# Mobile Wellbeing: Shrinking Android Apps

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GDG RAJKOT
DevFest Season'18

GDG RAJKOT

Women Techmakers RAJKOT

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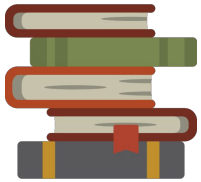


NATIONAL RIFLE ASSOCIATION OF INDIA

ASSOCIATE ANDROID DEVELOPER
GOOGLE CERTIFIED

#io18

GDG

WPO Premium Member

# Today..

keep rules!!

# Configuration language for **ProGuard**

to specify things you need to keep in your APK while shrinking

# Luckily..

Same language is used to build

## R8 shrinker

(replacement for ProGuard)

# Android Developers here?!

Who of you uses ProGuard?!

# Google statistics show that..

Only **25%** of apps on

Play Store actually use keep rules!

# Why does it matter?!

Next billion users &

Entry level Android Devices


# Limited Resources

RAM

Disk space

Bandwidth :P

# Smaller is faster

Download

Install (compile)

Startup


# You say..

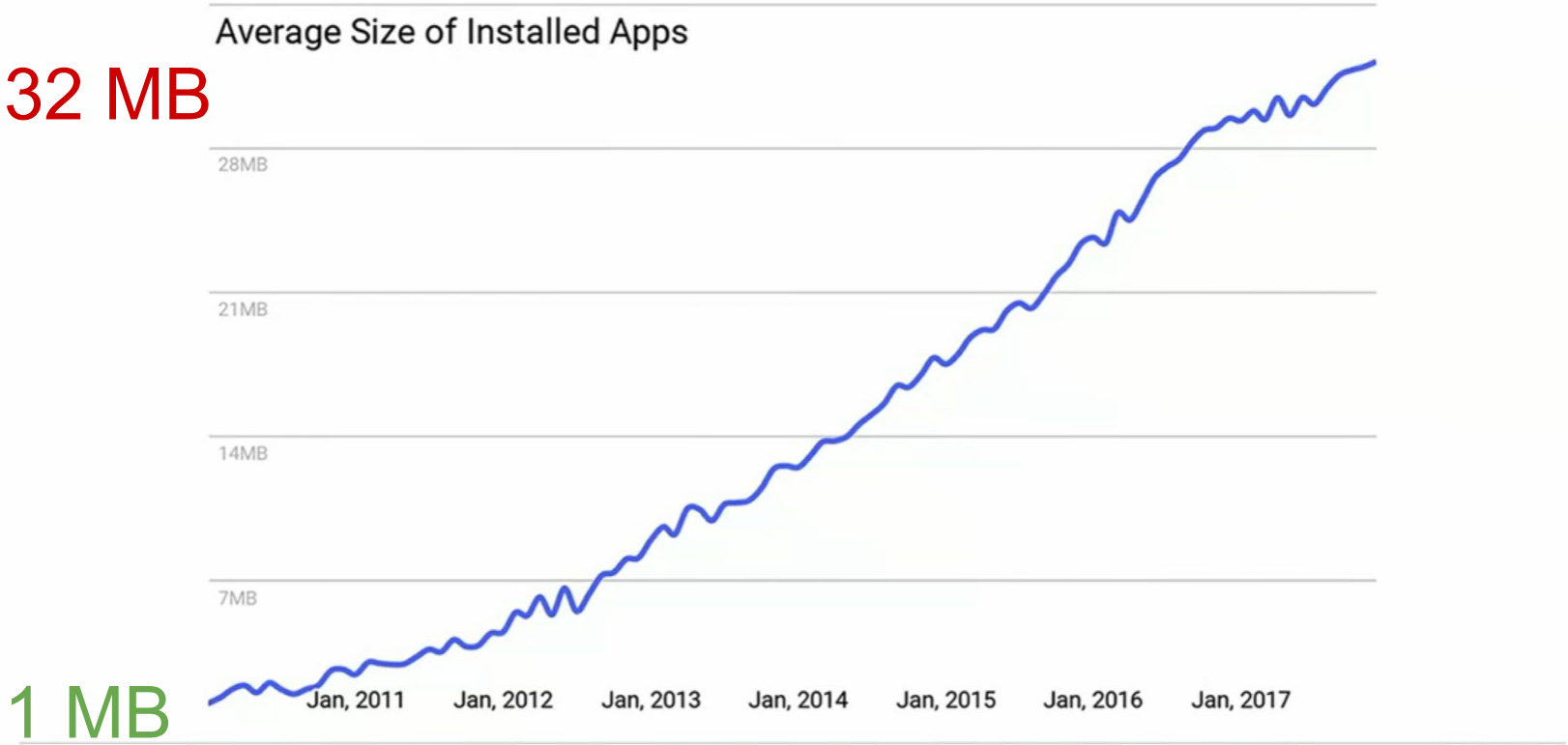
“Hardware will fix this!”

