

# Mobile Application Design and Development

## Introduction to Android Operating System

---

*“When the opportunities comes, this is  
like aligning the stars”*

***-Andy Rubin-  
Co-funder of Android***



# Learning outcomes of this lecture

---

At the end of this Lecture students will be able to

- Describe the life cycle of android application
- Illustrate the architecture of android
- List the components of android application architecture
- Recognize the folder hierarchy and components of android application project
- Comprehend activity life cycle

# Overview to Android



Developed by Open Handset Alliance,  
headed by Google



Millions of mobile devices

The largest installed platform



Open source



Offers unified development  
environment



Built based on **LINUX**  
& other open source

More than **190** countries



**1,000,000 +** new Android devices are  
activated worldwide per day

# Benefits of Android

---

- Open source
- Large development and community reach
- Increased marketing
- Inter app integration
- Reduced the development cost
- Higher success ratio
- Rich development environment

# Features of Android

---

- Attractive UI (User Interface)
- Connectivity
- Storage
- Media support
- Messaging
- Web browser
- Multi-tasking
- Multi-touch
- Resizable widgets
- GCM (Google Cloud Messaging)
- Wi-Fi Direct
- Android Beam
- Multi language



# API (Application Program Interface) Levels



Reference:

<https://www.jsys.co/wp-content/uploads/2017/02/Android-Versions.jpg>

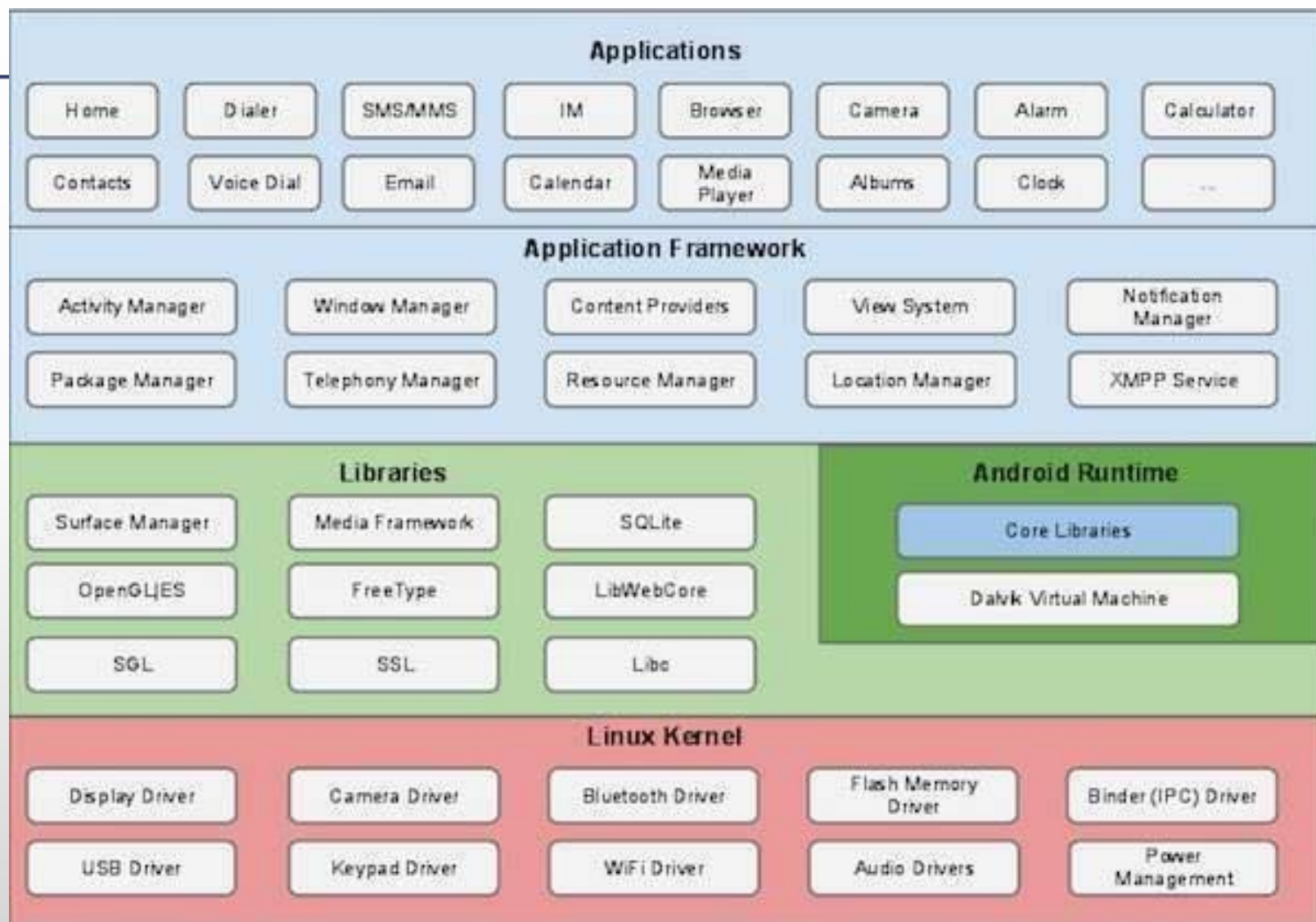
<https://i.ytimg.com/vi/olglEgEEZKo/maxresdefault.jpg>

