UNIVERSITY of WASHINGTON

Android 210 - Lecture 1 Overview

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Agenda

- Biography & Course overview
- Intro to Android
- Android Studio & tools
- HelloWorld & hands-on lab
- Android components

Biography

- Instructor:

  Margaret Maynard-Reid
- Teaching Assistant:

  Chuwuezugo Nwosu

Course Overview

- Course portal on Catalyst
- Sample code on GitHub
- Video recording available after class

Homework and Project

- 4 homework assignments
- 1 (group) project
- Submit on Catalyst Dropbox

Final Project

- Choose an app of your interest
- Form team & idea by Jan 12
- Submit source code by March 15
- Present project on March 16, via recording or in person

Course Materials

Official reference:

- The Android Developer Online Documentation

Recommended

- The Busy Coder’s Guide to Android Development, by Mark Murphy

Optional Reading:

- Android Programming: The Big Nerd Ranch Guide, by Bill Phillips and Brian Hardy
- Learn Java for Android Development 3rd Edition, by Jeff Friesen

Learning Resources

Aside from classroom learning,

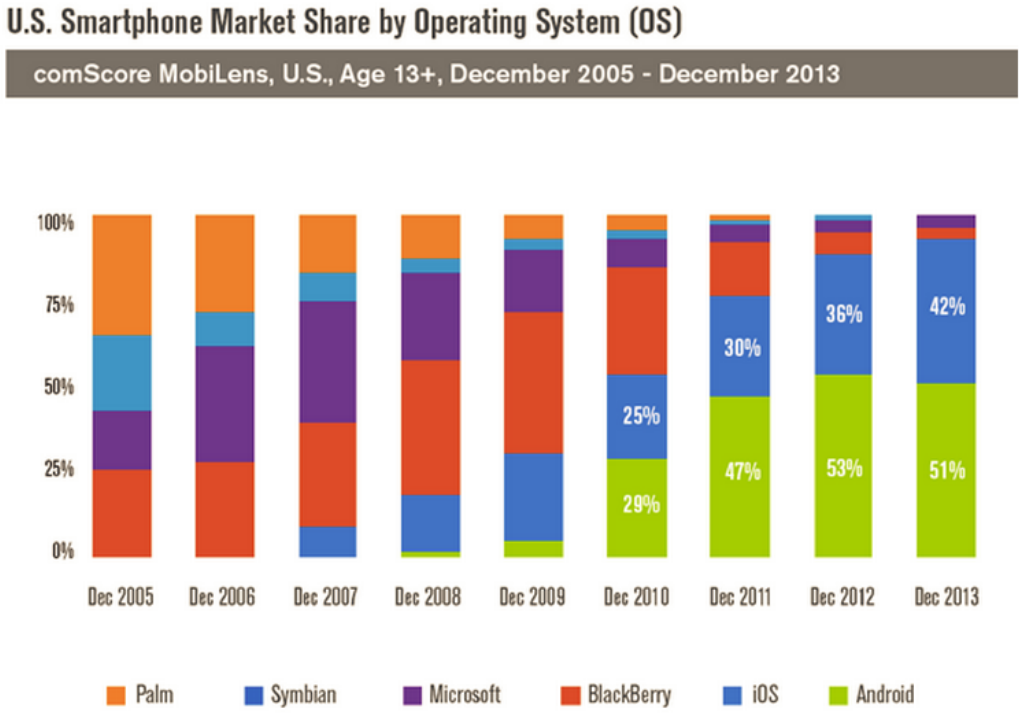
- Online documentation
- Textbooks
- Android SDK sample code
- Stackoverflow
- Course discussion forum

Android

Android Stories

- Android 2.3 Gingerbread—Four years later, the OS just won't die
- Android fragmentation by OpenSignal (Aug 2014)
- Looking back, moving forward: 2014 in retrospect, 2015 in preview
- Android Studio eclipses Eclipse on Google's developer tools page

Android US Smartphone Market Share



Android History

- 2002 - Danger Inc released the Hiptop (Sidekick)
- 2003 - Android Inc. was founded by Andy Rubin
- 2005 - Google acquired Android Inc.
- 2007 - Android SDK available to devs
- 2008 - First Android phone: HTC Dream
- 2009 - Motorola Droid (Android 2.0)
- 2010 - an exciting year for Android! Nexus One, Samsung Galaxy S line, HTC 4G Evo, Ginger Bread 2.3

