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An Introduction To Android

"There should be nothing that users can access on their desktop that they can't access on their cell phone."

Andy Rubin

This statement given by Andy Rubin, Google's director of mobile platforms, reflects exactly the goal of the Android mobile stack (a stack inculdes a mobile operating system, middle ware and applications). Android is intended to revolutionize the mobile market by bringing the internet to the cell phone and allowing its use in the same way as on the PC.

Early History

Android, Inc. was founded in Palo Alto, California, United States in October, 2003 by Andy Rubin, Rich Miner , Nick Sears (once VP at T-Mobile), and Chris White (headed design and interface development at WebTV).to develop, in Rubin's words

> "smarter mobile devices that are more aware of its owner's location and preferences."

Despite the obvious past accomplishments of the founders and early employees, Android Inc. operated secretively, admitting only that it was working on software for mobile phones.

In July, 2005 google acquired android.

OHA

In November 2007, a business alliance called Open Handset Alliance(OHA) lead by google. OHA,a business alliance of 80 firms to develop open standard for mobile devices. Members of OHA include Google, HTC, Sony, Dell, Intel, Motorola, Qualcomm, Texas Instruments, Samsung, LG, T-Mobile, Nvidia and Wind RiverSystems.

The Open Handset Alliance released the Google Android SDK on November 12th, 2007, having announced it about a week before.

Members of OHA

Following are the members of OHA

Mobile Operators

- China Mobiles
- KDDI Corpotation
- NTT DoCoMo
- Sprint Nextel
- T-Mobile
- Telecom Italia
- Telefonika

Software Companies

- Ascender Corporation
- eBay
- Esmertec
- Google
- LivingImage
- NMS Communications
- Pocket Video
- SkyPop
- Sonivox

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Commercialisation

- Aplix
- Noser Engineering
- The Astounding Tribe
- Wind River Sstem

Handset Manufacturers

- HTC
- LG
- Samsung Electronics
- Motorola

Semiconductor Companies

- Audience
- Broadcom Corporation
- Intel Corporatin
- Marvell Tecnology Group
- Nvidia Corporation
- Qualcomm

- SiRF Technology Holdings
- Synaptics
- Texas Instrument

What is Android

The term "Android" has its origin in the Greek word andr-, meaning "man or male" and the suffix -eides, used to mean "alike or of the species". This together means as much as "being human

Android is a software platform and operating system for mobile devices, based on the Linux operating system, developed by Google and later the Open Handset Alliance. It allows developers to write managed code in a Java-like language that utilizes Google-developed Java libraries, but does not support programs developed in native code.

Andorid is a software stack for mobile devices which means a reference to a set of system programs or a set of application programs that form a complete system. This software platform provides a foundation for applications just like a real working platform.

The idea of the Android Platform was and still is amazing and is of course attracting more and more programmers every day. Especially the open architecture based on Intents and the possibility to replace even the Home-application grant a really large amount of flexibility to the whole platform.

"Android – Imagination is the limit"

Google within the Open Handset Alliance (OHA) delivers a complete set of software for mobile devices: an operating system, middleware and key mobile applications. What was released a week later was not a final product, but a "***First Look SDK***" what many did not realize. Major news sites grabbed the discomforts of some developers who said that Android is full of bugs and heavily lacks of documentation. But the majority says that Android is not buggier than any other software at this stage.

Let's take a look at what the OHA emphasizes on its Android Platform:

Openness

"Android was built from the ground-up to enable developers to create compelling mobile applications that take full advantage of all a handset has to offer. It is built to be truly open. For example, an application could call upon any of the phone's core functionality such as making calls, sending text messages, or using the camera, allowing developers to create richer and more cohesive experiences for users."

This is true, as a developer you can do everything, from sending short messages with just 2 lines of code, up to replacing even the HOME-Screen of your device. One could easily create a fully customized operating system within weeks, providing no more of Google's default application to the user.

"Android is built on the open Linux Kernel. Furthermore, it utilizes a custom virtual machine that has been designed to optimize memory and hardware resources in a mobile environment. Android will be open source; it can be liberally extended to incorporate new cutting edge technologies as they emerge. The platform will continue to evolve as the developer community works together to build innovative mobile applications."

All applications are created equal

"Android does not differentiate between the phone's core applications and third-party applications. They can all be built to have equal access to a phone's capabilities providing users with a broad spectrum of applications and services. With devices built on the Android Platform, users will be able to fully tailor the phone to their interests. They can swap out the phone's home screen, the style of the dialer, or any of

the applications. They can even instruct their phones to use their favorite photo viewing application to handle the viewing of all photos."

Once again this is all true. Developers can 100% customize their Android-Device. The Android System Communication is based on so called Intents, which are more or less just a String (with some data attached) which defines an action that needs to be handled.

Breaking down application boundaries

"Android breaks down the barriers to building new and innovative applications. For example, a developer can combine information from the web with data on an individual's mobile phone - such as the user's contacts, calendar, or geographic location - to provide a more relevant user experience. With Android, a developer could build an application that enables users to view the location of their friends and be alerted when they are in the vicinity giving them a chance to connect."

Fast & easy application development

"Android provides access to a wide range of useful libraries and tools that can be used to build rich applications. For example, Android enables developers to obtain the location of the device, and allows devices to communicate with one another enabling rich peer-to-peer social applications. In addition, Android includes a full set of tools that have been built from the ground up alongside the platform providing developers with high productivity and deep insight into their applications."

All of the recent hype in the mobile industry has been around the iPhone. But with the unveiling of the open-source, license-free mobile operating system Google Android, that is destined to change. And why is that so?

Android is appealing to developers

• Android apps can be developed on any platform (Windows XP and Vista, Linux, and Mac OSX) where iPhone apps can only be developed on a fairly new Mac.

• iPhone apps require developers to learn Objective-C (which is used almost nowhere outside Apple). But Android is Java which all mobile app developers are familiar with.

• Anyone can develop and launch an Android app whereas Apple has strict control of their App Store.

• Getting your iPhone app available in the App Store requires you to jump through the hoops of an approval process which can take 2-3 months (and could be rejected for "competing"
with a native application!) But Android apps can be available in the Android Market instantly.

Android is feature rich

• Android can support the same hardware as the iPhone: touchscreen, accelerometer,GPS,WiFi,SMS & still camera;plus features that the iPhone doesn't support: MMS, video camera & bluetooth

• Android has some fresh ideas like Google Maps "street view" and customisable home page

• Unlike the iPhone, apps on an Android handset can run in parallel (eg an app running in the background can send an alert)

• The Android platform is open source and extensible by the developer community where as the iPhone is controlled by Apple.

Software stack. of Android –

The software stack has divided in four different layers.

- *The application layer*

  The Android software platform will come with a set of basic applications like browser, email client, SMS program, maps, calendar, contacts and many more. All these applications are written using the Java programming language. It should be mentioned that applications can be run simultaneously, it is possible to hear music and read an email at the same time. This layer will mostly be used by commonly cell phone users.

- *The application framework*

  An application framework is a software framework that is used to implement a standard structure of an application for a specific operating system. With the help of managers, content providers and other services programmers it can reassemble functions used by other existing applications.

- *The libraries*

  The available libraries are all written in C/C++. They will be called through a Java interface. These includes the Surface Manager (for compositing windows), 2D and 3D graphics,

Media Codecs like MPEG-4 and MP3, the SQL database SQLite and the web browser engine WebKit.

- *The kernel*

  The Linux Kernel will be used by Android for its device drivers, memory management, process management and networking.

The following diagram shows the major component of Android Operating system listed above.

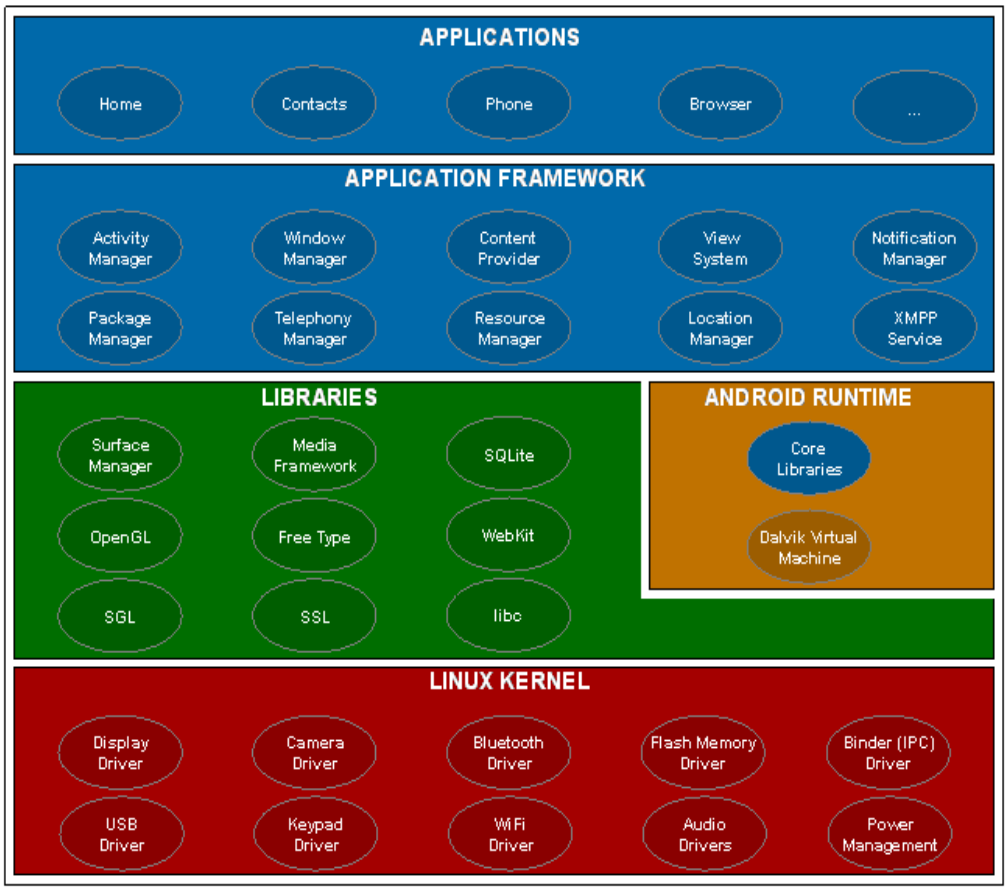


Figure: Major component of Android Operating System

Android offers many features cover many areas such as application development, internet, media and connectivity. Some of the most important ones are presented in the following list

- **Application framework** enabling reuse and replacement of components.
- **Dalvik virtual machine** optimized for mobile devices
- **Integrated browser** based on the open source WebKit engine

- **Optimized graphics** powered by a custom 2D graphics library, 3D graphics based on the OpenGL ES 1.0 specification (hardware acceleration optional)
- **SQLite** for structured data storage
- **Media support** for common audio, video, and still image formats(MPEG4, H.264, MP3, AMR, JPG. PNG, GIF)
- **GSM Telephony** (hardware dependent)
- **Bluetooth,** EDGE, 3G, and WiFi (hardware dependent)
- **Camera**, GPS, compass, and accelerometer (hardware dependent)
- **Rich development environment** including a device emulator, tools for debugging memory and performance profiling, and plugin for the Eclipse IDE

The another software stack of android is Runtime

- *Runtime*

  There are two parts of Android Runtime Stack.

- *Core Libraries*
  - ✓ Providing most of the functionality available in the core libraries of the Java language.
  - ✓ APIs
    - ➢ Data Structures
    - ➢ Utilities
    - ➢ File Access
    - ➢ Graphics
    - ➢ Etc.

