UI - Layout

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Topics

- Declaring Layout
- Layout File
- Attributes
  - ID
  - Layout parameters
- Types of Layout
  - LinearLayout
  - RelativeLayout
  - TableLayout
  - FrameLayout
  - Tab layout

Declaring Layout

What is a Layout?

- Your layout is the architecture for the user interface in an Activity.
- It defines the layout structure and holds all the visual elements that appear to the user.

How to declare a Layout? Two Options

- Option #1: Declare UI elements in XML (most common and preferred)
  - Android provides a straightforward XML vocabulary that corresponds to the View classes and subclasses, such as those for UI controls called widgets (TextView, Button, etc.) and layouts.
- Option #2: Instantiate layout elements at runtime (programmatically in Java code)
  - Your application can create View and ViewGroup objects (and manipulate their properties) programmatically (in Java code).

Using both options

- You can use either or both of these options for declaring and managing your application's UI
- Android system create Java objects for the visual elements defined in the XML
  - Every View and ViewGroup has a corresponding Java class (We use the terms “View element” and “View class” interchangeably)
- Example usage scenario of using both
  - You could declare your application's default layouts in XML, including the visual elements that will appear in them and their properties. (Option #1)
  - You could then add code in your application that would modify the state of the visual elements declared in XML, at run time. (Option #2)

Advantages of Option #1: Declaring UI in XML

- Separation of the presentation from the code that controls its behavior
  - You can modify UI without having to modify your source code and recompile
  - For example, you can create XML layouts for different screen orientations, different device screen sizes, and different languages
- Easier to visualize the structure of your UI (without writing any code)
  - Easier to design/debug UI
  - Visualizer tool (like the one in Eclipse IDE)

Layout File

Layout File Structure

- A layout specifies a hierarchical tree structure of ViewGroup and View elements
  - A ViewGroup is considered as a branch
  - A View is considered as leaf
- A layout file must contain exactly one root element, which must be one of the following
  - ViewGroup element (i.e., LinearLayout) - typical
  - View element (Button, for example)
- A ViewGroup element can have child elements, which themselves can be ViewGroup or View elements

