History

J2ME

- Java 2 Platform, Micro Edition
- A java platform designed for mobile development and personal assitants (PDAs)
- Used Java K Virtual Machine

Blackberry Mobile

- Smartphones designed by Research in Motion
- Very succesful at launch
- Business oriented
- Secure

Android

- Founded by Andy Rubin in Palo Alto, California
- Acquired by Google in 2005
- Originally intended for camera, later shifted to mobile
- Currently over 2 billion monthly active users

Windows Mobile

- Mobile OS by Microsoft
- Initially called PocketPC 2000
- Replaced by Windows phone
- Now deprecated

Android Platform

- Android is an open source, Linux-based software stack created for a wide array of devices and form factors.
- Android provides a rich application framework that allows you to build innovative apps and games for mobile devices in a Java language environment.
- Founded by Andy Rubin in Palo Alto, California
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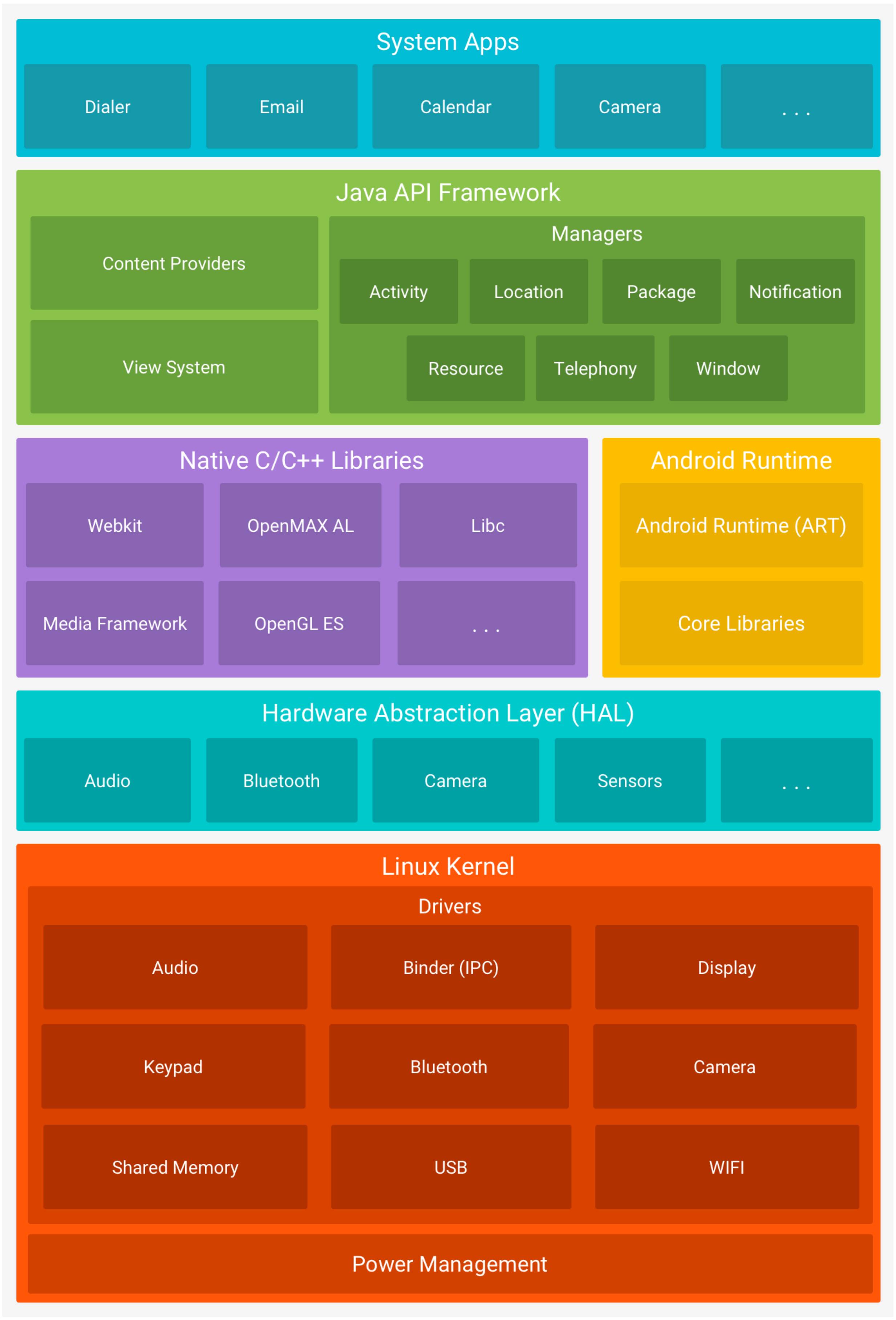
Architecture