- *Delvik Vertual Machine(DVK)*

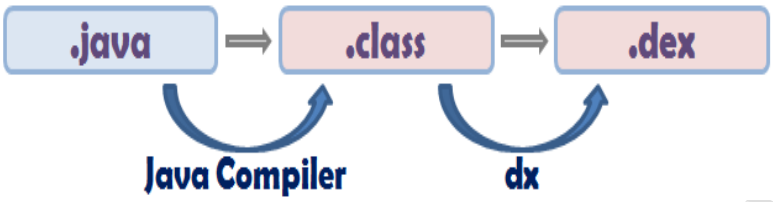
  - ✓ Providing environment on which every Android application runs.

    - ➢ Each Android application runs in its own process, with its own instance of the Dalvik VM.
    - ➢ Dalvik has been written so that a device can run multiple VMs efficiently.

  - ✓ Register based virtual machine
    - ➢ In the words "register based" we find the first difference to *normal* Java virtual machines (JVM) which are stack based.

  - ✓ It is an interpreter-only virtual machine that executes files in the Dalvik Executable (*.dex) format, a format that is optimized for efficient storage and memory-mappable execution .

- .dex format is optimized for minimal memory footprint.
- Compilation



✓ Relying on the Linux Kernel for:

- Threading
- Low-level memory management

There are four building blocks to an Android application

- ***Activity*** **-** a single screen
- ***Intent Receiver*** **-** to execute in reaction to an external event
- ***Service*** **-** code that is long-lived and runs without a UI
- ***Content Provider*** **-** an application's data to be shared with other applications

Activity

Activities are the most common of the four Android building blocks. An activity is usually a single screen in your application. Each activity is implemented as a single class that extends the Activity base class. Your class will display a user interface composed of Views and respond to events. Most applications consist of multiple screens. For example, a text messaging application might have one screen that shows a list of contacts to send messages to, a second screen to write the message to the chosen contact, and other screens to review old messages or change settings. Each of these screens would be implemented as an activity. Moving to another screen is accomplished by a starting a new activity.

In some cases an Activity may return a value to the previous activity – for example an activity that lets the user pick a photo would return the chosen photo to the caller.

When a new screen opens, the previous screen is paused and put onto a history stack. The user can navigate backward through previously opened screens in the history. Screens can also choose to be removed from the history stack when it would be inappropriate for them to remain. Android retains history stacks for each application launched from the home screen.

Intent/Intent filters

` Android uses a special class called `Intent` to move from screen to screen. Intent describe what an application wants done. The two most important parts of the

intent data structure are the action and the data to act upon. Typical values for action are MAIN (the front door of the application), VIEW, PICK, EDIT, etc. The data is expressed as a Uniform Resource Indicator (URI). For example, to view a website in the browser, you would create an Intent with the VIEW action and the data set to a Website-URI.

There is a related class called an IntentFilter. While an intent is effectively a request to do something, an intent filter is a description of what intents an activity (or intent receiver, see below) is capable of handling. An activity that is able to display contact information for a person would publish an IntentFilter that said that it knows how to handle the action VIEW when applied to data representing a person. Activities publish their IntentFilters in the *AndroidManifest.xml* file.

Navigating from screen to screen is accomplished by resolving intents. To navigate forward, an activity calls `startActivity(myIntent)`. The system then looks at the intent filters for all installed applications and picks the activity whose intent filters best matches `myIntent`. The new activity is informed of the intent, which causes it to be launched. The process of resolving intents happens at run time when startActivity is called, which offers two key benefits:

- Activity can reuse functionality from other component simply by making a request in the form of an Intent.
- Activities can be replaced at any time by a new activity with an equivalent IntentFilter.

Intent Reciver

We can use an `IntentReceiver` when you want code in your application to execute in reaction to an external event, for example, when the phone rings, or when

the data network is available, or when it's midnight. Intent receivers do not display a UI, although they may display `Notifications` to alert the user if something interesting has happened. Intent receivers are also registered in `AndroidManifest.xml`, but you can also register them from code using `Context.registerReceiver()`. Your application does not have to be running for its intent receivers to be called; the system will start your application, if necessary, when an intent receiver is triggered. Applications can also send their own intent broadcasts to others with `Context.broadcastIntent()`

Service

A `Service` is code that is long-lived and runs without a UI. A good example of this is a media player playing songs from a play list. In a media player application, there would probably be one or more activities that allow the user to choose songs and start playing them. However, the music playback itself should not be handled by an activity because the user will expect the music to keep playing even after navigating to a new screen.

In this case, the media player activity could start a service using `Context.startService()` to run in the background to keep the music going. The system will then keep the music playback service running until it has finished. (You can learn more about the priority given to services in the system by reading Life Cycle of an Android Application.) Note that you can connect to a service (and start it if it's not already running) with the `Context.bindService()` method. When connected to a service, you can communicate with it through an interface exposed by the service. For the music service, this might allow you to pause, rewind, etc.

Content Provider

Applications can store their data in files, a SQLite database, preferences or any other mechanism that makes sense. A content provider, however, is useful if you want your application's data to be shared with other applications. A content provider is a class that implements a standard set of methods to let other applications store and retrieve the type of data that is handled by that content provider.

Android User Interface(UI)

User Interfaces (UI) in Android can be built within two ways, by defining XML-Code or by writing Java-Code. Defining the GUI structure in XML is highly preferable, because as one knows from the Model-Viewer-Control principle that the UI should always be separated from the program-logic. Additionally adapting a program from one screen-resolution to another is a lot easier. Defining a UI in XML is very similar to creating a common HTML-document, where you have i.e. such a simple file:

```
<html>
<head>
 <title>Page Title</title>
 </head>
<body>
        The content of the body element.
 </body>
 </html>
```

Just the same as in Android's XML-Layouts. Everything is well structured and can be expressed by tree-structures:

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
 xmlns:android=http://schemas.android.com/apk/res/android
        android:orientation="vertical"
       android:layout_width="fill_parent"
       android:layout_height="fill_parent">
           <TextView
                android:layout_width="wrap_content"
               android:layout_height="wrap_content"
               android:text="Hello World"/>
</LinearLayout>
```

Hierarchy of Screen Elements

The basic functional unit of an Android application is the activity-an object of the class `android.app.Activity`. An activity can do many things, but by itself it does not have a presence on the screen. To give your activity a screen presence and design its UI, you work with views and viewgroups - basic units of user interface expression on the Android platform.

Views

A view is an object extending the base class `android.view.View`. It's a data structure whose properties store the layout and content for a specific rectangular area of the screen. A View object handles measuring, its layout, drawing, focus changes, scrolling, and key/gestures for the screen area it represents.

The View class serves as a base class for all widgets - a set of fully implemented subclasses that draw interactive screen elements. Widgets handle their own measuring and drawing, so you can use them to build your UI more quickly. The list of widgets available includes i.e. TextView, EditText, Button, RadioButton, Checkbox, ScrollView, …

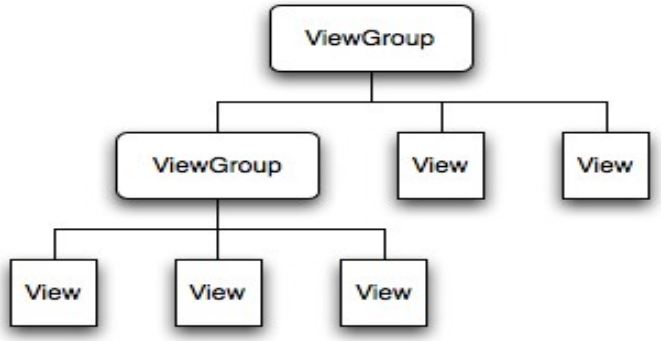
Viewgroups

A viewgroup is an object of class `android.view.Viewgroup`. As its name indicates, a viewgroup is a special type of view object whose function is to contain and manage a subordinate set of views and other viewgroups, Viewgroups let you add structure to your UI and build up complex screen elements that can be addressed as a single entity.

The Viewgroup class serves as a base class for layouts - a set of fully implemented subclasses that provide common types of screen layout. The layouts give you a way to build a structure for a set of views.

A Tree Structure UI

On the Android platform, you define an Activity's UI using a tree of view and viewgroup nodes, as shown in the diagram below. The tree can be as simple or complex as you need to make it, and you can build it up using Android's set of predefined widgets and layouts or custom view types that you create yourself.



Picture : Android UI – Tree Structure

To attach the tree to the screen for rendering, your Activity calls its `setContentView()` method and passes a reference to the root node object. Once the Android system has the reference to the root node object, it can work directly with the node to invalidate, measure, and draw the tree. When your Activity becomes active and receives focus, the system notifies your activity and requests the root node to measure and draw the tree. The root node then requests that its child nodes draw themselves - in turn, each viewgroup node in the tree is responsible for drawing its direct children.

```
// Android
myView.setOnClickListener(new OnClickListener(){ ...

//
Swing
myButton.addActionListener(new ActionListener() {...
```

The *AndroidManifest.XML* file

Before the Android system can start an application component, the system must know that the component exists by reading the application's *AndroidManifest.xml* file (the "manifest" file). Your application must declare all its components in this file, which must be at the root of the application project directory.

The manifest does a number of things in addition to declaring the application's components, such as:

- Identify any user permissions the application requires, such as Internet access or read-access to the user's contacts
- Declare the minimum API Level required by the application, based on which APIs the application uses.
- Declare hardware and software features used or required by the application, such as a camera, bluetooth services, or a multitouch screen.
- API libraries the application needs to be linked against (other than the Android framework APIs), such as the Google Maps library.

Besides declaring our application's Activities, Content Providers, Services, and Intent Receivers, we can also specify permissions in `AndroidManifest.xml`.

A very simple AndroidManifest.XML looks like this :