---

# Android Architecture & Android Application Architecture



# Android Architecture



Reference: <https://qph.ec.quoracdn.net/main-qimg-d9a11de4d00d7fd5730cb1180cc062dc-c>

# 1. Linux Kernel

---

- This layer provides a level of abstraction between the hardware of the device and contains all the essential hardware drivers, such as the camera, keyboard, screen, etc.
- Kernel handles networks and a wide range of device drivers, which eliminate interference with hardware peripherals.

## 2. Libraries

---

- This layer operates on top of Linux kernel
- This layer includes,
  - **Open source web browser engine Webkit**
  - **SQLite database**
  - **Libraries to play and record (video & audio)**
  - **SSL libraries and etc.**

**Homework:** Search & write about **Android Libraries** and bring it to the tutorial session.

# Cont'd...

---

## Android Runtime

This is a section of second layer. Consists of,

### 1. **Core Libraries –**

- These libraries enable developers to develop android applications using Java programming language

# Cont'd...

---

## 2. Dalvik Virtual Machine –

- Kind of Java Virtual Machine specially designed and optimized for Android
- Makes use of Linux core features like memory management and multi-threading, which is fundamental in the Java language
- Enables the application to run in its own process, with its own instance

# 3. Application Framework

---

Set of activities that forms the environment in which apps are run and managed.

This layer provides higher-level services to applications in the form of Java classes. So that they can be reused by other application development process.

## **Key services;**

- Activity Manager
- Content Providers
- Resource Manager
- Notifications Manager
- View System

## 4. Applications

---

This layer contains, native apps provided with the OS and the third party apps installed by the users will get installed here.



### Market store for android apps

- Google Play
- SlideME
- Opera Mobile Store
- Mobango
- F-droid A
- mazon Appstore

# Android Application Architecture

---

## Components of an Android application architecture

- **Services** – Perform background functionalities
- **Intent** – Perform the inter connection between activities and the data passing mechanism
- **Resource Externalization** – strings and graphics
- **Notification** – light, sound, icon, notification, dialog box and toast
- **Content Providers** – Share the data between applications

