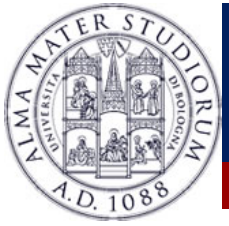
Programming with Android:
Widgets and Events

Luca Bedogni

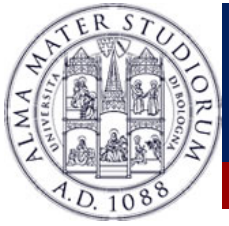
Dipartimento di Scienze dell'Informazione

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**

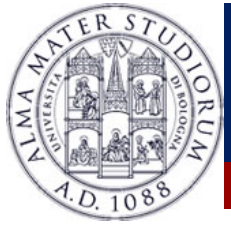


Android: Where are we now …

Android Applications' anatomy:

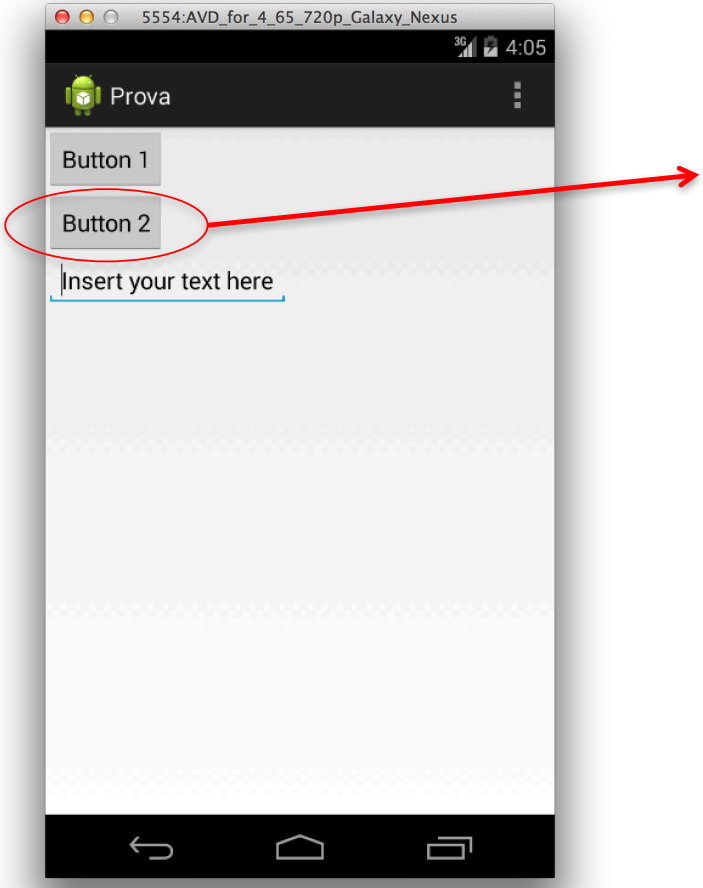
- **Activities** → Application Components (screens)
- **Intents** → Communication between components
- **Layouts** → Placement of the elements on the screen …
- **Views** → … Elements to be placed!

Pre-defined, common-used View objects …



Android: Views objects

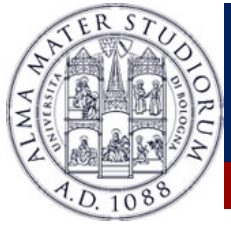
Views → basic building blocks for user interface components



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

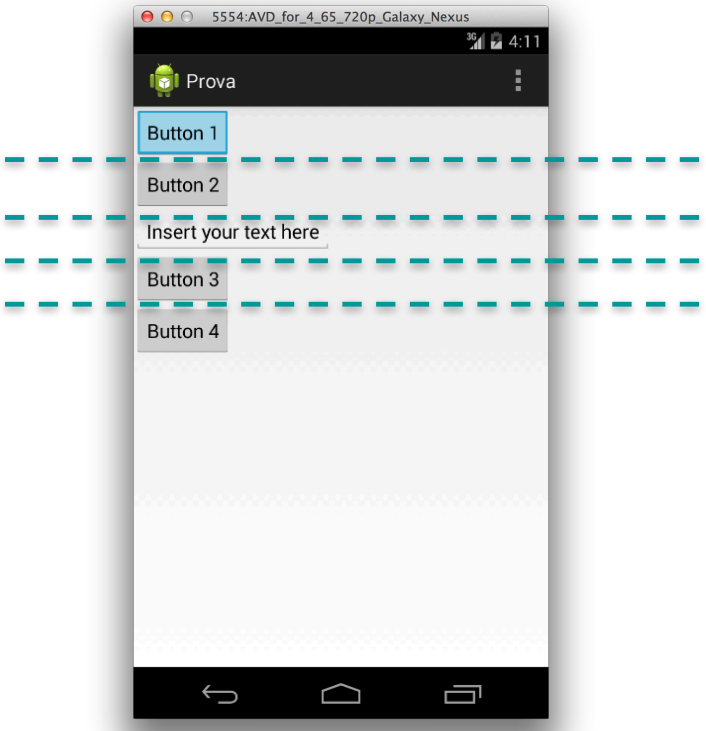
EXAMPLEs of **VIEWS** objects:

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



Android: Views objects

ViewGroup → Container of other views, base class for **layouts**



LINEAR LAYOUT

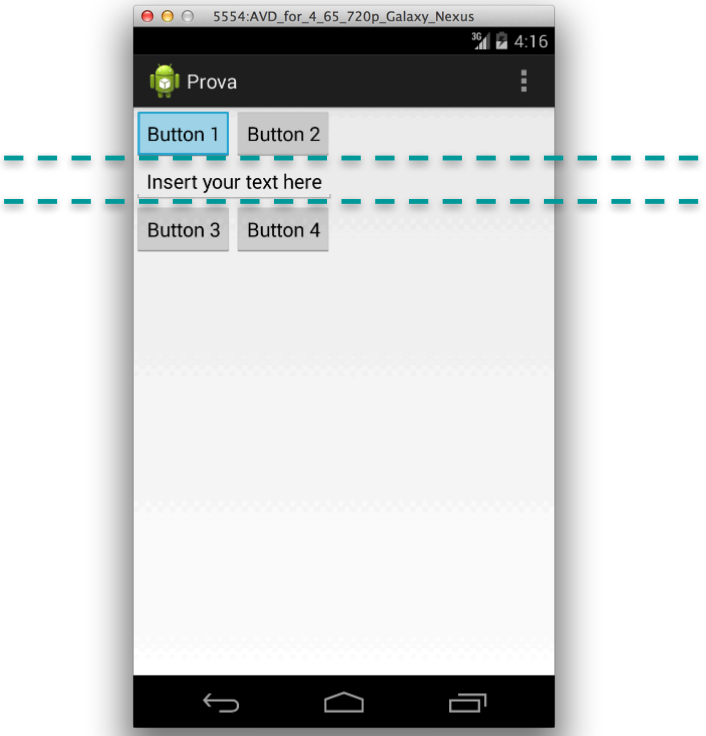
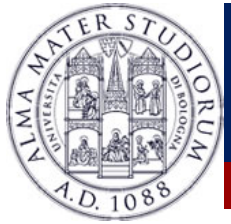


