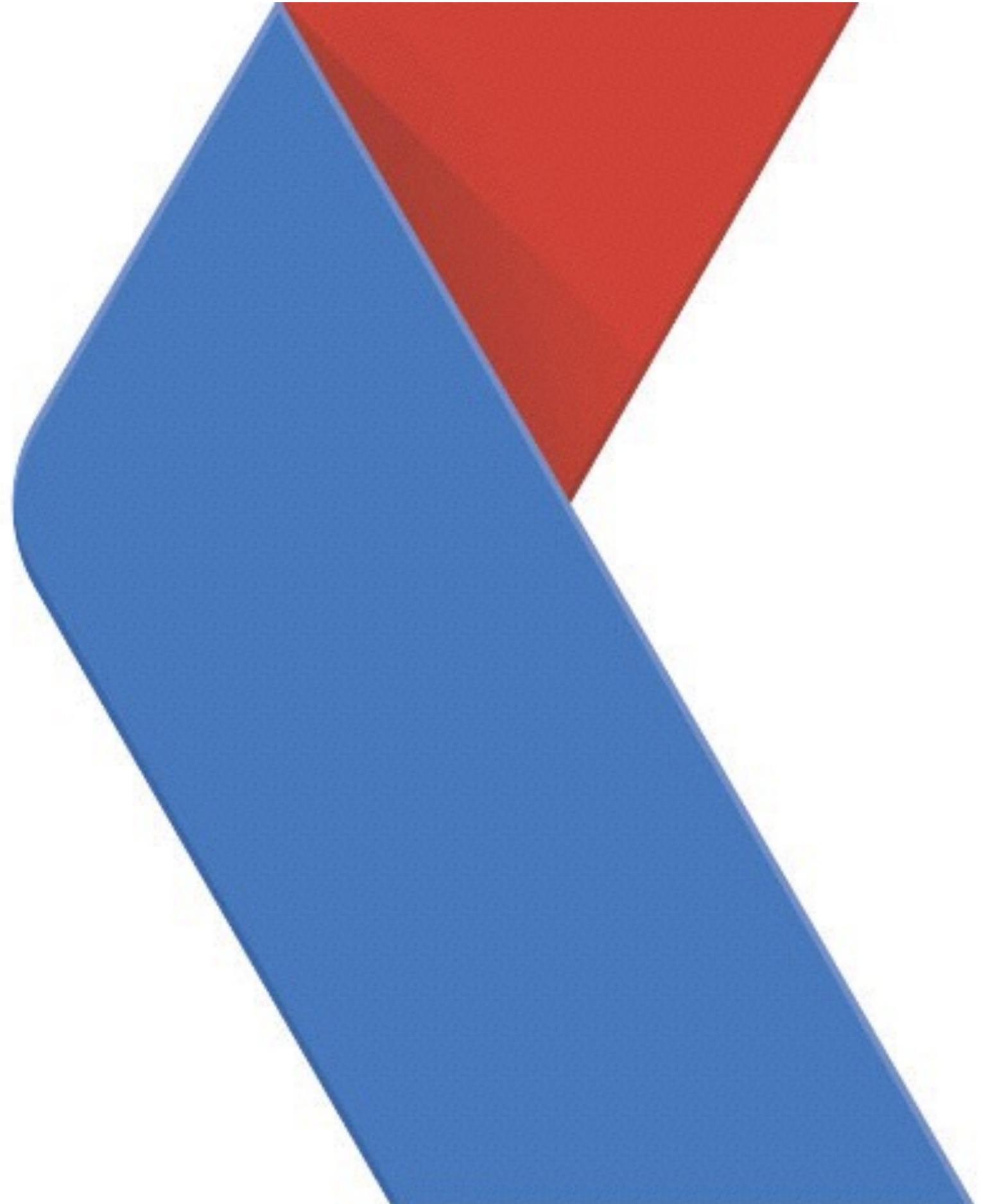
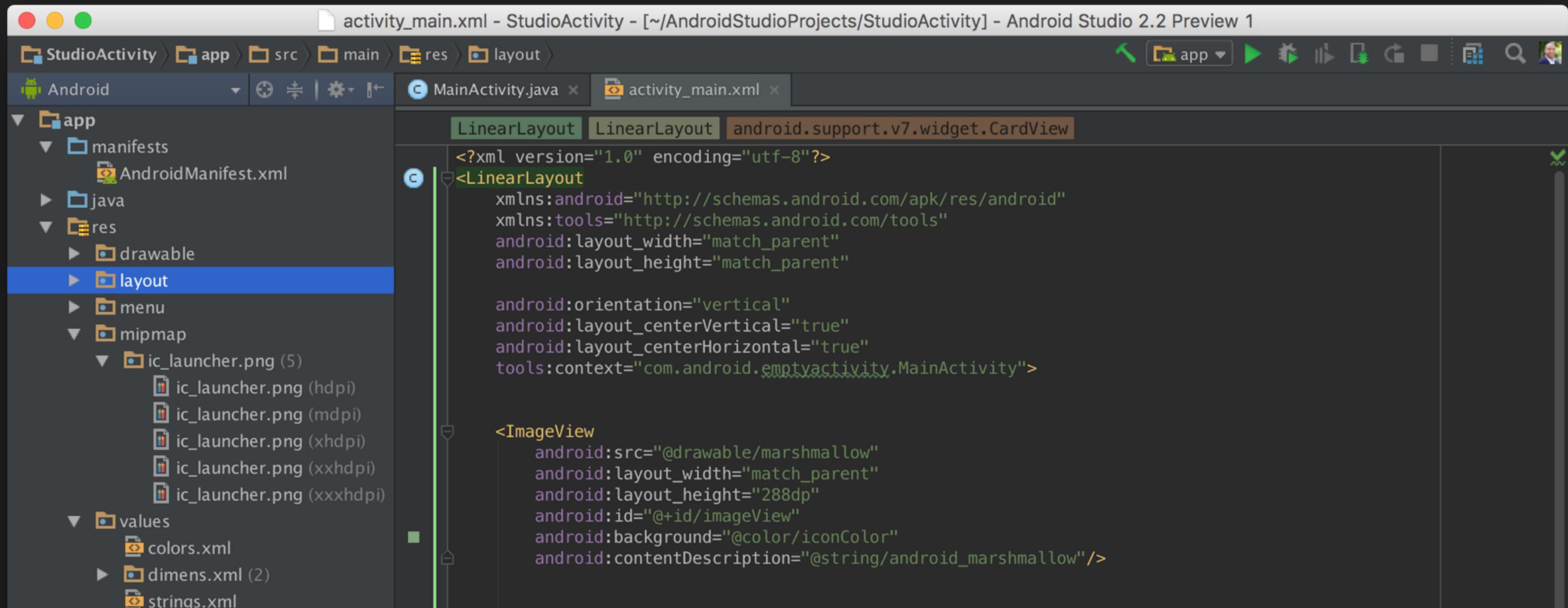


# Android Studio and Tools

December 2016





# Android Studio



Google Developer Day



92%



of top 125 apps use  
Android Studio



# 143

---

Releases across  
Preview, Beta, and Stable  
Channels





# Android Studio 2.0

Instant Run

Accelerated build and deployment speeds

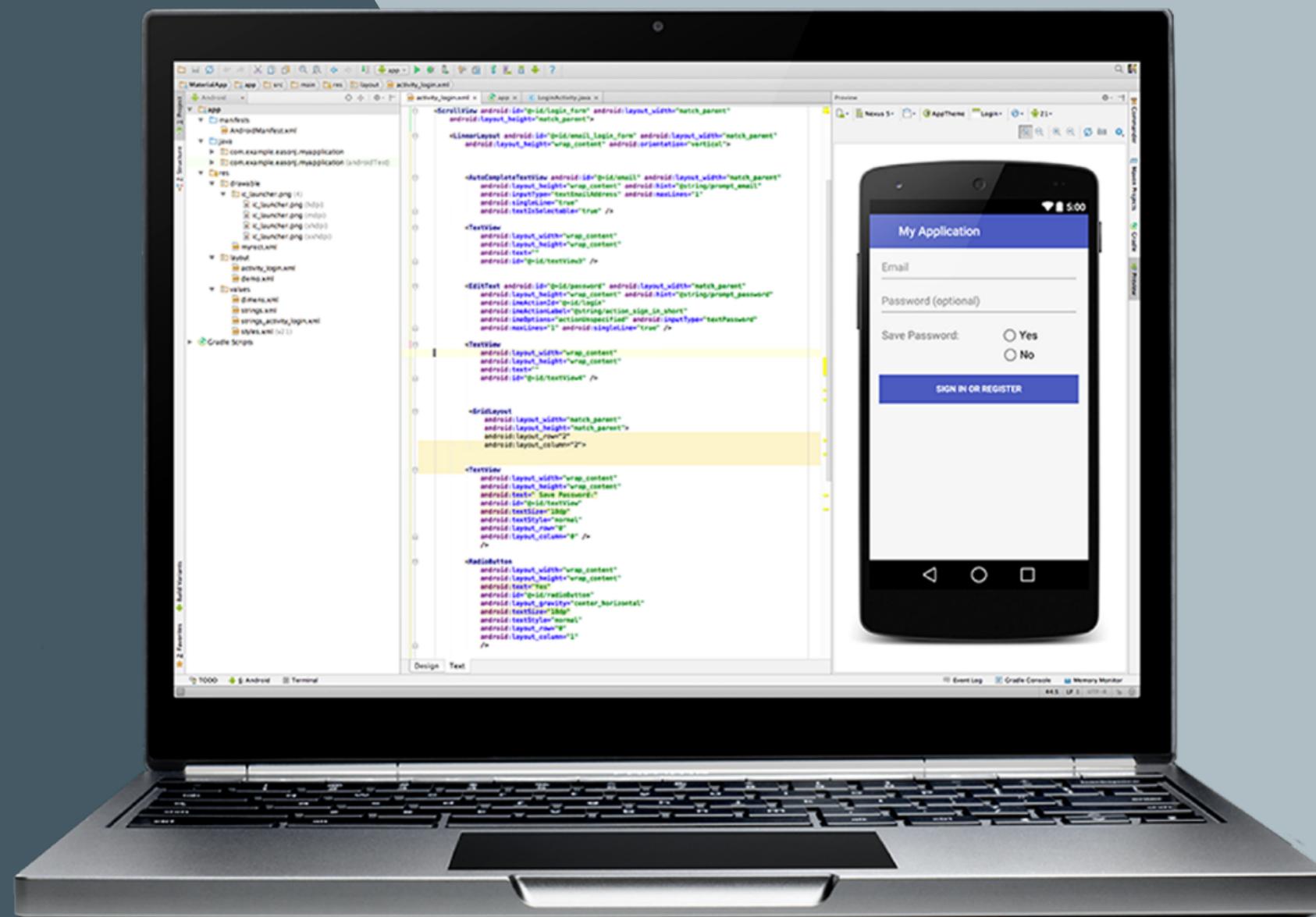
Next-generation Emulator

New GPU profiler

IntelliJ 15

Enhanced testing support

Support for Google Search deep linking





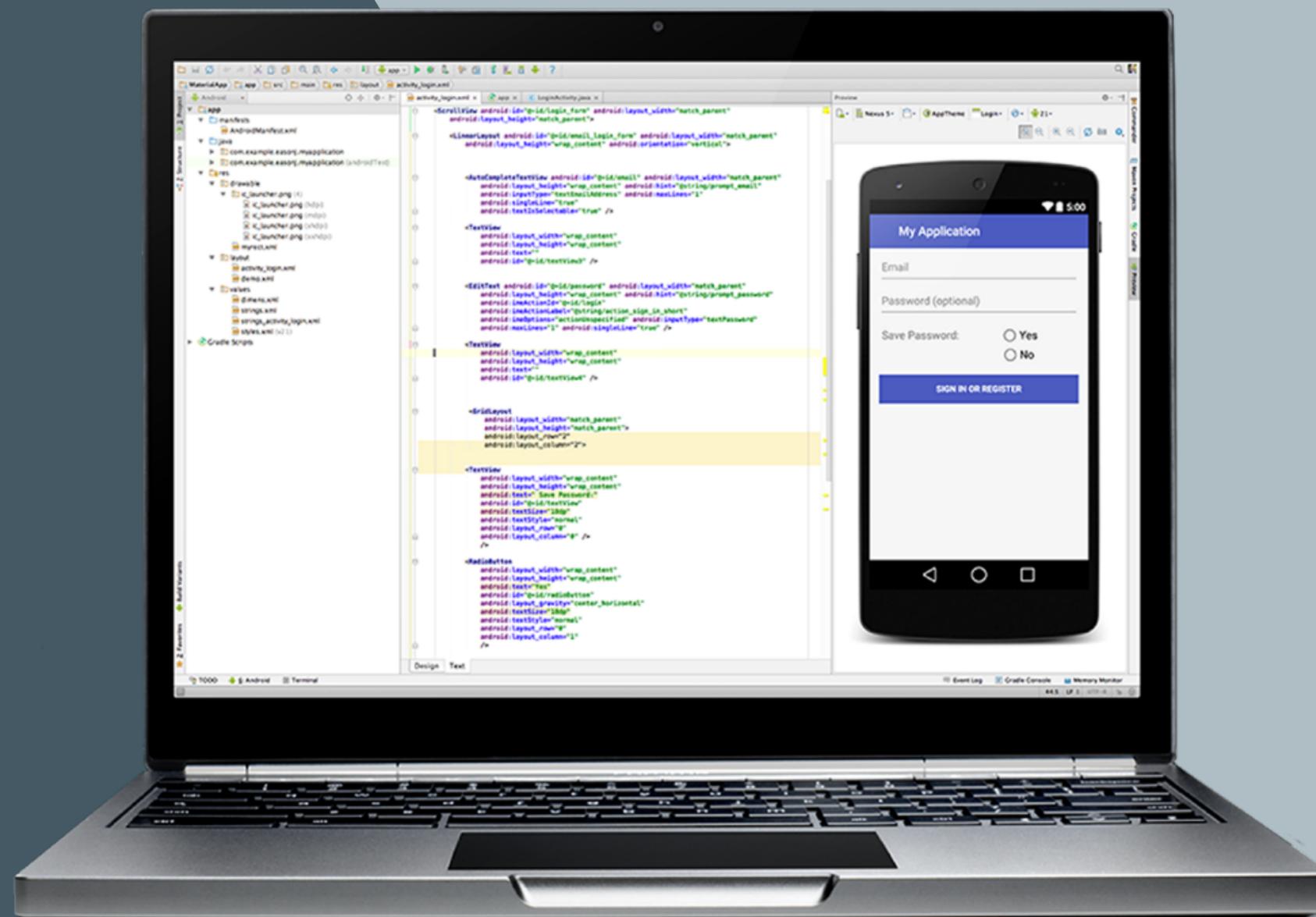
# Android Studio 2.1

Nougat Developer Preview Features & APIs

Jack compiler & Java8 language feature support

Nougat Developer Preview Android Virtual Devices (AVDs)

