



Chapter 1

Getting Started with Android Programming

Outline

- Introduction
- Android Features and Versions
- Tools Installation
- Create and configure your first app
- Run an app
 - On a real device
 - On the emulator

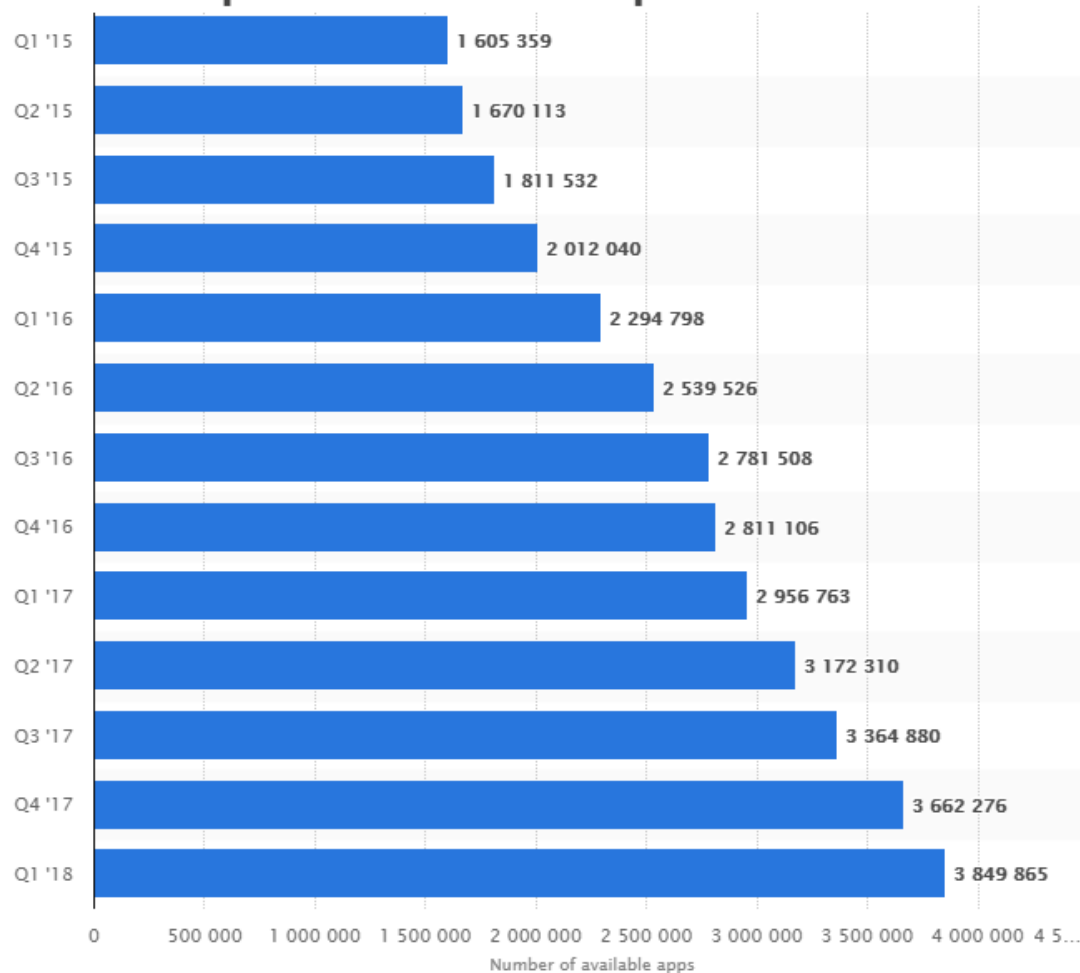
Introduction

○The Smartphone Revolution – In Numbers (Sources: statista.com – August 2017)

- 2.32 Billion Smartphone Users Worldwide.
- 3 Million Apps available on Google Play Store.
- 2.2 Million Apps on Apple Store
- \$36.2 Billion in Revenue on App Stores.
- ~200 Minutes Spent Daily on Smartphones.
- 8 Apps Used on Average Daily.

