Android App development

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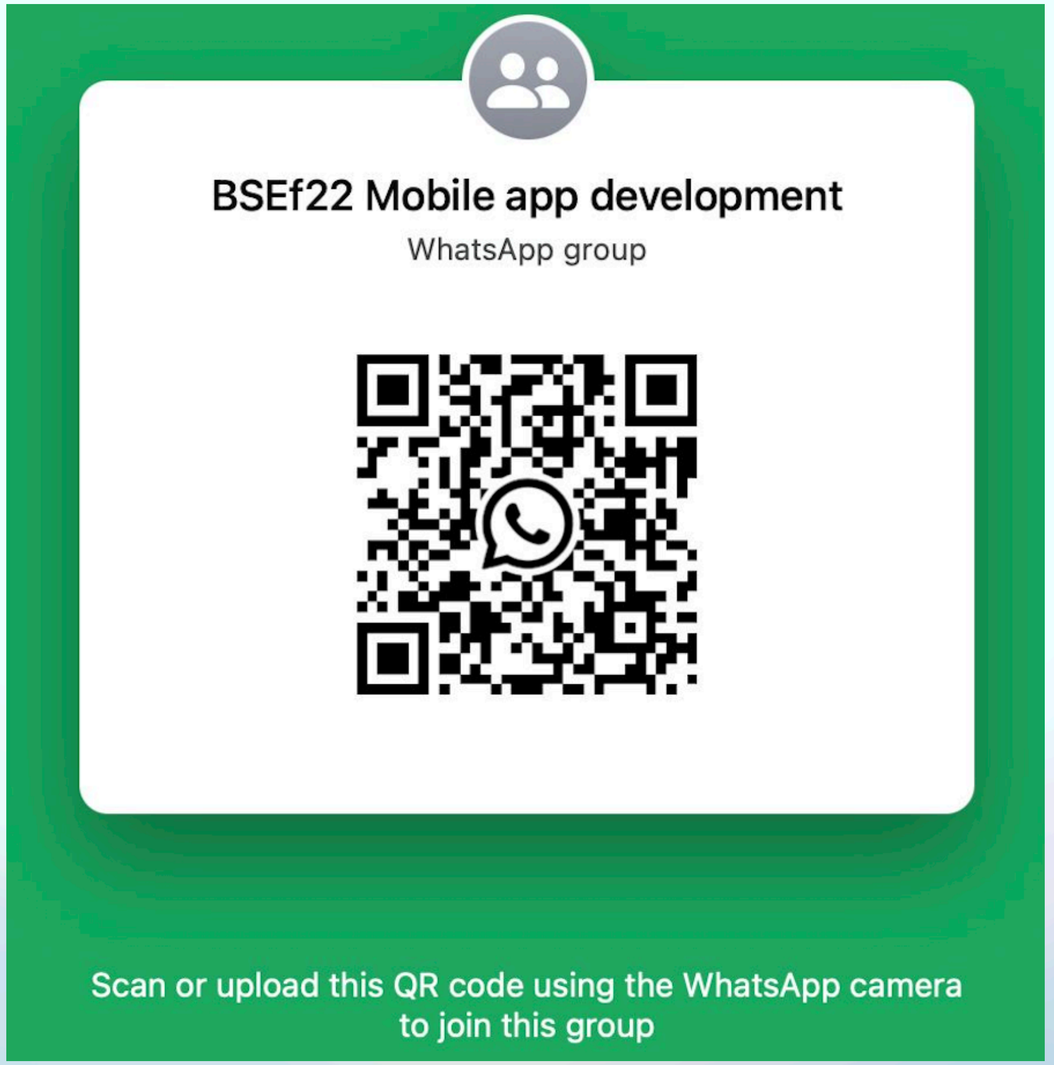
Whatsapp group



What is Android 

- Open-source operating system based on Linux kernel
- Developed by Android Inc., acquired by Google in 2005
- Designed primarily for **touchscreen devices** (smartphones, tablets).
- Currently the world's most popular mobile operating system
- Used in smartphones, tablets, TVs, wearables, and more

