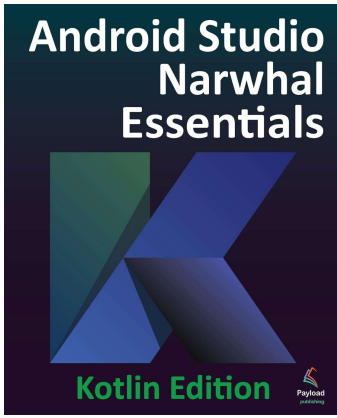
Android Studio
(ako začať)
Jazyk Kotlin
(ako neskončiť)

Peter Borovanský
KAI, I-18

MS-Teams: 2sf3ph4, List, github

borovan 'at' ii.fmph.uniba.sk



Základné info o kurze

- Stránka predmetu
  - https://dai.fmph.uniba.sk/courses/VMA/

prihláste sa do L.I.S.T.
- ak ste v ňom nikdy neboli, ozvite sa mi mailom
- sledujte LIST, všetky zadania budú v ňom
- sledujte Teams 2sf3ph4, komunikácia/prednášky/oznamy

veľká časť kurzu bude dobre sledovateľná z knihy

- **Android Studio Koala Essentials - Kotlin Edition: Developing Android Apps Using Android Studio 2025.1.2 and Kotlin , Neil Smyth** https://www.payloadbooks.com/product/android-studio-koala-essentials-kotlin-edition-ebook/
- .pdf pre minuloročnú verziu Giraffe je k dispozícii... https://www.amazon.com/Android-Studio-Giraffe-Essentials-Developing/dp/1951442776
- **Android Studio Narwhal Essentials - Compose Edition: Developing Android Apps with Android Studio, Jetpack Compose, and Kotlin,** https://www.amazon.com/Android-Studio-Narwhal-Essentials-Developing

Vývojové jazyky/nástroje

- Symbian
  - C++, Java ME, Python, …
- Windows Mobile 6
  - C# (MS Visual Studio)
- iOS
  - Objective-C -> Swift 3/4/5 (Xcode)

iOS - Apple Center kurz

- Android
  - scratch (MIT Inventor)
  - java (Android SDK + plugin pre Eclipse) -> (Android Studio)
  - java (A.I.D.E.)
  - Kotlin (Android Studio 4+)
  - C++ (Android NDK)
- Multi-platform
  - C# (Xamarin iOS, Android, Windows) – fy. MS, Visual Studio 2015
  - Pascal (Delphi XE5 iOS, Android, Windows 10) – fy. Embarcadero
  - JavaScript/TypeScript (React Native)
  - Flutter od Google
- game engine
  - C# (Unity 2D/3D), C++ (Unreal Engine)

1-AIN-303/24

...

Unity
(game engine)

#1 Unreal Engine

#2 Unity

Obľúbený nástroj pre tvorbu multi-platform aplikácií pre bakalárske práce

- 2-INF-263/15 magisterský predmet: Tvorba a dizajn počítačových hier
  - http://sccg.sk/~mferko/tdh/
  - https://candle.fmph.uniba.sk/ucitelia/Michal-Ferko
- 1-AIN-303/24 bakalársky predmet: Game Engines
  - Šimko (Gajdošech?)

Vývoj a nástroje
(detailnejšie)

- natívne aplikácie
  - Android 
    - Java
    - Kotlin
  - iOS 
    - Objective-C
    - Swift

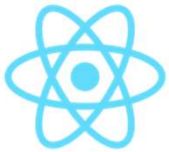

Priamy prístup k všetkým fičúrkam a komponentom OS, aj tým najnovším ...

- hybridné aplikácie
  - Cordova
  - ionic


Web-app na báze .html,. css, .js, ktoré púšťame v prostredí WebView=browser/wrapper bez browserových ovládačov

Vývoj a nástroje
(detailnejšie)

- kompilované aplikácie
  - React Native



    - JavaScript
    - Facebook
    - nekompiluje do natívneho kódu
    - obmedzená množina widgets
  - Flutter (Dart framework od Googlu)

    - Dart
    - Google
    - kompilované do ARM C++
    - bohatšia množina widgets
    - Material design (Quantum Paper)– Google 2014

  - NativeScript

    - JavaScript

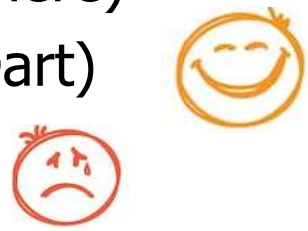
Aspekty programátora

Code sharing (write once, use everywhere)

- Cordova, ionic
- Flutter (Material Design)
- ReactNative
- Java, Swift

Knowledge sharing (learn once, use everywhere)

- Cordova, ionic, ReactNative (.js), Flutter (Dart)
- Java, Kotlin, Swift



Widget library

- Java, Swift, Cordova, ionic
- Flutter (Dart)
- ReactNative (.js)

https://www.youtube.com/watch?v=bnYJRYFsrSw&feature=youtu.be

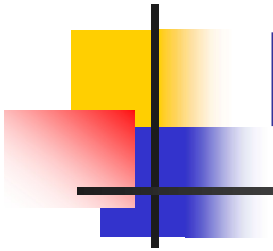
Aspekty programátora

Eco-system (schopnosť nájsť riešenie/radu/blog na stackoverflow,..)

- Java, Swift, Kotlin 
- Cordova, ionic (.js) 
- ReactNative (.js, React) 
- Flutter (nové ale zlepšuje sa) 

Popularita

- Java, Swift, Kotlin 
- Cordova, ionic, ReactNative, Flutter (pushujú FB a Google) 



Kotlin Multiplatform

- *KMM* is an SDK designed to simplify creating cross-platform mobile applications (Android, iOS iPhone, watchOS, Windows, Linux)
- share common code between iOS and Android apps
- write platform-specific code
- plaftorms jvm, js, wasm
- xcode (mac) is necessary to build an iOS app

https://kotlinlang.org/lp/multiplatform/

Android Studio

AA Shakil
Flutter sucks too. 1
Páči sa mi to · Odpovedať · Zdieľať · 3 d.

Daniel Peraza
XCode is much worse 8
Páči sa mi to · Odpovedať · Zdieľať · 4 d.

Eloy Hunter-Bruckhoff
Daniel Peraza for Android development, yes 1
Páči sa mi to · Odpovedať · Zdieľať · 3 d.

Marko Bašelj
Daniel Peraza what do people use instead of xcode?
Páči sa mi to · Odpovedať · Zdieľať · 3 d.

Daniel Peraza
Marko Bašelj there is a JetBrains IDE for iOS development but you still need XCode for compilation 1
Páči sa mi to · Odpovedať · Zdieľať · 3 d.

