

# Introduction to Android



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Image credit: <http://www.flickr.com/photos/jesusbelzunce/4366759251>

# History

- **2005** – Google acquired Android Inc.
- **2007** – Open Handset Alliance formed
  - Android is the **first OHA product**
- Released **2009** – ver. 1.1, 1.5, 1.6, 2.0, 2.1
- Released **2010** – ver. 2.2 (May), 2.3 (Q4?)
- Cupcake, Donut, Éclair, Froyo, Gingerbread...
- **2010 Q2** – Android **ranked first** among all smartphone OS handsets sold in US (33%)

# Android Platform

- Android is a 'component' **framework**
- **API Levels** are from 1 (v 1.0) to 8 (v 2.2), generally applications are forward-compatible
- Software and hardware\*\* **features:**
  - WebKit browser with V8, SQLite, media support (MPEG4, H.264,MP3, AAC, AMR,JPG, PNG,GIF)
  - Networking, GFX HW Acceleration, Camera, GPS, Compass, Touch screen, Keyboard, Accelerometer

\*\* - *hardware dependent*

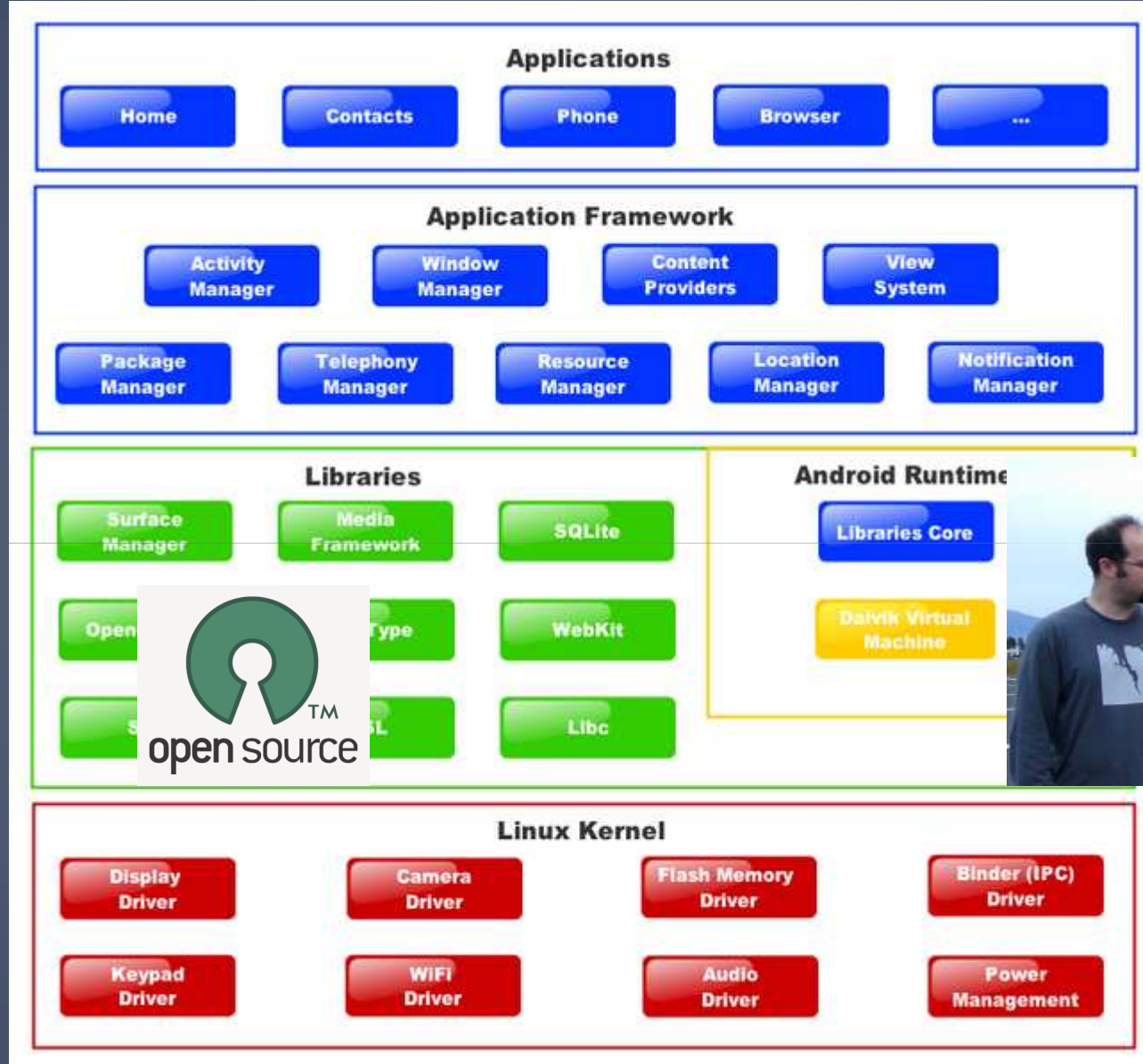
# Android Platform<sup>2</sup>



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# Android Platform (3)

