Android lecture 1

Android history, Kotlin

Agenda

- History of Android OS
- Development options
- Kotlin
- Android UI - overview
- Project structure
    - Gradle
    - Source code
    - Resources
- Android components
    - AndroidManifest
    - Activity
    - Service
    - Content provider
    - Broadcast receiver
    - Intent

History

Android history

- October 2003 - Android Inc.
  - Intended as software for digital cameras
- July 2005 - Android Inc. acquired by Google
- November 5, 2007 - Open Handset Alliance
  - Consortium of technology companies (Google), manufacturers (HTC, Sony,...), carriers (Sprint, T-mobile,..) and chipset makers (Qualcomm, …)
- October 22, 2008 - T-mobile G1 (HTC)

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T-Mobile G1 (HTC Dream)

Android

- Linux based OS
  - No bash, no access to root (by default)
  - GNU C library (glibc) replaced by bionic
- Open source
  - https://source.android.com/
  - Just the OS, not the Play store or Google play services

Android versions

- 1.0 - 23 September 2008 (API 1)
- 1.1 - 9 February 2009 (API 2)
- 1.5 - Cupcake 27 April 2009 (API 3)
- 1.6 - Donut 26 October 2009 (API 4)
- 2.0 -2.1 - Eclair (API 5 - 7)
- 2.2 - Froyo (API 8)
- 2.3.x - Gingerbread (API 9 - 10)

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Android versions

- 3.x - Honeycomb (API 11 - 13) - Tablet only
- 4.0.x - Ice cream sandwich (API 14-15)
- 4.1 - 4.3 - Jelly Bean (API 16 - 18)
- 4.4 - Kitkat (API 19)
- 4.4W - Kitkat for wearables (API 20)
- 5.0 - 5.1 - Lollipop (API 21 - 22)
  - Material design
  - ART runtime - Just In Time vs Ahead Of Time
- 6.0 - Marshmallow (API 23) October 2015
  - Runtime permissions
  - Doze mode

Android versions

- 7.0 - Nougat (API 24) - August 2016
    - Multi window
    - Doze on the go
    - Vulkan API
    - Quick settings tiles
- 7.1 Nougat (API 25) - October 4, 2016
    - App shortcuts

Android versions

- 8.0 Oreo (API 26) August 21, 2017
  - Picture in picture
  - Notification channels
  - Custom fonts and downloadable fonts
  - Autosizing textview
  - Multi display support
  - Permissions
    - Fix granting permission to whole group
  - Some packages from java 8
    - java.time
    - java.nio.file
    - java.lang.invoke
  - Project treble
    - Sony, Nokia, OnePlus
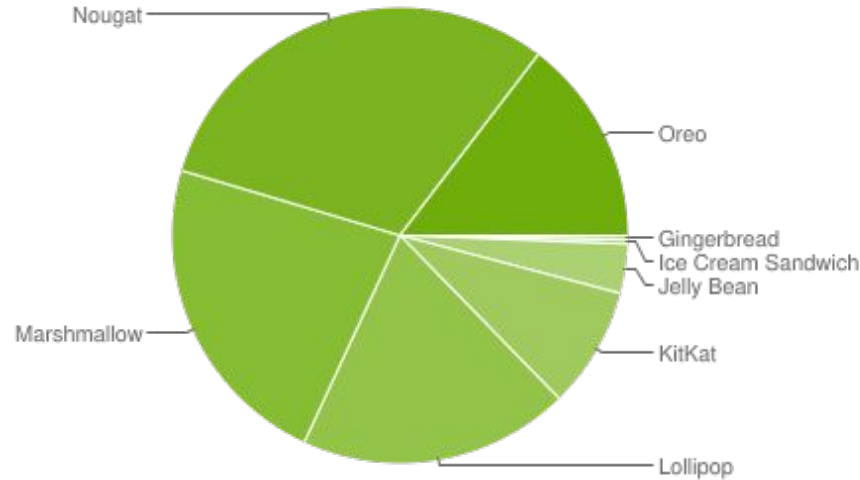
Android versions

- 8.1 Oreo (API 27) December 5, 2017
  - Neural Network API
  - Programmatic safe browsing actions
  - Video thumbnail extractor
  - Wallpapers color API
  - Fingerprint updates
    - New error codes
  - Cryptography updates
    - Prefer Conscrypt over Bouncy castle

