



Android Overview

Session 1

Objective

- Tổng quan về Android
- Lịch sử Android
- Kiến trúc Android
- Môi trường phát triển
- Tạo project Android bằng Android Studio
- Cấu trúc project
- Xây dựng ứng dụng
- Gỡ lỗi ứng dụng

Overview of Android

- Android là nền tảng phần mềm nguồn mở của **Google** và *Open Handset Alliance*
- Android is một ứng dụng hoàn chỉnh: OS, Middleware, Applications
- Android xây dựng trên **Linux** version 2.6 với các dịch vụ lõi hệ thống
- **Open source** Apache 2 license
- **Android SDK** cung cấp các công cụ và APIs cần thiết để xây dựng ứng dụng trên nền tảng Android dựa trên ngôn ngữ lập trình Java.



What is Open Handset Alliance?

- The Open Handset Alliance (OHA) is a business alliance of 80 firms to develop new mobile platform (Android):



Lịch sử Android

- 2005: Android Inc. acquired by Google
- 2007: Open Handset Alliance announces Android
- 2008: Android 1.0 SDK release



Android 1.5 Cupcake



Android 1.6 Donut



Android 2.0 Eclair



Android 2.2 Froyo



Android 2.3 Gingerbread



Android 3.0 Honeycomb



Android 4.0
Ice Cream Sandwich



Android 4.1 Jelly Bean

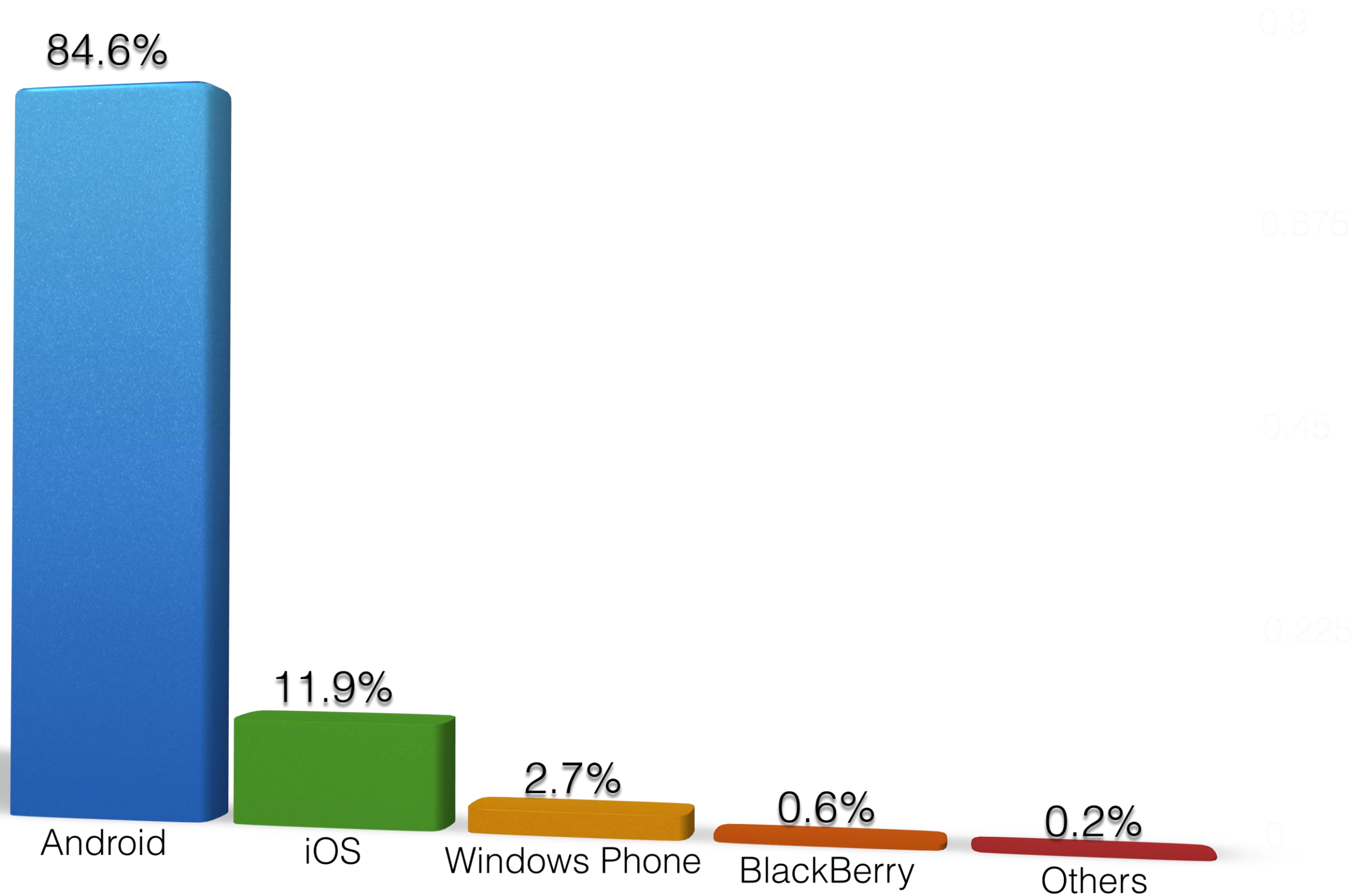


Android 4.4 KitKat



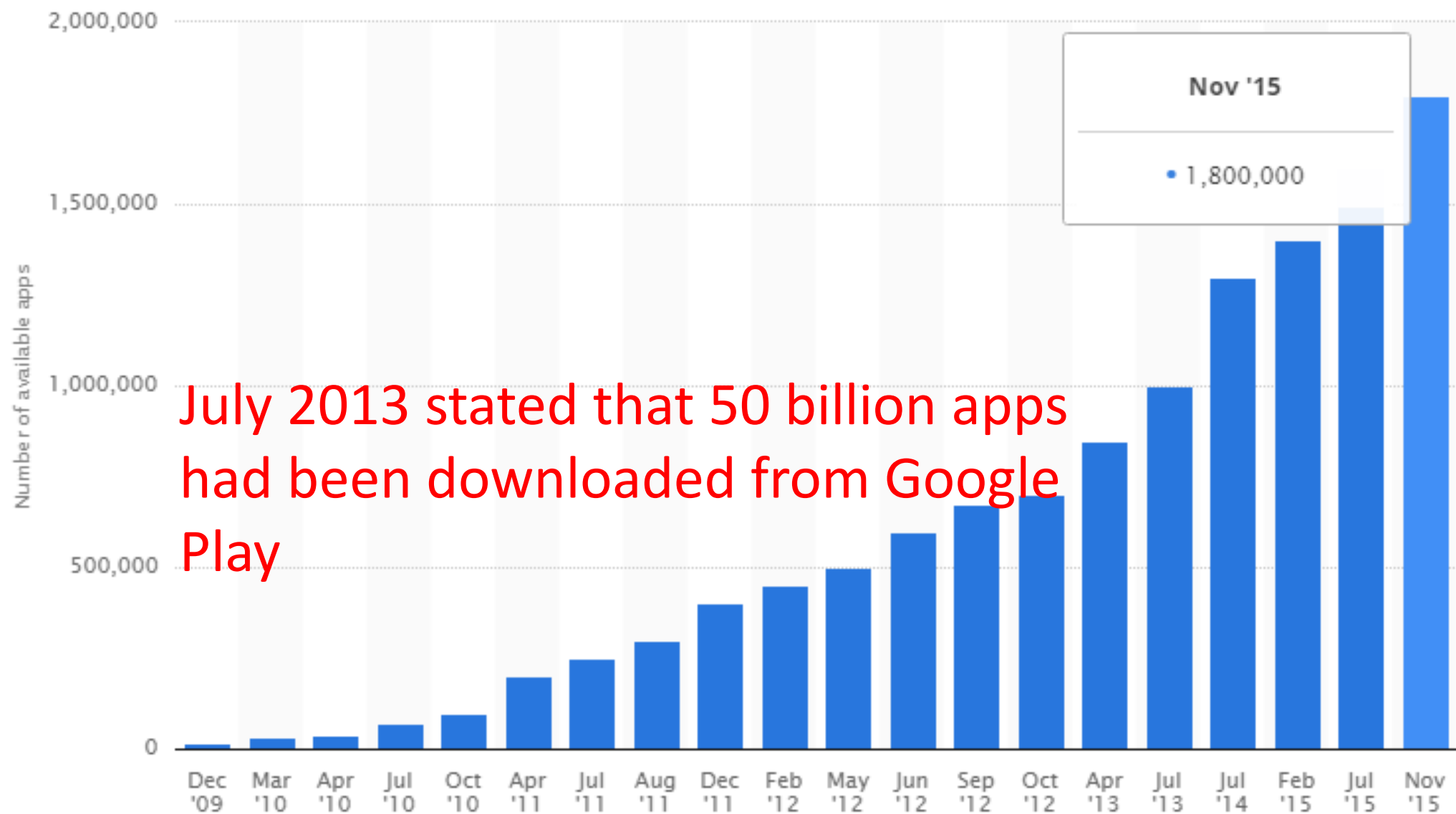
Android 5.0 Lollipop

Mobile Platforms Market Share - 2014



Google Play Apps

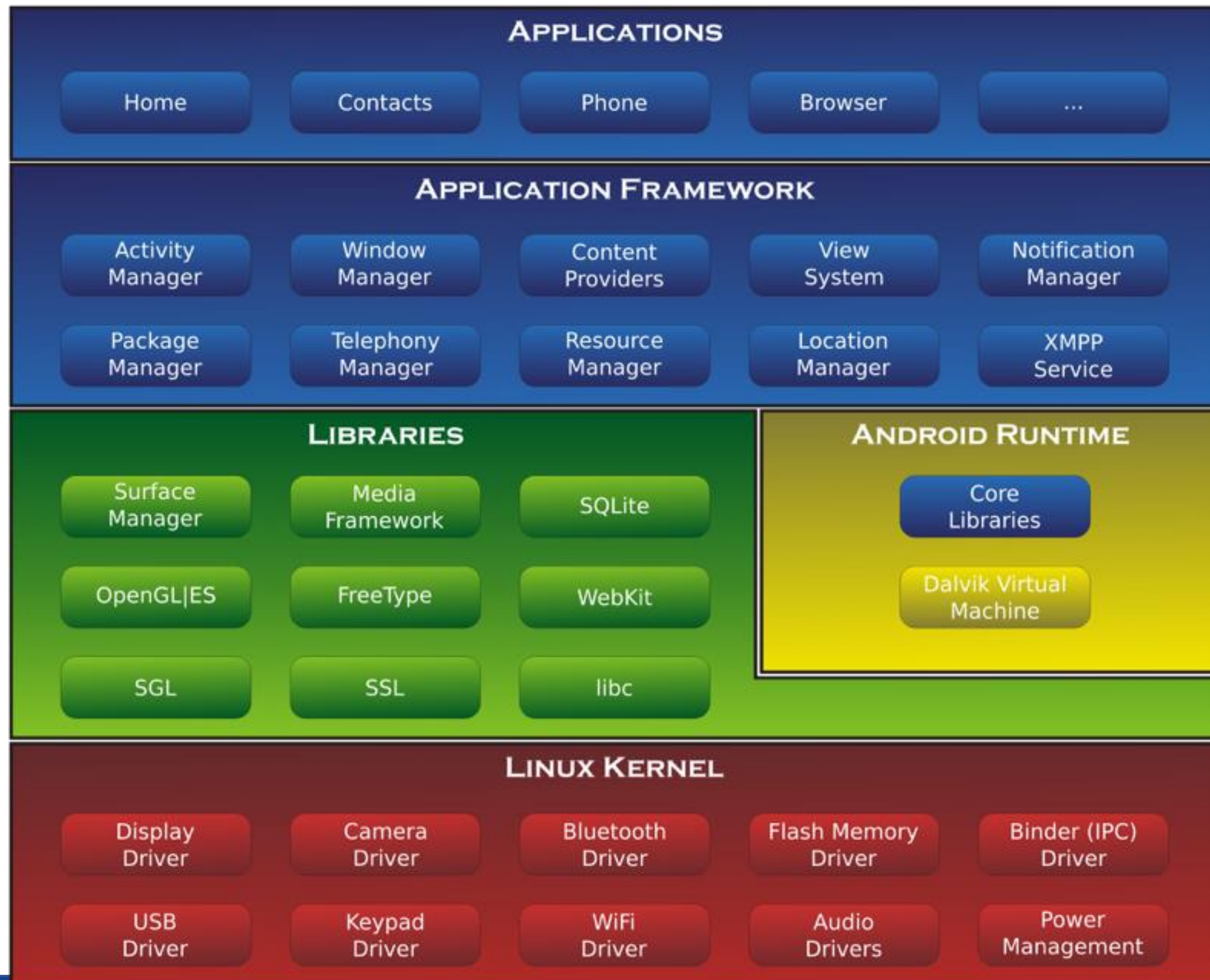
statista.com



Android Platform

- Android is a **software environment** built for mobile devices.
- Android includes:
 - Linux kernel-based OS
 - A rich UI
 - Telephone functionality
 - End-user applications
 - Code libraries
 - Application frameworks
 - Multimedia support, ...
- User applications are built for Android in **Java**.

