Android Application Development

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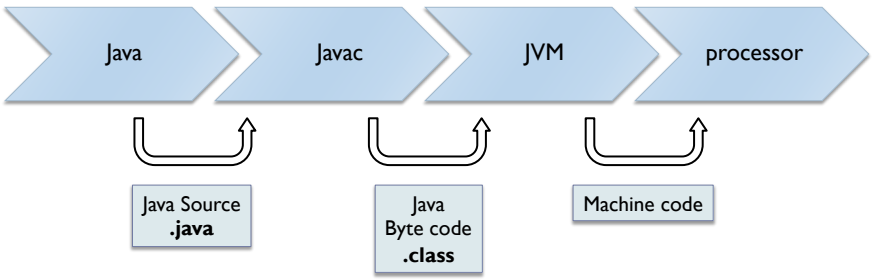
Android Architecture

- Java Virtual Machine
  - Java byte code requires an JVM that converts the byte code to native instructions



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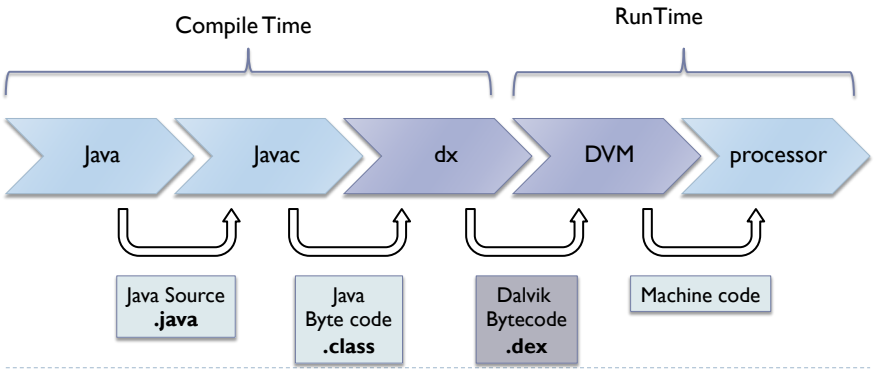
Android Architecture

- Dalvik Virtual Machine
  - Default with Kitkat and below
  - Optimized for mobile and embedded devices
  - Runs Dalvik byte code or "**.dex**" files.



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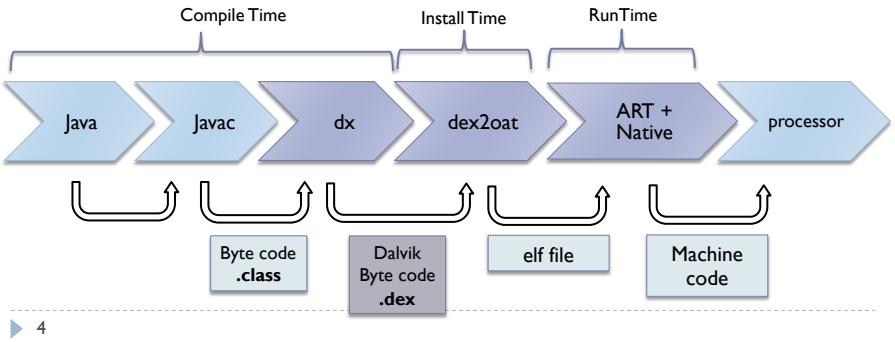
Android Architecture

- ART
  - Default with Lollipop and above
  - Ahead-of-time (AOT)
  - Improved Garbage Collection
  - 64bit support



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Android Studio

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Android Studio

- Installation
  - Download location

https://developer.android.com/studio

Android Studio provides the fastest tools for building apps on every type of Android device.

