

Mobile Development Overview

Ph.D Nguyen Dinh Vinh
vinhnd18@fe.edu.vn

Today's Agenda

- Why Mobile App Development?
- Why Android?
- Android Devices
- Android Version History
- The Android Developer Website
- Distribution of Platform Versions
- Mobile Devices: Advantages
- Mobile Devices: Disadvantages
- Mobile Applications
- Useful Materials

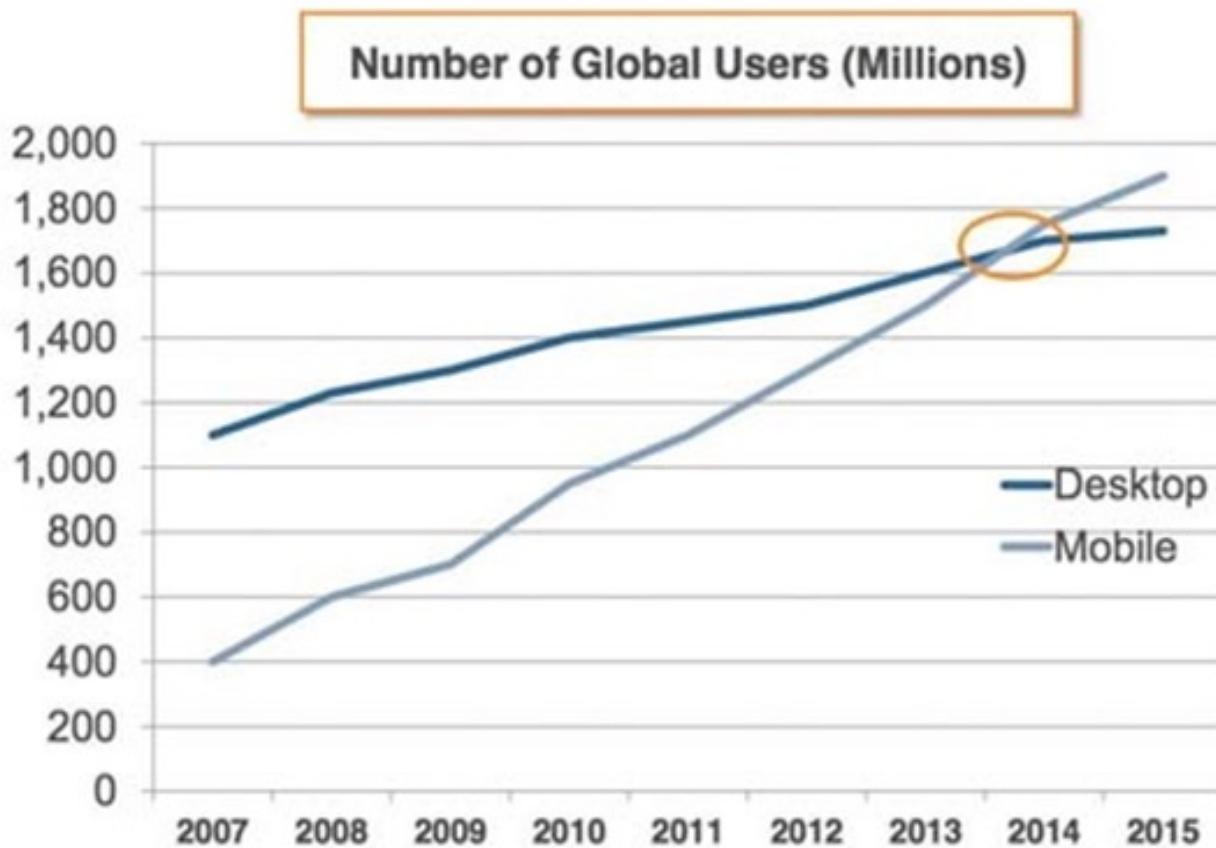
Why Mobile App Development?