Android Architecture



Android Architecture

- Linux Kernel:
 - Android xây dựng trên nền Linux version 2.6 với các dịch vụ hệ thống lõi như: security, quản lý bộ nhớ, quản lý tiến trình, network stack, driver model.
 - Kernel cũng hoạt động như lớp trừu tượng (abstract) giữa phần cứng và các phần sau:



Android Architecture

- Libraries:
 - Android chứa thư viện C/C++ libraries được sử dụng bởi các thành phần của hệ thống Android.
 - Một số thư viện lõi:



Android Architecture

- Android Runtime:
 - Dalvik VM:
 - Dex files
 - Nhỏ gọn và hiệu quả hơn các file lớp
 - Giới hạn bộ nhớ và pin
 - Core Libraries:
 - Java 5 Std edition
 - Collections, I/O etc...



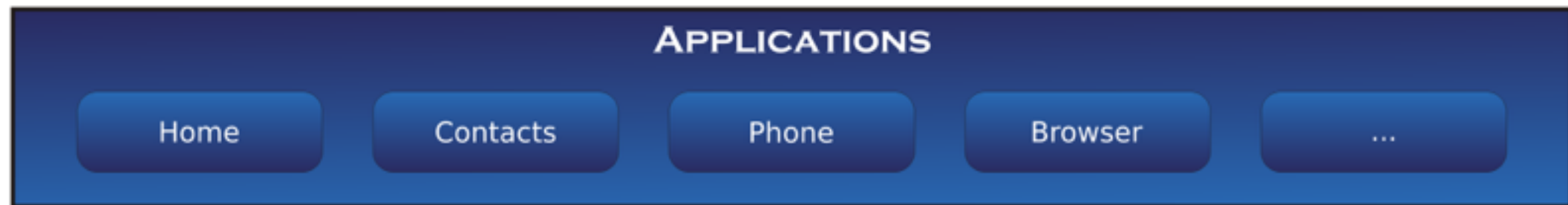
Android Architecture

- Application Framework:
 - Developers có quyền truy cập vào cùng framework APIs được sử dụng bởi core applications.
 - Kiến trúc ứng dụng được thiết kế để sử dụng lại các components một cách dễ dàng



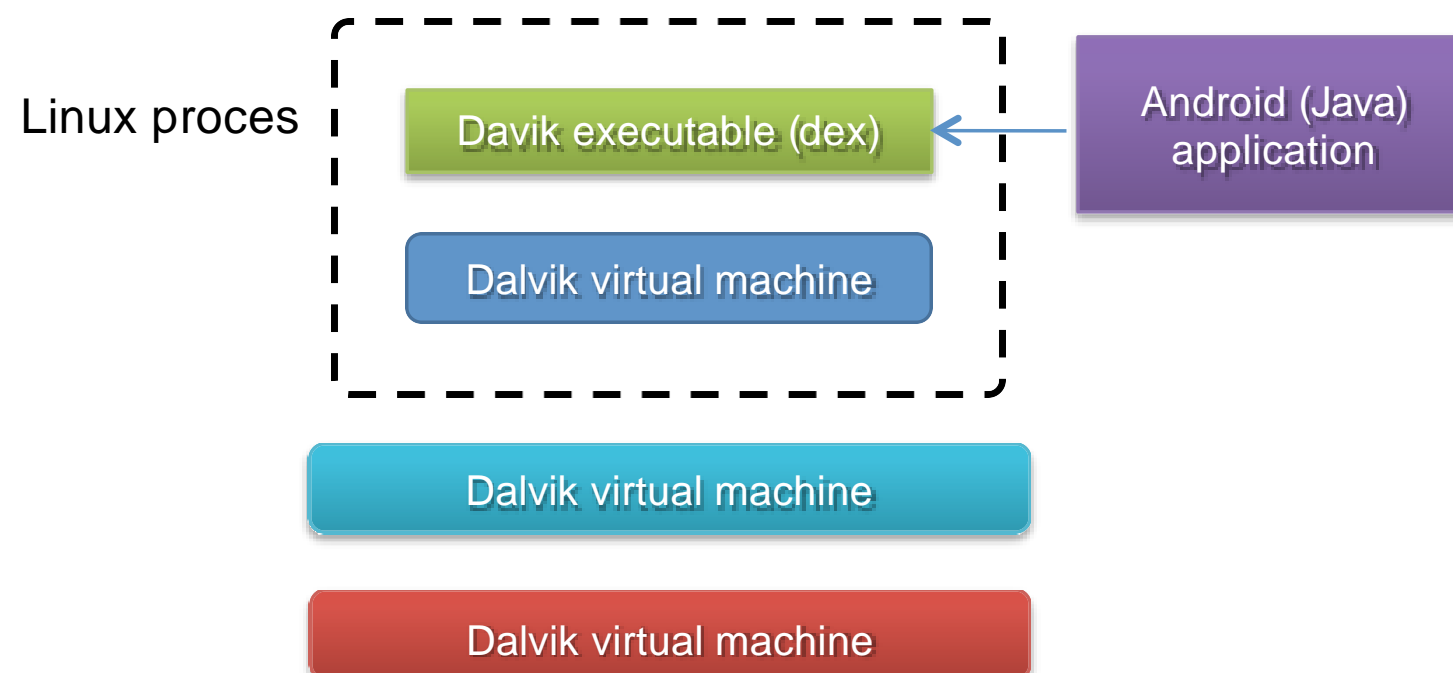
Android Architecture

- Applications:
 - Android bao gồm các ứng dụng lõi: email client, SMS program, calendar, maps, browser, contacts,....
 - Tất cả các ứng dụng được viết trên ngôn ngữ lập trình Java.



