Lesson 2

Android Workbenches: Android Studio & Eclipse

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Android App's Anatomy

Android Applications (Just Apps)

- Android applications are usually created using the **Java** programming language [1]
- Apps must import various **Android Libraries** (such as android.jar, maps.jar, etc) to gain the functionality needed to work inside the Android OS.
- Android apps are made of multiple elements such as: user-defined classes, android jars, third-party libraries, XML files defining the UIs or views, multimedia resources, data assets such as disk files, external arrays and strings, databases, and finally a *Manifest* summarizing the 'anatomy' and permissions requested by the app.
- The various app components are given to the compiler to obtain a single signed and deployable **Android Package** (an **.apk** file).
- Like ".class" files in Java, ".apk" files are the **byte-code** version of the app that finally will be 'executed' by interpretation inside either a **Dalvik Virtual Machine** (DVM) or an Android-Runtime Engine (**ART**).

[1] Visit http://xamarin.com/monoforandroid for a commercial iOS and Android IDE that works with C# and Windows .NET

Android's Byte-Code Execution

Dalvik Virtual Machine vs. Android Runtime (ART)

The **Dalvik Virtual Machine** is a Just-in-Time (**JIT**) runtime environment (similar to the Oracle's Java Virtual Machine JVM) that interprets Android byte-code only when it's needed (however it will be phased out soon).

The newer **ART** (introduced as an option in Android 4.4 KitKat) is an anticipatory or Ahead-of-Time (AOT) environment that compiles code before it is actually needed.

ART promises:

- enhanced performance and battery efficiency,
- improved garbage collection,
- better debugging facilities,
- Improved diagnostic detail in exceptions and crash reports.

Quoting from
https://source.android.com/devices/tech/dalvik/art.html (Aug-27-2014)

> ***Important:*** *Dalvik must remain the default runtime or you risk breaking your Android implementations and third-party applications.*

Setting up Eclipse + ADT + SDK

You are a developer - Which is your SDK audience?

SDKs are named after types of desserts. Available versions at the time of writing are:

- **1.5 Cupcake,**
- **1.6 Donut,**
- **2.1 Eclair,**
- **2.2 Froyo,**
- **2.3 Gingerbread ,**
- **3.x Honeycomb,**
- **4.0 Ice Cream Sandwich**
- **4.3 Jelly Bean**
- **4.4 Kitkat**
- **5.x Lollipop**
- **6.X Marshmallow**

Android SDK version	Current market share
4.4 (KitKat)	42.0 %
4.1-4.3 (Jelly Bean)	34.4 %
5.0-5.1 (Lollipop)	16.5 %
2.3 (Gingerbread)	3.5 %
4.0.x (ICS)	3.3 %
2.2 (Froyo)	0.2 %
3.0-3.2 (Honeycomb)	0.1 %
2.0-2.1 (Eclair)	0.0 %

Statistics accessed on **Sept 3, 2015** from AppBrain at http://www.appbrain.com/stats/top-android-sdk-versions

Tools for Constructing Android Apps

Development Workbenches

Android apps are made out of many components. The use of an IDE is *strongly* suggested to assist the developer in creating an Android solution. There are various options including:

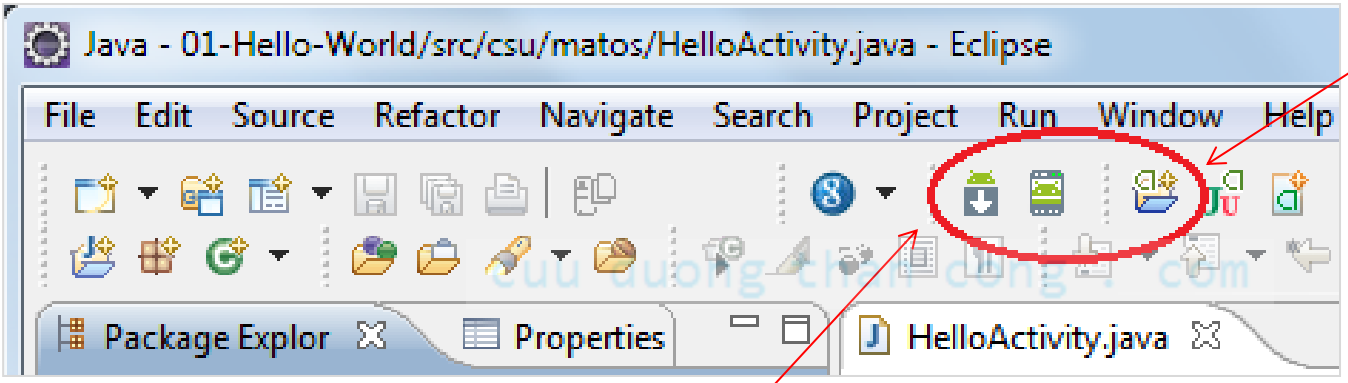
- **Eclipse+ADT.** The classic general purpose Eclipse IDE can be enhanced (with the ADT plugin) to provide a 'conventional' way to create and debug Android Apps. The associated **SDK Manager** allows you to reach the various API libraries needed by the apps.

- **Android Studio** is a new Android-only development environment based on IntelliJ IDEA. It is the 'preferred' IDE platform for Android development.

- **Netbeans+Android.** Similar to Eclipse+ADT. Soon to be deprecated(?)

Eclipse + ADT + SDK

Typical Layout of the Eclipse-ADT IDE for Android Development



These icons are added to Eclipse by the ADT plugin

Opens Android SDK manager

Opens Android AVD Virtual Device Manager

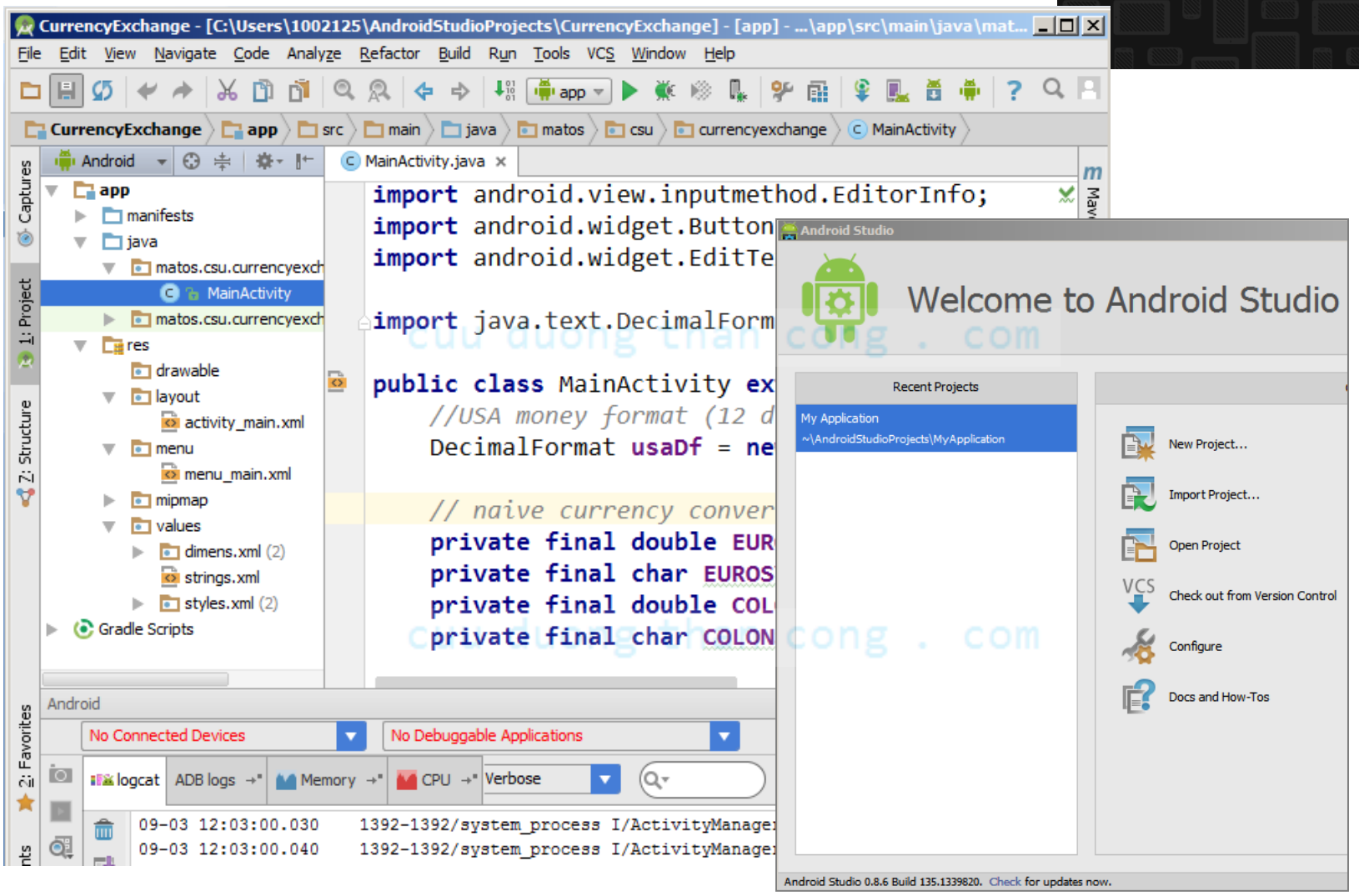
Wizard creates a new Android Project

Opens DDMS Perspective
Dalvik Debugging Monitoring System

***Note**: The **DDMS** and **Hierarchy View** can be manually added by the user to Eclipse's tool bar*

Android Studio

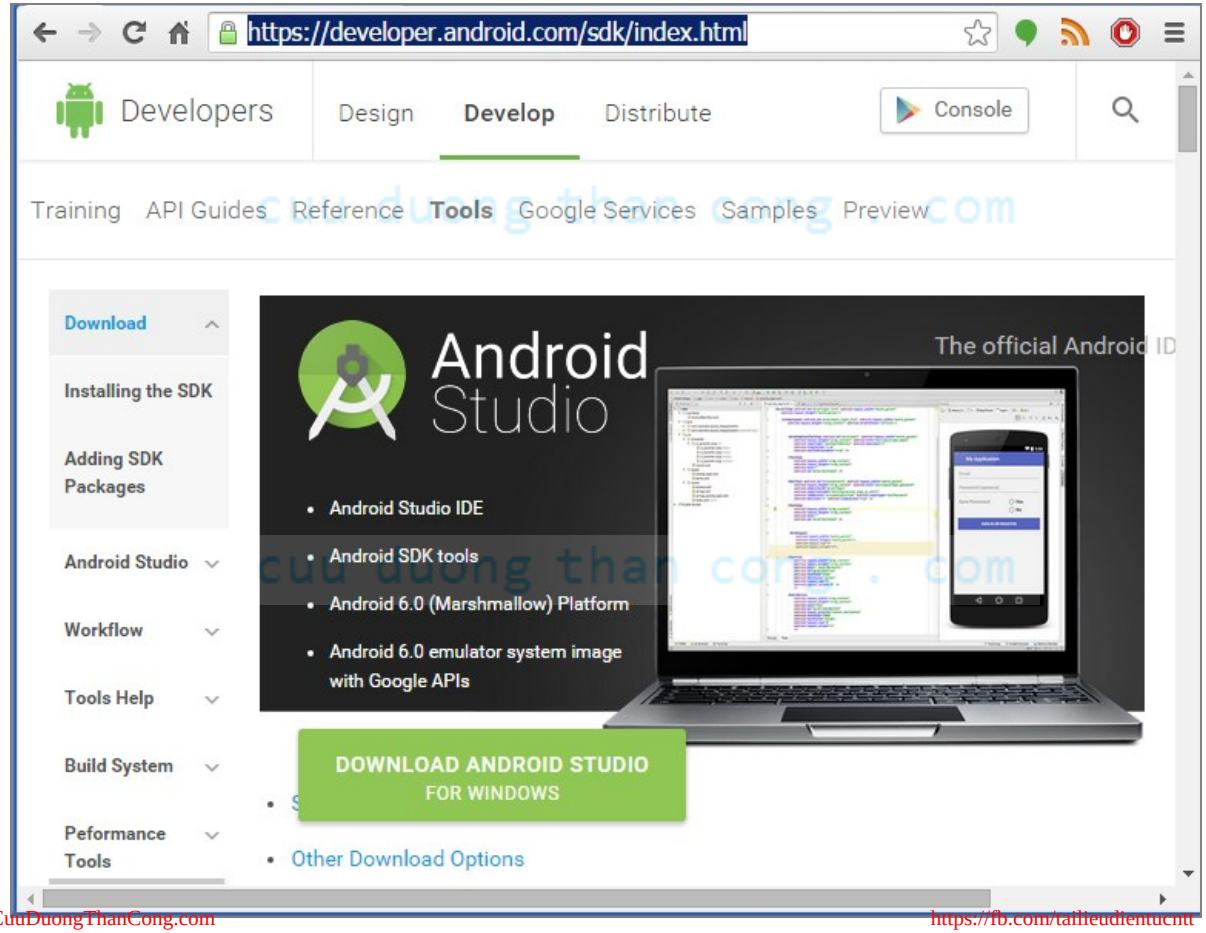
Typical Layout of Android-Studio IDE



Setting up Android Studio

Downloading Android Studio IDE

Download IDE from: https://developer.android.com/sdk/index.html
Run the executable, you are (*almost*) done!



Setting up Eclipse + ADT + SDK

ECLIPSE SETUP
Prepare your computer – Install SDK: Windows, Mac, Linux

We assume you have already installed the most recent Java JDK and Eclipse IDE in your computer

- Java JDK is available at:
  http://www.oracle.com/technetwork/java/javase/downloads/index.html

- Eclipse IDE for Java EE Developers is available at:
  http://www.eclipse.org/downloads/

The next instructions are given to:

(a) User wanting to add a newer SDK to their existing collection,
(b) First time users (who may or not be Eclipse users).

Setting up Eclipse + ADT + SDK

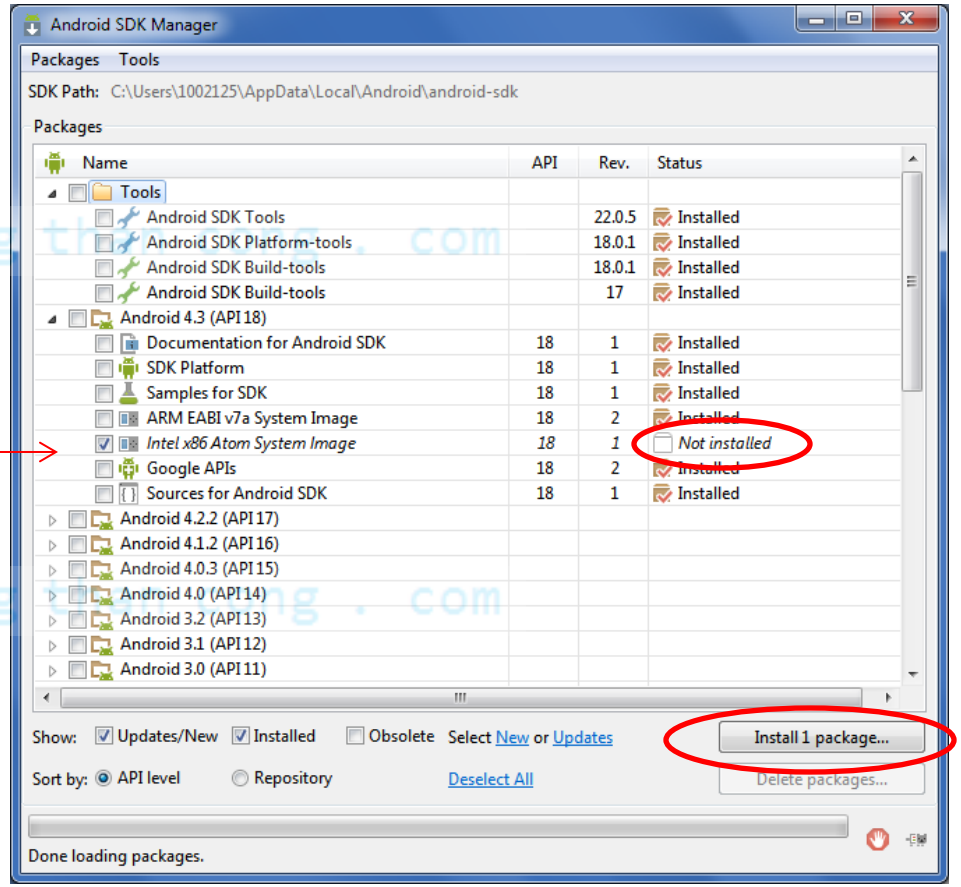
(a) Users Wanting to Update an Older Android Workbench

If you are currently using the Android SDK, you just need to *update* to the latest tools or platform using the already installed *Android SDK Manager.*

1. Click on the  *SDK Manager* icon.

2. You will see a form similar to the one on the right.

3. Select the SDK packages and independent components you want to install (click 'Install' button and wait until they are setup in your machine…)



Setting up Eclipse + ADT + SDK

(b) First Time Android Users who have Eclipse already installed

1. Obtain the appropriate (Windows, Max, Linux) **Stand-alone SDK Tools for Windows** from the page http://developer.android.com/sdk/index.html
   Execute the program, *remember the folder's name and location* in which the SDK is stored, you will have to supply this path to Eclipse.

2. Install the **ADT Plugin** for Eclipse (it must be already available in your machine)
   1. Start Eclipse, then select **Help** > **Install New Software...**.
   2. Click **Add** button (top-right corner)
   3. In the next dialog-box enter "**ADT Plugin**" for the *Name* and the following URL for the *Location*: **https://dl-ssl.google.com/android/eclipse/**
   4. Click **OK**
   5. Select the checkbox next to Developer Tools and click **Next** > **Next**
   6. Accept the license agreements, then click **Finish**.
   7. After the installation end you need to restart Eclipse.