TABLE LAYOUT



Android: Views objects

View→ Pre-defined interactive UI components

TextView

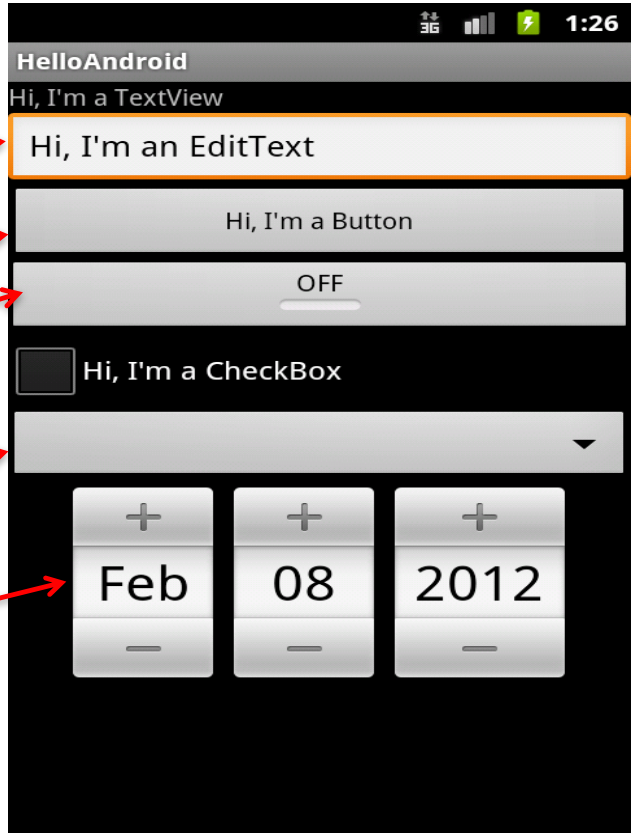
EditText

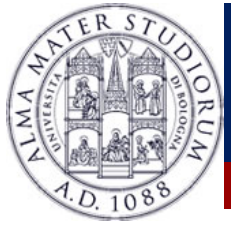
Button

ToggleButton

Spinner

DataPicker

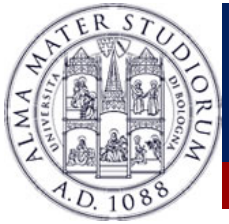




Views: Java and XML code

- Views 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”
        ….
/>
```



Views: Java and XML code

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

XML

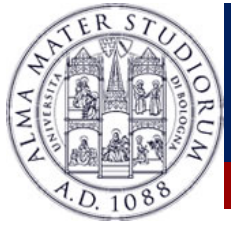
```
< TextView
    android:id="@+id/name1" />
```

JAVA

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

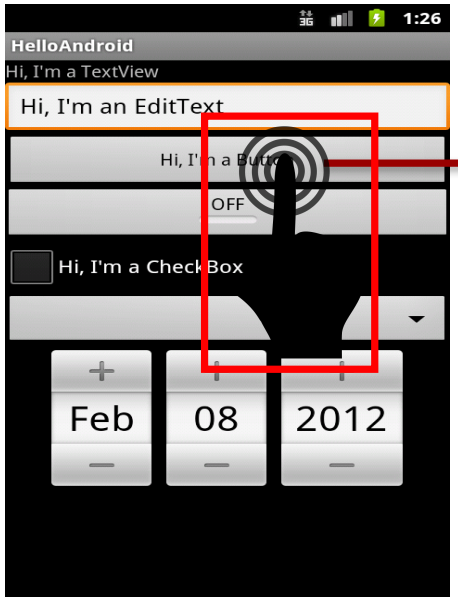
CAST REQUIRED

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



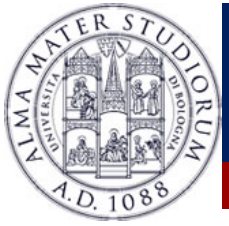
Views: Java and XML code

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



ONCLICK event

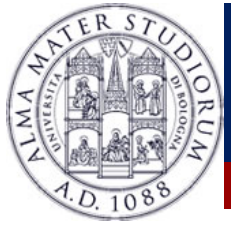
Java code that manages the **onClick** event …



Views: Java and XML code

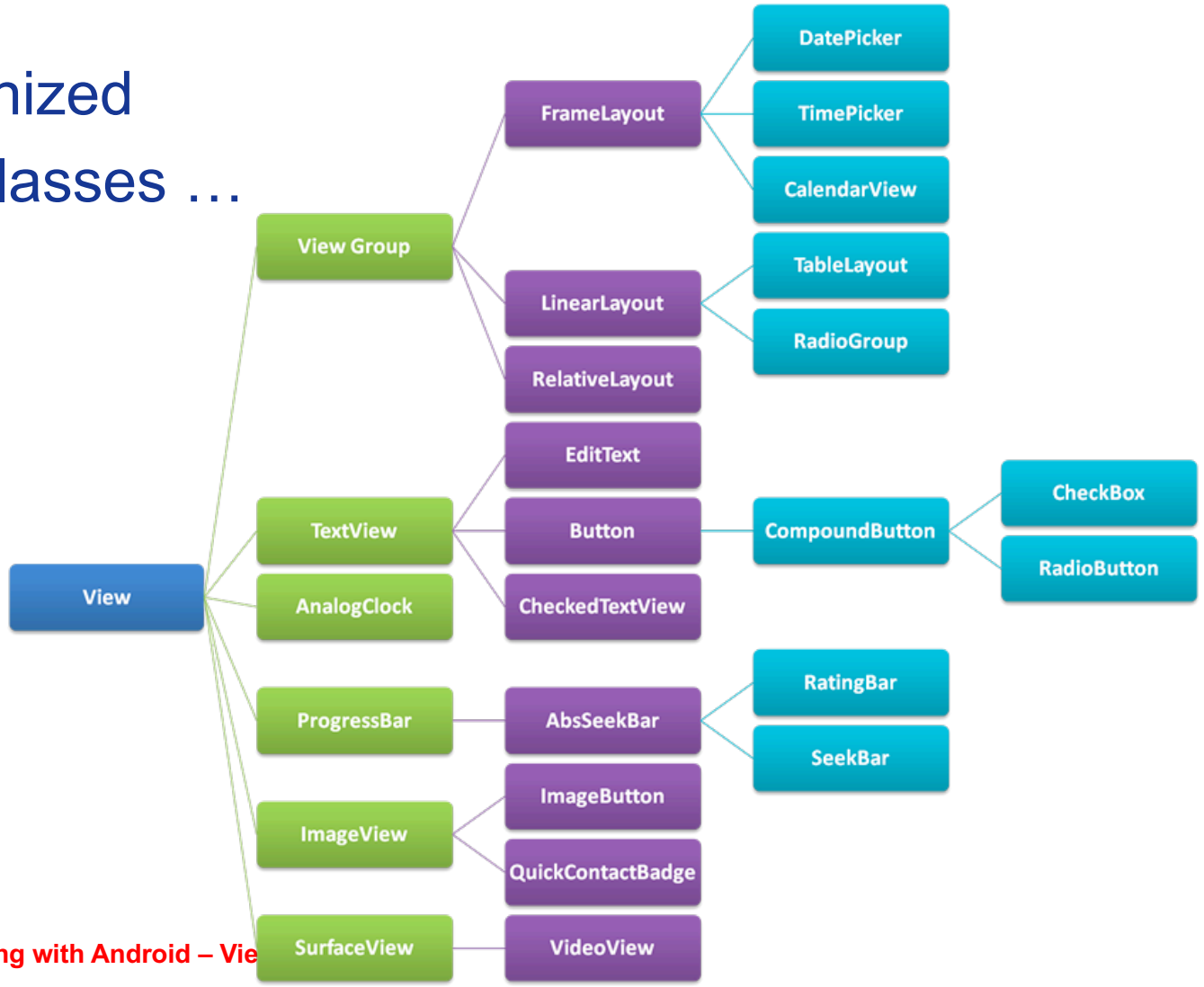
- Each View can have a **focus** and a **visibility**, based on the user's interaction.
- The user can force a focus to a specific component through the **requestFocus()** method.
- The user can modify the visibility of a specific component through the **setVisibility(int)** method.

