SSE3052: Embedded Systems Practice

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Agenda

- Let's boot new android kernel on the "Android Emulator"
  - Create new project on android studio
    - Create new AVD (Android Virtual Device)
  - Download android kernel (*goldfish*) source code
    - Compile it
  - Run AVD by compiled new kernel image
    - Check the kernel version is updated

Environment Setup

- (Virtual) Device
- Compiler
- Kernel

Environment Setup

- (Virtual) Device
  - Download Android Studio
  - Create an AVD (Android Virtual Device)
- Compiler
- Kernel

(Virtual) Device

Install required libraries

1. Open Terminal. (Ctrl + Alt + 't')
2. `sudo apt-get install libc6:i386 libncurses5:i386 libstdc++6:i386 lib32z1 libbz2-1.0:i386`

(Virtual) Device

Download Android Studio

- Go to https://developer.android.com/studio.
- Download.

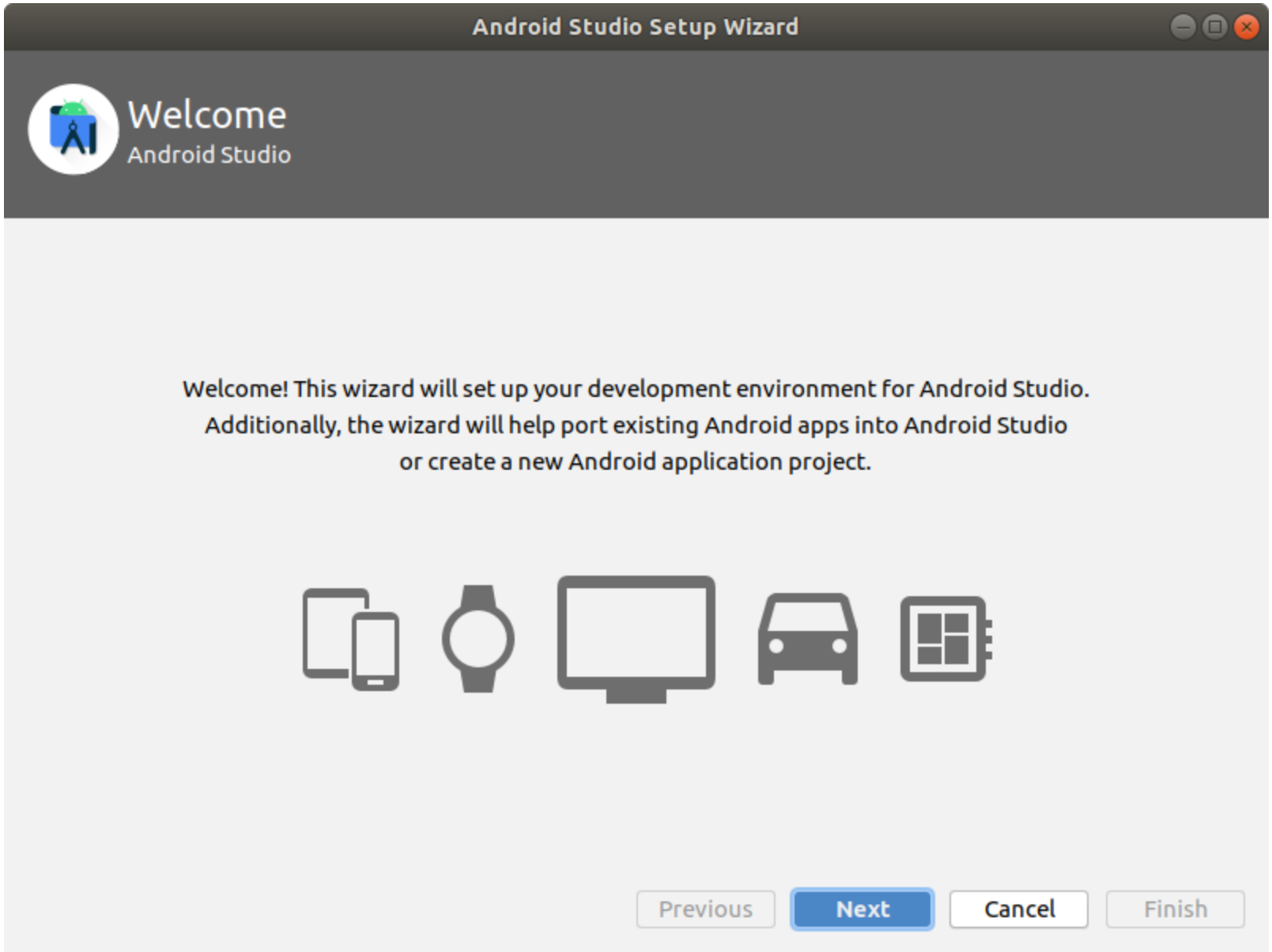
Android Studio downloads

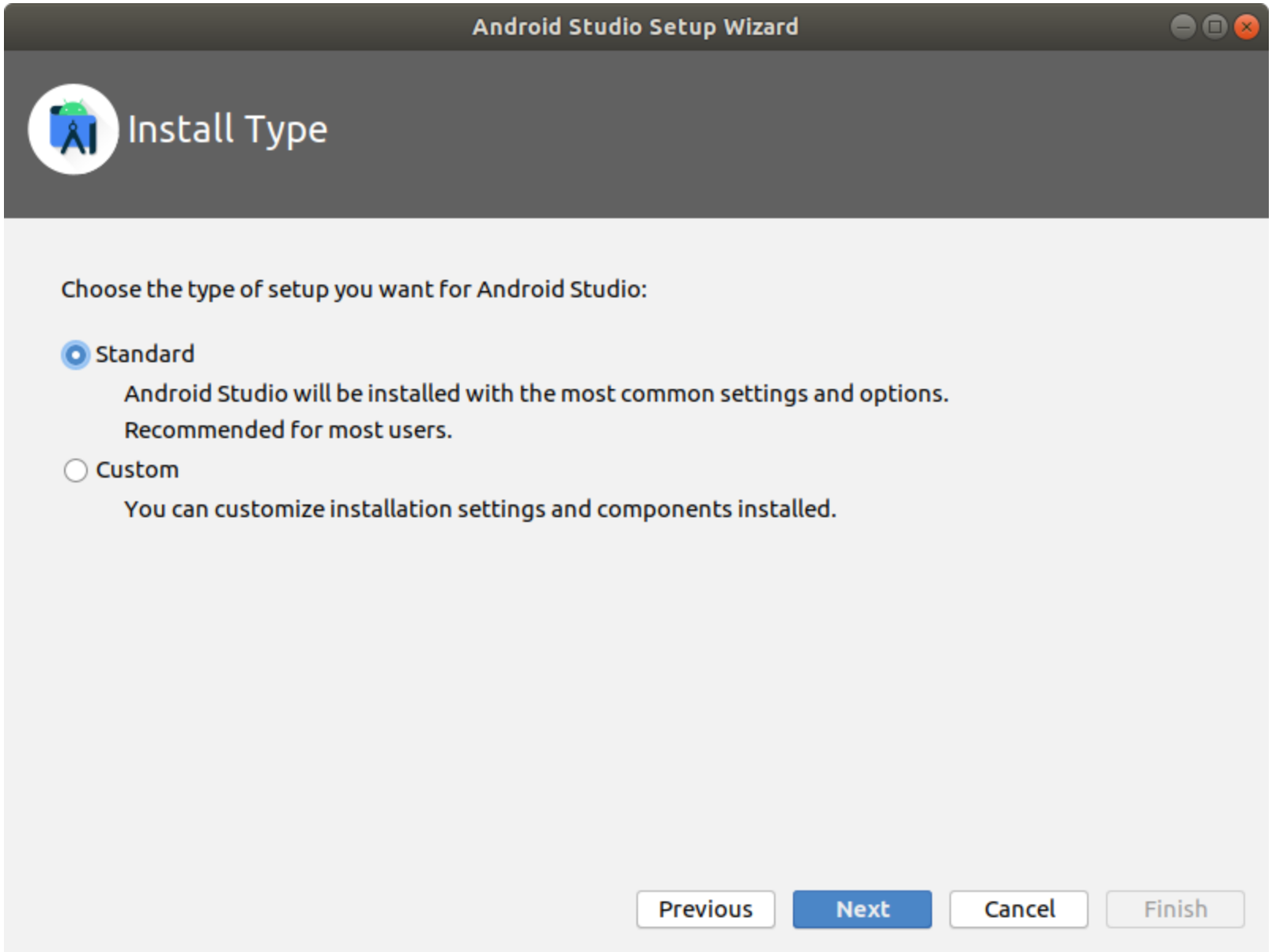
Platform	Android Studio package	Size	SHA-256 checksum
Windows (64-bit)	android-studio-ide-201.7042882-windows.exe Recommended	896 MiB	22cdcfeffabe384e788b679c5c03238684fa3f1f4c73e2a3744f2fe5aab7f97f
	android-studio-ide-201.7042882-windows.zip No .exe installer	900 MiB	7fb6e49e76ead2ff389c37f83a6c90526aa1f716aece028c8b8c34edf8ce9804
Mac (64-bit)	android-studio-ide-201.7042882-mac.dmg	877 MiB	541db2ab0fda0b1197509b39fac905b7e4879a1d0bad749ad1ccc0727e02ea6b
Linux (64-bit)	android-studio-ide-201.7042882-linux.tar.gz	882 MiB	89f7c3a03ed928edeb7bbb1971284bcb72891a77b4f363557a7ad4ed37652bb9
Chrome OS	android-studio-ide-201.7042882-cros.deb	742 MiB	13a7bda7a58cd56e1544f16705a17cc633951d692a16c0b9a9767b07d7cfea54