3. Add **Android platforms** and other components to your SDK (see previous option (a))

Setting up Eclipse + ADT + SDK

Configure the ADT Plugin

4. The next step is to inform your Eclipse+ADT workbench of the **android-sdk** directory's location (this is the path you saved on Step1)

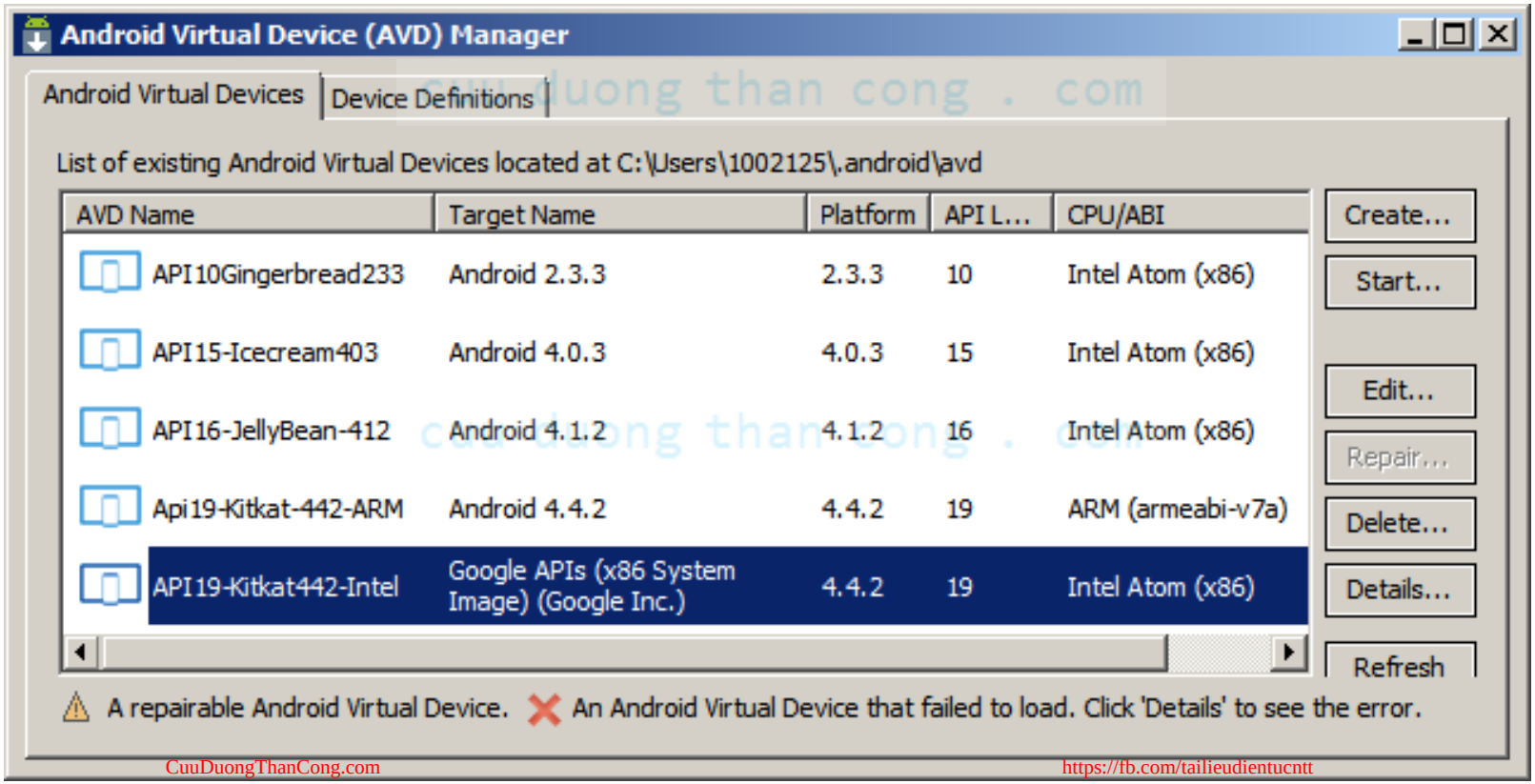
1. In Eclipse, select **Window** > **Preferences...** to open the Preferences panel (Mac OS X: **Eclipse** > **Preferences**).
2. Select **Android** from the left panel.
3. To set the box *SDK Location* that appears in the main panel, click **Browse...** and locate your downloaded SDK directory (usually C:\Program Files (x86)\Android\android-sdk)
4. Click **Apply**, then **OK**.

Done!

Setting up Eclipse + ADT + SDK

Working with Virtual Devices (AVDs)

Ideally you should test your applications on a device (a physical phone or tablet). However, the SDK allows you to create realistic virtual devices on which your applications could be executed/debugged before they are deployed on actual hardware.

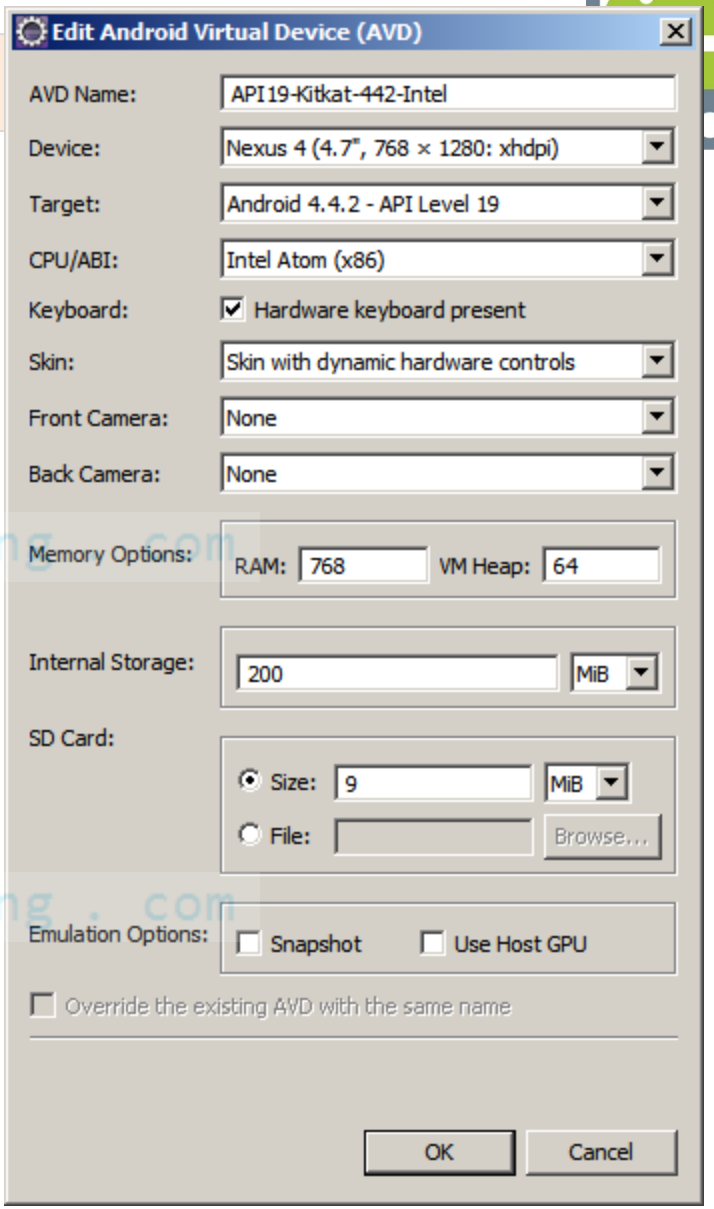


Setting up Eclipse + ADT + SDK

Creating a Virtual Device (AVD)

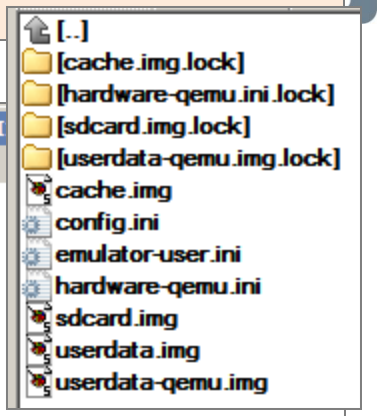
An AVD allows you to simulated devices and prototype your solution on a variety of SDKs. To create a virtual unit follow the next steps:

1. Click on the *AVD Manager* > Create. The **Create New AVD** wizard appears requesting your input.
2. Type the name of the emulator, enter a value such as "API19-Kitkat-442-Intel" (see figure on the right)
3. Select from the drop-downlist a Device (Nexus 4…) and CPU/ABI such as Intel Atom (x86)
4. Choose a target from the already installed SDKs (eg. "Android 4.4.2 - API Level19").
5. Tick the *Keyboard* box to enable your PC's keyboard.
6. Choose a skin of your preference (…dynamic hard …)
7. Set memory RAM to no more than 768 MB
8. Indicate how much internal storage the simulator will use (200MB).
9. Add a small SD card (9MB)
9. Click **OK** to create the **AVD**.



Setting up Eclipse + ADT + SDK

AVDs are saved in the folder:
c:\Users\yourName\.android\avd\API19-Kitkat-442-Intel.avd



Lister - [c:\Users\1002125\.android\avd\API

File Edit Options Encoding Help

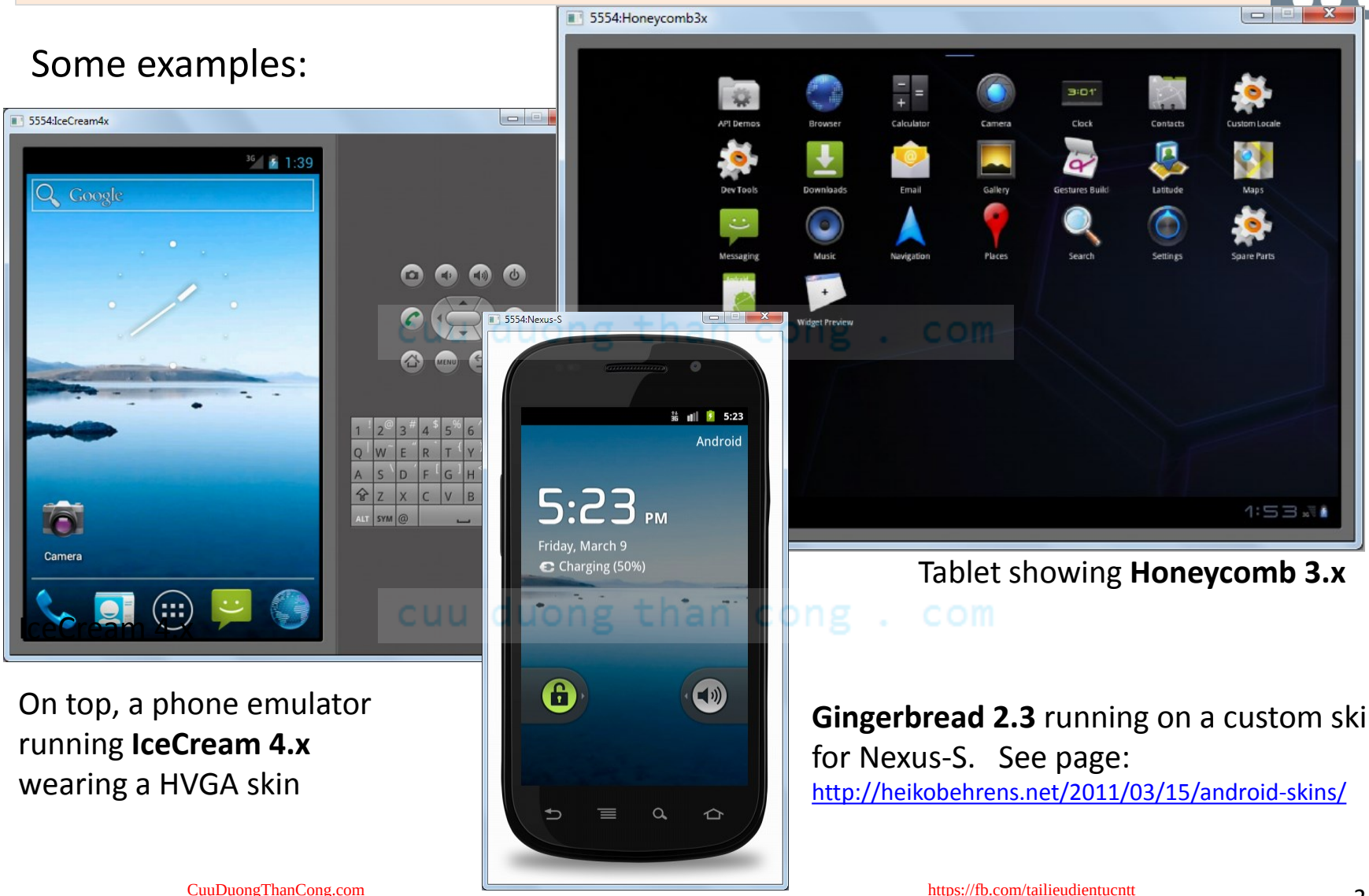
```
avd.ini.encoding=ISO-8859-1
abi.type=x86
disk.dataPartition.size=200M
hw.accelerometer=yes
hw.audioInput=yes
hw.battery=yes
hw.camera.back=none
hw.camera.front=none
hw.cpu.arch=x86
hw.dPad=no
hw.device.hash2=MD5:6930e145748b87e87d3f40cabd140a41
hw.device.manufacturer=Google
hw.device.name=Nexus 4
hw.gps=yes
hw.keyboard=yes
hw.lcd.density=320
hw.mainKeys=no
hw.ramSize=768
hw.sdCard=yes
hw.sensors.orientation=yes
hw.sensors.proximity=yes
hw.trackBall=no
image.sysdir.1=system-images\android-19\default\x86\
sdcard.size=9M
skin.dynamic=yes
skin.name=768x1280
skin.path=768x1280
tag.display=Default
tag.id=default
vm.heapSize=64
```

A summary of the AVD specs is saved in the **/config.ini** file

Setting up Eclipse + ADT + SDK

Creating a Virtual Device (AVD)

Some examples:



Tablet showing **Honeycomb 3.x**

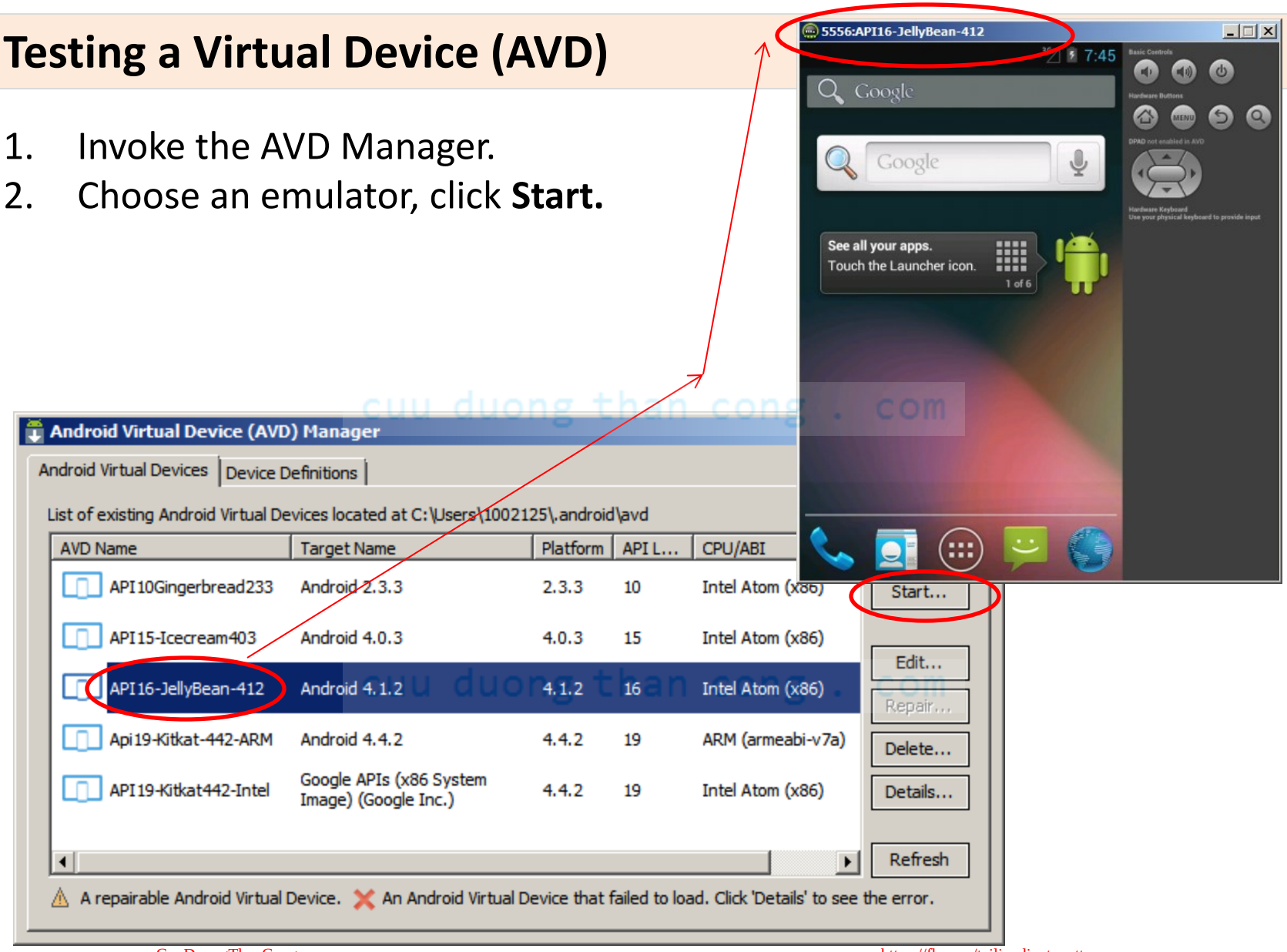
On top, a phone emulator running **IceCream 4.x** wearing a HVGA skin

Gingerbread 2.3 running on a custom skin for Nexus-S. See page: http://heikobehrens.net/2011/03/15/android-skins/

Setting up Eclipse + ADT + SDK

Testing a Virtual Device (AVD)

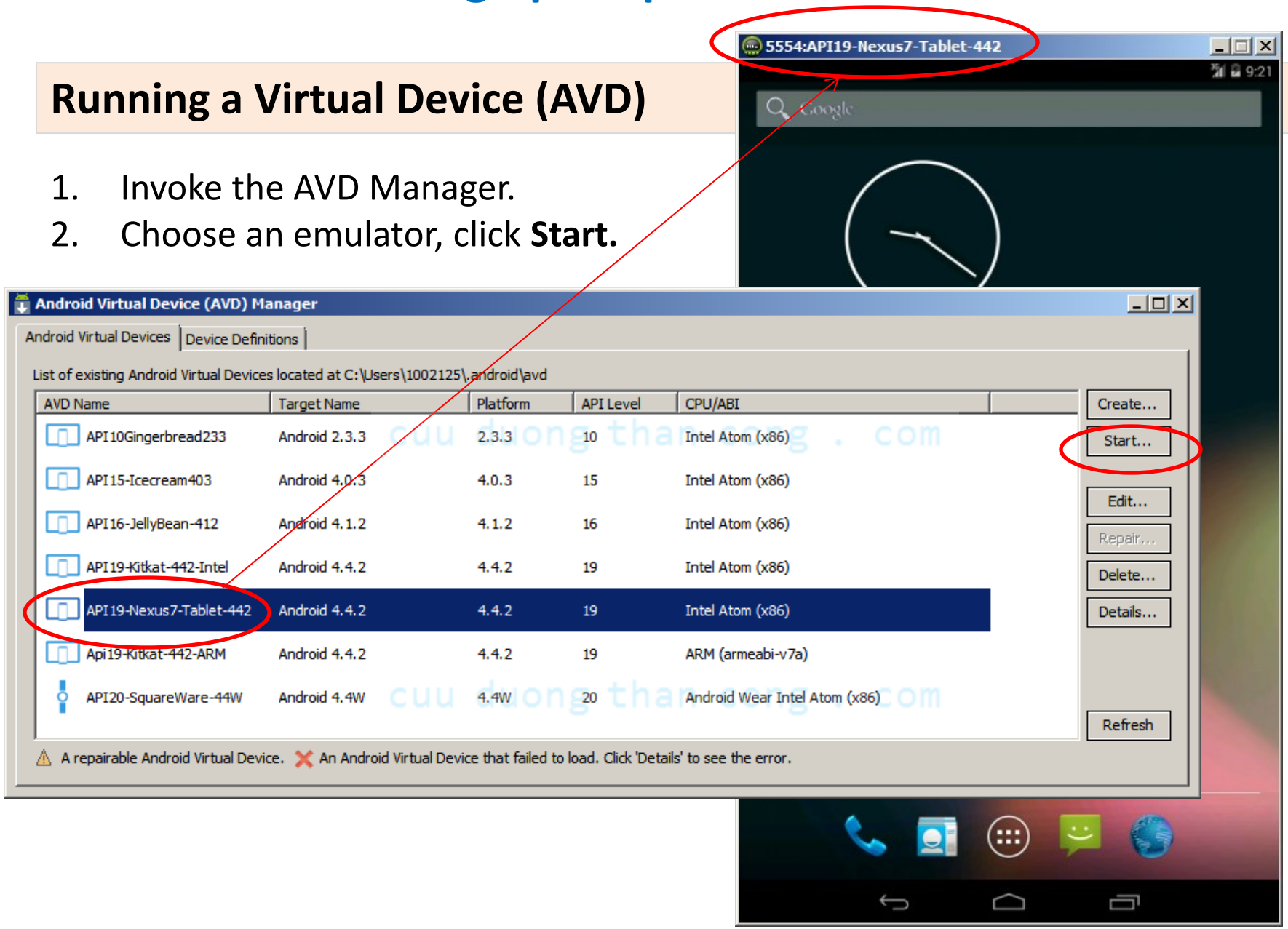
1. Invoke the AVD Manager.
2. Choose an emulator, click **Start.**