How to use Android studio on low-end machines 4GB 8 GB of RAM

Java vs. Kotlin

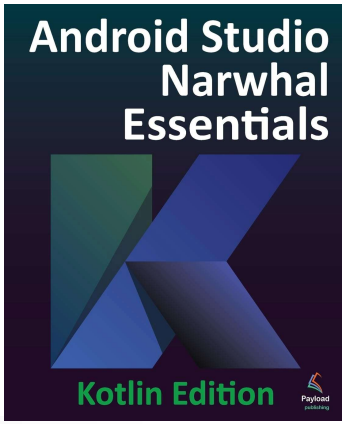
tradičný VMA kurz postavený na Java už štvrtý rok beží v jazyku Kotlin 1.9

Dôvody:

- ako iOS má svoj moderný jazyk Swift (3/4/5), aj Android má svoj Kotlin
- Java je trochu *skamenelina* medzi modernými jazykmi (Swift, Kotlin, Scala)
- Kotlin je Googlom oficiálne podporovaným vývojový nástroj pre Android
- projekt Kotlin má už >14 rokov
- kompiluje do JVM
- funguje s Android Studiom
- na JetBrains produkty ste si asi zvykli, a sú top
- oboznámite sa s niektorými princípmi moderných jazykov

- Reference: https://kotlinlang.org/docs/reference/
- Online: https://play.kotlinlang.org/byExample/

Android Studio Koala
Kotlin Edition



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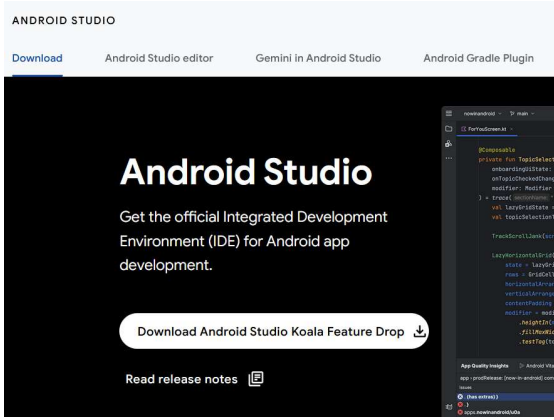
- https://www.amazon.com/Android-Studio-Giraffe-Essentials-Developing/dp/1951442776
- https://www.ebookfrenzy.com/errata/giraffekotlin.html
- sources: https://www.ebookfrenzy.com/retail/giraffekotlin/index.php

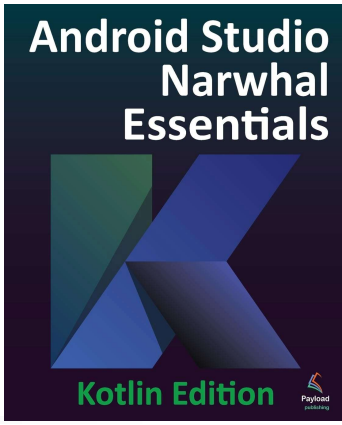


Inštalácia Android Studio:
https://developer.android.com/studio

Predmet má cvičenie, ale aj tak:
- ozvite sa v prípade problémov inštalácie na platformy, napr. Linux, Mac.
- posnažíme problém vyriešiť

Inštalácia Android Studia:
- SDK Packages: Tools/SDK Manager tab SDK Platforms
- AVD: Android Virtual Device

Android Studio Giraffe
Kotlin Edition



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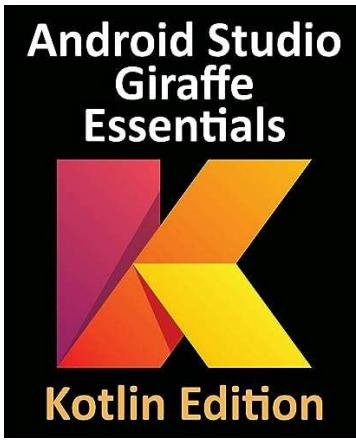
- https://www.ebookfrenzy.com/errata/giraffekotlin.html
- sources: https://www.ebookfrenzy.com/retail/giraffekotlin/index.php



2. Setting up an Android Studio Development Environment (mac/Windows/Linux)
3. Creating an Example Android App in AS
4. Creating an Android Virtual Device (AVD) in AS
5. Using and Configuring the Android Studio AVD Emulator
6. A tour of the Android Studio User Interface
7. Testing Android Studio App on a Physical Android Device
8. The Basics of the Android Studio Code Editor.
9. An Overview of the Android Architecture
10. The Anatomy of an Android App
11. An Introduction to Kotlin
12. Kotlin Data Types, Variables, and Nullability
13. Kotlin Operators and Expressions
14. Kotlin Control Flow
15. An Overview of Kotlin Functions and Lambdas
16. The Basics of Object Oriented Programming in Kotlin
17. An Introduction to Kotlin Inheritance and Subclassing

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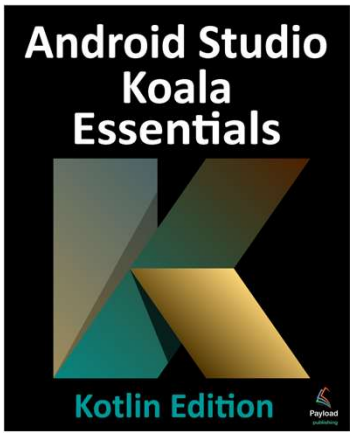
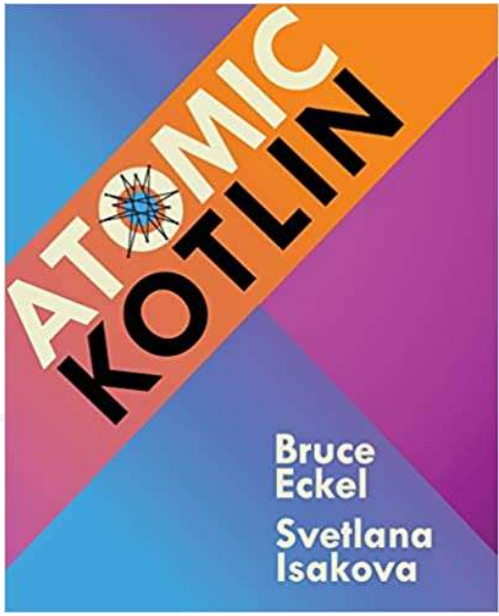
91. An Overview of Gradle in Android Studio

