

Android 101 - Developer Workshop



6th October, 2012

Goals of Workshop

2

- 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

Participant Requirements

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- 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 ?



What is Android?

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- 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>

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

Android Device Dashboard

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Version	Codename	API	Distribution
1.5	Cupcake	3	0.2%
1.6	Donut	4	0.4%
2.1	Eclair	7	3.7%
2.2	Froyo	8	14%
2.3 - 2.3.2	Gingerbread	9	0.3%
2.3.3 - 2.3.7		10	57.2%
3.1	Honeycomb	12	0.5%
3.2		13	1.6%
4.0 - 4.0.2	Ice Cream Sandwich	14	0.1%
4.0.3 - 4.0.4		15	20.8%
4.1	Jelly Bean	16	1.2%

~ **75%**

~ **22%**

September 4, 2012 : <http://developer.android.com/resources/dashboard/platform-versions.html>

Android Features

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

Why Android?

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- ❑ Android has garnered more than 50% of the current marketshare in Smartphones
- ❑ 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

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- 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



Tools Needed

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- 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-adb.html>

(Recommended to begin with)

Android Virtual Device

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- ❑ SDK includes an Emulator - a virtual mobile device
- ❑ Emulator helps you 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

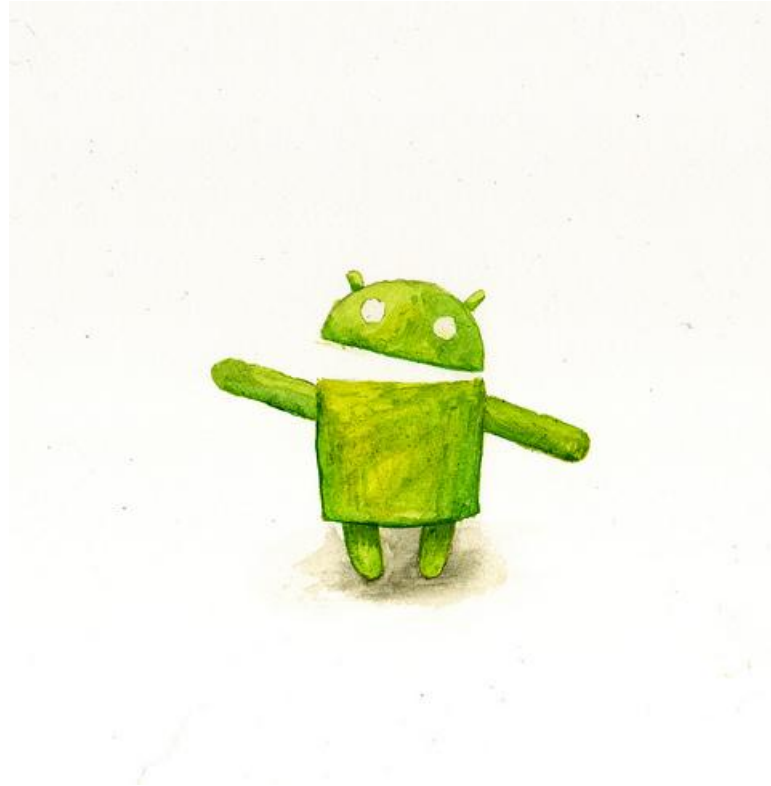
Android Emulator

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

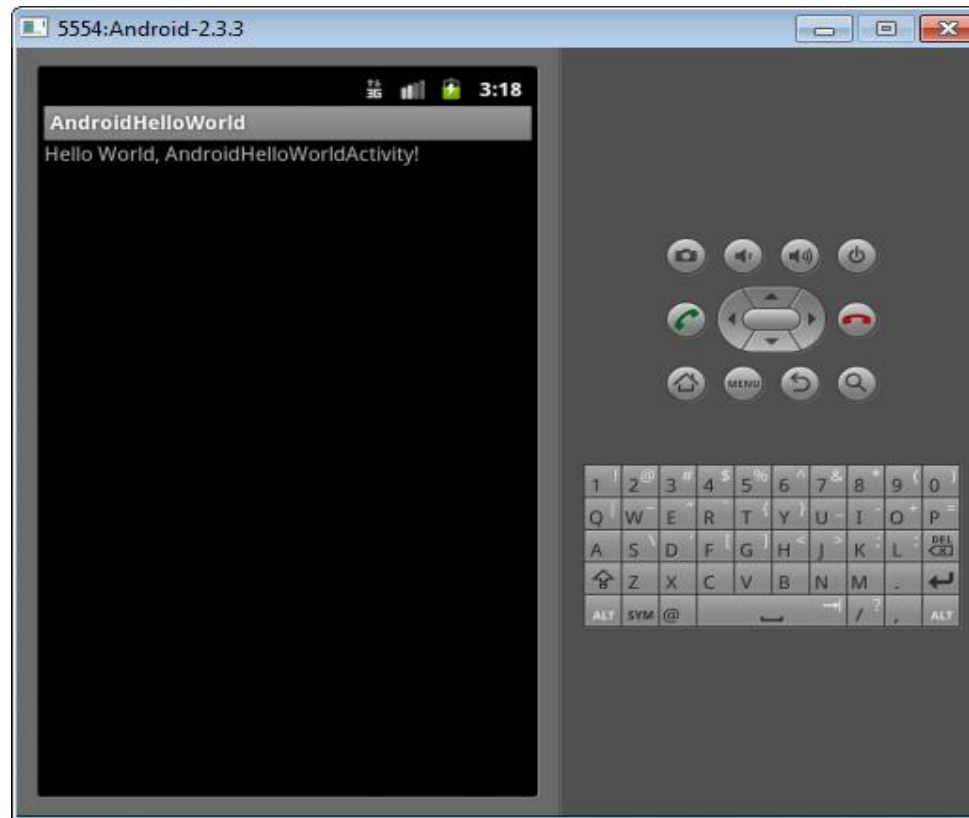


Your First Android App



Hello World In Android

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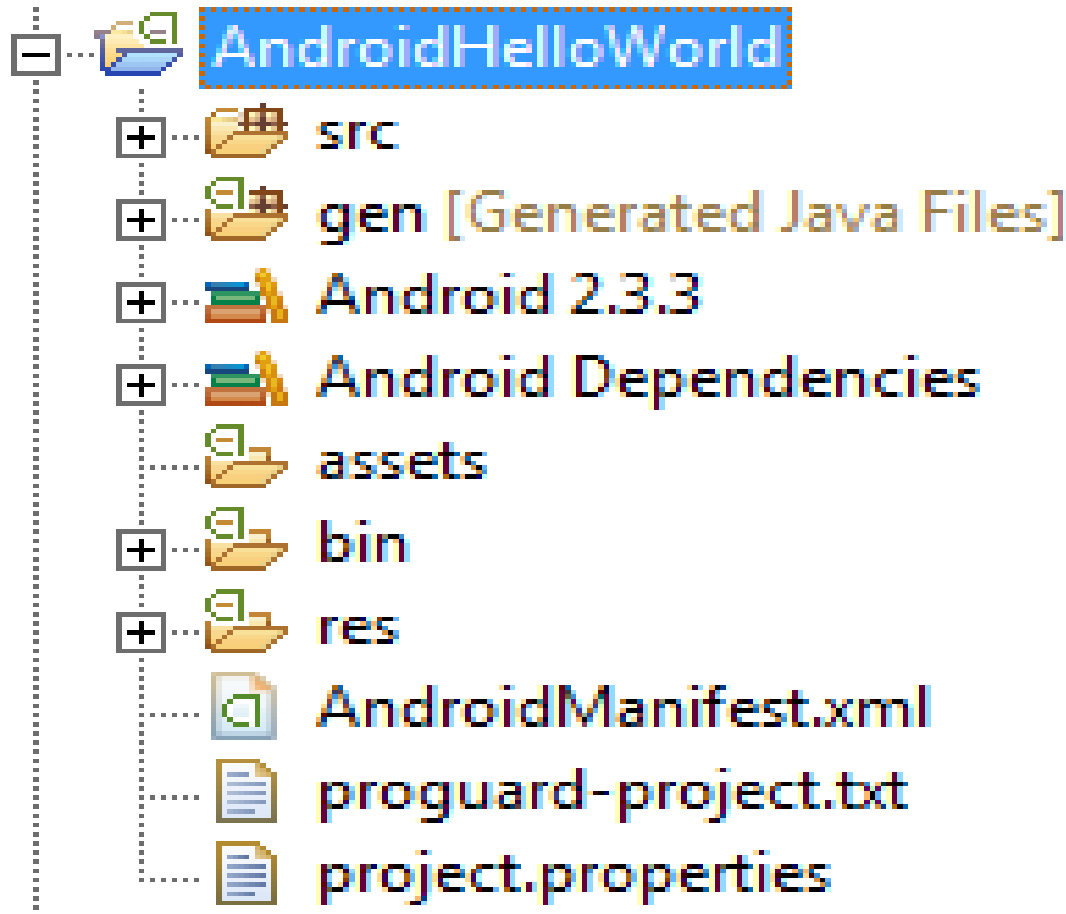
Steps to First Hello World

