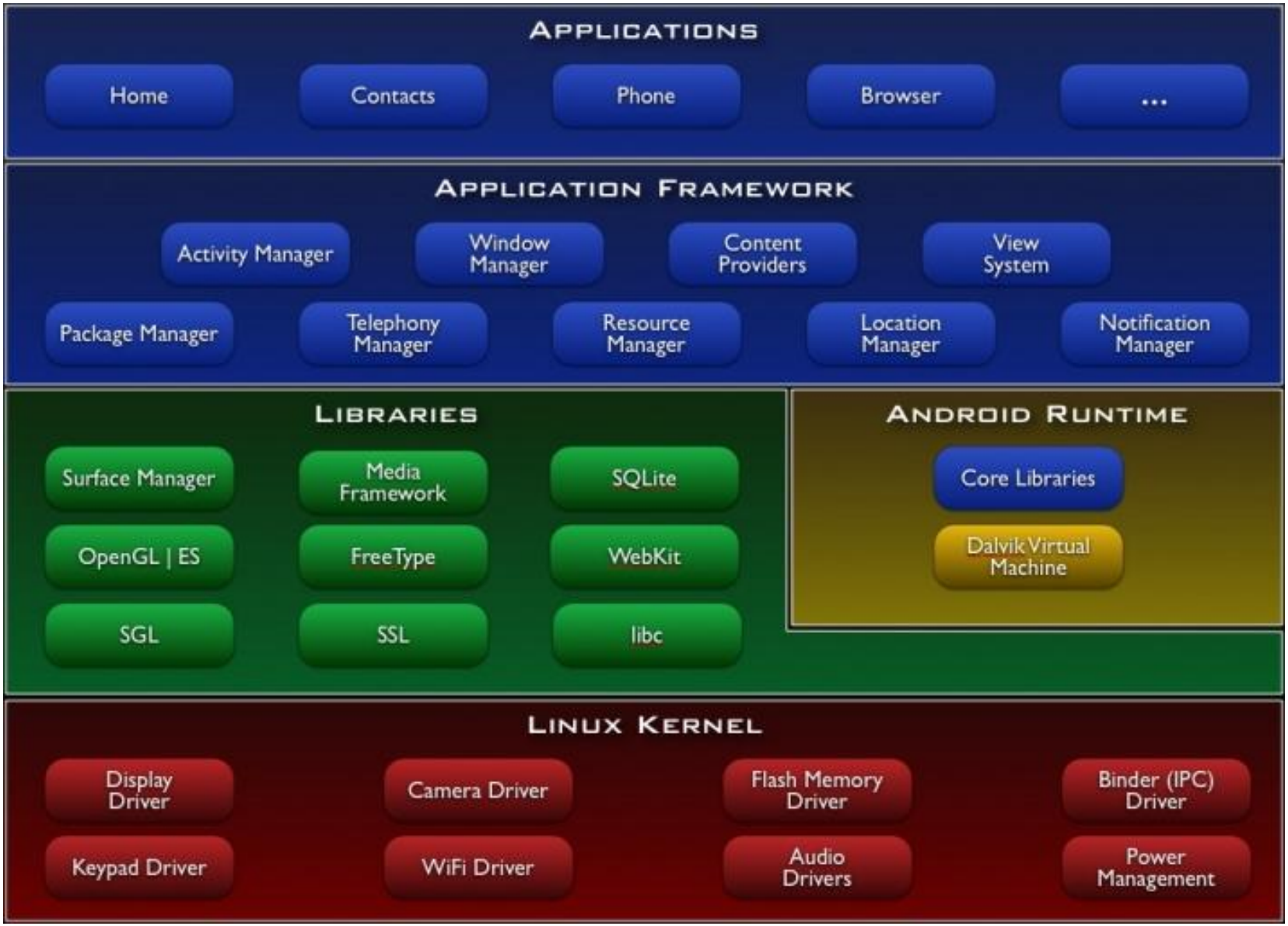
Introduction to Android Development Environment

ECOD - Aug 2015

What is Android?

- A software stack for mobile devices that includes
  - An operating system
  - Middleware
  - Key Applications
- Uses Linux to provide core system services
  - Security
  - Memory management
  - Process management
  - Power management
  - Hardware drivers



http://developer.android.com/guide/basics/what-is-android.html

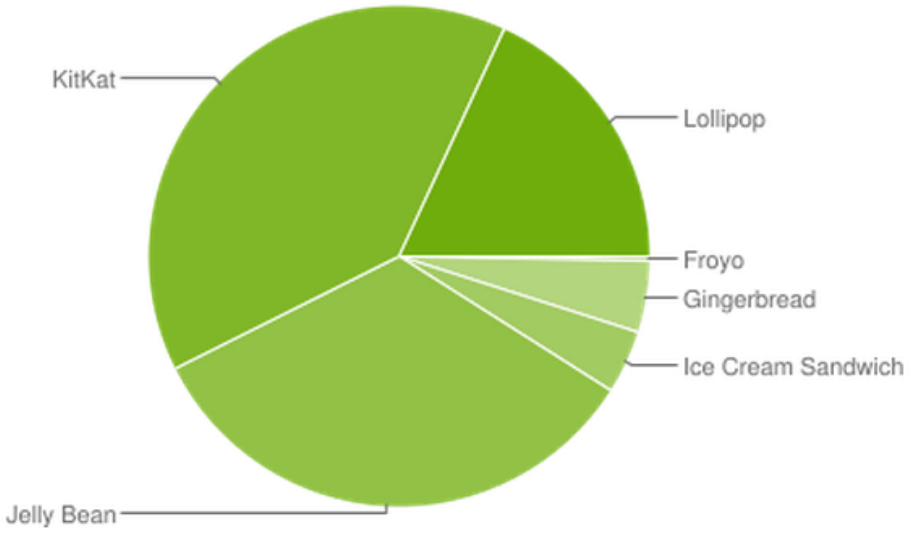
Android Features

- **Application framework** enabling reuse and replacement of components
- **Dalvik virtual machine** optimized for mobile devices
- **Integrated browser** based on the open source WebKit engine
- **Optimized graphics** powered by a custom 2D graphics library; 3D graphics based on the OpenGL ES 1.0 specification (hardware acceleration optional)
- **SQLite** for structured data storage
- **Media support** for common audio, video, and still image formats (MPEG4, H.264, MP3, AAC, AMR, JPG, PNG, GIF)
- **GSM Telephony** (hardware dependent)
- **Bluetooth, EDGE, 3G, and WiFi** (hardware dependent)
- **Camera, GPS, compass, and accelerometer** (hardware dependent)
- **Rich development environment** including a device emulator, tools for debugging, memory and performance profiling, and a plugin for the Eclipse IDE

http://developer.android.com/guide/basics/what-is-android.html

Android Distribution Aug 2015

Version	Codename	API	Distribution
2.2	Froyo	8	0.3%
2.3.3 - 2.3.7	Gingerbread	10	4.6%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	4.1%
4.1.x	Jelly Bean	16	13.0%
4.2.x		17	15.9%
4.3		18	4.7%
4.4	KitKat	19	39.3%
5.0	Lollipop	21	15.5%
5.1		22	2.6%



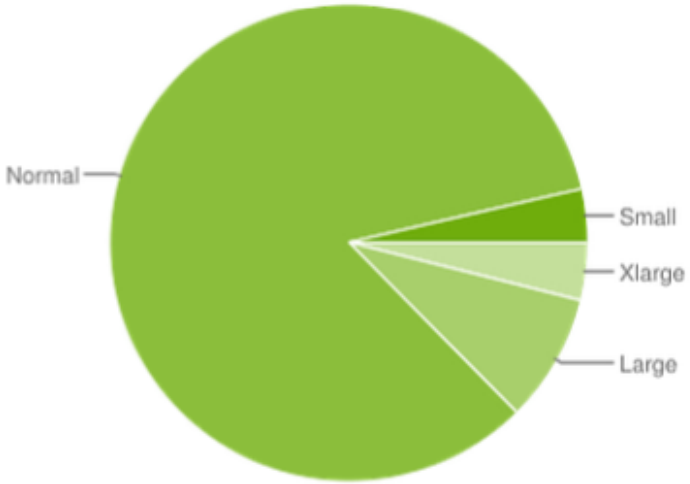
https://developer.android.com/about/dashboards/index.html

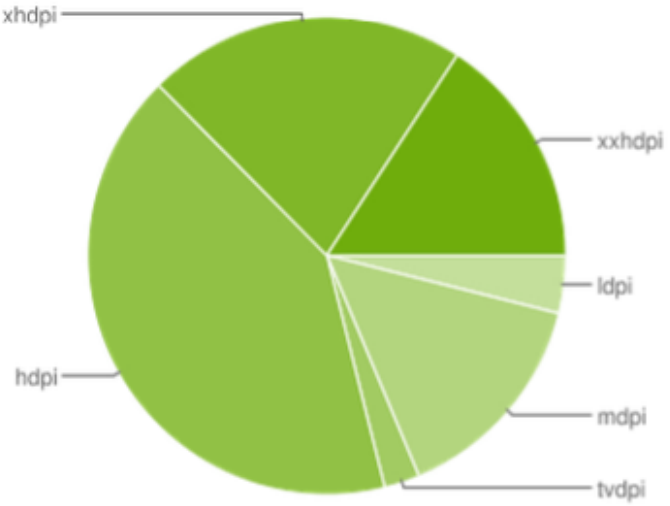
Data collected during a 7-day period ending on August 3, 2015.

Any versions with less than 0.1% distribution are not shown.

Screen Densities as of August 2015

	~120dpi	~160dpi	~240dpi	~320dpi	~480dpi	~640dpi	
	ldpi	mdpi	tvdpi	hdpi	xhdpi	xxhdpi	Total
Small	3.6%						3.6%
Normal		6.9%	0.1%	40.6%	20.4%	15.8%	83.8%
Large	0.3%	4.9%	2.3%	0.6%	0.6%		8.7%
Xlarge		3.0%		0.3%	0.6%		3.9%
Total	3.9%	14.8%	2.4%	41.5%	21.6%	15.8%	





Data collected during a 7-day period ending on August 3, 2015.

Any screen configurations with less than 0.1% distribution are not shown.

Android Runtime

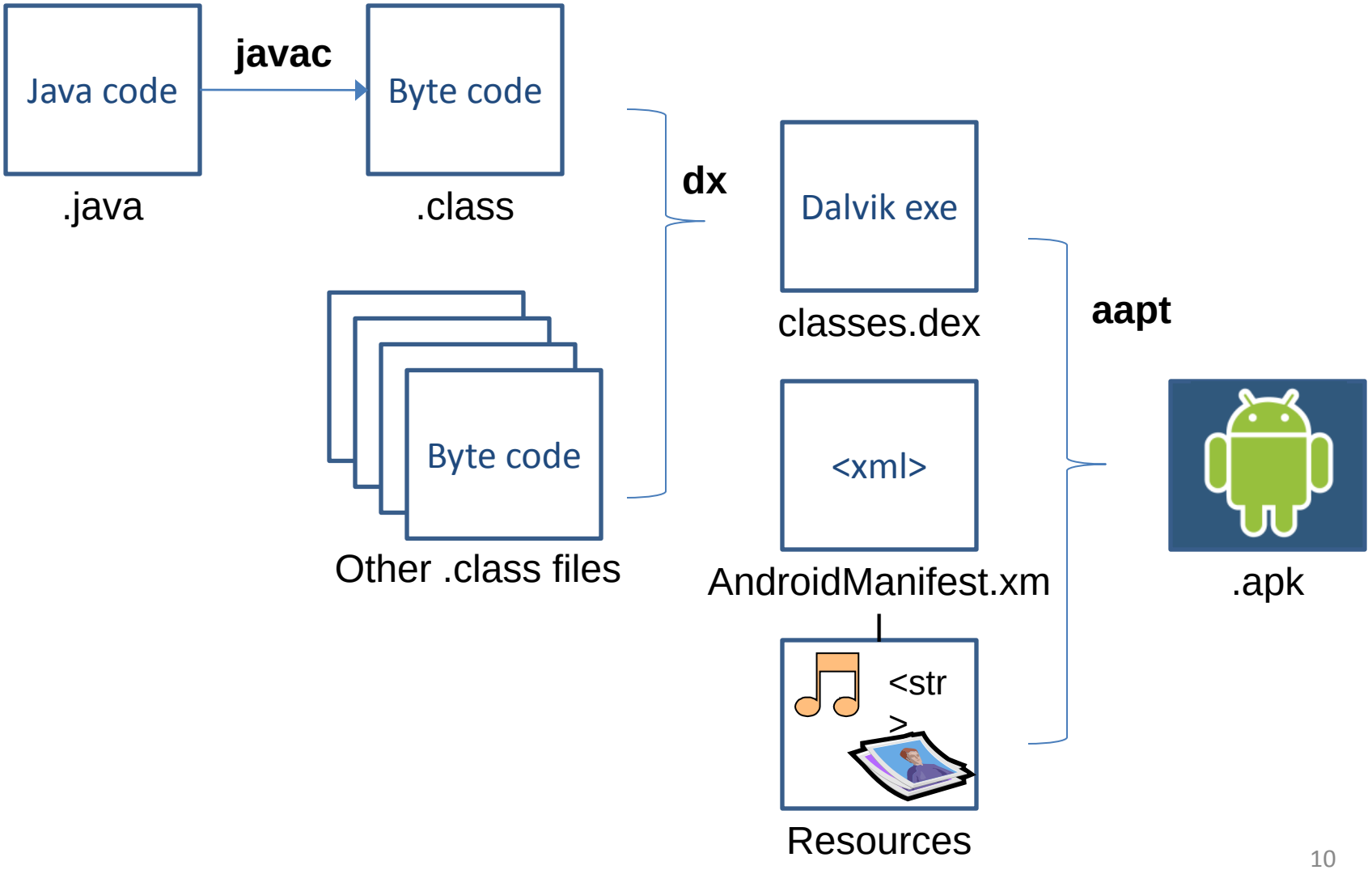
Android Runtime: Dalvik VM

- Subset of Java developed by Google
- Optimized for mobile devices (better memory management, battery utilization, etc.)
- Dalvik runs .dex files that are compiled from .class files
- Introduces new libraries
- Does not support some Java libraries like AWT, Swing
- http://developer.android.com/reference/packages.html

Applications Are Boxed

- By default, each app is run in its own Linux process
  - Process started when app's code needs to be executed
  - Threads can be started to handle time-consuming operations
- Each process has its own Dalvik VM
- By default, each app is assigned unique Linux ID
  - Permissions are set so app's files are only visible to that app

Producing an Android App



Emulator

Emulator Basics

- Host computer's keyboard works
- Host's mouse acts as finger
- Uses host's Internet connection
- Other buttons work: Home, Menu, Back, Search, volume up and down, etc.
- Ctrl-F11 toggle landscape → portrait
- Alt-Enter toggle full-screen mode
- More info at http://developer.android.com/guide/developing/devices/emulator.html

Emulator Limitations

- No support for placing or receiving actual phone calls
  - Simulate phone calls (placed and received) through the emulator console
- No support for USB connections
- No support for camera/video capture (input)
- No support for device-attached headphones
- No support for determining connected state
- No support for determining battery charge level and AC charging state
- No support for determining SD card insert/eject
- No support for Bluetooth
- No support for simulating the accelerometer
  - Use OpenIntents's Sensor Simulator

Android Emulator or AVD

- Emulator is essential to testing app but is not a substitute for a real device
- Emulators are **Android Virtual Devices** (AVDs)
- Android SDK and AVD Manager allows you to create AVDs that target any Android API level
- AVD have configurable resolutions, RAM, SD cards, skins, and other hardware

