

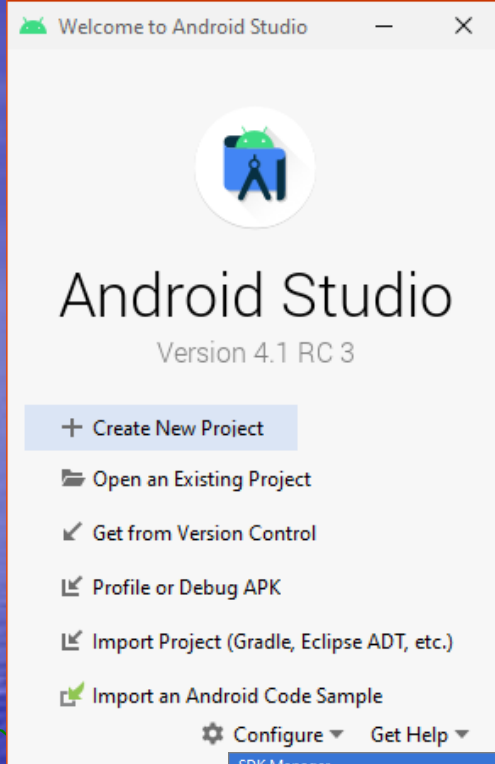
Development with Android Studio

Main screens

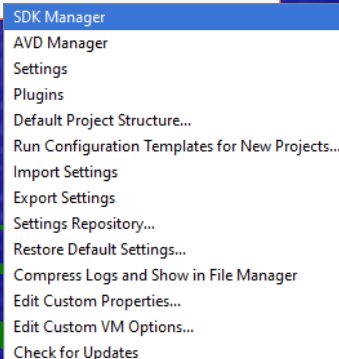
Android IDE

Android Studio IDE and SDK

