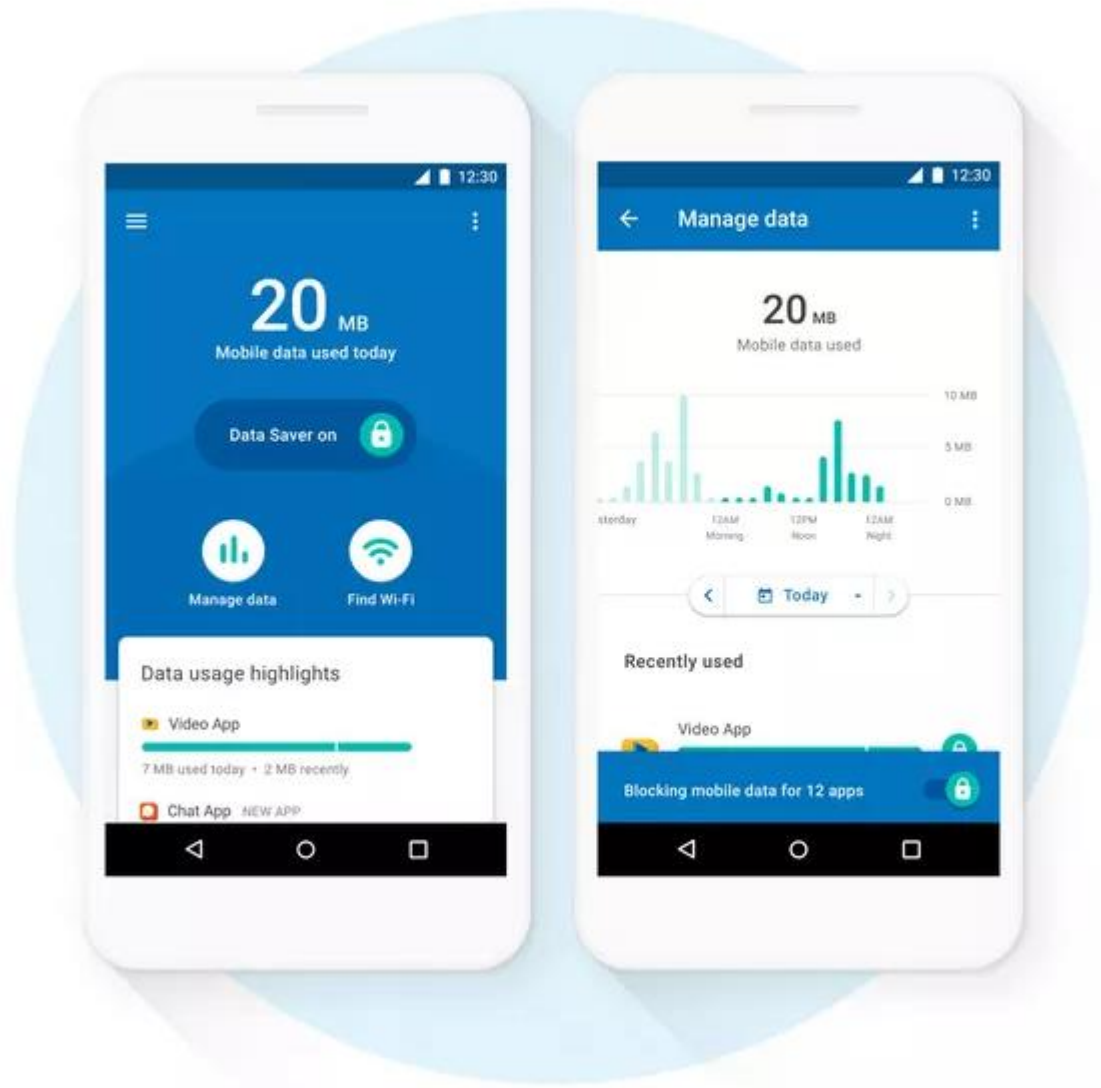


# Mobilné výpočty

Ing. Maroš Čavojský, PhD.





Android aplikácie



# Kotlin dokumentácia

<https://kotlinlang.org/docs/home.html>

<https://kotlinlang.org/docs/books.html>

<https://kotlinlang.org/docs/android-overview.html>



# Android dokumentácia

<https://developer.android.com/docs>

<https://developer.android.com/reference>

# Kontakty

Dr. rer. nat. Martin Drozda

- Prednášky a skúška
- C601, martin.drozda@stuba.sk

Ing. Maroš Čavojský, PhD.

- Prednášky a cvičenia
- C606 , maros.cavojsky@stuba.sk

# Podmienky absolvovania:

Cvičenia 50 bodov (min. 25 bodov)

- Android aplikácia

Skúška 50 bodov (min. 25 bodov)

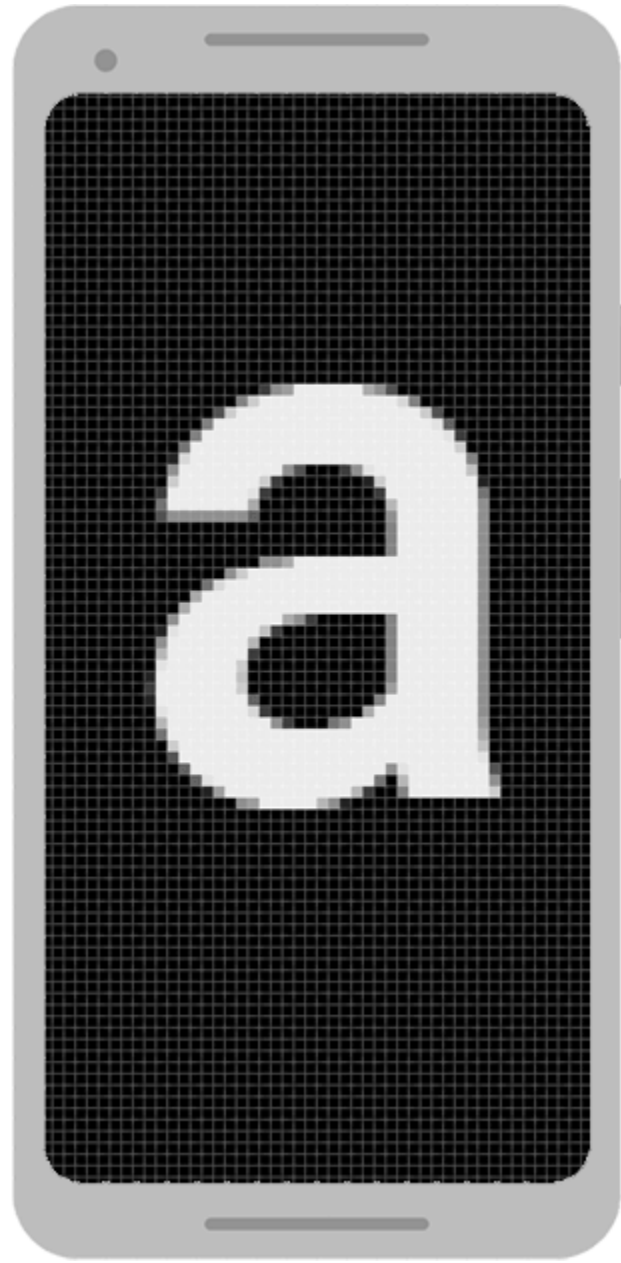
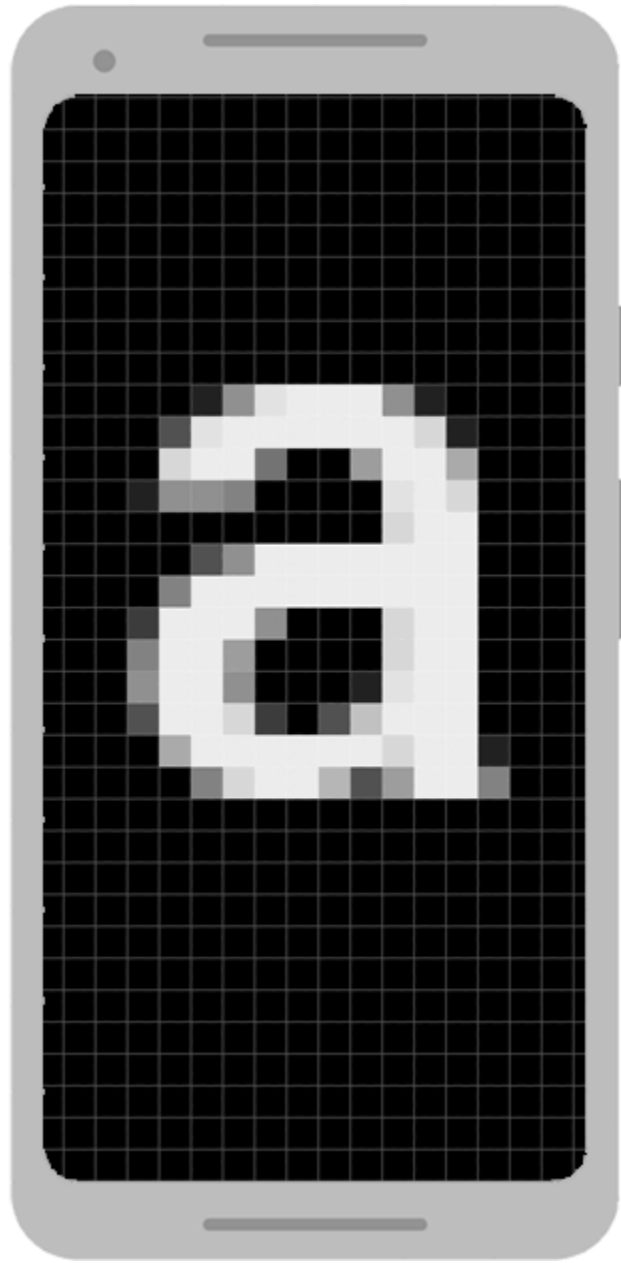
- Test

