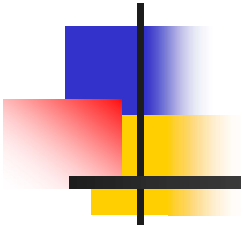


Android Studio (ako začat')

Jazyk Kotlin (ako neskončit')



Peter Borovanský
KAI, I-18

MS-Teams: [2sf3ph4](#), [List](#), [github](#)

borovan 'at' ii.fmph.uniba.sk

Vývojové platformy

(pre natívne appky)



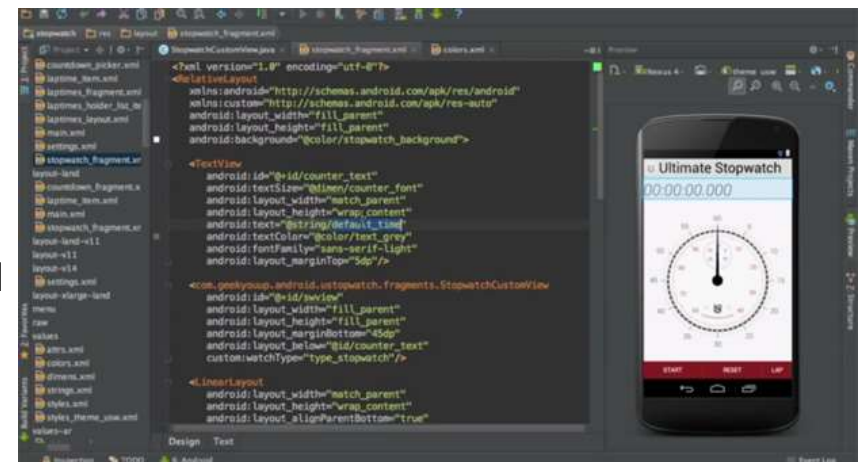
- A.I.D.E. – Android IDE on Android
Java+Android SDK/ C/C++ Android NDK
<https://play.google.com/store/apps/details?id=com.aide.ui&hl=sk>

- Android Studio (IntelliJ iDEA)
<http://developer.android.com/sdk/installing/studio.html>
<http://developer.android.com/tools/studio/index.html>



- IntelliJ iDEA plugging for Android (**Professional Android IDE**)
<http://www.jetbrains.com/idea/>

- ADT plugin pre Eclipse
Android Development Tool
Eclipse ADT plugin is no longer supported
Google ended official support in June 2015



Zdroje a Android Studio

Android Studio a jeho eco-systém:

- Developer Android Forum (<http://developer.android.com/>)
- Stackoverflow (<http://stackoverflow.com/>)
- kotlin.org (<https://kotlinlang.org/>)
- iná literatúra (<http://dai.fmph.uniba.sk/courses/VMA/android/pdfs/>)
- (!) väčšinu odporúčaných kníh nájdete v našej knižnici ☹



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Používame Android Studio 4.0 (Official IDE for Android)

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



Už obsahuje aj Kotlin
(1.5) support

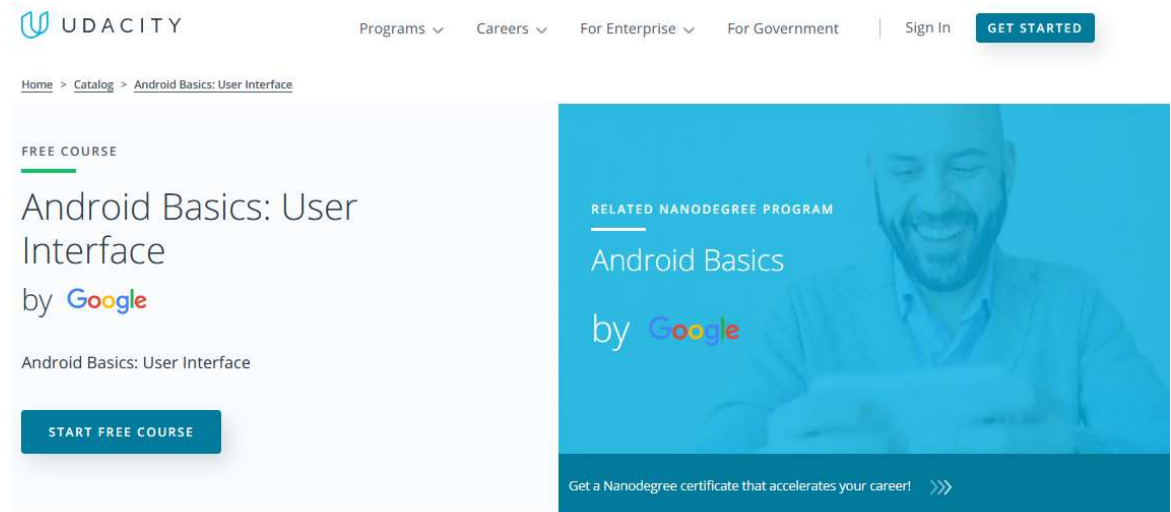




Free Udacity courses

(alternatívne free online)

