

What is Android?



Android is an open source and Linux-based **Operating System** for mobile devices such as smartphones and tablet computers. Android was developed by the *Open Handset Alliance*, led by Google, and other companies.

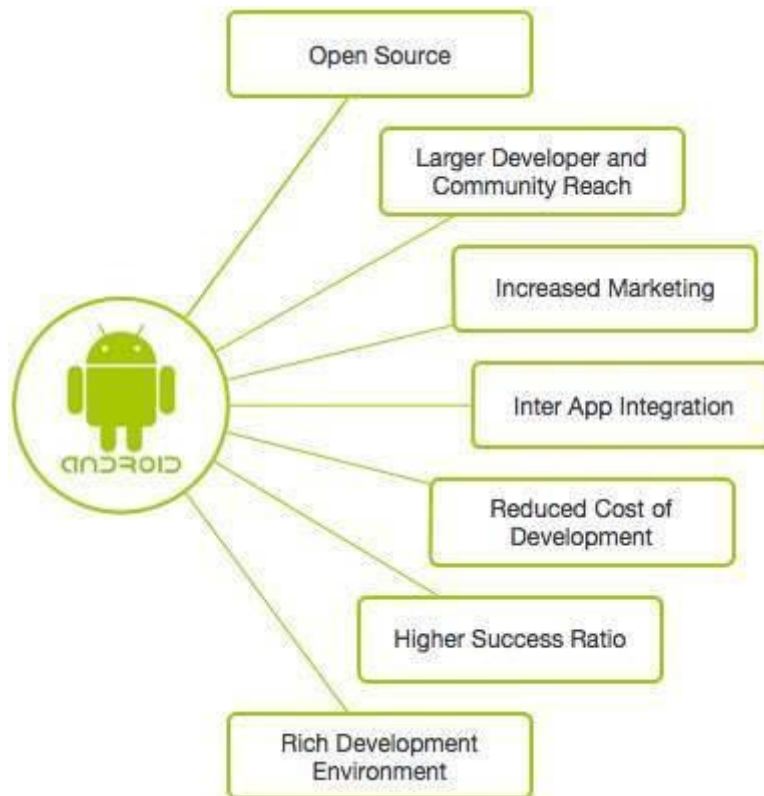
Android offers a unified approach to application development for mobile devices which means developers need only develop for Android, and their applications should be able to run on different devices powered by Android.

The first beta version of the Android Software Development Kit (SDK) was released by Google in 2007 where as the first commercial version, Android 1.0, was released in September 2008.

On June 27, 2012, at the Google I/O conference, Google announced the next Android version, 4.1 **Jelly Bean**. Jelly Bean is an incremental update, with the primary aim of improving the user interface, both in terms of functionality and performance.

The source code for Android is available under free and open source software licenses. Google publishes most of the code under the Apache License version 2.0 and the rest, Linux kernel changes, under the GNU General Public License version 2.

Why Android ?



Features of Android

Android is a powerful operating system competing with Apple 4GS and supports great features. Few of them are listed below –

Sr.No.	Feature & Description
1	<p>Beautiful UI</p> <p>Android OS basic screen provides a beautiful and intuitive user interface.</p>
2	<p>Connectivity</p> <p>GSM/EDGE, IDEN, CDMA, EV-DO, UMTS, Bluetooth, Wi-Fi, LTE, NFC and WiMAX.</p>
3	<p>Storage</p> <p>SQLite, a lightweight relational database, is used for data storage purposes.</p>
4	<p>Media support</p> <p>H.263, H.264, MPEG-4 SP, AMR, AMR-WB, AAC, HE-AAC, AAC 5.1, MP3, MIDI, Ogg Vorbis, WAV, JPEG, PNG, GIF, and BMP.</p>

