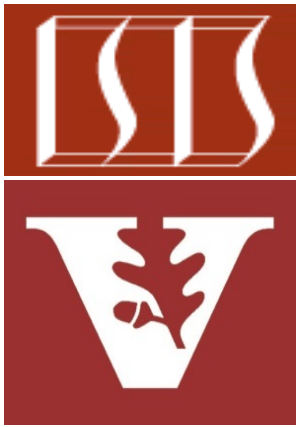
Introduction to Android Activities (Part 1)



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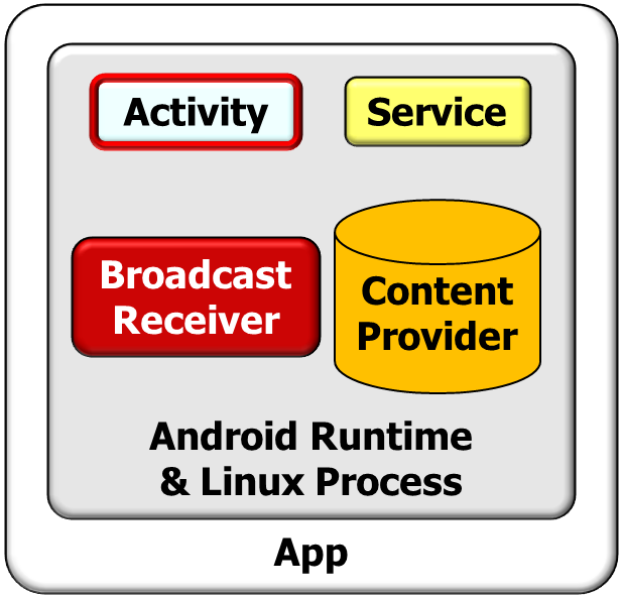
Institute for Software Integrated Systems
Vanderbilt University
Nashville, Tennessee, USA

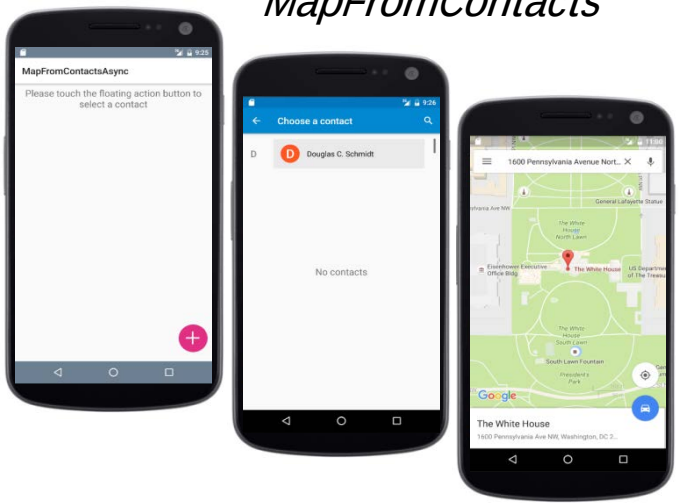
Learning Objectives in this Part of the Lesson

- Know how an activity defines a user-facing operation that's displayed on a device screen

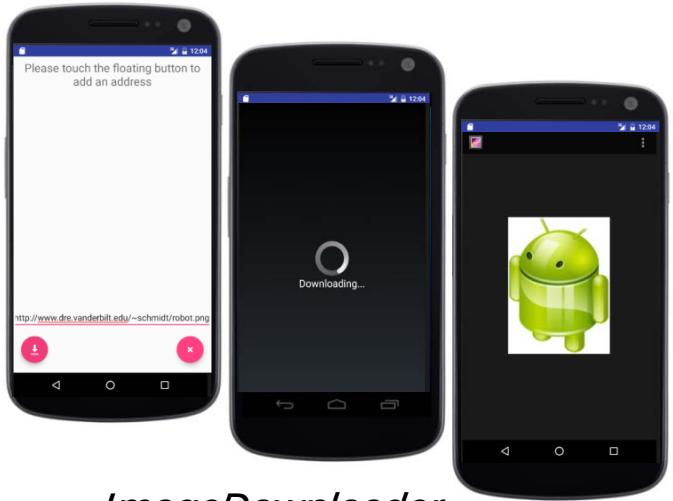


Learning Objectives in this Part of the Lesson

- Know how an activity defines a user-facing operation that's displayed on a device screen
- Recognize the various apps used as case studies throughout this module



MapFromContacts



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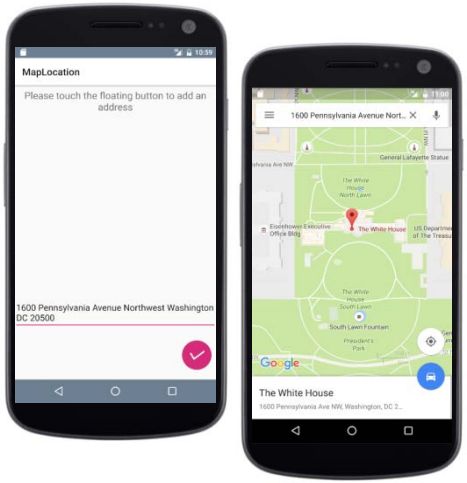

MapLocation

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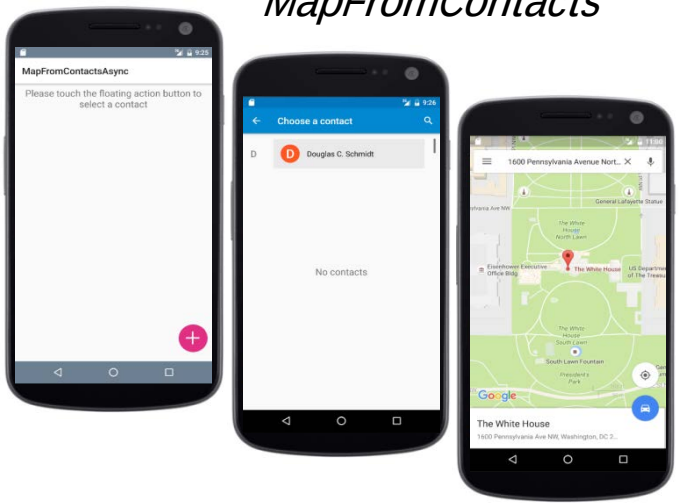

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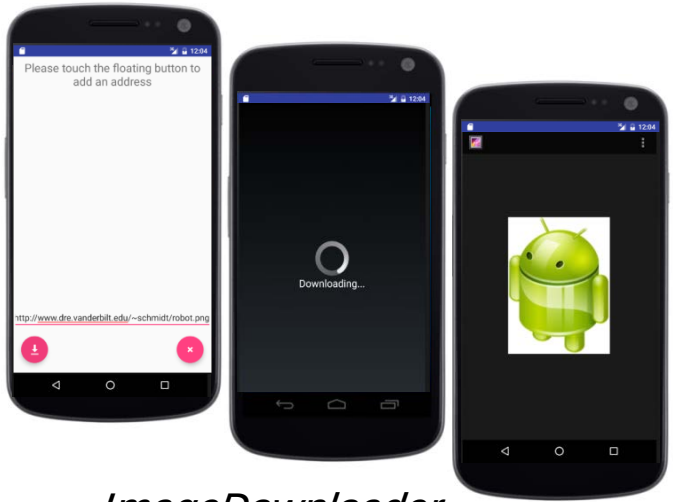

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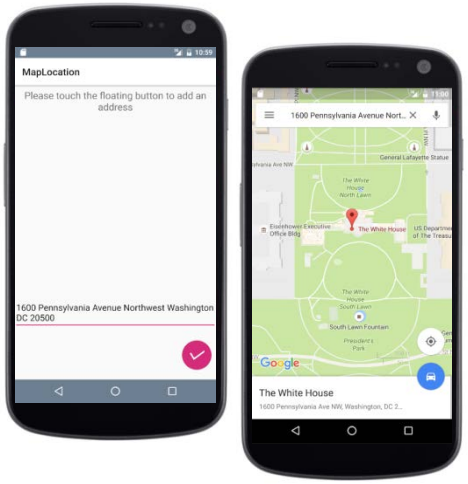

MapLocation

The source code for all these apps is available at www.gitlab.com

Learning Objectives in this Part of the Lesson

- Know how an activity defines a user-facing operation that's displayed on a device screen
- Recognize the various apps used as case studies throughout this module
- Understand the general steps used to implement an activity

