

Mobile Application Development

Produced
by

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Introducing Android





Agenda

- ❑ Background (and more)
- ❑ Quick tour of Android
- ❑ Setting up the Environment
- ❑ Android Apps vs iPhone Apps
- ❑ Books & References

Background



- ❑ Android is a comprehensive open source platform designed for mobile devices (more in a bit)
- ❑ It is championed by Google and owned by the Open Handset Alliance (next Slide)
- ❑ The goal of the alliance is to “accelerate innovation in mobile and offer consumers a richer, less expensive, and better mobile experience.”
(November 2007)



Mobile Operators



Software Companies



Commercialization Companies



ARM



Semiconductor Companies

GARMIN



Handset Manufacturers

Open Handset Alliance
<http://www.openhandsetalliance.com>



Background

- ❑ Android, along with iOS, is revolutionising the mobile space.
- ❑ Unlike iOS however, Android is an open platform that separates the hardware from the software that runs on it.
- ❑ This allows for a much larger number of devices to run the same applications and creates a much richer ecosystem for developers and consumers.



ANDROID WEAR



PHONES



TABLETS



ANDROID TV

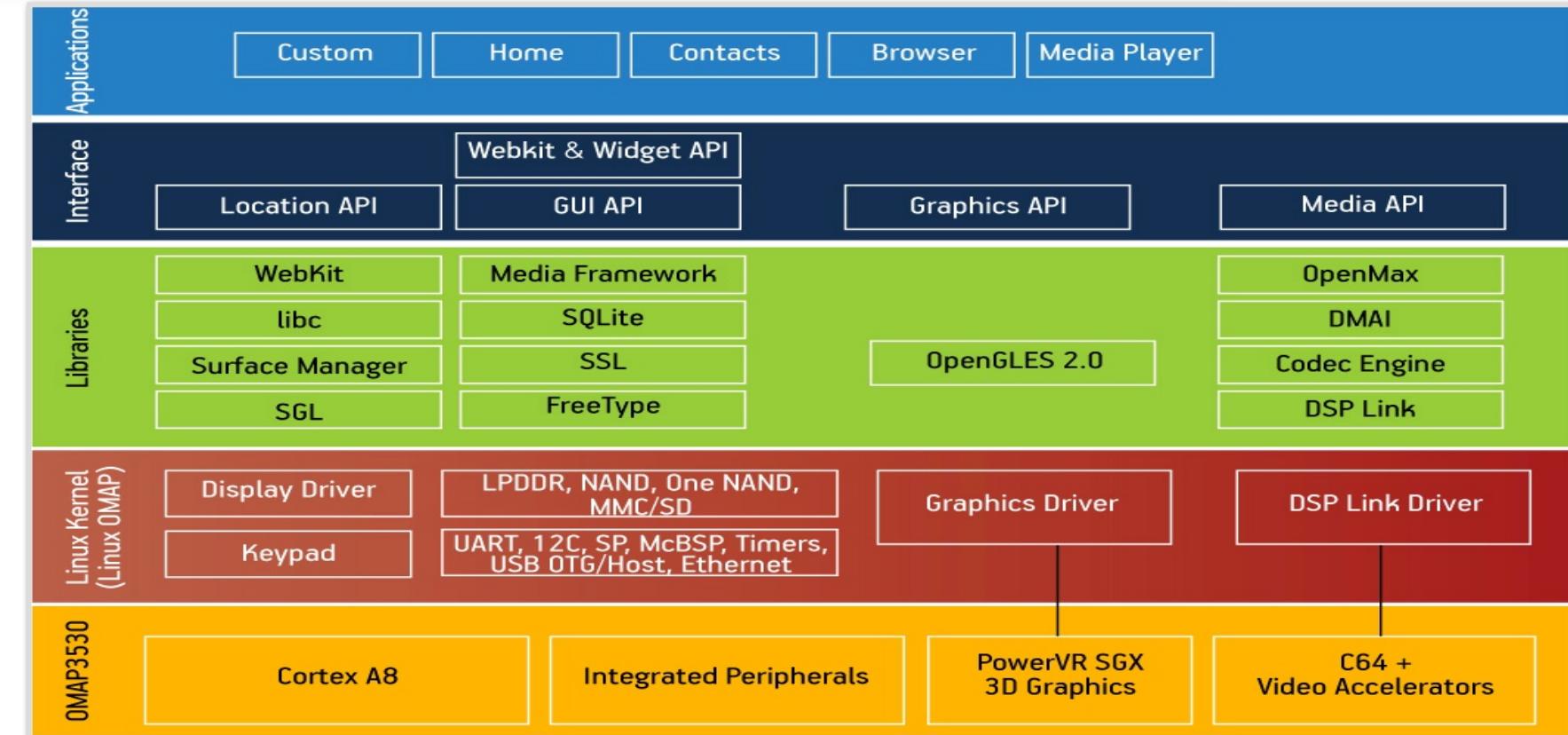


ANDROID AUTO



Comprehensive

- ❑ Android is a comprehensive platform, which means it is a complete software stack for a mobile device.



