
Application Development for Mobile Computer

<Week 2>

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Introduction to Android

Android

- Android is based on Linux, an open-source operating system.
- Android apps are developed using Java or Kotlin.
- Most of the core parts of the Android OS, libraries, and some Google apps are open-source.
- Android apps can be distributed not only through Google Play Store but also in various other ways.



Introduction to Android

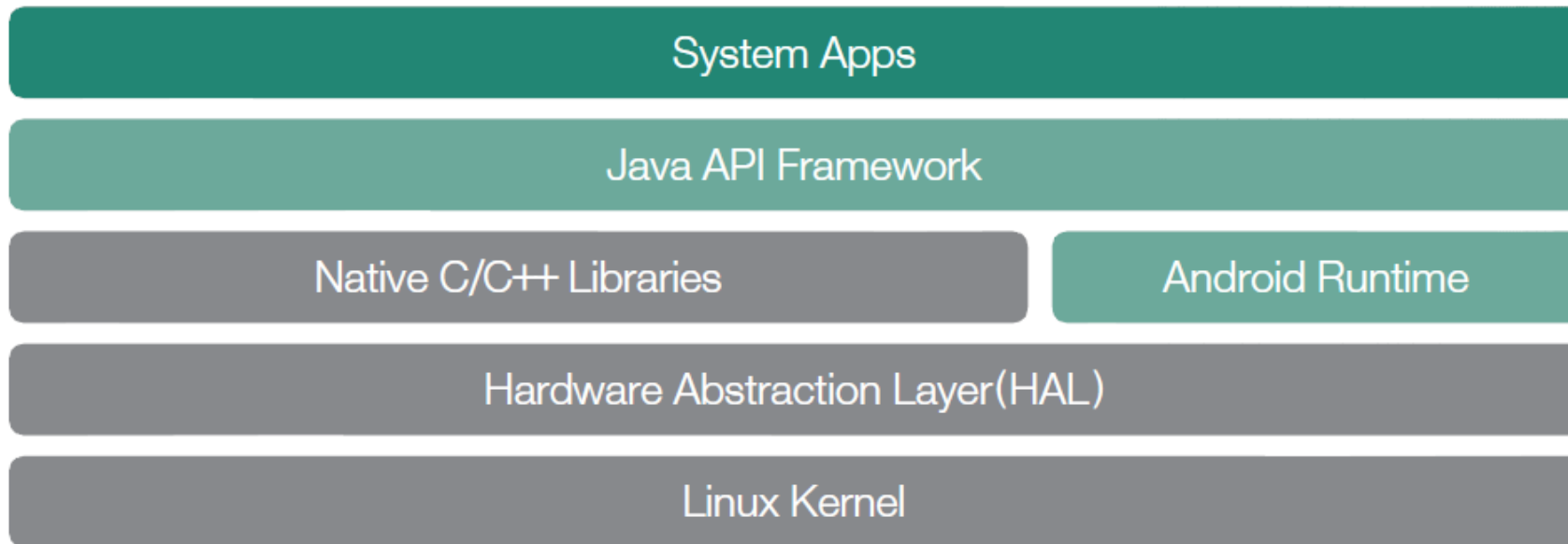
Android OS

- The structure of the Android platform combines the Linux kernel and the Java API framework.
- In the past, explanations of the Android platform always mentioned the JVM (actually Dalvik VM, but usually written as JVM) because apps ran on the Java Virtual Machine.
- Now, Android Runtime (ART) is used instead of the JVM.
- Therefore, although the JVM is no longer present, apps still run on a virtual machine, adopting the execution model of Java.

Introduction to Android

Android OS

- Linux kernel: Android is an open-source software stack based on Linux.
- Android Runtime (ART): Responsible for running applications.
- Java API Framework: Provides Java APIs used for app development.



Introduction to Android

Android

- Android does not run Java classes directly at runtime but compiles them into DEX files.
- These DEX files are executed in the Android Runtime (ART), which interprets them

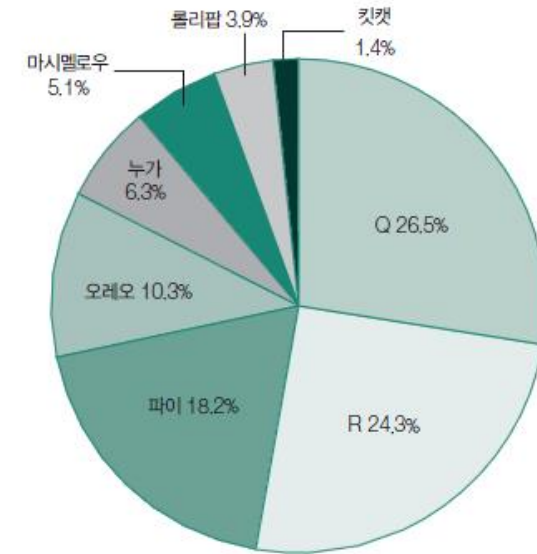


Android Versions

Android Versions

- Android has an API level that exists separately from the platform version.
- Depending on the API level, new features may be added, or major code changes may be required.