Setting up Eclipse + ADT + SDK

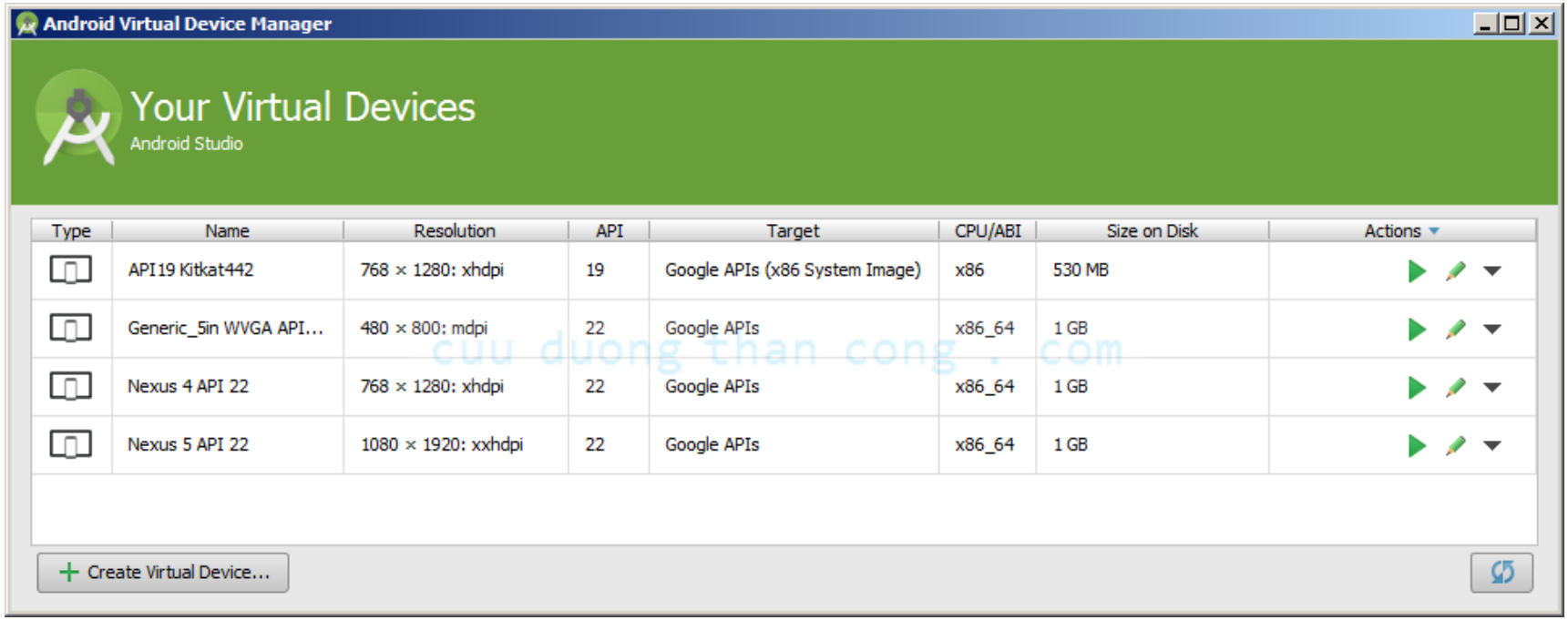
Running a Virtual Device (AVD)

1. Invoke the AVD Manager.
2. Choose an emulator, click **Start.**



Setting up Android Studio

Working with Virtual Devices (AVDs)

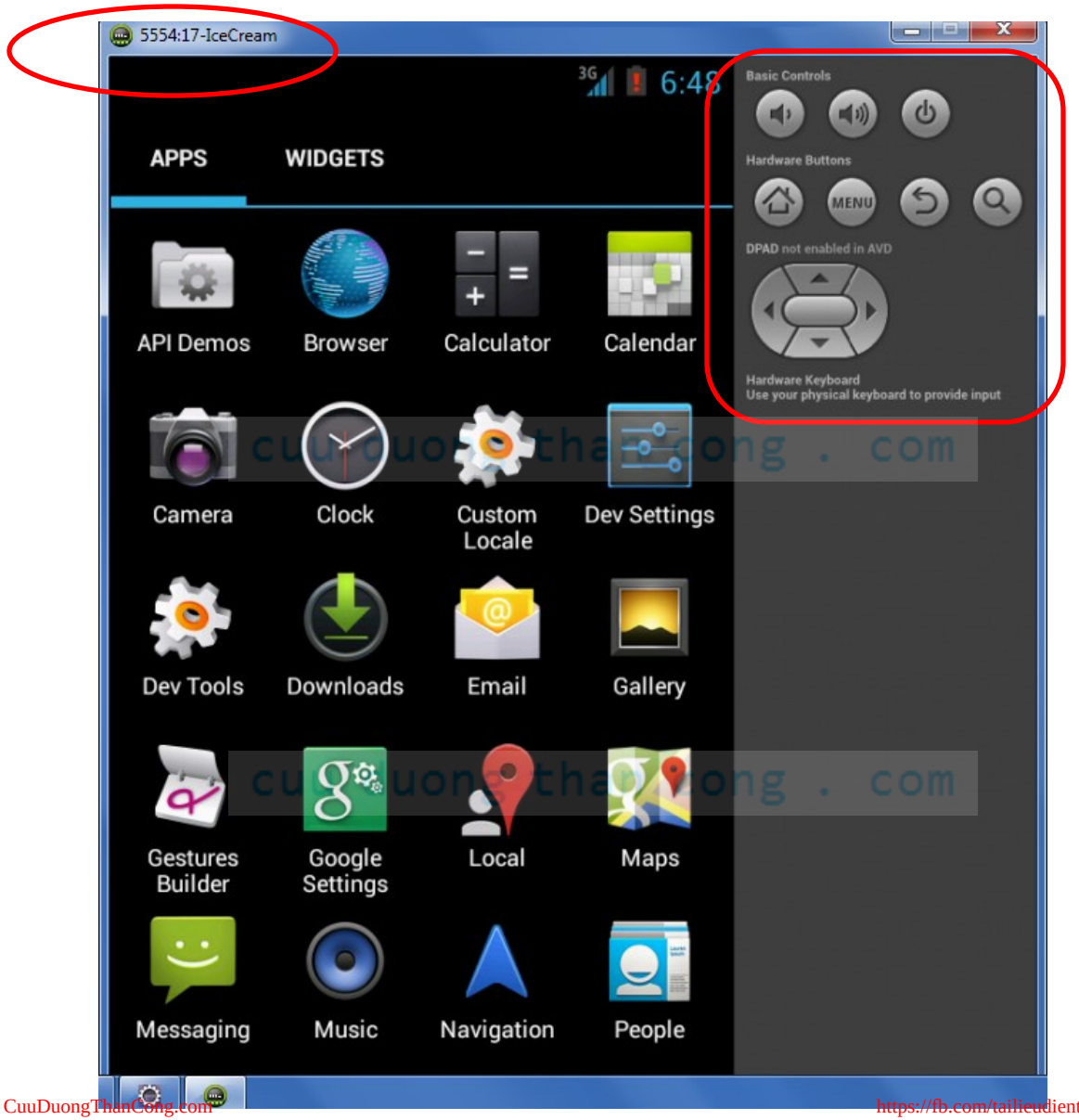


The Android Studio process to create, edit, remove, and execute AVDs is similar to the strategy already discussed for Eclipse-ADT (only cosmetic differences on the GUI)

Example of an AVD Emulator wearing a HVGA Skin

AVD – Emulator wearing: Skin with dynamic hardw. controls

Numeric ID:
5554



Controlling the AVD Operations

Keyboard	OS function
Escape	Back button
Home	Home button
F2, PageUp	Menu (Soft-Left) button
Shift-F2, PageDown	Start (Soft-Right) button
F3	Call/Dial button
F4	Hangup / EndCall button
F5	Search button
F7	Power button
Ctrl-F3, Ctrl-KEYPAD_5	Camera button
Ctrl-F5, KEYPAD_PLUS	Volume up button
Ctrl-F6, KEYPAD_MINUS	Volume down button
KEYPAD_5	DPad center
KEYPAD_4	DPad left
KEYPAD_6	DPad right
KEYPAD_8	DPad up
KEYPAD_2	DPad down
F8	toggle cell network on/off
F9	toggle code profiling
Alt-ENTER	toggle FullScreen mode
Ctrl-T	toggle trackball mode
Ctrl-F11, KEYPAD_7	switch to previous layout
Ctrl-F12, KEYPAD_9	switch to next layout

Controlling an Android Emulator through *your computer's* keyboard

Note: Keypad keys only work when *NumLock* is deactivated.

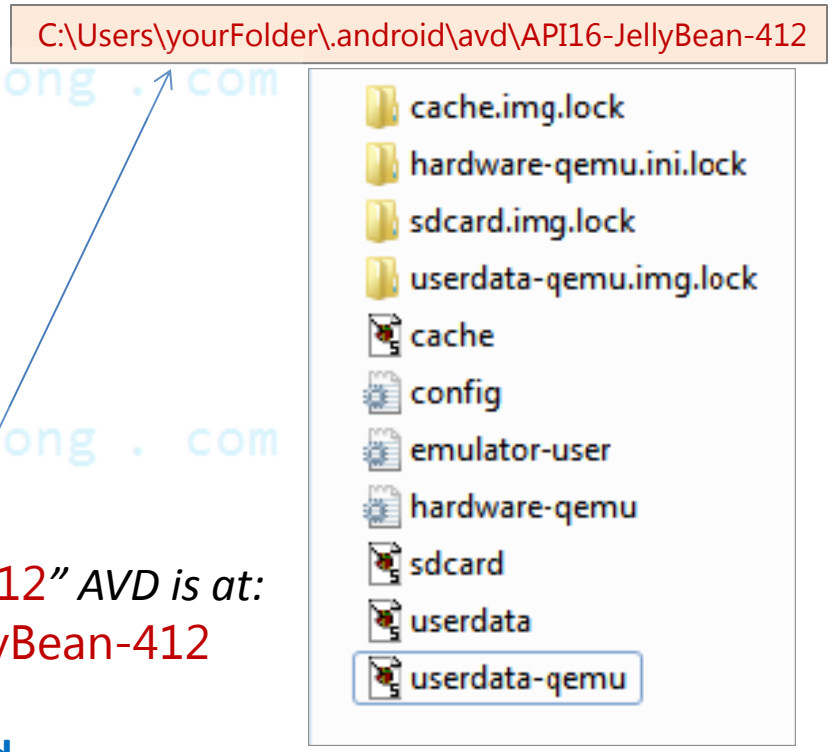
AVD – Emulator : Disk Images

Working with Emulator Disk Images

- *The Android simulator uses QEMU technology* [Website: www.qemu.org]
- *QEMU is an open source machine emulator which allows the operating system and programs made for one machine (e.g. an ARM CPU) run efficiently on a different machine (e.g. your Windows PC).*

When you create a Virtual Device, the SDK Makes several **disk images** containing among others:

(1) OS kernel,
(2) the Android system,
(3) user data (userdata-qemu.img)
(4) simulated SD card (sdcard.img).

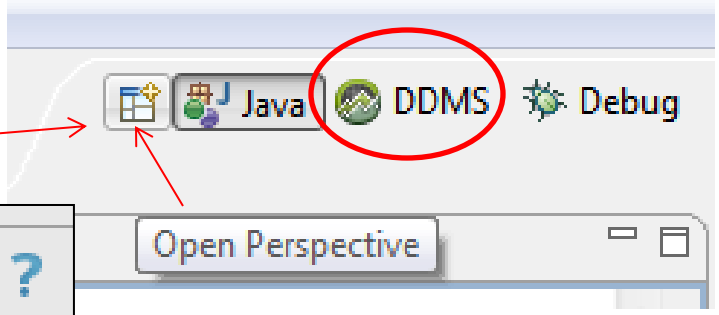


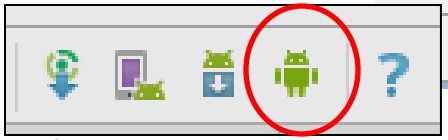
By default, the Emulator searches for the disk images in the private storage area of the AVD in use, for instance the "API16-JellyBean-412" AVD is at:
C:\Users\yourFolder\.android\avd\API16-JellyBean-412

Mac OS users should look into **~/.android/avd**

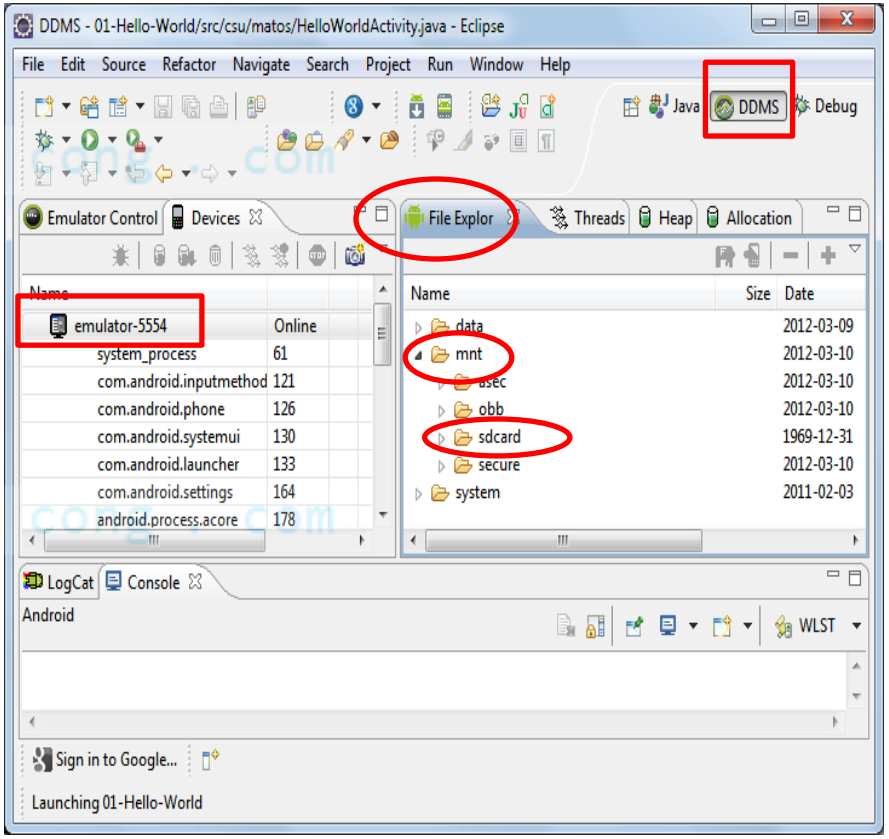
Transferring Files to/from Emulator's SD Card

Upload/download Data, Music and Picture files to the Emulator's SDcard



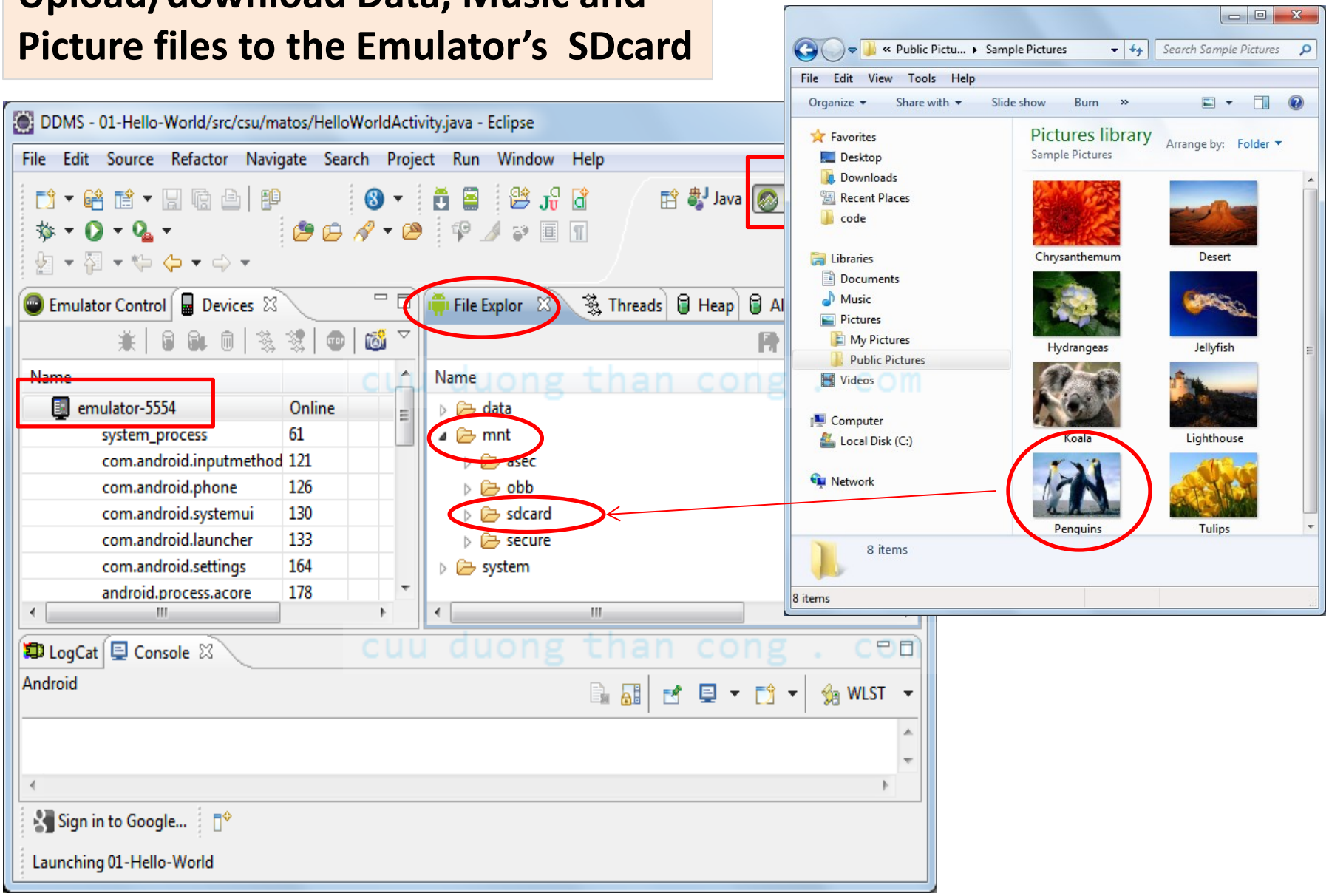


1. Eclipse developers needs to add the **DDMS** perspective.
2. Android-Studio uses the equivalent '**Android Device Monitor**' button.
3. Change to the DDMS perspective. Make sure your AVD has started (You will see a layout similar to the figure on the lower right side)
4. Click on the **File Explorer** tab.
5. Expand the **mnt** (mounted devices) folder.
6. Expand the **sdcard** folder
7. Open your Window's **Explorer**.
8. Choose a file stored in your PC. Transfer a copy to the emulator by dragging and dropping it on top of the **sdcard** folder.