17

- 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

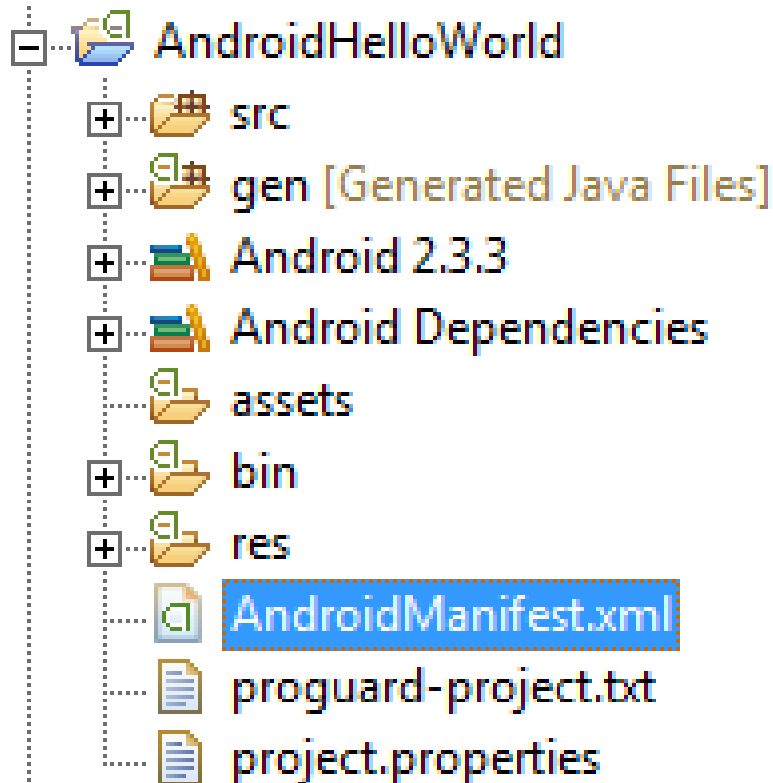
Project Structure

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Android Manifest XML

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

Android Manifest XML

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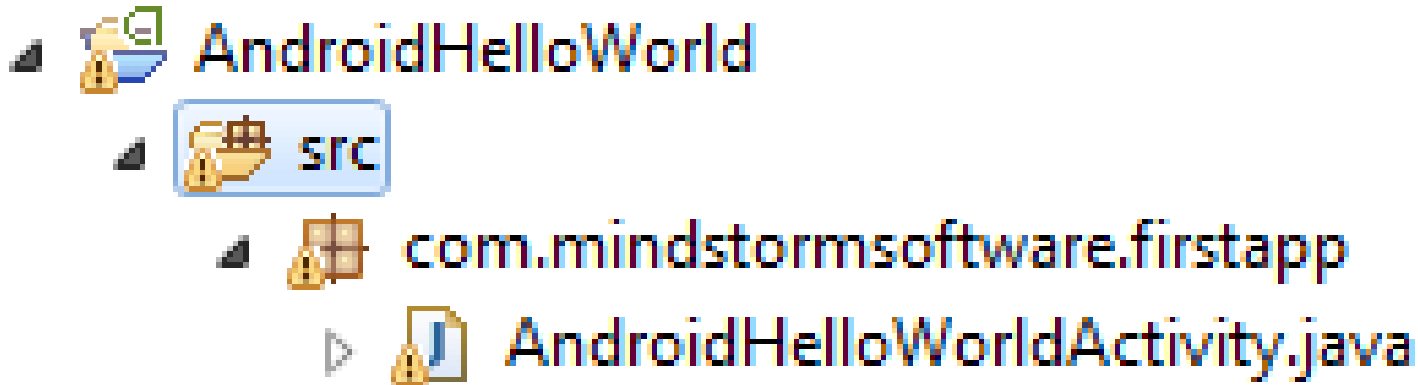
AndroidHelloWorld Manifest

```
<?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

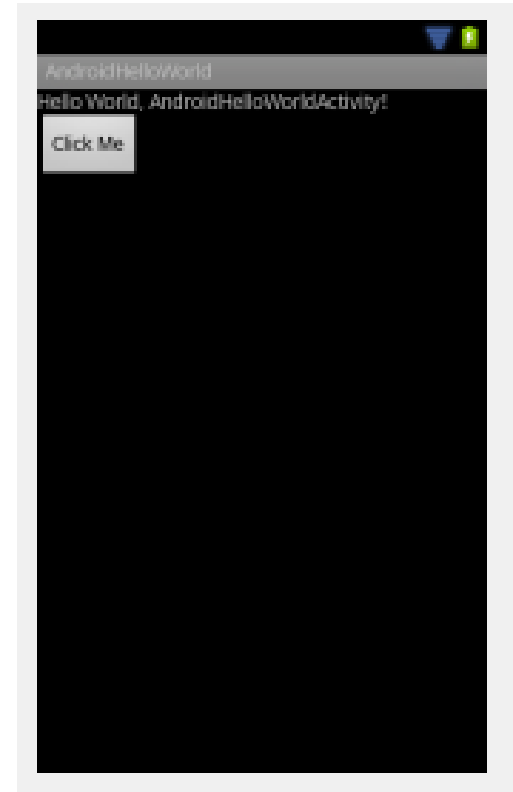
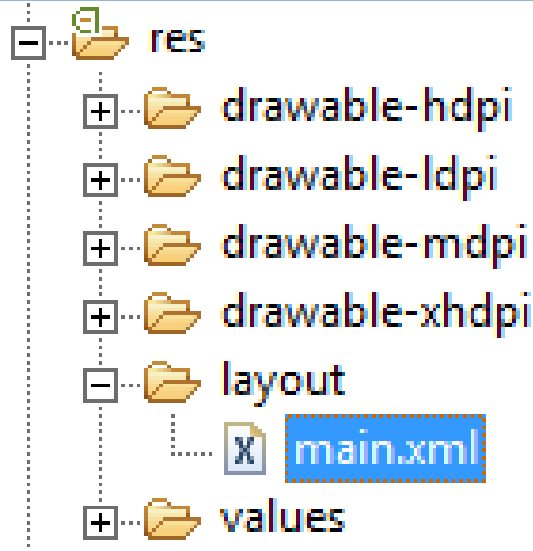
21



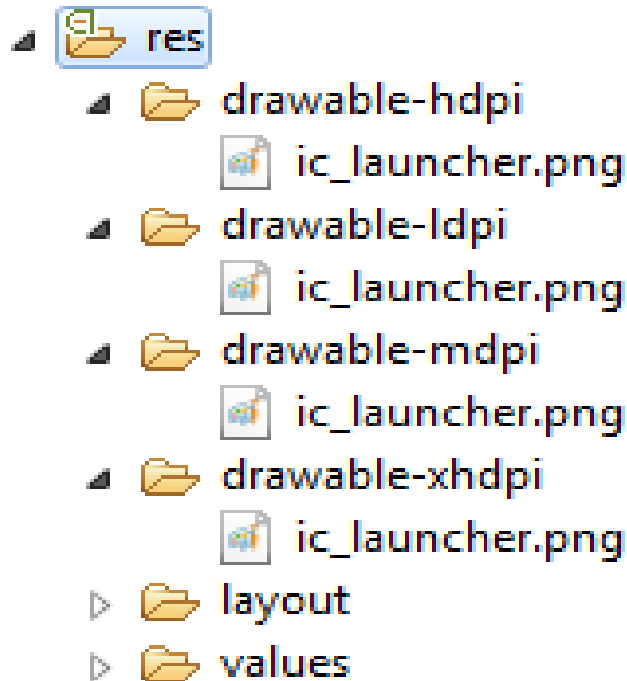
- Contains all the Java Source files

Project Structure - Layout

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- Defines how the User Interface is laid out.

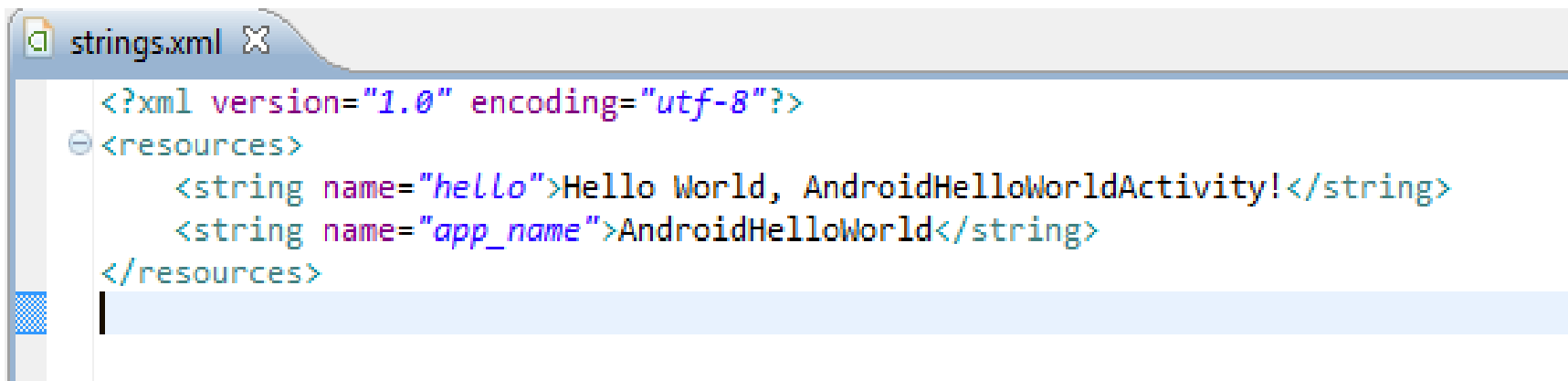


- Define Image Resources for different resolutions
- The runtime takes care of using the right image
- If not present, it scales it accordingly.

Project Structure – strings.xml

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

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```
R.java X
+ /* 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;
    }
}
```

