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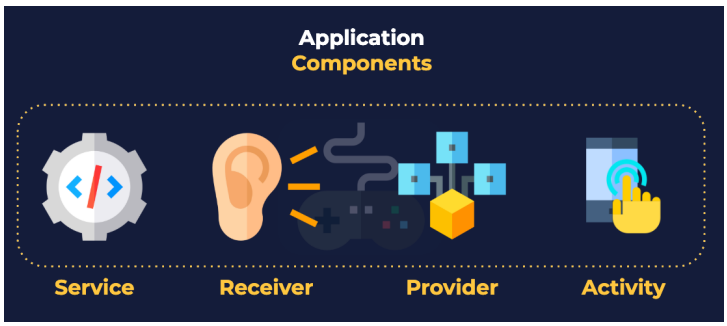
Android App Fundamentals

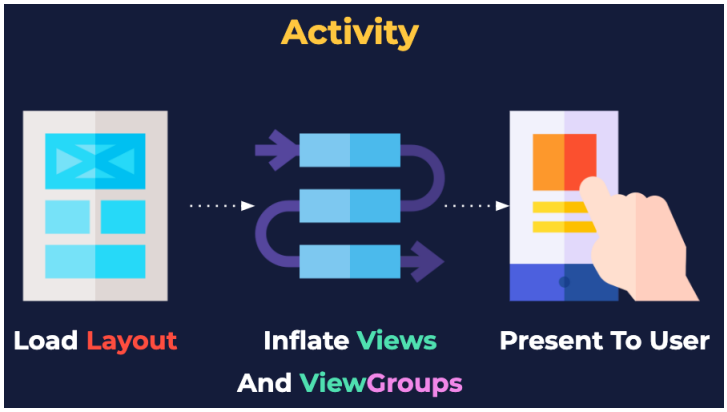
Top Level Components

The ability to text, email, play games and much more are accomplished in Android applications through four top-level component classes: BroadcastReceiver, ContentProvider, Service, and Activity. These are all represented by Java Objects.



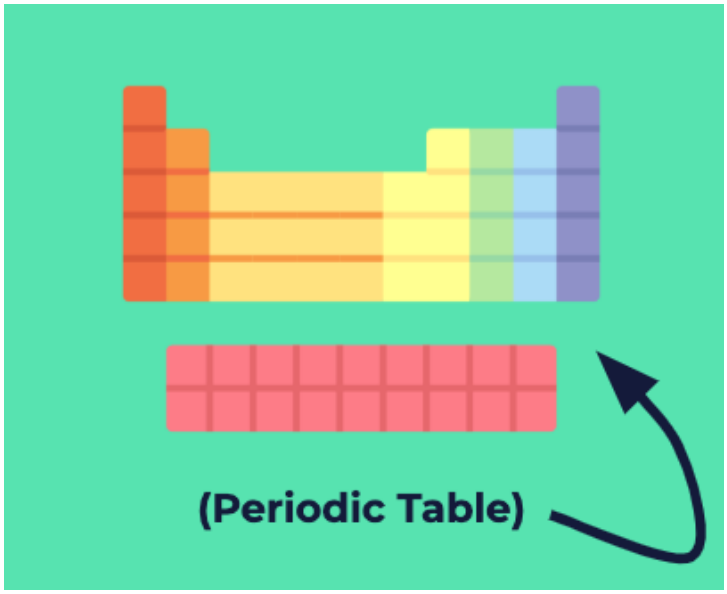
Activity Components

Activities provide the most visible of the application components. They present content to the screen and respond to user interaction. `Activity` components are the only components that present interactive content to the user. An `Activity` represents something an application can do, and an application often "does" several things – meaning, most applications provide more than one `Activity`.



