Android 101 - Developer Workshop

6th October, 2012

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Thank You for not using iOS 6 Maps

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Goals of Workshop

- Help you understand what Android is
- Try out some Android APIs via Android Eclipse Projects
- Build a simple Application (Quotes)
- Build enough enthusiasm for you to take your next leap into Android Programming


A problem has been detected and windows has been shut down to prevent damage
to your computer.
DRIVER_IRQL_NOT_LESS_OR_EQUAL
If this is the first time you've seen this Stop error screen,
restart your computer, If this screen appears again, follow
these steps:
Check to make sure any new hardware or software is properly installed.
If this is a new installation, ask your hardware or software manufacturer
for any windows updates you might need.
If problems continue, disable or remove any newly installed hardware
or software. Disable BIOS memory options such as caching or shadowing.
If you need to use Safe Mode to remove or disable components, restart
your computer, press F8 to select Advanced Startup Options, and then
select Safe Mode.
Technical information:
*** STOP: 0x000000D1 (0x0000000C,0x00000002,0x00000000,0xF86B5A89)
***
gv3.sys - Address F86B5A89 base at F86B5000, DateStamp 3dd991eb
Beginning dump of physical memory
Physical memory dump complete.
Contact your system administrator or technical support group for further
assistance.

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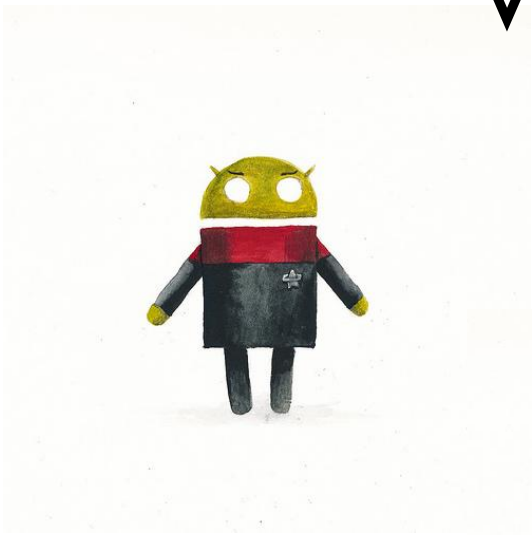
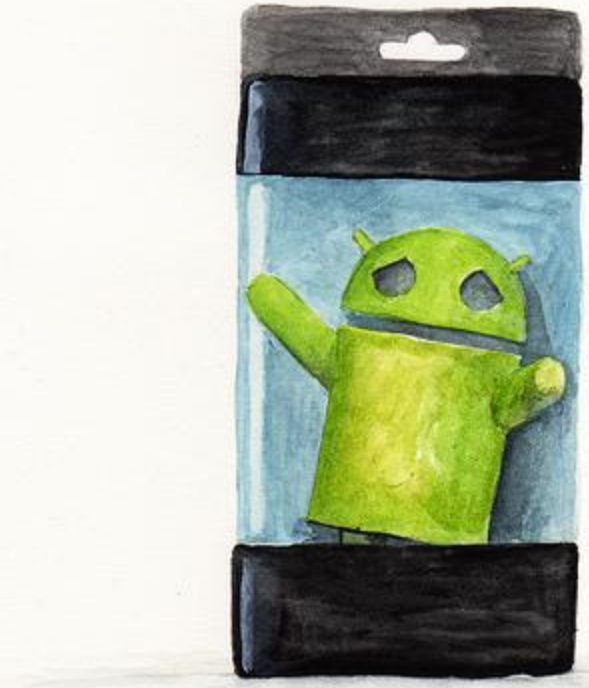
Participant Requirements

- Basic working knowledge of Java or any other OOP language
- Eclipse IDE
- Android SDK and Tools
- We shall run all examples on the Android Emulator
- A device is important to have but not necessary for this course

What is Android ?





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What is Android?

- A software stack for mobile devices
- Includes Linux Kernel, OS Middleware, Application Framework & Applications.
- Provides SDK for developers
- From Google
- Open Source and provided to Handset manufacturers
- http://www.android.com
- http://developer.android.com

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Android - History

OS Version	Name	API Level	Date
Beta, 1.0 , 1.1	-	-, 1 , 2	Nov 2007, Sep 2008, Feb 2009
1.5	Cupcake	3	April 2009
1.6	Donut	4	September 2009
2.1	Eclair	7	October 2009
2.2	Froyo	8	May 2010
2.3	Gingerbread	10	December 2010
3.0	Honeycomb	11	February 2011
3.1.x, 3.2	Honeycomb	12,13	
4.0, 4.0.1, 4.0.2	Icecream Sandwich	14	October 2011
4.0.3, 4.0.4	Icecream Sandwich	15	December 2011
4.1	JellyBean	16	June 2012

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Android Device Dashboard

Version	Codename	API	Distribution
1.5	Cupcake	3	0.1%
1.6	Donut	4	0.4%
2.1	Eclair	7	3.4%
2.2	Froyo	8	12.9%
2.3 - 2.3.2	Gingerbread	9	0.3%
2.3.3 - 2.3.7		10	55.5%
3.1	Honeycomb	12	0.4%
3.2		13	1.5%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	23.7%
4.1	Jelly Bean	16	1.8%

~ 72%

~ 25%

October 1, 2012 : http://developer.android.com/resources/dashboard/platform-versions.html

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Android Features

- Handset Layouts, Multiple Languages
- Storage
- Connectivity
- Messaging
- Media Support
- Hardware support
  - Cameras, touch screens, GPS, accelerometer, etc.

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Why Android?

- Android has garnered more than 50% of the current market share in Smartphone
- Android by its nature is available across various devices (Phone, Tablet, TV, Navigation Devices, etc)
- Robust Ecosystem : 300+ Hardware/Software partners
- Open Source (http://git.android.com)
- Good set of Developer Tools
- 25 Billion+ Downloads

Android Developer Tools

- Java SDK
- Eclipse
- Android SDK
  - Android Emulator
  - Command Line Tools
  - Documentation + Samples
  - Platform Libraries
- Android Development Tools (ADT) for Eclipse (Recommended to begin with)

Development Environment Setup

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Tools Needed

- Java SDK
  - http://www.oracle.com/technetwork/java/javase/downloads/index.html
- Eclipse
  - http://www.eclipse.org/downloads
- Android SDK
  - http://developer.android.com/sdk/index.html
- Android Development Tools (ADT) for Eclipse
  - http://developer.android.com/sdk/eclipse-adt.html
    (Recommended to begin with)

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Android Virtual Device

- SDK includes an Emulator - a virtual mobile device
- Emulator helps your test your applications without a physical device
- It mirrors the System Image and functionality as closely as possible
- You need to create an Android Virtual Device for the Android OS that you wish to target. E.g. 2.2, 2.3, 3.x, 4.x

Android Emulator

- Mimics a Normal Android Device
- Use it to get familiar with the functions

Your First Android App

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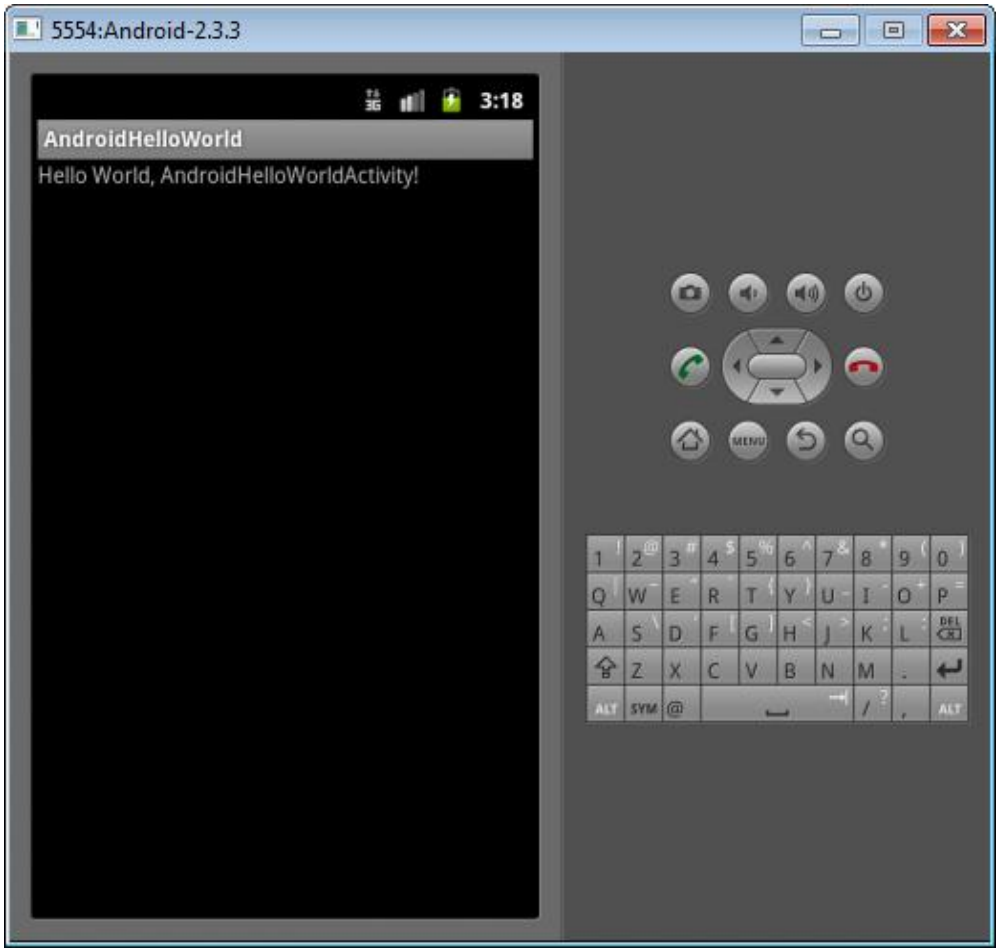
Hello World In Android



