CS260 Intro to Java & Android
04.Android Intro

Winter 2014

Android - Getting Started

- Android SDK contains:
  - API Libraries
  - Developer Tools
  - Documentation
  - Sample Code

- Best development environment is Eclipse with the Android Developer Tool (ADT) plugin which integrates developer tools

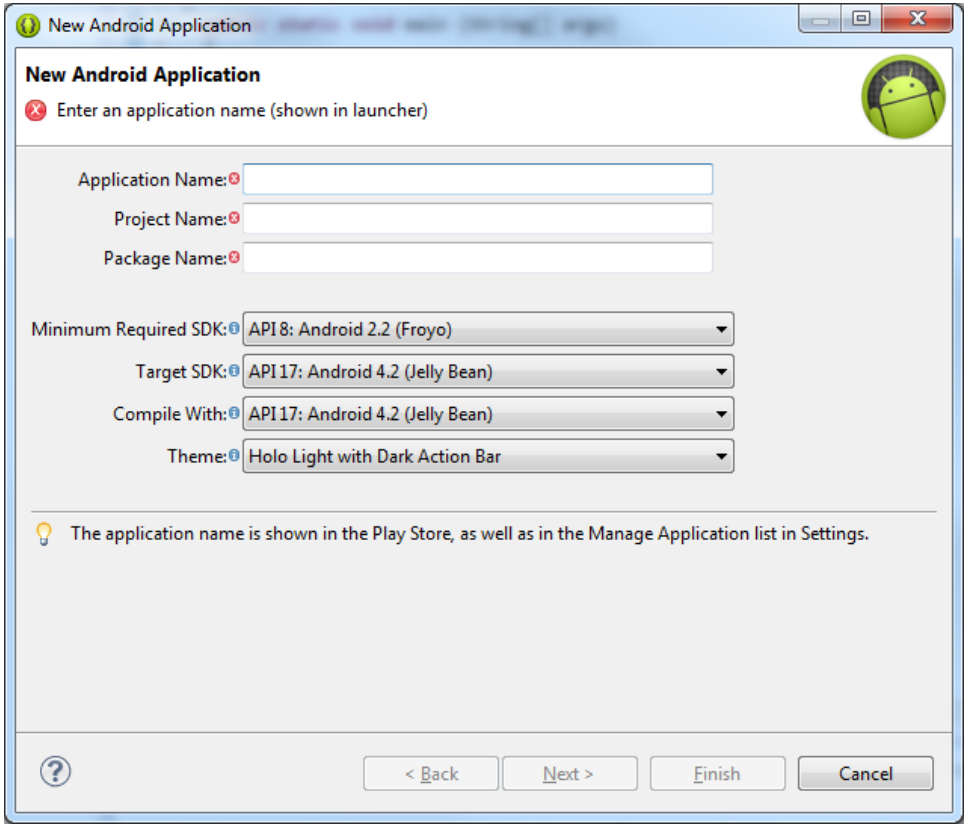
Android Portability

- Android applications run within the Dalvik virtual machine

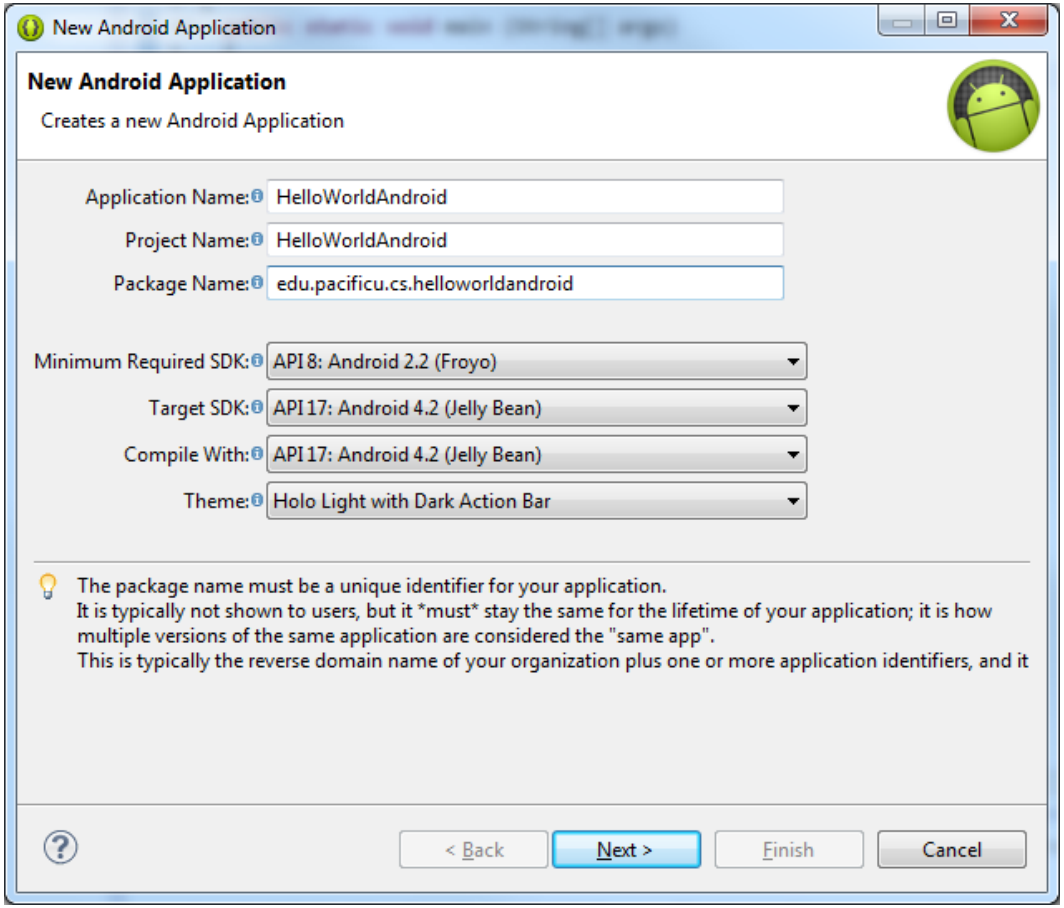
- Development Platforms:
  - Windows (XP, Windows, 7, 8)
  - Linux
  - Mac OS 10.4.8 or later (Intel chips only)