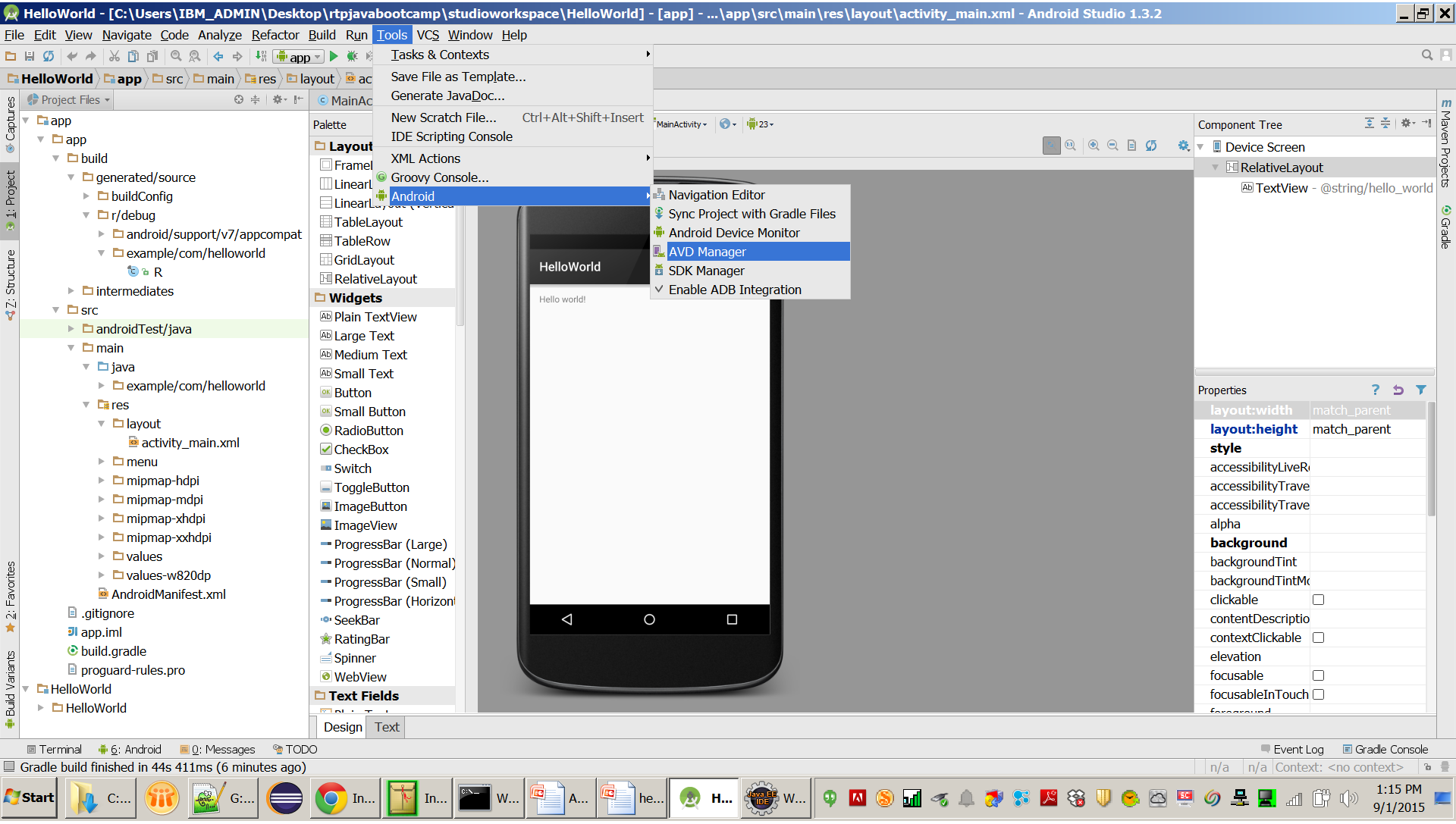
Live Lab

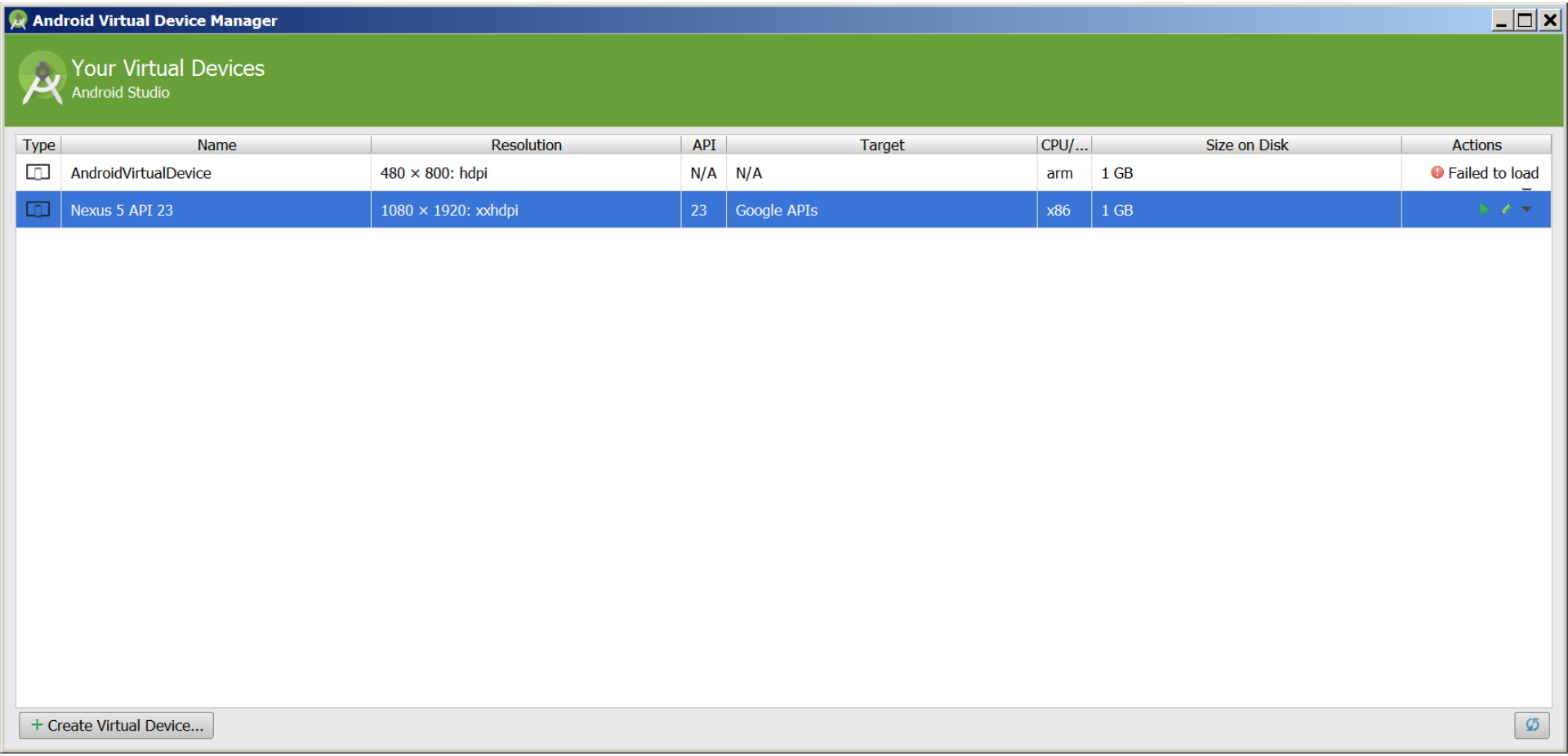
Creating Hello World App

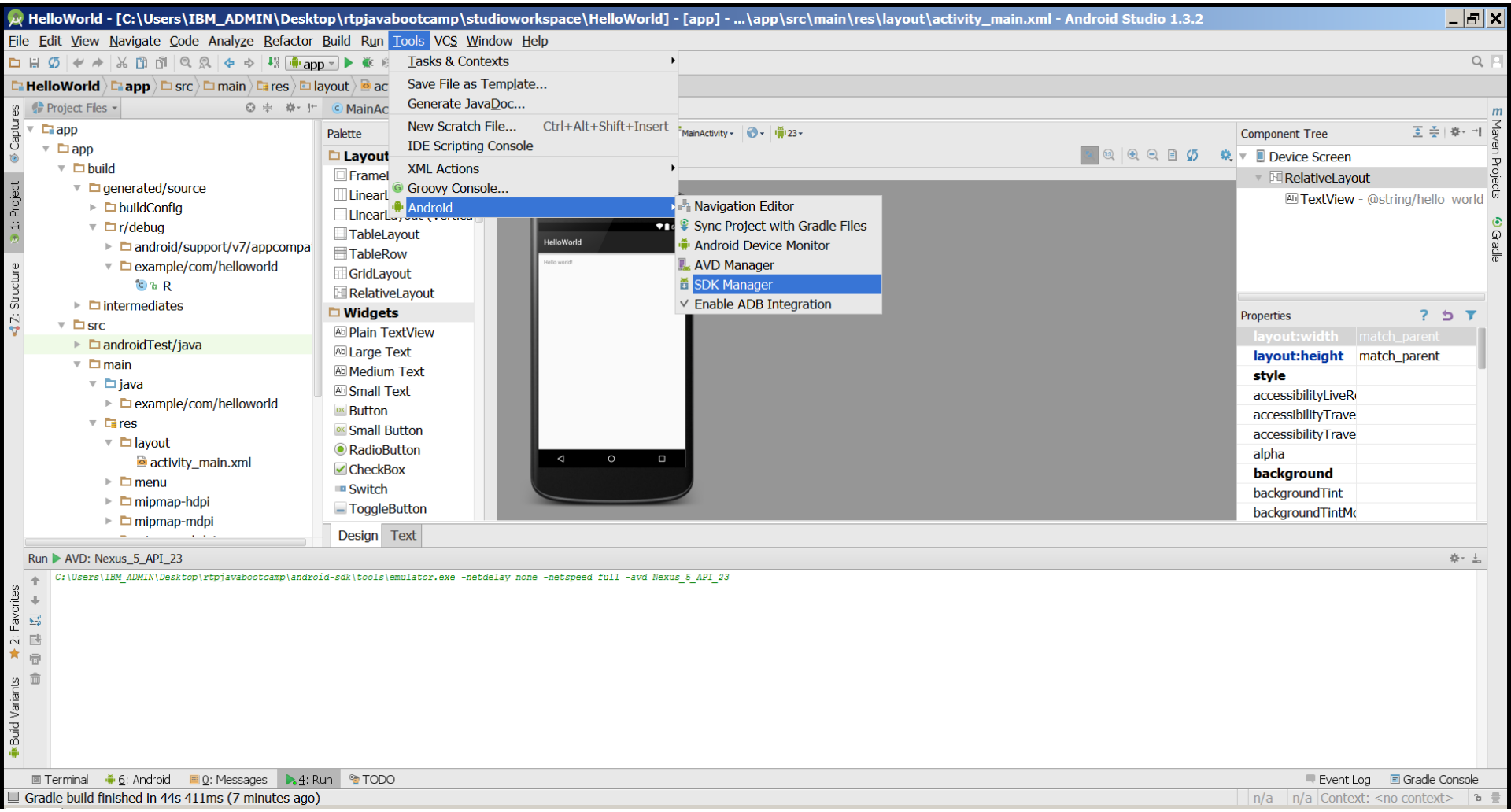
1. Create an Activity
2. Demonstrate resources created
3. show the Activity lifecycle within the Android OS
4. show the various debugging tools available
5. show how to start one Activity from another

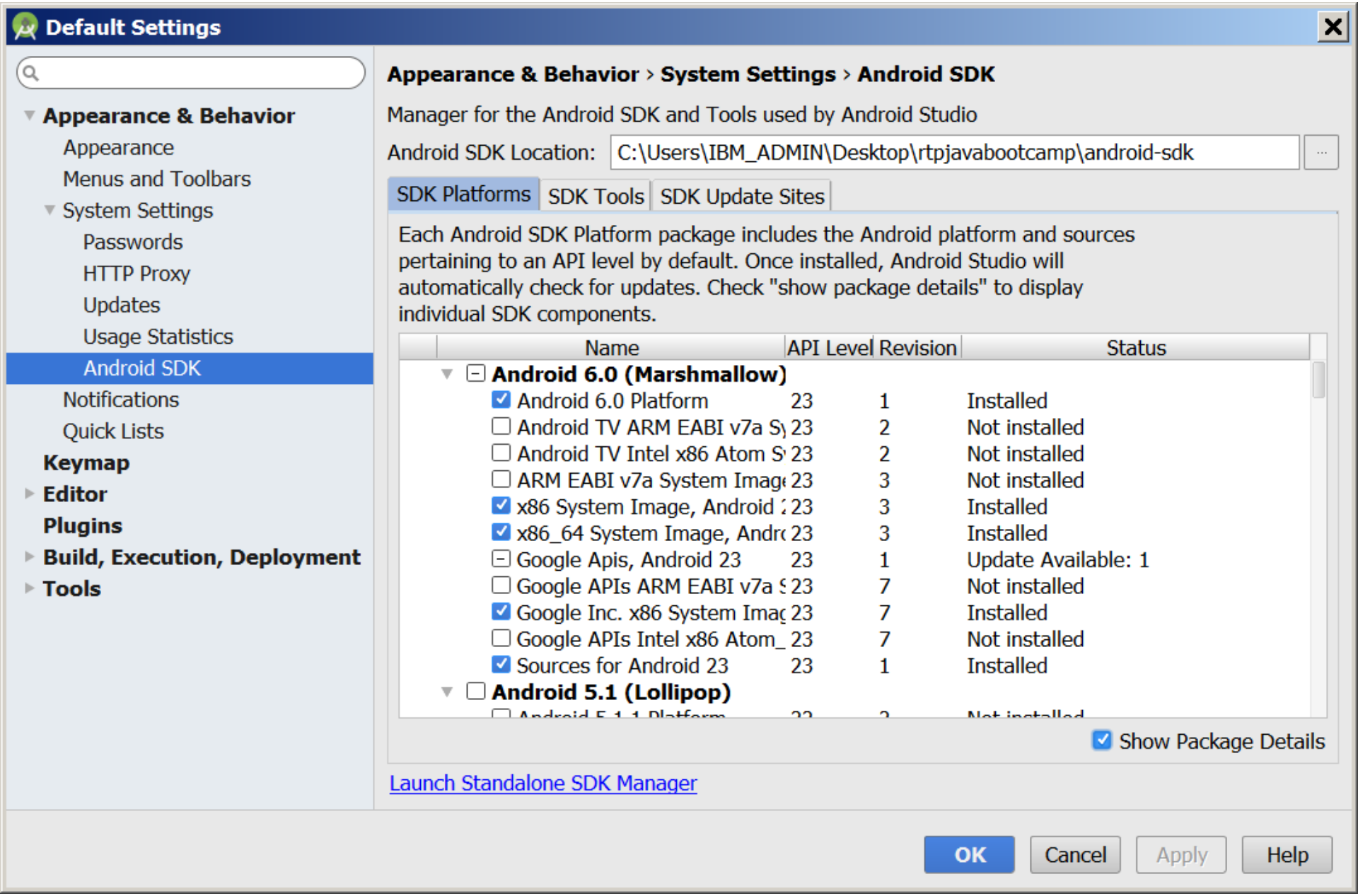
Pre-Req for Mobile Lab

Ensure the AVD and DSK are confugired well


HelloWorld - [C:\Users\IBM_ADMIN\Desktop\rtpjavabootcamp\studioworkspace\HelloWorld] - [app] - ...\app\src\main\res\layout\activity_main.xml - Android Studio 1.3.2
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Tasks & Contexts
Save File as Template...
Generate JavaDoc...
New Scratch File... Ctrl+Alt+Shift+Insert
IDE Scripting Console
XML Actions
Groovy Console...
Android
Navigation Editor
Sync Project with Gradle Files
Android Device Monitor
AVD Manager
SDK Manager
Enable ADB Integration
HelloWorld
Hello world!
Component Tree
Device Screen
RelativeLayout
TextView - @string/hello_world
Properties
Design
Text
Terminal
6: Android
0: Messages
TODO
Event Log
Gradle Console
Gradle build finished in 44s 411ms (6 minutes ago)


Android Virtual Device Manager
Your Virtual Devices
Android Studio
Type
Name
Resolution
API
Target
CPU/...
Size on Disk
Actions
AndroidVirtualDevice
480 × 800: hdpi
N/A
N/A
arm
1 GB
Failed to load
Nexus 5 API 23
1080 × 1920: xxhdpi
23
Google APIs
x86
1 GB
+ Create Virtual Device...


