



Laboratorio di Applicazioni Mobili
Bachelor in Computer Science &
Computer Science for Management

University of Bologna

Android Setup

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Small Glossary...

SDK (Software development kit)

IDE (Integrated Development Environment)

API (Application Program Interface)



Small Glossary...

SDK (Software development kit)

- A set of tools that help you in creating software
 - Compiler, tester, debugger, libraries

IDE (Integrated Development Environment)

- Graphical environment in which all the tools are accessible.

API (Application Program Interface)

- A set of calls that the underlying world exposes to the developer for interaction.
 - It does not correspond to “libraries”.



Android Studio

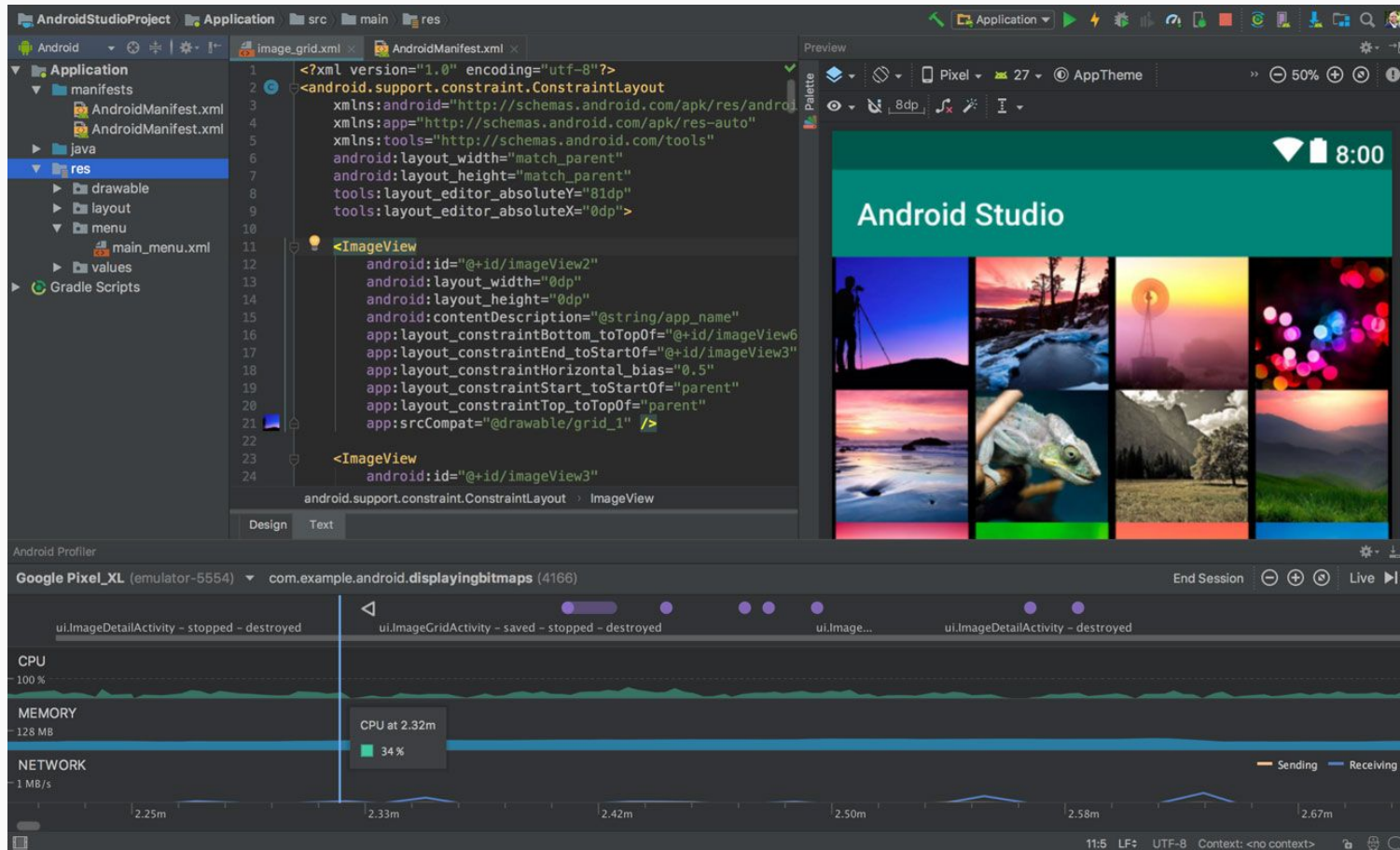
The official development platform for Android Apps is **Android Studio** by JetBrains.

Historically Android development was in Eclipse with an android plugin.

- Eclipse SDK has been DEPRECATED since the end of 2015, which means newer versions of Android are no longer supported.
 - <https://android-developers.googleblog.com/2015/06/an-update-on-eclipse-android-developer.html>



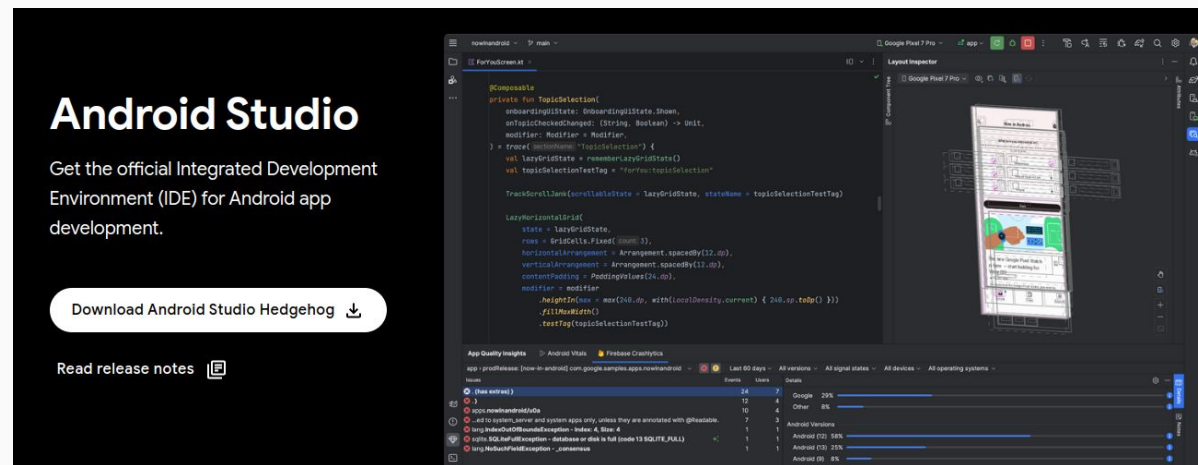
Android Studio





Android Studio

- Go to <https://developer.android.com/studio>
- Download Android Studio and the SDK
- Install it and you're done!
 - Version Ladybug at the time of writing





Android Studio

How to develop Android applications?