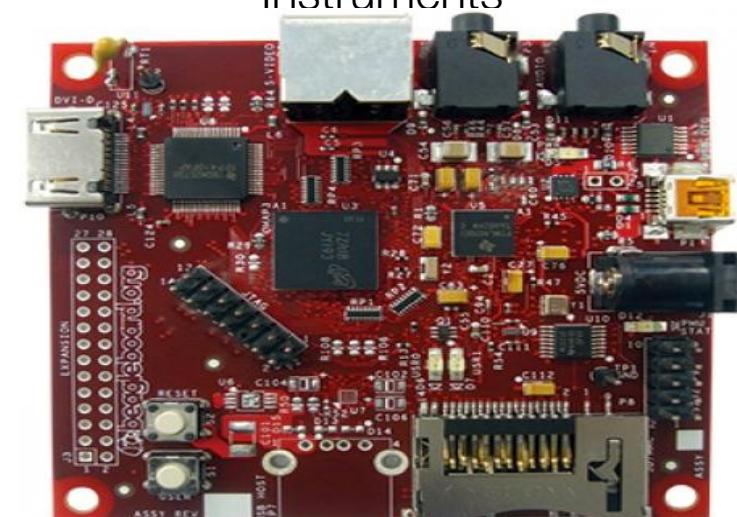
- ❑ Users can customize their phone experience substantially.
- ❑ Manufacturers can also customise the platform in substantial ways - even generating complete 'forks' of the original project (Amazon).



Open Source

- ❑ Android is an open source platform.
- ❑ Aside from the Linux kernel itself, Android is licensed under business-friendly licenses (Apache/MIT/BSD) so that others can freely extend it and use it for variety of purposes.
- ❑ Manufacturers can port Android OS to specific hardware. with minimal legal issues.
- ❑ Android has many hooks at various levels of the platform, allowing anyone to extend it in unforeseen ways.

BeagleBoard, a low-power open-source hardware single-board computer produced by Texas Instruments



Designed for Mobile Devices

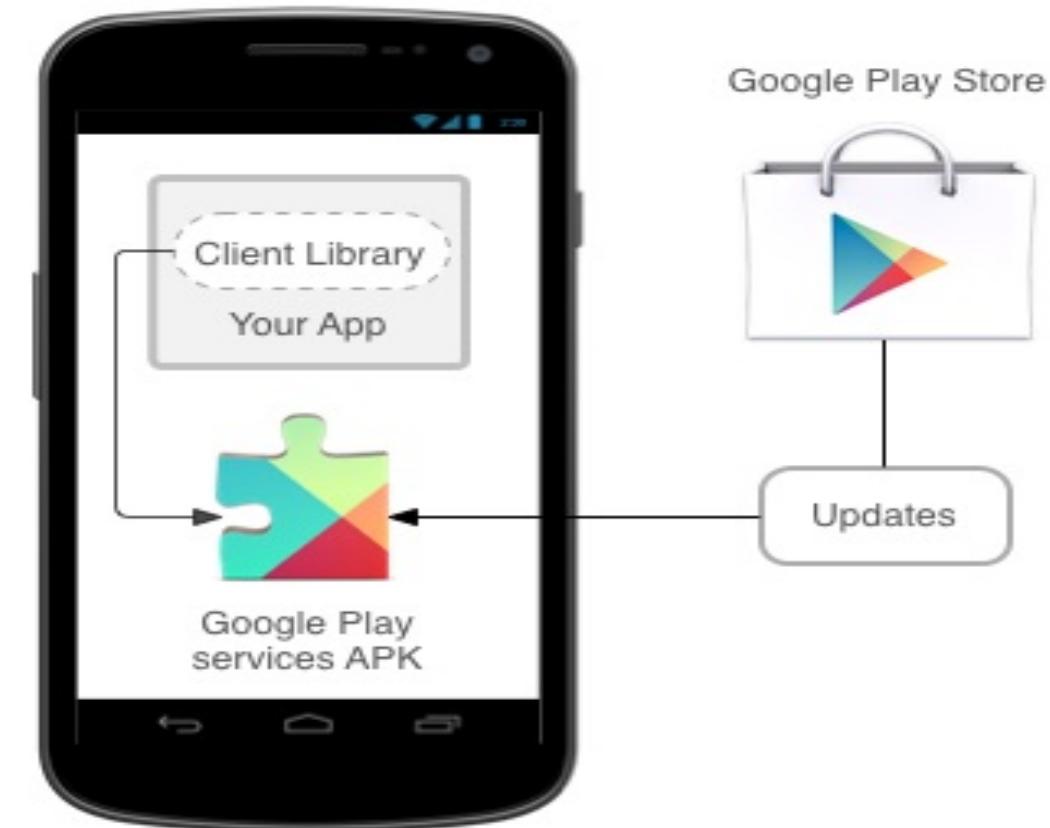
- ❑ When designing Android, the team looked at which mobile device constraints were likely *not going to change* for the foreseeable future:
 - *Battery power, and battery performance* is probably not going to get much better anytime soon.
 - In general, small size of mobile devices means that they will always be limited in terms of memory and speed.
 - However, a device's screen size, resolution, chipset may vary considerably
- ❑ These constraints have been taken into consideration throughout the platform.





