CS 4518 Mobile and Ubiquitous Computing

Lecture 7: Fragments, Camera

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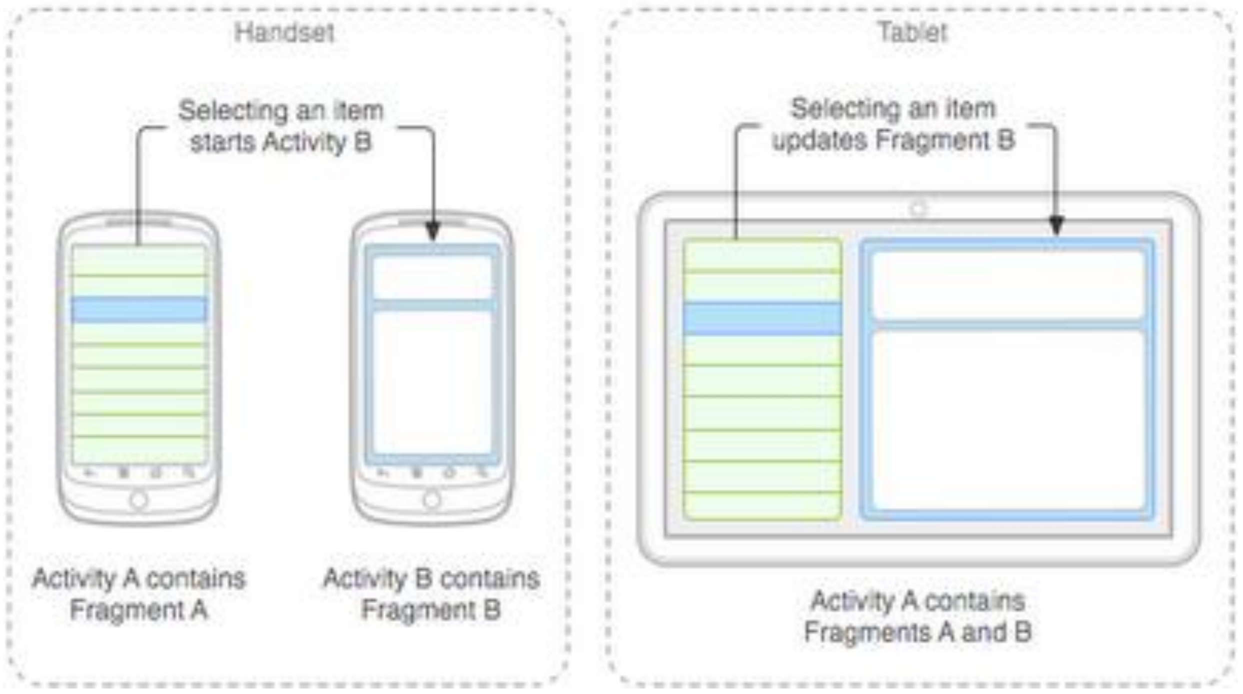
Fragments

Recall: Fragments

- Sub-components of an Activity (screen)
- An activity can contain multiple fragments, organized differently on different devices (e.g. phone vs tablet)
- Fragments need to be attached to Activities.

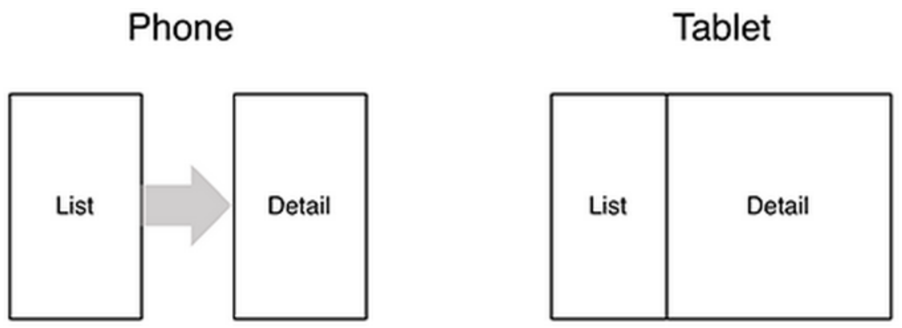


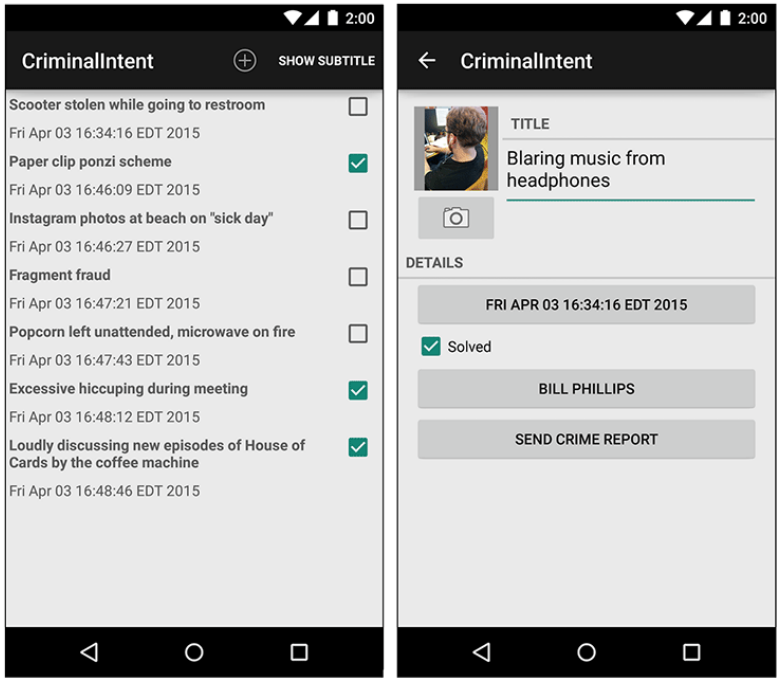
Handset
Selecting an item starts Activity B
Activity A contains Fragment A
Activity B contains Fragment B
Tablet
Selecting an item updates Fragment B
Activity A contains Fragments A and B

Fragments

Ref: Android Nerd Ranch (2nd ed), Ch 7, pg 121

- 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





Scooter stolen while going to restroom	☐
Fri Apr 03 16:34:16 EDT 2015	
Paper clip ponzi scheme	✓
Fri Apr 03 16:46:09 EDT 2015	
Instagram photos at beach on "sick day"	☐
Fri Apr 03 16:46:27 EDT 2015	
Fragment fraud	☐
Fri Apr 03 16:47:21 EDT 2015	
Popcorn left unattended, microwave on fire	☐
Fri Apr 03 16:47:43 EDT 2015	
Excessive hiccuping during meeting	✓
Fri Apr 03 16:48:12 EDT 2015	
Loudly discussing new episodes of House of Cards by the coffee machine	✓
Fri Apr 03 16:48:46 EDT 2015	

Blaring music from headphones

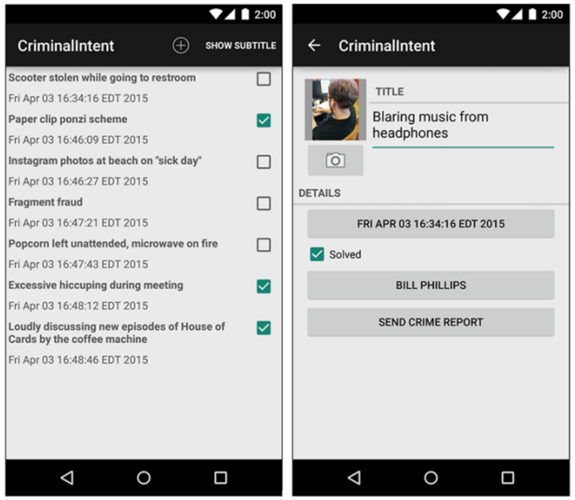
FRI APR 03 16:34:16 EDT 2015

✓ Solved

- **On tablet:** show list + detail
- **On phone:** swipe to show next crime

Fragments

- Activities can contain multiple fragments
- Fragment's views are inflated from a layout file
- Can rearrange fragments as desired on an activity
  - i.e. different arrangement on phone vs tablet