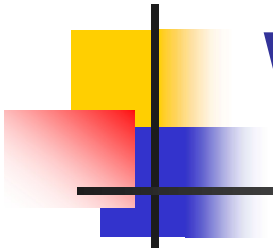


Atomic Kotlin



https://www.amazon.com/Atomic-Kotlin-Bruce-Eckel/dp/0981872557

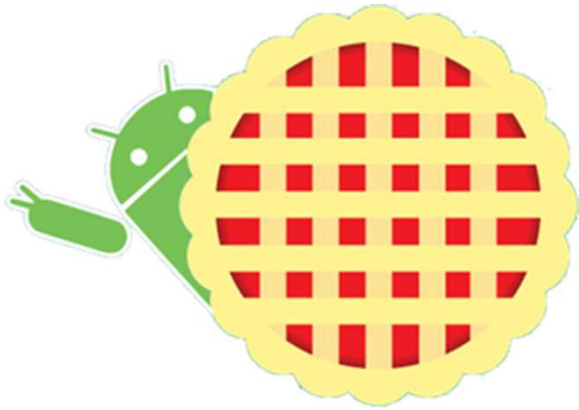
- Section I: Programming Basics
  - Introduction
  - Why Kotlin?
  - Hello, World!
  - var & val
  - Data Types
  - Functions
  - if Expressions
  - String Templates
  - Number Types
  - Booleans
  - Repetition with while
  - Looping & Ranges
  - The in Keyword
  - Expressions & Statements
  - Summary 1
- Section II: Introduction to Objects
  - Objects Everywhere
  - Creating Classes
  - Properties
  - Constructors
  - Constraining Visibility
  - Packages
  - Testing
  - Exceptions
  - Lists
  - Variable Argument Lists
  - Sets
  - Maps
  - Property Accessors
  - Summary 2
- Section III: Usability
  - Extension Functions
  - Named & Default Arguments
  - Overloading
  - when Expressions
  - Enumerations
  - Data Classes
  - Destructuring Declarations
  - Nullable Types
  - Safe Calls & the Elvis Operator
  - Non-Null Assertions
  - Extensions for Nullable Types
  - Introduction to Generics
  - Extension Properties
  - break & continue
- Section IV: Functional Programming
  - Lambdas
  - The Importance of Lambdas
  - Operations on Collections
  - Member References
  - Higher-Order Functions
  - Manipulating Lists
  - Building Maps
  - Sequences
  - Local Functions
  - Folding Lists
  - Recursion
- Section V: Object-Oriented Programming
  - Interfaces
  - Complex Constructors
  - Secondary Constructors
  - Inheritance
  - Base Class Initialization
  - Abstract Classes
  - Upcasting
  - Polymorphism
  - Composition
  - Inheritance & Extensions
  - Class Delegation
  - Downcasting
  - Sealed Classes



Why Teach Kotlin

- Kotlin is basically becoming the language of Android.
- Decrease in boilerplate helps us to quickly identify which fundamental Android concepts students are missing.
- On numerous courses, where we proceed through Java to Kotlin, we are considering a Kotlin-first approach.
- Students are happy to have the chance to program in something they may have heard about.
- I think our students benefit in general from being exposed to a wide range of programming languages, and I think it is valuable for them to gain experience in using more modern languages alongside the more traditional ones like Java and C++.
- My Kotlin students in fact understand OO concepts better than my Java students do.
- One of Kotlin's advantages is a good combination of strong typing and nullability.

https://kotlinlang.org/education/why-teach-kotlin.html



Android a Google

- 2005 Google acquired Android Inc. with Rubin, Miner et at.
- 2007 Open Handset Alliance, a consortium
  - device manufacturers: HTC, Sony and Samsung,
  - wireless carriers: T-Mobile, ...
  - chipset makers: Qualcomm, Texas Instruments,

  includes Google with a goal to develop open standards for mobile devices
- major release named in alphabetical order after a dessert or sugary treat
  - 2.3 Gingerbread
  - 4.3 *Jelly Bean, July, 2012,*
  - 4.4 *KitKat*, announced, October, 2013,
  - 5.1 Lollipop, November, 2014,
  - 6.0 Marsmallow, October, 2015,
  - 7.0 Nougat, August, 2016.
  - 8.0 Oreo, August, 2017,
  - 9.0 Pie, August, 2018,
  - 10.0 Android 10, September 2019
  - 11.0 Android 11, …

Version history by API level

2.1 Android 1.0 (API 1)
2.2 Android 1.1 (API 2)
2.3 Android 1.5 Cupcake (API 3)
2.4 Android 1.6 Donut (API 4)
2.5 Android 2.0 Eclair (API 5)
2.6 Android 2.2 Froyo (API 8)
2.7 Android 2.3 Gingerbread (API 9)
2.8 Android 3.0 Honeycomb (API 11)
2.9 Android 4.0 Ice Cream Sandwich (API 14)
2.10 Android 4.1 Jelly Bean (API 16)
2.11 Android 4.4 KitKat (API 19)
2.12 Android 5.0 Lollipop (API 21)
2.13 Android 6.0 Marshmallow (API 23)
2.14 Android 7.0 Nougat (API 24)
2.15 Android 8.0 Oreo (API 26)
2.16 Android 9 Pie (API 28)
2.17 Android 10 (API 29)
2.18 Android 11 (API 30)

http://en.wikipedia.org/wiki/Android_version_history

API Levels

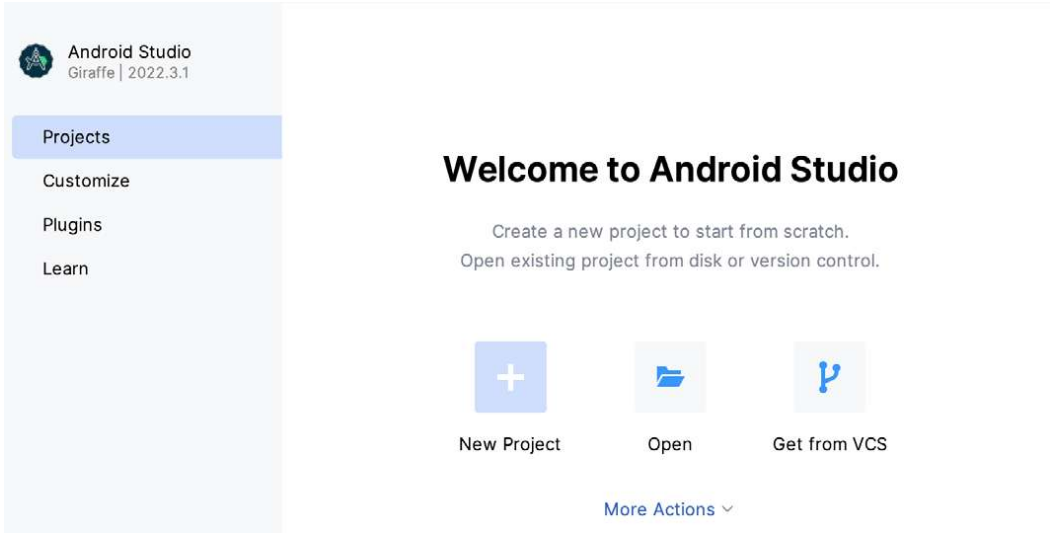
https://apilevels.com/

Version	SDK / API level	Version code	Codename	Cumulative usage [1]	Year [4]
Android 16	Level 36	BAKLAVA	Baklava [2]	0%	2025
Android 15	Level 35	VANILLA_ICE_CREAM	Vanilla Ice Cream [2]	10.06%	2024
	▪ **targetSdk** must be 35+ for new apps and app updates as of August 31, 2025.				
Android 14	Level 34	UPSIDE_DOWN_CAKE	Upside Down Cake [2]	43.5%	2023
Android 13	Level 33	TIRAMISU	Tiramisu [2]	60.4%	2022
Android 12	Level 32 Android 12L	S_V2	Snow Cone [2]	72.6%	
	Level 31 Android 12	S			2021
Android 11	Level 30	R	Red Velvet Cake [2]	83.0%	2020
Android 10	Level 29	Q	Quince Tart [2]	88.5%	2019
Android 9	Level 28	P	Pie	91.7%	2018
Android 8	Level 27 Android 8.1	O_MR1	Oreo	92.6%	2017
	Level 26 Android 8.0	O		94.8%	
Android 7	Level 25 Android 7.1	N_MR1	Nougat	95.0%	2016
	Level 24 Android 7.0	N		96.2%	
Android 6	Level 23	M	Marshmallow	97.6%	2015
Android 5	Level 22 Android 5.1	LOLLIPOP_MR1	Lollipop	98.0%	
	Level 21 Android 5.0	LOLLIPOP, L		99.8%	2014
	▪ Jetpack/AndroidX libraries require a **minSdk** of 21 or higher since April 2024. ▪ Jetpack Compose requires a **minSdk** of 21 or higher. ▪ Google Play services v23.30.99+ (August 2023) drops support for API levels below 21.				