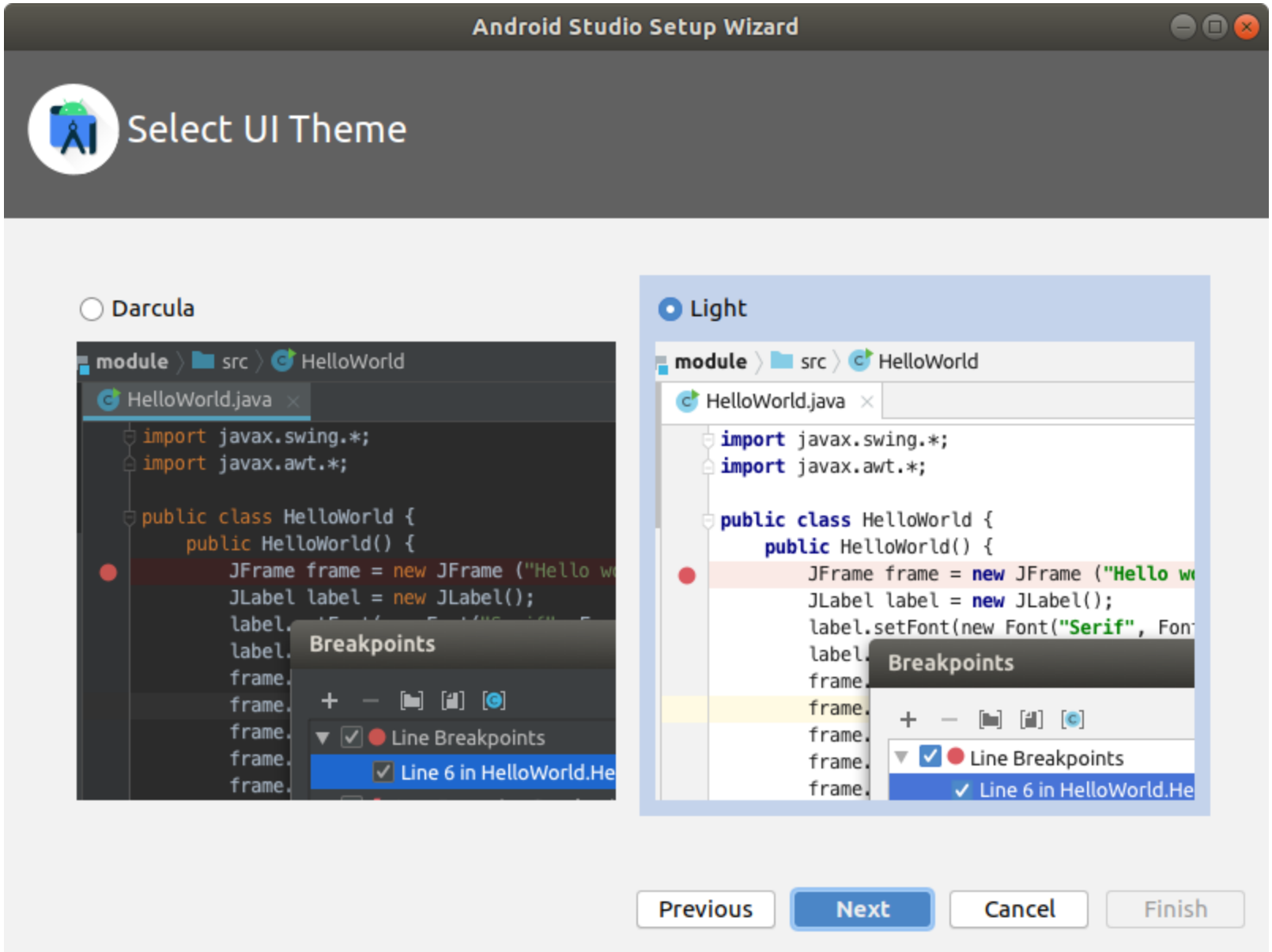
See the Android Studio release notes. More downloads are available in the download archives.

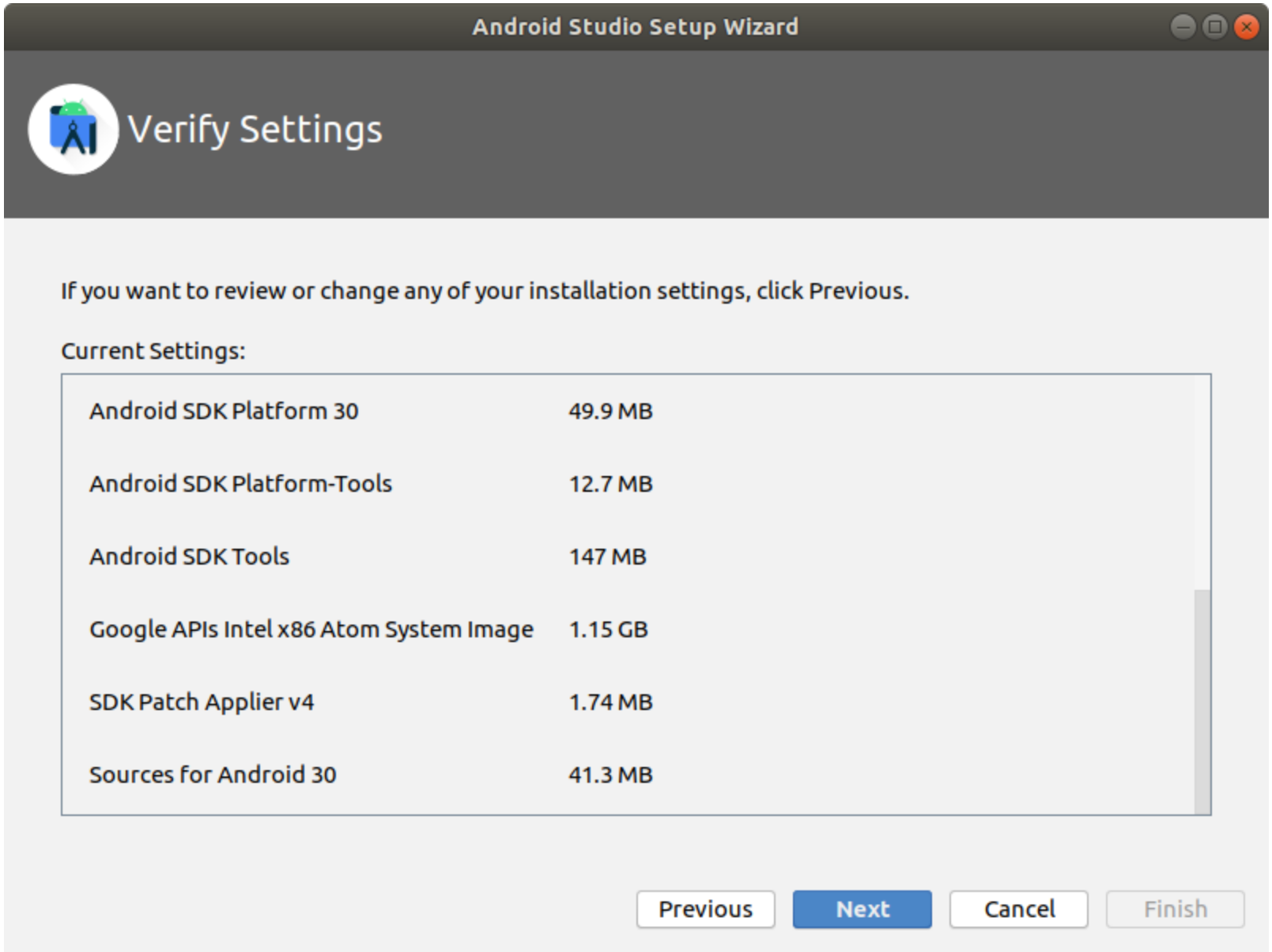
(Virtual) Device

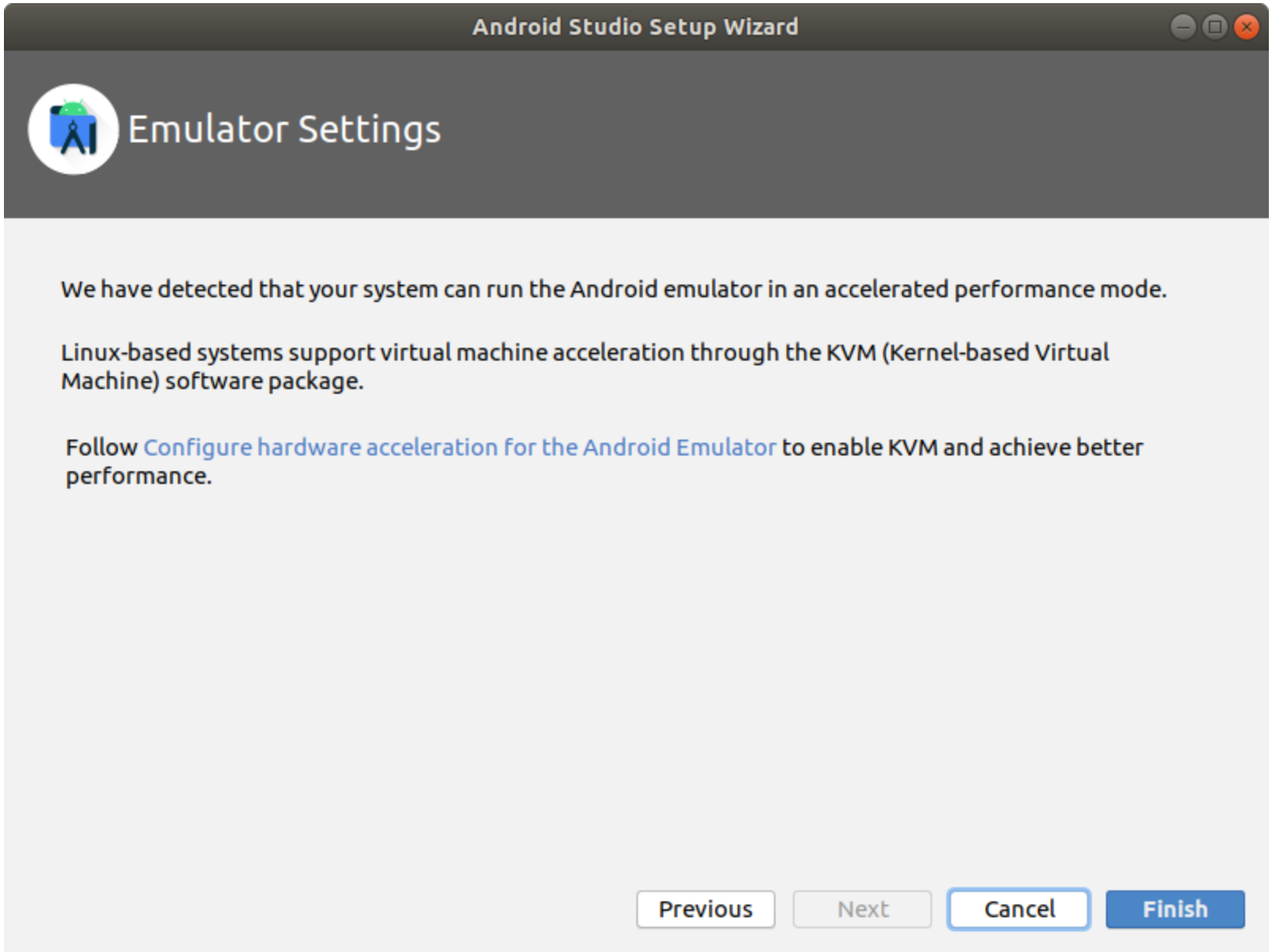
```
$cd ~/Downloads
$mv android-studio-ide-201.7042882-linux.tar.gz [Your Workspace]
$cd [Your Workspace]
$tar –xf android-studio-ide-201.7042882-linux.tar.gz
$cd android-studio/bin
$./studio.sh
```

