# What is Android?

- mobile operating system maintained by **Google**
  - □ originally purchased from Android, Inc. in 2005
- runs on phones, tablets, watches, TVs, …
- based on **Java** (dev language) and **Linux** (kernel)

- the #1 mobile OS worldwide
  - □ and now #1 overall OS worldwide!
- has over 1 million apps published in Play Store

- code is released as open source (periodically)
  - □ easier to customize, license, pirate, etc. than iOS
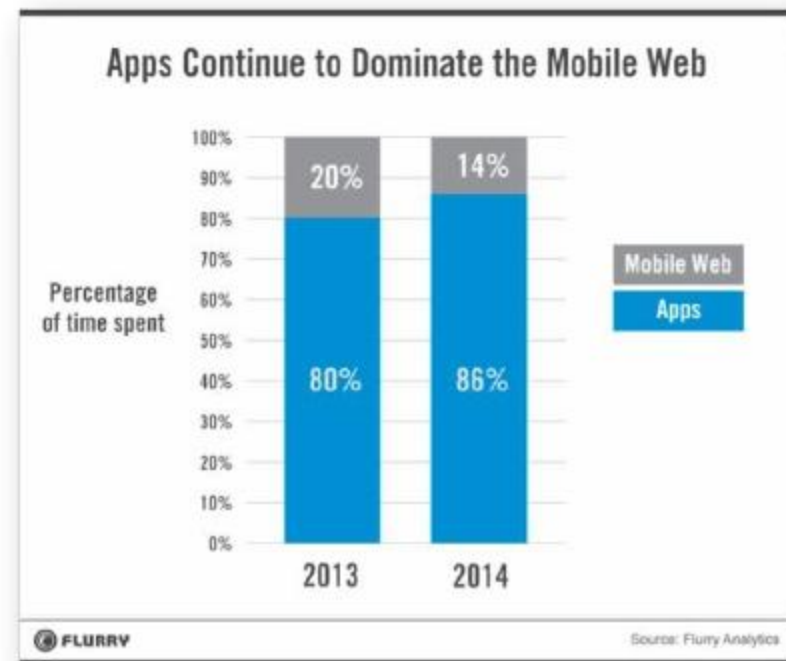
# Why develop for Android?

- Why not just write a **web site**? Android has a browser...
  - ☐ better, snappier UI with a more consistent user experience
  - ☐ able to use different kinds of widgets/controls than in a web page
  - ☐ more direct access to the device's hardware (camera, GPS, etc.)
  - ☐ users highly prefer apps over mobile web browsing