- [user interface](#) – začiatok, user interface
- [user input](#)
- [multiscreen apps](#) – activities, fragments, master-detail view, ...
- [networking](#) – http networking, json parsing, ...
- [data storage](#) - sqlite
- [material design](#)
- [Google Firebase](#)
- [Kotlin for Android](#)



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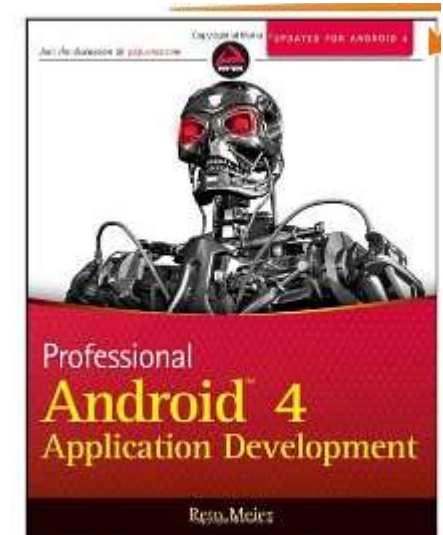
Get a Nanodegree certificate that accelerates your career! >>>

Professional Android 4

(stará ale dobrá...java)

- 2012, Reto Meier, Amazon: 4/5

CHAPTER 1	Hello, Android.	1
CHAPTER 2	Getting Started.	19
CHAPTER 3	Creating Applications and Activities	53
CHAPTER 4	Building User Interfaces	95
CHAPTER 5	Intents and Broadcast Receivers	165
CHAPTER 6	Using Internet Resources	201
CHAPTER 7	Files, Saving State, and Preferences	221
CHAPTER 8	Databases and Content Providers	251
CHAPTER 9	Working in the Background	331
CHAPTER 10	Expanding the User Experience	359
CHAPTER 11	Advanced User Experience	425
CHAPTER 12	Hardware Sensors	481
CHAPTER 13	Maps, Geocoding, and Location-Based Services	513
CHAPTER 14	Invading the Home Screen.	565
CHAPTER 15	Audio, Video, and Using the Camera.	621
CHAPTER 16	Bluetooth, NFC, Networks, and Wi-Fi.	665
CHAPTER 17	Telephony and SMS.	701
CHAPTER 18	Advanced Android Development	739
CHAPTER 19	Monetizing, Promoting, and Distributing Applications	771



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Android Sensor Programming

(stará ale dobrá...java)

2012, Greg Milette, Adam Stroud, Amazon: 5/5

PART I LOCATION SERVICES

CHAPTER 1 Introducing the Android Location Service

CHAPTER 2 Determining a Device's Current Location

CHAPTER 3 Tracking Device Movement

CHAPTER 4 Proximity Alerts

PART II INFERRING INFORMATION FROM PHYSICAL SENSORS

CHAPTER 5 Overview of Physical Sensors

CHAPTER 6 Errors and Sensor Signal Processing

CHAPTER 7 Determining Device Orientation

CHAPTER 8 Detecting Movement

CHAPTER 9 Sensing the Environment

CHAPTER 10 Android Open Accessor

PART III SENSING THE AUGMENTED, PATTERN-RICH EXTERNAL WORLD

CHAPTER 11 Near Field Communication (NFC)

CHAPTER 12 Using the Camera

CHAPTER 13 Image-Processing Techniques

CHAPTER 14 Using the Microphone

PART IV SPEAKING TO ANDROID

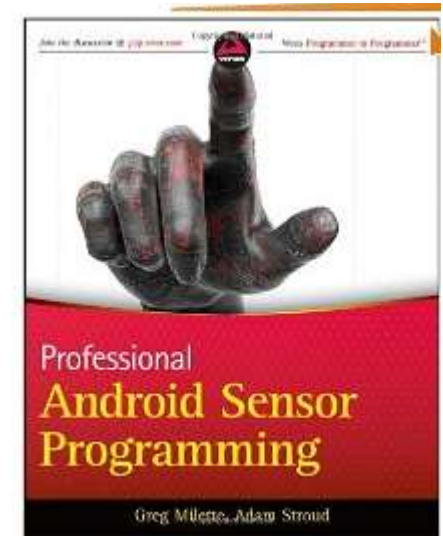
CHAPTER 15 Designing a Speech-Enabled App

CHAPTER 16 Using Speech Recognition and Text-To-Speech APIs

CHAPTER 17 Matching What Was Said

CHAPTER 18 Executing Voice Actions

CHAPTER 19 Implementing Speech Activation



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Professional Android Application Development

(stará ale dobrá...java)

- 2014, Reto Meier, Amazon: 4/5
 1. Hello, Android
 2. Getting Started
 3. Creating Applications and Activities
 4. Creating User Interfaces
 5. Intents, Broadcast Receivers, Adapters, and the Internet
 6. Data Storage, Retrieval, and Sharing
 7. Maps, Geocoding, and Location-Based Services
 8. Working in the Background
 9. Peer-to-Peer Communication
 10. Accessing Android Hardware
 11. Advanced Android Development