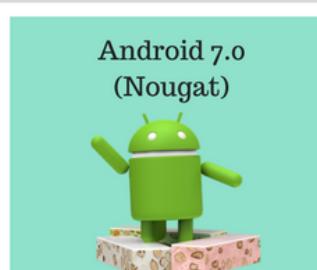
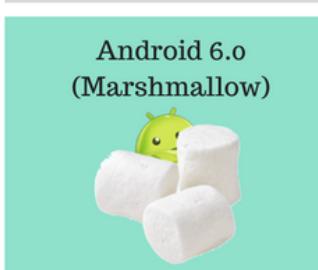
Compatibility & Google Play Services

- ❑ The major reason manufacturers would want to ensure Android compatibility is access to Google Play Services, and its rich set of apps.
- ❑ It allows apps to take advantage of the latest, Google-powered features such as Maps, Places, Google+, and more, with automatic platform updates distributed as an APK through the Google Play store.
- ❑ Makes it faster for phone to receive updates and easier for developers to integrate some new features into their apps.





Android History / Versions so Far *



Android 9.0
Pie
(API 28)



Versions – API Level *

- The Android version number itself partly tells the story of the software platform's major and minor releases. What is most important is the API level. Version numbers change all the time, sometimes because the APIs have changed, and other times because of minor bug fixes or performance improvements.
- As an application developer, you will want to make sure you know which API level your application is targeting in order to run. That API level will determine which devices can and cannot run your application.

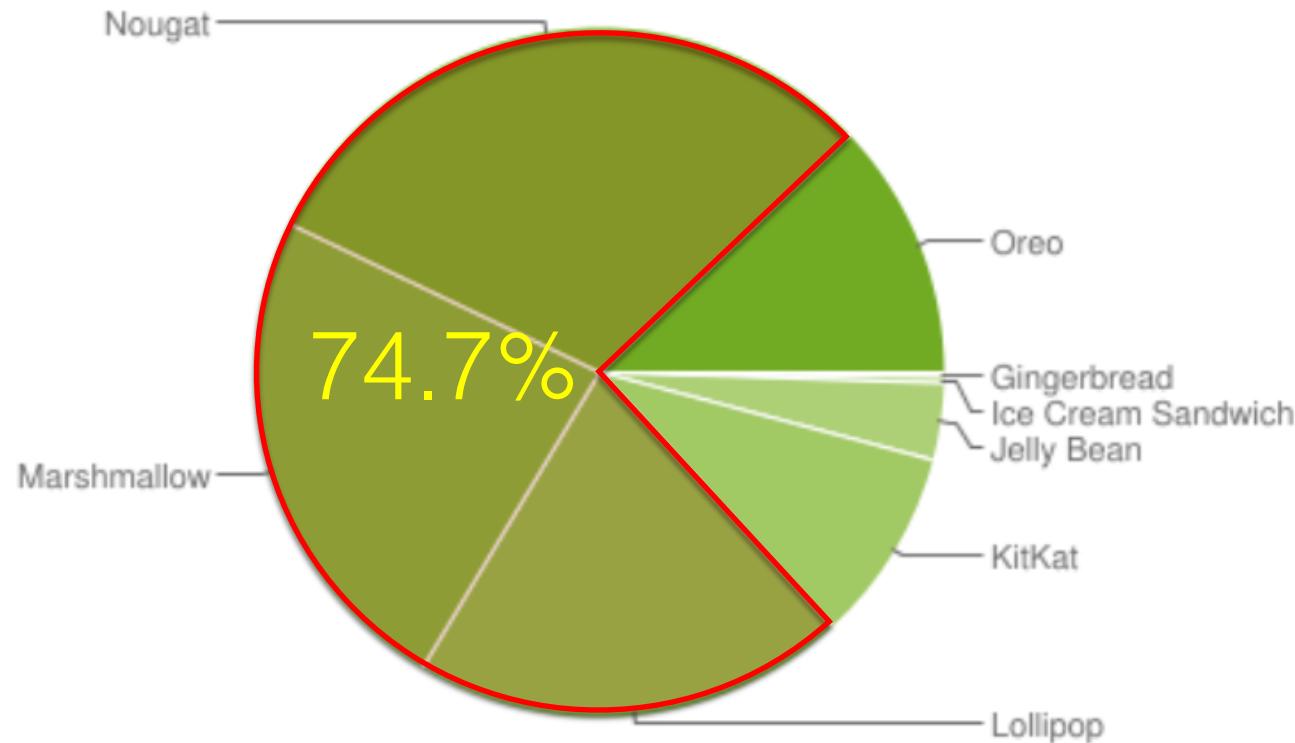
| Version | Codename | API | Distribution |
|---------------|--------------------|-----|--------------|
| 2.3.3 - 2.3.7 | Gingerbread | 10 | 0.2% |
| 4.0.3 - 4.0.4 | Ice Cream Sandwich | 15 | 0.3% |
| 4.1.x | Jelly Bean | 16 | 1.2% |
| 4.2.x | | 17 | 1.9% |
| 4.3 | | 18 | 0.5% |
| 4.4 | KitKat | 19 | 9.1% |
| 5.0 | Lollipop | 21 | 4.2% |
| 5.1 | | 22 | 16.2% |
| 6.0 | Marshmallow | 23 | 23.5% |
| 7.0 | Nougat | 24 | 21.2% |
| 7.1 | | 25 | 9.6% |
| 8.0 | Oreo | 26 | 10.1% |
| 8.1 | | 27 | 2.0% |

Data collected during a 7-day period ending on July 23, 2018.

