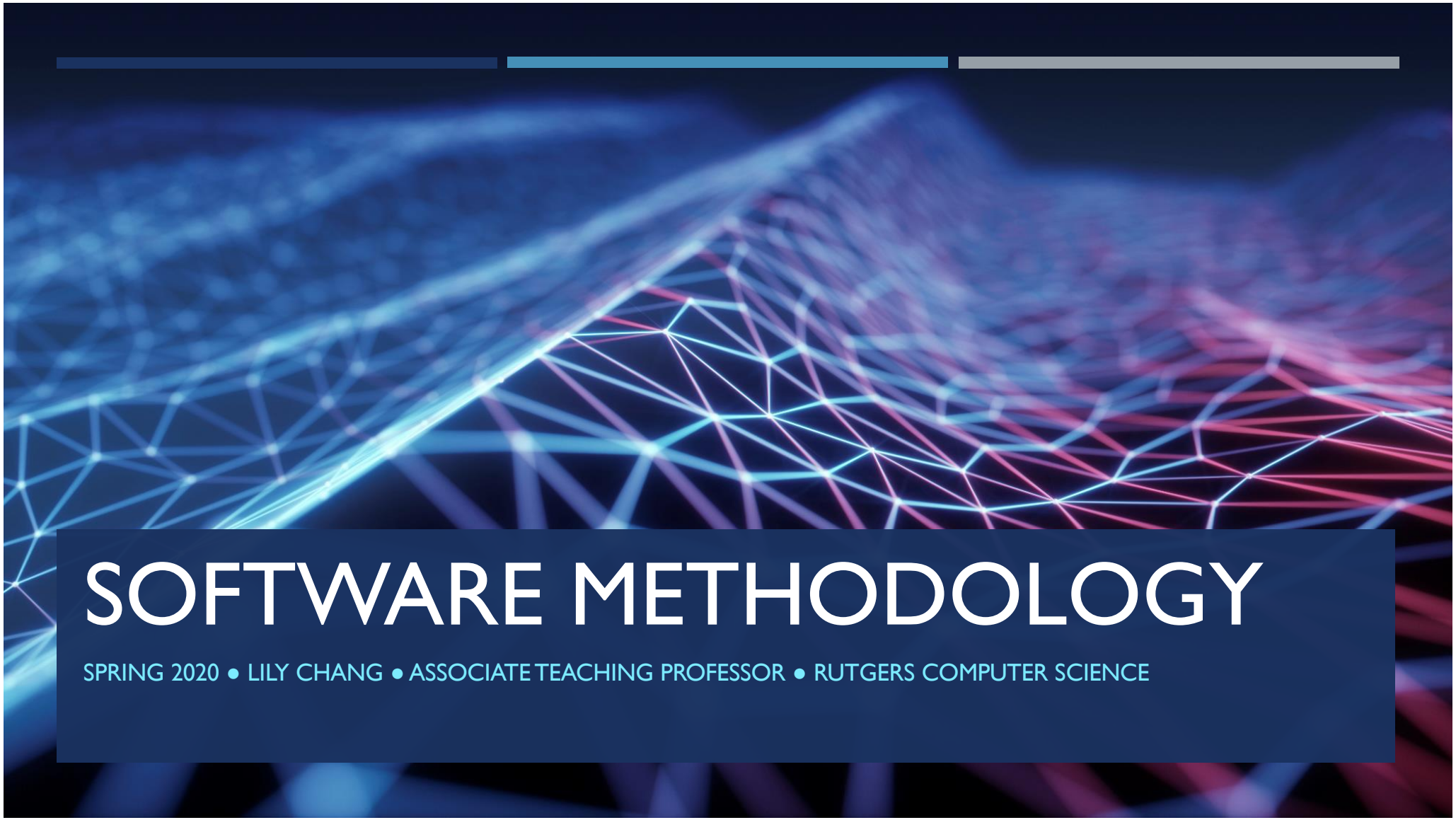


SOFTWARE METHODOLOGY

SPRING 2020 • LILY CHANG • ASSOCIATE TEACHING PROFESSOR • RUTGERS COMPUTER SCIENCE

ANDROID APP DEVELOPMENT BASICS

ANDROID APP DEVELOPMENT

- What is Android?
- Android versions and its feature set
- The Android architecture
- The various Android devices on the market
- The Android Market application store
- How to obtain the tools and SDK for developing Android applications
- How to develop your first Android application

WHAT IS ANDROID?

