Lecture 00

Android Computing Platform

CMSC 4303/5303 Mobile Apps Programming

Hong K. Sung, Ph.D.
Department of Computer Science
University of Central Oklahoma

1

Objectives

- a brief history (versions) of Android
- how to set up development environemnt

2

Android

- an open-source software stack that includes:
  - the operating system
  - middleware
  - key mobile applications with a set of API libraries for writing applications
- an open development environment built on an open-source Linux kernel
  - Apple iPhone and Microsoft Windows Phone are built on proprietary operating systems.

3

Android Timeline





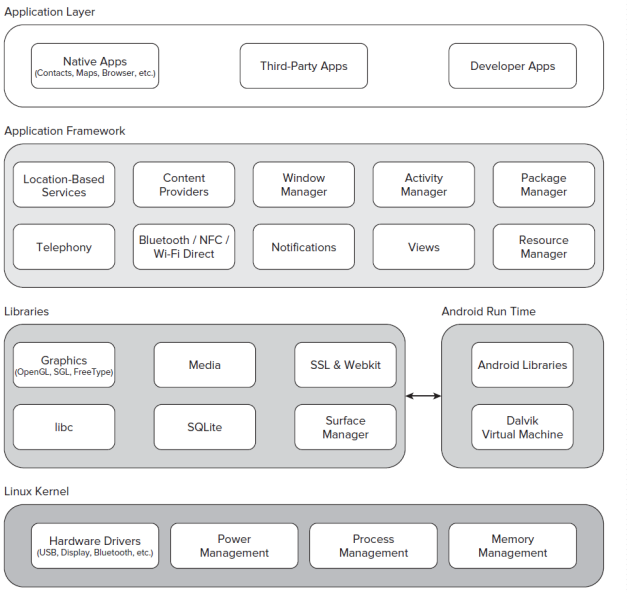




- 1.0 (*Astro*) – 2008.09
- 1.1 – 2009.02
- 1.5 (Cupcake) – 2009.04
- 1.6 (Donut) – 2009.09
- 2.0/2.1 (Eclair) – 2009.10 / 2010.01
- 2.2 (Froyo) – 2010.05
- 2.3 (Gingerbread) – 2010.12
- 3.0 (Honeycomb) – 2011.02 (tablet)
- 4.0 (Ice Cream Sandwich) – 2011.10
- 4.1/4.2 (Jelly Bean) – 2012.07/2012.11
- **4.3 (Jelly Bean) – 2013.07**
- 5.0 (Key Lime Pie) – 2014?

4

Android Software Stack



5

Android Application Framework

- **Activity Manager and Fragment Manager** – control the lifecycle of your Activities and Fragments including management of the Activity stack
- **Views** – used to construct the user interface for your Activities and Fragments
- **Notification Manager** – provides a consistent and nonintrusive mechanism for signaling your users
- **Content Provider** – lets your applications share data
- **Resource Manager** – enables non-code resources such as string and graphics, to be externalized
- **Intents** – provide a mechanism for transferring data between applications and their components

6

development of User Interface

- 1st generation UI: the traditional C based MS Windows API
- 2nd generation UI: C++ based MS Foundation Classes (MFC)
- 3rd generation UI: Java based Swing
- 4th generation UI: Android, JavaFX, MS Silverlight, Mozilla XML UI

7

Android UI

- Declaring the interface in XML file
- Load XML view definitions as windows in UI application. Menus are loaded from XML files, too.
- **Activity**: screen or window
  - An activity comprises multiple views
- **View**: basic UI building block
  - view groups: composite views
  - a view internally uses concepts of canvas, painting, user interaction.
  - fragment (Android 3.0): chunked view and functionality

8

advanced UI concepts

XML file:

```
<?xml version="1.0" encoding="utf-8"?>
<!-- place it in /res/layout/sample_page1.xml -->
<!-- will auto generate an id called: R.layout.sample_page1 -->
<LinearLayout ..some basic attributes..>
<TextView android:id="@+id/textViewId"
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:text="@string/hello"
    />
</LinearLayout>
```

Program:
TextView tv = (TextView) this.findViewById(R.id.**textViewId**);

9

development environment

10

The necessary tools

- The ADT (Android Developer Tools) Bundle
  - Eclipse: IDE (integrated development environment)
  - ADT: a plug-in for Eclipse.
  - Android SDK
  - Android SDK tools and platform-tools: for debugging and testing your apps
  - a system image for the Android emulator