Inštalácia

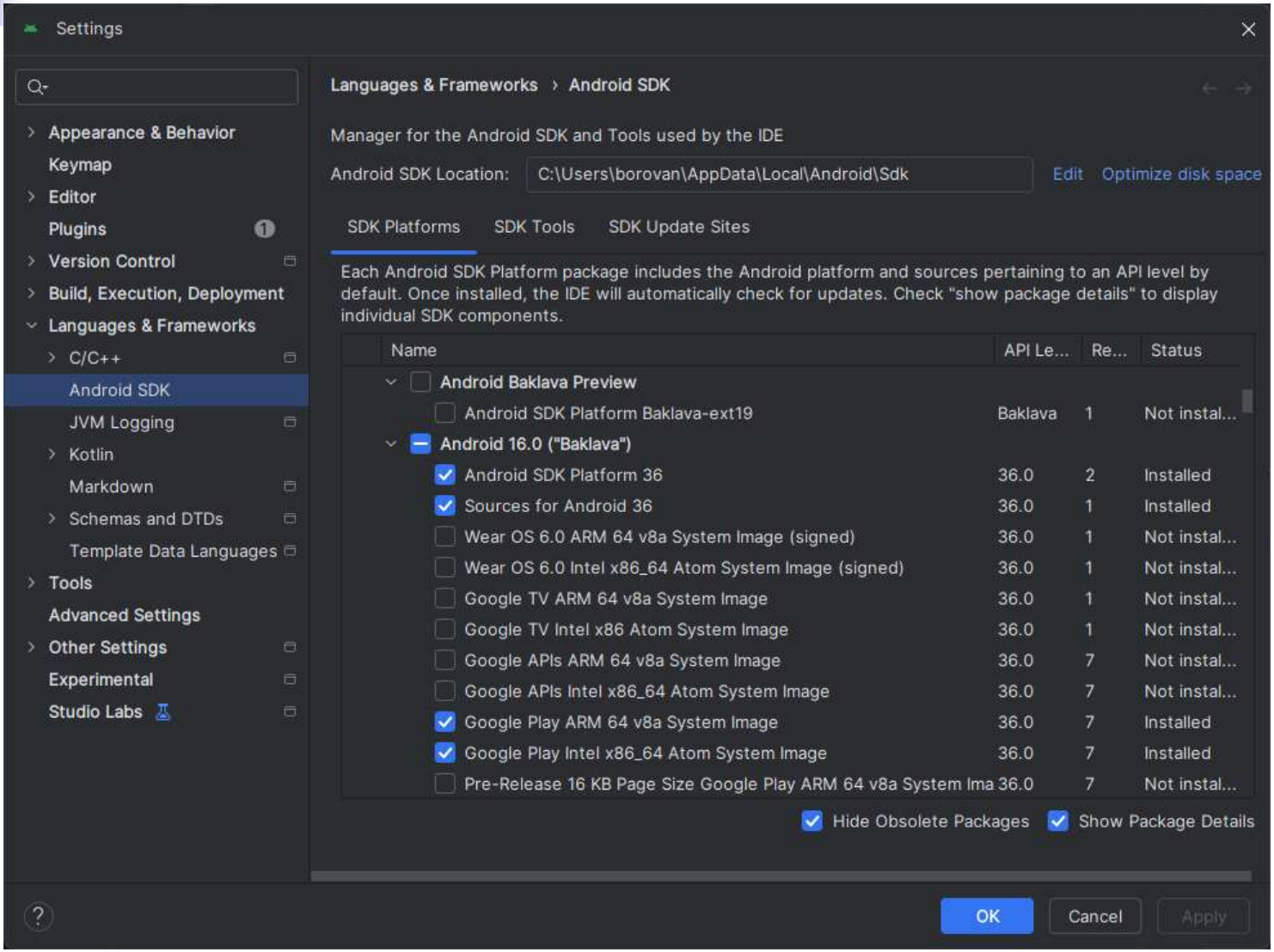
System requirements
- Windows 8/10/11 64-bit
- macOS 10.14 or later running on Intel or Apple silicon
- Chrome OS device with Intel i5 or higher
- Linux systems with version 2.31 or later of the GNU C Library (glibc)
- **Minimum of 8GB of RAM**
- **Approximately 8GB of available disk space**
- 1280 x 800 minimum screen resolution