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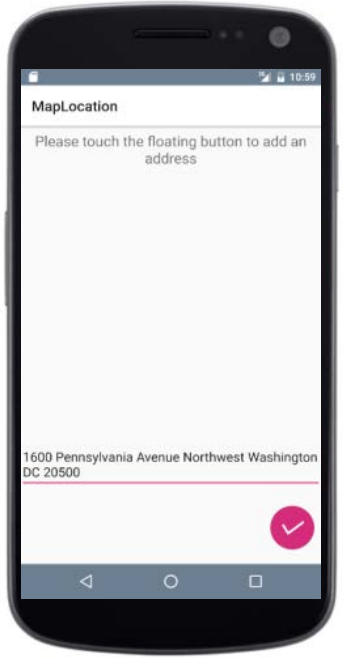
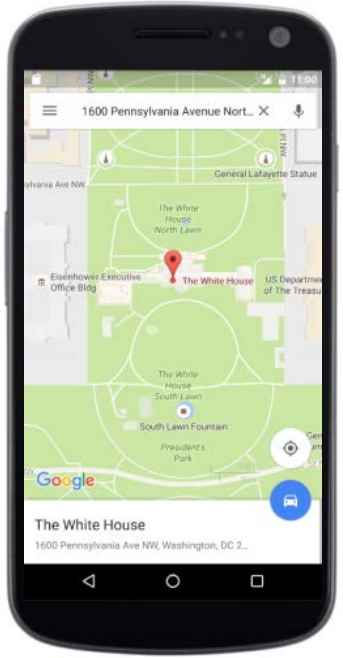


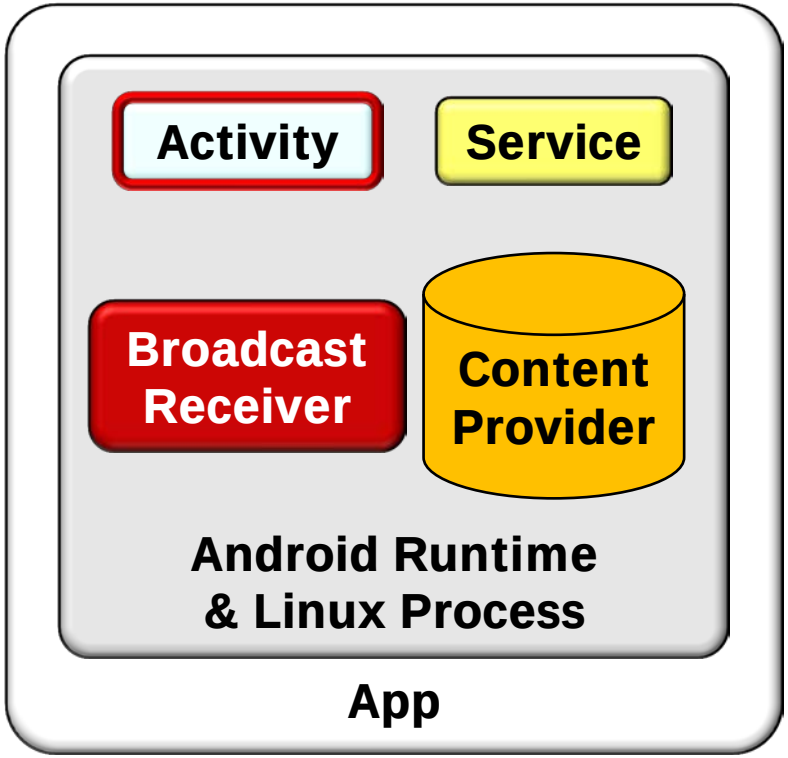


Part 2 will then show how these steps are applied in the MapLocation app

Overview of Android Activities

Overview of Android Activities

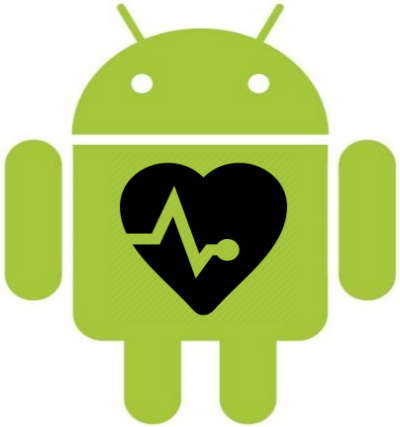
- An Activity is the most common type of Android component

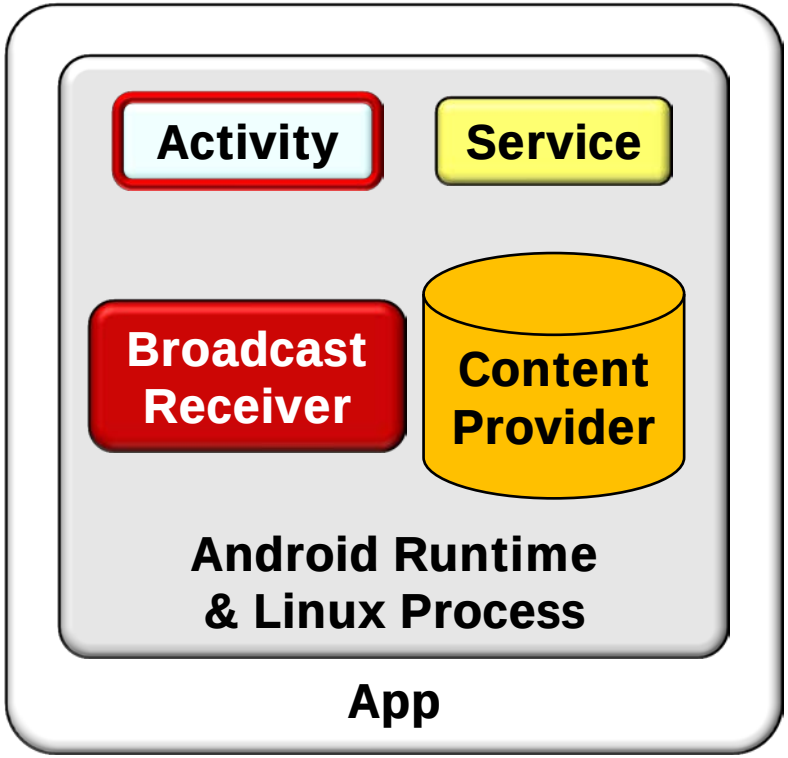


See developer.android.com/reference/android/app/Activity.html

Overview of Android Activities

- An Activity is the most common type of Android component
  - It's at the heart of all Android apps





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Overview of Android Activities

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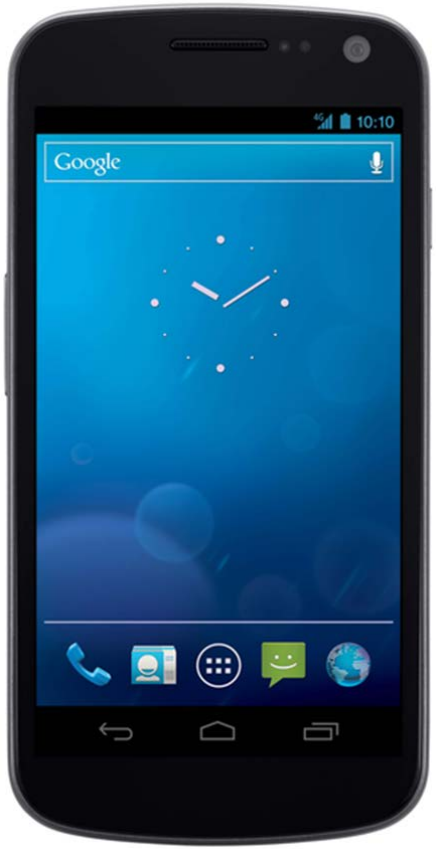

Overview of Android Activities

- An activity defines a user-facing operation that's displayed on a device screen, e.g.
  - Showing a login prompt

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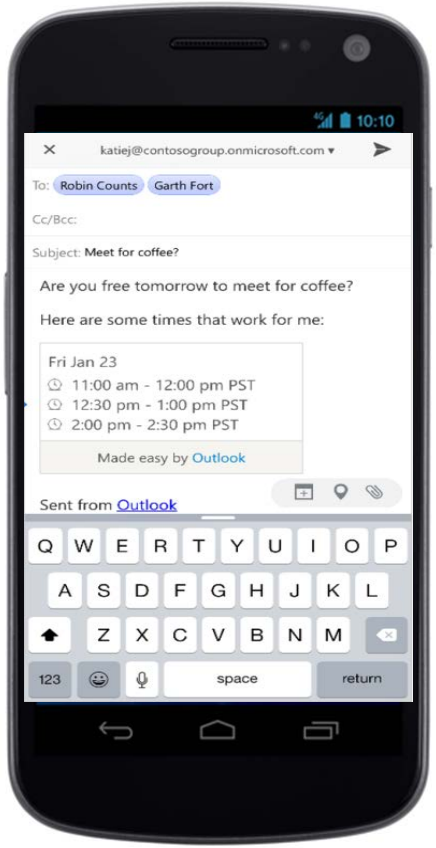