Project Structure – R.java file

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```
R.java X
+ /* 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;
    }
}
```

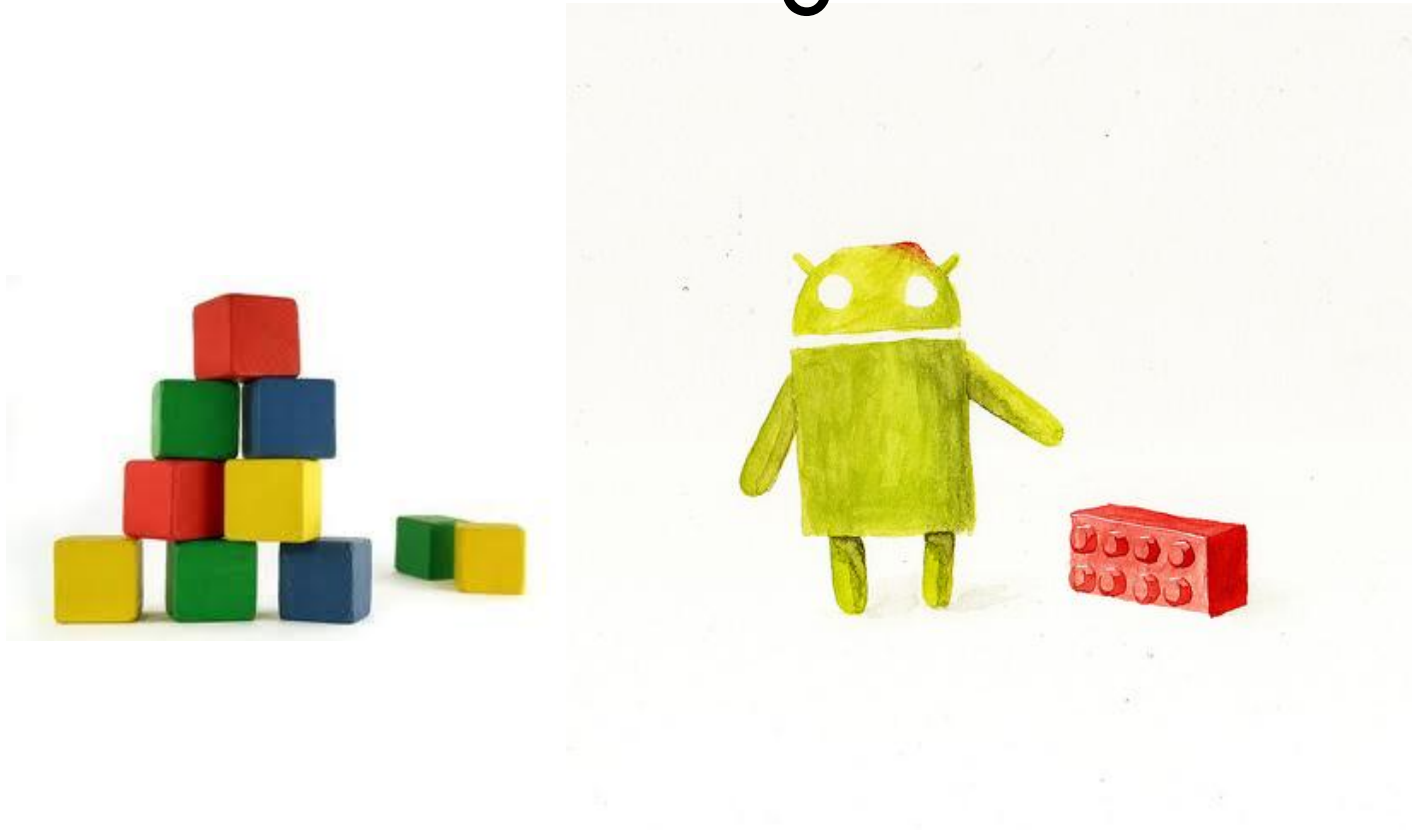
Hands On Exercise

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



Android Building Blocks



Building Blocks

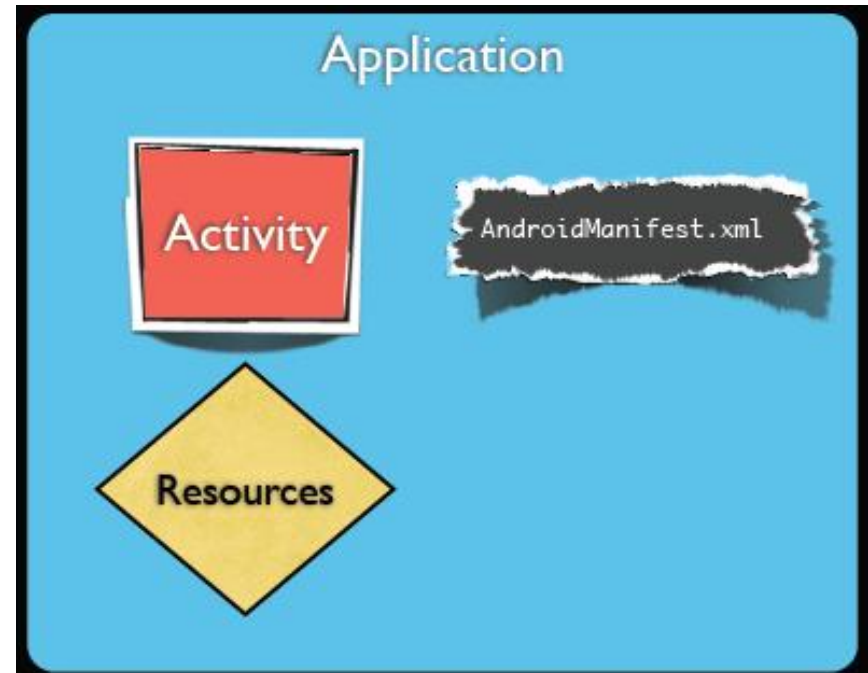
29

- Important to understand what an Android Application is made up of
- Android defines few buildings blocks that make up an application
 - ▣ Activity
 - ▣ Manifest File
 - ▣ Resources
 - ▣ Content Provider
 - ▣ Broadcast Receiver
 - ▣ Service

Android Application - Minimal

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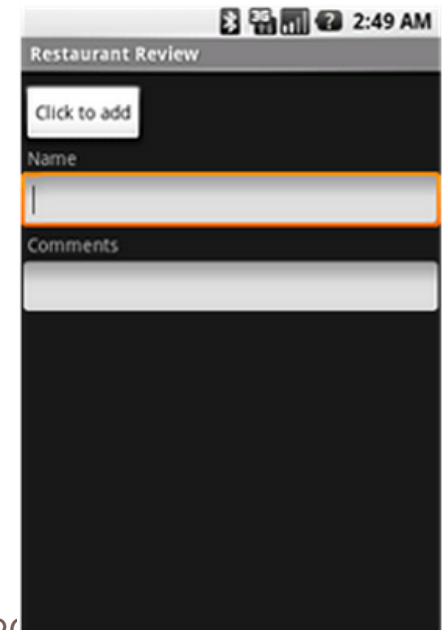
- You need 3 things at least
 - ▣ Activity
 - ▣ Android Manifest XML
 - ▣ Resources



Android Activity

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- ❑ 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)



Android Activity

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- 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

Android Activity

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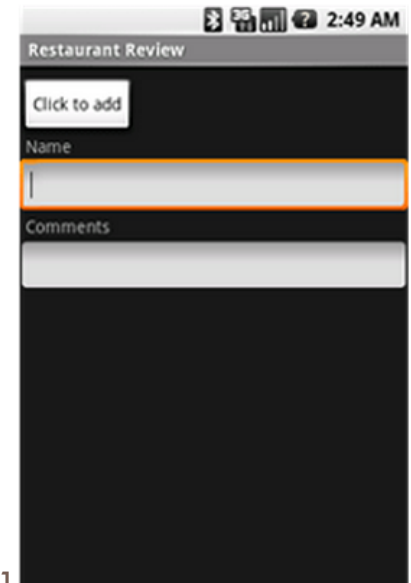
- An Application can have one or more Activities
- One Activity is designated as the Main Activity that is launched when the Application Starts

```
<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 Activity – User Interface

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- ❑ 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()`



Android UI

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- 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

