

# Mobile phones and networks technologies

# Mobile phones and network technologies

## Different types of mobile devices

Smartphones

Tablets

Wearable Technologies

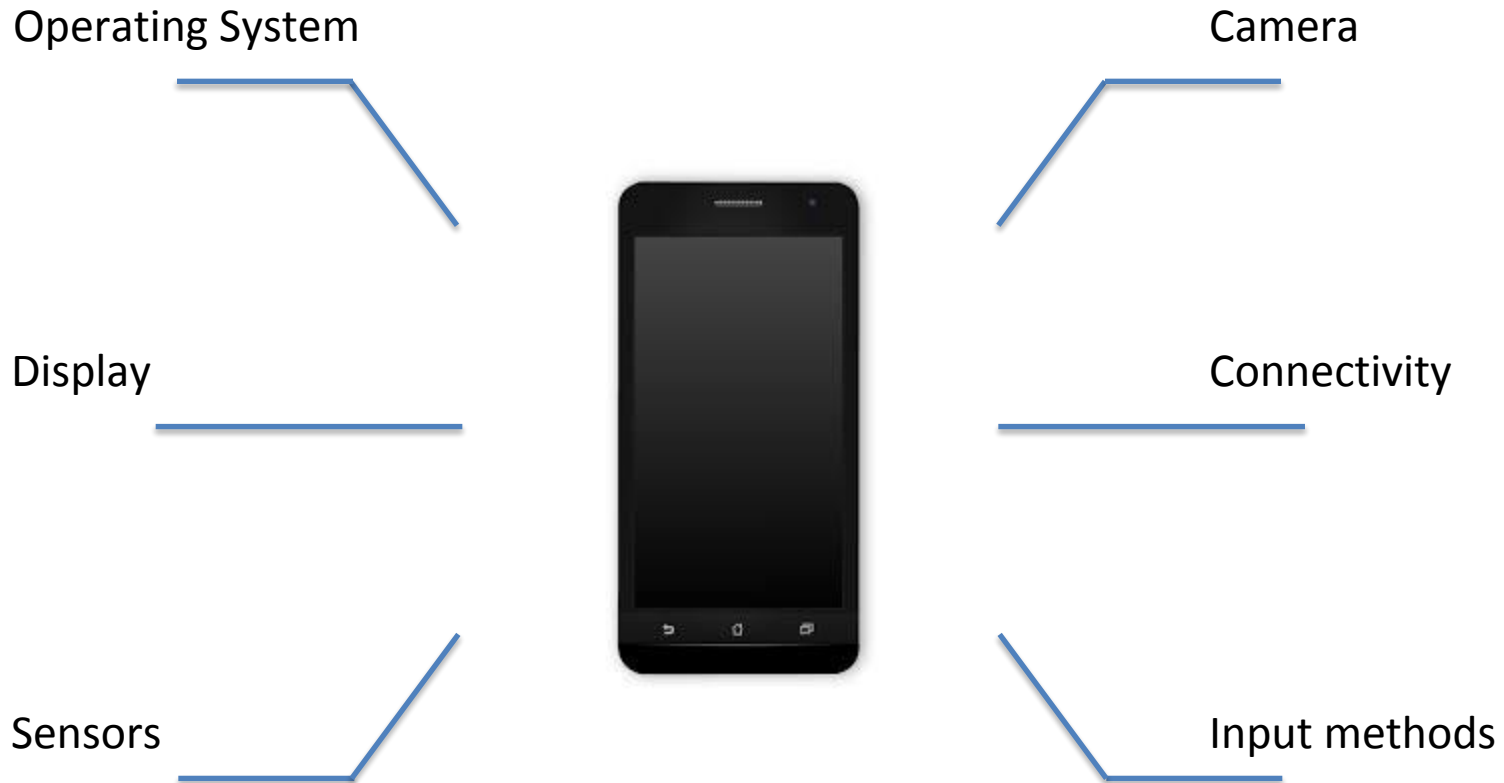
Smart watches

Smart TVs

Automotive Infotainment

# Mobile phones and network technologies

## Capabilities of mobile devices



# Mobile phones and network technologies

## Limitations of Mobile Devices

CPU Speed

Screen size

Memory

Network Coverage

Battery

Voice recognition



# Mobile phones and network technologies

## Low power wireless technologies: Wi-Fi

- Wirelessly connects electronic devices that use IEEE standard for Wi-Fi 802.11x (x: a, b, g, n, ac, etc.)
- Access point of 20-70m (indoors) and 100-250m (outdoors)
- Allows direct communication from one computer to another without access point intermediary (ad hoc Wi-Fi)
- Supports speeds up to 150Mbps (n) and 7Gbps (ac)



