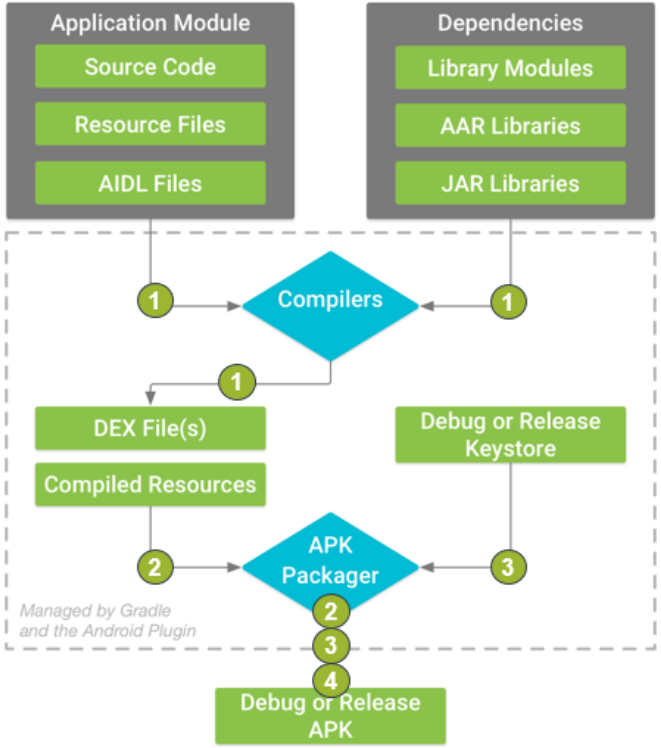
Fresher Android

Gradle Build system

GLOBAL SMART TECHNOLOGIES

Build process overview

General build steps



1. Compiler convert:
   (Source Code) -> (DEX files)
   (Other resource) -> (Compiled Resource)
2. APK Packager combines:
   (DEX Files) & (Compiled Resource) -> (APK file)
3. (APK Packager) signs (APK file)
   using (Debug or Release Keystore)
4. APK Packager uses:
   zipalign tool to optimize APK to use less memory

GLOBAL SMART TECHNOLOGIES

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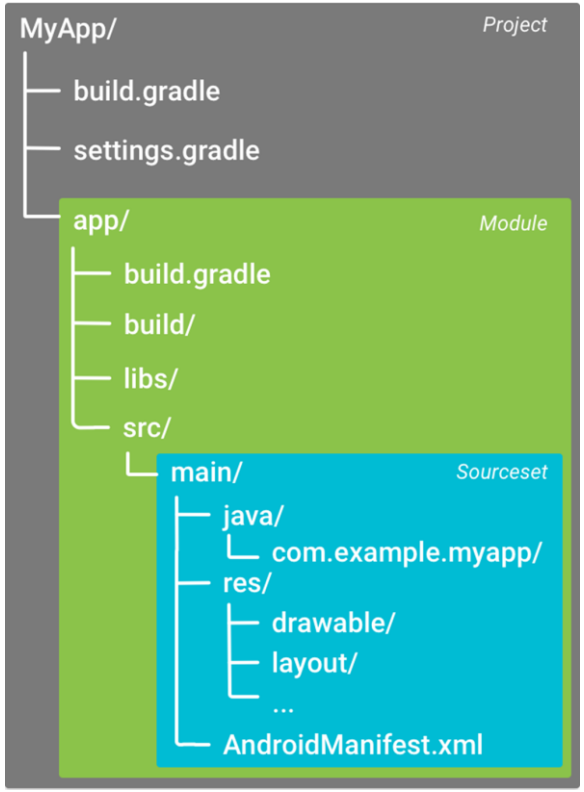
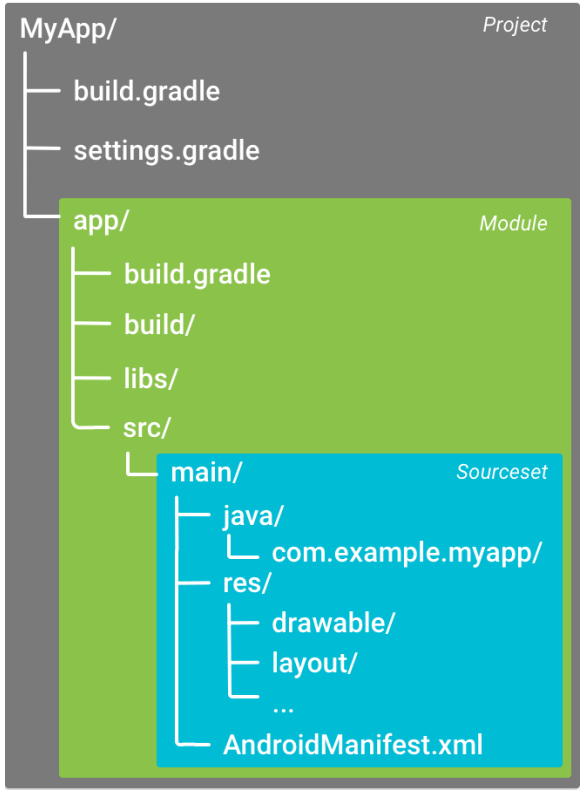
#1. Configurations files in project