Android HelloWorld Application

- File -> New -> Android Application Project



New Android Project



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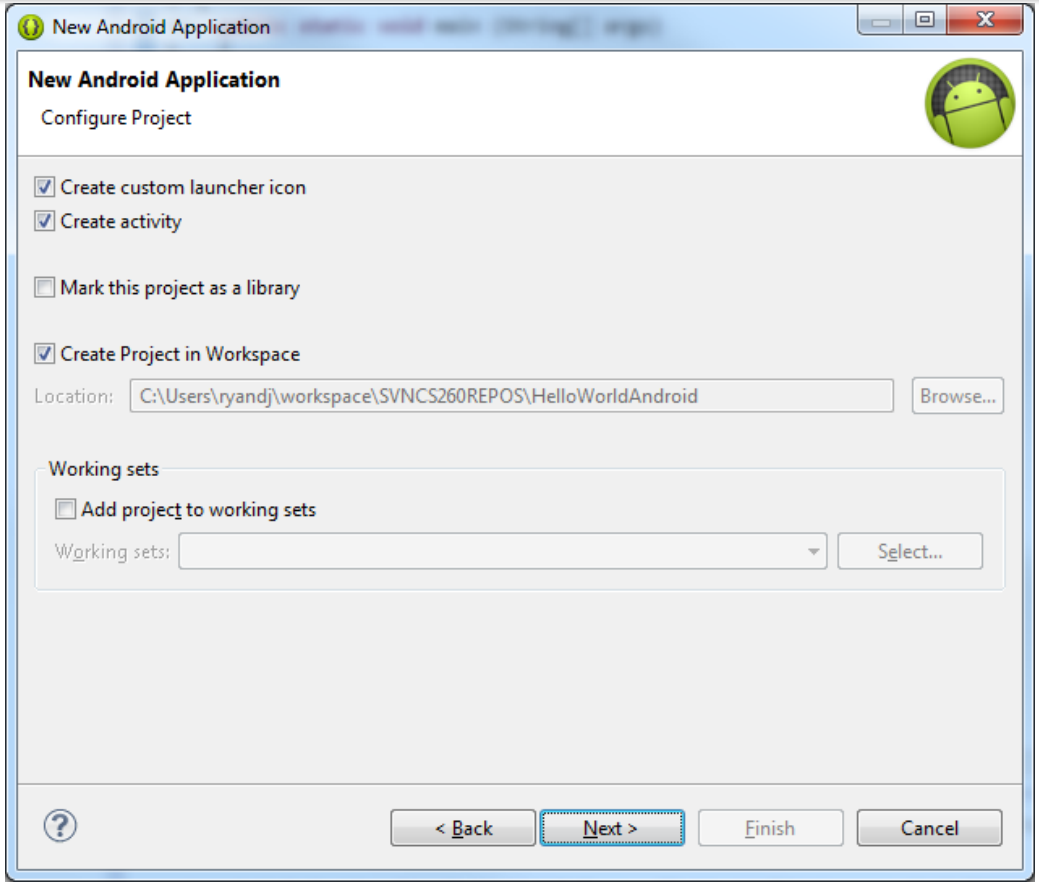