Introduction

**Number of available apps at Google Play
from 2nd quarter 2015 to 1st quarter 2018**



Introduction

○Smartphones vs. Computers

- Geolocation: WiFi/3G/GPS.
- Push Notifications.
- Camera & Sharing.
- NFC (Near Field Communications) & BLE (Bluetooth Low Energy introduced by PayPal).
- Accelerometer.
- ...

Introduction

○ Mobile Operating Systems



Introduction

Android vs. iOS: A Battle Lasting For 9 Years (And Still Counting)

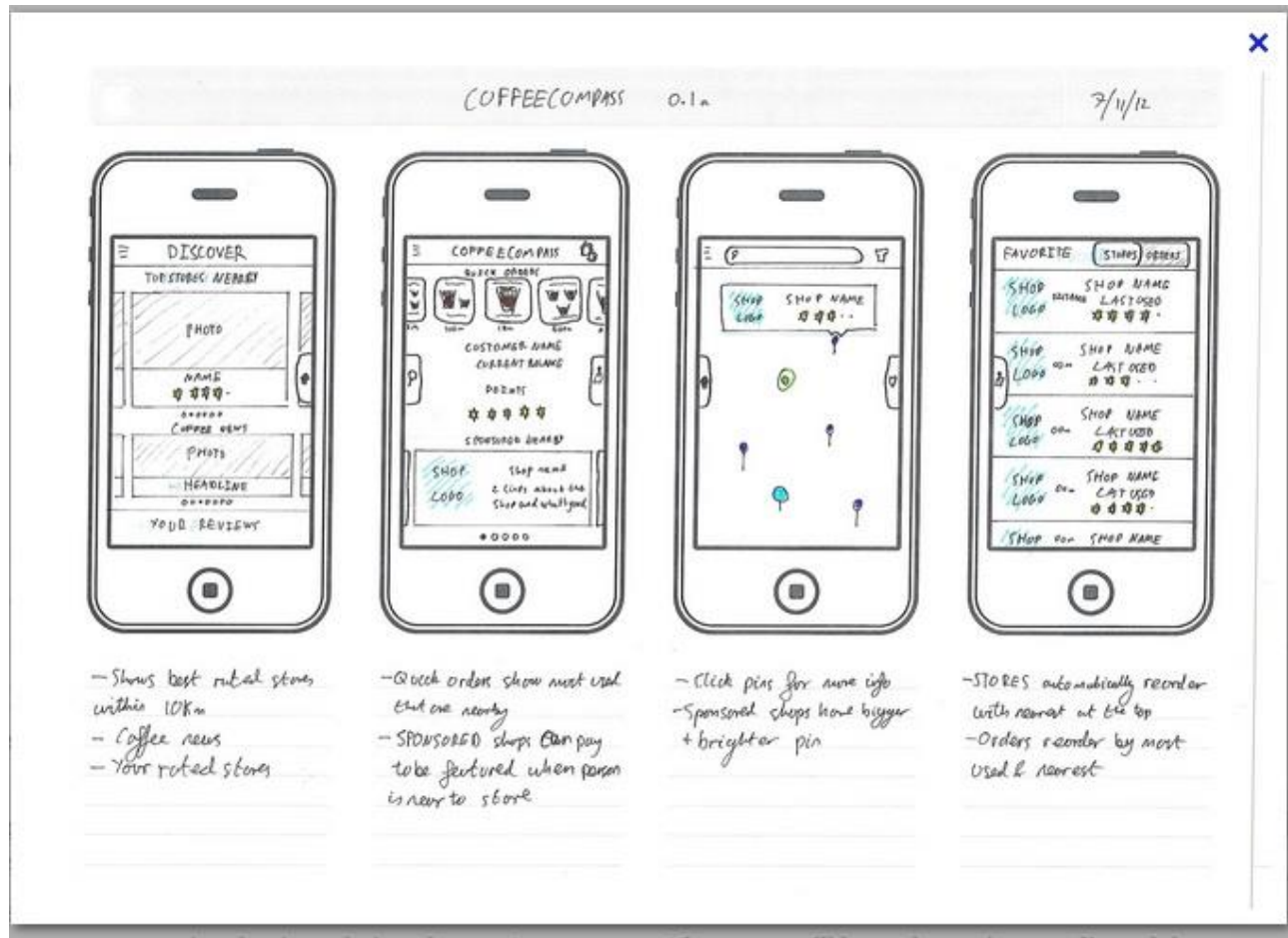
| | Android | iOS |
|--------------------------|---|------------------------|
| Source Model | Open Source | Proprietary |
| Manufacturer | Samsung, HTC, LG, Sony... | Apple |
| User Profile | Least likely to pay | More likely to pay |
| Version Naming | Sweet | Sober |
| Apps in Store | ~4M | ~3M |
| Fragmentation (end 2016) | ~20% on latest version (changes very quickly!! Why?) | ~80% on latest version |
| Computer OS | Any | Mac OS X |