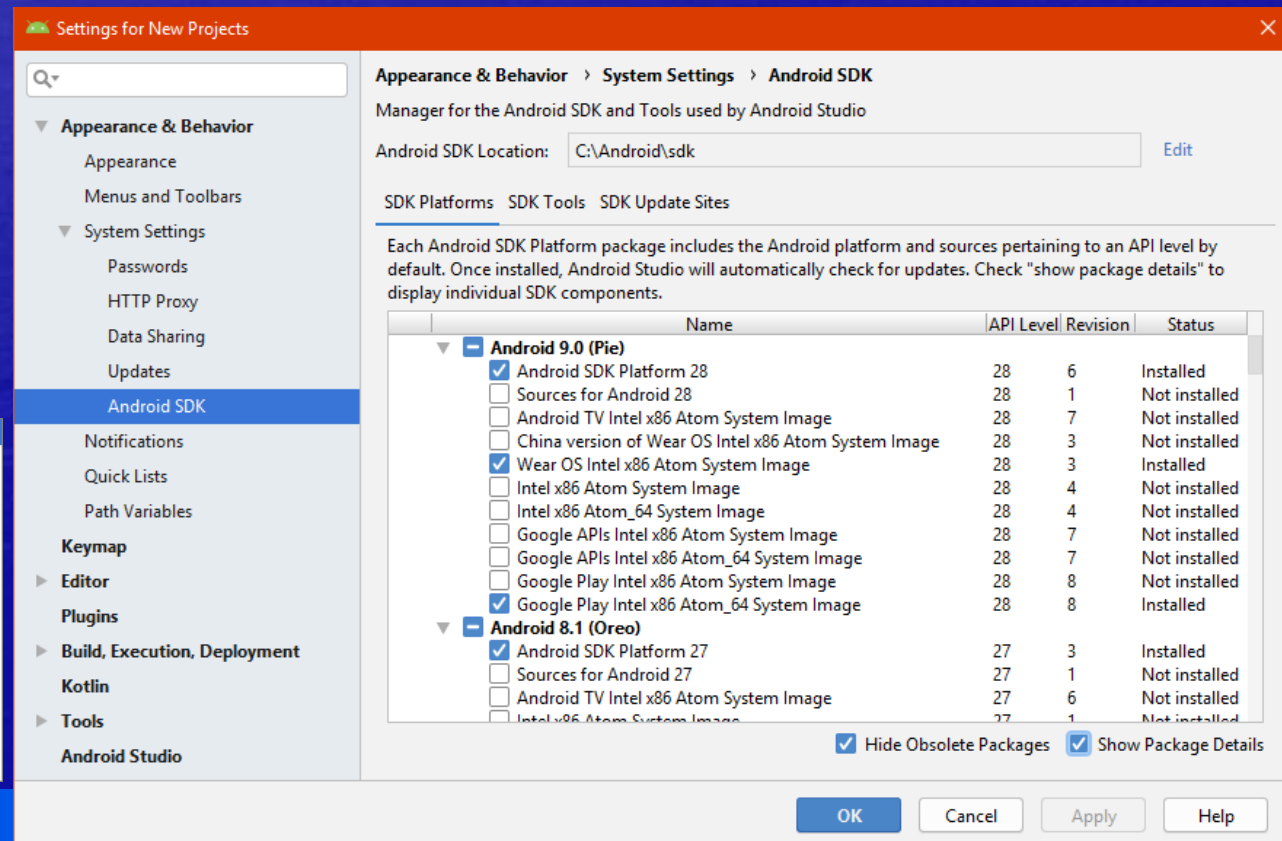
<https://developer.android.com/studio>



Android Studio



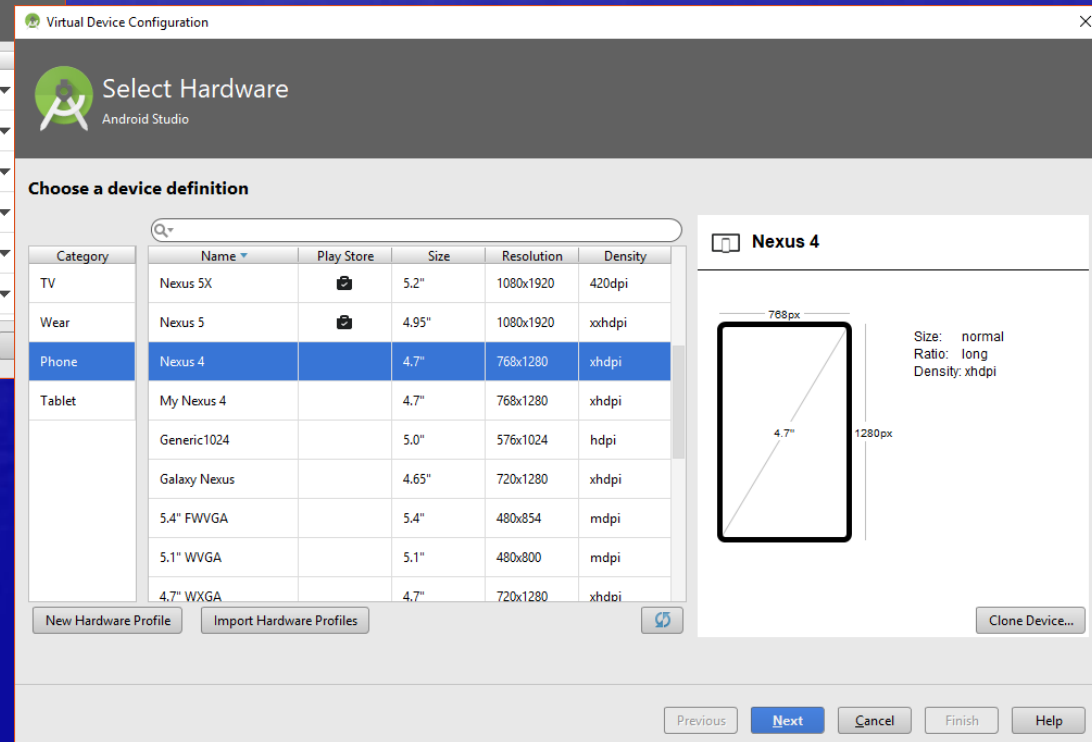
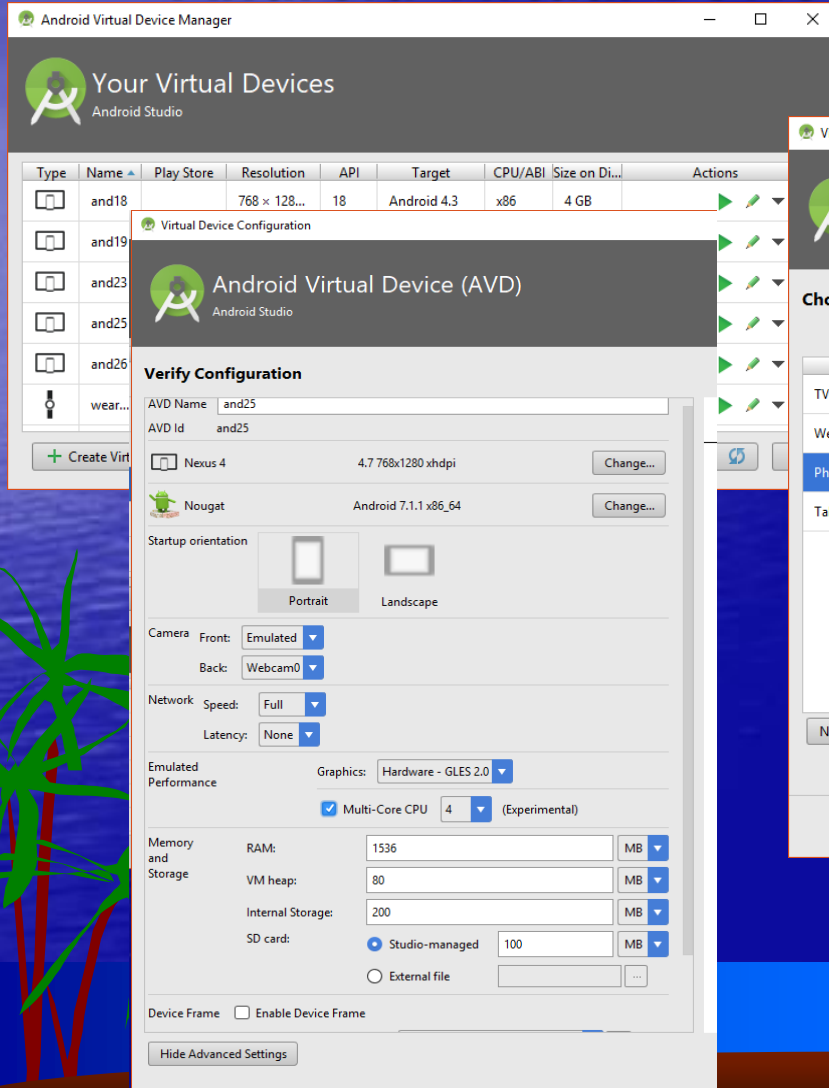
Android SDK