https://developer.android.com/studio/index.html



Android SDK Packages

Tools/SDK Manager tab SDK Platforms - API 36

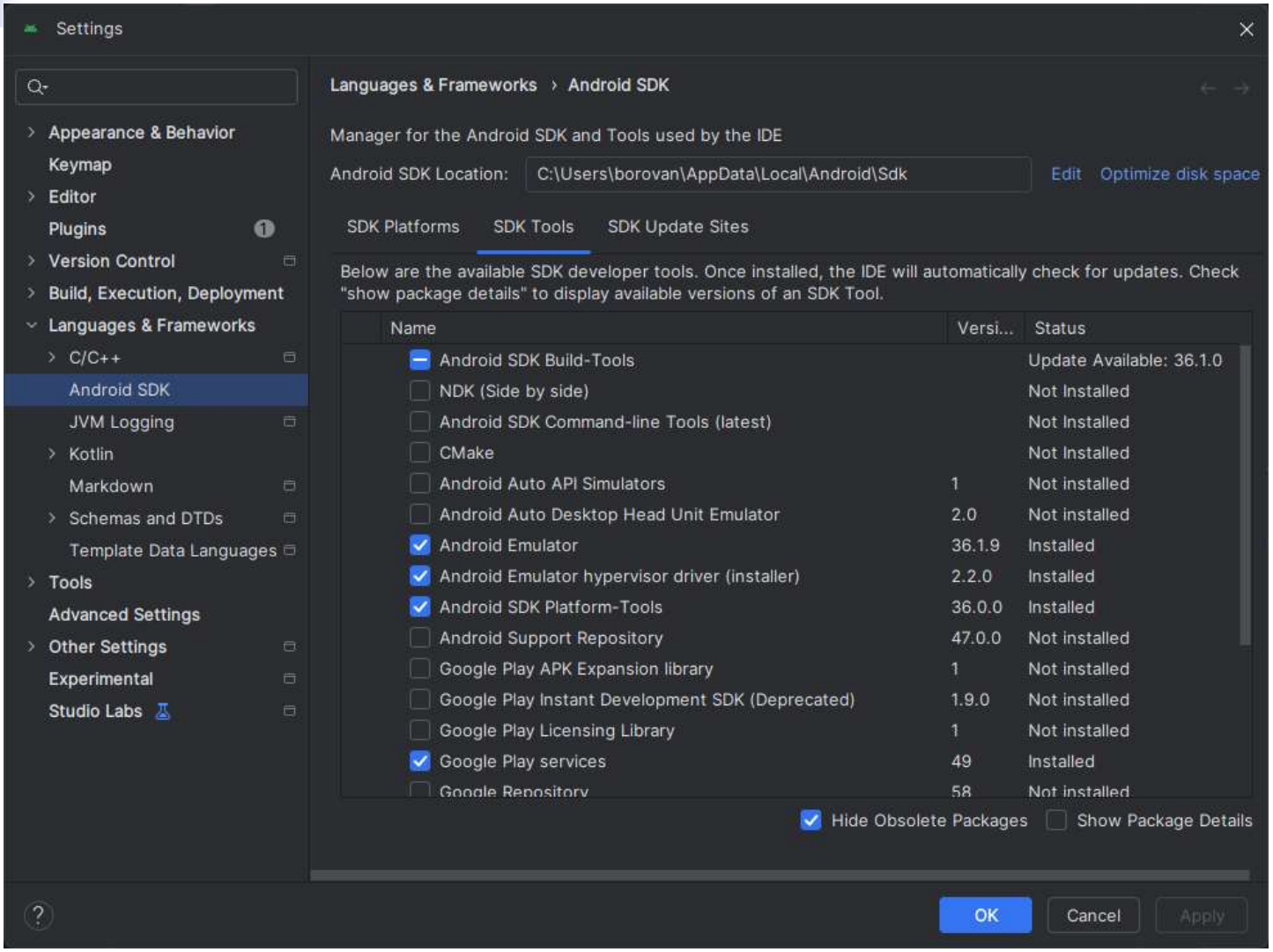


Chapter 2

2. Setting up an Android Studio Development Environment

Android SDK Packages

Tools/SDK Manager tab SDK Tools



Chapter 4

4. Creating an Android Virtual Device (AVD) in Android Studio

Android Virtual Device

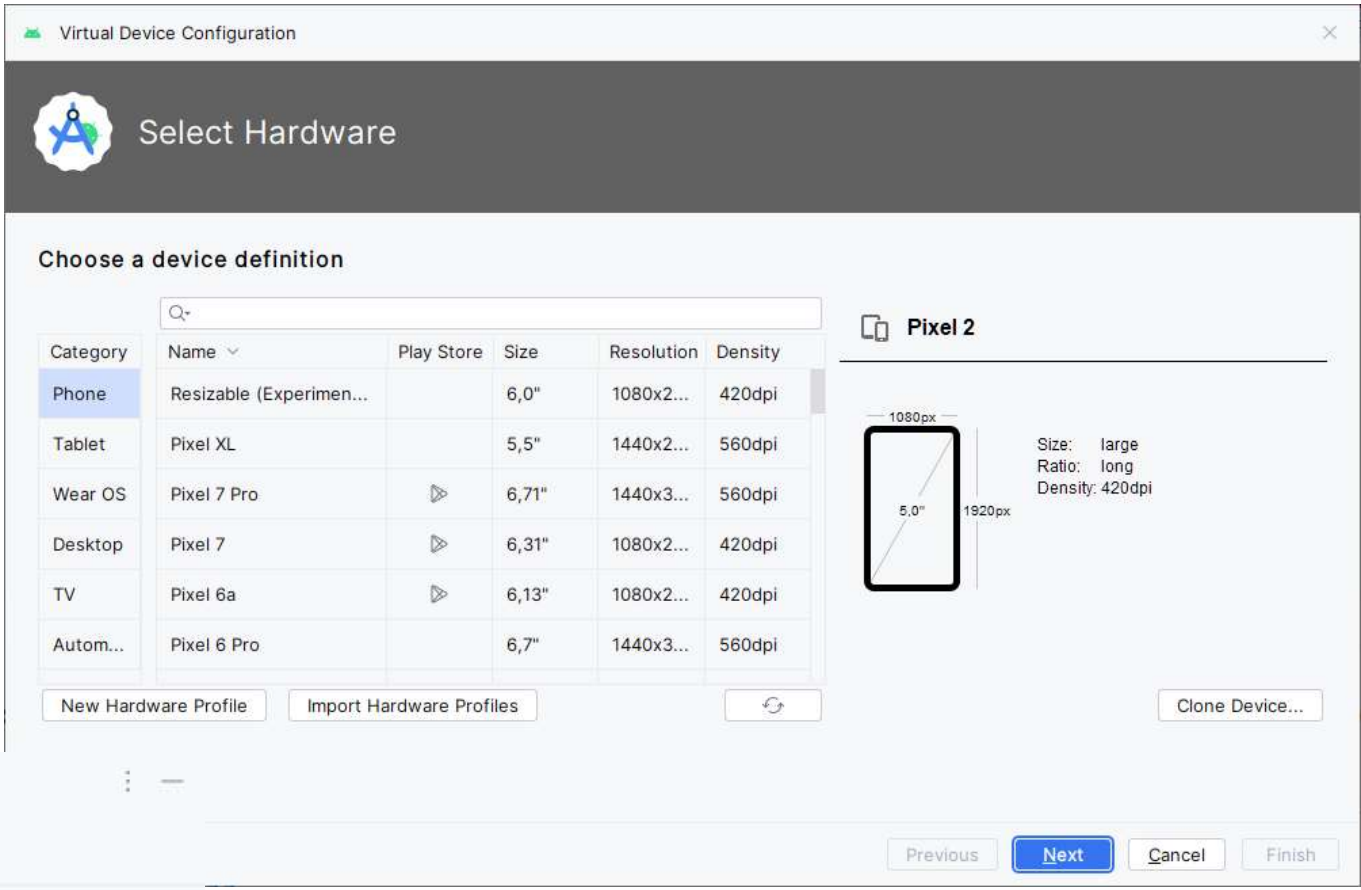
Tools/AVD manager

Nakonfigurujte si AVD zodpovedajúci vášmu zariadeniu

alebo si vyberte zo zoznamu predvolených,

- Create Device
- modifikujte