- Mobile platform is the platform of the future
- More people access the web via mobile devices than from personal computers
- Job market is hot
 - Market for mobile software surges from \$4.1 billion in 2009 to \$17.5 billion by 2012¹
 - 2010 Dice.com survey: 72% of recruiters looking for iPhone app developers, 60% for Android¹
 - Dice.com: mobile app developers made \$85,000 in 2010 and salaries expected to rise²

¹ http://www.businessweek.com/technology/content/oct2010/tc20101020_639668.htm

² <http://it-jobs.fins.com/Articles/SB129606993144879991/Mobile-App-Developers-Wanted-at-Ad-Agencies>

Why Mobile App Development?



Smartphones



iPhone 4



LG Revolution



HTC Trophy



BlackBerry
Curve



Mobile Devices: Advantages

- Always with the user
- Typically have Internet access
- Typically GPS enabled
- Typically have accelerometer & compass
- Typically have cameras & microphones
- Apps are free or low-cost

Mobile Devices: Disadvantages

- Limited screen size
- Limited battery life
- Limited processor speed
- Limited and sometimes slow network access
- Limited or awkward input: soft keyboard, phone keypad, touch screen, or stylus
- Limited web browser functionality
- Range of platforms & configurations across devices

Mobile Applications

➤ What are they?

- Any application that runs on a mobile device

➤ Types

- Web apps: run in a web browser
 - *HTML, JavaScript, Flash, server-side components, etc.*
- Native: compiled binaries for the device

➤ Economics

- Free (often ad-supported) vs. paid

Why Android?

Top Four Operating Systems, Shipments, and Market Share, Q3 2013 (Units in Millions)

Operating System	3Q13 Shipment Volumes	3Q13 Market Share	3Q12 Shipment Volumes	3Q12 Market Share	Year-Over-Year Change
Android	211.6	81.0%	139.9	74.9%	51.3%
iOS	33.8	12.9%	26.9	14.4%	25.6%
Windows Phone	9.5	3.6%	3.7	2.0%	156.0%
BlackBerry	4.5	1.7%	7.7	4.1%	-41.6%
Others	1.7	0.6%	8.4	4.5%	-80.1%
Total	261.1	100.0%	186.7	100.0%	39.9%

Why Android?

- Students already know Java
 - Low learning curve
 - Students can use [App Inventor](#) for Android
- Transferring app to phone is trivial
 - Can distribute by putting it on the web
 - Android Market for wider distribution
- A lot of students have Android device





<http://www.csectioncomics.com/2010/11/iphone-vs-android-vs-blackberry.html>

Android Devices



HTC Desire



Samsung Galaxy Tab™ 10.1 WIFI



Galaxy Nexus



Asus Eee Pad Transformer (WIFI+3G)



Google augmented reality glasses

Android Devices



Android Devices



Android Version History

- ▶ 1.5 (Cupcake): 04/2009
- ▶ 1.6 (Donut): 09/2009
- ▶ 2.0/2.1 (Eclair): 10/2009, 01/2010
- ▶ 2.2 (Froyo): 05/2010
- ▶ 2.3 (Gingerbread): 12/2010
- ▶ 3.0/3.1/3.2 (HoneyComb): 02-07/2011
- ▶ 4.0 (Ice cream sandwich): 10/2011
- ▶ 4.1/4.2/4.3 (Jelly Bean): 9 July 2012
- ▶ 4.4 (KitKat): 31 October 2013