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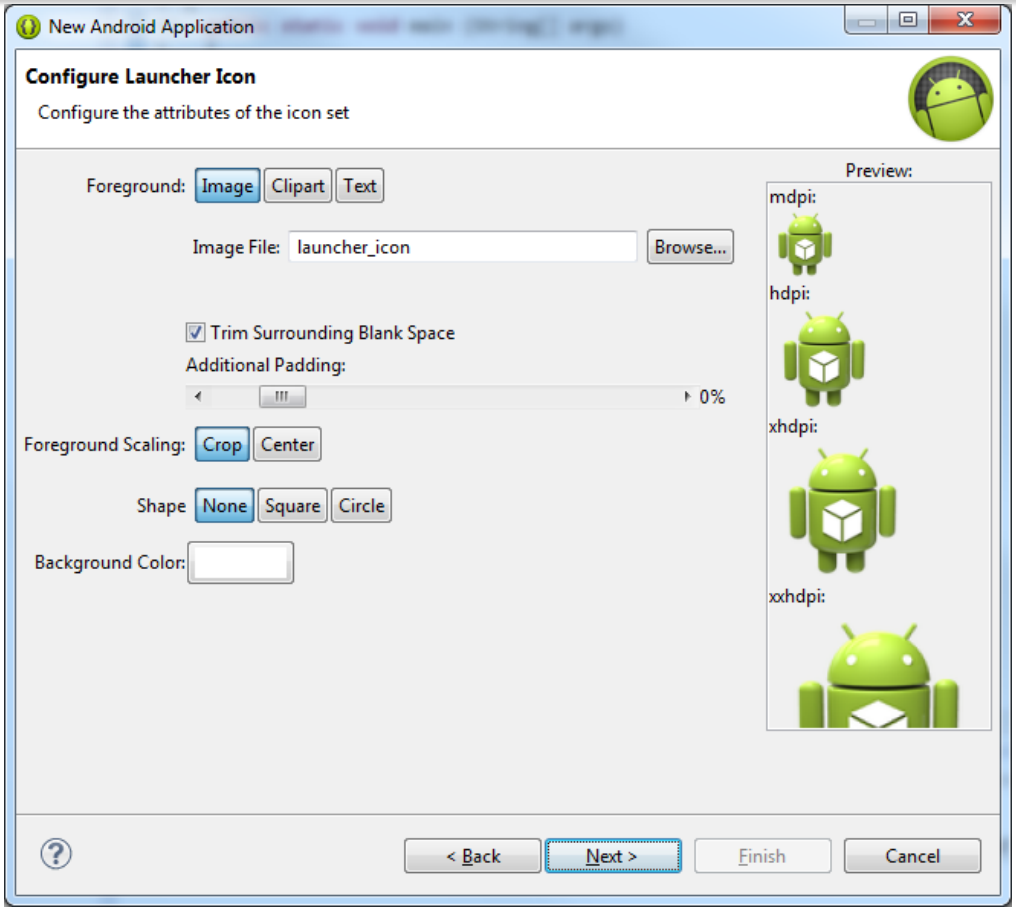

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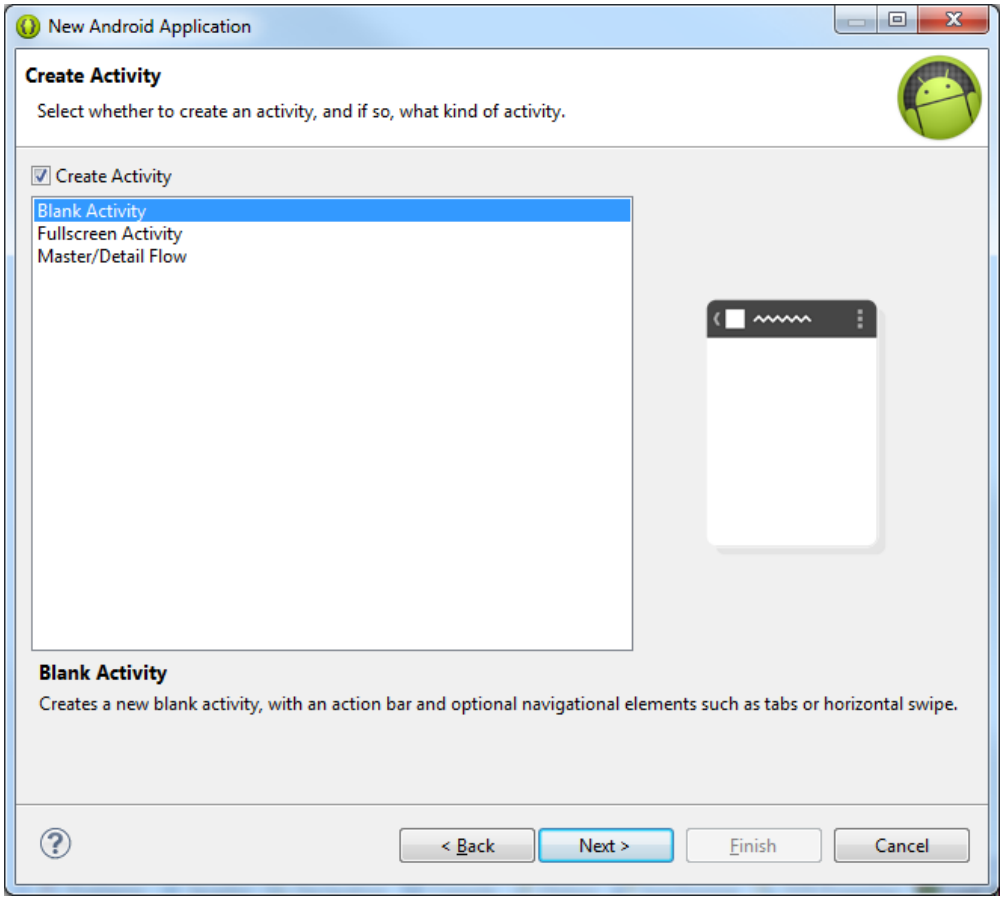