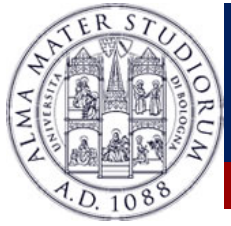
```
public TextView text;
text=(TextView) findViewById(R.id.name1);
text.setVisibility(true)
text.requestFocus();
```



Views: Hierarchy of the classes …

- **Views** are organized on a *hierarchy* of classes …



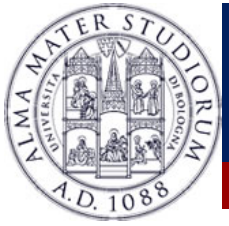


Views: TextView

- **XML** tags: **<TextView> </TextView>**

- Could be filled with **strings** or HTML **markups**
- Not directly editable by users
- Usually used to display **static** informations

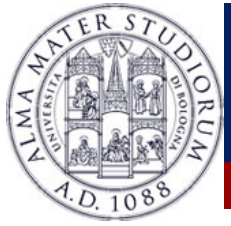
```
<TextView
    android:text=”@string/textWelcome"
    android:id="@+id/textLabel"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content”
/>
```



Views: 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**

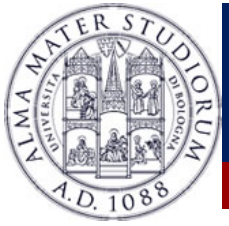


Views: Linkify elements

- 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. ..

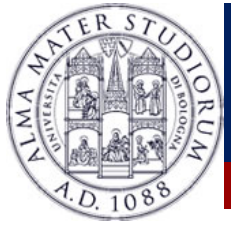


Views: EditText

- **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” |
                          “textMultiLane” | “textNoSuggestions”
/>
```

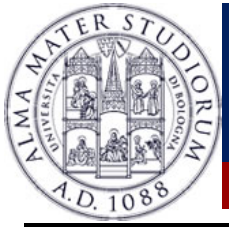


Views: AutocompleteTextView

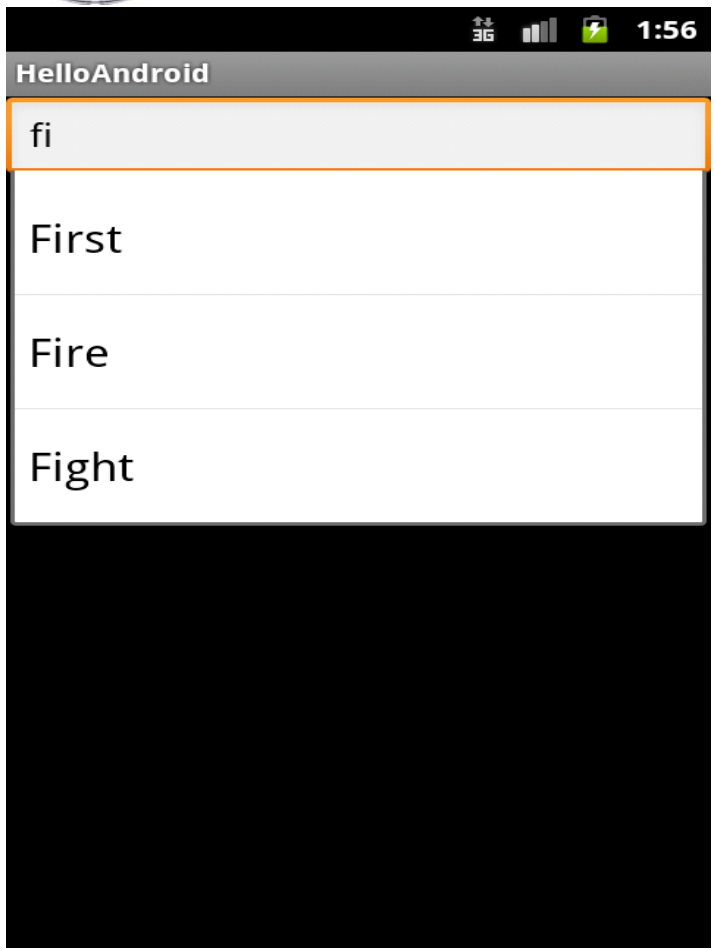
- **XML** tags: **<AutoCompleteTextView> </Auto…View>**