# Mobile phones and network technologies

## Low power wireless technologies: Bluetooth

- Supports both point-to-point and point-to-multipoint connections
- Piconet - 8 devices connected in Bluetooth network (1 master and 7 slaves)
- Bluetooth 3.0+HS - supports theoretical data transfer speeds up to 24 Mbit/s
- Bluetooth link - used for negotiation and establishment



# Mobile phones and network technologies

## Low power wireless technologies: Near Field Communication (NFC)

- Allows for simplified transactions, data exchange, and wireless connections between two devices in close proximity
- 2006 Nokia 6131 - first NFC phone
- Main application - mobile payment
- Support added to Android starting from 2.3 platform



# Mobile phones and network technologies

## Activity 1

**Compare Wi-Fi to Bluetooth and NFC in terms of access range (distance)?**



# Mobile phones and network technologies

- **WiFi:**

*An access point compliant with either 802.11b or 802.11g, using the stock antenna might have a range of 100 m (330 ft). The same radio with an external semi parabolic antenna (15 dB gain) might have a range over 20 miles.*

- **Bluetooth:**

*Officially Class 3 radios have a range of up to 1 metre (3 ft), Class 2, most commonly found in mobile devices, 10 metres (33 ft), and Class 1, primarily for industrial use cases, 100 metres (300 ft). Bluetooth Marketing qualifies that Class 1 range is in most cases 20–30 metres (66–98 ft), and Class 2 range 5–10 metres (16–33 ft).*

- **NFC:**

*NFC is a set of short-range wireless technologies, typically requiring a separation of 10 cm or less.*

# Android OS

# Android OS

## What is Android?

- Mobile operating system based on Linux.
- Developed by a start-up company named “Android”
- Bought by Google in 2005.



Source: [www.androidshack.com](http://www.androidshack.com)

# Android OS

## Android architecture

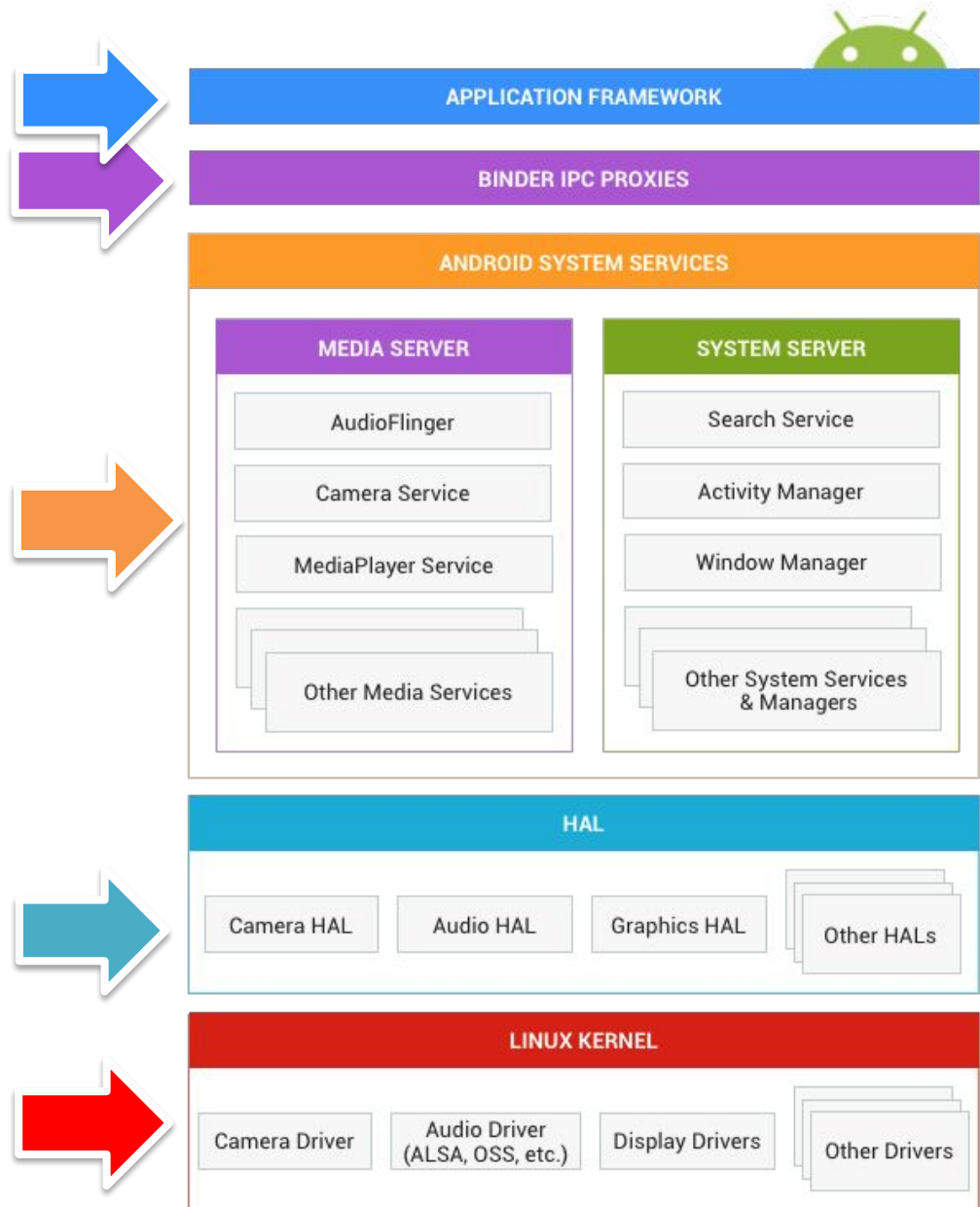
Most often used by application developers