HelloWorld - [C:\Users\IBM_ADMIN\Desktop\rtpjavabootcamp\studioworkspace\HelloWorld] - [app] - ...\app\src\main\res\layout\activity_main.xml - Android Studio 1.3.2
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Tasks & Contexts
Save File as Template...
Generate JavaDoc...
New Scratch File... Ctrl+Alt+Shift+Insert
IDE Scripting Console
XML Actions
Groovy Console...
Android
Navigation Editor
Sync Project with Gradle Files
Android Device Monitor
AVD Manager
SDK Manager
Enable ADB Integration
Project Files
Palette
Component Tree
Device Screen
RelativeLayout
TextView - @string/hello_world
Properties
layout:width match_parent
layout:height match_parent
style
background
backgroundTint
alpha
Design Text
Run AVD: Nexus_5_API_23
C:\Users\IBM_ADMIN\Desktop\rtpjavabootcamp\android-sdk\tools\emulator.exe -netdelay none -netspeed full -avd Nexus_5_API_23
Terminal 6: Android 0: Messages 4: Run TODO Event Log Gradle Console
Gradle build finished in 44s 411ms (7 minutes ago)

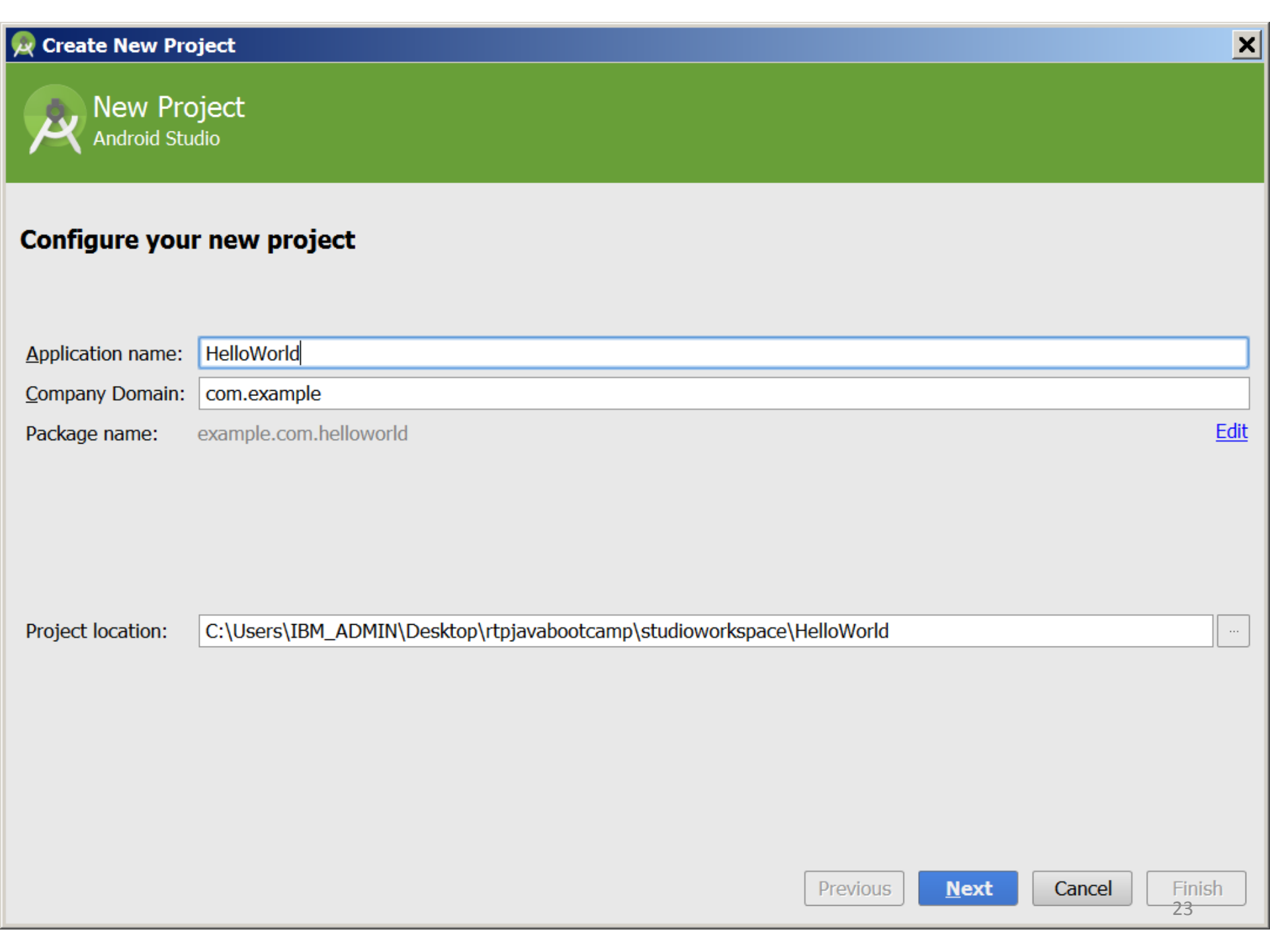

Default Settings
Appearance & Behavior
Appearance
Menus and Toolbars
System Settings
Passwords
HTTP Proxy
Updates
Usage Statistics
Android SDK
Notifications
Quick Lists
Keymap
Editor
Plugins
Build, Execution, Deployment
Tools
Appearance & Behavior › System Settings › Android SDK
Manager for the Android SDK and Tools used by Android Studio
Android SDK Location:
C:\Users\IBM_ADMIN\Desktop\rtpjavabootcamp\android-sdk
SDK Platforms
SDK Tools
SDK Update Sites
Each Android SDK Platform package includes the Android platform and sources pertaining to an API level by default. Once installed, Android Studio will automatically check for updates. Check "show package details" to display individual SDK components.
Name
API Level
Revision
Status
Android 6.0 (Marshmallow)
Android 6.0 Platform 23 1 Installed
Android TV ARM EABI v7a S 23 2 Not installed
Android TV Intel x86 Atom S 23 2 Not installed
ARM EABI v7a System Imag 23 3 Not installed
x86 System Image, Android 23 3 Installed
x86_64 System Image, Andr 23 3 Installed
Google Apis, Android 23 23 1 Update Available: 1
Google APIs ARM EABI v7a 23 7 Not installed
Google Inc. x86 System Ima 23 7 Installed
Google APIs Intel x86 Atom_ 23 7 Not installed
Sources for Android 23 23 1 Installed
Android 5.1 (Lollipop)
Show Package Details
Launch Standalone SDK Manager
OK
Cancel
Apply
Help

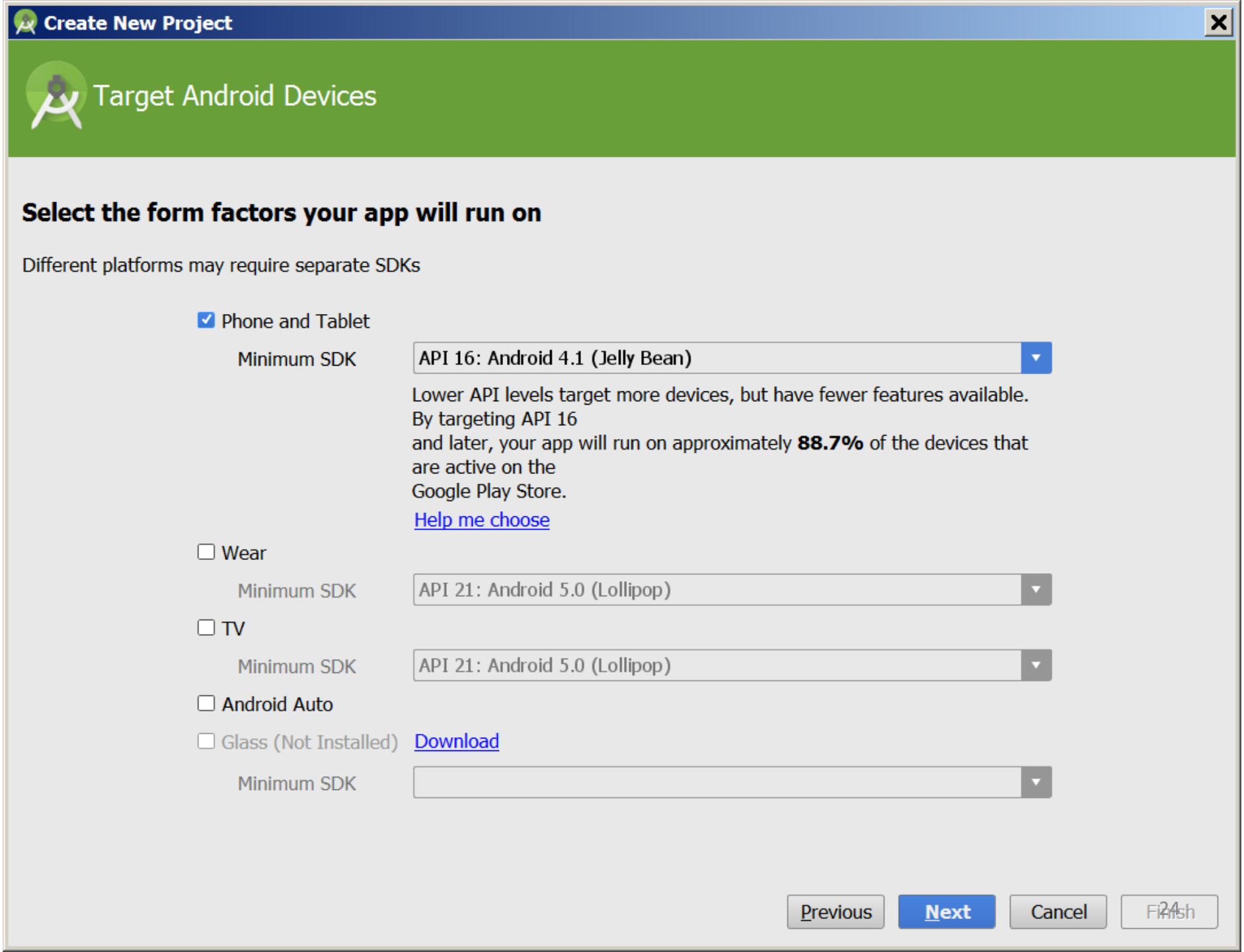
Mobile Labs

1-7

Lab 1

Getting Hello World App Running

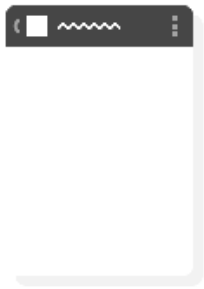

Create New Project
New Project
Android Studio
Configure your new project
Application name:
HelloWorld
Company Domain:
com.example
Package name:
example.com.helloworld
Edit
Project location:
C:\Users\IBM_ADMIN\Desktop\rtpjavabootcamp\studioworkspace\HelloWorld
Previous
Next
Cancel
Finish


Create New Project
Target Android Devices
Select the form factors your app will run on
Different platforms may require separate SDKs
Phone and Tablet
Minimum SDK
API 16: Android 4.1 (Jelly Bean)
Lower API levels target more devices, but have fewer features available.
By targeting API 16
and later, your app will run on approximately 88.7% of the devices that are active on the
Google Play Store.
Help me choose
Wear
Minimum SDK
API 21: Android 5.0 (Lollipop)
TV
Minimum SDK
API 21: Android 5.0 (Lollipop)
Android Auto
Glass (Not Installed)
Download
Minimum SDK
Previous
Next
Cancel
Finish

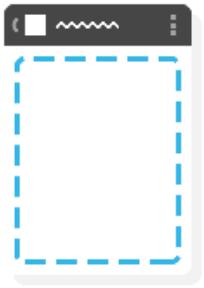
Create New Project

Add an activity to Mobile

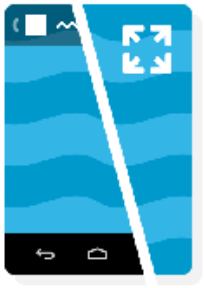
Add No Activity



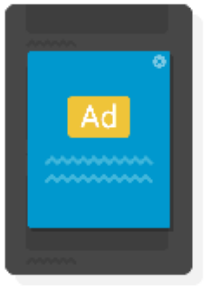
Blank Activity



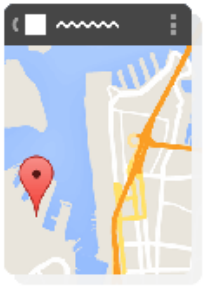
Blank Activity with Fragment



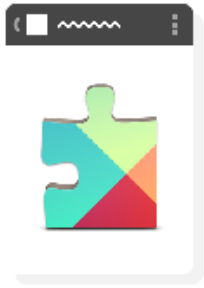
Fullscreen Activity



Google AdMob Ads Activity



Google Maps Activity

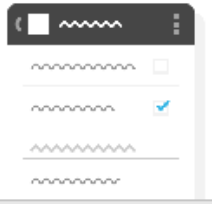


Google Play Services Activity

Login Activity

Master/Detail Flow

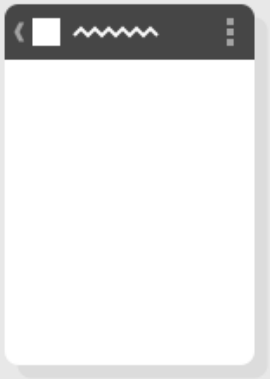
Navigation Drawer Activity



Previous | Next | Cancel | Finish

Create New Project

Customize the Activity



Blank Activity

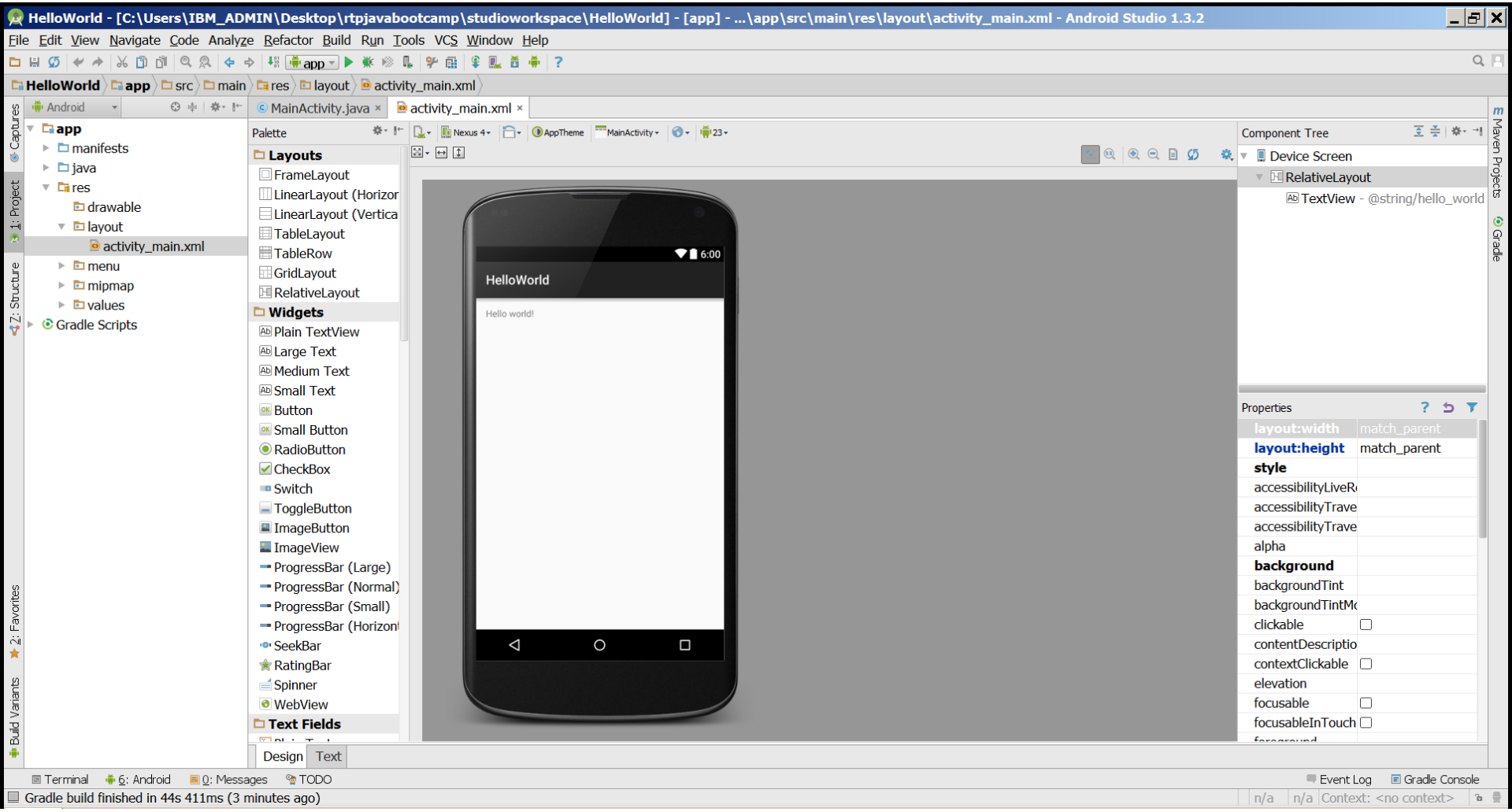
Creates a new blank activity with an action bar.