Overview of Android Activities

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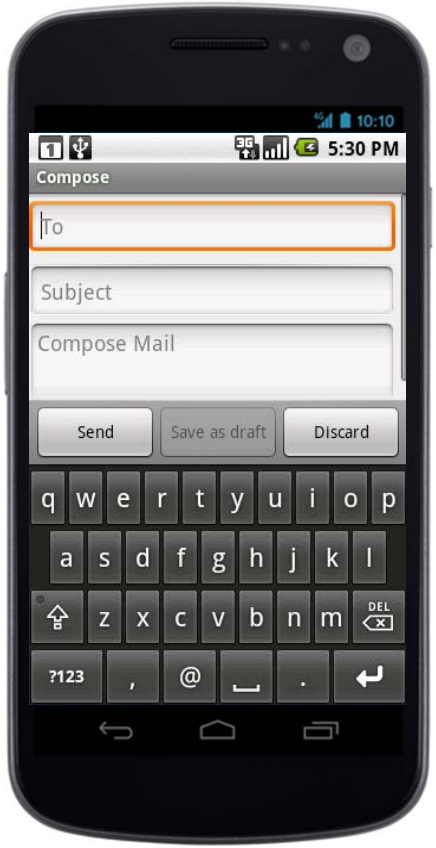

Overview of Android Activities

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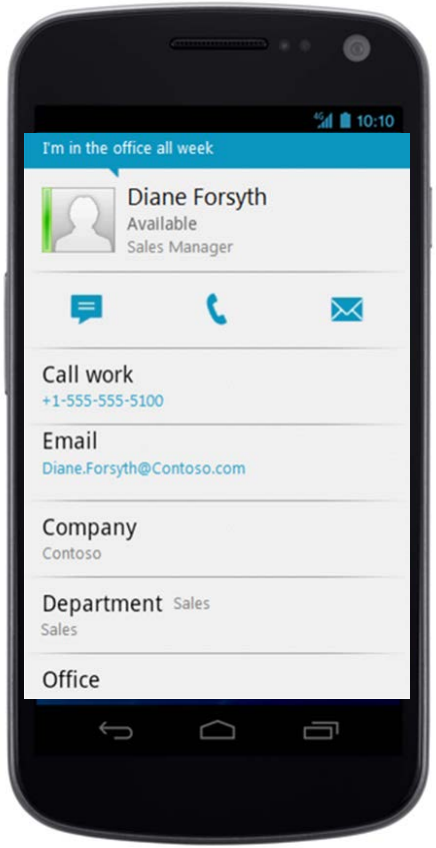

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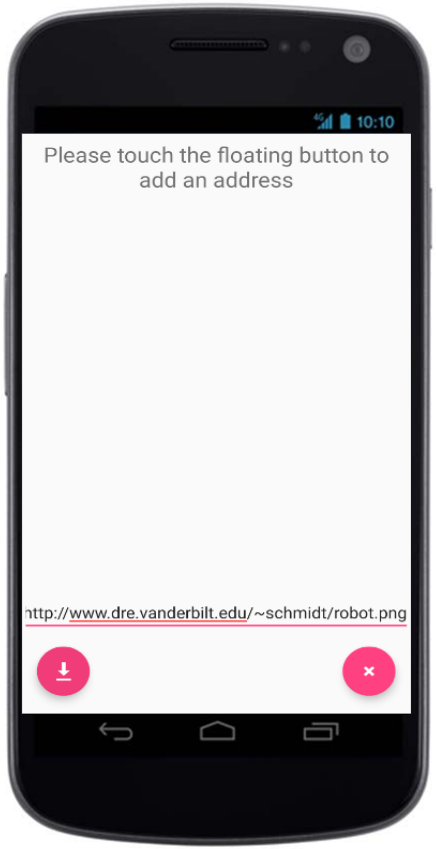
  - Browsing the Internet
  - Downloading



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  - Downloading & displaying an image

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  - Viewing a contact
  - Browsing the Internet
  - Downloading & displaying an image

Activities needn't provide a user-facing operation, though this is a common use-case

Overview of Android Activities

- An Android app may contains more than one activity

```
<application
    android:allowBackup="true"
    android:icon="@mipmap/ic_launcher"
    android:label="DownloadImageViewer"
    android:supportsRtl="true"
    android:theme="@style/AppTheme" >
    <activity
        android:name=".activities.MainActivity"
        android:label="DownloadImageViewer"
        android:windowSoftInputMode="adjustPan" >
        <intent-filter...>
    </activity>

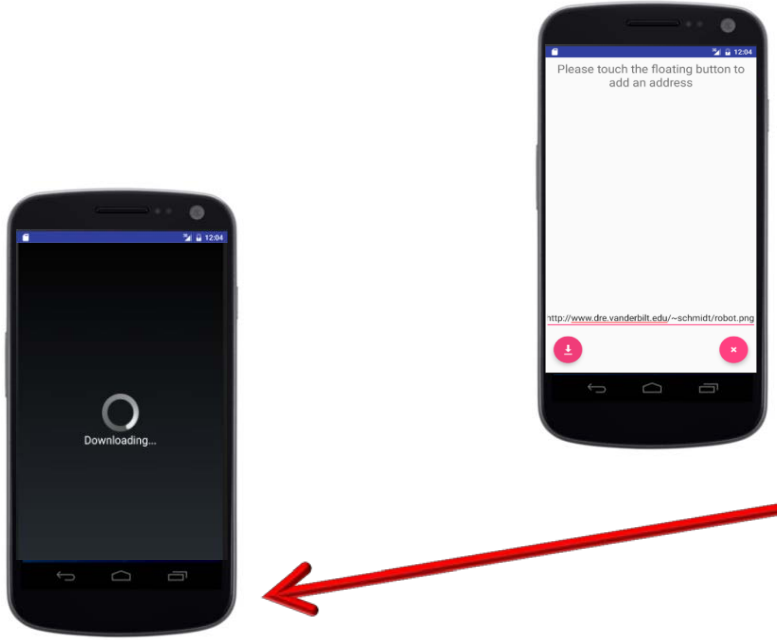
    <activity
        android:name=".activities.DownloadImageActivity"
        android:theme="@android:style/Theme.NoTitleBar">
        <intent-filter...>
    </activity>

    <provider...>
</application>
```

