



PROGRAMMING HANDHELD SYSTEMS

ADAM PORTER

THE ANDROID DEVELOPMENT ENVIRONMENT

THE ANDROID PLATFORM

A MULTI-LAYERED SOFTWARE STACK
FOR BUILDING AND RUNNING MOBILE
APPLICATIONS

THE ANDROID DEVELOPMENT
ENVIRONMENT

YOUR WORKBENCH FOR WRITING
ANDROID APPLICATIONS

TODAY'S TOPICS

INSTALLING THE ANDROID DEVELOPER TOOLS
(ADT) BUNDLE

USING THE ECLIPSE IDE

USING THE ANDROID EMULATOR

DEBUGGING ANDROID APPLICATIONS

OTHER TOOLS

PREREQUISITES

SUPPORTED OPERATING SYSTEMS:

WINDOWS XP, VISTA, OR WINDOWS 7

MAC OS X 10.5.8 OR LATER (x86 ONLY)

VARIOUS LINUX DISTRIBUTIONS

SEE: <http://developer.android.com/sdk>

PREREQUISITES

MAKE SURE YOU HAVE THE JAVA
DEVELOPMENT KIT (JDK6) INSTALLED

SEE:

<http://www.oracle.com/technetwork/java/javase/downloads>

GETTING STARTED

DOWNLOAD & INSTALL THE ANDROID
DEVELOPER TOOLS (ADT) BUNDLE

SEE: <http://developer.android.com/sdk>

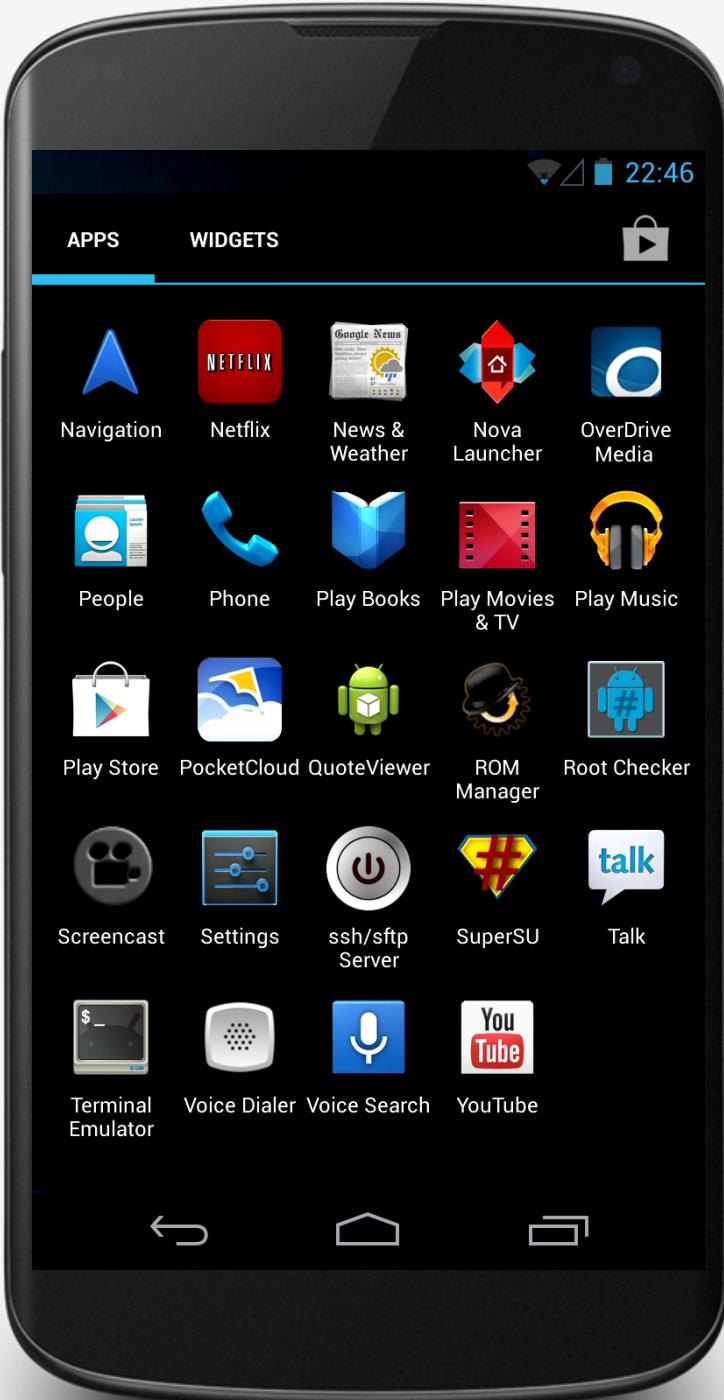
ADT BUNDLE

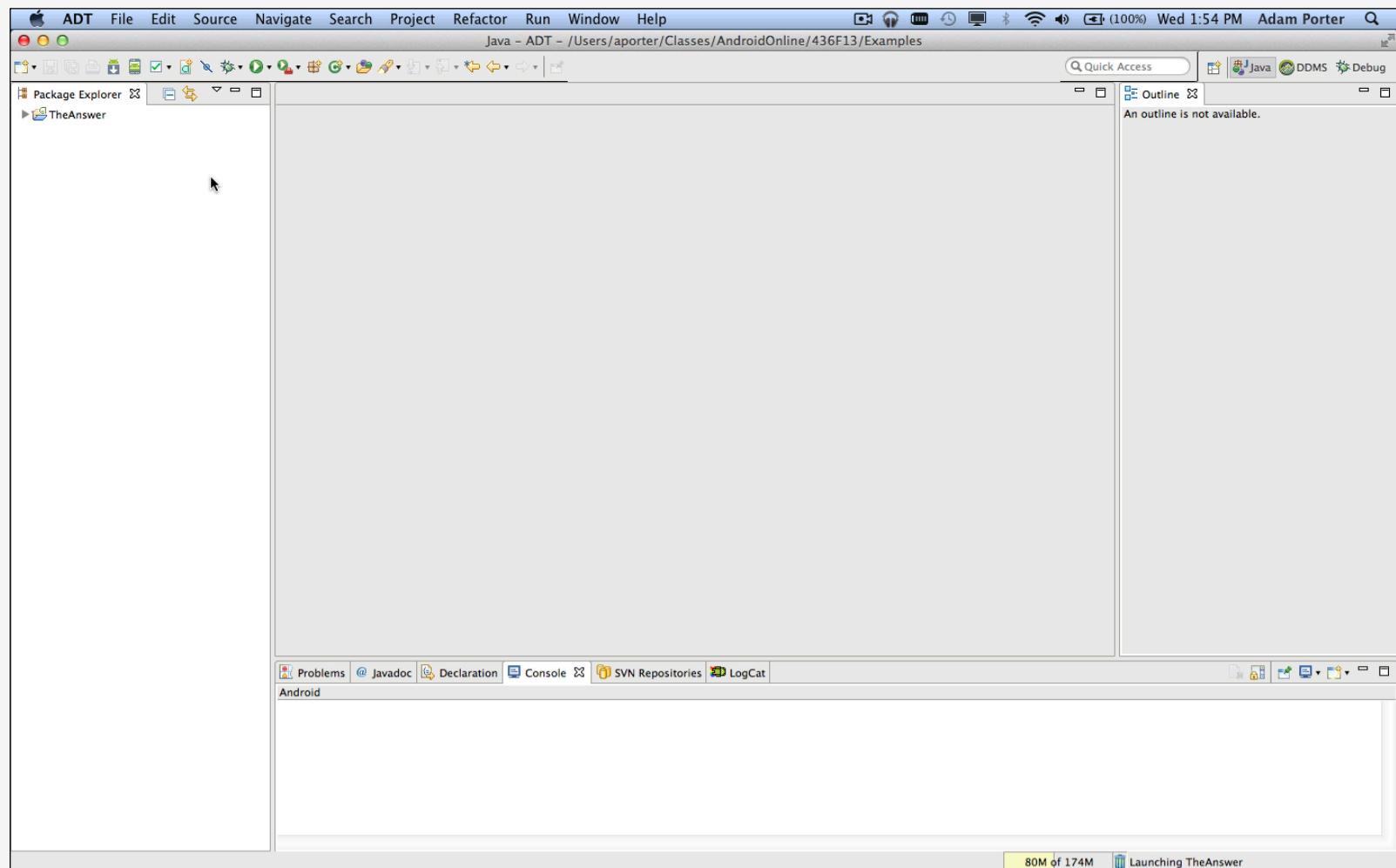
LATEST ANDROID PLATFORM

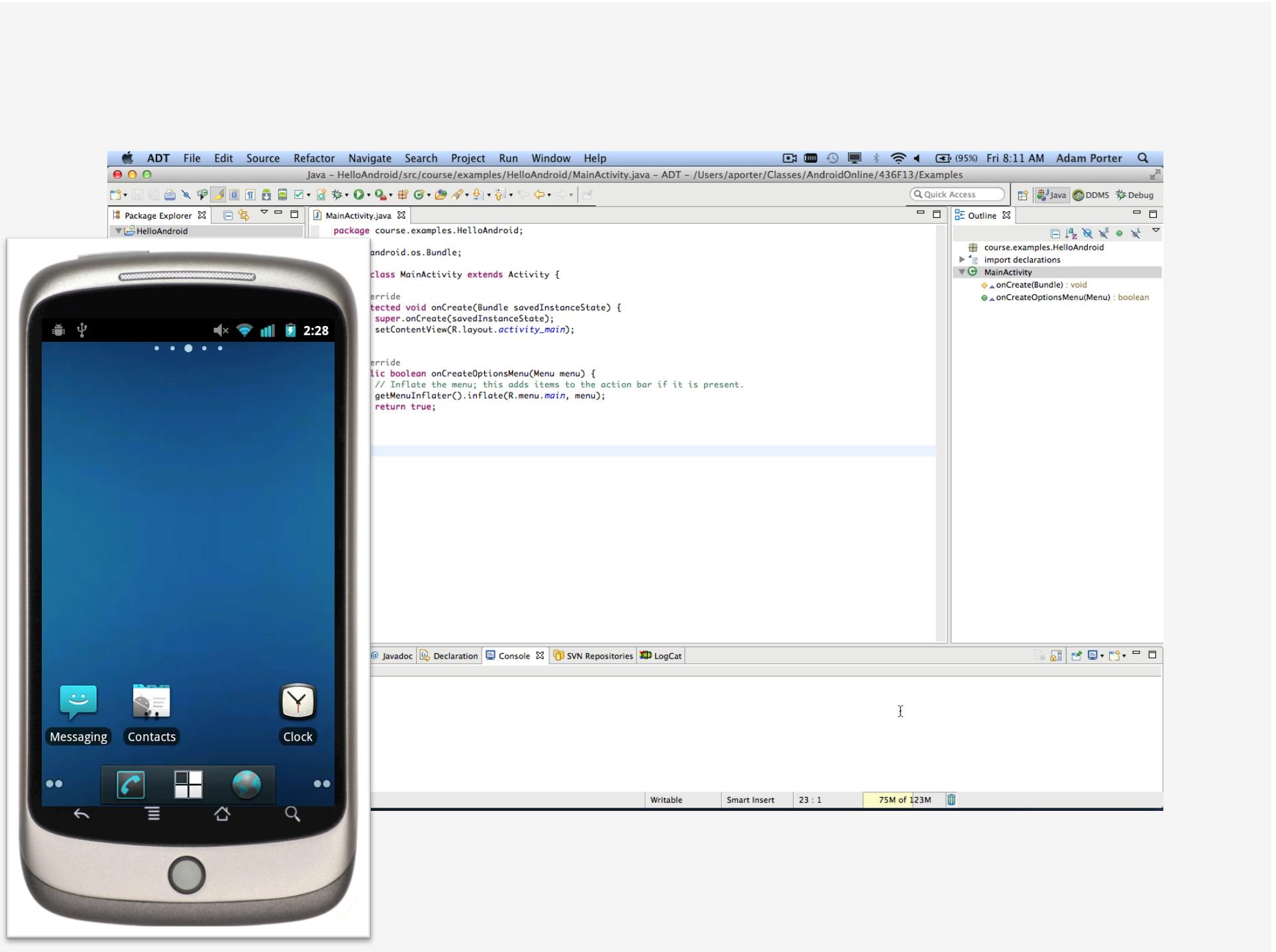
ECLIPSE + ADT PLUGIN

LATEST SYSTEM IMAGE FOR EMULATOR

ADDITIONAL DEVELOPMENT TOOLS







THE ANDROID EMULATOR

RUNS VIRTUAL DEVICES

ADT File Edit Source Refactor Navigate Search Project Run Window Help (100%) Wed 3:13 PM Adam Porter

Java - HelloAndroid/src/course/examples/HelloAndroid/MainActivity.java - ADT - /Users/aporter/Classes/AndroidOnline/436F13/Examples