DOWNLOAD ANDROID STUDIO

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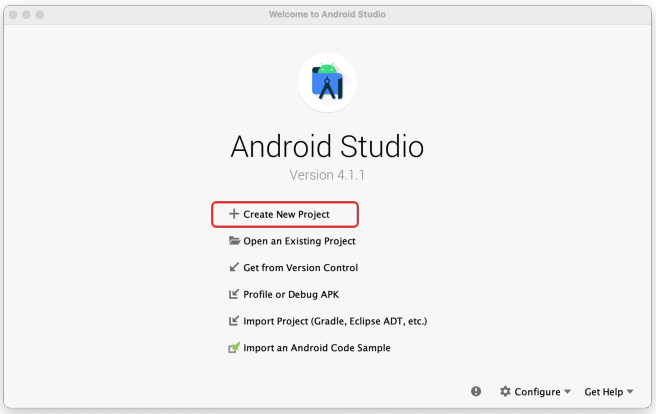
Android Studio

- Start Android Studio
  - Select "Create New Project"



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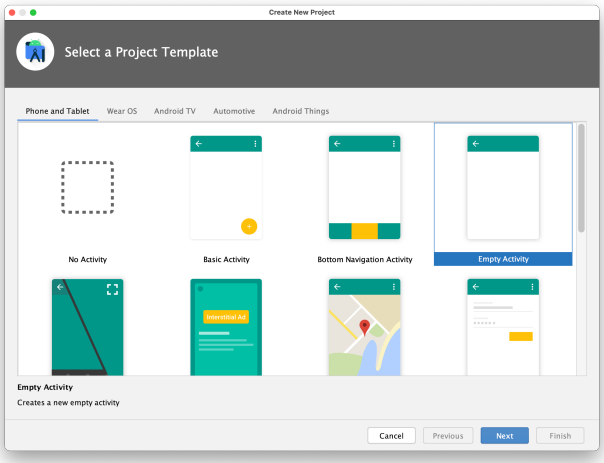
Android Studio

- Project Template



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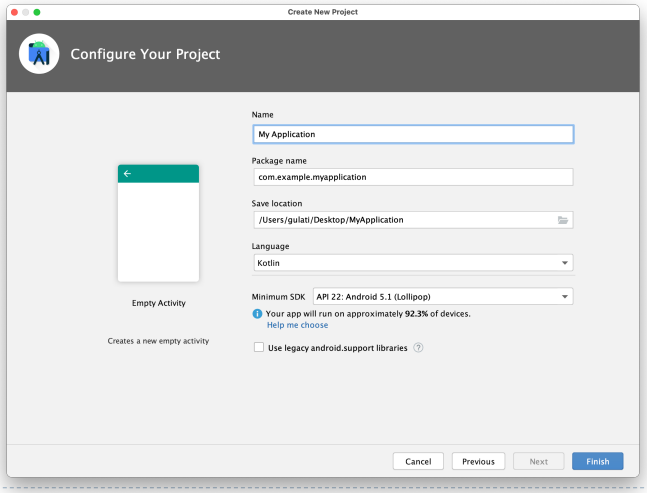
Android Studio

- Project Settings



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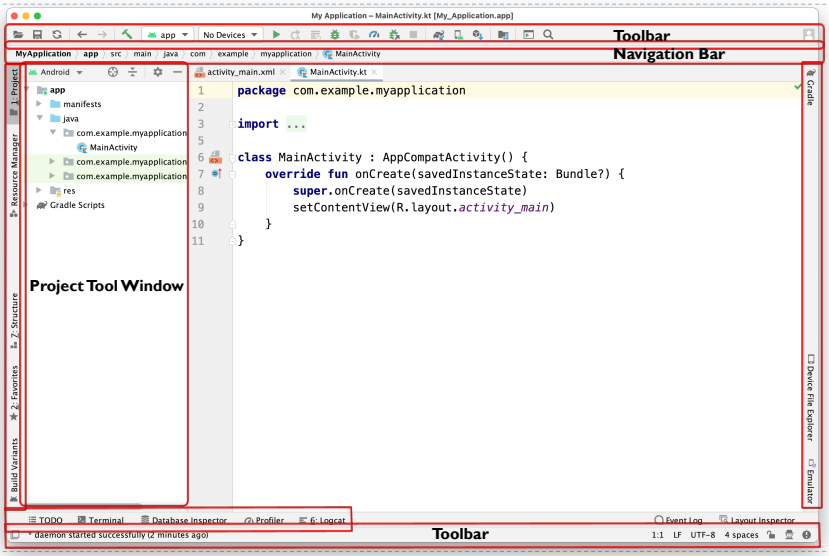
Android Studio