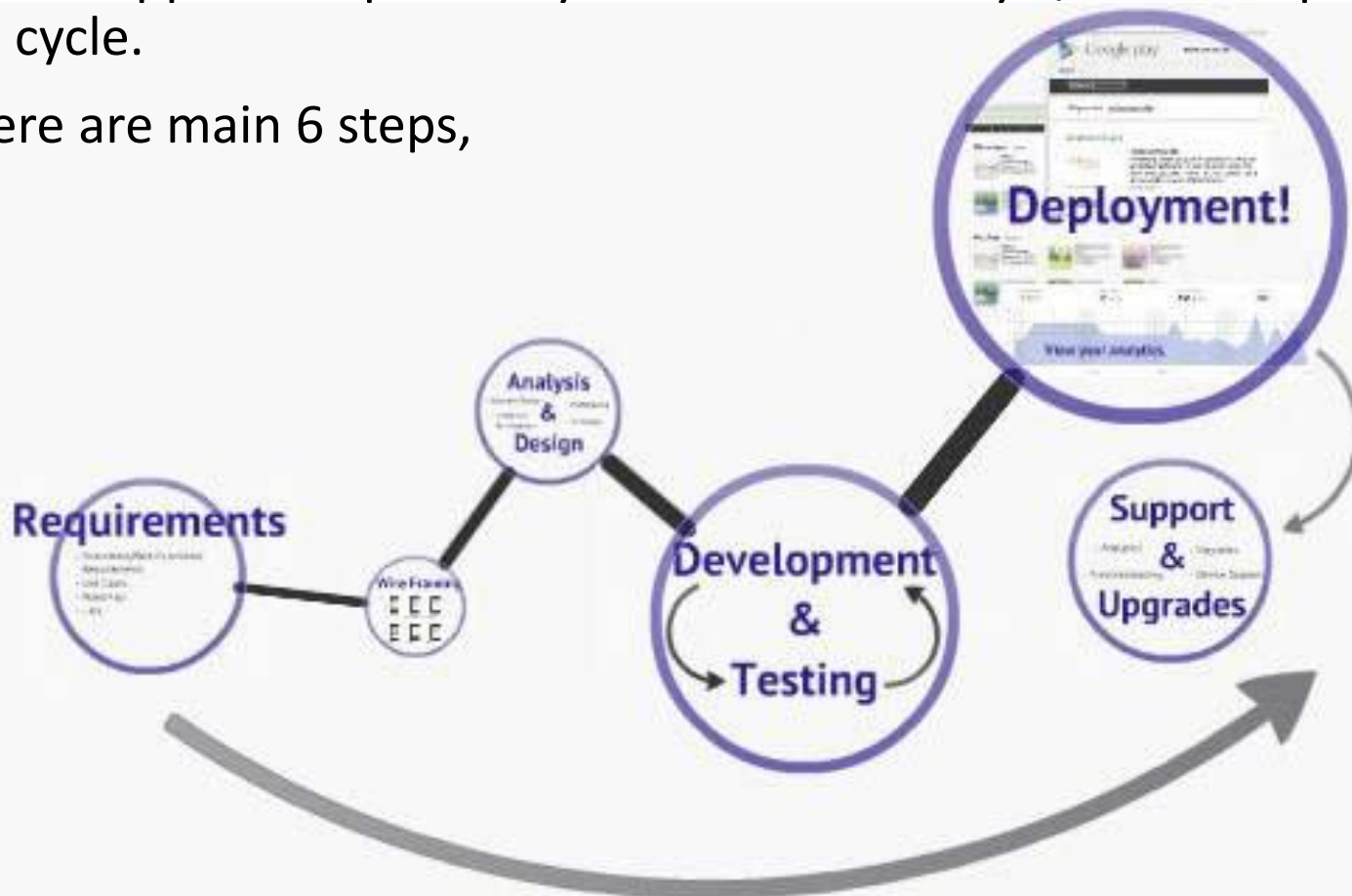


# Mobile Application Development Life cycle



# Mobile Application Development Life cycle

- Mobile app development cycle is similar to any S/W development life cycle.
- There are main 6 steps,



Reference:

<https://www.oceanasolutions.org/wp-content/uploads/2016/12/Enterprise-Mobile-App-Development-560x320.png>

