Wireless Programming

COMP-304
Fall 2018

Review of Lecture 2

- **Android Activities**:
  - **Activity:** a task in an Android application
  - Extends class Activity
  - Life Cycle:
    - onCreate
    - onStart
    - onRestart
    - onResume
    - onPause
    - onStop
    - onDestroy

- **Android Manifest File** - application configuration information
  - Application's package name
  - The components of the app, which include all activities, services, broadcast receivers, and content providers
  - The permissions
  - Hardware and software features
- Some attributes are defined in build.gradle file

Review of Lecture 2

- **Registering Activities**:

  <activity android:name=".AudioActivity" />

  - Primary Point Activity:

    <intent-filter>

    <action android:name="android.**intent.action.MAIN**" />

    <category android:name="android.**intent.category.LAUNCHER**" />

    </intent-filter>

- **Registering permissions:**

  <uses-permission android:name="android.permission.CAMERA" />

- **Managing Resources**
  - /res folder
  - Layout, drawables, values
  - R.java class
  - **findViewById**(R.id.myimageview)

- **Intents**
  - Used to call other activities and built-in apps
  - startActivity method
    - Source activity
    - Started activity
  - Intent objects
    - the action to be performed
    - the data to be acted upon
  - Passing information
    - putExtra
    - getExtras

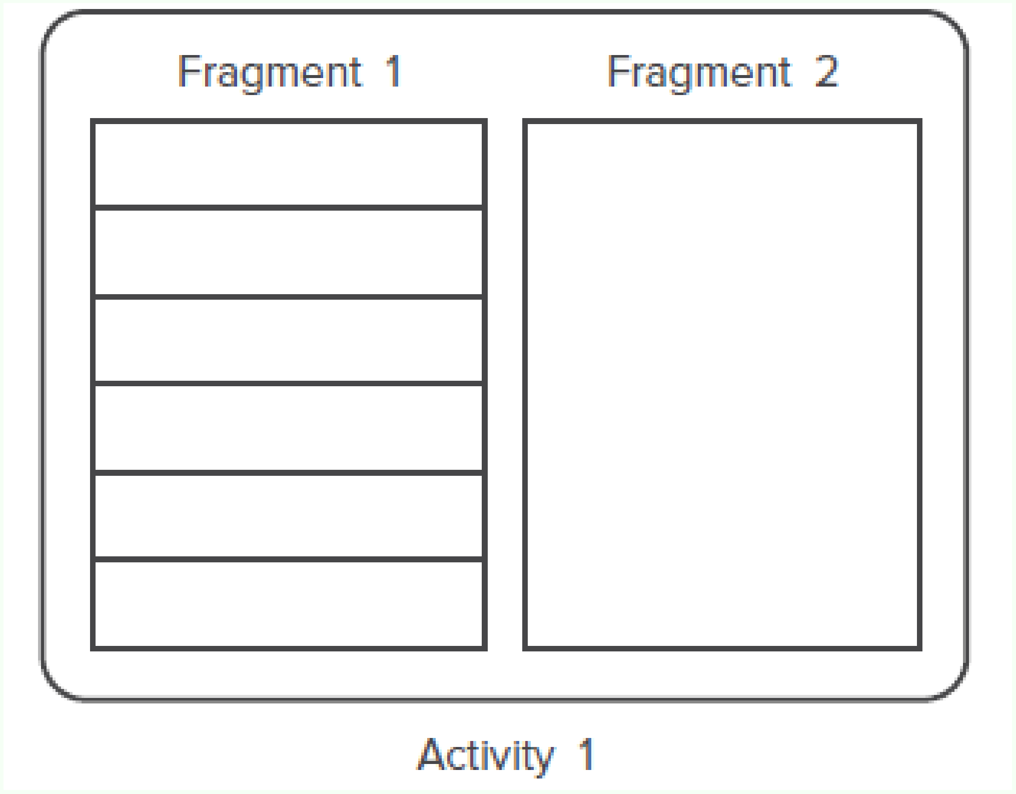
Lecture 3

Objectives:

- ❑ Explain and use Fragments
- ❑ Manage Application resources:
  - ➢ Declare simple resource values - Strings, Integers, Booleans, Colors, Drawables, String Arrays, XML files, etc
  - ➢ Simple Resources Example
- ❑ Create and use Android User Interface elements
  - ➢ Explain Android Layout classes
  - ➢ Explain and use Simple UI controls and event handling:
    - ▪ TextView
    - ▪ EditText
    - ▪ Button

FRAGMENTS

- A fragment is a **mini activity**.
- An activity can have many fragments to contain views.



FRAGMENTS

- Fragments are Java classes and load their UIs from corresponding XML files
- A fragment extends the Fragment base class:

```
public class Fragment1 extends Fragment {
}
```

- To add a fragment to an activity, you use the <fragment> element

```
<?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=”horizontal” >
<fragment
android:name=”net.learn2develop.Fragments.Fragment1”
android:id=”@+id/fragment1”
android:layout_weight=”1”
android:layout_width=”0px”
android:layout_height=”match_parent” />
```

…………

FRAGMENTS

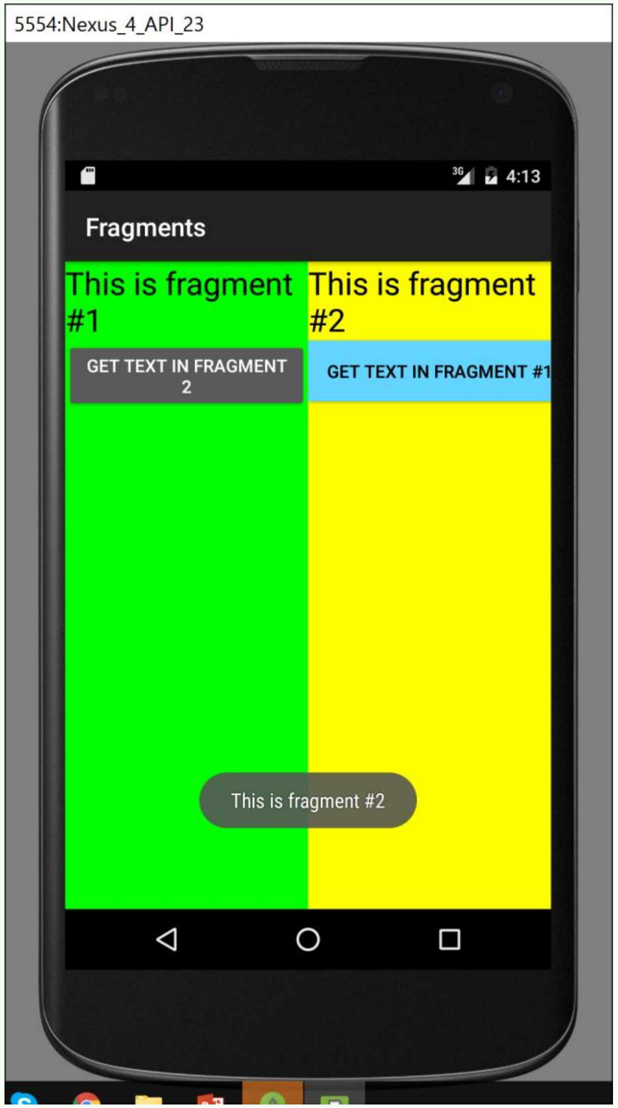
- You can add fragments dynamically to activities during runtime.
  - FragmentManager class
  - FragmentTransaction class

```
FragmentManager fragmentManager = getFragmentManager();
FragmentTransaction fragmentTransaction =
fragmentManager.beginTransaction();
//---get the current display info---
WindowManager wm = getWindowManager();
Display d = wm.getDefaultDisplay();
if (d.getWidth() > d.getHeight())
{
        //---landscape mode---
        Fragment1 fragment1 = new Fragment1();
        // android.R.id.content refers to the content view of the activity
        fragmentTransaction.replace(
        android.R.id.content, fragment1);
}
```