Introduction

- From Code To App: 3 main SE steps
 - App Design
 - App Development
 - App Publication

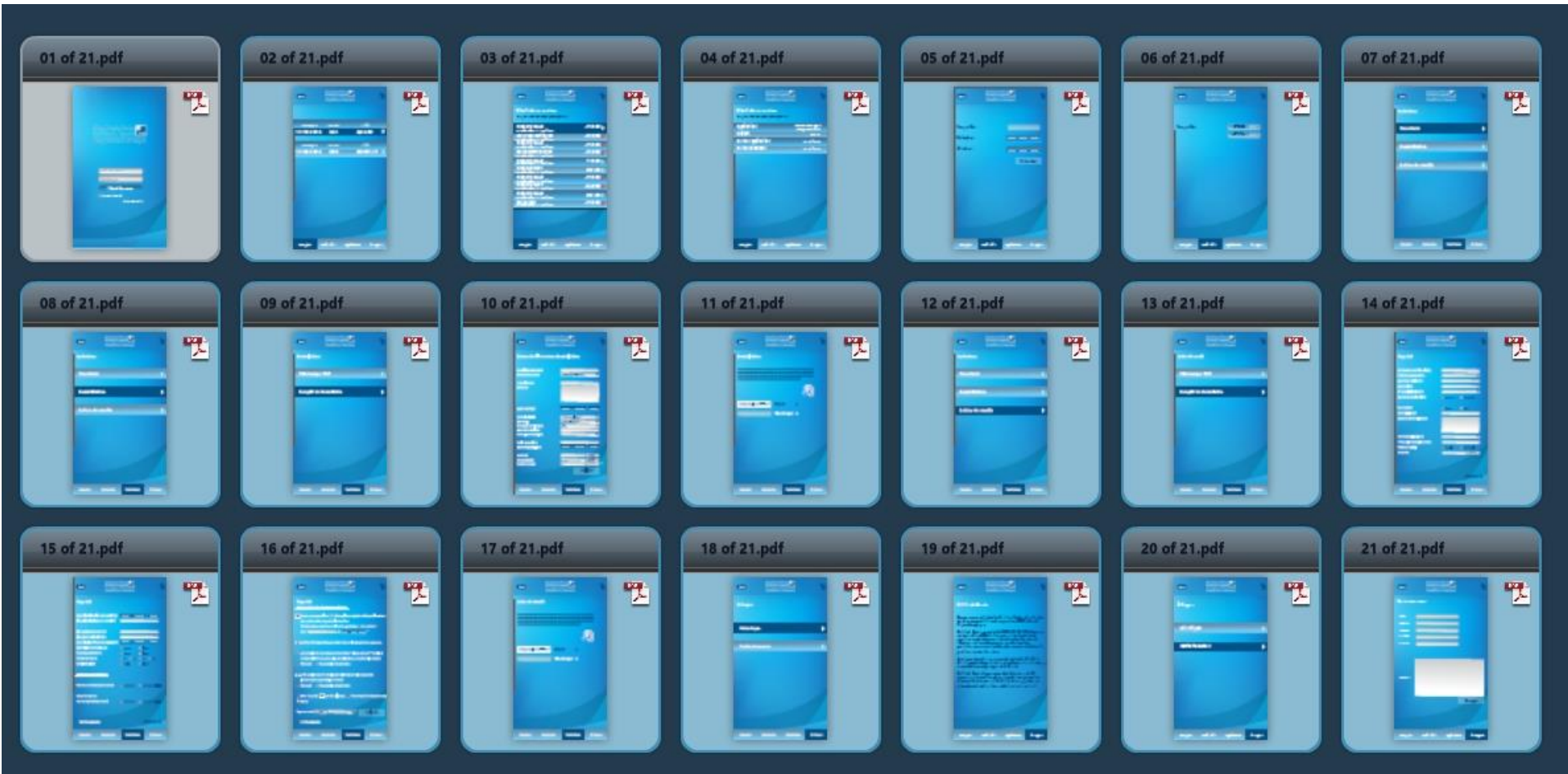
App Design

Representing the Idea: Wireframes



App Design

○User Journey: Storyboard





App Design

○Preparing the Assets: Slicing

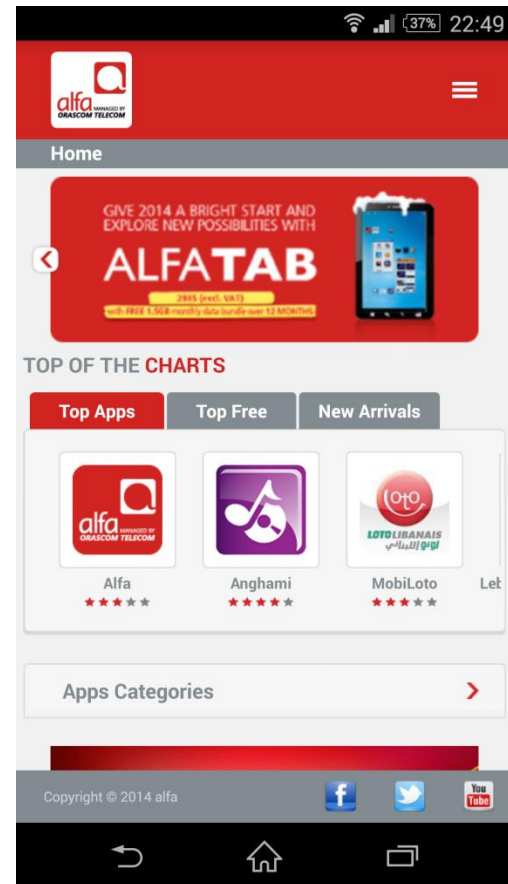


App Development

○HTML5 vs. Native

| |  |  |  |
|---------------------|---|---|---|
| Technologies | CSS3, Javascript | Java | Objective-C/Swift |
| Code Once | Yes | No | No |
| IDE/SDK | PhoneGap/Ionic/... | Eclipse/Studio | XCode |

App Development



App Development

○What Not To Forget

- User Experience.
- Only Using Required Permissions.
- Accounting for Multiple Image Resolutions.
- Memory and Battery Usage.
- Bandwidth Usage.
- Error/Exception Management.
- Code Quality: « Always code as if the person who will maintain your code is a maniac serial killer who knows where you live »

App Publication

- Create an account.
- Upload your app:
 - Binary/Archive.
 - Metadata: language, title, short/full description, category, contact details, country, screenshots, version, icon...
 - Set the price (if any).
- App is published within:
 - A couple of hours on Google Play.
 - A few days/weeks on App Store.
- Track your app: downloads, payments...