Android Views

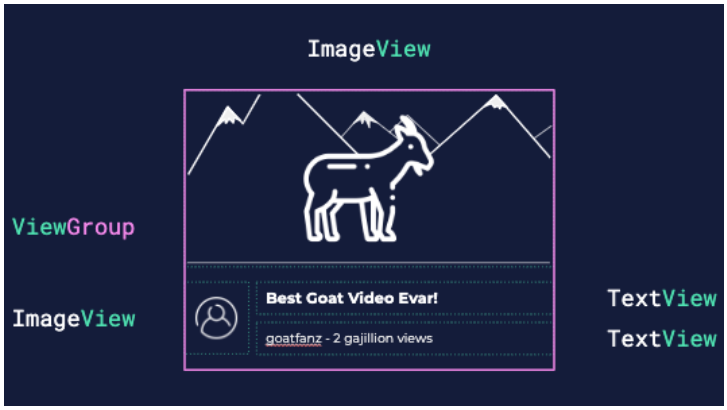
In Android, `Views` are atomic, indivisible elements that draw themselves to the screen. They can display images, text, and more. Like periodic elements combine to form chemicals, we combine `Views` to form design components that serve a purpose to the user.



Android ViewGroups

In Android, `ViewGroups` arrange `Views` (and other `ViewGroups`) to form meaningful designs.

`ViewGroups` are the special bond that combines Views to form design components that serve a purpose to the user. ViewGroups are Views that may contain other Views within them.



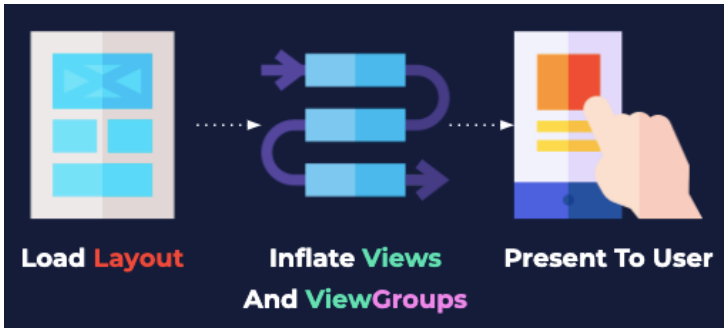
Android Layout Files

In Android, each layout is represented by an XML file. These plain text files serve as blueprints for the interface that our application presents to the user.

```
<ConstratinLayout ...>
        <ImageView id="thumbnail" .../>
  <ImageView id="avatar" .../>
  <ImageView id="title" .../>
  <imageView id="subtitle" .../>
</ConstratinLayout>
```

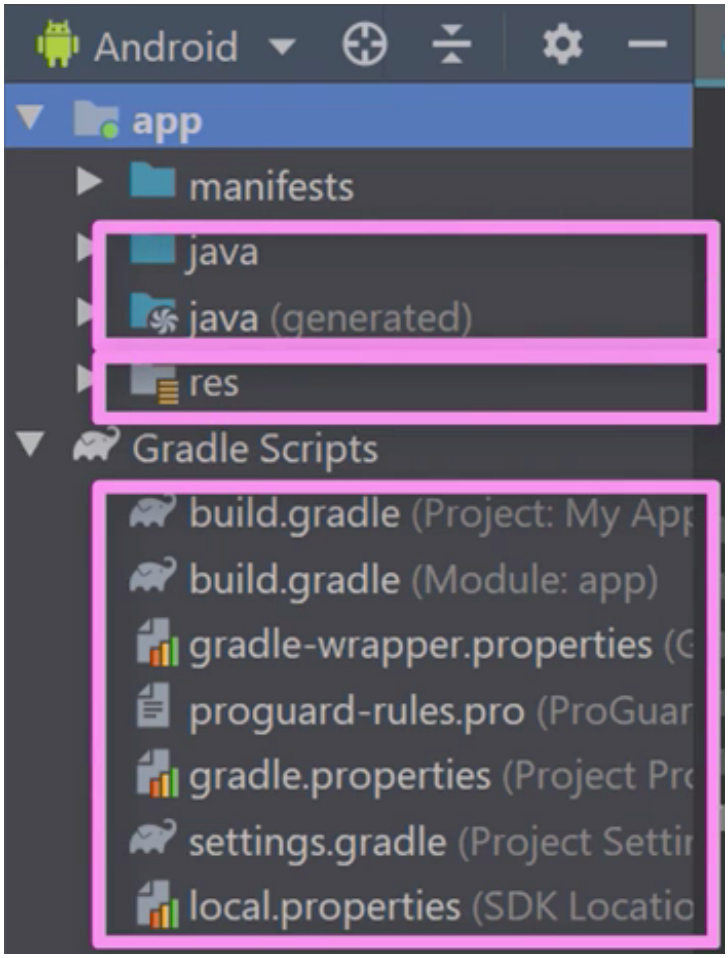
Layout File Conversion

When Activities first launch, they read a layout file and convert it to a set of corresponding Java objects. These objects inherit from the base View object, and may draw themselves to the screen.