- Linux / Mac OS / Windows? Doesn't matter
- A real device is not mandatory although suggested...
- Code your application in the IDE
 - Test it with the emulator
 - Deploy it on a real device (if you can)



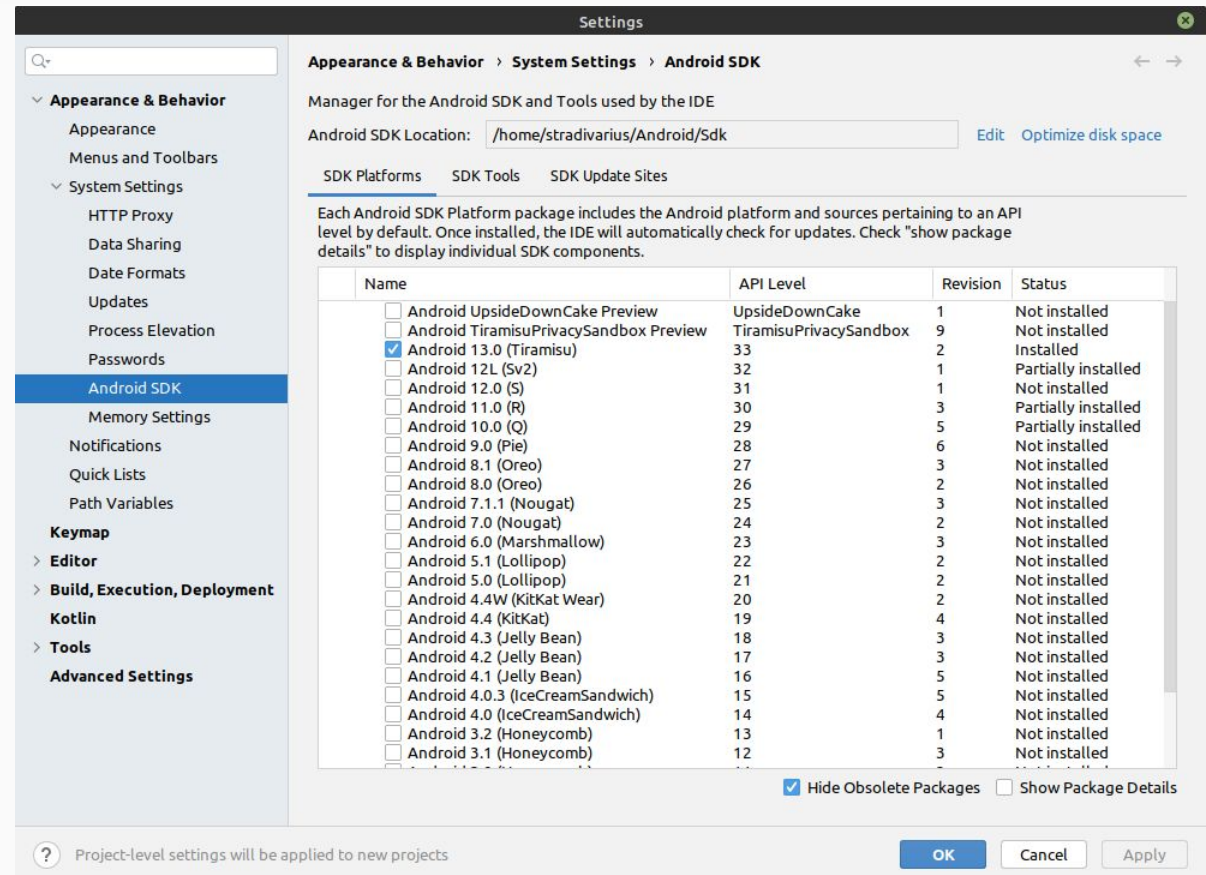
SDK Setup

Tools > SDK Manager

Android tool Used to get APIs and add-ons

You can also start it from Android Studio

It'll affect the compileSdkVersion (details later)





