



JÖNKÖPING UNIVERSITY

School of Engineering

ANDROID INTRODUCTION

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THE ANDROID STORY

2005:

- July: Google buys Android Inc.

2007:

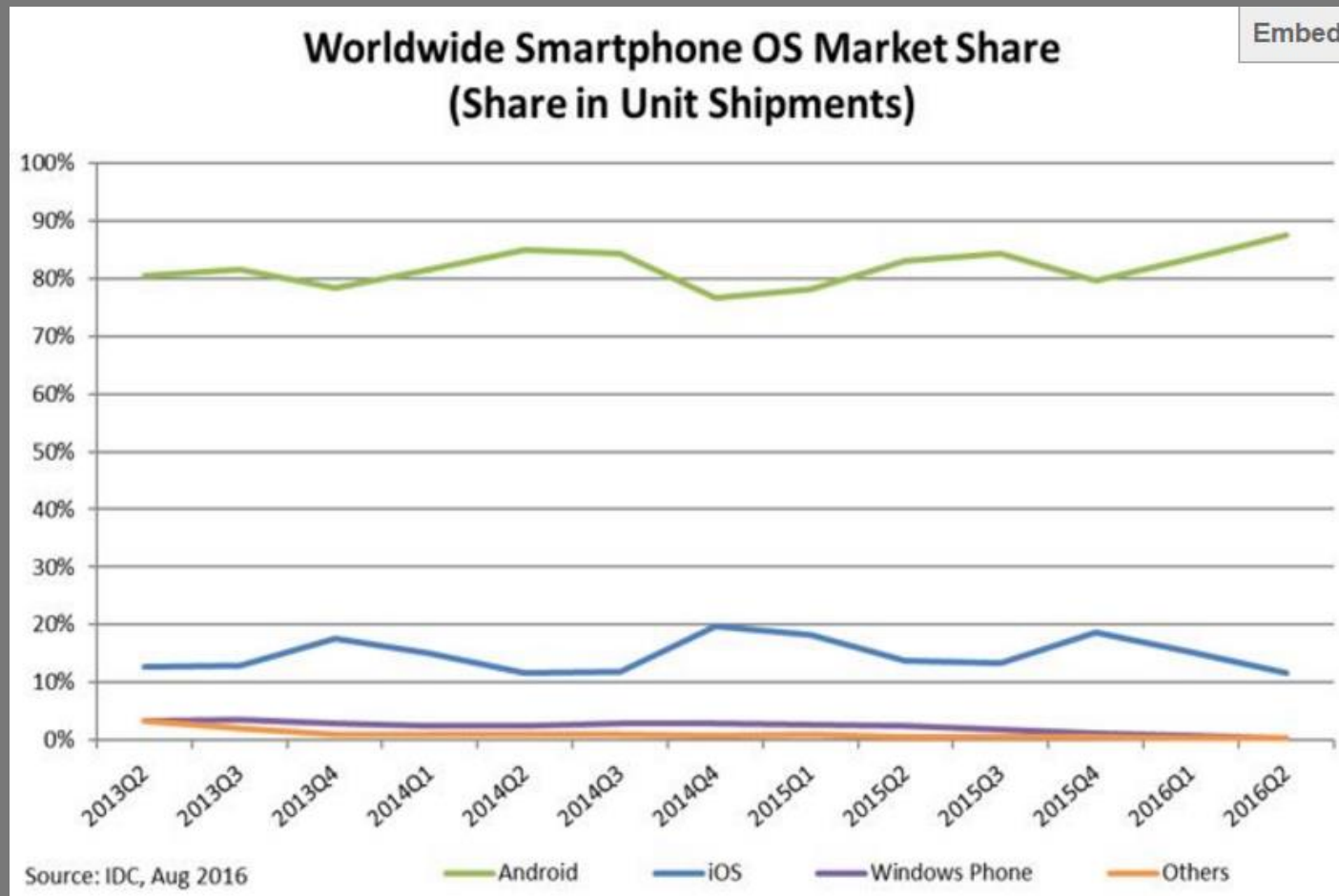
- June: Apple releases iPhone.
- November: Open Handset Alliance established.
 - Mission: to develop open standards for mobile devices.
 - Flagship: Android

2008:

- October: First device running Android: HTC Dream



THE ANDROID SUCCESS



<http://www.idc.com/prodserv/smartphone-os-market-share.jsp>

IS ANDROID OPEN SOURCE?

Android is open source.

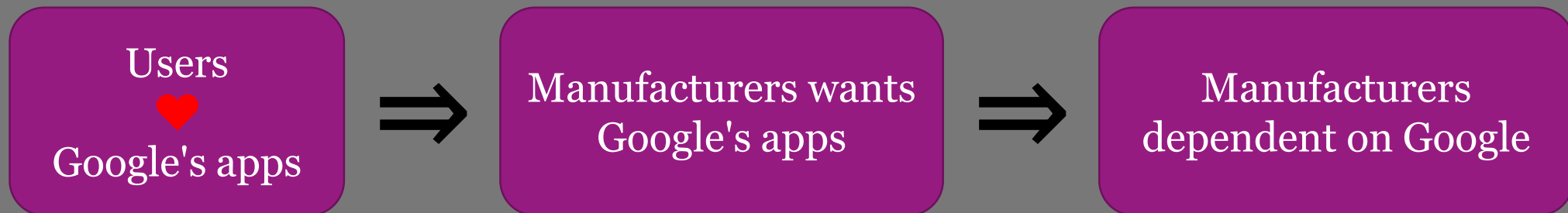
- Android Open Source Project (AOSP):
 - <https://source.android.com/index.html>
- Successfully forked by Amazon: Fire OS.

The name *Android* is a trademark of Google Inc.