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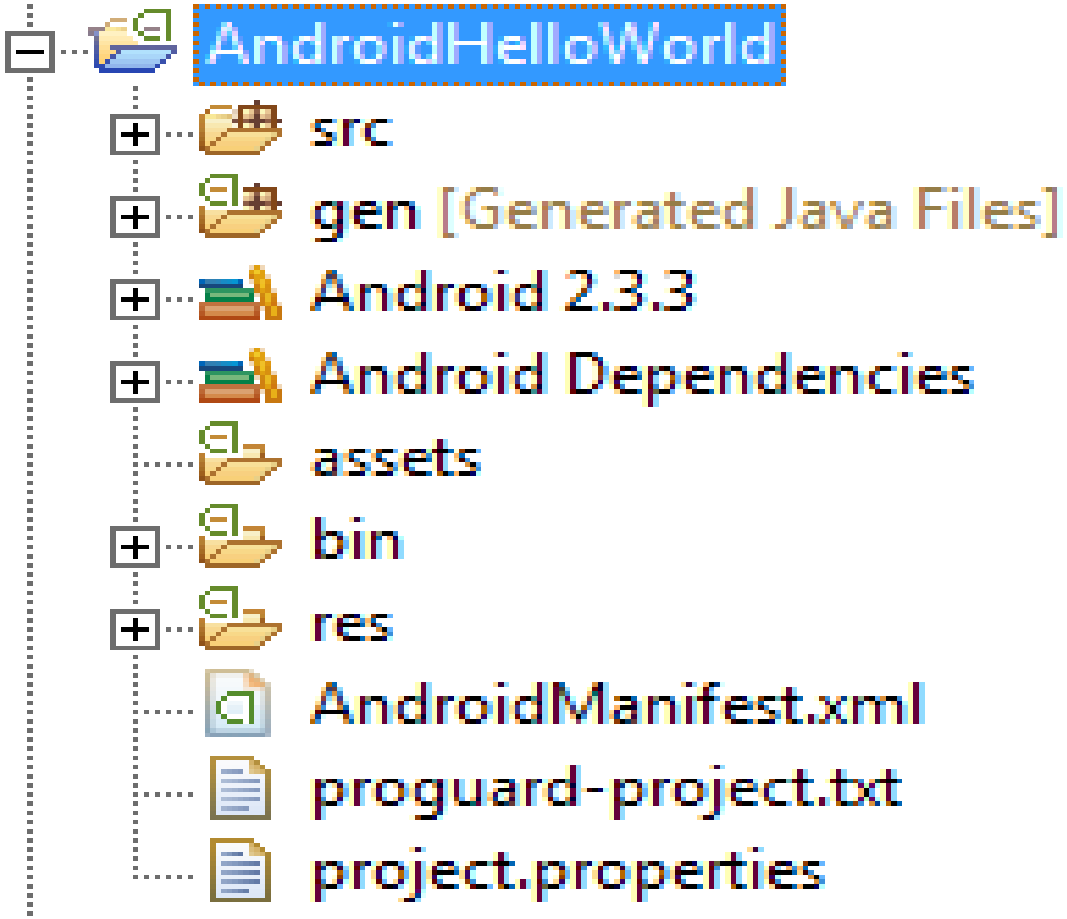
Steps to First Hello World

- Development Environment !
- Create the AVD and start the Device
- Use Eclipse to create the Android Project
  - Code, Code, Code
- Run the Application either the AVD or a real device

Project Structure



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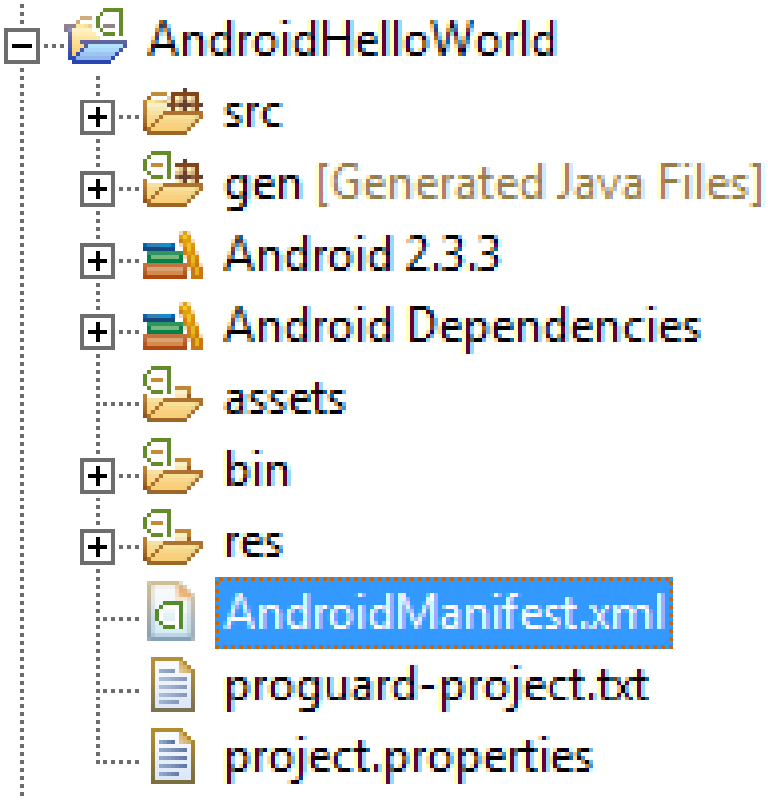
Android Manifest XML



- Describes the Application
- Activities and other components
- Application Name
- Application Version
- Permissions
- Android SDK Version

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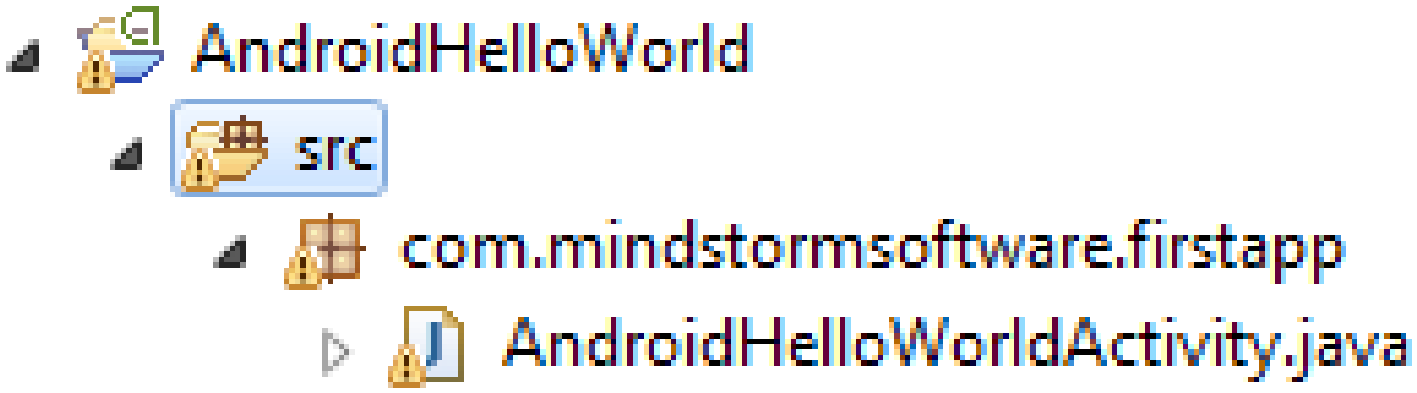
Android Manifest XML