Android development

❖ Creation of emulators

● Android Virtual Device Manager (AVD)



New Android project

2.

Create New Project

Configure Your Project

Name
My Application

Package name
com.example.myapplication

Save location
C:\Users\Miguel\AndroidStudioProjects\MyApplication

Language
Java

Minimum SDK
API 22: Android 5.1 (Lollipop)

! Your app will run on approximately 92.3% of devices.
[Help me choose](#)

☐ Use legacy android.support libraries ?

Previous Next Cancel Finish

1.

Create New Project

Select a Project Template

Phone and Tablet Wear OS Android TV Automotive Android Things

No Activity
Creates a new empty project

Basic Activity

Bottom Navigation Activity

Empty Activity

Fullscreen Activity

Google AdMob Ads Activity

Google Maps Activity

Login Activity

Previous Next Cancel Finish

3.

Create New Project

Configure Your Project

Name
MainActivity

☒ Generate a Layout File

Layout Name
activity_main

☒ Launcher Activity

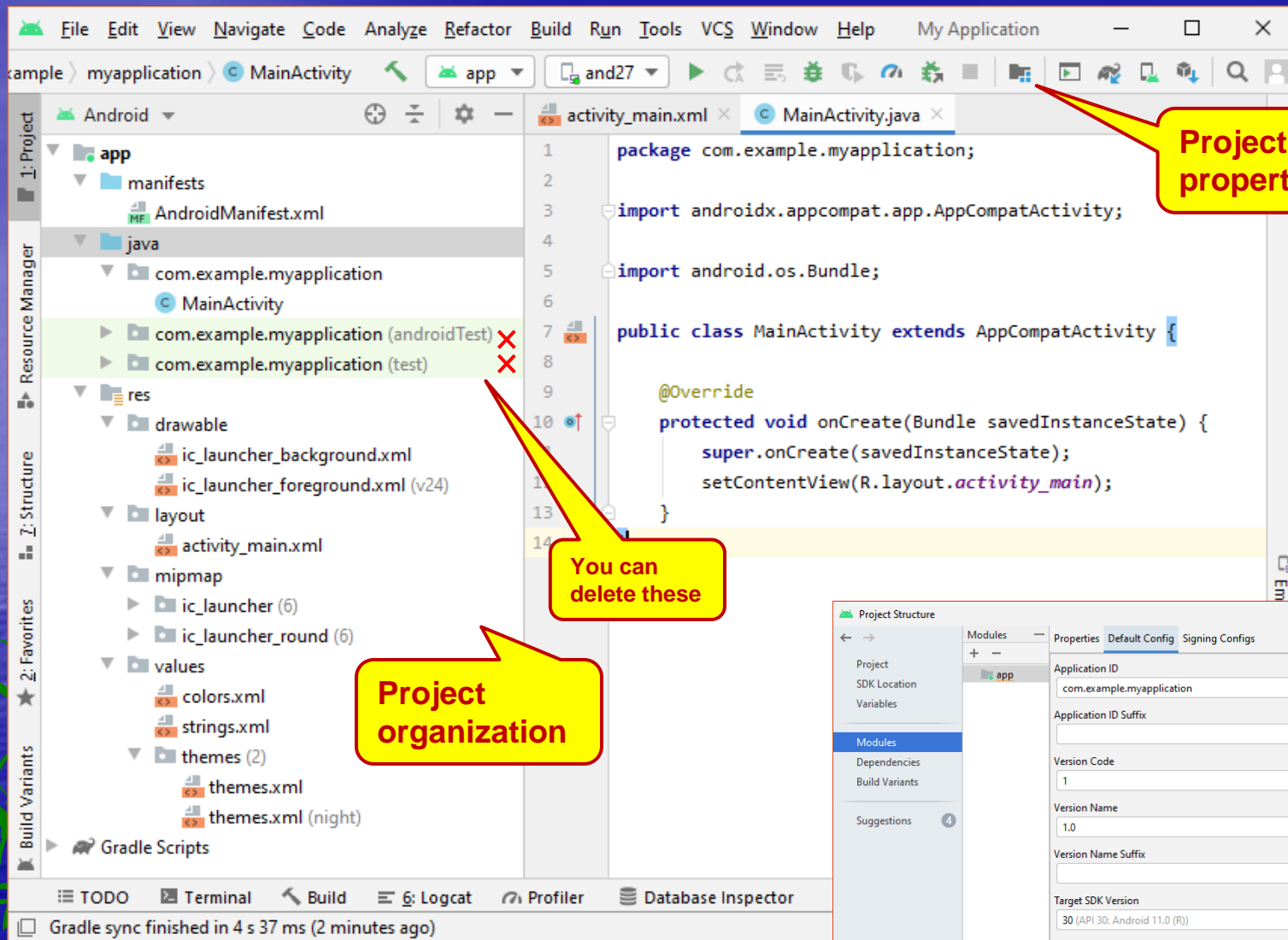
Package name
com.example.myapplication

Source Language
Java

Empty Activity
Creates a new empty activity

Previous Next Cancel Finish

Characterizing a project

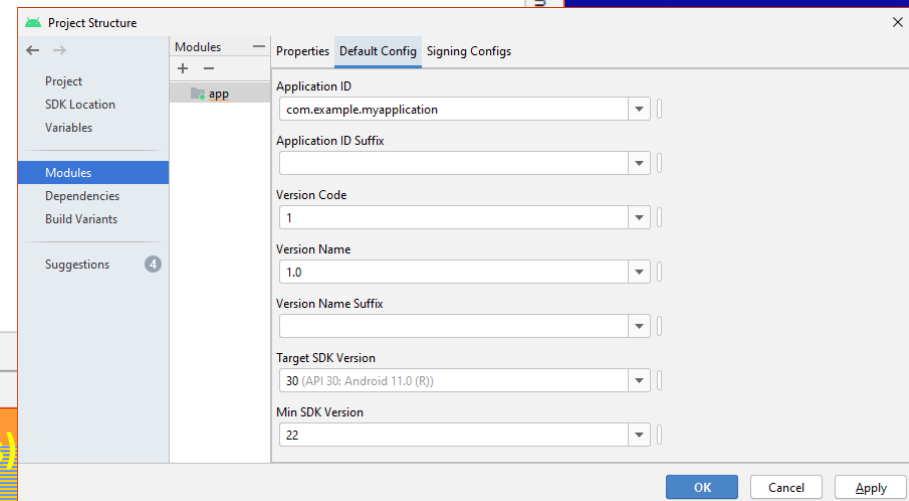


Project organization

You can delete these

Project properties

Project Structure (some properties and dependencies)



