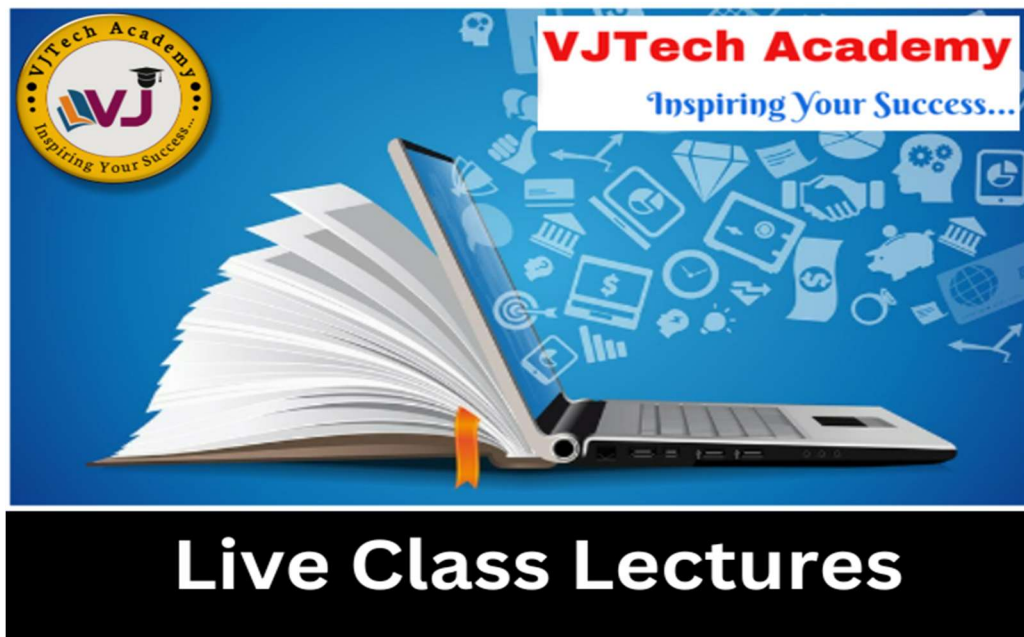




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UNIT-I Android and its tools



History of Android

- The history and versions of android are interesting to know. The code names of android ranges from A to J currently, such as **Aestro, Blender, Cupcake, Donut, Eclair, Froyo, Gingerbread, Honeycomb, Ice Cream Sandwich, Jelly Bean, KitKat** and **Lollipop**.
- Initially, **Andy Rubin** founded Android Incorporation in Palo Alto, California, United States in October, 2003.
- In 17th August 2005, Google acquired android Incorporation.
- The key employees of Android Incorporation are **Andy Rubin, Rich Miner, Chris White** and **Nick Sears**.
- Originally intended for camera but shifted to smart phones later because of low market for camera only.
- Android is the nick name of Andy Rubin given by co-workers because of his love to robots.
- In 2007, Google announces the development of android OS.
- In 2008, HTC launched the first android mobile.

Introduction to android, Open Handset Alliance, Android Ecosystem:

Introduction to 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.
- OHA is association of multiple companies like Samsung, Sony, Intel and many more to provide a service and deploy handsets using android platform.
- The operating system has developed a lot in last 15 years starting from black and white phones to recent smart phones or mini computers. One of the most widely used mobile OS these days is android.
- 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 android is a powerful operating system and it supports large number of applications in Smartphones.

What is Android?

- Android is a stack of software for mobile devices that are an Operating System, Middleware and Key Applications.

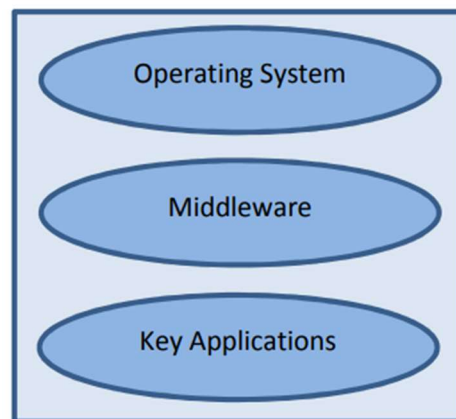


Figure: Android Operating System

- Android is a Linux-based operating system which is designed for touchscreen mobile devices like smartphones and tablet computers.