# Cont'd

---

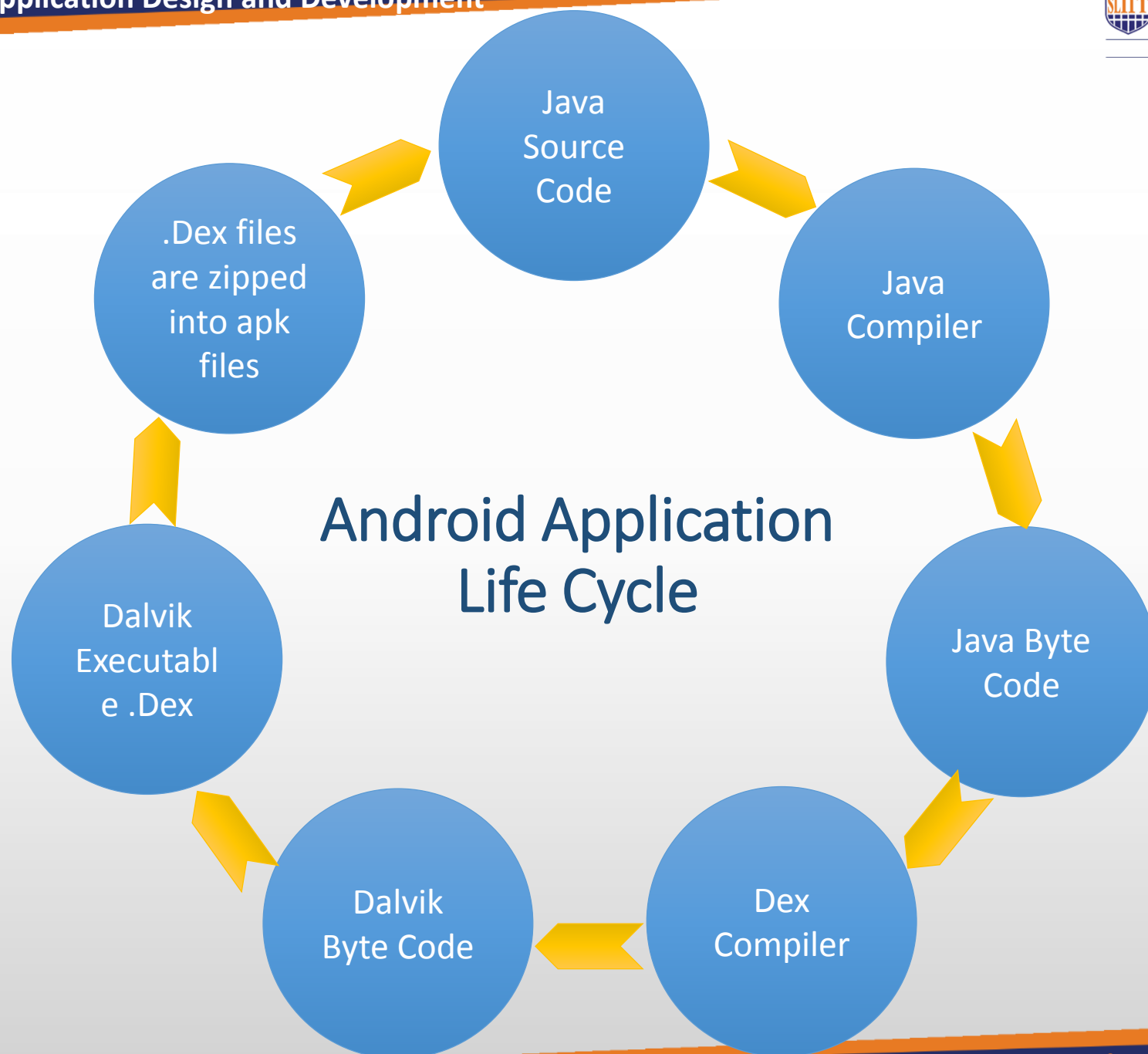
- **Analyze Requirements**– Use cases, technology selection and strategy
- **Design** – Wire-framing, prototyping and UI design
- **Development** – Performance and usability, Security & network response, platform, device & browser
- **Testing** Detect the bugs and fixing the app
- **Deployment** – Launch the app on play store / any market place
- **Support & Upgrades** – Analyze the reviews and update the app

# Cont'd

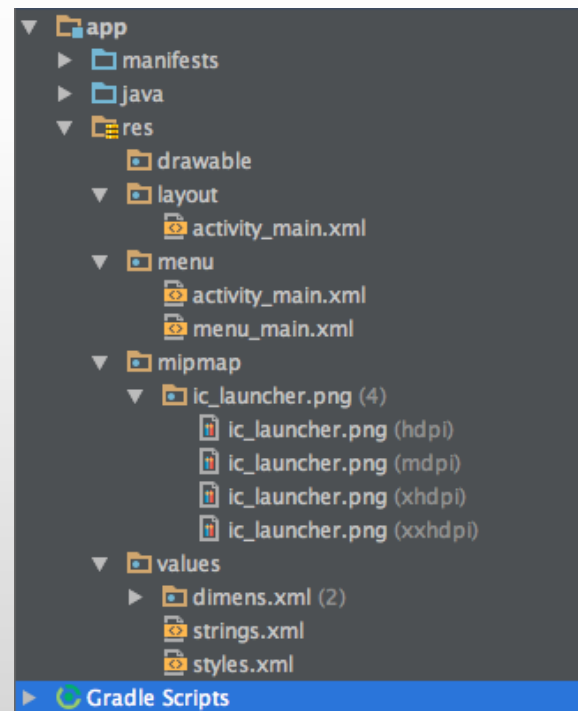
---

Video Reference: [6 Steps of Mobile App Development Lifecycle.mp4](#)