Package Explorer activity_main.xml MainActivity.java

```
package course.examples.HelloAndroid;
import android.os.Bundle;

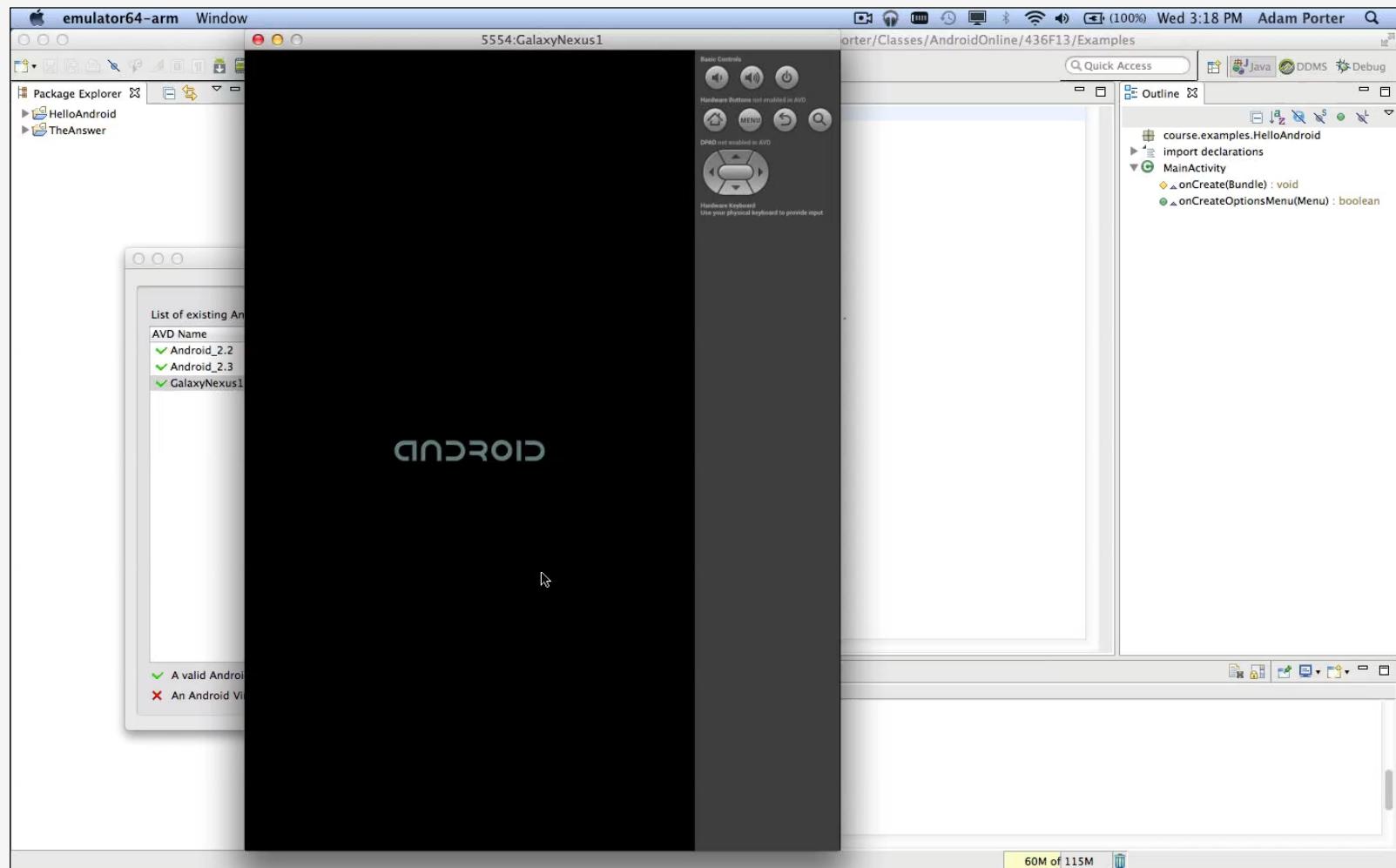
public class MainActivity extends Activity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }

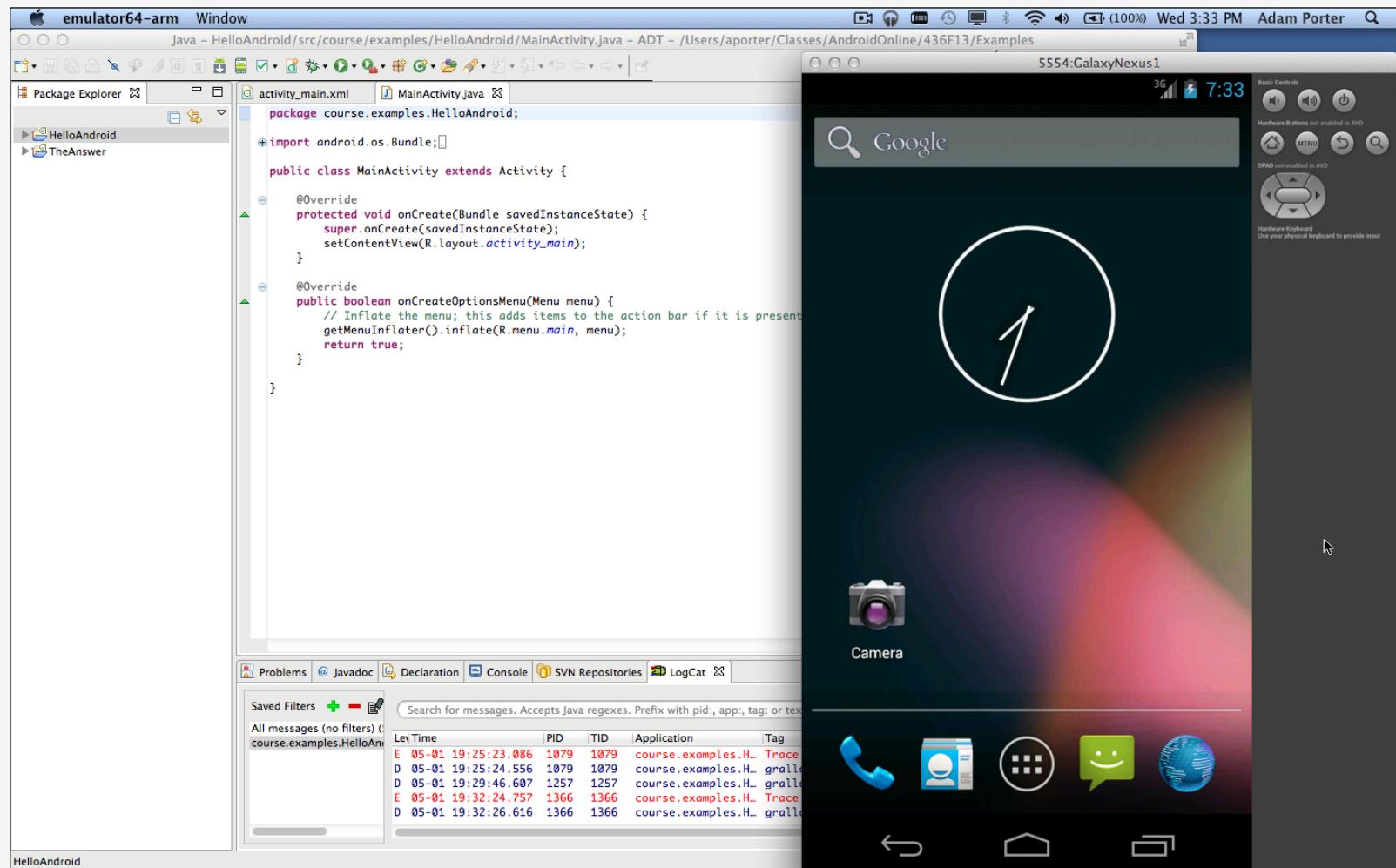
    @Override
    public boolean onCreateOptionsMenu(Menu menu) {
        // Inflate the menu; this adds items to the action bar if it is present.
        getMenuInflater().inflate(R.menu.main, menu);
        return true;
    }
}
```