Instant Run - incremental java compilation + dex in process

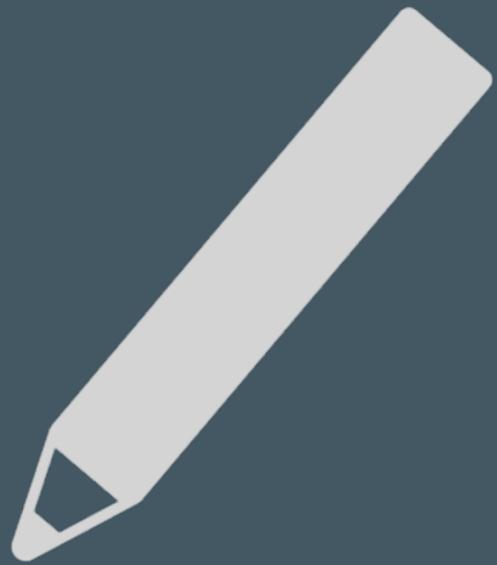




# **Android Studio 2.2**



Android  
Studio 2.2



Design



Develop



Build



Test



Design



Develop

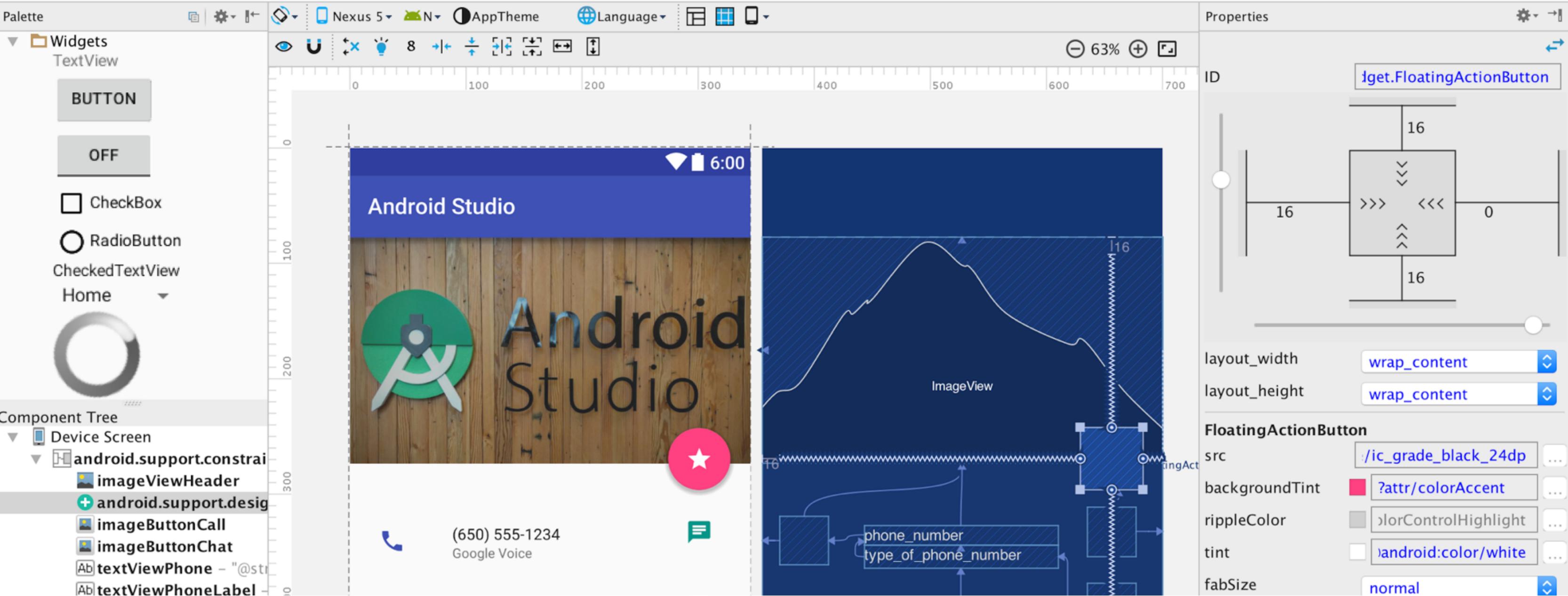


Build

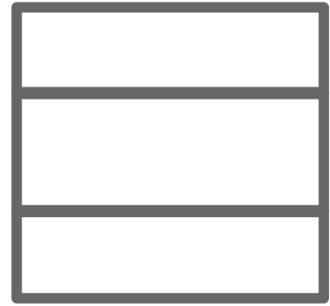


Test

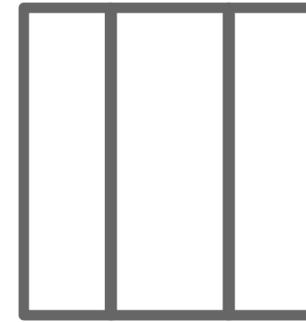
No XML Editing  
Required



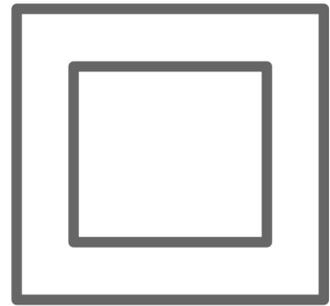
# Layout Editor



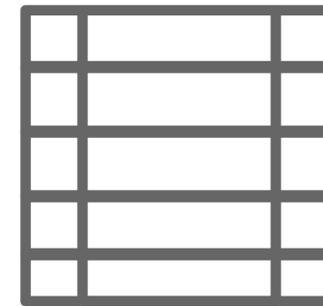
LinearLayout  
(horizontal)



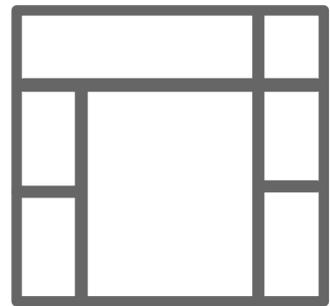
LinearLayout  
(vertical)



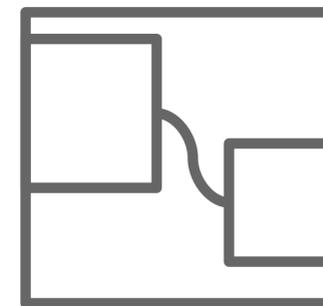
FrameLayout



TableLayout



GridLayout



RelativeLayout

# Constraint Layout

The screenshot displays the Android Studio IDE with a ConstraintLayout. The design view shows a dark blue background with a grid. A white checkmark icon and the text "CheckBox" are positioned at the top. Below them is a button with a rounded rectangle and the text "SAVE". Dimension lines indicate a 24dp vertical gap between the CheckBox and the button, and 24dp horizontal margins for the button. The Properties panel on the right shows the following settings for the selected button (ID: @+id/button3):

- layout\_width: wrap\_content
- layout\_height: wrap\_content
- Button style: /borderlessButtonStyle
- background: or\_disabled\_holo\_dark
- backgroundTint: #FF4081
- stateListAnimator: @null
- elevation: 10dp
- visibility: visible
- onClick: buttonClick
- TextView text: Save
- contentDescription: Save Button
- textAppearance: AppCompatActivity.Body1



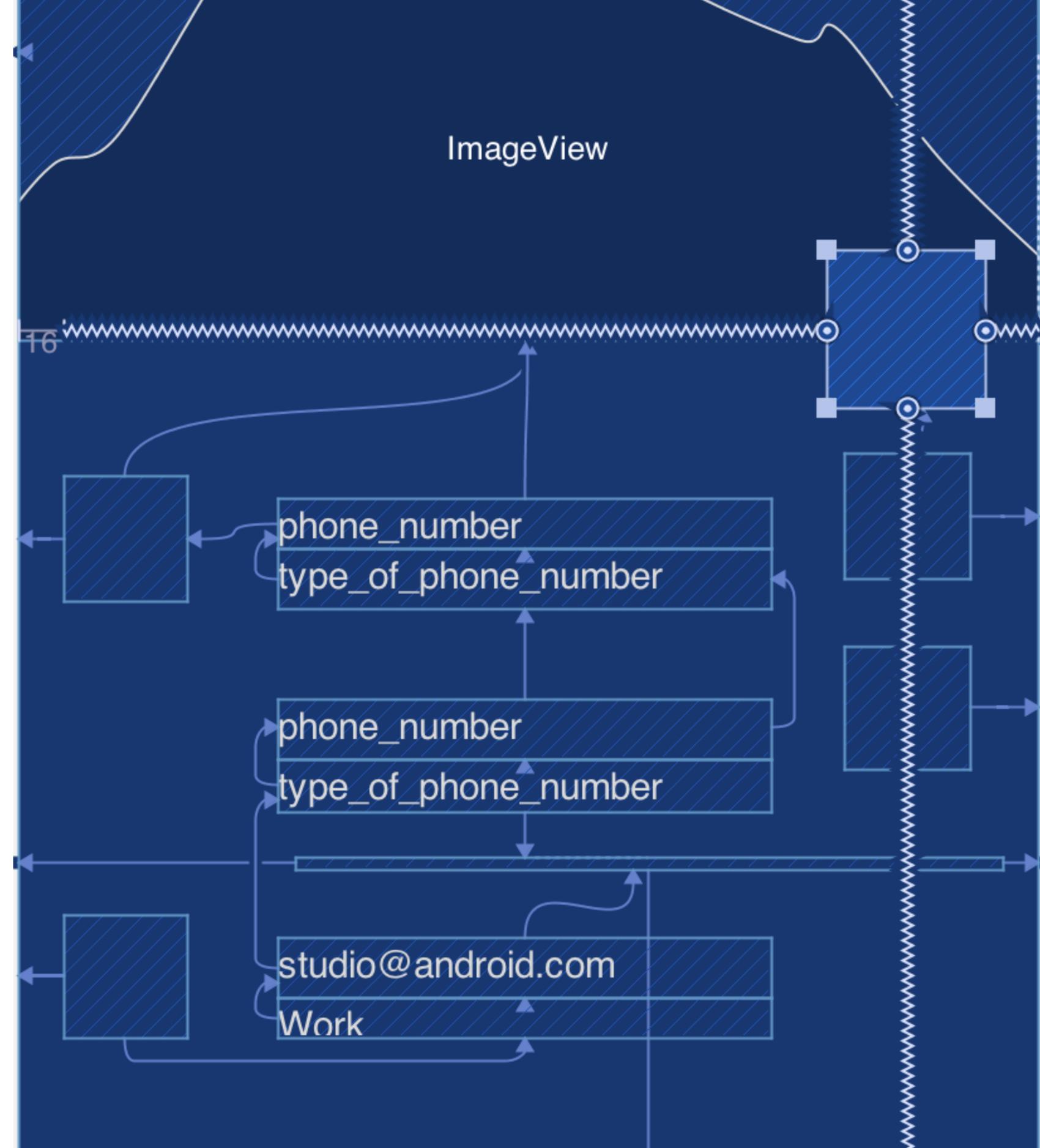
# Constraint Layout

Fast UI Development

Responsive Design

Performant UI

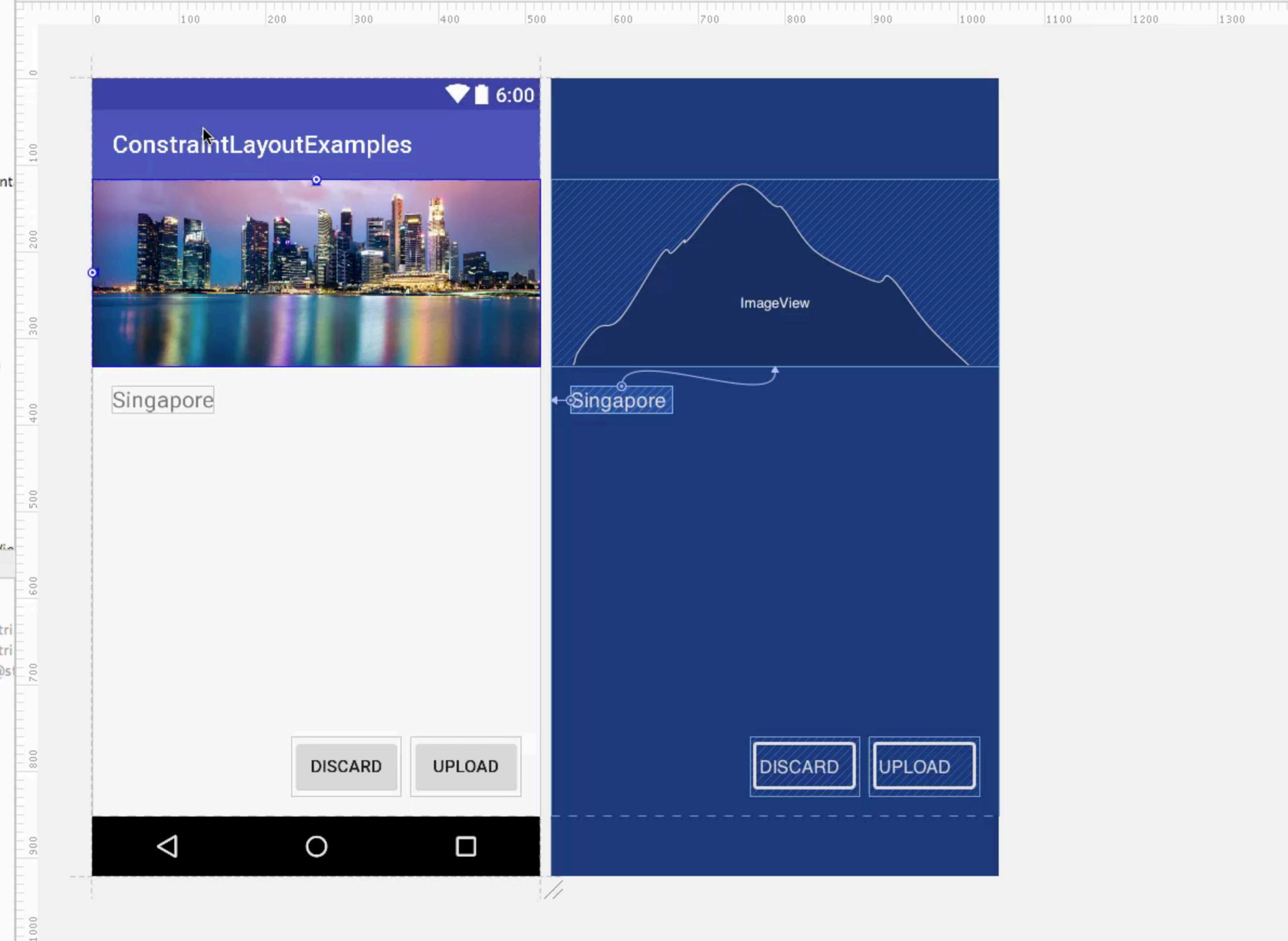
Gingerbread Compatible





- Widgets
  - TextView
  - Button
  - ToggleButton
  - CheckBox
  - RadioButton
  - CheckedTextView
  - Spinner
  - ProgressBar (Large)
  - ProgressBar
  - ProgressBar (Small)
  - ProgressBar (Horizontal)
  - SeekBar
  - SeekBar (Discrete)
  - QuickContactBadge
  - RatingBar
  - Switch
  - Space
- Text Fields (EditText)
  - Plain Text
  - Password
  - Password (Numeric)
  - E-mail
  - Phone
  - Postal Address
  - Multiline Text
  - Time
  - Date
  - Number
  - Number (Signed)
  - Number (Decimal)
  - AutoCompleteTextView

- Component Tree
- ConstraintLayout
    - imageView2
    - button35 - "@str
    - button36 - "@str
    - textView12 - "@s



Properties

Gradle

Android Model

Palette

- Widgets
  - TextView
  - Button
  - ToggleButton
  - CheckBox
  - RadioButton
  - CheckedTextView
  - Spinner
  - ProgressBar (Large)
  - ProgressBar
  - ProgressBar (Small)
  - ProgressBar (Horizontal)
  - SeekBar
  - SeekBar (Discrete)
  - QuickContactBadge
  - RatingBar
  - Switch
  - Space
- Text Fields (EditText)
  - Plain Text
  - Password
  - Password (Numeric)
  - E-mail
  - Phone
  - Postal Address
  - Multiline Text
  - Time
  - Date
  - Number
  - Number (Signed)
  - Number (Decimal)
  - AutoCompleteTextView

Component Tree

- ConstraintLayout
  - imageView2
  - button35 - "@str
  - button36 - "@str
  - textView12 - "@s
  - editText - "@strin
  - editText2 - "Nam
  - textView13 - "@s
  - textView15 - "@s
  - textView16 - "@s

8 76% 6

ConstraintLayoutExamples

Singapore

Camera Leica M Typ 240

Settings f/4 16s ISO 200

Singapore officially the Republic of Singapore, and often referred to as the Lion City, the Garden City, and the Red Dot, is a global city in Southeast Asia and the world's only island city-state. It lies one degree (137 km) north of the equator, at the southernmost tip of continental Asia and peninsular Malaysia, with Indonesia's Riau Islands to the south. Singapore's territory consists of the diamond-shaped main island and 62 islets.