Android OS Features

- **Open-source** and customizable.
- Multi-tasking & Multi-window **support.**
- **Regular updates** with new security patches.
- Supports multiple architectures **(ARM, x86, x64).**
- **Google Play Store** for app distribution.
- Wide range of libraries **for app development.**

What is Android API level

- Numeric identifier for Android platform version
- Each Android version has a unique API level
- Critical for:
  - App compatibility
  - Feature availability
  - Play Store distribution
  - Development targeting decisions

Version history - 1

Version	SDK / API level	Version code	Codename	Cumulative usage [1]	Year [4]
Android 16 BETA	Level 36	BAKLAVA	Baklava [2]	0%	*TBD*
Android 15	Level 35	VANILLA_ICE_CREAM	Vanilla Ice Cream [2]	1.34%	2024
Android 14	Level 34	UPSIDE_DOWN_CAKE	Upside Down Cake [2]	38.32%	2023
	▪ `targetSdk` must be to be 34+ for new apps and app updates as of August 31, 2024.				
Android 13	Level 33	TIRAMISU	Tiramisu [2]	57.1%	2022
Android 12	Level 32 Android 12L	S_V2	Snow Cone [2]	70.3%	
	Level 31 Android 12	S			2021
Android 11	Level 30	R	Red Velvet Cake [2]	82.2%	2020
Android 10	Level 29	Q	Quince Tart [2]	88.5%	2019
Android 9	Level 28	P	Pie	92.2%	2018
Android 8	Level 27 Android 8.1	O_MR1	Oreo	93.4%	2017
	Level 26 Android 8.0	O		95.7%	
Android 7	Level 25 Android 7.1	N_MR1	Nougat	96.0%	2016
	Level 24 Android 7.0	N		97.0%	
Android 6	Level 23	M	Marshmallow	98.4%	2015
Android 5	Level 22 Android 5.1	LOLLIPOP_MR1	Lollipop	98.8%	
	Level 21 Android 5.0	LOLLIPOP, L		99.7%	2014
	▪ Jetpack/AndroidX libraries require a `minSdk` of 21 or higher since April 2024. ▪ Jetpack Compose requires a `minSdk` of 21 or higher. ▪ Google Play services v23.30.99+ (August 2023) drops support for API levels below 21.				