- A mobile operating system that is based on a modified version of Linux.
- Originally developed by a startup of the same name, Android, Inc, which was acquired by Google in 2005
- Most of the Android code was released under the open source Apache License
- The main advantage to adopting Android is that it offers a unified approach to mobile application development

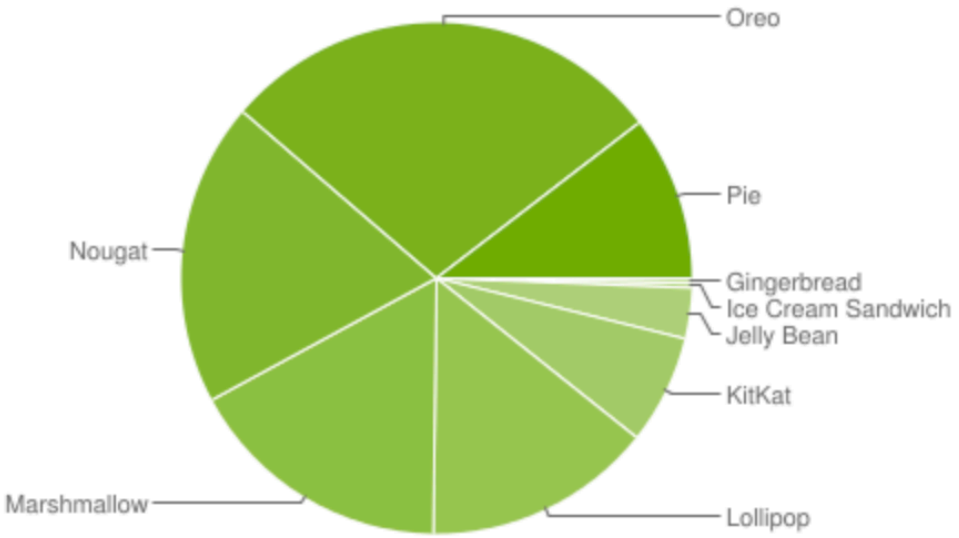
ANDROID VERSIONS

https://developer.android.com/about/dashboards

Version	Codename	API	Distribution
2.3.3 - 2.3.7	Gingerbread	10	0.3%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	0.3%
4.1.x	Jelly Bean	16	1.2%
4.2.x		17	1.5%
4.3		18	0.5%
4.4	KitKat	19	6.9%
5.0	Lollipop	21	3.0%
5.1		22	11.5%
6.0	Marshmallow	23	16.9%
7.0	Nougat	24	11.4%
7.1		25	7.8%
8.0	Oreo	26	12.9%
8.1		27	15.4%
9	Pie	28	10.4%

ANDROID VERSIONS

- Distribution of versions



Data collected during a 7-day period ending on May 7, 2019.
Any versions with less than 0.1% distribution are not shown.