2. Top-level build file
1. Gradle settings file
3. Module-level build file

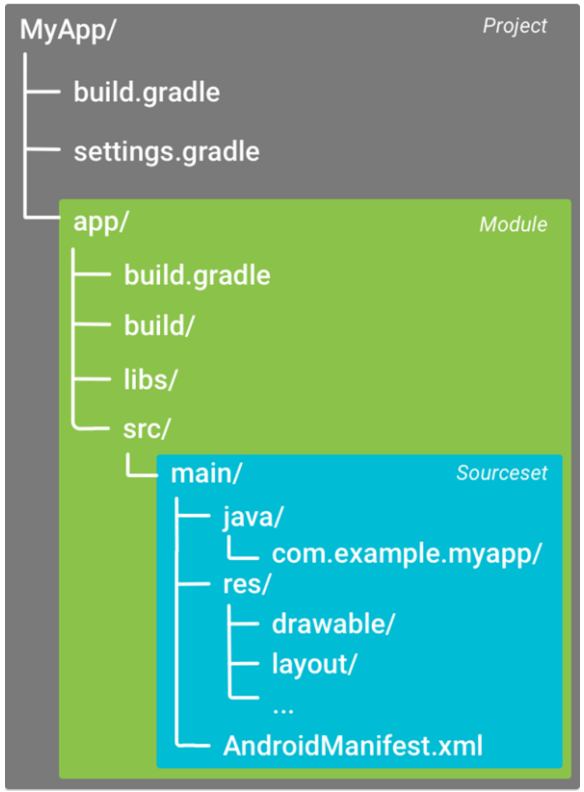
#2. Gradle settings file



1. Gradle settings file:
   - Location: in root project directory
   - Usage: tells Gradle which modules it should include when building your app

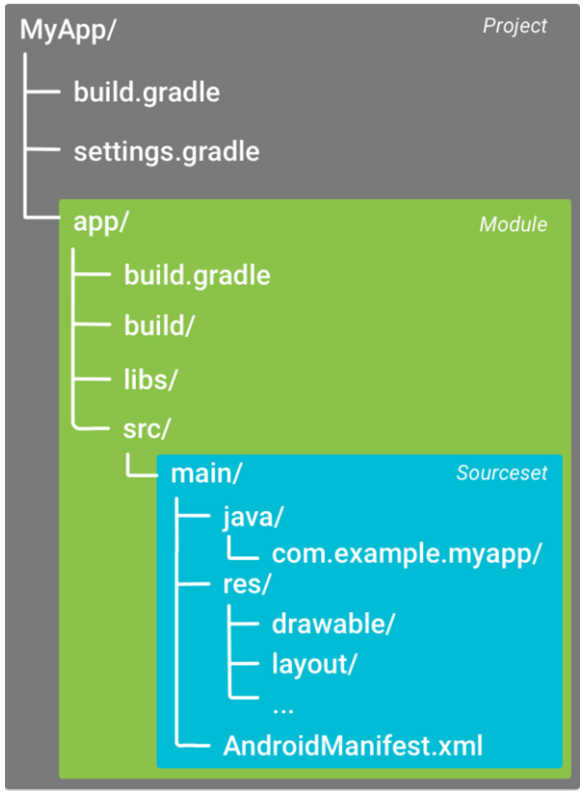
   Example:
   include':app'

#3. Top-level build file



2 Top-level build file:
- Location: in root project directory
- Usage: define build configuration that apply to all modules in your project

#3. Top-level build file (Cont.)