See developer.android.com/guide/components/activities.html

Overview of Android Activities

- An Android app may contains more than one activity
  - These activities are described in the AndroidManifest.xml file




```
<application
    android:allowBackup="true"
    android:icon="@mipmap/ic_launcher"
    android:label="DownloadImageViewer"
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```

See developer.android.com/guide/topics/manifest/manifest-intro.html

Overview of Android Activities

- An Android app may contains more than one activity
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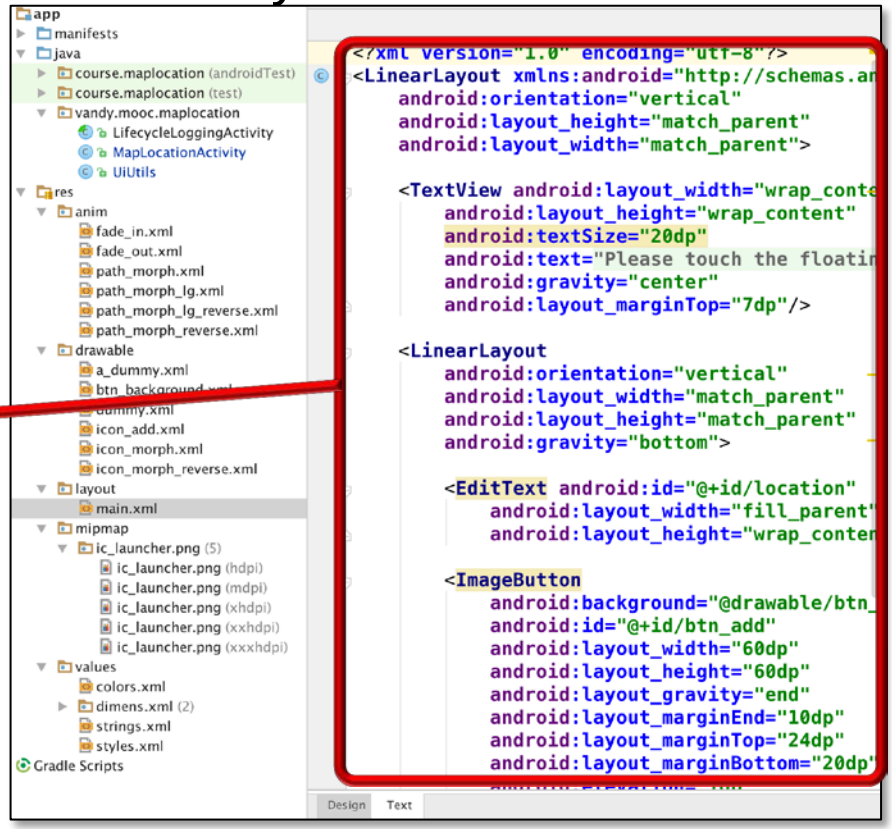
  - Other meta-data defines activity resources



See developer.android.com/guide/topics/resources/accessing-resources.html

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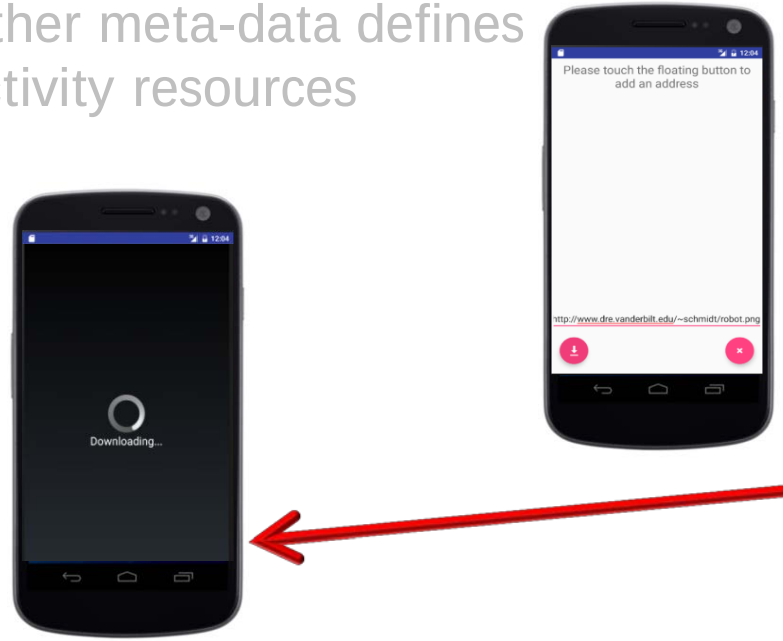


DownloadImageActivity.java

```
    */
   @Override
   protected void onStart() {
       //...
       super.onStart();

       // Make progress bar visible.
       mLoadingProgressBar.setVisibility(View.VISIBLE);

       Thread thread = mRetainedFragmentManager.get(THREAD);

       if (thread == null) {
           Log.d(TAG,
                   "onStart() creating and executing a Thread");

           //...
           Runnable DownloadImageTask = () -> {
               //...
               final Uri imagePath =
               DownloadUtils.downloadImage(DownloadImageActivity.this,
                       mRetainedFragmentManager.get(URL));

               // Set the result of the Activity.
               UiUtils.setActivityResult(DownloadImageActivity.this,
                                         imagePath,
                                         "download failed");

               // Run finish() on the UI Thread.
               DownloadImageActivity.this.runOnUiThread(() -> {
                       // This lambda runs on the UI thread.
                       Log.d(TAG, "runOnUiThread()");