ANDROID VERSIONS

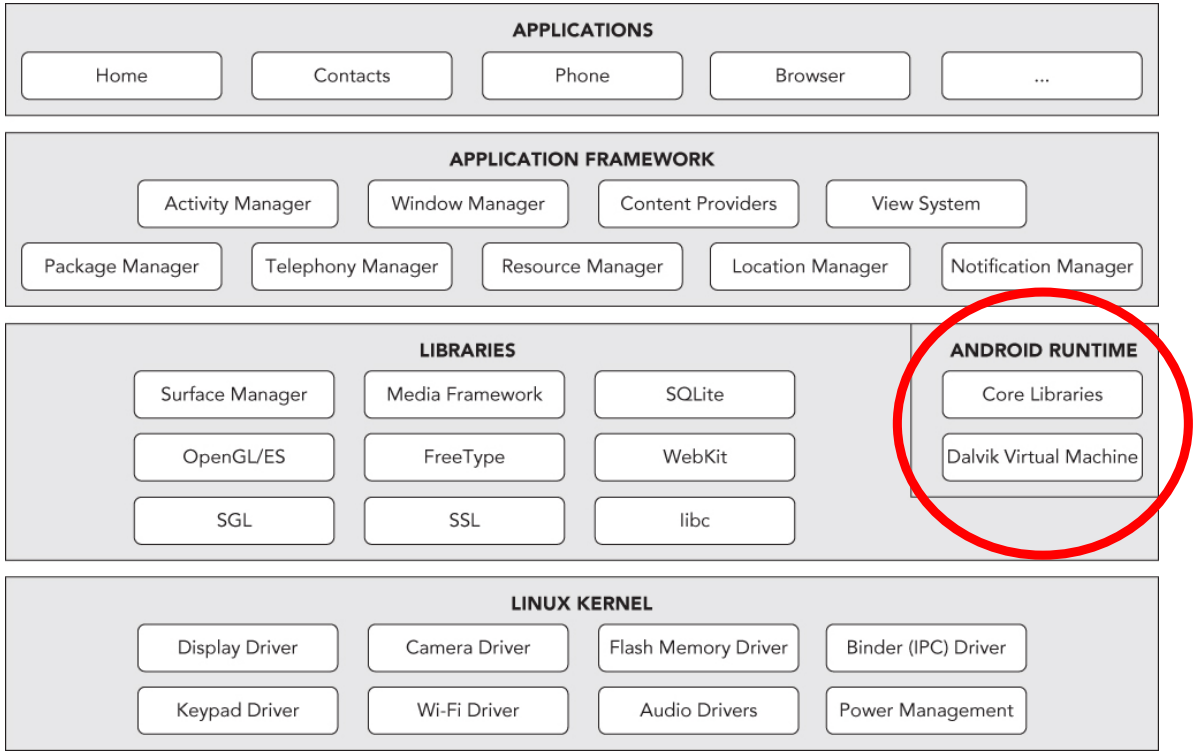
- One important thing to keep in mind as you are looking at Android versions is that each version has its own features and APIs (application programming interfaces)
- If your application is written for the newest version of Android, and it uses an API that was not present in an older version of Android, then only devices running that newer version of Android will be able to use your application

ANDROID IS OPEN SOURCE

- Freely available to manufacturers for customization, there are no fixed hardware or software configurations
- Base Android OS supports many features, including
  - Storage—SQLite, a lightweight relational database
  - Connectivity—GSM/EDGE, IDEN, CDMA, EV-DO, UMTS, Bluetooth (includes A2DP and AVRCP), Wi-Fi, LTE, and WiMAX
  - Messaging—Both SMS and MMS
  - Media support H.263, H.264 (in 3GP or MP4 container), MPEG-4 SP, AMR, AMR-WB (in 3GP container), AAC, HE-AAC (in MP4 or 3GP container), MP3, MIDI, Ogg Vorbis, WAV, JPEG, PNG, GIF, and BMP.
  - Hardware support—Accelerometer sensor, camera, digital compass, proximity sensor, and GPS
  - Multi-touch—Multi-touch screens.
  - Multi-tasking—Multi-tasking applications.
  - Tethering—Sharing of Internet connections as a wired/wireless hotspot.
- Android's web browser is based on the open source WebKit and Chrome's JavaScript engine.