FRAGMENTS

```
else
{
//---portrait mode---
Fragment2 fragment2 = new Fragment2();
fragmentTransaction.replace(
android.R.id.content, fragment2);
}
fragmentTransaction.commit();
```

- ❑ FragmentsInteractionActivity example



Fragment’s life cycle

- When a fragment is being created, it goes through the following states:
  - **onAttach()** - fragment is associated with its activity
  - **onCreate()** - initial creation of the fragment
  - **onCreateView()** – creates fragment view
  - **onActivityCreated()** – its activity finished onCreate
- When the fragment becomes visible, it goes through these states:
  - **onStart()** - makes the fragment visible to the user
  - **onResume()** - makes the fragment interacting with the user

Fragment’s life cycle

- When the fragment goes into the background mode, it goes through these states:
  - onPause()
  - onStop()
- When the fragment is destroyed (when the activity it is currently hosted in is destroyed), it goes through the following states:
  - onPause() - fragment is no longer interacting with the user
  - onStop() - fragment is no longer visible to the user
  - onDestroyView() - clean up resources associated with its View
  - onDestroy() - final cleanup of the fragment's state
  - onDetach() – before the fragment no longer being associated with its activity

Fragment’s life cycle

- Like activities, you can restore an instance of a fragment using a Bundle object, in the following states:
  - onCreate()
  - onCreateView()
  - onActivityCreated()

Interactions between Fragments

- Example:
  - you can obtain the activity in which a fragment is currently embedded by first using the **getActivity()** method and then using the **findViewById()** method to locate the view(s) contained within the fragment:

```
TextView lbl = (TextView)
getActivity().findViewById(R.id.lblFragment1);
Toast.makeText(getActivity(), lbl.getText(),
Toast.LENGTH_SHORT).show();
```

Setting Simple Resource Values

- You can define resource types by **editing resource XML files manually** or by **using resource editors** available in Android Studio.
  - Here is a view of /res/values/strings.xml file:

```
<?xml version="1.0" encoding="utf-8"?>
<resources>
        <string name="hello">Using Android Resources</string>
        <string name="display">Demonstrating Font and Color!</string>
        <string name="app_name">Simple Resource Example</string>
        <color name="prettyTextColor">#fa31ff</color>
        <dimen name="textPointSize">14pt</dimen>
        <drawable name="redDrawable">#ff0000</drawable>
</resources>
```

Setting Simple Resource Values

- You can create:
  - A **String** resource named *hello* with a value of "Using Android Resources"
  - A **String** resource named *display* with a value of "Demonstrating Font and Color!"
  - A **color** resource named *prettyTextColor* with a value of #ff0000
  - A **dimension** resource named *textPointSize* with a value of 14pt
  - A **drawable** resource named *redDrawable* with a value of #F00

Setting Simple Resource Values

- ❑ **The generated R.java file:**

```
package test.simpleresources;
public final class R {
    public static final class attr {
    }
    public static final class color {
        public static final int prettyTextColor=0x7f050000;
    }
    public static final class dimen {
        public static final int textPointSize=0x7f060000;
    }
    public static final class drawable {
        public static final int icon=0x7f020000;
        public static final int redDrawable=0x7f020001;
    }
    public static final class layout {
        public static final int main=0x7f030000;
    }
    public static final class string {
        public static final int app_name=0x7f040001;
        public static final int hello=0x7f040000;
    }
}
```

Accessing resources from Java code

```
package test.simpleresources;

import android.app.Activity;
import android.graphics.drawable.ColorDrawable;
import android.os.Bundle;
import android.widget.ImageView;
import android.widget.TextView;

public class SimpleResource extends Activity {
    /** Called when the activity is first created. */
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);
```

Accessing resources from Java code

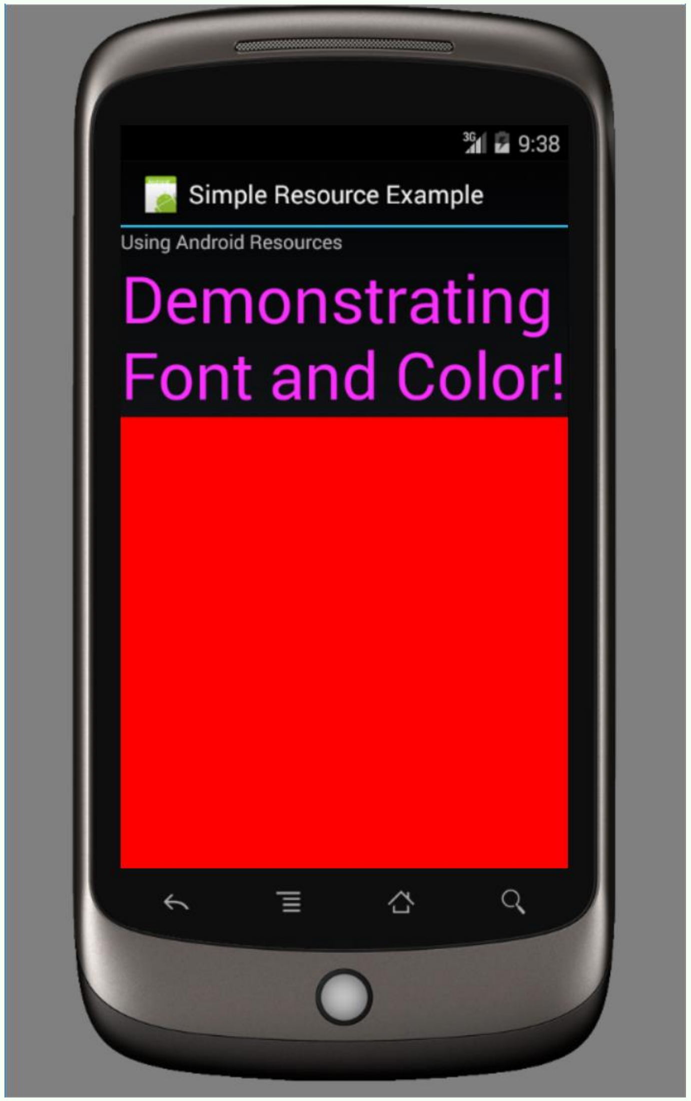
```
        String myString = getResources().getString(R.string.display);
        int myColor = getResources().getColor(R.color.prettyTextColor);
        float myDimen = getResources().getDimension(R.dimen.textPointSize);
        ColorDrawable myDraw =
      (ColorDrawable)getResources().getDrawable(R.drawable.redDrawable);
        ImageView imgView = (ImageView)findViewById(R.id.imageView1);

        imgView.setImageDrawable(myDraw);
        //String[] flavors = getResources().getStringArray(R.array.flavors);

        TextView tv = (TextView)findViewById(R.id.txtView);
        tv.setTextSize(myDimen);
        tv.setTextColor(myColor);
        tv.setText(myString);

    }
}
```

Simple Resources example



Using Android Resources

Demonstrating Font and Color!