Activity Name:	MainActivity
Layout Name:	activity_main
Title:	MainActivity
Menu Resource Name:	menu_main

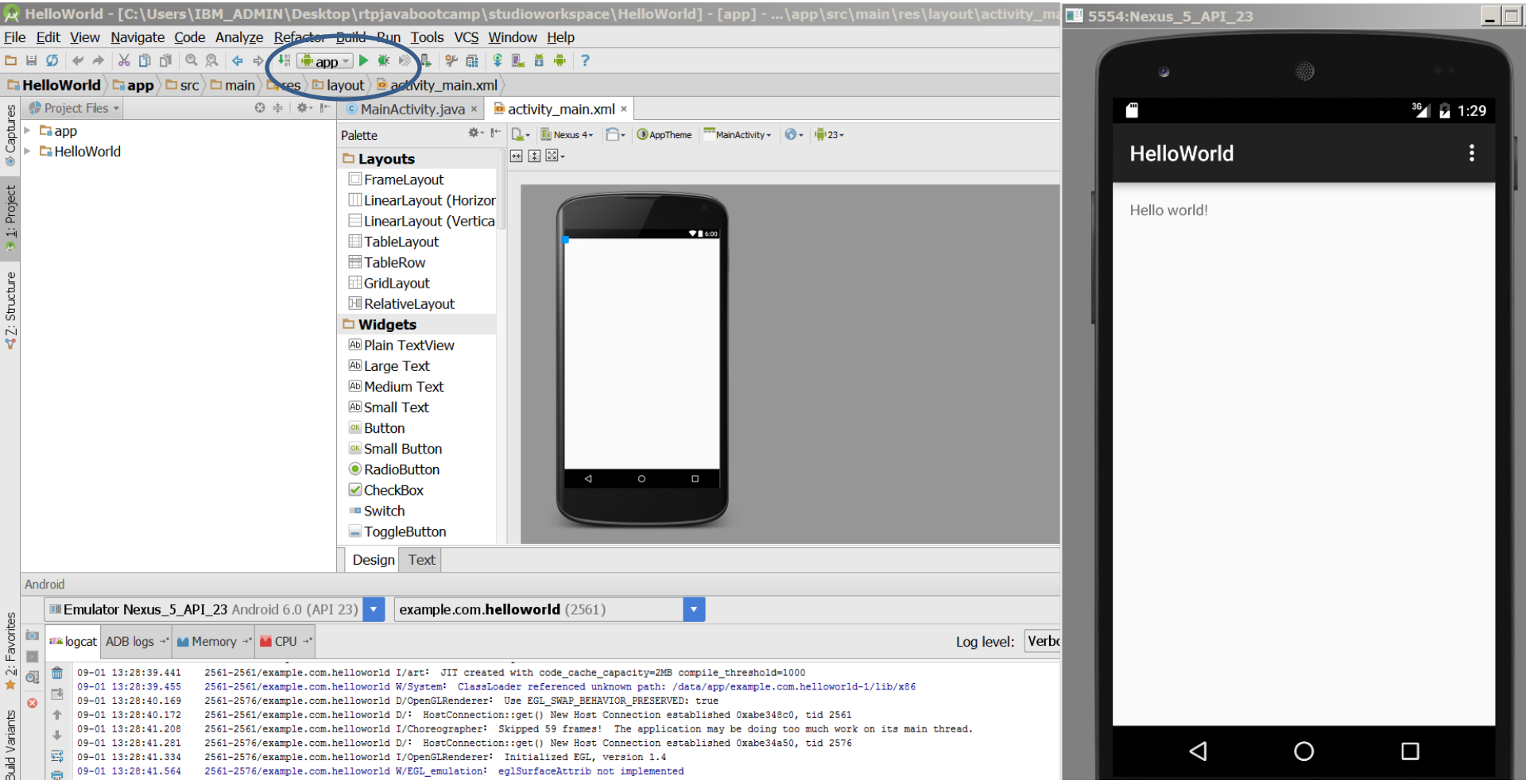
The name of the activity class to create

Previous | Next | Cancel | Finish

Ready to Launch !



Hurray !


HelloWorld - [C:\Users\IBM_ADMIN\Desktop\rtpjavabootcamp\studioworkspace\HelloWorld] - [app] - ...\app\src\main\res\layout\activity_main.xml
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
app
HelloWorld app src main res layout activity_main.xml
Project Files
app
HelloWorld
MainActivity.java
activity_main.xml
Palette
Layouts
FrameLayout
LinearLayout (Horizor
LinearLayout (Vertica
TableLayout
TableRow
GridLayout
RelativeLayout
Widgets
Plain TextView
Large Text
Medium Text
Small Text
Button
Small Button
RadioButton
CheckBox
Switch
ToggleButton
Design
Text
Android
Emulator Nexus_5_API_23 Android 6.0 (API 23)
example.com.helloworld (2561)
logcat
ADB logs
Memory
CPU
Log level:
09-01 13:28:39.441 2561-2561/example.com.helloworld I/art: JIT created with code_cache_capacity=2MB compile_threshold=1000
09-01 13:28:39.455 2561-2561/example.com.helloworld W/System: ClassLoader referenced unknown path: /data/app/example.com.helloworld-1/lib/x86
09-01 13:28:40.169 2561-2576/example.com.helloworld D/OpenGLRenderer: Use EGL_SWAP_BEHAVIOR_PRESERVED: true
09-01 13:28:40.172 2561-2561/example.com.helloworld D/: HostConnection::get() New Host Connection established 0xabe348c0, tid 2561
09-01 13:28:41.208 2561-2561/example.com.helloworld I/Choreographer: Skipped 59 frames! The application may be doing too much work on its main thread.
09-01 13:28:41.281 2561-2576/example.com.helloworld D/: HostConnection::get() New Host Connection established 0xabe34a50, tid 2576
09-01 13:28:41.334 2561-2576/example.com.helloworld I/OpenGLRenderer: Initialized EGL, version 1.4
09-01 13:28:41.564 2561-2576/example.com.helloworld W/EGL_emulation: eglSurfaceAttrib not implemented
5554:Nexus_5_API_23
1:29
HelloWorld
Hello world!

Lab 2

Add some Code to onCreate method

Application Components List

five primary components - different purposes

1. Activity
   - single screen with a user interface, app may have several activities, subclass of Activity
   - Most of early examples will be activities

2. Intents
   - used to pass information between applications

3. Service
   - Application component that performs long-running operations in background with no UI
   - example, an application that automatically responds to texts when driving

Application Components List..contd

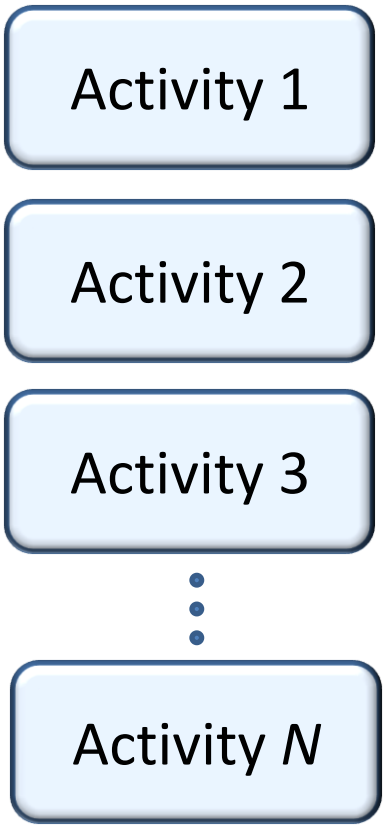
4. Content Providers
   - a bridge between applications to share data
   - for example the devices contacts information
   - we tend to use these, but not create new ones

5. Broadcast Receivers
   - component that responds to system wide announcements
   - battery low, screen off, date changed
   - also possible to initiate broadcasts from within an application

Understanding Activity Stack

Activity Stack

Most recently created is at Top

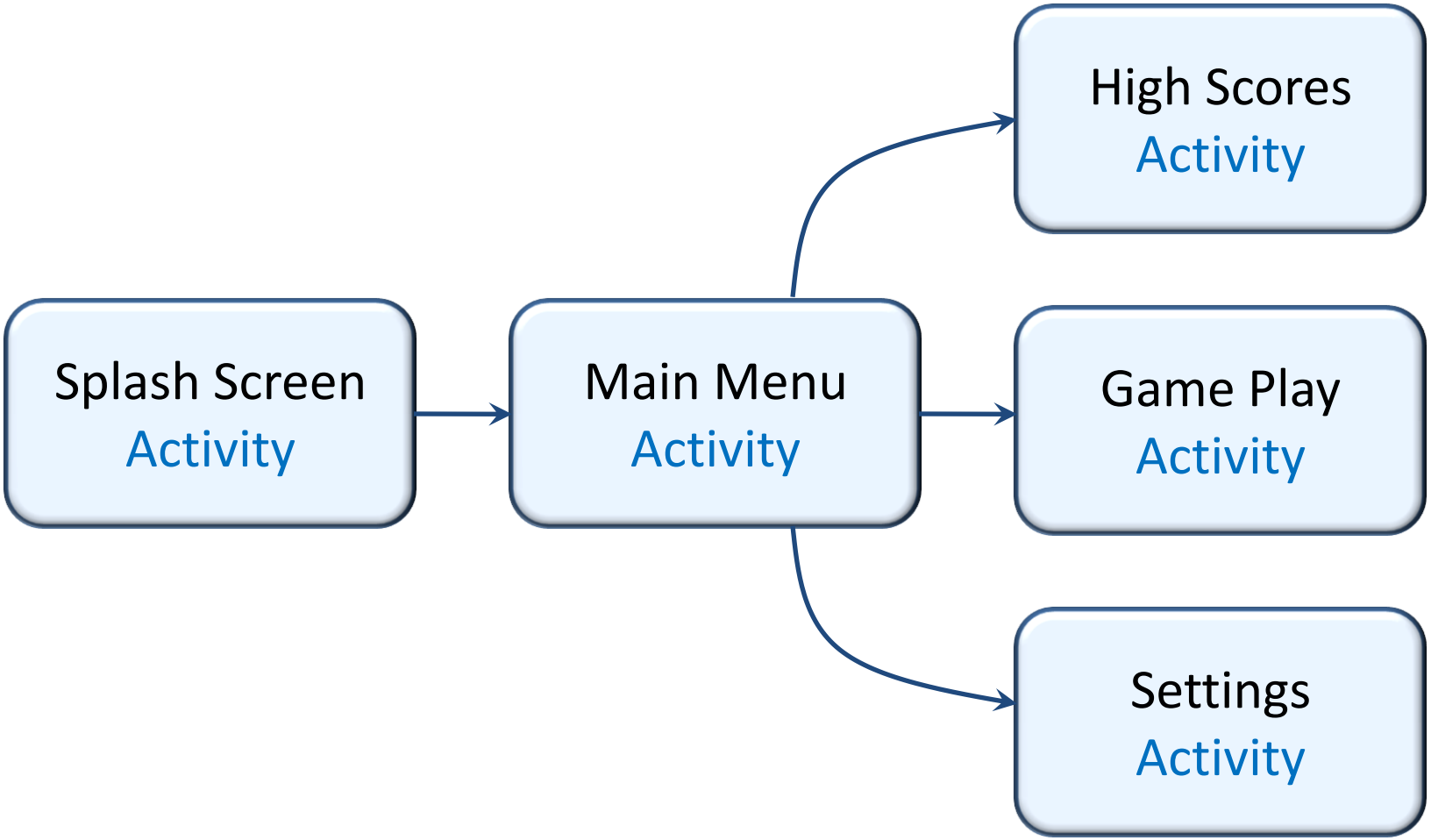


User currently interacting with me

Pressing Back or destroying A1 will bring me to the top

If Activities above me use too many resources, I'll be destroyed!

Typical Game



Conder & Darcey (2010), Fig 4.1, p. 74

Understanding the Essence of Lifecycle

Necessary to overload callback methods so you app behaves well:

1. App should not crash if the user receives a phone call or switches to another app while using your app.
2. App should not consume valuable system resources when the user is not actively using it.
3. App should not lose the user's progress if they leave your app and return to it at a later time.
4. App should not crash or lose the user's progress when the screen rotates between landscape and portrait orientation.

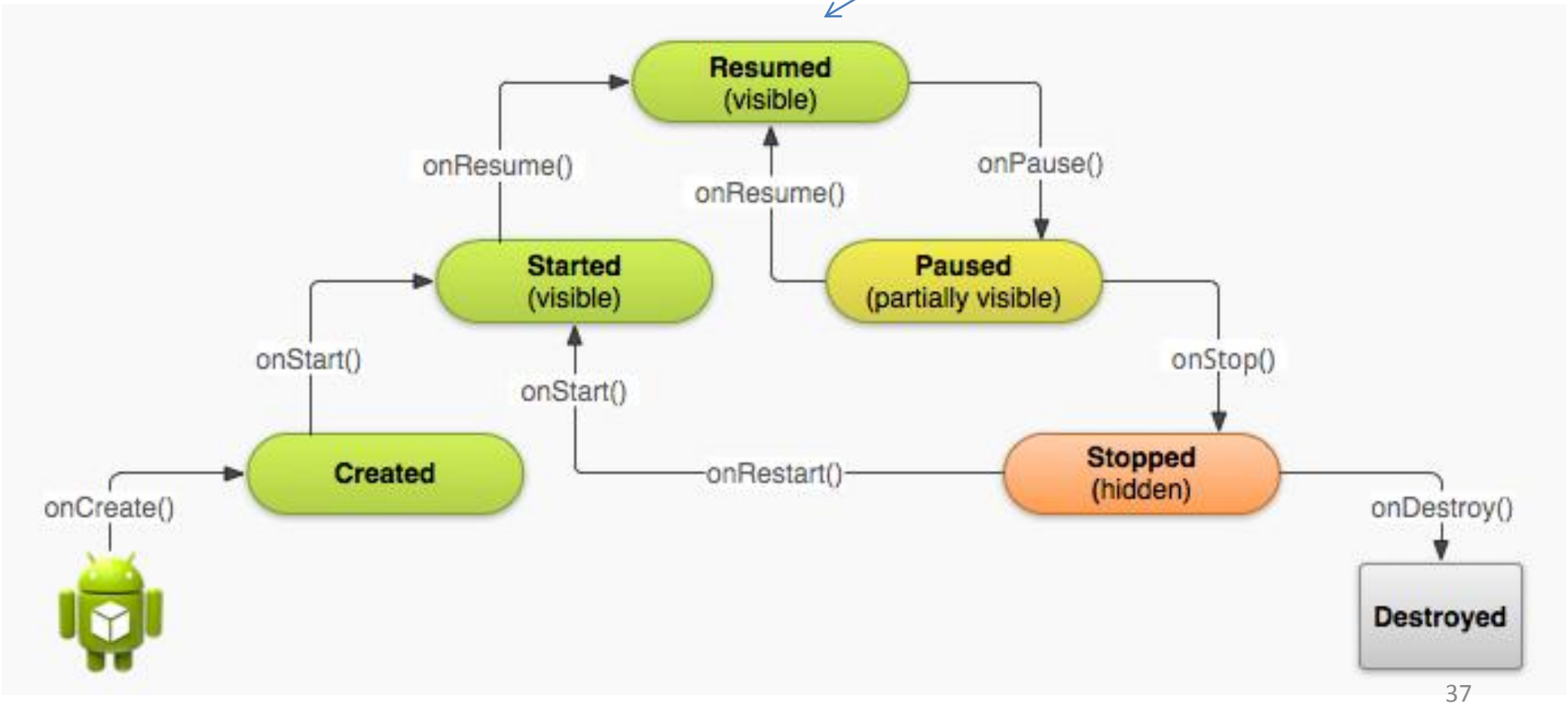
http://developer.android.com/training/basics/activity-lifecycle/starting.html

Starting Activities

- Android applications don't start with a call to main(String[])
- instead a series of callback methods are invoked
- each corresponds to specific stage of the Activity / application lifecycle
- callback methods also used to tear down Activity / application

Simplified Lifecycle Diagram

ready to interac
with user



Primary States

- Active
  - activity is in the foreground and user can interact with it
- Paused
  - activity partially obscured by another activity and user cannot interact with it (for example when working with a menu or dialog)
- Stopped
  - activity completely hidden and not visible to user. It is in the background.
  - Activity instance and variables are retained but no code is being executed by the activity
- Dead, activity terminated (or never started)
- Two other states, Created and Started, but they are transitory onCreate -> onStart -> onResume

Change MainActivity.java to this

MainActivity.java × | activity_main.xml ×

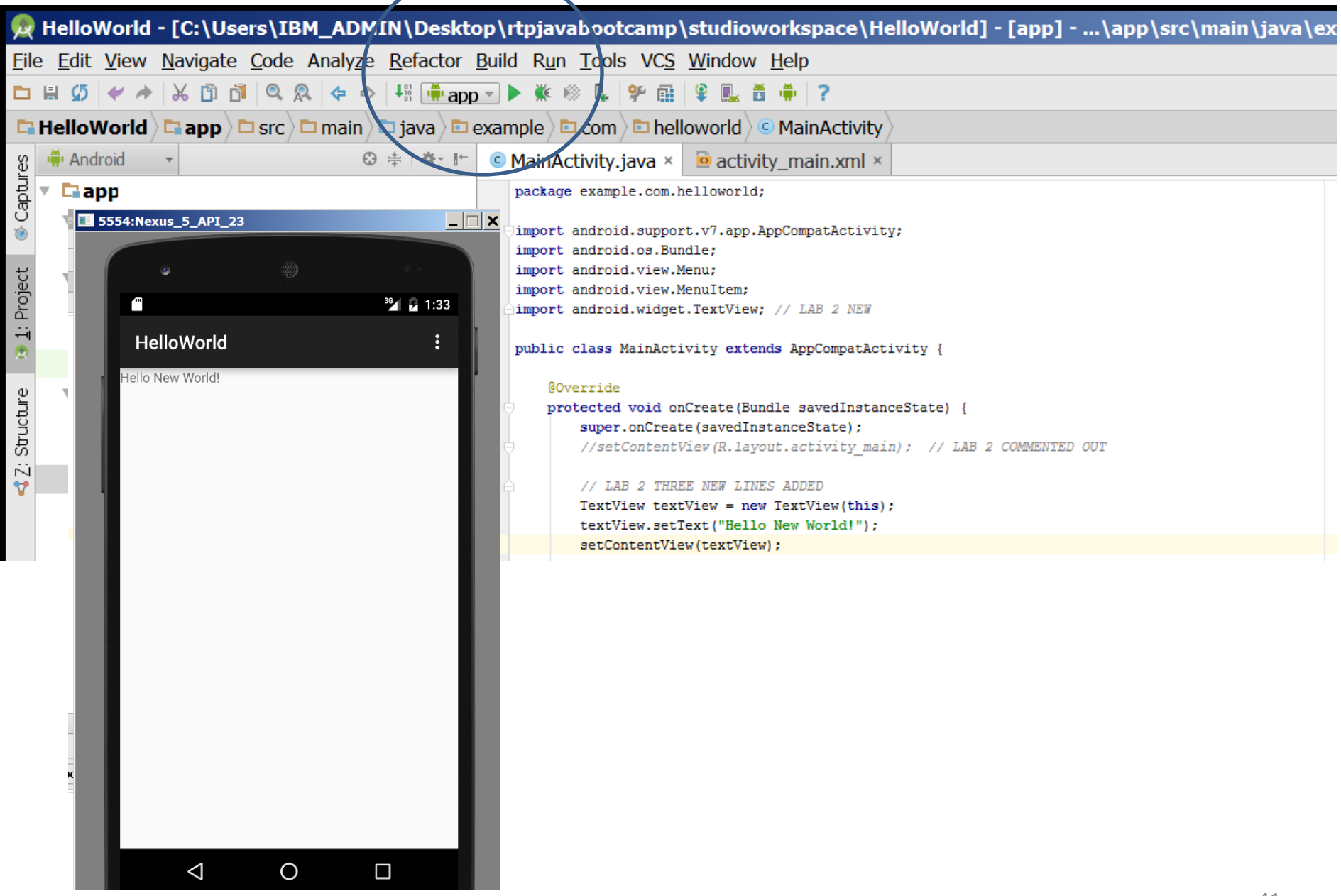
```
package example.com.helloworld;

import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.view.Menu;
import android.view.MenuItem;
import android.widget.TextView; // LAB 2 NEW

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        //setContentView(R.layout.activity_main);  // LAB 2 COMMENTED OUT

        // LAB 2 THREE NEW LINES ADDED
        TextView textView = new TextView(this);
        textView.setText("Hello New World!");
        setContentView(textView);

    }
```