Android UI - Views

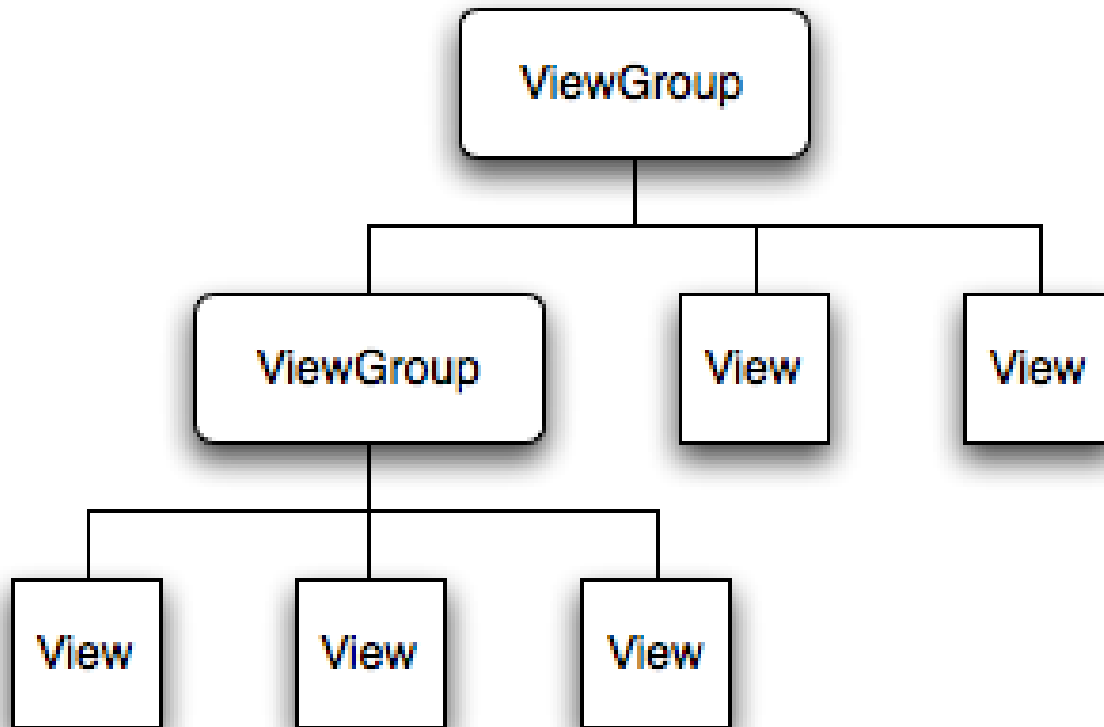
36

- View
- Basic Unit of UI
- Base class for all widgets
- Examples : TextField, Button, etc.

Android UI - ViewGroup

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- 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 – View Types

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- Android supports variety of views that help capture various kinds of user input
- What kind of data + User Experience

- Button
- EditText
- TextView
- ImageButton

- CheckBox
- RadioButton, RadioGroup
- ToggleButton
- SeekBar
- ProgressBar

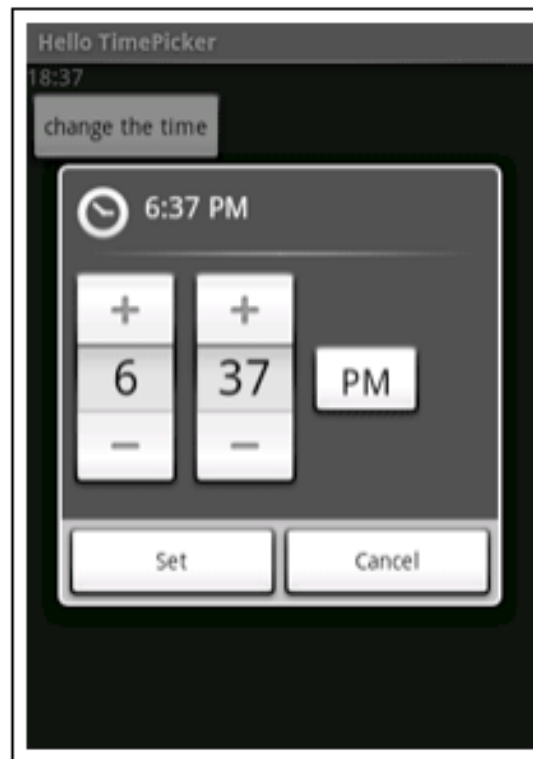
Android UI – Basic Views

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Date Picker



Time Picker



Form Stuff



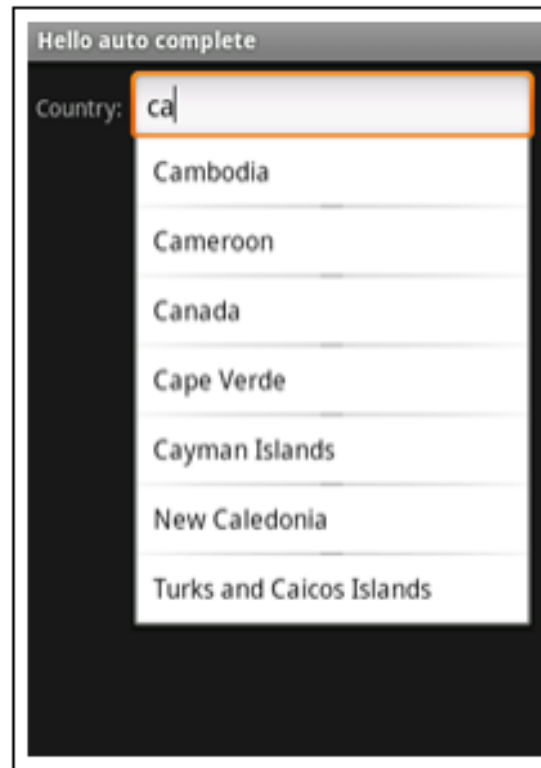
Android UI – Basic Views

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Spinner



Auto Complete



Gallery

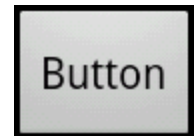


- XML
- Common attributes
 - ▣ Id , text , layout_width, layout_height
 - ▣ Various other fields

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

```
</Button>
```

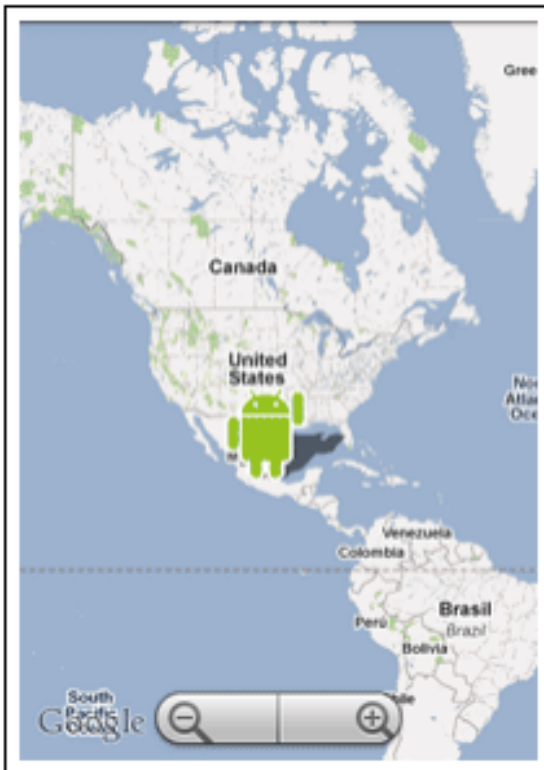
```
<CheckBox android:text="CheckBox"
          android:id="@+id/checkbox1"
          android:layout_width="wrap_content"
          android:layout_height="wrap_content"
          android:checked="true">
```



Android UI – Basic Views

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Google Map View



Web View

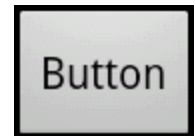


- XML
- Common attributes
 - ▣ Id , text , layout_width, layout_height
 - ▣ Various other fields

```
<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">
```



Android UI – Event Handling

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- 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

Android UI – Layout

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- 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.

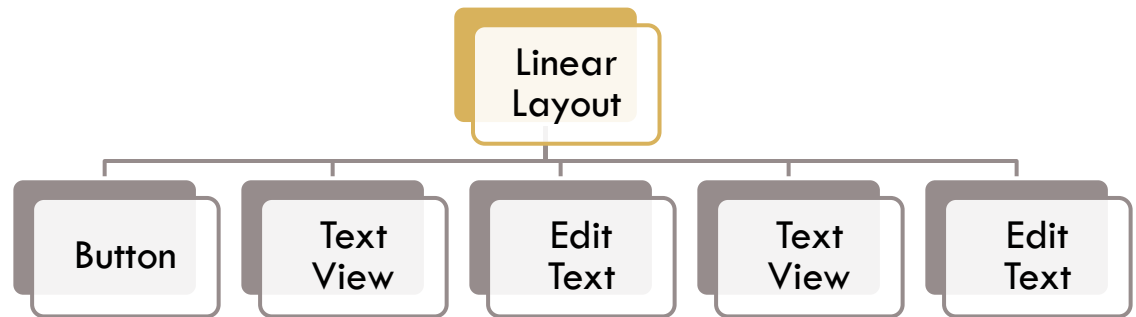
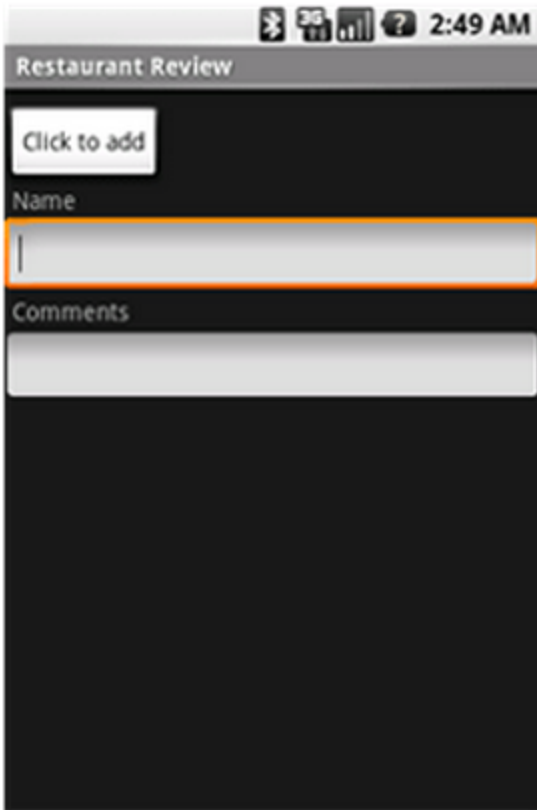
Android UI – Linear Layout