Example: Layout File

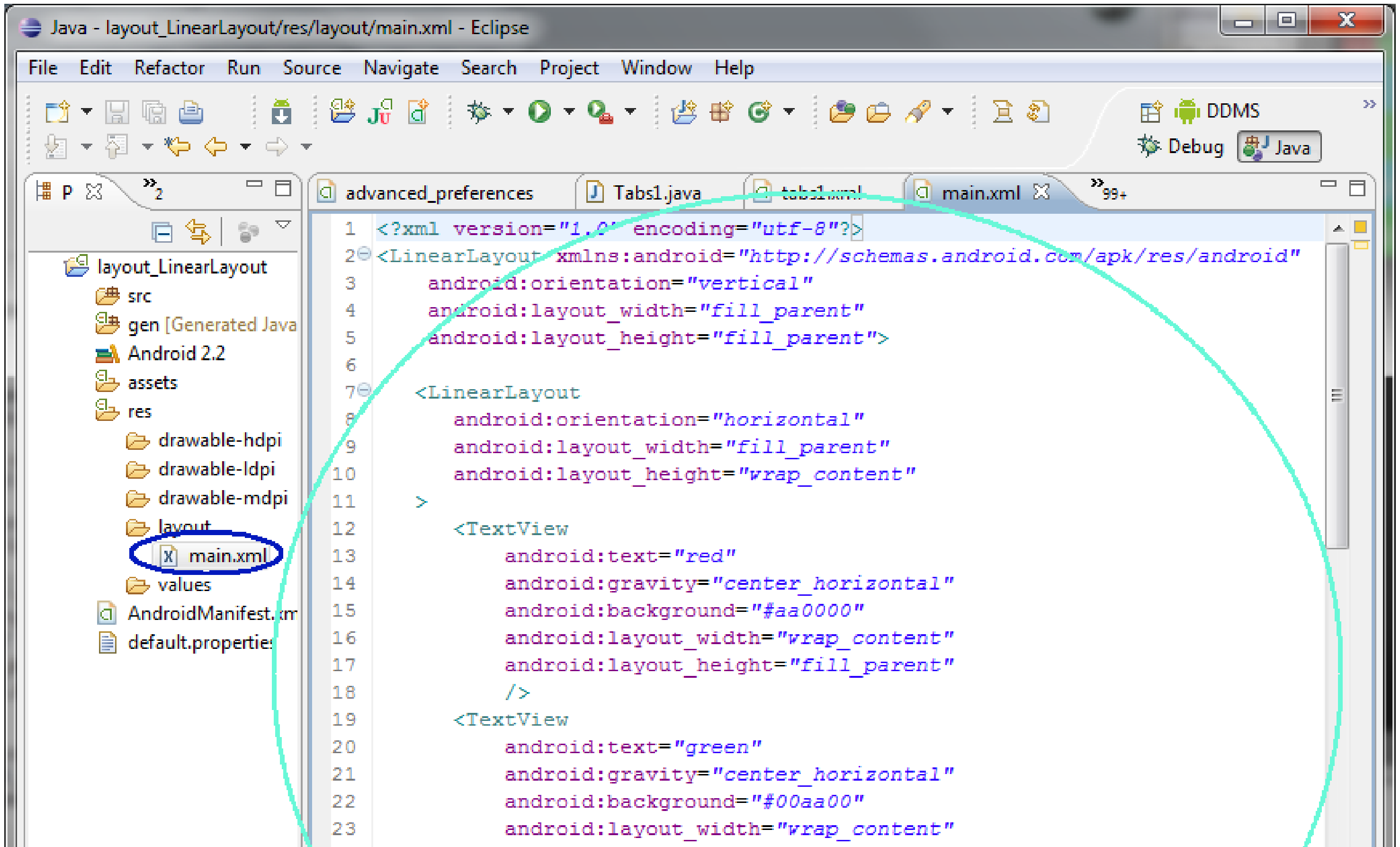
```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
          xmlns:android="http://schemas.android.com/apk/res/android"
          android:layout_width="fill_parent"
          android:layout_height="fill_parent"
          android:orientation="vertical" >
   <TextView android:id="@+id/text"
          android:layout_width="wrap_content"
          android:layout_height="wrap_content"
          android:text="Hello, I am a TextView" />
   <Button android:id="@+id/button"
         android:layout_width="wrap_content"
         android:layout_height="wrap_content"
         android:text="Hello, I am a Button" />
</LinearLayout>
```

ViewGroup

View

Where to create Layout file?

- Save the file with the .xml extension, in your Android project's *res/layout/* directory



```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent">

   <LinearLayout
      android:orientation="horizontal"
      android:layout_width="fill_parent"
      android:layout_height="wrap_content"
   >
      <TextView
          android:text="red"
          android:gravity="center_horizontal"
          android:background="#aa0000"
          android:layout_width="wrap_content"
          android:layout_height="fill_parent"
          />
      <TextView
          android:text="green"
          android:gravity="center_horizontal"
          android:background="#00aa00"
          android:layout_width="wrap_content"
```

Load the Layout XML Resource

- Each XML layout file is compiled into a layout resource
  - A layout resource is referred to as *R.layout.<layout_file_name>*
- The layout resource is loaded through *setContentView(R.layout.<layout_file_name>)*

```
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.main_layout);
}
```

Attributes

Attributes

- Every View and ViewGroup element has a set of attributes.
  - Some attributes are specific to a View element (for example, *TextView* supports the *textSize* attribute) but these attributes are also inherited by any View elements that may extend this element.
  - Some are common to all View elements, because they are inherited from the root View element (like the *id* attribute).
  - Other attributes are considered "layout parameters," which are attributes that describe certain layout orientations of the View element, as defined by that object's parent ViewGroup object.
  - These attributes are typically in XML form but can be set programmatically

Attributes: ID

ID Attribute

- A View element has an integer ID associated with it, to uniquely identify the View within the tree.
- When the application is compiled, this ID is referenced as an integer, but the ID is typically assigned in the layout XML file as a string, in the *id* attribute
  - > *android:id="my_own_id"*
- Syntax - *@+id* specifies that you ask the Android system to generate an ID
  - > *android:id="@+id/my_button"*

Android's Built-in Resource ID

- Android framework comes with its own built-in resources
- When referencing an Android's built-in resource in the layout resource file, you do not need the plus-symbol, but must add the android package namespace
  - *android:id="@android:id/empty"*
- When referencing an Android's built-in resource in the Java code, it is referenced throug
  - *android.R.id.empty*

How to reference views in Java code?