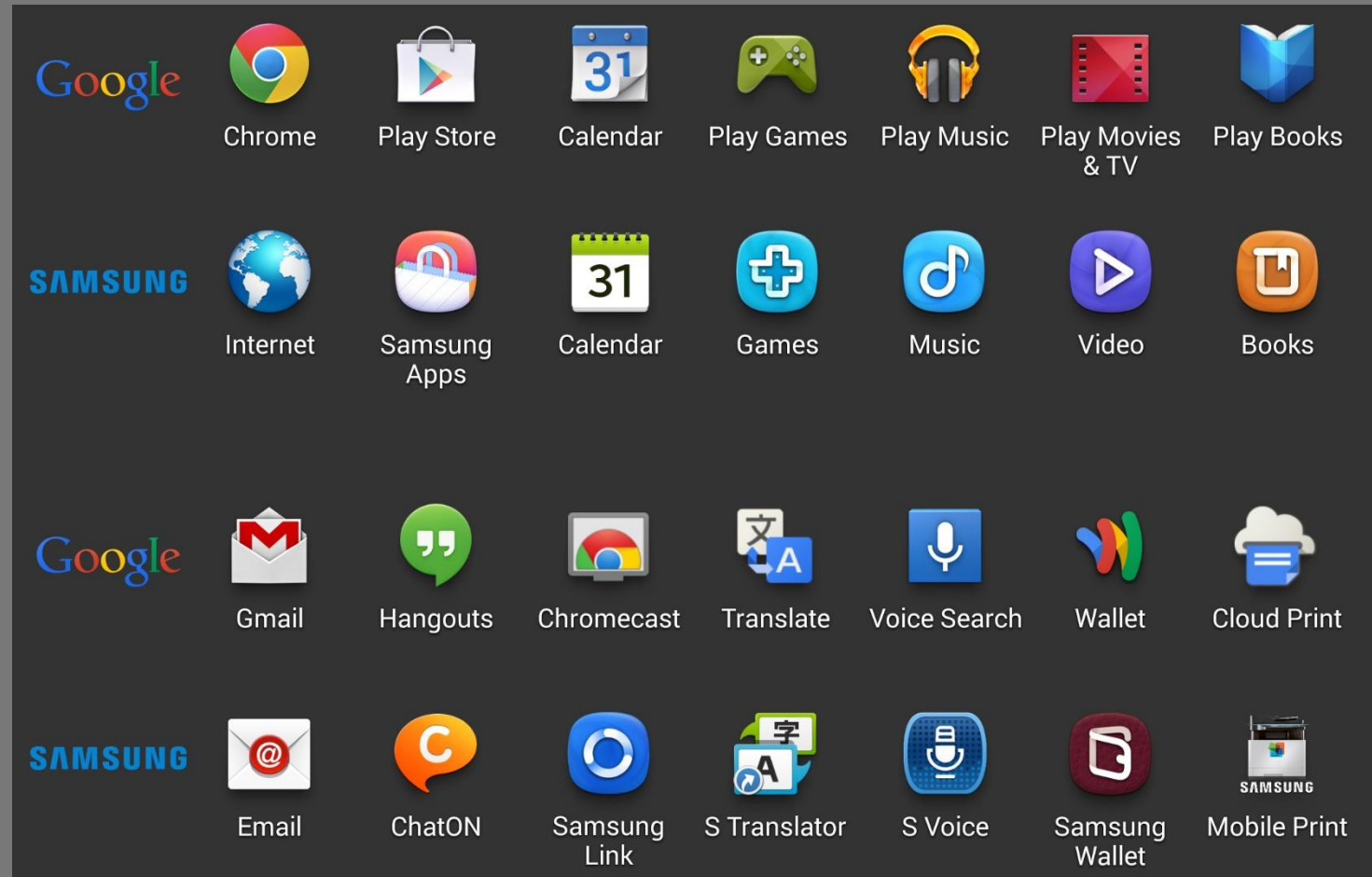
- <https://developer.android.com/legal.html>

DOES GOOGLE CONTROL ANDROID?

- Next version always developed behind closed doors.
- Google has abandoned many original AOSP apps in favor of their own.
 - Google's apps are not part of AOSP; they are closed source.
- Google improves Google Play Services instead of AOSP.
 - Many applications depends on Google Play Services.



SAMSUNG'S PLAN B



<http://arstechnica.com/gadgets/2013/10/googles-iron-grip-on-android-controlling-open-source-by-any-means-necessary/3/>

ANDROID

- Smartphones
- Tablets
- Wear
- TV
- Auto
- Things



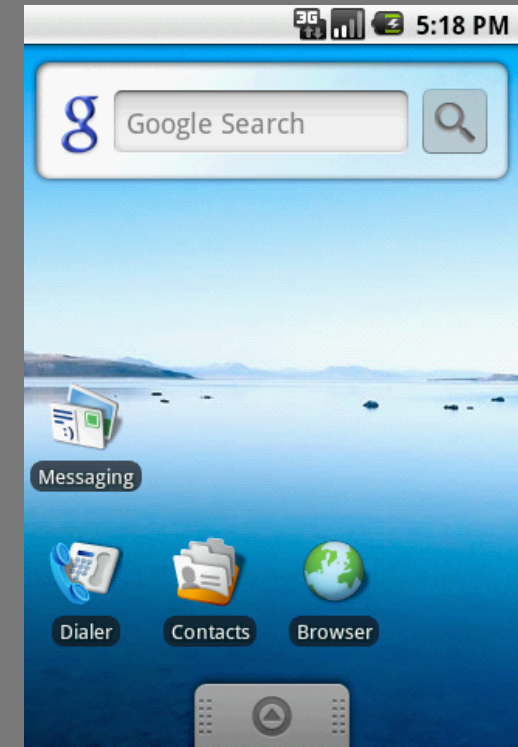
HISTORY LESSON

2008, Android 1.0

- Designed for mobile phones with touchscreen.
- Can only handle single touch.
- Four hardware buttons:
Back, Home, Menu and Search.
- Status bar at the top.
- Title bar at the top of applications.