Lab 2 Changes to Lab 1 Code

- Add
  import android.widget.TextView;

- In the OnCreate Method
  1. Comment out THIS LINE
     // setContentView(R.layout.activity_main);

  2. Add the lines
  - TextView textView = new TextView(this);
  - textView.setText("Hello New World!");
  - setContentView(textView);


HelloWorld - [C:\Users\IBM_ADMIN\Desktop\rtpjavabootcamp\studioworkspace\HelloWorld] - [app] - ...\app\src\main\java\ex
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
app
HelloWorld app src main java example com helloworld MainActivity
Android
MainActivity.java
activity_main.xml
app
1: Project
Z: Structure
Captures
5554:Nexus_5_API_23
1:33
HelloWorld
Hello New World!
package example.com.helloworld;
import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.view.Menu;
import android.view.MenuItem;
import android.widget.TextView; // LAB 2 NEW
public class MainActivity extends AppCompatActivity {
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
//setContentView(R.layout.activity_main); // LAB 2 COMMENTED OUT
// LAB 2 THREE NEW LINES ADDED
TextView textView = new TextView(this);
textView.setText("Hello New World!");
setContentView(textView);

Lab 3

Change MainActivity.java to this

MainActivity.java × activity_main.xml ×

```
package example.com.helloworld;

import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.view.Menu;
import android.view.MenuItem;
import android.widget.TextView; // LAB 2 NEW
import android.util.Log;    // LAB 3 NEW

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        //setContentView(R.layout.activity_main);  // LAB 2 COMMENTED OUT

        Log.i(this.getClass().getName(), "Here before LAB 2 code in onCreate");  // LAB 3 CODE

        // LAB 2 THREE NEW LINES ADDED
        TextView textView = new TextView(this);
        textView.setText("Hello New World!");
        setContentView(textView);

        Log.i(this.getClass().getName(), "Here After LAB 2 code in onCreate");  // LAB 3 CODE
    }
```

Lab 3 Changes to Lab 2 Code

- Add to Import

import android.util.Log;

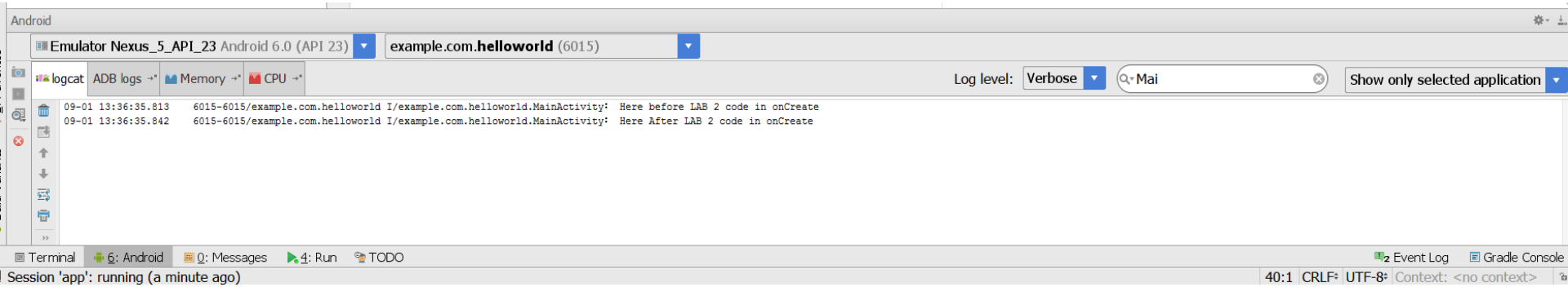
- ADD THESE LINES to OnCreate Method

Log.i(this.getClass().getName(), “TEXT1");

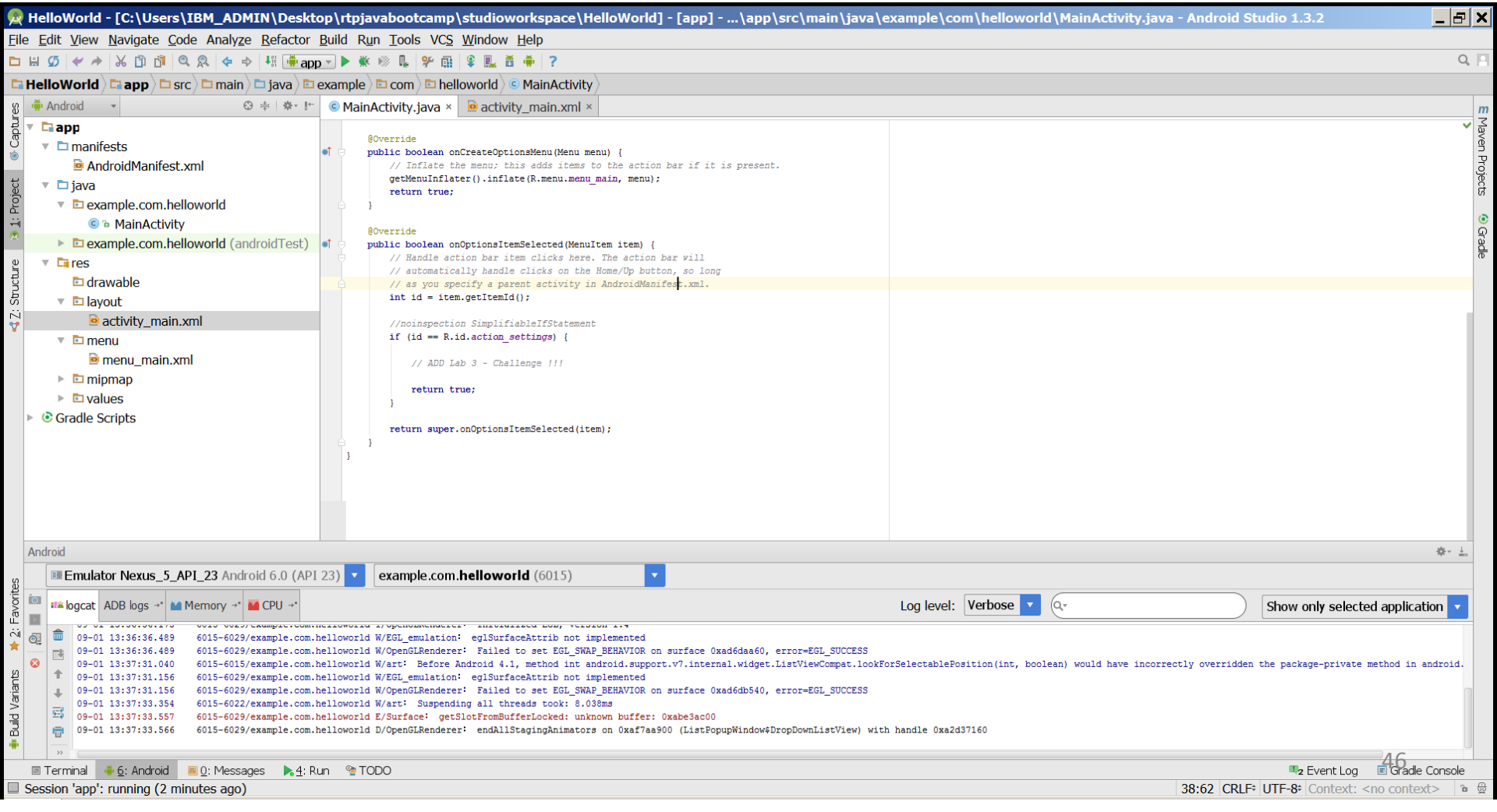
TextView textView = new TextView(this); // 3 lines already exists from lab2
textView.setText("Hello New World!");
setContentView(textView);

Log.i(this.getClass().getName(), “TEXT2");

Run and Check the Logcat Filter



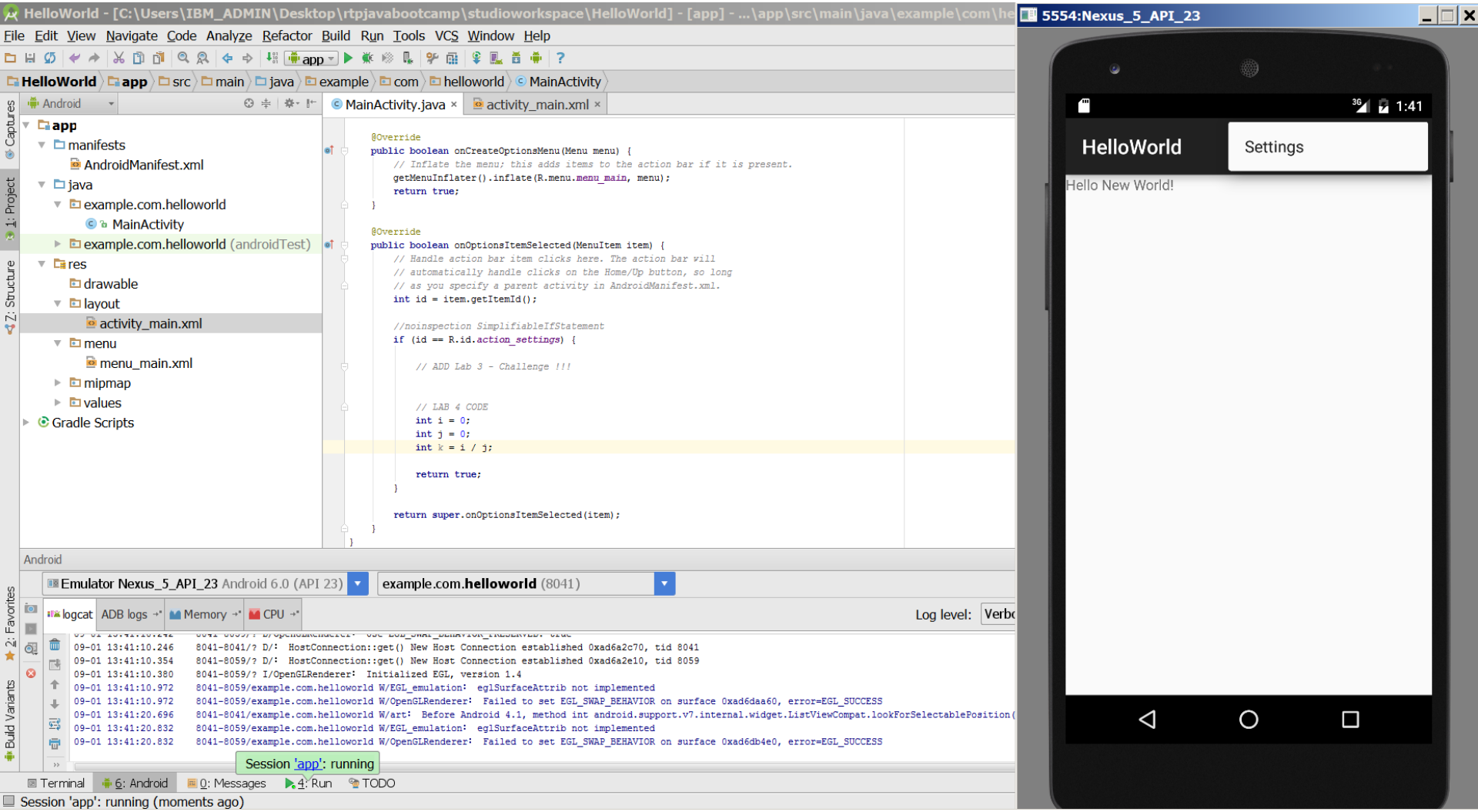
See if you can Find Method for Options Settings menu via Logging



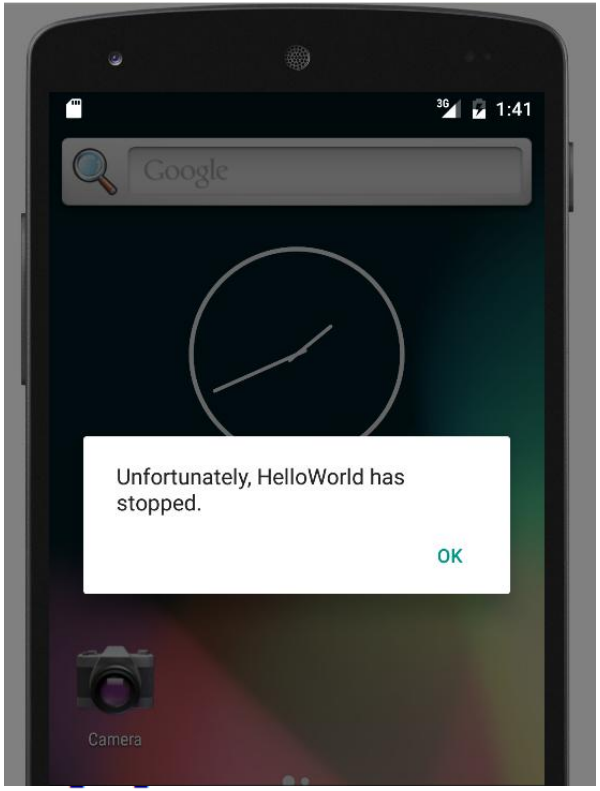
Lab 4

Creating ERROR

Lab 4 – MainActivity.java



Error




```
09-01 13:41:39.073    8041-8041/example.com.helloworld E/InputEventReceiver:  Exception dispatching input event.
09-01 13:41:39.073    8041-8041/example.com.helloworld E/MessageQueue-JNI:  Exception in MessageQueue callback: handleReceiveCallback
09-01 13:41:39.074    8041-8041/example.com.helloworld E/MessageQueue-JNI:  java.lang.ArithmeticException: divide by zero
            at example.com.helloworld.MainActivity.onOptionsItemSelected(MainActivity.java:50)
            at android.app.Activity.onMenuItemSelected(Activity.java:2908)
            at android.support.v4.app.FragmentActivity.onMenuItemSelected(FragmentActivity.java:325)
            at android.support.v7.app.AppCompatActivity.onMenuItemSelected(AppCompatActivity.java:147)
```

Lab 5

Toasting

Change onOptionsSelectedItem Method

MainActivity.java × activity_main.xml ×

```
        // Handle action bar item clicks here. The action bar will
        // automatically handle clicks on the Home/Up button, so long
        // as you specify a parent activity in AndroidManifest.xml.
        int id = item.getItemId();

        //noinspection SimplifiableIfStatement
        if (id == R.id.action_settings) {

            // ADD Lab 3 - Challenge !!!

            Toast toast = Toast.makeText(this, "CLICKED SETTINGS !!!", Toast.LENGTH_LONG);
            toast.show();

            // LAB 4 CODE - COMMENTED in LAB 5
            //int i = 0;
            //int j = 0;
            //int k = i / j;

            return true;
        }

        return super.onOptionsItemSelected(item);
    }
}
```