Mobile Web App



Native App on iOS



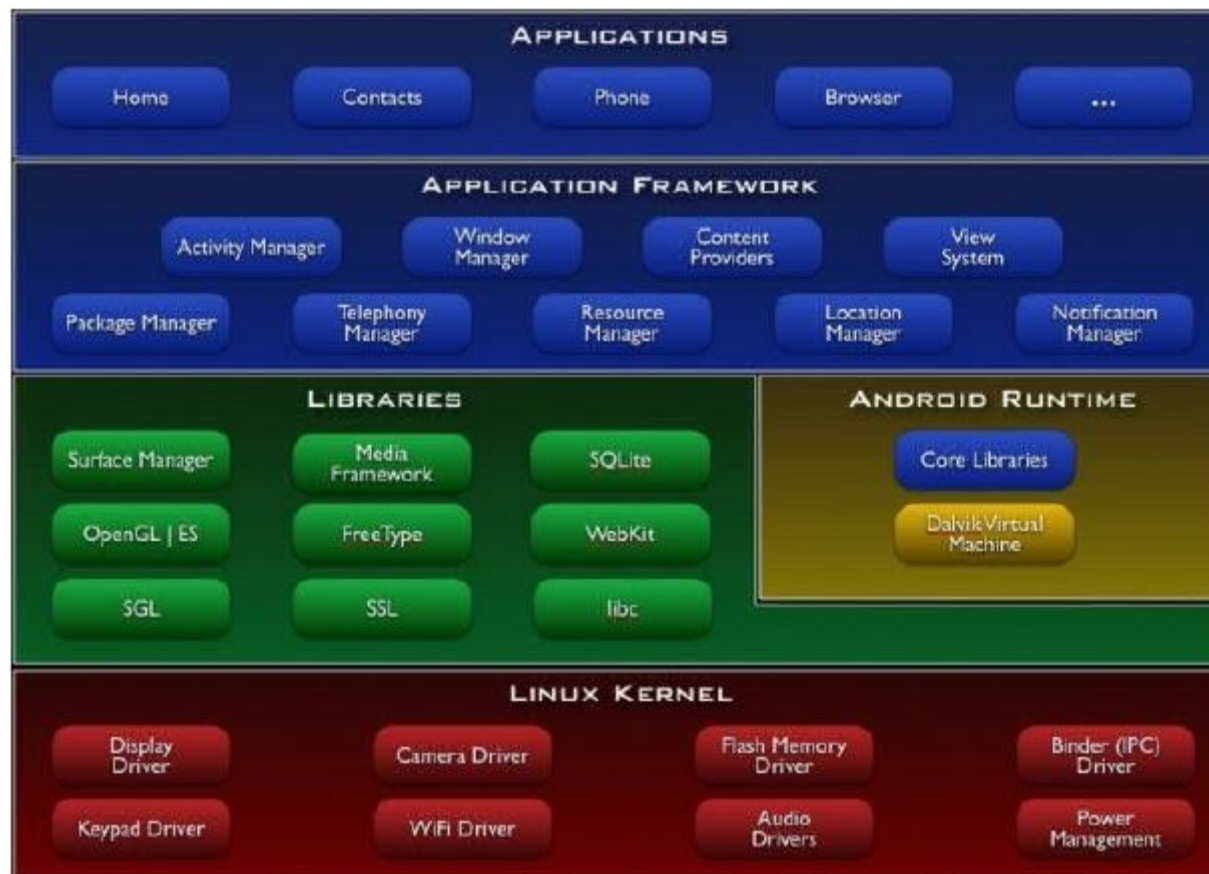Apps Continue to Dominate the Mobile Web

# Why not iOS?

- Why not write apps for **iOS**, which runs on iPhones and iPads?

  ☐ familiar programming language
  (Java instead of Obj-C or Swift)

  ☐ free developer tools
