CMSC436: Programming Handheld Systems

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

See:

https://developer.android.com/studio/intro/

Today's Topics

Downloading Android SDK Using the Android Studio IDE Using the Android emulator Debugging Android applications

Other tools

Prerequisites

Supported Operating Systems:

Microsoft Windows 7/8/10 (32- or 64-bit)

Mac OS X 10.10 (Yosemite) up to 10.12 (Sierra)

GNOME or KDE desktop (tested on Ubuntu 14.04 LTS, Trusty Tahr)

Prerequisites

3 GB RAM min, 4 GB RAM rec

1 GB+ for Android SDK, emulator system images, and caches

1280 x 800 min screen resolution

Getting Started

Download & install Android Studio

See: https://developer.android.com/studio/ index.html#downloads

Android Studio

Android platform

Android Studio IDE

Key development tools

System image for emulator



HelloWorld

package course.examples.helloworld;

....

public class MainActivity extends Activity {

```
@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);
}
```

Runs virtual devices

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Pros

- Doesn't require an actual phone
- Hardware is reconfigurable
- Changes are non-destructive

Cons

Slower than an actual device

Some features unavailable

e.g., no support for Bluetooth, USB connections, NFC, etc.

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

Change network speeds

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Advanced Features

Emulate incoming phone calls & SMS messages

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Can interconnect multiple emulators



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Advanced Features

Many more options

See:

https://developer.android.com/studio/run/emulator.html

Debugger

Tool for examining the internal state of a running application

TheAnswer



```
public class TheAnswer extends Activity {
```

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

@Override
protected void onCreate(Bundle savedInstanceState) {

// Required call through to Activity.onCreate()
super.onCreate(savedInstanceState);

// Set up the application's user interface (content view)
setContentView(R.layout.answer_layout);

// Get a reference to a TextView in the content view
TextView answerView = findViewById(R.id.answer_view);

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

}



Development Tools

Android Studio provides numerous tools for monitoring application behaviors

Example Tools

Device File Explorer

Logcat

CPU Profiler

Layout Inspector

Device File Explorer

View, copy, and delete files on your device

Often used to examine and verify file creation and transfer

Added in Android Studio 3.0



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Q, II

Logcat

Write and review log messages

Apps use Log class to write messages to log

Developer can search and filter log messages

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စို 🕨 📑 app		The	Answer findAnswer()		Gra					
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build.gradle (Module:	22		<pre>setContentView(R.layout.answer_Layout);</pre>		_					
settings.gradle (Proje	23		// Cat a reference to a TaxtView in the content view							
local.properties (SDK	24		TextView answerView - findViewBvId(P id answer view):							
	25		Textview answerview - Tindviewbyid(K.id.answer_view),							
7	20		<pre>int val = findAnswer():</pre>							
s	27 28 String output = (val == answer) ? String valueOf(answer) : "We may never know":									
	29		Schiling Sucput = (Fut == unswort) - Schiling Fut door (unsw	or, i no may never know ;						
3	30		<pre>// Set desired text in answerView TextView</pre>							
	31		answerView							
	32		<pre>.setText(output);</pre>							
	33		}							
	34									
	35		<pre>private int findAnswer() {</pre>							
	36		<pre>Log.d(TAG, msg: "Entering findAnswer()");</pre>							
	37		<pre>for (int val : answers) {</pre>							
	38	8	if (val !⊨ <i>answer</i>)							
	39		return val;							
	40		}							
	41		Log.e(TAG, msg: "Unexpected behavior");							
	42		return -1;							
	43	θ,	}							
	44	}								
	45				•					
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CPU Profiler

Logs execution sequences and timing taken from a running application

Graphically displays method traces and metrics

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2 ► 1 app 1	<pre>package course.examples.theanswer;</pre>	Grad								
Gradle Scripts		dle								
3	import									
grue 4	<pre>public class TheAnswer extends Activity {</pre>									
9	public clubb membres extends metricly (
s N 10	<pre>private static final int[] answers = { 42, -10, 0, 100, 1000 };</pre>	+ 1								
11	<pre>private static final int answer = 42;</pre>									
12 12	<pre>private static String TAG = "TheAnswer";</pre>									
15 14	Override	+								
5 15 o	<pre>protected void onCreate(Bundle savedInstanceState) {</pre>									
16										
17	<pre>// Required call through to Activity.onCreate()</pre>									
18	<pre>// Restore any saved instance state</pre>									
19	<pre>super.onCreate(savedinstancestate);</pre>									
20	// Set up the application's user interface (content view)									
22	<pre>setContentView(R.layout.answer_layout);</pre>									
23										
24	<pre>// Get a reference to a TextView in the content view</pre>									
25	<pre>TextView answerView = findViewById(R.id.answer_view);</pre>									
20	<pre>int val = findAnswer():</pre>									
28	String output = (val == answer) ? String.valueOf(answer) : getString(R.string.never k	nc								
29		1								
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Layout Inspector

Shows the runtime organization of the user interface

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Next

Application Fundamentals

Example Applications

HelloWorld

TheAnswer