CriminalIntent — SHOW SUBTITLE

Scooter stolen while going to restroom Fri Apr 03 16:34:16 EDT 2015	☐
Paper clip ponzi scheme Fri Apr 03 16:46:09 EDT 2015	✓
Instagram photos at beach on "sick day" Fri Apr 03 16:46:27 EDT 2015	☐
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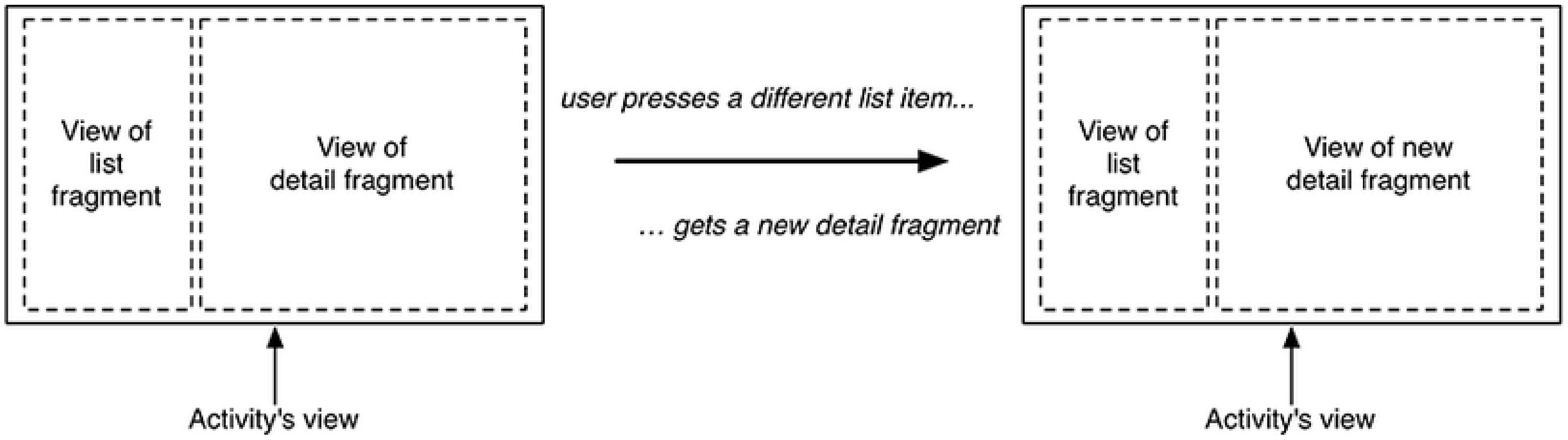
Popcorn left unattended, microwave on fire Fri Apr 03 16:47:43 EDT 2015	☐
Excessive hiccuping during meeting Fri Apr 03 16:48:12 EDT 2015	✓
Loudly discussing new episodes of House of Cards by the coffee machine Fri Apr 03 16:48:46 EDT 2015	✓

CriminalIntent

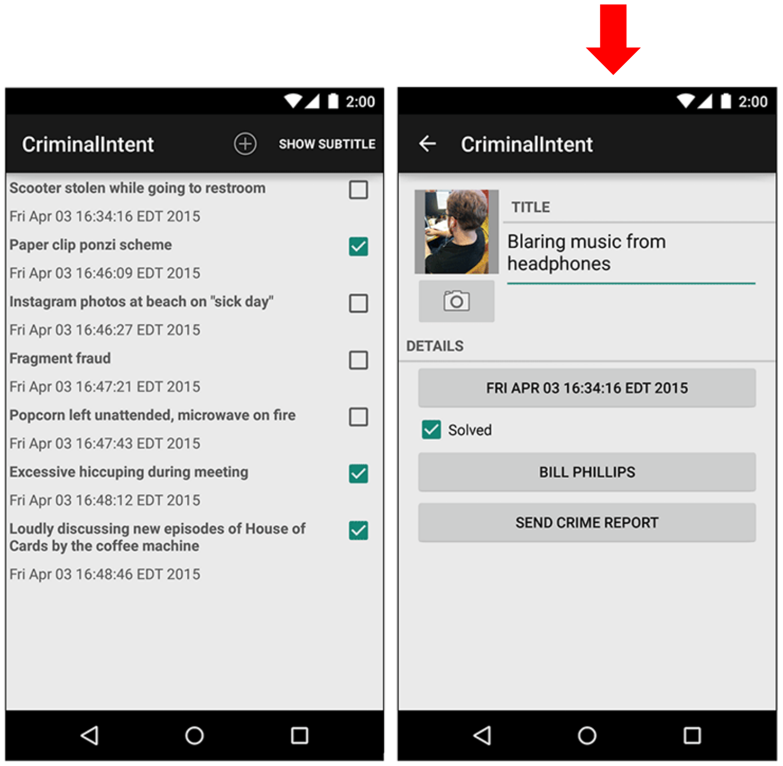
TITLE
Blaring music from headphones

DETAILS
FRI APR 03 16:34:16 EDT 2015
✓ Solved
BILL PHILLIPS
SEND CRIME REPORT



Starting Criminal Intent

- Initially, develop detail view of **CriminalIntent** using Fragments



2:00

CriminalIntent ⊕ SHOW SUBTITLE

Scooter stolen while going to restroom ☐
Fri Apr 03 16:34:16 EDT 2015
Paper clip ponzi scheme ✓
Fri Apr 03 16:46:09 EDT 2015
Instagram photos at beach on "sick day" ☐
Fri Apr 03 16:46:27 EDT 2015
Fragment fraud ☐
Fri Apr 03 16:47:21 EDT 2015
Popcorn left unattended, microwave on fire ☐
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Excessive hiccuping during meeting ✓
Fri Apr 03 16:48:12 EDT 2015
Loudly discussing new episodes of House of Cards by the coffee machine ✓
Fri Apr 03 16:48:46 EDT 2015

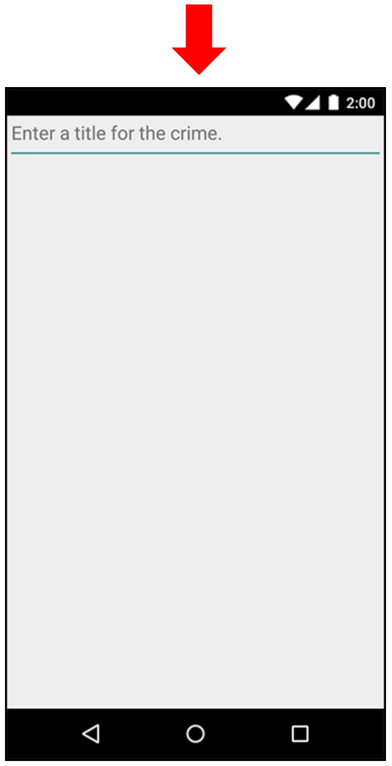
2:00

← CriminalIntent

TITLE
Blaring music from headphones

DETAILS
FRI APR 03 16:34:16 EDT 2015
✓ Solved
BILL PHILLIPS
SEND CRIME REPORT

Final Look of CriminalIntent



2:00

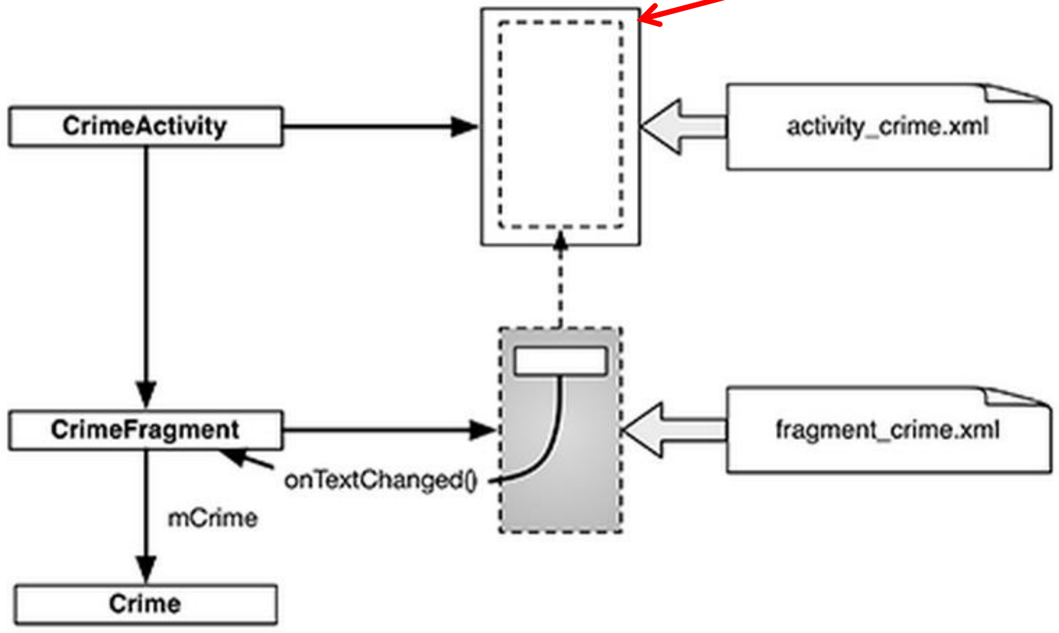
Enter a title for the crime.

