



Programming with Android: **Widgets and Events**

Luca Bedogni

Marco Di Felice

Dipartimento di Scienze dell'Informazione

Università di Bologna



Outline

What is a **Widget**?

Widget: TextView and EditText

Widget: Button and CompoundButton

Widget: ImageView

Widget: CheckedTextView

Event Management: Event **Handlers**

Event Management: Event **Listeners**



Android: **Where are we now** ...

Android Applications' anatomy:

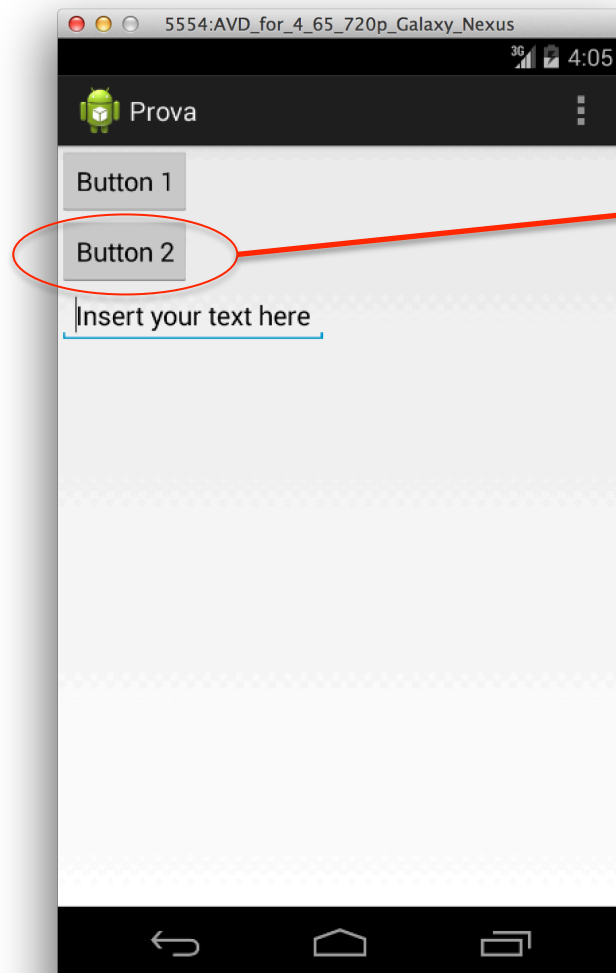
- **Activities** → Application Components (screens)
- **Intents** → Communication between components
- **Layouts** → Placement of the elements on the screen ...
- **Views** → ... **Elements to be placed!**

Widget → *Pre-defined, common-used View objects ...*



Android: Views objects

Views → basic building blocks for user interface components



- ✧ Rectangular area of the screen
- ✧ Responsible for **drawing**
- ✧ Responsible for **event handling**

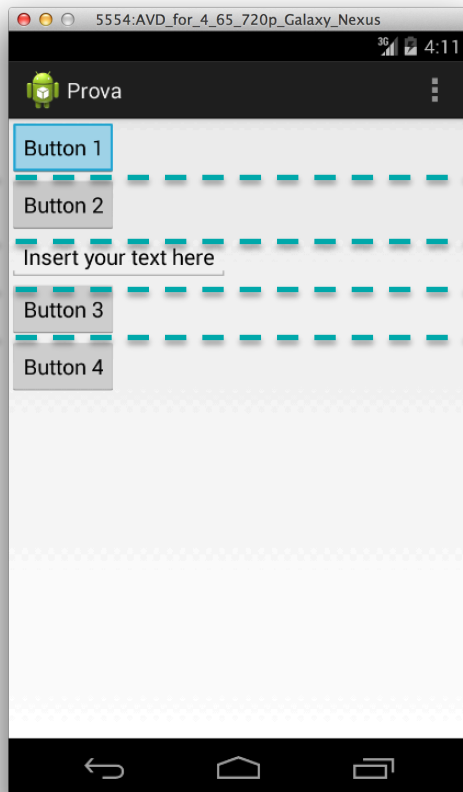
EXAMPLES of **VIEWS** objects:

- GoogleMap
- WebView
- **Widgets** → topic of the day
- ...
- User-defined Views



Android: Views objects

ViewGroup → Container of other views, base class for layouts



LINEAR LAYOUT

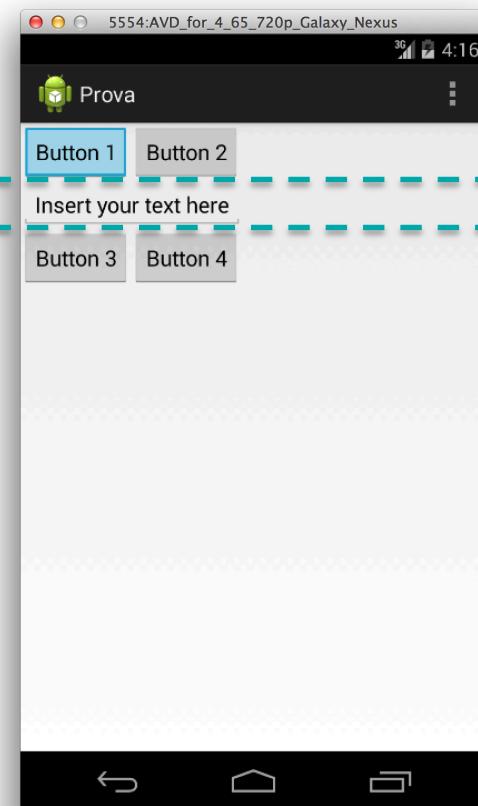
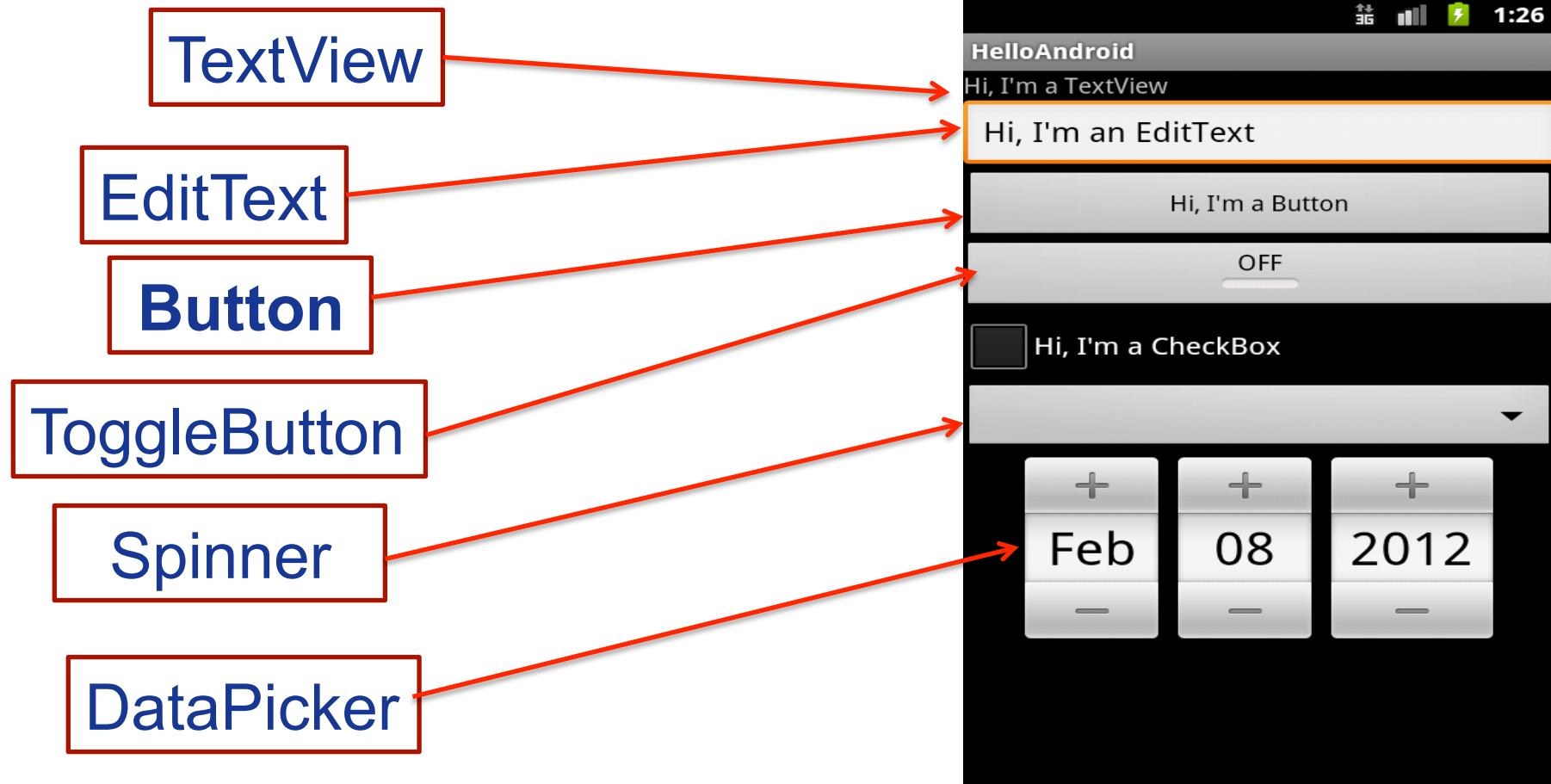