# Štruktúra prednášok

- Android aplikácie v Kotlin (6 týždňov)
- Social computing, Gamification, Vážne hry (5 týždňov)
- Pozvaná prednáška







# Veľkosti a vzdialenosti

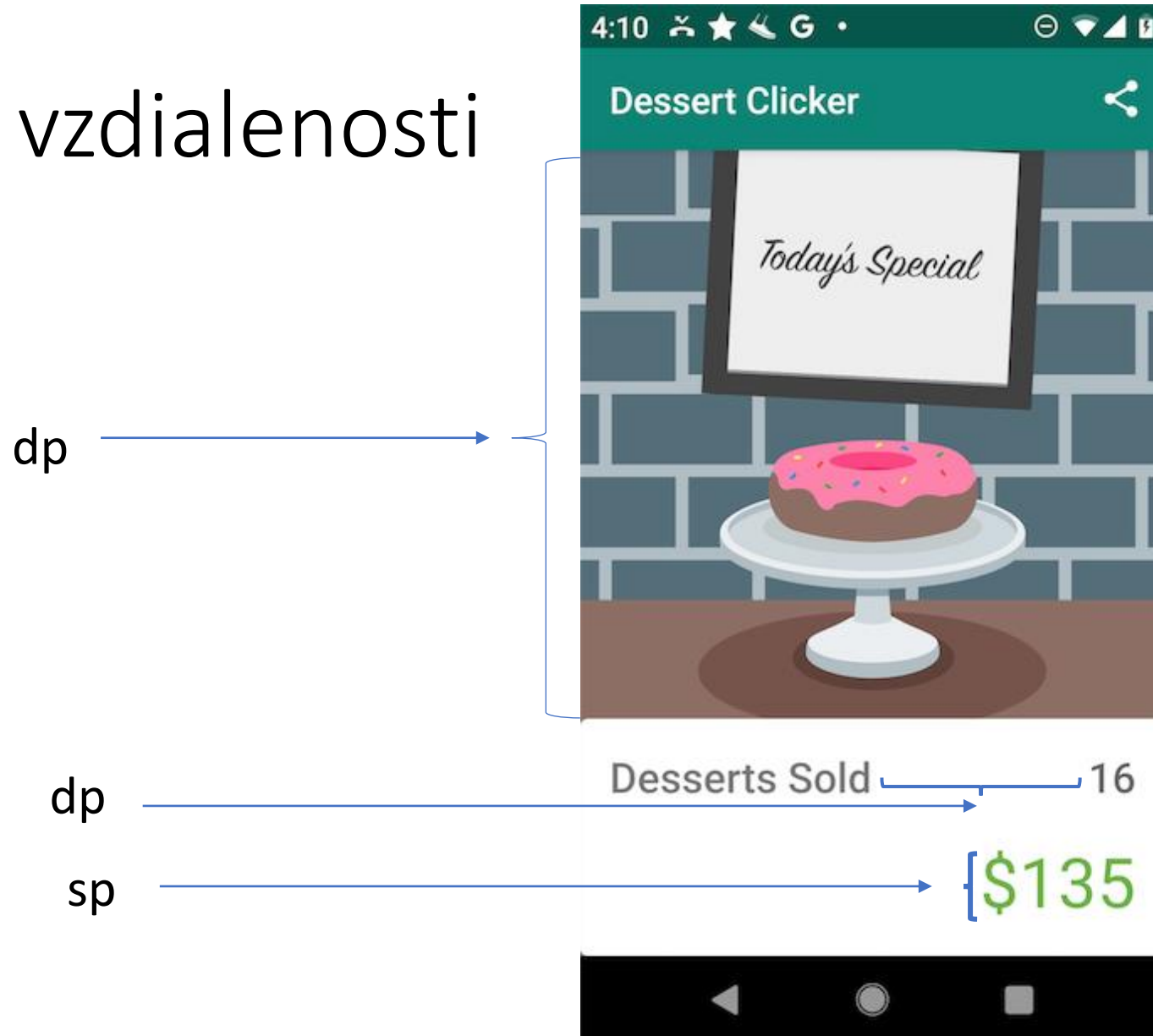
**px** = pixel

$$\text{px} = \text{dp} * (\text{dpi} / 160)$$

**dip/dp** = density independent pixel,  
relatívny pixel pre 160 dpi obrazovku  
(na 160 dpi obrazovke 1px =1dip)

**sp** = scale independent pixel,  
relatívna veľkosť k veľkosti zvoleného fontu,  
je vhodný pre určenie veľkosti fontu

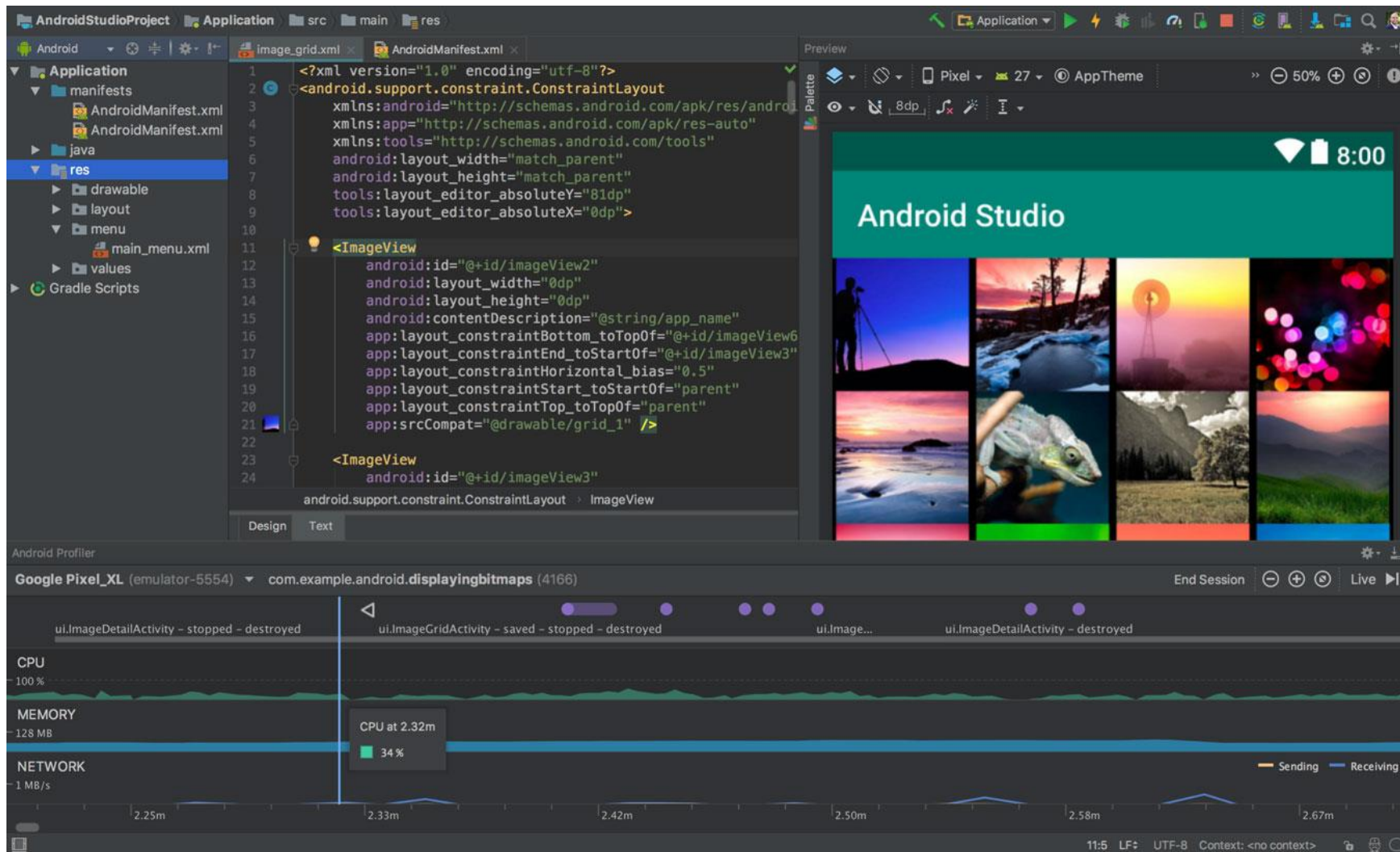
# Veľkosti a vzdialenosti

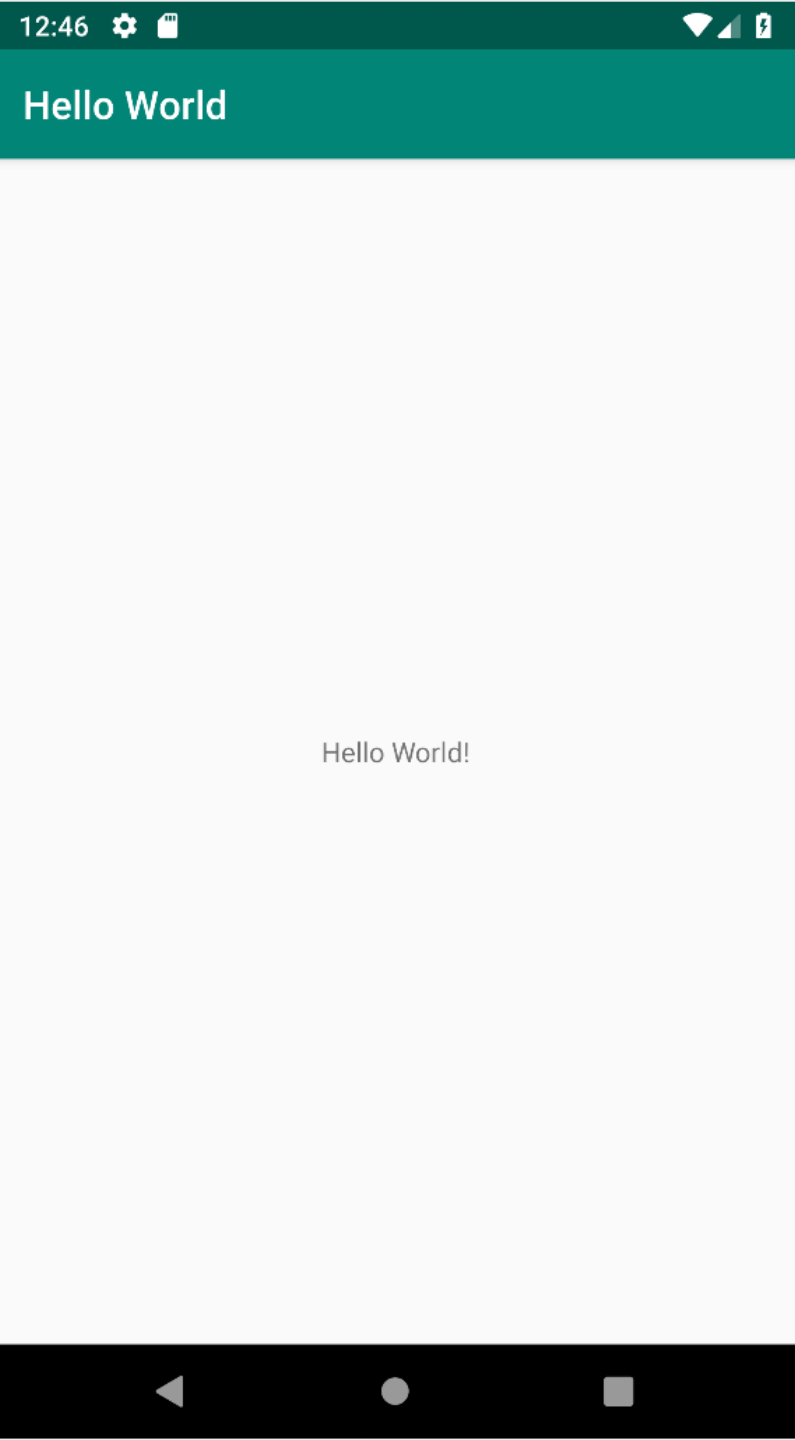


[https://developer.android.com/training/  
multiscreen/screendensities](https://developer.android.com/training/multiscreen/screendensities)

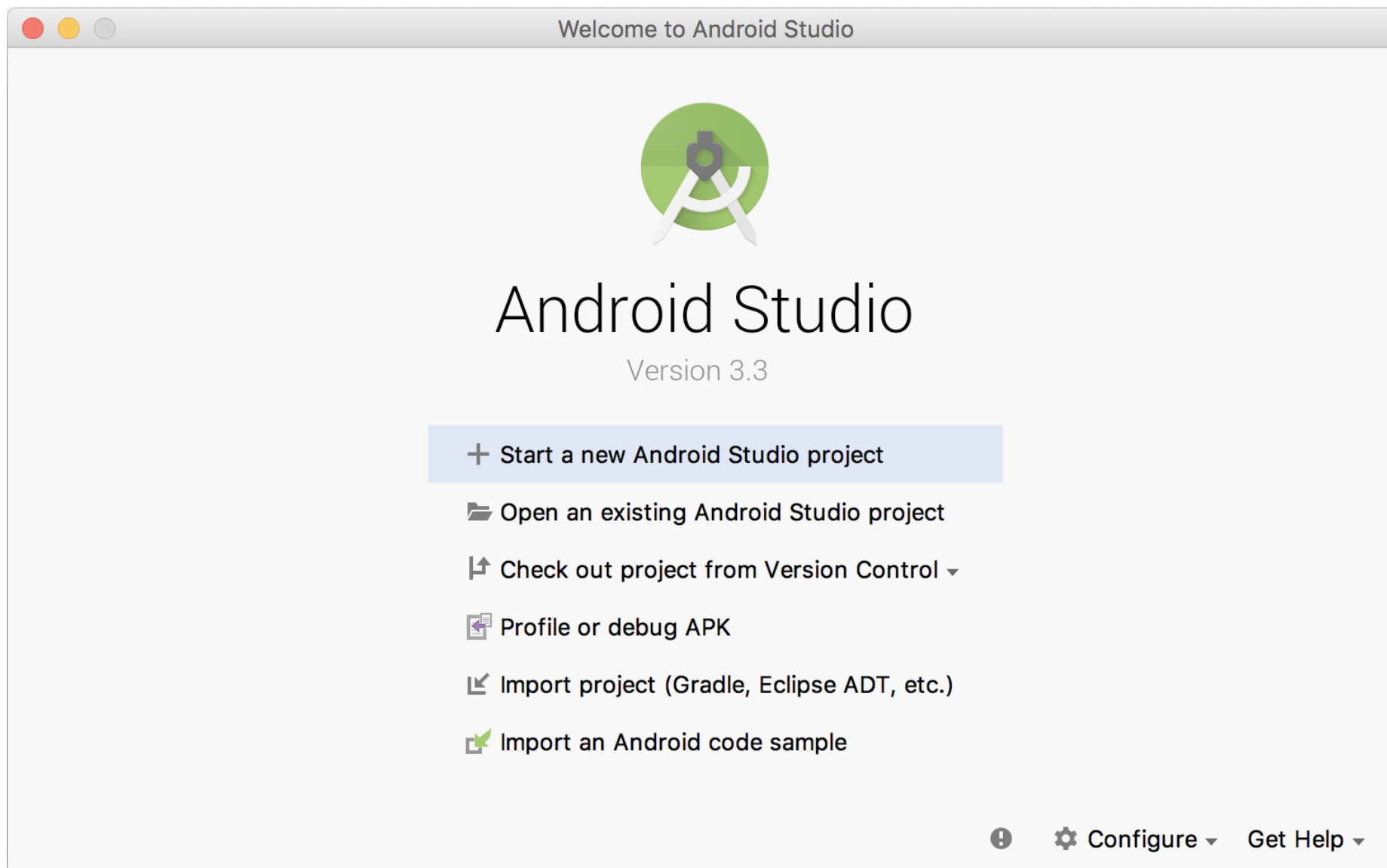
<https://android.mpage.sk>

<https://developer.android.com/studio/>









### Create New Project

## Choose your project

Phone and Tablet | Wear OS | TV | Android Auto | Android Things

Add No Activity

Basic Activity

Empty Activity

Bottom Navigation Activity

Fullscreen Activity