Android application development

- In this course, we will learn Android application development
- Android is an open-source software platform developed by Google.
 - includes an operating system, middleware and key applications.
- Android SDK provides the tools and APIs
 - to begin developing applications on the Android platform
- Language
 - Java

Android Features

◦Dalvik virtual machine

- optimized for mobile devices

◦Integrated browser

- based on the open source [WebKit](#) engine

◦Optimized graphics

- powered by a custom 2D graphics library; 3D graphics based on the OpenGL ES 1.0 specification (hardware acceleration optional)

◦SQLite

- for structured data storage

◦Media support

- for common audio, video, and still image formats (MPEG4, H.264, MP3, AAC, AMR, JPG, PNG, GIF)

◦GSM Telephony (hardware dependent)

◦Bluetooth, EDGE, 3G, and WiFi (hardware dependent), 4G LTE recently

◦Camera, GPS, compass, and accelerometer (hardware dependent)

◦Rich development environment

- including a device emulator, tools for debugging, memory and performance profiling, and a plugin for the Eclipse IDE

Android Versions

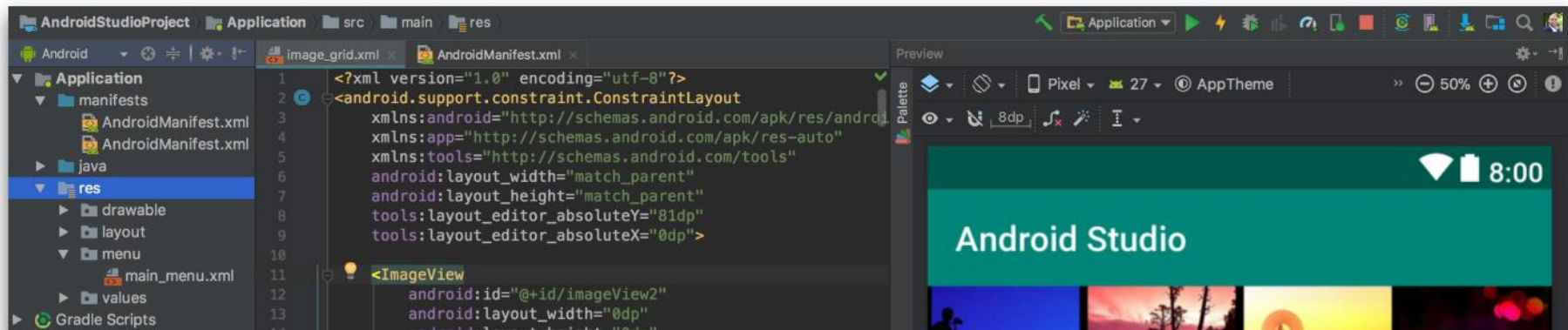
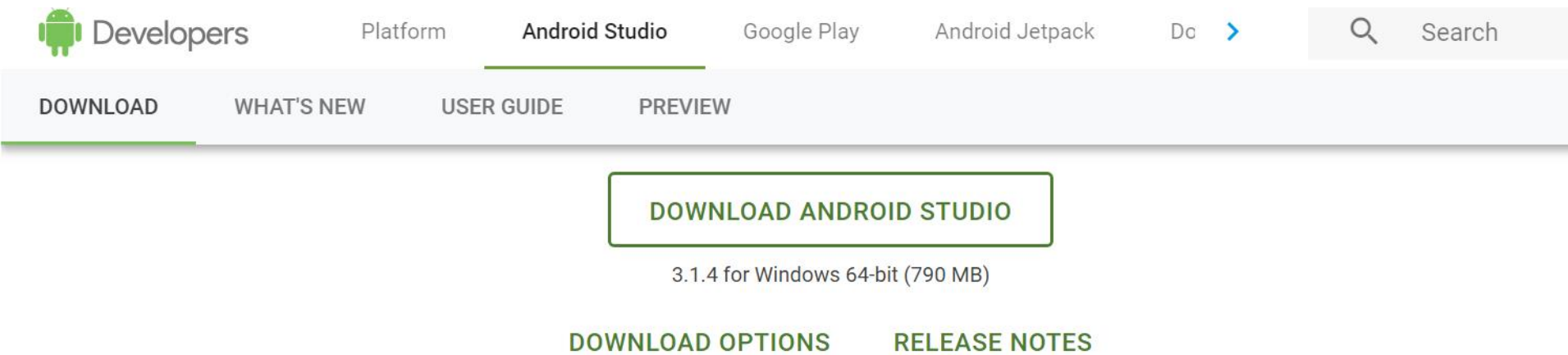
| VERSION | RELEASE | CODENAME |
|------------|----------------|-----------------------|
| 1.19 | 2/2009 | |
| 1.5 | 4/2009 | Cupcake |
| 1.6 | 9/009 | Donut |
| 2.0-2.1 | 10/2009 | Eclair |
| 2.2 | 5/2010 | Frozen Yogurt (Froyo) |
| 2.3 | 12/2010 | Ginger bread |
| 3.0-3.2 | 2/2011 | Honeycomb |
| 4.0 | 10/2011 | Ice Cream Sandwich |
| 4.1/2/3 | 6/2012 | Jelly Bean |
| 4.4 | 10/2013 | Kit Kat |
| 5.0 | 11/2014 | Lollipop |
| 6.0 | 10/2015 | Marshmallow |
| 7.0 – 7.1 | 08/2016 | Nougat |
| 8.0 – 8.1 | 08/2017 | Oreo |
| 9.0 | 03/2018 | Pie |