Defining String Arrays

- String arrays, may be added to resource files by editing them manually:

```
<?xml version="1.0" encoding="utf-8"?>
<resources>
    <string name="hello">Hello World, SimpleResource!</string>
    <string name="app_name">Simple Resource Example</string>
    <color name="prettyTextColor">#ff0000</color>
    <dimen name="textPointSize">14pt</dimen>
    <drawable name="redDrawable">#F00</drawable>
    <string-array name=”flavors”>
        <item>Vanilla</item>
        <item>Chocolate</item>
        <item>Strawberry</item>
    </string-array>
</resources>
```

- Access the array in your code:

```
String[] aFlavors = getResources().getStringArray(R.array.flavors);
```

Working with Resources

- It is a common practice to store different types of resources in different files.
- For example, store:
  - the strings in ***/res/values/*****strings.xml**
  - the prettyTextColor color resource in ***/res/values/*****colors.xml**
  - the textPointSize dimension resource in ***/res/values/*****dimens.xml**
- This does not change the names of the resources, nor the code used earlier to access the resources programmatically

Working with Boolean Resources

- **Boolean** resources are defined in XML under the /res/values project directory and compiled into the application package at build time
- Are tagged with the <bool> tag and represent a name-value pair:

```
<resources>
    <bool name=”bOnePlusOneEqualsTwo”>true</bool>
    <bool name=”bAdvancedFeaturesEnabled”>false</bool>
</resources>
```

- The following code retrieves a boolean resource named bAdvancedFeaturesEnabled:

```
boolean bAdvancedMode =
getResources().getBoolean(R.bool.bAdvancedFeaturesEnabled);
```

Working with Integer Resources

- **Integer** values are tagged with the <integer> tag and represent a name/value pair.

```
<resources>
    <integer name=”numTimesToRepeat”>25</integer>
    <integer name=”startingAgeOfCharacter”>3</integer>
</resources>
```

- The following code accesses your application’s integer resource named numTimesToRepeat:

```
int repTimes =
    getResources().getInteger(R.integer.numTimesToRepeat);
```

Working with Colors

- Android applications can store RGB color values, which can then be applied to other screen elements
- The following color formats are supported:
  - #RGB (example, #F00 is 12-bit color, red)
  - #ARGB (example, #8F00 is 12-bit color, red with alpha 50%)
  - #RRGGBB (example, #FF00FF is 24-bit color, magenta)
  - #AARRGGBB (example, #80FF00FF is 24-bit color, magenta with alpha 50%)
- Color values are tagged with the <color> tag and represent a name-value pair:

```
<resources>
        <color name=”background_color”>#006400</color>
        <color name=”text_color”>#FFE4C4</color>
</resources>
```

- The following code retrieves a color resource called prettyTextColor:

```
int myResourceColor = getResources().getColor(R.color.prettyTextColor);
```

Working with Dimensions

- Many user interface layout controls such as text controls and buttons are drawn to specific dimensions.
  - These dimensions can be stored as resources.
- Dimension values always end with a unit of measurement tag:

Pixels	Actual screen pixels	**px**	20px
Inches	Physical measurement	**in**	1in
Millimeters	Physical measurement	**mm**	1mm
Points	Common font measurement unit	**pt**	14pt
Screen density Independent Pixels	Pixels relative to 160dpi screen (preferable dimension for screen compatibility). One **dp** is one pixel on a 160 dpi screen. dp = (width in pixels * 160) / screen density	**dp**	1dp
Scale independent Pixels	Best for scalable font display sp preserves a user's font settings	**sp**	14sp

- Dimension values are tagged with the <dimen> tag and represent a name/value pair.

Working with Dimensions

- Here’s an example of a simple dimension resource file /res/values/dimens.xml:

```
<?xml version=”1.0” encoding=”utf-8”?>
<resources>
    <dimen name=”FourteenPt”>14pt</dimen>
    <dimen name=”OneInch”>1in</dimen>
    <dimen name=”TenMillimeters”>10mm</dimen>
    <dimen name=”TenPixels”>10px</dimen>
</resources>
```

- Dimension resources are simply floating point values.
    - The following code retrieves a dimension resource called textPointSize:

```
float myDimension =
getResources().getDimension(R.dimen.textPointSize);
```

Working with Simple Drawables

- **Simple paintable drawable** resources are defined in XML under the /res/values project directory and compiled into the application package at build time.
- **Paintable drawable resources** use the <drawable> tag and represent a name-value pair.
  - Here's an example of a simple drawable resource file /res/values/drawables.xml:

```
<resources>
    <drawable name=”red_rect”>#F00</drawable>
</resources>
```

- Drawable resources defined with <drawable> are simply **rectangles of a given color**:

```
ColorDrawable myDraw = (ColorDrawable)getResources().
getDrawable(R.drawable.redDrawable);
```

Using Image Resources Programmatically

- Images resources are simply **another kind of Drawable** called a **BitmapDrawable**
- Use resource ID of the image to set as an attribute on a user interface control:

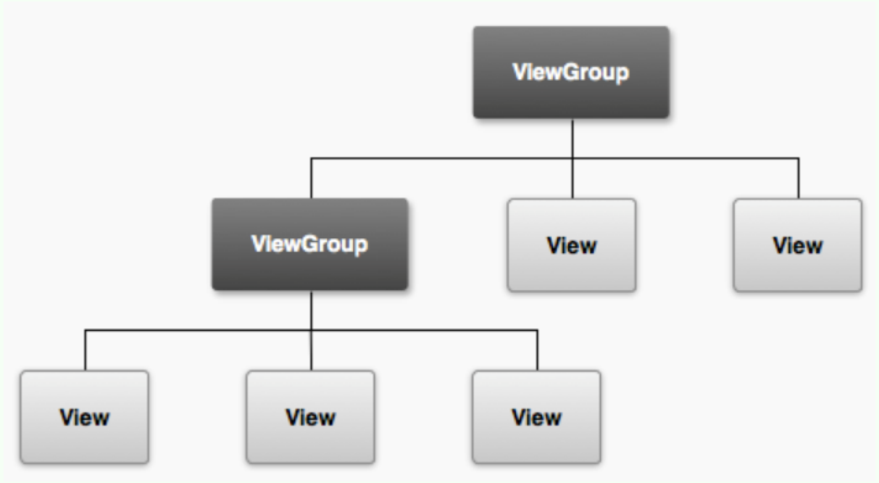
```
ImageView flagImageView =
(ImageView)findViewById(R.id.ImageView01);
flagImageView.setImageResource(R.drawable.flag);
```

- You can access the BitmapDrawable object directly:

```
BitmapDrawable bitmapFlag = (BitmapDrawable)
getResources().getDrawable(R.drawable.flag);
```

Android Views

- android.**view** package contains a number of interfaces and classes related to drawing on the screen.
- android.view.**View** class is the basic user interface building block within Android.
  - It represents a rectangular portion of the screen.
- The View class serves as the **base class** for nearly all the user interface controls and layouts within the Android SDK.
- ViewGroup is an invisible container that defines the layout structure for View and other ViewGroup object