```
<manifest xmlns:android=http://schemas.android.com/apk/res/android
package="org.anddev.android.hello_android">
<application android:icon="@drawable/icon">
        <activity android:name=".Hello_Android"
                  android:label="@string/app_name">
                <intent-filter>
                  <action android:name="android.intent.action.MAIN" />
                  <category
android:name="android.intent.category.LAUNCHER" />
                </intent-filter>
        </activity>
</application>
</manifest>
```

What follows is a detailed list of the structure of an `AndroidManifest` file, describing all available `<tags>`

Let's discuss about each tag of AndroidManifet file

<manifest>

This is the root node of each AndroisManifest.xml. It contains the package-attribute, which points to any package in out Activity.

<uses-permission>

Describes a security permission, which your package must be granted in order for it to operate correctly (i.e. when you want to send SMS or use the Phone-Contacts). The permissions get granted by the user during installation of your application.

<permission>

Declares a security permission that can be used to restrict which applications can access components or features in your (or another) package.

<instrumentation>

Declares the code of an instrumentation component that is available to test the functionality of this or another package. See Instrumentation for more details.

<application>

Root element containing declarations of the application-level components contained in the package. This element can also include global and/or default attributes for the application, such as a label, icon, theme, required permission

<activity>

An Activity is the primary thing for an application to interact with the user. The initial screen the user sees when launching an application is an activity, and most other screens they use will be implemented as separate activities declared with additional activity tags.

Note: *Every Activity must have an <activity> tag in the manifest whether it is exposed to the world or intended for use only within its own package. If an Activity has no matching tag in the manifest, you won't be able to launch it.*

<intent-filter>

Declares what kind of Intents a component supports. In addition to the various kinds of values that can be specified under this element, attributes can be given here to supply a unique label, icon, and other information for the action being described.

<action>
An action-type that the component supports.

<category>
A category-type that the component supports.

<data>
An MIME type, URI scheme, URI authority, or URI path that the component supports. You can also associate 1+ pieces of meta-data with your activity:

<meta-data>

Adds a new piece of meta data to the activity, which clients can retrieve through ComponentInfo.metaData.

<receiver>

An IntentReceiver allows an application to be told about changes to data or actions that happen, even if it is not currently running. As with the activity tag, you can optionally include 1+ <intent-filter> elements that the receiver supports or <meta-data> values, just all the same as with <activity>.

<service>

A Service is a component that can run in the background for an arbitrary amount of time. As with the activity tag, you can optionally include one or more <intent-filter> elements that the service supports or <meta-data> values; see the activity's <intent-filter> and <meta-data> descriptions for more information.

<provider>

A ContentProvider is a component that manages persistent data and publishes it for access by other applications. You can also optionally attach one or more <meta-data> values, as described in the activity's <meta-data> description.

Installation of Android

For installing Android to our system we have to download and install the Eclipse IDE.