<http://www.android.com/history/> : versions and logos

Tools installation - Android Studio

- Android Studio is the official Android IDE

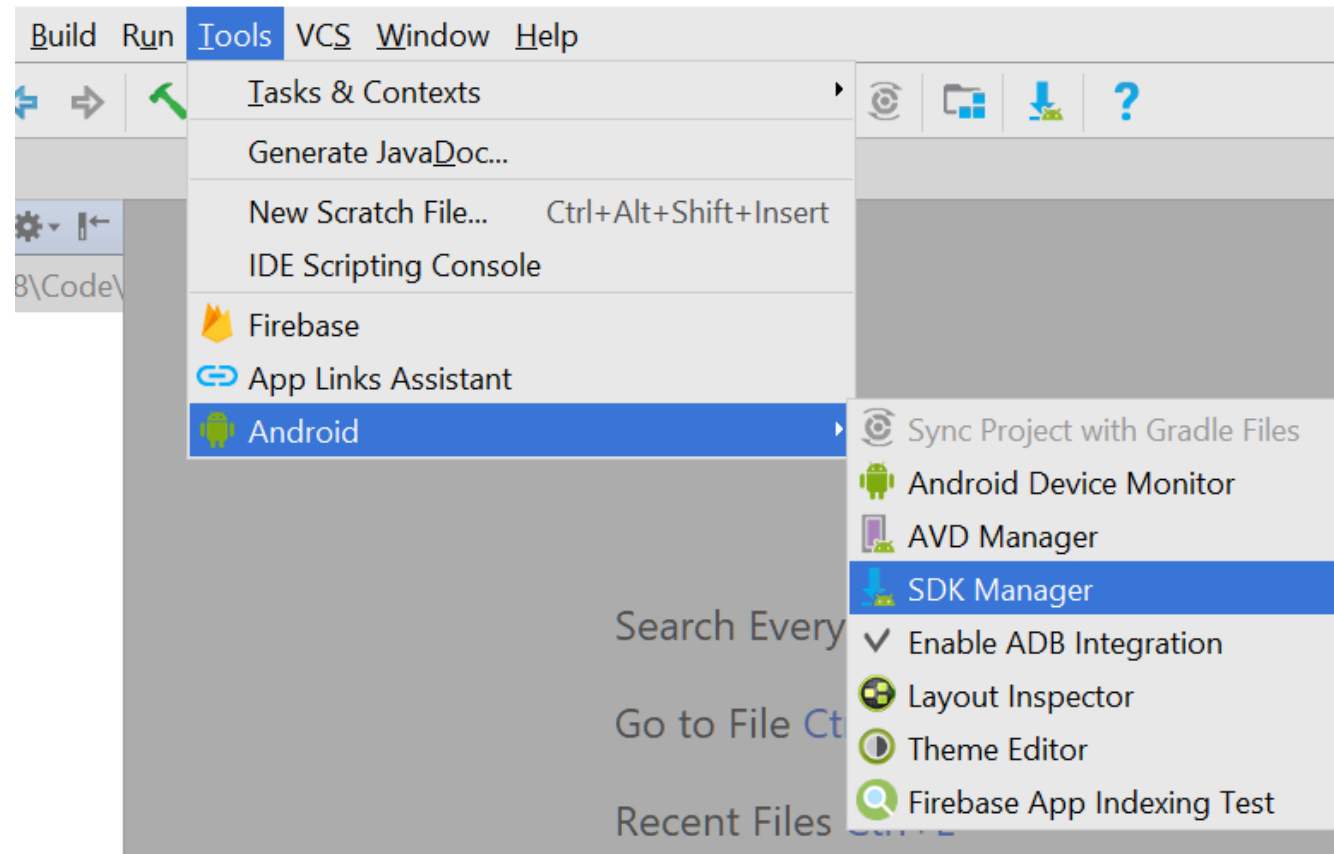
<https://developer.android.com/studio/>



Tools installation - Android Studio

oDownload the latest SDK tools and platforms using the SDK Manager

- Android Studio **Tools** menu: **Tools** > **Android** > **SDK Manager**.



Menus and Toolbars

System Settings

Passwords

HTTP Proxy

Updates

Usage Statistics

Android SDK

Notifications

Quick Lists

Path Variables

Keymap

Editor

Plugins

Build, Execution, Deployment

Tools


SDK Platforms

SDK Tools

SDK Update Sites

Each Android SDK Platform package includes the Android platform and sources pertaining to an API level by default. Once installed, Android Studio will automatically check for updates. Check "show package details" to display individual SDK components.

| | Name | API Level | Revision | Status |
|-------------------------------------|----------------------------------|-----------|----------|---------------------|
| <input type="checkbox"/> | Android 8.0 (O) | 26 | 2 | Not installed |
| <input checked="" type="checkbox"/> | Android 7.1.1 (Nougat) | 25 | 3 | Update available |
| <input checked="" type="checkbox"/> | Android 7.0 (Nougat) | 24 | 2 | Installed |
| <input checked="" type="checkbox"/> | Android N Preview | N | 3 | Partially installed |
