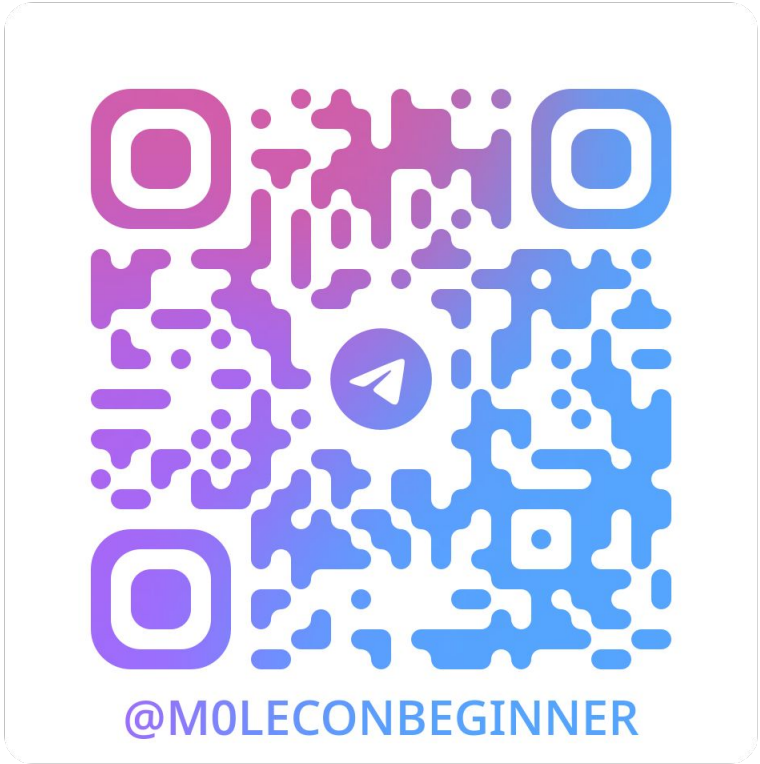
# Intro to
# Android Reverse Engineering

# Join the Telegram channel



# What does Reverse Engineering mean?

It means **analyzing** for the purpose to **understand** how something works.

This process helps us **finding bugs and vulnerabilities** in a program that we can exploit to find what we need or sometimes even the information we are looking for.

Reverse engineering might allow us to find **useful data** (for example passwords, DLC keys, seeds, etc. ) or **unintended behaviours**. In some cases we can even **tamper** some parts of the code.

(like buffing our speed in a **videogame** or even implementing fly hacks as we have seen in the 2022 workshops!)

# A little flashback

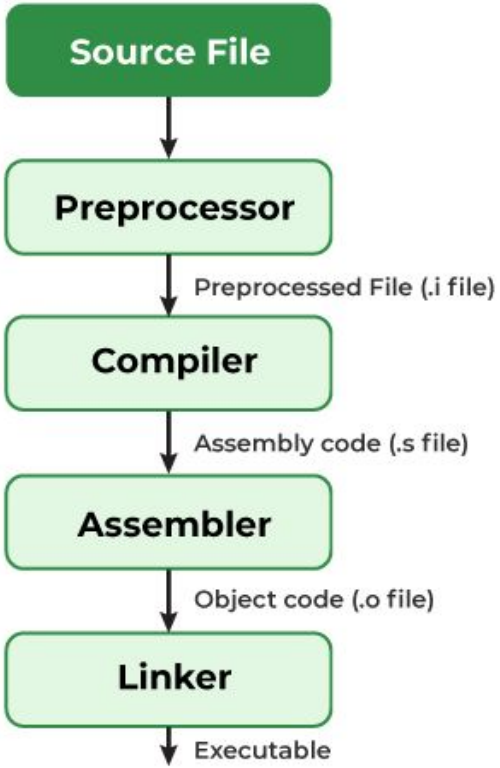
```
mov     rax, 0x3
cvtsi2ss xmm1, rax
mov     rax, 0x2710
cvtsi2ss xmm0, rax
mov     rax, qword [rbp-0x38 {var_40}]
cvtsi2ss xmm2, dword [rax+0x38]
divss   xmm2, xmm0
movss   dword [rbp-0x24 {var_2c_1}], xmm2
cvtsi2ss xmm0, dword [rbp-0x1c {var_24}]
movss   xmm2, dword [rbp-0x24 {var_2c_1}]
movss   dword [rbp-0x3c {var_44_1}], xmm0
movaps  xmm0, xmm2
call    powf
// vita come valore signed
mov     ecx, 10000
mov     rax, 0x4
cvtsi2ss xmm1, rax
movss   xmm2, dword [rbp-0x3c {var_44_1}]
mulss   xmm2, xmm0
mulss   xmm2, xmm1
cvttss2si edx, xmm2
mov     dword [rbp-0x28 {var_30_1}], edx
mov     rax, qword [rbp-0x38 {var_40}]
sub     ecx, dword [rax+0x38]
mov     dword [rbp-0x2c {var_34_1}], ecx
mov     ecx, dword [rbp-0x28 {var_30_1}]
cmp     ecx, dword [rbp-0x2c {var_34_1}]
// jump below or equal =  controllo per unsigned int
jbe     0x13afeb
```




# From code to executable

In order to be used in **different** machines, a program must be compiled differently according to the architecture and OS.

Compilation though is a **lossy** process



# Decompilation

**Decompiling** means trying to obtain a **higher-level** version (the language the original program was written in) of an executable for a better understanding. Since compilation carries a loss of information, decompiling won't always be precise and we'll also rely on understanding the assembly code.
There are various decompilers we might use to analyze our executable, like **Ghidra**, **IDA**, **Binary Ninja** or in case of APKs, **Jadx**.