DISCARD UPLOAD

DISCARD UPLOAD

imageView

Properties

Android Model

com.example.android.sunshine\_2016.11.17\_18.37.li x com.google.samples.apps.iosched\_2016.11.18\_07.14.li x

**LinearLayout**

- ViewStub
- FrameLayout
  - FitWindowsLinearLayout
    - ViewStubCompat
    - ContentFrameLayout
      - CoordinatorLayout
        - AppBarLayout
          - CollapsingToolbarLayout
            - AspectRatioView
              - AppCompatActivity
                - AppCompatActivity Watch
          - LinearLayout
            - Toolbar
              - ImageButton *Close and go back*
              - ActionMenuView
                - ActionMenuItemView *Map*
                - ActionMenuItemView *Share*
              - AppCompatActivity *What's new in Android development t*

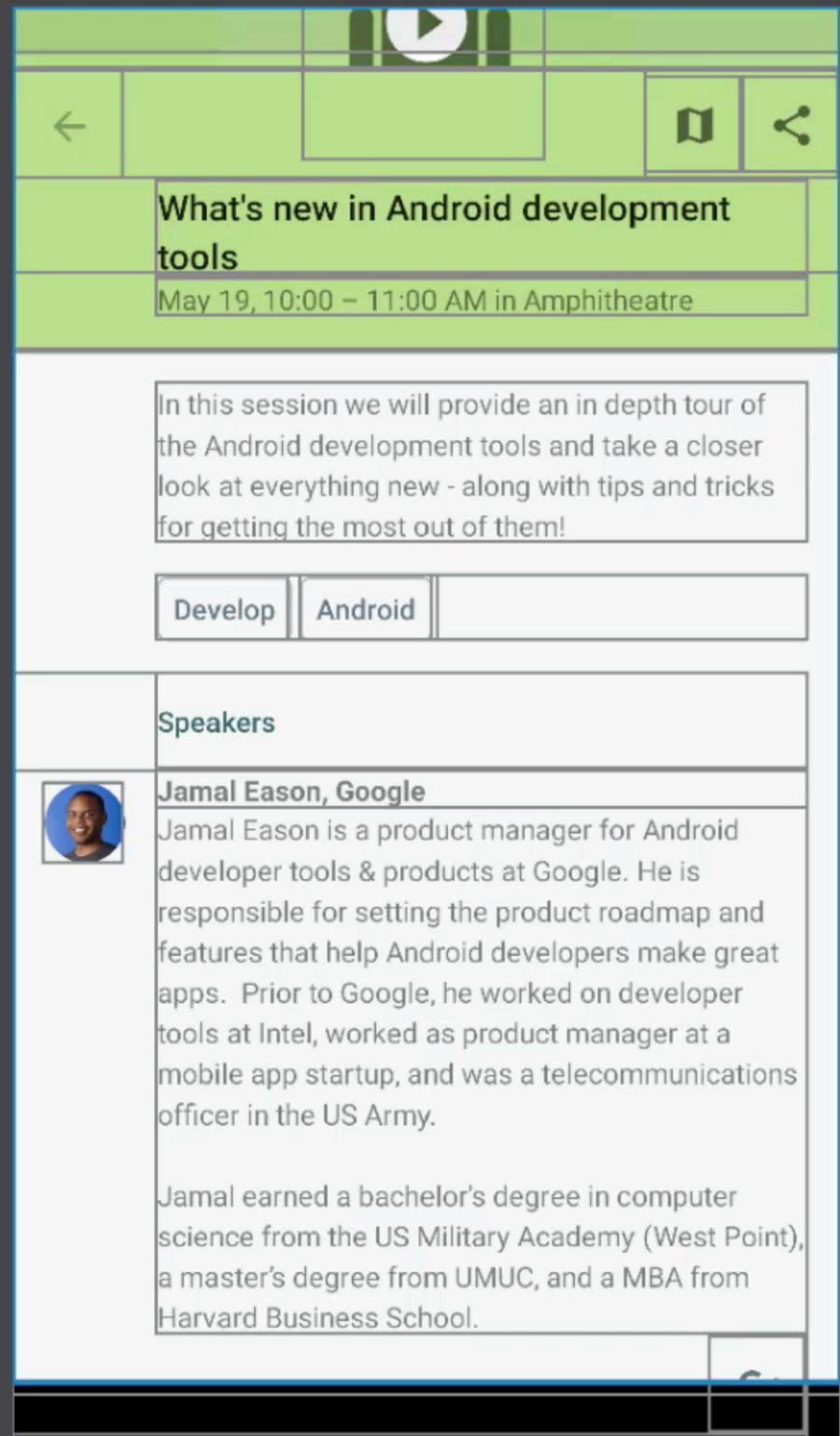
Property Value

mGroupFlags...	0x1
mGroupFlags...	0x2
mGroupFlags	0x224053
bg_	null
fg_	null
mID	NO_ID
mPrivateFlags...	0x20
mPrivateFlags	0x10088B0
mSystemUiVis...	0x0
mSystemUiVis...	0x0
mViewFlags	0x18000882
getFilterTouc...	false
getFitsSystem...	true
getScrollBarSt...	INSIDE_OVER...
getTag()	null
getTransition...	null
getVisibility()	VISIBLE
isActivated()	false
isClickable()	false
isEnabled()	true

# Layout Inspector

**Project Structure:**

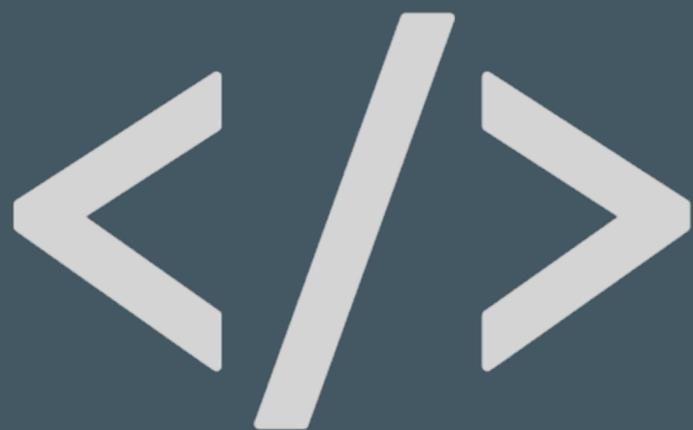
- LinearLayout
  - ViewStub
- FrameLayout
  - FitWindowsLinearLayout
    - ViewStubCompat
  - ContentFrameLayout
    - CoordinatorLayout
      - AppBarLayout
        - CollapsingToolbarLayout
          - AspectRatioView
            - AppCompatActivity
              - AppCompatActivity Watch
        - LinearLayout
          - Toolbar
            - ImageButton *Close and go back*
          - ActionMenuView
            - ActionMenuItemView *Map*
            - ActionMenuItemView *Share*
    - AppCompatActivity *What's new in Android development t*
    - AppCompatActivity *May 19, 10:00 - 11:00 AM in Amphit*
  - NestedScrollView
    - LinearLayout
      - MessageCardView
      - AppCompatActivity
      - AppCompatActivity *In this session we will provide an in d*
      - AppCompatActivity *Live streamed*



Property	Value
mGroupFlags...	0x1
mGroupFlags...	0x2
mGroupFlags	0x224053
bg_	null
fg_	null
mID	NO_ID
mPrivateFlags...	0x20
mPrivateFlags	0x10088B0
mSystemUiVis...	0x0
mSystemUiVis...	0x0
mViewFlags	0x18000882
getFilterTouc...	false
getFitsSystem...	true
getScrollBarSt...	INSIDE_OVER...
getTag()	null
getTransition...	null
getVisibility()	VISIBLE
isActivated()	false
isClickable()	false
isEnabled()	true
isFocusableIn...	false
isHapticFeed...	true
isHovered()	false
isInTouchMod...	true
isPressed()	false
isSelected()	false
isSoundEffect...	true
getContentDe...	null



Design



Develop



Build



Test

# Firebase

Easy Access to Firebase Resources

A screenshot of an IDE (Android Studio) showing the project structure on the left and the Assistant panel on the right. The Assistant panel displays the Firebase logo and a list of services with brief descriptions and "More info" links. The project structure shows a Java package structure for an Android app, with "AppData1" selected in the Project view.

android-topeka app src main java com google samples apps topeka AppData1

Android Assistant

Project Structure Captures Favorites

app

- manifests
- java
  - android.support.test.espresso
  - com.google.samples.apps.t...
    - activity
    - adapter
    - fragment
    - helper
    - model
    - persistence
    - widget
  - AppData1
  - AppData2
  - EditorDemo
  - com.google.samples.apps.t...
  - com.google.samples.apps.t...
- res
  - animator
  - drawable
  - layout
    - activity\_category\_select
    - activity\_quiz.xml
    - activity\_sign\_in.xml
    - answer\_submit.xml
    - fab\_done.xml
    - fragment\_categories.xml
    - fragment\_quiz.xml
    - fragment\_sign\_in.xml (2)
    - item\_answer.xml
    - item\_answer\_start.xml
    - item\_avatar.xml
    - item\_category.xml
    - item\_scorecard.xml
    - question.xml

Assistant

**Firebase**

Firebase gives you the tools and infrastructure from Google to help you develop, grow and earn money from your app. [Learn more](#)

- Analytics**  
Measure user activity and engagement with free, easy, and unlimited analytics. [More info](#)
- Cloud Messaging**  
Deliver and receive messages and notifications reliably across cloud and device. [More info](#)
- Authentication**  
Sign in and manage users with ease, accepting emails, Google Sign-In, Facebook and other login providers. [More info](#)
- Realtime Database**  
Store and sync data in realtime across all connected clients. [More info](#)
- Storage**  
Store and retrieve large files like images, audio, and video without writing server-side code. [More info](#)
- Remote Config**  
Customize and experiment with app behavior using cloud-based configuration parameters. [More info](#)
- Test Lab**  
Test your apps against a wide range of physical devices hosted in Google's cloud. [More info](#)
- Crash Reporting**  
Get actionable insights and reports on app crashes, ANRs or other errors. [More info](#)
- Notifications**  
Send targeted notifications to engage the right users at the right time. [More info](#)

# Sample Browser

Quick search for relevant sample code

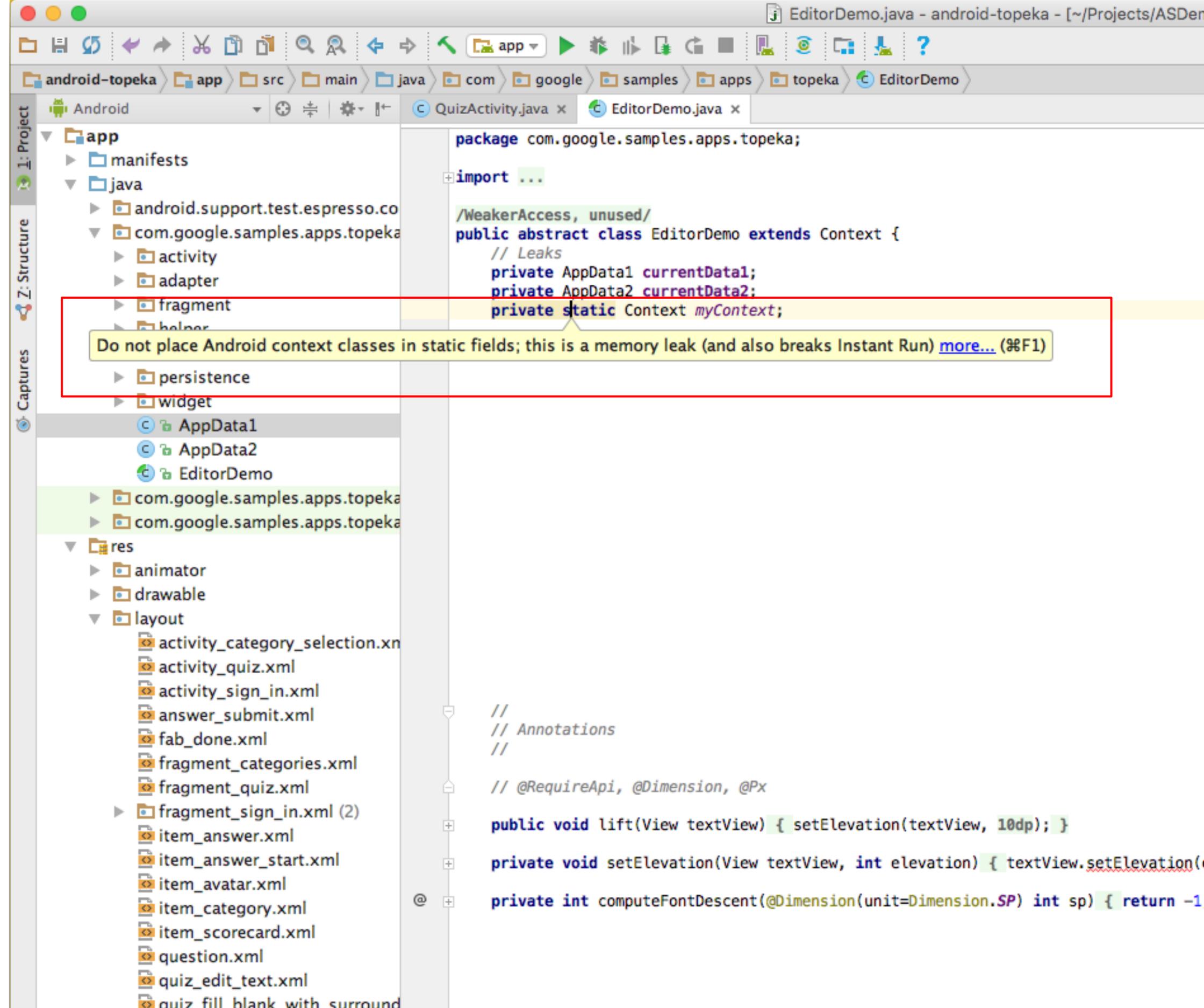
The screenshot shows an IDE interface with the following components:

- Project Structure:** A tree view on the left showing the project hierarchy: `app` (manifests, java, res), `com.google.samples.apps.topeka` (activity, adapter, fragment, helper, model, persistence, widget, AppData1, AppData2, EditorDemo), and `res` (animator, drawable, layout).
- Main Editor:** Displays the `QuizActivity.java` file. The class declaration `public class QuizActivity extends AppCompatActivity {` is highlighted. A context menu is open over this line, with `Find Sample Code` selected. Other menu items include Cut, Copy, Paste, Refactor, etc.
- Find Sample Code Panel:** Located at the bottom, it shows search results for the symbol `android.support.v7.app.AppCompatActivity`. It lists 63 results, including:
  - `android.support.v7.app.AppCompatActivity`
  - Found results (63 results)**
    - Android Developers**
      - `google/iosched`
        - `LUtils.java (10 results)`
        - `BaseActivity.java (1 result)`
        - `WelcomeActivity.java (1 result)`
        - `SessionDetailFragment.java (1 result)`
      - `googlemaps/android-samples`
        - `TileOverlayDemoActivity.java (1 result)`
        - `MarkerDemoActivity.java (1 result)`
        - `CircleDemoActivity.java (1 result)`
        - `PermissionsUtils.java (1 result)`



# Enhanced Code Analysis

New code quality checks





Design



Develop



Build



Test

# Instant Run

5554:Nexus\_6P\_API\_23

ScrollingActivity.java - DesignDemo - [~/Documents/DesignDemo]

ScrollingActivity.java x marshmallow\_431.png x activity\_scrolling.xml x

```
14 @Override
15 protected void onCreate(Bundle savedInstanceState) {
16     super.onCreate(savedInstanceState);
17     setContentView(R.layout.activity_scrolling);
18     Toolbar toolbar = (Toolbar) findViewById(R.id.toolbar);
19     setSupportActionBar(toolbar);
20
21     FloatingActionButton fab = (FloatingActionButton) findViewById(R.id.fab);
22     fab.setOnClickListener(new View.OnClickListener() {
23         @Override
24         public void onClick(View view) {
25             Snackbar.make(view, "Replace with your own action", Snackbar.LENGTH_LONG)
26                 .setAction("Action", null).show();
27         }
28     });
29
30
31 @Override
32 public boolean onCreateOptionsMenu(Menu menu) {
33     // Inflate the menu; this adds items to the menu list.
34     getMenuInflater().inflate(R.menu.menu_scrolling, menu);
35     return true;
36 }
37
```

Marshmallow

(650) 555-1234  
Mobile

(323) 555-6789  
Work

ali@example.com  
Personal

Applied code changes without activity restart

(650) 555-1234  
Mobile

onOptionsItemSelected(M...  
tion bar item clicks h...  
ly handle clicks on...  
fy a parent activit...  
ItemId());  
if (...  
plifiableIfState...  
ion\_settings) {

Gradle build finished in 1s 130ms

26:43



Hot  
Swap

Warm  
Swap

Cold  
Swap



# Instant Run: Benchmark

---

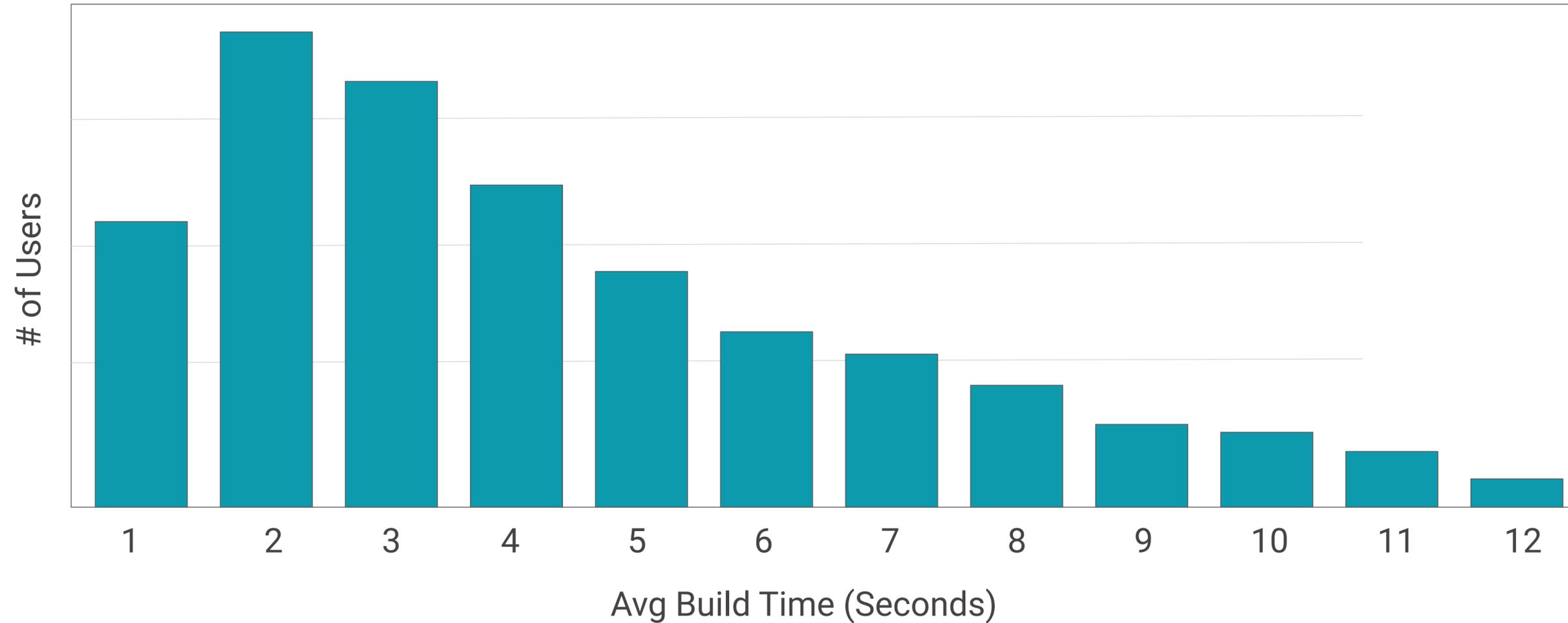
Version Build Type	Mean (seconds)	StdDev	Delta
<b>2.0</b> Instant Run Disabled	45.02	0.78	n/a
<b>2.1</b> Cold Swap	9.46	0.56	<b>4.7X faster</b>
<b>2.1</b> Hot Swap	4.20	0.70	<b>10.7X faster</b>

---

@Github: [wikimedia/apps-android-wikipedia](https://github.com/wikimedia/apps-android-wikipedia)

# Instant Run: Average Build Time per User

---



---

Android Studio opted-in user IDE instrumentation, May 2016

# Instant Run

Build

Speed

Enhancements

New AAPT

Split APK



Google Developer Day

# Project Structure Dialog

The screenshot displays the Project Structure dialog for an Android project. The 'Dependencies' tab is active, showing a list of dependencies for the 'app' module. The dependency 'appcompat-v7:23.3.0' is selected. The right pane shows the details for this dependency, including its Group ID (com.android.support) and Artifact Name (appcompat-v7). It also displays an update notification for a newer version (23.4.0) available from the Android SDK.

**Project Structure**

Modules: <All Modules>, app

All Dependencies:

- cardview-v7:23.2.1
- constraint-layout:1.0.0-alpha1
- design:23.3.0
- ▶ appcompat-v7:23.3.0**
- recyclerview-v7:23.3.0
  - support-annotations:23.3.0
  - support-v4:23.3.0

**Details**

Group ID: com.android.support  
Artifact Name: appcompat-v7

**Information (1 item)**

- [appcompat-v7:23.2.1](#) (app): Gradle promoted version from 23.2.1 to 23.3.0

**Update (1 item)**

- [appcompat-v7:23.2.1](#) (app): Newer version **23.4.0** (Android SDK) [\[Update\]](#)



# Merged Manifest Viewer

The screenshot displays the Merged Manifest Viewer in an IDE. The main window shows the merged AndroidManifest.xml code with various permissions and application settings. The right sidebar lists 'Manifest Sources' and 'Other Manifest Files'.

```
android:name="com.google.samples.apps.iosched.permission.C2D_MESSAGE"
android:protectionLevel="signature" />
<uses-permission
  android:name="com.google.samples.apps.iosched.permission.C2D_MESSAGE" />
<permission
  android:name="com.google.samples.apps.iosched.permission.MAPS_RECEIVE"
  android:protectionLevel="signature" />
<uses-permission
  android:name="com.google.samples.apps.iosched.permission.MAPS_RECEIVE" />
<uses-permission
  android:maxSdkVersion="18"
  android:name="android.permission.READ_EXTERNAL_STORAGE" />
<uses-permission
  android:name="android.permission.ACCESS_NETWORK_STATE" />
<uses-permission
  android:name="android.permission.INTERNET" />
<uses-feature
  android:glEsVersion="0x00020000"
  android:required="true" />
<uses-permission
  android:name="android.permission.WAKE_LOCK" />
<uses-permission
  android:name="com.google.android.c2dm.permission.RECEIVE" />
<application
  android:allowBackup="false"
  android:hardwareAccelerated="true"
  android:icon="@mipmap/ic_launcher"
  android:label="@string/app_name"
  android:name="com.google.samples.apps.iosched.AppApplication"
  android:supportsRtl="true"
  android:theme="@style/Theme.IOSched" >
  <meta-data
    android:name="com.google.android.maps.v2.API_KEY"
    android:value="@string/maps_api_key" />
  <activity
    android:label="@string/app_name"
    android:name="com.google.samples.apps.iosched.explore.ExploreIOActiv:
    android:theme="@style/Theme.IOSched.Light" >
    <intent-filter
      <action
        android:name="android.intent.action.MAIN" />
      <category
        android:name="android.intent.category.LAUNCHER" />
    <intent-filter
      android:label="@string/app_name"
      android:priority="0" >
      <action
```

**Manifest Sources**

- [android main](#) manifest (this file)
- [play-services-basement:8.4.0](#) manifest
- [play-services-gcm:8.4.0](#) manifest
- [play-services-maps:8.4.0](#) manifest
- [play-services-measurement:8.4.0](#) manifest

**Other Manifest Files**  
(Included in merge, but did not contribute any elements)

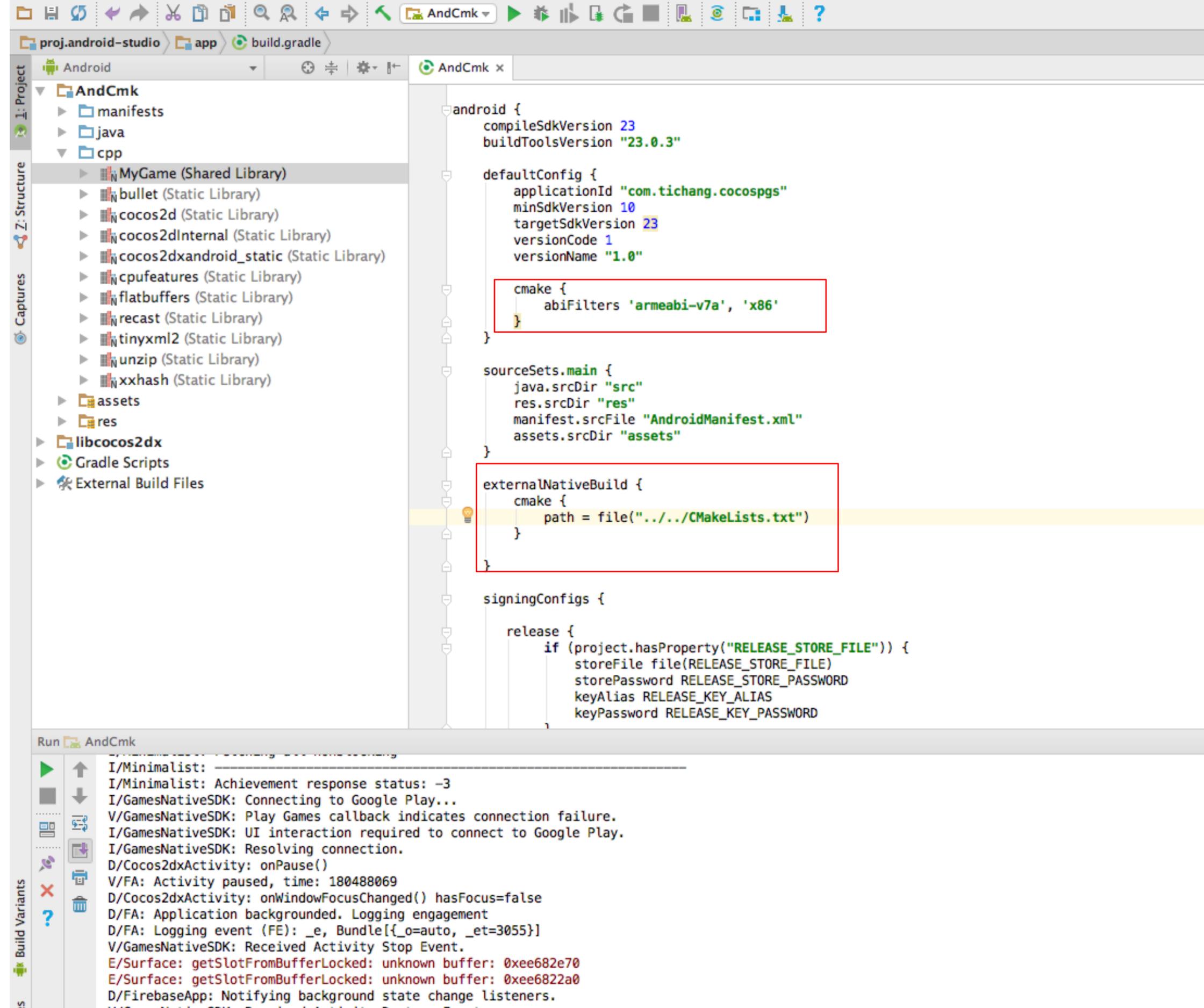
[android-sliding-up-panel-master-8129831576](#): manifest, [constraint-layout:1.0.0-alpha1](#) manifest, [animated-vector-drawable:23.4.0](#) manifest, [appcompat-v7:23.4.0](#) manifest, [cardview-v7:23.4.0](#) manifest, [design:23.4.0](#) manifest, [multidex:1.0.1](#) manifest, [preference-v7:23.4.0](#) manifest, [recyclerview-v7:23.4.0](#) manifest, [support-v13:23.4.0](#) manifest, [support-v4:23.4.0](#) manifest, [support-vector-drawable:23.4.0](#) manifest, [play-services-analytics:8.4.0](#) manifest, [play-services-appindexing:8.4.0](#) manifest, [play-services-base:8.4.0](#) manifest, [play-services-plus:8.4.0](#) manifest, [android-maps-utils:0.3.4](#) manifest



# C++ Support

ndk-build

CMake



The screenshot shows the Android Studio IDE with the following components:

- Project Structure:** A tree view on the left showing the project hierarchy: `proj.android-studio` > `app` > `build.gradle`. Under `AndCmk`, there are folders for `manifests`, `java`, and `cpp`. The `cpp` folder contains a `MyGame (Shared Library)` and several static libraries like `bullet`, `cocos2d`, `recast`, etc.
- Code Editor:** The main editor displays the `build.gradle` file. Two sections are highlighted with red boxes:
  - `cmake { abiFilters 'armeabi-v7a', 'x86' }`
  - `externalNativeBuild { cmake { path = file("../CMakeLists.txt") }`
- Logcat:** The bottom panel shows the log output for the `AndCmk` run. It includes messages from `I/Minimalist`, `I/GamesNativeSDK`, `V/GamesNativeSDK`, `D/Cocos2dxActivity`, and `E/Surface`.