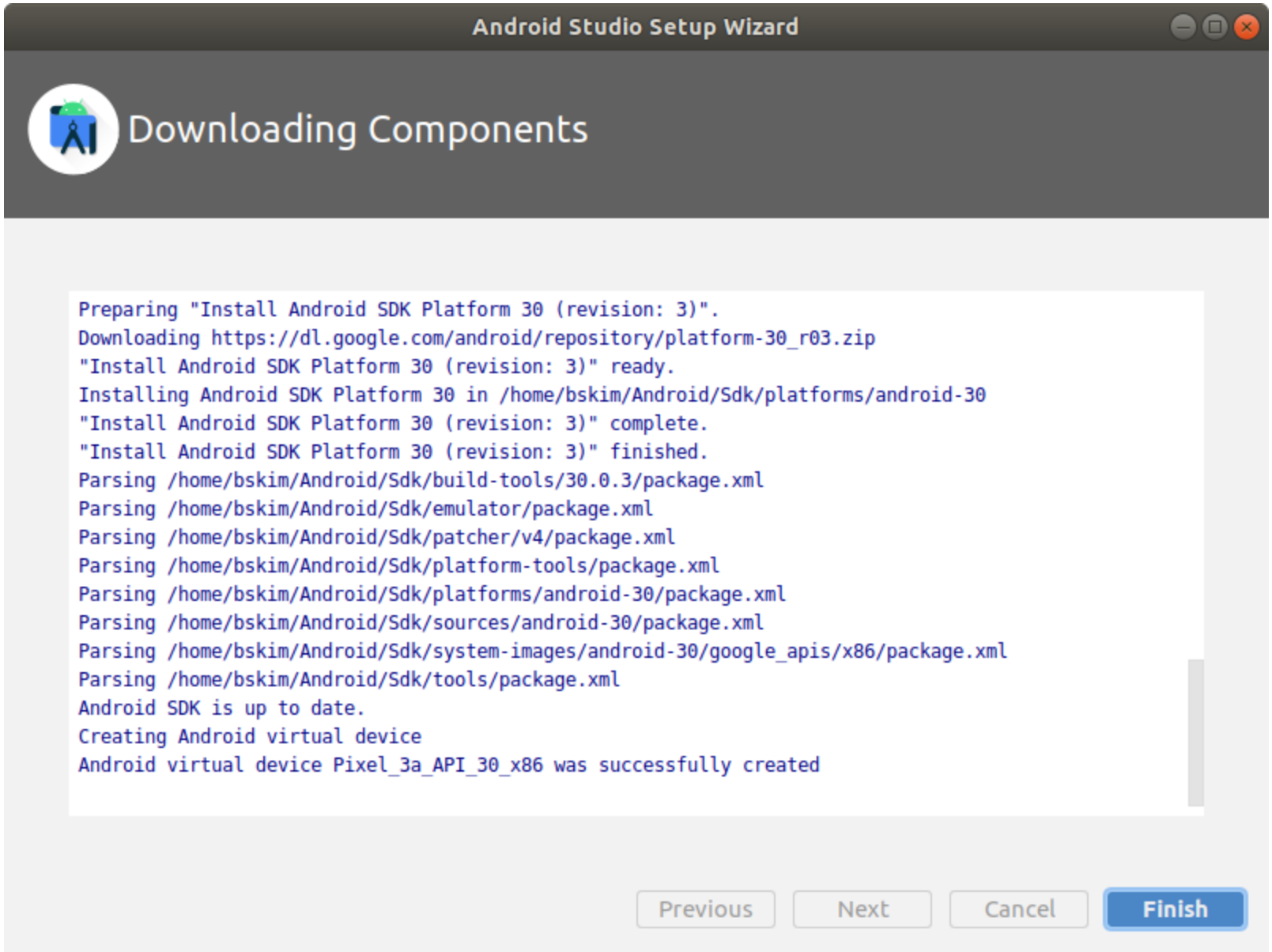

Android Studio Setup Wizard
Welcome
Android Studio
Welcome! This wizard will set up your development environment for Android Studio.
Additionally, the wizard will help port existing Android apps into Android Studio
or create a new Android application project.
Previous
Next
Cancel
Finish

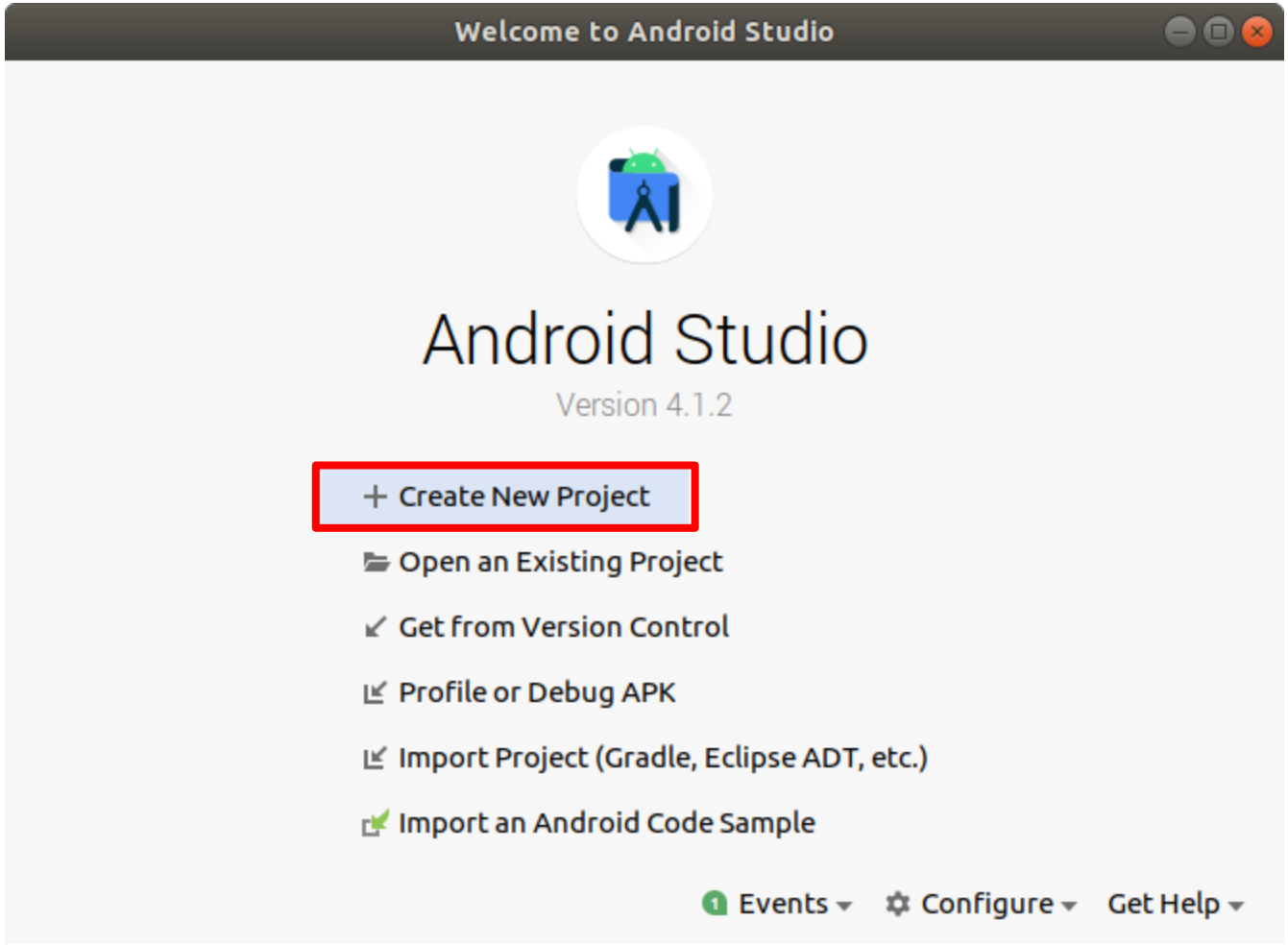

Android Studio Setup Wizard
Install Type
Choose the type of setup you want for Android Studio:
Standard
Android Studio will be installed with the most common settings and options.
Recommended for most users.
Custom
You can customize installation settings and components installed.
Previous
Next
Cancel
Finish

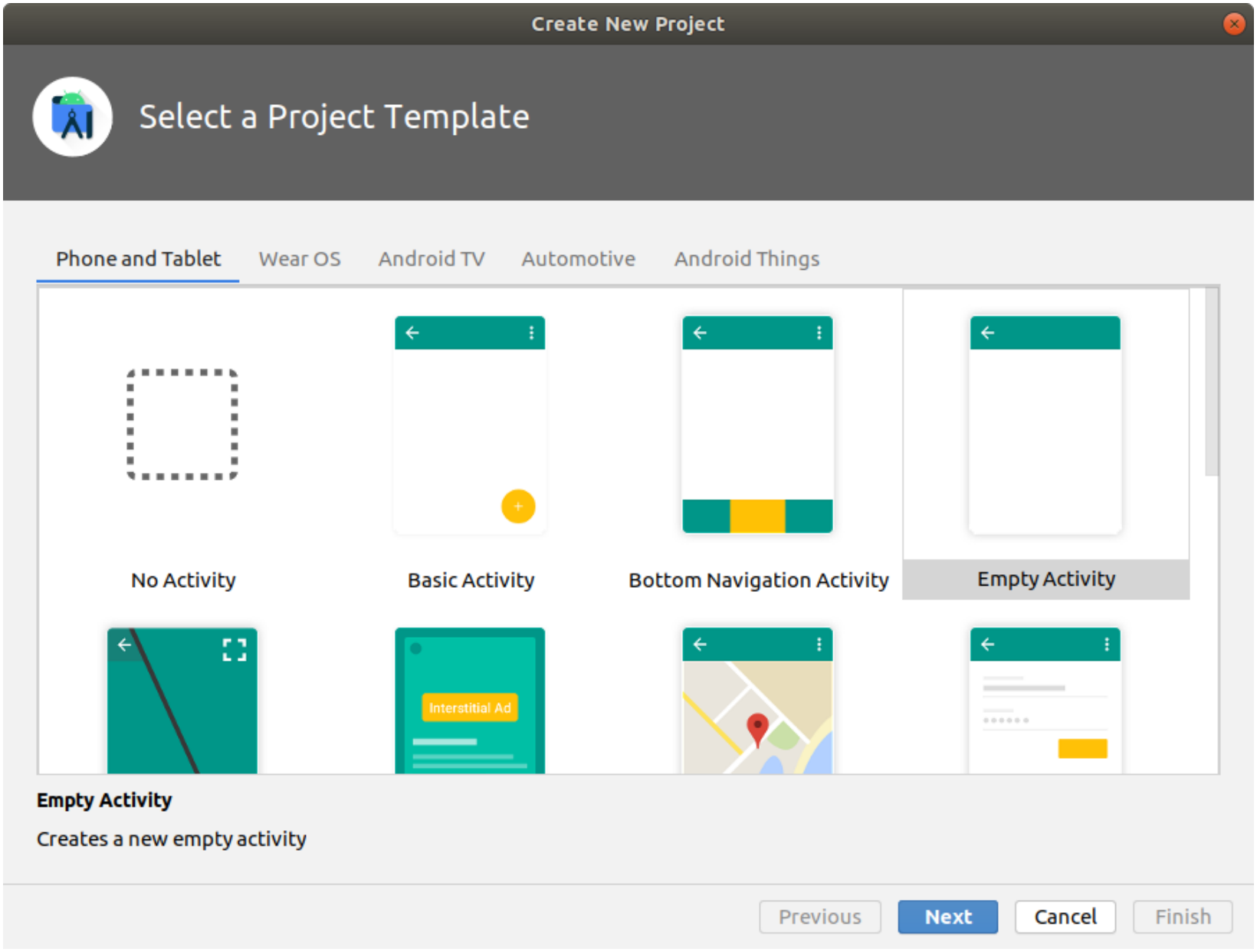

Android Studio Setup Wizard
Select UI Theme
Darcula
Light
module
src
HelloWorld
HelloWorld.java
import javax.swing.*;
import javax.awt.*;
public class HelloWorld {
public HelloWorld() {
JFrame frame = new JFrame ("Hello w
JLabel label = new JLabel();
label.setFont(new Font("Serif", Fon
Breakpoints
Line Breakpoints
Line 6 in HelloWorld.He
Previous
Next
Cancel
Finish