플랫폼 버전	코드네임	API 레벨	버전 코드
12.0	Android 12	31	S
11.0	Android 11	30	R
10.0	Android 10	29	Q
9.0	Pie	28	P
8.1	Oreo	27	O_MR1
8.0	Oreo	26	O
7.1.1	Nougat	25	N_MR1
7.0	Nougat	24	N
6.0	Marshmallow	23	M



Kotlin

Kotlin

- In the past, Java was mainly used as the primary app development language.
- At Google I/O in May 2017, Kotlin was announced as an official language, and since then more companies have gradually adopted it for app development.



Kotlin

- Kotlin supports functional programming.
- In object-oriented programming, logic is written only in functions inside a class.
- In functional programming, logic can be written anywhere without such restrictions.

자바 코드 – 객체지향 프로그래밍

```
class Hello {  
    public static void main(String args[]) {  
        System.out.print("Hello World");  
    }  
}
```

코틀린 코드 – 함수형 프로그래밍

```
System.out.print("Hello World");
```

Kotlin

- When developing Android apps, Kotlin requires writing logic inside classes.
- Kotlin is 100% compatible with Java.
- Code written in Kotlin is usually much shorter compared to Java.

자바 코드 – ButtonActivity.java

```
CheckBox check = findViewById(R.id.check);
ImageView image = findViewById(R.id.image);
check.setOnCheckedChangeListener(new CompoundButton.OnCheckedChangeListener() {
    public void onCheckedChanged(CompoundButton buttonView, boolean isChecked) {
        if (isChecked) {
            image.setVisibility(View.VISIBLE);
        } else {
            image.setVisibility(View.GONE);
        }
    }
});
```

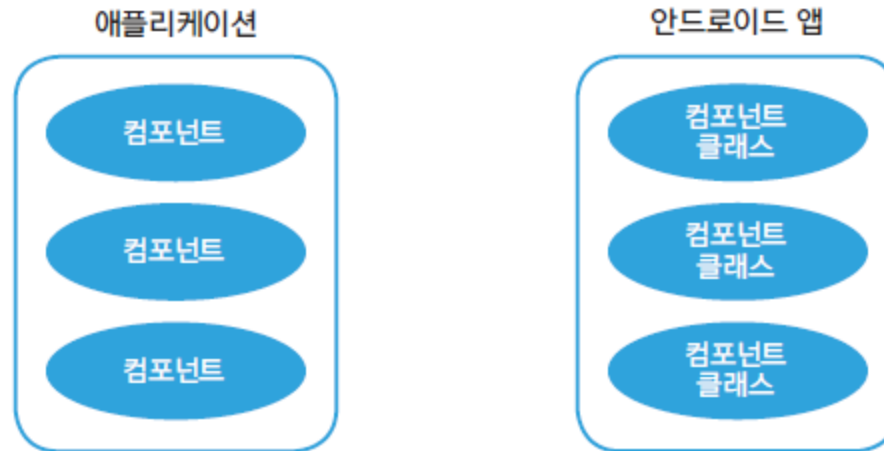
코틀린 코드 – ButtonActivity.kt

```
binding.check.setOnCheckedChangeListener { buttonView, isChecked ->
    binding.image.visibility = if(isChecked).View.VISIBLE else View.GONE
}
```

Android App Development

Android Components

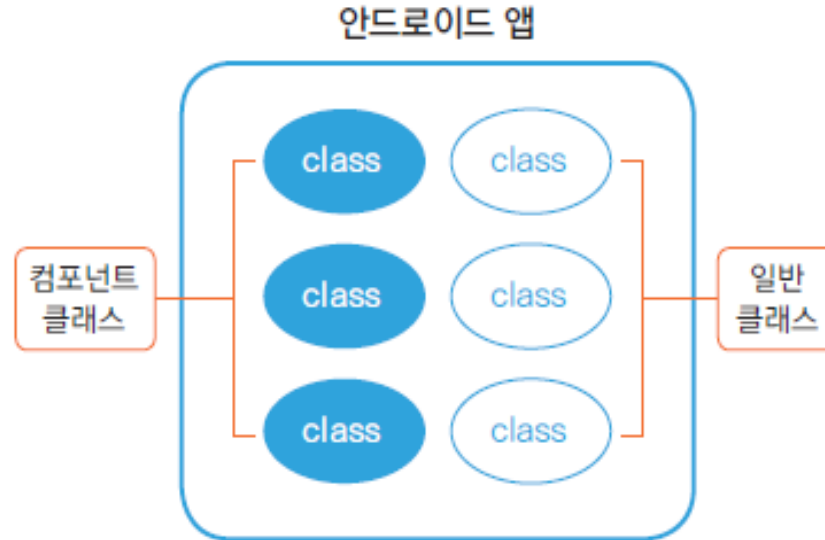
- A component is a building block of an application.
- A component is an independent unit of execution within an app.