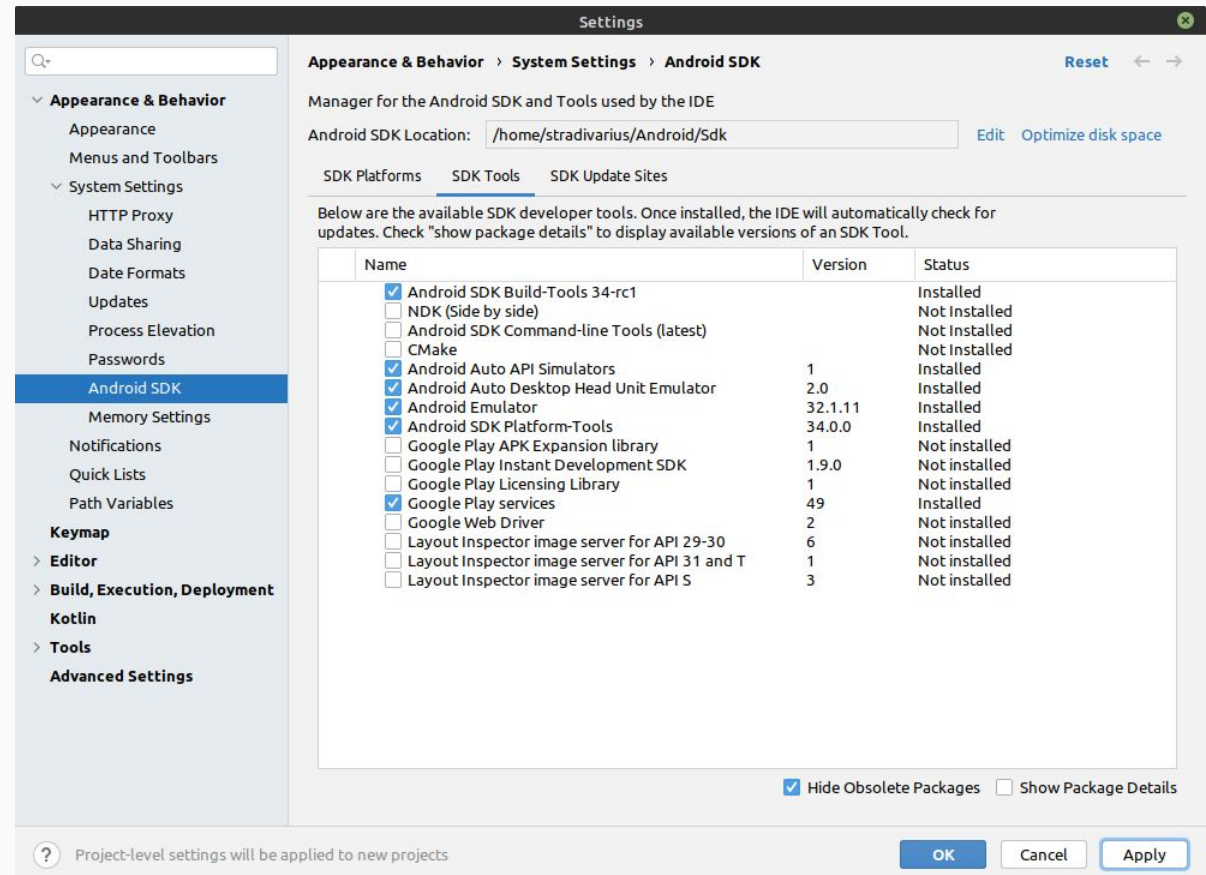
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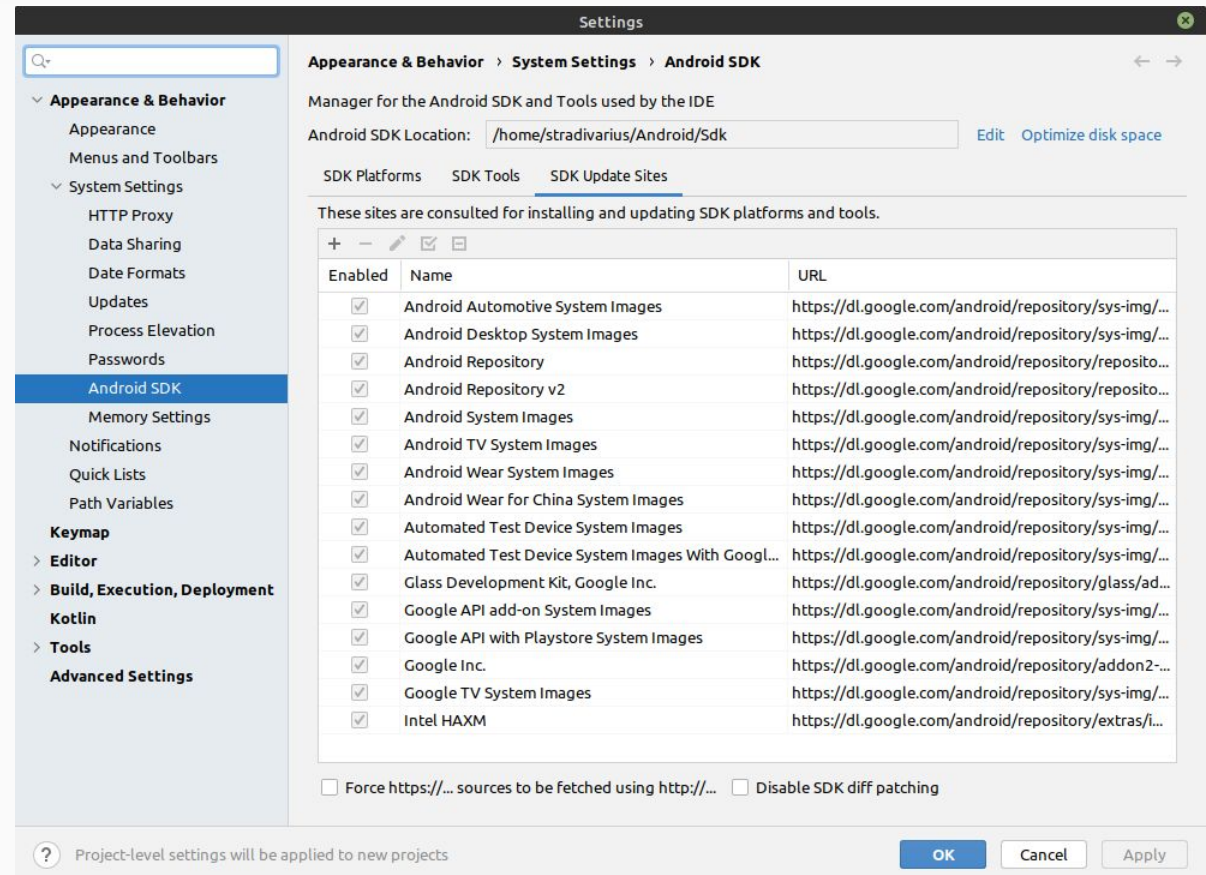
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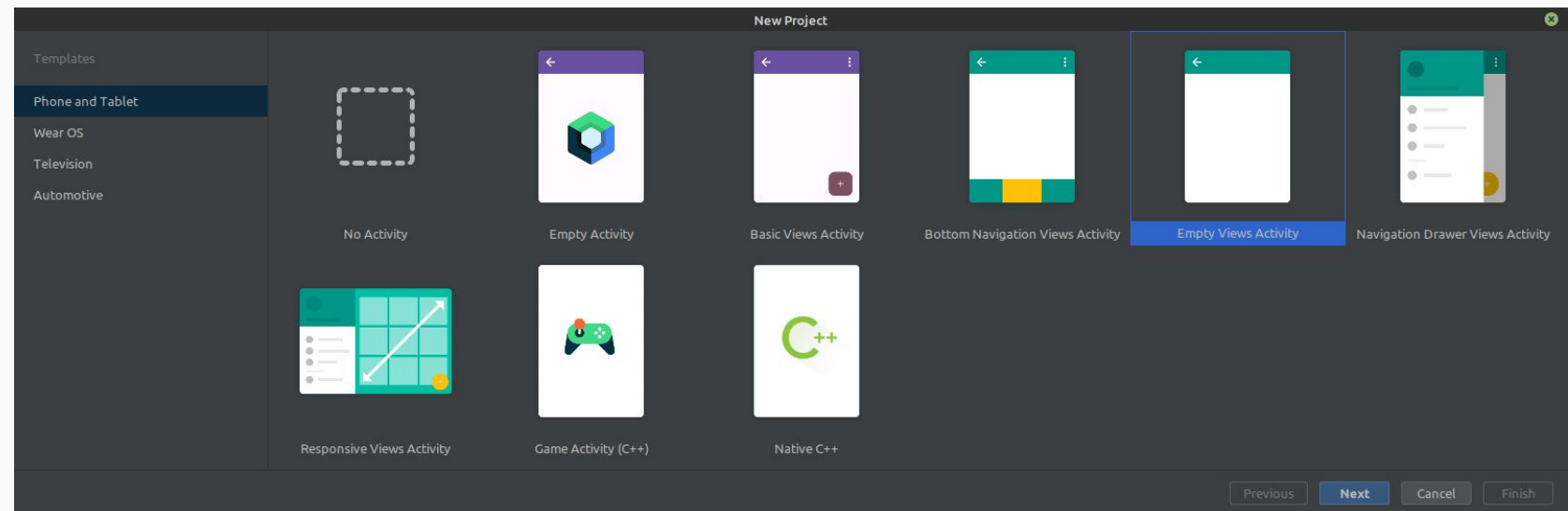




Hello World App

Go to File > New Project

Newest version of Android Studio makes you choose first which kind of activity you want to start with.





Hello World App

Go to File > New Project

Your activity will be named MainActivity by default (Java class).

Of course you can refactor it ...