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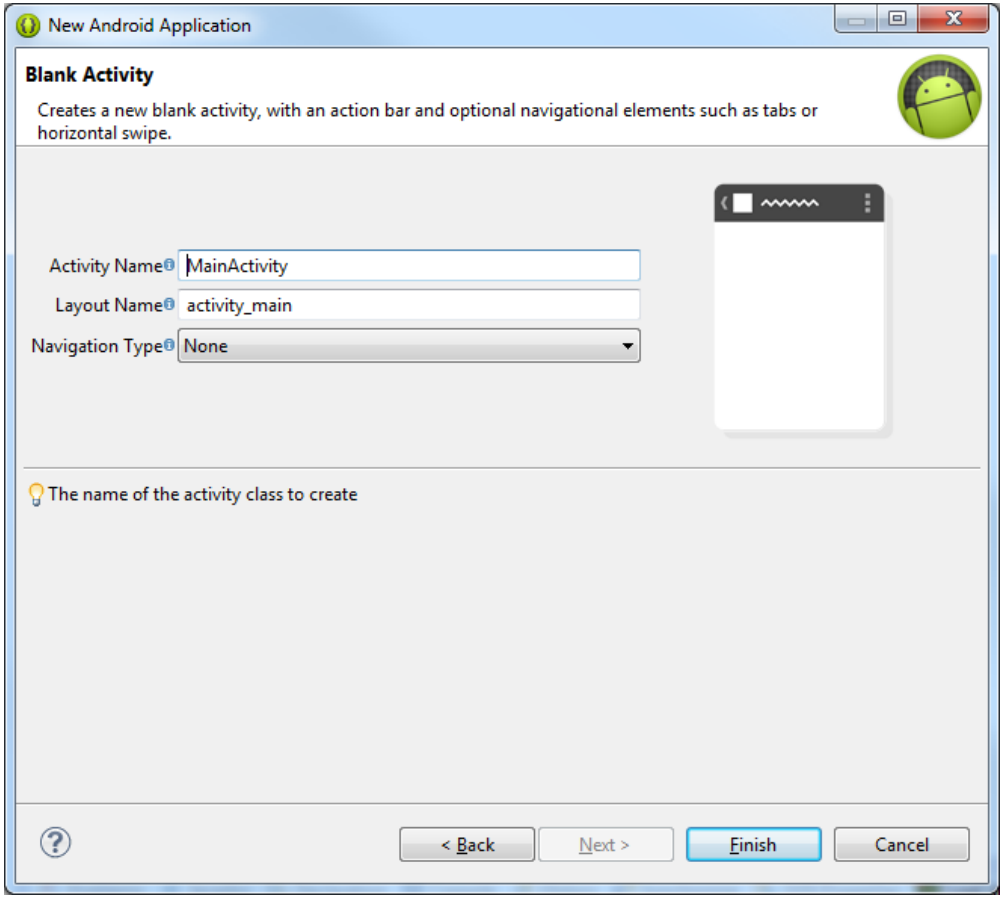