Components

- Android applications are built using reusable components
- They Are:
    - Activities
    - Services
    - Content Provider
    - Broadcast Reciever

Android Tools

SDK

- The Android SDK (software development kit) is a set of development tools used to develop applications for Android platform. The Android SDK includes the following:
    - Required libraries
    - Debugger
    - An emulator
    - Relevant documentation for the Android application program interfaces (APIs)
    - Sample source code
    - Tutorials for the Android OS
- Every time Google releases a new version of Android, a corresponding SDK is also released.
- To be able to write programs with the latest features, developers must download and install each version's SDK for the particular phone.
- The development platforms that are compatible with SDK include operating systems like Windows (XP or later), Linux (any recent Linux distribution) and Mac OS X (10.4.9 or later). The components of Android SDK can be downloaded separately.

ADB:

- Android Debug Bridge (adb) 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, and it provides access to a Unix shell that you can use to run a variety of commands on a device.
- It is a client-server program that includes three components:
    - **A client**, which sends commands. The client runs on your development machine. You can invoke a client from a command-line terminal by issuing an adb command.

    - **A daemon (adbd)**, which runs commands on a device. The daemon runs as a background process on each device.
    - **A server**, which manages communication between the client and the daemon. The server runs as a background process on your development machine.

Gradle:

- Gradle is a build system used to build Android applications.
- The build system automatically takes all the source files (`.java` or `.xml`), then applies the appropriate tool (e.g. takes `java` class files and converts them to `dex` files), and groups all of them into one compressed file, our beloved APK.
- Gradle is a **build system** that takes the best features from other build systems and combines them into one.
- A project using Gradle describes its build via a *build.gradle* file.
- This file is located in the root folder of the project.
- The Gradle build system uses plug-ins to extend its core functionality.
- A plug-in is an extension to Gradle which typically adds some preconfigured tasks.
- Gradle ships with a number of plug-ins, and you can develop custom plug-ins.

Activities and Lifecycle, Fragments and Intents

Activities

- Activities are one of the fundamental building blocks of apps on the Android platform. They serve as the entry point for a user's interaction with an app, and are also central to how a user navigates within an app (as with the Back button) or between apps (as with the Recents button).