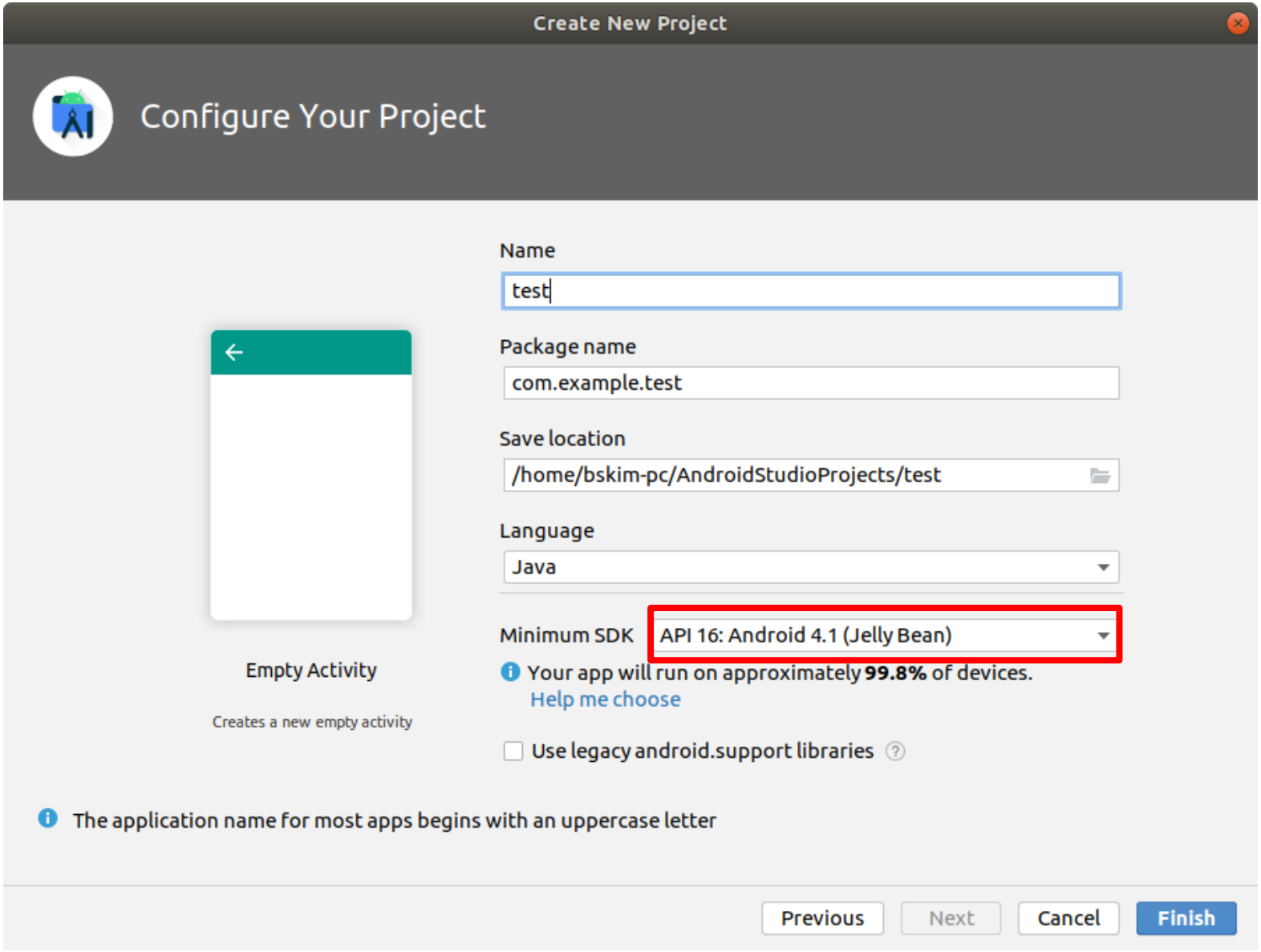

Android Studio Setup Wizard
Verify Settings
If you want to review or change any of your installation settings, click Previous.
Current Settings:
Android SDK Platform 30 49.9 MB
Android SDK Platform-Tools 12.7 MB
Android SDK Tools 147 MB
Google APIs Intel x86 Atom System Image 1.15 GB
SDK Patch Applier v4 1.74 MB
Sources for Android 30 41.3 MB
Previous
Next
Cancel
Finish

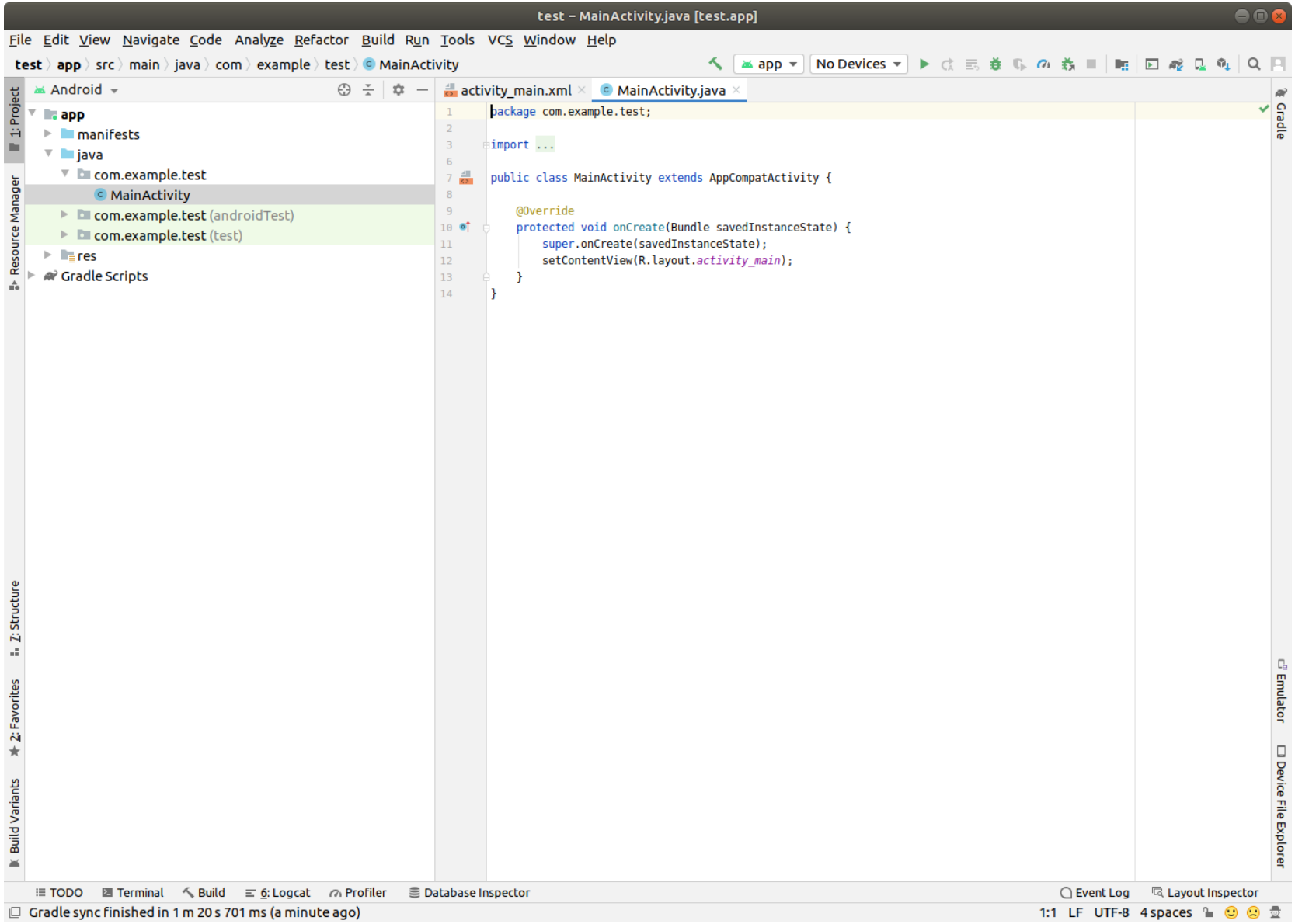

Android Studio Setup Wizard
Emulator Settings
We have detected that your system can run the Android emulator in an accelerated performance mode.
Linux-based systems support virtual machine acceleration through the KVM (Kernel-based Virtual Machine) software package.
Follow Configure hardware acceleration for the Android Emulator to enable KVM and achieve better performance.
Previous
Next
Cancel
Finish


Android Studio Setup Wizard
Downloading Components
Preparing "Install Android SDK Platform 30 (revision: 3)".
Downloading https://dl.google.com/android/repository/platform-30_r03.zip
"Install Android SDK Platform 30 (revision: 3)" ready.
Installing Android SDK Platform 30 in /home/bskim/Android/Sdk/platforms/android-30
"Install Android SDK Platform 30 (revision: 3)" complete.
"Install Android SDK Platform 30 (revision: 3)" finished.
Parsing /home/bskim/Android/Sdk/build-tools/30.0.3/package.xml
Parsing /home/bskim/Android/Sdk/emulator/package.xml
Parsing /home/bskim/Android/Sdk/patcher/v4/package.xml
Parsing /home/bskim/Android/Sdk/platform-tools/package.xml
Parsing /home/bskim/Android/Sdk/platforms/android-30/package.xml
Parsing /home/bskim/Android/Sdk/sources/android-30/package.xml
Parsing /home/bskim/Android/Sdk/system-images/android-30/google_apis/x86/package.xml
Parsing /home/bskim/Android/Sdk/tools/package.xml
Android SDK is up to date.
Creating Android virtual device
Android virtual device Pixel_3a_API_30_x86 was successfully created
Previous
Next
Cancel
Finish