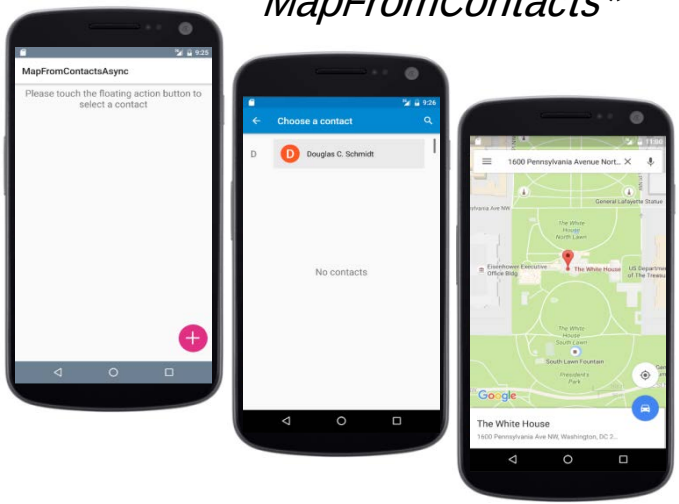
                       // Stop the Activity from running.
                       DownloadImageActivity.this.finish();
                   });
           };
```

Activity code itself is typically written in Java

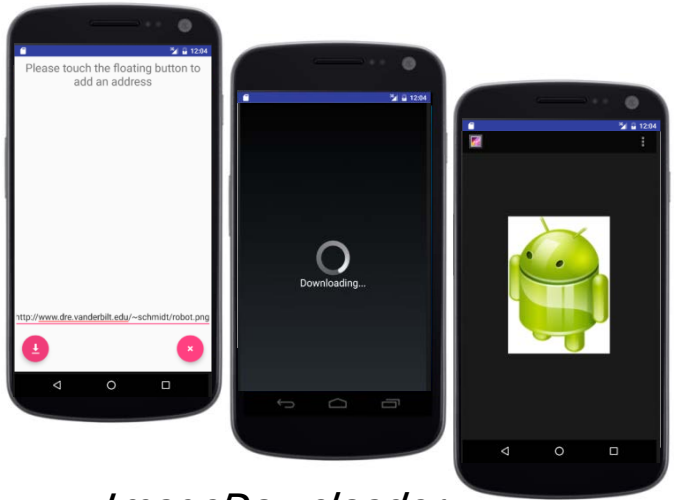
Overview of Case Study Apps

Overview of Case Study Apps

- Throughout this module we'll illustrate key elements & properties of activities via several representative apps



*MapFromContacts**



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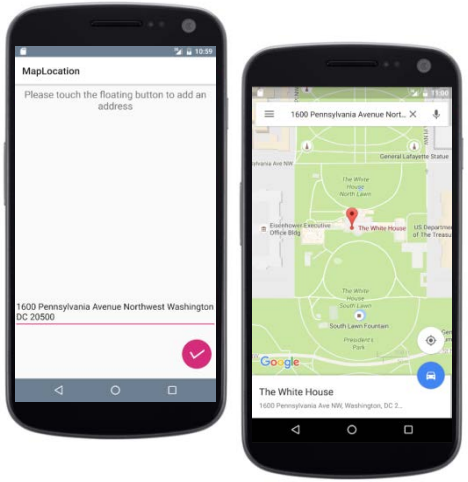

MapLocation

Overview of Case Study Apps

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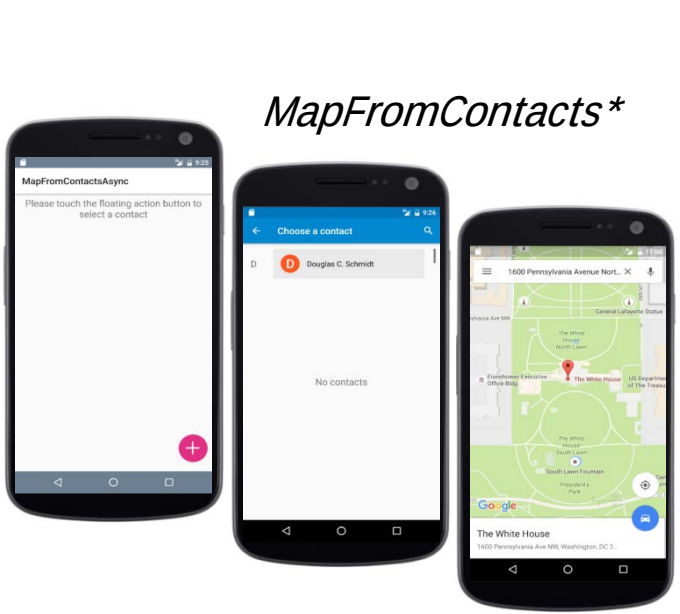
  - One app will look familiar, but the others are new



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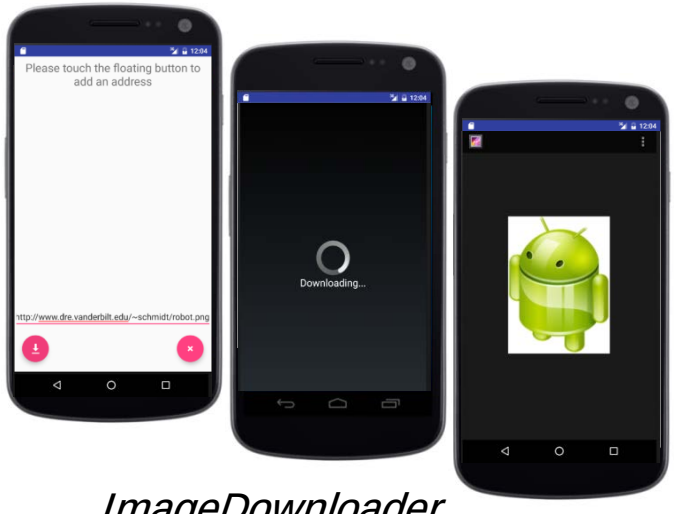

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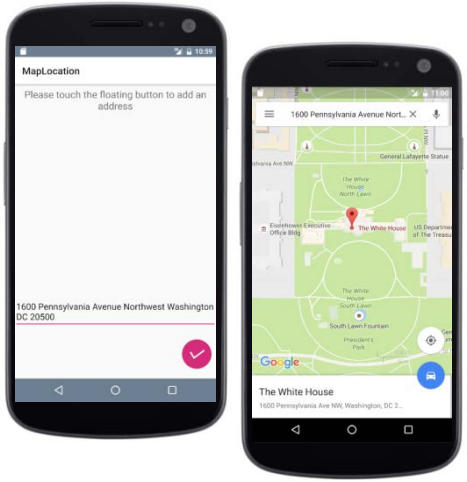

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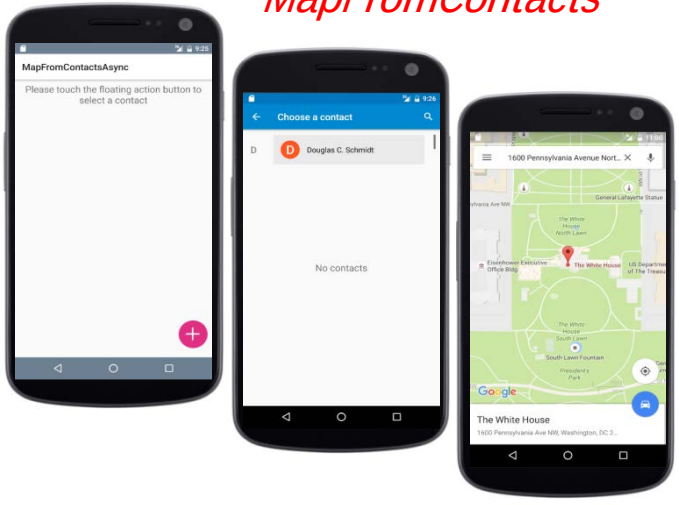

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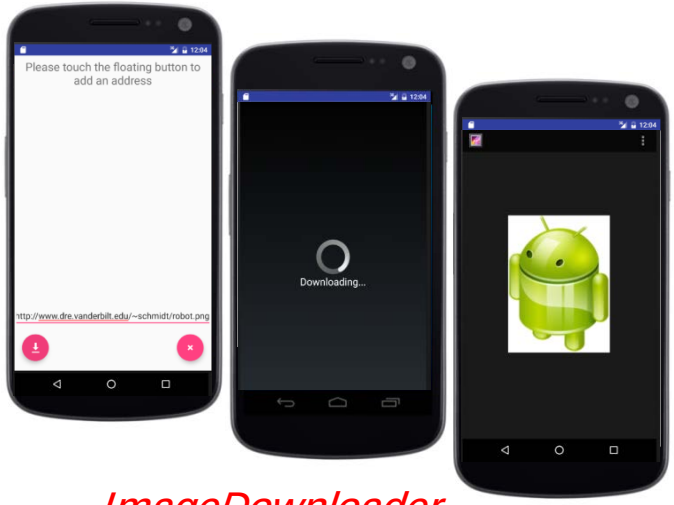

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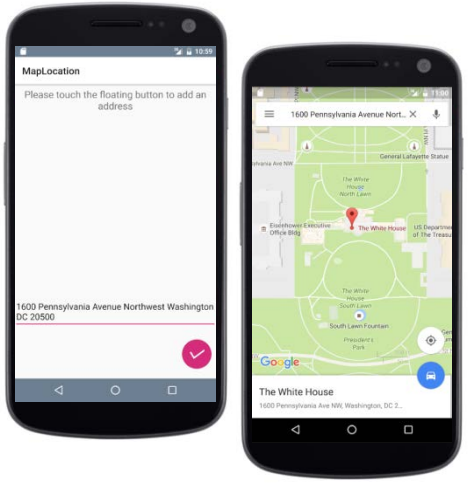
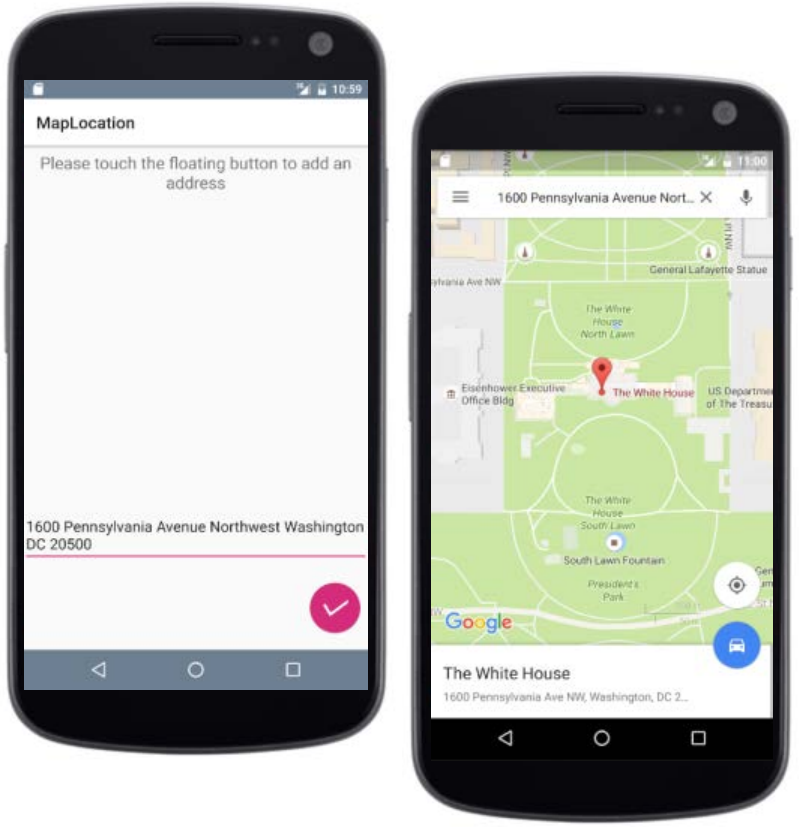


MapLocation

Source code for all these app case studies is available at gitlab.com/vandy-aad-2

Overview of MapLocation

- This app uses an intent & an activity to map a location from an address given by the user



See gitlab.com/vandy-aad-2/MapLocation

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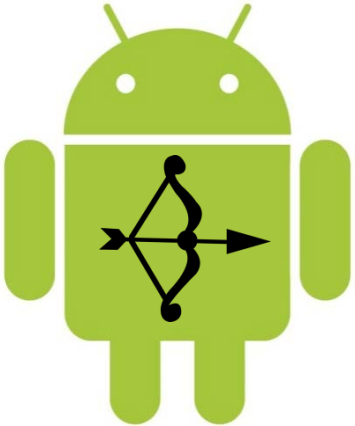
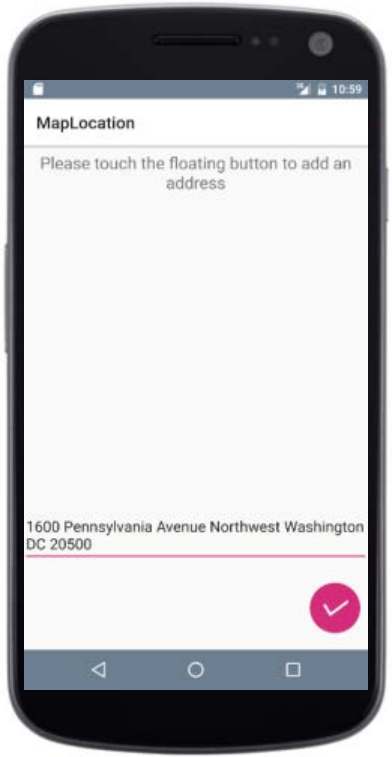
  - Earlier we reviewed this app's code wrt its use of intents





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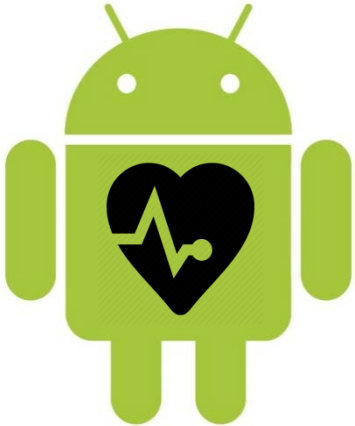
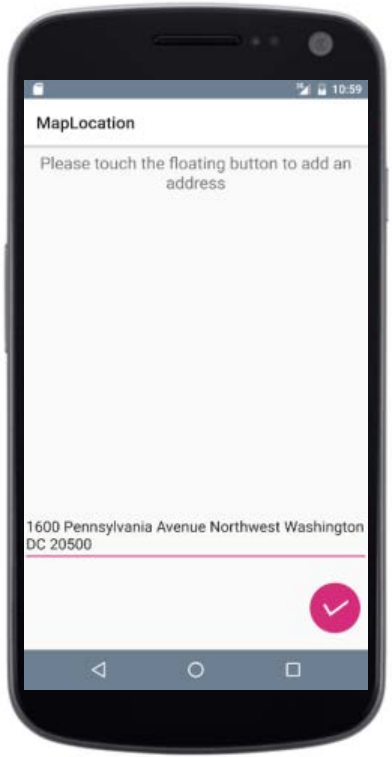
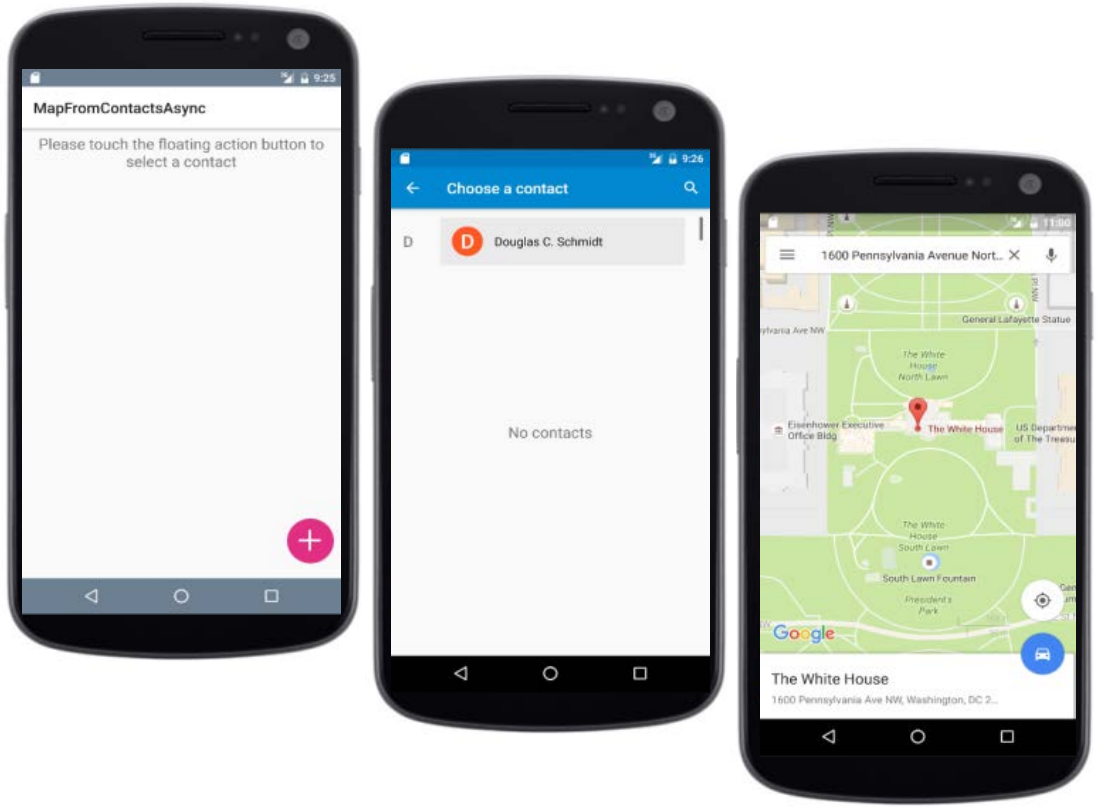