47

- ❑ 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

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```
<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>
```

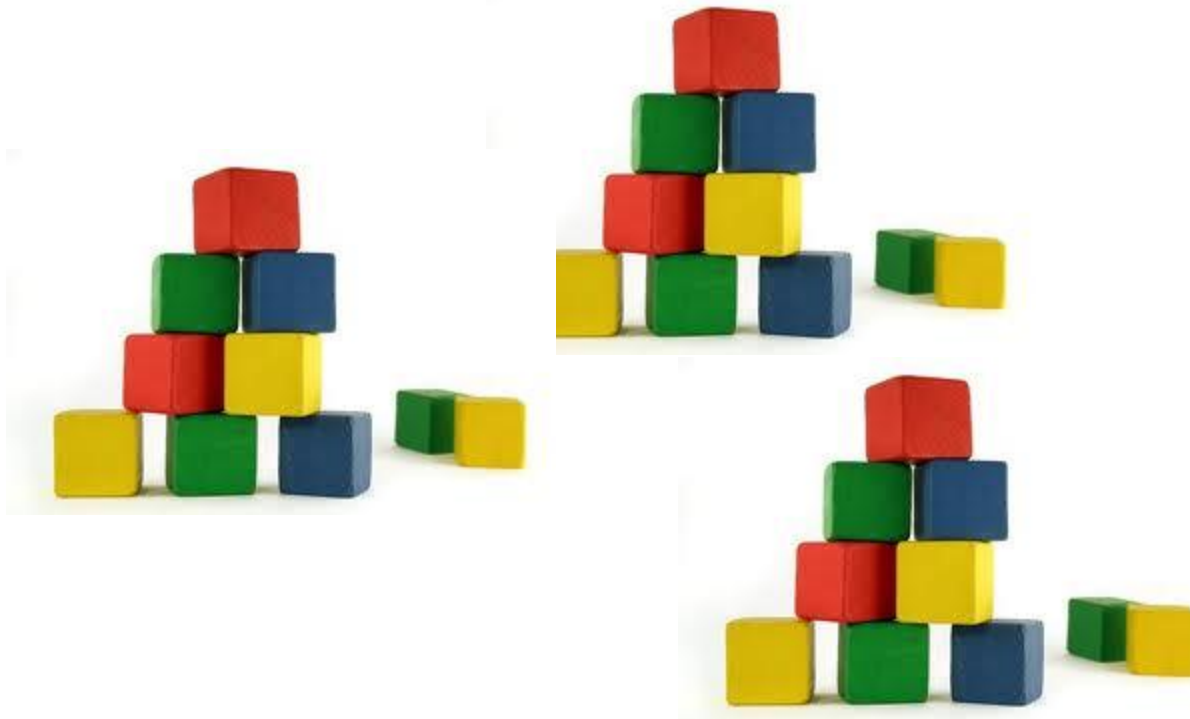
Hands On Exercise

50

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



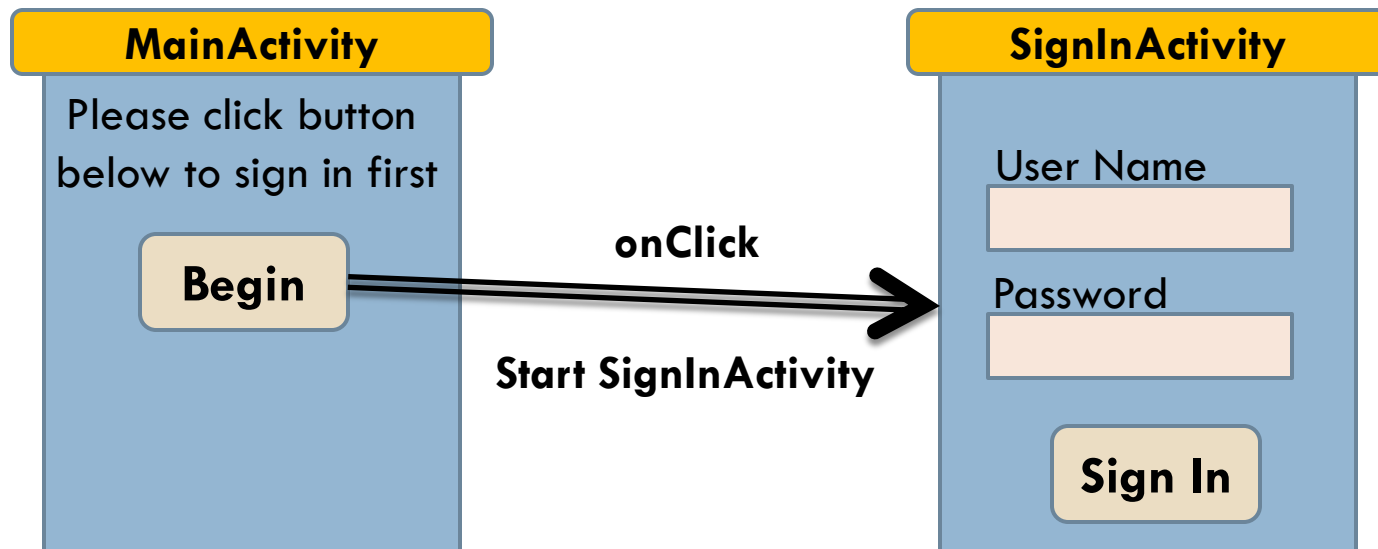
Multiple Activities



Multiple Activities

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



Android - Intent

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- 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

Android – Explicit Intent

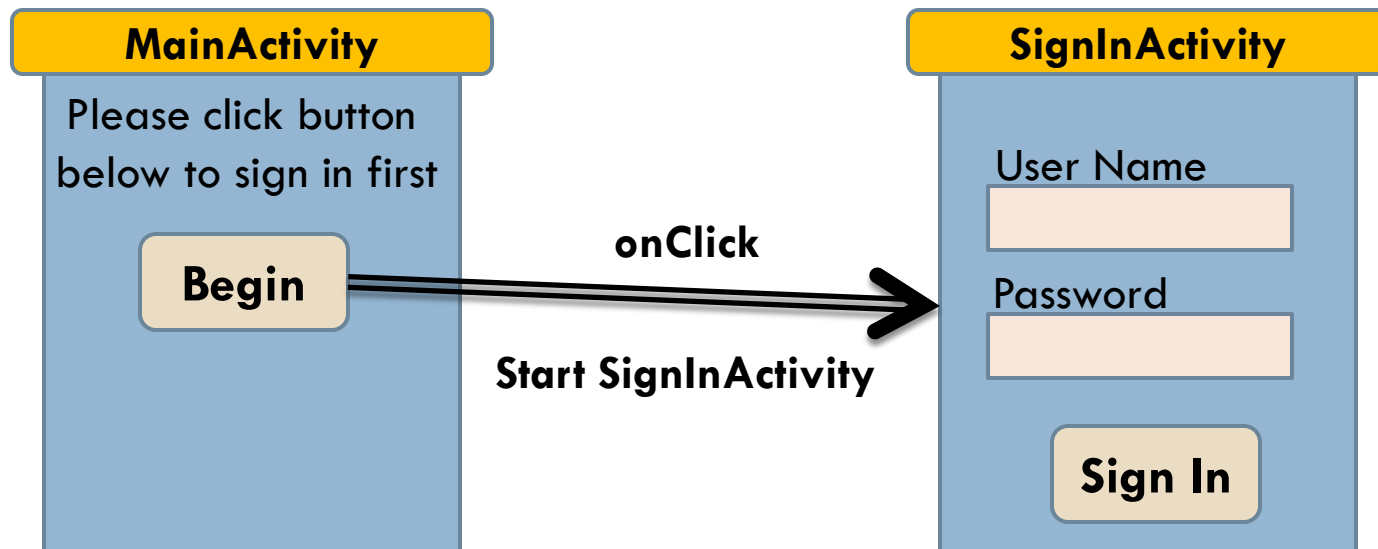
54

- 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

55

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



Android - Intent

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- 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

Android – Explicit Intent

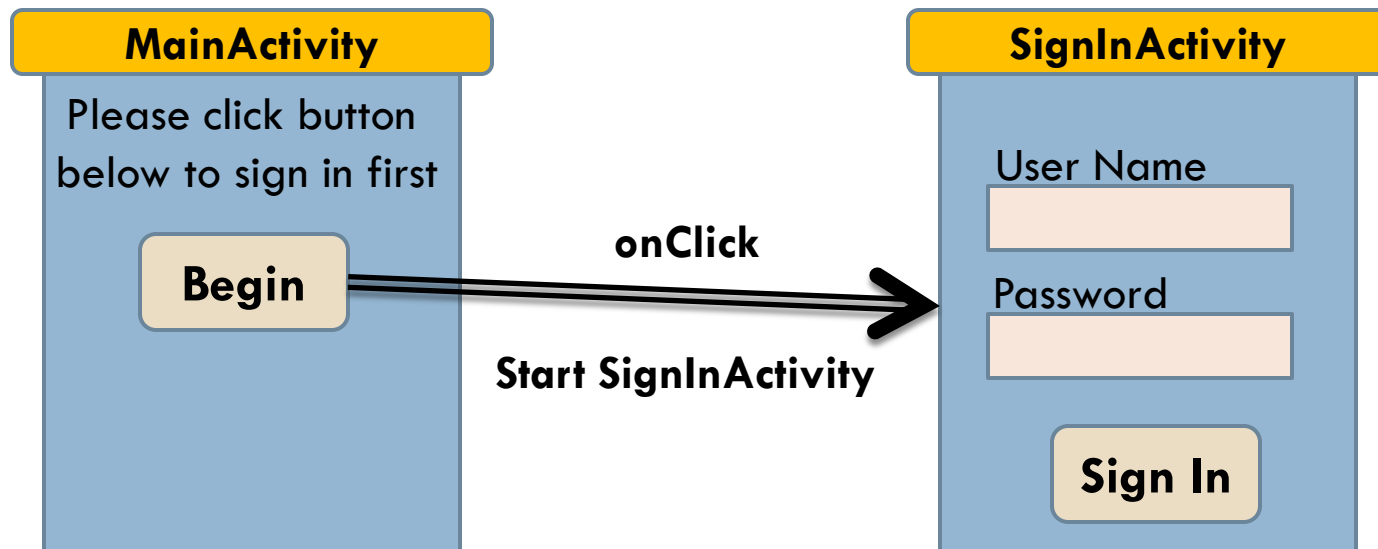
57

- 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 “Login”, you want to display another form (start Activity) where the user enters userid/password

Android – Explicit Intent

58

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



Android Activity - Manifest

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- 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>
```