Allows framework to cross process boundaries and call into Android system services code

APIs communicates with system services to access underlying hardware

**Hardware Abstraction Layer**  
Defines a standard interface

Contains all of the low level device drivers



# Android versions and features

# Android versions and features

Version	Code Name
<b>Android 1.0</b>	(No codename)
<b>Android 1.1</b>	Petit Four
<b>Android 1.5</b>	<b>C</b> <b>CupCake</b>
<b>Android 1.6</b>	<b>D</b> <b>Donut</b>
<b>Android 2.0/2.1</b>	<b>E</b> <b>Eclair</b>
<b>Android 2.2</b>	<b>F</b> <b>Froyo</b>
<b>Android 2.3</b>	<b>G</b> <b>Ginger Bread</b>
<b>Android 3.0/3.1/3.2</b>	<b>H</b> <b>Honeycomb</b>
<b>Android 4.0</b>	<b>I</b> <b>Ice Cream Sandwich</b>
<b>Android 4.1/4.2/4.3</b>	<b>J</b> <b>Jelly Bean</b>
<b>Android 4.4</b>	<b>K</b> <b>Kit Kat</b>
<b>Android 5.0</b>	<b>L</b> <b>Lollipop</b>
<b>Android 6.0</b>	<b>M</b> <b>Marshmallow</b>
<b>Android 7.0</b>	<b>N</b> <b>Nougat</b>
<b>Android 8.0 (beta)</b>	<b>O</b> <b>Orio</b>

# Android P?





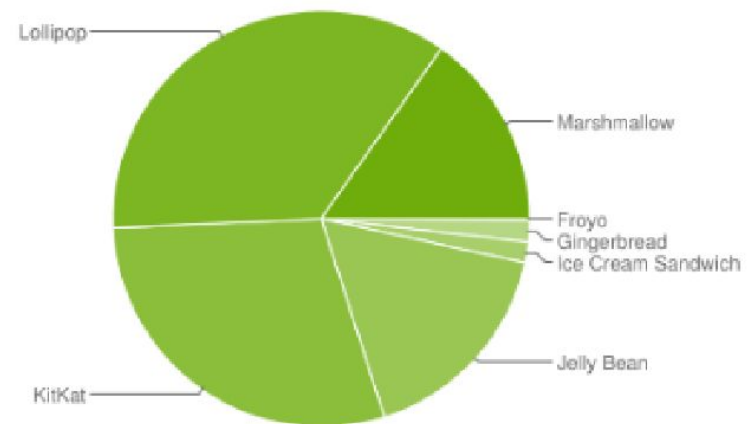
<https://www.android.com/versions/oreo-8-0/>