AndroidHelloWorld Manifest

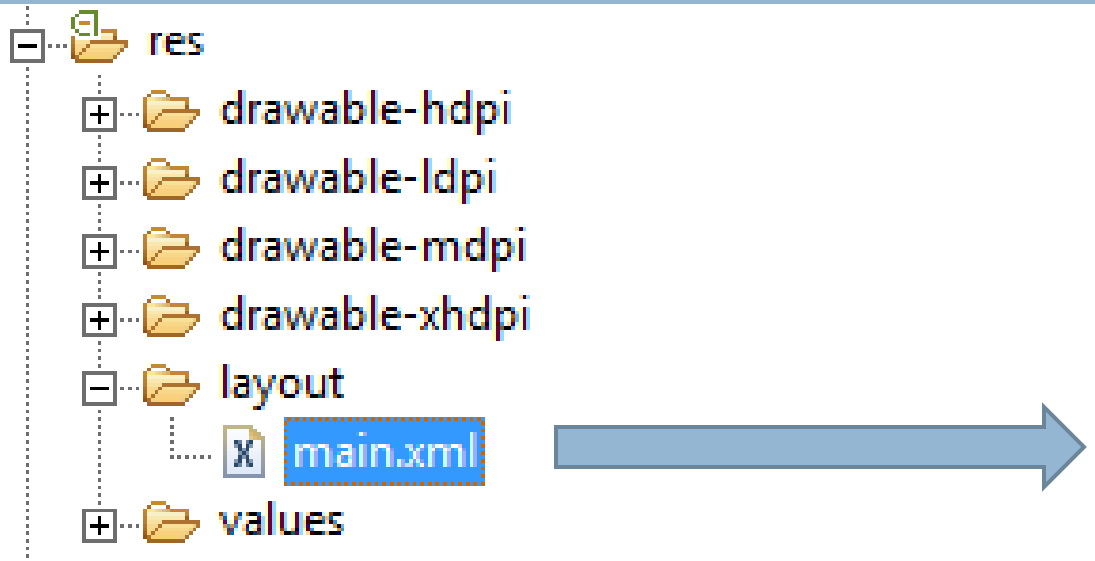
```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
      package="com.mindstormsoftware.firstapp"
      android:versionCode="1"
      android:versionName="1.0">
    <uses-sdk android:minSdkVersion="10" />

    <application android:icon="@drawable/icon" android:label="@string/app_name">
        <activity android:name=".AndroidHelloWorldActivity"
                  android:label="@string/app_name">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>

    </application>
</manifest>
```

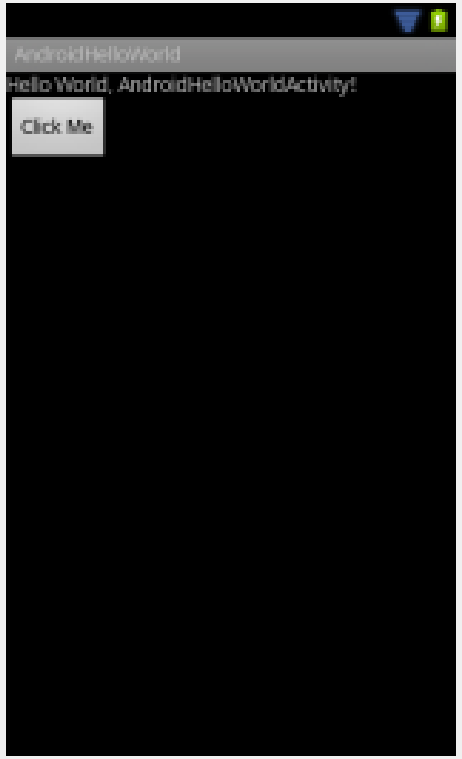
Project Structure - Source



- Contains all the Java Source files

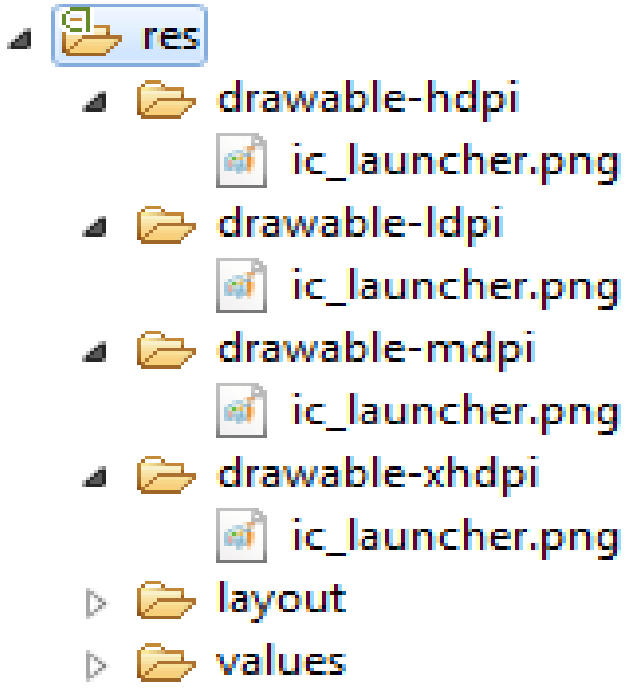
Project Structure - Layout





- Defines how the User Interface is laid out.

Project Structure – Image Resources



- Define Image Resources for different resolutions
- The runtime takes care of using the right image
- If not present, it scales it accordingly.

Project Structure – strings.xml

- Externalize all String values
- strings.xml is just one kind of resource you can put
- Other examples are:
  - colors.xml
  - dimens.xml
  - arrays.xml

strings.xml

```
<?xml version="1.0" encoding="utf-8"?>
<resources>
    <string name="hello">Hello World, AndroidHelloWorldActivity!</string>
    <string name="app_name">AndroidHelloWorld</string>
</resources>
```

Project Structure – R.java file

R.java

```
/* AUTO-GENERATED FILE.  DO NOT MODIFY.

package com.mindstorm.helloworldapp;

public final class R {
    public static final class attr {
    }
    public static final class drawable {
        public static final int ic_launcher=0x7f020000;
    }
    public static final class layout {
        public static final int main=0x7f030000;
    }
    public static final class string {
        public static final int app_name=0x7f040001;
        public static final int hello=0x7f040000;
    }
}
```

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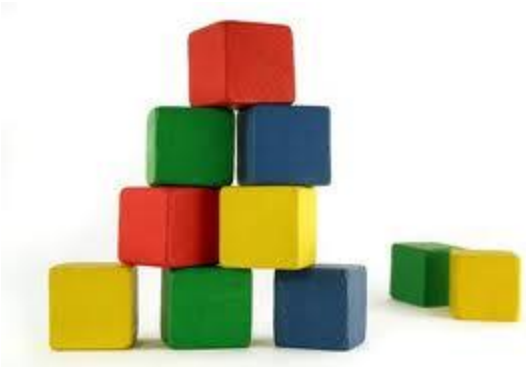
Hands On Exercise

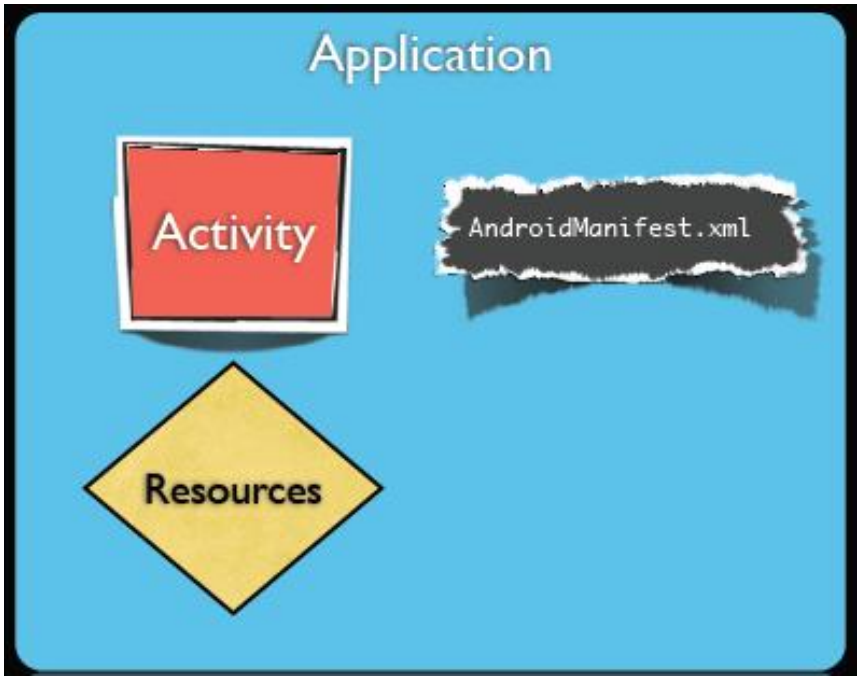
- Hands On Exercise : **ex01 – Hello World.doc**
  - Hello World
- Check List
  - Developer Tools are setup
  - Android Virtual Device has been created

Android Building Blocks



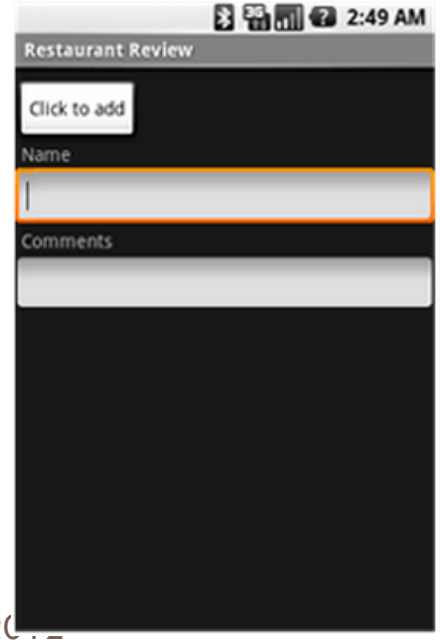
Android Application - Minimal

- You need 3 things at least
  - Activity
  - Android Manifest XML
  - Resources



Android Activity

- Most Basic Building Block
- It is a Screen that users can interact with
- Example: Filling out a text field, dialing a number, etc.
- An Activity is typically written by extending the **Activity** class.
- You can implement the call back methods to get notified of Activity life cycle (onCreate(), onDestroy(), etc)