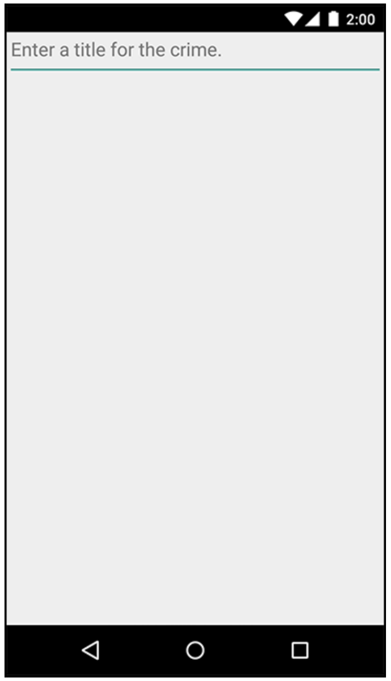
Start small
Develop detail view using Fragments

Starting Criminal Intent

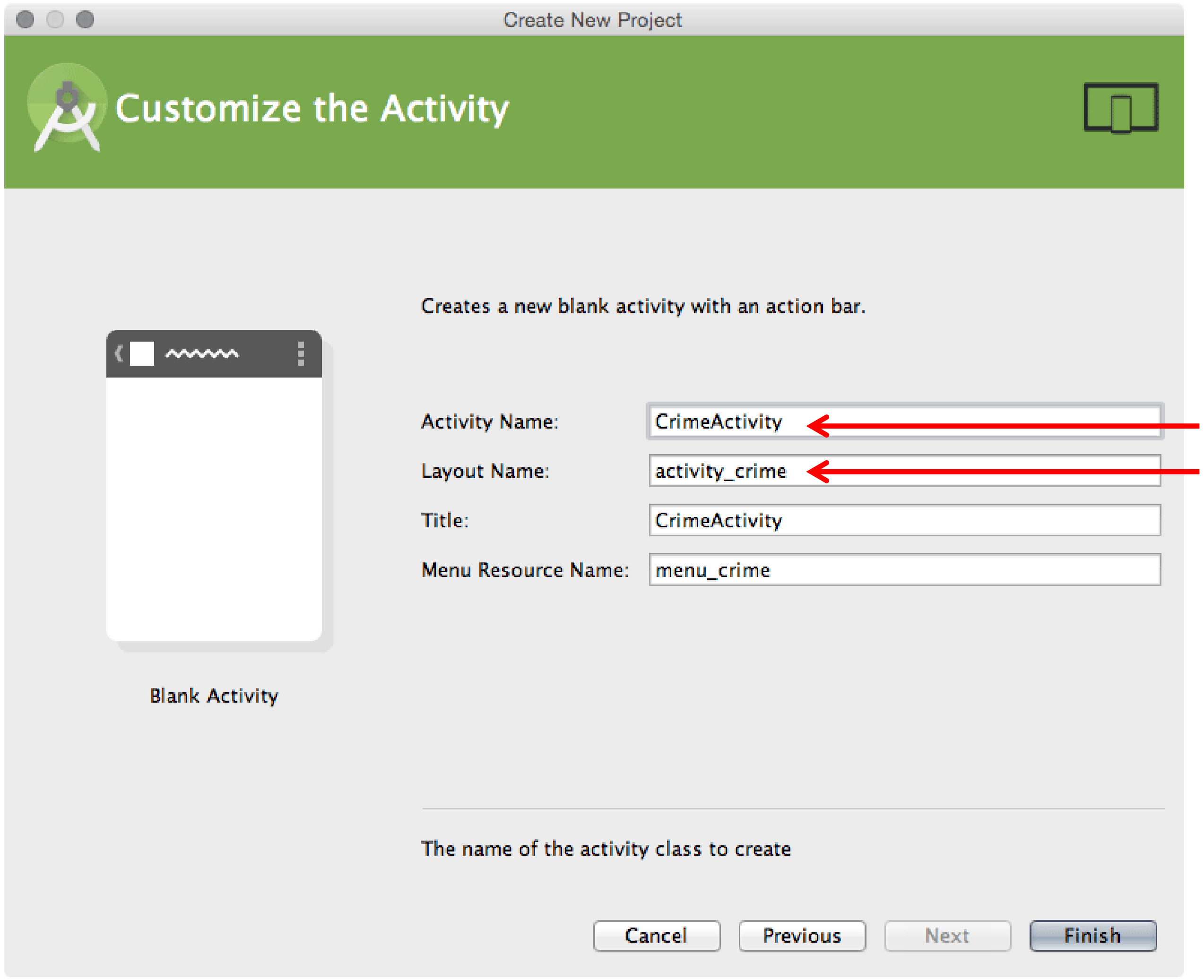
- **Crime:** holds record of 1 office crime. Has
  - **Title** e.g. “Someone stole my yogurt!”
  - **ID:** unique identifier of crime
- **CrimeFragment:** UI fragment to display Crime Details
- **CrimeActivity:** Activity that contains **CrimeFragment**

Next: Create CrimeActivity





Create CrimeActivity in Android Studio



Create New Project

Customize the Activity

Creates a new blank activity with an action bar.

Activity Name: CrimeActivity

Layout Name: activity_crime

Title: CrimeActivity

Menu Resource Name: menu_crime

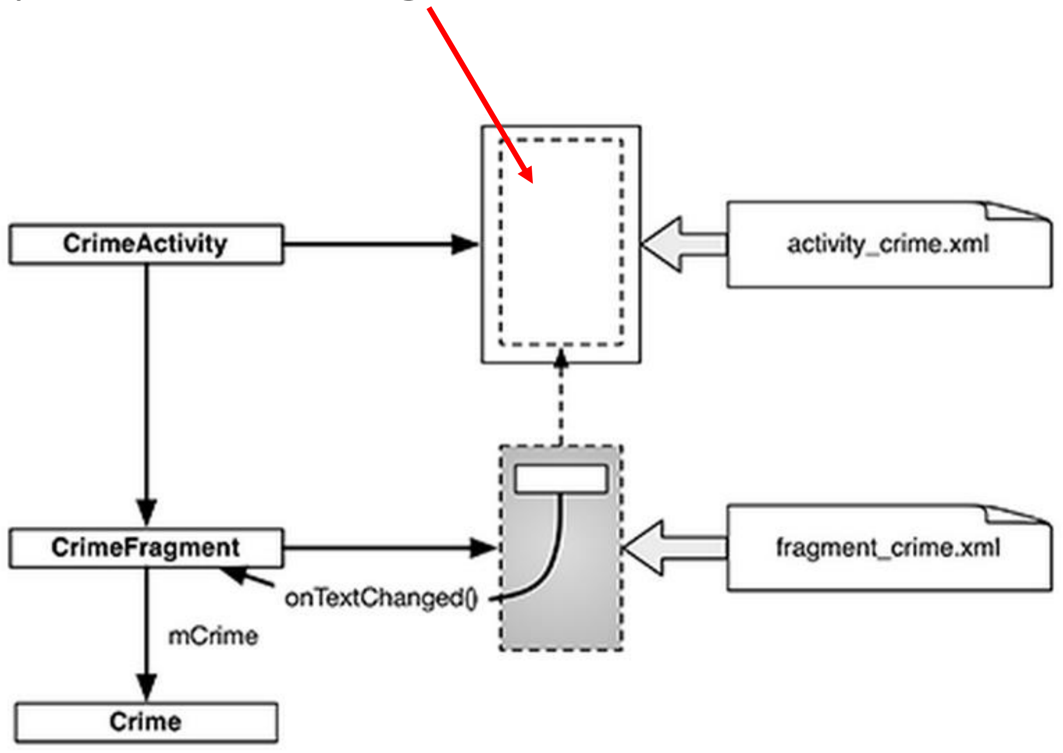
The name of the activity class to create

Creates CrimeActivity.java

Formatted using activity_crime.xml

Fragment Hosted by an Activity

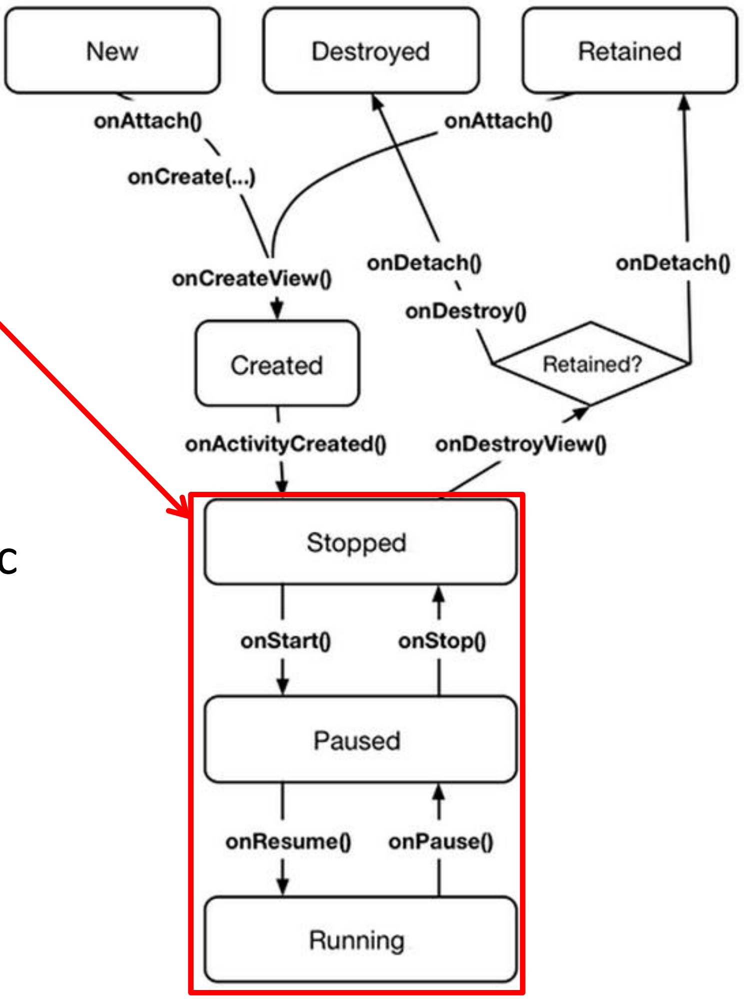
- Each fragment must be hosted by an Activity
- To host a UI fragment, an activity must
  - Define a spot in its layout for the fragment
  - Manage the lifecycle of the fragment instance (next)
- E.g.: **CrimeActivity** defines “spot” for **CrimeFragment**