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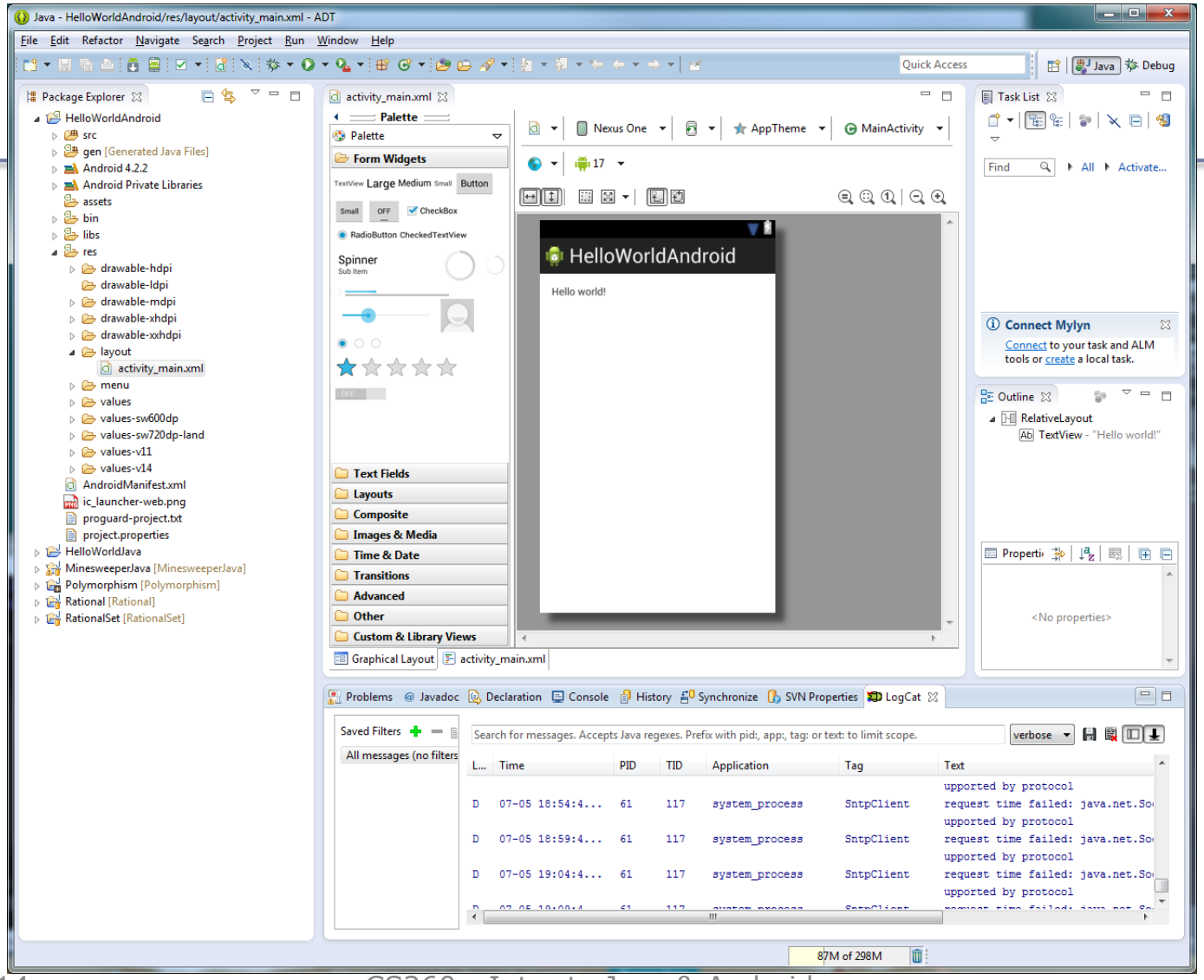
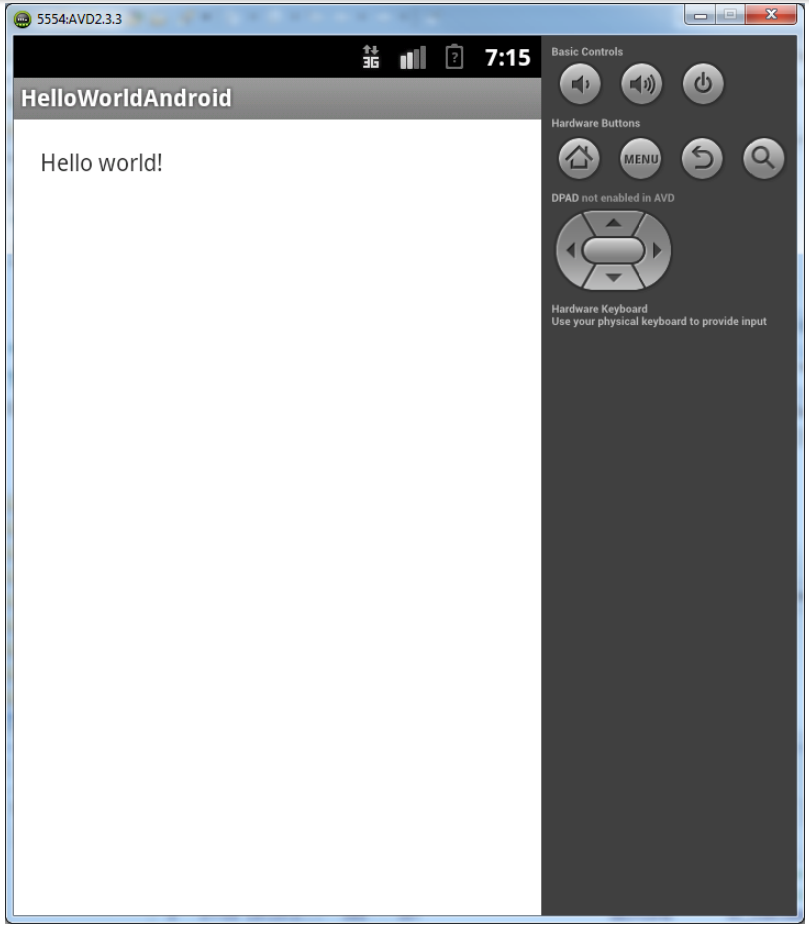


