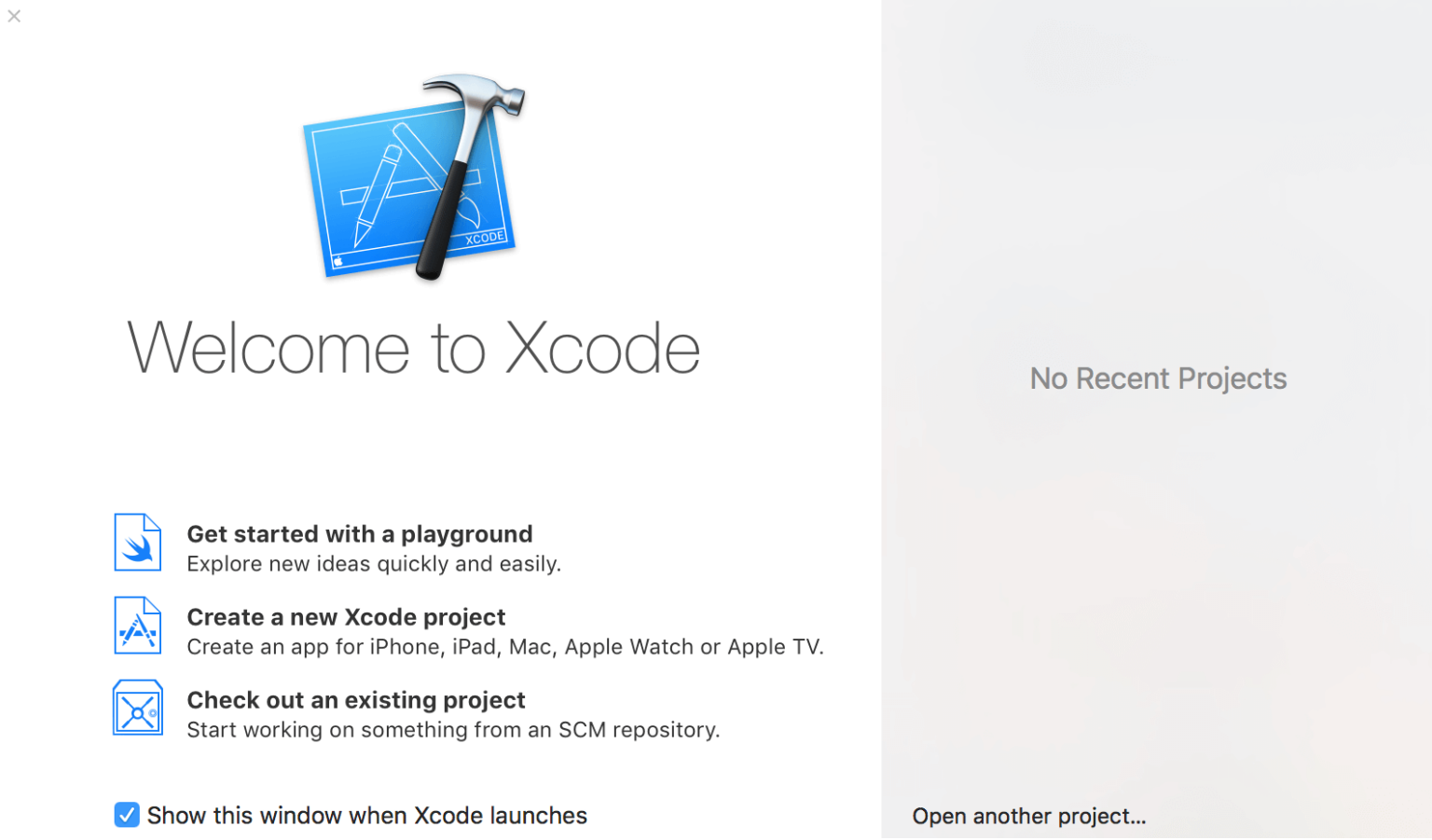
Pázmány Péter Catholic University
Faculty of Information Technology and Bionics

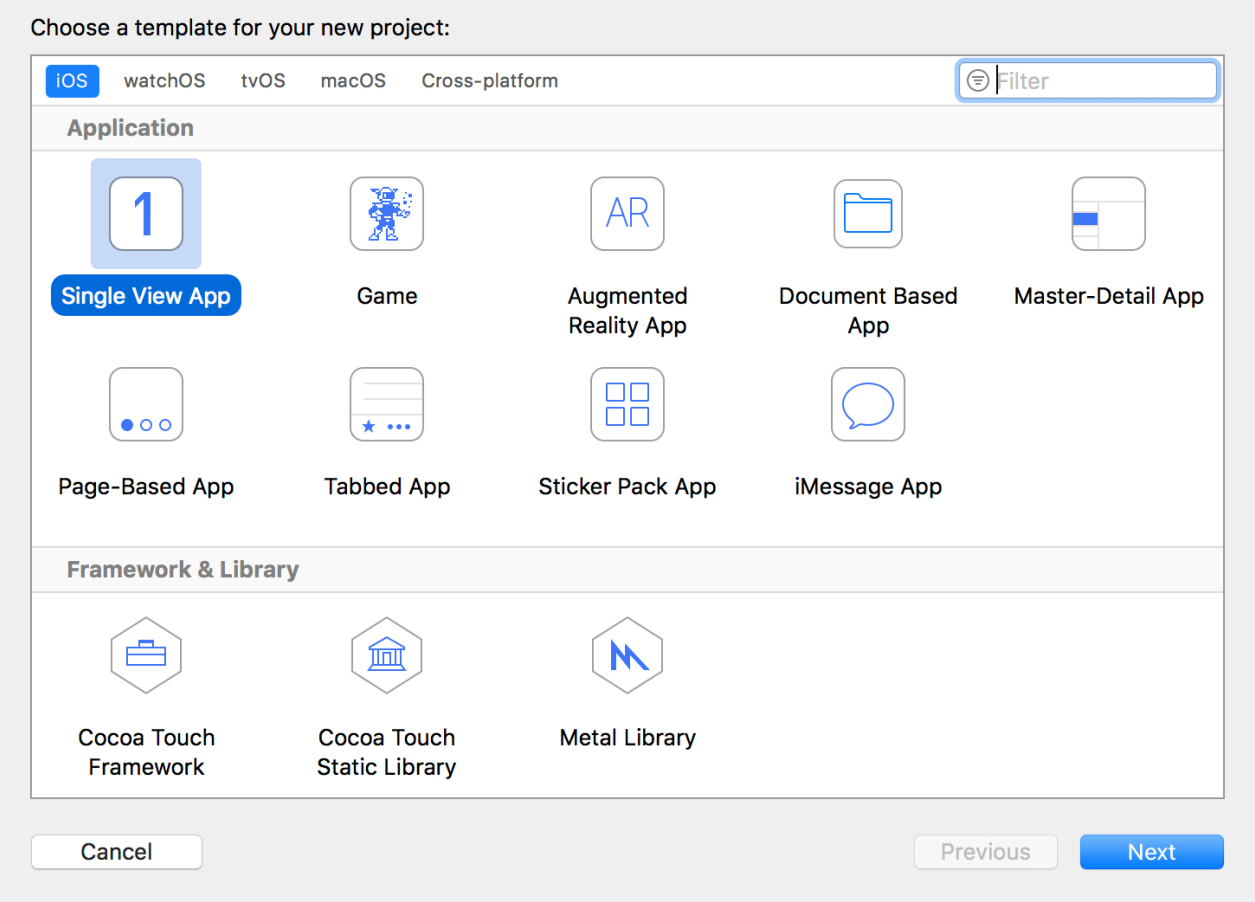
Basics of Mobile Application Development

