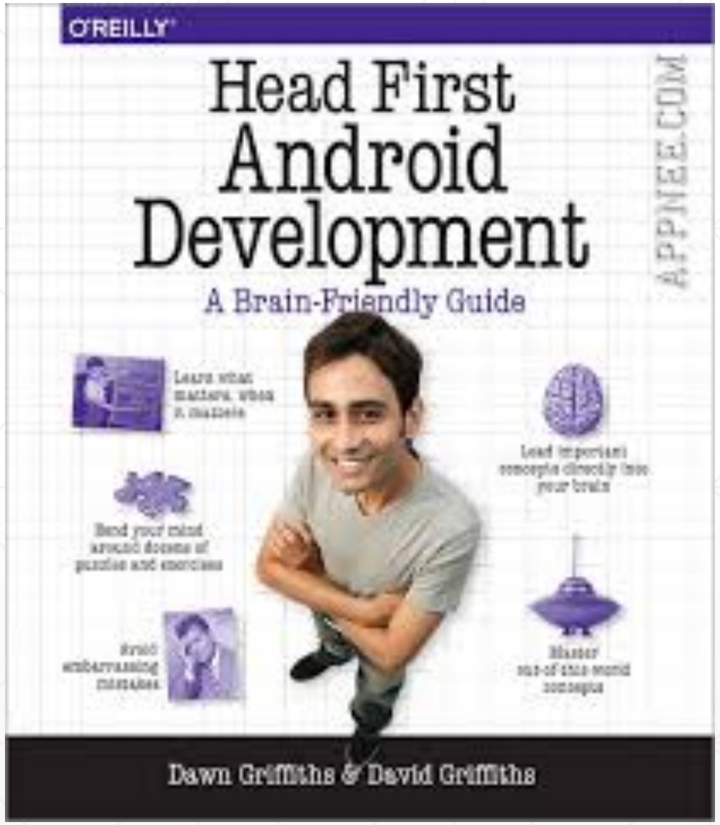
Android Wokshop

RIIS LLC

Books


O'REILLY
Head First Android Development
A Brain-Friendly Guide
APPNEE.COM
Learn what matters, when it matters
Load important concepts directly into your brain
Bend your mind around dozens of puzzles and exercises
Avoid embarrassing mistakes
Master out-of-this-world concepts
Dawn Griffiths & David Griffiths

Agile Android
Godfrey Nolan
Apress

Hello World Android app

- Set up development environment
- Build a basic app
- Run the app in the Android emulator
- Change the app

Hello World Android app

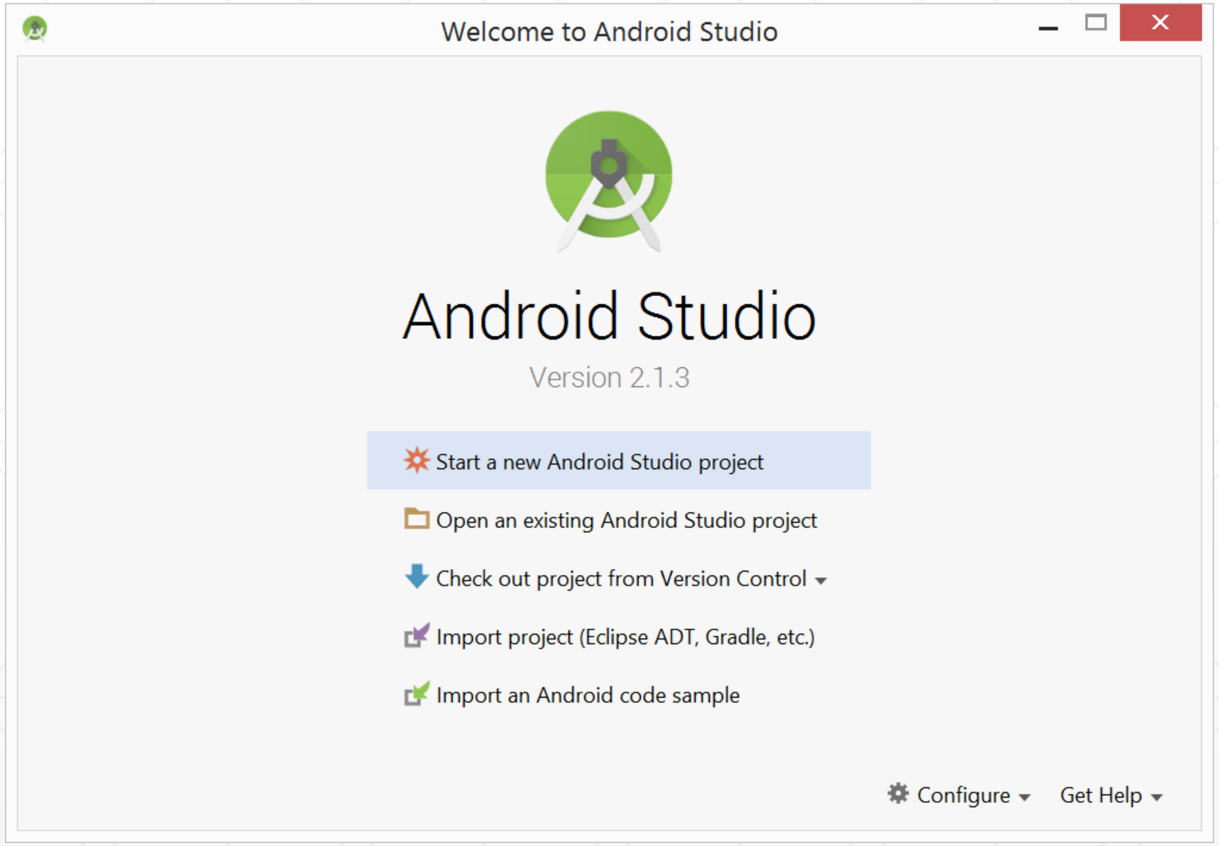
- Set up development environment
  - Install Java JDK (not the JRE)

    http://www.oracle.com/technetwork/java/javase/downloads/index.html
  - Install Android Studio

    https://developer.android.com/studio/index.html

Hello World Android app

- Build a basic app



Welcome to Android Studio

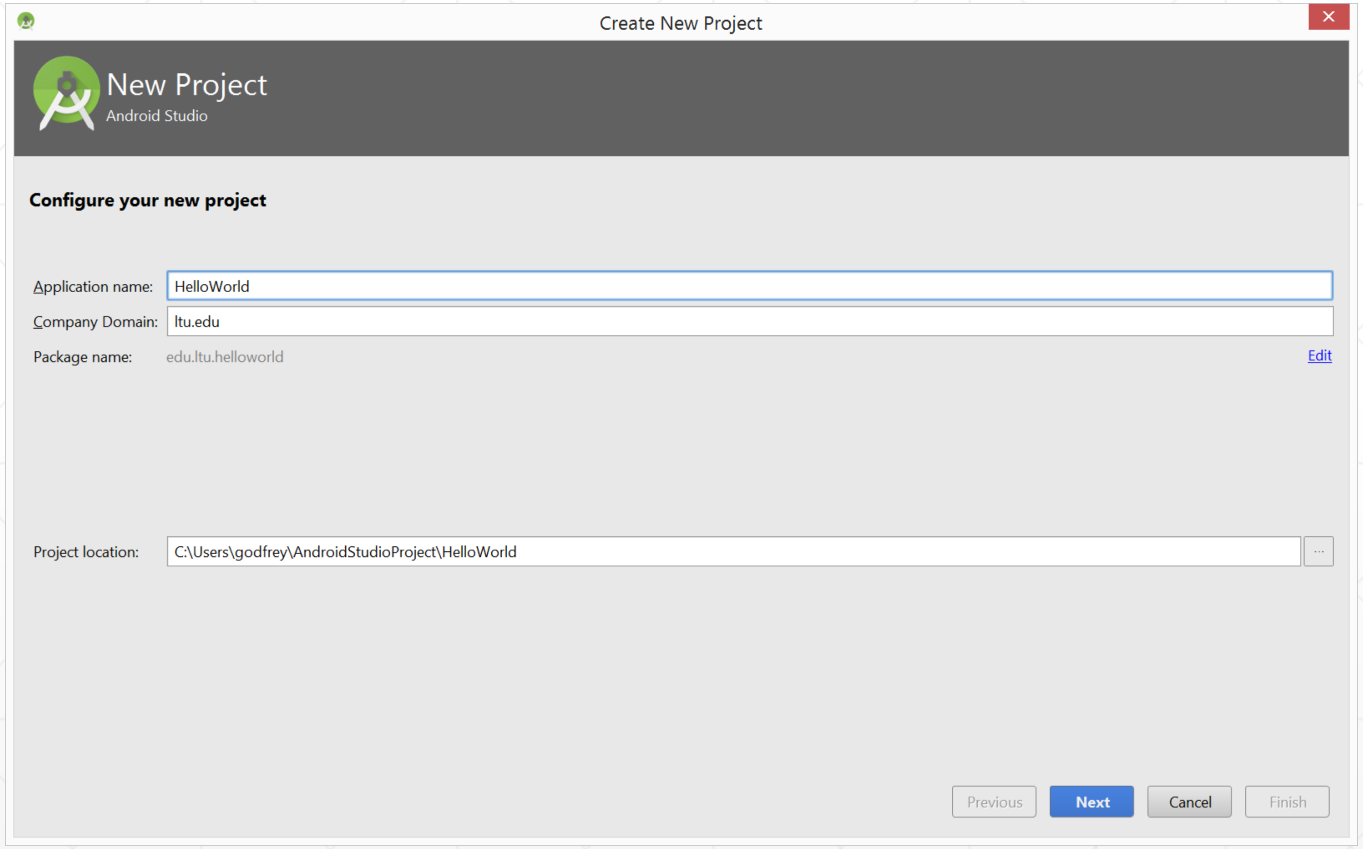
Android Studio

Version 2.1.3

Start a new Android Studio project
Open an existing Android Studio project
Check out project from Version Control
Import project (Eclipse ADT, Gradle, etc.)
Import an Android code sample
Configure
Get Help