Dalvik VM

- Dalvik là công nghệ VM nguồn mở phát triển bởi **Google** cho hệ điều hành Android.
- Không giống các công nghệ VM khác dựa trên kiến trúc stack, Dalvik VM là kiến trúc ảo **register-based**
- Tất cả các ứng dụng viết trên Java và được converted thành Dalvik executable **.dex**
- Kiến trúc đơn giản của một Dalvik software stack:



Development Environment

- Android Studio cung cấp đầy đủ các công cụ cần thiết để xây dựng app cho Android, bao gồm Android Studio IDE các công cụ Android SDK.
- Cho phép tạo và debug **Android apps** dễ dàng và nhanh hơn.
- Các ưu điểm:
 - Intelligent code editor
 - Code templates and GitHub integration
 - Multi-screen app development
 - Virtual devices for all shapes and sizes
 - Android builds evolved, with Gradle



Setting up Development Environment

1. Preparing development computer
2. Adding SDK Packages

Preparing Development Computer

- System Requirements.
- Install the JDK
- Download and install Android Studio

System Requirements

- Windows
 - Microsoft® Windows® 8/7/Vista/2003 (32 or 64-bit)
 - 2 GB RAM minimum, 4 GB RAM recommended
 - 400 MB hard disk space
 - At least 1 GB for Android SDK, emulator system images, and caches
 - 1280 x 800 minimum screen resolution
 - Java Development Kit (JDK) 7
 - Optional for accelerated emulator: Intel® processor with support for Intel® VT-x, Intel® EM64T (Intel® 64), and Execute Disable (XD) Bit functionality

Install the JDK

Java SE Development Kit 7u79

You must accept the [Oracle Binary Code License Agreement for Java SE](#) to download this software.

☐ Accept License Agreement ☒ Decline License Agreement

Product / File Description	File Size	Download
Linux x86	130.4 MB	jdk-7u79-linux-i586.rpm
Linux x86	147.6 MB	jdk-7u79-linux-i586.tar.gz
Linux x64	131.69 MB	jdk-7u79-linux-x64.rpm
Linux x64	146.4 MB	jdk-7u79-linux-x64.tar.gz
Mac OS X x64	196.89 MB	jdk-7u79-macosx-x64.dmg
Solaris x86 (SVR4 package)	140.79 MB	jdk-7u79-solaris-i586.tar.Z
Solaris x86	96.66 MB	jdk-7u79-solaris-i586.tar.gz
Solaris x64 (SVR4 package)	24.67 MB	jdk-7u79-solaris-x64.tar.Z
Solaris x64	16.38 MB	jdk-7u79-solaris-x64.tar.gz
Solaris SPARC (SVR4 package)	140 MB	jdk-7u79-solaris-sparc.tar.Z
Solaris SPARC	99.4 MB	jdk-7u79-solaris-sparc.tar.gz
Solaris SPARC 64-bit (SVR4 package)	24 MB	jdk-7u79-solaris-sparcv9.tar.Z
Solaris SPARC 64-bit	18.4 MB	jdk-7u79-solaris-sparcv9.tar.gz
Windows x86	138.31 MB	jdk-7u79-windows-i586.exe
Windows x64	140.06 MB	jdk-7u79-windows-x64.exe

Download and Install Android Studio

- Download Android Studio

<https://developer.android.com/sdk/index.html>

- Install Android Studio:

1. Launch the `.exe` file you just downloaded
2. Follow the setup wizard to install Android Studio and any necessary SDK tools

Adding SDK Packages

- Get the latest SDK tools
- Get the support library for additional APIs
- Get Google Play services for even more APIs
- Install the packages

Get the Latest SDK Tools











































1. Open the Tools directory and select:
 - Android SDK Tools
 - Android SDK Platform-tools
 - Android SDK Build-tools (highest version)
2. Open the first Android X.X folder (the latest version) and select:
 - SDK Platform
 - A system image for the emulator, such as
 - ARM EABI v7a System Image

Get the Latest SDK Tools

Android SDK Manager

SDK Path: /Volumes/Data/Android Developer/Tool/adt-bundle-mac-x86_64/sdk

Packages

 Name	API	Rev.	Status
<input type="checkbox"/>  Tools			
<input checked="" type="checkbox"/>  Android SDK Tools		24.0.2	 Update available: rev. 24.1.0
<input checked="" type="checkbox"/>  Android SDK Platform-tools		21	 Update available: rev. 22
<input type="checkbox"/>  Android SDK Build-tools		22.0.1	<input type="checkbox"/> Not installed
<input type="checkbox"/>  Android SDK Build-tools		21.1.2	 Installed
<input type="checkbox"/>  Android SDK Build-tools		21.1.1	 Installed
<input type="checkbox"/>  Android SDK Build-tools		21.1	 Installed
<input type="checkbox"/>  Android SDK Build-tools		21.0.2	 Installed
<input type="checkbox"/>  Android SDK Build-tools		21.0.1	 Installed
<input type="checkbox"/>  Android SDK Build-tools		21	 Installed
<input type="checkbox"/>  Android SDK Build-tools		20	 Installed
<input type="checkbox"/>  Android SDK Build-tools		19.1	 Installed
<input type="checkbox"/>  Android SDK Build-tools		19.0.3	 Installed
<input type="checkbox"/>  Android SDK Build-tools		19.0.2	 Installed
<input type="checkbox"/>  Android SDK Build-tools		19.0.1	 Installed
<input type="checkbox"/>  Android SDK Build-tools		19	 Installed
<input type="checkbox"/>  Android SDK Build-tools		18.1.1	 Installed
<input type="checkbox"/>  Android SDK Build-tools		18.1	 Installed
<input type="checkbox"/>  Android SDK Build-tools		18.0.1	 Installed
<input type="checkbox"/>  Android SDK Build-tools		17	 Installed
<input checked="" type="checkbox"/>  Android 5.1.1 (API 22)			
<input checked="" type="checkbox"/>  Documentation for Android SDK	22	1	<input type="checkbox"/> Not installed
<input checked="" type="checkbox"/>  SDK Platform	22	2	<input type="checkbox"/> Not installed

Show: ☒ Updates/New ☒ Installed Select [New](#) or [Updates](#)

☐ Obsolete [Deselect All](#)

[Install 32 packages...](#)

[Delete 19 packages...](#)

Done loading packages.