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Android Activity

- Creating an Activity
  - Extend the Activity class
  - Implement the following method
    - onCreate() : In this method, you can specify the layout (UI) for the activity and write any other initialization functions

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Android Activity

- An Application can have one or more Activities
- One Activity is designated as the Main Activity that is launched when the Application Starts

```
<application android:icon="@drawable/icon" android:label="@string/app_name">
    <activity android:name=".AndroidHelloWorldActivity"
              android:label="@string/app_name">
        <intent-filter>
            <action android:name="android.intent.action.MAIN" />
            <category android:name="android.intent.category.LAUNCHER" />
        </intent-filter>
    </activity>

</application>
```

Android UI

- Android supports
  - Description of UI in XML
  - Programming UI creation
- Design Principle : Separate the UI Design from Behaviour (Event Handling e.g. Click)
- Views
- ViewGroups

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Android UI - Views

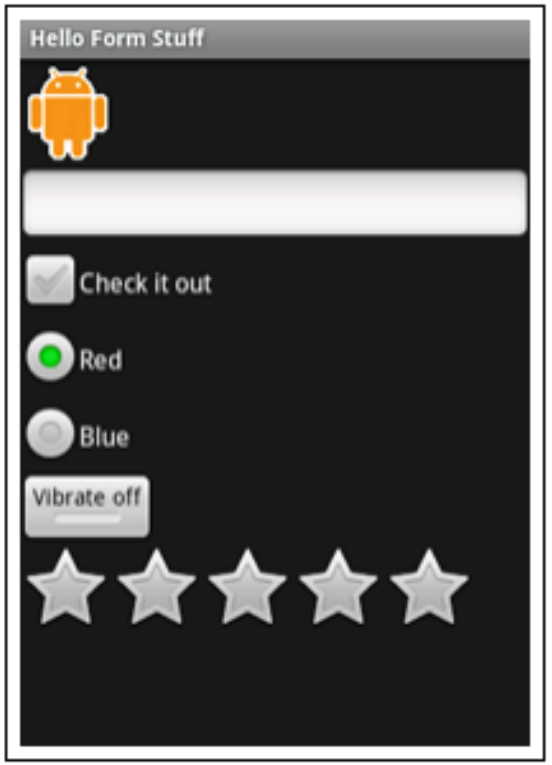
- View
- Basic Unit of UI
- Base class for all widgets
- Examples :
  - Button
  - EditText
  - TextView
  - ImageButton
  - CheckBox
  - RadioButton, RadioGroup
  - ToggleButton
  - SeekBar
  - ProgressBar

Android UI – Basic Views

Date Picker

Time Picker

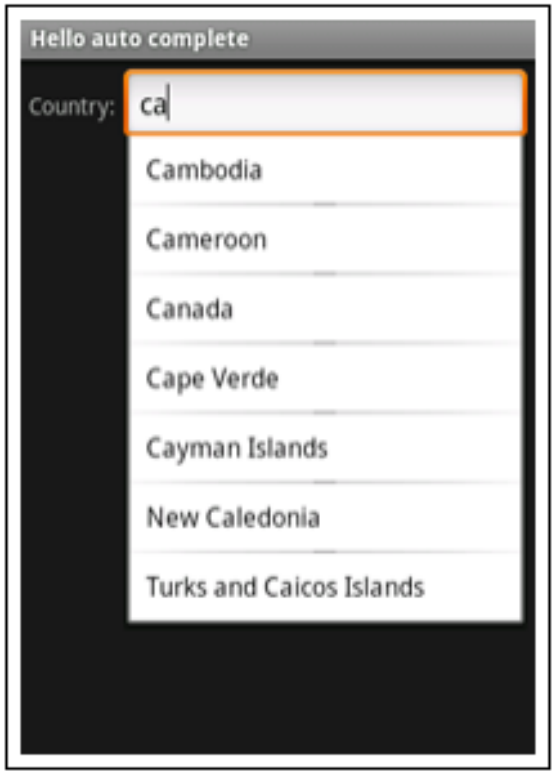
Form Stuff



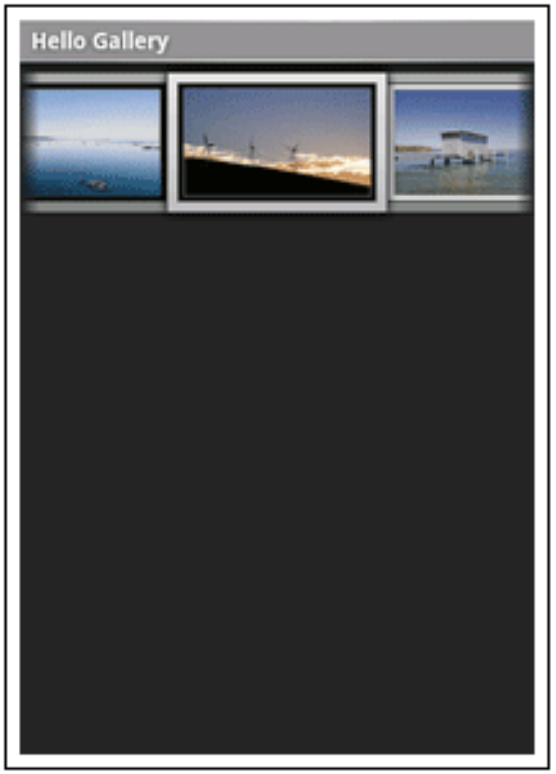
Android UI – Basic Views

Spinner

Auto Complete



Gallery



Android UI – Basic Views

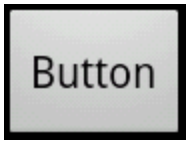
Google Map View

Web View

Android UI – View Declaration

- XML
- Common attributes
  - id , text , layout_width, layout_height
  - Various other fields

```
<Button android:text="Button"
        android:id="@+id/button1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content">
</Button>
<CheckBox android:text="CheckBox"
          android:id="@+id/checkBox1"
          android:layout_width="wrap_content"
          android:layout_height="wrap_content"
          android:checked="true">
```



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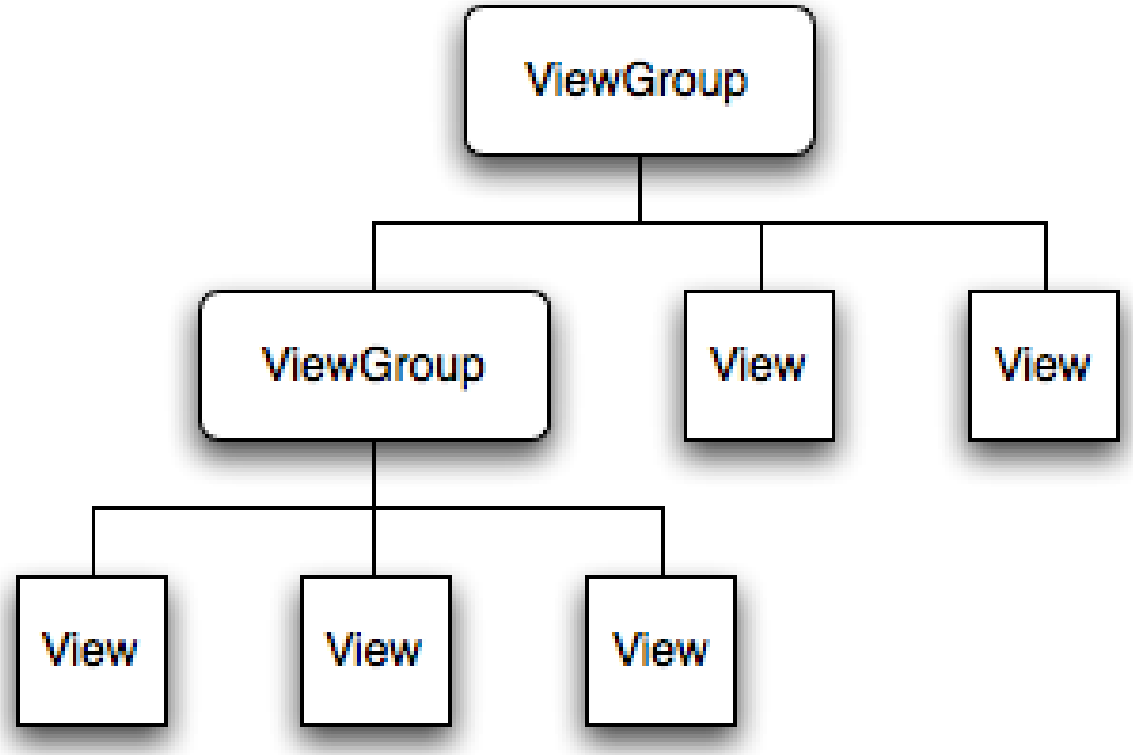
Android UI - ViewGroup

- ViewGroup serves as the base class for “Layouts”
- Layout
  - Allows to group Views
  - Lay them out in various architectural ways
    - Tabular
    - Linear
    - Relative
- Layouts can be nested to create complex screens

Android UI – ViewGroup + View



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Android UI – Layout

- Layout – Recommended way is to define the Viewgroup hierarchy in an XML file
- Different Layouts are supported. Common ones are:
  - LinearLayout
  - Framework
  - TableLayout
  - RelativeLayout
- Other ViewGroups: Gallery, GridView, ScrollView, TabHost, etc.

