CS 403X Mobile and Ubiquitous Computing

Lecture 4: AdapterViews, Intents, Fragments Audio/Video, Camera

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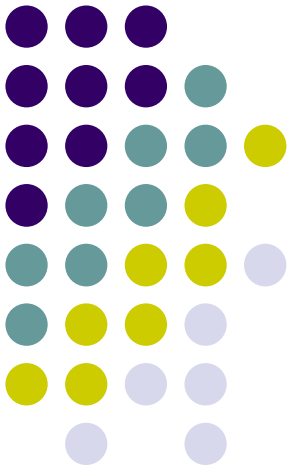
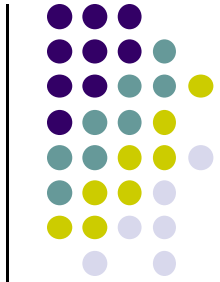
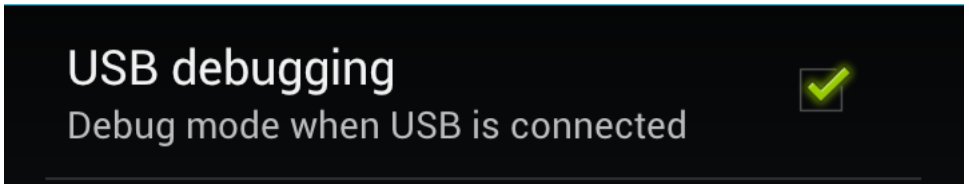
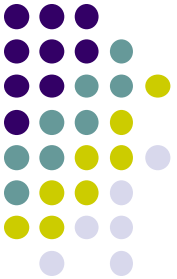




Android UI Components: Controls



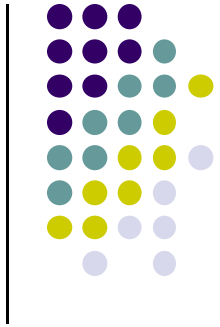


Checkbox

- Has 2 states: **checked** and **unchecked**
- Clicking on checkbox toggles between these 2 states
- Used to indicate a choice (e.g. Add rush delivery)
- Since Checkbox widget inherits from TextView, its properties (e.g. **android:textColor**) can be used to format checkbox
- XML code to create Checkbox:

```
<?xml version="1.0" encoding="utf-8"?>
<CheckBox xmlns:android="http://schemas.android.com/apk/res/android"
  android:id="@+id/check"
  android:layout_width="wrap_content"
  android:layout_height="wrap_content"
  android:text="@string/unchecked"/>
```

Checkbox Example Java Code



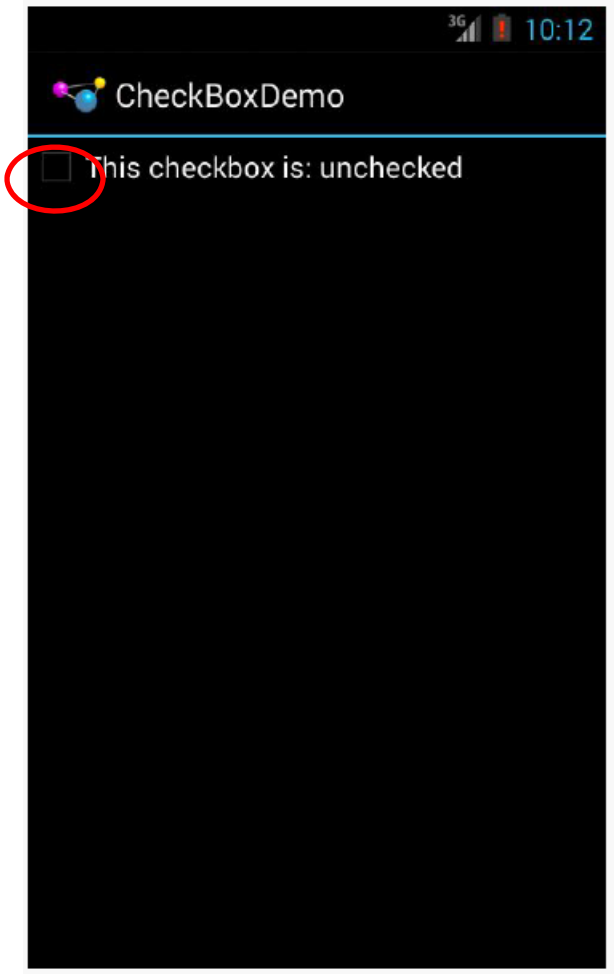
```
package com.commonsware.android.checkbox;

import android.app.Activity;
import android.os.Bundle;
import android.widget.CheckBox;
import android.widget.CompoundButton;

public class CheckBoxDemo extends Activity implements
    CompoundButton.OnCheckedChangeListener {
  CheckBox cb;

  @Override
  public void onCreate(Bundle icicle) {
    super.onCreate(icicle);
    setContentView(R.layout.main);

    cb=(CheckBox)findViewById(R.id.check);
    cb.setOnCheckedChangeListener(this);
  }

  public void onCheckedChanged(CompoundButton buttonView,
                               boolean isChecked) {
    if (isChecked) {
      cb.setText(R.string.checked);
    }
    else {
      cb.setText(R.string.unchecked);
    }
  }
}
```

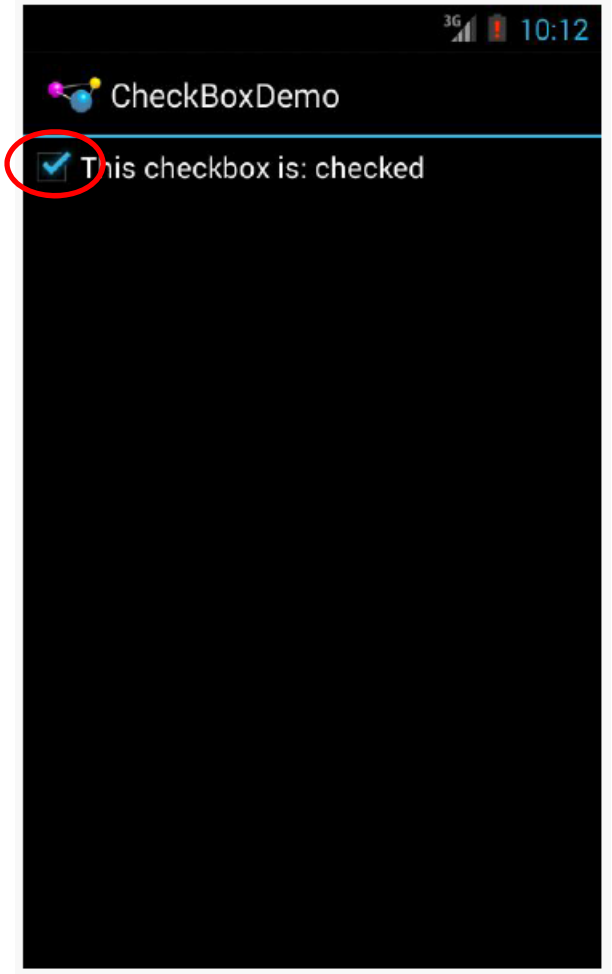
Checkbox inherits from CompoundButton

Register listener **OnCheckedChangeListener** to be notified when checkbox state changes

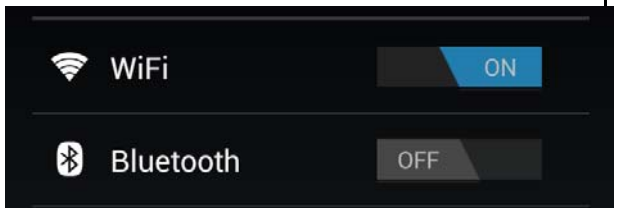
Callback, called When checkbox state changes

Checkbox Example Result





Other Android Controls



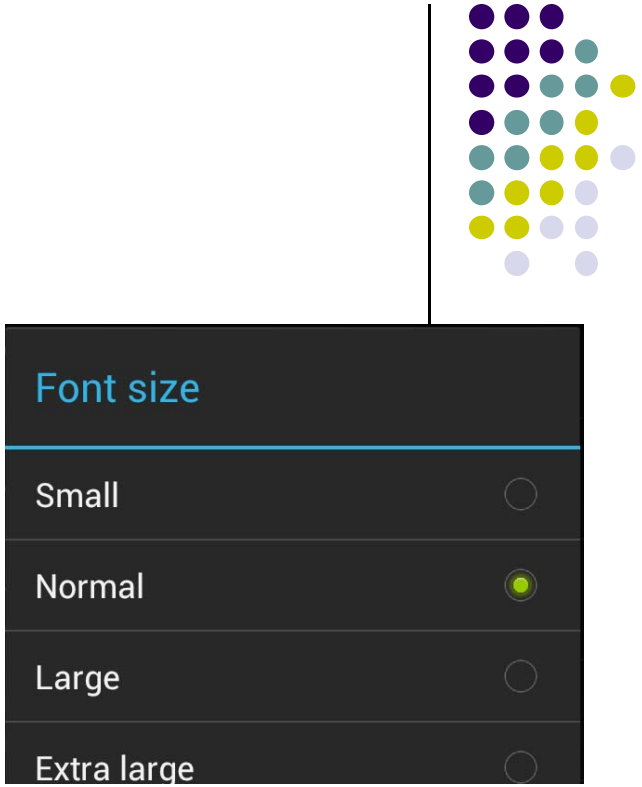
- **ToggleButton and Switches**
  - Like CheckBox has 2 states
  - However, visually shows states on and off text

Toggle buttons

- XML code to create ToggleButton

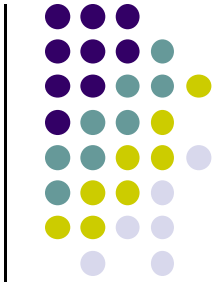
```
<?xml version="1.0" encoding="utf-8"?>
<ToggleButton xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/toggle"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content" />
```

RadioButton and RadioGroup

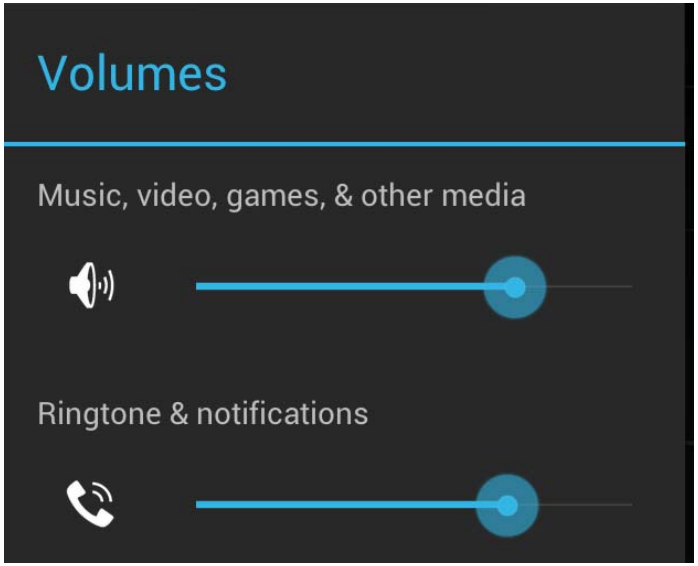


- Select only 1 option from a set
- set onClick method for each button
  - generally same method
- Inherits from **CompoundButton** which inherits from **TextView**
  - Format using TextView properties (font, style, color, etc)

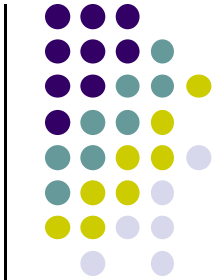
SeekBar



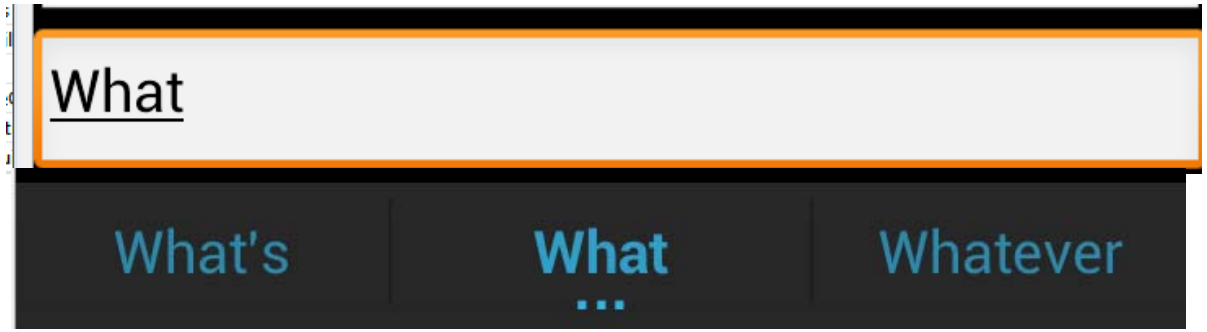
- a slider
- Subclass of progress bar
- implement a SeekBar.OnSeekBarChangeListener to respond to changes in setting



Auto Complete Options



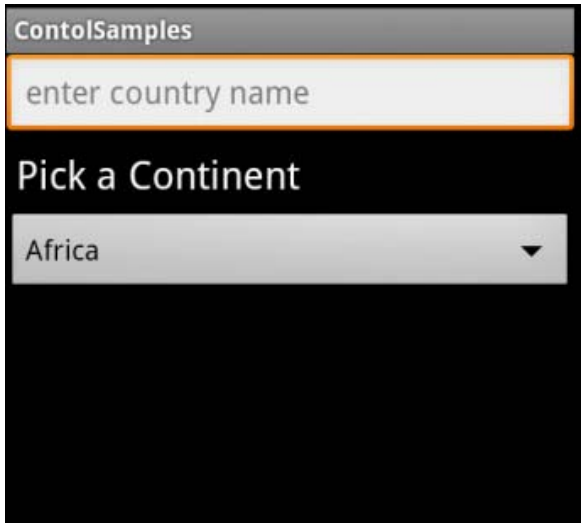
- Depending on EditText inputType suggestions can be displayed
  - works on actual devices

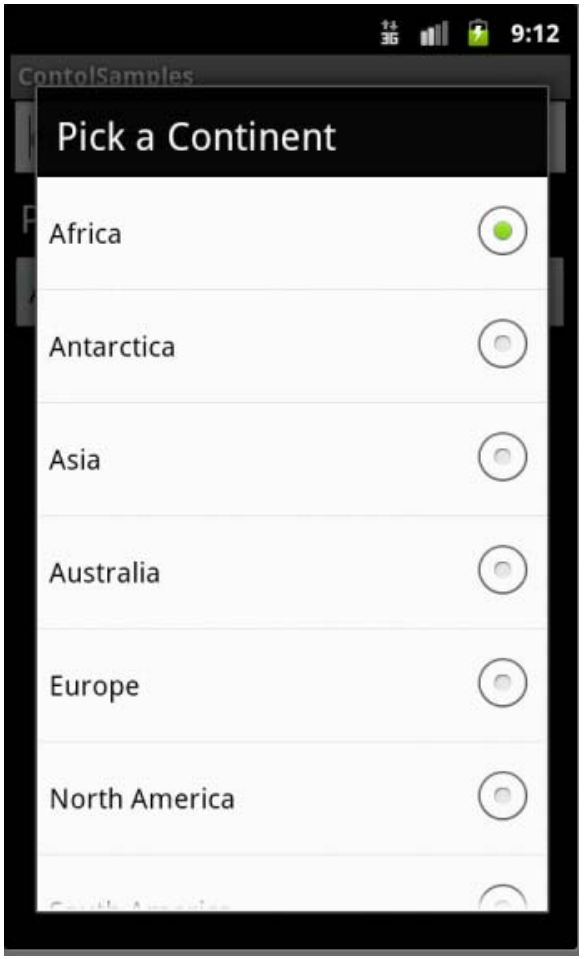


- Other options for exist for auto complete from list
  - AutoCompleteTextView
    - choose one option
  - MultiAutoCompleteTextView
    - choose multiple options (examples tags, colors)