  (Apple charges $$$ for theirs)

  ☐ more liberated app store
  (can make an app and put on your phone or others')

  ☐ Android has a larger install base

  ☐ there is already a **CS 193P** class for building iOS apps!  Take it!
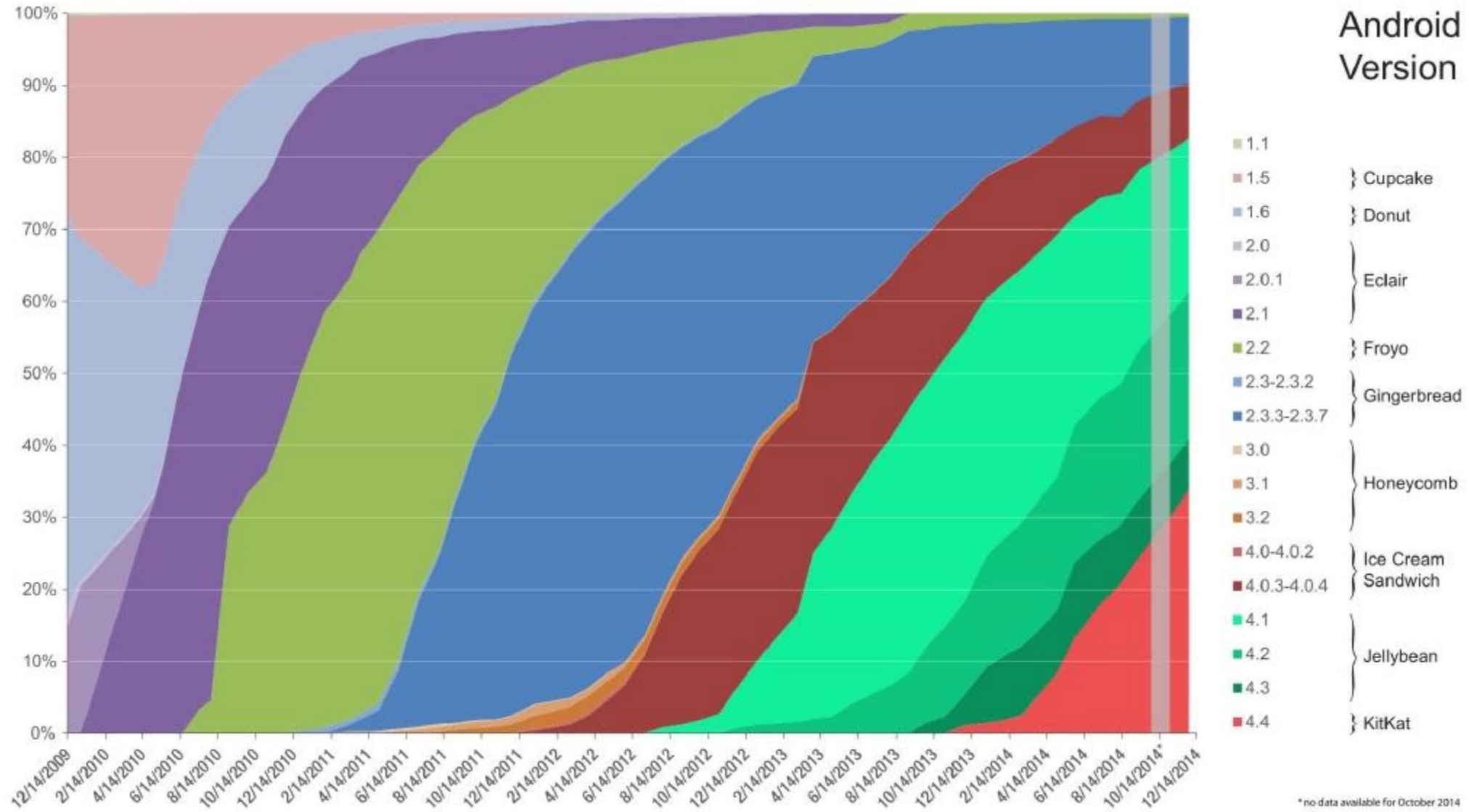
# Android architecture