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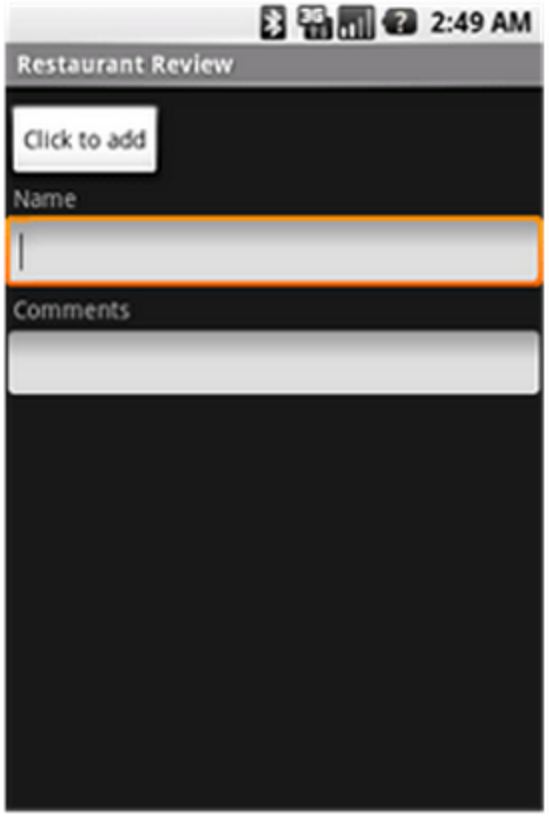
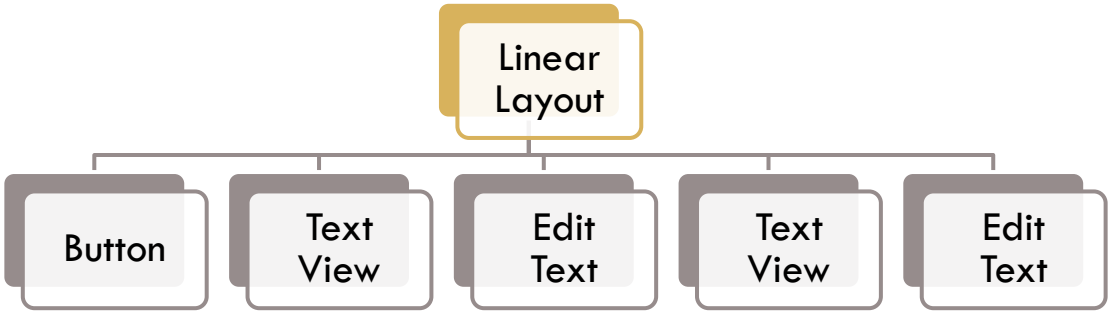
Android UI – Linear Layout

- Is a ViewGroup
- Displays Child View Elements in a linear fashion
- Linear = One After Another
- Orientation attribute
  - Horizontal
  - Vertical

Android UI – Linear Layout





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Android UI – Linear Layout

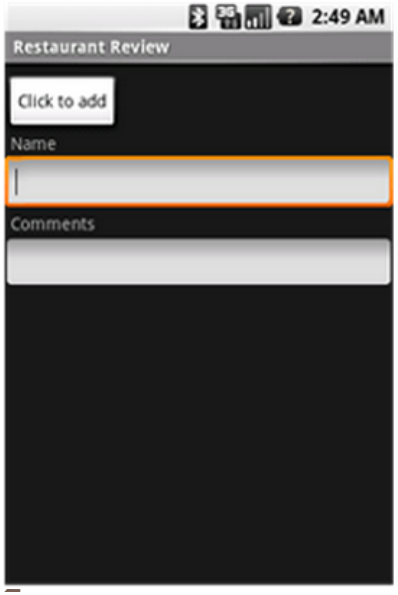

```
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent">

    <Button …. />
    <TextView ….. />
    <EditText …./>
    <TextView …./>
    <EditText …./>

</LinearLayout>
```

Android Activity – User Interface

- An Activity can implement its User Interface by defining a XML file.
- The User Interface will consist of ViewGroups (Layout) and Views.
- You can set the View by calling the setContentView() method in the onCreate() method of the Activity
- Pass the layout in the onCreate()



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Android UI – Event Handling

- Pattern for working with Widgets
- Get the instance to the view
  - findViewById(R.id.<viewid>)
- Set up Event Handlers
  - Example : onClick
- Provide Event Handler implementation
- Study the Java class for different methods and events that you can handle on the Widgets

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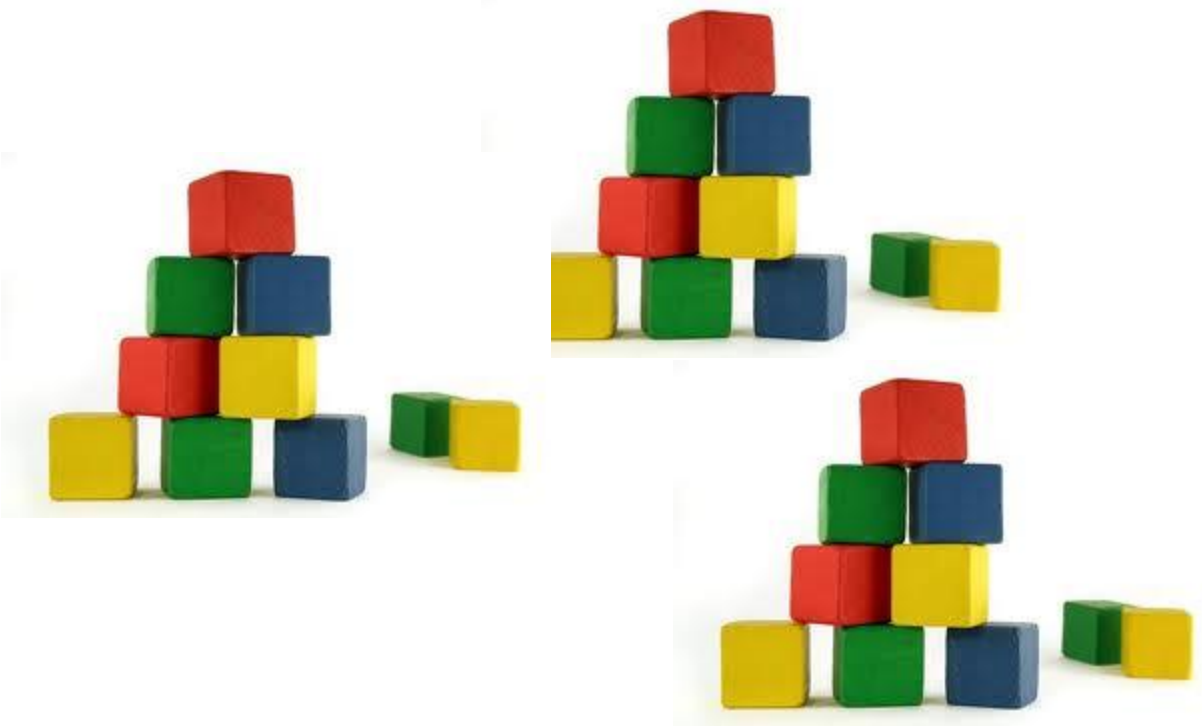
Hands On Exercise

- Hands On Exercise
  - **ex02.docx –** View and Layout Basics

Multiple Activities



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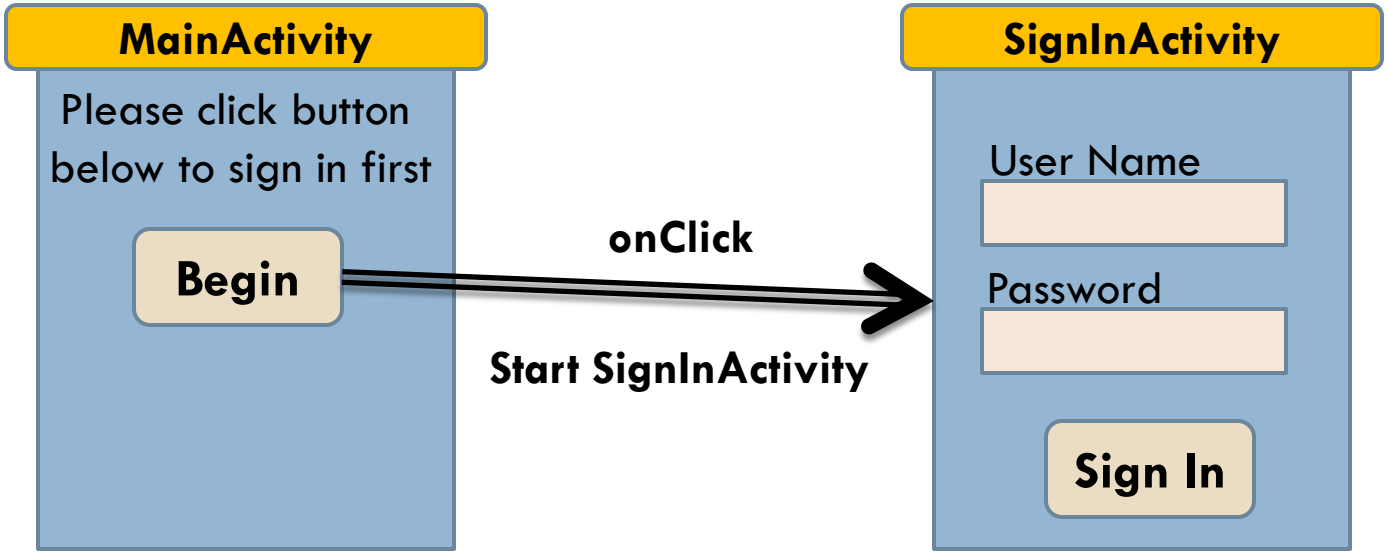
Multiple Activities