TABLE LAYOUT



Android: Views objects

Widget → Pre-defined interactive UI components (android.view.widgets)





Widgets: Java and XML code

- Widgets can be created in the **XML layout files**

```
< TextView
```

```
    android:id="@+id/textLabel"
```

```
    android:width="100dp"
```

```
    android:height="100dp"
```

```
    android:layout_width="match_parent"
```

```
    android:layout_height="wrap_content"
```

```
    android:visibility="visible"
```

```
    android:enabled="true"
```

```
    android:scrollbars="vertical"
```

```
    ....
```

```
/>
```



Widgets: Java and XML code

- **Widgets** can be created in **Java**
- **Widgets** can be created in **XML** and accessed in **Java**

```
< TextView
```

XML

```
  android:id="@+id/name1" />
```

```
public TextView text;  
text=(TextView) findViewById(R.id.name1);
```

JAVA

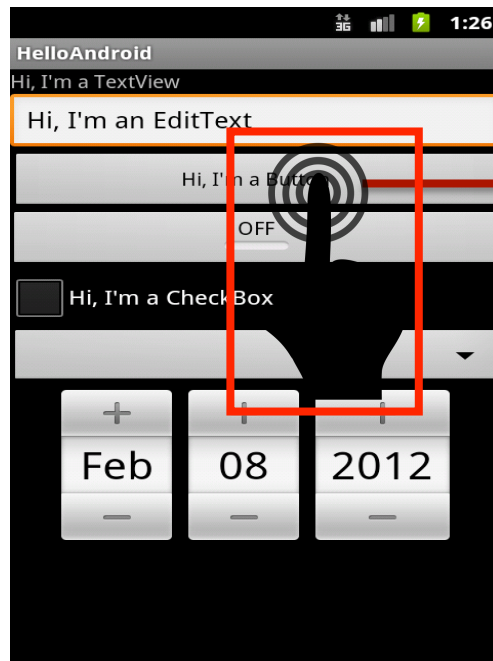
CAST REQUIRED

```
public TextView text;  
text=new TextView();
```




Widgets: Java and XML code

- Each Widget can generate events, that can be captured by **Listeners** that define the appropriate actions to be performed in response to each event.



ONCLICK event



Java code that
manages the **onClick** event ...



Widgets: Java and XML code

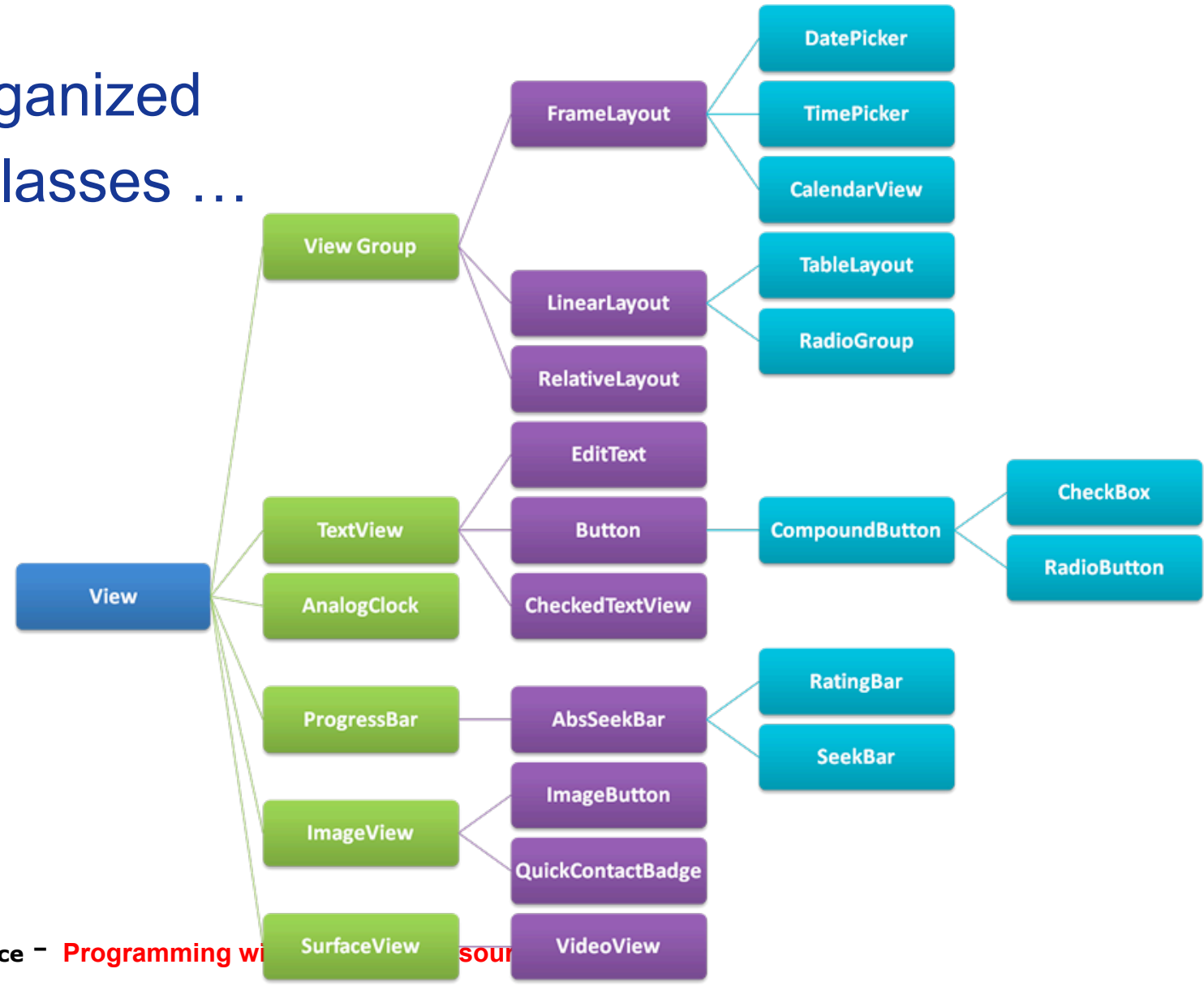
- Each Widget can have a **focus** and a **visibility**, based on the user's interaction.
- The user can force a focus to a specific component through the **requestFocus()** method.
- The user can modify the visibility of a specific component through the **setVisibility(int)** method.

```
public TextView text;  
text=(TextView) findViewById(R.id.name1);  
text.setVisibility(true)  
text.requestFocus();
```



Widgets: Hierarchy of the classes ...

➤ Widgets are organized on a hierarchy of classes ...





Widgets: TextView

- XML tags: **<TextView> </TextView>**
- ✧ Could be filled with **strings** or HTML markups
- ✧ Not directly editable by users
- ✧ Usually used to display **static** informations

```
<TextView  
    android:text="@string/textWelcome"  
    android:id="@+id/textLabel"  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
/>
```



Widgets: TextView methods

➤ Methods to place some texts inside a TextView ...