# Android versions and features

## Distribution of Android versions

Version	Codename	API	Distribution
2.2	Froyo	8	0.1%
2.3.3 - 2.3.7	Gingerbread	10	1.7%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	1.6%
4.1.x	Jelly Bean	16	6.0%
4.2.x		17	8.3%
4.3		18	2.4%
4.4	KitKat	19	29.2%
5.0	Lollipop	21	14.1%
5.1		22	21.4%
6.0	Marshmallow	23	15.2%



*Data collected during a 7-day period ending on August 1, 2016.  
Any versions with less than 0.1% distribution are not shown.*

<https://developer.android.com/about/dashboards/index.html>

# Introduction to Android apps development

# Introduction to Android apps development

## Android Studio: Features

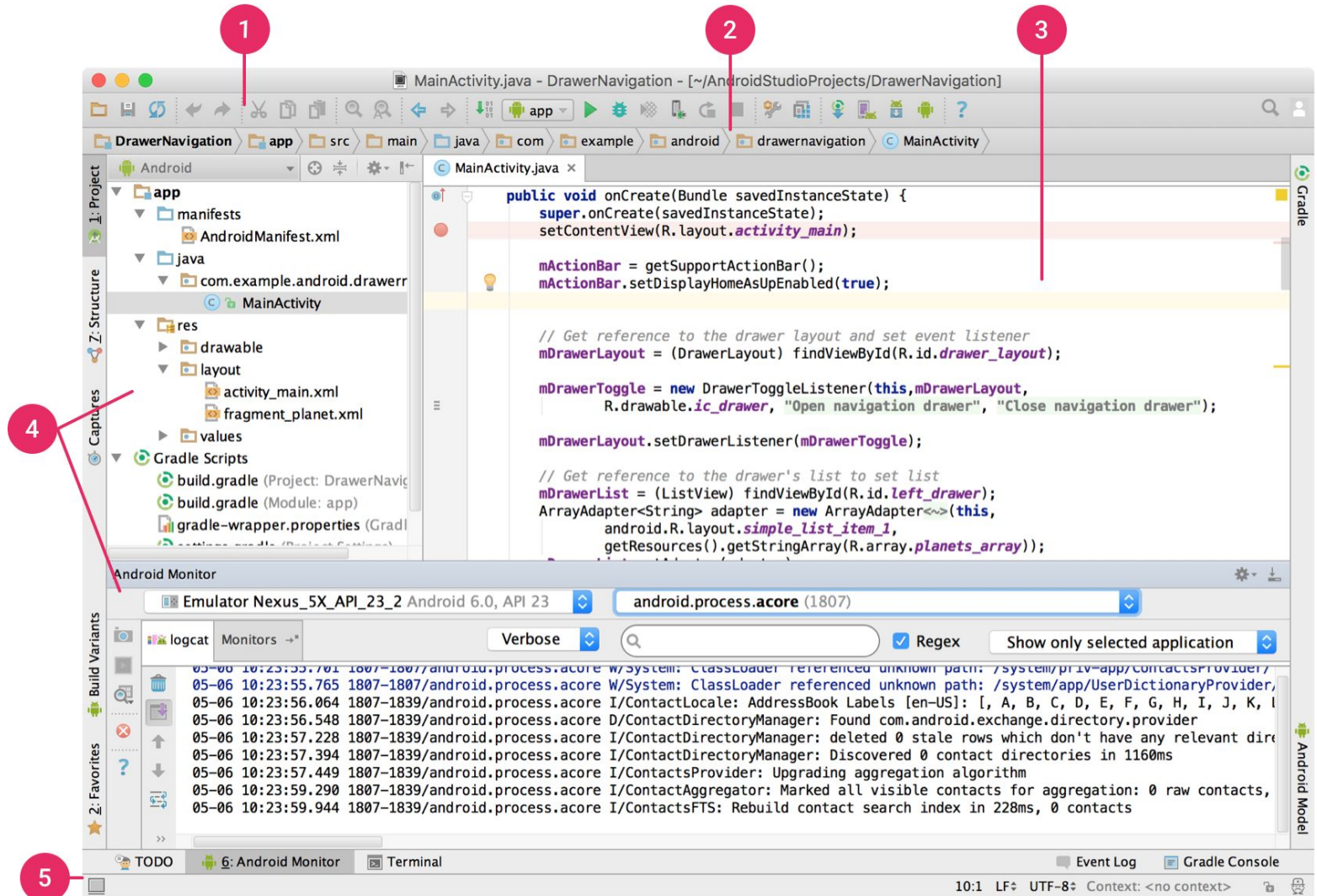
(Integrated Development Environment (IDE) for Android app development)