- You can define more than one Activity in an Application
- Think of : Activity ←→ User Screen
- You can launch an Activity from within an Activity



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Android - Intent

- An Intent can be loosely termed as what you want to do.
- Examples:
  - Start a particular Activity
  - Send Email
  - Send SMS
  - View URL
- Intents : Explicit and Implicit

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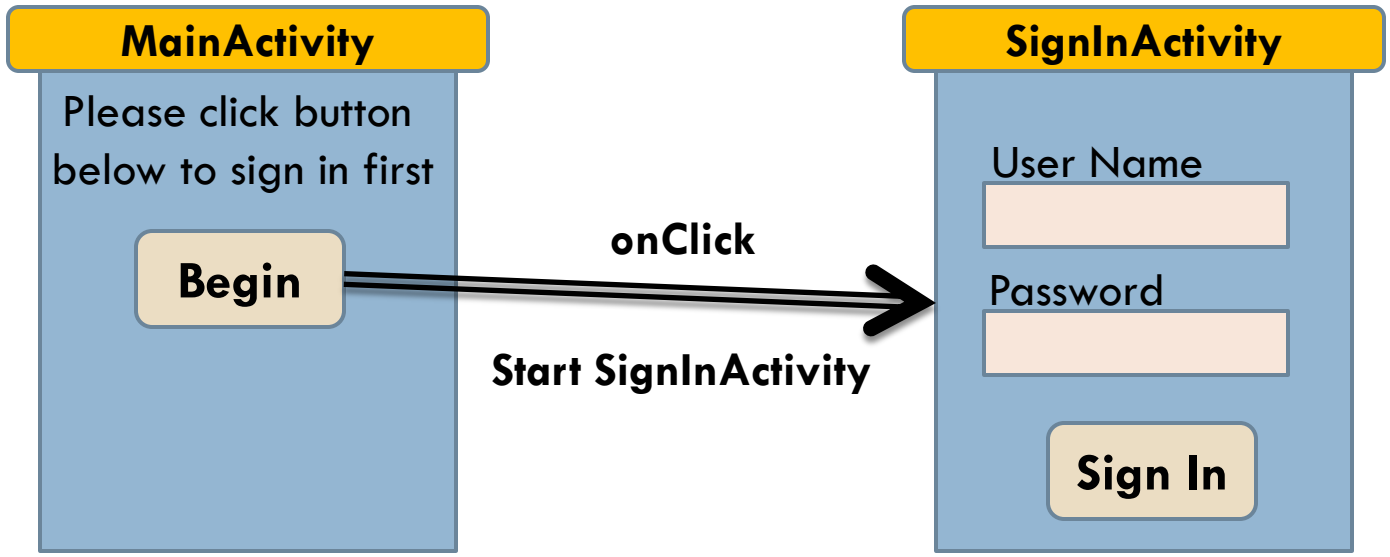
Android – Explicit Intent

- Explicit Intent
  - Start Activity 2
  - You need to know the class for Activity 2
  - For e.g. if you have a screen (Activity 1) which has one button saying “Begin”
  - On clicking “Begin”, you want to display another form (start Activity) where the user enters userid/password

Android – Explicit Intent


```
Intent intent = new Intent(this, SignInActivity.class);

    startActivity(intent);
```



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Android Activity - Manifest

- All Activities need to be defined in the Android Manifest XML file

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
      package="com.mindstorm.android"
      android:versionCode="1"
      android:versionName="1.0">
    <uses-sdk android:minSdkVersion="10" />

    <application android:icon="@drawable/icon" android:label="@string/app_name">
        <activity android:name=".Activity1"
                  android:label="@string/app_name">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
        <activity android:name=".Activity2" android:label="@string/app_name"></activity>

    </application>
</manifest>
```

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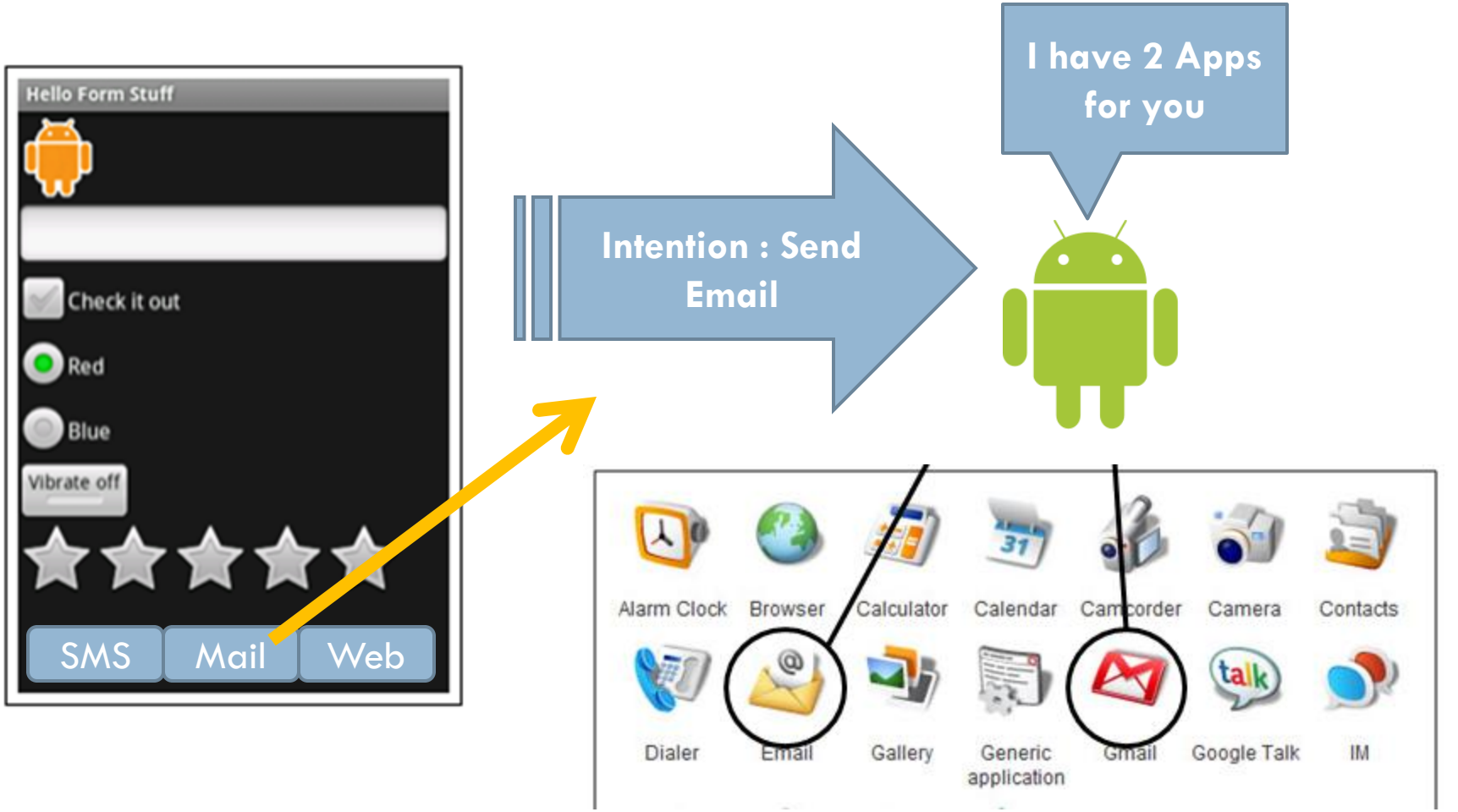
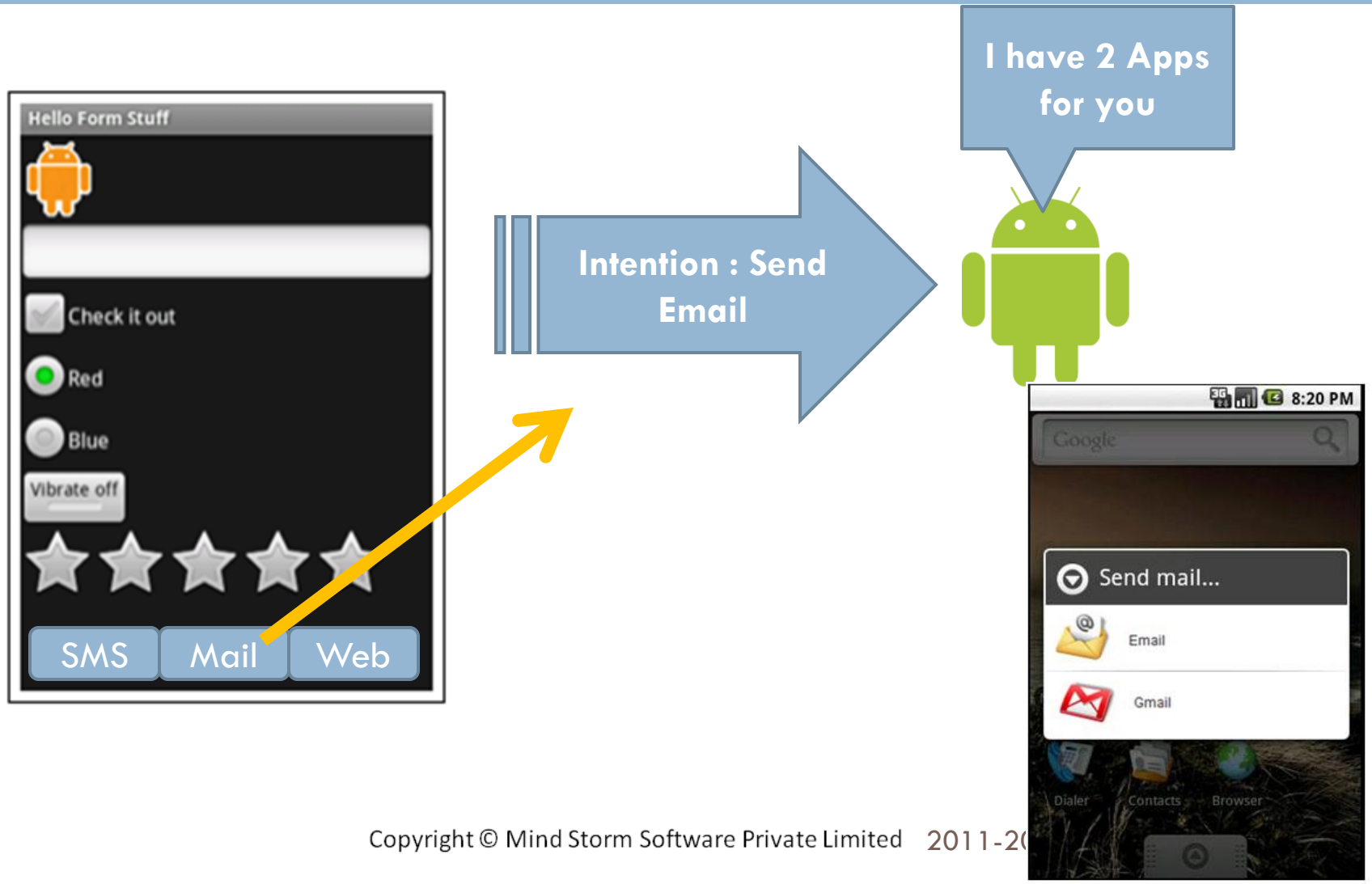
Android – Implicit Intent

- Android supports various standard activties that are commonly clubbed under Implicit Intent
- Examples:
  - Send Email
  - Send SMS
  - Dial / Call a number
  - View a web page
  - View a Map
  - Launch Camera
  - Share Content
- Android will look at all applications that are capable of handling the Intent and then it will launch that

Android – Implicit Intent



Android – Implicit Intent



Android – Implicit Intents - 1

- To Launch a Browser