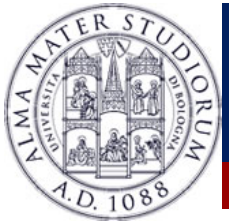
  - Used to make easier the input by the users …
    - As soon as the user starts typing, hints are displayed
  - A list of hints is given through an **Adapter**

```
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);
```



Views: AutocompleteTextView





Views: Button

- **XML** tags: **<Button> </Button>**

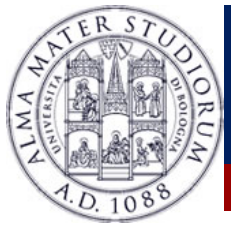
  - Superclass of a TextView, but not directly **editable** by users
  - Can generate events related to click, long click, drag, etc

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

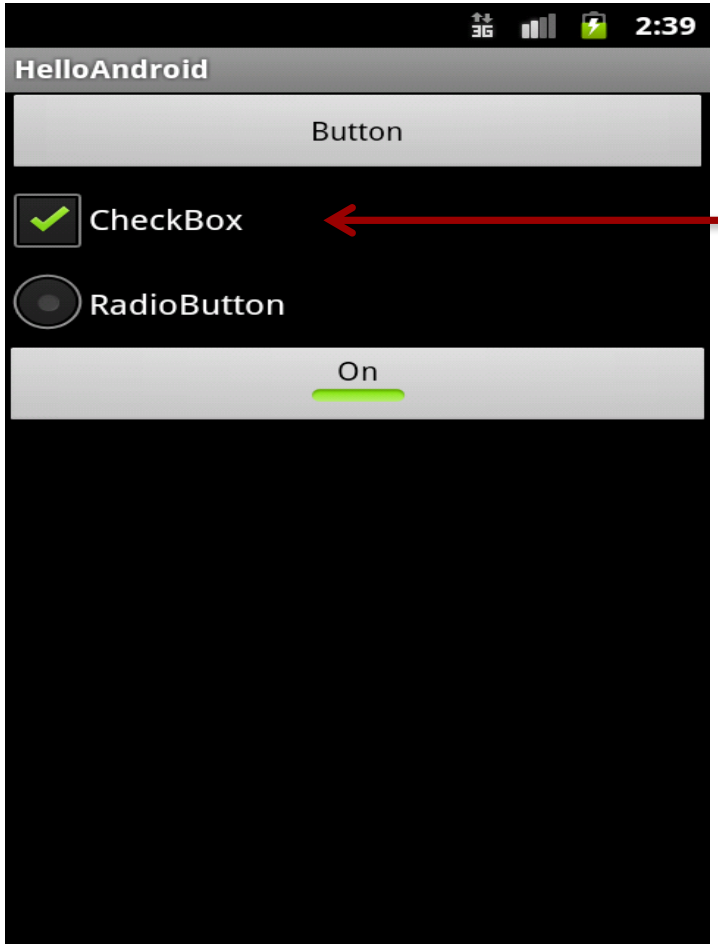
```
<selector>
<item android:color="#ff819191"
    android:state_pressed="true”>
</item>
</selector>
```