V knižnici FMFI

Bohužiaľ len na prezenčnú výpožicku (t.j. len tam):

- Meier: Professional Android 4 Application
- Milette: Professional Android Sensor Programming
- Wii-Meng Lee: Beginning Android 4 Application Development



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ANDROID™ 6 FOR PROGRAMMERS

AN APP-DRIVEN APPROACH

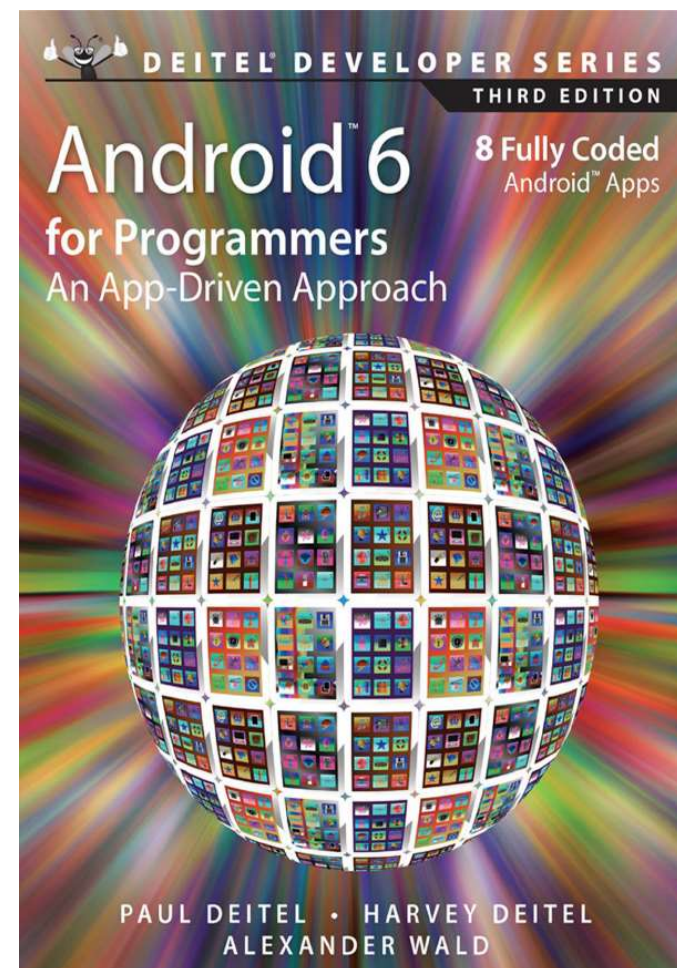
■ Paul Deitel • Harvey Deitel • Alexander Wald, 2016, 3rd Edition, Amazon 4.4/5

8 konkrétnych appiek detailne vysvetlených

1. Welcome App
2. Cannon Game
3. Tip Calculator
4. Weather Viewer
5. Flag Quiz
6. Twitter® Searches
7. Doodlz
8. Address Book



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Java vs. Kotlin



tradičný VMA kurz postavený na Java už druhý rok beží v jazyku Kotlin 1.3

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 >7 rokov
 - kompiluje do JVM
 - funguje s Android Studiom a na JetBrains produkty ste si asi zvykli, sú top
 - oboznámite sa s niektorými princípmi moderných jazykov
-
- Reference: <https://kotlinlang.org/docs/reference/>
 - Online: <https://play.kotlinlang.org/byExample/>

Android Studio 4.* Development Essentials – Kotlin Edition

- <https://www.amazon.com/Android-Studio-4-0-Development-Essentials-ebook/dp/B089T8Z66P>
- sources: <https://www.ebookfrenzy.com/retail/as40kotlin/page.php>

Inštalácia Android Studio (4.0):

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

Predmet má cvičenie, ale aj tak:

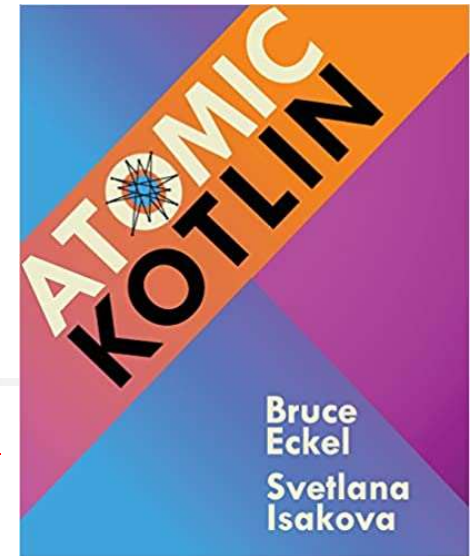
- ozvite sa v prípade problémov inštalácie na platformy, napr. Linux, Mac.
- Dominika, Jožo, Lukáš, ja sa vám posnažíme problém vyriešiť

Inštalácia Android Studia:

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



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

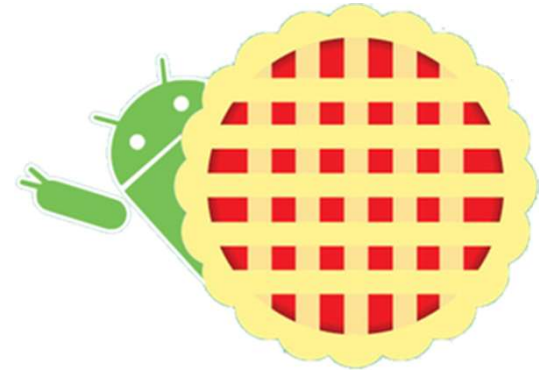


Why Teach Kotlin

- 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



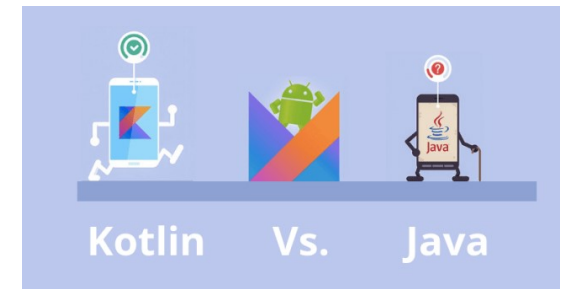
- 2005 [Google](#) acquired Android Inc. with Rubin, Miner et al.
- 2007 [Open Handset Alliance](#), a consortium
 - device manufacturers: [HTC](#), [Sony](#) and [Samsung](#),
 - wireless carriers: [T-Mobile](#), ...
 - chipset makers: [Qualcomm](#), [Texas Instruments](#),includes Google with a goal 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)

Android SDK Packages

Tools/SDK Manager tab SDK Platforms - API 30



Settings for New Projects

Appearance & Behavior > System Settings > Android SDK

Manager for the Android SDK and Tools used by the IDE

Android SDK Location: [Edit](#) [Optimize disk space](#)

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.

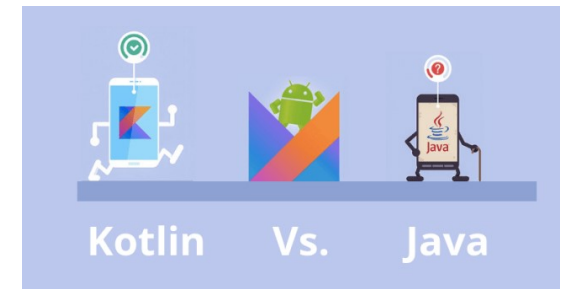
Name	API Level	Revision	Status
<input type="checkbox"/> Google APIs Intel x86 Atom_64 System Image	31	8	Not installed
<input type="checkbox"/> Google Play Intel x86 Atom_64 System Image	31	8	Not installed
Android 11.0 (R)			
<input checked="" type="checkbox"/> Android SDK Platform 30	30	3	Installed
<input checked="" type="checkbox"/> Sources for Android 30	30	1	Installed
<input type="checkbox"/> Android TV Intel x86 Atom System Image	30	3	Not installed
<input type="checkbox"/> China version of Wear OS - Preview Intel x86 Atom System Image	30	4	Not installed
<input type="checkbox"/> Wear OS - Preview Intel x86 Atom System Image	30	4	Not installed
<input type="checkbox"/> Google TV Intel x86 Atom System Image	30	3	Not installed
<input type="checkbox"/> Google APIs ARM 64 v8a System Image	30	11	Not installed
<input checked="" type="checkbox"/> Google APIs Intel x86 Atom System Image	30	10	Installed
<input type="checkbox"/> Google APIs Intel x86 Atom_64 System Image	30	10	Not installed
<input type="checkbox"/> Google Play Intel x86 Atom System Image	30	9	Not installed
<input type="checkbox"/> Google Play Intel x86 Atom_64 System Image	30	10	Not installed
Android 10.0 (Q)			
<input checked="" type="checkbox"/> Android SDK Platform 29	29	5	Installed
<input type="checkbox"/> Sources for Android 29	29	1	Not installed
<input type="checkbox"/> Android TV Intel x86 Atom System Image	29	3	Not installed

☒ Hide Obsolete Packages ☒ Show Package Details

OK Cancel Apply

Android SDK Packages

Tools/SDK Manager tab SDK Tools



Settings for New Projects

Appearance & Behavior > System Settings > Android SDK

Manager for the Android SDK and Tools used by the IDE

Android SDK Location: [Edit](#) [Optimize disk space](#)

SDK Platforms SDK Tools SDK Update Sites

Below are the available SDK developer tools. Once installed, the IDE will automatically check for updates. Check "show package details" to display available versions of an SDK Tool.