Any versions with less than 0.1% distribution are not shown.



Versions – Platforms *



Data collected during a 7-day period ending on July 23, 2018.

Any versions with less than 0.1% distribution are not shown.

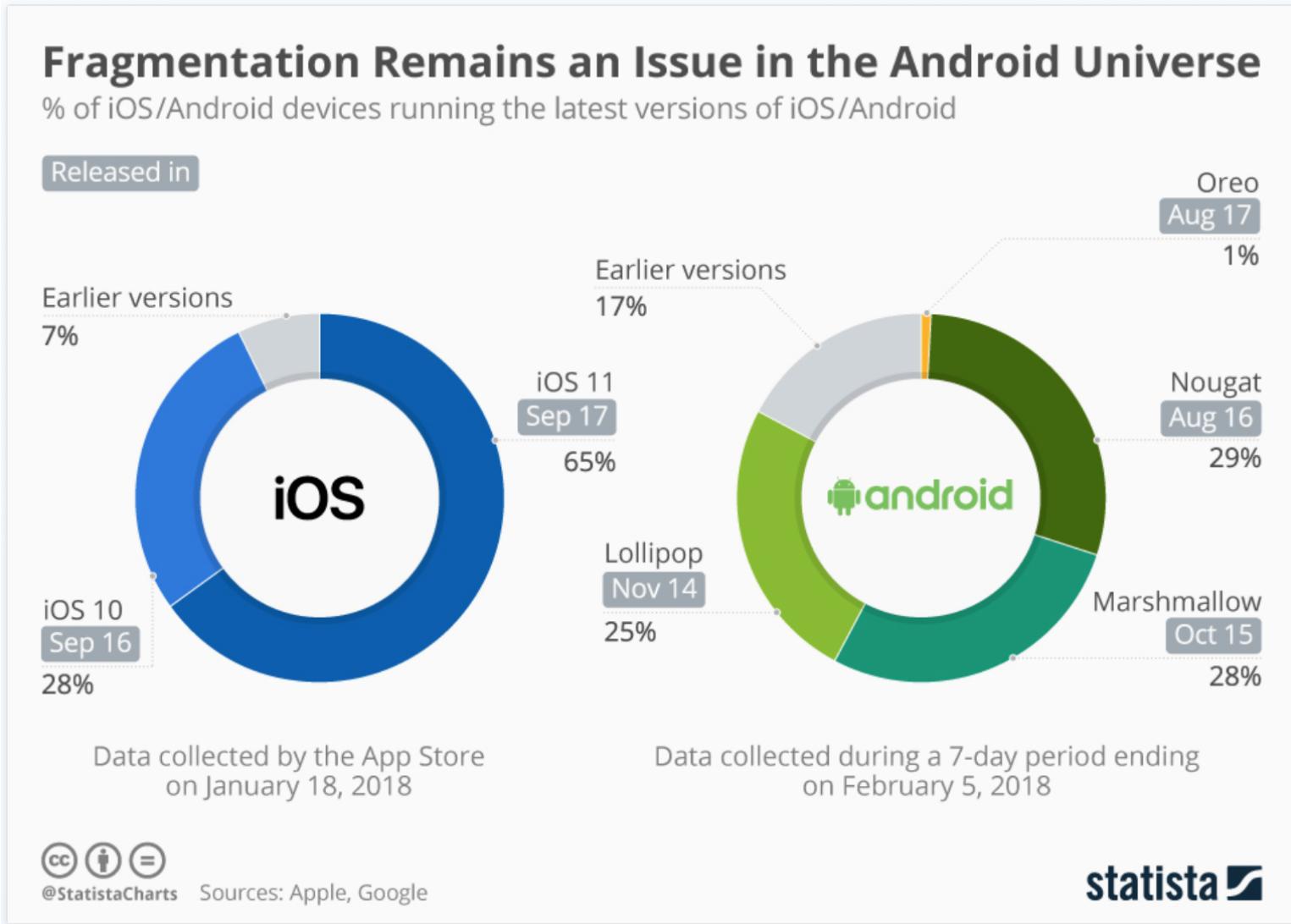


Android Pie Version 9.0 - API level 28

- ❑ Official Release Date was August 6th 2018
- ❑ New Features
 - App Navigation
 - Notifications
 - Do Not Disturb
 - Digital Wellbeing
 - App Actions
 - Adaptive Battery / Adaptive Brightness modes
- ❑ Available for Google Pixel devices and the Essential Phone



Adoption Rates



[https://www.statista.com/
chart/5930/adoption-of-
ios-and-android-versions/](https://www.statista.com/chart/5930/adoption-of-ios-and-android-versions/)



Quick Tour of Android (1)

❑ Standard Features:

- User Interface
 - ◆ IO widgets (buttons, textboxes, lists etc.)
 - ◆ Images
 - ◆ 2D/3D drawing
 - ◆ ActionBar/ActionBarMode
 - ◆ ViewPager
 - ◆ NavDrawer
 - Database (Sqlite)
 - App Lifecycle
- ❑ (More Later on...)



