1. Introduction and Environment Setting for android development

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Based on material from Adam Champion, Xinfeng Li, C. Horstmann, J. Bloch, C. Collins et al., M.L. Sichitiu (NCSU), V. Janjic (Imperial College London), CSE 2221 (OSU), and other sources
Contents

• Settings for
  – Android studio
  – MySQL
  – Apach Tomcat
Introduction to Android

- Popular mobile device OS: 52% of U.S. smartphone market [1]
- Developed by Open Handset Alliance, led by Google
- Google claims 900,000 Android device activations
Top OS by years in US

DURING Q1 2014
- 42% Android OS
- 52% Apple iOS
- 2% Windows Phone
- 1% BlackBerry
- 3% Others

Q4 2014
- 43.4% Android OS
- 51.7% Apple iOS
- 1.2% Windows Phone
- 0.9% BlackBerry
- 0.7% Others

Q3 2015
- 42.7% Android OS
- 52.6% Apple iOS
- 2.8% Windows Phone
- 1.2% BlackBerry
- 0.7% Others

Legend:
- Green: Android OS
- Gray: Apple iOS
- Blue: Windows Phone
- Red: BlackBerry
- Orange: Others
Android is an operating system for mobile devices such as smartphones and tablet computers. It is developed by the Open Handset Alliance led by Google.

Android has beaten Apple iOS, being the leading mobile operating system from first quarter of 2011.

Version: Android 1.0, 1.1 to 1.5 (Cupcake), 1.6 (Donut), 2.0/2.1 (Eclair), 2.2 (Froyo), 2.3 (Gingerbread), to 3.0 (Honeycomb), 4.0 (Ice Cream Sandwich), 5.0 (Lollipop), 6.0 marshmallow.
Android version
Architecture
Platform overview

• Dalvik VM
  – optimised to run on slow-cpu, low-ram, low-power devices
  – runs .dex files (not .class/.jar)
  – Multiple instances of DVM can run in parallel
Java vs. android api

• Since it uses Java compiler, it implicitly supports a set of Java commands
• Compatible with Java SE5 code
• A subset of Apache Harmony (open source, free Java implementation)
• Multithreading as time-slicing.
• Dalvik implements the keyword synchronized and java.util.concurrent.* package
• Supports reflexion and finalizers but these are not recomended
• Does not support
  – awt, swing, rmi, applet, …
Download JDK

• Need to install Java Development Kit (JDK) to write Java (and Android) programs
  – **Do not** install Java Runtime Environment (JRE); JDK and JRE are different!
• Can download the JDK for your OS at [http://java.oracle.com](http://java.oracle.com)
• Alternatively, for OS X, Linux:
  – OS X:
    • Open /Applications/Utilities/Terminal.app
    • Type javac at command line
    • Install Java when prompt appears
  – Linux:
    • Type `sudo apt-get install default-jdk` at command line (Debian, Ubuntu)
    • Other distributions: consult distribution’s documentation
Install Android Studio


• Alternatives:
  – Download/install Android Developer Tools from this site (based on Eclipse)
  – Install Android SDK tools by themselves, then install ADT for Eclipse separately (from this site)

• We’ll use Android Studio with SDK included (easy)
Welcome! This wizard will set up your development environment for Android Studio. Additionally, the wizard will help port existing Android apps into Android Studio or create a new Android application project.

Choose the type of setup you want for Android Studio:

- Standard
  - Android Studio will be installed with the most common settings and options. Recommended for most users.
- Custom
  - You can customize installation settings and components installed.

If you want to review or change any of your installation settings, click Previous.

Current Settings:
- Setup type: Standard
- Destination Folder: /Users/mac/Library/Android/sdk
- Total Download Size: 451 MB
- Six components to download:
  - Android SDK Build-tools, revision 23.0.2: 36.3 MB
  - Android SDK Platform-tools, revision 23.1.0: 2.62 MB
  - Android SDK Tools, revision 24.4.1: 98 MB
  - Android Support Repository, revision 25: 149 MB
  - Google Repository, revision 24: 67.5 MB

Downloading android-sdk r22.6.2-macosx.zip (832 KB/s)
Installing Android Studio

Android Studio provides everything you need to start developing apps for Android, including the Android Studio IDE and the Android SDK tools.

If you didn't download Android Studio, go [download Android Studio now](#), or switch to the stand-alone SDK Tools install instructions.

Before you set up Android Studio, be sure you have installed JDK 6 or higher (the JRE alone is not sufficient)—JDK 7 is required when developing for Android 5.0 and higher. To check if you have JDK installed (and which version), open a terminal and type `javac -version`. If the JDK is not available or the version is lower than version 6, download the [Java SE Development Kit 7](#).