Name	Version	Status
<input checked="" type="checkbox"/> Android SDK Build-Tools 31		Update Available: 31.0.0
<input checked="" type="checkbox"/> GPU Debugging tools		Installed
<input type="checkbox"/> NDK (Side by side)		Not Installed
<input type="checkbox"/> Android SDK Command-line Tools (latest)		Not Installed
<input type="checkbox"/> CMake		Not Installed
<input type="checkbox"/> Android Auto API Simulators	1	Not installed
<input type="checkbox"/> Android Auto Desktop Head Unit Emulator	1.1	Not installed
<input checked="" type="checkbox"/> Android Emulator	30.8.4	Installed
<input type="checkbox"/> Android Emulator Hypervisor Driver for AMD Processors (installer)	1.7.0	Not installed
<input checked="" type="checkbox"/> Android SDK Platform-Tools	31.0.3	Installed
<input checked="" type="checkbox"/> Android SDK Tools	26.1.1	Installed
<input type="checkbox"/> Google Play APK Expansion library	1	Not installed
<input checked="" type="checkbox"/> Google Play Instant Development SDK	1.9.0	Installed
<input type="checkbox"/> Google Play Licensing Library	1	Not installed
<input checked="" type="checkbox"/> Google Play services	49	Installed
<input checked="" type="checkbox"/> Google USB Driver	13	Installed
<input type="checkbox"/> Google Web Driver	2	Not installed
<input checked="" type="checkbox"/> Intel x86 Emulator Accelerator (HAXM installer)	7.6.5	Installed
<input type="checkbox"/> Layout Inspector image server for API 29-30	6	Not installed

☒ Hide Obsolete Packages ☐ Show Package Details

OK Cancel Apply

Android Virtual Device

Tools/AVD manager

Nakonfigurujte si AVD zodpovedajúci vášmu zariadeniu

alebo si vyberte zo
zoznamu

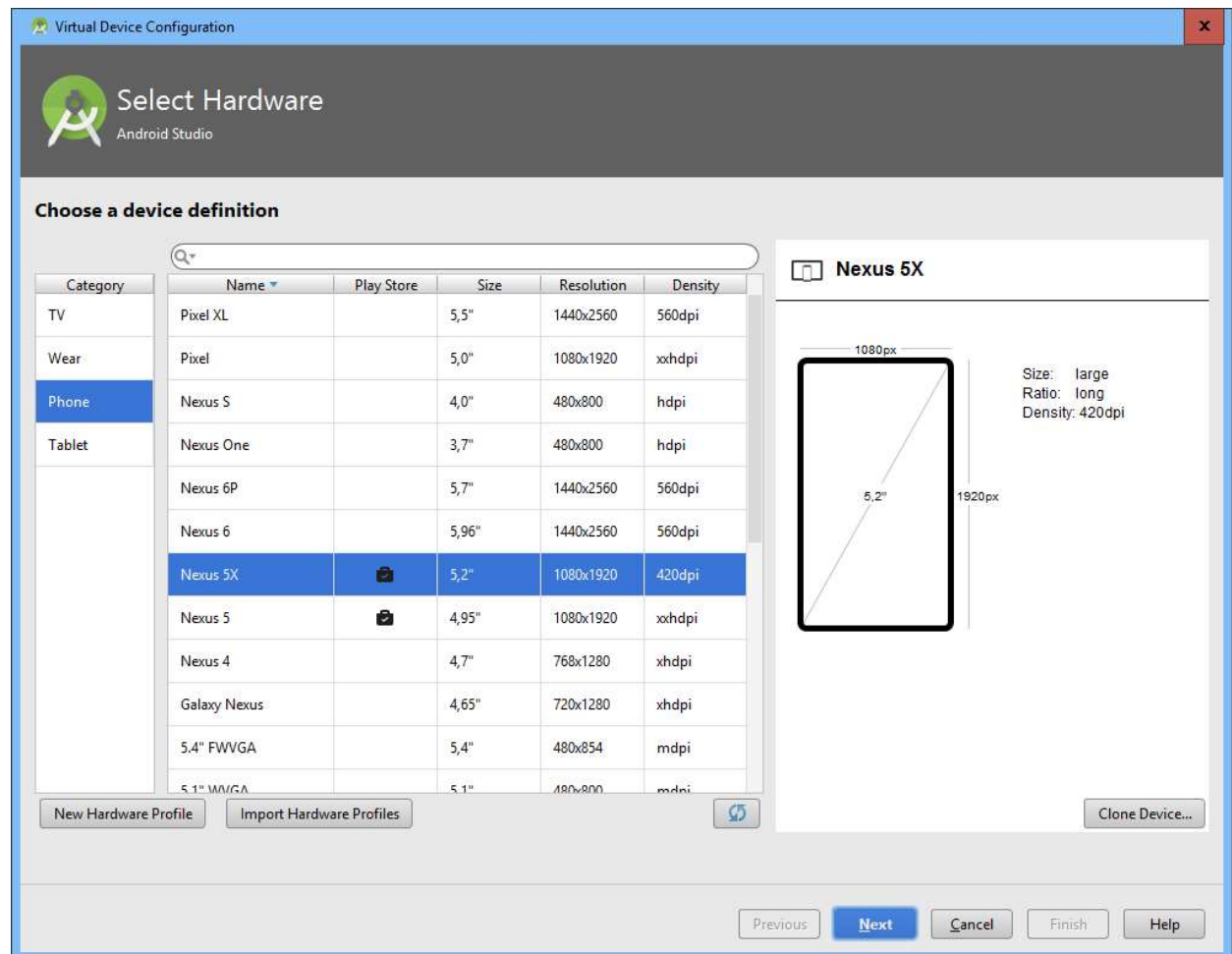
predvolených,

- Create Device
- modifikujte

nastavenia

podľa vášho

zariadenia



Android Studio 4.* Development Essentials – Kotlin Edition

- <https://www.amazon.com/Android-Studio-4-0-Development-Essentials-ebook/dp/B089T8Z66P>
- sources: <https://www.ebookfrenzy.com/retail/as40kotlin/page.php>