Android App Development

Android Components

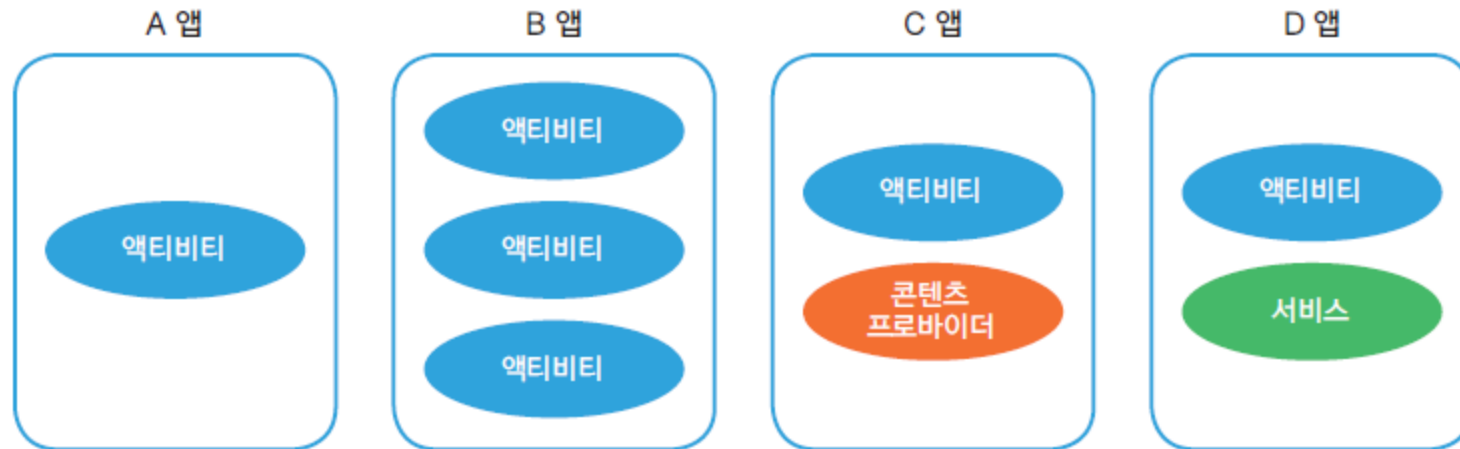
- An app is made up of many classes, mainly divided into component classes and regular classes.
- If the lifecycle (from object creation to destruction) is managed by developer code, it is a regular class.
- If the lifecycle is managed by the Android system, it is a component class.



Android App Development

Android Components

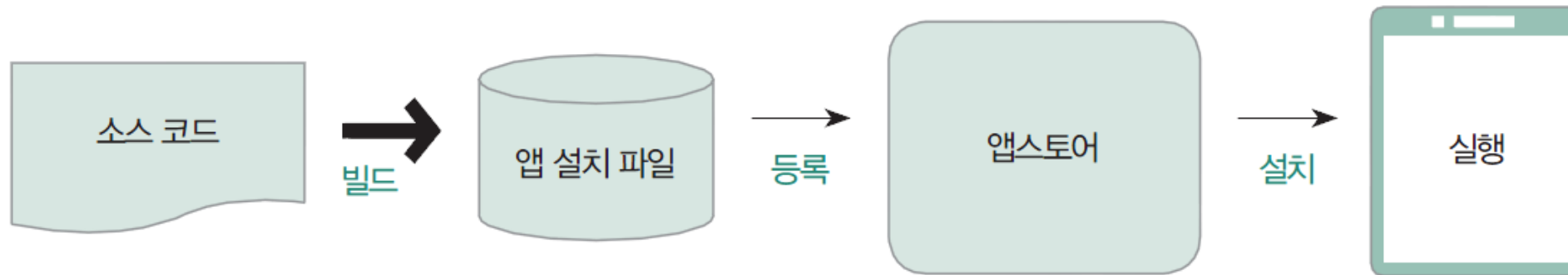
- Activity: A component that provides the user interface (screen).
- Service: A component that performs background tasks.
- Content Provider: A component that shares app data.
- Broadcast Receiver: A component that responds to system events.