Creating Layouts Using XML Resources

- Layouts and user interface controls can be **defined as application resources** or **created programmatically** at runtime
- Android provides a simple way to create layout files in XML as resources provided in the **/res/layout** project directory
  - This is the most common way

Layout classes

- ❑ LinearLayout
- ❑ AbsoluteLayout
- ❑ TableLayout
- ❑ RelativeLayout
- ❑ ConstraintLayout
- ❑ FrameLayout
- ❑ ScrollView

- ❑ AbsoluteLayout may be used to specify the exact x/y coordinate locations of each control on the screen instead, but this is **not easily portable across many screen resolutions**

Creating Layouts Using XML Resources

- You can configure almost any ViewGroup or View (or View subclass) attribute using the XML layout resource files
- **LinearLayout** is the **default layout** file provided with any new Android project in Android Studio, referred to as /res/layout/main.xml:

```
<?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” >
<TextView
android:layout_width=”fill_parent”
android:layout_height=”wrap_content”
android:text=”@string/hello” />
</LinearLayout>
```

Creating Layouts Using XML Resources

- **LinearLayout** is a ViewGroup that shows each child View either in a **single column** or in a **single row**.
- When applied to a full screen, each child View is drawn under the previous View if the **orientation** is set to **vertical** or to the right of the previous View if orientation is set to **horizontal**
- To associate the **main.xml** layout with the activity, use the method call **setContentView()** with the identifier of the **main.xml** layout.
  - The ID of the layout matches the XML filename without the extension:

    setContentView(R.layout.main);

Creating Layouts Using XML Resources

```
<?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”
>
<TextView
android:id=”@+id/TextView1”
android:layout_width=”fill_parent”
android:layout_height=”wrap_content”
android:text=”Hi There!”
/>
<TextView
android:id=”@+id/TextView2”
android:layout_width=”fill_parent”
android:layout_height=”wrap_content”
android:textSize=”60px”
android:text=”I’m second. I need to wrap.”
/>
</LinearLayout>
```

Creating Layouts Programmatically

- You can create user interface components such as layouts at runtime programmatically:

```
public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        TextView text1 = new TextView(this);
        text1.setText(“Hi there!”);
        TextView text2 = new TextView(this);
        text2.setText(“I’m second. I need to wrap.”);
        text2.setTextSize((float) 60);
        LinearLayout ll = new LinearLayout(this);
        ll.setOrientation(LinearLayout.VERTICAL);
        ll.addView(text1);
        ll.addView(text2);
        setContentView(ll);
}
```

Organizing Your User Interface

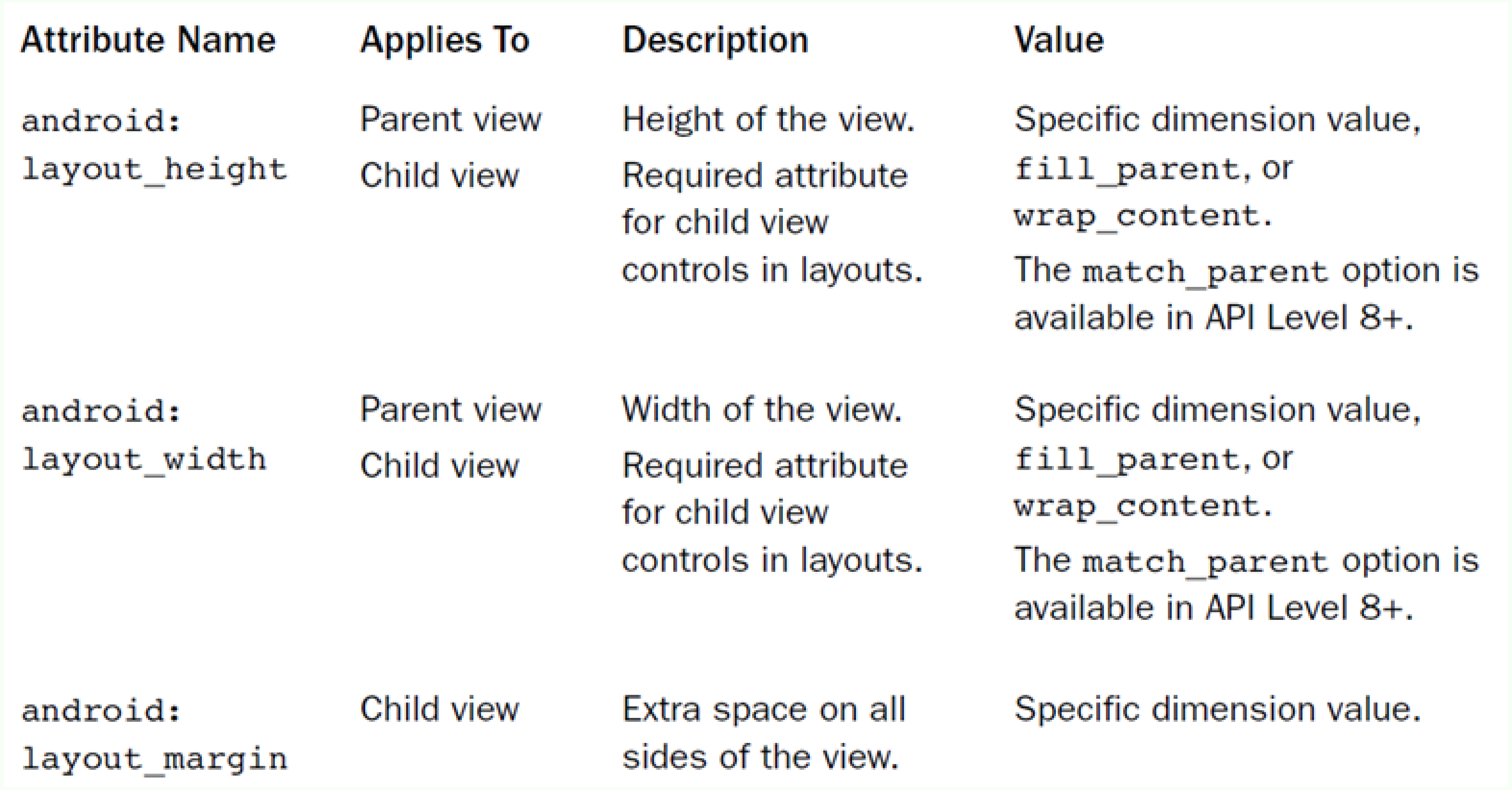
- You add child View objects to a **ViewGroup** programmatically using the method addView().
- In XML, you add child objects to a ViewGroup by defining the child View control as a child node in the XML
- **ViewGroup** subclasses are broken down into two categories:
  - **Layout** classes
  - View **container controls**

Using Built-In Layout Classes

- All layouts, regardless of their type, have basic layout attributes:

  android:layout_attribute_name=”value”

- Common attributes include the size attributes and margin attributes



Attribute Name	Applies To	Description	Value
`android:layout_height`	Parent view Child view	Height of the view. Required attribute for child view controls in layouts.	Specific dimension value, `fill_parent`, or `wrap_content`. The `match_parent` option is available in API Level 8+.
`android:layout_width`	Parent view Child view	Width of the view. Required attribute for child view controls in layouts.	Specific dimension value, `fill_parent`, or `wrap_content`. The `match_parent` option is available in API Level 8+.
`android:layout_margin`	Child view	Extra space on all sides of the view.	Specific dimension value.