Hello World Android app

- Build a basic app



Configure your new project

Application name: HelloWorld

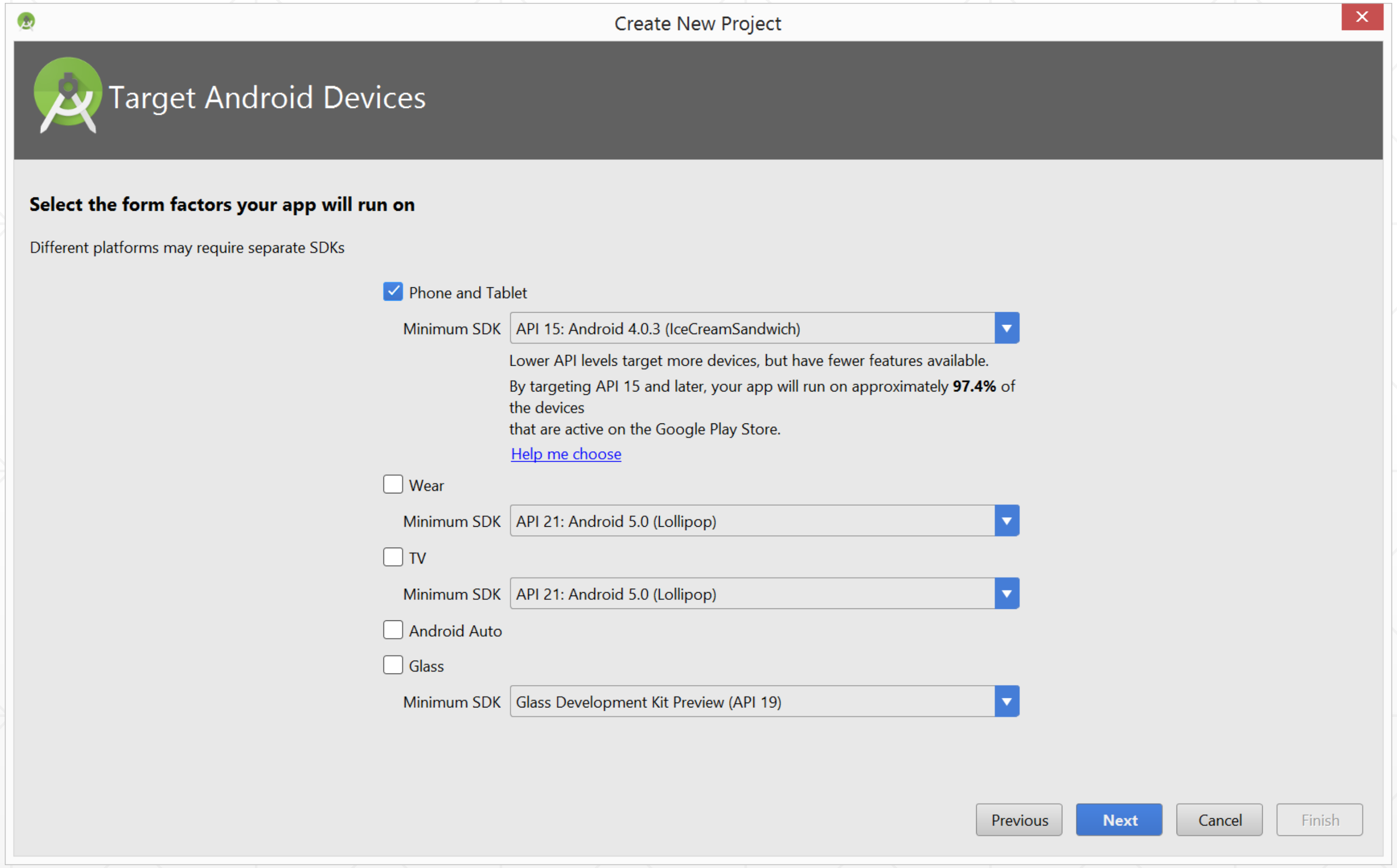
Company Domain: ltu.edu

Package name: edu.ltu.helloworld

Project location: C:\Users\godfrey\AndroidStudioProject\HelloWorld

Hello World Android app

- Build a basic app



Select the form factors your app will run on

Different platforms may require separate SDKs

☑ Phone and Tablet

Minimum SDK: API 15: Android 4.0.3 (IceCreamSandwich)

Lower API levels target more devices, but have fewer features available.
By targeting API 15 and later, your app will run on approximately **97.4%** of the devices
that are active on the Google Play Store.
Help me choose

☐ Wear

Minimum SDK: API 21: Android 5.0 (Lollipop)

☐ TV

Minimum SDK: API 21: Android 5.0 (Lollipop)

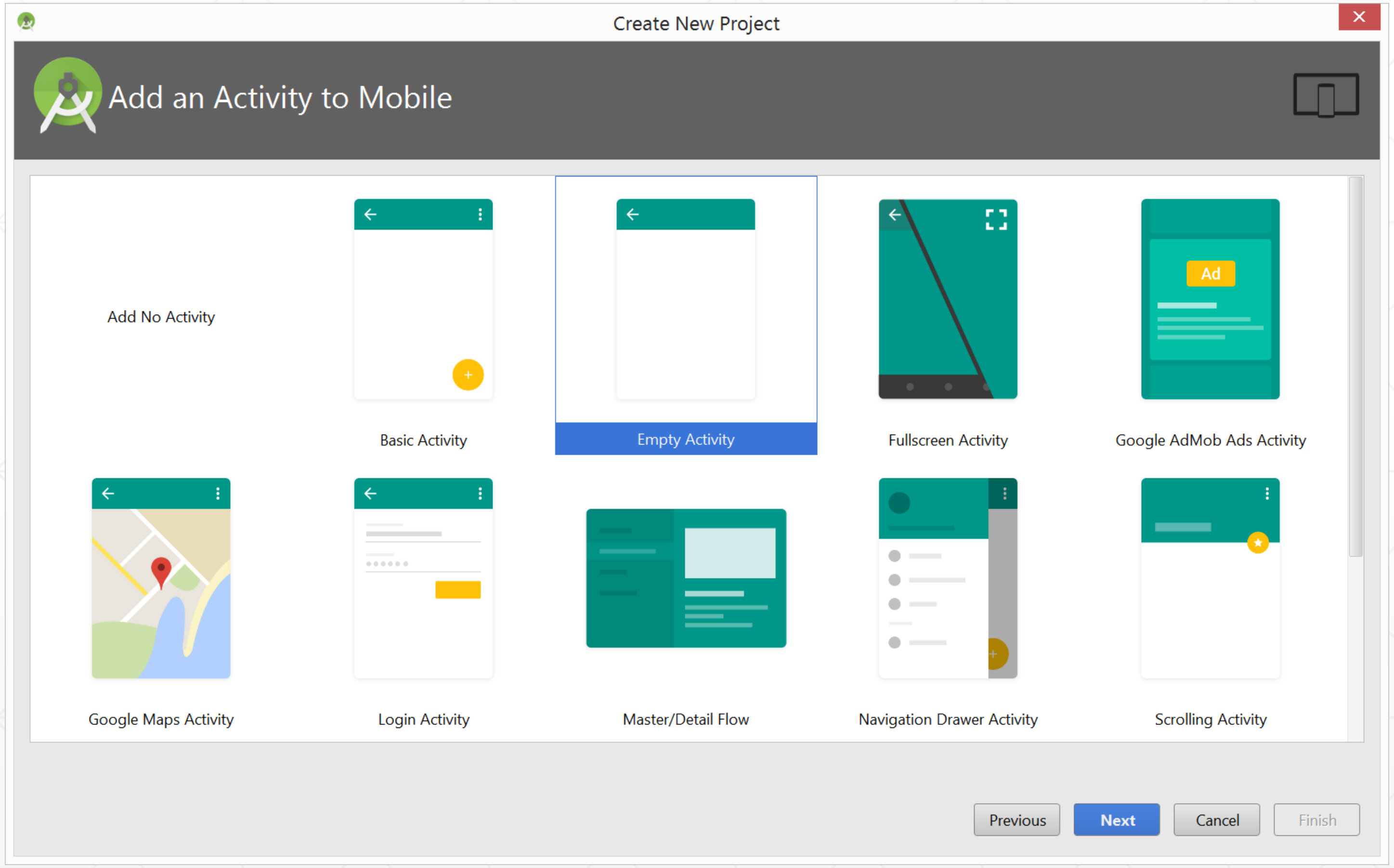
☐ Android Auto

☐ Glass

Minimum SDK: Glass Development Kit Preview (API 19)