Version history - 2

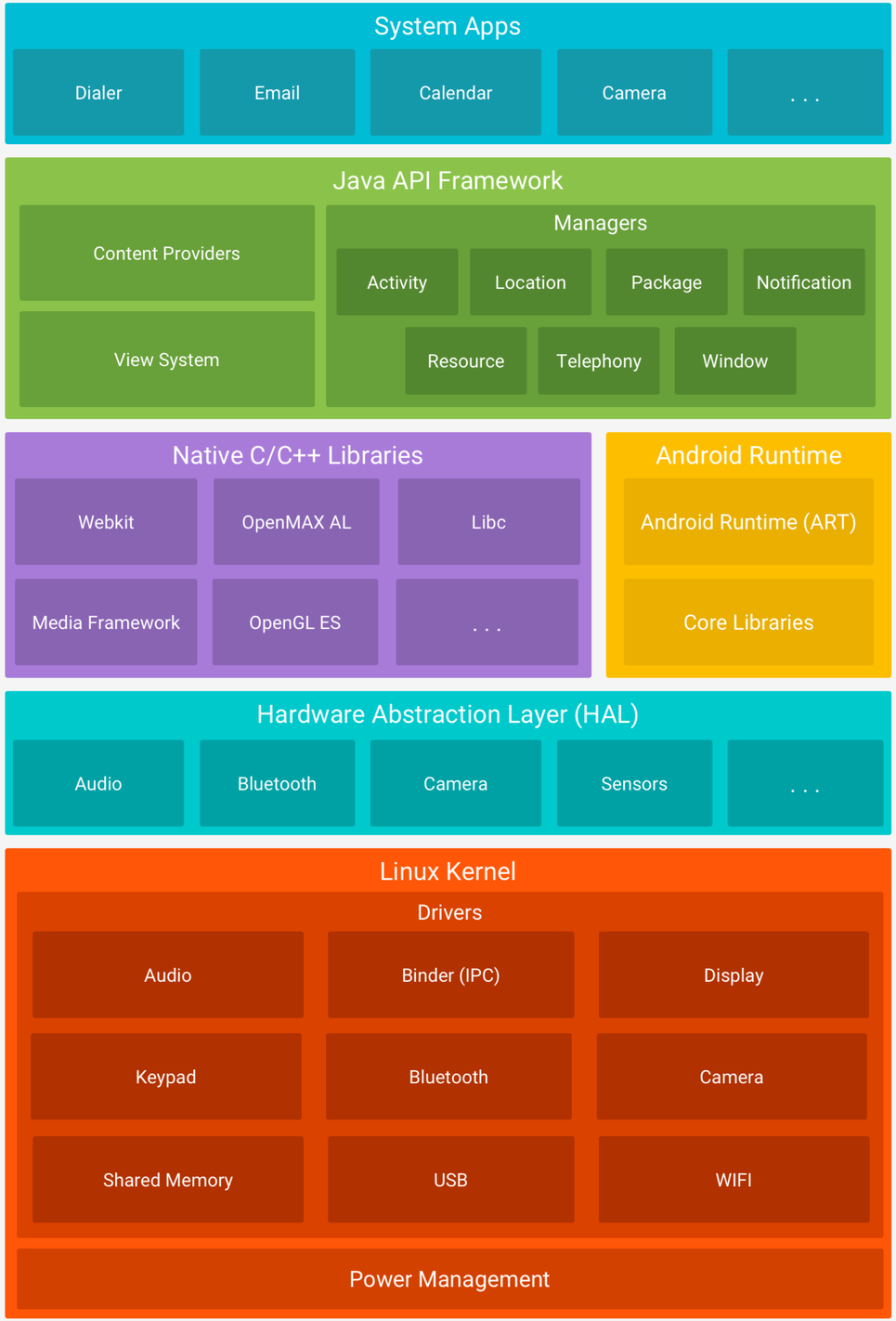
Android 4	Level 20 Android 4.4W [3]	KITKAT_WATCH	KitKat	99.9%	
	Level 19 Android 4.4	KITKAT			2013
	▪ Jetpack/AndroidX libraries require a `minSdk` of 19 or higher since October 2023. ▪ Google Play services v21.33.56+ (July 2021) drops support for API levels below 19.				
	Level 18 Android 4.3	JELLY_BEAN_MR2	Jelly Bean	99.9%	
	Level 17 Android 4.2	JELLY_BEAN_MR1		99.9%	2012
	Level 16 Android 4.1	JELLY_BEAN		99.9%	
	▪ Google Play services v14.8.39+ (December 2018) drops support for API levels below 16.				
	Level 15 Android 4.0.3 – 4.0.4	ICE_CREAM_SANDWICH_MR1	Ice Cream Sandwich	100.0%	2011
	Level 14 Android 4.0.1 – 4.0.2	ICE_CREAM_SANDWICH			
	▪ Earlier Jetpack/AndroidX libraries required a `minSdk` of 14 or higher.				
Android 3	Level 13 Android 3.2	HONEYCOMB_MR2	Honeycomb	*No data*	
	Level 12 Android 3.1	HONEYCOMB_MR1			
	Level 11 Android 3.0	HONEYCOMB			
Android 2	Level 10 Android 2.3.3 – 2.3.7	GINGERBREAD_MR1	Gingerbread		
	Level 9 Android 2.3.0 – 2.3.2	GINGERBREAD			2010
	Level 8 Android 2.2	FROYO	Froyo		
	Level 7 Android 2.1	ECLAIR_MR1	Eclair		
	Level 6 Android 2.0.1	ECLAIR_0_1			2009
	Level 5 Android 2.0	ECLAIR			
Android 1	Level 4 Android 1.6	DONUT	Donut		
	Level 3 Android 1.5	CUPCAKE	Cupcake		
	Level 2 Android 1.1	BASE_1_1	Petit Four		
	Level 1 Android 1.0	BASE	*None*		2008