Run the Android Application



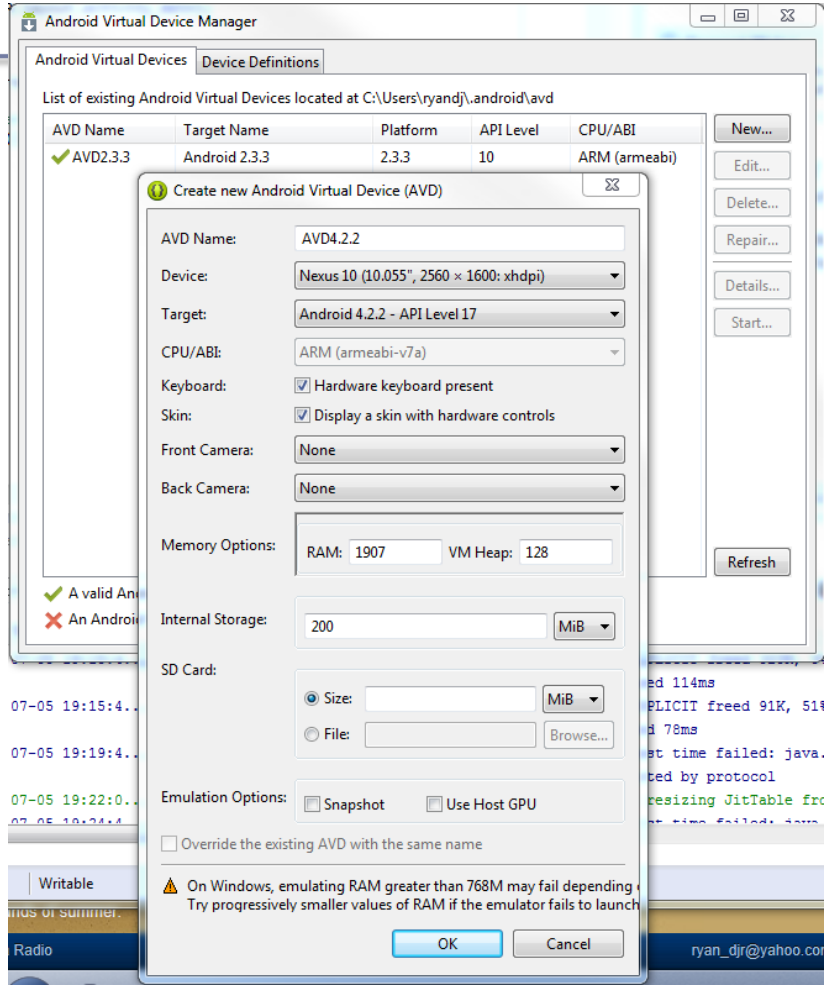
HelloWorldAndroid Project

activity_main.xml | MainActivity.java

```
1  package edu.pacificu.cs.helloworldandroid;
2
3  import android.os.Bundle;
4  import android.app.Activity;
5  import android.view.Menu;
6
7  public class MainActivity extends Activity
8  {
9
10   @Override
11   protected void onCreate (Bundle savedInstanceState)
12   {
13     super.onCreate (savedInstanceState);
14     setContentView (R.layout.activity_main);
15   }
16
17   @Override
18   public boolean onCreateOptionsMenu (Menu menu)
19   {
20     // Inflate the menu; this adds items to the action bar if it is present.
21     getMenuInflater ().inflate (R.menu.main, menu);
22     return true;
23   }
24
25 }
```

Running Your Android Application

- Before you can run an Android application, you need to create a new Android Virtual Device (AVD)
  - Window->Android Virtual Device Manager
  - Create whatever virtual device you want
  - Create an SD Card if you want



A Quick Look At HelloWorld

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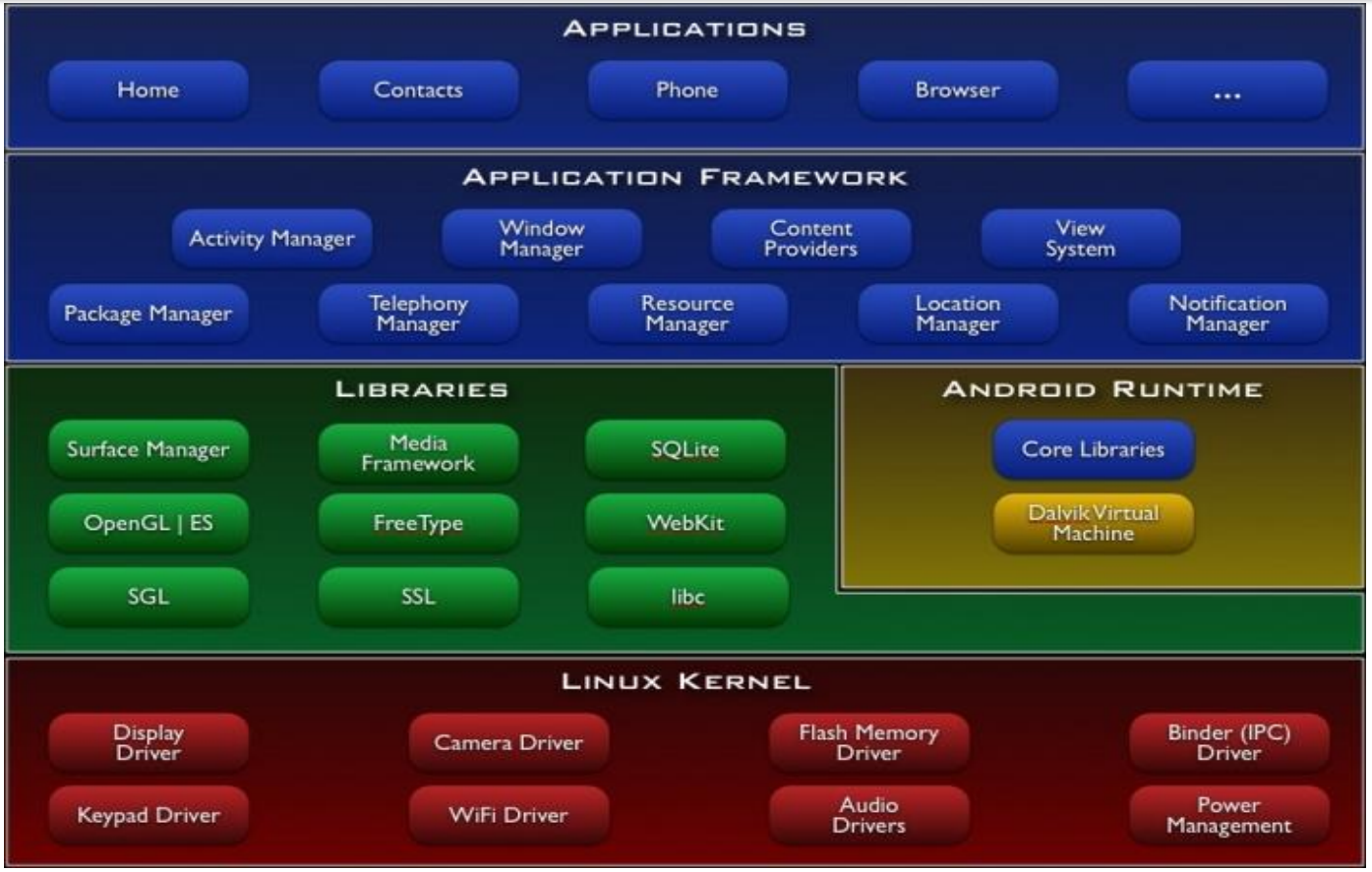
Important Android Dates