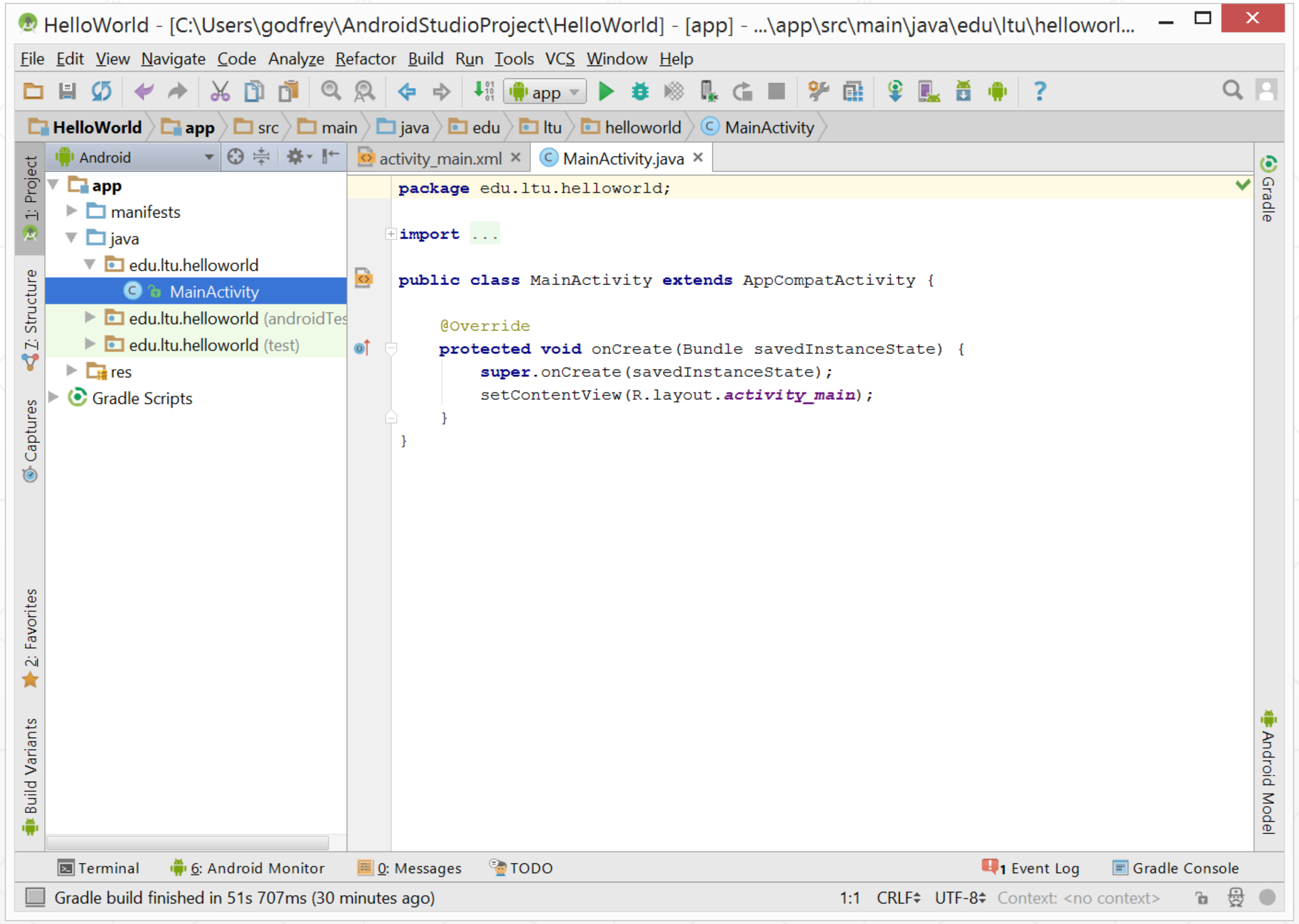
Hello World Android app

- Build a basic app



Hello World Android app

- Build a basic app

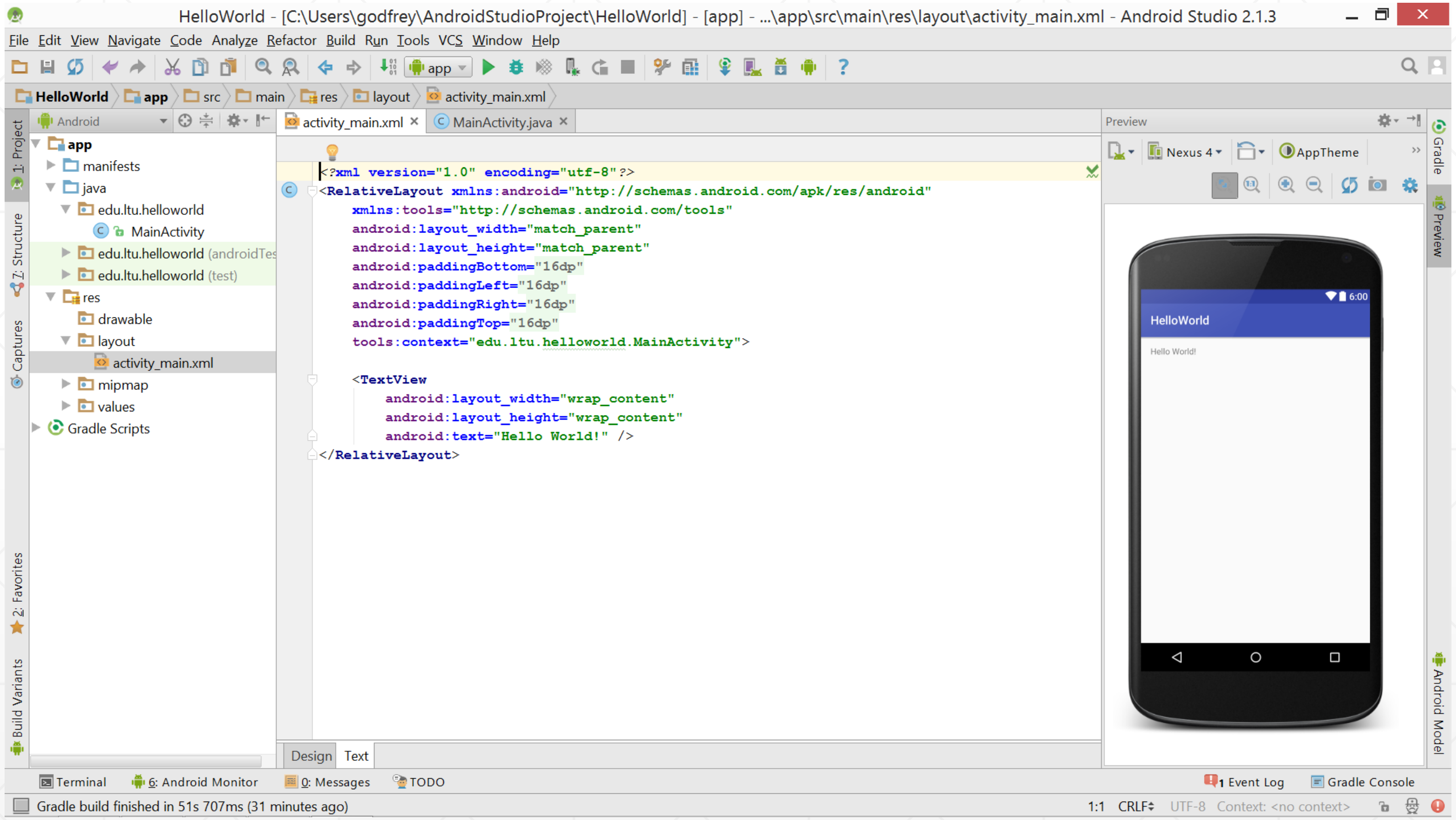

HelloWorld - [C:\Users\godfrey\AndroidStudioProject\HelloWorld] - [app] - ...\app\src\main\java\edu\ltu\helloworl...
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
app
HelloWorld app src main java edu ltu helloworld MainActivity
Android
activity_main.xml
MainActivity.java
app
manifests
java
edu.ltu.helloworld
MainActivity
edu.ltu.helloworld (androidTes
edu.ltu.helloworld (test)
res
Gradle Scripts
1: Project
7: Structure
Captures
2: Favorites
Build Variants
Gradle
Android Model
Terminal
6: Android Monitor
0: Messages
TODO
1 Event Log
Gradle Console
1:1 CRLF UTF-8 Context: <no context>

```
package edu.ltu.helloworld;

import ...

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }
}
```

Gradle build finished in 51s 707ms (30 minutes ago)

Hello World Android app

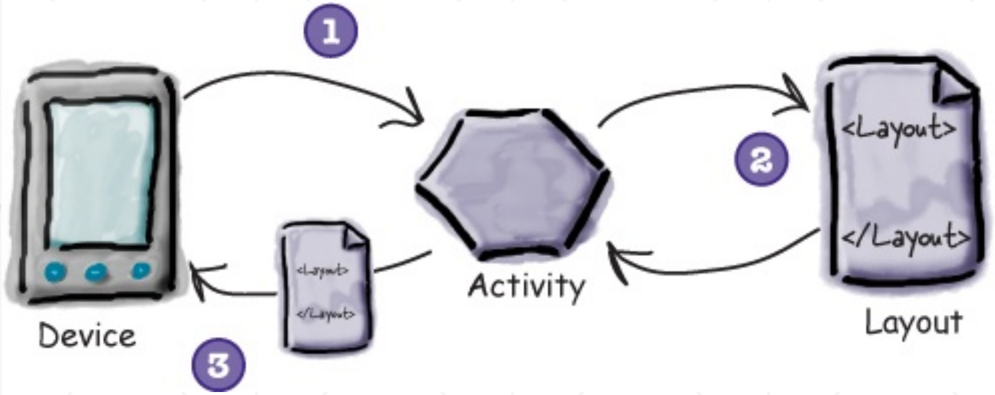
- Build a basic app

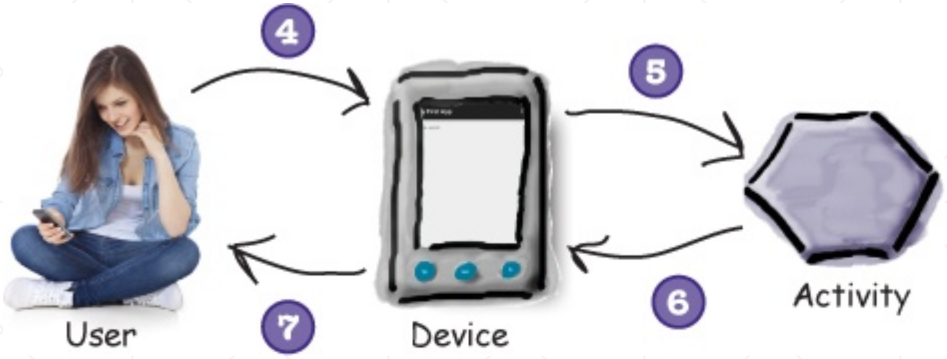


HelloWorld - [C:\Users\godfrey\AndroidStudioProject\HelloWorld] - [app] - ...\app\src\main\res\layout\activity_main.xml - Android Studio 2.1.3

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingBottom="16dp"
    android:paddingLeft="16dp"
    android:paddingRight="16dp"
    android:paddingTop="16dp"
    tools:context="edu.ltu.helloworld.MainActivity">