New Project

Empty Views Activity

Creates a new empty activity

Name: HelloWorld

Package name: com.example.helloworld

Save location: /home/stradivarius/AndroidStudioProjects/HelloWorld

Language: Kotlin

Minimum SDK: API 24 ("Nougat"; Android 7.0)

ⓘ Your app will run on approximately 96.3% of devices.
[Help me choose](#)

Build configuration language ⓘ Kotlin DSL (build.gradle.kts) [Recommended]

Previous Next Cancel Finish



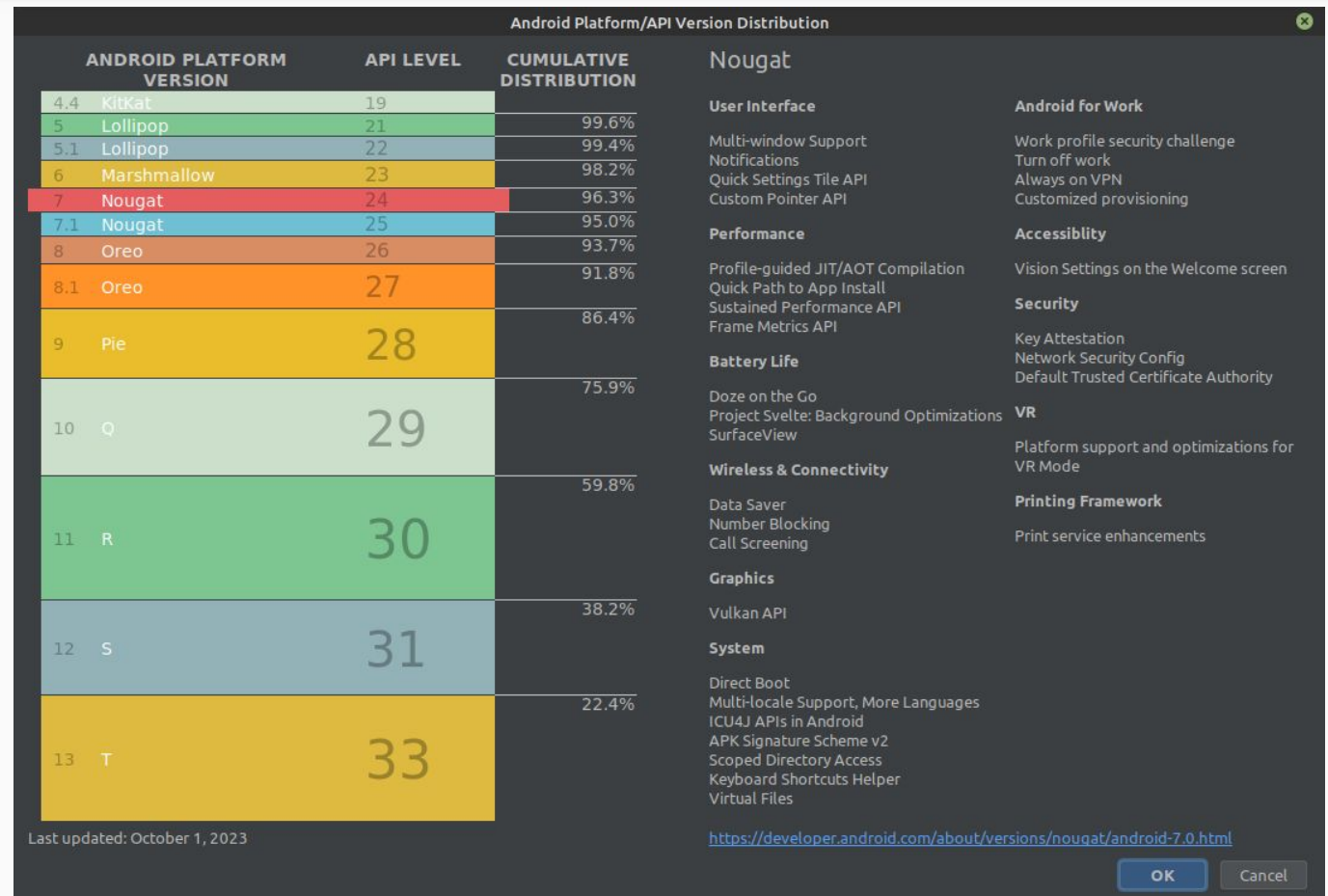
Hello World App

Go to File > New Project

Choose carefully
which API version
to use.

Low version =
high compatibility

Low version =
less features



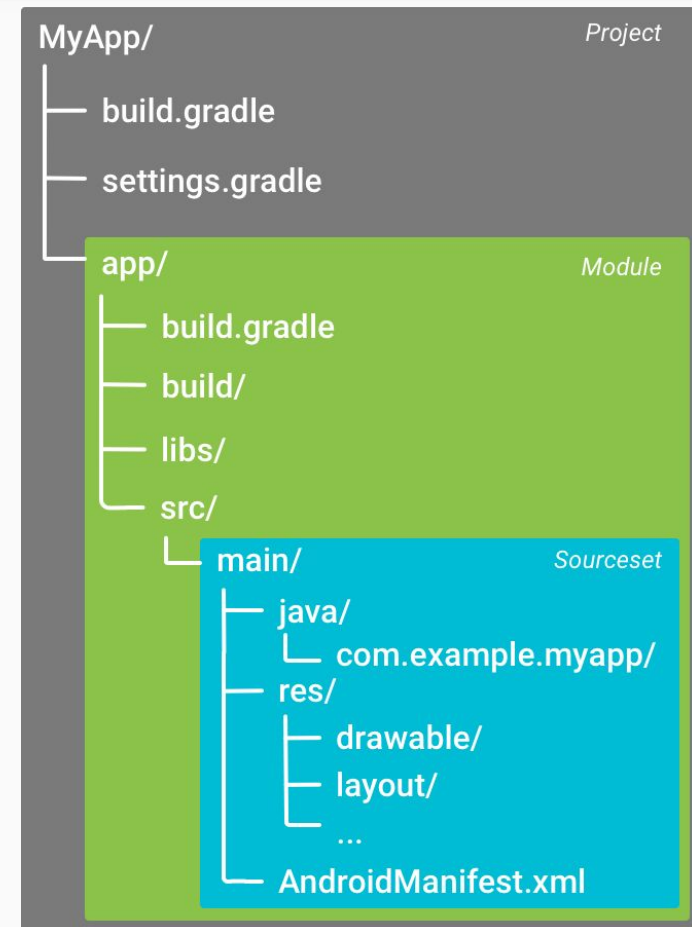


Hello World App

“Whatever you do in IntelliJ IDEA, you do that in the context of a project. A project is an organizational unit that represents a complete software solution.

Your finished product may be decomposed into a series of discrete, isolated modules, but it's a project definition that brings them together and ties them into a greater whole.”

This means that in theory you can develop more than one app within the same project but you will hardly want to do so.

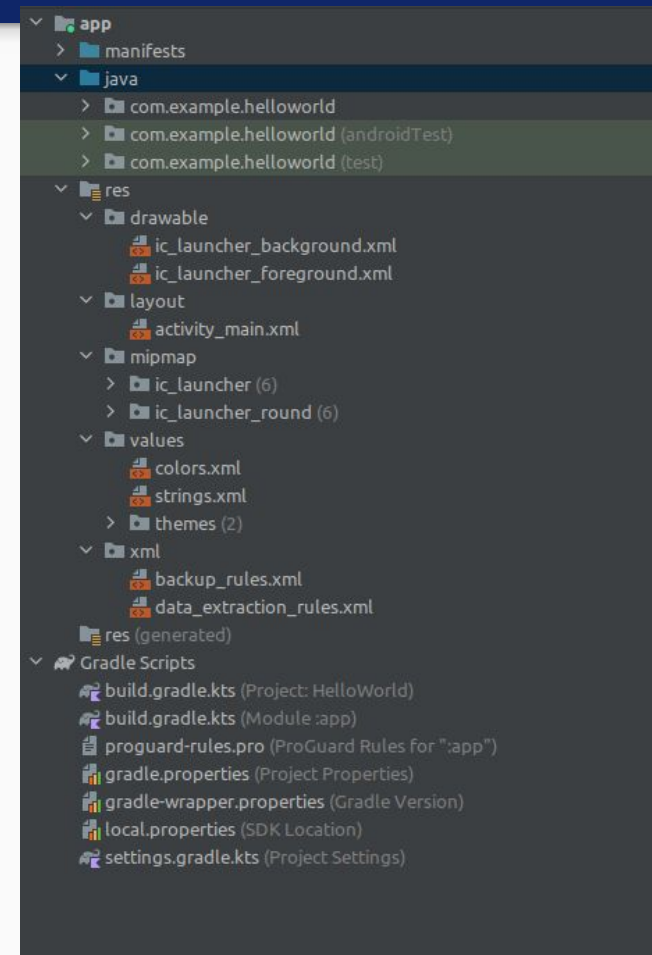




Hello World App

The code of your application:

- The java folder contains... the java code!
 - ... or Kotlin actually
- Inside res there are a lot of resources
 - Images
 - Layouts
 - Xml files
 - Strings
- AndroidManifest.xml





Hello World App

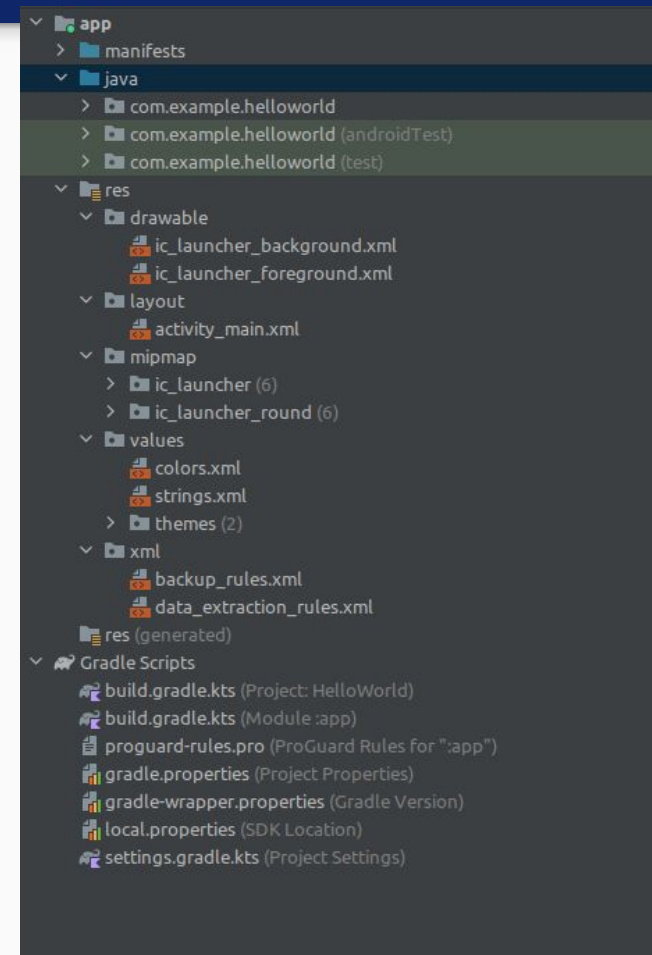
Android Manifest

the only file exposed to the OS

Mandatory file for every application

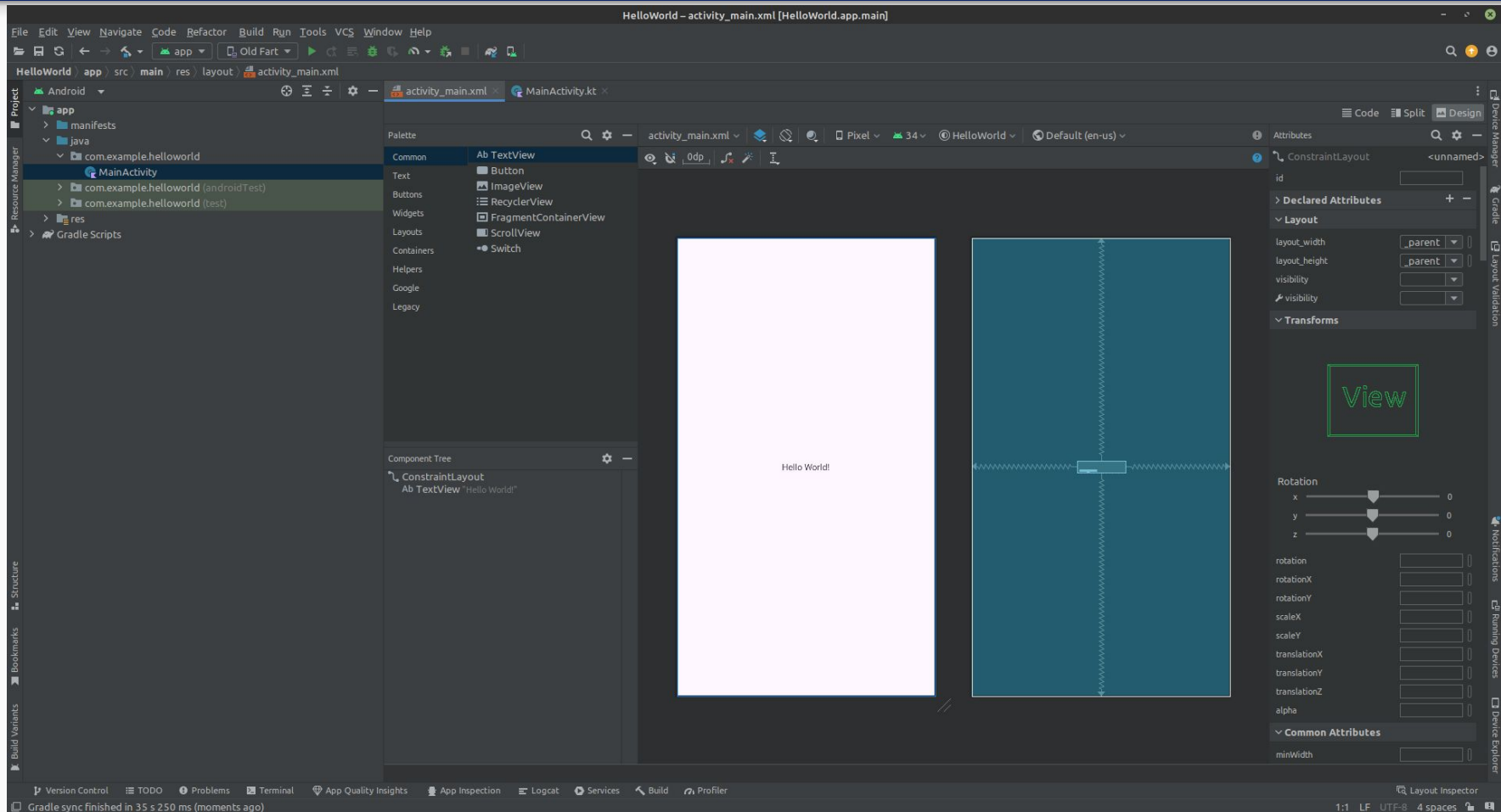
Contains:

- Application declaration
- Permissions
- Intent filters
- Targets





Hello World App





Hello World App

```
File Edit View Navigate Code Refactor Build Run Tools VCS Window Help
HelloWorld - MainActivity.kt [HelloWorld.app.main]
HelloWorld app src main java com example helloworld MainActivity
Project
  Android
  app
  manifests
  java
  com.example.helloworld
  MainActivity
  com.example.helloworld (androidTest)
  com.example.helloworld (test)
  res
  Gradle Scripts
Resource Manager
Structure
Bookmarks
Build Variants
1 package com.example.helloworld
2
3 import ...
4
5
6 class MainActivity : AppCompatActivity() {
7     override fun onCreate(savedInstanceState: Bundle?) {
8         super.onCreate(savedInstanceState)
9         setContentView(R.layout.activity_main)
10    }
11 }
```

Device Manager
Gradle
Notifications
Running Devices
Device Explorer
Version Control
TODO
Problems
Terminal
App Quality Insights
App Inspection
Logcat
Services
Build
Profiler
Layout Inspector
1:1 LF UTF-8 4 spaces
Gradle sync finished in 35 s 250 ms (a minute ago)



Running the App

Hit Tools >

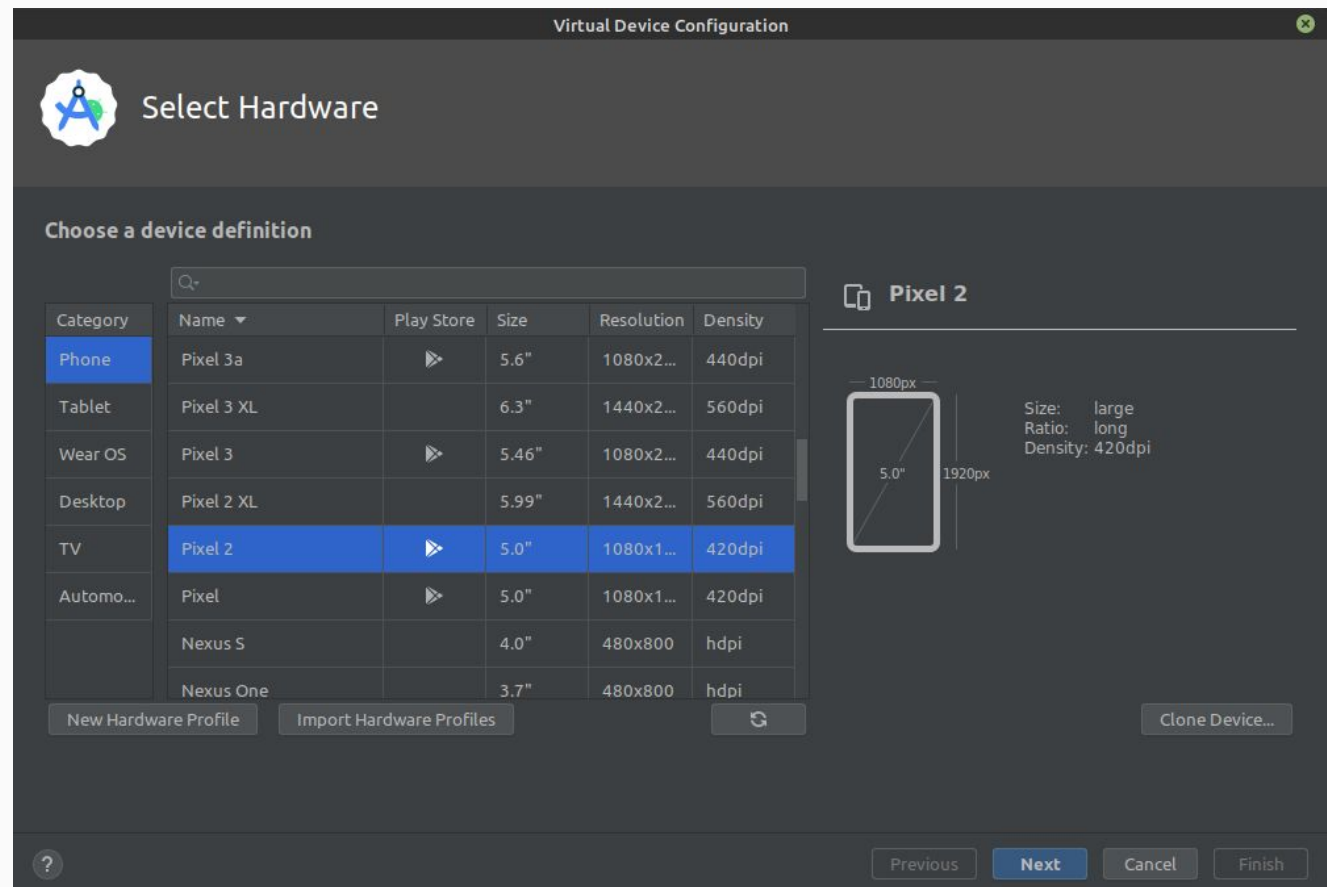
Device Manager

Previously AVD

AVD = Android Virtual Device

You can select options for the emulator

You can create as many as you want





Running the App

Hit Tools >

Device Manager

Previously AVD

AVD = Android Virtual Device

You obviously need to download the Android system image for the version you want.

Virtual Device Configuration

System Image

Select a system image

Recommended x86 Images Other Images

Release Name	API Level	ABI	Target
UpsideDownCa...	UpsideDownCake	x86_64	Android API UpsideDov
TiramisuPrivac...	TiramisuPrivacySc	x86_64	Android API TiramisuPi
API 34	34	x86_64	Android API 34 (Google
Tiramisu	33	x86_64	Android 13.0 (Google
Sv2	32	x86_64	Android 12L (Google Pi
S	31	x86_64	Android 12.0 (Google
R	30	x86	Android 11.0 (Google P
Q	29	x86	Android 10.0 (Google
Pie	26	x86	Android 9.0 (Google Pl
Oreo	27	x86	Android 8.1 (Google Pl

UpsideDownCakePrivacySandbox

API Level
UpsideDownCakePrivacySand

Android
Google Inc.

System Image
x86_64

We recommend these Google Play images because this device is compatible with Google Play.