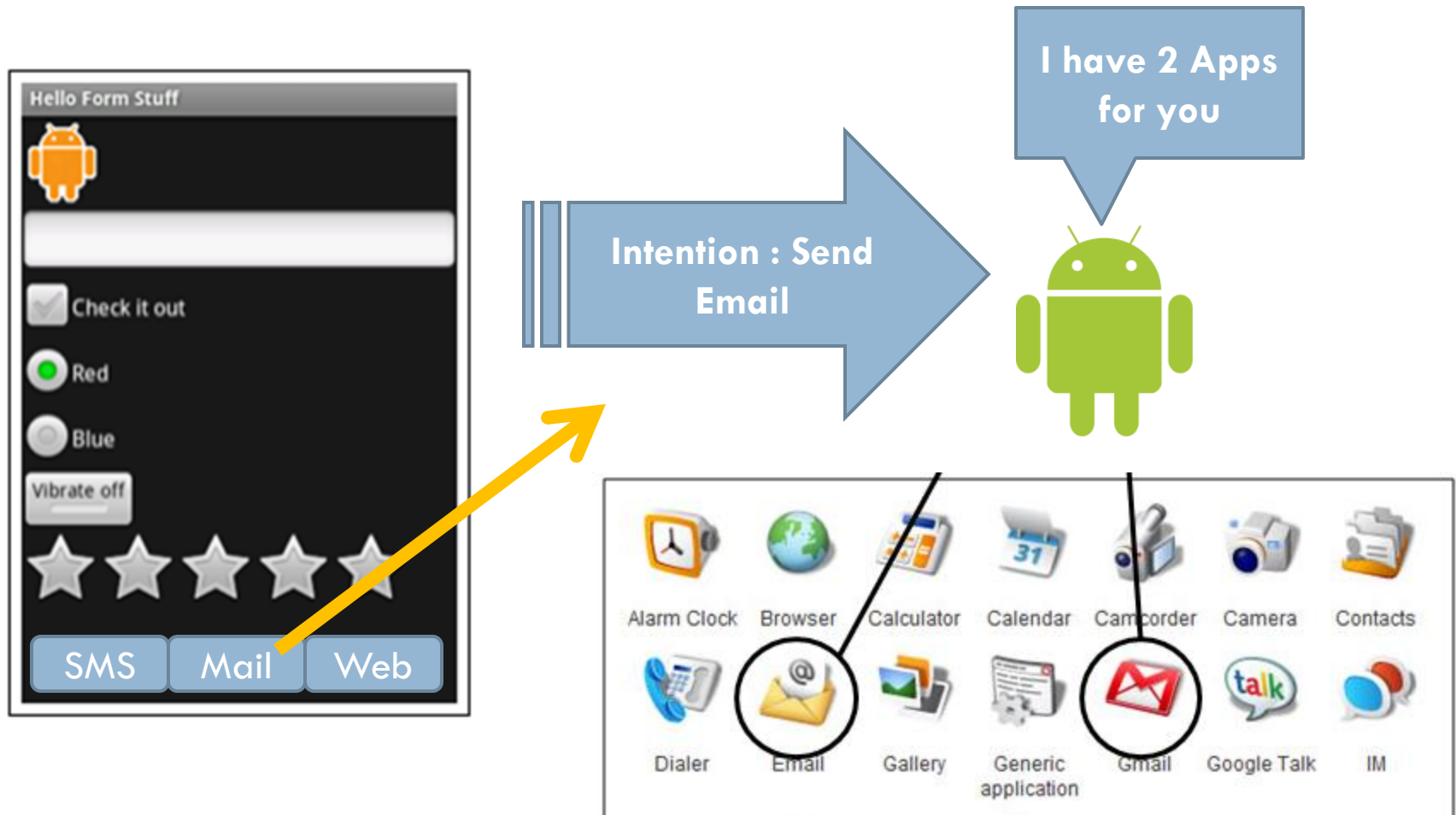
Android – Implicit Intent

60

- Android supports various standard activities 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

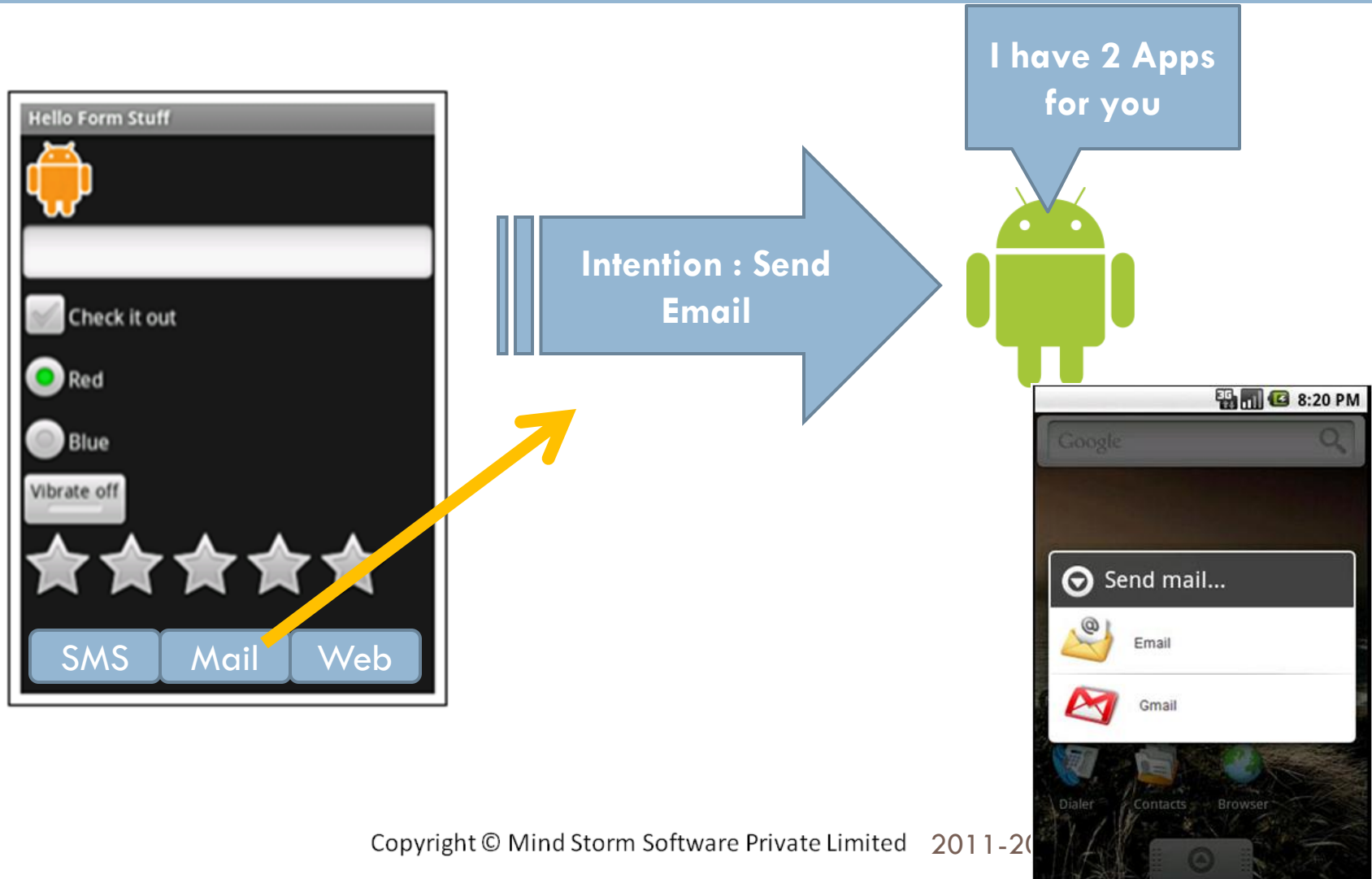
Android – Implicit Intent

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Android – Implicit Intent

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Android – Implicit Intents - 1