- ✓ Flexible Gradle-based build system
- ✓ Fast and feature-rich emulator
- ✓ Unified environment for development of all Android devices
- ✓ Instant Run to push changes to your running app
- ✓ Code templates and GitHub integration Extensive testing tools and frameworks
- ✓ Lint tools to catch performance, usability, version compatibility, and other problems
- ✓ C++ and NDK support
- ✓ Built-in support for Google Cloud Platform

*Reference: <https://developer.android.com/studio/intro/index.html>*

# Introduction to Android apps development

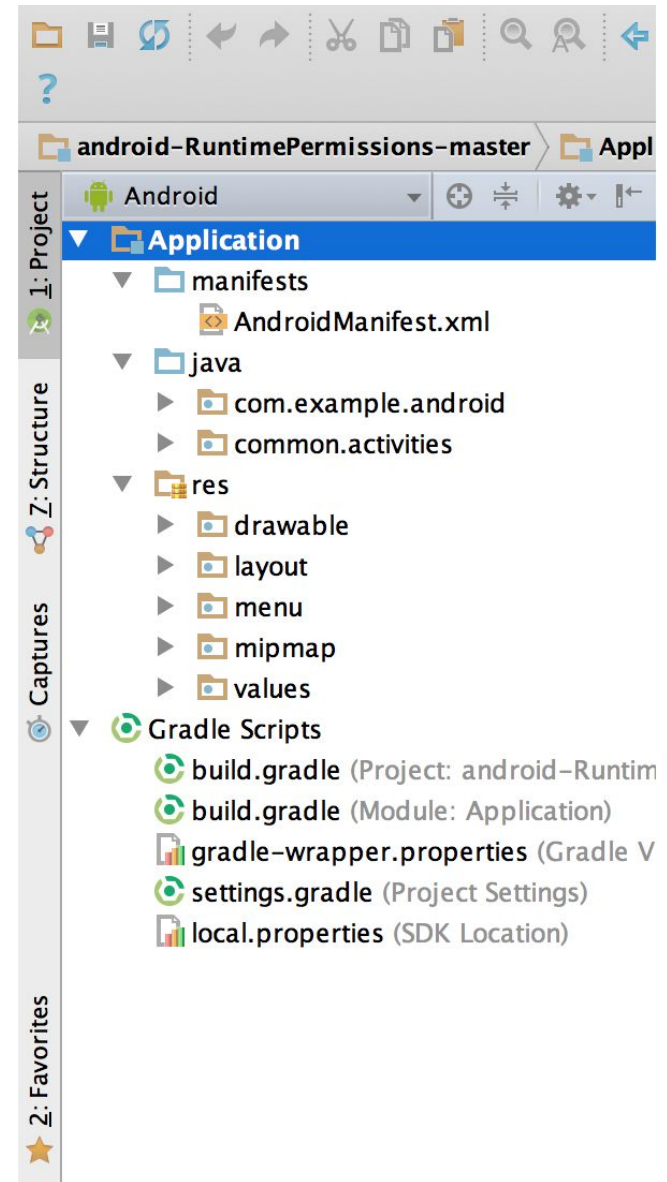
## Android Studio: User interface



# Introduction to Android apps development

## App directory structure

- Each project in Android Studio contains one or more modules with source code files and resource files.
- Types of modules include:
  - Android app modules
  - Library modules
  - Google App Engine modules