Cupcake
1.5



Donut
1.6



Eclair
2.0/2.1



Froyo
2.2



Gingerbread
2.3



Honeycomb
3.0



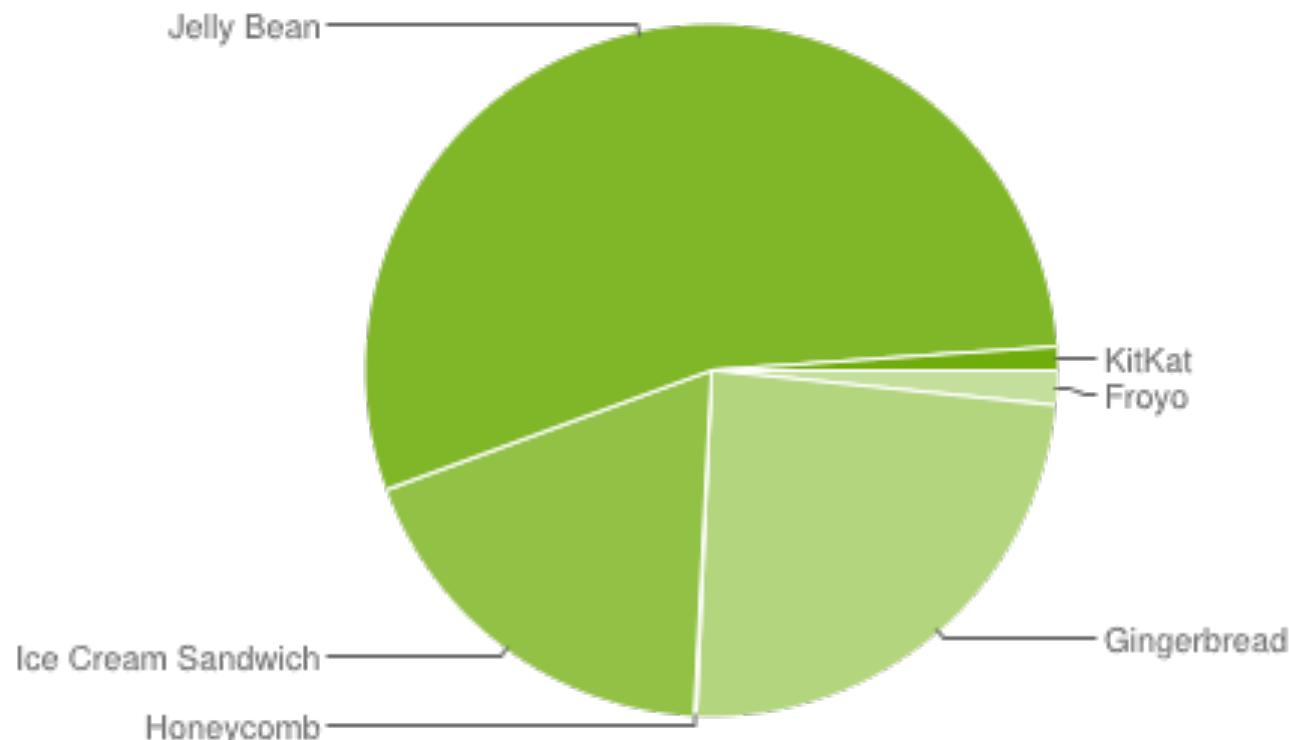
Ice cream sandwich



The Android Developer Website

- <http://developer.android.com/index.html>
- <http://developer.android.com/guide/components/index.html>
- <http://developer.android.com/tools/index.html>
- <http://developer.android.com/training/index.html>
- <http://developer.android.com/samples/index.html>