Lab 5 Changes to Lab 4 Code

- Add to Import

```
import android.widget.Toast;
```

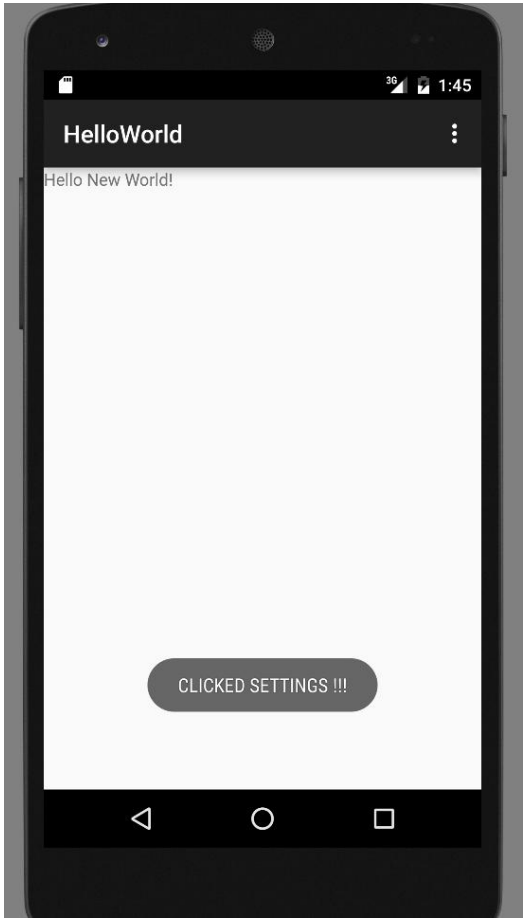
- REMOVE – int Lines

- ADD THESE LINES

```
Toast toast = Toast.makeText(this, "Created !!!",
                                                    Toast.LENGTH_LONG);
toast.show();
```

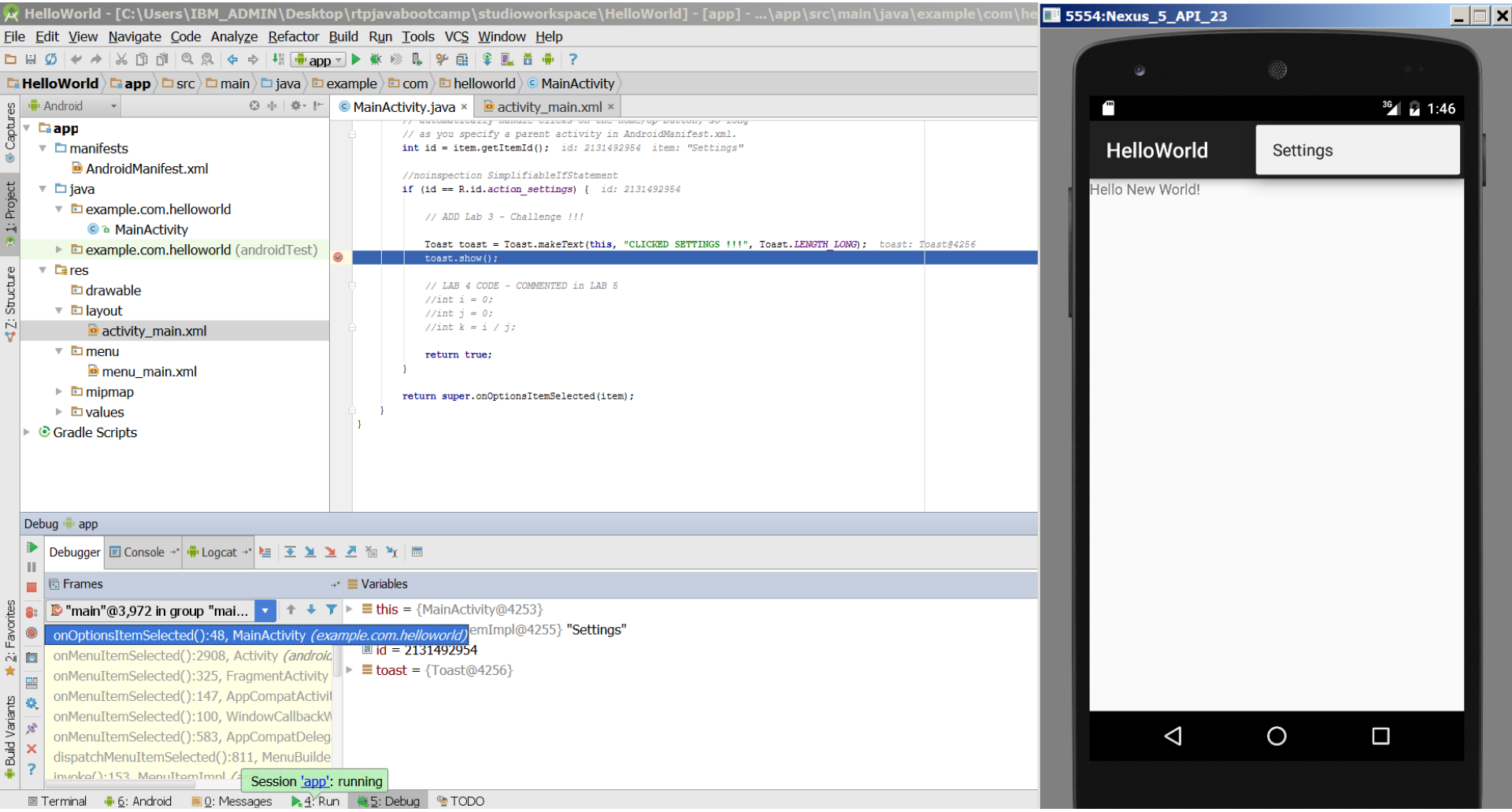

5554:Nexus_5_API_23
1:33
HelloWorld
Hello New World!

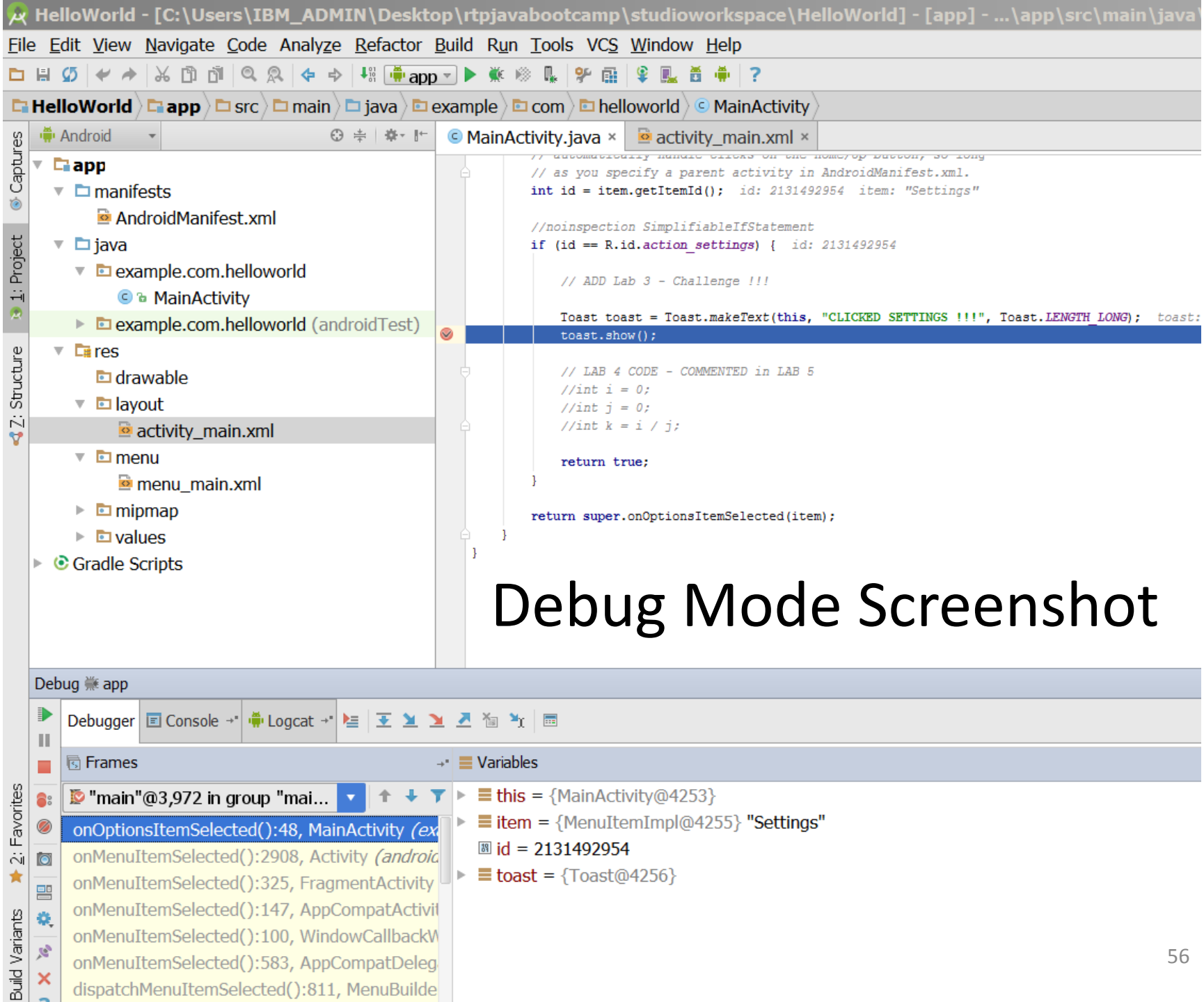

1:45
HelloWorld
Settings
Hello New World!


1:45
HelloWorld
Hello New World!
CLICKED SETTINGS !!!

Lab 6

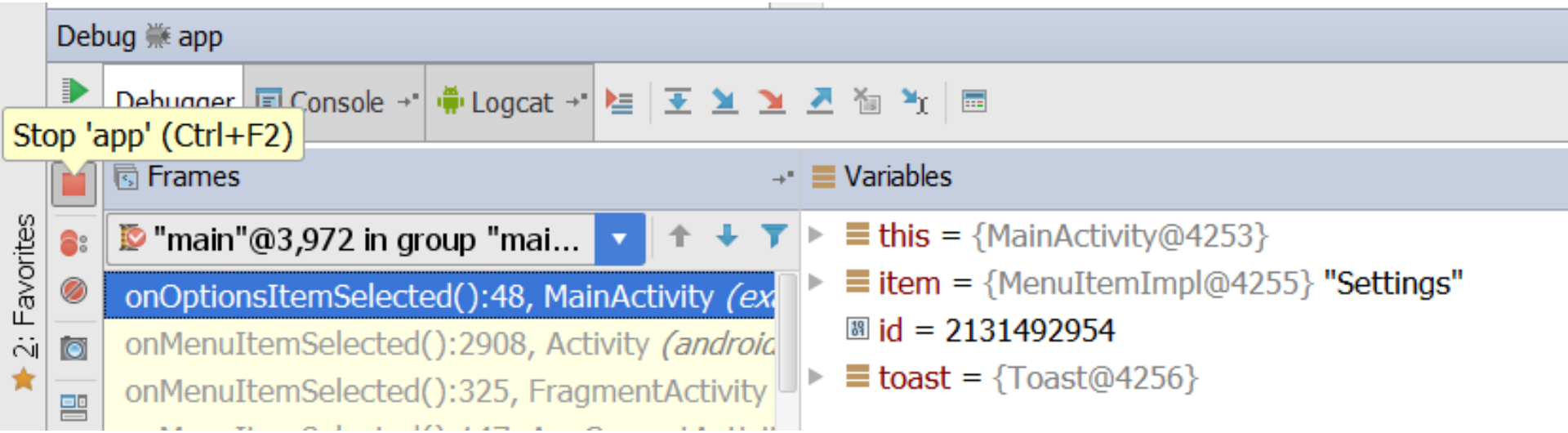
Adding DEBUG Breakpoint





Debug Mode Screenshot

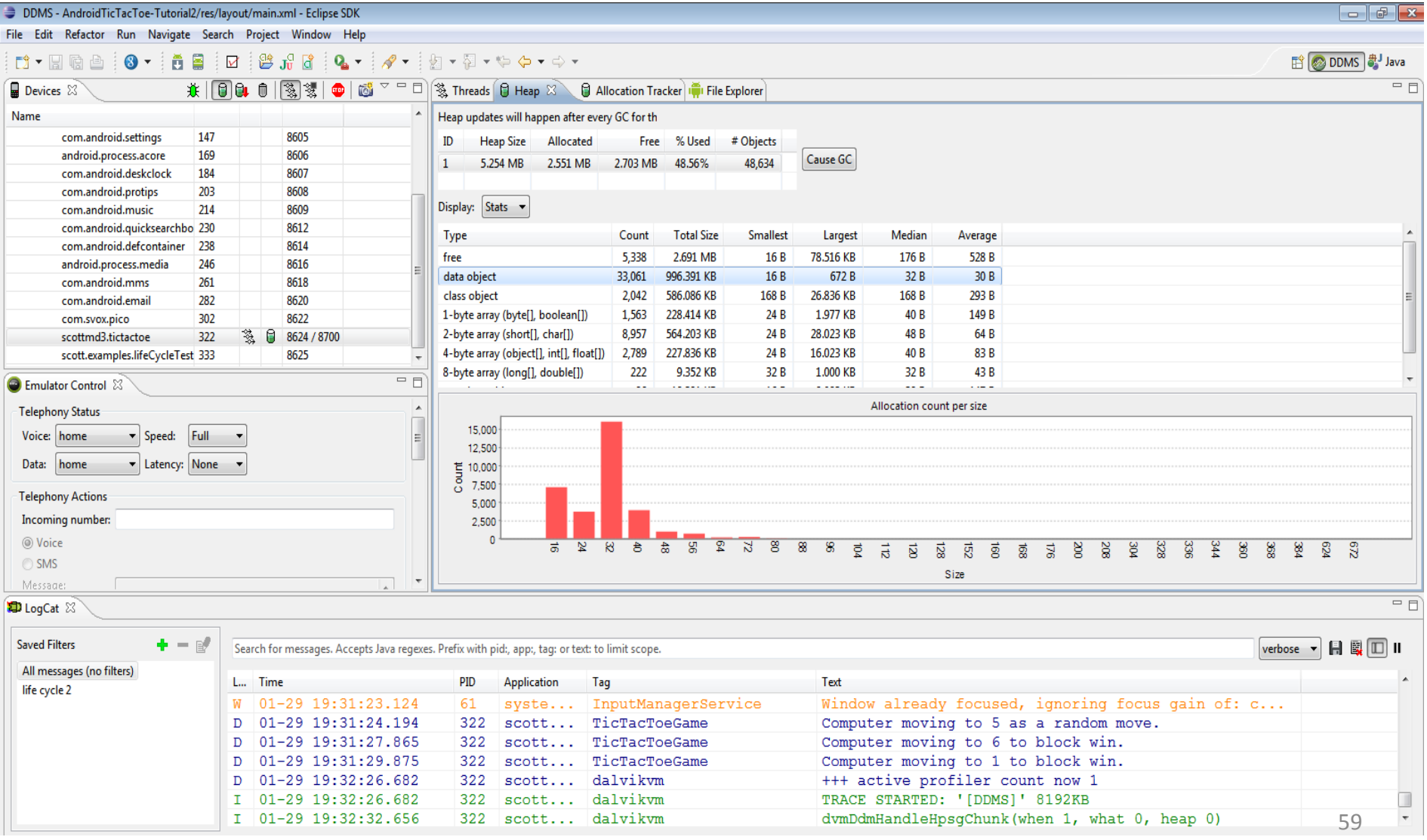
Stopping the Debbuger



Dalvik Debug Monitor Server

- DDMS
- debugging tool
- "provides, screen capture on the device, thread and heap information on the device, logcat, process, and radio state information, incoming call and SMS spoofing, location data spoofing, and more."
- can interact with DDMS via Eclipse plugin, another view in Eclipse