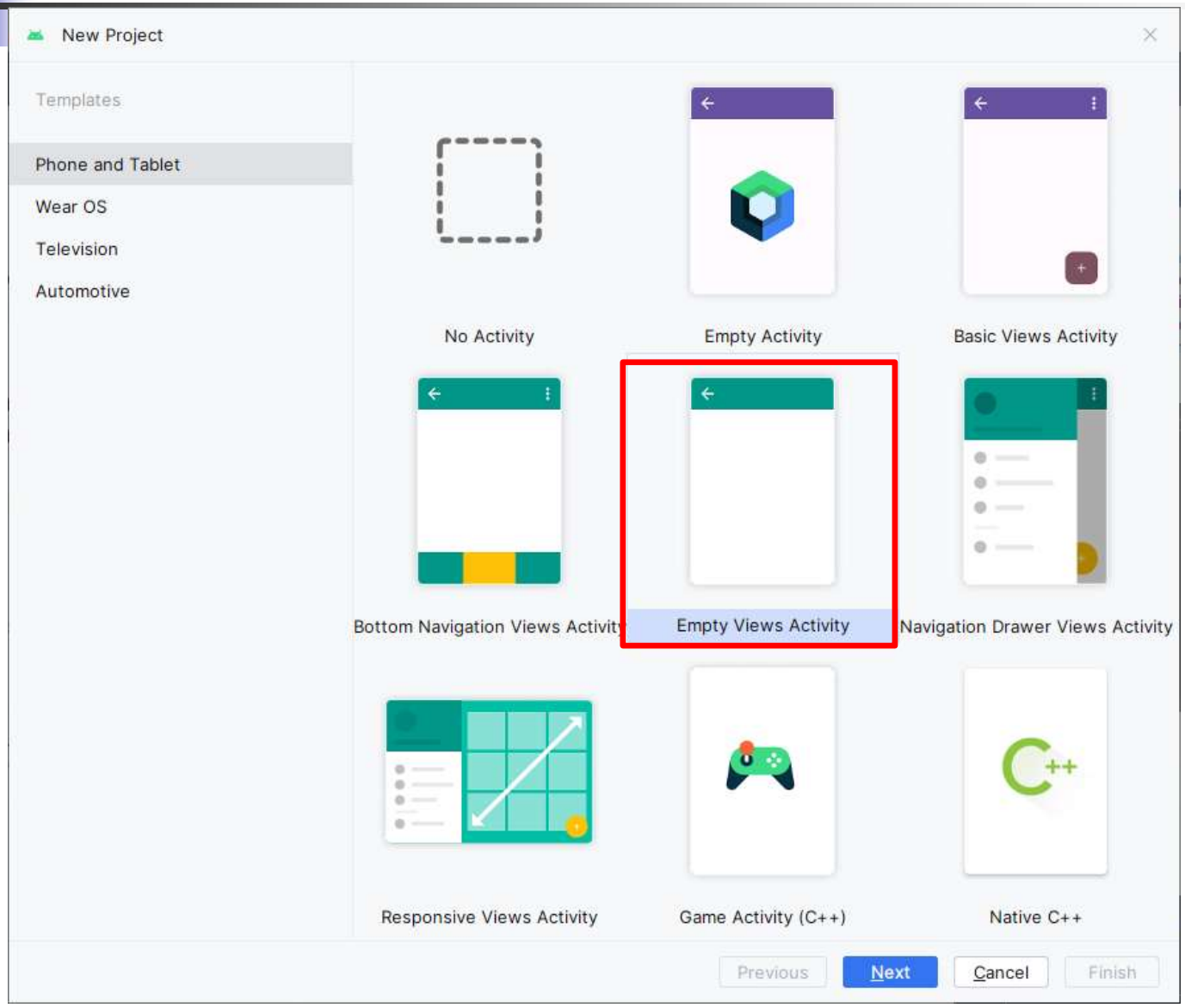
nastavenia podľa vášho zariadenia



3. Creating an Example Android App in Android Studio

Nový projekt

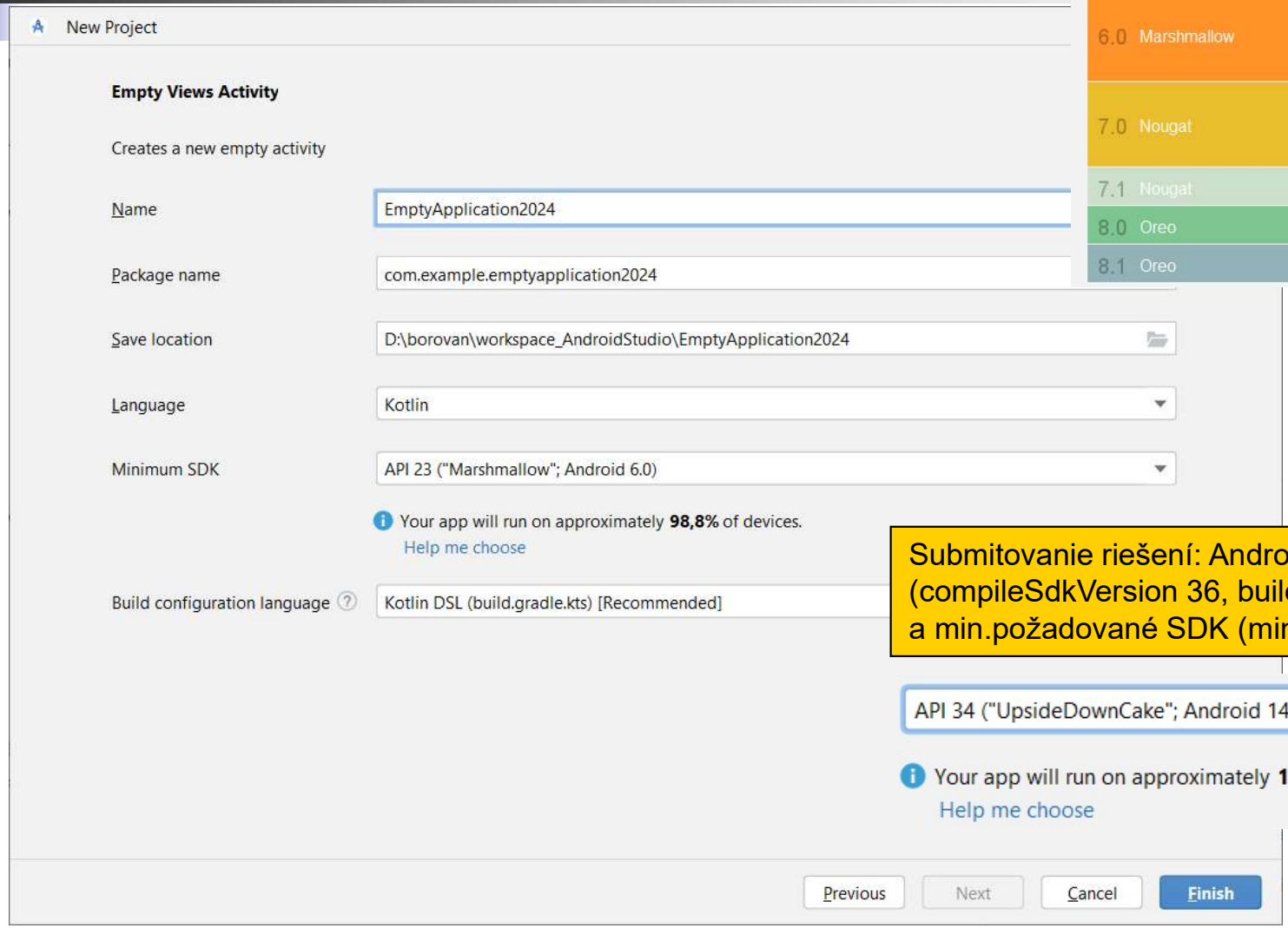
(File/New/New Android Project)



Nový projekt

(File/New/New Android Project)

ANDROID PLATFORM VERSION	API LEVEL	CUMULATIVE DISTRIBUTION
4.0 Ice Cream Sandwich	15	
4.1 Jelly Bean	16	99.6%
4.2 Jelly Bean	17	98.1%
4.3 Jelly Bean	18	95.9%
4.4 KitKat	19	95.3%
5.0 Lollipop	21	85.0%
5.1 Lollipop	22	80.2%
6.0 Marshmallow	23	62.6%
7.0 Nougat	24	37.1%
7.1 Nougat	25	14.2%
8.0 Oreo	26	6.0%
8.1 Oreo	27	1.1%