ARCHITECTURE OF ANDROID

- Android runtime provides a set of core libraries that enable developers to write Android apps using the Java programming language
- Dalvik virtual machine was used prior to version 5
- Android Runtime (ART) replaced Dalvik started version 5



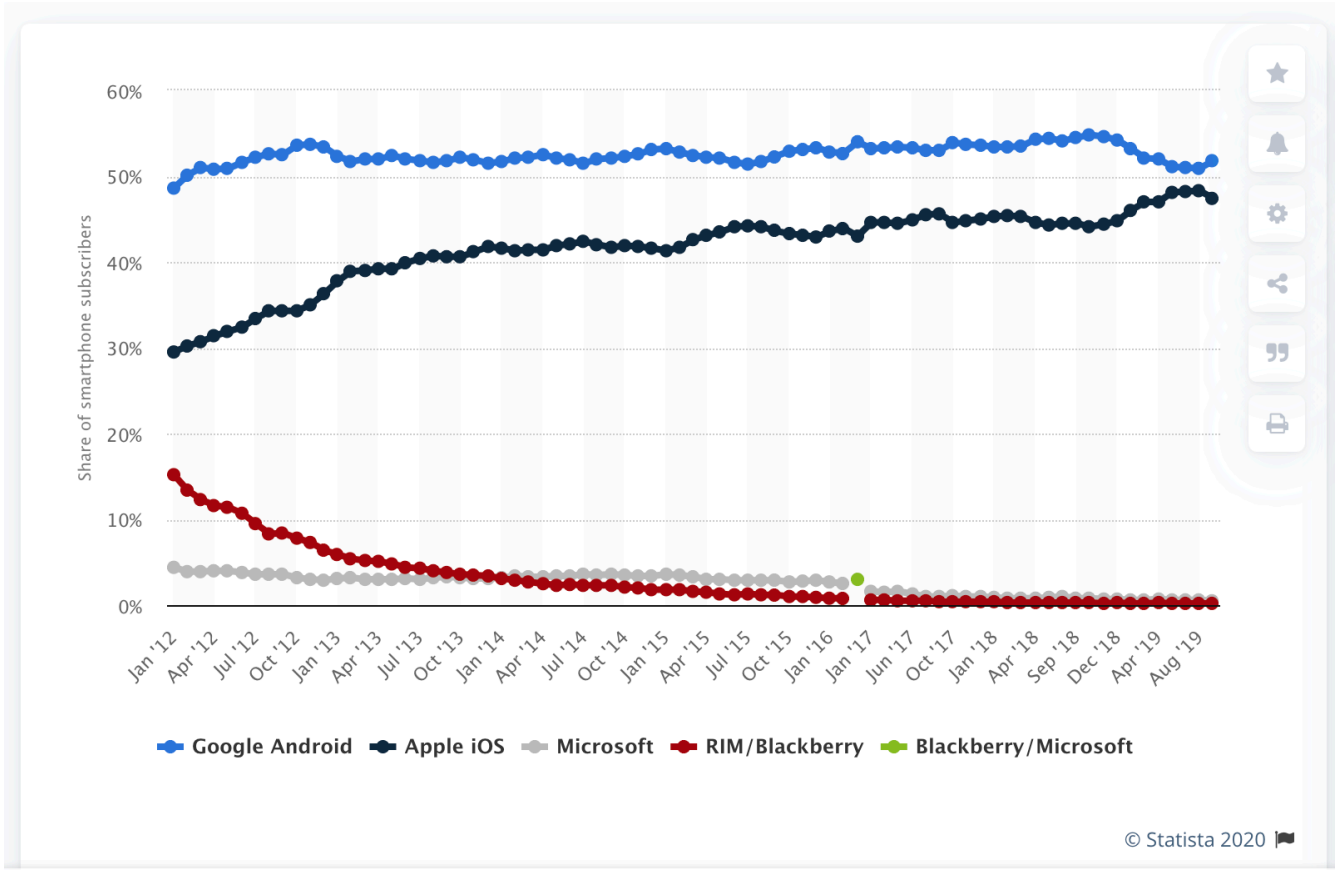
ANDROID DEVICES IN THE MARKET

- Smartphones
- Tablets
- E-reader devices
- Internet TVs
- Automobiles
- Smartwatches

THE ANDROID MARKET

- One of the main factors determining the success of a smartphone platform is the applications that support it.
- It is clear from the success of the iPhone that applications play a very vital role in determining whether a new platform swims or sinks. Also, making these applications accessible to the general user is extremely important.
- Users can simply use the Google Play application that is preinstalled on their Android devices to directly download third-party applications to their devices. Both paid and free applications are available in the Google Play Store