“Haha, devices are faster”

“There’s more storage ;)”

“Connectivity is better!”

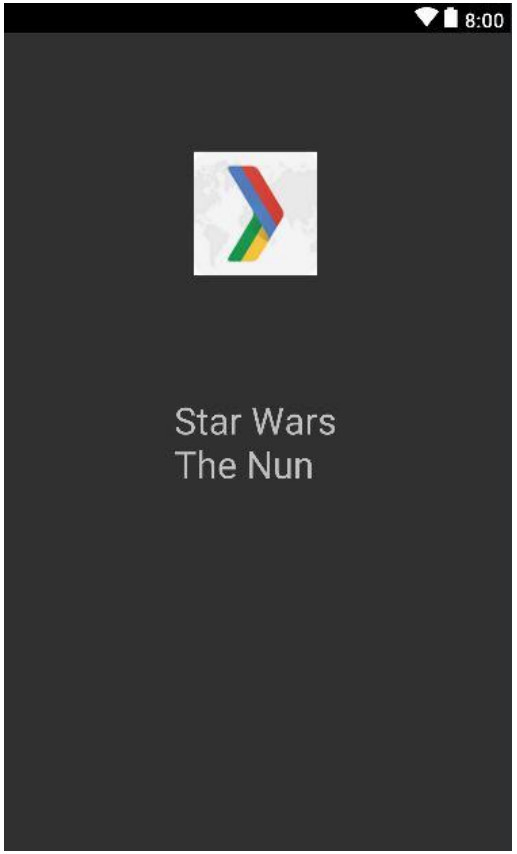
# That’s not a solution!




Google Internal Data, 2018

Hardware is not going to fix this shit for us!

Let’s look at an example..




# A simple app

Just 30 minutes!

Android Support +

ConstraintLayout +

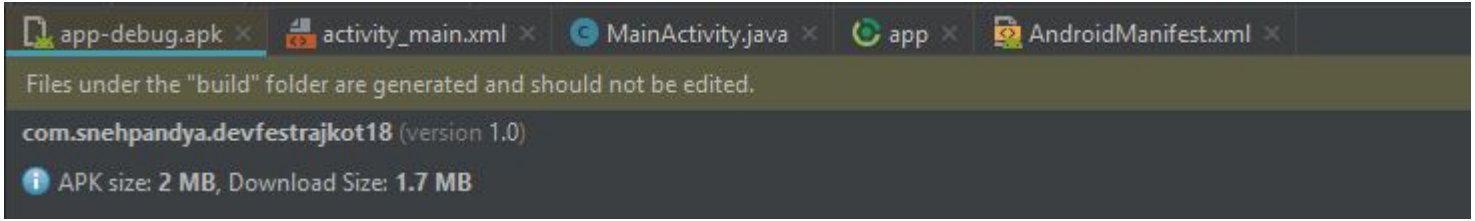
Retrofit + Gson + Glide

Static data & Dynamic view

```
dependencies {
    implementation fileTree(dir: 'libs', include: ['*.jar'])
    implementation 'com.android.support:appcompat-v7:28.0.0'
    implementation 'com.android.support.constraint:constraint-layout:1.1.3'
    implementation 'com.squareup.retrofit2:retrofit:2.4.0'
    implementation 'com.squareup.retrofit2:converter-gson:2.4.0'
    implementation 'com.github.bumptech.glide:glide:4.8.0'
    testImplementation 'junit:junit:4.12'
    androidTestImplementation 'com.android.support.test:runner:1.0.2'
    androidTestImplementation 'com.android.support.test.espresso:espresso-core:3.0.2'
}
```

