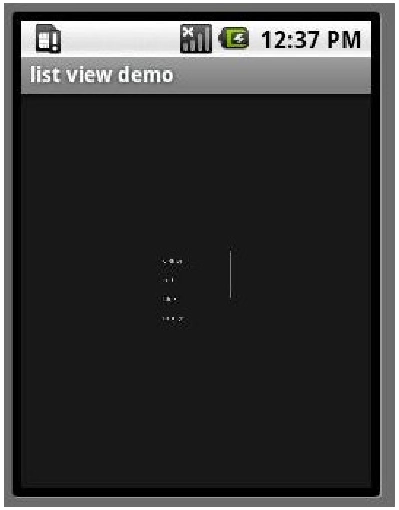
Android Security Model

- Each APK should be signed in order to be able to install it.
- We can set user permissions within the AndroidManifest file.
- Each application is executed as a separated process.

Graphics Animation

- The android platform supports frame by frame animations as well as tween animations.





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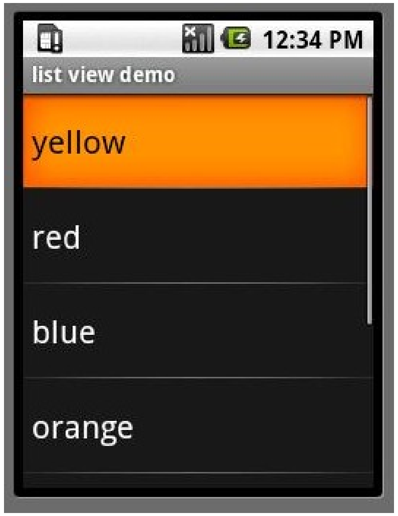
list view demo



12:34 PM

list view demo

yellow

red

blue

orange

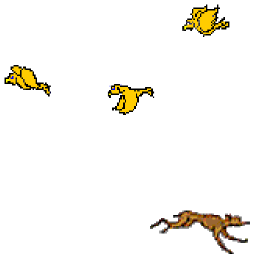
Basic Grahpics

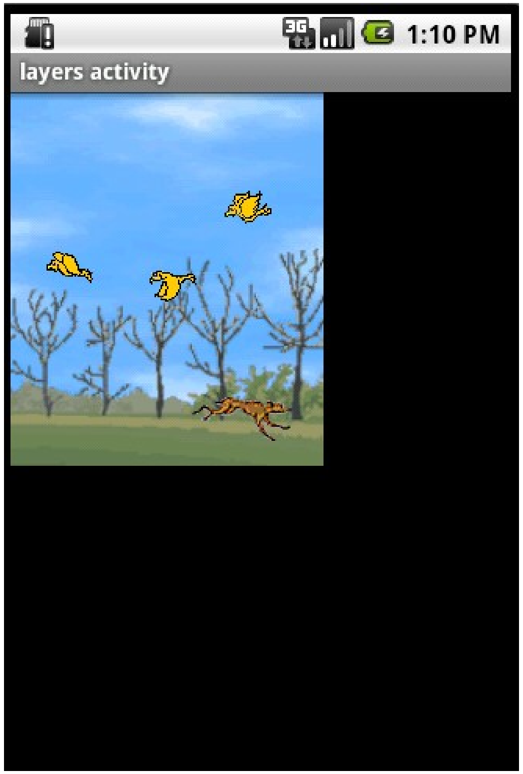
- The android platform supports the rendering of basic graphics.

a.png

b.png

c.png





OpenGL Grahpics

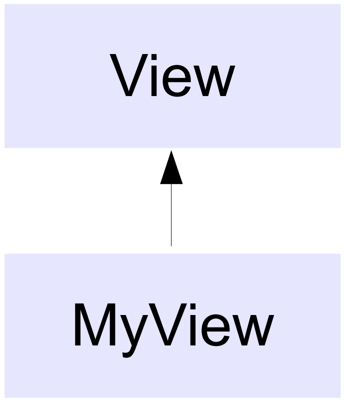
- The android platform supports OpenGL graphics. We can either write our code in native or use the Java layer classes that wrap the native code.

www.opengl.org

Customized Views

- We can define a new view component by defining a new class that extends View or one of the specific View child classes.