Android 1.5 added:

- Widgets.
- Accelerometer-based application rotations.



https://en.wikipedia.org/wiki/File:Android_1.5_Cupcake_Screenshot.png

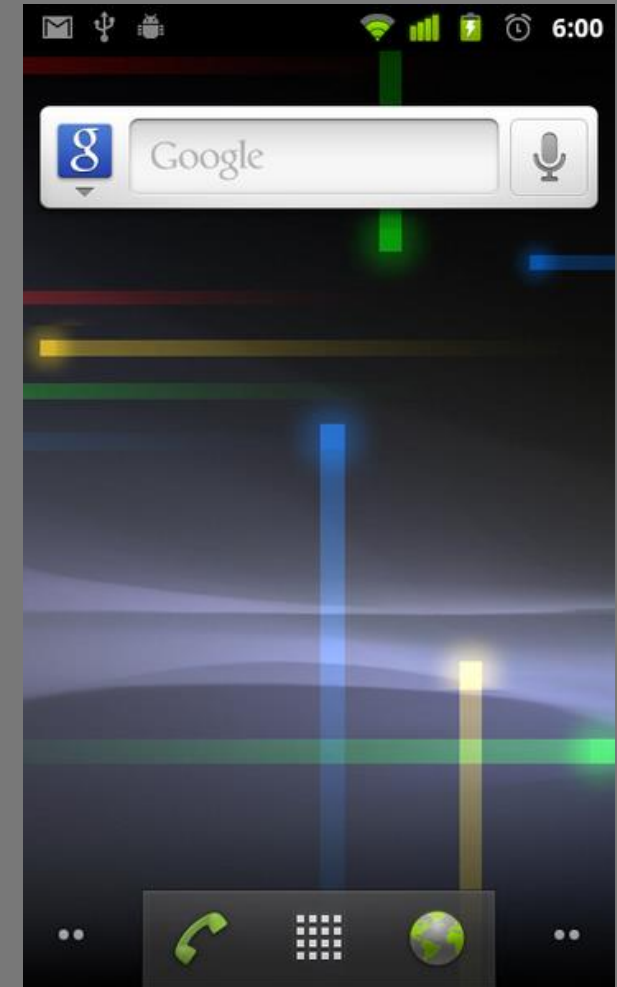
HISTORY LESSON

2009, Android 2.0

- Multi touch support.

Android 2.3 added:

- Front camera support.



https://commons.wikimedia.org/wiki/File:Android_screenshot.png

HISTORY LESSON

2011, Android 3.0

- Better tablet support.



- Added system and action bar.
- Software navigation buttons (in the system bar) instead of hardware buttons.
- The Menu and Search buttons deprecated.
- The Recent button added.

Android 3.1 added:

- Resizable home screen widgets.

Has not been used on many devices.

HISTORY LESSON

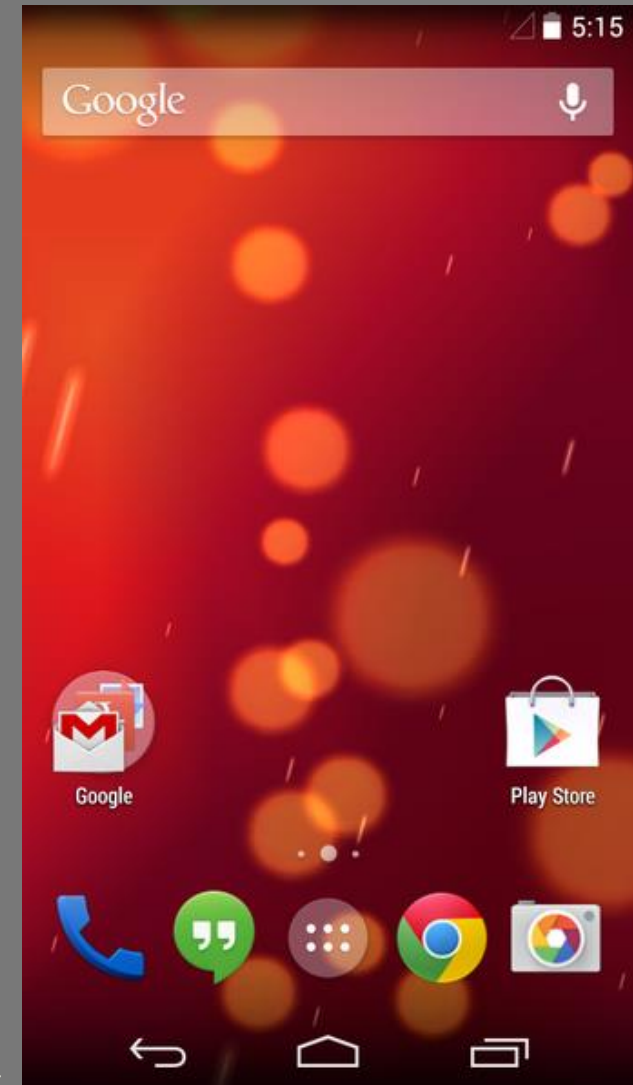
2011, Android 4.0

- Access applications directly from the lock screen.

Android 4.2 added:

- Widgets on lock screen.
- Multiple user accounts (only tablets).

https://commons.wikimedia.org/wiki/File:Android_4.4.4_KitKat.png

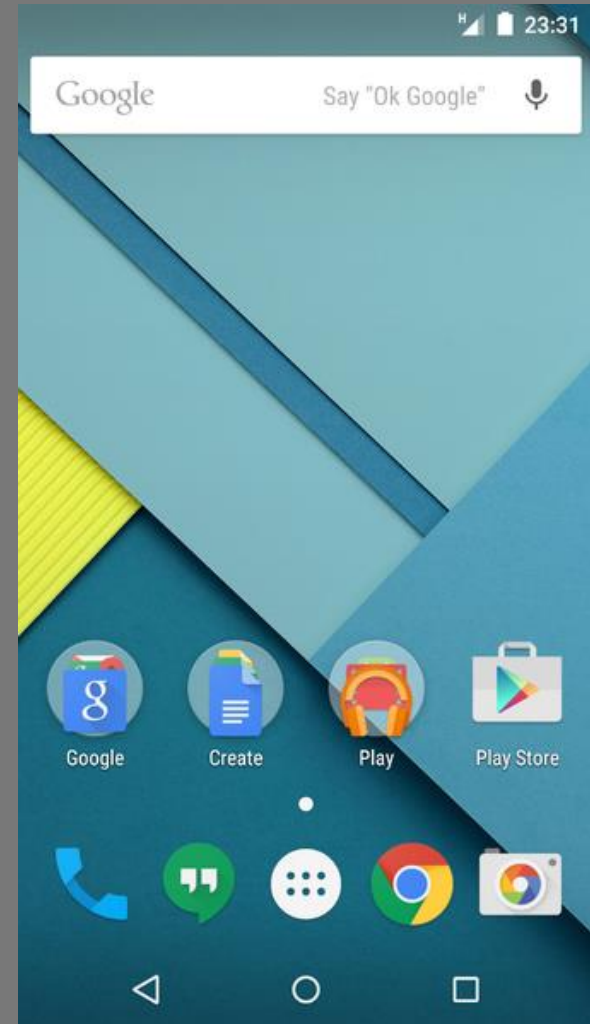


HISTORY LESSON

2014, Android 5.0

- Android RunTime (ART) replacing Dalvik.
- User accounts for smartphones too.
- Widgets no longer supported on lock screen.
- Material design