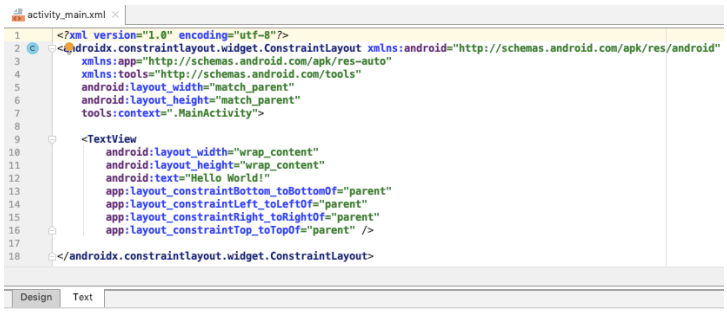
Project Files

Android project files belong to one of three main categories: configuration, code, and resource. Configuration files define the project structure, code files provide the logic, and resource files are pretty much everything else.



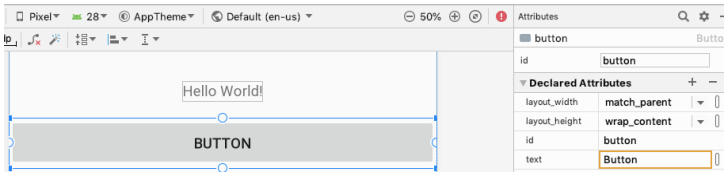
Layout Editor

The Android Studio Layout Editor includes two tabs: `Text` and `Design`. The `Text` tab edits the underlying XML file directly, and the `Design` tab provides a drag-and-drop interface for achieving the same results.



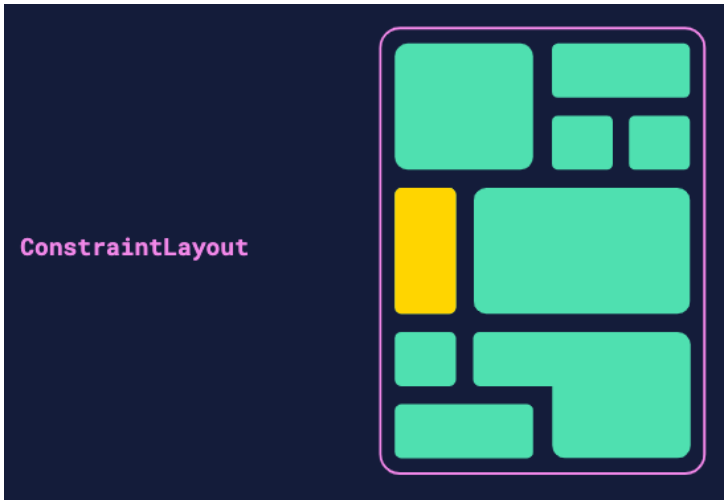
Mandatory Layout Attributes

In Android, two attributes are mandatory within every layout: `layout_width` and `layout_height`, and the most common values for these attributes are `match_parent` and `wrap_content`.



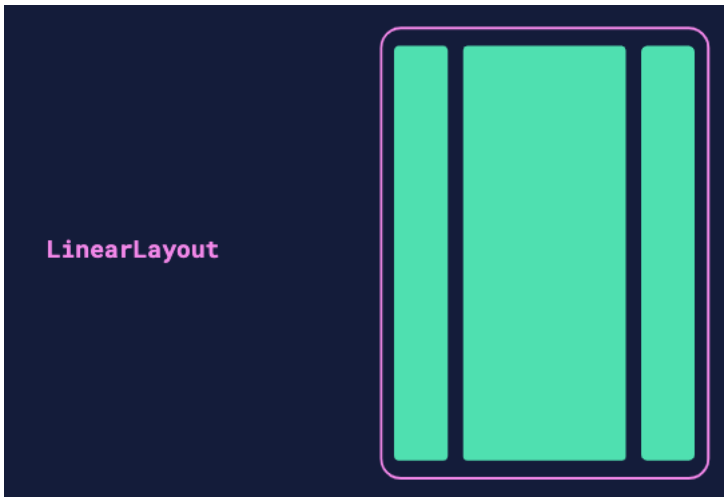
Constraint Layout

ConstraintLayout arranges its children relative to itself and other children (leftOf, rightOf, below, etc.). It is more complex than a linear or frame layout, but it's a lot more flexible. It's also much more efficient for complex UIs as it gives you a flatter view hierarchy, which means that Android has less processing to do at runtime. Another advantage of using constraint layouts is that they're specifically designed to work with Android Studio's design editor. Unlike linear and form layouts where you usually make changes to XML, you build constraint layouts visually. You drag and drop GUI components onto the design editor's blueprint tool, and give it instructions for how each view should be displayed.