5	<p>Messaging SMS and MMS</p>
6	<p>Web browser Based on the open-source WebKit layout engine, coupled with Chrome's V8 JavaScript engine supporting HTML5 and CSS3.</p>
7	<p>Multi-touch Android has native support for multi-touch which was initially made available in handsets such as the HTC Hero.</p>
8	<p>Multi-tasking User can jump from one task to another and same time various application can run simultaneously.</p>
9	<p>Resizable widgets Widgets are resizable, so users can expand them to show more content or shrink them to save space.</p>
10	<p>Multi-Language Supports single direction and bi-directional text.</p>
11	<p>GCM Google Cloud Messaging (GCM) is a service that lets developers send short message data to their users on Android devices, without needing a proprietary sync solution.</p>
12	<p>Wi-Fi Direct A technology that lets apps discover and pair directly, over a high-bandwidth peer-to-peer connection.</p>
13	<p>Android Beam A popular NFC-based technology that lets users instantly share, just by touching two NFC-enabled phones together.</p>

Android Applications

Android applications are usually developed in the Java language using the Android Software Development Kit.

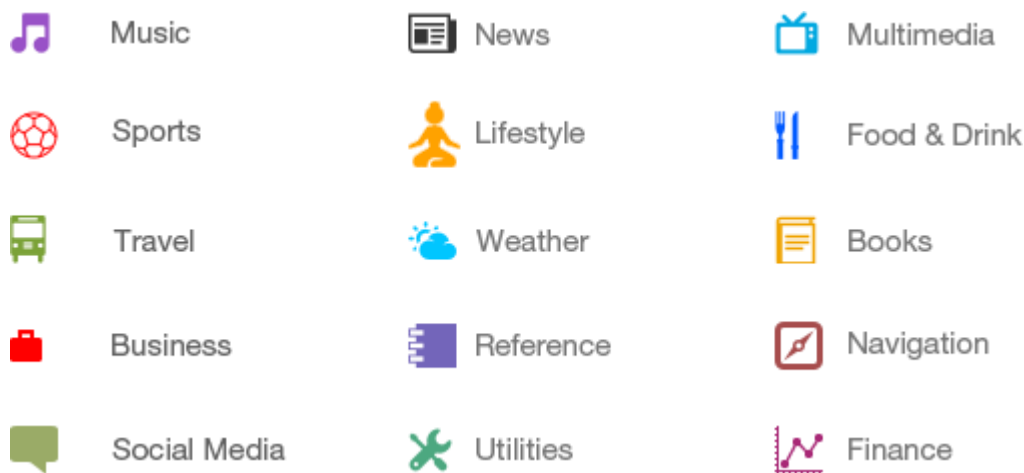
Once developed, Android applications can be packaged easily and sold out either through a store such as **Google Play, SlideME, Opera Mobile Store, Mobango, F-droid** and the **Amazon Appstore**.

Android powers hundreds of millions of mobile devices in more than 190 countries around the world. It's the largest installed base of any mobile platform and growing fast. Every day more than 1 million new Android devices are activated worldwide.

This tutorial has been written with an aim to teach you how to develop and package Android application. We will start from environment setup for Android application programming and then drill down to look into various aspects of Android applications.

Categories of Android applications

There are many android applications in the market. The top categories are –



History of Android

The code names of android ranges from A to N currently, such as Aestro, Blender, Cupcake, Donut, Eclair, Froyo, Gingerbread, Honeycomb, Ice Cream Sandwich, Jelly Bean, KitKat, Lollipop and Marshmallow. Let's understand the android history in a sequence.