Xcode Demo – Android Studio

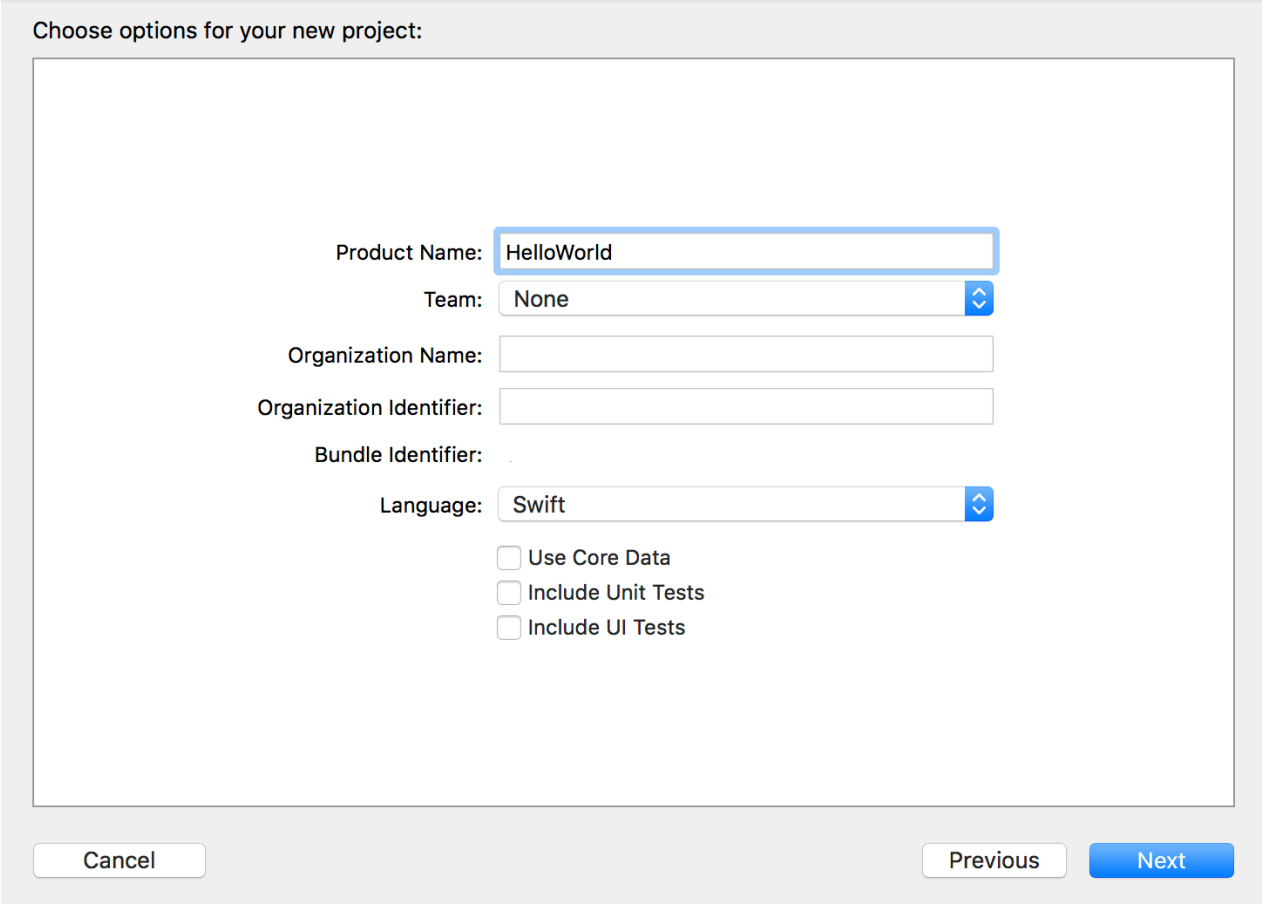
First App - XCode



First App - XCode



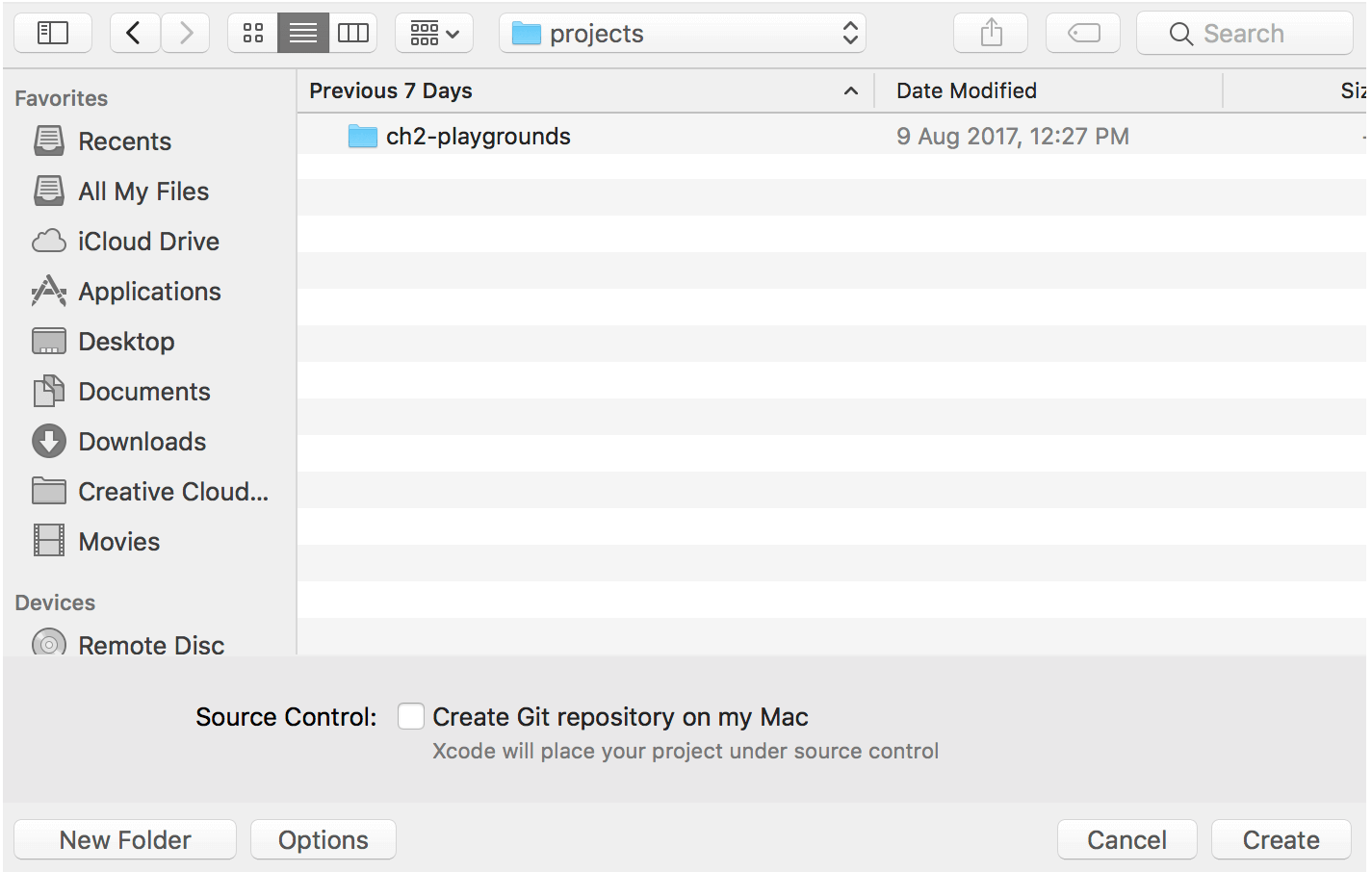
First App - XCode

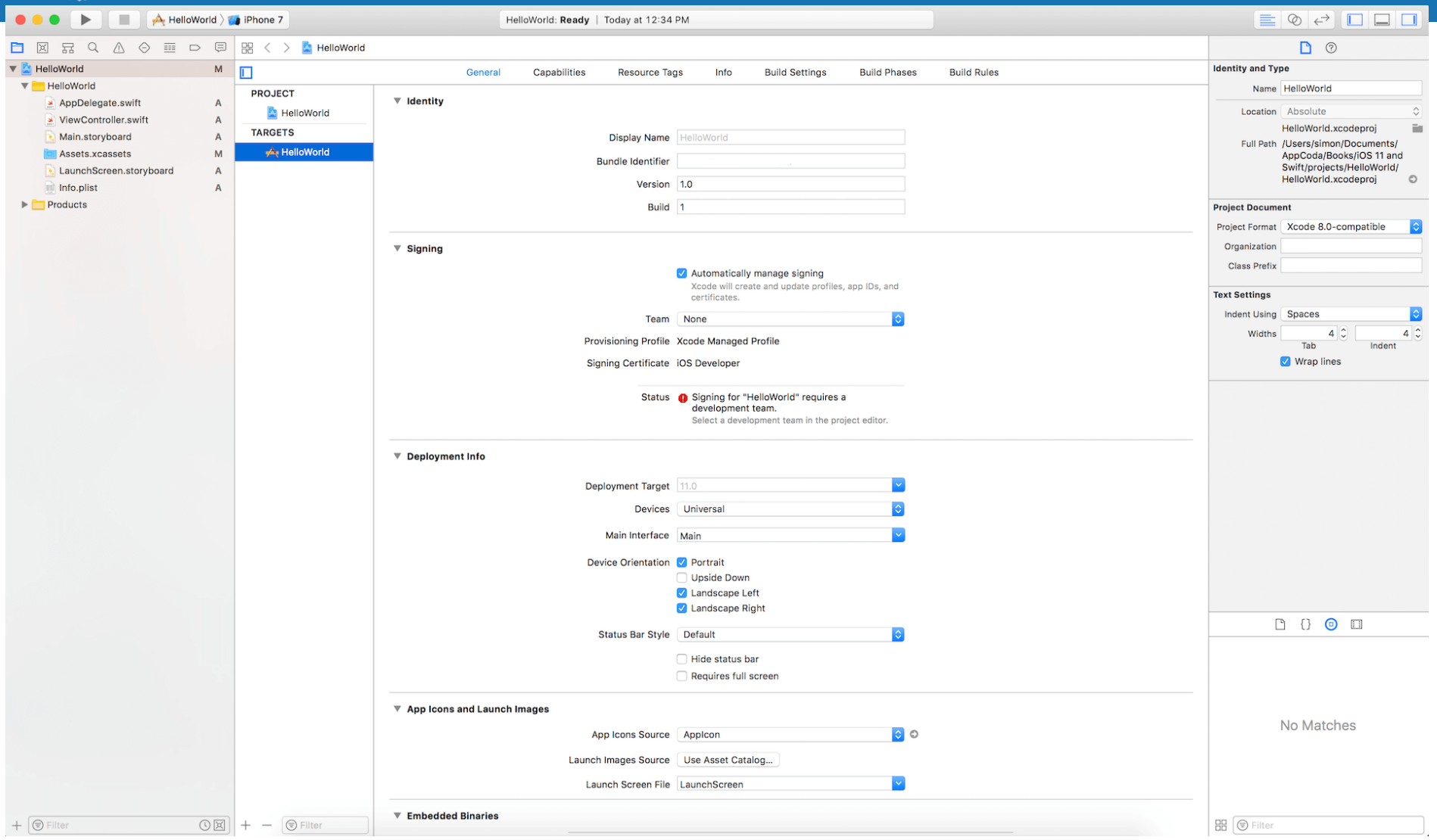


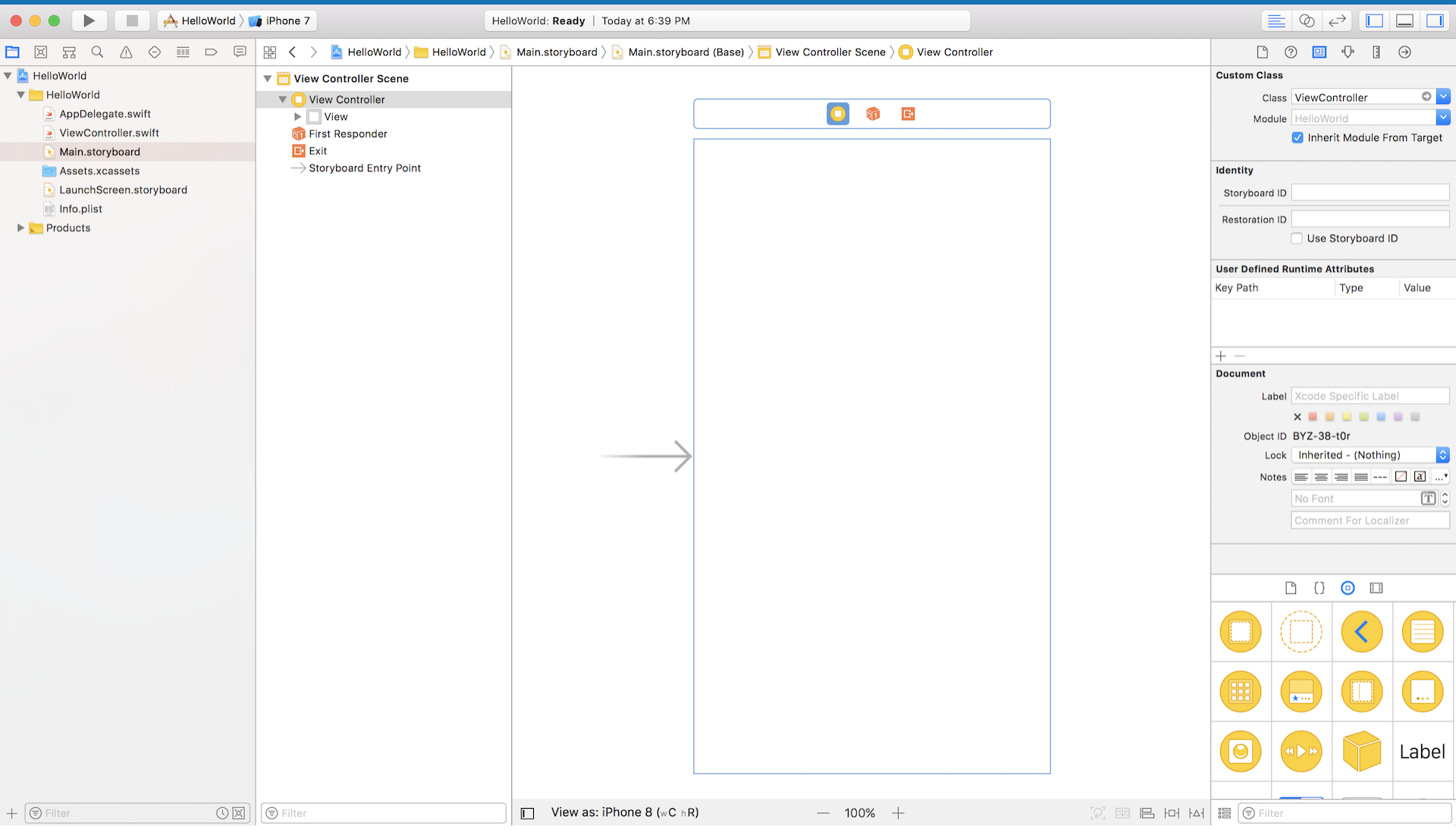
Options

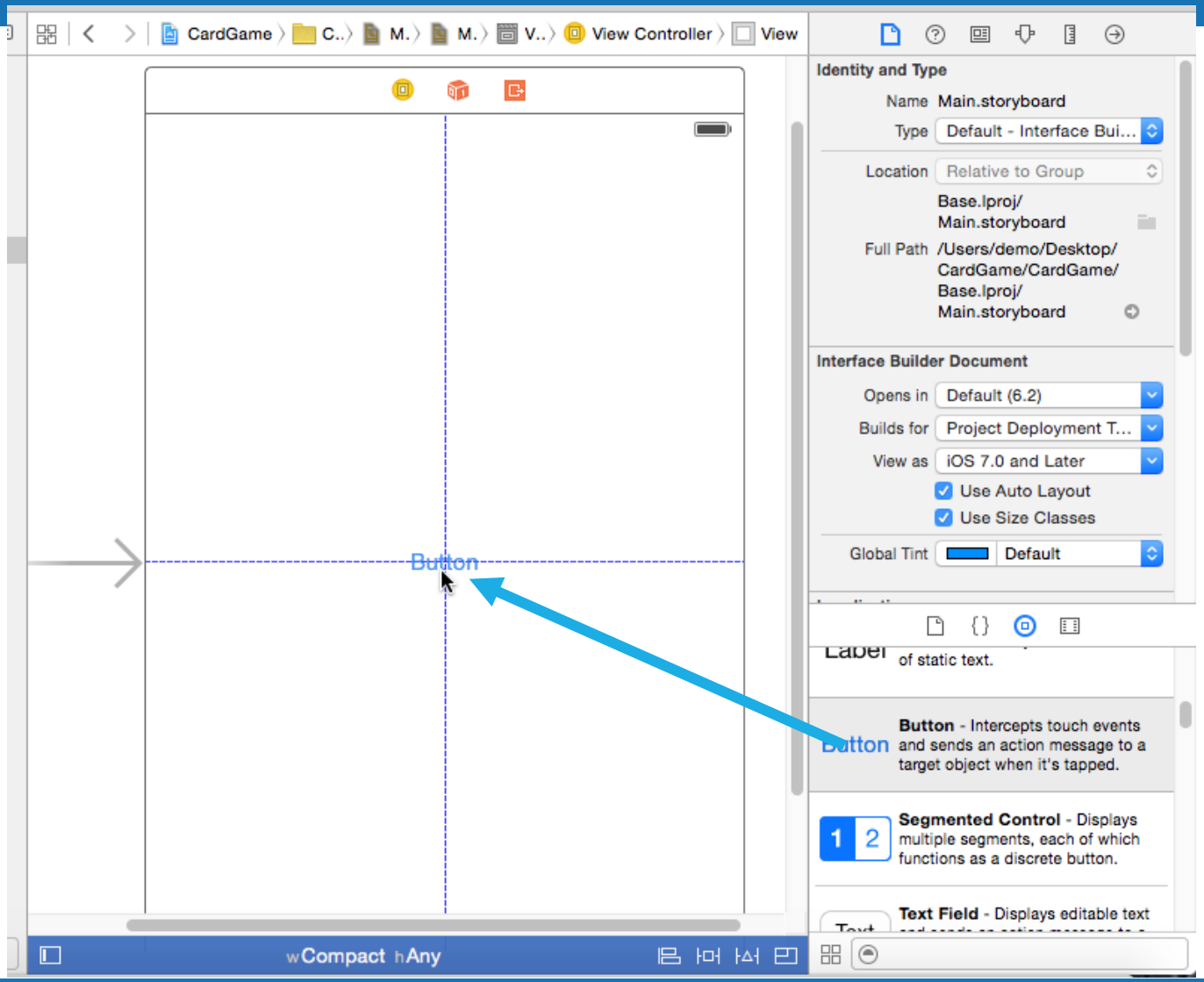
- **Product Name: HelloWorld**
  - This is the name of your app.
- **Organization Name: MAD**
  - It is the name of your organization.
  - If you are not building the app for your organization, use your name as the organization name.
- **Organization Identifier: mad.itk.ppke.hu**
  - It is actually the domain name written the other way round.
  - If you have a domain, you can use your own domain name.
- **Bundle Identifier**
  - It is a unique identifier of your app, which is used during app submission.
  - You do not need to fill in this option. Xcode automatically generates it for you.
- **Language: Swift**
  - Xcode supports both Objective-C and Swift for app development.
- **Use Core Data: [unchecked]**
  - You do not need Core Data for this simple project.
- **Include Unit Tests: [unchecked]**
  - You do not need unit tests for this simple project.
- **Include UI Tests: [unchecked]**
  - You do not need UI tests for this simple project.