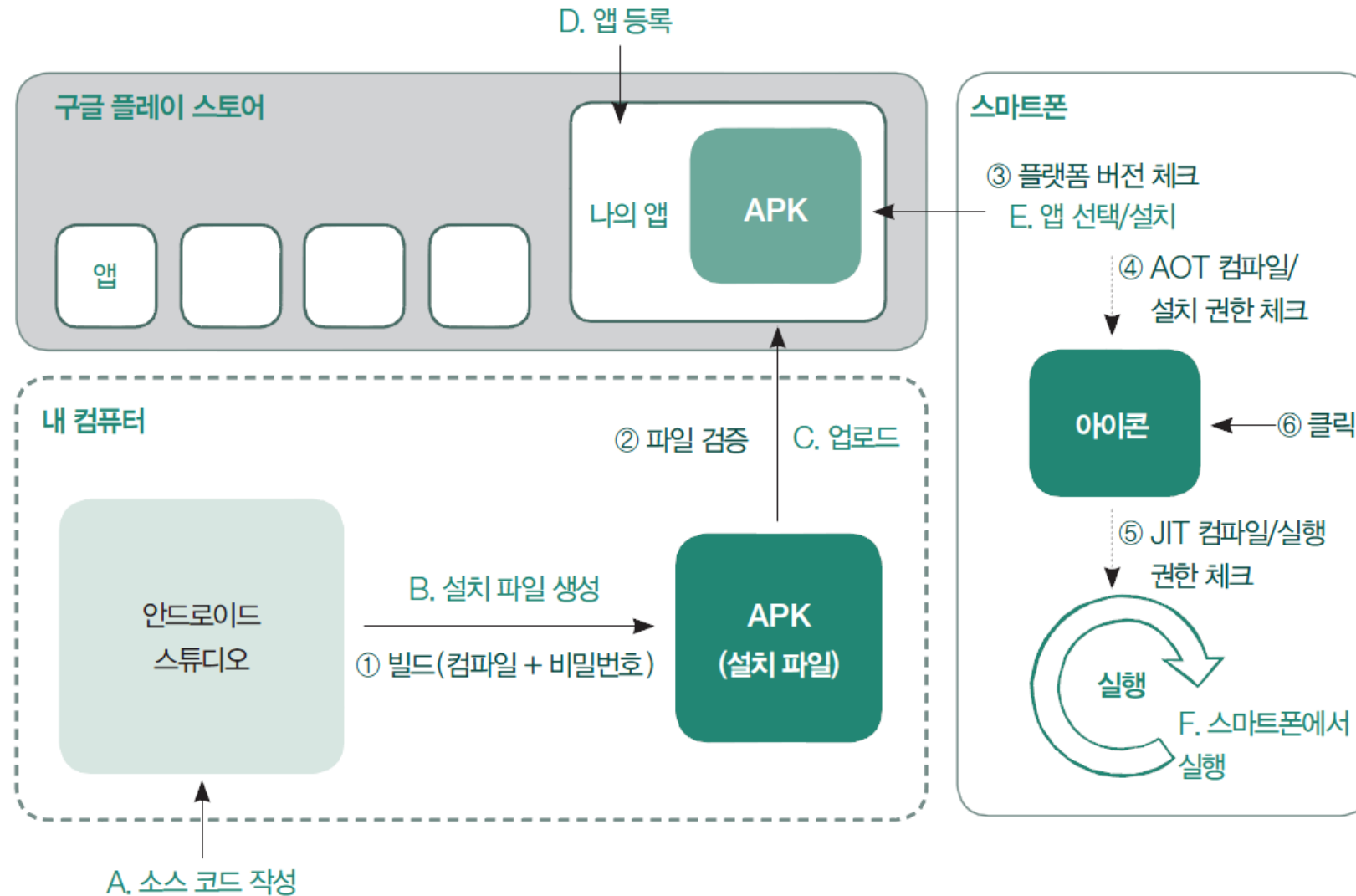
Android App Development

Development Process

- Write the source code.
- Use build commands to convert it into an installable Android package.
- Upload the app to the Google Play Store.
- Register the app in the Google Play Console.
- On a smartphone, open the Play Store, select the app, and install it.
- Tap the app icon to launch it.