Fragment's Life Cycle

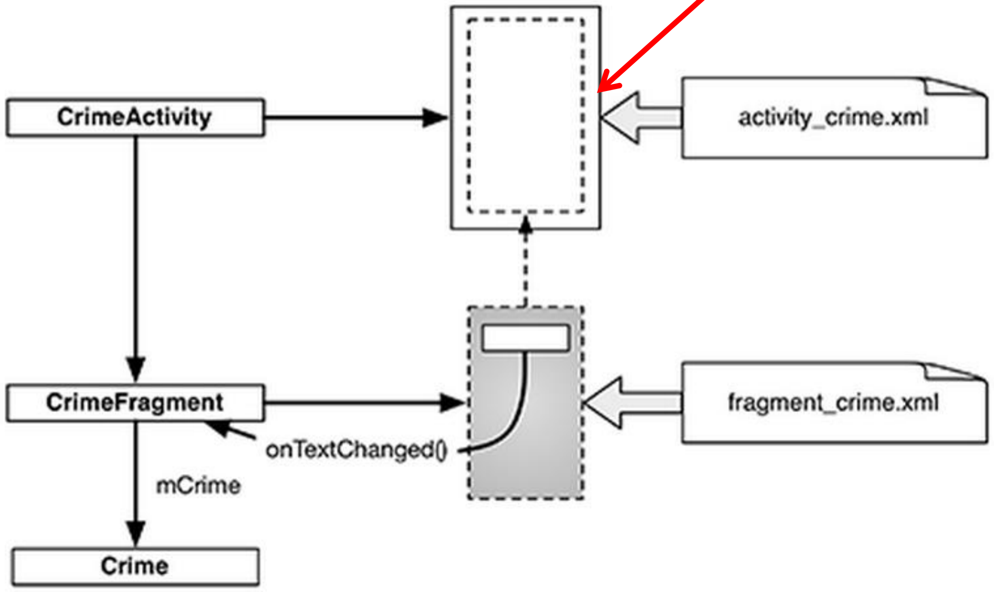
- Fragment's lifecycle similar to activity lifecycle
  - Has states **running**, **paused** and **stopped**
  - Also has some similar activity lifecycle methods (e.g. **onPause()**, **onStop( )**, etc)

- **Key difference:**
  - Android OS calls Activity's onCreate, onPause( ), etc
  - Fragment's **onCreateView( )**, onPause( ), etc **called by hosting activity NOT Android OS!**
  - E.g. Fragment has **onCreateView**



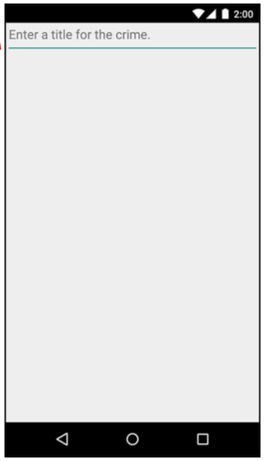
Hosting UI Fragment in an Activity

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



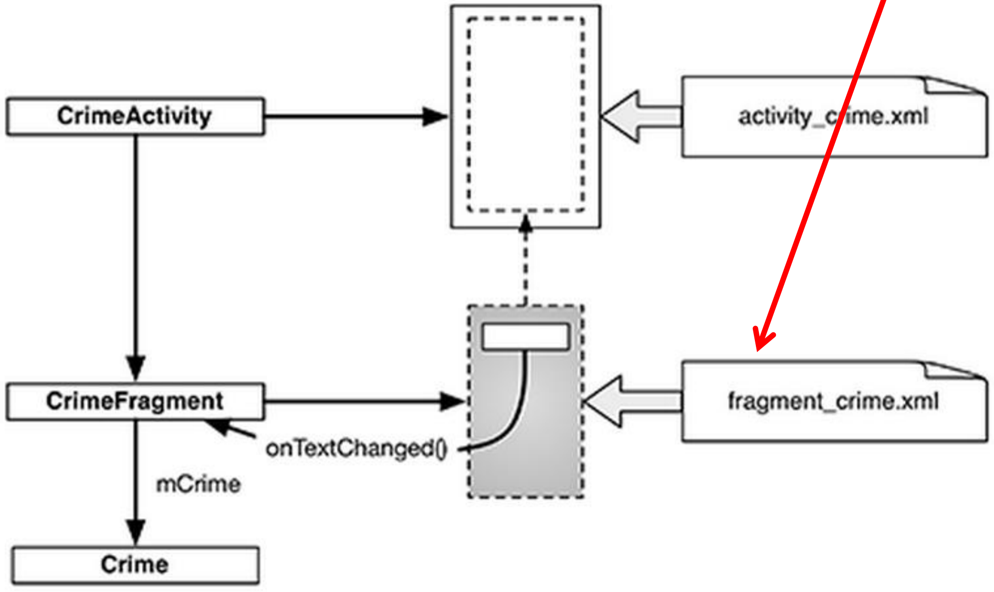
FrameLayout

```
xmlns:android="http://schemas.android.com/apk/res/android"
android:id="@+id/fragment_container"
android:layout_width="match_parent"
android:layout_height="match_parent"
```

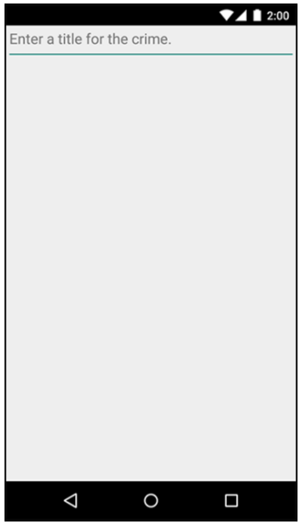


Creating a UI Fragment

- Creating Fragment is similar to creating activity
  1. Define widgets in a layout (XML) file
  2. Create java class and specify layout file as XML file above
  3. Get references of inflated widgets in java file (findviewbyId), etc
- XML layout file for **CrimeFragment (fragment_crime.xml)**

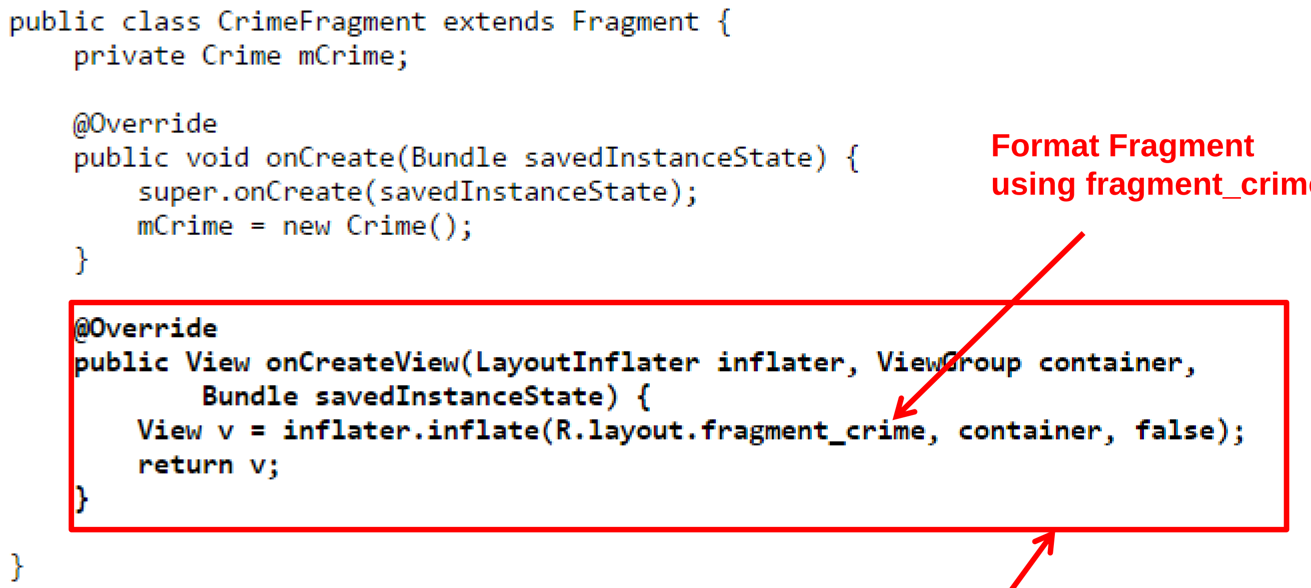


```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  android:orientation="vertical"
  >
  <EditText android:id="@+id/crime_title"
    android:layout_width="match_parent"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



Java File for CrimeFragment

- In **CrimeFragment** Override CrimeFragment's **onCreate( )** function



