ANDROID DEVELOPMENT

OS Layers

1) application layer

2) application framework layer

3) libraries layer

a) Android Runtime

b) Platform Libraries

4) Linux kernel layer.

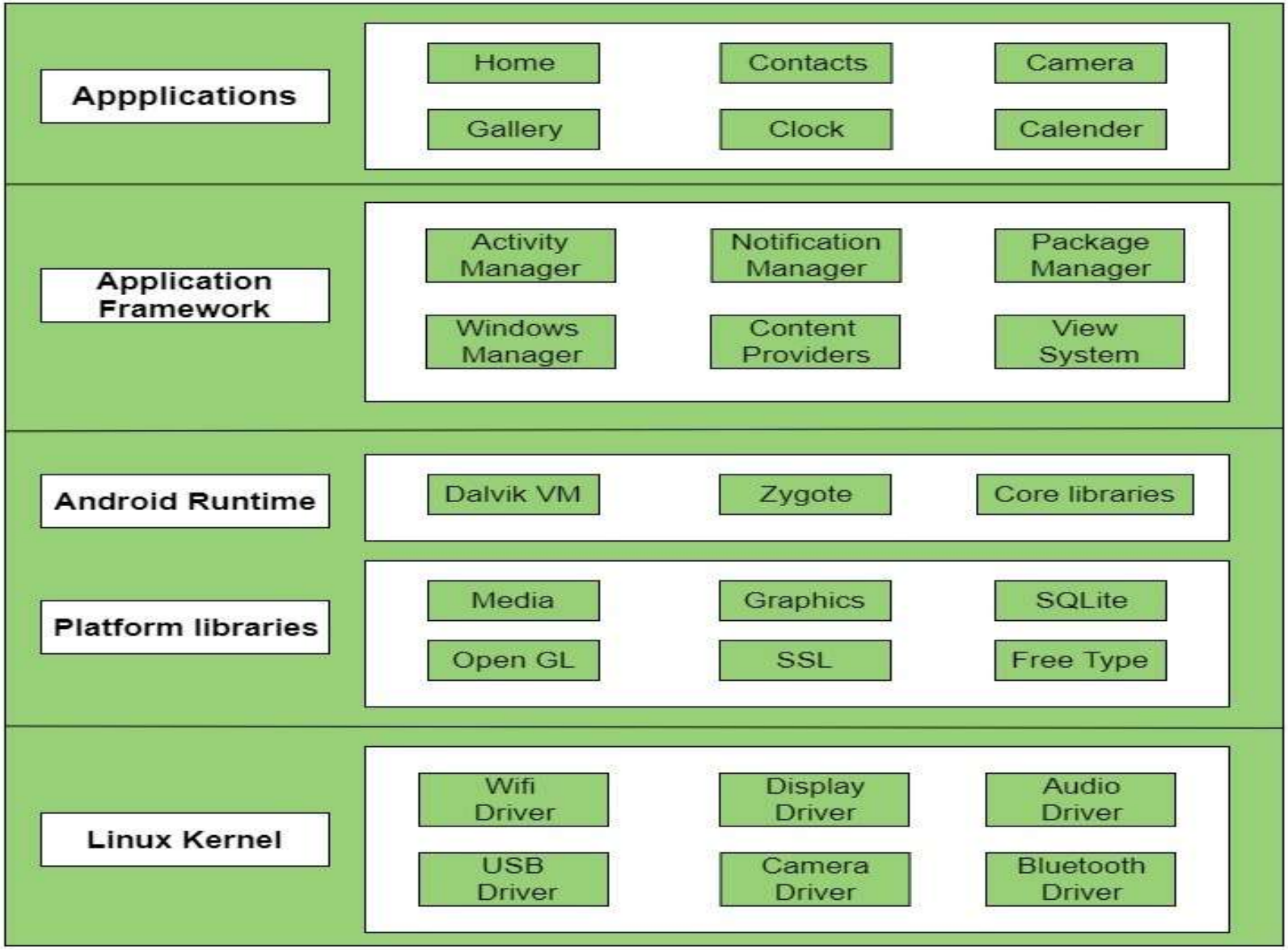
Android Architecture

- Android architecture contains different number of components to support any android device needs. Android software contains an open-source Linux Kernel having collection of number of C/C++ libraries which are exposed through an application framework services.

- Among all the components Linux Kernel provides main functionality of operating system functions to smartphones and Dalvik Virtual Machine (DVM) provide platform for running an android application.

The main components of android architecture are following:-

- Applications
- Application Framework
- Android Runtime
- Platform Libraries
- Linux Kernel



Architecture of Android

- **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.

- **Home:** The Homepage on Android consists of launcher icons for commonly used applications that the end-user may want quick access to. You can start the apps by clicking on the launchers of these apps. At the very top of the screen, you have widgets that show network, battery level, date, and time.

- **Contacts:** Android, by default, provides a means to store and retrieve contacts. Contact information is shared across other apps to enhance functionality.

- **Messages:** Android provides the capability to send and receive SMS messages.