  - Now we'll review it wrt its use of activities





Overview of MapFromContacts*

- These apps uses an intent & an activity to map the address of a contact using Android concurrency frameworks



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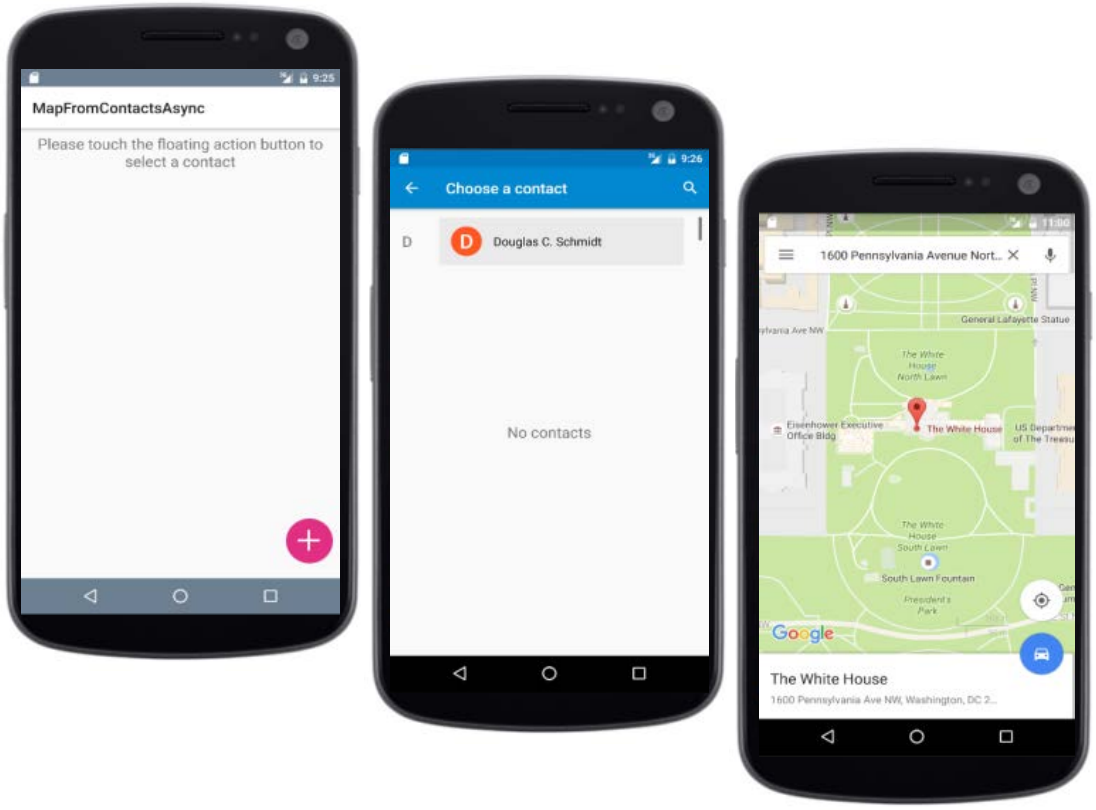
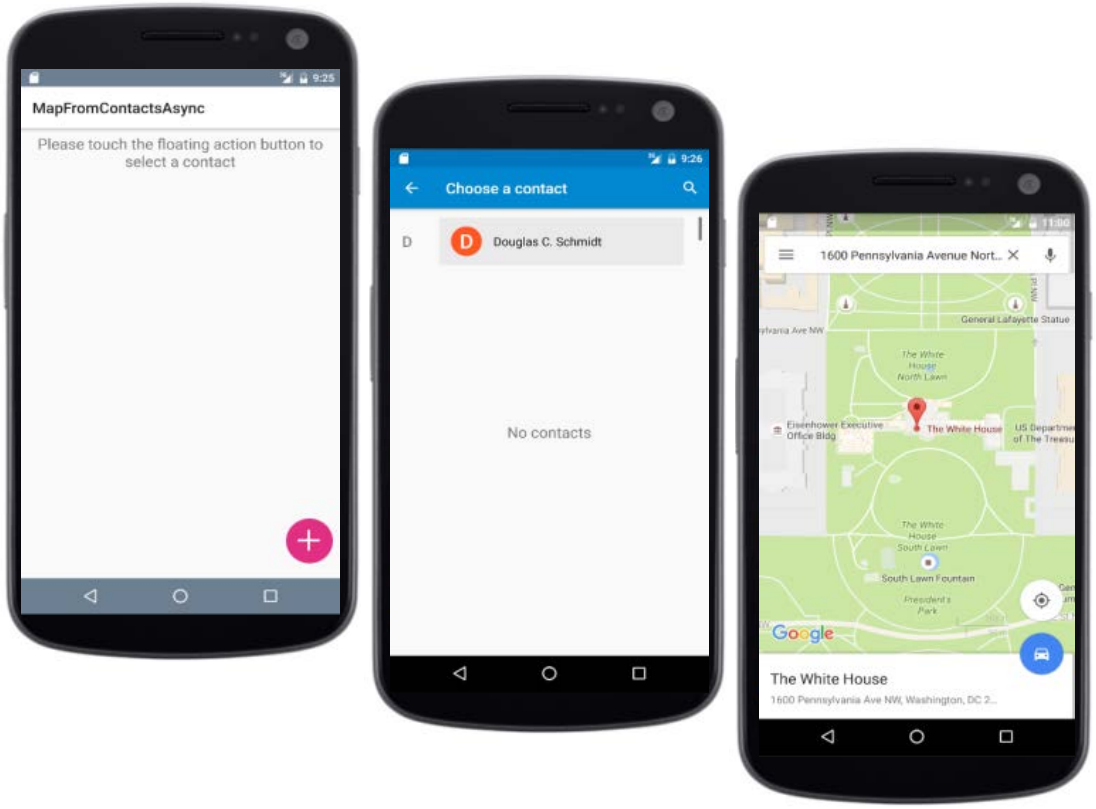
- These apps uses an intent & an activity to map the address of a contact using Android concurrency frameworks, e.g.
  - HaMeR framework



See gitlab.com/vandy-aad-2/MapFromContactsHaMeR

Overview of MapFromContacts*

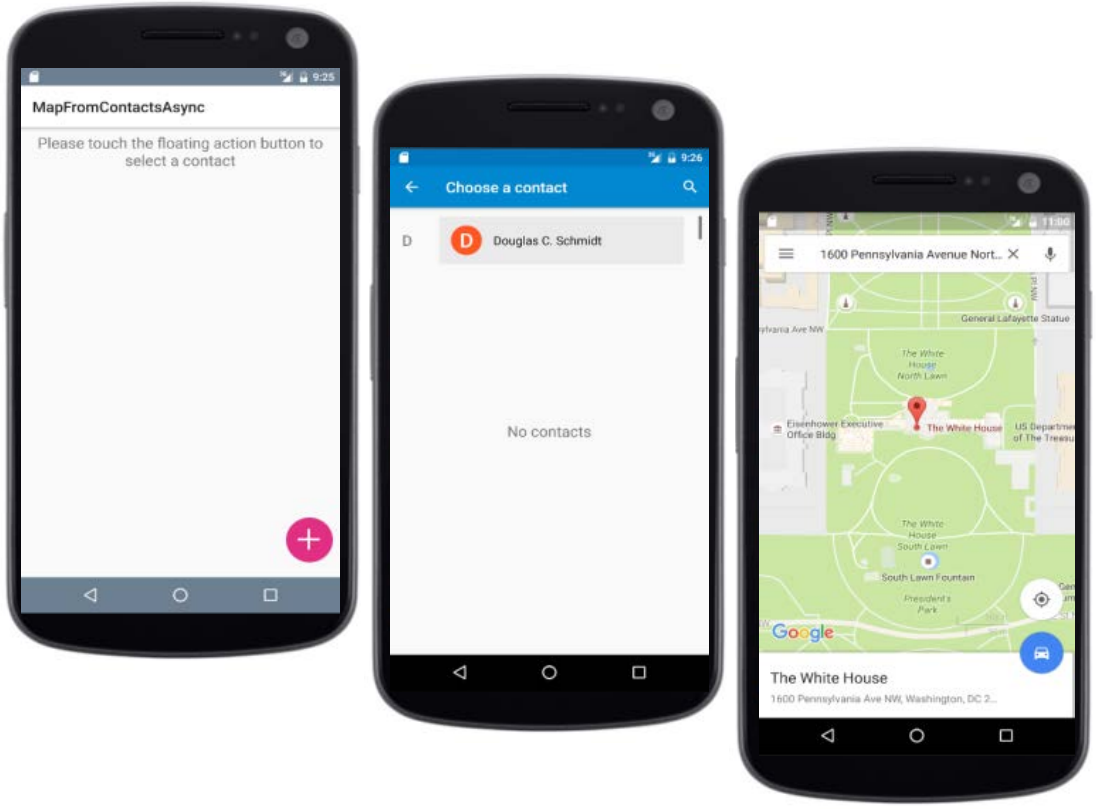
- These apps uses an intent & an activity to map the address of a contact using Android concurrency frameworks, e.g.
  - HaMeR framework
  - AsyncTask framework



See gitlab.com/vandy-aad-2/MapFromContactsAsync

Overview of MapFromContacts*

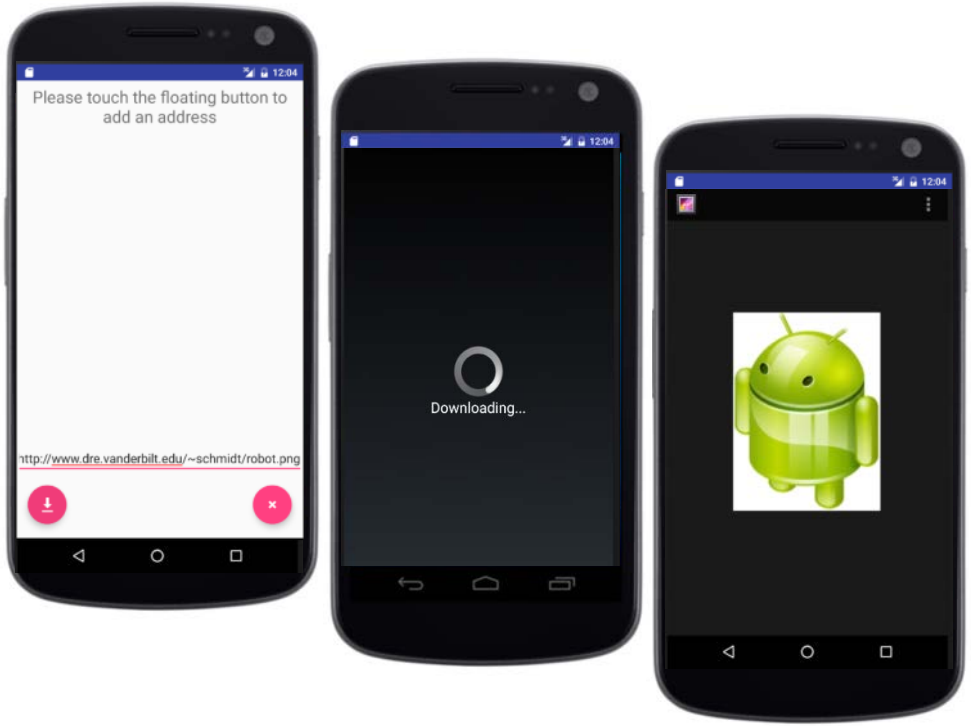
- These apps uses an intent & an activity to map the address of a contact using Android concurrency frameworks, e.g.
  - HaMeR framework
  - AsyncTask framework



We'll also examine this app's use of Content Providers in an upcoming course

Overview of ImageDownloader

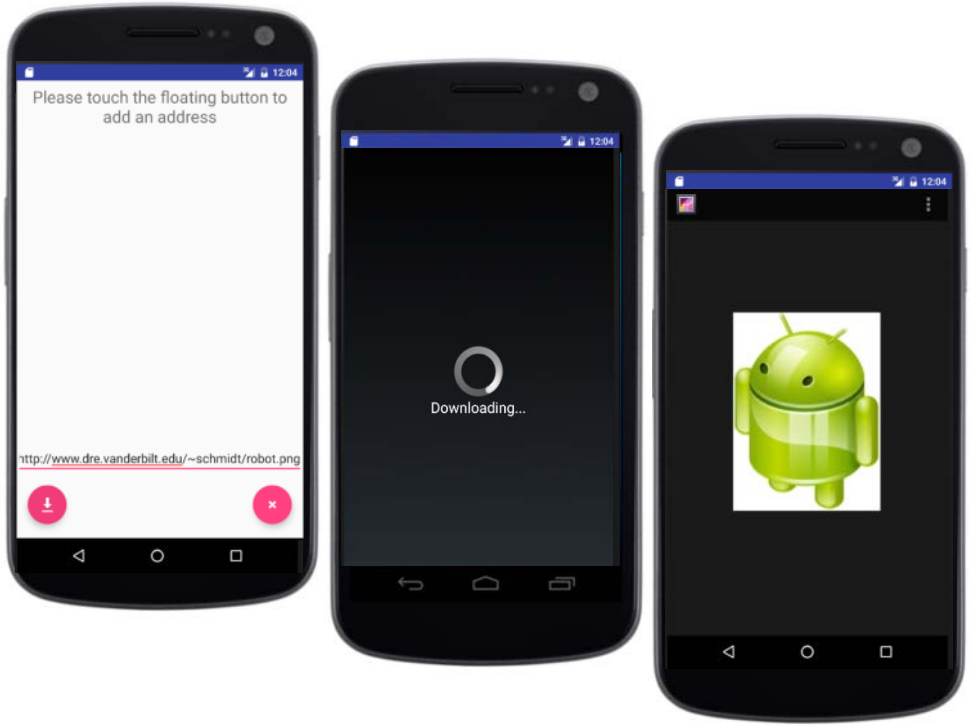
- This app uses an activity to prompt the user for a URL to an image & then uses intents & other activities to download the image & view it



See gitlab.com/vandy-aad-2/ImageDownloader

Overview of ImageDownloader

- This app uses an activity to prompt the user for a URL to an image & then uses intents & other activities to download the image & view it

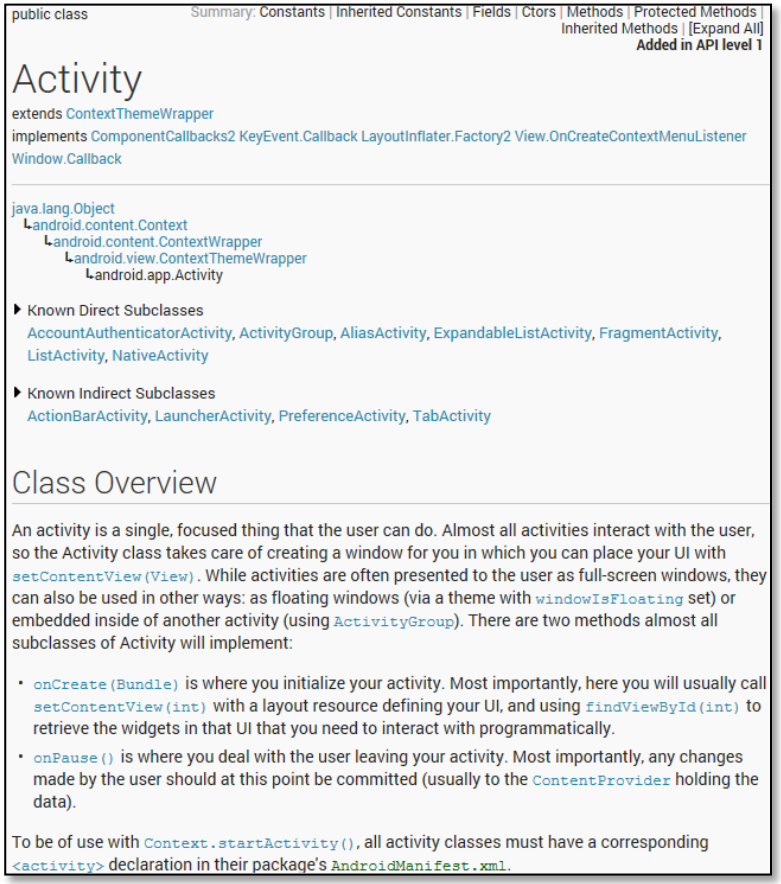


We'll also analyze variants of ImageDownloader in later courses

Steps for Implementing an Android Activity

Steps for Implementing an Android Activity

- Implementing an Activity involves multiple steps



public class — Summary: Constants | Inherited Constants | Fields | Ctors | Methods | Protected Methods | Inherited Methods | [Expand All]
Added in API level 1