```java
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 container,
            Bundle savedInstanceState) {
        View v = inflater.inflate(R.layout.fragment_crime, container, false);
        return v;
    }
}
```

Format Fragment using fragment_crime.xml

- **Note:** Fragment's view inflated in **Fragment.onCreateView()**, NOT **onCreate**

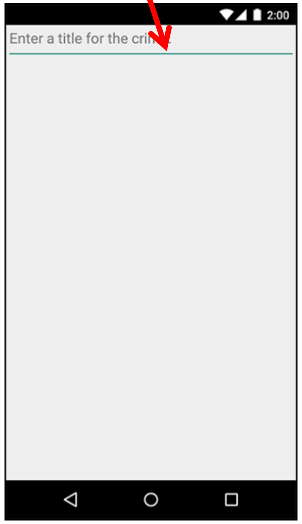
Wiring up the EditText Widget

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

    ...

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

        mTitleField = (EditText)v.findViewById(R.id.crime_title);
        mTitleField.addTextChangedListener(new TextWatcher() {
            @Override
            public void beforeTextChanged(
                CharSequence s, int start, int count, int after) {
                // This space intentionally left blank
            }

            @Override
            public void onTextChanged(
                CharSequence s, int start, int before, int count) {
                mCrime.setTitle(s.toString());
            }

            @Override
            public void afterTextChanged(Editable s) {
                // This one too
            }
        });

        return v;
    }
}
```

Add listener to listen for text change events

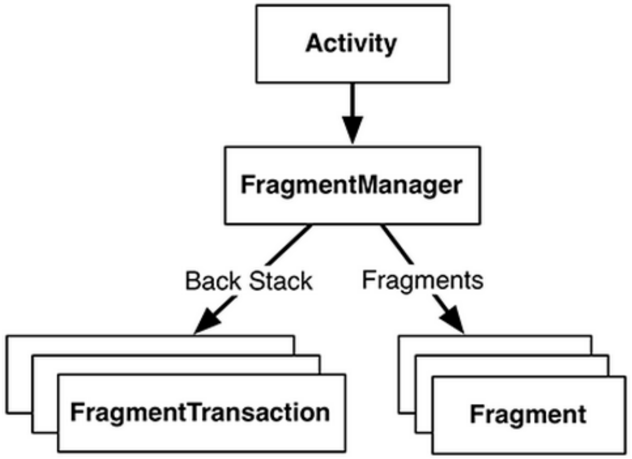
Get handle to EditText widget

Store user's input as Crime Title (if text entered)



Adding UI Fragment to FragmentManager

- We add new fragment to activity using **FragmentManager**
- **FragmentManager**
  - Manages fragments
  - Adds fragment's views to activity's view
  - Handles
    - List of fragment
    - Back stack of fragment transactions



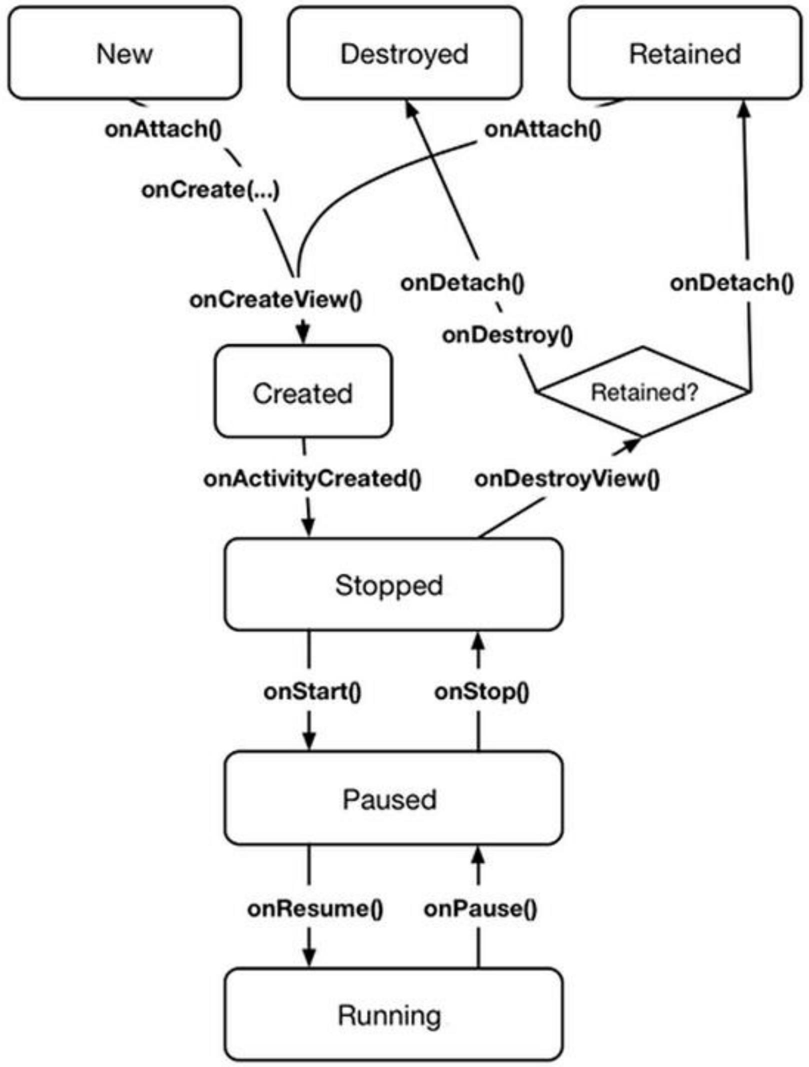
```
public class CrimeActivity extends FragmentActivity {

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

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

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

Find Fragment using its ID

Interactions with FragmentManager are done using transactions

Add Fragment to activity's view

Examining Fragment's Lifecycle



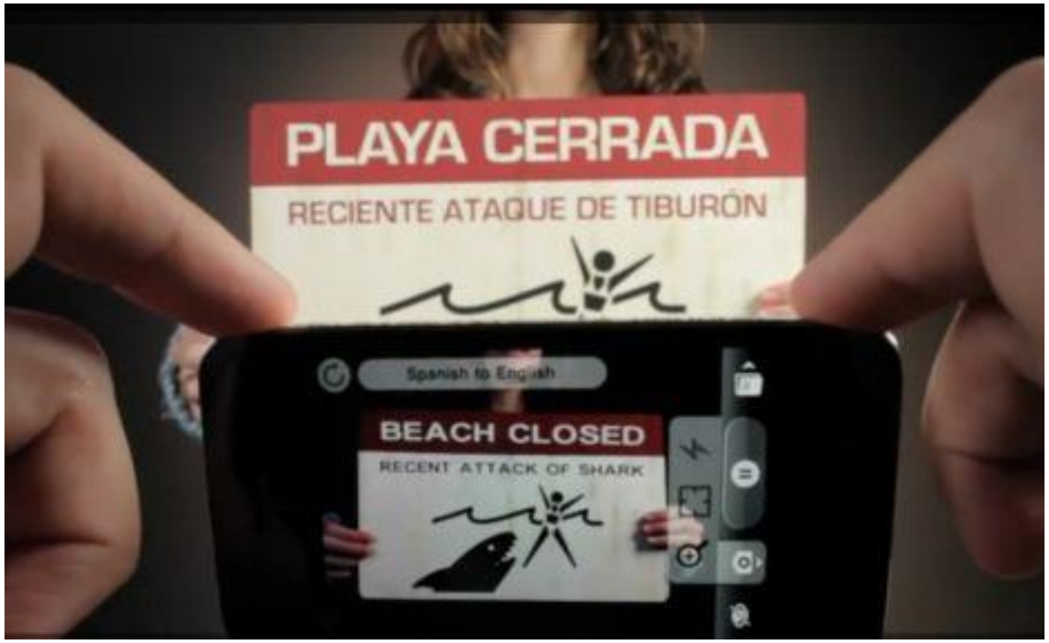
- **FragmentManager** calls fragment lifecycle methods
- **onAttach( ), onCreate( )** and **onCreateView()** called when a fragment is added to **FragmentManager**
- **onActivityCreated( )** called after hosting activity's **onCreate( )** method is executed
- If fragment is added to already running Activity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

The Mobile Camera

Interesting application

Mobile App: Word Lens

- Translates signs in foreign Language
- Google bought company. Now integrated into Google Translate
- [Video]



Camera:Taking Pictures

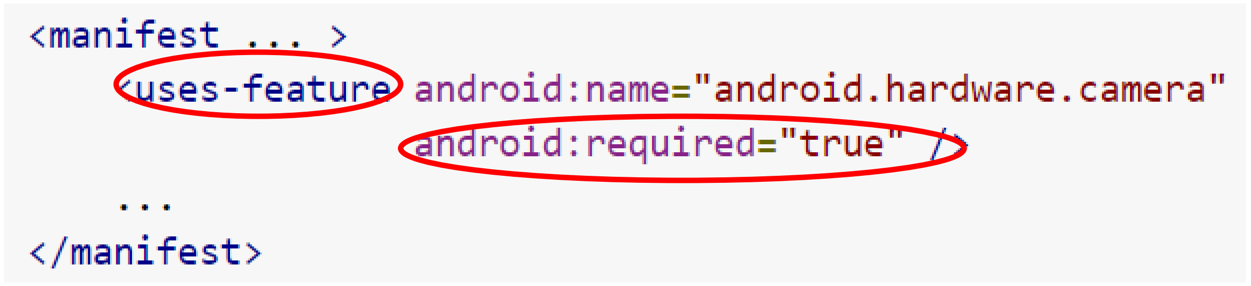
Taking Pictures with Camera

Ref: https://developer.android.com/training/camera/photobasics.html

- How to take photos from your app using existing Android Camera app
- Steps:
  1. Request Camera Permission
  2. Take a Photo with the Camera App
  3. Get the Thumbnail
  4. Save the Full-size Photo

Request Permission to Use SmartPhone Camera

- If your app takes pictures using Android Camera, on Google Play, can make your app visible only to devices with a camera
- E.g. This app requires a smartphone camera
- Make the following declaration in AndroidManifest.xml