- It is an open-source technology that allows the software to be freely modified and distributed by device manufacturers, wireless carriers and developers.
- 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.
- Java language is mainly used to write the android code even though other languages can be used.
- The goal of android project is to create a successful real-world product that improves the mobile experience for end users.
- Android is a mobile operating system developed by Google.
- It is based on a modified version of the Linux kernel and other open-source software designed primarily for touchscreen mobile devices such as smartphones and tablets.
- In addition, Google has further developed Android TV for televisions, Android Auto for cars, and Wear OS for wrist watches, each with a specialized user interface.

❖ Open Handset Alliance

- The Open Handset Alliance (OHA) is a business alliance that was created for the purpose of developing open mobile device standards.
- The OHA has approximately 84 member companies, including HTC, Dell, Intel, Motorola, Qualcomm and Google.
- The OHA's main product is the Android platform - the world's most popular smartphone platform.
- OHA members are primarily mobile operators, handset manufacturers, software development firms, semiconductor companies and commercialization companies.
- Main purpose of OHA:
 - Lower overall handset costs: Opens up resources, which facilitates the focus on creating innovative applications, solutions and services.
 - Developer-friendly environment: In the open-source community, developers share notes to expedite application development.
 - Post-development: Provides an ideal channel for application marketing and distribution

❖ Android Ecosystem:

- Ecosystem in Market terminology refers to the inter-dependence between demand and supply.
- Android ecosystem is nothing but the relationship between Users, developers, and Hardware equipment makers.
- The Android ecosystem is nothing but the mutual dependence between Users, Developers, and equipment makers.
- In the Android ecosystem this translates to inter-dependence between users, developers, and equipment makers.
- They are independent of each other so one cannot exist without the other.
 - **Users:** buy devices and applications
 - **Equipment makers:** sell devices, sometimes bundled with applications
 - **Developers:** buy devices, then make and sell applications

Need of Android, Features of Android:

❖ **Need of Android:**

Following are the many reasons, you should choose Android platform for mobile application development.

1. **Zero or negligible development cost:** The development tools like Android SDK, JDK, and Eclipse IDE etc. are free to download for the android mobile application development. Also, Google charge a small fee \$25, to distribute your mobile app on the Android Market.
2. **Open Source:** The Android OS is an open-source platform based on the Linux kernel and multiple open-source libraries.
3. **Multi-Platform Support:** In market, there are a wide range of hardware devices powered by the Android OS, including many different phones and tablet. Even development of android mobile apps can occur on Windows, Mac OS or Linux.
4. **Multi-Carrier Support:** World wide a large number of telecom carriers like Airtel, Vodafone, Idea Cellular, AT&T Mobility, BSNL etc. are supporting Android powered phones.
5. **Open Distribution Model:** Android Market place (Google Play store) has very few restrictions on the content or functionality of an android app. So, the developer can distribute theirs app through Google Play store and as well other distribution channels like Amazon's app store.

❖ Features of Android:

The important features of android are given below:

1. **Connectivity:** Android supports multiple connectivity technologies including GSM, CDMA, Bluetooth, Wi-Fi, etc.
2. **Storage:** SQLite, a lightweight relational database is used for data storage purposes.
3. **Media support:** Android supports various type of audio/video media formats like MP3, JPEG, PNG, GIF, BMP, etc.
4. **Web browser:** The web browser available in Android is based on the open-source Blink layout engine, coupled with Chrome's V8 JavaScript engine supporting HTML5 and CSS3.
5. **Messaging:** In Android, SMS and MMS are available forms of messaging.
6. **Multitasking:** Multitasking of applications, with unique handling of memory allocation is available, using this user can jump from one task to another and at the same time various application can run simultaneously.
7. **Resizable widgets:** Widgets are re-sizable, so users can expand them to show more content or shrink them to save space
8. **Multi-touch:** Android has native support for multi-touch which was initially made available in handsets such as the HTC Hero.
9. **Wi-Fi:** A technology that apps can find and pair directly over a high bandwidth peer-to-peer connection.
10. **Screen capture:** Android supports capturing a screenshot by pressing the power and home-screen buttons at the same time. This feature supports after Android 4.0
11. **Multi-language:** Android supports multiple languages.