Project skeleton

MyApp - [D:\Users\Miguel\Documents\AndroidStudioProjects\MyApp] - [app] - ... \app\src\main\java\org\feup\apm\myapplication\MainActivity.java - Android Studio 2.3.3

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

MyApp app src main java org feup apm myapplication MainActivity

Android

1: Project

2: Structure

Captures

app

- manifests
 - AndroidManifest.xml
- java
 - org.feup.apm.myapplication
 - MainActivity
- res
 - drawable
 - layout
 - activity_main.xml
 - mipmap
 - values
 - colors.xml
 - strings.xml
 - styles.xml
- Gradle Scripts

MainActivity.java x AndroidManifest.xml x activity_main.xml x strings.xml x

```
package org.feup.apm.myapplication;

import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }
}
```

First method to be called

Activities are classes that ultimately derive from Activity or some descendent

The screen is defined using a layout resource

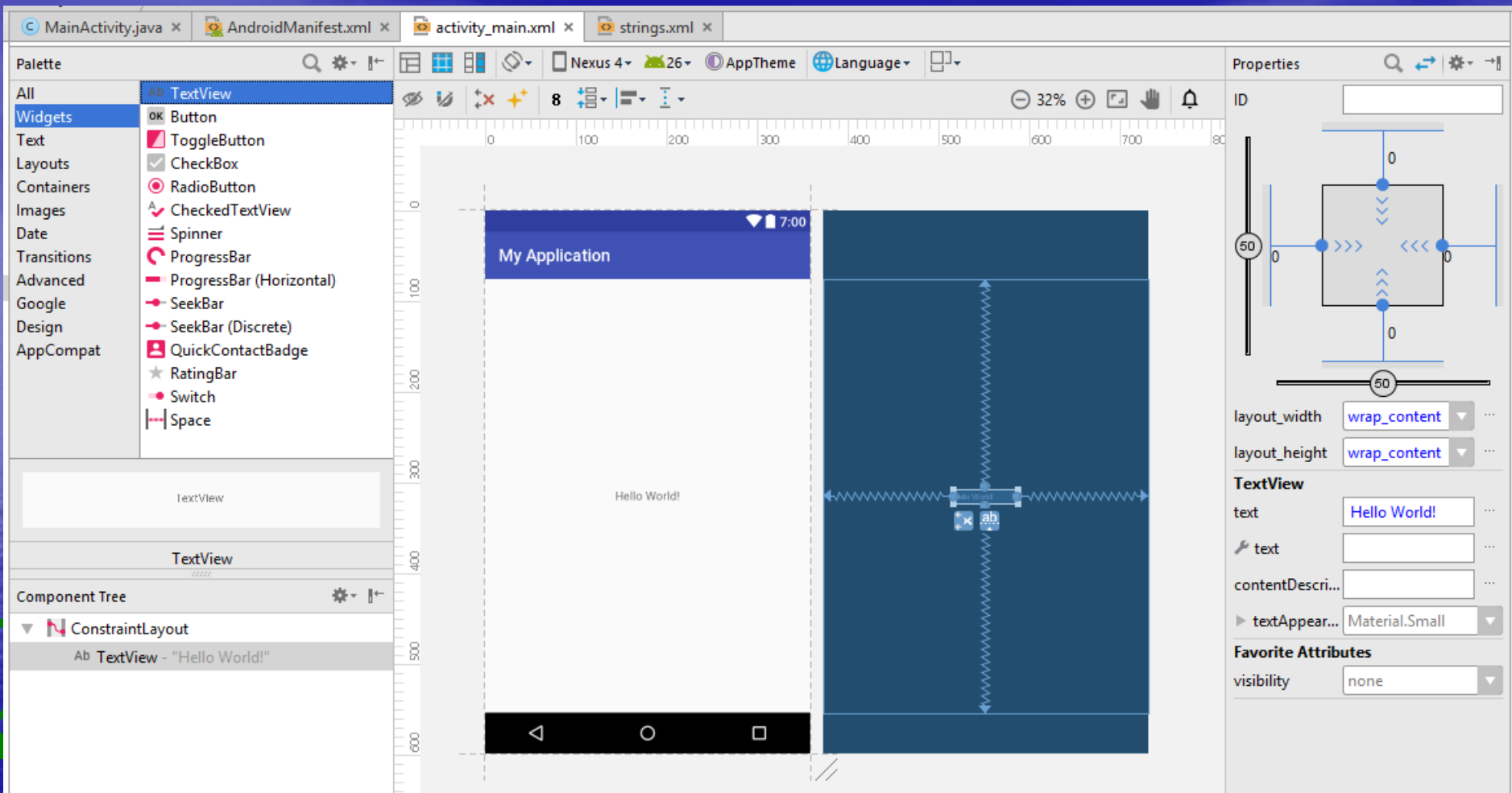
Resources (activity layout)