- ✧ public void **setText**(CharSequence text)
- ✧ public CharSequence **getText**()
- ✧ public void **setSingleLine**(boolean singleLine)
- ✧ public void **setHorizontallyScrolling**(boolean enable)
- ✧ public void **setLines**(int lines)
- ✧ public void **setEllipsize**(TextUtils.TruncateAt where)
- ✧ public void **setHints**(CharSequence hints)

-
- ✧ TextUtils.TruncateAt.**END**
 - ✧ TextUtils.TruncateAt.**MARQUEE**
 - ✧ TextUtils.TruncateAt.**MIDDLE**
 - ✧ TextUtils.TruncateAt.**START**



Widgets: Linkify elements

- Simple **strings** could be **linkified** automatically.
- How? Pick a normal string, and use **Linkify.addLinks()** to define the kind of links to be created.
- Could manage: *Web addresses, Emails, phone numbers, Maps*

```
TextView textView=(TextView) findViewById(R.id.output);  
Linkify.addLinks(textView, Linkify.WEB_URLS |  
                    Linkify.WEB_ADDRESSES |  
                    Linkify.PHONE_NUMBERS );  
Linkify.addLinks(textView, Linkify.ALL);
```

- It is possible to define **custom** Linkify objects. ..



Widgets: EditText

- XML tags: `<EditText>` `</EditText>`
- ✧ Similar to a TextView, but **editable** by the users
- ✧ An appropriate **keyboard** will be displayed

`<EditText`

`android:text="@string/textDefault"`

`android:id="@+id/editText"`

`android:inputType= "textCapSentences" | "textCapWords" |
"textAutoCorrect" | "textPassword" |
"textMultiLine" | "textNoSuggestions"`

`/>`



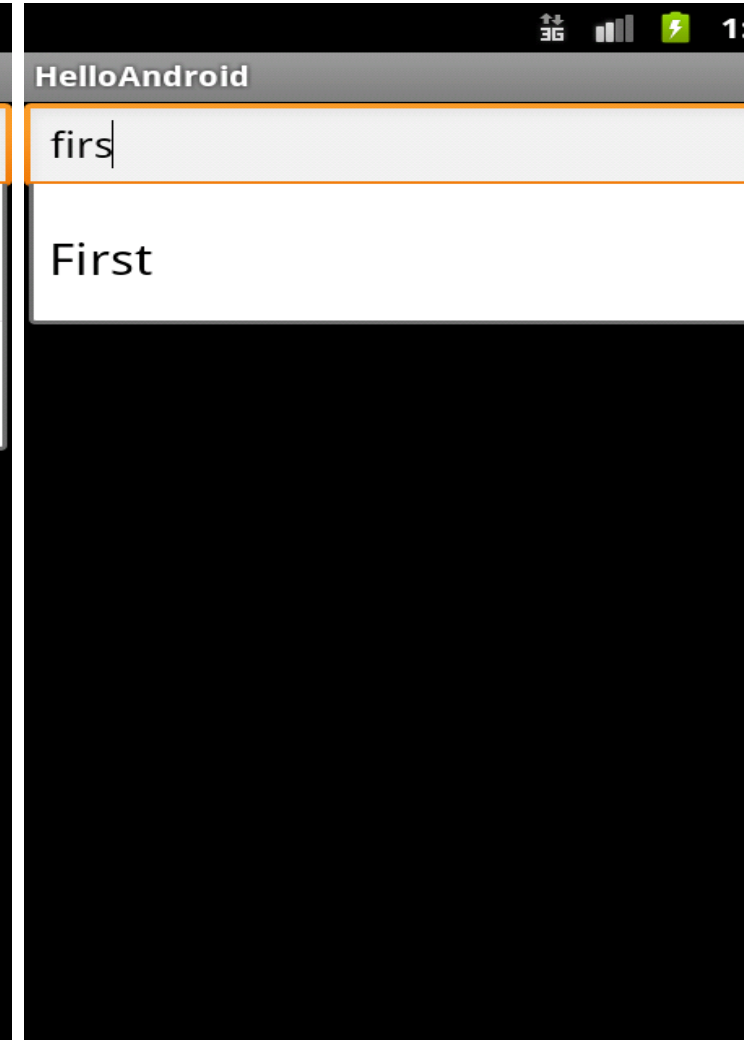
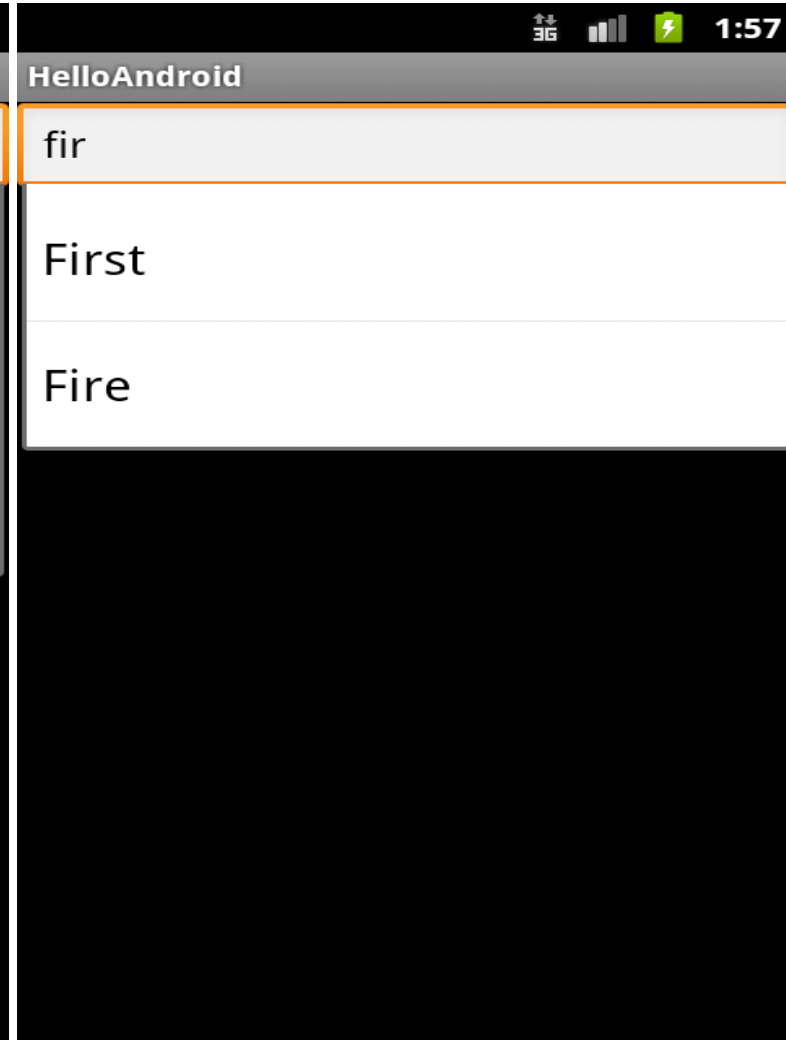
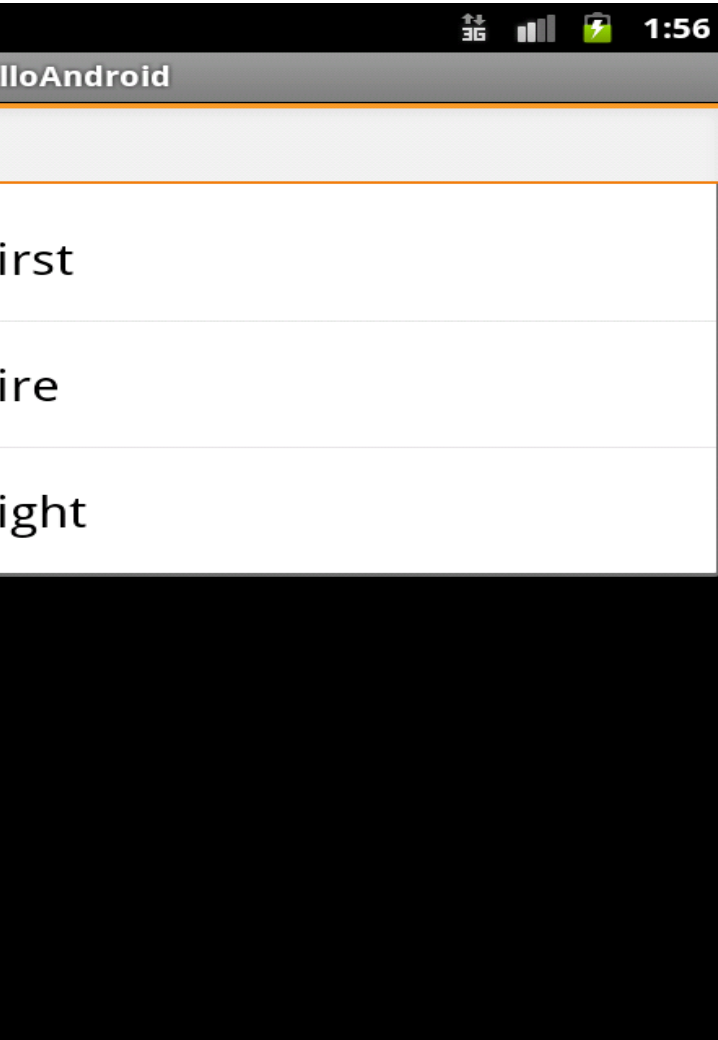
Widgets: autoCompleteTextView