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

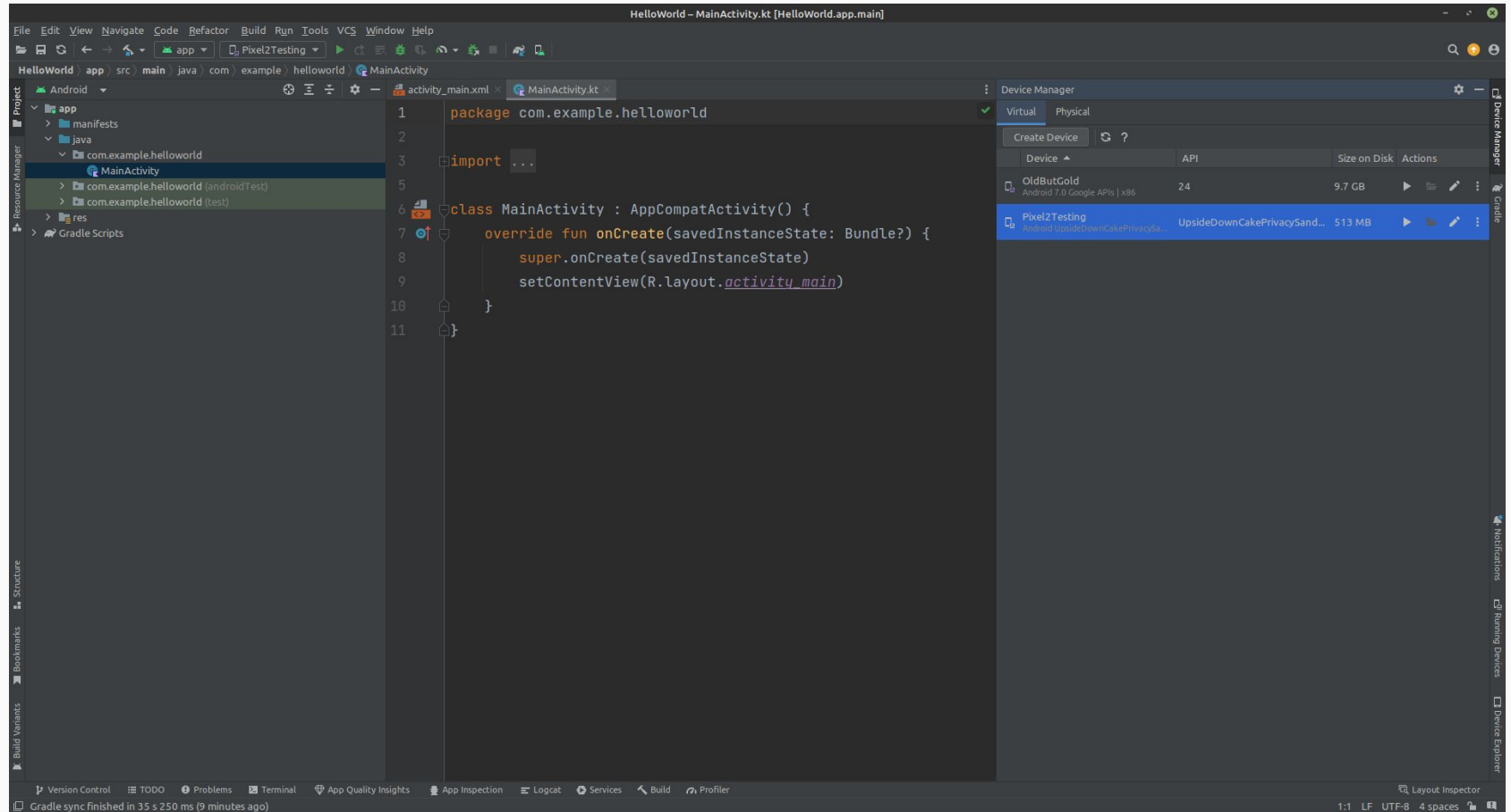
A system image must be selected to continue.

Previous Next Cancel Finish



Running the App

Hit the play button
for testing!





Running the App

If you run it, it will turn on and resemble pretty much a real device.

It is legit a virtual machine.

YES you can use the internet (by default each AVD is individually NATted).

NO you can't call (lol)



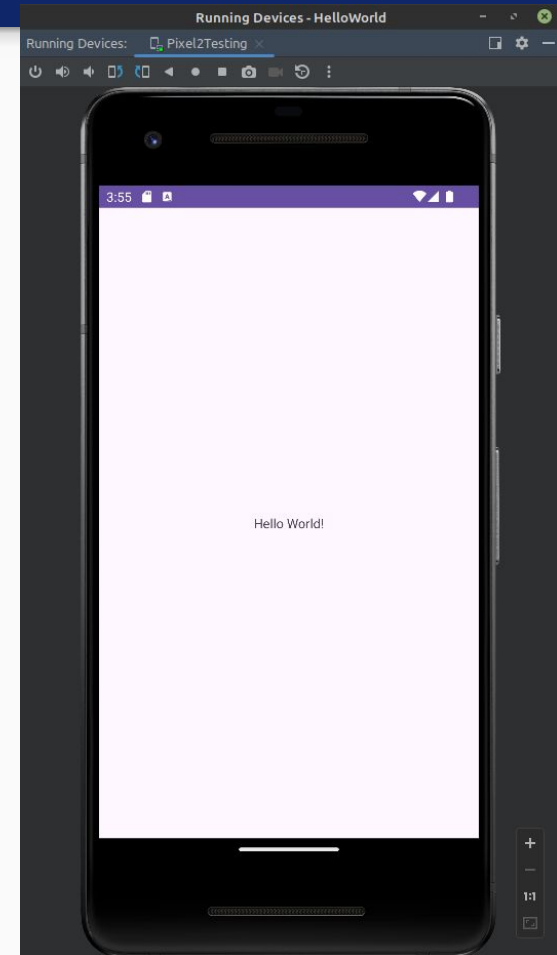


Running the App

Hit Run > Run 'app'

Test in on the emulator

You should see something
similar to this





Running the App

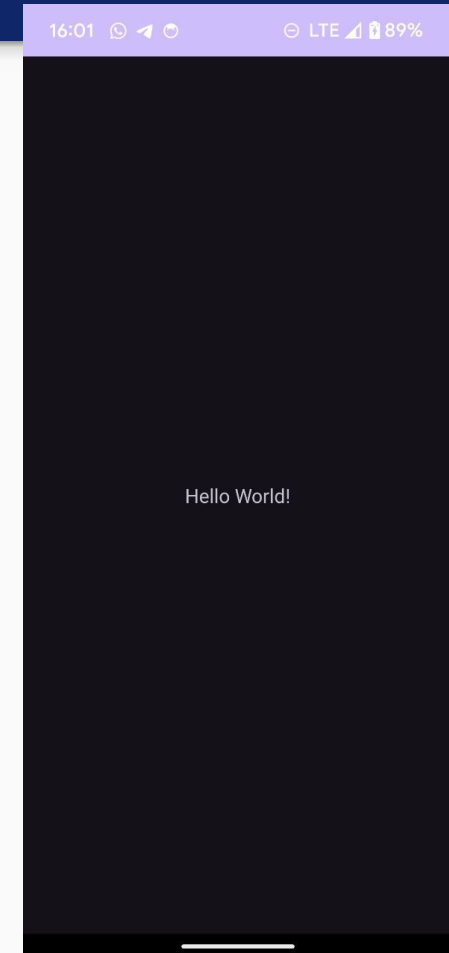
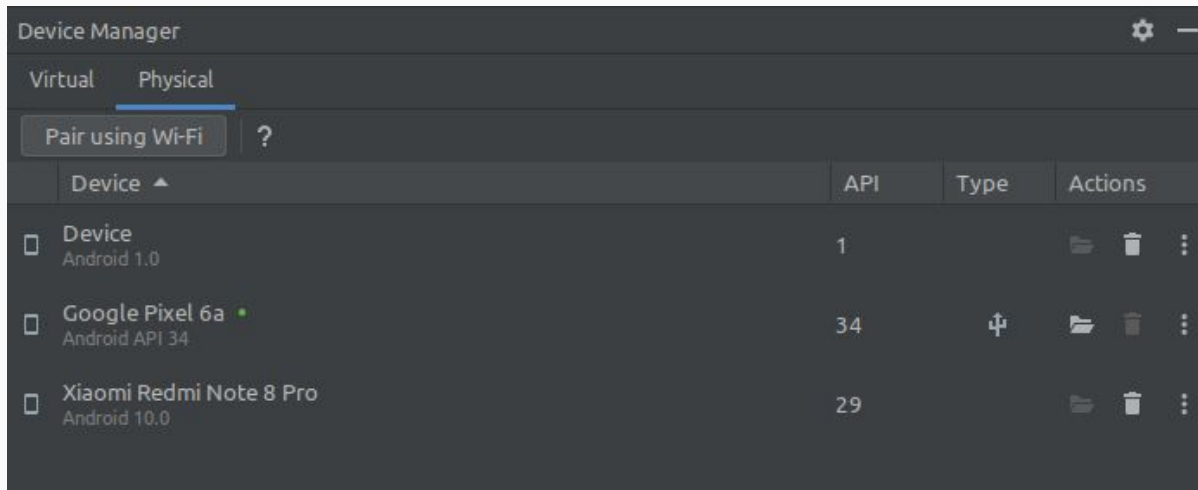
You can also test the app on a real device: there are two ways to do it:

- Via USB debugging (more for debugging)
 - Phone must have developer options and USB debugging enabled
(<https://developer.android.com/studio/debug/dev-options.html#enable>)
 - PC's OS must have the correct driver/module
(<https://developer.android.com/studio/run/device#setting-up>)
 - You can then run apps just by hitting the Run > Run 'app'
 - You can use the newest WiFi pairing!
- Create an **apk** (more for releasing and sharing)
 - Must be signed



Running the App

Here's the app running on my phone





Versioning

Hit “File > Project Structure > Modules” and you’ll see two sections that’ll help you deal with versioning.

Properties

versioning and other stuff at Compile time

- Mostly having to do with Gradle

Default Config

versioning and other stuff at Run Time



Versioning

What is Gradle?

It's the official build automation tool for Android, coming with a lot of optimizations.

It has config files that can be modified through the Android Studio GUI.

It manages build configurations that no longer are assigned to the Android Developer.



Versioning

Gradle features

- Build types
 - Release, debug, etc...
- Product Flavors
 - Free and paid versions...
- Manifest Entries
 - Override values on the manifest files
- Dependencies
 - Reference to libraries to import (Maven style) that are not included by default in the Android build.
- Signing
 - Configuration for signing your app during the build process...
- ...



Versioning

compileSdkVersion

- Used by Gradle to compile the project
- i.e. which set of classes and functions should I use?
- It's the newest possible SDK theoretically supported by your app (watch out, NOT the API).
- Suggested to use the latest available (unless you haven't learned it yet...)
- It's COMPILED, therefore retro-compatibility is structurally ensured.



Versioning

minSdkVersion

- Indicates which is the oldest release of the SDK (but also API) your app is compatible with...
- ... though it is compiled with another version.
- Obviously you cannot implement certain functionalities (e.g. channels).
- In practice if a customer has a phone that's too old, then the app is neither installable nor visible.



Versioning

targetSdkVersion

- Indicates which is the newest release of the SDK (but also API) your app is compatible with...
- ... in practice it tells what is the expected version.
- It is ideally the same as the compileSdkVersion, however it can be older if newer versions had not been tested.

In short:

`minSdkVersion <= targetSdkVersion <= compileSdkVersion`

Even though it's better:

`minSdkVersion <= targetSdkVersion == compileSdkVersion`



Deploying

Android applications must be signed before installing them on a real device.

Hit: Build >

Generate Signed Bundle / APK

You can generate a Bundle (ABB) alternatively:

a Bundle is Google Play's new app serving model, called Dynamic Delivery, then uses your app bundle to generate and serve optimized APKs for each user's device configuration, so they download only the code and resources they need to run your app. You no longer have to build, sign, and manage multiple APKs to support different devices, and users get smaller, more optimized downloads. It is a **publishing** format.

<https://developer.android.com/guide/app-bundle>

You need a key for this and you can generate one from the menu.

You can potentially use no key, but it will generate a debug version.



Deploying

Using here V2 Signature (faster, since Android 7.0)

https://developer.android.com/about/versions/nougat/android-7.0.html#apk_signature_v2

New Key Store

Key store path: /home/stradivarius/Android/myKeystore/newKeystore.jks

Password: Confirm:

Key

Alias: key0

Password: Confirm:

Validity (years): 2

Certificate

First and Last Name: Federico Montori

Organizational Unit: Death Star

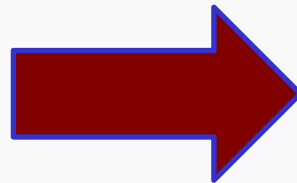
Organization: The Galactic Empire

City or Locality:

State or Province:

Country Code (XX):

OK Cancel



Generate Signed Bundle or APK

Module: app

Key store path: /home/stradivarius/Android/myKeystore/newKeystore.jks

Create new... Choose existing...

Key store password:

Key alias: key0

Key password:

☒ Remember passwords

Previous Next Cancel Help

... transfer the .apk file to your phone and you're done.



Deploying

To be published on the market, you have to pay 25 \$

- Lifetime fee, unlimited APPs
- Not required for the LAM class
- Upload the ABB, and in few hours/days the APP is on the play store
 - Since a few years the APK is not accepted anymore.
- Receive comments, improve, update
- Smartphone specific bugs? AVDs



Deploying

<https://play.google.com/console>

Google Play Console

Produzione

Test

Test aperti

Test chiusi

Test interni

Preregistrazione

Report pre-lancio

Panoramica

Dettagli

Impostazioni

Copertura e dispositivi

Explorer per app bundle

Integrità dell'app

Configurazione

Crescita

Presenza nello Store

Scheda dello Store principale

Cerca in Play Console

T9A HowToDie

Telefoni, Tablet, Chrome OS

Crea nuova release

Test interni

Crea e gestisci release di test interno per mettere a disposizione la tua app a un massimo di 100 tester interni. [Scopri di più](#)

Il nome temporaneo della tua app è "it.stradivarius.t9ahowtodie (unreviewed)"

Fino a quando la configurazione e la revisione dell'app non saranno completate, i tester interni che scaricheranno la tua app visualizzeranno un nome temporaneo.

[Scopri di più](#) [Ignora](#)

Riepilogo del canale

Metti in pausa il canale

Attivo • Ultima release: 2 (0.97 Beta) • Nome temporaneo dell'app "it.stradivarius.t9ahowtodie (unreviewed)"

Release

Tester

Release

2 (0.97 Beta)

[Visualizza i dettagli della release](#)

Disponibile per i tester interni • 1 codice versione • Pubblicazione della release: 20 feb 11:09 • Non esaminata

Mostra riepilogo

Promuovi release

Cronologia release

Mostra



Deploying

- **Privacy Policy**
- **A lot of claims about what you are going to do with user data...**
- **Internal Tests**
 - a.k.a. distribute the apk with a handful of friends
- **Closed Tests (Mandatory)**
 - create a distribution list via the dashboard of at least 20 ppl
- **Open Tests**
 - every time you update you can pre-release the test version



Questions?

federico.montori2@unibo.it