Spinner Controls

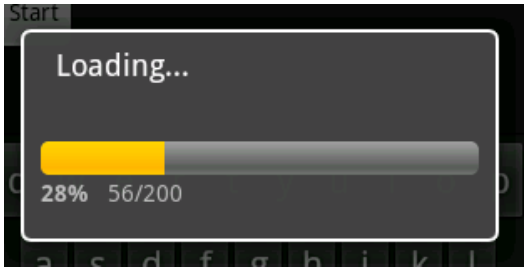
- User **must** select from a set of choices



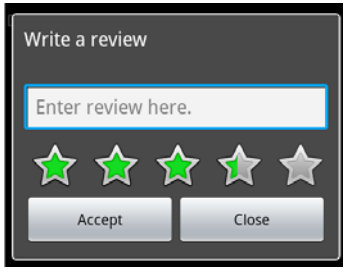


Indicators

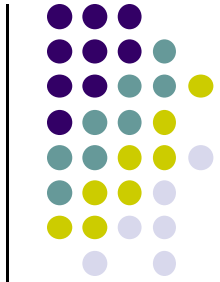
- Variety of built in indicators in addition to TextView
- ProgressBar



- RatingBar



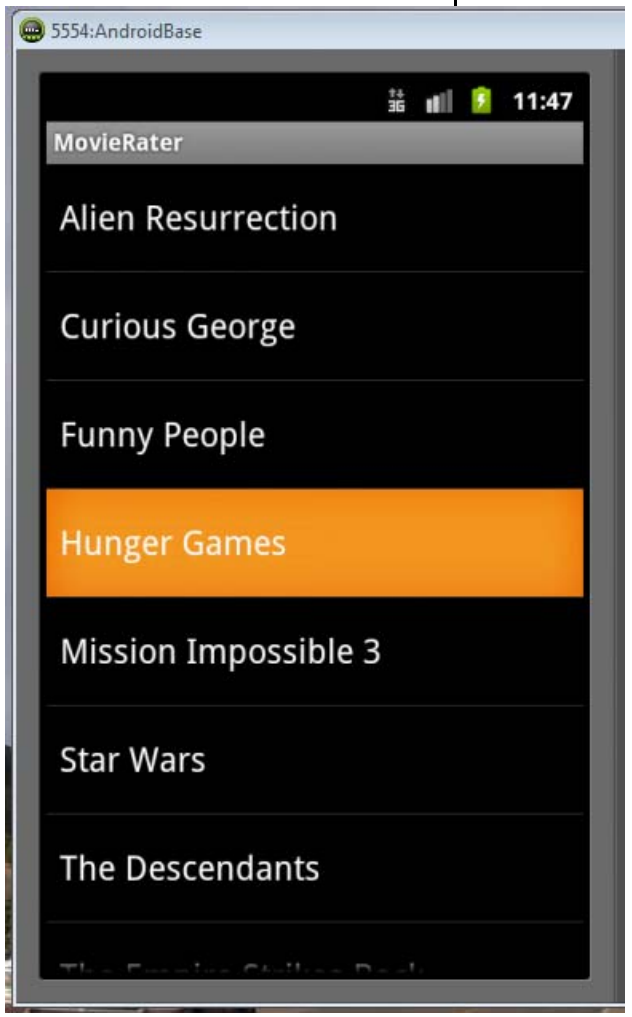
- Chronometer
- DigitalClock
- AnalogClock



Dynamic and Data-Driven Layouts

Data Driven Containers

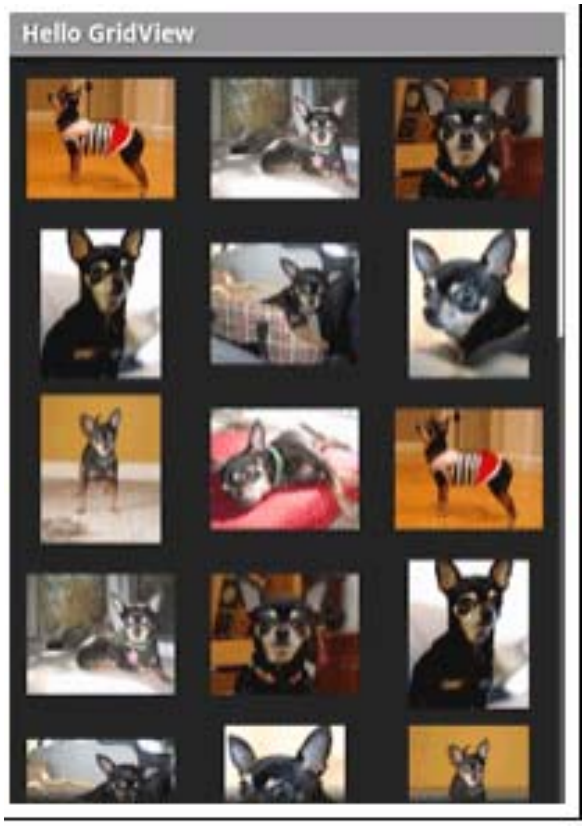
- Sometimes want to read in data (e.g. from file) => organize, display
- Dynamic Layout in which child views are generated from data
- ListView
  - vertical scroll, horizontal row entries, pick item



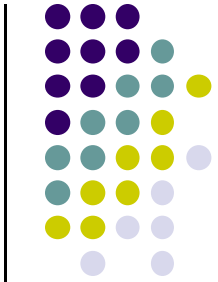
Data Driven Containers

- GridView
  - specified number of rows and columns

- GalleryView
  - horizontal scrolling list, typically images

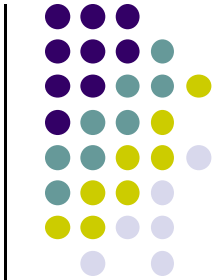


AdapterView



- ListView, GridView, and GalleryView are all sub classes of AdapterView
- Adapter generates child Views from some data source and populates the larger View.
  - E.g. Data is adapted into cells of GridView
- Most common Adapters (sources)
  - **CursorAdapter:** read data from database
  - **ArrayAdapter:** read data from resource, typically an XML file
- The adapter
  - Creates Views (widgets) each element in data source
  - Fills layout (List, Grid, Gallery) with the created Views

Using ArrayAdapter



- Wraps adapter around a Java array of menu items or **java.util.List** instance

```
String[] items={"this", "is", "a", "really", "silly", "list"};
new ArrayAdapter<String>(this,
                         android.R.layout.simple_list_item_1,
                         items);
```

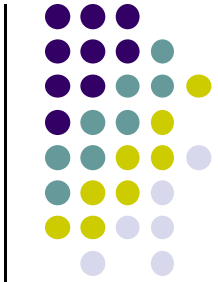
Context to use. Typically app's activity instance

Actual array of Items to show

Resource ID of View to use

- In example, **android.R.layout.simple_list_item_1** turns strings into TextView objects
- TextView widgets shown in list using this ArrayAdapter

Example: Creating ListView using AdapterArray



- See project from textbook:

theSelection/List sample

- Want to create the following listView from the following strings

```
private static final String[] items={"lorem", "ipsum", "dolor",
        "sit", "amet",
        "consectetuer", "adipiscing", "elit", "morbi", "vel",
        "ligula", "vitae", "arcu", "aliquet", "mollis",
        "etiam", "vel", "erat", "placerat", "ante",
        "porttitor", "sodales", "pellentesque", "augue", "purus"};
```

Example: Creating ListView using AdapterArray

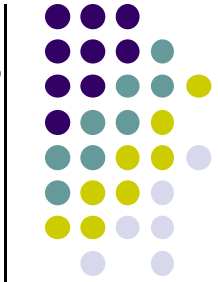
- First create LinearLayout

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
  xmlns:android="http://schemas.android.co
  android:orientation="vertical"
  android:layout_width="match_parent"
  android:layout_height="match_parent" >
  <TextView
    android:id="@+id/selection"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"/>
  <ListView
    android:id="@android:id/list"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    />
</LinearLayout>
```

TextView Widget for selected list item

Widget for main list of activity

Example: Creating ListView using AdapterArray

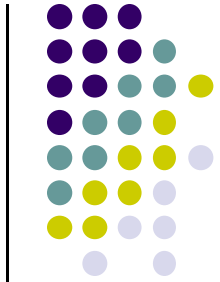


```
package com.commonsware.android.list;

import android.app.ListActivity;
import android.os.Bundle;
import android.view.View;
import android.widget.ArrayAdapter;
import android.widget.ListView;
import android.widget.TextView;
public class ListViewDemo extends ListActivity {
  private TextView selection;
  private static final String[] items={"lorem", "ipsum", "dolor",
          "sit", "amet",
          "consectetuer", "adipiscing", "elit", "morbi", "vel",
          "ligula", "vitae", "arcu", "aliquet", "mollis",
          "etiam", "vel", "erat", "placerat", "ante",
          "porttitor", "sodales", "pellentesque", "augue", "purus"};

  @Override
  public void onCreate(Bundle icicle) {
    super.onCreate(icicle);
    setContentView(R.layout.main);
    setListAdapter(new ArrayAdapter<String>(this,
                        android.R.layout.simple_list_item_1,
                        items));
    selection=(TextView)findViewById(R.id.selection);
  }

  @Override
  public void onListItemClick(ListView parent, View v, int position,
                              long id) {
    selection.setText(items[position]);
  }
}
```

Set list adapter (Bridge Data source and views)

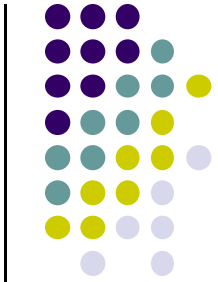
Get handle to TextView of Selected item

Change Text of selected view When user clicks on selection

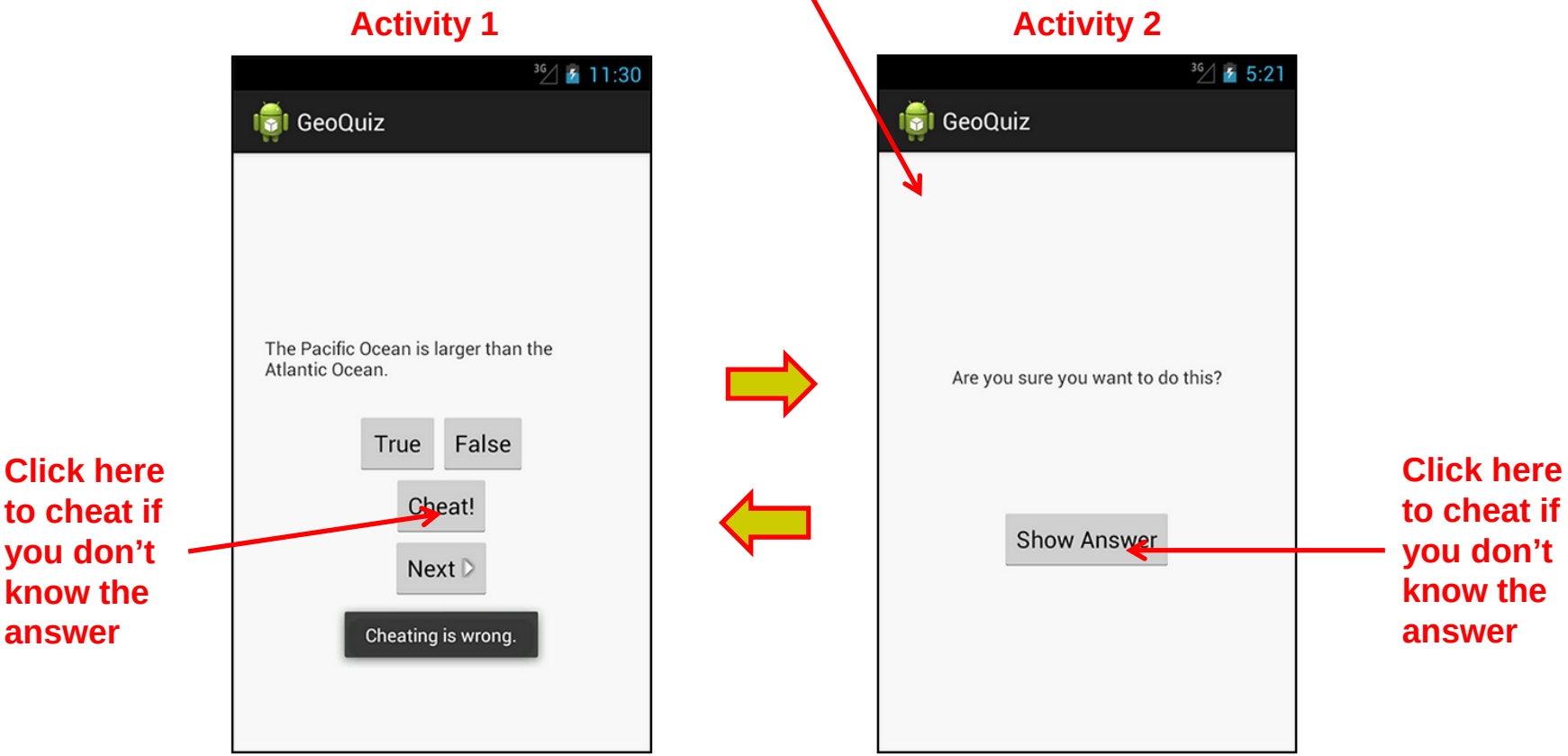


Starting Activity 2 from Activity 1

Why would we want to do this?
Ref: Android Nerd Ranch pg 89



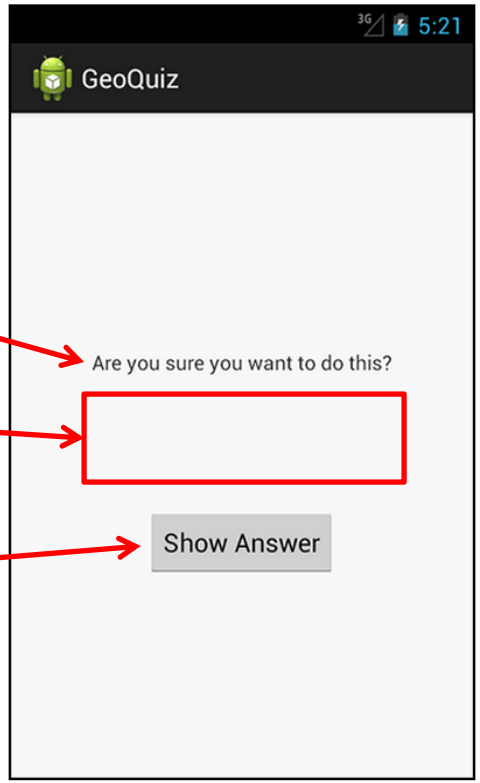
- May want to allow user to cheat by getting answer to quiz
- Second screen pops up, displays “Are you sure?, show Answer”



Layout for Screen 2

- First create layout for screen 2

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

  <TextView
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:padding="24dp"
    android:text="@string/warning_text" />

  <TextView
    android:id="@+id/answerTextView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:padding="24dp" />

  <Button
    android:id="@+id/showAnswerButton"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="@string/show_answer_button" />

</LinearLayout>
```



Declare New Activity in AndroidManifest.xml

- Create new activity in Android Studio, override onCreate( )

```
public class CheatActivity extends Activity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_cheat);
    }
```

Format using the layout you just created

- Then declare new Activity in AndroidManifest

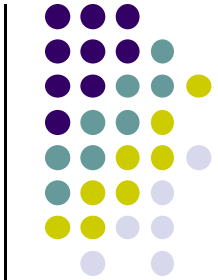
```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
  package="com.bignerdranch.android.geoquiz"
  android:versionCode="1"
  android:versionName="1.0" >

  <uses-sdk
    android:minSdkVersion="8"
    android:targetSdkVersion="17" />

  <application
    android:allowBackup="true"
    android:icon="@drawable/ic_launcher"
    android:label="@string/app_name"
    android:theme="@style/AppTheme" >
    <activity
      android:name="com.bignerdranch.android.geoquiz.QuizActivity"
      android:label="@string/app_name" >
      <intent-filter>
        <action android:name="android.intent.action.MAIN" />
        <category android:name="android.intent.category.LAUNCHER" />
      </intent-filter>
    </activity>
    <activity
      android:name=".CheatActivity"
      android:label="@string/app_name" />
  </application>
```