Master/Detail Flow

Navigation Drawer Activity

Google Maps Activity

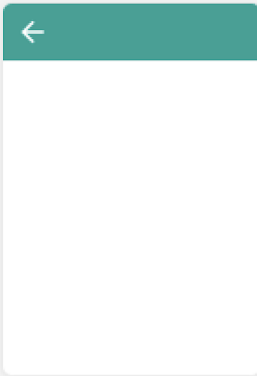
### Empty Activity

Creates a new empty activity

Cancel Previous Next Finish

### Create New Project

## Configure your project



Empty Activity

Creates a new empty activity

Name  
HelloWorld

Package name  
com.example.android.helloworld

Save location  
/Users/llemay/HelloWorld

Language  
Kotlin

Minimum API level  
API 19: Android 4.4 (KitKat)

**i** Your app will run on approximately **95.3%** of devices.  
[Help me choose](#)

This project will support instant apps

Use AndroidX artifacts

Cancel Previous Next **Finish**

HelloWorld [C:\Users\maros\Documents\android\mobv\helloworld] - Android Studio

File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help

helloworld Add Configuration...

Android  
helloworld C:\Users\maros\Documents\android\mobv\helloworld  
Gradle Scripts

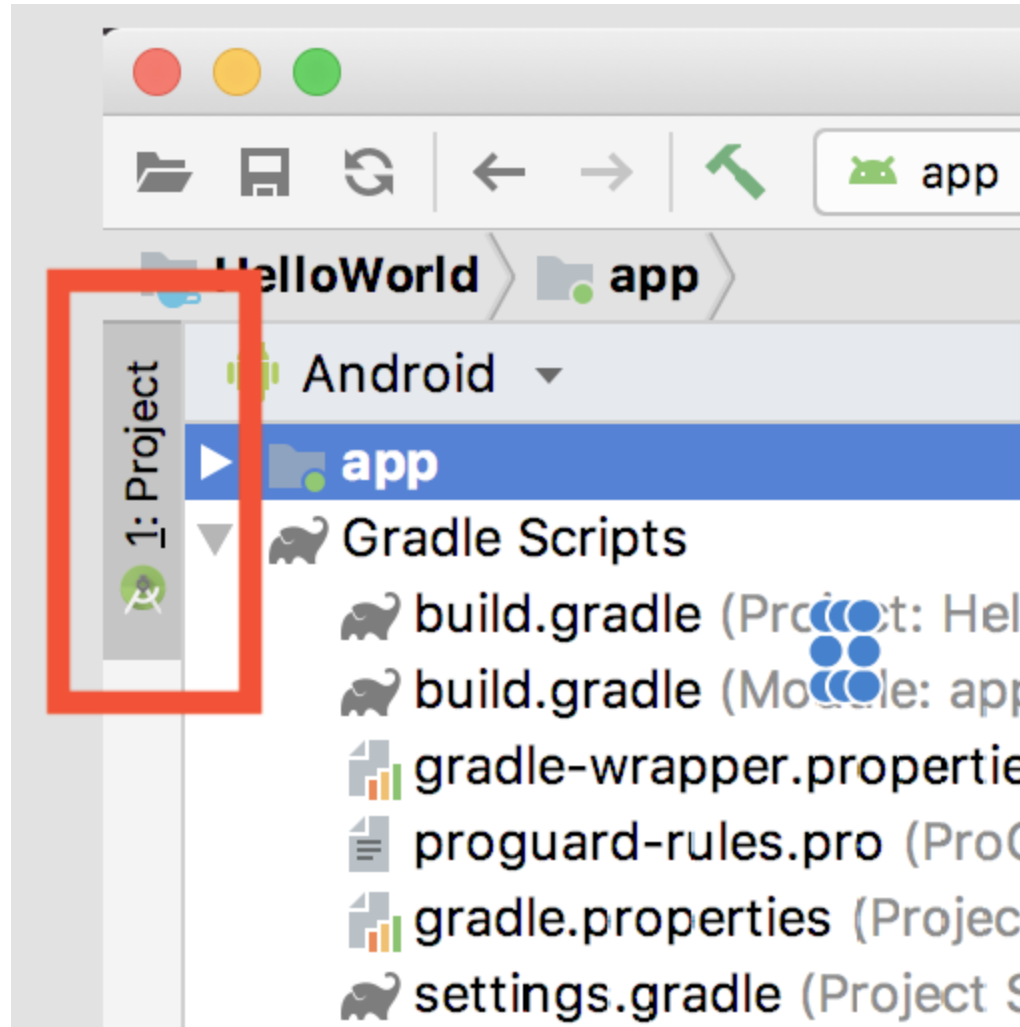
Search Everywhere Double Shift  
Go to File Ctrl+Shift+N  
Recent Files Ctrl+E  
Navigation Bar Alt+Home  
Drop files here to open

