INFO 498 D: Android Development

JOEL ROSS

WINTER 2016

Plan for the Day

1. Introductions and syllabus
2. Android History
3. break!
4. Getting Started: "Hello World"

Introductions

Who is Joel?
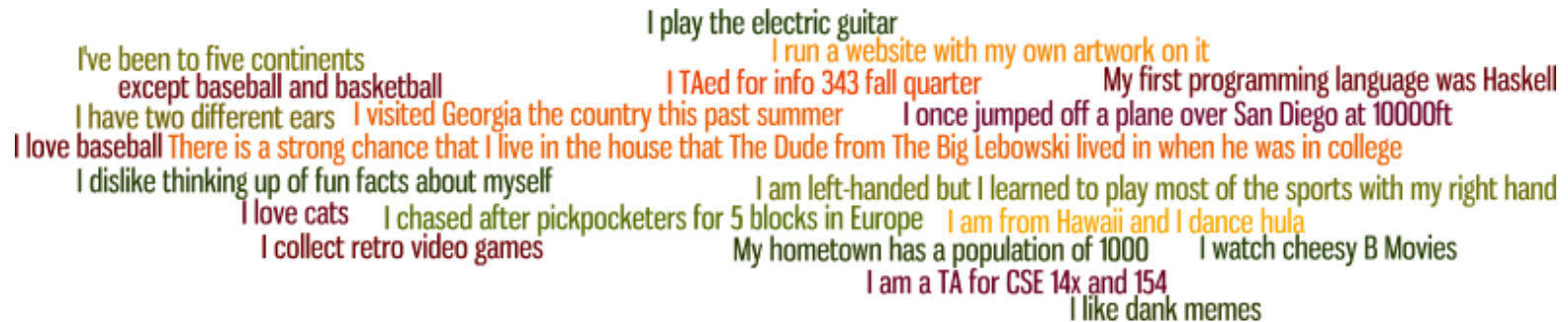
Who are you?

Ask the person across from you

- Who are you?
- Where are you from?
- What are you most excited about for this class?

I play the electric guitar
I run a website with my own artwork on it
I've been to five continents
except baseball and basketball
I TAed for info 343 fall quarter
My first programming language was Haskell
I have two different ears   I visited Georgia the country this past summer   I once jumped off a plane over San Diego at 10000ft
I love baseball There is a strong chance that I live in the house that The Dude from The Big Lebowski lived in when he was in college
I dislike thinking up of fun facts about myself
I am left-handed but I learned to play most of the sports with my right hand
I love cats   I chased after pickpocketers for 5 blocks in Europe   I am from Hawaii and I dance hula
I collect retro video games
My hometown has a population of 1000   I watch cheesy B Movies
I am a TA for CSE 14x and 154
I like dank memes

Course Materials

On Canvas

https://canvas.uw.edu/courses/1023396

On GitHub

https://github.com/info498d-w16/

    Let your TA know your username!

What is Android?