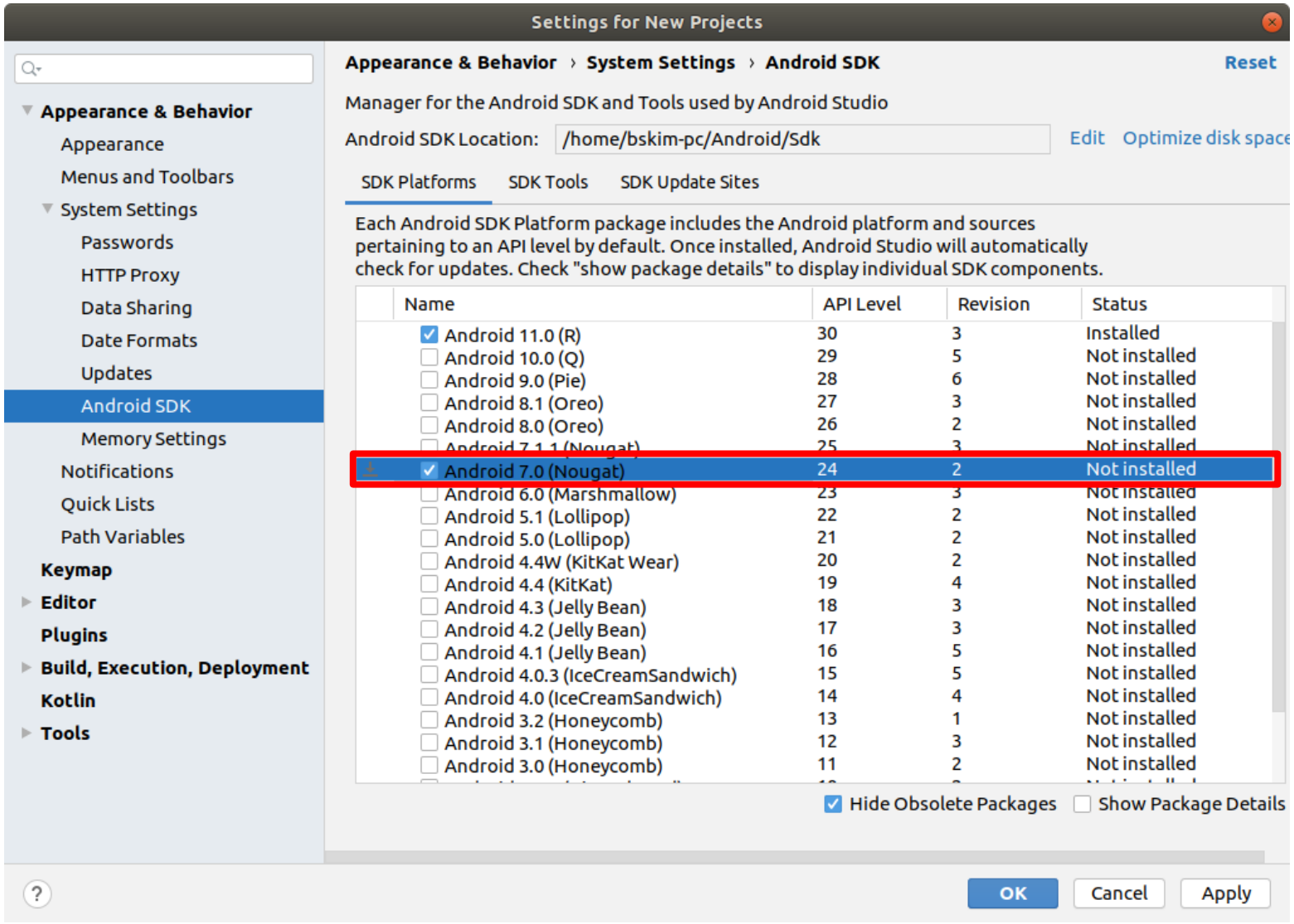

Welcome to Android Studio
Android Studio
Version 4.1.2
Create New Project
Open an Existing Project
Get from Version Control
Profile or Debug APK
Import Project (Gradle, Eclipse ADT, etc.)
Import an Android Code Sample
Events
Configure
Get Help


Create New Project
Select a Project Template
Phone and Tablet
Wear OS
Android TV
Automotive
Android Things
No Activity
Basic Activity
Bottom Navigation Activity
Empty Activity
Interstitial Ad
Empty Activity
Creates a new empty activity
Previous
Next
Cancel
Finish

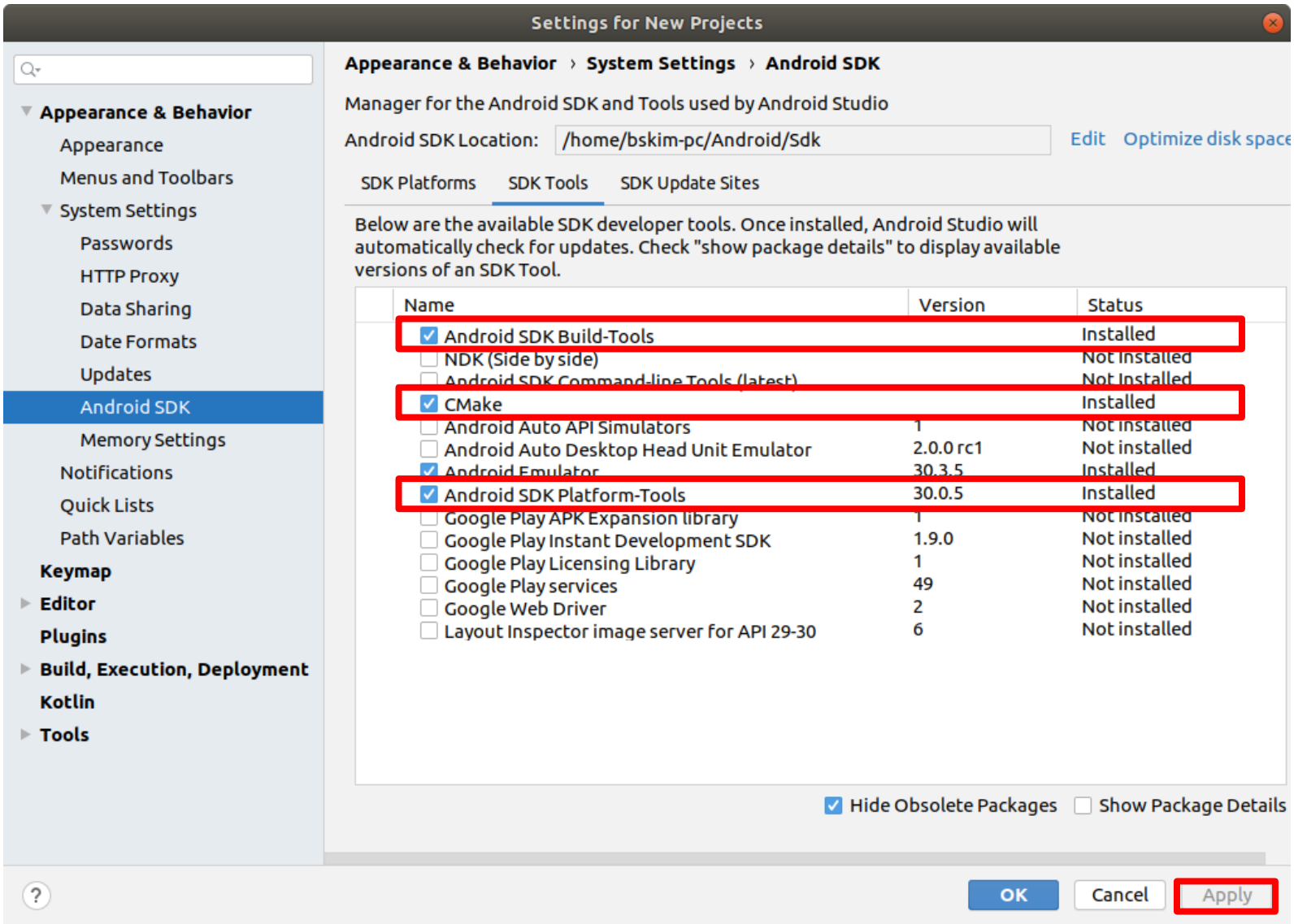

Create New Project
Configure Your Project
Name
test
Package name
com.example.test
Save location
/home/bskim-pc/AndroidStudioProjects/test
Language
Java
Minimum SDK
API 16: Android 4.1 (Jelly Bean)
Your app will run on approximately 99.8% of devices.
Help me choose
Use legacy android.support libraries
Empty Activity
Creates a new empty activity
The application name for most apps begins with an uppercase letter
Previous
Next
Cancel
Finish


test – MainActivity.java [test.app]
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
test 〉 app 〉 src 〉 main 〉 java 〉 com 〉 example 〉 test 〉 MainActivity
app
No Devices
Android
app
manifests
java
com.example.test
MainActivity
com.example.test (androidTest)
com.example.test (test)
res
Gradle Scripts
activity_main.xml
MainActivity.java
package com.example.test;
import ...
public class MainActivity extends AppCompatActivity {
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.activity_main);
}
}
1: Project
Resource Manager
7: Structure
2: Favorites
Build Variants
Gradle
Emulator
Device File Explorer
TODO
Terminal
Build
6: Logcat
Profiler
Database Inspector
Event Log
Layout Inspector
Gradle sync finished in 1 m 20 s 701 ms (a minute ago)
1:1 LF UTF-8 4 spaces