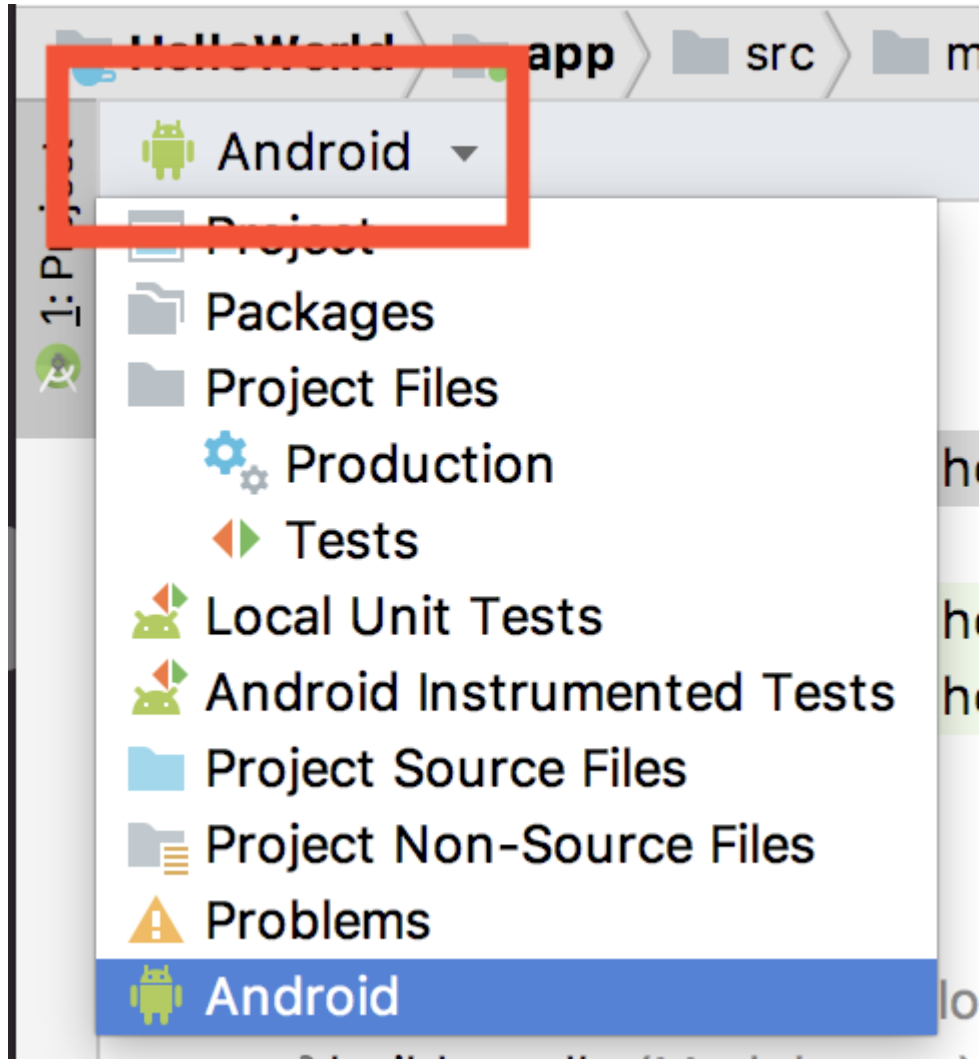
Build: Sync

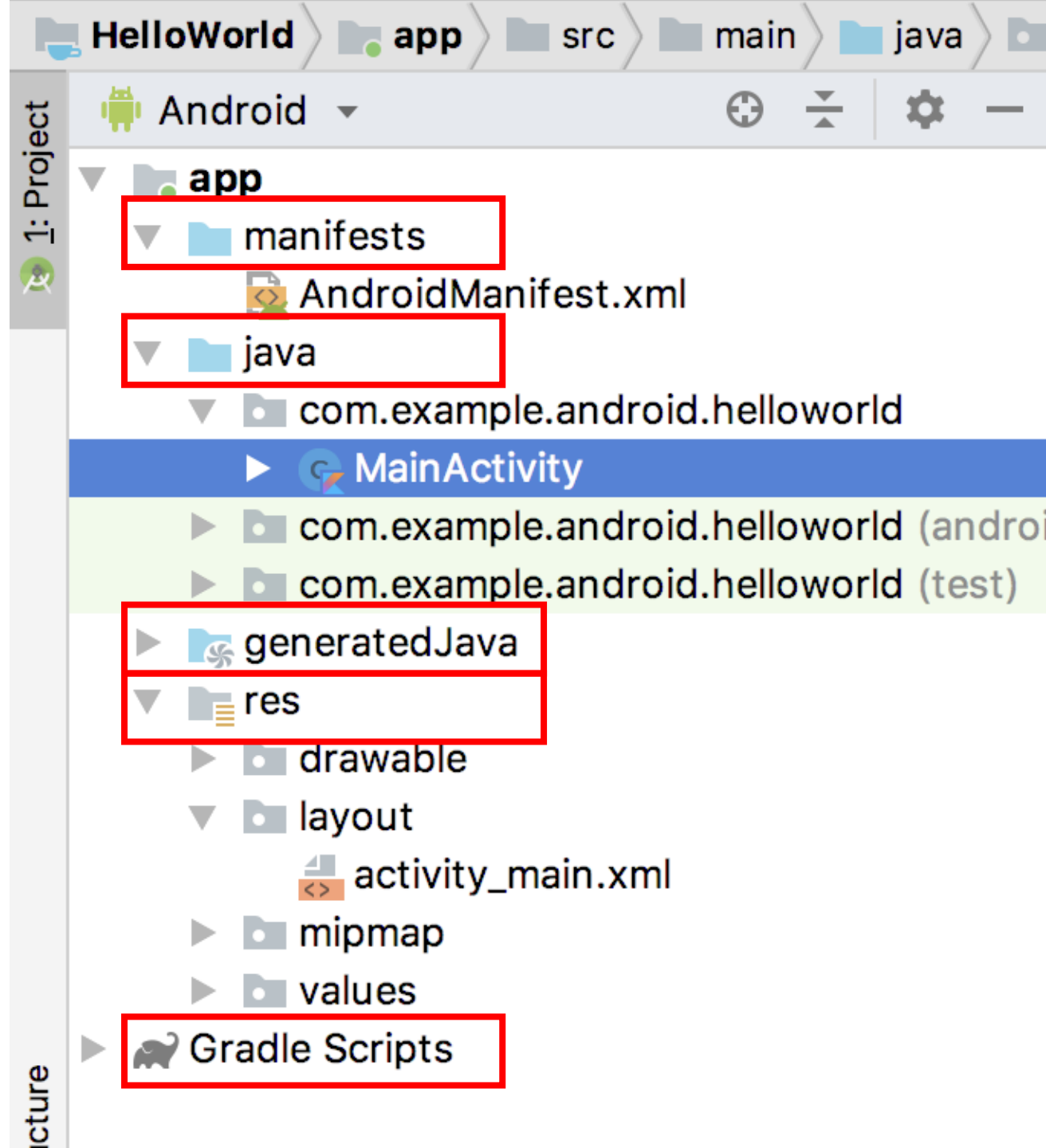
- helloworld: syncing...
  - Run build C:\Users\maros\Documents\android\mobv\helloworld
    - Load build
      - Run init scripts
      - Evaluate settings
    - Configure build