- XML tags: `<AutoCompleteTextView> </Auto...View>`
- ✧ Used to make easier the input by the users ...
 - ✧ As soon as the user starts typing, hints are displayed
 - ✧ A list of hints is given through an **Adapter**

```
String[] tips=getResources().getStringArray(R.array.nani_array);
ArrayAdapter<String> adapter=new ArrayAdapter(this,
android.R.layout.simple_dropdown_item_1lines, tips);
AutoCompleteTextView acTextView=(AutoCompleteTextView)
findViewById(R.id.inputText);
acTextView.setAdapter(adapter);
```




Widgets: AutocompleteTextView





Widgets: Button

- XML tags: **<Button>** **</Button>**
- ✧ Superclass of a TextView, but not directly **editable** by users
- ✧ Can generate events related to click, long click, drag, etc

```
<Button  
    android:text="@string/textButton"  
    android:id="@+id/idButton"  
    android:background="@color/blue"  
>
```

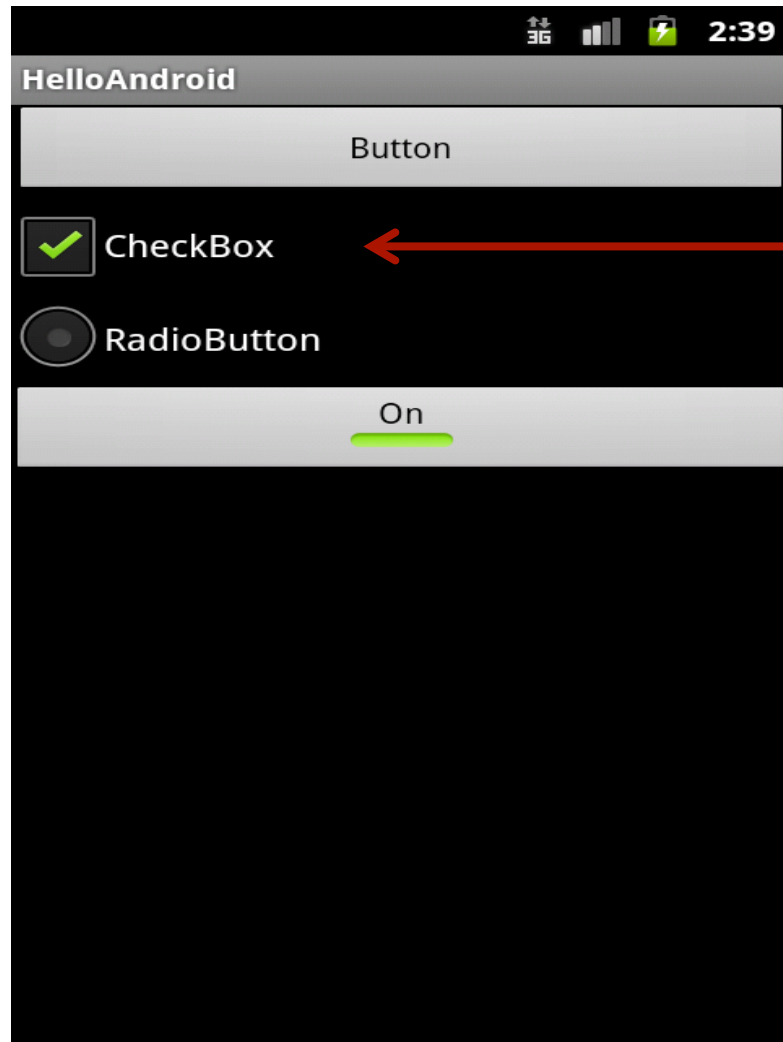
```
<selector>  
    <item android:color="#ff819191"  
        android:state_pressed="true">  
    </item>  
</selector>
```

res/color/blue.xml

- **CompoundButton**: Button + *state* (checked/unchecked)



Widgets: Button and CompoundButton



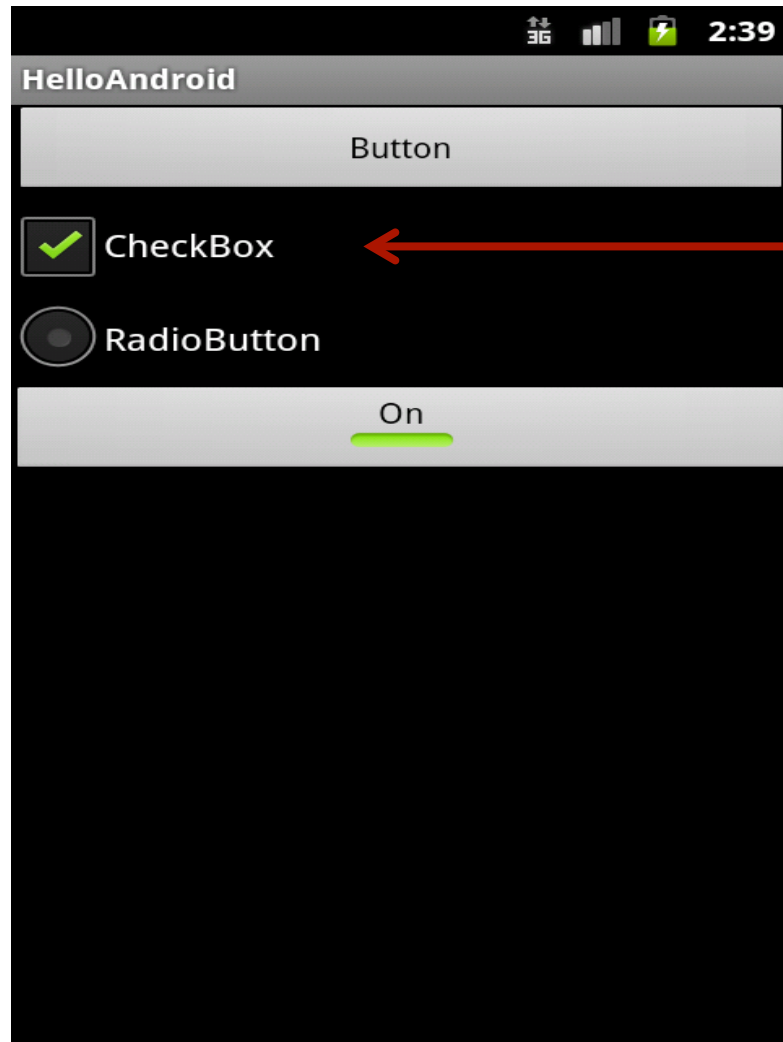
checkBox CompoundButton

XML tags: **<CheckBox>**
</CheckBox>

```
<CheckBox  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:id="@+id/buttonCheck"  
    android:text="CheckBox"  
    android:checked="true"  
/>
```



Widgets: Button and CompoundButton



checkBox CompoundButton

✧ public boolean **isChecked()**:
Returns true if the button is checked, false otherwise.