THE ANDROID MARKET



OBTAINING THE REQUIRED TOOLS

- For Android development, you can use a Mac, a Windows PC, or a Linux machine.
- You can freely download all the necessary tools
  - Java JDK
  - Android Studio: https://developer.android.com/studio ➔ IDE + Android SDK
    - IntelliJ includes the Android Studio IDE
    - Android devices don't run .class and .jar files. Instead, to improve speed and battery performance, Android devices use their own optimized formats for compiled code.
- Resources for Android developers: https://developer.android.com/
  - Some of the materials in this presentation are taken from this website

ANDROID APP DEVELOPMENT

- As a beginning Android programmer, there is a learning curve
- Android has a culture, which speaks Kotlin or Java (or a bit of both), but knowing Kotlin or Java is not enough
- Getting your head around Android requires learning many new ideas and techniques
  - There are good software engineering practices involved!!

KOTLIN VS. JAVA

- Official support for Kotlin for Android development was announced at Google I/O in 2017
- Since 2017, Kotlin has become widely adopted
- The Android framework team has released more and more Kotlin extensions for Android
- The Android framework was originally written in Java. This means most of the Android classes you interact with are Java
- Kotlin is interoperable with Java
- In May 2019, Google announced that the Kotlin programming language is now its preferred language for Android app developers

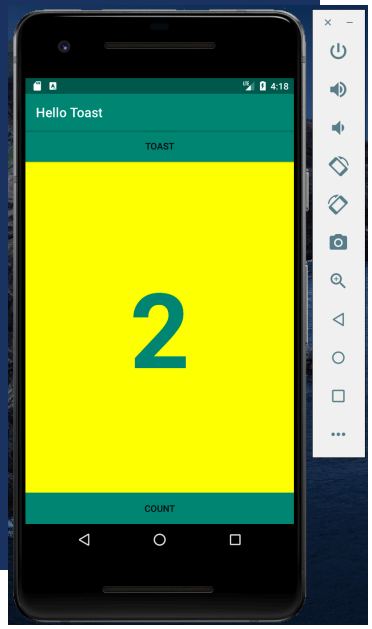
CREATING ANDROID VIRTUAL DEVICES (AVDS)

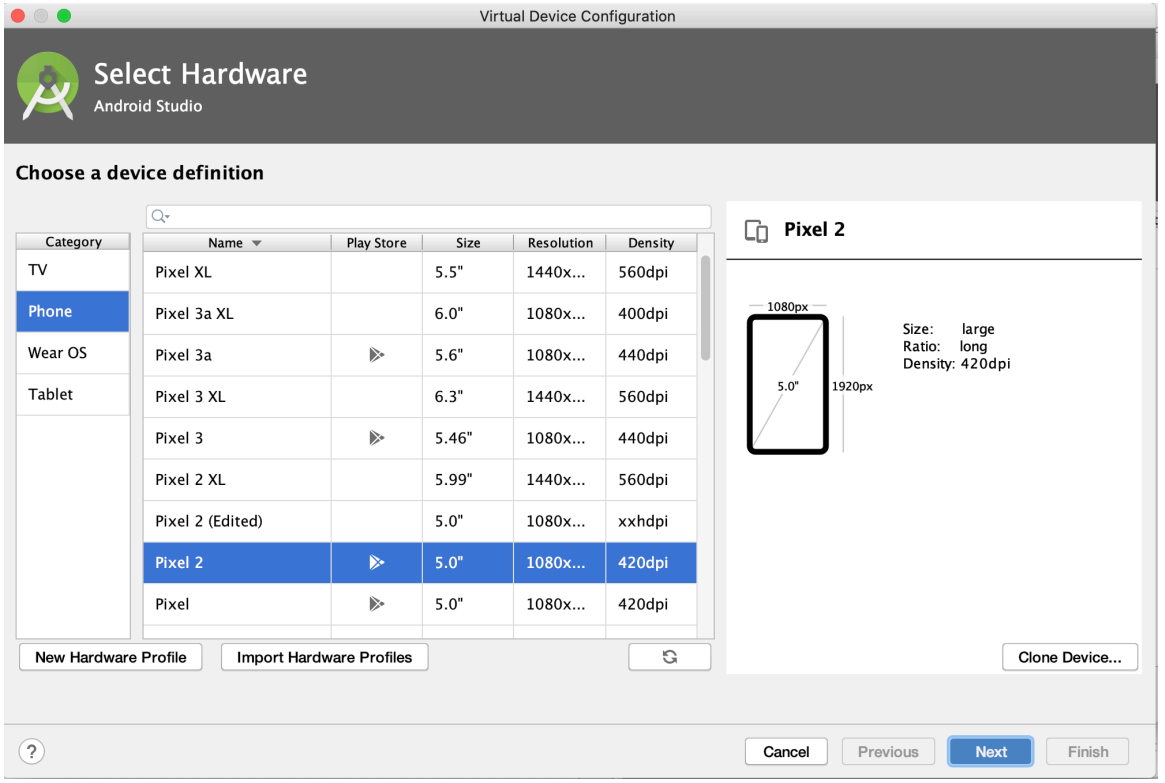
- Once you installed the Android Studio, the next step is to create an Android Virtual Device (AVD), which you use to test your Android applications
- An AVD is an emulator instance that enables you to model an actual device
- Each AVD consists of a hardware profile; a mapping to a system image; and emulated storage, such as a secure digital (SD) card
- The emulator is good for doing some generalized testing of your applications
  - Games (GPU heavy) or applications using sensors (GPS) cannot be simulated with the same speed or consistency
- You can create as many AVDs as you want to test your applications with different configurations