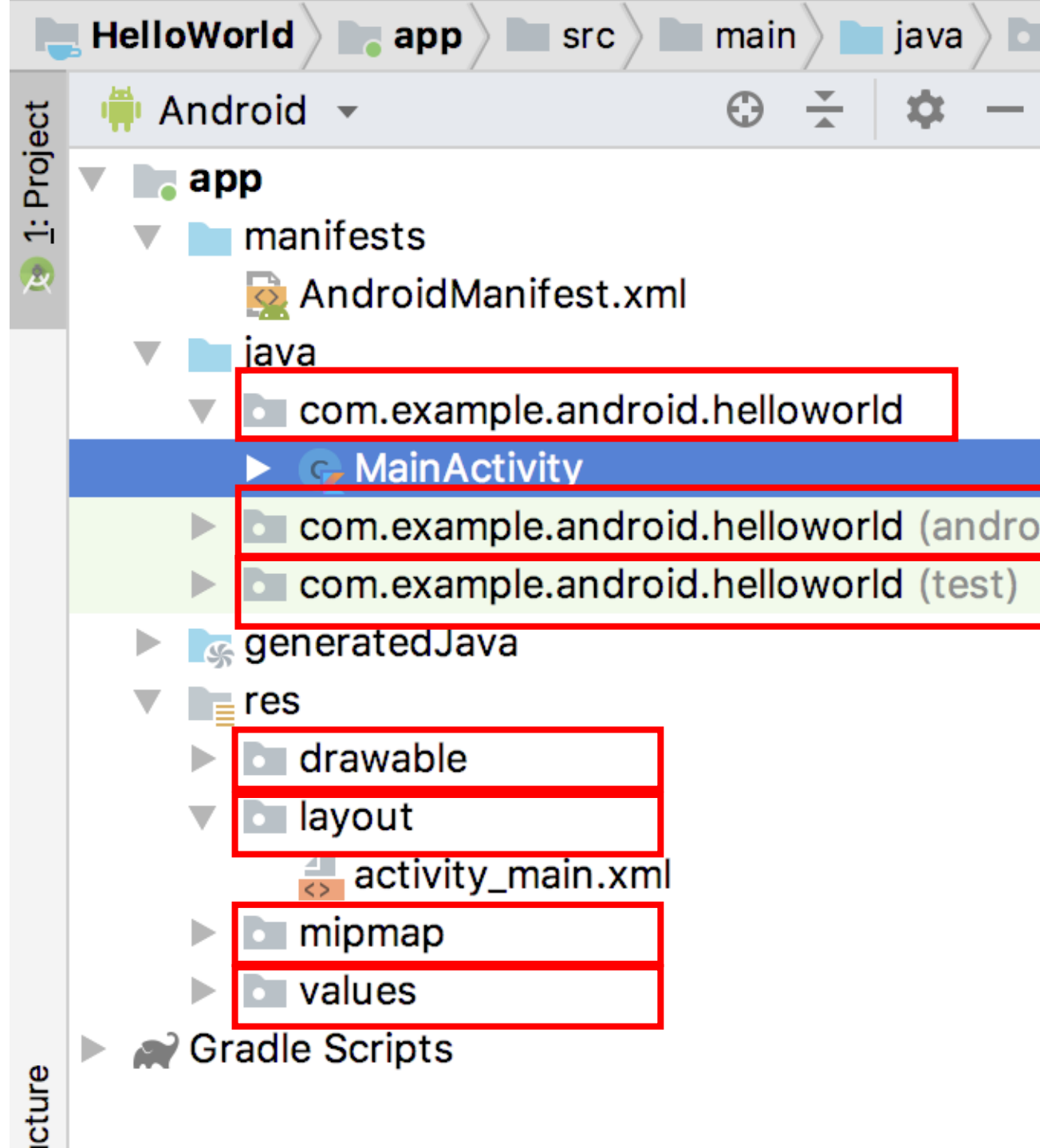
Running for 9 s  
Running for 9 s  
489 ms  
194 ms  
290 ms  
5 s 403 ms

Event Log  
Gradle sync started  
2 processes running...











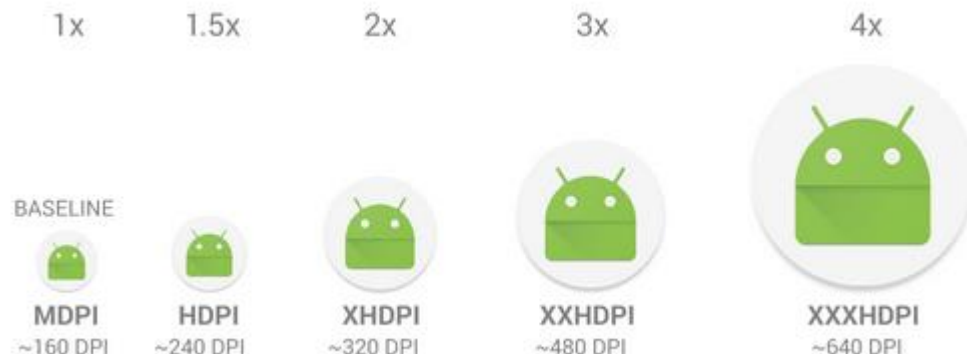
# mipmap vs. drawable

## Mipmap

- ikony pre používané v aplikácii
- automaticky sa neprispôsobujú podľa hustoty displeja

## Drawable

- všetko ostatné ( obrázky,... )
- automaticky sa prispôsobujú podľa hustoty displeja



Density qualifier	Description
<b>ldpi</b>	Resources for low-density ( <i>ldpi</i> ) screens (~120dpi).
<b>mdpi</b>	Resources for medium-density ( <i>mdpi</i> ) screens (~160dpi). (This is the baseline density.)
<b>hdpi</b>	Resources for high-density ( <i>hdpi</i> ) screens (~240dpi).
<b>xhdpi</b>	Resources for extra-high-density ( <i>xhdpi</i> ) screens (~320dpi).
<b>xxhdpi</b>	Resources for extra-extra-high-density ( <i>xxhdpi</i> ) screens (~480dpi).
<b>xxxhdpi</b>	Resources for extra-extra-extra-high-density ( <i>xxxhdpi</i> ) uses (~640dpi).
<b>nodpi</b>	Resources for all densities. These are density-independent resources. The system does not scale resources tagged with this qualifier, regardless of the current screen's density.
<b>tvdpi</b>	Resources for screens somewhere between <i>mdpi</i> and <i>hdpi</i> ; approximately 213dpi. This is not considered a "primary" density group. It is mostly intended for televisions and most apps shouldn't need it—providing <i>mdpi</i> and <i>hdpi</i> resources is sufficient for most apps and the system will scale them as appropriate. If you find it necessary to provide <i>tvdpi</i> resources, you should size them at a factor of 1.33* <i>mdpi</i> . For example, a 100px x 100px image for <i>mdpi</i> screens should be 133px x 133px for <i>tvdpi</i> .

```
res/
  drawable-xxxhdpi/
    awesome-image.png
  drawable-xxhdpi/
    awesome-image.png
  drawable-xhdpi/
    awesome-image.png
  drawable-hdpi/
    awesome-image.png
  drawable-mdpi/
    awesome-image.png
```

```
res/
  mipmap-xxxhdpi/
    launcher-icon.png
  mipmap-xxhdpi/
    launcher-icon.png
  mipmap-xhdpi/
    launcher-icon.png
  mipmap-hdpi/
    launcher-icon.png
  mipmap-mdpi/
    launcher-icon.png
```

# Násobky pre zdroje

36x36 (0.75x) for low-density (ldpi)

48x48 (1.0x baseline) for medium-density (mdpi)

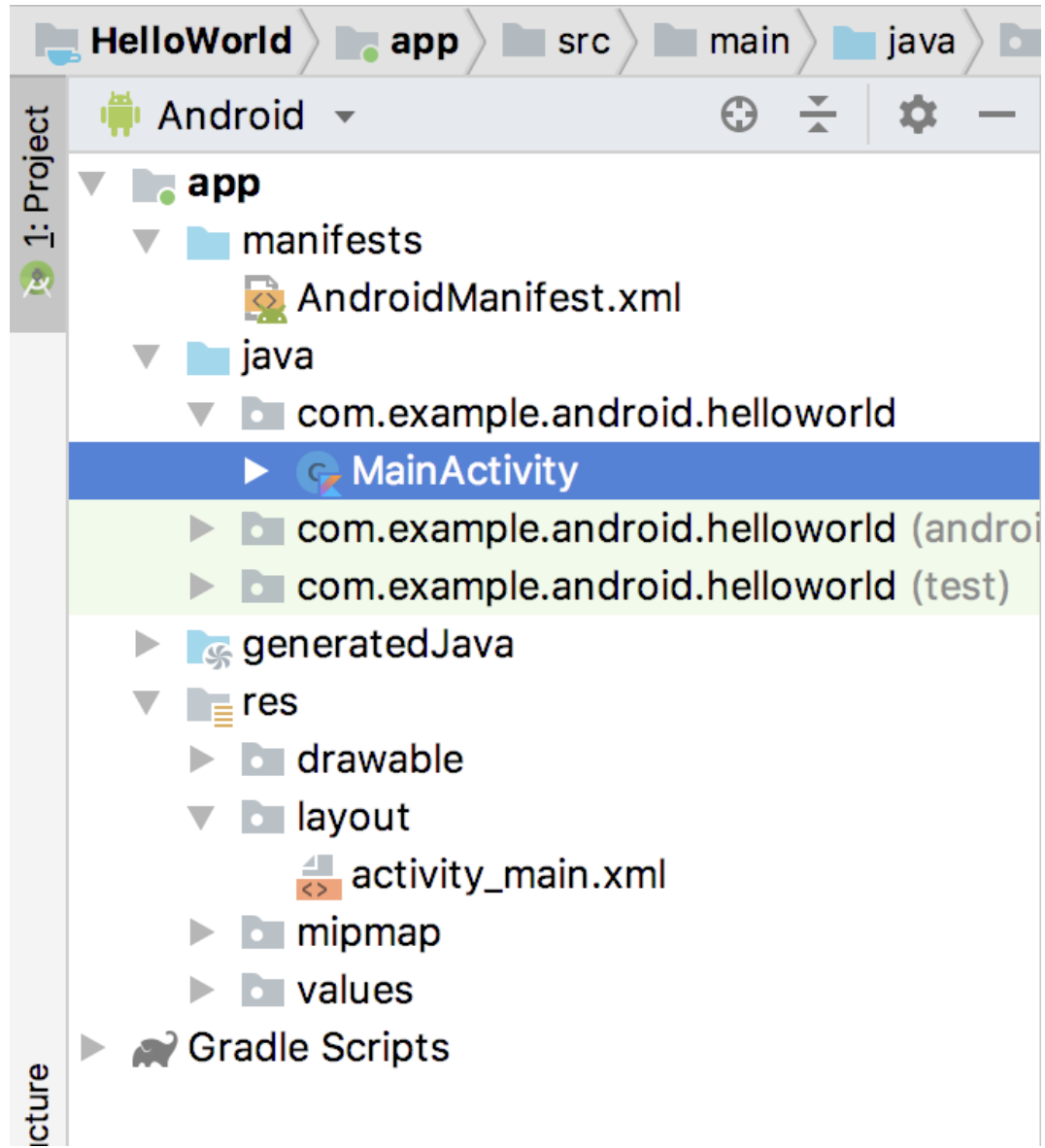
72x72 (1.5x) for high-density (hdpi)