Outline course.examples.HelloAndroid import declarations MainActivity onCreate(Bundle) : void onCreateOptionsMenu(Menu) : boolean

Problems @ javadoc Declaration Console SVN Repositories LogCat

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THE ANDROID EMULATOR

PROS

DOESN'T REQUIRE AN ACTUAL PHONE

HARDWARE IS RECONFIGURABLE

CHANGES ARE NON-DESTRUCTIVE

THE ANDROID EMULATOR

CONS

CAN BE VERY SLOW

SOME FEATURES UNAVAILABLE

E.G., NO SUPPORT FOR BLUETOOTH OR USB
CONNECTIONS

PERFORMANCE / USER EXPERIENCE CAN BE
MISLEADING

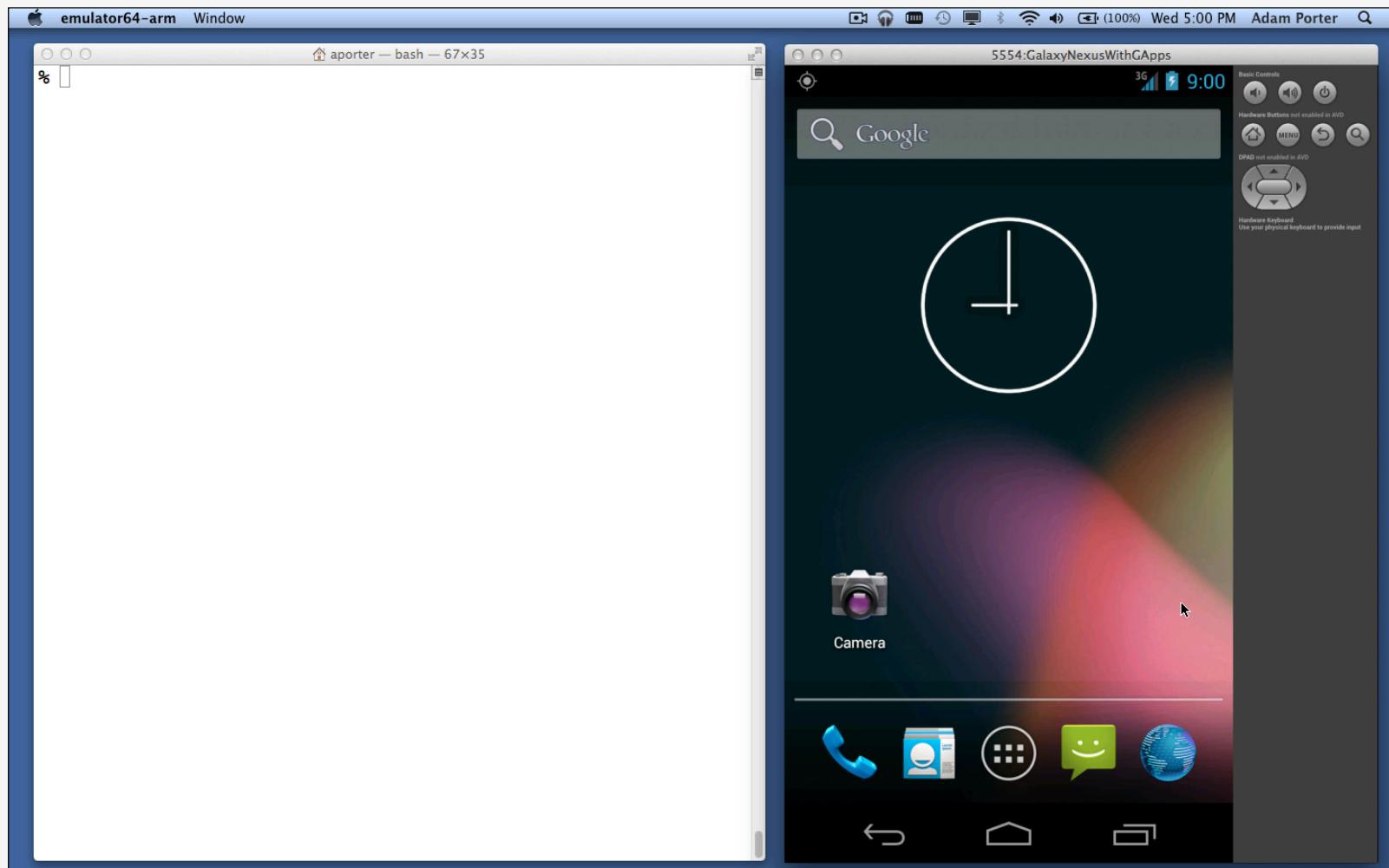
ADVANCED FEATURES

CAN EMULATE MANY DIFFERENT DEVICE/
USER CHARACTERISTICS, SUCH AS:

NETWORK SPEED/LATENCIES

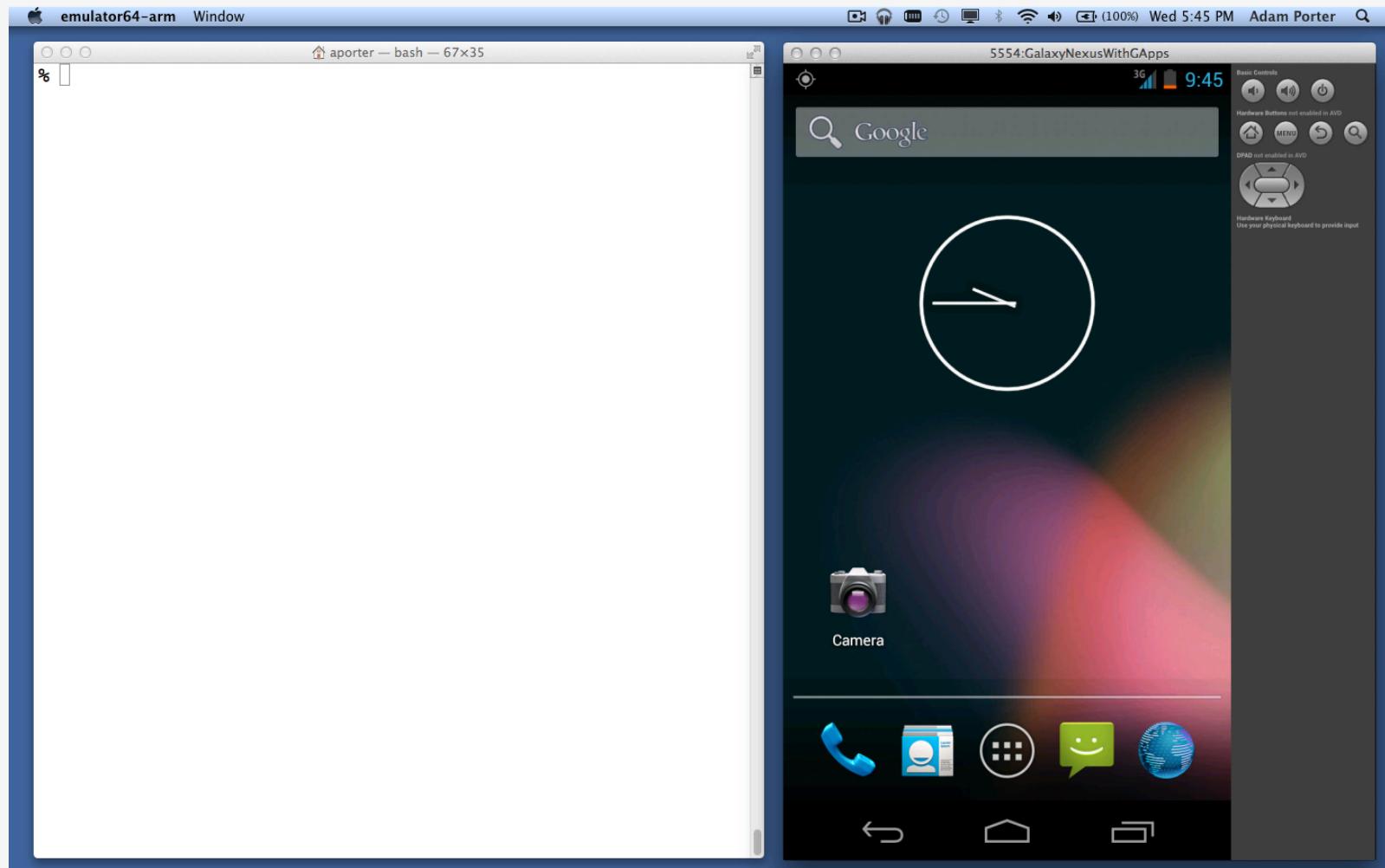
BATTERY POWER

LOCATION COORDINATES



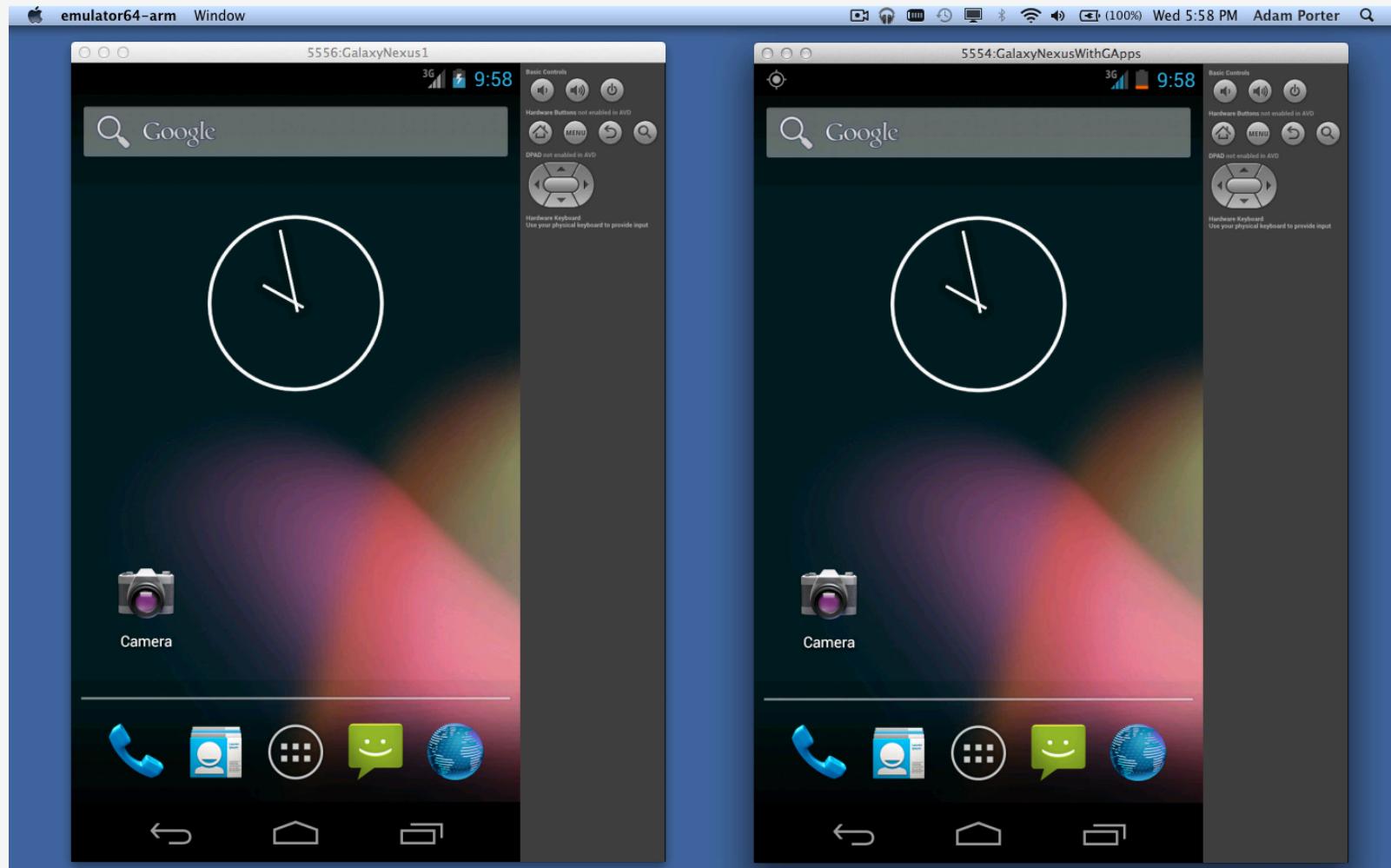
ADVANCED FEATURES

EMULATE INCOMING PHONE CALLS &