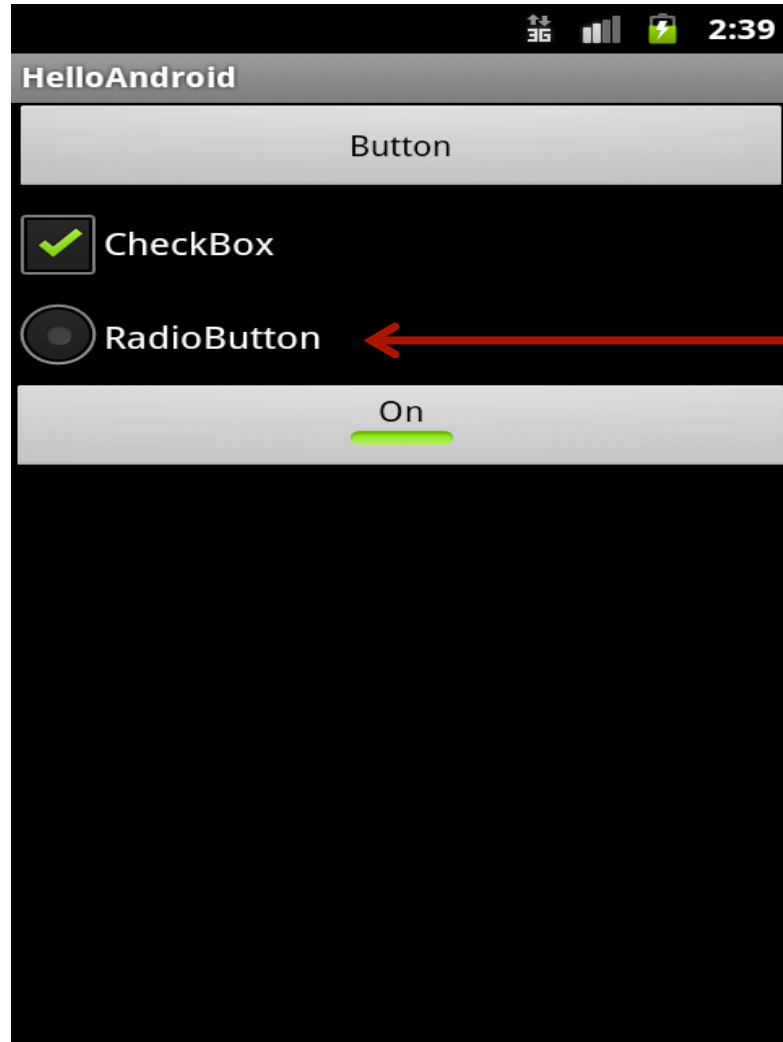
✧ public boolean
setChecked(bool)

Listener:

onCheckedChangeListener



Widgets: Button and CompoundButton



radioButton CompoundButton

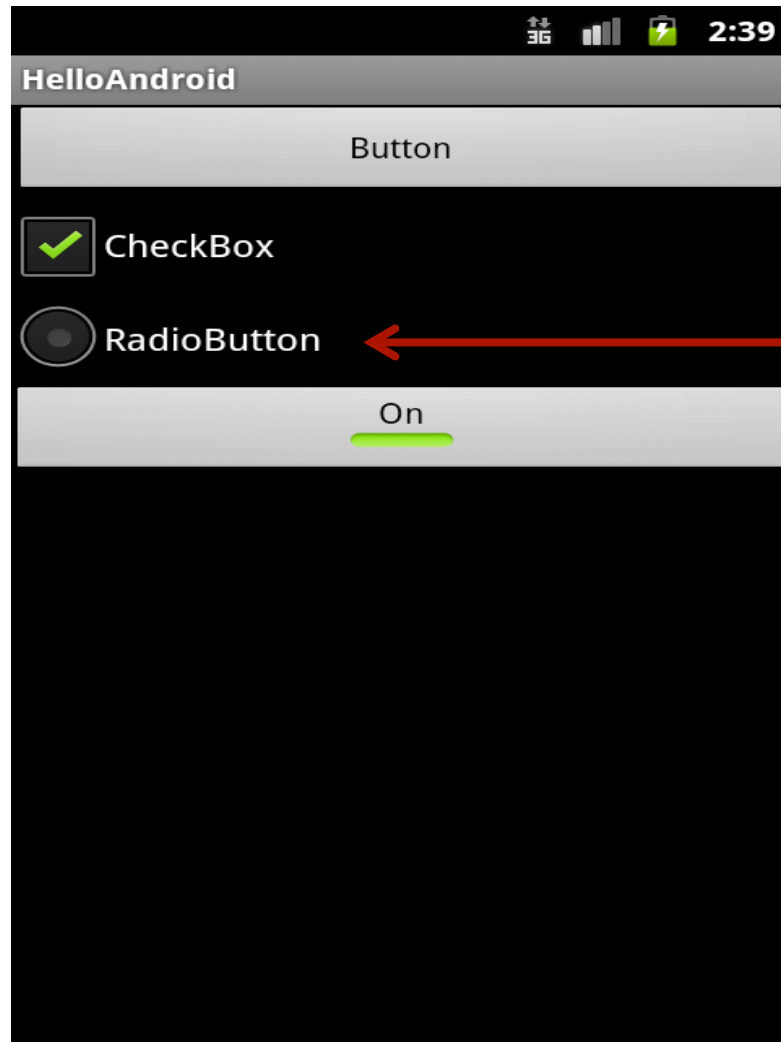
XML tags: **<RadioButton>**
</RadioButton>

<RadioButton

```
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:id="@+id/buttonRadio"  
    android:text="ButtonRadio"  
    android:checked="true"  
/>
```



Widgets: Button and CompoundButton



radioButton CompoundButton

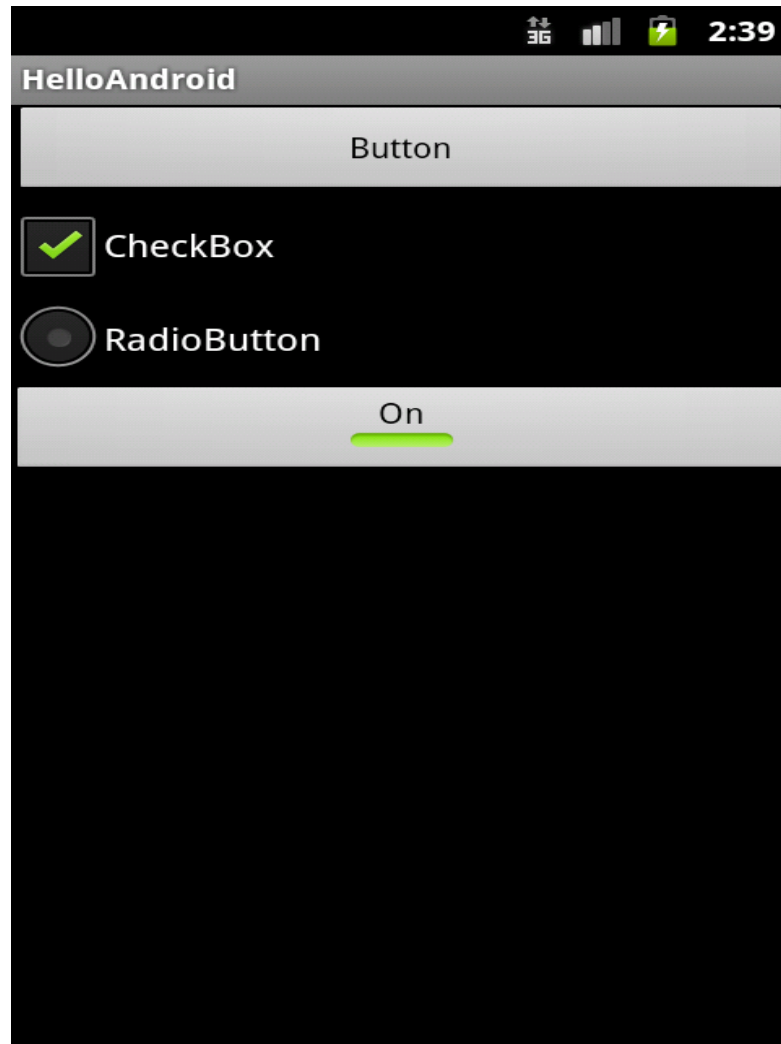
- ✧ Define multiple (**mutual-exclusive**) options through a `<RadioGroup>` tag.
- ✧ Only one button can be checked within the same **RadioGroup**.