(Menu) Tools – SDK Manager



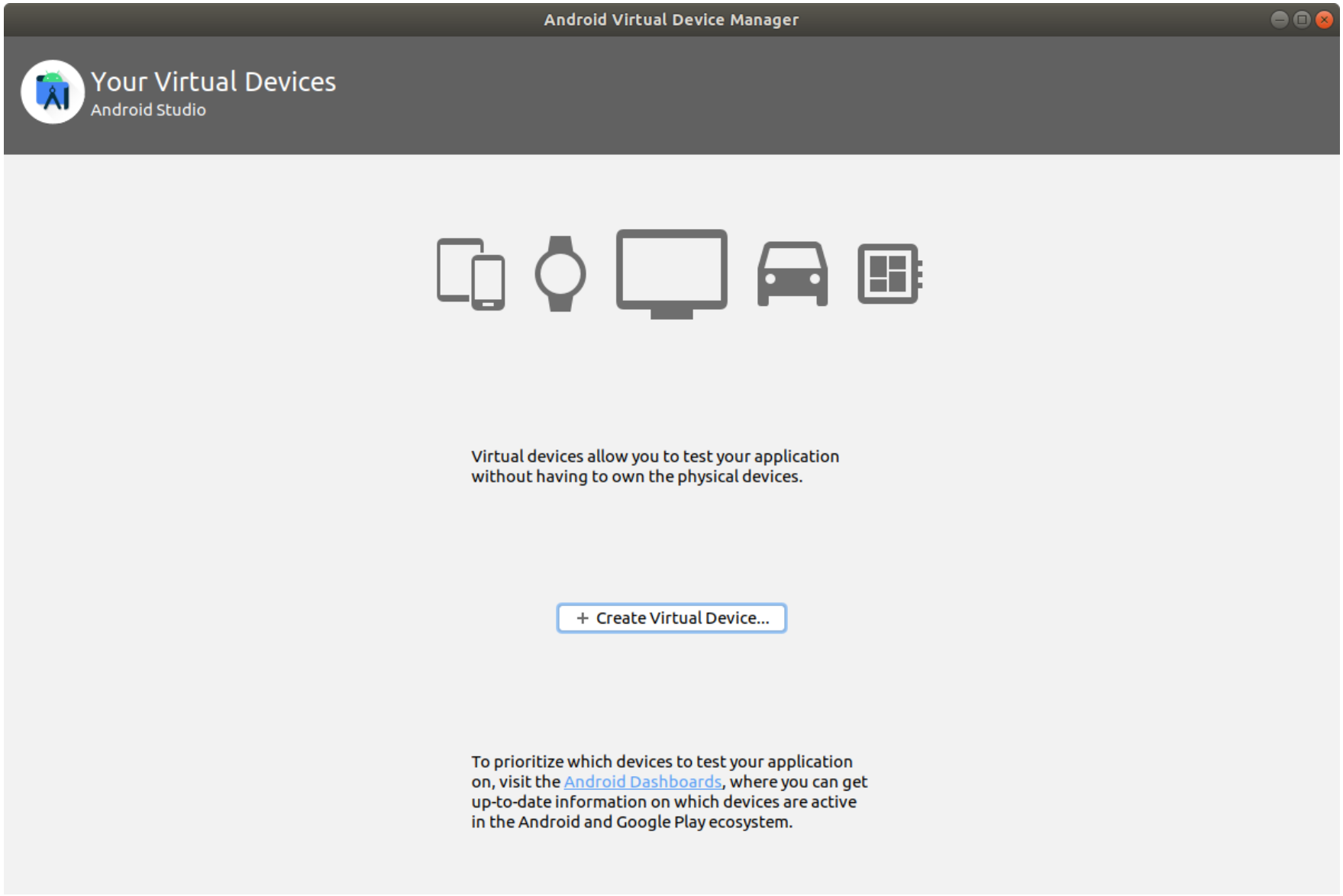
(Menu) Tools – SDK Manager

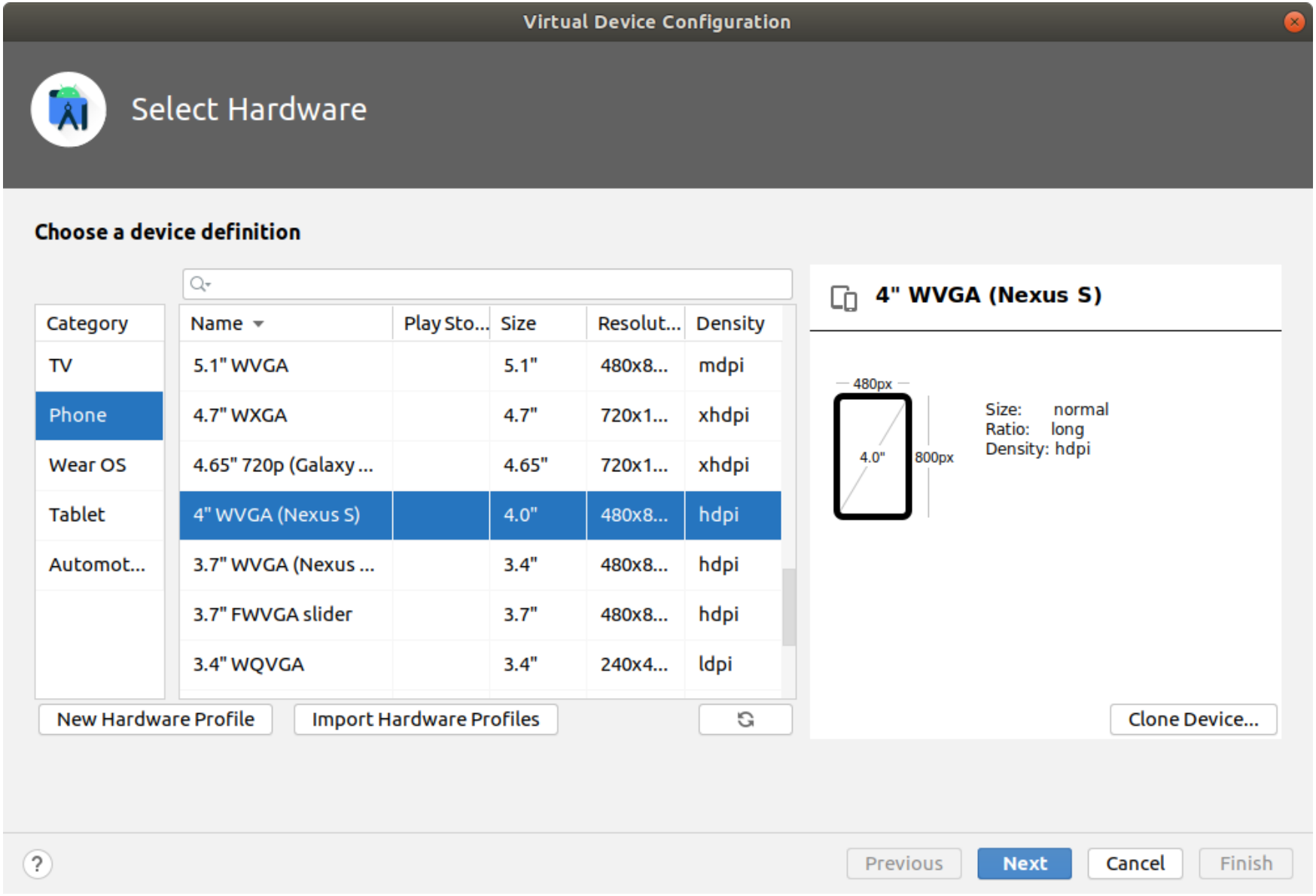


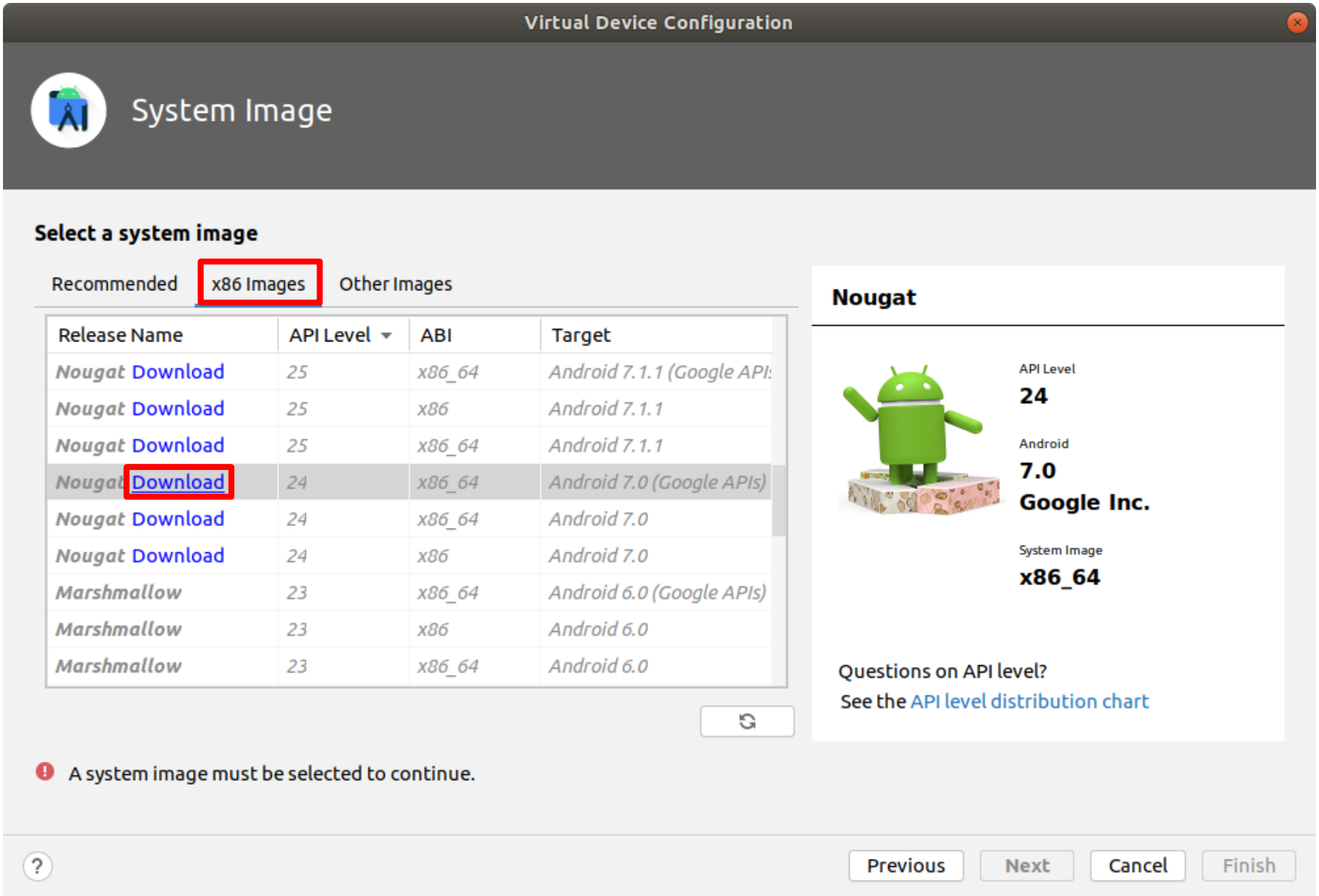
(Virtual) Device

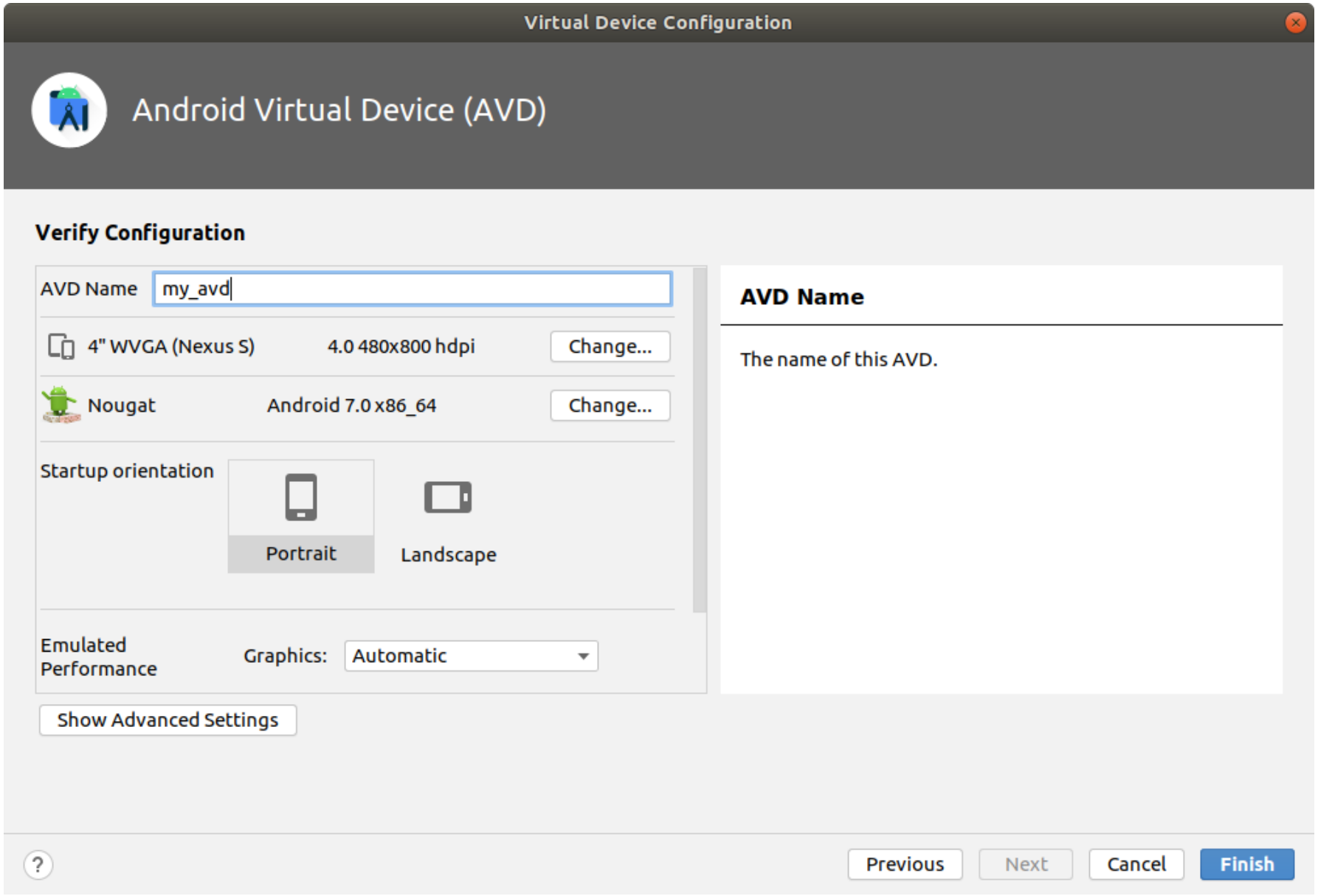
Create an AVD (Android Virtual Device)