Some Android History

2003   Founded by Android Inc.

2005   Acquired by Google

2007   Launch of Open Handset Alliance

Some Android History

2008   First Android Device
(HTC Dream / G1)

528Mhz ARM
256mb RAM
3.2" screen at 320x480px

2010   First Nexus Device
(Nexus One)

1Ghz Scorpion
512mb RAM
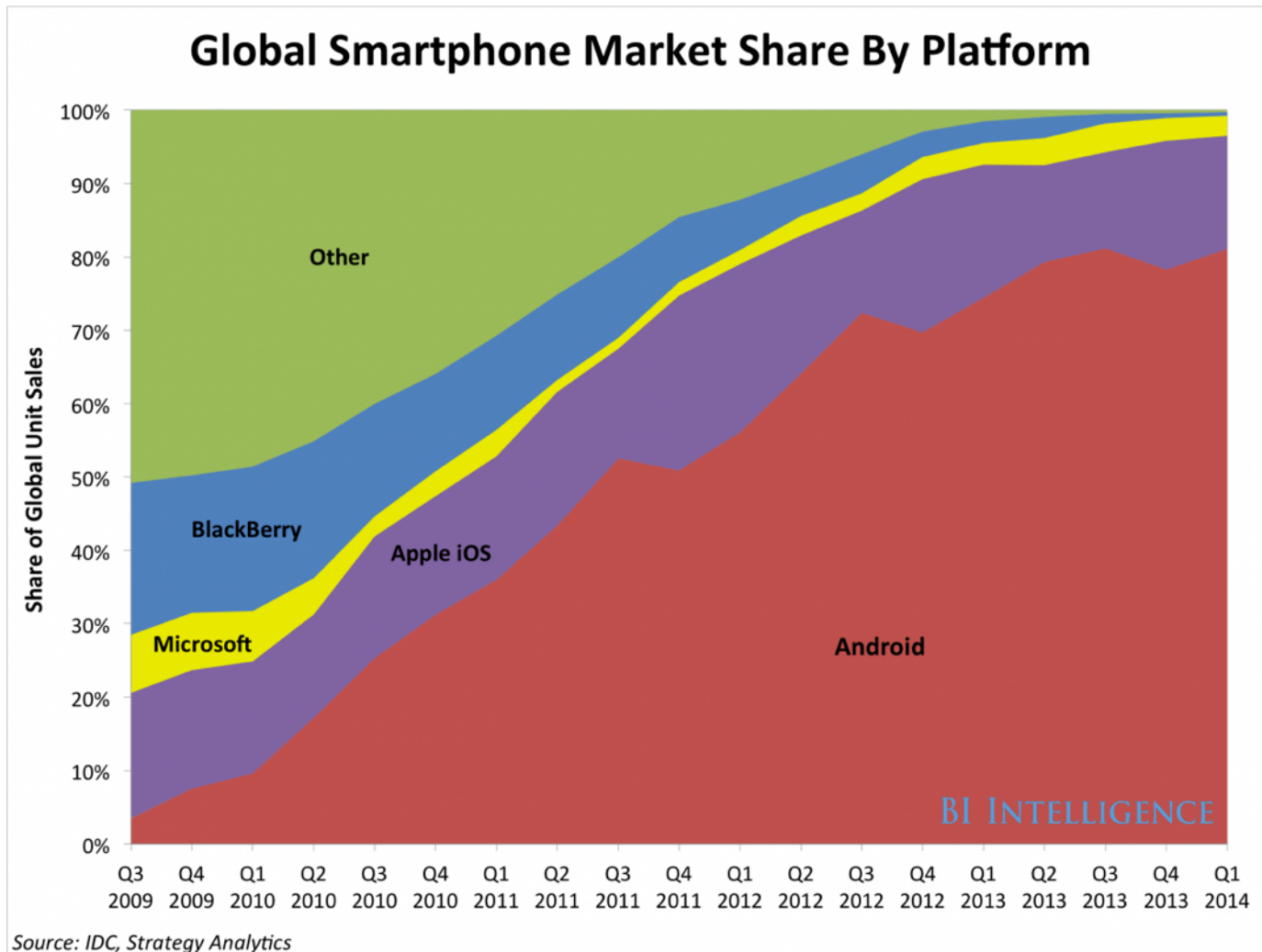3.7" screen at 480x800px

Some Android History

2014 Android One

2015 Project Brillo

Popularity

Global Smartphone Market Share By Platform

Share of Global Unit Sales

- Other
- BlackBerry
- Apple iOS
- Microsoft
- Android

100%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10%, 0%

Q3 2009, Q4 2009, Q1 2010, Q2 2010, Q3 2010, Q4 2010, Q1 2011, Q2 2011, Q3 2011, Q4 2011, Q1 2012, Q2 2012, Q3 2012, Q4 2012, Q1 2013, Q2 2013, Q3 2013, Q4 2013, Q1 2014

BI INTELLIGENCE

Source: IDC, Strategy Analytics

Android Versions

Date	Version	Nickname	API Level
Sep 2008	1.0	Android	1
Apr 2009	1.5	Cupcake	3
Sep 2009	1.6	Donut	4
Oct 2009	2.0	Eclair	5
May 2010	2.2	Froyo	8
Dec 2010	2.3	Gingerbread	9
Feb 2011	3.0	Honeycomb	11
Oct 2011	4.0	Ice Cream Sandwich	14
July 2012	4.1	Jelly Bean	16
Oct 2013	4.4	KitKat	19
Nov 2014	5.0	Lollipop	21
Oct 2015	6.0	Marshmellow	23