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Hello World!" />
</RelativeLayout>
```

Gradle build finished in 51s 707ms (31 minutes ago)



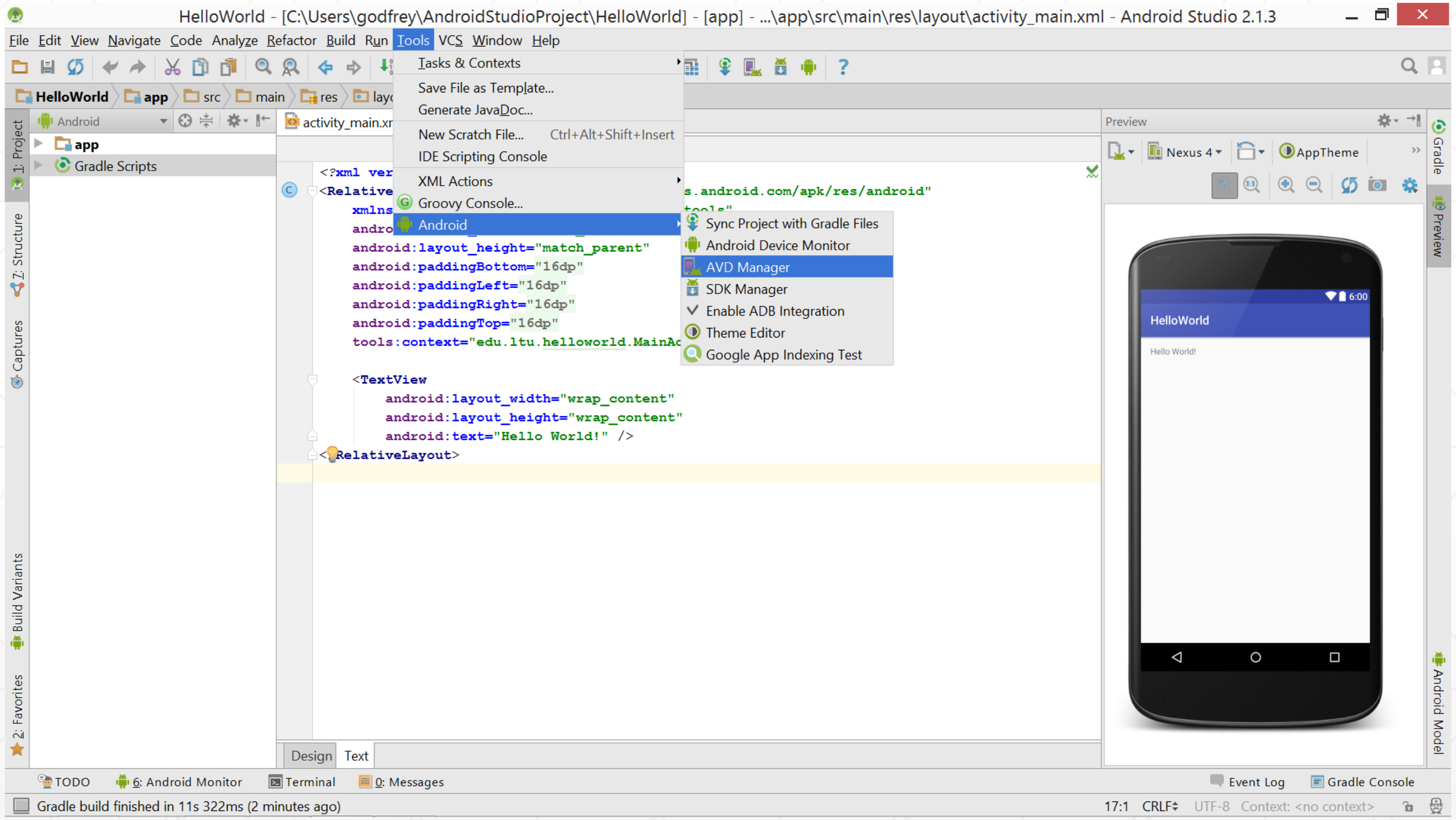


Layouts define how the user interface is presented.
Activities define actions.

1. The device launches your app and creates an activity object.
2. The activity object specifies a layout.
3. The activity tells Android to display the layout on screen.
4. The user interacts with the layout that’s displayed on the device.
5. The activity responds to these interactions by running application code.
6. The activity updates the display...
7. ...which the user sees on the device.

Hello World Android app

- Run the app in the Android emulator



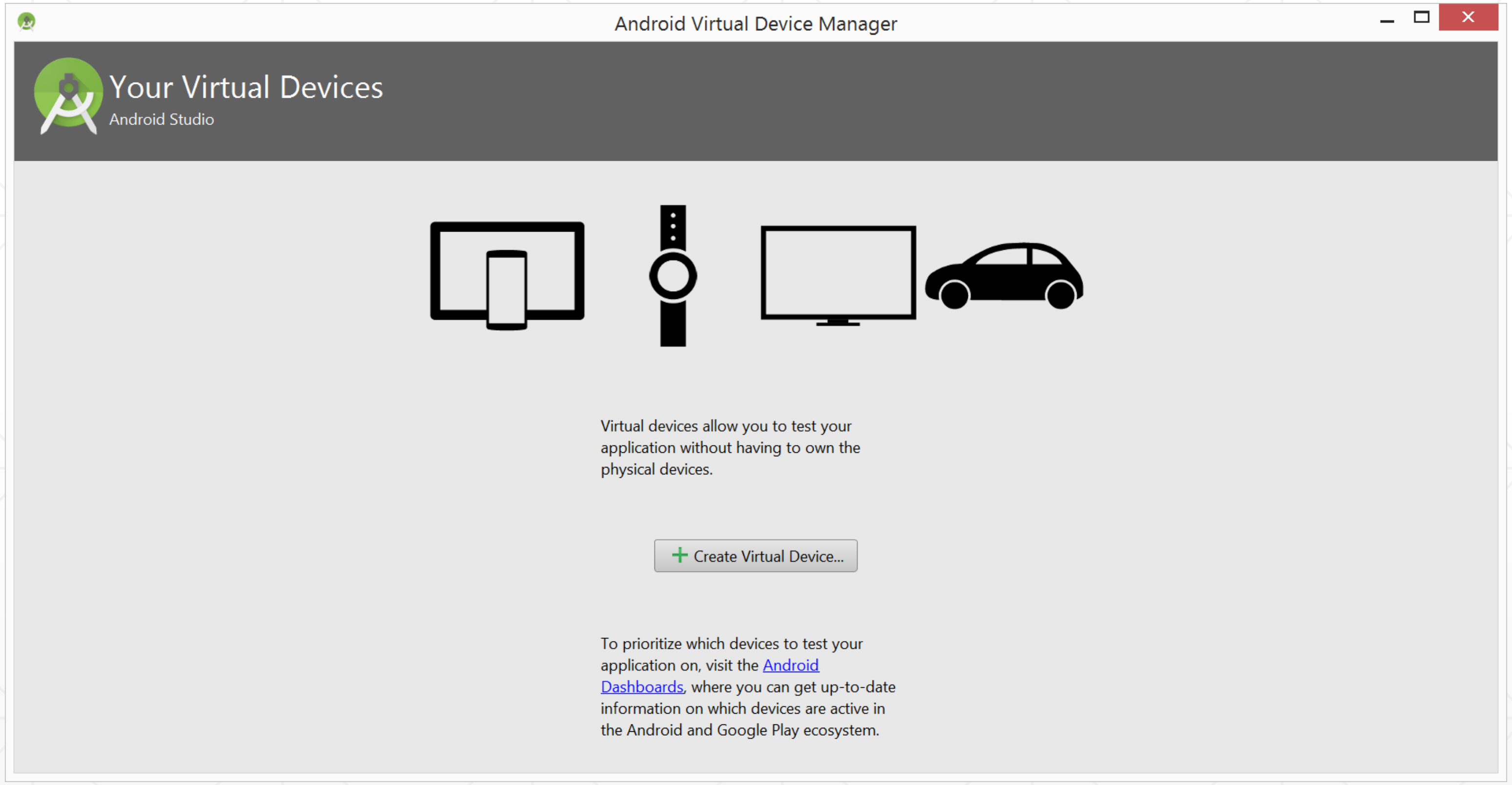
HelloWorld - [C:\Users\godfrey\AndroidStudioProject\HelloWorld] - [app] - ...\app\src\main\res\layout\activity_main.xml - Android Studio 2.1.3

```
<?xml ver
<Relative                                        s.android.com/apk/res/android"
    xmlns                                        tools"
    andro
    android:layout_height="match_parent"
    android:paddingBottom="16dp"
    android:paddingLeft="16dp"
    android:paddingRight="16dp"
    android:paddingTop="16dp"
    tools:context="edu.ltu.helloworld.MainAc