Transferring Files to/from Emulator's SD Card

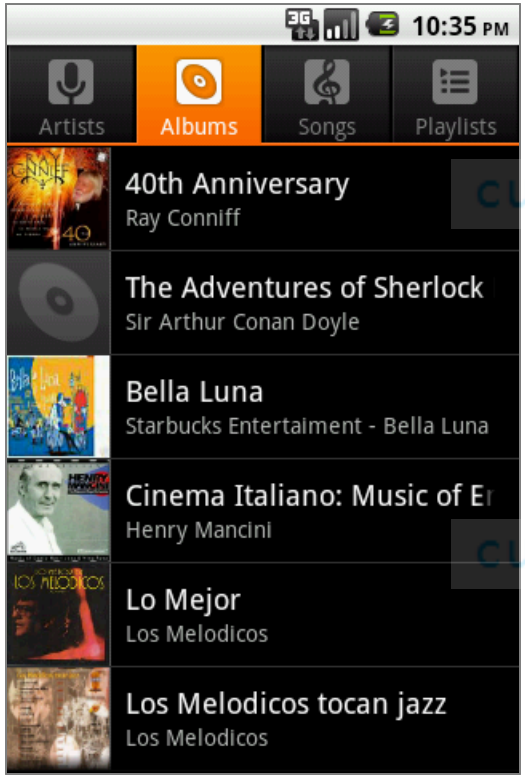
Upload/download Data, Music and Picture files to the Emulator's SDcard

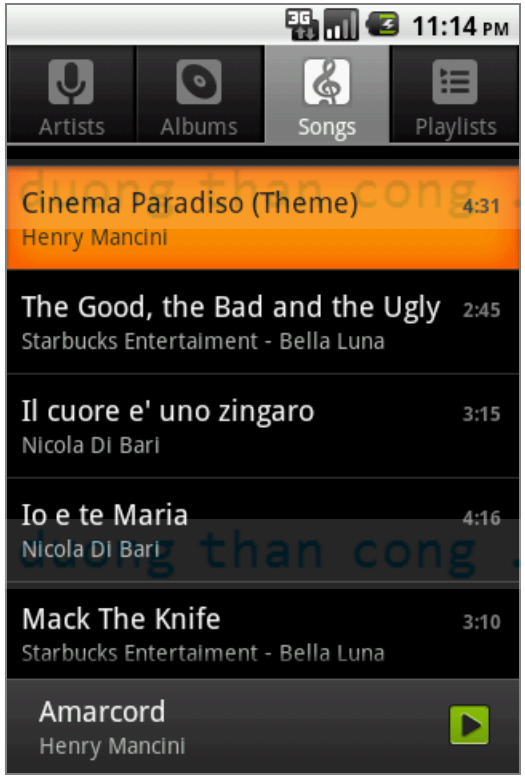


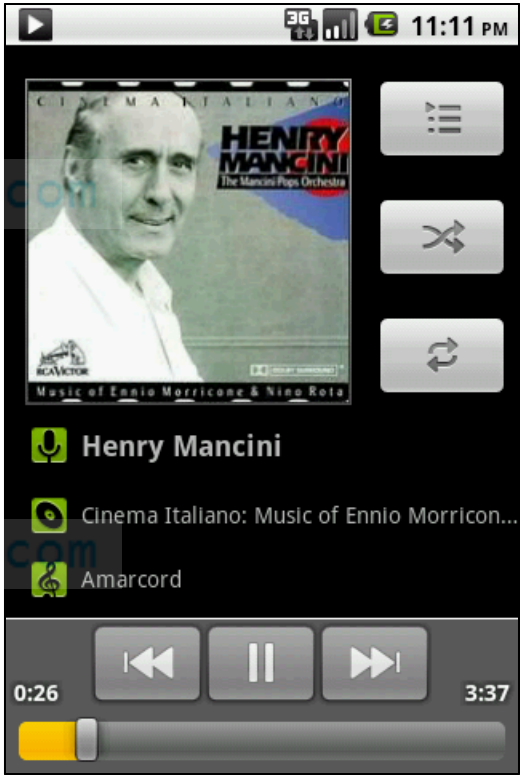
Transferring Files to/from Emulator's SD Card

Upload/download Data, Music and Picture files to the Emulator's SDcard

8. Return to the emulator. This time you may use native apps such as 'Music' and 'Gallery' to see your recently uploaded multimedia files. For instance…



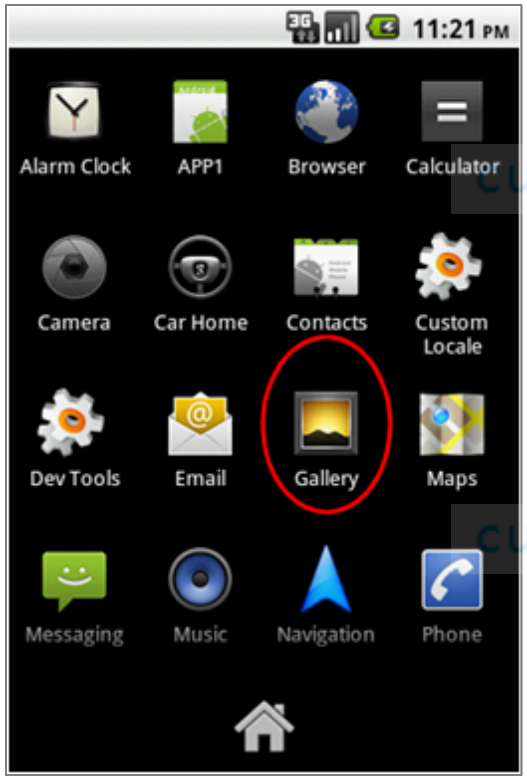


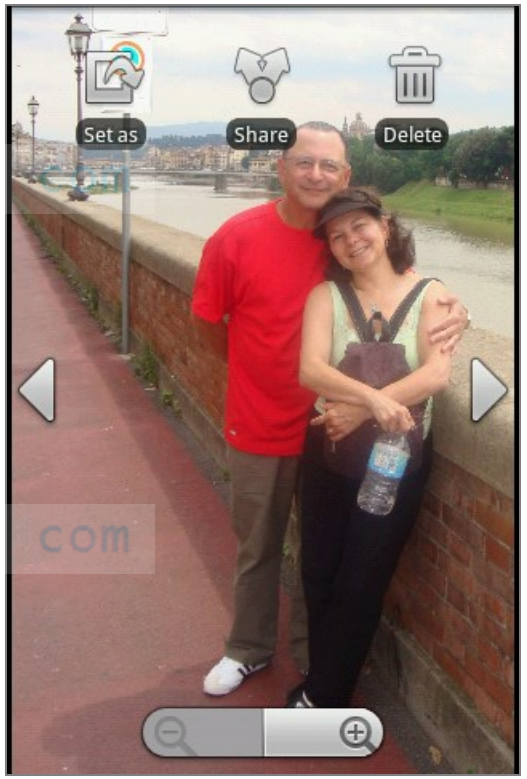


Transferring Files to/from Emulator's SD Card

Upload/download Data, Music and Picture files to the Emulator's SDcard

9. Pictures may be displayed by clicking the *Application Pad* and invoking the **Gallery** application



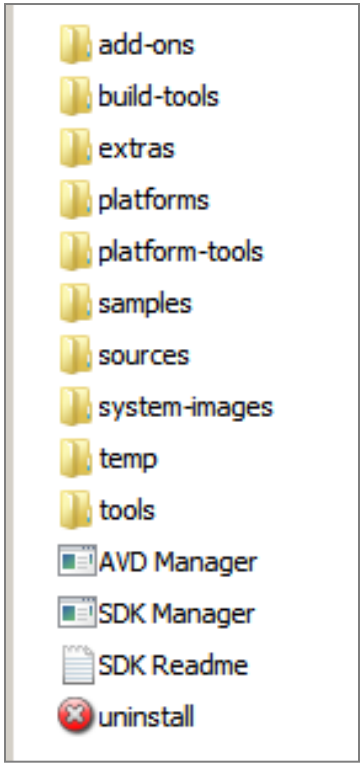


Setting up Eclipse + ADT + SDK

Locate your 'android-sdk' & AVD folder

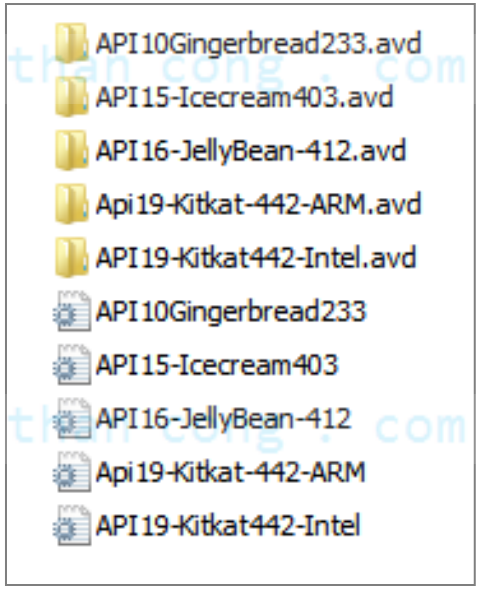
After you complete your setup look for the following two subdirectories in your PC's file system

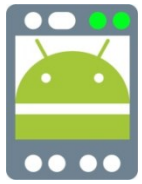
C:\Program Files (x86)\Android\android-sdk



This folder contains your Android SDK, tools, and platforms

C:\Users\yourWindowsUserName\.android\avd





This directory holds your Virtual Devices (AVDs)

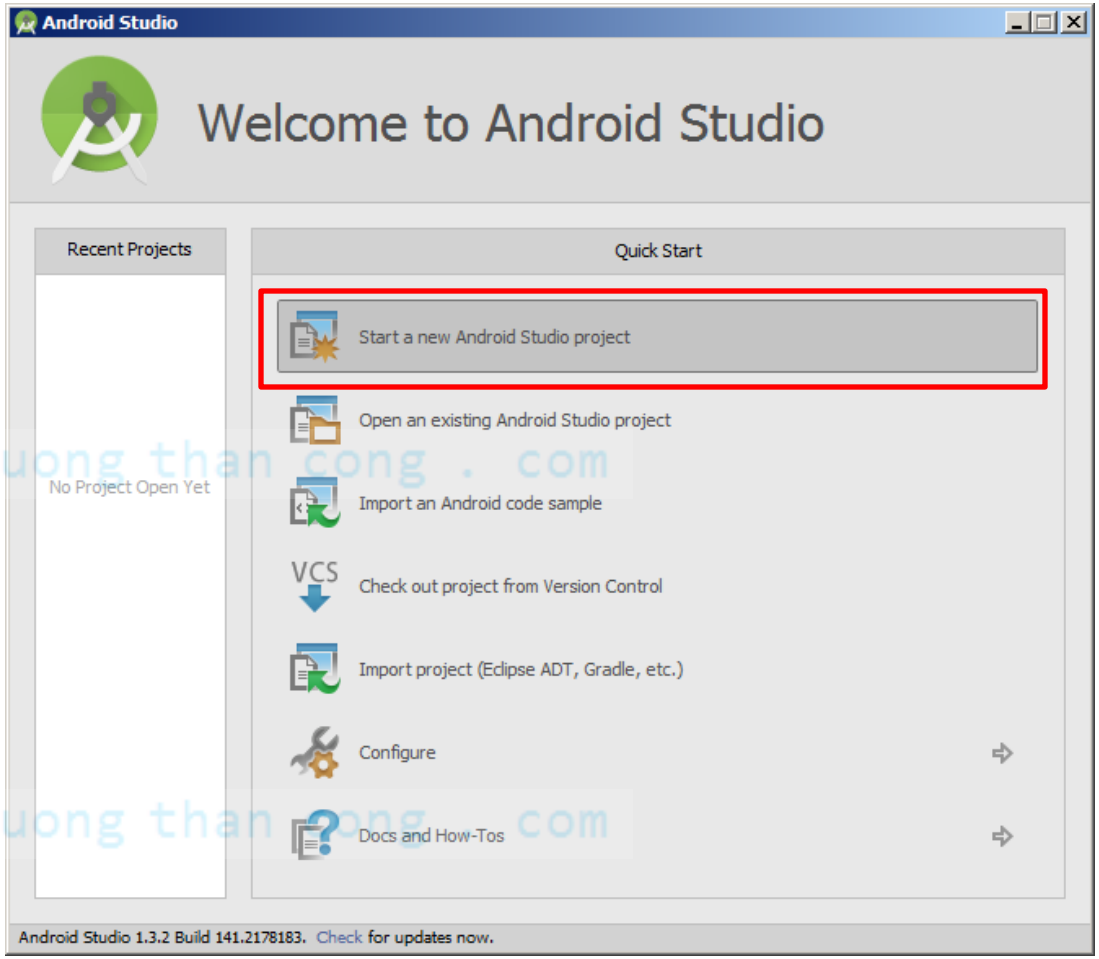
Android Studio: Hello World App

Example 2.1 : HelloWorld App

We will use **Android Studio IDE** to create a bare bone app.

Click on the entry: *'Start new Android Studio Project'* .
A wizard will guide you providing a sequence of menu driven selections.

The final product is the skeleton of your Android app.



Android apps are usually made of a rich collection of various type of components including Java code, multimedia resources, XML files, etc. The *New Android Studio Project* Wizard facilitates the assembly of those parts and organizes the components in various sub-directories.

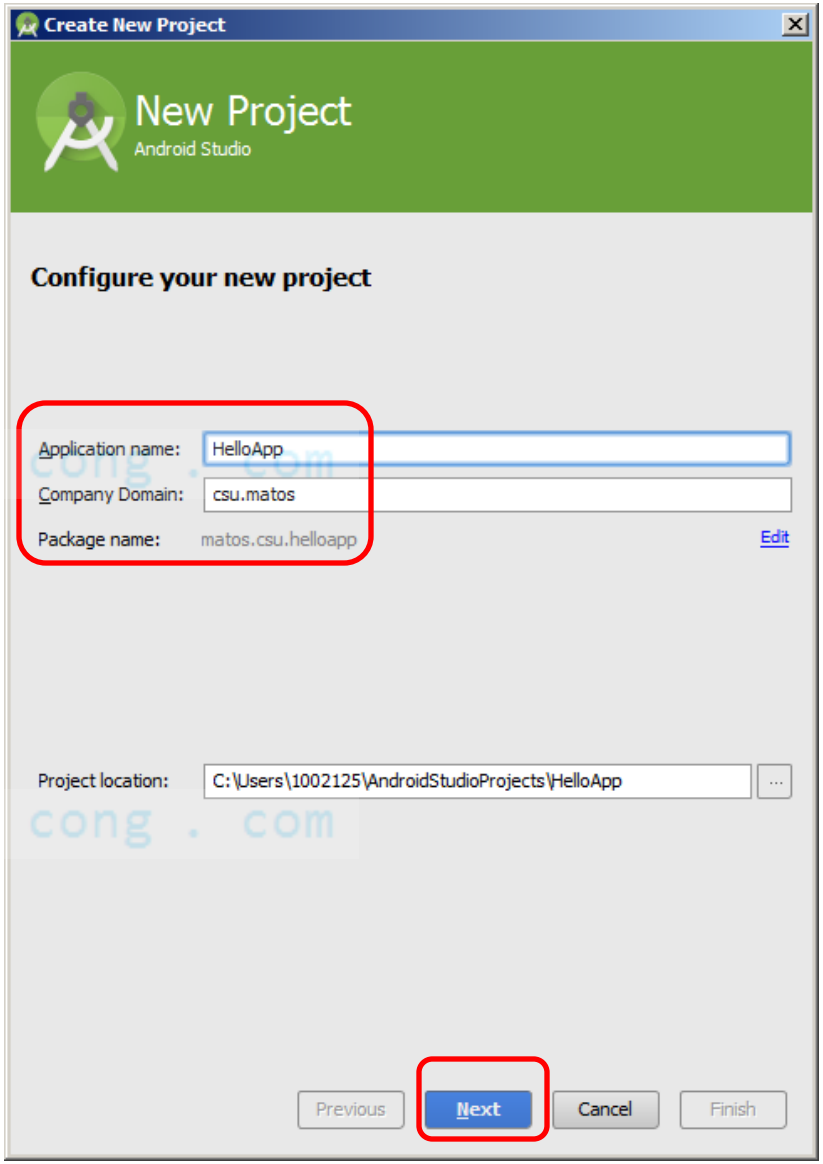
Android Studio: Hello World App

Example 2.1 : HelloWorld App

1. Enter in the *Application Name* box: **HelloApp**

2. Enter *Company Domain*: **csu.matos** (usually a dot-separated string consisting of company and programmer's name)

3. Click **Next**



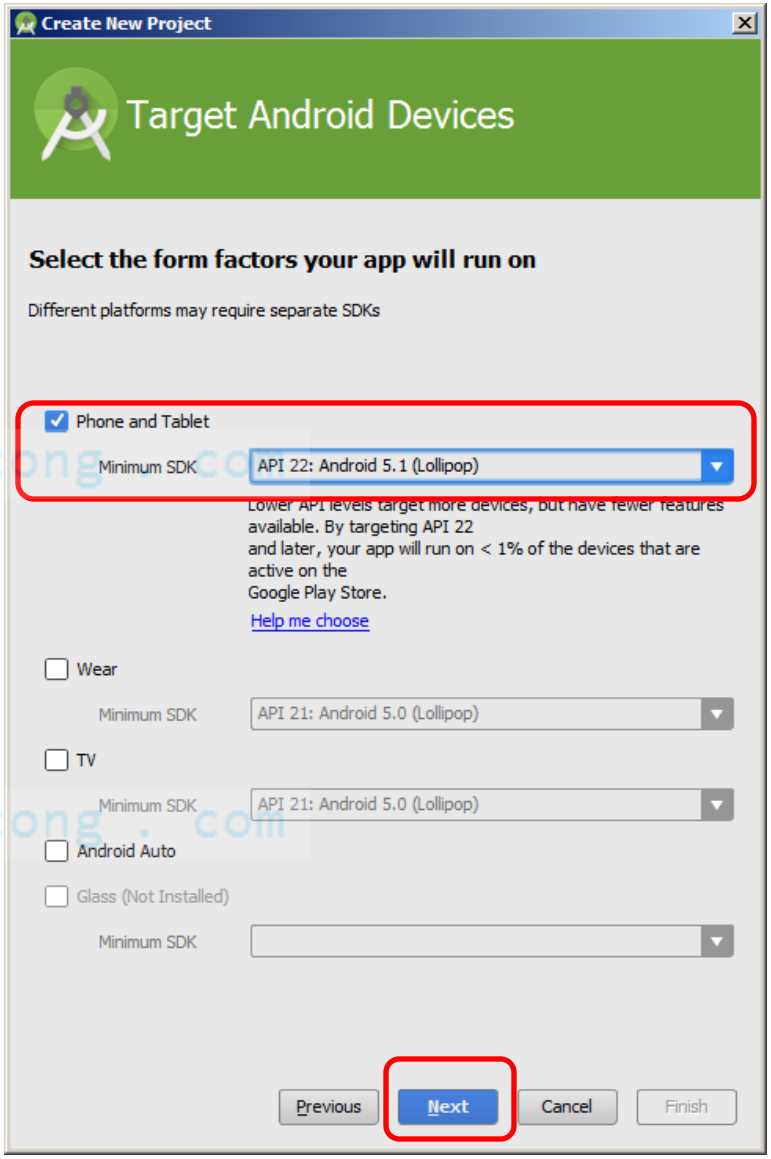
Android Studio: Hello World App

Example 2.1 : HelloWorld App

4. Select Target Android Device. In this example **Phone and Table** is already checked. Other options are: Wear, TV, Auto, Glasses.