96x96 (2.0x) for extra-high-density (xhdpi)

144x144 (3.0x) for extra-extra-high-density (xxhdpi)

192x192 (4.0x) for extra-extra-extra-high-density (xxxhdpi)

[https://developer.android.com/training/  
multiscreen/screendensities](https://developer.android.com/training/multiscreen/screendensities)

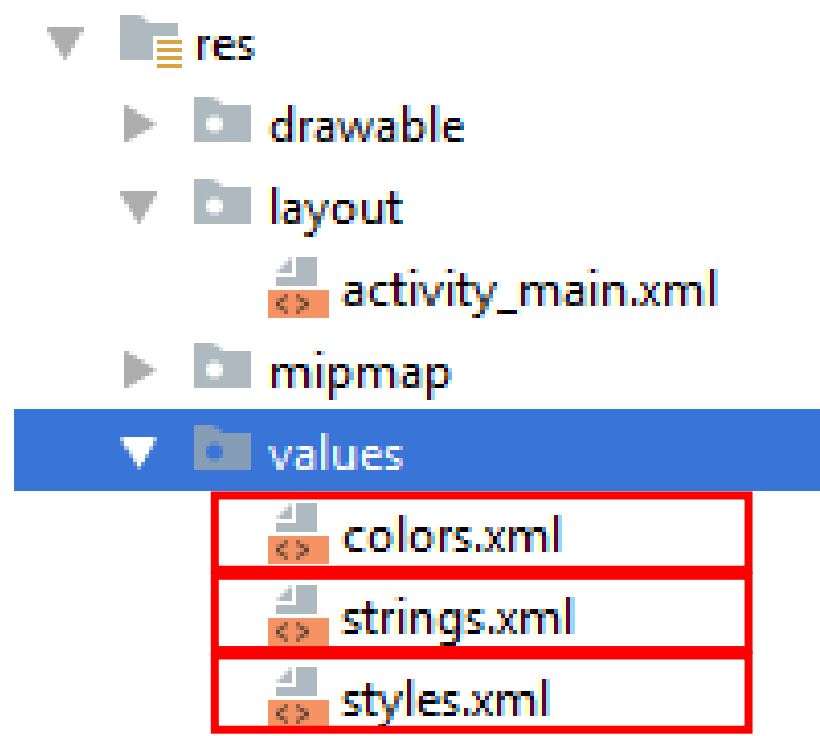
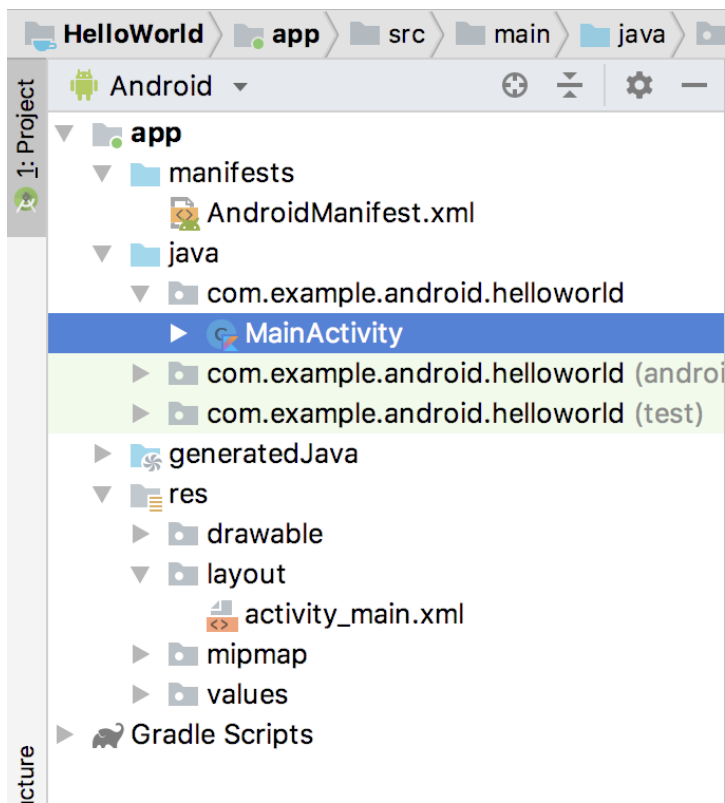


# java/.../MainActivity.kt

```
2
3  import ...
4
5
6  class MainActivity : AppCompatActivity() {
7
8      override fun onCreate(savedInstanceState: Bundle?) {
9          super.onCreate(savedInstanceState)
10         setContentView(R.layout.activity_main)
11     }
12 }
13
```

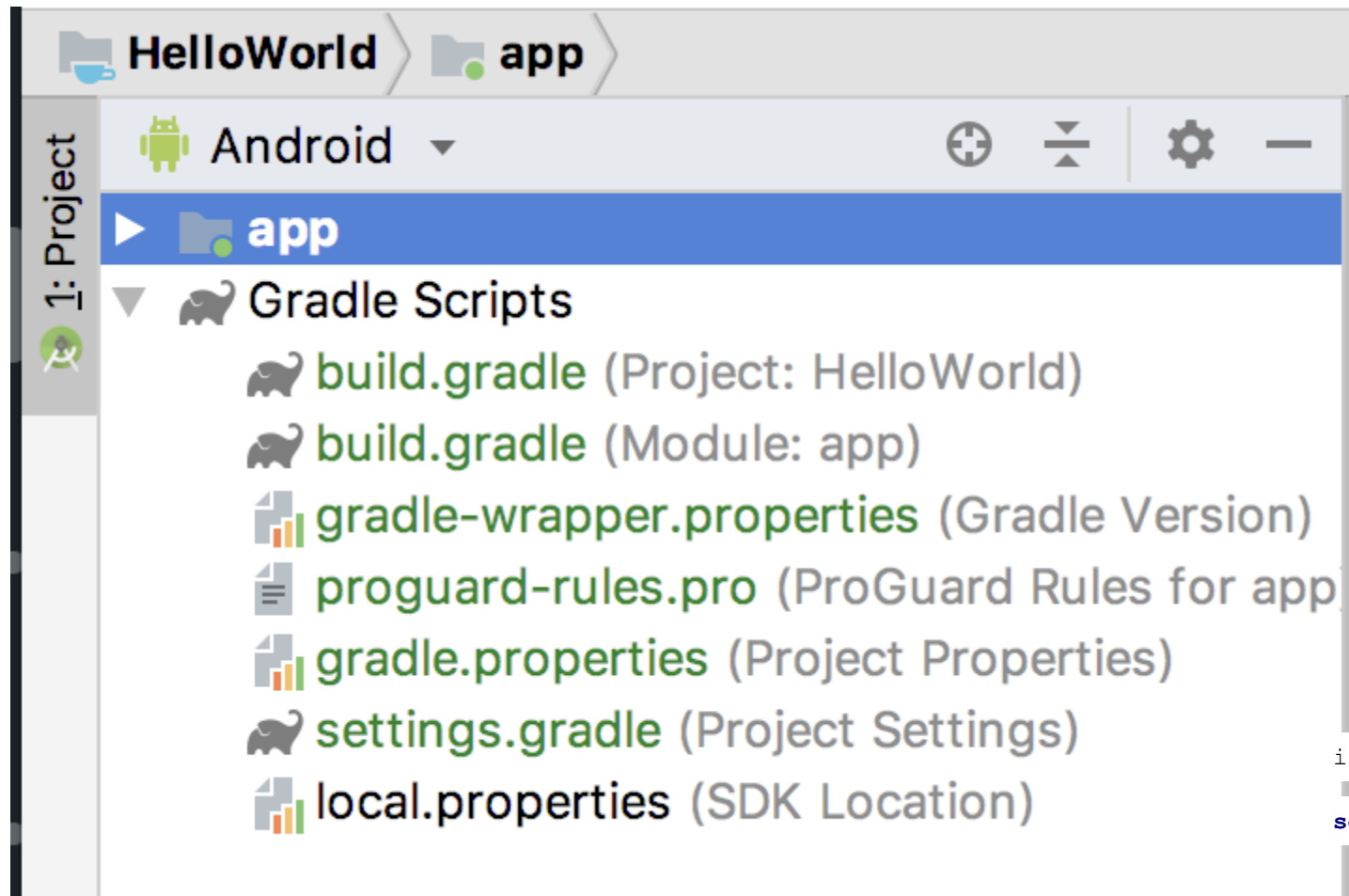
# res/layout/activity\_main.xml

```
1 <?xml version="1.0" encoding="utf-8"?>
2 <androidx.constraintlayout.widget.ConstraintLayout
3     xmlns:android="http://schemas.android.com/apk/res/android"
4     xmlns:tools="http://schemas.android.com/tools"
5     xmlns:app="http://schemas.android.com/apk/res-auto"
6     android:layout_width="match_parent"
7     android:layout_height="match_parent">
8
9     <TextView
10         android:layout_width="wrap_content"
11         android:layout_height="wrap_content"
12         android:text="Hello World!"
13         app:layout_constraintBottom_toBottomOf="parent"
14         app:layout_constraintLeft_toLeftOf="parent"
15         app:layout_constraintRight_toRightOf="parent"
16         app:layout_constraintTop_toTopOf="parent"/>
17
18 </androidx.constraintlayout.widget.ConstraintLayout>
```





```
1 <?xml version="1.0" encoding="utf-8"?>
2 <manifest xmlns:android="http://schemas.android.com/apk/res/android"
3         xmlns:tools="http://schemas.android.com/tools" package="com.██████████.android.helloworld">
4
5     <application
6         android:allowBackup="true"
7         android:icon="@mipmap/ic_launcher"
8         android:label="HelloWorld"
9         android:roundIcon="@mipmap/ic_launcher_round"
10        android:supportRtl="true"
11        android:theme="@style/AppTheme" tools:ignore="AllowBackup,GoogleAppIndexingWarning">
12        <activity android:name=".MainActivity">
13            <intent-filter>
14                <action android:name="android.intent.action.MAIN"/>
15
16                <category android:name="android.intent.category.LAUNCHER"/>
17            </intent-filter>
18        </activity>
19    </application>
20
21 </manifest>
```