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Hello World!" />
</RelativeLayout>
```

Gradle build finished in 11s 322ms (2 minutes ago)

Hello World Android app

- Run the app in the Android emulator

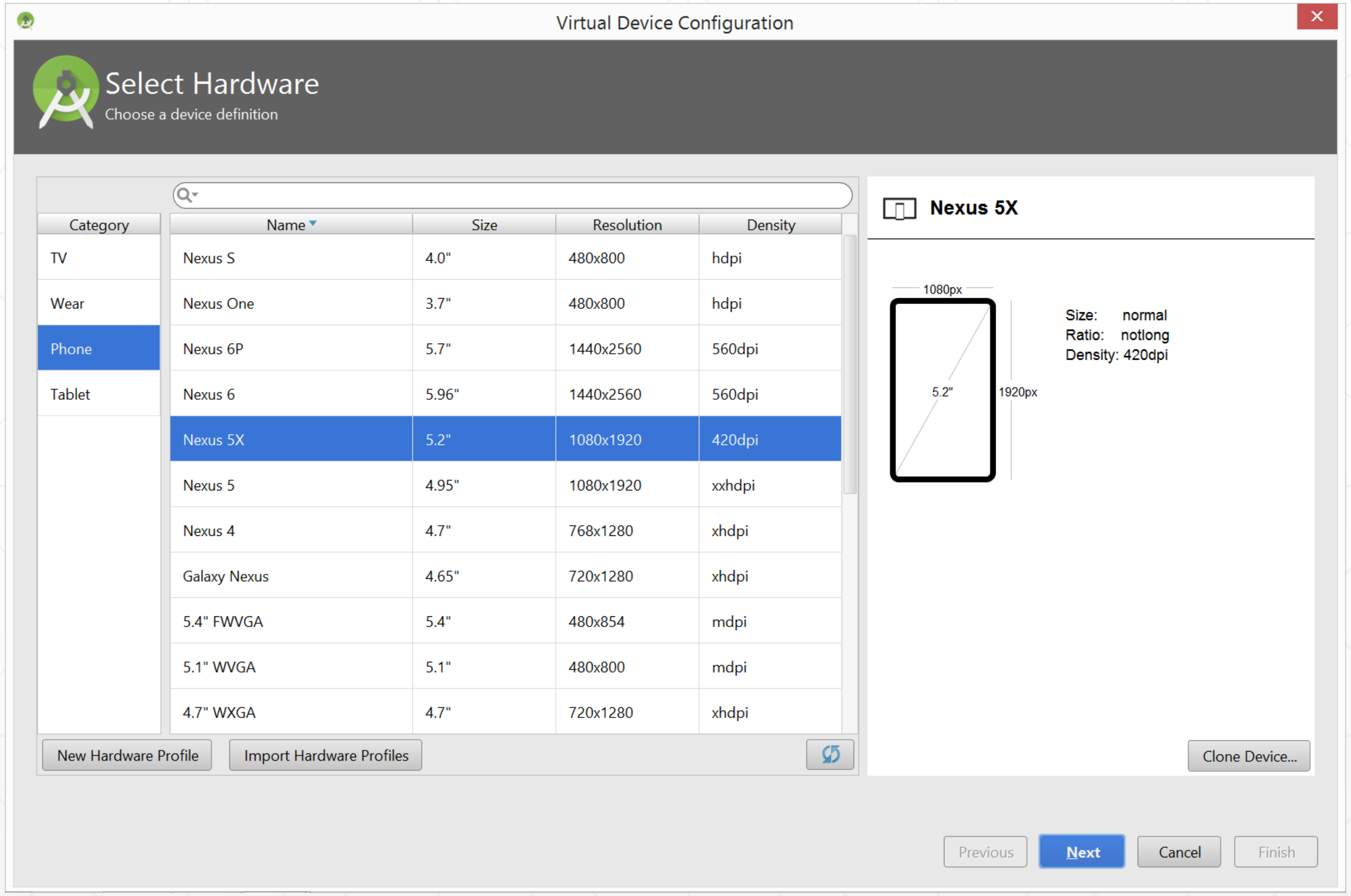


Virtual devices allow you to test your application without having to own the physical devices.

To prioritize which devices to test your application on, visit the Android Dashboards, where you can get up-to-date information on which devices are active in the Android and Google Play ecosystem.

Hello World Android app

- Run the app in
  the Android emulator



Virtual Device Configuration

Select Hardware

Choose a device definition

Category
TV
Wear
Phone
Tablet

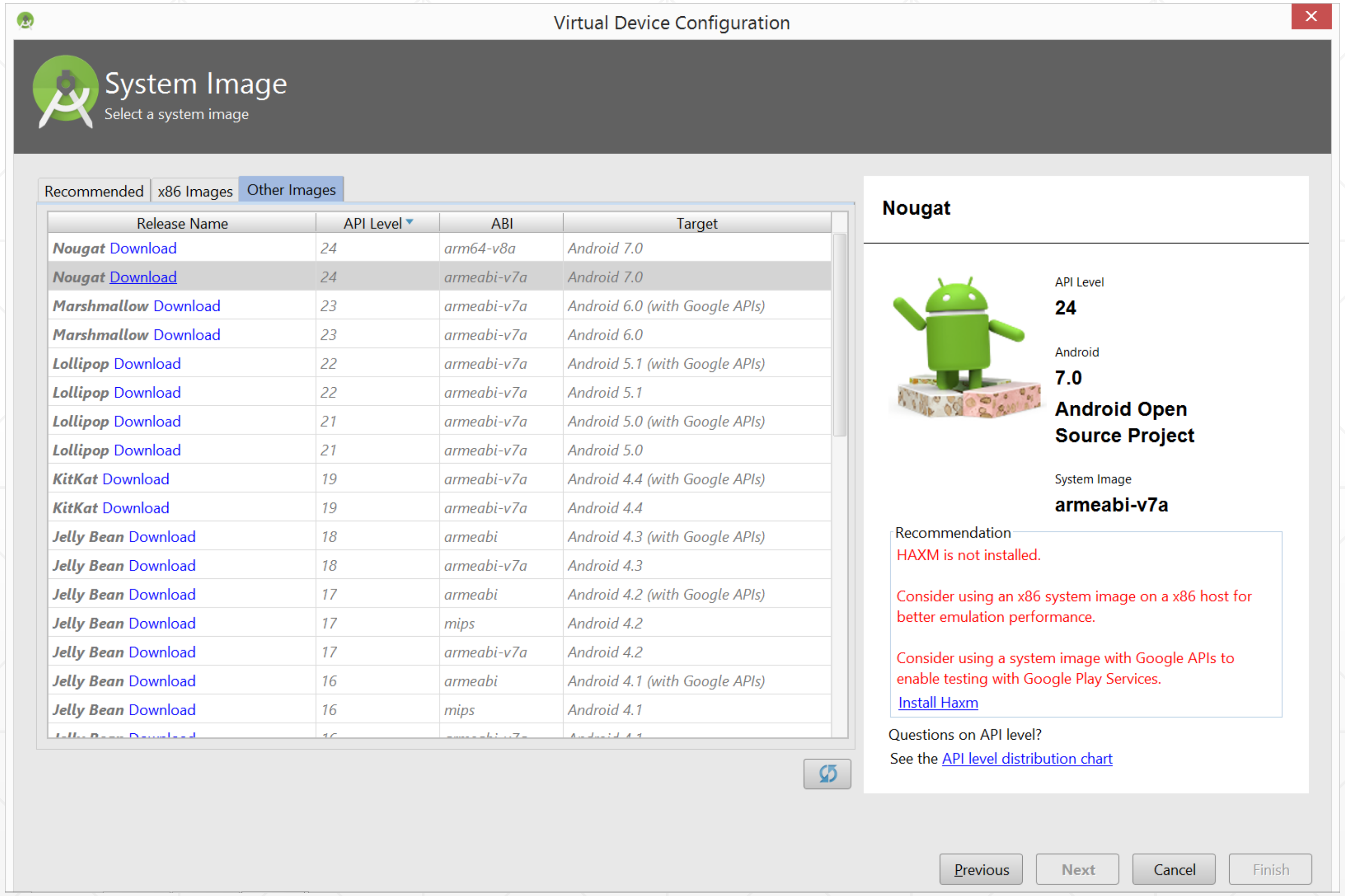
Name	Size	Resolution	Density
Nexus S	4.0"	480x800	hdpi
Nexus One	3.7"	480x800	hdpi
Nexus 6P	5.7"	1440x2560	560dpi
Nexus 6	5.96"	1440x2560	560dpi
Nexus 5X	5.2"	1080x1920	420dpi
Nexus 5	4.95"	1080x1920	xxhdpi
Nexus 4	4.7"	768x1280	xhdpi
Galaxy Nexus	4.65"	720x1280	xhdpi
5.4" FWVGA	5.4"	480x854	mdpi
5.1" WVGA	5.1"	480x800	mdpi
4.7" WXGA	4.7"	720x1280	xhdpi

Nexus 5X

Size: normal
Ratio: notlong
Density: 420dpi

Hello World Android app

- Run the app in the Android emulator



System Image

Select a system image

Release Name	API Level	ABI	Target
Nougat Download	24	arm64-v8a	Android 7.0
Nougat Download	24	armeabi-v7a	Android 7.0
Marshmallow Download	23	armeabi-v7a	Android 6.0 (with Google APIs)
Marshmallow Download	23	armeabi-v7a	Android 6.0
Lollipop Download	22	armeabi-v7a	Android 5.1 (with Google APIs)
Lollipop Download	22	armeabi-v7a	Android 5.1
Lollipop Download	21	armeabi-v7a	Android 5.0 (with Google APIs)
Lollipop Download	21	armeabi-v7a	Android 5.0
KitKat Download	19	armeabi-v7a	Android 4.4 (with Google APIs)
KitKat Download	19	armeabi-v7a	Android 4.4
Jelly Bean Download	18	armeabi	Android 4.3 (with Google APIs)
Jelly Bean Download	18	armeabi-v7a	Android 4.3
Jelly Bean Download	17	armeabi	Android 4.2 (with Google APIs)
Jelly Bean Download	17	mips	Android 4.2
Jelly Bean Download	17	armeabi-v7a	Android 4.2
Jelly Bean Download	16	armeabi	Android 4.1 (with Google APIs)
Jelly Bean Download	16	mips	Android 4.1
Jelly Bean Download	16	armeabi-v7a	Android 4.1

Nougat

API Level
24

Android
7.0
Android Open Source Project

System Image
armeabi-v7a

Recommendation

HAXM is not installed.

Consider using an x86 system image on a x86 host for better emulation performance.

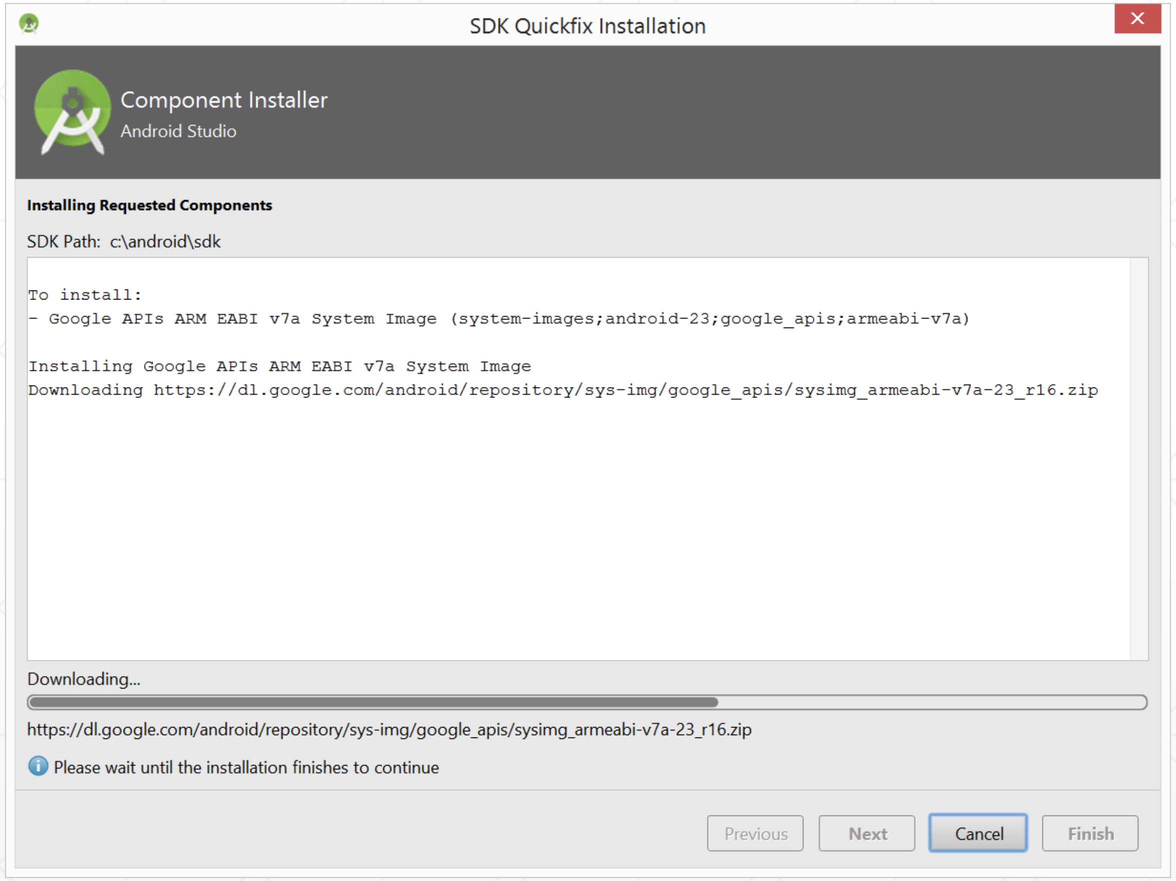
Consider using a system image with Google APIs to enable testing with Google Play Services.

Install Haxm

Questions on API level?
See the API level distribution chart

Hello World Android app

- Run the app in the Android emulator



Installing Requested Components

SDK Path: c:\android\sdk

```
To install:
- Google APIs ARM EABI v7a System Image (system-images;android-23;google_apis;armeabi-v7a)

Installing Google APIs ARM EABI v7a System Image
Downloading https://dl.google.com/android/repository/sys-img/google_apis/sysimg_armeabi-v7a-23_r16.zip
```

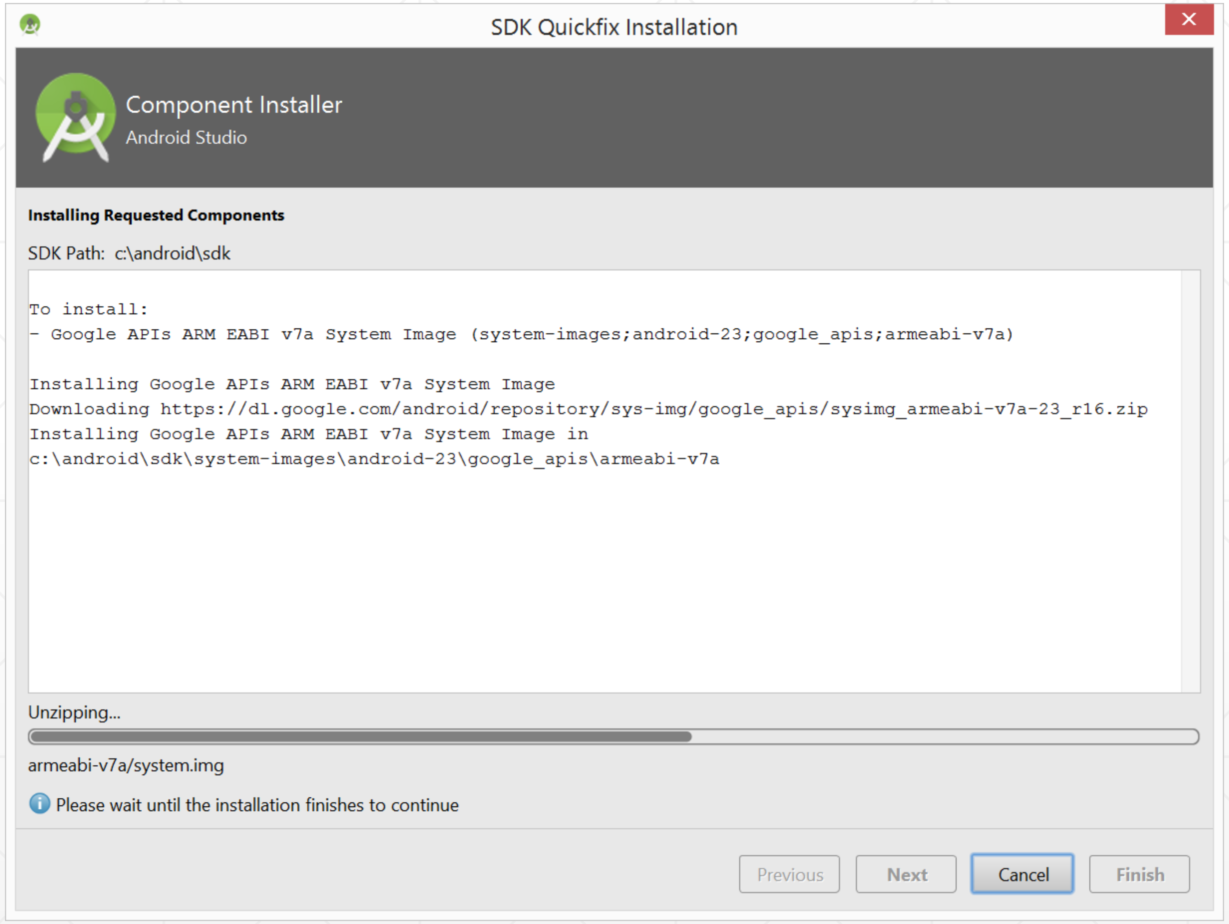
Downloading...

https://dl.google.com/android/repository/sys-img/google_apis/sysimg_armeabi-v7a-23_r16.zip

Please wait until the installation finishes to continue

Hello World Android app

- Run the app in the Android emulator



Installing Requested Components

SDK Path: c:\android\sdk