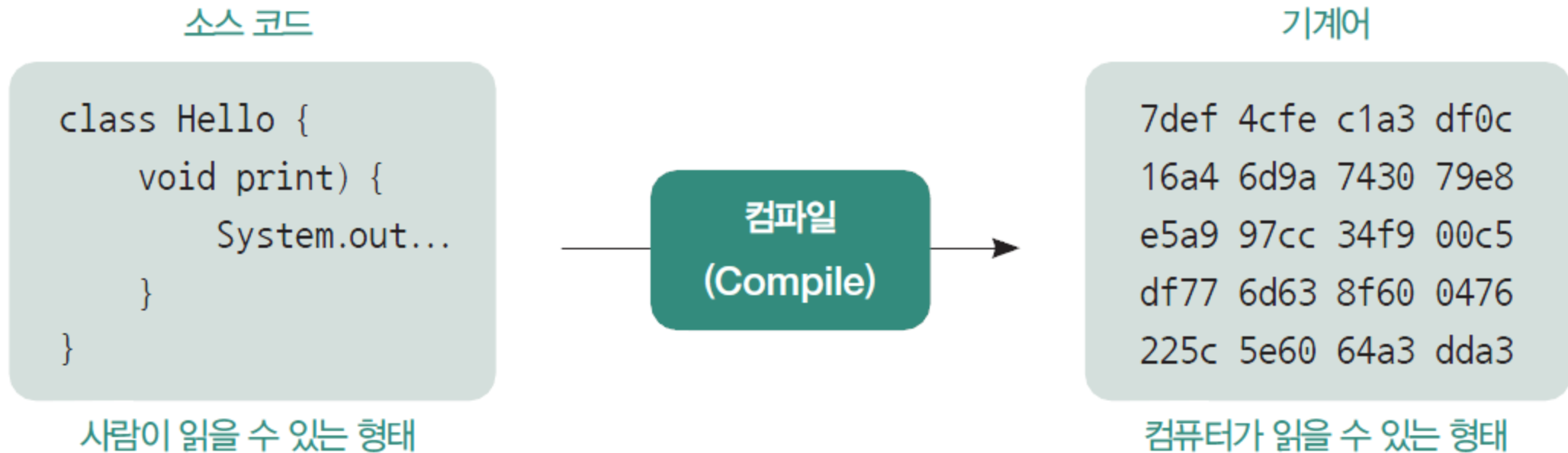
Android App Development



Android App Development

Compile

- Converting human-readable source code into machine code that a computer can understand.



Android App Development

Build in Linux

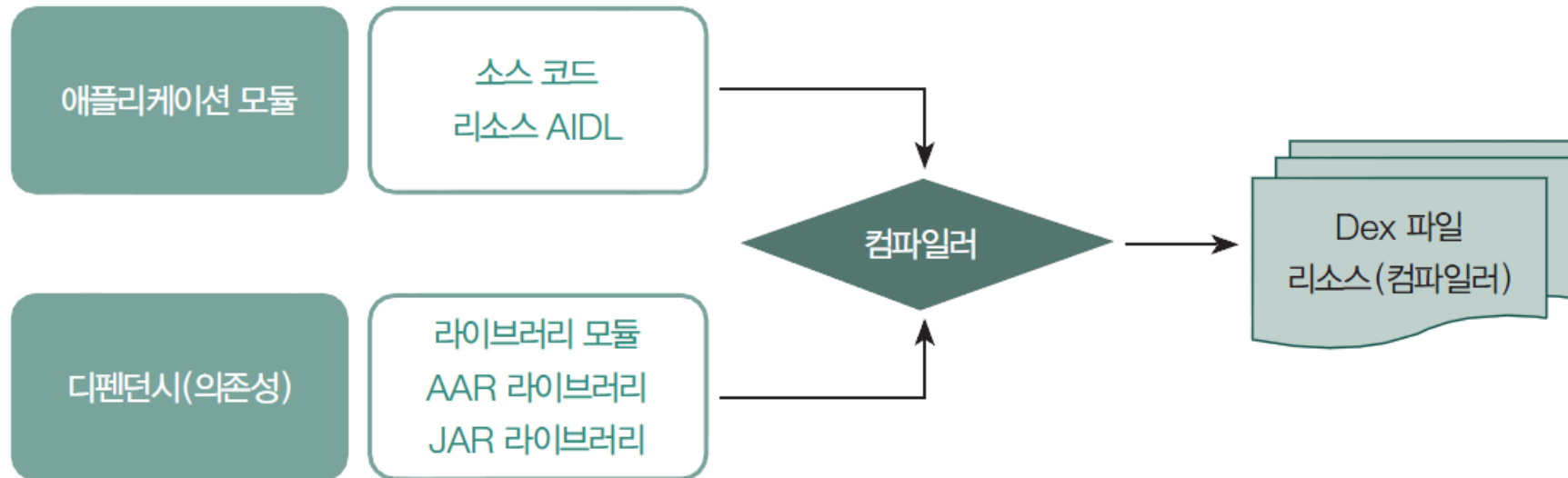
- Translating (compiling) the source code into machine code and linking it with the libraries used, to produce the final executable file.