- Assuming a view/widget is defined in the layout file with a unique ID

```
<Button android:id="@+id/my_button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="@string/my_button_text"/>
```

- Then you can make a reference to the View element via *findViewById(R.id.<string-id>)*.

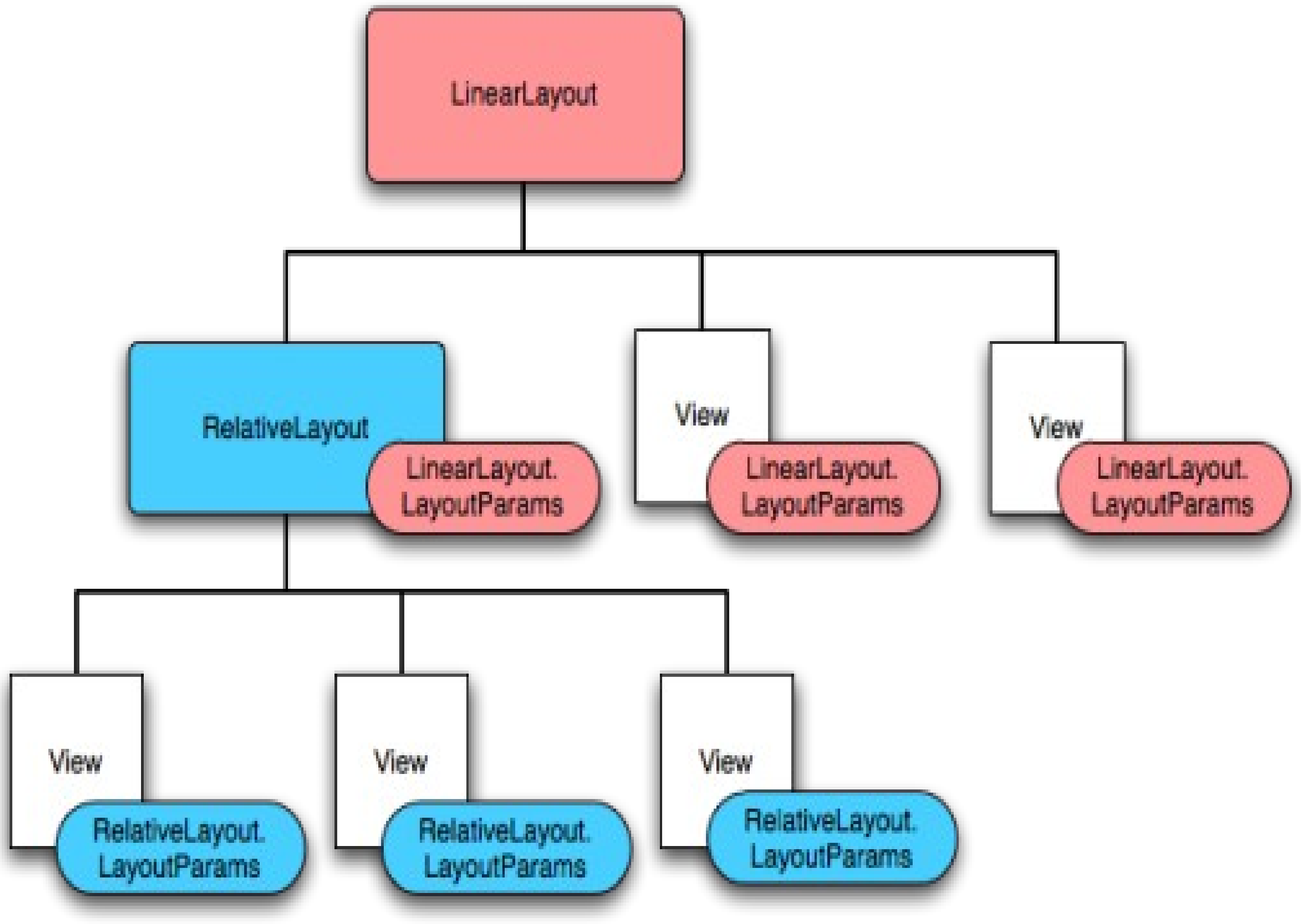
```
// The value of R.id.my_button is defined in the
// mypackage.R.java
Button myButton = (Button) findViewById(R.id.my_button);
```

Attributes:
Layout Parameters

What Are Layout Parameters?