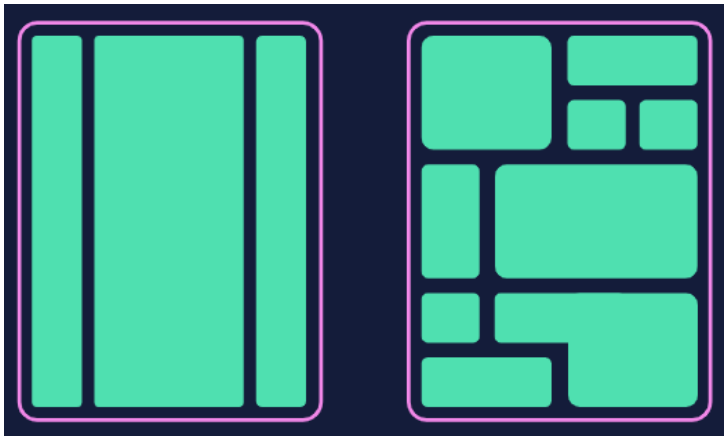
Linear Layout

In Android, `LinearLayout` arranges its children in a straight line, either horizontally or vertically. If it is vertically, they're displayed in a single column, and if it's horizontally, they're displayed in a single row.



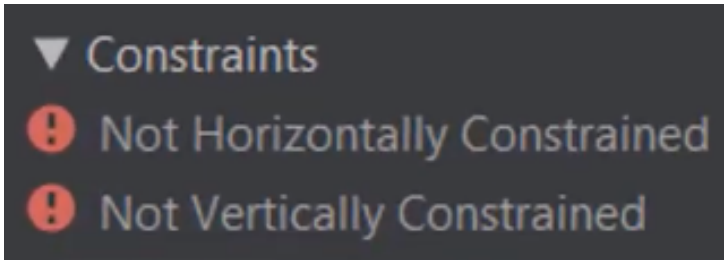
Linear and Constraint Layouts

`LinearLayout` is 'top-down' and dictates the final position to each child, whereas `ConstraintLayout` is primarily 'bottom-up,' as it requires its children to supply position-related attributes.



Children of ConstraintLayout

Children of `ConstraintLayout` must provide one horizontal and one vertical constraint to define their position within the `ConstraintLayout`. Android Studio will warn us if we have set neither vertical nor horizontal constraints for any child component of a ConstraintLayout.