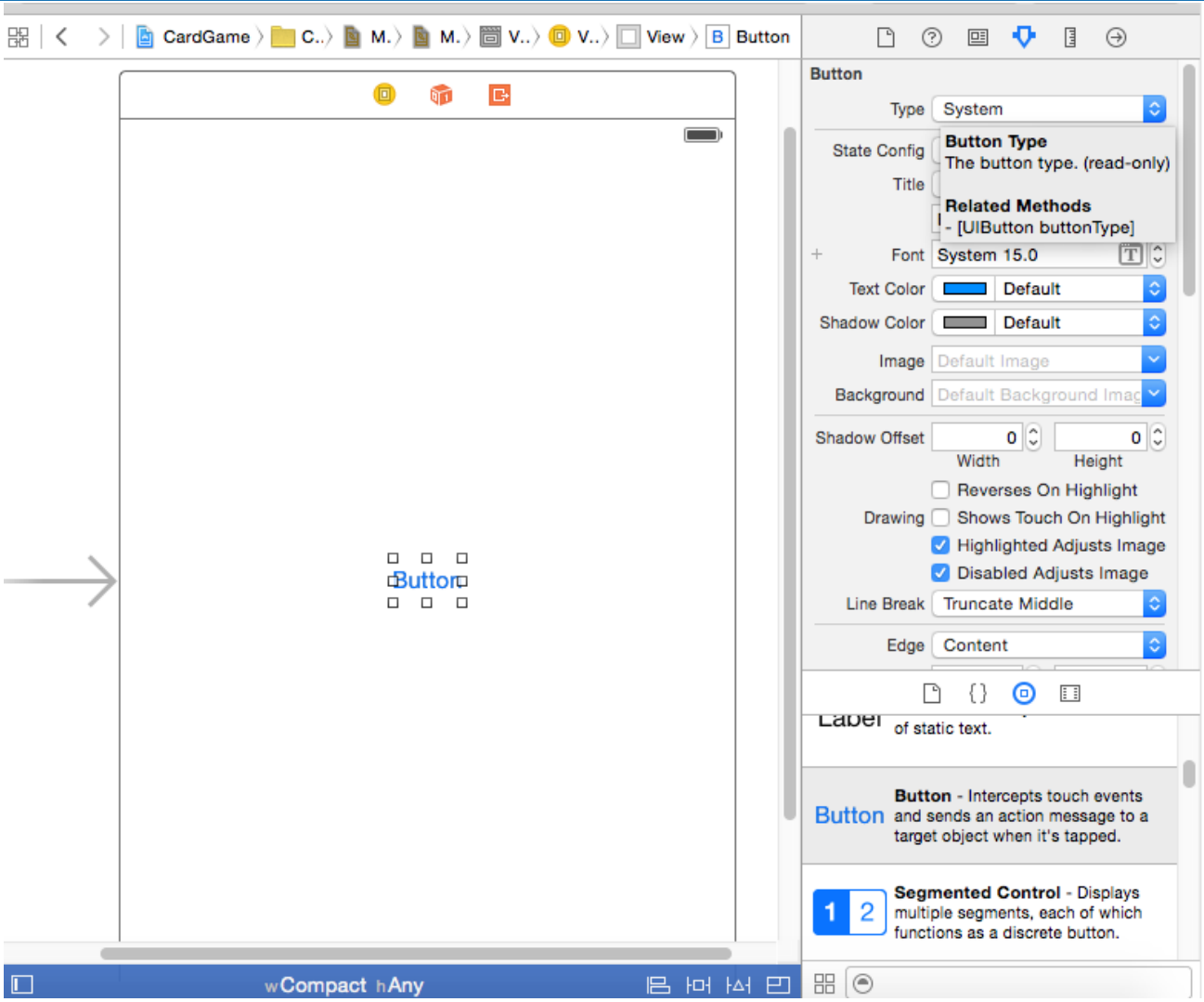
First App - XCode




HelloWorld 〉 iPhone 7
HelloWorld: Ready | Today at 12:34 PM
HelloWorld
HelloWorld
AppDelegate.swift
ViewController.swift
Main.storyboard
Assets.xcassets
LaunchScreen.storyboard
Info.plist
Products
General
Capabilities
Resource Tags
Info
Build Settings
Build Phases
Build Rules
PROJECT
HelloWorld
TARGETS
HelloWorld
Identity
Display Name
HelloWorld
Bundle Identifier
Version
1.0
Build
1
Signing
Automatically manage signing
Xcode will create and update profiles, app IDs, and certificates.
Team
None
Provisioning Profile
Xcode Managed Profile
Signing Certificate
iOS Developer
Status
Signing for "HelloWorld" requires a development team.
Select a development team in the project editor.
Deployment Info
Deployment Target
11.0
Devices
Universal
Main Interface
Main
Device Orientation
Portrait
Upside Down
Landscape Left
Landscape Right
Status Bar Style
Default
Hide status bar
Requires full screen
App Icons and Launch Images
App Icons Source
AppIcon
Launch Images Source
Use Asset Catalog...
Launch Screen File
LaunchScreen
Embedded Binaries
Identity and Type
Name
HelloWorld
Location
Absolute
HelloWorld.xcodeproj
Full Path
/Users/simon/Documents/AppCoda/Books/iOS 11 and Swift/projects/HelloWorld/HelloWorld.xcodeproj
Project Document
Project Format
Xcode 8.0-compatible
Organization
Class Prefix
Text Settings
Indent Using
Spaces
Widths
4
4
Tab
Indent
Wrap lines
No Matches


HelloWorld
iPhone 7
HelloWorld: Ready | Today at 6:39 PM
HelloWorld
HelloWorld
AppDelegate.swift
ViewController.swift
Main.storyboard
Assets.xcassets
LaunchScreen.storyboard
Info.plist
Products
View Controller Scene
View Controller
View
First Responder
Exit
Storyboard Entry Point
Main.storyboard (Base)
Custom Class
Class ViewController
Module HelloWorld
Inherit Module From Target
Identity
Storyboard ID
Restoration ID
Use Storyboard ID
User Defined Runtime Attributes
Key Path
Type
Value
Document
Label
Xcode Specific Label
Object ID BYZ-38-t0r
Lock Inherited - (Nothing)
Notes
No Font
Comment For Localizer
Label
View as: iPhone 8 (wC hR)
100%


CardGame
C..
M.
M.
V..
View Controller
View
Button
wCompact hAny
Identity and Type
Name Main.storyboard
Type Default - Interface Bui...
Location Relative to Group
Base.lproj/
Main.storyboard
Full Path /Users/demo/Desktop/
CardGame/CardGame/
Base.lproj/
Main.storyboard
Interface Builder Document
Opens in Default (6.2)
Builds for Project Deployment T...
View as iOS 7.0 and Later
Use Auto Layout
Use Size Classes
Global Tint Default
of static text.
Button - Intercepts touch events and sends an action message to a target object when it's tapped.
Segmented Control - Displays multiple segments, each of which functions as a discrete button.
Text Field - Displays editable text


CardGame
C..
M.
M.
V..
V..
View
Button
Button
wCompact hAny
Button
Type
System
State Config
Title
Button Type
The button type. (read-only)
Related Methods
- [UIButton buttonType]
Font
System 15.0
Text Color
Default
Shadow Color
Default
Image
Default Image
Background
Default Background Imag
Shadow Offset
0
0
Width
Height
Reverses On Highlight
Drawing
Shows Touch On Highlight
Highlighted Adjusts Image
Disabled Adjusts Image
Line Break
Truncate Middle
Edge
Content
of static text.
Button
Button - Intercepts touch events and sends an action message to a target object when it's tapped.
1 2
Segmented Control - Displays multiple segments, each of which functions as a discrete button.

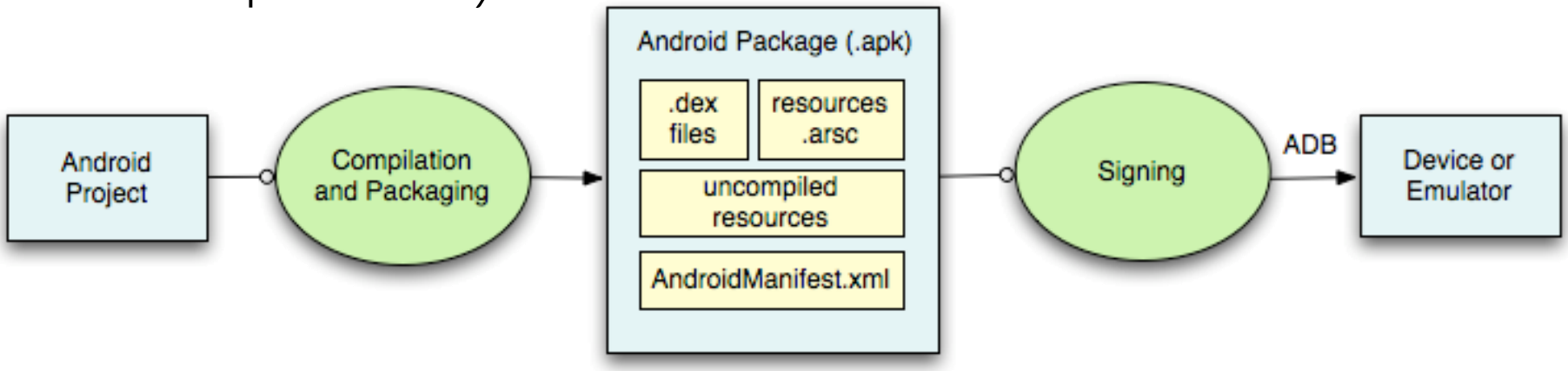
Code

- Existing code belongs to the lifecycle management of the application
  - viewDidLoad
  - didReceivedMemoryWarning
- Write a code which changes the properties of the button
  - To do so drag the button to the code editor
  - And hold the CTRL button
  - Then the connection between the storyboard and the code is made
    - Xcode indicates that

Android

Android project cycle

- Android applications are developed in Java language (most of the cases, so there are other possibilities)
- Source code is compiled to byte code, which is transformed to Dalvik Executable, which can be interpreted by Android VM (ART)
- Resources (images, layouts, etc.) are compiled
- All of above is packaged to the APK file, with the AndroidManifest.xml
- APK is signed digitally, and then can be installed on device or emulator
- Previous steps are done by the IDE



Android development tools

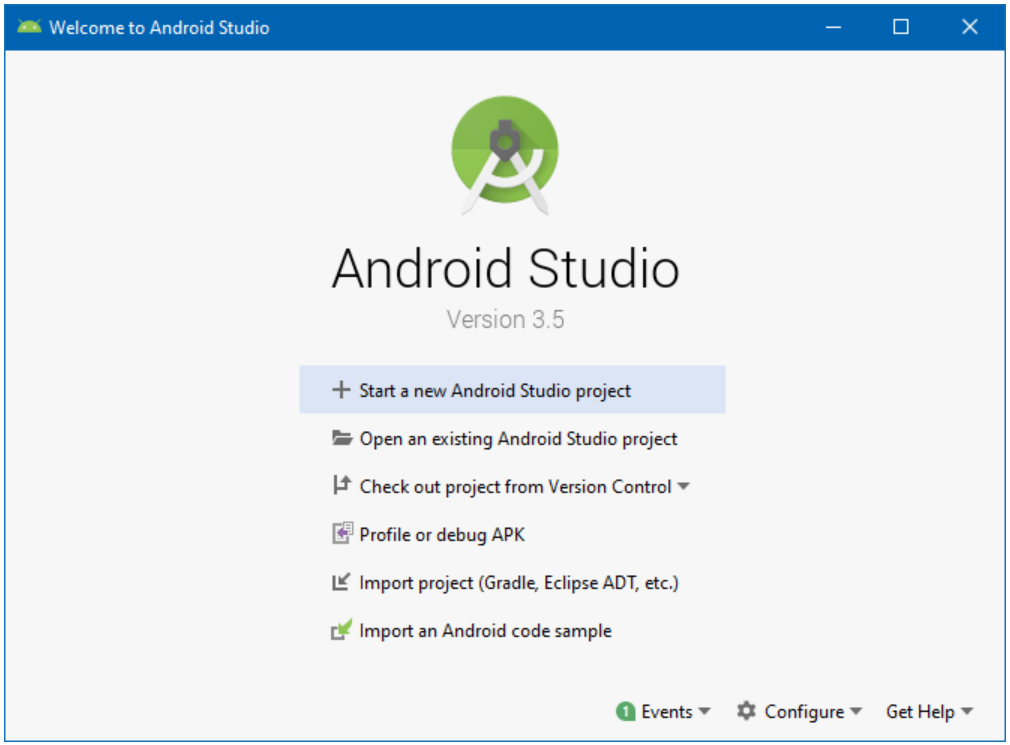
- Android Studio
  - Java SDK
- Android SDK
  - Compiler and program libraries
  - Emulator
    - This is and emulator, where executes the entire Android operating system over you OS on your device
- Android NDK
  - For native (C/C++) libraries
  - Currently you do not need it
- As a result we can develop Android software on any of the main desktop platforms
  - Even on Android: AIDE

Android Debug Bridge (ADB)

- For communication between the PC and device
- Client-server architecture
  - Client
    - Command line application, running on the developer's computer
    - IDE's hide it
  - Server
    - Manages the communication between the client and the daemon
  - Daemon thread
    - Background thread on the device or emulator
- Steps
  - Starting client
  - Server listens on 5037 TCP port
  - Server sets up the link between the client and daemon
    - TCP ports between 5555-5585
  - Two ports for each connection
    - Even for console, Odd for ADB
    - Emulator 1, console: 5554
      Emulator 1, adb: 5555
      Emulator 2, console: 5556
      Emulator 2, adb: 5557 ...

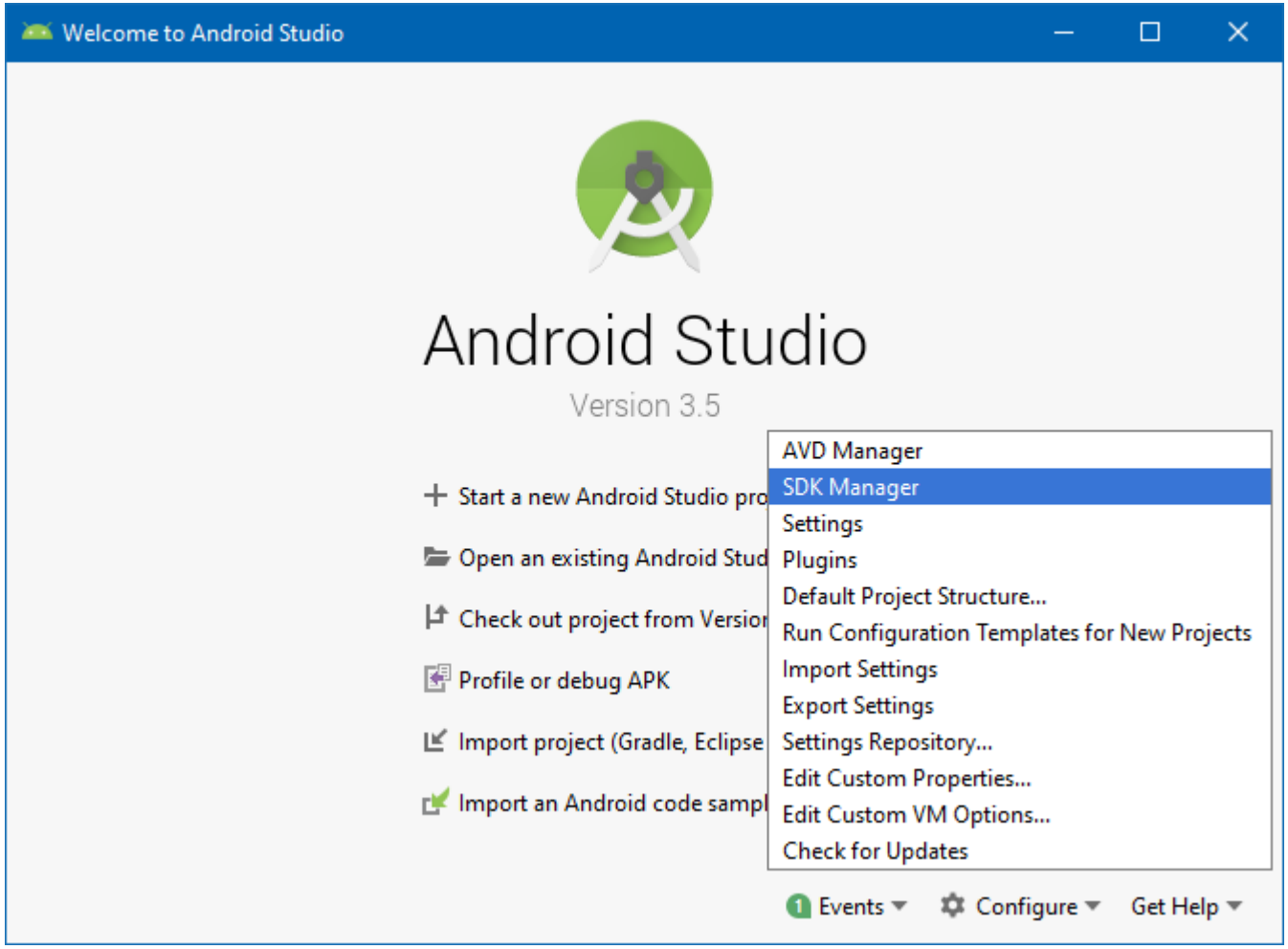
Obtaining development environment

- Java SDK
  - Install as usual
- Android Studio
  - http://developer.android.com/sdk/index.html
- Start