- XML layout attributes named *layout_<something>* define layout parameters for the View that are appropriate for the ViewGroup in which it resides

Parent view group defines layout parameters for each child view (including the child view group)


LinearLayout
RelativeLayout
LinearLayout. LayoutParams
View
LinearLayout. LayoutParams
View
LinearLayout. LayoutParams
View
RelativeLayout. LayoutParams
View
RelativeLayout. LayoutParams
View
RelativeLayout. LayoutParams

Values of layout_width & layout_height

- wrap_content
  - tells your view to size itself to the dimensions required by its content
- fill_parent
  - tells your view to become as big as its parent view group will allow.
- match_parent
  - Same as fill_parent
  - Introduced in API Level 8

```
<Button android:id="@+id/my_button"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:text="@string/my_button_text"/>
```

layout_weight attribute

- Is used in a LinearLayout to assign "importance" to child Views within that layout.
- All Views have a default layout_weight of zer
  - They take up only as much room on the screen as they need to be displayed
- Assigning a value higher than zero will split up the rest of the available space in the parent View
  - <each View's layout_weight>/<total value of layout_weight of all View's>

Layout Types

Layout Types

- All layout types are subclass of *ViewGroup* class
- Layout types
  - *LinearLayout*
  - *RelativeLayout*
  - *TableLayout*
  - *FrameLayout*
  - Tab layout

LinearLayout

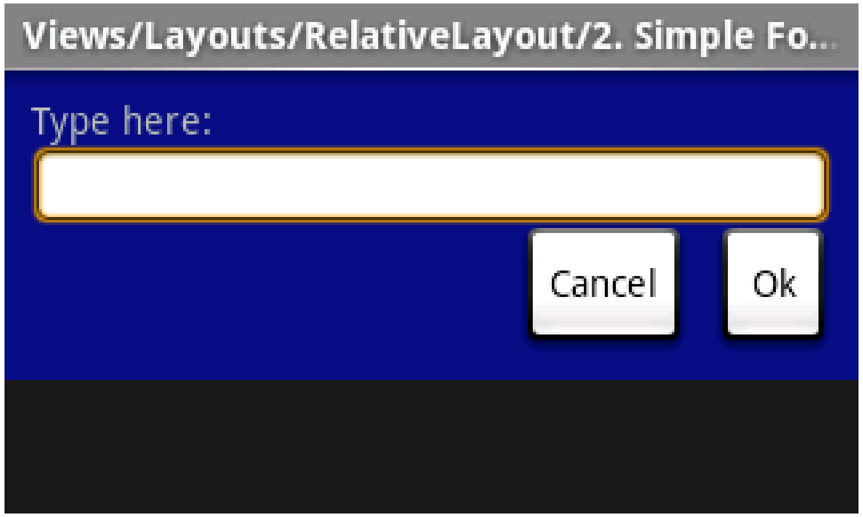
- Aligns all children in a single direction — vertically or horizontally, depending on how you define the *orientation* attribute.
- All children are stacked one after the other, so a vertical list will only have one child per row, no matter how wide they are
- A LinearLayout respects
  - margins between children
  - gravity (right, center, or left alignment) of each child.
  - weight to each child

RelativeLayout

- RelativeLayout lets child views specify their position relative to the parent view or to each other (specified by ID)
  - You can align two elements by right border, or make one below another, centered in the screen, centered left, and so on
- Elements are rendered in the order given
  - If the first element is centered in the screen, other elements aligning themselves to that element will be aligned relative to screen center.