Android App Development

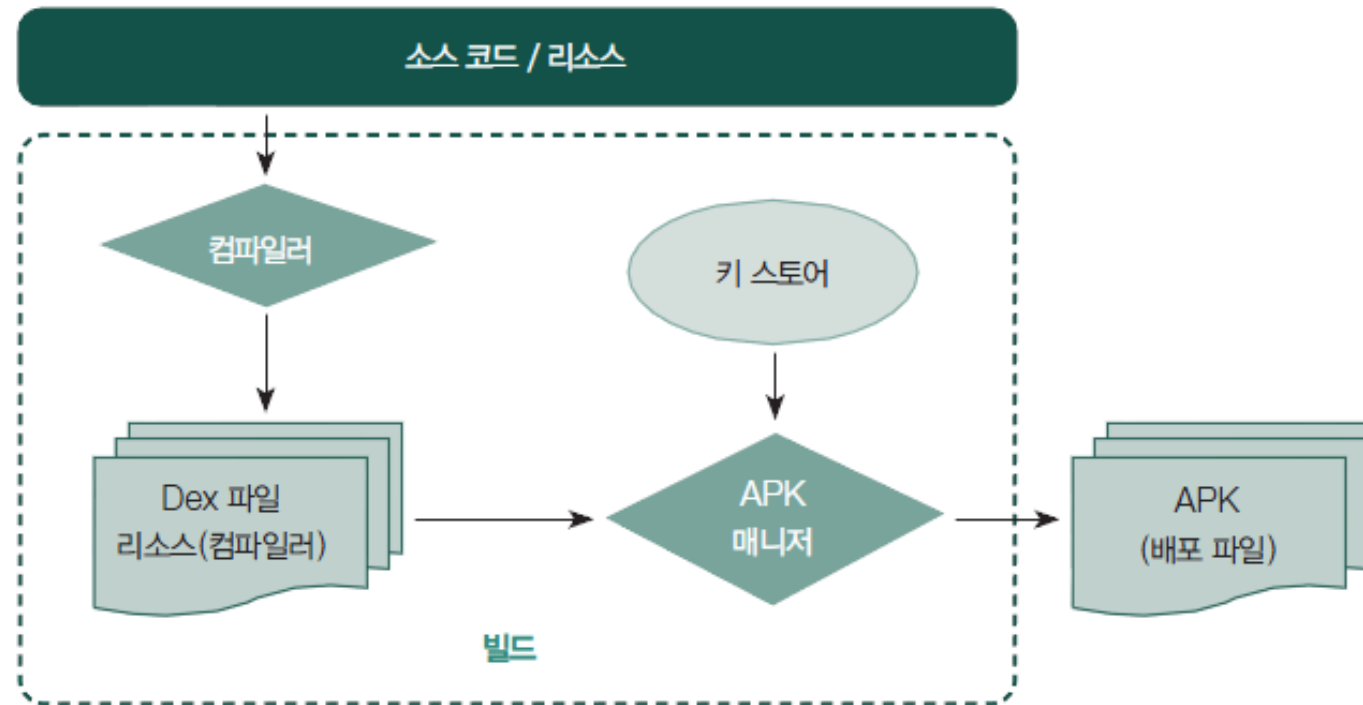
Build in Android

- The difference from Linux compilation is that Android has the concept of resources.
- Android compilation happens in two steps:
 - Step 1: Bytecode generation
 - Step 2: APK file creation