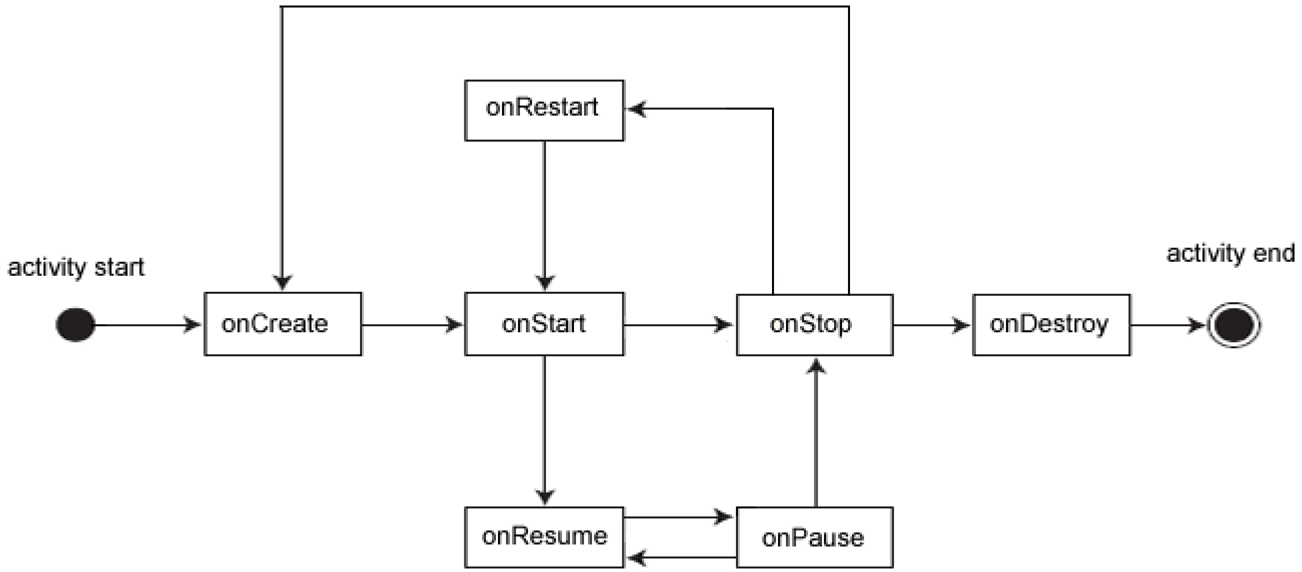
```
class MyEditText extends EditText
{
    ....
}
```



Android Threads

- Each process (application) is executed in a separated thread.
- The user interface single thread rule apply on the android platform as well.

Application Life Cycle



SQLite Database

- The android platform includes the SQLite open source database.

www.sqlite.org

Content Providers

- The Android platform allows to expose the data sources (e.g. the SQLite database) through a REST like abstraction, known as a 'Content Provider'.

```
...
content://com.abelski.schoolprovider/student/34234
...
values = new ContentValues();
values.put(Contacts.People.NAME, "Haim Michael");
uri = getContentResolver().insert(Contacts.People.CONTENT_URI,
values);
...
```

Shared Preferences

- The preferences mechanism allows us to store and retrieve key value pairs of primitive data types.
- This mechanism is typically used to store application preferences, such as the default text font to be loaded whenever the application starts.

Files Management

- The android platform has a files system based on the linux operating system.

```
...
FileInputStream fis = openFileInput(“myfile.txt”);
...
```

Dalvik VM

- The Dalvik VM is a virtual machine, designed and written by Dan Bornstein with the help of more than a few software engineers from Google.
- It doesn't execute virtual machine. It executes dalvik byte code instead.

www.Dalvik.com

SMS Messages

- The short messaging service (SMS) is used both as a service for sending short messages between people and for sending data messages consumed by applications.
- The android platform provides a full access to the SMS functionality through the `SMSManager` class.

Telephony

- The android platform includes the PhoneApp application through which we can initiate and receive phone calls.

- This application embodies the functionality of a mobile telephone.