Android Versions

| Version	Codename	API	Distribution
2.2	Froyo	8	0.2%
2.3.3 - 2.3.7	Gingerbread	10	3.4%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	2.9%
4.1.x	Jelly Bean	16	10.0%
4.2.x		17	13.0%
4.3		18	3.9%
4.4	KitKat	19	36.6%
5.0	Lollipop	21	16.3%
5.1		22	13.2%
6.0	Marshmallow	23	0.5%

http://developer.android.com/about/dashboards/
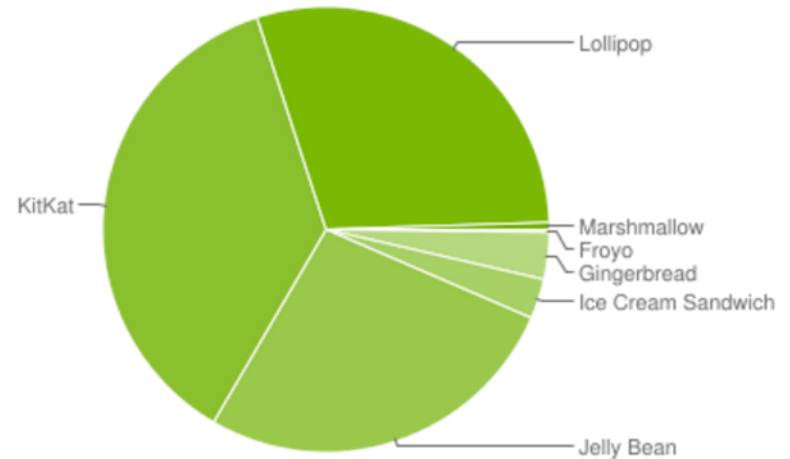
Upgrading Versions