Tools and software required for developing an Android Application

The android developer tools help you to create interactive and powerful application for android platform. The tools can be generally categorized into two types.

1. SDK tools
2. Platform tools

❖ **SDK tools:**

- SDK tools are generally platform independent and are required no matter which android platform you are working on.
 - When you install the Android SDK into your system, these tools get automatically installed. The list of SDK tools has been given below
1. **Android** : This tool help us to manage AVDs(Android Virtual Devices), projects, and the installed components of the SDK
 2. **DDMS(Dalvik debug monitor server)** : This tool help us to debug Android applications
 3. **Draw 9-Patch**: The Draw 9-patch tool is a WYSIWYG editor included in Android Studio. The tool lets you create bitmap images that automatically resize to accommodate the contents of the view and the size of the screen
 4. **Emulator**: These tools let you test your applications without using a physical device
 5. **Mksdcard**: Helps you create a disk image (external sdcard storage) that you can use with the emulator
 6. **Proguard**: ProGuard is a free Java app for Android that allows us to do : Reduce the code, Unused code in the project should be removed, etc.
 7. **sqlite3**: It can be used to create a database, define tables, insert and change rows, run queries and manage an SQLite database file.
 8. **traceview**: Provides a graphical viewer for execution logs saved by your application
 9. **ADB**: Android Debug Bridge (adb) is a versatile command line tool that lets you communicate with an emulator instance or connected Android-powered device.