Get Support Library

- Open the Extras directory and select:
 - Android Support Repository
 - Android Support Library

Get Google Play Services




































- Để phát triển với Google API, ta cần các gói dịch vụ Google Play. Mở thư mục Extras và chọn
 - Google Repository
 - Google Play services

Get Google Play Services

Android SDK Manager

SDK Path: /Volumes/Data/Android Developer/Tool/adt-bundle-mac-x86_64/sdk

Packages

 Name	API	Rev.	Status
<input type="checkbox"/> ARM EABI v7a System Image	15	2	 Installed
<input type="checkbox"/> Intel x86 Atom System Image	15	1	 Installed
<input type="checkbox"/> MIPS System Image	15	1	 Installed
<input type="checkbox"/>  Google APIs	15	2	 Installed
<input type="checkbox"/> Sources for Android SDK	15	2	 Installed
<input type="checkbox"/>  Android 4.0 (API 14)			
<input type="checkbox"/>  SDK Platform	14	4	 Installed
<input type="checkbox"/>  Samples for SDK	14	2	 Installed
<input type="checkbox"/>  ARM EABI v7a System Image	14	2	 Installed
<input type="checkbox"/>  Google APIs	14	2	 Installed
<input type="checkbox"/> Sources for Android SDK	14	1	 Installed
<input type="checkbox"/>  Android 2.3.3 (API 10)			
<input type="checkbox"/>  Android 2.2 (API 8)			
<input type="checkbox"/>  Extras			
<input checked="" type="checkbox"/>  Android Support Repository		11	 Update available: rev. 14
<input checked="" type="checkbox"/>  Android Support Library		21.0.3	 Update available: rev. 22.1.
<input checked="" type="checkbox"/>  Google Play services		21	 Update available: rev. 24
<input checked="" type="checkbox"/>  Google Repository		15	 Update available: rev. 17
<input type="checkbox"/>  Google Play APK Expansion Library		3	 Installed
<input type="checkbox"/>  Google Play Billing Library		5	<input type="checkbox"/> Not installed
<input type="checkbox"/>  Google Play Licensing Library		2	<input type="checkbox"/> Not installed
<input type="checkbox"/>  Android Auto API Simulators		1	<input type="checkbox"/> Not installed
<input type="checkbox"/>  Google USB Driver		11	 Not compatible with Mac OS

Show: ☒ Updates/New ☒ Installed Select [New](#) or [Updates](#)

☐ Obsolete [Deselect All](#)

[Install 32 packages...](#)

[Delete 19 packages...](#)

Done loading packages.

Install the Packages

- Sau khi chọn các packet, tiếp tục cài đặt:
 1. Click Install Xpackages.
 2. In the next window, double-click each package name on the left to accept the license agreement for each.
 3. Click Install.

Emulator



Start Android Project using Android Studio

- Start Android Studio
- Select Start a new Android Studio project
- Configure your new project
 - Application Name is the app name that appears to users
 - Company domain provides a qualifier that will be appended to the package name
 - Project location is the directory on your system that holds the project files.

Create New Project

New Project
Android Studio

Configure your new project

Application name: My Application

Company Domain: android.example.com

Package name: com.example.android.myapplication [Edit](#)

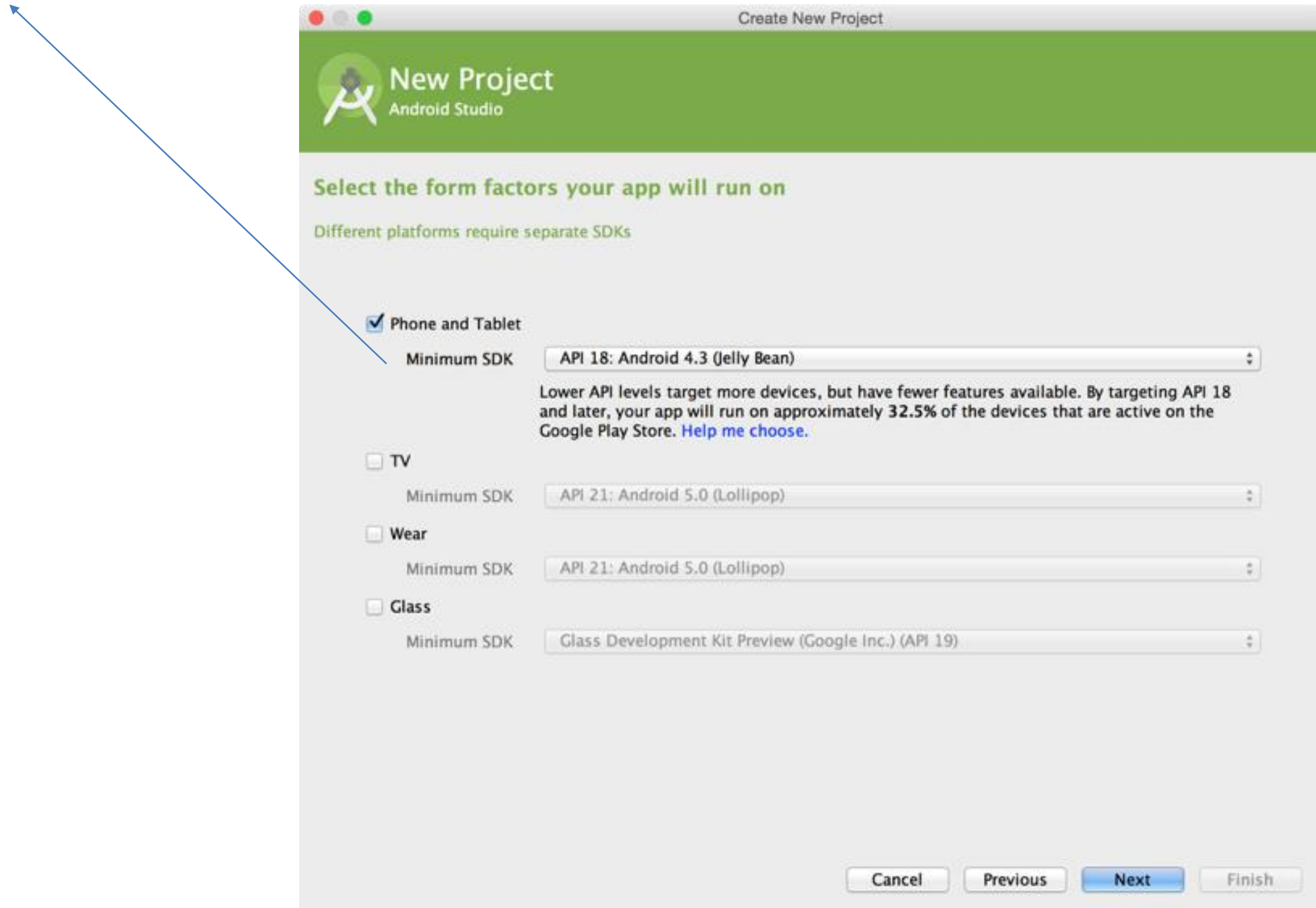
Project location: /Volumes/Data/Android Developer/Course/VTC/Android/Workshop/MyApplication

Your project location contains whitespace. This can cause problems on some platforms and is not recommended.