```
To install:
- Google APIs ARM EABI v7a System Image (system-images;android-23;google_apis;armeabi-v7a)

Installing Google APIs ARM EABI v7a System Image
Downloading https://dl.google.com/android/repository/sys-img/google_apis/sysimg_armeabi-v7a-23_r16.zip
Installing Google APIs ARM EABI v7a System Image in
c:\android\sdk\system-images\android-23\google_apis\armeabi-v7a
```

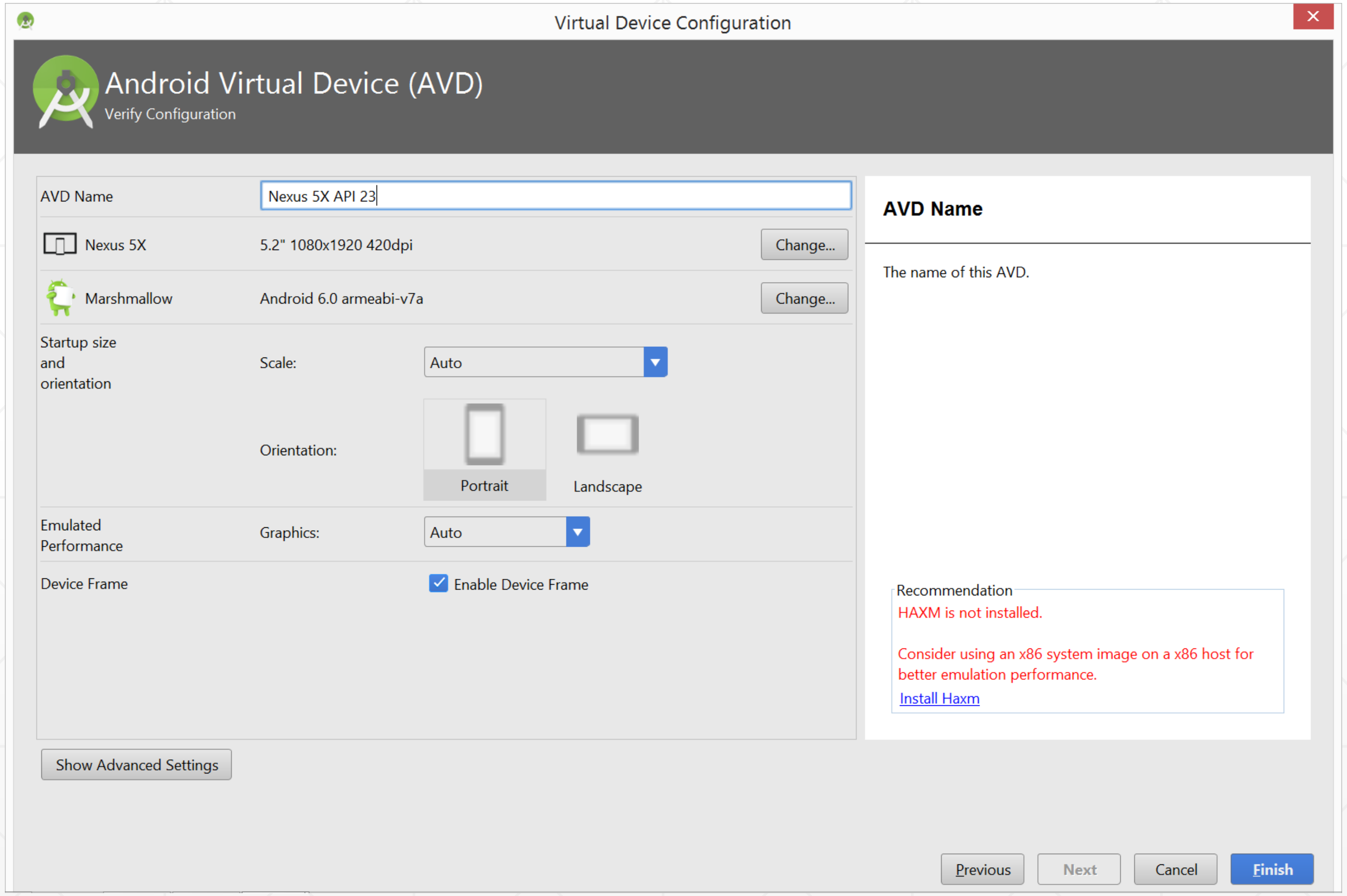
Unzipping...

armeabi-v7a/system.img

Please wait until the installation finishes to continue

Hello World Android app

- Run the app in the Android emulator



Virtual Device Configuration

Android Virtual Device (AVD)

Verify Configuration

AVD Name: Nexus 5X API 23

Nexus 5X: 5.2" 1080x1920 420dpi

Marshmallow: Android 6.0 armeabi-v7a

Startup size and orientation: Scale: Auto

Orientation: Portrait / Landscape

Emulated Performance: Graphics: Auto

Device Frame: ☑ Enable Device Frame

AVD Name

The name of this AVD.

Recommendation

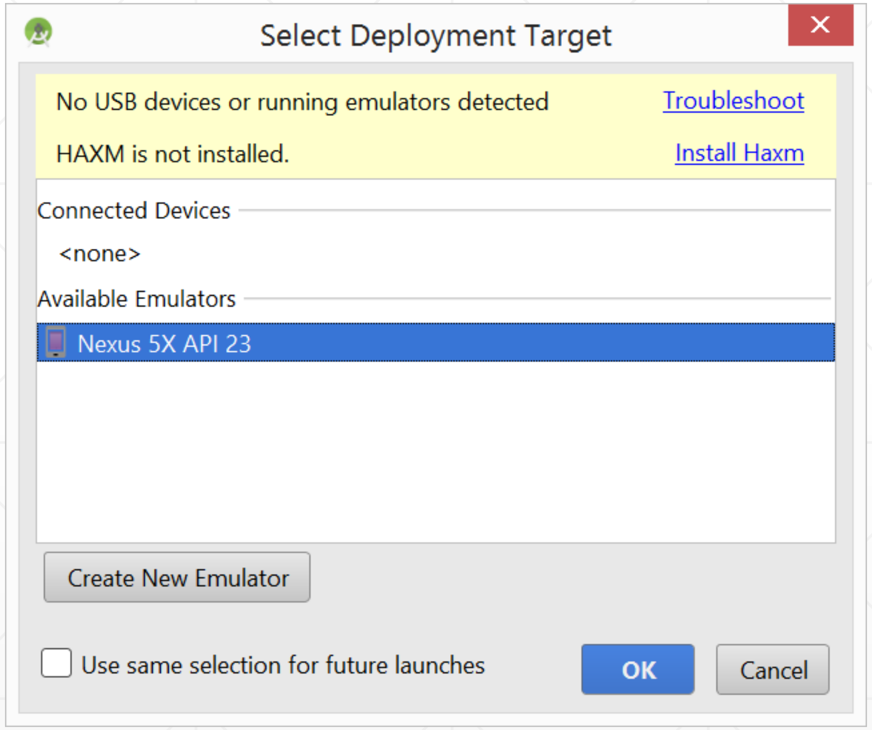
HAXM is not installed.

Consider using an x86 system image on a x86 host for better emulation performance.

Install Haxm

Hello World Android app

- Run the app in the Android emulator
- Run->Run ‘App’



Select Deployment Target

No USB devices or running emulators detected

HAXM is not installed.

Connected Devices

<none>

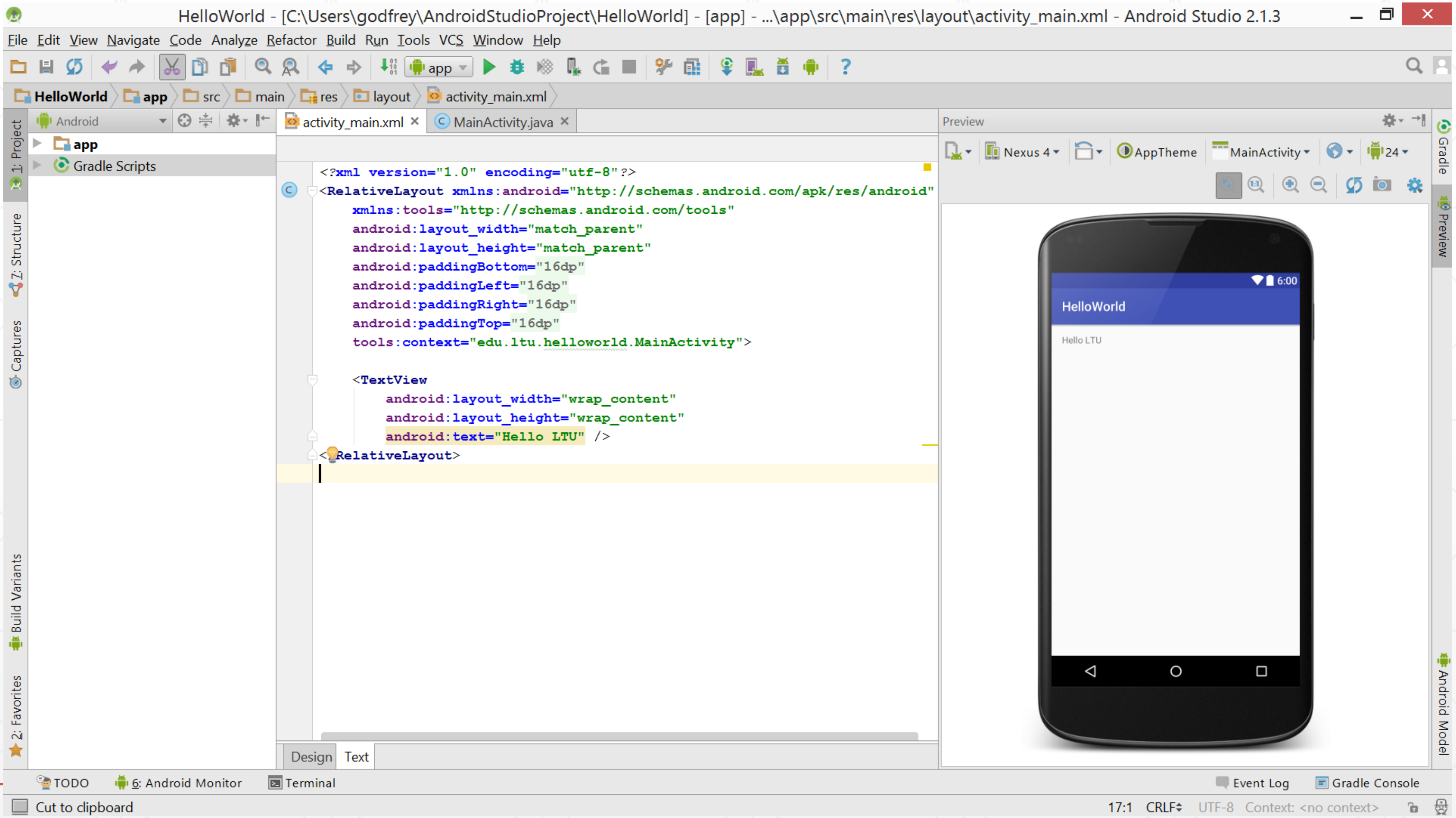
Available Emulators

Nexus 5X API 23

☐ Use same selection for future launches

Hello World Android app

- Change the text
- Run->Run ‘App’



HelloWorld - [C:\Users\godfrey\AndroidStudioProject\HelloWorld] - [app] - ...\app\src\main\res\layout\activity_main.xml - Android Studio 2.1.3

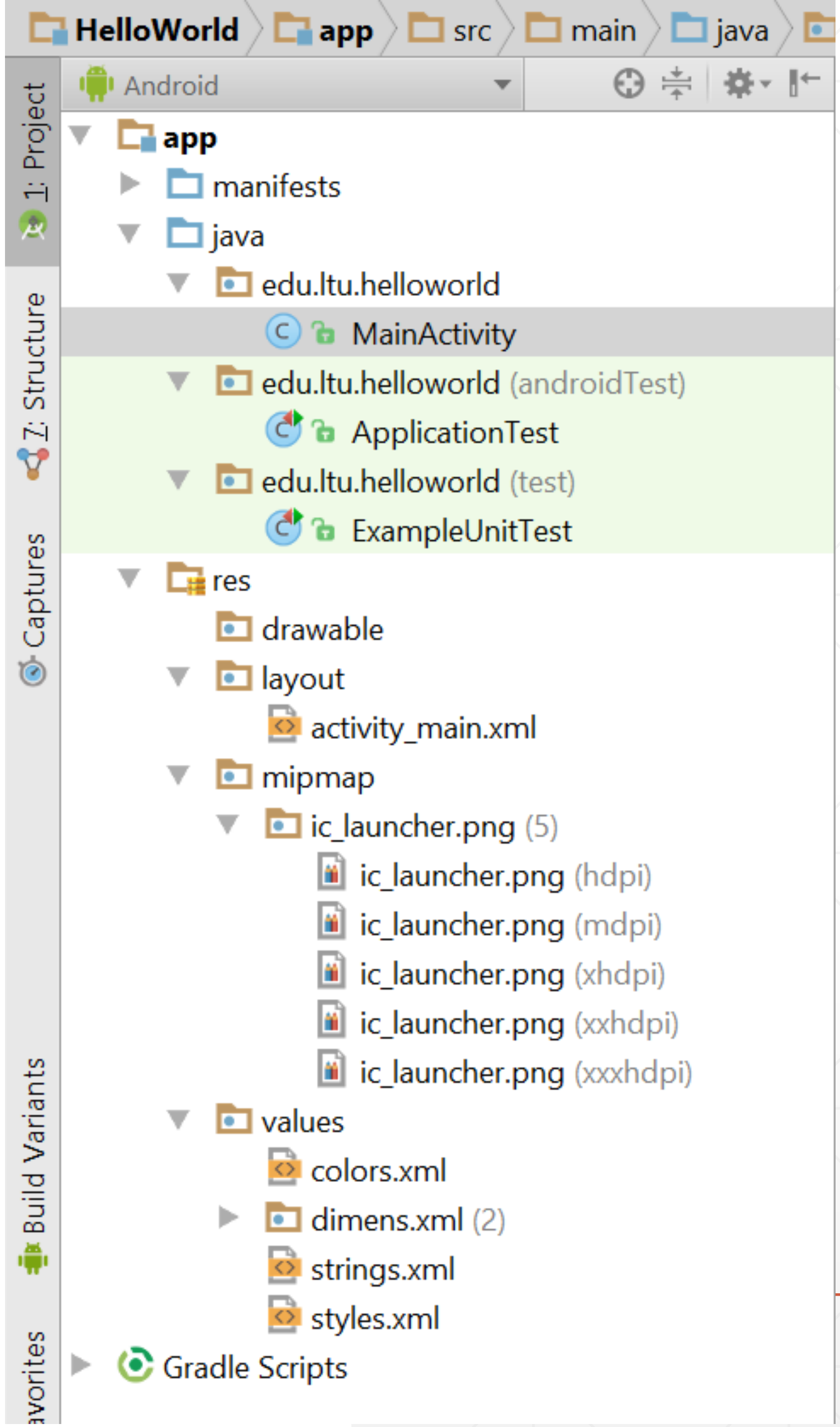
```xml
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingBottom="16dp"
    android:paddingLeft="16dp"
    android:paddingRight="16dp"
    android:paddingTop="16dp"
    tools:context="edu.ltu.helloworld.MainActivity">