The WebView Component

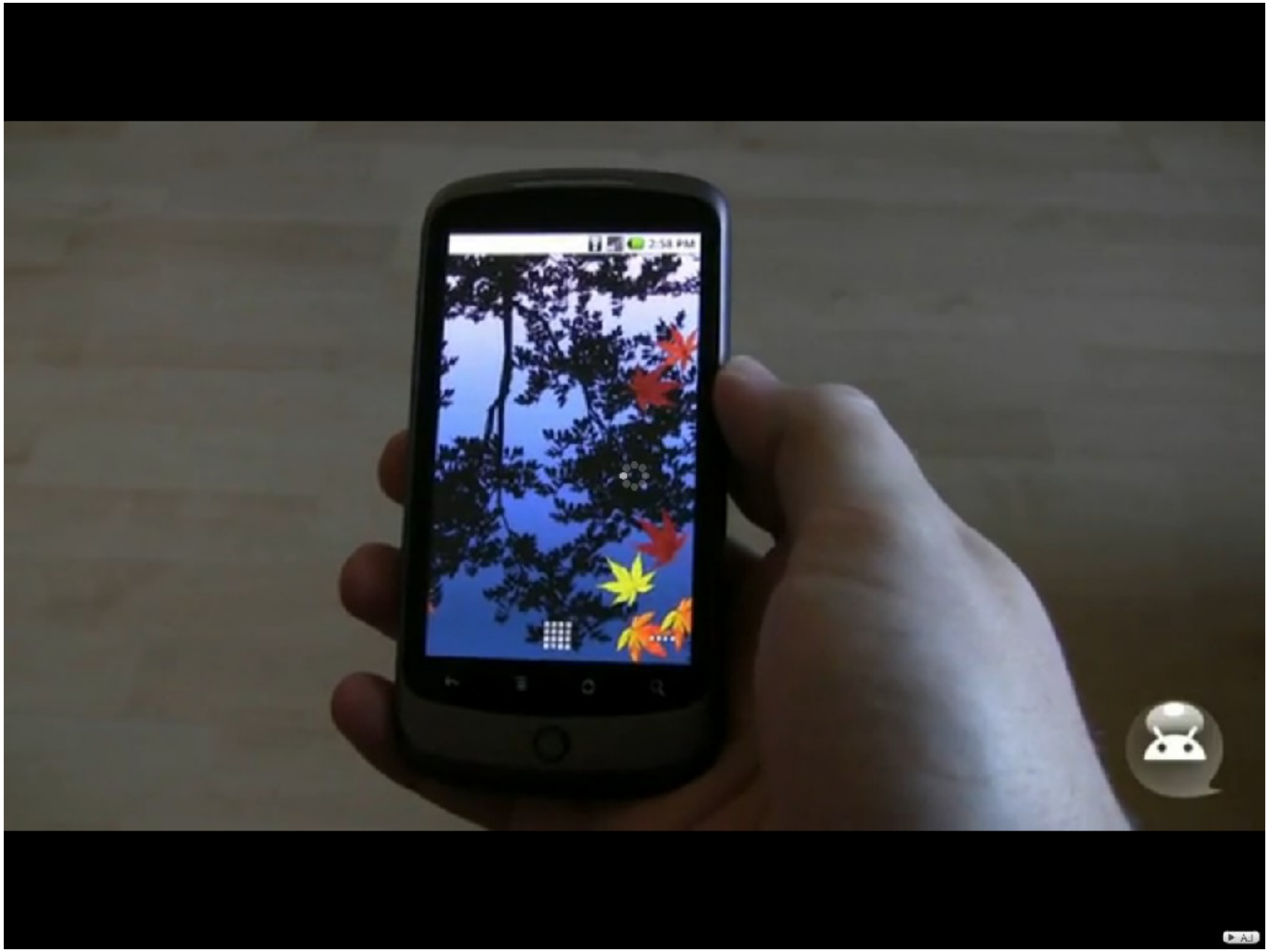
- Allows us to embed web based content within the user interface of our native application.
- The WebView component implementation is based on the WebKit web browser.

HTML5, JavaScript
Ajax, jQuery, CSS,
Flash, DOM, XML

Java

- The Dalvik virtual machine (VM) at its heart is not precisely Java. Its support for the Java SDK is not precisely the same as the traditional Java SDK.
- Using third party Java libraries should work in most cases. Nevertheless, the possibility the android platform doesn't support them still exists.

Live Wallpapers



Bluetooth

- The Android platform includes the support for working with the bluetooth connectivity and allows us to develop applications that wirelessly exchange data with applications running on other bluetooth devices.
- The support for bluetooth is as of SDK 2.1. Current emulator doesn't support bluetooth.

Bluetooth

- The Android Bluetooth APIs allow the following:

  + Scan for other bluetooth devices.

  + Query for paired bluetooth devices.

  + Create RFCOMM channels connected with other device.

  + Use the service discovery.

  + Transfer data to/from other devices.

  + Manage multiple connections.

Text To Speech

- As of Android 1.6 the Android platform includes a multilingual speech synthesis engine, also known as Pico.
- Using this engine it is possible for our application to speak a string of text with an accent that matches the language.
- Using this engine, our application can interact with the users without having them looking back at the screen.