Android App Development

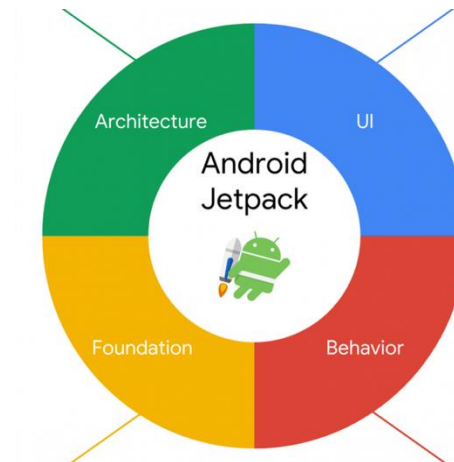
Build in Android



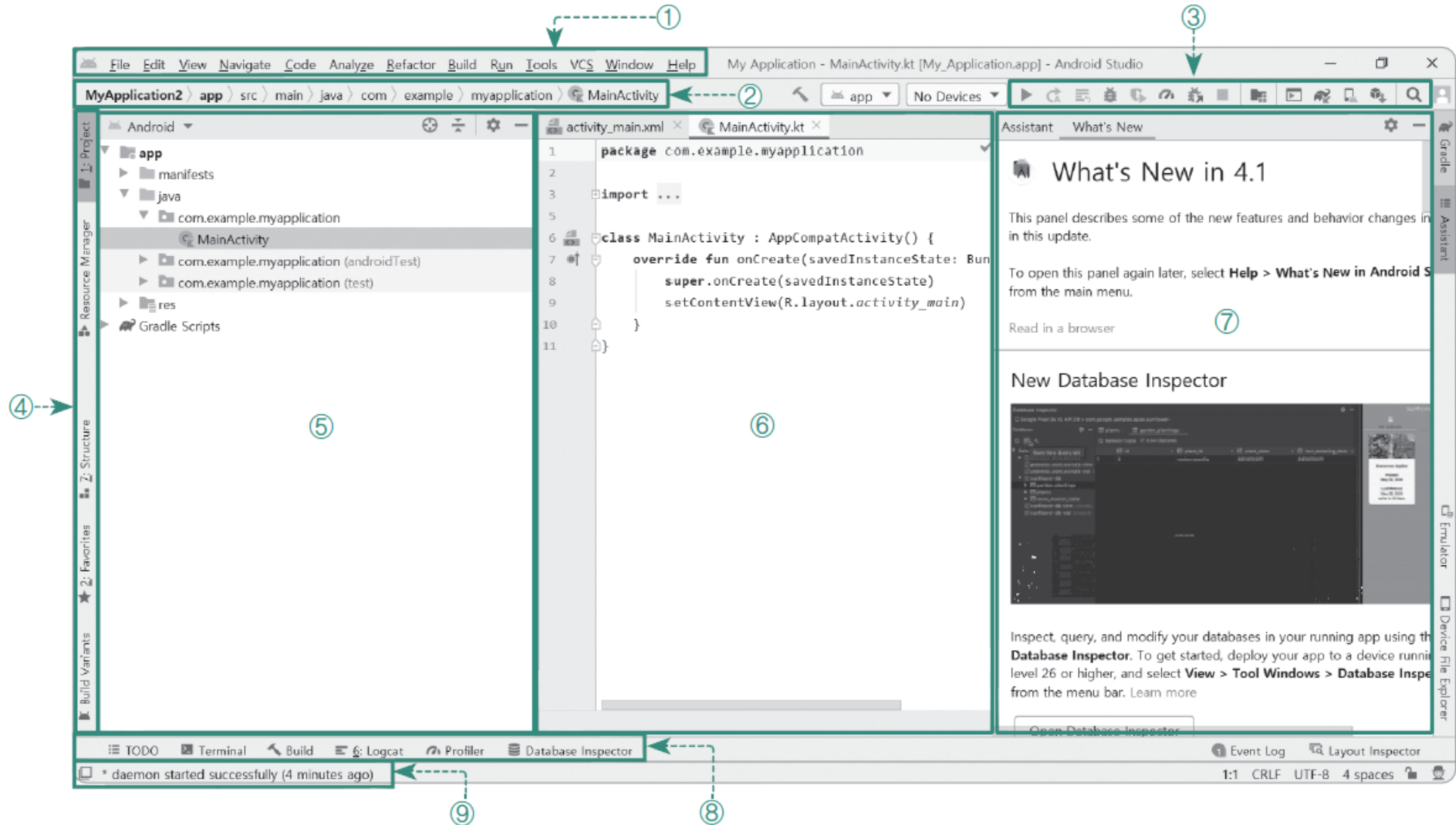
Android App Development

Jetpack

- Consistent libraries: Work uniformly across all versions and devices.
- Backward compatibility: Jetpack libraries, built on modern design principles, include compatibility features for older versions, reducing crashes and memory leaks.
- Reduced boilerplate code: Jetpack removes repetitive tasks like background work and lifecycle management, allowing developers to focus on business logic.
- Lower complexity: Provides consistent behavior across versions and devices, simplifying code.



Android Studio



Android Studio

Android SDK

Settings

Appearance & Behavior > System Settings > Android SDK

Manager for the Android SDK and Tools used by Android Studio

Android SDK Location: C:\Users\Wyoone\\AppData\Local\Android\Sdk Edit Optimize disk space

SDK Platforms SDK Tools SDK Update Sites

Below are the available SDK developer tools. Once installed, Android Studio will automatically check for updates. Check "show package details" to display available versions of an SDK Tool.

Name	Version	Status
<input checked="" type="checkbox"/> Android SDK Build-Tools		ed
<input type="checkbox"/> NDK (Side by side)		Not installed
<input type="checkbox"/> Android SDK Command-line Tools (latest)		Not installed
<input type="checkbox"/> CMake		Not installed
<input type="checkbox"/> Android Auto API Simulators	1	Not installed
<input type="checkbox"/> Android Auto Desktop Head Unit Emulator		Not installed
<input checked="" type="checkbox"/> Android Emulator		d
<input type="checkbox"/> Android Emulator Hypervisor Driver for AMD Processor		Not installed
<input checked="" type="checkbox"/> Android SDK Platform-Tools		
<input type="checkbox"/> Google Play APK Expansion library	1	Not installed
<input type="checkbox"/> Google Play Instant Development SDK	1.9.0	Not installed
<input type="checkbox"/> Google Play Licensing Library	1	Not installed
<input type="checkbox"/> Google Play services	49	Not installed
<input type="checkbox"/> Google USB Driver	13	Not installed
<input type="checkbox"/> Google Web Driver		
<input checked="" type="checkbox"/> Intel x86 Emulator Accelerator (HAXM installer)		
<input type="checkbox"/> Layout Inspector image server for API 29-30		

☒ Hide Obsolete Packages ☐ Show Package Details

OK Cancel Apply

1 Android SDK Build-Tools

2 Android Emulator

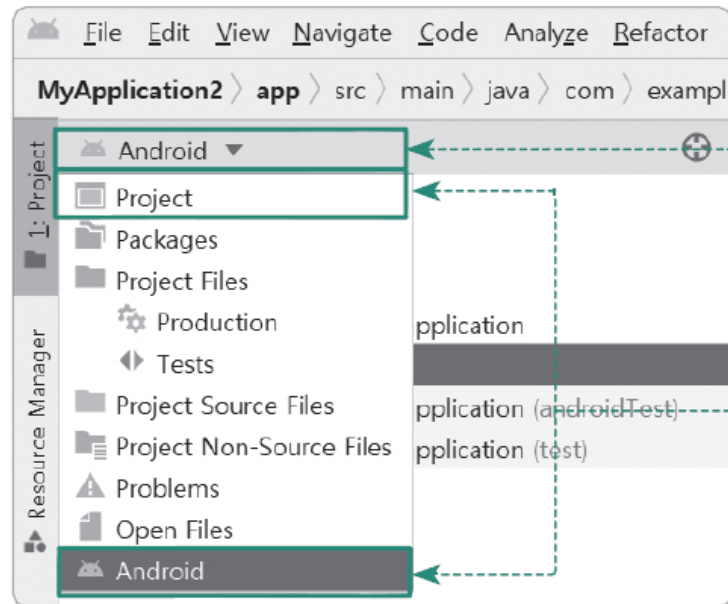
3 Android SDK Platform-Tools

4 Intel x86 Emulator Accelerator (HAXM installer)

Android Studio

Android Project

- The top-level directory that systematically manages source code, images, music, text files, and other resources.