Android applications are developed in Java. Android itself is not a language, but rather an environment within which to run applications. As such, we can theoretically use any distribution or integrated development environment (IDE) you have at your disposal to begin your development.

If you are more comfortable with one Java IDE over any other, such as JBuilder by Borland or the open source NetBeans, feel free to use it. However, the Open Handset Alliance and Google do endorse one Java IDE over any others: Eclipse

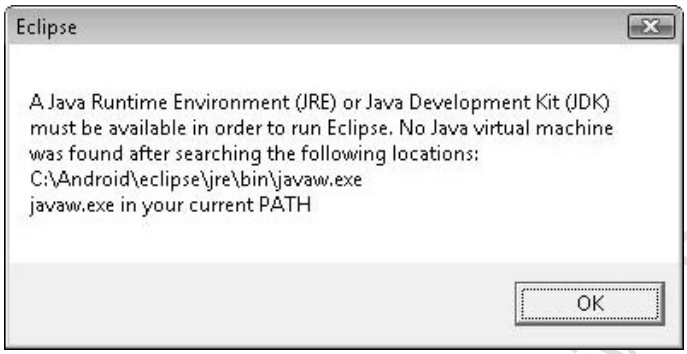
Before installing Eclipse a question occurs in our mind that **why we use Eclipse.**
So there are following reasons why we are using Eclipse. These are :

- In keeping with the Open Handset Alliance's theme of truly opening the mobile development market, Eclipse is one of the most fully featured, free, Java IDEs available. Eclipse is also very easy to use, with a minimal learning curve. This makes Eclipse a very attractive IDE for solid, open Java development.
- The Open Handset Alliance has released an android plugin for Eclipse that allows us to create Android-specific projects, compiling them, and use the Android Emulator to run and debug them. These tools and abilities will prove invaluable when we are creating our first Android apps. We can still create Android apps in other IDEs, but the Android plugin for Eclipse creates certain setup elements- such as files and compiler settings for us.

.

Downloading and installing JRE

Before we start downloading and installing Eclipse we have to make sure that we have Java Runtime Environment(JRE) downloaded and installed in our machine. Because Eclipse as an application was written in java, it requires the JRE to run. If JRE is not installed or is not detected, we will see the following error, if we try to open Eclipse environment.



If you are an existing Java developer and already have Java installed on your computer, you will still want to follow along here, just to be sure you have the correct version of the JRE installed.

Note : *Most people who have used the Web, or applications that are web-based, have the JRE installed. The JRE allows us to run Java-based applications, but it does not allow us to create them. To create Java applications, we need to download and install the Java Development Kit (JDK), which contains all the tools and libraries needed to create Java applications. If we are not familiar with Java, keep these differences in mind. For the examples in this book, we will be downloading the JDK, because it also includes the JRE.*

For downloading the JDK

Navigate

http://www.oracle.com/technetwork/java/javase/downloads/index.html

And we will see the following page to download JDK

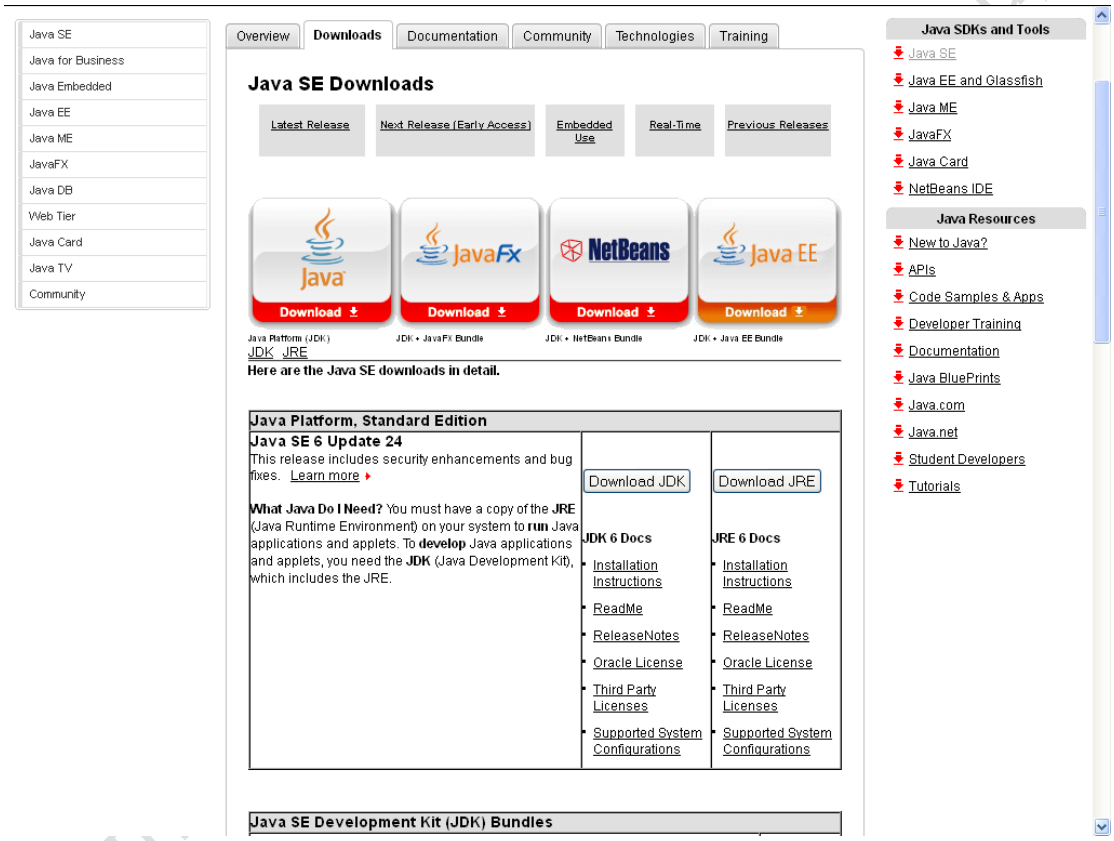


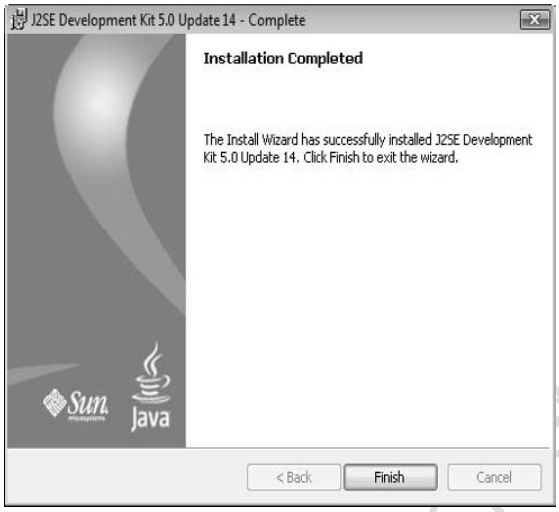
Figure : Download page for downloading JDK

If you are downloading to a Microsoft Windows environment, when you see the notification in the following illustration, click Run to begin the installation of the JDK.

If you want to have a copy of the JDK then click on the save button, and after saving run it to your machine.

During the installation process, you will be prompted to read and accept the License Agreement, shown next. After agreeing to the standard License Agreement and clicking Next, you will be able to select your custom setup options.

To keep the process simple, and fairly standardized, you should accept the suggested packages—by default everything is selected—and continue the installation by clicking Next. Once again, if you are comfortable with making specific changes, feel free to do so. However, if you have trouble in later chapters, you will want to modify your installation options. When the Installation Completed page appears, shown in the following illustration, click Finish and your installation should be completed.

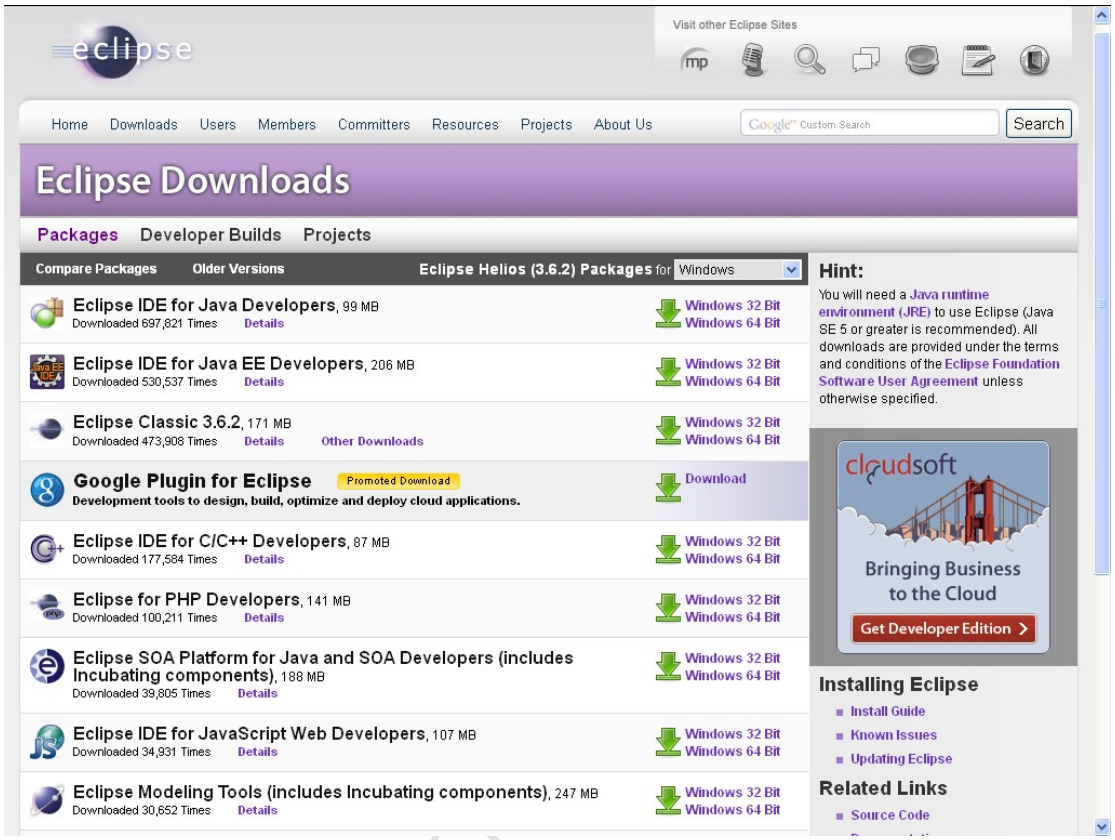


Once we complete the Java JDK installation—and by default the JRE Installation we can begin to install Eclipse.