Google Developer Day

# C++ Support

## Native Debugging

The image shows a screenshot of an IDE (likely Android Studio) with the following components:

- Project Structure:** A tree view on the left showing the project hierarchy. The 'cpp' folder is expanded, showing 'main.cpp', 'StateManager.cpp', and 'StateManager.h'. Below it are various static libraries like 'bullet', 'cocos2d', 'recast', etc.
- Code Editor:** The main window displays C++ code for 'main.cpp'. The code includes headers, defines, and a JNIEXPORT void function. A breakpoint is set at the line: `LOGD("Java_com_tichang_cocospgs_AppActivity_nativeInitGPGS");`. The code below this line shows a lambda function for authentication and calls to `StateManager::BeginUserInitiatedSignIn()` and `StateManager::InitServices()`.
- Debugger:** The bottom half of the screen shows the LLDB debugger interface. The 'Frames' pane shows the current stack frame: `main` in `org.cocos2dx.cpp.AppActivity`. The 'Variables' pane shows the current state of `env` and `functions`, including reserved memory and various JNI function pointers.



Design



Develop



Build



Test

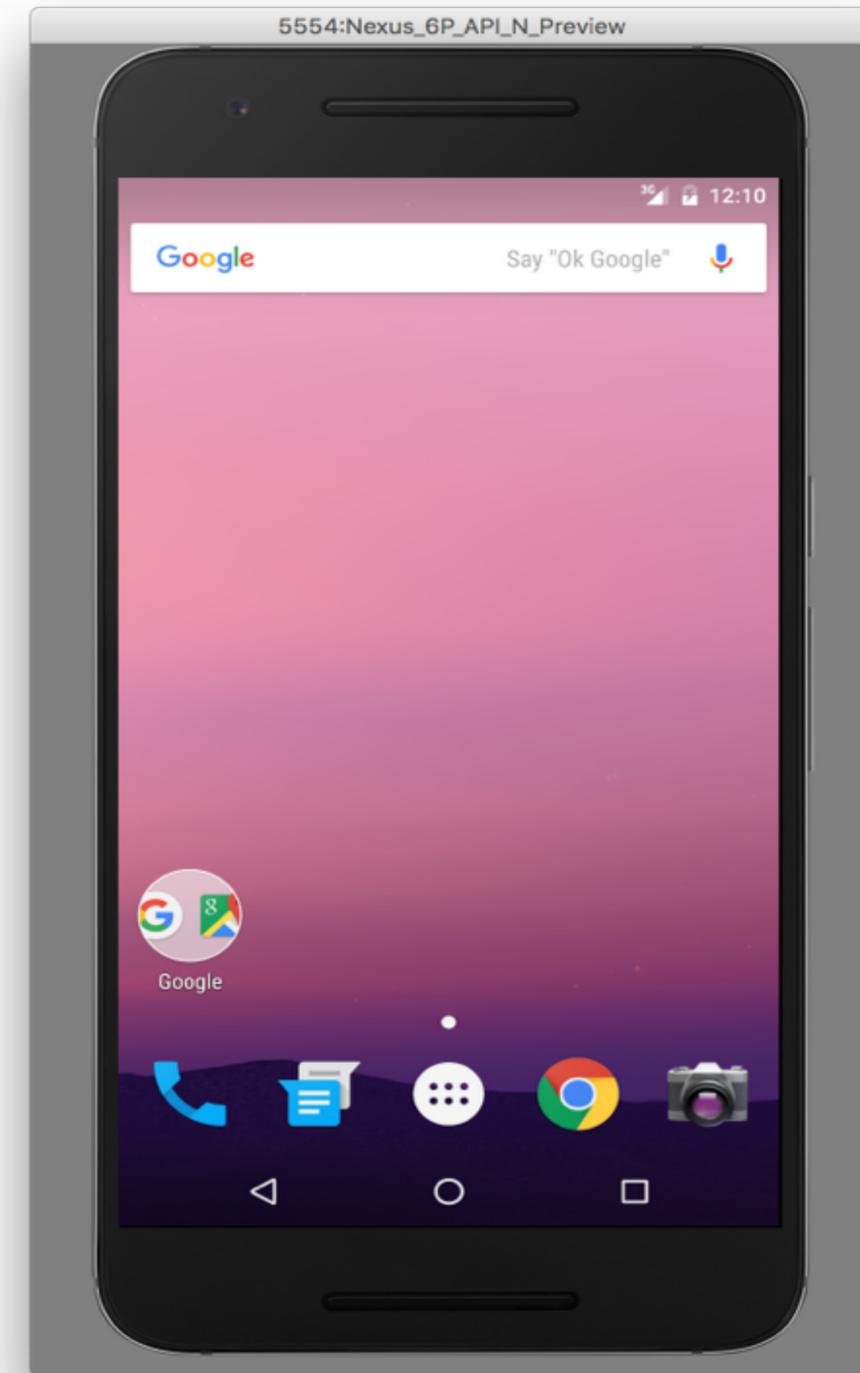
# Android Emulator

Faster than Device

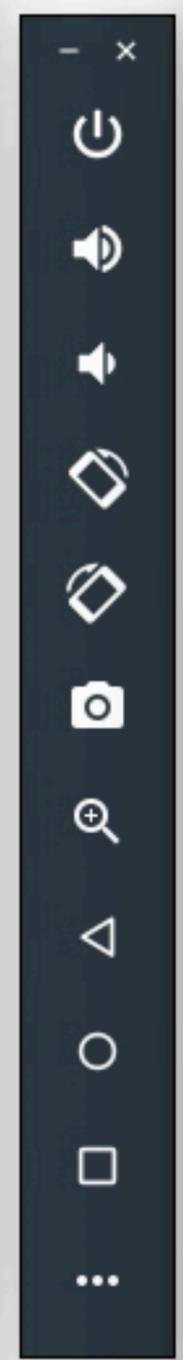
10x fast ADB

Sensor Control

New UI



Google Developer Day



### Extended controls

- Location
- Cellular
- Battery
- Phone
- Directional pad
- Fingerprint
- Virtual sensors**
- Settings
- Help

Accelerometer    Additional sensors



Rotate     Move

Yaw        0.0

Pitch        0.0

Roll        -1.5

Device rotation



Resulting Values

```
Accelerometer (m/s²): -0.00  9.80  0.00
Magnetometer (uT):    23.12  5.90  42.51
Rotation:              ROTATION_0
```



Name

- Custom
- Defaults
  - Sample configuration (12)

- Device (2/16)
- Platform (3/6)
- Locale (1/1)
- Orientation (2/2)

- PHYSICAL**
  - Moto E, Motorola
  - Moto G (1st Gen), Motorola
  - Nexus 7 (2013), ASUS
  - Nexus 9, HTC
  - LG G3, LG
  - Nexus 5, LG**
  - Galaxy Note 3 Duos, Samsung
  - HTC One (M8), HTC
  - Galaxy S4 (3G), Samsung

Tests will run on **12 configurations** and [Cloud Test Lab pricing](#) will apply.



# Firebase Test Lab



# Espresso Test Recorder



Record Your Test

- Tap NavigationMenuItemView with text **Schedule**
- Tap LinearLayout with ID **touch\_area**
- Tap ImageButton with content description **Close and go back**
- Tap LinearLayout
- Tap SquareFrameLayout with position index **2**
- Tap ImageButton with content description **Close and go back**
- Tap ImageButton with content description **Close and go back**
- Tap ImageButton with content description **Navigation Menu**
- Tap TabView with text **May 19**
- Tap NavigationMenuItemView with text **Settings**
- Tap ImageButton with content description **Navigation Menu**
- Tap NavigationMenuItemView with text **About**
- Tap ImageButton with content description **Navigation Menu**
- Tap NavigationMenuItemView with text **Explore**
- Tap FrameLayout with position index **1**

Edit assertion

`com.google.samples.apps.iosched:id/live_streamed_indicator`

text is

Live streamed

Cancel Save Assertion Save and Add Another

What's new in Android development tools

May 19, 10:00 – 11:00 AM in Amphitheatre L

In this session we will provide an in depth to the Android development tools and take a cl look at everything new - along with tips and t for getting the most out of them!

Live streamed

Develop Android

Speakers

**J. Eason, Google**

Jamal Eason is a product manager for Andro developer tools & products at Google. He is responsible for setting the product roadmap features that help Android developers make apps. Prior to Google, he worked on develop tools at Intel, worked as product manager at mobile app startup, and was a telecommunic officer in the US Army.

Jamal earned a bachelor's degree in comput science from the US Military Academy (West a master's degree from UMUC, and a MBA fr Harvard Business School.

# APK Analyzer

Method counts

Ref. counts

The screenshot shows the Android Studio interface with the APK Analyzer open. The top toolbar includes icons for navigation and analysis. The breadcrumb trail shows the path: iosched16 > android > build > outputs > apk > android-normal-release-unsigned.apk. The main window displays the project name 'com.google.samples.apps.iosched (version 4.3.0d)' and the raw file size (4.5 MB) and download size (3.6 MB) of the selected APK. Below this is a table of files with their raw file sizes, download sizes, and percentages of the total download.

File	Raw File Size	Download Size	% of Total Download
classes.dex	5.5 MB	2.2 MB	61.3%
res	1.8 MB	1.2 MB	31.9%
resources.arsc	898.4 KB	218.9 KB	5.9%
assets	83.3 KB	26.3 KB	0.7%
AndroidManifest.xml	24.1 KB	4.8 KB	0.1%
NOTICE_firebase_jvm	2 KB	1 KB	0%
NOTICE_firebase_android	2 KB	1 KB	0%
META-INF	463 B	379 B	0%

Below the file list, a summary states: 'This dex file defines 5418 classes with 34099 methods, and references 42019 methods.' Below this is a table showing the distribution of defined and referenced methods across various packages.

Class	Defined Methods	Referenced Methods
com	25655	25746
google	15625	15670
fasterxml	4954	4973
firebase	2717	2734
bumptech	1590	1596
android	329	330
sothree	189	190
turbomanage	87	87
larvalabs	84	84
jakewharton	80	80
nineoldandroids	0	2
android	12136	14829
java	0	1333
org	0	93
javax	0	10
dalvik	0	1
byte[]	0	1
char[]	0	1
double[]	0	1
float[]	0	1
int[]	0	1
long[]	0	1
boolean[]	0	1



# APK Analyzer

## Resource Lookup

The screenshot displays the Android Studio interface for analyzing an APK. The top toolbar shows various icons for navigation and analysis. The breadcrumb path is: iosched16 > android > build > outputs > apk > android-normal-release-unsigned.apk. The main window shows the project structure for 'com.google.samples.apps.iosched (version 4.3.0d)' with a raw file size of 4.5 MB and a download size of 3.6 MB. A table lists the files and their sizes:

File	Raw File Size	Download Size	% of Total Download
classes.dex	5.5 MB	2.2 MB	61.3%
res	1.8 MB	1.2 MB	31.9%
resources.arsc	898.4 KB	218.9 KB	5.9%
assets	83.3 KB	26.3 KB	0.7%
AndroidManifest.xml	24.1 KB	4.8 KB	0.1%
NOTICE_firebase_jvm	2 KB	1 KB	0%
NOTICE_firebase_android	2 KB	1 KB	0%
META-INF	463 B	379 B	0%

Below the file list, the 'Package' is set to 'com.google.samples.apps.iosched'. The 'Resource Types' section shows a list of resource categories on the left and a table of 350 ID resources across 1 configuration on the right. The 'id' resource type is selected, showing a list of IDs and their corresponding names and default values.

Resource Type	ID	Name	default
drawable	0x7f130000	action_bar_activity_content	
mipmap	0x7f130001	action_bar_spinner	
layout	0x7f130002	action_menu_divider	
anim	0x7f130003	action_menu_presenter	
animator	0x7f130004	home	
transition	0x7f130005	item_touch_helper_previous_elevati...	
xml	0x7f130006	myschedule_generation_tagkey	
raw	0x7f130007	myschedule_listview_day1	
string	0x7f130008	myschedule_listview_day2	
plurals	0x7f130009	myschedule_listview_preconference...	
bool	0x7f13000a	myschedule_uri_tagkey	
dimen	0x7f13000b	myschedule_viewtype_tagkey	
style	0x7f13000c	progress_circular	
integer	0x7f13000d	progress_horizontal	
fraction	0x7f13000e	split_action_bar	
array	0x7f13000f	tag_person_id	
color	0x7f130010	tag_person_name	
id	0x7f130011	tag_person_note	
menu	0x7f130012	text	
	0x7f130013	up	
	0x7f130014	view_offset_helper	
	0x7f130015	listMode	false
	0x7f130016	normal	false
	0x7f130017	tabMode	false
	0x7f130018	disableHome	false
	0x7f130019	homeAsUp	false
	0x7f13001a	none	false
	0x7f13001b	showCustom	false

# GPU Debugger

Troubleshooting 3D Graphics

iosched16 > android > build > outputs > apk > android-normal-release-unsigned.apk

android-normal-release-unsigned.apk x

com.google.samples.apps.iosched (version 4.3.0d)

Raw File Size: 4.5 MB, Download Size: 3.6 MB

File	Raw File Size	Download Size	% of Total Download
classes.dex	5.5 MB	2.2 MB	61.3%
res	1.8 MB	1.2 MB	31.9%
resources.arsc	898.4 KB	218.9 KB	5.9%
assets	83.3 KB	26.3 KB	0.7%
AndroidManifest.xml	24.1 KB	4.8 KB	0.1%
NOTICE_firebase_jvm	2 KB	1 KB	0%
NOTICE_firebase_android	2 KB	1 KB	0%
META-INF	463 B	379 B	0%