https://commons.wikimedia.org/wiki/File:Android_5.0-en.png



HISTORY LESSON

2015, Android 6.0

- Ask for permissions at runtime.
- Finger print support.

https://commons.wikimedia.org/wiki/File:Android_6.0-en.png



HISTORY LESSON

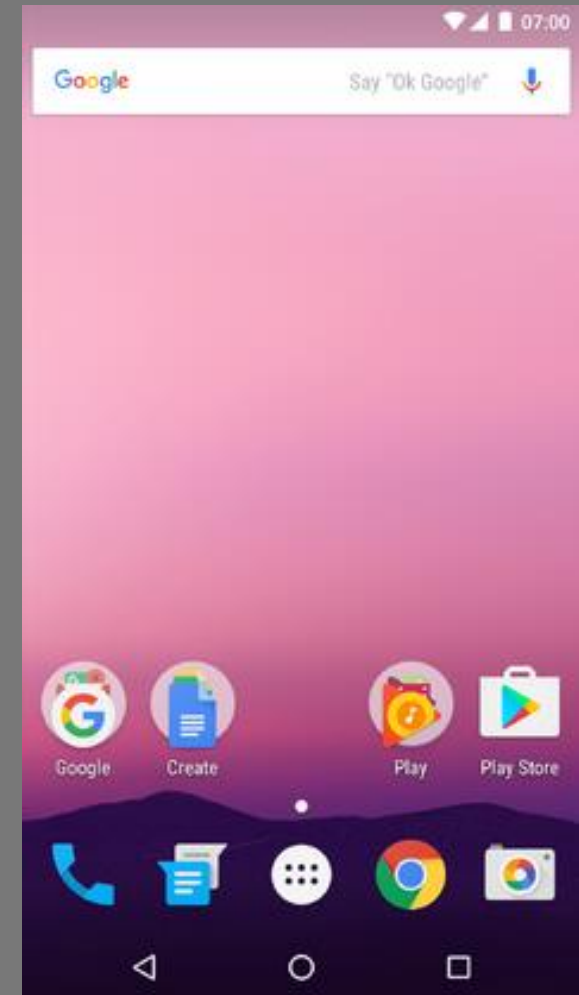
2016, Android 7.0

- Double tap overview button
→ Switch app

- Multi-window

Android 7.1 added:

- App shortcuts

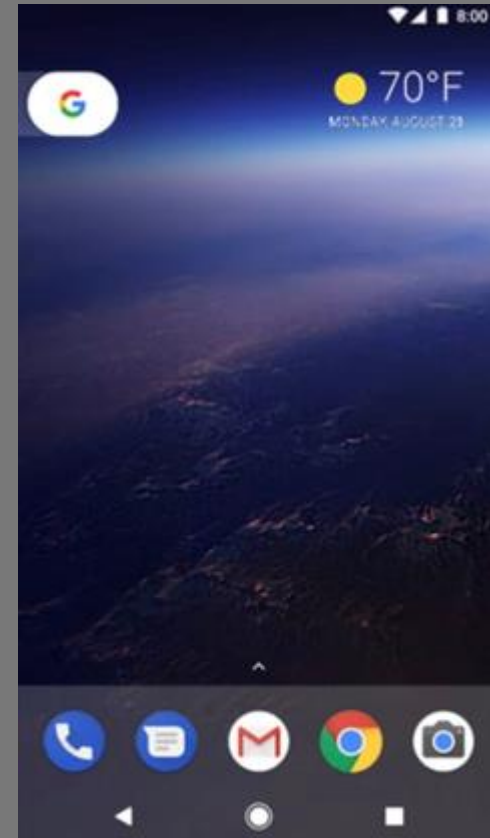


https://upload.wikimedia.org/wikipedia/en/7/78/Android_7.0_Home_Screen.png

HISTORY LESSON

2017, Android 8.0

- Picture-in-picture.
- Autofill framework.