Downloading and installing Eclipse

For downloading Eclipse navigate :

http://www.eclipse.org/downloads/

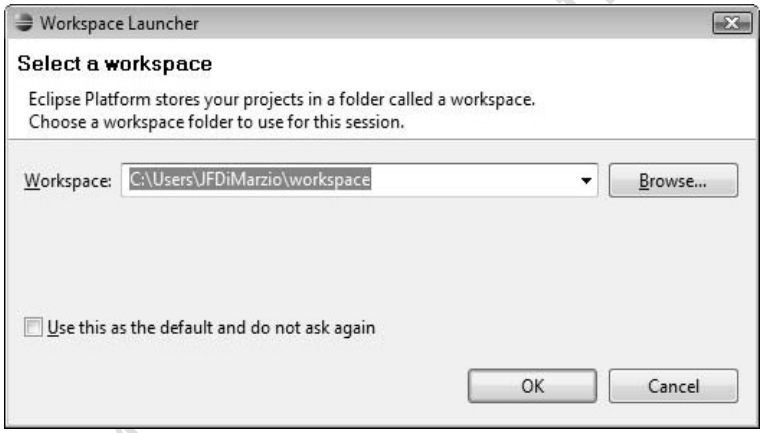


Download Eclipse classic 3.6.2 from list and save it to your machine.

After saving, unzip this to any directory drive of your machine.

Run the eclipse form the folder it is located, and you will see following figure.

Once it starts then it will ask to create workspace to your system. Where it will save your all projects by default. For making workspace the following screen will come



After you select a location for your workspace, click OK.

At this point, your development environment is downloaded and installed. While the installation of Eclipse seemed deceivingly quick, you still need to do some configuration work before you can create your first Android project. Much of the configuration work that you need to do centers on the Android SDK and the Android plugin for Eclipse.

Downloading SDK and Android plugin for Eclipse.

The android SDK can be download from the following URL

http://developer.android.com/sdk/index.html

After clicking it following page will open to the screen.

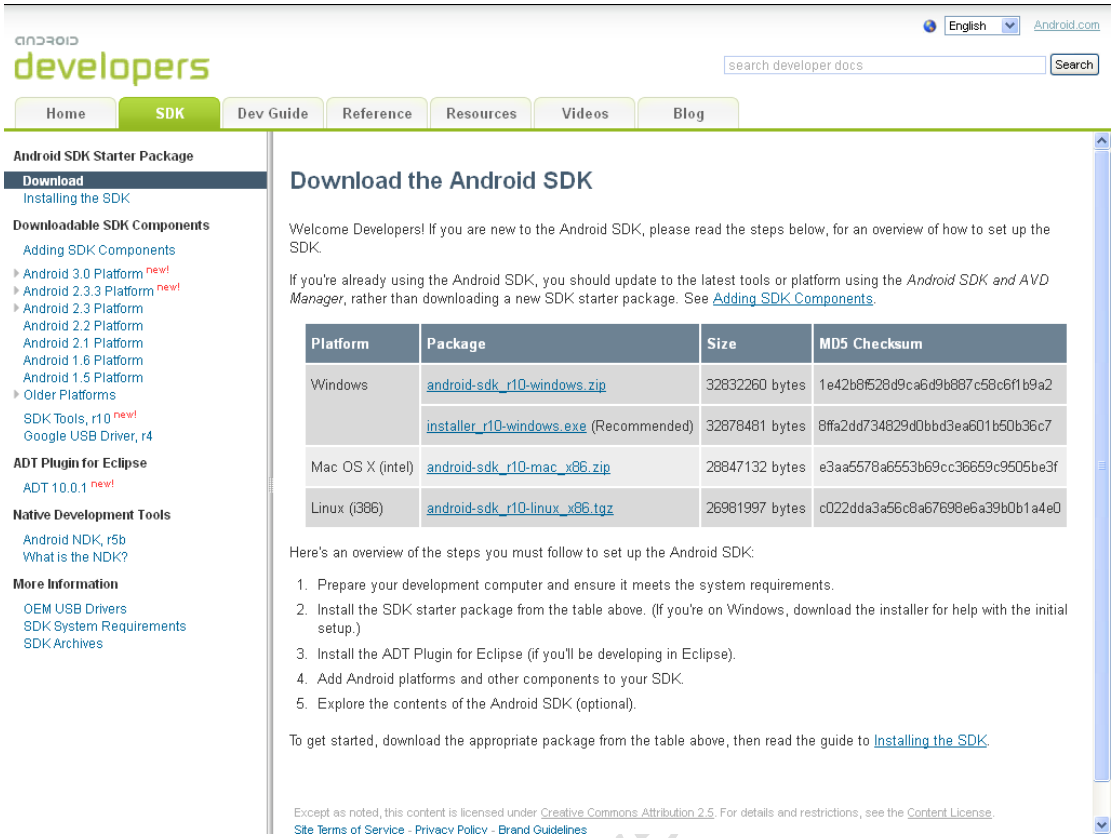


Figure : Android SDK Location page

Select SDK's latest version for your machine from the list and save the zip file to any disk drive of your machine.

Unzip the zip folder at any location.

There is no "setup" or installation process to speak of for the Android SDK; rather, you must follow a series of steps to associate the SDK with your Eclipse development environment. The first of these steps is to obtain the Android plugin for Eclipse, after which you will configure it.

Click on SDK manager from android-sdk folder. After clicking on it this will start downloading SDK Release for android till date.

This may take time depending on your internet connection speed.

Downloading and installing Eclipse Plugin

You can install plugin by two steps.

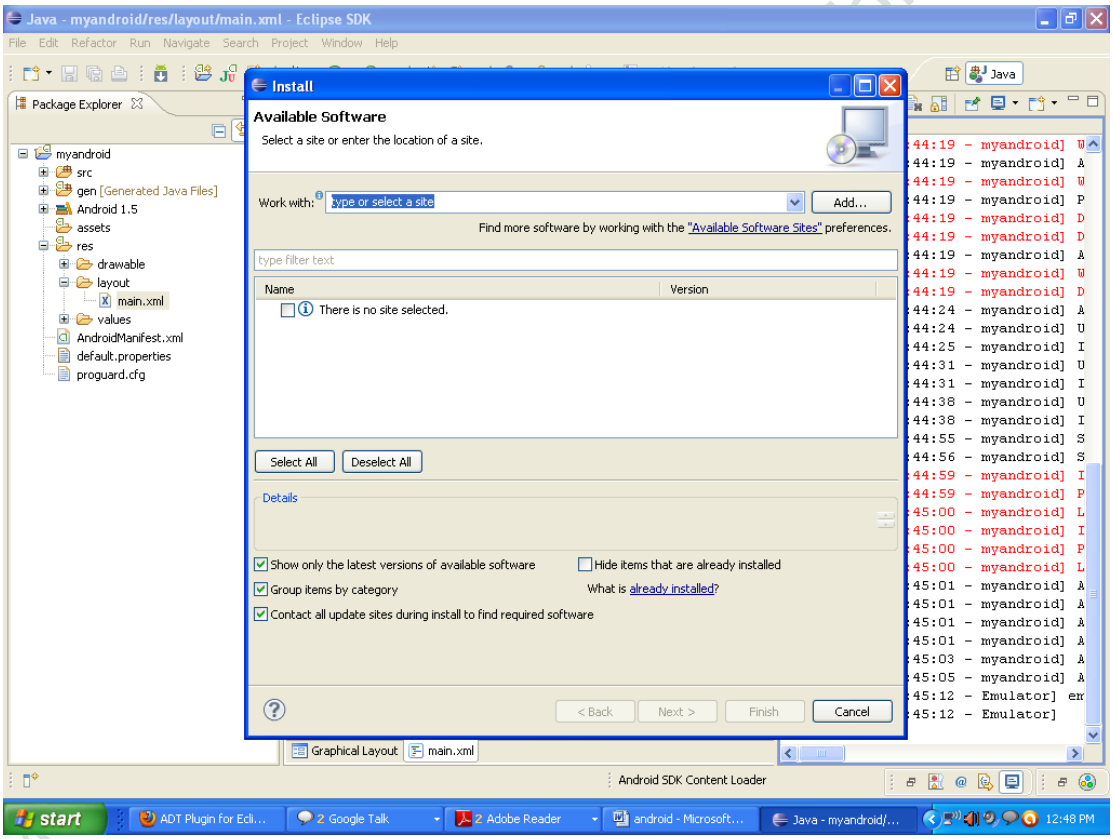
1. By giving the location of ADT Plugin from Eclips SDK

   We can install it by Step by step.

2. **Go to help menu of Eclips and click install new software**

   A new window will open . Write down the following URL to the work with box., or click on add button and give the url to the box, and give the name ADT Plugin or any thing you want.

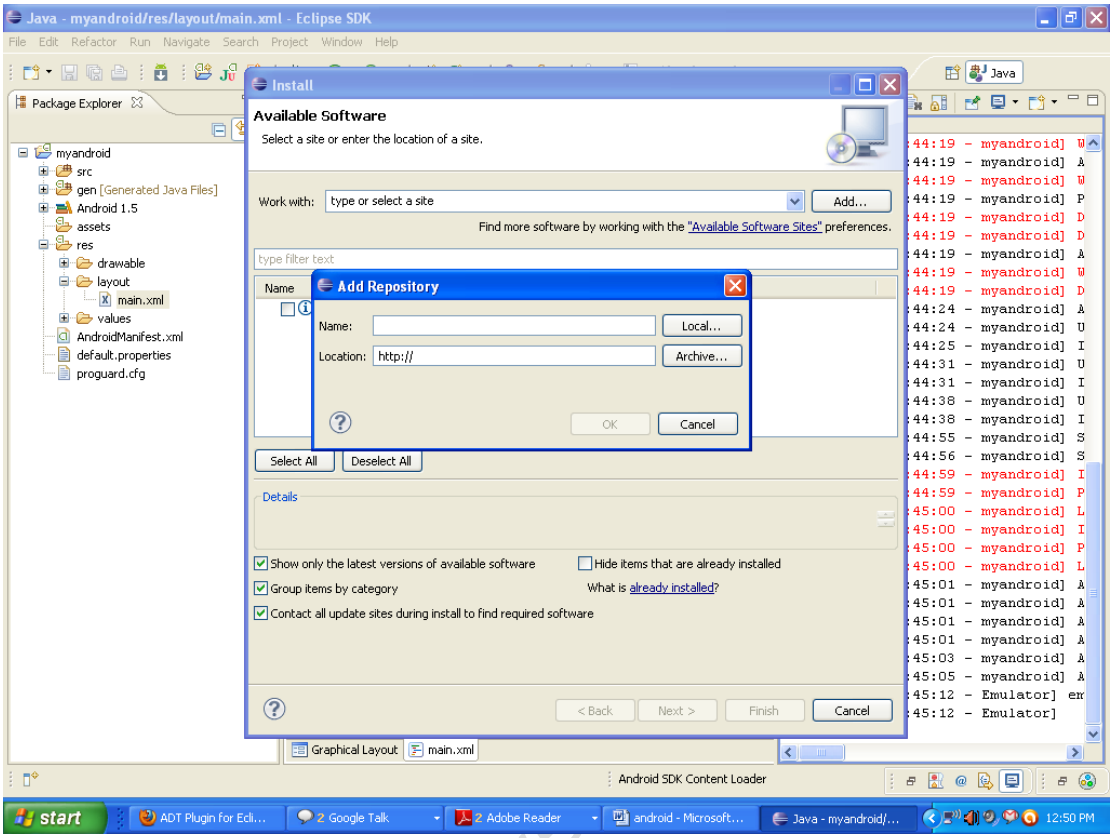
URL : `https://dl-ssl.google.com/android/eclipse/`



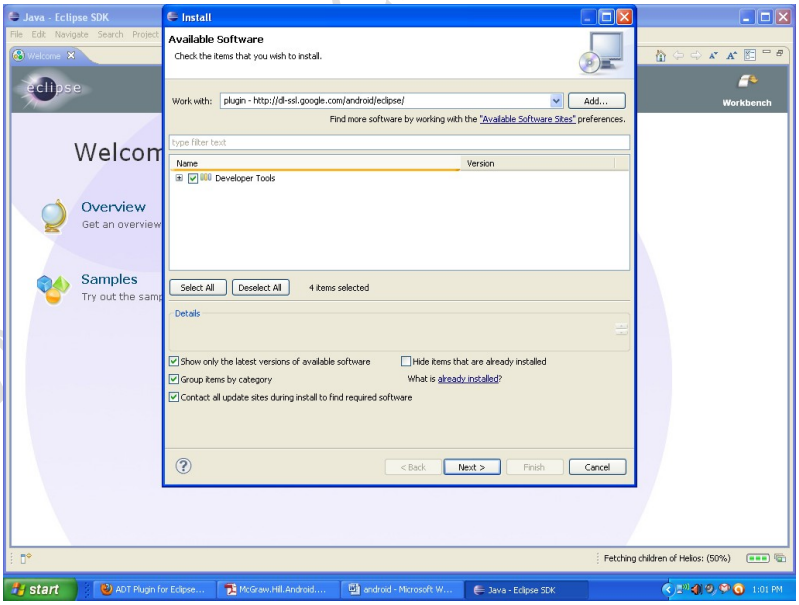
Give Url to the work with text box or click on add button

3. **After clicking on add the following screen will appear.**

   Give any name and url of plugin and click ok.

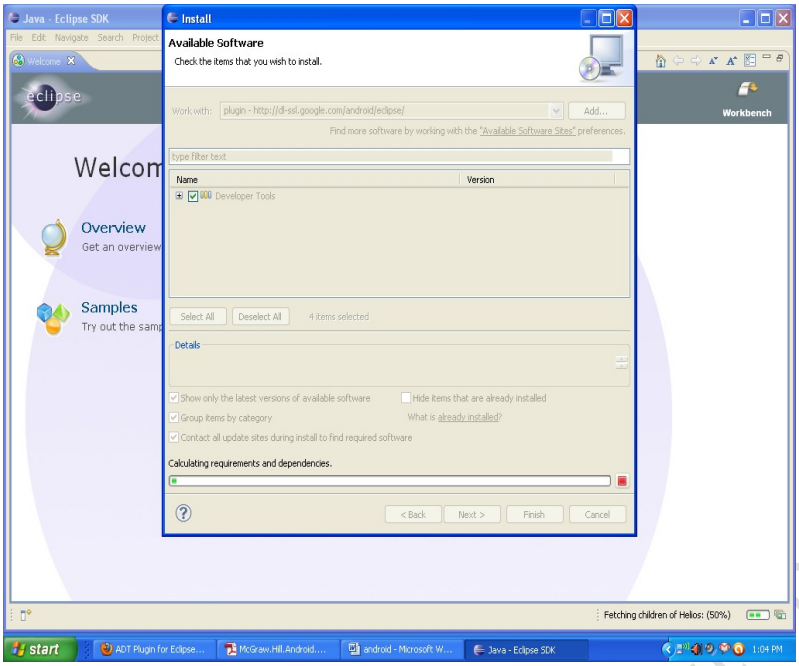


4. **After writing url and clicking OK a window will open**



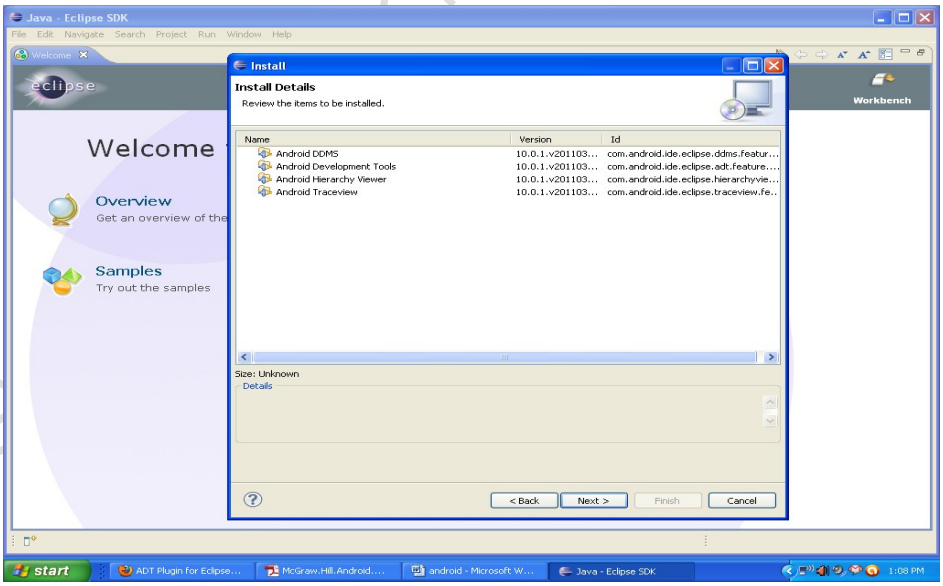
5. Click on **select all** button and then click on **next**

   Eclips will start downloading plugins .

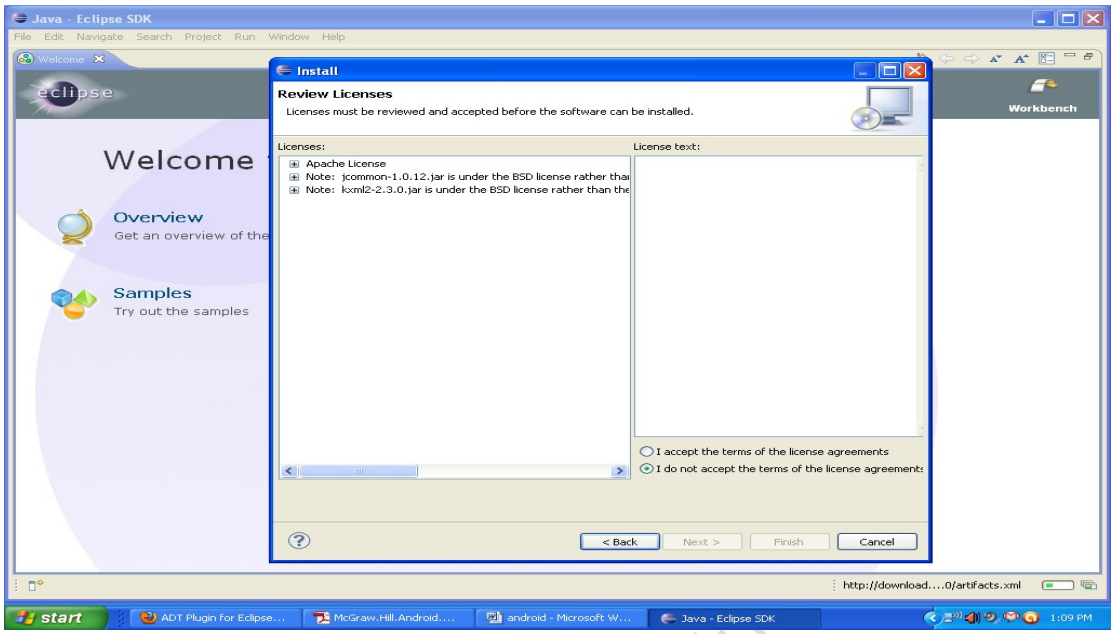


6. Click **next after processing.**

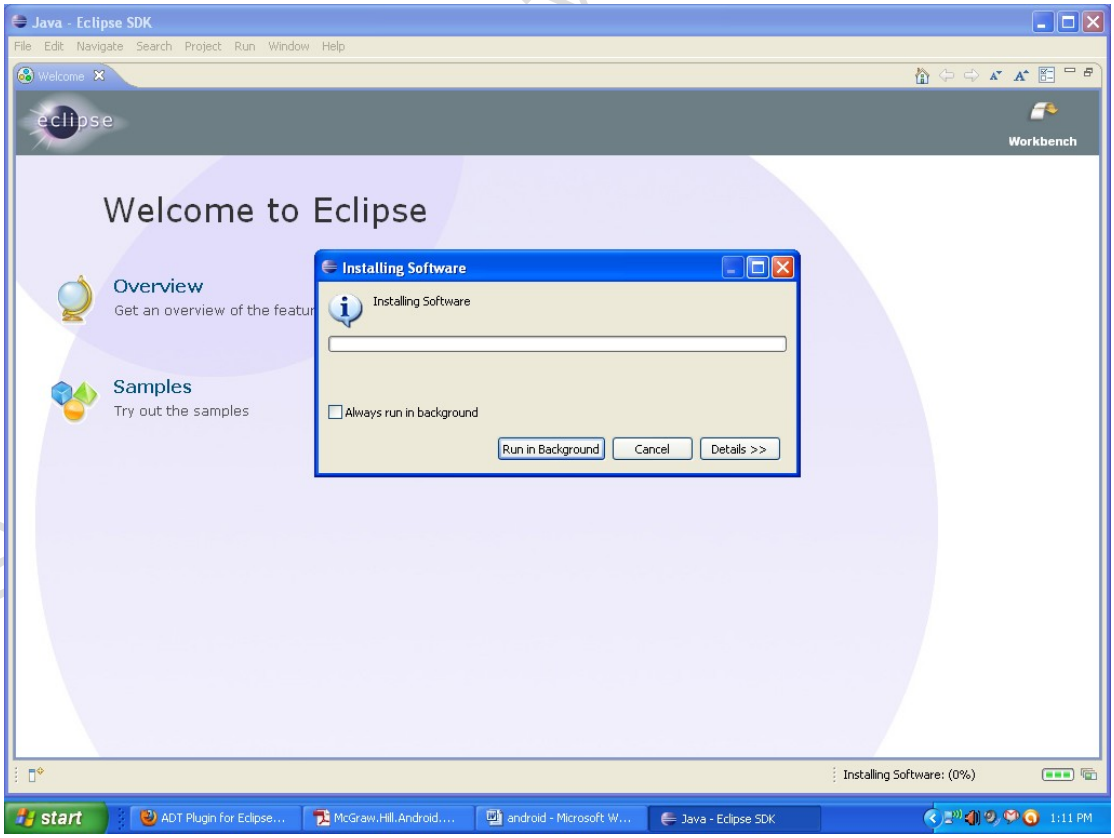
A new window appears



7. **Click on next and check combo box for accepting the license agreement and then click finish.**



Clicking on finish this will start downloading application.



After this it will ask you to restart your Eclipse, click Ok.

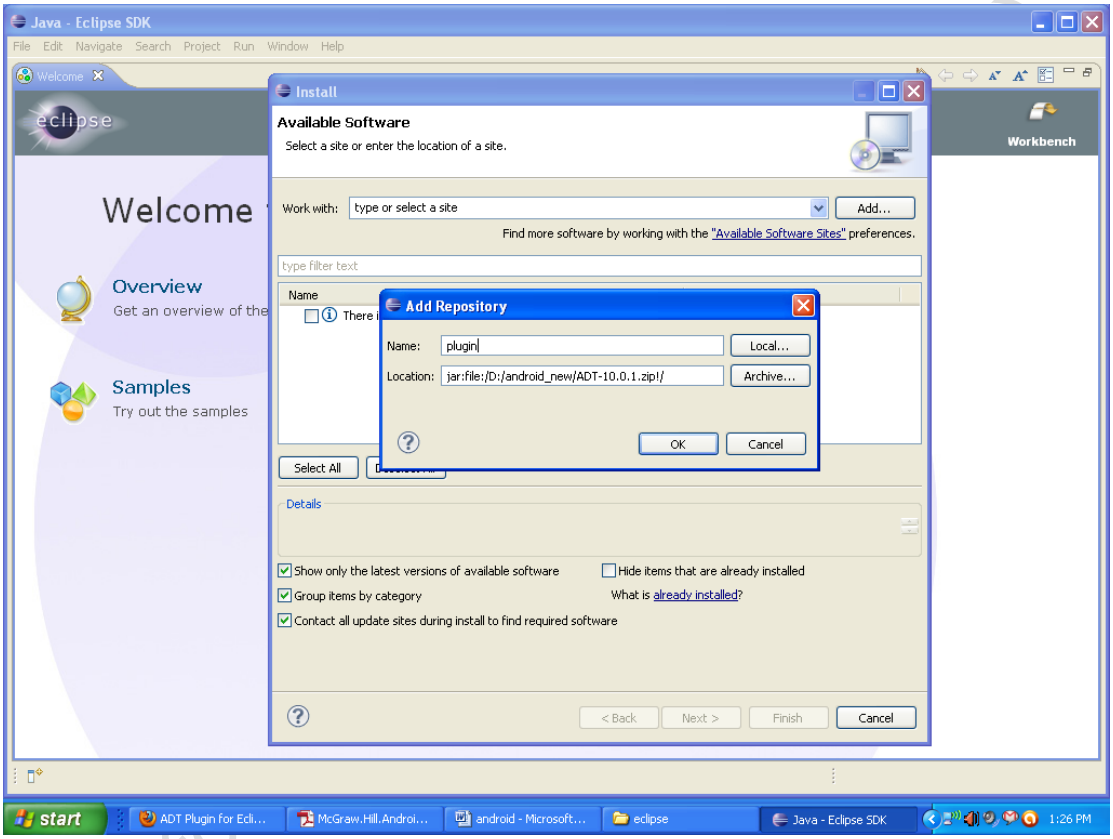
The another way to install ADT plugin

1. **Download ADT plugin from the following url**

http://developer.android.com/sdk/eclipse-adt.html#installing

and save it in your system as a zip folder.

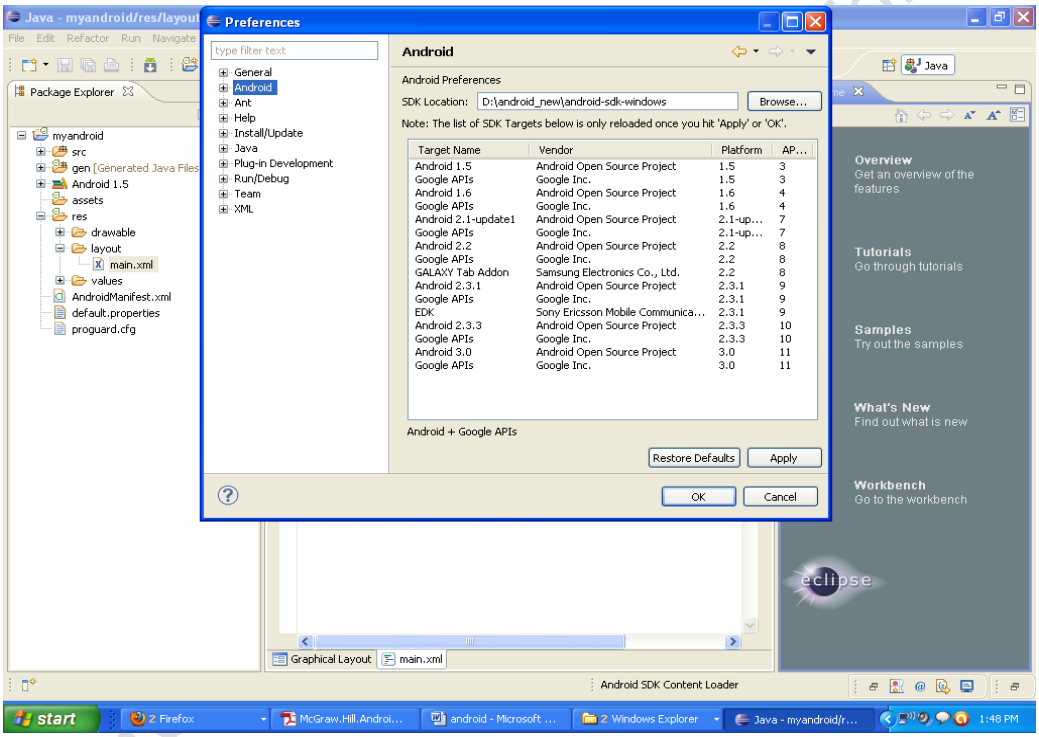
2. **Follow step 2 and 3 form previous installation**
3. **In step 3 instead of giving url click on archive button and give the path of your ADT Plugin zip file and then click ok.**



4. **And follow steps 4-7 for remaining installation.**

The Android plugin for Eclipse is configured from the Preferences window of Eclipse. Proceed as follows:

- **From the main Eclipse window, choose Window | Preferences.**
