

Android Studio (ako začat')

Jazyk Kotlin (ako neskončit')



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 budú tam

veľká časť kurzu bude dobre sledovateľná z knihy

Android Studio Koala Essentials - Kotlin Edition:

Developing Android Apps Using Android Studio 2024.1.2 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>



Vývojové jazyky/nástroje

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

iOS - Apple Center kurz

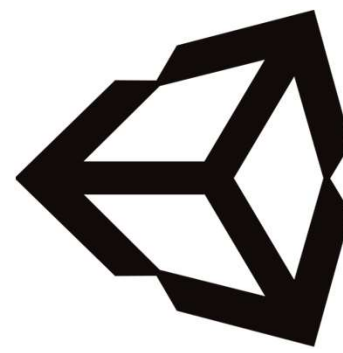
1-AIN-303/24

...



Unity

(game engine)



unity

#1 Unreal Engine

#2 Unity

Oblíbený 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



APACHE
CORDOVA™



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

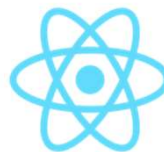
Vývoj a nástroje

(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



QUANTUM
and the building blocks of a unified interface



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

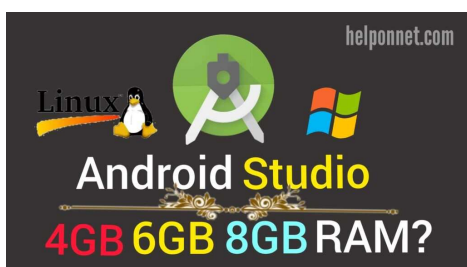
- Java, Swift, Kotlin 😊
- Cordova, ionic, ReactNative, Flutter (pushujú FB a Google) 😐



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
- platforms jvm, js, wasm
- xcode (mac) is necessary to build an iOS app

Android Studio



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 >13 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/>

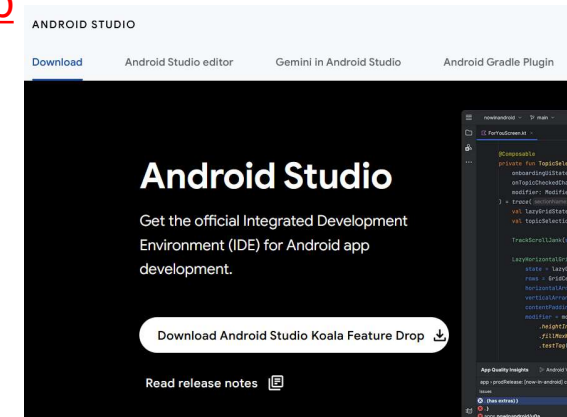
Android Studio Koala Kotlin Edition



- <https://www.payloadbooks.com/product/android-studio-koala-essentials-kotlin-edition-ebook/>
- <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.
- Dominika, Daniel, Jožo, ja sa vám posnažíme problém vyriešiť

Inštalácia Android Studia:

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

Android Studio Giraffe Kotlin Edition



<https://www.payloadbooks.com/product/android-studio-koala-essentials-kotlin-edition-ebook/>

■ <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>

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

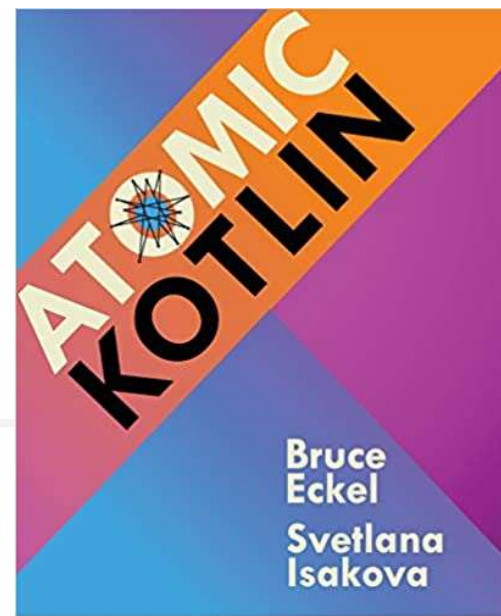
17. An Introduction to Kotlin Inheritance and Subclassing

...

91. An Overview of Gradle in Android Studio



Atomic Kotlin



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

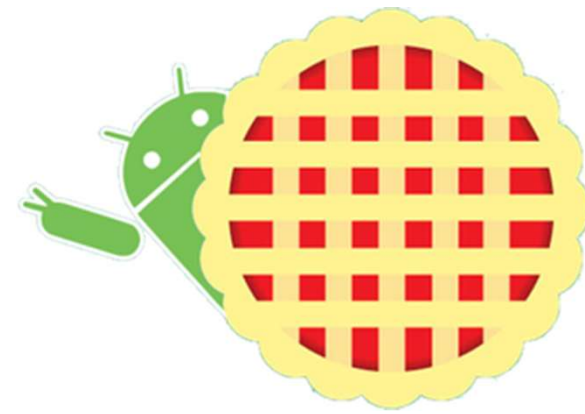
Section I: Programming Basics			
Introduction			
Why Kotlin?			
Hello, World!			
var & val			
Data Types			
Functions			
if Expressions			
String Templates			
Number Types			
Booleans			
Repetition with while			
Looping & Ranges			
The in Keyword			
Expressions & Statements			
Summary 1			
	Section II: 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.