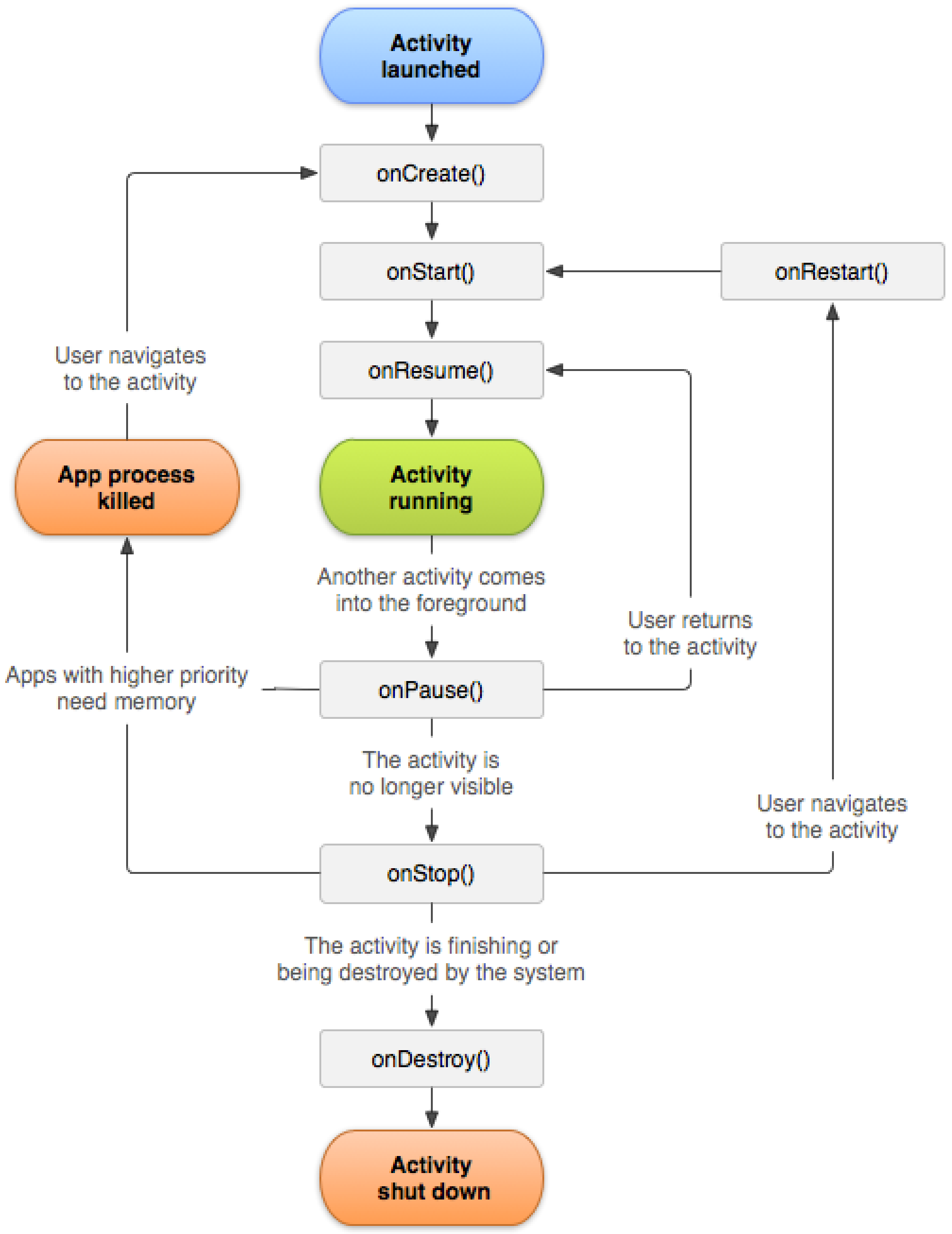
  Skillfully managing activities allows you to ensure that, for example:

    - Orientation changes take place smoothly without disrupting the user experience.
    - User data is not lost during activity transitions.
    - The system kills processes when it's appropriate to do so.

- For your app to be able to use activities, you must declare the activities, and certain of their attributes, in the manifest:

-
  ```
  <manifest ... >
    <application ... >
        <activity android:name=".ExampleActivity" />
        ...
    </application ... >
    ...
  </manifest >

  ```

- **Life Cycle:**



Activity launched
onCreate()
onStart()
onRestart()
User navigates to the activity
onResume()
App process killed
Activity running
Another activity comes into the foreground
User returns to the activity
Apps with higher priority need memory
onPause()
The activity is no longer visible
User navigates to the activity
onStop()
The activity is finishing or being destroyed by the system
onDestroy()
Activity shut down

  - **onCreate()**
    - You must implement this callback, which fires when the system first creates the activity.

    - On activity creation, the activity enters the *Created* state.
    - In the `onCreate()` method, you perform basic application startup logic that should happen only once for the entire life of the activity.
- **onStart()**
    - When the activity enters the Started state, the system invokes this callback.
    - The `onStart()` call makes the activity visible to the user, as the app prepares for the activity to enter the foreground and become interactive.
    - For example, this method is where the app initializes the code that maintains the UI.
- **onResume()**
    - When the activity enters the Resumed state, it comes to the foreground, and then the system invokes the `onResume()` callback.
    - This is the state in which the app interacts with the user.
    - The app stays in this state until something happens to take focus away from the app.
    - Such an event might be, for instance, receiving a phone call, the user's navigating to another activity, or the device screen's turning off.
    - When an interruptive event occurs, the activity enters the *Paused* state, and the system invokes the `onPause()` callback.
- **onPause()**
    - The system calls this method as the first indication that the user is leaving your activity (though it does not always mean the activity is being destroyed).
    - Use the `onPause()` method to pause operations such animations and music playback that should not continue while the `Activity` is in the Paused state, and that you expect to resume shortly.
    - There are several reasons why an activity may enter this state. For example:
        - Some event interrupts app execution. This is the most common case.
        - In Android 7.0 (API level 24) or higher, multiple apps run in multi-window mode. Because only one of the apps (windows) has focus at any time, the system pauses all of the other apps.
        - A new, semi-transparent activity (such as a dialog) opens. As long as the activity is still partially visible but not in focus, it remains paused.
- **onStop()**
    - When your activity is no longer visible to the user, it has entered the *Stopped* state, and the system invokes the `onStop()` callback.
    - This may occur, for example, when a newly launched activity covers the entire screen.
    - The system may also call `onStop()` when the activity has finished running, and is about to be terminated.
- **onDestroy()**