Package: com.google.samples.apps.iosched

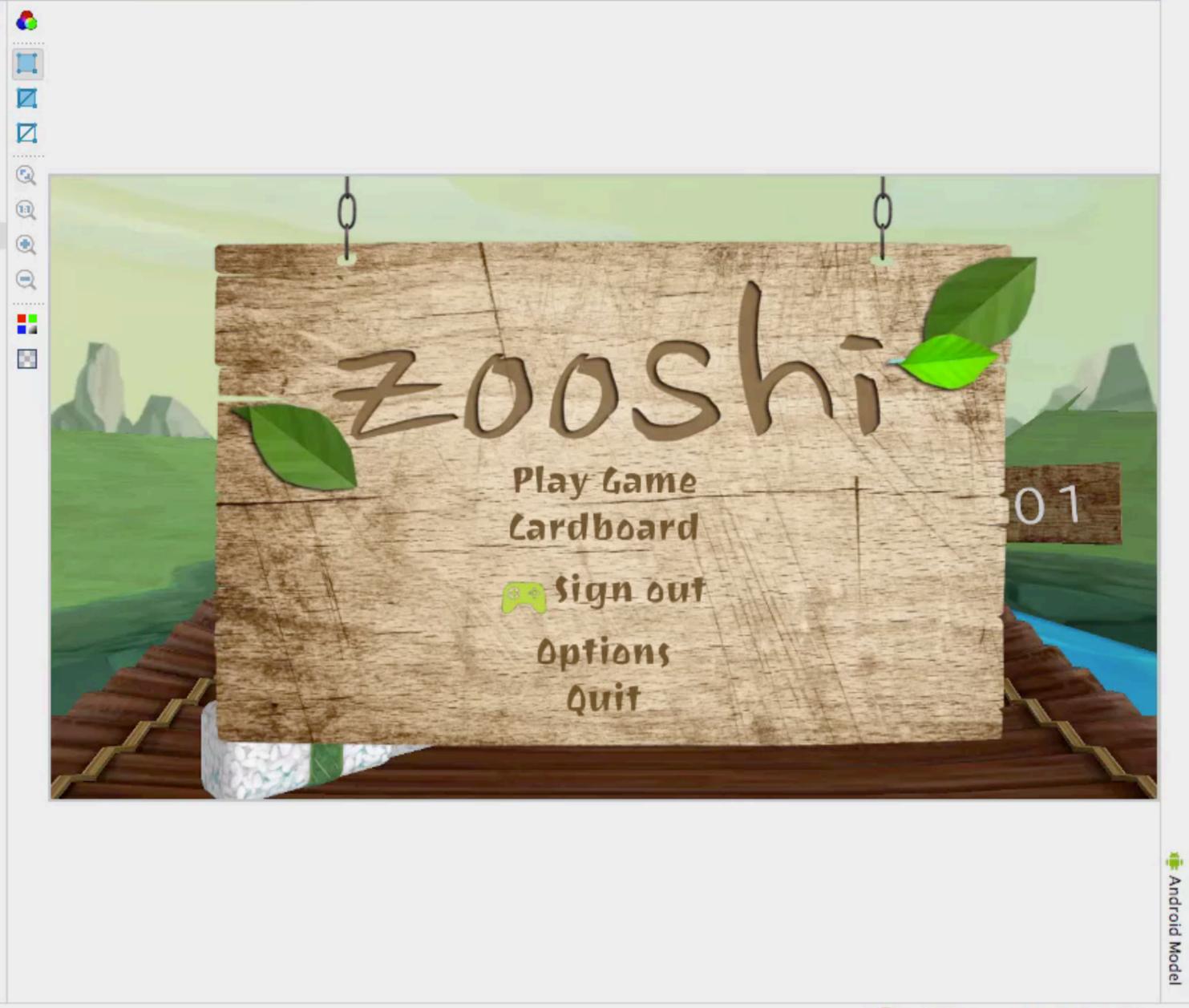
Resource Types: There are 350 id resources across 1 configuration

Resource Type	ID	Name	default
drawable	0x7f130000	action_bar_activity_content	
mipmap	0x7f130001	action_bar_spinner	
layout	0x7f130002	action_menu_divider	
anim	0x7f130003	action_menu_presenter	
animator	0x7f130004	home	
transition	0x7f130005	item_touch_helper_previous_elevati...	
xml	0x7f130006	myschedule_generation_tagkey	
raw	0x7f130007	myschedule_listview_day1	
string	0x7f130008	myschedule_listview_day2	
plurals	0x7f130009	myschedule_listview_preconference...	
bool	0x7f13000a	myschedule_uri_tagkey	
dimen	0x7f13000b	myschedule_viewtype_tagkey	
style	0x7f13000c	progress_circular	
integer	0x7f13000d	progress_horizontal	
fraction	0x7f13000e	split_action_bar	
array	0x7f13000f	tag_person_id	
color	0x7f130010	tag_person_name	
id	0x7f130011	tag_person_note	
menu	0x7f130012	text	
	0x7f130013	up	
	0x7f130014	view_offset_helper	
	0x7f130015	listMode	false
	0x7f130016	normal	false
	0x7f130017	tabMode	false
	0x7f130018	disableHome	false
	0x7f130019	homeAsUp	false
	0x7f13001a	none	false
	0x7f13001b	showCustom	false



Regex

- ▶ 2174: Draw 11 (14 Commands)
- ▶ 2188: Draw 12 (17 Commands)
- ▶ 2205: Draw 13 (17 Commands)
- ▶ 2222: Draw 14 (17 Commands)
- 2239: glDisableVertexAttribArray(Location:0)
- 2240: glDisableVertexAttribArray(Location:3)
- 2241: eglSwapBuffers(Display:0x00000001, Surface:0xe7241720)->1
- ▼ 2242: Frame 2 (1116 Commands)
  - ▶ 2242: Draw 0 (117 Commands)
  - ▶ 2359: Draw 1 (21 Commands)
  - ▶ 2380: Draw 2 (21 Commands)
  - ▶ 2401: Draw 3 (21 Commands)
  - ▶ 2422: Draw 4 (26 Commands)
  - ▶ 2448: Draw 5 (28 Commands)
  - ▶ 2476: Draw 6 (23 Commands)
  - ▶ 2499: Draw 7 (26 Commands)
  - ▶ 2525: Draw 8 (28 Commands)
  - ▶ 2553: Draw 9 (23 Commands)
  - ▶ 2576: Draw 10 (21 Commands)
  - ▶ 2597: Draw 11 (26 Commands)
  - ▶ 2623: Draw 12 (23 Commands)
  - ▶ 2646: Draw 13 (21 Commands)
  - ▶ 2667: Draw 14 (21 Commands)
  - ▶ 2688: Draw 15 (21 Commands)
  - ▶ 2709: Draw 16 (21 Commands)
  - ▶ 2730: Draw 17 (21 Commands)
  - ▶ 2751: Draw 18 (23 Commands)
  - ▶ 2774: Draw 19 (25 Commands)
  - ▶ 2799: Draw 20 (24 Commands)
  - ▶ 2823: Draw 21 (24 Commands)
  - ▶ 2847: Draw 22 (25 Commands)
  - ▶ 2872: Draw 23 (24 Commands)
  - ▶ 2896: Draw 24 (25 Commands)
  - ▶ 2921: Draw 25 (24 Commands)
  - ▶ 2945: Draw 26 (24 Commands)
  - ▶ 2969: Draw 27 (25 Commands)
  - ▶ 2994: Draw 28 (24 Commands)



## Design

Layout Editor  
Constraint  
Layout  
Layout Inspector

## Develop

Firestore  
Sample Search  
Enhanced Lint  
Analysis  
IntelliJ 2016.1  
Accessibility

## Build

Instant Run  
Project Structure  
Jack Compiler  
C++: NDK &  
CMake Build

## Test

Android Emulator  
Firebase Test Lab  
Espresso Test  
Recorder  
APK Analyzer

Android Studio 2.2



# **Android Studio 2.3**



# Android Studio 2.3

IntelliJ Idea 2016.2

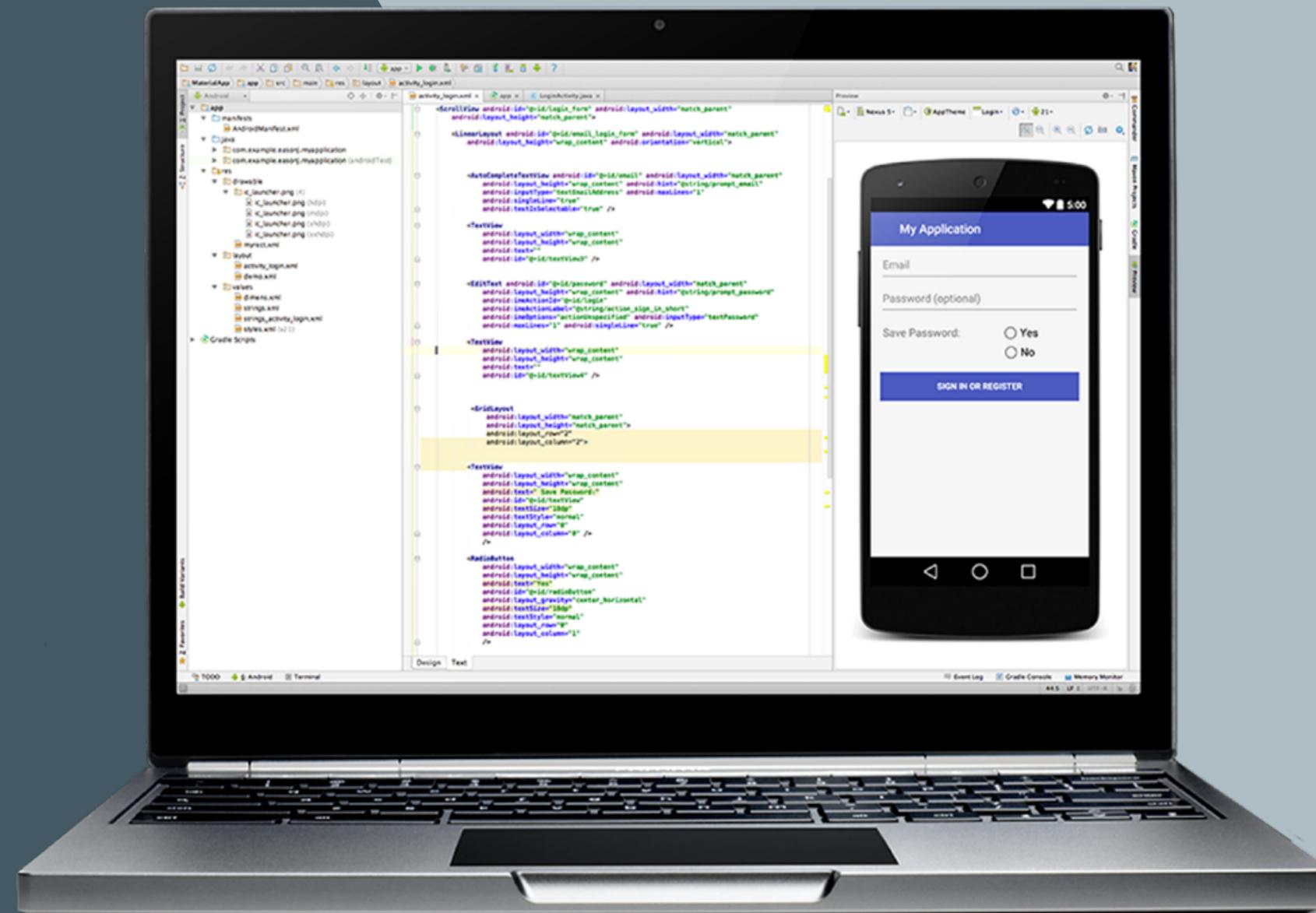
Constraint Layout: Chains and Ratios support