Platform Version	API Level	VERSION_CODE	
Android 6.0	23	MARSHMALLOW	
Android 5.1	22	LOLLIPOP_MR1	
Android 5.0	21	LOLLIPOP	
Android 4.4W	20	KITKAT_WATCH	KitKat for Wearables Only
Android 4.4	19	KITKAT	

Android 4.3	18	JELLY_BEAN_MR2	
Android 4.2, 4.2.2	17	JELLY_BEAN_MR1	
Android 4.1, 4.1.1	16	JELLY_BEAN	
Android 4.0.3, 4.0.4	15	ICE_CREAM_SANDWICH_MR1	
Android 4.0, 4.0.1, 4.0.2	14	ICE_CREAM_SANDWICH	
Android 3.2	13	HONEYCOMB_MR2	
Android 3.1.x	12	HONEYCOMB_MR1	
Android 3.0.x	11	HONEYCOMB	
Android 2.3.4 Android 2.3.3	10	GINGERBREAD_MR1	
Android 2.3.2 Android 2.3.1 Android 2.3	9	GINGERBREAD	
Android 2.2.x	8	FROYO	
Android 2.1.x	7	ECLAIR_MR1	
Android 2.0.1	6	ECLAIR_0_1	
Android 2.0	5	ECLAIR	
Android 1.6	4	DONUT	
Android 1.5	3	CUPCAKE	
Android 1.1	2	BASE_1_1	
Android 1.0	1	BASE	

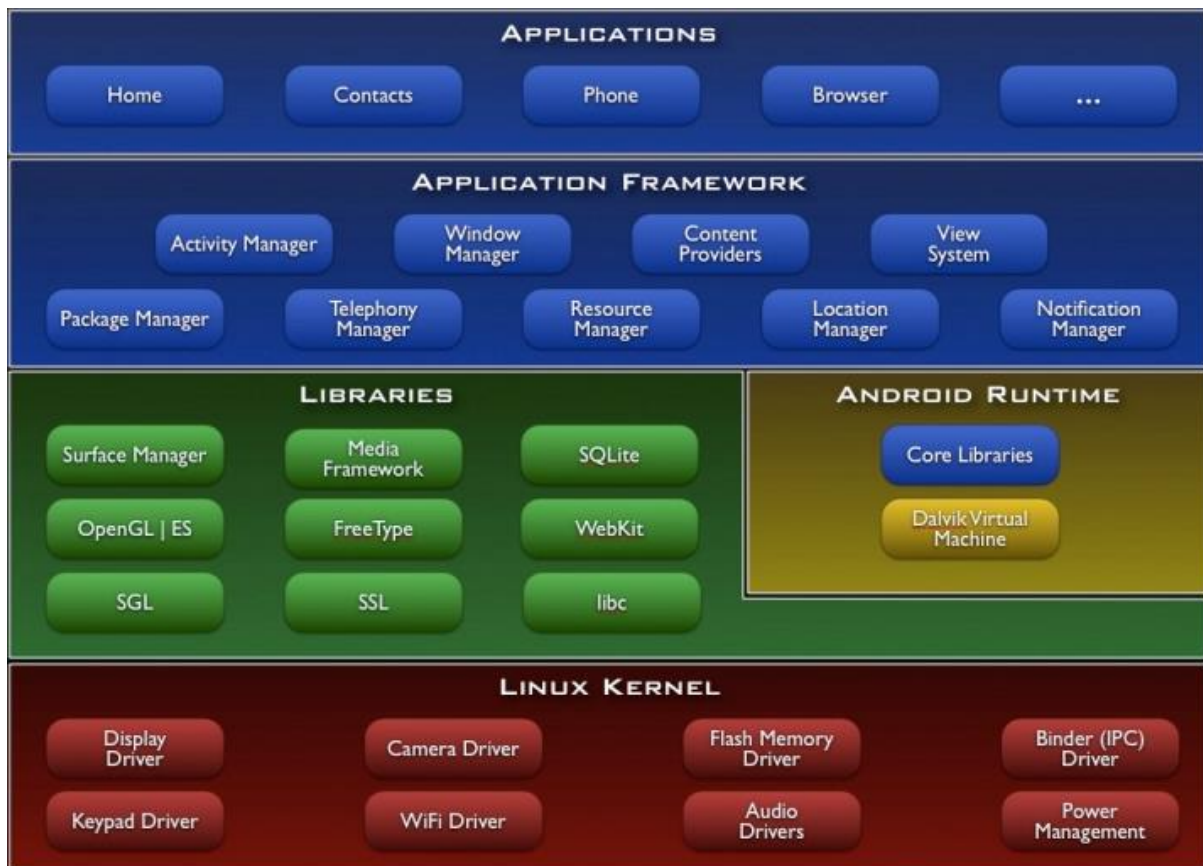
 Android 1.6 Donut	 Android 2.0 Eclair	 Android 2.2 Froyo	 Android 2.3 Gingerbread	 Android 3.0 Honeycomb
 Android 4.0 Ice Cream Sandwich	 Android 4.1 Jelly Bean	 Android 4.4 KitKat	 Android 5.0 Lollipop	 Android 6.0 Marshmallow