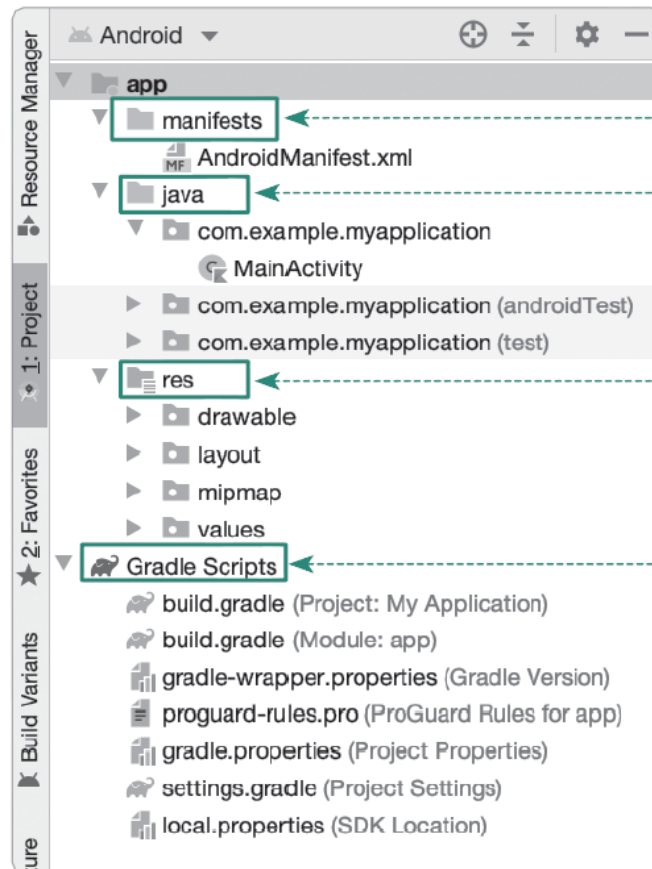


When clicked, the list of views expands.

Mainly uses Project and Android views.

Android Studio

Android View



Directory for installation-related information

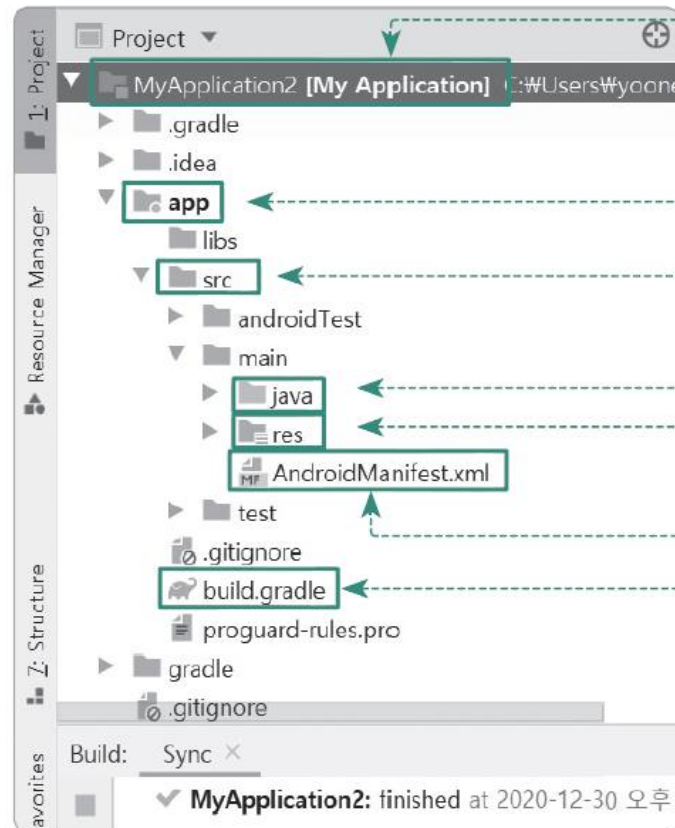
Directory for source code

Directory for resources such as images, layouts, and MP3 files

Directory for build-related configuration information

Android Studio

Project View



Directory for the actual project

Directory containing all app-related sources (code, libraries, images, etc.)

Directory for user-created sources (code, layouts, images, etc.)

Directory containing source code (still shown as java)

Directory for resources such as images, layouts, and MP3 files

Installation information file

Build information file

Android Studio

Emulator



Q & A

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