5. Choose from drop-down list the Minimum SDK on which the app will work. In this example we have selected: **API22 Android 5.1 (Lollipod)**

6. Click **Next**



Android Studio: Hello World App

Example 2.1 : HelloWorld App

7. Select the pre-defined app template to apply. In this example we choose: **Blank Activity**

8. Click **Next**

Android Studio: Hello World App

Example 2.1 : HelloWorld App

9. The wizard is ready to construct the solution. The text-boxes give you an opportunity to change any of the default names given to the main activity, the app's layout, its title, and menu. *Please do not change anything now*.

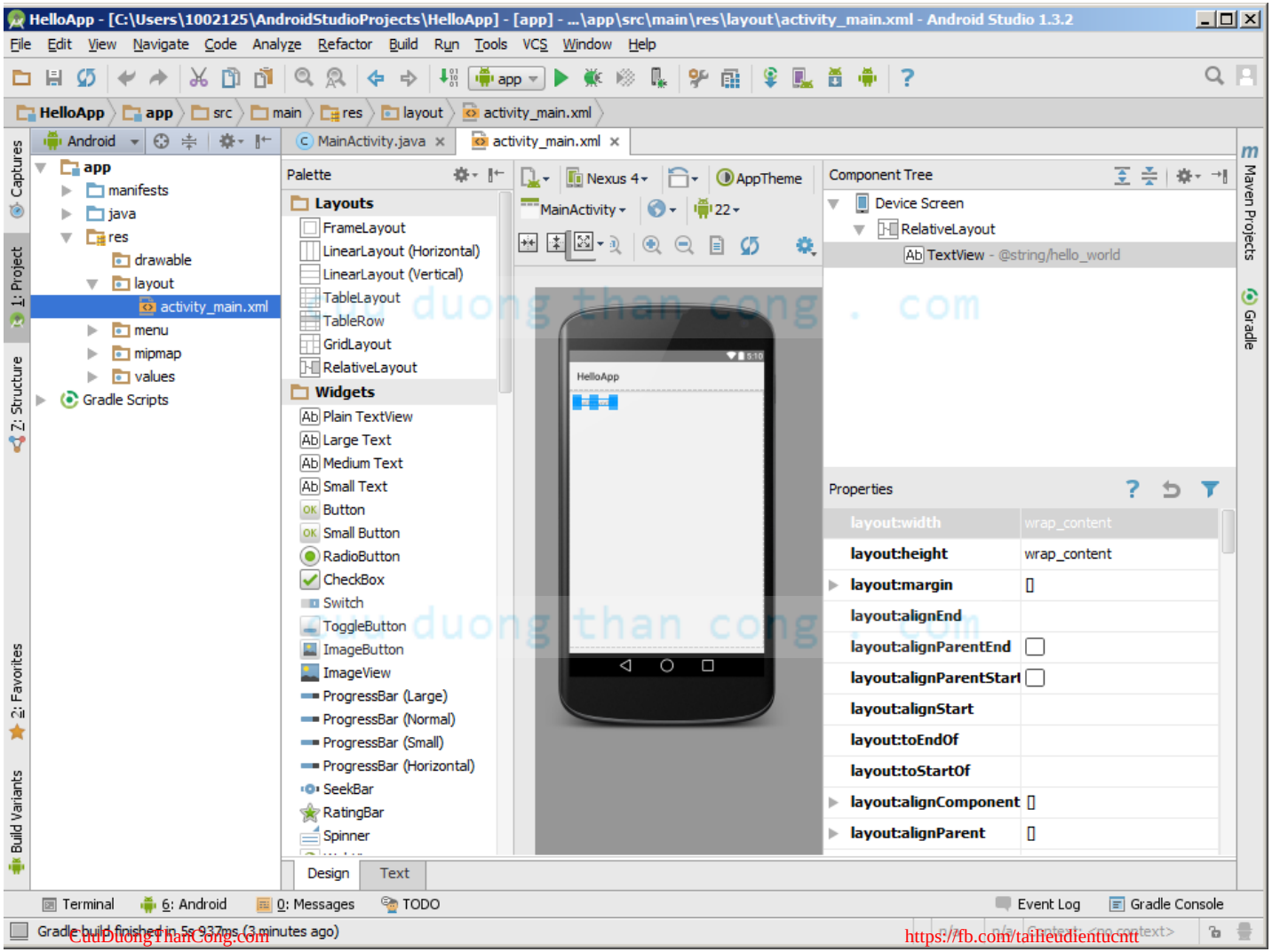
10. Click **Finish**

11. You are done! (your next step is to try the app on the emulator – explained later in this lesson)

Android Studio: Hello World App

Example 2.1 : HelloWorld App

The app's GUI and the Palette (graphical toolbox) are shown. On the left pane, the Project Explorer shows the application's file structure.

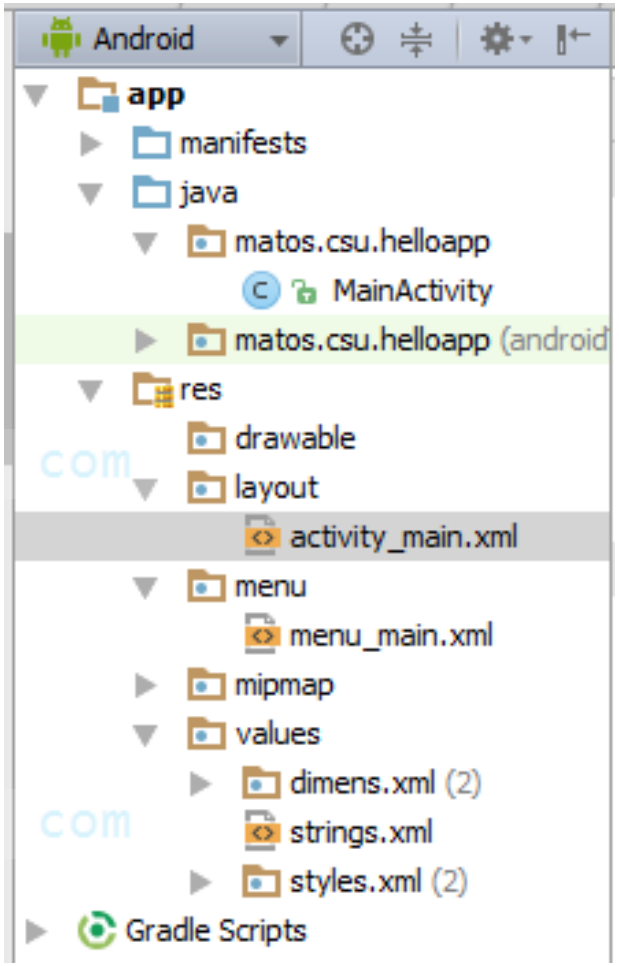


Android Studio: Hello World App

Example 2.1 : HelloWorld App

- **Java/** Holds your Main-Activity Java code. All other Java files for your application go here.

- **res/** This folder stores application resources such as *drawable* files, UI *layout* files, *string* values, *menus*, multimedia, etc.
- **manifests** The Android Manifest for your project.



Android Studio: Hello World App

Example 2.1 : HelloWorld App – Java Code: MainActivity.java

```
package matos.csu.helloapp;
import …

public class MainActivity extends Activity {

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

    @Override
    public boolean onCreateOptionsMenu(Menu menu) {
        // Inflate the menu; this adds items to the action bar if it is present.
        getMenuInflater().inflate(R.menu.menu_main, menu);
        return true;
    }

    @Override
    public boolean onOptionsItemSelected(MenuItem item) {
        // Handle action bar item clicks here. The action bar will
        // automatically handle clicks on the Home/Up button, so long
        // as you specify a parent activity in AndroidManifest.xml.
        int id = item.getItemId();

        //noinspection SimplifiableIfStatement
        if (id == R.id.action_settings) {
            return true;
        }

        return super.onOptionsItemSelected(item);
    }
}
```

Android Studio: Hello World App

Example 2.1 : HelloWorld App - Layout: activity_main.xml

MainActivity.java | activity_main.xml

```
<RelativeLayout xmlns:android="http://schemas.andro
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingLeft="16dp"
    android:paddingRight="16dp"
    android:paddingTop="16dp"
    android:paddingBottom="16dp"
    tools:context=".MainActivity">

    <TextView
        android:text="Hello world!"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content" />

</RelativeLayout>
```

Design | Text

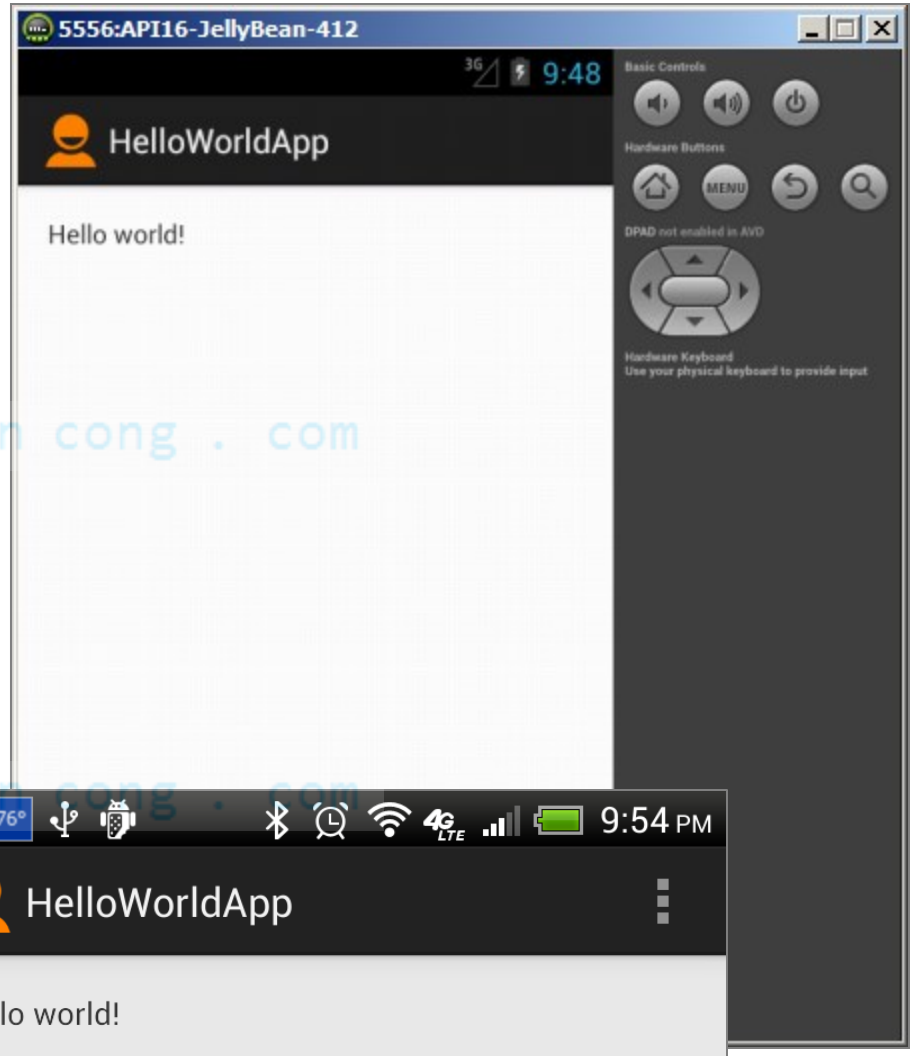
Preview

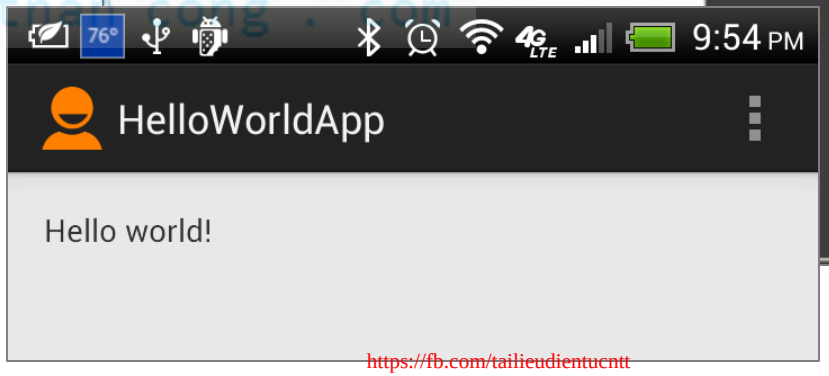
Eclipse: Using the 'New Android Application' Wizard

Example2.1 *(again…)* : HelloWorld App

We will use **Eclipse + ADT** to create a bare bone app. All it is needed from the developer is to feed the *New Android Application* wizard with a few selections (*no extra code will be added to the default app skeleton generated by the IDE+SDK*).

The adjacent figures show the solution made by the wizard running on a *Jelly Bean* emulator and device.

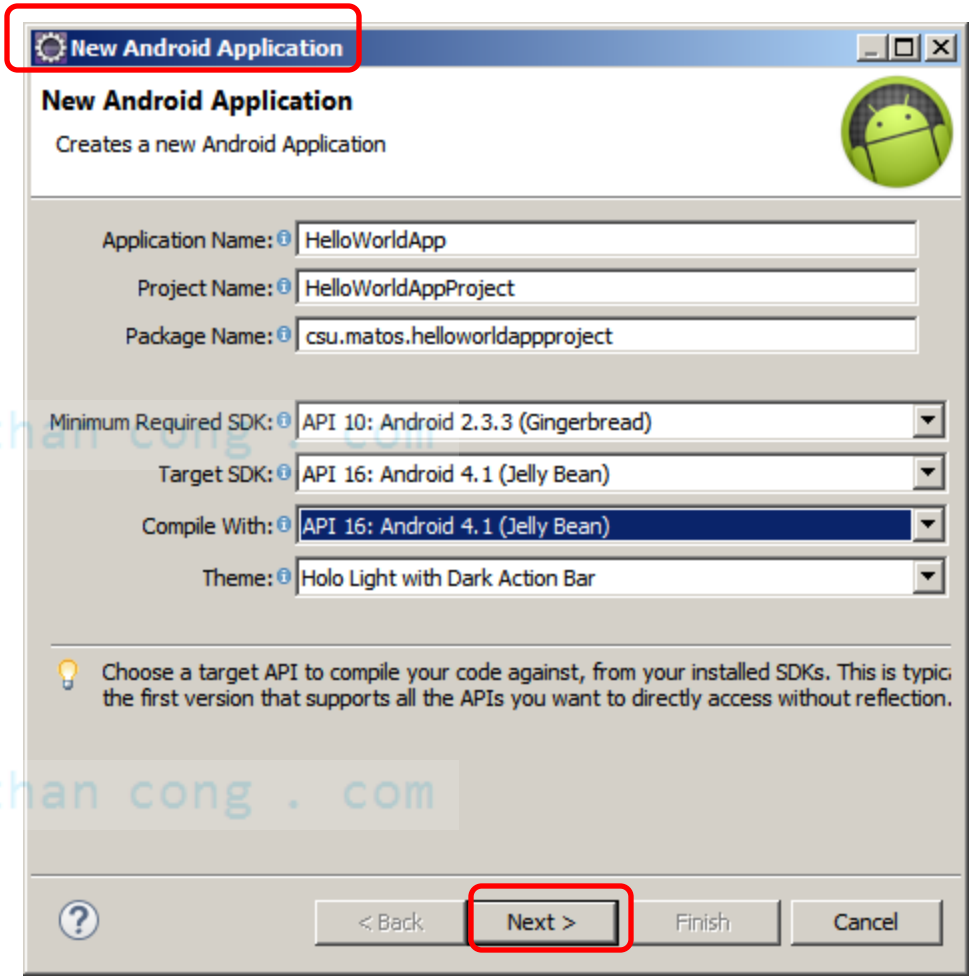




Eclipse: Using the 'New Android Application' Wizard

Example : HelloWorld App

1. Start **Eclipse**
2. From menu choose **File** > **New** > **Android Application Project**
3. Enter in the *Application Name* box: **HelloWorldApp**
4. Enter Project name: **HelloWorldAppProject**
5. Modify *Package Name* prefix to: **csu.matos.helloworldappproject**
6. For *Minimum Required SDK* choose: **API 10: Android 2.3.3 (Gingerbread)**
7. For *Target SDK* select the option: **API 16:Android 4.1 (Jelly Bean)**
8. Select for *Compile With* the option: **API 16:Android 4.1 (Jelly Bean)**
9. Click **Next**
10. Click **Next**