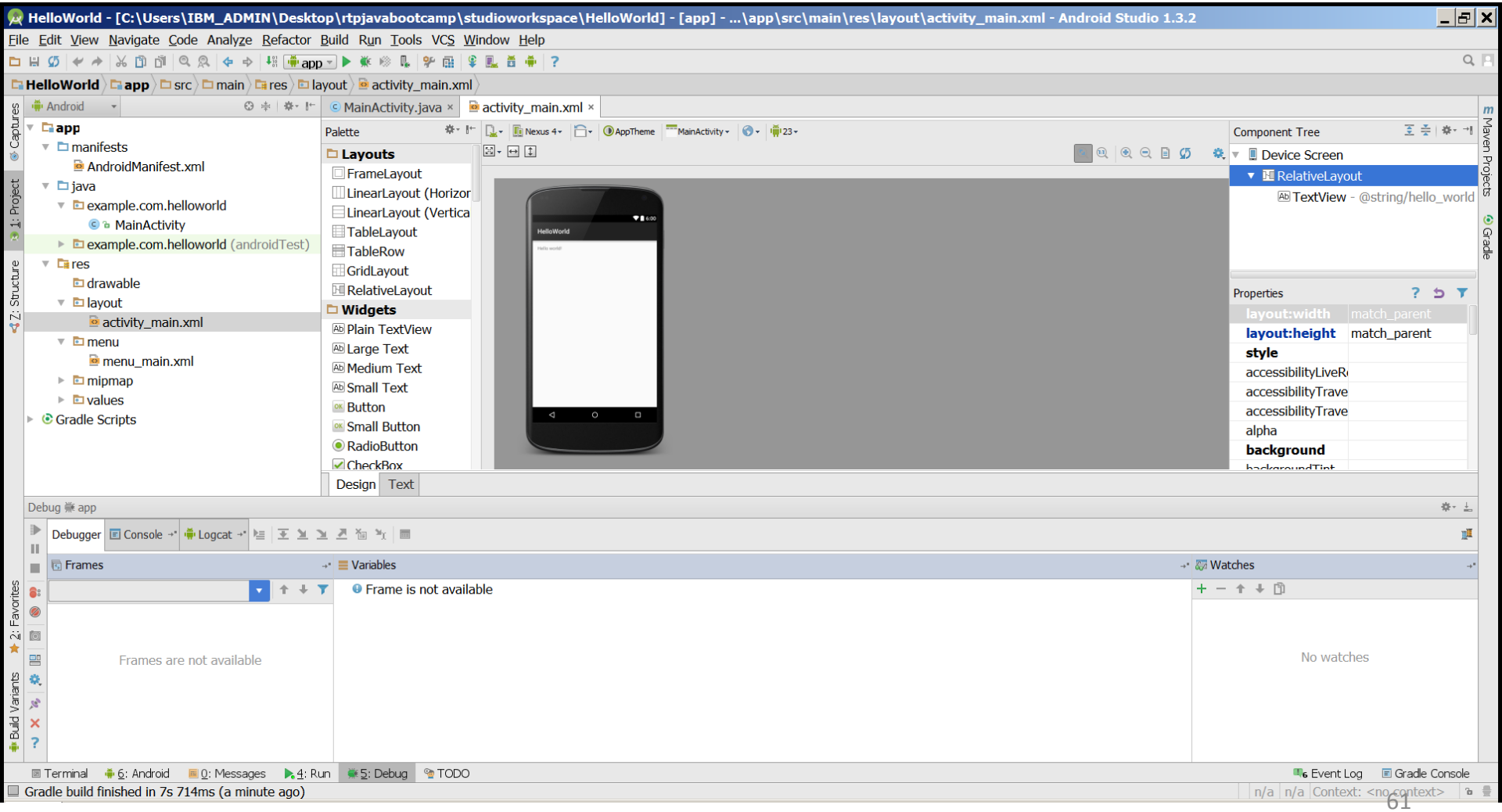
DDMS


DDMS - AndroidTicTacToe-Tutorial2/res/layout/main.xml - Eclipse SDK
File Edit Refactor Run Navigate Search Project Window Help
DDMS
Java
Devices
Name
com.android.settings 147 8605
android.process.acore 169 8606
com.android.deskclock 184 8607
com.android.protips 203 8608
com.android.music 214 8609
com.android.quicksearchbo 230 8612
com.android.defcontainer 238 8614
android.process.media 246 8616
com.android.mms 261 8618
com.android.email 282 8620
com.svox.pico 302 8622
scottmd3.tictactoe 322 8624 / 8700
scott.examples.lifeCycleTest 333 8625
Threads
Heap
Allocation Tracker
File Explorer
Heap updates will happen after every GC for th
ID Heap Size Allocated Free % Used # Objects
1 5.254 MB 2.551 MB 2.703 MB 48.56% 48,634
Cause GC
Display: Stats
Type Count Total Size Smallest Largest Median Average
free 5,338 2.691 MB 16 B 78.516 KB 176 B 528 B
data object 33,061 996.391 KB 16 B 672 B 32 B 30 B
class object 2,042 586.086 KB 168 B 26.836 KB 168 B 293 B
1-byte array (byte[], boolean[]) 1,563 228.414 KB 24 B 1.977 KB 40 B 149 B
2-byte array (short[], char[]) 8,957 564.203 KB 24 B 28.023 KB 48 B 64 B
4-byte array (object[], int[], float[]) 2,789 227.836 KB 24 B 16.023 KB 40 B 83 B
8-byte array (long[], double[]) 222 9.352 KB 32 B 1.000 KB 32 B 43 B
Allocation count per size
Count
15,000
12,500
10,000
7,500
5,000
2,500
0
16 24 32 40 48 56 64 72 80 88 96 104 112 120 128 152 160 168 176 200 208 304 328 336 344 360 368 384 624 672
Size
Emulator Control
Telephony Status
Voice: home Speed: Full
Data: home Latency: None
Telephony Actions
Incoming number:
Voice
SMS
Message:
LogCat
Saved Filters
All messages (no filters)
life cycle 2
Search for messages. Accepts Java regexes. Prefix with pid:, app:, tag: or text: to limit scope.
verbose
L... Time PID Application Tag Text
W 01-29 19:31:23.124 61 syste... InputManagerService Window already focused, ignoring focus gain of: c...
D 01-29 19:31:24.194 322 scott... TicTacToeGame Computer moving to 5 as a random move.
D 01-29 19:31:27.865 322 scott... TicTacToeGame Computer moving to 6 to block win.
D 01-29 19:31:29.875 322 scott... TicTacToeGame Computer moving to 1 to block win.
D 01-29 19:32:26.682 322 scott... dalvikvm +++ active profiler count now 1
I 01-29 19:32:26.682 322 scott... dalvikvm TRACE STARTED: '[DDMS]' 8192KB
I 01-29 19:32:32.656 322 scott... dalvikvm dvmDdmHandleHpsgChunk(when 1, what 0, heap 0)

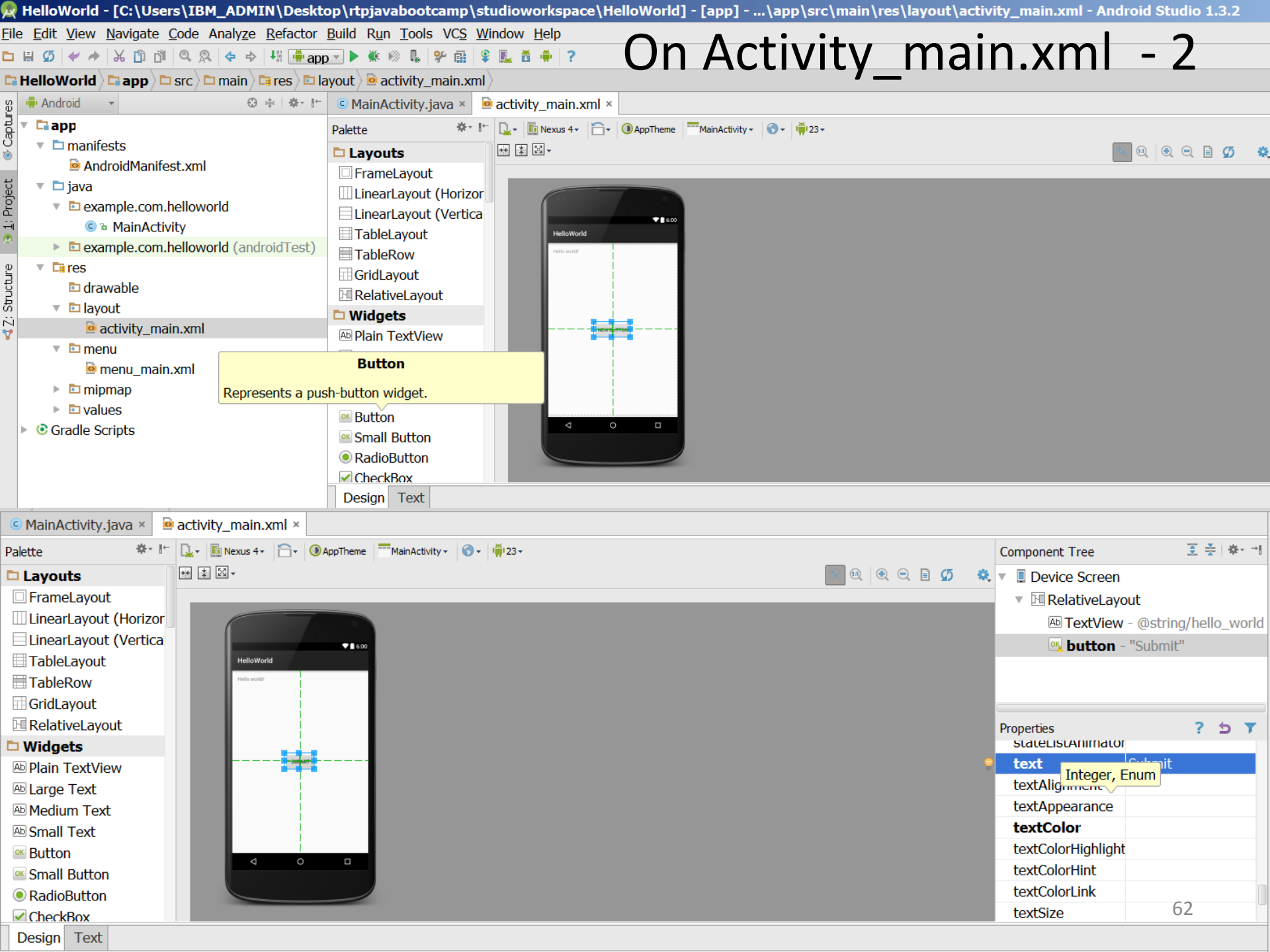
Lab 7

Adding Button and OnClickEvent

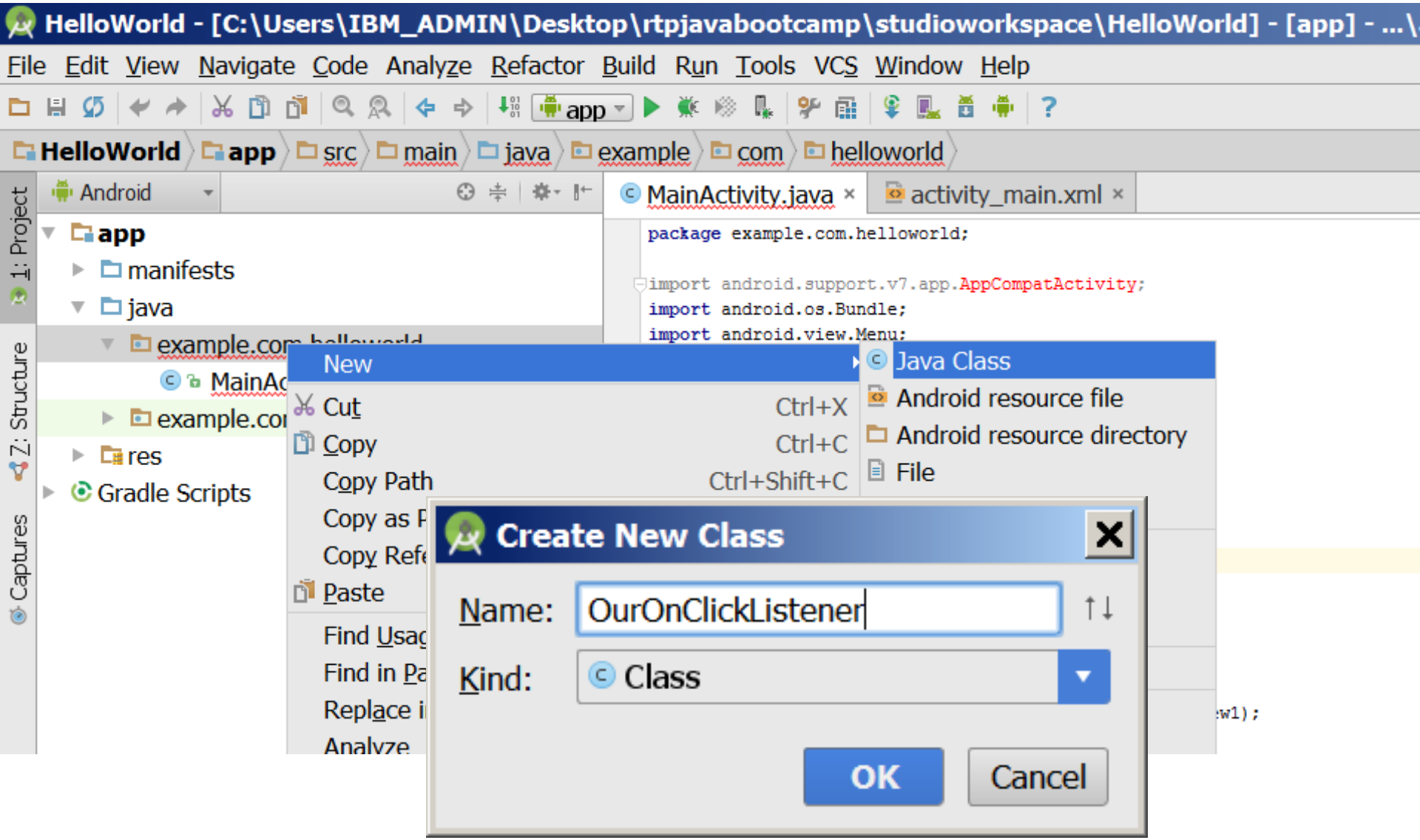
On Activity_main.xml - 1
add a button and change properties to Submit