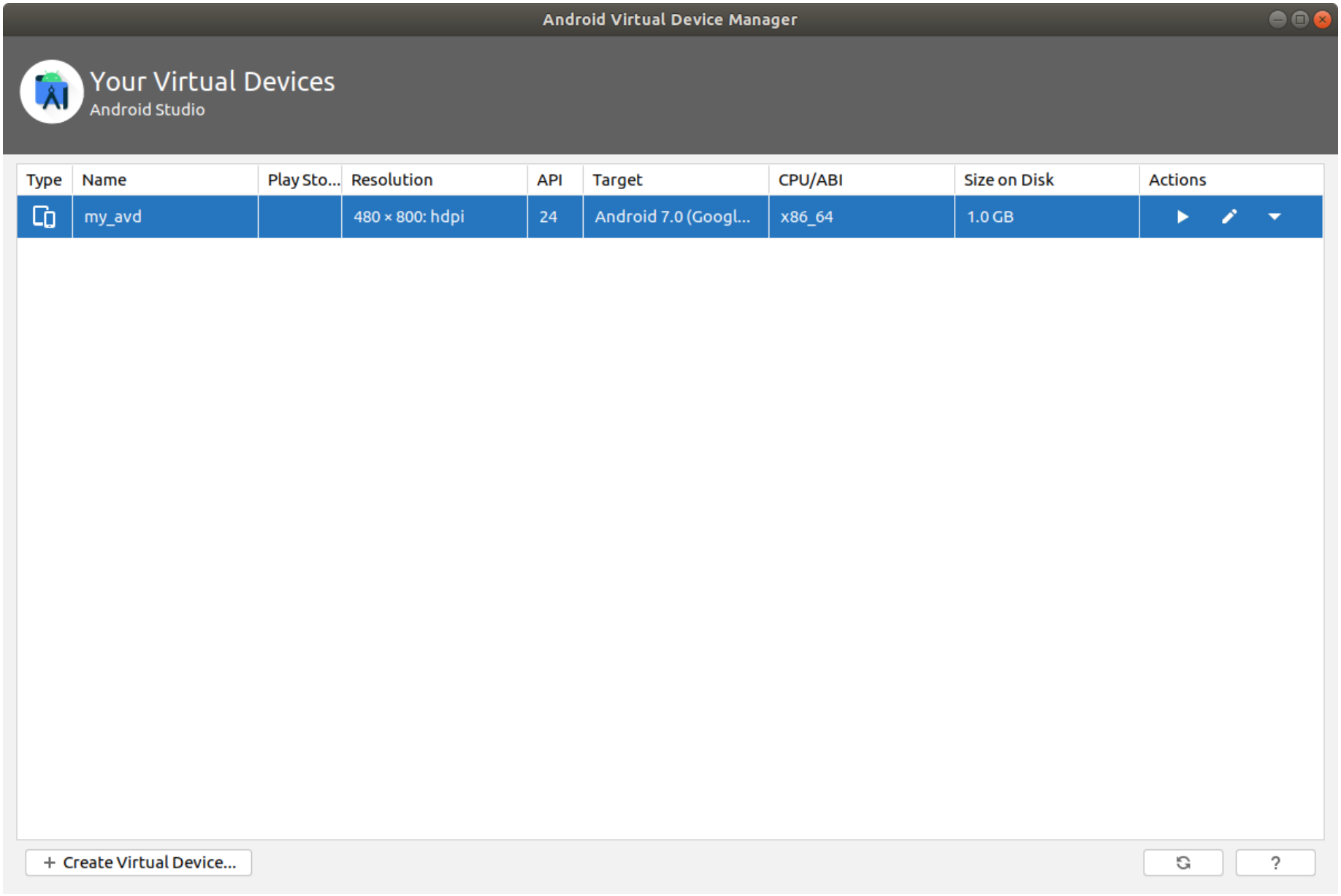
- (Menu) Tools – AVD Manager

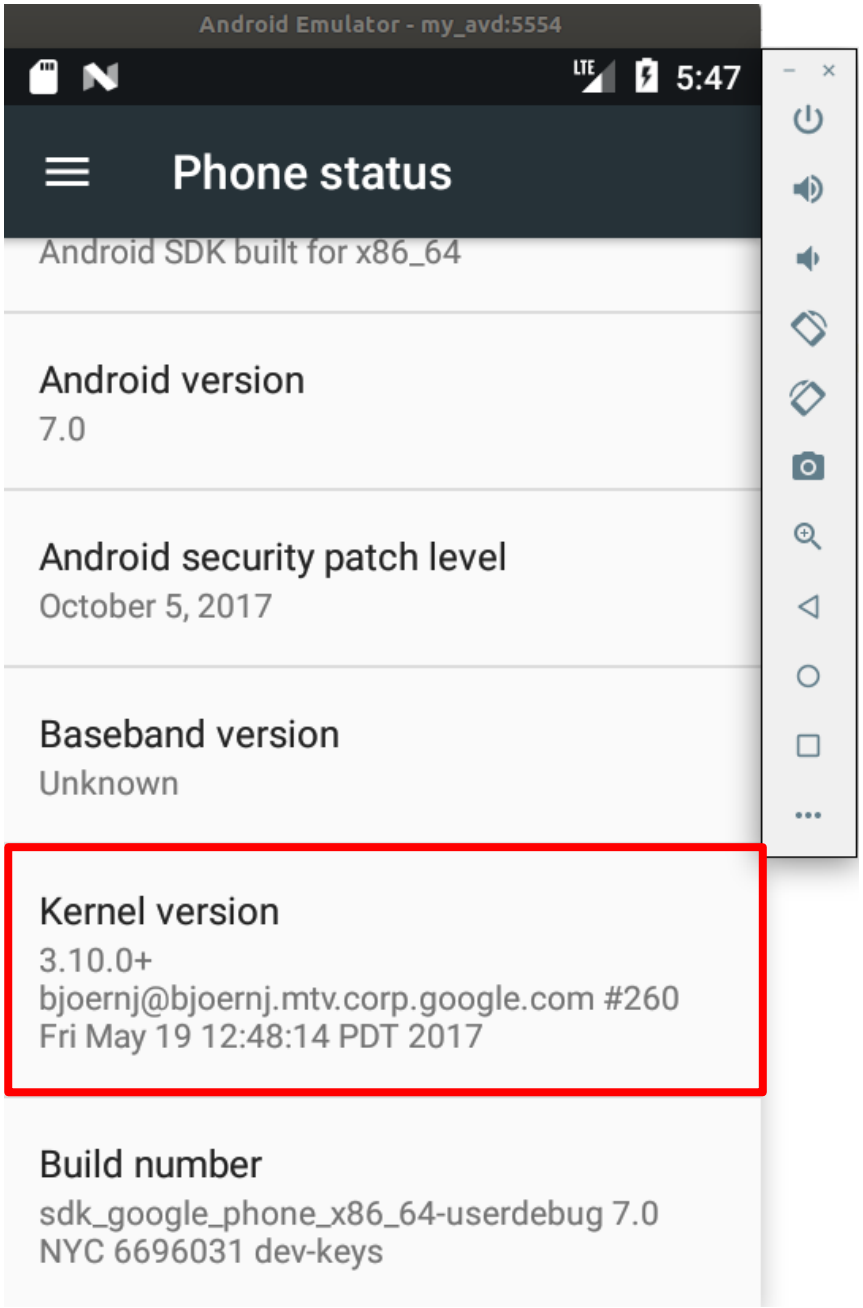

Android Virtual Device Manager
Your Virtual Devices
Android Studio
Virtual devices allow you to test your application
without having to own the physical devices.
+ Create Virtual Device...
To prioritize which devices to test your application
on, visit the Android Dashboards, where you can get
up-to-date information on which devices are active
in the Android and Google Play ecosystem.


Virtual Device Configuration
Select Hardware
Choose a device definition
Category
TV
Phone
Wear OS
Tablet
Automot...
Name
Play Sto...
Size
Resolut...
Density
5.1" WVGA
5.1"
480x8...
mdpi
4.7" WXGA
4.7"
720x1...
xhdpi
4.65" 720p (Galaxy ...
4.65"
720x1...
xhdpi
4" WVGA (Nexus S)
4.0"
480x8...
hdpi
3.7" WVGA (Nexus ...
3.4"
480x8...
hdpi
3.7" FWVGA slider
3.7"
480x8...
hdpi
3.4" WQVGA
3.4"
240x4...
ldpi
New Hardware Profile
Import Hardware Profiles
4" WVGA (Nexus S)
480px
4.0"
800px
Size: normal
Ratio: long
Density: hdpi
Clone Device...
Previous
Next
Cancel
Finish


Virtual Device Configuration
System Image
Select a system image
Recommended
x86 Images
Other Images
Release Name
API Level
ABI
Target
Nougat Download 25 x86_64 Android 7.1.1 (Google API
Nougat Download 25 x86 Android 7.1.1
Nougat Download 25 x86_64 Android 7.1.1
Nougat Download 24 x86_64 Android 7.0 (Google APIs)
Nougat Download 24 x86_64 Android 7.0
Nougat Download 24 x86 Android 7.0
Marshmallow 23 x86_64 Android 6.0 (Google APIs)
Marshmallow 23 x86 Android 6.0
Marshmallow 23 x86_64 Android 6.0
Nougat
API Level
24
Android
7.0
Google Inc.
System Image
x86_64
Questions on API level?
See the API level distribution chart
A system image must be selected to continue.
Previous
Next
Cancel
Finish


Virtual Device Configuration
Android Virtual Device (AVD)
Verify Configuration
AVD Name
my_avd
4" WVGA (Nexus S)
4.0 480x800 hdpi
Change...
Nougat
Android 7.0 x86_64
Change...
Startup orientation
Portrait
Landscape
Emulated Performance
Graphics:
Automatic
Show Advanced Settings
AVD Name
The name of this AVD.
Previous
Next
Cancel
Finish


Android Virtual Device Manager
Your Virtual Devices
Android Studio
Type
Name
Play Sto...
Resolution
API
Target
CPU/ABI
Size on Disk
Actions
my_avd
480 × 800: hdpi
24
Android 7.0 (Googl...
x86_64
1.0 GB
+ Create Virtual Device...
?