- Programming abstractions:
  - **Manifest file** (metadata)
  - **Services / Content Providers**
  - **Activities** (a single screen, UI thread)
  - **Views** (UI elements)
  - **Intents** (simple message passing)
  - **System Services**: notifications, location, resources, and much, much more
- **Process model** (not application controlled):
  - Foreground, Visible, Service, Background, Empty





# Dalvik Virtual Machine

- Open source, Apache 2 license
- Built on a subset of **Apache Harmony**
- Executes on a modified 2.6.x **Linux** Kernel
- **Java** bytecode is compiled to **Dalvik** bytecode, placed in an .apk file that is distributed
- Register-based VM, **extremely optimized for mobile** applications and **concurrent VMs**
- Security through **permission, VM isolation**

# Example: Hello World (Java)

```
package com.example.helloandroid;

import android.app.Activity;
import android.os.Bundle;
import android.widget.TextView;

public class HelloAndroid extends Activity {
    /** Called when the activity is first created. */
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        TextView tv = new TextView(this);
        tv.setText("Hello, Android");
        setContentView(tv);
    }
}
```



More examples...

# Alternative JVM Languages

- Definitely Yes:
  - Webkit, Scala, C/C++, AppInventor
  - Rumored: AIR, C# (Mono), many translators
- In Progress (60% or more):
  - Clojure, LUA, Rhino, Ruby, Scheme
  - Scripting Layer for Android (SL4A):
    - Beanshell, JRuby, LUA, Perl, Python, Rhino
- Probably not:
  - Anything with dynamically generated Java bytecode
  - Anything that requires compilation from C on non-ARM platforms

# Alternative: Scala

```
package com.example.helloandroid

import android.{app.Activity, os.Bundle, widget.TextView}

class HelloAndroid extends Activity {
  override def onCreate(savedInstanceState: Bundle) : Unit = {
    super.onCreate(savedInstanceState)
    val tv = new TextView(this)
    tv.setText("Hello Android, I'm Scala!")
    setContentView(tv)
  }
}
```

# Alternative: Python

```
import android
```

```
droid = android.Android()
```

```
code = droid.scanBarcode()
```

```
isbn = int(code['result']['SCAN_RESULT'])
```

```
url = "http://books.google.com?q=%d" % isbn
```

```
droid.startActivity('android.intent.action.VIEW', url)
```

# Development Tools

- **ADK** (Java) and **NDK** (ARM, future x86)
- Eclipse plugin and Ant toolchain
- Other GUIs/IDEs: *Motorola, IntelliJ IDEA*
- Android **Emulator** and **AVDs**
- Debug **Bridge** (adb) and **Monitor** (ddms)
- Traceview (methods) and **aapt** (packaging)
- UI/Monkey, SQLite tools, dx, mksdcard, etc

# The Market

- **\$25 fee to register**, approx. 30 countries
- Shows **statistics**, error reports, allows upload
- Sales via Google Checkout merchant account
- Revenue: **70% developers**, 30% upkeep
- **57% apps are free**, double Apple's 28%
- Alternative markets: Verizon, Best Buy, Amazon, and many, many others (**or malware**)
- Automagical device **capability** filtering (!)



## Upload an Application

### Upload assets

Application .apk file

org.mbs3.android.ufcm (247k)

[\[Upload Upgrade\]](#)



UF Campus Map

VersionName: 1.3

VersionCode: 9

Localized to: default

**This apk requests 4 permissions that users will be warned about**

android.permission.INTERNET

android.permission.ACCESS\_FINE\_LOCATION

android.permission.ACCESS\_COARSE\_LOCATION

android.permission.ACCESS\_LOCATION\_EXTRA\_COMMANDS

Screenshots

0 or 2

Add a screenshot:

[Browse...](#)

[Upload](#)

**Screenshots:**

320w x 480h or 480w x 854h

24 bit PNG or JPEG (no alpha)

Full bleed, no border in art

Landscape thumbnails are cropped

Promotional Graphic

optional



[Replace this image](#) | [delete](#)

**Promo Graphic:**

180w x 120h

24 bit PNG or JPEG (no alpha)

Full bleed, no border in art

Marketing Opt-Out

☐ Do not promote my application except in Android Market and in any Google-owned online or mobile properties. I understand that any changes to this preference may take sixty days to take effect.