[Cancel](#) [Previous](#) [Next](#) [Finish](#)

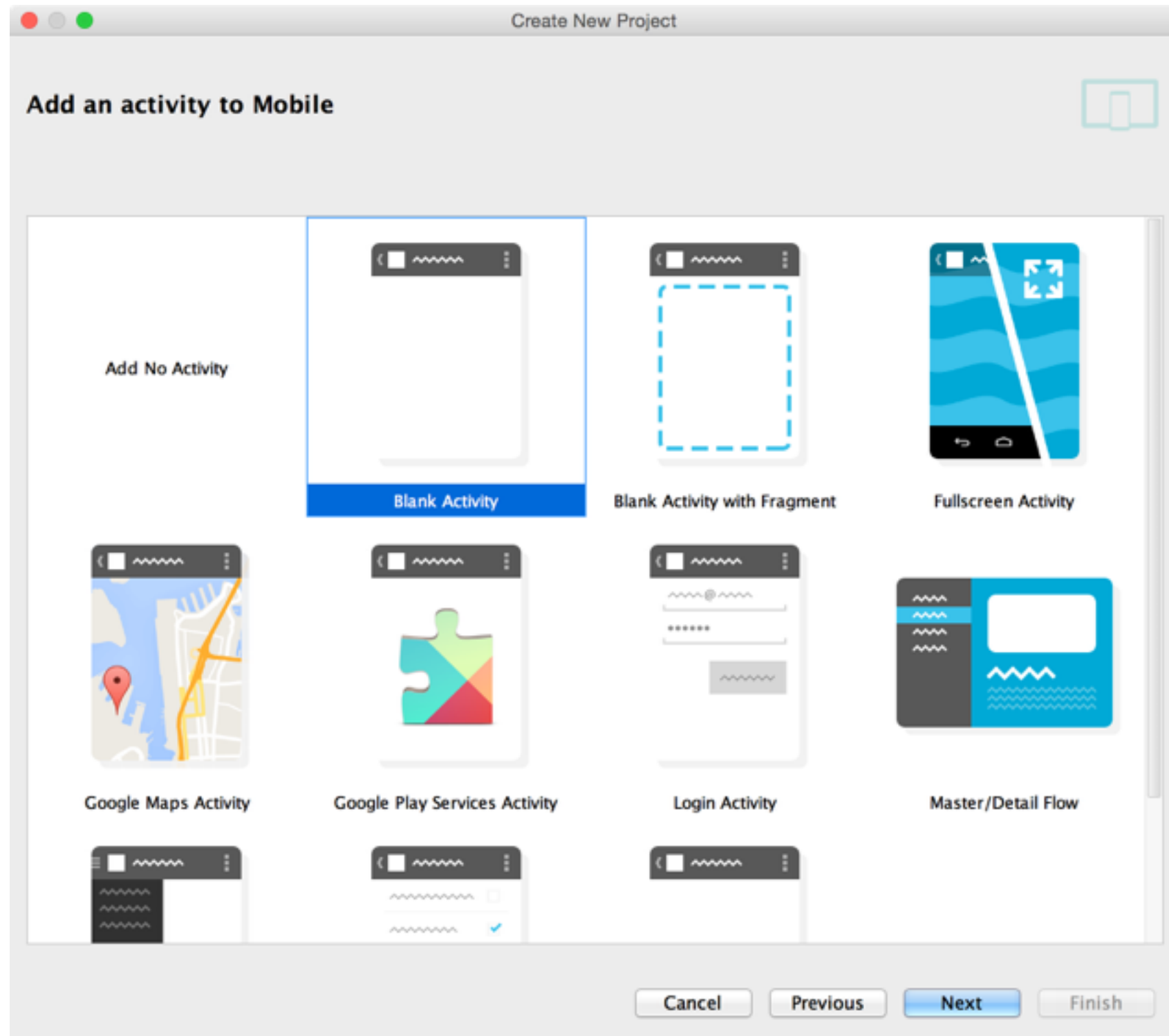
Start Android Project using Android Studio

- Select Phone and Tablet with minimum SDK



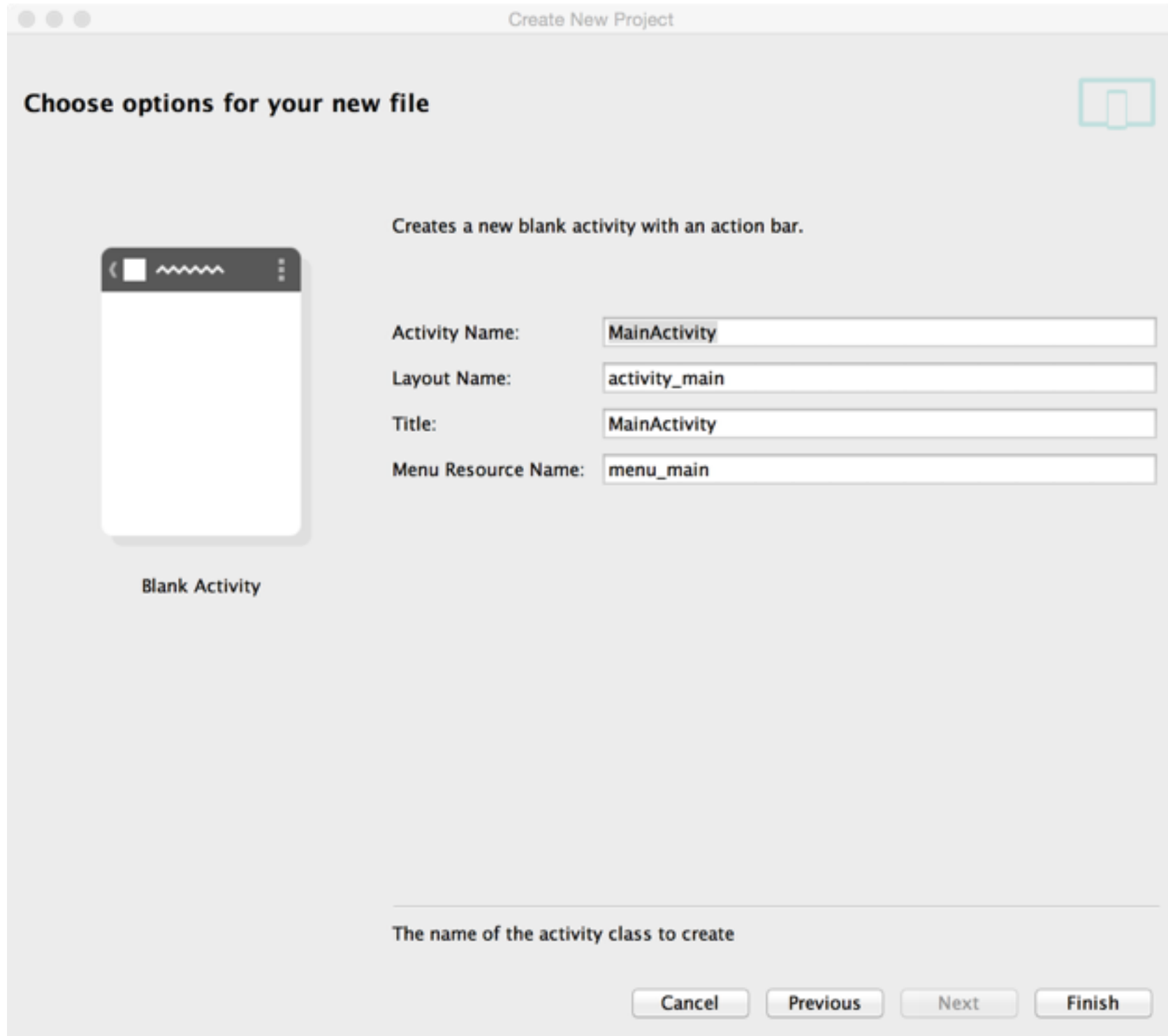
Start Android Project using Android Studio