Android Search

- The Android platform search facility allows us to extend the google search bar to search both device based local content and internet external one.
- The android search facility allows local applications to take part.
- When the user enters text, the android platform takes the text and passes it to various applications that were registered to respond the search.

Camera

- In order to access the camera hardware we first must acquire the required permission.

```
<uses-permission android:name=”android.permission.CAMERA”/>
```

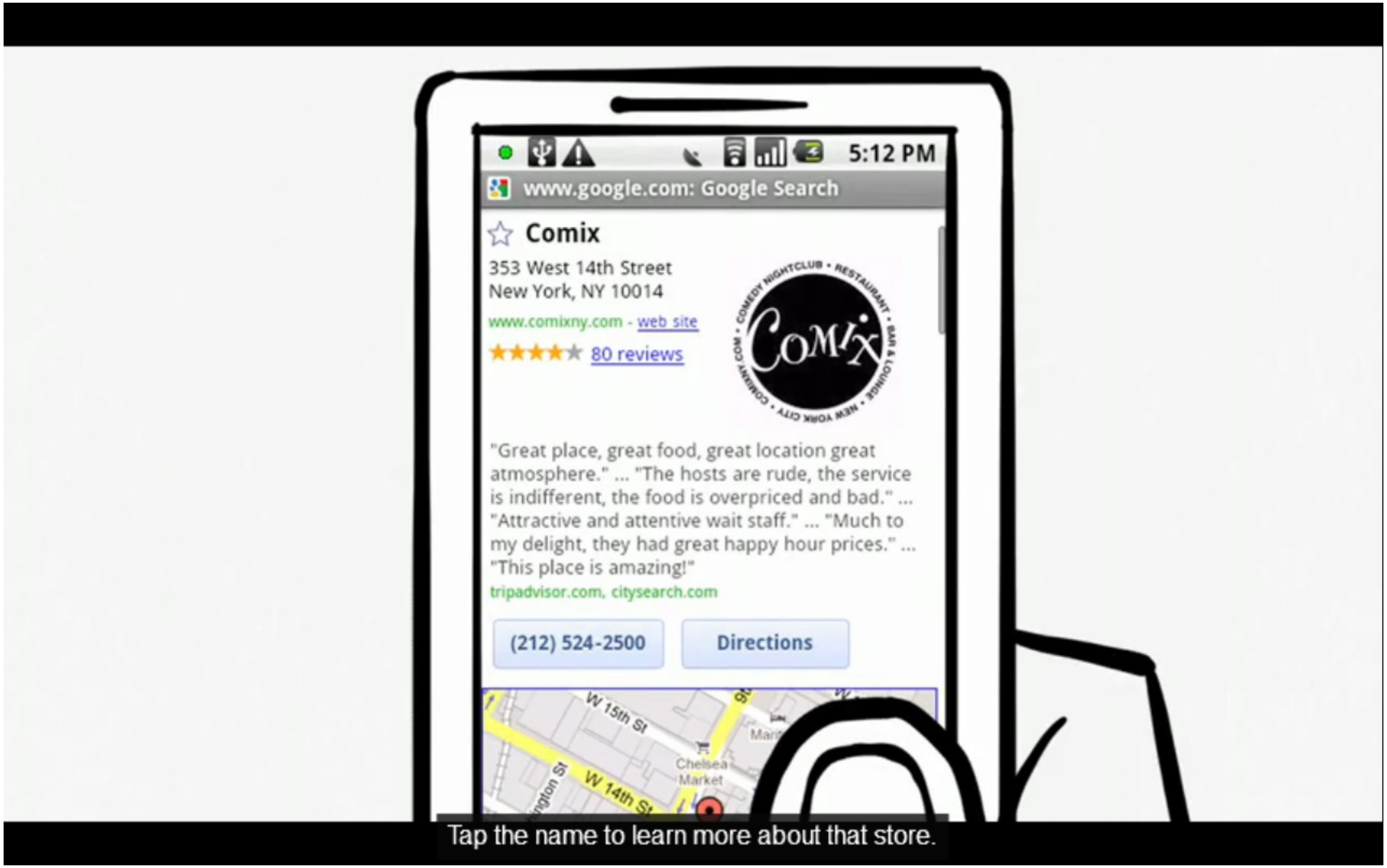
- The `Camera` class lets you adjust camera settings, take pictures and manipulate streaming camera previews.

```
...
Camera myCam = Camera.Open();
...
```

Camera

Just point your phone at the store. Using GPS and compass, Google Goggles will show you the name.