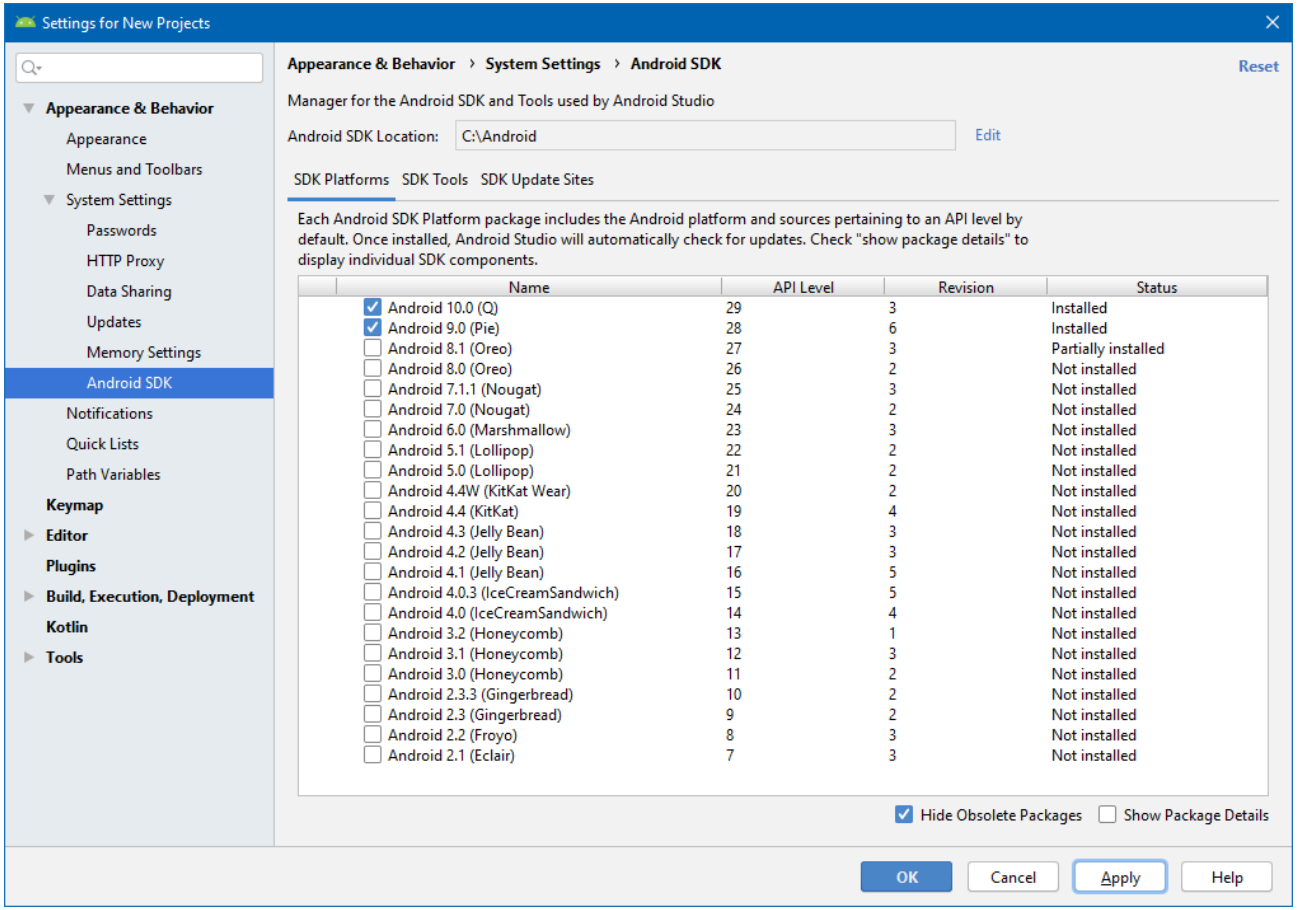


Settings

- SDK settings



SDK

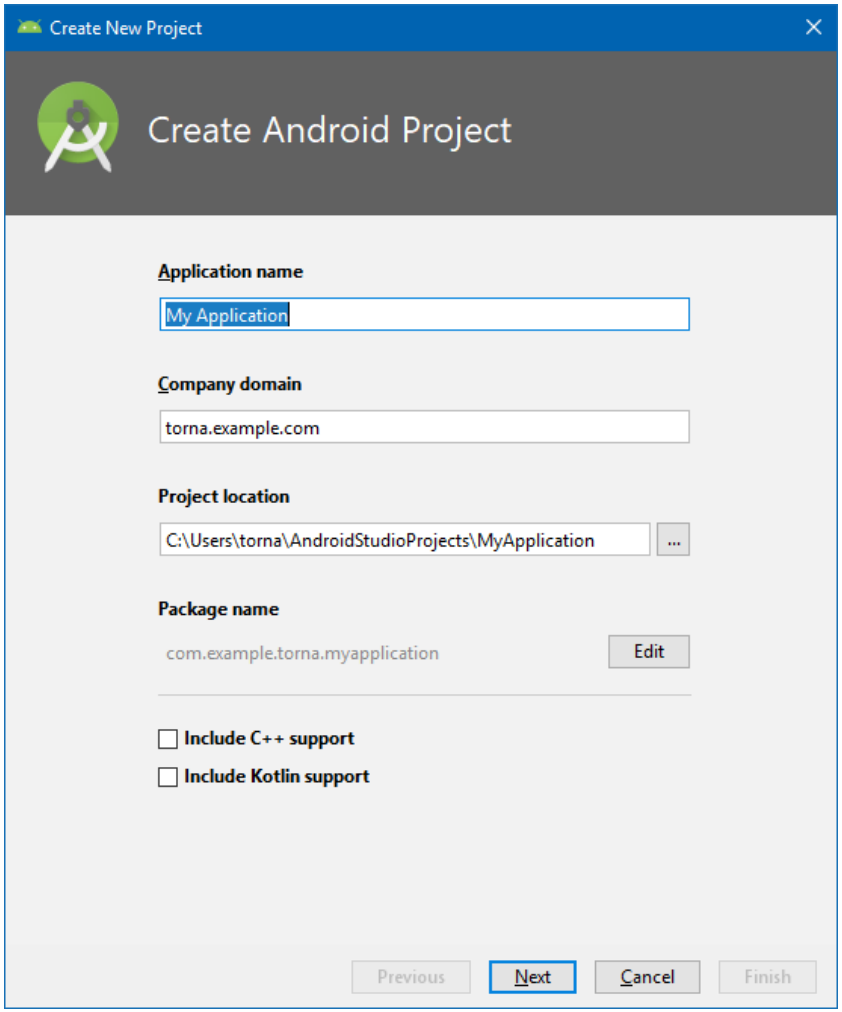

Settings for New Projects
Appearance & Behavior
Appearance
Menus and Toolbars
System Settings
Passwords
HTTP Proxy
Data Sharing
Updates
Memory Settings
Android SDK
Notifications
Quick Lists
Path Variables
Keymap
Editor
Plugins
Build, Execution, Deployment
Kotlin
Tools
Appearance & Behavior › System Settings › Android SDK
Reset
Manager for the Android SDK and Tools used by Android Studio
Android SDK Location: C:\Android
Edit
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, Android Studio will automatically check for updates. Check "show package details" to display individual SDK components.
Name
API Level
Revision
Status
Android 10.0 (Q) 29 3 Installed
Android 9.0 (Pie) 28 6 Installed
Android 8.1 (Oreo) 27 3 Partially installed
Android 8.0 (Oreo) 26 2 Not installed
Android 7.1.1 (Nougat) 25 3 Not installed
Android 7.0 (Nougat) 24 2 Not installed
Android 6.0 (Marshmallow) 23 3 Not installed
Android 5.1 (Lollipop) 22 2 Not installed
Android 5.0 (Lollipop) 21 2 Not installed
Android 4.4W (KitKat Wear) 20 2 Not installed
Android 4.4 (KitKat) 19 4 Not installed
Android 4.3 (Jelly Bean) 18 3 Not installed
Android 4.2 (Jelly Bean) 17 3 Not installed
Android 4.1 (Jelly Bean) 16 5 Not installed
Android 4.0.3 (IceCreamSandwich) 15 5 Not installed
Android 4.0 (IceCreamSandwich) 14 4 Not installed
Android 3.2 (Honeycomb) 13 1 Not installed
Android 3.1 (Honeycomb) 12 3 Not installed
Android 3.0 (Honeycomb) 11 2 Not installed
Android 2.3.3 (Gingerbread) 10 2 Not installed
Android 2.3 (Gingerbread) 9 2 Not installed
Android 2.2 (Froyo) 8 3 Not installed
Android 2.1 (Eclair) 7 3 Not installed
Hide Obsolete Packages
Show Package Details
OK
Cancel
Apply
Help

Setup

- You should install (some of them are already installed)
  - „Tools" folder
    - Android SDK Tools
    - Android SDK Platform-tools
    - Android SDK Build-tools
  - „Android O" (10.0) folder (older versions are also supported)
    - SDK Platform
    - Intel x86 Atom System Image
    - Sources for Android SDK
  - „Extras" folder
    - Android Support Library
    - Google Play Services
    - Google USB Driver (Windows)
    - Intel x86 Emulator Accelerator (HAXM Installer) – if you have appropriate Intel CPU

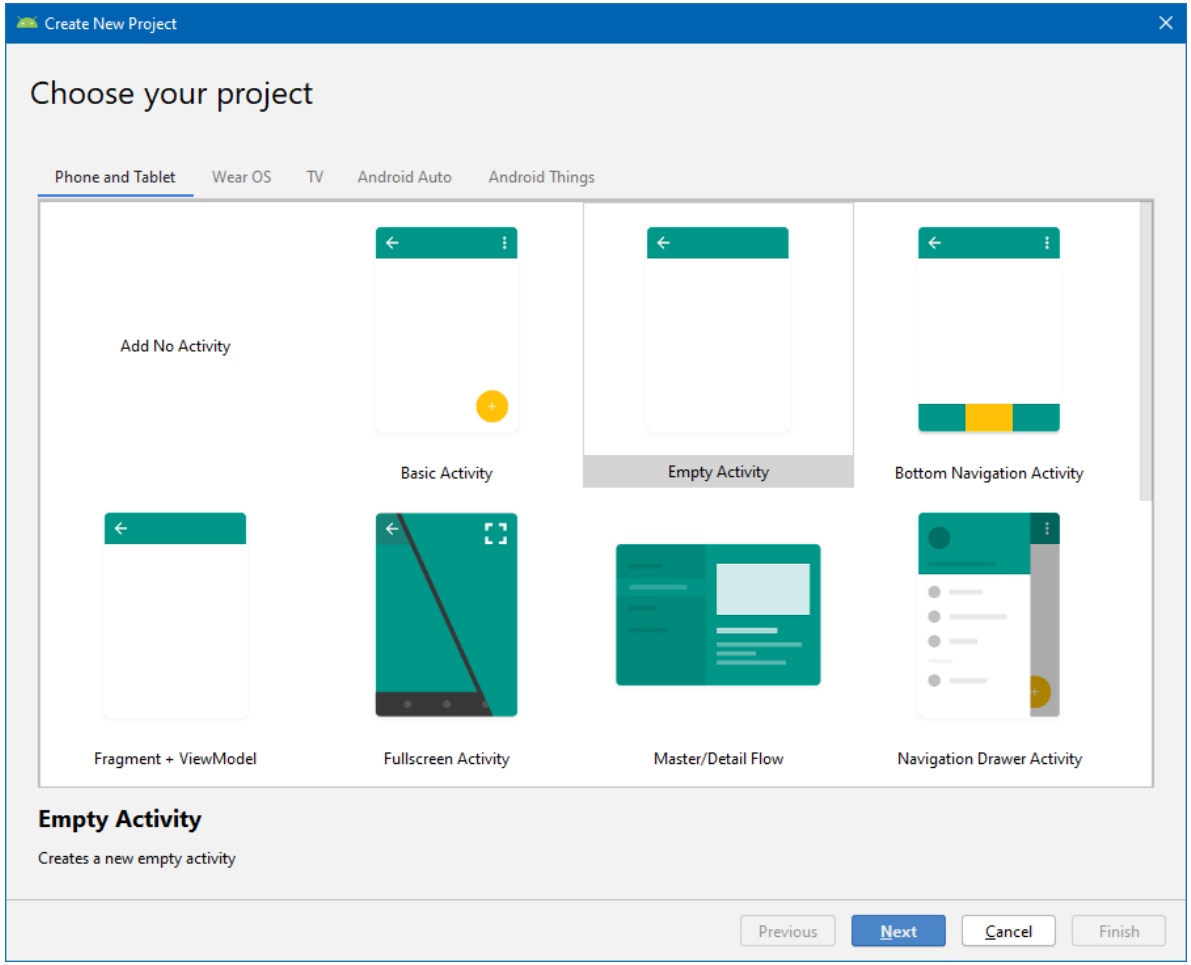
Hello Android

- Let's create a new Android app
- On welcome screen choose „Start new Android Studio project"
- Set the name of the project
- Set the company domain
  - Package name is generated
  - Package name should be unique
    - mad.itk.ppke.hu