        - Called before the activity is destroyed.
        - This is the final call that the activity receives.
        - The system either invokes this callback because the activity is finishing due to someone's calling `finish()`, or because the system is temporarily destroying the process containing the activity to save space.

Styles and Themes

- A *style* is a collection of attributes that specify the look and format for a `View` or window.
- A style can specify attributes such as height, padding, font color, font size, background color, and much more.
- A style is defined in an XML resource that is separate from the XML that specifies the layout.
- To create a set of styles, save an XML file in the `res/values/` directory of your project.
- The XML file must
    - use the `.xml` extension
    - use lowercase, underscores,
    - be saved in the `res/values/` folder.
- Eg:

```
<resources>
    <style name="AppTheme" parent="Theme.Material">
        <item name="colorPrimary">#673AB7</item>
        <item name="colorPrimaryDark">#512DA8</item>
        <item name="colorAccent">#FF4081</item>
    </style>
</resources>
```

- Depending on the attribute, you can use values with the following resource types in an `<;item>;` element:
    - Fraction
    - Float
    - Boolean
    - Color
    - String
    - Dimension
    - Integer
- The `parent` attribute in the `<;style>;` element lets you specify a style from which your style should inherit attributes.

- You can use this to inherit attributes from an existing style and define only the attributes that you want to change or add.

- ## There are several ways to set a style
    - ### Apply a style to a view

        -
          ```xml
          <TextView
              style="@style/CodeFont"
              android:text="@string/hello" />
          ```
    - ### Apply a theme to an activity or app
        - To set a theme for all the activities of your app, open the `AndroidManifest.xml` file and edit the `<;application>;` tag to include the `android:theme`attribute with the style name.
        - For example:

        -
          ```xml
          <application android:theme="@style/CustomTheme">
          ```

Dialogs

- A dialog is a small window that prompts the user to make a decision or enter additional information.
- A dialog does not fill the screen and is normally used for modal events that require users to take an action before they can proceed.
- Use DialogBuilder to create basic Dialogs:

-
  ```
  AlertDialog dialog = new
  AlertDialog.Builder(MainActivity.this).create();

  dialog.setTitle("Title");
  dialog.setMessage("Message");

  //ADD A POSITIVE BUTTON
  dialog.setButton(dialog.BUTTON_POSITIVE, "YES", new
  DialogInterface.OnClickListener() {                      @Override
    public void onClick(DialogInterface dialog, int i) {
      //      POSITIVE BUTTON ACTION

      }
  });

  //ADD A NEGATIVE BUTTON
  dialog.setButton(dialog.BUTTON_POSITIVE, "NO", new
  DialogInterface.OnClickListener() {                      @Override
    public void onClick(DialogInterface dialog, int i) {
      //      NEGATIVE BUTTON ACTION

      }
  });

  //SHOW THE DIALOG
  dialog.show();
  ```

Intents

- An `Intent` is a messaging object you can use to request an action from another app component.
- Although intents facilitate communication between components in several ways, there are three fundamental use cases:
  - Starting an activity
    - An `Activity` represents a single screen in an app.
    - You can start a new instance of an `Activity` by passing an `Intent` to `startActivity()`.
    - The `Intent` describes the activity to start and carries any necessary data.
  - Starting a service
    - A `Service` is a component that performs operations in the background without a user interface.
  - Delivering a broadcast

        - A broadcast is a message that any app can receive.
        - The system delivers various broadcasts for system events, such as when the system boots up or the device starts charging.
        - You can deliver a broadcast to other apps by passing an `Intent` to `sendBroadcast()` or `sendOrderedBroadcast()`.