ViewGroup Attributes

- This example of a LinearLayout sets the size of the screen, containing one TextView that is set to its full **height** and the **width** of the LinearLayout (and therefore the screen):

```
<LinearLayout xmlns:android=
“http://schemas.android.com/apk/res/android”
android:layout_width=”fill_parent”
android:layout_height=”fill_parent”>
<TextView
android:id=”@+id/TextView01”
android:layout_height=”fill_parent”
android:layout_width=”fill_parent” />
</LinearLayout>
```

ViewGroup Attributes

- Here is an example of a **Button** object with some margins set via XML used in a layout resource file:

```
<Button
android:id=”@+id/Button01”
android:layout_width=”wrap_content”
android:layout_height=”wrap_content”
android:text=”Press Me”
android:layout_marginRight=”20px”
android:layout_marginTop=”60px” />
```

Using **FrameLayout**

- **FrameLayout** view is designed to display **a stack of child View items**.
- You can add multiple views to this layout, but **each View is drawn from the top-left corner** of the layout.
- Use this to show multiple images within the same region, and the **layout is sized to the largest child View** in the stack.

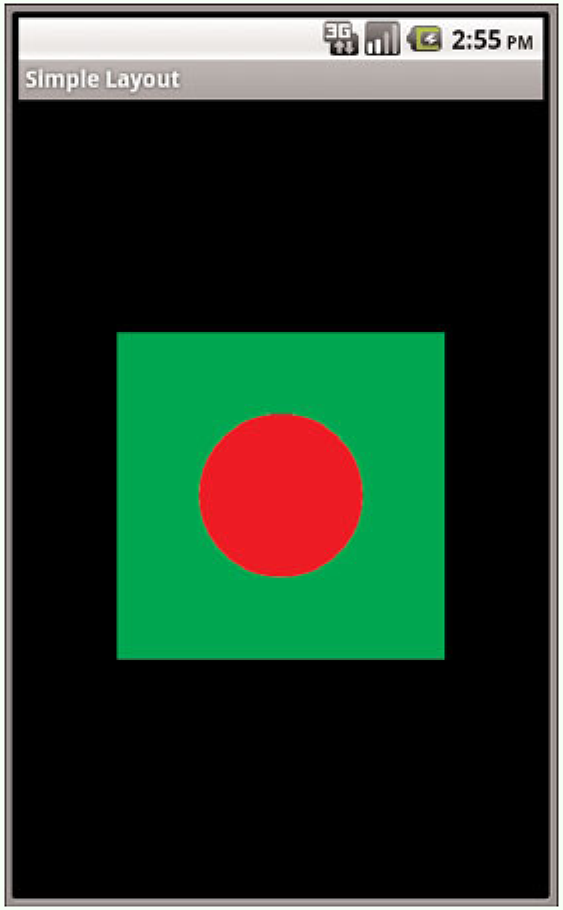
Using **FrameLayout**

- Here's an example of an XML layout resource with a FrameLayout and **two child View objects**, both **ImageView** objects.
- The green rectangle is drawn first and the red oval is drawn on top of it.
- The green rectangle is larger, so it defines the bounds of the FrameLayout:

```
<FrameLayout xmlns:android=
"http://schemas.android.com/apk/res/android"
android:id="@+id/FrameLayout01"
android:layout_width="wrap_content"
android:layout_height="wrap_content"
android:layout_gravity="center">
```

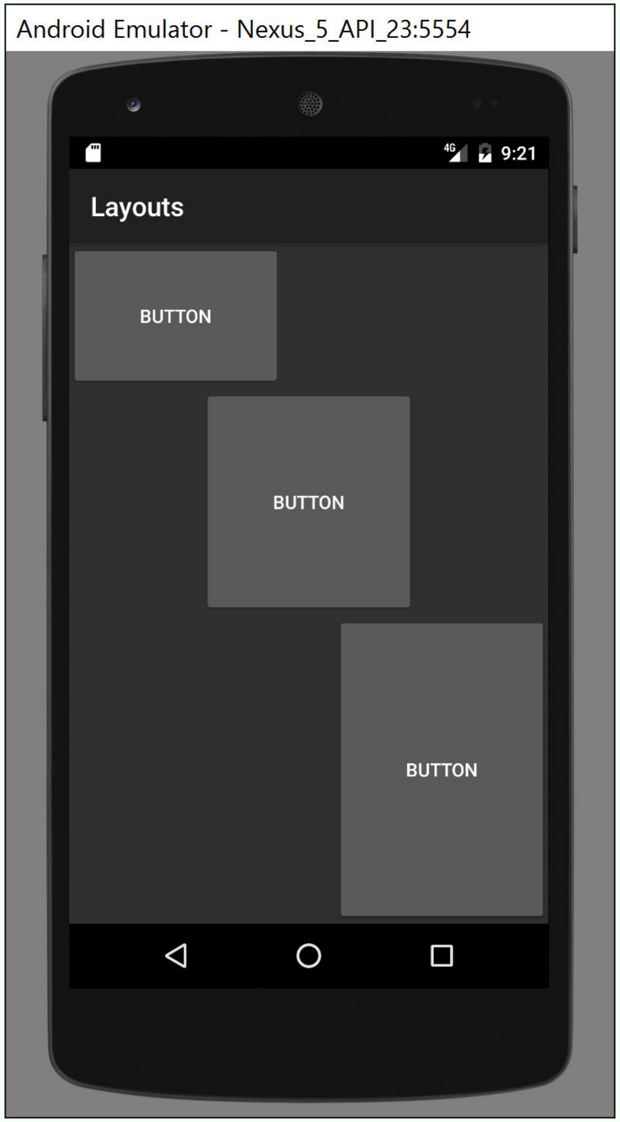
Using **FrameLayout**

```
<ImageView
android:id=”@+id/ImageView01”
android:layout_width=”wrap_content”
android:layout_height=”wrap_content”
android:src=”@drawable/green_rect”
android:minHeight=”200px”
android:minWidth=”200px” />
<ImageView
android:id=”@+id/ImageView02”
android:layout_width=”wrap_content”
android:layout_height=”wrap_content”
android:src=”@drawable/red_oval”
android:minHeight=”100px”
android:minWidth=”100px”
android:layout_gravity=”center” />
</FrameLayout>
```



Using **LinearLayout**

- A LinearLayout view organizes its child View objects in a single row, or column, depending on whether its orientation attribute is set to horizontal or vertical.
- Very handy layout method for creating forms