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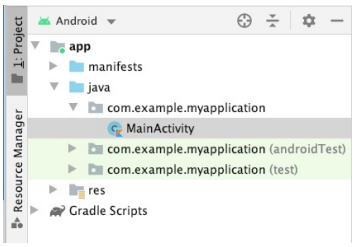
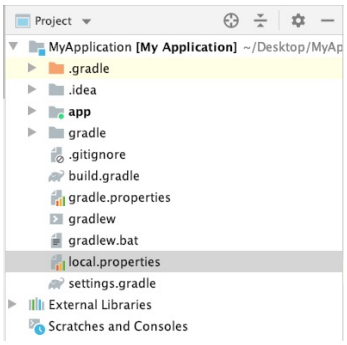
Android Studio

- Project Tool Window

Android View



Project View



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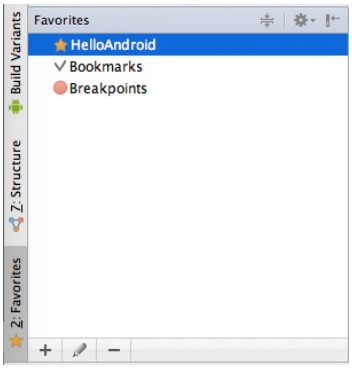
Android Studio

- Favorite Tool Window
  - Logically group references to related files
  - Contains 3 sections
    - Favorites
      - Files can be added to Favorites sections.
    - Bookmarks
      - Allow you to navigate to any line in a file.
    - Breakpoints



Favorite (⌥ ⇧ f)

Bookmark (fn F3)

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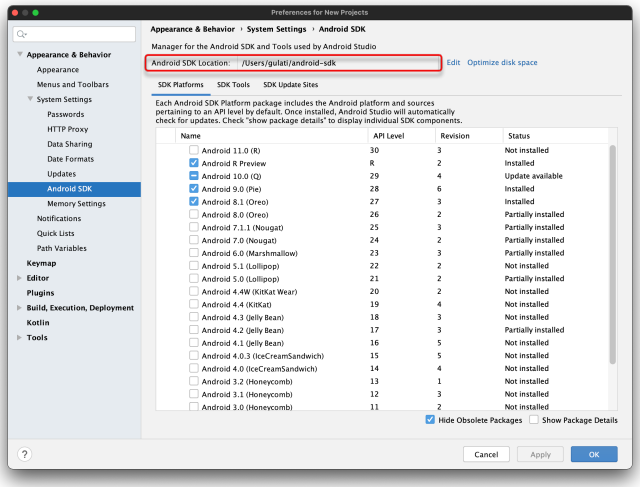
Android Studio

- SDK Manager



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Android Project

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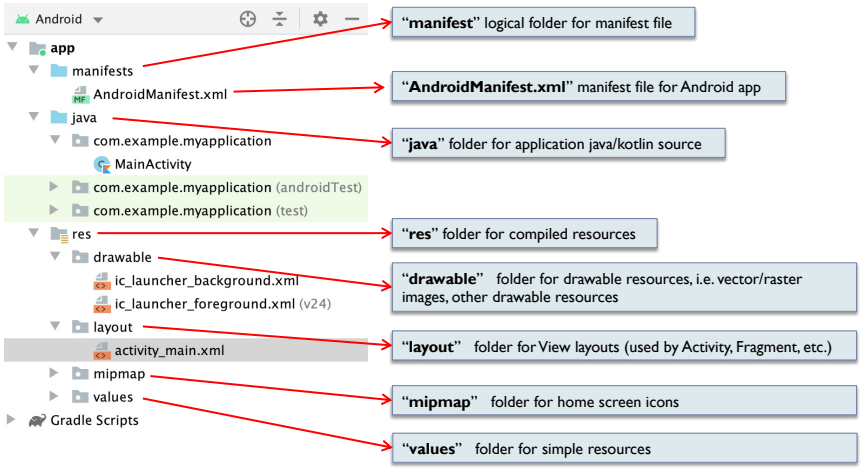
Android Studio