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

- Project Manager (Left):** Shows the project structure for 'MyApplication'. The 'layout' folder is expanded, showing 'activity_main.xml'.
- Editor (Center):** Displays the XML code for 'activity_main.xml':

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout 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:gravity="center"
    tools:context=".MainActivity">
    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="@string/tv_greeting" />
</LinearLayout>
```
- Palette (Middle-Right):** Lists various UI components like TextView, EditText, etc.
- Component Tree (Bottom-Middle):** Shows the hierarchy: LinearLayout (horizontal) > TextView.
- Attributes (Right):** Shows the properties for the selected TextView, including layout_width, layout_height, gravity, and text.
- Preview (Center-Right):** A visual representation of the layout on a mobile device screen.
- Bottom Bar:** Contains tabs for TODO, Terminal, Database Inspector, Profiler, Build, and Logcat.

Layout editor



Resources (values)

MyApp - [D:\Users\Miguel\Documents\AndroidStudioProjects\MyApp] - [app] - ...app\src\main\res\values\strings.xml - Android Studio 2.3.3

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

MyApp app src main res values strings.xml

Android

- app
 - manifests
 - AndroidManifest.xml
 - java
 - org.feup.apm.myapplication
 - MainActivity
 - res
 - drawable
 - layout
 - activity_main.xml
 - mipmap
 - values
 - colors.xml
 - strings.xml
 - styles.xml
 - Gradle Scripts

MainActivity.java x strings.xml x activity_main.xml x AndroidManifest.xml x

Edit translations for all locales in the translations editor.

```
1 <resources>
2   <string name="app_name">My Application</string>
3 </resources>
4
```

You can define string constants, number constants, colors, styles, ... in the values directory

The manifest

MyApp - [D:\Users\Miguel\Documents\AndroidStudioProjects\MyApp] - [app] - ...app\src\main\AndroidManifest.xml - Android Studio 2.3.3

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

MyApp app src main res mipmap-hdpi

Android

1: Project

Structure

Captures

AndroidManifest.xml

MainActivity.java x AndroidManifest.xml x strings.xml x activity_main.xml x