Inštalácia Android Studio (4.0):

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

Kapitola 2. Setting up an Android Studio Development Environment
(mac/Windows/Linux)

Kapitola 3. Creating an Example Android App in AS

Kapitola 4. Creating an Android Virtual Device (AVD) in AS

Kapitola 5. Using and Configuring the Android Studio AVD Emulator

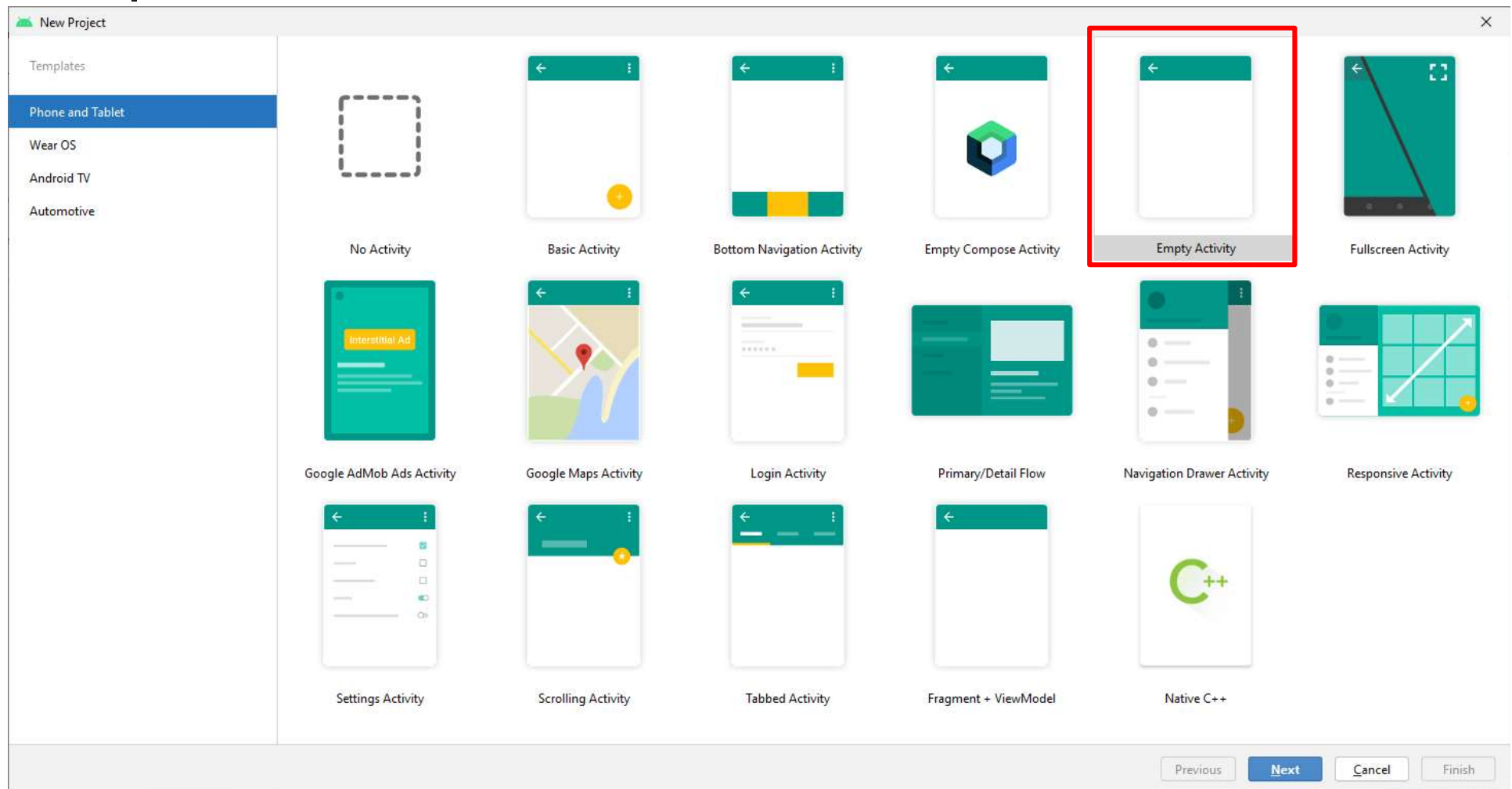
Kapitola 6. A tour of the Android Studio User Interface

Kapitola 7. Testing Android Studio App on a Physical Android Device



Nový projekt

(File/New/New Android Project)



Nový projekt

(File/New/New Android Project)