- Android OS provides libraries for many system features like contacts, phone dialing, notifications, 2D/3D graphics, database access, security / encryption, camera, audio, input/output, ...
  - □ Android Java code is compiled into a special **Dalvik** binary format

# Android version history (link)

| Version | API level | Date | Name |
|---------|-----------|------|------|
| 1.0-1.1 | 1,2 | Sep 2008 | none |
| 1.5 | 3 | Apr 2009 | Cupcake |
| 1.6 | 4 | Sep 2009 | Donut |
| 2.0-2.1 | 5,6,7 | Oct 2009 | Eclair |
| 2.2 | 8 | May 2010 | Froyo |
| 2.3 | 9,10 | Dec 2010 | Gingerbread |
| 3.0 | 11,12,13 | Feb 2011 | Honeycomb |
| 4.0 | 14,15 | Oct 2011 | Ice Cream Sandwich |
| 4.1-4.3 | 16,17,18 | Jun 2012 | Jelly Bean |
| 4.4 | 19,20 | Sep 2013 | Kit Kat |
| 5.0 | 21 | Jun 2014 | Lollipop |

# Android version distribution

# Version issues

- Check your phone's version of Android:
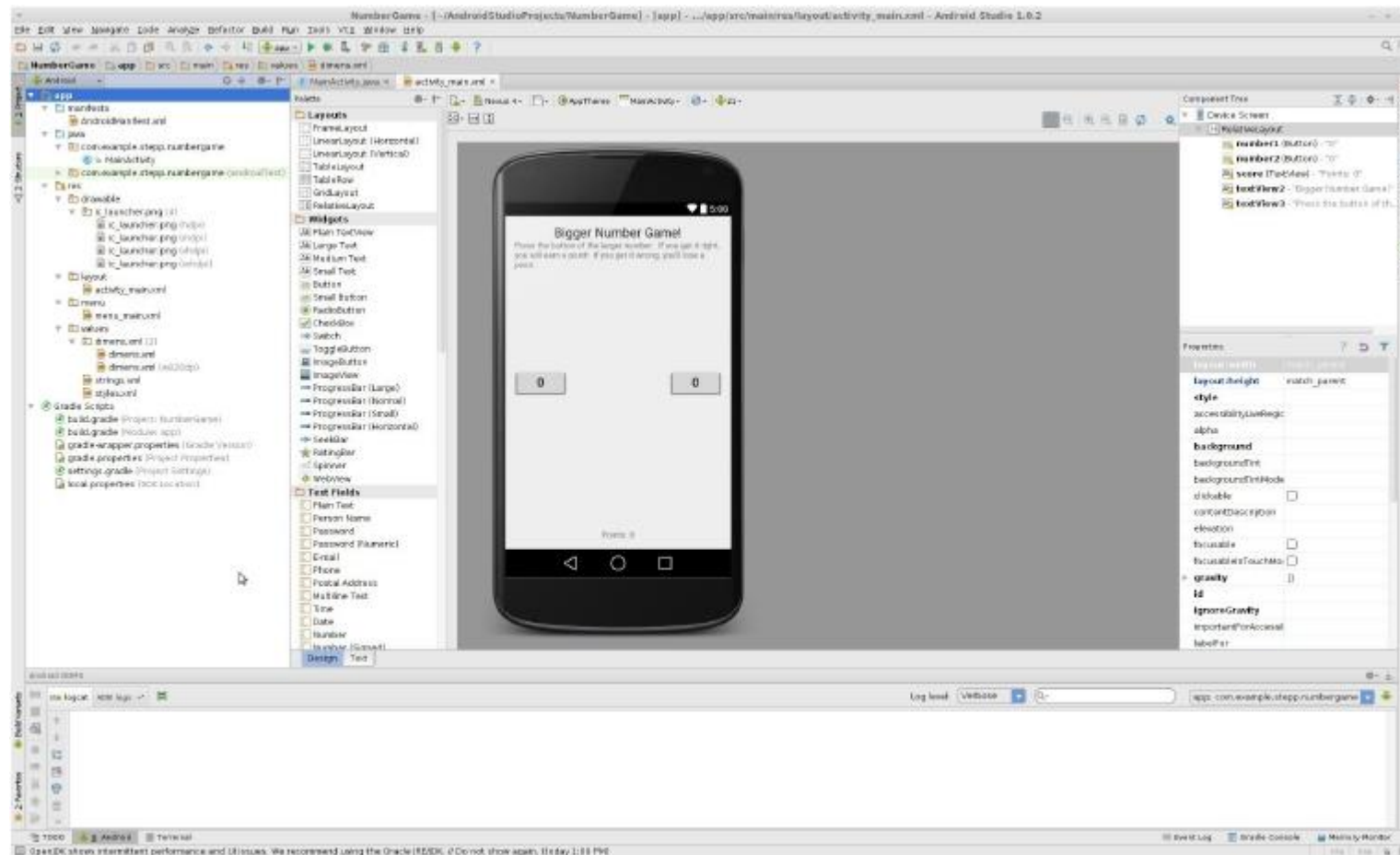  - ☐ Settings → System → About Device → Android version
  - ☐ "Why wouldn't my phone have the newest Android version? Can't I just update it?"

- Several companies affect whether your device is up-to-date:
  - ☐ Google;  phone manufacturer;  service provider;  ...