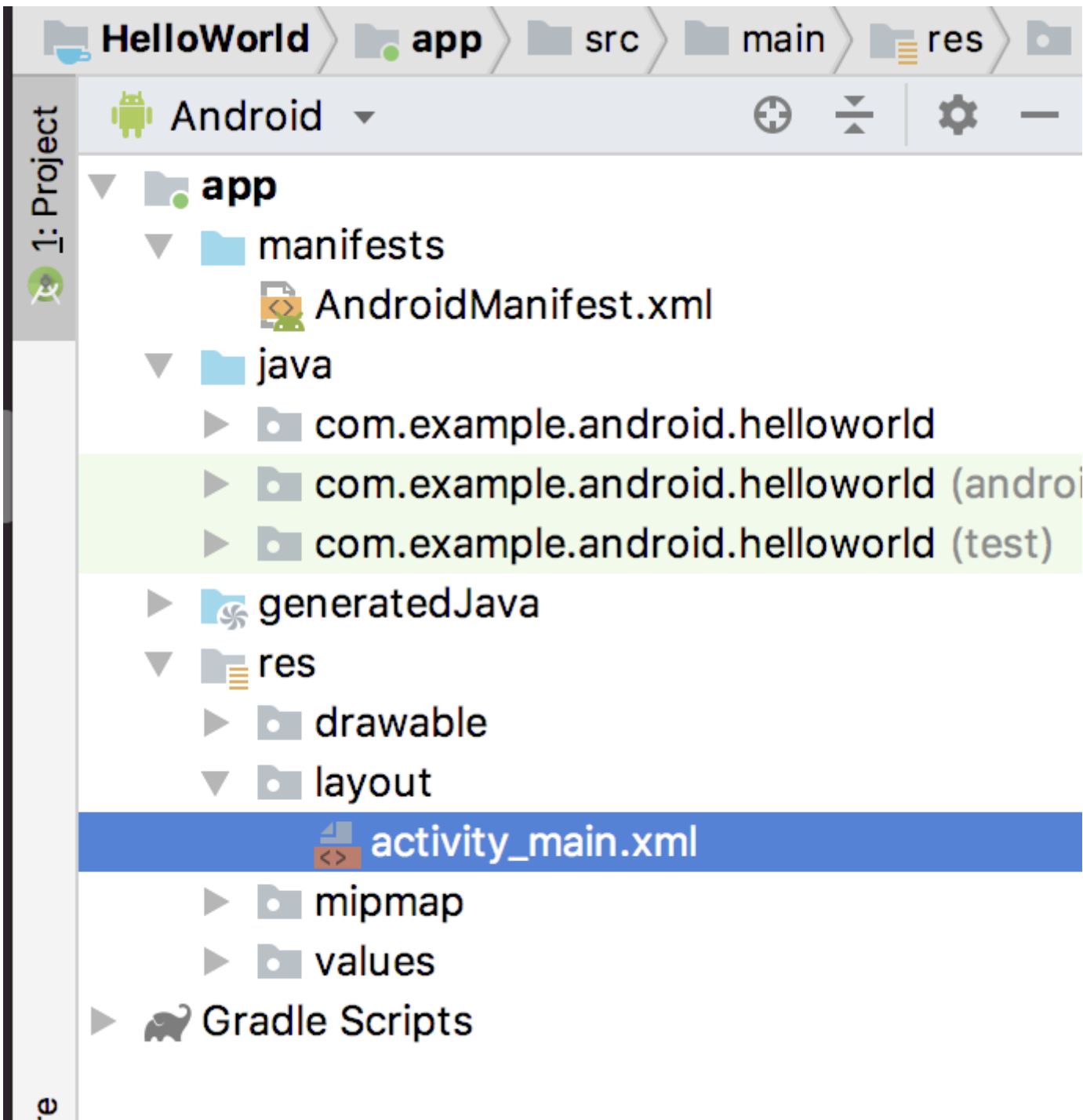


The screenshot shows an IDE's project explorer for an Android project named 'HelloWorld'. The current view is the 'app' module. The 'app' folder is expanded to show the following files:

- build.gradle (Project: HelloWorld)
- build.gradle (Module: app)
- gradle-wrapper.properties (Gradle Version)
- proguard-rules.pro (ProGuard Rules for app)
- gradle.properties (Project Properties)
- settings.gradle (Project Settings)
- local.properties (SDK Location)

```
include ':app'  
sdk.dir=C:\\Users\\maros\\Documents\\android-sdk
```

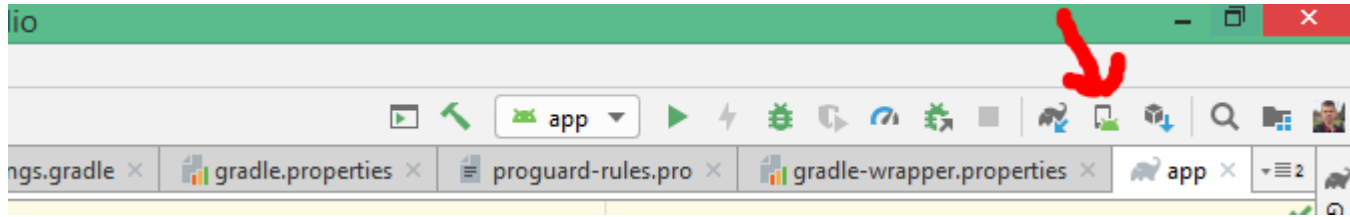
```
1  apply plugin: 'com.android.application'
2
3  apply plugin: 'kotlin-android'
4
5  apply plugin: 'kotlin-android-extensions'
6
7  android {
8      compileSdkVersion 28
9      defaultConfig {
10         applicationId "com. .android.helloworld"
11         minSdkVersion 21
12         targetSdkVersion 28
13         versionCode 1
14         versionName "1.0"
15         testInstrumentationRunner "androidx.test.runner.AndroidJUnitRunner"
16     }
17     buildTypes {
18         release {
19             minifyEnabled false
20             proguardFiles getDefaultProguardFile('proguard-android-optimize.txt'), 'proguard-rules.pro'
21         }
22     }
23 }
24
25 dependencies {
26     implementation fileTree(dir: 'libs', include: ['*.jar'])
27     implementation "org.jetbrains.kotlin:kotlin-stdlib-jdk7:$kotlin_version"
28     implementation 'androidx.appcompat:appcompat:1.1.0'
29     implementation 'androidx.core:core-ktx:1.1.0'
30     implementation 'androidx.constraintlayout:constraintlayout:1.1.3'
31     testImplementation 'junit:junit:4.12'
32     androidTestImplementation 'androidx.test:runner:1.2.0'
33     androidTestImplementation 'androidx.test.espresso:espresso-core:3.2.0'
34 }
35
```



# Spustenie aplikácie

na virtuálnom zariadení

na fyzickom zariadení



### Android Virtual Device Manager

Your Virtual Devices  
Android Studio

Type	Name	Play Store	Resolution	API	Target	CPU/ABI	Size on Disk	Actions
	Nexus 4 API 19		768 × 1280: xhdpi	19	Android 4.4 (Google ...	x86	1 GB	
	Nexus 5 API 23		1080 × 1920: xxhdpi	23	Android 6.0 (Google ...	x86...	2 GB	
	Nexus 5 API 25 Nou...		1080 × 1920: xxhdpi	25	Android 7.1.1 (Googl...	x86...	2 GB	
	Nexus 5X O API 26		1080 × 1920: 420dpi	26	Android 8.0 (Google ...	x86	2 GB	
	Nexus 7 2012 API 16		800 × 1280: tvdpi	16	Android 4.1	x86	4 GB	
	Nexus 7 API 23		1200 × 1920: xhdpi	23	Android 6.0 (Google ...	x86...	4 GB	
	Nexus 9 API 23		2048 × 1536: xhdpi	23	Android 6.0 (Google ...	x86...	2 GB	
	Nexus One API 16		480 × 800: hdpi	16	Android 4.1	x86	4 GB	



# Select Hardware

Android Studio

## Choose a device definition

Q

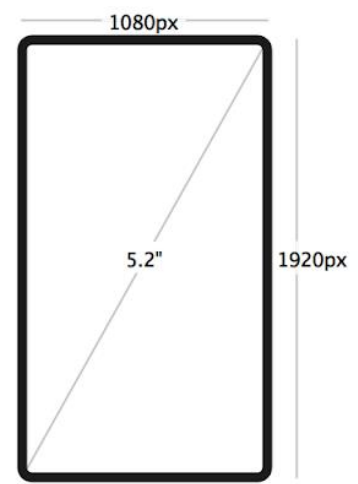
Category	Name	Play Store	Size	Resolution	Density
TV	Pixel XL		5.5"	1440x2...	560dpi
Wear	Pixel		5.0"	1080x1...	xxhdpi
Phone	Nexus S		4.0"	480x800	hdpi
Tablet	Nexus One		3.7"	480x800	hdpi
	Nexus 6P		5.7"	1440x2...	560dpi
	Nexus 6		5.96"	1440x2...	560dpi
	Nexus 5X	▶	5.2"	1080x1...	420dpi
	Nexus 5	▶	4.95"	1080x1...	xxhdpi
	Nexus 4		4.7"	768x12...	xhdpi
	Galaxy Nexus		4.65"	720x12...	xhdpi

New Hardware Profile

Import Hardware Profiles



### Nexus 5X



Size: large  
Ratio: long  
Density: 420dpi

Clone Device...