Types of Intents:

- **Explicit intents**:
    - Specify the component to start by name (the fully-qualified class name).
    - You'll typically use an explicit intent to start a component in your own app, because you know the class name of the activity or service you want to start.
- **Implicit intents**
    - Do not name a specific component, but instead declare a general action to perform, which allows a component from another app to handle it.
    - For example, if you want to show the user a location on a map, you can use an implicit intent to request that another capable app show a specified location on a map.
- An `Intent` object carries information that the Android system uses to determine which component to start, plus information that the recipient component uses in order to properly perform the action.
- The primary information contained in an `Intent` is the following:
    - **Component name**

      This is optional, but it's the critical piece of information that makes an intent *explicit*, meaning that the intent should be delivered only to the app component defined by the component name.

      Without a component name, the intent is *implicit* and the system decides which component should receive the intent based on the other intent information.
    - **Action**

      A string that specifies the generic action to perform (such as *view* or *pick*).
    - **Data**

      The URI (a `Uri` object) that references the data to be acted on and/or the MIME type of that data.
    - **Extras**

      Key-value pairs that carry additional information required to accomplish the requested action.

      You can add extra data with various `putExtra()` methods, each accepting two parameters: the key name and the value.
- **Example Explicit Intent**

```
Intent intent = new Intent(this, SecondActivity.class);
startActivity(intent);
```

- **Example Implicit Intent**

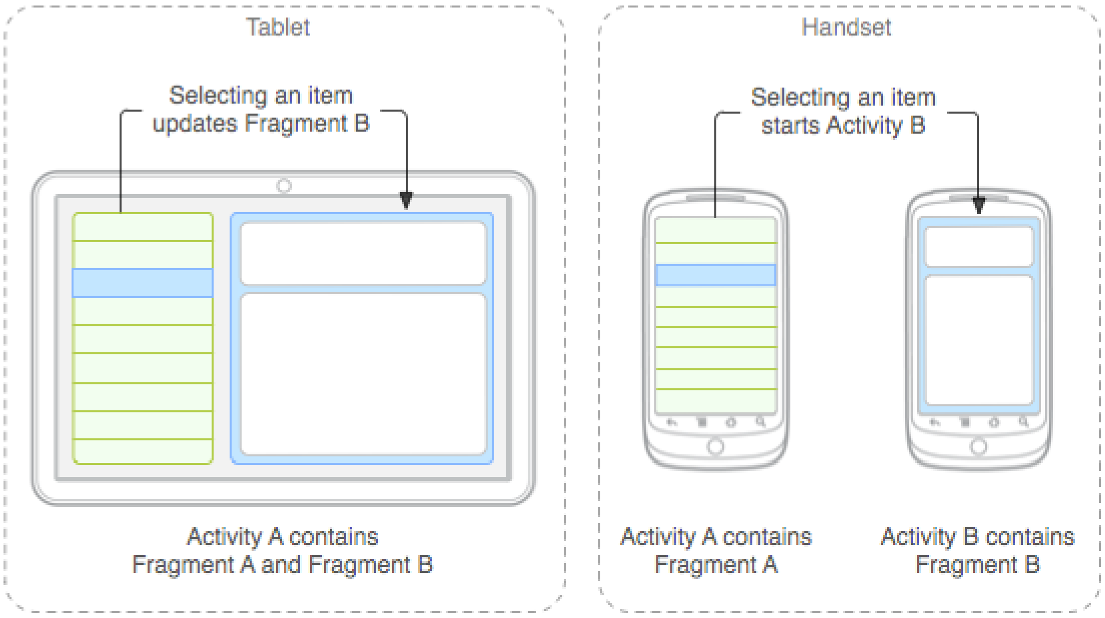
```
Intent sendIntent = new Intent();

sendIntent.setAction(Intent.ACTION_SEND);
sendIntent.putExtra(Intent.EXTRA_TEXT, textMessage);
sendIntent.setType("text/plain");

startActivity(sendIntent);

```

- Recieving an Implicit Intent:
    - To advertise which implicit intents your app can receive, declare one or more intent filters for each of your app components with an `<;intent-filter>;` element in your manifest file.
    - For example, here's an activity declaration with an intent filter to receive an `ACTION_SEND` intent when the data type is text:

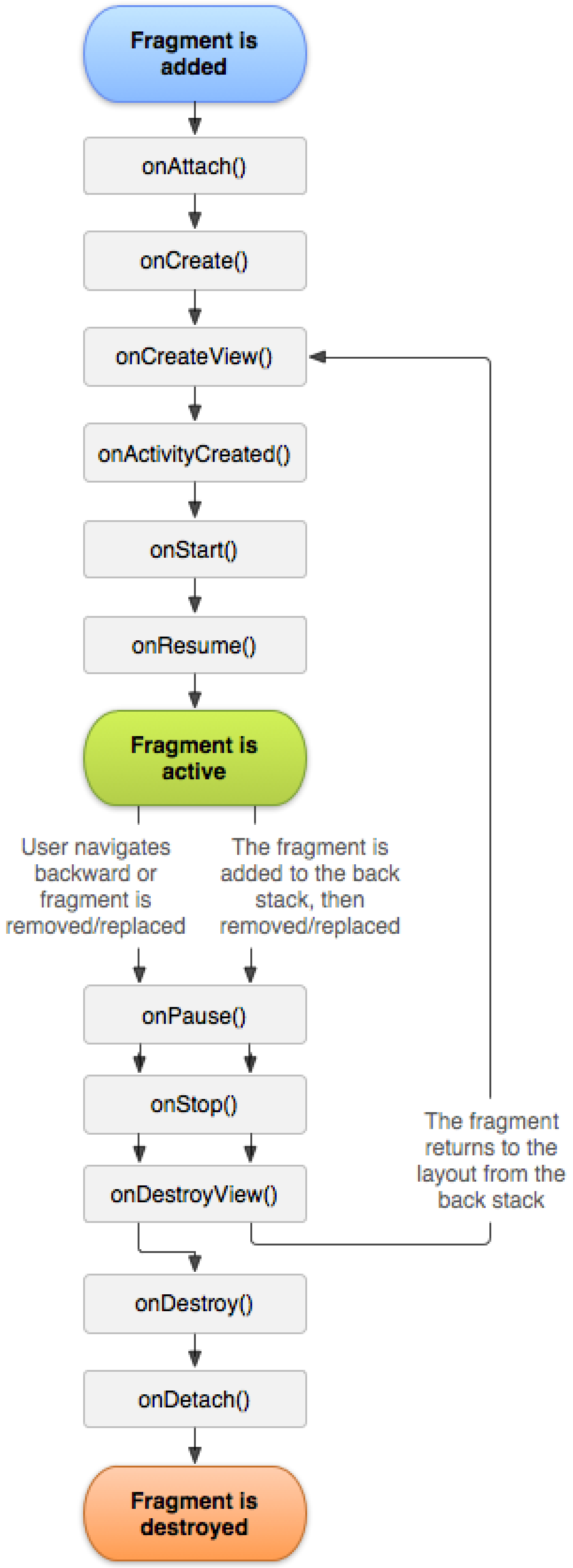
    ```
    <activity android:name="ShareActivity">
        <intent-filter>
            <action android:name="android.intent.action.SEND"/>
            <category android:name="android.intent.category.DEFAULT"/>
            <data android:mimeType="text/plain"/>
        </intent-filter>
    </activity>
    ```

Fragments

- A `Fragment` represents a behavior or a portion of user interface in an `Activity`.
- You can combine multiple fragments in a single activity to build a multi-pane UI and reuse a fragment in multiple activities.
- You can think of a fragment as a modular section of an activity, which has its own lifecycle, receives its own input events, and which you can add or remove while the activity is running (sort of like a "sub activity" that you can reuse in different activities).


Tablet
Selecting an item updates Fragment B
Activity A contains Fragment A and Fragment B
Handset
Selecting an item starts Activity B
Activity A contains Fragment A
Activity B contains Fragment B

Life-Cycle of a Fragment:


Fragment is added
onAttach()
onCreate()
onCreateView()
onActivityCreated()
onStart()
onResume()
Fragment is active
User navigates backward or fragment is removed/replaced
The fragment is added to the back stack, then removed/replaced
onPause()
onStop()
onDestroyView()
The fragment returns to the layout from the back stack
onDestroy()
onDetach()
Fragment is destroyed