```
Intent i = new
        Intent(android.content.Intent.ACTION_VIEW,
        Uri.parse("http://www.amazon.com"));
        startActivity(i);
```

Android – Implicit Intents - 2

- Built In Intent (ACTION_DIAL)
- This will show the Dial Screen but not start calling

```
Intent i = new Intent
                (android.content.Intent.ACTION_DIAL,
                 Uri.parse("tel:+9810020011"));

startActivity(i);
```

Android – Implicit Intents - 3

- Built In Intent (ACTION_CALL)
- This will start calling the number
- Requires the following permission:

<uses-permission
android:name="*android.permission.CALL_PHONE*">

```
Intent i = new Intent
                (android.content.Intent.ACTION_CALL,
                 Uri.parse("tel:+9810020011"));

startActivity(i);
```

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Android – Send Email


```
Intent emailIntent = new Intent(Intent.ACTION_SEND);
emailIntent.setType("text/plain");

String[] to = {"romin.k.irani@gmail.com"};
emailIntent.putExtra(Intent.EXTRA_EMAIL, to);
emailIntent.putExtra(Intent.EXTRA_SUBJECT, "Email Subject");
emailIntent.putExtra(Intent.EXTRA_TEXT, "Email message");

startActivity(Intent.createChooser(emailIntent, "Send Email via..."));
```

Android – Send SMS