Activity 1

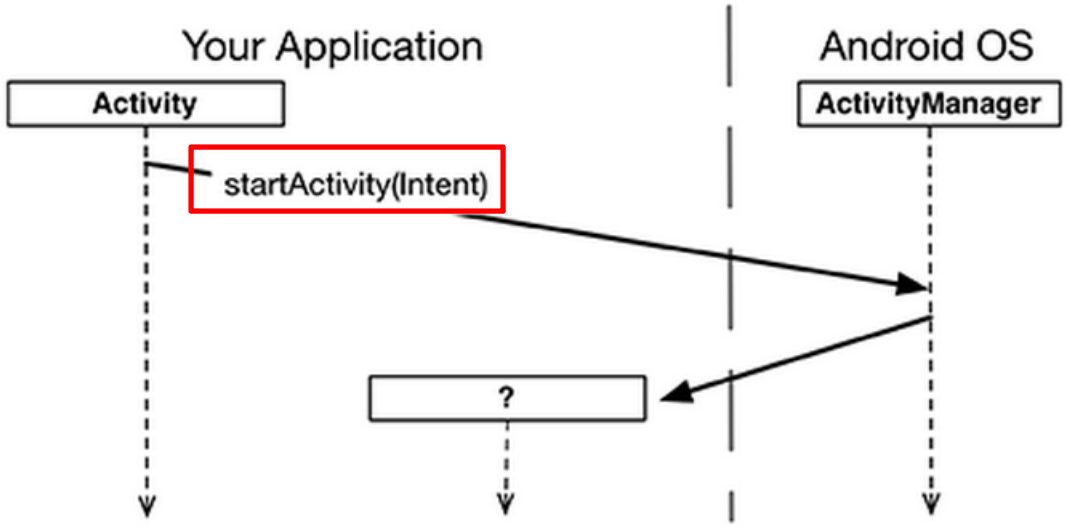
Activity 2

Activity 2

Starting Activity 2 from Activity 1



- Activity 1 starts activity 2 **through** the Android OS
- Activity 1 starts activity 2 by calling **startActivity(Intent)**
- Passes Intent (object for communicating with Android OS)

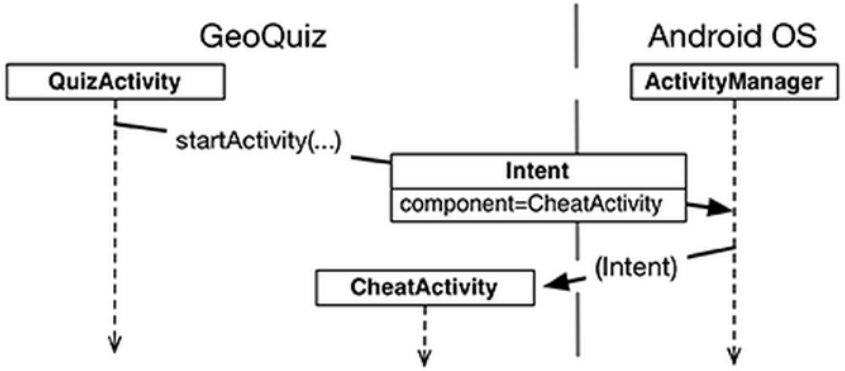


- Intent specifies which Activity OS ActivityManager should start

Starting Activity 2 from Activity 1

- Intents have many different constructors. We will use form:

```
public Intent(Context packageContext, Class<?> cls)
```



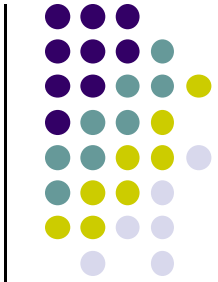
- Actual code looks like this

```
    ...

    mCheatButton = (Button)findViewById(R.id.cheat_button);
    mCheatButton.setOnClickListener(new View.OnClickListener() {

        @Override
        public void onClick(View v) {
            Intent i = new Intent(QuizActivity.this, CheatActivity.class);
            startActivity(i);
        }
    });

    updateQuestion();
}
```

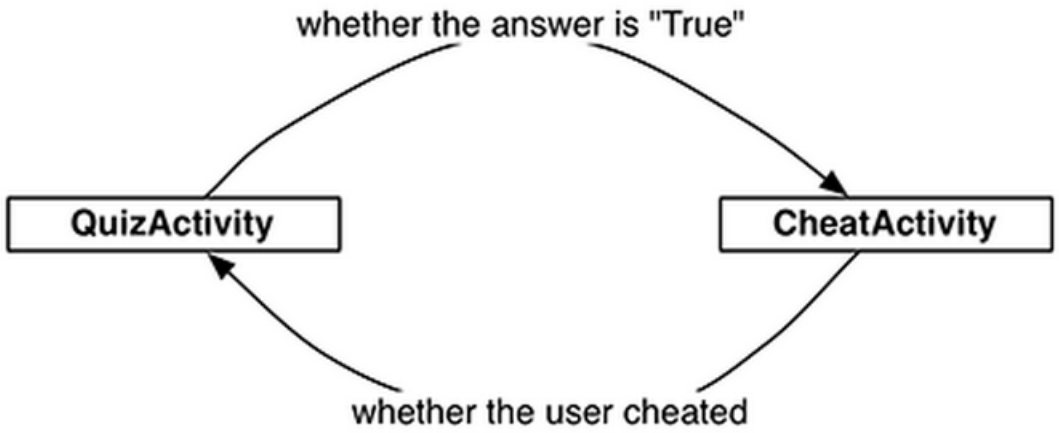
Parent Activity

Activity 2

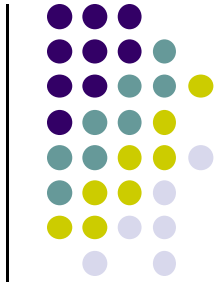
Final Words on Intents



- Previous example is called an **explicit intent** because Activity 1 and activity 2 are in same app
- If Activity 2 were in another app, an **implicit intent** would have to be created instead
- Can also pass data between Activities 1 or 2
  - E.g. New Activity 2 can tell activity 1 if user checked answer

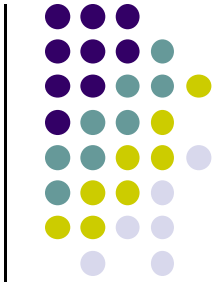


See Android Nerd Ranch for more details



Intents

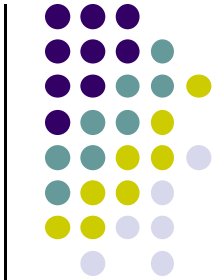
Intents



- Allows apps to use Android applications and components
  - start **activities**
  - start **services**
  - deliver **broadcasts**
- Also allows other apps to use components of our apps

- More details at: http://developer.android.com/guide/components/intents-common.html

Intents

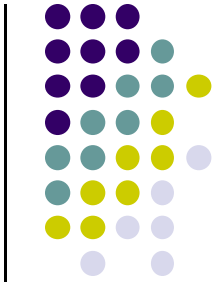


- "An intent is an abstract description of an operation to be performed"

- Intents consist of:
  - **Action** (what to do, example visit a web page)
  - **Data** (to perform operation on, example web page url)

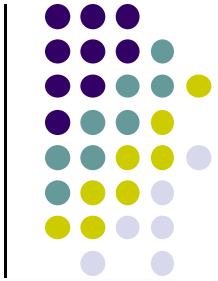
- Commands related with Intents: **startActivity**, **startActivityForResult**, **startService**, **bindService**

Intent Object Info



- data for component that receives the intent (e.g. Activity 2)
  - action to take
  - data to act on
- data for the Android system
  - category of component to handle intent (activity, service, broadcast receiver)
  - instructions on how to launch component if necessary

Recall: Inside AndroidManifest.xml



Your package name

Android version

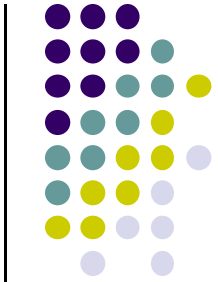
List of activities (screens) in your app

Action of intent

Category of intent

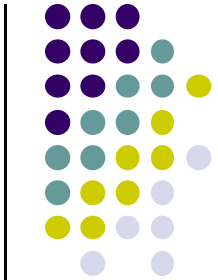
```
<?xml version="1.0"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
  package="com.commonsware.android.skeleton"
  android:versionCode="1"
  android:versionName="1.0">

  <application>
    <activity
      android:name="Now"
      android:label="Now">
      <intent-filter>
        <action android:name="android.intent.action.MAIN" />

        <category android:name="android.intent.category.LAUNCHER" />
      </intent-filter>
    </activity>
  </application>

</manifest>
```

Intent Action



Constant	Target component	Action
ACTION_CALL	activity	Initiate a phone call.
ACTION_EDIT	activity	Display data for the user to edit.
ACTION_MAIN	activity	Start up as the initial activity of a task, with no data input and no returned output
ACTION_SYNC	activity	Synchronize data on a server with data on the mobile device.
ACTION_BATTERY_LOW	broadcast receiver	A warning that the battery is low.
ACTION_HEADSET_PLUG	broadcast receiver	A headset has been plugged into the device, or unplugged from it.
ACTION_SCREEN_ON	broadcast receiver	The screen has been turned on.
ACTION_TIMEZONE_CHANGED	broadcast receiver	The setting for the time zone has changed.

Intent Info - *Category*



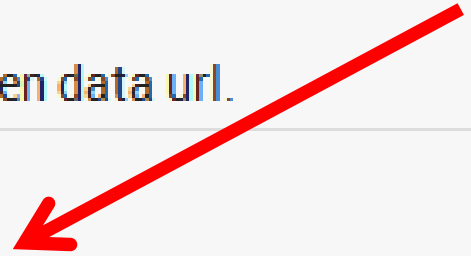
- String with more information on what kind of component should handle Intent

Constant	Meaning
`CATEGORY_BROWSABLE`	The target activity can be safely invoked by the browser to display data referenced by a link – for example, an image or an e-mail message.
`CATEGORY_GADGET`	The activity can be embedded inside of another activity that hosts gadgets.
`CATEGORY_HOME`	The activity displays the home screen, the first screen the user sees when the device is turned on or when the *Home* button is pressed.
`CATEGORY_LAUNCHER`	The activity can be the initial activity of a task and is listed in the top-level application launcher.
`CATEGORY_PREFERENCE`	The target activity is a preference panel.

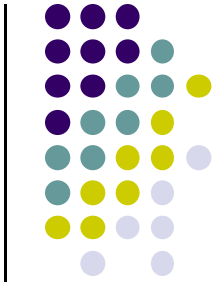
Intent Constructors

Public Constructors
Intent () Create an empty intent.
Intent (Intent o) Copy constructor.
Intent (String action) Create an intent with a given action.
Intent (String action, Uri uri) Create an intent with a given action and for a given data url.
Intent (Context packageContext, Class<?> cls) Create an intent for a specific component.
Intent (String action, Uri uri, Context packageContext, Class<?> cls) Create an intent for a specific component with a specified action and data.

We used this previously

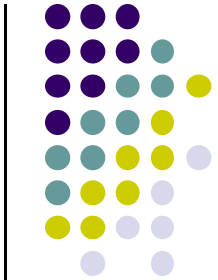


Intent Info - *Data*



- How is data passed to newly created component (e.g. Activity 2)
- URI (uniform resource identifier) of data to work with / on
  - for content on device E.g. an audio file or image or contact
- MIME (Multipurpose Internet Mail Extension),
  - Initially for email types, now used to generally describe data/content type
  - `E.g. image/png` or `audio/mpeg`

Intent - *Extras*

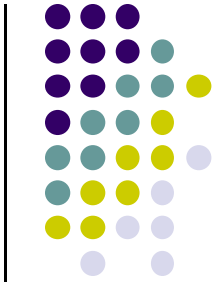


- A *Bundle* (key-value pairs) of additional information to be passed to component handling the Intent (e.g. Activity 2)

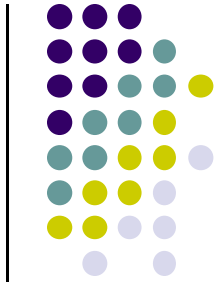
- Some Action will have specified extras
  - ACTION_TIMEZONE_CHANGED will have an extra with key of "time-zone"
  - Example of use of Intents extras to create alarm

```
public void createAlarm(String message, int hour, int minutes) {
    Intent intent = new Intent(AlarmClock.ACTION_SET_ALARM)
            .putExtra(AlarmClock.EXTRA_MESSAGE, message)
            .putExtra(AlarmClock.EXTRA_HOUR, hour)
            .putExtra(AlarmClock.EXTRA_MINUTES, minutes);
    if (intent.resolveActivity(getPackageManager()) != null) {
        startActivity(intent);
    }
}
```

AndroidManifest.xml



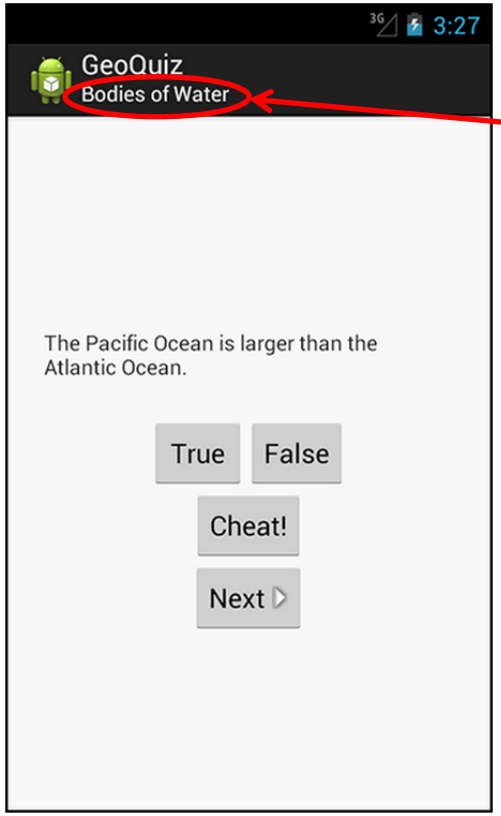
- describes app components:
  - activities, services, broadcast receivers, content providers
- **Intents:** Also describes *intent messages each component can handle*
- **Permissions:** declares permissions requested by app
- **Libraries:** libraries application to link to



Action Bar

Action Bar

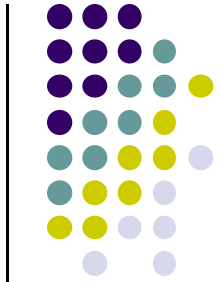
- Can add Action bar to the onCreate( ) method of GeoQuiz to indicate what part of the app we are in



Action bar

```
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    Log.d(TAG, "onCreate() called");
    setContentView(R.layout.activity_quiz);

    ActionBar actionBar = getActionBar();
    actionBar.setSubtitle("Bodies of Water");
```