Reference: <https://www.youtube.com/watch?v=z3NsfhqAmnA>

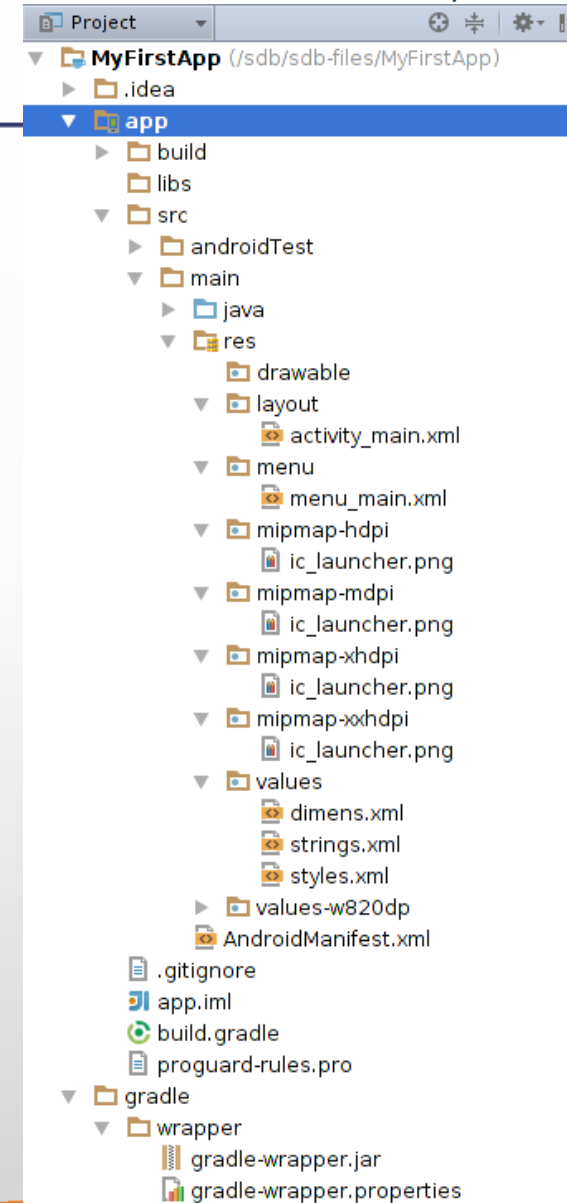


# Android Application Project Structure



# Project File Structure (based on Android Studio)

- Once a project is created in Android Studio, the project view will contain all the project files (as shown in the image)
- In here the files are organized into directories



Reference: <https://developer.android.com/images/tools/projectview-p2.png>

# Cont'd...

---

Some important directories are,

- **build** - Contains build outputs
- **libs** - Contains private libraries.
- **src** - Contains all source files (code) and resource files in subdirectories such as,
  - androidTest
  - **Main**
  - build.gradle (module)
- **gradle (project)** - This defines your build configuration that apply to all modules.



# Cont'd... (src/main)

---

main directory contain subdirectories within it,

- **java** - contains Java code sources
- **AndroidManifest.xml** - Describes the nature of the application and each of its components.
- **gen** - Contains the Java files generated by Android Studio, such as your R.java
- **assets**

# Cont'd...

---

- **res** - Contains all non-code resources

The XML files here can be divided into corresponding sub-directories

## **drawable** –

consists of Bitmap files or XML files

Ex:

bitmap files,  
shapes,  
animation drawables  
other drawable

## **layout** –

XML files that define a user interface layout

# Cont'd...

---

- **menu** – XML files that define app menus (context menu, options menu)
- **mipmap** – Drawable files for different launcher icon densities
- **values** – XML files that contain simple values such as, string, style, color

---

# Fundamental Components of Android

# Core building blocks / fundamental components of android

---

An android component is simply a piece of code that has a well defined life cycle. The components are:

- **Activity** (Will be covered in this lecture)
- View
- Intent
- Service
- Content Provider
- Fragment and etc.