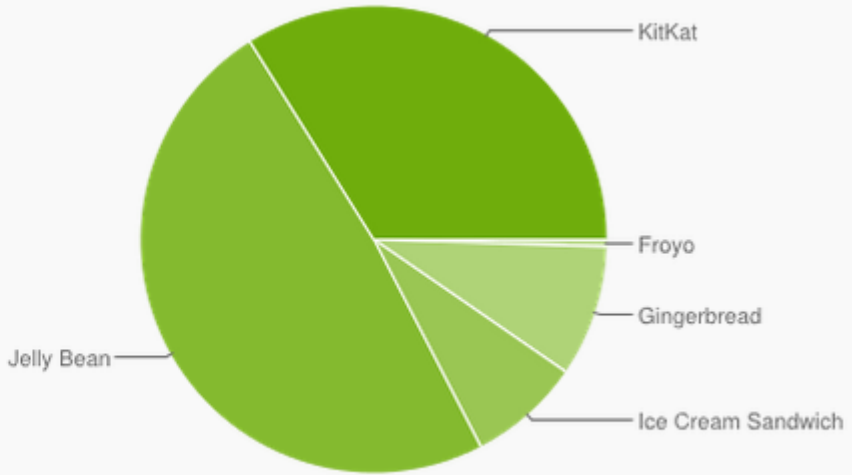
Android Versions

Codename	Version	API Level	Date Released
	1.0-1.1	API 1-2	SEP 2008 – FEB 2009
Cupcake	1.5	API 3	Apr-09
Donut	1.6	API 4	Sep-09
Éclair	2.0-2.1	API 5-7	OCT 2009 – JAN 2010
Froyo	2.2–2.2.3	API 8	May-10
Gingerbread	2.3–2.3.7	API 9-10	Dec-10
Honeycomb	3.0–3.2.6	API 11-13	Feb-11
Ice Cream Sandwich	4.0–4.0.4	API 14-15	Oct-11
Jelly Bean	4.1–4.3.1	API16-18	Oct-12
Kitkat	4.4–4.4.4	API19	Oct-13
Lollipop	5.0–5.0.2	API20-21	Oct-14

http://en.wikipedia.org/wiki/Android_version_history

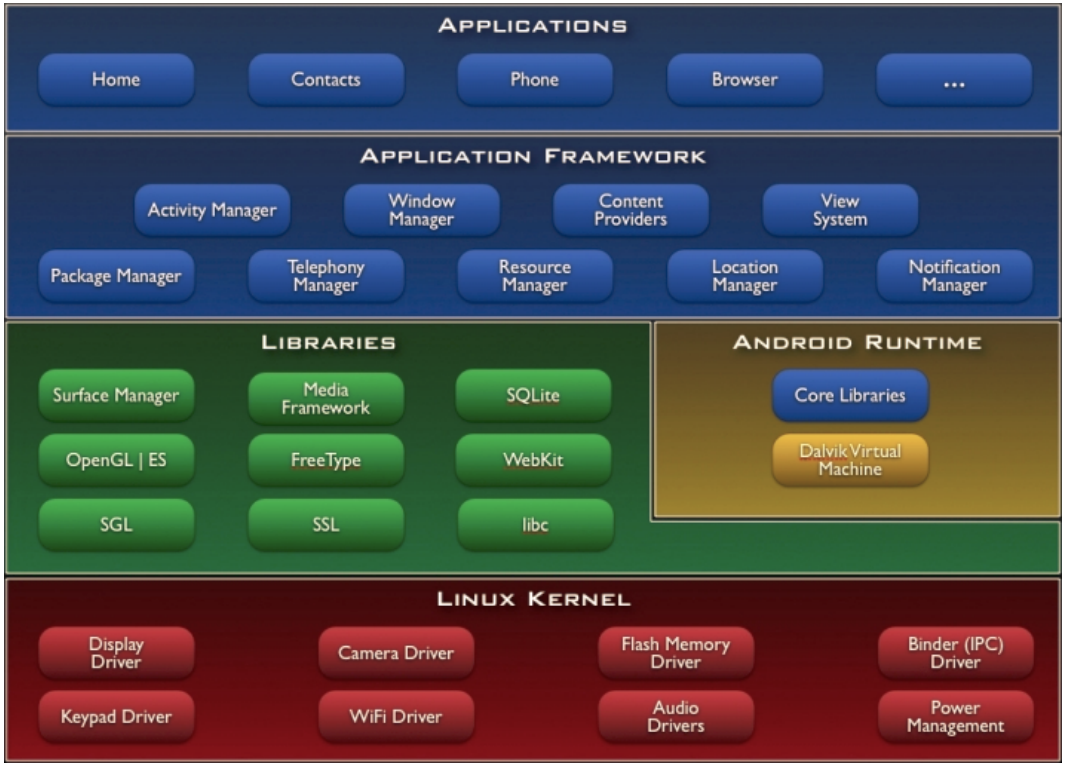
Android Distribution (as of 12/12014)