```
<manifest ... >
    <uses-feature android:name="android.hardware.camera"
                  android:required="true" />
    ...
</manifest>
```

Take a Photo with the Camera App

- To take picture, your app needs to send **Intent** to Android's Camera app, (i.e. action is capture an image)
- Potentially, multiple apps/activities can handle take a picture
- Check that at least 1 Activity that can handle request to take picture using **resolveActivity**
- Call **startActivityForResult( )** with Camera intent since picture sent back

```
static final int REQUEST_IMAGE_CAPTURE = 1;

private void dispatchTakePictureIntent() {
    Intent takePictureIntent = new Intent(MediaStore.ACTION_IMAGE_CAPTURE);
    if (takePictureIntent.resolveActivity(getPackageManager()) != null) {
        startActivityForResult(takePictureIntent, REQUEST_IMAGE_CAPTURE);
    }
}
```

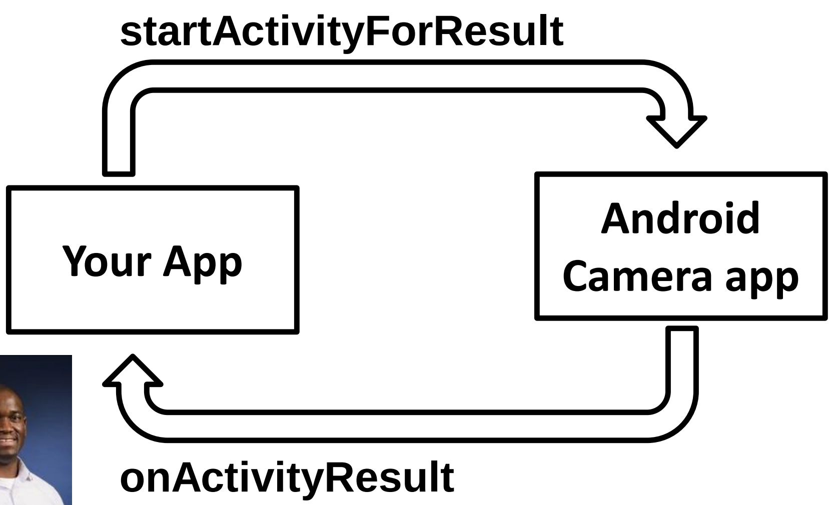
Build Intent describing taking a picture

Check that there's at least 1 Activity that can handle request to take picture

Send Intent requesting taking a picture (usually handled by Android's Camera app)

Get the Thumbnail

- Android Camera app returns thumbnail of photo (small bitmap)
- Thumbnail returned in “extra” of **Intent** delivered to **onActivityResult( )**



```
protected void onActivityResult(int requestCode, int resultCode, Intent data
    if (requestCode == REQUEST_IMAGE_CAPTURE && resultCode == RESULT_OK) {
        Bundle extras = data.getExtras();
        Bitmap imageBitmap = (Bitmap) extras.get("data");
        mImageView.setImageBitmap(imageBitmap);
    }
}
```

Save Full-Sized Photo

Ref: https://developer.android.com/training/basics/data-storage/files.html

- Android Camera app can save full-size photo to
  1. **Public external storage** (shared by all apps)
     - **getExternalStoragePublicDirectory( )**
     - Need to get permission
  2. **Private storage** (Seen by only your app, deleted when your app uninstalls):
     - **getExternalFilesDir( )**
- Either way, need phone owner's permission to write to external storage
- In AndroidManifest.xml, make the following declaration