What is API level?

API Level is an integer value that uniquely identifies the framework API revision offered by a version of the Android platform.

Android - Architecture

Android operating system is a stack of software components which is roughly divided into five sections and four main layers as shown below in the architecture diagram.



Linux kernel

At the bottom of the layers is Linux - Linux 3.6 with approximately 115 patches. This provides a level of abstraction between the device hardware and it contains all the essential hardware drivers like camera, keypad, display etc. Also, the kernel handles all the things that Linux is really good at such as networking and a vast array of device drivers, which take the pain out of interfacing to peripheral hardware.

Libraries

On top of Linux kernel there is a set of libraries including open-source Web browser engine WebKit, well known library libc, SQLite database which is a useful repository for storage and sharing of application data, libraries to play and record audio and video, SSL libraries responsible for Internet security etc.

Android Libraries

This category encompasses those Java-based libraries that are specific to Android development. Examples of libraries in this category include the application framework libraries in addition to those that facilitate user interface building, graphics drawing

and database access. A summary of some key core Android libraries available to the Android developer is as follows –

- **android.app** – Provides access to the application model and is the cornerstone of all Android applications.
- **android.content** – Facilitates content access, publishing and messaging between applications and application components.
- **android.database** – Used to access data published by content providers and includes SQLite database management classes.
- **android.opengl** – A Java interface to the OpenGL ES 3D graphics rendering API.
- **android.os** – Provides applications with access to standard operating system services including messages, system services and inter-process communication.
- **android.text** – Used to render and manipulate text on a device display.
- **android.view** – The fundamental building blocks of application user interfaces.
- **android.widget** – A rich collection of pre-built user interface components such as buttons, labels, list views, layout managers, radio buttons etc.
- **android.webkit** – A set of classes intended to allow web-browsing capabilities to be built into applications.

Having covered the Java-based core libraries in the Android runtime, it is now time to turn our attention to the C/C++ based libraries contained in this layer of the Android software stack.

Android Runtime

This is the third section of the architecture and available on the second layer from the bottom. This section provides a key component called **Dalvik Virtual Machine** which is a kind of Java Virtual Machine specially designed and optimized for Android.

The Dalvik VM makes use of Linux core features like memory management and multi-threading, which is intrinsic in the Java language. The Dalvik VM enables every Android application to run in its own process, with its own instance of the Dalvik virtual machine.

The Android runtime also provides a set of core libraries which enable Android application developers to write Android applications using standard Java programming language.

Application Framework

The Application Framework layer provides many higher-level services to applications in the form of Java classes. Application developers are allowed to make use of these services in their applications.

The Android framework includes the following key services –

- **Activity Manager** – Controls all aspects of the application lifecycle and activity stack.
- **Content Providers** – Allows applications to publish and share data with other applications.

- **Resource Manager** – Provides access to non-code embedded resources such as strings, color settings and user interface layouts.
- **Notifications Manager** – Allows applications to display alerts and notifications to the user.
- **View System** – An extensible set of views used to create application user interfaces.

Applications

You will find all the Android application at the top layer. You will write your application to be installed on this layer only. Examples of such applications are Contacts Books, Browser, Games etc.