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Hello LTU" />
</RelativeLayout>
```

```
Cut to clipboard                                17:1  CRLF  UTF-8  Context: <no context>
```

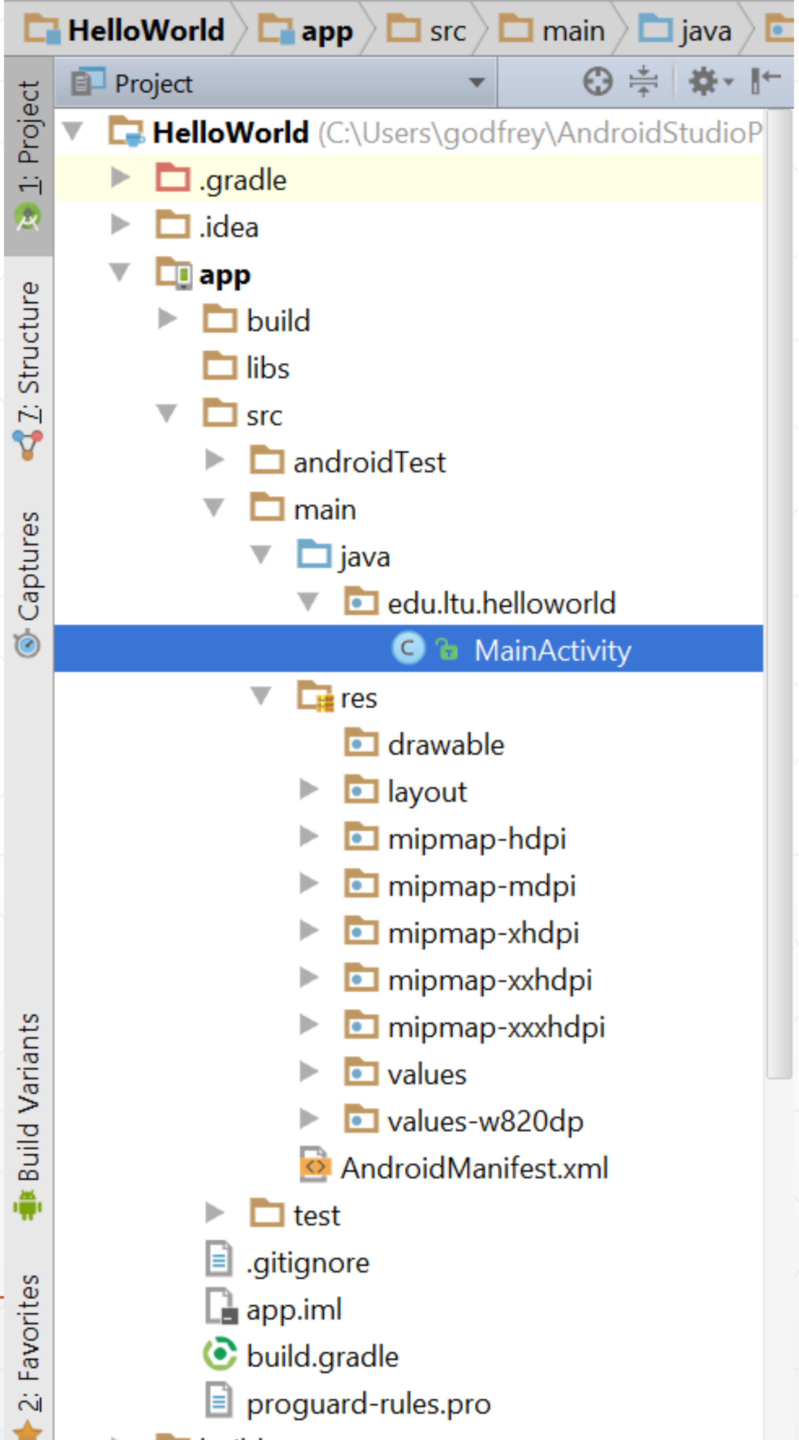
Reminder

- Java test next class
- Assignment for next Tuesday – create HelloWorld app / change text