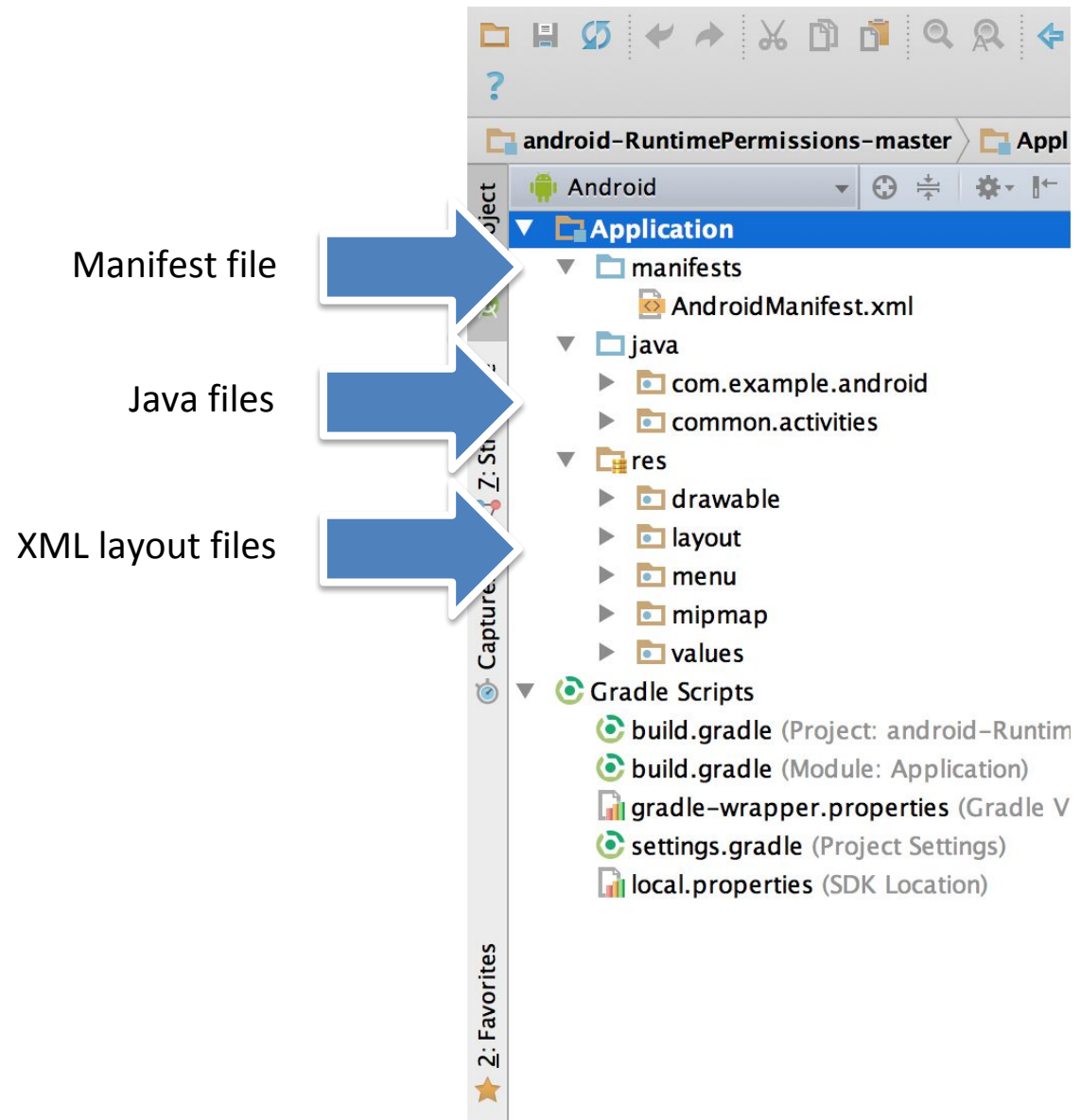


Reference: <https://developer.android.com/studio/intro/index.html>



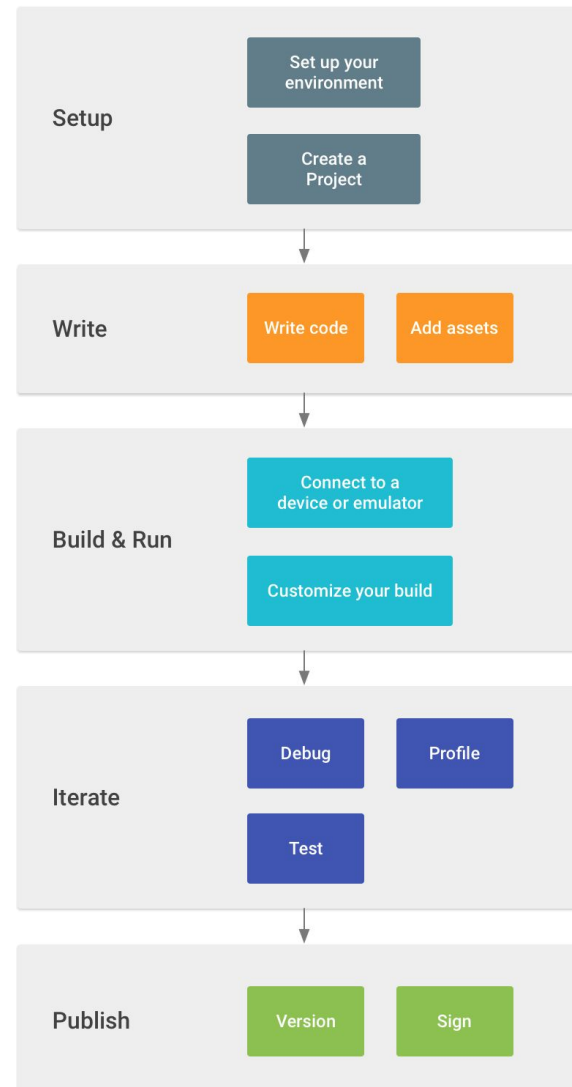
# Introduction to Android apps development