- Google acquires Android, August 2005
- Open Handset Alliance (OHA) announced, November 2007. OHA developed Android and is "…committed to commercially deploy handsets and services using the Android Platform." [10]
- First Android Phone, G1, October 2008
- Android SDK 1.0, October 2008

What is Android?

- Android is a software stack (set of programs working together) for mobile devices that includes:
  - an operating system
  - middleware
  - applications

Android Architecture

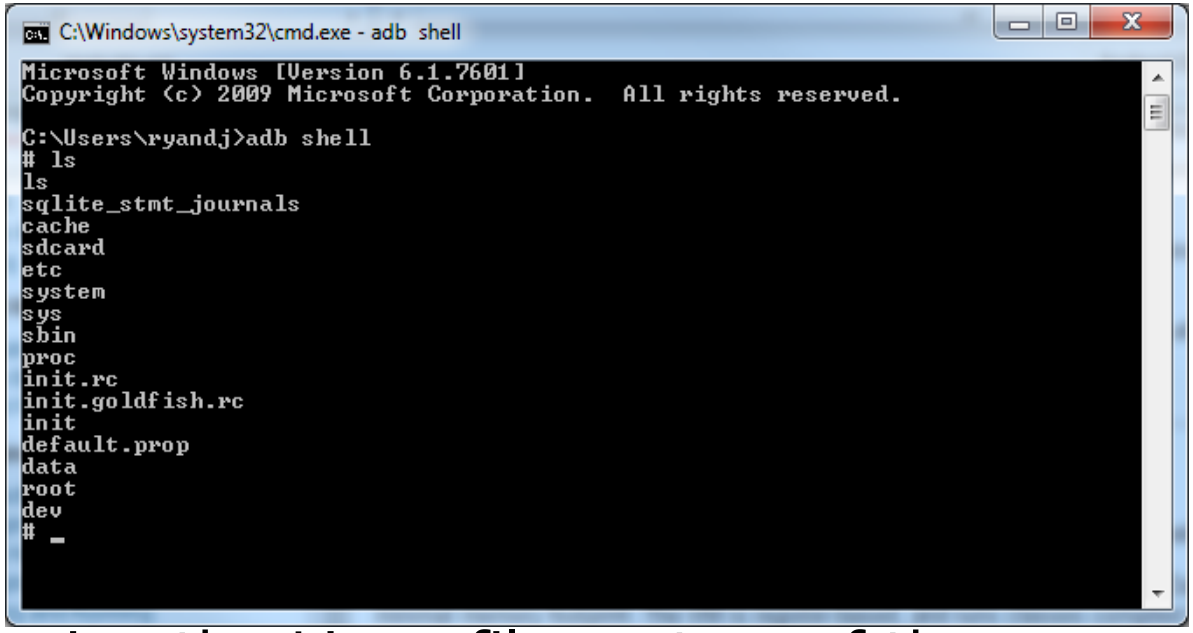


Linux Kernel

- Android relies on Linux version 2.6 (3.x from Android 4.0 Ice Cream Sandwich) for:
  - memory management
  - process management
  - security
  - networking
- You will not make Linux system calls
- Some utilities interact with Linux
  - e.g. adb shell

adb shell

- With an emulator running, open a Windows command shell
- Type adb shell
- Type ls



- Now you can examine the Linux file system of the phone which aids in in debugging

Native Libraries

- The native libraries are written in C & C++
- The libraries are exposed through the Application framework

Application Framework

- Android developers have access to the same framework APIs use by the core applications

- Services and systems for applications include:
  - **Views** – including lists, grids, buttons, ...
  - **Content Providers** – methods for accessing data
  - **Resource Manager** – organizes non-code resources such as strings and layout files
  - **Notification Manager** – displays custom alerts
  - **Activity Manager** – manages lifecycle of applications

Android Runtime

Every Application:

- Runs in its own process space
- Has a separate instance of the Dalvik VM
  - The Dalvik VM uses the Linux kernel for functionality such as threading and low-level memory management
  - Dalvik VM != JVM
- All Android code is written in Java and run within the Dalvik VM

What is Dalvik?