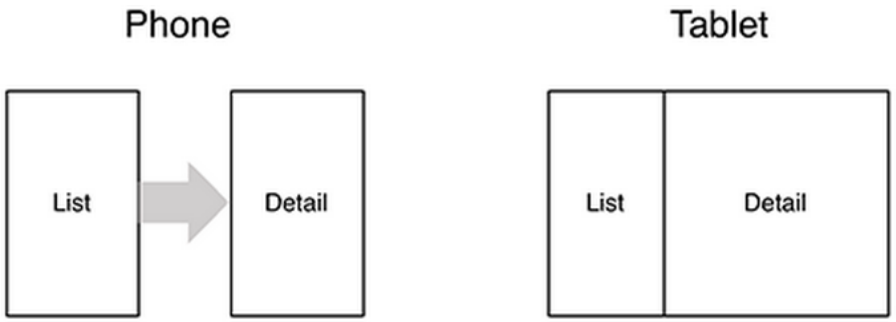
Code to add action bar



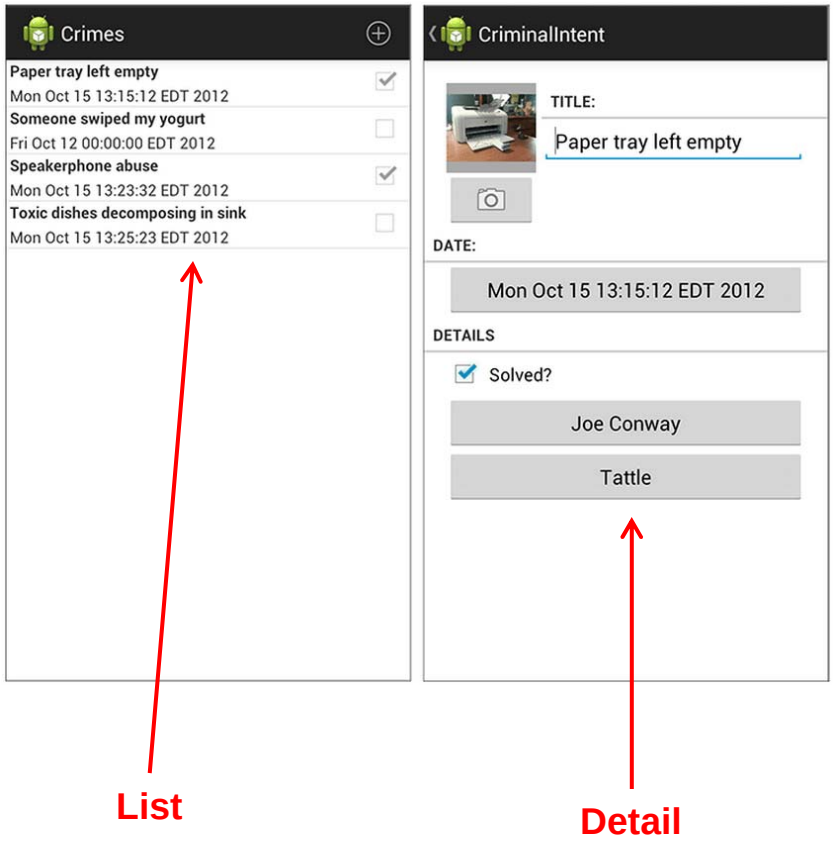
Fragments

Fragments
Ref: Android Nerd Ranch, Ch 7 pg 125

- To illustrate fragments, we create new app **CriminalIntent**
- Used to record “office crimes” e.g. leaving plates in sink, etc
- Record includes:
  - Title, date, photo
- List-detail app + Fragments

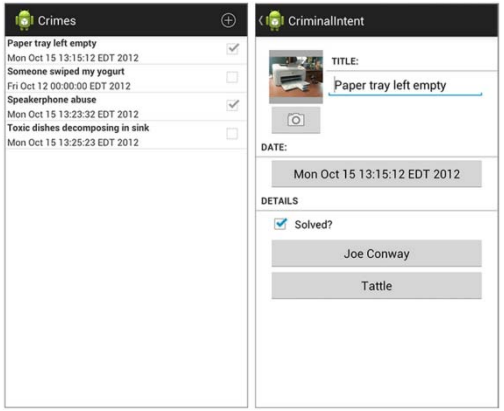


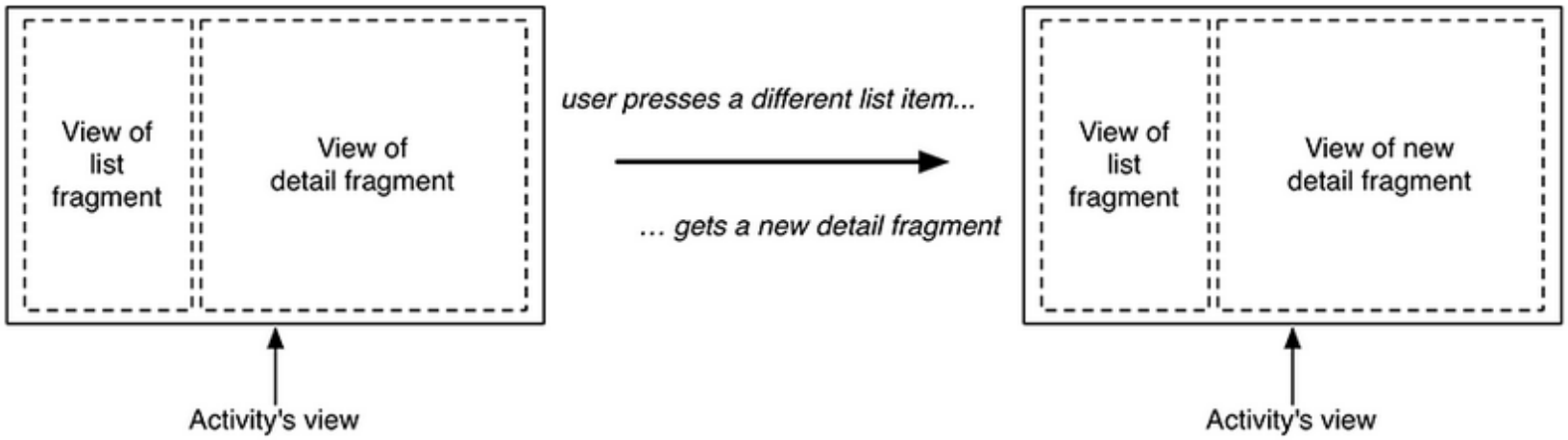
- **Tablet:** show list + detail
- **Phone:** swipe to show next crime



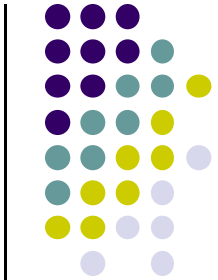
Fragments

- Activities can **contain** multiple fragments
- Fragment's views are inflated from a XML layout file
- Can rearrange fragments as desired on an activity

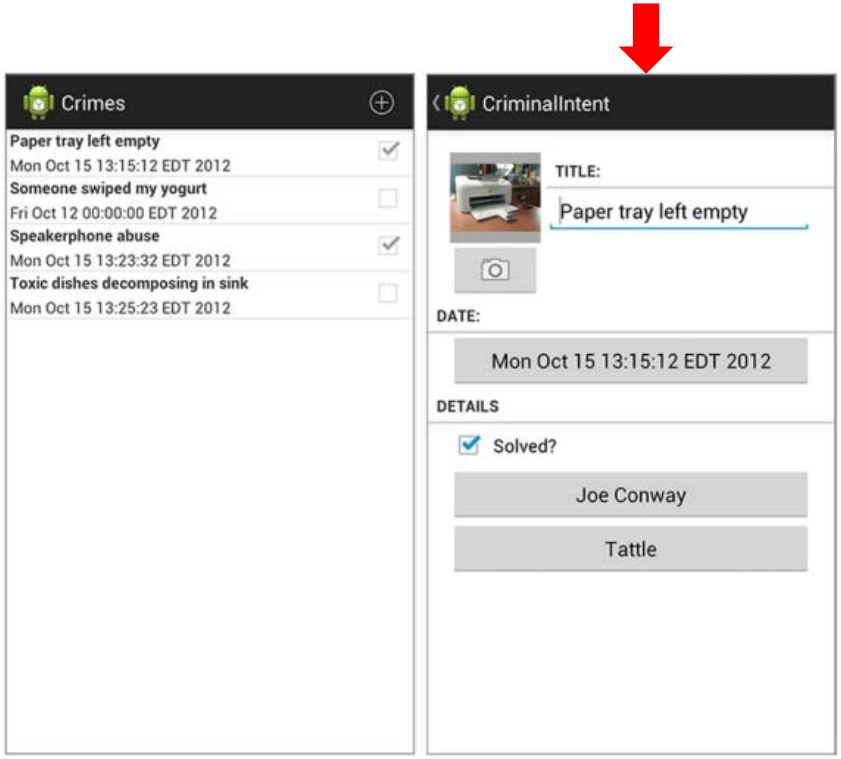




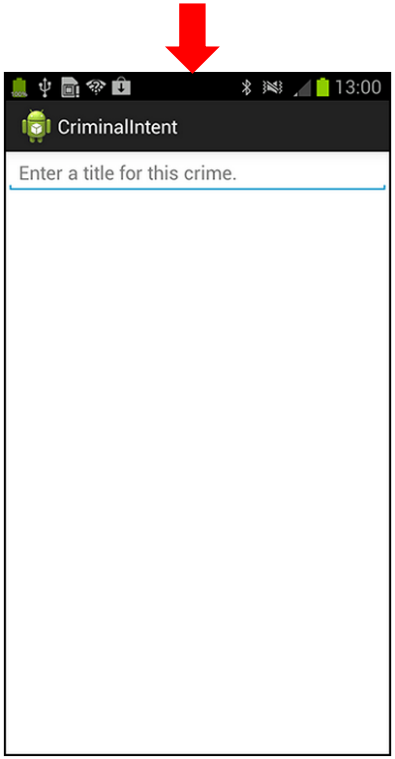
Starting Criminal Intent



- So, we will start by developing the detail view of **CriminalIntent** using Fragments

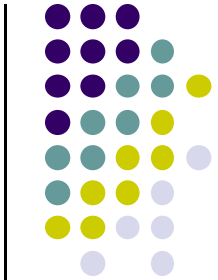


Final Look of CriminalIntent

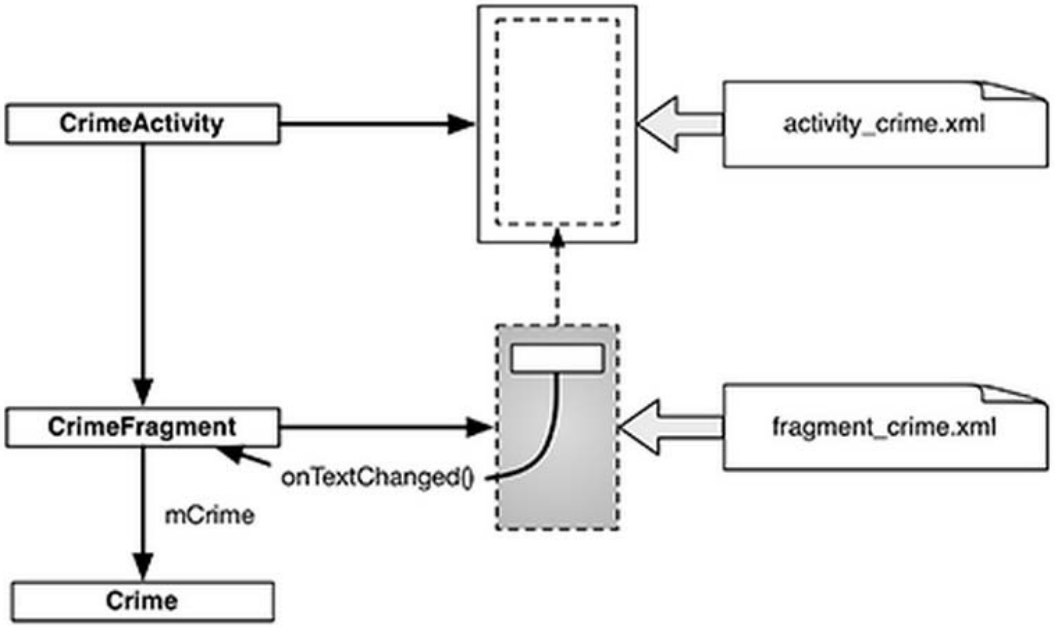


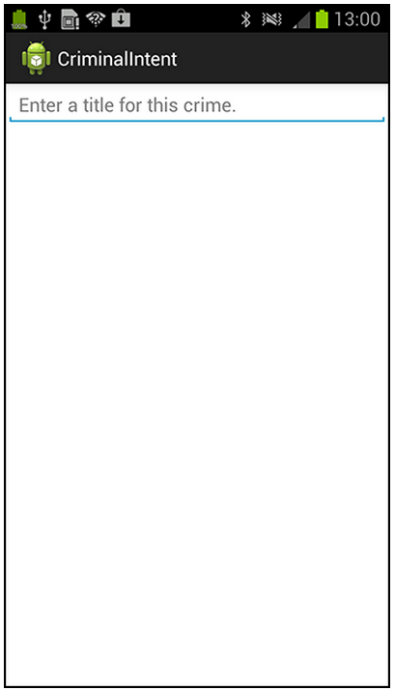
Start by Developing detail view using Fragments

Starting Criminal Intent

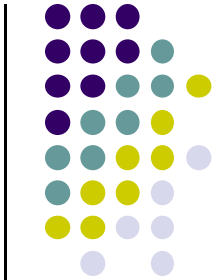


- Detail screen shown will be managed by a UI fragment called **CrimeFragment**
- Activity called **CrimeActivity** will host instance of fragment **CrimeFragment**
- **Hosted? CrimeActivity** provides a space/spot for **CrimeFragment** in its view hierarchy

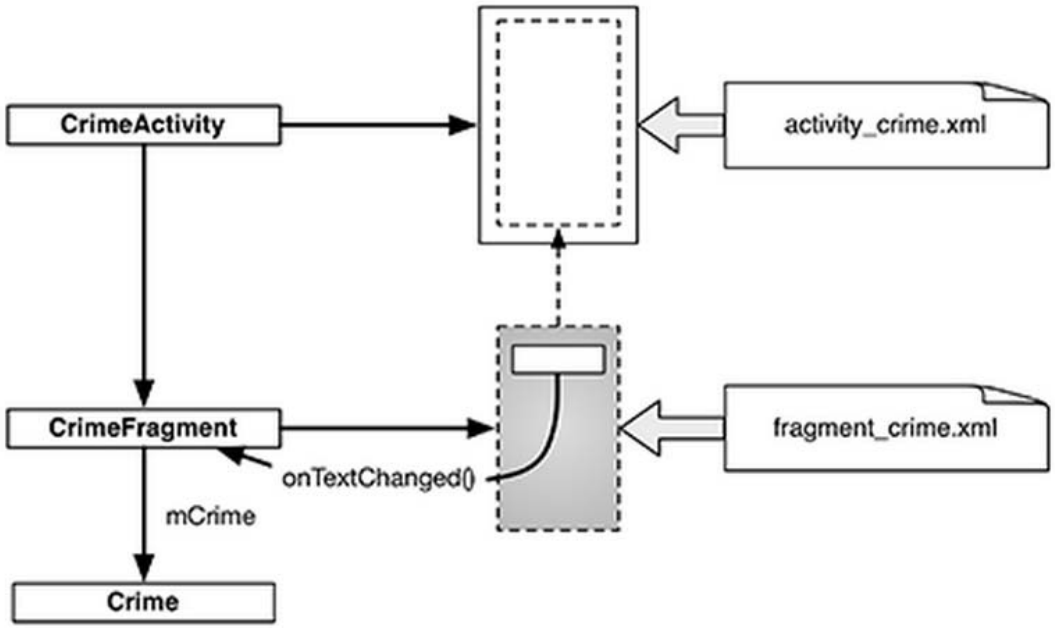




Starting Criminal Intent

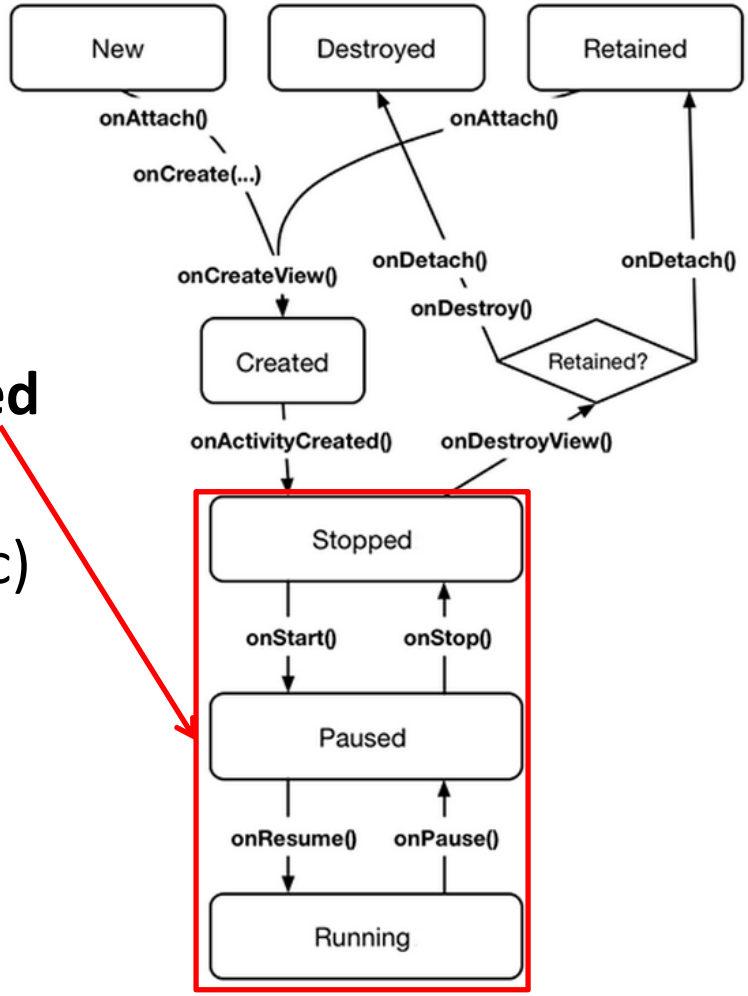


- **Crime:** holds single office crime. Has
  - **Title** e.g. “Someone stole my yogurt!”
  - **ID:** uniquely identifies crime
- **CrimeFragment** has member variable **mCrime** to hold crimes
- **CrimeActivity** has a FrameLayout with position of **CrimeFragment** defined