# APK Analyzer says..

2 MB for APK &




5.74 MB when installed!

| File | Raw File Size | Download Size | % of Total Download size |
|---|---|---|---|
| classes2.dex | 1.5 MB | 1.3 MB | 82.9% |
| res | 131.2 KB | 129.1 KB | 7.8% |
| resources.arsc | 220.9 KB | 52.3 KB | 3.2% |
| classes.dex | 51.5 KB | 48.4 KB | 2.9% |
| okhttp3 | 33.2 KB | 33.2 KB | 2% |
| META-INF | 20.9 KB | 19.7 KB | 1.2% |
| AndroidManifest.xml | 889 B | 889 B | 0.1% |

| Class | Defined Methods | Referenced Methods | Size |
|---|---|---|---|
| android | 10784 | 15169 | 1.5 MB |
| com | 4105 | 4192 | 501.5 KB |
| okhttp3 | 1616 | 1634 | 244.9 KB |
| *java* | | 1061 | 25.1 KB |
| okio | 606 | 619 | 74.2 KB |
| retrofit2 | 323 | 337 | 47.9 KB |
| androidx | 206 | 222 | 22.4 KB |
| *javax* | | 35 | 828 B |
| *org* | | 25 | 622 B |
| *byte[][]* | | 1 | 20 B |
| *byte[]* | | 1 | 20 B |
| *int[]* | | 1 | 20 B |
| *long[]* | | 1 | 20 B |

We flew to the Moon & back with just 60KB of code!

fly to the Moon

vs

render an app on Android!

# Limited Resources

Apollo mission had a dedicated team that hand crafted, meticulously reduced & put only code needed

Fast forward to today..

# We use components!

# Simply..

```
buildTypes {
    release {
        minifyEnabled true
        shrinkResources true
        proguardFiles getDefaultProguardFile('proguard-android.txt'), 'proguard-rules.pro'
    }
}
```

# Uh-oh!!

Build Sync

- Build: build failed at 05-10-2018 11:18 with 107 warnings
  - Run build C:\Users\Sneh\AndroidStudioProjects\DevFestRajkot18
    - Load build
    - Configure build
    - Calculate task graph
    - Run tasks
    - Unmanaged thread operation #-1 (Tasks limiter_1)
    - Java compiler: (107 warnings)
      - okhttp3.Address: can't find referenced class javax.annotation.Nullable
      - okhttp3.Authenticator: can't find referenced class javax.annotation.Nullable
      - okhttp3.Cache: can't find referenced class javax.annotation.Nullable
      - okhttp3.Cache$2: can't find referenced class javax.annotation.Nullable
      - okhttp3.Cache$CacheResponseBody: can't find referenced class javax.annotation.Nullable
      - okhttp3.Cache$Entry: can't find referenced class javax.annotation.Nullable
      - okhttp3.CacheControl: can't find referenced class javax.annotation.Nullable
      - okhttp3.CertificatePinner: can't find referenced class javax.annotation.Nullable
      - okhttp3.Challenge: can't find referenced class javax.annotation.Nullable
      - okhttp3.Connection: can't find referenced class javax.annotation.Nullable
      - okhttp3.ConnectionPool: can't find referenced class javax.annotation.Nullable
      - okhttp3.ConnectionSpec: can't find referenced class javax.annotation.Nullable
      - okhttp3.ConnectionSpec$Builder: can't find referenced class javax.annotation.Nullable
      - okhttp3.Cookie: can't find referenced class javax.annotation.Nullable
      - okhttp3.Dispatcher: can't find referenced class javax.annotation.Nullable
      - okhttp3.EventListener: can't find referenced class javax.annotation.Nullable
      - okhttp3.FormBody: can't find referenced class javax.annotation.Nullable
      - okhttp3.Handshake: can't find referenced class javax.annotation.Nullable
      - okhttp3.Headers: can't find referenced class javax.annotation.Nullable
      - okhttp3.HttpUrl: can't find referenced class javax.annotation.Nullable
      - okhttp3.HttpUrl$Builder: can't find referenced class javax.annotation.Nullable
      - okhttp3.Interceptor$Chain: can't find referenced class javax.annotation.Nullable
      - okhttp3.MediaType: can't find referenced class javax.annotation.Nullable
      - okhttp3.MultipartBody: can't find referenced class javax.annotation.Nullable
      - okhttp3.MultipartBody$Builder: can't find referenced class javax.annotation.Nullable
      - okhttp3.MultipartBody$Part: can't find referenced class javax.annotation.Nullable
      - okhttp3.OkHttpClient: can't find referenced class javax.annotation.Nullable
      - okhttp3.OkHttpClient$Builder: can't find referenced class javax.annotation.Nullable
      - okhttp3.Request: can't find referenced class javax.annotation.Nullable
      - okhttp3.Request$Builder: can't find referenced class javax.annotation.Nullable
      - okhttp3.RequestBody: can't find referenced class javax.annotation.Nullable