Listener:

`OnCheckedChangeListener`



Widgets: Button and CompoundButton



<RadioGroup

```
android:layout_width="wrap_content"  
android:layout_height="wrap_content"  
android:orientation="vertical">
```

<RadioButton

```
android:layout_width="wrap_content"  
android:layout_height="wrap_content"  
android:id="@+id/buttonRadio1"  
android:text="Option 1"  
android:checked="true" />
```

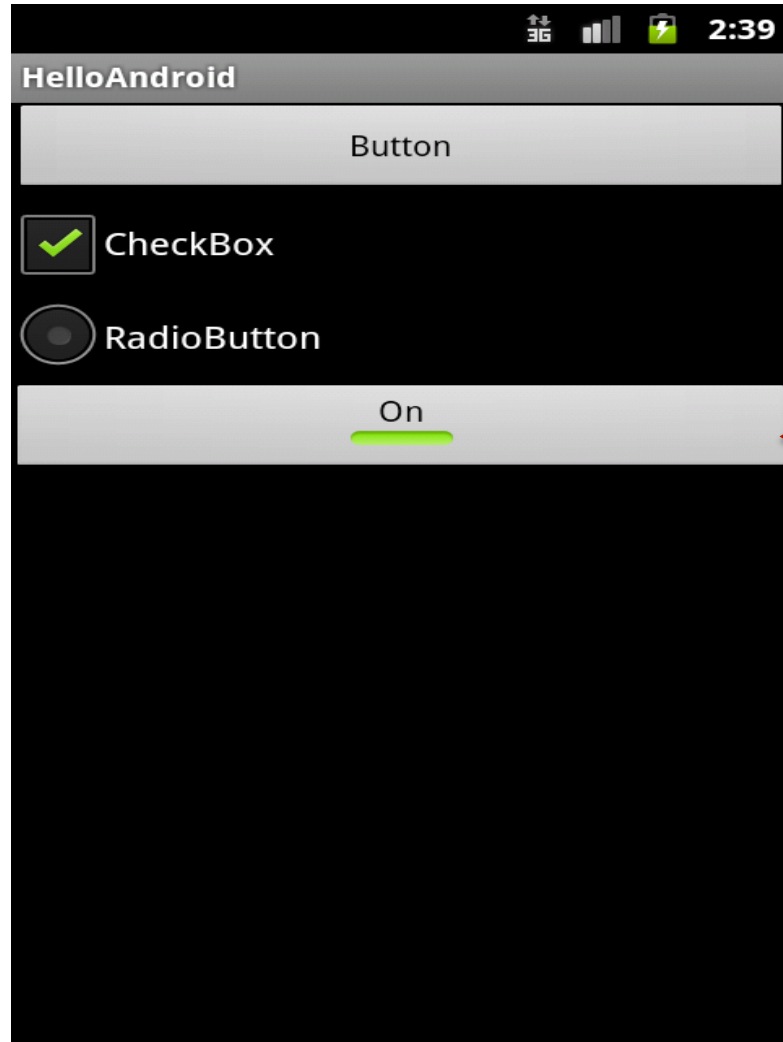
<RadioButton

```
android:layout_width="wrap_content"  
android:layout_height="wrap_content"  
android:id="@+id/buttonRadio2"  
android:text="Option 2" />
```

```
</RadioGroup>
```



Widgets: Button and CompoundButton



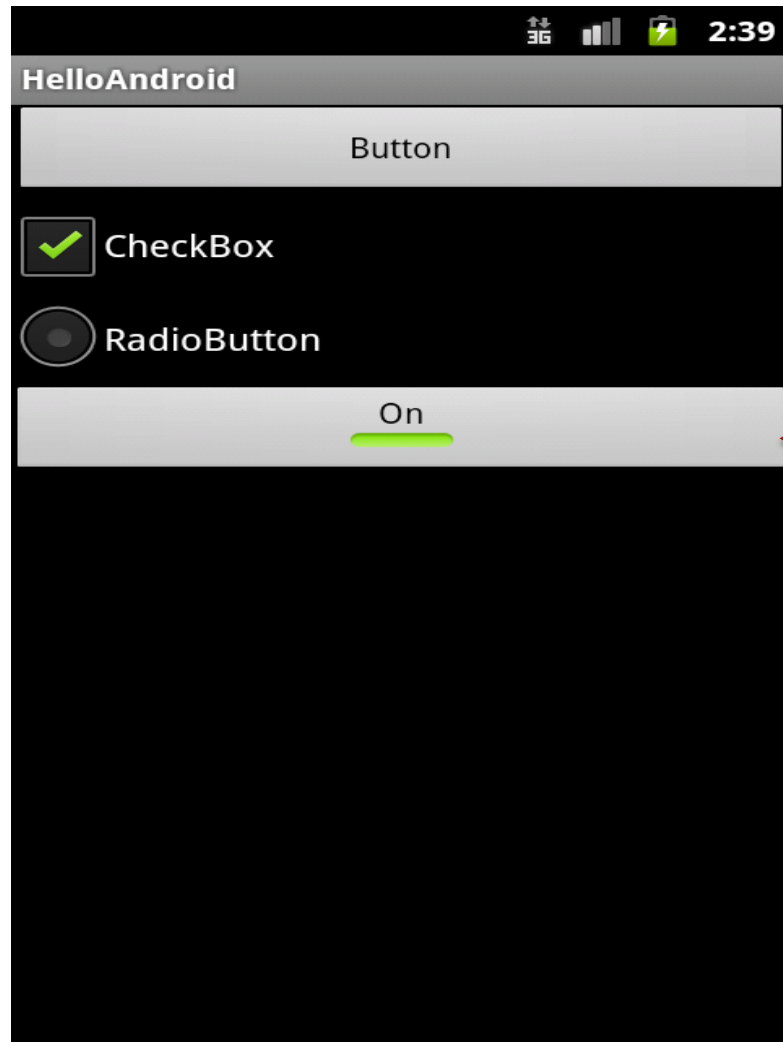
ToggleButton CompoundButton

XML tags: **<ToggleButton>**
</ToggleButton>

```
<ToggleButton  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:id="@+id/toggleButtonId"  
    android:textOn="Button ON"  
    android:textOff="Button OFF"  
    android:checked="false"  
/>
```




Widgets: Button and CompoundButton



ToggleButton CompoundButton

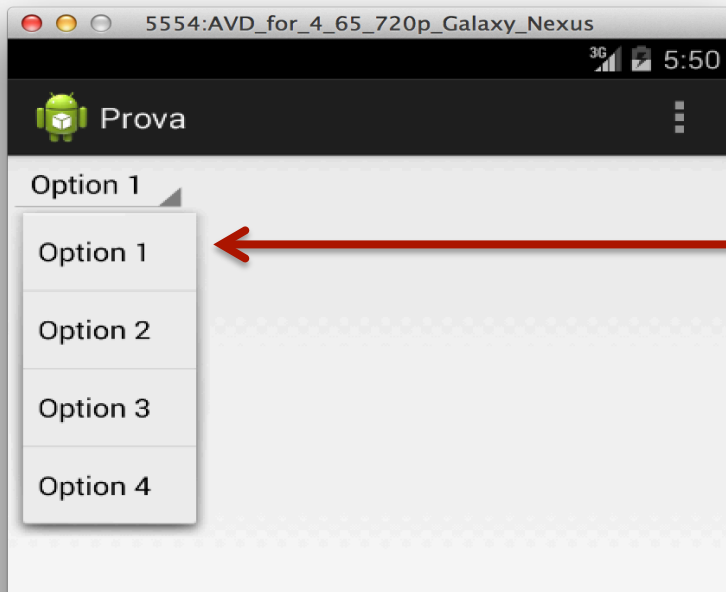
- ✧ It can assume only 2 states: *checked/unchecked*
- ✧ Different labels for the states with: `android:textOn` and `android:textOff` XML attributes.

Listener:

`OnCheckedChangeListener`



Widgets: Spinners



Spinner component

XML tags: **<Spinner>**
</Spinner>

<Spinner

```
android:layout_width="wrap_content"  
android:layout_height="wrap_content"  
android:id="@+id/spinnerId"  
android:entries="@array/stringOptions">
```