- Android View



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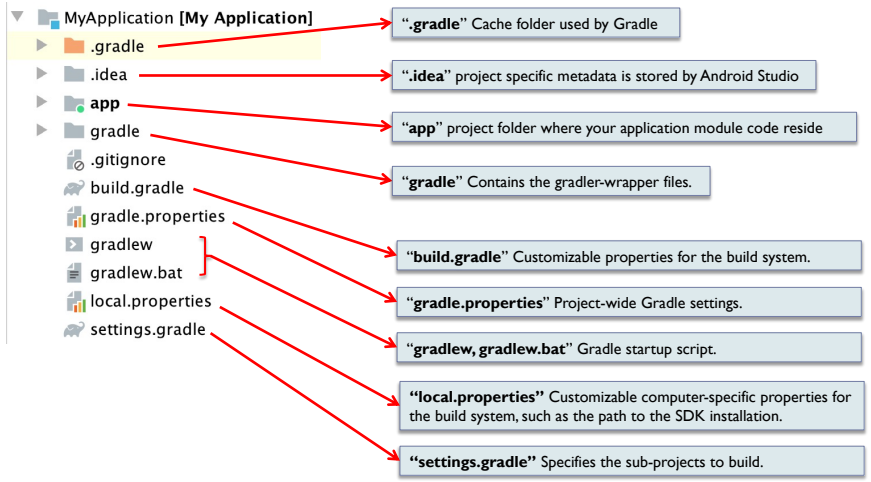
Android Studio

- Project View: File/Folder structure



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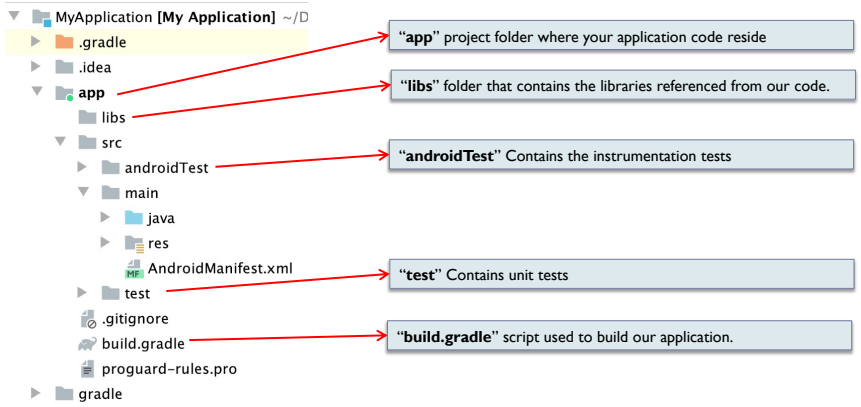
Android Studio

- Project View: File/Folder structure



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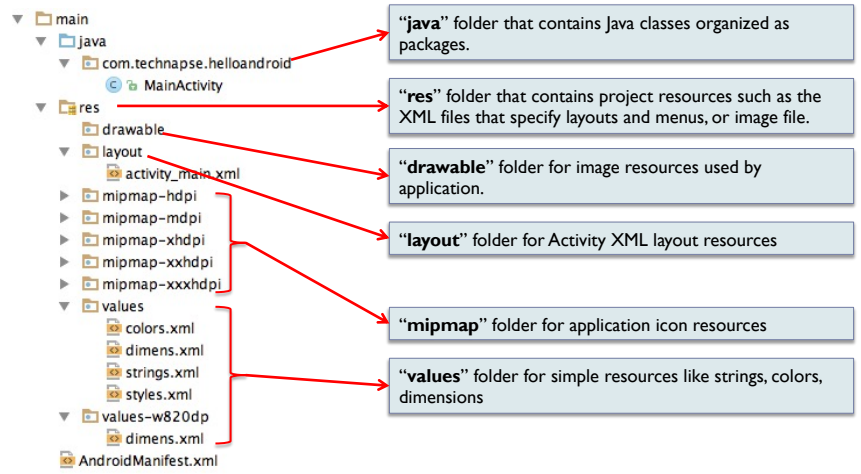
Android Studio