- Thêm Activity vào project



Start Android Project using Android Studio

- Nhập thông tin activity rồi bấm finish



Create New Project

Choose options for your new file

Creates a new blank activity with an action bar.

Blank Activity

Activity Name: MainActivity

Layout Name: activity_main

Title: MainActivity

Menu Resource Name: menu_main

The name of the activity class to create

Cancel Previous Next Finish

Project Structure

The screenshot displays the Android Studio IDE interface for a project named "My Application". The top toolbar shows various development tools. The left sidebar contains the "Project" view, "Structure" view, "Favorites" view, and "Build Variants" view. The "Project" view shows the following structure:

- MyApplication
 - app
 - manifests
 - AndroidManifest.xml
 - java
 - com.example.android.myapp
 - MainActivity
 - res
 - drawable
 - layout
 - activity_main.xml
 - menu
 - values
 - Gradle Scripts

The "Structure" view shows the "Layouts" and "Widgets" sections. The "Layouts" section includes:

- FrameLayout
- LinearLayout (Horizontal)
- LinearLayout (Vertical)
- TableLayout
- TableRow
- GridLayout
- RelativeLayout

The "Widgets" section includes:

- Plain TextView
- Large Text
- Medium Text
- Small Text
- Button
- Small Button
- RadioButton
- CheckBox
- Switch
- ToggleButton
- ImageButton
- ImageView
- ProgressBar (Large)
- ProgressBar (Normal)

The "Design" tab is active, showing a preview of the app on a Nexus 4 device. The app displays "Hello world" on a white background. The "Component Tree" on the right shows the hierarchy:

- Device Screen
 - RelativeLayout
 - TextView - @string/hello_w

The "Properties" panel on the right shows the following properties for the selected TextView:

Property	Value
layout:width	match_parent
layout:height	match_parent
style	
accessibilityLive	
alpha	
background	
backgroundTint	
backgroundTint	
clickable	<input type="checkbox"/>
contentDescript	

The bottom status bar shows the following information:

- Terminal
- 6: Android
- 0: Messages
- TODO
- Event Log
- Gradle Console
- Memory Monitor
- Gradle build finished in 7 sec (16 minutes ago)

Project Structure

- Android project chứa các file và thư mục ngầm định:
 - `app/src/main/res/layout`: Thư mục chứa các file định nghĩa user interface cho app
 - `app/src/main/java/com.example.myapplication`: Thư mục chứa file java cho Android Studio project
 - `app/src/main/AndroidManifest.xml`: `manifest file` mô tả đặc tính cơ bản của app và định nghĩa các components components.
 - `app/build.gradle`: Android Studio sử dụng Gradle để dịch và tạo app. Có một file build.gradle cho mỗi module của project, cũng như file build.gradle cho toàn bộ project.
 - `/res` thư mục con chứa tài nguyên (`resources`) ứng dụng application: drawable, layout, menu, value

Android Application Sample Code

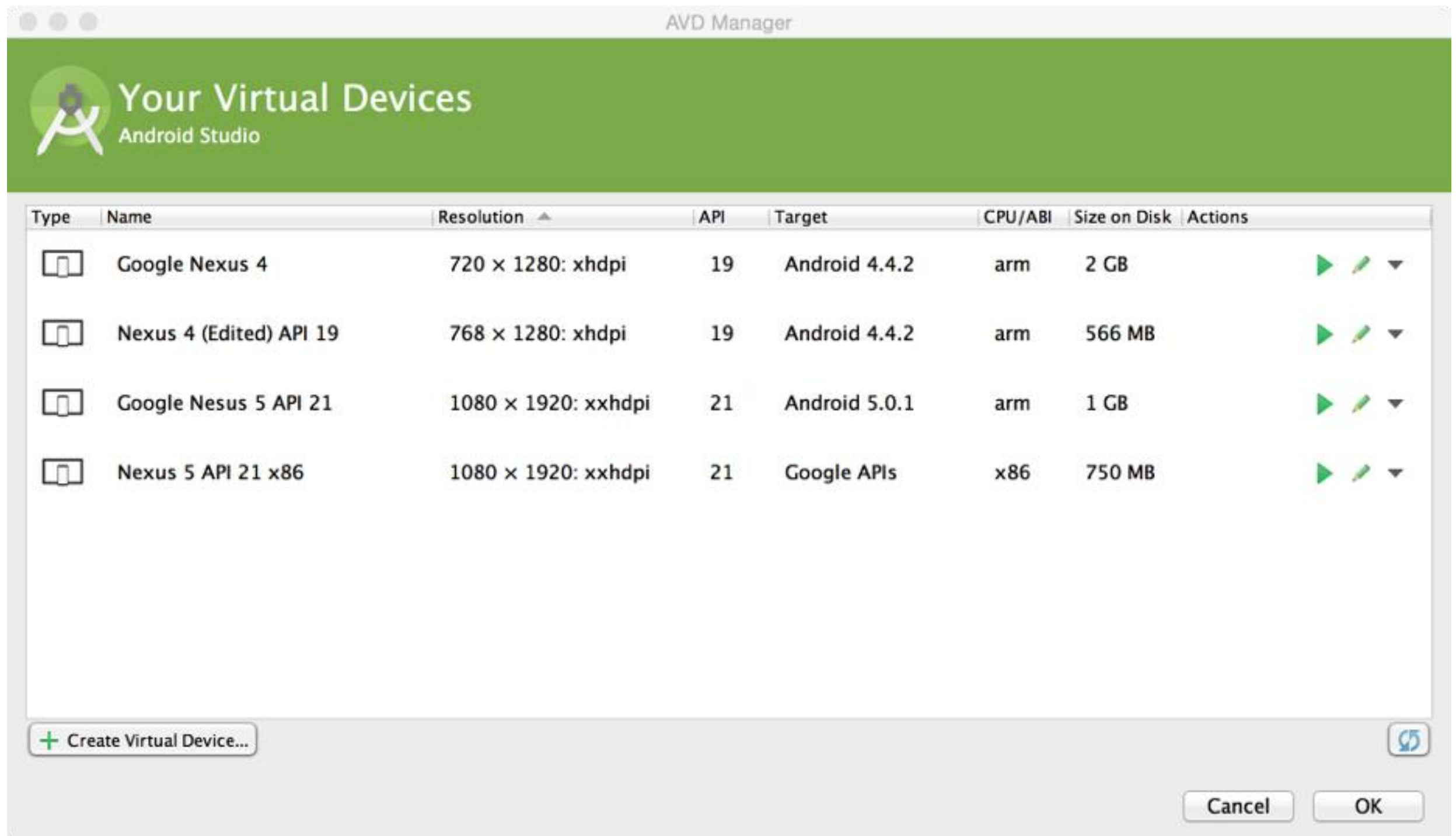
```
package com.example.myapplication;

import android.app.Activity;
import android.os.Bundle;
import android.widget.TextView;

public class MyApplication extends Activity {
    /* Called when the activity is first created. */
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        TextView tv = new TextView(this);
        tv.setText("Hello, Android");
        setContentView(tv);
    }
}
```