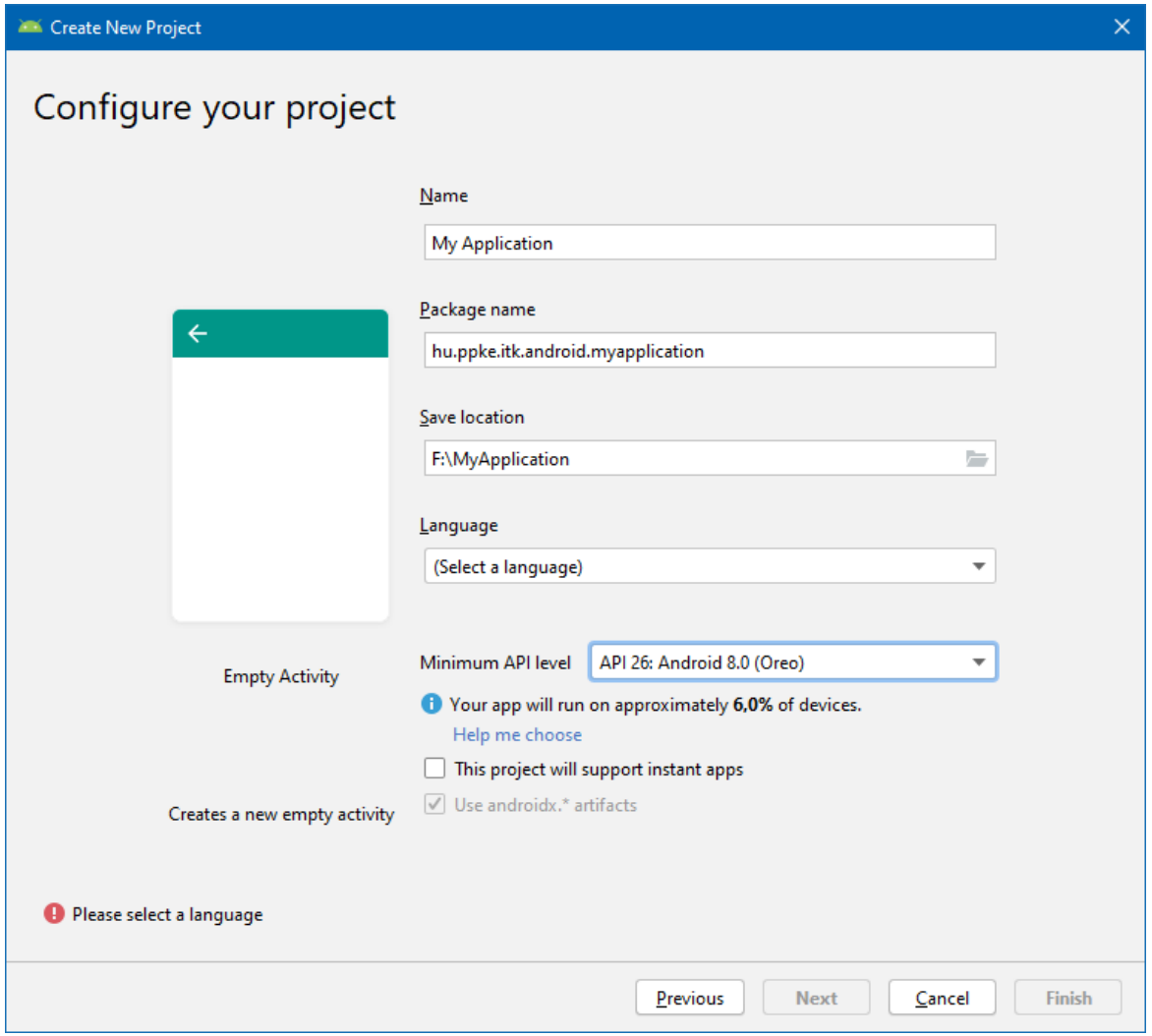
Hello Android

- Let's create a new Android app



Hello Android

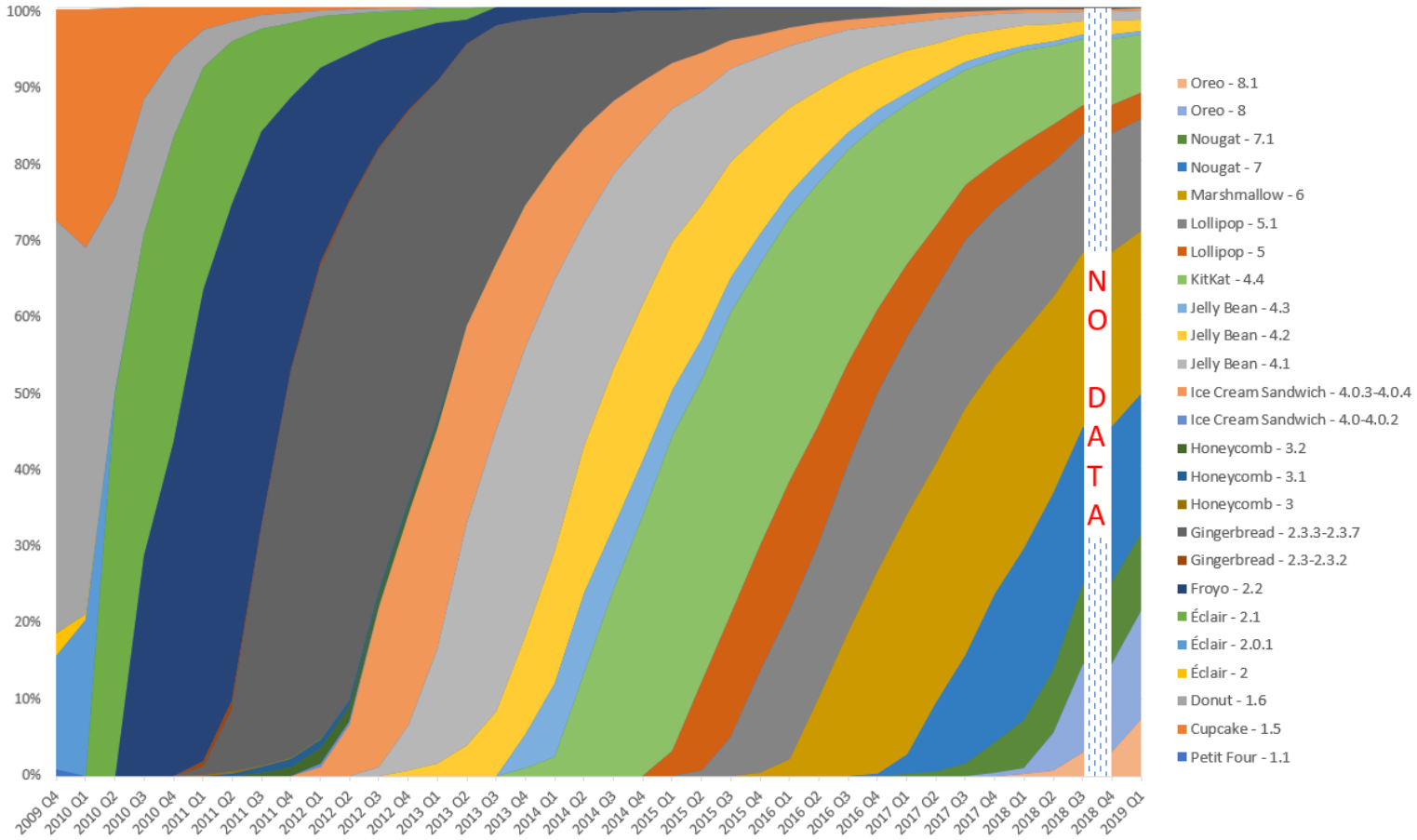
- Minimum SDK
- Language!



Hello Android

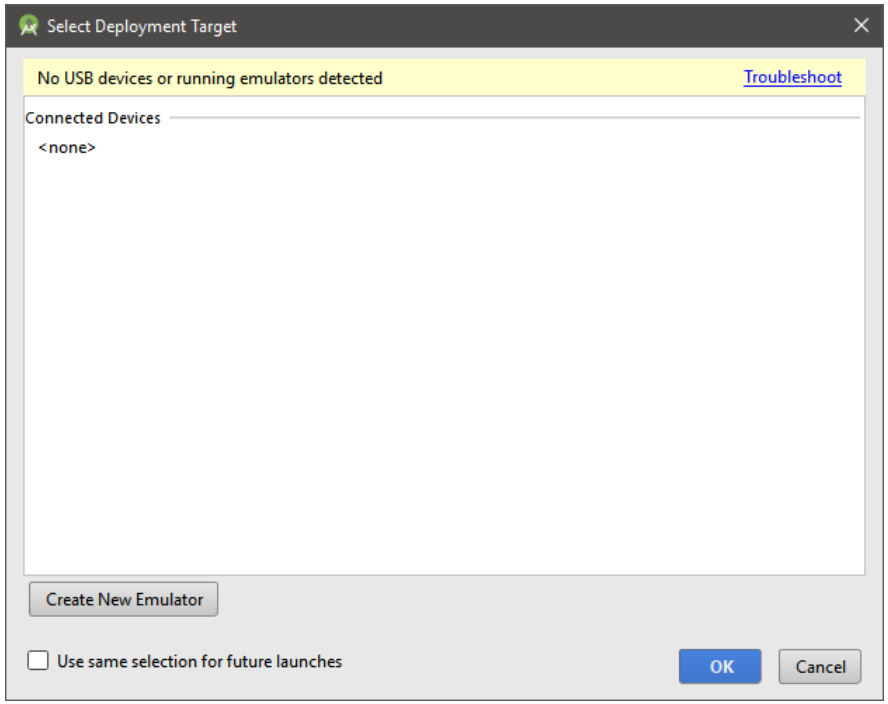
- Minimum SDK version: the oldest Android version, which is supported by the app
  - If it is too low, many of new API components cannot be used
  - If it is too high, only a few device will be supported
- Target SDK version: which capabilities wanted to be utilized
  - You should choose the latest one
- Compile with: which used for compilation
  - You should choose the latest one as well

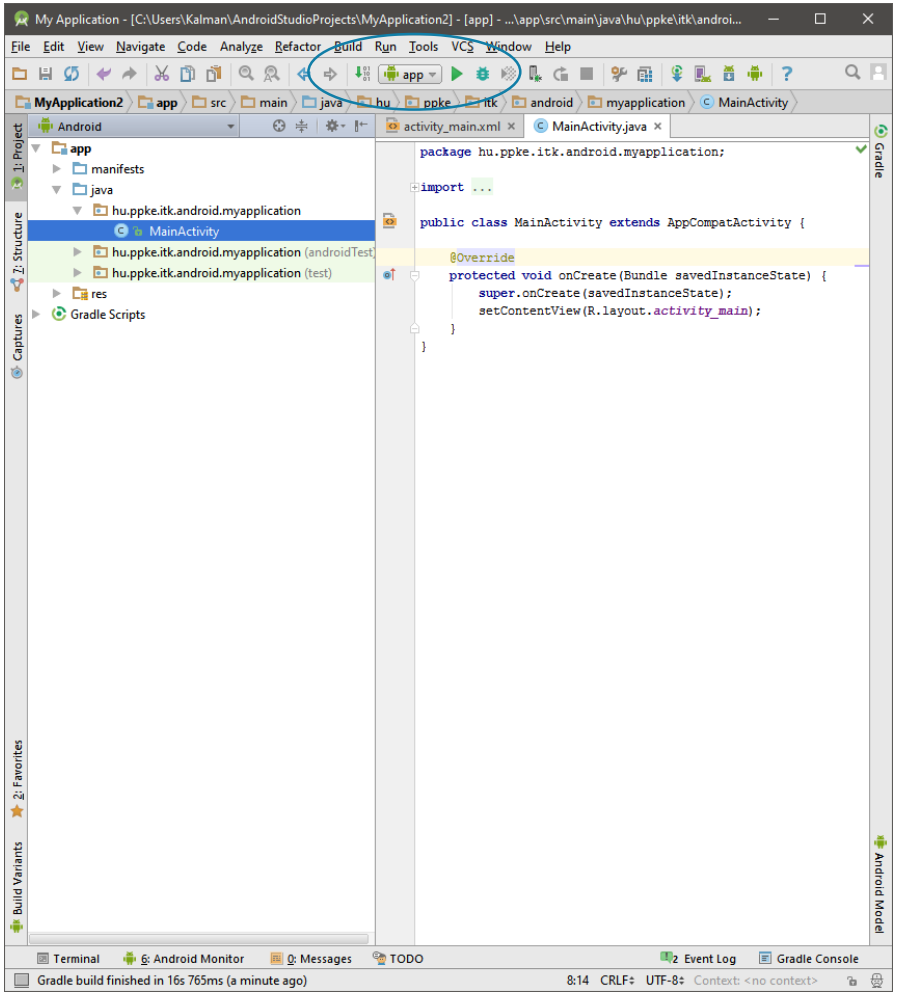
Spread of different versions



Hello Android

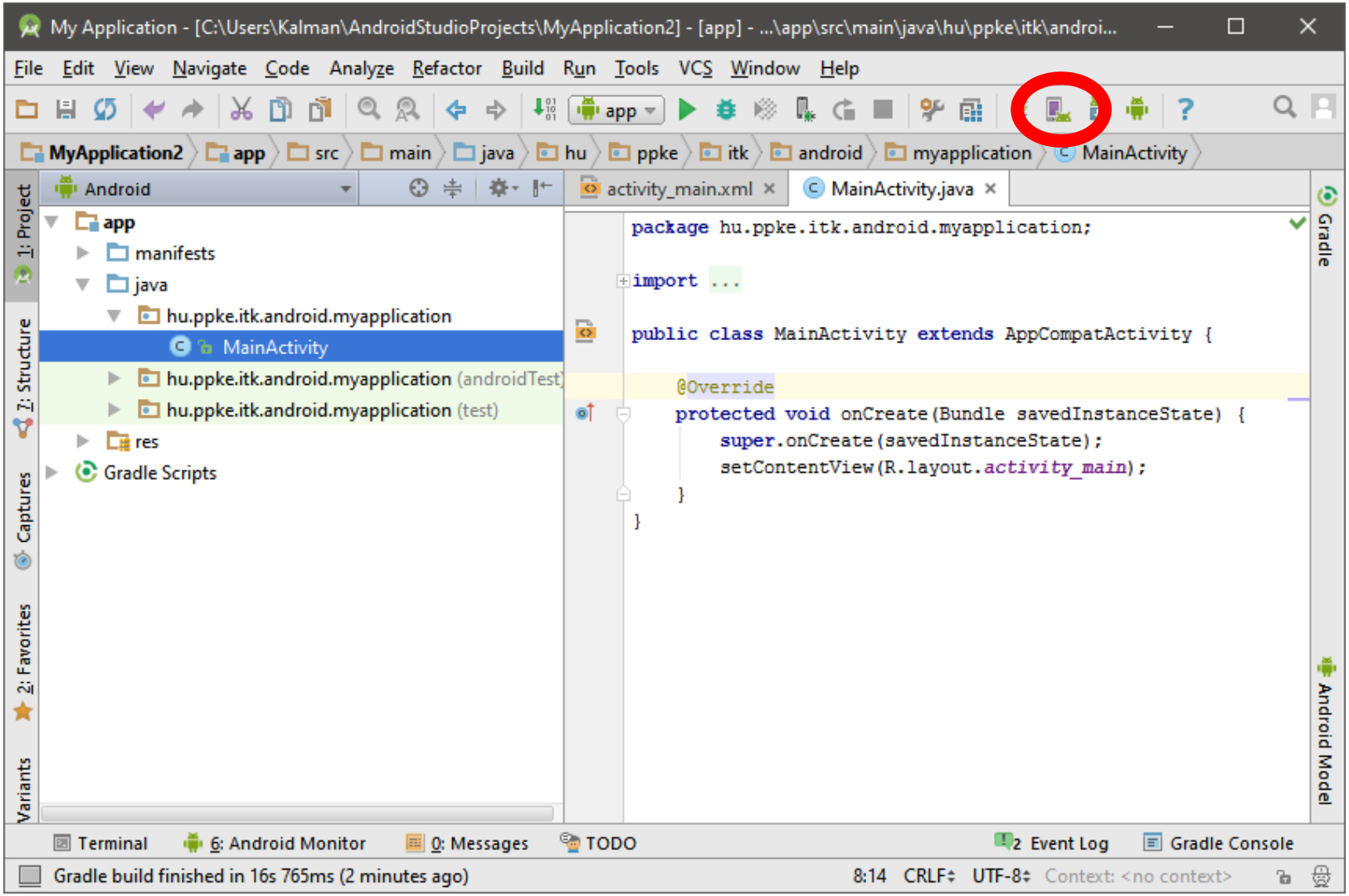
- Compile, install and execute the application





What is required?