- Project View: File/Folder structure



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Application Essentials

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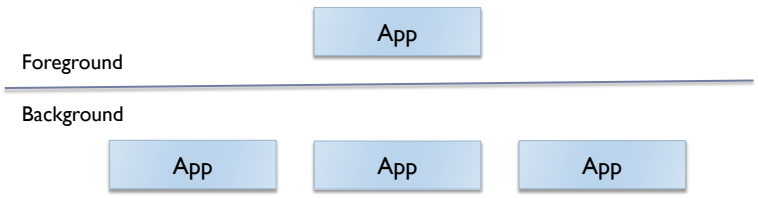
Android Runtime

- Active vs Background Applications
  - Active application
    - Application that is currently displaying content on the screen and has focus
  - Background application
    - Application process is still in Memory but is not displaying content on the screen.
    - Application has restricted access to CPU



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Application Essentials

- Physical Structure
  - An Android application is bundled as a "**.apk**"file.
  - .apk if a zip file

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Application Essentials

- What is an Android Application ?
  - Collection of loosely coupled Application Components
    - Activity
    - Service
    - Content Provider
    - Broadcast Receiver
  - Bound together by the Application Manifest.
  - Communicate with each other via Intent objects.
  - Use Resources
    - Almost everything other than Java code in Android is a resource.
    - Common Resources: String, Images, Audio, Video, Layouts etc.

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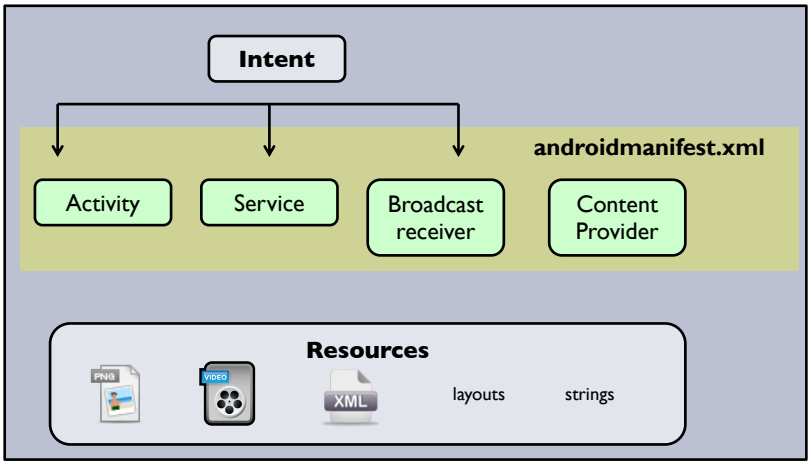
Application Essentials

- What is an Android Application ?



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Application Essentials

- Activity
  - Activities form the Presentation layer of an Android application.
  - A Single Screen in your application is an Activity.
    - Covers the whole screen of device
  - Activity object is given a blank window to draw.
    - Activity object is not capable of drawing in a window.

Simple Activity

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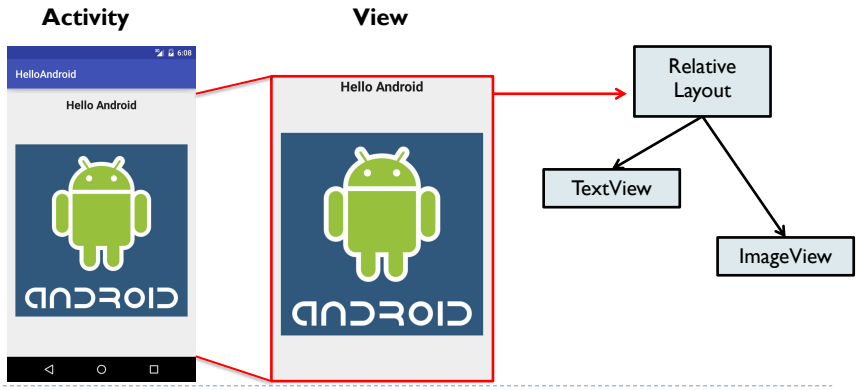
Application Essentials

- Activity
  - Activity attaches a **View** object to itself
    - A View object can draw in the window.



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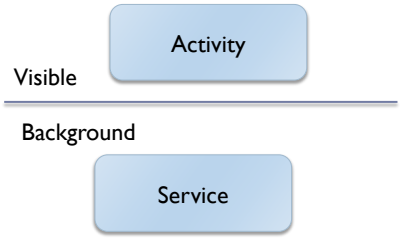
Application Essentials

- Service
  - Service is an Android Application Component that runs in the background.