Cancel

Previous

Next

Finish

### Virtual Device Configuration

## System Image


Android Studio

### Select a system image

Recommended x86 Images Other Images

Release Name	API Level	ABI	Target
<b>Pie</b>	<b>28</b>	<b>x86</b>	<b>Android 9.0 (Google APIs)</b>
<b>Oreo</b>	27	x86	Android 8.1 (Google APIs)
<b>Oreo</b> <a href="#">Download</a>	26	x86	Android 8.0 (Google APIs)
<b>Nougat</b>	25	x86	Android 7.1.1 (Google APIs)
<b>Nougat</b> <a href="#">Download</a>	24	x86	Android 7.0 (Google APIs)
<b>Marshmallow</b> <a href="#">Download</a>	23	x86	Android 6.0 (Google APIs)
<b>Lollipop</b> <a href="#">Download</a>	22	x86	Android 5.1 (Google APIs)

### Pie



API Level  
**28**

Android  
**9.0**

Google Inc.

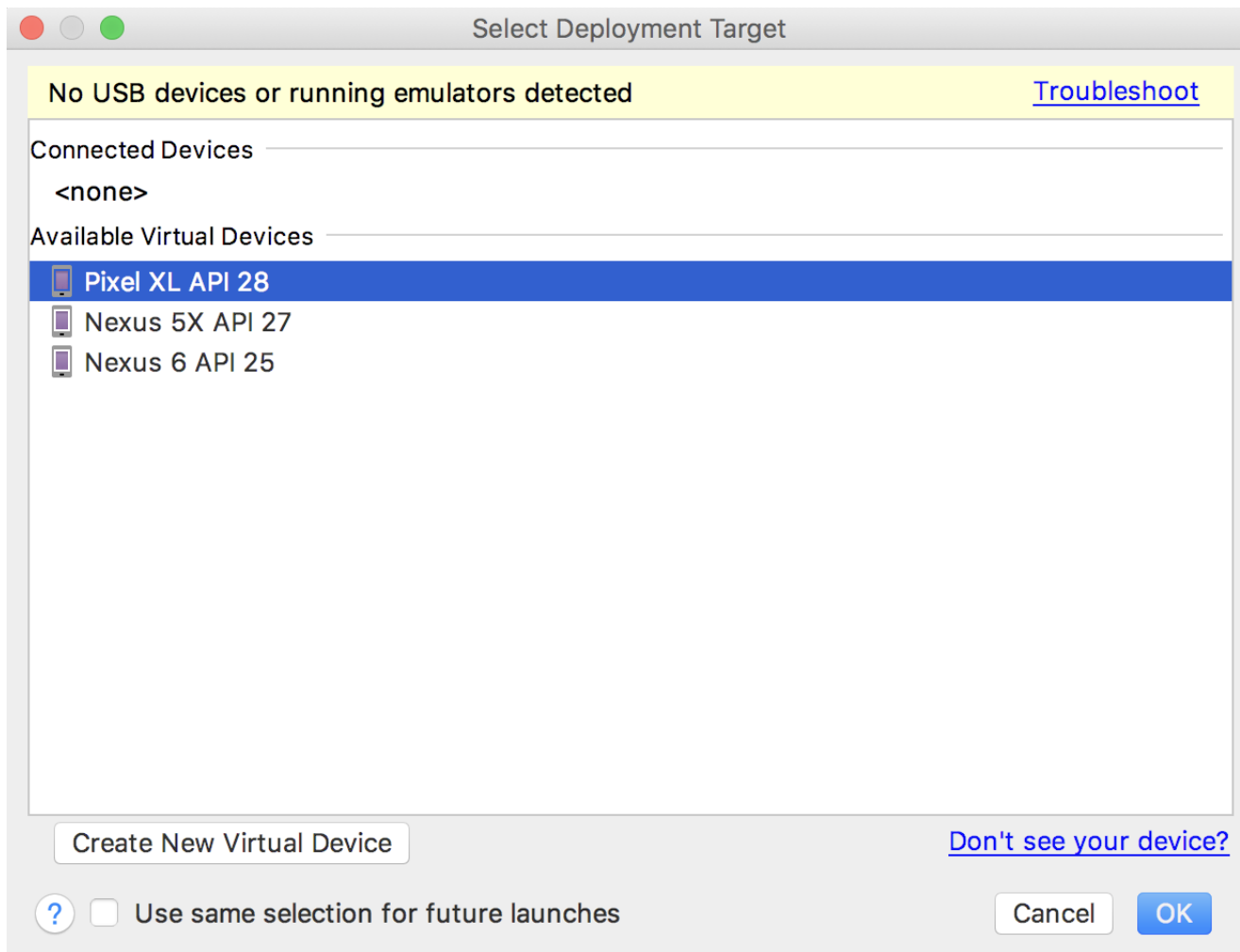
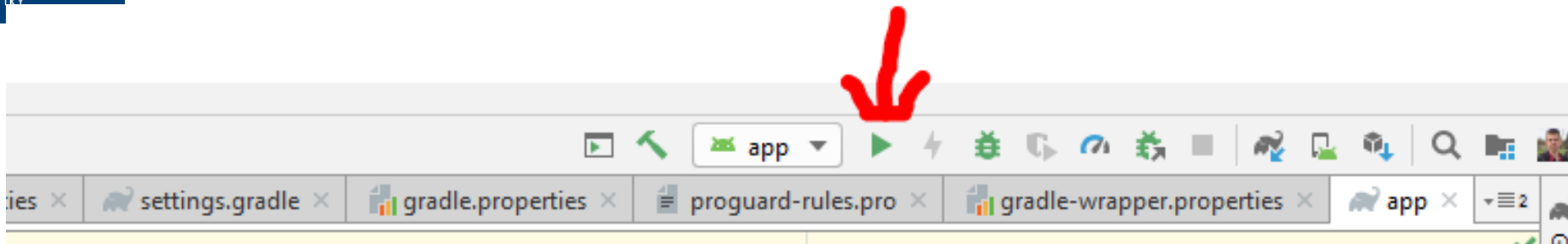
System Image  
**x86**

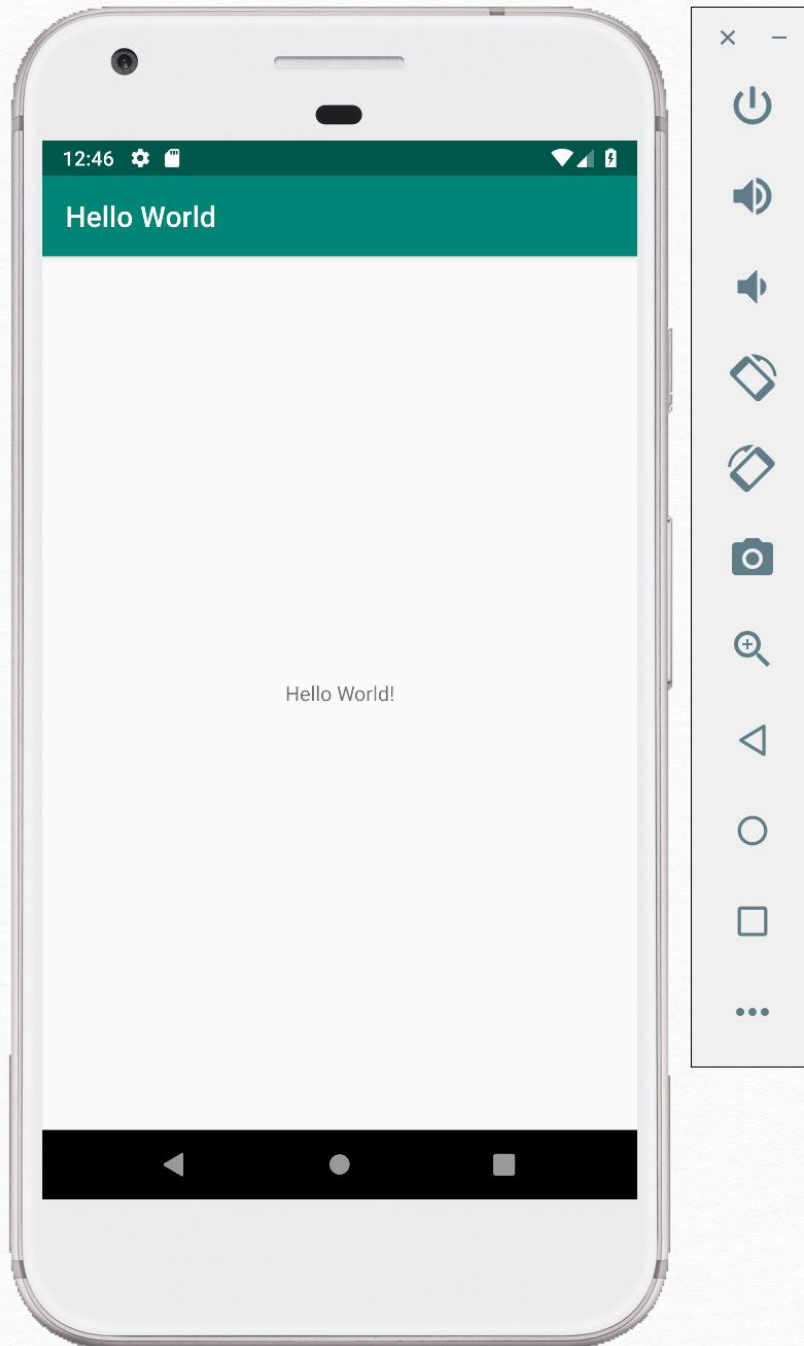
We recommend these images because they run the fastest and support Google APIs.

Questions on API level?  
See the [API level distribution chart](#)

Cancel Previous **Next** Finish







# Allow USB debugging?


The computer's RSA key fingerprint is:  
1B:28:11:B0:AC:F4:E6:1E:01:0D:

Always allow from this computer




CANCEL OK

## Select Deployment Target

Connected Devices

-  LGE Nexus 5X (Android 8.1.0, API 27)

Available Virtual Devices

-  Pixel XL API 28
-  Nexus 5X API 27
-  Nexus 6 API 25

Create New Virtual Device

Use same selection for future launches

Cancel OK

# Mobilné výpočty

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C606