Activity

extends ContextThemeWrapper
implements ComponentCallbacks2 KeyEvent.Callback LayoutInflater.Factory2 View.OnCreateContextMenuListener Window.Callback

java.lang.Object
↳android.content.Context
↳android.content.ContextWrapper
↳android.view.ContextThemeWrapper
↳android.app.Activity

▸ Known Direct Subclasses
AccountAuthenticatorActivity, ActivityGroup, AliasActivity, ExpandableListActivity, FragmentActivity, ListActivity, NativeActivity

▸ Known Indirect Subclasses
ActionBarActivity, LauncherActivity, PreferenceActivity, TabActivity

Class Overview

An activity is a single, focused thing that the user can do. Almost all activities interact with the user, so the Activity class takes care of creating a window for you in which you can place your UI with `setContentView(View)`. While activities are often presented to the user as full-screen windows, they can also be used in other ways: as floating windows (via a theme with `windowIsFloating` set) or embedded inside of another activity (using `ActivityGroup`). There are two methods almost all subclasses of Activity will implement:

- `onCreate(Bundle)` is where you initialize your activity. Most importantly, here you will usually call `setContentView(int)` with a layout resource defining your UI, and using `findViewById(int)` to retrieve the widgets in that UI that you need to interact with programmatically.
- `onPause()` is where you deal with the user leaving your activity. Most importantly, any changes made by the user should at this point be committed (usually to the `ContentProvider` holding the data).

To be of use with `Context.startActivity()`, all activity classes must have a corresponding `<activity>` declaration in their package's `AndroidManifest.xml`.

See developer.android.com/reference/android/app/Activity.html

Steps for Implementing an Android Activity

- Implementing an Activity involves multiple steps, e.g.
  - Extend the Activity class