Distribution of Platform Versions



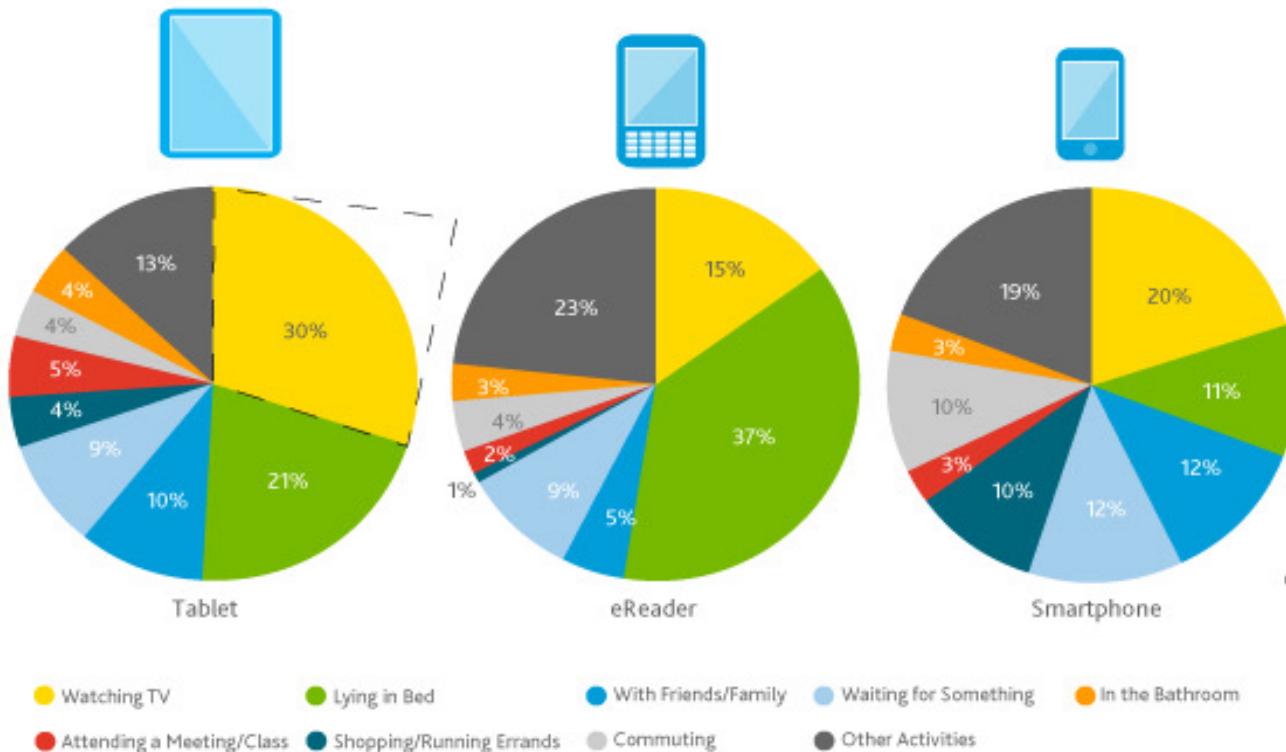
Distribution of Platform Versions

Version	Codename	API	Distribution
<u>2.2</u>	Froyo	8	1.6%
<u>2.3.3 - 2.3.7</u>	Gingerbread	10	24.1%
<u>3.2</u>	Honeycomb	13	0.1%
<u>4.0.3 - 4.0.4</u>	Ice Cream Sandwich	15	18.6%
<u>4.1.x</u>	Jelly Bean	16	37.4%
<u>4.2.x</u>		17	12.9%
<u>4.3</u>		18	4.2%
<u>4.4</u>	KitKat	19	1.1%

Device Usage

US Connected Devices: Time Distribution of Usage

Time Distribution for Device Usage by Location



Source: Q1 2011 Mobile Connected Device Report

nielsen

What is Android?

- Mobile operating system based on Linux kernel
- User Interface for touch screens
- Used on over 80% of all smartphones
- Powers devices such as watches, TVs, and cars
- Over 2 Million Android apps in Google Play store
- Highly customizable for devices / by vendors
- Open source

Android user interaction

- Touch gestures: swiping, tapping, pinching
- Virtual keyboard for characters, numbers, and emoji
- Support for Bluetooth, USB controllers and peripherals

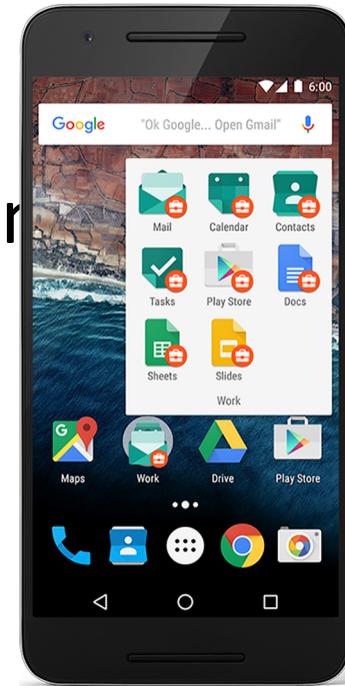
Android and sensors

Sensors can discover user action and respond

- Device contents rotate as needed
- Walking adjusts position on map
- Tilting steers a virtual car or controls a physical toy
- Moving too fast disables game interactions

Android home screen

- Launcher icons for apps
- Self-updating widgets for live content
- Can be multiple pages
- Folders to organize apps
- "OK Google"