https://en.wikipedia.org/wiki/File:Android_8.0_Oreo_Pixel.png

HISTORY LESSON

2018, Android 9.0

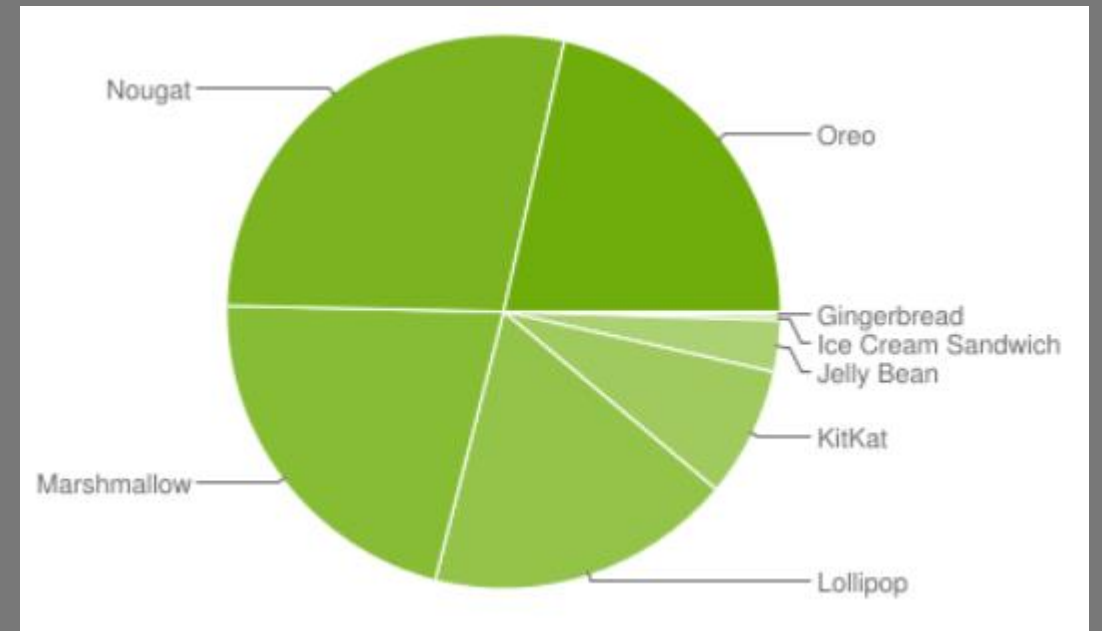
- New recent task list
- The Dashboard



https://commons.wikimedia.org/wiki/File:Android_Pie_9.0_screenshot.png

PLATFORM VERSIONS TODAY

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	1.1%
4.2.x		17	1.5%
4.3		18	0.4%
4.4	KitKat	19	7.6%
5.0	Lollipop	21	3.5%
5.1		22	14.4%
6.0	Marshmallow	23	21.3%
7.0	Nougat	24	18.1%
7.1		25	10.1%
8.0	Oreo	26	14.0%
8.1		27	7.5%



Data collected during a 7-day period ending on October 26, 2018

DIFFERENT LOOKS

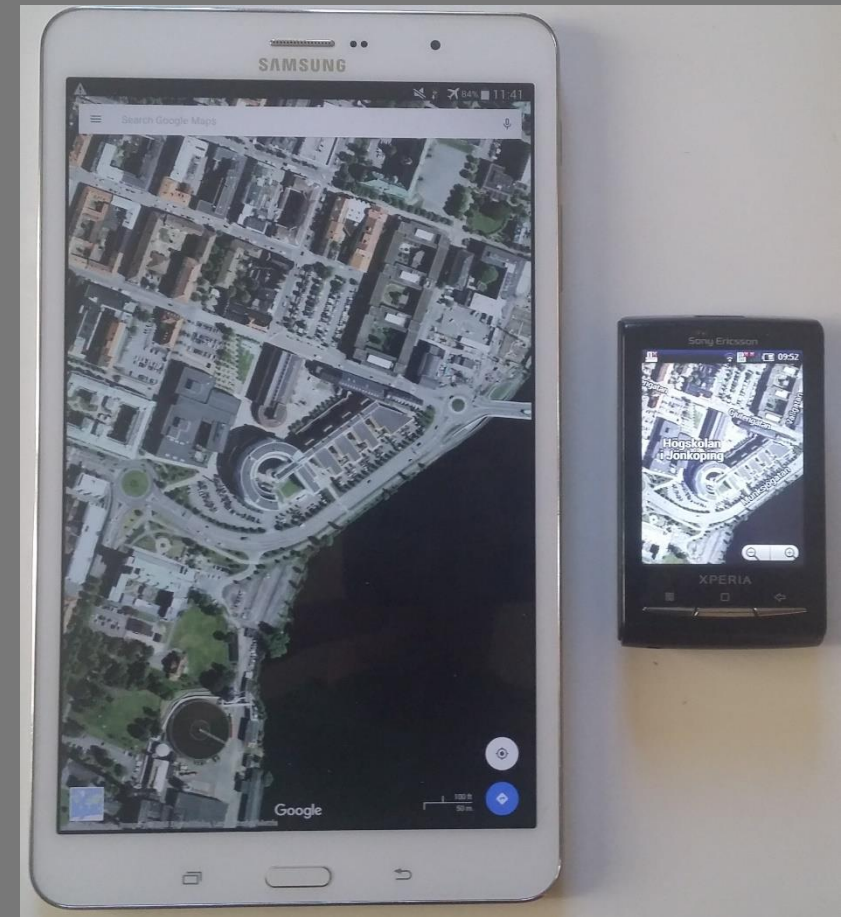
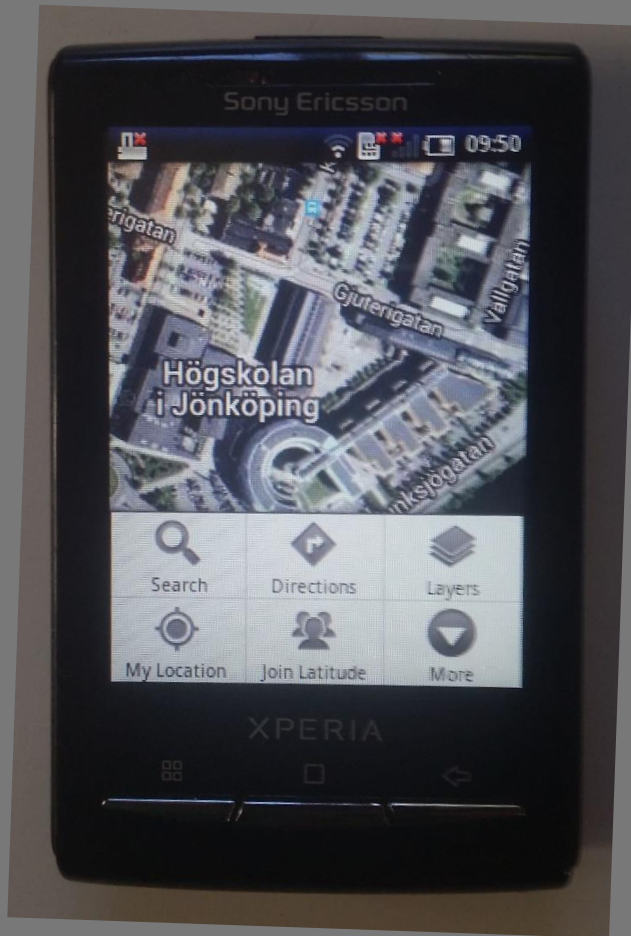
Manufacturers usually customize Android a bit.