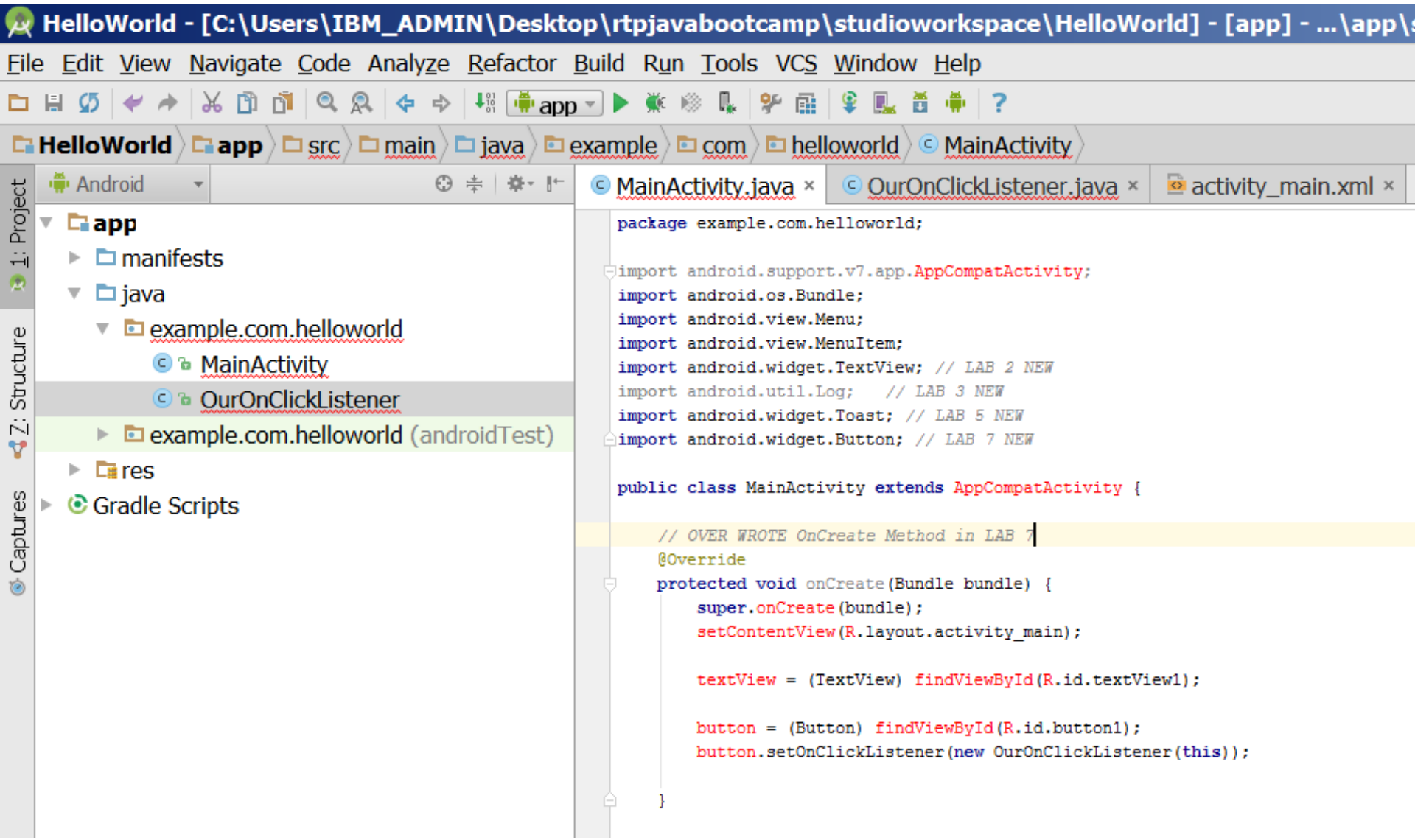
On Activity_main.xml - 2



Create a new Java Class



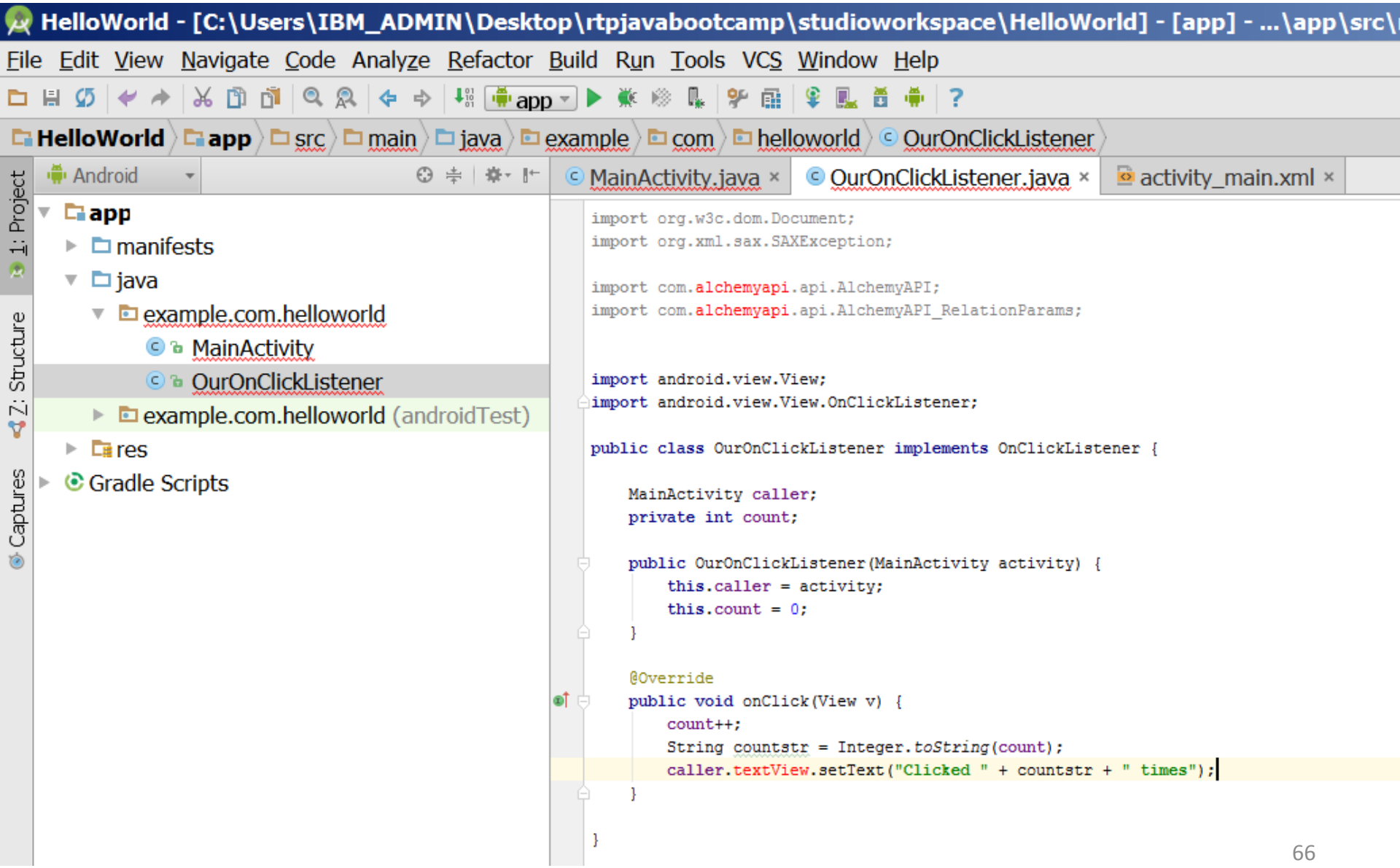
New OnCreate Method



New OnCreate Method

```
package com.example.helloandroid;

import android.app.Activity;
import android.os.Bundle;
import android.os.StrictMode;
import android.util.Log;
import android.view.Menu;
import android.view.MenuItem;
import android.widget.Button;
import android.widget.TextView;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity {
   TextView textView;
   Button ourButton;
   // OVER WRITE OnCreate Method in LAB 7
   @Override
   protected void onCreate(Bundle bundle) {
      super.onCreate(bundle);
      setContentView(R.layout.activity_main);
      textView = (TextView) findViewById(R.id.textView);
      ourButton = (Button) findViewById(R.id.button);
      ourButton.setOnClickListener(new OurOnClickListener(this));
   }
...
```

New OurOnClickListener Class



NEW CLASS CREATED IN LAB 7

```
package com.example.helloandroid;
import android.view.View;
import android.view.View.OnClickListener;
public class OurOnClickListener implements OnClickListener {

MainActivity caller;
private int count;

public OurOnClickListener(MainActivity activity) {
        this.caller = activity;
        this.count = 0;
}

@Override
public void onClick(View v) {
        count++;
        String countstr = Integer.toString(count);
        caller.textView.setText("Clicked " + countstr + " times");
}

}
```

Important Files

1. src/**MainActivity.java**
    1. Activity which is started when app executes
2. gen/**R.java** (DO NOT MODIFY!)
    1. Auto-generated, auto-updated file with identifiers from main.xml, strings.xml, and elsewhere
3. res/layout/**activity_main.xml**
    1. Defines & lays out widgets for the activity
4. res/values/**strings.xml**
    1. String constants used by app
5. **AndroidManifest.xml**
    1. Declares all the app's components
    2. Names libraries app needs to be linked against
    3. Identifies permissions the app expects to be granted

1 - src/**MainActivity.java**

```
package com.example.helloworld;

import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.view.Menu;
import android.view.MenuItem;

public class MainActivity extends AppCompatActivity {

    @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.menu_main, menu);
        return true;
    }

    @Override
    public boolean onOptionsItemSelected(MenuItem item) {
        // Handle action bar item clicks here. The action bar will
        // automatically handle clicks on the Home/Up button, so long
        // as you specify a parent activity in AndroidManifest.xml.
        int id = item.getItemId();

        //noinspection SimplifiableIfStatement
        if (id == R.id.action_settings) {
            return true;
        }

        return super.onOptionsItemSelected(item);
    }
}
```

2 - gen/**R.java**

- Auto-generated file with identifiers from main.xml, strings.xml, and elsewhere

- *\/* AUTO-GENERATED FILE. DO NOT MODIFY.*
  ***
  ** This class was automatically generated by the*
  ** aapt tool from the resource data it found. It*
  ** should not be modified by hand.*
  **\/*

  package com.example.helloworld;

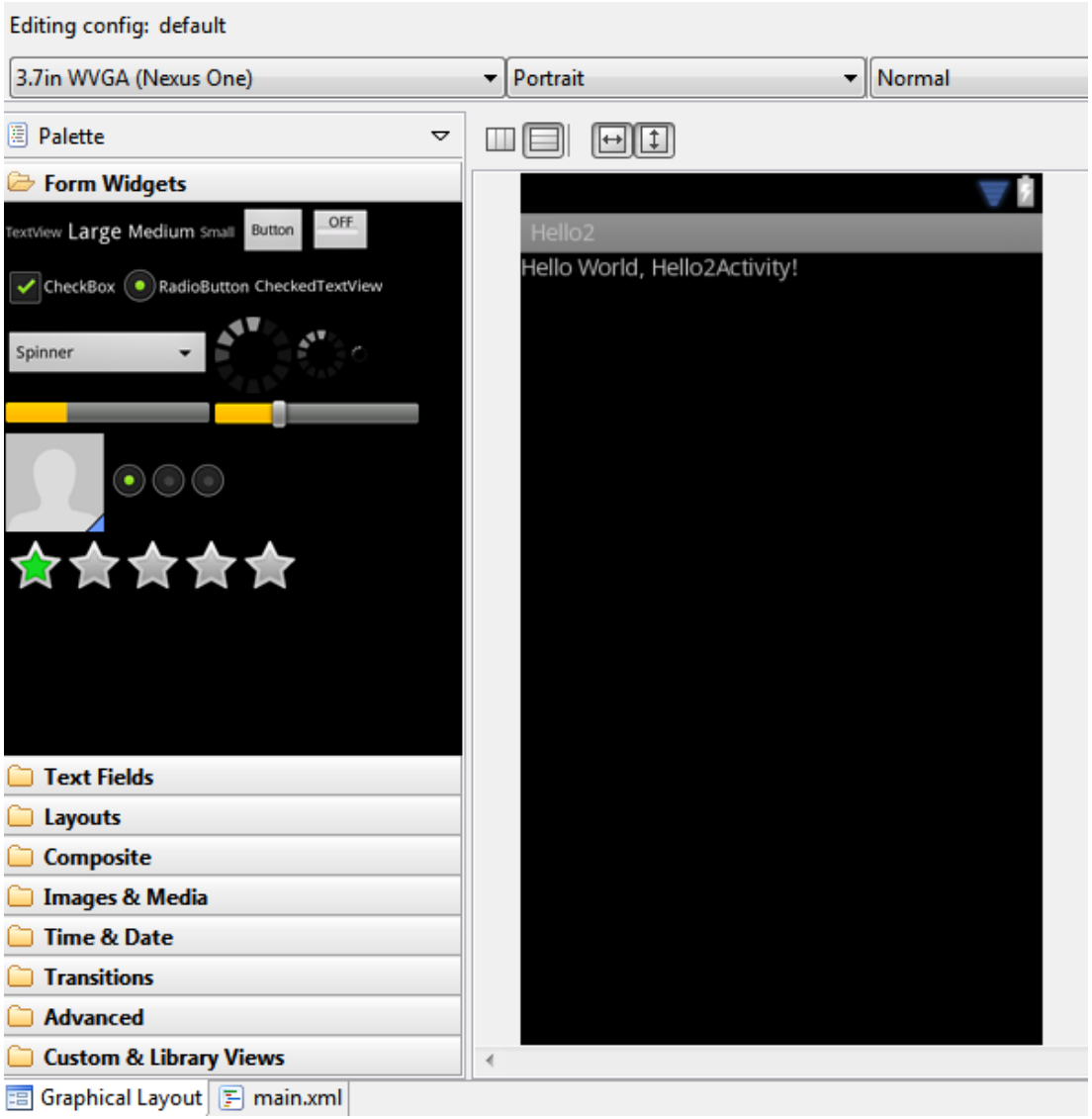
  public final class R {
  public static final class anim {
  public static final int ***abc_fade_in***=0x7f050000;
  public static final int ***abc_fade_out***=0x7f050001;
  public static final int ***abc_grow_fade_in_from_bottom***=0x7f050002;
  public static final int ***abc_popup_enter***=0x7f050003;
  public static final int ***abc_popup_exit***=0x7f050004;
  public static final int ***abc_shrink_fade_out_from_bottom***=0x7f050005;
  public static final int ***abc_slide_in_bottom***=0x7f050006;
  public static final int ***abc_slide_in_top***=0x7f050007;
  public static final int ***abc_slide_out_bottom***=0x7f050008;
  public static final int ***abc_slide_out_top***=0x7f050009;
  }
  public static final class attr {
  *\/** <p>Must be a reference to another resource, in the form*
  "<code>@[+][package:]type:name</code>"
  or to a theme attribute in the form "<code>?[package:][type:]name</code>".

Do not modify!

3 - res/layout/activity_main.xml

```
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
   xmlns:tools="http://schemas.android.com/tools" android:layout_width="match_parent"
   android:layout_height="match_parent" android:paddingLeft="@dimen/activity_horizontal_margin"
   android:paddingRight="@dimen/activity_horizontal_margin"
   android:paddingTop="@dimen/activity_vertical_margin"
   android:paddingBottom="@dimen/activity_vertical_margin" tools:context=".MainActivity">

   <TextView android:text="@string/hello_world" android:layout_width="wrap_content"
      android:layout_height="wrap_content"
      android:id="@+id/textView" />

   <Button
      android:layout_width="wrap_content"
      android:layout_height="wrap_content"
      android:text="Submit"
      android:id="@+id/button"
      android:layout_below="@+id/textView"
      android:layout_toRightOf="@+id/textView"
      android:layout_toEndOf="@+id/textView"
      android:layout_marginTop="68dp" />

</RelativeLayout>
```

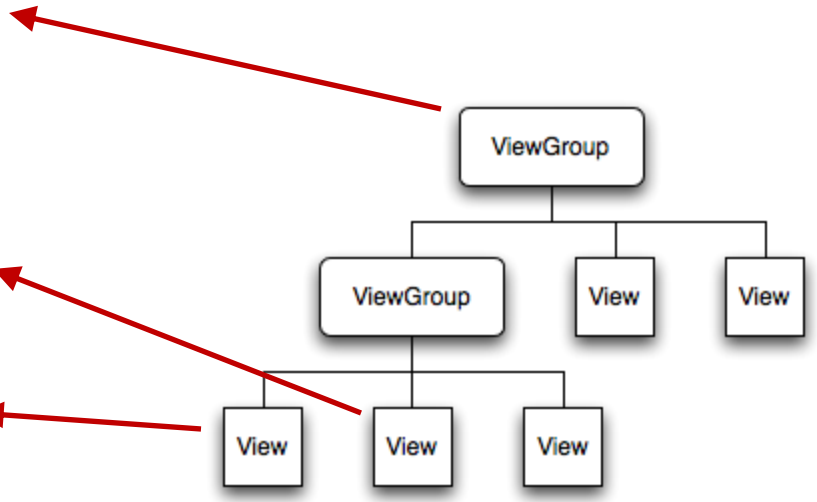
3 contd. - Layout could be complex



3 contd. - Understanding Layout

- Declares layouts & widgets for the activity

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent" >

    <EditText
        android:id="@+id/name"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:text="@string/hello" />

    <Button
        android:id="@+id/hello_button"
        android:layout_height="wrap_content"
        android:layout_width="wrap_content"
        android:text="Press Me" />

</LinearLayout>
```



Tree from: http://developer.android.com/guide/topics/ui/index.html

3 Contd - Available Layouts

LinearLayout

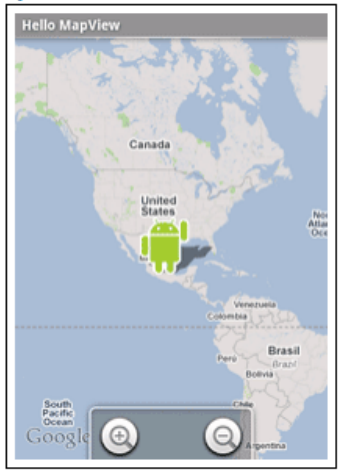
RelativeLayout

TableLayout

http://developer.android.com/resources/tutorials/views/index.html

3 Layout and Available Widgets

MapView

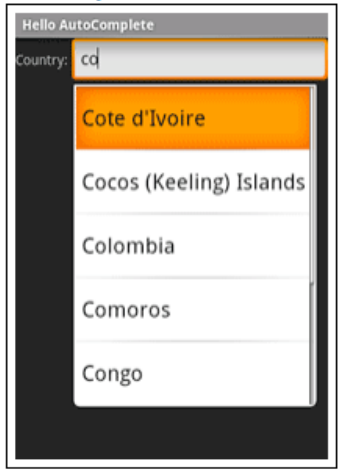


WebView

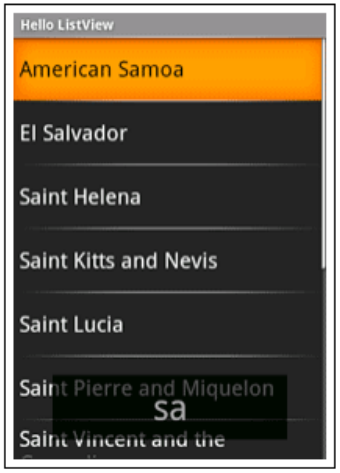
DatePicker

Spinner

AutoComplete



ListView



http://developer.android.com/resources/tutorials/views/index.html

4 - res/values/**strings.xml**

- String constants used by app

```
<resources>
<string name="app_name">HelloWorld</string>

<string name="hello_world">Hello world!</string>
<string name="action_settings">Settings</string>
</resources>
```

- Used for supporting Localization
  - res/values-**es**/values/strings.xml to support Spanish
  - res/values-**fr**/values/strings.xml to support French
  - Etc.

5 - AndroidManifest.xml

- Declares all the app's components
- Names libraries app needs to be linked against
- Identifies permissions the app expects to be granted

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
package="com.example.helloworld" >

<application
android:allowBackup="true"
android:icon="@mipmap/ic_launcher"
android:label="@string/app_name"
android:theme="@style/AppTheme" >
<activity
android:name=".MainActivity"
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>
```

5 contd - AndroidManifest.xml

All Activities that are part of application must be registered in M

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="scott.examples.lifeCycleTest"
    android:versionCode="1"
    android:versionName="1.0" >

    <uses-sdk android:minSdkVersion="10" />

    <application
        android:icon="@drawable/ic_launcher"
        android:label="@string/app_name" >
        <activity
            android:name=".LifeCycleTestActivity"
            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=".NameGetter"
            android:label="@string/getName"/>
    </application>
```

Specify Activity to start w

Some other topics covered

- onCreate() in Activity
- Adding Text and Changing Properties from Code
- Use the log to v, d, i, w, e

  VERBOSE, DEBUG, INFO, WARN, ERROR
- Create a TAG so we can filter
- Toast a message
- Debug BreakPoint
- ScreenShot of the APP
- Adding component
- Adding an Event and Setting Properties

References

- Android Dev Guide http://developer.android.com/guide/topics/fundamentals.html

- http://developer.android.com/guide/topics/fundamentals/activities.html