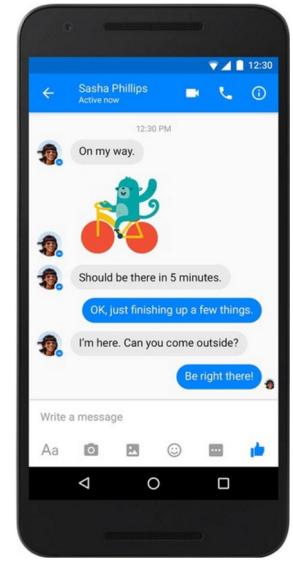
Android app examples



Pandora



Pokemon GO

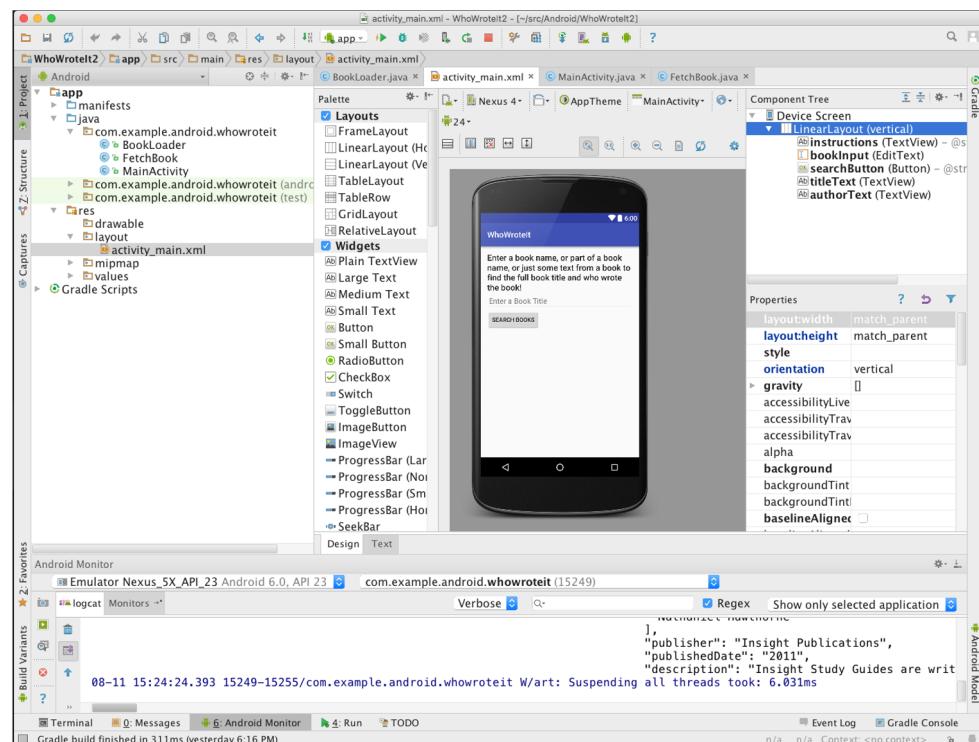


Facebook
Messenger

Android Software Developer Kit (SDK)

- Development tools (debugger, monitors, editors)
- Libraries (maps, wearables)
- Virtual devices (emulators)
- Documentation (developers.android.com)
- Sample code

Android Studio



- Official Android IDE
- Develop, run, debug, test, and package apps
- Monitors and performance tools
- Virtual devices
- Project views
- Visual layout editor