New Lint checks + baseline support

PNG to WebP converter

Data Binding generated code debugging

Incremental SDK Updates



# IntelliJ Idea 2016.2

Background Images

Font Ligatures

Improved Version Control

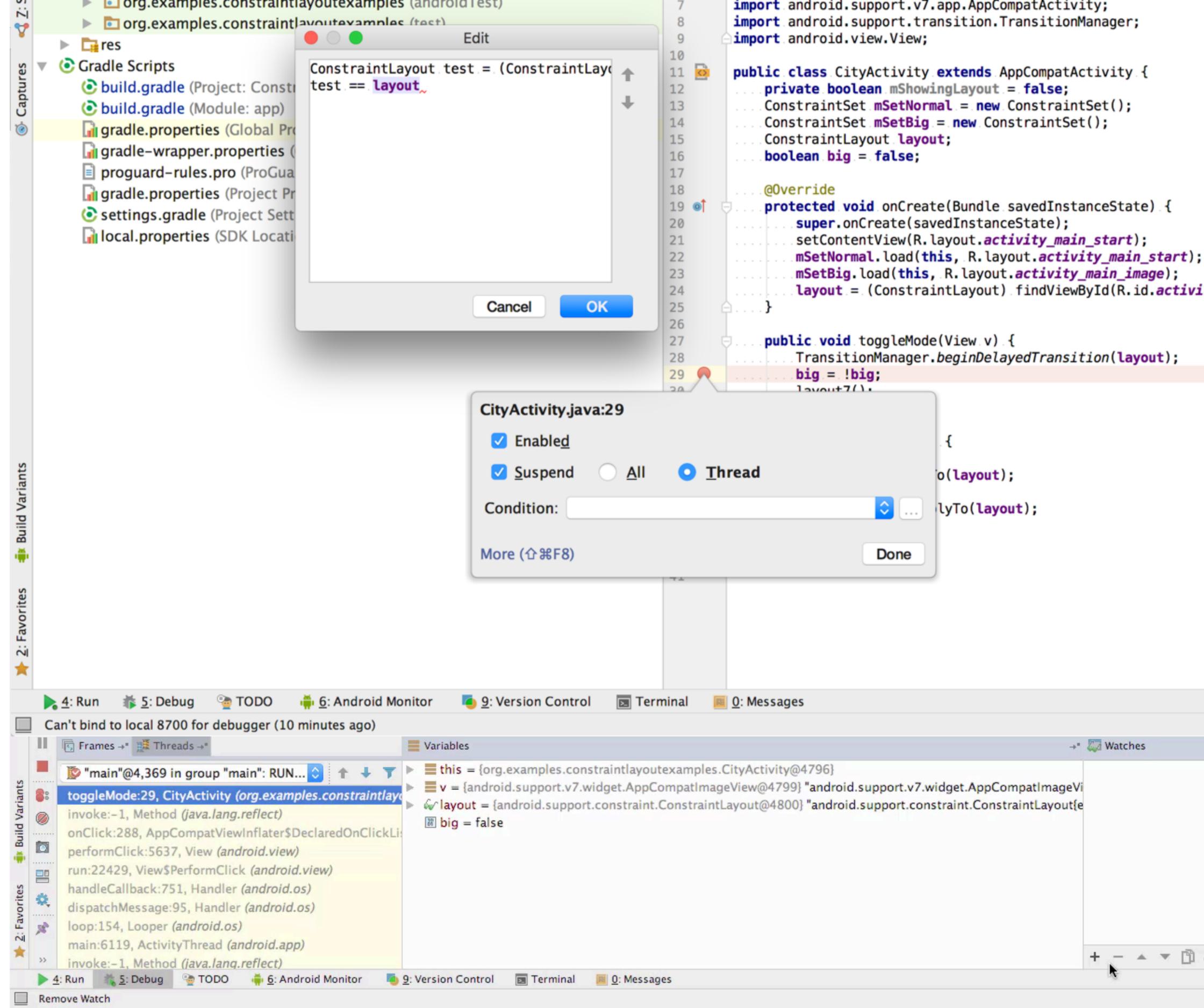
Log View

Multiline Breakpoint

Expressions

Merged Watch/Variables

And more!



```
ConstraintLayoutExamples > app > src > main > java > org > examples > constraintlayoutexamples > CityActivity
Android | Project Files | Problems | Production | Tests | activity_main_start.xml | activity_main_image.xml | activity_main_done.xml | CityActivity.java | ConstraintLayoutExamples | app
Project Structure
  app
  manifests
  java
  org.examples.constraintlayoutexamples
  CityActivity
  MainActivity
  org.examples.constraintlayoutexamples (androidTest)
  org.examples.constraintlayoutexamples (test)
  res
  Gradle Scripts
  build.gradle (Project: ConstraintLayoutExamples)
  build.gradle (Module: app)
  gradle.properties (Global Properties)
  gradle-wrapper.properties (Gradle Version)
  proguard-rules.pro (ProGuard Rules for app)
  gradle.properties (Project Properties)
  settings.gradle (Project Settings)
  local.properties (SDK Location)

CityActivity toggleMode()
5 import android.support.constraint.ConstraintLayout;
6 import android.support.constraint.ConstraintSet;
7 import android.support.v7.app.AppCompatActivity;
8 import android.support.transition.TransitionManager;
9 import android.view.View;
10
11 public class CityActivity extends AppCompatActivity {
12     private boolean mShowingLayout = false; mShowingLayout: false
13     ConstraintSet mSetNormal = new ConstraintSet(); mSetNormal: android.support.constraint.ConstraintSet@4806
14     ConstraintSet mSetBig = new ConstraintSet(); mSetBig: android.support.constraint.ConstraintSet@4805
15     ConstraintLayout layout; layout: "android.support.constraint.ConstraintLayout{e5fedb1 V.E..... 0,0-1080,1584 #7f0b005d app:id/activity_main}"
16     boolean big = false; big: false
17
18     @Override
19     protected void onCreate(Bundle savedInstanceState) {
20         super.onCreate(savedInstanceState);
21         setContentView(R.layout.activity_main_start);
22         mSetNormal.load(this, R.layout.activity_main_start);
23         mSetBig.load(this, R.layout.activity_main_image);
24         layout = (ConstraintLayout) findViewById(R.id.activity_main);
25     }
26
27     public void toggleMode(View v) { v: "android.support.v7.widget.AppCompatImageView{a330e17 V.ED..C.. ...P.... 0,0-1080,394 #7f0b0071 app:id/imageView2}"
28         TransitionManager.beginDelayedTransition(layout); layout: "android.support.constraint.ConstraintLayout{e5fedb1 V.E..... 0,0-1080,1584 #7f0b005d app:id/activity_main}"
29         big = !big; big: false
30         layout7();
31     }
32
33     private void layout7() {
34         if (big) {
35             mSetBig.applyTo(layout);
36         } else {
37             mSetNormal.applyTo(layout);
38         }
39     }
40 }
41
```

Debug app

Debugger Console

Frames → Threads →

Variables

- this = {org.examples.constraintlayoutexamples.CityActivity@4796}
- v = {android.support.v7.widget.AppCompatImageView@4799} "android.support.v7.widget.AppCompatImageView{a330e17 V.ED..C.. ...P.... 0,0-1080,394 #7f0b0071 app:id/imageView2}"
- layout = {android.support.constraint.ConstraintLayout@4800} "android.support.constraint.ConstraintLayout{e5fedb1 V.E..... 0,0-1080,1584 #7f0b005d app:id/activity\_main}"
- big = false