- If any company in the chain doesn't want to push out an update for your device, it can become out of date.
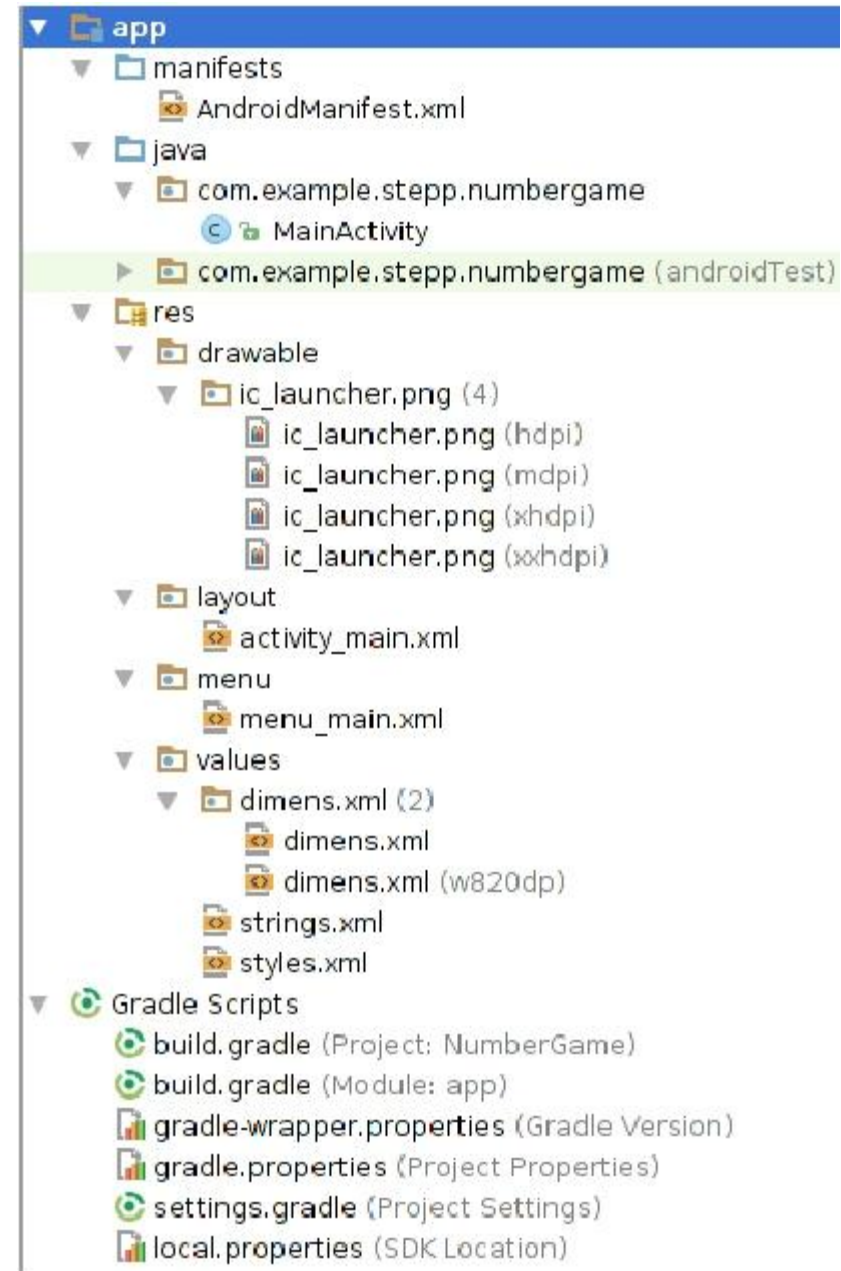
# Android Studio

- Google's official Android IDE, in v1.0 as of November 2014
  - replaces previous Eclipse-based environment
  - based on IntelliJ IDEA editor;  free to download and use

# Project structure

- **AndroidManifest.xml**
  - ☐ overall project config and settings

- **src/java/**...
  - ☐ source code for your Java classes

- **res**/... = resource files  *(many are **XML**)*

  - ☐ drawable/ = images
  - ☐ layout/ = descriptions of GUI layout
  - ☐ menu/ = overall app menu options
  - ☐ values/ = constant values and arrays
  - ☐ strings = localization data
  - ☐ styles = general appearance styling

- **Gradle**
  - ☐ a build/compile management system
  - ☐ **build.gradle** = main build config file

▼ ☐ app
  ▼ ☐ manifests
    ☐ AndroidManifest.xml
  ▼ ☐ java
    ▼ ☐ com.example.stepp.numbergame
      Ⓒ ☐ MainActivity
    ▶ ☐ com.example.stepp.numbergame (androidTest)
  ▼ ☐ res
    ▼ ☐ drawable
      ▼ ☐ ic_launcher.png (4)
        ☐ ic_launcher.png (hdpi)
        ☐ ic_launcher.png (mdpi)
        ☐ ic_launcher.png (xhdpi)
        ☐ ic_launcher.png (xxhdpi)
    ▼ ☐ layout
      ☐ activity_main.xml
    ▼ ☐ menu
      ☐ menu_main.xml
    ▼ ☐ values
      ▼ ☐ dimens.xml (2)
        ☐ dimens.xml
        ☐ dimens.xml (w820dp)
      ☐ strings.xml
      ☐ styles.xml
  ▼ ☐ Gradle Scripts
    ☐ build.gradle (Project: NumberGame)
    ☐ build.gradle (Module: app)
    ☐ gradle-wrapper.properties (Gradle Version)
    ☐ gradle.properties (Project Properties)
    ☐ settings.gradle (Project Settings)
    ☐ local.properties (SDK Location)

# Virtual Devices (AVDs)

- allows you to run your project in an emulator

  - ☐ a software simulation of an entire Android tablet, phone, watch

  - ☐ when you click the "Run" button in Android Studio,
    it builds your app, installs it on the virtual device, and loads it

- must set up virtual device first
  in Android Studio

- alternative: install your app
  on your actual Android device!

  - ☐ pro: app will run faster,
    better test of real execution

  - ☐ con: requires Android device,
    must be plugged into dev PC

# App build process