- **In the preference window, shown next, select Android in the menu on the left. On the right side of window, click browse, find the location of android SDK on your hard drive, and enter in the SDK location field. Eclipse need this information to be able to access all the same tools that are supplied with Android.**



- **Click apply and then OK.**

Creating the Virtual Device

After installation of Android SDK we are all set to make android application, but before making and running applications we have to add a virtual device. Virtual devise is nothing, a clone of a phone devise ehich runs on the machine, just like a real devise, with the help of this devise we can test our application to the machine if we don't have the cell phone device.

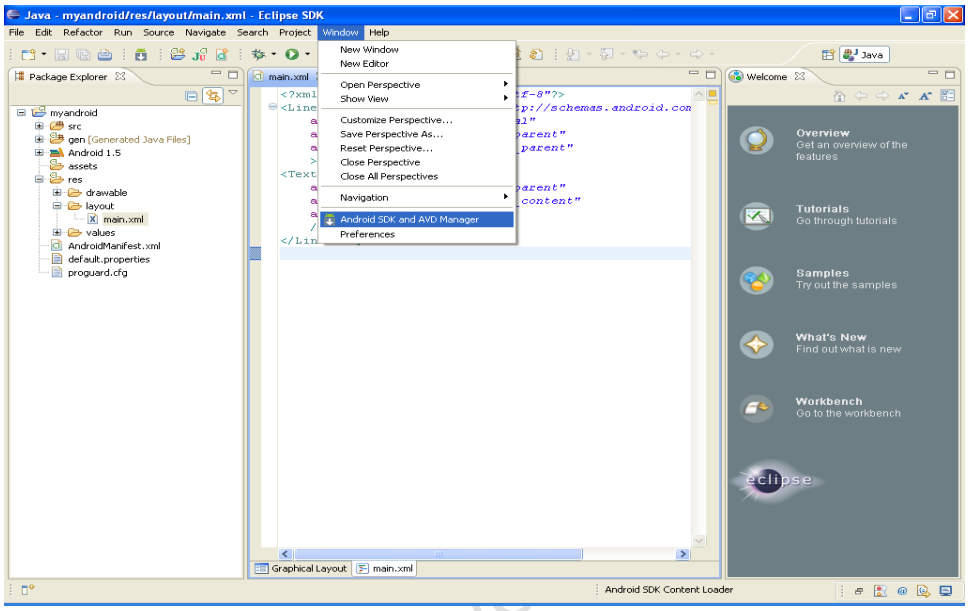
Following image is a virtual device's image.

We can create virtual device according to different versions of android application. This is the android 1.5 version's device.

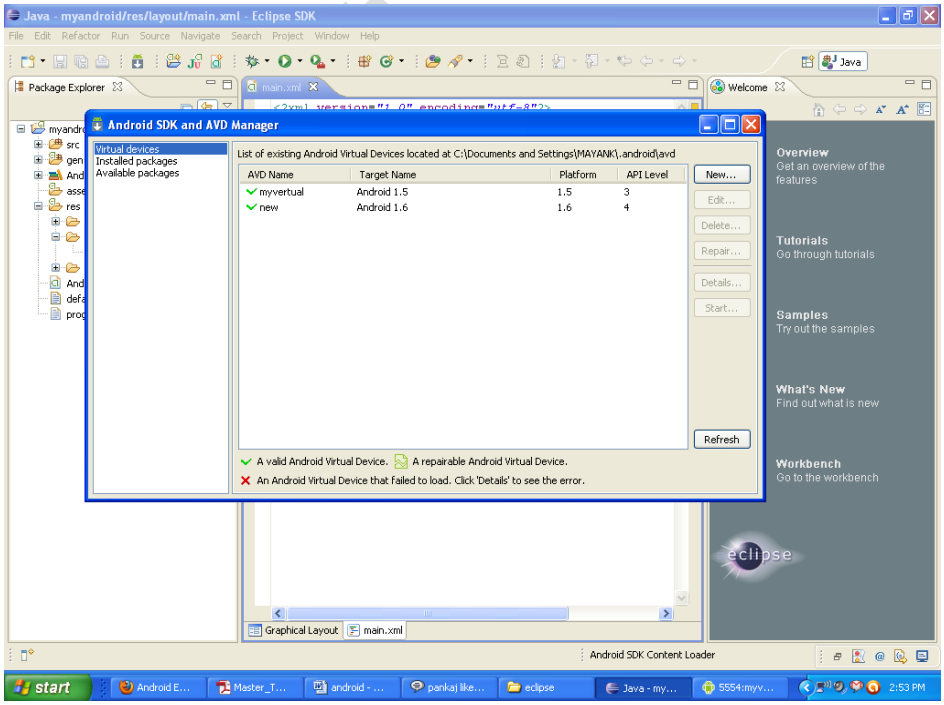
How to add a virtual device

Following are the steps of adding virtual device

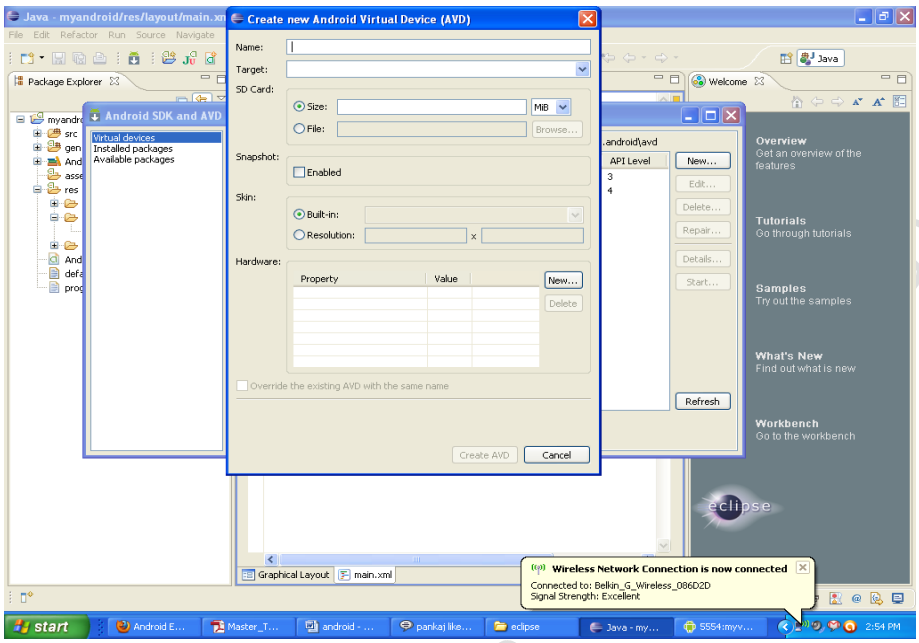
- Go to **Window** menu of Eclipse then click on **the Android SDK and AVD manager**



- On the left side click on the **virtual device**
- From the right side click on **New** button



- In the next window give the name of virtual device name and in next field select its version or target.



- Click on **create AVD** .

These steps will create a virtual device for your application

Versions Of android

Android has seen a number of updates since its original release. These updates to the base operating system typically focus on fixing bugs as well as adding new features. Generally each new version of the Android operating system is developed under a code name based on a dessert item.

Evolution of versions

Platforms	Name	API Level
Android 1.5	Cupcake	3
Android 1.6	Donut	4
Android 2.1	Éclair	7
Android 2.2	Froyo	8
Android 2.3	Gingerbread	9
Android 2.4	Gingerbread	10
Android 3.0	Honeycomb	11

The upcoming version of Android is **Ice Cream**

Details of recent released versions of Android

- **2.0/2.1** , which revamped the user interface and introduced HTML5 and Exchange ActiveSync 2.5 support
- **2.2** , which introduced speed improvements with JIT optimization and the Chrome V8 JavaScript engine, and added Wi-Fi hotspot tethering and Adobe Flash support.
- **2.3** , which refined the user interface, improved the soft keyboard and copy/paste features, and added support for Near Field Communication.

- **3.0** , a tablet-oriented release which supports larger screen devices and introduces many new user interface features, and supports multicore processors and hardware acceleration for graphics. The Honeycomb SDK has been released and the first device featuring this version, the Motorola Xoom tablet, went on sale in February 2011.[50] Google has chosen to withhold the source code for the time being, which calls into question the "open-ness" of this Android release. Google claims this is done to eliminate manufacturers putting a tablet-specific OS on phones, much like the previous autumn, where tablet manufacturers put a non-tablet optimized phone OS (Android 2.x) on their Tablets resulting in bad user experiences.

Features of Android SDK

As an application-neutral platform, Android gives you the opportunity to create applications that are as much a part of the phone as anything provided out of the box. The following list highlights some of the most noteworthy Android features:

- No licensing, distribution, or development fees
- Wi-Fi hardware access
- GSM,EDGE, and 3G networks for telephony or data transfer, allowing you to make or receive calls or SMS messages, or to send and receive data across networks.
- Comprehensive APIs for location-based services such as GPS.
- Full multimedia hardware control including playback and recording using the camera and microphone