Quick Tour of Android (2)

❑ More Advanced Features:

- Google Maps
- Google Sign-In
- FireBase
- Hardware APIs
 - ◆ GPS/Geo-location, calls, accelerometer, compass, bluetooth, camera
 - ◆ Fused Location Provider (latest addition)
- Multiple processes
 - ◆ Managed by ART (as of Kit Kat 4.4+)
 - ◆ Background Services (e.g. AsyncTasks/Volley)
 - ◆ Inter-process communications (e.g. Intents)
- No difference between third-party and native apps (2 lines of code to launch Camera on Device)



Android Applications (re : the installation stuff)

- ❑ Android applications get distributed in a .apk file
- ❑ APK == “Android Package”
 - It is simply a zip file that has a particular file structure (similar to JAR files that take snapshots of the file system)
 - An APK contains
 - ◆ The Android Manifest file (an XML file with lots of metadata)
 - ◆ A Resource bundle containing sounds, graphics, etc.
 - ◆ The ART bytecodes that make up your application



What You need to Get started

- ❑ The Android SDK supports several different integrated development environments (IDEs). Here we will focus on Android Studio because it is supported by Google, with the SDK and it's free (*and* Google aren't supporting Eclipse anymore!)
- ❑ No matter which operating system you are using, you will need essentially the same set of tools:
 - IDE
 - Sun's / ORACLE's Java Development Kit (JDK)
 - The Android Software Developer's Kit (SDK)
 - Phone driver (for specific device development)
- ❑ Android offer an “ADT Bundle” with everything you need
<http://developer.android.com/sdk/index.html> just confirm your SDK with mine (next slide) re solutions.....



Android SDK Setup for the Labs *

Default Preferences

Appearance & Behavior > System Settings > Android SDK

Manager for the Android SDK and Tools used by Android Studio

Android SDK Location: /Users/ddrohan/env/appdev/android [Edit](#)

[Reset](#)

[SDK Platforms](#) [SDK Tools](#) [SDK Update Sites](#)

Each Android SDK Platform package includes the Android platform and sources pertaining to an API level by default. Once installed, Android Studio will automatically check for updates. Check "show package details" to display individual SDK components.

| | Name | API Level | Revision | Status |
|-------------------------------------|----------------------------------|-----------|----------|---------------------|
| <input type="checkbox"/> | Android API 28 | 28 | 6 | Not installed |
| <input checked="" type="checkbox"/> | Android 8.1 (Oreo) | 27 | 3 | Installed |
| <input type="checkbox"/> | Android 8.0 (Oreo) | 26 | 2 | Not installed |
| <input type="checkbox"/> | Android 7.1.1 (Nougat) | 25 | 3 | Not installed |
| <input type="checkbox"/> | Android 7.0 (Nougat) | 24 | 2 | Partially installed |
| <input type="checkbox"/> | Android 6.0 (Marshmallow) | 23 | 3 | Not installed |
| <input type="checkbox"/> | Android 5.1 (Lollipop) | 22 | 2 | Not installed |
| <input type="checkbox"/> | Android 5.0 (Lollipop) | 21 | 2 | Not installed |
| <input type="checkbox"/> | Android 4.4W (KitKat Wear) | 20 | 2 | Not installed |
| <input type="checkbox"/> | Android 4.4 (KitKat) | 19 | 4 | Not installed |
| <input type="checkbox"/> | Android 4.3 (Jelly Bean) | 18 | 3 | Not installed |
| <input type="checkbox"/> | Android 4.2 (Jelly Bean) | 17 | 3 | Not installed |
| <input type="checkbox"/> | Android 4.1 (Jelly Bean) | 16 | 5 | Not installed |
| <input type="checkbox"/> | Android 4.0.3 (IceCreamSandwich) | 15 | 5 | Not installed |
| <input type="checkbox"/> | Android 4.0 (IceCreamSandwich) | 14 | 4 | Not installed |
| <input type="checkbox"/> | Android 3.2 (Honeycomb) | 13 | 1 | Not installed |
| <input type="checkbox"/> | Android 3.1 (Honeycomb) | 12 | 3 | Not installed |
| <input type="checkbox"/> | Android 3.0 (Honeycomb) | 11 | 2 | Not installed |
| <input type="checkbox"/> | Android 2.3.3 (Gingerbread) | 10 | 2 | Not installed |
| <input type="checkbox"/> | Android 2.3 (Gingerbread) | 9 | 2 | Not installed |
| <input type="checkbox"/> | Android 2.2 (Froyo) | 8 | 3 | Not installed |
| <input type="checkbox"/> | Android 2.1 (Eclair) | 7 | 3 | Not installed |

Show Package Details

[Cancel](#) [Apply](#) [OK](#)



Android SDK Setup for the Labs *

Default Preferences

Appearance & Behavior > System Settings > Android SDK

Manager for the Android SDK and Tools used by Android Studio

Android SDK Location: /Users/ddrohan/env/appdev/android [Edit](#)