Android Emulator - my_avd:5554
5:47
Phone status
Android SDK built for x86_64
Android version
7.0
Android security patch level
October 5, 2017
Baseband version
Unknown
Kernel version
3.10.0+
bjoernj@bjoernj.mtv.corp.google.com #260
Fri May 19 12:48:14 PDT 2017
Build number
sdk_google_phone_x86_64-userdebug 7.0
NYC 6696031 dev-keys

Environment Setup

- (Virtual) Device
- Compiler
- Kernel

Compiler

```
$cd [Your Workspace]
$git clone https://android.googlesource.com/platform/prebuilts/gcc/linux-x86/x86/x86_64-linux-android-4.9
$cd x86_64-linux-android-4.9
$git checkout 271538
```

Environment Setup

- (Virtual) Device
- Compiler
- Kernel
  - Download source code
  - Build
  - Run

Kernel

Download source code

```
$cd ~/
$git clone https://android.googlesource.com/kernel/goldfish
$cd goldfish
$git checkout -b android-goldfish-3.10-n-dev origin/android-goldfish-3.10-n-dev
```

Kernel

Build

1. `export ARCH=x86_64`
2. `export CROSS_COMPILE=~/x86_64-linux-android-4.9/bin/x86_64-linux-android-`

   `--> use newly downloaded compiler on previous slide`
3. `make x86_64_ranchu_defconfig`
4. `make -j4`

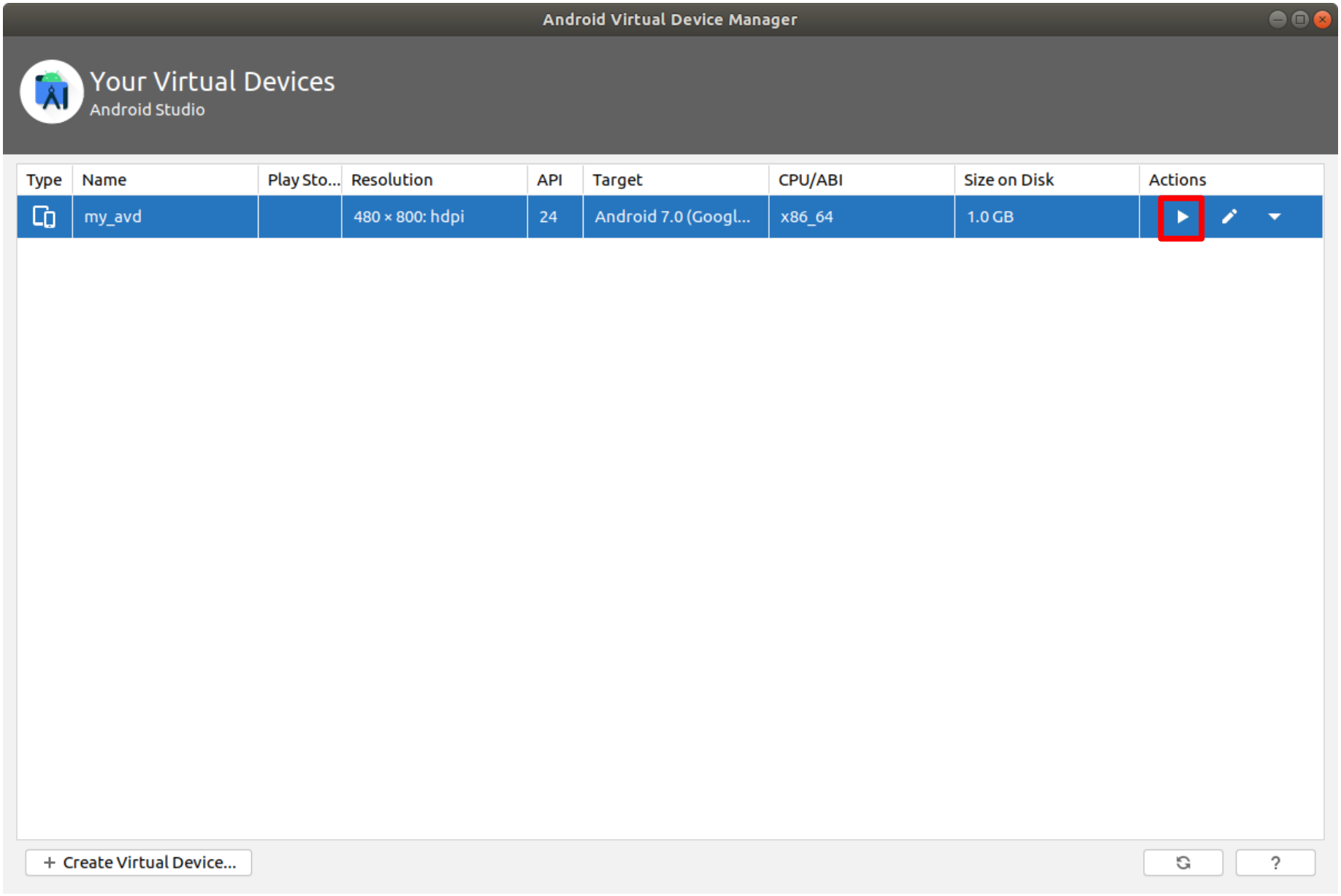
Kernel

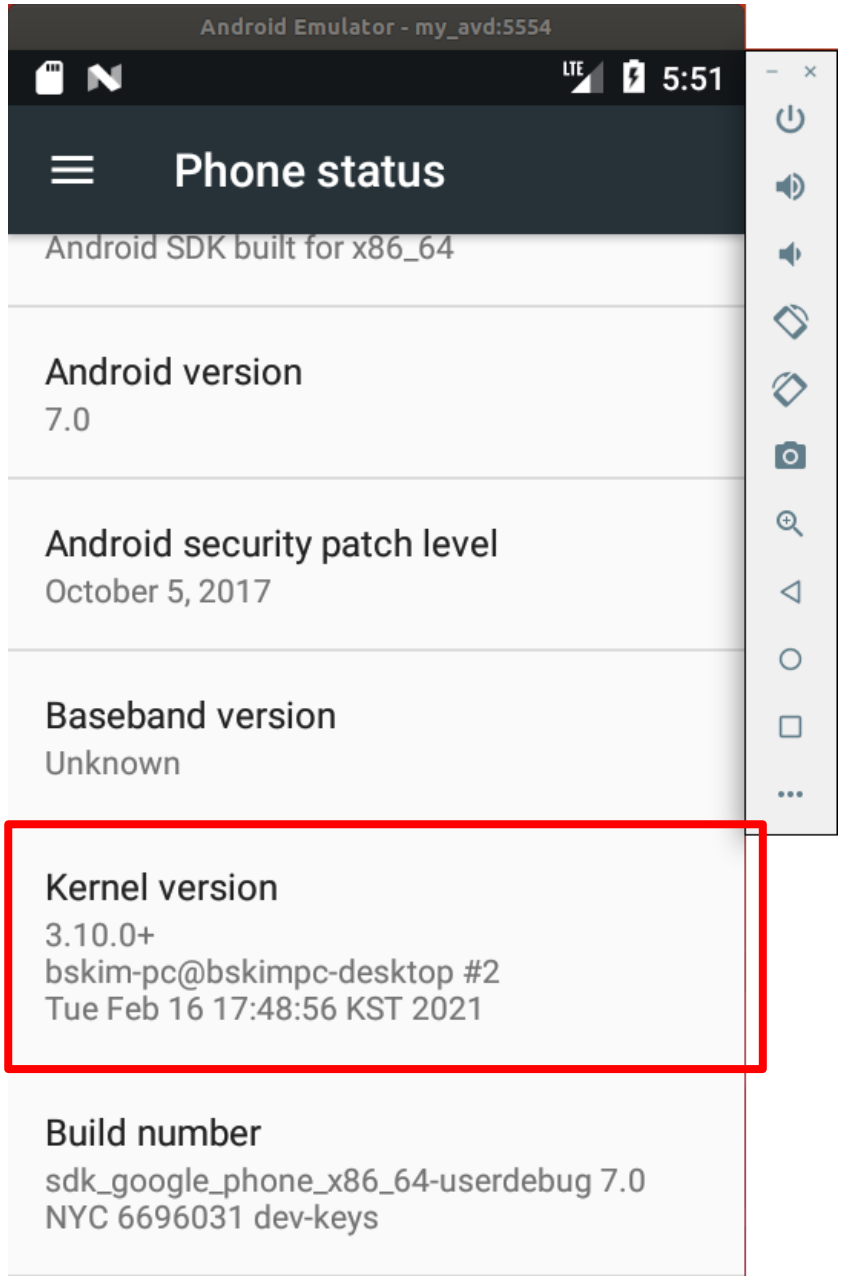
Run

1. `cd ~/Android/Sdk/system-images/android-24/google_apis/x86_64`
2. `mv kernel-ranchu kernel-ranchu.bak`
3. `cp ~/goldfish/arch/x86/boot/bzImage kernel-ranchu`

   `--> copy boot image of new kernel to emulator`

4. (Run!)


Android Virtual Device Manager
Your Virtual Devices
Android Studio
Type
Name
Play Sto...
Resolution
API
Target
CPU/ABI
Size on Disk
Actions
my_avd
480 × 800: hdpi
24
Android 7.0 (Googl...
x86_64
1.0 GB
+ Create Virtual Device...
?


Android Emulator - my_avd:5554
5:51
Phone status
Android SDK built for x86_64
Android version
7.0
Android security patch level
October 5, 2017
Baseband version
Unknown
Kernel version
3.10.0+
bskim-pc@bskimpc-desktop #2
Tue Feb 16 17:48:56 KST 2021
Build number
sdk_google_phone_x86_64-userdebug 7.0
NYC 6696031 dev-keys

Summary

- Today, we booted android emulator with new andr oid kernel
- For the next week,
  - we will learn what is system call,
  - and add a new system call on our android kernel

Lab Report

- Submit report
  - You must include the result(captured emulated device)
  - Format: YourStudentID_lab1.pdf
  - Upload to i-Campus
  - Deadline: 3/1 (Mon.) 23:59

Questions?

- If you have questions,
  - please use i-Campus (토론>수업 Q&A 토론) or email
    - minwoo.ahn@csi.skku.edu
    - bumsuk.kim@csi.skku.edu