```
1 <?xml version="1.0" encoding="utf-8"?>
2 <manifest xmlns:android="http://schemas.android.com/apk/res/android"
3       package="org.feup.apm.myapplication">
4
5   <application
6       android:allowBackup="true"
7       android:icon="@mipmap/ic_launcher"
8       android:label="My Application"
9       android:roundIcon="@mipmap/ic_launcher_round"
10      android:supportRtl="true"
11      android:theme="@style/AppTheme">
12
13       <activity android:name=".MainActivity">
14           <intent-filter>
15               <action android:name="android.intent.action.MAIN"/>
16
17               <category android:name="android.intent.category.LAUNCHER"/>
18           </intent-filter>
19       </activity>
20   </application>
21 </manifest>
22
```

Properties of application and other components

All components should be listed

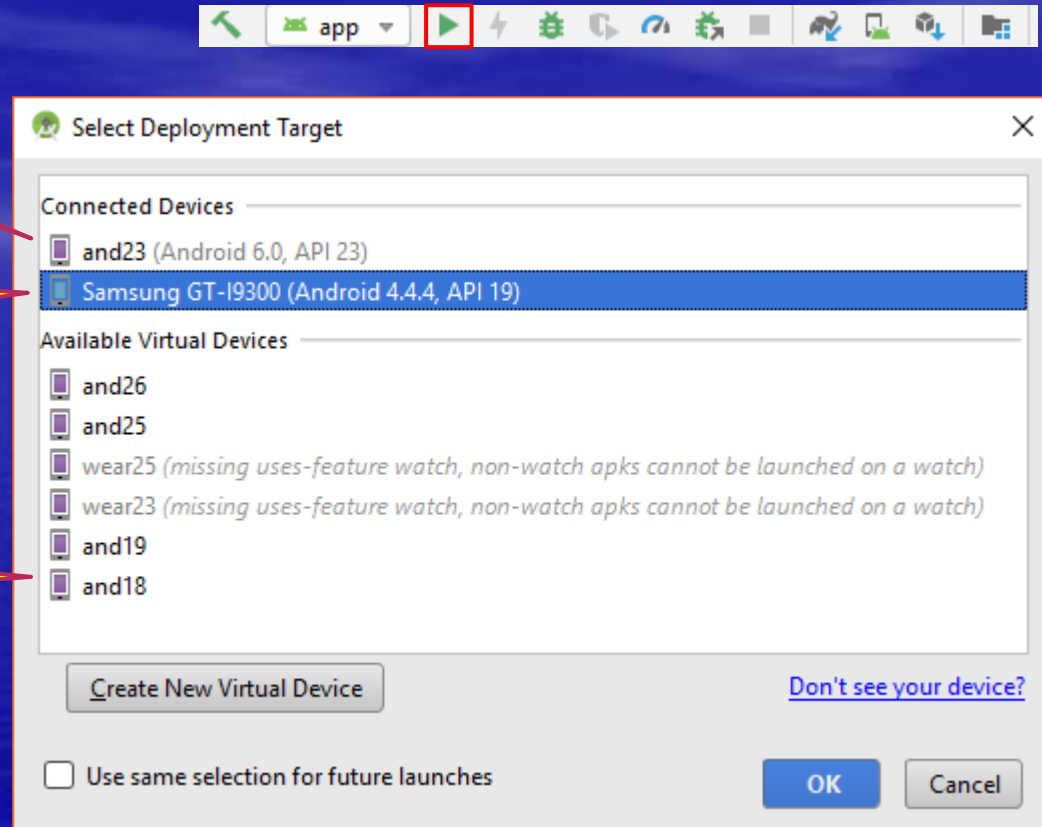
Intent filters allow the activation by the Launcher and other applications, using the corresponding intent

Execution

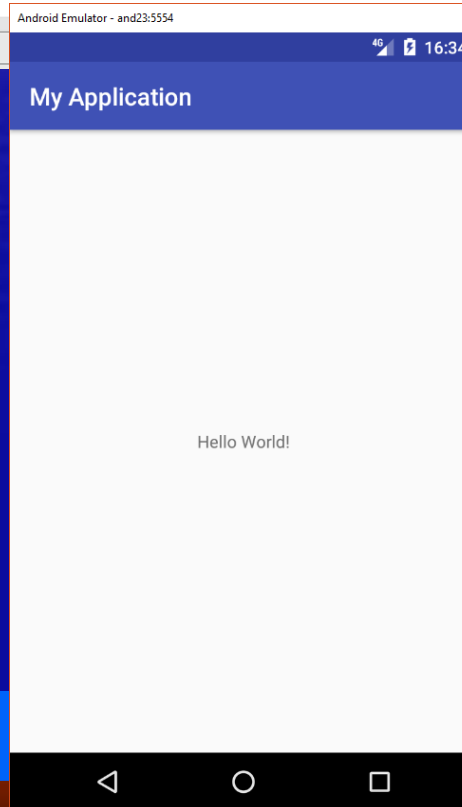
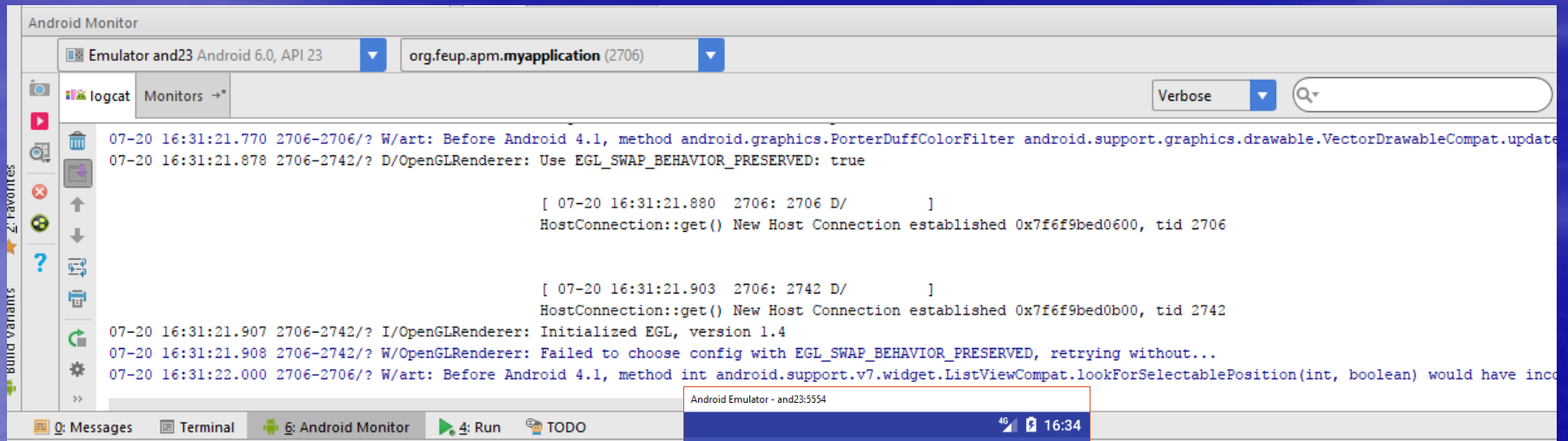
An emulator

Real device connected through USB

Launch other emulator



Messages and emulator



An emulator

Execution messages

Debugging (1)

❖ Logging messages

- Using the Log class which has several static methods

- `Log.e()` - log errors
- `Log.w()` - log warnings
- `Log.i()` - log information
- `Log.d()` - log debugging
- `Log.v()` - log verbose
- `Log.wtf()` - log 'what a terrible failure'

- These messages are shown on the Android Monitor

- Many API functions and even the OS emit them
- In Android Studio: Use the bottom tab Android Monitor (Alt+6)
- In an independent view: `adb logcat` (SDK)
- Leave it running during the all session

Debugging (2)

- breakpoints, single step, variable state, ...



MyApp - [D:\Users\Miguel\Documents\AndroidStudioProjects\MyApp] - [app] - ...\app\src\main\java\org\feup\apm\myapplication\MainActivity.java - Android Studio 2.3.3

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

MyApp app src main java org feup apm myapplication MainActivity

Android

app

manifests

java

org.feup.apm.myapplication

MainActivity

res

Gradle Scripts

MainActivity.java x AndroidManifest.xml x strings.xml x activity_main.xml x

