ĐẠI HỌC BÁCH KHOA HÀ NỘI
VIỆN CÔNG NGHỆ THÔNG TIN VÀ TRUYỀN THÔNG

Mobile Programing

Chapter 1. Android Introduction

Note

- This slides is based on Google Android code labs slides
- Original slides: https://drive.google.com/drive/folders/1eu-LXxiHocSktGYpG04PfE9Xmr_pBY5P

Contents

- Android is an ecosystem
- Android platform architecture
- Android Versions
- Challenges of Android app development
- App fundamentals

Android Ecosystem

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

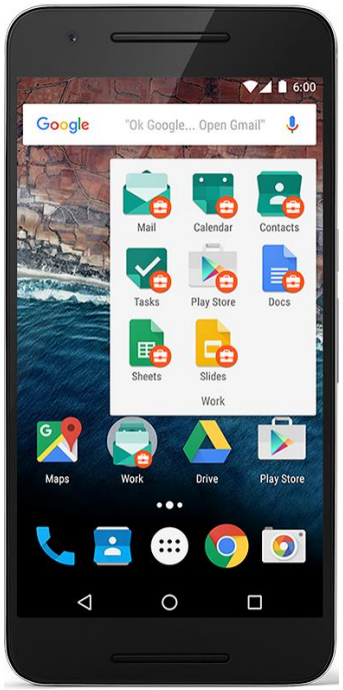
Android and sensors

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

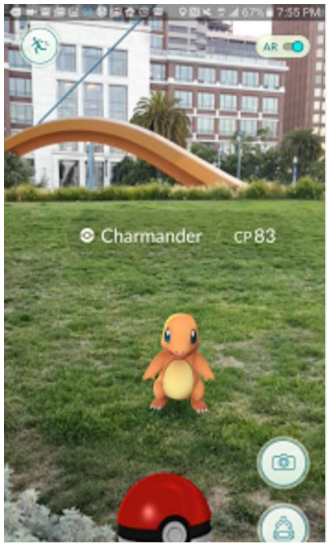
Android home screen

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

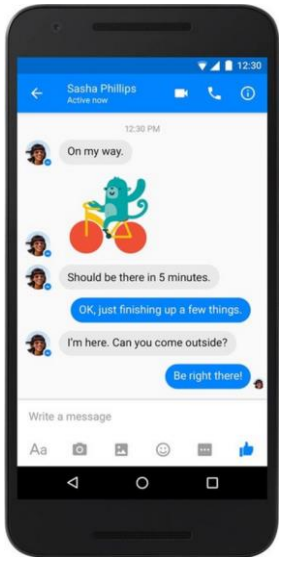


Android app examples

Pandora



Pokemon GO

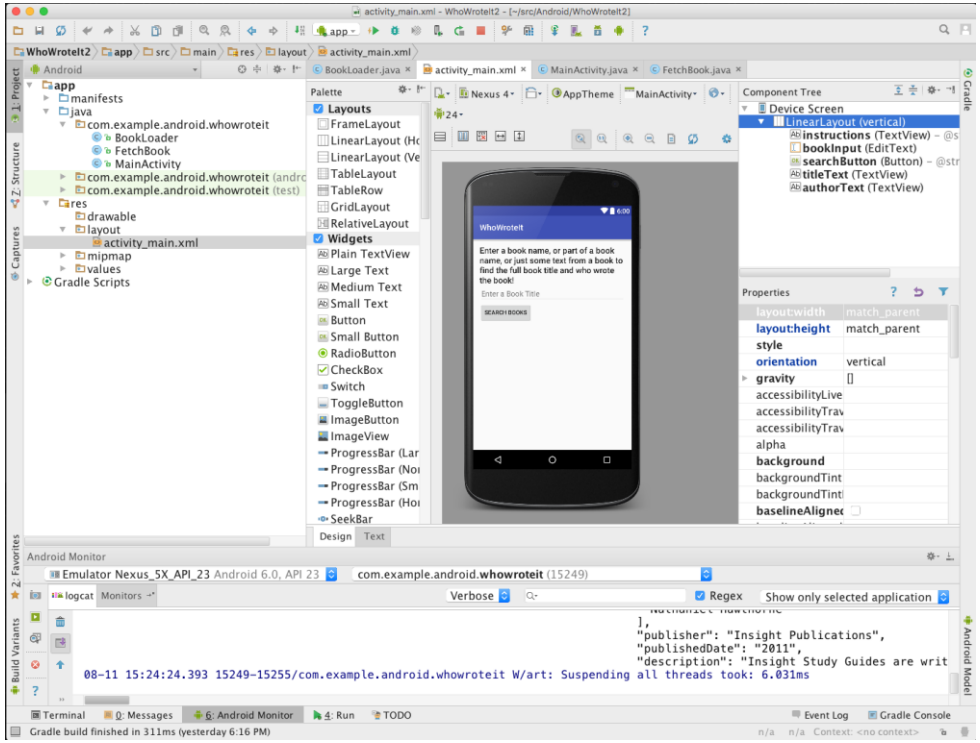


Facebook Messenger

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

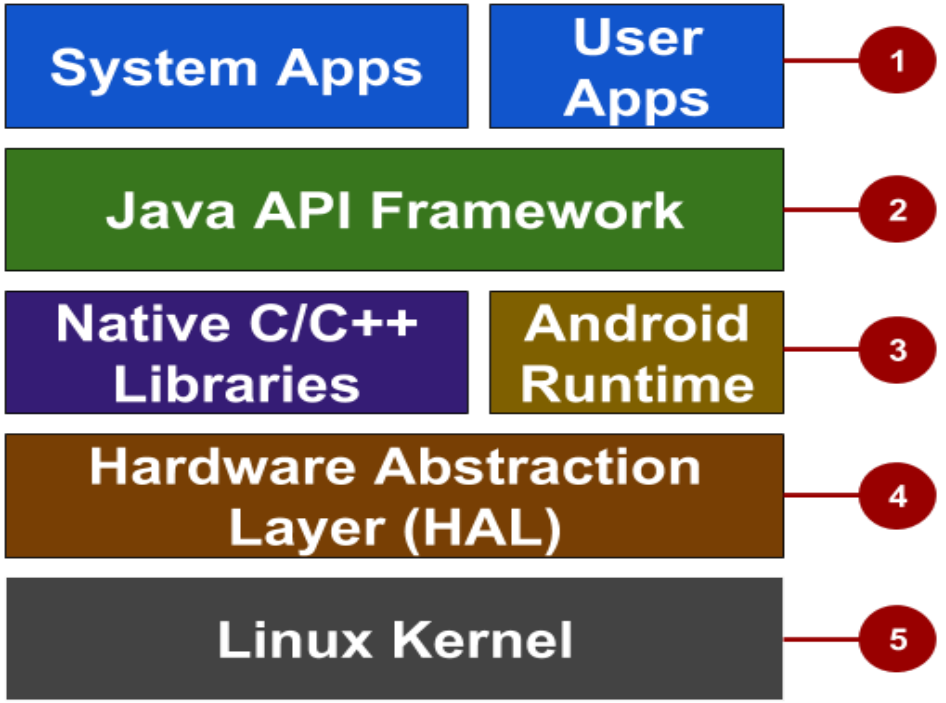
Publish apps through Google Play store:

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

Android Platform Architecture

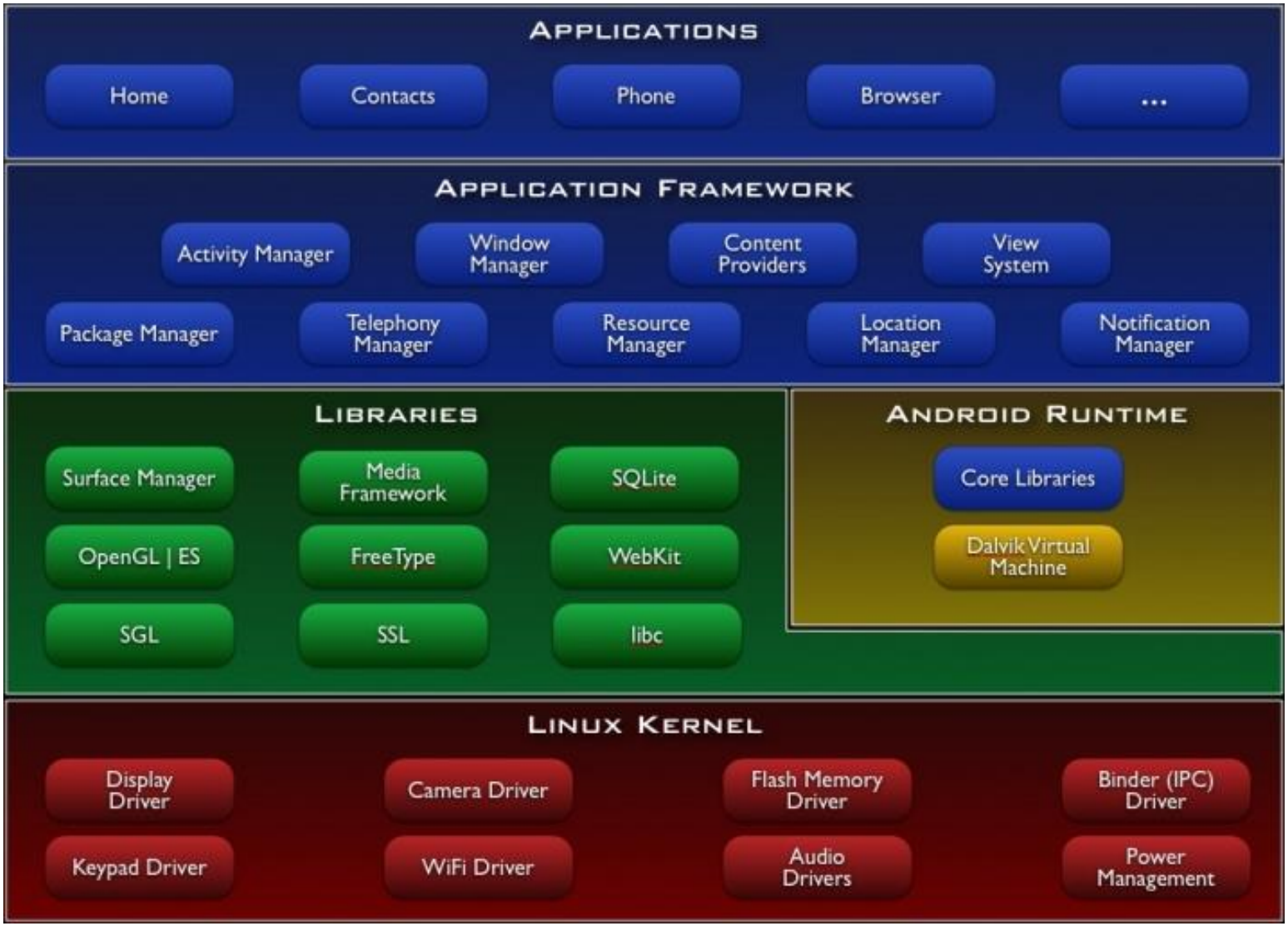
Android stack

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



Android stack

TFLite



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

Linux Kernel

- 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
Marshmallow	6.0 - 6.0.1	Oct 2015	23
Nougat	7.0 - 7.1	Sept 2016	24 - 25
Oreo	8.0 - 8.1	Sept 2017	26 - 27
Pie	9.0	Aug 2018	28