Start AVD

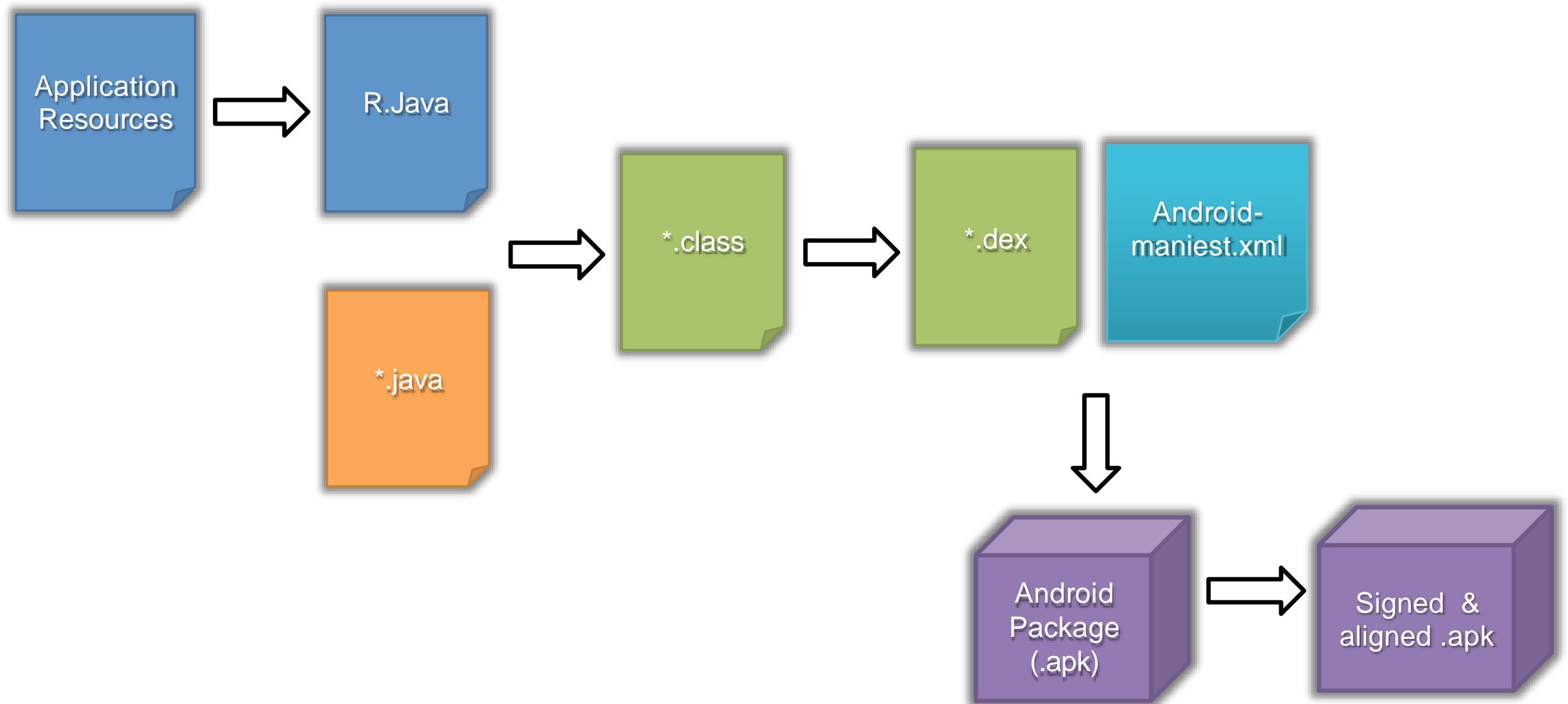
- Click on AVD Manager icon on toolbar to start Android Virtual Device



Building and Running your Application

- Trong quá trình build, Android projects được dịch và đóng gói thành một file **.apk**
- File này chứa tất cả các thông tin cần thiết để chạy app:
 - Compiled .dex files (.class files converted to Dalvik byte code)
 - Binary version of the AndroidManifest.xml file
 - Compiled resources (resources.arsc)
 - Uncompiled resource files for your application.
- Để chạy app trên emulator hoặc thiết bị, app phải đăng ký sử dụng chế độ debug hoặc release

Building and Running your Application



Debugging your Application

- Android SDK cung cấp hầu hết các công cụ cần thiết để debug ứng dụng
- Các thành phần chính cấu thành một môi trường debug Android bao gồm:
 - ADB
 - Dalvik Debug Monitor Server
 - Device or Android Virtual Device
 - JDWP debugger
- More technique for debugging:
 - <http://android-sdk.appspot.com/guide/developing/debugging/index.html>

Summary

- Qua bài này ta đã học:
 - Android platform – history and architecture
 - The Dalvik VM
 - Setup Android SDK to build Android applications
 - Create a Android project using Android Studio
 - Writing a simple Android application
 - Building and running an Android application
 - Debugging