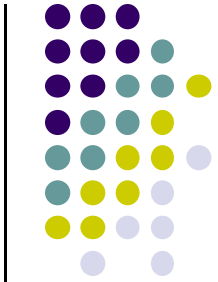


Hosting a UI Fragment

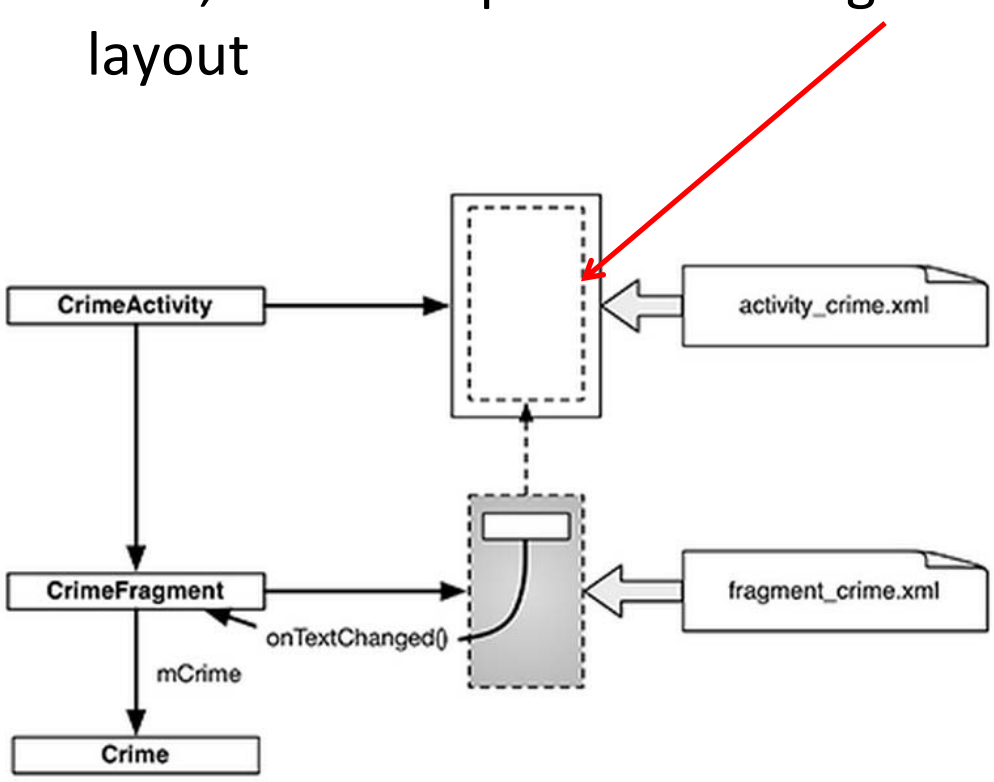
- To host a UI fragment, an activity must
  - Define a spot in its layout for the fragment's view
  - Manage the lifecycle of the fragment instance
- Fragment's lifecycle somewhat similar to activity lifecycle
- Has states **running**, **paused** and **stopped**
- Also has some similar activity lifecycle methods (e.g. **onPause()**, **onStop( )**, etc)
- **Key difference:**
  - Activity's lifecycle methods called by OS
  - Fragment's lifecycle's methods **called by hosting activity NOT Android OS!**



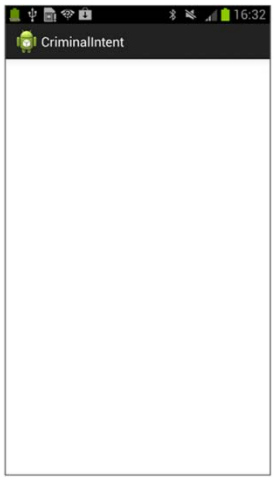
Hosting UI Fragment in an Activity



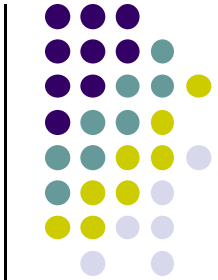
- 2 options. Can add fragment either
  - **XML:** To **Activity's layout (layout fragment),** or
  - **Java:** In **activity's code** (more complex but more flexible)
- We will add fragment to activity's code now
- First, create a spot for the fragment's view in **CrimeActivity's** layout



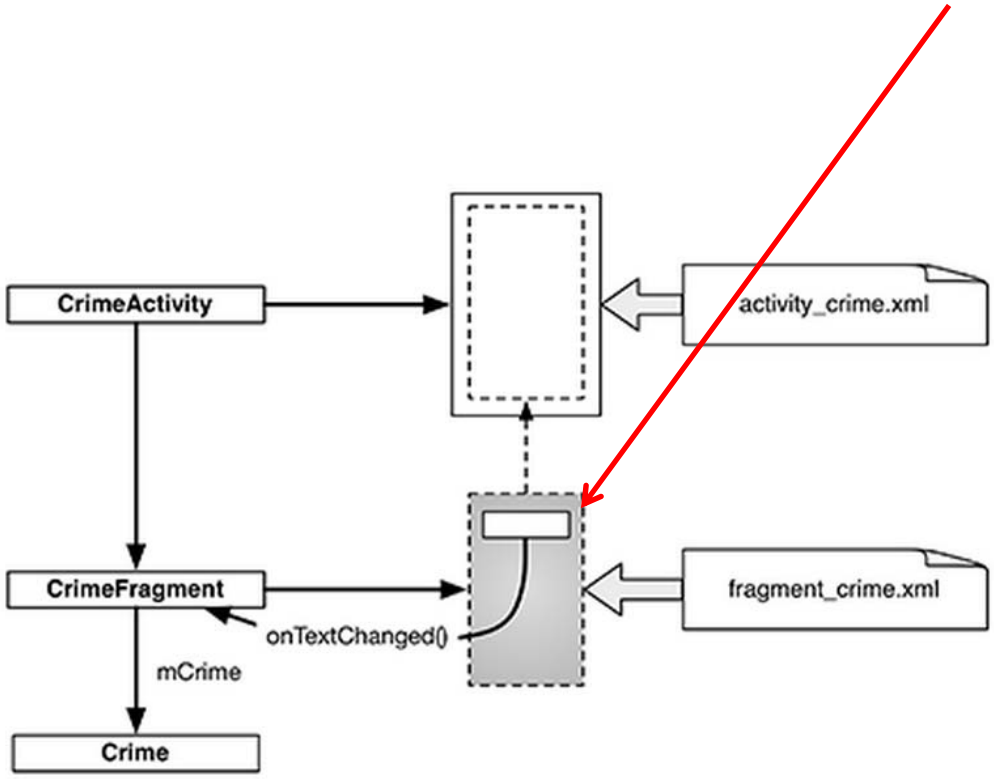

```
<?xml version="1.0" encoding="utf-8"?>
<FrameLayout xmlns:android="http://schemas.android.com/apk/res/android"
  android:id="@+id/fragmentContainer"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  />
```



Creating a UI Fragment

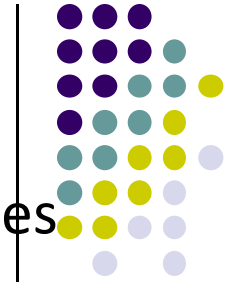


- Creating Fragment is similar to creating activity
  1. Define widgets in a layout file
  2. Create class and specify its view as layout above
  3. Wire up widget inflated from layout in code
- Defining layout file for **CrimeFragment (fragment_crime.xml)**




```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  android:orientation="vertical"
  >
  <EditText android:id="@+id/crime_title"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:hint="@string/crime_title_hint"
    />
</LinearLayout>
```

Implementing Fragment Lifecycle Methods



- **CrimeFragment** presents details of a specific crime + updates
- Override CrimeFragment's **onCreate( )** function

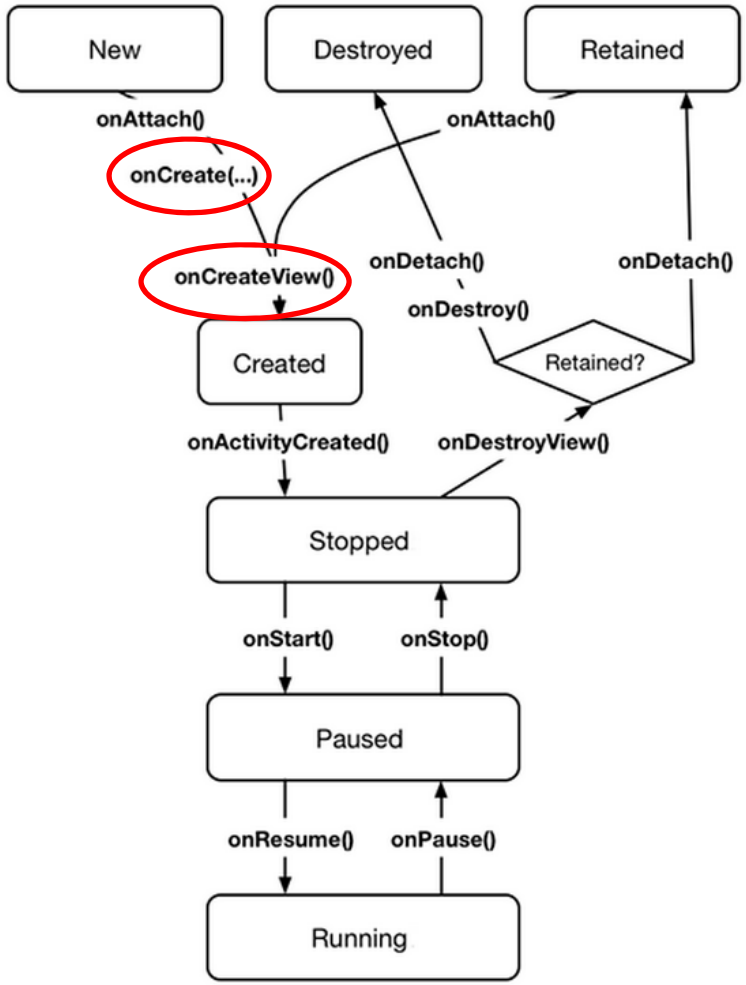
Declared public so that It can be called by any Activity hosting the fragment

```
public class CrimeFragment extends Fragment {
    private Crime mCrime;

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        mCrime = new Crime();
    }

    @Override
    public View onCreateView(LayoutInflater inflater, ViewGroup parent,
            Bundle savedInstanceState) {
        View v = inflater.inflate(R.layout.fragment_crime, parent, false);
        return v;
    }

}
```

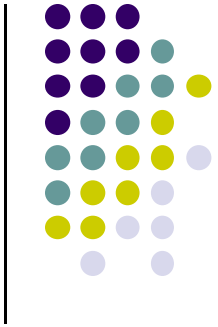
- **Note:** Fragment's view not inflated in **Fragment.onCreate( )**
- Fragment's view created and configured in another fragment lifecycle method (**onCreateView**)

Fragment LifeCycle

- **Note:** Fragment's view not inflated in **Fragment.onCreate( )**
- Fragment's view created and configured in another fragment lifecycle method (**onCreateView**)



Wiring up the EditText Widget



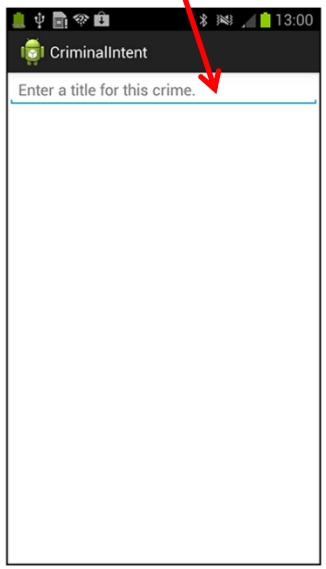
```
public class CrimeFragment extends Fragment {
    private Crime mCrime;
    private EditText mTitleField;

    ...

    @Override
    public View onCreateView(LayoutInflater inflater, ViewGroup parent,
            Bundle savedInstanceState) {
        View v = inflater.inflate(R.layout.fragment_crime, parent, false);

        mTitleField = (EditText)v.findViewById(R.id.crime_title);
        mTitleField.addTextChangedListener(new TextWatcher() {
            public void onTextChanged(
                    CharSequence c, int start, int before, int count) {
                mCrime.setTitle(c.toString());
            }

            public void beforeTextChanged(
                    CharSequence c, int start, int count, int after) {
                // This space intentionally left blank
            }

            public void afterTextChanged(Editable c) {
                // This one too
            }
        });

        return v;
    }
}
```

Find EditText widget

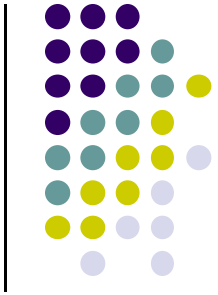
Add listener for text change event (user entry)

User's input

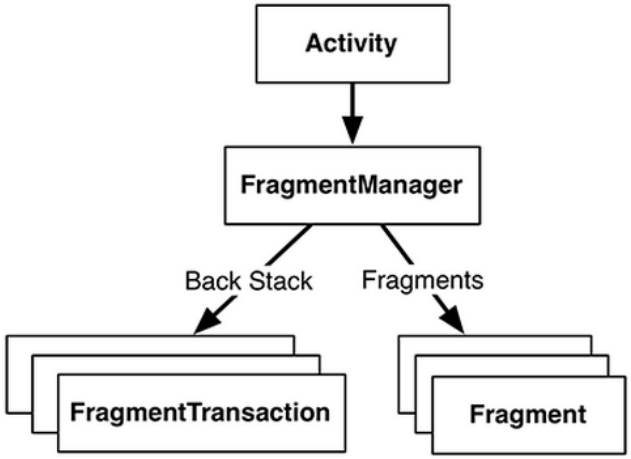
EditText widget



Adding UI Fragment to FragmentManager



- Finally, we add fragment just created to **FragmentManager**
- **FragmentManager**
  - Manages fragments
  - Adds their views to activity's view
  - Handles
    - List of fragment
    - Back stack of fragment transactions