Submitovanie riešení: Android SDK 16 (API 36), (compileSdkVersion 36, buildToolsVersion "36.*"), a min.požadované SDK (minSdkVersion 24)

Nový projekt
(File/New/New Android Project)

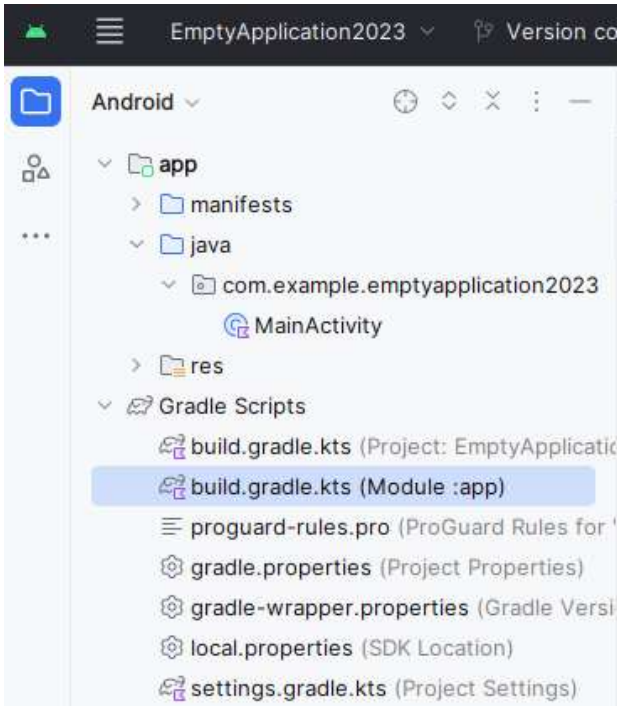
```
plugins {
    id("com.android.application")
    id("org.jetbrains.kotlin.android")
}
```

Submitovanie riešení: Android SDK 16 (API 36), (compileSdkVersion 36, buildToolsVersion "36.*"), a min.požadované SDK (minSdkVersion 24)

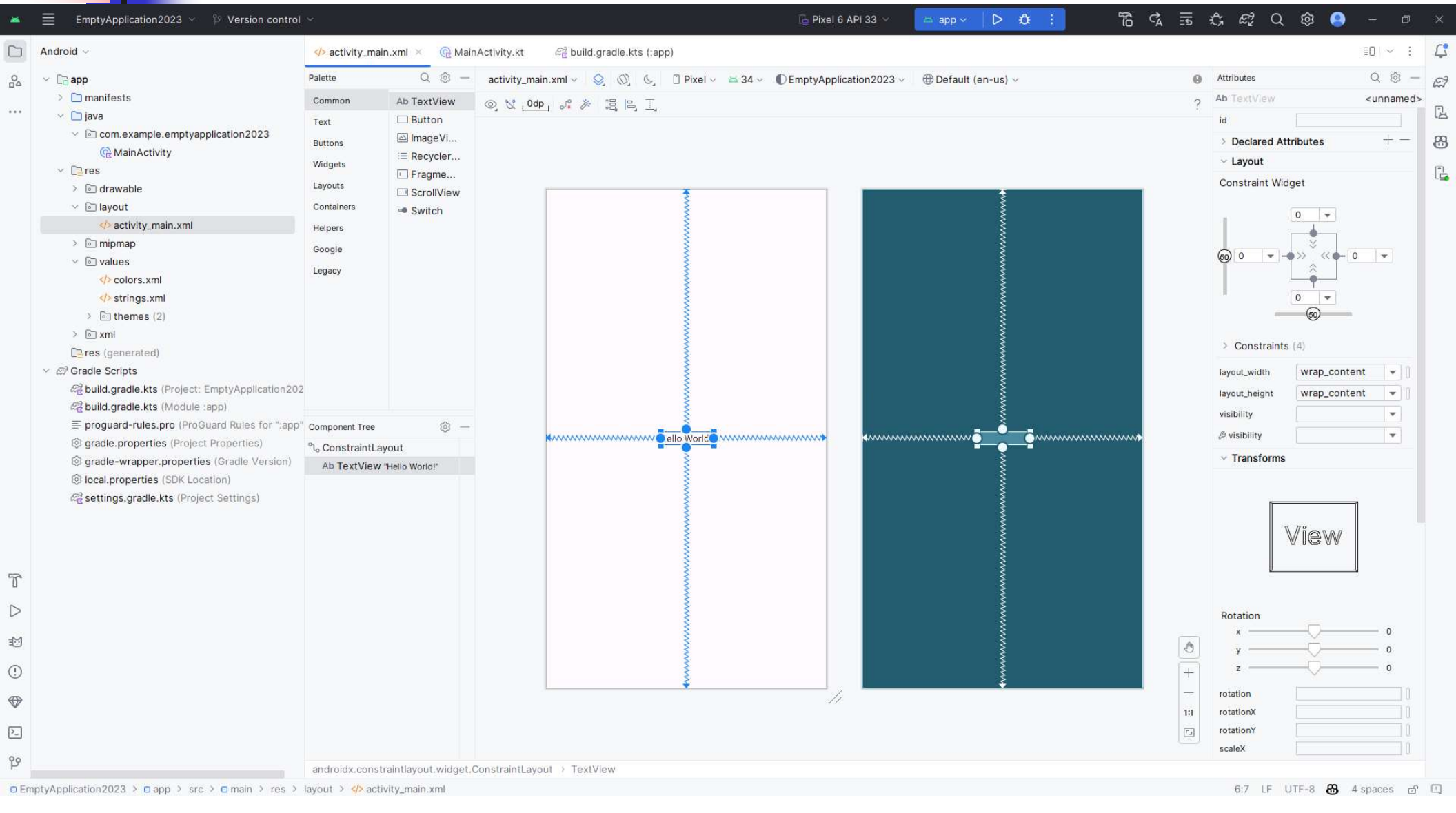
```
android {
    namespace = "com.example.emptyapplication2024"
    compileSdk = 35

    defaultConfig {
        applicationId = "com.example.emptyapplication2024"
        minSdk = 23
        targetSdk = 35
        versionCode = 1
        versionName = "1.0"
```