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Android versions

- 9.0 Pie (API 28) August 6, 2018
    - Display cutout
    - Notifications - messaging
    - Multi camera support
    - ImageDecoder
    - Animation
        - GIF, WebP animated images
    - HDR VP9, HEIF and Media APIs

Avast mobile security < 0.3% userbase

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Android today - versions

Data collected during a 7-day period ending on September 28, 2018. Any versions with less than 0.1% distribution are not shown.

https://developer.android.com/about/dashboards/
https://www.bidouille.org/misc/androidcharts

Version	Codename	API	Share
2.3.3 - 2.3.7	Gingerbread	10	0.3%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	0.3%
4.1.x	Jelly Bean	16	1.1%
4.2.x		17	1.6%
4.3		18	0.5%
4.4	KitKat	19	7.8%
5.0	Lollipop	21	3.6%
5.1		22	14.7%
6.0	Marshmallow	23	21.6%
7.0	Nougat	24	19.0%
7.1		25	10.3%
8.0	Oreo	26	13.4%
8.1		27	5.8%

Android

- Android - phones and tablets
- Android wear - smartwatch
  - Extended notification center
- Android TV - televisions, consoles
  - Native TV app experience for IPTV
- Android auto - cars
  - Connecting phone with the car
- Android things
  - Platform for IoT
  - Development board Raspberry Pi 3 B
- Google glass
  - Glass explorer program - retired
  - Now glass for enterprise - to be used in logistic, manufactures…
    https://www.x.company/glass

Android ecosystem

- Apps are available on Google Play store
- Paid and free apps
- Subscription
- In-app purchases
- Android users not like to pay for apps => a lot of advertisements
- Available in most countries

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Mobile devices specifics

- Not enough computation power
- Changing state - screen orientation
- Unstable network connection
- Small battery

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Android - cons

- Fragmentation, slow upgrades
  - http://opensignal.com/repo
- Low-end devices
- Low-quality apps in Google pla
  - Solar charger app

Android - pros

- Open source
- Lot of users
- Lot of apps
- Freedom (keyboard, launcher, …)
- Developers one time fee 25$
  - Alpha, beta channels, staged rollout
  - Basic crash reporting
  - Pre-launch reports
  - Android vitals
- Dev tools available for Linux, Windows and Mac
- A lot of OSS libraries
  - Retrofit, OkHttp, Dagger, Styled dialogs, Butterknife, Stetho, RxJava
- Nexus/Pixel devices

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Android - security

- Root user is not available by default
    - Rooting devices to get more features, often void warranty
- Permissions
    - Until API-23 before installation "all or nothing"
    - Since API-23 permissions are requested at runtime
    - Empty data or crash, depends on TargetSDK
- Bouncer
    - Service that scan google play store for malicious apps

Development

Development options

- App-like mobile web
- Other language frameworks (Xamarin, flutter.io)
- WebView based frameworks (PhoneGap)
- Native
    - Java
    - Kotlin - officially announced support for android development on Google IO 2017
    - C/C++ (mainly games and libraries)

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Development tools

- Android studio
- SDK
  - ADB
  - Lint, UiAutomatorViewer
  - Emulator
  - Aapt, aidl, dx, (jack & jill - java 8, now deprecated)
  - D8
  - Proguard
- NDK (C/C++ development)
  - Cross compile
  - Native libraries
- Gradle
  - Build system
  - Use Groovy (kotlin) as DSL
  - Extensible

Kotlin

Ketchup

Island

Kotlin

https://kotlinlang.org/

History

- Developed by JetBrains
  - No other language except scala did not have features, they needed
- July 2011 unveiled Project Kotlin
- February 2012 open sourced
- February 2016 Kotlin v1.0
- Google IO 2017 first-class support on Android
- November 2017 Kotlin v1.2
- September 2018 1.3-RC

Why Kotlin

- Concise
  - Reduce boilerplate code
- Safe
  - Avoid NullPointerExceptions
- Interoperable
  - Works well with legacy java code
- Tool-friendly
  - Support in IDEs (IntelliJ IDEA, Android Studio, Eclipse, Netbeans, standalone compiler)

Kotlin - concise

- Data classes
- Smart casting
- Named parameters
- Default parameter values
- Extension functions
- Lambda expressions
- String interpolation
- Operator overloading

Kotlin - safe

- Null safety
- Immutable by default
  - List vs. MutableList, Map vs. MutableMap

Kotlin - interoperability

- Java
- Swift