- APIs for accelerometer and compass hardware
- IPC message passing
- Shared data stores
- An integrated open source WebKit-based browser.
- Full support for applications that integrate Map controls as part of their user interface.

- Peer-to-peer (P2P) support using Google Talk.
- Mobile-optimized hardware-accelerated graphics including a path-based 2D graphics library and support for 3D graphics using Open GL ES.
- Media libraries for playing and recording a variety of audio/video or still image formats.
- An application framework that encourages reuse of application components and the replacement of native applications.

Creating Android Projects/Applications

Before going to making any Project/ application we have to understand the life cycle of any application.

Application life cycle

An application life cycle consists of the steps that the application's processes must follow from execution to termination. Every application, regardless of the language it was written in, has a specific life cycle, and Android applications are no exception.

Android Application life cycle

The Android application life cycle is unique in that the system controls much of the life cycle of the application. All Android applications, or Activities, are run within their own process. All of the running processes are watched by Android and, depending on how the activity is running (this is, a foreground activity, background activity, and so forth), Android may choose to end the activity to reclaim needed resources.

Some of the specific methods called during the life cycle of an android activity are

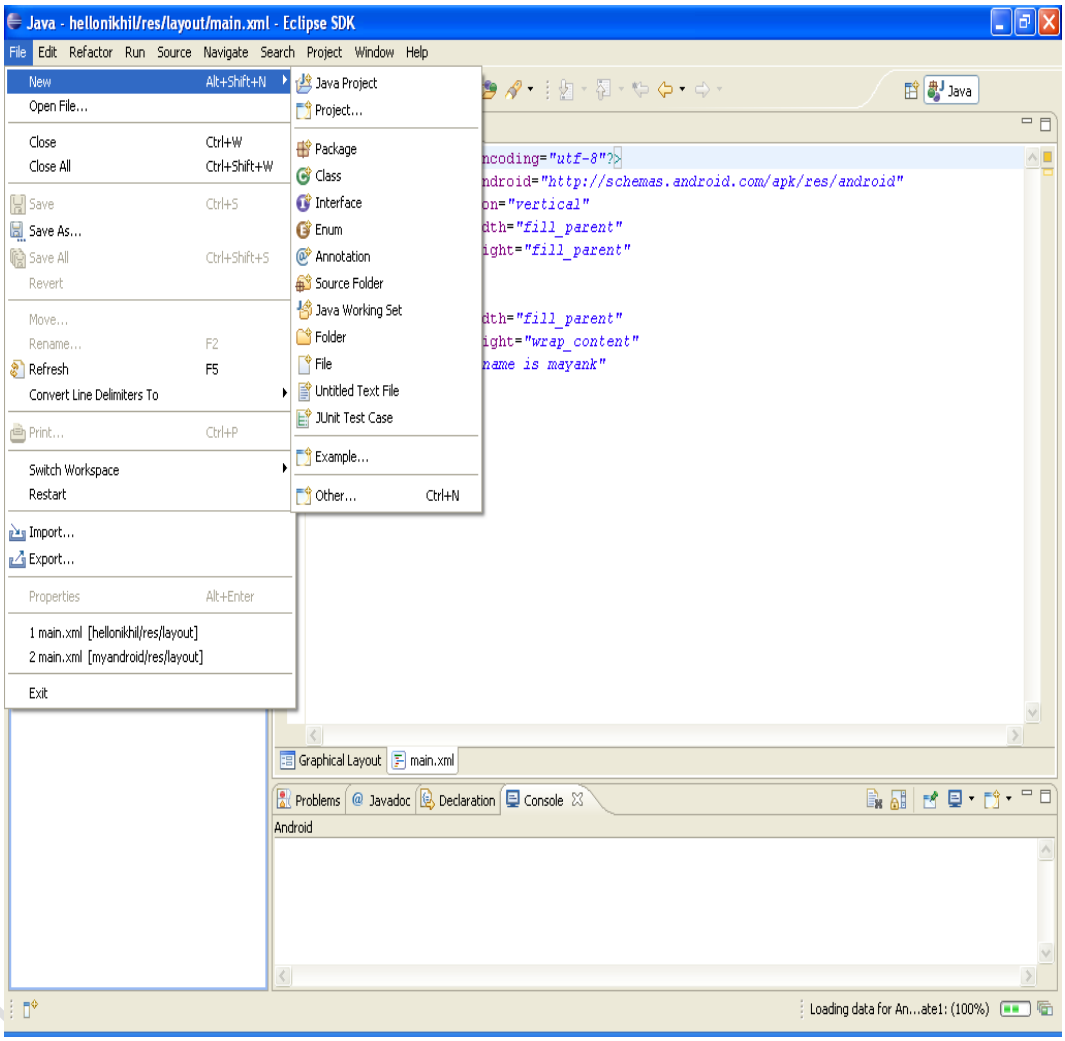
- **onCreate**
- **onStart**
- **Process-specific events**
- **onStop**
- **onDestroy**

Following the same logic as other application life cycles, an Android application is created, the processes are started, events are fired, processes are stopped, and the application is destroyed.

We can create Android Application in Eclipse form following steps.

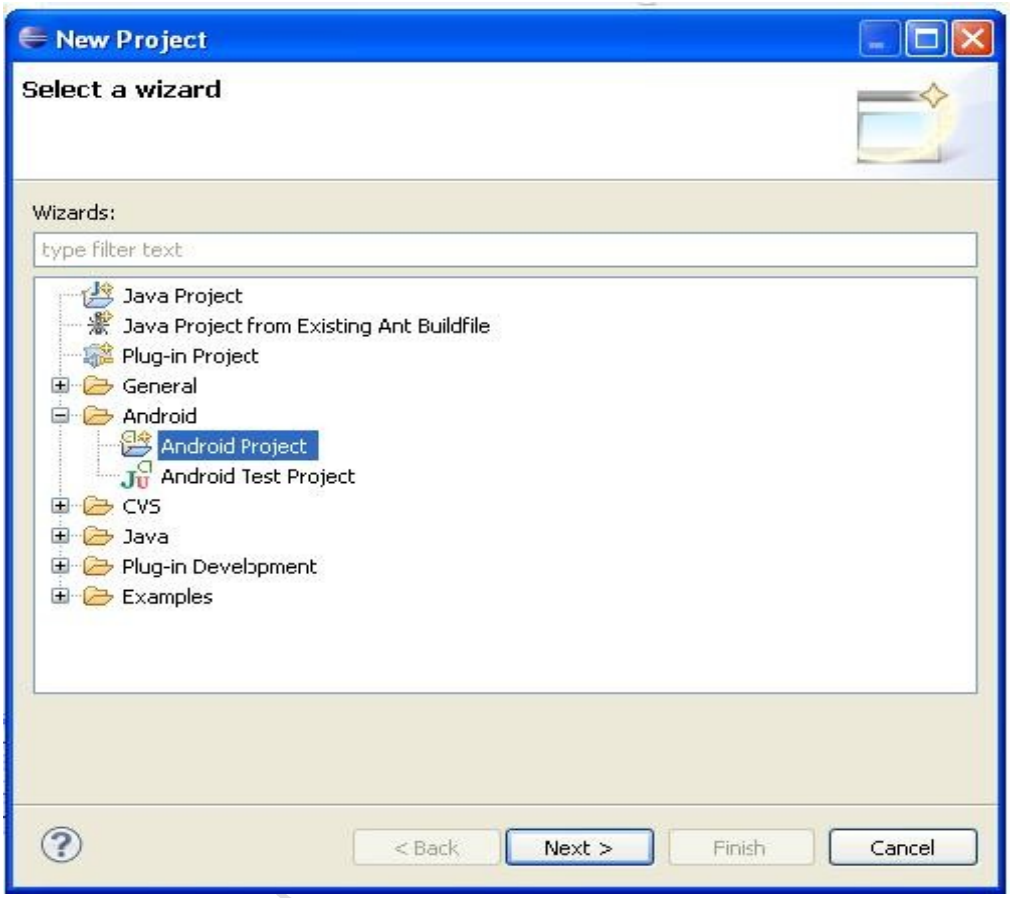
These are

1. **Open Eclipse IDE from its folder**
2. **Go to file menu and click on new.**



3. **Go to project menu and select Android Project**

And click on Next

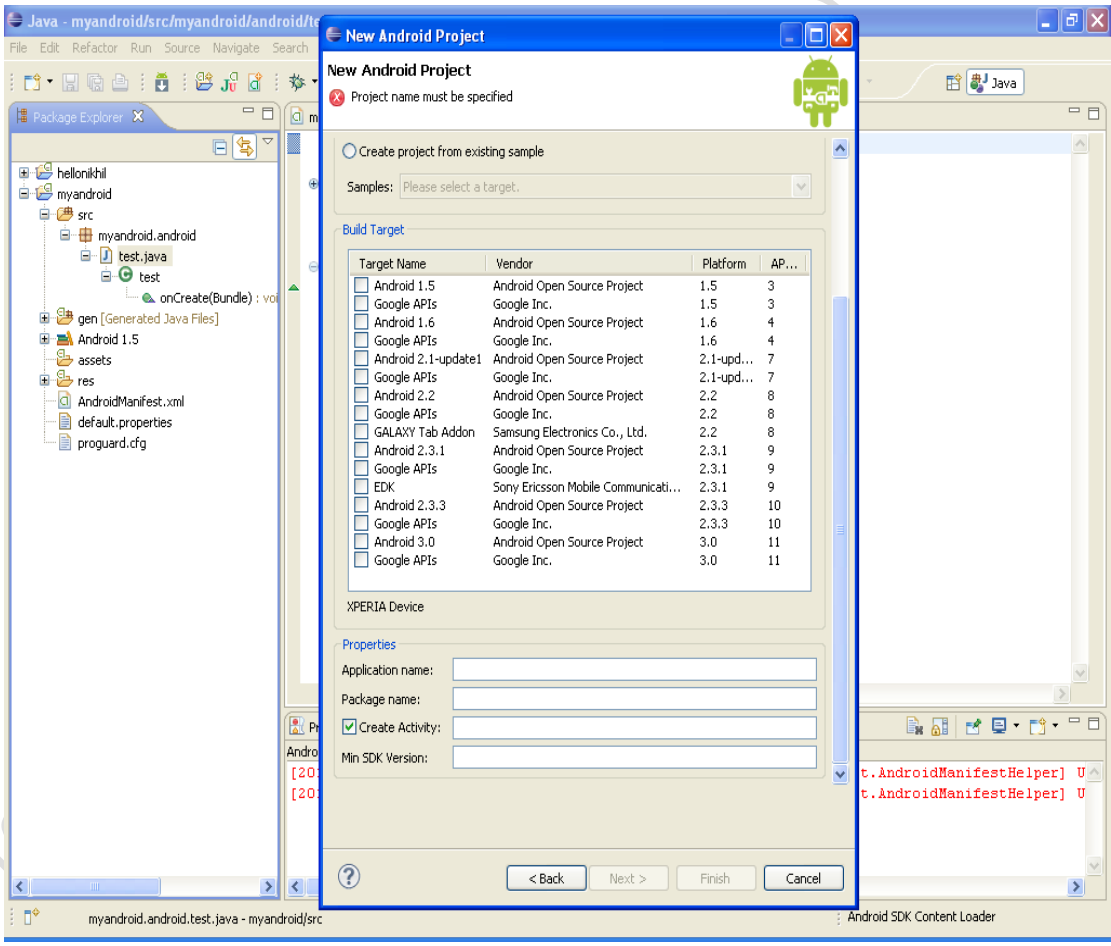


4. **After clicking on next a new window will open, in which there are many fields. We have to fill all these fields. Before filling these field let's have a look at these field.**

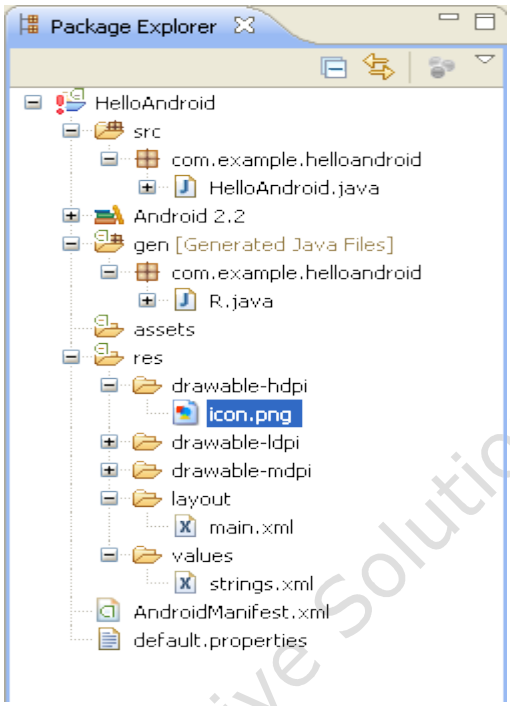
- **Project Name :** In this field we write the project name, which will be the our project folder for android.
- **We will check option to create new project on workspace.**
- **We will check a check box for our source target for Android Application.**
- **Next is Application name whatever we give it.**

- **Next is package name which is same as java package we cannot make two packages with the same name.**
- **Next is activity it is nothing, a class name of our project which we create .**

Click on finish to make project.



After finish a project window will open with a directory structure of the project. Which is given below



For making our first HelloAndroid there are two approaches

By going through layout directory and going through the xml file

The XML file called **main.xml** that is referenced by your application when building its interface.

For making HelloAndroid Application we will edit this XML file .

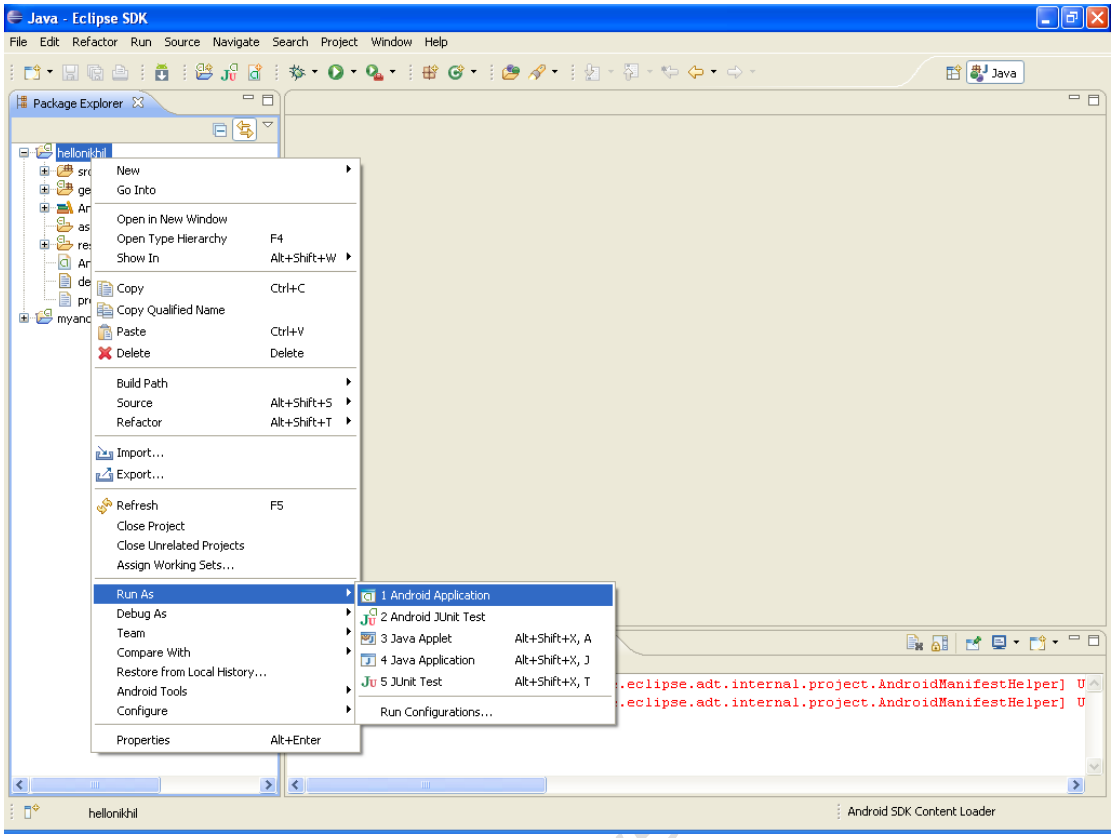
This file will allow us to insert views, into application's layout and will display it.

The actual unaltered xml file's layout ig giving next, let's have a look to it

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
xmlns:android=http://schemas.android.com/apk/res/android
android:orientation="vertical"
android:layout_width="fill_parent"
android:layout_height="fill_parent"
>
<TextView
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:text="HelloAndroid"
    />
</LinearLayout>
```