4: Run | TODO | 6: Logcat | Profiler | Terminal | Build

Build APK(s): Errors while building APK. You can find the errors in the 'Messages' view. (a minute ago)

# StackOverflow says..

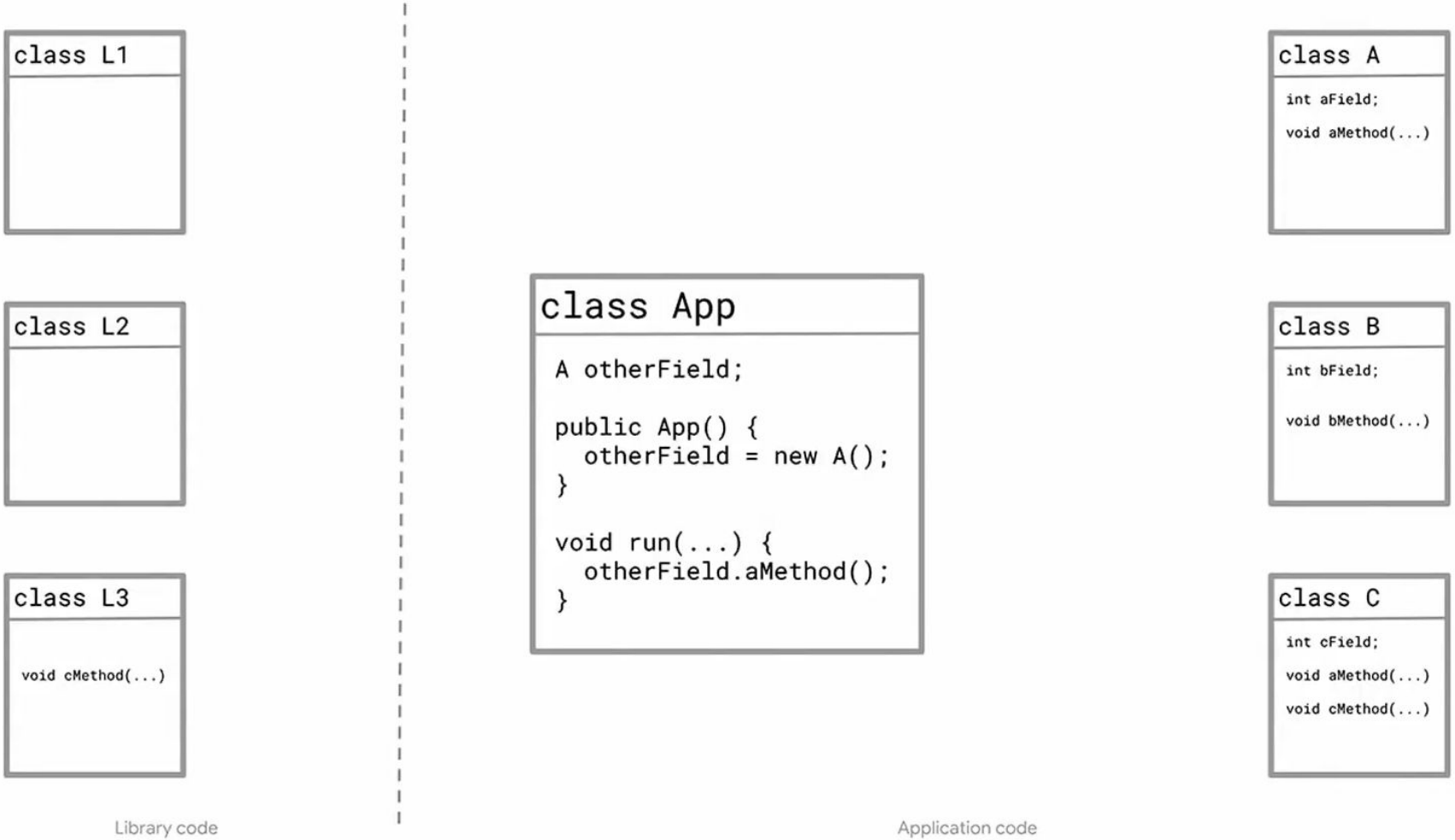
TOO GENERIC RULE

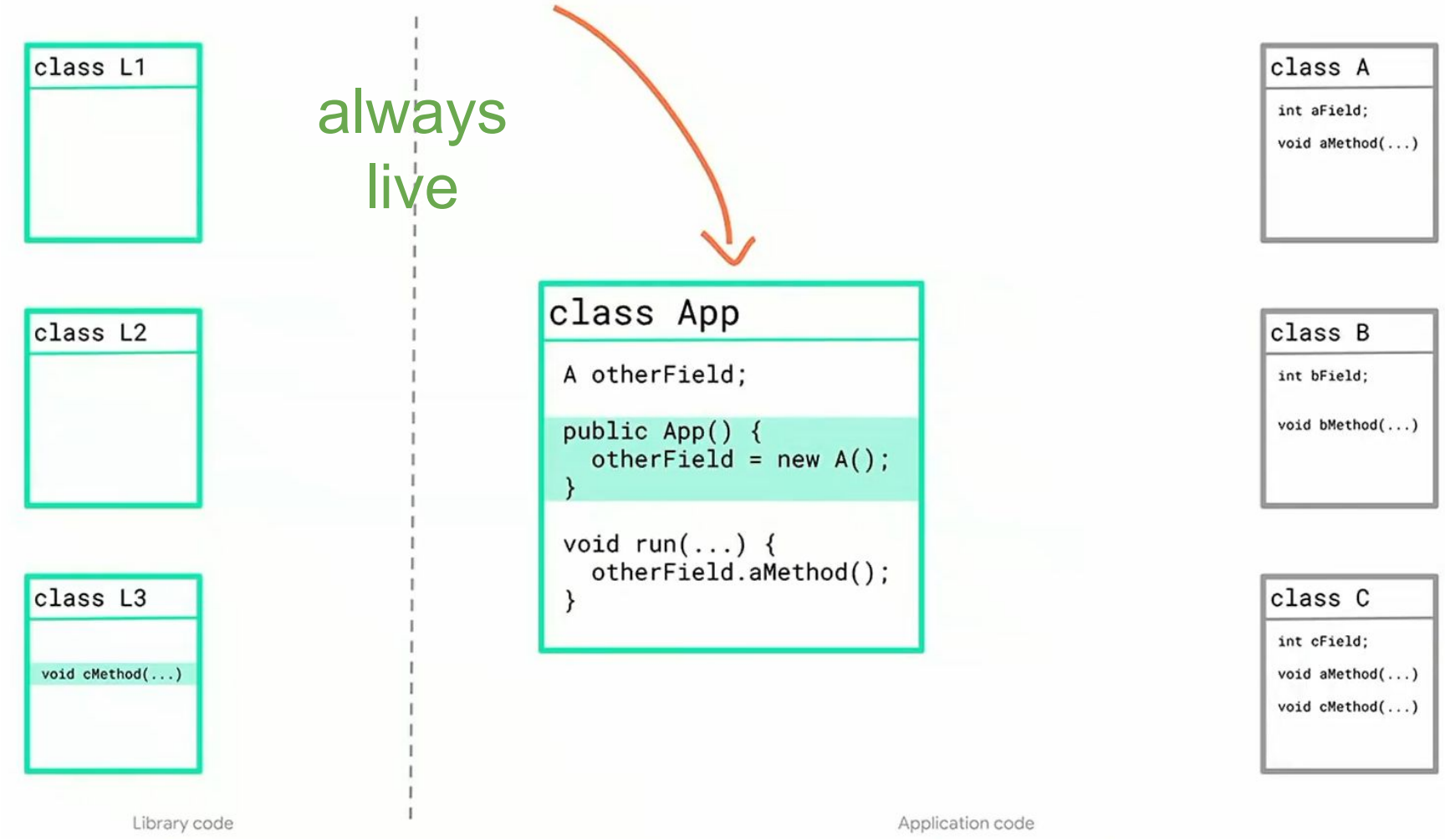