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 | | Installed |
| <input type="checkbox"/> | GPU Debugging tools | | Not Installed |
| <input type="checkbox"/> | CMake | | Not Installed |
| <input type="checkbox"/> | LLDB | | Not Installed |
| <input checked="" type="checkbox"/> | Android Auto API Simulators | 1.0.0 | Installed |
| <input type="checkbox"/> | Android Auto Desktop Head Unit emulator | 1.1 | Not installed |
| <input checked="" type="checkbox"/> | Android Emulator | 27.3.9 | Installed |
| <input checked="" type="checkbox"/> | Android SDK Platform-Tools | 28.0.0 | Installed |
| <input checked="" type="checkbox"/> | Android SDK Tools | 26.1.1 | Installed |
| <input checked="" type="checkbox"/> | Android Support Library, rev 23.2.1 | 23.2.1 | Installed |
| <input checked="" type="checkbox"/> | Documentation for Android SDK | 1 | Installed |
| <input checked="" type="checkbox"/> | Google Play APK Expansion Library, rev 3 | 3.0.0 | Installed |
| <input type="checkbox"/> | Google Play APK Expansion library | 1 | Not installed |
| <input checked="" type="checkbox"/> | Google Play Billing Library, rev 5 | 5.0.0 | Installed |
| <input type="checkbox"/> | Google Play Licensing Library | 1 | Not installed |
| <input checked="" type="checkbox"/> | Google Play Licensing Library, rev 2 | 2.0.0 | Installed |
| <input checked="" type="checkbox"/> | Google Play services | 49 | Installed |
| <input checked="" type="checkbox"/> | Google Play services for Froyo, rev 12 | 12.0.0 | Installed |
| <input type="checkbox"/> | Google Web Driver | 2 | Not installed |
| <input type="checkbox"/> | Instant Apps Development SDK | 1.3.0 | Not installed |
| <input checked="" type="checkbox"/> | Intel x86 Emulator Accelerator (HAXM installer) | 7.2.0 | Installed |
| <input type="checkbox"/> | NDK | 17.1.4828580 | Not installed |
| <input checked="" type="checkbox"/> | Support Repository | | |

Show Package Details

Cancel Apply OK



Android Apps vs iPhone Apps



Installing Apps

❑ For Generic (on the market) apps

- iPhone has larger selection
- Android catching up

❑ For In-house-developed corporate apps

- iPhone apps can only (mostly) be installed via the App Store
 - ◆ iPhone requires you to submit app to the Apple App Store and get approval, even for apps from your own company
 - Unless you setup a Provisioning profile or
 - you use something like TestFlight or
 - jailbreak your phone of course.....
- Android apps can be installed through
 - ◆ Google App Store / Google Play
 - ◆ Amazon App Store
 - ◆ **USB connection from PC**
 - ◆ **Email**
 - ◆ **Corporate Web site**



Languages for Apps

❑ iPhone

- Objective-C
 - ◆ Similar to, but not exactly the same as, C++
 - ◆ Virtually no corporate presence for Objective-C, other than for mobile apps
 - ◆ However, **Swift** becoming more popular

❑ Android

- Java
 - ◆ The single most widely used language inside corporations
- C/C++
 - ◆ Can call native apps (with some difficulty) via an approach similar to JNI for desktop Java
- Kotlin gaining a lot of traction