2

Example:

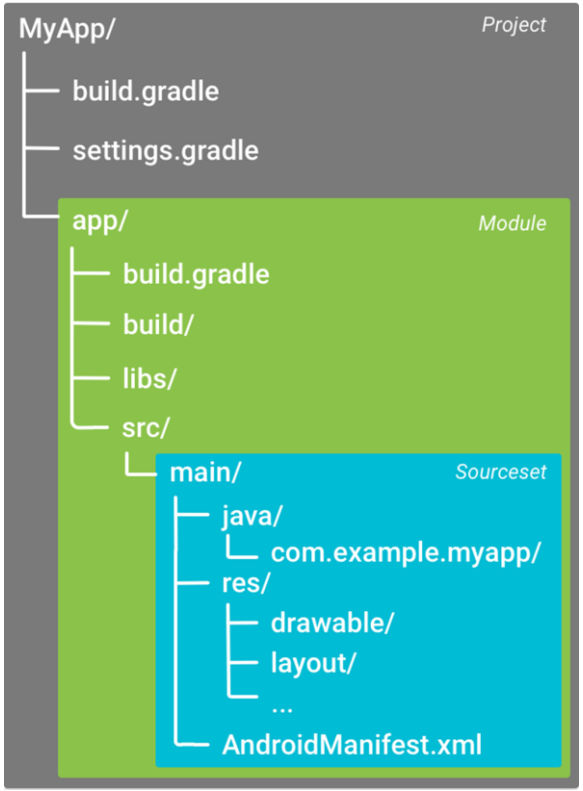
```
buildscript {

    repositories {
        google()
        jcenter()
    }

    dependencies {
        classpath 'com.android.tools.build:gradle:3.6.0'
    }
}


allprojects {
    repositories {
        google()
        jcenter()
    }
}
```

#4. Module-level build file



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Module-level build file:
- Location: in each ***project/module/*** directory
- Usage:
  - Configure build settings for the specific module it is located in.
  - Provide custom packaging options, such as additional build types and product flavors
  - Override settings in the main/ app manifest or top-level build.gradle file

#4. Module-level build file (Cont.)

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

android {

  compileSdkVersion 28
  buildToolsVersion "29.0.2"

  defaultConfig {
    applicationId 'com.example.myapp'

    minSdkVersion 15
    targetSdkVersion 28

    versionCode 1
    versionName "1.0"
  }

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

  flavorDimensions "tier"
  productFlavors {
    free {
      dimension "tier"
      applicationId 'com.example.myapp.free'
    }

    paid {
      dimension "tier"
      applicationId 'com.example.myapp.paid'
    }
  }

}

dependencies {
    implementation project(":lib")
    implementation 'com.android.support:appcompat-v7:28.0.0'
    implementation fileTree(dir: 'libs', include: ['*.jar'])
}
```

#5. How to custom build file

- Gradle build configuration files (build.gradle) files using **Groovy** programming language described in **Domain Specific Language** (**DSL**)

- No need to understand **Groovy** language to custom build file, we start from learning **Android plugin DSL (**Android plugin for Gradle written in Groovy, described in DSL)
    - Refer to http://google.github.io/android-gradle-dsl/current/index.html

#6. Build Types

- Build types define certain properties that Gradle uses when building and packaging your app, and are typically configured for different stages of your development lifecycle

- For example, the **debug build type** enables **debug options** and signs the APK with the **debug key**, while the **release build** type may **shrink**,and sign your APK with a **release key** for distribution

- You must define at least one build type in order to build your app—Android Studio creates the **debug** and **release** build types by **default**

#6. Build Types (Cont.)

- **Example for buildTypes block**

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

android {
    ....
    signingConfigs {
        release {
            storeFile file("release.keystore")
            storePassword "******"
            keyAlias "******"
            keyPassword "******"
        }
    }
    buildTypes {
        release {
            shrinkResources true
            signingConfig signingConfigs.release
        }

        debug {
            debuggable true
        }
    }
    ....
}
```

- **Documentation of BuildType DSL object**

http://google.github.io/android-gradle-dsl/current/com.android.build.gradle.internal.dsl.BuildType.html

#7. Product flavors

- Product flavors represent different versions of your app that you may release to users, such as free and paid versions of your app
- You can customize product flavors to use different code and resources, while sharing and reusing the parts that are common to all versions of your app
- Product flavors are optional and you must create them manually

#7. Product flavors (Cont.)