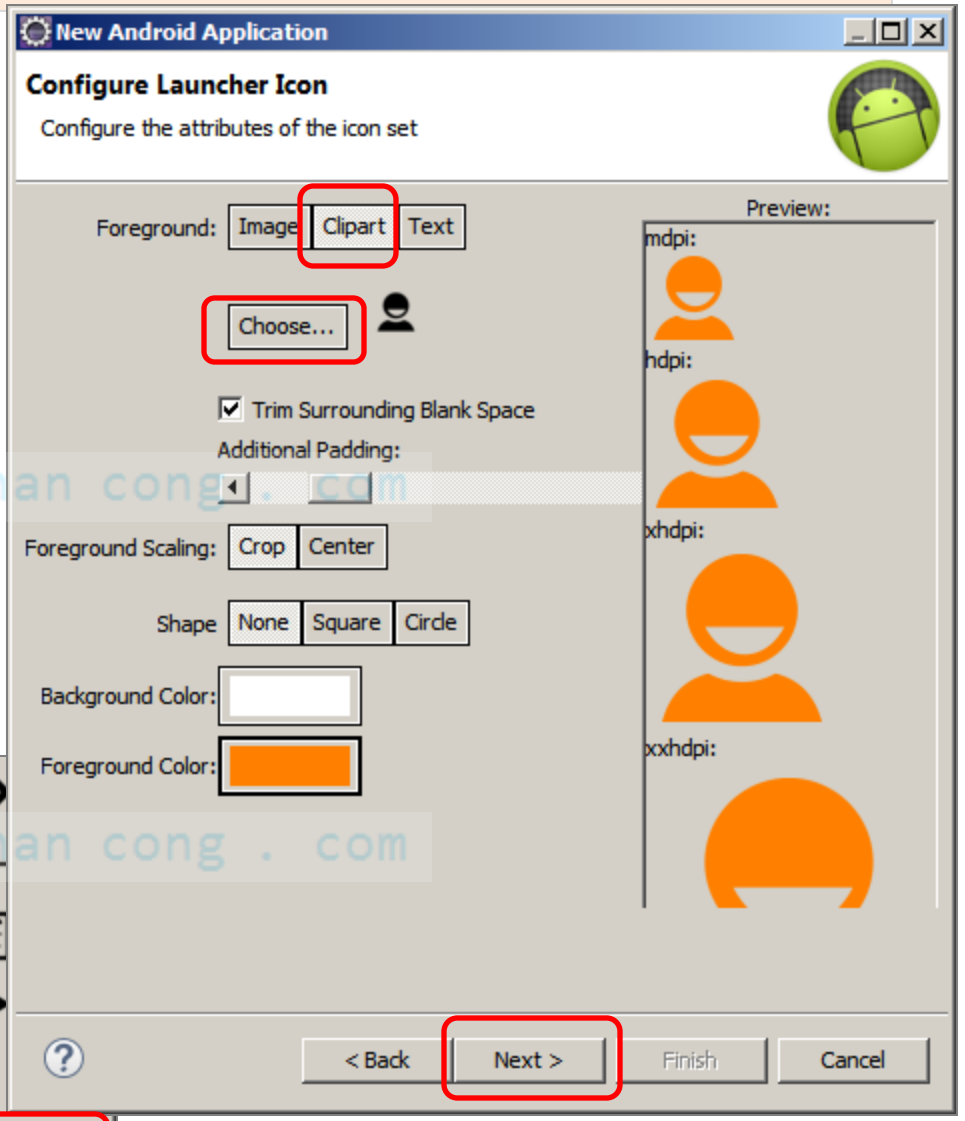


Eclipse: Using the 'New Android Application' Wizard

Example : HelloWorld App

On the form **Configure Launcher Icon** do the following:

11. Foreground > Clipart > Choose
12. Select an icon from the set of available images > Close
13. Pick a *Foreground Color*
14. Click **Next**

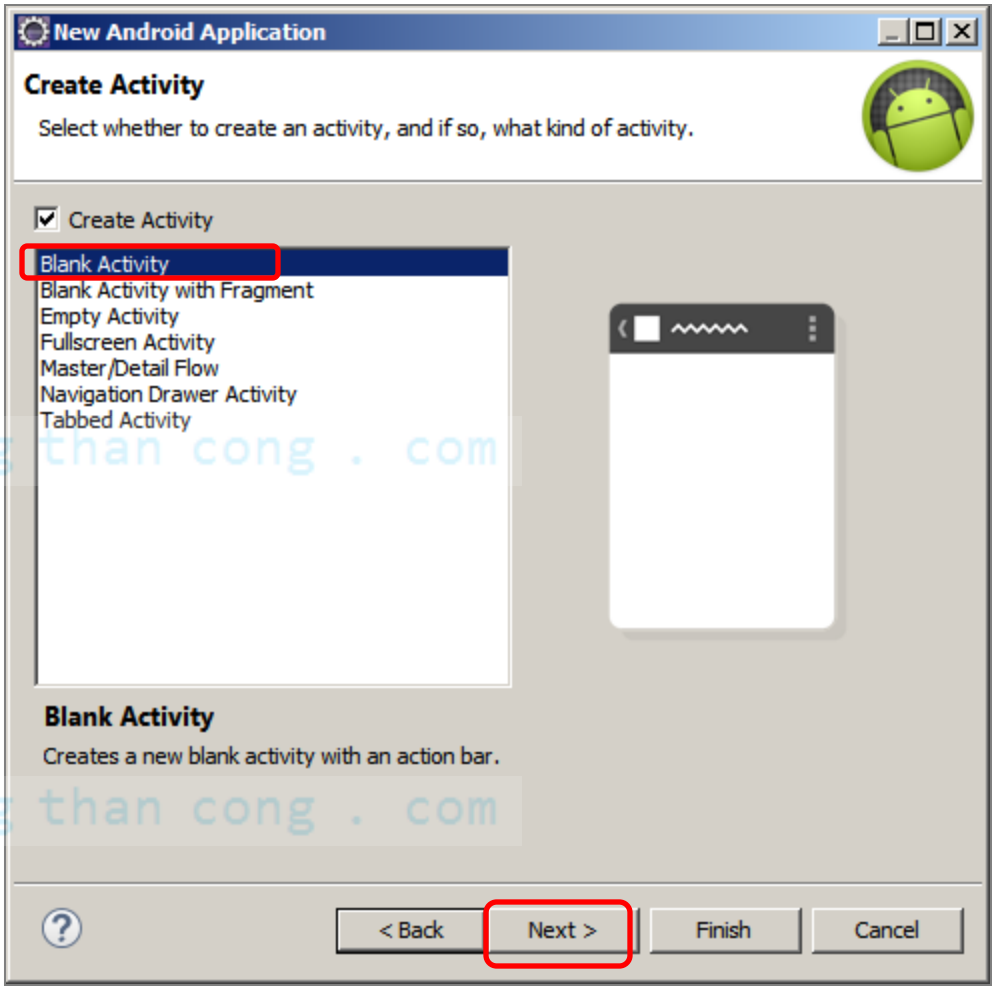


Eclipse: Using the 'New Android Application' Wizard

Example : HelloWorld App

The **Create Activity** form provides a number of basic templates from which your application could be constructed.

15. Select the **Blank Activity** template.
16. Click **Next**.



Eclipse: Using the 'New Android Application' Wizard

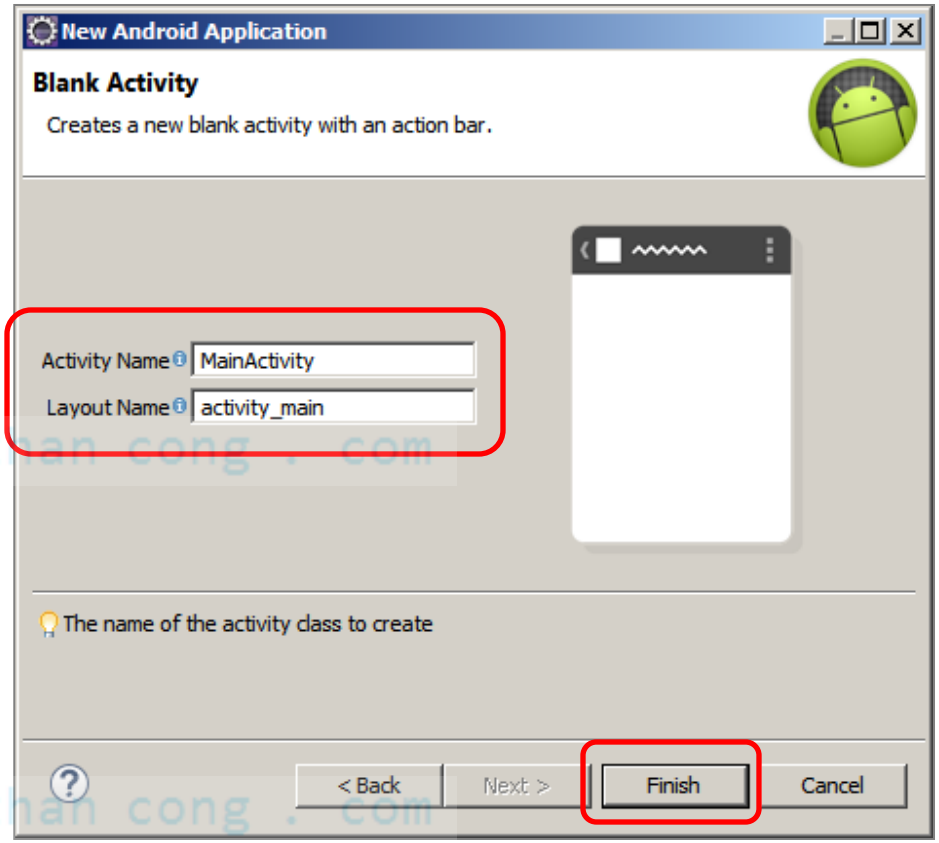
Example : HelloWorld App

The **Blank Activity** form provides a way to name the main Activity and Layout name.

17. Leave the default values shown in the form (Activity Name and Layout Name).
18. Click **Finish**.

At this point the wizard has completed all the steps required to make the app.

After a few seconds the Eclipse perspective shows the app's UI. The Java solution is shown in the PackageExplorer pane (see next pages)



Eclipse: Using the 'New Android Application' Wizard

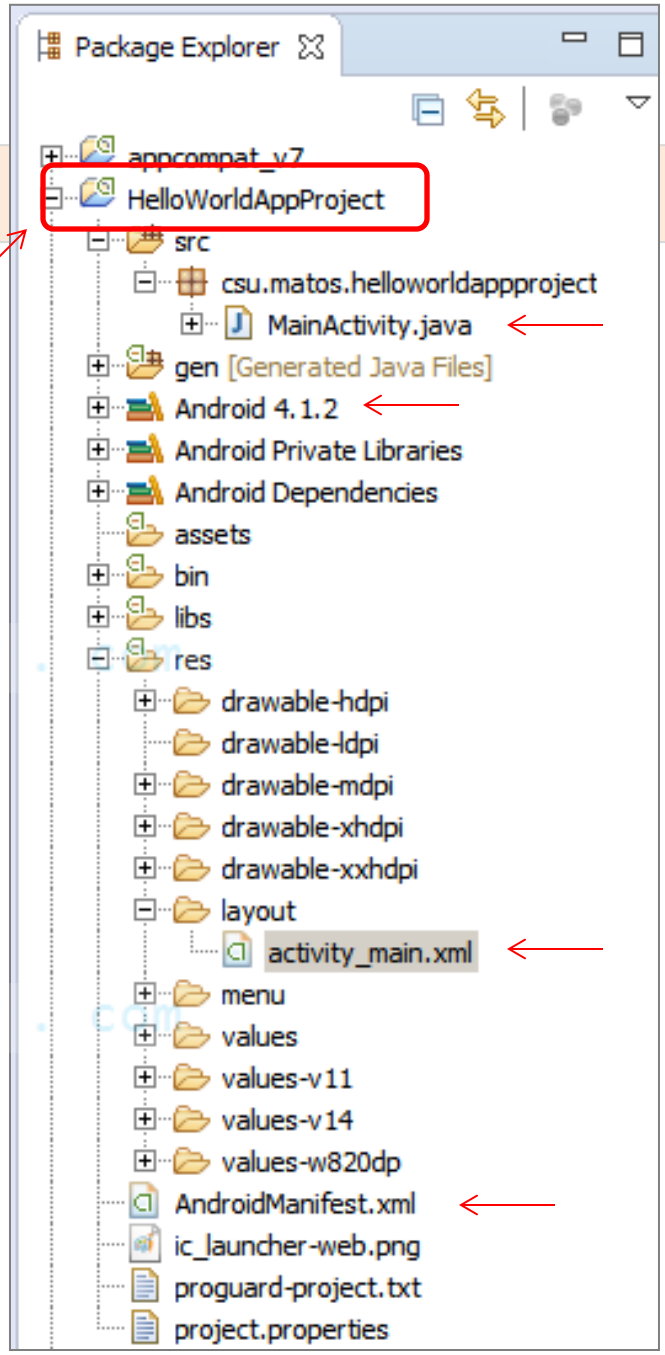
Example : HelloWorld App

File Structure

The folders and files shown on the figure are part of the newly created app.

Here we are using Eclipse's *Package Explorer* facility to navigate inside the folder holding the app.

To test the application, position the cursor on the code panel, and then click on the *Run* menu button.



Eclipse: Using the 'New Android Application' Wizard

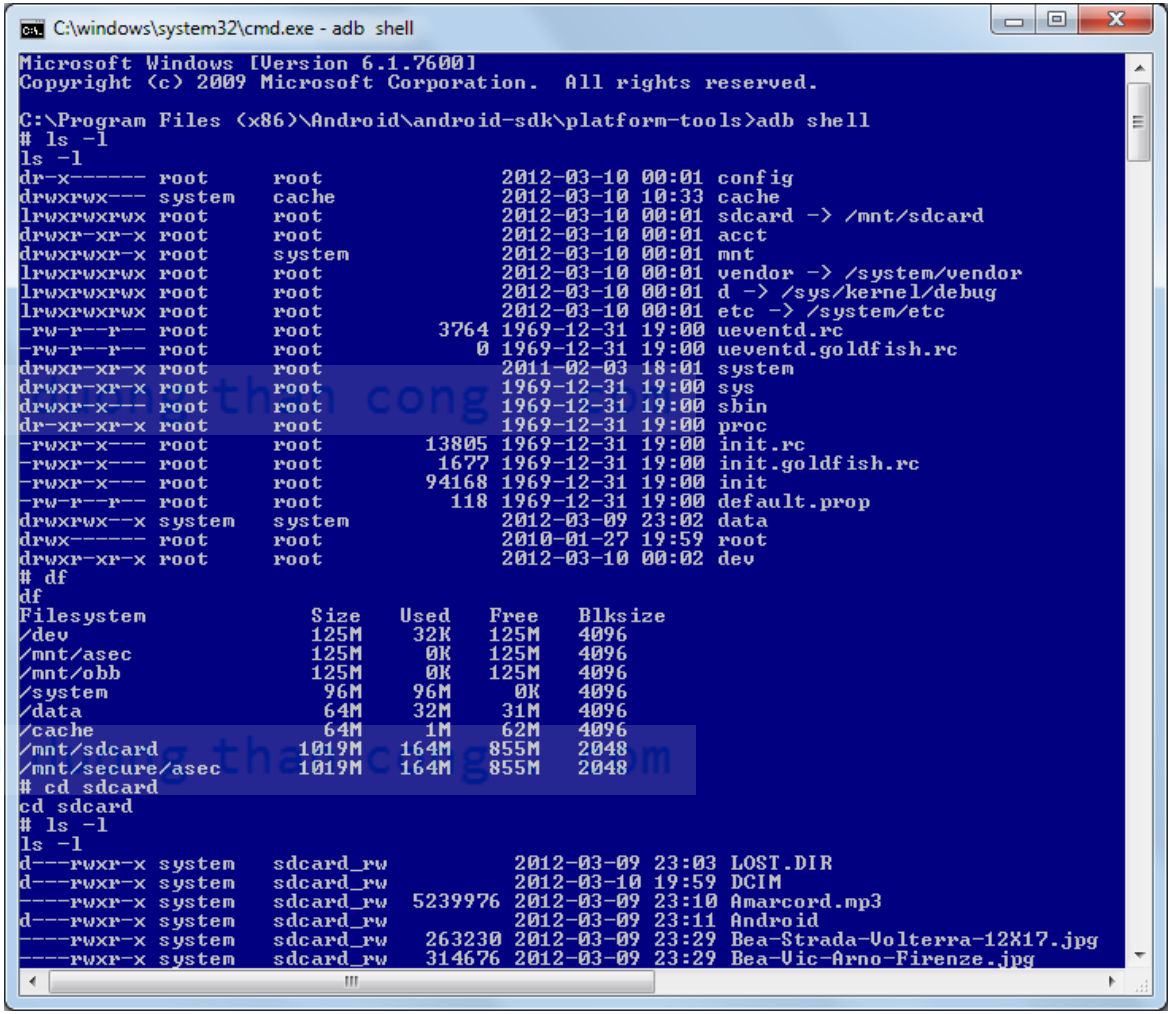
File Structure of a Typical Android App

- **src/** Includes your skeleton Activity Java file. All other Java files for your application go here.
- ***<Android Version>/*** (e.g., Android 4.1/) Includes the android.jar file that your application will build against.
- **gen/** This contains the Java files generated by ADT, such as your R.java file
- **assets/** This is empty. You can use it to store raw asset files.
- **res/** This folder holds application resources such as *drawable* files, UI *layout* files, *string* values, etc.
- **bin/** The bytecode (.apk) version of your app is stored here
- **AndroidManifest.xml** The Android Manifest for your project.
- **default.properties** This file contains project settings, such as the build target.

Android Emulator – Looking Under the Hood

Login into the Android OS shell

- Although it is *not* necessary, a developer may gain access to some of the innermost parts of the Android OS.
- For a UNIX-like experience you can log into the system by executing the emulator and issuing selected shell commands.