OS for Dev Apps

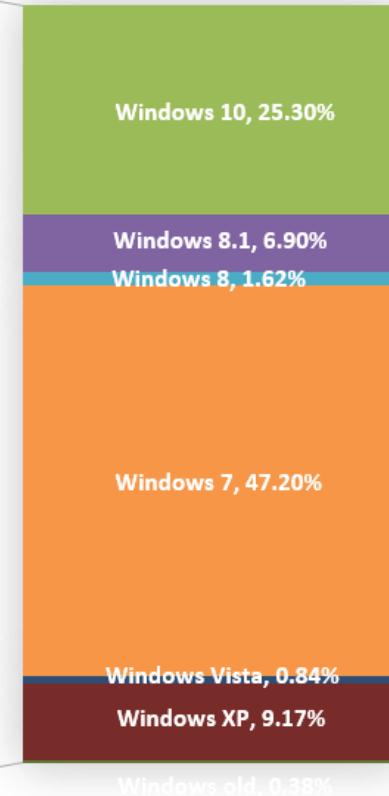
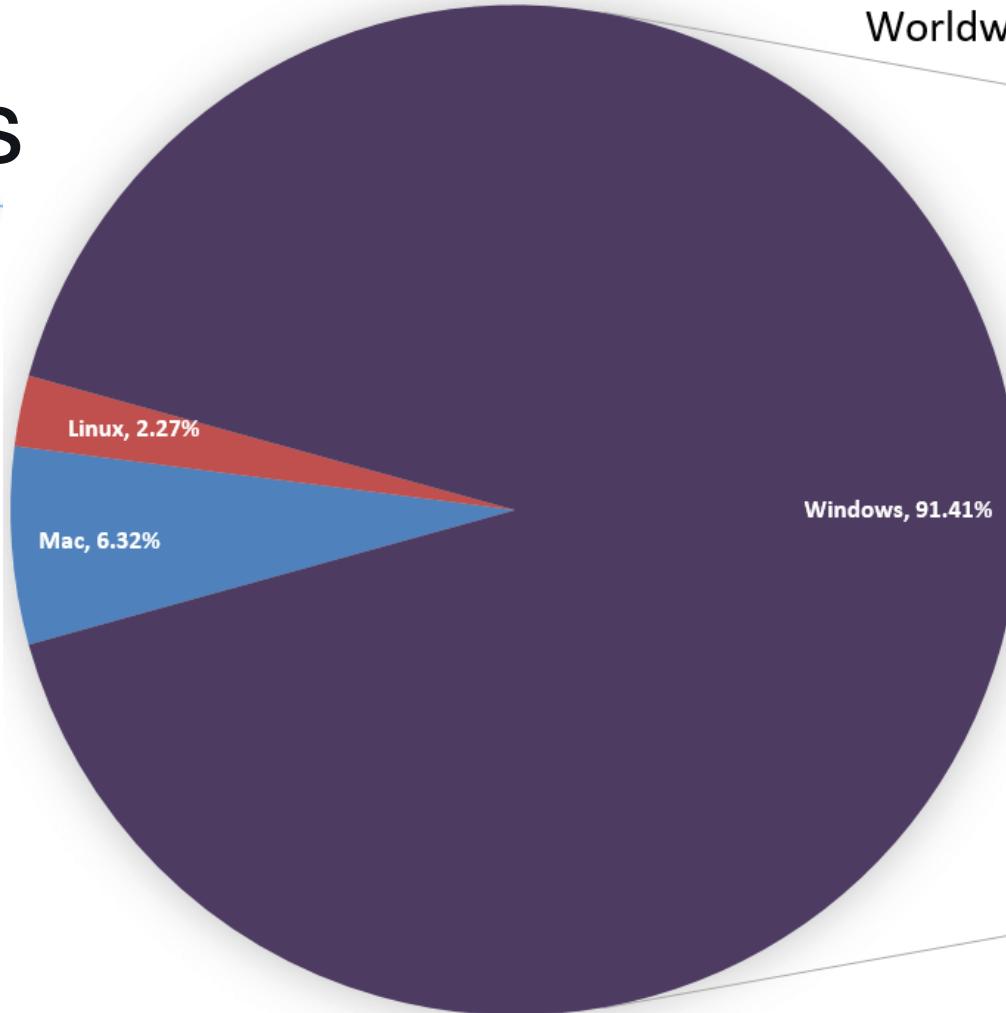
iPhone