```
Intent i = new
    Intent(android.content.Intent.ACTION_VIEW);
i.putExtra("address", "9821111111;9822211111");
i.putExtra("sms_body", "Hello");
i.setType("vnd.android-dir/mms-sms");
startActivity(i);
```

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Hands On Exercise

- Hands On Exercise
  - **ex03.docx --** Multiple Activities
  - **ex04.docx --** Built In Intents

Building a Complete Android Application

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Quotes Application

- Functional Specifications
  - Displays Random Quotes
  - User can share quotes via SMS
  - **Future Extensions**
    - User can view quotes by category
    - User can mark some quotes as favourites

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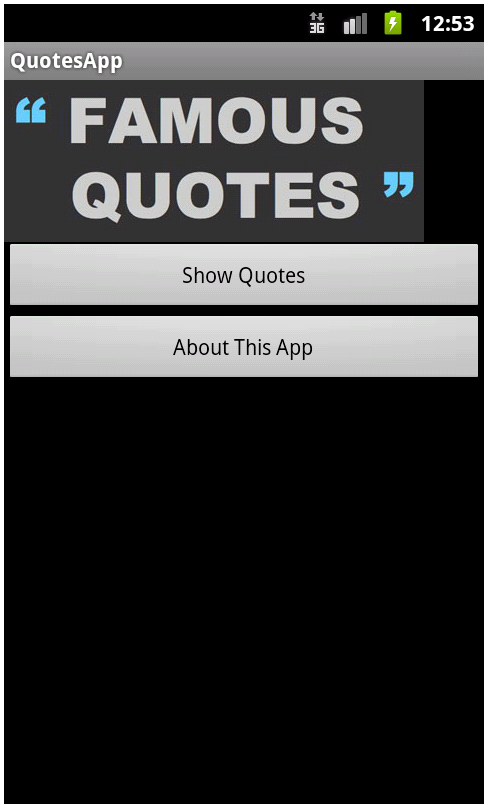
Quotes Application

- Android Features to be used
  - Activities [**Multiple Screens**]
  - Layouts for all activities [**LinearLayout**]
  - **Built in Intents**
    - Launch SMS App to share Quote via SMS
    - Launch Email App to share Quote via Email
  - File based database to store quotes

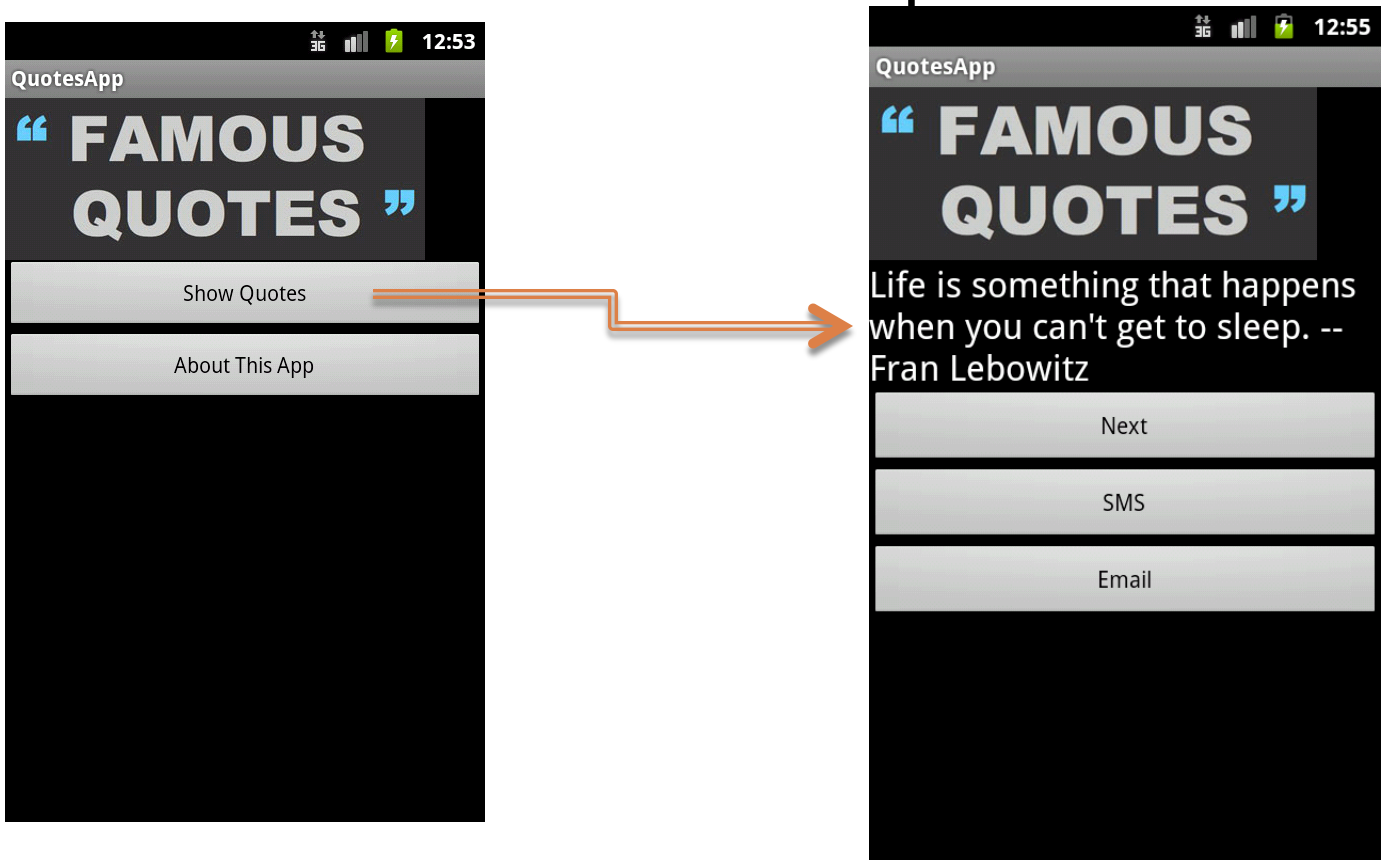
Quotes App in Action

- QuoteActivity – Shows Main Menu



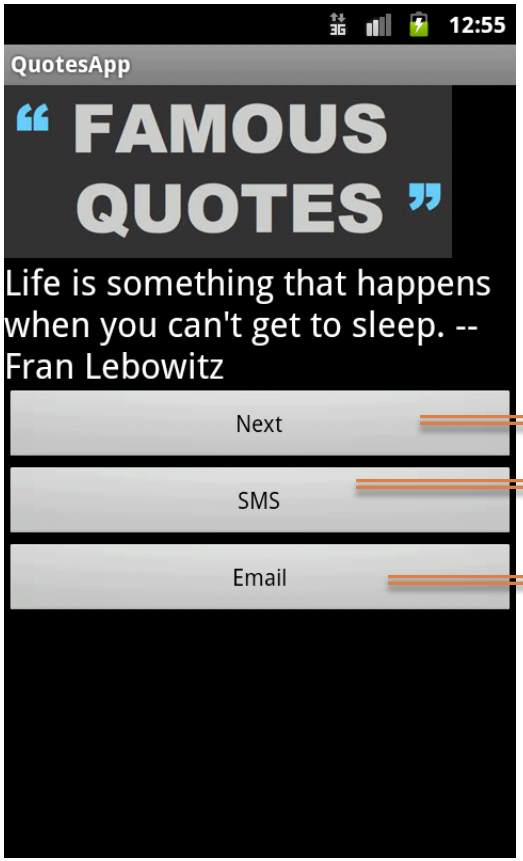
Quotes App in Action

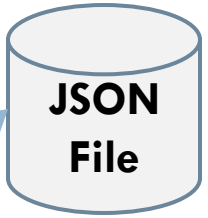
- Show Quotes retrieves a quote from Database



Quotes App in Action

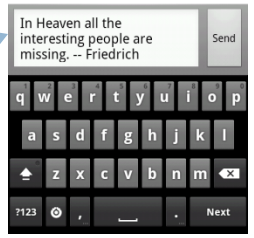
- Show Quote Activity – Other Functions





Retrieves another random quote from database and displays it

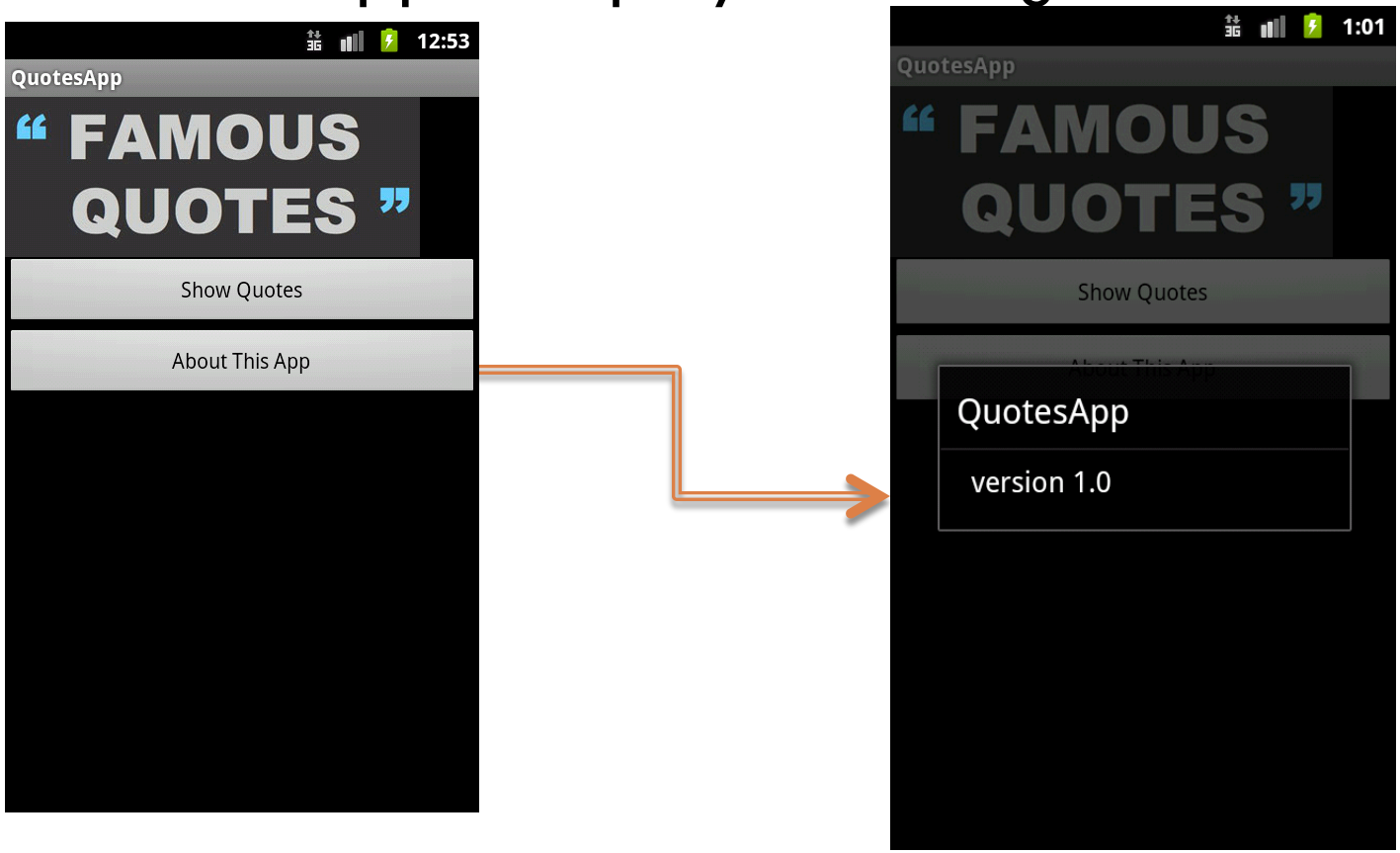
Launches SMS App on phone to share this quote



Launches Email App on phone to share this quote

Quotes App in Action

- About App – Displays a Dialog box



Quotes App – Step by Step

- Quotes App – Step 1 - Navigation
- Quotes App – Step 2
  - Random Quotes
  - Share a Quote via SMS
  - Share a Quote via Email
- *Future - Quotes App – Step 3 - Favourites*
- *Future - Quotes App – Step 4 – Category Quotes*

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Android APIs

- We have seen just a fraction of what Android phones can do
- APIs for
  - Media
  - Networking
  - Location Based Programming (GPS, Maps)
  - Storage (File, Database)
- Rich UI Widgets

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Next Steps

- Go back and absorb the material
- Look at the examples again
- Github: https://github.com/rominirani/Nitrodroid-2012-Android101-Workshop
- Android Developer http://developer.android.com
- Android Training http://developer.android.com/training
- Get the Google Play Account…
- … unleash your Apps
- All The Best !

- Q & A
- Website : http://www.mindstormsoftware.com
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- Twitter: iRomin
- 2-Day Android, HTML5 and Cloud Computing Hands-on Developer Courses