Camera



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www.google.com: Google Search

☆ Comix

353 West 14th Street
New York, NY 10014

www.comixny.com - web site

★★★★★ 80 reviews

"Great place, great food, great location great atmosphere." ... "The hosts are rude, the service is indifferent, the food is overpriced and bad." ... "Attractive and attentive wait staff." ... "Much to my delight, they had great happy hour prices." ... "This place is amazing!"

tripadvisor.com, citysearch.com

(212) 524-2500 | Directions

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COMIX
W 15th St
W 14th St
Chelsea Market

Tap the name to learn more about that store.

Accelerometer

- The android device is already bundled with an accelerometer.
- Using the accelerometer we can detect the movement and the rate of change in the speed of that movement.
- We cannot use the accelerometer for measuring the speed.

Compass

- The android compass is available through the `SensorManager` class.

- Using the compass we can perform the following operations:

  + Determine the current orientation of our hardware

  + Monitor for changes in its orientation

  + Know the direction the user is facing

Vibration

- The `Vibrator` class describes the device vibration component.

```
...
String vibratorService = Context.VIBRATOR_SERVICE;
Vibrator vibrator = (Vibrator)getSystemService(vibratorService);
...
```

WiFi

- The `WiFiManager` class is responsible for managing the Wi-Fi connectivity.
- We can use the `WiFiManager` class for configuring the Wi-Fi connections, managing the current Wi-Fi connection, scan for access points and monitor for changes.

```
...
String service = Context.WIFI_SERVICE;
WifiManager wifi = (WifiManager)getSystemService(service);
...
```