```
<manifest ...>
    <uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE" />
    ...
</manifest>
```

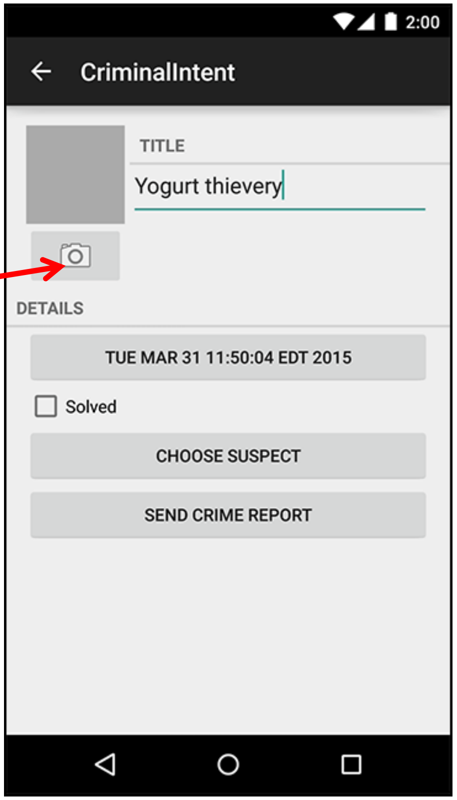
Taking Pictures: Bigger Example

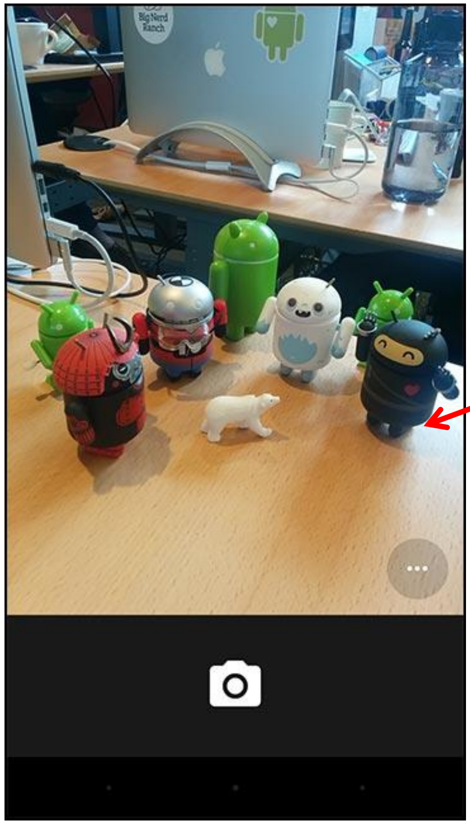
Taking Pictures with Intents

Ref: Ch 16 Android Nerd Ranch 2nd edition

- Would like to take picture of "Crime" to document it
- Use implicit intent to start Camera app from our CrimeIntent app
- **Recall:** Implicit intent used to call component in different activity

Click here to take picture

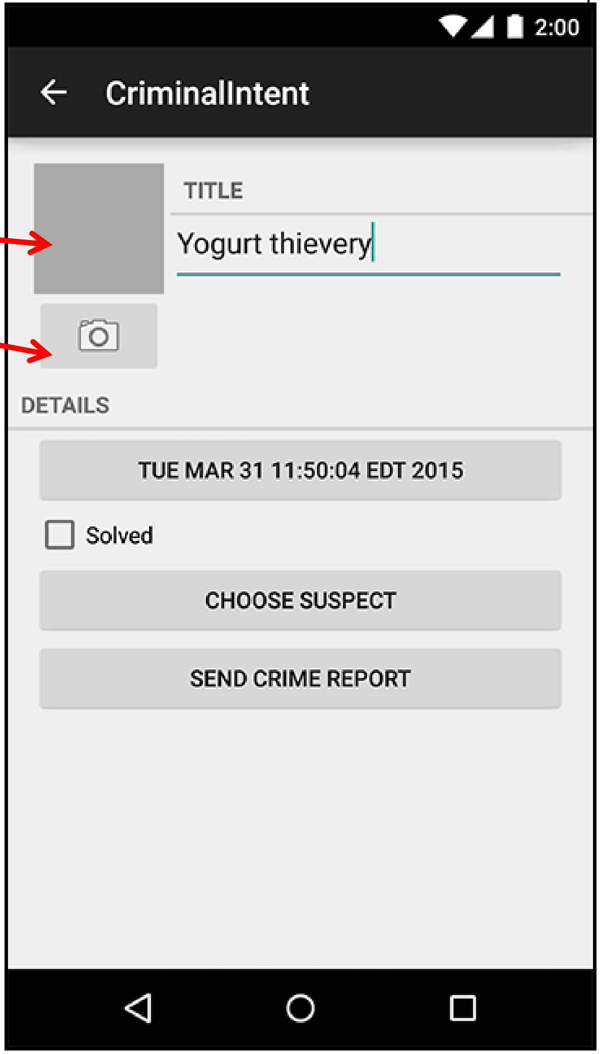




Launches Camera app

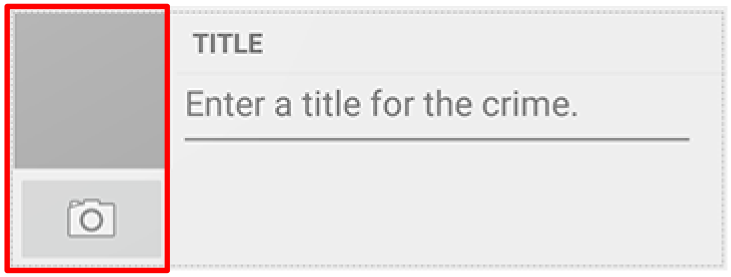
Create Placeholder for Picture

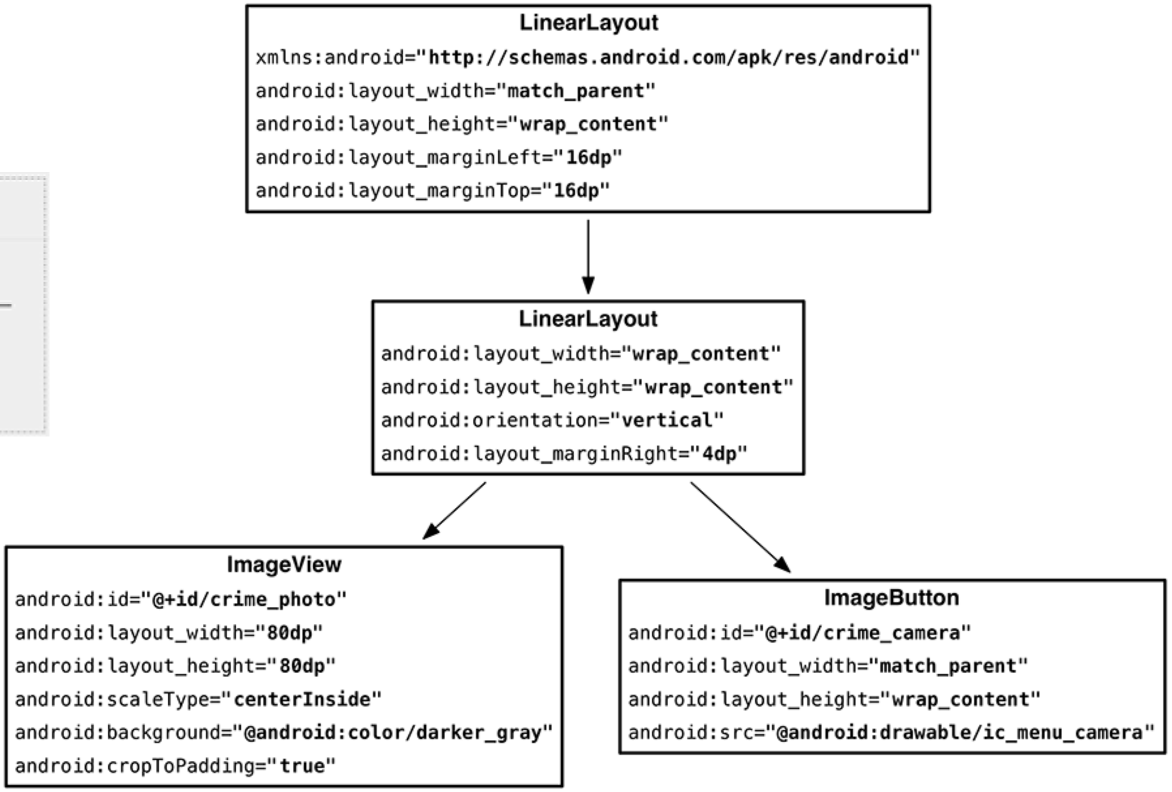
- Modify layout to include
  - ImageView for picture
  - Button to take picture



Create Layout for Thumbnail and Button

- First, build out left side

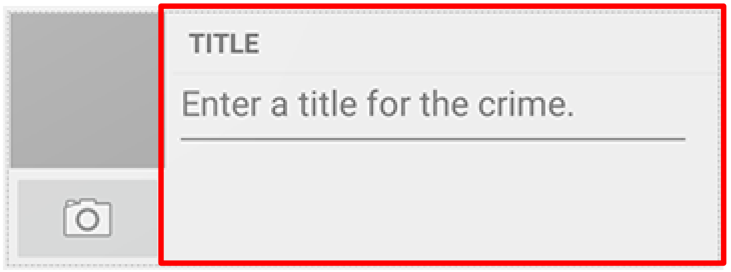


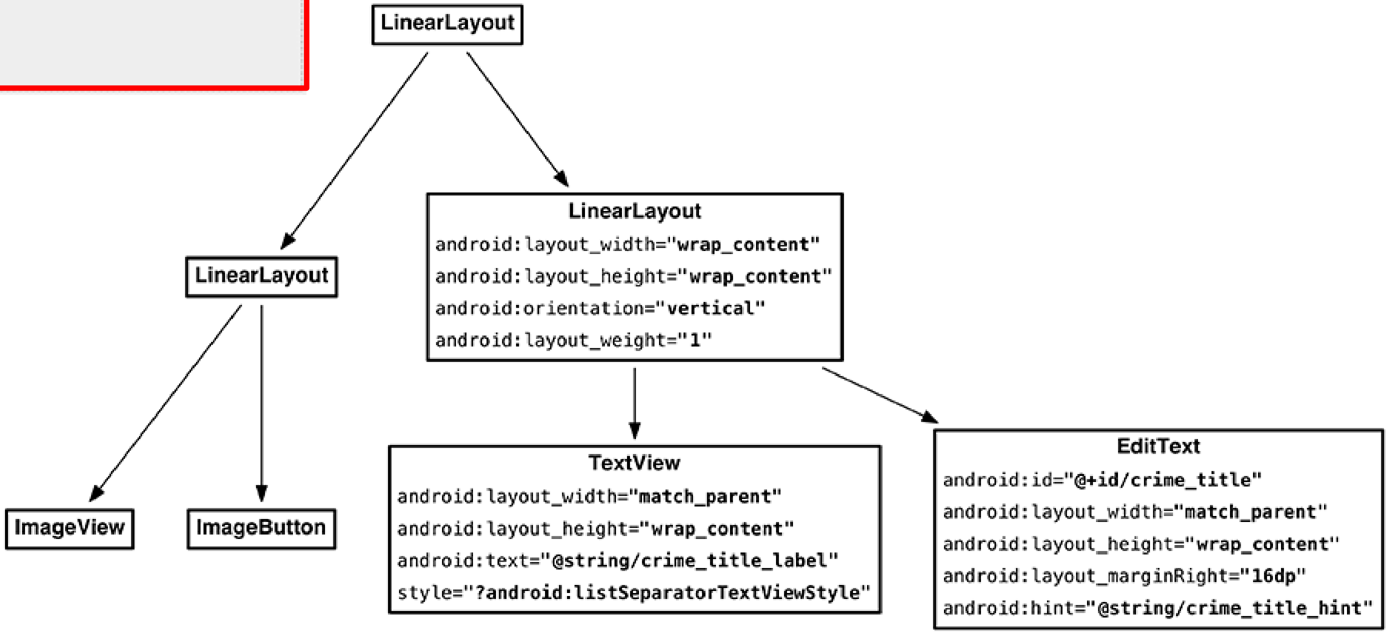


```
LinearLayout
xmlns:android="http://schemas.android.com/apk/res/android"
android:layout_width="match_parent"
android:layout_height="wrap_content"
android:layout_marginLeft="16dp"
android:layout_marginTop="16dp"

    LinearLayout
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="vertical"
    android:layout_marginRight="4dp"

        ImageView
        android:id="@+id/crime_photo"
        android:layout_width="80dp"
        android:layout_height="80dp"
        android:scaleType="centerInside"
        android:background="@android:color/darker_gray"
        android:cropToPadding="true"