Version	Codename	API	Distribution
2.2	Froyo	8	0.5%
2.3.3 - 2.3.7	Gingerbread	10	9.1%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	7.8%
4.1.x	Jelly Bean	16	21.3%
4.2.x		17	20.4%
4.3		18	7.0%
4.4	KitKat	19	33.9%



http://developer.android.com/about/dashboards/index.html

Android Architecture



Dalvik Runtime

Dalvik Virtual Machine (subset of Apache Harmony)

– Designed for mobile efficiency

– Uses kernel threading and physical memory management

– DVM isn't a JVM

- Executes Dalvik Executable (DEX) files
  - – Android source files are compiled into java and then dex via dx
  - – Included Java class files are transmogrified into dex via dx
- Improvements
  - – Reduced memory footprint
    - » Duplicate string removal across classes
    - » Register-Based and not Stack-Based
  - – Improvements to concurrent VM execution

ART

- Introduced in 4.4 and released in 5.0
- Ahead-of-time (AOT) compilation
- Improved garbage collection
- Development and debugging improvements

What is an Android Application?

- Application Package = Manifest + Resources + Code
- Application Package == APK
- APK == A zip file

Break

IDEs for Android Development

- Android Studio
- Eclipse with ADT
- IntelliJ
- AIDE

Eclipse vs. Android Studio

- Build Tools (AS uses Gradle which is much more powerful)
- User Interface (AS is better)
- Code completion & refactoring (AS is better)
- Performance

Android Studio

- Installation
- Project structure
- Gradle

Setup Android Studio

- Download Android Studio
- Download Android SDK
- Create emulator in ADV

Android Studio

Launch Android Studio

- Import an Android code Sample
- Import a non-AS project
- Start a new project

Import a non-AS project

- Import a project
- Run project
- Show results on device

Create a new project

- **Application Name** = HelloWorld (what user sees)
- **Package name** = follow Java convention
- **Project Location** = where your project files are located
- Select “**Phone and Tablet”** & set **minSDK = 15**
- Add new activity to mobile: **new blank activity**
- Activity and xml names (leave as default for now)
- Click “Finish”.

Emulator from Android SDK

- In Android Studio, click AVD
- Add a new emulator Nexus 5
- Choose x86
- Install Intel HAXM
- Run emulator again

3rd Party Emulator - Genymotion

- Better UI
- Very fast, may even be faster than actual device
- Run in VirtualBox VM
- Set up fairly easy for Mac, may not work on Windows (behind firewall)
- Doesn’t have Google Play Services

Android Debug Bridge

- Download device driver (Windows only)
- Connect your device via USB
- Enable USB debugging on device (under **Developer options**)

adb Commands

- adb help
- adb devices
- adb logcat
- adb shell
- adb kill-server, adb start-server

Full list of commands here:

http://developer.android.com/tools/help/adb.html

Break

Brief Java Overview

Java crash course

http://commonsware.com/blog/2010/08/02/java-good-parts-version.html

Project Structure

- Manifest
- Source code, java classes
- res folder
- xml layout

Android Manifest

Defines Application

– Permissions, Activities, Services, Receivers, etc

• Every Activity to be used needs to be defined

– Dot Notation in Manifest

.HelloWorld

edu.uw.aad.mzm.sample.HelloWorldActivity

/res folder

- /drawable - images
- /layout - UI xmls
- /values - constants definitions
  - colors.xml
  - strings.xml
  - dimens.xml

R.java

- Contains identifiers for resources used in the application.
- Automatically generated from resources defined in the resources files.
- Package name for R for your application is the package name provided in the manifest.

Hands-on lab

- change text
- change text color
- change app name
- change title in activity
- create a new activity
- add a button, click button to second activity

Android Core Components

- Activity
- Service
- Receiver
- Content Provider

Activity

An interactive component that fills a user need

- If it is normally a verb, action, or “activity”
  - Displaying something
  - Filling out a form
  - Calculating something
  - Etc...
- Usually one screen but doesn’t have to be full-screen
- Defined in the Manifest as <activity />

Service

An application background task

Defined in the Manifest as <service />

Content Provider

Cross-process data sharing

- Defined in the Manifest as <provider />

Receiver

Application callback for intents

- Defined in the Manifest as <receiver />

Intent

- A method of inter-process communication
- An operation to be performed
  - “The glue between activities”
  - “A passive data structure holding an abstract description of an action to be performed”

Appendix

- **Official Android Developer Guide**
  https://developer.android.com/guide/index.html
- **Android Platform Distribution**
  http://developer.android.com/about/dashboards/index.html
- **Android Studio**
  https://developer.android.com/sdk/installing/studio.html