### To set up Android Studio on Mac OSX:

1. Launch the `.dmg` file you just downloaded.
2. Drag and drop Android Studio into the Applications folder.
3. Open Android Studio and follow the setup wizard to install any necessary SDK tools.

If you need to use the Android SDK tools from a command line, you can access them at:

```
/Users/<user>/Library/Android/sdk/
```

Android Studio is now ready and loaded with the Android developer tools, but there are still a couple packages you should add to make your Android SDK complete.
Android Highlights (1)

- Android apps execute on Dalvik VM, a “clean-room” implementation of JVM
  - Dalvik optimized for efficient execution
  - Dalvik: register-based VM, unlike Oracle’s stack-based JVM
  - Java .class bytecode translated to Dalvik EXecutable (DEX) bytecode, which Dalvik interprets
Android Highlights (2)

• Android apps written in Java 5
  – Actually, a Java dialect (Apache Harmony)
  – Everything we’ve learned still holds

• Apps use four main components:
  – Activity: A “single screen” that’s visible to user
  – Service: Long-running background “part” of app (not separate process or thread)
  – ContentProvider: Manages app data (usually stored in database) and data access for queries
  – BroadcastReceiver: Component that listens for particular Android system “events”, e.g., “found wireless device”, and responds accordingly
App Manifest

• Every Android app must include an AndroidManifest.xml file describing functionality
• The manifest specifies:
  – App’s Activities, Services, etc.
  – Permissions requested by app
  – Minimum API required
  – Hardware features required, e.g., camera with autofocus
  – External libraries to which app is linked, e.g., Google Maps library
Activity Lifecycle

- **Activity**: key building block of Android apps
- Extend **Activity** class, override `onCreate()`, `onPause()`, `onResume()` methods
- Dalvik VM can stop any **Activity** without warning, so saving state is important!
- Activities need to be “responsive”, otherwise Android shows user “App Not Responsive” warning:
  - Place lengthy operations in Runnable Threads, AsyncTasks

Source: [12]
Make your first android app
Configure your new project

Application name: MyApplication

Company Domain: mhlee.com

Package name: com.mhlee.myapplication

Project location: /Users/mac/Dropbox/class/android_projects/MyApplication
Target Android Devices

Select the form factors your app will run on

Different platforms may require separate SDKs

- **Phone and Tablet**
  - Minimum SDK: API 15: Android 4.0.3 (IceCreamSandwich)
    - Lower API levels target more devices, but have fewer features available.
    - By targeting API 15 and later, your app will run on approximately **96.2%** of the devices that are active on the Google Play Store.
    - Help me choose

- **Wear**
  - Minimum SDK: API 21: Android 5.0 (Lollipop)

- **TV**
  - Minimum SDK: API 21: Android 5.0 (Lollipop)

- **Android Auto**

- **Glass**
  - Minimum SDK: Glass Development Kit Preview

---

[Options] Cancel  Previous  Next  Finish
Installing Requested Components

SDK Path: /Users/mac/Library/Android/sdk

Loading SDK information...

Installing Archives:
  Preparing to install archives
  Installing Android SDK Build-tools, revision 19.1.0
  Installed Android SDK Build-tools, revision 19.1.0
Done. 1 package installed.

Done
Add an activity to Mobile

- Add No Activity
- Blank Activity
- Empty Activity
- Fullscreen Activity
- Google AdMob Ads Activity
- Google Maps Activity
Customize the Activity

Creates a new blank activity with an app bar.

Activity Name: MainActivity
Layout Name: activity_main
Title: MainActivity
Menu Resource Name: menu_main

Blank Activity

The name of the activity class to create

Cancel  Previous  Next  Finish
No files are open

- Search Everywhere with Double ⌘
- Open a file by name with ⌘O
- Open Recent Files with ⌘E
- Open Navigation Bar with ⌘↑
- Drag and Drop file(s) here from Finder
Virtual devices allow you to test your application without having to own the physical devices.

To prioritize which devices to test your application on,
<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Resolution</th>
<th>Density</th>
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<tr>
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<td>4.0&quot;</td>
<td>480x800</td>
<td>hdpi</td>
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<tr>
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<tr>
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<td><strong>1080x1920</strong></td>
<td><strong>xxhdpi</strong></td>
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<tr>
<td>Nexus 4</td>
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<td>xhdpi</td>
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<tr>
<td>Galaxy Nexus</td>
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<td>xhdpi</td>
</tr>
<tr>
<td>5.4&quot; FWVGA</td>
<td>5.4&quot;</td>
<td>480x854</td>
<td>mdpi</td>
</tr>
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<td>480x800</td>
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<td>hdpi</td>
</tr>
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<td>480x800</td>
<td>hdpi</td>
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</table>
References