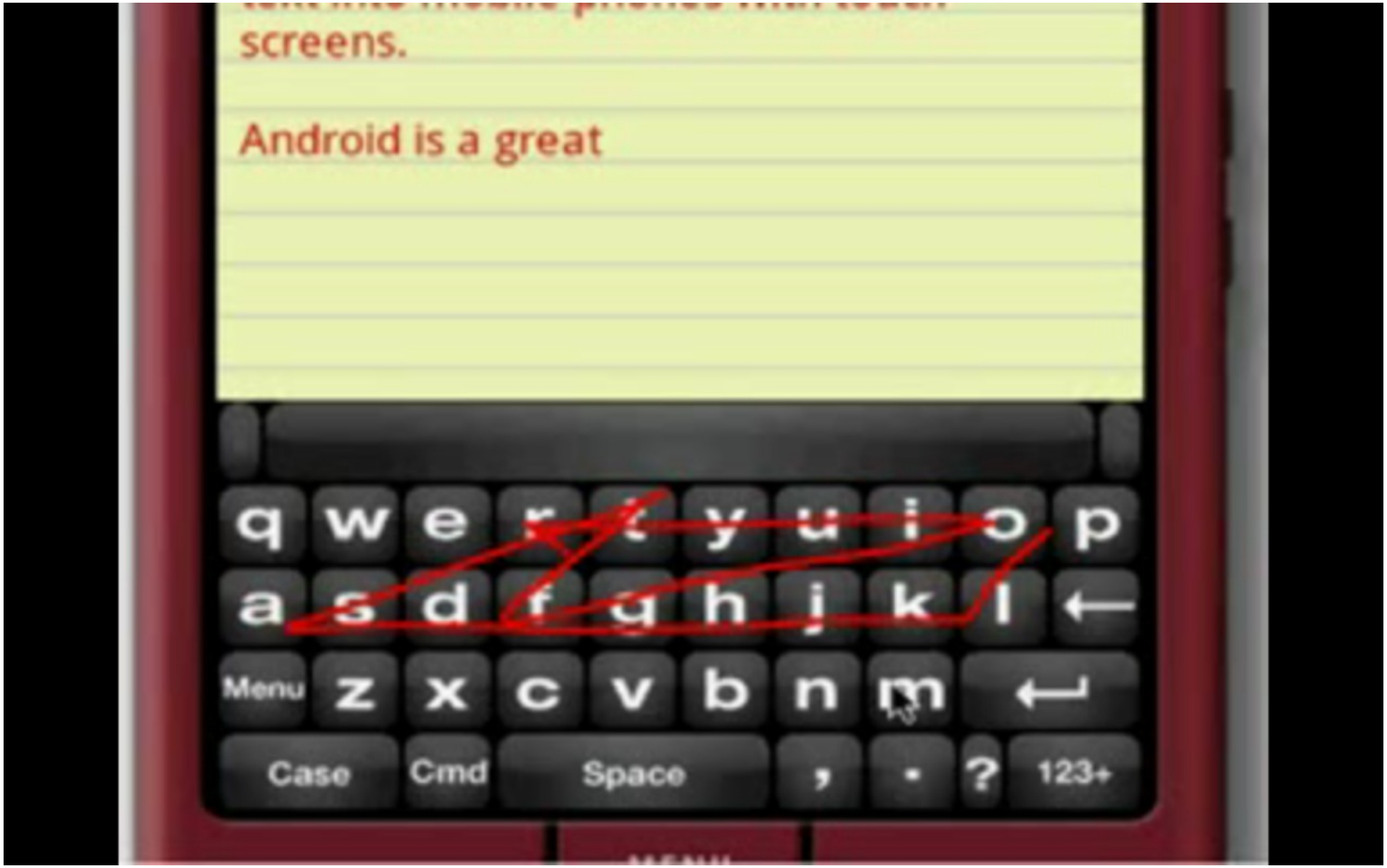
Networking

- The Android platform includes networking classes that exist in Java SE, networking classes that were added as part of the android project and networking classes that belong to various other open source projects, such as those that belong to the Apache foundation.

Input Method Framework

- The IMF (Input Method framework) was introduced in Android 1.5. This framework allows us to develop a tailored software keyboard for our application.
- Some android handsets don't have a hardware keyboard. Others do have one.
- When a hardware keyboard doesn't exist the input method editor (IMF) will be available.

Input Method Framework



screens.

Android is a great

Device Rotation

- Some android handsets switch from portrait mode into landscape mode when sliding out the keyboard. Others switch between the two based on the data received from the accelerometer.

- The android platform provides several ways for handling screen rotation in order to allow us properly handle each of the two possible orientations.

Localization

- The resources include text strings, layouts, sounds, graphics, xml documents and any other static data.

- The android application can include multiple sets of resources, each customized for a different device configuration and/or a different localization.

- When the user runs the application, the android platform automatically selects and loads the resources that best match the handset Locale.

Memory Management

- Many of Java advance memory management tools are available on the Android platform (e.g. WeakReference, System.gc() etc).

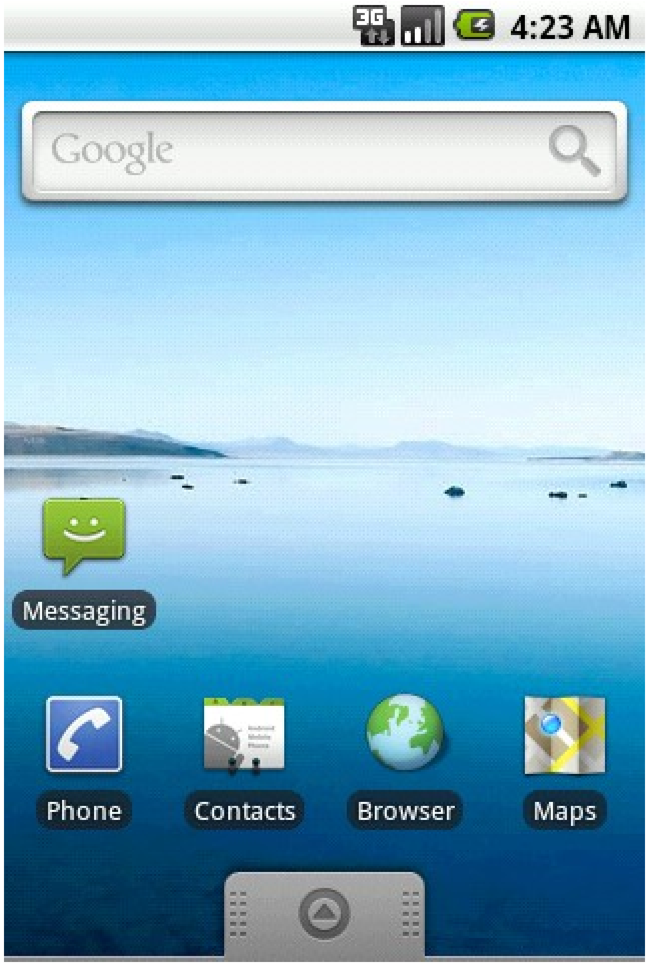
Speech Recognition

- The Android SDK 2.1 includes a voice enabled keyboard.
- Users can use this voice enabled keyboard for dictating a message instead of typing it.
- The user just needs to tap the new microphone button on the keyboard and speak.
- The Android SDK allows us to integrate speech input directly into our own application.