Android a Google



2005 [Google](#) acquired Android Inc. with Rubin, Miner et al.

- 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 [Marshmallow](#), 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](#), tba

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)

API Levels

Version	SDK / API level	Version code	Codename	Cumulative usage ¹	Year ⁴
Android 15	Level 35	VANILLA_ICE_CREAM	Vanilla Ice Cream ²	—	TBD
Android 14	Level 34	UPSIDE_DOWN_CAKE	Upside Down Cake ²	30.9%	2023
	▪ targetSdk will need to be 34+ for new apps and app updates by August 31, 2024.				
Android 13	Level 33	TIRAMISU	Tiramisu ²	51.5%	2022
	▪ targetSdk must be 33+ for new apps and app updates since August 31, 2023.				
Android 12	Level 32 <small>Android 12L</small>	S_V2	Snow Cone ²	66.5%	2021
	Level 31 <small>Android 12</small>	S			
Android 11	Level 30	R	Red Velvet Cake ²	79.8%	2020
Android 10	Level 29	Q	Quince Tart ²	87.1%	2019
Android 9	Level 28	P	Pie	91.7%	2018
Android 8	Level 27 <small>Android 8.1</small>	O_MR1	Oreo	93.0%	2017
	Level 26 <small>Android 8.0</small>	O		95.7%	
Android 7	Level 25 <small>Android 7.1</small>	N_MR1	Nougat	96.0%	2016
	Level 24 <small>Android 7.0</small>	N		97.2%	
Android 6	Level 23	M	Marshmallow	98.6%	2015

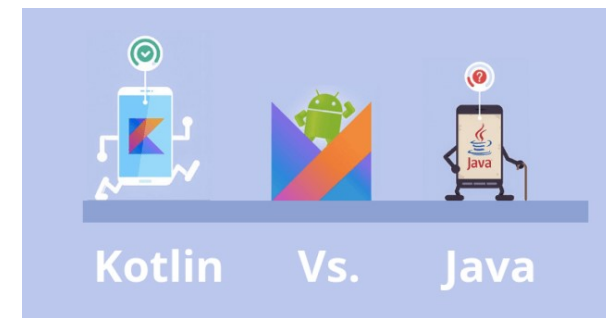
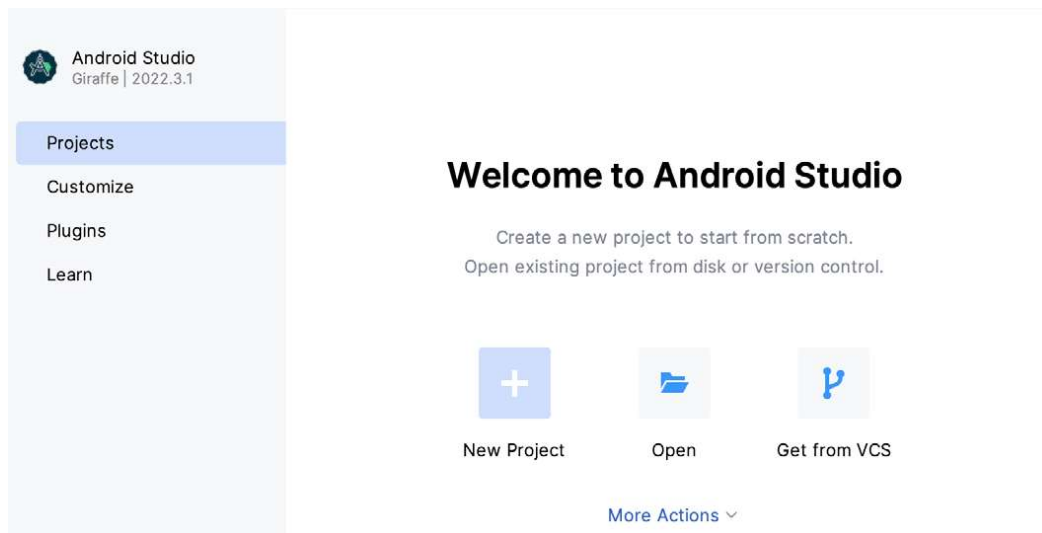
2. Setting up an Android Studio Development Environment

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>



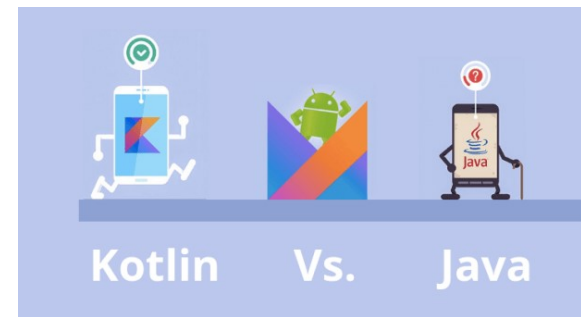
 **Android Studio**
Koala Feature Drop
2024.1.2



2. Setting up an Android Studio Development Environment

Android SDK Packages

Tools/SDK Manager tab SDK Platforms - API 35



Settings

Languages & Frameworks > Android SDK

Manager for the Android SDK and Tools used by the IDE

Android SDK Location: C:\Users\borovan\AppData\Local\Android\Sdk

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, the IDE will automatically check for updates. Check "show package details" to display individual SDK components.