  - Accomplish tasks that are to be run even when none of the Activities associated with an application are visible or running.

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Application Essentials

- Service
  - Service can be scheduled for execution in the background at a later point in time or periodically.
  - Common Use-cases
    - Playing music in the background
    - Syncing Application data with remote server.
    - Run scheduled tasks

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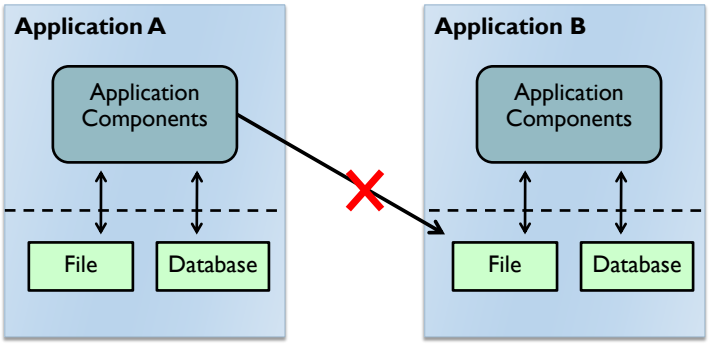
Application Essentials

- Content Provider
  - Android Applications run in a sand-boxed environment.
    - An application does not have direct access to files and directories of other applications.



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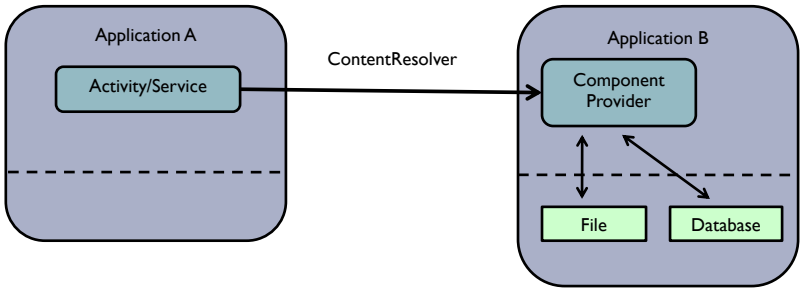
Application Essentials

- Content Provider
  - Allows sharing data between applications
    - By implementing content provider, an application can share its data with other applications



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Application Essentials

- Content Provider
  - Android ships with a number of content providers for common data
    - call log, contacts, browser information, audio and video media etc.

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Application Essentials

- Broadcast Receiver
  - System and Application broadcast events.
    - Android System generates broadcasts when certain state changes occur.
    - Applications can generate broadcasts.
  - Applications that want to listen for broadcasts
    - Implement Broadcast receiver component
    - Register the Broadcast Receiver for the Broadcast Action.

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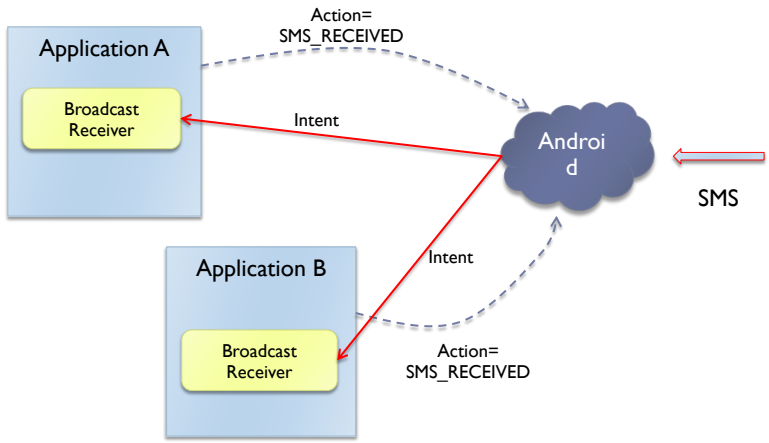
Application Essentials

- Broadcast Receiver



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Application Essentials

- Broadcast Receiver
  - Application with broadcast receiver does not have to be running or in background
    - Launched automatically in the background in order to execute Broadcast Receiver.
    - Executed as a result of a specific broadcast is raised by the System or an Application.
  - Broadcast announcements generated by system may include:
    - Airplane mode
    - Phone call received.
    - Low battery
    - USB connection
    - Etc.