| <input checked="" type="checkbox"/> | Android 6.0 (Marshmallow) | 23 | 3 | Update available |
| <input type="checkbox"/> | Android 5.1 (Lollipop) | 22 | 2 | Not installed |
| <input type="checkbox"/> | Android 5.0 (Lollipop) | 21 | 2 | Partially installed |
| <input type="checkbox"/> | Android 4.4W (KitKat Wear) | 20 | 2 | Not installed |
| <input type="checkbox"/> | Android 4.4 (KitKat) | 19 | 4 | Not installed |
| <input type="checkbox"/> | Android 4.3 (Jelly Bean) | 18 | 3 | Not installed |
| <input type="checkbox"/> | Android 4.2 (Jelly Bean) | 17 | 3 | Not installed |
| <input type="checkbox"/> | Android 4.1 (Jelly Bean) | 16 | 5 | Not installed |
| <input type="checkbox"/> | Android 4.0.3 (IceCreamSandwich) | 15 | 5 | Partially installed |
| <input type="checkbox"/> | Android 4.0 (IceCreamSandwich) | 14 | 4 | Not installed |
| <input type="checkbox"/> | Android 3.2 (Honeycomb) | 13 | 1 | Not installed |
| <input type="checkbox"/> | Android 3.1 (Honeycomb) | 12 | 3 | Not installed |
| <input type="checkbox"/> | Android 3.0 (Honeycomb) | 11 | 2 | Not installed |
| <input type="checkbox"/> | Android 2.3.3 (Gingerbread) | 10 | 2 | Not installed |
| <input type="checkbox"/> | Android 2.3 (Gingerbread) | 9 | 2 | Not installed |
| <input type="checkbox"/> | Android 2.2 (Froyo) | 8 | 3 | Not installed |
| <input type="checkbox"/> | Android 2.1 (Froyo) | 7 | 2 | Not installed |

Looking for updates... 