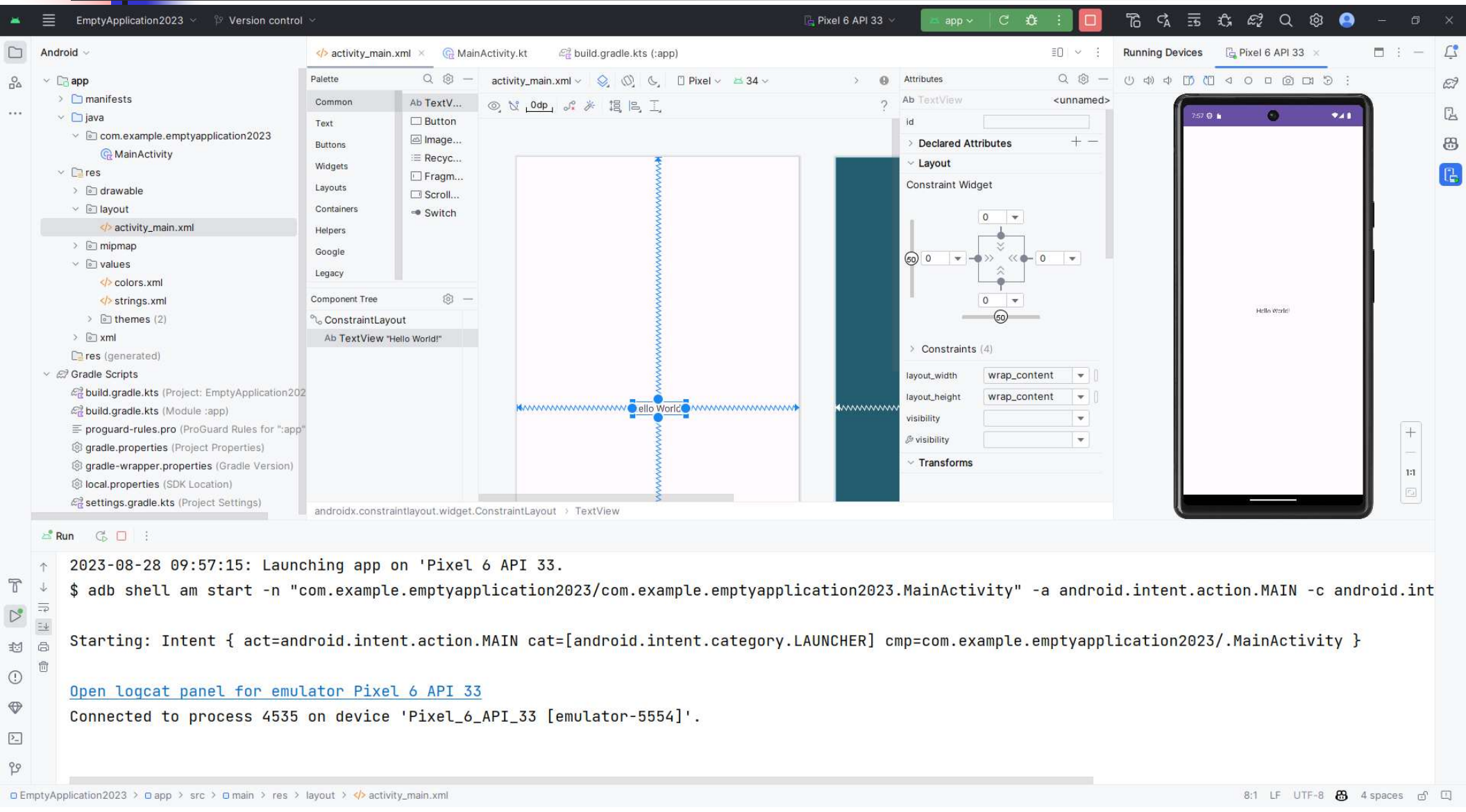
ANDROID PLATFORM VERSION	API LEVEL	CUMULATIVE DISTRIBUTION
4.0 Ice Cream Sandwich	15	
4.1 Jelly Bean	16	99.6%
4.2 Jelly Bean	17	98.1%
4.3 Jelly Bean	18	95.9%
4.4 KitKat	19	95.3%
5.0 Lollipop	21	85.0%
5.1 Lollipop	22	80.2%
6.0 Marshmallow	23	62.6%
7.0 Nougat	24	37.1%
7.1 Nougat	25	14.2%
8.0 Oreo	26	6.0%
8.1 Oreo	27	1.1%



Nový projekt
(Empty views activity)

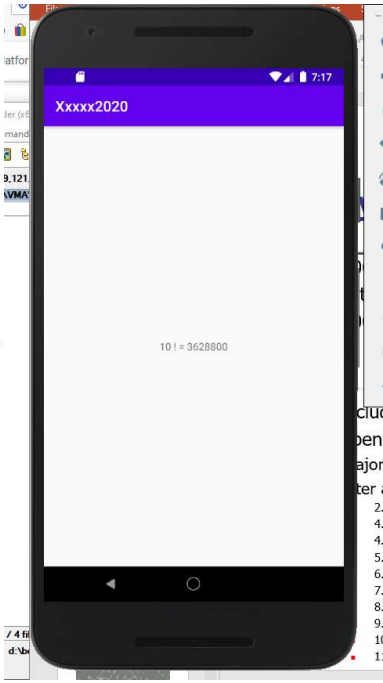


Pýtajte sa
kým nedostanete



Ako si skúšať Kotlin v AS

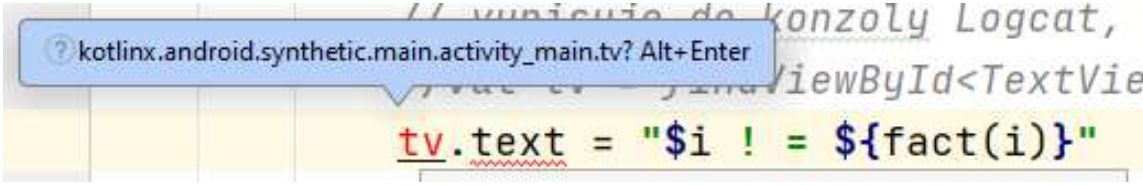
(kým sa nedozvieme viac)




```
class MainActivity : AppCompatActivity() {
    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContentView(R.layout.activity_main)
        //println(fact(10))
        for (i in 0..10) {
            Log.d("TAG", "$i ! = ${fact(i)}")
            // vypisuje do konzoly Logcat, pouzite filter s "TAG"
            val tv = findViewById<TextView>(R.id.tv)
            tv.text = "$i ! = ${fact(i)}"
            // vypise do View komponentu, ktory je v Activite
            Toast.makeText(this, "$i ! = ${fact(i)}",
            Toast.LENGTH_SHORT).show()
            // Toast alias Notifier (MITI)
        }
    }
    fun fact(n : Int) : Int = if (n == 0) 1 else n * fact(n-1)
}
```

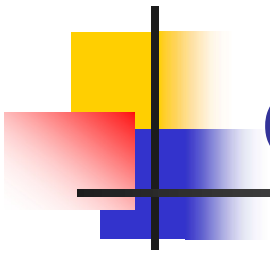
Integrovanie Android Extensions

```
plugins {
    id 'com.android.application'
    id 'kotlin-android'
    id 'kotlin-android-extensions'
}
```




```
import androidx.appcompat.app.AppCompatActivity
import android.os.Bundle
import android.util.Log
import android.widget.TextView
import android.widget.Toast
import kotlinx.android.synthetic.main.activity_main.*
```

```
    for (i in 0..10) {
        Log.d("TAG", "$i ! = ${fact(i)}")
        // vypisuje do konzoly Logcat, pouzite filter s "TAG"
        val tv = findViewById<TextView>(R.id.tv)
        tv.text = "$i ! = ${fact(i)}"
        // vypise do View komponentu, ktory je v Activite
        Toast.makeText(this, "$i ! = ${fact(i)}",
        Toast.LENGTH_SHORT).show()
        // Toast alias Notifier (MITI)
    }
```



Break point

(štruktúrou projektu pokračujeme na budúce)

- Switch to kotlin intro