res/color/blue.xml

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



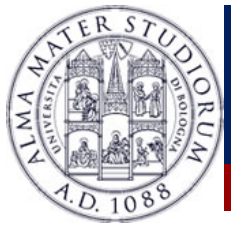
Views: Button and CompoundButton



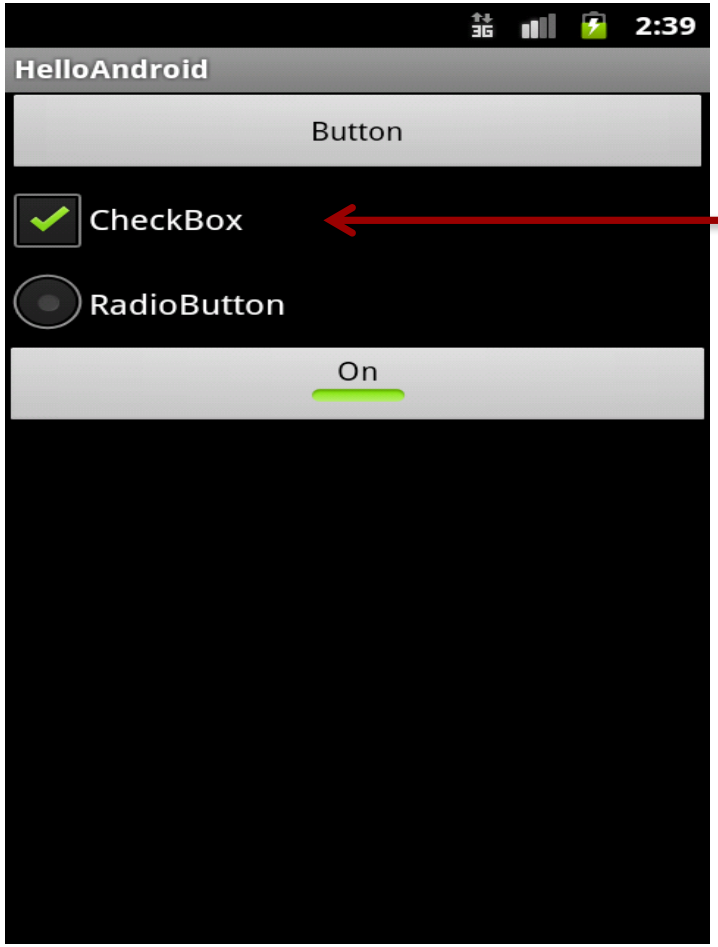
checkBox CompoundButton

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”
/>
```



Views: Button and CompoundButton

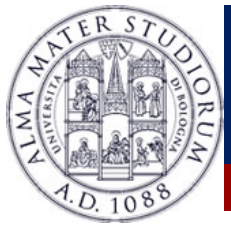


checkBox CompoundButton

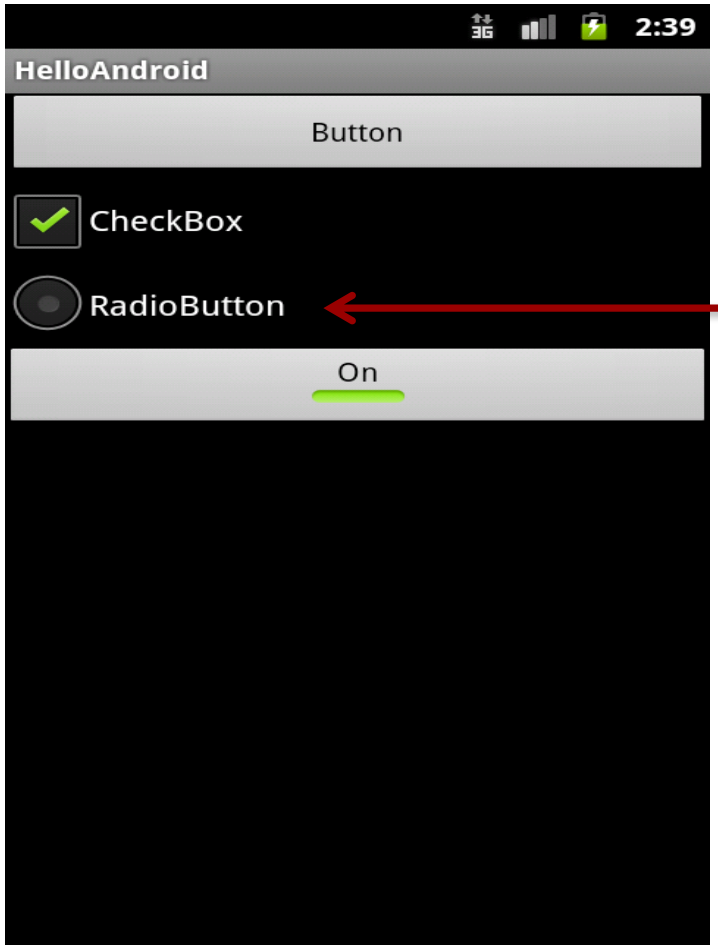
- public boolean **isChecked**():
  Returns true if the button is checked, false otherwise.

- public boolean **setChecked**(bool)

Listener:
onCheckedChangeListener



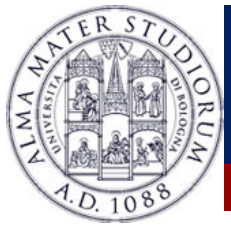
Views: Button and CompoundButton



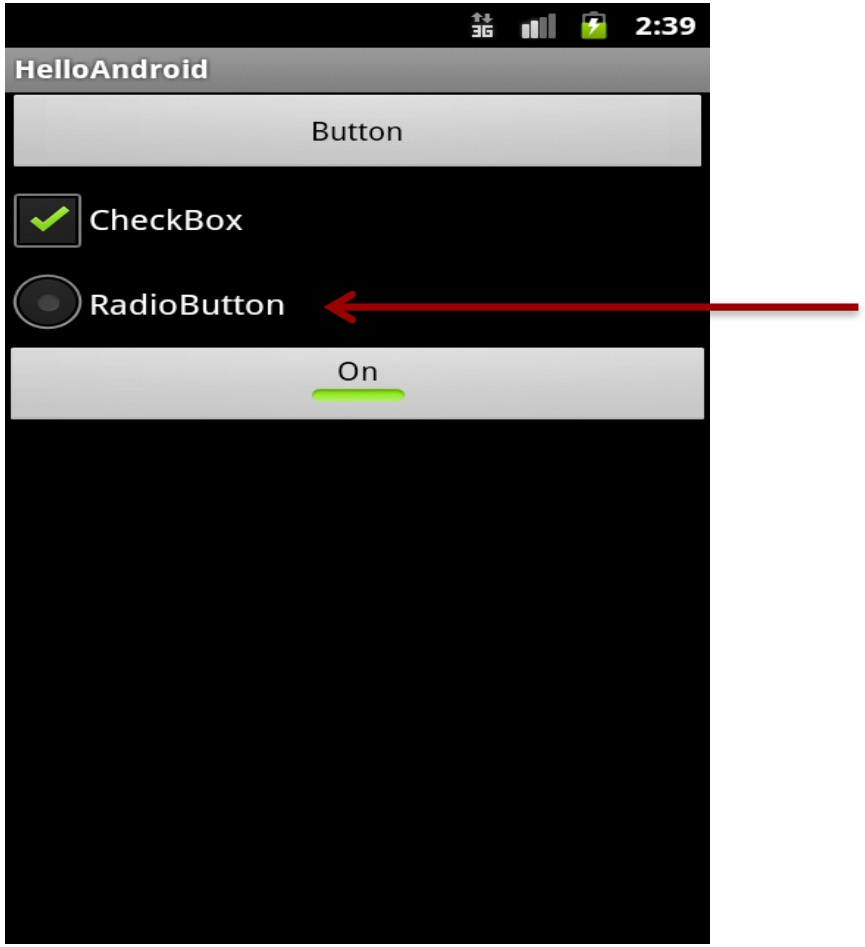
radioButton CompoundButton

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"
         />
```