For creating **HelloAndroid** we have to make changes to **TextView** tag of **main.xml** file's **android:text** , and we can give any name of that view.

Save the project and with right click on the project directory and run it as a Android Project.



After running the following output will come to the Virtual Device.

Another way to create HelloAndroid in Eclipse IDE

In first method we made HelloAndroid by editing the main.xml file, but this time we will program the UI in code rather than by using the xml file, and we will do most of work for this.

So the first step is to remove **TextView** Tag from **main.xml** file in the **layout** directory.

After remoing **TextView** the main.xml file should look like this.

```
<?xml version="1.0" encoding="utf-8"?>
      <LinearLayout
xmlns:android=http://schemas.android.com/apk/res/android
      android:orientation="vertical"
      android:layout_width="fill_parent"
      android:layout_height="fill_parent"
      >
</LinearLayout
```

After cleaning **main.xml** file we have to write code for **HelloAndroid** application. Now open source directory form directory structure and open HelloAndroid.java file and remove **setContentView(R.layout.main);** line from that file.

This line uses **setContentView( )** to draw the **main.xml** file to the screen. Since you will not be using **main.xml** to define your **TextView**, you will not be setting it to your view. Instead, you will be building the **TextView** in code.

Our next step is to import the package **TextView** from **android.widget**. This will give you access to the **TextView** and let you create your own instance of it. Place this code near the top of your **current HelloAndroid.java** file, where the existing import statements are

```
import android.widget.TextView;
```

Now, create an instance of TextView. By creating the TextView instance, you can use it to display text to the screen without directly modifying main.xml. Place the ollowing code after the onCreate( ) statement is fired:

```
TextView HelloTextView = new TextView(this);
```

The preceding line creates an instance of **TextView** named **HelloldTextView** and then instantiates **HelloTextView**, by setting it to a **new TextView**. The new TextView is passed the context of ***this*** to be fully instantiated.

Now that the TextView is defined, you can add your text to it. The following line of code assigns the text **"HelloAndrid"** to the **TextView**

HelloTextView.setText("HelloAndroid");

Now our text view is ready, and we want to display. Because simply passing TextView does not display any thing to the screen..

For that we have to set the ContentView to display something on the screen.
So we have to use the following code to set the TextViw to Context and display it.
To the screen.

setContentView(HelloTextView);

Now full **HelloAndroid.java** file look like this :-

```
package android_programmers_guide.HelloWorldText;
import android.app.Activity;
import android.os.Bundle;
import android.widget.TextView;
public class HelloWorldText extends Activity
 {
     /** Called when the activity is first created. */
     @Override
     public void onCreate(Bundle icicle)
      {
```

```
        super.onCreate(icicle);
        /**Hello World JFD */
        /**BEGIN */
        /**Create TextView */
        TextView HelloTextView = new TextView(this);
        /**Set text to Hello World */
        HelloWorldTextView.setText("HelloAndroid");
        /**Set ContentView to TextView */
        setContentView(HelloTextView);
        /**END */
        }
}
```

Save this and run it. This will also give the same result as previous example given.