

# Improve your multi-module app build configuration with convention plugins

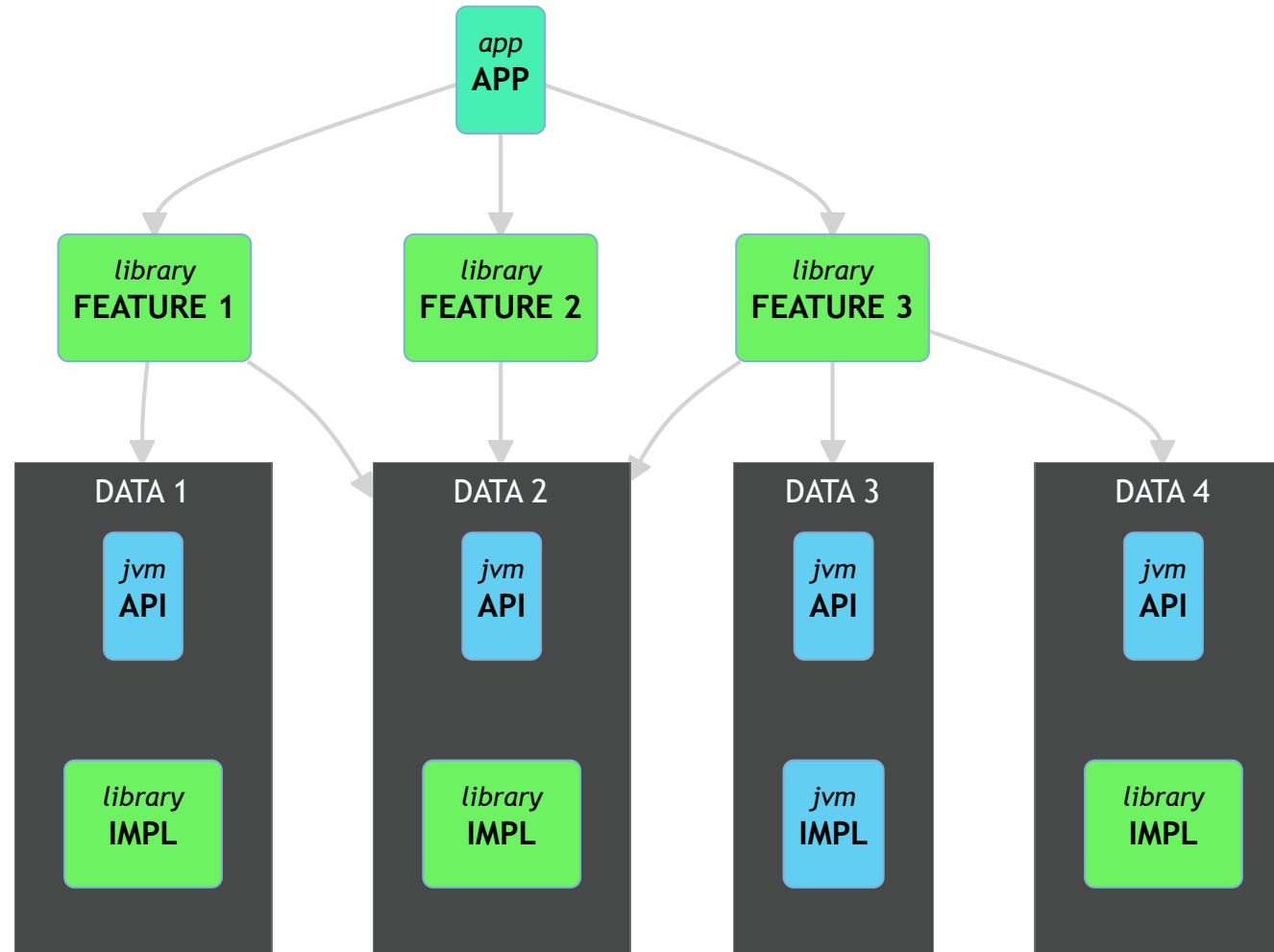
Satyan Jacquens - developer @Mojo

# A multi-module architecture

## Why should I use a multi-module architecture ?

- Separation of the concerns
- Reduces the build time:
  - public/impl modules pattern (compilation avoidance)
  - Only use the necessary plugins in your module (android plugins are expensive)
  - Gradle modules parallel compilation
- Create several apps (demo apps, free vs pro, white-labelling, etc)
- Part of the Google's Guide to app architecture
- ~~Square/Slack/Twitter is doing it~~

# A multi-module architecture



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## Drawbacks

- Each module has its own gradle configuration file ( `build.gradle` )
- `com.android.library` and `com.android.applications` plugins should be configured the same way for each modules
- Feature modules are all configured the same way (with extra dependencies and plugins)
- ⚡+C, ⚡+V 🙄

▶▶ Let's fix this

# Simplify our modules build configurations files

Let's take for example an implementation data module ( `data:game:impl` ).