```
-dontwarn *
```

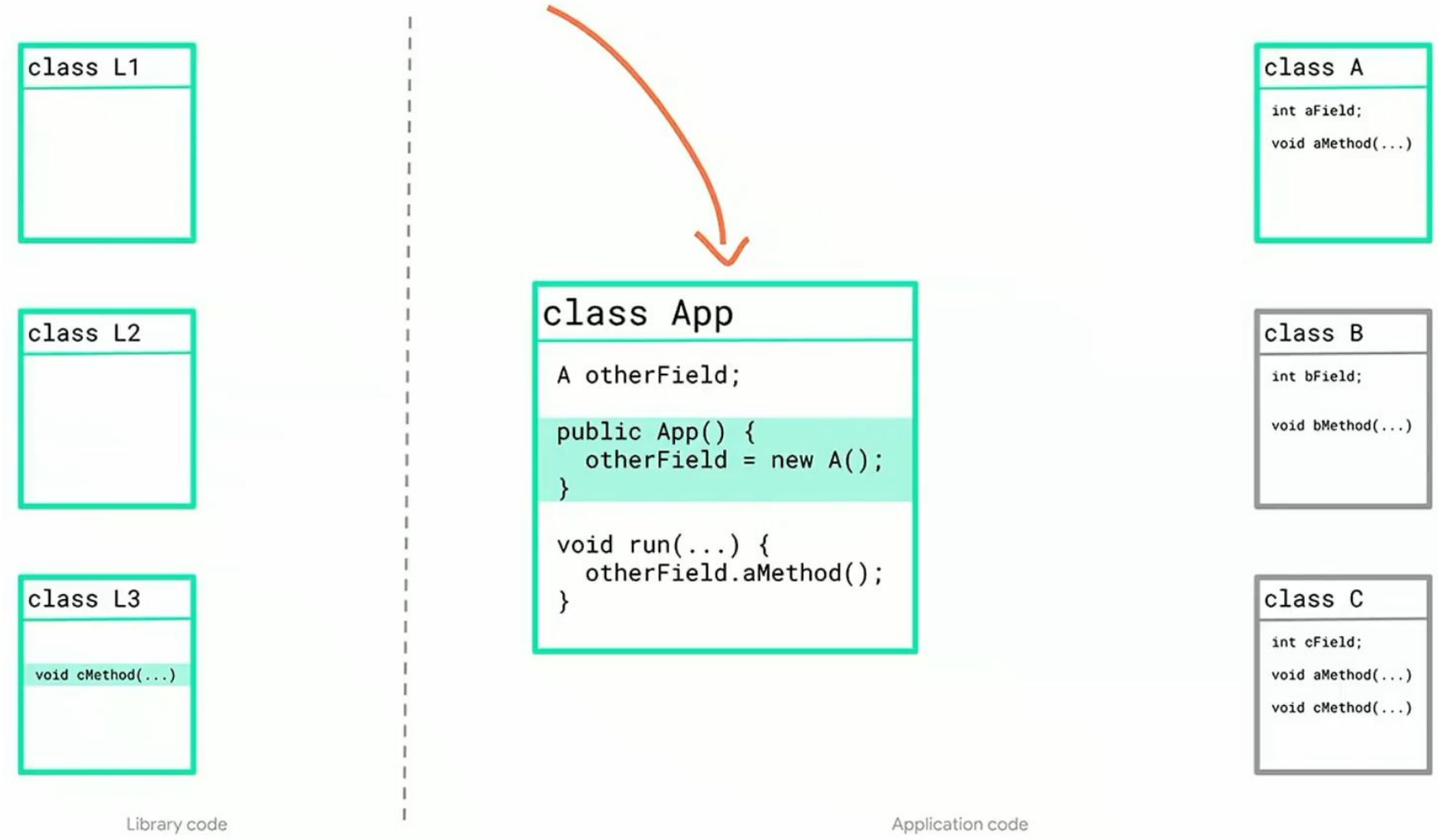
ProGuard shrinks the code and generates the smaller app