Speech Recognition

>> Navigate to the de Young Museum in San Francisco.

Android App Widgets



The Android Components Architecture

remote service

local service

broadcast receiver

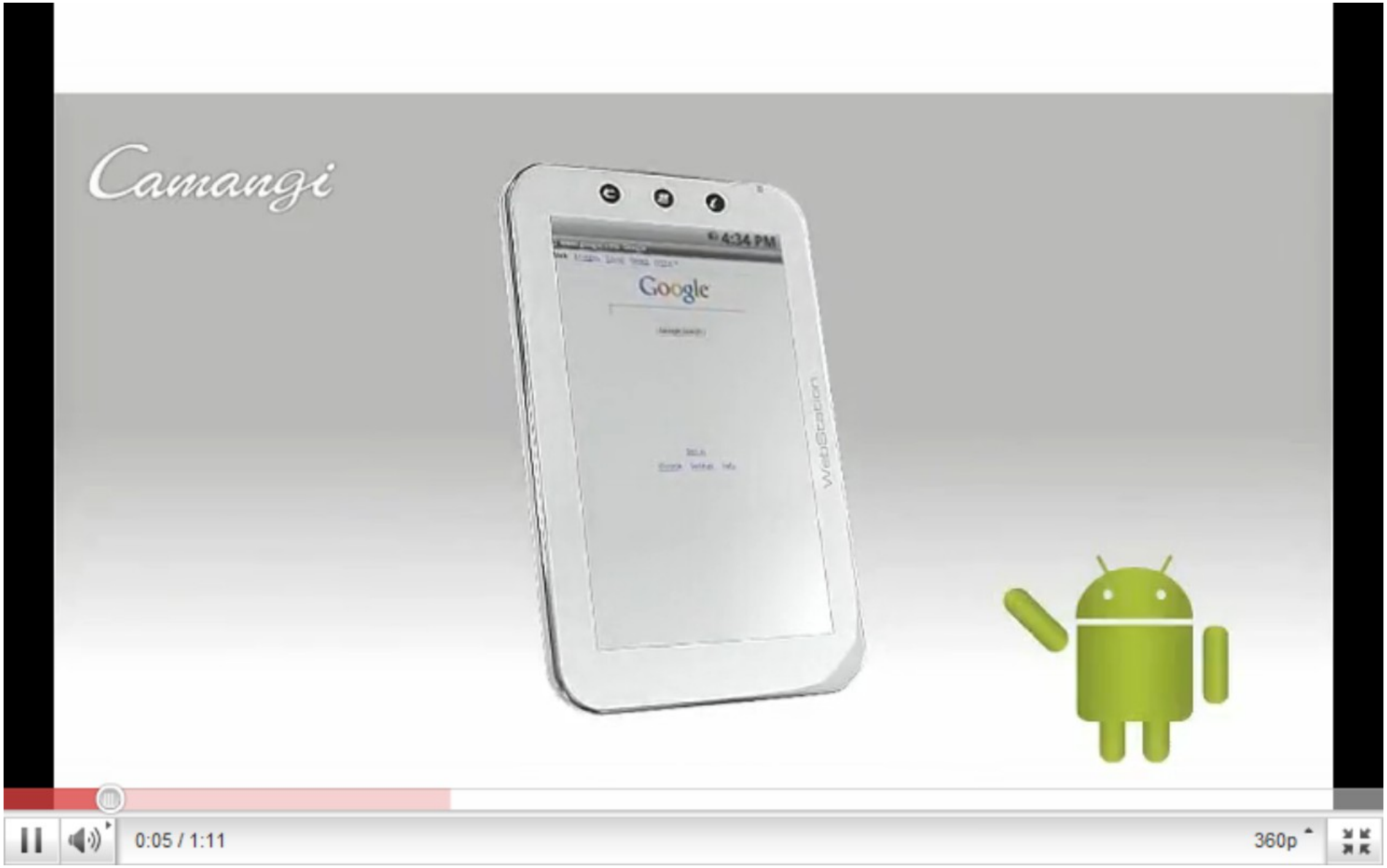
activity

content provider

Android Embedded

Mobile Telephones

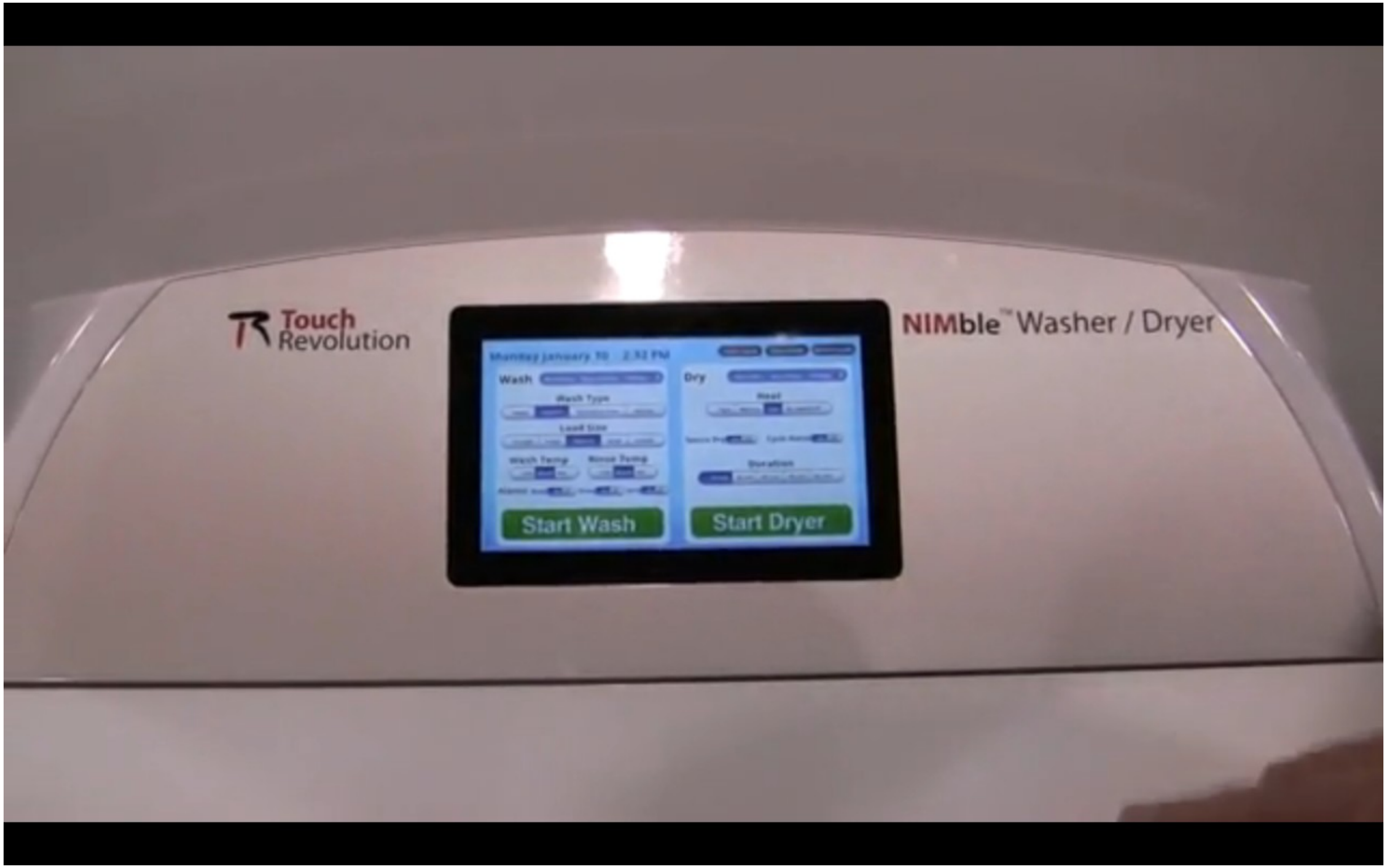
Tablets



Google TV

Microwaves

Washing Machines



Cars

Developers Resources

Android Official Websites

- http://www.openhandsetalliance.com

  This is the official website of the alliance that was set that powers the development of the android platform.

- http://www.android.com

  This is the android main resources web site for developers. Here you can download the SDK, get access to the online API documentation and get the most up-to-date technical information.

Free Learning Resources

- http://www.abelski.com

  This web site includes a huge range of up-to-date eLearning courses about various topics, including the android platform. All courses are free for personal and academic usage.

- http://www.lifemichael.com/en/?p=742

  Here you can find short video clips that explain how to set up the required environment in order to start developing for the android platform.

Discussion Groups

- http://groups.google.com/group/android-ndk

  This is google developers group for native code development on the android platform.

- http://groups.google.com/group/android-platform

  This is google main developers group for the android platform.

Questions & Answers

Thanks:)

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