```
public class LifecycleLoggingActivity
             extends Activity {

  ...
```

Steps for Implementing an Android Activity

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```

Provides a common interface for interacting with a user, including operations performed when moving between lifecycle states

See www.dre.vanderbilt.edu/~schmidt/PDF/Commonality_Variability.pdf

Steps for Implementing an Android Activity

- Implementing an Activity involves multiple steps, e.g.
  - Extend the Activity class
  - Override selected lifecycle methods

```
public class LifecycleLoggingActivity
             extends Activity {
  protected void onCreate
     (Bundle savedInstanceState) {...}
  protected void onStart() {...}
  protected void onRestart() {...}
  protected void onResume() {...}
  protected void onPause() {...}
  protected void onStop() {...}
  protected void onDestroy() {...}
  ...
```

Steps for Implementing an Android Activity

- Implementing an Activity involves multiple steps, e.g.
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Subclasses can override lifecycle hook methods to do necessary work when an Activity changes state

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             extends Activity {
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     (Bundle savedInstanceState) {...}
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  protected void onRestart() {...}
  protected void onResume() {...}
  protected void onPause() {...}
  protected void onStop() {...}
  protected void onDestroy() {...}
  ...
```

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Steps for Implementing an Android Activity

- Implementing an Activity involves multiple steps, e.g.
  - Extend the Activity class
  - Override selected lifecycle methods
  - Define other methods & nested classes needed to implement the Activity

```
public class MapLocationActivity
    extends LifecycleLoggingActivity {
  ...
  public void mapAddress(View view)
  {...}

  private void startMap() {...}

  private Intent makeMapsIntent
    (String address) { ... }

  private Intent makeBrowserIntent
      (String address) { ... } ...
```

Steps for Implementing an Android Activity

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```

This method is connected to a button via a layout XML file

Steps for Implementing an Android Activity

- Implementing an Activity involves multiple steps, e.g.
  - Extend the Activity class
  - Override selected lifecycle methods
  - Define other methods & nested classes needed to implement the Activity
- Update the AndroidManifest.xml file to include the Activity so Android knows about it

```
<manifest ...
   package="vandy.mooc.maplocation">
  ...
  <application
     <activity
        android:name=
        ".MapLocationActivity"
       <intent-filter> ...
       </...>
     </...>
     ...
```

If Activities aren't exported in AndroidManifest.xml they won't be accessible to other apps

See developer.android.com/guide/topics/manifest/manifest-intro.html

End of the Introduction to Android Activities (Part 1)