- They use their own launcher application.
- They use their own standard applications.

This does usually not matter for your own applications.



OLD & NEW, SMALL & LARGE



ANDROID FRAGMENTATION

https://www.opensignal.com/sites/opensignal-com/files/data/reports/global/data-2015-08/2015_08_fragmentation_report.pdf

IOS VS ANDROID



IOS VS ANDROID



iOS widgets

Swipe



iOS installed apps



Swipe

Android widgets/shortcuts



Swipe



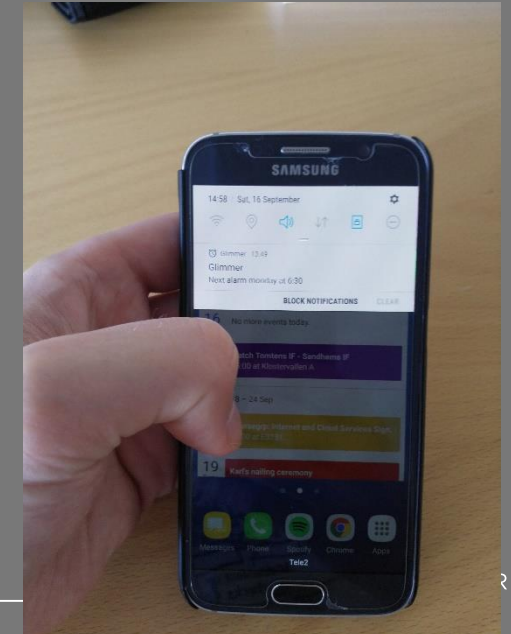
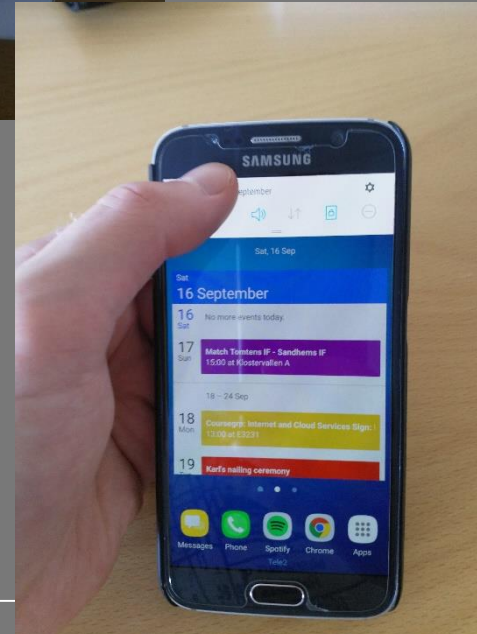
Android installed apps