SMS MESSAGES



THE ANDROID EMULATOR

CAN INTERCONNECT MULTIPLE
EMULATORS



ADVANCED FEATURES

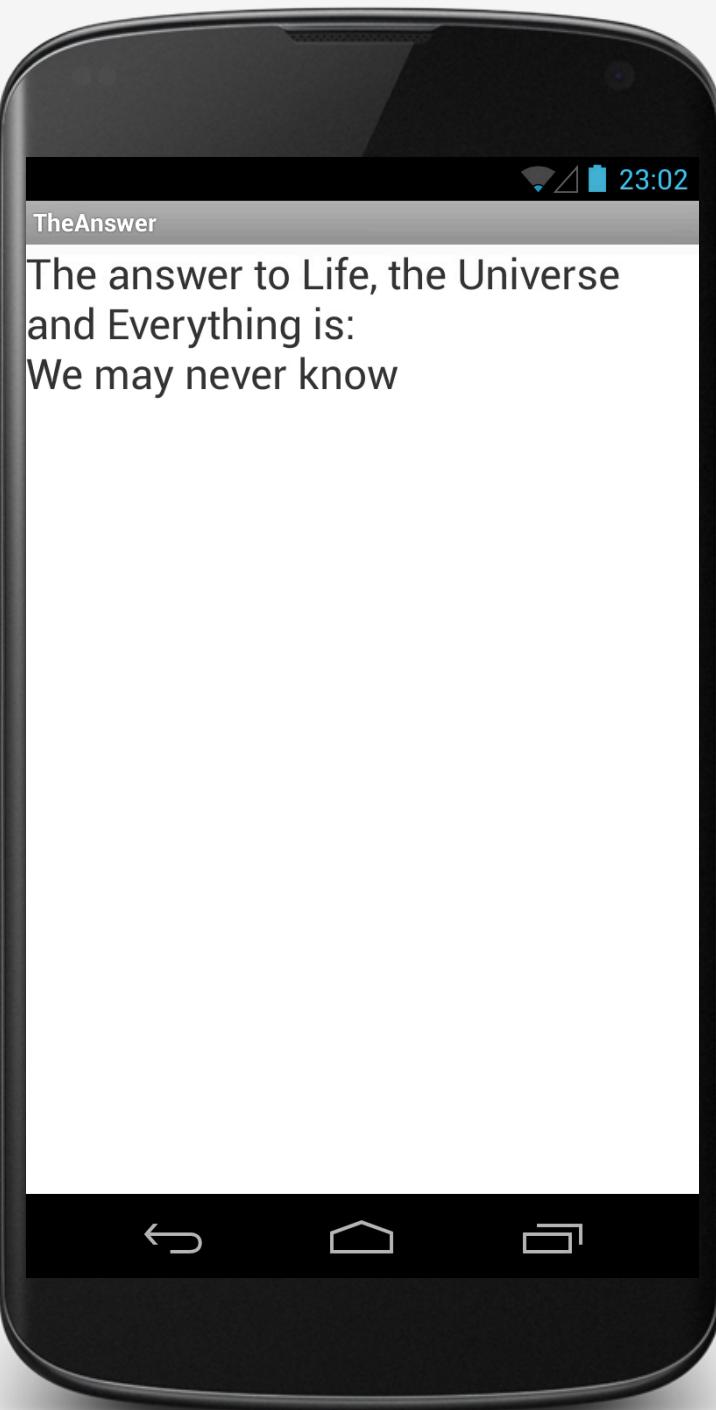
MANY MORE OPTIONS

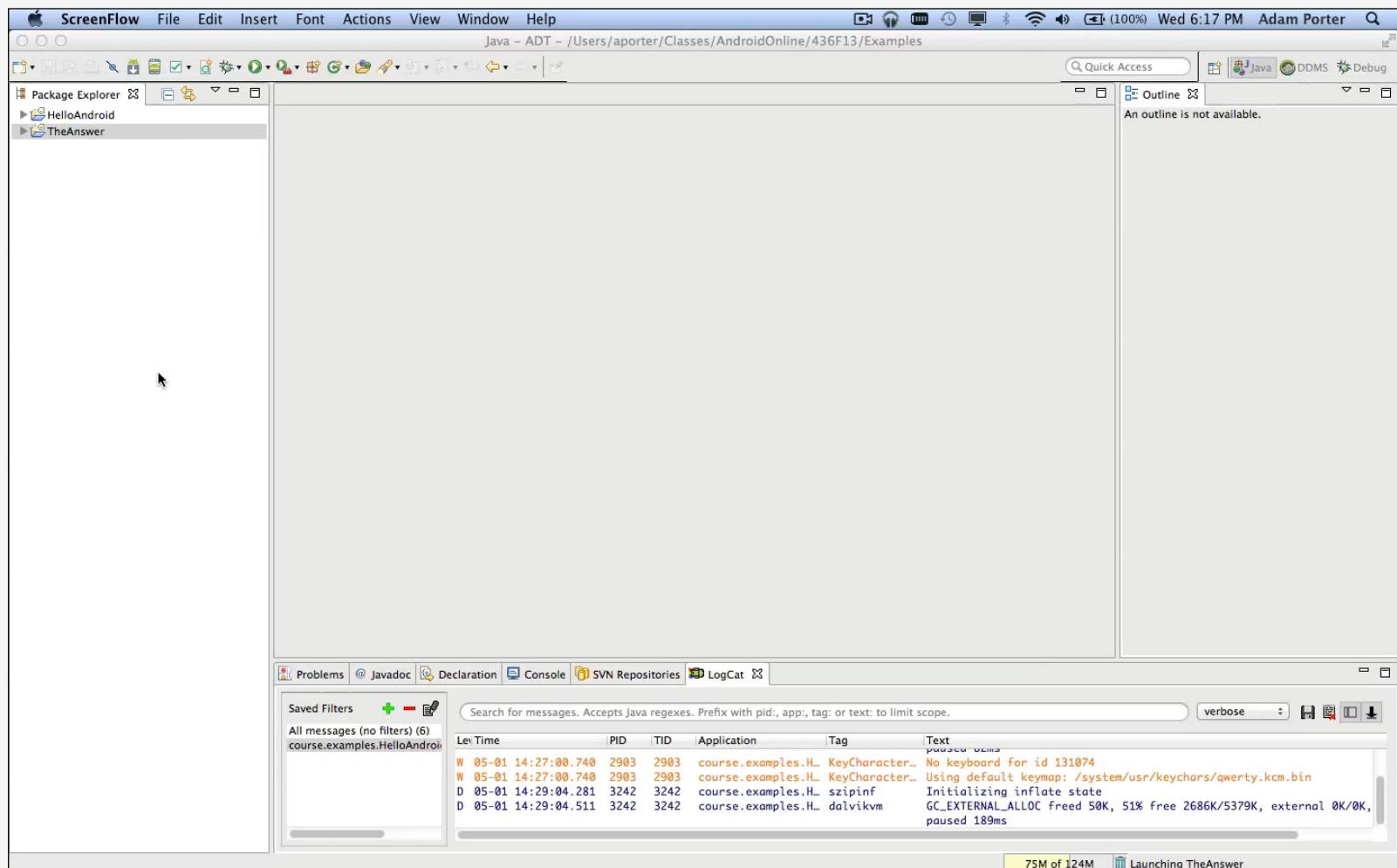
SEE:

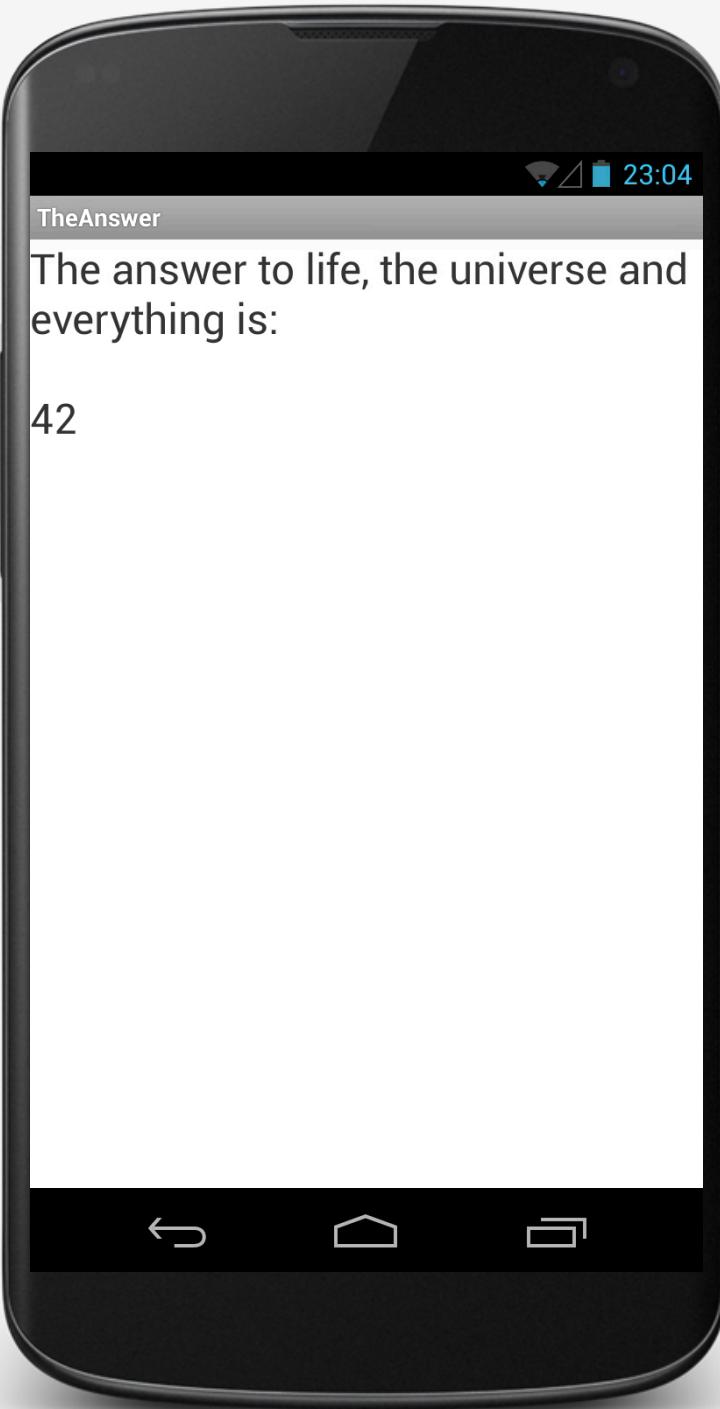
<http://developer.android.com/guide/developing/devices/emulator.html>

DEBUGGER

TOOL FOR EXAMINING THE INTERNAL
STATE OF A RUNNING APPLICATION







DALVIK DEBUG MONITOR SERVICE (DDMS)

GENERAL TOOLS FOR MONITORING
APPLICATION BEHAVIORS

DALVIK DEBUG MONITOR SERVICE (DDMS)