Updates through purchasing new devices

Reliant on carriers… but looking to change that

Google Play services
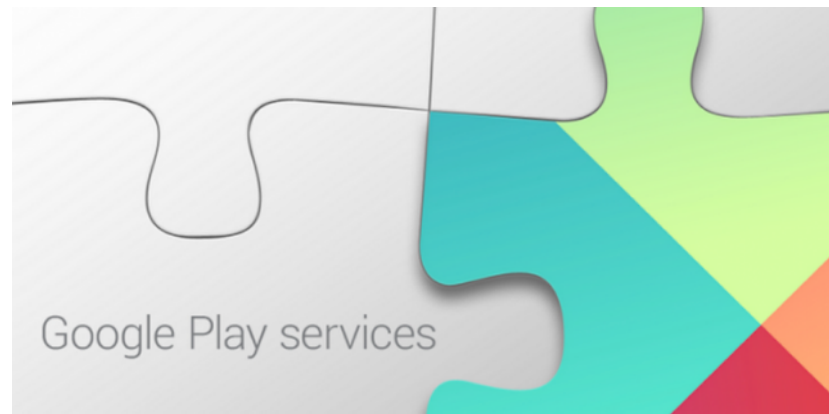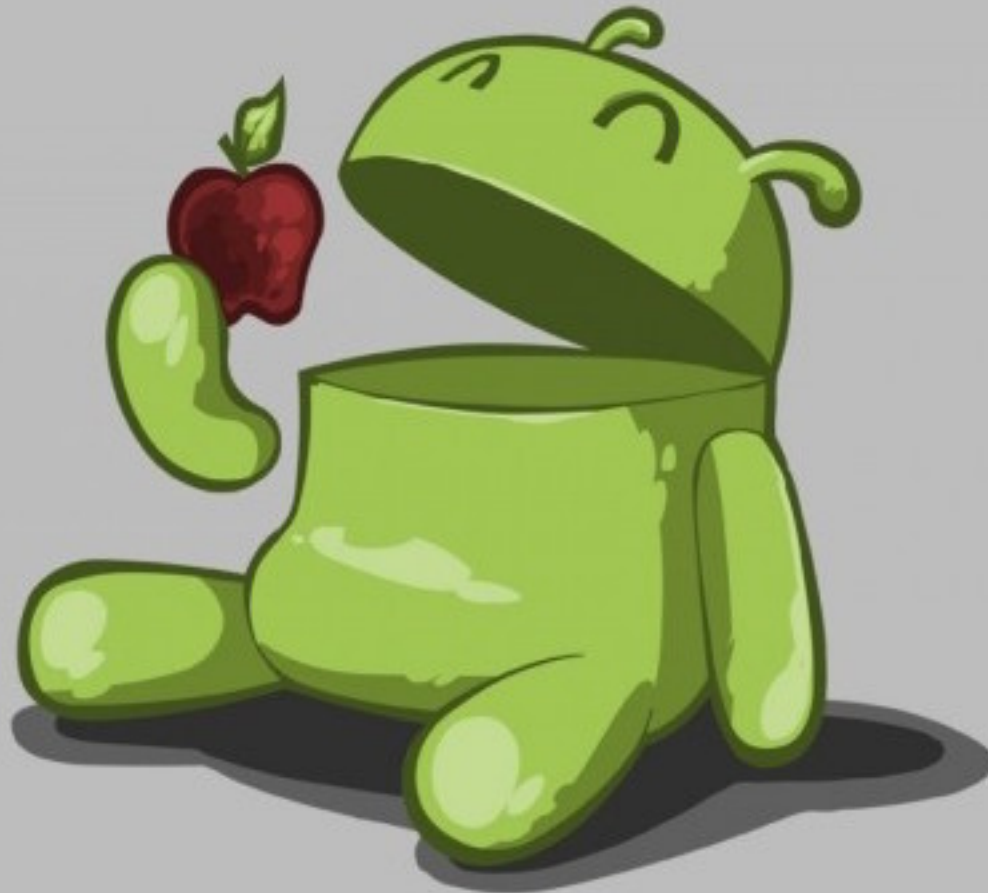
Legal Battles

ORACLE® vs. **Google**

Claim: Java API is copyrighted, so Google violated that by using it in Android (see EFF)
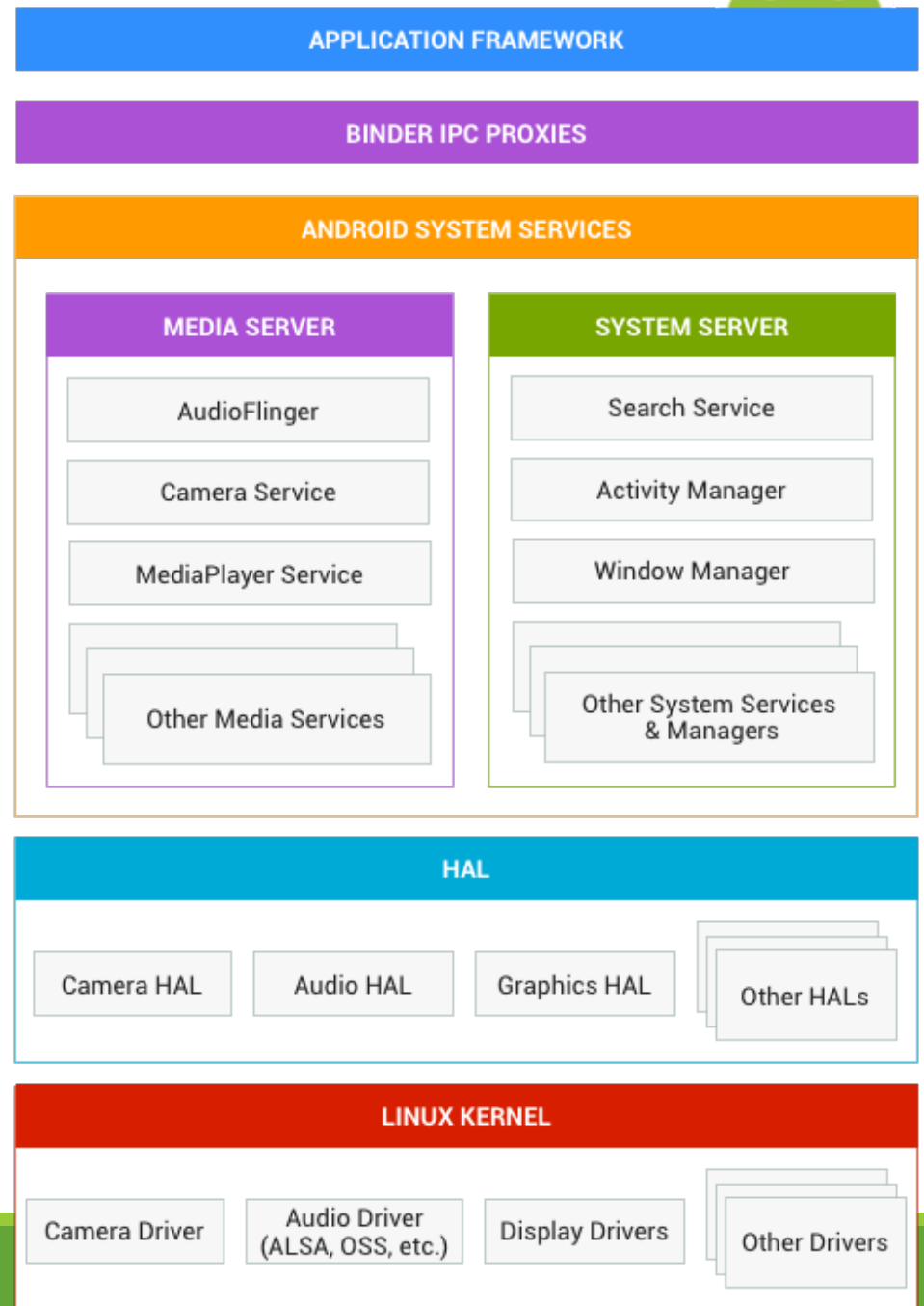
VB