New Project

Empty Activity

Creates a new empty activity

Name: My Application

Package name: com.example.myapplication

Save location: D:\borovan\workspace_AndroidStudio\MyApplication6

Language: Kotlin

Minimum SDK: API 23: Android 6.0 (Marshmallow)

i Your app will run on approximately **84,9%** of devices.
[Help me choose](#)

☐ Use legacy android.support libraries **?**
Using legacy android.support libraries will prevent you from using the latest Play Services and Jetpack libraries

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 11 (API 30),
(compileSdkVersion 30, buildToolsVersion "30.*"),
a min.požadované SDK (minSdkVersion 23)

Minimum SDK: API 30: Android 11.0 (R)

i Your app will run on < 1% of devices.
[Help me choose](#)

Nový projekt

(File/New/New Android Project)

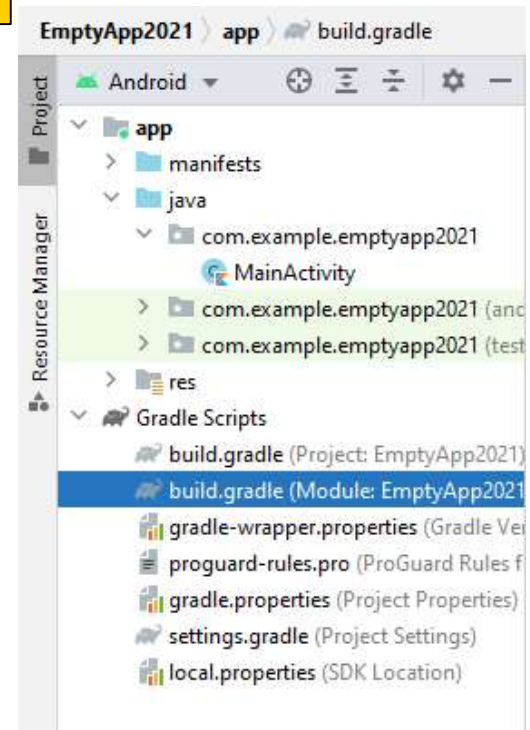
```
plugins {  
    id 'com.android.application'  
    id 'kotlin-android'  
}
```

```
android {  
    compileSdk 30
```

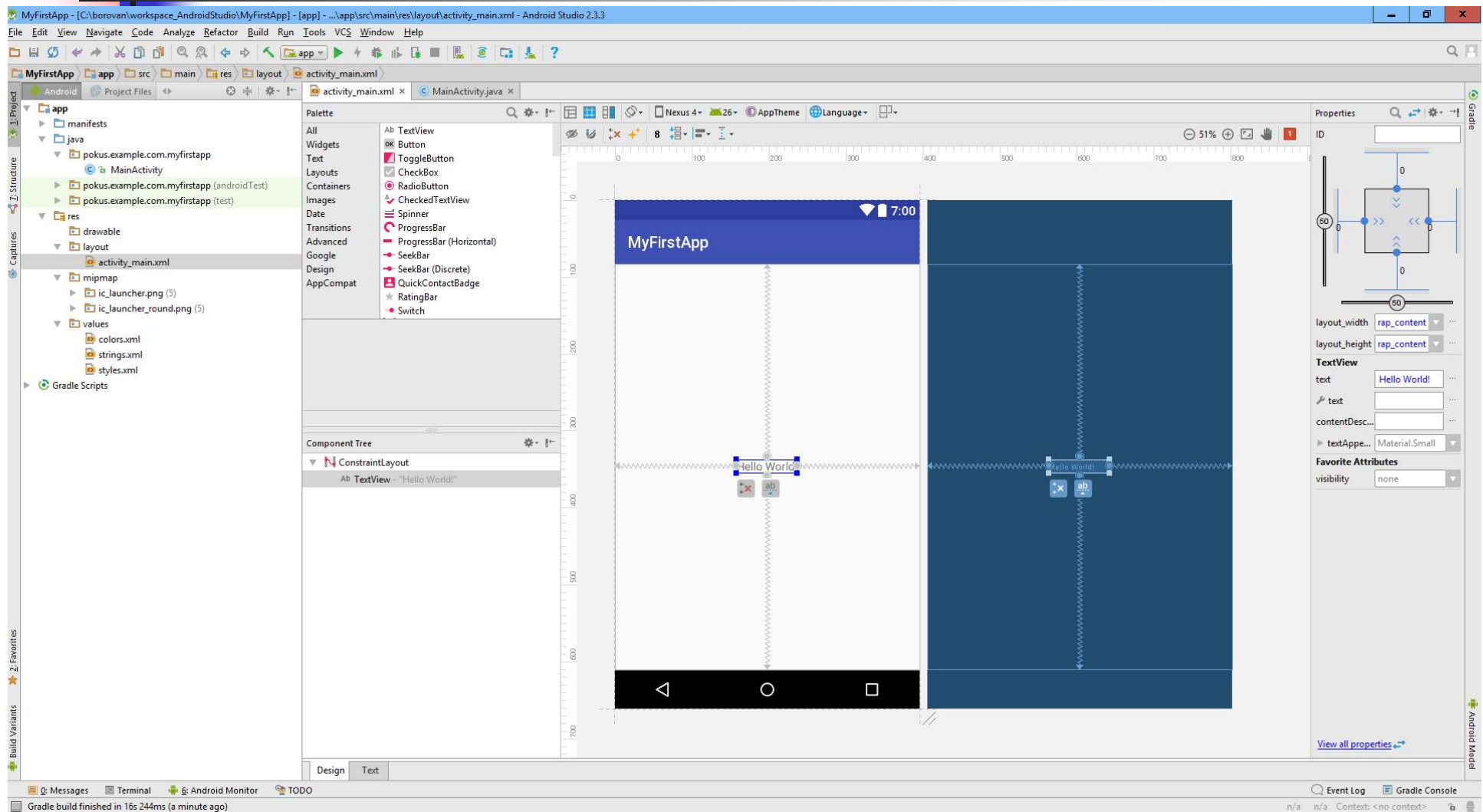
```
    defaultConfig {  
        applicationId "com.example.emptyapp2021"  
        minSdk 23  
        targetSdk 30  
        versionCode 1  
        versionName "1.0"  
    }
```