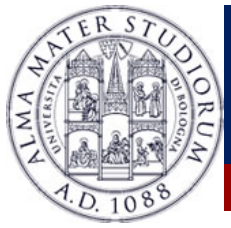
Views: Button and CompoundButton



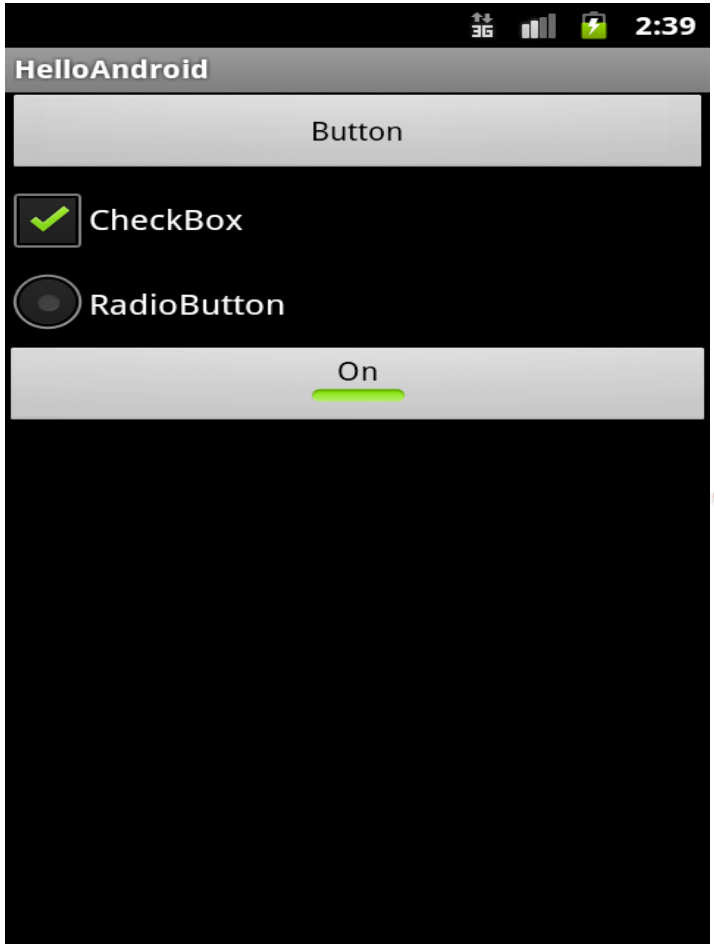
radioButton CompoundButton

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

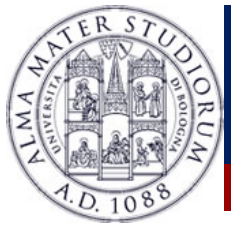
Listener:
OnCheckedChangeListener



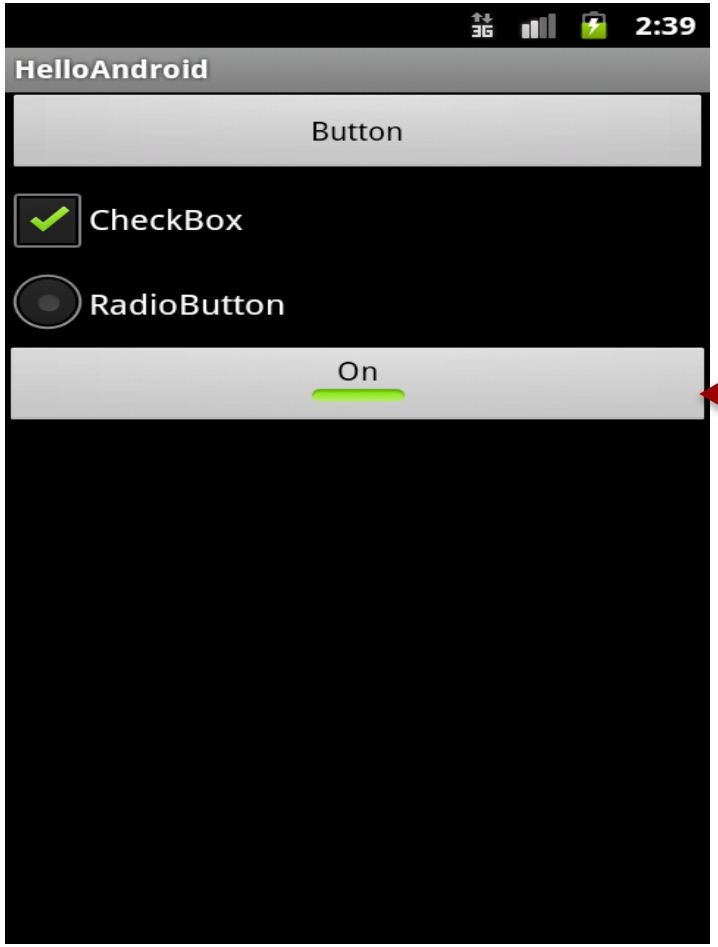
Views: Button and CompoundButton




```
<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>
```