### Listing details

Language  
[add language](#)

| English (en) |

Title (en)

UF Campus Map



Image credit: <http://www.flickr.com/photos/solbronnumberone/4895471094/>

# Advertising and Analytics

- Only two advertising solutions in town:
  - **AdMob**, recently acquired by Google for \$750M
  - Google **AdSense** for Mobile (beta-ish)
- You get a UI control that displays ads, along with some choice about location-awareness and keywords
- ...
- **Profit!**

## Sites &amp; Apps

## ★ Limited Time Offer: Get a 20% Transfer Bonus!

Transfer funds and receive a 20% bonus on any amount over \$50

Example: Transfer \$100 from pending earnings to run ads and receive an additional \$20 from AdMob for a total of \$120

## Today's Revenue

\$0.00

	Revenue	eCPM
Yesterday	\$0.01 (-86%)	\$0.33 (-79%)
Last 7 Days	\$0.02 (-95%)	\$0.10 (-93%)

Last updated on 2010-10-19 00:00:00 GMT

## Pending Earnings

\$1.71

Ad Balance: \$0.00 [Transfer Funds](#)

## Revenue Trends

[+ Add Site/App](#)

Set table date range:

2010/01/01 - 2010/10/19

Name	Type	Status	House Ads	Revenue ▼	Requests	eCPM	Fill Rate	RPM
UF Campus Map			Off	\$1.71	3,517	\$0.51	95.39%	\$0.49

# Oracle (lions), rooting (tigers), privacy (bears), and more (oh my!)

- August 2010 – Oracle sues Google over patent and copyright infringement over Java IP
- G2 ‘temporary’ root, modders like Cyanogen

# The End: Questions?

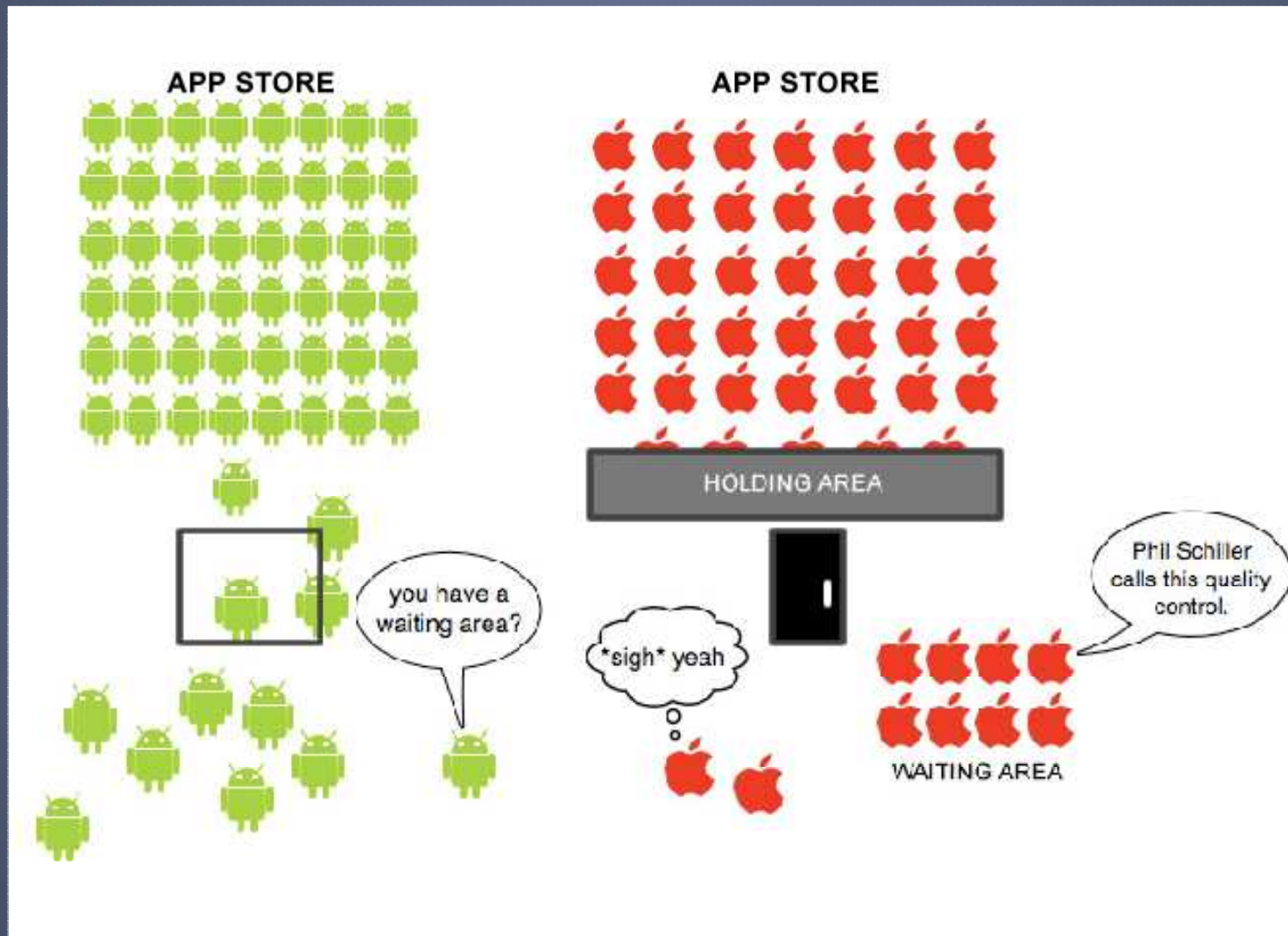


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