AVD MANAGER

- When you create your first Android project, you will be asked to create an AVD
- OR, select

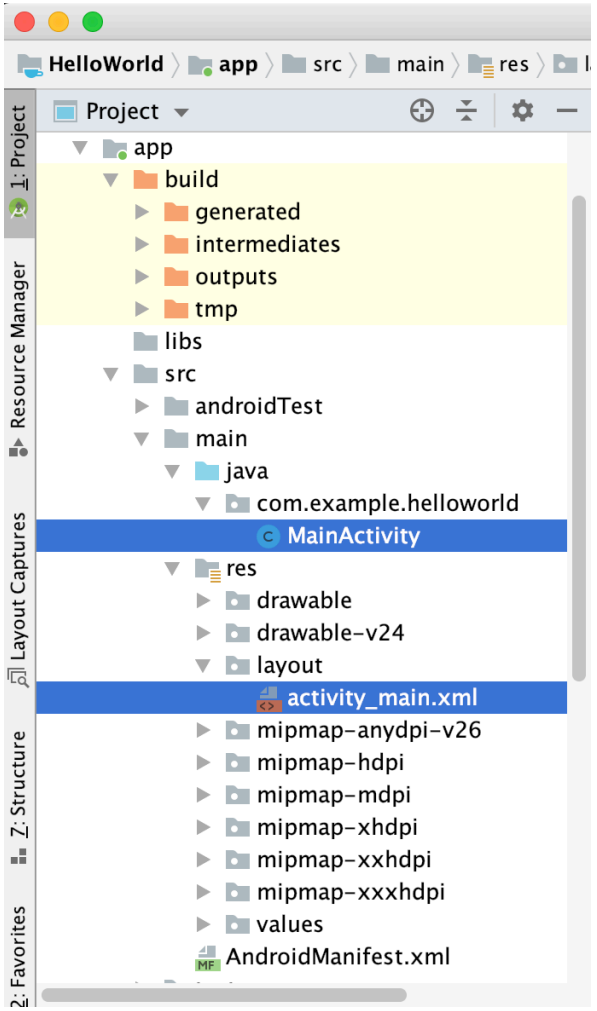
Tools/AVD Manager to add other emulators





ANDROID PROJECT STRUCTURE

- MainActivity.java (the controller)
- The layout activity_main.xml (the view)
- res folder
  - layout foler
  - drawable folder
    - Hold images with different resolutions and pixel densities (DPI)
  - values



THANK YOU