Here's the target `build.gradle.kts` :

```
plugins {  
    id("fr.sjcqs.android.lib")  
    id("com.squareup.sqldelight")  
}  
  
dependencies {  
    implementation(platform(libs.firebase.bom))  
    implementation(libs.firebase.database)  
    implementation(libs.kotlin.coroutines.playServices)  
  
    implementation(libs.sqldelight.coroutines)  
  
    implementation(projects.data.game.public)  
}
```

# Sharing dependencies and versions with a Gradle version catalog

★ Having a single source of truth for the dependencies and plugins

You can create a version catalog file in `gradle/libs.versions.toml`

```
[versions]
coroutines = "1.6.0"
sqldelight = "1.5.3"
// ...

[libraries]
// ...
firebase-bom = "com.google.firebase:firebase-bom:29.0.4"
firebase-database = { module = "com.google.firebase:firebase-database-ktx" }
// ...
kotlin-coroutines-playServices = { module = "org.jetbrains.kotlinx:kotlinx-coroutines-play-services", version.ref = "coroutines" }
// ...
sqldelight-coroutines = { module = "com.squareup.sqldelight:coroutines-extensions-jvm", version.ref = "sqldelight" }
```

A `libs` property will be accessible from all your modules build configuration.

- `libs.<library>` to get a dependency
- `libs.versions.<version>` to get a version



Let's create our conventions plugins and included them in our app

# Creating the convention plugins project

Alongside our app, let's create a `plugins` directory with a `settings.gradle.kts` file

```
dependencyResolutionManagement {
    repositories {
        google()
        gradlePluginPortal()
        mavenCentral()
    }
}
// Sharing the root project version catalog
versionCatalogs {
    create("libs") {
        from(files("../gradle/libs.versions.toml"))
    }
}
```

## Include the plugins build in our root project

In our root project `settings.gradle.kts` :

```
includeBuild("plugins")
```

Plugins will be compiled and accessible in the app modules' build configuration.



## Adding the used plugins as dependencies

In our convention plugins project `build.gradle.kts` :

Define the plugins that will be used in our app as `compileOnly` dependencies.

```
dependencies {  
    compileOnly(libs.kotlin.gradle) // org.jetbrains.kotlin:kotlin-gradle-plugin  
  
    compileOnly(libs.android.gradle) // com.android.tools.build:gradle  
    compileOnly(libs.hilt.gradle) // com.google.dagger:hilt-android-gradle-plugin  
}
```

# Register the conventions plugins

In our plugins, `build.gradle.kts` :

```
plugins {  
    id("java-gradle-plugin")  
}  
  
dependencies { ... }  
  
// java-gradle-plugin  
gradlePlugin {  
    plugins {  
        register("fr.sjcqs.android.lib") {  
            id = "fr.sjcqs.android.lib"  
            implementationClass = "fr.sjcqs.AndroidLibPlugin"  
        }  
    }  
}
```

 Now let's write our convention plugin

## Writing a convention plugin

Regardless of the language we are using in our `build.gradle(.kts)` files (Kotlin or Groovy), we can write Gradle plugins in Groovy, Java or Kotlin.

The syntax is similar to the one we would use in a `build.gradle` file.

## Creating the convention plugin class

```
package fr.sjcqs

import org.gradle.api.Plugin
import org.gradle.api.Project

class AndroidLibPlugin : Plugin<Project> {
    override fun apply(target: Project) {
        // configuration ...
    }
}
```

## Applying plugins on the target project

```
package fr.sjcqs

import org.gradle.api.Plugin
import org.gradle.api.Project
import org.gradle.kotlin.dsl.apply

class AndroidLibPlugin : Plugin<Project> {
    override fun apply(target: Project) {
        with(target) {
            with(pluginManager) {
                apply("com.android.library")
                apply("kotlin-android")
            }
            // ...
        }
    }
}
```

## Configure the Android extension

```
class AndroidLibPlugin : Plugin<Project> {  
    override fun apply(target: Project) {  
        with(target) {  
            extensions.configure<LibraryExtension> {  
                configureAndroidAndKotlin(this)  
                // Config is a shared object  
                defaultConfig.targetSdk = Config.android.targetSdk  
                buildTypes {  
                    all { isMinifyEnabled = false }  
                }  
            }  
        }  
    }  
}
```

## Configure the Android extension

Shared configuration properties:

```
object Config {  
    val android = AndroidConfig(  
        minSdk = 26,  
        targetSdk = 31,  
        compileSdkVersion = 31,  
    )  
    val jvm =JvmConfig(  
        javaVersion = JavaVersion.VERSION_11,  
        kotlinJvm = "11",  
        freeCompilerArgs = listOf("-Xopt-in=kotlin.RequiresOptIn")  
    )  
}
```