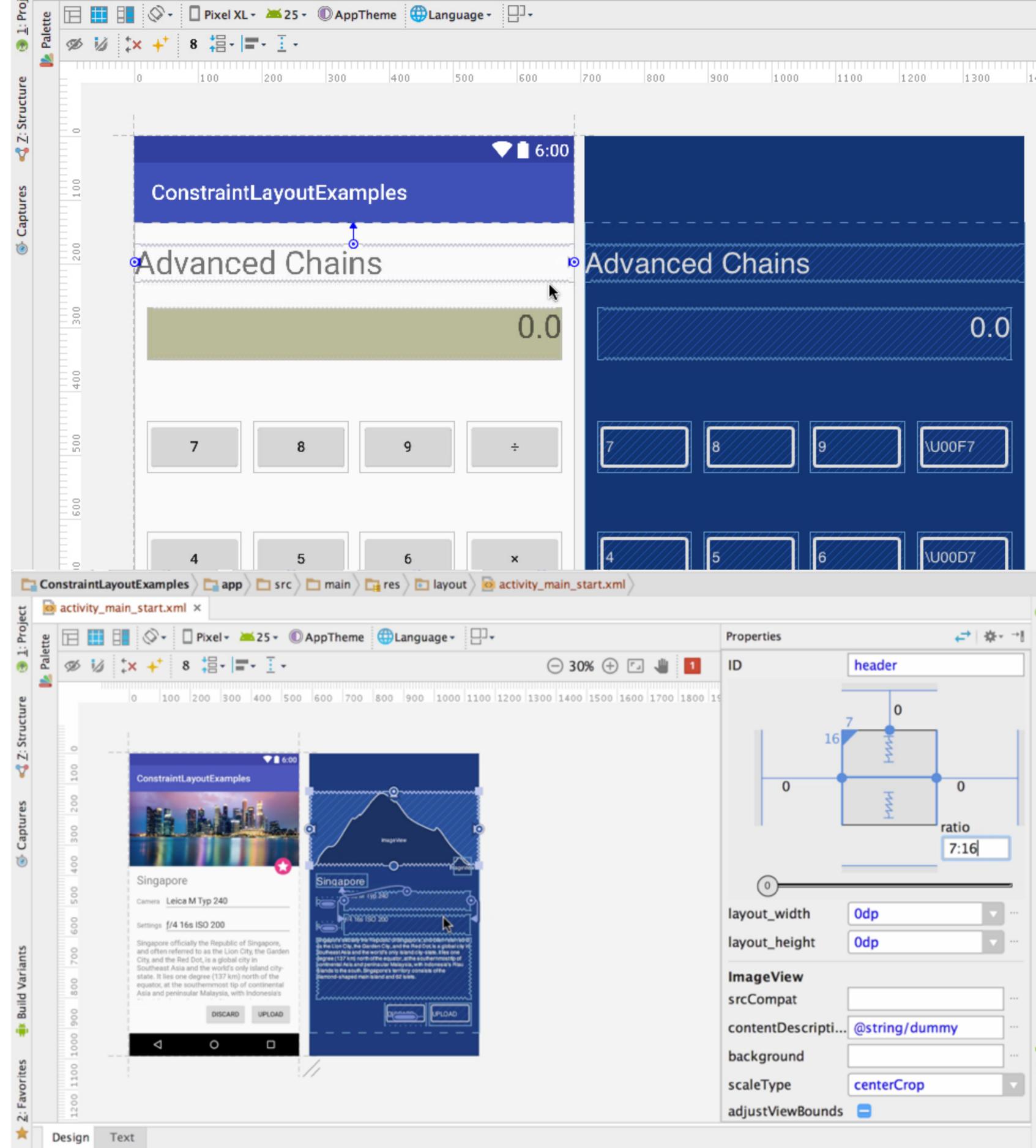
Watches: No watches

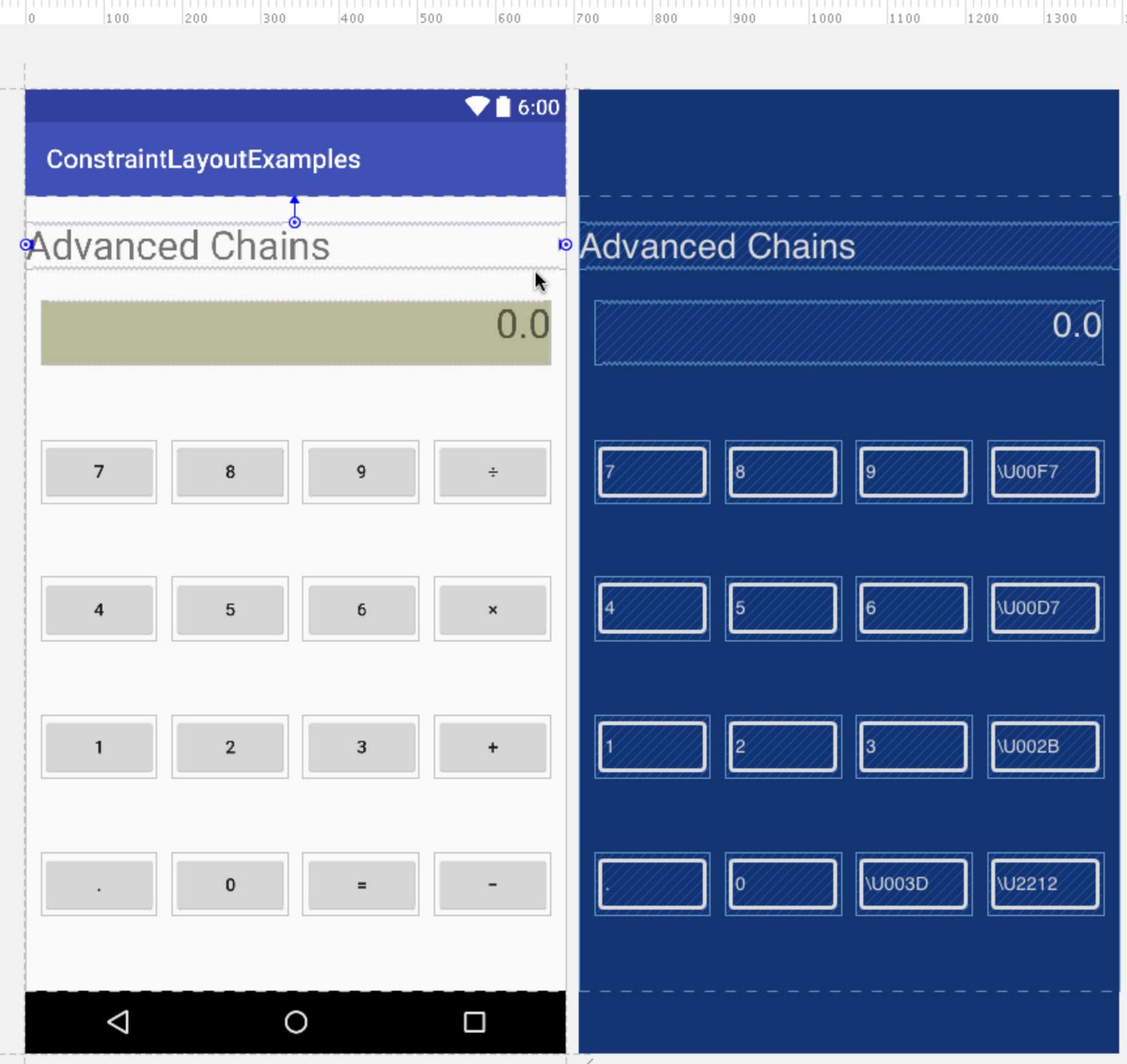
Event Log | Gradle Console

1:16 LF UTF-8 Git: master Context: <no context>

# Constraint Layout

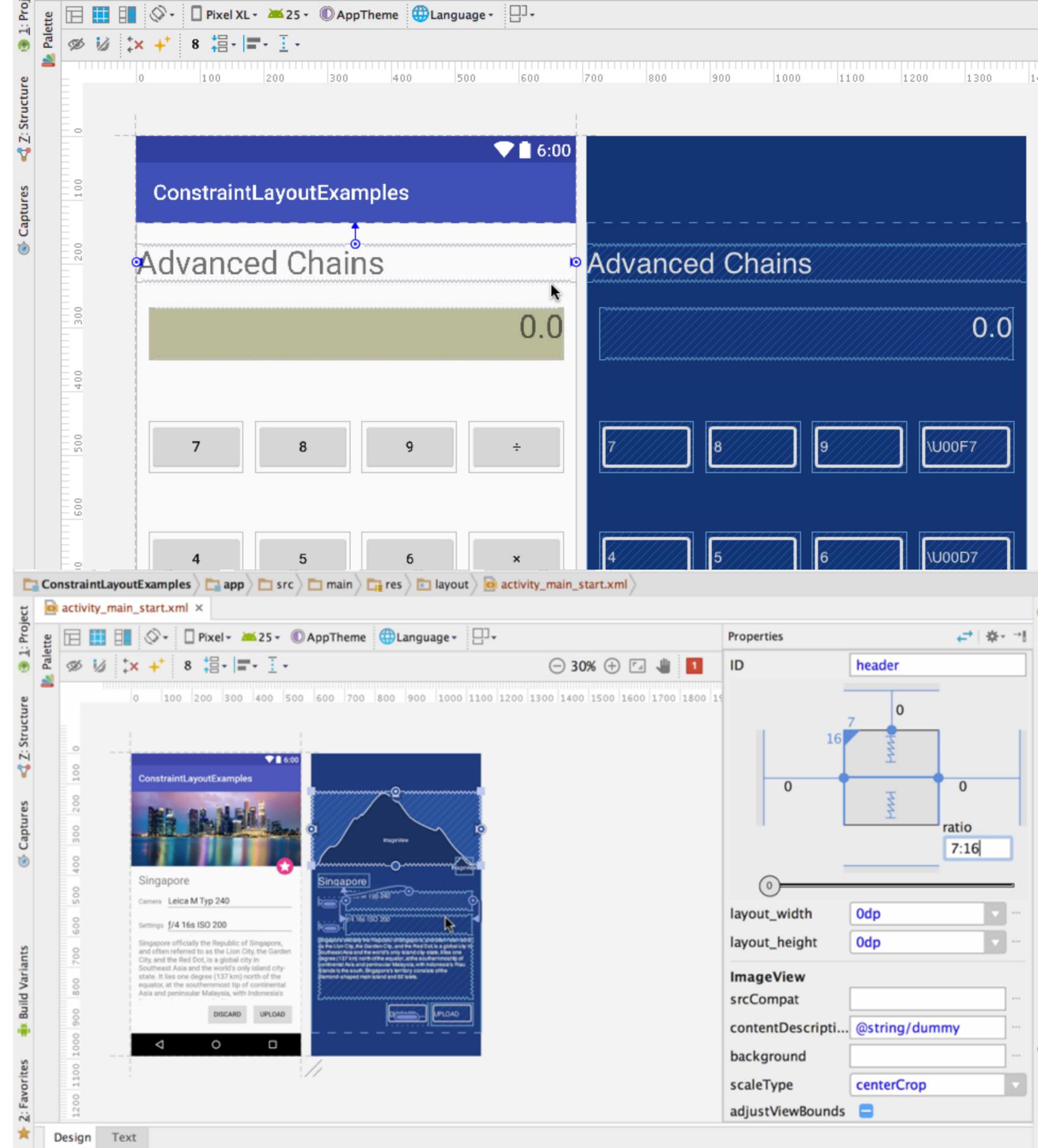
## Chains and Ratios Support

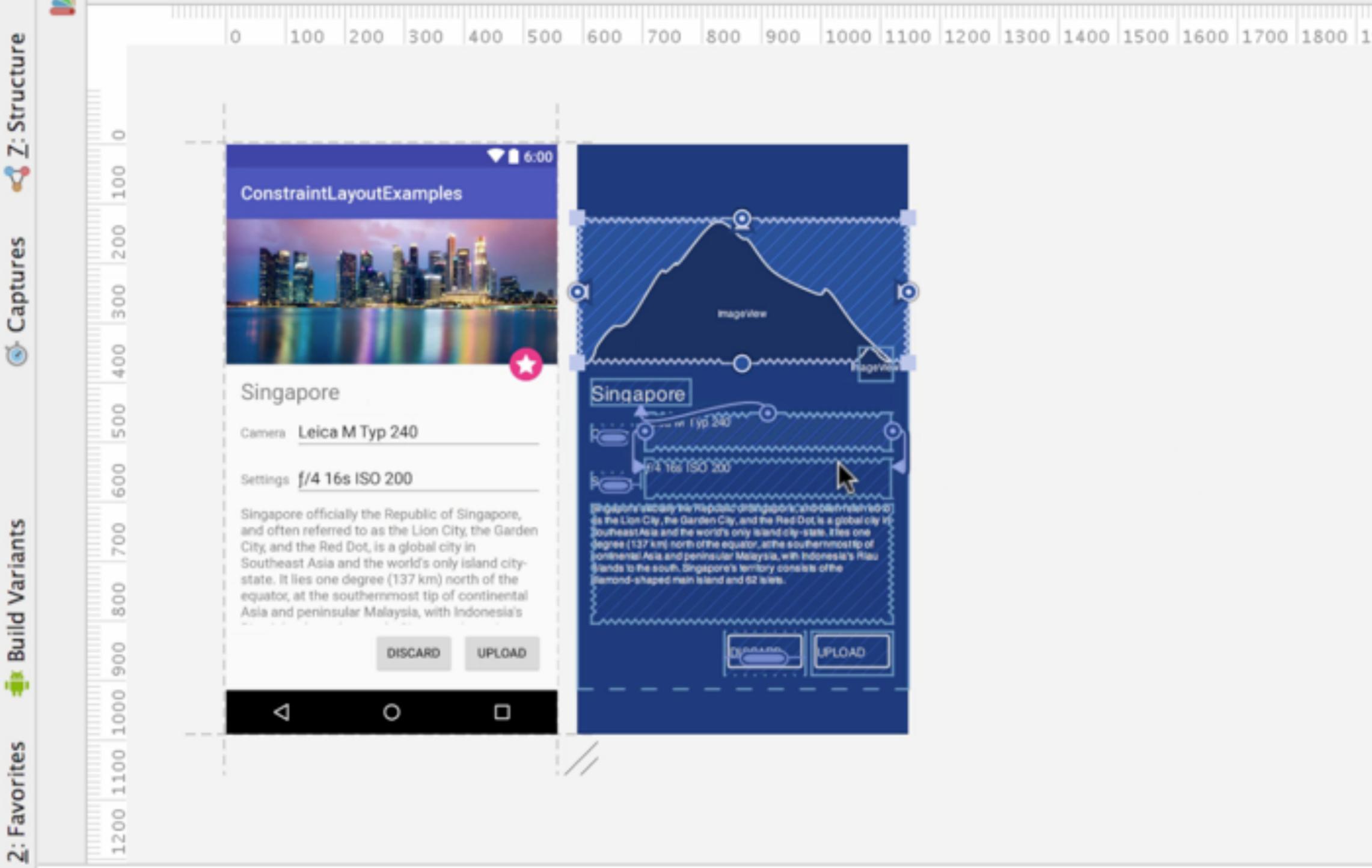




# Constraint Layout

## Chains and Ratios Support





ID: header

ratio: 7:16

layout\_width: 0dp

layout\_height: 0dp

**ImageView**

srcCompat: [empty]

contentDescripti...: @string/dummy

background: [empty]

scaleType: centerCrop

adjustViewBounds: [checked]

# Lint

Baseline Support

```
android {  
    lintOptions {  
        baseline file("lint-baseline.xml")  
    }  
}
```

New Lint Checks

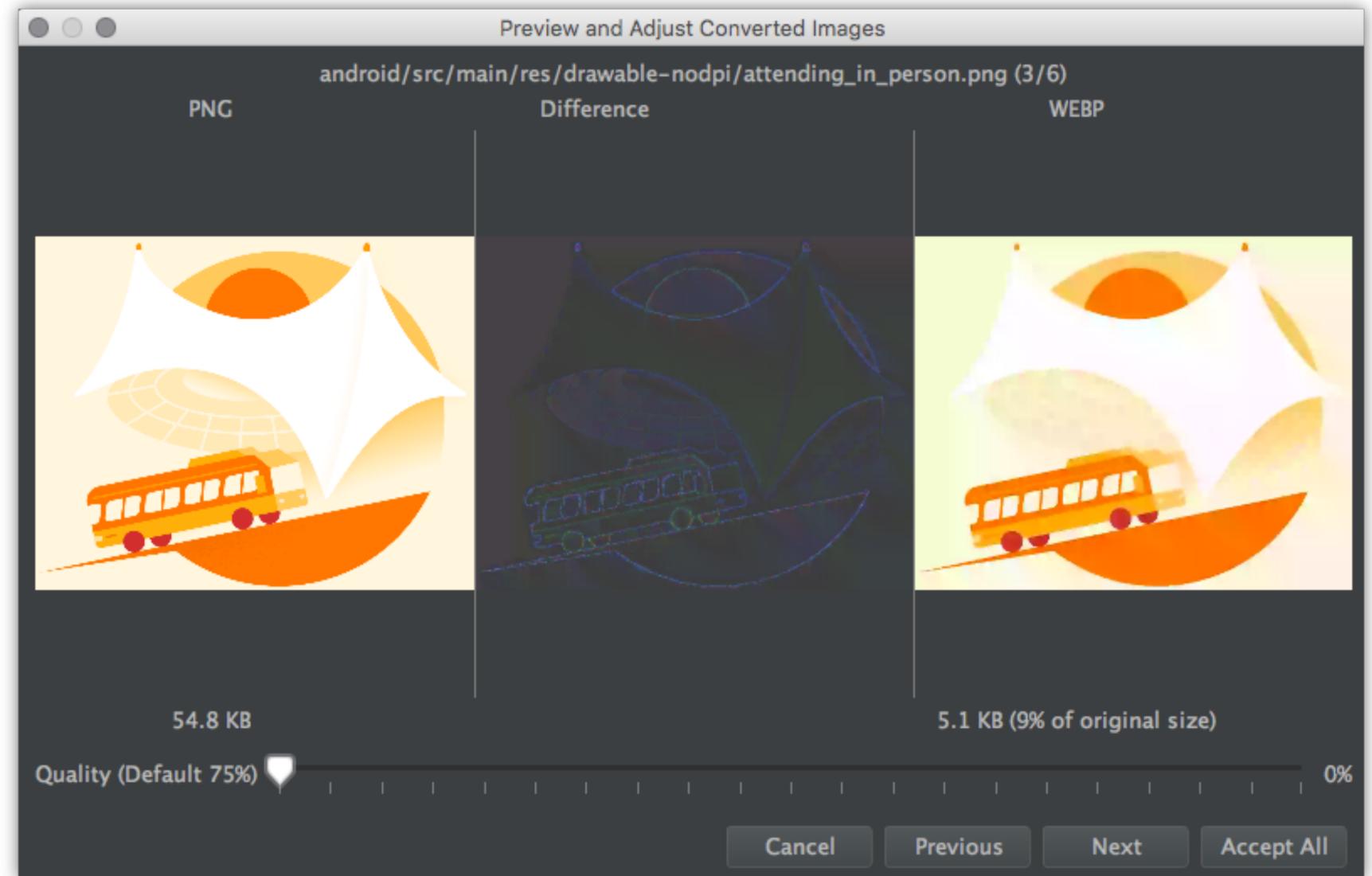
Obsolete SDK\_INT  
Object Animator Validation  
Unnecessary Item Decorator Copy  
WifiManager Leak

and many more!



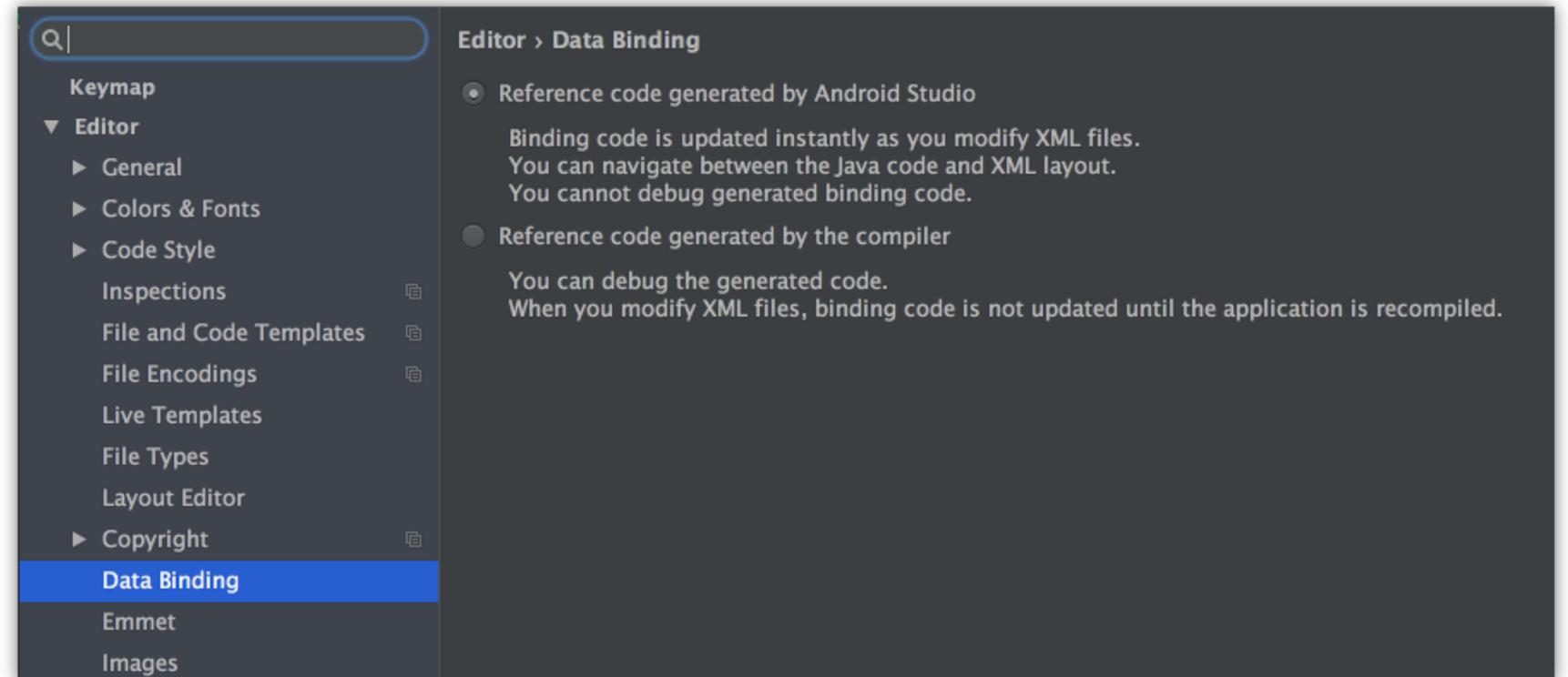
# PNG to WebP

#APKSizeMatters



# Data Binding

Now Debuggable!



# Incremental SDK Updates

Less waiting!

Default Preferences

Appearance & Behavior > System Settings > Android SDK

Manager for the Android SDK and Tools used by Android Studio

Android SDK Location:  [Edit](#)

**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
<input checked="" type="checkbox"/>	Android 7.1.1 (Nougat)	25	1	Partially installed
<input type="checkbox"/>	Android 7.0 (Nougat)	24	2	Partially installed
<input checked="" type="checkbox"/>	Android N Preview	N	3	Partially installed
<input checked="" type="checkbox"/>	Android 6.0 (Marshmallow)	23	3	Update available
<input checked="" type="checkbox"/>	Android 5.1 (Lollipop)	22	2	Installed
<input checked="" type="checkbox"/>	Android 5.0 (Lollipop)	21	2	Installed
<input type="checkbox"/>	Android 4.4W (KitKat Wear)	20	2	Not installed
<input type="checkbox"/>	Android 4.4 (KitKat)	19	4	Partially installed
<input type="checkbox"/>	Android 4.3 (Jelly Bean)	18	3	Not installed
<input type="checkbox"/>	Android 4.2 (Jelly Bean)	17	3	Not installed
<input type="checkbox"/>	Android 4.1 (Jelly Bean)	16	5	Partially installed
<input type="checkbox"/>	Android 4.0.3 (IceCreamSandwich)	15	5	Partially installed
<input type="checkbox"/>	Android 4.0 (IceCreamSandwich)	14	4	Not installed
<input type="checkbox"/>	Android 3.2 (Honeycomb)	13	1	Not installed
<input type="checkbox"/>	Android 3.1 (Honeycomb)	12	3	Not installed
<input type="checkbox"/>	Android 3.0 (Honeycomb)	11	2	Not installed
<input checked="" type="checkbox"/>	Android 2.3.3 (Gingerbread)	10	2	Installed
<input type="checkbox"/>	Android 2.3 (Gingerbread)	9	2	Not installed
<input type="checkbox"/>	Android 2.2 (Froyo)	8	2	Not installed

Show Package Details

Cancel Apply **OK**



# Support Library

# Support Library

Night Mode

Bottom Navigation

Transitions Framework

Constraint Layout

Custom Tabs

DiffUtil

Commit Content



Project Structure

- ConstraintLayoutExamples
  - app
    - manifests
    - java
      - org.examples.constraintlayoutexamples
        - CityActivity
        - MainActivity
      - org.examples.constraintlayoutexamples (androidTest)
      - org.examples.constraintlayoutexamples (test)
    - res
      - drawable
      - layout
        - activity\_main.xml
        - activity\_main\_done.xml
        - activity\_main\_image\_final.xml
        - activity\_main\_start.xml
        - activity\_main\_work.xml
        - constraint\_example\_1.xml
        - constraint\_example\_2.xml
        - constraint\_example\_3.xml
        - constraint\_example\_4.xml
        - constraint\_example\_5.xml
        - constraint\_example\_6.xml
        - constraint\_example\_7.xml
        - constraint\_example\_7a.xml
        - constraint\_example\_7b.xml
        - constraint\_example\_x1.xml
        - timer\_nested.xml
      - mipmap
      - values
    - Gradle Scripts

activity\_main\_start.xml x activity\_main\_done.xml x

Pixel 25 AppTheme Language

8 38%

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300

ConstraintLayoutExamples

Singapore

Camera Leica M Typ 240

Settings f/4 16s ISO 200

Singapore officially the Republic of Singapore, and often referred to as the Lion City, the Garden City, and the Red Dot, is a global city in Southeast Asia and the world's only island city-state. It lies one degree (137 km) north of the equator, at the southernmost tip of continental Asia and peninsular Malaysia, with Indonesia's Riau Islands to the south. Singapore's territory consists of the diamond-shaped main island and 62 islets.

DISCARD UPLOAD

Component Tree

- activity\_main (Const)
  - imageView2
  - button35 - "@stri
  - button36 - "@stri
  - textView12 - "@s
  - editText - "@strin
  - editText2 - "Nam
  - textView13 - "@s
  - textView15 - "@s
  - textView16 - "@s
  - imageView3

Design Text

Properties

Cradle

Android Model

# Helpful Links

Android Studio: [d.android.com/studio](https://d.android.com/studio)

Support Library: [d.android.com/topic/libraries/support-library](https://d.android.com/topic/libraries/support-library)

Constraint Layout: [d.android.com/training/constraint-layout](https://d.android.com/training/constraint-layout)