- **Example for flavorDimensions function & productFlavors block**

```
android {
    ...
    defaultConfig {...}
    buildTypes {
        debug{...}
        release{...}
    }
    // Specifies one flavor dimension.
    flavorDimensions "version"
    productFlavors {
        demo {
            // Assigns this product flavor to the "version" flavor dimension.
            // If you are using only one dimension, this property is optional,
            // and the plugin automatically assigns all the module's flavors to
            // that dimension.
            dimension "version"
            applicationIdSuffix ".demo"
            versionNameSuffix "-demo"
        }
        full {
            dimension "version"
            applicationIdSuffix ".full"
            versionNameSuffix "-full"
        }
    }
}
```

- **Documentation of ProductFlavor DSL object**

http://google.github.io/android-gradle-dsl/current/com.android.build.gradle.internal.dsl.ProductFlavor.html

#8. Build variants

- Each build variant represents a different version of your app that you can build.
- Based on example of section “Build Types” and “Product Flavor”, we have:
  - 2 build types:
    - debug
    - release
  - 2 product flavor
    - demo
    - full
- Now we will have 4 build variants, which are cross product of these build types and flavor, they are
  - demoDebug
  - fullDebug
  - demoRelease
  - fullRelease

#9. Manifest Entries

#10. Dependencies

- To add a dependency to your project, specify a dependency configuration such as implementation in the dependencies block of build.gradle file.
- Example of dependencies block

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

android { ... }

dependencies {
    // Dependency on a local library module
    implementation project(":mylibrary")

    // Dependency on local binaries
    implementation fileTree(dir: 'libs', include: ['*.jar'])

    // Dependency on a remote binary
    implementation 'com.example.android:app-magic:12.3'
}
```

#11. Signing

The build system enables you to specify signing settings in the build configuration, and it can automatically sign your APKs during the build process

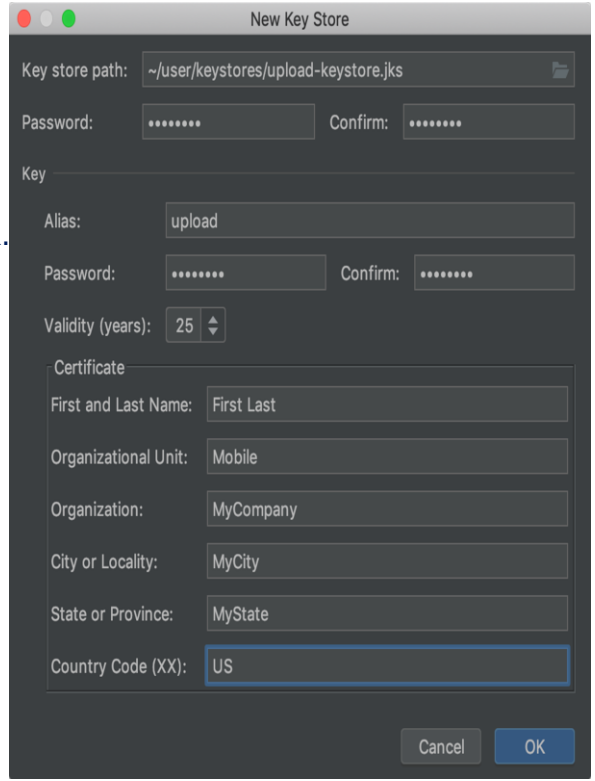
```
apply plugin: 'com.android.application‘

android {
    ....
    signingConfigs {
        release {
            storeFile file("release.keystore")
            storePassword "******"
            keyAlias "******"
            keyPassword "******"
        }
    }
    buildTypes {
        release {
            shrinkResources true
            signingConfig signingConfigs.release
        }

        debug {
            debuggable true
        }
    }
    ....
}
```

#11. Signing (Cont.)

- **APK debug** is signed with $HOME/.android/debug.keystore as default, with
  - Keystore password: “android”
  - Keyalias: “androiddebugkey”
  - Key password: “android”
- To generate our keystore to sign **APK release**, we can use Android Studio:
  - 1. In the menu bar, click Build > Build > Generate Signed Bundle/APK.
  - 2. In the Generate Signed Bundle or APK dialog, select Android App Bundle or APK and click Next.
  - 3. Below the field for Key store path, click Create new.



#12. Code and resource shrinking

#13. Multiple APK support

Functions

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13. Multiple APK support

Lesson Summary

- **Build process overview**
- **Build configuration files**

Thank you