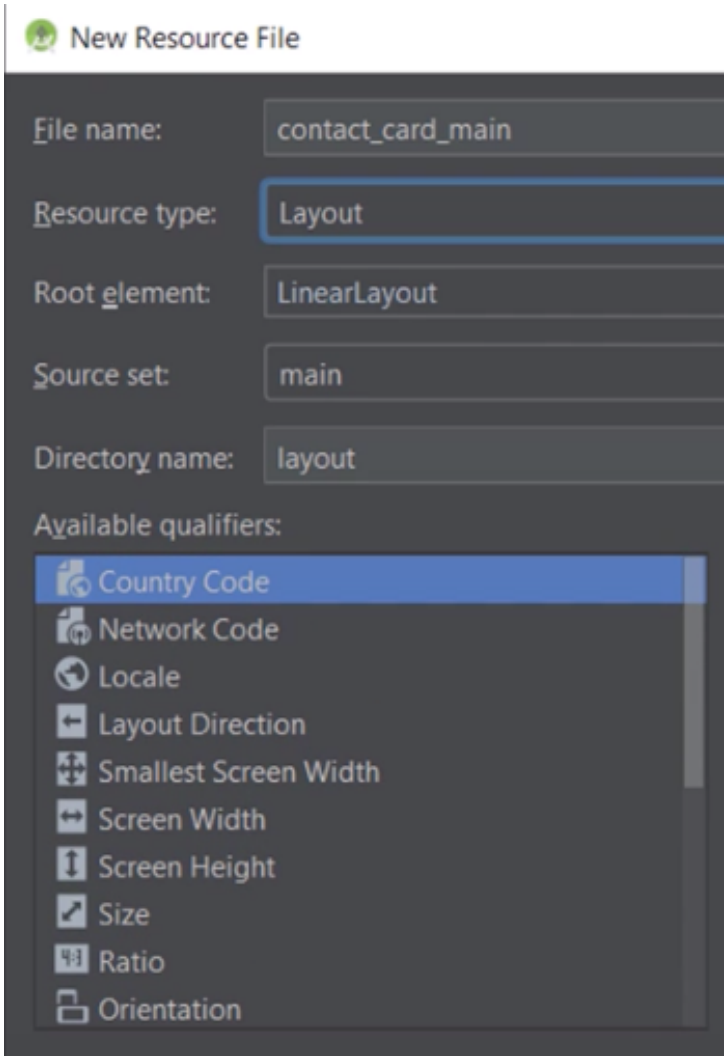


Create Space with Margins

Margins introduce space between Views, and Views often benefit from the “breathing room” margins provide.

Resource Qualifiers

Resource qualifiers help us generate XML files for specific device configurations. Resource qualifiers allow us to create alternate versions of a resource tailored to one or more device factors: screen size, aspect ratio, android version, and others, such as screen orientation.

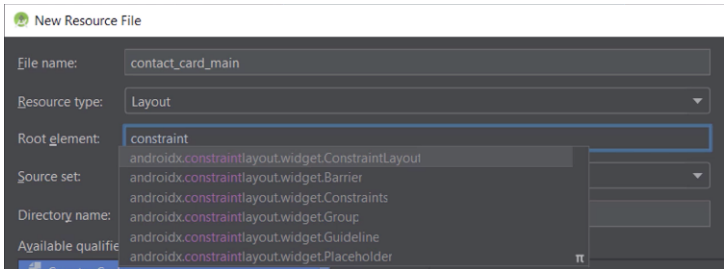


AndroidX

AndroidX is a support library designed to bring new features to old devices. AndroidX is a compatibility library that offers unique features and the latest APIs to versions of Android past & present. AndroidX enables older devices to have a taste of new APIs and Android technology.

ConstraintLayout Exclusive to AndroidX

Unlike `LinearLayout`, available in version one of the Android development kit, `ConstraintLayout` is not a part of any version of Android past or present and is only available through AndroidX.



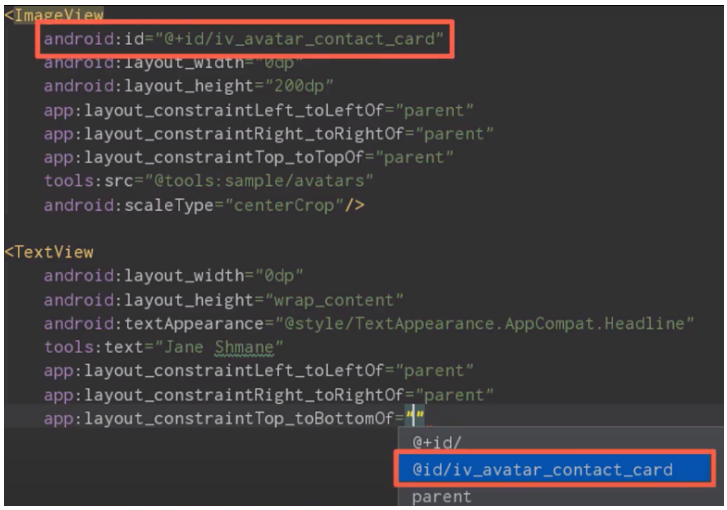
Android Namespaces

In Android, *namespaces* help avoid attribute conflicts (two versions of the `src` attribute on a single `ImageView`, for example). Three common namespaces are: `android`, `tools`, and `app`. The `android` namespace belongs to the Android SDK and represents attributes available out-of-the-box. The `app` namespace allows us to reference attributes defined by external libraries (e.g. AndroidX) and those defined by our application. The `tools` namespace allows us to define attributes used exclusively for development, the user's device never sees these attributes.

```
...
xmlns:tools=""
xmlns:app=""
android:layout_height=""
...
```