Name	API Level	Rev...	Status
Android API 35			
<input checked="" type="checkbox"/> Android SDK Platform 35	35	1	Not installed
<input type="checkbox"/> Sources for Android 35	35	1	Not installed
<input type="checkbox"/> Google APIs ARM 64 v8a System Image	35	8	Not installed
<input type="checkbox"/> Google APIs Intel x86_64 Atom System Image	35	8	Not installed
<input type="checkbox"/> Google Play ARM 64 v8a System Image	35	8	Not installed
<input type="checkbox"/> Google Play Intel x86_64 Atom System Image	35	8	Not installed
<input type="checkbox"/> Google Play Experimental 16k Page Size ARM 64 v8a System Image	35	3	Not installed
<input type="checkbox"/> Google Play Experimental 16k Page Size Intel x86_64 Atom System Image	35	3	Not installed
<input type="checkbox"/> Pre-Release 16 KB Page Size Google APIs ARM 64 v8a System Image	35	3	Not installed
<input type="checkbox"/> Pre-Release 16 KB Page Size Google APIs Intel x86_64 Atom System Image	35	3	Not installed
Android VanillalceCream Preview			
<input type="checkbox"/> Android SDK Platform VanillalceCream	VanillalceCream	4	Not installed
<input type="checkbox"/> Google APIs ARM 64 v8a System Image	VanillalceCream	5	Not installed
<input type="checkbox"/> Google APIs Intel x86_64 Atom System Image	VanillalceCream	5	Not installed
<input type="checkbox"/> Google Play ARM 64 v8a System Image	VanillalceCream	5	Not installed
<input type="checkbox"/> Google Play Intel x86_64 Atom System Image	VanillalceCream	5	Not installed
<input type="checkbox"/> Pre-Release 16 KB Page Size Google APIs ARM 64 v8a System Image	VanillalceCream	1	Not installed
<input type="checkbox"/> Pre-Release 16 KB Page Size Google APIs Intel x86_64 Atom System Image	VanillalceCream	1	Not installed

☒ Hide Obsolete Packages ☒ Show Package Details

Confirm Change

The following components will be installed:

- Android SDK Platform 35 (revision 1)

Disk usage:

- Estimated download size: 61,3 MB
- Estimated disk space to be additionally occupied on SDK partition after installation: 245,2 MB

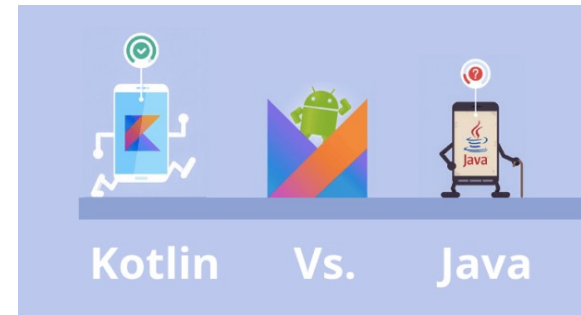
Cancel OK

OK Cancel Apply

2. Setting up an Android Studio Development Environment

Android SDK Packages

Tools/SDK Manager tab SDK Platforms - API 33



Settings

Appearance & Behavior
 Keymap
 Editor
 Plugins
 Version Control
 Build, Execution, Deployment
 Languages & Frameworks
 C/C++
 Schemas and DTDs
Android SDK
 GitHub Copilot
 Kotlin
 Markdown
 Template Data Languages
 Tools
 Advanced Settings
 Kotlin Compiler
 Experimental

Languages & Frameworks > Android SDK

Manager for the Android SDK and Tools used by the IDE

Android SDK Location: C:\Users\borovan\AppData\Local\Android\Sdk

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, the IDE will automatically check for updates. Check "show package details" to display individual SDK components.