Android Architecture

Android consists of **five key layers**:

1. **Linux Kernel** – Hardware interaction, drivers, power management.
2. **Hardware Abstraction Layer (HAL)** – Interfaces between hardware and software.
3. **Native Libraries & Android Runtime (ART)** – Core libraries, sqlite, multimedia, WebKit, etc.
4. **Application Framework** – Java/Kotlin-based frameworks for UI, location, notifications, etc.
5. **Applications** – Pre-installed and user-installed apps.

Visit https://developer.android.com/guide/platform for more information

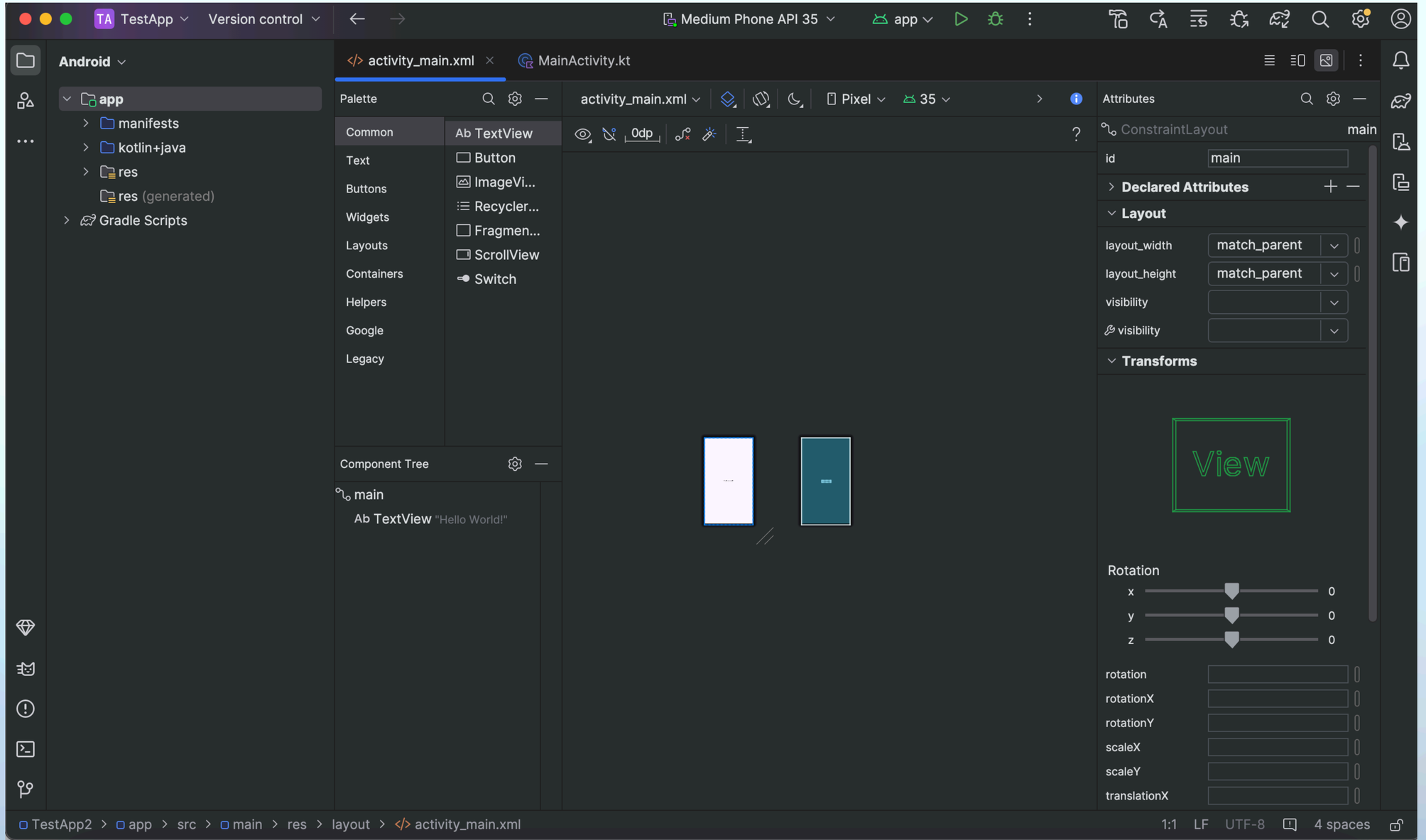

System Apps
Dialer
Email
Calendar
Camera
. . .
Java API Framework
Content Providers
View System
Managers
Activity
Location
Package
Notification
Resource
Telephony
Window
Native C/C++ Libraries
Webkit
OpenMAX AL
Libc
Media Framework
OpenGL ES
. . .
Android Runtime
Android Runtime (ART)
Core Libraries
Hardware Abstraction Layer (HAL)
Audio
Bluetooth
Camera
Sensors
. . .
Linux Kernel
Drivers
Audio
Binder (IPC)
Display
Keypad
Bluetooth
Camera
Shared Memory
USB
WIFI
Power Management

What is Android Studio

- Official IDE for Android development **by Google.**
- **Built on** JetBrains IntelliJ IDEA.
- **Supports** Java, Kotlin, and C++.
- **Provides** built-in emulators, Gradle, and debugging tools.

Download and install **Android Studio** from https://developer.android.com/studio