RelativeLayout Example

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android
                android:layout_width="fill_parent"
                android:layout_height="wrap_content"
                android:background="@drawable/blue"
                android:padding="10px" >

    <TextView android:id="@+id/label"
              android:layout_width="fill_parent"
              android:layout_height="wrap_content"
              android:text="Type here:" />

    <EditText android:id="@+id/entry"
              android:layout_width="fill_parent"
              android:layout_height="wrap_content"
              android:background="@android:drawable/editbox_background"
              android:layout_below="@id/label" />

    <Button android:id="@+id/ok"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_below="@id/entry"
            android:layout_alignParentRight="true"
            android:layout_marginLeft="10px"
            android:text="OK" />

    <Button android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_toLeftOf="@id/ok"
            android:layout_alignTop="@id/ok"
            android:text="Cancel" />
</RelativeLayout>
```

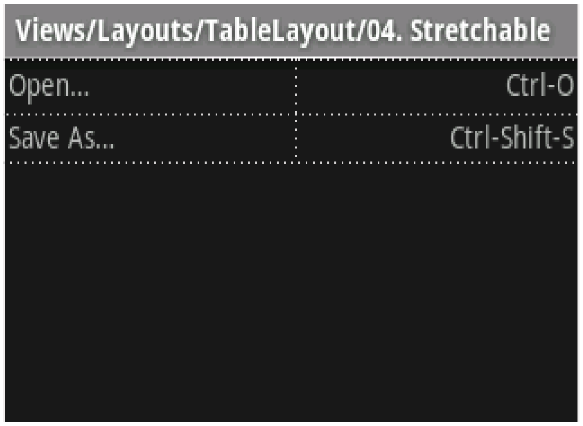


TableLayout

- TableLayout positions its children into rows and columns
- *TableRow* objects are the child views of a TableLayout
  - Each TableRow defines a single row in the table
  - Each row has zero or more cells, each of which is defined by any kind of other View.
- Columns can be
  - Hidden
  - Stretch and fill the available screen space
  - Shrinkable to force the column to shrink until the table fits the screen

TableLayout Example

```
<?xml version="1.0" encoding="utf-8"?>
<TableLayout xmlns:android="http://schemas.android.com/apk/res/android"
   android:layout_width="fill_parent"
   android:layout_height="fill_parent"
   android:stretchColumns="1">
   <TableRow>
      <TextView
         android:text="@string/table_layout_4_open"
         android:padding="3dip" />
      <TextView
         android:text="@string/table_layout_4_open_shortcut"
         android:gravity="right"
         android:padding="3dip" />
   </TableRow>