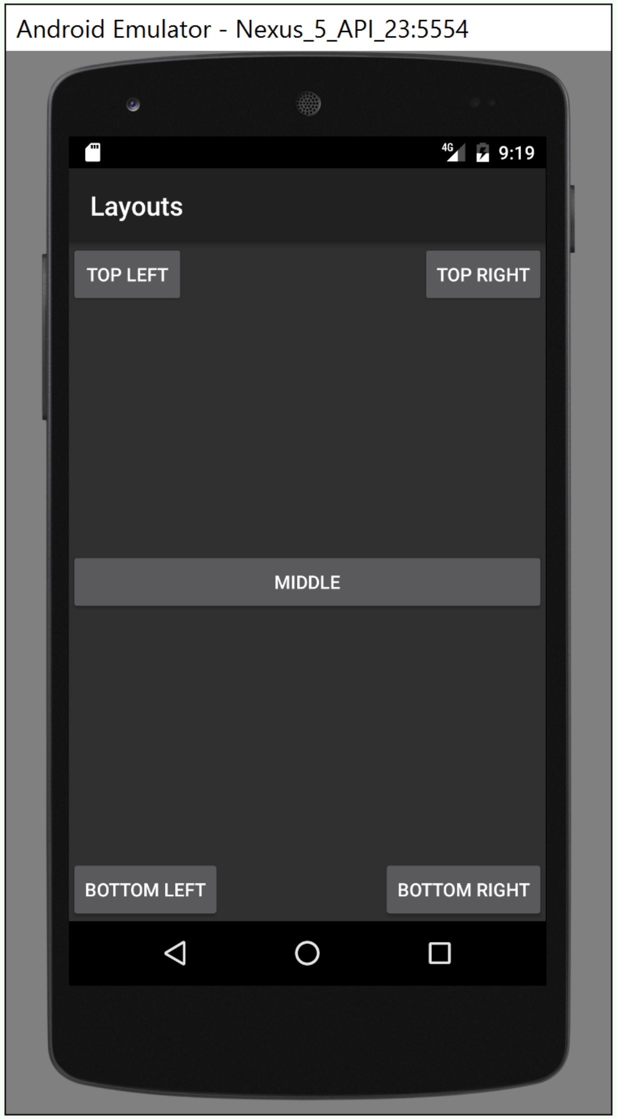


Using **RelativeLayout**

- The **RelativeLayout** view enables you to specify where the child view controls are **in relation to each other**.
- For instance, you can set a child View to be positioned “above” or “below” or “to the left of ” or “to the right of ” another View, referred to by its unique identifier.
- You can also align child View objects relative to one another or the parent layout edges.

Using **RelativeLayout**

- ❑ Combining RelativeLayout attributes can simplify creating interesting user interfaces without resorting to multiple layout groups to achieve a desired effect.
- ❑ The picture shows how each of the button controls is relative to each other



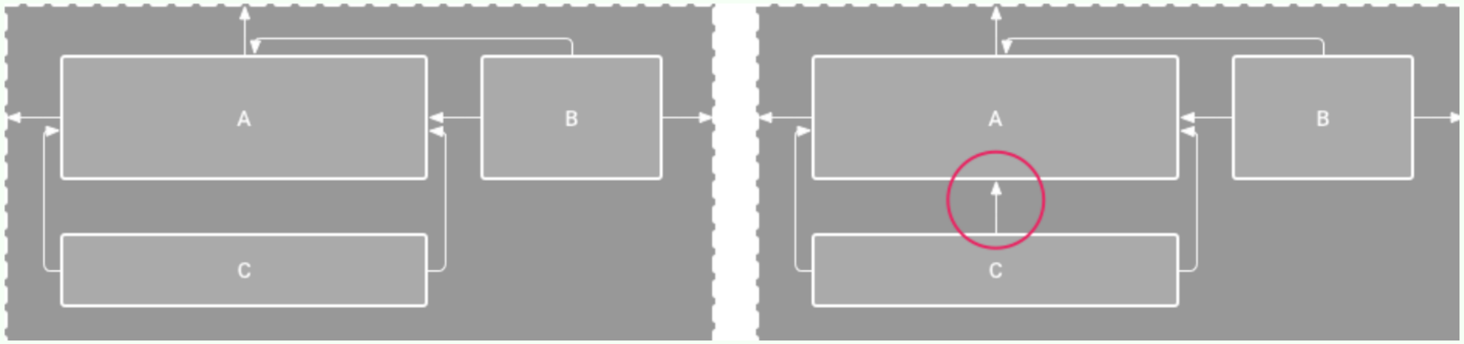
Using **RelativeLayout**

- Here’s an example of an XML layout resource with a RelativeLayout and two child View objects, a Button object aligned relative to its parent, and an ImageView aligned and positioned relative to the Button (and the parent):

```
<?xml version=”1.0” encoding=”utf-8”?>
<RelativeLayout xmlns:android=
“http://schemas.android.com/apk/res/android”
android:id=”@+id/RelativeLayout01”
android:layout_height=”fill_parent”
android:layout_width=”fill_parent”>
<Button
android:id=”@+id/ButtonCenter”
android:text=”Center”
android:layout_width=”wrap_content”
android:layout_height=”wrap_content”
android:layout_centerInParent=”true” />
<ImageView
android:id=”@+id/ImageView01”
android:layout_width=”wrap_content”
android:layout_height=”wrap_content”
android:layout_above=”@id/ButtonCenter”
android:layout_centerHorizontal=”true”
android:src=”@drawable/arrow” />
</RelativeLayout>
```

ConstraintLayout

- ConstraintLayout allows you to create large and complex layouts with a flat view hierarchy (no nested view groups).
- It's similar to RelativeLayout in that **all views are laid out according to relationships between sibling views and the parent layout**, but it's more flexible than RelativeLayout and easier to use with Android Studio's Layout Editor.



- The editor shows view C below A, but it has no vertical constraint
- View C is now **vertically constrained below view A**

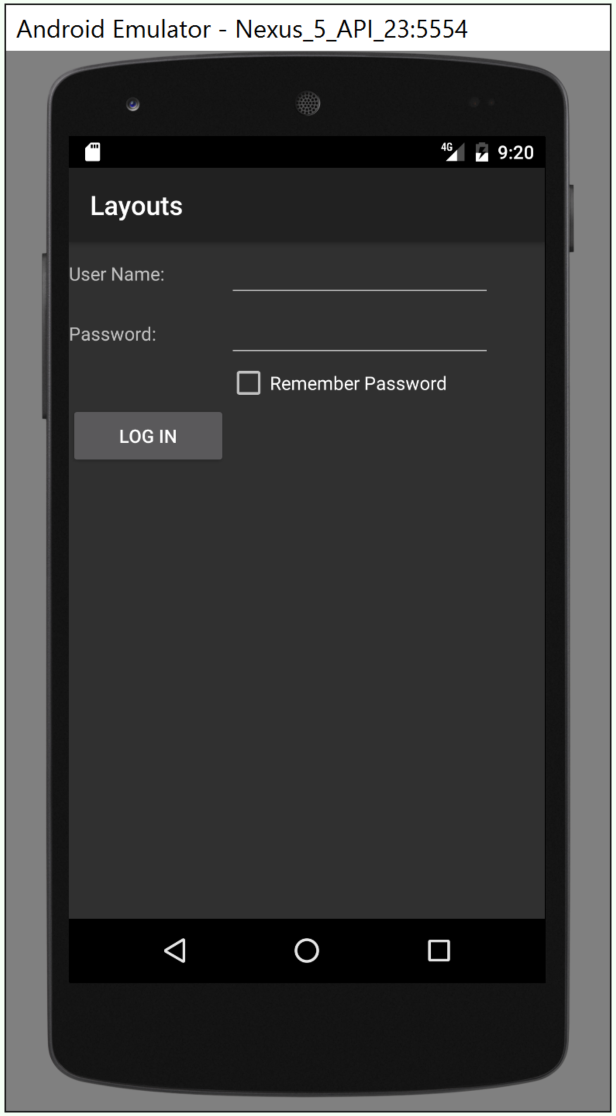
https://developer.android.com/training/constraint-layout/

Using **TableLayout**

- A **TableLayout** view organizes children into rows,
- You add individual View objects within each row of the table using a **TableRow** layout View (which is basically a horizontally oriented LinearLayout) for each row of the table.
  - Each **column** of the TableRow can contain one View (or layout with child View objects).
  - You place View items added to a TableRow in columns in the order they are added.
  - You can specify the **column number** (zero-based) to skip columns as necessary; otherwise, the View object is put in the next column to the right.
  - **Columns scale** to the size of the largest View of that column.