# Activity & Activity Life Cycle

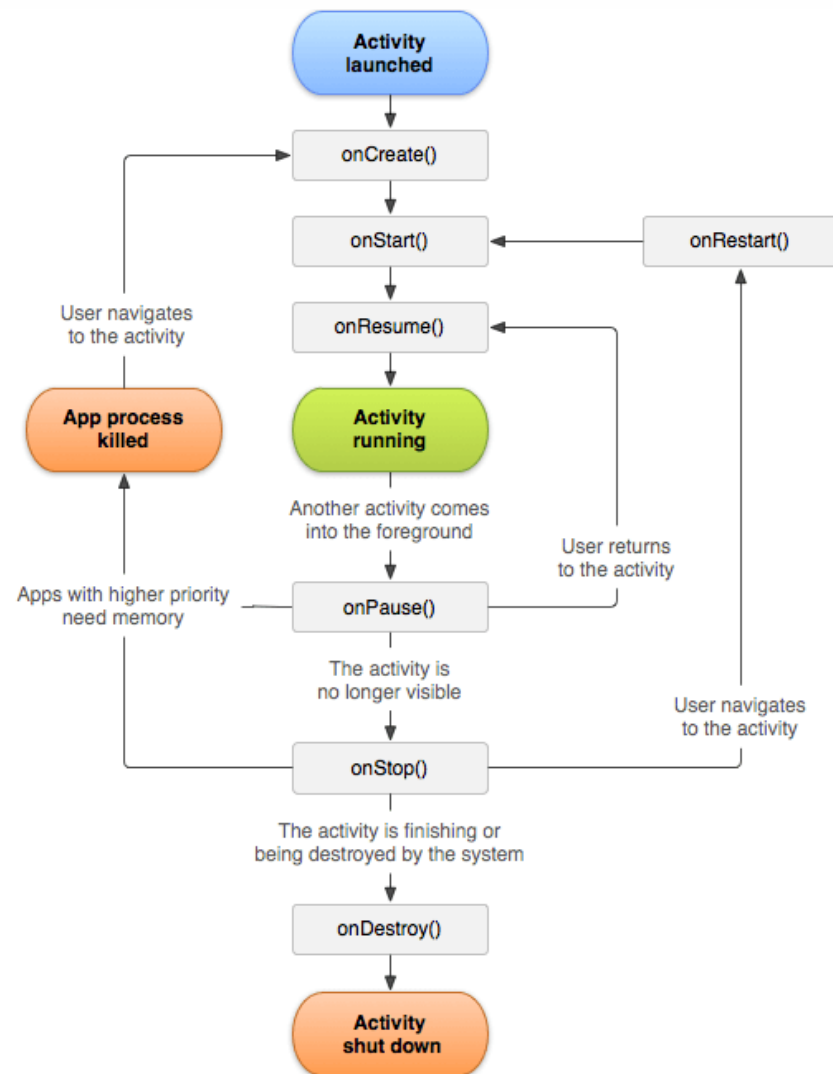


# Activity

---

- An activity is like a frame or window in java that represents GUI
- It represents one screen of android
- They perform actions on the screen

# Activity Life Cycle





# Cont'd...

---

- **onCreate():** called when activity is first created
- **onStart():** called when activity is becoming visible to the user
- **onResume():** called when activity will start interacting with the user
- **onPause():** called when activity is not visible to the user
- **onStop():** called when activity is no longer visible to the user
- **onRestart():** called after your activity is stopped, prior to start
- **onDestroy():** called before the activity is destroyed

# References

---

1. <https://developer.android.com/>
2. <https://www.tutorialspoint.com/>
3. <https://www.javatpoint.com>

# Summary

---

1. Overview to Android system
2. Android architecture & Android application architecture
3. Mobile App development life cycle
4. Android app development life cycle
5. Android app project structure
6. Activity & Activity life cycle

---

# Questions???



# Thank You!!!