Android Emulator – Looking Under the Hood

Login into the Android OS shell

STEPS

1. Use the Eclipse **AVD Manager** to start one of your AVDs (say Gingerbread23)

2. At the DOS command prompt level run the Android Debug Bridge (**adb)** application

   adb shell

```
C:\windows\system32\cmd.exe - adb shell
Microsoft Windows [Version 6.1.7600]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Program Files (x86)\Android\android-sdk\platform-tools>adb shell
# ls -l
ls -l
dr-x------ root     root              2012-03-10 00:01 config
drwxrwx--- system   cache             2012-03-10 10:33 cache
lrwxrwxrwx root     root              2012-03-10 00:01 sdcard -> /mnt/sdcard
drwxr-xr-x root     root              2012-03-10 00:01 acct
drwxrwxr-x root     system            2012-03-10 00:01 mnt
lrwxrwxrwx root     root              2012-03-10 00:01 vendor -> /system/vendor
lrwxrwxrwx root     root              2012-03-10 00:01 d -> /sys/kernel/debug
lrwxrwxrwx root     root              2012-03-10 00:01 etc -> /system/etc
-rw-r--r-- root     root         3764 1969-12-31 19:00 ueventd.rc
-rw-r--r-- root     root            0 1969-12-31 19:00 ueventd.goldfish.rc
drwxr-xr-x root     root              2011-02-03 18:01 system
drwxr-xr-x root     root              1969-12-31 19:00 sys
drwxr-x--- root     root              1969-12-31 19:00 sbin
dr-xr-xr-x root     root              1969-12-31 19:00 proc
-rwxr-x--- root     root        13805 1969-12-31 19:00 init.rc
-rwxr-x--- root     root         1677 1969-12-31 19:00 init.goldfish.rc
-rwxr-x--- root     root        94168 1969-12-31 19:00 init
-rw-r--r-- root     root          118 1969-12-31 19:00 default.prop
drwxrwx--x system   system            2012-03-09 23:02 data
drwx------ root     root              2010-01-27 19:59 root
drwxr-xr-x root     root              2012-03-10 00:02 dev
# df
df
Filesystem             Size   Used   Free   Blksize
/dev                   125M    32K   125M   4096
/mnt/asec              125M     0K   125M   4096
/mnt/obb               125M     0K   125M   4096
/system                 96M    96M     0K   4096
/data                   64M    32M    31M   4096
/cache                  64M     1M    62M   4096
/mnt/sdcard           1019M   164M   855M   2048
/mnt/secure/asec      1019M   164M   855M   2048
# cd sdcard
cd sdcard
# ls -l
ls -l
d---rwxr-x system   sdcard_rw         2012-03-09 23:03 LOST.DIR
d---rwxr-x system   sdcard_rw         2012-03-10 19:59 DCIM
----rwxr-x system   sdcard_rw  5239976 2012-03-09 23:10 Amarcord.mp3
d---rwxr-x system   sdcard_rw         2012-03-09 23:11 Android
----rwxr-x system   sdcard_rw   263230 2012-03-09 23:29 Bea-Strada-Volterra-12X17.jpg
----rwxr-x system   sdcard_rw   314676 2012-03-09 23:29 Bea-Vic-Arno-Firenze.jpg
```

adb is a tool located in the directory:
C:\Your-SDK-Folder\Android\android-sdk\platform-tools

Android Emulator – Looking Under the Hood

Login into the Android OS shell

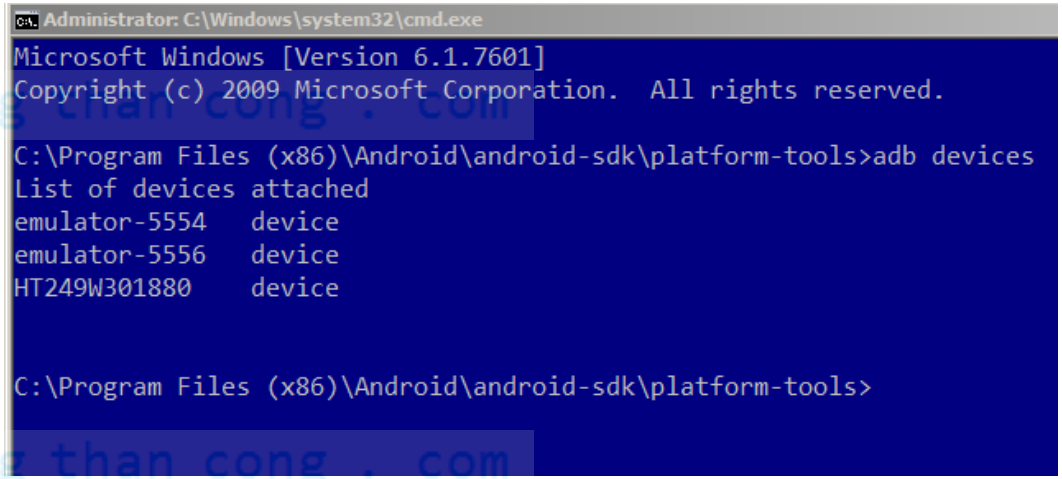
If more than one emulator is running (or your phone is physically connected to the computer using the USB cable) you need to identify the target.

Follow the next steps:

1. Get a list of attached devices

```
adb devices

List of devices attached
emulator-5554   device
emulator-5556   device
HT845GZ45737    device
```



2. Run the **adb** application as follows:

```
adb  -s emulator-5554  shell
```

Remember, the **adb** tool is located at **C:\Program Files (x86)\Android\android-sdk\platform-tools**

Android Emulator – Looking Under the Hood

Login into the Android OS shell

Android accepts a number of Linux shell commands including the useful set below

```
ls ................. show directory (alphabetical order)
mkdir .............. make a directory
rmdir .............. remove directory
rm -r .............. to delete folders with files
rm ................. remove files
mv ................. moving and renaming files
cat ................ displaying short files
cd ................. change current directory
pwd ................ find out what directory you are in
df ................. shows available disk space
chmod .............. changes permissions on a file
date ............... display date
exit ............... terminate session
```


There is no copy (**cp**) command in Android, but you could use **cat** instead.
For instance:

```
# cat data/app/theInstalledApp.apk > cache/theInstalledApp.apk
```

Android Emulator – Looking Under the Hood

Hacking: Moving an app from a Rooted Phone to the Emulator

If you want to transfer an app that is currently installed in your rooted developer's phone to the emulator, follow the next steps:

1. Run command shell: > **adb devices** (find out your hardware's id, say **HT096P800176**)
2. Pull the file from the device to your computer's file system. Enter the command
   adb -s HT096P800176 pull data/app/theInstalledApp.apk c:\theInstalledApp.apk
3. Disconnect your Android phone
4. Run an instance of the Emulator
5. Now install the app on the emulator using the command
   adb -s emulator-5554 install c:\theInstalledApp.apk
   adb -s emulator-5554 uninstall data/app/theInstalledApp.apk ⟵ *to uninstall*

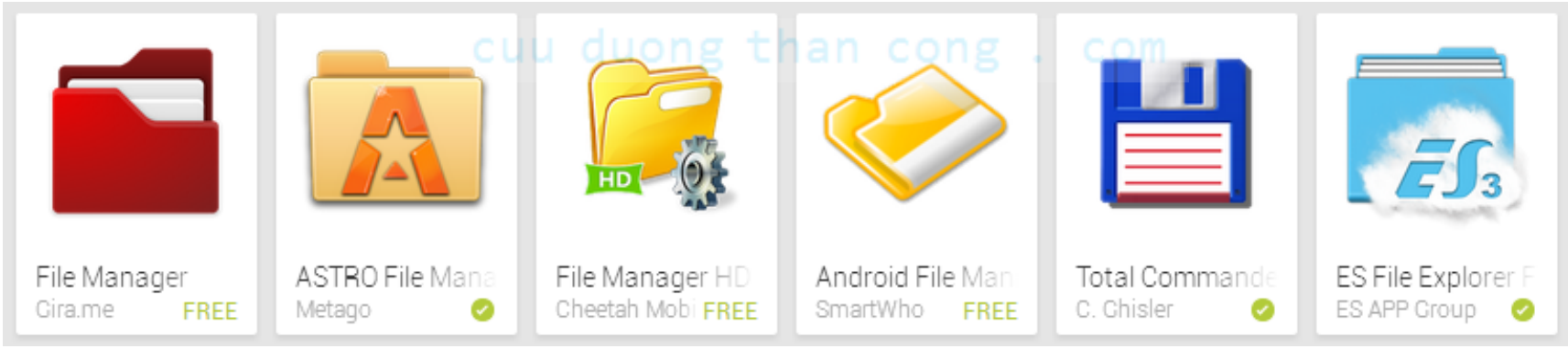
You should see a message indicating the size of the installed package, and finally: *Success*.

Android Emulator – Looking Under the Hood

Simpler than Hacking: Install a File Manager for Android

Visit **Google Play Store** and choose a user-friendly file manager app from the various (usually very good) options available.

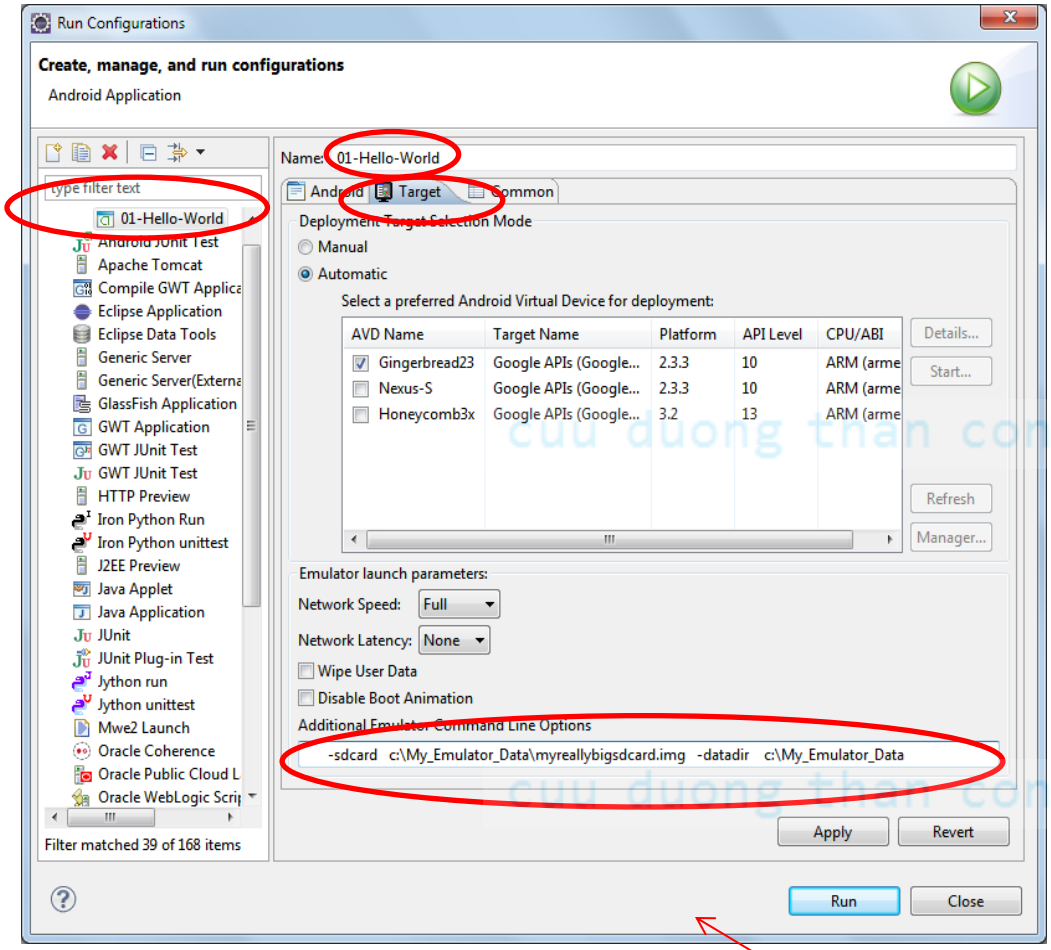
A file manager app allows you to easily administer the folders and files in the system's flash memory and SD card of your Android device (or emulator).



A sample of *File-Management* apps seen at https://play.google.com on Aug-27th -2014

Android Emulator – Looking Under the Hood

Using an alternate SD card & userData Image



From the Eclipse menu create a new launch configuration:

Run >
Run Configurations >
New icon

On the **Target** panel:

1. Select existing AVD (Gingerbread in this example)
2. Enter additional Command Line Options (see caption below)
3. Click on **Apply** > **Run**

Additional Emulator Command Line Options:
-sdcard c:\My_Emulator_Data\myreallybigsdcard.img **-datadir** c:\My_Emulator_Data

Android Emulator – Simulate Texting

Sending Text Messages from your Window's PC to the Emulator

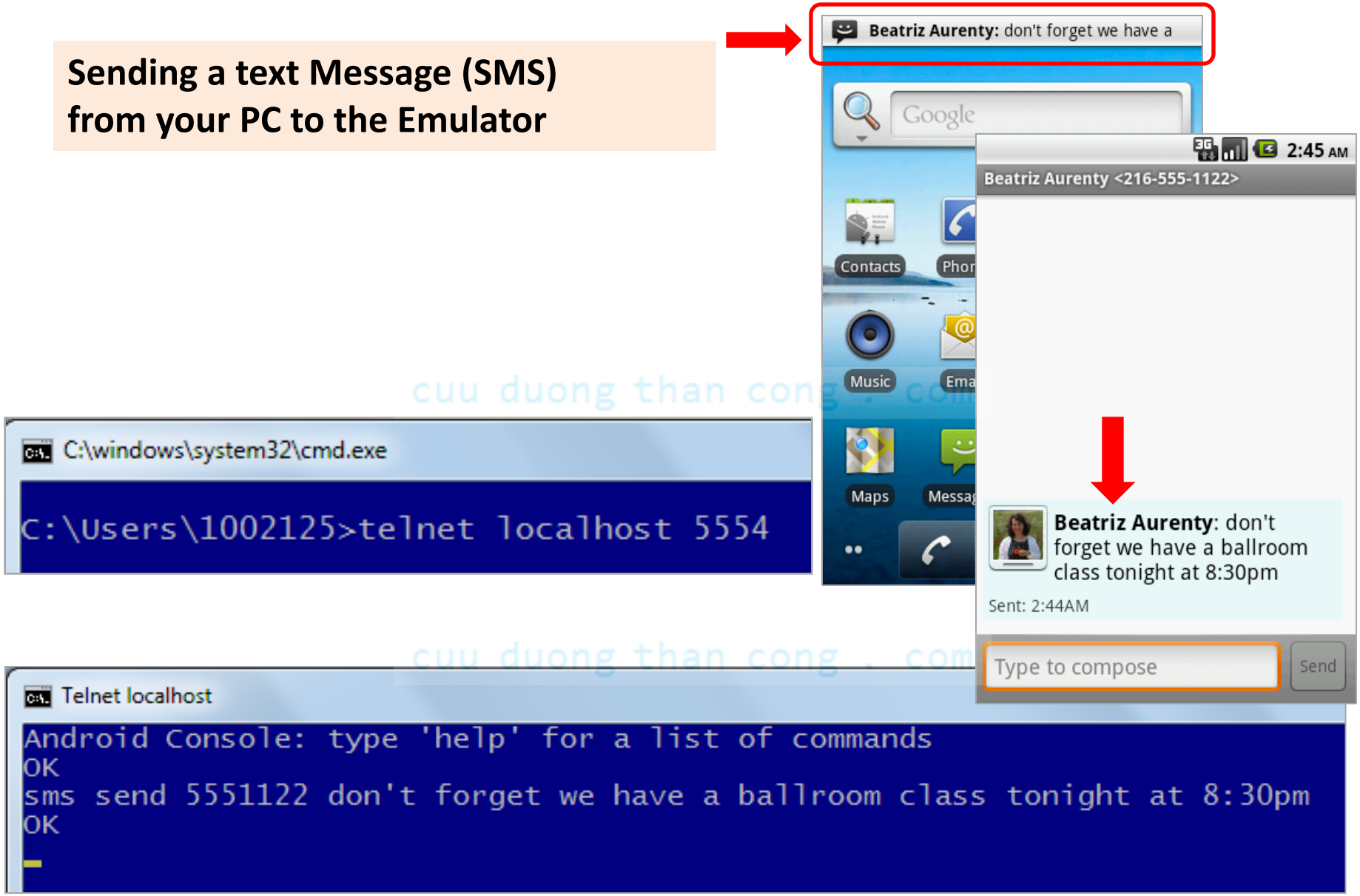
1. Start the emulator.
2. Open a new DOS command shell and type :
   c:> adb devices
   this way you get to know the emulator's numeric port id (usually **5554**, **5556**, and so on)
3. Initiate a Telnet session with the sender at localhost, port 5556 identifies an active (receiving) Android emulator. Type the command:
   c:> telnet localhost 5554
4. After receiving the telnet prompt, you can send a text message to the emulator on port 5554 (no quotes needed for the message)
   sms send <Sender's phone number> <text message>

Windows7 – temporarily install Telnet Client by using a command line

1. Click **Start** button, type **cmd** in the **'search programs and files'** box, and then press **ENTER**.
2. Type the following command: **`pkgmgr /iu:"TelnetClient"`**

Android Emulator – Simulate Texting

Sending a text Message (SMS) from your PC to the Emulator



Android Emulator – Simulate Phone Calls

Making a Phone Call from your PC to the Emulator

1. Start the emulator.

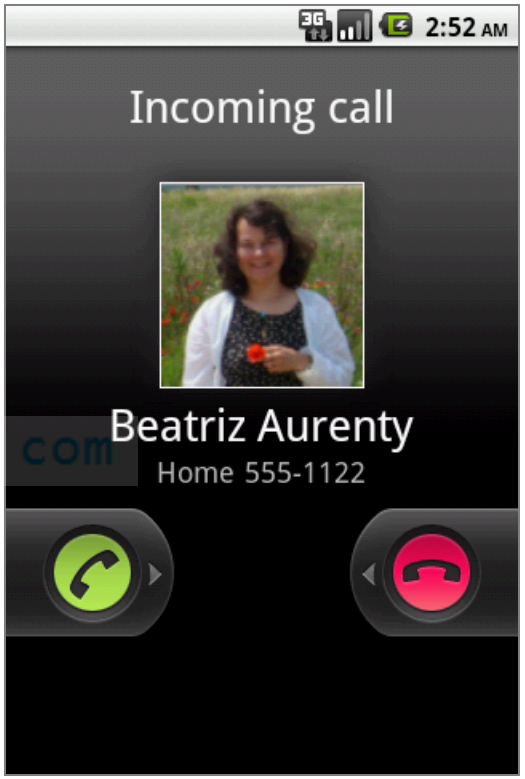
2. Open a new shell and type :
   adb devices
   to know the emulator's numeric port id (usually **5554**, **5556**, and so on)

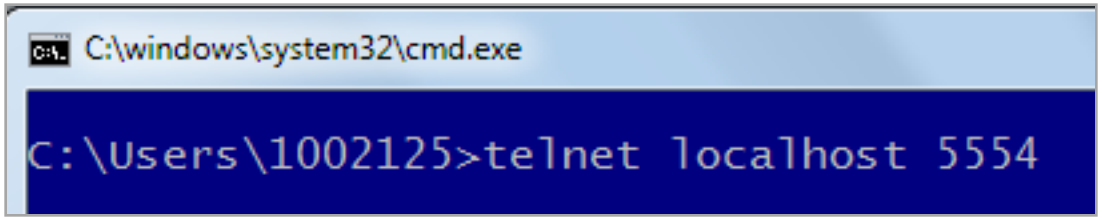
3. Connect to the console using telnet command like:
   telnet localhost 5554 (5554 is the 'phone number' to be called)

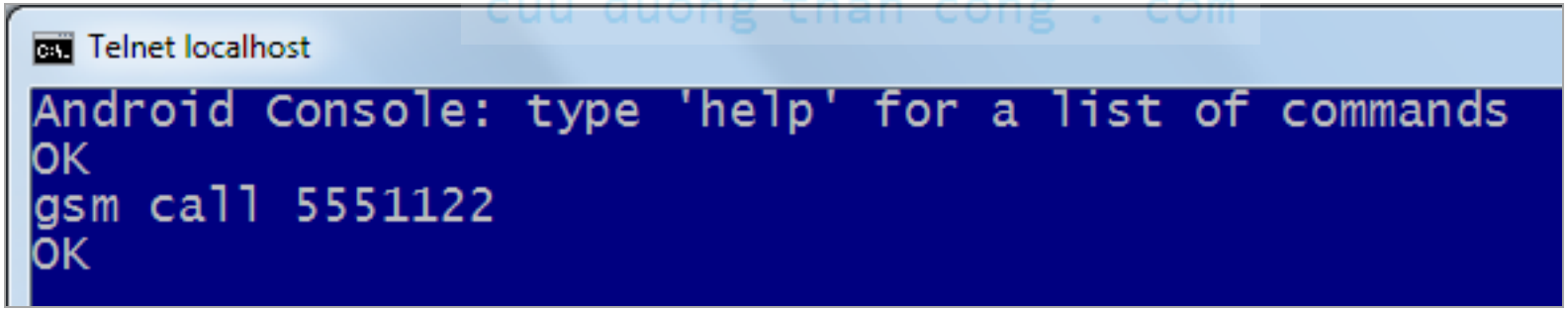
4. After receiving the telnet prompt you can place a call (voice) with the command
   gsm call <caller's phone number>