   <TableRow>
      <TextView
         android:text="@string/table_layout_4_save"
         android:padding="3dip" />
      <TextView
         android:text="@string/table_layout_4_save_shortcut"
         android:gravity="right"
         android:padding="3dip" />
   </TableRow>
</TableLayout>
```


Views/Layouts/TableLayout/04. Stretchable

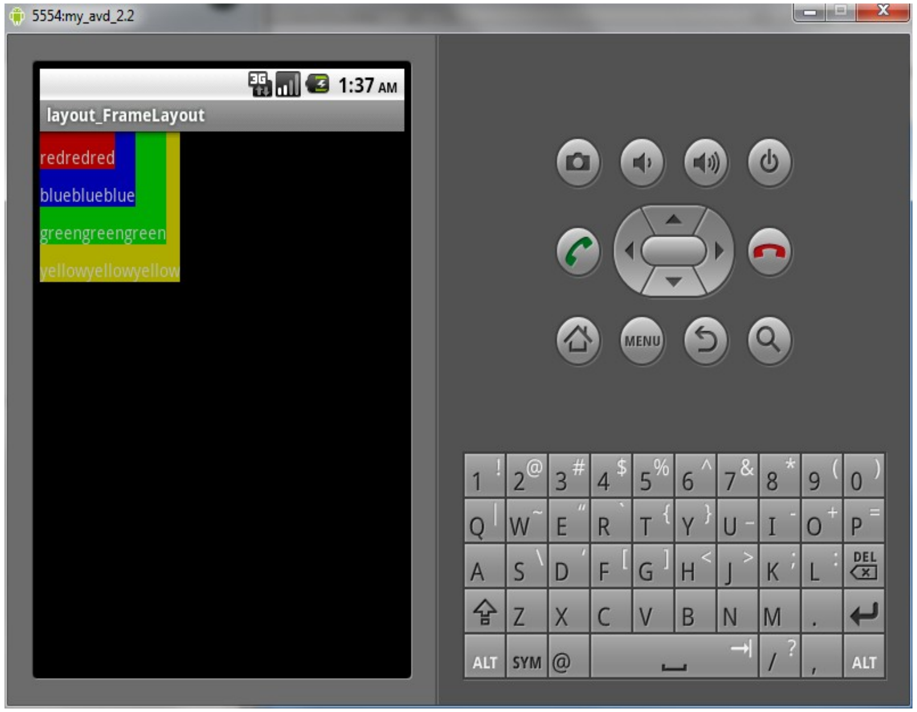
Open...	Ctrl-O
Save As...	Ctrl-Shift-S

FrameLayout

- FrameLayout is the simplest type of layout object. It's basically a blank space on your screen that you can later fill with a single object
  - For example, a picture that you'll swap in and out.
- All child elements of the FrameLayout are pinned to the top left corner of the screen; you cannot specify a different location for a child view.
  - Subsequent child views will simply be drawn over previous ones, partially or totally obscuring them (unless the newer object is transparent).

FrameLayout Example

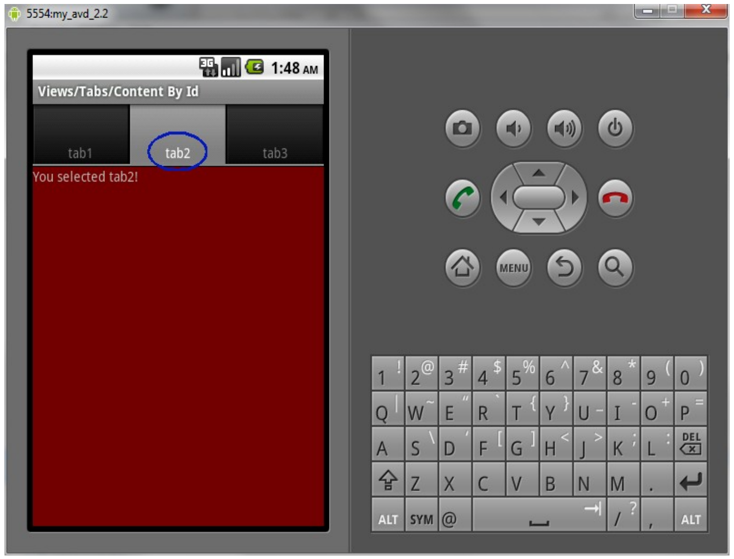
```
<FrameLayout xmlns:android="http://schemas.android.com/apk/res/android"
   android:layout_width="match_parent"
   android:layout_height="match_parent">

    <TextView
       android:text="yellowyellowyellow"
       android:gravity="bottom"
       android:background="#aaaa00"
       android:layout_width="wrap_content"
       android:layout_height="120dip"/>
    <TextView
       android:text="greengreengreen"
       android:gravity="bottom"
       android:background="#00aa00"
       android:layout_width="wrap_content"
       android:layout_height="90dip" />
   <TextView
       android:text="blueblueblue"
       android:gravity="bottom"
       android:background="#0000aa"
       android:layout_width="wrap_content"
       android:layout_height="60dip" />
    <TextView
       android:text="redredred"
       android:gravity="bottom"
       android:background="#aa0000"
       android:layout_width="wrap_content"
       android:layout_height="30dip"/>
</FrameLayout>
```



Tab Layout

Tab Layout

- A tab has
  - > Tab indicator
  - > Content
  - > Tag
- Tab indicator can be
  - > Label or
  - > Label and Icon
- Tab content
  - > View
  - > Runtime creation via *TabHost.TabContentFactory*
  - > Activity



Two Schemes of Creating Tab Content

- Use the tabs to swap Views within the same Activity - two sub-schemes
  - The view can be static
  - The view can be created during run-time
- Use the tabs to change between entirely separate activities
  - Use it when each tab triggers a distinct user activity

APIs - TabHost class

- Container for a tabbed window view.
- This object holds two children:
  - A set of tab labels that the user clicks to select a specific tab
  - *FrameLayout* object that displays the contents of that page.

Thank you!

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