- Dalvik is a VM optimized for low memory requirements
- Android code is compiled into bytecodes executed by the Dalvik VM
- bytecodes are machine-independent instructions

Android Applications

- Apps are written in Java
- Code is compiled into Android package (.apk file)
- All code (including data & resource files) in .apk is one application

Android Application Specifics

- Android is a multi-user Linux system where each application is a user
- Only one application is visible at a time
- Each process has its own VM running an application in isolation
- Two or more applications can share data
- Applications consist of one or more activities

What is an Activity?

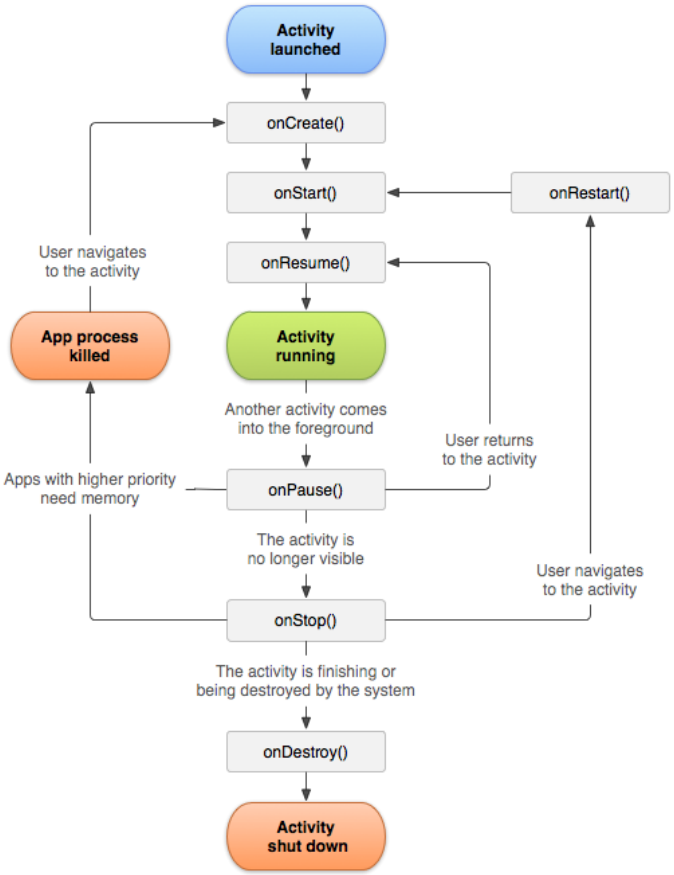
- An Activity represents a single screen with a UI
- Ex: Email Application consists of activities for
  - Showing list of emails
  - Composing an email
  - Reading an email
- Each activity is independent
- Other applications can use a particular activity if the email application gives permission to do so

Activity Lifecycle

Activity – a process that performs some specific action

- Every Android application is made up of one or more activities managed on an Activity Stack (AS) or the "back stack".
- A new activity is always placed on top of the AS and then becomes the running activity.
- The AS is LIFO; therefore, when the Back button is pressed the current activity is popped and destroyed

Activity Lifecycle Visual



Activity States

An activity has essentially four states:

- **running** – in the foreground of the screen
- **paused** – lost focus but still visible with all state maintained
  - How? A new activity that is transparent or not full sized is running on top of the stack
- **stopped** – a new activity completely obscures another activity
  - The stopped activity is no longer visible
  - State is maintained
- **destroyed** – the activity must be completely restarted and the state information must be

Activity Skeleton

```
 6  public class MainActivity extends Activity
 7  {
 8
 9    @Override
10    protected void onCreate (Bundle savedInstanceState)
11    {  // The activity is being created
12      super.onCreate (savedInstanceState);
13    }
14    @Override
15    protected void onStart ()
16    { // The activity is about to become visible
17      super.onStart ();
18    }
19    @Override
20    protected void onResume ()
21    { // The activity has become visible (is is now "resumed")
22      super.onResume ();
23    }
24    @Override
25    protected void onPause ()
26    { // Another activity is taking focus
27      super.onPause ();
28    }
29    @Override
30    protected void onStop ()
31    { // The activity is no longer visible (it is now "stopped")
32      super.onStop ();
33    }
34    @Override
35    protected void onDestroy ()
36    { // The activity is about to be destroyed
37      super.onDestroy ();
38    }
39    @Override
40    protected void onRestart ()
41    { // The user returns to the activity
42      super.onRestart ();
43    }
```

ActivityLifeCycleDemo Application

Check out the Android Project **ActivityLifeCycle** from the class repository

1. Import project into your workspace
2. Let's take a look at the source code
3. Run the application

Q1: What is the difference between hitting the home button and back button?

Q2: What is Log.v and how can it be used?