Android Emulator – Simulate Phone Calls

Example:
Making a Phone from your PC to the Emulator







Using: Android Device Monitor

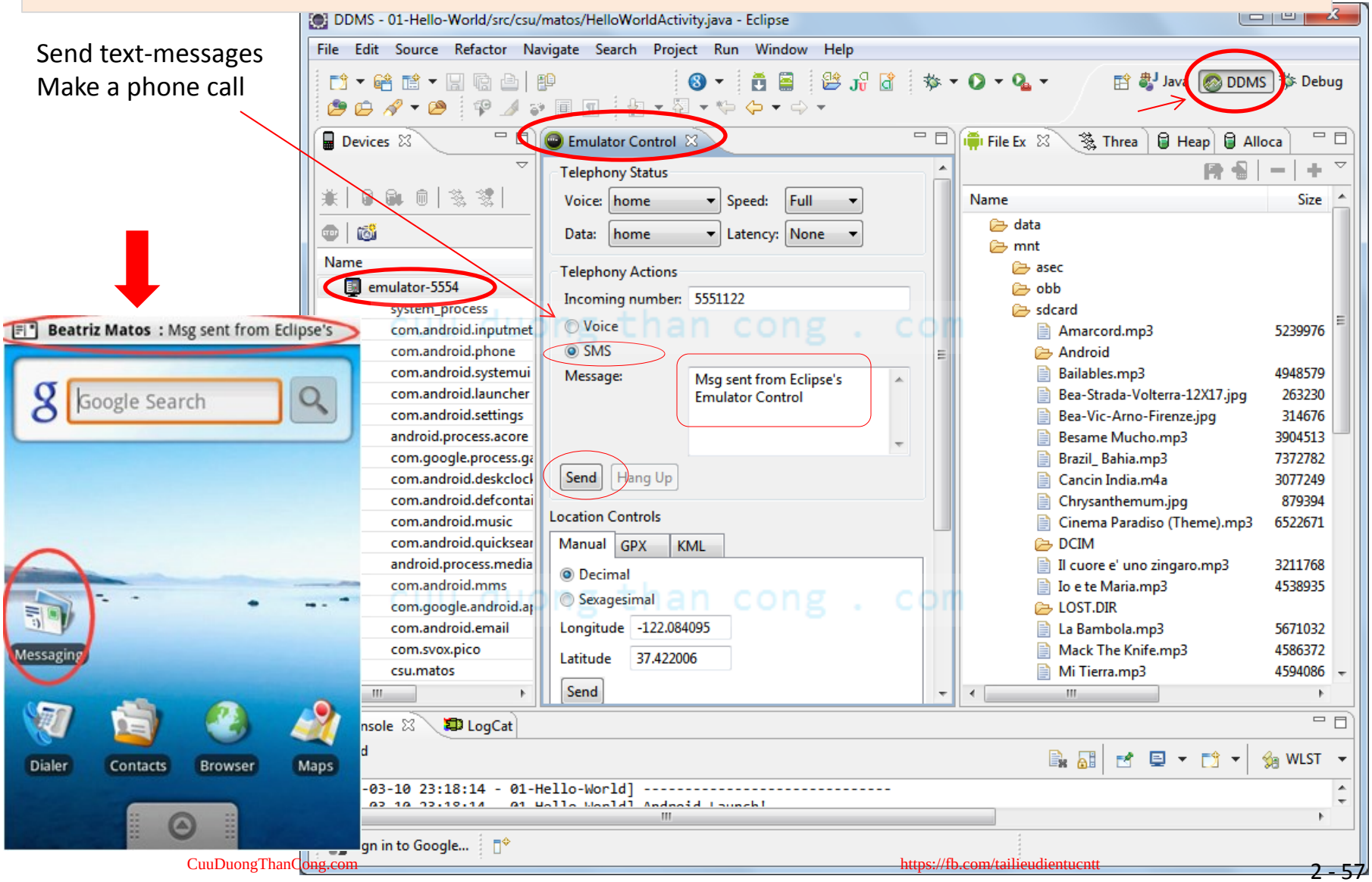
It is *much simpler* to test telephony operations (SMS/Voice) as well as GPS services using the controls included in the IDE (both AS and Eclipse)

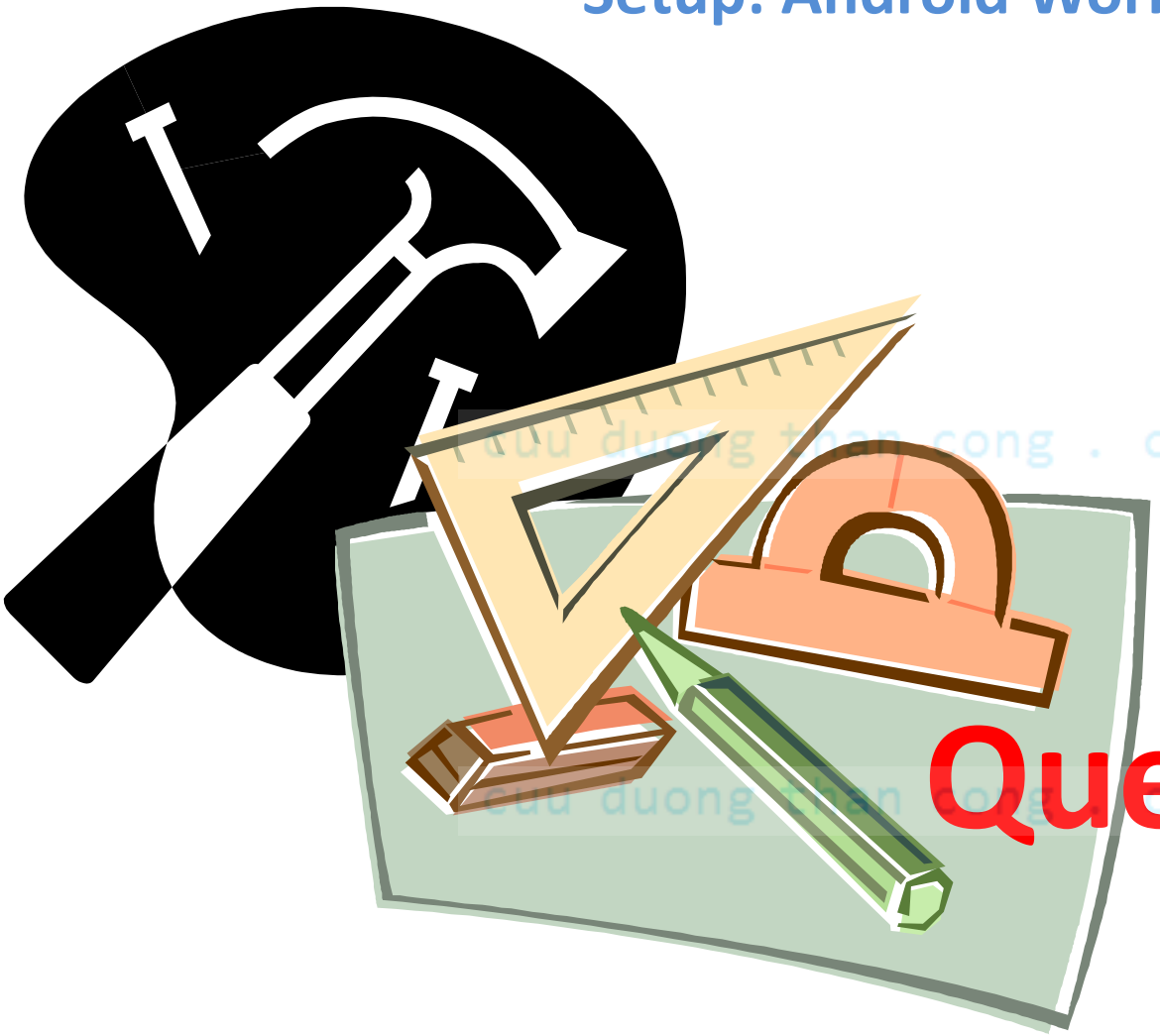
1. **Telephony Status** - change the state of the phone's Voice and Data plans (home, roaming, searching, etc.), and simulate different kinds of network Speed and Latency (GPRS, EDGE, UTMS, etc.).
2. **Telephony Actions** - perform simulated phone calls and SMS messages to the emulator.
3. **Location Controls** - send mock location data to the emulator so that you can perform location-aware operations requiring GPS assistance.
   - Manually send individual longitude/latitude coordinates to the device. Click **Manual**, select the coordinate format, fill in the fields and click **Send**.
   - Use a **GPX file** describing a route for playback to the device.
   - Use a **KML** file to place multiple *placemarker points* on a map

Using Eclipse's DDMS facility

DDMS Telephony Services

Send text-messages
Make a phone call



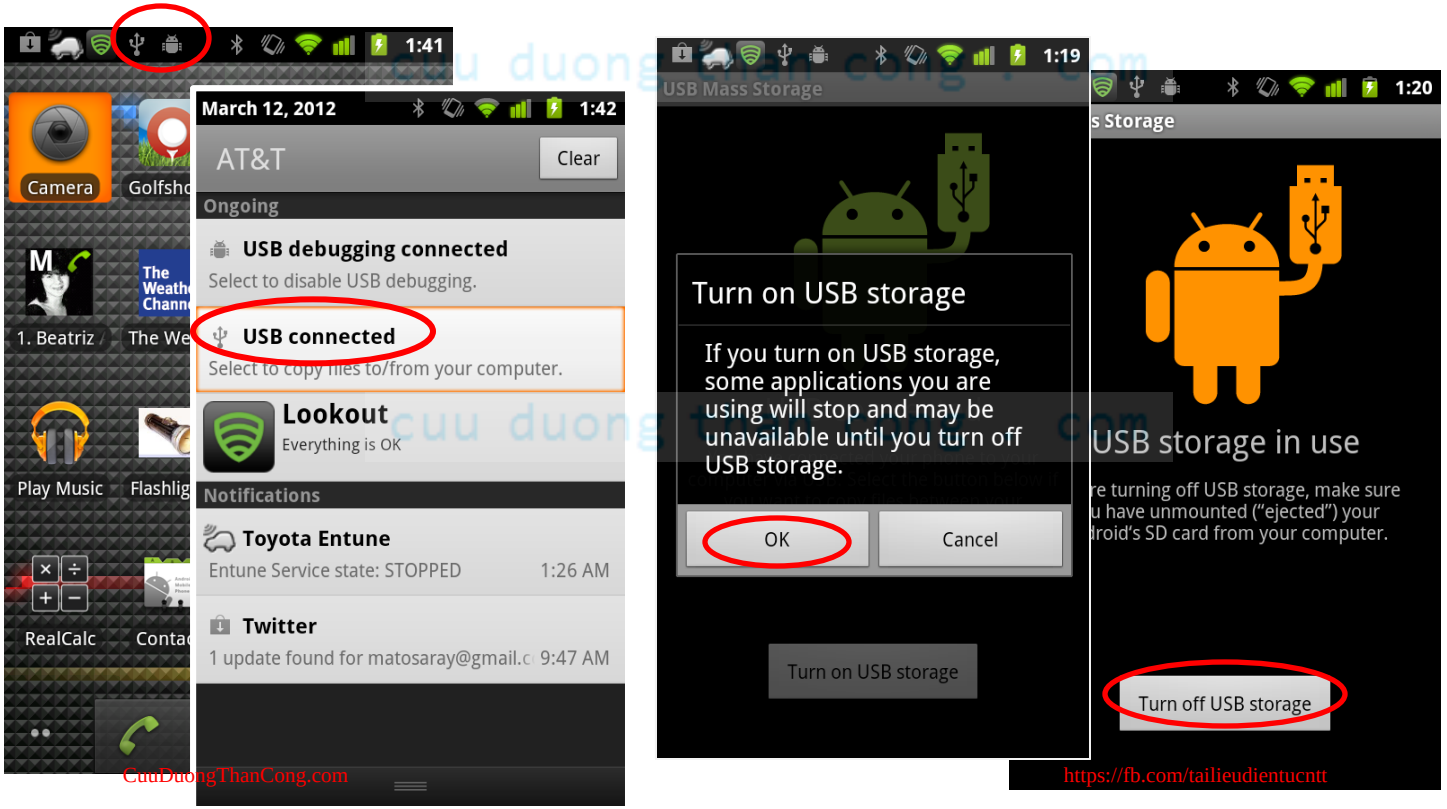


Questions ?

Appendix 1 - Using a Hardware Device

Connecting your Physical Device to the Computer

1. Make sure the USB driver has been installed in your PC (click SDK Manager > Extras > check box [*Google USB driver package*] to install)
2. Use a mini-USB cable to connect the device to your computer.
3. Expand the Notification bar. Click on [*USB connected*] option.
4. Click on [*Turn on USB storage*] to mount the device.
5. Now you could now use the Eclipse-ADT-File Explorer and your Window's Explorer tool to pull/push/delete/rename files to the device.

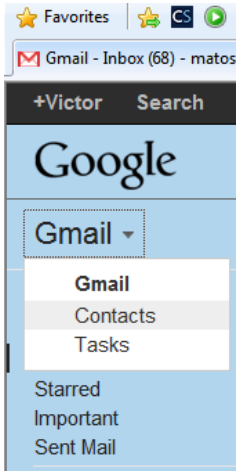


Appendix 2 – Emulator-to-Emulator Interaction

1. Run **two** instances of the emulator (typical IDs are: 5554, 5556, …)
2. Dial (or send SMS) from one of them (say 5554) to the other (5556)
3. Press the Green/Red call buttons to accept/terminate the call
4. Try sending SMS (use numbers 5554 and 5556)

Appendix 3 – Sync your Contacts

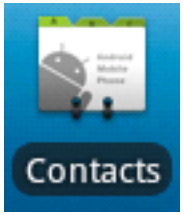
How to Transfer Your Google Contacts into the Emulator



1. Go to your Gmail account using a web browser, click on **Gmail** > **Contacts** on the left sidebar.

2. Select all the contacts you want on your emulator/phone. Then click on **More > Export** and select **vCard** format. Download the "contacs.vcf" file to your PC.

3. Push the contacs.vcf file from the PC to the emulator's **SD card**.



4. Open the emulator's **Contacts** app hit **Menu** > **Import**.

5. Choose the option *Import from SD card*.

Source visited on July 2009, link:
http://stackoverflow.com/questions/1114052/importing-gmail-contacts-on-android-emulator

Appendix 4

Shortcuts: Android-Studio IDE

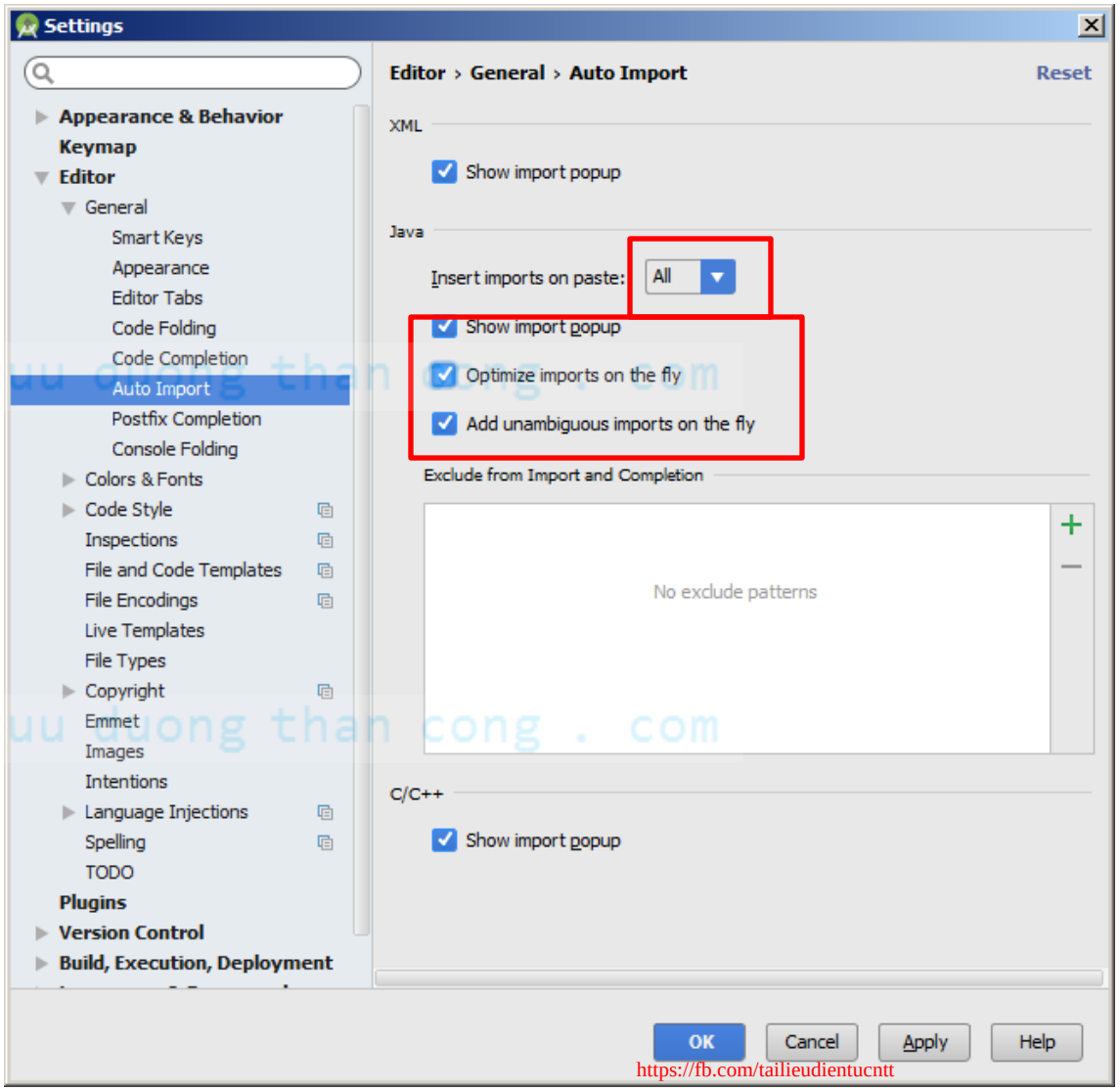
Eclipse developers are used to typing

Ctrl + Shift + O

To **Organize ALL imports**.

To automatically accomplish the same effect, modify your Android Studio Workbench as indicated on the figure to the right.

File > Settings > Editor > General > Auto Import



Appendix 4

Shortcuts: Android-Studio IDE

Operation	Android Studio Shortcut
Reformat code	CTRL + ALT + L
Optimize imports	CTRL + ALT + O
Code Completion	CTRL + SPACE
Issue quick fix	ALT + ENTER
Surround code block	CTRL + ALT + T
Line Comment or Uncomment	CTRL + /
Block Comment or Uncomment	CTRL + SHIFT + /
Close Active Tab	CTRL + F4
Build and run	SHIFT + F10
Build	CTRL + F9
All Options	Ctrl + Shift + A