Using **TableLayout**

- You can also include normal View objects instead of TableRow elements, if you want the View to take up an entire row.


Android Emulator - Nexus_5_API_23:5554

Using **TableLayout**

- Here’s an example of an XML layout resource with a TableLayout with two rows (two TableRow child objects).
- The TableLayout is set to **stretch the columns** to the size of the screen width.
  - The first TableRow has three columns; each cell has a Button object.
  - The second TableRow puts only one Button view into the second column explicitly:

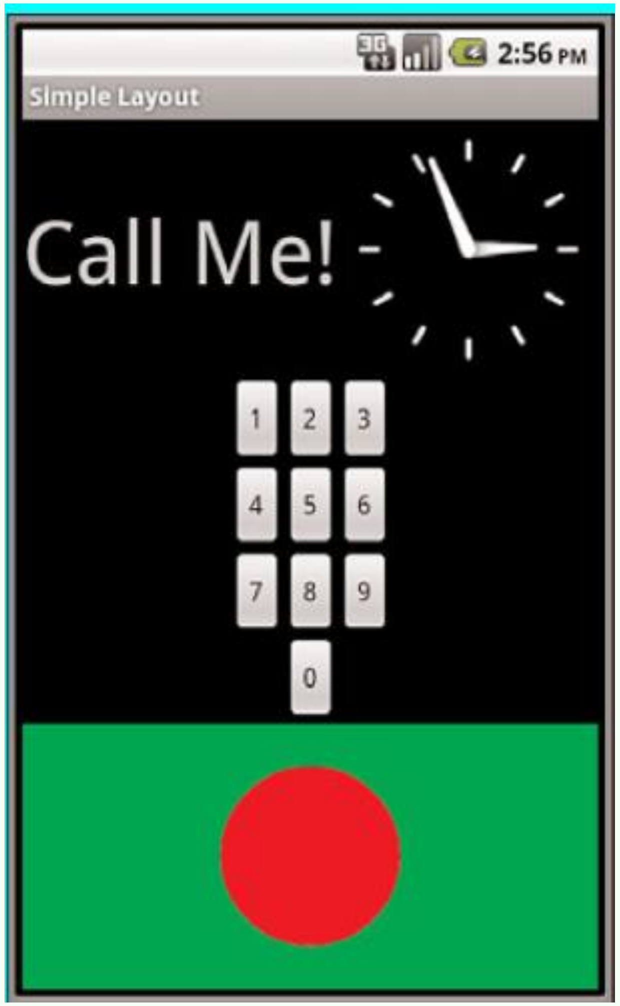
```
<TableLayout xmlns:android=
“http://schemas.android.com/apk/res/android”
android:id=”@+id/TableLayout01”
android:layout_width=”fill_parent”
android:layout_height=”fill_parent”
android:stretchColumns=”*”>
<TableRow
android:id=”@+id/TableRow01”>
<Button
android:id=”@+id/ButtonLeft”
android:text=”Left Door” />
```

Using **TableLayout**

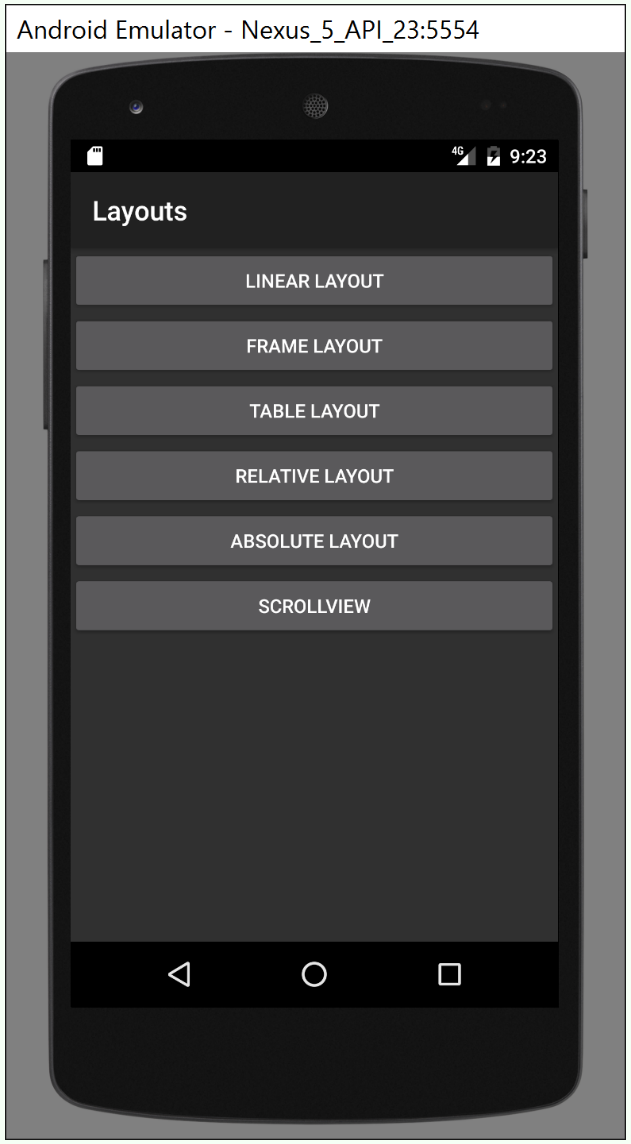
```
<Button
android:id=”@+id/ButtonMiddle”
android:text=”Middle Door” />
<Button
android:id=”@+id/ButtonRight”
android:text=”Right Door” />
</TableRow>
<TableRow
android:id=”@+id/TableRow02”>
<Button
android:id=”@+id/ButtonBack”
android:text=”Go Back”
android:layout_column=”1” />
</TableRow>
</TableLayout>
```

Using Multiple Layouts on a Screen

- ❑ Combining different layout methods on a single screen can create complex layouts.
- ❑ Because a layout contains View objects and is, itself, a View, it can contain other layouts.
- ❑ The figure on the right demonstrates a combination of layout views used in conjunction to create a more complex and interesting screen



Layout example


Android Emulator - Nexus_5_API_23:5554

ScrollView

- A ScrollView is a special type of FrameLayout in that it enables users to **scroll through a list of views** that occupy more space than the physical display.
- The ScrollView can **contain only one child** view or ViewGroup, which normally is a LinearLayout.

```
<ScrollView
android:layout_width=”fill_parent”
android:layout_height=”fill_parent”
xmlns:android=”http://schemas.android.com/apk/res/android” >
        <LinearLayout
                android:layout_width=”fill_parent”
                android:layout_height=”wrap_content”
                android:orientation=”vertical” >
                ……..
        </LinearLayout>
</ScrollView>
```

Android Controls

- android.**widget** contains Android controls
- The Android SDK includes classes to draw most common objects, including **ImageView**, **FrameLayout**, **EditText**, and **Button** classes.
  - All controls are typically **derived from the View** class

Displaying Text to Users with TextView

- TextView control is used to draw text on the screen.
  - You primarily use it to **display fixed text** strings or labels
- It is derived from View and is within the **android.widget** package:
  - all the standard attributes such as width, height, padding, and visibility can be applied to the object
- You can set the **android:text** property of the TextView to be either a raw text string in the layout file or a reference to a string resource.