Google confirms next Android version will use Oracle's open-source OpenJDK for Java APIs

EMIL PROTALINSKI DECEMBER 29, 2015 1:31 PM

Some Architecture

APPLICATION FRAMEWORK

BINDER IPC PROXIES

ANDROID SYSTEM SERVICES

MEDIA SERVER
- AudioFlinger
- Camera Service
- MediaPlayer Service
- Other Media Services

SYSTEM SERVER
- Search Service
- Activity Manager
- Window Manager
- Other System Services & Managers

HAL
- Camera HAL
- Audio HAL
- Graphics HAL
- Other HALs

LINUX KERNEL
- Camera Driver
- Audio Driver (ALSA, OSS, etc.)
- Display Drivers
- Other Drivers

Building Apps: Dalvik

Dalvik Pre-Lollipop (5.0)

| Java Code | → compile → | JVM bytecode | → "dexing" → | DVM bytecode |

- Register-based architecture
- bytecode stored in DEX or ODEX files
- **J**ust-**I**n-**T**ime compilation to native code

Building Apps: ART

Android RunTime (ART) Post-Lollipop
- Compile into native code on installation
  ("**A**head **O**f **T**ime")
- Accepts DEX bytecode
  (for backwards compatibility)

https://source.android.com/devices/tech/dalvik/

Packaging Apps: **APK**s

- Basically **.zip** files
- "side-load" or cryptographically sign for upload to Play Store

Building Process

1. Generate Java source files (e.g. from XML)
2. Compile Java source into JVM bytecode
3. "dex" JVM bytecode into Dalvik bytecode
4. Pack with graphics and assets into **.apk**
5. Cryptographically sign **.apk**

6. …

7. Profit!

Development Hardware

- Windows, Mac, or Linux (because Java!)
  - emulator sucks on Windows
  - use the Intel HAXM for acceleration!

- Physical Android Device
  - turn on developer options!

Development Software

- Java SDK
- Gradle or Apache ANT
- Android Studio IDE
- Android SDK (command-line tools)
  - **android** manage SDK/AVDs
  - **emulator** run the emulator
  - **adb** "android debugging bridge" connect to devices