## Multiple entry points



# Introduction to Android apps development

## Developer workflow basics




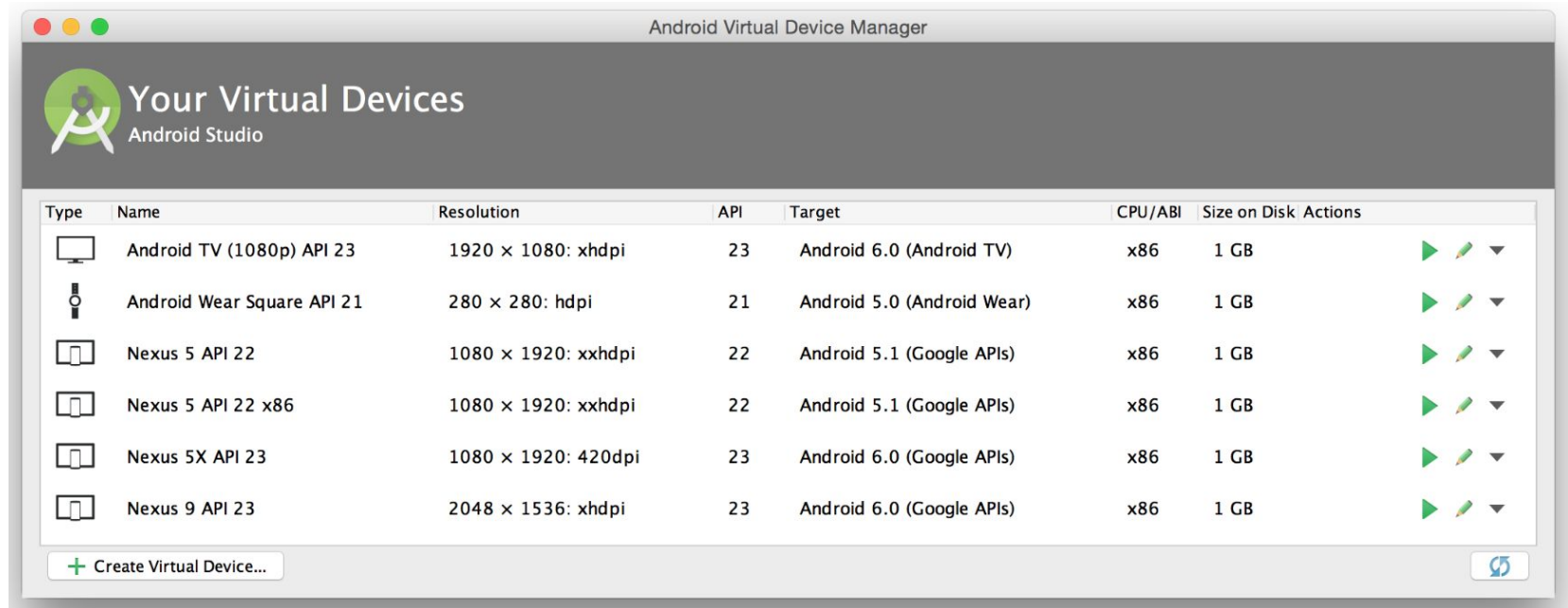
Reference: <https://developer.android.com/studio/workflow.html>

# Introduction to Android apps development

## Creating an Android Virtual Device (AVD)

To run the AVD Manager:

- In Android Studio, select **Tools > Android > AVD Manager**, or
- Click AVD Manager  in the toolbar.



Reference: <https://developer.android.com/studio/run/managing-avds.html>



# End of Module 1