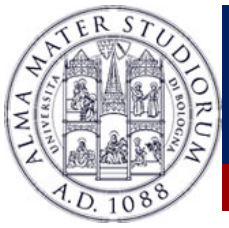
Views: Button and CompoundButton



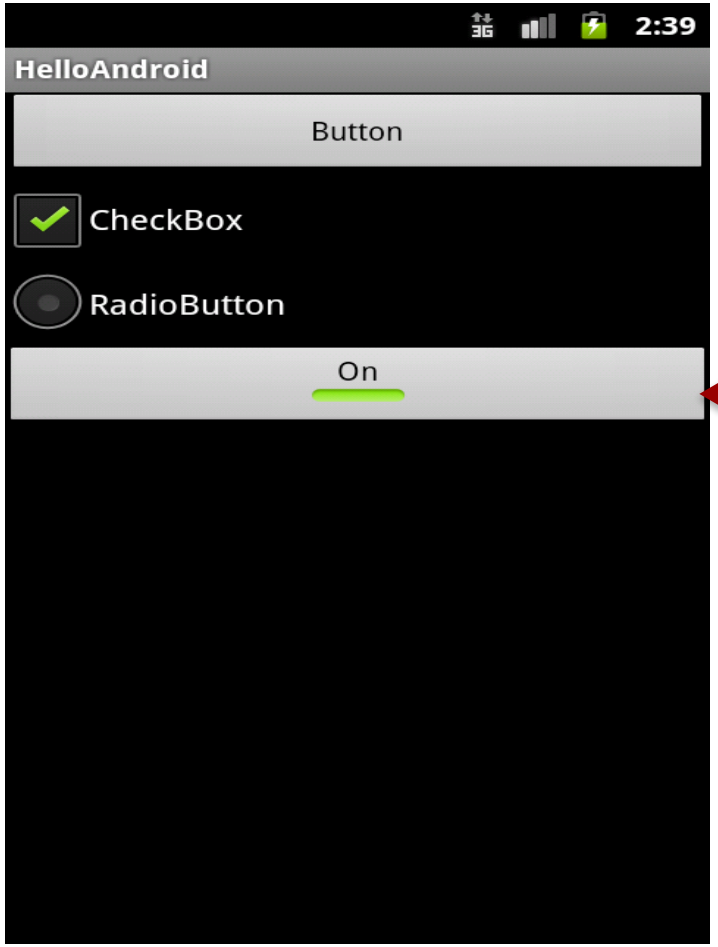
toggleButton CompoundButton

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”
/>
```



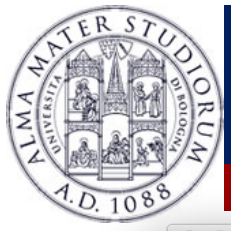
Views: Button and CompoundButton



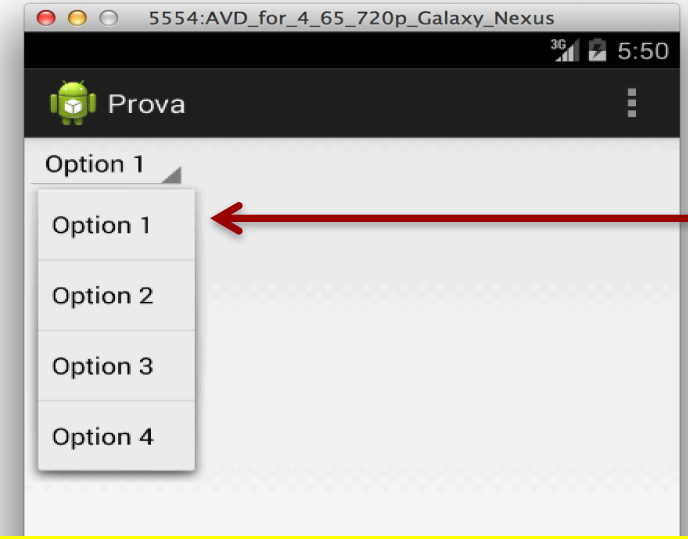
toggleButton CompoundButton

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

Listener:
OnCheckedChangeListener



Views: Spinners



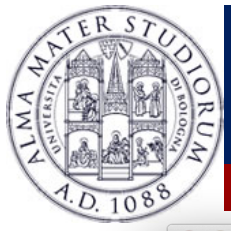
Spinner component

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

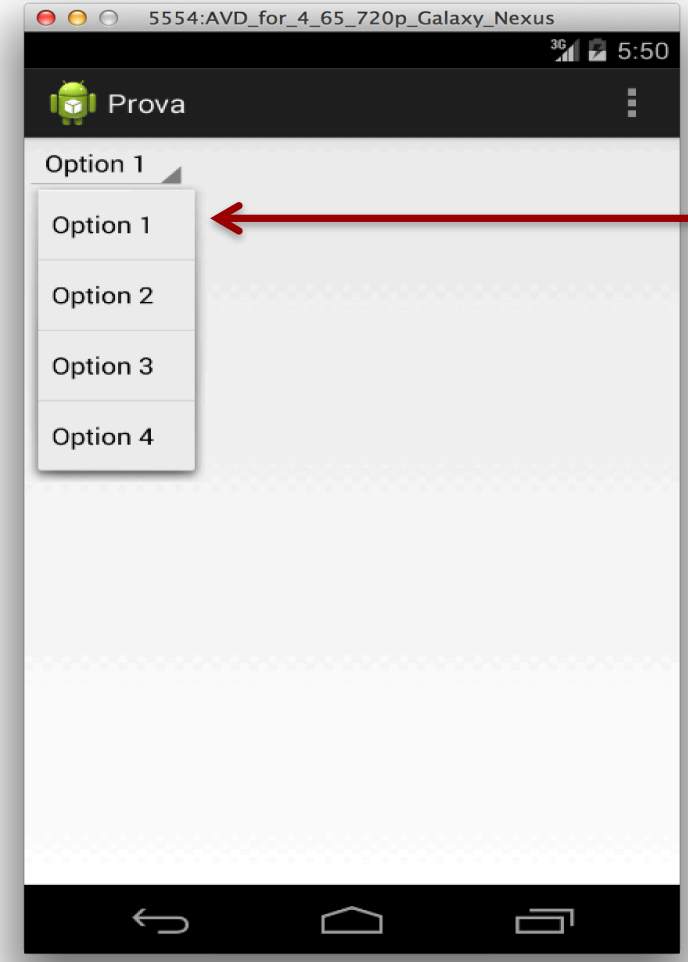
```
<Spinner
   android:layout_width="wrap_content"
   android:layout_height="wrap_content"
   android:id="@+id/spinnerId"
   android:entries="@array/stringOptions">
 </Spinner>
```