Submitovanie riešení: Android SDK 11 (API 30),
(compileSdkVersion 30, buildToolsVersion "30.*"),
a min.požadované SDK (minSdkVersion 23)

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 (java)



Nový projekt (kotlin)



The screenshot displays the Android Studio IDE with a new project named "My Application" open. The interface is divided into several panels:

- Project View (Left):** Shows the project structure. The "app" folder is expanded, revealing "manifests", "java", "res", and "layout". The "activity_main.xml" file is selected in the "layout" folder.
- Palette (Top Left):** Displays a list of UI components categorized by "Common", "Text", "Buttons", "Widgets", "Layouts", "Containers", "Google", and "Legacy". The "TextView" component is currently selected.
- Component Tree (Bottom Left):** Shows the hierarchy of the UI components. It lists "ConstraintLayout" and "TextView" with the text "Hello World!".
- Design View (Center):** Shows a visual representation of the layout. It features a dark blue background with a white "Hello World!" text centered on the screen. The text is connected to the "TextView" component in the Component Tree.
- Attributes (Right):** Displays the attributes for the selected "TextView" component. It shows the "id" attribute and a section for "Declared Attributes" under the "Layout" category. The "ConstraintWidget" section shows a visual representation of the constraints.
- Build Output (Bottom):** Shows the build process. It indicates that the build was completed successfully at 9/21/2019 12:35 PM with 2 warnings. The build steps listed are: Run build, Load build, Configure build, Calculate task graph, and Run tasks. The total build time is 884 ms.

Pýtajte sa kým nedostanete



Emulátor

—

- je pomalý, dlho bootuje
- neposkytuje všetky služby ako konkrétne zariadenie
- o senzoroch ani nehovorí
- dá sa použiť na začiatku

+

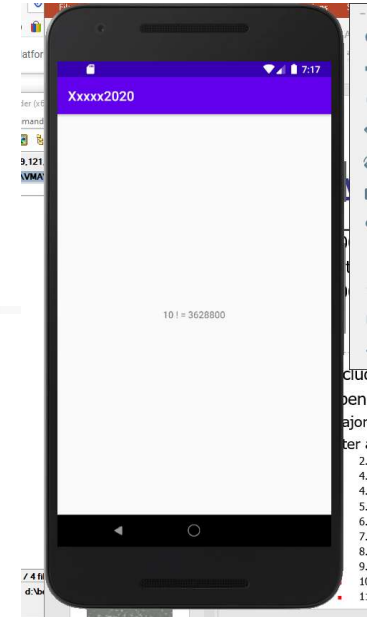
- má ho každý, nič nestojí
- dokonca má viac platforiem
- netreba sync-driver

Ked' už beží, tak ho nezabíjajte !

Ako si skúšať Kotlin v AS

(kým sa nedozvieme viac)

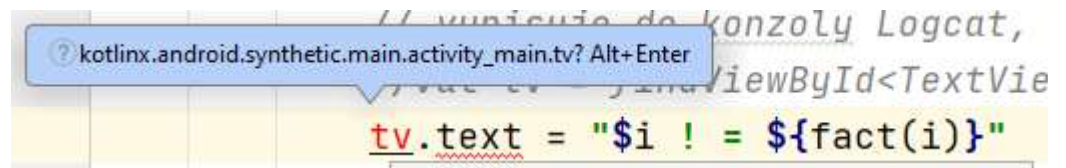
```
class MainActivity : AppCompatActivity() {  
    override fun onCreate(savedInstanceState: Bundle?) {  
        super.onCreate(savedInstanceState)  
        setContentView(R.layout.activity_main)  
        //println(fact(10))  
        for (i in 0..10) {  
            Log.d("TAG", "$i ! = ${fact(i)}")  
            // vypisuje do konzoly Logcat, použite filter s "TAG"  
            val tv = findViewById<TextView>(R.id.tv)  
            tv.text = "$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