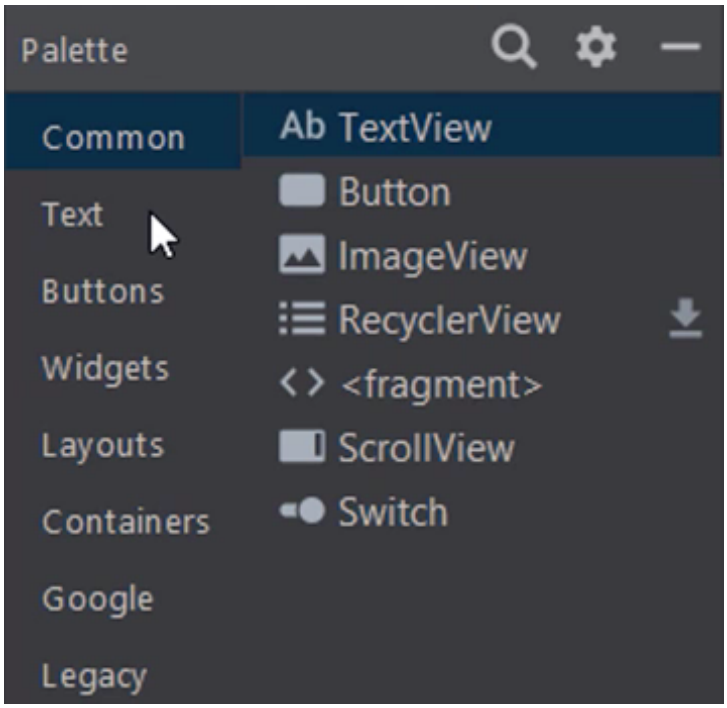
Android Resource Identifier

For Views to relate or constrain themselves to their siblings, they need a way to reference them — resource identifiers satisfy this need.



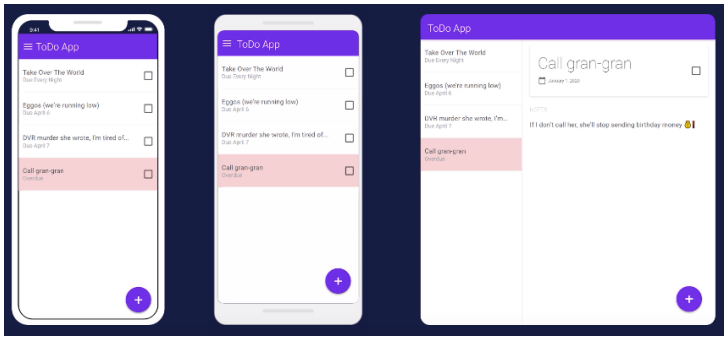
Component Palette

The component palette provides a selection of elements that we may drag and drop right into our layout.



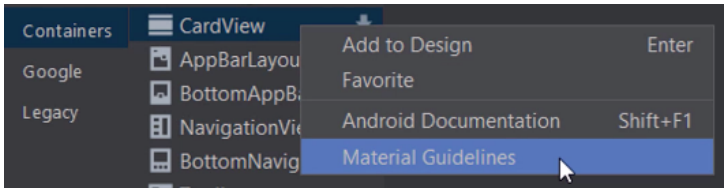
Material Design IOS Android Web Applications

Google introduced Material Design in 2014 to help standardize the appearance of web and mobile applications across the Google ecosystem. Material Design continues to evolve and is available for iOS, Android, and several web frameworks—however, applying its principles is entirely optional.