# Configure the Android extension

```
internal fun Project.configureAndroidAndKotlin(extension: CommonExtension<*, *, *, *>) {
    with(extension) {
        compileSdk = Config.android.compileSdkVersion
        defaultConfig {
            minSdk = Config.android.minSdk
            testInstrumentationRunner = "androidx.test.runner.AndroidJUnitRunner"
        }
        buildTypes {
            getByName("debug") {
                isMinifyEnabled = false
                matchingFallbacks.add("release")
            }

            getByName("release") {
                isMinifyEnabled = true
                proguardFiles(getDefaultProguardFile("proguard-android-optimize.txt"), "proguard-rules.pro")
            }
        }
        compileOptions {
            sourceCompatibility = Config.jvm.javaVersion
            targetCompatibility = Config.jvm.javaVersion

            isCoreLibraryDesugaringEnabled = true
        }
        kotlinOptions {
            jvmTarget = Config.jvm.kotlinJvm
            freeCompilerArgs = freeCompilerArgs + Config.jvm.freeCompilerArgs
        }
        packagingOptions.resources.excludes += "/META-INF/{AL2.0,LGPL2.1}"
    }

    dependencies.apply {
        add("coreLibraryDesugaring", libs["desugarJdk"])
    }
}

private fun CommonExtension<*, *, *, *>.kotlinOptions(block: KotlinJvmOptions.() -> Unit) {
    (this as ExtensionAware).extensions.configure("kotlinOptions", block)
}
```



## Adding dependencies

We have to use the unsafe API to access the version catalog from the plugins code.

Extensions:

- `project.libs["<library>"]`
- `project.requireVersion("<version-name>")`

# Adding dependencies

```
internal val Project.libs: VersionCatalog
    get() = extensions.getByType<VersionCatalogsExtension>().named("libs")

internal operator fun VersionCatalog.get(name: String): Provider<MinimalExternalModuleDependency> {
    val optionalDependency = findLibrary(name)
    if (optionalDependency.isEmpty) {
        error("$name is not a valid dependency, check your version catalog")
    }
    return optionalDependency.get()
}

internal fun VersionCatalog.requireVersion(alias: String): String {
    val optionalVersion = findVersion(alias)
    if (optionalVersion.isEmpty) {
        error("$alias is not a valid version, check your version catalog")
    }
    return optionalVersion.get().toString()
}
```

## Adding the dependencies

```
class AndroidLibPlugin : Plugin<Project> {  
    override fun apply(target: Project) {  
        // ...  
        // We don't have access to extensions like `implementation` and `compileOnly`  
        dependencies {  
            add("implementation", project(":tools:annotations"))  
  
            add("compileOnly", libs["javaxInject"])  
  
            add("implementation", libs["kotlin.stdlib"])  
        }  
    }  
}
```

## ~~interface~~ dependencies segregation principle

Limit the number of dependencies (and plugins) declared in your conventions plugins.

## Reusing a convention plugin

We can reuse our convention plugin in another one.

```
package fr.sjcqs

class AndroidFeaturePlugin : Plugin<Project> {
    override fun apply(target: Project) {
        with(target) {
            pluginManager.apply {
                apply(AndroidLibPlugin::class.java)
            }
        }
        // ...
    }
}
```

`fr.sjcqs.android.app` convention plugin does **not** configure:

- `versionName`
- `versionCode`
- `applicationId`

Those are configured by the consuming modules.

# Performances

It's possible to write gradle script in `src/main/java/<plugin-id>.build.gradle.kts`,  
Gradle will generate a plugin whose id is `<plugin-id>`

Don't do this (cf issue [#39](#) on [android/nowinandroid](#))

	scripts plugins	code plugins
Configuring Projects	12.724s	0.765s
Total Build Time	25.373s	11.205s

# Publishing

You could publish those plugins to an internal maven repository, it should also improve configuration and build time. (using binary vs compilation)

But it comes with a few costs:

- Setup your CI to publish those plugins
- Version the plugins
- Switching between the internal repository and the included build when working on the build config

# Disclaimers

You don't have to follow this talk to the letter

- Speak with your team:
  - How many modules do you have ?
  - Is build configuration a pain point ?
  - Would you be able to maintain those plugins ? (and teach how ?)
- *I'm not perfect nor an expert on the subject. There might be things that could be done in a better way.*

 Finally some references and peoples to follow



## References

Those references should not be blindly followed. Some of them are from people working in large companies with multiples people working on a single app and even people dedicated to build configuration.

Be pragmatic, keep the scale of your app and your team in mind, take only what you need.

~~Don't be a fanboy~~ 😄

# References

## 1. Herding elephants

Some feedbacks and best practices on the Android's build configuration by [Tony Robalik](#) who is working on build and tooling at Square

 <https://developer.squareup.com/blog/herding-elephants/>

## 2. Slack gradle plugins

Slack [started open sourcing](#) part of their build tools on Github.

 <https://github.com/slackhq/slack-gradle-plugin>

## 3. Improve Build Times in Less Time by Zac Sweers, Slack

[A talk from Android Makers 2022](#) with some best practices to improve build time.

## 4. Now in Android project

 <https://github.com/android/nowinandroid>

# Any Questions ?

## Code references and complete notes:

[sjcqs/convention-plugins-android](#)

## Feedbacks 🧐



🐦 [@sjcqs](#) (*feel free to reach out*)