Name	API Level	Size	Status
<input type="checkbox"/> Android UpsideDownCakePrivacySandbox Preview			
<input type="checkbox"/> Android SDK Platform UpsideDownCakePrivacySandbox	UpsideDownCakePrivacySandbox		
<input type="checkbox"/> Google Play Intel x86_64 Atom System Image	UpsideDownCakePrivacySandbox		
<input checked="" type="checkbox"/> Android API 34			
<input type="checkbox"/> Android TiramisuPrivacySandbox Preview			
<input type="checkbox"/> Android SDK Platform TiramisuPrivacySandbox	TiramisuPrivacySandbox	9	Not installed
<input type="checkbox"/> Google Play Intel x86_64 Atom System Image	TiramisuPrivacySandbox	9	Not installed
<input checked="" type="checkbox"/> Android 13.0 ("Tiramisu")			
<input checked="" type="checkbox"/> Android SDK Platform 33	33	3	Installed
<input checked="" type="checkbox"/> Sources for Android 33	33	1	Not installed
<input type="checkbox"/> Android TV ARM 64 v8a System Image	33	5	Not installed
<input type="checkbox"/> Android TV Intel x86 Atom System Image	33	5	Not installed
<input type="checkbox"/> Google TV ARM 64 v8a System Image	33	5	Not installed
<input type="checkbox"/> Google TV Intel x86 Atom System Image	33	5	Not installed
<input type="checkbox"/> Google APIs ARM 64 v8a System Image	33	13	Not installed
<input checked="" type="checkbox"/> Google APIs Intel x86 Atom_64 System Image	33	7	Update Available: ...
<input checked="" type="checkbox"/> Google Play Intel x86_64 Atom System Image	33	7	Not installed

☒ Hide Obsolete Packages ☒ Show Package Details

OK Cancel Apply

Confirm Change

The following components will be installed:

- Google Play Intel x86_64 Atom System Image API 33 (revision 7)
- Sources for Android 33 (revision 1)

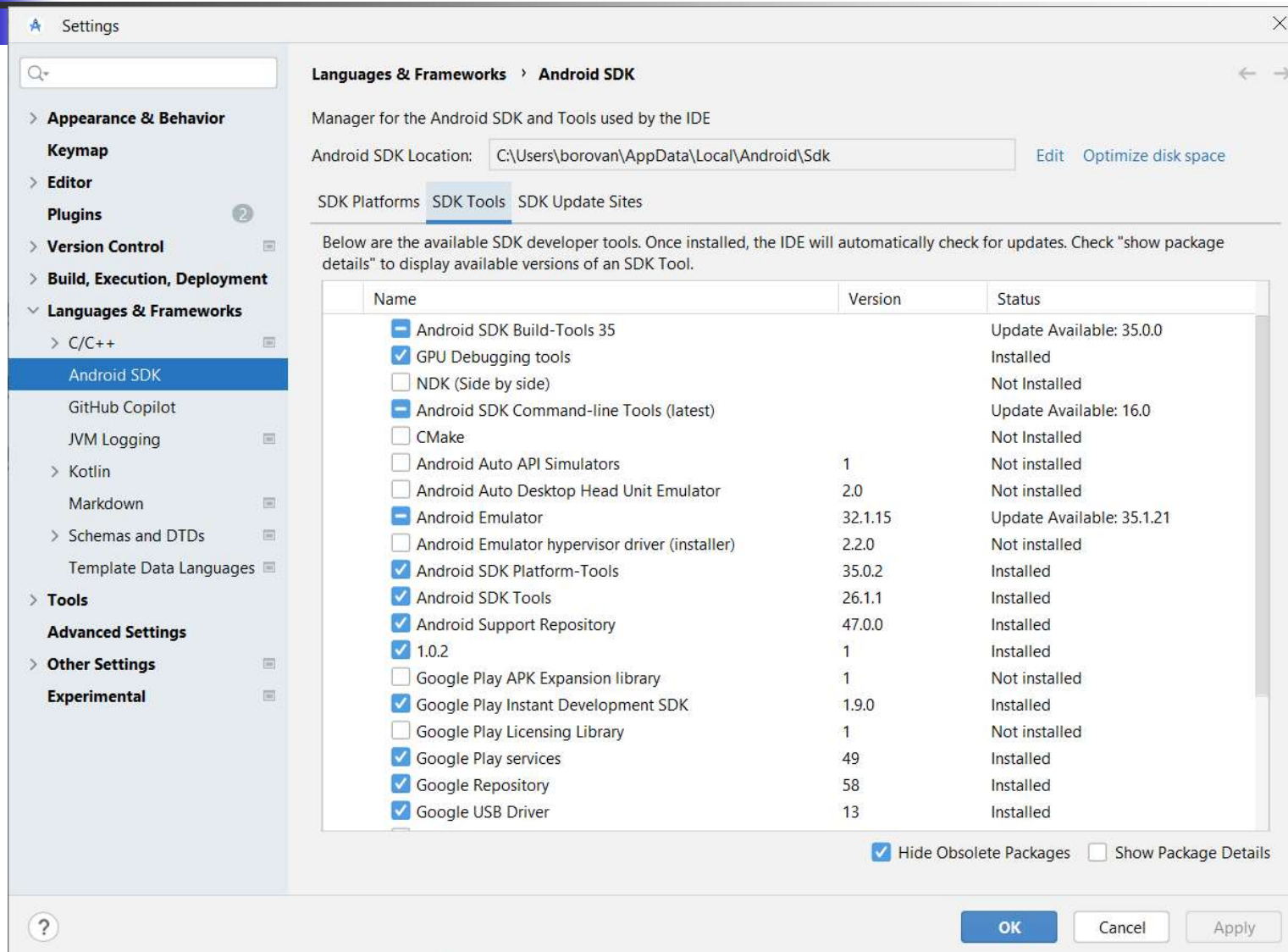
Disk usage:

- Estimated download size: 1,4 GB
- Estimated disk space to be additionally occupied on SDK partition after installation: 5,7 GB
- Currently available disk space in SDK root (C:\Users\borovan\AppData\Local\Android\Sdk): 24,0 GB

Cancel OK

Android SDK Packages

Tools/SDK Manager tab SDK Tools



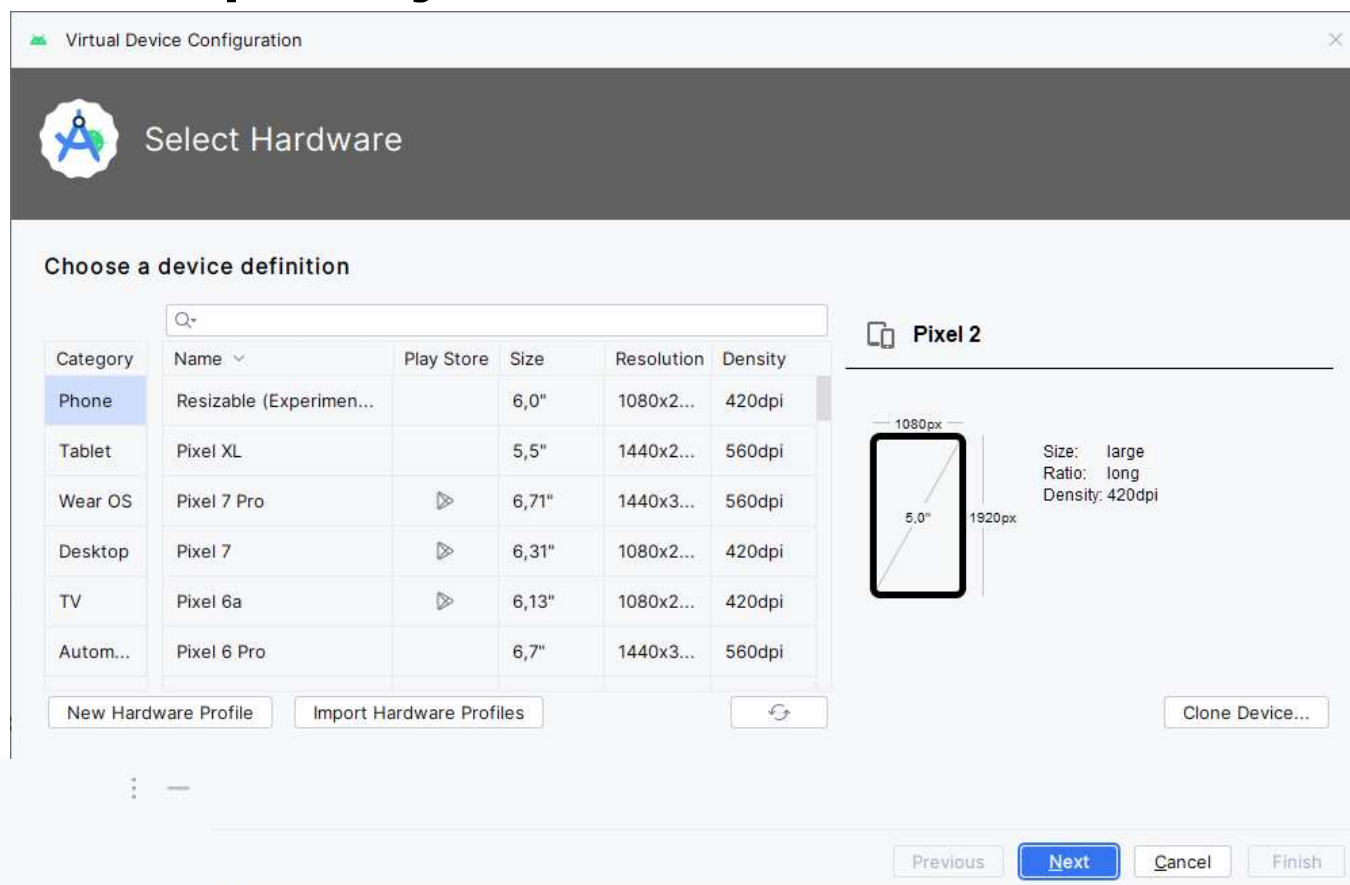
Android Virtual Device

Tools/AVD manager

Nakonfigurujte si AVD zodpovedajúci vášmu zariadeniu

alebo si vyberte zo zoznamu predvolených,

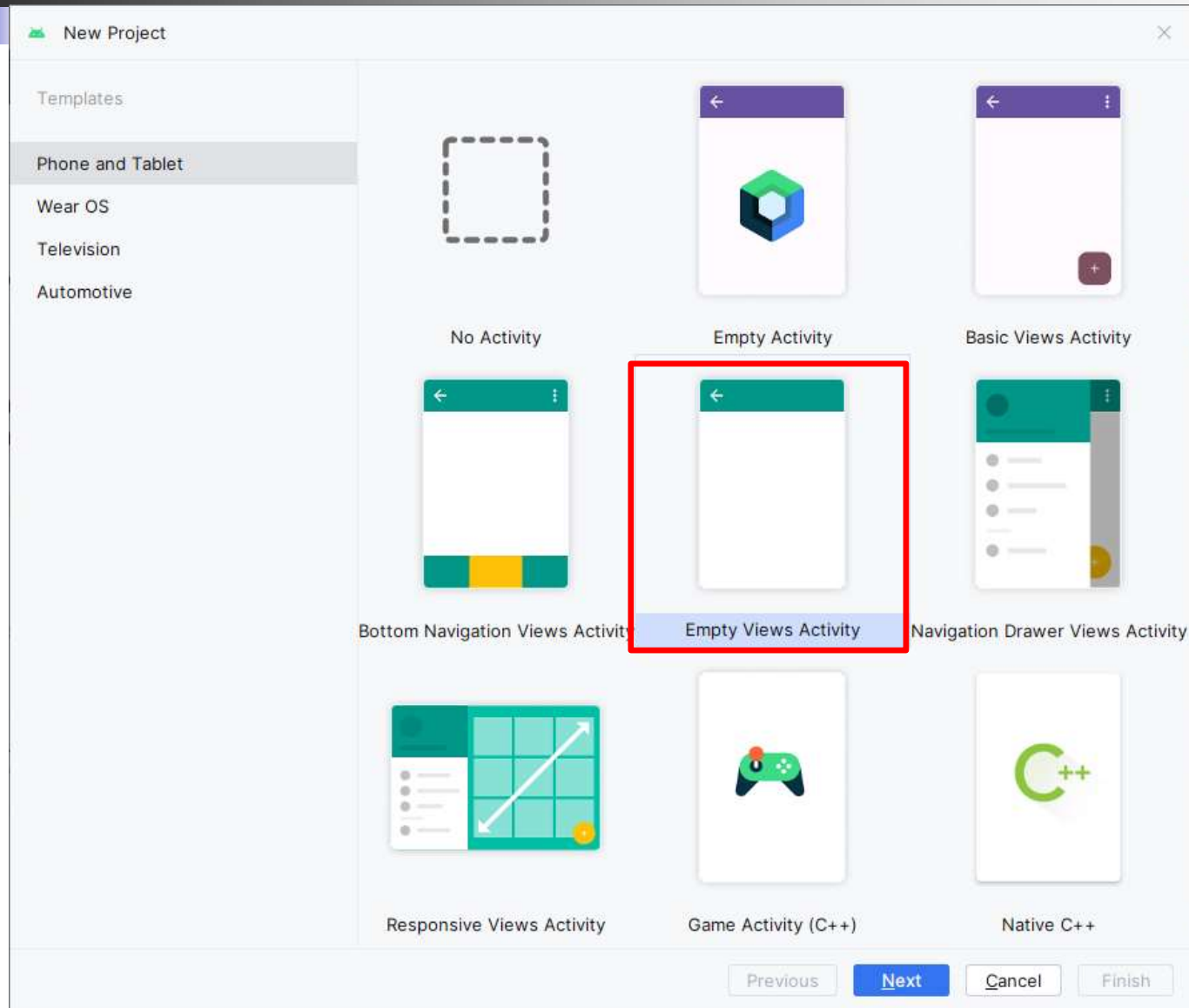
- Create Device
- modifikujte nastavenia podľa vášho zariadenia



3. Creating an Example Android App in Android Studio

Nový projekt

(File/New/New Android Project)



Nový projekt

(File/New/New Android Project)

New Project

Empty Views Activity

Creates a new empty activity

Name: EmptyApplication2024

Package name: com.example.emptyapplication2024

Save location: D:\borovan\workspace_AndroidStudio\EmptyApplication2024

Language: Kotlin

Minimum SDK: API 23 ("Marshmallow"; Android 6.0)

i Your app will run on approximately **98,8%** of devices.
[Help me choose](#)

Build configuration language *?*: Kotlin DSL (build.gradle.kts) [Recommended]

[Previous](#) [Next](#) [Cancel](#) [Finish](#)

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 15 (API 35),
(compileSdkVersion 35, buildToolsVersion "35.*"),
a min.požadované SDK (minSdkVersion 23)

API 34 ("UpsideDownCake"; Android 14.0)

i Your app will run on approximately **13,0%** of devices.
[Help me choose](#)

Nový projekt

(File/New/New Android Project)