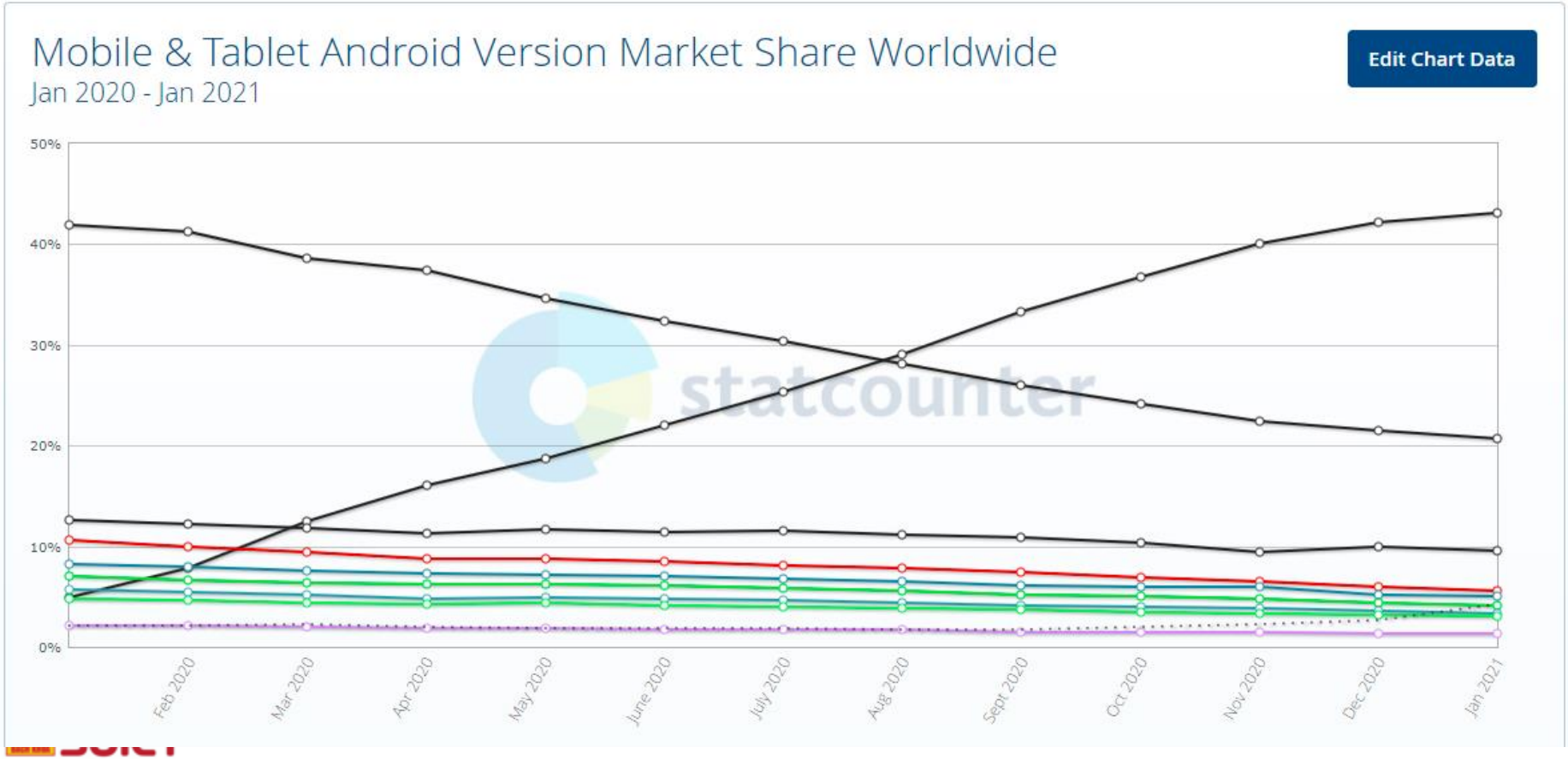
Android version

Name	Version number(s)	Initial stable release date	Supported (security fixes)	API level	References
No official codename	1.0	September 23, 2008	No	1	[9][14]
	1.1	February 9, 2009	No	2	[9][14][15]
Cupcake	1.5	April 27, 2009	No	3	[14][16]
Donut	1.6	September 15, 2009	No	4	[14][17]
Eclair	2.0 – 2.1	October 26, 2009	No	5 – 7	[14][18]
Froyo	2.2 – 2.2.3	May 20, 2010	No	8	[14][19]
Gingerbread	2.3 – 2.3.7	December 6, 2010	No	9 – 10	[14][20]
Honeycomb	3.0 – 3.2.6	February 22, 2011	No	11 – 13	[14][21]
Ice Cream Sandwich	4.0 – 4.0.4	October 18, 2011	No	14 – 15	[14][22]
Jelly Bean	4.1 – 4.3.1	July 9, 2012	No	16 – 18	[14][23]
KitKat	4.4 – 4.4.4	October 31, 2013	No	19 – 20	[14][24]
Lollipop	5.0 – 5.1.1	November 12, 2014	No	21 – 22	[14][25]
Marshmallow	6.0 – 6.0.1	October 5, 2015	No	23	[14][26]
Nougat	7.0 – 7.1.2	August 22, 2016	No	24 – 25	[14][27][28][29][30]
Oreo	8.0 – 8.1	August 21, 2017	Yes (for 8.1 only)	26 – 27	[14][31]
Pie	9	August 6, 2018	Yes	28	[14][32]
Android 10	10	September 3, 2019	Yes	29	[14][33][34]
Android 11	11	September 8, 2020	Yes	30	[14][35]
Android 12	12	TBA	Presupported	31	[14][36]

Android version market share

10.0 10	9.0 Pie	8.1 Oreo	6.0 Marshmallow	8.0 Oreo	7.0 Nougat
44.47%	21.29%	9.89%	5.77%	5.17%	4.26%

Mobile & Tablet Android Version Market Share Worldwide - January 2021



App Development

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.)

Android dashboard

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

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

Learn more

- Android History
- Introduction to Android
- Platform Architecture
- UI Overview
- Platform Versions
- Supporting Different Platform Versions
- Android Studio User's Guide

What's Next?

- Concept Chapter: 1.0 Introduction to Android
- No Practical