Google Play store

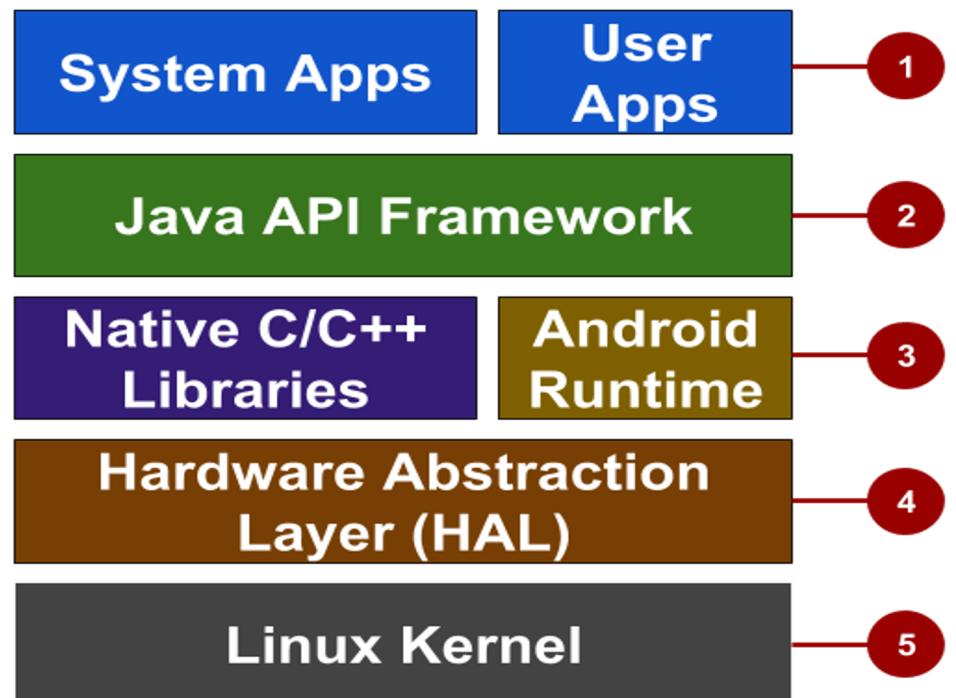
Publish apps through Google Play store:

- Official app store for Android
- Digital distribution service operated by Google



Android stack

1. System and user apps
2. Android OS API in Java framework
3. Expose native APIs; run apps
4. Expose device hardware capabilities
5. Linux Kernel



System and user apps



- System apps have no special status
- System apps provide key capabilities to app developers

Example:

Your app can use a system app to deliver a SMS message.

Java API Framework

The entire feature-set of the Android OS is available to you through APIs written in the Java language.

- View class hierarchy to create UI screens
- Notification manager
- Activity manager for life cycles and navigation

Android runtime

Each app runs in its own process with its own instance of the Android Runtime.

C/C++ libraries

- Core C/C++ Libraries give access to core native Android system components and services.

Hardware Abstraction Layer (HAL)

- Standard interfaces that expose device hardware capabilities as libraries

Examples: Camera, bluetooth module

- Threading and low-level memory management
- Security features
- Drivers

Older Android Versions



Codename	Version	Released	API Level
Honeycomb	3.0 - 3.2.6	Feb 2011	11 - 13
Ice Cream Sandwich	4.0 - 4.0.4	Oct 2011	14 - 15
Jelly Bean	4.1 - 4.3.1	July 2012	16 - 18
KitKat	4.4 - 4.4.4	Oct 2013	19 - 20
Lollipop	5.0 - 5.1.1	Nov 2014	21 - 22

[Android History](#) and
[Platform Versions](#)
for more and earlier
versions before 2011

Newer Android versions



Codename	Version	Released	API Level
<i>Marshmallow</i>	6.0 - 6.0.1	Oct 2015	23
<i>Nougat</i>	7.0 - 7.1	Sept 2016	24 - 25
<i>Oreo</i>	8.0 - 8.1	Sept 2017	26 - 27
<i>Pie</i>	9.0	Aug 2018	28

What is an Android app?

- One or more interactive screens
- Written using Java Programming Language and XML
- Uses the Android Software Development Kit (SDK)
- Uses Android libraries and Android Application Framework
- Executed by Android Runtime Virtual machine (ART)

Challenges of Android development

- Multiple screen sizes and resolutions
- Performance: make your apps responsive and smooth
- Security: keep source code and user data safe
- Compatibility: run well on older platform versions
- Marketing: understand the market and your users
(Hint: It doesn't have to be expensive, but it can be.)

App building blocks

- Resources: layouts, images, strings, colors as XML and media files
- Components: activities, services, and helper classes as Java code
- Manifest: information about app for the runtime
- Build configuration: APK versions in Gradle config files

Useful Materials

- The official site for Android developers
<http://developer.android.com/index.html>
- Android Development Community
<http://www.anddev.org/>
- 30 Days of Android Apps
<http://bakhtiyor.com/category/30-days-of-android-apps/>