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

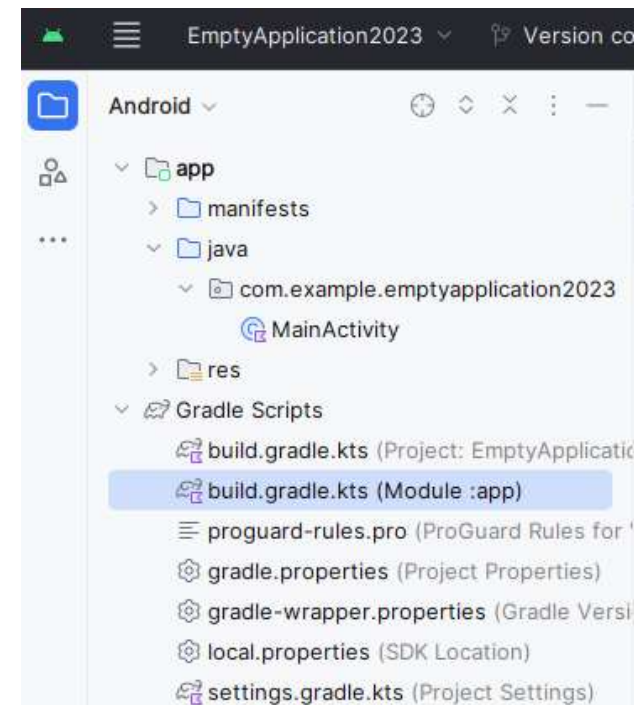
Submitovanie riešení: Android SDK 15 (API 35),
(compileSdkVersion 35, buildToolsVersion "35.*"),
a min.požadované SDK (minSdkVersion 23)

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

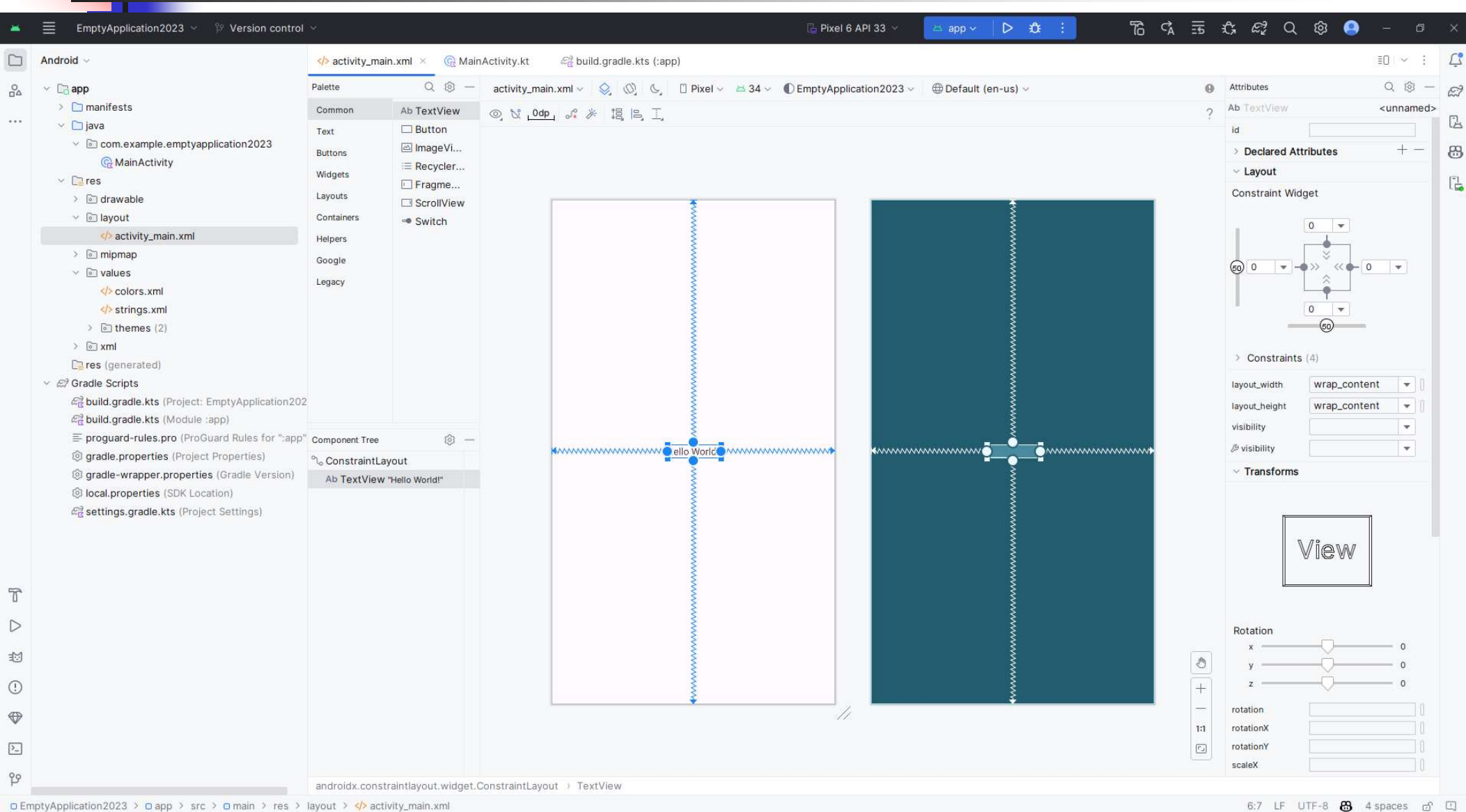
acts be like...