- Emulator
  - A mobile phone can be emulated
    - Realistic, even location with GPS coordinates can be simulated
    - And AVD have to be configured, and we have to select the device to be started
  - AVD (Android Virtual Device)
    - Virtual devices can be created and its properties can be set
      - Screen size, SD size, etc.
- Device
  - Physical device

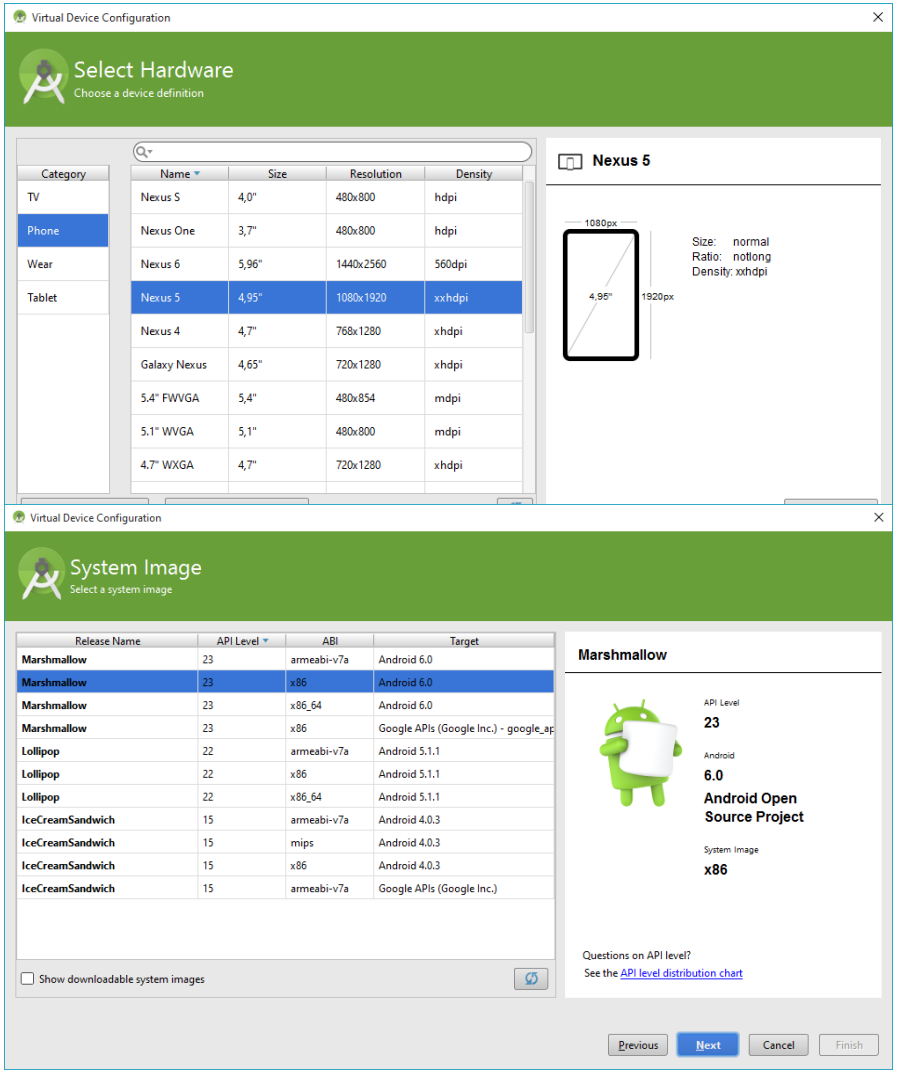

My Application - [C:\Users\Kalman\AndroidStudioProjects\MyApplication2] - [app] - ...\app\src\main\java\hu\ppke\itk\androi...
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
app
MyApplication2 app src main java hu ppke itk android myapplication MainActivity
Android
app
manifests
java
hu.ppke.itk.android.myapplication
MainActivity
hu.ppke.itk.android.myapplication (androidTest)
hu.ppke.itk.android.myapplication (test)
res
Gradle Scripts
activity_main.xml
MainActivity.java
package hu.ppke.itk.android.myapplication;
import ...
public class MainActivity extends AppCompatActivity {
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.activity_main);
}
}
1: Project
7: Structure
Captures
2: Favorites
Variants
Gradle
Android Model
Terminal
6: Android Monitor
0: Messages
TODO
2 Event Log
Gradle Console
Gradle build finished in 16s 765ms (2 minutes ago)
8:14 CRLF UTF-8 Context: <no context>

Setting an emulator

- AVD Manger
  - A virtual device can be
    - created
    - deleted
    - started
    - modified
- Each device has an „disk" image, which is used by the emulator
  - Thus we have persistent storage

Setting an emulator

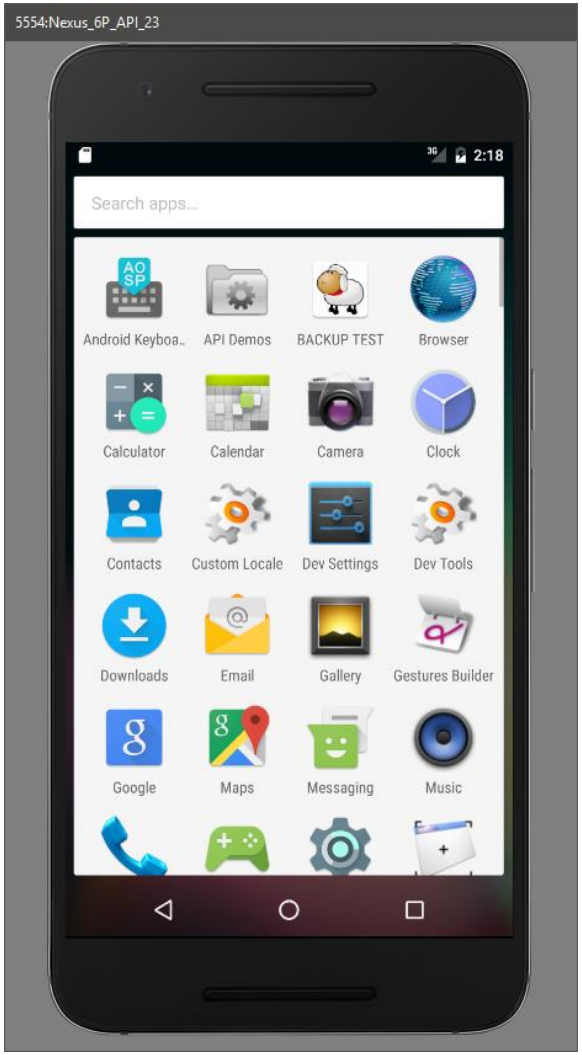
- Create a new one
  - Device: Pixel
  - Set the previously downloaded Android version
    - 10.0
    - Architecture x86
    - With Google API



Advanced settings

Emulator settings

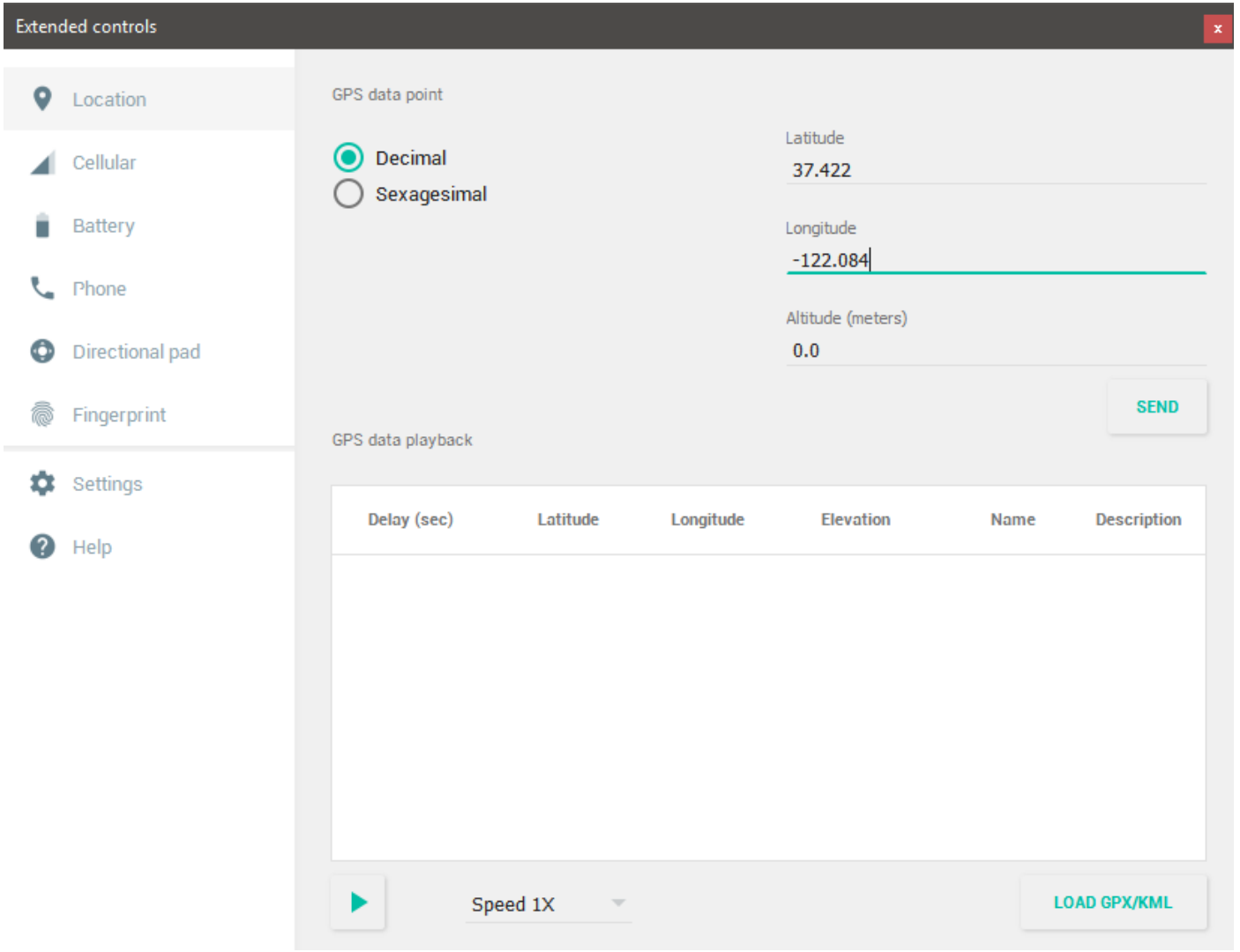
- Optional: if you have an appropriate Intel processor, which supports virtualization, install HAXM
  - As previously discussed
  - Enable it in BIOS / EFI
  - It would really speed up the emulator
- Emulator can be started by pressing the green „Play” button



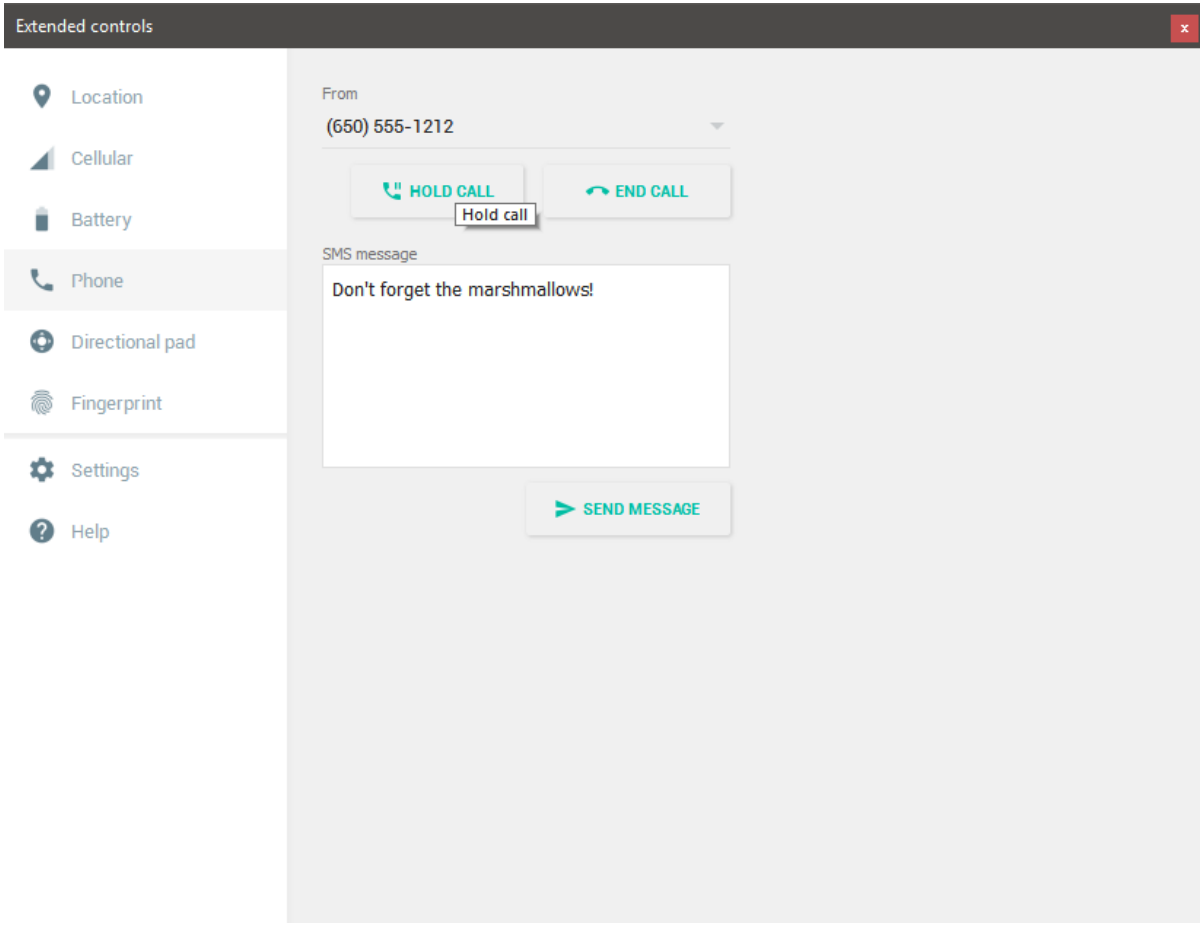
Emulator

- On the emulator image there is a complete system
  - Most of things are working
  - Events can be simulated
    - Network type
    - Incoming call
    - Incoming SMS
    - GPS coordinate
- Android device monitor
  - Tools | Android | ADM

Events


Extended controls
Location
Cellular
Battery
Phone
Directional pad
Fingerprint
Settings
Help
GPS data point
Decimal
Sexagesimal
Latitude
37.422
Longitude
-122.084
Altitude (meters)
0.0
SEND
GPS data playback
Delay (sec)
Latitude
Longitude
Elevation
Name
Description
Speed 1X
LOAD GPX/KML