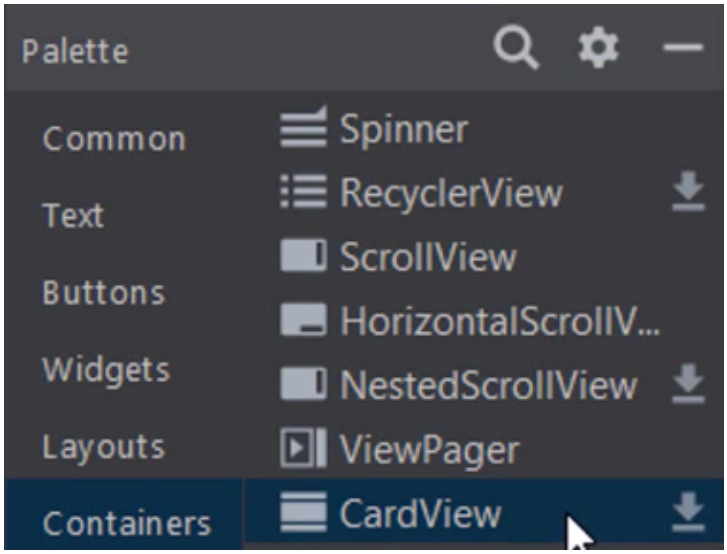
Material Design Documentation

By right-clicking any element within the component palette, we may navigate to its respective documentation or Material Design guidelines.



Material Design Guidelines

The purpose and behavior of most Views, including `CardView`, are inspired by Material Design guidelines. Google introduced Material Design in 2014 to help standardize the appearance of web and mobile applications across the Google ecosystem.



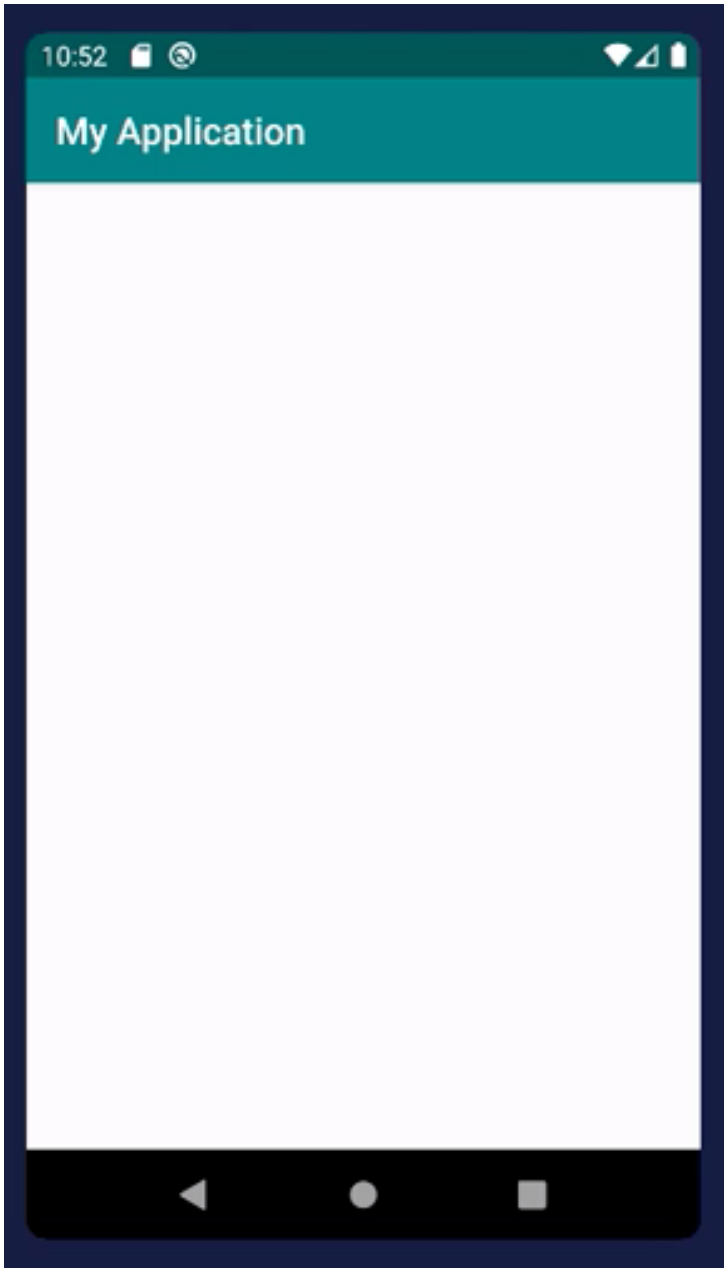
Layout Inflation Process

During project creation, Android Studio associates the `activity_main.xml` layout file with the MainActivity object. The two are associated not by name, but by the `setContentView` method found in the Activity class. This complex method accepts a layout file resource identifier, generates the Views designed within, and presents them on screen — a process known as Layout Inflation

```
setContentView(R.layout.activity_main);
```

Decor View

Activity objects may opt to present nothing to the screen, but the Android operating system always provides them with a Decor View. Decor View is the top-level ViewGroup in which Activity objects draw their content.