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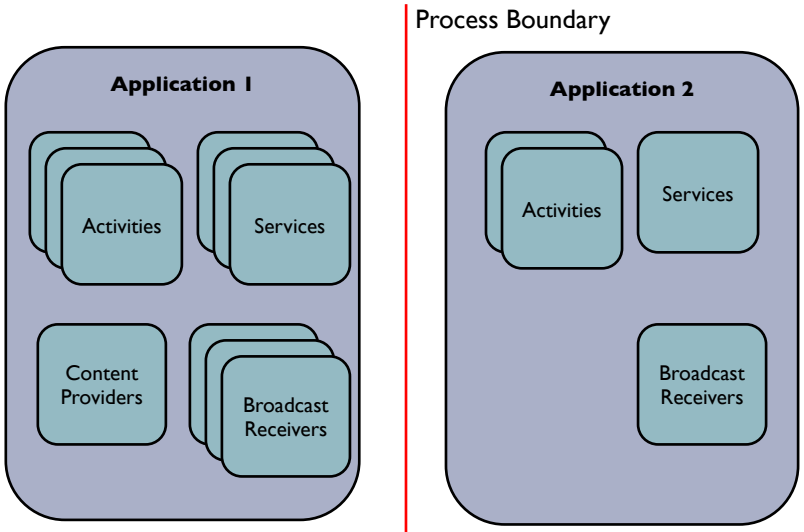
Application Essentials



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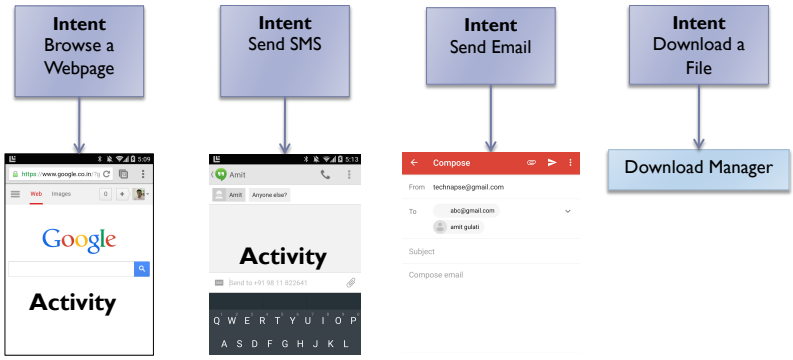
Application Essentials

- Intent
  - Abstract concept that represent
    - Operation or action to be performed.
  - Actions are performed via Application components



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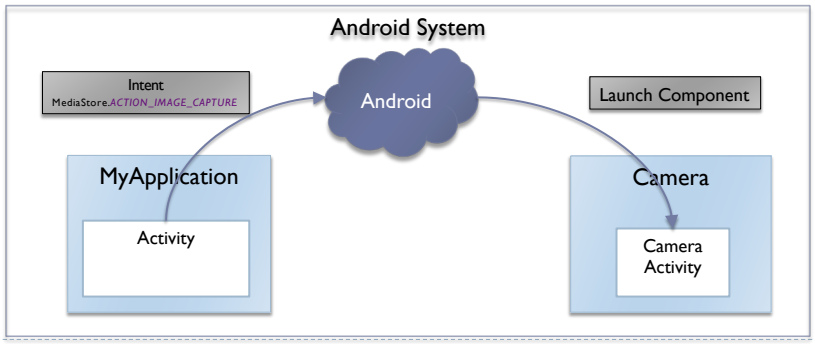
Application Essentials

- Intent
  - Primary way for launching Application components.
  - Components that are launched using Intent may be part of other applications



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Application Essentials

- Intent
  - Example

```
var intent = Intent(MediaStore.ACTION_IMAGE_CAPTURE)
startActivity(intent)
```


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Application Essentials

- Intent
  - Primary way for launching Application components.
  - Primary way in which system / third party application send events to applications.
  - Communication between application components