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□ 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

64

- Built In Intent (ACTION_DIAL)
- This will show the Dial Screen but not start calling
- Example Project : **BuiltInIntents**

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


Android – Implicit Intents - 3

65

- 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);
```

Android – Send Email

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```
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

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```
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);
```

Hands On Exercise

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



Building a Complete Android Application



Quotes Application

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- 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

Quotes Application

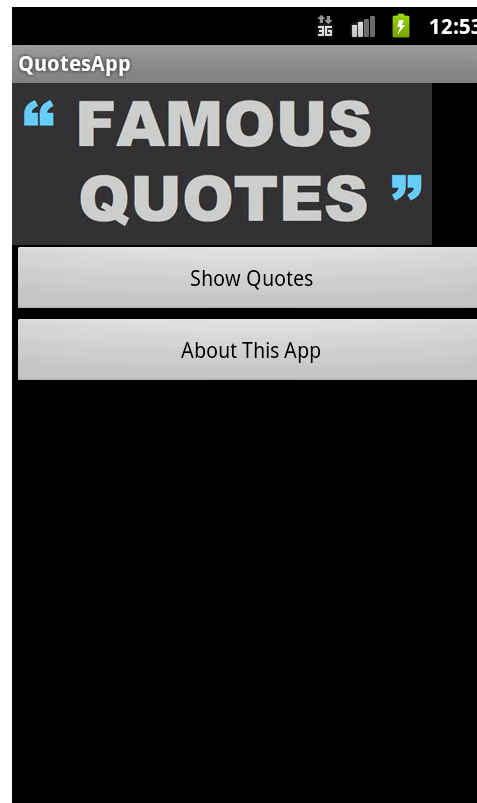
71

- Android Features to be used
 - ▣ Activities
 - ▣ Layouts for all activities
 - ▣ 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

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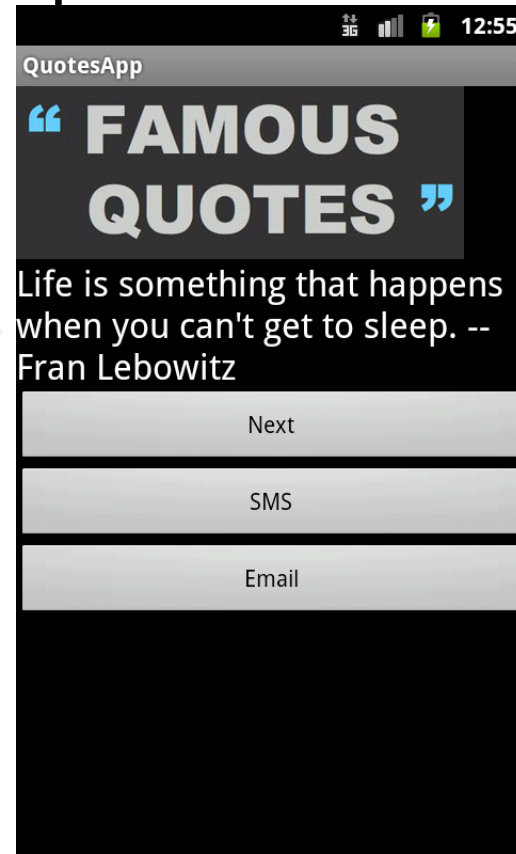
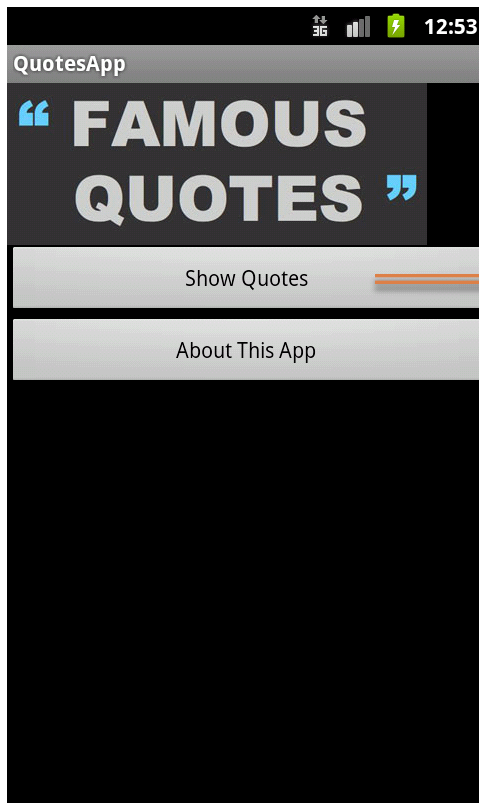
- QuoteActivity – Shows Main Menu



Quotes App in Action

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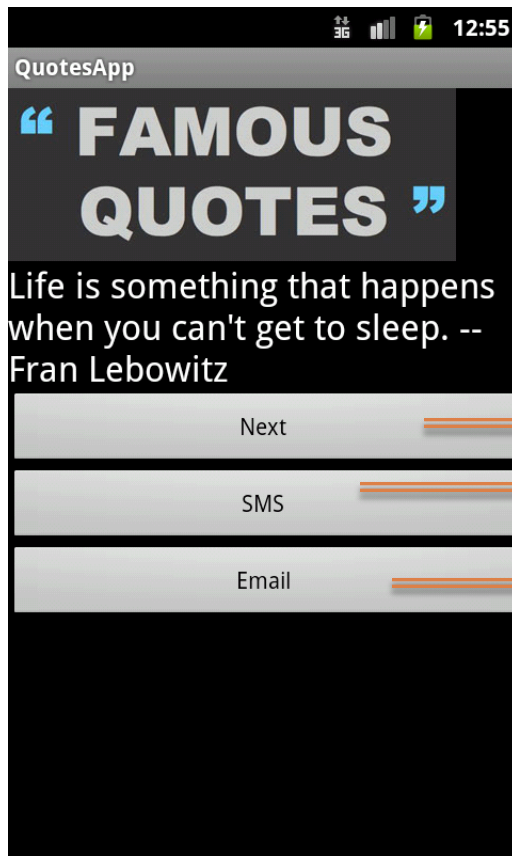
- Show Quotes retrieves a quote from Database



Quotes App in Action

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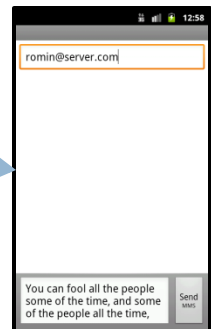
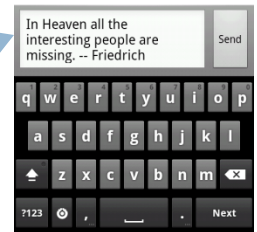
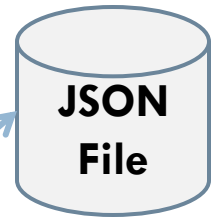
□ Show Quote Activity – Other Functions



Retrieves another random quote from database and displays it

Launches SMS App on phone to share this quote

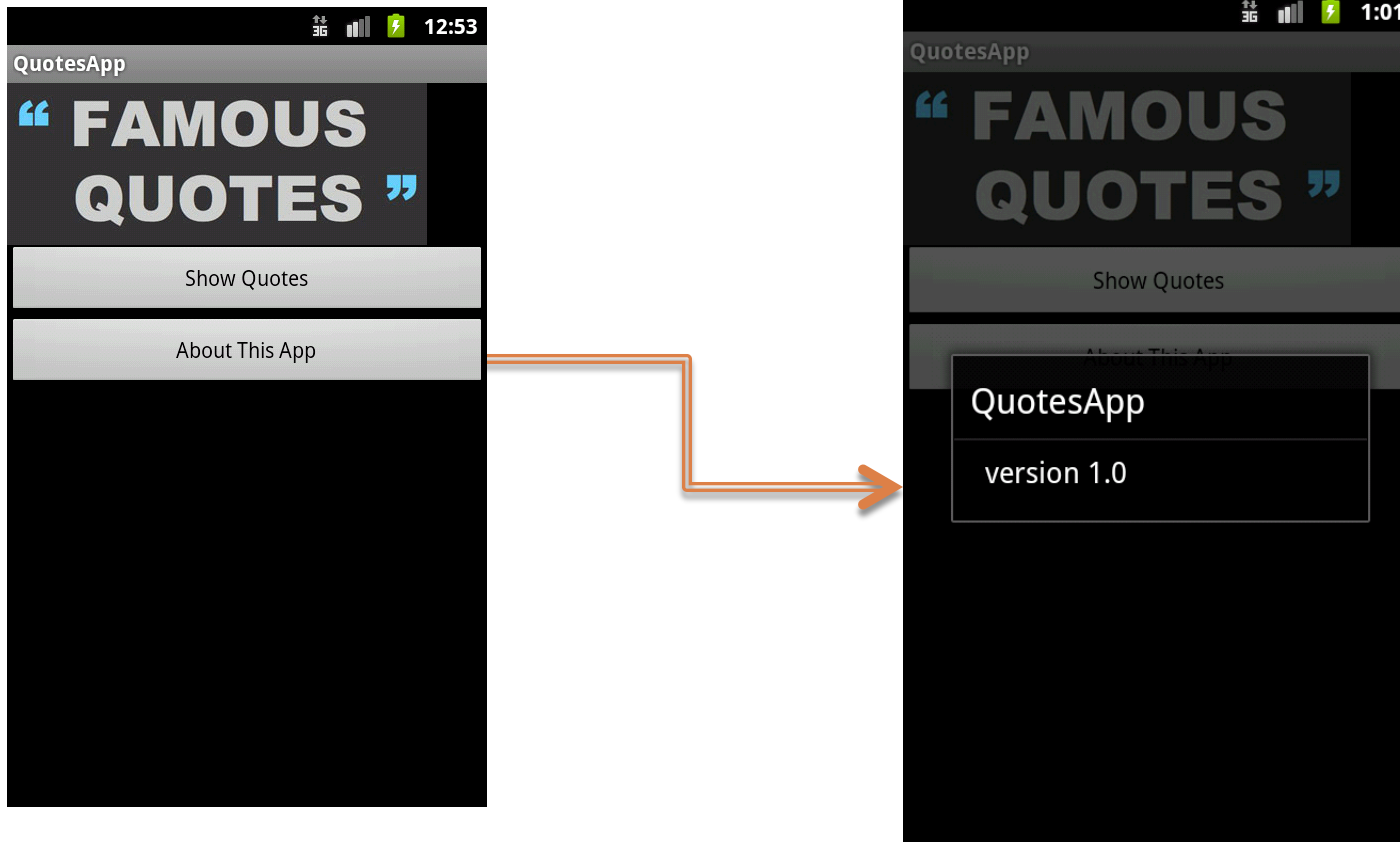
Launches Email App on phone to share this quote