# What is an APK?

**Android Pakage Kit** (APK) is the file format for Android apps.
An APK is a type of **archive** format that contain multiple files and metadata in them. They are conceptually a variant of JAR files.

Notable APK concepts:

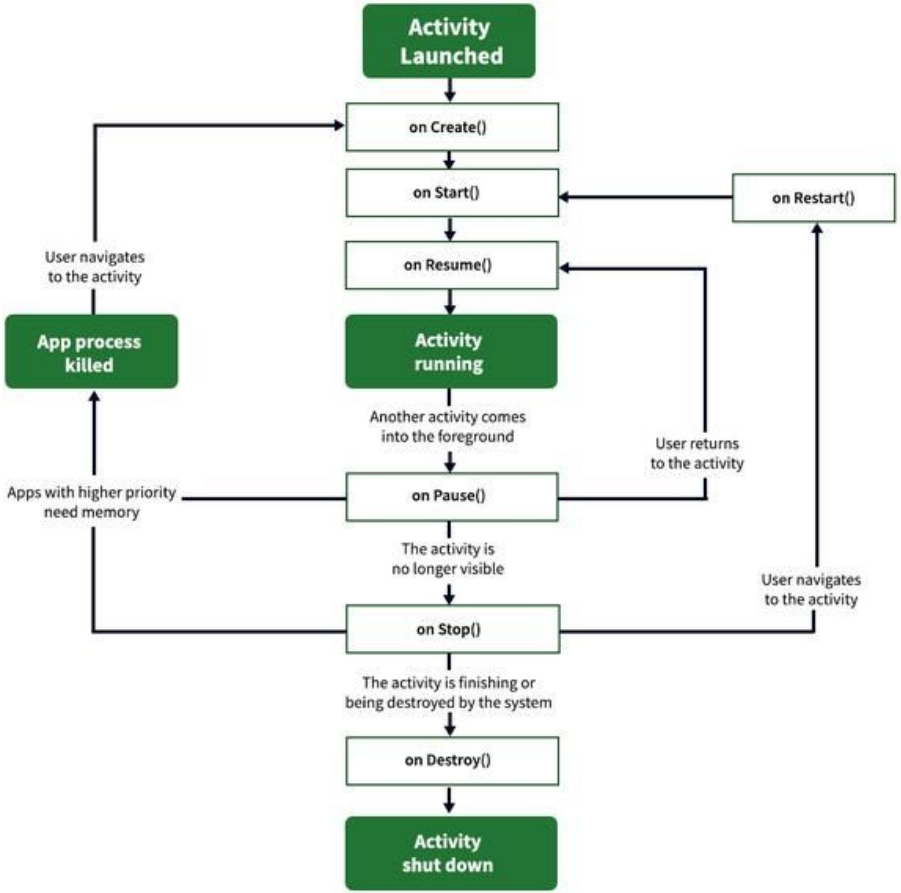
- Activity ➜ Single focus thing a user can do
- Intent ➜ Object used to request an action from a different component
- Manifest ➜ xml file that contains fundamental metadata for the app execution (list of all activities, required authorizations, etc)

APK

# Android manifest

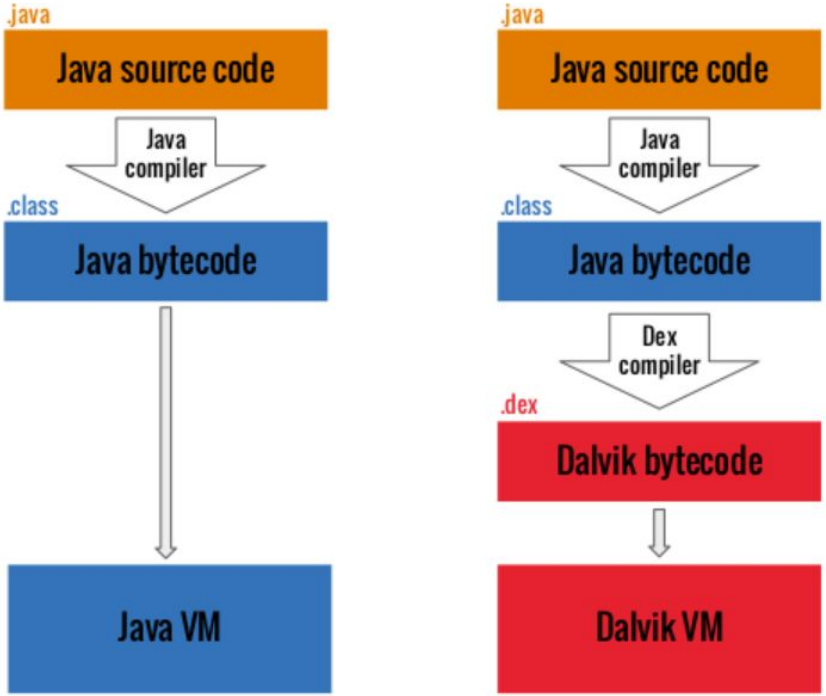
- presents **essential info** to the android system
- Names the **Java package** for the application
- Describes the components
- Declares both **permissions** necessary to **interact** with other apps and vice versa

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.deneme2.uygulama1">

    <application
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="Uygulama1"
        android:supportsRtl="true"
        android:theme="@style/AppTheme">
        <activity android:name=".MainActivity">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
        <activity android:name=".CustomList"></activity>
    </application>

</manifest>
```




# Activity Lifecycle in Android

# How an APK is compiled?



# NOW SOME CHALLENGES