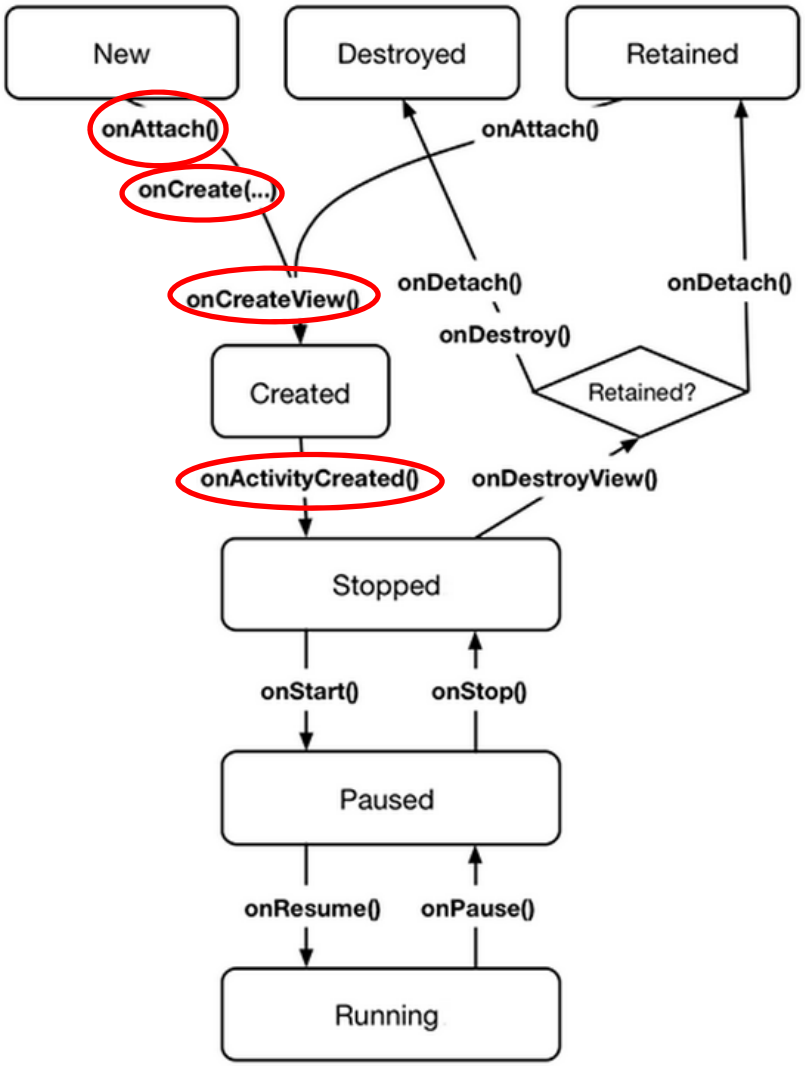
Find Fragment using its ID

Interactions with FragmentManager are done using transactions

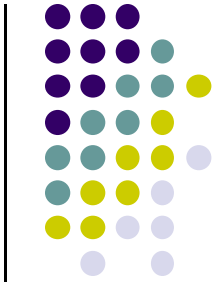
Add Fragment to activity's view

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

        FragmentManager fm = getSupportFragmentManager();
        Fragment fragment = fm.findFragmentById(R.id.fragmentContainer);

        if (fragment == null) {
            fragment = new CrimeFragment();
            fm.beginTransaction()
              .add(R.id.fragmentContainer, fragment)
              .commit();
        }
    }
}
```

Examining Fragment's Lifecycle

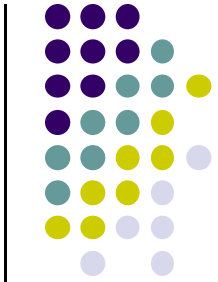


- **FragmentManager** calls fragment lifecycle methods
- **onAttach( ), onCreate( )** and **onCreateView()** called when a fragment is added to **FragmentManager**
- **onActivityCreated( )** called after hosting activity's **onCreate( )** method is executed
- If fragment is added to already running Activity then **onAttach( ), onCreate( ), onCreateView()**, **onActivityCreated( )**, **onStart( )** and then **onResume( )** called



Playing Audio File using MediaPlayer

Example taken from Android Nerd Ranch Chapter 13

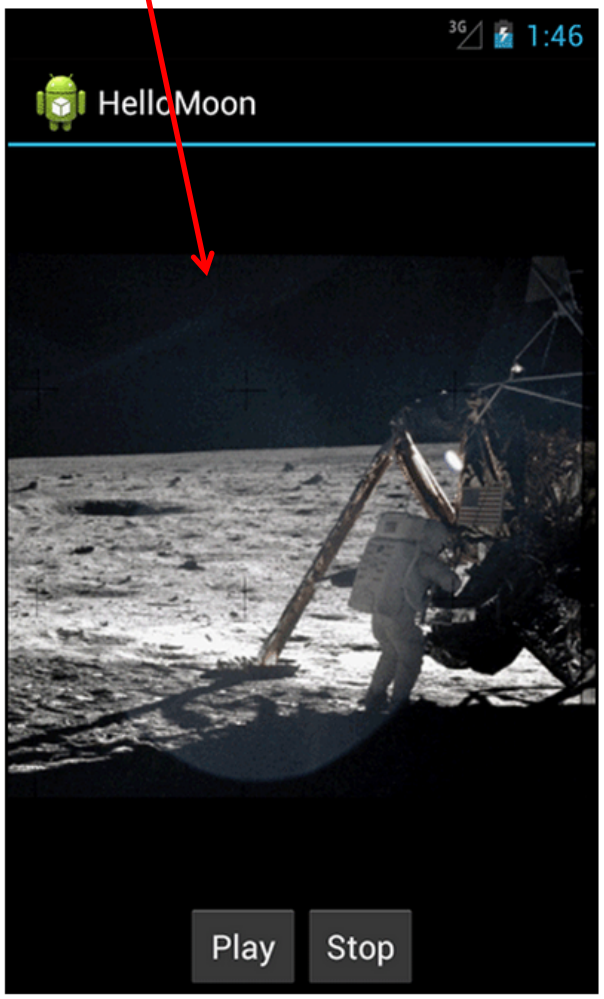


- Example creates **HelloMoon app** that uses **MediaPlayer** to play audio file
- **MediaPlayer:** Android Class for audio and video playback
- **Source:** Can play local files, or streamed over Internet
- **Supported formats:** WAV, MP3, Ogg, Vorbis, MPEG-4, 3GPP, etc

HelloMood App

- Put image **armstrong_on_moon.jpg** in **res/drawable-mdpi/** folder
- Place audio file to be played back (**one_small_step.wav**) in res/raw folder
- Can also copy mpeg file and play it back
- Create **strings.xml** file for app

```
<?xml version="1.0" encoding="utf-8"?>
<resources>

  <string name="app_name">HelloMoon</string>
  <string name="hello_world">Hello world!</string>
  <string name="menu_settings">Settings</string>
  <string name="hellomoon_play">Play</string>
  <string name="hellomoon_stop">Stop</string>
  <string name="hellomoon_description">Neil Armstrong stepping
            onto the moon</string>

</resources>
```

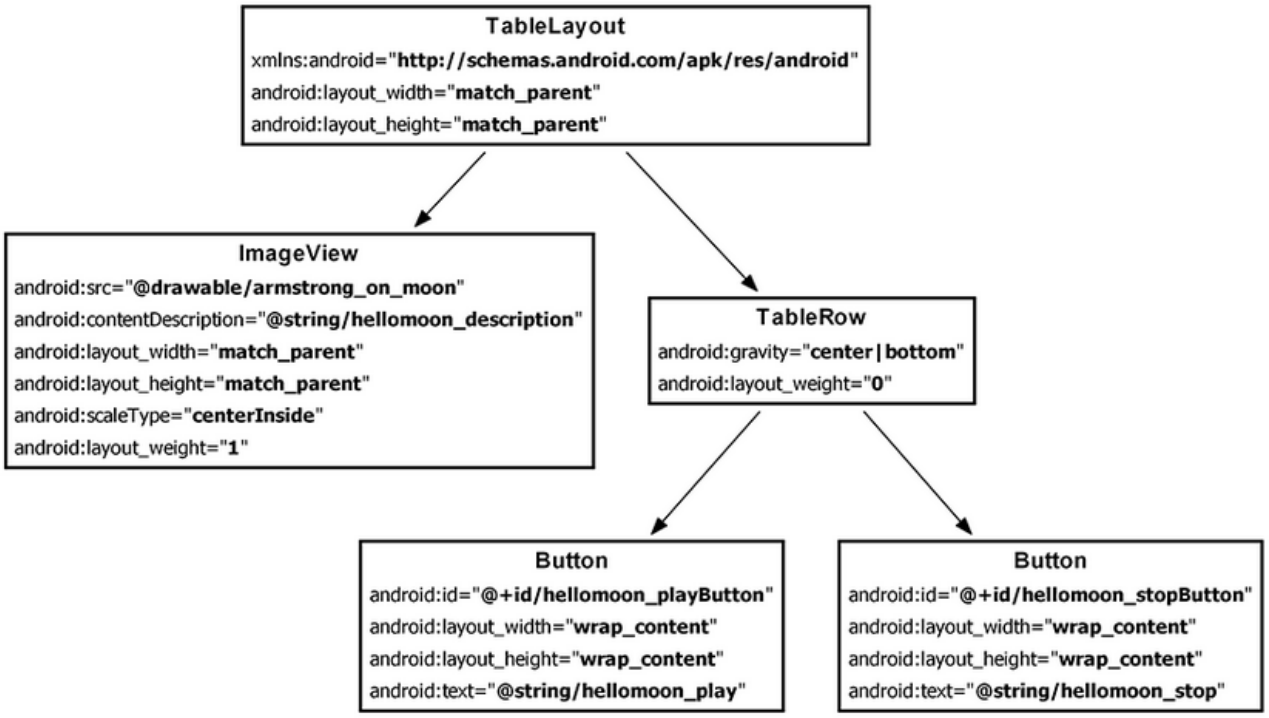


HelloMoon App

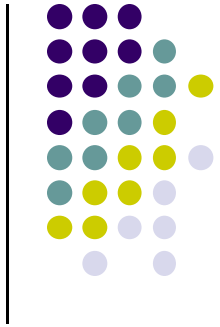
- HelloMoon app will have:
  - 1 activity (**HelloMoonActivity**) that hosts **HelloMoonFragment**
- **AudioPlayer** class will be created to encapsulate **MediaPlayer**

- First set up the rest of the app by
  1. Define a layout for the fragment
  2. Create the fragment class
  3. Modify the activity and its layout to host the fragment

Defining the Layout for HelloMoonFragment



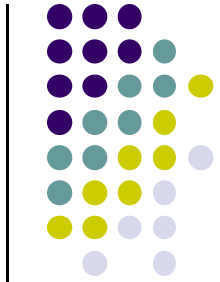
Creating a Layout Fragment



- Previously added Fragments to activity's code
- Layout fragment enables fragment views to be inflated from XML file
- We will use a layout fragment instead
- Create layout fragment **activity_hello_moon.xml**

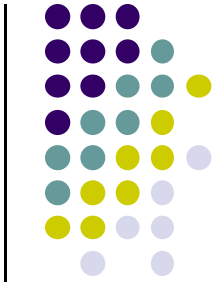
```
<?xml version="1.0" encoding="utf-8"?>
<fragment xmlns:android="http://schemas.android.com/apk/res/android"
  android:id="@+id/helloMoonFragment"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  android:name="com.bignerdranch.android.hellomoon.HelloMoonFragment">

</fragment>
```

Set up HelloMoonFragment



```
public class HelloMoonFragment extends Fragment {

    private Button mPlayButton;
    private Button mStopButton;

    @Override
    public View onCreateView(LayoutInflater inflater, ViewGroup parent,
            Bundle savedInstanceState) {
        View v = inflater.inflate(R.layout.fragment_hello_moon, parent, false);

        mPlayButton = (Button)v.findViewById(R.id.hellomoon_playButton);
        mStopButton = (Button)v.findViewById(R.id.hellomoon_stopButton);

        return v;
    }
}
```

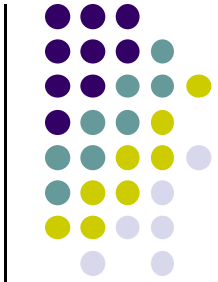
Create AudioPlayer Class to Wrap MediaPlayer



```
public class AudioPlayer {

    private MediaPlayer mPlayer;

    public void stop() {
        if (mPlayer != null) {
            mPlayer.release();
            mPlayer = null;
        }
    }

    public void play(Context c) {
        mPlayer = MediaPlayer.create(c, R.raw.one_small_step);
        mPlayer.start();
    }
}
```

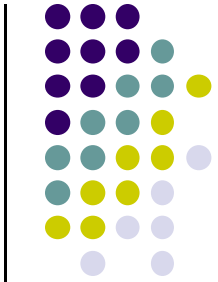
Hook up Play and Stop Buttons

```
public class HelloMoonFragment extends Fragment {
    private AudioPlayer mPlayer = new AudioPlayer();
    private Button mPlayButton;
    private Button mStopButton;

    @Override
    public View onCreateView(LayoutInflater inflater, ViewGroup parent,
            Bundle savedInstanceState) {
        View v = inflater.inflate(R.layout.fragment_hello_moon, parent, false);

        mPlayButton = (Button)v.findViewById(R.id.hellomoon_playButton);
        mPlayButton.setOnClickListener(new View.OnClickListener() {
            public void onClick(View v) {
                mPlayer.play(getActivity());
            }
        });

        mStopButton = (Button)v.findViewById(R.id.hellomoon_stopButton);
        mStopButton.setOnClickListener(new View.OnClickListener() {
            public void onClick(View v) {
                mPlayer.stop();
            }
        });
        return v;
    }
```



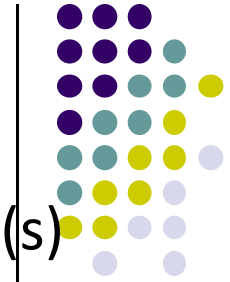
Taking Pictures with the Smartphone's Camera

Camera Example
Ref: Android Nerd Ranch Ch 19 & 20 (pg 299)

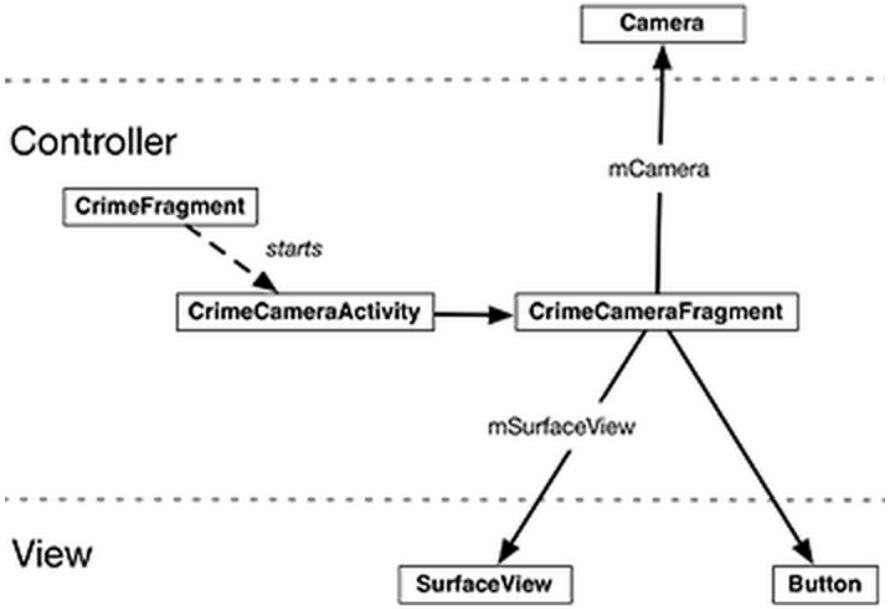


- Simple way: Send intent with **MediaStore.ACTION_IMAGE_CAPTURE** to Android camera app
  - Buggy on many phones
- Alternate way: Use **SurfaceView** class, display live video preview from camera
  - We will try second (alternate) way here

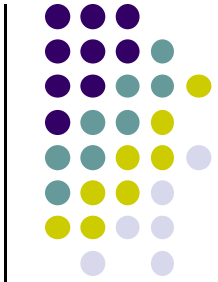
Overview of Camera App for CriminalIntent



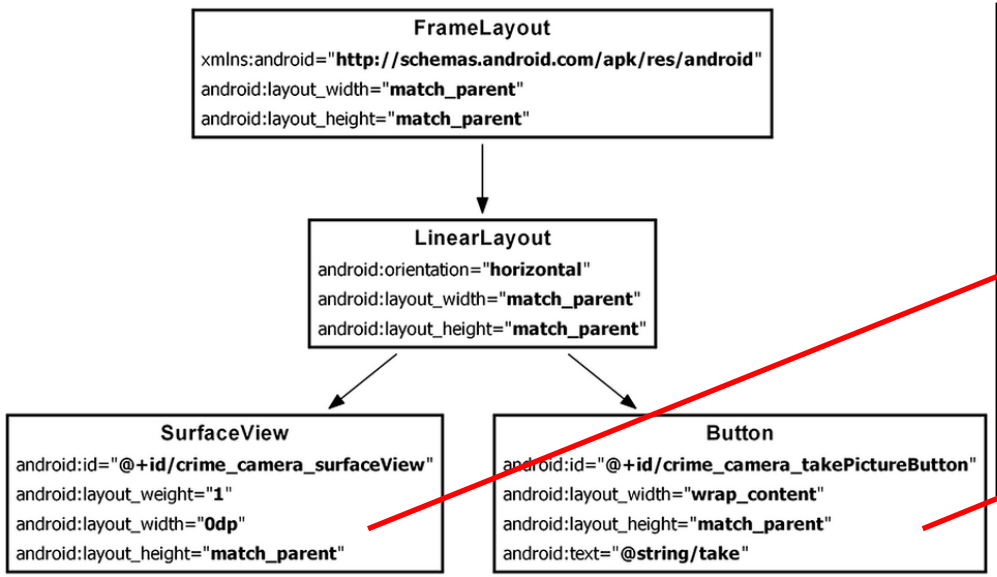
- **Camera** provides hardware-level access to device's camera(s)
- A **SurfaceView** is a view (widget) that allows content to be directly rendered unto the screen
- App will use instance of **SurfaceView** as **ViewFinder**
- Create in following order:
  - Layout for **CrimeCameraFragment's** view
  - **CrimeCameraFragment** class
  - **CrimeCameraActivity** class
  - Use camera API in **CrimeCameraFragment**
- Finally enable instance of **CrimeCameraActivity**

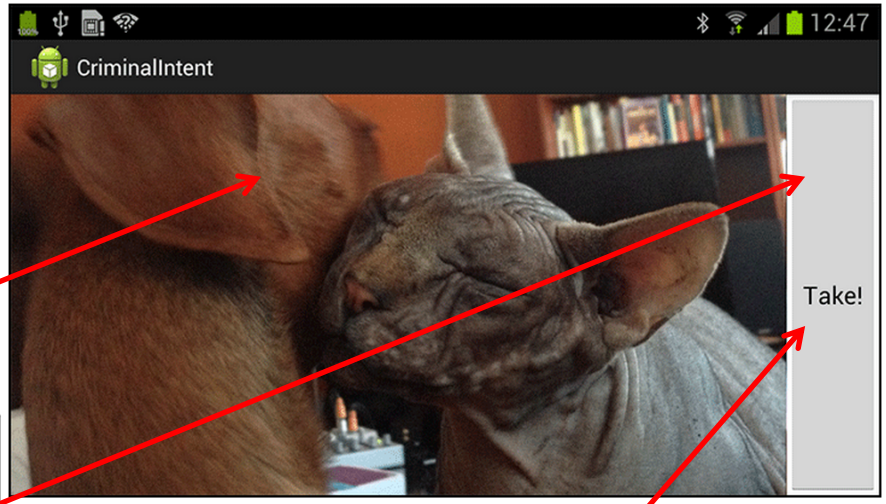


Creating Layout for CrimeCameraFragment



- Steps
  - Layout for **CrimeCameraFragment's** view
  - **CrimeCameraFragment** class
  - **CrimeCameraActivity** class
  - Use camera API in **CrimeCameraFragment**



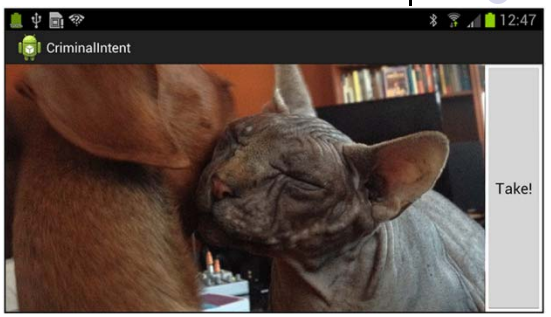


Add "Take!" for Camera button to strings.xml