```
1 MainActivity onCreate()
2 package org.feup.apm.myapplication;
3 import android.support.v7.app.AppCompatActivity;
4 import android.os.Bundle;
5
6 public class MainActivity extends AppCompatActivity {
7
8     @Override
9     protected void onCreate(Bundle savedInstanceState) { savedInstanceState: null
10         super.onCreate(savedInstanceState); savedInstanceState: null
11         setContentView(R.layout.activity_main);
12     }
13 }
```

Debug app

Debugger Console

Frames

"main" @ 3,972 in group "main": RUNNING

onCreate:11, MainActivity (org.feup.apm.myapplication)

performCreate:6237, Activity (android.app)

callActivityOnCreate:1107, Instrumentation (android.app)

performLaunchActivity:2369, ActivityThread (android.app)

handleLaunchActivity:2476, ActivityThread (android.app)

-wrap11:-1, ActivityThread (android.app)

handleMessage:1344, ActivityThread\$H (android.app)

dispatchMessage:102, Handler (android.os)

loop:148, Looper (android.os)

main:5417, ActivityThread (android.app)

invoke:-1, Method (java.lang.reflect)

run:726, ZygoteInit\$MethodAndArgsCaller (com.android.internal.os)

main:616, ZygoteInit (com.android.internal.os)

Variables

this = {MainActivity@4161}

savedInstanceState = null

Evaluate Expression

R.layout.activity_main

Use Control+Shift+Enter to add to Watches

Result:

result = 2130968603

Evaluate Code Fragment Mode Close

Q: Messages Terminal Android Monitor 4: Run 5: Debug TODO

Gradle build finished in 1s 719ms (5 minutes ago)