```
HelloWorld/
├── HelloWorld.iml
├── app
│   ├── app.iml
│   ├── build.gradle
│   ├── libs
│   ├── proguard-rules.pro
│   └── src
│       ├── androidTest
│       │   └── java
│       │       └── edu
│       │           └── ltu
│       │               └── helloworld
│       │                   └── ApplicationTest.java
│       ├── main
│       │   ├── AndroidManifest.xml
│       │   ├── java
│       │   │   └── edu
│       │   │       └── ltu
│       │   │           └── helloworld
│       │   │               └── MainActivity.java
│       │   └── res
│       │       ├── drawable
│       │       ├── layout
│       │       │   └── activity_main.xml
│       │       ├── mipmap-hdpi
│       │       │   └── ic_launcher.png
│       │       ├── mipmap-mdpi
│       │       │   └── ic_launcher.png
│       │       ├── mipmap-xhdpi
│       │       │   └── ic_launcher.png
│       │       ├── mipmap-xxhdpi
│       │       │   └── ic_launcher.png
│       │       ├── mipmap-xxxhdpi
│       │       │   └── ic_launcher.png
│       │       ├── values
│       │       │   ├── colors.xml
│       │       │   ├── dimens.xml
│       │       │   ├── strings.xml
│       │       │   └── styles.xml
│       │       └── values-w820dp
│       │           └── dimens.xml
│       └── test
│           └── java
│               └── edu
│                   └── ltu
│                       └── helloworld
│                           └── ExampleUnitTest.java
├── build.gradle
├── gradle
│   └── wrapper
│       ├── gradle-wrapper.jar
│       └── gradle-wrapper.properties
├── gradle.properties
├── gradlew
├── gradlew.bat
├── local.properties
└── settings.gradle
```

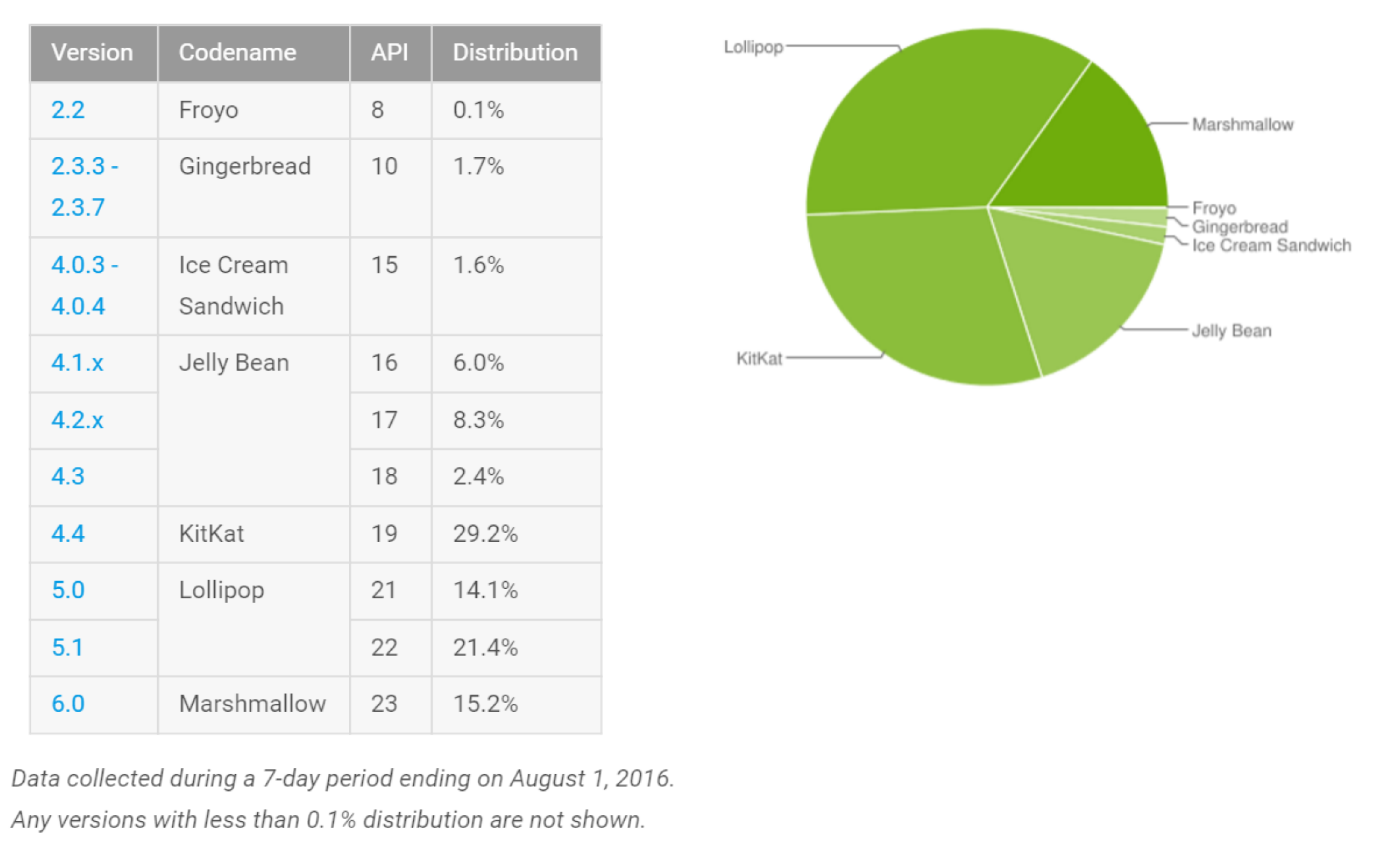


```
app
    manifests
    java
        edu.ltu.helloworld
            MainActivity
        edu.ltu.helloworld (androidTest)
            ApplicationTest
        edu.ltu.helloworld (test)
            ExampleUnitTest
    res
        drawable
        layout
            activity_main.xml
        mipmap
            ic_launcher.png (5)
                ic_launcher.png (hdpi)
                ic_launcher.png (mdpi)
                ic_launcher.png (xhdpi)
                ic_launcher.png (xxhdpi)
                ic_launcher.png (xxxhdpi)
        values
            colors.xml
            dimens.xml (2)
            strings.xml
            styles.xml
Gradle Scripts
```



```
HelloWorld (C:\Users\godfrey\AndroidStudioP
    .gradle
    .idea
    app
        build
        libs
        src
            androidTest
            main
                java
                    edu.ltu.helloworld
                        MainActivity
                res
                    drawable
                    layout
                    mipmap-hdpi
                    mipmap-mdpi
                    mipmap-xhdpi
                    mipmap-xxhdpi
                    mipmap-xxxhdpi
                    values
                    values-w820dp
                AndroidManifest.xml
            test
        .gitignore
        app.iml
        build.gradle
        proguard-rules.pro
```

```
apply plugin: 'com.android.application'

android {
    compileSdkVersion 24
    buildToolsVersion "24.0.1"

    defaultConfig {
        applicationId "edu.ltu.helloworld"
        minSdkVersion 15
        targetSdkVersion 24
        versionCode 1
        versionName "1.0"
    }
    buildTypes {
        release {
            minifyEnabled false
            proguardFiles getDefaultProguardFile('proguard-android.txt'), 'proguard-rules.pro'
        }
    }
}

dependencies {
    compile fileTree(dir: 'libs', include: ['*.jar'])
    testCompile 'junit:junit:4.12'
    compile 'com.android.support:appcompat-v7:24.2.0'
}
```



Version	Codename	API	Distribution
2.2	Froyo	8	0.1%
2.3.3 - 2.3.7	Gingerbread	10	1.7%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	1.6%
4.1.x	Jelly Bean	16	6.0%
4.2.x		17	8.3%
4.3		18	2.4%
4.4	KitKat	19	29.2%
5.0	Lollipop	21	14.1%
5.1		22	21.4%
6.0	Marshmallow	23	15.2%

Data collected during a 7-day period ending on August 1, 2016.

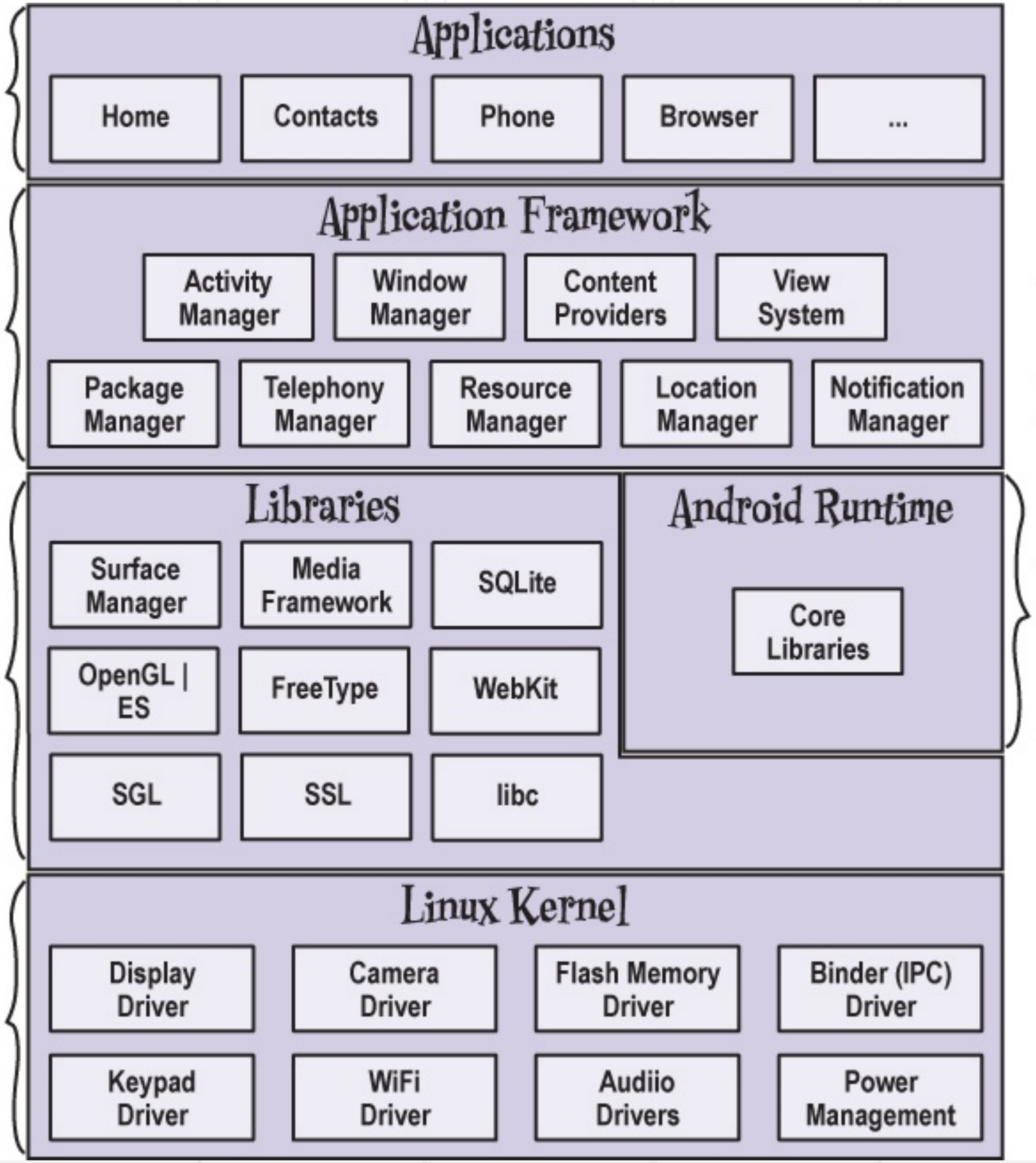
Any versions with less than 0.1% distribution are not shown.

Android comes with a set of core applications such as Contacts, Calendar, Maps, and a browser.

When you build your apps, you have access to the same APIs used by the core applications. You use these APIs to control what your app looks like and how it behaves.

Underneath the application framework lies a set of C and C++ libraries. These libraries get exposed to you through the framework APIs.

Underneath everything else lies the Linux kernel. Android relies on the kernel for drivers, and also core services such as security and memory management.



Applications

Home | Contacts | Phone | Browser | ...

Application Framework

Activity Manager | Window Manager | Content Providers | View System

Package Manager | Telephony Manager | Resource Manager | Location Manager | Notification Manager

Libraries

Surface Manager | Media Framework | SQLite

OpenGL | ES | FreeType | WebKit

SGL | SSL | libc

Android Runtime

Core Libraries

Linux Kernel

Display Driver | Camera Driver | Flash Memory Driver | Binder (IPC) Driver

Keypad Driver | WiFi Driver | Audiio Drivers | Power Management

The Android runtime comes with a set of core libraries that implement most of the Java programming language. Each Android app runs in its own process.