```
<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



Views: Spinners

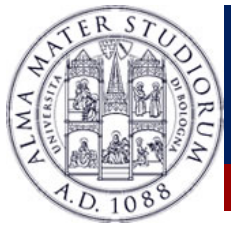


Spinner component

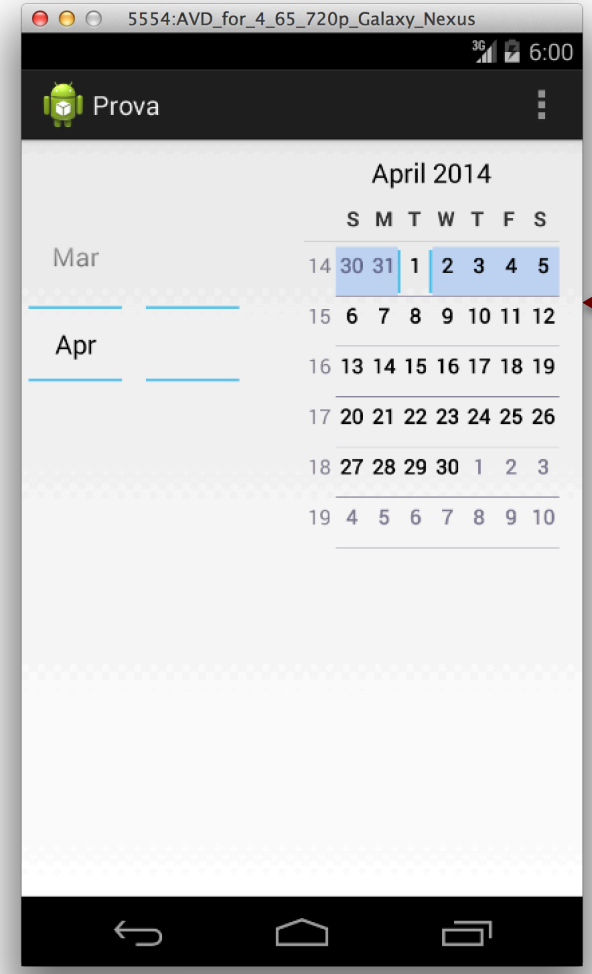
XML tags: **<Spinner>**
</Spinner>

- ✧ 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



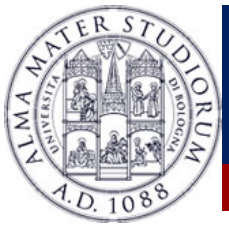
Views: Button and CompoundButton



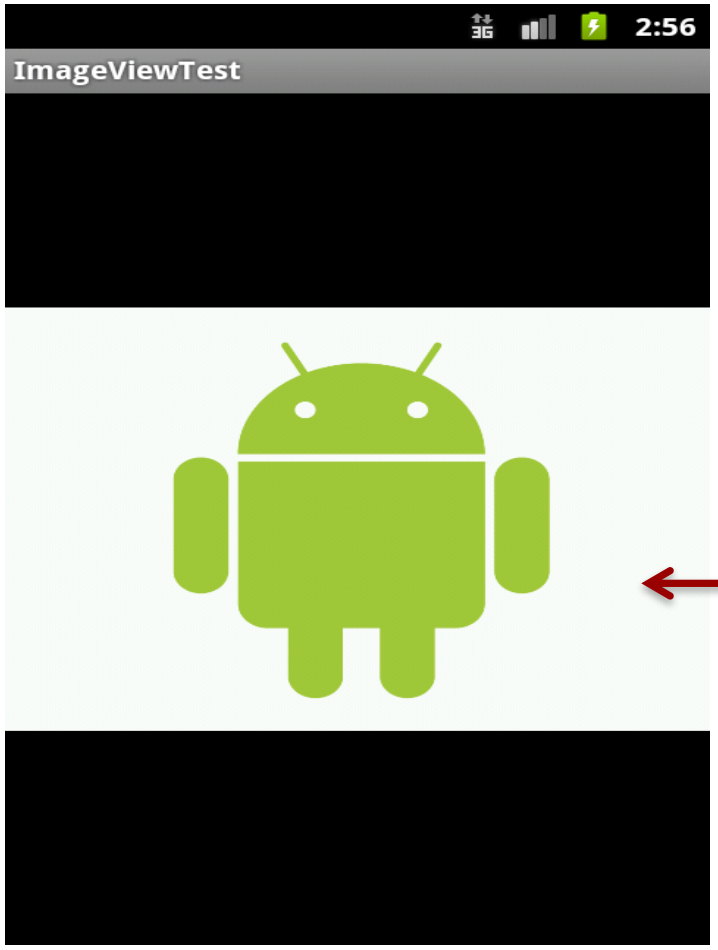
DataPicker component

XML tags: **<DataPicker>**
</DataPicker>

```
<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”
/>
```



Views: ImageView

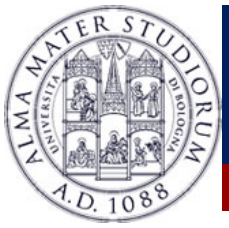


ImageView component

XML tags: **<ImageView>**
</ImageView>

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

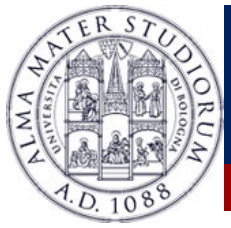
Source: **android**.jpg in drawable/



Views: ImageView

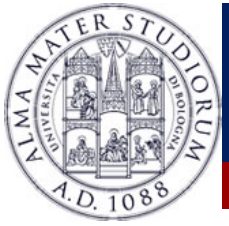
- **ImageView**: subclass of View object.
- Some methods to manipulate an image:
  - void **setScaleType**(enum scaleType)
  - void **setAlpha**(double alpha)
  - void **setColorFilter**(ColorFilter color)

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



Views: 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()



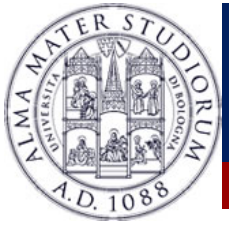
Views and Events

Views 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

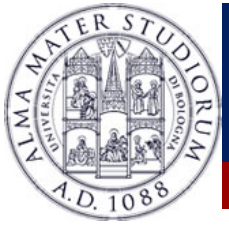
- For a limited set of components, it is possible to manage the events through **callbacks**, directly indicated in the XML.

```
<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
}
```



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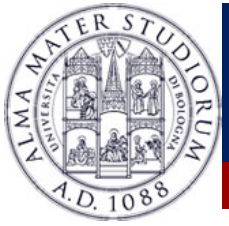
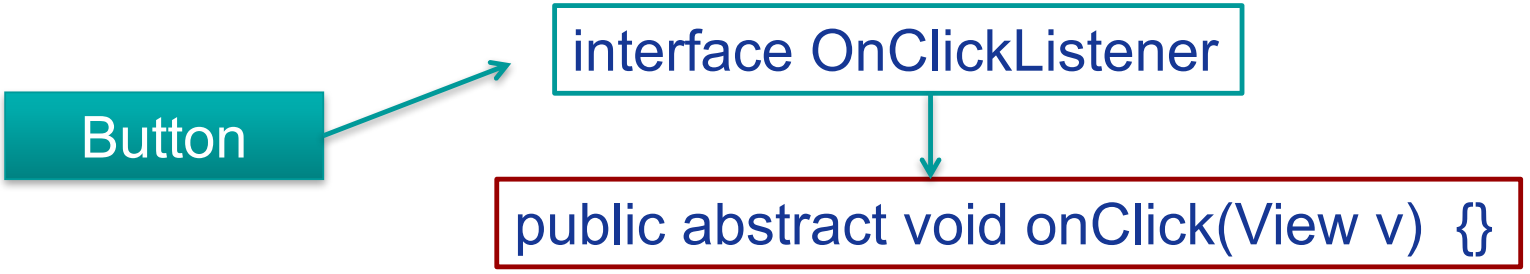
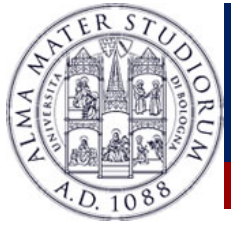


Views and Events

- 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.



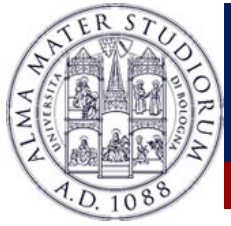


Views and Events: ActionListener

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.**setOnClickEventListener**() method

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

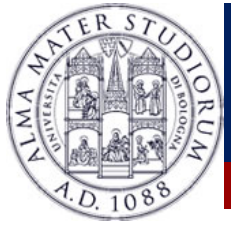


Views and Events: ActionListener

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.**setOnClickEventListener**() method

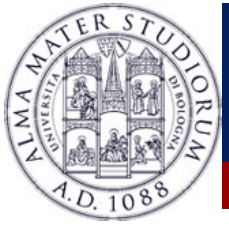
```
Button btn = (Button)findViewById(R.id.btn);
btn.setOnClickListener(new OnClickListener() {
    @Override
    public void onClick(View view) {
        // Event management
    }
});
```



Views and Events: ActionListener

Some ActionListeners:

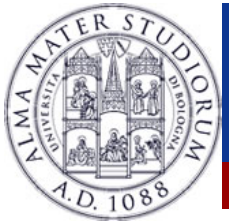
- **interface OnClickListener**
  - abstract method: *onClick()*
- **interface OnLongClickListener**
  - abstract method: *onLongClick()*
- **interface OnFocusChangeListener**
  - abstract method: *onFocusChange()*
- **interface OnKeyListener**
  - abstract method: *onKey()*



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()*

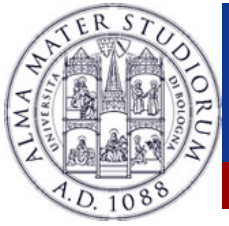


Views and Events: ActionListener

- Possible to fire an event directly from the Java code (without user's interaction) … useful for debugging purpose.
- Tipically 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

Views/Widgets are interactive components …

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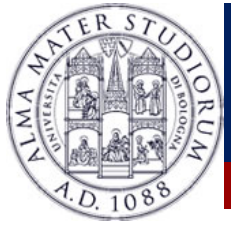

Views and Events

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 …