IOS VS ANDROID

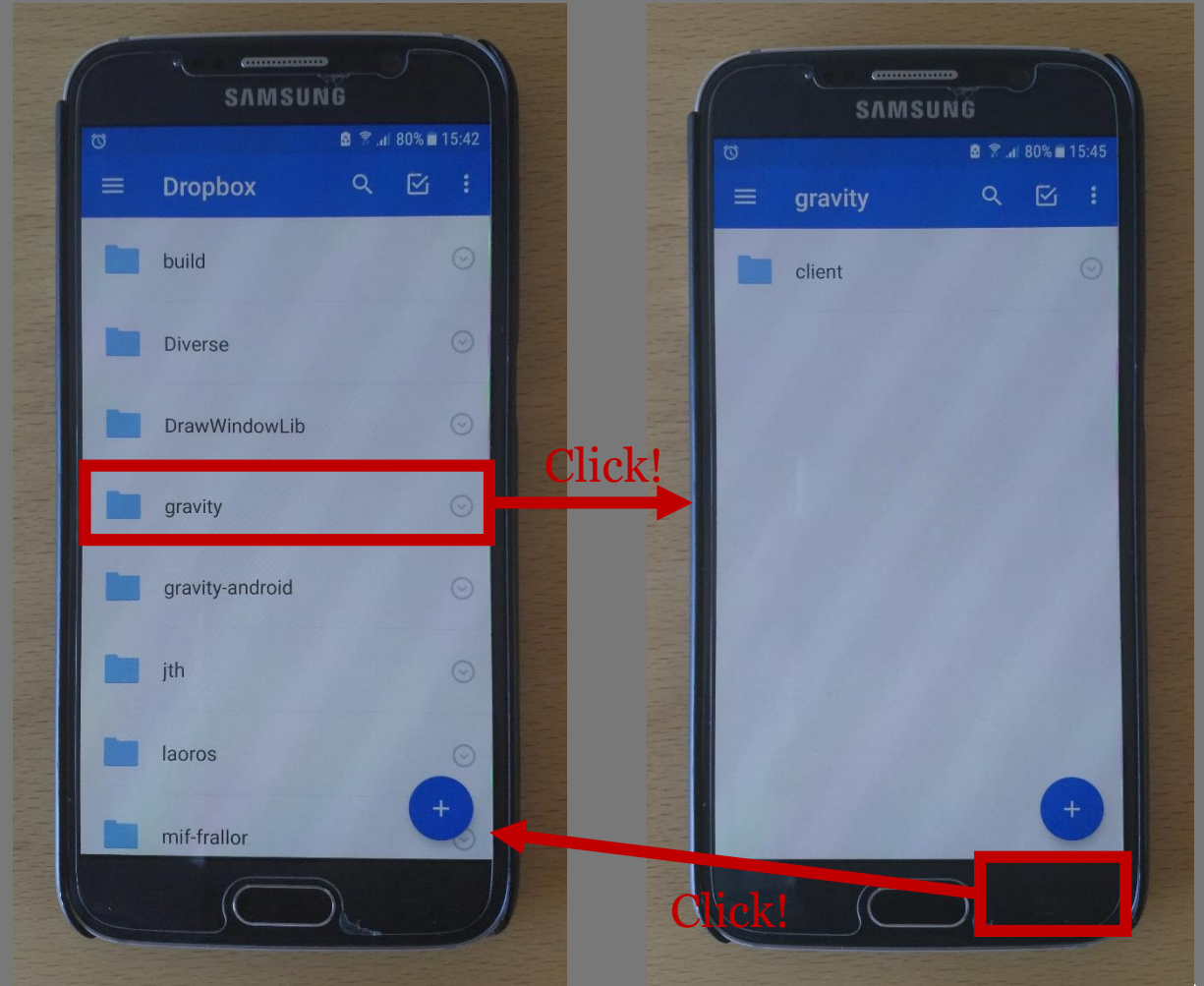
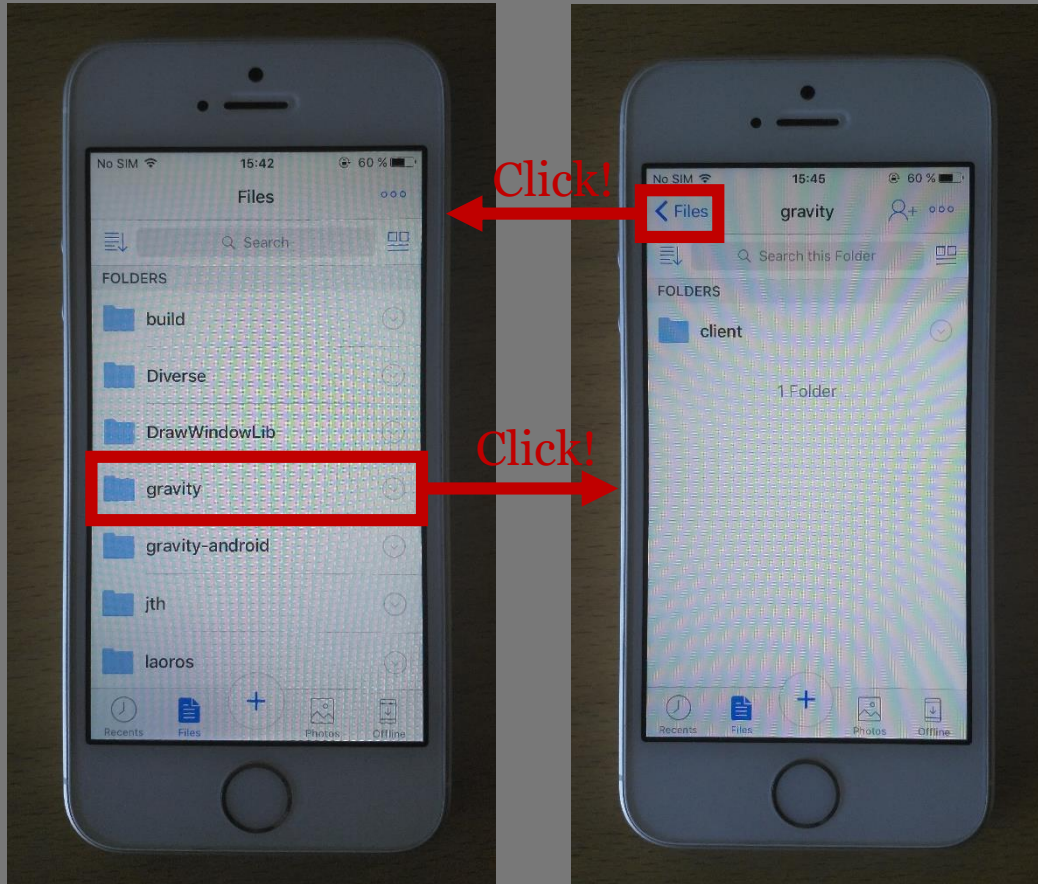


iOS Control Center
(pull up from button)

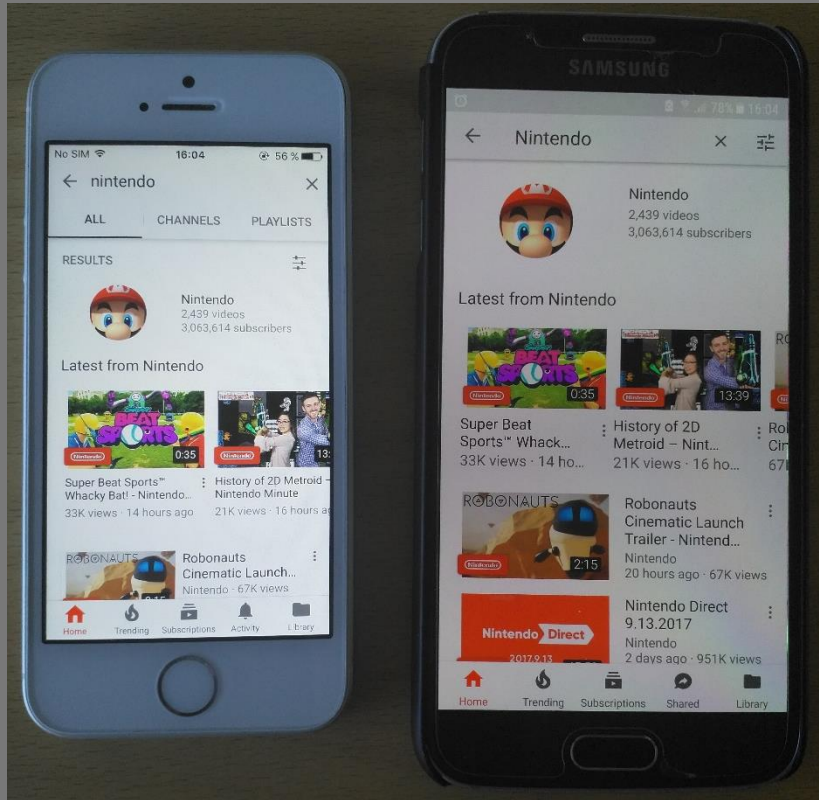
Android Status Bar
(pull down from top)