        ImageButton
        android:id="@+id/crime_camera"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:src="@android:drawable/ic_menu_camera"
```

Create Camera and Title

- Build out right side





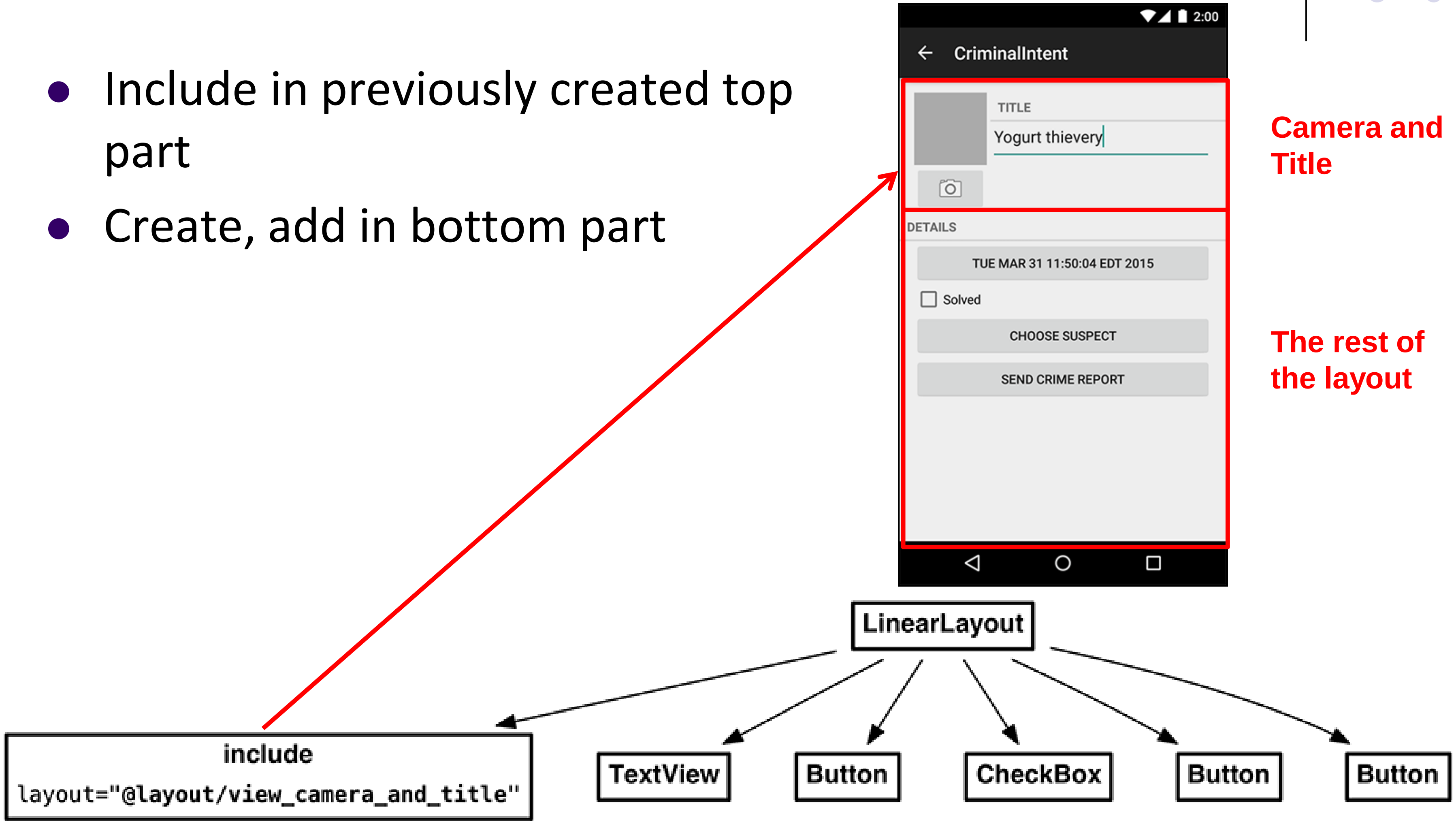
```
LinearLayout
android:layout_width="wrap_content"
android:layout_height="wrap_content"
android:orientation="vertical"
android:layout_weight="1"
```

```
TextView
android:layout_width="match_parent"
android:layout_height="wrap_content"
android:text="@string/crime_title_label"
style="?android:listSeparatorTextViewStyle"
```

```
EditText
android:id="@+id/crime_title"
android:layout_width="match_parent"
android:layout_height="wrap_content"
android:layout_marginRight="16dp"
android:hint="@string/crime_title_hint"
```

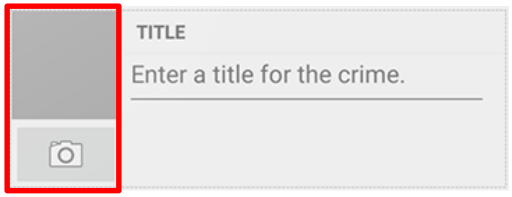
Include Camera and Title in Layout

- Include in previously created top part
- Create, add in bottom part



Get Handle of Camera Button and ImageView

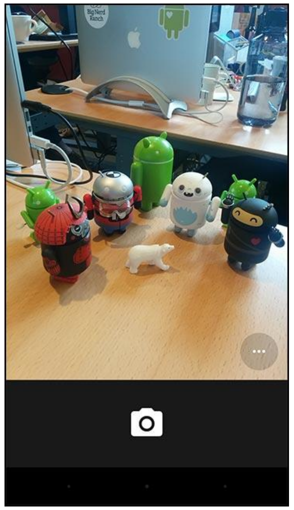
- To respond to Camera Button click, in camera fragment, need handles to
  - Camera button
  - ImageView



```
...
private CheckBox mSolvedCheckbox;
private Button mSuspectButton;
private ImageButton mPhotoButton;
private ImageView mPhotoView;

...

@Override
public View onCreateView(LayoutInflater inflater, ViewGroup container,
                         Bundle savedInstanceState) {
    ...

    PackageManager packageManager = getActivity().getPackageManager();
    if (packageManager.resolveActivity(pickContact,
            PackageManager.MATCH_DEFAULT_ONLY) == null) {
        mSuspectButton.setEnabled(false);
    }

    mPhotoButton = (ImageButton) v.findViewById(R.id.crime_camera);
    mPhotoView = (ImageView) v.findViewById(R.id.crime_photo);

    return v;
}

...
```

Firing Camera Intent

```
...

private static final int REQUEST_DATE = 0;
private static final int REQUEST_CONTACT = 1;
private static final int REQUEST_PHOTO= 2;

...

@Override
public View onCreateView(LayoutInflater inflater, ViewGroup container,
                              Bundle savedInstanceState) {
    ...

    mPhotoButton = (ImageButton) v.findViewById(R.id.crime_camera);
    final Intent captureImage = new Intent(MediaStore.ACTION_IMAGE_CAPTURE);

    boolean canTakePhoto = mPhotoFile != null &&
            captureImage.resolveActivity(packageManager) != null;
    mPhotoButton.setEnabled(canTakePhoto);

    if (canTakePhoto) {
        Uri uri = Uri.fromFile(mPhotoFile);
        captureImage.putExtra(MediaStore.EXTRA_OUTPUT, uri);
    }

    mPhotoButton.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            startActivityForResult(captureImage, REQUEST_PHOTO);
        }
    });

    mPhotoView = (ImageView) v.findViewById(R.id.crime_photo);

    return v;
}
```



Create new intent for image capture

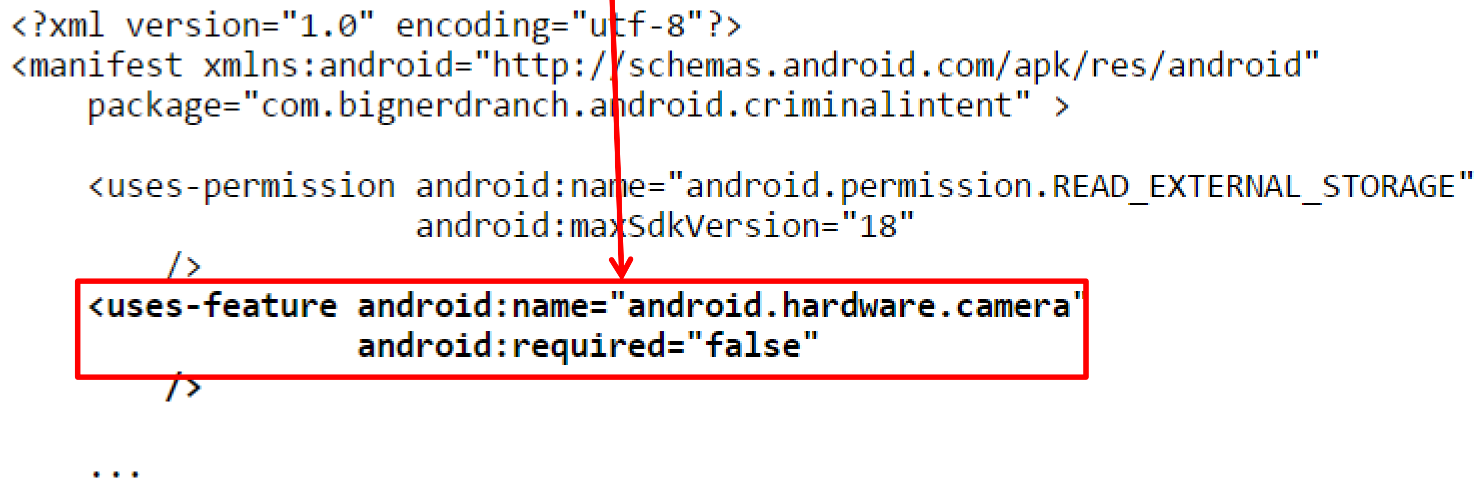
Check with PackageManager that a Camera exists on this phone

Build Intent to capture image, store at uri location

Take picture when button is clicked

Declaring Features

- Declaring “uses-features” in Android manifest means only cameras with that feature will “see” this app for download on the app store
- E.g. declaring “uses-feature… android.hardware.camera”, only phones with cameras will see this for download



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

    <uses-permission android:name="android.permission.READ_EXTERNAL_STORAGE"
                     android:maxSdkVersion="18"
        />
    <uses-feature android:name="android.hardware.camera"
                  android:required="false"
        />

    ...
```

References

- Google Camera "Taking Photos Simply" Tutorials, http://developer.android.com/training/camera/photobasics.html
- 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