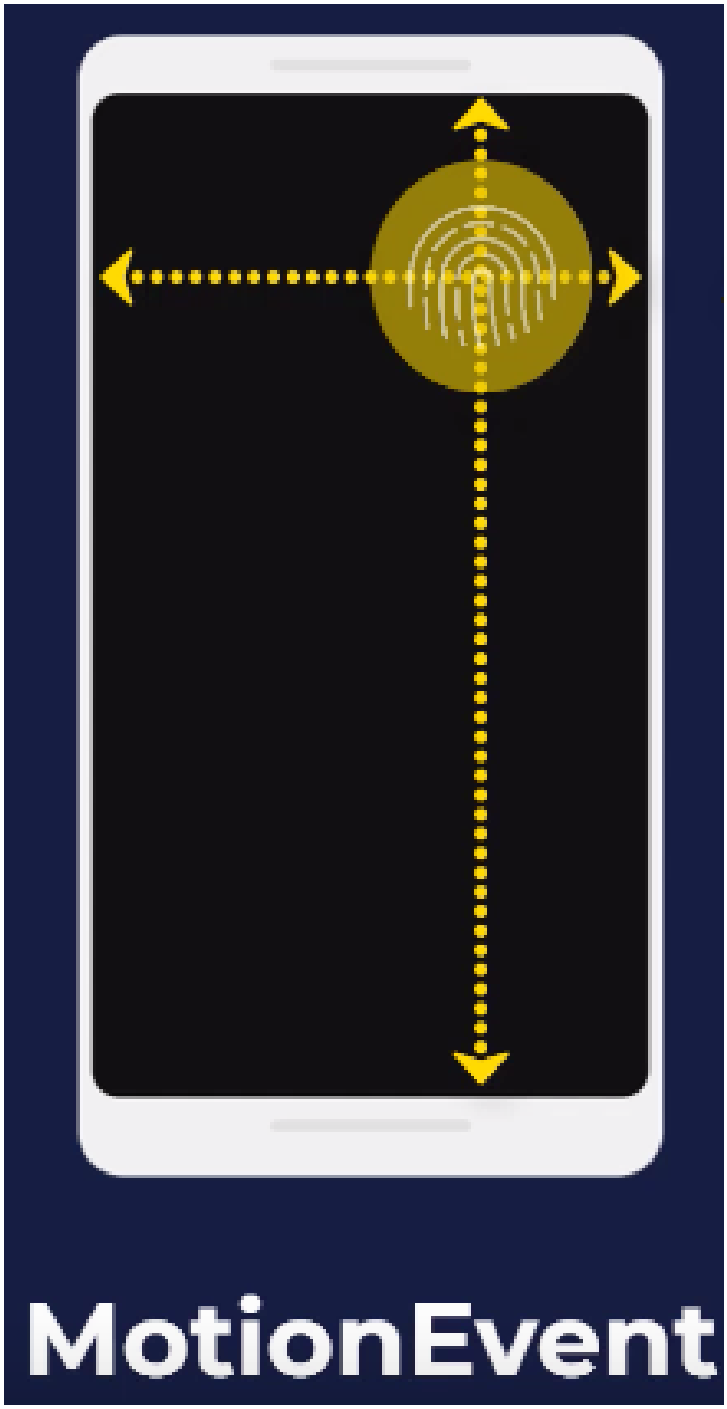
Android FindViewById

`setContentView` converts all the XML components in our layout into Java View objects, so after this method returns, we can access any View object from our layout programmatically. To find a specific View object, we invoke the `findViewById()` method. This method returns an object that inherits from the View object, or View itself.

```
public class MainActivity extends
AppCompatActivity {
...
  setContentView(R.layout.activity_main);
  findViewById(R.id.incl_cardview_contact-
card_main_1);
...
}
```

Android Motion Event Objects

MotionEvent objects are created by Android after capturing user input from the touchscreen and translating it into operable data. All Views can respond to clicks, drags, swipes, and more by processing MotionEvents.



Clicks And Long Clicks

By default, all Views detect clicks and long-clicks.