- **Email:** Android comes with native support for email services. Setting up an Android device requires a Gmail account. Setting up Gmail activates other email-dependent components on Android devices. Some email dependent features include security and recovery mechanisms. Another email dependent feature is access to the Play Store, a marketplace for Android applications.

- **Browser:** Android comes with a default browser.

Application framework –

- Application Framework provides several important classes which are used to create an Android application. It provides a generic abstraction for hardware access and also helps in managing the user interface with application resources. Generally, it provides the services with the help of which we can create a particular class and make that class helpful for the Applications creation.

- It includes different types of services activity manager, notification manager, view system, package manager etc. which are helpful for the development of our application according to the prerequisite.

- **1) Activity Manager**
- Applications use the Android activity component for presenting an entry point to the app. Android Activities are the components that house the user interface that app users interact with. As end-users interact with the Android device, they start, stop, and jump back and forth across many applications. Each navigation event triggers activation and deactivation of many activities in respective applications.

- **2) Window Manager**
- Android can determine screen information to determine the requirements needed to create windows for applications. Windows are the slots where we can view our app user interface. Android uses the Window manager to provide this information to the apps and the system as they run so that they can adapt to the mode the device is running on.

- **3) Location Manager**
- Most Android devices are equipped with GPS devices that can get user location using satellite information to which can go all the way to meters precision. Programmers can prompt for location permission from the users, deliver location, and aware experiences.
- **5) Resource Manager**
- Android app usually come with more than just code. They also have other resources such as icons, audio and video files, animations, text files, and the like. Android helps in making sure that there is efficient, responsive access to these resources. It also ensures that the right resources are delivered to the end-users. For example, the proper language text files are used when populating fields in the apps.

- **Application runtime –**
- Android Runtime environment is one of the most important part of Android. It contains components like core libraries and the Dalvik virtual machine(DVM). Mainly, it provides the base for the application framework and powers our application with the help of the core libraries.
- Like Java Virtual Machine (JVM), **Dalvik Virtual Machine (DVM)** is a register-based virtual machine and specially designed and optimized for android to ensure that a device can run multiple instances efficiently. It depends on the layer Linux kernel for threading and low-level memory management. The core libraries enable us to implement android applications using the standard JAVA or Kotlin programming languages.

- **Platform libraries**
- The Platform Libraries includes various C/C++ core libraries and Java based libraries such as Media, Graphics, Surface Manager, OpenGL etc. to provide a support for android development.

- **Media** library provides support to play and record an audio and video formats.
- **Surface manager** responsible for managing access to the display subsystem.
- **SGL** and **OpenGL** both cross-language, cross-platform application program interface (API) are used for 2D and 3D computer graphics..

- **SQLite** provides database support and **FreeType** provides font support.
- **Web-Kit** This open source web browser engine provides all the functionality to display web content and to simplify page loading.
- **SSL (Secure Sockets Layer)** is security technology to establish an encrypted link between a web server and a web browser

- **Linux Kernel –**
- Linux Kernel is heart of the android architecture. It manages all the available drivers such as display drivers, camera drivers, Bluetooth drivers, audio drivers, memory drivers, etc. which are required during the runtime.

- The Linux Kernel will provide an abstraction layer between the device hardware and the other components of android architecture. It is responsible for management of memory, power, devices etc.

1) USB Driver

Linux also provides Android with a means to interface with USB devices. Modern devices come with different USB ports, including USB 2.0 and new versions of USB, including USB-C. These drivers make it possible to use the USB port to charge, transfer live data such as logs from the Android devices, and interact with the android file system.

2) Bluetooth Driver

Linux Kernel provides support for interfacing with Bluetooth hardware components. It provides a way to read and write data received from supported bluetooth radio frequencies. It also provides a set of facilities for Android to configure Bluetooth.

3) Wifi Driver

The Linux kernel provides drivers to integrate the WiFi networking hardware components. WiFi components embedded in mobile devices enable Android devices to connect to wifi networks. The driver enables the wifi components to broadcast wifi networks and create hotspots.

4) Display Driver

Android makes it possible to interface with display components. For most devices, the interface component is an LCD touch-screen. It allows support for configuring and drawing pixels.

The features of Linux kernel are:

1. **Security:** The Linux kernel handles the security between the application and the system.
2. **Memory Management:** It efficiently handles the memory management thereby providing the freedom to develop our apps.
3. **Process Management:** It manages the process well, allocates resources to processes whenever they need them.
4. **Network Stack:** It effectively handles the network communication.
5. **Driver Model:** It ensures that the application works properly on the device and hardware manufacturers responsible for building their drivers into the Linux build.

Installation of Android Machine

1. Open any web browser and navigate to the Android Studio download page. This is the Android Developers website, where you can download Android Studio. This page automatically detects your operating system.

2. Click Download Android Studio. The Terms and Conditions page with the Android Studio License Agreement opens.

3. Read the License Agreement.

4. At the bottom of the page, if you agree with the terms and conditions, select the I have read and agree with the above terms and conditions checkbox.

5. Click Download Android Studio to start the download.

6. When prompted, save the file to a location where you can easily locate it, such as the Downloads folder.

7. Wait for the download to complete. This may take a while and may be a good moment to enjoy some tea!

8.How to Install Android studio step by step guide