```
...
<string name="show_subtitle">Show Subtitle</string>
<string name="subtitle">Sometimes tolerance is not a virtue.</string>
<string name="take">Take!</string>

</resources>
```

Creating Layout for CrimeCameraFragment

- Steps
  - Layout for **CrimeCameraFragment's** view
  - **CrimeCameraFragment** class
  - **CrimeCameraActivity** class
  - Use camera API in **CrimeCameraFragment**




```
public class CrimeCameraFragment extends Fragment {
    private static final String TAG = "CrimeCameraFragment";

    private Camera mCamera;
    private SurfaceView mSurfaceView;

    @Override
    public View onCreateView(LayoutInflater inflater, ViewGroup parent,
            Bundle savedInstanceState) {
        View v = inflater.inflate(R.layout.fragment_crime_camera, parent, false);

        Button takePictureButton = (Button)v
            .findViewById(R.id.crime_camera_takePictureButton);
        takePictureButton.setOnClickListener(new View.OnClickListener() {
            public void onClick(View v) {
                getActivity().finish();
            }
        });

        mSurfaceView = (SurfaceView)v.findViewById(R.id.crime_camera_surfaceView);

        return v;
    }
}
```

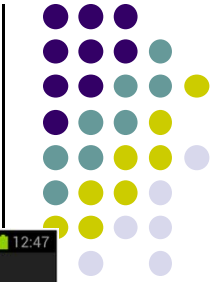
Inflate camera view

Get handle to "Take" button

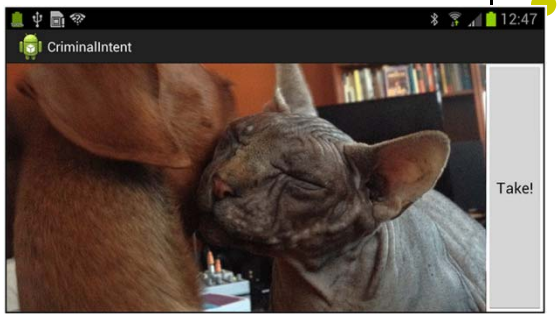
Handle "Take" Button click

Get handle to Surface View

Creating Layout for CrimeCameraFragment



- Steps
  - Layout for **CrimeCameraFragment's** view
  - **CrimeCameraFragment** class
  - **CrimeCameraActivity** class
  - Use camera API in **CrimeCameraFragment**

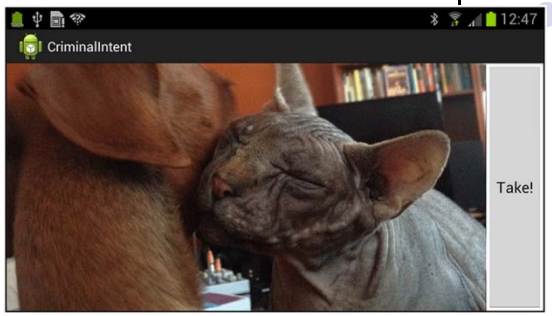


- Create new **SingleFragmentActivity** subclass named **CrimeCameraActivity**

```
public class CrimeCameraActivity extends SingleFragmentActivity {
    @Override
    protected Fragment createFragment() {
        return new CrimeCameraFragment();
    }
}
```

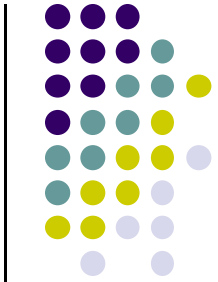
Modify AndroidManifest.xml

- Steps
  - Layout for **CrimeCameraFragment's** view
  - **CrimeCameraFragment** class
  - **CrimeCameraActivity** class
  - Use camera API in **CrimeCameraFragment**
- Add permissions and camera activity to AndroidManifest.xml
- Permissions?
  - Ask phone owner to use phone's camera when app is installed
- **uses-feature** means that GooglePlay, app offered only to phones with camera




```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
  package="com.bignerdranch.android.criminalintent"
  android:versionCode="1"
  android:versionName="1.0" >

  <uses-sdk android:minSdkVersion="8" android:targetSdkVersion="16"/>
  <uses-permission android:name="android.permission.CAMERA" />
  <uses-feature android:name="android.hardware.camera" />

  <application

          ...

    <activity android:name=".CrimeCameraActivity"
      android:screenOrientation="landscape"
      android:label="@string/app_name">
    </activity>

  </application>

</manifest>
```

Use Camera API: Opening and Releasing Camera



- Camera is system-wide resource, needs to be obtained when needed and released afterwards
- Have camera handle in **CrimeCameraFragment**
- Camera Methods:

```
public static Camera open(int cameraId)
public static Camera open()
public final void release()
```

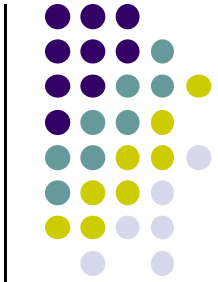
- Open Camera in onResume( ), release it in onPause( )

```
@TargetApi(9)
@Override
public void onResume() {
    super.onResume();
    if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.GINGERBREAD) {
        mCamera = Camera.open(0);
    } else {
        mCamera = Camera.open();
    }
}
```

Use 0 argument post-gingerbread

Don’e use 0 argument pre-gingerbread

Use Camera API: Opening and Releasing Camera



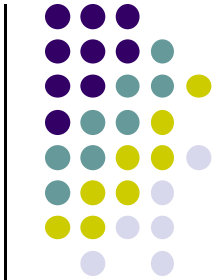
- Release camera in onPause( ) method if it is going offscreen
- Releasing camera if you don't have it causes crash (e.g. running on a virtual device or another activity has it) so check first

```
public void onResume() {
    super.onResume();
    if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.GINGERBREAD) {
        mCamera = Camera.open(0);
    } else {
        mCamera = Camera.open();
    }
}
```

```
@Override
public void onPause() {
    super.onPause();

    if (mCamera != null) {
        mCamera.release();
        mCamera = null;
    }
}
```

Check that you have camera

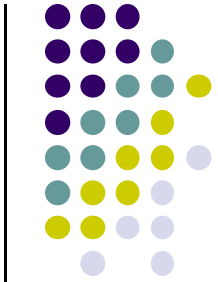
Use Camera API: Opening and Releasing Camera



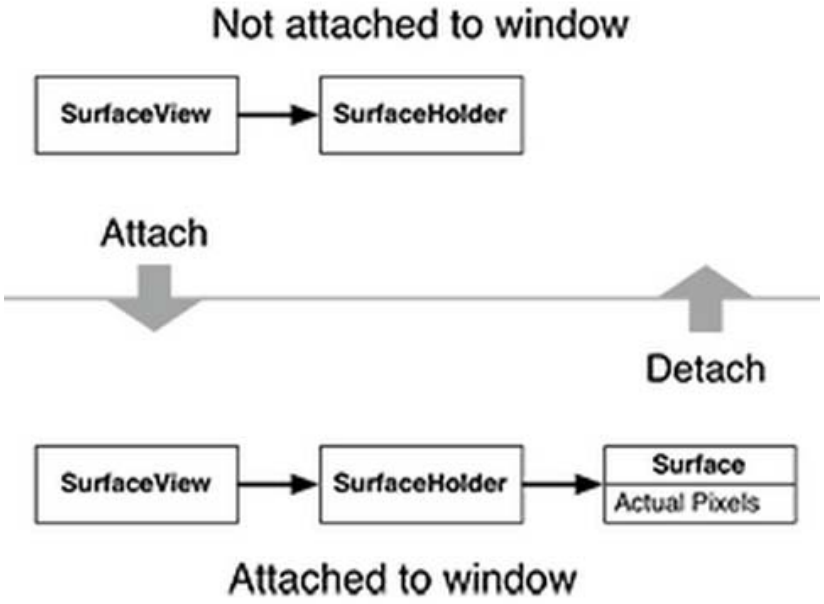
- Camera image will be displayed on a **Surface**
- A **Surface** is a buffer of raw pixel data
- In **CrimeCameraFragment**, get **SurfView's SurfaceHolder**

```
@Override
@SuppressWarnings("deprecation")
public View onCreateView(LayoutInflater inflater, ViewGroup parent,
        Bundle savedInstanceState) {

    ...

    mSurfaceView = (SurfaceView)v.findViewById(R.id.crime_camera_surfaceView);
    SurfaceHolder holder = mSurfaceView.getHolder();
    // setType() and SURFACE_TYPE_PUSH_BUFFERS are both deprecated,
    // but are required for Camera preview to work on pre-3.0 devices.
    holder.setType(SurfaceHolder.SURFACE_TYPE_PUSH_BUFFERS);

    return v;
}
```

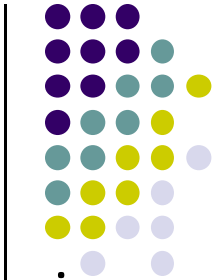
Camera API: Attaching Camera to Surface



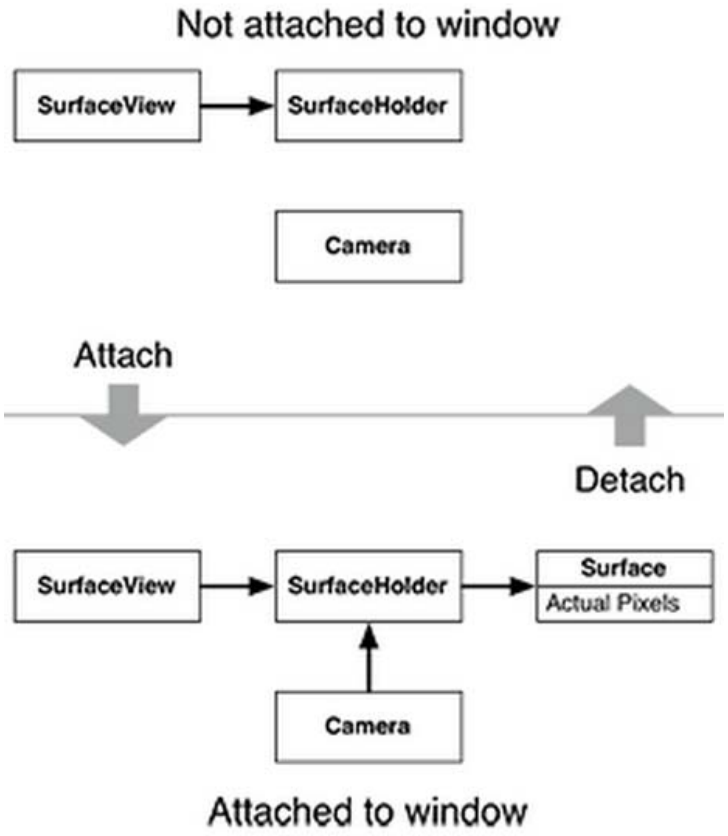
- A **Surface** has a lifecycle
  - Created when **SurfaceView** appears on screen
  - Destroyed when **SurfaceView** no longer visible
- Ensure nothing is drawn to **Surface** when it no longer exists
- **SurfaceView** allows other clients to draw to its buffer



Camera API: Attaching Camera to Surface



- Would like **Camera** to attach to **SurfaceHolder** when **Surface** is created, detach when it is destroyed
- **SurfaceHolder.Callback** is another interface of **Surface**



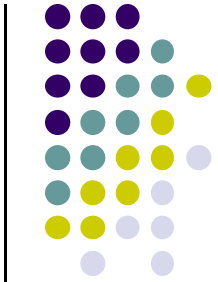
Camera API: Using Surface