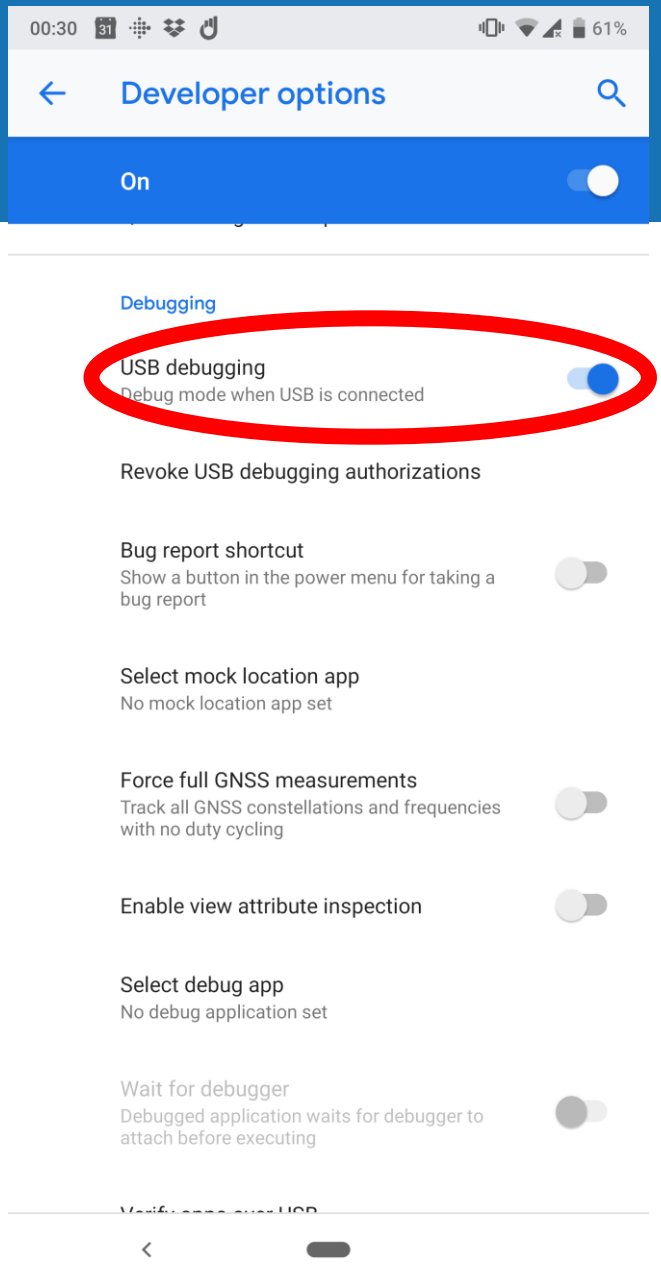
Emulator


Extended controls
Location
Cellular
Battery
Phone
Directional pad
Fingerprint
Settings
Help
From
(650) 555-1212
HOLD CALL
Hold call
END CALL
SMS message
Don't forget the marshmallows!
SEND MESSAGE


5554:Nexus_6P_API_23
(650) 555-1212
Incoming call
2:24 PM
DISMISS
ANSWER
Google
Play Games

Physical device

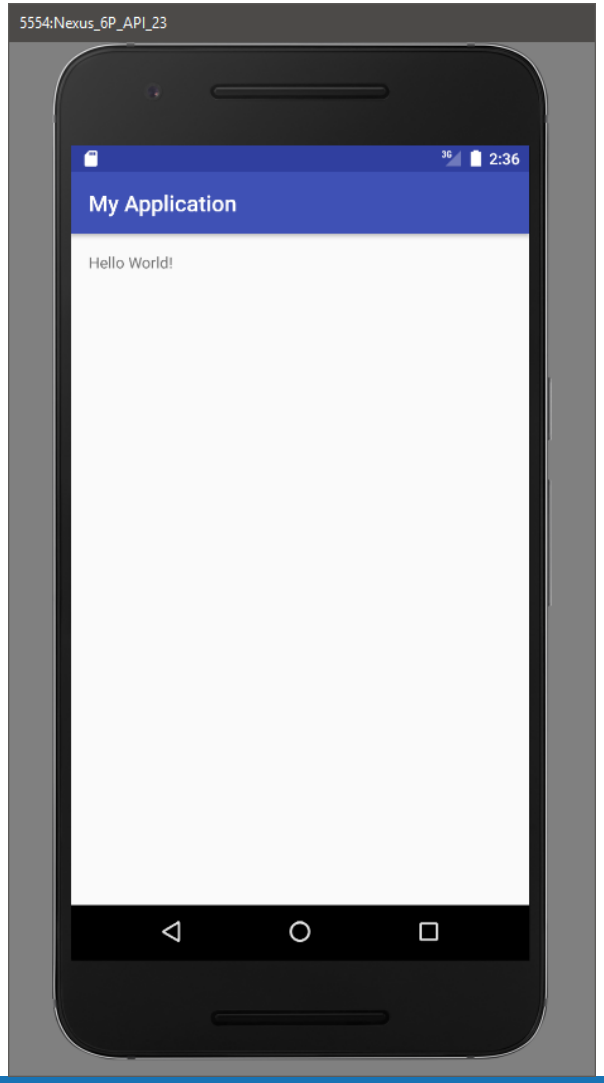
- Enabling developer mode
  - Settings | About Phone | Build number
  - Press it eight times
  - Then enable USB debugging
    - Settings / Developer settings
- Set up drivers on Windows
  - There is an universal driver available (Google USB driver)
  - It does not work with all devices
  - Linux and MacOS almost always recognize devices



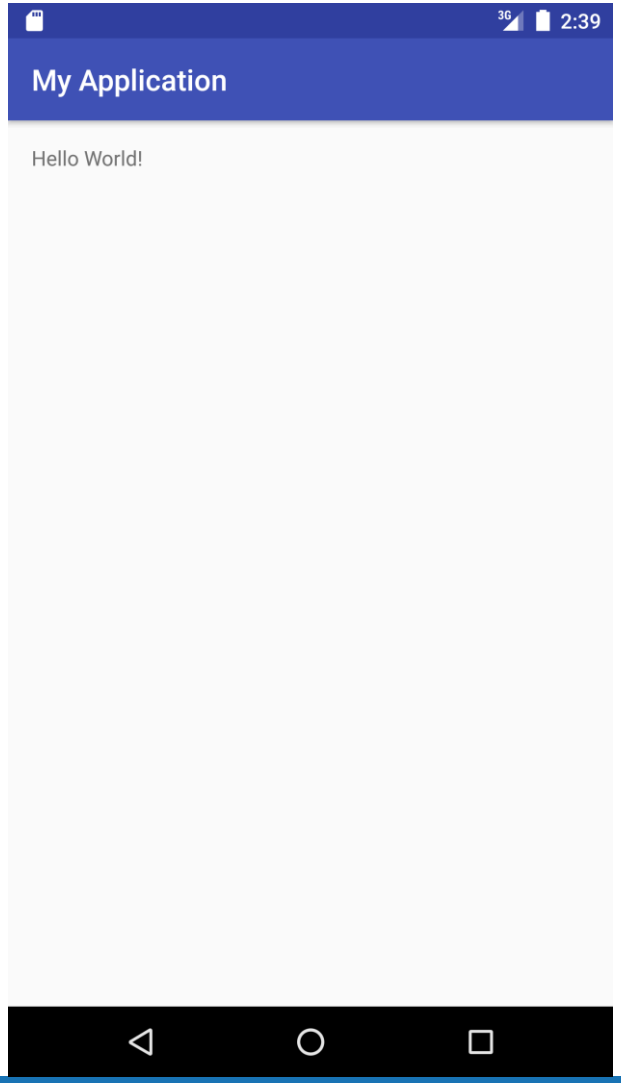
Physical device

- You have to accept the certificate of the PC
  - A pop-up windows appears to do so
- Once everything is done then a notification is sent
- In Android Studio, the device is listed as online devices
  - You can used only online devices
  - If there is a problem you should pull out and plugin
    - Its a miracle
  - TO check devices, type in command line
    - `adb devices`
  - ADB is located at
    - <ANDROID SDK>\platform-tools\adb

Result

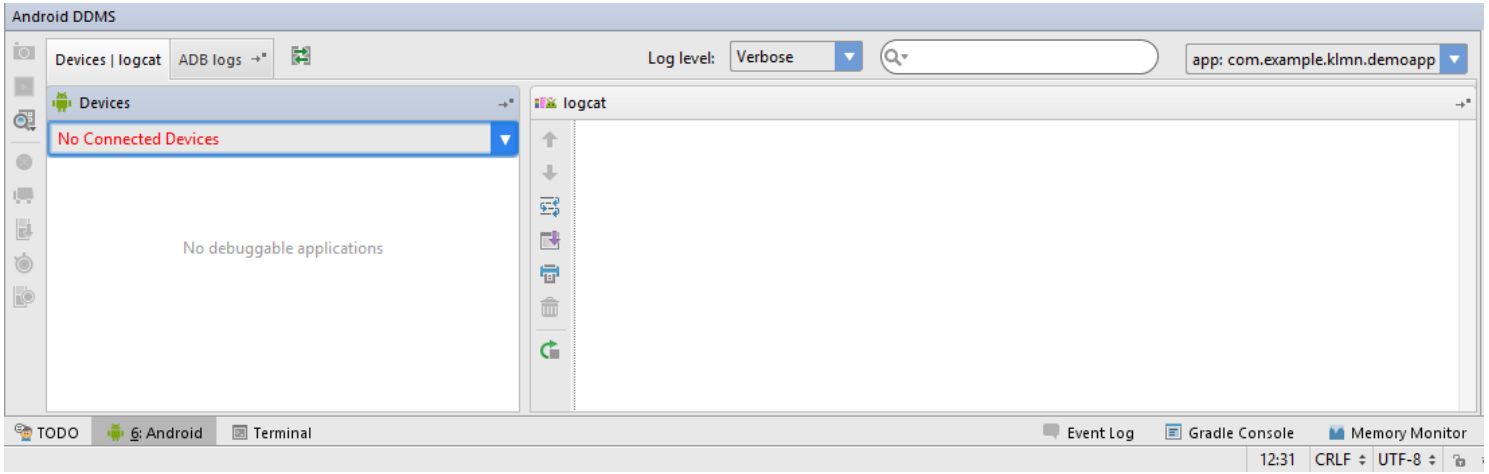


Result

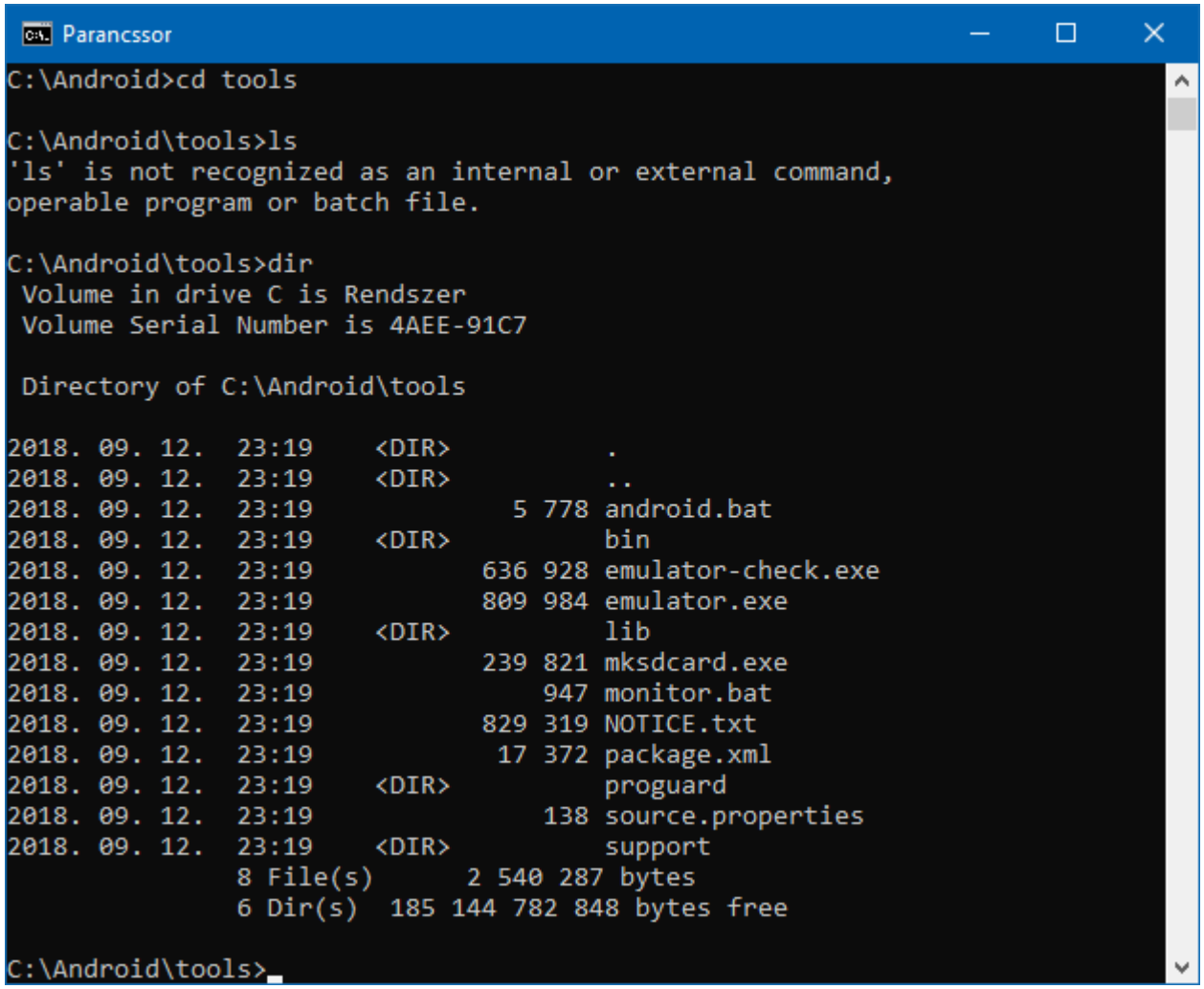


LogCat

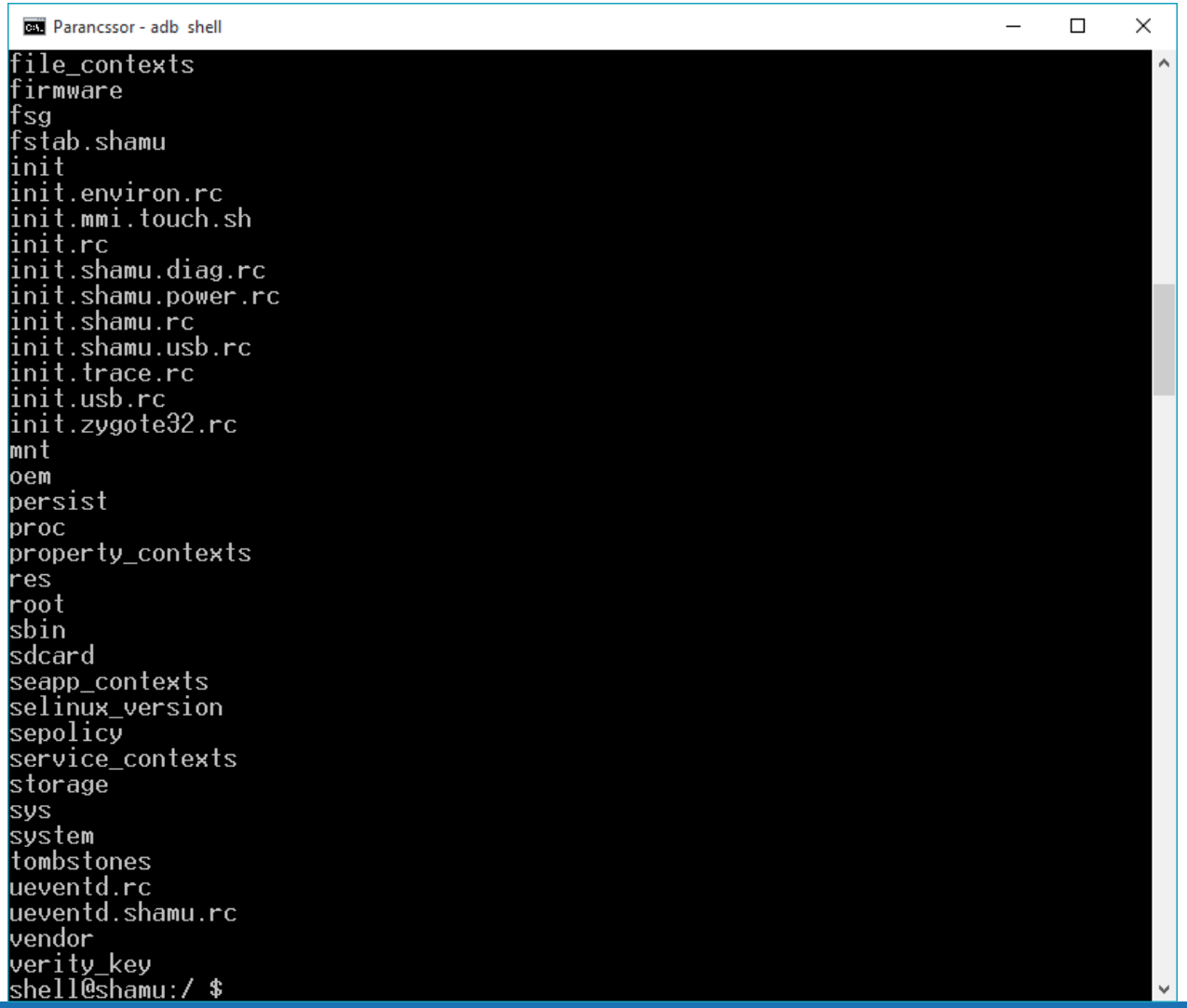
- Informative messages can be sent to the console of the PC
- Use the static functions of the `android.util.Log` class
  - `Log.i("MainActivity", "Hello logging!"); // information log`
  - First parameter: label – you may want to write the classname here
  - Second parameter: message
- In Android Studio press Alt + 6 to open the console