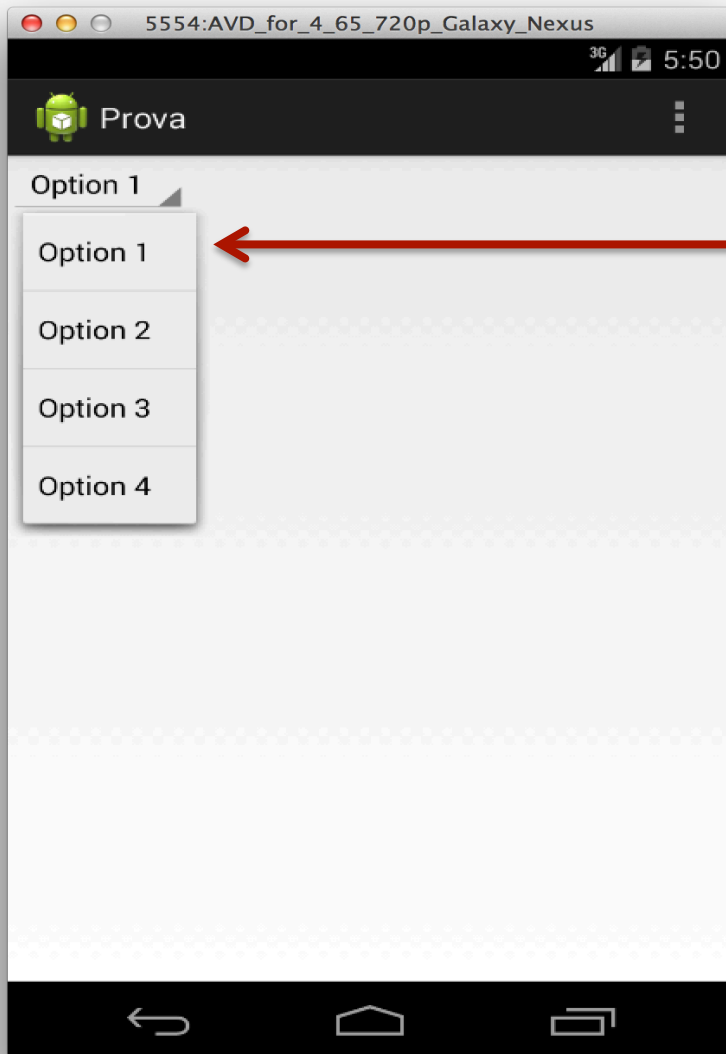
</Spinner>

```
<resources>  
  <string-array name="stringOptions">  
    <item>Option 1</item>  
    <item>Option 2</item>  
    <item>Option 3</item>  
    <item>Option 4</item>  
  </string-array>  
</resources>
```

res/values.xml



Widgets: Spinners



Spinner component

XML tags: **<Spinner>**
</Spinner>

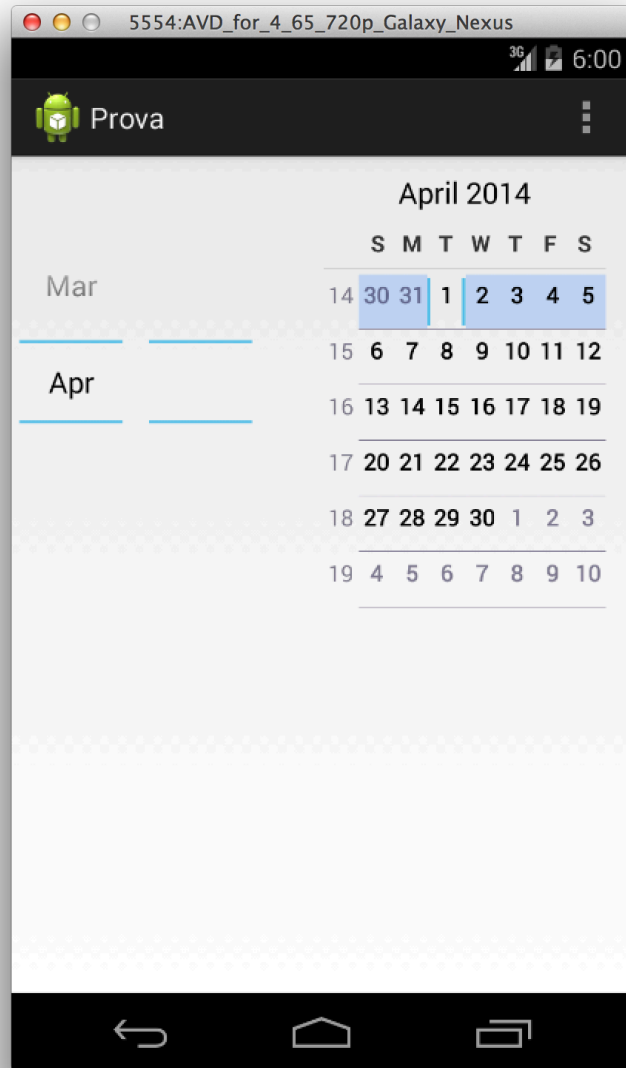
- ✧ Provides a quick way to select values from a specific set.
- ✧ The spinner value-set can be defined in XML (through the **entries** tag) or through the *SpinnerAdapter* in Java

Listener:

OnItemSelectedListener



Widgets: Button and CompoundButton



DataPicker component

XML tags: **<DatePicker>**
</DatePicker>

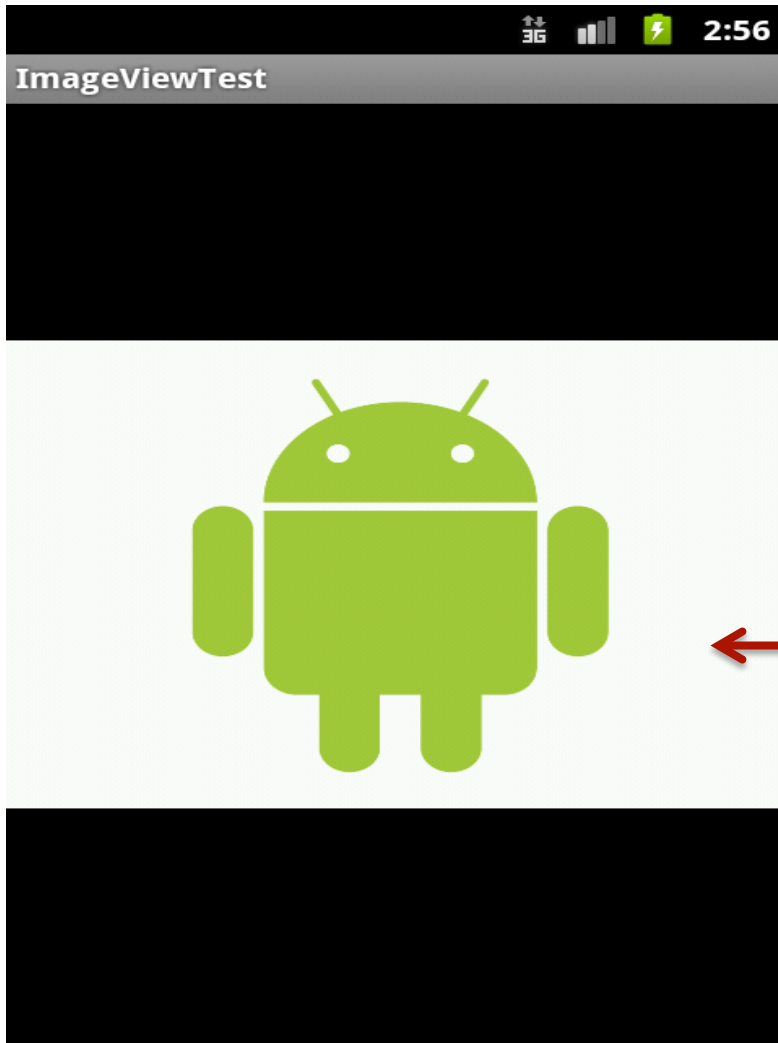
<DatePicker

```
android:layout_width="wrap_content"  
android:layout_height="wrap_content"  
android:id="@+id/datePickerId"  
android:endYear="1990"  
android:startYear="2014"  
android:maxDate="10/10/2014"
```