```
...
SurfaceHolder holder = mSurfaceView.getHolder();
// setType() and SURFACE_TYPE_PUSH_BUFFERS are both deprecated,
// but are required for Camera preview to work on pre-3.0 devices.
holder.setType(SurfaceHolder.SURFACE_TYPE_PUSH_BUFFERS);

holder.addCallback(new SurfaceHolder.Callback() {

    public void surfaceCreated(SurfaceHolder holder) {
        // Tell the camera to use this surface as its preview area
        try {
            if (mCamera != null) {
                mCamera.setPreviewDisplay(holder);
            }
        } catch (IOException exception) {
            Log.e(TAG, "Error setting up preview display", exception);
        }
    }

    public void surfaceDestroyed(SurfaceHolder holder) {
        // We can no longer display on this surface, so stop the preview.
        if (mCamera != null) {
            mCamera.stopPreview();
        }
    }

  public void surfaceChanged(SurfaceHolder holder, int format, int w, int h) {
      // The surface has changed size; update the camera preview size
      Camera.Parameters parameters = mCamera.getParameters();
      Size s = null;
      Size s = getBestSupportedSize(parameters.getSupportedPreviewSizes(), w, h);
      parameters.setPreviewSize(s.width, s.height);
      mCamera.setParameters(parameters);
      try {
          mCamera.startPreview();
      } catch (Exception e) {
          Log.e(TAG, "Could not start preview", e);
          mCamera.release();
          mCamera = null;
      }
  }
});

  return v;
}
```

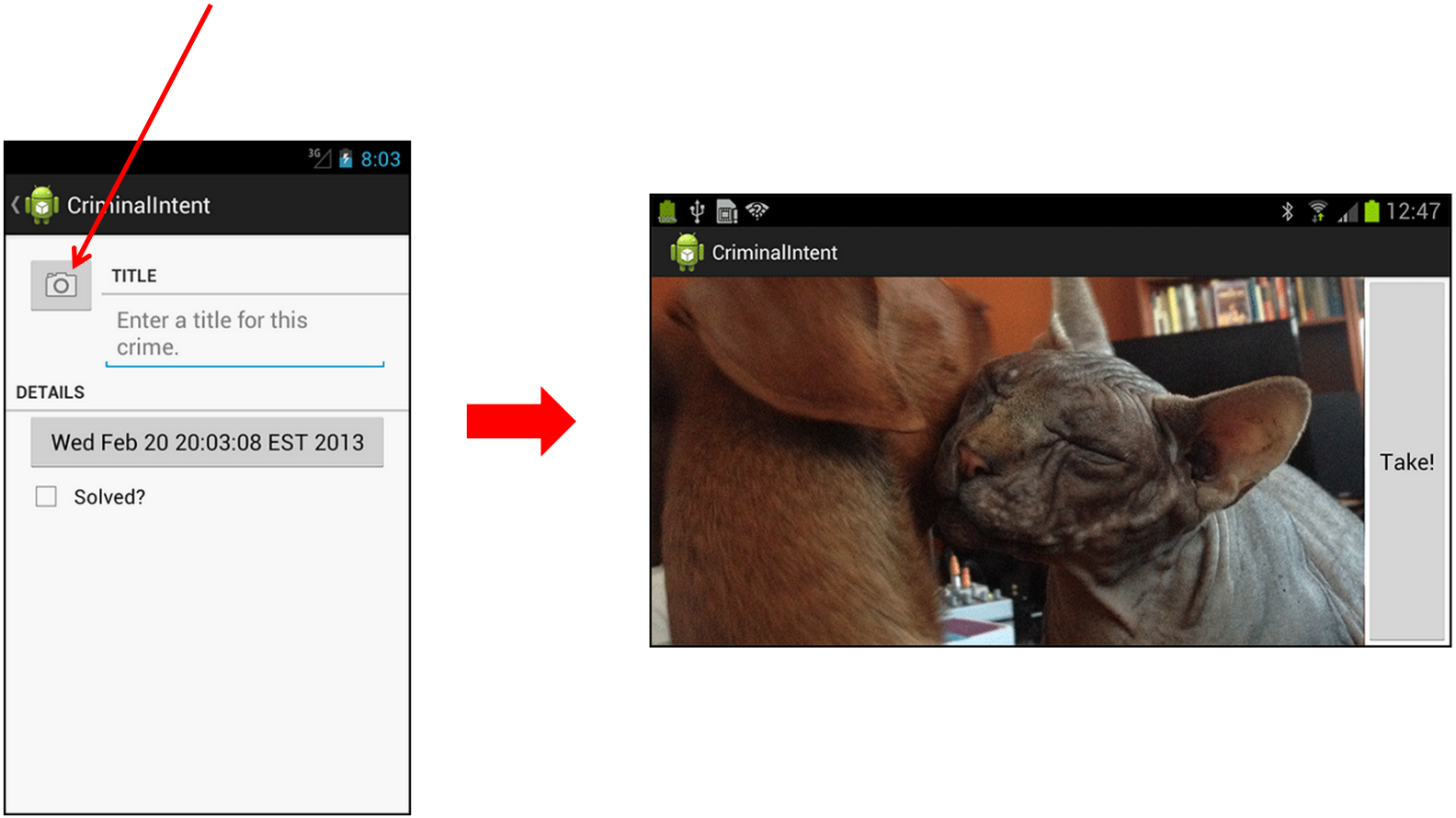
- **SurfaceHolder.Callback** has 3 methods:

1. **SurfaceCreated:** Called when view hierarchy containing **SurfaceView** is created
2. **SurfaceChanged:** Called when surface is first displayed
3. **SurfaceDestroyed:** Called when **SurfaceView** is destroyed

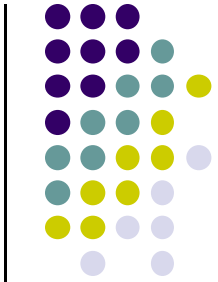
Adding Camera Start Button in CriminalIntent



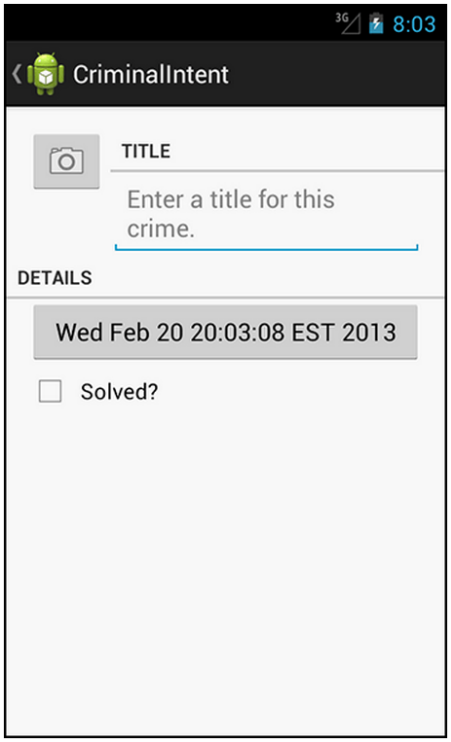
- Would like to add Button in **CriminalIntent** to launch camera

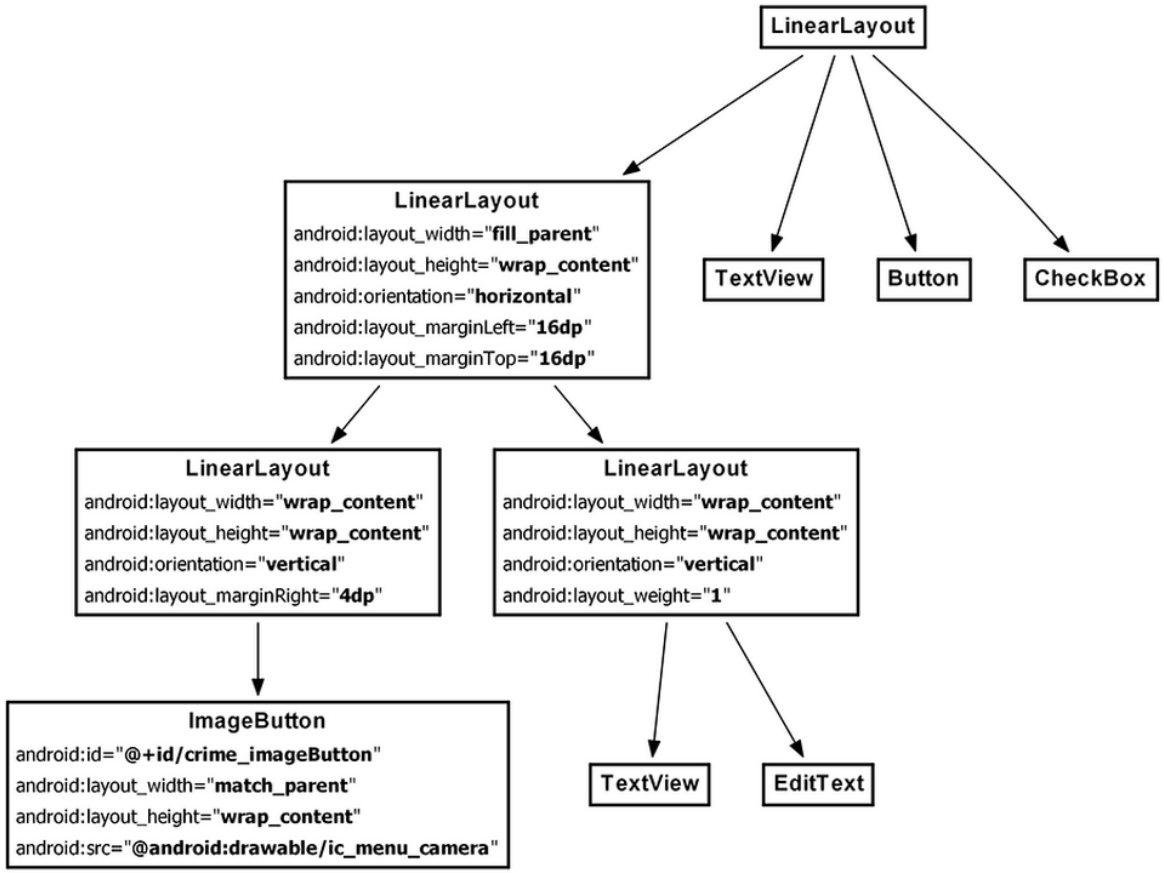


Adding Camera Start Button in CriminalIntent

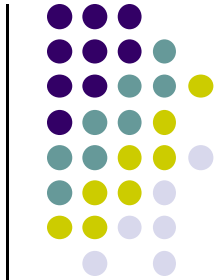


- Add 3 linearlayouts, rearrange widgets





Update CrimeFragment

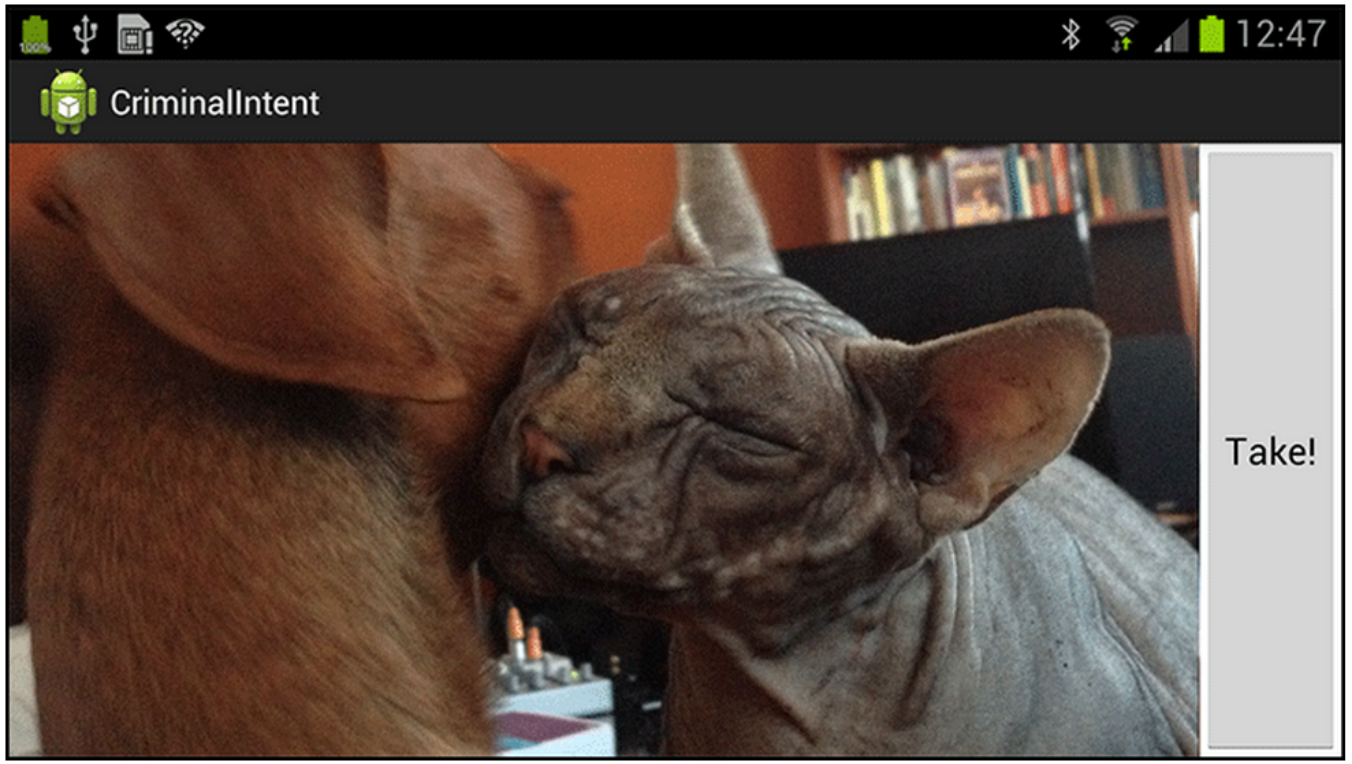


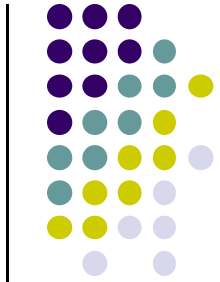
1. Add member variable for image button
2. Get reference to it
3. Set onClickListener that starts CrimeCameraActivity

```
public class CrimeFragment extends Fragment {

    private ImageButton mPhotoButton;

    ...
    public View onCreateView(LayoutInflater inflater, ViewGroup parent,
            Bundle savedInstanceState) {
        View v = inflater.inflate(R.layout.fragment_crime, parent, false);

        ...

        mPhotoButton = (ImageButton)v.findViewById(R.id.crime_imageButton);
        mPhotoButton.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent i = new Intent(getActivity(), CrimeCameraActivity.class);
                startActivity(i);
            }
        });

        return v;
    }
```

Final Result

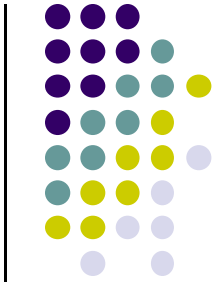
- Final Result after running App and clicking Camera Button



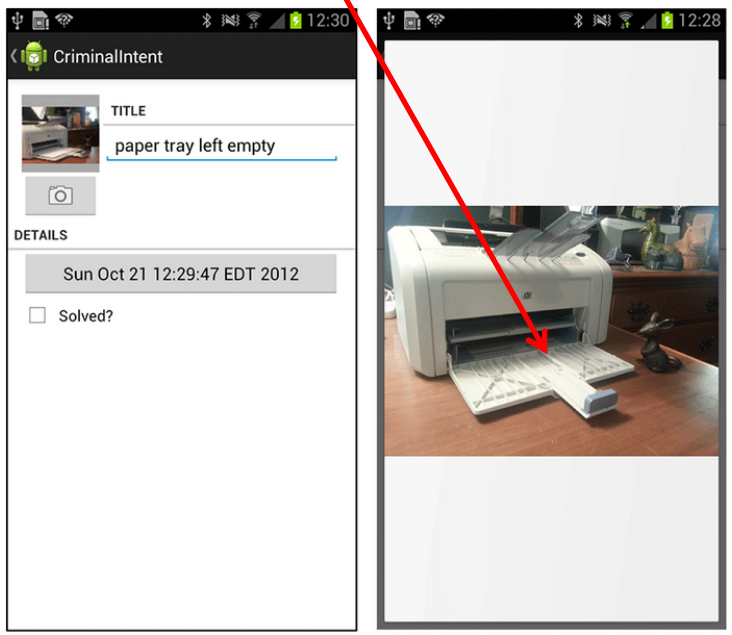


Camera II: Taking Pictures and Handling Images

Camera II: Taking Pictures and Handling Images (Ref: Chapter 20 Android Nerd Ranch)

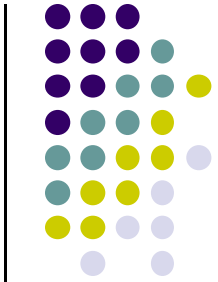


- **Goal:** Write program to:
  - Capture image from camera's preview
  - Save image as JPEG as part of a **Crime**
  - Display image in **CrimeFragment's view**
  - Offer user option to view larger version of image in **DialogFragment**



IMPORTANT: Read Android Nerd Ranch Chapter 20!!!!

References



- Busy Coder's guide to Android version 4.4
- CS 65/165 slides, Dartmouth College, Spring 2014
- CS 371M slides, U of Texas Austin, Spring 2014