IOS VS ANDROID



IOS VS ANDROID



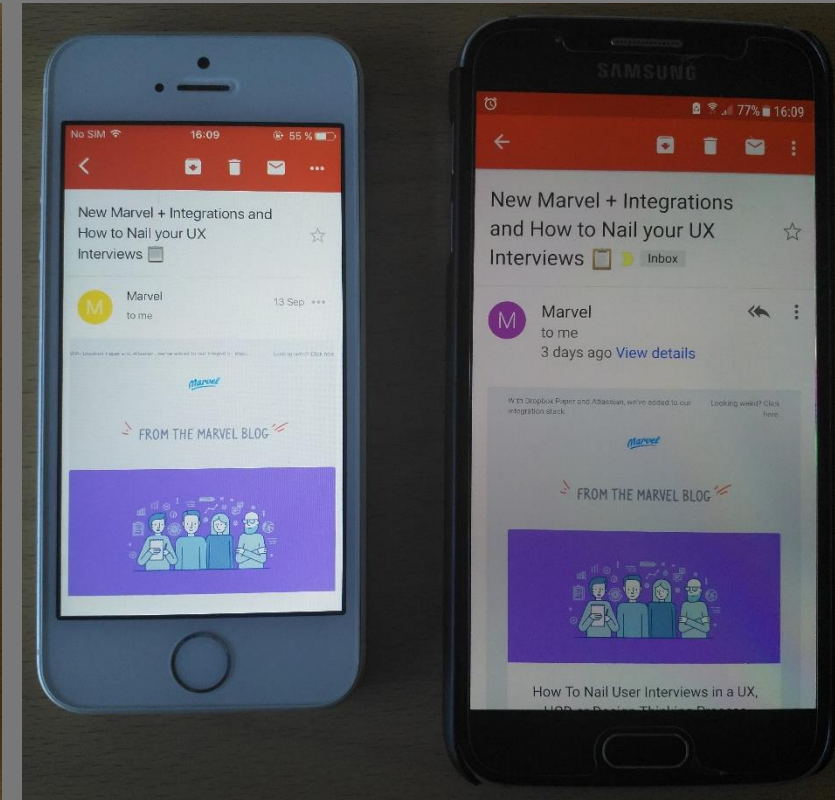
YouTube

(searching for *Nintendo*)



Spotify

(start screen)



Gmail

(reading an email)

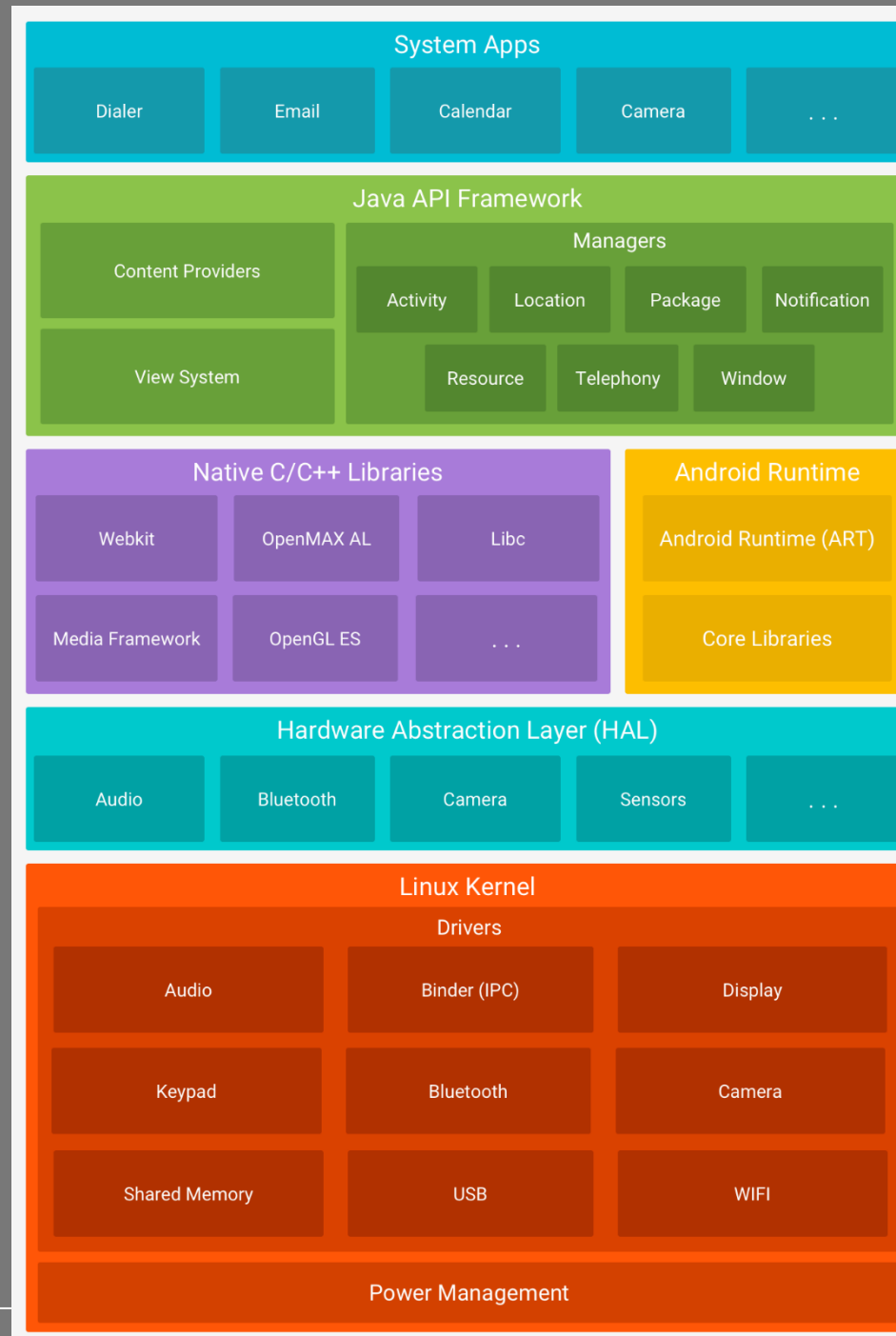
ANDROID ARCHITECTURE

<https://developer.android.com/guide/platform/index.html>

AOSP developers improves Android everywhere

Each app run as its own Linux user.

- *App A* can create files *App B* can't access.



Used by app developers

OEM implements HAL