- Macs

Android

- Anything with Java and Android Studio

- ◆ Macs
- ◆ PCs
- ◆ Linux
- ◆ Solaris



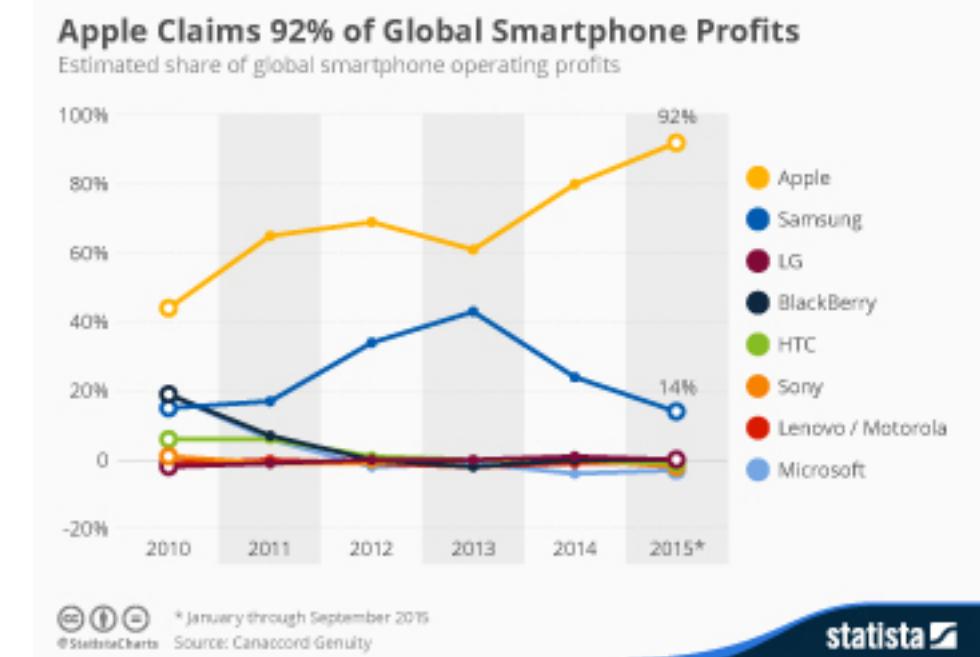
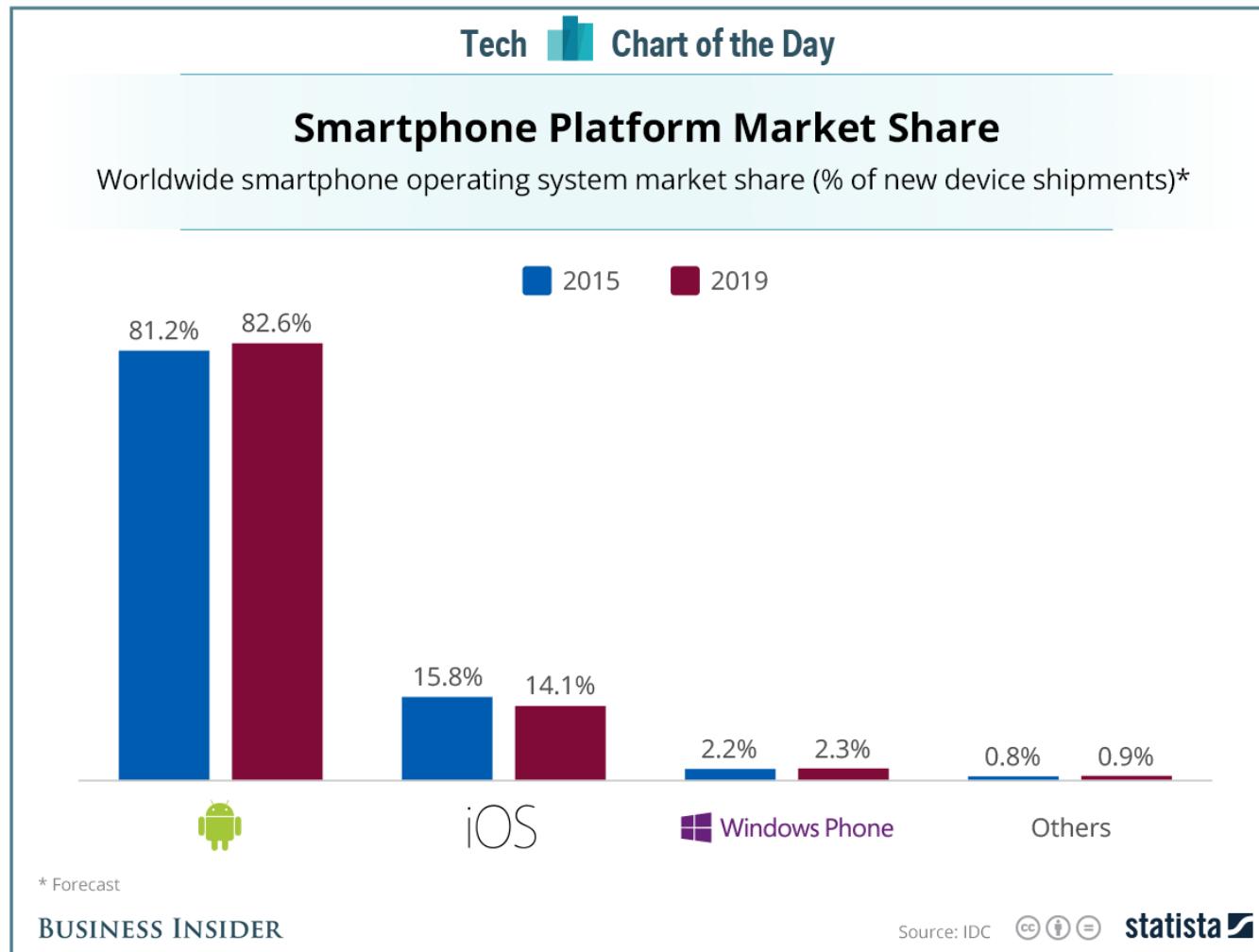
VB

Issue

- Not so much which is cooler and which you personally prefer, but rather which is already installed in corporate environments.



Market Share Vs Operating Profits





Other Issues

- ❑ Phone features, quality of apps, customer loyalty and coolness factors
 - Matter of opinion, but iPhone **very** strong here
- ❑ Market presence based on sales / app downloads etc.



Bottom Line: Android vs iPhone

❑ Which to use personally

- iPhone has bigger app store, and more loyal users
- Android more open and growing more rapidly
- Bottom line: no clear winner, personal preferences prevail, but iPhone has the edge (for me anyway!)

❑ Which to use for in-house apps

- iPhone apps very hard/restrictive to install, Android very simple
- iPhone uses mainly Objective-C (Swift on the up), Android uses Java
- Bottom line: Android is clear winner IMHO



References

❑ Books (in rough order of preference)

- Android Developer's Cookbook (Steele & To)
- Busy Coder's Guide to Android Development (Murphy)
 - ◆ Online only: <http://commonsware.com/Android/>
- Android in Action, 2nd Edition (Ableson, Sen, & King)
- Android Application Development for Dummies (Felker)

❑ Online references

- <http://developer.android.com/>
 - ◆ By far the most important single reference.
- Android forum on StackOverflow
 - ◆ <http://stackoverflow.com/questions/tagged/android>
- Android widget gallery
 - ◆ <http://www.droiddraw.org/widgetguide.html>
- Marty Hall's Tutorials
 - ◆ <http://www.coreservlets.com/android-tutorial/>



Questions?



Thanks!