11

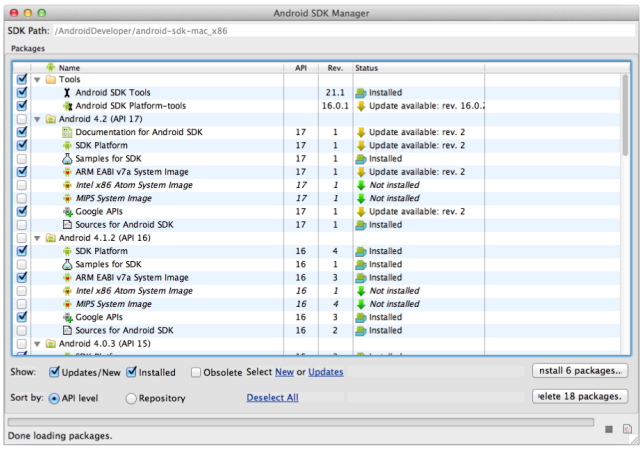
Downloading and installing the ADT Bundle

- For Windows, install the JDK first from http://www.oracle.com
- Download the bundle from http://developer.android.com/sdk/index.html
- Extract the zip file to where you want Eclipse and the other tools installed.
- In the extracted files, find and open the **eclipse** directory and launch Eclipse.
- For more info: http://developer.android.com/sdk/index.html

12

Downloading earlier SDK versions

- To have your apps compatible with earlier versions of Android, you will need to install earlier SDK versions.
- In Eclipse, select Window → Android SDK Manager



How far going back?

- You may want every version back to Froyo (Android 2.2)
  - the SDK platform
  - an emulator system image
  - the Google APIs
  - Note that downloading these components may take a while.

Version	Code name	Release date	API level	Distribution
4.3	*Jelly Bean*	July 24, 2013	18	0,0%
4.2.x	*Jelly Bean*	November 13, 2012	17	5.6%
4.1.x	*Jelly Bean*	July 9, 2012	16	32.5%
4.0.3–4.0.4	*Ice Cream Sandwich*	December 16, 2011	15	23.3%
3.2	*Honeycomb*	July 15, 2011	13	0.1%
3.1	*Honeycomb*	May 10, 2011	12	0%
2.3.3–2.3.7	*Gingerbread*	February 9, 2011	10	34.1%
2.3–2.3.2	*Gingerbread*	December 6, 2010	9	0%
2.2	*Froyo*	May 20, 2010	8	3.1%
2.0–2.1	*Eclair*	October 26, 2009	7	1.5%
1.6	*Donut*	September 15, 2009	4	0.1%
1.5	*Cupcake*	April 30, 2009	3	0%

As of July 2013.
Source: Wikipedia

Problems in updating Android SDK Tools with rev. 22.

> *This Android SDK requires Android Developer Toolkit version 22.0.0 or above.*
> *Current version is 21.x.x.*
> *Please update ADT to the latest version.*

Here is a list of steps that you need to take.

1. Help - Install New Software in the ADT menu.
2. Type https://dl-ssl.google.com/android/eclipse/site.xml in "Work with:" and Enter.
3. You can see the "Developer Tools" item.
4. Select it and click Next.
5. Click Next one more.
6. Click Finish accepting the terms of the license agreements.
7. Click OK in the "Security Warning" window.
8. Let the installer restart ADT after installing the tools.

http://mirlab.wordpress.com/2013/05/22/problems-in-updating-android-sdk-tools-with-rev-22/

15

Emulator vs. Actual devices

- The emulator is useful for testing apps. However, it is good to have an actual Android device to run apps on.
  - Some apps cannot run on emulator (telephony API)
  - Actual device is much faster to launch apps.
- If you have an actual device (smartphone or tablet), set the min ADK version of Eclipse project to the Android version of your device.
  - To find Android version from the device: "Settings" → "About device"

16

fundamental components 1

- **View**
  - a UI element that form the basic building block.
  - e.g., button, label, text field, other UI elements
- **Activity**
  - a UI concept that represents a single screen.
  - An activity may contain zero or multiple views.
  - An Android application may have several activities.
- **Fragment**
  - for a large screen (tablets), an activity can display multiple fragments on the screen at the same time.

17

fundamental components 2

- **Intent**
  - an "intention" to do some work
  - an intra- or inter-process mechanism to invoke components (activity, service, receiver, etc) in Android
  - e.g., broadcast a message, start a service, launch an activity, display a web page, dial a phone number, etc
- **Content provider**
  - a standard mechanism for applications to share data without exposing the underlying storage.
  - an abstraction of a data source

18

fundamental components 3

- **Service**
  - background process that can potentially run for a long time
    - local service: only accessible by the application that is hosting the service
    - remote service: accessible remotely by other applications running on the device
  - e.g., email application to poll for new messages
- **`AndroidManifest.xml`**
  - defines the contents and behavior of an application.
  - lists activities, services, permissions and features, etc.

19