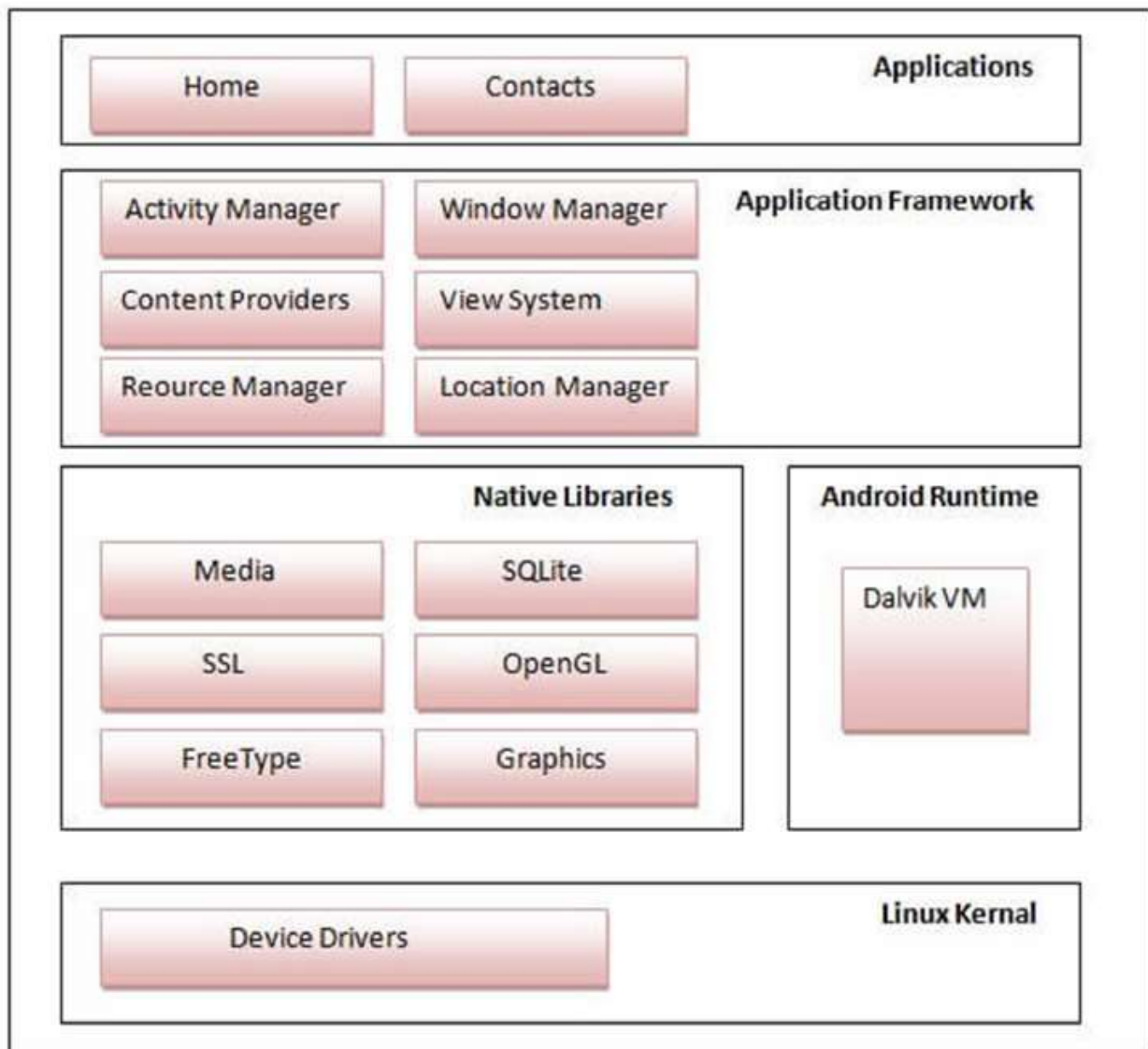
❖ Platform tools

- The platform tools are customized to support the features of the latest android platform.
- The platform tools are typically updated every time you install a new SDK platform. Each update of the platform tools is backward compatible with older platforms.
- Some of the platform tools are listed below –
 - **Android Debug bridge (ADB):** It is a versatile command-line tool that lets you communicate with a device. The ADB command facilitates a variety of device actions, such as installing and debugging apps.
 - **Android Interface definition language (AIDL):** It allows you to define the programming interface that both the client and service agree upon in order to communicate with each other using inter-process communication (IPC)
 - **AAPT (Android Asset Packaging Tool):** This tool allows you to view, create, and update Zip-compatible archives (zip, jar, apk).
 - **DEXDump :** It is tool used to find and dump dex in memory to support security engineers in analyzing malware.
 - **DEX(Dalvik Executable).**

Android Architecture:

The main components of android architecture are following:

1. Linux kernel
2. native libraries (middleware),
3. Android Runtime
4. Application Framework
5. Applications



1. Linux kernel:

- It is the heart of android architecture.
- It manages all the available drivers such as display drivers, camera drivers, Bluetooth drivers, audio drivers, memory drivers, etc
- Linux kernel is responsible for device drivers, power management, memory management, device management and resource access.

2. Native Libraries:

- The Native Libraries includes various C/C++ core libraries and Java based libraries such as Media, Graphics, OpenGL, SSL etc. to provide a support for android development.
- **Media** library provides support to play and record an audio and video formats.
- **Open GL(graphics library)**: This cross-language, cross-platform application program interface (API) is used to produce 2D and 3D computer graphics.
- **Secure Socket Layer (SSL)**: These libraries are used to establish a security between a web server and a web browser.
- **Web-Kit** This open-source web browser engine provides all the functionality to display web content and to simplify page loading.
- **SQLite** provides database support.
- **FreeType** provides font support.

3. Android Runtime:

- In android runtime, there are core libraries and DVM (Dalvik Virtual Machine) which is responsible to run android application.
- DVM is like JVM but it is optimized for mobile devices. It consumes less memory and provides fast performance.
- The DVM is a virtual machine to run Android applications. The DVM executes Dalvik bytecode, which is compiled from programs written in the Java language.

4. Application Framework:

- Application Framework provides a lot of classes and interfaces for android application development.
- **Activity Manager**: It manages the activity lifecycle and the activity stack.

- **Telephony Manager:** It provides access to telephony services as related subscriber information, such as phone numbers.
- **View System:** It builds the user interface by handling the views and layouts.
- **Location manager:** It finds the device's geographic location.
- **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.
- **Window manager** is responsible for managing the list of windows, which windows are visible, and how they are displaying on screen.

5. Applications:

- Applications is the top layer of android architecture
- The pre-installed applications like home, contacts, camera, gallery etc and third-party applications downloaded from the play store like chat applications, games etc will be installed on this layer only.
- It runs within the Android run time with the help of the classes and services provided by the application framework.