Tools

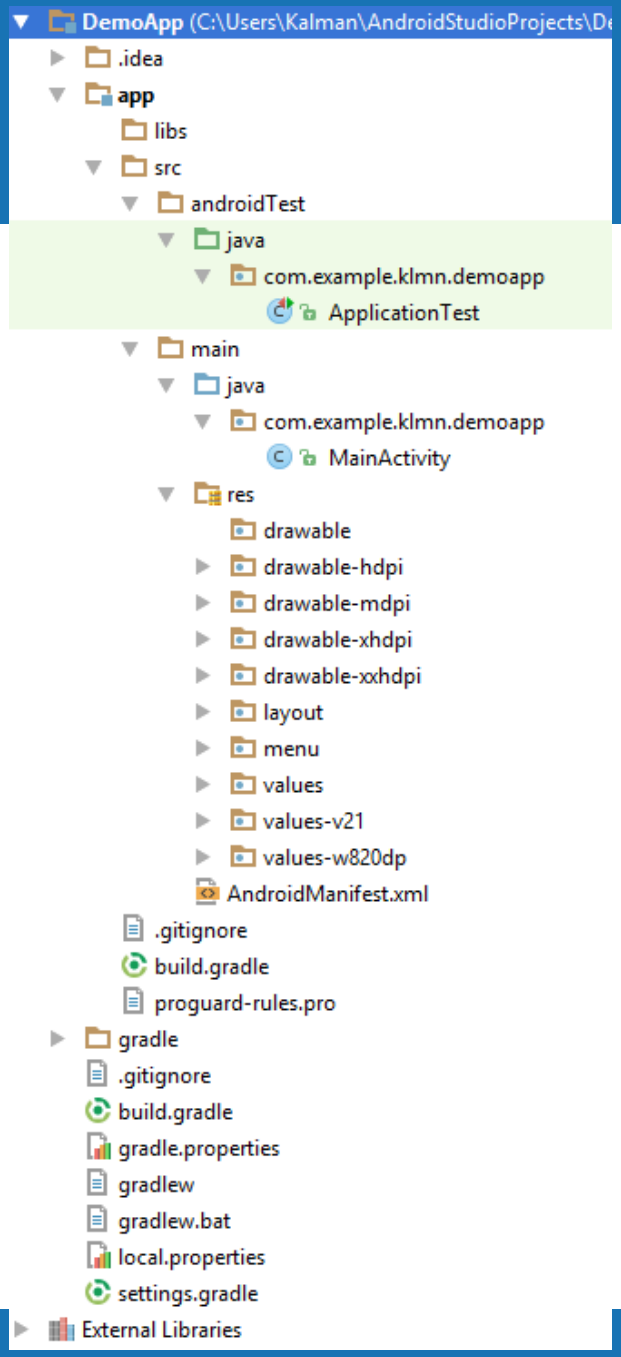

Parancssor
C:\Android>cd tools
C:\Android\tools>ls
'ls' is not recognized as an internal or external command,
operable program or batch file.
C:\Android\tools>dir
Volume in drive C is Rendszer
Volume Serial Number is 4AEE-91C7
Directory of C:\Android\tools
2018. 09. 12. 23:19 <DIR> .
2018. 09. 12. 23:19 <DIR> ..
2018. 09. 12. 23:19 5 778 android.bat
2018. 09. 12. 23:19 <DIR> bin
2018. 09. 12. 23:19 636 928 emulator-check.exe
2018. 09. 12. 23:19 809 984 emulator.exe
2018. 09. 12. 23:19 <DIR> lib
2018. 09. 12. 23:19 239 821 mksdcard.exe
2018. 09. 12. 23:19 947 monitor.bat
2018. 09. 12. 23:19 829 319 NOTICE.txt
2018. 09. 12. 23:19 17 372 package.xml
2018. 09. 12. 23:19 <DIR> proguard
2018. 09. 12. 23:19 138 source.properties
2018. 09. 12. 23:19 <DIR> support
8 File(s) 2 540 287 bytes
6 Dir(s) 185 144 782 848 bytes free
C:\Android\tools>

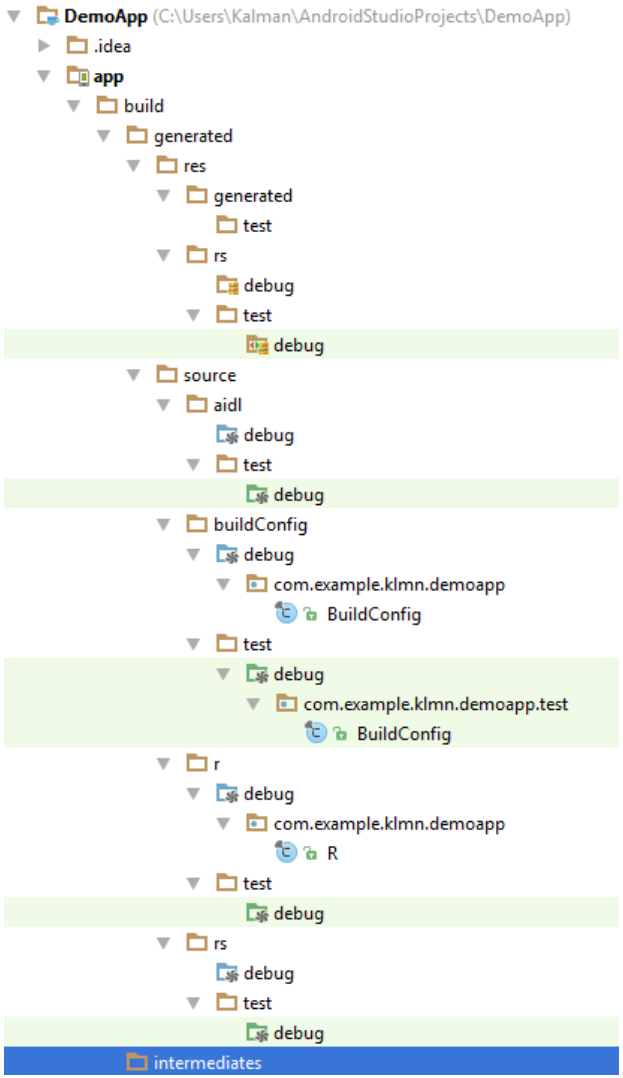
Tools

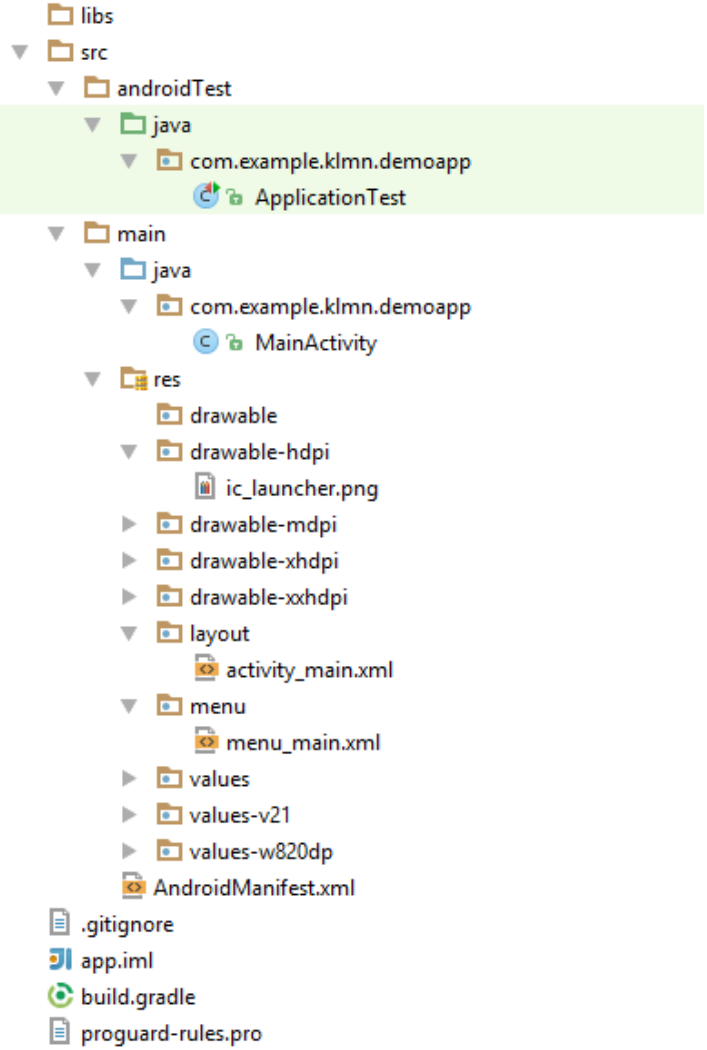

Parancssor - adb shell
file_contexts
firmware
fsg
fstab.shamu
init
init.environ.rc
init.mmi.touch.sh
init.rc
init.shamu.diag.rc
init.shamu.power.rc
init.shamu.rc
init.shamu.usb.rc
init.trace.rc
init.usb.rc
init.zygote32.rc
mnt
oem
persist
proc
property_contexts
res
root
sbin
sdcard
seapp_contexts
selinux_version
sepolicy
service_contexts
storage
sys
system
tombstones
ueventd.rc
ueventd.shamu.rc
vendor
verity_key
shell@shamu:/ $

Project structure

- .idea
  - IntelliJ IDEA settings
- app
  - Files of Android applications
- build
  - Files generated during build
- gradle
  - Location of gradle wrapper
- build.gradle
  - Project settings for Gradle building
- gradle.properties
  - Project settings for Gradle
- gradlew or gradlew.bat
  - OS specific gradle settings
- local.properties
  - Local computer specific settings
- .iml
  - IntelliJ IDEA module information
- settings.gradle
  - Gradle tool parameters




DemoApp (C:\Users\Kalman\AndroidStudioProjects\DemoApp)
.idea
app
build
generated
res
generated
test
rs
debug
test
debug
source
aidl
debug
test
debug
buildConfig
debug
com.example.klmn.demoapp
BuildConfig
test
debug
com.example.klmn.demoapp.test
BuildConfig
r
debug
com.example.klmn.demoapp
R
test
debug
rs
debug
test
debug
intermediates


libs
src
androidTest
java
com.example.klmn.demoapp
ApplicationTest
main
java
com.example.klmn.demoapp
MainActivity
res
drawable
drawable-hdpi
ic_launcher.png
drawable-mdpi
drawable-xhdpi
drawable-xxhdpi
layout
activity_main.xml
menu
menu_main.xml
values
values-v21
values-w820dp
AndroidManifest.xml
.gitignore
app.iml
build.gradle
proguard-rules.pro

Project structure

- build
  - Files generated after build process – flavor and version specific
  - Several builds for different API, etc.
- libs
  - User defined libraries
- src
  - androidTest
    - For Junit tests
  - main/java/ …
    - Java source codes
  - main/jni
    - Android NDK/JNI source codes
  - main/assets
    - Most of the cases it is empty
    - Files are put into the APK file, raw resources

Project structure

- src/main/res
  - anim
    - Animations encoded in XML
  - drawable (xdpi, hdpi, mdpi, ldpi)
    - Images (.jpg .png or .xml)
  - layout - *.xml
    - To describe UI layouts
  - raw
    - Resources: mp3, mp4, avi, CVS, etc.
  - values – strings.xml
    - Texts used in the application
    - Used for localization

Project structure – AndroidManifest

- src/main/AndroidManifest.xml
  - All important information about the application
  - Components
  - Hardware requirements
  - Android version compatibilities
  - Permissions
  - Java package name
  - The libraries that the application must be linked

- http://developer.android.com/guide/topics/manifest/manifest-intro.html

AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.hello"
    android:versionCode="1"
    android:versionName="1.0" >                                    <!- Application version-->

    <uses-sdk
        android:minSdkVersion="15"
        android:targetSdkVersion="19" />                           <!- Android 4.0 and above -->

    <uses-permission android:name="android.permission.INTERNET" />          <!- can access internet -->
    <uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE" />  <!- write on external storage (SD card) -->
    <uses-permission android:name="android.permission.CAMERA" />           <!- use camera -->

    <uses-feature android:name="android.hardware.camera" />                <!- requires camera -->
    <uses-feature android:name="android.hardware.camera.autofocus" />      <!- requires autofouces -->

    <application
        android:icon="@drawable/ic_launcher"
        android:label="@string/app_name"
        android:theme="@style/AppTheme" >                          <!- icon, name and theme for app -->
        <activity
            android:name=".MainActivity"
            android:label="@string/app_name" >                     <!- main Activity (later) -->
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
        <activity android:name=".SettingsActivity" android:screenOrientation="portrait" />
        <activity android:name=".NewsActivity" android:screenOrientation="portrait" />
    </application>
</manifest>
```

build.gradle

```
apply plugin: 'com.android.application'

android {
    compileSdkVersion 24
    buildToolsVersion "24.0.3"

    defaultConfig {
        applicationId "hu.ppke.itk.mad"
        minSdkVersion 20
        targetSdkVersion 24
        versionCode 1
        versionName "1.0"
    }
    buildTypes {
        release {
            minifyEnabled false
            proguardFiles getDefaultProguardFile('proguard-android.txt'), 'proguard-rules.pro'
        }
    }
}

dependencies {
    implementation fileTree(dir: 'libs', include: ['*.jar'])
    testImplementation 'junit:junit:4.12'
    implementation 'com.android.support:appcompat-v7:24.2.1'
}
```

Used SDK version

Package name

Minimum SDK version needed

Version of the application

Used libraries

Android

Next week