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Application Essentials

- Why Intents ?
  - Re-usability & Loose Coupling
    - Use of components written by other programmers without knowing much about them.
    - To use the Camera Activity in android

```
Intent camera =
        new Intent(MediaStore.ACTION_IMAGE_CAPTURE);
```

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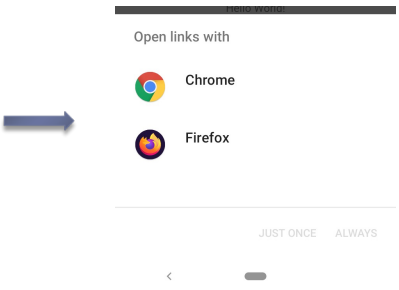
Application Essentials

- Why Intents ?
  - Re-usability & Loose Coupling
    - Intents are bound to Application components at Run-time
    - In case of multiple components for an intent the user can select which one to use.

```
var intent = Intent(Intent.ACTION_VIEW)
intent.data = Uri.parse("http://www.google.com")
startActivity(intent)
```



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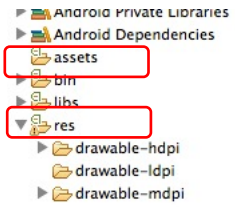
Application Essentials

- Android Application Resources
  - Resources are things that are used by your application other than source code.
    - Images (Icons, Splash Screen, etc.)
    - XML files
    - Media files (Audio, Video etc.)
    - Strings, Arrays, Styles and Themes etc.
  - Two folders for adding resources
    - **res**
    - **assets**



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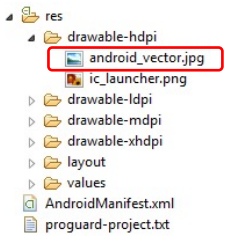
Application Essentials

- Android Application Resources
  - "res" folder resources
    - Android Asset Packaging Tool (AAPT) processes resources added to the "res" folder in project.
    - A unique entry (ID) for each resource is placed in the R.java file.
    - Resource can then be accessed in an Android project with the ID.




```
public final class R {
    public static final class attr {
    }
    public static final class drawable {
        public static final int android_vector=0x7f020000;
        public static final int ic_launcher=0x7f020001;
    }
```

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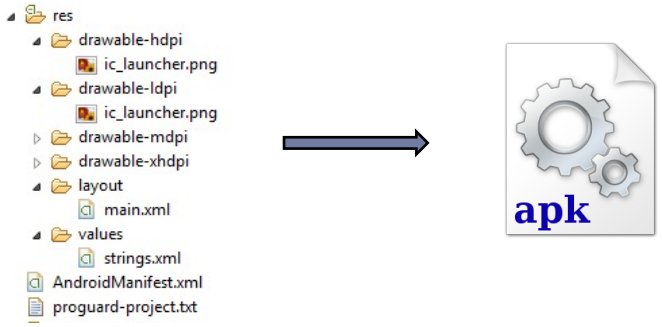
Application Essentials

- Android Application Resources
  - Resources added to the application project are packaged together in the application bundle (.apk) that is installed on the device.



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Application Essentials

- Android Manifest
  - Every Android application package contains an Application Manifest file (androidmanifest.xml).
  - Contains application meta-data, that is used by Android system.
  - Application Manifest file serves the following purpose
    - Application information i.e. Name, Version, icon, etc are defined in the manifest file.
    - Used to specify hardware and software dependencies of the application.
    - Used to specify permissions required by the application.
    - Used to define the different Application components present in the application package.

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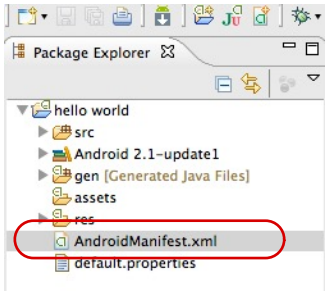
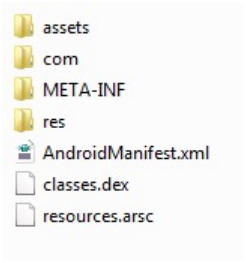
Application Essentials

- Android Manifest
  - Manifest file is located at the root level in the Android project hierarchy.
  - Manifest file is packaged along with executable code and resources in the .apk file.





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