But, under the hood..

It actually grows the tree & scans everything that will be executed at runtime


class L1
class L2
class L3
void cMethod(...)
Library code
class App
A otherField;
public App() {
otherField = new A();
}
void run(...) {
otherField.aMethod();
}
class A
int aField;
void aMethod(...)
class B
int bField;
void bMethod(...)
class C
int cField;
void aMethod(...)
void cMethod(...)
Application code


class L1
always live
class App
A otherField;
public App() {
otherField = new A();
}
void run(...) {
otherField.aMethod();
}
class A
int aField;
void aMethod(...)
class L2
class B
int bField;
void bMethod(...)
class L3
void cMethod(...)
class C
int cField;
void aMethod(...)
void cMethod(...)
Library code
Application code


class L1
class L2
class L3
void cMethod(...)
Library code
class App
A otherField;
public App() {
otherField = new A();
}
void run(...) {
otherField.aMethod();
}
Application code
class A
int aField;
void aMethod(...)
class B
int bField;
void bMethod(...)
class C
int cField;
void aMethod(...)
void cMethod(...)

```
# Referenced at AndroidManifest.xml:14
-keep class com.snehpandya.devfestrajkot18.MainActivity {
    <init>(...);
}
```

MainActivity

AppCompatActivity

FragmentActivity

SupportActivity

Activity

MainActivity

AppCompatActivity

FragmentActivity

SupportActivity

Activity

Neither R8, nor ProGuard
understand the Manifest files

That’s done by **AAPT**:

preprocess all resources
& keep corresponding keep rules

# When ProGuard removes too much..

ClassNotFoundException

MethodNotFoundException

and so on..

It is very important to test the **release build** with **ProGuard enabled** of your app thoroughly and deal with these errors

# keep rules

## -keep

preserves all classes & methods

## -keepclassmembers

members to be kept, only if their parent class is being preserved

## -keepclasseswithmembers

keep class & its members, only if all members listed are present

**-keepnames**, **-keepclassmembernames, -keepclasseswithmembernames**

# shrinking rules

## -dontshrink

not to shrink the input class files

## -printusage

list dead code of the input class files

## -whyareyoukeeping

print details on why the given classes and class members are being kept in the shrinking step

Now our APK Analyzer says..

1.1 MB (2 MB) for APK &

com.snehpandya.devfestrajkot18 (version 1.0)

APK size: **1.1 MB**, Download Size: **906.3 KB**

2.1 MB (5.74 MB) when installed!

# Sneh Pandya

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# Thank You!

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