Android Studio tour



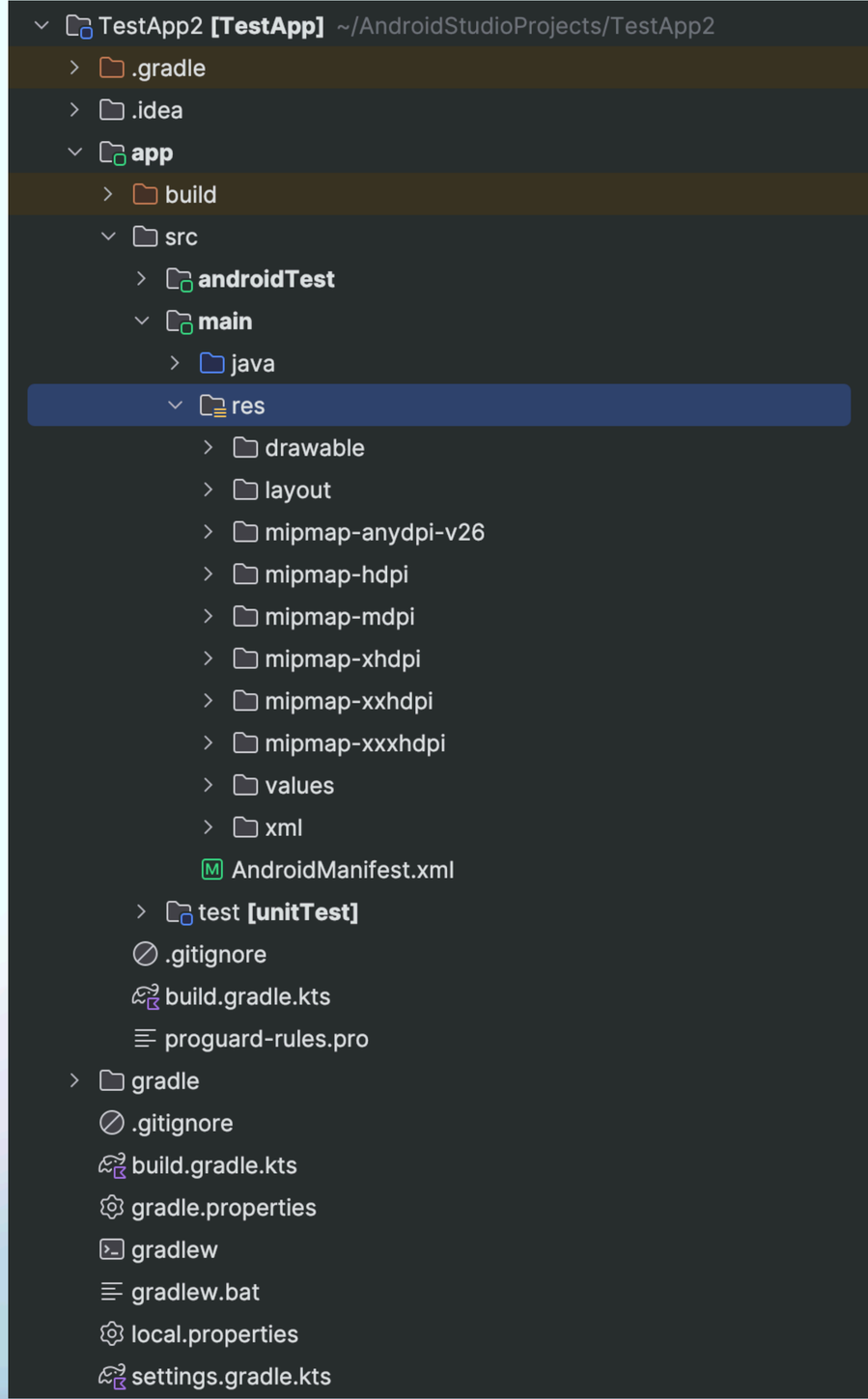
Running an application

- Android device (phone, tablet)
- Emulator on your computer

Android Project Structure

1. src/main/
    - java/ → Java/Kotlin source code
    - res/ → Resources (layouts, strings, images)
    - AndroidManifest.xml → App configuration
2. build.gradle files
    - Dependencies
    - Build configurations
    - SDK versions

For more information https://developer.android.com/studio/projects
& https://developer.android.com/guide/topics/resources/providing-resources



Android project structure

```
res/
├── layout/         # XML layout files
├── drawable/       # Images & shapes
├── values/
│   ├── strings.xml     # Text strings
│   ├── colors.xml      # Color definitions
│   └── styles.xml      # UI styles
├── mipmap/       # App icons
└── raw/          # Raw resources
```

What is AndroidManifest.xml

- Essential configuration file for every Android app
- Located at: app/src/main/AndroidManifest.xml
- Declares all app components and permissions
- Hardware and software features that app require

For more information https://developer.android.com/guide/topics/manifest/manifest-intro

What is Gradle?

"Android Gradle" refers to the build system used by Android Studio, which leverages the Gradle build automation tool to automate the process of compiling, testing, and packaging Android applications, allowing developers to define how their apps are built with a high degree of customization and flexibility within their project files.

- Automated build system for Android
- Manages dependencies
- Handles build configurations
- Automates tasks
- Generates final APK/Bundle

For more information visit https://developer.android.com/build/gradle-build-overview & https://developer.android.com/build/android-build-structure

build.gradle(module) vs build.gradle(app)

Build.gradle(module)

This defines the module-specific build configurations. build.gradle is the correct filename if you're using Groovy as your build script language, and it's build.gradle.kts if you're using Kotlin script.

```
MyApp/
├── build.gradle (Project Level)     # Project-wide settings
├── settings.gradle                  # Project settings
└── app/
    └── build.gradle (Module Level)  # App-specific settings
```

Build.gradle(app):

This defines your build configuration that applies to all modules. build.gradle is the correct filename if you're using Groovy as your build script language, and it's build.gradle.kts if you're using Kotlin script. This file is integral to the project, so maintain it in revision control with all other source code.

Thank you!