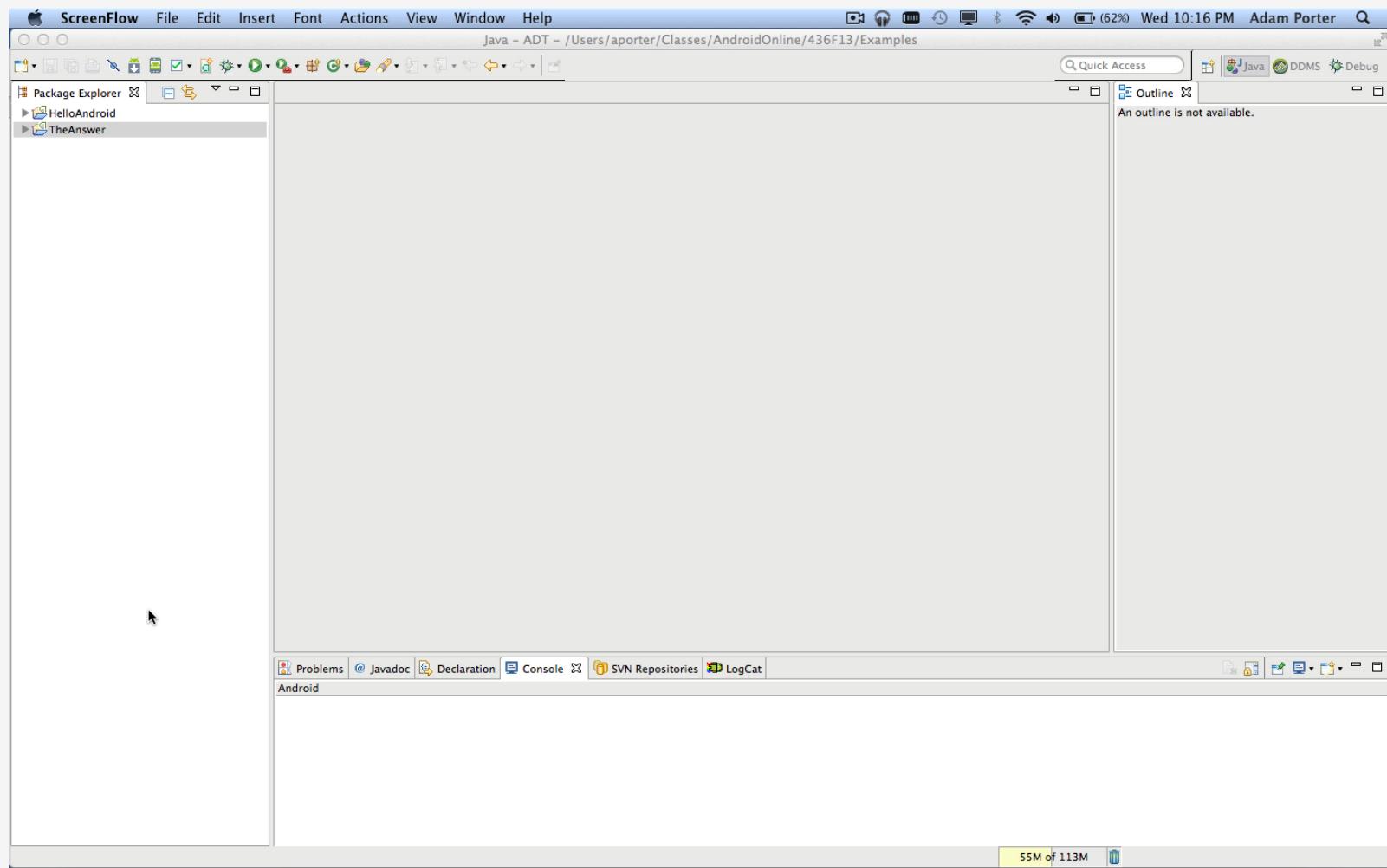
DDMS INCLUDES

FILE EXPLORER

LOGCAT

TRACEVIEW

HIERARCHYVIEW



TRACEVIEW

GRAPHICALLY DISPLAY METHOD TRACES
TAKEN FROM RUNNING APPLICATION

ADT File Edit Source Refactor Navigate Search Project Run Window Help

(51%) Wed 10:34 PM Adam Porter

Java - TheAnswer/src/course/examples/TheAnswer/TheAnswer.java - ADT - /Users/aporter/Classes/AndroidOnline/436F13/Examples

Quick Access Java DDMS Debug

Package Explorer

- HelloAndroid
- TheAnswer
 - src
 - course.examples.TheAnswer
 - TheAnswer.java
 - gen [Generated Java Files]
 - Android 4.2.2
 - assets
 - bin
 - res
 - AndroidManifest.xml
 - proguard.cfg
 - project.properties

TheAnswer.java

```
package course.examples.TheAnswer;

import android.app.Activity;

public class TheAnswer extends Activity {

    private static final int answers = {42,-10,0,10, 100,1000};
    private static final int answer = 42;

    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);

        int val = findAnswer();
        String output = (val == answer) ? String.valueOf(answer) : "We may never know...";

        TextView tv = new TextView(this);
        tv.setText("The answer to Life, the Universe and Everything is:\n" + output);

        setContentView(tv);
    }

    private int findAnswer() {
        for (int val : answers) {
            if (val == answer) return val;
        }
        return -1;
    }
}
```

Outline

- course.examples.TheAnswer
 - import declarations
 - TheAnswer
 - answers : int
 - answer : int
 - onCreate(Bundle) : void
 - findAnswer() : int

Problems Javadoc Declaration Console SVN Repositories LogCat

Android

```
[2013-05-01 22:32:35 - TheAnswer] -----
[2013-05-01 22:32:35 - TheAnswer] Android Launch!
[2013-05-01 22:32:35 - TheAnswer] adb is running normally.
[2013-05-01 22:32:35 - TheAnswer] Performing course.examples.TheAnswer activity launch
[2013-05-01 22:32:35 - TheAnswer] Automatic Target Mode: Unable to detect device compatibility. Please select a target device.
[2013-05-01 22:32:39 - TheAnswer] Application already deployed. No need to reinstall.
[2013-05-01 22:32:39 - TheAnswer] Starting activity course.examples.TheAnswer on device HT03RP901884
[2013-05-01 22:32:40 - TheAnswer] ActivityManager: Starting: Intent { act=android.intent.action.MAIN cat=[android.intent.category.LAUNCHER] cmp=course.examples.TheAnswer }
[2013-05-01 22:32:41 - TheAnswer] Attempting to connect debugger to 'course.examples.TheAnswer' on port 8614
```

Writable Smart Insert 1:1 72M of 129M Launching TheAnswer

UI HIERARCHY VIEWER

SHOWS THE RUNTIME ORGANIZATION OF
THE USER INTERFACE

ADT File Edit Source Refactor Navigate Search Project Run Window Help

Java - TheAnswer/src/course/examples/TheAnswer/TheAnswer.java - ADT - /Users/aporter/Classes/AndroidOnline/436F13/Examples

Quick Access Java DDMS Debug

Package Explorer HelloAndroid TheAnswer

TheAnswer.java

```
package course.examples.TheAnswer;

import android.app.Activity;

public class TheAnswer extends Activity {

    private static final int[] answers = {42,-10,0,10, 100,1000};
    private static final int answer = 42;

    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);

        int val = findAnswer();
        String output = (val == answer) ? String.valueOf(answer) : "We may never know...";

        TextView tv = new TextView(this);
        tv.setText("The answer to Life, the Universe and Everything is:\n" + output);

        setContentView(tv);
    }

    private int findAnswer() {
        for (int val : answers) {
            if (val == answer) return val;
        }
        return -1;
    }
}
```

Outline

```
course.examples.TheAnswer
import declarations
TheAnswer
answers : int[]
answer : int
onCreate(Bundle) : void
findAnswer() : int
```

Problems Javadoc Declaration Console SVN Repositories LogCat

Android

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NEXT TIME

APPLICATION FUNDAMENTALS