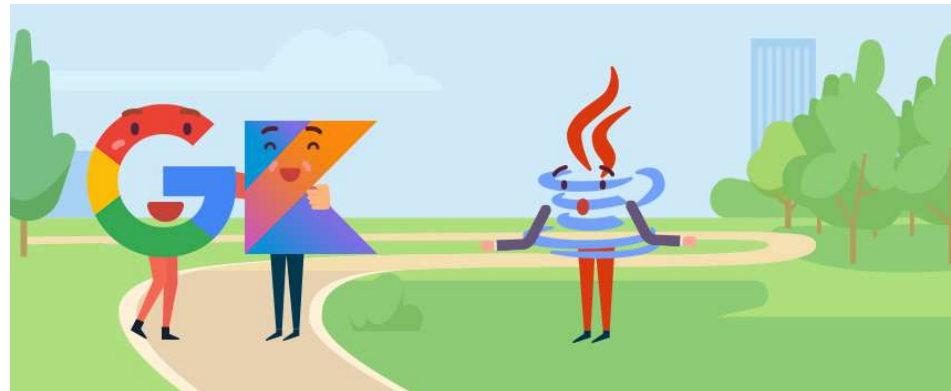
ANDROID PLATFORM VERSION	API LEVEL	CUMULATIVE DISTRIBUTION
4.0 Ice Cream Sandwich	15	
4.1 Jelly Bean	16	99.6%
4.2 Jelly Bean	17	98.1%
4.3 Jelly Bean	18	95.9%
4.4 KitKat	19	95.3%
5.0 Lollipop	21	85.0%
5.1 Lollipop	22	80.2%
6.0 Marshmallow	23	62.6%
7.0 Nougat	24	37.1%
7.1 Nougat	25	14.2%
8.0 Oreo	26	6.0%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



Nový projekt (Empty views activity)



Pýtajte sa kým nedostanete



2023-08-28 09:57:15: Launching app on 'Pixel 6 API 33.'

```
$ adb shell am start -n "com.example.emptyapplication2023/com.example.emptyapplication2023.MainActivity" -a android.intent.action.MAIN -c android.intent.action.MAIN
```

Starting: Intent { act=android.intent.action.MAIN cat=[android.intent.category.LAUNCHER] cmp=com.example.emptyapplication2023/.MainActivity }

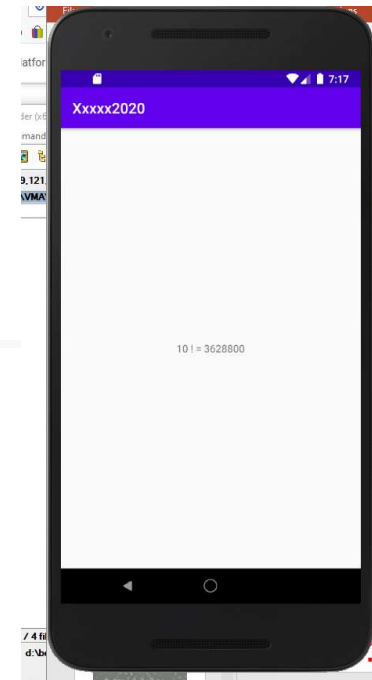
[Open logcat panel for emulator Pixel 6 API 33](#)

Connected to process 4535 on device 'Pixel_6_API_33 [emulator-5554]'.

Ako si skúšať Kotlin v AS

(kým sa nedozvieme viac)

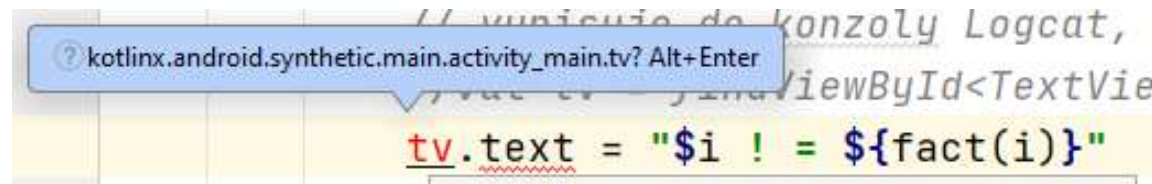
```
class MainActivity : AppCompatActivity() {  
    override fun onCreate(savedInstanceState: Bundle?) {  
        super.onCreate(savedInstanceState)  
        setContentView(R.layout.activity_main)  
        //println(fact(10))  
        for (i in 0..10) {  
            Log.d("TAG", "$i ! = ${fact(i)}")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





Break point

(štruktúrou projektu pokračujeme na budúce)

- Switch to kotlin intro