☐ Show details

OK

Cancel

Create a Project with Android Studio

- In Android Studio, create a new project (File -> New Project)
- Fill out the fields on the screen, and click **Next**.
 - **Application Name** is the app name that appears to users.
 - **Company domain** provides a qualifier that will be appended to the package name.
 - **Package name** is the fully qualified name for the project. Your package name must be unique across all packages installed on the Android system.
 - **Project location** is the directory on your system that holds the project files.

Create a Project with Android Studio

○ Under **Select the form factors your app will run on**, check the box for **Phone and Tablet**.

○ For **Minimum SDK**, select **API 8: Android 2.2 (Froyo)**

- The Minimum Required SDK is the earliest version of Android that your app supports, indicated using the [API level](#).
- To support as many devices as possible, you should set this to the lowest version available that allows your app to provide its core feature set.

Create a Project with Android Studio

- Under **Add an activity to <template>**, select **Blank Activity** and click **Next**.
- Under **Customize the Activity**, change the **Activity Name** to *MyActivity*. The **Layout Name** changes to *activity_my*, and the **Title** to *MyActivity*. The **Menu Resource Name** is *menu_my*.
- Click the **Finish** button to create the project.

Android project – Main Files

- `app/src/main/res/layout/activity_my.xml`
 - XML layout file is for the activity `MyActivity`
- `app/src/main/res/layout/content_my.xml`
 - XML layout file to be included by the `activity_main.xml`
- `app/src/main/java/com.mycompany.myfirstapp/MyActivity.java`
 - class definition for the activity you created
- `app/src/main/AndroidManifest.xml`
 - The [manifest file](#) describes the fundamental characteristics of the app and defines each of its components (more details later)

Folders

○App/src/main/res/ folder contains several sub-directories for [app resources](#). Here are just a few:

- mipmap-hdpi/

Directory for drawable objects (such as bitmaps) that are designed for high-density (hdpi) screens. Other mipmap directories contain assets designed for other screen densities.

- layout/

Directory for files that define your app's user interface.

- values/

Directory for other various XML files that contain a collection of resources, such as string and color definitions.

Running your application

- When you build and run the default Android app, the default Activity class starts and loads its layout file
- You have several options to run:
 - If you own an Android device, you can test your application automatically on the real device
 - You can use the Android emulator or Android Virtual Device (AVD) that comes with the ADT
 - You can use an independent Android emulator like BlueStacks, Genymotion, ...

Run on a real device

- Plug in your device to your development machine with a USB cable
- Enable **USB debugging** on your device.
 - On most devices running Android 3.2 or older, you can find the option under **Settings > Applications > Development**.
 - On Android 4.0 and newer, it's in **Settings > Developer options**.

Note: On Android 4.2 and newer, **Developer options** is hidden by default. To make it available, go to **Settings > About phone** and tap **Build number** seven times. Return to the previous screen to find **Developer options**.

Run on a real device

- To run the app from Android Studio:
 - Open one of your project's files
 - Click **Run** from the toolbar.
 - In the **Choose Device** window that appears, select the **Choose a running device** radio button, select your device
 - Android Studio installs the app on your connected device and starts it.
- ** If you are developing on Windows, you need to install the USB driver for your phone.**

Run on the emulator

- The emulator is similar to a virtual machine that runs Android apps.
- To run your app on the emulator you need to first create an [Android Virtual Device](#) (AVD).
- An AVD is a device configuration for the Android emulator that allows you to model different devices.
 - It's a good idea to create several AVDs:
 - Test several screen sizes and densities
 - Test several device models

Run on the emulator

- To create an AVD:
 - Select AVD Manager from the toolbar.
 - Click **Create Virtual Device**.
- To run the app from Android Studio:
 - Click **Run** from the toolbar
 - In the **Choose Device** window, click the **Launch emulator** radio button
 - From the **Android virtual device** pull-down menu, select the emulator you created

- You are required to install the tools at home and develop the “Hello world” app and install it on your phone (if you have one) or run it on an emulator.

- Creating Welcome App ...
- Understand different folders
- and files
- Work with colors