/>



Widgets: ImageView



ImageView component

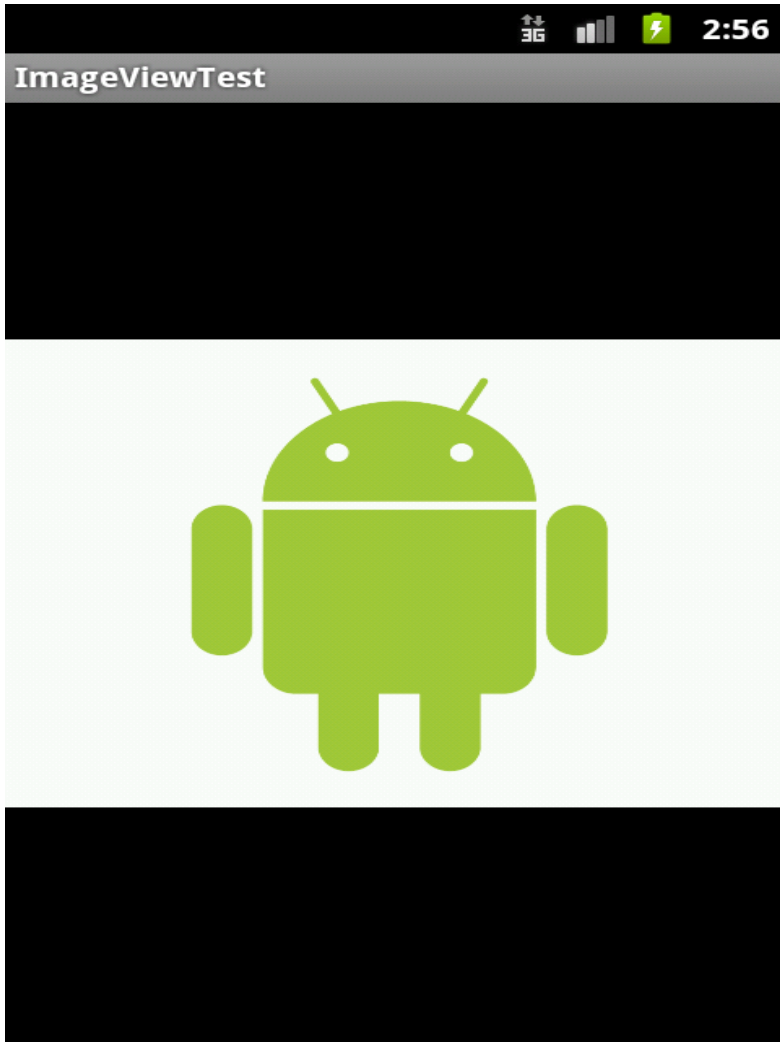
XML tags: `<ImageView>`
`</ImageView>`

```
<ImageView  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:id="@+id/imageld"  
    android:src="@drawable/android">
```

Source: **android.jpg** in **drawable/**



Widgets: ImageView

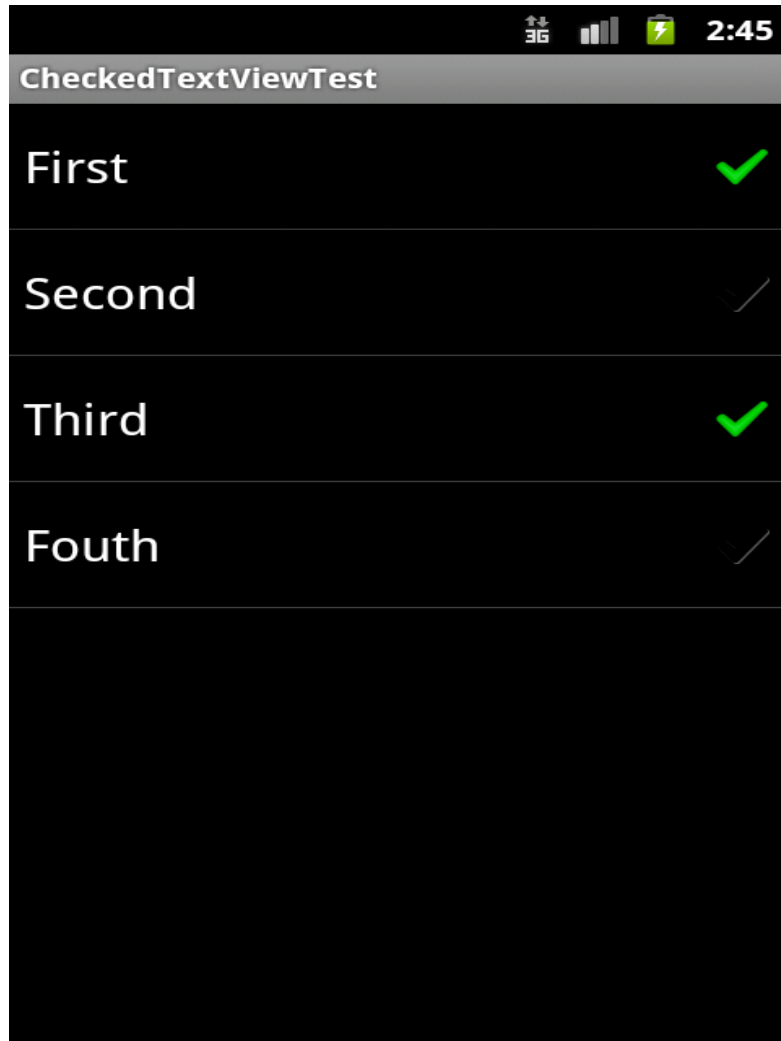


- ✧ **ImageView**: subclass of View object.
- ✧ Some methods to manipulate an image:
 - void **setScaleType**(enum scaleType)
 - void **setAlpha**(double alpha)
 - void **setColorFilter**(ColorFilter color)

CENTER, CENTER_CROP, CENTER_INSIDE,
FIT_CENTER, FIT_END, FIT_START, FIT_XY, MATRIX



Widgets: **CheckedTextView**



✧ **Checkable** version of a **TextView**

✧ Usable with a **ListView Adapter**

✧ *Multiple* or *single* selection of items
(`CHOICE_MODE_SINGLE`, `CHOICE_MODE_MULTIPLE`)

✧ **Methods:**

- `void setChoiceMode(int choiceMode)`
- `long[] getCheckItemIds()`
- `int getCheckedItemPosition()`



Views and Events

Views/Widgets are interactive components ...

- ✧ ... Upon certain action, an appropriate **event** will be fired
- ✧ Events generated by the user's interaction: click, long click, focus, items selected, items checked, drag, etc

PROBLEM: How to **handle** these events?

1. Directly from **XML**
2. Through **Event Listeners** (general, recommended)
3. Through **Event Handlers** (general)



Views and Events

- ✧ For a limited set of components, it is possible to manage the events through **callbacks**, directly indicated in the XML.

```
<Button
```

```
    android:text="@string/textButton"  
    android:id="@+id/idButton"  
    android:onClick="doSomething"
```

```
/>
```

XML Layout File

Java class

```
public void doSomething(View w) {  
    // Code to manage the click event  
}
```



Views and Events

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Views and Events

- Each View contains a collection of nested **interfaces** (**listeners**).
 - Each listener handles a single **type of events**...
 - Each listener contains a single **callback** method ...
 - The callback is invoked in occurrence of the event.





Views and Events: ActionListener

*To handle **OnClick** events through the **ActionListener**:*

1. Implement the **nested interface** in the current Activity
2. Implement the **callback** method (onClick)
3. Associate the ActionListener to the Button through the **View.setOnClickListener()** method

```
public class ExampleActivity extends Activity implements OnClickListener {  
    ...  
    Button button=(Button)findViewById(R.id.buttonNext);  
    button.setOnClickListener(this);  
    ...  
    public void onClick(View v) { } }
```



Views and Events: ActionListener

To handle OnClick events through the ActionListener:

1. Create an **anonymous** OnClickListener object
2. Implement the **callback** method (onClick) for the anonymous object
3. Associate the ActionListener to the Button through the **View.setOnClickListener()** method

```
Button btn = (Button)findViewById(R.id.btn);  
btn.setOnClickListener(new OnClickListener() {  
    @Override  
    public void onClick(View view) {  
        // Event management  
    }  
});
```



Views and Events: ActionListener

Some ActionListeners:

➤ **interface OnClickListener**

abstract method: *onClick()*

➤ **interface OnLongClickListener**

abstract method: *onLongClick()*

➤ **interface OnFocusChangeListener**

abstract method: *onFocusChange()*

➤ **interface OnKeyListener**

abstract method: *onKey()*



Views and Events: ActionListener

Some ActionListeners:

- **interface OnCheckedChangeListener**
abstract method: *onCheckedChanged()*
- **interface OnItemSelectedListener**
abstract method: *onItemSelected()*
- **interface onTouchListener**
abstract method: *onTouch()*
- **interface OnCreateContextMenuListener**
abstract method: *onCreateContextMenu()*



Views and Events: ActionListener

- Possible to fire an event directly from the Java code (without user's interaction) ... useful for debugging purpose.
- Typically in the form **performXXX()**
- The corresponding listener (if set) will be invoked...

```
..  
Button button=(Button)findViewById(R.id.buttonNext);  
button.performClick();  
..
```

```
// Callback method  
public void onClick(View v) {  
    ....  
}
```




Views and Events

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Views and Events

Event Handlers → Some views have **callback** methods to handle specific events

When a **Button** is touched → **onTouchEvent()** called

PROBLEM: to intercept an event, you must extend the View class and override the callback method ... not very practical!

- In practice: *Events Handlers are used* for custom (user-defined) components ...
- ... *Events Listeners are used* for common View/Widget components ...