Displaying Text to Users with TextView

```
<TextView android:id=”@+id/TextView01”
android:layout_width=”wrap_content”
android:layout_height=”wrap_content”
android:text=”Some sample text here” />

<TextView android:id=”@+id/TextView02”
android:layout_width=”wrap_content”
android:layout_height=”wrap_content”
android:text=”@string/sample_text” />
```

Displaying Text to Users with **TextView**

- Call **setContentView**() method with the layout resource identifier to display this TextView on the screen

```
displayTextView = (TextView) findViewById(R.id.TextView01);
```

- You can change the text displayed programmatically by calling the **setText()** method on the TextView object.
- Retrieving the text is done with the **getText()** method.

Retrieving Data from Users

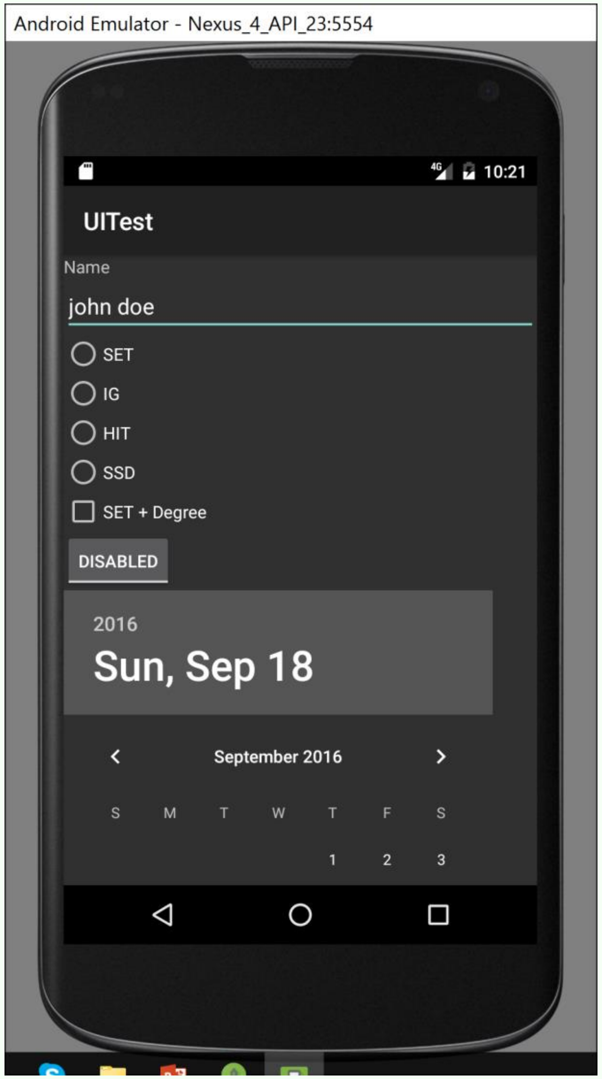
- Two frequently used controls to handle this type of job are **EditText** controls and **Spinner** controls
- **EditText** handles text input from a user.
  - The EditText class is **derived from TextView**
- This is how to define an EditText control in an XML layout file:

```
<EditText
android:id=”@+id/EditText01”
android:layout_height=”wrap_content”
android:hint=”type here”
android:lines=”4”
android:layout_width=”fill_parent” />
```

- **hint** attribute gives a hint to the user as to what should be typed in EditText control
- **lines** attribute, which defines how many lines tall the input box is

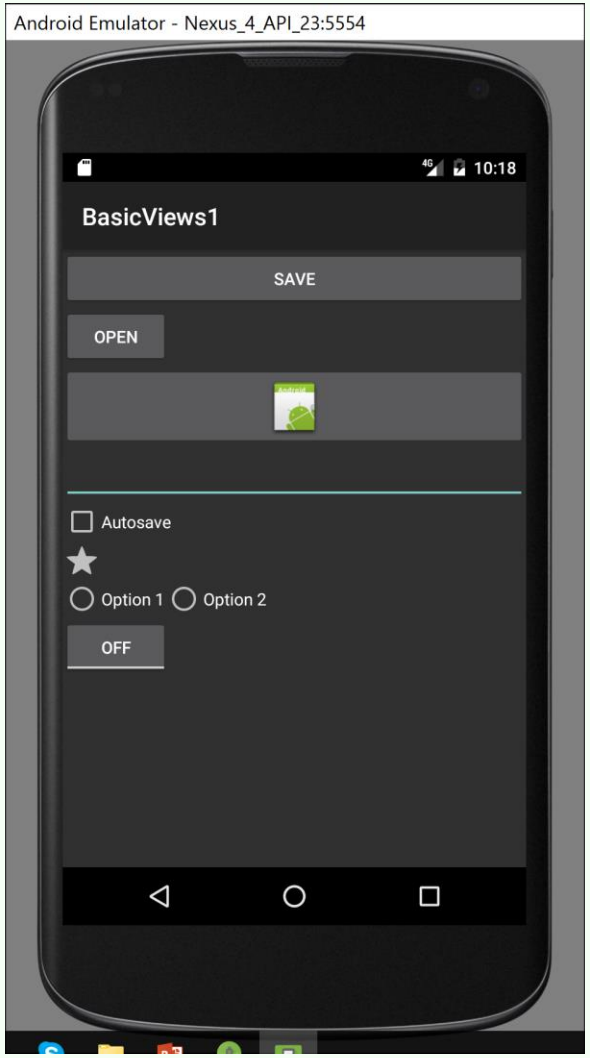
Retrieving Data from Users

- To highlight a portion of the text from code use **setSelection()** method, and a call to **selectAll()** highlights the entire text entry field.
- EditText object is essentially an editable TextView.
  - This means that you can read text from it in the same way as you did with TextView: by using the **getText()** method.
  - You can also set initial text to draw in the text entry area using the **setText()** method



Using Buttons

- The android.widget.**Button** class provides a basic button implementation in the Android SDK.
- Within the XML layout resources, buttons are specified using the Button element.
- The primary attribute for a basic button is the text field
- Use basic Button controls for buttons with text such as “Ok,”“Cancel,” or “Submit.”



Using Buttons

- The following XML layout resource file shows a typical Button control definition:

```
<Button
android:id=”@+id/basic_button”
android:layout_width=”wrap_content”
android:layout_height=”wrap_content”
android:text=”Basic Button” />
```

- This is some code that handles a click for a basic button and displays a Toast message on the screen:

```
final Button basic_button = (Button) findViewById(R.id.basic_button);
basic_button.setOnClickListener(new View.OnClickListener() {
public void onClick(View v) {
Toast.makeText(ButtonsActivity.this, “Button clicked”,
   Toast.LENGTH_SHORT).show();
}
});
```

References

- Textbook
- Android Documentation
- https://material.io/guidelines/layout/units-measurements.html
- https://developer.android.com/guide/topics/ui/overview.html
- https://developer.android.com/guide/topics/ui/declaring-layout.html
- Lauren Darcey, Shane Conder: Introduction to Android Application Development: Android Essentials (5th Edition)