Quotes App in Action

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□ About App – Displays a Dialog box



Quotes App – Step by Step

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- 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*

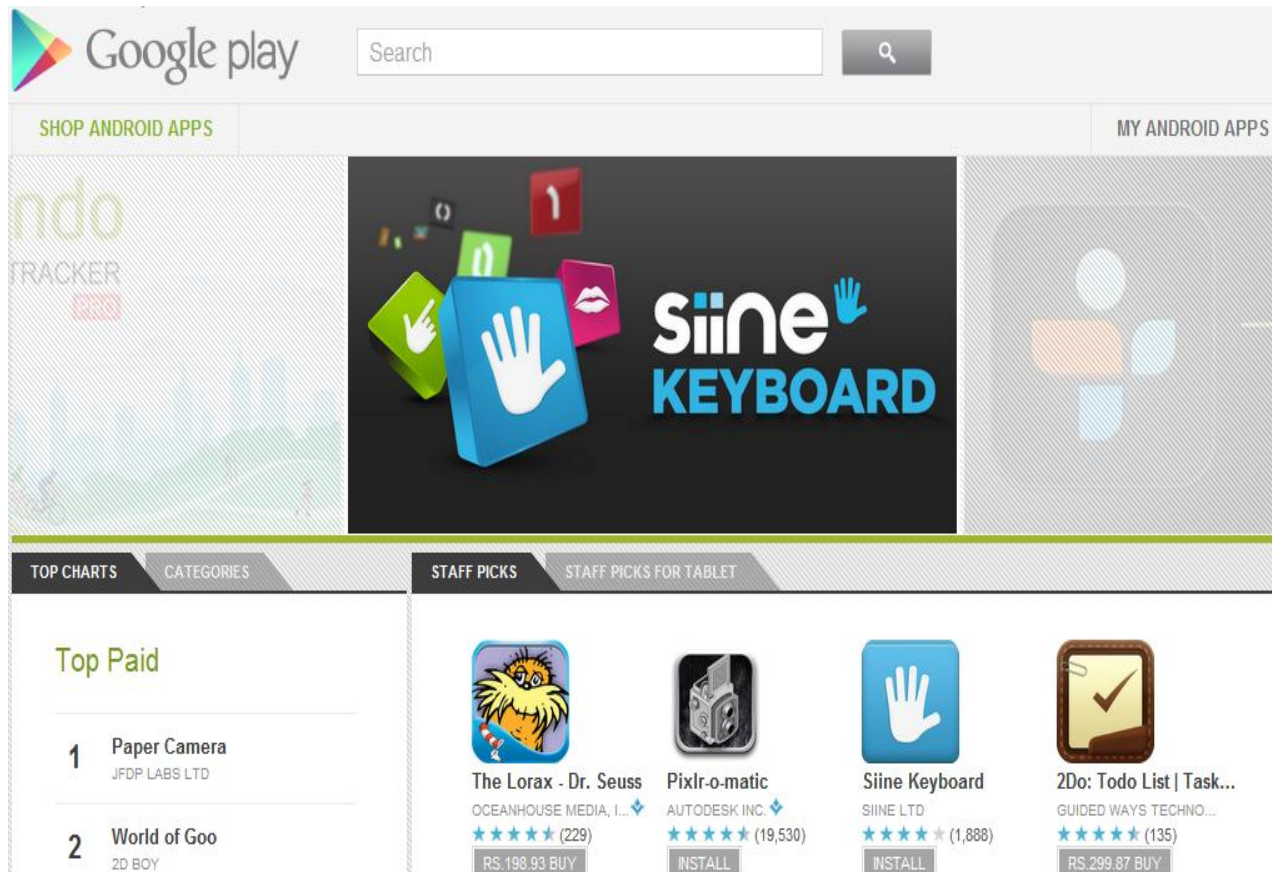
Android Marketplace



Android Marketplace (Google Play)

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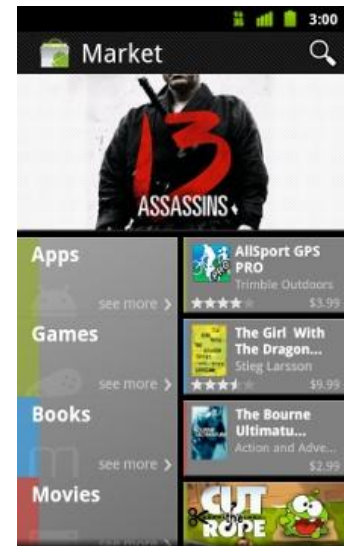
□ <http://play.google.com>



Android Marketplace

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- Web application + Android Application
- Single Marketplace for eBooks, Music, Movies and Android Applications
- Filters out the above categories if services are not available in particular country
- Publisher Account
 - ▣ Google Account
 - ▣ Free Apps and Paid Apps (30% commission)
 - ▣ Selling a Paid App currently not available for India
 - ▣ Download Free Apps
 - ▣ Download Paid Apps
 - ▣ \$25 Registration Fee
 - ▣ Application Approval - Immediate











Android Marketplace

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- For the Publisher – Login and visit <https://play.google.com/apps/publish/Home>

All Android Market listings

	Blood Donor Contact Manager 2.0 Applications: Social	(6)★★★★★ Comments	317 total installs 54 active installs (17 %) Statistics	Free	Errors	✓ Published Advertise this app
	Cows And Bulls 1.0 Games: Brain & Puzzle	(1)★★★★★ Comments	592 total installs 80 active installs (13 %) Statistics	Free	Errors	✓ Published Advertise this app
	Daily Channel 1.0 Applications: Entertainment	(1)★☆☆☆☆ Comments	54 total installs 8 active installs (14 %) Statistics	Free	Errors	✓ Published Advertise this app
	Game Score 1.0 Applications: Sports	(1)★★★★★ Comments	292 total installs 108 active installs (36 %) Statistics	Free	Errors	✓ Published Advertise this app
	Tambola Nite 3.0 Games: Casual	(3)★★★★☆ Comments	264 total installs 119 active installs (45 %) Statistics	Free	Errors	✓ Published Advertise this app
	Time Table Lite 2.0 Applications: Education	(0)☆☆☆☆☆ Comments	504 total installs 116 active installs (23 %) Statistics	Free	Errors	✓ Published Advertise this app
	Time Table Pro 1.0 Applications: Education	(9)★★★★★ Comments	2187 total installs 820 active installs (37 %) Statistics	Free	Errors	✓ Published Advertise this app

 Upload Application

Build the APK

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- APK = Android Application Package
- File Format to distribute and install software on Android OS
- Android Marketplace allows only signed APKs
- APK = Archive File
 - ▣ META-INF directory
 - ▣ res
 - ▣ AndroidManifest.xml
 - ▣ classes.dex
 - ▣ resources.arsc



- Upload the APK
- **Hands On Exercise : Build the APK : ex15.docx**
- Provide 2 screenshots
- Provide 1 High Resolution Image Icon (512 x 512)
- Title , Description, Recent Changes
- Application Type
- Category
- Contact Details



- Test Your Application
- Review your AndroidManifest.xml file
 - ▣ Permissions (<uses-permission>)
 - ▣ Icon and Label
 - ▣ Application Version
 - ▣ API Level : <uses-sdk>, minSDKVersion, targetSDKVersion
 - ▣ Other Filters : <supports-screens>, etc
 - ▣ <http://developer.android.com/guide/appendix/market-filters.html>
- Compile Your Application
- Export Signed Application (.APK)

Next Steps

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- ❑ Go back and absorb the material
- ❑ Look at the examples again
- ❑ Android Developer
<http://developer.android.com>
- ❑ Android Training
<http://developer.android.com/training>
- ❑ Get the Google Play Account...
- ❑ ... unleash your Apps
- ❑ All The Best !





THANK YOU!!!



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